Technology Brief

Thermal Print Head (TPH) Resolution and Advantages

Introduction

This technology brief covers the print quality and image size that can be achieved with different thermal print head (TPH) resolutions.

Depending on customer requirements it might make sense to propose a higher resolution print head.

Intermec printers support three different TPH resolutions:

- 203 dpi (8 dots/mm)
- 300 dpi (11.8 dots/mm)
- 406 dpi (16 dots/mm)

Note: when viewing this Tech Brief on a computer screen, the relatively low resolution of the display will affect the apparent differences between different resolutions. To best see the examples, print this document on a high-quality inkjet or laser printer.

Supported Printers

This paper describes general technology and is not limited to any specific printer.

Note that not all Intermec printers support higher resolution; refer to the respective product sheets for resolutions supported by each printer.

Print Head Resolution

Higher print head resolution means more dots available within the same print area. This makes it possible to print smaller barcodes and fonts.

Also the higher resolution TPH provides crisper printouts; which lead to improved print quality (PQ).

For labels containing graphic images, a higher resolution TPH renders the image with greater detail and finer shading.

Printing Speed

Higher resolution print heads have more dots to heat up and require more time to process each printed line. This generally results in a slower maximum printing speed.

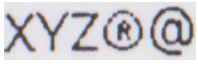
For some products however, the maximum printing speed may be the same for different resolutions. Refer to the respective product profiles for supported speeds with each resolution.

Font Size and Quality

The significant PQ difference can be seen in the table below. With a higher resolution, smaller text can be printed and thus better readability can be achieved.

Even larger font sizes will render with smoother edges and will have a more pleasing appearance.

The table below shows that at a certain small font size the text is only readable in labels printed with higher resolution.

203dpi	300dpi	406dpi
		
		

(Note: the images above are scaled and the actual size on the label is very small.)

Bar Code Size

With higher resolution, barcode width is narrower in proportion, hence bar codes will require less space on the label. The tables and images below illustrate the difference in size when printing the same bar code data in different TPH resolutions.

	203dpi	300dpi	406dpi
Minimum achievable bar code size (mil)	5	3.3	2.5

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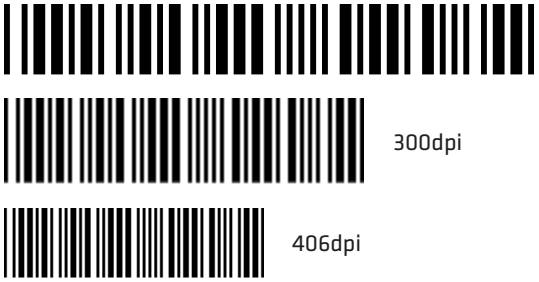

203dpi 300dpi 406dpi

Image Quality

The following images show that higher resolution gives much higher printout quality for the same image. This is because higher resolution means more dots in a given physical area, which directly translates to more shades of grey and sharper details.

Note that these images are rendered at the same physical size and the image is generated in the PC, based on the resolution at which it will print.

203dpi 300dpi 406dpi

203dpi 300dpi 406dpi

Migrating to Different TPH Resolution

When migrating from one TPH resolution to another (higher or lower) there are a few things to consider.

Most drawing objects are resolution dependent and will decrease in size when using higher resolution. This includes:

- Bitmap fonts
- Images
- Lines
- Bar codes

The only object that does not change size based on resolution is scalable fonts, e.g. TrueType. This type of font will always have the same physical size on the label, independent of resolution. If the target of changing resolution is to have better quality but same size then all objects except scalable fonts must be magnified. Bitmap fonts should be rendered in the target resolution or slanted lines and curves will look jagged. Images should be re-saved at the target resolution instead of magnifying them, as magnifying will decrease sharpness.

If the target is to create a smaller label then the scalable fonts must be reduced to a smaller font size.

Changing Print Head

As with existing PF, PM and PX printers, the new PM and PC series printers feature simple, no-tools print head replacement, whether replacing with the same or a different-resolution.

Only the print head itself needs to be replaced – no belts to change and no motor adjustments are necessary. One notable improvement over our earlier model printers: the wires are now much longer, making replacement even simpler.

Considerations/Notes

- The 1D bar code in this document is a code 39 with a bar ratio of 3:1 (wide vs. narrow bar).
- All bar codes are printed with the smallest available bar code size of the respective resolution.
- Most bar code scanners are able to decode bar codes printed at 3 mil size.
- When migrating from one TPH resolution to another there are some objects that get scaled and some that do not.

Conclusion

Clearly there are quality advantages to using a higher resolution print head. The most benefit is gained when printing on small labels that require smaller objects to be printed. When evaluating the right resolution for your usage, the following table may be useful.

Use case	203dpi	300dpi	406dpi
Label contains very small text	Harder to read	Good balance	Crisp
Desire for high-quality text	Good	Better	Best
Greyscale graphics	Fair	Better	Best
Need very small bar codes	Bigger	Medium	Smaller
Maximum printing speed	Fastest	Very fast	Fast

In many instances a 300dpi print head delivers nearly the same throughput as a 203dpi print head with virtually the same print quality as a 406dpi print head, resulting in an ideal combination of economy and quality.

Migrating from one resolution to another is not "plug-and-play" unless the customer application already takes resolution into consideration. If not then some of the objects needs to be scaled to fit the label.

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