

WHY POSTSCRIPT-ENABLED THERMAL PRINTERS MAKE SENSE IN TODAY'S MANUFACTURING ENVIRONMENT

I. Introduction

Warren Buffett once noted, "If history was all there was to the game, the richest people would be librarians." His point: as things move forward they change; in terms of commercial success, anticipating and integrating change is essential to success—to winning the game.

Consider manufacturing. In today's accelerating, often volatile, and increasingly global competition, manufacturers understand that change is the constant and most prevalent element of the business landscape. This challenge must be met with agility if the company is to thrive and survive. In our digital, data-driven manufacturing world, the use of enterprise resource planning (ERP) software is one of the principal tools used to maintain control in an environment exposed to many risks and inundated by a proliferating mass of data. Since the enterprise is "connected"—from the plant floor to the top floor, across the supply and value chain—ERP and systems integrated with it are the principal means of knowing what has happened and is happening within one's business.

A key part of the strategy in which ERP plays a central role is process standardization: as businesses become more complex and dispersed across physical and geographical distances, having standardized processes enables efficient operations despite the challenges increased complexity presents. Consequently, there is constant movement to establish enterprise (and



on a broader scale, global) standards.

In printing, PostScript/PDF (Portable Document Format) is rapidly gaining acceptance in the global marketplace as the standard file format for document printing. Yet thermal printers—the dominant type of printer used on the industrial plant floor—have historically not supported PostScript/PDF, effectively adding an inflexible element to companies that seek simplicity and flexibility as standard operating procedure. With many barcode printers (e.g., Zebra, Sato, Datamax, Intermec, Toshiba Tec), there is no direct way to print PostScript/PDF, nor can one convert PostScript/PDF to their native printer emulations (ZGL, STGL, DGL, IGL, TGL, etc.) because of the fundamental difference in the way the printers are designed to process printer language emulations.

The introduction of the Printronix T8000 Series is a signature event in the printing industry. It is the first thermal printer to offer PostScript/PDF support that easily integrates with existing operating systems and supports up to 35 scalable fonts. When considering how thermal printers interface with ERP systems, this new technology makes sense in the digitally driven manufacturing environment.

II. The Case of ERP

ERP is a good place to start when looking at the efficacy of PostScript/PDF support in thermal printers. If printer manufacturers use their own language for a big ERP system such as SAP—which most do—they need to develop SAP drivers. For a Windows operating system, it's typical to have Windows drivers; for a Linux operating system, it's likewise common to have Linux drivers. Since SAP offers neither of those, a user needs its own SAP driver to use a thermal printer. It can be difficult and cumbersome to install those drivers; they don't necessarily come with SAP, and they're usually custom in their function.

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Many printer manufacturers have their own SAP drivers that convert to their unique graphic language, but these devices often have problems achieving true WYSIWYG (what-you-see-is-what-you-get) output. So typically someone on the SAP side makes up a new form, and then the printer manufacturer has to update the driver to assure that barcodes reproduce properly. Then the user has to reinstall the driver with every update. This creates the Constant Update Game.

A key advantage of having a language in PostScript is that most native ERP systems understand PostScript because laser was prevalent in the industry, and PostScript is a laser standard. Therefore, it's built into

many ERP systems. SAP is a good example: because it supports PostScript, there's no driver installation.

Further, you can send PostScript-enabled thermal printer jobs with color embedded in any kind of context and the printer will print it, albeit in grayscale. This means that the PostScript-enabled thermal printer will plug and play perfectly with the ERP system; the user on the ERP side simply selects the right language and is on their way.

Another advantage of using PostScript versus another laser standard such as PCL-5 is its scalability. While PCL-5 is limited to 300 DPI and multiples thereof, PostScript can scale on any DPI printer (i.e., 203, 300, 600); so regardless of application, the output is excellent.

III. The Printronix T8000 Series

The Printronix T8000 is the industry's first thermal printer that is PostScript/PDF enabled, providing seamless connectivity of PostScript/PDF files for rapid deployment, and supporting the latest ERP systems with plug-and-play capabilities (e.g., with native SAP drivers). Postscript and PDF are traditionally laser emulations that require a great deal of processing power and memory. Thermal printers in the past were not suitable platforms in either category. However, the T8000 runs a high-performance ARM Cortex-A9 processor with 512 MB of DRAM and 128 MB Flash memory, making this breakthrough possible.

“It's not just the PostScript that makes this an interesting solution; it's the fact that we're running it on a high-powered engine (i.e., the ARM Cortex A9 processor) at full 14ips (inches per second),” says Bill Brown, Director of Software Engineering at Printronix. “That's high-performance thermal printing that can compete with the best laser printers.”

The T8000 is also ideal for harsh environments. It performs reliably in sub-zero conditions without a heated enclosure (-5°C for direct thermal and 5°C for thermal transfer). For cold supply chain users, this feature can result in significant savings on enclosures and energy consumption. Moreover, the printer has been designed to handle the dirt, grime, humidity, and extreme temperatures found in many manufacturing, warehouse, and distribution centers worldwide.

With outstanding industrial performance, ease of use, and 100 percent verifiable barcode output with ODV (online data verification), the T8000 exceeds the

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requirements of the most demanding mission-critical manufacturing and distribution operations. Here are some key reasons to make the switch to a PostScript/PDF enabled thermal printer:

• **Seamless Integration**

PostScript/PDF is the laser printing industry standard that runs on a wide range of operating systems such as Microsoft, Mac OS, Linux, and others. It is independent of any application software, ensuring easy plug-and-play integration without downtime.

• **Flexibility**

Printronix T8000 PostScript/PDF thermal printers come pre-loaded with 35 fonts. There is no need to add additional middleware or interfaces for character substitutions. Barcodes will print correctly with high



print quality and optimal performance. “The trouble with middleware is that it forces the installation of addition hardware, software or both,” notes Brown. “Companies don’t like to inject middleware due to additional security concerns, configuration, and operational complexity. The PostScript/PDF solution eliminates all of those issues.”

• **Reliability and Performance**

Printing labels on a laser printer is unreliable and slow. When printing label stock paper, laser printer speed will decrease by more than 60 percent (a 40-page-per-minute [ppm] laser printer will print at 16 ppm when printing label stock through the bypass tray). In addition, the printer is much more prone to paper jams because of the glue on the label stock paper.

• **Serviceability**

Laser printers are not engineered to print label stock, so they can handle label stock only in a limited quantity.

Therefore, most laser printers will only feed through the bypass tray. This may require an extensive number of maintenance calls, as the printer fuser unit and paper rollers will have to be replaced more frequently. There's a higher level of complexity and more parts in laser printers, which affects running time and downtime. In contrast, all the media in the T8000 is side loaded. There is no threading of media, and the print station opens up for easy access.

• Total Cost of Ownership

The total cost of ownership is lower on thermals because of three factors: consumables, longevity, and electrical

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consumption. Due to the barcodes and amount of information on most labels, the percentage of coverage is typically high. The cost per label/page when printing on thermal is constant, while for virtually every laser printer, as coverage increases, operating cost increases exponentially. Printronix desktop thermal printers typically have an installed life of 7 to 10 years. The average lifespan for a laser printer is around three years. So it's possible that one thermal printer can last for the life of three laser printers.

Finally, the electric usage of a thermal printer is far lower than a laser printer. Consider a comparison between the Printronix T8000 and the HP 9050 laser printer: sleep/energy saver mode: T8000 4 watts, HP 9050 36 watts; standby mode: T8000 34 watts, HP 9050 205 watts; printing: T8000 200 watts, HP 9050 1,000 watts.

• Output Retrieval Efficiency

Thermal printers offer peel and present, cut, tear-off, rewind, and deliver one label/page at a time; laser printers are limited to producing a page of labels at a time. The T8000 is capable of printing a full letter-size page (8.5x11) at a speed of up to 75 ppm, and the first page out on a thermal printer is faster than a laser because of no warm-up time. A laser printer has a warm up of one form or another. The longest form is just powered up or energy save mode, which can take 30-34 seconds. A ready state still requires it to charge up the xerographic process (drum), so a 10-second delay at least can be expected. With thermal, there's nothing to warm up—just send and go.

• Superior Environmental Tolerance

Printronix thermal printers are designed to deliver consistent, dependable performance in virtually any environment. The T8000 is certified to reliably operate in temperatures of 23-104°F (-5-40°C). Additionally, the T8000 has a sealed case so airborne contaminants cannot build up on electrical components. Laser printers by design are very susceptible to varying environmental conditions. Their user's manuals state to place the printer in a stable environment with no abrupt changes in temperature or humidity. Operating temperature range for the average laser printer is 60-90°F. Laser printers require a vented case; as such, dust and other airborne contaminants can accumulate on the drum, rollers, fuser, etc., and eventually cause paper jams and print quality issues.

Finally, all laser printers emit ozone. They have a carbon filter meant to capture it, but some escapes. In contrast, nothing in the thermal printing process creates ozone. Laser printers also use carbon toner, which is carcinogenic when airborne and inhaled.

Other factors to consider: laser and inkjet printers are purely stationary and can't be used in work

environments that require the printer to be moved between different locations (i.e., point of use) on mobile print carts. What's more, the life of the thermal printer print head is more than 80,000 letter-size pages for direct thermal and more than 160,000 letter-size pages for thermal transfer, providing extended operation without user intervention, other than loading media and ribbons.

IV. Steamrolling Ahead

The American futurist Stewart Brand observed, "Once a new technology rolls over you, if you're not part of the steamroller, you're part of the road." PostScript isn't a new technology, but its use in thermal printers is a breakthrough that comes at an opportune time. Industrial environments evolve at a different pace than office environments; they use specialized equipment and systems, and to a large degree still use hard-coded applications. However, we are starting to see a clear and inexorable shift to enterprise applications on the "concrete floor" as well as carpeted executive suites, which makes the T8000's integration of PostScript very timely

When thermal manufacturers introduce a new emulation, there is always a concern about how well it is designed: Is it a mature implementation? Can it handle complex graphics? Can it do jobs that include color? In the case of the T8000, the answer to all these questions is "yes."

These printers use the proven Ghostscript® solution by Artifex Software, Inc. Ghostscript is a suite of software based on an interpreter for Adobe Systems' PostScript and Portable Document Format (PDF) page description languages. Its main purposes are the rasterization or rendering of such page description language files for the display or printing of document pages and the conversion between PostScript and PDF files. Ghostscript software began in 1988 as a freely



available alternative to Adobe's PostScript products and is now widely recognized as a premiere independent implementation of all the leading page description languages.

"This is a solution that will produce quality output without concerns of compatibility or maturity," concludes Brown. "We're adding much more than a new language; we're adding seamless integration to meet a de facto requirement of the manufacturing environment. This powerful combination of high-end print quality, 100% verifiable barcodes, and PDF printing will drive change on the industrial plant floor."

So don't expect that sector to be rolled over as technology advances to their advantage.