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ANSI Verification For Determining Bar Code Quality

In recent years, both hand held and in line bar code verifiers have played an important part in feeding retail distribution channels and logistic supply chains with high quality bar codes. With out confirmation of high quality bar code production, manufactures introduce inefficiencies to automatic data collection systems that rely on machine readable symbols. Both random sampling (hand held) and 100% (unattended) verifiers are a part of complete verification.

TRADITIONAL VERIFICATION- Since the early days of bar codes, there have been published standards regarding print quality. Each symbology (bar code type), such as UPC or the Interleaved 2 of 5 "case code" specifies a tolerance on the printed widths of bars and spaces, and contrast between bars and spaces. Early verifiers were developed to measure these characteristics and pass or fail bar codes accordingly. This so-called "traditional" verification was a natural extension of the printed bar code specifications.

The difficulty with traditional verification is that the actual scanning experience by the end user did not always correlate to verifier results. Many bar codes that failed verification were actually very easily scanned by normal scanners at the retail store. On the other hand, some bar codes that passed traditional verification could not be scanned. The problem stems from the fact that this verification method was far removed from the way real scanners operate.

The traditional verification method is based on comparing the printed bar widths to the specified bar width within the published tolerance. As scanning systems improved they could read bar codes that were more inaccurate than the published specification allowed. Following the advice of the verifier either required keeping tighter than necessary control over the printing, or throwing away usable product.

Another limitation of traditional verification is that it does not address defects within the printed code, such as voids in bars. To address the issue of defects, ambiguous statements such as "without any spots and voids" were often specified along with the traditional measurement criteria. This subjective means for identification of defects is impossible to quantify and therefore the acceptability of the bar codes cannot be validated.

ANSI VERIFICATION- In recent years new standards and guidelines have been established by ANSI (American National Standards Institute) and the UCC (Uniform Code Council). These new standards measure bar code print quality according to the way actual scanners work. ANSI verification is now relied upon by suppliers and customers of packaging as a basis for ensuring compliance because it addresses virtually all the aspects of print quality that affect scanning.

Verification to the ANSI standard provides printers and converters the benefits of the improved performance to which scanning systems have evolved. Using ANSI grading you do not have to print to tougher standards than are actually required. At the same time, end users are provided protection from getting printing defects in their material that traditional verfication could miss.

ANSI's "Bar Code Print Quality Guideline", X3.182 published in 1990, established a procedure for measuring bar code quality. The ANSI guideline provides a standard measurement methodology and defines eight categories of print quality to be measured. The output of the ANSI method is a grade for any bar code on a scale of 0 to 4 or expressed as a letter grade (A,B,C,D, or F) based on the measurements in each category. A grade of "C" or better should scan on virtually any properly maintained scanner on the first pass. Since better quality labels will scan more easily and allow more margin of error, some package purchasers even specify grade "B" or better codes.

The ANSI specification was adopted by the UCC and applied to the most common bar code used in retail distribution, the UPC. The resulting specification filled in some details particular to UPC and also added a ninth criteria, checking the quiet zones.

The benefit of the new standards is that they are closely related to the way scanners work so they can predict scannability of a bar code consistently. Because virtually all of the aspects of print quality that affect scanning are measured, ANSI verification has become the basis for communication between producers and users of printed bar coded products. With these new meaningful standards available, purchasers of packaging are asking for a specific level of bar code quality from their suppliers. Converters are expected to be able to comply.

9 parameters for ANSI Verification

1. Edge Determination - is the image of the bar code as it is perceived by a moving aperture, such as a laser beam or a bar code wand. The scan reflectance profile is a measurement of spots and voids (called "defects") as well as contrast and other parameters.

2. Minimum Reflectance - checks that the darkness of the bars is sufficient. The amount of light reflected by the bars (bar reflectance) must be less than half the light reflected by the spaces (space reflectance).

3. Symbol Contrast - measures the contrast between the brightest space and the darkest bar. The result is assigned a letter grade of A,B,C,D or F, with A being the highest contrast.

4. Minimum Edge Contrast - checks that the contrast between adjacent bars and spaces is high enough.

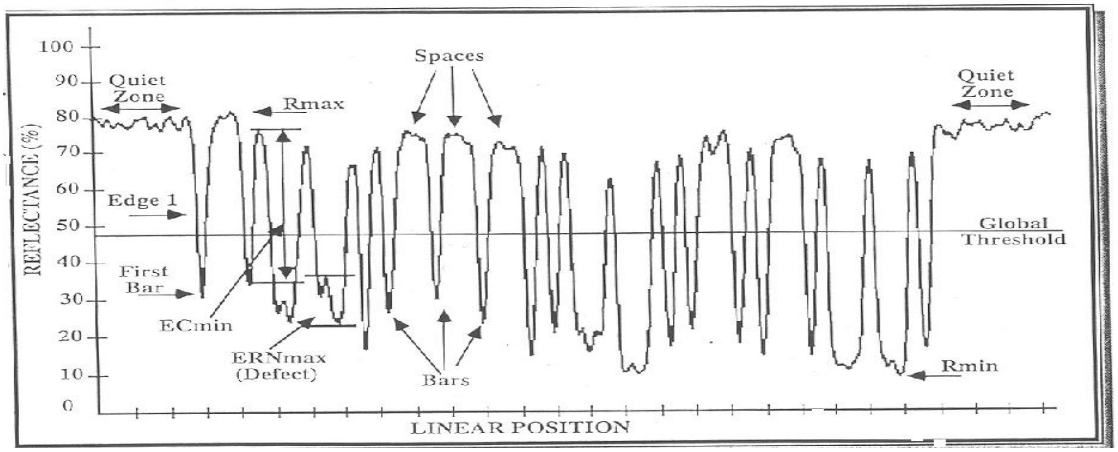
5. Modulation - checks the worst case dip in contrast any place in the bar code. If all bars and spaces are the same brightness, modulation would be equivalent to symbol contrast, or 100 percent. If some spaces are less bright than the brightest one, modulation will be some fraction of the overall contrast. The percentage is assigned a letter grade. Excessive ink spread can result in low modulation because very narrow spaces appear to be filled in by the encroaching bars in the scan reflectance profile. This very serious issue for scanner was not directly addressed by Traditional verification techniques.

6. Defects - the worst case change in darkness within a single bar or space. The largest difference in reflectivity found in a single bar or space is measured as a percentage of the Symbol Contrast and assigned a letter grade.

7. Decode - the widths of each bar and space is measured and used to interpret the number content of the bar code according to a specific mathematical formula appropriate for the bar code type. This formula must be specified, such as by the UCC Quality Specification for the UPC Printed Symbol, to apply to ANSI method to new types of bar codes. If the bar code cannot be decoded according to the formula, the accuracy of the bar and space widths are inadequate.

8. Decodability - the formula used for Decode is further analyzed to see how accurate the bar and space widths are. A perfectly accurate bar code will have 100 percent decodability, but decodability as low as 25 percent is often acceptable. This measure helps track degradation in printing plates and gives early warning while there is still plenty of room for more degradation.

9. Quiet Zone - this checks for adequate space on the left and right of the bar code. Often a design oversight violates the requirements for adequate space, but generally this is not something that would fluctuate during a print run.



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