

PROPOSED UNIVERSAL PRODUCT CODE SYMBOL

Submitted by:

DYMO INDUSTRIES, INC.
91 BOLIVAR DRIVE
BERKELEY, CALIFORNIA 94710

For Further Information Contact:

Dr. William Mullen
or

Mr. Luigi Contini

DYMO BAR CODE SPECIFICATION FOR UNIVERSAL PRODUCT CODE SYMBOL

In the development of a symbol for submission as the proposed Universal Product Code, Dymo considered the following criteria to be of prime importance:

1. The symbol must be readily printable by grocery manufacturers without requiring revolutionary changes in their manufacturing and quality control procedures. The most important element is a system permitting very broad tolerances in printed width.
2. The symbol must be capable of being reduced to a compact configuration for its long range use as grocery manufacturers learn to print and control to much narrower tolerances. Equally important, a very compact symbol is necessary for the many small packages and labels that grocery manufacturers now have in their product lines.
3. The compact symbol must be capable of being printed by simple, inexpensive, hand-held, in-store label printing and application devices. This permits the installation of automatic check-out systems with code scanners utilizing in-store marking and labeling procedures well known to the supermarket industry today. Additionally, it permits the evolution of grocery manufacturers' source printing capability to the ultimate narrower tolerances required and answers the problem of the gradual transition from no source marked symbols to extensive use of source marking. Additionally, in-store marking will always be required to some significant extent.
4. The symbol must be capable of being read by simple, inexpensive devices such as wand scanners but also, more complicated, more expensive, "hands-off" scanners which may have some attractive characteristics for some supermarket chains and/or some stores within a chain.

Dymo feels that its symbol amply satisfies the above criteria. Compact codes and broad tolerances tend to be diametrical opposites. Broad tolerances, however, are essential if grocery manufacturers, who must underwrite the expense and solve the problems associated with source printing the symbol, are expected to respond quickly and provide rapid escalation of source symbol marking. Conversely, compact codes requiring tighter tolerances will slow the growth of source marking, but are essential both for in-store labeling and source printing of small items, as well as the long range requirements of source symbol marking. Dymo has extensive experience in printing bar codes both in the store and by source-printing techniques and is well aware of the present state of the art. As a result of this experience and the additional information provided by the PIDAS Study, we have developed a symbol format which may be printed in two basic sizes with two separate sets of tolerances. Both formats can be scanned and decoded by one system.

Code Format A, which is the basic subject of this paper, has a density of $8\frac{1}{3}$ characters per inch with a basic bar width tolerance of ± 0.007 ". This is well within the grocery industry's present printing capability and, therefore, should cause no printing problems in source marking.

The compact code, Format B, provides a density of 12 characters per inch with bar width tolerances of ± 0.002 ". This particular code format, therefore, is intended initially for in-store labeling with hand-held printers, such as Dymo's, which have the capability of printing this format with its required tolerances. Additionally, this compact format could be used by the grocery manufacturers for source symbol printing after they have refined their printing techniques and quality procedures to meet the tighter tolerances required.

Additionally, a third format, Format C, having a density of $16\frac{2}{3}$ characters per inch with bar width tolerances of ± 0.002 " is possible both for in-store labeling and source printing in the future, but not initially.

In summary, Format A, with its loose tolerances, is intended as the primary format to be source printed by the grocery manufacturers. Format B, with its tight tolerances, is intended to be used primarily for in-store labeling, but may be source printed, if desired. Formats A & B will be scanned and decoded by the same system.

Format C is intended as the future replacement for Format B, providing a very compact code for both source printing and in-store labeling, but requiring tight printing tolerances. In the future, Formats A & C would be scanned and decoded by the same system. However, if it were essential, all three formats could be accommodated in the same system but would require a change in the start and stop code assignments.

CODE FORMAT A

Every effort was made to keep this specification as simple as possible.

Bar Spacing, Width and Tolerances

All black bars are printed on center lines which are a multiple of 0.024 inches apart. There are five elements (or center lines) in each of the characters. The nominal character width, therefore, is 0.120 inches. All black bars are 0.021 ± 0.007 inches wide on their center lines with the exception of the first bar in the start code and the last bar in the stop code which are 0.027 ± 0.007 inches wide. The bar edge used to determine its width is defined as the average edge of any 0.010 inch length any place within the bar length excepting the 0.015 inches at either end. No separate tolerance specification on the spaces is necessary.

Bar-to-Bar Center Line Variations

All black bars are on center lines which are multiples of 0.024 inches. Center line to center line spacing is important only for any three of these center lines in a row. If the spacing is in error, the bar tolerance is still the same, but is skewed to one side by the amount the center line spacing is in error. As a practical matter, the center line error is usually extremely small compared to the width tolerance and causes no problem.

Reflectance Levels

Although absolute reflectance levels are not important, backgrounds giving high reflectance values provide broader tolerance in reflectance of the printed black bars. High contrast ratios are desirable. The maximum ratio of printed reflectance to background reflectance is 0.4 to 1.0. The reflectance of the background is the lowest reflectance level obtained on the background using a 0.008 inch diameter eye on a Kidder Model 081 Optical Character Tester equipped with an IR narrow band filter (peak response at 900 millimicrons, half-power bandwidth 100 millimicrons). The reflectance level of the black bar is the highest reading obtained within the bar.

Voids

If a void were entirely white (usually they are gray) it would be limited to 0.004 inches in dimension in the scanning direction. In the transverse direction to scanning, any length is permitted.

Spots

A spot is limited to 0.004 inches in dimension in the scanning direction. In the transverse direction to scanning, any length is permitted.

Background and Bar Colors

Any combination of colors which provides the desired contrast ratio is acceptable. It is preferable that the background be white and the bars black.

Symbol Location

The symbol may be located wherever it is convenient. If the item is cylindrical then the bars should be perpendicular to the axis.

Embossment

An embossment of 0.002 inches maximum is permitted in the bar area.

Printing Direction

Whenever possible, the long dimension of the bars should be parallel to the direction of paper travel in the printing press.

Folds, Creases, etc

Obviously, the bar code should not be located over folds or creases and areas that tend to wrinkle. Preferably, the code should be printed on a flat surface of the article.

Concave, Convex Surfaces, etc

In general, these surfaces should be avoided but they may be printed if absolutely necessary. Concave surfaces are easier to scan than convex. A surface whose radius is less than 1 inch should not be printed.

Check Digit

Based on our experience, we recommend the use of a modulo-10 check digit for the 10-digit Universal Product Code.

Other Considerations

Considerations concerning frost, water, overlays, gloss, opacity, uniformity, stroke angle, stains, smudges, scratches, temperature, humidity, etc., are to be considered part of the basic code width tolerances and contrast ratio tolerances. In other words, if any of the foregoing elements occur but the code remains within specification, it is acceptable. If it does not remain within specification, it is not acceptable.

Other Specifications

See page 5 for symbol dimensions and character assignment. A low profile version is also shown for source printing on very small items.

CODE FORMAT B

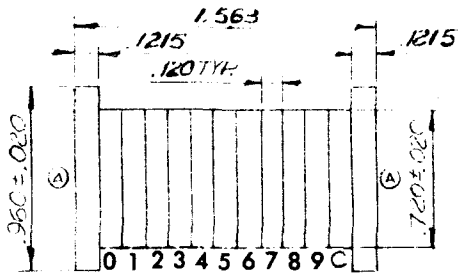
This compact code format is included primarily for informational purposes. For the most part, manufacturers would not be expected to consider this format at this time, but may want to consider it for some of their smaller sized items. However, it is the format that would be used with hand-held printers and labelers such as Dymo's. All of the specifications of the code Format A described above also apply here with the exception of the bar spacing width and width tolerances. In Format B all black bars are 0.012 ± 0.002 inches wide and are printed on center lines which are multiples of 0.012 inches. There are seven elements (or center lines) in each of the characters except the stop code. The nominal character width, therefore, is 0.084 inches. See page 5 for symbol dimensions and character assignment.

FUTURE CODE FORMAT C

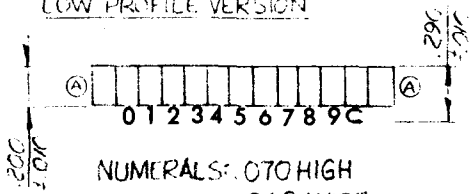
This format is 30% more compact than Code Format B and is intended to replace it in the future. If necessary, however, all three formats could be scanned and decoded by the same system. All of the specifications of Format B above apply to Format C. There are five elements (or center lines) in each of the characters (except the start and stop codes which have six). The nominal character width, therefore, is 0.060 inches. See page 5 for symbol dimensions and character assignment.

CODE FORMAT A

ACTUAL SIZE (SOURCE PRINTED)



LOW PROFILE VERSION



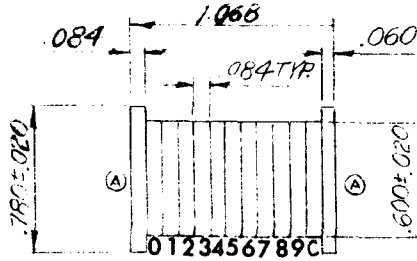
NUMERALS: .070 HIGH

NOTES: .060 WIDE

- ① DIMENSIONS ARE IN INCHES.
- ② ⓐ DENOTES .100 MIN. CLEARANCE AT ENDS.
- ③ NO CLEARANCE REQUIRED ABOVE & BELOW PRINTED FORMAT.
- ④ 'C' IS MODULO 10 CHECK DIGIT.

CODE FORMAT B

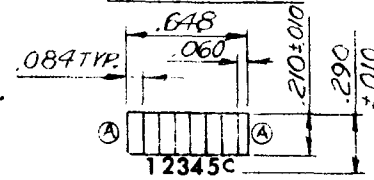
ACTUAL SIZE (SOURCE PRINTED)



LOW PROFILE VERSION



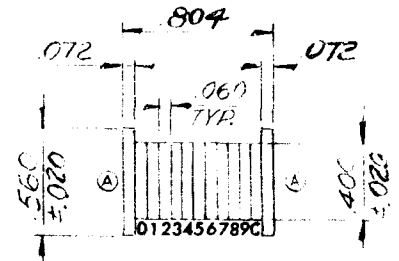
MODIFIED VERSION
for HAND TOOL



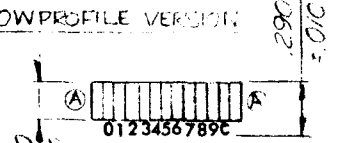
NUMERALS: .070 HIGH .060 WIDE

FUTURE CODE FORMAT C

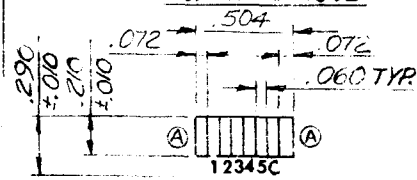
ACTUAL SIZE (SOURCE PRINTED)



LOW PROFILE VERSION

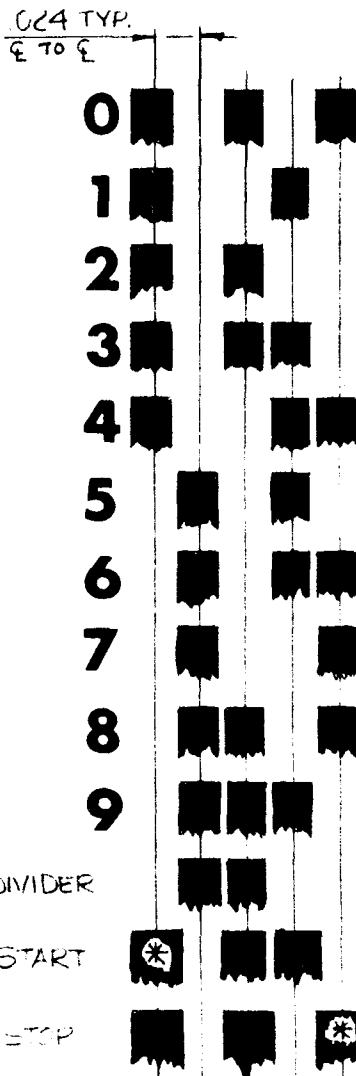


MODIFIED VERSION
for HAND TOOL



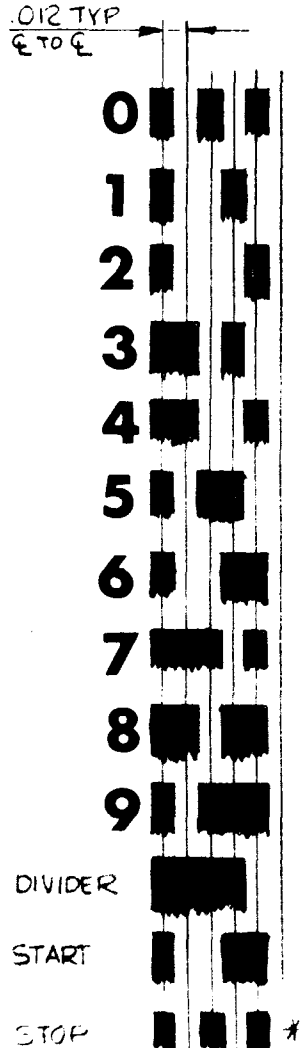
NUMERALS: .070 HIGH .045 WIDE

CHARACTER ASSIGNMENT



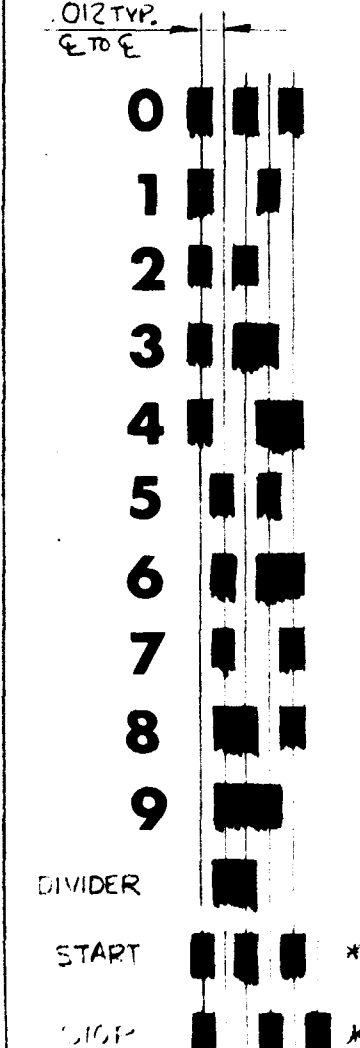
ALL BARS .021 ± .007 EXCEPT
* BARS ARE .027 ± .007 WIDE.

CHARACTER ASSIGNMENT



ALL BARS .012 ± .002 WIDE
* NOTE: STOP CODE IS 5
ELEMENTS, INSTEAD OF 7

CHARACTER ASSIGNMENT



ALL BARS .012 ± .002 WIDE
* NOTE: START & STOP CODES
6 ELEMENTS INSTEAD OF 5