



White Paper

**Canon imagePROGRAF
PAGE DESCRIPTION
LANGUAGES (PDLs)**

Introduction to Page Description Languages (PDLs)

A non technical explanation of PostScript, HP GL/2, GARO and other page description languages

If you have ever clicked the “print” button on your computer you’ve used a page description language (PDL). If you’ve worked in the digital printing industry, or bought a printer at anytime in the past 20 years, the names of the languages may even sound familiar – PostScript, HP GL/2, PCL, GARO. Yet, unless you are a programmer writing code for print applications or an administrator who manages the printers on a network you are unlikely to have had a reason to give page description languages much thought. Page description language technology is so universal and so reliable that most people are completely unaware that they are using it every time they click print

So why write a white paper about PDLs now? Because one of the oldest and best known page description languages – PostScript – is maturing and is slowly being replaced by new technologies. Unlike some technologies that come and go quickly, PostScript has been around for a long time. Some of your large-format printing customers may be reluctant to give it up – even if they don’t need it anymore – just because it is familiar. At the same time because PostScript is so deeply entrenched in digital printing technology (and remains useful for certain applications) it will probably be around for a long time to come. During this period of technology transition, some of your customers are going to look to you for advice. This white paper is therefore intended to help you gain a better understanding of what PDL’s are so that you can feel more comfortable discussing this topic with your customers. Please note however, this is not a technical guide to PDLs, many of the technical concepts are greatly simplified here in hopes of presenting this technology in terms that can be easily understood by a wide variety of people and customers.



WHAT IS PAGE DESCRIPTION LANGUAGE (PDL)?

- A page description language is programming code that instructs a digital print engine where and how to place text and graphics onto a page.

WHY WERE PAGE DESCRIPTION LANGUAGES INVENTED?

- Perhaps the best way to understand why page description languages were invented is to go back to the early 1980's before the page description languages in use today were created. Back then there were basically two types of printers; impact printers that could print only text and plotters that used computer directed pens to draw pictures and graphics. Each of these technologies treated letter characters and lines as individual elements which were sequentially printed one after the other onto a page. This made it difficult to manage the page as a whole and thus made creating page layouts that included both text and graphics difficult. With the invention of the modern page description languages elements such as words and lines could be handled together at the same time, making it possible to layout and print complete pages that included both text and graphics.

WHAT DOES A PAGE DESCRIPTION LANGUAGE DO?

- In simplified terms, here is what a page description language does. When a designer engineer or architect uses a software application (such as AutoCAD) to create a drawing, document, or graphic software application, they capture the information required to draw that design on a page. The software knows where to place lines, text and other elements onto the page. The software also knows details like how thick the lines should be and what colors to print them. Though we view this information on-screen as if it were a "picture", the data that defines the image actually exists in bytes as a set of instructions that the software application can follow to remember and recreate the page whenever needed.

When a user clicks "print," the printer driver helps send that code to an out-put device, such as a large-format printer. The page description language then takes the code supplied by the software, interprets that code and uses it to instruct the printer where and how to place the text and graphics onto the page. Page description languages are therefore part of the core technology that enables computers and printers to work together.

If it helps, think of it as if a computer and printer are working together on a jig-saw puzzle. The individual pieces of the puzzle represent the data bytes required to construct the full page as you see it on the monitor. The computer knows how to put the puzzle together, but the printer has to do the assembly work. The only problem is the computer software and the printers don't speak the same language so they need help communicating with each other. The printer driver and page description language provides this needed help. Clicking "print" begins a process by which the software (with the printer driver's help) collects and sends the pieces, it uses a page description language to interpret the instruction provided to reassemble the puzzle and output a print.



WHAT ARE SOME COMMON PAGE DESCRIPTION LANGUAGES?

- Over the years various technology companies have developed Page Description Languages to enhance the quality and efficiency of the printing process. Here are some of the most common languages and their creators.

ADOBE POSTSCRIPT:

- Created by Adobe in 1982, PostScript is a platform independent page description language credited by many for the desktop publishing boom of the 1990s. By the time Adobe introduced the third generation of the code (known as PostScript 3) in 1997, PostScript was considered the de facto standards for desk top publishing and had been expanded into a full programming language capable of supporting pages in various formats across multiple viewing and imaging platforms.

As PostScript evolved over time it also became more versatile and device independent. Device independent means that PostScript can be used equally well to print any document from any software application to any printer. For software programmers and printer manufacturers alike, the device independent characteristics of PostScript remain attractive because it simplifies programming while ensuring that the product (software or printer) will work reliably with other system components available in the marketplace.

Though PostScript's popularity peaked in the late 1990's it is now gradually being replaced by newer technologies. While PostScript continues to offer developers many advantages it has historically come with expensive licensing fees from Adobe. So not wanting to be held captive to Adobe, companies such as Canon, Hewlett Packard and others have developed their own page description languages, which they can use freely without paying a premium to Adobe.

By 2001, the number of printer models in the marketplace which came with support for PostScript had declined significantly, largely due to growing competition from low cost non-PostScript printers and new software-based methods to render images on a computer and make them suitable for output on any printer. The most popular example is the Portable Document Format (PDF) – another Adobe invention.

HEWLETT PACKARD HP GL:

- Around the same time that Adobe was inventing a page description language for desktop publishing Hewlett Packard was doing the same for large format printers, which at the time were primarily pen-plotters. With the advent of large-format inkjet printers, HP GL/2 was released to adapt HP's code to ink jet printing. HP also developed HP RTL as a sub set language specifically designed to handle raster images. Today HP GL/2 and HP RTL are used concurrently for large format output, especially technical documents applications. In an effort to expand the market for their printers, HP released the HP GL/2 and HP RTL page description languages as open source technology. This meant that unlike paying Adobe fees to use PostScript, application developers and printer manufactures could use HP's code for free. And as a result most CAD/CAM/CAE programs today rely on HP GL/2 and HP RTL to output print files.



HEWLETT PACKARD PCL:

- Printer Control Language (PCL) is another open source code language developed by HP to help it compete against PostScript in the desktop publishing market. PCL was released in the 1980s by Hewlett-Packard as a simpler, faster and less expensive alternative to PostScript-based laser printers. Though PCL has fewer features than PostScript, the vast majority of business documents do not require the power of PostScript. Fewer features means simplicity, and therefore PCL is an attractive language for workgroup printing applications.

CANON GARO

- Canon's page description language, known as GARO (Graphic Arts language with Raster Operations) is built to optimize printing while facilitating integration with third party applications for greater overall versatility. When processing print jobs, GARO is designed to select the fastest, most portable, most accurate and most efficient command sets, minimize overhead memory requirements and send data to the printer more quickly. The GARO language is a unique Canon technology that contributes to the imagePROGRAF's impressive output speed and performance.

DON'T CONFUSE FILE FORMATS WITH PAGE DESCRIPTION LANGUAGES

- So what's the difference between a file format and a PDL? A file format is produced by the software application used to create the page. Most software applications can save a page into a variety of different file formats to enable the user a variety of options and features. A file format originates with the software application that is running on the computer that creates the page. Examples of file formats include PDF, TIFF, DWG, JPEG and others.

On the other hand, a page description language resides with the printing device. As long as the appropriate drivers and/or plug-ins are in place to ensure proper communications between the computer and the printer, the files should be printed on the designated output device.

WHAT IS PDF?

- Introduced by Adobe in 1993, the Portable Document Format (PDF) is unique because it is an independent file format that enables documents to be consistently and accurately displayed and printed regardless of the software application used to create it, the operating system used to access it or the printer used to output it.

Because PDF is based on much of the same underlying Adobe technology employed by PostScript, a PDF file has many of the same imaging capabilities as PostScript. However, because the PDF format is more versatile, it is usually easier to use.



From the perspective of large-format printing this means that any document can be printed once it has been converted to PDF. One of the primary advantages of PDF documents is specifically that printing and viewing does not require PostScript or the original software application that created the document.

In July 2008, the Portable Document Format was officially published as an open standard (ISO 32000-1:2008) we therefore would expect the proliferation of the PDF format to accelerate in the near future.

DOES YOUR TECHNICAL DOCUMENT CUSTOMER NEED POSTSCRIPT?

- Probably not. Today, many of the original developers of page description languages (PDLs) have released their code as “open source software” so that other developers can use it freely. And as page description language technology has matured many of the features and functions of PDLs have cross-pollinated into other types of programming code. Operating System developers like Microsoft and Apple have incorporated many of PostScript’s originally functionality into their systems. Even software application developers now include elements of PDL technology in their code to help make printing from their applications easier and faster. The best example of this is Adobe’s PDF. While PDF is a file format and not a page description language, it embodies so many of PostScript’s features that it supplants the need for PostScript and allows pages to be printed independently.

The result is that many operating systems, application software, printer drivers and page description languages are today designed to work well interchangeably with each other. Therefore your technical documents customer will be able to print the industry’s most commonly used file formats (PDF, DWG, TIFF, JPEG, HP GL/2, HP-RTL) from applications such as AutoCAD, Photoshop, Micro Station, and Microsoft Office without the need for PostScript. For the majority of CAD/CAM/CAE (2-D AND 3-D) printing, PostScript is not required because Canon’s GARO page description language will handle these – no problem.

The Canon Printer Driver, built around the GARO page description language was designed to address a broad range of output requirements. Nonetheless, there remain some occasions where PostScript may be useful – such as when printing high-end graphic arts applications and occasionally in a UNIX or LINUX operating environment. If our customer wants to print graphic arts applications such as Illustrator, Quark, InDesign, CorelDraw or PageMaker, Canon offers a wide range of PostScript enabled RIP solutions to address this need. However, even in these cases you may find that PostScript is more of an exception than a necessity, as PDF is quickly becoming the preeminent file format for graphic arts printing as well.





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