Optimizing Print Performance
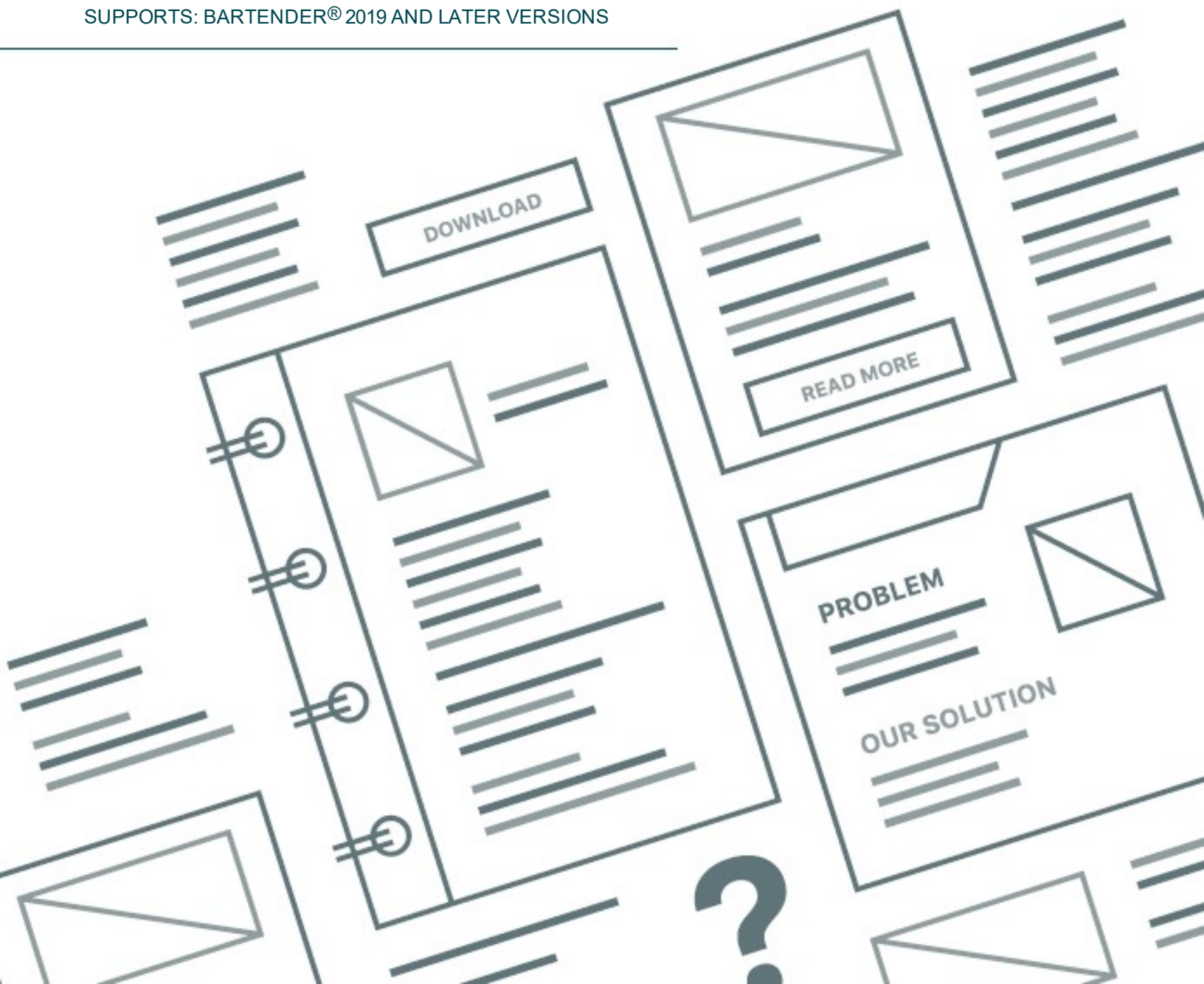
CONFIGURING YOUR PRINTERS AND OPTIMIZING
YOUR TEMPLATES FOR MAXIMUM THROUGHPUT

SUPPORTS: BARTENDER® 2019 AND LATER VERSIONS

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 modifications. This technical document describes how to optimize your printing process by modifying how you design your items in BarTender, configure your printer and printer driver, and configure the software settings. Depending on the BarTender edition that you are running, you can also optimize your print process by using automation.

Designing Your Items

The choices that you make when you design your items can affect the size of your print code and subsequently the speed at which your documents are printed. If you want to increase your printing performance, consider the following design techniques.

Font Selection

In general, two kinds of fonts are available: TrueType fonts and printer-based (or resident) fonts.

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

Printer-based fonts can be native to (resident to) the printer or saved to the printer, rather than to the computer. In heavy production environments, items can be printed more quickly when printer fonts are used, because the text is not sent to the printer as an image. Instead, it is sent as a set of code numbers, one for each character.

Some printers can download TrueType fonts directly to the printer's memory, where they are typically stored until a user deletes them. In this case, text that uses the font does not have to be sent to the printer as an image.

Resident fonts

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

Unlike TrueType and OpenType fonts, the resident fonts that are available depend on which printer is selected for the active document. If you print the same document to multiple printers, there may not be one resident font that is available on all the printers. In this case, to gain the performance boost that you get from using resident fonts, select a TrueType 𝕋 or OpenType 𝑂 font, and then click to select the **Substitute Best Matching Printer Font** check box on the **Font** tab of the **Text Properties** dialog.

When you do this, none of your print jobs actually use the font that you selected. Instead, each printer substitutes the resident font that most closely matches the TrueType or OpenType font that you selected.

Downloaded fonts

Not all printers support downloaded fonts, but for those that do, two kinds of downloaded fonts are available: bitmap and scalable.

A *bitmap font* is a pixel-by-pixel specification for each letter in the font that determines which pixels are black and which are white. TrueType and OpenType fonts are scalable rather than bitmap, but your driver can create a bitmap font of a single size of a single font and then download that to the printer.

> A single bitmap font contains one font size. Although any one bitmap font usually takes up less printer memory than a scalable font, the combined memory that is used by several such bitmap fonts that use the same typeface but different sizes might exceed the amount of memory that is used by a single scalable font.

A *scalable font* contains rules and formulas that specify how each symbol is to be drawn rather than pixel-by-pixel specifications. When you use scalable fonts, you have multiple font size options; however, this advantage comes at the cost of a slight decrease in printing performance.

To download a font to your printer, follow these steps:

1. In Windows, open the **Devices and Printers** window.
2. Right-click the printer, and then click **Printer properties**. The **Printer Properties** dialog opens.
3. Click the **Fonts** tab. (If there is no **Fonts** tab, your printer does not support any type of device fonts.)
4. In the **Font** list, click **Download Font**. The **Download Font** dialog opens. (If there is no **Download Fonts** option, your printer does not support downloaded fonts.)
5. In the **Download Font** dialog, click **Scalable** or **Bitmap**. (Your printer might support only one and not the other.) Then, specify the font settings, as follows:

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

6. Leave the **Location** setting at its default value. (For more information about this setting, refer to your printer's documentation.)
7. Click **OK**. The driver downloads the font to the printer, and 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 use 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.
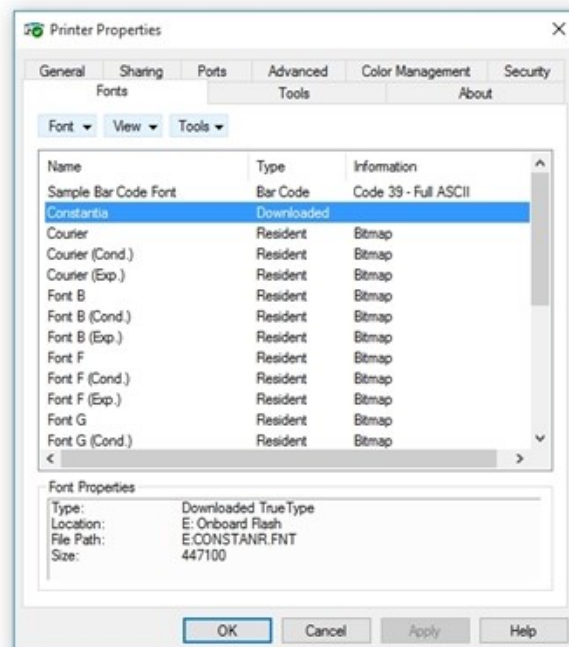
Barcode Rendering

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.

> If the symbology that you want is not supported by your printer, certain application settings might enhance your printing performance. For more information, refer to the Object Print Method section of this technical document.

By default, BarTender takes advantage of this functionality, but you can verify that the default setting has not changed. To do this, follow these steps:

1. In the **Print** dialog, make sure that the printer that you want is selected.
2. Double-click the barcode object to open the **Barcode Properties** dialog.
3. In the left navigation pane, click **Symbology and Size**.
4. Verify that the correct symbology is selected.
5. Click **Print Method**. The **Print Method Options** dialog opens.
6. Verify that one of the following options is selected:

    - **Barcodes and human readable text controlled by the printer**
    - **Barcodes controlled by the printer and text controlled by BarTender**

7. Click **OK** to close the **Print Method Options** dialog.
8. Click **OK** to close the **Barcode Properties** dialog.
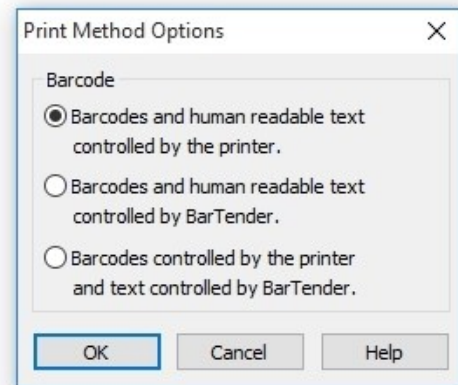
Image Sizing and Resolution

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

Summary Quick Help Chart

Possible slowdown cause	Optimization techniques
Use of TrueType fonts	- Change to a printer-based font - Use the **Substitute Best Matching Printer Font** option - Download the TrueType font to the printer
Use of barcodes	- Let the printer render the barcode object - Change to a supported symbology
Use of large image files	- Use images sparingly - Convert image files to a smaller format

Configuring BarTender

Many of the BarTender print settings can affect the size of your printer code file, and subsequently, the speed at which your documents are printed. When you optimize these settings in BarTender, they apply to any printer that you select in the **Print** dialog.

> These optimizations are available only for printers that have Drivers by Seagull™ installed.

Object Print Method

In most cases, you can design your items to improve printing performance, as described in the previous chapter. However, sometimes you do not have control over the design, or you need to use text, barcodes or images that are not supported by your printer. In these cases, you can use BarTender 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 affect your printing performance.

Unsupported barcode symbologies

If your design uses a barcode symbology that your printer does not support, BarTender must send the barcode as an image. It can treat the image as a set of device lines or as a raster graphic (bitmap). It usually takes BarTender longer to send a bitmap to the printer (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 two-dimensional (2-D) symbologies have a large number of very short lines, meaning that each line is composed of a relatively small number of dots. In these cases, it might take longer to send the position and size of every one of those lines than to send a bitmap of the barcode.

The printer driver defaults to the method that is usually the fastest for your printer model. In most cases, it defaults to using device lines for linear (1-D) symbologies and to using bitmaps for 2-D 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 the following ways:

- As device lines (where the only information that is sent is the size and position of the line or shape)
- 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 are printed 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 if your printer has its own serialization feature, BarTender uses the printer's serialization by default. When the printer is updating the serialized field, BarTender does not send an updated value for the field with every printed item. Instead, BarTender sends only the starting value at the beginning of the print job, and then the printer updates the field with each item.

To use your printer's serialization capability, click to select the **Allow Serialization** check box on the **Performance** tab of the **Print** dialog.

Be aware that even when you enable printer serialization, the following conditions prevent BarTender from using it:

- Using paper stock that has multiple labels per page
- Setting the total number of serial numbers in the print job to a value that is 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 that is rendered by BarTender instead of by the printer
- Using a character template for a serialized barcode (for more information about character templates, refer to the Character Template topic in the BarTender help system)
- Using a Visual Basic script that runs with every item in the print job or every time the serialized object is incremented or 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" in the **Serialization** dialog
- Serializing any data source, except the last one, in an object that has multiple data sources

Printer Storage and Caching

When you use BarTender to print a document, you have the option to store (or cache) images, objects or entire documents to the printer's internal memory. Some of the options specify that items are stored for the duration of a print job, while others specify that objects and documents are cached between multiple print jobs.

Storing objects for the duration of a print job

Typically, some objects on the BarTender document are exactly the same for every item in the print job. These objects might be images, boxes, lines, text or even barcodes. If each of these objects is re-sent for every printed item, your printing process is slowed. To ensure that the printer stores these items for the duration of the print job so that BarTender sends these

elements only one time at the beginning of each print job, use the following settings on the **Performance** tab of the **Print** dialog:

- **Allow static objects**: Specifies that for the duration of the print job, the printer stores all objects on your design that do not contain data that changes.
- **Allow static graphics**: Specifies that for the duration of the print job, the printer stores all images on your design. In this case, "images" include text areas that use a TrueType or OpenType font that you have not downloaded to the printer.

> Some printers do not support the storing of non-image objects (such as barcodes, lines or shapes) but do support the storing of images.

- **Allow variable data optimization**: Specifies that BarTender uses the printer's data merge feature for the duration of the print job. This means that the printer stores formatting information (such as object positions, barcode symbology, font name and size, and line and box colors) for both static and variable objects. BarTender then sends only the content of the objects to the printer. If the content is also stored by using the **Allow static objects** or **Allow static graphics** option, BarTender sends only the content of variable objects for each item. The printer then merges this data into the appropriate fields on the document.

> BarTender does not use this feature, even if it is selected, when a text object on the document contains tabs, is configured as a paragraph, or contains multiple data sources that use different fonts.

Caching images and templates

Many printers can store images or whole templates between print jobs, so 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*. In theory, there is no limit to the length of time that items can stay in the printer's cache. However, if the printer does not have flash memory, then the cache is emptied when the printer is turned off.

When you enable caching, printed items and images are stored in the printer's cache the first time it prints. Afterward, when a print job uses that printed item or image, the driver determines whether it is already in the cache. If it is, then BarTender does not resend it. Instead, the printer driver instructs the printer to retrieve the BarTender document or image from the cache.

To enable caching, click to select the **Allow graphic caching** and/or **Allow template caching** options on the **Performance** tab of the **Print** dialog.

> ⚠️ Because the printer driver on the computer, not on the printer, keeps the record of what items are cached, a potential hazard can occur if two different computers send jobs to the printer. When the second computer sends a print job, it can overwrite the printer memory that the first computer was using as the printer's cache, which makes the first computer's record of what is in the cache inaccurate. In this case, the next time that the first computer sends a job to the printer, it does not resend items that used to be in cache, which causes blank areas to appear on the printed items.
>
> To avoid this hazard, you can configure the printer as a network printer on all computers that use it. This means that the computers all use the same printer driver and, therefore, also use the same record of what is in the cache.

Viewing the cache

To view the printer cache, follow these steps:

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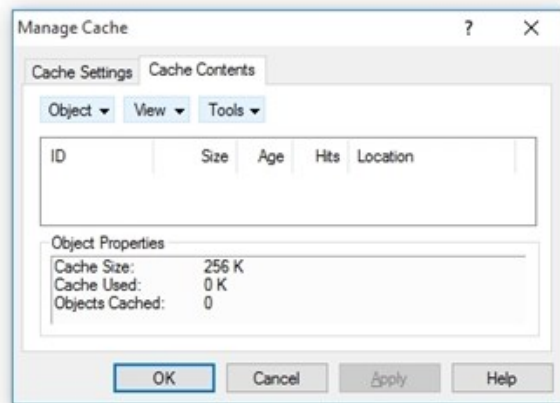
Flushing the cache

Even if you use caching only when no other computer uses the printer, the printer driver's record of the items it has cached can become inaccurate in some circumstances. For example, the printer driver cannot detect when a printer is replaced. When this happens, BarTender can run a print job and fail to send certain items to the printer because its current record indicates that the items are already stored there. This condition can result in printed items that have missing parts or are blank.

To prevent this condition, we recommend that you periodically flush (clear) the printer's cache. This process empties the cache and indicates to the printer driver that the cache is now empty. You can flush the cache manually or configure BarTender to flush it on a set schedule by using the options on the **Printer's Cache** tab of the **Print** dialog.

Summary Quick Help Chart

Possible slowdown cause	Optimization techniques
Template design contains boxes, lines, and/or barcodes	Render these items as device lines
Text or barcode object is serialized	Enable printer serialization
Multiple items are printed in a single print job	Select the **Allow static objects** and/or **Allow static graphics** options
Same print job is printed multiple times	Use printer caching

Optimizing Your Printer Driver

You can use the following methods to configure your Drivers by Seagull™ printer driver for optimal performance.

Verification of Job Completion

Some printers have a job buffering feature, which enables the printer driver to send a new print job to the printer before the last items of the preceding print job are printed. However, the printer does not use this feature if the printer driver is configured to verify that each print job is completed before it starts the next print job. Therefore, to use job buffering, you must turn off the verification of job completion. To do this, follow these steps.

> ⓘ When you use this optimization, you cannot log print job verifications to your computer for later analysis. If you require logs of your print jobs, we recommend that you try other optimizations before turning this option off.

1. In Windows, open the **Devices and Printers** pane.
2. Right-click the printer that you want, and then click **Printer properties**. The **Printer Properties** dialog opens.
3. Click the **Tools** tab.
4. Click **Status Monitoring**. The **Status Monitoring** dialog opens.
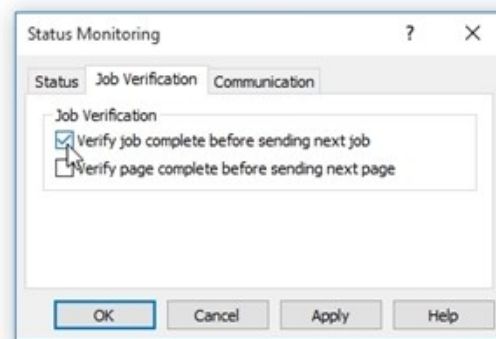
> ⓘ If the **Status Monitoring** option is unavailable, the printer is not using its "verify print job completion" feature. This means that if the printer supports job buffering, it buffers jobs automatically. In this case, you must use a different optimization method.

5. Click the **Job Verification** tab.
6. Click to clear the **Verify job complete before sending next job** check box.

Graphic Dithering

Dithering is a process of distributing black dots against a white background throughout a sub-area of an image. This process makes the area appear to be gray. If your template contains a graphic (either in color or grayscale) that is printed by using shades of gray, then your printer driver is using some method of dithering to produce these gray areas.

> (i) Dithering affects only bitmap graphics that have color or gray areas. It does not change the darkness of pure-black images, barcodes or fonts.

To optimize the printing process, you can reduce the amount of information that BarTender must send to the printer by using the simplest dithering method that still maintains acceptable quality.

To adjust dithering, follow these steps:

1. In Windows, open the **Devices and Printers** window.
2. Right-click the printer that you want, and then click **Printing preferences**. The **Printing Preferences** dialog opens.
3. Click the **Graphics** tab.
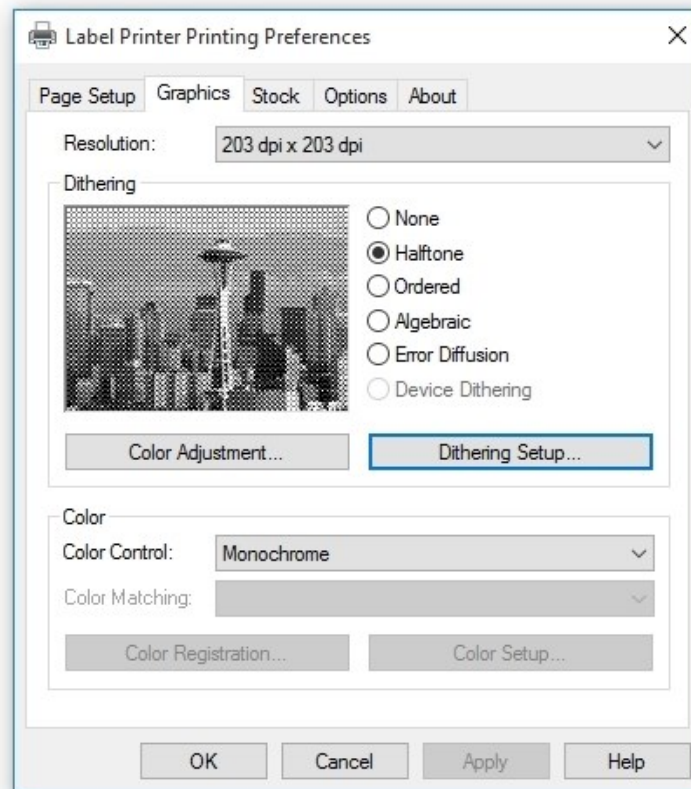
In the **Dithering** area, several dithering methods are listed. Methods that are unavailable in this list are not available for your printer.

The **Device Dithering** option is the best choice if it is available, because it means that the printer itself does 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 still maintains acceptable quality.

The **None** option specifies that there are no gray areas; every area of the graphic will be all black or all white.

Each of the other options (**Halftone**, **Ordered**, **Algebraic**, and **Error Diffusion**) is the name of a family of dithering algorithms. When you select any of these options, you can click **Dithering Setup** to open the **Dithering Setup** dialog, which you can use to choose an algorithm from the selected family of algorithms. Experiment with the alternate algorithms for the family to determine whether one or more meets your quality requirements.
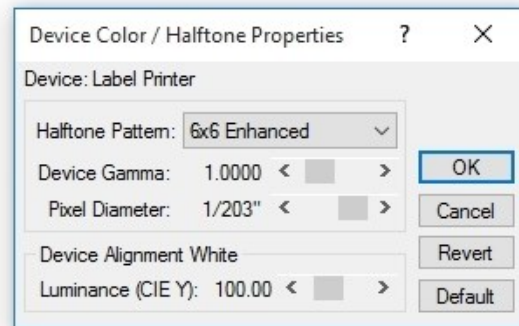
Windows Printer Pooling

In some situations, a print job need not use a particular printer. For example, some shipping departments use BarTender to send print jobs to any of several identical printers that are sitting side by side. In this situation, when you configure two or more identical printers to use Windows printer pooling, print job performance is improved because BarTender sends a print job to the first available printer in the pool, even if it is not the currently selected printer in BarTender.

To configure printer pooling, follow these steps:

1. In Windows, open the **Devices and Printers** window.
2. Right-click the printer that you want, and then click **Printer properties**. The **Printer Properties** dialog opens.
3. Click the **Ports** tab.
4. Click to select the **Enable printer pooling** check box.
5. Click **OK**.
6. Repeat steps 2 through 5 for other printers of the exact same make and model as the first one.

⚠️ Printer caching cannot be used with any pooled printers.

Printer Resolution

If your printer supports more than one resolution, you can optimize your print process by selecting the lowest resolution that still maintains acceptable quality of output. To do this, follow these steps:

1. In Windows, open the **Devices and Printers** window.
2. Right-click the printer that you want, and then click **Printing preferences**. The **Printing Preferences** dialog opens.
3. Click the **Graphics** tab.
4. In the **Resolution** list, select the resolution that you want.

> The **Resolution** setting affects performance only 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 an item moves through the printer when multiple items are being printed. Increasing the print speed improves printing performance, but it may also reduce the quality of the printed items. Experiment with this optimization method by printing one copy per available speed of a representative sampling of your BarTender documents. Then, set your print speed at the fastest value that still maintains acceptable quality.

When you evaluate quality, be aware that you might be able to compensate for the increased printer speed by increasing the darkness of each dot that is printed. The steps to use to adjust this setting, and even the name of the setting, vary depending on the printer model. For more information, refer to the help system for the printer driver. Search for terms such as "darkness," "contrast," "print head temperature" or "print density."

> Regardless of what the darkness setting is called, when you increase the darkness on a thermal printer, you also increase the temperature of the print head. Be aware that the manufacturers of your stock and ribbon might specify an upper limit for print head temperature. For more information, refer to the stock and ribbon manufacturer documentation.

Evaluating Your Printer Hardware

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

Use the Fastest Cable

When you cable the printer to a computer, you should use the fastest computer-to-printer connection that is available for your printer, whether USB or Ethernet. Parallel and serial connections (such as RS-232) are used less often and might require adapters.

> ⓘ Using the printer's fastest connection does not guarantee that items are printed 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. For more information, refer to the Windows help documentation. Be aware that when you increase the baud rate, unreliable communication might result, depending on cable length, interference, and other factors. Therefore, you may want to experiment with representative BarTender documents to verify that they are printed correctly.

Also, we recommend that you use a stopwatch to verify that your effective baud rate actually increases when you set a higher nominal baud rate. The RS-232 standard requires the printer to check each part of the data for errors and requires the computer to resend erroneous parts. An increase in the baud rate might increase the number of errors in the data. It is possible that the time that is lost when the data is re-sent cancels out the nominal speed increase, so that you end up with a lower effective baud rate.

Experiment with Alternate Network Connections

If you do not directly connect the printer to the computer that is running BarTender, your print jobs go through your network. In this case, you can often improve printing performance by changing how or where you connected the printer to the network. We recommend that you experiment with different settings, because situation-specific factors, especially network load, have a bigger effect on printing performance than network design does. Be aware of the following considerations:

- A printer that you directly connect to a network (for example, by using a TCP/IP card) receives data faster than a printer that you cabled to a computer on the network. However, if multiple users send print jobs to this printer at the same time, problems might arise because no print server is available to direct the printer traffic. You can also use a hardware print server that uses an Ethernet card to connect directly to your network.

- Data that stays within the same LAN as the computer that is running BarTender usually reaches the printer faster than data that must 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 megabits (Mbits) per second, while others allow 100 Mbits per second. Whenever possible, avoid sending data to the printer through the slowest parts of the network.

Upgrade the Printer

Some printer models are slower than others. Also, older printers tend to be slower than newer ones. In these cases, the optimization methods that this technical document describes might improve your printing performance only marginally. It might be more cost-effective to upgrade to a printer that has a higher items-per-second printing rate.

For some models, another option is to add memory to improve the printer's capacity to store static objects between labels and/or between print jobs.

Using Automation

If you are running the Automation or Enterprise edition of BarTender, you can use the Process Builder and Integration Builder companion applications to optimize printing processes through automation.

Process Builder

Use BarTender Process Builder to build a process to print one or more documents or to perform other actions, such as sending an email message or writing to a database. By using Process Builder, you can create customizable process files so that you can automate repetitive operations. You can use the Process Builder user interface as an alternative to programming interfaces such as ActiveX, the Microsoft .NET Framework SDK, the command-line interface, or BarTender XML (BTXML) script.

You can use BarTender process files to perform a wide variety of actions on multiple BarTender documents in a single operation. For example, you can create a process file that prints multiple documents over and over again, writes data to a file or database, and sends an email message, all by using a single command.

You can use a process file when an event in a business process requires a repetitive set of steps. For example, you might require that the following operations occur in the following sequence whenever an order is received:

- Print one copy of DocumentA.btw to printer X
- Print one copy of DocumentB.btw to printer Y
- Insert a record into a database

Rather than opening the two documents separately in BarTender to print them and then manually updating the database each time an order is received, you can use a process file to automatically open and print the documents and update the database in one operation. You can also specify that other actions take place when the process file is run, such as automatically sending an email message or deleting a file.

For more information, refer to the Process Builder book in the BarTender help system and to the *Process Builder* technical document:

https://www.seagullscientific.com/resources/white-papers/

Integration Builder

You can use BarTender Integration Builder to implement a sophisticated printing system that integrates directly with a wide variety of business systems, including SAP and Oracle.

By using Integration Builder, you can create highly customizable integrations that seamlessly connect the printing capabilities of BarTender to virtually any enterprise business operation. When you create an integration, you define a trigger event that you want the BarTender Integration Service to monitor for, and then when the event occurs, the service runs the actions that you specify.

By using integrations, you can import data from external systems and run tasks automatically without ever needing to open BarTender or any other application.

For more information, refer to the Integration Builder book in the BarTender help system and to the *Integrating with BarTender Integration Builder* technical document:

https://www.seagullscientific.com/resources/white-papers/

Related Documentation

Technical Documents

- *Drivers by Seagull™*
- *Installing Drivers by Seagull™*
- *Status Monitoring*
- *Process Builder*
- *Integrating with BarTender Integration Builder*

To view and download technical documents, visit:

https://www.seagullscientific.com/resources/white-papers/

User Guides

- *Getting Started with BarTender*
  https://support.seagullscientific.com/hc/categories/200267887

BarTender Help System

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

Other Resources

Please visit the BarTender website at *https://www.seagullscientific.com*.

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