



IMb™ ERROR REFERENCE GUIDE

MAILING EVALUATION, READABILITY AND LOOK-UP INSTRUMENT (MERLIN)

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| Trademark | Description |
|-----------------------|--|
| ACS™ | Address Change Service |
| BRM® | Business Reply Mail |
| CRM™ | Courtesy Reply Mail |
| CONFIRM® | Computerized On-line Notification For Inbound Reply Mail |
| FAST® | Facility Access and Shipment Tracking |
| Full-Service ACS™ | Full Service Address Correction Service |
| IM® Tray barcode | Intelligent Mail barcode for trays |
| IM® Container barcode | Intelligent Mail barcode for containers |
| IMb™ | Intelligent Mail barcode suite used on letters and flats |
| Mail.dat® | File format |
| Mail.XML™ | File format |
| MERLIN® | Mail Evaluation Readability Lookup Instrument |
| PLANET® | Postal Alpha-Numeric Encoding Technique |
| PostalOne!® | PostalOne |
| Postal Wizard® | Postal Wizard |
| POSTNET™ | Postal Numeric Encoding Technique |
| USPS® | United States Postal Service |

INTRODUCTION

This document describes the various IMb™ evaluation error codes reported in the MERLIN Barcode Readability Report. MERLIN is capable of evaluating postcards, letters and flat mail. Even though the mail physical requirement characteristics are different from postcard, letter and flats, the majority of the parameters of the barcode evaluation are the same. In fact the differences are related to barcode position on the mail piece. The barcode printing requirements are the same for all types of mail. In addition, this document provides a description of the standards for IMb™ printing per the Domestic Mail Manual (DMM) USPS publication USPS-B-3200.

This document explains the differences of the 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 singularizing process which is achieved at the feeder section of the machine. The mail is singularized 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 module 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 that is used in the image recognizing process. Lastly, the mail is stacked in the order it is presented at the feeder section.

When the mail piece is transported through the imaging module section then the IMb™ is recognized. The image is analyzed within the Imaging PC (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 Control PC (CPC) storing 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 and the results are utilized in the sortation analysis. The second engine performs the barcode quality analysis comparing the recognized printing characteristics of the barcode within the specified MERLIN tolerances. The second engine's results are reported in the MERLIN Barcode Quality Report.

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

MERLIN IMb™ EVALUATION THRESHOLDS

The following table identifies the threshold levels for the IMb™ acceptance process.

| | Parameter | USPS-B-3200 |
|----|---|--------------------|
| 1 | Minimum Full Bar Height | .125" |
| 2 | Minimum Tracker Bar Height | .039" |
| 3 | Minimum Ascender or Descender Bar Height | .082" |
| 4 | Maximum Full Bar Height | .165" |
| 5 | Maximum Tracker Bar Height | .057" |
| 6 | Maximum Ascender or Descender Bar Height | .111" |
| 7 | Minimum Tall Bar Width (Full and Ascender) | .015" |
| 8 | Minimum Short Bar Width (Tracker and Descender) | .015" |
| 9 | Maximum Tall Bar Width (Full and Ascender) | .025" |
| 10 | Maximum Short Bar Width (Tracker and Descender) | .025" |
| 11 | Maximum Void Spacing | 0.010 |
| 12 | Overink Size | 0.010 |
| 13 | Minimum Bars Per Inch | 20 |
| 14 | Maximum Bars Per Inch | 24 |
| 15 | Minimum Bar Pitch | .0416" |
| 16 | Maximum Bar Pitch | .050" |
| 17 | Minimum PRD | 30% |
| 18 | Minimum Reflectance | 50% |
| 19 | Barcode Clearance Top | .028" |
| 20 | Barcode Clearance Bottom | .028" |
| 21 | Barcode Clearance Left | .125" |
| 22 | Barcode Clearance Right | .125" |
| 23 | Minimum Bar Space | .012" |
| 24 | Maximum Bar Space | .040" |
| | FLATS | |
| 25 | Maximum Bar Rotation - Flats | +/- 10 degrees |
| 26 | Maximum Pattern Skew - Flats | N/A |
| | LETTERS | |
| 27 | Maximum Bar Rotation - Letters | +/- 5 degrees |
| 28 | Maximum Pattern Skew - Letters | +/- 5 degrees |

TABLE 1 – BARCODE THRESHOLD VALUES

REPORT ERROR IDENTIFICATION

MERLIN software reports the IMb™ evaluation results based on a percentage level. MERLIN utilizes an averaging approach in reporting the individual error categories at the bottom of the report (see Figure 1 – AUTOMATION RATE BARCODE COMPONENTS REPORT)

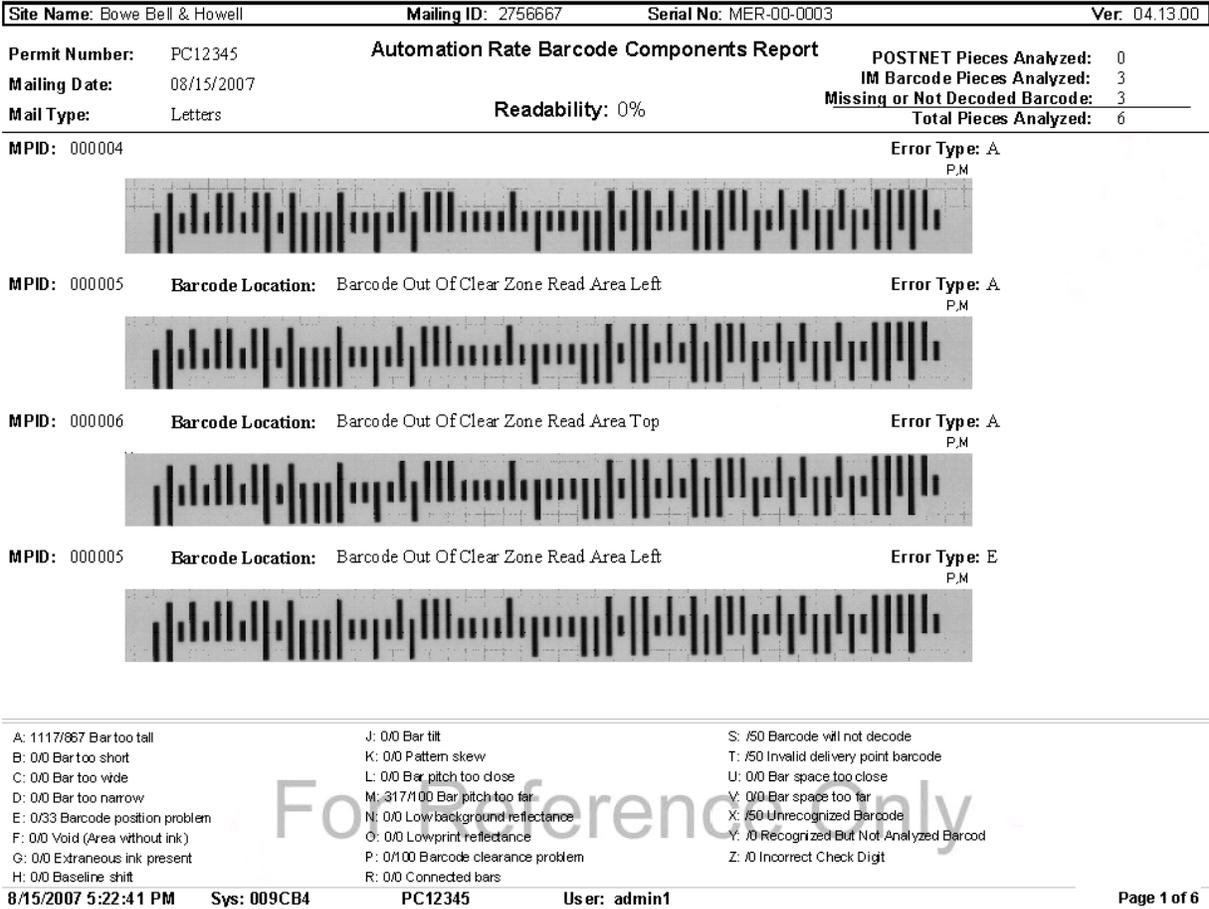


FIGURE 1

Upper and lower case alpha characters are displayed below the barcode's bars when errors/warnings are identified. Upper case characters represent hard errors. One upper case character (hard error) will fail a barcode. Lower case characters represent warnings. More than 10 same lower case letters (warning) will fail a barcode.

REPORTING ERRORS

The following table lists all the error codes and their associated messages. The last error condition does not have a letter associated with it, but the message replaces the barcode image of the identified piece.

| Code | Description | Code | Description | Code | Description |
|------|--------------------------|------|-------------------------------------|------|-------------------------------------|
| A/a | Bar is too tall | J/j | Bar tilt problem | S/s | Barcode will not decode |
| B/b | Bar is too short | K/k | Pattern skew problem | T/t | Invalid delivery point barcode |
| C/c | Bar is too wide | L/l | Bar pitch too close | X/x | Unrecognized barcode |
| D/d | Bar is too narrow | M/m | Bar pitch too far apart | Y/y | Recognized but not analyzed barcode |
| E/e | Barcode position problem | N/n | Background reflectance is low | Z/z | Incorrect Check Digit |
| F/f | Void (Area without ink) | O/o | Print reflectance difference is low | | Report image can't be displayed |
| G/g | Extraneous ink present | P/p | Barcode clearance problem | | |
| H/h | Base line shift problem | R/r | Connected bars | | |

TABLE 2 – REPORTING ERROR AND WARNING TYPES

The following sections provide a description of the problem and the requirement for each error type.



Bar is too tall

An ascender bar must not be greater than 0.111" in height. A tracker bar must not be greater than 0.057" in height. A descender bar must not be greater than 0.111" in height. A full bar must not be greater than 0.165" in height.

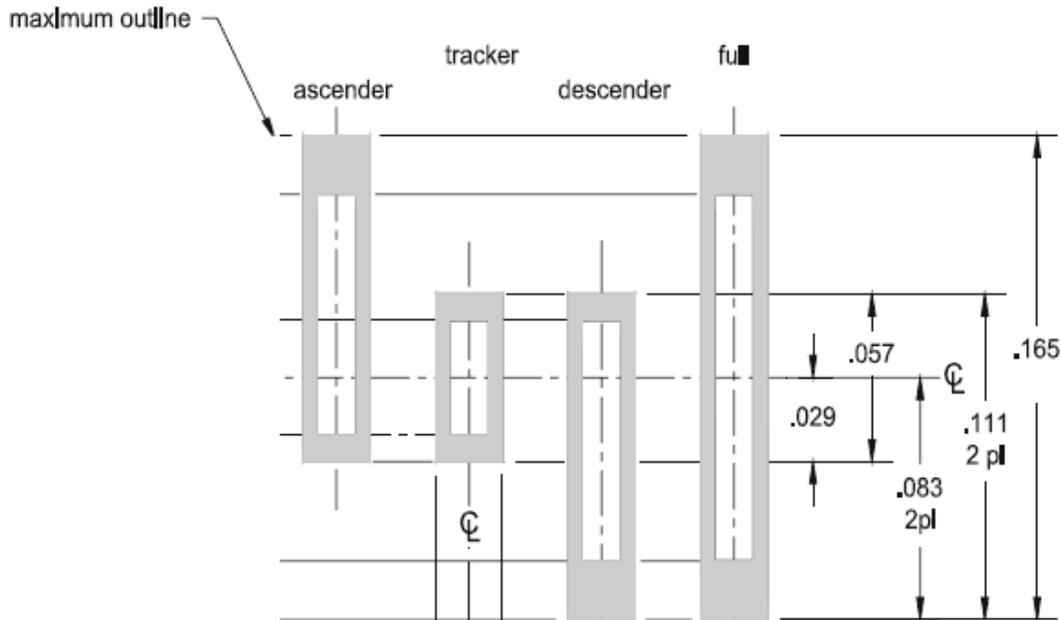


FIGURE 2

B

b

Bar is too short

A full bar must be no less than 0.125" in height. An ascender bar must be no less than 0.082" in height. A tracker bar must be no less than 0.039" in height. A descender bar must be no less than 0.082" in height.

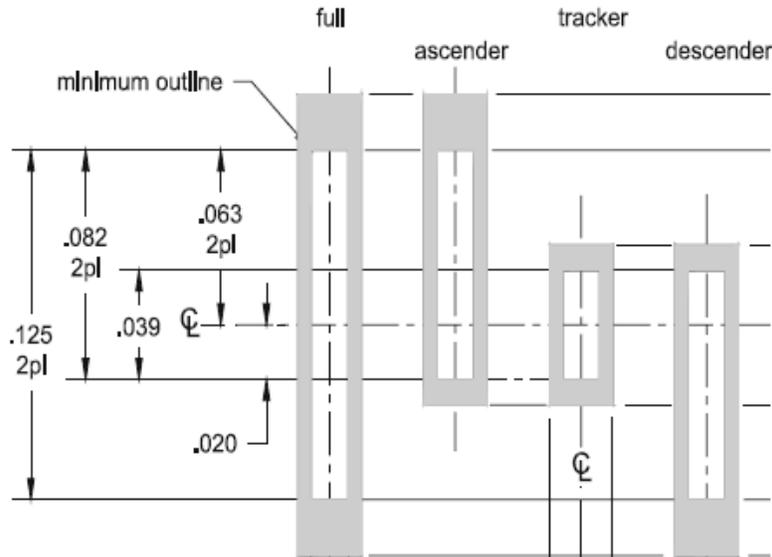


FIGURE 3

C

c

Bar is too wide

No bar can be greater than 0.025" in width.

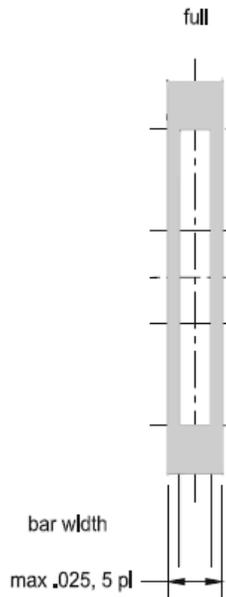


FIGURE 4



Bar is too narrow

No bar can be less than 0.015" in width.



FIGURE 5



Barcode Position Problem

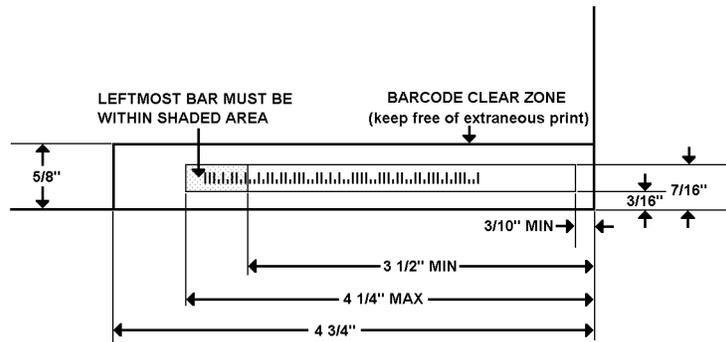
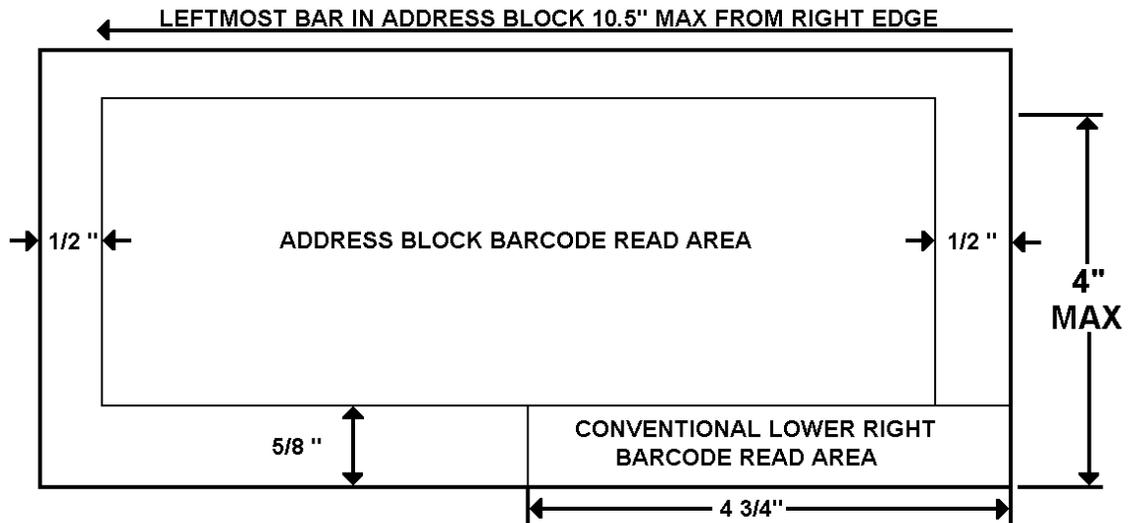


FIGURE 6

For letters the barcode position follows the two areas described in the figure. For flat mail, the barcode can be within the flats OCR area (greater than 0.125 inches from each edge of the mail piece). Also, the barcode clearance zone requirements need to be observed within this category.



Void (Area Without Ink)

Underinking, common with inkjet and dot matrix printers, can cause a bar to fail to meet its minimum dimensions and prevent successful barcode interpretation. Underinking and voids shall not cause any bar to fail to meet minimum specified dimensions.

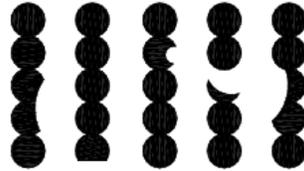


FIGURE 7



Extraneous Ink Present

Overinking can cause a bar to exceed its maximum dimensions and prevent successful barcode interpretation. Excessive or extraneous ink shall not cause any bar to exceed the specified dimensions.

Ideally, inkjet printing, dot matrix printing, or any other similar printing process should yield dots that touch or overlap, as shown below.

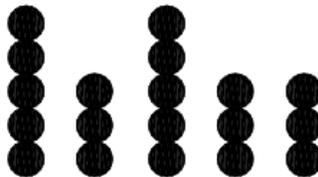


FIGURE 8



Baseline Shift Problem

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

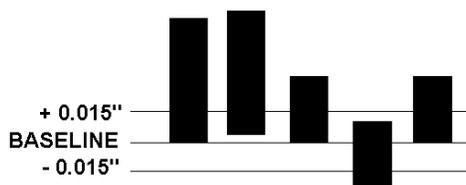


FIGURE 9



Bar Tilt Problem

The combined effects of positional skew (slant or tilt of the entire barcode baseline) and rotational skew (slant or tilt of the individual barcode bars) for letters and postcards must be limited to a maximum rotation of the bars of ± 5 degrees perpendicular to the bottom edge of the piece.

For flat mailings, the requirement is limited to a maximum of ± 10 degrees.

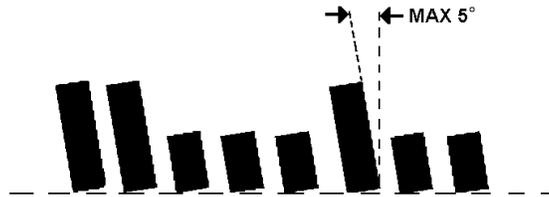
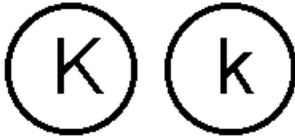


FIGURE 10



Pattern Skew Problem

The combined effects of positional skew (slant or tilt of the entire barcode baseline) and rotational skew (slant or tilt of the individual barcode bars) for letters and postcards must be limited to a maximum rotation of the bars of ± 5 degrees perpendicular to the bottom edge of the piece. For a flat mailing, there are no requirements at this time.



FIGURE 11



Bar pitch is too close

The pitch or center-to-center horizontal spacing of bars must be a minimum of .0416 or 24 bars per inch. The minimum space between bars must be .012". Horizontal dimensions shall be based on the centerline of the individual bars, forming an overall barcode pitch of 22 ± 2 bars per inch.

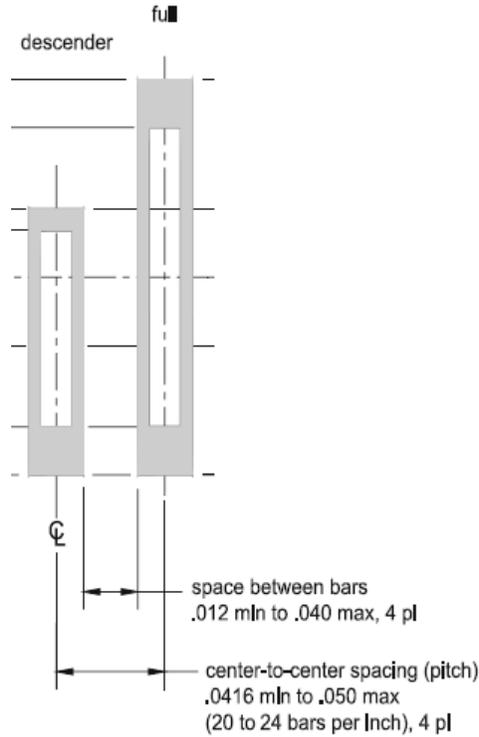
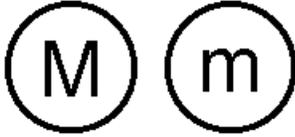


FIGURE 12



Bar pitch is too far apart

The pitch or center-to-center horizontal spacing of bars must be a maximum of .050 or 20 bars per inch. The maximum space between bars must be .040". Horizontal dimensions shall be based on the centerline of the individual bars, forming an overall barcode pitch of 22±2 bars per inch.

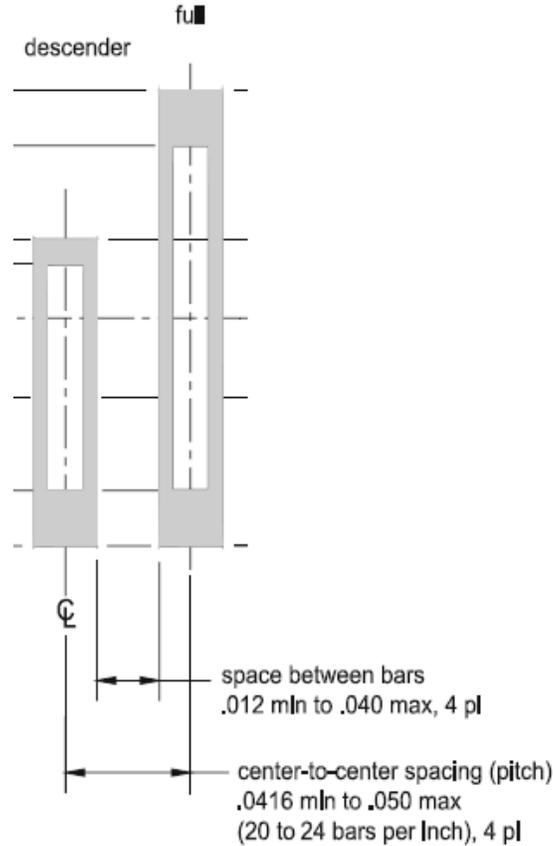


FIGURE 13



Background reflectance is low

A background reflectance of at least 50% in the red portion and 45% in the green portion of the optical spectrum must be produced in the following locations when measured with a USPS or USPS-licensed envelope reflectance meter:

- a. The barcode clear zone of a card-size or a letter-size piece barcoded in the lower right corner.
- b. The area surrounding the barcode (within 1/8 inch of the leftmost and rightmost bars and 1/25 inch above and below the barcode) of a card-size, letter-size, or flat-size piece barcoded in the address block and of a flat-size piece barcoded elsewhere.
- c. The barcode clear zone on a non-barcoded card-size or letter-size piece in an upgradable mailing.



Print reflectance difference is low

A print reflectance difference (PRD) of at least 30% in the red and green portions of the optical spectrum is required between the background material of the mailpiece and the barcode, when measured with a USPS or USPS-licensed envelope reflectance meter. (PRD equals the reflectance of the background minus the reflectance of the ink.)



FIGURE 14



Barcode Clearance Problem

A clear zone shall be placed around the barcode to ensure that readers can locate and read the barcode. A minimum clear zone shall be 0.028 inch above and below the barcode and 0.125 inch on each end of the barcode.

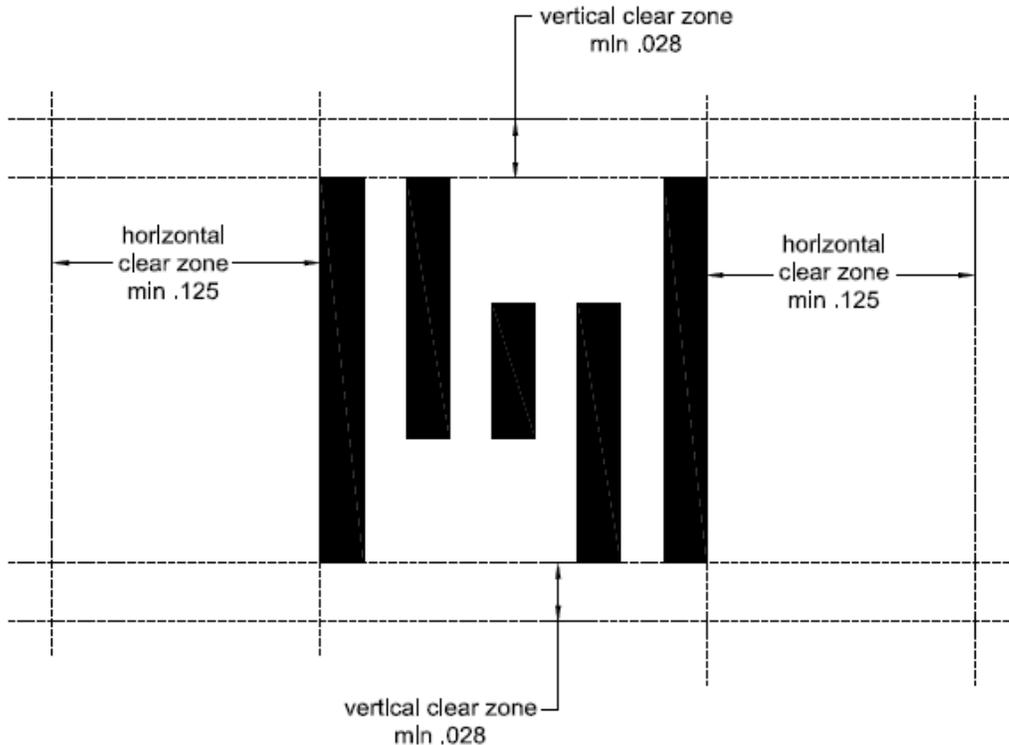


FIGURE 15



Connected Bars

The clear vertical space between bars must not be less than 0.012 inch or more than 0.04 inch.



FIGURE 16



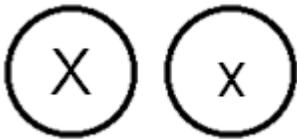
Barcode will not decode

A 4-State Symbology (ascender, descender, tracker, and full bars) barcode must contain 65 bars that encodes up to 31-characters. Barcode will not decode is reported when 65 bars exist but bar combinations do not produce a valid encode result.



Invalid Delivery Point Barcode

The correct Delivery Point Barcode must be derived and provide rules for common and unusual address formats. This code may also appear in conditions in which a digit is printed incorrectly.



Unrecognized Barcode

MERLIN is able to recognize an area as containing a possible barcode or found a 4-state barcode with other than 65 bars. One or more quality errors preventing MERLIN from making out what type of barcode is present and what the barcode represents can also cause this condition.



FIGURE 17



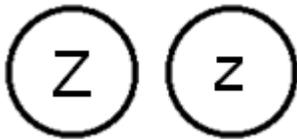
Recognized but not analyzed barcode

In this error condition, MERLIN knows that there is a barcode but the barcode analysis engine does not have an image available for performing the barcode analysis. The reader engine was able to recognize it. This error condition is associated with poor printing of a barcode for the analysis engine to recognize it and perform measurements.



FIGURE 18

The barcode reader engine may be able to decode it, but the barcode analysis engine may not be able to recognize it. This error condition may produce a recognized but not analyzed barcode condition.



Incorrect Check Digit

This error type is only used for POSTNET barcode and is not reported for an IM Barcode. Unlike POSTNET barcode, the Routing Code within the IMb™ does not require a check digit. Also, unlike POSTNET barcode, the IMb™ is always 65 bars regardless of ZIP Code length. In certain situations the mailer may opt not to populate the Routing Code and use the barcode only for tracking; however, mailers should adhere to USPS program-specific guidance. The Routing Code, if populated, must never be padded with zeros, spaces or nulls that are not part of the valid ZIP Code.

Report image can't be displayed

This error condition is reported if barcode readability failed, but due to internal MERLIN file transfer, an image was unable to be included in the report. Readability errors are included in the legend.