AMERICAN BARCODE
AND RFID

Bar Code Basics

Basic concepts for barcode and automatic identification beginners.

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Introduction

Barcode technology is becoming an essential tool for successful companies. Barcoding will bring to the new millennium what the internet has done for us in the last decade. In order for businesses to effectively utilize this technology, however, a base level of knowledge of how barcoding works is necessary. This guide will lead new end-users of barcode technology through the Barcode Basics and the devices that make them work.

History of Barcoding

Barcoding, also known as Automatic Identification (Auto ID), was invented in the early 1970s. It was created to help large retail and grocery stores process their goods. It used to be that Cashiers would take a product, enter the price into the register by hand, and the Cash Register would calculate change and print a receipt. Today, with the help of sophisticated computer systems, a series of numbers representing the product in the form of a barcode is scanned. The computer looks up the price in a master database (the price of a product is not in the barcode!), subtracts it from the store inventory, and calculates the change. The software also creates reports regarding inventory levels, shows what products are the most and least popular, creates demographic reports on individual products and customers, and tracks much more. The key to the whole system is accurate reporting of the product purchased. Cashiers are inherently fallible and slow. Barcoding is neither.

In the 1970s and 1980s, companies would hire teams of data entry professionals to enter repetitive information concerning warehouse inventory, shipping, and receiving. This laborious process took a lot of time and money and was grossly inaccurate. Barcoding became very essential for inventory tracking for many large and mid-size businesses throughout the 1980s. As the technology was adopted for industrial and warehousing applications, more commercial enterprises realized the value of improved data management and accessibility via barcoding. The use of data collection through barcoding expanded exponentially and standards were adopted.

Barcoding Today

Barcoding is happening everywhere. Doctor's offices and hospitals are revolutionizing patient care. Barcodes on medication and patient ID bracelets ensure medication is given to the right patient and surgery is performed on the correct body part. Law firms are barcoding their case files to help manage account files and more accurately report billable hours. Post Offices are extensively using barcodes to track packages all over the world. Rental car companies use barcodes to help facilitate quicker car rental/returns. Virtually every mid-size and large company employs barcoding in some manner; usually in shipping and receiving stations. And the retail industry is dependent on the valuable data barcodes provide concerning product purchasing patterns. There isn't one day when the majority of Americans do not come into contact with barcoding in some manner or another.

Barcoding benefits

Barcode data entry is at least 100 times faster and more accurate than traditional manual keyboard entry.

Data Accuracy

Accurate data is the single most important resource for any company. Precise data produces accurate reports on any operational function of a company and allows for more accurate predictions about the future needs and patterns of processes. Data accuracy is the biggest benefit of barcoding.

During the 1970s, it was common for large corporations to allow for data entry errors in 85 percent of transactions. By 1985, these same companies were striving to reach precise data tolerances of 90 percent. An integrated barcode system can increase these tolerances well into the 99th percentile. Organizations that cannot afford data entry errors, such as hospitals, crime labs, professional service organizations, and many manufacturing companies, are implementing barcoding systems to achieve near 100 percent accuracy in data reporting.

Efficiency

Barcoding also enables users to work faster. Barcode scanning improves data entry speed. It also alleviates the need for correcting data entry errors; a costly byproduct of manual data entry. Truly beneficial efficiency occurs when processes can become automated using barcodes. A shipping/receiving dock does not need a person dedicated to counting inventory just received if it is scanned as it is unloaded. Conveyor systems can efficiently route products to the correct destination when scanners read strategically placed barcodes on product bins. Stores do not need as many Cashiers to handle customers when each register is equipped with a scanner that can quickly and accurately scan barcoded products.

The real efficiency for businesses, though, occurs when these automated processes can be coordinated between different departments of the same company and other companies. When a barcode off of a medication bottle is scanned by a Home Health Care Provider delivery person at the residence of a patient, the information can be relayed from this person's vehicle back to the company, sent to Accounts Receivable for billing, and then tells the warehouse to subtract one more bottle from inventory. A good example of how barcoding allows companies to work with each other is Federal Express. Barcoding ensures that the record of a package's journey will be recorded at every stop along its trip. So if a company wants to know where their package is, they can look up the package's tracking number on FedEx's website and find out where it is. Much of this technology exists on its own, but it is barcoding that allows for the easy tracking and transfer of this information.

Consistency

Consistency is becoming more important to companies not only with the type of products they create or sell, but with how these products are sent to other companies that create or sell. Large companies need to receive products in a timely and efficient manner from their

suppliers. They do this by demanding that all of the companies they work with adhere to certain standard principles when using barcodes. This is called Compliance Labeling. By making sure these suppliers use a certain type of barcode placed in a certain way on the package, a dependable uniformity is established. That lets each company know what each of the different barcodes on the package represent. It also allows companies to preset their scanners to only read a certain type of barcode. This allows only the right company to read the right barcode off of the right product.

Where do you barcode?

Retail Operations

Barcode systems are most widely used in Retail Operations. The ability to track products from the manufacturer to every reseller and wholesaler to the customer who eventually purchases the product is essential for every retail establishment. Clothing stores need to know where their clothes are selling, what types of clothes are selling, and to whom their clothes are selling. Grocery stores need to know how quickly perishable items are being bought and which items are the most purchased. Barcoding allows for the easy recording of these events.

Receiving & Shipping Operations

Shipping companies depend on barcoding to get products transported quickly and efficiently from one transit hub to another. Just about every parcel traveling through the mail today is affixed with some sort of barcode to help aid in its travel. Without barcoding, delivery companies such as UPS would be unable to process the immense number of packages that flows through their systems each day.

Barcodes with internal information are placed on incoming products at receiving docks. These labels may include information regarding the supplier, purchase order number, product information, inventory location or other pertinent information. Companies may also print a small label to affix to the packaging slip or bill of sales to track the item at a later date. These products are then tracked internally to show they went to the right department or are warehoused accordingly.

Manufacturing Operations

The use of barcoding in manufacturing operations is increasing. Many factories are using barcoding in the production cycle to help track the product's progress and provide assembly and warehousing instructions. In a conveyor system, barcodes (usually on product bins) indicate the particular route a product must follow along the conveyor path to receive the appropriate parts. After the production cycle, many of these barcodes are still used as job tickets after the sale and help improve customer service and quality control. The information contained on the label, which serves as a guarantee of the product's original features and maintenance history, may improve product resale, thereby boosting the initial value of the item.

The durability of a label printer is paramount when considering it for manufacturing environments. Depending on the amount of labels to be printed daily, how the label is to be used, the type of physical dangers the printer is exposed to, and how often the printer is running non-stop, your choice of printer differs widely. Be sure to research what your options are before you pay for a several thousand dollar printer and it doesn't stand up to the requirements you had set out for it.

Asset Management

Many companies have a need to track company assets internally. Whether it's a tool shed where management needs to make sure all of the tools bought for the company stays with the company, or is used to manage taxation related to the depreciation of office assets, barcoding is the easiest way to track this process. For many companies, security management tasks require capital assets such as computers, office furniture, machinery, tools, and appliances be barcoded and tracked. This enables the company to record when items have changed locations, been maintained, or track what software has been loaded to what computer. This type of data can be invaluable for office managers tasked with the requisition and maintenance of a company's assets.

Warehousing

Whether by barcoding products entering receiving stations or by manually barcoding products already in inventory, barcoding trims inventory and costs associated with managing the supply of raw materials and finished goods. Barcoding allows people who physically move inventory in/out/throughout the warehouse, or pickers, to be much more efficient. Barcoding, Enterprise-wide computer systems, and warehouse management systems can produce real-time reports detailing every product in inventory, giving warehouse managers the confidence to improve inventory efficiency. The growth of pallet and shelf labeling because of barcoding has allowed many products too small or inconvenient to be barcoded to be grouped with like products in a barcoded area.

Office & Customer Service Applications

Many non-industrial and non-retail operations are beginning to adopt barcoding systems. Law firms, hospitals, and service organizations are using barcodes to mark files and identify clients. Electricians are barcoding cables and data ports to aid in identification. Home delivery professionals are using barcoding and signature capture devices to record transactions more accurately. Many companies are using small barcode printers for many types of internal tracking and mail.

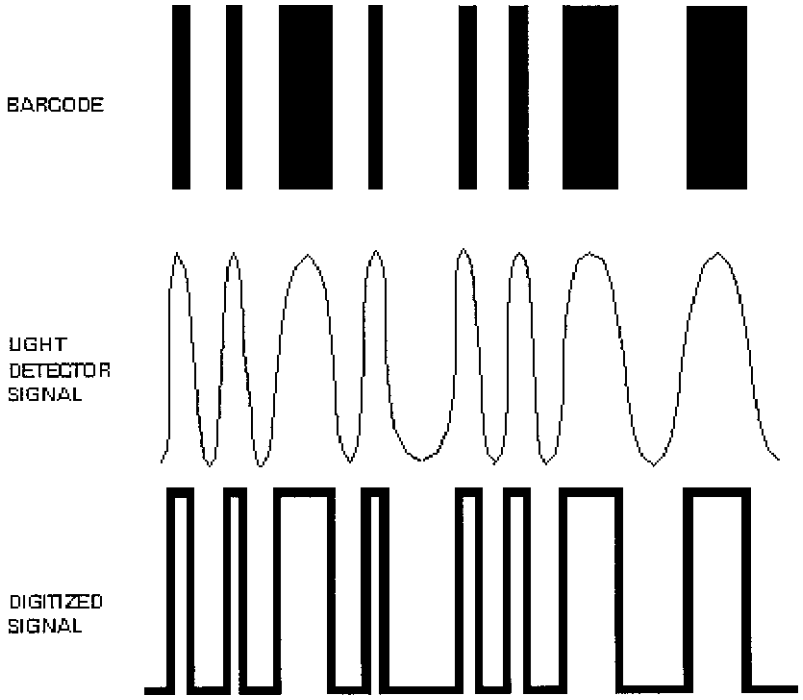
How does a barcode work?

Traditional one-dimensional barcodes are usually made up of black bars printed on a white background. The bars are either wide or narrow and the spaces between the bars are likewise either wide or narrow. The length of the bars have no significance other than to make it easier for the scanner to find the barcode.

Barcodes are measured by the width of the narrow bar and are recorded in mils, or 1/1000 inch. A 15 Mil bar code, for instance, has a narrow bar that is 15/1000 inches wide. Further, "quiet zones," or blank spaces to the left and right of barcode symbols, are included to insure the barcode can be read.

The process of reading a barcode begins when a device directs a light beam through a barcode. The device contains a small sensory reading element. This sensor detects the light being reflected back from the barcode, and converts light energy into electrical energy. The result is an electrical signal that can be converted into data. (See Figure 1)

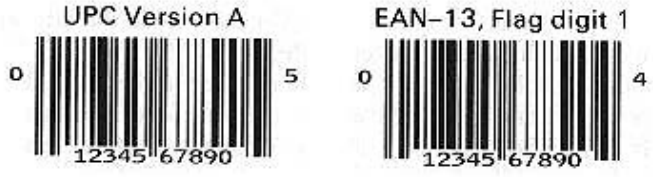
Figure 1



Types of barcodes

1-Dimensional

UPC /EAN



The most popular barcode format is the UPC (Universal Product Code) Format which we find on all supermarket products. Available since the early 1970's, this format is known worldwide and is universally recognized. A normal UPC code contains 12 numerical digits. The first digit tells what type of product the code is on (retail, pharmaceutical, etc.). The next five digits identify a specific product produced by that manufacturer. The last digit is a check digit used to tell if the barcode scanner read the first eleven digits correctly. Manufacturers of retail products must apply for a UPC barcode for that product by contacting the Uniform Code Council (UCC). The address and phone is *Uniform Code Council, Inc., Princeton Pike Corporate Center, 1009 Lenox Dr., Suite 202, Lawrenceville, New Jersey 08648, Telephone: 609-620-0200, Fax: 609-620-1200.*

In Europe the European Article Numbering (EAN) is used. It's similar to UPC, but contains an extra digit as part of the identification of the country where the product originated. To find out more about the EAN go to their website at www.ean.be/ .

Code 39

Code 39 is a two level code that is designed to encode both letters and numbers. The standard version encodes upper case letters A-Z, numbers and a few punctuation marks. The asterisk (*) character is always used as a start and a stop character. Extended Code 39 encodes all 128 ASCII characters. Code 39 has become standard for Government, Manufacturing, Barcode Industry, Education, and Business applications.

It is called Code 39 because each character is made up of nine elements, five bars, and four spaces. Three of the nine elements are wide, while the remaining six are narrow. Extended Code 39 uses certain character pairs to represent characters not normally present in Code 39. These added characters take the space that would normally yield two characters, so the resulting code is longer than normal Code 39 for a given number of characters.

Code 128

Code 128 is the best code to use when all 128 ASCII characters are needed. It is a four level code, meaning that bars and spaces can have four different widths. There are actually three versions of Code 128. The A version encodes all upper case alphanumeric characters plus all of the ASCII control characters. The B version encodes all upper and lower case alphanumeric characters. The C version encodes numbers only. It is possible to switch between character sets within the code by using shift characters. The advantage of Code 128

is that it can encode all ASCII characters in the shortest possible code length. The disadvantage is, because it has four different bar and space widths rather than two, more demands are put on printing and decoding technologies.

Interleaved 2 of 5

Interleaved 2 of 5 code is designed to encode numbers only. It is a two level code, meaning that the bars and spaces have only two widths. The code is interleaved in that one digit is represented by a series of five bars, two of which are always wide. The next digit is represented by five spaces, two of which are always wide. For this reason an I 2 of 5 code always contains an even number of digits. A leading zero is usually added if an odd number of characters are to be encoded. All codes have unique patterns at the start and end of the code. This tells the barcode reader which direction it is reading the code. Most all codes can be scanned front to back or back to front, as long as the scanner knows which way it's going. Because of the simple start/stop pattern it is possible for a decoder, looking for an I 2 of 5 code, to mistake printing for the code and try and decode it. Many times the decoder will be successful in decoding a two-digit code. To avoid potential problems with I 2 of 5 code, always use four digits or more. In addition, always try to use the same number of digits and program your decoder to only accept a code with only that number of digits.

2-Dimensional

In 1984 the trend to portable databases began when the Automotive Industry Action Group (AIAG) published an application standard for shipping and parts identification labels which consisted of four "stacked" Code 39 barcodes. These contained part number, quantity, supplier, and serial number.

Intermec introduced the first truly two-dimensional barcode in 1988 called Code 49. Since Code 49's introduction, six other codes have either been invented or have been redesigned to meet the need to place a portable database in as little space as possible.

The main difference between a 2-dimensional code and a 1-dimensional code is that the height as well as the length of the symbol stores information. In fact, a 2-dimensional code is often referred to as a stacked symbology or multi-row code.

Initially, 2-dimensional symbologies were developed for applications where only a small amount of space was available for an Auto ID symbol. The first application for such symbols was unidose packages in the healthcare industry. The electronics industry also showed an early interest in very high density barcodes because free space on electronics assemblies was scarce.

There are well over 20 different 2-D symbologies available today. The following is a list of a few of the more popular.

PDF 417

The PDF 417 and Data Matrix codes are the most commonly used 2-dimensional symbologies today. PDF 417 is a stacked symbology and was invented by Ynjiun Wang in 1991 at Symbol Technologies. PDF stands for Portable Data File, and the symbology consists of 17 modules each containing 4 bars and spaces (thus the number "417"). The structure of the code allows for an information density of between 100 and 340 characters. The code is in the public domain. General Motors announced in February of 2000 that all of its suppliers must convert to a PDF 417 standard for all parts and shipments.

Data Matrix

Data Matrix from CiMatrix is a 2-D matrix code designed to pack a lot of information in a very small space. A Data Matrix symbol can store between 1 and 500 characters. The symbol is also scalable between a 1-mil square to a 14-inch square. Since the information is encoded by absolute dot position rather relative dot position, it is not as susceptible to printing defects as is traditional barcode. The coding scheme has a high level of redundancy with the data "scattered" throughout the symbol. According to the company, this allows the symbol to be read correctly even if part of it is missing.

The most popular application for Data Matrix is the marking of small items such as integrated circuits and printed circuit boards. These applications make use of the code's ability to encode approximately fifty characters of data in a symbol 2 or 3mm square and the fact that the code can be read with only a 20 percent contrast ratio.

The code is read by CCD video camera (also called an Imager) or CCD scanner. Symbols between one-eight inch square to seven inches square can be read at distances ranging from contact to 36 inches away. Typical reading rates are 5 symbols per second.

There are many other 2-dimensional symbologies. Some are proprietary while others have been introduced to the public. To ensure industry standards, not all of these symbologies can be used. But the following list provides good examples of how 2-dimensional symbologies have evolved into what are standards today. Here is a list in alphanumeric order of many of the other 2-dimensional symbologies in use.

3-DI

3-DI was developed by Lynn Ltd. and is a proprietary code. It is most suited for identification marks on shiny, curved metal surfaces such as surgical instruments.

ArrayTag

ArrayTag was invented by Dr. Warren D. Little of the University of Vistoria and is a proprietary code. ArrayTags can encode hundreds of characters and can be read at distances up to 50 meters and is optimized for reading at a distance or in variable lighting situations. The principle application of the code is to track logs and lumber.

Aztec Code

Aztec Code was invented by Andy Longacre of Welch Allyn Inc. in 1995 and is in the public domain. Aztec Code was designed for ease-of-printing and ease-of-decoding. The smallest Aztec Code encodes 13 numeric or 12 alphabetic characters, while the largest symbol encodes 3832 numeric or 3067 alphabetic characters.

Code 1

Code 1 was invented by Ted Williams in 1992 and is the earliest public domain matrix symbology. The symbol can encode ASCII data, error correction data, function characters, and binary encoded data. Code 1 can hold 2218 alphanumeric characters or 3550 digits. This code is currently used in the health care industry for medicine labels and the recycling industry to encode container content for sorting.

Code 16K

Code 16K was developed by Ted Williams in 1989 to provide a simple to print and decode multiple row symbology. Williams also developed Code 128, and the structure of 16K is based on Code 128. Not coincidentally, 128 squared happened to equal 16,000 or 16K for short. Code 16K resolved an inherent problem with Code 49. Code 49's structure requires a large amount of memory for encoding and decoding tables and algorithms. 16K is a stacked symbology.

Code 49

Code 49 was developed by David Allais in 1987 at the Intermec Corporation to fill a need to pack a lot of information into a very small symbol. Code 49 accomplishes this by using a series of barcode symbols stacked one on top of another. The code is a continuous, variable-length symbology that can encode the complete ASCII 128-character set. Its structure is actually a cross between UPC and Code 39. Intermec has put the code in the public domain.

CP Code

CP Code is a proprietary code developed by CP Tron, Inc. It is made up of square matrix symbols with a L-shaped peripheral Finder and adjacent timing marks. CP Code is visually similar to a Data Matrix Code.

DataGlyphs

DataGlyph is a proprietary code developed by Xerox PARC. DataGlyphs are designed to merge with the design of the product they are printed on. DataGlyphs can be logos or tints behind text or graphics. Applications include questionnaires, direct-mail reply forms and surveys and business cards. This symbol is read using an image scanner.

Datastrip Code

Datastrip Code was originally called Softstrip and was developed by Softsrtip Systems. It is the oldest of the 2-dimensional symbologies. It is a patented encoding and scanning system that allows data, graphics, and even digitized sound to be printed on plain paper in a highly condensed format and read error-free into a computer.

Dot Code A

Dot Code A (also known as Philips Dot Code) is one of a limited number of dot code symbologies. This symbology was designed for unique identification of objects in a relatively small area, or for direct marketing by low precision marking technologies. The symbol consists of a square array of dots ranging from 6 x 6, to 12 x 12, the latter enabling over 42 billion, billion, billion, billion individual items to be distinguished. Applications include the identification of laboratory glassware and the marking of laundry.

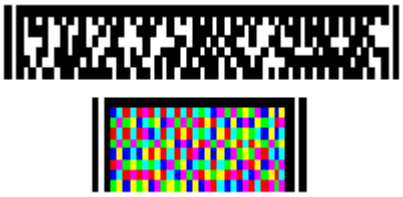
MaxiCode

Maxicode (originally called UPSCode) is a matrix code developed by United Parcel Service in 1992. However, rather than being made up of a series of square dots, MaxiCode is made up of an a 1-inch by 1-inch array of 866 interlocking hexagons. This allows the code to be at least 15 percent denser than a square dot code, but requires higher resolution printers like thermal transfer or laser to print the symbol. Approximately 100 ASCII characters can be held in the 1-inch square symbol. The symbol can still be read even when up to 25% of the symbol has been destroyed and can be read by CCD camera or scanner.

SuperCode

SuperCode was invented by Ynjiun Wang in 1994 and is in the public domain. The symbology uses a packet structure, a variant of a multi-row symbology. The maximum number of data characters per symbol at the lowest level of error correction is 4,083 alphanumeric data characters. SuperCode symbols have error correction codewords, based on Reed-Solomon error correction algorithms, which can be used not only to detect errors but to correct erroneously decoded or missing codewords. A user may select one of 32 error correction levels.

Ultracode



Ultracode was developed by Zebra Technologies and is in the public domain. The Ultracode symbologies differ from most 2-dimensional, error-correcting barcodes in that they have a long, thin aspect ratio similar to existing linear barcodes and are not positioned as high-capacity symbologies. Ultracode is especially suited for direct printing with low linear precision.

When do you barcode?

As barcoding takes hold of the business world, how do you know if your company should barcode? First, let's dispel the myths. Many industry salespeople will generally say that an Auto ID (Automatic Identification; barcoding) System will pay for itself in two years. This is a gross generalization. The degree of benefits received from barcode utilization will depend on the correct and thorough implementation of that system. If barcodes are used on all of the appropriate materials of a particular environment (warehousing, shipping/receiving, or accounting, etc.), appropriate scanners are abundant and in place, and employees are sufficiently educated as to the use and benefits of the system, then general results should be immediate. Barcodes placed on goods to spare employees from manually entering each product's price or serial number should show drastic improvement in input time. This will lead to labor cost reduction. Other immediate cost savings Auto ID creates are in improved customer service and supplier response times, capital and inventory management, space management and equipment costs.

There are also some benefits that can be realized once barcoding is proven to be an effective tool. Once the data entry on the production line is automated, can production be increased? If each product has a unique barcode, can the company fulfill customized solutions? Once inventory is monitored in real time, can warehousing costs be trimmed? There are many hidden gains to barcoding if implemented correctly. The biggest downfall of an Auto ID System is the partial implementation of it by uneducated and unaffected personnel who work with it. It is an all or nothing proposition. Good data will be obtained only if the data represents the whole process. A company cannot barcode some inventory and ignore the

rest. That yields inaccurate inventory reports. Partial implementation does not work and is not cost efficient enough to implement an Auto ID System.

Buy labels or print your own?

So you have decided to implement a barcoding system, but don't know how to start. Thousands of companies order pre-printed labels rather than investing in a barcoding system of their own. Pre-printed labels are useful in operations that require only a low volume of identical or serialized labels, often with extensive use of color or graphics. The benefits are clear. An organization that has relatively few different products, or is required by another company to barcode their products (compliance labeling) cannot afford to implement a system on their own can still have an Auto ID system where the labels are printed for them.

The restrictions are also clear. Only generic information can be recorded about the product. As the products produced diversify, or as more detailed information about the products becomes necessary, a barcode system in-house becomes necessary.

Many companies start out buying pre-printed labels, but quickly realize the value of an in-house system. One of the ways companies manage to split the cost is by buying a barcode system that can manage the basics of what is needed while still purchasing pre-printed labels requiring many colors or graphics. This way, companies have a correctly configured label, but also the ability to print additional information on the label specific to the product it will be placed on.

There are many varieties of labels for a variety of applications. Label materials and adhesives differentiate substantially for the variety of applications they can be used for. Anyone needing to know what label they should use for their own application should contact an industry professional at 1-800-274-0324 or visit www.zebrasupplies.com. There are many standardized labels and sizes that are immediately available. There is also a Custom Label Form if your label needs are not standard.

Compliance Labeling

Many large companies demand their suppliers produce labels in a particular format. If a supplier does not submit products with labels of this particular format, "chargebacks," or fines, may be charged. This presents a complex problem to suppliers especially if they supply multiple large companies demanding compliant labels. Many organizations are taking the lead in setting standards for other large companies to standardize the labels suppliers must comply with. One such organization,The Automotive Industry Action Group (AIAG), sets car industry standards for its many suppliers.

How do I print a barcode?

Ink Jet Printing

The least expensive approach to printing barcodes, ink jet printing is not acceptable for most applications. Most ink jet printer inks are water-based. This lets the barcode streak, run, or

blur when it comes in contact with water. Even non-soluble inks are not recommended for barcode production. This type of ink produces a shine that interferes with the reflective light a scanner uses to read the barcode. Additionally, these printers are too slow for most applications and cannot reproduce a barcode with acceptable accuracy.

Dot Matrix Printing

Dot Matrix printing, the process where pigment is transferred from a ribbon onto the substrate via a hammer or pin, is virtually unusable for barcoding. Most of the reason lies with the inaccurate dot placement and low resolution of the printing technology.

Laser Printing

Laser printing can be used for small batch barcode printing, but only if kept a close eye on. Laser printing provides a good quality print, but has many drawbacks. A laser printer can only print a sheet of labels at a time which is not very time efficient and wasteful. It is also subject to toner flaking and smudging. Laser printers cannot be used for high volume printing and are not very rugged. And sheet labels are normally quite inconvenient for peeling.

Thermal Transfer Printing

Thermal transfer printers use a heated printhead to create an image on a label. Thermal transfer printing is noted for creating crisp, often glossy images and barcodes using a thin ribbon roll that, when heated by the printhead, melts onto the label the desired image. When matched with suitable media, thermal transfer technology is not only impervious to heat and moisture, but the image can not be rubbed off, making the printed labels the most durable available.

Direct Thermal Printing

Direct thermal printers utilize heat-sensitive media that blackens as it passes under the printhead. This simple process creates a clear and crisp image that typically has a considerable shelf life. Direct thermal printers are just as solid as thermal transfer printers. However, for labels that may be subject to extended amounts of heat, thermal transfer printing may be a better alternative.

Selecting the printer that is right for you is not as intimidating as it first appears. By describing the barcoding functions in specific terms and answering a few simple questions, users can narrow their printer choices considerably. The primary questions to ask are:

- What are the intended uses of the bar code labels?
- Where will the printers be located?
- In what kind of environment will the printers operate? (temperature fluctuation, vibration, high humidity, exposure to chemicals, etc.)
- What are the anticipated duty cycles for the printers?
- Are there any minimum speed requirements?
- What are the dimensions of the labels to be used?

- How frequently do label specifications change?
- What kind of environments will the labels be exposed to? (temperature fluctuation, abrasion, high humidity, exposure to chemicals, etc.)
- Will the printer be connected to a network ort connected to stand-alone terminals?
- What is the budget for the project?

Software

What software can I use?

For companies that only need to track small amounts of data and do not need to print barcodes out on labels, Access, Excel, Word or Clipper can be used for an application where barcodes need to be scanned or printed. You need to get a scanner that has a "keyboard wedge interface" and a built in decoder or a "software wedge" and a scanner with serial output. A wedge interface works like a really fast keyboard so it's easy to connect and use. Some wedge readers are programmable, so that after the scan, a "return" or tab will be produced to move the cursor to the next field. If you are using Access, the barcode data will directly to the active text box, when you are using Excel the data will go directly to the selected cell. If you are using Word, the data will go directly to where your cursor is positioned. Scanned barcode data looks to your PC just as if it is typed on the keyboard.

To print barcodes you can use a TrueType Font. There are some problems with TrueType Font barcode printing. The fonts may not print properly for very small or very large point sizes. If you want to print a barcode in a report or document (from Word or Access for example), the easiest TTF to use is Code 39. You have to pre-pend and post-pend the "*" to the data you want to print as barcode and then just change the font to Code 39. To change from your default text font to a specific barcode font, use the same font selection window normally used to change between various text fonts. This window will have both regular text options as well as barcode font options.

If you need to print in Access 2000, try "*" & [FieldNameWithValue] &"*". If you need to print using clarion, the format is loc:barcode='*'&left(clip(KAT:ID_NUMBER))&'*'.

A better solution for printing labels is a stand-alone program to print the labels. Many of these programs can connect to Access via ODBC and will let you print labels from a database. For example, you can list all the parts that you have in a database and have the label program pull the part numbers from Access and print them on a label printer rather than typing them by hand each time you want to print.

Quicken or Quickbooks can receive barcodes with a little work. The way you do it is similar to the answer above regarding using barcodes with Access, Excel, or Word. Use a keyboard wedge barcode reader to scan the data in as if it were typed. If you have a part number you are deducting from inventory, you make sure that the cursor is in the part number box in Quickbooks, then scan the barcode.

If you want to scan a series of barcodes and do a batch update at the end of the day, you could write a VBA (Visual Basic for Applications) program in Excel to store the data in a

complete record form. At the end of the day, you use Excel to generate a csv or txt file and use that, with the import feature of Quickbooks, to update the master record. If you try this, be sure to make a back up of your master record. If you don't import correctly, you can overwrite your data.

What software should I use?

There is a lot of software available developed specifically for barcode receiving/printing. Some of this software focuses only on label design like BarOne by Zebra Technologies. Many others focus on certain areas of Data Management. Intellitrack from PSC handles a variety of Data and Inventory Management Solutions with its Inventory, Fixed Assets, Shipping/Receiving, StockRoom, Check In/Out, and ToolRoom modules. There are many types of software programs for many type of applications. These software programs work seamlessly with many of the popular database software programs to print the right labels. Investigate all software to see if it's compatible with your system and the hardware you will be using to collect and print barcodes.

Input Devices

Portable Data Collectors

Portable data collectors are non-cabled devices used for collecting barcode and text based information to be inputted into a central database. There are key-based and pen-based terminals. Of the key-based terminals, there are hand-held, stationary, and vehicle mount portable data collection devices. These devices usually have screens and keypads. They also transmit information either through a Radio Frequency (RF) connection or Batch. Batch transmission, the most common, means the information is physically attached to a communication port (cradle, RS232 port, keyboard wedge, etc.) and all of the information collected over a period of time is downloaded all at once. RF transmission sends the information to a com port via radio waves and is virtually instantaneous. As expected, RF equipment is usually more expensive than batch equipment.

Pen Terminals

The pen-based terminals are usually large screened data collectors and uses pens and very few keys to input data. Palm Portable Data Assistants (PDA) are the most well known of the pen-based terminal family. Many ruggedized versions of the Palm and other large screen devices allow those who are familiar with Palm technology to more easily adapt to barcode technology.

Wand Scanners

Another way to input barcode information is with a scanner. Pen wands, CCD's, lasers, and imagers make up the scanning group. Pen wands are rudimentary pen like devices attached to computers that emit a laser which must be dragged across a barcode to read it. This device is the least accurate and reliable. People with laptops who scan very few documents mostly use it.

CCD Scanners

Charged-Couple Devices (CCD) are hand held scanners used for short range scanning (0 - 3"). CCDs are attached by cable to a computer. Cheaper than laser scanners, CCDs are very popular in the retail industry.

Laser Scanners

Laser scanners are the most popular input devices. Laser scanners come in hand-held, fixed and counter versions. Some hand-held laser scanners are used for very small and dense barcodes. Many are used for scanning ranges between (3" - 18"). Some scanners can even scan up to 50 feet. There are office scanners and highly rugged industrial scanners. The majority are hand held and corded, but others are cordless or are body scanners that wrap around a person's arm.

Fixed laser scanners are most commonly seen in warehouse conveyor environments. Scanners are affixed in a position that would be able to read labels on boxes or totes passing down the conveyor.

Counter versions of laser scanners can be either in the counter or on the counter. Often they emit multiple lasers to allow the operator to pass an item at many different angles in order to scan the product.

Imager Scanners

Imagers are scanners that basically take a picture and uses software to apply algorithms to the barcode to decipher the data. They can also be used to capture signatures should the application require it. Imaging technology, while expensive, provides many appealing benefits beyond traditional laser barcode scanners.

RFID

The most anticipated development in barcode data collection is Radio Frequency Identification. This technology, which is too expensive for most organizations to utilize currently, allows for the reading of information through devices on the product that emit radio waves. This device may be in form of a button, tag, or imbedded circuitry behind a regular barcode label. This device allows for information to be transmitted without actually seeing the barcode. The applications for this technology are limitless. As of today, however, RFID technology is in its infancy and only very few distributors are available for this technology.

Verifiers

Verifiers are similar to scanners except they are specifically made to test the "readability" of a barcode. Many companies use this device to ensure the data integrity of their barcode printing. This is a very important item to have if a company is printing from any type of printer that isn't Direct Thermal or Thermal Transfer.

The Future

The Auto ID industry is continually improving the ways which data is printed, collected, and transmitted. The onset of RFID technology has invigorated the ambitions of many barcode manufacturers. New and exciting data management applications are being developed exponentially.

Auto ID technology will become as common as PCs in the new economy. Companies will not be able to function properly without them. This technology will also become more visible in our personal lives. They will become much more than passive items we notice on the things we buy. They will be our keys in multiple environments for retrieving and sending information. They will evolve as common tools for us to navigate the minutia of every day life as hyperlinks are to us for internet exploring. Auto ID is the next wave of the digital revolution.

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