Display Peripherals—
Emerging Technology and Trends

INTRODUCTION

Display peripherals is an expanding category that now includes devices for a variety of display mediums. These are visual mediums such as video displays, panel displays, and, more recently, typeset–quality page printers. Although video control devices are not especially new, the concept of dedicated processing engines for page–oriented printing systems and related tasks is only now emerging.

This service section will discuss the semiconductor technology and trends surfacing in the applications segment of raster printer processing engines/controllers and associated devices.
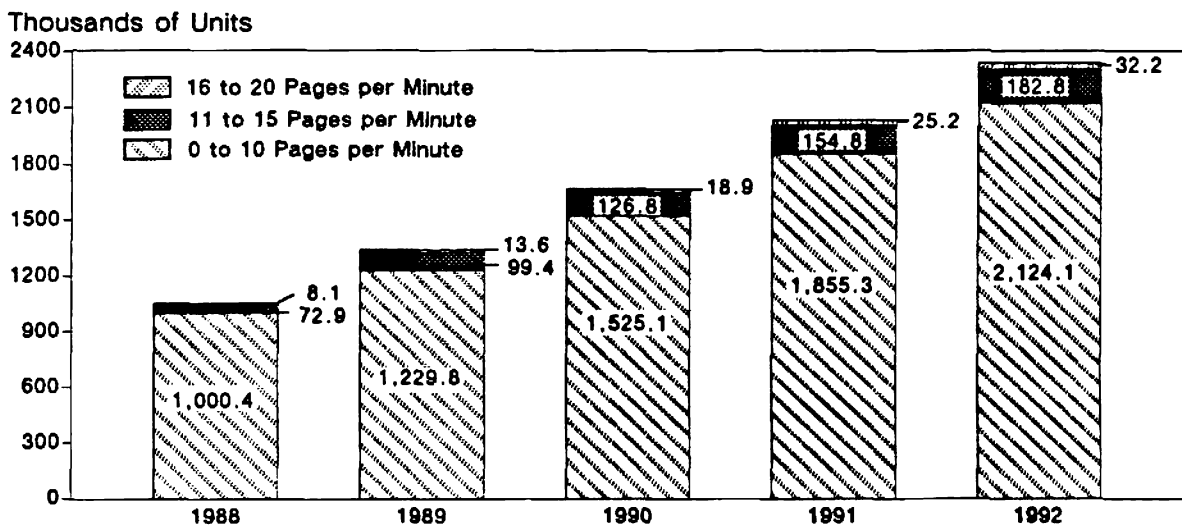
A BIT OF HISTORY

Over the last five years, the business computing market has experienced an influx of higher–speed, typeset–quality page–oriented printers. These are systems based on ink–jet, laser engines, ion–deposition, and other print technologies.

As an example, laser systems are capable of generating a text–only page image in 2 to 10 seconds. However, speed is only one aspect of page printers; they are also very flexible in terms of mixing complex graphics and multiple type fonts. Their versatility has helped create an expanding market poised for rapid growth. Figure 1 displays the market potential for these printers and, therefore, the control processors.

Figure 1

North American Page Printer Shipment Forecast

Thousands of Units

- 16 to 20 Pages per Minute
- 11 to 15 Pages per Minute
- 0 to 10 Pages per Minute

Year	0 to 10	11 to 15	16 to 20
1988	1,000.4	72.9	8.1
1989	1,229.8	99.4	13.6
1990	1,525.1	126.8	18.9
1991	1,855.3	154.8	25.2
1992	2,124.1	182.8	32.2

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The accelerated market growth will remain predicated on the technical abilities of the printers to image various graphics with text and to do so at the rated page-per-minute speed. The necessity of quality and quantity prompted semiconductor suppliers, in conjunction with printer engine manufacturers, to develop tailored integrated circuit controllers for this task.

DEFINITION OF A RASTER PRINTER CONTROLLER

A raster printer controller is a type of computing engine, be it a processor or controller, resolved for a given class of task or, in other words, a task solution engine. Dataquest believes that the boundary between microprocessors and microcontrollers is disintegrating as applications evolve. As this phenomenon occurs, more of the powerful processor architectures will infiltrate dedicated control applications. In this case, the processing device is resolved for control of a high-speed printing system. Prior designs have used general-purpose microprocessors or other alternatives.

The Technical Rationale: Clear-Cut Speed

Regardless of the printing technology used, there is a distinct need to keep the page output in unison with the data output of the image processor. Electronic printer engines—such as a laser—can lay down thousands of characters, or millions of dots for graphics, per second. The controlling processor must be able to decode incoming data for print, execute the page layout program in memory, and then feed the printing engine quickly enough to create an unbroken page image.

Page printers (especially laser printers) contain two primary functional sections, as depicted in Figure 2.

Laser print engines have been optimized for high-speed throughput and relatively low cost for desktop publishing. For this reason, the cost of the electronics must be kept at a minimum to avoid a high printer average selling price.

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Figure 2

An Example Laser Printer
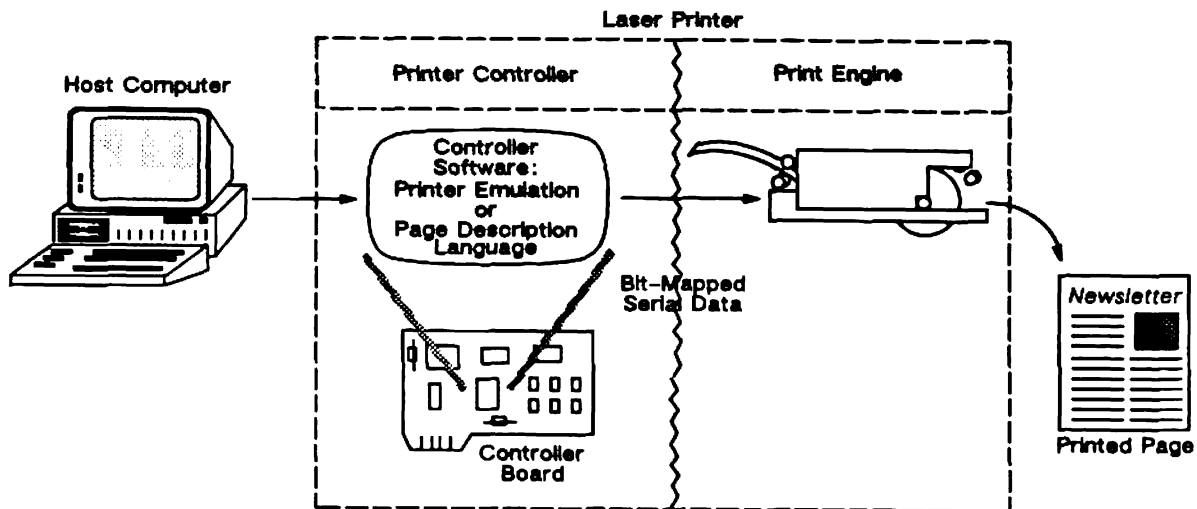
0001443-2   Source: Cirrus Logic

PAGE PRINTER DEVICE SUPPLIERS

Table 1 lists the current announced set of products and vendors in the page printer device market.

As indicated in Table 1, these devices function in a variety of ways. Many are self-contained microprocessors tailored for graphics operations. Others, such as Cirrus Logic's Raster Printer Accelerator (RPX) device is a coprocessor compatible with a variety of low-cost microprocessors. Western Digital's WD65C10 is an interface controller designed to work as a slave to a local MPU in the printer controller. It performs the contiguous bit transfer to the printing engine, thus off-loading the data formatting task and the direct memory access function from the MPU.

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Table 1

Suppliers of Page Printer Control Devices

<u>Company</u>	<u>Product</u>	<u>Function</u>
Advanced Micro Devices	Am95C75	N/A
Cirrus Logic	CL-GP340/315	Coprocessor
National Semiconductor	NS32CG16	Processor
Texas Instruments	TMS34010	Processor
Weitek Corp.	XL-8200	Processor
Western Digital	WD65C10	Interface

N/A = Not available

Source: Dataquest
October 1988

TECHNICAL ARCHITECTURAL ASPECTS

The application of page printers requires a unique combination of technical resources to manage the efficient translation of incoming text and graphics data into a complete page image. Specifically, the most salient features are as follows:

- Arithmetic computational speed

- Dot–per–inch resolution for graphics and complex character sets

- Slower, low–cost DRAMs

- BITBLT operation (bit–aligned block level transfer)

- Page memory address capacity

- Dedicated graphics functions/instructions

- Appropriate pricing for class (speed range) of printer

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