## Barcode Format Templates Overview

The Microplate Labeler G5404B and support software include a set of pre-defined label formats which may be used for experimentation, training or to fast-track a new application. All support software also retains the capability for the user to design and save their own label formats using the full range of symbologies available with the instrument.


## Notes:

1. End-users should confirm that their barcode readers are capable of decoding any barcode symbology they are considering prior to making a final choice in label format.
2. The official file names found in the software look like this: Template $\mathbf{1}$ - Code 128 over single small text 20090923.xml (The 20090923 is the revision date of the file. The files used in this document were all released September 23, 2009)
3. Although the software format files for these formats are not directly compatible with the previous instrument version Microplate Labeler G5404A, similar label styles/formats can also be recreated for the G5404A version of the product. Contact the Agilent Automation Solutions business unit Technical Support department for assistance.
4. 2D symbologies (Templates 6-9) require significantly more advanced barcode readers (actually "imagers" or cameras) to be decoded. A majority of lab automation equipment will have more difficulty handling 2D symbologies, than the widely used 1D symbologies such as Code 128. However, if the reader that will decode the labels is known to be able to handler 2D codes, then some advantages can be realized from the use of 2D symbologies. The biggest advantage is greater data density which allows for more data to fit on a single label or for bigger text fields to be paired with similar amounts of data (as would fit using a 1D symbol).


Discussion. This is Agilent Technologies' top recommendation for a label format to use on microplates. This 1D symbology offers reasonable data capacity and should be readable with a great range of readers. A barcode that stretches the length of the label allows maximum data capacity for the label size. The text field underneath the barcode allows the barcode data to be repeated as human readable for verification. Alternatively, the text field could be used for other notes or data in addition to the barcode.

Specs. Max data $=24$ numerals or 12 alphas (max length of mixed alphanumeric data depends on mix). Note: Higher data density for numerals is achieved because they are encoded in pairs. So a number with 23 digits will not fit, even though a number with 24 digits will. Anything under 23 digits will fit.

## Detailed Description

- Code 128 symbology is very common and offers good data density for this size label.
- Narrow bar width (NBW) gives good readability and accommodates a good amount of data.
- To allow for some print drift, the margin to the left of the symbol is 0.050 " more than the minimum required quiet zone of 10 times the NBW.
- The margin at the right will depend on the amount of data in the code. Example shows the max data length while still maintaining a right margin of 0.15."
- Barcode extends to the top of label to maximize use of precious vertical space.
- Height of barcode is balanced to offer reasonable vertical redundancy but still allow room for a text field which is readable.
- The Droid Mono Bold font offers consistent character spacing, discernable and attractive characters.
- Text size is small to allow max space for barcode, but text is still legible.
- Minimum white space is left between the barcode and the text.
- Generous margin to the left of the text.
- Margin to the right of the text will depend on the number of characters as shown in the example.
- Text field is left justified to allow longer strings to fit on the label.
- 0.02 " white space left below the text to allow for some vertical print drift.


Discussion. If readability of the barcode is the primary objective, the best solution is to use all of the available space on the label for the barcode. This label can be paired (this label placed on one side of a microplate, while another label with the human readable equivalent content can be placed on another side of the microplate). See Template 3 for an example of a large-character, human readable label which might be paired with a barcode only label as illustrated in this example.

Specs. Max data $=24$ numerals or 12 alphas (max length of mixed alphanumeric data depends on mix).

## Detailed Description

- Code 128 symbology is very common and offers good data density for this size label.
- Narrow bar width (NBW) gives good readability and accommodates a good amount of data.
- To allow for some print drift, the margin to the left of the symbol is 0.050 " more than the minimum required quiet zone of 10 times the NBW.
- The margin at the right will depend on the amount of data in the code. Examples show max data lengths while still maintaining a right margin of 0.15 ."
- Barcode extends to top of label to maximize use of precious vertical space.
- Height of barcode is fills the label to offer maximum vertical redundancy.


## ABCD123456xyz



Discussion. If maximum legibility of text is the primary objective, the best solution is to use all of the available space on the label for the text. This label is designed to be paired with Template 2.

Specs. Max data $=24$ characters of any type.

## Detailed Description

- The Droid Mono Bold font offers consistent character spacing, discernable characters and a modern, attractive look.
- Text height is maximized within the height of the label.
- Adequate margin kept above the text to allow for 0.030 " vertical print drift.
- White space below the text allows room for lower case descenders (characters like q and g ) while also allowing for vertical print drift.
- Generous left margin allows for horizontal print drift (specification for the label is $\pm 0.030$ " on the positioning of the edge of the label to the edge of the label backing)
- Margin to the right of the text will depend on the number of characters as shown in the example.
- Horizontal scaling squeezes enough characters onto the label to match the max data that can fit onto a barcode label of Template 2.


Discussion. For those who are using only a small amount of data (max 10 numerals or 6 alphas) a large barcode symbol and large text can be combined on a single label. The small amount of data can be encoded with maximum readability for both barcode and human readable text.

Specs. Max data $=10$ numerals or 6 alphas (max length of mixed alphanumeric data depends on mix).

## Detailed Description

- Code 128 symbology is very common and offers good data density for this size label.
- Narrow bar width (NBW) gives good readability and accommodates a good amount of data.
- The margin at the right will depend on the amount of data in the code. Example shows max data length while still maintaining a right margin of 0.15"
- Barcode extends to top of label to maximize use of precious vertical space.
- Height of barcode fills the label to offer maximum vertical redundancy.
- Space between text and barcode is $0.025^{\prime \prime}$ more than the minimum quiet zone even when maximum data lengths are used.
- The Droid Mono Bold font offers consistent character spacing, discernable characters and a modern, attractive look.
- Text height is maximized within the height of the label.
- Adequate margin kept above the text to allow for 0.030 " vertical print drift.
- White space below the text allows room for lower case descenders (characters like q and g ) while also allowing for vertical print drift.
- Margin at left allows for horizontal print drift.
- Horizontal scaling squeezes enough characters onto the label to match the max data that can fit into the barcode symbol.


Discussion. The 2.0 " x 0.25 " label, although small, can easily fit multiple text fields (if barcode not necessary). This template offers 4 text fields which are all quite legible and can hold a generous amount of data.

Specs. Fields 1 and 2 , max data $=20$ characters; Fields 3 and 4 , max data $=13$ characters.

## Detailed Description

- The Droid Mono Bold font offers consistent character spacing, discernable characters and a modern, attractive look.
- Text height is scaled to fit one field above the other in the vertical space.
- Horizontal scaling offers good data density without sacrificing legibility.
- Top margin allows for some vertical print drift.
- Adequate space between bottom of one field and top of the next so the characters will not overlap (even with mixed upper and lower cases).
- White space below the text allows room for lower case descenders (characters like $q$ and $g$ ) while also allowing for vertical print drift.
- Generous left and right margin allow for horizontal print drift (specification for the label is $\pm 0.030$ " on the positioning of the edge of the label to the edge of the label backing).
- Usable width of fields 1 and 2 is slightly more than fields 3 and 4 offering options for both longer and shorter sets of data.


Discussion. The Data Matrix symbology with this dot size will encode roughly the same amount of data that can fit on a label with the Code 128 symbology. So, this template is analogous to Template 1. Because the Data Matrix symbol is so much denser than the Code 128 symbol, the text field on this label can be much larger than the corresponding text field from the Code 128 label.

Specs. Max data $=24$ numerals or 16 alphas (max length of mixed alphanumeric data depends on mix).

## Detailed Description

- Data Matrix is a very dense and a very popular 2D symbology.
- Dot size is conservative, promising good readability.
- Generous margins on both the right and left of the symbol.
- The margin above the symbol allows for 0.030 " vertical print drift.
- The margin below the symbol will depend on the amount of data in the code. Examples show max data lengths while still maintaining a lower margin of 0.030 ."
- The symbol is positioned to the left of the text in case too much data is accidentally used for the text fields. In that case, the text will run off the right edge of the label, but will not interfere with the barcode symbol.
- The Droid Mono Bold font offers consistent character spacing, discernable characters and a modern, attractive look.
- The font size is large to offer optimum legibility.
- The text field is scaled horizontally so it can fit enough characters to match the data that can be encoded in the symbol.
- Text field is left justified to allow longest possible strings for the available space.
- Generous space above and below the text to allow for vertical print drift.


Discussion. The use of the Data Matrix symbology with this dot size allows a large amount of data to be encoded into a symbol that only uses a small portion of the label. This template leverages the large space available for text to get two text fields. The upper text field can contain any extra information that might be useful on the label. The lower text field is sized to be able to fit the same number of characters that can fit in the barcode symbol.

Specs. Max data $=36$ numerals or 25 alphas (max length of mixed alphanumeric data depends on mix).

## Detailed Description

- Data Matrix is a very dense and a very popular 2D symbology.
- Dot size is relatively conservative for readability but still allows for roughly twice the amount of data that can fit on a label with the Code 128 symbology.
- Generous margins on both the right and left of the symbol.
- The margin above the symbol allows for 0.035 " vertical print drift.
- The margin below the symbol will depend on the amount of data in the code. Example shows max data lengths while still maintaining a lower margin of 0.035 "
- The symbol is positioned to the left of the text in case too much data is accidentally used for the text fields. In that case, the text will run off the right edge of the label, but will not interfere with the barcode symbol.
- The Droid Mono Bold font offers consistent character spacing, discernable characters and a modern, attractive look.
- Text field 1 offers good legibility and space for up to 26 characters.
- Text field 2 compresses the horizontal scaling so it can fit enough characters to match the data that can be encoded in the symbol.
- Text fields are left justified to allow longest possible strings for the available space.
- Adequate space above and below text to allow for some vertical print drift.


Discussion. The PDF 417 symbology can be used to create a template that is analogous to Templates 1 and 6. In this case, slightly more data can be encoded than in either the Code 128 or Data Matrix formats. And the text size ends up in between the sizes used in the Code 128 and Data Matrix formats.

Specs. Max data $=33$ numerals or 24 alphas (max length of mixed alphanumeric data depends on mix).

## Detailed Description

- PDF 417 is good for encoding large amounts of data.
- Narrow bar width should provide good readability while allowing a large amount of data to be encoded.
- In compliance with recommended practices, which states that row height should be at least 3 times the NBW.
- The symbol aspect ratio is set so the symbol will stretch across the label and allow significant room underneath for text.
- The printer's default error level of 0 is used.
- Generous margins on both the right and left of the symbol.
- The margin above the symbol allows for 0.030 " vertical print drift.
- The white space below the symbol will depend on the amount of data in the code. Examples show max data lengths while still maintaining 0.010 " of white space between the text and the symbol.
- The Droid Mono Bold font offers consistent character spacing, discernable characters and a modern, attractive look.
- The font size is larger than what is used with Code 128 in Template 1 but smaller than what is used with Data Matrix in Template 6.
- The text field is scaled horizontally so it can fit enough characters to match the data that can be encoded in the symbol.
- Generous margin on the left of the text.
- Margin on the right of the text will depend on number of characters as shown in the examples.
- Text field is left justified to allow longest possible strings for the available space.
- White space below the text allows for some vertical print drift.


Discussion. The PDF 417 symbology offers the label format which can encode the most data on this size label. In order to fit the same amount of data into the text field that can be encoded in the symbol, the text is small and compacted horizontally.

Specs. Max data $=58$ numerals or 41 alphas (max length of mixed alphanumeric data depends on mix).

## Detailed Description

- PDF 417 is good for encoding large amounts of data.
- Narrow bar width should provide good readability while allowing a large amount of data to be encoded.
- In compliance with recommended practices, which states that row height should be at least 3 times the NBW.
- The symbol aspect ratio is set so the symbol will stretch across the label and allow room underneath for text.
- The printer's default error level of 0 is used.
- Generous margins on both the right and left of the symbol.
- The margin above the symbol allows for 0.030 " vertical print drift.
- The white space below the symbol will depend on the amount of data in the code. Example shows max data lengths while still maintaining 0.020 " of white space between the text and the symbol.
- The Droid Mono Bold font offers consistent character spacing, discernable characters and a modern, attractive look.
- The font size is small to fit in the available space, but is still legible.
- The text field is scaled horizontally so it can fit enough characters to match the data that can be encoded in the symbol.
- Reasonable margins on the left of the text.
- Margin on the right of the text will depend on the number of characters as shown in the examples.
- Text field is left justified to allow longest possible strings for the available space.
- White space below the text allows for some vertical print drift.

