The Ultimate Guide to Barcode Verification

IMPRINTENTERPRISES

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Barcodes have become a vital component of supply chain management, asset tracking, and other applications across industries. In warehouses, distribution centers, retail stores, hospitals, and other businesses, barcode labels or direct part marks help manage inventory, initiate new orders, confirm employee identification, confirm medication dosages, help locate valuable assets, and automate countless other tasks. That's why the ability to quickly and accurately scan barcodes is so vital. A poor quality barcode can disrupt tracking operations and cause multiple failures across the value chain. This can lead to expensive mistakes, scrap, rework, incorrect shipments, or fines.

As barcoded products travel across the supply chain, manufacturers, carriers, and customers that have difficulty scanning a barcode may initiate disputes that affect sales, increase returns, or result in fees or chargebacks. Ultimately, the benefits of using barcodes — improved productivity and accuracy — are undermined by a poorly performing printing and labeling operation. Because of this, barcode verification and validation have become critical steps in the automatic identification process. By verifying and validating barcodes, companies can ensure that they maintain barcode print quality and data integrity.

The terms verification and validation are often used interchangeably or confused. While both processes will improve the effectiveness of a labeling program, they evaluate very different elements of the barcode.

Barcode Verification: *Standards-Based Quality Measures*

Barcode verification is the process of confirming the print quality of a barcode using ISO or ANSI standards, as well as confirming that the data content format within the barcode meets specific application standards. Verification provides feedback about the quality of barcodes that can help companies improve and control the barcode production process. Positive verification results let operators know that their labels, printers, or direct part marking equipment is working correctly and can create barcodes that will be readable by any stakeholder using any scanner elsewhere in the supply chain. Verification also helps ensure compliance with both regulatory and customer requirements and can help improve customer satisfaction.

Verification usually takes place offline using purpose-built barcode verifiers that meet ISO/IEC 15426 standards. These verifiers should be calibrated on a regular basis to ensure proper operation. Calibration is usually performed using a GS1 Calibrated Conformance test card. Each barcode symbology specification

includes a reference decode algorithm. Verifiers decode those symbols by applying that algorithm. Once the symbol is decoded, the verifying system uses a variety of measurements to grade the results.

Using a standards-based verifier is a must. The fact that a regular barcode scanner can read the code is not verification; there's no guarantee that another scanner further along the supply chain can also read that code. Verification ensures readability, regardless of who is scanning the mark.

Barcodes are graded using an ANSI standard using familiar letter grades A, B, C, D, and F (with A being the highest quality and F the lowest). The ISO/IEC standard provides numeric grades that range from 4.0 (highest quality) to 0.0 (lowest quality). The ISO grades provide a higher granularity than the ANSI grades. ISO/IEC 15416 standard is for 1D codes, while ISO/IEC 15415 covers 2D codes. For most applications, an ISO score of 1.5 (ANSI grade C) is considered "passing." There are also application-specific standards (such as the GS1 General Specifications or MailMark for the UK Post Office) that have their own requirements which can be confirmed via barcode verification.

In applications where barcodes will be scanned by multiple facilities using different equipment, and where 100% readability and accuracy are critical, verification at the point of printing or labeling will ensure that the automatic identification solution works as expected and in compliance with customer or industry standards.

Barcode Validation: *Matching the Right Data to the Right Product*

While barcode verification confirms the quality of the code and the data it carries, barcode validation confirms that the correct barcode information is applied to the correct product. The barcodes are validated based on rules created by the company performing the validation. The results of the validation test are more subjective in nature, and don't necessarily ensure that the barcode can be scanned. A poorly printed barcode could pass a validation test (because it contains the right data), while still failing a verification test. Validation may also include checking the size of the barcode, its position on the final product/package, and ensuring that other packaging elements won't interfere with scanning.

Although validation doesn't follow stringent or defined standards, as is the case with verification, it is equally important to ensure the success of a barcode labeling/marking program. If the data encoded in a barcode is incorrect, or the barcode is applied to the wrong item or package, then there could be a number of operational failures including inaccurate shipments, returns, repackaging, chargebacks, and other costly errors.

In some applications, this process is even more critical: Consider the consequences of improperly labeling a pharmaceutical or medical device, for example. In the retail sector, incorrect barcode data can affect sales and profitability or result in a recall.

In order to validate barcodes, fixed-mount barcode scanners are positioned to read the codes on a production or shipping line. A software solution lets the scanner know what barcodes to expect. The system generates an alert if the wrong barcode is present or if the barcode label is missing. In some cases, these validation scanners may be integrated with automated material handling or packaging equipment, or included with label application systems.

Barcode Verification vs. Barcode Validation

Verification

- Ensures print quality and scannability of the barcode
- Standards-Based
- Requires purpose-built verification systems

vs

Validation

- Evaluates the accuracy of the barcode data and that the correct product is labeled
- Subject and based on company requirements
- Can be conducted using any scanning equipment

Machine Vision Technology

Machine vision technology plays an important role in both barcode verification and validation processes. Machine vision provides optical, non-contact sensing to extract information from digital images for process control or inspection of manufactured products. Using the correct combination of cameras, sensors, lighting, and software, machine vision can help companies ensure that their barcodes meet all industry and customer requirements and that they contain the correct information. These systems use vision sensors or 3D displacement sensors to evaluate products, using images to confirm proper sizes or measurements, or to ensure that a product is the correct shape or configuration. Machine vision's image analysis capabilities are used widely in graphic parts/packaging, pharmaceutical, food packaging, electronics, semiconductor, automotive, and shipping and transportation industries.

There are several types of machine vision systems, including 1D machine vision (which uses line-scan cameras for 100% continuous web inspection), and 2D systems that build images either use line-scan or area-scan technologies. 3D machine vision systems use multiple cameras or laser displacement sensors.

There are a number of benefits to using machine vision, including:

- Products can be inspected on high-speed production lines.
- Machine vision can be used in clean room or hazardous environments.
- It can provide microscopic inspection that can't be conducted with the human eye.
- Robotic guidance ensures consistent results.
- It provides precise, non-contact measurement.
- It eliminates time-consuming, manual inspections.
- Because changeovers can be programmed in advance, there is less machine downtime.
- Inspection/measurement data is accurate and consistent.

In barcode verification or validation processes, machine vision systems allow companies to automate the process of ensuring they are printing readable barcodes that meet customer requirements and other specifications. Machine vision verifies that barcodes:

- Can be read with a scanner
- Are in the proper orientation
- Do not contain any defects
- Are the correct size

Machine vision systems can read both 1D and 2D codes that are on a label or a direct part mark. These systems can also recognize human-readable text for optical character recognition (OCR) or optical character verification (OCV) applications.
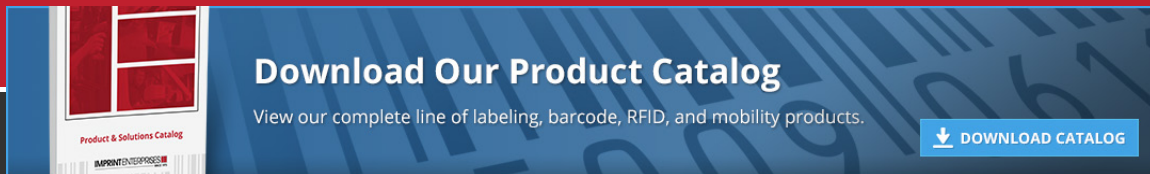
Verification and Validation:
Mission-Critical Quality Control

As barcodes play an increasingly important role in automating data collection and inventory/asset tracking in multiple industries, ensuring that the barcodes can be consistently read and contain the correct data is vitally important. Barcode verification processes use standards-based measures to ensure that the barcode can be read by any scanner at any location. Barcode validation further ensures that the right barcode label or mark has been applied to the right product, and contains the right data.

There are a variety of verification and validation solutions available, including a wide range of models and price points. Integration partners like Imprint Enterprises can provide expert guidance in finding the right solution for your industry and application, as well as integrating verification and validation into your existing labeling and production processes.

Imprint Enterprises has been in business since 1975 and is focused on providing customers the highest quality products with the most comprehensive service. Whether you're looking to purchase new barcode equipment and supplies, or need best-in-class installation and service for your barcode products, we have a solution for you. We specialize in nationwide barcode printer service, site surveys and end-to-end barcode solutions. Imprint's Barcode and Custom Labeling Division focuses on the following industries: manufacturing, distribution, logistic centers, food processing, co-packagers, beverage, and pharmaceuticals.

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