The User’s Guide to the Gimp-Print Top Quality Printer Drivers

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by Andy Stewart

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The Gimp-Print Top Quality Printer Drivers (hereafter called Gimp-Print) are a set of printer drivers written to take advantage of the full capabilities of a wide range of printers. These drivers should work on any POSIX compliant operating system (e.g. Linux, Solaris, IRIX, etc). This document will explain how to use the Gimp-Print software to achieve high quality printouts from the GIMP (http://www.gimp.org) (GNU Image Manipulation Program) and CUPS (http://www.cups.org) (Common Unix Printing System).

Please note that in addition to using the Gimp-Print software as a print plugin for the GIMP, and as a set of printer drivers for CUPS, this software can also be compiled and used with the Ghostscript (http://www.ghostscript.com) software and with the Foomatic (http://www.linuxprinting.org/foomatic.html) software.

Regardless of whether the Gimp-Print software is used with the GIMP, CUPS, Ghostscript, or Foomatic, the print quality and printer settings remain the same. However, use of the Gimp-Print with Ghostscript and Foomatic is not covered in this document. These topics may be covered in a future revision of this document.

This document corresponds to version 4.2.0 and later of the Gimp-Print software. This document will serve as a guide to the user, and as such will not explain how to install Gimp-Print, CUPS, GIMP, Ghostscript, Foomatic, or any other related software.

Andy Stewart, the author, is the founder of the Worcester Linux Users' Group (http://www.wlug.org) in Worcester, Massachusetts, USA. The group was founded in July 1997 and has approximately 140 people on its mailing list. Monthly meetings are held and all are invited.

In terms of "code", this is the author's first contribution to the open source community, and definitely his first experience with DocBook. Constructive comments, praise, words of encouragement, and the like will be most appreciated if e-mailed to the author (mailto:andystewart@attbi.com).

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Chapter 1. Project History

This software package was first written by Michael Sweet of Easy Software Products (http://www.easysw.com) and initially worked only as a print plugin to the GIMP (GNU Image Manipulation Program). In the summer of 1999, Robert Krawitz (the current Gimp-Print project leader) purchased an Epson Stylus Photo EX printer to feed his photography hobby. Finding no existing printer drivers, Robert adapted Mike's Gimp-Print plugin to his six-color printer, and by the end of the year released version 3.0 of the Gimp-Print software, which was included in version 1.1 of the GIMP. The intention was for this to be the stable plugin in version 1.2 of the GIMP while development of the Gimp-Print plugin continued for later release.

Robert put the Gimp-Print development tree on SourceForge starting with version 3.1, and quickly found a group of like-minded people who wanted to print high quality output on inexpensive inkjet printers. One of the main goals, which was not expected to be met until late in the version 3.1 cycle, was to write a Ghostscript driver so that printing would not be restricted to the GIMP. Imagine Robert's surprise when Henryk "Buggs" Richter wrote one within days!

In July 2000, not more than a year after Robert bought his Epson Stylus Photo EX, he was invited to the Linux Printing Summit hosted by VA Linux Systems. In preparation for that, he spent long hours printing out test images. Robert went back to the Gimp-Print version 3.0.9 release, which seemed like such an advance at the time, and was floored at how far the project had come in four months! Output that had been considered impressive with using six colors was put to shame by four color output. That should give you an idea what six color and variable dot size printers can do. It also illustrates what a group of committed people can do.

Robert came away from the Printing Summit with a lot of new ideas, and in November 2000, Gimp-Print version 4.0 was released, the culmination of 9 months of work by the team. The quality was already tremendously improved over what the software could do at the Printing Summit.

The team started serious work on version 4.1 in December 2000, and version 4.2.0 was released in November 2001. Despite the fact that version 4.2.0 is a "minor" release over version 4.0, there are vast improvements:

- The driver is built as a shared library, making it much easier to use by higher layers of software
- The packaging system now follows GNU standards
- The print quality (in particular, color accuracy, a well-known weakness in 4.0) is even better
- Improved performance
- Many more options
- More supported printers

Releases of Gimp-Print have been historically numbered in a fashion similar to that of the Linux kernel, where major releases are denoted by the first digit (in this case ’4’), while minor releases are denoted by subsequent digits (such as ’4.2.0’). Even numbered minor releases are considered stable, while odd numbered minor releases are considered development releases (whose stability may vary for any given release).

This project is by no means finished. In future releases, the development team hopes to include the following:

- implementation of proper color management
- improved dithering
- improvements in performance

The entire Gimp-Print team hopes you will really enjoy using this software! For more information, please consult the GIMP-Print project web page (http://gimp-print.sourceforge.net).

Chapter 2. GIMP and Gimp-Print

2.1. Running the GIMP

This section assumes that you have the GIMP version 1.2 installed and working properly on your computer, and that you have an image of some type that you desire to print. To get started quickly, log into your system, start the X window system, and bring up your favorite terminal window. At the $ prompt, type:

```
$ gimp &
```

This should start the GIMP for you. If it does not, check that you have installed the GIMP properly, and that its binary is located in one of the directories listed in your $PATH environment variable. On the assumption that this worked, the screen should now look something like this:

Figure 2-1. The Startup Window for The GIMP

At this point, you should use the File⟶Open menu option to open your favorite picture. We will print this picture shortly. Your picture should be displayed next to the GIMP startup window, perhaps looking similar to the following (sssh! Don't tell anybody the secret!):

Figure 2-2. A Sample Image Displayed by The GIMP

2.2. The Gimp-Print Graphical User Interface

Now that the GIMP is displaying your picture, put your mouse over the picture and click the right mouse button. A menu will appear. Choose the File⟶Print menu option. This will cause the Gimp-Print GUI window to appear (see Figure 2-3). Move the mouse cursor over the various parts of the Gimp-Print GUI window, and notice that if you leave your mouse in one place for a short time without clicking any buttons, a small box appears. This box contains helpful text. These small boxes are called "tooltips" and are intended to remind you about the function of each part of the graphical interface.

The next several sections will continuously refer to Figure 2-3 and Figure 2-4. The difference between the two figures can be seen in the top right corner of the window. Notice that there are two tabs, one which reads Printer Settings and another which reads Image/Output Settings. Notice also that the window is divided into several major sections which directly map to the major sections of this document:

- Preview
- Printer Settings
- Image/Output Settings
- Position
- Size
- Printing and Saving Settings

Figure 2-3. The Gimp-Print Graphical User Interface 1 (GUI)

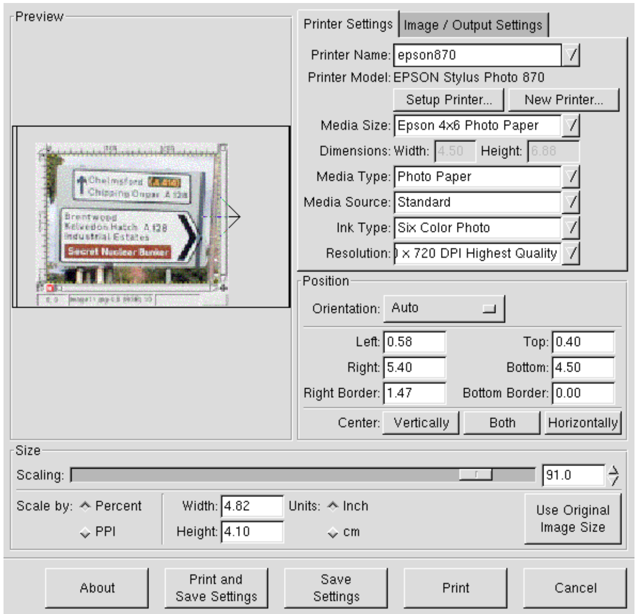
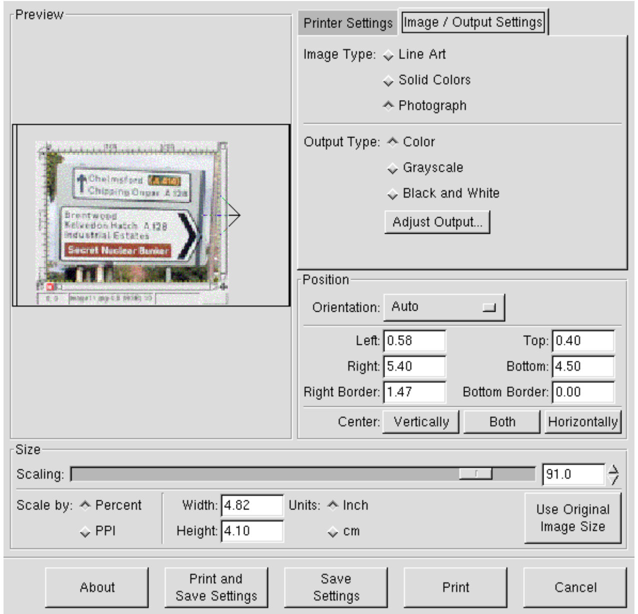


Figure 2-4. The Gimp-Print Graphical User Interface 2 (GUI)



2.2.1. Printer Settings

2.2.1.1. Printer

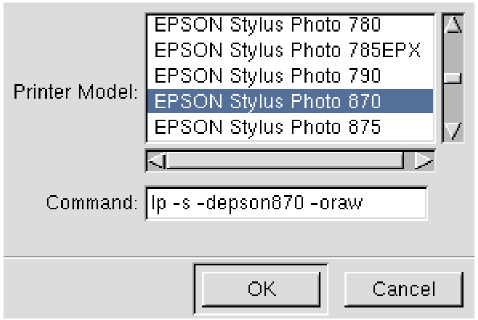
Click on the Printer Settings tab near the top right hand corner of the window (see Figure 2-3). Then, click on the downward facing arrow to the right of the Printer combo box to see a list of the system printer queues. Select the queue to which you would like the printed image to be sent. One may also print the image directly to a file by selecting File. In this event, the user will be prompted for the filename when either the Print button or the Print and Save Settings button is clicked.

When either the Print and Save Settings button or the Save Settings button is clicked, the settings are saved in a file called `~/.gimp-1.2/printrc`. The user is cautioned about hand editing this file since it is generated by Gimp-Print (although it was the only way that the author found for removing bogus entries created while playing with the New Printer button).

2.2.1.2. Setup Printer

Before any useful printing can occur, the user needs to associate the named printer with the actual make and model of the printer. Click the Setup Printer button in the Printer section of the window (the upper right, and just below the Printer display box). When this is done, the following window appears:

Figure 2-5. The Setup Printer Window



Scroll through the Printer Model section of the window until you find a printer which matches yours. If you cannot find the precise model, pick something close and hope for the best. There are selections for a wide array of Postscript, inkjet, and laser printers. After you have selected a printer, you will see the printer command displayed.

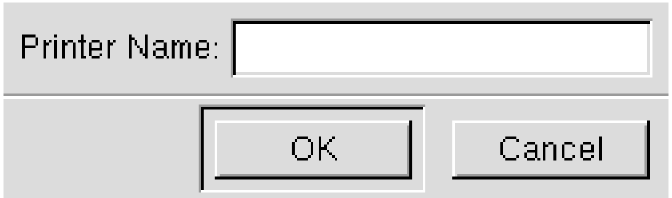
The Gimp-Print software does all of the necessary conversion of the image to be printed into the language of your printer. It is unnecessary and undesirable for any other sofware to manipulate this data. (This is why the command contains the "-l" switch or the "-o raw" switch). Please use care if you feel the need to edit this command. Once you are satisfied with your selection, click the OK button.

2.2.1.3. New Printer

In the previous sections, the user selected an existing printer queue and associated a particular type of printer to that queue. For most cases, this is probably all that is required. However, some situations might require more detailed control over the handling of the printer data.

Click the New Printer button to tell the software that you wish to create a new name. In this case, the new name may actually be an existing printer with different settings that you wish to save, or it may simply be a name associated with a particular command for handling the printer data. A window will appear thus:

Figure 2-6. The New Printer Window



Type a name into the window and click OK (or Cancel if you wish not to do this). Notice that the new name now appears as the selected Printer. As you change settings in the rest of the Gimp-Print GUI, they will be associated with this printer name. When the settings are saved, they can be recovered easily by simply selecting this named printer from the Printer combo box.

One example where this feature might be used is as follows. The author frequently prints photos on Epson 4x6 photo paper. Note that this paper is physically larger than 4x6 and it has perforations on all four sides. The author dislikes printing part of the image on the perforated parts of the paper which will be removed after printing the photo. By selecting the proper scaling percentage, printing can be constrained to the 4x6 part of the paper which will remain after the perforated sections are removed. The author has saved this setting using this feature of the Gimp-Print software.

2.2.1.4. Media Size

The term *media* refers to paper, card stock, envelopes, or whatever you have put into your printer onto which something will be printed. Click the arrow to the right of the Media Size box to see a long list of different sizes of media. Choose the size that matches the media which you have loaded into your printer. Once you have made your choice, the drop down menu will disappear, and your choice will be shown in the Media Size box. The available paper sizes will vary depending upon the printer model you have selected.

Some printers support arbitrary (within limits!) paper sizes. These printers will let you select *Custom* or *Roll* paper sizes. When you select such a printer, one or both of the Dimensions boxes will let you enter your paper size (in inches or centimetres). The boxes will not let you enter sizes that your printer cannot handle.

2.2.1.5. Media Type

The type of media onto which your image will be printed should be selected here. Click on the arrow to the right of the Media Type box to see a long list of the different types of media onto which you may print your image. Media types include such things as plain paper, postcards, photo quality paper, transparencies, and more! Once you have made your choice, the drop down menu will disappear, and your choice will be shown in the Media Type box. The choices available will vary depending upon the printer model you have selected.

2.2.1.6. Media Source

The Media Source box allows the user to choose the paper source, sometimes called *Input Slot*, that the paper will be fed from. Many printers only have one available input source (such as the standard paper tray), in which case this entry will be grayed out. If your printer does support multiple input sources, you may specify the source of your choice here. Some Epson printers offer a roll feed option in addition to the standard paper tray, and many HP LaserJet printers have multiple paper trays.

2.2.1.7. Ink Type

Some printers offer a choice of different types of ink or ink cartridges. Many Canon and Lexmark printers support various combinations of cartridges, such as black only, black and color, photo color, and so forth. Most Epson printers let you choose between three and four color printing (three color uses only color ink, while four color uses black ink as well). Epson printers that support six color photo printing allow you to choose five and six color printing as well.

2.2.1.8. Resolution

Click on the arrow to the right of the Resolution box to see a long list of resolutions at which you can print your image. The list is written with the lowest resolution at the top, with increasing resolution (and generally improved printing quality) as you approach the bottom of the list. Different printers support different resolution options, and many printers support different quality choices using the same basic resolution. In this menu are a few terms which may be unfamiliar to you, and they will now be explained.

2.2.1.8.1. DPI

DPI is an acronym which stands for *D*ots *P*er *I*nch. This term refers to the number of dots that your printer will print in a space of one inch (approximately 2.54 cm). This is highly dependent upon the capability of your printer. Resolutions below 300 DPI are used for draft quality. For general purpose printing, select 300 - 360 DPI. Higher quality printing can be achieved by selecting 600 - 720 DPI. Settings higher than this are used for the highest possible quality for printing photographs and other high quality graphics. Experiment with your printer and these settings with different types of graphics and photographs to see what results you can obtain with your printer. High resolutions (large numbers of dots per inch) require substantial image processing time, and the print files can be very large; it's not uncommon for a full page, 1440x720 DPI image to require 100 MB of temporary storage!

2.2.1.8.2. Draft or Fast Economy Draft

When this text appears next to the resolution, it refers to the fact that the quality will be relatively low, but suitable for rough drafts. Draft quality is higher than fast economy draft. These options will give you the fastest printing speed. Economy Draft uses less ink, and as a result the image will be pale. These modes are generally not very useful for printing photographs.

2.2.1.8.3. Unidirectional

When printing an image, you have probably noticed the print head inside the printer moving back and forth across the print media. Many printers are capable of putting ink on the page regardless of which direction the print head is moving. However, quality can sometimes be improved by only putting ink on the page when the printer head is moving in one direction. The Unidirectional setting instructs the software to only place ink on the page when the print head is moving one way. When the print head returns, it will not place ink on the page. On many printers, the print quality is better, at the expense of printing speed.

2.2.1.8.4. High(est) Quality

With lower quality print modes, one may see an effect where the printed image looks like it has rows of stripes with a small separation between the stripes. This effect is called "banding" and is undesirable. In the *high* and *highest* quality modes, the printer will make more passes over the same part of the page in order to improve quality and (reduce or) eliminate banding. This requires more temporary disk space and prints more slowly, but does not require significantly more processing time.

2.2.1.8.5. Microweave

Certain Epson printers (older models mostly) support a printing mode called *Microweave*. This mode uses special software within the printer to improve the print quality. Microweave print modes will usually produce better quality output than non-Microweave modes, with only a small performance penalty. If Microweave is not listed at your chosen resolution, fear not. In those cases, the non-Microweave print modes offer similar printing quality improvements.

2.2.1.8.6. DMT

DMT is an acronym which stands for *D*ot *M*odulation *T*echnology. This term refers to a print mode used by certain Canon printers to improve the quality of the printed output. Unfortunately, at this time, all of the available DMT modes do not work correctly. The cases which do work correctly will offer significantly improved printing quality.

2.2.2. Preview

Notice in the upper left of the window is a preview of your image. This preview is a representation of where your picture will print on the selected media, and approximately what it will look like. This preview will be updated as you modify selections in the Position, Size, Media Size, and Output Type portions of the window. You may also select the image with your mouse and move it manually if you wish. In doing so, you will note that the Position settings are updated accordingly. Take note of the arrow, which points toward the top of the media, where top is the first part of the media to enter the printer.

The preview may be moved around the page as follows:

- Clicking and dragging the *left* (primary) mouse button moves the image around the page as you would expect; the image moves with the mouse.
- Clicking and dragging the *middle* mouse button moves the image around the page in a finer fashion, such that each pixel of mouse movement moves the image by one point (1/72 inch). This allows very fine placement of the image on the page.
- Clicking and dragging the *right* (secondary) mouse button moves the image around the page much the same as with the left button, but the image will only move in units of the image size. Thus, if the image is one inch wide and two inches tall, the image will not move at all until you have moved the mouse far enough so that the image would be moved one inch vertically and two inches horizontally. This is handy if you wish to print multiple images of the same size on one piece of paper.
- If you hold down the *shift* key on the keyboard when you click and drag the mouse, the image will only move in the horizontal or vertical direction (depending upon which way you first move the mouse). This allows you to constrain motion to the horizontal or vertical.
- If you click another button while dragging the mouse, the image will immediately return to the position it was in before you clicked the mouse the first time. This allows you to not move the image if you have started moving it and have decided that you don't want to move it. The preview will not respond to the mouse until you release all of the mouse buttons and click and drag afresh.

2.2.3. Position

2.2.3.1. Orientation

The Orientation menu allows the user to choose the orientation of the paper. The menu selections are Auto, Portrait, Landscape, Upside down, and Seascape. Click on the rectangular tab to see these choices and make your selection. When you have done so, the pulldown menu will have disappeared, and your choice will appear. Also, note that the preview image will have changed accordingly.

When set to Auto, the software will make an intelligent choice of orientation based on the dimensions of the image to be printed. Portrait orients the print media with the longest edge going from top to bottom, while Landscape orients the paper with the longest edge going from side to side. Upside down and Seascape orient the paper the same as Portrait and Landscape respectively, with the difference being that the image is rotated 180 degrees.

2.2.3.2. Automatic Centering

There are three buttons that deal with centering an image. The leftmost button is the Vertically button, the middle button is the Both button, and the rightmost button is the Horizontally button. Use the Both button to center your image both horizontally and vertically. This will cause the top and bottom borders to be equal, and the left and right borders to be equal. If you have placed your image manually by using the mouse button, then you may center the image in the horizontal direction only by clicking on the Horizontally button. Likewise, to adjust the image only in the vertical direction, click on the Vertically button. Note that in each case, the image is centered with regard to the edges of the media, and without regard to the printable portion of the media. Many printers are incapable of printing to each edge of the media. Some media may have edges which detach. Consult your printer documentation for more details regarding your printer's capabilities in this regard.

2.2.3.3. Manual Settings

You will notice that there are six boxes that contain numbers just below the Orientation menu and just above the GUI buttons related to centering an image.

When you move the preview image manually with the mouse, or when you click on one of the centering buttons, the preview image moves and these six boxes get updated.

2.2.3.3.1. Left

The number appearing in the Left box denotes the number of units (cm or inches) that the left side of the image will be printed away from the left edge of the media. You may select the units by clicking the Inch or cm buttons in the Units section just below these GUI boxes.

2.2.3.3.2. Right

The number appearing in the Right box denotes the number of units (cm or inches) that the right side of the image will be printed away from the left edge of the media. You may select the units by clicking the Inch or cm buttons in the Units section just below these GUI boxes.

2.2.3.3.3. Right Border

The number appearing in the Right Border box denotes the number of units (cm or inches) that the right side of the image will be printed away from the right edge of the media. You may select the units by clicking the Inch or cm buttons in the Units section just below these GUI boxes.

2.2.3.3.4. Top

The number appearing in the Top box denotes the number of units (cm or inches) that the top side of the image will be printed away from the top edge of the media. You may select the units by clicking the Inch or cm buttons in the Units section just below these GUI boxes.

2.2.3.3.5. Bottom

The number appearing in the Bottom box denotes the number of units (cm or inches) that the bottom side of the image will be printed away from the top edge of the media. You may select the units by clicking the Inch or cm buttons in the Units section just below these GUI boxes.

2.2.3.3.6. Bottom Border

The number appearing in the Bottom Border box denotes the number of units (cm or inches) that the bottom side of the image will be printed away from the bottom edge of the media. You may select the units by clicking the Inch or cm buttons in the Units section just below these GUI boxes.

2.2.4. Size

2.2.4.1. Slider Bar and Spin Box

The slider bar can be moved as desired by the user. Notice that while sliding this bar, the preview image changes accordingly. One will also note that several boxes in the Gimp-Print GUI change values when this bar is moved. These boxes are the six position boxes (left, right, right border, top, bottom, bottom border), the two size boxes (width and height), and the spin box to the right of the slider bar.

This slider bar is used to scale the image to a desirable size, but the same effect can be obtained by either clicking an arrow on the spin box to the right of this slider bar, or by manually typing a number into this spin box. Notice that by setting the spin box in this way, the slider bar is also moved. All of the described methods will cause the image to be scaled accordingly.

2.2.4.2. Scale by Percent or PPI

One may choose to scale the image by a percentage, or by PPI, which means "*p*ixels *p*er *i*nch". Click the radio button next to the word to set the desired scaling factor.

When scaling by a percentage, the number reflected in the spin box next to the slider bar represents the percentage relative to the full size of the selected print medium. For example, with this spin box set to 50, the image will be scaled to 50%

of the size of the print medium. When set to 100, the image will attempt to fill the print medium, within the constraints of maintaining the proper aspect ratio and the margins of the selected print medium. This effect can be seen in the preview window.

When scaling by PPI, the number reflected in the spin box next to the slider bar represents the number of pixels that will be printed per inch. For example, if the user is printing a 640x480 image at a size of 6.4x4.8 inches (as measured by the size boxes), the image will be printed at 100 DPI.

2.2.4.3. Use Original Image Size

By clicking this button, the image will be scaled to as close to the native size of the image as possible. This effect can immediately be seen in the preview image.

The native image size may be found or set in the GIMP by selecting Image/Scale Image in the GIMP. Under the Print Size and Display Unit group in the Scale Image dialog, you can determine (or change) the width and height of the image, or choose the resolution.

2.2.4.4. Width and Height

These boxes show the size of the printed image in either inches or centimeters (depending on which unit is selected). The user may choose to manually modify these values. When one value is modified, the other value is automatically modified in order to maintain the aspect ratio (the ratio of width to height). This effect can be immediately seen in the preview image.

2.2.4.5. Units

The units can be set to inches or centimeters by clicking the appropriate radio button next to the desired unit. This setting effects the values printed in the six position boxes (left, right, right border, top, bottom, bottom border) and the two size boxes (width and height).

2.2.5. Image/Output Settings

By clicking on the tab labeled Image/Output Settings, the Gimp-Print window will appear as shown in Figure 2-4. Notice that there are two sections to this portion of the window, namely, Image Type and Output Type.

2.2.5.1. Image Type

2.2.5.1.1. Line Art

This setting tells the printer driver to generate color quickly. The color is bold and bright, but color accuracy is not very good. There may also be some unexpectedly sharp transitions in colors. This mode is acceptable for printing text with small amounts of color, and may be acceptable for presentation graphics.

2.2.5.1.2. Solid Colors

This mode produces color which is considerably more accurate than the Line Art mode, but with a reduction in performance. In general, hues will be accurate but tonalities may not be accurate. There should be no sharp transitions in colors. This mode is good for printing presentation graphics in most cases.

2.2.5.1.3. Photograph

This mode produces the most accurate colors and tonalities at a greater cost in performance. This is the mode to use when printing high quality photographs or other high quality images.

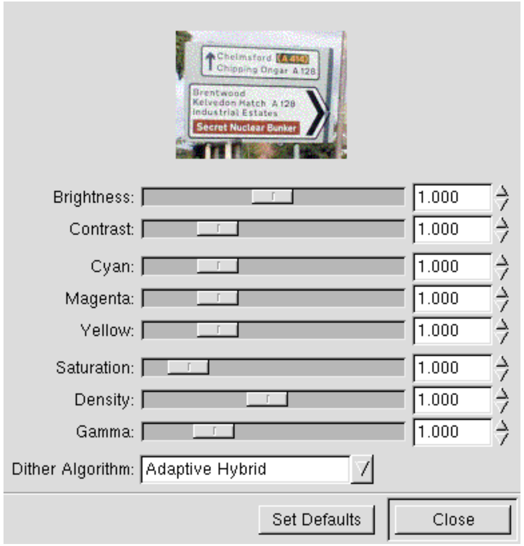
2.2.5.2. Output Type

The user is given the choice of color, black and white, and grayscale. Color is selected when the desired output is to be in color. Greyscale will result in the printed image having various shades of grey. Black and white is just that. The effect of this setting can be seen in the preview window.

2.2.5.3. Adjust Output

Clicking on this button causes the Print Color Adjust window to appear (see Figure 2-7). In this window, one will see a representation of the image to be printed as well as several slider bars. These slider bars collectively adjust many different aspects of the image. The values can also be adjusted by clicking the arrows or by typing a value into the appropriate spin box on the right side of each slider bar.

Figure 2-7. The Print Color Adjust Window



2.2.5.3.1. Brightness

Adjust the brightness of the image. A setting of 0.0 gives a fully black image, while a 2.0 setting gives a fully white image. Values greater than 1.0 will result in black not being solid and highlights turning white; values less than 1.0 will result in white not being perfectly clear and shadows turning black.

2.2.5.3.2. Contrast

Adjust the contrast of the image. A setting of 0.0 gives a solid gray for the entire image, the exact gray depending upon the brightness chosen.

2.2.5.3.3. Cyan, Magenta, Yellow

These three options allow specification of the cyan, magenta, and yellow levels independently, for rebalancing the levels. Normally, these should be adjusted to yield neutral gray, but they can be used for other effects.

2.2.5.3.4. Saturation

Adjust the brilliance of colors. A setting of 0.0 results in pure grayscale. A saturation setting of less than 1.0 results in more muted colors. A saturation setting of greater than 1.0 results in more vibrant colors. Very high saturation often results in very strange effects, including posterization and banding that might not be expected. For normal purposes, the saturation should generally be set to a value less than 1.5.

2.2.5.3.5. Density

Adjust the amount of ink deposited on the paper. If you have chosen the correct paper type and are getting ink bleeding through the paper or puddling, try reducing the density to the lowest value you can while still achieving solid black. If black is not solid black, even with the contrast and brightness at 1.0, try increasing the density. Note that changes to this setting will not be visible in the image preview.

All of the supported printers actually need less than 100% ink density in most cases, so the actual density is something other than the nominal density setting. The effective density setting cannot go above 100%, so if a value specified will result in an excessively high density level, it will be silently limited to a setting of 1.0.

2.2.5.3.6. Gamma

Adjust the gamma of the image, over and above the printer-specific correction. Gamma less than 1.0 will result in a darker image; gamma greater than 1.0 will result in a lighter image. Unlike brightness, gamma adjustment does not change the endpoints; it merely changes the shape of the input->output curve.

2.2.5.3.7. Dither Algorithm

The recommended dither algorithm is Adaptive Hybrid (which is the default) for text or other fine black detail, or if this is mixed with continuous tone images. The Ordered dithering algorithm is just as good (and somewhat faster) for pure continuous-tone images and photographs, but may yield poor results with text or other fine detail, particularly at high printing resolutions.

The Fast algorithm gives the fastest results at the expense of color accuracy. It is a simplified ordered dither. On simple four color printers (or other printers used in four color mode), the quality is similar to Ordered, although dark gray rendition is not as good due to a simpler transfer between black and colored ink. With six-color printers, color rendition is somewhat worse, but it should be quite usable in cases where optimum quality is not critical. In black and white, it is an efficient way to render grayscale, but it may not give best results when used with variable dot size printers (modern Epson printers, or Canon printers using DMT). On rare three color printers (CMY only) the results should be identical to ordered dither.

Very Fast is even faster than Fast, with even more loss of quality. Color and grayscale output will show strong patterning that resembles screening, although it isn't. On laser printers, and possibly on certain kinds of text and line art, Very Fast dithering may actually yield the best quality.

Error diffusion algorithms (Hybrid Floyd-Steinberg is such an algorithm) perform very well at high densities, and are capable of rendering very fine detail rather well, but they tend to exhibit artifacts in the form of "waves" or "worms" of dots which results in noticeable texturing in pale areas. Furthermore, pale areas immediately adjacent to white take a while to "build up" sufficient error to print at all. This is sometimes called "tearing" or "waterfalling".

2.2.5.3.8. Set Defaults and Close

When the Set Defaults button is clicked, the slider bar settings will return to their default values. The dither algorithm setting is uneffected. The Print Color Adjust window will close when the Close button is clicked.

2.2.6. Printing and Saving Settings

At the bottom of the Gimp-Print window, there are five buttons labeled About, Print and Save Settings, Save Settings, Print, and Cancel. The About button will show information about the Gimp-Print software, such as the version number, authors names, project web site, and software licensing. After clicking on the About, read the information, and then close the window by pressing the OK button.

The Print and Save Settings button will save the current settings and then print the desired image. Recall that these settings are saved in `~/.gimp-1.2/printrc`. The Save Settings button will only save the settings. The Print button will print the image only. The Cancel will close the Gimp-Print GUI window.

Chapter 3. CUPS and Gimp-Print

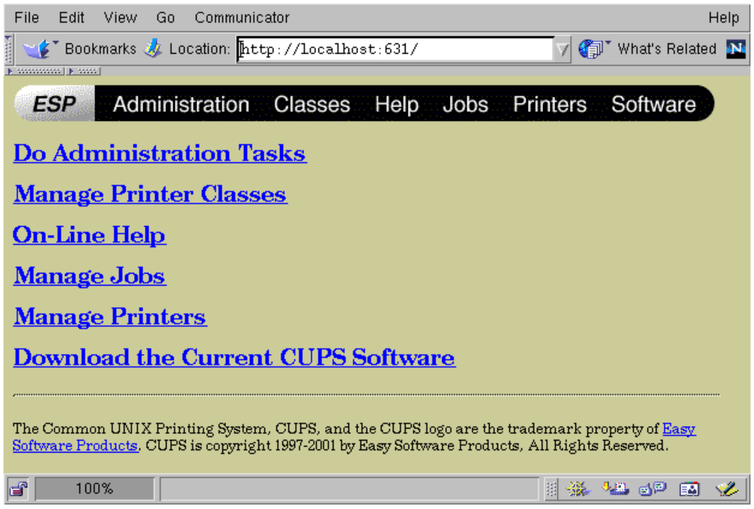
3.1. Introduction

CUPS is an acronym which stands for *C*ommon *U*nix *P*rinting *S*ystem. It is assumed that the reader has properly installed the CUPS software and the Gimp-Print software. This section will discuss adding a printer to CUPS that uses a Gimp-Print printer driver, as well as how to modify the various settings supplied by Gimp-Print. This will be a rather quick explanation, as the CUPS software is quite well documented, and it is not my intention to attempt to duplicate the CUPS documentation here.

3.2. CUPS Printer Installation

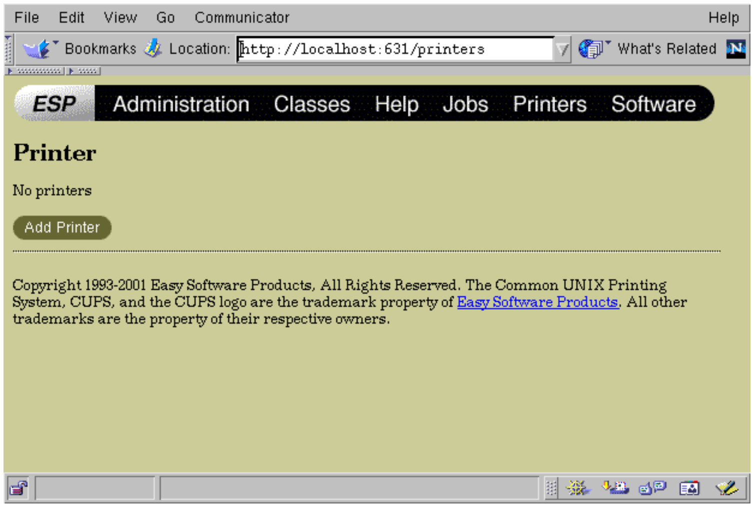
This explanation will use the web interface provided by CUPS. First, aim your favorite web browser at the CUPS server (http://localhost:631). The following screen should appear within your browser.

Figure 3-1. The CUPS Startup Window



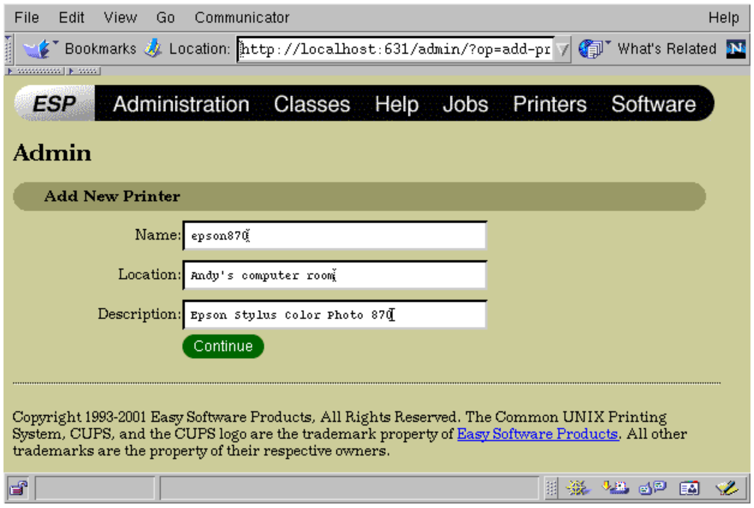
Now, you may click on either the word Printers in the bar at the top of the page, or you may click on the Manage Printers text. In either case, the next screen you see will look like this one if you have not yet configured any printers.

Figure 3-2. The CUPS Printers Window



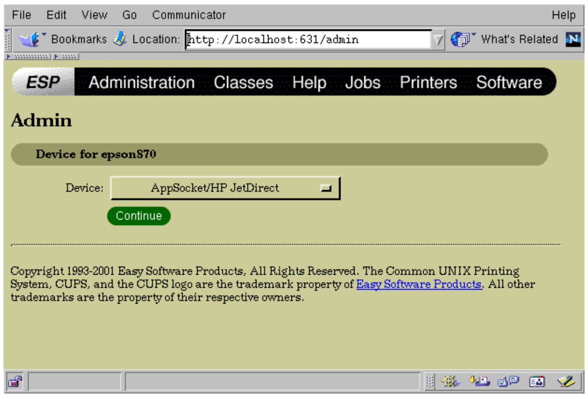
At this time, click on the Add Printer button. You will then see the Admin screen (shown below).

Figure 3-3. The CUPS Admin Window



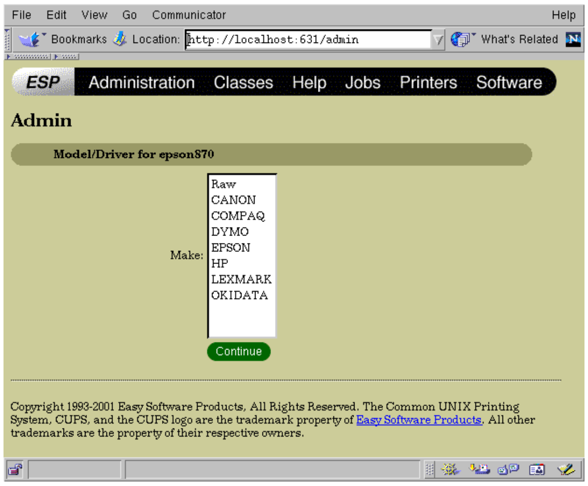
Notice in the screenshot that the three boxes are shown after the author filled them in for his printer at home. You will need to fill in an appropriate name of your printer, its location, and a description which meets your own needs. Once this is done, click on the Continue button, and then this screen will appear.

Figure 3-4. The CUPS Admin Device Window



Click on the drop down menu next to the word Device and a list of possible printer devices appears. Select the device appropriate for your printer. Note that there are a range of serial, parallel, USB, and other devices from which to choose. Once the selection is made, click the Continue button. Now, this screen appears.

Figure 3-5. The CUPS Admin Model/Driver Window



Caution Regarding USB Printers

CUPS versions 1.1.11 and later *REQUIRE* the user to insure that the desired USB printer is powered on *AND* physically connected to the USB bus *BEFORE* starting the CUPS software.

CUPS must see the USB printer when the software starts. The CUPS software is typically started when the computer boots. Note that one cannot simply plug in the USB printer and power it on after CUPS has started. (Note that this does not apply to parallel port printers).

If the USB printer was not connected and powered on at the time CUPS was started, there will not be a USB printer shown in the list of devices on the CUPS Admin Device Window (see Figure 3-4). In this event, stop the CUPS software, properly connect and power on the USB printer, and restart the CUPS software.

From the list of devices shown in the CUPS Admin Device Window (see Figure 3-4), a clever user might attempt to avoid this issue by selecting Internet Printing Protocol and then enter something similar to 'usb:/dev/usblp0' in the next screen. However, this fails later in the configuration process with a "client_error_not_possible" error message with no other explanation. Note that entering 'file:/dev/usblp0' will not work either. While CUPS will allow this, printing will not actually work in some situations.

CUPS versions 1.1.10 and earlier exhibit similar behavior with regard to not displaying the USB printer if it was not connected to the USB bus and powered up prior to starting the CUPS software. However, these versions of CUPS will indeed allow the user to enter the name of the USB connection, unlike versions 1.1.11 and later.

Select the manufacturer of your printer and click the Continue button. A window will appear which asks you to select the specific model number for your printer.

Scroll through the long list and find the model number for your printer. Notice carefully that there are many different languages supported for each printer, as denoted by the initials in parenthesis. (en) would be for English, (da) for Danish, (sv) for Swedish, (fr) for French, (no) for Norwegian, (pl) for Polish, and (en_GB) for British English (see Figure 3-6). Also take note of the Gimp-Print revision for the driver, and ensure that it is indeed the version of Gimp-Print which you have most recently installed. Once you have made the proper selection, click on the Continue button.

Figure 3-6. The 2nd CUPS Admin Model/Driver Window

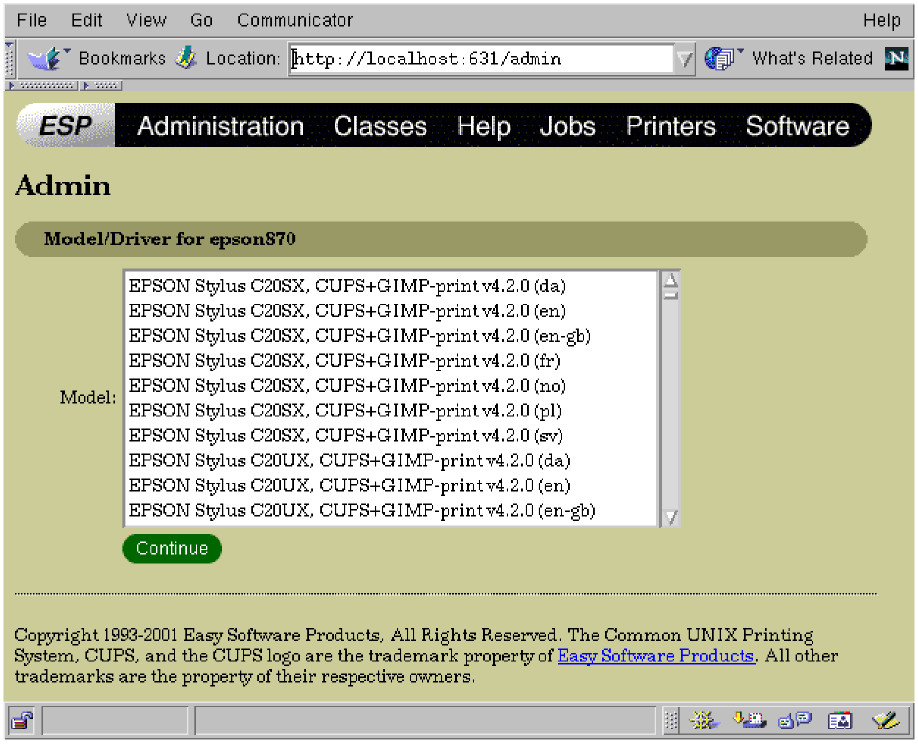
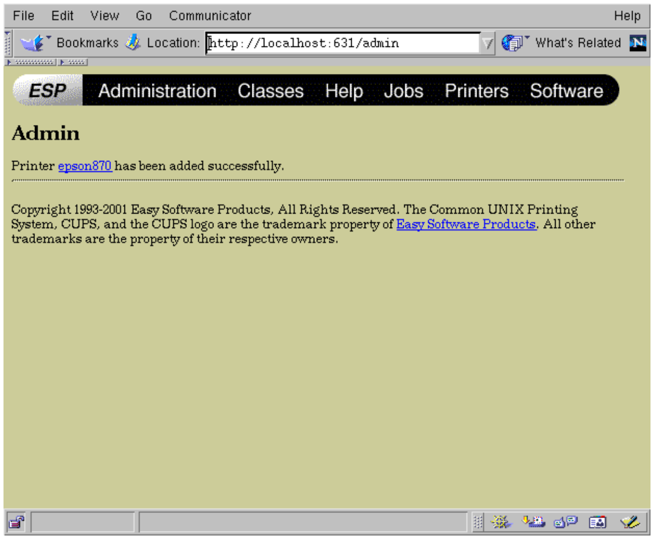
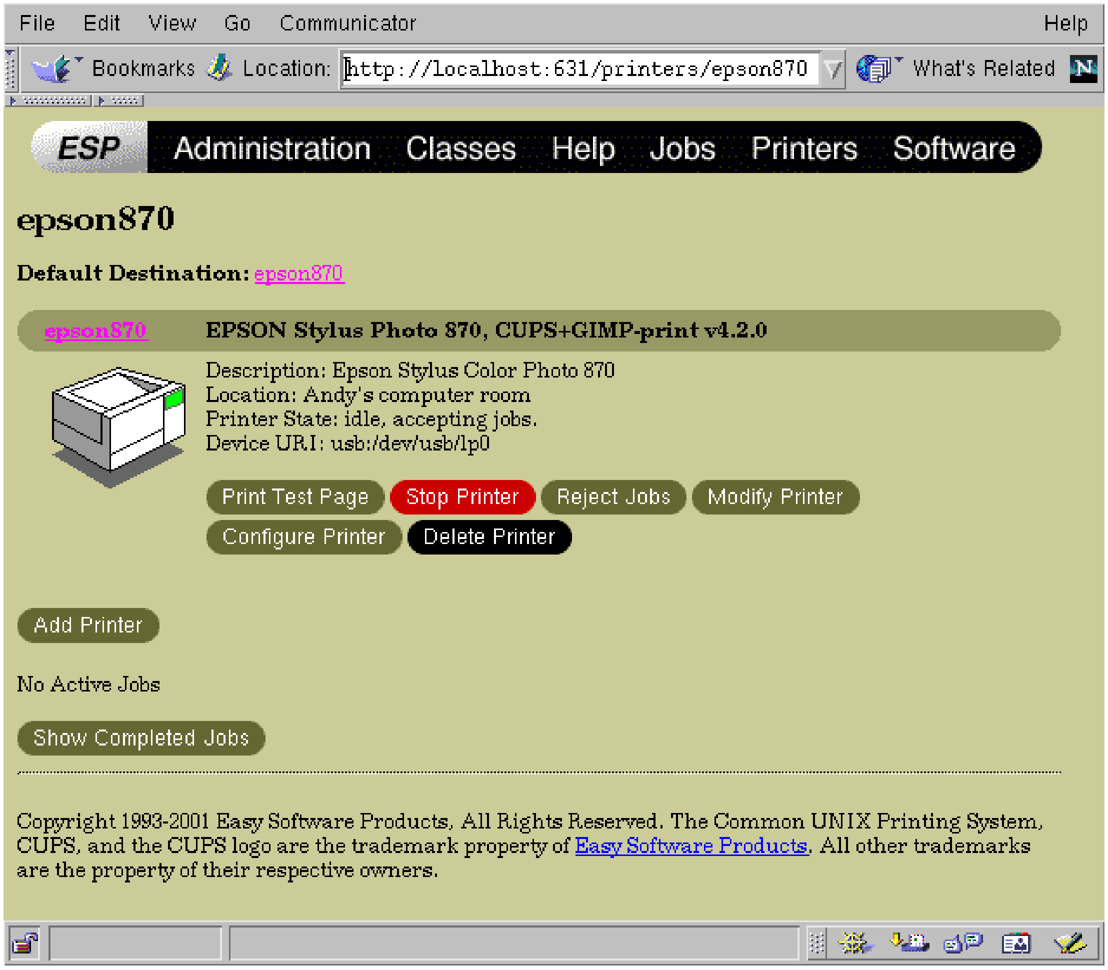


Figure 3-7. The CUPS Admin Success Window



Congratulations! You should now see the CUPS window indicating that your printer was successfully installed. Notice the sentence which reads "Printer your_printer has been added successfully". Click on your_printer, which will be the underlined name for your printer.

Figure 3-8. The CUPS Window for Your Printer

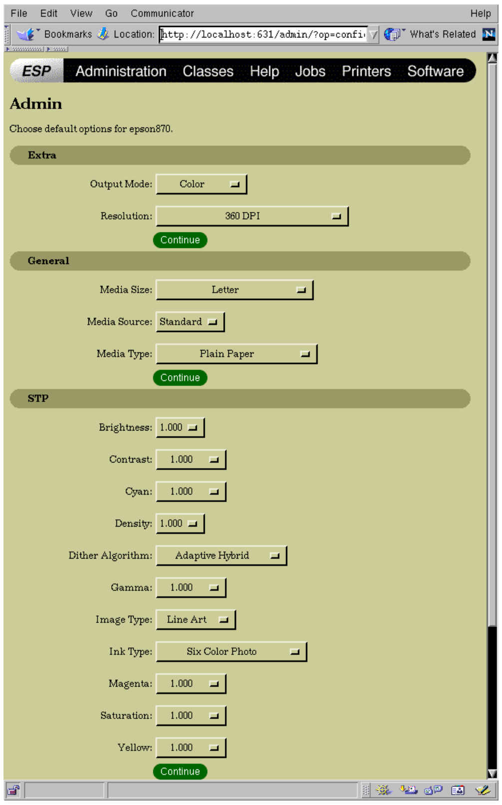


After clicking on your_printer (epson_870 in this example), a window will appear similar to that shown in Figure 3-8. It would probably be a good idea at this point to click on the Print Test Page button to ensure that everything is working properly. Take note of the Gimp-Print revision printed on this screen and confirm once again that it is the expected revision.

3.3. Configuring your Printer in CUPS

With reference to Figure 3-8, click on the Configure Printer button. A partial screenshot of the printer configuration window appears in Figure 3-9. The contents of this window will vary depending on precisely which printer you selected when you configured CUPS for your printer. The screenshot shows the selections made by the author for his printer. The individual selections will not be explained in detail here, as they are the same selections which are available when using the Gimp-Print plugin to the GIMP. These selections are explained in detail in various sections of Chapter 2.

Figure 3-9. The CUPS Printer Cofiguration Window



3.4. Using CUPS from the Command Line

It is possible to use the CUPS printing system from the command line. While this document will not delve into all of the specifics of the CUPS command line interface, there are portions of this interface which are specific to the Gimp-Print software.

The command line is in some cases a more convenient way to generate printed output (e.g. when printing from a script). However, most people (including the author) cannot easily predict what a command line option of "-o stpCyan=1350" will do to the output. It is therefore a good idea to use the GIMP to view the image and the Gimp-Print plugin to preview these settings before relying on the command line.

When using CUPS from the command line, the command will have this general format:

```
lpr -P my_printer_name \
    -o option1=<choice1> \
    -o option2=<choice2> \
    /path/to/printfile
```

When typing the command directly onto the command line, put all of the command line options on one line, and do not type the "\" characters. The list of possible options which are specific to Gimp-Print, followed by some of the supported choices, are shown below:

```
-o PageSize=<...| A3 | A4 | A4 | ...>
-o InputSlot=<Roll | Standard>
-o MediaType=< ..| Inkjet | Plain | GlossyPaper | ...>
-o Resolution=<360sw | 360swuni ...| 1440x720 >
-o ColorModel=<Black | RGB | Gray | CMYK>
-o stpBrightness=<0...2000>
-o stpContrast=<0...2000>
-o stpCyan=<0...4000>
-o stpDensity=<0...2000>
-o stpDither=<0...4000>
-o stpGamma=<0...4000>
-o stpImageType=<LineArt | Continuous | SolidTone>
-o stpInkType=<PhotoCMY | CMYK | PhotoCMYK | RGB>
-o stpMagenta=<0...4000>
-o stpSaturation=<0...9000>
-o stpYellow=<0...4000>
```

For more detailed information, consult the appropriate sections of Chapter 2.

Chapter 4. Gimp-Print Utilities

4.1. escputil

escputil is a command line utility which allows the user to perform a variety of maintenance tasks on Epson Stylus inkjet printers. These tasks include head alignment, head cleaning, nozzle check, printer identification, and retrieval of the ink level from the printer. In order for many of the *escputil* functions to work, the user must have read/write access to the raw printer device (typically /dev/lp0, /dev/usb/lp0, and the like). In general, these operations should be performed by the root user. As always, the user must insure that the directory containing the *escputil* utility is listed in the $PATH environment variable, or that the full path is specified on the command line. The examples in this section will assume the former.

> **Caution**
>
> The *escputil* utility was designed for use ONLY with Epson Stylus inkjet printers supported by the Gimp-Print software. It is possible that damage MIGHT occur to your printer if this utility is misused or if it is used with a printer other than an Epson Stylus inkjet printer. It is the sole responsibility of the user to insure that this utility is suitable for the task at hand.

In this section, specific examples of common usage will be presented. A summary of the command line switches can be found in the *escputil*(1) man page.

4.1.1. Determining Ink Level

Perhaps the most basic function performed by *escputil* is that of determining the amount of ink remaining in the printer. To do this, the user must know the name of the raw printer device. This is usually /dev/lp0 for a printer connected to the parallel port, or /dev/usb/lp0 for a printer connected to the USB.

If there are multiple printers connected, one of them may be referenced as /dev/lp1 or perhaps /dev/usb/lp1. In the event of uncertainty, and if CUPS is in use, view the following URL (http://localhost:631/printers) with a web browser. At that URL, look for a line which reads "Device URI". The author’s USB printer is listed as "Device URI: usb:/dev/usb/lp0".

For this example, assume that the raw printer device is a USB printer specified as /dev/usb/lp0. To get the ink level for this printer, issue this command and notice the output.

```
# escputil -r /dev/usb/lp0 -i

Escputil version 4.3.0, Copyright (C) 2000-2001 Robert Krawitz
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'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

           Ink color    Percent remaining
               Black     18
                Cyan     71
             Magenta     70
              Yellow     67
          Light Cyan     71
       Light Magenta     70
```

The user would substitute their own raw printer device for the one shown in the example after the "-r" switch. Notice that the printout shows the percent of ink remaining for each color of the author’s Epson Stylus Photo 870. When the ink levels get too low, print quality will suffer. In the author’s personal experience, ink levels approaching 10% begin to cause print quality degredation, but this will vary depending on the precise printer model.

4.1.2. Error During Ink Level Determination

What? The example above did not work? An error message was printed? What does it mean? There are several possibilities, depending on the specific error message. If the error message is "Invalid argument" (see following example), the problem is that the kernel is not configured with the CONFIG_PRINTER_READBACK option enabled.

```
# escputil -r /dev/lp0 -i

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'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

Cannot read from /dev/lp0: Invalid argument
```

Another possibile cause for error is that the raw printer device does not have both read and write permission for the user attempting to access the device. In this case, the error message will read "Permission denied". A final possibility is that the raw printer device specified is incorrect, in which case the error message will read "No such device".

4.1.3. Nozzle Check

On an inkjet printer, there are several small holes on the bottom of each ink cartridge through which the ink must flow smoothly in order to create high quality images on paper. If these holes become clogged, the printed image will show small gaps where there should have been ink. One can easily test for the existence of this condition by running a nozzle check. One need not be the root user to issue this command. Note that as shown, the command will print a nozzle test pattern on the default printer. If there are multiple printers present, the desired printer must be specified with an additional "-P printer_name" switch, where "printer_name" is the name of the desired printer.

The printer will print a series of black (and colored) slanted lines on the paper. Observe these lines carefully. If there are gaps or spaces in these lines, then the corresponding nozzle is clogged and the print head must be cleaned. However, if there are no gaps, the nozzles are clean.

```
# escputil -n
Escputil version 4.3.0, Copyright (C) 2000-2001 Robert Krawitz
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'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

Running nozzle check, please ensure paper is in the printer.
```

4.1.4. Clean the Print Head

If the printed output is showing gaps where there should have been ink, it is likely that one or more nozzles are clogged and the print head is in need of cleaning. One can verify this by first running a nozzle check and looking for gaps in the printout. To clean the print head, issue the following command. One need not be the root user to issue this command. Note that as shown, the command will clean the print head on the default printer. If there are multiple printers present, the desired printer must be specified with an additional "-P printer_name" switch, where "printer_name" is the name of the desired printer.

```
# escputil -c
Escputil version 4.3.0, Copyright (C) 2000-2001 Robert Krawitz
Escputil comes with ABSOLUTELY NO WARRANTY; for details type
'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

Cleaning heads...
```

Nothing will be printed on the paper. The printer will make some noise as it cleans the print head. Wait until the printer is finished cleaning the print head. Afterwards, execute another nozzle check and insure that the print head is indeed completely clean. Note that the process of cleaning the print head causes ink consumption, so do not clean the print head any more than necessary.

For severely clogged nozzles, one may have to execute two or three cycles of nozzle check followed by a cleaning of the print head. If the printer had gone unused for a long time, the nozzles may be so clogged with dried ink as to be unrecoverable, in which case, the best course of action is to replace the ink cartridge.

4.1.5. Align the Print Head

To insure the highest quality printouts, the print head must be in proper physical alignment. One can check and realign the print head by running this interactive alignment test.

The *escputil* utility must know the exact printer model in use. One may specify the model on the command line using the "-m" switch, or the utility can detect the printer model if the user passes the "-r" switch and the name of the raw printer device.

Note that an unprivileged user may use this command with the "-m" switch, but that (in general) the root user may only use the "-r" switch (which requires read/write access to the raw printer device). In the case of multiple printers in use, the "-P" switch is required to align the print head on the non-default printer.

> **Caution**
>
> This utility lets you align the print head of your Epson Stylus inkjet printer. Misuse of this utility may cause your print quality to degrade and possibly damage your printer. This utility has not been reviewed by Seiko Epson for correctness, and is offered with no warranty at all. The entire risk of using this utility lies with you.

Aligning the print head is an interactive process. The utility will print out a set of instructions and ask you for responses. Please read the instructions carefully and follow them precisely. A single sheet of paper will be needed (one can print on both sides to save paper).

The following example illustrates the alignment process when issued by an unprivileged user who specified the printer model on the command line. (To obtain a list of printer models, issue the "escputil -M" command). Of course, your responses will vary and should be substituted for the responses shown in the following example.

```
*** NOTE - 870 is an illustrative example! ***
*** You MUST use the proper printer model! ***
*** Run:  escputil -M for a listing of     ***
*** supported printer models!              ***

linuxpc> escputil -a -m 870
Escputil version 4.3.0, Copyright (C) 2000-2001 Robert Krawitz
Escputil comes with ABSOLUTELY NO WARRANTY; for details type
'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

Please read these instructions very carefully before proceeding.

This utility lets you align the print head of your Epson Stylus
inkjet printer.  Misuse of this utility may cause your print
quality to degrade and possibly damage your printer.  This utility
has not been reviewed by Seiko Epson for correctness, and is
offered with no warranty at all.  The entire risk of using this
utility lies with you.

This utility prints 3 test patterns.  Each pattern looks very
similar.  The patterns consist of a series of pairs of vertical
lines that overlap.  Below each pair of lines is a number between
1 and 15.

When you inspect the pairs of lines, you should find the pair
of lines that is best in alignment, that is, that best forms
a single vertical line.  Inspect the pairs very carefully to
find the best match.  Using a loupe or magnifying glass is
recommended for the most critical inspection.  It is also
suggested that you use a good quality paper for the test, so
that the lines are well-formed and do not spread through the
paper.  After picking the number matching the best pair, place
the paper back in the paper input tray before typing it in.

Each pattern is similar, but later patterns use finer dots for
```

```
more critical alignment.  You must run all of the passes to
correctly align your printer.  After running all the alignment
passes, the alignment patterns will be printed once more.  You
should find that the middle-most pair (#8 out of the 15) is the
best for all patterns.

After the passes are printed once more, you will be offered the
choices of (s)aving the result in the printer, (r)epeating the
process, or (q)uitting without saving.  Quitting will not restore
the previous settings, but powering the printer off and back
on will.  If you quit, you must repeat the entire process if
you wish to later save the results.  It is essential that you
not turn your printer off during this procedure.

This procedure assumes that your printer is an Epson Stylus Photo
870.  If this is not your printer model, please type control-C now
and choose your actual printer model.

Please place a sheet of paper in your printer to begin the head
alignment procedure.
Press enter to continue >
Please inspect the print, and choose the best pair of lines in
each pattern.  Type a pair number, '?' for help, or 'r' to repeat
the procedure.
Pass #1> 8
Pass #2> 8
Pass #3> 8
Attempting to set alignment...succeeded.
Please verify that the alignment is correct.  After the alignment
pattern is printed again, please ensure that the best pattern
for each line is pattern 8.  If it is not, you should repeat the
process to get the best quality printing.
Please insert a fresh sheet of paper.
Press enter to continue >
Please inspect the final output very carefully to ensure that your
printer is in proper alignment. You may now:
  (s)ave the results in the printer,
  (q)uit without saving the results, or
  (r)epeat the entire process from the beginning.
You will then be asked to confirm your choice.
What do you want to do (s, q, r)?
```

```
> s
This will permanently alter the configuration of your printer.
WARNING: this procedure has not been approved by Seiko Epson,
and it may damage your printer. Proceed?
Please confirm by typing 's' again that you wish to save the
settings to your printer:
> s
About to save settings...succeeded!
Your alignment settings have been saved to the printer.
```

The following example shows what will happen if an unprivileged user attempts to align the print head by specifying the raw printer device on the command line.

```
linuxpc> escputil -a -r /dev/usb/lp0
Escputil version 4.2.0, Copyright (C) 2000-2001 Robert Krawitz
Escputil comes with ABSOLUTELY NO WARRANTY; for details type
'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

Attempting to detect printer model...
Cannot open /dev/usb/lp0 read/write: Permission denied
```

This next example illustrates the results obtained when the root user issues an alignment command while specifying the raw printer device. Note that the output is truncated and only shows the printer detection output.

```
# escputil -a -r /dev/usb/lp0
Escputil version 4.3.0, Copyright (C) 2000-2001 Robert Krawitz
Escputil comes with ABSOLUTELY NO WARRANTY; for details type
'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

Attempting to detect printer model...Stylus Photo 870

Please read these instructions very carefully before proceeding.
```

4.1.6. Printer Identification

The printer identification command will query the printer for make and model information. This command requires read/write access to the raw printer device (generally limited to the root user). Substitute your own raw printer device in place of the /dev/usb/lp0 shown in the example. The output will vary depending on the precise printer model.

```
# escputil -d -r /dev/usb/lp0
Escputil version 4.3.0, Copyright (C) 2000-2001 Robert Krawitz
Escputil comes with ABSOLUTELY NO WARRANTY; for details type
'escputil -l'
This is free software, and you are welcome to redistribute it
under certain conditions; type 'escputil -l' for details.

@EJL ID
MFG:EPSON;CMD:ESCPL2,BDC;MDL:Stylus Photo 870;CLS:PRINTER;DES:
EPSON Stylus Photo 870;
```

4.1.7. More Information

For more detailed information about the command line switches accepted by the *escputil* utility, please consult the man page which is supplied with the Gimp-Print software. The user may also issue the "escputil --help" command to get a listing of supported command line switches. The command requires no special privileges to execute.

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Version 1.1, March 2000

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