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Introduction

The laser printers covered in this book—the Personal LaserWriter LS, the Personal LaserWriter NT, the LaserWriter IIf, and the LaserWriter IIg—comprise Apple Computer's third generation of laser printers.

You can use any of the Apple LaserWriters to print text and graphics at near-typeset quality.

Any Macintosh application can be used to print pages on any member of the LaserWriter family, and with the appropriate connections, some members of the Apple LaserWriter family can be used with computers running MS-DOS or Windows.

Who Can Use This Book

This book is intended for anyone who is currently using or contemplating the purchase of an Apple LaserWriter. Two specific groups of users are targeted:

- Individuals and very small workgroups who are using a LaserWriter or who are contemplating the purchase of one.
- Network administrators within medium-to-large-sized organizations who are using LaserWriters or who are contemplating the purchase of them.

This book is not meant to be a replacement for Apple's excellent documentation set. Nor is this book intended to replace the wide variety of information available for using the PostScript page description language. This is not a programmer's manual; it's a user's reference.

I'm assuming that you have at least a passing acquaintance with things Macintosh; that you know how to click and double-click on screen items and that you understand basic Macintosh conventions.

I'm not assuming that you're an expert, but I am assuming that you have read at least the most basic parts of the documentation set that came with your computer. If you haven't, it's OK; go and do it now. This book will still be here when you get back.

About the Rapid Reference Series

This book is part of the Business One Irwin Rapid Reference series. Each is designed basically the same way, and with the same intention: to provide coverage of the basic functionality of leading software applications for the Apple Macintosh family of computers.

The underlying idea for this series is that people are too busy to wade through enormous amounts of documentation, and that they

shouldn't have to. Each book in this series will cover the basic functionality of the product at hand. The idea at work here is that basic information will enable you to become productive quickly, allowing you to explore the deeper levels of a program's functionality later, when you have more time.

A wide variety of titles is currently under development. If there are specific titles you would like to see, please don't hesitate to contact the publisher or the author.

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Navigating This Book

This book is organized in a series of very short chapters for brevity and easy navigation. The material is thoroughly cross-referenced wherever possible, and a complete table of contents and index are provided.

Conventions Used in This Book

Each title in the Rapid Reference series contains various tips, warnings, and items flagged for your consideration. These items are represented graphically throughout the entire series using the following conventions:

The **checkmark** is used to mark an item for your consideration. It is recommended that you consider this information before going any further in the process described. Items marked with the **checkmark** are important to consider, but will not cause any serious problems if you ignore or disregard them. The checkmark is also used to identify undocumented features as well as tips and shortcuts.

The familiar **caution** icon is used in a manner consistent with Apple's documentation and human user interface guidelines. The **caution** icon is used throughout this book to call your attention to an operation that may have undesirable results.

The **stop** icon is used in a manner consistent with Apple's documentation and human interface guidelines. The **stop** icon is used to call your attention to an operation that can cause a serious problem. The **stop** icon is used only for information that can cause serious and sometimes irreparable damage. Pay close attention to any stop icons.

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How a LaserWriter Works

All laser printers work by combining light, electric charges, and plastic particles to produce a printed page, and the Apple LaserWriters are no exception.

All laser printers use the following sequence to produce a printed page.

1. The printer receives an image.
2. Inside the printer, a series of laser beams strike a drum that carries a negative electrical charge, creating areas of positive charge on the drum.
3. Negatively charged bits of black-plastic toner are attracted to the areas where the light beams have drawn an image.
4. Positively charged paper is passed through the roller, attracting the particles of toner from the drum.
5. The paper passes between two or more heated fusing rollers, causing the toner to bond to the paper.

The paper path for the LaserWriter II family is shown in Figure 1.

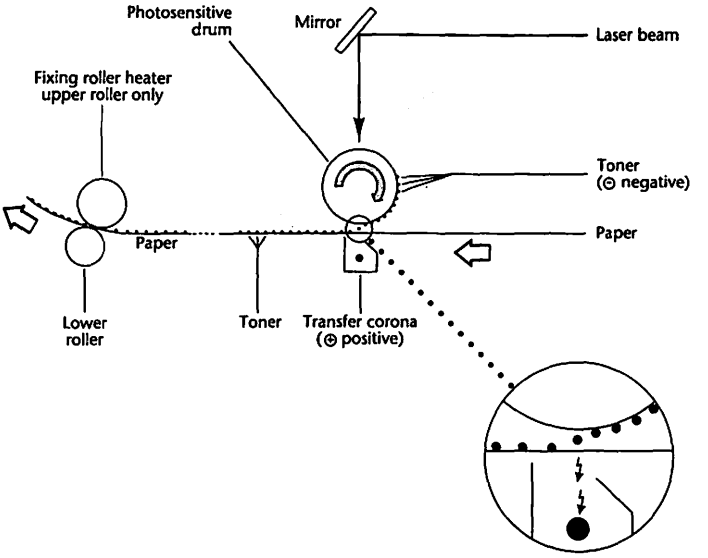


Figure 1 LaserWriter II paper path.

Printer performance is directly attributable to two components.

- The printer's engine
- The printer's controller

The Engine

The LaserWriter's engine is the part of the printer that actually marks and creates the printed page. Apple's LaserWriters are built around either the Canon LBP-LX or LBP-SX engine.

A laser printer's engine is usually rated in the number of pages per minute it can produce. Individuals or organizations that produce moder-

ately large amounts of documents need a printer with an engine that is capable of printing between 6–10 pages per minute.

The good news is that laser printer engines are getting faster and sharper. It is important to bear in mind, however, that most laser printers—especially those in the Macintosh environment—do not reach their rated speed except on the most simple documents.

The Resolution Issue

Most laser printers offer 300 dot-per-inch (dpi) resolution. Printers that offer higher resolution output produce documents that are sharper because the stair-stepped jagged edges are reduced. In addition, a higher resolution printer makes it possible to output halftone screens with more lines per inch.

There are three generally recognized ways, all currently in use, to increase the resolution of a laser printer engine.

- *Shorten the pulse of the printer engine's laser to apply more horizontal dots.* Printers that use this method are usually easy to recognize because they offer a horizontal resolution that is twice as high as the vertical resolution. Printers that shorten the laser pulse offer smoother characters and vertical lines, but produce landscape-format documents that are of lower quality.
- *Use software resolution enhancement tricks.* Some manufacturers, most notably Apple and Hewlett-Packard, increase a given printer engine's resolution by adjusting the size of the dots the printer prints, rather than increasing the number of dots that are output.

- *Use an engine that offers a higher resolution.* Some printers are a sort of hybrid. These printers are built around engines capable of producing higher resolution output combined with shortened laser pulses.

All of the Apple LaserWriters use a standard 300-dpi engine. The high-end LaserWriter IIf and LaserWriter IIg have additional proprietary circuitry that enhance resolution (covered in the FinePrint and PhotoGrade chapters).

The Controller

The LaserWriter's controller is the part of the printer that processes all print jobs and tells the printer's engine where to apply toner on the printed page.

Apple's LaserWriters use controllers based on the same Motorola processors that are used in the company's personal computers. In fact, the controller for the LaserWriter IIg is essentially a Macintosh IIci motherboard with added print-specific and networking features.

How well the printer can handle complex pages is a direct result of the printer's controller. A general rule of thumb for Macintosh printers is that a printer with a fast controller and a relatively slow engine is faster than a printer with a slow controller and a fast engine.

Controllers are getting faster and smarter. Only a few years ago, state of the art controllers were based on the Motorola 68020 processor. Now, most engines use fast 68030s or RISC (reduced instruction set computing) chip sets.

In some cases, most or all of the processing related to a print job takes place in the computer that

is connected to the laser printer. In these cases, the host computer is actually the laser printer controller.

A Hard Disk Connection

A Small Computer System Interface (SCSI)hard disk drive connection on the laser printer can be quite important if you work with a lot of downloadable fonts. Both the LaserWriter IIf and LaserWriter IIg offer a SCSI port.

A hard disk drive connected to your printer and loaded with fonts can speed most print jobs considerably, especially those documents that use fonts other than the ones included in the printer's ROM.

Using a hard disk drive connected to the laser printer eliminates the need to download fonts over the local area network. Fonts generally take about 30 seconds each to download across a LocalTalk network, and take less than a second when downloaded from a hard disk drive connected to the LaserWriter.

Laser Printer Classes

Laser printers can be classified as fitting into one of five broad categories.

- *Personal Printers* are non-PostScript printers that use a 4- to 6-page-per-minute engine. They cannot be shared across a network, and generally use the host computer to control the print engine. These printers use inexpensive print engines that are slow and rated for a relatively light duty cycle.

- *Personal PostScript Printers* use the same type of 4- to 6-page-per-minute print engine found in personal printers, but add PostScript to the equation. These printers sometimes have network ports, but their slow print engines preclude their use across a local area network.
- *Light-Duty PostScript Printers* are usually built around an 8-page-per-minute engine, and employ a controller based on a 68000 processor. These printers are inexpensive enough to be distributed among small workgroup members on a single network.
- *Medium-Duty PostScript Printers* are based on an 8- to 12-page-per-minute engine, and use a 68020-, 68030-, or RISC-based controller. They are appropriate for a five to ten-member workgroup.
- *Heavy-Duty PostScript Printers* use 12- to 22-page-per-minute engines coupled with 68030- or RISC-based controller. They usually have large or multiple paper trays and are capable of large volume printing.

CHAPTER TWO

The LaserWriter Family

Apple Computer's LaserWriter family of printers all fall within the Laser Printer Classes presented on page 19, with the exception of the heavy-duty PostScript category. At this time, Apple does not market a printer with large enough paper trays to be appropriate for heavy-duty use.

Apple's LaserWriters can be categorized as either personal printers or workgroup printers. The categories are based on the capabilities of the print engines and controllers they use and their ability to be shared by workgroup members across a local area network.

Personal LaserWriters

The personal LaserWriters (Personal LaserWriter LS and Personal LaserWriter NT) are designed for use by an individual, even though the Personal LaserWriter NT has a built-in LocalTalk port. The personal LaserWriters are built around an engine—the Canon LBP-LX—that is too slow for use by most workgroups. The engine is rated at an output capacity of 4 pages per minute. In a

real-world setting, the actual throughput of printed pages is significantly less.

Either of Apple's Personal LaserWriters are appropriate for use by a single user and a good choice if your printing needs are moderate and not likely to grow in the foreseeable future.

Personal LaserWriter LS

Apple's Personal LaserWriter LS is positioned as an inexpensive, entry-level, non-PostScript laser printer offering modest performance and no expandability. The Personal LaserWriter LS cannot be upgraded to PostScript.

The closest competitor to this printer is the Hewlett-Packard LaserJet IIP, a printer that can be upgraded to PostScript and used on a network for less money.

The Personal LaserWriter LS is truly a personal printer; it cannot be shared across a local area network, and instead is connected to the serial port of any Macintosh.

The Personal LaserWriter LS, like the other members of Apple's Personal LaserWriter family, is built around the Canon LBP-LX engine. The Canon LBP-LX engine is rated at 4 pages per minute. You can expect output speed at about one page per minute when the Personal LaserWriter LS is attached to a low-end Macintosh such as the LC or Classic and about two pages per minute with 68030-based Macintosh models such as the IIsi or IIci.

The output capability of the Personal LaserWriter LS—because it is a "dumb" printer (relying on the processing power of the computer to which it is attached to rasterize a page)—is dependent

on the host Macintosh's processing power. According to Apple, the minimum configuration would be a 1 MByte Macintosh with a hard disk drive running System 6.0.7.

The Canon LBP-LX engine has a rated life cycle of 150,000 pages over five years with no monthly maximum, and each toner cartridge is rated for about 3,500 pages.

The print controller used in the Personal LaserWriter LS is based on a Motorola 68000 processor running at 8 MHz.

The Personal LaserWriter LS comes with 512 KBytes of RAM installed, and there is no provision for adding more memory. According to Apple, the printer incorporates proprietary data compression/decompression technology that allows the Personal LaserWriter LS to work as if it had 2.5 MBytes of RAM installed. This appears to be a valid claim.

A 50-page paper tray is built into the printer. You can adjust the paper tray to accommodate letter, legal-, A4-, and B5-size paper. The Personal LaserWriter LS paper tray can also be used to feed envelopes to the printer.

A 250-sheet paper cassette is available for $79, but requires the addition of a paper feeder, available for an additional $120. A legal-sized paper tray costs $79, and an envelope cassette that holds 15 envelopes costs $89.

Apple has always been fairly competitive with its laser printer pricing, and the Personal LaserWriter LS is an indication of Apple's renewed interest in the lower end of the market. The Personal LaserWriter LS carries a suggested retail price of $1299—$700 less than its LaserWriter IISC predecessor.

Instead of attaching to the SCSI port, like the Personal LaserWriter SC does, the LS attaches to any Macintosh's serial port. This isn't as bad as it sounds, because the printer externally clocks the Macintosh's serial port to achieve a transfer rate of 909 KBits per second; almost four times the speed LocalTalk can accomplish.

QuickDraw vs. PostScript

Apple's Personal LaserWriter LS is the only member of the LaserWriter family that uses Apple's proprietary QuickDraw to image a page instead of Adobe Systems Inc.'s PostScript page description language.

QuickDraw is a set of graphic routines stored within the Macintosh ROM and system software. The routines are used by all Macintosh applications—including PostScript applications—to display images on the screen.

A QuickDraw printer works in basically the same way. The printer's driver software takes the 72-dpi QuickDraw screen image and converts it into a 300-dpi bit map image that is then sent to the printer.

The standard rule of thumb for QuickDraw printers is that the faster the Macintosh used, the faster the printing results.

QuickDraw is appropriate for many business tasks, especially those that are text-based. QuickDraw printers are incapable of printing PostScript images, however, so they are inappropriate for most desktop publishing and graphic design tasks. If you print mostly spreadsheets and letters, a QuickDraw printer will serve you well. If your work entails printing any other sort of doc-

uments, however, you would do well to consider a PostScript printer.

QuickDraw printers like the Personal LaserWriter LS are less expensive than PostScript printers for two reasons.

- Adobe PostScript licenses are avoided
- The Macintosh is used to rasterize images instead of the printer

Apple's Personal LaserWriter LS comes with a TrueType startup document for use under System 6.x, and the printer utilizes the TrueType technology built into System 7. Four TrueType fonts are also included with the Personal LaserWriter LS: Courier, Helvetica, Times, and Symbol; the original LaserWriter font set.

Adobe Systems Inc.'s Adobe Type Manager can also be used with the Personal LaserWriter LS with no problem, giving you access to the entire PostScript Type 1 font library.

For more information on TrueType and PostScript Type 1 fonts, refer to TrueType vs. Type 1 Fonts beginning on page 55.

Personal LaserWriter NT

Apple's Personal LaserWriter NT is positioned as an entry-level PostScript laser printer offering modest performance and limited expandability. The Personal LaserWriter NT is a PostScript Level 1 printer, and carries a retail price of $2599, about double that of the Personal LaserWriter LS. The extra money is well spent, however, since you get a true PostScript printer and a little room for growth.

Built around the Canon LBP-LX engine, rated at 4 pages per minute, the Personal LaserWriter NT is Apple's least expensive PostScript printer. The Canon LBP-LX engine has a rated life cycle of 150,000 pages over five years with no monthly maximum, and each toner cartridge is rated for about 3,500 pages.

The controller used in the Personal LaserWriter NT is based on a Motorola 68000 running at 12 MHz and PostScript v51.8. The ROMs in the printer are mounted on removable SIMMs. Because the version of PostScript used in the Personal LaserWriter NT includes the fast type-rasterizing code developed for Adobe Type Manager, the printer actually outperforms earlier Apple PostScript LaserWriter models in some areas. The printer also offers Diablo 630 and Hewlett-Packard LaserJet Plus emulation.

When printing pages composed of all text, however, the Personal LaserWriter NT quickly bumps into the limitations of its 4-page-per-minute engine. In fact, the printer is able to image text pages faster than the engine is capable of keeping up with.

The Personal LaserWriter NT is networkable with a built-in LocalTalk port. The LocalTalk connection is accomplished with a special co-processor, the Peripheral Interface Controller (PIC) chip. The PIC chip off-loads all LocalTalk traffic handling from the printer's main processor, resulting in faster throughput than competing printers with faster controllers.

A 25-pin RS-422 serial port is also provided. This port can be used to connect to computers without LocalTalk. The serial port settings and emulation modes are selected with a push-wheel switch on the back of the printer.

A 250-sheet paper cassette is standard. A legal cassette is available for $79, and an envelope cassette costs $89.

Apple's Personal LaserWriter NT comes standard with 2 MBytes of RAM which is barely adequate for a PostScript printer.

The Personal LaserWriter NT's RAM limitation is especially apparent when working with a lot of downloadable fonts. When a PostScript font is downloaded from the computer to the printer, it is sent as an outline. The printer then creates a bit map from the outline description. The bit maps are stored in the printer's memory for as long as possible, but they are relatively large and when memory is needed for another task, the bit maps are flushed from the printer's memory. When the font is needed again, the printer has to create the bit map from scratch.

A simple rule of thumb is that the more RAM a PostScript printer has, the less likely font bit maps will be flushed, resulting in significantly faster printing times.

The good news is that the Personal LaserWriter NT uses standard SIMM slots for both RAM and ROM. You can upgrade the printer's RAM by replacing the two 1 MByte RAM SIMMs with 4 MByte SIMMs, bringing the RAM capacity up to a very respectable 8 MBytes. Future versions of PostScript would only require a ROM swap, although anything that even remotely resembles a ROM upgrade is something Apple historically has been very hesitant to provide.

Apple's Personal LaserWriter NT is best suited for the individual that works alone and needs PostScript output. Because it has a LocalTalk port, it can be shared between two or three users with very light-duty printing needs.

Workgroup LaserWriters

Apple's workgroup LaserWriters (the LaserWriter IIf and LaserWriter IIg) are designed for use by workgroups. Both models come with built-in networking (the LaserWriter IIg offers Ethernet support) and relatively fast engines and controllers.

The LaserWriter IIf and LaserWriter IIg represent Apple Computer's initial entry into the resolution enhancement laser printer market. Although both printers use the standard 300-dpi Canon LBP-SX engine—the same engine used in their predecessors—software enhancements are provided to boost the quality level of text, line art, and gray scale images.

Both printers use FinePrint to perform anti-aliasing on text. This significantly reduces the jagged edge effect that is common with 300-dpi laser printers. Apple claims that FinePrint has no impact on printing performance, and tests bear this out. For more information on Apple's FinePrint technology, refer to the information beginning on page 39.

PhotoGrade provides almost 70 shades of gray, allowing you to create artwork that previously was available only on printers that offered resolutions of 1000 dpi or higher. PhotoGrade is standard on the LaserWriter IIg and optional on the LaserWriter IIf with a RAM upgrade. For more information on PhotoGrade, refer to the information beginning on page 41.

The workgroup LaserWriters are built around the Canon LBP-SX engine, rated at 8 pages-per-minute. Although based on the same engine as the discontinued LaserWriter IINT and LaserWriter IINTX, a new toner cartridge has been designed for use with the newer models.

The new toner cartridge design addresses four problems with the original cartridge design.

- Toner leakage on the right edge of the page
- Horizontal banding and streaking as the toner cartridge ages
- Ghosting effects on filled areas of the page
- Insufficient black density

Because banding and streaking is more apparent on the LaserWriter IIg, the newly designed toner cartridge is required on that printer. Its use is optional on other LaserWriter II-family printers, although strongly recommended for the LaserWriter IIf.

The LaserWriter IIf and LaserWriter IIg are appropriate for all but the largest workgroups.

LaserWriter IIf

The LaserWriter IIf provides full PostScript Level 2 support and uses a controller based on a Motorola 68030 processor running at 20 MHz—the same processor used in the Macintosh IIsi. This is a significantly faster controller than those used in earlier LaserWriter models.

For more information about Adobe Systems Inc.'s PostScript Level 2, refer to the PostScript Level 2 chapter beginning on page 49.

The LaserWriter IIf performs at about the same speed as the LaserWriter IINTX on text-intensive documents, but about 25% faster on graphics-intensive pages.

Two MBytes of RAM is standard on the LaserWriter IIf, and you can upgrade to a total of 32

MBytes of memory using 4 MByte SIMMs. There are eight standard SIMM slots on the LaserWriter IIf motherboard, and standard configuration 80 ns SIMMs can be used.

Because of the increased efficiency of PostScript Level 2, Apple claims that the standard 2 MBytes of RAM on the LaserWriter IIf should allow most users to download more fonts than was possible with the LaserWriter IINTX. Preliminary testing validates this claim.

Apple's LaserWriter IIf supports memory configurations of 2, 4, 5, 8, 16, 17, and 32 MBytes.

The LaserWriter IIf does not come with enough installed RAM to support Apple's PhotoGrade technology. You must upgrade to a total of at least 4 MBytes of memory in order to use the enhanced gray scale technology offered by Apple's PhotoGrade.

Both the LaserWriter IIf and LaserWriter IIg offer a built-in TrueType rasterizer, although very little mention of this was made when the printers were introduced. TrueType versions of the standard LaserWriter Plus font set—Avant Garde, Bookman, Courier, Helvetica, Helvetica Narrow, New Century Schoolbook, Palatino, Symbol, Times, Zapf Chancery, and Zapf Dingbats—are included on floppy disk.

For more information on TrueType and Adobe Type 1 PostScript fonts, refer to TrueType vs. Type 1 Fonts, beginning on page 55.

Both the LaserWriter IIf and the LaserWriter IIg automatically arbitrate connections between the available communications ports (serial and LocalTalk on the LaserWriter IIf; serial, LocalTalk, and Ethernet on the LaserWriter IIg). This allows each port to be physically connected to a different source. This feature is called All Ports Active

and more information is provided in the LaserWriter IIg section, beginning on page 32.

The LaserWriter IIf features 2 MBytes of ROM and a SCSI port for hard disk drives.

Because ROM space is severely limited in the LaserWriter IIf and LaserWriter IIg, the ITC Zapf Dingbats PostScript Type 1 font was removed from the ROM of both printers. The font is included—on the font disk—as a downloadable font.

LaserWriter IIf/IIg Driver

As of late 1991, the LaserWriter driver that ships with the LaserWriter IIf and LaserWriter IIg is the System 7.0 LaserWriter driver. This driver does not support any of the PostScript Level 2 features. A new driver is being developed by Adobe that is scheduled to be available in the first quarter of 1992.

The new Adobe driver will take full advantage of the PostScript Level 2 features and will be made available to LaserWriter IIf and LaserWriter IIg owners free of charge. When it becomes available, the Adobe driver will become the standard LaserWriter driver and will be distributed by Apple.

For more information on PostScript Level 2 and its advantages, refer to the information beginning on page 49.

The LaserWriter IIf and LaserWriter IIg offer a minimum duty cycle of 300,000 pages, with no monthly page limit. This is the equivalent of printing 200 pages per day, five days a week, for more than five years. The toner cartridge is rated to produce 4,000 pages at a five percent print density.

LaserWriter IIf/IIg Utility Software

You can use the utility software provided with the LaserWriter IIf and LaserWriter IIg to control these functions:

- *Disable Start*: Disable/enable startup page each time the LaserWriter is turned on.
- *Calibrate*: Download an alternate hardware gray-scale enhanced calibration table and print a test page.
- *Select Halftone*: Set the PostScript screen interpreter to use a specific halftone screen and print a test page.
- *Enable*: Enable/disable the FinePrint text and line anti-aliasing feature.
- *Configuration*: Set the parameters for user defined switch settings (emulation, baud rate, data length, handshaking, port, and cut sheet feeder). Also provides a way to set Ethernet network addresses.
- *Naming*: Change the name of the printer.
- *Download Fonts*: Download PostScript and TrueType fonts to the printer's memory or hard disk drive.

LaserWriter IIg

The Apple LaserWriter IIg offers all of the features of the LaserWriter IIf and adds more standard memory, standard PhotoGrade, a faster processor, and support for Ethernet.

The LaserWriter IIg uses a controller built around the Motorola 68030 processor running at 25 MHz—the same processor used in the Macintosh IIci.

In fact, the LaserWriter IIg's motherboard is basically identical to the Macintosh IIci motherboard with additional chips for printing-specific tasks.

The standard configuration allows the LaserWriter IIg to perform at about the same speed as the LaserWriter IINTX on text-intensive documents, but about 25% faster on graphics-intensive pages. When the Ethernet port is used, performance is about 35% faster than the LaserWriter IINTX and about 10% faster than the LaserWriter IIf.

5 MBytes of memory is standard on the LaserWriter IIg. You can upgrade the printer to a total of 32 MBytes (using 4 MByte SIMMs). There are 8 standard SIMM slots, and standard 80 ns SIMMs can be used.

Although the LaserWriter IIg ships with more than twice as much RAM as the LaserWriter IIf, it's important to note that the PhotoGrade gray scale printing offered by the LaserWriter IIg requires four times more memory to store a full page of text and graphics.

The LaserWriter IIg supports memory configurations of 4, 5, 8, 16, 17, and 32 MBytes.

Apple's LaserWriter IIg supports both TrueType and PostScript fonts, and includes a built-in TrueType rasterizer.

For more information on TrueType and Adobe Type 1 PostScript fonts, refer to TrueType vs. Type 1 Fonts, beginning on page 55.

EtherTalk Port

The LaserWriter IIg uses the National SONIC chip running at 25 MHz to provide EtherTalk

support. The EtherTalk implementation on the LaserWriter IIg is identical as on Apple's Ethernet NB card.

The LaserWriter IIg offers a feature Apple calls All Ports Active, that allows the printer to be connected simultaneously to a LocalTalk and an EtherTalk network as well as to a PC via the serial port. All Ports Active monitors the ports and switches automatically between the ports based on incoming traffic. (The LaserWriter IIf can switch automatically between its LocalTalk and serial ports.)

Because Adobe PostScript is limited to processing only one job at a time, all ports are polled in turn until activity is sensed on one of the ports. Port polling is then terminated as the job begins. When the print job finishes, polling of all ports resumes.

Paper Handling

Both workgroup LaserWriters share identical paper handling characteristics. Apple recommends 16- to 20-lb. paper in normal mode, and up to 36-lb. paper stock in manual mode with the face-up tray open. I've been running 24-lb. bond paper stock through my LaserWriter II for over four years with no problems.

The LaserWriter IIf and LaserWriter IIg come with a 200-sheet capacity paper cassette, and an optional 15-envelope cassette is available. An adjustable manual feed is also standard for use with single pages and envelopes. All standard envelope sizes are supported, with a 3.5- by 7-inch minimum.

All of the Apple LaserWriters are incapable of printing to the edge of a page, making bleeds im-

possible. The minimum margins on all four sides—top, bottom, left, and right—is 0.197 inches (5.0 mm).

Power Consumption

Laser printers require a lot of power to generate enough heat to fuse the toner to the paper. This can be a concern if you live in a building with older wiring.

The LaserWriter IIf and LaserWriter IIg are typical of most laser printers in their electricity consumption. In North America, either model requires about 170 watts in standby mode and about 900 watts while printing.

Surge suppression devices become very important if you are using laser printers in your work environment. They provide protection for the printer as well as your computer and peripheral devices.

LaserWriter II Upgrades

Apple markets the LaserWriter IIf and LaserWriter IIg controllers as upgrade products for owners of discontinued LaserWriter II-family printers (LaserWriter IISC, LaserWriter IINT, and LaserWriter IINTX).

The LaserWriter IIf upgrade is an especially attractive bargain for most owners of older LaserWriter II models.

LaserWriter Family Comparison

Figure 2 shows a table comparing the various members of Apple's LaserWriter family.

	Personal LaserWriter LS	Personal LaserWriter NT	LaserWriter IIf	LaserWriter IIg
Retail price	$1,299	$2,599	$3,599	$4,599
Engine	Canon LBP-LX	Canon LBP-LX	Canon LBP-SX	Canon LBP-SX
Engine speed	4 ppm	4 ppm	8 ppm	8 ppm
Memory	512 KB	2 MB	2 MB	5 MB
Monthly duty cycle	2,500 pages	2,500 pages	Unlimited	Unlimited
Engine life	150,000 pages	150,000 pages	300,000 pages	300,000 pages
Network support	No	LocalTalk	LocalTalk	LocalTalk, Ethernet
PostScript	No	Yes	Yes	Yes
Outline fonts	13 TrueType	35 PostScript	35 PostScript	35 PostScript
Toner copies	$99 3,500	$99 3,500	$129 4,000	$129 4,000
Cost per page	$0.02	$0.02	$0.03	$0.03

Figure 2 LaserWriter family comparison.

Selecting a LaserWriter

If you work by yourself, print only basic text and graphics, and print less than 100 pages per day,

the Personal LaserWriter LS is an appropriate choice and will meet your printing needs.

If you work with one or two other people and produce more complex documents that still total less than 100 pages per day, the Personal LaserWriter NT is your best choice.

If you are part of a small workgroup or if you produce longer documents that contain sophisticated text and graphics, the LaserWriter IIf with at least 5 MBytes of RAM is your best option. The LaserWriter IIf is the most appropriate choice for most Macintosh users.

If you are part of a workgroup of moderate size, producing documents with complex text and graphic elements, you will need the Ethernet capabilities offered only by the LaserWriter IIg.

The Apple LaserWriter family compares favorably with competing printers from other vendors. Hewlett-Packard's LaserJet III, for example, enjoys approximately an 80 percent market share in the IBM PC and compatible market. The LaserJet III was the first laser printer on the market to offer edge smoothing (Hewlett-Packard's proprietary Resolution Enhancement Technology) for improved text quality.

The LaserJet III is designed primarily as a PCL printer, however, and when PostScript is added to the Hewlett-Packard printer, performance suffers. In addition, when used in a mixed computing platform environment, the Hewlett-Packard LaserJet III must be restarted to switch between PostScript and its native PCL.

For most Macintosh users, the LaserWriter IIf is a significantly better choice than the Hewlett-Packard LaserJet III. The LaserWriter IIf was designed as a high-speed shared printer offering roughly seven times the performance of the

Hewlett-Packard LaserJet III. Additionally, Apple's LaserWriter IIf offers PostScript Level 2 and much better support for mixed computing platform environments.

Problems with Legal Size Printing

Note that the standard LaserWriter IIf and LaserWriter IIg do not support full legal size printing. At the standard RAM configuration of 2 MBytes the LaserWriter IIf is incapable of printing a full legal page. Similarly, the LaserWriter IIg is incapable of printing a full gray-scale legal page with its standard RAM configuration of 5 MBytes.

In order to print full legal pages, the LaserWriter IIf must be upgraded to at least 5 MBytes and the LaserWriter IIg must be upgraded to at least 8 MBytes of RAM.

FinePrint

FinePrint is Apple's proprietary text-smoothing algorithm that images type in a more pleasing manner. The technology is standard on both the LaserWriter IIf and LaserWriter IIg.

Apple claims its FinePrint technology is better than Hewlett-Packard's Resolution Enhancement Technology (RET), and this seems to be an accurate claim, except at small point sizes.

FinePrint output on a LaserWriter IIf or LaserWriter IIg looks significantly better than output from previous LaserWriter models, but it doesn't improve legibility of type at less then 8 points. Hewlett-Packard's competing Resolution Enhancement Technology produces better looking type at small point sizes.

Even though Hewlett-Packard's Resolution Enhancement Technology producers better small-size type, FinePrint offers three distinct advantages over Hewlett-Packard's RET:

- FinePrint works on any kind of text or line; RET operates only on a fixed set of patterns. Letterforms or lines that fall outside of the specific patterns are not enhanced by the Hewlett-Packard technology.

- FinePrint maintains the integrity of letterforms to a significantly greater degree than RET. Hewlett-Packard's RET enhances serif type, for example, by actually extending the serif of the letterform.
- FinePrint smooths edges at more than 2400 dpi; Hewlett-Packard's RET smooths edges at up to 900 dpi.

The FinePrint technology works by expanding or contracting the pixels of a letterform to create smoother edges, using the logic shown in Figure 3.

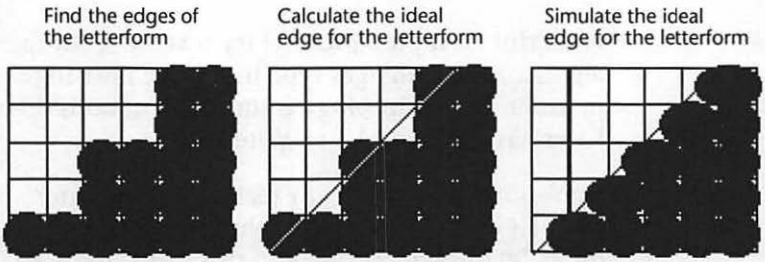


Figure 3 FinePrint typographic logic.

Apple claims that FinePrint is capable of altering individual pixels at a horizontal resolution of more than 2400 dpi.

FinePrint manipulates existing dots rather than using smaller individual dots because Apple believes that currently available printer engines and toner are incapable of translating smaller theoretical dots to the page.

PhotoGrade

Apple Computer's proprietary gray-scale enhancement technology—PhotoGrade—is one of the most impressive features of the LaserWriter IIf and LaserWriter IIg. PhotoGrade is a standard feature of the LaserWriter IIg and is available as a user-installable option on the LaserWriter IIf.

To upgrade a LaserWriter IIf to support Apple's PhotoGrade gray-scale enhancement technology, you need only add at least 3 additional MBytes of memory. PhotoGrade technology is built into both the LaserWriter IIf and LaserWriter IIg, but requires a minimum of 5 Mbytes of memory.

A memory upgrade to support PhotoGrade is the most important addition you can make to the LaserWriter IIf. In fact, if you do not need the faster networking offered by the LaserWriter IIg, the LaserWriter IIf may be a better choice. The 5 MHz difference in the processor's clock speed is all but unnoticeable, and the printers are otherwise identical.

Even though the LaserWriter IIf and LaserWriter IIg are based on the same Canon LBP-SX engine as Apple's earlier printers, PhotoGrade double's

the LaserWriter II family's default screen frequency from 53-lines-per inch (lpi) to 106-lpi.

PhotoGrade also more than doubles the range of achievable gray shades from 33 to 67—twice the number of gray shades that a standard 600-dpi printer can image at the same line frequency. Also impressive is that PhotoGrade accomplishes this in only 5 MBytes of RAM; a standard 600-dpi printer requires 8 MBytes to image the same page.

PhotoGrade significantly improves the appearance of gray scale images. A standard 300-dpi printer's optimum halftone screen is from 50–60-lpi, allowing for about 30 levels of gray. PhotoGrade is capable of screens up to 106 lpi, allowing for 67 shades of gray.

Apple's PhotoGrade technology is theoretically capable of dividing a single 300-dpi pixel into 16 discrete pixel sizes. The practical capability is limited to about 8 discrete pixel sizes, however, because charged toner particles tend to attract more toner particles.

Gray Scale Printing

Face the fact that regardless of the laser printer you are using, it cannot match the quality of the gray scale image you can display on your screen. Gray scale monitors are capable of producing up to 256 shades of gray. Laser printers are incapable of producing anything other than black (or other colored toner) dots on paper. Laser printers use a process called *half-toning* to simulate gray shades by using dots of varying sizes.

The printer combines the smallest dots it can create into clusters called cells. The printer then

turns on different numbers of dots within each cell. The number of cells per square inch corresponds to the screen frequency, and is usually measured in lines per inch (lpi).

As dots are combined into cells, resolution drops drastically:

- A 300-dpi laser printer's optimal halftone screen frequency is about 53-lpi.
- Newspapers generally use an 85-lpi halftone screen.
- Magazines use 133- to 150–line screens.

To create halftones with higher screens, the printer is forced to use fewer dots per cell. The fewer the dots available, the fewer the grays each cell can represent. At 53-lpi, for example, a 300-dpi printer is capable of producing only 30 gray levels. At 100-lpi, the same printer is limited to producing only 9 gray levels.

As the resolution of the printer is increased, halftone screen capability also increases:

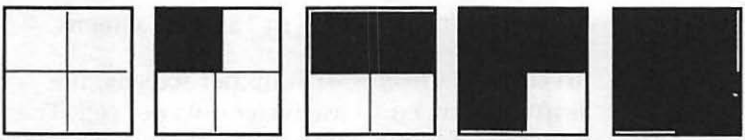
- A 600-dpi printer is capable of producing 85-lpi halftones.
- PhotoGrade allows the LaserWriter IIg to produce 106-lpi halftones.
- Imagesetters produce 120-lpi halftones.

Screens and Halftones

A laser printer is capable of printing only black and white, not shades of gray. A PostScript printer simulates gray shades by a process known as *screening*. A *screen* is comprised of a group of pixels grouped together, called a halftone cell.

The illustration in Figure 4 shows two simple halftone cells. The upper-most example is a 1 x 1 halftone cell; the lower-most example is a 2 x 2 halftone cell.

1 x 1 halftone cell



2 x 2 halftone cell

Figure 4 Simple halftone cells.

As Figure 4 clearly illustrates, the total possible number of gray shades increases as the number of pixels in the halftone cell is increased. The size of the halftone cell determines what is called the *screen frequency.* The screen frequency is the effective resolution available for a halftone cell of a given size.

Because PhotoGrade employs multiple pixels to simulate shades of gray, the effective resolution decreases as the size of the halftone cell increases. Screening then, is a trade-off between resolution and the number of shades of gray that can be imaged. The higher the resolution, the more grays that can be imaged.

A standard 300-dpi printer that uses a 1 x 1 halftone cell provides a 300-line screen and two shades of gray. An enhanced 300-dpi printer such as the LaserWriter IIg—using a 2 x 2 half-

tone cell—is capable of producing a 150-line screen and five shades of gray.

The result is that the LaserWriter IIg is capable of providing a significantly wider range of gray scales than typical 600-dpi printers, as illustrated in Figure 5.

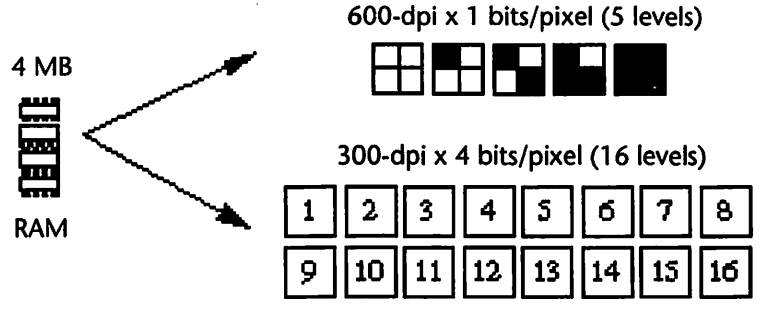


Figure 5 Available gray levels.

Because laser printers can only print black dots on the page, the key to getting better quality gray scale images is to exert more control over the size of the dots laid down on the page.

PhotoGrade is theoretically capable of providing 16 gray shades for each 300-dpi pixel, although this is not attainable with currently available print engines.

Using the Canon LBP-SX engine found in the LaserWriter IIf and LaserWriter IIg, PhotoGrade can attain a maximum of about eight distinct levels of gray for each pixel.

This is equivalent to the gray levels provided by a standard 800 x 800 dpi printer with an 8 MByte page buffer.

The LaserWriter IIg's default halftone cell, as defined by the PhotoGrade technology, has eight elements, as shown in Figure 6.

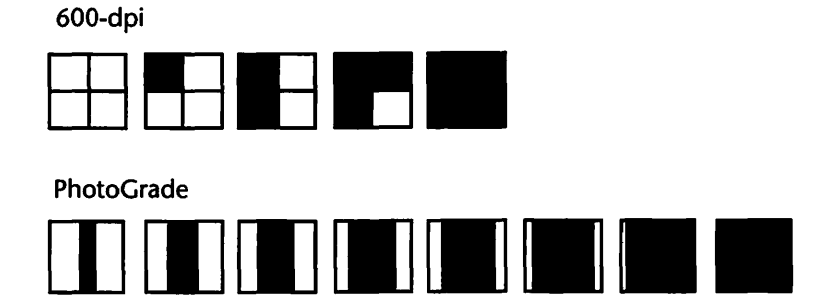


Figure 6 LaserWriter IIg default halftone cell.

Each LaserWriter IIg halftone cell can deliver about eight levels of saturation. This results in a 106 line screen with 67 gray levels.

A 106 line screen is appropriate for just about any application short of offset printing. The printing company that printed this book, for example, recommends using 110 to 150 line screens, depending on the type of paper that will be used. As a general rule of thumb, you can get by with a coarser screen when using lower grade ground wood and magazine papers although higher grade book and coated papers require the use of a finer screen.

An Application Specific Integrated Circuit (ASIC) in the LaserWriter IIf and LaserWriter IIg (available in the LaserWriter IIf, but accessible only with the memory upgrade mentioned on page 41) controls the timing of the laser pulse in the printer engine.

The LaserWriter IIf and Laser Writer IIg ASIC is capable of pulsing the laser at a fraction of the time needed for a single pixel. This allows a smaller area of the drum in the toner cartridge to

be exposed, resulting in more control of the dot on the page, as illustrated in Figure 7.

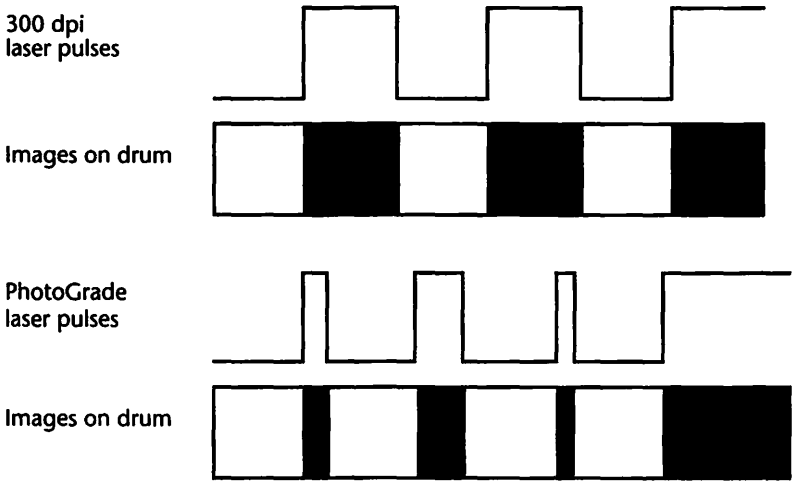


Figure 7 PhotoGrade laser pulse control.

Hype or Substance

Apple's PhotoGrade technology is very good. So good, in fact, that you have to see it to believe it. If you own—or are considering the purchase of—a LaserWriter IIf, the memory upgrade required to utilize PhotoGrade is one of the best computer bargains available.

Nevertheless, toner on paper cannot rival the quality of output available from even the lowliest imagesetter. The technologies involved are different and given the current technology, printers that put bits of plastic on pieces of paper will always be inferior to the chemical photographic process involved with imagesetters.

Apple's claims of equivalency with 600- and even 800-dpi printers is potentially misleading. Reso-

lution is resolution, and the higher the better. Apple's LaserWriters are all built around 300-dpi print engines. PhotoGrade's gray scale output may *look* like the equivalent of 800-dpi resolution, but it's still 300 dots wide by 300 dots tall. Most people will be pleased with the benefits offered by Apple's new technology, however.

PhotoGrade is a powerful addition to the Apple LaserWriter family and individuals and businesses will find many applications for it. It is most appropriate for proofing pages that will be output on an imagesetter and for those applications that don't require the quality of imagesetter output.

Perhaps what's most remarkable about PhotoGrade is that it is capable of even better results with a higher-resolution print engine. The output achieved with PhotoGrade—even with the aging Canon LBP-SX engine—is nothing short of remarkable.

PostScript Level 2

PostScript Level 2 is the first major enhancement to Adobe's page description language since its release in 1985. The new release does not render PostScript Level 1 obsolete, however. Any document that will print on a PostScript Level 2 printer will also print on a PostScript Level 1 device.

Most benefits of PostScript Level 2 will be available only after software applications and printer drivers have been updated to take advantage of the new features.

For the first time, Adobe is developing its own printer drivers for use with PostScript Level 2. The driver for Windows is currently available; the Macintosh driver is expected before the end of 1991; and a UNIX driver is scheduled for release sometime in 1992.

The Macintosh drivers, when released, will be made available free of charge to the installed user base. Apple will include the Adobe drivers with the LaserWriter IIf and LaserWriter IIg.

It's important to note that most of PostScript's Level 2 improvements will be unavailable until the new drivers are used. In addition, even PostScript Level 1 printers should benefit from the

new Adobe drivers. Finally, most mainstream PostScript applications will have to be updated to take advantage of the new features in PostScript Level 2.

What's New in Level 2

There are seven general areas in which PostScript Level 2 offers significant advantages over PostScript Level 1:

- Faster printing
- Improved color support
- Dynamic memory allocation
- Improved support for device-specific features
- Improved Display PostScript
- Composite font technology
- Forms and forms caching

Each of these improvements are covered in the following sections.

Faster Printing

PostScript Level 2 offers significant speed enhancements over PostScript Level 1. Documents print noticeably faster with the PostScript Level 2 driver. PostScript Level 2 printers can use the older printer drivers, but their performance is comparable to that of PostScript Level 1 printers.

The older version of PostScript used ASCII encoding that allowed transportability at the expense of compactness and speed. Display PostScript and PostScript Level 2 use a binary en-

coding system that trades limited transportability for increased speed.

Adobe's PostScript Level 2 printer drivers use binary encoding when printing to a PostScript Level 2 printer, but use ASCII encoding when printing a PostScript file to disk. This seems to offer the best of both worlds, ensuring both speed and transportability across disparate computer hardware platforms.

Improved Color Support

The Cyan, Magenta, Yellow, and Black (CMYK) color model that was available only in color PostScript printers in Level 1 is now included in PostScript Level 2. In addition, color support for the Red, Green, and Blue (RGB) color model has been added.

Like the PostScript page description language itself, all supported color models are device independent. Device independent color provides a standardized way of specifying colors completely independent of the variations and discrepancies between different scanners, monitors, printers, or other output devices.

CIE 1931 (XYZ) Color Space

The color model used in PostScript Level 2 is based on the CIE 1931 (XYZ) *color space*, originally developed by the Commission Internationale de l'Eclairage, an international standards organization. A color space is a way of representing colors by describing their positions in a three-dimensional space.

The CIE color space provides a way to specify color that is related to human perception rather than the mechanics of how a particular device reproduces color.

Since almost all other CIE color spaces are based on the CIE 1931 (XYZ) color space, it was an appropriate choice.

A potential drawback to the CIE 1931 (XYZ) color space, however, is that there are problems using the color model on screen displays. The color values must be converted from the XYZ color space into RGB color values, and the conversion process requires relatively complex mathematical computations.

Accurate Screen Algorithms

The halftone algorithms for color separations have been dramatically improved in PostScript Level 2.

The new algorithms, called Accurate Screen algorithms, reduce undesirable moiré patterns in color separations by providing a much more accurate simulation of traditional screen angles and frequencies.

Dynamic Memory Allocation

PostScript Level 2's improved memory allocation results in smaller PostScript files.

In PostScript Level 1, fixed amounts of memory were allocated to various tasks—page imaging, font caching, and executing PostScript code, for example. PostScript Level 2 offers dynamic memory allocation, where the total available memory

is treated as a common resource that is available for any use. Memory that is used for one task can be reclaimed when that task is finished and the memory is no longer needed.

The result is that printing documents with very complex graphics and a large number of fonts should not pose the problems that were sometimes encountered with PostScript Level 1. Specifically, the dreaded "VM_error" message should become much less common.

Improved Support for Device-Specific Features

Printer-specific features such as automated duplex printing and multiple paper bins are now directly supported.

Improved Display PostScript

All of the PostScript Level 1 Display PostScript extensions are now part of PostScript Level 2 and the text and graphics operators have been optimized for greater speed.

Macintosh users will not see any benefit of the Display PostScript improvements.

Composite Font Technology

Under PostScript Level 1, composite font technology—instructions that allow very large character sets—was available only on Japanese-language printers. Composite font technology is now part of PostScript Level 2.

Forms and Forms Caching

PostScript Level 1 offered only a font cache; Level 2 offers additional caches for forms, paths, and patterns.

The forms cache was designed primarily for traditional forms, but any graphic or text elements can be defined as a form and cached. The cached material is retained in the printer's memory or hard disk, and only the information that changes from page to page has to be interpreted by the printer.

Patterned fills, such as the ones created in software applications like Adobe Illustrator and Aldus FreeHand, can also be cached.

The end result is that ranges of pages that use cached information will print much faster than they did under PostScript Level 1.

TrueType vs. Type 1 Fonts

Typography is one of the most widely misunderstood topics in the Macintosh community. Apple Computer has been of very little help in this matter, having consistently underestimated the importance of effective typography within the desktop computing environment. In the short history of the Macintosh and desktop publishing, Apple has almost single-handedly managed to cloud the issues beyond the point of chaos.

Adobe Type Manager

Adobe Type Manager (ATM) allows PostScript fonts to be rendered automatically for screen display and non-PostScript output.

Installing any single size of any Type 1 PostScript font and ATM allows any type size to be rendered automatically. Screen display is markedly improved, as is output from non-PostScript printers like the Personal LaserWriter LS.

In September 1991 Apple and Adobe announced that ATM would be folded into future versions of the Macintosh operating system.

In October 1991 Adobe quietly announced that it was making a special version of ATM available to Apple customers for the price of shipping and handling. The package is comprised of Adobe Type Manager v2.0.3 and four Adobe Garamond typefaces.

Coupons are included with the sale of new Macintoshes as well as the LaserWriter IIf and LaserWriter IIg. Current Macintosh owners can order the ATM package by calling 800/521-1976, extension 4400 and charging the $7.50 shipping and handling fee to a credit card.

TrueType

In 1987, Apple began work on a new font format that would be an extension to QuickDraw. This project evolved into what we now recognize as TrueType. At the same time Microsoft was working on a new imaging model for Windows, known as TrueImage. In 1989, Apple and Microsoft swapped technologies resulting in Apple's release of TrueType fonts. Microsoft threw in the towel on the TrueImage page description language in the late spring of 1991.

The TrueType hinting techniques include all the information in the font outlines required to optimize the font at any resolution. PostScript hinting, in comparison, is minimal because most of the optimizing is done in the printer's Raster Image Processor (RIP).

TrueType allows the weight of any font to be adjusted, making it legible at smaller sizes. Conversely, as a larger size is specified, TrueType thins the weight, making it more elegant. This is known as optical scaling, and many believe Ado-

be will add the feature to future versions of the PostScript font specification.

Adobe Multiple Master

Adobe's answer to the optical scaling feature of TrueType is the Multiple Master series of typefaces. Due in the first quarter of 1992, Multiple Master typefaces will allow you to create virtually instantaneous variations of a single typeface. The Multiple Master typefaces contain definitions for weight, width, style, and size.

A Multiple Master font can be scaled along a specified axis, allowing faces in the same font family to be combined to create completely new typefaces. For example, a bold condensed face could be combined with a bold expanded face to create any weight in between.

What You Need to Know

If you already own a PostScript printer, or if your service bureau offers PostScript output on an imagesetter, the best solution is to stay as far away from TrueType as possible. If you're shopping for a printer, get PostScript. Even though most applications fully support TrueType, your best bet is to avoid it if you can use PostScript.

A PostScript device will try desperately not to have to deal with TrueType and the TrueType rasterizer is designed to be re-downloaded to the PostScript output device each time a new page is imaged. This results in dreadfully slow output on PostScript devices and as of early 1992, most service bureaus were refusing to run TrueType jobs.

TrueType may be free, but it's more trouble than it's worth.

If you're running System 7.0, remove the TrueType versions of any PostScript fonts in your System file (usually Courier, Helvetica, Times, and Palatino) and replace them with the PostScript equivalents. Adobe Type Manager gives you all the advantages of first-generation TrueType with none of the headaches.

Keep the TrueType versions of Chicago, Geneva, and Monaco in your System 7.0 System file; they improve the screen legibility of these System fonts considerably.

If you use a lot of fonts, one of the best purchases you can make is Fifth Generation's Suitcase II at a street price of about $50. Suitcase II allows you to control your font collection and place your screen fonts and printer fonts virtually anywhere on your hard disk drive. (Fifth Generation Systems Inc., 10049 North Reiger Road, Baton Rouge, LA 70809. Phone 800/225-2775 or 504/291-7221; fax 504/295-3268.)

TrueType is quickly developing into little more than a nuisance in the Macintosh world. Apple chief executive John Sculley didn't even bother to mention the built-in TrueType rasterizer in the company's new printers when they were introduced in early October 1991.

Managing Fonts

TrueType fonts are easily installed and managed. Just drag their icons to your closed System Folder icon and they will automatically be installed in your System file.

PostScript Type 1 fonts pose more of a challenge. Commercial PostScript fonts are generally distributed as three files:

- A *font suitcase* containing the screen fonts. The screen fonts contain the font's character width table, kerning pairs, and other font-specific information as well as bitmap versions of the font. This bitmap is used for display on the screen if Adobe Type Manager is not installed.

- A series of *printer fonts* containing the actual PostScript instructions for imaging the font on the output device. The printer fonts are the files that are actually used by a PostScript printer.

- A series of *Adobe Font Metrics* (AFM) text files. The AFM files contain a text version of the same font-specific information contained in the font suitcase. For most applications except type creation, the AFM files serve no purpose and can be deleted.

Suitcase II allows you to access your font suitcase files without installing them in your System file. This allows you to load only those fonts for which you have an immediate need, resulting in significantly better performance in some situations. It also makes your font menu much easier to navigate.

You can use these instructions to install and manage your Type 1 font library.

1. Install Adobe Type Manager and Suitcase II using the manuals that came with them.
2. Open your System file and remove all of the TrueType versions of any PostScript fonts in your System file (usually Courier, Helvetica, Times, and Palatino).
3. Place all of your printer fonts in a folder.

- This folder can be named anything, and can reside anywhere. For now, leave it on the top level of your hard disk drive.

4. Launch Font/DA Mover v4.1 or later.
   - System 7 users can obtain Font/DA Mover v 4.1 or later free of charge from online services or user groups.
5. Remove all but the 10- and 12-point screen fonts from your various font suitcase files.
6. Combine font families into a single font suitcase file.
   - All the Helvetica screen fonts, for example, can be combined into a single font suitcase file. Alternatively, you can group several families in a single file by frequency of use or numbering system.
7. [*Optional, see below*] Merge the font families that comprise your screen font library using the Font Harmony utility and instructions that came with Suitcase II.
   - This is an optional step and may not be appropriate for everyone.
   - Merged fonts appear in font menus as a single entry such as "Bookman," and you obtain the other weights by applying the "italic" or "bold" font styles within an application.
   - Unmerged fonts display each weight as a separate entry, so Bookman would show up as four entries: Bookman, I Bookman Italic, B Bookman Bold, and BI Bookman Bold Italic.
   - The problem with using merged fonts is that the Macintosh operating system only thinks about fonts in terms of a basic four-weight font family (plain, italic,

bold, and bold italic). Merged fonts don't work well with font families that contain more than the four basic weights.

- Note that the font family merging process is irreversible. You should only merge duplicates of the original font suitcase, keeping a backup copy in case you want to go back to using the unmerged screen fonts.

8. Using Font/DA Mover v4.1 or later, remove the italic, bold, and bold italic screen fonts.
   - With Adobe Type Manager you need only the plain (roman) version of any typeface in order to display and print the entire font properly.
9. Place your font suitcase files in the folder containing your printer fonts.
10. Open the font suitcase files you want to use with Suitcase II.

Font Conflicts

Even though font conflicts are no longer the problem they once were, you can still experience conflicts where the fonts displayed on the screen are not the ones you specified.

The easiest way to resolve font conflicts is to close any Suitcase files you do not need. A more permanent solution is to use the Font Harmony utility that is included with Suitcase II to harmonize your font set.

Kerning

If you're serious about typography, you'll probably want to adjust the default kerning pairs that are provided with the fonts you purchase. Kerning is the act of adjusting the amount of white space between two adjacent letters.

Several commercial kerning utilities are available. The one that seems to have the broadest appeal is Pairs Software's KernEdit. (Pairs Software, 160 Vanderhoof Avenue, Suite 201, Toronto, Ontario, Canada M4G 4B8. Phone 416/467-8784.)

Paper Selection

Color, texture, weight, opacity, ink holdout, and brightness all impact the effectiveness of any printed communication. These factors—especially a paper's texture and weight—are even more important with laser printers due to the nature of the laser imaging process.

Paper Categories

Paper appropriate for use in a LaserWriter falls in one of three basic categories, each of which are covered in the following sections.

Bond

Bond paper is also referred to as "writing" paper. If the paper has cotton fibers mixed in with the wood pulp, it is called "rag" paper. Bond paper is most often used for stationery, forms, and other workaday documents that are usually printed on only one side.

Most grades of bond paper have matching envelopes, cover stock, and card stock for business cards.

Text

Text paper is often referred to as "book" or "offset" paper. This is the paper that is most commonly used in most commercial printing jobs and comes in a wide variety of colors and surface textures.

Text paper is generally more opaque than bond and is available in both coated and uncoated varieties. Text paper is widely used in annual reports, brochures, newsletters, magazines, and books.

Cover

Cover paper is stiffer than either bond or text paper and is most commonly used for covers of brochures and reports.

Cover paper should not be run through any of the LaserWriter models. Apple Computer specifically recommends 16- to 20-lb. paper in normal mode, and up to 36-lb. paper stock in manual mode with the face-up tray open. Most cover paper is too bulky and stiff to run through the LaserWriter and can damage the printer's paper path or toner cartridge.

For most uses, bond and text papers are the most appropriate paper choices for use with any laser printer, including the members of the Apple LaserWriter family.

Paper Texture

The three broad paper categories—bond, text, and cover stocks—are also available in a wide assortment of textures. There are five common paper textures in wide use:

- *Smooth.* Smooth paper stocks are usually the least expensive.
- *Laid.* Laid paper stocks have a pattern and are popular for use as stationery. Laid papers are not often used for two-sided printing because one side of the paper usually has a more pronounced pattern than the other side.
- *Felt.* Felt paper stocks have a deep texture and are most often used for covers and other special purposes.
- *Offset.* Offset paper stocks are a type of smooth paper stocks that have been made even smoother by running the paper through pressure rollers. The process of running the paper through pressure rollers is called *calendering.*
- *Coated.* Coated paper stocks are usually calendered papers that have a thin coating layer to provide an even smoother surface. Coated papers are usually rated in terms of their shininess, ranging from a super-gloss to a suede or dull finish.

Heavily textured papers are not appropriate for use with the LaserWriter. The toner particles don't fuse to the pattern on the paper very well, and results in toner flaking off the page if it adheres at all. As a general rule of thumb, smoother papers work the best with LaserWriters. The smoother the texture of the paper, the better the laser printed output.

Paper Weight

Paper manufacturers all measure paper weights differently. Bond, for example, is based on the weight of a ream (500 sheets) of 17- by 22-inch sheets. 500 sheets of 20-lb. bond paper stock, for example, would weigh 20 pounds in 17- by 22-inch sheets. This is also referred to as the paper's basis weight.

Text stock has a basis weight dimension of 25- by 38-inches, and cover stock has a basis weight size of 20- by 26-inches.

Bond paper stock usually comes in 12, 16, 20, 24, and 28 lb. weights. Most stationery is 20 lb.

Uncoated text stock usually is available in 50, 60, 70, and 80 lb. weights. In most cases, 60 lb. text stock is the minimum weight that should be used.

Coated text stock usually is available in 60, 70, 80, and 100 lb. weights.

Cover stock is usually available in 65, 80, and 100 lb. weights.

Other Paper Qualities

A paper stock's *ink holdout* is a measurement of how well the surface of a sheet of paper resists the absorption of ink. Coated papers have the greatest ink holdout, absorbing less ink and taking longer to dry. Ink holdout has a minimal effect on how well toner adheres to paper.

A paper's *opacity* is a measurement of its translucency. Coated papers are generally less opaque than uncoated papers.

A paper's *brightness* is a measurement of its ability to reflect light.

A paper's *grain direction* is usually only of concern to the pressman. You may, however, want to pay attention to a paper's grain direction when outputting pieces that will be folded. It's harder to fold a piece of paper against its grain.

LaserWriter Paper

Paper designed for laser printers is manufactured to withstand higher heat than normal copier paper. In addition, most laser papers are smoother than other papers and are also brighter, providing a higher level of contrast.

Hammermill Laser Plus

One side of this paper, designed specifically for laser printers, is extremely smooth and bright. The other side is treated with a wax-resistant barrier to prevent wax from bleeding through to the image side. Laser Plus is also a surprisingly "tough" paper, resistant to tearing.

This paper is especially useful if you will be pasting your pages on boards. If not, you won't need the wax holdout capabilities and would be better served by a different paper.

Hammermill Laser Print

Hammermill's Laser Print is an excellent choice if you don't need the wax holdout capabilities of

the Hammermill Laser Plus paper. It has all the characteristics of the Laser Plus paper except for the wax-resistant barrier on the back side of the paper.

Recycled Paper

Many paper mills claim to produce recycled paper, and there is no standard definition or set of criteria to determine the accuracy of the claims. The Environmental Protection Agency considers paper to be "recycled" if it contains 50 percent or more recycled content. You can judge recycled paper with two general criteria:

- The kind of waste materials that were used to produce the paper
- The amount of the paper that started as waste material

Paper that is produced with the scraps left over from the process of making other paper is referred to as being made from *pre-consumer waste.* Most vendors call it recycled paper, although it isn't really recycled at all, since it has never been sold or used.

Paper that is produced from *post-consumer waste* is paper that has actually been recycled; that is, the paper was sold, used, thrown away, and recycled for sale again.

Even though the Environmental Protection Agency considers paper to be "recycled" if it contains at least fifty percent recycled content, it doesn't set a criteria for post-consumer waste content. In other words, paper that is labeled as recycled may contain only ten percent post-consumer waste.

The most environmentally-conscious papers are those with the highest post-consumer waste content. Unfortunately, paper with a high post-consumer waste content is of noticeably lower quality than a virgin paper.

Recycled papers that contain higher percentages of post-consumer waste are on the horizon and will eventually offer quality as good as virgin paper. The best source is Conservatree Paper Company, 250 Lombard Street, San Francisco, CA 94111. Phone 800/522-9200.

Paper Recommendations

For workaday use, standard 18- to 24- pound bond is your best bet. You'll get good results at the lowest possible cost. Paper lighter than 18 lb. should be avoided. The lighter paper is prone to mis-feeds and is more sensitive to humidity changes. Conservatree markets a range of good-quality recycled papers.

The best everyday laser paper I've found is a 24-pound bond called "LaserPro" that offers a brightness measurement of 91. Unfortunately, I haven't been able to find this paper in the last few months, and it may be discontinued. If you can find it, it's inexpensive and attractive.

For stationery, I use Neenah Paper's Classic Crest Solar White and matching envelopes. It's a 24-lb. paper of medium quality that is widely available at about $10 a ream.

For the best possible laser printer output, use a coated paper that is specifically manufactured for laser printers. Most paper vendors offer at least one type of this paper, and many offer several different varieties.

Conservatree offers a complete range of recycled papers for use with LaserWriters.

- The Conservatree Premium Rag Bond series is quite attractive for stationery use. It is available in 20- and 24-lb. weights (with an 80-lb. cover stock available) and contains 15 percent post-consumer waste.
- The Conservatree Premium Xerographic 3HP is a general purpose 20-lb. paper that contains 10 percent post-consumer waste.

Specialty papers are also available. Specialty papers include color gradations, artistic border designs, vellum, certificate borders, foils, self-mailers, and labels. The best source for specialty papers is Paper Direct, 205 Chubb Ave., Lyndhurst, NJ 07071. Phone 800/272-7377; Fax 201/507-0817.

Avoid heavily textured papers. The laser printing process requires pressure from hot rollers to fuse the toner to the paper and textured paper prevents the pressure from being applied evenly. Textured papers also leave more paper particles called *paper dust* inside the printer.

CHAPTER EIGHT

Using the LaserWriter

Before you can print to the LaserWriter, the printer driver must be installed in your System Folder. You install the printer driver by dragging its icon to your System Folder. Under System 7, the printer driver will automatically be placed in the Extensions folder.

If you're working within a workgroup environment, it's important that everyone use the same versions of the printer driver. It's a good idea to get in the habit of updating all the machines at the same time, avoiding the use of outdated software.

Next, the LaserWriter has to be connected to a local area network (or a Macintosh serial port in the case of the Personal LaserWriter LS). The rest of this chapter assumes at least a single LaserWriter II attached to a local area network, although some examples also apply to the Personal LaserWriter LS.

If your network includes more than one LaserWriter, you will find it convenient to name each one of them. If you give each printer a unique name, they will be easier to distinguish by workgroup members.

You can rename any number of LaserWriters with either the Namer utility or the newer LaserWriter utility by following the instructions that came with your printer.

Using the Chooser

Before you can print to a LaserWriter for the first time you have to select the target printer within the Chooser. You can follow these steps to select a LaserWriter.

1. Select the Chooser from the Apple menu. The Chooser window, shown in Figure 8, will be displayed.

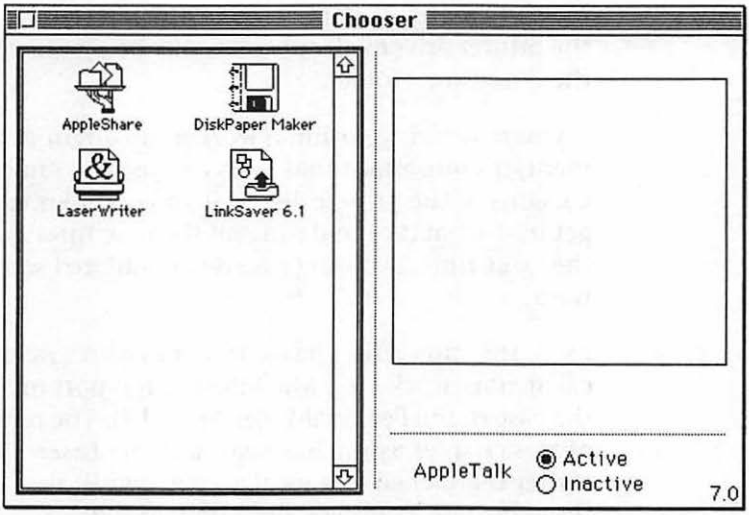


Figure 8 Chooser window.

2. Select the appropriate LaserWriter icon in the left panel of the Chooser window. A list of available printers of the type selected will be displayed in the scrolling list in the right

panel of the Chooser window, as shown in Figure 9.

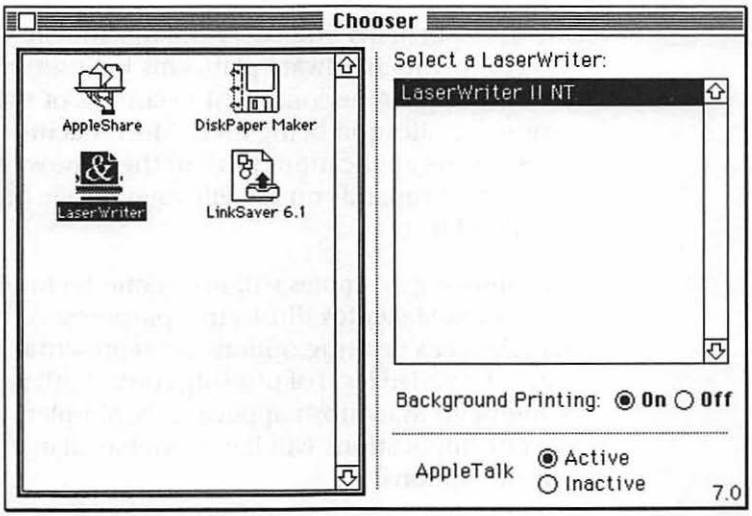


Figure 9 Chooser window with LaserWriter IINT selected.

- Note that a scrolling list of any available network zones will appear in the bottom portion of the left panel of the Chooser window. Be sure to select the appropriate zone before selecting a printer.

3. Select the printer you want to use from the scrolling list. Note that the **AppleTalk Active** radio button must be selected in order to select printers available on the network.
4. Click the **Background Printing On** radio button if you want to use the print spooler that is built into the System software.
5. Close the Chooser window.

- The LaserWriter you selected will remain active until you select another printer in the Chooser window.

Page Setup and Print

One of the benefits offered by the Macintosh over competing hardware platforms is a user interface that remains consistent regardless of the software application being used. Most Macintosh software applications print in the same way, with two commands on the File menu: Page Setup... and Print....

The following examples will use Frame Technology's FrameMaker for illustrative purposes. FrameMaker's printing options are representative of the varied level of printing control offered by high-end Macintosh applications. Simpler software applications will have fewer available printing options.

Page Setup... Command

You can use the Page Setup... command to set the page size, orientation, reduction or enlargement, and standard printer effects for the documents you print.

The Page Setup options are specific to the printer you have selected in the Chooser.

The Page Setup options are retained within each document once it has been printed. It's a good practice, however, to check the document's Page Setup settings before beginning any print job.

You can use these steps to customize the Page Setup for your document.

1. Select the Page Setup... command from the File menu. The Page Setup dialog box, like

the FrameMaker example shown in Figure 10, will be displayed.

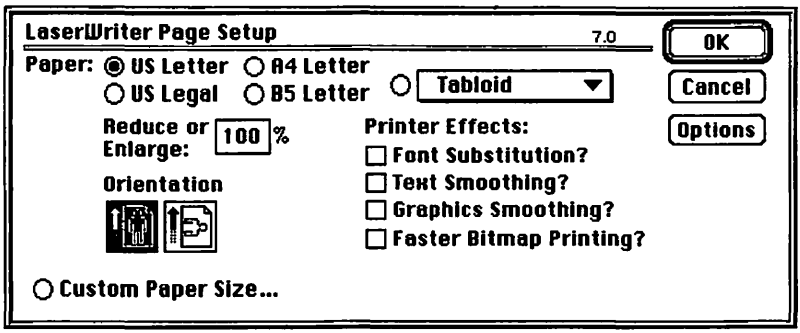


Figure 10 Page Setup dialog box.

2. Specify the appropriate paper size using one of the available radio buttons. The rightmost radio button has a pop-up menu associated with it. You can use this pop-up menu to select other standard paper sizes—such as envelopes and tabloids—that are more specialized.

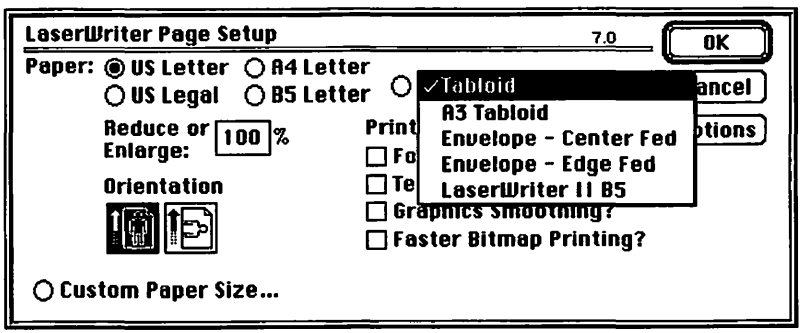


Figure 11 Page Setup dialog box with paper size pop-up menu.

3. Specify the percentage by which to reduce or enlarge the print job by entering a numeric value in the Reduce or Enlarge field.

4. Select the page orientation—portrait or landscape—by clicking on the appropriate **Orientation** button.

5. Specify the appropriate printer effects from the group of available checkboxes.

   - **Font Substitution**, when checked, substitutes the resident Macintosh font set—Geneva, New York, and Monaco—with the PostScript Helvetica, Times, and Courier. Note that the letter spacing, line endings, and pagination of your document may be altered if you use this option. If you want to print using the resident Macintosh font set, make sure **Font Substitution** is unchecked.

   - **Text Smoothing**, when checked, smooths the LaserWriter output of bitmapped fonts.

   - **Graphics Smoothing**, when checked, minimizes the jagged edges of some types of graphic images.

   - **Faster Bitmap Printing**, if checked, improves the printing speed of bitmapped graphic images. Note that some documents will not print if this option is checked. If you have problems printing documents with bitmapped graphic images, try turning this option off.

6. Set any other application-specific printing options that may be available.

   - These custom features are explained in the documentation that accompanied your software application.

   - In the FrameMaker example used here, a **Custom Paper Size...** radio button is available, as shown in Figures 10 and 11. Clicking this button displays a special

Imagesetter paper configuration dialog box, shown in Figure 12.

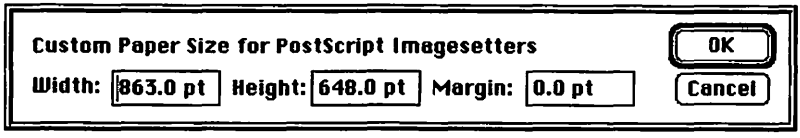


Figure 12 FrameMaker Custom Paper Size for PostScript Imagesetters dialog box.

- The Width, Height, and Margin settings are values for PostScript imagesetter page size parameters.

7. Click the **Options** button in the Page Setup dialog box. The LaserWriter Options dialog box, shown in Figure 13, will be displayed.

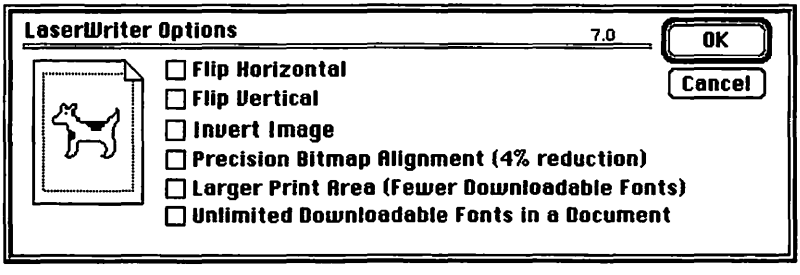


Figure 13 LaserWriter Options dialog box.

8. Specify the appropriate options from the group of available checkboxes.
   - **Flip Horizontal**, when checked, reverses the page from left to right, printing a mirror image of the document.
   - **Flip Vertical**, when checked, reverses the page from top to bottom, printing the document upside down.
   - **Invert Image**, when checked, prints a negative image of the document.

- **Precision Bitmap Alignment**, when checked, reduces the size of the printed page by 4 percent, resulting in more precise bitmapped graphics that are also less distorted.
- **Larger Print Area**, when checked, extends the imaging area of the printer by reducing the minimum margins. Note that selecting this option may prevent you from using more than a few downloadable fonts for the document. Because the printer is using more of its memory to create the page instead of downloadable fonts, some documents may print more slowly, and documents with many downloadable fonts may not print at all.
- **Unlimited Downloadable Fonts**, if checked, allows more fonts to be used in the document. Selecting this option can result in slower printing.

9. Click the OK button in the LaserWriter Options dialog box. The original Page Setup dialog box will still be displayed.
10. Click the OK button in the Page Setup dialog box to complete the process.

The Page Setup settings have now been configured for your document. They will be saved with your document after you initiate the Print command covered in the next section.

Print... Command

Selecting the Print... command from the File menu allows you to print the current document to the printer you have selected in the Chooser, using the settings and options you specified with the Page Setup... command.

You can initiate the actual printing sequence with these steps.

1. Select the Print... command from the File menu. The Print dialog box, similar to the FrameMaker example shown in Figure 14, will be displayed.

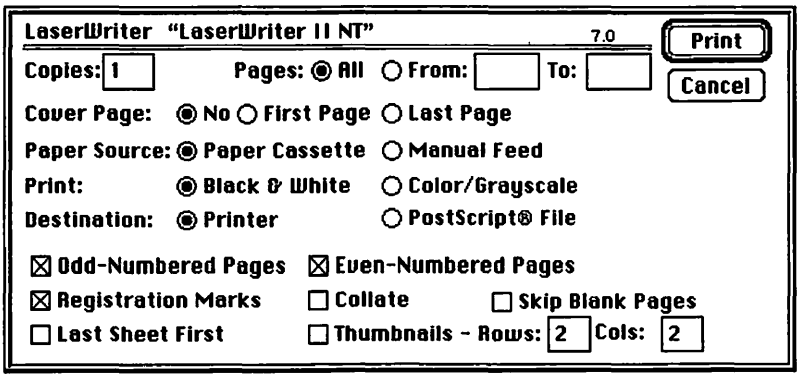


Figure 14 Print dialog box.

2. Enter the number of copies you wish to print in the Copies field.
3. Check the **All Pages** radio button, or specify a range of pages to print in the appropriate From: and To: fields.
4. Check the appropriate radio button to print or suppress a cover page.
   - The cover page identifies the document. It contains the user name, application name, document name, and the date and time of the print job.
5. Check the appropriate radio button for the correct paper source.
6. Check the appropriate radio button for either black and white or color/grayscale output printing.

- If you print a color document on a black and white printer like the LaserWriter, a *halftone* format will be used.

7. Check the appropriate radio button for the destination for the printed document.
   - The **Printer** option directs the output to the printer or output device you have selected in the Chooser.
   - The **PostScript® File** option directs the output to a PostScript file on disk rather than the selected printer.

8. The remaining options are specific to the application from which you are printing. In the FrameMaker example used here:
   - **Odd- and Even-Numbered Pages**, prints (checked) or suppresses (unchecked) the printing of left- and right-hand pages. This is useful for printing on both sides of the page.
   - **Registration marks**, when checked, prints crop and color registration marks outside of the live text area. This is useful when preparing camera-ready mechanicals for offset printing.
   - **Collate**, when checked, prints one complete copy of the document before starting the next copy when more than one is specified in the Copies field. This results in completely collated output, but slower printing times.
   - **Skip Blank Pages**, when checked, prevents blank pages from being printed.
   - **Last Sheet First**, when checked, reverses the order in which the pages are printed. This is useful when you are printing with the face-up tray open.

- **Thumbnails**, when checked and specified, prints multiple reduced images of the document—called *thumbnails*—on a single page. This is useful for seeing the overall layout of several pages at a single glance.

9. Click the **Print** button.

Managing Print Jobs

Various options are available that allow you to manage the actual printing process, including face-up or face-down page delivery, background printing, and print job monitoring.

Page Delivery Options

You can control how the pages are delivered from the LaserWriter with the face-up tray.

Most Macintosh software applications print the first page first, delivering the pages face-down so that the document is properly collated. Some applications print first page last, however, requiring face-up page delivery for proper collation.

To configure the LaserWriter for face-up page delivery, open the face-up tray.

Be careful to never open the face-up tray when printing is in process. Also, the face-up tray should always be open when printing envelopes, transparencies, or paper stock heavier than 24-lb. With the face-up tray open, the LaserWriter can use paper stock up to 36-lb.

Background Printing

Apple's PrintMonitor, included as part of the Macintosh System software, allows you to print on a LaserWriter in the background while continuing to work with one or more software applications. This process is known as *background printing.*

The PrintMonitor file is automatically put in the Extensions folder inside your System Folder when you install System 7.

Under System 6, the PrintMonitor is automatically installed in the System Folder only if you have also installed MultiFinder.

If you didn't install the LaserWriter with Apple's Installer utility, the PrintMonitor file can be found on the Printing disk.

PrintMonitor and background printing works seamlessly with System 7. Background printing with System 6 is available only under MultiFinder, Apple's first-generation multi-tasking implementation. The rest of this section assumes you are using System 7.

You can turn on background printing by selecting a LaserWriter in the Chooser and selecting the **Background Printing On** radio button. Once you have turned on background printing, it stays in effect until you turn it off.

Turning background printing on prints your document to a file on disk and returns control of your Macintosh to you sooner.

When you select the Print... command and initiate the printing process, the Printing Status dialog box appears on the screen while the print

job is written to your hard disk drive, as shown in Figure 15.

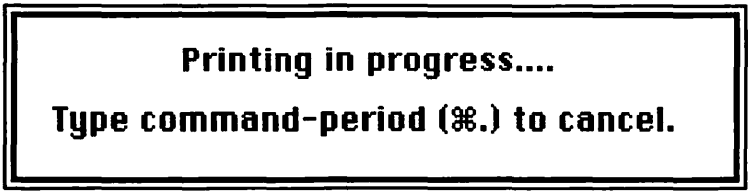


Figure 15 Printing Status dialog box.

As soon as the Printing Status dialog box disappears, control of your Macintosh is returned and you can continue other work.

PrintMonitor controls the actual printing job, and offers you several levels of control. When the print job begins, the PrintMonitor application is automatically launched and its icon can be located in the Application menu.

The version of PrintMonitor supplied with System 7 is notorious for being unable to handle large or complex print jobs without reporting an error condition.

It is common for the PrintMonitor application to report that it cannot complete the print job because of insufficient memory. When this happens, a dialog box is displayed, reporting the condition and suggesting that the size of the memory partition allocated to the PrintMonitor application be increased.

If you click the OK button, PrintMonitor will perform this action automatically, although the current print job will be flushed from the printer's memory and automatically restarted.

You can avoid this situation by manually adjusting the size of the memory partition allocated to the PrintMonitor application. Instructions for

increasing the allocated memory partition of an application is provided in the *Macintosh Reference* manual.

When you select the PrintMonitor item from the Application menu during a print job, its main window is displayed on your screen, as shown in Figure 16.

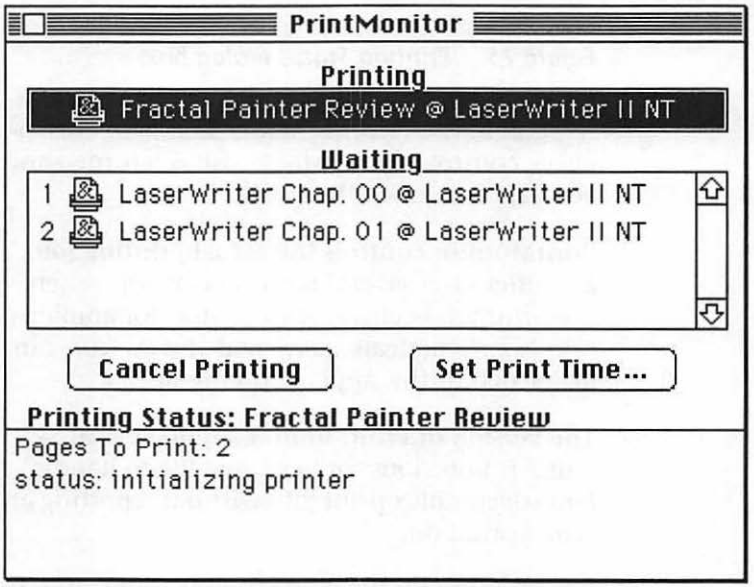


Figure 16 PrintMonitor main window.

PrintMonitor's main window provides the name of the document currently being printed and the printer in use as well as a scrolling list of documents waiting to be printed.

The lower portion of the window displays information concerning the status of the document currently being printed.

In the middle portion of the window, two buttons are provided that allow you to control the background printing process.

- You can cancel the printing of the current document by clicking **Cancel Printing**.
- You can remove a spooled document from the waiting list by selecting it from the list and clicking the **Remove From List** button (the **Cancel Printing** button changes into the **Remove From List** button when a document in the waiting list is selected).
- You can set the printing time of any waiting document by selecting it from the scrolling list and clicking the **Set Print Time...** button. Doing so causes the Set Print Time dialog box, shown in Figure 17, to be displayed.

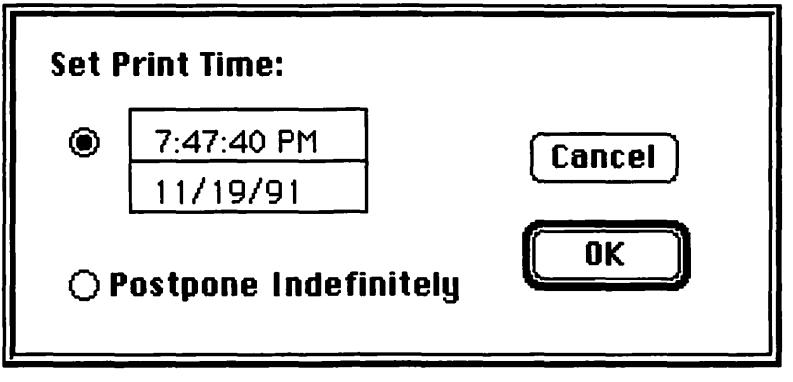


Figure 17 Set Print Time dialog box.

- You can assign any time and date you like using the **Set Print Time** radio button and its associated time and date fields. Alternatively, you can postpone the print job indefinitely without cancelling it by clicking the **Postpone Indefinitely** radio button.

PrintMonitor has a menu that allows you to control the broader aspects of the background printing options offered by the Macintosh System

software and LaserWriter printer drivers. The PrintMonitor menu is shown in Figure 18.

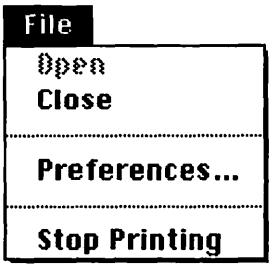


Figure 18 PrintMonitor menu.

The Open and Close commands are self explanatory and reproduce the action of selecting the PrintMonitor item from the System 7 Application menu and the PrintMonitor main window close box respectively.

Selecting the Preferences... command displays the PrintMonitor Preferences dialog box, shown in Figure 19.

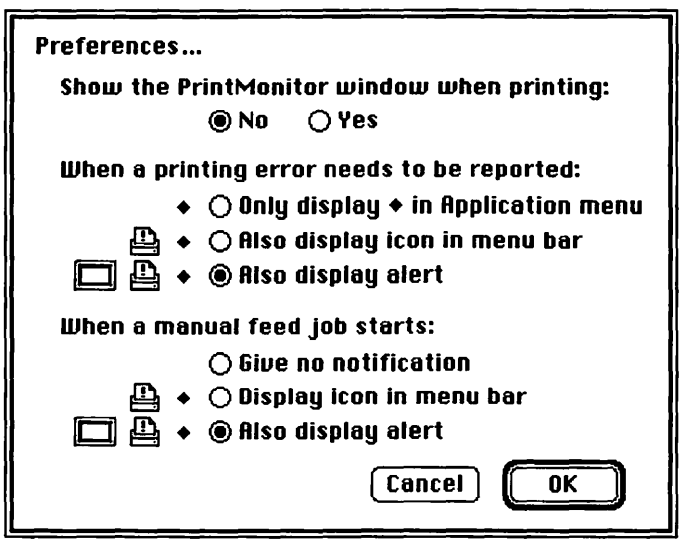


Figure 19 PrintMonitor Preferences dialog box.

The PrintMonitor dialog box allows you to control the following aspects of the background printing process.

- Whether or not the PrintMonitor window is displayed automatically during printing.
- The level of feedback and form of alert provided when an error condition occurs.
- The level of feedback provided when a manual feed print job begins.

You can use the Stop Printing command on the PrintMonitor menu to temporarily halt the background printing process. When you select this command, the command automatically changes to the Resume Printing command, allowing you to restart the printing process.

Downloading Fonts

Downloading fonts to a LaserWriter—or to a hard disk drive attached to the SCSI port of a LaserWriter IIf or LaserWriter IIg—results in significantly faster printing times. To download fonts to the printer or its hard disk drive, use the LaserWriter Font Utility.

In addition to downloading fonts, the LaserWriter Font Utility also allows you to:

- Download a PostScript file
- List the fonts available on the LaserWriter
- Print a sample of available fonts
- Initialize the printer's hard disk drive

You can follow these steps to download fonts to a LaserWriter.

1. Turn on the LaserWriter.
2. Launch the LaserWriter Font Utility.
   - The program will automatically search for the characteristics of the LaserWriter selected in the Chooser.
3. Select the Download Fonts... command from the File menu. The Font Download dialog box will be displayed, as shown in Figure 20.

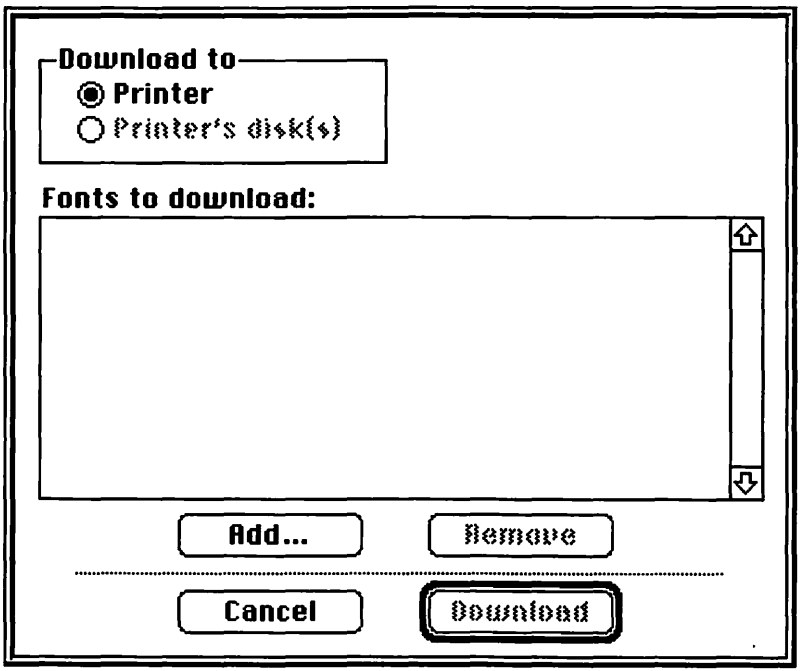


Figure 20 LaserWriter Font Utility Font Download dialog box.

4. Click the **Add...** button. A standard file dialog box will appear.
5. Select the fonts you want to download and click the **Add** button for each font.
6. When you have selected all the fonts you want to download, click the **Done** button.

The Font Download dialog box will appear like the example shown in Figure 21.

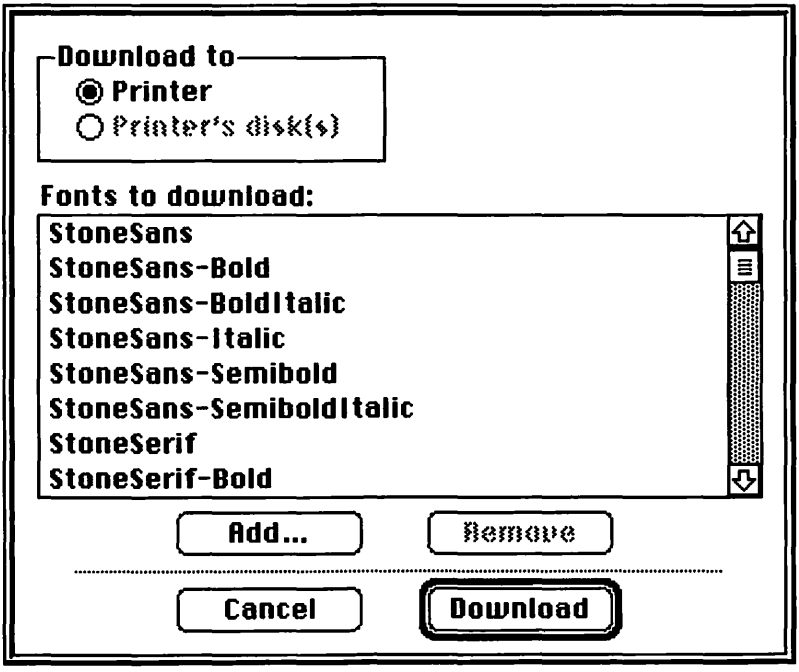


Figure 21 ***LaserWriter Font Utility Font Download dialog box with selected fonts ready to download.***

7. Click the **Printer** radio button to download the selected fonts to the LaserWriter's memory or click the **Printer's disk(s)** radio button to download to the printer's hard disk drive.
8. Click the **Download** button. The fonts you added to the Fonts to download scrolling list will be downloaded to the printer's memory or hard disk drive.
    - The downloading process can take a while depending on the number of fonts you selected. During the download, a dialog box similar to the one shown in Fig-

ure 22 will be displayed, reporting the status of the download.

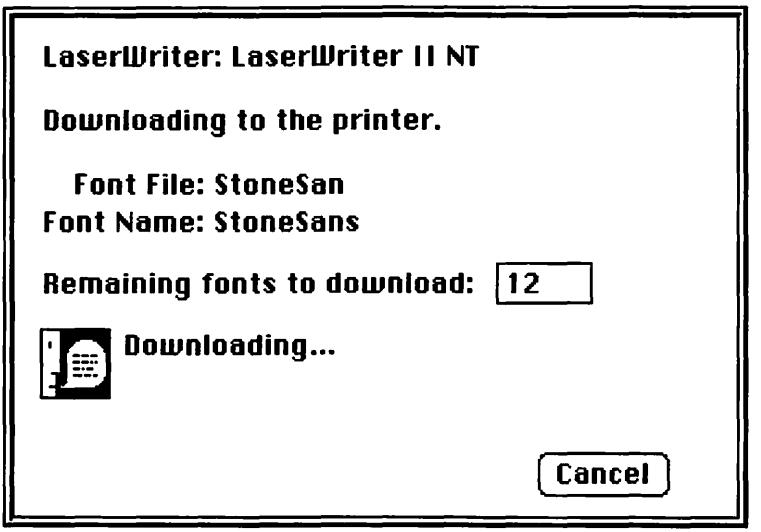


Figure 22 Font Download Status dialog box.

- When the download process is complete, the Download Completed dialog box, shown in Figure 23, will appear.

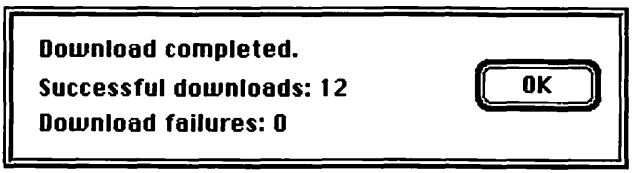


Figure 23 Download Completed dialog box.

9. Click the OK button.

The selected fonts are now resident in the printer. If you downloaded them to the printer, they will remain resident until you restart the printer or turn its power off. If you downloaded the fonts to the printer's hard disk, they will remain resident until you reformat the disk.

Listing Available Fonts

You can also use the LaserWriter Font Utility to list the fonts available on the LaserWriter.

1. Select the Display Available Fonts... command from the File menu. The Available Fonts window, similar to the example shown in Figure 24, will be displayed.

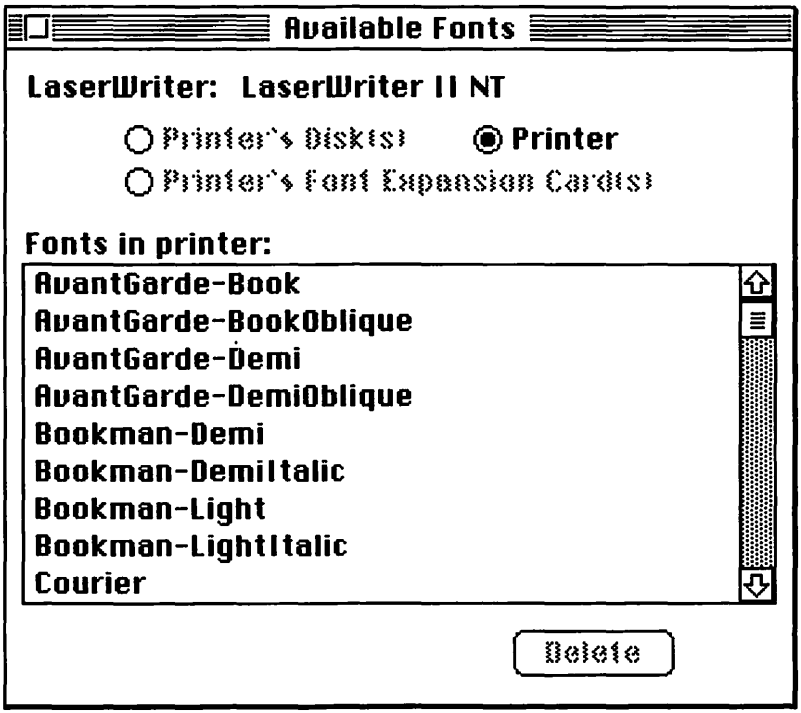


Figure 24 Available Fonts window.

2. Click the **Printer** radio button to display the available fonts in the LaserWriter's memory (both RAM and ROM).
3. Click the **Printer's Hard Disk(s)** radio button to display the fonts available on the hard

disk. (This option is available only if a hard disk is attached to the printer.)

4. Click the **Printer's Font Expansion Card(s)** radio button to display the available fonts contained on any expansion card that may be installed in the printer. (This option will be available only if there is a font expansion card installed.)

Turning Off the Sample Page

The LaserWriter prints a sample page each time it is turned on or restarted. You can use the LaserWriter Font Utility to turn off the LaserWriter's sample page.

1. Select the Start Page Options... command from the Utilities menu. The Printer Start Page dialog box, shown in Figure 25, will be displayed.

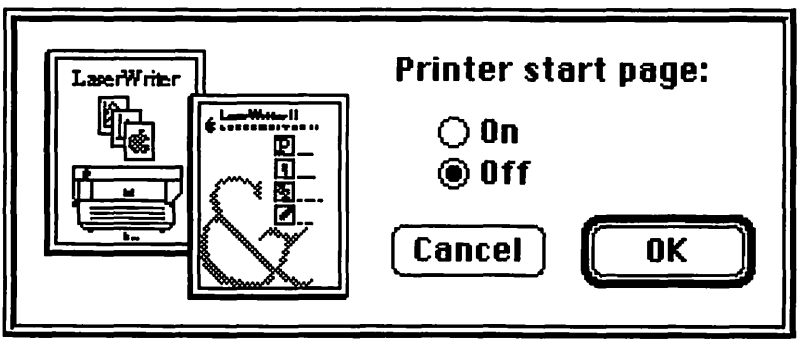


Figure 25 Printer Start Page dialog box.

2. Click the **Off** radio button to suppress the printing of the sample page.
3. Click the **On** radio button to restore the printing of the sample page.

Downloading a PostScript File

You can use the LaserWriter Font Utility to download a PostScript file directly to the LaserWriter selected in the Chooser.

1. Select the Download PostScript File... command from the Utilities menu. A standard file dialog box will be displayed.
2. Navigate to the folder containing your PostScript file and open it.
    - You will be prompted to name and save a PostScript Log file to disk. This log file contains any errors reported by the PostScript interpreter in the LaserWriter. The file can be named anything and stored anywhere on disk. If no errors are encountered or messages received from the PostScript interpreter, the log file will be created.

Restarting the LaserWriter

From time to time the LaserWriter may encounter an error from which it cannot recover. This can result from a PostScript error or a problem with the local area network connection.

If you encounter such a problem, you can either cycle the power on the LaserWriter or you can use the LaserWriter Font Utility to restart any LaserWriter with these steps.

1. Launch the LaserWriter Font Utility.
2. Choose the Restart Printer... command from the Utilities menu. An alert dialog box, warning that restarting the printer will erase all

downloaded fonts in the printer's memory, will be displayed.

3. Click the **Restart** button.

Note that using the LaserWriter Font Utility's Restart Printer... command will erase all downloaded fonts currently stored in the LaserWriter's memory. This action will have no effect on the fonts contained in the LaserWriter's ROM or hard disk drive.

Camera-Ready Copy

LaserWriter output can best be described as near-typeset-quality. While many printing applications will require high-resolution output from an imagesetter, the LaserWriter IIf and LaserWriter IIg can be used to produce camera-ready mechanicals for many applications. The proper paper and settings can help.

An appropriate paper specification is important when you are producing camera-ready copy from your LaserWriter.

- Use the smoothest texture paper you can find. The smoother the better.
- Paper brightness doesn't seem to have much of an impact when the material is reproduced by the printer. There is, however, a perceptual difference. Use the brightest paper possible when presenting material to clients.

Even more important than an appropriate paper, however, is the density setting you use in your LaserWriter.

- Keep the LaserWriter's density setting a step or two lighter than normal for the best re-

sults when producing camera-ready mechanicals.

- A setting of about "7" on the green wheel inside of the LaserWriter II series seems to work the best. (A setting of "5" is normal on the same printer series.)

Be aware that toner cartridges can vary. I've had cartridges that insist on printing a wide black band down the side of every sheet of paper, for example. You may want to keep a cartridge that you find to be especially good for use only when printing camera-ready material.

High humidity and static electricity can weaken the toner's adherence to the paper. Try to maintain as consistent an environment as possible for crucial printing tasks.

CHAPTER TEN

LaserWriter Maintenance

The LaserWriter family is designed to require a minimum of maintenance. The only user maintenance required is to replace the toner cartridge every 4,000 pages or so. Apple recommends that an authorized dealer service the LaserWriter every 100,000 pages. Every time you replace the LaserWriter's toner cartridge, it's a good idea to also clean the internal areas of the printer where paper dust and toner particles are likely to collect.

Careful! It's Hot!

The fixing rollers in the LaserWriter get very hot when the printer is in operation. One of the reasons the LaserWriter uses so much electricity is that the fixing rollers must be kept at a temperature of about 400 degrees. The best strategy is to let the fixing rollers cool before performing any maintenance on the printer.

There are other internal parts of the LaserWriter that are quite sensitive and should be considered off-limits for general maintenance activities. All of the exposed gears and electrical contacts in-

side of the LaserWriter should not be touched, as indicated by the dark shaded areas in Figure 26.

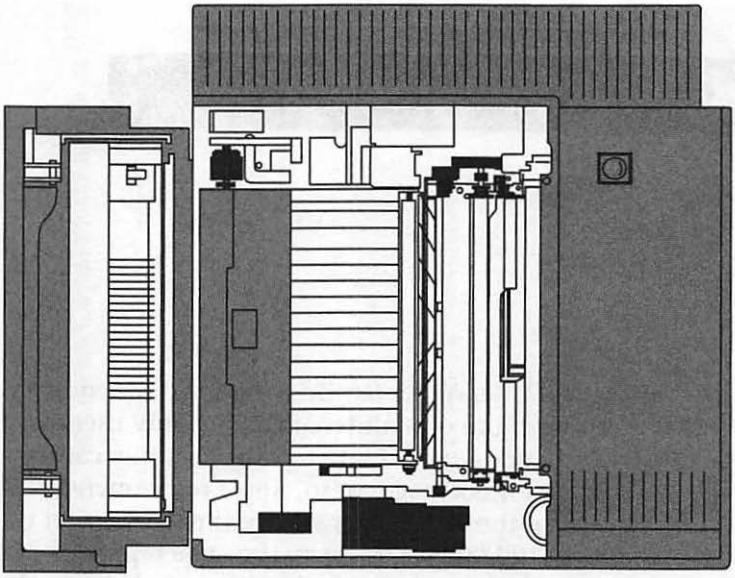


Figure 26 LaserWriter internal view (top).

An internal view of the LaserWriter is provided in Figure 27.

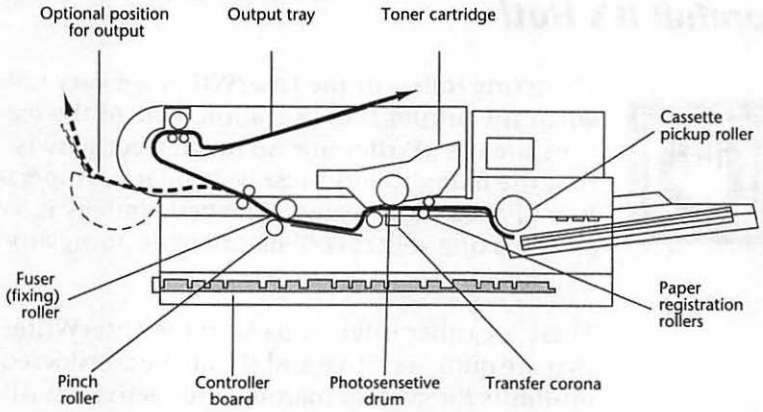


Figure 27 LaserWriter internal view (side).

Toner Cartridge Replacement

The LaserWriter toner cartridge is designed to yield about 4,000 pages. The actual number of pages you can expect from a toner cartridge will vary depending on the kind of pages you print. If your pages start to look too light, or if you can see thin white lines in dark graphic images, it's time to replace the toner cartridge and perform routine maintenance.

If the Low Toner Level light—shown in Figure 28—comes on, the cartridge may not need replacement. Instead, try removing the toner cartridge and redistributing the toner powder.

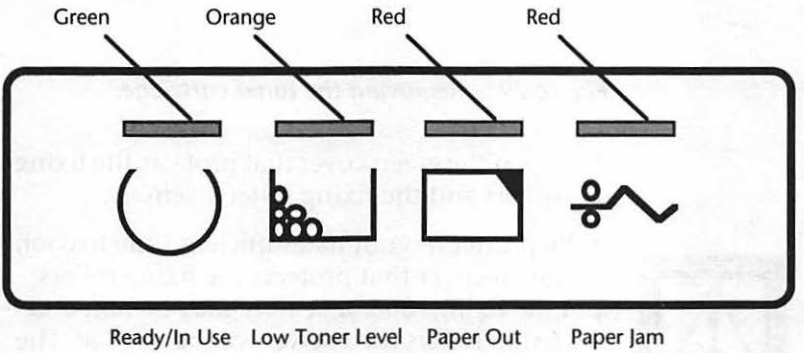


Figure 28 LaserWriter indicator lights.

You can redistribute the toner powder by removing the toner cartridge and rocking it gently back and forth while holding it level horizontally. If the Low Toner Level light comes in the middle of a print job, there is no need to cancel the printing unless the output is unsatisfactory. You can't harm the LaserWriter by continuing to print when the Low Toner Level light is on.

You can use the following steps to replace the toner cartridge.

1. Remove the old toner cartridge by opening the LaserWriter cover and pulling out the cartridge as shown in Figure 29.

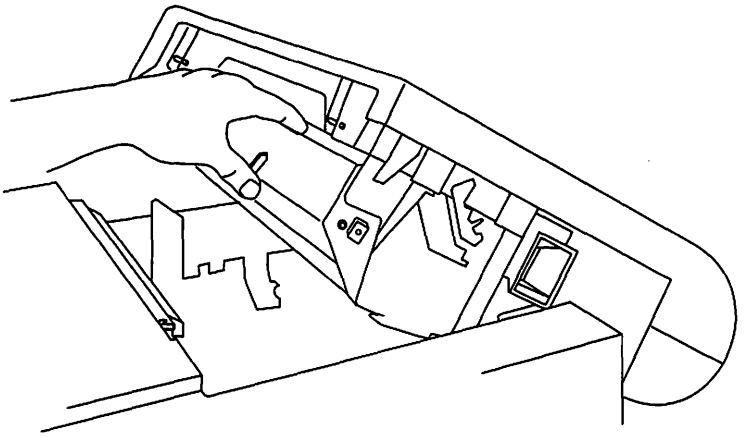


Figure 29 Removing the toner cartridge.

2. Open the green cover that protects the fixing rollers and the fixing roller assembly.

If the printer has not had sufficient time to cool, the green cover that protects the fixing rollers and the fixing roller assembly may be hot, and the fixing rollers themselves will be *very hot*. The operating temperature of the LaserWriter fixing rollers is about 400 degrees.

3. Remove the used cleaning pad from the fixing roller assembly.
4. Unwrap the new cleaning pad that came packaged with the new toner cartridge.
5. Use the white felt tip attached to the new cleaning pad to clean the fixing rollers.
6. Remove the white felt tip from the new cleaning pad.
7. Insert the new cleaning pad into the fixing roller assembly.

8. Close the green cover that protects the fixing rollers.

9. Clean the discharge pins, as shown in Figure 30, with the green plastic cleaning brush stored inside of the LaserWriter.

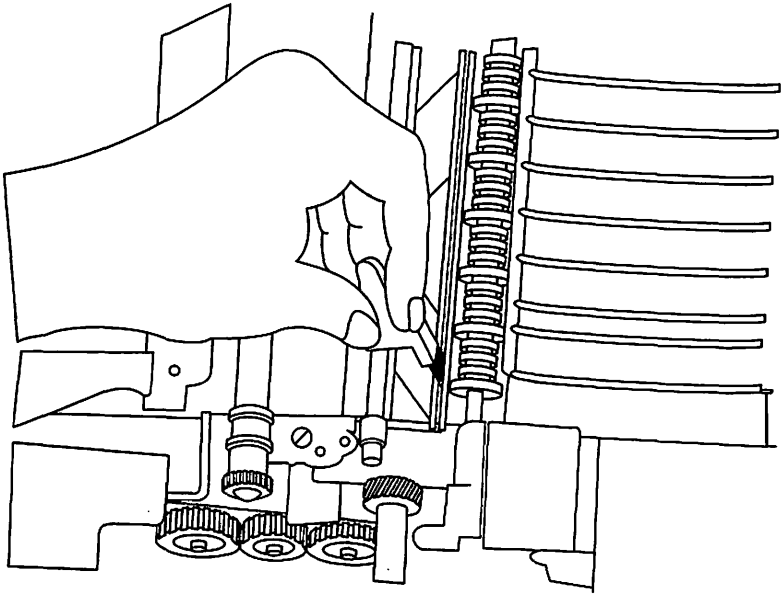


Figure 30 Cleaning the discharge pins.

Take extreme care during all internal cleaning operations not to break any of the fine wires inside of the LaserWriter. They are quite fragile and not designed to withstand rough handling. These fine wires—the transfer corona wire and the transfer guide wires—are illustrated in Figure 30 and Figure 31.

10. Replace the green plastic cleaning brush in its storage clip when you're finished.

11. Carefully clean the transfer corona wire with the cotton swab packaged with the new toner cartridge, as shown in Figure 31.

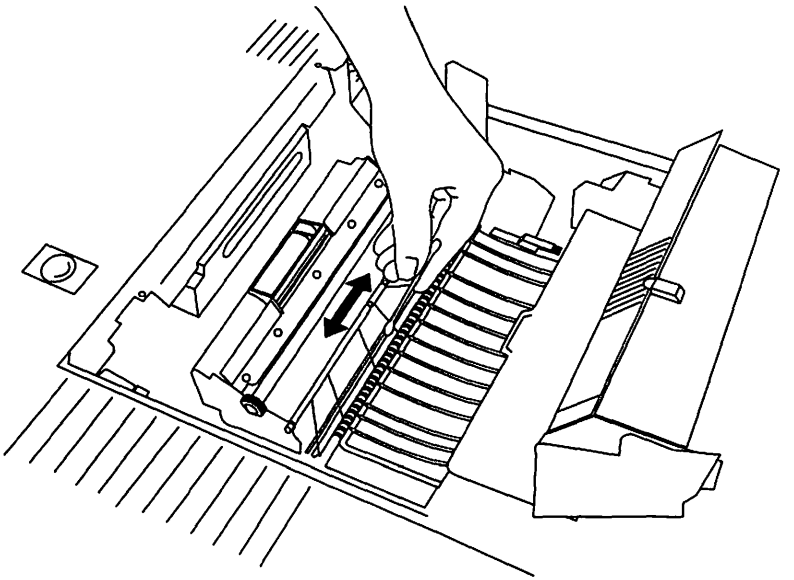


Figure 31 Cleaning the transfer corona wire.

- The transfer corona wire is the fine wire that runs across the middle of the LaserWriter. Clean it and the diagonal wires above it very gently with the cotton swap that is packaged with the new toner cartridge.

Take extreme care during all internal cleaning operations not to break any of the fine wires inside of the LaserWriter. They are quite fragile and not designed to withstand rough handling. These fine wires are illustrated in Figure 30 and Figure 31.

12. Clean the transfer guide with a damp cloth, as shown in Figure 32.

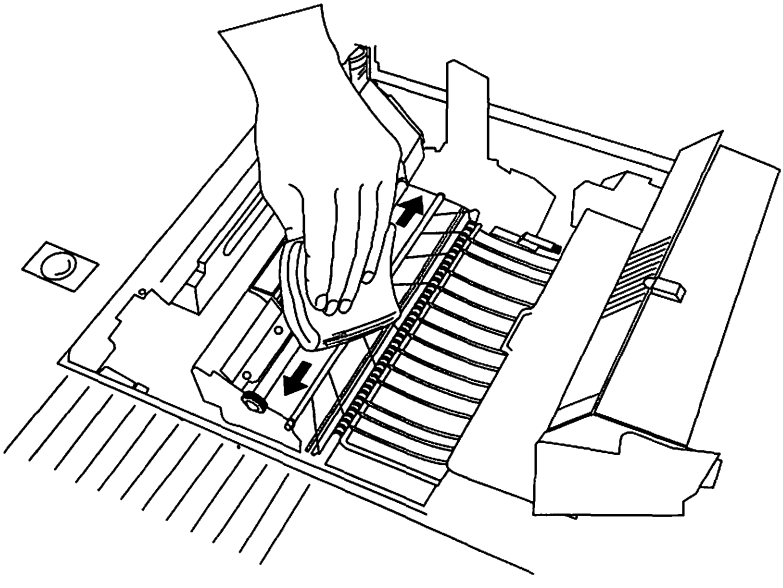


Figure 32 Cleaning the transfer guide.

13. Unwrap the new toner cartridge.
14. Place the used toner cartridge in the carton used to ship the new toner cartridge.
    - Some toner cartridge manufacturers offer a recycling program for their used toner cartridges. They will provide you with a special shipping-paid mailer to return your expended toner cartridges to them for recycling. Contact your dealer or toner cartridge vendor for more information.
15. Holding the cartridge horizontally level, gently rock it back and forth several times to redistribute the toner powder that may have

settled during shipping and storage. The process is illustrated in Figure 33.

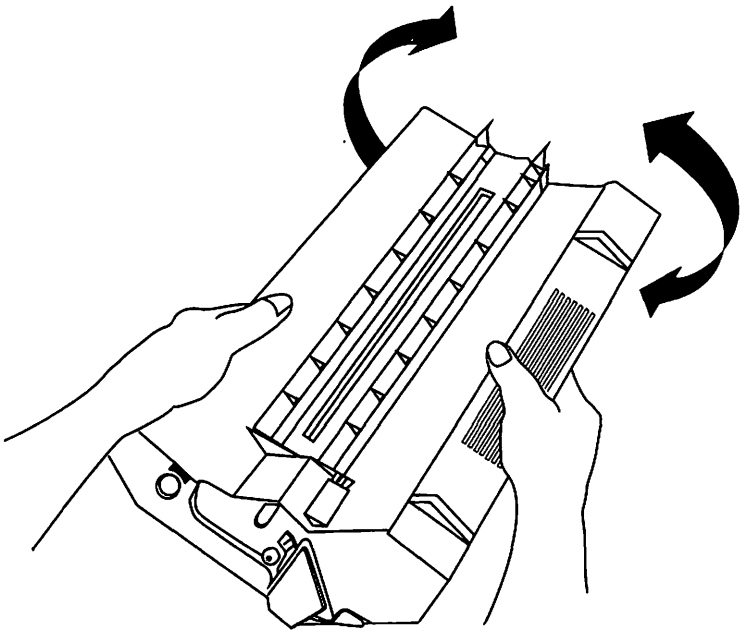


Figure 33 Rocking toner cartridge.

Toner Cartridge Recharging

Some toner rechargers are now offering special long-life drum components that they claim are good for six or seven refills, or about 30,000 copies. As a comparison, most rechargers agree that standard LaserWriter II toner cartridges can be refilled only two or three times.

I don't recommend using recharged toner cartridges. Toner cartridges are relatively inexpensive compared to the repair cost associated with cleaning up after a defective cartridge.

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GUIDE TO THE LASERWRITER® FAMILY

Michael Fraase

All the basics you need to get up-to-speed quickly and easily with your printer! Now you can minimize headaches and become more productive with this *Rapid Reference Guide to the LaserWriter® Family.*

While many user guides are filled with technical jargon, this Rapid Reference Guide clearly describes how to take advantage of the numerous features of the LaserWriter Family. Instead of an encyclopedic listing of features, you'll find the information you need to get your work done now. Michael Fraase shows you how to:

- Get the best output from each printer.
- Avoid paper jams—and easily clear them when they do occur.
- Select the best paper for use with the printers.

About the Author . . .

Michael Fraase is the proprietor of Arts & Farces, a multi-faceted communications and professional services business specializing in hypermedia production, technical writing, desktop/electronic publishing, and software design. He is the author of *Structured Publishing from the Desktop: Frame Technology Corporation's FrameMaker* (Business One Irwin, 1992), *Groupware for the Macintosh: A Complete Guide for Collaborative Computing* (Business One Irwin, 1991), and *Farallon's MediaTracks* (Business One Irwin, 1991).

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