Mailing Evaluation Readability and Look-Up INstrument (MERLIN)

Barcode Error Reference Guide

August 2002

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INTRODUCTION

This document describes the various POSTNET/PLANET barcode evaluation error codes reported in the MERLIN Barcode Readability Report. MERLIN is capable of evaluating post cards, letters and flat mail. Even though the mail physical characteristics are different for post card, letter and flats, the majority of the barcode evaluation parameters are the same. In fact, the differences are specific to barcode position on the mail piece. The barcode printing requirements are the same for all types of mail. The document explains the differences of the barcode evaluation requirements between letter and flats when it is appropriate. When no references are made, the printing requirements are the same for all types of mail.

METHODOLOGY

There are three distinctive processes that help with the mail evaluation process in a MERLIN machine. The first one is the mail separation process which is achieved at the feeder section of the machine. The mail is separated piece by piece by the suction cups and mechanically advanced to the input rollers delivering it to the scale module. The second process is the settling of the mail and is performed within the scale module. At this section, the weight of the mail piece is determined as the mail piece settles continuing to the imaging module station. The third process is the image lifting process and it is performed as the mail moves along within the imaging module station to the stacker. The imaging camera acquires a line-scan image (200 by 200 dpi) that is used in the image recognition process. Lastly, the mail is stacked in the order it is presented at the feeder section.

A MERLIN machine is equipped with two computers. The Control Process Computer (CPC) controls the graphical user interface, monitors the transport and performs the database processes to produce the reports. The Imaging Process Computer (IPC) controls all the imaging acquisition activities. The two computers communicate to each other in real time providing information about a mail piece. It is during the transport of the mail piece through the imaging module section that the POSTNET/PLANET barcode is recognized. The image is analyzed within the IPC defining the best barcode recognition areas and selecting the area with highest barcode composition probability. The barcode characteristics are determined and communicated to the CPC which stores the results into the evaluation run database.

MERLIN utilizes two recognition engines for barcode analysis. One engine does the reading of the code (ZIPCODE) from the barcode symbols. The second engine performs the barcode quality analysis comparing the recognized printing characteristics of the barcode within the specified MERLIN tolerances. It is the results of the second engine that are reported in the POSTNET Barcode Readability Report.

The POSTNET Barcode Readability Report displays the barcode evaluation results using a set of error codes that are displayed with the POSTNET barcode image and summarized at the bottom of the report.

MERLIN POSTNET BARCODE EVALUATION THRESHOLDS

The mailer community should use the barcode specifications presented in the Domestic Mail Manual (DMM) to set up their barcode printing parameters. The barcode

specifications used by MERLIN are slightly less stringent than the ones in the DMM, but using the DMM specifications as a goal will result in less margin of error.

The following tables identify the common and the respective individual threshold level requirements for letters and flats for POSTNET barcode acceptance:

MERLIN Barcode Threshold Values					
	Scope	Common Parameters - Letters and Flats	DMM	MERLIN Software	
			Specification	Warning	Error
1	Per Bar	Minimum Tall Bar Height	0.1150	< 0.0936	< 0.0860
2	Per Bar	Minimum Short Bar Height	0.0400	< 0.0390	< 0.0234
3	Per Bar	Minimum Tall Bar Width	0.0150	< 0.0078	< 0.0039
4	Per Bar	Minimum Short Bar Width	0.0150	< 0.0078	< 0.0039
5	Per Bar	Maximum Tall Bar Height	0.1350	> 0.1716	> 0.1872
6	Per Bar	Maximum Short Bar Height	0.0600	> 0.0702	> 0.0780
7	Per Bar	Maximum Tall Bar Width	0.0250	> 0.0351	> 0.0429
8	Per Bar	Maximum Short Bar Width	0.0250	> 0.0351	> 0.0429
9	Per Bar	Maximum Void Spacing	0.0050	> 0.0156	> 0.0234
10	Per Bar	Maximum Baseline Shift	0.0150	> 0.0156	> 0.0234
11	Per Bar	Overink Size		> 0.0156	> 0.0234
12	Global	Minimum Bars Per Inch	20.0000	< 20.0000	< 19.5000
13	Global	Maximum Bars Per Inch	24.0000	> 24.0000	> 24.5000
14	Per Bar	Minimum Bar Pitch	0.0416	< 0.0351	< 0.0273
15	Per Bar	Maximum Bar Pitch	0.0500	> 0.0546	> 0.0624
16	Global	Minimum PRD	30.0000	< 30.0000	< 15.0000
17	Global	Minimum Reflectance	GR45 – RD 50	< 50.0000	< 35.0000
18	Global	Barcode Clearance Top	0.0400	< 0.0390	< 0.0390
19	Global	Barcode Clearance Bottom	0.0400	< 0.039	< 0.0390
20	Global	Barcode Clearance Left	0.1250	< 0.1250	< 0.1250
21	Global	Barcode Clearance Right	0.1250	< 0.1250	< 0.1250
22	Per Bar	Minimum Bar Space	0.0120	< 0.0078	< 0.0039
23	Per Bar	Maximum Bar Space	0.0400	> 0.0429	> 0.0468

MERLIN Barcode Threshold Values					
	Scope	LETTER Parameters	DMM	MERLIN Software	
30	Per Bar	Maximum Bar Rotation - Letters	5.0000	> 5.0000	> 7.0000
31	Global	Maximum Pattern Skew - Letters	5.0000	> 5.0000	> 5.5000
32	Global	Address Block Top - Letters	4.0000	> 4.0000	> 4.0000
33	Global	Address Block Bottom - Letters	0.6250	< 0.6250	< 0.6250
34	Global	Address Block Left - Letters	10.5000	> 10.5000	> 10.5000
35	Global	Address Block Right - Letters	0.5000	< 0.5000	< 0.5000
36	Global	Address Block Left Edge Clearance - Letters	0.5000	> L - 0.5000	> L - 0.5000
37	Global	Barcode Read Area Top - Letters	0.6250	> 0.6250	> 0.6250
38	Global	Barcode Read Area Bottom - Letters	0.0000	> 0.0000	> 0.0000
39	Global	Barcode Read Area Left - Letters	4.7500	> 4.5000	> 4.5000
40	Global	Barcode Read Area Clear Zone (Right) First Bar - Letters	3.5000	> 3.5000	> 3.5000
41	Global	Barcode Clear Zone Top LRH - Letters	0.4375	> 0.4375	> 0.4375
42	Global	Barcode Clear Zone Bottom LRH - Letters	0.1875	< 0.1875	< 0.1875
43	Global	Barcode Clear Zone Left first bar - Letters	4.2500	> 4.2500	> 4.2500
44	Global	Barcode Clear Zone Right LRH - Letters	0.3000	< 0.3000	< 0.3000

MERLIN Barcode Threshold Values					
	Scope	FLAT Parameters	DMM	MERLIN Software	
24	Global	Maximum Bar Rotation - Flats	10.0000	> 10.000	N/A
25	Global	Maximum Pattern Skew - Flats		N/A	N/A
26	Global	Address Block Top - Flats	0.1250	> H - 0.125	> H - 0.125
27	Global	Address Block Bottom - Flats	0.1250	< 0.125	< 0.1250
28	Global	Address Block Left - Flats	0.1250	> L - 0.125	> L - 0.125
29	Global	Address Block Right - Flats	0.1250	< 0.125	< 0.1250

REPORT ERROR IDENTIFICATION

The POSTNET Barcode Readability Report identifies the pieces that produced a barcode error by displaying a Mail Piece ID, the associated barcode error codes and the image of the failing barcode (when applicable.) The error codes are displayed in three places for each instance. They could be located at the upper right hand corner at the end of the image (Global area), below the image at each barcode bar (Per Bar Area), and at the upper part of the image (Barcode Location error area).

Errors can be identified as Global or Per-Bar error instances. Global and Per-Bar error instances can be broken down as Warnings or Errors. Global error conditions are reported when barcode parameters that control the overall barcode quality such as the Print Reflectance Difference are encountered. One Global Error condition makes the barcode evaluation process fail. Global Warning Conditions never fail the barcode evaluation process. One Per-Bar Error instance will make the evaluation process fail. A Per-Bar Warning instance is categorized as non-critical, but more than 10 Per-Bar Warning instances of the same type for a given barcode will make the evaluation process fail. Global or Per-Bar Errors are reported by capitalized error code letters. Global or Per-Bar Warnings are reported by lower case error code letters.

At the bottom of the POSTNET Barcode Readability Report, the barcode evaluation results are reported in a percentage level. The error conditions are reported in a numerator/denominator format for the whole sample pieces. The numerator represents the Warnings and denominator represents the Error conditions. MERLIN reports these numbers based in an average process. The reported number indicates, in the average, the number of errors per one hundred pieces present in the sample. For example, in Figure 1 – POSTNET BARCODE READABILITY REPORT, the error code letter A: reports "**499/360**" for the Bar Too Tall condition. The numerator indicates that in the average, every one hundred mail pieces there are 499 instances of bar too tall warnings. The denominator indicates that in the average, every one hundred mail pieces there are 360 instances of bar too tall errors. It is clear from this sample that the verification process failed because of error condition A, and since the report shows the major concentration (distribution) in this area, it is safe to indicate that the mailing as a whole has barcode bars that exceed the maximum DMM requirement.

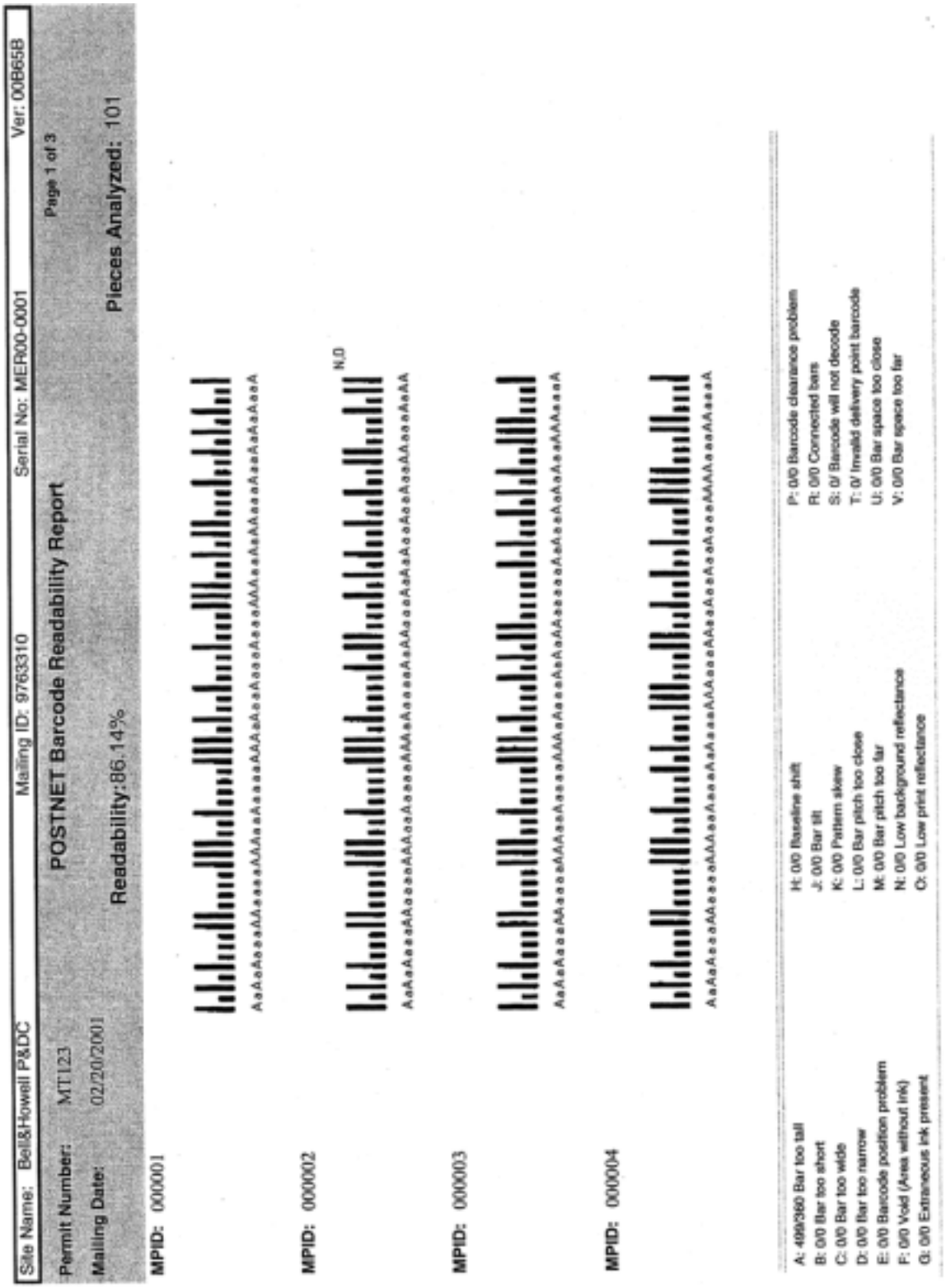

FIGURE 1 – POSTNET BARCODE READABILITY REPORT

REPORTING ERRORS

The following table lists all the error codes and their associated messages. There is no error code associated to the following upper and lower case letters: i, q, w, x, y, and z.

Code	Description	Code	Description	Code	Description
a/A	Bar is too tall	h/H	Base line shift problem	p/P	Barcode clearance problem
b/B	Bar is too Short	j/J	Bar tilt problem	r/R	Connected bars
c/C	Bar is too wide	k/K	Pattern skew problem	s/S	Barcode will not decode
d/D	Bar is too narrow	l/L	Bar pitch too close	t/T	Invalid delivery point barcode
e/E	Barcode position problem	m/M	Bar pitch too far apart	u/U	Bar space too close
f/F	Void (Area without ink)	n/N	Background reflectance is low	v/V	Bar space too far apart
g/G	Extraneous ink present	o/O	Print reflectance difference is low		

OTHER REPORTING ERRORS

The following table lists error conditions that do not have an error code associated with them. The error text replaces the barcode image of the identified piece in the POSTNET Barcode Readability Report.

Code	Description	Code	Description	Code	Description
N/A	Unrecognized barcode	N/A	Recognized but not analyzed barcode	N/A	Report image can't be displayed

ERROR CODE DESCRIPTION

The following section addresses each error code providing a description of the problem and the associated DMM requirement:

Note: Presented drawings are not to scale. The applicable measurement values are indicated in the MERLIN Barcode Threshold Values Table.

Bar is too tall

DMM Section C840 4.0 a, b

A full bar must not be greater than 0.135" in height.
A half bar must not be greater than 0.060" in height.

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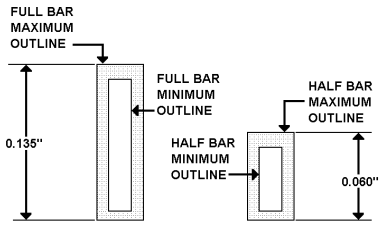
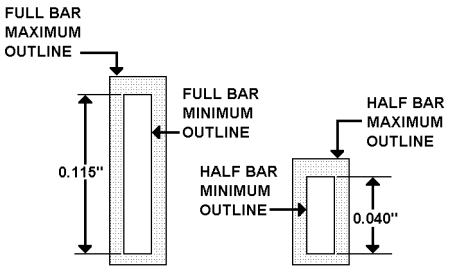


Bar is Too Short

DMM Section C840 4.0 a b

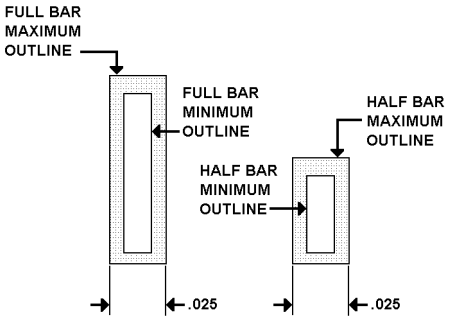
A full bar must be no less than 0.115” in height.
A half bar must be no less than 0.040” in height.



Bar is Too Wide

DMM Section C840 4.0 c

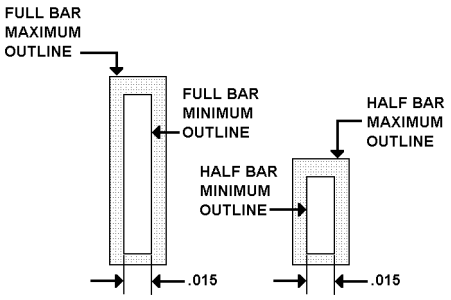
No bar can be greater than 0.025” in width.

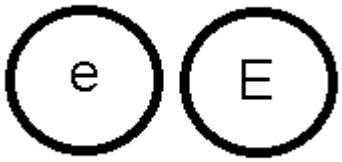


Bar is Too Narrow

DMM Section C840 4.0 c

No bar can be less than 0.015” in width.



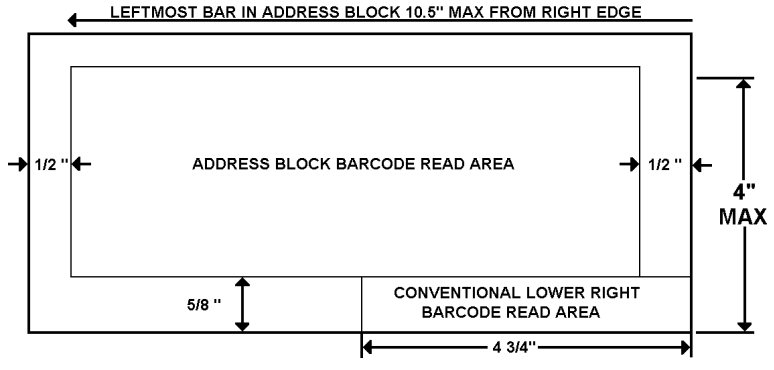


Barcode Position Problem

See DMM Sections C840 2.3, 2.4, 2.5, and 3.0

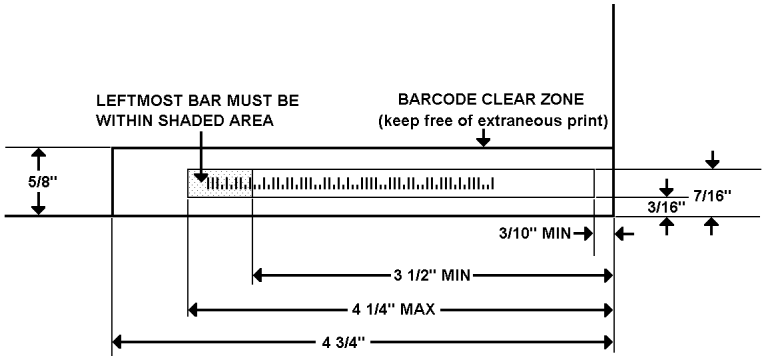
For letters the barcode position follows the two areas described in the Letter OCR Area figure below. The mailer can produce barcodes that are placed in either of the two areas - the Address Block Barcode Read Area or the Conventional Lower Right Barcode Read Area.

Letter OCR Area



If the barcode is printed in the Address Block Barcode Read Area and if any part of it is in contact with either the upper, lower, right or left OCR margins, the following barcode positional error descriptors are printed in the Barcode Location error area in the POSTNET Barcode Readability Report.

Code	Description	Code	Description	Code	Description
e/E	Barcode Out Of Address Block Read Area Left	e/E	Barcode Out Of Address Block Read Area Right	e/E	Barcode Out Of Address Block Read Area Top
e/E	Barcode Out Of Address Block Read Area Bottom				

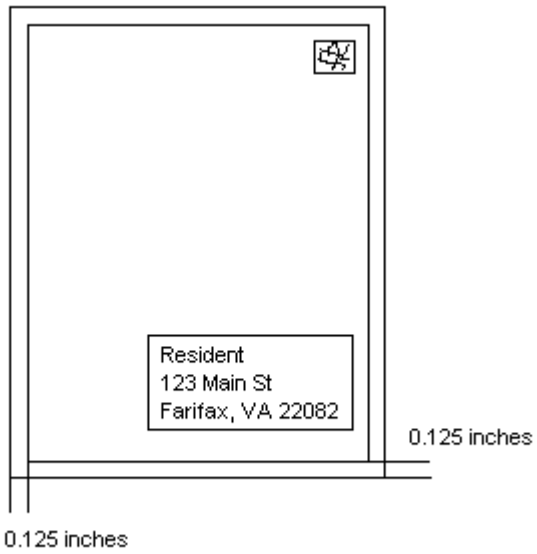


If the barcode is printed in the Conventional Lower Right Barcode Read Area and any part of the barcode is in contact with either of the upper, lower, right or left OCR margins, the following barcode positional error descriptors are printed in the Barcode Location error area in the POSTNET Barcode Readability Report.

Code	Description	Code	Description	Code	Description
e/E	Barcode Out Of Clear Zone Read Area Left	e/E	Barcode Out Of Clear Zone Read Area Right	e/E	Barcode Out Of Clear Zone Read Area Top
e/E	Barcode Out Of Clear Zone Read Area Bottom	e/E	First Bar out of the Firs Bar Zone Location		

If the first bar of the barcode (left most bar) is printed outside the Barcode Clear Zone left margin (to the left), the error condition is considered as if it were an Address Block Barcode Read Area "Barcode Out of the Address Block Read Area Bottom" instance and it is reported as such. If the first bar is positioned within the "leftmost bar shaded area" but outside of the upper or bottom margins, the barcode position error printed in the POSTNET Barcode Readability Report is: "First Bar out of the First Bar Zone Location".

Flats OCR Area



For flat mail, the barcode can be within the flats OCR area (Area about 0.125 inches from each edge of the mail piece. See Flats OCR Area Figure.)

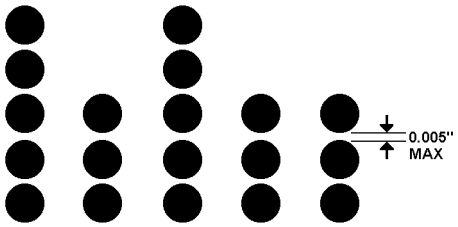
If the barcode in a flat mail is printed and positioned outside the OCR area margins (top, left, bottom, or right margins), the MERLIN software will report in the Barcode Location field of the POSTNET Barcode Verification Report the error messages listed in the following table:

Code	Description	Code	Description	Code	Description
e/E	Barcode Out Of Address Block Read Area Left	e/E	Barcode Out Of Address Block Read Area Right	e/E	Barcode Out Of Address Block Read Area Top
e/E	Barcode Out Of Address Block Read Area Bottom				

Void (Area Without Ink)

DMM Section C840 4.0

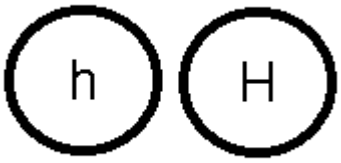
Ink voids must not cause any bar to fail to meet the minimum or maximum bar dimension standards. Extraneous ink may also cause void error conditions.



Extraneous Ink Present

DMM Section C840 4.0

Extraneous ink must not cause any bar to fail to meet the minimum or maximum bar dimension standards. Ink voids may also cause this error condition.



Baseline Shift Problem

DMM Section C840 6.1 and 6.2

The individual bars of a barcode must not shift (be vertically offset) more than 0.015 inches from the average baseline of the entire barcode.