Trouble-Shooting Guide

for ANSI Print Quality Guideline

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I. **EDGE DETERMINATION –** This requirement is that the correct number of elements be present in a bar code. The grade is pass or fail. Each bar and space is considered an element. For example, the U.P.C.-A symbol always has 59 elements: 30 bars and 29 intervening spaces. If the number of elements is invalid for the symbology, the Edge Determination fails. Otherwise it passes.

The most common cause for Edge Determination failures is ink gain or ink bleed. When this happens, the spaces get narrower and don't allow for as much light to be reflected. The print process being used must be adjusted (i.e. less pressure applied, plates with greater bar width reduction) so that the bars will be narrower, which will allow the spaces to open back up.

II. **MINIMUM REFLECTANCE (Rmin) –** This requirement is that the bars must be sufficiently dark when compared to the spaces. The grade is pass or fail. The measured value is the darkest reflectance value (darkest bar) in the code. It must be less than or equal to half the maximum reflectance.

Symbols that fail in this parameter may benefit from darkening the bars or changing colors. The best color combination is black and white, however other dark colors such as blue and green can also be used for the bars. Always avoid using any kind of reds or pinks as the color for the bars. Visible red light sees red bars as white.

III. **MINIMUM EDGE CONTRAST (ECmin)** – This parameter examines adjacent bars and spaces (including the quiet zones) to determine if there is sufficient contrast. The grade is pass or fail. Each bar and space pair is measured for reflective difference. The absolute value must be greater than or equal to 15%.

Changing colors or adjusting the print process so that the edges of bars are crisp, clean, and straight may correct failing grades for ECmin.

IV. **SYMBOL CONTRAST (SC) –** Symbol Contrast measures the difference between the darkest bar and the lightest space. The grade is then based upon the amount of reflective difference.

A (4.0) >= 70%
B (3.0) >= 55%
C (2.0) >= 40%
D (1.0) >= 20%
F (0) < 20%

A low symbol contrast grade indicates the bars may not be printed dark enough and/or the spaces are not white. Colored bars or spaces as well as shiny materials commonly cause low Symbol Contrast grades.

V. **MODULATION** – This measurement is graded based on the relationship found between the Edge Contrast Minimum and Symbol Contrast. The closer the ECmin and the SC are, the higher the Modulation grade. Modulation relates to how a scanner sees wide bars and spaces in relationship to narrow bars and spaces.

A (4.0) >= 70%
B (3.0) >= 60%
C (2.0) >= 50%
D (1.0) >= 40%
F (0) < 40%

To improve the Modulation grade, make narrow spaces wider than narrow bars.
This can usually be done by adjusting plate pressure or using plates with greater bar width reduction.

VI. **DEFECTS** – This measurement looks for spots (in spaces) and voids (in bars). A scanner may misinterpret these printing imperfections as an additional bar or space if they are too large.

A (4.0) <= 15%
B (3.0) <= 20%
C (2.0) <= 25%
D (1.0) <= 30%
F (0) > 30%

To improve Defects grades minimize the amount of ink “splatter” in spaces, and be sure that bars are solid in color with no background “show through."

VII. **DECODABILITY** – This parameter measures the printed symbol and evaluates how close the symbol comes to an ideal symbol. Each symbology has a specified dimension for each bar and space width. In addition, each bar and space width has certain margins, or tolerances, which allow a small range of sizes to be acceptable. Decodability measures the amount of margin left from the ideal after printing the bar code. One can think of Decodability as how much tolerance has been used in the printing process, allowing the remainder of the tolerance to be used by the reader. The scannability of a bar code increases with its Decodability grade. This parameter is especially important for high first scan read rates. A low Decodability grade is an indication of poor scannability. The actual measurement is dependent upon the specific symbology and is from the scanners’ viewpoint, NOT the printer’s viewpoint. There are several specific measurements made of each symbol character. The worst of these measurements becomes the Decodability grade.

A (4.0) >= 62%
B (3.0) >= 50%
C (2.0) >= 37%
D (1.0) >= 25%
F (0) < 25%

Low Decodability grades are most often associated with the bars becoming too thick or too thin. This can be corrected by checking printing plates to be sure that the proper amount of bar width reduction has been used when making the plates. Another cause for low decodability is the orientation (or direction) in which the bar code is printed. If the bar code is printer “ladder style,” where the bars are printed one at a time as if walking up a ladder, then the decodability grade will be lower. Bar codes should be printed “picket fence” whenever possible. “Picket fence” is where the printer prints from the top of every bar down to the bottom.

VIII. **DECODE (Symbol Reference Decode)** – Each symbology type has a specific decode algorithm. These are defined rules used to decode the symbol. This measurement is graded pass/fail. All symbologies include the following rules:

- All data characters are valid.
- Legal start and stop patterns (or characters).
- Correct check character(s) if specified.
- Legal quiet zones.
- Correct number and format of characters as specified.
- Correct "control" and "formatting" patterns (or characters).

Some application standards will place additional checks and/or restrictions on the symbology. Do not confuse these additional requirements with proper decode.

SUMMARY:

The majority of printing problems can be associated with one or more of the following problems:

- Incorrectly Made Plates
- Too Much or Too Little Pressure When Printing
- Poor Choice of Colors for Bars and Spaces
- Orientation of Bar Code in Relation to Print Direction

If you encounter any problems that have not been mentioned in this guideline please contact:

Stratix Corporation
4920 Avalon Ridge Pkwy.
Peachtree Corners, GA 30071
(800) 883-8300
www.stratixcorp.com