



CodeFacts

AIDC (Automated Identification and Data Collection) Technical & Informational Documents
Written for Everyone

Some Common Basic Questions & Answers About Bar Code Technology

What is a bar code?

A bar code is simply a series of stripes (usually black) on a light background (usually white) that can be scanned and read directly into a computer. They are interpreted virtually instantaneously and unerringly by a bar code reading system. The elements (bars and spaces) in a bar code symbol must be of a consistent, proportional thickness and thinness. The widest element could be as thick as a pencil or as thin as a business card, as long as the corresponding thin bars and spaces in the bar code remain proportionally thin.

How is a bar code read?

Bar codes are read the same way that people read text from a page; the reflectance and absorption of light. A light of a given wavelength is beamed and moved across a bar code at a consistent speed. The reflected light is measured with a photoreceptor, tuned to look for light of the given wavelength. The off-and-on (white and black) pattern of the bar code creates an electrical wave that is sent on to a computer chip called a "decoder." The decoder then deciphers the signal into something the waiting computer understands.

Imager and CCD (charge coupled device) bar code scanners read somewhat differently in that they "take a picture" of a bar code symbol, analyse it, and create a conditioned electronic signal that basically mimics that from the reader types described in the paragraphs above.

What is a symbology?

A bar code "symbology" is to bar codes in much what a particular alphabet is to language. Different symbologies of bar codes use different combinations of bars and spaces to represent different characters. Bar code symbologies, like languages, are given different names, like Code 39, UPC or Codabar.

Why are there many different symbologies?

Different symbologies have been developed in order to satisfy various application requirements. Each has a set of characteristics tuned to these various situations. Recently, there has been a trend toward standardization of symbology selection both within and between user groups and in specific industries.

What factors should be considered when choosing a symbology?

It should first be determined whether or not a particular symbology is required to comply with an existing industry or organization standard. If no standard exists, it is wise to consult with other businesses like your own, in order to determine whether any standard is forthcoming. The second factor is the type and amount of data that needs to be encoded. Some codes allow full alphanumeric encodation, but usually do so at the cost of the symbol taking up more space. Also, the size of the article or label being encoded must be taken into account, keeping in mind that the density of the characters varies greatly between symbologies and printing method. Finally, compatibility with available reading and printing equipment must be taken into account.

Technical information regarding the different symbologies of bar codes and their specifications may be obtained from AURORA on request. Refer to our other CodeFacts document specifically regarding symbologies for more information.

What methods are used to print bar codes?

Many options are available. If a static identification number is all that is required (e.g. on a retail product), then printing the bar code when the packaging is printed makes the most economical sense. However, most bar code labels require variable information such as a consecutive number, date or a unique product code. These labels can either be produced in-house or off-site. This decision is greatly determined by the application itself, quantity and the label environment.

Variable bar codes can be printed with any of the following technologies:

- ❖ Dot-matrix printers
- ❖ Laser, LED and other printers that use toner
- ❖ Direct thermal label and tag printers
- ❖ Thermal transfer label and tag printers
- ❖ Inkjet printers

In what density should bar codes be printed?

Density refers to just how thin the bars and spaces of the symbol are printed. This will depend on a number of factors. Generally, high-density symbols are used in situations where you wish to pack a lot of information in a small space. Low-density printing is used where space constraints are not such a factor. The more relaxed tolerances allowed by low density printing enable more “in-spec” printing and typically, a higher “first-pass-read-rate.” Since the scanning equipment is matched to the density of the symbols, it is generally desirable to try to limit the number of densities used in the application.

What size should the bar codes be?

In simple terms, as big as possible. Although most bar codes are one-dimensional and their height is redundant, the “taller” the bar codes are, the easier they are to read. Typically, the vertical height of the bar code is chosen as a balance between space allowed and easy sight and alignment of the reading equipment.

What are the specific factors to consider in deciding on an approach to bar code printing?

Among the factors to consider are:

- ❖ On-site vs. off-site (i.e. whether the labels will be preprinted or imprinted by the end user, as required)
- ❖ Fixed vs. variable data
- ❖ Direct marking vs. labeling or tagging
- ❖ Print density requirements
- ❖ Print speed of on-site printers
- ❖ Type of substrate (stock) to be marked
- ❖ Compatibility with reading equipment
- ❖ The possible need for automatic label application
- ❖ Format flexibility requirements

Each bar code system requires a different approach to printing, depending on the situation. It is important to identify the key requirements of your application before proceeding. We are happy to outline the pros and cons of different printing systems to you.

How can bar code symbols be verified for quality and readability?

Obviously, the simplest approach is to use the codes within your system, although sometimes this method is impractical. Bar code verifiers are available from AURORA, which will allow you to measure such characteristics as bar and space dimensions and symbol contrast. Regardless of the method used, attention to symbol print quality is essential to the performance of any bar code system.

How does someone choose among the various types of bar code reading equipment that is available?

Like printing, the choice will depend on the specific circumstances of the application. Contact and non-contact, fixed beam and automatic scanning, portable and fixed terminal and hand-held and stationary readers are all available to suit specific requirements. You should identify the key requirements of your application, keeping in mind potential future needs, and contact AURORA to assist you in the selection. Issues to consider are: *Will an operator be involved? What are the throughput requirements? Will the items be stationary or moving? Can they be read on contact or must they be read at a distance? Does the reader need to be portable? Is manual data entry, as well as bar code data entry required?*

What can cause a poor read performance?

The most likely cause is "out of spec" printing. The symbol must comply with specifications for: dimensions, reflectivity and contrast, spots and voids, and quiet zones at the beginning and end of the bar codes. Operator technique and symbol/reader alignment must also be considered as well as mismatch of the reader to the print characteristics of the code (especially density).

Can errors occur in the reading process?

The attractiveness of bar code technology is that with all the checks and balances within the codes, the chance of a misread character averages about 1 in 10,000,000! Compared to key-entry systems that have an average of 1 in 300 misreads, bar code scanning is virtually flawless.

How long does the reading process take?

A twelve-character bar code is accepted by the computer in between .3 and 2 seconds, depending on the kind of reading equipment used and the skill of the operator. By comparison, a skilled keyboarder averages about 6 seconds.

Some readers are offered with different "resolutions." Why?

The term "resolution" refers to the reader's ability to discern symbol features (bars and spaces) of differing size. Therefore, high-resolution devices can detect smaller-dimensioned features (high density) than low-resolution readers. Conversely, low-resolution devices are designed to ignore the imperfections normally associated with low-density printing. In summation, the reader's resolution must be matched to the density of the bar code.

How can bar code equipment be connected to an existing computer system?

A wide variety of standard data communications protocols are supported by today's bar code equipment. Among the options to the system designer are: on-line wedge (between the keyboard and CPU), serial (typically RS-232), and USB.

Most reading devices are "transparent," meaning that the computer will not differentiate between information inputted by keyboard or bar code reader. In all cases, the keyboard of the terminal or computer is not disconnected.

What are the applications for bar coding?

Anything that needs to be kept track of, physically exists, and can potentially move or be misplaced, can be effectively tracked through the use of bar coding. Bar codes, while typically placed on labels, can also be added to business forms, packaging, catalogues, badges or i.d. cards, job tickets, waybills, or even become part of the article they are being kept track of. Applications exist all the way from inventory and asset control to job costing and order entry. Very seldom does an existing or proposed application exist that cannot be easily adapted to the use of bar coding.