![BarTender by Seagull Scientific]

Optimizing Print Performance
Configuring Your Printers and Optimizing
Your Templates for Maximum Throughput

Contents

Overview

Getting the right item printed at the right place at the right time can be the critical path for many shipping and inventory control departments. Whether you are designing your items in BarTender or printing them, you can improve your printing performance with a few quick and easy modifications. In this paper, you will find handy tips to print up the printing process by making modifications to the ways you design your items in BarTender, configure your printer and printer driver, and define the application settings of your software.

Designing Your Items

The choices you make when designing your items can profoundly affect the size of your print code, and subsequently, the speed at which your documents print. If you're looking to increase your printing performance, consider these simple design techniques:

Font Selection

In general, fonts come in two varieties: TrueType fonts and printer-based (or resident) fonts.

TrueType fonts are completely scalable, and you can specify any size text you want. By using TrueType fonts, such as Arial or Times New Roman, BarTender ensures that what you see on your template is the same font that will print on your item. However, any text objects on your design are sent to the printer as graphics.

Conversely, *printer-based fonts* are saved to the printer, rather than the computer. In heavy production environments, the use of printer fonts allows the items to print more quickly, since your application does not have to send the text to the printer as an image. Instead, all that is sent is a set of code numbers, one for each character.

Some printers have the capability to download TrueType fonts directly to the printer's memory. Since the font is then stored in the printer's memory, text that uses the font does not have to be sent to the printer as a graphic. The font usually remains in the printer's memory until a user deletes it.

Resident Fonts

In BarTender, resident fonts are listed with a printer icon 🖳 to the left of the font.

Unlike TrueType and OpenType fonts, the resident fonts available to you depend entirely on which printer is selected for the active document. If you print the *same* document to multiple printers, there may be no one resident font that is available on *all* the printers you will be using. In this situation, to gain the performance boost you get from using resident fonts, select a TrueType 🅻🆃 or OpenType font 𝑂 , but enable the **Substitute Best Matching Printer Font** check box on the **Font** tab of the **Text Properties** dialog.

None of your print jobs will actually use the font you selected. Instead, each printer will substitute the resident font that most closely matches the TrueType or OpenType font you selected.

Downloaded Fonts

Downloaded fonts come in two varieties: scalable and bitmap.

A *scalable font* contains rules and formulas that specify how each symbol is to be drawn. It is not simply a file that specifies pixel-by-pixel which pixels in each letter are black and which are white. With scalable fonts, you have multiple font size options; however, this advantage comes at the cost of a slight decrease in printing performance.

A *bitmap font* is a pixel-by-pixel specification, for each letter in the font, of which pixels are black and which are not. Even though TrueType and OpenType fonts are scalable, your driver can create a bitmapped font of a single size of a single font and download that to the printer. Note that a single bitmapped font contains one single font size; although any one bitmapped font

usually takes up less printer memory than a scalable font, the combined memory used by several such bitmapped fonts using the same typeface but different sizes might exceed the amount of memory used by a single scalable font.

Note that to download a font to your printer, your printer must support this functionality. To download a font:

1. Open the Windows **Devices and Printers** pane.
2. From the printer's context menu, select **Printer properties**. The **Printer Properties** dialog opens.
3. Click the **Fonts** tab. (If there is no **Fonts** tab, then your printer does not support any type of device fonts.)
4. From the **Font** dropdown list, select **Download Font**. The **Download Font** dialog opens. (If there is no **Download Fonts** option, then your printer does not support downloading fonts.)
5. On the **Download Font** dialog, select **Scalable** or **Bitmap**. (Your printer may support only one and not the other.)

   - If you selected **Scalable**, select a font type and style.
   - If you selected **Bitmap**, select a font type, style, size, scale and character set.

6. Leave the **Location** setting at its default. Consult your printer's documentation for information on this setting.
7. Click **OK** and the driver will download the font to the printer. The new font appears in the **Fonts** list on the **Printer Properties** dialog.
8. Click **OK** to close the **Printer Properties** dialog.

You can now select this font in BarTender. Although it will not have a printer icon beside its name, it is now, in effect, a kind of resident font for the current printer.
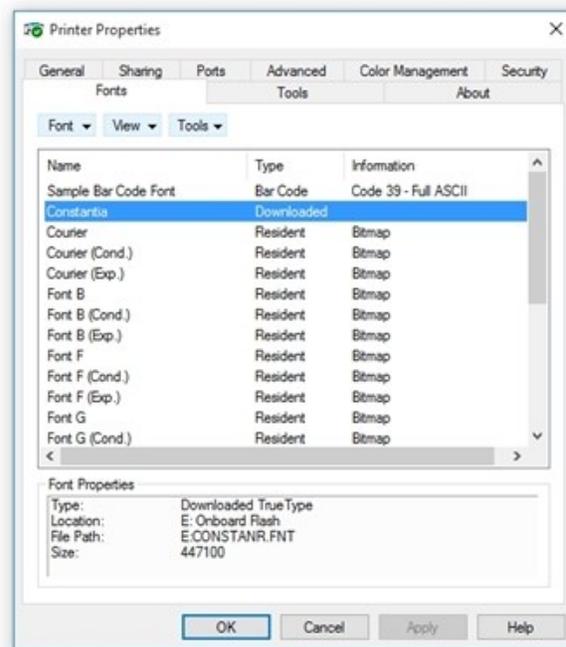
Barcode Rendering

Most thermal printers have built-in support for many popular barcode symbologies. By taking advantage of this printer feature, you can send only the data for the barcode to the printer and let the printer itself render the barcode symbol to print.

> **NOTE:** If the desired symbology is unsupported by your printer, there are application settings which may enhance your printing performance. See Object Print Method later in this white paper for more information.

BarTender, by default, will take advantage of this capability, but you can verify that the default has not changed with these steps:

1. Be sure that the printer you will be using is selected in the Print dialog for your document.
2. Double-click the barcode object to open the **Barcode Properties** dialog.
3. From the Navigation Pane on the left side, click **Symbology and Size**.
4. Verify that the desired symbology is selected.
5. Click the **Print Method** button. The **Print Method Options** dialog opens.
6. Verify that either option where barcodes are controlled by the printer is selected.
7. Click **OK** to close the **Print Method Options** dialog.
8. Click **OK** to close the **Barcode Properties** dialog.
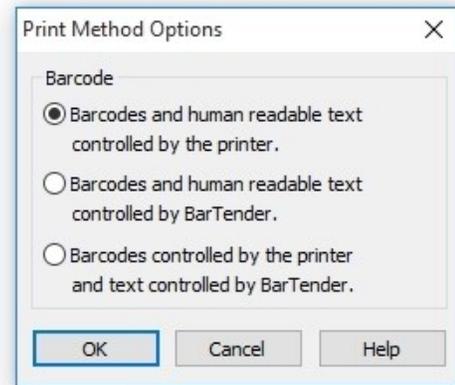
Image Sizing and Resolution

Printing is slowed when BarTender sends large images to the printer. To increase printing performance, use graphics sparingly in your designs and try to minimize the use of large graphics in your designs. Additionally, you can use graphics with fewer colors or decrease the resolution of your images to decrease their size.

Summary Quick Help Chart

Potential Performance Slowdown	Optimization Techniques
Use of TrueType fonts	• Change to a printer-based font • Enable **Substitute Best Matching Printer Font** • Download the TrueType font
Use of barcodes	• Let the printer render the barcode object • Change to a supported symbology
Use of large graphic files	• Use graphics sparingly • Convert graphic files to a smaller format

Configuring BarTender

Many of BarTender's print settings can affect the size of your printer code file, and subsequently, the speed at which your documents print. The following suggestions can be adjusted from within the BarTender application and will apply to any printer that you select from the **Print** dialog.

> **NOTE:** The following optimizations are only available for printers installed with Drivers by Seagull.

Object Print Method

In the previous chapter, we talked about modifications you can make when designing your items to improve printing performance. There may be, however, situations in which you do not have control over the design and/or you need to use text, barcodes or graphics that are not directly supported by your printer. Luckily, BarTender allows you to control *how* these unsupported objects are sent to the printer. Experiment with these different settings on the **Object Print Method** tab of the **Print** dialog to see how they may affect your printing performance.

Unsupported Barcode Symbologies

If your design uses a barcode symbology that your printer does not support, then BarTender must send the barcode as a graphic. It can treat the image as a set of device lines or as a raster graphic (bitmap). It usually takes BarTender longer to send to the printer a bitmap (a bit for every dot that makes up the barcode) than it does to send only the position and size of each line in the barcode. However, there are exceptions: many 2D symbologies have a large number of very short lines, meaning that each one is composed of only a relatively small number of dots. In such cases, sending the position and size of every one of those lines might take longer than just sending a bitmap of the barcode.

The printer driver will default to the method that is usually the fastest for your printer model. In most cases, it defaults to using device lines for 1D symbologies and to using bitmaps for 2D symbologies. However, these defaults are not best in every situation.

Lines and Shapes

Lines, boxes and ellipses in your design can be sent to the printer in one of two ways: either as device lines (where the only information sent is the size and position of the line or shape) or as a raster graphic (a bitmap, where a bit for every single dot in the line or shape is sent to the printer). Typically, your items will print faster if you send lines, shapes and ellipses as device lines.

Printer Serialization

If you have any serialized text or barcodes on any of your BarTender documents and your printer has its own serialization feature, BarTender will use the printer's serialization by default. When the printer is updating the serialized field, BarTender will not send an updated value for the field with every printed item. It sends only the starting value at the beginning of the print job, and the printer will then update the field with each item. To use your printer's serialization capability, enable **Allow Serialization** on the **Performance** tab of the **Print** dialog.

Even if you have checked the box, the following options prevent BarTender from using the printer's serialization:

- Using paper stock that has multiple labels per page.
- Setting the total number of serial numbers in the print job to a value greater than the printer can render.
- Using a TrueType font on a serialized text object instead of a resident font or downloaded font.
- Using a symbology that the printer does not support on a serialized barcode.
- Using a serialized barcode that has a check digit.
- Using a serialized barcode that has visible human readable text being rendered by BarTender instead of the printer.
- Using a character template for a serialized barcode. (See BarTender's help for information about character templates.)
- Using a Visual Basic script that runs with every item in the print job or every time the serialized object is incremented/decremented.
- Selecting **Every copy** as the Serialization Event in the **Serialization** dialog.
- Enabling a Reset option in the **Serialization** dialog.
- Selecting any method other than **Numeric** in the **Serialization** dialog.
- Setting the Event Internal to anything other than "1" on the **Serialization** dialog.
- Serializing any data source, except the last one, in a multiple data sourced object.

Printer Storage and Caching

When you print a document from BarTender, you have the option to store (or cache) graphics, objects or entire documents to the printer's internal memory. Some of the options allow you to store graphics for the duration of a print job, while others let you cache objects and documents between multiple print jobs.

Storing Objects for the Duration of a Print Job

Typically, there are parts of the BarTender document that will be exactly the same on every item in the print job. These might be graphics, boxes, lines, text or even barcodes. Resending each of these objects for every printed item slows your printing. By enabling the following settings on the **Performance** of the **Print** dialog, you can ensure that the printer will store these items for the duration of the print job, so that BarTender only has to send these elements once at the beginning of each print job.

- **Allow Static Objects**: This causes the printer to store, for the duration of the print job, all objects on your design that do not contain data that changes.
- **Allow Static Graphics**: This has the same effect as **Allow Static Objects**, except that it applies only to graphics. "Graphics" includes text areas that use a TrueType or OpenType font that you have not downloaded to the printer.

     NOTE: Some printers do not support storing of non-graphic objects (such as barcodes, lines or shapes) but do support the storing of graphics.

- **Allow Variable Data Optimization**: This causes BarTender to use the printer's data merge feature, where the printer stores, for the duration of the print job, formatting information

(object positions, barcode symbology, font name and size, line and box colors, etc.) for both static and variable objects. BarTender then needs to send *only* the content of the objects to the printer. If the content is also being stored by means of either option above, then BarTender will have to send only the content of variable objects for each item. The printer will merge this data into the appropriate fields on the document. (BarTender will not use this feature, even if it is enabled, when a text object on the document contains tabs, is configured as a paragraph, or contains multiple data sources using different fonts.)

Caching Graphics and Templates

Many printers allow graphics or whole templates to be stored between print jobs. This ensures that BarTender does not have to resend these elements to the printer at the start of every print job. The portion of the printer's memory that holds these items is called the *cache*. There is no limit, in principle, to how long items can stay in the printer's cache. They can stay there literally for years. (If the printer does not have flash memory, then the cache is emptied when the printer is powered off.)

Once caching is enabled, printed items and/or graphics are stored in the printer's cache the first time it prints. In the future, when a print job uses that printed item or graphic, the driver will check to see if it is already in the cache. If it is, then BarTender will not resend it; instead, the printer driver will simply tell the printer to fetch the BarTender document or graphic from the cache.

To enable caching, check **Allow Graphic Caching** and/or **Allow Template Caching** on the **Performance** of the **Print** dialog.

> **WARNING:** Because the printer driver on the computer, not the printer, keeps the record of what items have been cached, there is a potential hazard if two different computers are sending jobs to the printer. If a second computer uses the printer, it overwrites the printer memory that the first computer was using as the printer's cache. Thus, the first computer's record of what is in the cache is no longer accurate. The next time the first computer sends a job to the printer, it will not resend items that used to be in cache and this will cause blank areas on the printed items. To avoid this hazard, you can install the printer as a network printer on all computers that use it. This means they will all be using the same printer driver and, thus, the same record of what is in the cache.

Viewing the Cache

To view the printer cache, take these steps in BarTender:

1. Open the **Print** dialog and verify that you have selected the correct printer.
2. Click the **Printer Cache's** tab.
3. Click the **Manage Cache** button. The **Manage Cache** dialog opens.
4. Click the **Cache Contents** tab to see a list of items in the cache.
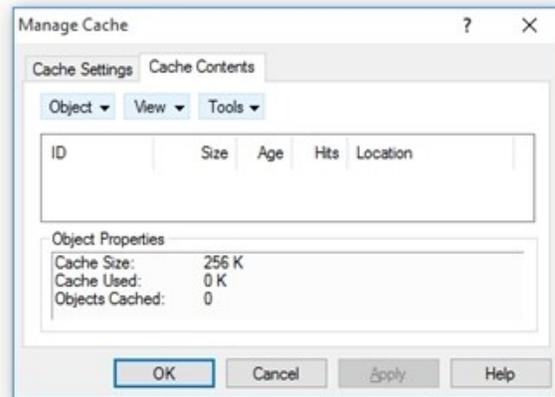
Flushing the Cache

Even if you use caching only when no other computer will be using the printer, the printer driver's record of what items it has cached can become inaccurate in some circumstances. If you replace the printer, for example, the printer driver does not have any way of knowing that you have done so. Once this happens, BarTender can execute a print job and fail to send certain items to the printer because it thinks that the items are already stored there. This can result in printed items with missing parts, or even blank printed items.

To prevent this, you should periodically flush (clear) the printer's cache. This empties the cache and it tells the printer driver that the cache is now empty. Using the **Printer's Cache** tab of the **Print** dialog, you can flush the cache manually and/or configure BarTender to flush it on a set schedule.

Summary Quick Help Chart

Potential Performance Slowdown	Optimization Techniques
Template design contains boxes, lines, and/or barcodes	Render as device lines
Text or barcode object is serialized	Enable printer serialization
Multiple items are printed in a single print job	Enable **Allow Static Objects** and **Allow Static Graphics**
The same print job is printed multiple times	Use printer caching

Optimizing Your Printer Driver

This section discusses ways that you can configure your Seagull Scientific printer driver for optimal performance.

Verification of Job Completion

Some printers have a feature, called job buffering, which enables the printer driver to begin sending a new print job to the printer even before the last items of the preceding print job have printed. However, the printer will not use this feature if the printer driver is configured to verify the completion of each print job before it starts the next print job. So to use job buffering, you need to turn *off* verification of job completion.

> **NOTE:** By using this optimization, you are unable to log print job verifications to your computer for later analysis. If you require logs of your print jobs, please try other optimizations before turning this option off.

1. Open the Windows **Devices and Printers** pane.
2. From the printer's context menu, select **Printer properties**. The **Printer Properties** dialog opens.
3. Click the **Tools** tab.
4. Click the **Status Monitoring** button. The **Status Monitoring** dialog opens.

   > **NOTE:** If the button is grayed out, then the printer is not using its verify print job completion feature. If the printer supports job buffering it will buffer jobs automatically. At this point, continue to the next optimization.
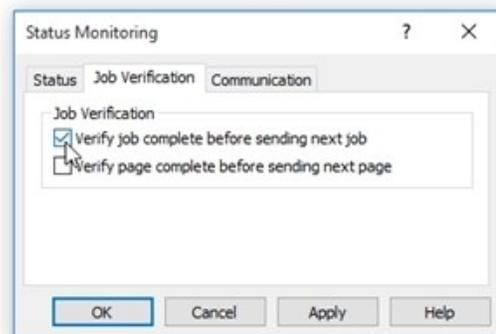
5. Click the **Job Verification** tab.
6. Be sure that **Verify job complete before sending next job** is *not* checked.

Graphic Dithering

Dithering is a process of distributing black dots against a white background throughout a sub-area of an image. This makes the area appear to be gray. If your template contains a graphic (color or not) that prints with shades of gray, then your printer driver is using some method of dithering to produce these gray areas.

You can reduce the amount of information that BarTender must send to the printer, and thus get better throughput, by using the simplest dithering method that maintains acceptable quality. To adjust dithering:

1. Open the Windows **Devices and Printers** pane.
2. From the printer's context menu, select **Printing preferences**. The **Printing Preferences** dialog opens.
3. Click the **Graphics** tab.
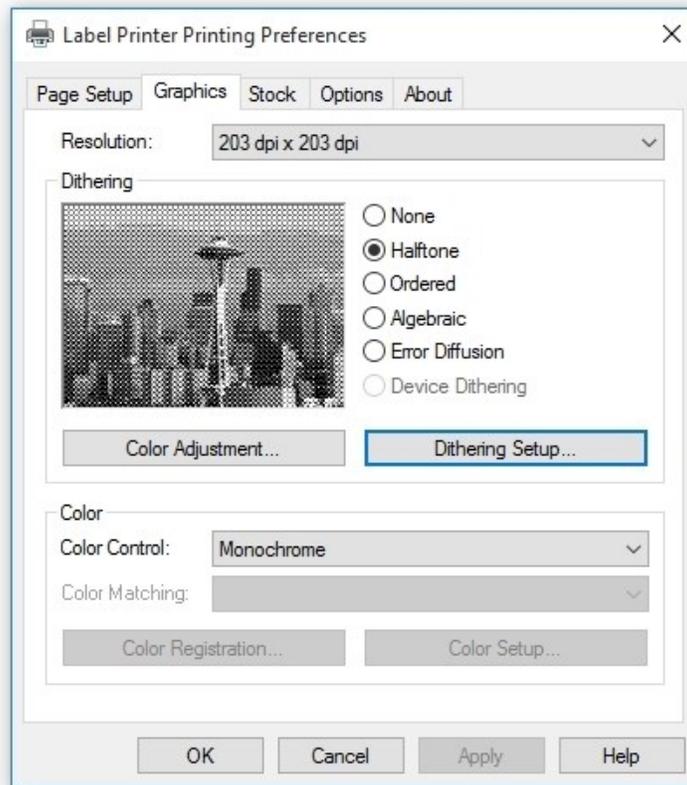
In the **Dithering** area are listed several methods of dithering. If any method is grayed out, then it is not available on your printer. If it is available, **Device Dithering** is the best choice, because it means the printer itself will do all the dithering so that the computer does not have to send specific information about which dots in the gray areas will be black and which will be white. The other options are listed in order from the fastest (but poorest quality) to the slowest (but best quality). You want to find the fastest dithering method that maintains acceptable quality.

The option **None** means that there will be no gray areas: every area of the graphic will be all black or all white. Each of the remaining four options, **Halftone**, **Ordered**, **Algebraic**, and **Error Diffusion**, is really the name of a family of dithering algorithms (that is, methods). When you select any of these radio buttons, you can click the **Dithering Setup** button to open a **Dithering Setup** dialog that enables you to choose from among the algorithms of the selected family of algorithms.
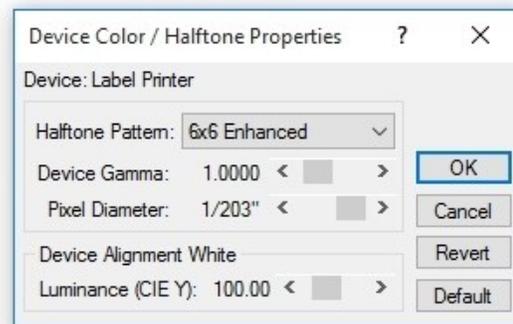
Before you give up on any family as too poor in quality, do some experimenting with the alternate algorithms for the family.

> NOTE: Dithering affects only bitmap graphics with color or gray areas. It does not change the darkness of pure black images, barcodes or fonts.

Windows Printer Pooling

In some situations, it is not necessary that a particular print job use a particular printer. For example, some shipping departments would work fine if BarTender sent print jobs to any of two or more identical printers sitting side by side. In this situation, configuring two or more identical printers to use Windows Printer Pooling will improve print job performance because BarTender will send any given print job to the first available printer in the pool, even if it is not the currently selected printer in BarTender.

1. Open the Windows **Devices and Printers** pane.
2. From the printer's context menu, select **Printer properties**. The **Printer Properties** dialog opens.
3. Click the **Ports** tab.
4. Enable the check box **Enable printer pooling**.
5. Click **OK**.
6. Repeat steps 2 through 5 for one or more printers of the exact same make and model as the first one.

> **WARNING:** You may not use printer caching with any pooled printers.

Printer Resolution

If your printer supports more than one resolution, select the lowest resolution that maintains acceptable quality of output using these steps in BarTender:

1. Open the Windows **Devices and Printers** pane.
2. From the printer's context menu, select **Printing preferences**. The **Printing Preferences** dialog opens.
3. Click the **Graphics** tab.
4. Use the **Resolution** dropdown list to select a resolution.

> **NOTE:** The **Resolution** setting only affects performance for templates that contain graphics or TrueType fonts that you have not downloaded to the printer.

Print Speed

The print speed is the measure of how fast a single item will move through the printer while multiple items are printing. While increasing the print speed will improve printing performance, note that it may also reduce the quality of the printed items. Experiment by printing one copy, at each available speed, of a representative sampling of your BarTender documents. Set your speed at the fastest value that preserves acceptable quality.

When you are evaluating quality, keep in mind that you may be able to compensate for the increased printer speed by increasing the darkness of each dot printed. The steps for adjusting this setting and even the name of the setting will vary with the printer model. Open the help for the printer driver and search on terms like "darkness," "contrast," "print head temperature" or "print density."

> **NOTE:** Regardless of what the darkness setting is called, increasing it on a thermal

printer means increasing the temperature of the print head. So before you experiment, consult the literature of your stock and ribbon manufacturers: either or both may have set an upper limit for print head temperature.

Evaluating Your Printer Hardware

The rate at which printing data is sent from the computer to your printer via a cable or your network directly affects your printing performance. Consider the following when optimizing your printer hardware:

Use the Fastest Cable

When you have directly cabled the printer to a computer, you should use the fastest computer-to-printer connection available for your printer. In order from fastest to slowest, as measured by the maximum data transfer rate they allow, the types of connections are: USB 2.0, USB 1.0, parallel, and RS-232 (old-style serial).

> NOTE: Using the printer's fastest connection does not guarantee that items will print faster, because some printers do not process the data any faster than they would if you were using a slower connection.

Optimizing an RS-232 Connection

You can speed up an RS-232 connection by setting a higher baud rate on the printer than the default. After you reconfigure the printer, you must change the baud rate in your Windows operating system to the same value. See Windows Help for details. Increasing the baud rate may result in unreliable communication depending on cable length, interference, and other factors; so, experiment with representative templates and verify that they all print correctly.

Also, you should use a watch to verify that your effective baud rate really increases when you set a higher nominal baud rate. The RS-232 standard requires that the printer check each part of the data for errors, and that the computer resend erroneous parts. An increase in the baud rate may increase the number of errors in the data. It is possible that the time lost resending data will cancel the nominal speed increase, so that you end up with a lower effective baud rate.

Experiment with Alternate Network Connections

If you have not directly connected the printer to the computer running BarTender, then your print jobs will go through your network. You can often improve printing performance by changing how or where you have connected the printer to the network. Experimentation is advisable because situation-specific factors, especially network load, have more impact on printing performance than network design. Nevertheless, these rules of thumb can guide you:

- A printer that you have directly connected to a network, with a TCP/IP card, for example, will receive data faster than one that you have cabled to a computer on the network. But if multiple users are sending jobs to this printer at the same time, there may be problems since there is no print server to direct the printer traffic. You could also use a hardware print server with an Ethernet card connecting it directly to your network.
- Data that stays within the same LAN as the computer running BarTender will usually reach the printer faster than data that has to pass through a gateway, router, or network bridge.
- Different parts of your network may run at different speeds. For example, some parts may allow data throughput of 10 Mbits (megabits) per second while others allow 100 Mbits a second. Whenever possible, avoid sending data to the printer through the slowest parts of the network.

That Old Printer

Some printers are just old and slow. If that is your situation, then all the tips in this paper may only marginally improve your printing performance. You should investigate the cost effectiveness of getting a printer with a higher rate of items-per-second. Another option, for some printer models, is to add memory to improve the printer's capacity to store static objects between labels and/or between print jobs.

Related Documentation

White Papers and Manuals

- Drivers by Seagull™
- Installing Drivers by Seagull™
- Status Monitoring

For downloadable versions, visit:

http://www.seagullscientific.com/support/white-papers

BarTender Help System

- Print Dialog
- Print Method Option Dialog
- Substitute Best Matching Printer Font

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