

**symbol**<sup>®</sup>

WHO CAN HELP ME  
GET STARTED?

WHAT'S THE  
FIRST THING I  
SHOULD DO?

# Bar Coding For Beginners

WHAT DO I  
NEED TO KNOW?

(What you've always wanted to know about bar coding, but were afraid to ask!)

## Technology Behind Bars

Bar Codes have infiltrated every facet of our lives; you'll find them in grocery stores, hospitals, department stores, jails, on farms, even in your own home. They've become an accepted part of our everyday lives, but what exactly are they and what do they represent?

You're not alone in your confusion about the bars and spaces printed on food labels, shipping boxes, letters, patient bracelets, etc. They all seem to look the same, but they're not. Each industry has a unique symbology as its standard, which we'll explore later on. If you're thinking about installing a bar code data management system, there are many issues to consider in order to make the right choice for your business challenges.

Get answers to all the questions that have puzzled you, and a better understanding of the technology, so you can better plan for your own bar coding applications. In this guide, you'll learn about:

- ◆ Bar Code Basics
- ◆ Symbologies
- ◆ Scanners—Fixed, Key-Based Portable, and Wireless
- ◆ Compatibility With Existing Systems
- ◆ Application Software
- ◆ Printing Bar Codes
- ◆ Industries and Applications
- ◆ Questions to Ask a Salesperson
- ◆ And Much More!

*Bar Coding For Beginners* was written to help forward-thinking professionals like you understand how the benefits bar code data management can improve your company's productivity and increase its profit margin.



## Reading Between The Lines



Don't be intimidated by bar codes. You don't need to be a rocket scientist to understand them; they are just a different way of encoding numbers and letters by using a combination of bars and spaces of varying widths. Think of them as another way of writing since they replace key-

data entry as a method of gathering data. In business, the correct use of bar codes can reduce inefficiencies and improve a company's productivity thereby growing their bottom line.

*Simply put, bar codes are a fast, easy, and accurate way of entering data.*

This may come as a surprise to you! A bar code doesn't contain descriptive data. Just as your social security number doesn't contain your name or address, a bar code is also a reference number that a computer uses to look up an associated record that contains descriptive data and other important information.

**FOR EXAMPLE: a bar code found on a loaf of bread doesn't contain the product name, type of bread, or price; instead it contains a 12-digit product number. Now, when this number is scanned by the cashier at the check-out, it's transmitted to the store's computer which finds the record associated with that item number in its database. The matching item record contains a description of the product, vendor name, price, quantity-on-hand, etc. The computer instantly does a "price lookup" and displays the price on the cash register (it also subtracts the quantity purchased from the quantity-on-hand.) This entire transaction is done instantly; think of how long it would take the cashier to key in a 12-digit number for every item you wanted to buy!**

To recap: a bar code typically has ID data encoded in it, and that data is used by a computer to look up all specific information associated with the data.

## Symbology: An easy definition

Symbology is considered a language in bar code technology. Just as you might speak French while traveling in France, a symbology allows a scanner and a bar code to "speak" to each other. When a bar code is scanned, it's the symbology that enables the information to be read accurately. And then when a bar code is printed, it's the symbology that allows the printer to understand the information that needs to be turned into a label.

## Types of Bar Code Symbologies\*

Bar codes come in many flavors. Most of us are familiar with the ones seen in grocery or retail stores, but there are many others that are used as standards in various industries. Healthcare, manufacturing, retail, etc. all have symbologies unique to their industry and aren't interchangeable. Why are there so many different types of bar codes? Simply because different symbologies evolved to solve specific problems. Let's take a quick look at a few of the most common symbologies, and how, where and why they're used:

**UPC/EAN** This is the symbol used on items destined for the



check-out line. UPC symbols are fixed length, are mandatory in the retail and food industry, and not used anywhere

else for the most part. They were developed to meet the needs of grocery retailing as it fits 12 digits into a reasonably compact space.

**Code 39** Developed because some industries needed to encode the alphabet as well as numbers into a bar code, Code 39 is by far the most popular bar



code symbology of choice. It is typically the non-food standard bar code, and is used for ID, inventory, and tracking purposes in various industries such as manufacturing. However, Code 39 produces relatively long bar codes and may not be suitable if label length is a consideration.

**Code 128** This bar code came about when the need for a wider selection of characters arose than Code 39 could provide. When label



length is a consideration, Code 128 is a good alternative because it's very compact and results in a dense symbol. This symbology is often used in the shipping industry where label size is an issue.

## Interleaved 2 of 5

Another popular symbology in the shipping industry, Interleaved 2 of 5 is widely used by the warehousing industry, too. This is also a very compact symbology and you'll see them on the corrugated boxes in which things are shipped to the grocery store.



**Postnet** Unique to the United States Postal Service, this symbology encodes zip codes for processing mail for speedy delivery.



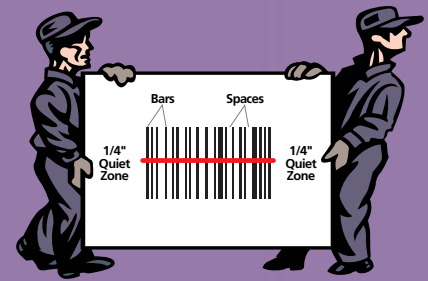
**PDF417** Known as a 2D (two-dimensional) bar code, this is a high-density, non-linear symbology that reminds you of a crossword puzzle. But the difference between this and the other bar codes

listed above is that PDF417 is really a portable data file (PDF) as opposed to simply being a reference number. Some states require a 2D bar code be printed on your driver's license. If your state has this requirement, it's interesting to know that there's room enough in this bar code to encode your name, photo and summary of your driving record, and other pertinent information. As a matter of fact, a PDF417 bar code can encode the Gettysburg Address in a space the size of a postage stamp!

An important fact to remember is that the larger the width of the bars and spaces, the more space it takes to print the bar code; therefore, the lower the bar code density. The thinner the bars and spaces, the less space is required and the higher the bar code density. We'll talk about this more in the printing section of this guide.

To get a manufacturer's number assigned for UPC bar codes, call Uniform Code Council at 937-435-3870. For most other bar code specifications, call AIM USA at 412-963-8588.

## How Bar Codes Are Read



Bar codes are read by sweeping a small spot of light across the printed bar code symbol. Your eyes only see a thin red line emitted from the laser scanner. But what's happening is that the scanner's light source is being absorbed by the dark bars and reflected by the light spaces. A device in the scanner takes the reflected light and converts it into an electrical signal.

The scanner's laser (light source) starts to read the bar code at a white space (the quiet zone) before the first bar and continues passing by the last bar, ending in the white space which follows it. Because a bar code cannot be read if the sweep wanders outside the symbol area, bar heights are chosen to make it easy to keep the sweep within the bar code area. The longer the information to be coded, the longer the bar code needed. And as the length increases, so does the height of the bars and spaces to be read.

## Bar Code Scanners

There are three basic types of bar code scanners—fixed, portable batch, and portable wireless.

1. Fixed scanners (hand held or mounted) remain attached to their host computer or terminal, and transmit one data item at a time as the bar code is scanned.



2. Portable batch scanners are battery operated and store data in memory for later batch transfer to a host computer.



3. Wireless portable scanners also store data in memory, however data is transmitted to the host in real time. This allows for instant access to all data for management decisions.



\*Symbologies shown are not displayed to actual size.

## How Do Scanners Connect to Computers?

### How Do Scanners Work?

A basic bar code scanner consists of a scanner, a decoder, and a cable that interfaces between the decoder to the computer or terminal.

The scanner's function is to scan the bar code symbol and provide an electrical output to the computer that corresponds to the bars and spaces of the bar code. However, it's the decoder that recognizes the bar code symbology, analyzes the content of the bar code scanned, and transmits that data to the computer in a traditional data format.

A scanner can either have the decoder built into its handle or be "undecoded" which requires a separate box, called an interface or wedge. Undecoded scanners are also used when connecting to portable batch scanners as the decoding is performed by the terminal itself.



### Fixed Scanners

#### *Keyboard Wedge Readers*

A keyboard wedge reader is attached to a computer through a port called the keyboard interface. When a bar code is scanned, the information is transmitted as though it were keyed in from the keyboard. Sometimes they're referred to as wedge readers because they physically wedge between the keyboard and the computer and attach as a second keyboard. One great advantage of a keyboard wedge is that bar code reading can be added with no software changes necessary; the software thinks that the data received was entered by a speedy typist. With a wedge reader, any program that accepts keyed data will accept bar code data with no change.

#### *Serial Bar Code Scanners*

Another way to transmit data from a bar code reader to a computer is to connect it to the computer's RS-232 serial port. The bar code information read will be transmitted in ASCII format and look just like keyed data to the computer. Using a serial port connection is ideal for a multi-user computer. With serial ASCII terminals for each user, the bar code reader can attach between the terminal and host computer and transmit ASCII data just like the terminal.

### Portable Batch Scanners

Portable scanners are hand-held battery operated readers which store data in memory for uploading to the host at a different time. A portable batch reader contains a bar code scanner, an LCD display to prompt the user to perform a task, and a keyboard to enter variable data such as quantities. A cradle must also be purchased to upload information to the computer. Portable batch scanners are ideal when mobility is a must and when collected data isn't immediately needed. These scanners come in a variety of styles including hand-held, wearable and truck mounted. Your application will determine which style is best.

### Wireless Portable Scanners

When you need to collect information at a remote location, and need the information immediately, a wireless solution is the perfect one. A wireless scanner is also built into a terminal, and uploads data to the host as it's scanned, instantly and accurately. Wireless products let the user scan the information at the point-of-activity which makes it ideal for many industries.

### Cables

The cable required depends upon how you need to connect the scanner. Cables are either RS-232 direct cables or Synapse adapters and all require a power supply. RS-232 connections have either 9 or 25 pins and connect the scanner to the PC. A Synapse adapter enables you to use one scanner with a variety of different PCs by simply changing the Synapse adapter cable.

#### **CONNECTION:**

Serial port

OCIA-Register or wedge interface

Portable Terminal

#### **CABLE REQUIRED:**

RS-232 cable and power supply

Synapse adapter

9-pin cable



## Which Scanner Is Right For My Application?

With all the choices available, it's critically important to understand your environment and application thoroughly before making any decisions. Answer these few questions to help you determine which scanner is best for you:

- ◆ What type of environment will the scanner be used in?  
Harsh as in a factory or normal as in a store?
- ◆ Is continuous or periodic scanning needed?
- ◆ Is hands-free or a hand-held capability required?
- ◆ Will scanning be conducted close to the bar code or from a distance?
- ◆ What will the scanner connect to?
- ◆ Will the information scanned be needed in real time?

Remember, there are a variety of scanners suited for each application. Don't purchase the first scanner that seems right. The least expensive scanner might work well in an application where scanning is infrequent, but it certainly wouldn't be the answer in a harsh manufacturing environment where a ruggedized scanner is needed. Ask questions and probe for additional answers.

## Are Scanners Compatible With My Existing System?

Special software isn't required to get information into your computer. Scanning and decoding are handled by the bar code scanner/decoder. So, by the time the data gets to the computer, it has already been translated. There's nothing more for you to do.

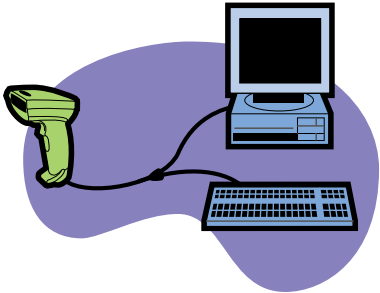
However, while your computer and computer software may be capable of accepting bar code data, your existing software may not be able to print bar codes. If it can't, you'll either have to buy pre-printed labels from a service, or upgrade the software so you can print your own bar coded shipping labels, pick tickets, badges, etc. This, of course, is more convenient.

## What Application Software Is Required?

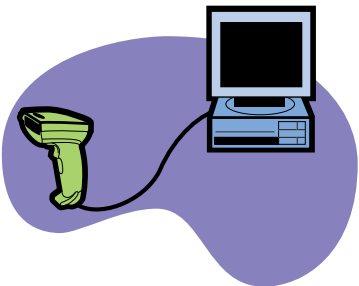
Whether you want to use bar codes to track inventory, monitor patient care, for shipping and receiving, or at point-of-sale, you are going to need application software. It's the application software that accepts the bar code data and controls the success of an application. Think of software as your computer's silent partner, organizing incoming data into information needed to manage business.

Whatever your industry, or application needs, Symbol and its Business Partners can help you every step of the way—from planning and coordination of delivery, implementation, and training, to installation services, integration services, and a lot more.

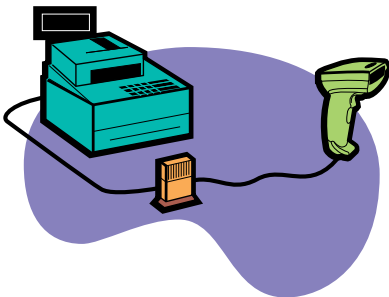
### A KEYBOARD WEDGE SYNAPSE CABLE CONNECTS SCANNER TO COMPUTER VIA KEYBOARD



### SCANNER CONNECTS TO COMPUTER THROUGH THE RS 232 SERIAL PORT



### UNDECODED SCANNER CONNECTS TO REGISTER THROUGH AN INTERFACE CONTROLLER



### UNDECODED SCANNER CONNECTS TO BATCH OR WIRELESS TERMINAL



## Printing Bar Codes

With the proper PC software, today's dot matrix, thermal transfer and laser printers are capable of printing excellent quality bar codes. If you want to print the best quality bar codes, then have the laser printer do the job; it's also perfect for printing batches of labels. But if you need only one label at a time, a dot matrix is the printer of choice. Thermal transfer printers are required when you need to print a roll



of labels so that labels can be applied by applicators directly to boxes. Volume industrial printing is done mostly by thermal transfer printers; they're fast and produce excellent quality bar codes.

One important note to remember is that lower density bar codes are more reliably printed and more consistently read than higher density bar codes because minor variations, due to printing or damage to the bar code.

## Put Bar Coding To Work Anywhere!

Just about any business can benefit from bar code data capture technology. Whether you make it, move it, market it, or do them all, Symbol has a lot to offer. Here are just a few examples of how a data management system from Symbol can improve your productivity and profitability.



### Manufacturing

Manufacturers can tightly couple warehouse and plant operations to support today's just-in-time manufacturing techniques. Your system will be fully compatible with your Manufacturing Requirements Planning (MRP) system, Warehouse Management System (WMS), or Manufacturing Execution System (MES).

### Transportation

Transportation companies can better manage both fixed and mobile assets. Transportation systems integrate LAN and WAN connectivity, Global Positioning System (GPS), mobile computing, bar code scanning, and state-of-the-art software to link all your warehousing, distribution, and transportation operations. The result? Lower costs and better customer service.



### Retail

Retailers can control the flow of inventory and information from dock to stock and out the door. In-store and warehouse software applications, with wireless communications, help retailers increase productivity. For example, they can take advantage of automatic markdown and replenishment systems, and improved price management, inventory control, and merchandise movement.



### Healthcare

The Healthcare industry uses bar code data capture systems to help manage important information with speed and precision. From laboratory to hospital, bar code data capture solutions can enable real-time access to clinical documentation, patient demographics, insurance data, and more.



### Countless other applications

No matter what industry you're in, bar code data capture technology can help you meet the toughest challenges you face.

## What Questions Should I Ask Before Buying?

**Q.** What is the first thing I should do if I want a bar code system?

**A.** Make sure you understand how you'll benefit from the solutions that the software and hardware can provide.

**Q.** What considerations should I understand before I choose either a keyboard wedge or a serial port connection for my application?

**A.** Understand and prepare for questions about your application and number of who will be using the scanners.

**Q.** What kind of technical support is available after I make my purchase?

**A.** At Symbol, technical support is available 24 hours a day, 365 days a year. Don't settle for anything less than that or you may be vulnerable to downtime in productivity.

**Q.** Who will help me make the right decision?

**A.** When you're making a bar code data capture purchase, you want to work with a company that truly understands your unique business challenges. Symbol and its business partners have the experience and expertise you're looking for.

**Q.** What peripherals (such as battery packs) are required for the scanner I'm purchasing?

**A.** Get the facts first before you place the order, because they all add to the price.

**Q.** I'm only buying two scanners, how will I program them to read the right symbology for my application?

**A.** Symbol's scanners can be programmed for various symbologies by using the function card enclosed with all Symbol scanners.

## I Need to Know More!

**Please send me more information**  
(check off all that apply)

- Straight Answers to Tough Questions About Bar Code Data Capture
- Straight Answers to Tough Questions About Bar Code Data Capture and Your Warehouse
- Straight Talk About Bar Code Data Capture and Wireless Networks
- Seven Ways To Get More From Your ERP System

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Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

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Telephone \_\_\_\_\_

Fax \_\_\_\_\_

E-mail \_\_\_\_\_



"Want to find out what bar code data technology can do for your business? Consider this a personal invitation to give us a call. We'd be delighted to learn about the business applications you face every day and then give you some practical ideas that could save you a lot of money.

Please remember that we're not a sales unit. Our only job is to introduce forward-looking business professionals like you to exciting technologies that are proving themselves every day. Give us a call at 1-800-722-6234. We hope to hear from you soon!"

Peg Haigy  
Symbol Technologies

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## When You Work With Symbol Technologies, You're In Good Company

Symbol Technologies, Inc. is a global leader in wireless local area network solutions for voice and data, mobile computing, and bar code data capture technology. Our innovative solutions, used in a wide variety of industries are based on wireless local area networking for voice and data, application-specific mobile computing, and bar code data capture. Symbol's wireless LAN solutions are installed at more than 45,000 customer locations worldwide and support more than seven million Symbol scanners and hand-held computers.

### We're ready to help whenever you need us.

Have a question about how bar code data capture technology can help improve productivity and increase your bottom line? Give our information center a call at 1-800-722-6234. This unique Symbol unit does not make sales and does not take orders. Its only purpose is to help you determine how your company can harness the power of bar code data solutions.

Our team is always at your service to:

- ◆ Discuss your specific application requirements.
- ◆ Introduce you to new technologies that can increase productivity.
- ◆ Determine how much money bar code data capture technology can save you.
- ◆ Answer any questions you may have about specific products.
- ◆ And that's just for starters!

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