Applying ID Readers In Multiple Code Applications

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As product safety and traceability become more critical factors in a wide range of industries, engineers are more and more often faced with the challenge of reading multiple codes on a single product.

There are a wide variety of multiple code reading applications, including multiple codes of the same symbology (such as 1-D or 2-D data matrix) within a single field of view, multiple codes of mixed symbologies in single field of view, and multiple codes in multiple fields of view, such as on different sides of a product.

Today's most advanced image-based ID readers can easily handle multiple codes at high rates of speed. One example is reading an image with 3 codes at 90 frames per second for a total of 270 codes per second. This article will explain the different types of multiple code-reading applications, how to select ID readers for multiple code reading, and how to format and validate the output and communicate with a personal computer (PC) or programmable logic controller (PLC).

Multiple code reading applications

Multiple code reading is often divided into four basic types of applications. The first and simplest involves reading two or more codes of the same symbology within a single field of view. An example would be two 1-D codes or three 2-D codes. The second type of application involves reading multiple codes of mixed symbologies within a single field of view. An example would be reading a 1-D Universal Product Code (UPC) and a 2-D Data Matrix code within the same field of view. The third type of multiple code-reading application is where multiple codes occur in multiple fields of view. An example may be found on opposite sides of the product so multiple cameras are required to read them. The fourth type of application also has multiple codes in multiple fields of view, but the difference is that that both codes must be output as a single concatenated string.

The automotive industry has many multiple code reading applications, often involving reading codes of the same symbology within a single field of view. Many of these applications involve bins of parts each of which has a unique 1-D barcode. It is not uncommon for the bins to be moved around the factory and undergo handling and bumping that can degrade the codes, so the ability of the ID reader to maintain high read rates is often the most critical challenge.

The solar energy industry often has the need to read multiple codes with the same symbology in a single field of view. The PB29-0212 standard requires that four redundant 2-D codes be placed on wafers so that the product can be identified even if several codes are damaged. At the time of production, all four of these codes

must be read or the product must be reworked.

The food and beverage industry has a wide range of multiple code reading applications, including multiple codes of mixed symbologies within a single field of view and one or more codes on multiple sides that need to match each other. 2-D codes are increasingly used in the food and beverage industry because traceability requirements frequently require far more data than just the product identification as provided by the UPC. Multiple codes are frequently used in applications where there is a risk of injury if a package is mislabeled. For example, a company makes vanilla ice cream and also chocolate ice cream with nuts that some customers are allergic to. The manufacturer uses a standard UPC code on the side of the box and a 2-D code on the top of the lid. The company needs to make sure that the two codes match each other so that there is no chance that the customer will purchase a tub of chocolate ice cream with nuts that has a lid indicating that it is vanilla ice cream and suffer an allergic reaction.

Many other industries have multiple code reading applications. Multiple codes are often used on consumer products, including two codes with the same symbology and multiple codes of mixed symbologies within a single field of view. Consumer products manufacturers are increasingly adding 2-D codes to existing UPC codes to improve traceability or product marketing. Electronics manufacturers also frequently use multiple codes of the same symbology. For example, 1-D barcodes may be used on labels while 2-D Direct Part Mark (DPM) codes are printed on a panel or tray containing multiple printed circuit boards. High resolution fixed-mount readers need to be able to read all of the codes, count the parts in the tray and make sure the code on each part matches the code on the tray. There is many multiple code reading applications in the pharmaceutical industry. Regulations require unique identities to control traceability and combat counterfeiting from the single unit, to the package, the carton, the shipping box, and the pallet.

Types of readers

The 1-D code reading market is currently dominated by opto-mechanical laser scanners. These readers offer some advantages such as simplicity, low cost, and ease of use. But they are mechanical devices that have a limited life and require calibration. Multiple code-reading applications present particular challenges for lasers such as the potential for codes to be in a degraded condition, at varying angles and in different positions. Because they see only a single scan line at a time, laser scanners have a very limited ability to read codes that are in any way different from an ideal image. Laser scanners also do not form an image of the object so they cannot read 2-D codes, which completely rule them out for many multiple code reading applications.

Image-based code reading technology is generally a better choice for multiple code-reading applications because it captures an image of the entire box and locates the code regardless of its position and orientation so the position and orientation of the barcode no longer matters. The basic idea behind image-based technology is that the reader captures an image and uses a series of algorithms to process the image to make it easier to read. A typical algorithm searches the entire image for the code

and identifies the position and orientation of the code for easy reading. Other algorithms handle degradations in code quality due to differences in material types and surfaces. Image-based ID readers can also read two-dimensional codes like Data Matrix that hold a much larger volume of data, providing redundancy that can enable the code to be read even when it is damaged.

Developers of image-based vision technology have begun providing setup tool software that simplifies the process of setting up for the reader for multiple code-reading applications. The process can be as simple as selecting the number of codes that should be detected in the image and then defining the symbologies of each of those codes. The example in Figure 3 shows the setup for an application with two 1-D codes and one 2-D code. Multiple readers can be set up independently but linked together so their results are communicated in a single string. This approach is useful when using multiple readers to capture information from different sides of a product.

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