In the spring of 1993, Apple Computer and Adobe Systems introduced a new version of the LaserWriter® printer driver. This version was created to support PostScript™ Level 2 functions, improve performance, and provide user access to device specific features. But the new printer driver has also created some controversy. To see why, it helps to understand what a printer driver does.

It should be noted here that the printer drivers discussed here are for the Macintosh® computer. Of course, printer drivers exist for other computer platforms, but the discussion here will focus on the Macintosh.

What is a printer driver?

What is a PostScript printer driver? In the simplest sense it is a small computer program which performs these functions:

- **PostScript code generation**– The driver takes QuickDraw™ code from a Macintosh computer and generates PostScript code.

- **Communication** – The driver facilitates communication between the Macintosh and a printer.

[1] JPEG stands for Joint Photographic Experts Group. JPEG is the committee that produced the color image data compression standard of the same name.

- **PostScript Level 2 support** – In its most recent versions it provides access to PostScript Level 2 functions like JPEG compression.[1] (Other important PostScript Level 2 features include forms & patterns support, color extensions, and improved memory management.)

What does it do?

Consider for a moment what happens when a designer is creating a page in a page layout program. The software program has two important tasks:

- It must display the page on the monitor.

- It must be able to print that page to an output device.

[2] A PostScript RIP takes the PostScript code and converts it into something that an output device can print.

[3] This interpretation can take place in a variety of places. A RIP may be a stand-alone device that sits next to the printer. A RIP may be built into a printer. A RIP may even reside on a computer that is networked to a RIP.

[4] Software programs that generate their own PostScript are called 'Minheaders'. They tell the printer driver to step out of the way so that they can generate their own PostScript (i.e., they request a minimal header).

For the Macintosh, displaying the page on the monitor is done with a graphics description language called QuickDraw. The software program must create the page (usually in its own internal format) and then convert that format (ideally very quickly) into QuickDraw so that it may be displayed on the screen. A similar process must occur for a job to be printed on a printer. In the case of a QuickDraw printer, no conversion is necessary, the host Macintosh acts as the printer's raster image processor (RIP).[2] With a PostScript printer, the QuickDraw code must be converted to PostScript. This code is then interpreted[3] and is output on the printer.

The conversion of QuickDraw into PostScript may be done either by the program itself or by the PostScript printer driver. In many cases, even though the printer driver is capable of creating the PostScript code, the software program will do it itself.[4] Why do software developers overlook the PostScript generation capability of the driver? Programs that have sophisticated typographic or color capabilities often create their own code because of the level of sophistication involved. However, even if the printer driver isn't used for PostScript generation, in most cases it still will be used to establish a communication link with the printer. (Exception: LaserTalk.™)

Selected Milestones in PostScript Printer Driver History		
Version #	**Year released**	**Description**
4.0	1987	LaserWriter Page Setup dialog box now includes a tool ("Moof" the dog/cow, see right) for inverting black and white regions as well as horizontal and vertical flipping.
4.2	1987	Support for tabloid sizes.
5.2	1988	Color printer support.
6.0	1989	Improved support for color printers, made halftone printing possible for grayscale/color images.
7.0	1992	LaserPrep dictionary eliminated.
8.0	1993	PostScript Level 2 support, two pass architecture.
8.2.1	1994	Most recent version at the time this article was completed (November 1994).
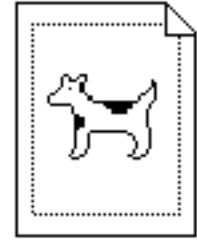
With most programs, PostScript code is not created (whether by the printer driver or by the software application) until the user clicks OK in the Print dialog box. (If you could open a QuarkXPress® file and read it as text, the text would be in Quark's internal language, not PostScript or even QuickDraw.) Two exceptions to this rule are Adobe Illustrator, which creates its code in PostScript, and Adobe Acrobat, which creates Portable Document Format (PDF). Even if you were to print a job as a PostScript file[5], the resulting code would be unfamiliar, even if you knew all of the operators in the PostScript page description language. Why? The PostScript language uses a feature called a 'key value pair' dictionary to put the PostScript code into an abbreviated shorthand. One or more dictionaries may be used in this manner to reduce the size of the PostScript file.

[5] There are several ways to create PostScript print-to-disk files. Using System 7 it is possible to do this easily from the Print dialog box.

Versions

Updates of a printer driver (or most software programs for that matter) are distinguished from earlier versions by a version number. When a new version is released, the version number is incremented by one. (Version 6 becomes version 7.) In many cases, revisions are made that are not deemed sufficiently large enough to create an entirely new version number. (They may allow only a small increase in functionality, or perhaps they contain only a bug fix.) In these cases, a decimal place and an number are added, and then incremented as necessary. (Version 7.0 becomes version 7.1.) When an even smaller correction is made, a second decimal place is added. (Version 7.1 becomes version 7.1.1.) Finally, a decimal place and the letter 'x' are used to describe all the variants of a version. (For example, 7.x includes each version of the version 7 release, i.e., 7.0, 7.1, 7.1.1, etc.)

Today, the most commonly used PostScript printer drivers are versions 7.x and 8.x (selected earlier versions are listed in the box above):

- **Apple LaserWriter 7.x** – This driver is a descendant of the original 1985 version. It was continually reworked with new code, and though that meant it might not produce the most elegant or sleek PostScript code it certainly performs well and reliably.

- **LaserWriter 8.x (also known as the PSPrinter 8.x)** – This driver was created to streamline PostScript operations, and to make it PostScript Level 2-aware. One big advantage of this driver for users dealing with large images is that JPEG files are passed through the driver to Level 2 printers. Also of interest are real-time PostScript error reporting and an improved network printing feature which checks to see if a printer is off-line. The latest version as of November 1994 is 8.2.1.

Versions of the printer driver prior to 8.x were produced by Apple Computer. Adobe and Apple have worked together to create version 8.x For some users, the 8.x printer driver will print faster than earlier drivers. It also allows users to create a PostScript file whose pages are independent of each other.[6] (Something that was not possible in earlier versions.) This is particularly handy for imposition. 8.x is more efficient for short documents, it remembers output device setups, and it provides PostScript Level 2 capabilities. But at present, the 8.x printer driver is not necessarily recommended for all types of documents. (See 'Two-pass architecture' discussion below.)

The simplest way to find out which version of the driver you are running is to print a job. The printer driver's version number will appear in the upper right hand corner of the Print dialog box. (See Figure 1.) It also appears in the Page Setup dialog box.
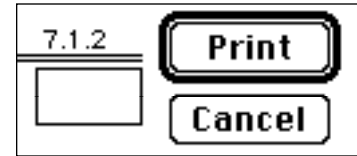

Figure 1 – Upper right hand corner of Print dialog box showing version 7.1.2

An 8.x driver is included with Apple System 7.5. One also comes with PageMaker® 5.0. New drivers are often posted on on-line services or they may be obtained from Apple or Adobe.

Issues and problems

In the production world, people have very strong opinions about whether or not to use the 8.x version of the printer driver. This often has to do with the programs that they commonly use. Aldus PageMaker 5.0 users are required to use the new driver.[7] QuarkXPress users are not.

Slow printing times and spooling issues (see below) have made the 8.x driver unpopular with high-end PostScript users. As a result, many users who do high resolution output have chosen to stick with the 7.x driver.

PPDs

PPDs play an important role in the operation of the printer driver. In general, PPDs are used to supply device specific attributes of the target printing device. How does the use of PPDs differ between versions 7.x and 8.x? The 8.x printer driver queries the PPDs and uses this information in the Print dialog box. Earlier versions of the printer driver use the information in PPDs, but it is not necessarily reflected in the Print dialog box.

With version 8.x, PPDs go in the system folder in a file folder called "printer descriptions" which the 8.x printer driver finds automatically. However, if you prefer to put PPDs elsewhere, you may do so manually.

Two-pass architecture

Two-pass architecture is another difference between the 7.x version and the 8.x version of the printer driver. The two-pass architecture refers to the way that the job is sent to the printer. To understand how this works, we must first define the terms background, foreground, and spooling.

A process that happens **'in the background'** means that it does not keep you from using your computer while it happens. For example, you can buy software that allows to your receive faxes in the background while you continue to work uninterrupted. Usually when you print, the printing takes place **'in the foreground'** which means that you have to wait until the process is through until you can go back to using the computer. You can make printing a background process by using a process called **spooling**.

When you send a job to a printer, the printer handles it page by page, and prints it as quickly as it can. But chances are it won't be able to print it as fast as it receives the data. In the meantime (while you are waiting) your computer is still needed to communicate the rest of the data to the printer.

That means that you can't do other work until your computer has finished sending the job. If instead you choose to spool, the job, instead of being sent to your printer, is sent to either your own internal hard disk or to a separate device like a print server.[8] From there the file is sent to the printer, but in the meantime you have regained control over your computer.

In the two-pass architecture of the 8.x printer driver, the two passes refer to the way that data is spooled. The 8.x printer driver has two spooling functions, one which cannot be disabled (the first pass) and one which can (the second pass). The first pass takes the job to the Macintosh's internal hard disk as a series of pages. Each page can contain Quickdraw or PostScript commands (or both). The second pass occurs when these pages are fully converted to PostScript and sent to the printer. (This is what allows the 8.x printer driver to create a PostScript file whose pages are independent of each other.)

The first pass happens in the foreground (even with background printing is turned on in the Chooser). This spooling can take a long time with large documents and even longer if the document contains high resolution images. In addition, you must have enough disk space for those images, otherwise the job won't print.

Conclusion

The two-pass architecture is at the heart of debate over the 8.x printer driver. One benefit of the two pass architecture is that the first pass is better able to determine which resources are required for the file (in terms of fonts, forms, patterns, etc.). This is particularly advantageous with documents that use a wide variety of fonts. The resulting two-pass PostScript file uses these resources more efficiently. However, for images that contain large scanned files this advantage is overshadowed by the spooling problems described above. This leaves users with a difficult choice of which driver to use. For files that contain large scanned images, it is probably best to continue using the 7.x driver for now.

Acknowledgements