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Because each press and paper differ always consult with your printer.

### Image Resolution Formula (Based on Amplitude Modulated Screening)

\[
\text{Screen Frequency (lp)} \times 2 = \text{Scanning Resolution}
\]

\[
\frac{\text{Final Image Width}}{\text{Original Image Width}} \times \text{Screen Frequency} \times 2 = \text{Scanning Resolution}
\]

### Output Resolution Formula (Based on Amplitude Modulated Screening)

\[
\text{Required Output Resolution (dpi)} = \text{Screen Frequency (lp)} \times 16
\]

\[
\text{Screen Frequency (lp)} = \frac{\text{Required Output Resolution (dpi)}}{16}
\]
Macintosh Design to Production
the DEFINITIVE GUIDE
acknowledgments

From a chance meeting on the way to Macworld to the completion of our first book, this has been quite an odyssey. Despite the long hours, forgotten holidays and lost recreational opportunities, it has been an experience we'll never forget. We'd like to first thank the friends we had before we started, who grew tired of our excuses for not leaving the house, but stuck around nevertheless. Our thanks also go out to the new friends we've made as a direct result of writing this book, including everyone at Prima Publishing, Waterside Productions, and Rich Grace who helped get us started.

Because desperation is such a good motivator, we were able to convince Becky Sundling to leave soggy Seattle to visit sunny San Diego to help us with research and production. Thanks Becky, it was fun having you as our prisoner in paradise.

Luckily, some of our friends are also talented Macintosh digital artists who graciously contributed artwork for our color gallery as well as helpful tips and suggestions along the way. (Their names are provided in the "Sources" section under "Contributors.") We would also like to thank each of the software developers who provided either information or review copies of their products to verify our statements. (They are listed in the "Sources" section under "Software Companies.") With special thanks to International Paper Company for permission to use information from the Pocket Pal and to Frank Merritt Braswell, for his contribution to our discussion of PostScript.

Others deserving special thanks are Lynn Harvey and Conklin Litho for time and help proofing the artwork for this book and to Nancy Casey for lending a trained eye to our text.

The single person who deserves our thanks most of all is Linnea Dayton. Without her continuous optimism, wisdom, and valuable contributions, this book would have never come together. We just hope that all of our faxes and phone calls at all times of the day and night haven't driven you out to the desert for good. Thanks for everything.
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CHAPTER 14

THE WORKING COLOR GALLERY

APPENDIX

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introduction

Design to Production: The Definitive Guide will help graphic designers, desktop publishers, production artists, photographers, and illustrators effectively produce their work on Macintosh computers, including the PowerMac. This book provides a framework to help you make educated buying decisions about software and hardware, to organize projects efficiently, and to choose and work with service bureaus and printers. Design to Production also provides fundamental techniques and step-by-step explanations of how to prepare trouble-free computer files for prepress.

Design to Production: The Definitive Guide is also a reference book that you can pull off the shelf to answer your tough production and prepress questions and find sources of additional information. The book includes lists of vendors, periodicals, on-line services, image services, and other resources available to the electronic design and publishing industry. Most of all, Design to Production has been written to help you avoid the stressful, irritating problems in the production and prepress process, such as:

- inadequate hardware for your needs
- inappropriate software for the job
- mysterious system errors
- overly ambitious designs that can’t be produced
- miscommunication with clients, service bureaus, and printers
- preparation of inadequate files for prepress
- printed colors that appear different than expected
- work environments that create health problems

If you’re a budding graphic designer, with stars in your eyes and a burning desire to set out on your own, this book is aimed directly at you. And, if you’ve already made a substantial investment in hardware and software and have largely mastered the tools of the trade, this book will help you through the process of production.

Whether you’re designing a black-and-white newsletter to be printed on a laser printer or working with high-resolution images, doing color correction and trapping, this book will help you plan ahead to get the best results.
If you manage a design firm or art department and need to make the transition from traditional production techniques to the electronic design and production process, this book addresses the challenges you face.

Desktop publishing has evolved as one of the primary uses for personal computer technology. In 1984, when Apple created the Macintosh, followed by the Apple LaserWriter, a quiet revolution occurred. In a small way, it was analogous to the revolution started by Gutenberg's invention of movable type. Suddenly, publishing became a decentralized, democratic endeavor. Now, digital desktop publishing is taken for granted as a vital office skill, along with word processing, spreadsheet usage, and database management.

By now, most members of the visual arts community have included digital media in their work to some extent. But the explosion of desktop publishing has not been accompanied by a commensurate explosion of digital design and production expertise. Many graphic artists still view the computer as an obstacle rather than a tool and continue to rely, in many ways, on the tried-and-true methods of mechanical drawing and hand-drawn graphics. In order to utilize computers effectively, designers need to understand computer methods as well as they understand traditional methods.

Beyond the initial creative part of the process, many tasks traditionally performed by color separation houses and typesetting firms can now be done in-house on the computer. Designers need to know where those convergences exist, how to integrate desktop production with their own working process, and whether to do the work themselves or use the services of others.

Why Should You Read this Book?

When you decide to go from design to production on the Macintosh, you'll confront a minefield of glitches and gotchas that can significantly delay or even torpedo an important project. Working on the desktop to conceive and prepare graphic design projects for final output is a process of learning from your mistakes—your own and those of others. The tips and guidelines contained in this book are based on the experiences of designers, production artists, and service bureau technicians.

It's not just a question of properly organizing your work. It's not even a question of knowing and achieving the aesthetic goals of your projects. You must know the technologies and the processes by which you can effectively work with service bureaus and the printers to produce your work. You must
also work with clients to make sure that your final product is what they were looking for in the first place! Ultimately, what you don’t know can definitely hurt you. Learn from this book, and don’t let production problems limit your creativity or keep you up all night.

**How to Read this Book**

Begin at the beginning, because each section of the book builds upon the previous one. Knowledge and techniques acquired in one chapter are referred to and applied in later chapters. The approach is concise and step-by-step so you can get the information you need quickly. Throughout the book, definitions, important tips, and summaries appear in the margins. They are signposts you can use to quickly locate more complete explanations in the main body text.

A certain level of reader knowledge is assumed. At a minimum, you should know the basics of operating a computer, finding and launching programs on the Macintosh, and using pull-down menus and dialog boxes. It is also assumed that you understand the basics of graphic design and document layout.

Section I of the book lays the groundwork by describing the production process, the tools of the trade, and how to effectively use them. The section begins by describing the numerous steps of the process, and the organization and teamwork needed to succeed. It also shows how to set up a good work environment and offers some tips for managing your system.

Section II helps you get organized and gain a working understanding of all aspects of a project before beginning: how to work with clients to develop successful projects; how to set up templates and prepare digital mechanicals for prepress; how to choose and work with service bureaus and printers; and how to communicate effectively with everyone in the process.

Section III assumes some reader knowledge of the key graphic design and production packages used in the industry, primarily "The Big Five:" Adobe Illustrator, Macromedia FreeHand, QuarkXPress, Adobe PageMaker, and Adobe Photoshop. It details the production process, starting at the desktop, by including step-by-step discussions of procedures such as scanning and color correction. It also outlines many ways to take the big step to the service bureau (in other words, to prepress) and finally to the printing press. An eight-page color section visually details specific production techniques discussed within Section III.
A final working color gallery chapter completes this book. This sixteen-page color insert is a working gallery that highlights actual printed pieces and outlines some of the issues and problems that can, and do, occur during the production process. The solutions and tips used to address those problems can serve you well during your own production experiences.
SECTION I
THE ESSENTIALS OF GETTING STARTED

CHAPTER I
DESIGN TO PRODUCTION OVERVIEW

Understanding the Digital Design Process

How Far Do You Want to Go?

Project Planning and Management
Research and Creative Idea Generation
Writing, Editing, and Proofreading
Template Creation, Type Specs, and Page Layout
Acquiring, Creating, and Manipulating Digital Images
Correcting Color
Trapping
Color Separation and Films
Imposition and Traditional Stripping
Plate-Making
Printing
Design and production is not an individual sport. You can’t play all the positions at one time. The best approach is to choose your position, learn how to work with the rest of the team, and don’t drop the ball. The key to success is a good game plan—one based on fundamentals, teamwork, and practice.

In the past, the responsibilities of each professional within the publishing industry were clearly defined; a designer was a designer, a typesetter was a typesetter, an illustrator was an illustrator. Production was performed in places like typesetting studios and color-separation houses. It was clear where design stopped and production started.

Today, responsibilities shift from job to job, and design and production activities tend to happen under the same roof—even on the same computer. Only the prepress activities are still usually performed elsewhere by service bureaus.

The electronic publishing boom has reduced the number of specialists required to complete any one job. It has accelerated project schedules, shortened deadlines, and increased expectations. The advantage is that you have powerful publishing tools at your fingertips, giving you more control over the production process. The disadvantage comes when the rapid increase in capabilities overwhelms your ability to fully understand them. All this technology has created a complex, fast-moving process in which errors can occur without the opportunity to correct them.

Understanding the Digital Design Process
As you start thinking through the design process, several activities may come to mind: project planning and management, research, creative idea generation, writing, template creation, type specs, page layout, scanning or
image creation and manipulation, color correction, trapping, color separating, imposition, traditional stripping, plate-making, and printing. Every activity has equal importance.

There are basically three factors that determine the responsibilities for these design and production activities. First, your environment often affects the extent of your involvement in the process. If you're in a large studio, you may have the luxury of specializing because there's enough work to keep each person busy at one or two activities all day. A larger firm may employ a project manager, art director, designer, production artist, in-house illustrator, and technical guru, while in a small studio, the key is to be a jack-of-all-trades. This can be exciting and rewarding because you're always learning, but it can also be frustrating because the amount you need to know never seems to stop growing.

Second, your equipment and software can be a determinant in how far you take the process. For example, if you don't have a scanner in-house, your scans and color correction will be done at a service bureau. Or, the trapping functions available in your desktop applications may not be nearly sophisticated enough for the trapping you need, forcing you to take that part of the job to a service bureau. (Trapping is a fairly complex file preparation technique used to account for misalignment of plates on the printing press. It is described in Chapter 10, "Registration, Dot Gain, and Paper.")

Finally, you may simply not have the time, the skill, or the desire to perform certain tasks. For example, many electronic designers would prefer to have someone else in the studio prepare the final file before page layouts go out for imagesetting. Before taking on any new task within the production process, make sure you have time to consult the experts or read your manuals and run tests. If you don't, your results may be less than acceptable.

**How Far Do You Want to Go?**

Whether you intend to create simple or complex pieces on the computer, you have the choice of doing it all yourself, or turning it over to experts at a certain point. The choice depends partly on your personal preferences and partly on economics. If you're a technology buff and live for the details, you can work toward understanding all aspects of the process. If you don't have the time or interest to learn it all, or if the cost of the required equipment just doesn't balance with the productivity you can get out of it, you need to
understand how to plan for production, how to find good vendors, and how to work with them. Whatever the case, you must have a general understanding of the overall process.

The activities performed during the electronic production and prepress processes are outlined below. These descriptions provide perspective on the industry and are the subject of recommendations, tips, and guidelines in later chapters.

**PROJECT PLANNING AND MANAGEMENT**

Project planning happens both on and off the computer. It consists of meetings, information gathering, proposal writing, quoting, contract writing, organization, and planning throughout the project. No matter what, you'll have to plan or manage projects to some extent. At the very least, you need to know who was working on the project before you got it, and who will have it after you.

**RESEARCH AND CREATIVE IDEA GENERATION**

Research and idea generation go together. Without research, which includes collecting data from the client and from other sources, such as books and periodicals, your idea generation could be limited. With a computer and a modem, data can be collected from online services, like Apple's eWorld, America Online, CompuServe, and the Internet. Many exciting design ideas develop simply out of the advanced capabilities of graphics software—from type manipulation programs to paint programs. Nevertheless, most ideas aren't developed on the computer, especially by those who feel that machinery hampers their creativity. (Keep in mind, though, that software and hardware hamper the creative process most when their capabilities are not fully explored.)

**WRITING, EDITING, AND PROOFREADING**

Lots of electronic publishers have had to take on writing, editing, and proofreading by default. Because of shorter deadlines and tighter budgets, editors and proofreaders are sometimes cut from the process, and designers, production artists, or even service bureau technicians are often called upon to pick up the slack.

**TEMPLATE CREATION, TYPE SPECS, AND PAGE LAYOUT**

These activities are usually performed together. Page layout software features, such as templates and style sheets (both are types of format guidelines), become important for consistency in headers, body copy, and captions throughout long text documents. Even on a one-page document,
it can be useful to set up styles within a template if the document is part of a series. Placing type and images into a document and selecting colors happens during the page-layout stage of the process. Type specs and template creation are often done by the art director or designer, while a designer or production artist lays out the pages and assigns the specified styles to blocks of type.

**ACQUIRING, CREATING, AND MANIPULATING DIGITAL IMAGES**

Images can be acquired with a scanner, video recorder, digital camera, or Photo CD. If you acquire them yourself, the quality of the results depends upon your skill level, and the sophistication of your equipment and software. You can also create your own artwork. Image creation and manipulation is becoming increasingly easier with improved software. Although the best work tends to come from those with a background in traditional photography, illustration, or painting, many designers and art directors are beginning to create their own images on the desktop, bypassing custom photography and illustration.

**CORRECTING COLOR**

Regardless of whether you acquire images yourself or have them scanned by a service bureau, some color correction is usually required. This can be a very tricky endeavor. What takes a skilled technician five minutes could take you hours. Don't underestimate the skill needed for color correction. Traditionally only color-house specialists had the equipment and skills to perform this task. Now, more and more designers, production artists, photographers, and illustrators are taking it in-house, which requires an understanding of some fairly sophisticated color issues and color calibration.

**TRAPPING**

*Trapping* is the process of making adjustments to colored items to account for misregistration on press. Many designers, production artists, and illustrators who attempt trapping in-house have trouble perfecting it. As a result, most spend less time trapping than they spend figuring out how to avoid it! Even with the improvements in desktop trapping software, trapping is still primarily the domain of a skilled service bureau technician.

**COLOR SEPARATION AND FILMS**

*Color separation* is the process of separating a continuous-tone image into four process colors (cyan, magenta, yellow, and black, or CMYK) for reproduction on commercial ink presses. Outputting color separations to film for plate-making is usually the domain of the imagesetting service bureau or
the printer with in-house prepress capabilities. While continuous-tone images are separated into four process colors, spot colors in the same document are also output onto separate pieces of film for plate-making. Designers and production artists can run separations on a laser printer to test whether colors are properly assigned.

IMPOSITION AND TRADITIONAL STRIPPING

*Imposition* is the process of arranging pages to fit on a large press sheet to optimize printing, folding, and trimming. *Stripping* is the task of actually placing the films on the press sheet mask for plate-making. Imposition can be performed manually, photographically, or on the computer. Imposition can be done by the designer, but is usually left to the production artist or service bureau technician. Stripping is reserved for the service bureau or printer.

PLATE-MAKING

Printers have traditionally made the plates that will run on their presses. To a large extent, this is still true, although new plate-making techniques that go directly from digital files, bypassing film, can put plate-making in the domain of the imagesetting service bureau.

PRINTING

Most printing is still done exclusively by commercial printers, but some short black-and-white print runs, or even certain types of color jobs, can now be done on desktop printers.

One of the keys to successfully working within this complex industry is determining where your design and production responsibilities stop and where service bureaus and printers begin. Your responsibilities can vary on different jobs, but you should be competent and thorough with the things you decide to do. Make sure you read your hardware and software manuals, build good relationships with knowledgeable people, and understand your responsibilities within the process. Only then can you successfully decide what part of the production process of each job should be done on your desktop and what part you should send out as part of the prepress process.
SECTION I
THE ESSENTIALS OF GETTING STARTED

CHAPTER 2
THE ESSENTIAL HARDWARE

The Central Components
Buying the CPU
Upgrading Memory
Monitors
Video Cards and VRAM

Data Storage and Transfer Devices
The SCSI Connection
Hard Disk Drives
Removable Disk Drives
Modems

Input and Output Devices
Scanners
Other Input Options
Printers

Networking

Service Bureaus Can Complement Your System

Keeping Your Working Environment Healthy
Avoid Cramping Yourself or Your Computer
Give Your Equipment Room to Breathe
Choose Your Seat Wisely
Avoid Bad Lighting and Eyestrain
Avoid Repetitive Motion
Avoid Aches and Pains
Take a Break
Listen to Your Body
Electromagnetic Fields

Summing Up
If you were a skydiver, would you buy an expensive parachute but skimp on the ripcord? Well, if you intend to seriously pursue electronic publishing, you can't afford to skimp on the principal system components: the central processing unit (CPU), random access memory (RAM), a keyboard and mouse, a monitor, hard disks, and external data storage devices and a printer.

The Central Components
The CPU is the brain of the computer, and RAM is the active memory that holds the files and applications as you work with them. The keyboard, mouse and monitor provide ways for you to interact with the computer. Hard disks provide storage for your files and applications. Other input and data storage devices can range from the 3.5-inch floppy disks drives that come standard with desktop Macs, to various kinds of other disks and tape drives.

Trying to choose the "best" or most "cost-effective" system components is like trying to hit a moving target because the state-of-the-art is continuously changing. But making the right choices at the beginning can save a great amount of difficulty later. Having a hot CPU without enough RAM to make it perform is like having the ripcord break and that expensive parachute stay in its pack! Don't slight yourself on the tools of the trade, but spend your investment dollars wisely.

If you're planning your first system purchase, you're entering this field at an exciting time. There are more choices for system purchases, at lower prices, than at any time since the Mac first appeared. Machines with the power that
commanded princely sums three short years ago can now be had at entry-level prices. So your system dollar can buy more computing power than ever. But with the rapid advancement in technology seen recently, buying an appropriate system can be a daunting task.

BUYING THE CPU

Things to Consider:

- Buy the fastest processor you can afford.
- Make sure there are adequate expansion slots for graphics and processor add-on cards.
- Make sure it supports more than 32 megabytes (MB) of RAM.

If you follow only one guideline when buying a computer system for electronic publishing it should be this: Look for expandability—even ahead of raw processing speed. For example, increasing the amount of RAM in a machine can sometimes increase overall performance better than changing the processor, and it can give you more flexibility in running software.

With the wonderful array of expansion options available, you can always upgrade to the latest and greatest processor when you have the resources.

Expandability is also required for the color and graphics accelerator cards needed for high-end graphics work. In recent years, Apple has tended to release systems in three general configurations that span from the low end to the high end of performance and expandability. Coincidentally, they tend to come in three distinct shapes; the low-end systems generally come in a thin, wide "pizza-box" style, the mid-level systems come in a thicker desktop box, and the high-end machines come in a side-standing mini-tower. The shape of the box is a good physical indication of expandability when it comes to the room needed to install cards and extra hard disk drives. RAM expandability, however, is more subtle. Because RAM chips or single in-line memory modules (SIMMs) aren't very big, the box size won't tell you much. To find out about the capability for additional RAM, you need to look at the system specifications, which are available from the dealer.

In addition to its mainstream line, Apple has introduced a consumer line called the Performa. While this line of computers is wonderful for home and educational use, it does not allow enough expandability to be considered for electronic design and production.
Section 1: The Essentials of Getting Started

Until early 1994, Macintoshes were based on a type of microprocessor called the 68000 series, manufactured by Motorola. The latest Quadra models, for example, are 68040 systems. In March 1994, Apple introduced a totally new class of machine called the PowerMac in the 6100/60, 7100/66, and 8100/80 configurations. In November 1994, Apple introduced the 8100/110 model and in January 1995 it upgraded the basic configurations to 6100/66, 7100/80, and 8100/100. These machines are based on a new chip called the PowerPC, which was created through an alliance among Apple, IBM, and Motorola. This chip is based on RISC (reduced instruction set computing) technology, similar to that used in UNIX-based workstations like Sun and Silicon Graphics systems, and it promises workstation-like performance on the desktop.

The primary component governing system speed is the speed of CPU, which is given in megahertz (MHz). The higher the number of MHz, the faster the processor. The new PowerMac models kindly display their processing speeds in the last two or three digits of the name. Along with differences in expandability and other on-board capabilities, the price of Apple's systems increases with CPU speed. However, in both the Centris and Quadra lines, the difference between the mid- and high-end system performance has been minimal, making the mid-level system the recommended buy for those without extraordinary expansion needs. While they are not quite as close in raw speed, this general observation also appears to hold true for the first PowerMacs.

Among the PowerMacs, Apple's low-end machine still has its limits. Running native PowerPC software, the 6100/66 is easily the fastest system you can buy for the money, but it offers only one internal expansion slot. That slot is a processor direct slot (PDS), not the NuBus-type used for most expansion cards. The PowerMac 6100/66 is inherently limited in its ability to accept internal hardware add-ons, especially the color cards needed by illustrators and other designers. For graphics and color publishing you'd be best served by at least the mid-level 7100/80 PowerMac.

Be aware that running older 68040-type software on PowerMacs will not yield the speed gains you expect from these faster machines. The software will run respectfully, but not even at the levels of regular Quadra performance. However, key Macintosh publishing and graphics packages such as PageMaker, Adobe Illustrator, QuarkXPress, and Adobe Photoshop are now available in "native" versions specially compiled for optimal performance on the PowerPC. Native publishing and graphics packages for PowerMacs
CHAPTER 2: THE ESSENTIAL HARDWARE

A PMC chip can store up to four times faster than its 040-based counterparts—usually two to three times faster than their 040-based counterparts. When you decide to increase the

Many Macs and PowerMacs come with 8 MB of RAM installed. That amount

early slower than it may and may not work with all applications.

After you choose a CPU, you'll need to decide about random access memory

Before you decide to max out your system, RAM should not be considered

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upgrading RAM. Some have a minimum number of slots that need to be filled and others need chips that run at a particular speed, so read your owner's manual closely. For example, if your system can work with open slots (a Quadra 800, for example), it's better to buy one 32 MB chip and have three open slots than to buy four 8 MB chips and have no room to expand. But when you do buy 16 MB or larger chips, make sure they are non-composite, because non-composite RAM has more stable performance than composite. (A composite 32 MB RAM chip, for example, could actually be made up of four 8 MB chips rather than a single continuous chip.)

If you plan to run programs like QuarkXPress and Adobe Photoshop at the same time, importing big files into them and printing in the background, you'll need much more than 24 MB of RAM. You'd be amazed how quickly your programs can eat up RAM after you allocate the appropriate memory to them. However, unless you need to do a lot of high-resolution digital imaging (working with full-color photos that will be printed), 40 MB of RAM should provide enough flexibility for your system. This brings us back to expandability. Some low-end machines cannot even accommodate this much RAM.

If you're a service bureau technician, production artist, graphic designer, illustrator, or photographer, you'll need to perform complex, RAM-hungry color work, and you should consider buying 64 MB of additional RAM to supplement the 8 MB that comes with the machine. For example, an 8 x 10-inch photographic image in 24-bit color CMYK format will occupy about 30 MB when you open it in Photoshop. To efficiently work with the image in Photoshop, Adobe says you need three to five times the file size of RAM available. Without it, the program needs to swap data back and forth from the hard disk, which is slower than RAM processing. Ninety megabytes of RAM may sound ridiculous, but if you work with large images on a regular basis, you'll realize why it's necessary the first time you have to wait for a filter to finish processing.

MONITORS
It never ends. Now that you've studied and made decisions about the CPU and memory, another knotty issue comes up—your video or screen display. Your computer screen is a critical investment, you'll be staring into it for a long time to come.

As with anything else in life, if you want quality, you're going to have to pay for it. In your work, a high-quality monitor is a must for viewing full color and calibrating color throughout your system with any accuracy. If you cut
corners in this area, you can also suffer from eyestrain and headaches from a monitor with inadequate performance adjustments. *(For more information, see "Keeping Your Working Environment Healthy" later in this chapter.)*

**Things to Consider:**

- There are only a few physical and performance characteristics you need to be aware of when deciding which monitor to buy:
  - Tube size
  - Dot pitch
  - Refresh rate
  - Multi-frequency display capability

**Tubes**

When you read ads referring to a "15-inch," "17-inch," or "21-inch" monitor, it isn't the monitor's height or width they're talking about but the diagonal measurement of the viewing area from one corner of the screen to another. Those numbers are also approximate. Few monitors measure exactly 15, 17, or 21 inches diagonally. Many 17-inch monitors may actually measure 15-1/2 or 16 inches, depending on the shape of the front plastic bezel that frames the screen. Most 20- or 21-inch monitors also come up an inch or so smaller. The numbers actually refer to the "size class" of the monitor rather than its actual size.

The picture tubes that actually serve as monitor screens are made by a few large manufacturers, including Mitsubishi, Hitachi, and Sony. The Sony Trinitron tube is considered by many to have the best display characteristics. Especially with the larger monitors, Trinitron tubes are generally thought to offer a sharper image and better color accuracy than other types. In the current large-monitor market, the leading producers who use Trinitron tubes are Radius/SuperMac (they merged), E-Machines, and RasterOps. However, once you begin shopping, you'll quickly notice that Trinitron monitors command a premium price for a high-quality monitor of 20 inches or more.

You don't have to select a Trinitron monitor, though. There are a number of high-quality monitors that use different tubes. In a side-by-side comparison, you may not be able to distinguish between them, and some very good 20-inch monitors are available for a significantly lower price. The key is to select the screen that looks sharp and clear to you and that has good performance characteristics, like a small dot pitch and a high refresh rate.
Many good-quality PC monitors are now being offered for sale on the Mac market. They're called auto synchronous and require an adapter to work on the Mac. But if you absolutely require cross-platform abilities, it's better to buy a Mac-based monitor that needs an adapter for a PC. Hook-up will be simpler, and Mac support (manuals and such) will usually be better.

**Dot Pitch**

*Dot pitch* refers to the vertical distance between adjacent phosphors of the same color (red, green, or blue) on your monitor. The smaller the dot pitch, the sharper the images. Monitors with Trinitron tubes have the tightest dot pitch of any products on the market. They average 0.25 millimeters (mm); 20- or 21-inch monitors will tend to have a somewhat higher dot pitch because of the sheer size of the screen. The dot pitch of other non-Trinitron monitors, called *shadow-mask* monitors, ranges from 0.26 mm to 0.39 mm and even higher. Some are excellent in quality, but you should avoid any monitor with a dot pitch over 0.31 mm.

**Refresh Rate**

The refresh rate determines how many times a second the monitor repaints the screen image. The higher the refresh rate, the more continuous the screen image will appear and the easier the monitor image will be on your eyes. Look for refresh rates of 72 Hz and above. Lower refresh rates create screen flicker, which can make you very uncomfortable over long work periods.

**Multi-Frequency Display**

The display resolution of a monitor is given in pixel dimensions. For example, a standard 14-inch monitor has a display resolution of 640 x 480 pixels, while 21-inch monitors have "two-page" display resolutions of 1152 x 870 pixels. The numbers refer to the horizontal number of pixels by the vertical number of pixels across the screen. Many big monitors can also support 1280 x 1024, and even 1600 x 1280 resolutions. Monitors with multi-frequency display capabilities use software to change resolutions. In this way, a 17-inch monitor can show a full two-page layout by changing to 1152 x 870 resolution. Squeezing two pages onto a smaller monitor will make your layout appear quite small. Nevertheless, if you can't afford a larger monitor, this capability can be very handy.

**What Monitor to Buy**

If you plan to do serious, complex color publishing (that is, if you're a bureau technician, graphic designer, production artist, illustrator or photographer), choosing a monitor becomes much easier, though more costly. You'll be best served by a 20-inch or 21-inch, high-quality, name-brand monitor. If you have to cut some corners in price, don't do it on the monitor side. A blurry or flickering screen is just not acceptable for all-day work.
If your business doesn’t call for many complex two-page color layouts, a
good 17-inch, multi-frequency monitor is a good bet. This size monitor may,

in fact, be preferred for detailed color imaging because of the excellent
sharpness and accurate color characteristics.

VIDEO CARDS AND VRAM

Things to Consider:
• 24-bit means millions of colors.
• Don’t confuse video acceleration with processor acceleration.

Color depth refers to the number of colors your computer system supports at
any given display resolution. Color depth is not related to the monitor but to
the hardware in your computer. The color depth your computer supports out of
the box depends on how much video RAM, or VRAM, is built in. Most Macs sold
today support at least 256 colors on most monitors. 256 colors or 8-bit color is
fine for viewing simple text layouts, but if you plan to do heavy-duty color
work at high resolutions, you’ll have to upgrade to 24-bit color to be able to see
millions of colors. There are two ways to do this. The one you choose will
depend on the computer you have.

The first way is by upgrading the VRAM if you have a PowerMac 7100, 8100, or
newer, high-end model. For example, the 7100 comes with 1 MB of VRAM built-in. To get 24-bit color on a 17 inch monitor you need to add an additional 1 MB
of VRAM. The 8100 has 2 MB of VRAM built-in. To get 24-bit color on a 20 inch
monitor, you need to add an additional 2 MB of VRAM. You can do this on
either model for less than $200.

The second way to get 24-bit color is by adding a video card. A video card
is a complex subsystem for your computer designed to boost color depth and
screen resolution. The primary function of video cards is to display 24-bit
color (millions of colors). Unfortunately, Macintosh video cards tend to be
expensive, sometimes costing as much as the monitor itself, or more. The
most costly video cards combine 24-bit color with video acceleration. Video
acceleration reduces the time needed to re-draw images on your screen. It
doesn’t affect the overall processing speed of your computer, but if you find
yourself waiting for images to re-draw, it can sure seem that way.

Most high-quality Mac video accelerator cards and special-function cards
are built for NuBus expansion slots, which are not available in low-end
Macs. This means that if you’re planning to do heavy color work, you’ll need

- To get full 24-bit color (millions of colors) on larger screens, you may need a video
or color card.

Some special expansion cards are designed to accelerate specific
functions in your
computer. The most
popular ones (like those
made by DayStar Digital
and Radius) use digital
signal processor (DSP)
chips to speed up certain
Adobe Photoshop opera­
tions and sound
processing. It is impor­
tant to note that they
only speed up specific
functions—not the entire
video system or your CPU.
Make sure you know the
difference between a
color card with video
acceleration and a
Photoshop accelerator
when you look at expan­
sion cards.
to invest in a Macintosh that has better expansion capabilities than the
entry-level Macs discussed earlier.

**Data Storage and Transfer Devices**

If you're the proud owner of a new Mac with enough memory and speed for
your work, you're still not quite finished. You now need to consider two
more things: the data storage inside and outside of your computer, and how
your files are going to get from one place to another. These can be very
complex issues, and very expensive. To deal with these two things effective­
ly, you need to know about the types of storage devices that are available
for the Mac, their relative merits, and how to choose the right ones for
the job.

Data storage devices can be split into several general categories:

- Hard disks (internal and external)
- Tape drives
- Removable-media disk drives
- Magneto-optical disk drives
- CD-ROM (compact disc read-only memory) drives
- WORM (write-once-read-many) drives

When you need an additional data storage device, you need to keep a few
basic things in mind. The most important is function; what will the device be
used for most? Once you've decided whether you need an everyday work
drive, a high-capacity transfer disk to deliver files to clients or service
bureaus, or a backup device for long-term storage of files, the rest comes
down to price and performance characteristics.

**Things to Consider:**

- Storage capacity
- Speed (access time and transfer rate)
- Cost to buy and cost of additional media (per MB)
- Portability and compatibility with vendor equipment

**THE SCSI CONNECTION**

Whether it's a tape drive, an external hard disk, or a removable disk, any
external data storage device you buy will be connected to your system in
the same way—through the SCSI port. SCSI (pronounced "scuzzy") stands for
small computer system interface. You can connect up to seven different devices to your Mac by hooking one device to another, with the last device hooked to the SCSI port on the computer. Color publishers usually build a long SCSI chain (sometimes called a "daisy chain") as they add equipment. While SCSI architecture is simple and useful, many truly baffling problems can occur when several SCSI devices are connected. (See Chapter 4, "Managing The Desktop." for more information on SCSI problems and how to address them.)

HARD DISK DRIVES

The hard disk drive is a critical part of your desktop system because all those huge files, graphics programs, and operating system components you’ll use need to be stored somewhere. The speed of a hard drive is important to system performance because the faster it is, the faster your disk can find (access) files and load (transfer) them into RAM, thus, the faster your CPU can work. With the rapid advances in CPU speeds, overall system speed is becoming limited by the ways data is transferred between the CPU, hard disks, and other devices. In fact, radical redesign of both the internal and external device connection architecture is underway, so we can expect even greater improvements in desktop computer performance in the future.

Every Mac available comes with an internal hard disk, often around 250 MB. Do you need more? Certainly. You’ll need as much disk storage as you can afford for your work, especially for color publishing that involves high-resolution, bitmapped images. When you decide to buy another drive, look for the most affordable combination of low-access time (given in milliseconds ms) and high data transfer rate (given in MB per second). Currently, the best drives have access times less than 10ms and transfer rates of more than 3 MB per second. The best disk manufacturers offer warranties of three or more years, and their disks will have high “mean time between failure” (MTBF) ratings of 300,000 hours or more.

REMOVABLE DISK DRIVES

Removable disks work much the same way that hard disks do except that the recorded media, either a disk or tape, can be removed from the recording device and safely transported or separately stored. For serious publishing work, you will certainly need more than the standard 1.4 MB floppy disk to transfer and archive files.
Removable Magnetic Disks

Magnetic disks work by recording data magnetically onto disks coated with a thin metallic film. This is the same technology used in floppy disks and hard disks. Two name brands are prominent in removable magnetic disk storage—SyQuest and Bernoulli. Both offer roughly the same capabilities and they're competitive in price. It's a bit easier to find SyQuest drives than Bernoullis at service bureaus, so check with the service bureaus you're likely to be trading disks with before you buy.

If you think Macintosh model names and numbers are complicated, removable media names are even more fun. For example, you can buy five different types of SyQuest removable drives and disks—44 MB, 88 MB, 105 MB, 200 MB, and 270 MB. Many Macintosh mail-order companies sell these drives and disks under their own names.

For the most part, removable media isn't a bargain. While the drives themselves tend to be reasonably priced, the individual disks or cartridges can be expensive compared to other technologies on a MB per dollar basis. Of the various SyQuest drives, the biggest turns out to be the best bargain. A 270 MB SyQuest drive offers several advantages: high speed (as fast as most low-end hard drives), decent capacity, and a good price per MB for cartridges. On the other hand, 44 and 88 MB SyQuest drives are very popular in service bureaus. That's their only advantage, because you spend as much for their cartridges as you do for a 270 MB cartridge.

Optical Media

In contrast to magnetic media disks, optical drives use a magneto-optical (MO) mechanism to read and write on CD-like disks. So-called MO drives are becoming more popular for everyday storage and file transfer. They closely resemble 3-1/2 inch floppy disks in size and shape, but they offer much higher capacity with their optical read-write capabilities. Typical MO drive capacities are 128 MB and 230 MB. Although they're slower than SyQuest or Bernoulli drives, they combine capacity with reasonable speed. They also offer a relatively low cost for disks.

Optical drives use the same MO recording technology, but they record on larger (5-1/4 inch) disks that can hold several gigabytes (GB) of data (one GB is equal to 1,000 MB). These systems are most commonly used for heavy-duty data back-up. For most print work, a 128 or 230 MB MO should work well.
CD-ROMs and WORMs

Many people are becoming very familiar with CD-ROM (compact disk read-only memory). Read-only means just that, you cannot record onto CD-ROM disks without special equipment. These disks offer 650 MB of storage in a slim, convenient package. CD-ROM readers have become important to digital production because of the proliferation of software packages, art libraries, photo collections, and typeface collections offered on CD-ROM disks. The medium has proven to be convenient and reliable for data storage. (And all the best games are on CD-ROM! Not that you, a serious professional, would waste valuable time playing a game…)

Fortunately, you won't have to spend thousands of dollars for a CD-ROM drive. A good, double-speed CD-ROM drive should cost you about $200 or maybe less, and double-speed is sufficient for most needs. Faster CD-ROM drives exist, but you won't see a noticeable improvement in performance between a double-speed and a triple-speed CD-ROM drive. However, quadruple-speed drives are now available that are noticeably faster than double-speed. It's only a matter of time before quadruple-speed drives are the norm.

WORM (write-once-read-many) drives are seldom-used devices similar to CD-ROM, except that you can actually write to WORM disks one time. Once you write data to a WORM disk, the data can't be changed, only read. WORM drives are mainly used for archiving and data storage, but they tend to be as expensive as optical drives, and they obviously aren't erasable, so they aren't widely used.

Tape Drives

A tape drive is a storage device that uses a special tape cassette (based on digital audio tape or DAT) to store data. For retrieving data, tape drives are much slower than disk drives because the reading head can only scan or record as fast as the tape can be rewound. The difference between a tape drive and a hard disk or removable disk is like the difference between rewinding to find a song on an audio tape cassette and pressing a button on an audio CD to hear the song right away. Because they have relatively slow access times, tape drives are not particularly useful in desktop publishing or graphics, other than for file backup.

DATs have extremely high capacity—from 8 GB (gigabytes) to 20 GB or more. Tape is the best way to go for massive, long-term data storage and for complete system backup. Tape drives have two great virtues: large storage capacity and inexpensive storage media.
MODEMS
A modem is a device that takes digital data from your computer and transfers it through telephone lines to a modem at another location. It's handy for transferring files to your service bureau, clients and colleagues and for downloading information and software updates from online services and bulletin boards (BBS). (See Chapter 4, "Managing the Desktop," for more about online services.) Unlike, the drives discussed earlier, modems are not SCSI devices. You can buy modems that are either external devices that connect to your computer through a special port or internal devices installed inside your computer.

Most modems manufactured today also have built-in fax capabilities. A fax modem can send files to be printed out on fax machines and can receive transmissions from fax machines and store them as digital files on your computer's hard disk. Some modems even have built-in telephone and answering machine capabilities.

Modems vary in the speed that they can transfer files. Some of the older models start at 1,200 and 2,400 baud (bits of data per second) and the newer models are 9,600 to 14,400 baud and higher. Speed is an important consideration for design and illustration professionals, who will have to transmit large files so it's best to buy a 9,600 baud modem or higher.

Input and Output Devices
Input and output devices are essential to effectively interact with your computer system. Digital color publishers require much more than just a mouse and a keyboard.

Things to Consider:
- Color scanner
- Mouse, trackball, keyboard, digitizing tablet
- Black-and-white laser printer
- Color printer

SCANNERS
To round out your production environment, you need a good-quality desktop scanner. A scanner will become one of your most important data input devices, giving you the ability to bring color images, line art, and illustrations into your system. Although the purchase of a scanner is optional when you set up a system, it probably won't be long before you find you can't live without one.
Scanners work by shining a light at an image (either printed or on film) and passing a small photo-sensitive device across it line-by-line, measuring reflected light and translating it into digital information. Flatbed scanners use a device called a charge-coupled device (CCD), and drum scanners use a more capable, but expensive, device called a photomultiplying tube. Because CCDs can only sense light and dark, red, green, and blue (RGB) filters are used to interpret color. One-pass color scanners collect all three colors at the same time, while three-pass scanners do each color separately. The quality from one-pass and three-pass scanners is usually about the same, but one-pass scanners are faster.

Making the Choice
Images are an important aspect of design and color publishing. Unless they are created entirely by computer, images and illustrations have to be scanned and translated into digital form. The quality of scanned images depends on a number of basic characteristics of scanning equipment. Similarly, the type of originals that need to be scanned determines the type of scanning equipment to be used.

Things to Consider:
- Resolution
- Color depth
- Registration
- Types of originals

Resolution
Scanner resolution is similar to laser printer resolution, except that instead of printing at a certain number of dots per inch, scanners read data at a certain number of samples per inch and create corresponding picture elements, or pixels. Scanner resolution is referred to as pixels per inch (ppi). True resolution is based on the sampling ability of the individual scanning mechanism. But resolution can be increased through hardware or software interpolation. For example, a desktop scanner may be capable of achieving 300 or 600 ppi without any additional support. To attain a 1,200 ppi scan of a picture, interpolation can be used to “average” the color values of adjacent dots in the scanned image. The average values are then used to create additional pixels between the originals for the final scanned image. Some desktop scanners offer good quality interpolation, but even the best cannot retain the detail of the scanners used by most service bureaus.
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You may be able to purchase replacement bulbs for your scanner at your local hardware store instead of from the scanner manufacturer. You can usually find the same kind of bulb, and it's quicker and cheaper.

Color Depth
Most color scanners are able to collect 24 bits of data per pixel, and some are capable of scanning at 30- or even 36-bit color depths. (Of course, if you don't have 24-bit color capability on your system, you won't be able to see all the colors that are actually in the scan.) This capability can be important for photographers and imaging professionals who work with continuous-tone images because the more bits of information per pixel, the greater the number of colors (or shades, or tones of color) that can be captured and the more realistic their images will appear. This color sensitivity is also referred to as dynamic range. The dynamic range of a scanner is given on a scale between 0.0 to 4.0 scale from the minimum and maximum number of tones that it can scan, from whitest to blackest.

Registration
Scanned images consist of combined samples of red, green, and blue (RGB). The precise positioning of RGB samples to reproduce the original image is known as scanner registration. If the registration is off, you may see one or more of these colors banding on edges in the scanned image. To check registration, magnify or zoom in the scanned image in Photoshop or some other image-enhancement program (by perhaps a ratio of 6 to 1), and check for individual red, green, and blue color lines. (Color on the desktop is discussed in detail in Chapter 8, "Color Concepts and Management.")

Types of Originals
To be able to achieve the best results, scanners have been specially optimized for specific image media such as photographic prints, 35 mm slides, or negatives. While it is possible to scan most images on more than one device, there is usually a particular device that works best. By understanding the types of originals you intend to scan, and the resolution and color depth you need to create your final product, you should be able to make the right choice for the job.

Types of Scanners

Three Options to Consider:

- Color flatbed scanner
- Color drum scanner
- 35 mm slide scanner
Flatbed Scanners
Flatbed scanners can be used for scanning two-dimensional artwork, photographs, film, and slides. (Some three-dimensional objects can be scanned as well.) Flatbed desktop scanners are very useful, surprisingly flexible and powerful, and available for reasonable prices. They're a popular option for graphics professionals because of their ability to capture images from a variety of originals and are also popular with desktop publishers because of their use in scanning text for optical character recognition (OCR), which is discussed in Chapter II, "Components of the Digital Mechanical".

When buying a flatbed scanner, look for a true resolution of 600 ppi or more. You'll need that level of resolution if you plan to print the images you scan. Average-quality desktop scanners will support at 24-bit color (16 million colors), but the better flatbed scanners offer 30-bit scanning. Flatbed scanners have an average dynamic range of about 2.8, which is the lowest of the scanner types described here. However, models with a dynamic range of 3.0 are becoming more common and affordable.

Select a scanner that supports an optional transparency adapter if you will be scanning film or slides. Also, buying a scanner is a good way to get your copy of Adobe Photoshop. The full version (not the LE or limited edition) usually comes bundled with the higher-end scanner you should buy anyway. If you need to scan multi-page documents for OCR, many desktop scanners also come with optional document feeders and OCR translation software.

Drum Scanners
These scanners work just as the name implies; images, both prints and film, are mounted on a drum that rotates rapidly past the scanning mechanism, which is usually a photomultiplier tube (PMT) that has greater sensitivity than the CCDs used in flatbed and 35 mm slide scanners. Drum scanners have very high true resolutions, in the range of 2,000 to 5,000 ppi, and can scan in 48-bit color (12 bits each for cyan, magenta, yellow, and black). The combination of high resolution and the PMT device gives drum scanners the best dynamic range of all of the scanner types, usually 3.8 or 3.9 of a possible 4.0. Although desktop sizes are available, most drum scanners are found in service bureaus for high-resolution commercial scanning. It almost goes without saying that drum scanners are very expensive.

35 mm Slide Scanners
35 mm slide scanners are specialty devices that can scan only 35 mm slides or mounted negatives. They are popular with photographers and magazine
publishers and most service bureaus have them. Slide scanners operate at very high resolutions, usually 2,000 and 5,000 ppi or higher. You'll sometimes see their resolutions abbreviated as 2K and 5K. These high resolutions are needed because when the images are finally printed, they're almost always significantly larger than the original slides. (The effect that resizing images has on scan resolution is described in Chapter II, "Components of the Digital Mechanical.")

The dynamic range of slide scanners varies between 2.2 for the less expensive desktop models (which scan in 24-bit color) and 3.7 for the professional models used by service bureaus (which scan in 36-bit color). Although they can scan at resolutions comparable to drum scanners, slide scanners generally have a smaller dynamic range because they use CCD scanning technology rather than the more sensitive PMTs found in drum scanners.

The Kodak Photo CD process uses a specialized slide scanner and color management system to capture images from film originals and save them on an optical CD-ROM. Photo CD is available through service bureaus. (Photo CD is discussed further in Chapter 6, "The Service Bureau as Your Partner.")

OTHER INPUT OPTIONS

Scanning is only one way to convert information for use on the computer. Other devices are needed to type, draw, and otherwise interface with your Mac.

Input Devices to Consider:
- Keyboard
- Mouse
- Trackball
- Digitizing tablet
- Digital camera
- Video capture cards

Keyboard

Most designers, illustrators, photographers, and production artists rely on the mouse and only utilize the keyboard for typing text and for shortcut commands. In most cases, a standard keyboard is all that you need. But if you do a lot of typing, you might want to consider an ergonomically designed keyboard. (See "Keeping Your Working Environment Healthy" later in this chapter for more information on ergonomics.)
Mouse
A mouse comes free with your CPU, so you'll automatically have one available. But you may choose to use a trackball or digitizing tablet instead, depending on your work and your preference.

Trackball
If you have limited desk space or want to use an alternative to a mouse to avoid repetitive motion disorders, you may be interested in purchasing a trackball. Some people find trackballs difficult to use, others see them as a godsend. Definitely test a trackball before purchasing it. If you don't find one particular trackball comfortable, don't assume they are all uncomfortable. Try different brands before deciding whether to buy one.

Digitizing Tablet
If you are going to be working with any of the painting, manipulation, or illustration programs, a digitizing tablet is a must. These tablets are the electronic equivalent of pen and paper. They consist of an electronic stylus (pen) that you use to draw on a plastic pad (tablet). As you draw, you move the cursor on the screen just as you do when you move the mouse. The strokes you draw are translated into lines (in an object-oriented application) or into painted brush strokes (in a bitmap paint program). (Object-oriented and bitmapped image formats are described in Chapter II, "Components of the Digital Mechanical.") There are many brands of tablets on the market, distinguished by physical size and price. The bigger the better if you plan to illustrate or paint digitally. But if price or space is your concern, you may want to consider a smaller one. The better models will be pressure-sensitive. That is, they can interpret how hard you press and create thicker or thinner lines or brush strokes.

Digital Camera
Digital camera technology is still developing, so it's expensive and the quality is not as good as it probably will be in the future. The great thing about the technology is that it allows you to capture an image as a digital file and download it directly into the computer. Costly film, chemicals, and delays are eliminated and there is no need for scanning. Digital cameras such as the QuickTake 100 by Apple Computer are handy and reasonably priced, but the image reproduction is still substandard for high-quality work. Even with image adjustments in Photoshop, detail falls short. Digital cameras are...
definitely going to be the way of the future for color publishers—the speed is there now and the quality can be expected to improve.

**Video Capture Cards and VCRs**

Still-frame images can also be captured from video tape and imported to the Mac from a video camera or VCR. To do this, you not only need the camera or VCR, but you also need at least a video-in card and the appropriate cables. The quality of the video capture card and the recording determine the quality of the images that can captured from video. If you anticipate the need to capture images from video for print work, look for a high-quality video card and VCR. The video card will come with basic capture software and may also include video editing software such as Adobe Premiere.

**PRINTERS**

**Things to Consider:**

- Buy PostScript-capable printers.
- Buy a black-and-white laser printer.
- A color printer is an option.

Your office or studio wouldn’t be complete without a way to print your work. Most freelance designers can get along with a good-quality, black-and-white PostScript laser printer. Throw in an inexpensive PostScript color ink-jet printer and you’ve got the makings of a versatile design and proofing system. Before a discussion of what to look for when buying black-and-white and color printers, a brief description of PostScript is in order.

Buying a PostScript printer is very important to a digital color publisher, because what you print on an in-house printer needs to match what will be output from an imagesetter or any other output device. PostScript is a page-description programming language developed by Adobe Systems, Inc., that tells an output device how to compose a page. You can output to any PostScript device and your final page will look the same on all of them (varying only with the resolution and color capabilities of the printer). Level 2 is the current version of PostScript. It’s far more stable and efficient than the previous versions.

When you print a graphic or image file on a PostScript printer, it’s converted into a series of commands that describe how to draw the image. After your file is converted into this format, a machine equipped with a PostScript
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interpreter (such as a laser printer, a desktop color printer, or an imagesetter) can read, interpret, and organize the commands stored in the PostScript file to re-create the final image. True PostScript printers are expensive because companies must license the rights for PostScript from Adobe. There are PostScript clones that are cheaper, but the Adobe version is the industry standard and it's best to stick with the real thing.

**Laser Printers**

*Things to Consider:*
- Resolution
- PostScript compatibility
- Printing speed and RAM
- Paper handling
- Expandability and connectivity

**Resolution**
The quality of a laser printer's output is determined primarily by how many dots per inch, or dpi, it can print. The dpi refers to the number of "dots" a printer places on one linear inch of paper. You'll sometimes see the resolution given by two numbers, like 600 x 600 dpi, which refer to the horizontal and vertical print resolutions, respectively. The "true resolution" of a printer is the actual number of dpi its hardware can physically print both horizontally and vertically. If you only see one number given for resolution, it usually means the horizontal and vertical numbers are the same.

Today's least expensive laser printers offer 300-dpi output, which was originally the industry standard. Many laser printer manufacturers now offer 600-dpi machines at prices they used to charge for 300-dpi printers.

Some vendors offer laser printers that can achieve up to 1200 dpi and that can print on paper as large as 11x17 inches. These advanced features are still relatively expensive but, as with all equipment, you can expect to see prices drop in the coming years. However, printing an 11x17-inch page at 1200 dpi requires more RAM.

**Printing Speed and RAM**
When looking at a printer's performance specifications, you'll typically see a page per minute (ppm) number between 8 and 20. A high ppm printer engine is only important if you're printing lengthy but simple documents.
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with only a couple of fonts, or numerous copies of the same document. What’s more important for most designers and desktop publishers is the amount of time it takes to process (primarily doing the PostScript interpretation) and print complex illustrations or layouts. You won’t see this listed as a performance specification because it varies with the complexity of the document. Printers are configured much like a computer in that they have a CPU and RAM for processing. In general, look for printers that use a RISC processor (they use the same technology as the PowerPC) and have at least 6 MB of RAM installed. Just as they are for your computer, a fast processor and lots of RAM are the keys to speedy printer performance. To evaluate processing speed, you’ll need to do some testing using your own files.

(For information about PostScript fonts, see Chapter 3, “The Essential Software.” Chapter 4, “Managing The Desktop,” provides information on PostScript errors. PostScript imagesetters are covered in Chapter 6, “The Service Bureaus as Your Partner.”)

Paper Handling
The way printers store and handle paper is important to overall performance and convenience. Some manufacturers keep costs down on their least expensive printers by not including an internal paper tray. These models use an external tray that extends from one end of the printer. This type of tray takes up more desk space and usually can’t hold very many sheets of paper. It’s worth it to spend a little more for the convenience of an internal paper tray—the higher the capacity the better, so you won’t need to reload paper as often. Most printers can also print on envelopes, but the envelopes usually get wrinkled in the process. The best printers for printing envelopes and odd paper sizes and weights have a straight paper path, which means the paper rolls straight through without getting turned over and around by the rollers.

Most printers are capable of printing on other types of stock including plastic transparencies and some types of craft paper. If you anticipate the need to print on heavy or irregular stock, check the printer’s specifications and do a few test prints before making your purchase.

Expandability and Connectivity
Finally, better laser printers have some degree of expandability and connectivity. The ability to increase RAM is desirable. Another interesting expansion option available on some printers is the ability to install a fax card to turn your printer into a plain-paper fax machine (some can only receive and others can send by “printing” a file to the fax card).
Many laser printers come with a SCSI port to connect a hard disk to store fonts. This set-up is used to eliminate the delay involved in downloading fonts from the computer, so they won’t take up as much of the printer’s RAM. If you use a lot of fonts, buy a laser printer that has support for a hard drive. You’ll see a great increase in printing performance with this feature, first because there’s no wait for downloading, and second because more RAM remains available for processing. If you work in a cross-platform environment and need to print from a PC, look for a printer that has the necessary ports and PC software.

**Color Printers**

**Things to Consider:**
- The output quality you need
- Print durability
- Paper size and transparency options
- Purchase price
- Cost of supplies
- Cost and availability of service

Desktop color printing is a rapidly advancing technology. Color printers available today use a variety of different pigment application technologies: ink-jet, dye-sublimation, thermal wax transfer, and color laser, and prices continue to fall.

Color printers of any type produce color printouts by mixing cyan, magenta, yellow, and black (or just cyan, magenta, and yellow). The type of pigments and the way they are applied to paper are the key differences between printers. Each has its own unique advantages and disadvantages. Of the large hardware components discussed so far, a desktop color printer is the first piece that’s truly optional—nice to have but not essential, because if you need a good-quality color proof you can go to a service bureau.

If you decide that you absolutely must be able to print in color in your studio, you’ll have to do a lot of homework before selecting a printer. The problem is that the available technology can cost anywhere from less than a thousand dollars to tens of thousands. The key is to define what you need color prints for and what quality is acceptable. One interesting thing about color printers is that many designers don’t want a perfect, highly saturated
print because it can create unrealistic expectations on the part of the client which may not be met by the final printed piece.

**Thermal-Wax Printers**

Thermal-wax printers use a roll that contains sequential rectangles of cyan (C), magenta (M), yellow (Y), and (sometimes) black (K) heat-sensitive pigments. Each of those rectangles is the size of the sheet of paper on which you're printing—cartridges usually come in standard letter and tabloid sizes. To create a four-color (CMYK) image, the four wax panels are sequentially pressed onto the piece of paper and heated pins transfer the colored wax to create the printed picture. The final result tends to be very shiny and easily damaged.

Replacing thermal-wax rolls is expensive, and you can generally get them only from a vendor who sells the printer. They also tend to be fairly wasteful because the colored wax sheets can't be used again, even if only a small part of the sheet was used for the print. Nonetheless, thermal-wax color printers have become the most popular option for inexpensive color prints in service bureaus. Though still expensive compared to other color printers, their prices have dropped substantially.

**Dye-Sublimation Printers**

In dye-sublimation printers, the image is created by a solid dye that is changed into a gas and then condensed on the paper. These printers usually achieve a resolution of only about 200 dpi, but because of the way color is applied, the dots can spread out and there is no noticeable dot patterning. Images usually resemble the quality of a photograph, but printed text can look soft instead of crisp and clean. Dye-sublimation printers are among the most expensive desktop color printing systems.

**Solid-Tone Printers**

Solid-tone printers use powdered inks to create their images. Canon and Kodak created the technology, which is also used for color copiers. The resulting quality is quite similar to that of laser printers. Solid-tone printers use four powdered ink reservoirs; ink is used only as needed, and each reservoir can be filled separately when it runs out. Tektronix makes a relatively small solid-tone printer that doubles as a color copier, which can be placed on your desktop and hooked directly to your Mac.
Ink-Jet Printers

Ink-jet printers use ink nozzles to spray carefully measured amounts of ink onto the paper. Some color ink-jet printers use two ink nozzles and some use four. Color ink-jet printers typically offer between 300- and 600-dpi color output, and some offer true 720-dpi resolution. Because of the way inks tend to spread and be absorbed, ink-jet print quality depends heavily on the paper used for printing. You can buy glossy paper stock made especially for ink-jet printers, which provides very good print quality. Usually an ink-jet print on a glossy paper stock will yield a more vivid color image than one that’s printed on typical copier or laser printer paper stock. However, several major paper producers make non-glossy paper stocks that also provide good results.

The quality of ink-jet output is also controlled by software. Most low-cost printers don’t come with PostScript built in, but you can add it by buying software. For example, Hewlett-Packard (HP) offers a PostScript driver for its ink-jet printers. Without PostScript (either Adobe or a clone), you may have trouble printing from PostScript-based applications like QuarkXPress, Adobe Illustrator and PageMaker, or Macromedia FreeHand, and, if you can print, the quality may not be adequate. Upgrading your color ink-jet printer to PostScript is worth the extra cost.

Ink-jet printers tend to be less expensive than other color printers both in purchase price and cost of replacement cartridges. With PostScript, they can be extremely useful for printing basic proofs of color separations and color artwork. Though their quality is not ordinarily good enough for final output. Because of these characteristics, a good-quality ink-jet printer can be an inexpensive and effective way to add color output capability to your studio. Again, HP and Apple tend to dominate the Macintosh market in this area.

Another, more expensive type of ink-jet printer technology is called solid ink. Wax sticks are used inside the printer. They’re melted and the wax is sprayed onto the paper surface, where it quickly dries. Unlike regular inkjets, solid ink does not soak into the surface of the paper, resulting in more vivid color. Another advantage is that you can use a variety of paper stocks in solid-ink printers. Their main drawbacks are extremely long warm-up times, slow printing, and relatively high prices. They also aren’t particularly good for printing transparencies.

Color Laser Printers

Color laser printers are just starting to appear at prices comparable to high-end dye-sublimation and thermal wax transfer printers. One available model uses four toner cartridges and weighs in at a back-breaking 106 pounds. HP
and Xerox offer color lasers primarily intended for production of presentation transparencies, flyers, and other business color documents.

**Networking**

The issue of networking or connecting several computers and various printers to work together is beyond the scope of this book. In a larger office or studio with Macs, PCs, printers, and maybe a file server or workstation, leave it to the professionals. But if you have an office or studio with a couple of Macs and a printer or two, installing a network is easy; you can do it yourself.

Apple has made it easy to build a basic Mac network. For years, Apple has built in the hardware and provided the basic software (called AppleTalk) to set up a LocalTalk network. All you need are LocalTalk connectors for each Mac and printer, and the cable to connect them. You can use either Apple LocalTalk connectors and cables, or connectors made by other vendors that use normal telephone wire and tend to be less expensive. There are a variety of hook-up arrangements that will work, like a straight daisy chain (where components are linked in series) or hub-and-spoke (where individual components are linked to a central computer). Clear illustrated instructions come with most connectors, so it's tough to go wrong.

Once you have hooked up the cables, you can enable LocalTalk networking by opening the Network control panel in the System folder and selecting "LocalTalk Built-in." (The other available selection is EtherTalk; more on that later.) To begin sharing files and programs between computers, you open the Sharing Setup control panel, give your Mac a name, enter a password for security, and click on Start. How's that for simple? Now anyone on the network who knows the name and password of your computer can share the files stored on its hard disk.  

The trade-off for simplicity is speed. LocalTalk is entirely adequate for copying files from one computer to another and for most types of printing. However, printing or copying massive design files is another story. It can
take more than twice as long to move one of these files on LocalTalk as it does on EtherTalk, which is the other network system supported by AppleTalk. EtherTalk is Apple’s software to run an Ethernet network.

In contrast to LocalTalk, EtherTalk requires an additional card or external box and more complex connectors (called transceivers). In recent years, Apple has begun to include the hardware to set up an Ethernet network on its machines along with the EtherTalk software. Quadras and PowerMacs come with built-in Ethernet cards and ports. However, most laser printers do not have built-in Ethernet capabilities, so a separate printer router is required to complete the network. The cost of Ethernet hardware has continued to fall, and it has become simpler to install. With the speed advantage it offers, it appears that, before too long, Ethernet will replace LocalTalk as the most common type of Mac network.

**Service Bureaus Can Complement Your System**

As an active participant in the digital design-to-production process, you’ll probably be spending a lot of time working with service bureaus to produce your finished designs. It’s important to know that besides doing final pre-press, service bureaus can be a big help in the up-front design phases of a project. In many ways, you can think of a service bureau as an extension of your in-house capabilities. All service bureaus, large and small, have to purchase expensive imagesetters, color printers, high-end Mac workstations, and a variety of other costly equipment to carry out their work. By leasing time on their equipment or hiring them directly, you can put off buying things like scanners, color printers, and the big-time hardware and software needed for high-resolution color image work.

Service bureau equipment often comes with costly service contracts, and requires constant calibration and maintenance. As a result, service bureaus hire skilled technicians to maintain and calibrate equipment, troubleshoot problems, and find answers to your questions. These technicians can be an invaluable source of information. By consulting them at the start of a project, you can avoid a variety of problems in the production and prepress stages. *(For insight into working with service bureaus, refer to Chapter 6.)*

**Keeping Your Working Environment Healthy**

If you’ve just bought a ton of hardware and software, you probably can’t wait to set it up and get to work—day and night, seven days a week. Before you do, it’s important to properly set up your office environment or studio...
because the nature of your working environment affects not only your mental and physical well-being and the quality of your work, but also the performance and life span of your equipment. Make your environment safe for you and your equipment.

If you've spent any time in a professional service bureau, you may have noticed some very particular features of the working environment. Since the work space is specifically designed to house computers and output equipment, it tends to have certain characteristics:

- Clean, uncluttered working environments
- No windows
- Controlled lighting
- Gray walls
- Both standing and sitting workstations
- Desktop computers kept away from layout work areas

This type of environment is designed to enhance the performance and comfort of service bureau workers and equipment. The end result may not look warm or appealing, but it represents a conscientious effort to create an ergonomically sound and a less physically stressful environment. When setting up a system in your own environment, you can take advantage of the same techniques employed by many service bureaus.

Ergonomics began as the study of effective movement and machine control design in the workplace to maximize the efficiency of workers. The field has evolved to include the study of most aspects of human-machine interaction, including worker health. An ergonomically sound and healthy studio doesn't have to cost a fortune or require a long time to set up. Since the science of ergonomics has taken on the computer environment, much more information is available on how the workplace can be redesigned to prevent injuries.

Many hardware components have been redesigned to address ergonomic issues by taking human factors into consideration. The most important factor in having an ergonomically sound office is awareness of the potential for problems. It's important to know what to make a habit and what to avoid. Making small and seemingly minor changes, such as adjusting the tilt of your drafting table, or the height of your chair or desktop, can have an important cumulative effect on how you feel at the end of the day.
A word of warning: Ergonomics is by no means an exact science, and manufacturers of office furniture and equipment are using it as a marketing tool. "Ergonomic" furniture can be expensive, and the benefits of many ergonomic wares have yet to be proven. By being aware of your work environment and making a few simple adjustments, you can create a safe and productive work environment without spending your last dime on expensive baubles of dubious benefit.

AVOID CRAMPING YOURSELF OR YOUR COMPUTER

Your table or desk space is a good place to start when you're designing your office. If you already have a good desk, other information in the rest of this section can help construct a comfortable working environment around what you already have.

Make sure that your mouse and keyboard are far enough back from the edge of the table so your wrists can lie flat on the table while using these tools. Hanging on the edge of the table can be very uncomfortable and gives no support to your hands and wrists when they get tired.

Are "under-the-table" keyboard trays a good idea? Probably not. Most provide no wrist support and position the keyboard awkwardly for typing. Keyboard trays tend to be much lower than they should be. The convenience of being able to slide the keyboard under the desk and out of your way is far outweighed by the stress that can result from the poor typing position offered by such devices.

Special tables are available that allow your computer to sit well above the table surface, removing it from the desktop. A device similar to a "rack-mount" securely suspends the computer box above the desktop. This allows the table surface to be tilted and frees space for the keyboard, digitizing tablets, other equipment, and art and design materials. This type of unit is usually on wheels, and it can be conveniently moved to expose the cables in the back of the computer if necessary.

By following the tips presented earlier for setting up your keyboard location and height, you can reduce the chances of developing problems related to typing. Another consideration if you type a lot is the nature of the keyboard itself. Try some of the newer ergonomic-design keyboards like the Apple Adjustable Keyboard, which has built-in wrist supports, and independent control of the left and right halves so it can be opened out to match your most comfortable typing position.

To avoid eye and neck strain, don't place monitors either too high or too low. The top of the screen should be about level with your eyes, not above, and no more than 15 degrees below eye level.
Monitor placement is critical to your physical comfort. If you spend long periods of time sitting in front of your monitor (and it’s a pretty good bet that you will), a good rule of thumb is to have the top of the monitor roughly level with your eyes to reduce strain to your neck and shoulders. This can prove difficult with the large screens that are typical in the computer graphics field. Considering the importance of correct desktop height and depth for typing comfort, you may have to do some subtle juggling to find the best monitor viewing angles.

It’s generally recommended to raise your chair so that your elbows are at the same level as the middle row of your keyboard. If you are shorter than average, this may cause your feet to miss the floor. If this is a problem, buy a footrest to reduce knee or thigh problems that could occur from letting your legs hang.

Many ergonomic recommendations are designed to make sitting, typing, and looking into a monitor more comfortable over the long haul. Another way to avoid feeling cramped is to remember that you don’t have to do everything at the computer! Having a work table with nothing electrical
hooked up to it except task lighting is a great way to break away from the electronic ball and chain to do things like proofing and reading.

**GIVE YOUR EQUIPMENT ROOM TO BREATHE**

Make sure that you have adequate space between your peripherals, CPU, and monitor. By allowing space between your equipment, you allow the components room to breathe. Each component generates heat and most have fans that help keep them cool. By allowing space, you can ensure that they have enough fresh air to work properly. Also, if you have a cramped work area, you are more likely to bump the table while your disk drives are operating. Always avoid shaking and moving a drive while it’s running because this can cause severe problems, requiring reformatting or even replacement of the drive. The worst case is a head crash, when the reading head of the drive actually touches or crashes into the data disk. In this case, the damage to the hardware may be permanent, and files often can’t be saved.

**CHOOSE YOUR SEAT WISELY**

When it comes to setting up your work environment, the most basic and important thing you can do for your body is to buy a good office chair that’s fully adjustable and adaptable. It should have height-adjustable backrests to support the mid-section of your back. A backrest should have at least two comfortable working positions. It should tilt back as much as 30 degrees to allow you to relax regularly. Lumbar support is also important. Lumbar support is provided by the lower area of the backrest, which helps maintain the spine in the correct curvature. If you use your chair for extended periods of time, choose a chair in which you can change the contour of the lumbar support so you don’t have to sit in the same position all the time. The backrest should also adjust up and down to accommodate shorter or taller people. If you tend to lean forward for most of the day, you may also want a seat that will tilt forward.

Chair arms can also be helpful. Combining armrests with wrist support in front of the keyboard is a good combination to help avoid the exceptionally painful muscle and tendon problems that can result from long periods of unsupported typing. You can expect to spend at least a hundred dollars for a good office chair. Seek out vendors that specialize in ergonomic office equipment to become familiar with the types and brand names available. Once you know what to look for, shop around for the best price.
If you don't need to work in color (when you're doing text editing, for instance), switch your monitor settings to black-and-white. The screen will not only redraw more quickly but will also cause less eyestrain.

AVOID BAD LIGHTING AND EYESTRAIN

There are four problems that can cause eyestrain: inappropriate room lighting, glare on your screen, low-quality (slow refresh rate) monitors, and your own eyes. Most offices are overlit or have uncontrolled, indirect fluorescent lighting. First, ensure that light within your environment does not over-power the brightness of your screen. The eye naturally adjusts itself to the brightest light in the range of vision. If the room is too bright, your eyes will strain to focus on the screen and will constantly adjust as you look away from the screen and back again. Reduce the overall lighting in your environment. If possible, use task lighting to illuminate your workspace. At the same time, don't work in the dark. Keep a balance between the light in your environment and the light on your screen.

No matter how you look at it, outside light can cause eyestrain when you spend a lot of time staring into a monitor, so try to choose a room that has few windows. The flicker and glare from overhead fluorescent lighting can also cause significant eyestrain. Try tilting your monitor down a bit to eliminate the glare from overhead lights. Outside light from windows can also cause problems. If you have windows in your office, position your monitor so the light does not hit it directly. Problems can also result if you place your monitor so that you are directly facing a window while you work. In a room that's brightly lit from windows, your best bet is to place your monitor at a right angle to the windows. You can also buy anti-glare screen covers and shades to help eliminate glare.

Bad lighting situations will not only cause eyestrain, but can also cause errors in judgment for some types of work. If you have a color-calibrated monitor and color printer, you should make sure that your lighting environment stays pretty constant all day. This will help you make consistent color judgments on and off the screen. If you rely on light from windows to illuminate your room and work, your color selection may be wildly inconsistent from one time of day to another. Maintain consistent lighting and neutral reflections by using window shades and painting your walls a neutral color. Wearing neutral-colored clothing will also help. As mentioned earlier, for graphic design work, you need a high-quality, flicker-free monitor, and that means a refresh rate of 72 Hz or more. (For more about refresh rates, refer to the "Monitors and Video Cards" section of this chapter.)

Have your eyes checked regularly, especially if you wear glasses. Most prescription glasses are set for a reading distance of 12 to 14 inches, but the...
average distance from eyes to screen is 24 to 30 inches. Ask your optometrist if you need a different prescription for your working environment.

AVOID REPETITIVE MOTION
Anyone who types for many hours or pushes a mouse around all day is a likely candidate for repetitive motion syndrome. Repetitive motion can cause inflamed tendons, which begin squeezing the nerves of the arms. The result is first numbness and then severe pain. It can become a permanent condition that only surgery can cure and can bring your productivity to a complete standstill. But a bit of advance preparation can save you years of difficulty.

Instead of using a mouse exclusively, you may want to try switching to a trackball or a digitizing tablet or alternating among all three of these input devices. By doing this you can avoid doing exactly the same motions day in and day out while you work on the computer. There are many trackball and tablet models, so try them out first at a nearby computer retailer to see what's comfortable. You can also order from a mail-order house, but make sure it allows returns if you're not satisfied.

AVOID ACHES AND PAINS
The number one cause of back, neck, and shoulder pain is sitting or standing in a hunched position for long periods of time. Whether you work at a desk or a drafting table, take some time before you begin working to get comfortable. Adjust the tilt of the table and the height of the chair so you don't hunch over. Make sure that your supplies are close by, to avoid reaching for them over and over again. Continuously reaching for distant items is a major cause of back pain.

Again, avoid positioning yourself and your equipment so you have to look up at your screen. If you favor placing your working monitor on top of your computer box, it will be hard to avoid being in this position. So try to make space for the computer elsewhere.

Try not to use excessive force when typing on the keyboard. Also avoid gripping your mouse or stylus pens too tightly. Continuous squeezing stresses the small muscles in the wrist and hand, and can cause permanent damage. It may be difficult to make yourself relax when you're facing a deadline, but it's important to adopt healthier work habits. Typing force, or a slightly misaligned position, may not seem like such a big deal in the short term, but the effects are cumulative and can be physically devastating in the long run.
TAKE A BREAK
The most important thing that you can do to avoid repetitive motion syndrome and other problems is to take breaks, and lots of them. A law adopted by the city of San Francisco in 1991 requires companies to give computer workers a fifteen-minute break every two hours. Some experts suggest that you should take a five-minute break every half hour. When you become absorbed in your work, it can be easy to forget to get up, stretch, walk around, or even eat. Taking a break is one of the simplest yet most important things you can do for your mind and body.

LISTEN TO YOUR BODY
If you are having recurring pains and aches, and adjustments in your environment don’t seem to help, see a physician. If the pains are caused by excessive muscle tension, you may want to think about getting regular massages. Depending upon where you live, the expense may be high, but it could be worth it.

ELECTROMAGNETIC FIELDS
Electromagnetic fields (EMF) are generated by everything from electric power transmission lines to radios, televisions, and toasters. The debate on whether EMF exposure causes adverse health effects remains unresolved. At this point, there is no clear indication whether EMF is or is not harmful. Most of the computer equipment that has been discussed as part of this chapter, monitors in particular, generate EMF. Their magnetic fields are at extremely low frequencies and, as a result, are often referred to as ELF.

Until the debate is settled, there is little you can do other than keep abreast of scientific development and take common sense precautions:

· When selecting a monitor, look for one that’s constructed and shielded in such a way as to minimize ELF to meet the Swedish National Board of Testing guidelines.

· As you work, stay about 30-inches away from your monitor.

· Turn your monitor off when you aren’t using it. Not only will this prolong its life, it will help reduce your exposure to ELF. (Many monitors that comply with EPA Energy Star guidelines have automatic shutdown modes.)
Monitor manufacturers and your local electric companies are possible sources of information on the sources of EMF and how to avoid them. But because they’re both generators of EMF, you should also seek other sources of information if this is of concern to you.

**Summing Up**
Simply choosing and building up your system can be a phenomenally complex undertaking. But many of the important considerations in choosing hardware can be summed up in a few words of advice:

- Get the most machine you can afford. Buy an expandable PowerMac if you can.
- You can never have too much RAM. Ditto for disk storage.
- Transportable storage and/or back-up storage is a must.
- If you plan to do two-page layouts and color work, you really need a good 20- or 21-inch color monitor.
- Get a good PostScript black-and-white laser printer; 600 dpi is best.
- If you need to, put off buying a scanner, but get one before you think about getting a color printer.
- Choose an inexpensive color printer. The prices are coming down and the quality is increasing.
- If you are going to be working with painting and illustration programs, definitely buy a digitizing tablet.
- If you have any type of repetitive motion disorder, or are concerned about such an injury, try a trackball.
SECTION I
THE ESSENTIALS OF GETTING STARTED

CHAPTER 3
THE ESSENTIAL SOFTWARE

The Programs You Can't Do Without
Page Layout Software
Text and Typefaces
Object-Oriented Drawing and Illustration Software
Digital Imaging and Manipulation Software

Software to Complement the Essentials
Page Layout Extras
Text and Type Extras
Object-Oriented Illustration Extras
Full-Featured 3-D Programs
Special Effects
Extras for Digital Imaging
Paint Programs
Production and Prepress Extras

Summing Up
When you look closely, you'll notice that there are three main components that make up just about any printed material: type, illustrations, and images. Each of the three components is handled differently by the computer and, as a result, you'll need specialized programs to create and combine them to produce a final printed piece. Programs to handle type, illustrations, and images are essential to your digital design and production system—you won't get very far without them. But it doesn't end there. Each essential type of software has a supporting cast of specialized applications designed to add functions and expand their capabilities (and yours).

The Programs You Can't Do Without
In electronic color publishing, the workhorse application with the ability to pull the various design components of a printed piece together is the page layout program. Page layout applications have the ability to import and place text, illustrations and digital images, but usually not before the
components have been created or modified in other specialized programs. Text is usually input through a word processing program, illustrations are produced with drawing software, and photographic images are created and manipulated in yet another class of software.

Besides software for design and production, a host of other programs are essential to any electronic publisher, such as the operating system itself, system maintenance and repair utilities, disk optimization and formatting programs, and virus protection utilities. If you plan to do layout and design for a living, you'll also be needing good business software for accounting, scheduling, and contact management. This chapter presents an overview of the software needed for design and production. These additional applications are described in later sections where their functions are more clearly defined.

PAGE LAYOUT SOFTWARE

Page layout programs are designed to imitate the way graphics professionals used to paste up images, text, and design elements to prepare mechanicals for printing. The goal is to have one application to pull together all the elements of a layout and create a "digital mechanical" to send for production. Page layout programs are the primary vehicle for multi-page document layout and production. They feature highly advanced text handling features like kerning and leading adjustment, type size and style selection, column layout, and spell checking. In addition to text handling, page layout programs are able to import and skillfully place digital images and illustrations from drawing programs. Professional page layout programs are also able to do color separations and specify commercial colors by vendors like Pantone, TruMatch, and Focoltone.

On the surface, page layout programs and word processing software seem very similar. They both handle text, can organize text into blocks and columns, and import graphics. The basic difference is that word processors are designed to create text documents for printing on office printers while layout programs are designed to stylize documents primarily for commercial printing. Although you'll probably wind up owning both kinds of programs (you'll see why later), it's important to recognize that a professional page layout program is the basic tool of the trade.

In the Macintosh publishing world, two all-purpose page layout programs have evolved to dominate the market. The first program to appear was PageMaker, followed by QuarkXPress. Both programs enjoy a loyal following and together serve over 90 percent of the Macintosh page layout market.
The clear recommendation is to select one of these two market giants and learn it inside and out. Each has its strengths and weaknesses and tends to have a different appeal. The choice between them typically comes down to personal preference.

**PageMaker**

PageMaker made its debut as the first professional page layout program for the Macintosh. The concept behind the design of PageMaker's interface and controls was to re-create the traditional graphic artist's work environment on the computer screen using a "pasteboard" analogy with familiar tools and organization. The electronic pasteboard represents the surface of the drafting board where you can temporarily place objects while designing your layout. Once they're on the board, design objects like text and graphics can be moved freely. These elements stay in view as you move from spread to spread.

The strength of PageMaker has always been its intuitive interface. Consequently, it has been a traditional favorite with the design community, especially with those who began working on the Mac when it first came out. The trade-off for focusing on the layout artist has been that the program is not as fully featured in the prepress area as is QuarkXPress.

**QuarkXPress**

QuarkXPress appeared on the market several years after PageMaker and took page layout software in a new and very powerful direction. Quark, Inc., came from the prepress end of the spectrum, offering precise color, very flexible type handling and excellent printing characteristics. It naturally became the application of choice for most service bureaus, prepress houses and artists working in production environments.
equal competitor to PageMaker, and eventually surpassed it in use by the
design community.

Unlike PageMaker, in QuarkXPress, you must place a text or image box on
the page in the layout before graphics or text can be imported or typed in.
This is probably the single greatest difference in the "feel" of programs. Some
people find the box method less intuitive and others don't seem to mind.

**Alternative Page Layout Software**

In addition to PageMaker and QuarkXPress, there are two special-purpose
page layout programs that deserve recognition: FrameMaker by Frame
Technology Corporation and PosterWorks by S.H. & Co.

**FrameMaker**

Like QuarkXPress, FrameMaker uses the box approach to handle text and
images and is designed primarily for business and technical documents.
Compared to QuarkXPress and PageMaker, FrameMaker offers fewer com­
plex page layout features, but it's a superb option for working with long text
documents and with documents that include tables, equations, and data. It's
a good program for simple magazines and newsletters, but it's especially
well-suited for book production, boasting the most powerful indexing and
table-creation features in its class. Among FrameMaker's most compelling
virtues is its compatibility across a wide variety of platforms, including Mac,
Windows, and UNIX. If you plan to create lots of book-length or technical
documents, FrameMaker is a strong candidate for consideration.

**PosterWorks**

PosterWorks was designed for creating large posters, exhibit
graphics, banners, and even billboards. With this program, you
have the flexibility of creating layout sizes up to 100 x 100 feet
and setting the size, number, and orientation of tiles and panels.
You can also select the placement, cropping, and size of each
layer of artwork. The program includes a library of templates for
signage and trade show displays, even formats for New York bus
shelters and standard phone booth displays. PosterWorks
allows you to import graphics from a variety of sources, sup­
porting both bitmapped and object-oriented art images. Posters
can be created on a small-format printer (such as a laser printer) by tiling
the image out one section at a time, which works on any PostScript compatible
printer. Tiled pages can then be pasted together for the final large graphic.
Because of the page size limitations of other programs, PosterWorks is
especially useful for creating very large-scale graphics.

When shopping for a page layout
program, avoid packages that
claim they are
"easy to learn" or "great
for the home office."

Many of these programs
are fine for designing to
output on a laser printer
but lack the professional
controls needed for high­
quality output.

In PosterWorks you can
create a layout up to 100 x 100
feet, which is excellent for large­
format graphics like trade show
exhibits and billboards.
TEXT AND TYPEFACES

Text is one of the three main components of a page layout. On the computer, there's a basic difference between what a text character is and what it looks like. Each letter of the alphabet and the other characters and numbers on the keyboard are represented electronically by a code in word processing and other text handling programs. On the other hand, the way a character appears on the screen and on the printed page is determined by its individual font or typeface software description. Because collecting, managing, and using fonts is a nearly constant activity for page layout artists, an introduction to what fonts are and how they're used is necessary. This chapter describes the various types of fonts and Chapter 4 presents tips and step-by-step organization procedures for font management.

There are a number of ways that fonts are defined for the screen and the printer; there are bitmapped "city" fonts, PostScript (Type 1 and Type 3) fonts, TrueType fonts, and Apple's new QuickDraw GX fonts. City fonts (with names like Geneva, Chicago, and New York) come loaded with Apple System software. Prior to System 7, city fonts were based on QuickDraw, Apple's screen drawing software. But now they are based on TrueType. QuickDraw GX fonts are a new class of fonts introduced with the release of System 7.5. PostScript Type 1 and TrueType faces are the two types you will have the opportunity to purchase for your collection.

City Fonts

City fonts are used primarily for on-screen viewing and printing on non-PostScript printers. Examples of city fonts include Chicago, New York, Monaco, and Geneva, which come with the Macintosh Operating System (Mac OS) software. They were designed for the large pin size limitations of the original dot-matrix Apple ImageWriter printers and for easy viewing on the computer screen.

City fonts are not used in professional practice because of their incompatibility with PostScript output devices. When do you use them? Because they were designed for optimum screen legibility, many people use them in word processing so that text can be viewed clearly on screen as it's entered or proofed. Then the font is changed all at once so the text can be used in a page layout or printed. Most application and System menus are displayed in city fonts like Geneva or Monaco. Printing a document that includes city fonts with a PostScript printer can produce strange results, like odd spacing or font substitution. If you print a file with city fonts on an imagesetter (and
it actually outputs the page), it will almost always convert the fonts to something like Courier.

**PostScript Type 1 Fonts**

The most widely used font format on the Mac for professional graphics and publishing is Adobe PostScript. When a font is saved in the PostScript format, it is converted into a series of commands that describe how to draw it as an outline rather than a bitmap. As outlines, fonts can be scaled up or down without losing detail or smoothness. Because they are compatible with all PostScript imagesetters and high-end output devices, PostScript Type 1 fonts are the choice of digital publishing professionals.

PostScript fonts consist of two separate files. The *printer font* is an outlined font and the *screen font* is bitmapped for display as pixels on the screen. Adobe has developed a very useful utility to enhance the appearance of fonts on the screen called Adobe Type Manager (ATM, for short). ATM smooths the appearance of screen fonts to make them look as much like the printed versions as possible. It is an essential utility for anyone who plans to design using type on the computer. ATM only works on PostScript Type 1 fonts.

PostScript fonts get to your printer in two ways; either they are built into the resident memory of the printer or must be downloaded from your computer.

**PostScript Resident Fonts**

Resident fonts (both screen and printer fonts) come installed on your PostScript-capable printer. The screen fonts reside in the System folder or Fonts folder of your system and can be managed with utilities like Suitcase or FontJuggler. The printer fonts for resident fonts are stored in the printer's ROM (read-only memory). The ROM holds the resident fonts for the printer and the PostScript interpreter and any other internal code the printer needs to do its job. When you print documents using these fonts, the printer font information comes from ROM, which prints fonts smoothly and quickly. (See "Printers," in Chapter 2, for a discussion of printer ROM and PostScript.) Avoid using Resident fonts in documents that are to be output by an imagesetter. Service bureaus do not necessarily have the same resident fonts in their imagesetter ROM as you have in your printer. It's best to use downloadable fonts for work that is to be sent to a service bureau.
PostScript Downloadable Fonts

Downloadable fonts are the fonts that you can buy and add to your system. Both Type 1 and TrueType fonts can be downloadable fonts. These fonts are available from numerous type vendors and computer software stores and as shareware from on-line services. Both the Type 1 screen and printer fonts are stored on your Mac's hard disk. When you send a file to print, the printer font is downloaded to the printer's RAM. When a document has several fonts, quite a bit of the printer's RAM is used to store them, which can slow printing or cause PostScript memory errors. (Errors are discussed in Chapter 4, "Managing the Desktop.") Because RAM is cleared out when you turn off your printer, printer fonts have to be downloaded every time you want to print a file.

TrueType Fonts

TrueType fonts were developed by Apple and Microsoft in the early 1990s. Like PostScript Type 1 fonts, they use scalable outlines. But they use a different mathematical formula to rescale characters. TrueType fonts behave like a Type 1 font combined with ATM, allowing smooth display of fonts on the computer screen and the laser printer. City fonts of the TrueType variety will also look smoother on the screen and the printer. TrueType fonts have the printer font and screen font information stored in one file. However, TrueType technology is not fully compatible with PostScript, and as a result, service bureaus typically discourage the use of TrueType fonts, preferring to standardize with PostScript Type 1 fonts. Therefore, avoid using TrueType fonts.

QuickDraw GX Fonts

With the release of System 7.5, another new font technology has been created: Apple's QuickDraw GX. GX fonts are outline fonts, just like TrueType and PostScript Type 1, but have a much wider array of characters—as many as 65,000 characters in a single font character set! GX fonts relieve the publisher from having to purchase expert sets or collections of extended font character sets that aren't available with the typical fonts you buy from Adobe and other vendors. Because few major software vendors are currently supporting GX fonts, they're not yet a necessary feature of a desktop publishing system.
OBJECT-ORIENTED DRAWING AND ILLUSTRATION SOFTWARE

There are two principal types of images created on the computer—object-oriented (sometimes called vector-based) and bitmapped (or pixel-based). Object-oriented images are created using the drawing or illustration programs that are the subject of this section. Bitmapped image software will be discussed later in the chapter.

Object-oriented images are composed of elements that can be individually moved, resized, reshaped, duplicated, and adjusted in a variety of other ways, without affecting other objects in the illustration. All elements are created with editable paths. By editing paths, you can change the shape of an existing line, whether it’s a simple line or an outline of a filled shape. Even type can be converted to editable outlines. This makes drawing programs a good choice for producing clean logos, illustrations, headline type, and complex design elements that can be edited at any time and smoothly resized. Because images created with the precision drawing tools provided by illustration programs can look mechanical or too precise, these programs include tools that can be used with pressure-sensitive tablets to create artwork with a hand-drawn look.

Drawing programs are mainly designed for creating illustrations, logos, and headline type to import into page layout programs. As these programs have evolved, more and more layout and prepress features have been added, making them great for ads and posters. In fact, the type-handling features in some of these applications are as good or better than some professional page layout programs.

Among drawing programs, Adobe Illustrator and Macromedia FreeHand (formerly owned by Aldus) are the most popular and are most widely supported by service bureaus. Deneba Canvas is another competing program that offers type-handling coupled with precise mechanical drawing capabilities.

**Illustrator and FreeHand**

Illustrator and FreeHand have been competitors in drawing as long as PageMaker and QuarkXPress have been in page layout. They are both extremely capable applications that allow artistic illustrations, type manipulation, and limited page layout. Both programs have added sophisticated type-handling features in recent upgrades. As a result, these programs have become favorites for designing complete layouts, as well as for
making illustrations. But if you need to import several Photoshop-like images, you might be better off using a page layout application because most service bureaus prefer to output from page layout programs.

Illustrator is considered to have more artistic drawing features for creating hand-painted looks and transparent paint effects. FreeHand is favored in production environments where its grid features are important. Both Illustrator and Freehand have color separation and trapping features, although Illustrator does separations using a separate application called Adobe Separator that comes with it. In general, their trapping features are limited and color separation is usually done through a page layout program at the service bureau rather than by the illustration application.

_Deneba Canvas_

Unlike specialty page layout and illustration programs designed and marketed for separate uses, Canvas is designed to be an all-purpose program, able to compete with both illustration and page layout programs. It's best described as a technical illustration program offering the same scalable and editable features as FreeHand and Illustrator. The difference is that the drawing features closely resemble those of CAD (computer-aided drawing) programs, specifically designed for technical drawing, not just free-form illustrations. Drawings can be created to scale, which is useful when designing signage and exhibit graphics that will be built by a fabricator requiring scaled drawings. It also offers the ability to save illustrations or page documents in several different formats such as DXF, PICT, Illustrator, and EPS. Because Canvas is not as commonly used for design as Illustrator and Freehand, it's also not as widely supported by service bureaus. If you buy it as your illustration package, be cautious of designing multi-page layouts to be output on an imagesetter. Your service bureau may not be familiar with its production features and output success rate.
DIGITAL IMAGING AND MANIPULATION SOFTWARE

If you have a great photograph that you want to use in your design or page layout, you need to have some way to get it into a form that can be used by your computer. You need two things—an input device like a scanner, digital camera or Photo CD, and the right software. (See Chapter 2, "The Essential Hardware," for a discussion of scanning devices and Chapter 12, "Image Resolution and Scanning," for information about scanning.)

Digital imaging software is designed to work with bitmapped or pixel-based images. It usually includes the software to operate desktop scanners to scan and import digital images. Once the image is on the computer, this software is used to crop, correct color, sharpen, or otherwise manipulate the images.

At the outset, imaging programs were designed to re-create many of the basic image manipulation methods used in the darkroom, such as changing contrast, cropping, selective enhancement, and retouching. With the versatility of the digital medium, it wasn't long before special effects, masking, and collaging became part of the package. On the desktop, Adobe Photoshop has become the single dominant digital imaging application. Because of its great utility and popularity, buying Photoshop is probably the easiest decision you'll have to make. This program is a must-have item. Of course there are other programs, but none approaches the wide acceptance of Photoshop.

Like PageMaker and QuarkXPress, Photoshop has an open program structure that allows additional functions (called plug-ins, in this case) to be added on. Software to drive individual scanners is usually added as a plug-in, for example. Some of the more interesting plug-ins are described later in this section under "Extras for Digital Imaging."

One of the challenges in using Photoshop is speed. Performing special filter functions like blurring or sharpening can take minutes to hours. As testament to its popularity, several vendors have created special accelerator cards to enhance Photoshop's performance. Photoshop is the program that will make you want to get as much RAM as you can afford. Because pixel-based image manipulation is so computationally intensive, software devel-
opera continue to devise better ways to do it. New entrants to the field include Xres by Fauve Software and LivePicture by HSC Software. These programs use different software approaches to image definition that enable them to work more quickly without enormous amounts of RAM for complicated functions.

Software to Complement the Essentials

Graphics applications are among the most complex and feature-packed programs written for the desktop computer. As users desire new functions, the number of features these programs offer continues to grow. To address this, some software companies have written their main applications with open structures to allow the addition of mini-programs—small bits of computer code that enable the main program to do new things. This approach allows you to add only the functions you need, or want, rather than waiting for a new version of the application to be developed.

However, because of the complexity of digital production, software developers have found that it's often better to create separate programs to address specific needs than to load already complex applications with add-ons. As a result, the marketplace is filled with every conceivable specialty program, designed to make life easier or to unleash your creativity.

As a practitioner in the field of digital publishing, you'll need to know how to use the three essential kinds of applications: page layout, object-oriented drawing, and digital image manipulation. But it doesn't end there. As you become familiar with these programs you'll want to do more and have greater control. To do this you'll add any number of extra programs and utilities to your tool box. The following sections cover several of the most useful and popular add-ons and supporting programs in the field.

PAGE LAYOUT EXTRAS

The competition between page layout software developers is fierce. Each is struggling to maintain and increase its share of the market. Developers compete by offering more and more functions, controls, and features. The two main competitors, PageMaker and QuarkXPress have given themselves a clever way to quickly add functions by using an open software structure. PageMaker has Additions and QuarkXPress has Xextensions.
PageMaker Additions

The simplest Additions are scripts (simple instructions) that automate repetitive tasks. Other Additions are more complex modules. Over 20 Additions come packaged with PageMaker and are accessible through the Additions menu. Another type of addition, Stand-Alone Additions, are used as independent programs to coordinate data exchange between PageMaker and other applications. Additions are provided not just by Adobe but are also available through independent software developers. Special function additions that come with PageMaker include:

- Equation editing
- Setting running headers and footers
- Booklet printing
  - Gathering publication information

Some popular commercially available additions include:

- Resizer by Sundae Software reduces, expands, or stretches all of the elements within a whole page or book.
- SmartAlign by Zephyr aligns objects vertically and horizontally by the center, top, or bottom.
- ArtSpree by Techpool allows the creation, fine-tuning, and previewing of object-based graphics. It also includes image controls such as color correction, tone manipulation, and other special effects.

QuarkXPress Xtensions

The creators of QuarkXPress were the first page layout developers to use an open architecture that allowed third-party developers to create additional capabilities called Xtensions. The success of QuarkXPress has definitely been boosted by the quality and variety of extensions that have been written by other software developers. Some of the most useful Xtensions offered for the publishing industry are described here.

- Resize XT by Vision's Edge adds a new tool to your tool palette. The resize tool provides a way to resize groups of boxes, text, and lines at the same time. Like Resize for PageMaker, this tool is an extremely valuable Xtension, if you have to resize the same ad for different magazine formats.
• Grids and Guides by Scitex allows you to automate the creation of equally spaced vertical and horizontal lines. Grids can even be copied and saved between documents.

• SXetch Pad by Daystream Imaging Systems allows you to place type on a curved path. You can edit the type even after it’s placed. With this extension you can also create Bezier curves (curved lines) and convert Type 1 fonts into editable outlines. All of SXetch Pad’s functions allow you to use QuarkXPress’ built-in trapping functions.

• INposition by DK&A will handle your imposition needs that QuarkXPress can’t. (Imposition is discussed in Chapters 6 and 13.) Whether you are building a 400-page book or a 16-page brochure, INposition will allow you to impose your entire document on any PostScript imagesetter.

(See “Adobe Developer Cooperative” under “Software” in the “Sources” section of this book to get more information about Additions and “XChange” to get more information about Xtensions.)

TEXT AND TYPE EXTRAS

The text for every layout has various origins. While you can type directly into page layout programs, text is usually provided on disk by a client or a copywriter. Sooner or later, a client will give you text on some type of incompatible disk written in a strange word-processing format. You need to be prepared to bring it into your computer one way or another. If you work with text on a regular basis, you’ll probably want to add one or more of the following programs.

Word Processing

To be compatible with your clients and others, you should have at least one word-processing program. The two most popular packages are Microsoft Word and WordPerfect. Choose the one that’s most commonly used by your clients and associates. The top-of-the-line word processors include several cross-program and cross-platform text-translating functions. They can be a great help in getting text into a format you can use.
OCR (Optical Character Recognition)
OCR, or Optical Character Recognition software is designed primarily to interpret text in image form (hard copy) into usable electronic form using a scanner. For example, if someone faxes typed information that you would like to include in a layout, it can be scanned and translated by OCR software into a compatible text format. There are two popular OCR packages: Omnipage by Caere and Textbridge by Xerox. If you anticipate working with clients and contributors who can't always provide electronic copy, OCR software is a handy way to avoid retyping. However, be sure to use all the spelling checkers and other features included in these packages and in your word processing and page layout programs to ensure proper translation, because OCR programs still have a tendency to make translation mistakes.

Type Manipulation Programs
There is a wide variety of type manipulation and type creation programs on the market that offer different levels of sophistication and features. The most sophisticated programs are good for creating or editing typefaces. Fontographer by Altsys and FontMonger by ARES Software are two of the most advanced. You can add signatures or logos and customize characters, to make new fonts and add to existing ones. Font Chameleon, also by ARES Software, is a good choice for the less experienced font designer—it lets you build your fonts from one master outline. It also supplies 200 fonts that you can customize by changing their heights, weights, or slants. You can also condense or extend them or blend two fonts together. All three programs can create PostScript Type 1, Type 3, and TrueType for DOS, Windows, and Mac. If you only need to convert fonts, consider Metamorphosis Pro by Altsys. It converts fonts into TrueType and PostScript Type 1 and Type 3 font for Macintosh from other computer formats like Windows and NeXT. It also converts type into outlines for use in drawing programs or into Fontographer database files so you can use Fontographer to create your own custom typefaces from existing ones.

OBJECT-ORIENTED ILLUSTRATION EXTRAS
Creating illustrations from scratch in an object-oriented drawing program can be a long and tedious process. What if you had a hand-drawn sketch and wanted to re-create it? Or what if you wanted to add 3-D perspective? Well, several helpful programs have been developed to address these situations.
Adobe Streamline

Adobe Streamline lets you can scan directly into the program and convert black-and-white line art or color and grayscale images into editable, object-oriented artwork. Streamline outlines areas of similar colors, which creates a posterized effect. You can select the number of colors (from 2 to 256) into which the program will break the image. The outlines can be edited and colorized within Streamline or exported into Illustrator, FreeHand, Canvas, or Adobe Photoshop, if further adjustments are needed. (You can cut and paste outlined images from Streamline into other Adobe programs like Photoshop and Illustrator.) You can even outline an object and export it to Photoshop as a clipping path that can be edited and used to create a mask. Streamline makes redrawing existing logos, illustrations, or bitmapped images a breeze.

2-D to 3-D and Back

Either Adobe Dimensions or Ray Dream's addDepth is a "must-have" 3-D companion to your main drawing package. These programs let you create, manipulate, and edit two-dimensional and three-dimensional artwork with built-in controls to add depth, shading, and perspective. If you simply want to add dimensions to type, consider using addDepth or another program, Pixar Typestry. Three-dimensional objects created in Dimensions, addDepth, or Typestry retain the PostScript language format, meaning that they are editable, object-based illustrations and can be resized, keeping sharp, clean edges. Because files are object-based and file sizes are small, simple 3-D rendering of text is speedy. PostScript images and text can be texture-mapped (applied kind of like wallpaper) onto your objects. Objects can be beveled and textured, and lighting effects can be added. You can print directly from Dimensions, addDepth, or Typestry, or export files into illustration, paint, or page layout programs. They are relatively easy to use because the tools, windows, commands, and dialog boxes are very similar to the ones found in your drawing program. These programs are particularly good for packaging designers or for those who just want to add another dimension to their work.
FULL-FEATURED 3-D PROGRAMS

There are many excellent software packages on the market that you can use to create 3-D effects in print. More advanced programs have the capability to not only create 3-D text and objects but also to create complex shapes, assemble them into lighted scenes, and animate them. Unless you are considering multimedia or video work, programs with animation will not be necessary, and they tend to be costly. The programs described below are some of the most commonly used by illustrators and packaging designers to create 3-D shapes, text, and illustrations.

Ray Dream Designer is a package that is relatively simple to use and offers a wider array of 3-D capabilities than Adobe Dimensions, for example. It has sophisticated modeling, texture-mapping, lighting, and scene-building capabilities. Infini-D by Specular International and Alias Sketch! are programs with even more sophisticated features. The 3-D tools in each of these programs make it easy to create organic shapes that you can tweak until you are completely satisfied. You can create surface textures and effects like shiny glass, dull metal, and rippled water. They calculate reflections, shadows, and refractions. When you are finished modeling and assigning surface characteristics, you can render your scene as a bitmapped image in the resolution of your choice and import it directly into Illustrator, FreeHand, or Photoshop, or into PageMaker or QuarkXPress to make it part of your final layout.

SPECIAL EFFECTS

In the past, photographic images or hand-drawn illustrations were the only sources of backgrounds for your work. Now, Photoshop and its countless special-effects filters have made it possible to create backgrounds electronically. The drawback is that Photoshop images are resolution-dependent. (See Chapter 11, "Components of the Digital Mechanical," for a discussion of resolution-dependence.) The final size has to be determined up front, and if you create the image and need it for a larger application later, you may have to re-create it. Fortunately, programs have been developed to help solve this dilemma. They actually let you select a predefined shape within the program or import a PostScript outline produced in Illustrator or FreeHand, generate a pattern, and modify it by changing the surface color, transparency, spacing of objects, softness, and lighting. The files are object-oriented, so until you render one as a bitmapped image, the file size will be very small. When you're ready to create the final image, the file can be rendered to the exact dimensions and resolution needed.
Two programs that are designed for this purpose are TextureScape by Specular International and TextureMaker by Adobe.

EXTRAS FOR DIGITAL IMAGING

Representing images by millions of pixels on a computer screen offers a seemingly endless amount of creative freedom. Painting programs have been created with "painterly" effects that can simulate most traditional painting and drawing tools. The following are a few key programs that add creative capabilities and increase productivity.

Plug-ins for Paint and Photo-Manipulation Programs

Plug-ins that expand the capability of Photoshop and other paint and manipulation programs can be applied to an existing image to distort, alter, or give it the appearance of being a traditionally created illustration or painting. A series of images with the same look and feel can be created by consistently using the same plug-in filter or set of filters. The advantage of using these plug-ins is that they allow you to restyle existing images, instead of creating new images from scratch.

- "Painterly" effects: Both Adobe's Gallery Effects and Xaos Tools' Paint Alchemy include a variety of artist filters, among them pencil, chalk, watercolor, oil, and drybrush.

- Surreal landscape and background effects: Kai's Power Tools (KPT) by HSC Software offers many filters with unlimited texture-creating capabilities and surreal effects. These include Texture Explorer and Gradient Designer which cycle through a vast array of texture and gradient options to select from. A stand-alone program called KPT Bryce, also by HSC Software, is specially designed to create surreal landscape images.

- 3-D Effects: Andromeda Software and HSC Software offer filters that allow you to create optical lens and other 3-D effects. Andromeda's 3-D filter allows you to completely wrap an image around a shaded 3-D surface and shift the surface of the image to view at various perspectives.
Collage, the Photoshop Companion

Collage is an image-composition tool that allows you to combine and manipulate images created in Photoshop quickly and with lower RAM requirements. It does this by creating low-resolution proxies for the original high-resolution image files. After the images are placed and manipulated, the file can be rendered at specified final resolution (consistent, of course, with the size and resolution of your original scans). Collage has a variety of special effects to choose from, including automatic image blending, drop shadows, and feathering. Collage also supports Photoshop plug-ins. You can move, rotate, and scale an image retaining the chosen effects. You can also back-track to the unaffected original image if needed. This program is a useful companion for Photoshop if you intend to do high-resolution image collaging.

Live Picture, the Proprietary Workstation Alternative

In 1994, HSC Software introduced Live Picture as a desktop solution for handling large image files for manipulation and separation. For some time there has been a significant gap between the standard desktop imaging solution, Photoshop, and the very high-end commercial systems used by service bureaus from Quantel, Scitex, or Shima-Seiki. Live Picture is designed to fall somewhere between these endpoints. While its cost is steep, it can be run on a relatively modest Mac system (at least a Quadra with 64MB of RAM).

Live Picture represents a significant change in the approach to handling images on desktop computers that is likely to become more widely used. Pixel data is represented mathematically using a process designed by FITS Imaging. The image data stays in mathematical form until it is finally rendered to the screen, a printer, or an imagesetter. By discarding the pixel approach, this application is able to move and manipulate even the largest files with nearly no time delay, something that has been impossible on desktop computers until now. Live Picture offers color correction and color separation along with painting, retouching, and special effects filtering.
PAINT PROGRAMS
Unlike object-oriented drawing programs, paint programs create pixel-based images. They also differ from image manipulation programs in that their focus is to offer the tools to create digital artwork (new pixels) that closely resembles traditional artwork. The best paint programs offer a wide variety of "painterly" tools, such as natural brush, pencil and chalk, as well as the ability to select various "paper" textures. Some paint programs, like image-editing programs, allow you to create layers or parts of images that can be individually scaled, rotated, or made transparent for collaging. The most widely used professional paint program is Fractal Design Painter. Painter has redefined the paint program with an innovative user interface and powerful tools. Painter also accepts Adobe Photoshop plug-ins, to add even more special-effect versatility.

PRODUCTION AND PREPRESS EXTRAS
As a designer, photographer, illustrator, or production artist you'll need to understand what level of production and prepress services you want to perform yourself before you turn your files over to the service bureau. This will help you determine the software to buy in order to make your production tasks more efficient. There are a number of software products designed to collect files for output, color correct images, perform separation and trapping functions, and even do imposition. A number of the most useful products are described below.

Trapping Software
If you are interested in doing it yourself, there are many products on the market that will give you trapping and separation abilities. Although, some of the best are designed for, and marketed to, service bureaus rather than graphic designers, primarily because of their sophistication (and price).

The first place to look for trapping capabilities is within the three main programs that you should already own: layout, drawing, and photo-manipulation software. Don't run out and buy a separate program if you have what you need already. QuarkXPress, Illustrator, and FreeHand support the ability to create basic traps. All have limitations for those who create more complicated work. Two limitations that Illustrator, FreeHand, and QuarkXPress share are the inability to trap color gradients (blends) and to trap imported graphics.
CHAPTER 3: THE ESSENTIAL SOFTWARE

The second place to look is within software packages designed specifically for these functions. TrapMaker is a PageMaker Addition that offers smarter trapping capabilities than those built into PageMaker. It traps the whole document, but by using PageMaker's overprint function, you can prevent some elements from trapping if you want to. TrapMaker also saves the trapping information as a separate document. This allows you to change or adjust the trapping file in the future if printing specifications change. Still, there are limitations. Imported graphics that include blends, type styled with outlines or shadows, and dotted and dashed lines will not trap with this utility.

If you don't want the responsibility of doing your own trapping, your local service bureau can probably do it for an additional charge. It's important to check with your service bureau to see what they offer in the way of trapping. (For a more thorough review of trapping and guidelines for when to rely on the professionals, see Chapter 10, "Registration, Dot Gain, and Paper.")

**Color Correction and Separation**

Color correction, separation, and imposition have customarily been the responsibility of the service bureau, color house, or printer, but with desktop software developed for these activities, it's now up to you to decide whether to do it yourself. A number of products are on the market for color correction and separation. Some programs are designed only to correct color and separate, while others include photo manipulation capabilities (which were described earlier). Cachet by Electronics for Imaging, Inc., is designed exclusively to correct and separate images. Photoshop, Painter, Xres, and Live Picture are a few that not only include color correction and separation abilities but also include advanced image-editing features.

**Preflight Software**

There are two types of preflight software: the first kind helps you collect general information and files before the job is sent to the service bureau and the second kind simulates how an imagesetter will output your file.

QuarkXPress is one of the few products that offers collection capabilities within the program. This feature collects documents, supports picture files and generates a detailed report into a specified folder for delivery to the service bureau. The only problem with Quark's feature is that it does not collect the fonts needed for output. There are several programs on the market designed to help you gather fonts (including both the printer and the screen fonts) along with your main project file and all support image
files for delivery to the service bureau. One such extension for QuarkXPress is BureauManager by CompuSense. Checklist by Adobe is a similar stand-alone product designed to work with PageMaker. These programs also provide you with detailed reports providing critical information on the project files.

LaserCheck by Systems of Merritt makes your color printer or black-and-white laser printer emulate an imagesetter. It helps you see how your pages will output on a particular imagesetting system. LaserCheck is important to use before going to the imagesetter because it helps you detect and solve problems and thereby reduce imagesetting time and cost. (See Chapter 13, "Preparing The Digital Mechanical" for more information on using preflight software.)

**Summing Up**

Now that you have been introduced to the various types of software you'll need, here are some key suggestions to get you off and running:

- You should have at least three programs on hand: a page layout package, a drawing/illustration program, and a photo-manipulation program.

- Choose long-standing programs designed for professional work. In this case, going with the crowd is not a bad thing. Avoid programs that are designed and marketed for the home computer. They don't have the output capabilities and consistency required for professional publishing.

- In general, use the programs for the jobs they were intended—layout for layout, drawing for drawing, and so on. For instance, the most popular layout programs offer image manipulation, cropping, and sizing functions that are fine for sketching purposes, but when you're ready for production, go back to the original image-creation software for final adjustments.

- Some of the extras, such as Xtensions for QuarkXPress, Collage used with Photoshop, and Streamline used with Illustrator or FreeHand, can make your life much easier.

- Don't let software choices overwhelm you. Just be aware of what's out there and only buy what you need when you need it.
SECTION I
THE ESSENTIALS OF GETTING STARTED

CHAPTER 4
MANAGING THE DESKTOP

Organization and Routine
Maintenance of Your Desktop
Organization and Backing Up
Regular Maintenance and Optimizing Performance
INITs and Utility Programs
Font Management

Troubleshooting Fundamentals
Memory Shortages
Hardware Problems
Software Problems and Step-by-Step Fixes
PostScript Errors

Keeping Up to Date and
Getting Technical Support

Summing Up
Owning the latest beefed-up Mac loaded with front-line software, external devices, countless extensions, utilities, and fonts is great, but it also creates a challenging environment for System management. It's only a matter of time before your high-performance system will need a tune-up, especially in design and publishing, where your tools are being pushed to their limits. Luckily, there are some basic techniques you can employ to cut down System crashes and minimize the impact when they do happen.

System crashes can't be avoided completely, although most problems can be avoided by understanding the basics of the Mac operating system, keeping your System software lean, staying organized, keeping track of new programs and updates, and being aware of helpful extensions, fix-it programs, and bug fixes. You can get a good start on solving many of the problems you encounter by staying calm, documenting the error, and thinking back to what was happening before the lights went out.

**Organization and Routine Maintenance of Your Desktop**
Just like any high-performance equipment, your Macintosh system will perform best if it's well-organized and properly maintained. Not only will
staying on top of the condition of your system enhance your performance and productivity, but the experience will be indispensable if you get into a situation where you need to do some troubleshooting.

ORGANIZATION AND BACKING UP

Custom Installations
An important part of setting up and staying organized is to keep your system slim and your hard drive clean. You can start by taking advantage of the custom installation options that come with most System and application software. Lately, software developers have gotten into the habit of putting all kinds of extras on their installation disks, thinking that more is better. Well, when it comes to putting extra stuff on your hard drive, less is better. Sure, custom installation may intimidate you because you have to make choices rather than just push a single button—but it can be the easiest way to keep unwanted drivers, tutorials, examples, "read me" files that tell about the software, and other digital junk mail, out of your system and off your disk. You can refer to the software manuals for custom installation instructions, but for the most part, custom installation menus are straightforward, and if you know your hardware, you won't go wrong.

Here's a hint to get you started. Most application installers and the Apple System installer will automatically download a bunch of equipment drivers (software to run printers, scanners, and so on) that you don't need. When custom-installing, only install the drivers for the equipment in your studio. If you intend to prepare PostScript files for output at a service bureau, make sure to download the drivers for their output devices as well. (PostScript files are created by printing to a file instead of the printer. The service bureau can give you the set-up specifications needed for their imagesetter.) If you don't plan to use the tutorials and sample files, don't load them. And if you do plan to use them, delete them when you're finished. If the software installation disk doesn't have a custom install option, fish through the installed software after installation and take out read me files, tutorials, and sample files you won't use.

Basic Organization
Minimizing the number of files on your system will make it easier to stay organized. Knowing where everything is stored is one of the most important factors in being productive. The Mac's system of using folders for grouping
Creating folders

<table>
<thead>
<tr>
<th>Name</th>
<th>Kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications</td>
<td>folder</td>
</tr>
<tr>
<td>Business</td>
<td>folder</td>
</tr>
<tr>
<td>System Folder</td>
<td>folder</td>
</tr>
<tr>
<td>Type folder</td>
<td>folder</td>
</tr>
</tbody>
</table>

Files together can help. For a solid, basic organization scheme, you'll need four main folders, one each for:

- The System
- Applications
- Fonts
- Client or project files

These are essential. Of course, you'll probably add other folders for things like accounting and personal stuff, but they have little effect on project organization and system performance. (1)

System software does a bit of the organization for you by creating the System folder at installation and putting extensions and control panels (software that controls your programs) in the right places when you install new applications. Install all your applications in one place to ensure that all their parts will be intact. Keeping fonts together makes them easily accessible for your font management utilities. Client files will be conveniently organized in one place, avoiding lost files and problem links as project files grow and change. (See Chapter 13, "Preparing the Digital Mechanical" for more on the importance of file organization and linking.)

Maintaining file organization gets complicated when you start working on projects with several scanned images, text files, and illustrations. It's easy to lose track of the latest versions of your work by accidentally putting them in the wrong place when you "Save As." If you don't select a folder, many programs save the file in their own application folder. If this happens several times while you're working on a job, your files can be spread all over your hard disk. Every time you accidentally save a file to some obscure place on your drive rather than replacing the old version, you are using up valuable space, especially if you have a small drive. And you're also adding to the potential for confusion. Set up a single location for your job files, and stick to it.

**Backing Up**

Backing up files to another disk is probably the single best thing you can do to make your life easier and to keep from staying up all night re-creating files. By saving frequently and backing up, you'll be prepared when things go wrong. How backing up relates to organization is simple. If everything you need for a particular project (layout, images, illustrations, and so forth) is in one folder, you can quickly back up the entire job by backing up that folder,
with the confidence that the most current versions of all job components are included. Also, when the project is complete, the folder can be easily archived and then taken off your working hard disk to free up space.

Creating a Back-up Emergency Disk
In addition to backing up your working files, it may be worth your while to create an emergency back-up disk with a copy of your System folder on it. This disk should include your current System, your fonts and applications, and the formatting software you would need to reformat your main hard drive. With this disk, you can re-install everything at once in case of a serious crash. Save your System back-up files to a removable media disk, like a magneto-optical or SyQuest disk. You don't want to have these files on another hard disk connected to the SCSI chain because more than one System in the chain can cause problems.

REGULAR MAINTENANCE AND OPTIMIZING PERFORMANCE

Rebuilding the Desktop
The everyday acts of opening, closing, cutting, pasting, and copying cause your system to read and write data to your hard drive in discontinuous bursts of activity. All this activity can impair performance by corrupting the Desktop file (an invisible System file that contains basic operational instructions and organization). If the Desktop file becomes corrupt, your System can get disorganized and even hung up (unable to function). Apple recommends that you "rebuild" your Desktop file, whether it seems to need it or not, about once a month for smooth performance. To do this, simply restart while holding down the Option and Command keys until you see the "Are You Sure You Want to Rebuild the Desktop?" message. Then click "OK." Rebuilding usually takes a few minutes, but it's well worth the time. If you need to rebuild your desktop but can't remember which keys to press, you can find a quick reference here and on the inside front cover of this book.  

Optimizing Hard Disk Performance
Hard disks perform best when the data stored on them is in order and when empty space is clean and continuous. This allows the drive to find a big enough space to store a file in one piece instead of in fragments, so it doesn't have to look all over to find and re-assemble the pieces when you want to open the file. Here's an example of how fragmentation of a disk can occur: You open a file that was stored in the middle of a nicely organized
section of the disk and add to it, making it too large to fit in its original location. When you save back to the disk, part of the file may be stored in the original location and the remainder somewhere else.

Fixing fragmentation on hard disks is referred to as optimizing. It’s a good idea to check your hard disks for fragmentation using a disk maintenance utility on a regular basis so you can tell when you need to optimize.

To help reduce file fragmentation, as well as disk searching time on larger hard disks (500 MB and up), it’s a good idea to partition your hard drive using a disk utility program like Hard Disk Tools or the formatting software that came with your drive. Partitioning divides the hard disk space into sections that act like independent disk drives. For example, you can create a partition just for applications, your font folder, and System, which are files that are mostly read from rather than written to. The second partition can contain files that are constantly being read and written to, like client project files. This will be your read/write partition. Both partitions should be regularly checked, but the partition with the client files will need optimization more often. With the applications, System, and fonts in one place and files in another, the disk reader can more quickly find the item you are looking for by searching only one partition. This keeps the drive from searching the whole disk every time you need something.

In addition, if you are copying a file from a small drive to a larger unpartitioned drive, the file will probably take up more space. Why? Because the block allocation size (the physical size of the basic unit of storage) is smaller on the small drive. For example, if you are copying a 10 MB document from a 230 MB drive to a 1 GB drive, it will be spread out over a relatively larger area of the drive—the file is the same number of bytes, it just takes up more space. By creating smaller partitions on large drives, you can keep the block allocation size down and store data more efficiently. It’s like the difference between the development of Tokyo and Los Angeles. When you have a lot of space like Los Angeles you tend to spread out rather than optimize space like they do in Tokyo.
Regular Check-Ups
Emergency repair and data recovery utilities aren't just for cleaning up after the bomb hits. Most of the major packages come with a general diagnostic utility to identify and fix file structure and corruption problems even before you experience symptoms. You should make it a habit to run one of these utilities every week or so, especially during periods of heavy use. You can do this by popping in the fix-it disk that comes with utilities like Norton Utilities and MacTools by Central Point. The Apple Disk Tools disk that comes with Mac System software also has a Disk First Aid application that can perform some basic maintenance operations. When you double-click on the First Aid disk, a dialog box full of options appears. Select the one that describes what you want to do. In Norton Utilities, double-click on Disk Doctor and click Start to begin your diagnostic check. By repairing things like bad blocks, cross-linked files (files with two "addresses" on the disk) and other forms of corruption before they freeze your system, you can avoid a lot of down time. If the utility you buy has an automatic background checking system, (one that runs invisibly while you work), give it a try. If it doesn't slow your system down or cause other problems, then keep it on.

Regular Cleaning
As well as giving your computer regular check-ups, you should also give it a regular cleaning, at least once a month. Any electronic device attracts dust from the air, and the internal hardware fans used to keep your equipment cool pull in dust and dirt particles. Eventually the dust builds up on the computer boards and connectors and can cause electrical shorts or bad connections. To avoid this problem, go to a computer store or your nearest Radio Shack and pick-up a can of condensed air and anti-static cleaner and protector. Once you have these, shut down your computer and all your peripherals, including the printer. Disconnect all cables and plugs. Use the condensed air to blow the dust off the connectors and plugs. Then take the cover off your computer to expose its guts, and carefully spray the dust away and out of your computer. Put the cover back on and securely plug your connectors back in to the computer and peripherals. Then use an anti-static cleaner on all of your equipment. It repels dust and protects against damaging electrical charges.

Symantec's Norton Utilities is only one of several programs that will scan the drive you select for problems, diagnose them, and fix all but the most serious ones.

Avoid overloading electrical outlets. Always make sure that plugs and outlets are grounded, and use electricity surge protectors. For extra
protection, consider an uninterruptible power supply (UPS). UPS devices go one step further in protecting your system by providing instant, temporary power if you suffer a power outage or brownout. They also provide excellent protection against power surges. Typically, a good UPS provides 10 to 15 minutes of power, during which you can save your work, close your applications and safely shut down your computers.

Avoid leaving machines on when they are not in use, especially computer monitors and scanners. Scanner bulbs are replaceable, but the tube on your monitor is usually not. Monitors usually have a certain life span before the tube begins to wear out, so it's better to turn them off than to keep a screen saver running for long periods of time.

INITS AND UTILITY PROGRAMS
The term INIT is a catch-all phrase used to describe control panels and extensions like screen savers, virus checkers, and monitor resolution switchers that reside in folders within the System folder. They begin to run when you start up the computer and continue until you shut down. INITs can be helpful, but they can also get in your way. Because all the active INITs on your system are running in RAM at the same time, conflicts between them (or between them and your applications) can and do occur. INIT conflicts are one of the main sources of System performance problems on the Mac.

The items in this section should be considered your tools for making things easier and solving problems when they arise. Some of these programs are strictly utilities and are reserved for regular check-ups, described above, and for troubleshooting. The following are the essentials to get you going, and in the spirit of keeping it simple, only the most useful programs will be outlined.

**Important System Utilities:**
- INIT management
- Disk fix
- Formatting and mounting
- Virus software
- Compression
- Adobe Type Reunion
- Adobe Type Manager (ATM)
- Font management
INIT Management Utilities

With the complete System 7.5 installation, your system can start out with as many as 106 INITs, and it will increase from there as you add applications and equipment. There are two main reasons why you need to effectively manage the INITs on your system: to stop conflicts that can cause System crashes and to free up RAM. Screen savers with flying fish and toasters are cool, but they can be a waste of memory and a source of problems. Try to avoid programs that don't provide practical uses and turn off INITs for programs or devices you aren't going to use. For example, if you know you won't be using your digitizing tablet during your day's work, turn its INIT off and restart your computer.

How do you turn an INIT off? By loading another INIT! Recognizing the need to control INITs, Apple has included an Extension Manager in System 7.5. This handy utility allows you to manage your extensions and control panels by turning them on or off as needed, and to create sets of INITs for specific tasks. Automated INIT conflict monitoring is not included as it is in several other stand-alone extension management programs, which are able to monitor the start-up process and turn off conflicting INITs at start-up to avoid System freezes. They also let you reorder the way your INITs are loaded at start-up, which can help you detect an outdated or corrupt INIT. Some are able to isolate specific conflicts, whether caused by individual INITs or conflicting multiple INITs, through mathematical reordering and a series of sequential restarts. Among the most popular are Conflict Catcher II by Casady & Greene and INIT Picker by Inline Design. (See the "Sources" section at the end of the book under "Software Companies" for more information about getting these programs.)

Complete Disk-Fix Utilities

It's very important to have full-service Mac diagnostic toolkit software. A few examples are the previously mentioned Norton Utilities and Central Point's MacTools. These programs can serve as your doctor for all kinds of Mac ailments and also provide a bit of preventive medicine. Along with anti-virus software, typical features include disk repair utilities, utilities to recover damaged and accidentally deleted files, and disk optimization software (to eliminate disk fragmentation).
Add-on extension management utilities like Conflict Catcher II, shown here, and INIT Picker, will alert you of a conflict and give you options for solving it, or disable the extension at start-up. Conflict Catcher II also goes through a sequence of start-ups and mathematically identifies the conflicting INIT(s).

Formatting and Mounting

Disk formatting utilities are important to have for custom reformatting and partitioning. A basic formatting utility, Apple HD SC Setup is included with the System software on the Disk Tools disk, which can be used for most formatting purposes.

Most disk drive manufacturers provide their own formatting utility as well as a number of other software goodies when you buy their drives. These utilities may be enough for most needs, but there are other full-service utilities, such as Hard Disk Tools by FWB Software, that offer high-level disk partitioning and formatting. Formatting software usually has the ability to automatically isolate damaged sectors or bad blocks. This means that when there is a damaged area on the disk, the drive will automatically set that block aside, not allowing it to be written to. A utility that helps you recognize and mount the SCSI devices on your SCSI chain is also usually included with these programs.

Virus-Protection Utilities

Virus-protection software is important. If you don’t think so, wait until one strikes! Anti-virus programs are typically System extension, that work quietly in the background while you go about your business. Although you shouldn’t panic or go overboard in your concern about viruses, you should definitely take steps to protect yourself. You may work with dozens of clients and associates, and, of course, you don’t know where their disks have been! Some examples of anti-virus programs are the shareware program Disinfectant, Symantec’s Norton Utilities for the Mac, and Central Point’s Anti-Virus program, part of CP’s popular MacTools software. (Symantec and Central Point have merged, so both programs, in effect, come from the same company.) Virus-protection extensions are stored in your System folder and are always activated at start-up. Check with your vendor or on-line services on a regular basis for updates to your virus software.

Compression Utilities

Compression utilities condense your files or folders of files to allow for more disk space, more compact storage or quicker transfer of files by modem. Compression is particularly good for transferring files via modem. Two of the most popular file-compression programs are Stuffit by Aladdin Systems and DiskDoubler by Symantec Corporation.
These programs also have the capability to automatically compress files every time you save, sometimes doubling the amount of free space. This sounds great, but in practice it can prove to be fairly problematic. As a general rule, file compression should be used only when absolutely necessary. (*File compression is discussed further in Chapter II, "Components of the Digital Mechanical.")

**RAM Extenders**

There are also programs that help expand usable active memory without extra RAM chips. They're excellent for running extra productivity applications during a typical day at the office. They work best with text and data. The most popular programs for "memory doubling" are RAMDoubler by Connectix and OptiMem by Jump Development Group. These programs optimize the way your Mac uses its RAM. RAMDoubler, for example, automatically reallocates unused memory when several applications are running at the same time. This enables you to use more applications at once than would otherwise be possible. This is useful if you are short on RAM and you use several smaller applications and files, but you'll need actual RAM, not just software-maximized RAM, to work on large, complex graphics files.

**Adobe Type Reunion**

Adobe Type Reunion is a utility program that groups your open font families together for display in the Font menu. Without Type Reunion, the font list will be displayed alphabetically. Font names sometimes start with the font vendor's initials, a number, or letters that characterize the style, like "BI" for bold italic. If you have several typeface families, each with a few member fonts, the members could wind up anywhere, depending upon their order in the alphabet. With Type Reunion, only the name of each typeface family is shown on the main Font menu. When you choose a family, a cascading menu pops out from the family name, displaying all the specific fonts for that family and saving you time finding the font you want.

**Adobe Type Manager (ATM)**

ATM renders a font on the computer screen as close as possible to the way it will look in print. It's the most powerful and popular example of a special type of program called a font rasterizer. ATM uses the mathematical descriptions of the outline shapes built into a font and displays them on the
Adobe Type Manager

ATM turned on
ATM turned off

With ATM PostScript, Type 1 font will appear smooth and without, they will appear jagged and hard to read on screen.

A font management utility allows you to organize your fonts in a separate folder outside the System folder. This is important if you have many fonts.

computer screen. The rasterized font image replaces the crude bitmapped description of the character created by the Apple QuickDraw screen font. ATM allows for nearly unlimited resizing without the jaggedness seen in bitmapped images. It supports only PostScript Type 1 fonts produced by Adobe or by other vendors. It functions as a control panel in the Mac system. Super ATM is another version of the program. It allows you to transfer documents to other computers and print them normally even if some of the fonts used are not loaded on the computer they're printing from.

FONT MANAGEMENT
As a publishing professional, one of the most common desktop management chores you’ll face is the effective organization of fonts. (The various types of fonts, their uses, and limitations were described in Chapter 3. "The Essential Software.") Here we address ways to keep them organized and ready for action. There’s no foolproof way to completely avoid font problems, but if you understand how they work and keep things organized, you’ll experience fewer of them.

When a Mac is operating under System 7 or a higher version, fonts that are stored in a Fonts folder in the System folder are loaded into RAM and become available when the computer is turned on. When you are working in an application, you’ll see these active fonts listed when you open the Font menu. If you continue to add fonts to the Fonts folder inside the System folder, more RAM will be needed to run the System, and the font menu will grow. Soon it will take a long time to find fonts and your System will take too much RAM to allow other applications to run properly. Here again, a number of useful utilities have been developed to solve organization problems. No one working in this industry should be without a good set of font management utilities.

Let’s face it: graphic designers and publishers are font collectors. Systems with hundreds, even thousands of fonts are not uncommon. Even if you’re a mini-collector with 20 or 50 type families, you can benefit from a font management utility. Service bureaus in the graphics industry have long relied upon programs like Suitcase by Fifth Generation Systems or MasterJuggler by Alsoft to help them manage their sprawling font libraries.
These programs allow you to store fonts in a separate folder, away from the System folder, and to activate only the fonts you most commonly use or sets of fonts you intend to use for a specific project. One of the best features is the ability to add and delete fonts to the active group whenever you like without restarting.

**Step-by-Step: Organizing Your Fonts**

The following approach to organizing your typeface families instructs you to leave only city fonts, which include Chicago, New York, Monaco, and Geneva, in the System folder and move all TrueType fonts that are not city fonts, all resident screen fonts, and all PostScript Type I fonts from within your System folder, and anywhere else on your drive, to a new folder on your drive, outside your System folder.

City fonts are designed for screen display and informal use. (As explained in Chapter 3, "The Essential Software.") Resident fonts have their screen fonts loaded in the System folder and their printer fonts in the printer’s ROM (they should not be used in files to be output by service bureaus). TrueType fonts are not completely compatible with PostScript, and service bureaus generally aren’t happy to see them. In addition, it’s very easy to have both a TrueType and a PostScript Type I version of the same font on your computer. Times Roman is typical example of one that can appear twice. This kind of font duplication can cause problems (like the wrong version printing in your document or in your service bureau output). It’s easiest to avoid these problems and successfully use your font management utility by buying and using only PostScript Type I downloadable fonts.

Make sure you’ve purchased the latest version of your font utility—one that works with your current System—before you start this organization process. Also make sure that your printer software and INITs (control panels and extensions) are up-to-date and that your fonts are backed up.

For purposes of this step-by-step approach, it’s assumed that you are using System 7.1 or higher. It’s also assumed that you purchased either PostScript Type I fonts or TrueType fonts and have the original disks. If you have a System prior to 7.1, it’s probably time to upgrade. System upgrades are created to solve problems, fix bugs in earlier versions of the System, and continually improve the working environment. (If you want to upgrade to a new System before organizing your fonts, refer to "Reload the System" under "Troubleshooting Fundamentals," later in this chapter.)
SECTION 1: THE ESSENTIALS OF GETTING STARTED

Step 1

Create a Temporary Typefolder: Before you begin, make sure that you have your fonts on their original disks because they will be deleted from your drive. Make a folder named Typefolder to put all your fonts into for temporary storage.

• Make a new folder on the desktop (Command + N).
• Rename the folder "Temporary Typefolder."

Step 2

Remove All Typefaces Except City Faces From Your System Folder's Fonts Folder: Whether you are working with a new, freshly installed or existing System, it's important to make a clean start. It is easier to make a clean start in a new System, but you can effectively create the same situation within an existing System by taking all typefaces out of the System except for the city typefaces, including Chicago, Monaco, Geneva, New York. This removal is especially necessary if you have been arbitrarily dumping typeface families into the Fonts folder. You may also have corrupt fonts that you're not aware of that need to be replaced. You should also search through your drive for typefaces that have accidentally been placed inside other folders. This may take a while, but it's worth it. Unless you have a font management utility already installed, all of the active fonts on your computer are inside the Fonts folder in the System folder. To find them:

• Under the View menu in the Finder, select View by Name.
• Click once on the pointer in front of the System folder mini-icon to reveal the folder's contents.
• Click once on the pointer in front of the Fonts folder mini icon to reveal its contents. (Make sure you are still in View By Name mode.)
• Remove all Typefaces except for the City-named fonts like Chicago, Monaco, Geneva, and New York, and place them into the Temporary TypeFolder. "Extra" screen fonts (Type 1 fonts without printer fonts) are likely to be resident fonts. Either delete them or put them in a separate folder within the Temporary Typefolder.
Step 3
Create a Permanent Typefolder: Make a folder named Permanent Typefolder to copy your PostScript Type I typeface families from their original disks. To do this:
• Make a new folder on the desktop.
• Rename the folder "Permanent Typefolder."
• Make new untitled folders inside the Permanent Typefolder to hold the typefaces you’ve purchased.

Step 4
Copy PostScript Type I Fonts: Gather together all your software disks for the PostScript Type I fonts. Download each typeface family from disk into a separate untitled folder inside the Permanent Typefolder and rename the untitled folder. To do this:
• Insert the disk.
• Drag each screen font suitcase and its corresponding printer fonts into an untitled folder in the Permanent Typefolder.
  (Don’t copy the AFM, read me files, or Help files.)
• Rename the untitled folder to the typeface family name.
• Repeat this procedure until all fonts have been copied.

Step 5
Remove Extra Screen Font Point Sizes from Your Suitcases: All but the 10 pt and 24 pt (or 12 pt and 36 pt) screen fonts should be removed from their suitcases in the Permanent Typefolder because ATM mathematically creates all other point sizes you need from these sizes. Keeping the others just takes up hard disk space for no reason. You could actually just keep one point size. But the reason two sizes are saved is that ATM can use the
lower size as a starting point to calculate smaller type sizes and the larger size as its starting point for larger type.

To remove point sizes from a suitcase:

- Double-click on the suitcase, which is inside the Permanent Typefolder.
- With the Shift key down, select all point sizes except 10 pt and 24 pt (or 12 pt and 36 pt).
- Drag them into the trash.
- Repeat this procedure until all suitcases contain only the 10 pt and 24 pt (or the 12 pt and 36 pt) sizes of each typeface.

**Step 6**

*TrueType Fonts Are Not Preferred:* If you've purchased TrueType fonts that you like the look of and you want to use them in work that will be output to an imagesetter, there are three things you can do:

- Buy the PostScript Type 1 equivalent. This will ensure that your typefaces will be compatible with PostScript and service bureaus will have them or accept them willingly.
- Convert TrueType to PostScript Type 1 typefaces using a type manipulation program like Fontographer or Metamorphosis. When converting a typeface, use a custom name like BOBTIMES. This is necessary because the TrueType font information, such as kerning pairs and matrix (detailed spacing and sizing information) is different from the same Adobe PostScript Type 1 version. For example, converting TrueType Times to PostScript Type 1 Times doesn't give you an exact replica of Adobe Times (which most service bureaus have in-house). Since you have created your own version of TIMES, just like Adobe and ITC have their versions, the screen and printer
fonts of your converted typeface must be sent to the service bureau along with the file in which you use the font.

- Create a folder for TrueType fonts in your Permanent Typefolder and copy them onto your disk. As discussed earlier, this is not advisable because it is very easy to have Type I and TrueType versions of the same typeface on your drive and mistakenly use the TrueType version in a file to be output at a service bureau. As mentioned earlier, service bureaus don't like TrueType fonts because they're not completely compatible with their PostScript-based output devices. However, if you have already been using certain TrueType fonts in documents and the documents have been output successfully at your service bureau, go ahead and use them.

- Repeat Step 4. Make sure you rename the folder in the Permanent Typefolder to say "TrueType" in the title. (Remember that with TrueType fonts, you will have only one font icon in your suitcase because the TrueType equivalent of ATM the PostScript Screen font and Printer font are included in the same icon.)

**Step 7**

*Back Up the Permanent Typefolder and Trash the Temporary Typefolder:* After you are certain you've organized all your fonts, make a back-up of your new Permanent Typefolder. It's best to copy it onto a magneto-optical or SyQuest disk with enough extra space to continue to back up as your library grows. It's important to have a back-up in case your drive goes down and files can't be recovered. (This is a good time to create your emergency back-up disk as described earlier in the chapter, if you haven't already.) Then trash the old Temporary Typefolder.

**Troubleshooting Fundamentals**

No matter how experienced you are or how "clean" you keep your system, you will eventually experience a freeze-up, a System crash, or an application quitting without warning. In fact, the more you stretch the limits of your System, the more likely it is that trouble will occur. However, with any luck, your troubleshooting skills will have grown along with your system and nothing will stop you for too long. This section presents basic concepts and techniques you can use to address the most common difficulties and provides a starting point in the area of troubleshooting. It's important to
read this section even if you are not experiencing problems to become aware of what can go wrong and the troubleshooting techniques you can use to identify and solve problems.

If you have problems with your system but don't feel comfortable with any level of troubleshooting, consult your authorized Apple dealer or, better yet, find yourself a knowledgeable technician or Mac consultant (guru) who will not only spend the time to fix your problem but will also help you understand troubleshooting along the way.

MEMORY SHORTAGES

If you're working within a software program and experience extremely slow response times when using certain commands, experience frequent unexplained crashes when working on very large files, or receive "Out of Memory" error messages, raise the RAM allowance for the application you're using.

As discussed in Chapter 2, it's vital to have enough RAM, especially when working with high-powered drawing, painting, and photo-manipulation programs. If you have the appropriate amount of RAM and allocate it correctly, the programs you use will work faster, and you'll be able to work with more than one program at a time.

You can determine how much memory you need for your System software by choosing "About this Macintosh" under the Apple in the menu bar. A dialog box appears, displaying your system software version, your total memory, and the amount of memory occupied by the Mac's operating system and by currently running applications.

In addition to the Total Memory occupied by the System, "About This Macintosh" also displays the Largest Unused Block. This is how much memory you have to play with.

Working with the unused RAM, you can increase the amount of memory reserved for an individual program. Select the program's icon, then press Command-l, or choose Get Info from the File menu. The Info dialog box displays basic information about the program and three separate memory allocation statistics. In the Info box, you can increase the Preferred size allocation, as shown in the sidebar.

Make it a habit to give your programs more RAM than the minimum requirement listed in their user manual. By increasing the memory
allowance, you will be able to work on more complex files and avoid Type 1 (memory) errors and freezes. The nature of your work will determine how much memory your program needs.  

For example, in Info for Adobe Photoshop 3.0, you will see that the Suggested Size is 5120K and the Minimum Size is 3072K. Set the Preferred Size to about 6500K to start. Working with large images and complex filters and functions requires more RAM. For example, to get the best performance from Adobe Photoshop you need three to five times as much RAM as the size of the image. (For instance, a file of 10 MB requires 30 to 50 MB of RAM).

**HARDWARE PROBLEMS**

If your computer won’t start, before assuming you have a major hardware problem check the obvious. As basic as it sounds, many people forget to check the power plug or keyboard plug when nothing happens after they turn the computer on. You need to check that all plugs are securely connected, the surge protector is plugged in and the switch is on, the wall outlet is functioning properly and the electricity is working. If still nothing happens, then you may have a bad logic board or power supply. In this case, the next thing to do is check the warranty and call the Apple Customer Assistance Center at 800-767-2775.

If your Mac starts and you’ve gone through all the SCSI and software troubleshooting options described in the rest of this chapter (even reformatted your drive), but you’re still having problems, again check the warranty and call Apple Customer Assistance Center or a technical consultant. (You can use software products, like MacCheck which comes free with Apple’s software Utility Update, to help you determine the cause of a hardware problem, but you’ll still end up consulting technical support to solve it).

**SCSI Problems**

One of the most common sources of unexplainable and unpredictable problems is the chain of SCSI devices that is attached to most professional Macintosh publishing systems. If your Mac starts up but shows a "sad Mac" or flashing question mark icon, or if you’re having frequent disk errors, like being unable to copy files onto an external drive, or if you can’t access your scanner, it’s more than likely that you have a SCSI problem. If the flashing question mark appears after you see the normal "happy Mac," you probably
have a System software problem (in which case skip to the latter part of this chapter). If the happy Mac never shows up, you have a SCSI-related problem. Take the following steps to resolve SCSI problems:

- **Check the Cables**: Sometimes a SCSI problem can be caused by something as simple as a loose cable. If you suspect your cables have worked themselves loose, turn everything off, unplug the cables, clean off any dust that may have built up, replace all cables making sure they are seated properly, and start the system up again.

It's also possible to have a faulty cable or a cable system that's too long. The total length of cable on your SCSI chain should be no longer than 18 feet, or roughly six meters. Keep in mind that there is also ribbon cable inside your computer that is an extension of your SCSI cable. This counts as part of the total length, too. Always use the shortest, highest-quality cables you can, especially with lots of SCSI devices on a system.

- **Check Your SCSI Addresses**: Every device on the SCSI chain has a numbered address between 0 and 7. These addresses can be changed. Most current SCSI devices have a convenient address switch, which you use to set a new address for the device. The SCSI controller (the internal hard disk) in your computer typically occupies the 0 address on Mac systems, so you can hook up seven more devices to your SCSI controller, normally through your external SCSI port. Make sure that every device in your SCSI chain has a unique address. If two devices share the same address, a conflict will result, and at least one of those two devices will not work. For example, if you have a tape drive and a CD-ROM drive both with SCSI address 4, turn everything off, then change the address of one of those devices to an unoccupied address.

- **Check the Termination**: In order to be linked in a SCSI chain, devices have an "in" and an "out" port. To tell the computer where the end of the chain is, the "out" port on the last device usually has to be blocked or terminated—even if it's the only device on that chain. You terminate most devices by putting a dead-end plug (a terminator) on the open port of the last device.

Some older external SCSI devices are internally (or automatically) terminated. But this can cause problems if that device is in the middle of a SCSI chain. Make sure, by reading the hardware manuals, that you
do not have an internally terminated device in the middle of your SCSI chain. If you do, move that device to the end of the chain. Most manufacturers don’t include internal termination anymore. Instead, they include a pass-through device or a block terminator that you can attach externally. When cabling lots of SCSI devices in a chain, make sure that you have the input cable and the output cables in the correct ports. Refer to the hardware manuals for that information for each device. (In many newer devices, either port on the back of a SCSI device will work as input or output.)

If you commonly use several SCSI devices and find you have problems that you can’t always pinpoint, consider using an active terminator. This type of terminator continually monitors conditions in the chain and automatically corrects things you can’t, like power and signal fluctuations. Many designers and service bureaus technicians get good results with active terminators like the APS Technologies SCSI Sentry. (See APS Technologies under “Hardware Companies” in the “Sources” section for more information.)

• Check External Drives and Other Devices: If you suspect that a cable or a peripheral is bad, you’ll need to test both the cables and the equipment to pinpoint the particular cable or piece of hardware that’s at fault. First turn off everything, disconnect any external drives or other devices, and try again to start up. If the internal drive works properly and starts the computer, you know the problem is with one of the external devices, one of the connections between them, or the connection with the computer. To determine which device or connection is the problem, shut them all off and disconnect the chain of devices. Rebuild the chain one connector and device at a time (shutting down and turning everything off with each attempt) until you suspect a device and/or cable. If you do not detect the problem, then try two devices at a time and continue to add until you find the problem. You can check to see if a connector is the cause by replacing and restarting your system. If you have corrected any cable connection, SCSI address, or termination problems, and haven’t found a bad cable, it is possible that you have an actual hardware problem with one of your devices. Always keep your warranty information and vendor phone numbers handy!
SOFTWARE PROBLEMS AND STEP-BY-STEP FIXES

With a complex, hardware- and software-packed publishing system, there could be any number of reasons for mysterious crashes and other erratic problems. But many crashes and other problems are software-related. These problems are primarily caused by outdated or conflicting control panels and System extensions or corrupted software, hardware drivers (software that runs your equipment), or System files. You may also experience problems related to PostScript that creep up when you try to print from your computer (discussed later in this chapter). The following tips can help isolate the problems that occur.

Rebuilding the Desktop

Not only is rebuilding your desktop recommended for regular maintenance, but it's also good to do if software is behaving erratically—for example, if a program shuts down suddenly or you get a message that a certain file can't be located. To rebuild your desktop, simply restart while holding down the Option and Command keys until you see the "Are you sure you want to rebuild the Desktop?" message. Then press "OK." If the problem was caused by a corrupt Desktop file, it should be corrected.

Zapping the PRAM

There is a small area of memory called parameter RAM or PRAM located on your Mac that stores simple settings like mouse speed, keyboard preferences, monitor settings, and start-up disk selections that stay the same even after you shut down. From time to time, the information stored in the PRAM can become corrupt. To clear out the corrupt information, you can "zap" the PRAM by pressing a key combination on start up. That key combination is Command-Option-P-R. Hold these keys down until you hear the start-up chime for the second time. Because zapping removes any stored selections, you'll need to check the settings in your Control Panels. (Be sure to check the Memory Control Panel to make sure that 32-bit Addressing is turned on, otherwise you can experience some dramatic performance problems in certain applications.)

Solve INIT Conflicts

If your computer is freezing at start-up, either right before or during the INIT parade across the bottom of your screen, you probably have an INIT conflict. First restart your computer while holding down the shift key. This will bring up a window that says "Extensions off." If the computer then
starts up but your original problem still exists or recurs, you will probably want to reinstall the System software (explained later in this section). If your computer starts up with no problems while the INITs are off, it means you probably have an INIT conflict. You can solve this in two ways:

- **Move Your Extension and Control Panels Folders from the System Folder to the Desktop:** When you restart, new Control Panels and Extensions folders will be created by the System. Reload a few INITS into the system folders and restart. Repeat the process of adding a few INITs at a time, keeping track of which INITs you're adding in each group. If the problem suddenly re-appears, then something in the last group of INITs is causing the problem. With System 7.5, you can simply turn off all of the INITs using the new Extensions Manager and add a few at a time to determine which ones are conflicting.

- **Use an INIT Management Program:** Each program has its own set of features, but most will allow you to change the order in which your INITs are activated at start-up and create INIT sets. Conflict Catcher II systematically turns INITs on and off at each start-up to help you isolate a start-up problem.

### Corrupt Programs, Preferences Files, and New Software

Preferences files are application-specific instructions that you can enable, disable, and customize the way your applications work. Each program creates a Preferences file within the System folder's Preferences folder. Preferences files can become corrupt and cause programs to freeze and shutdown automatically. When a program displays these symptoms, throw away the original preference file (found in the System folder in the Preference folder) and restart. The program will make itself a new "clean" Preference file. (Keep in mind this Preferences file will not contain any edits you made to the default Preferences. You will need to select them again.) If the problem still exists, reload the program in question from its original installation disks. And again make sure you throw away the Preferences file. If this does not solve the problem, call the manufacturer for new disks and information on bug fixes, updates, and other software that's known to conflict with the program. You may have a version of software that was released before it was completely bug-free, or your version is incompatible with other newer software you may have loaded.
SECTION 1: THE ESSENTIALS OF GETTING STARTED

Reload the System
If you're still experiencing a "sad Mac" or a "flashing question mark" at start-up, or freezes and crashes are occurring frequently for no consistent reason, try reloading the System. It is very important to make sure your System is installed correctly. If you restart your computer and re-install your System without renaming the old System and trashing the System and Finder files, you're making a big mistake. If the System file is corrupt, it will remain so because re-installation does not replace the system file, it only updates it. To make a clean installation:

• Restart your computer with the Disk Tool's disk that came with your System software.
• Remove the System and the Finder from the old system folder and throw them into the trash.
• Change the name of your original System folder to Old System. This will ensure that you save fonts, INITs, application-specific folders like Claris and Aldus, preferences files, etc.
• Now try to restart your computer from the hard drive to check for any hidden Systems on your drive. If your computer starts up, then you have another System that needs to be removed before you can proceed. Find it and trash it. Repeat this step until you've eliminated all extra Systems and the computer won't start from the hard disk. (Having more than one System anywhere within your SCSI chain could be the source of your problems.)
• Restart your computer with your Apple System Disk Installer and follow the directions that Apple gives you to reload the System. With System 7 and higher, you can select either Custom Install or Easy Install. If you choose the Custom Install, only install the printer drivers you need for your own printer or for imagesetters your service bureau uses.
• Restart your Mac to make sure it's in working order.
• Replace the application-specific folders, like Aldus and Claris, preference files, and INITs, moving them from the Old System folder to the new System Folder. (Refer to "Solve INIT Conflicts earlier in this section.) Place your INITs a few at a time in the new System Folder to check for any conflicts. If you have an INIT management program, load it first, then you can place all the INITs at once and let the management program help you do the job.
Trash the old System folder. Make sure you’ve removed everything that you needed from the old System folder to the new System folder.

**Run a Disk-Check Utility**
If you’ve disconnected all SCSI devices and your Mac starts but shows a "sad Mac" or flashing question mark icon, you could have a System software problem. Restart with the Disk Tools disk (from your Apple System disks) in your floppy disk drive. If it doesn’t start, you may have a bad or improperly installed RAM chip, or some other component on the circuit board may be bad. If the computer starts up from the floppy, you most likely have a problem with the internal hard drive or the System software.

At this point, you may want to use programs like Norton Utilities or MacTools, which offer more sophisticated disk-fix options than Apple’s Disk Tools. Using one of these repair utilities, you can run through a series of checks and fix all but the most serious problems like bad blocks or sectors (parts of the hard disk that are damaged and can’t be read); these can then be blocked off by disk-formating programs like Hard Disk Tool Kit. If you have a bad block or sector that cannot be fixed, back up all your files (because they’ll be wiped out by the next procedure), then restart with Hard Disk Tools or another formatting utility to solve the problem by completely reformating the disk. If you can restart with an emergency disk but the start-up disk (usually the internal drive) doesn’t show up, you can assume it needs to be reformatted or is seriously damaged.

**Reformatting a Hard Disk Drive**
If your disk-fix utility has not solved the problem, you’ve reviewed all the options up to this point, you are still experiencing erratic problems and/or frequent System crashes, you probably need to reformat the hard drive. When blocks of information become so messed up that the Finder cannot access them or a part of the disk has become corrupt, reformating is necessary. Reformating is done with software on a floppy or other external disk. It will erase everything on the hard drive, including the System. The process takes a lot of time if you have not prepared properly. But, if you’ve been regularly backing up your files and have created an emergency back-up disk containing your current System, fonts, applications, and formatting software (as described under "Basic Organization" earlier in the Chapter), it will be faster and easier.
Before you reformat:

- **Back Up All Files That Aren't Backed Up Already:** If the disk is still operating, back up important work files that have not already been backed up. Don't copy your System, fonts, applications, or INITs because they may have been corrupted (Re-install a new System, new fonts, new applications, and INITs). If you can't re-boot using a utility disk, your only choice may be to take the disk to your dealer to extract the information for you.

- **Check the Manual:** The computer manual may have suggestions for testing and reformatting that specifically apply to your particular drive or suggestions about how to avoid reformatting in the first place.

- **Reformatting:** Reformatting will erase the entire contents of your drive. Start up with the Apple Disk Tools disk that came with your computer. Using this approach, you will have to go through a lot of disk switching between Disk Tools and the reformatting utility disk unless you followed the advice in "Basic Organization" earlier in the Chapter, and created an emergency back-up disk with a clean System, your fonts, applications, and formatting software. To use your emergency back-up, you need to boot up using a System file on a floppy disk first to access the drive containing your emergency disk. Once you access your emergency back-up disk, you can reformat and then install everything you need to get back up and running.

- **Re-installing After Reformatting:** On your newly formatted disk, install the System first (from your emergency backup disk, if you made one), or from the original System floppy disks (or CD-ROM if your System came on one). Next re-install your applications, also from their original disks. If you created a back-up of your Permanent Typefolder, load it. If not, you'll have to go through the whole font organization process again. Remove all installed fonts except the city fonts. Then you can restart and get back to work.

**POSTSCRIPT ERRORS**

PostScript errors are some of the most common problems that occur during design and production. Because of the complexity of page layout files that contain large complex images and many fonts, the PostScript language is continually being pushed to its limits. Luckily, PostScript is updated.
periodically, so many of the most common errors are eventually eliminated by evolution. But in the meantime, they still occur.

The most common PostScript errors are caused by misinterpretation of instructions between the computer and a printing device. The following are just a few of the ways errors can occur:

- PostScript code may be messed up or misunderstood by the printer.
- The file code for complicated text or artwork may exceed the limits of complexity built into the PostScript interpreter used by the printer.
- The printer’s RAM may be insufficient to store the instructions needed to print complex files.

PostScript error messages come in two parts. The first part identifies the error and the second the offending command. The format consists of two percent signs at the beginning of the error message and two at the end. If you see the percent signs in an error message, it means the error is PostScript-related. The standard format looks like these two examples:

```
%%Error: limitcheck; Offending Command: image%%
%%Error: undefined; Offending Command: %%%
```

Reasoms for PostScript Errors
To diagnose and fix a PostScript error, it helps to know when the error occurs. Does it happen when printing from one computer or from all computers? From one application or from all applications? From one file made by a particular application or from more than one file made by that application? When printing all pages or just one page? Only when printing imported graphics in a page layout or drawing program? Only when printing a combination of elements, or even when each prints separately? If you determine when the error occurs, you can better determine the reasons and solutions. Some of the most common problems are described in the next few pages and at the end of this section in a table that lists the most common PostScript problems.

Corrupt File Element
A corrupt file element is an object in your document—text, image, or shape—that causes a PostScript error when you try to print. If you are printing to a laser printer, you can usually detect which element is the problem by watching the screen. (Make sure that background printing is off. Otherwise you won’t be able to see the messages. Background printing allows you to
print files and work at the same time. It can be turned off by selecting your printer icon in the Chooser Dialog Box under the Apple.) Each item is listed on the screen as it's downloaded to the printer. The item name that appears right before the error message comes up is usually the item that's causing the problem.

**Combination of Elements Exceeds the Printer's Memory**
This error may be caused by too many fonts on one page of a document, artwork with thousands of points that make up one continuous path, or very large bitmapped images. (Keep in mind that if you create your own typefaces in a type creation program, individual letters of a typeface can have too many points, which can slow down or stop printing.) To solve the first problem, you can limit the number of fonts or select "unlimited downloadable fonts." If it's a drawing problem, edit the number of points that make up your artwork in the drawing program in which it was created, or make a low resolution version of a large bitmapped image to temporarily place into your document for laser printing. (PageMaker allows you to print images at low resolution, which speeds up the printing and cuts down on the amount of memory used). If you do place low-resolution versions of images in your document, replace them with the high-resolution versions before you send the file to the the service bureau. Then alert the service bureau to the images that are giving you memory problems. Keep in mind, if the file doesn't print on your laser printer, the service bureau will have problems on their imagesetter.

**Corrupt File**
If you have double-checked the potentially troublesome elements that make up a file and you still get an error message, the file structure itself may be corrupt (meaning the file code can't be read by the printer). To check this, re-create the page by loosely placing the same text and graphic elements into a new file and then try to print. If the new page prints, then your original file structure was corrupt and you'll have to rebuild your file, tightening up the new layout.

**Corrupt Application**
PostScript errors can also be caused by corrupt applications. (*Corrupt applications and preferences were discussed in the "Troubleshooting Fundamentals" section.*) If you have double-checked the elements on the page and the file structure itself, and one program is still producing a PostScript error message, then you should probably re-install the program.
Operating System or Hard Disk Drive Problems
A PostScript error can also be caused by a corrupt System, by writing a file to a bad block (damaged sector on the hard disk), or by an extensively fragmented drive. In this case you should run a disk-fix utility to check the System and the drive. You should also optimize and rebuild the desktop now and regularly. This will probably help eliminate operating system and hard disk errors in the future, but in the meantime you will probably have to give up on your document and rebuild it from scratch.

PostScript Printer Limitations
Your printer may have an older version of PostScript installed in its ROM (possibly PostScript Level I) that was not designed for outputting complex graphics files. You can determine this by printing your file on the latest PostScript printer model (possibly at a computer superstore). If it prints there, then you need to think about upgrading your printer’s ROM or, more likely, buying a newer printer.

Printer Files Are Corrupt or Improperly Installed
If your printer file is installed incorrectly, or if it’s corrupt, one of two things will happen: An error message will appear on the screen before you are able to print anything, or your files will not print at all, but no error message will appear. The problem may have been caused by a memory overload, improper installation of applications, or corruption of the printer files. Sometimes turning the printer off for at least ten seconds and back on again will solve the problem. If this doesn’t work, reinstall your printer files and choose the new printer driver from the Chooser (under the Apple). If that fails, call the technical support department of your printer manufacturer. They may have an updated version or bug fixes that will solve your problem.

As mentioned earlier, the evolution of PostScript is eliminating many PostScript errors altogether. But in order to take advantage of the new technology, you need to upgrade or buy equipment and software with the latest PostScript technology. For example, if you are using a Level I printer, you may experience many of the errors listed in the chart to the right (and possibly more). That goes for service bureaus as well. If they still have a Level I imagesetter, they may be unable to print complex files or print them in a timely manner. (The error messages in the chart come from the printer. If you see an error message like 8133, it comes from the application program. Always look for the printer message to diagnose your problem. (The information presented in the chart was provided by Frank Merritt Braswell of Systems of Merritt, Inc.)
# Common PostScript Errors

<table>
<thead>
<tr>
<th>ERROR MESSAGE AND SYSTEM</th>
<th>CAUSE</th>
<th>CURE</th>
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<tr>
<td>A font is not available or corrupt: The font Courier is substituted for the expected font.</td>
<td>The font requested by your document is not available in the Fonts folder in the System folder or opened through a font utility program. Or the font utility program may be corrupt. (On most printers, Courier is substituted when the requested font is not available.)</td>
<td>Make sure the font is loaded into your font management utility. If the font is loaded, re-install your font utility and the font itself because one of the two may be corrupt.</td>
</tr>
<tr>
<td>Limitcheck error: Error type is a limitcheck. The Offending Command is any of the painting operators—like clpt, cctip, fill, etcfill, and stroke.</td>
<td>Your line art has too many control points, creating a path with too many elements. The flatness may be set too low, which also creates too many path elements. (This problem will be more likely to appear on a Level 1 laser printer or imagesetter. If you’re able to print a file on your Level 2 laser printer, but the service bureau can’t print it on their imagesetter, they may have a Level 1 imagesetter.)</td>
<td>Remove some control points, re-draw your path with fewer elements, increase flatness, or split long paths into shorter subpaths. Illustrator and FreeHand provide ways to do these things semi-automatically. (Always create simple lines with few control points or split paths. This will create files that will print faster, on both an imagesetter and a laser printer.)</td>
</tr>
<tr>
<td>Limitcheck error: Error type is a limitcheck. The Offending Command is: Image or Imagemask.</td>
<td>There is not enough memory to hold image data.</td>
<td>Try readjusting position and size of the image on the page, re-scan the image with fewer bits per sample, lower the resolution (ppi), un-rotate a rotated image, or add more memory to the printer.</td>
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<tr>
<td>VError: Error type is VError. The Offending Command varies.</td>
<td>Your printer does not have enough memory to do the requested task. This is often caused by the same operators that generate limitcheck errors. (On PostScript Level 2 printers, memory allocation is more flexible and dynamic, so this problem is less likely to occur.)</td>
<td>Add more memory to the printer if possible, or try the cures for limitcheck errors.</td>
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<tr>
<td>Communication error: Error type is leeror.</td>
<td>The communication lines that run between your computer, printer, modem, and so on may not be terminated or there is electrical noise interference (which can be caused by lines running too close to a fluorescent light or other source of electrical noise).</td>
<td>Make sure the line (a phone line if you are using Local Talk) is away from power cords, fluorescent lights, or anything else that could cause electrostatic interference. Also make sure they are terminated. (See the installation instructions that came with your communications lines and connectors.)</td>
</tr>
<tr>
<td>Communications error: Error type is undefined. The Offending Command looks like gibberish or random characters.</td>
<td>If you receive random characters or very strange error messages when printing an image file, your image data may be corrupt. (In other words, too much or too little data may be interpreted by the printer.)</td>
<td>Re-save the image in your image manipulation program or re-scan and import the image again to create a clean file with the correct image parameters.</td>
</tr>
<tr>
<td>Dictfull error: Error type is dictfull. The Offending Command is deq.</td>
<td>The file is too complex to be printed on your printer. (This error only appears on Level 1 printers.)</td>
<td>Simplify your file or print it on a Level 2 printer.</td>
</tr>
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Keeping Up-to-Date and Getting Technical Support

Most designers tend to avoid the issue of keeping up-to-date. They find it difficult to complete projects using new, unfamiliar equipment and software. And it can be very difficult. If you worked alone and never had to pass files along, upgrading wouldn’t be necessary. Fortunately, or unfortunately, you have to stay compatible with freelancers, clients, vendors and especially your service bureaus, who make it a point to have the latest and greatest. In addition, new advances in software and hardware increase functionality and (hopefully) reduce problems.

Keeping up-to-date also includes contacting technical support technicians when problems arise. In the past, technical support was included when you bought hardware and especially software. These days you usually have to purchase service contracts for the pleasure of calling up to solve a problem.

There are very good options for keeping up-to-date and getting technical support, which in some ways can replace the free technical support of the past. The first thing to do, in order to stay up-to-date and receive support, is get a handle on the software and hardware you currently own.

If you call a software company for technical support or an upgrade, the first thing they will ask you for is the name, version, serial number, and date of purchase of the product you are inquiring about. The same holds true when you call a hardware company. Rather than shuffling through boxes and disks for this information while the technician waits on the line, get it together ahead of time, or better yet, keep a list and update it whenever you add hardware or software. (See the following page for example forms that you can use as a model to create your own.)

Register your products as soon as you get them to make sure the software or hardware companies know you have bought their product. They’ll be sure to keep you informed of upgrades (that you can buy, of course). It is important to make sure the product works correctly first, but after that, send in the registration card. (Just be prepared for the extra junk mail you’ll get from every computer supply vendor.)

Maintaining a good relationship with your service bureau is also a good way to keep up-to-date. The service bureau usually gets the latest upgrades and fixes first, and often the software companies allow service bureaus to distribute them. Service bureau technicians can also give you suggestions on preparing your file or using certain software to make the file output go smoothly.
## Software Product Information

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<tr>
<th>SOFTWARE PRODUCT NAME</th>
<th>SOFTWARE VERSION</th>
<th>SERIAL #</th>
<th>DATE OF PURCHASE</th>
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<th>COMPANY'S TECHNICAL SUPPORT PHONE</th>
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## Hardware Product Information

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Join a local Macintosh User-Group (MUG) and you will have access to others who use some of the same software, do similar kinds of work, and have similar concerns. If you're a graphic designer, call an organization like the AIGA (American Institute for Graphic Artists). They have chapters in many cities, and many chapters have a computer-user sub-group. There are also other computer-user organizations specifically for photographers and illustrators, even interested technicians.

Use the fax-back services offered by major software companies to get answers by fax for many of the most commonly asked questions and for other information. If you don't know the fax-back system number for a particular company (or whether they even have one), call the company's main phone number for more information. If the company has a fax-back system, you'll be able to select the documents you want and have them faxed to you. This type of support is often available 24 hours a day.

Subscribe to an on-line service like America Online or CompuServe (two of the most popular on-line services for people in the publishing business). Log on a couple of times a week to keep up with software releases, notorious bugs, and system conflicts. Companies like Adobe and Microsoft, for example, have free technical forums online, and they post technical notes and other information in the online forum libraries. These files can be read online or downloaded and printed out. It's important to subscribe to an online service because some software updates are distributed first online. If you find the update on an online service, you can download it right away. It may take days, even weeks for the manufacturer to send you an update or an update notice, or you may have to call and request it. You can also post a message online describing your problem (including your hardware configuration, the programs and INITs involved, and so on) and ask for ways to solve it. This type of support gives you access not only to support technicians but also to other users who may have had the same problem. It is not uncommon to get support online within hours.

Subscribe to and review periodicals and newsletters. There are many periodicals that, beyond keeping you up to date, can help you compare and buy software and hardware, stay aware of new developments in technology, and keep up on the latest tips and techniques. Adobe Magazine (formerly Aldus Magazine), Macworld, MacWeek, MacUser, The Seybold Report, A View from the Edge, online Design and Design Tools Monthly give you the latest-breaking industry news. Other magazines and newsletters actually show you the latest and greatest step-by-step methods for creating
special effects and illustrations or for developing styles through the use of certain programs. These include *Step-By-Step Graphics Magazine*, *Step-By-Step Electronic Design Newsletter*, *Computer Artist*, and *Digital Imaging*. There are always new publications popping up, so it’s a good idea to look out for them.

If you are not remotely interested in doing the legwork yourself, you can hire a technical consultant who can regularly keep you up-to-date, install equipment and software, fix bugs, and keep your system in working order. To many computer-based graphic designers, consultants are reserved for disasters. But it may be worth it to hire one if you do not have the knowledge or the time to keep up when you first set up your system and organization.

**Summing Up**

Organization, routine maintenance, troubleshooting, and keeping up-to-date may seem like a full-time job. And it can be, if you have an office full of computers. But, if you only have one or two computers to look after, you can more than likely do it yourself. Here are a few words of advice:

- Organize your files, set aside time every day for back-up, and run a check-up utility once a month.

- Rebuild your desktop and clean dust from your computer and peripherals.

- Purchase the necessary INITs and utility programs to make your life easier and provide you with troubleshooting software.

- Organize your fonts and use a font management utility.

- Understand the basic troubleshooting techniques, even if you haven’t had a problem yet.

- If you do have problems, stay calm, document error messages, and systematically work through the steps provided in this chapter.

- Make a list containing important information about your software and hardware, and add to it as your system grows. It will make your life easier when you need to upgrade or get support.
SECTION II
BEFORE STARTING A PROJECT

CHAPTER 5
PROJECT PLANNING AND MANAGEMENT

Preparing to Win Work
Doing Background Research
Preparing Leave-Behind Items
Preparing and Showing a Pertinent Portfolio
Preparing to Talk the Client into Giving You the Job
Knowing Your Rate (and How to Calculate It)
Asking the Right Questions
Talking Business and Payment

Putting It All Together
Understanding the Project and Scope of Work
Outlining the Project and Collecting Estimates
Determining the Schedule Based on the Deadline
Preparing the Letter of Agreement

Project Planning and Management Tips
Project Outline
Systems for Documentation
Progress Reports
Quality Control and Proofing

Summing Up
SECTION II: BEFORE STARTING A PROJECT

If you’re meeting new clients for the first time, you need to have a basic understanding of who they are and what they do. You also need to prepare a biography and a pertinent portfolio, know your rates, and prepare a list of questions to ask about the clients and the project. If your meeting is with an existing client, you probably have all the background information you need, but make sure you ask all the pertinent questions regarding the project at hand. Most people don’t adequately prepare for client meetings. Here are some things you can do to help you win and successfully complete work.

**DOING BACKGROUND RESEARCH**

If a potential client has requested a meeting, make sure you have some background information on the client and the project before your initial meeting. First, you need to know if you want to work with the client. For example, you need to know if the client pays bills and will be willing to pay your billing rate (more on that later), and whether the client typically develops long-term professional relationships or switches from firm to firm or designer to designer.

Another reason to do up-front research is to gain an understanding of the client’s business, which will improve your chances of winning work. Find out what services or products your potential client provides. Also, look at the client’s existing collateral material, if they have any, and at their competitor’s to see what’s going on in their industry. Doing this research can be especially important if you don’t have a lot of experience with this type of client or industry. Pre-meeting research will also help you determine whether you are qualified or have the right skills, equipment, and support team to complete the project.

The easiest way to get background information is to ask the person who contacted you, or call the company and request information on its history, services, and products. A capabilities brochure not only tells you what the company does but also gives you an idea of what type of quality the client is willing to pay for, or has paid for in the past. Even the smallest company will have some kind of collateral, even if it’s photocopied flyers. Ask your contact for a brief overview of the company and the project over the phone. You may determine after only a brief explanation that this is not a project you want to take on. A client may need someone to work on a project that takes special experience or equipment that you may not have. For example, if your focus is designing corporate identity systems but the company
Actually needs trade show exhibit graphics, which require large images to be manipulated, you may want to refer the client to someone else with the appropriate equipment and photography or illustration experience.

Ask potential clients who they have worked with in the past and why they are looking for a new creative source. Their answer may indicate whether they are hard to work with or if their former creative company didn’t give them what they needed for their budget. If the company is local, ask around. Try to talk to people who have worked with them in the past. They may be able to give you more specific information that will help you determine whether this is the client for you—if the company is easy to work for, if their quality standards are at the same level as yours and if they pay their bills.

Keep in mind that you should choose your clients as carefully as they choose people to work for them. You don’t have to take every job from every client that comes along.

PREPARING LEAVE-BEHIND ITEMS
When you meet with a new client, always bring a few items to leave behind. Those items should include a business card, a company statement of qualifications or a personal biographic sketch, and samples that best represent the work you do or want to do. The samples can be photocopies if you don’t have originals to spare. The statement of qualifications or biographic sketch should include a personal or company history, a description or listing of the services you provide (like packaging, illustration, photography, and so on), a client list (if you have one), an equipment list, and a list of software you are proficient with. This information should be presented in a simple but memorable way. It’s also a good idea to bring more than one sample package in case you meet with a group. This way everyone can refer to his or her own copy during the meeting. Leave-behinds are important because the client may have to seek the opinion or approval of someone who could not attend the meeting. Also, if the client is interviewing a number of people for the project, the material you leave behind will ensure that you won’t be forgotten.

PREPARING AND SHOWING A PERTINENT PORTFOLIO
Showing a portfolio is show-and-tell at its best. This is an opportunity not only to show the client your work but also to describe how it was designed and produced. Be sure to review your portfolio well enough so you can adequately discuss the details of each piece you present.
As a general rule you should show only strong pertinent pieces and be prepared to discuss:

- The purpose of each piece (the client and market it was designed for).
- The concept behind the design, illustration, or photography.
- The process involved to complete each piece.
- Special production techniques that may have been required to produce the intended look.
- The total cost of each piece and the costs associated with each component or part of the process, such as photography and copywriting.
- Specific reasons why some pieces were inexpensive or easy to produce and some were expensive and more difficult to produce.
- Ways you were able to save money or provided added value.

Be prepared to distinguish for the client the inexpensive and expensive items in the process. For example, projects containing bleeds, solid ink coverage, trapping, or four-color printing plus a varnish will be more expensive than two-color projects requiring no traps to print.

If you were involved in the design and production of each piece, it should be easy to describe the purpose, concept and process behind each. You may need to consult your vendors to identify any special production techniques (done beyond your desktop) they used to produce the final piece, and also to point out how those techniques affected the final price.

If the total cost for any of your pieces is not well-documented or is out of date, you may want to consider checking with a few service bureaus and printers you use regularly to get current estimates for the prepress and printing of the piece. Compare the estimates and determine an average price for service bureau and printing services for the piece. If one of the prices is considerably higher or lower than the others, talk to the vendor to determine why or avoid using that price in your average. Once you have an approximate total cost for prepress and printing of the piece, add to that any expenses you incurred and the cost of the hours at your current rate that it took to complete (including any hours you couldn’t charge for, if any).

In the course of your client meeting, you may not have the opportunity to discuss all the points listed above. But, you will be prepared to answer any questions the client may ask. And, if the client is unfamiliar with the
process of designing and producing a piece of printed collateral, you’ll be able to educate him or her about your design and production process.

**PREPARING TO TALK THE CLIENT INTO GIVING YOU THE JOB**

Even if you don’t have a pertinent portfolio or experience with the type of project the client wants you to do, this doesn’t necessarily mean you are not right for the job. In your pre-meeting preparation, include in your portfolio your strongest pieces (of any kind), and do some research to make sure you have a solid understanding of the design and production process for the type of piece they need. Begin by reading the rest of this book, then get information from vendors and service bureaus, and talk to professionals who produce the kind of work the client is looking for. In other words, take a crash course to find out what it takes to deliver the product the client needs. This way you will be prepared to talk to the client even without actually having produced particular types of pieces. Taking advantage of the opportunity to educate yourself and the client can help you get the job.

**KNOWING YOUR RATE (AND HOW TO CALCULATE IT)**

It’s not unusual for clients to ask for your hourly rate. It’s important to know exactly what that rate is, so you don’t have to guess on the spot and risk coming up with a number that’s too high or (more often) too low. It’s also important to know your rate when you’re deciding whether to take a job you’ve been offered and when you’re preparing a project estimate.

How much do you have to charge for your work to make a living? It seems like a simple question, but it tends to be harder to answer than you might expect. Many desktop publishers and designers either pick a rate out of thin air or base it on some notion of “what the local market will bear.” The truth is that a profitable billing rate is different for different people and organizations. But regardless of your work situation, having an established billing rate is the first step toward being able to prepare accurate cost estimates and to maintain a profitable business.

In order to determine the value of your time, you need to decide what you want to earn per year (within reason). You may be an illustrator and want to make about $100,000 a year, but unless you’re well-known, with clients knocking down your door, it’s probably unrealistic. A more practical way to approach this is to add up all your living expenses (food, car insurance, health insurance, rent, entertainment, and so on) for a typical month.

<table>
<thead>
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<th>Monthly Expenses</th>
<th>$2,500</th>
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</thead>
<tbody>
<tr>
<td>To calculate necessary expenses for a year—</td>
<td>$2,500 x 12 months</td>
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<tr>
<td>Yearly Expenses</td>
<td>$30,000</td>
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<tr>
<td>Add what you want to save each year</td>
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<tr>
<td>Personal Savings</td>
<td>$30,000</td>
</tr>
<tr>
<td>Add your yearly expenses and personal savings</td>
<td></td>
</tr>
<tr>
<td>Target income</td>
<td>$60,000</td>
</tr>
</tbody>
</table>

Add all your necessary monthly personal expenses together—car insurance, rent or mortgage payment, food, utilities, school loans, and so on.
Multiply the number of hours you work a week by the number of weeks in a year—40 hours x 52 weeks.

**Work hours:** 2,080 hrs

Subtract the days you will not be working (8 hours/day).

Holidays: 10 days
3 weeks vacation: 15 days
Sick days: 5 days

**Actual hrs worked:** 1,840 hrs

Assuming 20% of your time will be spent organizing, billing, and pursuing work—.80 x 1840 hrs

**Total billable hrs:** 1,472 hrs

Divide your target income by the actual billable hours you could work—$60,000/1,472

**Base billing rate:** $40.76

Multiply that number by 12 to give you the amount for the year. Let’s say your monthly expenses add up to $2,500; that’s $30,000 per year. Add to that the amount you would like to save for a rainy day, to buy a house, a car, or make personal investments. Let’s say your goal is to save $30,000 (for personal use, not company profit). So now you have determined a target income of $60,000 per year (but you could survive on $30,000 if you had to). You may determine that this amount is unrealistic for your area. A realistic target income might be more like $40,000. That’s up to you to decide with the guidelines given above. But for this example, $60,000 is the target income.

Now that a target income is set, you need to figure out how many working hours you have to reach it. At 40 hours a week, 52 weeks a year, you’ll have available 2,080 hours to work with. If you take out 10 holidays, three weeks of vacation (15 days) and one week of sick time (five days) you’re down to 1,840. Realistically, you won’t be able to bill every one of these hours. As a freelancer or business owner, about 20 percent of your time will be spent organizing, billing, and pursuing work (many of the things that are described in this chapter, in fact). If you subtract 20 percent of 1,840 hours (or 368 hours) you’ll have 1,472 hours to earn $60,000. By dividing $60,000 by 1,472 hours you get a base billing rate of $40.76 per hour.

The rate calculated so far takes into account your living expenses, earning goals, vacation and sick time, and non-billable administrative and business development time. It doesn’t include business overhead and profit.

Overhead is a catch-all term to describe all the expenses that arise out of running a business, like rent, insurance, utilities, hardware, software, postage, and miscellaneous supplies. (Check with your accountant to see what are valid business expenses and how to depreciate equipment, etc.) Assuming your business expenses are around $1,000 per month or $12,000 a year, your earnings goal would need to increase to $72,000. Dividing this amount by 1,472 hours, your loaded billing rate, including overhead, would be $48.91. Round this up to $50.

If you intend to grow your business, or even invest in software and hardware upgrades, you’ll need to make a profit. You may think that profit has already been included in your target income—but it hasn’t. The extra $30,000 calculated in your income goal was for personal use only (to put toward a house or buy a new car). Your business profit is for business investment. A lot of people have a hard time keeping the two separate, but you should. A typical business profit margin is 20 percent. Twenty percent
of $50 is $10, so the real billing rate (fully loaded) based on your earning goals, overhead, and profit would be $60 per hour. So, if you work the full 1,472 hours and have a profit margin of $10 per hour, your business will make a profit of $14,720 per year. Now you can buy that new Power Mac you wanted.

It may seem that this method of calculating a billing rate applies only to individuals working for themselves, but it doesn't. This is the same general way that companies determine what to charge for their employees' time. They too have to calculate fringe benefits (vacation and sick time, health insurance, etc.), overhead, and profit into their billing rates. It's just a bit more complicated.

This is only one way to calculate a billing rate. If you know of another way that makes sense and is as comprehensive, by all means use it if you like. The important thing is that no matter how you figure it, you must establish a realistic billing rate for your business.

**ASKING THE RIGHT QUESTIONS**

Preparing for client meetings is like eating chicken soup when you're sick—it can't hurt and it just might help. Ask the right questions during the client meeting to help you understand the nature of the work, what the client's expectations and limitations are (i.e. schedule and budget), and how they will affect production. Consider preparing a list of questions or a checklist in advance, and don't be afraid to use it in front of clients.

If you've been working with a client for awhile, you may tend to ask fewer questions than you would with a new client. But be careful. The client may be looking for a new approach, and if you ask the right questions you'll be able to find out what he or she really wants. Keep an open mind and be aware of the client's changing needs. You never know—clients may be looking for something different than you're used to giving them. Unless you ask, they may feel you are unable to understand and fulfill their changing needs, and they may go elsewhere.

Be courteous, polite, and businesslike when conversing and asking questions. Don't feel compelled to read from a list. Many of your questions may be answered in the course of talking about the project. Preparing a list is simply providing yourself with a guide. Also, before you leave the meeting let the client know when he or she can expect to hear back from you or ask when the client needs the letter of agreement (or proposal).
Here are some basic questions that should be resolved at the first meeting:

**Project Specifics**
- What is the project? (Outline the project.)
- Does the project include more than one piece?
- If so, how many?
- What is the budget?

**Market Considerations**
- Who is the market for this piece?
- Is the market local, regional, national, or international?
- What are important considerations particular to this market?
- What are you (the client) trying to achieve with this piece?
- How will the final piece be distributed or used and are there multiple uses proposed for the piece?

**Style and Format Questions**
- Do you have a standards manual, or have basic standards been established that would affect the way this piece is designed?
- If so, what are the standards?
- Fonts? (Will I have to buy them?)
- Colors?
- Templates?
- Paper?
- Do you have examples of past pieces?
- Do you have examples of other pieces or styles you like?
- If so, what makes them seem good to you?
- What are your competitors doing and how does that relate to what you want to do with this piece?
- Do you have examples of competitors' materials?
- Will the style of this piece be transferred to other pieces?
- If so, how many pieces and what are they?
Components of the Final Piece

- How many photos or illustrations are needed?
- Are there existing photos or illustrations?
- If so, what are they and what form are they in—finished traditional mechanicals, photostats, digital files?
- If not, what types of photos or illustrations are needed? (line art, photos, slides, graphs, etc.)
- If existing art is electronic, what format is it in? (IBM or Mac, what software?)
- What are the sizes and resolutions of the electronic files?
- Do you have text already written?
- If so, will it be supplied on disk (this is preferred) and in what format?
- If not, do you need to hire a writer?
- Will you need an editor?
- Would you like me to help you find a writer or editor?

Production Concerns

- What quantities do you need?
- How many colors would you like?
- Is an exact color match required?
- What is the size(s) of the finished piece(s)?
- Do the images need to be scanned or stripped traditionally?
- What is the overall quality expectation, based on budget?
- If the budget turns out to be too small for everything you want, which area(s) can be compromised?

Schedule

- What is the deadline for finished, printed pieces?
- Do you have an existing schedule for the project? (Have you set up interim deadlines for each stage of the project?)
SECTION II: BEFORE STARTING A PROJECT

Budget Questions
- Do you have a budget yet?
- If so, what is that budget?
- Is the budget designed to cover everything from initial design to delivery of the printed pieces?
- If not, what is it supposed to cover?

Client’s Involvement
- Who will choose the service bureau and printer—you or me?
- What is your approval process for design and production, and who is involved in it?
- Who will have responsibility for proofing and approving at each stage of the process? How and when can he or she be contacted?

TALKING BUSINESS AND PAYMENT
As we discussed earlier in the section, it’s important to know your rate at the client meeting. It’s also good to get a sense of how the client conducts business and what payment schedules are like. This can be a very touchy issue, but it’s an important one. If it’s not convenient to bring it up before the end of the meeting, definitely address it in your letter of agreement. For example, “What are your company’s terms and conditions?” “Do you prefer to pay for services on delivery, within 30 days, 45 days?” (If they don’t usually pay within 45 days, you should reconsider having them as clients!) Make an effort to get a portion of the total fee (20 to 50 percent) up front as a buffer against slow payment and to cover outside expenses. Also ask them if they would prefer to receive the estimate as a lump sum, or on a time-and-expense basis. Typically, clients like to see the words “not to exceed” next to the total, at least for the design. This way they know the limits of what the project will cost.

Putting It All Together
After preparing for, and skillfully conducting a client meeting, you should have all the information you need to determine the scope of the work, how you plan to work through the project, how much the project will cost, how to schedule the work, and who the project team will be (even if it includes only you). The rest of this chapter describes how to use the information you’ve gathered to make those determinations. Then these important
specifics of the project should be summarized in a detailed letter of agreement between you and your client. The letter should also include a place for the client's signature to authorize you to begin work.

This type of agreement should also contain standard terms and conditions regarding ownership of creative work and other issues. (See the sample "Letter of Agreement" on page 121.) In order to determine what your contract language should be, think about what rights you want to retain in relation to the project you're bidding on. If you need more examples, you can find them in such books as Business and Legal Forms for Graphic Designers by Crawford and Doman Bruck, and The Graphic Artists Guild Handbook: Pricing & Ethical Guidelines.

Some clients may not request a letter of agreement, or you may feel it's not necessary to give them one (if you have a previous working relationship or you're the only one bidding, for example). But you should do it anyway. The letter of agreement will essentially serve as the formal contract that you should have in hand before beginning any work. That way, if there are any misunderstandings during the project, both parties can refer back to the letter of agreement for clarification. In any business relationship, it's up to you to protect yourself.

UNDERSTANDING THE PROJECT AND SCOPE OF WORK

It's important to make sure you understand the scope of work. Until you actually write down what the client wants, it may not be clear how complex (or how simple) the project may be. The first thing you want to do is identify the deliverables—what the client expects to have delivered to the door when the job is done. That may be a box of 2,500, four-color, three-fold, 8 x 10-inch brochures, for instance, or a floppy disk containing the final digital mechanical for a 5 x 7-inch ad containing custom two-color illustrations. Regardless, you need a detailed understanding of what the client expects to receive from you. If the details of the project are unclear when you start to write them down, call the client to confirm. Don't wait until after you've collected estimates.

OUTLINING THE PROJECT AND COLLECTING ESTIMATES

The next part of determining the scope of work is to outline the project in terms of the project team and the design and production process. If the project is large, it's important to list the members of the project team and what each person will be doing during the course of the project. On smaller
projects, especially ones that involve only you and possibly the service bureau and printer, a simple cost estimate breakdown may be enough to show the client what is being done in the design and production stage without identifying exactly who will do each task.

A project outline not only defines the project, it also creates a perfect template for developing cost estimates. If you understand the project completely, you can break it up into definable design and production tasks. The first step in developing cost estimates is to sort out what you will do yourself and what will be contracted out to other service providers.

**Your Costs**

You can estimate your own charges based on the hours and equipment required and your standard rate. If you are required to buy new hardware or software to do the job, you have to determine whether it’s already part of the profit margin built into your rate or whether you need to build it into the job cost. For example, you may be required to buy extra RAM just to perform a certain task for a project. If you are using the RAM upgrade only for this job and it will not affect future work, you need to build the cost into the project and inform the client. This may not fly with the client, who would see it as your asset rather than his expense. And the client has a point here. Chances are that you’ll use the RAM on other projects, especially with new and more powerful programs being designed to use more RAM. So, you have to determine whether it’s worth the investment for this job and if you can find future work that will help you cover the cost of the purchase. If the total project budget is $1,800 and the RAM chip is $1,000, you may not feel it’s worth it. But if you have profit built into your rate (for example, that $14,720 for the year) and the RAM can be used to get more work in the future, it’s probably worth the investment.

When you estimate your hours at your standard hourly rate, remember to account for project management (meeting with clients, coordinating with service providers, and so on) and project accounting in your cost estimates. For large projects, which require the management of a large project team and tracking several activities, the client will expect to see these items broken out in the written estimate in the letter of agreement. But for smaller projects, you don’t always have to identify project management and accounting as line items. Clients tend to question this kind of item for smaller jobs. You know it’s important, but a client may see it as your billing for every last second of time. In this case, you can build the cost into your
design or production line item. If you do this, though, make sure you identify the management and accounting items on your job sheet. *(The "Job Sheet" form that tracks the hours and expenses you actually incurred on a project is covered later in this chapter.*) This way you can still see how many hours were spent doing what.

**In-House Project Estimate Form**

To help you identify all the project components that require estimates, you may want to use a form that contains an outline of the information you need to keep in mind. The "In-House Project Estimate Form" includes columns for the scope of work, who will be responsible, time required, cost per hour, and total dollar amount. You will not be able to fill in the time and amount required for outside vendors until you get that information from them. *(An estimate request form is outlined later in this chapter.*) Don't guess! A small miscalculation here and there can make a big difference in the total numbers. You may want to modify this form depending on your working process, but this is a good place to start.

**Estimates from Outside Vendors**

Getting estimates for contracted services requires that you be very careful and explicit with vendors. Always be as comprehensive as possible, because it's a waste of time for both you and your vendors to re-estimate work. It can be embarrassing to have to explain it to the client, and it can cut into your profit.

After you've outlined the project and know where you require outside services, either from vendors or from freelancers, you need to communicate to them what you want. Too often, details are reviewed over the phone and miscommunication occurs because each party has a slightly different idea of what's going on. The best way to ensure that you communicate all the details to the vendor correctly is to write them down and fax them. Again it's good to have a handy form that does half the writing for you.

**Estimate Request Form**

The "Estimate Request Form" should include a column for the scope of work, time required, cost per hour, and total cost. Also include header information that contains your name, company name, date, project, who the form is going to, and so on. If you are collecting more than one bid for each outside service, you can use the same form for all vendors, changing only the name of the vendor. This will ensure that you give each of the bidders the same information.
In-House Project Estimate Form

Costs Involved in Completing the Project

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<tr>
<th>SCOPE OF WORK</th>
<th>Team Member</th>
<th>Time</th>
<th>Cost per hour</th>
<th>COST</th>
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<tr>
<td>CONCEPT AND IDEA DEVELOPMENT—DESIGN STAGE</td>
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<tr>
<td>Client meetings</td>
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<td>Research and development (concept planning)</td>
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<tr>
<td>Preliminary sketches</td>
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<td>Photography</td>
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<td>Comprehensive layouts</td>
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<td>Corrections</td>
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<tr>
<td>Proofing and approval</td>
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<tr>
<td>Other</td>
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<tr>
<td>TOTAL DESIGN</td>
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<tr>
<td>DIGITAL MECHANICAL—PRODUCTION STAGE</td>
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<tr>
<td>Typesetting</td>
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<tr>
<td>Hand lettering</td>
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<tr>
<td>Graphs and charts</td>
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<tr>
<td>Technical renderings</td>
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<tr>
<td>In-house high-resolution scanning</td>
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<tr>
<td>In-house color correcting</td>
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<td>Black-and-white proofs</td>
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<td>In-house color proofs</td>
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<td>Correction</td>
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<td>Proofing and approval</td>
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<tr>
<td>Preflight (collecting files, documentation, separations)</td>
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<td>Other</td>
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<td>TOTAL PRODUCTION</td>
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<tr>
<td>PROJECT MANAGEMENT</td>
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<td>Getting bids</td>
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<tr>
<td>Maintaining project documentation</td>
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<td>Progress reports and updating schedule</td>
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<tr>
<td>Estimating and accounting</td>
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<td>Other</td>
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<tr>
<td>TOTAL PROJECT MANAGEMENT</td>
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<tr>
<td>EXPENSES</td>
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<tr>
<td>Art materials (toner, paper, spray mount, etc.)</td>
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<tr>
<td>Research materials</td>
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<tr>
<td>Travel</td>
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<td>Phone (including fax and modem charges)</td>
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<tr>
<td>Fed-Ex, courier, or mail charges</td>
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<tr>
<td>Other</td>
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<tr>
<td>TOTAL IN-HOUSE EXPENSES</td>
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<tr>
<td>TOTAL PREPRESS PRODUCTION—OUTSIDE PRODUCTION</td>
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<tr>
<td>TOTAL PRINTING PRODUCTION—OUTSIDE PRODUCTION</td>
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<tr>
<td>TOTAL OF OTHER OUTSIDE SERVICES</td>
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<tr>
<td>SUBTOTAL</td>
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<td>TAX</td>
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<tr>
<td>TOTAL</td>
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</tbody>
</table>
# Service Bureau Estimate Request Form

**Date** .......................................................... **From** ..........................................................  
**To** .......................................................... **Fax** ..........................................................
**Company** .......................................................... **Phone** ..........................................................
**Fax** .......................................................... **Project / Job Number** ..........................................................
**Phone** .......................................................... **Project Date Due** ..........................................................

## SCOPE OF WORK

<table>
<thead>
<tr>
<th>Number</th>
<th>Size</th>
<th>Resolution (lpi or dpi)</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

### HIGH-RESOLUTION SCANNING
- [ ] File replacement
- [ ] High-resolution
- [ ] Photo CD
- [ ] Regular [ ] Pre

**TOTAL FOR SCANNING**
- [ ] IMAGE SERVICES
  - [ ] Color correcting
  - [ ] Editing and retouching
  - [ ] Manipulation
  - [ ] Other:

**TOTAL FOR IMAGE SERVICES**
- [ ] HIGH-RESOLUTION OUTPUT
  - [ ] Films
  - [ ] Paper
  - [ ] Plates
  - [ ] Colors
  - [ ] Spot [ ] Process
  - [ ] List colors:

**TOTAL FOR HIGH-RESOLUTION OUTPUT**
- [ ] COLOR PROOFS (PULLED FROM FILMS)
  - [ ] Overlay proof
  - [ ] Laminate proof

**TOTAL FOR COLOR PROOFS (FROM FILMS)**
- [ ] OTHER
  - [ ] Digital proofs
  - [ ] Trapping
  - [ ] How much trap?
  - [ ] Imposition
  - [ ] Archiving

**TOTAL FOR OTHER SERVICES**

**SUBTOTAL** ..........................................................
**MARK-UP** ..........................................................
**TAX** ..........................................................
**TOTAL** ..........................................................
### Printer Estimate Request Form

**Date**........................................................ From ........................................
**To**.............................................................. Fax ........................................
**Company**....................................................... Phone ........................................
**Fax**.............................................................. Project/Job Number .......................
**Phone**........................................................... Project Date Due ..........................

**SUPPLIED ITEMS:**
- [ ] Films supplied
- [ ] Paper supplied
- [ ] Disk supplied
- [ ] Color proofs
- [ ] Digital proofs

**SCOPE OF WORK (Services Required)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Time</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

- [ ] IMPOSITION AND STRIPPING
  - Description:

- [ ] COLOR SEPARATIONS
  - Description:

**Type of Plates:**
- [ ] Paper
- [ ] Plastic
- [ ] Metal

**PRINTING—Description:**

- [ ] LINE SCREEN:
  - One-sided printing
  - Two-sided printing

- [ ] COLORS (how many?):
  - [ ] Spot:
  - Spot Colors:
    - Metallic or special mix:
    - Process colors:
      - Four-color process black:

- [ ] FLAT SIZE:

- [ ] FOLDED SIZE:

**QUANTITIES:**
- [ ] 500
- [ ] 1000
- [ ] 2500
- [ ] 5000
- [ ] Other:

- [ ] BLUELINES PROOF REQUIRED
- [ ] PRESS CHECK REQUIRED

**BINDERY—Description:**

- [ ] Folding
- [ ] Special cutting (die cutting, etc.)
- [ ] Embossing
- [ ] Debossing
- [ ] Other:

- [ ] SHIPPING REQUIRED
  - [ ] Local
  - [ ] Non-local

**SHIPPING REQUIRED: [ ] Local [ ] Non-Local**

**Ship to:**

<table>
<thead>
<tr>
<th>SUBTOTAL</th>
<th>MARK-UP</th>
<th>TAX</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

**DEPOSIT REQUIRED:**

---

*A Great Studio · 123 Your Street · Anywhere, ST 00000 · Phone (000) 000-0000 · Fax (000) 000-0000*
General Estimate Request Form

Date: ____________________________ From: ____________________________
To: ____________________________ Fax: ____________________________
Company: ______________________ Phone: ____________________________
Fax: ____________________________ Project/Job Number: __________________
Phone: ____________________________ Project Date Due: __________________
Description: __________________

SCOPE OF WORK (Services required) | ESTIMATED COST

SUBTOTAL
MARK-UP
TAX
TOTAL

DEPOSIT REQUIRED:

ESTIMATE BY:

COMMENTS:

A Great Studio • 123 Your Street • Anywhere, ST 00000 • Phone (000) 000-0000 • Fax (000) 000-0000
Always be sure to work with an accountant to figure out what the tax laws are in your state. It’s important to know whether sales tax has to be calculated for design and publishing work. These rules always seem to be changing and are subject to interpretation, so make it your job to stay on top of them.

Miscellaneous Expenses
In addition to estimating your fees for design, production, and management and outside vendor costs, you also need to estimate other miscellaneous in-house expenses, like fax, phone, color copies, laser prints, and black-and-white copies. These costs are more important for large jobs, which will use a greater amount of supplies. The expenses on small jobs may amount to only a few dollars. It might be worthwhile to calculate the cost of one black-and-white printout or color printout. A black-and-white printout can range from 25 cents to more than a dollar depending on the printer and paper you use and the amount of toner, electricity, and time it takes for one page. The easiest way to get rough estimates is to refer to past jobs and make educated assumptions.

Mark-up on Outside Expenses
Once you have all your estimates in hand, review the information collected to make sure everything is clear and correct. This is a good time to add a handling charge for all your out-of-pocket expenses. If the client has agreed to pay all vendors directly, then it is not necessary to mark up vendor-related expenses. A common handling charge is about 15 percent. For example, if the final printing cost is $1,000, you should charge $1,150 (plus tax if applicable in your state). Handling fees are important because they’re your insurance for the cost of doing business. For example, let’s say you complete the job, then bill the client the total design and production cost (plus 15 percent). You pay all your vendors and other bills within 30 days, but your client doesn’t pay you until after 90 days. In this case you have, in effect, financed the project for the client. The handling charge is used to offset the risk you run by paying in advance for clients who don’t pay. Nine out of 10 clients may pay you within 30 days, but that tenth client may go bankrupt. The handling fees you charge can be used to improve your cash flow when clients don’t pay on time.

DETERMINING THE SCHEDULE BASED ON THE DEADLINE
Once the critical tasks of a project are defined, it becomes possible to set up a design and production schedule. Almost always, you will be juggling the schedule backward from the client’s due date. With experience, you’ll know right away, even during your first meeting, whether a client-imposed deadline is realistic. A clear statement of the project schedule, including
progress milestones and client responsibilities is an essential part of any letter of agreement or contract.

Timelines (schedules that identify project milestones) are particularly important if you are working on a large project or if you have several projects going on at the same time. They can help you anticipate a particularly heavy work flow or points when you'll need extra assistance.

Timelines can also help with estimating costs. If you prepare a timeline and see that rush service will be required on certain tasks, you can account for it in your price estimate. It also helps to have this information handy when your clients question your estimate (and they will). The following list of common milestones can help set up timelines for design and production projects.

- Estimate and meeting stage
- Letter of Agreement
  (with scope of work, estimate, and schedule) delivered
- Letter of Agreement or contract signed
- Research for design and production done
- Preliminary design stage (approval of color comp)
- Final design (approval of black-and-white or color print)
- Preliminary production (approval of digital mechanical)
- Final digital mechanical (black-and-white or digital color print approval)
- Prepress preparation done (by service bureau)
- Production of film done (approval of color proof)
- Print preparation done (by printer)
- Blueline or press proof approval
- Corrections and print preparation done
- Press check (at the printer)
- Printing complete
- Shipping date (from the printer)
- Client due date for delivery (at client's location)

For more information on standard business practices, establishing pricing, and preparing proposals, there are three books you can take a look at to start. The first is Business and Legal Forms for Graphic Designers by Tad Crawford and Eva Domain Bruck; the second is the Graphic Artist's Guild Handbook: Pricing and Ethical Guidelines; and the third is Electronic Design and Publishing Business Practices by Liane Sebastian. (For more information, see "Books and Pamphlets" in the "Sources" section at the back of this book.)
Terms and Conditions

The fees and expenses shown are estimates only. Final fees and expenses shall be shown when invoice is rendered. Client shall be responsible for making additional payments for charges in original assignment as may be requested by Client. No additional payment shall be required for additional changes required that conform to original assignment description or the first revision. Client shall offer Designer first opportunity to make any changes. In the event of cancellation, a fee for work completed based on the contract price and expenses incurred shall be paid by Client. At completion of project, Client shall own files and proofs. Electronic files of all work remain property of Designer unless otherwise noted on letter of agreement. Please verify final copy when proofs are presented. Designer will assume responsibility for that copy exactly as it appears. Estimate is valid for 30 days. Terms are 50% in advance, 50% upon completion. Order to commence work will constitute formal authorization to proceed in accordance with the attached estimate, terms, and conditions.

PREPARING THE LETTER OF AGREEMENT

Once you’ve gone through the procedures to determine the scope, schedule, and cost for a project, the last and, in some ways, the most important thing to do is to prepare a written letter of agreement. This should be a straightforward exercise because if you’ve taken the steps described above, all of the information you need will be available already. There are any number of ways to format written estimates and proposals, ranging from simple to “salesy” (from plain and factual to full of promotional language, if it’s a competitive bid, telling why you’re the one to choose). It’s a good practice to begin by re-stating your understanding of the project. If you can’t write it down, you probably don’t know it as well as you think you do and should clarify cloudy issues with the client.

After describing your understanding of the project, present a clear description of the scope of work you intend to complete and identify a project team, if necessary. Next, you should include the schedule of work. Indicate within the schedule the stages where the client has to proof and approve work. Make sure the client understands that proofing and final approval is their responsibility. Finally, include the estimated budget, the payment you request up front, a schedule of payments (often tied to progress on the job), the procedure that will be followed if there are changes to the scope of work, and a request for the client’s written authorization to proceed. (You should include a signature block so the client can sign and return a copy. Asking for a signature helps ensure that the client will read and try to understand your letter.) To protect yourself, it’s also a good idea to include standard contract language regarding terms and conditions. You may want to create a form or “template” on the computer which contains your terms and conditions of work. This way you can write the letter within this template and print it out on your letterhead.

Letter of Agreement Example

The letter of agreement template can begin with simple header information to differentiate it from a regular letter. The header information could include the client name, project name, date, and the words “letter of agreement.” Try to stay away from creating a complicated form. The letter of agreement should remain personalized, more like a letter than a formal contract.

When you send clients a written letter of agreement, you can expect to get questions from them. These questions will usually be about the basics, like the schedule and budget. (Why does it take so long? Why does it cost so
much? and so on.) In this case, because you’ve done such good preparation, it will be easy for you to double-check your "In-House Project Estimate" form and then explain how you came up with the costs, schedules, and so forth. Sometimes you can avoid this question-and-answer routine by breaking out all the items in the scope of work and their costs line by line. This may seem unnecessary and tedious, but if it helps the client clearly understand what it takes to get the job done, and gets you the job as a result, it’s worth it.

Sometimes clients question the contract language regarding things like copyright, ownership of electronic files, and so on. When this happens, be able to discuss how you do business and how you typically interact with clients. Part of the way you do business may include not doing speculative work, or retaining the rights to electronic files. These are things you need to communicate to the client in the letter of agreement, if not in the client meeting. If you and your client strongly disagree on some items and you can’t seem to work it out, refer to Graphic Artist’s Guild Handbook: Pricing and Ethical Guidelines for some basic guidelines, or possibly consult an attorney to give you legal advice on the issues. (If you get to this point, you may have to give up on this job, but at least you’ll be well-informed for next time.)

**Project Planning and Management Tips**

If you have ironed out all the details, the client has signed the letter of agreement, and you know your mission, you’ll probably want to jump right into the process. Well, just hold on—planning after you win work is just as important as planning before, because now you’re under contract to perform! Engineers, scientists, building contractors, and others have spent years developing methods and theories of project management. Whole college programs have been developed around it. Good project management is important no matter what the business. It’s especially important on very large jobs, where the success of the project depends less on design concepts and more on good project management. While you could spend a lifetime studying the finer points of project management, the following suggestions should help you through design and production.

**PROJECT OUTLINE**

The time and effort you put into preparing a clear, concise letter of agreement really pays off when it comes to project management. The scope of work described in the agreement makes a great project outline because each task is identified and its budget and due date are established.
A Great Studio • 123 Your Street • Anywhere, ST 00000 • Phone (000) 000-0000 • Fax (000) 000-0000

August 30, 1995

Whitney & Associates
000 San Juan Drive
Anywhere, ST 00000

Dear Mrs. Whitney:

Thank you very much for the opportunity to meet with you on Thursday, August 28. As we discussed, I've prepared a scope of work, schedule, and estimate.

Scope of Work:
It is my understanding that you want to have 10,000 copies of a four-color, 16-page, 8 x 10 inch capabilities brochure printed on a recycled stock. It will include 18 images, all of which are available and need to be scanned in high resolution, color-corrected, and touched-up. You would also like five graphs created, each approximately 5 x 8 inches. All final copy will be supplied on disk, including copy for charts.

Work Completion Scheme:
In order to complete the work specified above, I will be working with an assistant in-house and hiring a service bureau to complete the scans, color correction, and touch-up on the images. The printer we will use is part of the same business as the service bureau. This will ensure good quality control throughout the entire project.

Schedule:

<table>
<thead>
<tr>
<th>Task</th>
<th>Expected Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Images received</td>
<td>September 11</td>
</tr>
<tr>
<td>Scanned, color-corrected, touched-up</td>
<td>September 15</td>
</tr>
<tr>
<td>Copy received</td>
<td>September 16</td>
</tr>
<tr>
<td>Concept and comps presented</td>
<td>September 26</td>
</tr>
<tr>
<td>Final direction selected and proofed</td>
<td>October 30</td>
</tr>
<tr>
<td>Production of final design started</td>
<td>October 31</td>
</tr>
<tr>
<td>Production finished and approved by you</td>
<td>October 12</td>
</tr>
<tr>
<td>Files prepped and delivered to service bureau</td>
<td>October 16</td>
</tr>
<tr>
<td>Films and color proofs ready to be proofs</td>
<td>October 24</td>
</tr>
<tr>
<td>Blue line proofs created from the plates</td>
<td>October 26</td>
</tr>
<tr>
<td>On-press check</td>
<td>November 30</td>
</tr>
<tr>
<td>Printed material to bindery</td>
<td>November 31</td>
</tr>
<tr>
<td>Printed material delivered</td>
<td>November 5</td>
</tr>
</tbody>
</table>

Estimated Costs:

- Design (includes three comprehensive designs of brochure using existing images) ........................................... $7,000
- Charts (includes creation of five charts with supplied copy) ............................................................... $500
- Production (includes finalizing approved design for production) .............................................................. $2,000
- Scanning (includes high-resolution scanning, color correction and retouching) ........................................ $4,000
- Films and color proofs (includes final four-color film separations and color proofs) ................................ $5,000
- Printing (includes blue line proofs, press check, printing, saddle stitch bindery, delivery) ................... $10,000
- Misc. expenses (includes phone, fax, travel time, gas, five meetings, art materials) ............................... $1,500

Estimated Total: $30,000

(Tax will be added to the final invoice.)

If you have any questions, please feel free to call. If the above information is agreeable and you wish to proceed, please sign on the line below and send a check for 50% of the total amount to my office to authorize work to begin.

Sincerely,

Paige Turner

Signature ........................................... Date .........
SYSTEMS FOR DOCUMENTATION

Make sure that you have a system in place to document project-related activities. Documenting a project involves saving all correspondence, change orders, detailed time sheets, job sheets accompanied by all receipts for services and expenses, and a billing index to keep track of the date of the total charges billed to the client. It also includes keeping all hard copy generated during the course of the project, each page clearly marked with the date and project stage. You may choose to do your documentation tracking on the computer or actually create printed forms specifically tailored to your working process. Either way, the forms discussed below will give you a good idea of where to start.

Transmittal Form

The "Transmittal Form" is attached to every proof or other document sent out by messenger, fax, mail, Federal Express, UPS, or other source. This form should contain your name, address, phone and fax number, that of the client, and an area for any special comments. It should also contain a list of simple actions, each accompanied by a box where you can check off what you want the client to do. This list of instructions is a good reminder of all the details that are easy to forget if you try to generate a separate list with each transmittal.

Change Order Form

The "Change Order Form" should be attached to any pages that the client faxes or mails to you marked with changes to be made. It’s also the form to write down changes that the client communicates to you over the phone or gives you on disk as corrected copy. This form includes the date, client name, job, disk file, and whether the change is beyond the original scope of work. Every time the client requests any kind of change, by fax or otherwise, it should be noted on this form.

Time Sheet

The "Time Sheet" should be designed to help you keep track of your time each day. As you switch from job to job during the day, write down the time spent on each project. Track your time by task if you can. Even if you bid the job for a fixed fee or lump sum (not on an hourly or time-and-expense basis) you need to know how much time a job takes for reference in the future. If you use freelancers, have them include a breakdown of the hours they worked along with their bill. Your time sheet should contain a column
### Transmittal

<table>
<thead>
<tr>
<th>Date</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Company</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Fax</td>
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<tr>
<td></td>
<td>Phone</td>
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<tr>
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<td></td>
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**THE FOLLOWING PAGES INCLUDE**

<table>
<thead>
<tr>
<th>Proofs:</th>
<th>(Pages)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data files:</td>
<td>(Disk(s))</td>
</tr>
<tr>
<td>Final art:</td>
<td>(Pages)</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

**RESPONSE REQUESTED**

Date: 

- [ ] Approved
- [ ] Approved with revisions being sent, as noted below:
  - [ ] By fax
  - [ ] By phone
  - [ ] By mail
  - [ ] By overnight
- [ ] Not approved—will call (see following)

**Comments:**

---

*Great Studio • 123 Your Street • Anywhere, ST 00000 • Phone (000) 000-0000 • Fax (000) 000-0000*
## Change Order

<table>
<thead>
<tr>
<th>Date</th>
<th>To</th>
<th>Company</th>
<th>Fax</th>
<th>Phone</th>
<th>Project / Job Number</th>
<th>Description of changes to be made:</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

### THE FOLLOWING PAGES INCLUDE

- Proofs: .................................. (Pages)
- Data files: ................................ (Disks)
- Final art: .................................. (Pages)
- Other: .....................................

### FOR OFFICE USE ONLY

- Revisions made
  - Date: ....................................
  - Approved by: .............................
  - Additional comments: .................

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In addition to your Transmittal Form and the Change Order Form, you may want to create a rubber stamp with the words "Approved Final," and spaces for the date, initials of person giving the approval, and the name of the item being approved. This stamp can be used at each stage in the timeline, such as copy, black-and-white design hard copy, color design hard copy, digital mechanical, blue line, color proofs, and so on. It is to your advantage to stamp each item at that critical stage and require the client to approve it.

**Approved Final**

- **Date:**
- **Approved by:**
- **Item:**
- **Approved for:**

for the date, job name, description of project, hours worked, total cost, whether the job has been billed, and whether the hours worked were the result of a change order. At the end of the project, you can tally up the time on your time sheet from that job and place it on the job sheet, described next. (It's also a good idea to write down your time spent on non-billable activities. This will give you an idea of how many hours per week you are billing and how many hours you're not).

**Job Sheet**

The job sheet is designed to keep important information about the job, like the job name, shipping date, and costs or expenses incurred during the project. At the end of the project, you want to tally up the total hours worked on the project and place them on the job sheet. Also tally up the cost of change orders that were not part of the original contract on a separate part of the job sheet. As long as you include all the expenses incurred on the job sheets, you can save the receipts (in an envelope labeled with the client's name and the name of the project) in a different location with the rest of your business receipts.

**Billing Index**

After you complete the job sheet, including documenting all expenses and time, you're ready to fill out the Billing Index and then invoice the client. The Billing Index should include columns for the billing date, invoice number, job number, who it's being billed to, job name, design fee, production fee and expenses, tax if applicable (check with your accountant), total, date paid, and amount paid. The Billing Index keeps track of when and for how much you billed all of your clients.

**PROGRESS REPORTS**

Regular progress reports are a great way to keep the lines of communication clear and open with your clients and keep you both up-to-date. Areas of question or concern can be addressed as soon as they occur, and solutions can be reached before a deadline is missed or money is misspent. Besides, forcing yourself to sit down and write a progress report is a good way to get yourself reacquainted with the schedule.

For any project that you manage, it's your duty to update schedules and requirements and clearly communicate any changes to anyone who plays a role in your project. Schedules and product expectations are always best
<table>
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<tr>
<th>DATE</th>
<th>DESCRIPTION</th>
<th>HOURS</th>
<th>COST</th>
<th>DATE BILLED</th>
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**TOTAL**
## In-House Job Sheet

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<tr>
<th><strong>PROJECT INFORMATION</strong></th>
<th><strong>WORK CHANGE ORDERS</strong></th>
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<td>Date</td>
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<td>Job Number</td>
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<tr>
<th><strong>JOB DESCRIPTION</strong></th>
<th><strong>SUMMARY OF COSTS</strong></th>
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<tr>
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<td>ITEM</td>
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<table>
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<th><strong>SUMMARY OF COSTS</strong></th>
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<td>In-House Billing Index</td>
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**CHAPTER 5: PROJECT PLANNING AND MANAGEMENT**
understood when put in writing both to the client and to the project team. The progress report can be as simple as a letter with the updated schedule attached. It's common to submit a progress report along with progress billings, which are typically submitted every four weeks during long projects. For projects that don't last long enough for progress billings, tie your reports to important milestones during the project—for example, when items need to be approved to get to the next stage of the project.

QUALITY CONTROL AND PROOFING
Quality control is a combination of good communication, documentation, and proofing that is maintained throughout the course of a project. Before you send anything to a client, make sure you have thoroughly proofed it. It's your job to make sure the text is correct, the images are in good shape and in the right place, and communication is clear with service providers before you send anything off for client approval. It can be embarrassing and costly if you, or part of your team, overlooked changes requested by the client at a critical point in the process. Always double- and triple-proof everything even though you have established in the letter of agreement that the client is responsible for the final approval of all proofs. If you maintain high quality standards at every stage of the project, the results will reflect it. If you lose steam and let small details pass you by, they can become big flaws in the eyes of the client in the final product.

Summing Up
Preparation and project management are key aspects of the design-to-production process. In summary you need to:

- Prepare before you actively pursue work.
- Prepare before you meet with clients.
- Prepare to do work by having an agreement in place with the client.
- Prepare by understanding the basics of project management.
- Communicate with clients and vendors clearly and in writing.
- Document your time and expenses.
- Take control of proofing and quality at every step.
SECTION II
BEFORE STARTING A PROJECT

CHAPTER 6
THE SERVICE BUREAU
AS YOUR PARTNER

The Imagesetting Process

Types of Service Bureaus
- Small Service Bureaus
- High-Volume Service Bureaus
- High-End Color Bureaus
- Service Bureau/Printer Combinations
- Specialty Providers

Available Services
- Technical Support
- Scanning
- Image Services
- Trapping Services
- Imposition
- High-Resolution Output
- Offset-Press Proofing Systems
- Digital Color Proofing
- Large-Format Color Output
- Film Recorders
- Archiving Services

Choosing the Right Service Bureau
- What Services Do You Need?
- Finding Service Bureaus
- Evaluating Service Bureaus

Working with a Service Bureau as Your Partner
- Loyal Partnerships
- Your Responsibilities (Effective Communication)
- What You Expect of Them

Summing Up
What is a service bureau? A service bureau is a company that employs technicians who use expensive prepress equipment to convert your digital files into a form that can be used by the printers. The most important equipment used by service bureaus are imagesetters that convert your digital files (any computer file containing text, bitmapped or object-oriented images) into high-resolution images on paper, film, or plates that can be used by the printer to create the final printed piece.

The Imagesetting Process
The imagesetting process requires a Macintosh computer (or a PC compatible, depending on the bureau), a raster image processor (RIP), an imagesetter, and a developing system. Here's what typically happens:

1. Your files are delivered to the service bureau (either on a transfer floppy, optical, or SyQuest disk or by modem).

2. A Macintosh computer at the service bureau downloads your files from the transport disk. Technicians check to see that all files are accounted for. They make any necessary output adjustments— inverting the image if you requested negative films, for example—then create a PostScript file, made up of code, to be "ripped" for the imagesetter.
3. A raster image processor (or RIP) reads and translates (or rasterizes) the PostScript code in the file into the dot pattern the imagesetter will use to draw the page on film, paper, or plates.

4. The imagesetter receives the rasterized image data and draws it onto the output material (film, for example) using a laser. The exposed film (or paper) is stored in a light-proof container while in the imagesetter.

5. The canister is transferred to an automatic processing system and run through a processor that develops and sets the image.

6. The high-resolution image is then checked by the technician (against a hardcopy laser proof, if you sent one with the file as you should). Color proofs are made if you requested them, and the job is delivered to you or your print shop and billed.

Service bureaus don’t just do imagesetting; many have knowledgeable technicians who can help you prepare your files for output in the design and production stages. Service bureaus also offer other services like scanning, color-correcting, trapping, and imposition.

**Types of Service Bureaus**

Service bureaus come in many sizes and varieties—from mom-and-pop shops to complete service bureau/printer combinations. It’s important to understand that service and quality largely depend on equipment, software, and personnel. The following is a general overview of the types of service you have to choose from.

**SMALL SERVICE BUREAUS**

When Macintosh computers became the tool of choice for design and art studios, imagesetting output became a much needed commodity. Because the start-up costs for this type of business were relatively low, small shops began to spring up all over. As the needs of the industry grew and equipment changed and became more expensive, some shops dropped out of the technology race, sticking to the basics—using older imagesetters equipped with PostScript and capable of outputting only simple files. The advantage of working with this type of shop is their competitive pricing for paper or film output. The disadvantage is that these shops usually offer only limited services (typically black-and-white or spot color output at relatively small standard sizes) supported by one or two technicians using a few pieces of equipment.
HIGH-VOLUME SERVICE BUREAUS
Most service bureaus are high-volume shops offering a variety of services from simple paper and film output to scanning, color correction, color separation, trapping, and several types of color proofs. Their services are usually performed on the latest equipment by trained technicians. Because they turn out high volumes of work it's not uncommon for them to run several shifts, staying open 24 hours. Free pick-up and delivery and quick turn-around are commonplace. The advantage of working with this type of service bureau is that they will be able to meet most of your prepress needs. Some disadvantages are that their large workloads can cause employee stress, resulting in a high turnover of technicians; your job may be shelved if there are problems—without you being consulted for hours or days—or your job may not be proofed adequately before being sent out to you.

HIGH-END COLOR BUREAUS
High-end color bureaus usually have expensive proprietary prepress systems or ultra high-end Macintosh work stations designed to work with large images for tedious retouching. These bureaus grew out of traditional color houses where color separations were created photographically and stripped together. The advantage of this kind of service bureau is that their technicians typically know more about color and understand how to remove color casts, compensate for dot gain, and handle other printing issues. You can trust them to perform prepress production services with a high level of skill. They also offer color proofing systems and understand how to solve complicated color problems. You get what you pay for, so these services tend to be a bit more expensive than typical high-volume service bureaus.

SERVICE BUREAU/PRINTER COMBINATIONS
In order to bring in more business and maintain better control of the project once it leaves the client's (your) Mac, some companies have created one-stop shops for prepress and printing. Some of these new combined companies were printers that already had in-house stripping services, so prepress was a natural extension. With both capabilities in-house, there is regular communication between the prepress department and the printing department to ensure a smooth transition. Because both prepress and printing are handled in-house, any mistakes on the prepress side are usually caught as the job goes to print and correctly rerun without your knowledge, with no additional service charge. Systems are regularly calibrated, so that the color proofs you see are representative of the films.
laminated proofs, and final press colors. The advantages are obvious, but one disadvantage is that the quality produced by one part of the business may be better than another—and if you’re using one, you’re usually locked into using the other.

SPECIALTY PROVIDERS
There are a number of service providers who may not offer imagesetting but do offer other specialty services that can make design and production easier. For example, some photo labs have expanded their services to include developing slide film and scanning slides to Photo CD. (See “Scanning” on the next page for details.) The regular Photo CD service includes scans saved at five resolutions, and Pro Photo CD includes six resolutions. For example, if you have a 4 x 5 inch original, the highest-resolution image able to be used is a size of 57 1/2 inches, printed at 150 line screen. (See Chapter II, “Image Resolution and Scanning.”) for more information on image resolution and line screen.)

Some copy shops not only offer self-service copying, but they also sometimes offer color copiers that can make prints directly from a computer disk. Other companies specialize in large-format digital color output.

Available Services
Before deciding which service bureau to use, ask for a list of their services or get them over the phone. Make sure that the service bureau can fill your needs. It’s best to pick one with a variety of services and good technicians to walk you through problems that may occur.

TECHNICAL SUPPORT
Most service bureaus have at least one knowledgeable technician in-house. Bigger bureaus usually have specialists in each department. Some of the bigger service bureaus and printer/service bureau combinations provide a technician who regularly answers customers’ technical questions, goes on house-calls, or holds training classes for clients or trade groups. In-house troubleshooting and job management are also part of the technician’s job.

When your job comes in, a technician will be in charge of routing it through the system and, if there are problems, solving them. The more experienced the technician is, the more successfully your job will run through the system. Technicians are usually more than happy to answer questions when you are designing or constructing your final file, because this will help eliminate
problems on their end later. If you develop a good relationship with a service bureau, their technicians can help answer your production questions and supply you with software and hardware updates. Keep in mind that some service bureaus, especially the high-volume bureaus, don’t offer easy access to their technicians, or they may be too busy to answer questions.

**SCANNING**

There are a number of scanning services available at a variety of prices using very different equipment. These services range from low-resolution and high-resolution scanning to file replacement—the service bureau scans at high resolution but supplies you with a low-resolution FPO (For Position Only) scan and retains the high-resolution image to replace the FPO version before the file is output to the imagesetter. The quality and the way each service is performed differ from bureau to bureau, but in all cases you’re paying for some level of technical expertise. Typically the higher the price, the better the equipment, the more time is taken to adjust the scanner ahead of time, and the higher the final resolution will be. The scanning service you choose will depend on your client’s expectations for the quality of the final printed product. (For more information on when to use what services, see Chapter II, “Image Resolution and Scanning.”)

In order to offer these services, your service bureau may have one of the following types of scanners—flatbed scanner, drum scanner, 35 mm scanner, or Photo-CD scanner. Each kind of scanner has its advantages and disadvantages. For scanning inflexible 2-D artwork, photographs and even some 3-D objects, service bureaus may use a flatbed scanner. For creating very high-resolution scans of flexible images, both prints and transparencies, a drum scanner is usually used. A slide scanner is used to scan 35 mm slides.

The equipment needed for the Photo CD process is proprietary to Kodak. The process works like this: when you take an exposed roll of film to your Photo CD vendor, the film is processed into negatives or slides, which are then scanned in through a Kodak PCD film scanner. The images themselves are sent to a PCD Writer, which records the images to the Photo CD. When the process is complete, you get your negatives, prints, and your Photo CD—with each picture stored in at least five different resolutions (128 x 192, 256 x 384, 512 x 768, 1024 x 1536, and 2048 x 3072 pixels). Photo CD images can be accessed from a CD-ROM drive and used like any other digital photos.
IMAGE SERVICES
As well as scanning, some service bureaus also offer color-correcting, retouching, editing and manipulation of your scanned images. When you pay for high-resolution scans from a service bureau, a lot of the color-correcting is done before and during scanning—but if needed, additional color correction can be performed. Some service bureaus offer retouching and manipulation by technicians trained to perform these services with expert results.

If a service bureau offers these services, it generally has dedicated workstations for the task. These workstations can either be proprietary systems (by Scitex or Agfa, for example) with special software or they can be Macs with large amounts of RAM running Photoshop, Live Picture, or other commercial software. You may choose to use a service bureau for image manipulation if your files are beyond what your system can reasonably handle.

TRAPPING SERVICES
One of the most useful services offered by the service bureau is the trapping of your file before it's sent to the imagesetter. Trapping is the act of choking or spreading colors in order to compensate for misregistration on press to avoid gaps between colors. Even though these services are offered by the service bureau, you still have to understand how to prepare your file to be trapped. (For information on trapping, see Chapter 10, "Registration, Dot Gain, and Paper.")

Service bureaus offer different solutions for trapping—manually within your application file, semi-automatically through the use of software, and automatically through a high-end prepress system. Manual trapping can be performed within QuarkXPress, FreeHand, Illustrator, or Photoshop, and you can use Adobe Prepress to trap PageMaker files. A couple of software packages used for semi-automatic trapping are Adobe TrapWise and Island Trapper. These programs use enormous amounts of memory, so service bureaus who use them usually have Power Macs and lots of RAM. Automatic trapping is primarily performed on proprietary computer systems with special software by manufacturers like Agfa, Linotype-Hell, and Scitex. These systems are particularly good for trapping four-color process files. Workarounds have been developed for trapping spot color images and text on these systems, but they are not always successful. (Spot colors usually have to be converted to cyan, magenta, yellow or black to trap properly.)
IMPOSITION

Another service which is best left to the service bureau, or even the printer, is imposition. However, desktop imposition software is becoming more readily available and competent. (*imposition* is the process of arranging pages to fit on a large press sheet to optimize printing, folding, and trimming.) If imposition is performed by the service bureau, special software can be used to arrange different pages of a file and reduce stripping services at the printer. Most imagesetters don’t output film in large enough sheets to cover an entire size of the press sheet (the sheet of paper that is printed on press), so the film is output in sections (or several printer’s spreads may be output together on a long sheet of film) and the sections are stripped together. For example, if *reader spreads* (spreads set up the way you will see them in a book, with page 1 next to page 2, and so on) are converted to *printer spreads* (two-page units arranged in the way they will be placed on the flat) and then the file is output to film, the printer will not have to cut each spread apart and strip them back together.

HIGH-RESOLUTION OUTPUT

Producing high-resolution output for offset printing is one of the most important services provided by a service bureau. Files can be run through imagesetters from a Mac workstation, as discussed at the beginning of this chapter, or they can be ripped from the Mac over to a high-end pre-press system such as a Scitex or Agfa system. The quality of your final high-resolution output, whether films, paper, or plates, depends on the equipment, the software used in the RIP, the calibration of the imagesetter, and the skill of the operator.

All imagesetters are not created equal. There are two main types: capstan and drum-based. Most service bureaus use capstan systems, where the paper, film, or plates are stored in a canister (each medium has its own canister) and the medium is moved under an imaging laser using a transport system similar to the tractor feed of a dot-matrix printer. After imaging, the film is removed from the system to be processed.
The transport systems of some older capstan systems are not accurate. This makes them inadequate for color output because registration problems can occur when the film shifts during the running of the four separations. They're also slow and have memory limitations. As a result, you may pay for extra imaging time. The transport mechanisms in newer capstan systems are more precise, and they have more memory to handle PostScript better, for much quicker image production.

Drum-based imagesetters are the newest and most accurate. Mechanically they resemble the precision film recorders used for high-end prepress systems. An imaging medium (film) is fed onto the drum and a laser writes the image onto the film as the drum rotates. If the imaging medium has been loaded correctly, this system offers great accuracy in writing the image and therefore much less chance of misregistration.

Proprietary imagesetting systems have their own high-speed workstation, scanner, and proprietary software, and they can output to a large film developing system. Unless you request automatic trapping or the service bureau has an older imagesetter incapable of running very complicated files, a proprietary system will probably not be used—in general, because it's more expensive than using a Mac-based imagesetting system. When a page layout file is run through some proprietary systems, it sometimes can't be easily translated back over to the Mac and may be un-editable.

OFF-PRESS PROOFING SYSTEMS
After your films are output, you can request color proofs to check the film traps and color, and to make sure all elements of the page separated correctly so they'll produce the printed pages you expect. In order to get proofs you can rely on, they must be made from the film negatives actually generated from your computer files. There are two types of off-press proofs—overlays and laminates. Overlays consist of individual transparent prints of each separated color with the color sheets laid on top of one another. Laminates are similar, but the transparent layers are melded into a single proof and look more like the final printed piece.

DIGITAL COLOR PROOFING
Service bureaus offer several types of color printers for proofing your work at the design stage and before going to the imagesetter. These printers output color pages using cyan, magenta, yellow, and black. So, if you have specified a spot color, for example PMS 304, it will only print the process
equivalent, which may be close, but not exact. Some of these digital printers can simulate overprinting and trapping (though many don't), which is useful for proofing, especially if you don't want to pay for an off-press proof from the films. One problem with using digital proofs as a final proofing system before going on press is that they don't show the screen angle problems that can occur in the film called moirés. (Moirés are discussed in Chapter 10, "Registration, Dot Gain, and Paper.") Color calibration and consistency problems also may occur with digital printers. They need to be calibrated on a regular basis, and even then the correlation between digital printer color and spot or process inks can be poor. Overall, it's a great way to create color comps (or comprehensives—color representations of the final printed piece) in the design stage, but it's often inadequate for final color production proofing.

LARGE-FORMAT COLOR OUTPUT
Some service bureaus specialize in providing low-quantity large-format digital color graphics. In this active area of technology advancement, new devices are being developed all the time. As a result, this service is likely to be more commonly available. These service bureaus provide their customers with large-format digital color prints as color proofs or for trade shows, posters, and so on. The quality of large-format output services varies, so ask to see examples of finished work.

FILM RECORDERS
Some bureaus create slides and transparencies from computer files. This service is important if you want to create a slide presentation or a transparency of an image for reproduction by the traditional photographic process. Film recorders create slides or transparencies using a cathode ray tube, like a TV tube, and color filters to project images onto slide or transparency film. Slide recorders create high-resolution images—as high as 16,000 lines on the width of 35mm film—as well as on larger formats.

ARCHIVING SERVICES
Many service bureaus offer individual project and image archiving services. These services are usually available for a fee after you have had images scanned or files output. The service bureau may transfer the contents of your back-up disks (floppies, magneto-opticals, or SyQuests) onto CD. If you use the CD archiving method, you'll have the images at your location for immediate access. As another alternative, some bureaus are even creating
high-speed networks for archiving and communication with their best customers—supplying them with unlimited amounts of storage space and fast transfer rates of large images. The advantage is that you don’t have to archive your large files, which can be costly and time-consuming. The advantage to the service bureau is that the convenience they provide is likely to keep you coming back to them.

Choosing the Right Service Bureau
When you’re looking for a service bureau, you’ll usually be looking with a specific job in mind, but you should also be looking in general terms to get resources lined up for the future projects. While you are looking, keep in mind your skill level. If you’re not comfortable with certain production aspects and need the assistance of a service bureau, it can narrow your choices. Once you know what you need and have a few service bureaus in mind, you should prepare a list of questions to ask and a detailed estimate request form if you have a certain job in mind. This will ensure that you get the answers and estimates to help you determine which service bureau to use. It’s best to choose your service bureau before you get very far into the design or illustration of your piece—right after you get the initial job estimates. It is important to establish a working relationship and open the lines of communication early in the design and production process—helping to eliminate problems later. With all this in mind, you’re on your way to finding (and hopefully keeping) one of your most important partners in digital color publishing.

WHAT SERVICES DO YOU NEED?
The best way to evaluate the services you need is to review your past project outlines or create one for the job at hand. (See Chapter 5, “Project Planning and Management.” for more information on this topic.) This will help you understand all the important elements that make up your job and what you need to look for in a service bureau. Some of the items you need to evaluate are:

- Output and services required (digital prints, film, slides, trapping)
- Your software
- Budget
- Client expectations
- Timelines and deadlines
Avoid trying to give clients more than their money can buy. This happens when you give a client a more complicated design than can be properly produced within the budget. This can result in countless time-consuming complications and increased prices for output that you may have to cover.

Budget and Client Expectations
In general, the budget for any piece helps you determine which service bureau and printer to use and what quality can be expected. It's your job to make sure that the client's expectations are in line with the budget. For example, if the client expects exact color matching on a process color job, but the budget won't cover the services of an expert color service bureau, you need to either get the budget raised or the expectations lowered. Do not assume, without experience, that you can save money and do the color matching in-house. It may end up costing you more money if you don't have your equipment properly calibrated to do your own color correction.

If the budget is slim, your design will probably be simple, consisting of one or two colors not butting (to avoid the need for trapping) and simple images (no duotones, for example). This will allow for simple output of one or two pieces of film that do not require exact registration. This style of design will be easier to reproduce at a small print shop or copy shop outputting straight to plates—who will work within a limited budget. If the budget is more robust and you can design a piece that requires high-quality color-separated output and calibrated color proofs, you will more likely need a high-volume service bureau or service bureau/printer combination.

Timelines and Deadlines
If you typically have tight deadlines, you need to find a service bureau that can respond to that need, even for an extra charge. Some service bureaus have different rush policies than others, and rate schedules vary. Many high-volume service bureaus have round-the-clock shifts to accommodate tight turn-arounds.

Services You Need
Make sure you know what products you need—for example, film and color proofs—and understand your own limitations. For example, you may need to have the service bureau trap complicated files because you don't have the experience or the software to accomplish the task.

Software
The software that you use is also very important in your choice of a service bureau. You need to choose a service bureau that regularly uses the software packages that you use. Otherwise, it can take longer to output the problem files that are sure to come along once in a while, if they can be output at all.
FINDING SERVICE BUREAUS
There can be many reasons to look for a service bureau. You might be new in the business or new to an area and just starting to establish relationships. You may be expanding the type of work you do and need a service bureau that’s better able to meet your new needs. Or, maybe you’re expanding your business and need a bureau that can handle larger volumes of work.

The simplest way to find service bureaus in your area is to look in the Yellow Pages, under desktop publishing, typesetters, printers, or color separation. Just call and have the person who answers explain the firm’s services. This may not be the best way, but it’s the most direct if you are new to an area. (It’s not the best way because an ad can’t tell you how this company works and whether they provide high-quality results—you can only find out by working with a service bureau or talking to someone who has.) If you know other designers, illustrators, or photographers in your area, call and ask which service bureaus they use and what types of jobs they use them for. Or call a number of printers (or just the printer you plan to use) and ask which service bureaus they suggest.

EVALUATING SERVICE BUREAUS
Once you’ve defined the services you need and have a few service bureaus to call, you must select one to fit those needs. Contact a few and describe who you are and what services you need. Then get some information from them regarding their services—a capabilities brochure is a good place to start. Always choose a service bureau that’s pleasant and enthusiastic about the technology and the industry. Regardless of how large or small, if the service bureau personnel are overworked or burned out, you can probably expect poor performance.

Capabilities Brochures and Pricing Guides
Most established service bureaus have a brochure or a pricing guide that outlines their services and equipment. Obtaining this information from a number of bureaus will help you compare services and prices. You can sometimes get an idea of the quality of their work by examining their brochure, assuming, of course, that they produced it. If they don't have printed collateral material, ask questions to make sure they have what you need and to get information regarding other services you may need in the future.
Questions to Ask When Interviewing Service Bureaus

It’s handy to have a form to fill out as you gather information on each service bureau you interview. A sample of the Service Bureau Information Form is provided on page 145. It can help you directly compare one service bureau to another. It may also be a good idea to create a folder that contains service bureau collateral, price lists, and output request forms.

(To create your own Output Request form, for the service bureaus that don’t have one, see the inside back cover.) This way, you and your freelancers or co-workers will be able to find the information in one place. Here are some things to find out:

1. Do they have a service output request form? Evaluate the output request form for clarity and thoroughness. If the form has a section for other options or special instructions, ask them what this might include.

2. Do they have free pick-up and delivery? Is there a minimum job size for free pick-up and delivery?

3. Do they have a price list?

4. What are their standard turnaround times?

5. What transfer media do they accept? These may include optical disks, SyQuest cartridges, Bernoullis, their own BBS (bulletin board service for direct electronic file transfer), or file transfer through an on-line service such as CompuServe or America Online. If they don’t mention a media format you have access to, they won’t be a good choice.

6. What software do they use regularly? Tell them what you use and for what purpose to help them evaluate how your jobs might come in.

7. What font libraries do they own? They should own at least the Adobe Type Library, but it’s best if they own several complete libraries. They may have a CD-ROM with type on-call from Adobe, or from the International Type Founders (which includes several smaller type foundries like Emigré and GarageFonts). If they don’t have a lot of faces or instant access, they probably have limited experience with professional publishing projects.

8. What services do they provide?

9. What if there is a problem with my file? If they tell you that they will call as soon as a problem occurs that they can’t solve quickly, it’s a good sign. You should also ask if they have methods of troubleshoot-
ing to determine where and why the problem occurred. (But, in reality, the only way that you can truly determine how they deal with problems is by working with them.)

10. What do they charge extra for? Do they extend credit? They should be able to tell you their standard prices and charges. They should also be clear about rush charges so that you’ll be aware of them before requesting work in a certain amount of time. If they can’t give you a straight answer regarding charges, you must require a firm estimate for any project.

11. What printers, designers, or illustrators do they work with regularly? You may want to call their customers for feedback on their performance. Ask printers for samples of the work they have done with the service bureau. Ask designers what kinds of jobs they use them for and whether their performance is consistent.

Working with a Service Bureau as Your Partner
Like your printer, your service bureau should be like a partner, to consult not only before a job is sold (for competitive estimates) and after the file is ready for output, but also during the design and production stages. If you find and work with the right service bureaus, their technicians can help you make decisions regarding design and production and, if needed, can take some of the responsibility off your desk and onto theirs.

LOYAL PARTNERSHIPS
A true partnership would be to work with only one main service bureau. If you can successfully work with one service bureau, you won’t have to constantly form relationships with new vendors. You can more easily close the color calibration gap between your studio equipment and final printed output, and you can work out troubleshooting techniques. Working with one service bureau can also result in better service. They will be more interested in continually giving you good service because they know you’re willing to be a repeat customer.

The problem with relying on only one source is that its services can be limiting if they don’t have what you need. Also, if the service bureau knows you will come back no matter what, it can become less concerned with competitive pricing.
### Service Bureau Information Form

<table>
<thead>
<tr>
<th>Bureau name</th>
<th></th>
<th>Address</th>
<th></th>
<th>Contact</th>
<th>Phone number</th>
<th>Fax number</th>
<th>Modem number</th>
</tr>
</thead>
</table>

1. **Output request form:**  [ ] Yes  [ ] No
2. **Free pick-up and delivery?**  [ ] Yes  [ ] No

### Minimum charge:

3. **Price list:**  [ ] Yes  [ ] No

4. **Standard job turnarounds:**

5. **Transfer formats accepted (Size):**
   - [ ] Modem
   - [ ] Optical
   - [ ] Cartridge (SyQuest 44, 88, other, or Bernoulli)
   - [ ] Other:

6. **Software programs used regularly:**
   - [ ] QuarkXPress
   - [ ] FreeHand
   - [ ] Photoshop
   - [ ] PressWise
   - [ ] PageMaker
   - [ ] Illustrator
   - [ ] Prepress
   - [ ] Island Trapper
   - [ ] Others:

7. **Type libraries:**
   - [ ] Adobe
   - [ ] ITC
   - [ ] Other:

### Type of service bureaus:

- [ ] Small service bureau
- [ ] High-volume service bureau
- [ ] High-end color bureau
- [ ] Printer/service bureau combination
- [ ] Specialty provider
- [ ] Other:

### Services available:

- [ ] Technical support
- [ ] Scanning
- [ ] Color correction
- [ ] Image manipulation
- [ ] Trapping
- [ ] Imposition
- [ ] High-resolution output
- [ ] Offset press proofing
- [ ] Matteprint
- [ ] Colorkeys
- [ ] Cromalin
- [ ] Other:
- [ ] Digital color proofing
- [ ] Large-format color output
- [ ] Film recorder output
- [ ] Archiving

8. **What if there is a problem?**

9. **Extra charges:**

10. **Credit and payment terms:**

11. **References:**

   Comments:
It's a good idea to have a back-up, even if you work mainly with one company. If their equipment should break down when you need rush service, you may be in a bind. A working solution might be to establish relationships with three companies that, among them, offer a variety of services. You might want to pick a small inexpensive shop for low-cost output of film or paper; a larger bureau that provides a variety of services, maybe a high-volume shop or a printer/service bureau combination if the combination of services meets your needs; and a specialty shop that provides other services, like large format digital output.

YOUR RESPONSIBILITIES (EFFECTIVE COMMUNICATION)
Effective communication and a good working relationship with a service bureau should start from the time you request your first estimate and carry through to the end of the job. The following sections outline the process of working successfully with a service bureau.

Request an Estimate
In seeking an estimate, you should give the service bureau a detailed description of the project, along with the schedule. You should clearly indicate the services you will need and how you have allocated the time and budget necessary to complete those services. If you created an estimate request form (like the example from Chapter 5, "Project Planning and Management"), you're well on your way to getting the information you need.

Discuss Design and Production Details
When you have a concept for the design and a plan for production of your work, contact the service bureau you want to use (and the printer) to determine the best steps for completing it successfully. Your service bureau may be able to give you suggestions on what software to use and tips on how to design in a way that makes production easier. This is a good time to determine whether the service bureau can perform certain production tasks more economically than you can. For instance, some service bureaus include trapping with your film output for only a small fee. This fee may be considerably less than the cost of the hours it would take you to do it.
Prepare Your File for Output
Your goal in all this organization and set-up is to prepare "bullet proof" digital mechanicals that will sail right through to final output. (See Chapter 13, "Preparing the Digital Mechanical," for details.) If you've been communicating with the service bureau during the design and production stage, it should make this last-minute file prep process straightforward.

Prepare an Output Request Form
Always include all your file details (program used, lines per inch, resolution in dots per inch, and so on) on the output request form to the service bureau. Communicate all deadlines and pick-up or drop-off arrangements. (See the Output Request Form outlined in Chapter 13, "Preparing the Digital Mechanical") Do not communicate important details over the phone if you can help it. If something goes wrong, you want to make sure you have all directions in writing to protect yourself.

WHAT YOU EXPECT OF THEM
There are a number of things you should expect a service bureau to do in order to ensure a good working relationship: call promptly when there are problems with your file; meet deadlines (or tell you if they can't); keep up to date with technology (buy the latest software and hardware); and work with you to improve your file-preparation skills. If your service bureau falls short in any of these important areas, you may want to reconsider your relationship.

Promptly Calling When There Are Problems with Your File
If there are problems with your file, you should expect the service bureau to promptly call and resolve them. They should be willing to work with you to solve the problem. If the problem is a result of your setting up the file improperly, they should explain the correct way for you to set it up so the job can be rerun correctly. If the problem is a result of equipment, software, or personal error on their part, they should cover the cost of the bad output and time.

Meeting Deadlines (Or Telling You If They Can't)
If you have a specific deadline, the service bureau should be able to stick to it if they've made a commitment. If they have difficulties with equipment, they should call you well before the job is due to let you know it may be late.
Keeping Up-to-Date with Technology
You should expect your service bureaus to keep Up-to-Date. They should have all the latest program updates and disk fixes before you do. They should have regular technical support for their hardware and software. Participation in local user groups can be an indication that they try to stay up-to-date.

Working with You to Improve Your File-Preparation Skills
Service bureaus who really value your business will take the time to work with you to prepare your files. They will gladly answer your questions and give you advice for future work. Some service bureaus even offer classes about production and prepress methods to educate you on methods of color publishing, so you can understand the alternatives that will work best for different kinds of jobs.

Summing Up
There are a few points you should keep in mind when choosing and working with a service bureau:

- Understand the services, equipment, and expertise of different service bureaus.
- Pick one with consistent, knowledgeable personnel.
- When evaluating service bureau/printers, ask to see samples from both the prepress and the printing department.
- Provide detailed estimate request forms.
- Choose and work with the service bureau from the initial estimate to the time of final high-resolution output.
- Always work through problems. Never point fingers.
SECTION II
BEFORE STARTING A PROJECT

CHAPTER 7
THE PRINTER AS YOUR PARTNER

The Basics of Printing
  Printing Methods
  Types of Printers and Services

Matching Printers to Projects
  Finding Printers
  Evaluating a Printer
  What Services Do You Need?

Working with a Printer as Your Partner
  Loyal Partnerships
  Your Responsibilities (Effective Communication)
  What You Expect of the Printer

Summing Up
Printing is the last step in the production process after designing a piece of work and directing it through prepress. While design and prepress are almost exclusively electronic, printing is still mostly mechanical. At this point, forget about things like pixels and PostScript because the whole process has come down to a few pieces of film that a printer uses to create the final printed piece.

**The Basics of Printing**

Even though printing is so far removed from the initial design stage of a project, it's important to understand the methods of printing so you can choose the right printers and work with them from the beginning. A good printer can provide advice on how to create your piece so it can be economically run with professional results and will take the time to help you understand the printing processes and how to work efficiently.

Most of your commercial jobs will probably be printed using offset printing presses (or offset lithography). No matter what the method is, you should communicate with the printer from the beginning. And once your final films are output from the service bureau, you should take them to the printer yourself and check them with your print representative. You can usually rely on print personnel to proof the film for adequate traps, correct separations, dot patterns, dot densities, and other print characteristics. They'll be able to tell immediately if the film was inadequately run by the service bureau or if your final film has elements that weren't originally estimated, like solids, bleeds, and so on. At this time, you should review the printer's original estimates and agree on final production quantities, paper, and other specifications that might apply.
When the details have been worked out and the films have been checked and approved, the printer goes through a series of steps to get the final piece printed. How you prepared your work and what you gave the printer will determine what those steps are. Because offset printing is the most common type of printing, it's the one used in the example below. The next section covers the specifics of several other processes and how they differ from offset.  

The offset printing process:

1. At the printer, a schedule for stripping and printing is set up for your job based on your deadline and other jobs the print shop has scheduled. It's a good idea to factor in a few days of leeway when you set a deadline with the printer. It's also important to pick a printer that can fit your job in its schedule to begin with.

2. If separations of individual photos or line art are required, the art is sent out to be scanned at a service bureau and color film separations are output. (If you had high-resolution scans placed into your document before films were run, this step isn't necessary.)

3. When all the film is ready, the job is stripped. *Stripping* is the process of attaching pages of film together to fit the size of the press sheet to optimize printing, folding, and trimming. If you have set up the pages or items in your files to accommodate the press sheet (before the job was taken to the service bureau) or if *imposition* (page arrangement on the press sheet) was performed electronically by you or the service bureau, less manual stripping will be required (this saves time and money). Of course, the only way you could have prepared your files to fit the plate is if you had coordinated with the printer in advance, discussed the project, and knew which press the printer was going to use and what the plate size would be. (If the print shop you choose goes straight to plate from the electronic file, manual stripping is eliminated, but so is your last opportunity to proof before printing!) The negative films are placed inside the opening of an opaque plastic mask that's the same size as the plate needed for the press. The masks are used because printing plates are usually larger in size than the films output by most imagesetters.

4. A *blueline* or *brownline* proof is photographically created from the stripped films. (Whether it's called a blueline or a brownline depends on the color of the image on the paper, but there's no real difference.) The blueline enables you (the client) to proof the stripped film. This is the last opportunity for proofing before the plates are made, unless
5. Printer burns the plates. The printer pulls contact prints. Contact prints are created when the stripped film negatives are used to expose a photographic print on film or paper—just like regular photographs. They’re usually created to check the image density.

6. Plate is put on press roller.

5. The stripped and masked film negatives are placed on top of an unexposed photographic plate and exposed with a bright light (this step is called burning).

6. Exposed plates are carefully loaded onto the press.

7. Press sheets are printed.

7. Once the plates are loaded, press personnel load make-ready sheets into the press to run while they adjust the ink settings until the ink spreads evenly over the page. (Make-ready sheets consist of scrap paper left over from previous projects or extra stock ordered specifically for this purpose.) When all seems ready, the paper you specified for the job is loaded. The colors and registration are checked again and you (the client) will be called to the press for a last check and approval when the press is turned on and the first sheets of the job are run.

8. Press is folded.

8. Once all sheets are printed, they are dried for one to five days, depending on the ink coverage, and then trimmed.

9. Printer ships to client.

8 & 9. If the trimmed sheets need bindery or other treatments, like embossing, it’s either done in-house (if the printer has the capabilities) or sent out to a separate bindery shop.

10. Printer ships to client.

10. When the job is finally delivered, you should review a few pieces from the middle of each box to check the consistency of the printing.

PRINTING METHODS

Printing is the act of reproducing a page, or many pages, of type and images in quantity. There are a variety of printing methods, and each has distinct advantages and disadvantages. There are five main printing processes:

- Offset lithography
- Letterpress
- Gravure
- Screen printing
- Electronic printing
CHAPTER 7: THE PRINTER AS YOUR PARTNER

Presses are either roll-fed or sheet-fed, which is the most common. Sheet-fed presses are designed to print most commercial collateral material, with the flexibility to print on a variety of papers in varying quantities and at reasonable prices. A Web press is a type of roll-fed press designed for long printing runs for things like magazines, books, and newspapers. All roll-fed and some sheet-fed presses are designed as perfecting presses (which means both sides of the paper are printed in one pass) for much faster printing.

**Offset Lithography**

Offset lithography (offset printing), as described in the process on the previous page, is the most popular of all the printing processes. Because the image and the non-image areas are on the same level, or plane, (not raised or engraved) this is referred to as a planographic method. The key to offset printing is the basic principle that oil and water don't mix. The image area of the film is transferred to the plate in such a way that it will accept ink (oil). The non-image areas are treated to accept water and repel ink. When the plate goes through the press, it first contacts a roller with water on it then a roller with ink on it. Then the image is transferred from the plate to a rubber roller which applies the color to the paper.

Offset presses can be either roll-fed or sheet-fed. The sheet-fed method is the more common and generally provides better print quality. Many different papers can be run through sheet-fed offset presses, from glossy and smooth to textured. In general, the more expensive and well-maintained the press, the better it will transfer the image onto paper. Roll-fed presses are used mostly for large press runs where registration and print quality aren’t as critical, like newspapers and tabloids. Registration can be a problem in roll-fed presses because continuous paper can stretch unevenly during printing as it travels through the press. (See Chapter 10, "Registration, Dot Gain, and Paper," for a discussion of registration.) Web presses are enormous roll-fed presses, with a complicated stream of paper going into and coming out of the press. They are used for very large press runs.
When printing on offset presses, where plates are burned from film negatives, you should always supply high-resolution negative films from an imagesetter. This will eliminate the necessity of photographically producing negatives, which would be one more generation removed from the original and may result in a loss of detail.

**Collotype**

Collotype is a special type of planographic printing that is screenless, and continuous-tone images are printed straight from the plates. If you use this process, the printer will require positive films (unlike negatives for offset) to expose the image onto special plates containing a rough coating of photosensitive gelatin. Once the image is transferred to the plate, regular inks are used in printing and just as in lithography, the image area is water-repellent. The advantages of this process are that dot patterns can be eliminated and colors are cleaner and more saturated due to the random application of the ink on the paper. This process leaves little or no paper to reflect light and creates in truer, cleaner color. This method is not used often because of the inconsistency of the gelatin plate coatings. When it is used, it’s usually for printing fine art and limited edition color prints.

**Offset Duplicator**

An offset duplicator is a small lithographic offset press used by quick printers for simple one-color stationery, cards, posters, flyers, price sheets, and so on, in sizes ranging from 3 x 5 inches to 14 x 20 inches. These machines are capable of printing multiple colors, but because paper-plates are usually used (created from positive film or on paper you supply), tight registration is difficult to achieve. Offset duplicators can print on stocks as light as tissue paper and as heavy as cardboard. Like the other offset presses, duplicators are manufactured in sheet-fed and roll-fed varieties.

**Offset Presses with Digital Technology**

By combining offset printing and digital technology, the printing industry has reduced the distance between the desktop and the printed piece. Heidelberg, a leading manufacturer of traditional high-quality offset presses, has developed the GTO-DI direct-to-plate press. This system takes digital files directly from disk, processes them through the RIP and images them on plates already mounted on a standard Heidelberg offset press. By comparing this process to the offset method described earlier, you can see that the prepress and stripping steps are eliminated. Because the printing press is still a Heidelberg offset press, you would expect the print quality and characteristics to be the same. However, print quality can only be as good as the plates. At present, the techniques used to create the plates digitally are still evolving and are a bit unpredictable. Though like everything else in this field, you can expect them to iron out the last few wrinkles before too long. In order to use this type of service, it’s important that the digital files you deliver to the printer are perfect. As a result, more production preparation is required of you to ensure that no mistakes happen...
on press. (See Chapter 13, "Preparing the Digital Mechanical," for details on how to prepare a clean digital mechanical).

**Letterpress**

*Letterpress* is one of the oldest forms of printing and was the dominant method before the advent of the offset press. This technique is like using a rubber stamp except the image is on a steel plate rather than rubber, and the ink is applied with a roller instead of a pad.

There are three main types of letterpresses: platen, flatbed cylinder, and rotary. The platen letterpress is more readily available, because the other two are no longer being manufactured. There is also a form of belt letterpress that can print, collate, and bind an entire book in one pass. The flexography web-fed press is another form of letterpress that is still widely used today for printing labels and stickers.

Just as in offset printing, you should ask letterpress printers what kind of originals they need to print your job. Letterpress requires line art and type made with solid black lines, or coarse halftones (55 to 85 lpi screen) on film negatives. Because of the lower resolutions used for the letterpress, you can use either films from an imagesetter or from your laser printer (using laser printer output is not usually a good idea if your file has images in it). If you want to use your own laser printer (minimum of 600 dpi, 1,200 dpi preferred) be sure to use transparency film designed specifically for laser printers. Also, make sure the images and type are reversed (white with a black background) to create a negative, that they don't have jagged edges, and that small type and shapes aren't filled in with toner. If your film output looks bad, so will the metal die created for the letterpress.

To create a metal plate or die, a photographic coating is exposed with an ultraviolet light which is shown through the negative to create a positive image on the plate. After the image is transferred to the plate, the plate is put into an etching machine, which is basically a tank of acid with paddles that splash acid onto the plate. The areas of the metal not containing the image are eaten away by the acid. Four factors control the amount of metal that is eaten away; acid strength, temperature, paddle speed, and time the plate is left in the acid. The etching causes the image area to be raised above the surface of the plate—therefore letterpress is considered a relief method of printing. Once the die is created, it's placed into a form or letter plate (with other dies, if necessary) flat on the press bed of the machine (platen letterpress). The press bed moves underneath rollers that
Characteristics of letterpress printing

apply ink to the raised letterpress form and then under a larger roller with paper. This method produces clear, sharp images, with an almost embossed look and feel.

With all the high technology available, the letterpress may seem a bit outdated. However, with the popularity of "handmade" or "crafted" goods, the letterpress will be around for a long time because it's especially useful for printing on unusually textured, recycled, or handmade papers that can't run through an offset press. The letterpress is commonly used for letterhead, business cards, special invitations, and announcements of limited number.

In the 1800s and early 1900s images were generally produced as line art although it's possible to create dies for images with coarse halftone screens, from 55 line to 85 line screen, depending on the printer. This is because the principle of a halftone screen is similar to the idea of line art. In line art the image is created with lines, and depending on the skill of the artist, can look very realistic. Using a coarse halftone screen, different size dots are used to make up the image to be reproduced in a die.(See Chapter 9, "What Makes Printing Possible," for more information on screens.)

Flexography, another form of letterpress, uses flexible rubber plates that can achieve line screens as high as 150 lpi and thin, fast-drying brightly colored inks. As in offset printing, negative films are usually required to create the image on the flexible rubber plates. Flexography presses are usually roll-fed at high speed to print labels, packaging, wrapping paper, and paperback book covers. Because of its speed, quality, and versatility flexography will be used for some time to come.

Screen Printing

Screen printing or stenciling is just that, printing using a screen that is either prepared photographically or cut out as a stencil. One screen or stencil is used for each color. A screen printer will usually request positive film at a low line screen density (from 40 to 70 lines per inch) and an output resolution of 1,250 dpi or lower. The line screen frequency is important if you're printing halftone images or gradations, but it doesn't affect the quality of type and shapes filled with solid color. If you choose to use your laser printer to make the original, print your image on transparency film specifically designed for laser printers and copiers. This way the screen printer will not have to create a positive contact print from a paper print.
When the screen printer receives your positive film it will be placed on a screen coated with photographic emulsion and exposed to very bright lights to create a screen negative. Then ink is applied to the top of the screen and a squeegee is pulled across it to force the ink through the open dots of the negative in the photographic screen or the open part of the stencil onto the material to be printed. This creates a positive image on the object being screen printed.

The coarse line screens and heavy ink coverage of screen printing limit the quality of halftone images. However, because of the brilliant colors that can be produced and the versatility of this method, it’s a good choice for printing on alternative surfaces, including cloth (T-shirts are most common), paper, wood, plastic, and objects of different thicknesses, shapes, and sizes.

**Intaglio (Gravure)**

The *intaglio*, or *gravure*, printing process, as opposed to the letterpress, creates a recessed image on the printing plate. For this method, printers usually request film positives. Gravure requires line art and type made with solid black lines or coarse halftones like the letterpress method.

The positive film images are transferred onto metal plates (usually copper), by etching just as for the letterpress plate with one exception. The image area is depressed below the surface of the plate rather than raised. The amount and density of ink being laid down is controlled by how deeply the image is etched into the plate.

The etched plate is wrapped around a cylinder that rotates into an inkwell and a "doctor blade" (like a squeegee) removes excess ink from the flat, non-image area. An impression cylinder is located above the gravure cylinder. As the paper passes between the two cylinders, the ink comes out of the etched plate and the image is transferred to the paper.

This method produces clear sharp images and can be useful for one- or two-color runs on unusually textured or handmade papers that will not run through an offset press. Gravure is generally reserved for high-quality long runs that can absorb the high up-front costs of creating the plates. It’s also used to create line art prints, greeting cards, and other specialty items that...
require a more traditional look and where permanent plates are desirable for reprinting.

**Electronic Printing**

Electronic printing technologies are quickly developing and promise to make the digital print production process much simpler. The difference between the other processes and electronic or digital printing is that the plates are digital images which are recreated and can be changed by the system each time a page is printed directly from the computer file. This process is referred to as **direct-to-press**. The Heidelberg GTO-DI process, in which plates are created directly from disk, is referred to as **direct-to-plate** but continues as traditional offset printing. Direct-to-press electronic printing uses different color application technologies.

At this point electronic printing is generally considered to be a lower-quality printing method because print quality can vary from page to page (because it essentially creates a new plate for each page). The advantage of this process is that films and plates are eliminated from the process, saving time and money.

The Xeikon DCP-1 is a four-color PostScript Level 2 direct-to-press printer that uses toners instead of ink. It can achieve a resolution of 600 dpi and halftone screens of 150 lpi or more. Unlike the GTO-DI, it can print variable information on each page because there's no plate. It's a method that's probably best suited for smaller (less than 1,000) runs of multiple originals, for example a promotional postcard where different addresses are printed at the same time as the postcard. Because the color is applied using toner rather than ink, the output tends to have a photocopied look and feel rather than that of a good offset color print.

Like the DCP-1, another digital press called the E-Print by Indigo can print variable images. The E-Print uses a special electrostatic ink rather than dry toner. The system images directly from disk to a rotating drum. The electrostatic ink is applied to the drum and is completely transferred to the paper when it prints. This allows both the image and the colors to be changed on the fly with each rotation of the drum.

Other electronic printing methods that are often overlooked but can be very useful for short color runs include inkjet, dye sublimation, and color
laser printers (mentioned in the discussion of color printers in Chapter 2). If you need only a limited number of color pages, one of these may be the way to go. For instance, there are several large-format inkjet printers that print shops and service bureaus use for banners, trade show graphics, and murals. There are also smaller ones available for 8 1/2 x 11-inch or 11 x 17-inch full-color prints.

If you need to print a limited number of black-and-white pieces like newsletters and product sheets (especially with a tight deadline or budget) you can consider using a high-resolution laser printer or copier (between 600 and 1,200 dpi). You may own one of these high-resolution machines yourself or you can go to a copy shop, service bureau or printer that offers these services.

**TYPES OF PRINTERS AND SERVICES**

An important consideration in producing your designs is matching the printer to the piece. If you understand the nature of the piece to be printed and the qualities and capabilities of your regular printers, the decision should be easy. Print shops come in different sizes and configurations—from quick printers to complete turnkey service bureau/printer/binder combinations. Their service and quality largely depend on the equipment, software and personnel they have to offer. The following is a general overview of the types of print shops you have to choose from.

**Commercial Printers**

As a professional in color publishing, you’ll deal mostly with printers who fall into the general category of commercial printers. Some commercial printers consider themselves to be high-end, best-quality printers, and they cater to designers looking to create showpieces. Others are little more than quick printers with better equipment. It takes research—checking with a printer’s other clients and making site visits—to tell which is the right printer for you.

The quality of printing is a function of the printer’s experience, dedication, and equipment. The physical size of a commercial printing facility is no indication of the quality of work it can perform. Large commercial printers may have select employees and presses that provide high-quality specialty printing under the same roof as a monster web press for high-volume work. Conversely, a small facility with only one or two presses doesn’t necessarily
Quick printers are best for printing pieces that:

- are no more than 11 x 17 inches in size.
- have only one or two colors and are on uncoated paper.
- require 120 lpi screens or lower and do not have large solids or bleeds.
- use only one-color halftones—no duo tones or four color images.
- require small runs (250 to 5,000).

produce better-quality work because they’re “more focused”; it may be that they can’t afford more or better equipment because they’re not very good!

The equipment that commercial printers have will vary. They may have only a few small two- or four-color offset presses or several presses with six- or eight-color capabilities. Some commercial printers will have in-house color separation, bindery, and mailing facilities, and others won’t.

Because the size, quality, equipment, and personnel vary so much between commercial printers, you’ll have to do some shopping around to find the best printer for your needs.

**Instant Printers**

*Instant printers* (sometimes called quick printers) are either locally owned or part of national chains and are easy to find. They usually have one-color presses capable of running simple one- and two-color jobs that don’t require critical registration. Quick printers do just that—print quickly—by spending little time inking the press, adjusting ink coverage or preparing make-readies, running the job, and cleaning up afterwards. Press checks are usually not allowed, due to the tight time schedules the printers create for themselves. Usually they use paper or plastic plates, which do not hold their shape nearly as well as the metal plates used by professional high-end printers, and as a result, can’t withstand long press runs.

Some of the national quick printing chains have embraced the newer direct-to-press digital printing technologies described earlier. By combining prepress and stripping on the press, they can eliminate equipment and employees to keep their costs down and still provide acceptable-quality four-color printing with higher line screens (but usually no more than 150 lpi). Before using one of these printers, be sure to carefully evaluate the quality and limitations of their services.

**Large-Volume Printers**

Within the commercial printing community are printers who specialize in doing huge runs in the hundreds of thousands. They print things like newspapers, magazines, government documents, books, and other items for mass distribution. This work generally involves a web press. You won’t find as many of these printers as smaller ones because massive print jobs just aren’t as common, and the equipment costs are enormous.
**Specialty Printers**
Some of the printers who specialize in less common types of printing focus on printing rolls of labels using flexography. Others, like silk screen experts, can print on just about anything to create novelty items (coffee mugs, hats, water bottles, and so forth). Letterpress printers keep the tradition of handcrafted printing alive. As someone in a creative and constantly changing field, it’s important to keep your mind and eyes open to these other types of printers. You never know when their services may be just what you need in order to add a unique quality to a printed piece.

**Matching Printers to Projects**
Don’t wait until after you’ve completed a design and gone through production and prepress to start looking for a printer. If you start by outlining the project and defining important features like the number of pages, colors, folds, and images, and the quality requirements when you go out for estimates, you’ll be ahead of the game when it comes time to print. To facilitate getting estimates, though, you need to have a short list of a few printers whose capabilities you know and with whom you’re comfortable working.

The nature of the work you intend to print determines the type of printer you need, whether it’s a quick printer, commercial printer, large-volume, or specialty printer. It’s best to choose one right after you get the initial job estimates. That way you can establish a working relationship and lines of communication early in the design process to avoid problems later. After a bit of legwork, you’ll be on your way to finding, and hopefully keeping, one of your most important partners in digital color publishing.

**FINDING PRINTERS**
The simplest way to find printers in your area is to look in the *Yellow Pages* under "Printers." Then call and have someone explain their services. This may not be the most reliable way but it’s easy and direct, especially if you’re new to an area. Because it’s difficult to get valuable information over the telephone, it’s best to make visits to the printers you’re interested in.

Another way is to check with designers, illustrators, or photographers in your area. Call and ask which printers they use and what types of jobs they use them for. Ask if they’ve heard of any of the ones you found in the Yellow Pages. If you don’t know any designers, you might call the local chapter of professional groups such as AIGA or refer to a local creative...
directory if there is one. If you’ve picked a service bureau, call and ask which printers they suggest.

Still another way to find a printer is to call a "print broker." Essentially, a print broker is like an independent sales rep, who represents many different printers, rather than just one. It’s the broker’s job to know the services and capabilities of each printer inside and out. When a broker finds you a printer to work with, that printer pays him a commission, just like an in-house sales person. Commissions are usually the only way independent print brokers get paid. A print broker, especially a good one, can help you select paper, determine the most economical size for a piece, set up an initial meeting with the printer and even go to press checks with you. The catch is that to make all this service worthwhile for the broker, the cost of printing your project usually adds up to several thousand dollars. Another catch is that you may stumble onto a broker who represents only a few printers (the ones that pay the highest commissions) who may not be your best choice. You should suspect you’ve got one of these brokers if he or she gets only one quote for a job (particularly if it’s from an out-of-town printer) or if all the quotes exceed your budget and the broker doesn’t suggest other options.

EVALUATING A PRINTER
Once you’ve defined the printing services you need and have a few printers to call, you need to select a shop that fits your needs. Tell the printer who you are and what you need—give the printer a detailed work description if you have a job at hand. (See Chapter 5, "Project Planning and Management." for the "Printer Estimate Request Form.") Then get some information regarding printing services, press sizes, and so on—a capabilities brochure is a good place to start. Always choose a printer who is pleasant and enthusiastic about working with Mac-based files or with films produced electronically.

Your broker will already have relationships with printers and know what they can do. You may want to be prepared to ask questions yourself, though, just in case your broker doesn’t work out.

Capabilities Brochure
Most established printers have brochures that outlines their services and equipment. Obtaining this from a number of printers will help you compare pricing and printing capabilities. The brochure will almost certainly have
been printed at their location, so you can get some idea of the quality the shop can produce just by examining the brochure. It may also be a good idea to create a folder for each printer you interview to keep examples of their work so you or your co-workers can find the information in one handy place.

Questions to Ask When Interviewing Printers
To be able to directly compare and keep notes on different printers, you may want to prepare a "Printer Information Form." Use it as you interview each one and keep it in their folder. (An example form is provided on page 166.) Here are some of the questions you may want to ask the printer.

1. Do they have a print output request form? Ask them to fax you one if they do. Evaluate the form for clarity and thoroughness. If the form has a section for other options or special instructions, ask what this might include.

2. Do they pick up and deliver in your area? If not, what is the minimum charge?

3. How many people do they have at their location?

4. What kind of presses do they have? This might include offset, letterpress, gravure, silkscreen, or digital printing.

5. What kind of pieces do they print most often?

6. Do they have color proofing services?

7. What other services do they provide?

8. Do they have technicians available to answer questions about the files you’re preparing? Do they offer classes or seminars?

9. What are their procedures if there is a problem? They should be willing to work with you to solve problems. If a problem is a result of their work, they should cover the cost. If it’s your mistake or the service bureau’s, the printer should be willing to give you suggestions on what to do and what to deliver back to them.

10. What are their standard prices and what do they charge extra for? Do they extend credit? If so what are the terms? They should be able to tell to you what their standard prices and charges are. They should be clear about any rush charges so that you’re informed before requesting work in a specified amount of time.
Print brokers and in-house sales reps will usually have portfolios you can review of their work that has been printed for other designers. Keep in mind, though, that the pieces they show you will be their best work, so checking for basics like registration, color cutting and binding won’t necessarily tell you much about their everyday work.

II. What designers or service bureaus do they work with regularly? You may want to call their customers for feedback on their performance. Ask designers what kinds of jobs the printer runs for them and whether their performance is consistent.

WHAT SERVICES DO YOU NEED?
The best way to evaluate the type of printer you need is to review your past project outlines or create an outline for the job at hand. (See Chapter 5, "Project Planning and Management," for more on project outlines.) This will help you understand all the important elements that make up your job and what you need to look for in a printer. Some of the items you need to evaluate are:

- What kind of artwork you’ll be delivering to the printer (whether it’s a disk with complete digital files and all final artwork is in place, complete films with color proofs, or a combination of original images or line art and films with text)
- Size and colors of the piece (a varnish counts as a color)
- Extras like die-cutting and bindery
- Budget
- Your client’s expectations of the final printed piece
- Deadlines for the final printed piece and for critical stages along the way

What Will You Be Delivering?
It’s very important when choosing to work with a printer to determine what the printer will need in the way of artwork. There are three main ways you can bring your work into the printer: on disk, as final color-separated films, or in pieces that can include films and photos that need to be color separated and stripped into the film. Understandably, the more "final" your artwork, the less the printer needs to do and the lower the cost will be.

The Sizes and Colors of the Piece
It’s very important to consider the size of your piece and the colors that are in it. The size of your piece will determine what kind of press it will run on most economically. There are many different size presses that take different sheet sizes. When printers determine their estimates, they look at the colors and images in the piece and its overall complexity. (More variables such as
# Printer Information Form

<table>
<thead>
<tr>
<th>Printer name</th>
<th>Address</th>
<th>Contact</th>
<th>Phone number</th>
<th>Fax number</th>
<th>Modem number</th>
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<tr>
<th>Type of printer:</th>
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<tr>
<td>☐ Quick printer</td>
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<tr>
<td>☐ Digital printer</td>
</tr>
<tr>
<td>☐ Large-volume printer</td>
</tr>
<tr>
<td>☐ Commercial printer</td>
</tr>
<tr>
<td>☐ Printer/service bureau combination</td>
</tr>
<tr>
<td>☐ Specialty printer</td>
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<table>
<thead>
<tr>
<th>1. Print request form:</th>
<th>0 Yes ☐ No</th>
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<tr>
<th>2. Free pick up and delivery:</th>
<th>0 Yes ☐ No</th>
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<tr>
<th>Minimum charge:</th>
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<th>3. Size of print shop:</th>
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<tbody>
<tr>
<td>☐ 1-10 people</td>
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<tr>
<td>☐ 11-40 people</td>
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<td>☐ 40 or more</td>
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<th>4. Printing presses:</th>
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<tbody>
<tr>
<td>☐ 1-color sheet-fed</td>
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<td>☐ 2-color sheet-fed</td>
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<tr>
<td>☐ 4-color sheet-fed</td>
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<tr>
<td>☐ 6-color or more sheet-fed</td>
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<td>☐ Web or other roll-fed</td>
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<td>☐ Other:</td>
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<th>5. Pieces printed most often:</th>
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<tbody>
<tr>
<td>☐ Cards</td>
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<tr>
<td>☐ Letterhead</td>
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<tr>
<td>☐ Data sheets</td>
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<tr>
<td>☐ Brochures</td>
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<tr>
<td>☐ Posters (size)</td>
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<tr>
<td>☐ Books, magazines, etc.</td>
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<tr>
<td>☐ Catalogs</td>
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<tr>
<td>☐ Other:</td>
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| Comments: |

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<th>6. Proofing systems:</th>
</tr>
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<tbody>
<tr>
<td>☐ Blueline/brownline</td>
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<tr>
<td>☐ Cyan (Color key)</td>
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<tr>
<td>☐ Laminated (Matchprint, Cromalin)</td>
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<tr>
<td>☐ Other:</td>
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<th>7. Special services available:</th>
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<tbody>
<tr>
<td>☐ Bindery</td>
</tr>
<tr>
<td>☐ Foil stamping</td>
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<tr>
<td>☐ Die-cutting</td>
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<tr>
<td>☐ Other:</td>
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<th>8. Are technicians available to answer questions?</th>
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<tr>
<td>☐ Yes ☐ No</td>
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<tr>
<th>Are classes offered?</th>
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<tbody>
<tr>
<td>☐ Yes ☐ No</td>
</tr>
</tbody>
</table>

| 9. What if there is a problem? |

| 10. Standard Prices: |

| Extra Charges: |

| Credit and Payment Terms: |

| 11. References: |

Don't just interview the printer over the phone: go to the printing facility. Maintenance is critical to press performance, so check out the general conditions and working areas. A clean shop is usually a good shop. Watch the press person working on press. If a lot of time is spent adjusting the press and examining the press sheets with a loupe on a light table, it shows that the press person cares about quality. If the press person starts the job, makes a few adjustments then walks away, steer clear—he or she may not check the consistency of the printed pieces as the job comes off the press, which is important because sometimes the quality does vary during the run.

bleeds, solids, elements requiring tight registration, and trapping, increase the necessity of the more sophisticated presses and a highly skilled press person.) They also look at the size and determine which press and what sheet size they can most economically run your piece on. If they don’t have a press the size that will most economically run your piece, their price may be higher than that of another print shop with the right equipment. You may need to talk to other printers or be a little flexible with your sizes, especially if you have a tight budget and want to use a particular printer. This shouldn’t be a problem because if you talk to the printer before you begin design work in earnest, you should still have some flexibility.

**Budget and Client Expectations**

Like it or not, the budget for any piece is the single biggest factor in determining which printer and service bureau to use and the quality you can expect. For example, if your client expects four-color printing with exact registration but only has the budget for a two-color quick-print piece, the client will either have to rethink the budget or change the specification for the piece. It’s your job to make sure that your client’s expectations are in line with what the budget can achieve. As described in Chapter 5, the best way to educate your clients in this regard is to show examples. If you have a variety of printed materials and know what they cost to print, you can generally keep your client’s expectations in line with reality.

**Deadlines and Timelines**

If you have a tight deadline you’ll need to find a printer that can respond to that need, and depending on the situation you may have to pay for an extra rush charge. Some printers have different rush policies than others, and rate schedules vary. Keep in mind that printers have to accurately schedule a slot of press time for each job. Those slots can range from a few hours to a few days depending on the quantity and complexity of the press run. If you have a rush project and miss the deadline for your printing slot, you may not be able to get another one for a few days or even weeks at that same printer. Scheduling flexibility depends on how many presses the printer has to accommodate your particular job and how busy they are at the time. You need to make it a point to discuss the deadline and the printer’s schedule to ensure the job can be printed.
Working with a Printer as Your Partner

Like your service bureau, your printer should be your partner, to assist you not only before a job is sold (for competitive estimates) but also during the design and production stages. If you find and work with the right printers, they can help you make important decisions regarding design and production to ensure that the piece you design will be printed according to your expectations.

LOYAL PARTNERSHIPS

Just like with service bureaus, it makes life easier to work with a few select printers. Once you understand how they work, their equipment, skills, and limitations, selecting the printer for a particular job is much simpler. You should try to establish working relationships with printers of various types, mostly to give you scheduling flexibility and a way to get competitive estimates. You might want to develop a rapport with a small inexpensive shop for low-cost quick printing, a larger commercial shop that has a variety of presses, maybe a high-volume shop, or a printer/service bureau combination if the mix of services meets your needs, and a specialty shop that provides other services (like large-format digital output, a web press for large runs, or letterpress, for example).

YOUR RESPONSIBILITIES (EFFECTIVE COMMUNICATION)

Effective communication and a good working relationship with a printer should start when you request your first estimate and carry through to the end of the job. The following sections outline the process for working successfully with a printer.

Request an Estimate

In seeking an estimate, you should give the printer a detailed description of the project, what kind of artwork you’ll be delivering (such as films, color proofs) and the schedule. You should clearly indicate what you’ll need and how you have allocated time and budget. If you’ve created an estimate request form similar to the example given in Chapter 5, you’re well on your way to getting the information you need.

Discuss Design and Production Details

When you have a concept for the design and a plan for production of your work, you should contact the printer you want to use (and the service bureau) to determine the best steps toward completing it successfully. Your printer may be able to give you suggestions regarding what paper to use and tips on sizes that will make the press run more economically and with less waste.
Prepare Your File for Output
You should do everything you can to prepare "bullet proof" digital mechanicals. While you've been communicating with the printer and the service bureau during the design and production stages. (See Chapter 13, "Preparing the Digital Mechanical," for details.) This last-minute file prep process should be straightforward—and produce faultless output, with the least amount of stripping required by the printer.

Prepare a Comp and Print Request Form
When delivering a job to the printer, always include a filled-out request form—either yours or theirs. (See the example "Print Request Form" on the inside back cover of this book.) Include the final size, quantities, and colors, along with a detailed comp or color proofs, and the films from the service bureau. Just so there are no questions, also include a copy of the printer's original written estimate. The Print Request Form will ensure that all details regarding the project are clearly outlined in writing, including deadlines and pick-up or drop-off arrangements. The detailed comp will show the printer approximately what the piece will look like in final form as far as design, folds, trim, and binding. The color proof pulled from the films will indicate whether the traps are correct and colors are accurately selected and separated.

Communicate both verbally and in writing. That way if something goes wrong or personnel change at the print shop, you'll have all project details in writing so there is no misunderstanding by either party. Fax your communications and keep the originals.

WHAT YOU EXPECT OF THE PRINTER
There are a number of things you should expect a printer to do to ensure a good working relationship. If your printer falls short in any of these important areas, you may want to reconsider your relationship. The printer should:

- Evaluate the artwork you deliver and catch problems before the job goes to press.
- Determine when bluelines and pressmatch proofs are appropriate and help you check them for problems.
- Meet deadlines (or notify you of delays).
• Keep up to date with Mac technology (in order to understand how to better work with you and the service bureau).

• Help you understand the printing process and short cuts within the printing system. The printer should identify the best paper and sheet size for the presses in-house and suggest an alternative if the shop doesn’t have a press in-house that will run your job economically.

• Determine how to produce your designs in order to get the expected results in the final printed piece.

• Evaluate whether you need to deliver negative or positive films or whether paper is acceptable and at what resolution and line screens to have the service bureau output the film to accommodate dot gain on their presses.

• Decide how much trap will be needed for different presses. (Line screen is discussed in Chapter 9, trapping and dot gain are discussed in Chapter 10, and resolution is explained in Chapter 12.)

**Evaluating What You Deliver and Catching Problems Before the Job Goes to Press**

Your printer should carefully review the film to determine whether it was output correctly by the service bureau. If you deliver only a disk, they should check that all the elements are accounted for and output what they need for press. If you’re delivering the job in pieces, they need to have a clear understanding of what to do with each piece of the project in order to create the final product. They should also determine at this point if their original project estimates match the job. If there are any questions, you should be contacted and details should be resolved before printing begins.

**Bluelines, Pressmatch Proofs, and Quality Checks**

You should always ask for proofs—at least a blueline for you to proof—before expensive plates are made. (Printers sometimes resist producing proofs because of the time and expense.) They may also choose to create contact proofs to check the density of the films if they’re concerned that images will print too dark (filling in detail areas), or too light (blowing out highlight areas). This will give you the option to make changes before you print. If questions arise while the job is on press, the printer should alert you to them, possibly pulling a press proof before the entire job is printed, so you can see the actual printed piece.
This is an expensive alternative, but it may be worth it on very large runs costing thousands, even tens of thousands of dollars.

In general, good printers will work with you to prevent and solve problems because they want a good press run just as much as you do. No one wants problems! But if problems result from the way you set up the films or if the service bureau made a mistake, the printer should be able to explain how to fix things so the job can be run correctly. If problems are a result of equipment or human error on the printer’s part they should be willing to correct them at no extra cost.

Meeting Deadlines (Or Telling You If They Can’t)

If your printer has committed to a specific deadline, the date should be met. If difficulties with equipment arise, the printer should call you well before the job is due to let you know it may be late and should also offer you backup printing options.

Keeping up to Date with Technology

You should expect your printer to keep up to date with advances in software and new printing techniques. Printers should understand the latest advances in technology and how they affect printing. Some of the most progressive printers are actually investing in the new technology themselves, offering direct-to-plate and direct-to-press services, and are able to print using stochastic or FM screens. (See Chapter 9, “What Makes Printing Possible,” for a discussion of AM and FM screening.) Keep an eye open for printers like these. If the quality produced by these technologies is adequate for your particular job, it could save you some money and time. Printers should have regular technical support for their presses and for any other equipment on location, especially prepress equipment.

Working to Improve Your Understanding of Printing

Printers who value your business will take the time to work with you to prepare your jobs. They’ll gladly answer your questions and give you advice on future work. Some printers even offer classes to educate you on various methods of color printing, so you can understand the alternatives that will work best for different kinds of jobs.

Printers can provide a wealth of information in areas such as paper selection, based on their experience and the nature of their presses. Uncoated and coated papers react differently when the ink is applied to them.
Recycled paper tends to soak up more ink, resulting in greater dot gain. Ink can actually sit on top of coated papers because they’re less porous—sometimes requiring varnishes to keep solid colors from fading or fingerprinting. The printer should understand how different papers react to ink and should instruct you in how to compensate for these differences as you prepare your films.

Printers should also help you choose the correct halftone line screens for your images to accommodate dot gain on their press so you can make proper adjustments to your file and films. In addition, every printing press produces a certain amount of misregistration. An experienced printer will be able to tell you the trap required for the shop’s presses. These are just some of the ways you can learn from your printers. Keep an open mind and try to appreciate that in many ways, printing is as much an art as design.

**Summing Up**
Choosing and working with printers is an important step in developing your successful design-to-production process. Take your time, be selective, and keep the following points in mind:

- Understand the different types of printers available.
- Choose at least two that offer different services, and also have a few specialty printers in your address book.
- Pick printers with knowledgeable press personnel.
- When evaluating printers, ask to see samples of the kinds of work they do most often.
- Ask questions and provide detailed estimate request forms.
- Choose and work with the printer from the time of the initial estimate until the project is printed.
- If problems arise, always concentrate on finding the solution, not on placing blame.
- When delivering the job to the printer, always include a "Printer Request Form" with all important details in writing.
- When you deliver a job to be printed, include a comp, with colors, folds, and binding indicated, films or other high-resolution output, and a color proof pulled from the films.
SECTION III
DETAILS OF THE PROCESS

CHAPTER 8
COLOR CONCEPTS AND MANAGEMENT

Light and Color

Color Models
Seeing Red (and Green and Blue)
Why We Print in CMYK
Hue, Saturation and Brightness
Send It To the L*a*b for Reference

What's in a Gamut?

Color Management
Color Management Systems
Apple ColorSync 2.0, the Industry Standard?
Color Matching Systems

Summing Up
If the world were only black and white, design and production of printed materials on the Mac would be a whole lot simpler—boring, but simple. But because the world is such a colorful place, we all like our designs, photographs, and artwork to appear in vivid, living color. The complications of producing color work electronically lie in the differences of how you see color, how it appears on the monitor, how it's measured by scanners, and how it looks when it comes out of the printer or off the printing press.

An understanding of color and color management on the desktop is a fundamental requirement in electronic publishing. Nearly every tricky technical issue that affects the way the final piece looks is due in some measure to the way color is handled either by you, the service bureau or the print shop. By understanding color and managing it correctly on the desktop, you'll make it easier for others to deliver the results you want.

Light and Color
Scientists have been pursuing a universal description of color since at least the 1600s, when Sir Isaac Newton identified light as the source of color. In his now famous prism experiments, he showed that white or visible light is actually composed of a full spectrum of colors. (Many of us remember the
acronym ROYGBIV—red, orange, yellow, green, blue, indigo, and violet—to identify the colors of the spectrum in order from one end to the other.) The difference between colors was later identified as being related to wavelength and still later wavelengths were found to span a broad range from long wave (low frequency) to short wave (high frequency). The color red is on the long wave end and violet is on the short wave end of the visible spectrum.

The specific wavelengths that correspond to individual colors can be measured with sophisticated instruments called spectrophotometers. Light wavelengths are measured in nanometers (nm); a nanometer is one millionth of a millimeter. The spectrum of light visible to the human eye ranges from approximately 400 to 700 nm. The full range of visible colors from red to violet represents the gamut of what the human eye can distinguish.

There is light (or electromagnetic radiation) beyond what the human eye can distinguish, just as there are some sounds that we can’t hear (like a dog whistle). Light at wavelengths beyond the red we can see is referred to as infrared (IR), and light beyond the violet we can see is called ultraviolet (UV).

How do the various wavelengths of light relate to the perceived color of an object? If white light containing all visible wavelengths strikes an object, the color you see will depend on the nature of the object. If it’s reflective like a mirror, nearly all colors will be visible, but if it’s absorptive like printers ink, certain wavelengths of light will be absorbed and the reflected light you see is the "color" of the object. By measuring the wavelengths (called spectral data) of the reflected light, you could uniquely describe an object's color. If everyone had a spectrophotometer, it would be simple to uniquely identify colors by their spectral data.
Color Models

To describe and re-create colors (without spectral data), several color models have been developed based on human perception and primary colors—complementary colors within the visible spectrum. Unfortunately, perception is subject to a great deal of variability including the source of the light, the reflective surface, and the detector, be it an eye or a scanner.

The color models most commonly used in desktop color publishing software include the HSB(L) for hue, saturation and brightness (or lightness); red, green, blue (RGB); cyan, magenta yellow and black (CMYK); and CIE L’a’b’. Each model is used for different purposes based on its strengths and weaknesses. Some are better suited to capturing and displaying color (for scanners and monitors) and others are more effective at uniquely identifying specific colors. Most professional publishing software has the ability to translate color information from one model to another.

SEEING RED (AND GREEN AND BLUE)

Our perception of color is directly related to how our eyes work. Humans have two types of photoreceptors within the eye called rods and cones. Cones are primarily responsible for interpreting color under normal lighted conditions, while rods function mostly to distinguish detail in low light conditions. Among the cones themselves, some are more sensitive to specific colors—red, green, and blue in particular. Looking back at the visible spectrum, you can see that these three colors, while not equally spaced, do effectively span the visual gamut. Colors that fall in between are unconsciously perceived by the brain based on the input from these three color-sensitive receptors. Because of its physiology, the human eye acts like a red-green-blue (RGB) color detector, or we can say it uses an RGB color model.

The RGB color model is based on the color space defined by the three primary colors of red, green, and blue. Individual colors can be defined by a specific amount of each primary color. RGB is an additive color model because it’s based on light. If you think of the example of the prism in reverse, you can picture the colors of the visible spectrum combining, or adding up, to create white light. So by adding various amounts of the three primary colors to black (the absence of light), you can theoretically re-create colors of the visible spectrum.
Electronic imaging instruments that use light—like televisions, computer monitors and scanners—employ the RGB color model to define and display colors. Picture tubes have three electron guns that project electron beams to illuminate the red, green and blue phosphors on the inside surface of the screen. The screen is initially black until light is beamed onto its surface. If all three primary colors are beamed at full intensity at one tridot (cluster of red, green and blue phosphors) the color appears white. Scanners operate differently. They beam white light at images and measure the reflected light in terms of red, green, and blue using color filters. The amount of each primary color that’s reflected from each measuring point (pixel) defines the color at that location.

The problem with RGB color is that it is strongly dependent on the device that displays it as well as the device that reads it. Every monitor, scanner, and human eye sees color somewhat differently. For this reason, RGB, as well as CMYK, is called a device-dependent color model.

WHY WE PRINT IN CMYK
The complementary model to RGB is the CMY(K) model. Their similarities lie in the fact that theoretically, full color can be re-created using different percentages of only three colors, in this case cyan, magenta, and yellow (CMY). The letter K stands for black and has more to do with printing (discussed later) than with the actual color model. The difference between these two three-color models is that the CMY model is subtractive rather than additive. Theoretically, when the three subtractive primary colors are combined, they absorb all light and give the appearance of black rather than white—they subtract from the total visible spectrum.

CMY can best be visualized by thinking of colored inks on white paper. With no ink, the paper reflects nearly all of the visible spectrum and appears to be white. As ink is applied, the amount of reflected light is selectively reduced and different colors are created. The black (K) is included for actual printing because in the real world, the model can’t quite live up to the theory. Cyan, magenta and yellow inks cannot be manufactured in pure enough color to create pure black when they are combined. (Chapter 9, “What Makes Printing Possible,” tells more about how black is used in real-world printing situations.)
If you never had to print your work, there would be little or no reason to use the CMYK model. But as long as the offset press still dominates the world of printing and various color printers still use CMYK colored pigments, this model will be important.

HUE, SATURATION, AND BRIGHTNESS

The HSB (also called HSL, for lightness) color model is also based on how we perceive color but not just in terms of three primary colors. This model begins by taking the entire color spectrum from red to violet and bending it into a circle (where the endpoints of red and violet are adjacent) called the color wheel. By specifying that the additive primary colors red, green, and blue are equally distant from one another with the subtractive primary colors of cyan, magenta, and yellow between them, a color wheel makes it possible to begin to define a color by referring to its position on the wheel.

Position on the color wheel defines hue, the characteristic we use to give colors their basic names. However, colors are variable in more than just hue—they can range from vivid to pale and from light to dark. The vividness or richness of a color is called its saturation. Saturated colors appear pure, while less saturated colors appear gray and muted. The term "brightness" is used to describe how light or dark a color appears. To visualize the HSB model, pure (100 percent saturated) color is located along the perimeter of the color wheel and color decreases in saturation toward the center, which represents 0 percent saturation.

To account for variations in brightness, the model is expanded vertically from light to dark. The additional axis, which extends through the center of the color wheel, defines the brightness. Like saturation, the range for brightness is also given in percentages, with black being 0 percent and white being 100 percent. By defining the degree of hue and the percentage of saturation and brightness, a color can be defined. The HSB color model can be used to adjust images in Photoshop. It's also used by the Apple Color Picker. However, Apple uses the term "lightness" instead of brightness, so in its system software the model is labeled HSL. The reason the HSL model is used for the Color Picker is that it's a more intuitive way to select colors than picking varying amounts of red, green and blue.
SEND IT TO THE $L^*a^*b^*$ FOR REFERENCE
The last color model to be explained here is the one that's best able to define color and the one you'll probably never use directly. It's called the CIE $L^*a^*b^*$ model (or Lab model), created in 1931 by the Commission Internationale d'Eclairage (CIE) as a means of specifying colors for manufacturers of ink, dyes, paints and the like. To account for the variability of viewing conditions as well as between viewers, the CIE established a rigorous testing procedure which included controlled lighting using standard illuminants (colored lights) and a limited field of vision to define the "Standard Observer." By adjusting the contribution of red, green and blue lights to match example colors, volunteer observers developed a database of the average human perception of color based on the RGB color model. The CIE used this database to develop an empirical (derived from observation as opposed to a theoretical) color model to specifically identify colors in an RGB color space.

Like RGB and HSB, Lab color space is defined by three components. They consist of luminance ($L$), much like brightness in the HSB model, and two chromatic components, $a$ and $b$. The chromatic components vary from $-a$ (green) to $+a$ (red) and $-b$ (blue) to $+b$ (yellow). It's not important to know the math behind the Lab color model, just to know that it provides an unambiguous, device-independent way to describe color. And it's that independence which is the key to achieving consistent color on the desktop.

How does Lab color enter into the picture when monitors display colors in RGB and full-color printing is done using CMYK? Because of its device independence and relative similarity to other color models, Lab color is used within various applications (most notably Photoshop) to translate color data from one model to another. For example, to prepare an RGB or HSB image for color separation, you would need to change it to CMYK. In Photoshop it's a simple mode change. But what you don't see is that the image is first translated from RGB or HSB to Lab color then from Lab to CMYK. So, while you won't be working on your images directly in Lab color, it's important to understand how it works.

What's in a Gamut?
As described earlier, the gamut of visible colors corresponds to all the wavelengths of light between 400 and 700 nm. Every color model has its own gamut of reproducible colors. The largest gamut of colors is that of the human eye. The gamut of reproducible colors for the RGB model is significantly smaller, and the gamut for process color inks (CMYK) is smaller still.
What this means is that your screen won't be able to show every color that your eyes can see. But more importantly, you won't even be able to print all of the colors that your screen can show. This becomes important when you need to prepare images for printing. Color correction applications like EFI Cachet and Photoshop have built-in "out of gamut" indicators that show which parts of your image are beyond the printable gamut. By knowing which areas will not accurately print in CMYK, you can make corrections to your images while they're still in RGB. Colors visible in RGB but not printable in CMYK can usually be brought back into gamut by reducing their saturation. You can see why that makes sense if you compare the gamuts for the two color models.

**Color Management**

One of the most difficult aspects of desktop color publishing (actually, any kind of color work) is specifying and actually getting the colors you want. At every step, there are sources of variability. Here's just a partial list:

- Different people see color differently.
- The light around you affects the way you perceive color.
- Every monitor has its own color characteristics, which change with age.
- Not all software developers use the same RGB imaging specifications to display colors on the monitor.
- Scanners, like monitors, have different color characteristics.
- Color output from printers can vary based on environmental factors (such as heat, humidity) and age of the equipment.
- Different colorants (inks, scanner filters, screen phosphors, and so on) have different color characteristics.

If there are so many ways that color can be mismatched, what can you do to assure your clients (and yourself) of good color in your work? The answer in the long run will be through standardization of software color description by major software developers, hardware manufacturers and publishing industry leaders. The short-term answer may be the use of more software. The family of software used to keep colors consistent between applications and peripherals (scanners, monitors, and printers) is collectively called color management system (CMS) software.
COLOR MANAGEMENT SYSTEMS

Desktop CMS software typically consists of several separate steps of color adjustment and compensation to maintain color consistency between scanning, display, proofing, and final output. Some of the more common commercial CMS applications are EFICOLORWorks by Electronics for Imaging, Inc., Agfa FotoFlow, Kodak Precision Color Management System, and ColorMatch by DayStar Digital.

Color management is also possible without specific management software. Back-to-front or closed-loop calibration, as it’s called, is probably the most common method of color calibration used. With this method, you begin by calibrating your monitor using either the software that came with it or the Gamma control panel that comes with Photoshop. After you make sure that the appropriate monitor and output type settings are selected, you print a CMYK proof on the final output device. From the proof, you make adjustments to other settings. For example, in Photoshop you would adjust the dot gain or compensate for color casts.

The main drawback of the approach is that it is in fact a closed-loop—you need to know the exact output device and get a printed calibration chart or proof from it before you start. This isn’t always possible, especially with four-color off-set presses, because it’s expensive to make film and plates and run the press. However, if you’ve developed a good working relationship with your printer, chances are that you’ll be able to get them to print test proofs.

Ofoto by Light Source, Inc., a popular scanning utility, uses a closed-loop system to calibrate the color consistency between your scanner and particular software packages and output devices. You begin by printing a standard color chart (preferably using your layout program if that’s what the final file will be printed from), provided by Ofoto, on the output device(s) you intend to use. You then scan the print, and Ofoto compares the defined colors in its original with what came back from the scanner. The result is a profile for the output device. The next time you scan (through Ofoto), you select the output device, and the scan is adjusted to account for the characteristics of both your scanner and the selected output device.

The concept behind a true CMS is to compensate for the differences between pieces of hardware by understanding their individual characteristics. These characteristics are included with the CMS software as “device profiles,” which are usually defined based on testing by manufacturers. So by using the device profiles for your monitor, scanner, and printer, the CMS application can make adjustments to your file keep color consistent as it moves between them.
Device profiles most closely match the characteristics of factory-fresh equipment. How well they represent your equipment depends on how well it's maintained and calibrated. Some CMS applications include monitor calibration features to increase the correlation between a monitor's performance and its profile. To calibrate scanners, most CMS applications include color targets (both prints and transparencies). A common target is the ITC8 color target developed as a standard of color for the advertising industry by the American National Standards Institute (ANSI) and the International Standards Organization (ISO). These targets are scanned in, and the color results stored in the file are compared to the known colors of the target—comparing what you get with what you're supposed to get. Rather than actually calibrating your scanner, the CMS application creates an individual device profile for your scanner that takes into account its actual performance.

After the color variability between scanners, monitors and printers has been addressed, the next step in color management is to coordinate the transfer of color data between applications. As mentioned above, not all applications use the same color space. CMS applications are able to "tag" colors and translate them into different applications.

APPLE COLORSYNC 2.0, THE INDUSTRY STANDARD?

With all this variability in the reproduction of color on the desktop, why hasn't someone developed a standard? Probably the single most important reason is that software companies have a lot of time and money invested in their particular color solutions that they're reluctant to give up. Despite this obstacle, a consortium of software and hardware developers has been formed to develop a System-level color management format based on Apple's ColorSync format. The ColorSync 2.0 Consortium, as it's called, includes Adobe, Apple Computer, Kodak, Agfa, Microsoft and Compaq Computer.

ColorSync provides a control panel that resides in the System folder on the Mac that allows you to select the correct device profile (called a System Profile in ColorSync) for your monitor and other devices. The concept behind ColorSync is to bring color management to the operating system level from the application and device level. Version 1.0.2 of ColorSync shipped with the release of System 7.5 and only included the profile for an Apple 13-inch monitor. If developers continue to support ColorSync and version 2.0 is released, more and more profiles should become available, and with any luck a consistent, unified approach to color management will become a reality.
COLOR MATCHING SYSTEMS
One way to get consistent color is to ignore the way monitors and scanners deal with color and use known standards. Several such color matching systems that are used for printing have made the transition to the desktop. The most common of these are the Pantone, Focoltone and TruMatch systems. The TOYO system developed in Japan is also gaining acceptance. Using one of these systems is like going to the hardware store to get a couple of gallons of specially tinted paint for your living room. First you pick a color from a book of examples, then the clerk mixes it up using the manufacturer’s pigments and a set formula. Color matching for printing is quite similar to matching paint colors. Pigment manufacturers develop specific mixture formulas to create specific colors using their inks. The specific colors are given names and displayed in swatch books for users to select from. Printers are able to recreate these specific colors on press by using the manufacturer’s inks and formulas.

Each of these systems has a variety of swatch books to display their colors. You can usually find them at local art stores or order them through print industry mail order clubs, or you can buy them directly. (Company addresses are listed in the “Sources” section at the back of this book.) If you intend to do high-quality color work on the Mac that calls for spot or special colors, it’s essential that you have one or more of these color matching swatch books on hand.

Most of the major illustration, photomanipulation and page layout applications have licensed access to these matching systems and have them linked to their color selection menus.

What this means is if your client’s logotype is by definition PMS300 (a nice royal blue), you can select this color directly from within your application as you design. After you send your file out for films with PMS 300 specified as a spot color (discussed in Chapter 9, “What Makes Printing Possible”), the printer will look up the color formula and mix the ink to specifications, and your client will be happy with the color.
**Color Measurement Equipment**

In the initial discussion of light and color, you saw that the only way a color can be completely and accurately defined is by its spectral data. Scientists have used spectrophotometers to measure light for decades but until recently, the use of spectral data hasn’t been incorporated into the search for consistent desktop color. With the release of a hand-held combination spectrophotometer, densitometer, and colorimeter (two other more common instruments to measure color characteristics) called the Colortron, by Light Source, Inc. spectral data has been brought to the Macintosh.

The Colortron allows you to uniquely identify colors based on their spectral data to create color descriptions in CIE, RGB, or other formats accessible by other applications. If your client has an unusual color swatch or wants his logotype to be the same color as his car, you can create a matching profile and be assured of the results. The Colortron also can be used as a color calibrating device for monitors. With the release of this instrument, we may have seen the beginning of a shift from the use of the color model concept of color to the use of spectral data to describe colors exactly.

**Summing Up**

In this chapter you learned that the consistent identification and management of color on the desktop is an important part of producing high-quality color work. The main points to remember are:

- Light is the source of color, and individual colors can be identified by their wavelength or spectral data.
- Colors can be re-created by using combinations of three primary colors, either three additive primary colors (RGB) or three subtractive colors (CMY).
- Scanners, monitors, and the human eye operate on RGB models.
- Four-color printing is based on CMY plus K for better black.
- CIE Lab is the next best thing to spectral data to uniquely identify colors and is used to translate between various other models.
- Some color models have a larger gamut than others. The human eye has the largest, followed by RGB/HSB then CMYK.
- Color management software allows color consistency between devices like scanners, monitors, and printers and between applications.
SECTION III
DETAILS OF THE PROCESS

CHAPTER 9
WHAT MAKES PRINTING POSSIBLE

Putting Ink on Paper
  Spot Color
  Process Color

Color and Film Separations

What Makes a Screen?
  Amplitude-Modulated (AM) Screening
  Frequency-Modulated (FM) Screening

Summing Up
The whole desktop design and production process eventually boils down to the question of how to get something printed; how to get the ink on all those sheets of paper in all those colors. The simple answer is, one color at a time. But the interesting part is that you can print in "full color" with only four ink colors. Of course, they have to be special colors arranged in special ways. The way they're arranged—the essence of creating films and printing—is discussed here.

Putting Ink on Paper
To recall Chapter 7, most printing of digitally designed and produced pages is done using plates that are created photographically from the films output by a service bureau (except for direct-to-plate or electronic printing, of course). Because the press applies ink one color at a time, a separate plate needs to be made for each ink color, and every plate is generated from a separate film. If there is more than one color in the piece, either the press needs to have more than one ink station, or the ink needs to be changed and replaced by the new ink color and the paper run through the press again. There are two basic approaches to printing colors; spot color printing and process-color printing.
**SPOT COLOR**

If you were to design a simple brochure that had mostly black text but included a few highlights of some special color like periwinkle blue, you'd wind up printing in spot color. In this example, the printed piece would be a two-color job because separate plates (created from separate films) would be needed for the black and the periwinkle blue. Spot color printing is probably the most straightforward and predictable concept in printing. As described in the last chapter, you first pick the color you want from a commercial color matching system like those offered by Pantone, Focoltone, and TOYO, and the printer mixes it from a formula. (You can even have the printer mix colors that are not represented by any of the color matching systems. A custom mix may give you the color you want the first time, but it can be difficult to do it again without an exact predefined formula.) The black parts of the brochure would be printed using the plate for black and the blue part would be printed with its own plate and the specially mixed ink. So that the separate plates can be created for each color, your digital design file needs to be separated and output to films (one for each color) by a service bureau.

An important aspect of spot color printing is that it doesn't have to be all or nothing. You can print shades or tints of spot colors by creating screens (discussed in the next chapter). Screens reduce the amount of ink that's transferred to the paper by reducing the size of the individual spots of color. Smaller dots allow the white color of the paper to show through to visually create lighter shades of the spot color; larger dots cover more paper and create more intense colors. Screens are usually described in percentages of ink coverage, with 100 percent representing solid color and 0 percent representing no color.  

With photographs, using more than one spot color to print an image can create an interesting artistic effect and expand the tonal range of an original black-and-white image. Photographic or continuous-tone images printed with black plus one spot color are called monotones, black plus two colors are called duotones, three colors are called tritones and four are called quadtones. Usually when two or more spot colors are combined to print a photo, one of the colors used is black and the other is a specially mixed color. (Photoshop and other image manipulation programs can automatically convert an image into mono-, duo-, tri-, and quadtones with various mixes of the spot colors in the highlights, midtones, and shadows.)

Special finishes like varnishes and fluorescent and metallic inks are considered spot colors and require a separate piece of film for plate making. Even treatments that don't use ink, like embossing and debossing, need separate film and plates.

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<thead>
<tr>
<th>Screens or tints of spot colors can be created by varying the size of the ink spots that transfer to the paper. Smaller percentages of ink coverage create lighter tints.</th>
<th>20% spot color screen tint</th>
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<tr>
<td>70% spot color screen tint</td>
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[1] Screens or tints of spot colors can be created by varying the size of the ink spots that transfer to the paper. Smaller percentages of ink coverage create lighter tints.
If you're printing on off-white or colored paper, screening may create some unanticipated color effects, so remember to check with your printer and keep paper selection in mind when designing.

Knowing how to maximize the use of one or two spot colors is a valuable skill because every color that you add to a design increases to your printing and service bureau bills. But if you're designing with four or more spot colors or you want to reproduce a full-color image, you'll want to consider using process colors.

To make the most of two colors, you can overlap them to form a third color in your design. But be very careful that your third color doesn't look muddy. Talk to your printer about colors that mix to form useable third colors.

**PROCESS COLOR**

As discussed in Chapter 8, process color printing uses four colors—cyan, magenta, yellow (the subtractive primary colors) and black to simulate a full spectrum of color. It's the overlay of various densities of each of these colors rather than a specific formula mix that's used to create a particular color. Because the strength of this method is the ability to produce lots of different colors, four-color process is used most often to print work that contains photographic continuous-tone images.

In addition to printing full-color photographic images, process colors can also be combined to create solid colors (or tints of solid colors) by printing different percentages of CMYK. As for spot colors, there are a number of commercial color-matching systems available that show how process colors will appear when printed, including the *PostScript Process Color Guide* by Agfa and others by Focoltone, TruMatch, and Pantone. (See Chapter 8, "Color Concepts and Management." For more details on color matching systems.) Rather than by a formula, these colors are specified by percentages of CMYK and are shown as they will appear on coated and uncoated paper stock. By using these percentages, you can specify colors CMYK percentages in the color picker in applications like QuarkXPress and Photoshop.

Unfortunately, there are drawbacks to using screened process colors. The first is that colors created by overlaying process color inks are not as pure as spot color inks, so they won't appear as bright and saturated. The second is that when four colors are used to create one, registration on press is critical. If the colors are misaligned during printing, you may be able to see the individual process colors around the edges. This is particularly a problem when printing small colored type. (See Chapter 10, "Registration, Dot Gain, and Paper." For more details on registration.)
You really can't create pure black using only cyan, magenta and yellow because printers ink can't be manufactured to the standard used in CMY color theory. So instead, black ink is used when a pure black is needed, such as for text. Black ink is not just used to print pure black; it's also used as a replacement for neutral or dark tones within an image that would otherwise be printed as a combination of CMY. By using black, printers are able to use the lowest overall amount of ink. Printing too much cyan, magenta, and yellow (and black) on top of each other can cause ink build-up, excessive bleeding, or spreading and drying problems.

There are several ways that CMY inks can be replaced by black, but the most common methods are Under Color Removal (UCR) and Gray Component Replacement (GCR). In the same way that black is theoretically created by applying 100 percent each of CMY, shades of gray are created when the percentages of all three colors are equal but lower than 100 percent. UCR is the process of replacing areas of an image that are created by this "CMY gray scale" using black ink. The amount of UCR can be varied to replace some, or all, of the gray tones of an image but is usually limited to the darkest areas. Using UCR tends to improve the saturation of the other colors and improves detail in dark areas.

When colors are created by varying amounts of CMY, a certain percentage of that color is created by equal amounts of each color. Take for example, a light purple with 40 percent cyan, 70 percent magenta and 10 percent yellow or 40C70M10Y. Theoretically, as much as 10 percent of each color could be replaced by black to make up the gray component of the color; this is the second type of replacement—GCR. If the full 10 percent were replaced, only cyan and magenta would be left. The special case of GCR that involves printing with only two primary colors and black is called achromatic printing and requires significantly less ink.

The paper and press specifications determine what method of color replacement should be used. The default UCR/GCR setting in a program such as Photoshop is usually fine for most circumstances, although depending on your printer's specifications, you may want to adjust the program setting yourself or have the service bureau or printer technician do it for you. (If the images were converted from RGB to CMYK during scanning, black replacement of some kind was already applied. Don't apply additional adjustments.)
In this example there are four process color films, one each for cyan, magenta, yellow and black. There is also a plate for the spot color. All five film separations are necessary for the printer to prepare plates for the press.

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### Color and Film Separations

For the printer to create separate plates to print your piece, he needs to have separate pieces of film, one for each color. This isn't hard to do because either you or your service bureau can use software and hardware equipped with separation capabilities to produce the films directly from your electronic files. QuarkXPress, PageMaker, Illustrator, FreeHand, and Photoshop all have the capability to output color-separated films. If you're using a different layout or drawing program, you may need a specialized color separation program.

When printers talk about color separation, they're usually referring to a more specific process than outputting film from electronic files. Traditionally, the term refers to the process of separating a continuous-tone image into the four process colors (CMYK). But, it can also refer to creating color separations for duotone, tritone, or quad-tone images using spot colors. Images usually need to be converted into CMYK before they are added to page layouts. When a service bureau does your scans, they usually come back in CMYK mode, ready for separation. If they don't, you can do separations yourself using either a digital imaging program or separation software. Once the image is converted to CMYK, it can be imported into a drawing or page layout program and film separations can be output for the entire file.

If you have spot colors assigned to text or design elements in addition to the process colors used to create your images, they will have to be output on separate pieces of film. For example, if you're printing a poster that contains four-color process images and one spot color for text and graphics, each of the four process colors as well as the one spot color must be output on separate pieces of film. Say you were printing a flyer with a duotone image made up of black and PMS 545 and the text was specified as PMS 185, three pieces of film would have to
be output. In order to ensure that your colors will separate correctly when film is output, you can run a test by outputting each color separation individually on your laser printer before the file is taken to the service bureau for final output. (See Chapter 13. "Preparing the Digital Mechanical," for more details.)

Once you take your file to the service bureau, each film is output as a black-and-white (actually black-and-clear) image, representing areas where the ink will be printed and areas where it won’t. Each film separation represents the amount of its color that needs to be printed by the press to form the image. A piece of film consists of two layers, the emulsion, or photo-sensitive, layer and the acetate base. Before film is output, you must specify whether the film should be output as positive or negative, right-reading, emulsion-up or emulsion-down. Positive films have the printable image area represented by black, and negative films are just the opposite. Right-reading means that the image reads from left to right, and emulsion-up or -down refers to whether the emulsion is on the top of the acetate base when the film is right-reading or on the bottom. For example, if you hold a film up in front of you that is right-reading-emulsion down, you could read any text that was on it and the emulsion would be on the side facing away from you. Your print shop will tell you which film orientation it needs to match the press it intends to use. Negative films, right-reading, emulsion down is the most common specification for offset printing in the United States.

**What Makes a Screen?**

At the beginning of this chapter, you learned that both process and spot color inks are applied by the printing press one color at a time to form printed color images. Because each color component in a continuous-tone image—whether it’s a black-and-white or CMYK process color image—it can contain hundreds of different tones, or brightness levels, the image is broken down into tiny dots. By varying the size and location of these dots, the appearance of different brightness levels can be created. At a normal viewing distance, these dots give the illusion of modulated color—either hundreds of levels of brightness in one-color images or full continuous-tone color if CMYK process colors are used.

How these dots are created and organized is determined by the screening method used to output your films. Two types of commercial screening processes are available—conventional halftone screening or amplitude-
modulated (AM) screening and frequency-modulated (FM) screening. AM screening is the most widely used method, although some forms of FM screening are becoming more readily available and have certain advantages for doing electronic design and production.

AMPLITUDE-MODULATED (AM) SCREENING

AM screening is made possible by grouping tiny imagesetter or laser printer dots into a larger cell to create a halftone spot. These halftone spots are in turn printed a certain number of times per linear inch. The number of times per inch or the frequency at which these spots are printed is called the line screen and is expressed in lines per inch (lpi). In order to understand AM screening, you must understand how dots, halftone spots and line screens relate to one another.

The first component is the dot created by the output device like a laser printer or imagesetter. These devices can print different numbers of dots per inch (dpi) to form an image. A 300 dot per inch laser printer, for example prints 300 dots in a linear inch (which means 90,000 dots in a square inch) and an imagesetter capable of printing 2,400 dpi could print almost six million dots in one square inch. However, output devices don’t have to print a dot in every available space. When printing an image, spaces are skipped to create the light areas and completely filled in to create dark or black areas.

The dots of the output device are important because the computer groups them into halftone spots placed in the center of a cell, or grid element, of the halftone screen. In a halftone screen, the cells are all the same size. Devices with higher resolutions can print more dots per inch, so they can fit more dots within the halftone cell. AM screening creates shades of light or dark based on the size of the halftone spots within cells of fixed dimensions. When you specify a line screen for AM screening, the frequency of halftone spots is set. So what you are using to control (or modulate) the image is the size (or amplitude) of the halftone spot that gets printed in each cell.

The dots that make the halftone spots can be arranged so they create different shapes—squares, circles, ellipses, triangles, lines, or just about any shape that you can imagine. The halftone spots that make up an image are usually so small that their individual shape is not apparent. But the shape of the spot can nevertheless affect the overall look of the image. For example, square spots create higher-contrast, sharper-looking images while elliptical spots create smoother transitions, like those in sunsets and color
gradations. If you’re working with a combined service bureau/printer, the printer may be able to select the spot shape that will best reproduce your images on the print shop’s equipment. If you’re outputting films at a service bureau separate from the printer, you may want to show your comps to your printer in advance for suggestions on the best spot shape to use. For most purposes the default setting on the service bureau’s imagesetter will be fine.

Spots, regardless of their shape, are counted in rows of halftone cells or lines per inch (lpi). Lines of spots make up the grid that forms a halftone screen, and their number determines how coarse or fine the screen appears—the higher the number of lines per inch, the finer the screen and the better the illusion of continuous tone. In most instances, you’ll choose the highest line screen that can be printed using the paper you have selected and the capability of your printer’s equipment. (An exception is when you choose a low resolution line screen to create special effects or to print T-shirts.) For example, coated paper running on a high-quality press with metal or acetate plates will be able to reproduce higher (or finer) line screen frequencies. Uncoated paper running on rolls through web presses, or on sheets through small presses using paper plates, will only support lower line screen frequencies. Lower line screens (fewer spots per inch) are preferable for these kinds of situations because the spots are farther apart and the ink spreading on the paper (dot gain) will be less likely to fill in the detail of the image. (Dot gain is discussed in more detail in Chapter 10, “Registration, Dot Gain, and Paper.”)

If you were to print a high-quality brochure or annual report on coated paper, you might be able to support a line screen as high as 175 lpi. At that line screen 30,625 spots per square inch would be printed. If you were printing on newsprint (which is much more porous) a line screen of 85 lpi or lower would be required. This line screen would produce only 7,225 spots per square inch, resulting in a coarser image. (Typical line screens used for various kinds of print projects are outlined in a chart on the inside of the front cover.)

Line screen frequency is important to remember because it’s the basis for determining the resolution you need when you scan or create bitmapped images. (See Chapter 12, “Image Resolution and Scanning,” for more information.) It also determines what imagesetter output resolution setting you need to create the optimal number of color tints or shades of gray in your images.
**AM Screens and Shades of Gray**

As discussed earlier, halftone spots are made up of dots produced by the output device. The more output dots that can fit into a halftone cell to make up the spot, the more tones the halftone screen can produce. For example, if you had two cells, one that could fit nine dots and one that could fit 25 dots, the number of dots your output device could print in these cells would range from none (an empty, white cell) to all (a full, black cell). Looking at these two cells, the one that can fit 25 dots can create a wider variety of halftone spots sizes or tones.

At first glance, you may think that higher line screens used to create high-resolution prints would be able to produce the most shades of gray (or shades of a color). This is actually not the case because the number of dots that can fit in a given halftone cell depends on the resolution of the output device. If the device resolution is a fixed number and you increase the line screen, the device has to reduce the size of the cell to fit more of them into an inch. When the cells shrink, so does the number of dots that can be printed in them—so higher line screens can mean fewer shades of gray. However, an imagesetter that can print at a resolution of 2,400 dpi can still display about 189 levels of gray at a line screen of 175. To get a full 256 levels of gray at 175 lpi, you would need an output device with a resolution of at least 2,800 dpi.

The relationship between line screen (lpi), imagesetter or output resolution (dpi), and the number of shades of gray, is based on a very simple equation if you use 256 shades of gray as your standard (which is your best bet for most uses). The equation is:

\[ 16 \times \text{lpi} \times \text{dpi}, \text{or lpi} \times \text{dpi}/16 \]

If you knew you needed to print at 133 lpi, you would multiply this number by 16 to find out that you needed to use an imagesetter that had an output resolution of at least 2,128 dpi. In the same way, if you could only use a 1,200 dpi imagesetter, the highest line screen that you could use and still get 256 shades of gray would be 75 lpi. This consideration applies primarily to low-resolution pieces because for the most part, high-quality imagesetters are able to print at 3,600 dpi or higher, which eliminates this concern from your list of things to remember.
Amplitude-Modulated (AM) Screen Angles

When screens are used to lay down process color inks one color at time, the inks don't actually mix together to create different colors; it's your brain that mixes them. The process color ink spots are placed next to one another so that they are perceived in combination as individual colors. This is true for both AM and FM screens, which are discussed a little later. But because AM screens are characterized by highly structured grids of halftone spots, unusual patterns (called moirés) can occur that affect the way your brain interprets the image. Through trial and error, printers have found that the way to avoid moirés is to lay each screen down at a different angle to disrupt the horizontal and vertical characteristic of AM screens. In fact, the way we perceive printed color has a lot to do with the screen angles that are used for particular colors. If a color is not printed at its appropriate angle, the overall color of the image may not look "right" to us.

If you're printing a four-color image, three of the halftone screen angles for the color separations are 30 degrees apart, and the fourth is 15 degrees off. Common screen angles for reproducing a full-color image would be cyan at 15 degrees, black at 45 degrees, magenta at 75 degrees, and yellow at 0 degrees (vertical). When the four halftone screens are overlaid correctly, they form a rosette pattern that's less pronounced and the color they create looks more "normal." When the low screens frequencies (larger halftone spots) are used, the rosette pattern can be quite obvious, but at higher screen frequencies they give the appearance of smooth continuous tones, and you need a loupe magnifying loupe to see them.

An AM screen for one-color printing is usually placed at a 45 degrees angle. To the human eye individual dots are the least noticeable at this angle. If you're creating a duotone, the most prominent color is typically placed at the 45 degrees angle and the secondary color at 0 degrees. If you're printing a tritone using three color screens, they are placed at 30 degrees angles.

There are two rosette patterns you may encounter in four-color process printing—open-centered and closed-centered. The open-centered rosettes are mainly used when screen frequencies of 150 lpi or higher are printed because the rosettes are so small that the open center is much less noticeable than it would be at lower frequencies. The advantage of using this type of screen is that it resists moiré patterns if the screens angles happen to be slightly off register. The advantage of closed-centered rosettes is that less paper shows through, so more vibrant colors are possible with less ink. The
disadvantage with closed-centered rosettes is that if the registration is off even a hair, moiré patterns can become very apparent.

**FREQUENCY-MODULATED (FM) SCREENING**

Stochastic, or frequency-modulated (FM), screening is an increasingly popular alternative to conventional AM halftone screening. Instead of using a regular grid of spots that vary in size, FM screening uses very small identical dots placed somewhat randomly to reproduce continuous-tone images. This random dot pattern is similar to the diffusion dithering option used to display images in Photoshop. FM screening still uses the cell concept as in AM screening, but the dots are randomly distributed within the cell—with more dots in the cells in the dark areas and fewer dots in the cells in the light areas—rather than dots grouped into central spots of various sizes. What this means is that the color is determined (modulated) by the frequency (FM) of similar-sized dots within a cell rather than the size of the spots located in the centers of cells (AM).

Because FM screening doesn’t group imagesetter dots into halftone spots, the individual dot sizes can theoretically be as small as the dots produced by the imagesetter. However, dots that small do not make good "contact" in offset printing so they can’t be reproduced. Therefore, the smallest dot size that your printer’s press can "hold" (reliably print) is the minimum dot size you should target for FM screening.

Before you output FM screens, you must ask your printer what size dot can be consistently held on the press. Based on what the printer says, you can specify the proper imagesetter output resolution for the films. Since you’re not using a conventional AM screen, you’ll need to calculate the appropriate output resolution for the films (and your scanning resolution) to get the smallest printable FM dot. The chart below provides a breakdown of this relationship for a few common dot sizes and line screens (the results have been rounded to the nearest 5 dpi).

<table>
<thead>
<tr>
<th>OUTPUT RESOLUTION</th>
<th>85 LPI</th>
<th>133 LPI</th>
<th>150 LPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1% dot</td>
<td>755</td>
<td>1180</td>
<td>1330</td>
</tr>
<tr>
<td>3% dot</td>
<td>435</td>
<td>680</td>
<td>770</td>
</tr>
<tr>
<td>5% dot</td>
<td>335</td>
<td>525</td>
<td>595</td>
</tr>
<tr>
<td>7% dot</td>
<td>285</td>
<td>445</td>
<td>502</td>
</tr>
<tr>
<td>9% dot</td>
<td>250</td>
<td>390</td>
<td>445</td>
</tr>
</tbody>
</table>

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**SECTION III: DETAILS OF THE PROCESS**
Just as for AM screens, images consisting of more than one color are separated and FM screening algorithms are applied to each separation by software either on your computer (using special software like ICEfields by Isis Imaging Corporation) or at the service bureau. In a page layout application, FM screening can be applied to individual images or to the page as a whole (the same is true for AM screening).

In general, high-quality FM screening is available only from service bureaus and printers familiar with this new technology. There are two types currently available. One version of FM screening determines spot size automatically. The other type allows you to specify the dot size used to create the image. This version is quickly becoming the preferred method because all but the best printing equipment simply cannot print spots as small as they are sometimes created by FM screening.

If you can, find a service bureau or printer that offers FM screening at variable spot sizes so you can match the minimum spot size to the printing press you plan to use. This way, you can even use FM screening to create screens with a minimum spot size appropriate for silk-screen production. Most people find low-resolution FM screening more visually appealing than low-resolution AM screens because the pattern imposed by the FM screen is less noticeable.

There are advantages and disadvantages to FM screening and it’s important to keep these in mind when you design your piece. If specified correctly, in most cases FM screening will actually reduce problems that occur on press (like moirés) and make continuous-tone images look better. One thing that is not improved by FM screening is the look of solid colors and tints. The random nature of FM screening can cause colors that should be solid to appear less uniform than they would using traditional AM screening.

Unfortunately, many printers are not yet familiar with FM screening and won’t accept film produced using it. One of the reasons is that with such small dots there is less room to adjust the colors on press. In addition, dot gain tends to be greater using FM screens because there are more individual dots than there are halftone spots in a similar image using AM screening. Correcting for dot gain on FM screens is still an area of uncertainty. Always check with your printer before you decide to take this route.
Advantages of FM screening:

- It eliminates moiré patterns and reduces the possibility of misregistration in color separations because the screen pattern is randomized so it doesn’t have to line up exactly.
- Images appear to be sharper with more detail and color saturation because there are no rosette patterns to obscure fine detail and color.
- Scanning images for production using FM screening is simple—it’s one-to-one. If you want your image to print at a quality equivalent to 600 dpi you’ll need to scan at 600 dpi. But because they hold their image quality better at lower resolutions, you may be able to use lower resolution images (with smaller file sizes) than you would for comparable quality AM screen printing.

Disadvantages of FM screening:

- Because most service bureaus have their color proofing systems calibrated to output proofs from AM-screened films, color proofs created using FM screens may not be particularly accurate. (Color proofing systems have to be calibrated to accommodate FM screened films.)
- The look of FM screened images is distracting to some people because they’re conditioned to look at the rosette patterns created by conventional AM screening.
- Solid colors do not print well using random dot patterns and can look grainy or mottled.

**Summing Up**

If you understand what makes printing possible, it will be easier for you to prepare for that end of the process. There are a few things that you need to keep in mind from this chapter.

- You need to output one piece of film for each color of your piece.
- There are two basic approaches to printing colors: spot-color printing and process-color printing. Spot colors are used if you want specific, premixed colors in your design, and process colors are used when you want to print in full color using only CMYK.
• Color separation refers to the process of separating a continuous-tone image into the four process colors (CMYK). But, it can also refer to creating color separations of duotone, tritone or quadtone images using spot colors.

• There are two types of commercial screening processes available—conventional halftone screening, or amplitude-modulated (AM), screening and frequency-modulated (FM) screening.

• To create amplitude-modulated screens, the dots of the output device are grouped together by the computer to form halftone spots. The number of halftone spots per inch is known as the screen frequency.

• Screen frequency is the basis for determining what resolution you need when you scan or create bitmapped images. It also determines what imagesetter output resolution setting you need to create the optimal number of colors or shades of gray in your images.

• In an FM screen, spots are somewhat randomly distributed—but with more of them in the dark areas and less in the light areas. This means that the color is modulated by the frequency of same-size dots rather than by the size (or amplitude) of evenly spaced spots.
What Is Registration?

Things You Can Control to Compensate for Misregistration

What is Trapping?
Types of Trapping
Where's the Trap?
Who Should Do Trapping?

Dot Gain

What is Dot Gain?
How Dot Gain is Measured
Factors That Contribute to Dot Gain
Compensating for Dot Gain

Choosing Paper

Paper Grades
Weight and Thickness
Sheet Sizes
Surface Quality and Color
Availability
Runability
Paper Ratings
Paper Stretch
Making the Paper Choice

Summing Up
You saw in the last chapter that ink gets put on paper one color at a time, and that different color screens are separated from your digital files to make the plates. A key question in the production process is, "How do my computer-perfect electronic files relate to an imperfect printing process?" The short answer is, "not very well." So to get the best results, you need to account for real-world conditions as you prepare your files to make them printer-perfect. This section describes the printing issues that need to be considered from the desktop: registration, dot gain, and paper choice.

What is Registration?
If you were to print a full-color piece that also included a couple of spot colors, you'd need six sets of films and plates—one each for cyan, magenta, yellow and black and two more for the spot colors. As the paper ran through the press, it would get hit with each color, one after another. What would happen if the paper stretched or the sheets shifted a little between presses? Well, the colors that you carefully designed with, corrected and separated into films would be misaligned. The proper alignment of the
different films used to create a printed piece is called \textit{registration}. When something disturbs that alignment during printing it’s called \textit{misregistration}.

Misregistration can be a problem with both spot and process color printing. Any time you print spot colors that touch each other or touch process colors, or process colors that overprint one another (such as continuous-tone photographs), good registration is critical. When spot color inks get out of registration, gaps between colors can appear and let the paper show through. When misregistration occurs in process colors, it can cause unexpected color shifts and edge effects. If the alignment is particularly bad, individual lines of cyan, magenta, yellow, or black can show on the edges of images, ruining the illusion of continuous tone.

Misregistration is one of the most common problems that occurs in offset printing (along with incorrect color reproduction, which can result from a variety of factors that will be discussed throughout this section). Look at any printed material closely enough and you will probably see some misregistration. The truth is that there’s almost always going to be some misregistration on press, even under ideal conditions. There are too many variables that can cause little shifts in alignment. First and foremost, printing presses are complex mechanical devices that move paper, ink rollers, and press plates at very high speeds. Just a little unanticipated movement in any part of the system can cause misregistration. The second major factor is the paper itself and how it responds as it’s fed into the press. Because roll-fed paper tends to stretch as it’s pulled through, web presses generally have more misregistration than sheet-fed presses.

To address registration issues related to the workings of the printing press, you need to rely on your printer and the skill of the press operators. It can’t be stressed enough that you can only expect high-quality printing from an experienced printer with the right equipment. No matter who you use for printing, it’s essential that you (or your experienced representative) go on press checks to look at the registration yourself.

\textbf{THINGS YOU CAN CONTROL TO COMPENSATE FOR MISREGISTRATION}

Now that you recognize that perfect registration is impossible to achieve, there are a number of things you can do during design and production to account for, and minimize, the effect of misregistration.
You can:

- Remember to include registration marks in your files. The basic idea of aligning plates would be impossible if you didn’t have some kind of reference point to know when they were in the right place. That reference point is the registration mark. Take a look at the cover of this book and you’ll see registration marks around the central image. They’re just used as a design element in this case, but you can see what they look like. You can ask the service bureau to output your files with automatic registration marks on the films if you haven’t created them in your files. The registration marks and crop marks will appear on each piece of film and should perfectly align when you place them on top of one another. If you have negative films, you can check the alignment of the registration and crop marks by placing the films on top of one another on a light table. If all of the marks perfectly align, you will be able to see through the clear film area of the marks to the light table—if they’re off you won’t. It’s a good idea to run new films if there is a noticeable problem with the registration. Talk to your printer to determine what can be fixed in stripping and what is beyond the expertise of the stripper and requires new film.

- Select a paper stock that has as little stretch as you can afford (better paper usually stretches less but costs more). Talk to your printer. Printers know which paper stocks perform best on their presses. The last part of this chapter gives more detail about selecting paper.

- Design to make registration less of an issue. One way is not to include color elements that touch. If colors don’t touch, there’s no possibility of creating unsightly gaps.

- If you must have colors that touch, use overprinting—printing darker colors directly on top of lighter ones. Use overprinting when you have dark text or fine dark lines that you want to print over lighter colors. That way if they move a little, there won’t be a color gap. You can also print large areas of dark colors on top of lighter colors as long as you’re sure that they won’t combine to form a third, muddy color.

- Outline colored areas with black lines and set the black to overprint. Illustrations in color comics sometimes use this technique.

- When using process colors, you can minimize the visual impact of misregistration by picking colors that share process color components (CMYK). That means if each color you use has at least one process...
color in common with the colors it touches, the silver of shared color that will show if misregistration occurs will be less distracting than a silver of white. The more similar the two colors are, the more the misregistration will appear as a smooth transition between them. The drawback, of course, is that the more similar the colors are, the less color variety you’ll have.

When colors aren’t similar and you can’t change them, you need to trap. Trapping is an effective way to safeguard against misregistration of dissimilar colors. The next section looks more closely at trapping as a component of production.

WHAT IS TRAPPING?
Realizing that all print jobs will have some degree of misregistration is a bummer, but it’s good to be aware of. That way, you can plan for either by designing around the issue as mentioned above or by building a fudge factor into your color separations. That fudge factor is called a trap. What it consists of are slight overlaps of adjacent colors, strategically placed to cover up minor misregistrations without creating strange-looking outlines or hybrid colors.

Trapping is needed most often when dissimilar colors are printed on top of or against one another. In general, the effects of misregistration are more apparent when dealing with abutting spot colors because the inks are distinctly colored. If they misalign, you can see the paper between the colors. But, misregistration can also be a problem with process colors, even though chances are that with four plates at least some ink will make it onto the paper to fill in the gaps.

The most commonly occurring situation that requires trapping is when colors are “knocked-out.” When you knock out one color from another, you actually create a hole in the background color so that the color on top will print directly on the paper beneath. Knock-outs are done to reduce the amount of ink used and to keep colors true. For example, if you printed solid orange-yellow letters on top of a blue background, the colors would mix and look greenish. To keep the orange-yellow true, the blue would be knocked out, leaving the unprinted paper beneath the orange-yellow letters. In a perfect world that would be the end of the story—the blue would be out and the orange-yellow would be in. But to account for the ever present possibility of misregistration, you need to trap.
Using the previous example, the easiest way to visualize trapping is to think of making the orange-yellow letters slightly larger than the knock-out so if the plates were to shift a little, it wouldn’t show. When printed, the orange-yellow would overlap or spread out slightly onto the blue. This is called spreading. 3 If the colors were reversed—if the letters were dark blue and the background were orange-yellow—then the orange-yellow background could be extended inward onto the dark blue letters, which is called choking. 4 Choking and spreading are terms that simply refer to the way a trap is applied, depending on whether the color of the surrounded object extends outward into the surrounding color, or the surrounding color extends inward into the object.

To determine whether a trap should be a choke or spread, you have to look at the colors. Lighter colors should always be expanded to overlap darker colors because the trap tends to be less obvious that way.

If you spread a darker color over a lighter color to create the trap, the darker colored shape would look larger. If your darker objects are serif type characters, it’s likely that the type would lose some of its distinctive shape and look heavy.

One other special type of trapping is needed when you want to create rich black. Rich black is created by putting another color ink below black ink to create a richer, fuller black. In order to keep the extra color from spreading out from beneath the black if an object of a different color is slightly off register, you need to create a keep-away or stay-back trap. What you create is a spread of unsaturated black that would hide the underlying color if it is off registration but would be almost indistinguishable from the rich black. 5

The amount of overlap or trap you need depends on the accuracy of the particular printing press, the characteristics of the paper you select, and the fineness of the print job’s line screen. A good printer will know the tolerance of the press and can give you a target amount for trapping. The amount of spread or choke is measured in points (the same way you measure type sizes, where a point is 1/72 of an inch). Getting the size of the trap right is just about as important as trapping in the first place. It’s best if you actually show your piece to the printer to receive an accurate measurement. If the trap is too small, it may not cover up misregistration gaps. If it’s too large, it can create unwanted outlines or border effects.
TYPES OF TRAPPING

Trapping has traditionally been done by prepress specialists using photomechanical techniques. The trapping technician (called a stripper) had to isolate abutting colors to be spread, from colors, to be choked, on each color separation. Each area was adjusted by re-exposing the film to cause either choking or spreading. When every area of the films was trapped, they were reassembled into a composite film for platemaking. This approach is still used for non-electronic artwork.

Electronic trapping is fundamentally different than photomechanical trapping because the adjustments are made to the files before films are produced by the imagesetter. The process has been automated to some extent by the development of trapping software. However, good electronic trapping is difficult with even the most sophisticated software and requires skill and experience.

As a concept, it's much easier to visualize trapping using objects of solid but different spot colors. It can be slightly more troublesome to picture how trapping works between a spot color and a gradation or in continuous-tone images. Because of the various edge types to be trapped, there are two general categories of electronic trapping, object-based and edge-detection (they're also called vector- and raster-based). Each of these two approaches works well when used on its corresponding digital image type—object-oriented images or bitmapped images. (The characteristics of, and differences between, these image types are discussed further in Chapter 11.)

Object-Based Trapping

Layout and illustration drawing programs like FreeHand and Illustrator create shapes and outlines with mathematical instructions using the PostScript page-description language. Object-based trapping programs are also based on mathematical PostScript instructions. Using the previous example of trapping, the trapping program would read the PostScript file and know by comparing colors that the orange-yellow letters would need to be spread onto the blue (or the blue letters would need to be choked by the orange-yellow background). With solid colors, the trap could be handled by a simple mathematical command to increase the size of the letters (or shrink the knock-out in the background) to create an overlap. When colors change along the edges of objects, a uniform spread, or choke, cannot be applied. In this case, object-based trapping software sometimes creates a separate object to straddle the boundary and fills it with a neutral, interme-
Object-based trapping

Object-based trapping software sometimes creates separate, neutral-colored objects to straddle color boundaries.

Edge-detection trapping

Edge-detection trapping software evaluates color differences and makes adjustments at the pixel level.

diate color that's set to overprint to create a trap. Or a series of edge objects, each with an appropriate color trap, may be created.

Object-oriented electronic trapping is best suited for designs with solid colors, sharp edges, and type. However, designs with numerous small objects that require trapping can slow down and even stall these programs. With the ability to create complex designs on the Mac, difficult trapping scenarios frequently occur that are beyond the capabilities of object-based desktop trapping software. In particular, trapping gradations and continuous-tone images where color values change quickly is not possible electronically.

**Edge-Detection Trapping**

Edge-detection or raster-based trapping programs make their color comparisons at the pixel level. These programs review the rasterized image and look for "edges," places where color changes relatively abruptly. They compare the colors on the two sides of the edge, pixel-by-pixel, and create a separate PostScript object to form the trap or create "sliding traps" that gradually change from a choke to spread to make abrupt color changes less noticeable. (Only hybrid programs can do both.) These programs are currently the only way to truly trap bitmapped images and gradient fills (without producing hard edges or doing a lot of manual labor). Raster-based trapping software has been around for quite a while on high-end service bureau equipment but its use has been limited by the huge amounts of memory and processing speed needed to do it. As memory prices continue to fall and processing speeds improve, the use and utility of raster-based trapping software will improve. Nevertheless, the quality of the trapping job still depends on the skill and experience of the person operating the software.

**WHERE'S THE TRAP?**

Trapping can take place during image creation, page creation or the prepress stage. Several of the most commonly used illustration, image manipulation, and page layout programs (like Illustrator, FreeHand, Photoshop, QuarkXPress and TrapMaker for PageMaker) offer at least some form of rudimentary trapping ability. The PostScript illustration and page layout programs employ a limited set of object-based trapping tools. Photoshop, because it works at the pixel level, uses edge-detection trapping. However, not one of these programs is currently able to handle every trapping requirement.
Even with the incorporation of trapping tools into popular desktop applications, most trapping is still done in service bureaus by technicians. Service bureaus often use either high-end commercial trapping software like Adobe TrapWise, Island Graphics' IslandTrapper or Rampage's TrapIt, or equipment-specific proprietary systems like Full Auto-Frames by Scitex.

Commercial trapping programs are about ten times as expensive as typical desktop publishing applications and proprietary systems are even more expensive and don’t work without their own hardware (costing tens of thousands of dollars). These numbers, let alone the training and practice required, should convince most desktop publishers and designers to keep away.

As well as using high-end trapping software, service bureaus are also turning toward the trapping tools built into desktop applications for two main reasons. First, these tools are continually improving and are capable of handling many common trapping issues. Second, because many designers and publishers are learning to use them, service bureaus need to understand desktop trapping tools in order to troubleshoot their client’s mistrapped files.

**Which Programs Do What?**

It’s important to understand the limitations of each trapping program so you’ll know whether you can trap adequately on the desktop or you have to go to a service bureau. The chart on the following page lists the most common design scenarios and the programs that will handle them. This chart can help you determine when your trapping should be done and who should do it.

**WHO SHOULD DO TRAPPING?**

You could just as easily have substituted typesetting, color separation or photo manipulation in this question at different times during the evolution of desktop publishing and you would have arrived at the same answers. Some will say that trapping is best left to the experts and some will say the capability is here now so the designer or production artist should take responsibility for trapping. While typesetting, color separation and photo manipulation have arrived on the desktop, complete and reliable trapping still remains a somewhat distant goal for software developers.

In order to decide for yourself where to have your files trapped, evaluate the complexity of your file, your skill level with the trapping software available on the desktop and the cost. If you have a very simple project that requires only minimal trapping and you know the trap amount needed
# SECTION III: DETAILS OF THE PROCESS

1. Quark will only apply a one-color trap that may be adequate.
2. Island Trapper will only apply a one-color trap that may be adequate.
3. FreeHand will let you apply a one-color trap that may be adequate.

<table>
<thead>
<tr>
<th>DESIGN SCENARIO</th>
<th>OBJECT BASED—QUARKXPRESS &amp; TRAPPY</th>
<th>OBJECT BASED—FREEHAND &amp; ILLUSTRATOR</th>
<th>RASTER BASED—PHOTOSHOP</th>
<th>OBJECT BASED—ISLAND TRAPPER</th>
<th>HYBRID (OBJECT &amp; RASTER)—TRAPWISE</th>
<th>RASTER-BASED PROPRIETARY—FULL AUTO FRAMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text, lines &amp; shapes on a one-color background</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
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<tr>
<td>Saturated black (black w/CM or Y)</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Thin design elements like fine serif type or .5 rule lines</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
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</tr>
<tr>
<td>Object filled with a gradation touching solid color</td>
<td>![ ]</td>
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<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Text, lines &amp; shapes on a photograph</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Process colors in a continuous-tone image only</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
</tbody>
</table>
(from the printer), you may be able to do it yourself with little effort. If you have a complex design in mind that has some tough trapping, it's probably worth it to have your service bureau do the trapping. Having trapping done as part of prepress is an especially good idea if you think that you might be making design changes right up to the end of the design process.

Deciding whether or not to do your own trapping comes down to dollars and common sense. If it takes you two hours to trap a file and your billing rate is $50 per hour (remember what you read in Chapter 5), it will cost $100 to do your own trapping. If your local service bureau can trap your job for an additional $50 on top of the film output price, it's better for your project budget to have the service bureau do the job. But if it's going to take you only 15 minutes because you understand trapping within your program and the file is relatively simple, you may want to consider doing it yourself.

Because designers are starting to do their own traps, many service bureaus have taken on a "you supply it, you're responsible" policy. So before deciding to do your own trapping, keep in mind that if you mess up, the films will have to be rerun on your nickel, and it can take a lot longer to fix a file with bad traps than it did to trap it the first place. It could cost you more than if you just had the service bureau do it in the first place. However, if you pay for trapping and it doesn't come out right, the service bureau will be obligated to fix the file and rerun the films at no additional charge.

Beyond the price tag issue, trapping can be a complex job, and desktop programs almost always require some manual trap creation in addition to the automatic ones. Whoever does the trapping should be experienced in many applications, know how the press works, and understand how ink goes down on paper.

**Having the Service Bureau Do It**

If you decide to use a service bureau for trapping, call a few and ask them which trapping application(s) they use. Also ask how they would like to see your files prepared. Realize that even though the service bureau may say that their trapping software is automatic, it really isn't. A technician still has to understand how to choose the "automatic" settings for different types of files. They also need to check your file before it's run to make sure you prepared it the way they requested.

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**If you have a super-tight budget and just can't afford to spend the extra bucks, do everything you can in designing to avoid traps. See the tips at the beginning of this section. (There are also color examples of graphics created to avoid trapping in Chapter 14, "The Working Color Gallery.")**

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**If you're using FreeHand, or even some other illustration program, you may want to take a look at Real World FreeHand by Olav Kvern. It gives a great step-by-step account of the trapping process. The book is published by Peachpit Press. (You can find the address in the "Sources" section at the back of the book.)**
Island Trapper and Adobe TrapWise
A number of service bureaus have invested in dedicated high-end Mac workstations with commercial trapping software like Island Trapper or Adobe TrapWise. Both programs can automatically trap complex files that include a number of intersecting color elements, including text and continuous-tone images. Unlike design and illustration programs, both of these trapping applications can accept files with embedded graphics. They also accept and trap Encapsulated PostScript (EPS) files created in programs like FreeHand, Illustrator, PageMaker and QuarkXPress.

Island Trapper uses an object-based approach to trapping, while TrapWise uses a combination object/raster, or hybrid, approach. Island Trapper interprets the PostScript file, creates a display list of objects in the file, and sorts them based on their relative drawing order. It then analyzes the objects, looks for overlaps, and creates a trap by either changing the size of the objects or creating a third overlapping object.

TrapWise begins its hybrid operation by rasterizing PostScript files, using pixel data to identify areas of abrupt color change, and defining the kinds and characteristics of traps for the file. However, rather than doing traps at the pixel level, it uses the raster data to create PostScript objects, strokes, and fills to layer on top of the original image. The final trapped file is output as an EPS file. (The EPS format is described in Chapter II, "Components of the Digital Mechanical.")

The trapped files from both of these programs can be imported by the service bureau into other programs to have imposition (arranging the pages of a file to fit on the press sheet) applied and then to create color-separated output files. Because the files are in EPS format they can be returned to the designer with traps intact. This is useful if you want to store the final file electronically complete with trapping. Then if you need to print the piece later with the same trap requirements, you'll have the final file ready to go. Files trapped by proprietary systems usually can't be handled by desktop systems.

Proprietary High-End Systems
Among the first systems offering software that created automatic traps were the high-end proprietary systems. The most common of these in use today is Full Auto-Frames (FAF) by Scitex (traps are called frames). FAF uses a raster approach to trapping. PostScript files are rasterized and analyzed for color differences in adjacent pixels. Once the differences are determined and evaluated, trap adjustments are made and the file is output directly to a Scitex film recorder.
Trapping Yourself

If your design is simple and you decide to trap yourself there are a few things to keep in mind:

- Plan your trapping strategy ahead of time. You’ll need to know what you’re doing before you start.
- Read the manuals for your trapping programs. Make sure you have a clear understanding of how the trapping functions of the program work before you begin trapping.
- If you’re trapping an illustration or scanned image, make sure you trap the image at the size it will be printed in the final piece. (If it needs to be used in several sizes, each size illustration will have to be trapped individually.)
- If you want to run the same file in the future at another size or under different press conditions, you may have to retrap. When you finish a job, document how trapping was done (in what programs and what trap size was used, and so on).
- Trap graphic elements in their originating programs before you import them into your page layout application.

Dot Gain

Unfortunately registration is not the only inevitable factor that you’ll have to compensate for in the design and production process. Dot gain ranks right up there, needing an equal level of attention and understanding. No matter what your printing situation, there is always some level of dot gain on press. It’s important that you keep it in mind and know how to compensate for it in different situations. The printer can give you advice and the service bureau can adjust your file to help you out.

WHAT IS DOT GAIN?

The term dot gain refers to changes in the size of imagesetter dots and halftone dots between the size they appear on the film and the size they appear on the printed page. The term dot gain is used both when dots get larger and when they get smaller. In darker parts of an image where there are more large dots, dot gain will cause the dark areas to appear too dark. Porous papers like newsprint typically produce the highest amounts of dot gain. In the light parts of an image, the dots in the halftone cell are smaller and therefore farther apart. These smaller dots typically
There are a number of factors that affect the amount of dot gain you can expect, including the transfer of halftone images from disk to film then from film to plate and from plate to paper.

experience less dot gain than the larger dots found in darker parts of an image. In some cases, the smallest dots may not all print, making highlight areas appear washed out. On high-quality presses running with smooth coated paper, very small dot sizes can be printed. However, most presses running with porous papers may not be able to "hold" a small dot. In addition, the amount of dot gain and loss is not the same for both the light and dark parts of images.

HOW DOT GAIN IS MEASURED

If the printer tells you there will be a 20 percent dot gain, this does not mean that your 50 percent dot will become 70 percent when printed. It means that the dot itself will increase in size by 20 percent to 60 percent. Unfortunately dot gain doesn't occur uniformly. Dots in the dark areas may spread or gain 20 percent; dots in the light areas may shrink or disappear; and dots in the midtones change at varying percentages. Because dot gain isn't consistent, it's difficult to know exactly what the final result will be without an actual press proof. Printers are experienced with dot gain. It's best to consult with your printer for specifics regarding how much dot gain or loss you can expect on your paper and the press it's printing on.

FACTORS THAT CONTRIBUTE TO DOT GAIN

There are many factors in the production process that contribute to dot gain. It's important to be aware of them and compensate when necessary. If you consistently print the same kind of pieces and work with the same service bureau and printer, the variables will change less from job to job, but they may still change. Always communicate with your service bureau and printer before you scan your images and send your file out for films. They can help you understand when to compensate and by how much. The following are a number of factors that can increase dot gain:

- High screen resolution (both AM and FM)
- Emulsion density on the imagesetter film
- Variability in photographic reproduction
- Variability in the plate-burning processes
- Press conditions
- Application of inks, varnishes and other coatings
- Absorptive properties of the paper

Any of these factors can act in combination with any of the others.
CHAPTER 10: REGISTRATION, DOT GAIN, AND PAPER

High Screen Resolution
One of the most important contributors to dot gain is using high-screen resolution. Situations where high screen resolution is especially likely to cause dot gain problems are:

- Screens of 150 lpi or higher printing on absorbent papers.
- Screens over 120 lpi printing at a quick printer using paper plates.
- Screens of 60 lpi or more for half-tone silk-screening.

If you want to print at high screen frequencies, it's best to use a service bureau and printer who are both experienced with high-quality printing. The cost will probably be more, but the difference in the product will be worth it. It's also best to use a coated paper and avoid textured paper.

Emulsion Density on the Imagesetter Film
Because imagesetters use chemicals to develop paper, film, or plates, it's critical that they are balanced and changed regularly and that the temperature is regulated. If the chemical solution is not mixed properly or the temperature is too warm or cold, too much emulsion is removed from the surface of the output material. If the chemical solution is weak, not enough is removed. These variabilities can result in either too much or too little compensation for dot gain in your final films.

It's also important that the service bureau regularly calibrate its equipment and set the imagesetting correctly for the type of output material being run. The service bureau should have a densitometer and a systematic calibrating routine. The density on the imagesetter should be set so that the variation is no more than 2 percent either way.

Photographically Reproducing Films or Paper
Additional dot gain can occur if the printer has to reproduce an original photographically, to get the films to burn the plates. For example if you give the printer paper output, it may have to be photographed and the resulting film used to burn the plate. The best way to avoid dot gain is to eliminate any extra photographic reproduction. Ask the printer what kind of output he or she needs. (Most of the time, printers ask for negative films, right-reading emulsion down.)
When you do a press check, you should be able to tell if the ink is too heavy or too light by comparing the detail in the light and dark areas of the first sheets that come off the press to your proof pulled from the film. You'll also be able to check for consistent ink coverage. You need to look at the entire sheet and compare similar color on all sides of the sheet.

In order to truly see how a particular kind of paper will print, you really have to test it on press. Many large paper companies supply paper samples from all the paper mills they represent. In some cases these samples are printed, in order to show how the paper looks with ink on it. You can refer to these samples to review the print quality.

Burning the Films to the Plates
Films are pressed directly against the plate (or contacted) to burn in the image, so there is usually only a small amount of dot gain at this stage. With the direct-to-plate technologies (discussed in Chapter 7), film production is skipped completely, so there's no dot gain at the platemaking stage.

Applying Ink to Paper
Dot gain can result if the ink is:

- applied too heavily
- applied too lightly
- applied inconsistently across the surface of the page
- not in balance with the water used on an offset press
- water-based

Properties of Paper
Along with screen frequency, paper stock is one of the biggest contributors to dot gain. If you're printing on a very porous paper, such as newsprint or some recycled papers, you'll see the most dot gain—sometimes more than 20 percentage. (As described earlier, this means that a 50 percentage tint becomes 60 percentage.) Using coated stocks can reduce the amount of dot gain that will occur.

COMPENSATING FOR DOT GAIN
Like trapping, you can choose to compensate for dot gain yourself or you can have a service bureau handle it. In most cases, it makes sense to have the service bureau do it.

Except for very small colored type printed using process colors, the parts of documents that suffer the effects of dot gain the most are continuous-tone images. Photoshop has two ways to handle dot gain in your images. The first approach allows you to select the type of paper in the Printing Inks Setup dialog box (File, Preferences, Printing Inks Setup). This setting adjusts your images by a predetermined set of parameters included in the program. The default settings are SWOP (coated) (for standard offset webb proofing inks on coated paper) which sets dot gain at 20 percent. This dot gain setting adjusts the entire image based on the midtones. The second method provides more precise control over the dot gain adjustment throughout an
image by using transfer functions. Photoshop allows you to set up to 13
 tonal values to create a customized dot gain correction. To set the individ­
ual dot gain levels to create a transfer function, you would need to work
closely with your service bureau. Transfer functions are more often used as
a way to compensate for imagesetters that are out of calibration, but they
can also be used to compensate for dot gain in the imagesetting process.
Another way to compensate for dot gain is to adjust the tonal range (the
number of pixels in your images at each of the 256 levels of brightness) of
your images. By compressing the tonal range, you can lighten the dark
tones in your image to account for dot gain on press which would otherwise
over-darken your image. (For a step-by-step explanation of this process,
refer to Real World Scanning and Halftones, by David Blatner and Steve
Roth. See "Books and Pamphlets" in the "Sources" section in the back of
this book for the publisher's address.)

Choosing Paper
Just because you pick a paper stock that looks great or has a nice texture
doesn't mean that your design will look great printed on it. There are many
factors to consider when picking paper, and an experienced printer can be a
great help. Your printer can help pick the best stock based on your budget,
design requirements, number of colors, size of your piece, and number of pages
and folds, and amount of finishing required before the deadline. Once you
choose your paper, the printer can also give you the information you need to
prepare the digital mechanical and films to print your piece successfully.

Some print shops stock papers that print particularly well on their presses
and that are popular with many of their customers. Stocked papers are
usually ordered in large quantities with a considerable cost savings to the
printer, and sometimes the savings are passed on to you, the customer. If
the printer doesn't have the paper you want in stock, it can be ordered
from a paper merchant, mill or local mill warehouse. It's best to let your
printer order the paper rather than doing it yourself. Printers usually have
established credit lines and receive larger discounts than you could. In
addition, printers have regular paper deliveries from their favorite mills or
warehouses, so transport usually costs them little or nothing.

Because paper choice is so important to the success of your job, everyone
involved in producing your piece should understand something about paper.
Paper comes in different grades designed for specific uses, each one having
it's own weight, sizes, surface quality, availability, runability and color.
SECTION III: DETAILS OF THE PROCESS

PAPER GRADES
Common paper grades are newsprint, bond, offset, coated book, uncoated book (or text) and cover. Each paper grade is designed for specific uses. Different grades typically come in different standard sheet sizes with the size reflecting the trim size of the piece that is most commonly printed using that paper. For example, bond paper is typically used for letterhead and business forms that will trim out to 8 1/2 x 11 inches. The most common sheet size is 17 x 22 inches, which conveniently allows you to get four 8 1/2 x 11-inch sheets out of one full sheet of paper, with no waste. In some cases, the sheet sizes are actually slightly larger to allow for gripping by the press rollers, bleeds, and trimming. Most offset papers, for example, come in larger than standard sizes. Ask your printer or paper representative for more information regarding available sizes. (See the chart at the end of this section for different paper grades, uses, standard size, surface qualities, and dot gain potentials.)

WEIGHT AND THICKNESS
Paper stocks are generally described not only by their grade but also by weight. The basis weight of a paper stock is a measure determined by the weight of 500 sheets (a ream) of the basic size sheet of that paper. For example, if a ream of "uncoated book" paper with a basic sheet size of 25 x 38 inches weighs 60 pounds (lbs.) then it's called 60 lb. text. A paper's thickness is not necessarily closely related to its weight and may have more to do with its preparation and texture.

Paper thickness is called caliper (measured in mils, or thousandths of an inch). The caliper is important to know if you're working on a book and need to determine the spine width, which depends on the number of pages and the thickness of each page. For example, a 1000-page book printed on a 50 lb. "uncoated book paper" stock with a caliper of 500 pages per inch would have a 2-inch wide spine. The spine thickness is also called the bulk thickness of the book. (Bulk thickness refers to the thickness of paper sheets stacked one on top of another.)

SHEET SIZES
The sheet size you use determines how many pages of your piece can be printed at one time as the sheet goes through the press. It's important to try to maximize the use of your paper (by minimizing waste) because paper can be anywhere from 35 percent to 55 percent of the printing cost of your job. The more pages you can print on a sheet, the fewer sheets you'll need for the job. For example, if you can fit two spreads of an eight-page brochure
on a press sheet instead of one, you'll need only half the amount of paper to print the job—a huge savings.

It's best to talk to the printer to determine whether slight differences in the size of your piece will make it fit on the designated press sheet with significantly less waste. There are a few things that the printer needs to know to figure this out.

One consideration is the grain direction. If your piece has folds, they need to be parallel to the grain of the paper. (Most papers have the grain running parallel to the length of the stock.) A second consideration is whether or not color(s) will bleed off the edge of your printed piece. A bleed is created when your design calls for color to be applied right up to the edge. To get that effect, the printer must print beyond the edge and trim the excess.

If the piece has bleeds, different pages usually can't butt against one another to fit on the press sheet. If the bleeds in your design require too much space between the pages, there may not be enough area around the edges of the sheet for the grippers (metal clamps that grab the edge of the paper and guide it through the press) to grab the paper on the press. The amount of free edge space needed depends on the press (half an inch is common).

A third consideration is whether colors will be running next to each other on press. For example, to print a solid red cover page, the printer may have to boost up the magenta and yellow to get the right coverage. If the next page has a picture of a person and is located on the same press plate in alignment so that it will follow the cover through the press, increasing the ink flow for the red block may cause a red cast on the skin tones of the next image. To avoid this, the printer may switch the way the pages are placed on the sheet or run fewer pages together on the press.

SURFACE QUALITY AND COLOR

One of the first things you probably think about when choosing paper is how it's going to make your design look. But remember there is more to it than picking a textured paper just because it's textured or a glossy paper just because it's glossy. You need to keep in mind how the surface quality and paper color will interact with the ink. The surface quality of paper is described by the terms brightness, opacity, and smoothness.

The brighter the paper, the more vivid the image will appear and the higher the contrast will be. Because artificial additives (including color tints) are
Coated

Uncoated

Matte: Vellum

Dull: Antique

Gloss: Wove

Ultragloss: Smooth

Calendering is done at the end of the paper manufacturing process to smooth or finish the paper by rolling with steel rollers. The more rollers the paper goes through, the smoother the paper.

added to papers to make them bright, the white may be bright with a slight color cast. These papers can cause the color of your images to reflect too much of the paper's tinted color. If image color is critical to your job, ask your printer to help you pick an untreated or color neutral stock.

The opacity of the paper refers to how much the printed image and text shows through to the other side. The thickness and composition of the paper dictate what the opacity will be. To check the opacity of a paper, print a sample sheet on your laser printer twice, once on each side. This will give you an indication of how much the graphics will show through the other side of the sheet.

Colored paper changes the values and tints of the colors that are printed on it. With darker papers, light tints may look like a shadow of the paper color rather than a tint of the color you selected. To get an idea of how the color of the paper will affect the artwork, run a sample of the paper through a color printer (one that accepts different paper stocks). This will give you an indication of what you'll see on press. Keep in mind, though, that only running a press sheet will give you a true reading of exactly what will happen.

Each grade of paper comes in a variety of finishes. Different finishes are achieved by how much the paper is calendered (flattened with rollers) or supercalendered and whether a gloss coating is applied or the surface is embossed with a texture. (Calendering rolls determine how smooth and compact the paper is.) To achieve a very smooth finish, like those in grade one (high-quality) stocks, the paper is supercalendered after it's calendered. Coated finishes are applied in different ways on the paper press and can range from dull to super high-gloss. Halftone and color images print with sharper detail on coated stocks.

**AVAILABILITY**

Make sure you choose a paper that will be available when you need it. Some papers may not be regularly stocked by local paper suppliers, requiring the printer to order them directly from the manufacturer. If the paper is back-ordered, it can take weeks to arrive, particularly with paper rolls for web printing. It's important to find out as you're narrowing your paper choice whether the paper will be available when you need it. If you have a long lead time, it can be ordered well in advance to make sure you can meet the client's deadline.

If you're printing stationery, check to see if envelopes are available in that particular paper stock. If not, they'll have to be made. In some cases—for
instance, if there are bleeds or unusual folds—your design may require envelopes to be converted (or made). Making envelopes for larger print runs is not a problem because the start-up cost is amortized over quantity. But for small runs, the start-up costs associated with converting envelopes can be very expensive, costing four or five times as much as ready-made. In addition, you may not be able to wait for envelopes to be converted because it can take a few days, or even weeks if the paper is on back-order.

**RUNABILITY**

The runability is a measure of how well the paper will run through the press. If a paper stock is very runable then it will run through the press with no problems. Papers with less runability can have problems passing through the press and may cause very serious downtime for you and the printer.

There are a few specific factors that determine how runable a paper stock will be. They include the flatness, trimming, amount of loose material on the paper, surface quality, water resistance, and overall condition. If a paper is flat, free of wrinkles and waves, it will be a much better candidate to run freely through the press. Old paper that has gotten damp (or even wet) by sitting in a warehouse will buckle and should not be run through the press. Paper should be trimmed square in order to run smoothly through the press and avoid major shifting. It should be free of loose material such as paper fibers, lint, and trimming dust. Good-quality paper will have a surface that will not delaminate or in some way strip off as it runs through the press. In general, paper sheets should be clean and free of holes and uneven edges.

**PAPER RATINGS**

Paper ratings are determined by the individual paper manufacturers—based on calendering and what goes into making the paper (like chemicals and type of pulp). The pulp products that go into higher grades of paper will be purer, with little or no recycled wastes that may contain ink and other impurities. The more the paper is calendered, the higher the grade will be, because it will be more runable and take ink application more evenly. Each grade of paper is rated from one to four, with one being the best quality and usually more expensive than similar stocks with lower ratings.
PAPER STRETCH
Some papers stretch more than others as they’re pulled through the press. This can be a problem if you’re trying to maintain tight registration on a full press sheet. In other words, if you have an image in the upper left corner and one in the lower left, and both require tight registration, you may have a problem if the paper stretches as it runs through the press. Ask your printer how much stretch to expect on the press with the paper you choose. They can advise you if there will be a problem based on the way your design is set up and stripped on the press sheet.

MAKING THE PAPER CHOICE
The chart on the following page will give you an overview of paper grades, characteristics, uses, common sheet sizes, common weights, and estimated dot gain. The chart was created with information from a variety of sources, with special thanks to International Paper Company for permission to consolidate paper details from the Pocket Pal. (For more information on where to buy the Pocket Pal, see “Books and Pamphlets” in the “Sources” section at the back of this book. For more information where to get paper see “Paper” in the “Sources” section.) Remember, it’s important to consult your printer to determine the best paper choice for your particular job.

Summing Up
Understanding registration, dot gain, and how paper selection affects the printed piece is an essential part of the design and production process. In summary you need to:

- Prepare your file from the start knowing that there will always be some misregistration on press.
- Include registration marks in your file to be sure that they are output on the films.
- Design to reduce registration problems by not having colors touch, by overprinting colors or by using process colors that have common percentages.
- Trap by either choking or spreading the lighter color so it overlaps the darker color.
• Always ask your printer how much trap is needed before you do it yourself or have the service bureau do it.

• Understand the two types of trapping programs—object-based and raster-based.

• Only trap if you clearly know what you are doing. If you do it wrong you will be responsible for rerunning films.

• Ask your printer what dot gain and dot loss to expect on press based on the paper you’re using. The dot gain amount given by your printer most nearly applies to the 50 percent dot and can vary for larger or smaller dots. They will give you a curve to work with in your design.

• Understand how you measure dot gain and dot loss and compensate for it in your digital files.

• Understand what contributes to dot gain. Paper is usually the biggest factor. Others are high screen resolutions, emulsion density on the imagesetter film, photographic reproduction, plate-burning, press conditions, varnishes, and coatings.

• Always pick several papers that you could use for your piece and ask the printer which one will work best for your job.
<table>
<thead>
<tr>
<th>PAPER GRADE</th>
<th>PAPER CHARACTERISTICS</th>
<th>PAPER USES</th>
<th>SHEET SIZES (INCHES) &amp; WEIGHS (LBS)</th>
<th>ESTIMATED DOT GAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond</td>
<td>Colors: variety Finishes: wove, laid, linen, cockle, ripple Well-suited for writing or typing</td>
<td>Letterhead, business forms, books, magazines, folders, pamphlets</td>
<td>17 x 22, 13, 16, 20, 24, 28, 32, 36, 40</td>
<td>10%-30%</td>
</tr>
<tr>
<td>Coated</td>
<td>Colors: white, cream, and neutral Finishes: dull, gloss, ultra gloss, velvet, matte, and cast coated 1- or 2-sided</td>
<td>Books, magazines posters, calendars</td>
<td>25 x 38, 24, 28, 32, 36, 40</td>
<td>none-15%</td>
</tr>
<tr>
<td>Text</td>
<td>Colors: variety Finishes: textured surfaces—antique, felt, laid, linen, vellum, smooth</td>
<td>Cards, booklets brochures, annual reports</td>
<td>25 x 38, 24, 28, 32, 36</td>
<td>10%-30%</td>
</tr>
<tr>
<td>Book</td>
<td>Colors: variety Finishes: usually not textured—vellum, antique, wove, satin, luster (coated or uncoated) Book is similar to text but comes in a wider range of weights to achieve most any book thickness.</td>
<td>Books, magazines, posters, calendars</td>
<td>25 x 38, 24, 28, 32, 36, 40, 45, 50, 60, 70, 80, 90, 100, 120</td>
<td>10%-30%</td>
</tr>
<tr>
<td>Offset</td>
<td>Similar to bond and uncoated book, includes a sizing—helps resist water used in offset printing.</td>
<td>Most offset printing purposes</td>
<td>25 x 38, 24, 28, 32, 36, 40, 50, 60, 70, 80</td>
<td>10%-30%</td>
</tr>
<tr>
<td>Cover</td>
<td>Color and finish matches corresponding to text, bond or book. Very durable, most with a smooth printing surface for scoring and folding and other special bindery (die-cutting and so on).</td>
<td>Books, postcards, brochure covers, business cards, presentation folders</td>
<td>20 x 26, 24, 28, 32, 36, 40, 50, 60, 70, 80, 90, 100</td>
<td>10%-30%</td>
</tr>
<tr>
<td>Index</td>
<td>A stiff paper that comes in a smooth and vellum finish.</td>
<td>Used when a stiff stock is required</td>
<td>22.5 x 35 &amp; 25.5 x 30.5, 24, 30, 36, 40, 50, 60, 70, 80, 90, 110, 140, 170</td>
<td>20%-40%</td>
</tr>
<tr>
<td>Tag</td>
<td>Colors: sometimes tinted or colored Heavy weights available made from waste papers. Heavier weights (250°) will not run through some offset presses.</td>
<td>Packages, boxes, tags, flat envelopes</td>
<td>24 x 36, 28, 32, 36, 40, 50, 60, 70, 80, 100, 125, 150, 175, 200, 250</td>
<td>20%-40%</td>
</tr>
<tr>
<td>Bristol</td>
<td>Colors: sometimes tinted or colored Not as stiff as index or tag.</td>
<td>Packages, boxes, tags, flat envelopes</td>
<td>22.5 x 28.5, 24, 30, 36, 40, 50, 60, 70, 80, 100, 120, 140, 160</td>
<td>20%-40%</td>
</tr>
<tr>
<td>Newsprint</td>
<td>Colors: yellow or off-white, even gray color (easy to read text printed on this stock). Finish: vellum</td>
<td>Newspapers, directories (phone books)</td>
<td>24 x 36 inches, 24, 30, 50</td>
<td>20%-40%</td>
</tr>
<tr>
<td>Light-weight</td>
<td>Colors: variety Finishes: variety Very thin papers, most with transparent or translucent qualities.</td>
<td>Inserts in books and brochures to create special effects</td>
<td>Sizes and weights vary</td>
<td>Varies</td>
</tr>
</tbody>
</table>
SECTION III
DETAILS OF THE PROCESS

CHAPTER II
COMPONENTS OF THE DIGITAL MECHANICAL

Components of the Digital Mechanical

Text
Text on Disk
Scanning Text and OCR

Digital Artwork
Object-Based Images
Bitmapped Images
Pixels and Color Depth
FileSize and Formats
Blurring the Boundaries Between Objects and Bitmaps
File Compression

Getting Resolution Resolved

Summing Up
Just about any kind of printed piece you can think of is made up of the same few components: type, photographic images, line art, and other kinds of artwork. In this respect, work produced on the Macintosh is no different. Chapter 3 identified a number of specialty programs designed to handle each of these components individually and introduced the page layout programs that bring them all together. This chapter continues from there and describes how type and artwork are treated digitally and addresses what you need to know as you design for production. (Color is important for all kinds of artwork; that's why it was discussed by itself in Chapter 8.)

Components of the Digital Mechanical
This chapter discusses the ways that text and the various types of artwork are created and how they're handled. It explains the important file formats that you'll run into, as well as the ways the different components are brought together in the form of a page layout.
Text
Except for some photographs, paintings, and other works of art, most commercially printed materials include at least some form of written communication. It could be just a headline or some accompanying pages of text, but, in any case, the text has to be converted into digital form and into your file to get printed. Although they may sound like the same thing, there’s a difference between text and type. On any computer, each letter or keystroke of text has a specific code attached to it. This code knows what the letters (text) are but doesn’t care what they look like. How the letters look is determined by the type style or the font that’s used to display or print the text.

There are basically three ways to get text into your digital file; you can access it already on disk from your client, scan it in from hard copy, or type it in yourself. There are a few approaches you can follow to make this part of the process something you hardly have to think about.

TEXT ON DISK
By far, the best situation is to get final, proofed copy on disk from your client in the simplest form possible. The most basic format for text on the computer is called ASCII (American Standard Code for Information Interchange) text. Most of the popular word-processing programs have built-in options to save documents in ASCII format, sometimes just called text or generic format. If you have the option, ask your clients to save their copy in ASCII without the usual formatting elements such as italics, underlines or bolds. You’ll be designing the way the copy looks, so you don’t want to spend a lot of time cleaning out old formatting. But if your client’s text has specific words that should be kept bold or otherwise highlighted, ask for a hard copy that includes their formatting. That way, you can start with a file of plain text and add the highlights to suit the design.

When it comes to text, you’re lucky to be working on a Mac. It has always been simpler to bring PC files into the Mac than vice versa and, with the release of System 7.5, it has become even easier. In addition to changes at the System level, many programs have been upgraded to have "cross-platform" compatibility. For example, you can import a WordPerfect 5.2 file from a PC disk directly into WordPerfect 3.0 on the Mac.
If you don't want to buy a word-processing program, there are other ways to import text created in one of them. As an added text support measure, current copies of QuarkXPress, PageMaker, FreeHand and Illustrator include text translators (or filters) for most of the popular word-processing programs. These filters are automatically loaded when you install the main program. If you'll be receiving a lot of text from many different sources and won't always be able to control the format it comes in, make sure you install all the available filters.

SCANNING TEXT AND OCR

There are a lot of times when you just won't be able to get the copy for your piece in electronic format. It may be that your clients don't use a computer (rare) or use software that is so old or nonstandard that you can't import its format (it still happens). Sometimes at the last minute, a client will fax you completely revised text and expect you to plop it into your layout without missing a beat. When this happens, there are two things you can do: retype the text directly into your page layout program or scan it in and translate it into electronic format with special optical character recognition (OCR) software. If it's a short document, the best choice is probably typing. If the material is longer and typewritten, it may be quicker to use OCR.

OCR software allows you to translate scanned images of the text into editable electronic text format. (Scanning is covered in Chapter 12.) OCR programs work in one of two ways: they use either pattern matching or feature extraction to interpret text. Programs that use pattern matching actually have a library of stored characters of different typeface families that they match against the type on the scanned pages. The problem with this method is that it doesn't recognize unusual fonts very well, but you can program this type of software to recognize unusual characters by scanning in a page of the typeface characters that you want it to recognize ahead of time to serve as a template. The feature-extraction method recognizes letters by the characteristics that make up each letter—like horizontal, vertical and curved lines. Since the letters of most typefaces have the same basic characteristics, this method can be successful most of the time. Of course if you come across a really unusual font, chances are you'll still have problems.
If you’re going to use an OCR program, you need to prepare the text pages before you scan them and check for errors afterwards. For best results, make sure that the hard copy you have is clean, free from extra stray marks and handwriting. Use white-out or erase any stray marks from originals before scanning, or the program may try to recognize them and put them into your text. You’ll usually have the fewest problems with text in one column written in a standard typeface like Courier. If the original text is very small, blowing it up on a copier can increase your OCR success.

Some programs can recognize and interpret multi-column pages, but others just run together the lines of text that appear on each line of the page, making it difficult to work with. If you have originals with more than one column of text, try covering one side at a time with white paper and scanning them individually. (Covering images before you scan can also speed things up because the software won’t waste time trying to interpret them as text.)

Make sure that you scan in the text at a resolution that’s high enough for good recognition but not too high. A high-resolution scan, say 600 dpi, will take longer than it should to convert the scan to text. All OCR programs are different, so see your manual for the ideal settings.

At this stage in the game, the science of OCR is still not perfect. No matter how well you prepare and scan the original, the OCR translation will result in at least a few weird artifacts like misspellings or extra tabs and hard returns. You’ll always need to do some detailed proofing once the text has been translated. The best way to start is by using the proofing tools available in most word-processing and page layout programs.

Regardless of how you get your text, there are two cardinal rules for a designer to remember about working with copy. The first is that once you have your final text, keep a copy of it in a separate file in case you have a System crash or it gets messed up while doing a design experiment. The second is that you need to have your clients do the final proofing and approve all copy before you finalize your design. This is critical regardless of whether the client provided the text on disk or you’ve had to retype or use an OCR program to get it onto your Mac.
Digital Artwork
The next major component of a digital mechanical is the artwork. The term "artwork" as it's used here means all of the visual elements that you may use to create a piece. Artwork may be a photograph, a line drawing, a computer illustration, or simple rectangular colored boxes (for that Mondrian look). There are two fundamentally different ways that artwork is created and manipulated on the computer—as independent objects or as individual dots of color. These two approaches are referred to as object-oriented (or vector-based) and bitmapped (or raster-based), respectively. With these two methods, nearly any type of artwork can be re-created digitally.

When it comes to pulling these various elements into a page layout application for separation and output as film for printing, there are a few things you need to be aware of for each type. (Although the nuts and bolts of assembling your digital mechanical is discussed later in Chapter 13, the basics of file formats and resolution are covered here.)

OBJECT-BASED IMAGES
If you remember your high school algebra and geometry, you'll recall that many geometric objects like lines, circles, and triangles can be defined mathematically by relatively simple equations and instructions. These instructions may say something like "go up two inches from the bottom left corner and over two inches, draw a square with two-inch sides and fill it with yellow." Drawing programs, like Illustrator and FreeHand, use this approach to create objects and fill them with solid colors or gradations of color. You can also resize, rotate and overlay the objects and make many other manipulations. This mathematical approach to describing objects works hand-in-glove with the Adobe PostScript page description language which is the de facto standard for high-quality electronic printing. (See Chapters 3 and 4 for more about the PostScript language.) In fact, this process of creating artwork is sometimes referred to as PostScript-based illustration.

There are two very important characteristics of object-based images. The first is that each of the component objects you use to create an illustration remains separate and can be edited at any time, individually or as part of a group. The second characteristic has to do with resolution. In PostScript illustration programs, objects are resolution-independent. What this means is that changing size is simply a matter of changing the instructions.
For example, to double the size of the yellow box mentioned above, the PostScript instructions would simply say to draw the box with four-inch sides. Resolution independence also means that when object-oriented images print, they take advantage of the maximum resolution of the output device. In fact, the final printed resolution of an object-based illustration relies more on the capability of the printer than the nature of the file. So the higher the output resolution, the smoother curved lines and gradations will look. Object-oriented artwork is particularly useful for creating logos, since the size of the application can vary from a bumper sticker to a billboard and a sharp, scalable image is necessary.

There is some degree of cross-over between type and object-oriented artwork because type is handled by PostScript in much the same way as objects are. Type is often an essential part of object-based illustrations such as those used for logos. This close relationship between object-based illustration and type has resulted in continuous improvements in the text-handling features like spell-checking, text-wrapping and kerning found in drawing programs. Some people find they need only an illustrating program to create one-page advertisements, logos, and other short documents rather than a page layout program.

Object-oriented images and bitmapped images are not mutually exclusive. The best illustration programs allow you to import certain types of bitmapped images and even to paste them into outlines or text. A particularly useful feature is the ability to bring in a bitmapped image and trace it to create an editable outline. Both FreeHand and Illustrator have this capability, but a specialty program, Adobe Streamline, does it automatically. Not only does this autotracing capability allow you to create different looks for your artwork, but it also provides a way to gain a form of resolution-independence that isn't possible with bitmapped images, as discussed in the next section.

**BITMAPPED IMAGES**

The second type of digital artwork is the pixel-based or bitmapped image. The simplest way to visualize a bitmapped image is to think of millions of dots (or bits) of color assembled (or mapped) onto a page to create a picture. Each of these dots is a picture element, or *pixel* for short. If you were painting using a pointillist technique (with dots), you would choose the location on the canvas and the color you wanted for each dot to create an image. If you measured the location of each dot on a grid across the image and recorded the color, someone else could re-create your painting using
SECTION III: DETAILS OF THE PROCESS

the color and location information you recorded. How closely the recreation resembles the original would depend on how accurately and frequently the locations and colors were measured and recorded.

Breaking down an image into its smallest picture elements is the essence of bitmapped (sometimes called raster-based) digital imaging. The relationship between how many pixels are measured and how well the original can be reproduced is the reason that bitmapped images are considered resolution-dependent—the greater the number of pixels measured from the original, the better the reproduction. A low-resolution bitmapped image printed on a high-resolution output device will still print out at its original low resolution. It can't take advantage of the maximum resolution of a higher-resolution output device. (This issue of matching image resolution to the output device resolution is discussed further in Chapters 12 and 13.)

In color publishing, bitmapped images are best suited for printing continuous-tone, photographic, or photorealistic images where the sharpness of hard edges like type and lines is not as important as the simulation of subtle color transitions. Bitmapped artwork can be images that were either scanned into the computer or created using paint-type software like Claris MacPaint, Fractal Design Painter, or even Adobe Photoshop, better known for its digital image manipulation and color correction capabilities.

PIXELS AND COLOR DEPTH

To create a digital image, you need to know where each pixel is supposed to be and what color it is (you don't really, but your Mac does). Handling location is pretty simple using an X,Y coordinate system (there's that geometry again), but identifying color is a different story. If an image were only black and white, each pixel would only have two options. But what if there were grays in the image? or colors?

The way colors are identified at the pixel level has a lot to do with the way computers work and the number of levels of brightness your eyes can distinguish. For all their hyped-up speed and "intelligence" the microprocessors in computers only "know" the difference between two things: on and off. This choice between two things is referred to as the binary system. This on-off choice represents one bit of information. So distinguishing whether a pixel is black or white is a one bit operation.

The human eye is considered by some to be capable of distinguishing only about 256 shades of gray between pure white and pure black. Digitally, this means that
a pixel should have 256 shade options. Because of the way the binary system works, 8 bits of information per pixel can digitally represent 256 shades of gray. As an analogy, consider a light bulb. In a simple lamp, the bulb can be on or off—one option (one bit). Eight bit, or 256 shades of gray would be more like a lamp with a dimmer switch to go from off (black) to its brightest setting (white) in 256 stages.

But what about color? As discussed before, computer monitors display colors in dots of red, green, and blue (RGB). So to display full color on a monitor you need 8 bits of information each to express brightness levels for red, green and blue, or a total of 24 bits for each pixel. In four-color (CMYK) printing where black is added, this total becomes 32 bits. Image-manipulation programs like Photoshop and Painter allow you to create masks (or friskets) and transparent layers within their image files. Each of these components also requires information to be stored at the pixel level. You can clearly see how quickly the file size for an image grows when you go from black and white (one bit per pixel) to full color (24 bits per pixel for RGB or 32 bits for CMYK).

The number of bits of information used to describe the color of pixels is often referred to as bit depth or color depth. The greater the number of bits or the "deeper" the color, the more different colors can be represented. Your ability to scan images in full color is determined by your scanning hardware. Most desktop flatbed scanners are able to scan in 24-bit color, and 32-bit scanners (which collect more than 8 bits or 256 shades of red, green, and blue) are becoming more common. Even if you have a digital image captured in 24-bit color, you won't be able to see it in full color unless your Mac's video system supports 24-bit color. (See Chapter 2 for more discussion of scanning and video hardware.)

FILE SIZE AND FORMATS
The distinct advantages that object-oriented images have over bitmapped images are resolution independence and smaller file size. Because the objects used in illustrations are stored as a set of mathematical instructions, they take up comparatively little disk space. Bitmapped images, on the other hand, tend to take up large amounts of disk space because the color and location of each pixel has to be described.

The size of image files is not only a function of the type of image but also the way it's saved or formatted. A wide variety of file formats have been developed over the years to store, transfer, and print images. Some formats are designed to handle object-oriented image files, and others are primarily for bitmapped images, but some formats can handle both varieties.
Knowing all of the names and acronyms for the various file formats is just another part of understanding the design and production process. So when someone tells you that they JPEGed a TIFF image and archived it on DAT, you won't even raise an eyebrow.

Object-Oriented Formats

Knowing that illustration programs use a series of mathematical instructions to create objects, you can imagine that storing these instructions is quite complicated. There are two main object-type file formats, PICT and EPS. PICT is a format that stores instructions based on QuickDraw, the native format that the Macintosh uses to draw on the screen. EPS, or Encapsulated PostScript, is exactly what it sounds like—a format that stores instructions using a set of PostScript page-description commands. Most designers save artwork in EPS format to use in page layouts because its close association with PostScript generally results in higher-quality printing. PICT is typically used for screen displays and is not used for professional-quality output because it doesn't consistently provide the same level of precision offered by other formats and it can cause problems in some programs.

If your monitor display is based on QuickDraw and EPS files are based on PostScript, how can you see an EPS image on your screen? The answer is "not directly." When you save a file in EPS format, a screen-resolution PICT copy, or proxy, of the image can be included. EPS files that contain both the saved image and its PICT display image can become very large. If you choose not to create the PICT display image (as part of the EPS) the EPS image will appear on-screen as a grayed-out box when you bring it into a page layout program.

In addition to including a PICT proxy, some applications contain several additional options for saving files in EPS format. One common option is the choice of encoding methods, either binary or ASCII. The basic difference is that a binary-encoded EPS file will be about half the size of a ASCII-encoded file. With large or complex EPS files, this can be a great benefit. Most page layout programs are now able to read both types of encoded EPS files. Be sure to check the application you’re using. If file size is not an issue, it can be better to use ASCII encoding because some commercial printing and networking software is still incompatible with binary. To find out what format to save your files in, check with your service providers.

Another EPS saving option is Desktop Color Separations (DCS) format. Created by Quark, the DCS extension to the standard EPS file format separates images
into their component process colors (CMYK) and includes a preview file (like the PICT display file in the standard EPS format). You use the preview file to see your image so you can place it correctly in your document, and you can rotate or resize the image, but no photo-manipulation or editing can be done. Your laser writer processes the relatively low-resolution preview file instead of the whole CMYK file while you’re designing. The advantage is that when EPS image sizes approach 10 MB, DCS files print much faster. The preview file is linked to the real file, so when the service bureau outputs to an imagesetter, the final resolution separations for the image will print in the right place.

While EPS and PICT are the most common file format options found in object-oriented illustration programs, many programs have their own program-specific, or proprietary, formats. Software companies create these formats to optimize the performance of their programs. Unfortunately, many proprietary file formats cannot be read by other applications. The popular illustration programs on the Mac, including FreeHand, Illustrator and Canvas, have their own formats. Other applications can’t read files saved in FreeHand’s own EPS format, but files saved in several of Illustrator’s formats (most notably Illustrator 88 and 1.1) can be opened by other applications.

Rather than buy every competing application just to be sure you can import all kinds of graphics files, you can choose from a number of format translation utilities that are available. One family of programs is by Equilibrium Technologies and consists of DeBabelizer Toolbox and DeBabelizer Lite. These utilities are specially designed to translate not only Macintosh-compatible graphics files but file formats from many other platforms like DOS/Windows, Silicon Graphics, Amiga, and Sun. DeBabelizer Toolbox also includes the ability to appropriately translate color palettes between formats.

**Bitmapped Image File Formats**

For a partial list of the numerous bitmap file formats that exist, you need only use the Open command and click the Show All Files option in Photoshop 3.0.

You’ll see that Photoshop is able to open files saved as Adobe Photoshop 2.0 and 3.0, Adobe Illustrator, Amiga IFF, BMP, CompuServe GIF, EPS, EPS PICT Preview, EPS TIFF Preview, FilmStrip, JPEG, Kodak Photo CD, MacPaint, PCX,
When TIFF images are imported into a QuarkXPress box filled with None (no color), they will commonly print with jagged edges. Sometimes the jagged edges are more obvious. To avoid getting jagged edges, import your images into boxes filled with white (or 0 percent black) or import EPS images instead of TIFFs.

PICT File, PICT Resource, PIXAR, PixelPaint, Raw, Scitex™ CT, Targa, and TIFF; it also supports TWAIN scanned images. That's a mouthful. It's not surprising that the dominant desktop imaging application has such a wide range of file access and saving options. One interesting omission from this list is RIFF, the preferred format of Fractal Design Painter, another widely used bitmap painting and image manipulation program.

Some of the formats Photoshop can open—Raw and FilmStrip—are rarely used or have fairly specialized uses. Some like PIXAR, MacPaint, and PixelPaint are specific to certain programs. Several others—BMP, PCX and Targa—are formats found primarily in the PC world. TWAIN, which stands for "Technology Without An Important Name" (probably the goofiest acronym around), is more of a scanning protocol than a file format and is becoming a cross-platform standard for scanner manufacturers. In color publishing, you’ll most likely be using several of these formats to import images from other platforms, like the PC or the Amiga or Kodak Photo CD, to use in your designs. However, in preparing final files for printing, you’ll actually use only a select few.

Probably the single most universally applied format for saving bitmapped images on the Mac is the TIFF, or tagged-image file format, co-developed by Microsoft and Aldus. Image files can also be saved in a TIFF format that's compatible with PCs (distinguished by its DOS-like extension—.tif). When you save an image in the TIFF format, you often have the choice of applying LZW compression, which creates a smaller file. (Image compression and its effect on resolution and quality are discussed a little later in this chapter.)

Scitex and Crosfield are two of the largest manufacturers of imagesetting equipment around, so naturally they have developed their own image file formats: Scitex CT and Crosfield CT. In both cases, CT stands for continuous tone. In discussing the nature of your piece as you prepare it, your service bureau may ask that you use one of these formats to best suit their equipment.

Photoshop's native formats are beginning to be directly accepted by high-end imagesetting systems because of the huge number of people using the program. However, you typically can't bring Photoshop-formatted files into page layout programs, so you have to save them as either EPS or TIFF.

If you look at the file formats discussed previously, it's safe to say that EPS is best described as an object-based image format and TIFF is a bitmap format. Both formats are easily imported into page layout programs and will
probably be the formats you'll use most often. Of these two, EPS is more versatile because it can save mixed image types—images that combine objects and bitmaps. Although bitmaps can be included in an EPS file, the catch is that once bitmaps are placed in EPS format they can't be edited. You can only place, rotate, skew, and print them, so be sure to put the final touches on your bitmap files in an image-editing program before importing them into an EPS. One interesting and useful feature of bitmaps saved in EPS is that you can choose to have white bitmap areas appear as transparent, so you can have underlying colors (ink or the paper) show through open areas of an image.

**Objects Inside of Bitmaps**

Digital imaging applications like Photoshop and Painter have special functions that use object-based shapes and outlines to create masking effects. In Photoshop, these objects are called masks, and in Painter, they're called friskets. These objects are used to shield or block out certain areas of a bitmapped image so that special effects can be applied or portions of images can be collaged together. The layering feature in Photoshop 3.0 and the floating section extension in Painter rely heavily on the use of object-based drawing tools to create and edit mask outlines.

When masks are created, they're saved as separate "channels" not unlike the channels used for red, green, and blue color data. Every mask that's created adds to the file size until you decide you're done adding effects and you **merge** (in Photoshop 3.0 terminology) all the layers into one bitmap image.

**BLURRING THE BOUNDARIES BETWEEN OBJECTS AND BITMAPS**

If you've worked with high-resolution digital images on the Mac, you know that it can take a long time to open, move, resize, and apply filters. By comparison, working with object-oriented images is faster because you're re-arranging computer instructions instead of pushing around millions of pixels with 24 or 32 bits of information attached to each. Processing bitmaps has been such a bottleneck that Macintosh hardware and software developers like to use Photoshop processing times as a benchmark to show how fast their stuff works.

A couple of software developers have taken a different approach to digital imaging that appears to have some exciting potential. They began by rethinking the standard paradigm that digital images have to be edited pixel
"PostScript is to bitmapped fonts as FITS is to pixel imaging," claims Bruno Delean, creator of FITS, the new engine in Live Picture. "What we have here is a jet—everyone else is working with propellers." Fred Krueger, co-creator of Xres, on Fauve Software's new approach to digital image editing.

by pixel. Why not try to treat rows of color information like equations or mathematical instructions, as is done for object-oriented images? It appears that after several years of serious work and mathematical black magic, a new paradigm has appeared.

The first application to take a mathematical approach to digital imaging was Live Picture, distributed by HSC Software, followed by Xres from Fauve Software. The technology Live Picture uses to transform bitmapped images into a mathematical representation is called the Functional Interpolating Transformational System (FITS). The technology in Xres is called, Xres.

Both programs are able to import some or all of the major bitmap file formats like TIFF, PICT, Photoshop, and EPS and, of course, they each convert imported files into their own special formats. Live Picture's format is called IVUE and Xres' format is LRG. While you work with it, Live Picture totally discards the notion of a pixel, so when you zoom in you never see them. You won't see them again until you finish your manipulation (like retouching, collaging, or special effects) and render the IVUE file to a regular bitmap file for output. Live Picture's goal is to create a resolution-independent way to work with digital images. In Xres you get a similar degree of resolution independence (and the speed that comes with it), but the program continues to treat images as if they were made of pixels, so it has many of the familiar (Photoshop-like) editing tools. Another interesting feature of Xres is that as you make changes, the changed areas are rendered. The parts of the image that haven't changed are not re-rendered. This selective rendering is another way to speed up the digital imaging process.

These two applications appear to target two distinct markets. Live Picture is a relatively expensive piece of software (over $3,000) that seems to be geared toward the color house/service bureau crowd as a way to do heavy-duty image work without the heavy-duty hardware. Fauve's Xres is less than $1,000 and has more of the look and feel of Photoshop, so it will probably be found on desktop systems.

FILE COMPRESSION

Every application or font you load and every file you create and save takes up space on your hard disk and on your back-up or archiving media. Sooner or later you're bound to run out of space. You can get a bigger drive or
throw out stuff you don't need (which you should always do anyway) or, to make your files smaller, use compression software.

One common use for file compression is to speed up data transmission over phone lines. If you're tied into the Internet or you send files using a modem to your service bureau, you already know why. The process can seem as slow as molasses.

Compression software packages use different mathematical approaches (algorithms) to figure out the best way to make files smaller. Compression can dramatically reduce the size of files that are made up of text and numerical data without losing any information. When it comes to compressing image files, you can get a fair amount of compression without losing image data, and you can get a tremendous amount of compression if you're willing to sacrifice image quality. These two choices are termed "lossless" and "lossy" compression.

The two types of compression can be compared to packing to return home from vacation. In your first attempt to put everything you brought (and the stuff you bought, of course) into your same old suitcase, it doesn't fit. You notice that you didn't fold any of the clothes so you take them out, fold the clothes neatly, and everything fits. By reorganizing, you performed lossless compression on your stuff.

Now say that even after you reorganized, your stuff still doesn't fit. You take everything out and realize that you have three leis, three grass skirts and three Hawaiian shirts that look pretty much the same. By leaving out one of each of these items, you've done lossy compression on your wardrobe. When you get home, your wardrobe won't be quite the same as it would have been with the additional lei, shirt, and skirt but it won't be a very noticeable difference. Of course, the more items you leave out, the more significant the lossy compression. Lossy compression of images is similar except that you start with many more items (pixels) and the algorithm used to decide what to lose is quite a bit different. Instead of losing items, you tend to lose image detail. When you open an image after lossy compression, it may not look quite as sharp as it did before.

**Lossless Compression**

In the preceding sections on file formats, two acronyms were mentioned that are actually file compression types—LZW and JPEG. LZW, which stands for Lempel, Ziv, and Welsh (its creators), is a lossless compression routine
SECTION III: DETAILS OF THE PROCESS

In increasing the JPEG compression results in greater amounts of lossy compression and can result in blocky artifacts (bottom). Once an image is compressed with a lossy method, any lost detail can’t be restored.

that is usually shown as an option when you save a file in TIFF format. It won’t cut your file size by more than half, but it will save disk space. Before you go and compress all your TIFF files, be aware that not all page layout programs can import TIFF files that are compressed.

LZW is also the compression method for GIF which is the standard graphic information file format used by the CompuServe online service. The RIFF format used by Fractal Design Painter also has a built-in lossless compression feature similar to the LZW for TIFF.

There are quite a few commercial, stand-alone file compression software packages available that use their own lossless compression schemes. Some of the most popular are Stuffit, DiskDoubler and Now Compress. These programs allow you to compress individual files or entire folders manually or automatically. To open compressed files, however, you need to extract them. The key factor is time. It takes time to compress (the more compression you want, the longer it takes) and time again to extract. Consider how much time you’re willing to spend squeezing and extracting files before you decide to put off buying a larger drive.

Lossy Compression
There’s only so much you can compress a file by optimizing data storage without actually throwing some data out. That’s why lossy compression was invented. By using sophisticated color evaluation algorithms, lossy compression can radically reduce image file size by selectively removing or averaging color data with very little change in the appearance of the image. The most widely used method of lossy compression is JPEG, developed by the Joint Photographic Experts Group to serve as an international standard. JPEG compression is found as an option in most image-editing programs.

JPEG breaks down an image into 8 x 8 pixel blocks and transforms it based on the number of colors in each block. Without delving into the calculus, the process discards most of the high-frequency information (many small changes in color over a short distance) because most natural images contain primarily low-frequency components (more gradual changes in color). The net result is a softer-looking image. Because it works in blocks of pixels, extreme JPEG compression (where more data is discarded) can cause images to develop "blocky" artifacts.

It’s important to remember that the deteriorating effects of lossy compression are compounded. In addition, because the actual pixel data is
discarded or changed, there’s also no going back—once you perform lossy compression your image is changed for good. That is, if you compress an image with a JPEG compression ratio of 10:1 the first time, open it and compress at 10:1 again, the data loss will be greater than if you compressed at 20:1 to start with.

**Getting Resolution Resolved**

This chapter has discussed the concept of an image created with pixels. Halftone spots and line screens as they relate to printing, were described in Chapters 8 and 9. These concepts fall under the general heading of resolution. Resolution can affect nearly every aspect of the design and production process. It’s one of the reasons software developers are so focused on gaining resolution independence for electronic image manipulation. But until we can be truly free of its constraints, we need to understand resolution and how it relates to our work.

For the reasons discussed earlier, you need only be concerned with the resolution of bitmapped images because object-oriented images are resolution-independent. For bitmapped images, the concern with resolution starts at the beginning of the process—in the scanning step, unless you create original artwork in a paint-type program. When you scan an image, you’re actually taking a sample of the original one pixel at a time. The better you sample, the closer your digital version will be to the original. *(The topic of scanning and the various ways resolution affects your work with images is discussed in the next chapter.)*

**Summing Up**

In this chapter, text and artwork—the basic components of the digital mechanicals you’ll create—the various formats they come in, and the basics of handling them were discussed. Some important things to remember are:

- There are three ways to get text into your documents: import it from disks provided by your client, type it in yourself, or scan it and run OCR software. Always try to get final copy (text) from your clients on disk.
- If you must use OCR, use spelling checkers and proof very carefully.
- Digital artwork comes in two flavors: object-oriented and bitmapped.
- Object-oriented images are resolution-independent, and type is handled as objects in PostScript.
- Bitmapped images are resolution-dependent.
- Page layout programs can import both object-oriented and bitmapped artwork.
- You need 24-bit color display capabilities to see full color on your monitor.
- There are two types of file compression: lossless and lossy. Lossy compresses more but can result in image degradation. Once lossy compression has been used, an image cannot return to its original form.
SECTION III
DETAILS OF THE PROCESS

CHAPTER 12
IMAGE RESOLUTION AND SCANNING

How Resolution Relates
Determining Image Resolution
The Effect of Resizing on Resolution

Scanning—Two Ways to Go
How to Know When to Go Where
Outside Scanning Services
Doing It Yourself

Summing Up
At this point in Section III, you should have a pretty good understanding of color and how it relates to the production process, what makes printing possible, factors like dot gain and registration that have to be compensated for, why paper is so important, and the components that make up your digital mechanical—images and text. Chapter 11 explained why bitmapped images are resolution-dependent. What resolution-dependency means to the design and production process is explained in this chapter. To clarify the types of resolution and to prepare for the following discussion, keep these points in mind:

- Resolution of printer output is always given in dots per inch (dpi). Laser printers and imagesetters have internal mechanisms that are able to print a certain number of individual dots per linear inch of paper or film. Imagesetters group into cells the dots they print, creating halftone spots for AM screens or scattered dots for FM screens. The higher the dpi of the imagesetter, the higher the number of dots that can be printed in each cell.
- Resolution of halftone screens for the printing press is always given in lines per inch (lpi). Each line is composed of halftone spots that are in turn composed of printed dots. Line screen is the number of lines of halftone spots (cells) per inch. For a screen resolution of 100 lpi, an imagesetter that can print 2,400 dpi will be able to print a 24 x 24 dot halftone cell, 100 times per inch.

- Resolution of digital images is given in pixels per inch (ppi). Remember that pixel is short for picture element, and you won't go wrong.

Because reproducing original artwork is one of the most difficult issues in color publishing, this chapter is devoted to it. It's a complex issue because it deals with more than just scanning images and printing them out. You must understand how screen and image resolution, quality of the original, quality and calibration of your scanner, dot gain, color correction, and color separation affect the way an image will reproduce in the final printed piece. Even if you get it all perfect in the production stage, the four-color printing process won't be able to give you the tonal range and color range of the original image. If you recall Chapter 8, this reduction in quality happens because the RGB (scanning) color gamut is larger than the CMYK (printing) gamut. The key to getting the best result is understanding resolution and scanning and knowing whether to do it yourself or have someone else do it.

**How Resolution Relates**

If you intend to include bitmapped images in your printed materials, you need to be conscious of a couple types of resolution. The first is the screen resolution determined by your print shop—line screen (lpi) if you're using conventional AM screening or output resolution (dpi) and minimum dot size if you're using FM screening. The screen resolution is largely determined by the press and paper your piece is to be printed on. (Your printer can and should give you this information.) Screen resolution is the key because it sets the target for the second type of resolution—the bitmap image resolution (ppi). Wow—not only are your bitmapped images resolution-dependent (lpi or dpi), but choosing the right one for printing depends on another type of resolution (ppi)!

**DETERMINING IMAGE RESOLUTION**

Bitmapped image resolution is a key factor in determining the quality of the final printed piece. Your goal should be to have images at the right resolution for your output device—neither too low nor too high. If an image is
scanned at a resolution that's too low, it will appear "pixelized," or blocky when printed. Scanning images at resolutions higher than necessary will not improve the quality of the print. Files with images that are unnecessarily high resolutions may take longer to print on your laser printer or on the imagesetter. The following sections present a few guidelines to help you optimize the resolution of your images for printing.

**Continuous-Tone Image Resolution**

The basic rule of thumb if you’re using conventional AM screens for printing is to use an image resolution (ppi) to screen resolution (lpi) ratio of 2:1. For example, if the print line screen is going to be 133 lpi, then the resolution of your images should be 266 ppi. This ratio guideline is particularly important for images that have lots of straight or diagonal lines because they become jagged-looking and pixelized at lower resolution-to-line screen ratios.

In some cases when images contain mostly soft edges and gradual color changes, you can use a smaller ratio, more like 1.5:1. In some special cases this ratio can be even less, but it takes experience and experimentation to make the call, so it's usually best not to go below 1.5:1.

If you’re going to print with FM screens, even lower ratios can sometimes be used. Ask your service provider how the FM screen they are going to use for your job compares to an AM screen. If the printer says it’s equivalent to a 150 line screen, for instance, you may be able to scan your image at 150dpi. If you are scanning an image of clouds, 150dpi should be more than enough. But, if you’re scanning an image with lots of straight lines and edges, you may want to scan at 200 or 300 dpi to ensure sharp detail. In any case, ask your printer.

**Line Art Image Resolution**

When it comes to scanning line art, the basic ratio of 2:1 is not high enough. Line art images scanned at 2:1 can still look jagged at normal viewing distances. Line art that will be output through an imagesetter and printed should be scanned at 800 ppi or even 1,000 ppi. If you’re just planning to print on a laser printer or other lower-resolution device, you can get away with lower resolutions (400–600 ppi). The same rule applies with FM screening.
THE EFFECT OF RESIZING ON RESOLUTION

Once an image is scanned, there are only so many pixels per inch possible. What happens when you decide to change the dimensions of the image, say from four inches on a side to five inches on a side? Thinking in one dimension, it's like a Slinky toy. Say it has 100 coils and is six inches long when you push it all the way together. When you pull it out to be 12 inches long, there are still 100 coils but they're spaced apart and you can see between them. To shrink the Slinky to less than six inches, you'd have to take out some of the coils, but to shrink the image you don't have to throw away pixels unless you want to make the file size smaller. Changing the dimensions of an image is referred to as resizing.

**Increasing Image Size**

In the Slinky analogy, when you increase size but keep the number of coils (pixels) the same, they have to spread out, which creates empty areas. If you increase the size of an image, you don't get white spots between pixels because one of two things happens—either the pixels get bigger or new pixels are placed in between. You can control which process happens with the settings in the software you use.

If you take a two-inch square image that's at 300 ppi and double it's dimensions to four inches on a side and keep the number of pixels the same (constraining the file size), the image will end up at 150 ppi. When you print the image, it may look blocky because the pixels are big enough to be noticed—in other words, the image is pixelized. When you stretch bitmapped images in page layout programs, this is the type of resizing that occurs.

Using an image editing application like Photoshop, you have the option of filling in the spaces between pixels with new pixels (sometimes called sampling up). If you double the dimensions of an image, the number of ppi stays the same but there will be four times as many pixels in the image (the file size grows four times larger). The new pixels are created either by simple replication of the original colors or by taking an average of the color of the adjacent original pixels. This method is called interpolation.

Replication has a similar effect on image quality as the simple resizing discussed above. Instead of just making the pixels bigger (with their original color), replication makes more pixels of the same color. As a result, replication can also result in pixelization. Photoshop calls this kind of interpolation "Nearest Neighbor."
Interpolation minimizes the appearance of pixelization by making the color transition between pixels appear continuous. If you were only dealing with one row of pixels, it would be easy to visualize interpolation as taking the average color between two adjacent pixels, pair by pair down each row. However, images increase in both height and width. As a result, each original pixel has to compare with more than one other pixel to decide on the color of the new fill-in pixels. There are several mathematical ways to do this interpolation, and some are more accurate than others (and take longer to process). Photoshop offers two choices—Bicubic and Bilinear. Of these two, Bicubic is the most precise. Even using Bicubic interpolation, image quality is still affected by resizing, and excessive interpolation can result in a soft or blurry image.

**Decreasing Image Size**

If you start with a four-inch square with a resolution of 300 ppi and reduce it to a two-inch square, its resolution will become 600 ppi because the same number of pixels has to fit in half the length and width. If the image is going to be printed at 133 lpi, the highest resolution you really need is 266 ppi, so why carry around the extra pixels? Actually, original pixels are eliminated by resampling (or by sampling down) when you reduce an image. For example, if you have an image that’s 600 ppi and you want it to be only 266 ppi, you can sample down and keep only 266 of the 600 pixels per inch. Photoshop allows you to sample down by resetting the image resolution while keeping the height and width of an image fixed. Keep in mind that when you sample down and discard pixels you can’t bring them back—when they’re gone, they’re gone so make a copy of the original before resampling, just in case.

**Scan To Match Your Target Size and Resolution**

As a general practice, it’s best to scan your images (or have your service bureau scan them) as closely as possible to the final size and resolution you need. For example, if you know the image will be printed at four inches on a side and the line screen will be 133 lpi, make the appropriate settings in your scanning software. If your original photograph or transparency is smaller than the size you want, let the scanner do the interpolation. This way, any interpolation that’s necessary is done closest to the source—the original image.
Scanning—Two Ways to Go
Now that you understand how to determine your image resolution and how to handle resizing, it's time to figure out where to scan your image(s) in the first place. When it comes to scanning, there are two ways to go—do the job yourself or have an outside service bureau or specialty vendor do it.

The advantage of having a good service bureau scan is that high-quality calibrated scanners and knowledgeable technicians can do a lot more than just scan. They specialize in making sure your scans are correct based on the size and resolution specifications that you give them. The disadvantage is that in order to pay for those expensive scanners and experienced technicians, scans can cost from $30 to $100, or more. And if you need rush service, it can cost you double.

The advantage of doing your own scanning is that you can work right at your desktop. With a good-quality scanner and an understanding of how to get the best results, you can do your own scans for many kinds of work. The disadvantage is that desktop flatbed scanners don't have as wide a dynamic range as the drum scanners service bureaus use and usually have limited true resolution capabilities. (Chapter 2, "The Essential Hardware", discusses the differences in more detail.) Even with the best desktop flatbed scanner, you'll have to do some image adjustments after scanning to prepare for final production.

HOW TO KNOW WHEN TO GO WHERE
How do you make the decision? Do you do it yourself or do you call in a service bureau? It depends on the type and quality of the image you need to have scanned, the quality and type of in-house scanner you have, and whether you want or need specialty services that are only offered by a service bureau. To make the decision, you need to consider a few things first:

- Type of original
- Final size and scanning resolution needed
- In-house equipment and skill vs. a service bureau's
- Available disk space for storage
- Color, tonal, and other corrections needed

Avoid sizing up bitmapped images in page layout programs. Use an imaging program. Page layout programs do simple image resizing and do not use sophisticated interpolation. Sizing down isn't a problem. The imagesetter RIP will use all the information stored in the image, although it's always best to do all sizing in the original program.
If you’re not skilled at scanning, it may cost more for you to do it than to have a service bureau do it for you on a drum scanner. For example, if your billing rate is $50 per hour and it takes you two hours to scan and adjust each image it will cost your client $100 per scan. Depending on the size scan needed, it may cost you as much or less to get a better scan from a drum scanner and have all major color corrections made.

**Type of Original**

The type and size of the original image can sometimes make the decision for you: If your scanner is too small or you don’t have a transparency adapter, it’s off to the service bureau. But, in cases where you can do either, you have to make the decision based on the client’s expectations and on your understanding of in-house scanning limitations.

**Transparencies**

Film transparency originals are far and away the best originals to scan from—and the bigger the better. This is because transparencies are the first-generation image reproduction, and they offer more detail and a wider tonal range than photographic paper prints. If your transparencies are the product of a 4 x 5-inch or larger-format camera, they’ll contain more detail than 35mm transparencies.

Transparent art will require a drum, slide, or transparency scanner (including Kodak Photo CD scanners) to capture the most detail and the best tonal range. These scanners are most commonly found within the domain of a service bureau. Most flatbed desktop scanners don’t have very good transparency adapters, making it virtually impossible to scan transparent material for high-resolution output by yourself (although they’re handy for low-resolution scans used for designing). The Photo CD scanning and automatic color correction process is a cost-effective way to not only get good-quality scans of transparencies but to archive them as well.

**Photographic Prints**

Photographic prints are reflective and small enough to be easily scanned either on a desktop flatbed scanner or by a service bureau using drum or flatbed scanner. Three things determine whether you can scan it or you need to go to a service bureau: resolution, dynamic range, and the need for color correction. Your scanner may have a high enough resolution capability (300 ppi and up) for a piece that’s going to be printed at 150 lpi. However, if rich realistic colors are critical (like for a travel magazine or a high-quality clothing catalog) your flatbed scanner may not have the dynamic range for the job. To some degree, a restricted dynamic range can be compensated for in the image-editing process, but getting good results would take very exacting color correcting on your part, which requires experience, meticulous device calibration and color management—and time.

If you’re not sure what you can get in-house, do a few test scans with the appropriate scanner adjustments based on the printer’s specifications. Have the file...
output to films and proofs made. By examining the proofs, you can determine whether there's enough detail in the image. Also show it to your client. Even if you think it's fine, it's best if the client makes the final judgments.

Original Artwork
In some cases the original artwork can be a pencil sketch or a small watercolor painting with a limited color range that may be fine to scan on your desktop scanner. But in many cases, original artwork will be too large or have 3-D elements that make it impossible to scan on a flatbed, drum or transparency scanner. Unless your service bureau has a 3-D scanner, which is rare, have the art photographed and then have the transparencies scanned in by a service bureau. You'll want to have the best color match you can get to the original artwork. If you don't have a calibrated system and experience with color-correcting, leave it to the service bureau technicians with their drum and transparency scanners and automatic color correction software.

Quality
Usually when you look at the type of original, you also look at quality. If you're able to generate the original yourself, of course you'll strive for the best quality possible. But, if the image exists already (provided by the client, a photographer or an illustrator, for example), you may have to work with what you've got—if you can.

The original you start with should be free of scratches, dust, fingerprints and other miscellaneous marks, and it should be sharp, with good detail in the highlight, midtones, and dark areas.

Conscientious service bureau technicians color calibrate their scanners and other color equipment to ensure color accuracy and consistency, and they produce good color scans that require little or no color correction afterwards. They can also compensate for color casts and lighting deficiencies—even manipulate and retouch an image to improve on the original.

Your original image should ideally exceed the quality you expect to get in the final printed image. Because of the nature of the printing process, screens, color separation, dot gain, and so on, the quality of the original image can almost never be matched. So the better your original, the better your chances of having a nicely printed image, even though it's the product of an imperfect process.
There are two ways you can sometimes make less than adequate originals work for the final piece. The first way is by having a skilled technician use photo-manipulation software to enhance the image and fix any scratches and blemishes. You can also do this yourself, using a program like Photoshop, Xres or Live Picture. Remember, the results will be only as good as the skill and experience of the person retouching the original image. The second way is by applying special effects or collaging to hide the imperfections.

**Final Image Resolution**

Final image resolution is a key factor in determining whether to scan in-house or out-of-house. If you have a 300 ppi scanner and need to scan and enlarge a 5 x 7-inch original image to 10 x 14 inches to print a full page in your magazine at 150 lpi, you really need at least a 600 ppi scan if the image is going to reproduce well. In this case, unless you have a true 600 or 1200 dpi scanner, you won’t be able to do it in-house without interpolation. There is one exception to this rule. If the original image has soft edges and subtle gradations as discussed earlier, you may be able to up-sample using Bicubic interpolation or have a lower lpi:dpi ration on the order of 1.5:1. To see how resizing affects your target scanning resolution, use the following method. Begin with the resolution you would use at 100 percent with the standard rules of thumb (between 2:1 and 1.5:1) and multiply by the amount of increase (or decrease). For the above example, to print the 5 x 7-inch original at the same size at 150 lpi the resolution needed would be 300 ppi at a 2:1 ratio (225 ppi at 1.5:1). To double the size, you’d need to scan the original at twice that resolution, or 600 ppi (or 450 ppi) at 1.5:1. (Final width divided by original width will give you the factor to multiply by.)

**Storage and Disk Space**

Available disk storage space and RAM (or lack thereof) can be big determinants. In order to scan, store, and work with big images you’ll need space, and the more the better. If hard drive and storage space are limited, you may want to consider special services that service bureaus offer. Two of those are Photo CD and file replacement. These options allow you to design with small (low-resolution) versions of your images and then have them automatically replaced with the high-resolution versions when output.
OUTSIDE SCANNING SERVICES

Once you decide you need to use a service bureau, it’s time to pick the scanning service that best suits your needs and budget. The type of scanners, supporting equipment, and software a service bureau has determines the services they offer. The most common services are outlined below. They include high-resolution flatbed and drum scanning, Photo CD scanning and file replacement, as well as color correction for each type of scan.

Each bureau has its strengths and weaknesses, and quality and price can differ radically from vendor to vendor. There are usually reasons for the price difference. In general, the more expensive scans are done on drum scanners that cost tens of thousands of dollars and are operated by highly trained technicians. More care is usually put into scanning with them, and higher resolutions can be achieved. If the scan doesn’t come out right the first time, the better service bureaus will usually do it over with no questions asked. Some service bureaus even include one round of color correction to ensure that the scan will retain detail in light and especially dark areas (where detail is hard to hold).

Regardless of the scanning method used, the personnel, quality, and maintenance of the equipment make a difference in the quality of the service offered. If technicians at two different bureaus are equally conscientious, you may be able to get an image scanned to Photo CD for $3 and an image scanned on a drum scanner for $100 that would be hard to tell apart.

High-Resolution Scanning (Flatbed and Drum)

Service bureaus use flatbed scanners to scan rigid artwork, but even the most expensive models can’t capture the detail and color range that drum scanners can. Drum scanners are also able to do color correction "on the fly" and separate images automatically into CMYK components, rather than saving in RGB, like flatbed scanners. (See Chapter 2, "The Hardware Essentials," for more specifics about scanners.)

Service bureaus should use a drum scanner when possible. If you have rigid artwork, you may want to pay to have the artwork photographed to produce a transparency that can be drum-scanned. Drum scanners are good for:

- capturing subtle tone differences in images
- capturing subtle value differences in images (like landscapes with several shades of green)
- scanning small images that will be used in a much larger final form

Unless you’re experienced at scanning and color correction, and if the client requires exact color and tonal matches and expects the printed image to rival the original, make sure he or she is prepared to pay for it. Then take the original to a good color house or service bureau with a drum scanner. A flatbed scanner will never capture the image detail and color range that a drum scanner can. (For more information on the technology of scanners, see Chapter 2, "The Hardware Essentials." )
Any time you work with a scanning service bureau for the first time, ask to see sample scans from their scanners. If they don't have any, ask them to take an original that you have and create a few samples. You may have to pay for this, but if the service bureau is not willing to show samples or make test scans free or for a reduced cost, go elsewhere for your scans.

File Replacement Service

File replacement services vary slightly from bureau to bureau, but basically it works this way: The service bureau scans your original image in high resolution, resulting in a 10MB, 60MB, or even 100MB file. Instead of giving you the high-resolution version they give you a low-resolution FPO, for position only version, that's usually 72 ppi to match your screen resolution. The service bureau may also use file compression to make the FPO image more compact (which helps if you have a lot of them).

You can then use the FPO version in your layout and color comps which, because of their size, reduces the amount of time it takes to print or back-up and transfer files over the phone lines, as well as the amount of space the files occupy on disks. When you're finished with the design and have created your digital mechanical file, you hand it off to the service bureau and they replace the FPO versions with the high-resolution versions.

File replacement is a good option for those who:

- are organized and plan ahead
- need to scan many large images
- have little hard disk space for high-resolution scanning and adjustments
- don't want, or need, to manipulate the final images themselves

Many magazine art directors rely on file replacement because they use so many different scanned images each month within their basic format. They also rely on the service bureau to make all necessary color corrections and manipulations, like silhouetting and touch-up. This way, the service bureau stores the large images and is responsible for accurate image color and replacement. File replacement can take a lot of the load off the designer, but it also makes it hard to do any image manipulation or retouching. If you need this flexibility, you may be more interested in the Photo CD method described next.

Photo CD Service

Kodak Photo CD is a service that’s growing in quality and popularity. As discussed in Chapter 6, service bureaus that provide Photo CD services usually also develop film. But it’s also possible to send slides, negatives, or transparencies that have already been developed to be scanned to Photo CD. Standard Photo CD equipment includes a 35mm transparency scanner, so artwork needs to be in 35mm format. Pro Photo CD equipment can handle
larger format transparencies (up to 4 x 5 inches) and as a result produces higher-resolution files that can be enlarged to a greater final size.

Each service bureau that provides Photo CD services has its own level of quality control. A photo lab that does Photo CD work primarily for customers other than publishing professionals may not be your best source. Before using any vendor for an actual project, make sure you try a sample run. Provide a test roll of film to develop and scan onto Photo CD. This will give you an indication of the level of quality they can produce. Keep in mind that you can only be sure if their quality is reliable by using a bureau regularly.

After your films are developed and scanned, you'll receive a CD-ROM (your Photo CD) containing the scans. However, before you can use them you need to convert them from YCC (Kodak's own special color model) to RGB or CMYK format. Photoshop 3.0 has the Kodak CMS (Color Management System) built in, which includes the Photo CD import module. All you have to do is open the Photo CD image the same way you would open any other file and the KCMS module does the work for you automatically.

The advantages of using Photo CD for scans are:

- You receive five resolutions of each image (six with ProPhoto CD). This gives you the opportunity to do your own file replacement, so you can use lower-resolution images while you work. (For some kinds of image correction, you can also work on the lower-resolution version in Photoshop, save the settings you use to make changes and then apply them to the high-resolution versions.)

- Your scanned images come on a CD that accommodates up to 600MB of images; if you don't fill it up the first time, your service bureau can continue to add to it later. This helps you avoid storage problems on your desktop, because you only copy images to your drive as needed.

- It's cost-effective. It costs significantly less than drum-scanning services.

- It provides a safe and convenient way to archive images.
DOING IT YOURSELF

There are many occasions when your flatbed scanner will be all you need for scanning images. To get the best results, you really need to know your scanner—what it is capable of and how to compensate for its idiosyncrasies. Here are a few times when it may be appropriate to scan in-house:

- when the budget is low and exact reproduction of original color and detail not critical
- when lower-resolution final output is required—for newspapers, newsletters, and some brochure work printing between 65 and 133 lpi
- when working with duotones or custom colors, where color correction is unnecessary
- when the images are going to be manipulated or collaged together

You need to approach scanning as a step-by-step process, where each step contributes to image quality. There are a few things you need to do before, during, and after scanning to get the best results:

- Choose an original with the amount of detail you need for the intended use (see "Quality" earlier in this chapter).
- Know how the image is going to be printed and on what paper or other material, and determine the resolution.
- Prepare your scanner.
- Choose the appropriate scanning mode—line art, color, halftone, or gray scale.
- Set up as many of the adjustments as you can before you scan so they can be incorporated into the scanning of the image.
- Complete your color, tonal, and sharpening adjustments in as few steps as possible after you scan.

If you keep these things in mind and set up step-by-step methods for yourself, you'll be able to get the most out of your scanner.

Preparing Your Scanner

It's important to prepare before you scan. Preparation includes:

- testing the scanner in advance for best placement of images
- cleaning the scanner glass
• turning on and warming up your scanner (turn it off when not in use)

• adjusting and documenting scanner settings

Test the Scanner for the Best Placement of the Image
You should test your scanner to find out which area of the scanner bed makes the best scan. This is sometimes called finding the sweet spot. People typically line up the image with the top and the right or left edge of the scanner bed when they scan. This has the advantage of keeping the original straight, but it can sometimes be the worst place to position your images because it’s often where the most color and tonal inconsistencies occur. It’s usually better to place your artwork somewhere in the center of the scanner to ensure the best light balance.

Because all scanners are different, you may want to test yours to find the best image placement area. There is one way to do so:

• Place a piece of smooth, uniformly colored paper on the scanner that covers the entire glass surface.

• Scan it using your scanning plug-in from inside Photoshop or another image-manipulation program.

• Open the file and check the color consistency in each area of the scan. If you’re using Photoshop, use the eyedropper tool and bring up the Show Info window to compare color composition as you move the eyedropper tool around.

The area with the most consistent color is the right spot to place originals for scanning. You might even want to cut a mask with a square shape in the center so you have a straight edge to line up your photo. Some flatbed scanners come with these kinds of guides.

Cleaning the Scanner Glass
Check the glass to make sure it’s free from dust and smudges. Sometimes dust can get under the glass in your scanner. Consult your dealer or your owner’s manual on the best way to clean it.

Warm Up Your Scanner
Before starting to scan images, make sure your scanner has been turned on for at least 10 minutes. This is important for color consistency. If possible, keep your scanner off when it is not in use. If you leave it on all the time, the bulb will gradually wear down and scan color can become inconsistent over time. Scanners are usually SCSI devices and therefore have to be
turned on with your Mac. If you know that you won’t be scanning but you’ll be working for hours, disconnect the scanner from the SCSI chain.

**Adjusting and Documenting Scanner Settings**

Calibrate your scanner with the software that came with it or with third-party calibraters like Ofoto (*discussed earlier in Chapters 3, "The Essential Software," and Chapter 8, "Color Concepts and Management"). The software that came with your scanner will usually allow you to adjust brightness and contrast and save the settings (if you can’t save them, document them). Desktop flatbed scanners as a group have a tendency to create scans that are darker than the original, so you may find that you often need to increase the brightness. In order to figure out the best settings for your scanner, scan a series of small test images with different contrast and brightness settings. Once you’ve made the scans, zoom in and look at the lightest and darkest detail areas in each version of the image. Write down the settings for the scan that retained the most detail in the lightest and darkest areas. This way you can use the same settings for similar images in the future to compensate for the scanner’s deficiencies. For best test results, use images similar to the ones you would typically use and document the settings.

Besides taking advantage of the adjustments that come with your scanner software, you can (and should) calibrate the color quality of your scanner using a color management system (CMS). (*Several of these applications and how they work were described in Chapter 8, "Color Concepts and Management.")

**Scanning Mode**

The type of image you intend to scan determines the scanning mode you’ll use—either line art, color, grayscale, or halftone. For professional work, there’s no real reason to scan in halftone mode. This setting scans images in as a halftone pattern that is likely to conflict with the line screen imposed by the imagesetter later. Line art mode is appropriate for scanning outline-type illustrations. Grayscale is appropriate for scanning line art or black-and-white, or color continuous-tone images that will be printed in one color. Color mode is, of course, used to scan continuous-tone color images.

**Scanning**

Most scanner software will allow you to preview the image before you do the final scan. Previewing the image allows you to select only the part of the image that you need. Once the area is selected, scanning is usually as simple as clicking a button.
Scanning Previously Printed Artwork
When you scan artwork that has already been printed by an offset press, its halftone pattern can create moiré patterns within the scanned image. One way to reduce the chance of moirés is to use a program like Ofoto that has an anti-moiré setting designed for scanning images with a halftone pattern. Another way is to scan the image in at a slight angle. Once the image is in the computer, rotate it to the orientation you need in your image program. The interpolation required for the rotation disrupts the moiré pattern. To remove any remaining artifacts, apply the Despeckle filter (under Noise in the Filter menu). If the moiré does not dissipate, undo the Despeckle filter, and apply Gaussian blur, and Despeckle again. To make sure the moiré is gone, check the image at several magnifications. Then sharpen the image.

Scanning Line Art Images
If you’re scanning line art, only use the line art mode if a resolution of eight times the line screen can be reached by your scanner. For example, if you’re printing a T-shirt at a 55-line screen, your line art image only has to be 440 ppi at 100 percent. But if you want to scan that same image to use in a brochure to be printed at 133 lpi, you’ll need an image resolution of 1,064 ppi to avoid jagged edges.

There are two ways to get line art resolution as high as you need. The first option is to use large originals, scan them in, and scale them down. If you don’t have large originals, you can enlarge them on a copier and then scan them in. The second way is to scan using the grayscale setting at your scanner’s maximum resolution. Then in Photoshop or another image manipulation program, adjust the contrast to eliminate the midtones (shades of gray). Once the image is black and white, sharpen it using the Sharpen or Sharpen More feature and convert the image type to black and white by choosing Bitmap under the Mode menu; then resize to the final dimensions you need. You’ll end up with black-and-white line art at a high enough resolution that the eye can’t detect the pixels.

Scanning Continuous-Tone Black-and-White Images
To get the best quality from a black-and-white image on a flatbed scanner, scan in the color mode. Scanning in color will capture more detail. After you’ve scanned the image, convert it to a grayscale image and make the appropriate adjustments.
Correcting Color

Even after you have acquired the best scanned image your scanner can provide, you’ll probably need to make color adjustments to continuous-tone color images. There are a couple of reasons you might want to make color adjustments. The first is to make your image look as realistic as possible and to remove any color casts that were in the original photo or that the scanner created. A second reason is to create unusual effects by making color adjustments away from the norm.

If you don’t have much experience, color correction is very difficult. Even with experience it can be tricky. In order to correct color effectively, you need to have the right programs and know how to use them. Different programs have different tools for color correction, so it’s important to read the color correction sections of your software manuals thoroughly and to go through the tutorials and practice on your own scans. The more experience you have using them, the better you’ll be at color correction when it counts.

Even when you have the tools under control, you need to be very careful when making color adjustments. Instead of jumping right into color correction, think about what you want to do with the image. Here are a few things to keep in mind:

- What are the critical colors in the image you need to match? If the red in the image has to match the client’s logo red, you need to pay particular attention to the way that color is adjusted. In general, make as many changes globally (the whole image at once) as possible. This prevents stark color changes from developing. In some cases though, you won’t be able to make color corrections without isolating the areas or particular items that you want to adjust.

- Which colors have a narrow range of believability? Obviously a person’s clothing can be any color, but skin tones, nearly white collars and lace will look wrong if they have a color tint that’s too far one way or the other.

- What’s going on in the highlights and shadows areas? Are the colors neutral or do they have an unwanted color cast? As a general rule, there should be equal amounts of magenta and yellow in the image and a little more cyan. For example, a good reading for highlight areas on coated paper to be printed at 150 lpi is 5C2M2Y. A good reading for neutral midtone areas would be 45C40M40Y10K. These combinations indicate that the image has relatively neutral tones, which is important
for images that need to look realistic. (To check your tones, use the eyedropper tool in Photoshop in the highlight and shadow areas of your image. If the cyan is low or the magenta and yellow are not equal, you may want to adjust them.)

- What is the least color adjustment you can get by with? Make as few color adjustments as possible. Make a habit of scanning your image and saving a copy of it as a test image. Make your color corrections on the test image and either save the settings or write them down. Try to make as few color corrections as possible to get to your desired goal. Once you have the color corrections that you need, save the settings and apply them to your original scan.

- Is what I see what I'm going to get? It's important not to rely solely on the screen for adjusting color. Make sure that you have some kind of process color guide. (See Chapter 8 for an explanation.) Photoshop has an eyedropper tool that allows you to sample color in any area of your image on the screen, and you can compare that color mix to the corresponding printed version in your book. This will give you an idea of what that part of the image will look like in print.

**Sharpening**

Once you're finished with tonal and color corrections (if you're not having a service bureau do them), convert color images to CMYK, if they aren't already in that mode. Finally, sharpen your image. If the image consists of line art, use either a Sharpen or Sharpen More filter. These filters will sharpen the whole image evenly. If the image is continuous-tone, don't use a straight sharpen filter. Instead, use a sharpen filter that will recognize sudden breaks in tones and only sharpen areas of color contrasts. Photoshop has a filter called Unsharp Mask that is appropriate for this task.

Be careful not to sharpen too much, or your images may get an unreal look or become outlined. On the other hand, if you sharpen too little, your images will look blurry. Start with the default settings, and adjust from there. As usual, for a more detailed description, refer to your image-manipulation software manual. After you sharpen your image, you may need to adjust for dot gain. (See Chapter 10, "Registration, Dot Gain, and Paper," for more information.)
Summing Up

After Chapter II explained that bitmapped images were resolution-dependent, this chapter completed the story by explaining how you have to account for resolution in the design and production process. Points to remember include:

• The resolution of your images has to be sufficient to support the target resolution of the printed piece.

• The rule of thumb is that image resolution in ppi should be twice the line screen in lpi when using AM screens. Discuss target resolutions for FM screening with your service bureau and printer before acquiring images.

• Images (either reflective prints or film transparencies) are brought into digital form by scanning, and you can either do it yourself or have it done by a service bureau.

• Drum scanners used by service bureaus offer the highest quality scans because they have the widest dynamic range of color and can achieve very high resolutions.

• Photo CD is a good choice for consistent 35mm film scanning, color correction and archiving.

• Scan your images as close to the final size and resolution as you can to avoid resizing later.

• You can increase the dimensions of a scan by pixel replication or interpolation. Excessive resizing can result in pixelization.

• Images can be reduced with or without loss of pixel information depending upon the intended use.

• Many times, you can do your own scans for final production, but you need to understand and calibrate your equipment and understand the methods of tonal and color correction.
SECTION III
DETAILS OF THE PROCESS

CHAPTER 13
PREPARING THE DIGITAL MECHANICAL

What Are Digital Mechanicals?

Putting It All Together
Organizing Folders
Reviewing Project Estimates and Renewing Contacts
Reviewing the Design Concept
Designing with Production in Mind
Proofing Design
Getting the Client's Approval
Gathering All the Elements
Building the Digital Mechanical
Final Checklist and Clean-Up

Proofing the Digital Mechanical and Gathering Files
Printing Laser Proofs and Laser Separations
LaserCheck
Getting the Client's Approval
Gathering Files and Printing Lists
Output Request Form

You're Not Done Until the Piece is Printed
Check Before You Accept Service Bureau Output
Getting the Client's Approval
Hand Deliver to the Printer

Proofing the Last Steps
Blueline
On-Press Proofing

The Job's Not Over Until A Satisfied Client Sends You A Check

Summing Up
If you’ve read the earlier chapters and done your homework, you’ll have a good understanding of the production and printing process and a clear outline of your project. You’ll be familiar with the vendors and the other members of your design and production team. You’ll also have a budget, schedule, and approval from the client to develop the design and prepare the digital mechanical for service bureau output and printing. Now it’s just a matter of designing, producing, and going to press.

Your Macintosh gives you loads of freedom to design, but it also gives you lots of opportunities to create electronic files that won’t output, or that will at the very least, give your service bureau a headache. (Usually the bigger the service bureau’s headache, the more your file will cost to output.) This chapter will help you steer clear of creating files that are more trouble than they’re worth and guide you through a smooth design and production process. It presents some hints for organizing before you start your job; designing, creating, and cleaning up the final digital mechanical; gathering files and information to send to the service bureau; and proofing throughout the process.

What Are Digital Mechanicals?
Just like traditional paste-up mechanicals, digital mechanicals contain text, illustrations, and design elements in their final placement, ready to go to
CHAPTER 13: PREPARING THE DIGITAL MECHANICAL

prepress. The difference is that digital mechanicals are electronic files on disk instead of paste-up mechanicals on boards where you can see them. Digital mechanicals include type, illustrations, and scans placed within the printable area defined by a page layout or illustration program. Crop and registration marks and page sizes are either automatically set in the program or placed manually, and process or spot colors are applied to all elements of the design. The digital mechanical file is what goes from your desktop to the service bureau for further preparation and for final film, paper, or plate output.

In the past, mechanical boards wouldn’t be made until the design was approved and final. Type galleys (pages of type formatted according to your specifications) would be prepared by a typesetter, images would be color-separated and touched up at a color house, and the final assembly of all the elements was part of the stripper’s job. Now, with digital mechanicals, the production can start as early as the design stage. For example, you may actually start assembling the final design elements, like typeset text, high-resolution scans, digital illustrations and color selections, while you’re still determining the final design. This process gives you a great deal of freedom to experiment but it can result in a messy file, as you make quick changes to colors, fonts and images. Because you don’t have a tangible example of the final piece, you need to check your files closely to see that there aren’t any extras or stray items that can cause problems in prepress.

Putting It All Together
Because everyone designs differently, for different kinds of projects, and in different programs, it isn’t possible to give a step-by-step formula for every design. However, it’s important to keep a few things in mind to help make your design a success:

· Organize your job folders at the outset of the project.

· Review the project and design concept that the client approved.

· Create comprehensive design sketches keeping production aspects in mind.

· Proof your work and get client approval at all stages of the design and production process.

· Talk to your printer to get printing specifics and advice that will make your design print better and maybe save you money.
- Review with your service bureau what you need and determine what extra production chores they can do better and cheaper than you can.
- Gather all the components of your piece and determine the best way to prepare them to be imported into the final layout.
- Regardless of whether you're creating a short or long document, build your file with production in mind.

Remember that once you're finished with design, it doesn't mean your job is done. You have to go to the next stage and proof it thoroughly, gather all files and send it to the service bureau with the appropriate information and instructions. Once the service bureau does its job (usually creating film output), you have to proof the output and deliver it to the printer. Then the printer has to check the film to make sure it can be used effectively. The printer will then create a proof and, provided there are no problems, prepare and print your piece. To see it all the way through, you'll be at the press check to make sure that what you expected is what you're getting. It may sound like a lot of work, but once you develop your own system, it'll become just an extension of the process.

ORGANIZING FOLDERS

Even before you start designing, create a job folder—a physical folder, that is. In it, you'll keep all hard copies, design sketches, proofs, client correspondence, approvals and contracts, additional information from the service bureau and printer, and your time sheet. Your time sheet is very important because not only will it help you keep track of the time you bill on the job, but it will also help you determine estimates for future projects. By tracking the time it actually takes to complete the project, you can determine whether you've charged enough, and if not, you'll know to charge more next time.

As well as creating a physical job folder, you need to create one on the computer. You should start your job folder at the outset of the job, otherwise you're likely to save files all over the place and ultimately misplace some of them. Create a main folder for the job with two other folders inside, one for "process work" and another for "final files." While you're working on different concepts and manipulating images, save files to your process folder, but as you prepare the final text, images, and any other final files, move them from the process folder into the final folder. The important thing is not to confuse your final files with earlier stages.
If you're using a page layout program like PageMaker or QuarkXPress, the images you import are linked to the layout (the application knows where to find them). If you have several page layout files and supporting images in the main final folder, you may want to create a separate folder for each final page layout file and its support images. If you have to make a last minute change, all you need to do is relink one image and all the rest will relink automatically if everything is in the same folder. With the layout and all its artwork in one folder and images in separate folders or different locations on your desktop, you'll have to find each of the images and relink them one at a time.  

**REVIEWING PROJECT ESTIMATES AND RENEWING CONTACTS**

At this point you need to review the estimates and schedules that were approved by the client and renew contacts with all vendors, freelancers, or associates who were indicated as part of the project team in the estimate. Make sure that they can still perform the same tasks in the same amount of time and for the same cost as originally estimated. This is especially important if it took the client more than a month to give you approval to start the project. For example, some printers impose limits on how long their estimates are valid (usually 30 days). This protects them if the cost of paper or ink rises or if you wait too long and your job becomes a rush. (To rush your job, the printer may charge more to compensate for overtime or putting off other jobs.)

It may be helpful to fax each team member a note (with a place to indicate changes and a place for a signature and date) explaining that the job has been approved, along with a copy of the written estimate he or she originally sent to you. **If you remember from Chapter 5, estimate request forms were created to send out to vendors and freelancers for estimates.** In most cases, the vendors and freelancers probably filled them out and sent them back to you. In some cases, they sent you estimates on their own forms. Once they get the forms for review, they can approve them with or without adjustments and sign and date them to indicate that they have been reviewed. This way there will be no questions later on.  

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2 Creating descriptive file names is very important to help you recognize files without opening them (opening large image files can take a long time). Checking the creation date and time for the files and folders tells you which is most current.

3
SECTION III: DETAILS OF THE PROCESS

Fax to each vendor and freelancer the original estimate they sent to you along with a note telling them the project was approved. Ask if they can still do the job according to the schedule for the same budget. They should fax you back your letter with any changes or an OK as well as a signature and date. This is especially important if a month or more has passed since they provided their original estimates.

If there are changes and the budget has to be increased or the design concept needs to be adjusted, the first to be informed should be the client. This will ensure that he or she is aware from the start rather than being surprised later in the design or production process. Either write a change order or create a new letter of agreement to define the changes. You may want to have the client sign and date the letter to ensure that he or she understands the change (anytime a client has to sign something he or she will read it more carefully).

If the team, estimates, and design concepts remain the same as your original estimate or if the client sends you approval of your revised versions, you’re ready to review the design, production goals, and specifications.

REVIEWING THE DESIGN CONCEPT
Before you begin designing refamiliarize yourself with the design and production goals of the project and the original specifications—like color, size, and paper. If you remember from Chapter 5, you asked the client a series of questions and got answers to help you design more effectively. Don’t keep your notes buried in your job folder. Dig them out and make sure you understand what the client needs. Also review the project description that the client approved in the letter of agreement. It should have included specifications like the size, number of colors, images, and so on.

DESIGNING WITH PRODUCTION IN MIND
Now that you’ve reviewed what the client wants and what the design parameters are, you can begin designing. (Everyone works differently, so this section is not meant to tell you how to design, only to give you suggestions on keeping production aspects in mind as you work.) First think about what you want to do, gather ideas, look at books and experiment with programs. Then create some sketches and design comps, either on the computer or by hand, based on your ideas. Once you have a fairly solid design concept and specifications, talk to the printer and service bureau regarding production and printing details. (Always consult your printer about what you’re doing before you jump the gun and begin to create the final file. Only the printer
knows the idiosyncrasies of his or her own presses and what ink will do on a variety of papers.) The printer can help you determine the best way to prepare your digital mechanical and, if appropriate, take some production details off your hands.

Talk to Your Printer
Discussing project details at the beginning with the printer will help you make sure that what you design can be produced and run as smoothly as possible on press. Now is also the time to find out from the printer if you can save money by making small changes. There are a number of questions you should ask yourself and discuss with the printer while you’re still in the design stage. These questions include:

- What colors (spot or process) will be used?
- What about knock-outs and trapping or overprinting?
- How will you specify color on the computer so it looks the way you expect on paper?
- How can you get more bang for your buck with color?
- How should the color separations be done—using UCR or GCR? And what are the specifications?
- What paper stock will be used and what size is the stock?
- What is the size of the piece?
- How does the finishing and binding process affect the paper choice?
- What will the line screen and expected dot gain be?
- What type of output does the printer need (right-reading emulsion-up films or something else)?
- What else can the printer suggest?

It’s also important to talk to the printer at this point to re-estimate the job if any design changes you’ve made are likely to affect the cost. This way, when you show the client the new design comprehensives, you can also show the corresponding estimates. If you make changes and don’t check with the printer before the films are run and the job is on press, you may be in for an expensive shock that the client will not pay for because you didn’t warn him or her in the design stage.
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What Colors (Spot or Process) Will Be Used?
Talk to the printer about the colors you plan to use in the final design. In some cases you may be using the same colors specified in your original estimate. In other cases you may decide to change a color, add a color or even use fewer colors. Discussing color changes is especially important if you're using metallics, fluorescents or other special ink mixes because they may have to be ordered or specially mixed (which increases costs).

At this point, the printer can give you an idea of how your colors will print on selected papers and whether a varnish will be required. For example, if you want to print a solid black on a glossy cover stock, the printer will probably suggest using a varnish or an opaque coating. These special coatings protect the ink from scuffing and fingerprinting, which is particularly important for brochure covers and folders that are likely to be passed around. The printer can also explain how different recycled papers will take ink and may suggest that you print on a white recycled stock with a smooth finish, possibly with a white undercoating to retain sharp color.

What About Knock-Outs and Trapping or Overprinting?
If the colors in your document touch or overlap, your document will more than likely need trapping. (See Chapter 10, "Registration, Dot Gain, and Paper," to review when you need to trap and how to design to avoid trapping.) The printer will know what trap amount is needed based on the press being used and the paper being printed. You need to know this amount to tell the service bureau for trapping or to set traps yourself.

How Will You Specify Color on the Computer
So It Looks The Way You Expect On Paper?
If you're printing on a white or slightly off-white stock, the final printed colors may not change much. But if you're printing on colored paper, printed colors will shift dramatically. Light tints on some colored papers will look more like stains than tints of color. The printer may have paper samples or printed samples to show you how different colors look on different papers. If color is critical, the printer can create tests of specific colors on selected papers for you, although this service can be expensive.

How Can You Get More Bang For Your Buck With Color?
If you're running a three-color job it will probably run on either a two- or four-color press. Either way, it may not be that much more expensive to run four colors instead of three. If one ink station is empty, why not fill it up?
Printing in four colors may allow you to use four-color images or several screen tints to create a more lively design.

If you’re trying to cut costs but still need three colors, you can select two colors that you can overprint to create a third. This overprinting can also eliminate the need for trapping, which will save even more money. (See Chapter 14, “The Working Color Gallery,” for an example of overprinting.) The printer can help you determine what the ink colors are going to look like when they’re mixed. Because mixing inks in this way can be tricky and the results can be hard to predict, you may want to have the printer show you some samples.

How Should the Color Separations Be Done—
Using UCR or GCR? And What Are the Specifications?
Ask the printer how, or the service bureau, should color separate images to replace some of the cyan, magenta, and yellow with black in scanned images and throughout your piece. The printer should tell you which method of black replacement to use (UCR or GCR) and what the proper settings are for your separation program and their press. If color is critical, the printer may be able to give you the name of a good color house to work with. In some cases, if you’re using Photoshop and have compensated for dot gain, the default UCR/GCR settings may work just fine for your needs; nevertheless you need to check with your printer.

What Paper Stock Will Be Used and What Size is the Stock?
Discuss with the printer your paper choices and whether you need matching envelopes or folders. If you’re not sure, but you have an idea of the kind of paper you want to use (even if it’s just “I want coated paper with a smooth, non-glossy finish”), the printer can make suggestions based on their knowledge of paper stocks and experience running different stocks on in-house presses.

Talk to your printer about the paper you want to use as early as possible in the design process. Make sure you pick a few paper stocks that would be suitable for your job, because your first choice may not be readily available. (If you don’t already have paper samples on-hand you can either ask the printer for samples or order a paper cabinet from the paper companies your printer uses.) One of your choices should be available to meet your schedule. If you’re on a tight deadline and need envelopes or folders, pick a paper that has ready-made matching envelopes and folders. Out-of-stock paper can take a few days to a few weeks to be delivered to the printer. If
Always choose a few paper stocks that would work for your job. That way, if one isn’t readily available, one of the other ones might be. The printer will be able to take all the choices to the paper company at one time. This will save time for both you and the printer.

the envelopes or folders need to be converted (folded and glued), they will take even longer. (See Chapter 10, "Registration, Dot Gain, and Paper," for more details on paper.)

What is the Size of the Piece?
When you design your piece, keep in mind the sheet size that the printer will run on the press. Sheet size can be a factor in the final size of your piece. For example, if you change the size of the piece slightly, you may be able to fit four spreads on the press sheet instead of just two, which would require only half as much paper to run your job. Because paper is one of the most expensive components of the cost of printing, this may lead to significant savings.

Sometimes even if you maximize use of the press sheet, there may be extra space. This provides a good opportunity to print little extras like a postcard, tag, business card, or whatever you may need and can fit. The printer may be willing to give you a hand-drawn diagram of how your pages will be set up (imposed) on the press sheet to show you how much extra room you have.

The printer’s diagram will also be useful if you’re thinking about doing the imposition yourself or having the service bureau do it. Provided you do it right, this can save you money because the printer may have to do little or no stripping. Always talk to your printer before you decide to do your own imposition, because there are other factors besides size that determine how the pieces should be arranged. For example, if you’re running spreads that fold, the fold needs to run with the grain of the paper so the crease won’t crack and the paper will fold flat. If the imposition calls for a solid color area to run through the press just ahead of a portrait photo, the sheets may have to be rearranged to reduce potential color cast problems on press. In order for the printer to provide this kind of help, you have to make him or her aware of your design plans.

How Does the Finishing and Binding Process Affect the Paper Choice?
Also tell the printer what finishing and binding are required. The piece may only need to be cut to size, or it may need to be cut to size and folded in any of a variety of ways, or cut to size and bound together through perfect binding, saddle stitching, or some other binding method. Special die-cuts or embossing may be required. All these requirements need to be discussed when you’re choosing paper, because some papers work better with certain types of binding and finishing.
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What Will the Line Screen and Expected Dot Gain Be?
Based on the final paper choice and the press being used, the printer can tell you the maximum line screen resolution that can be printed and what dot gain to expect. (The chart on the inside front cover of the book gives you an idea of the dot gain and line screen you can expect on different papers and presses). Knowing the dot gain is important for you or the service bureau to appropriately adjust your images for good reproduction of photos and other artwork. The line screen gives you the basis for determining image resolution (for scanning) and imagesetter output resolution. (See Chapter 10, "Registration, Dot Gain, and Paper," for more details about dot gain.)

What Type of Output Does the Printer Need (Right-Reading, Emulsion-Down Films or Something Else)?
Ask your printer what type of output is needed. For offset printing printers often ask for negative film, right-reading emulsion down, because it can be directly contacted to the plate material, avoiding an extra photographic step in platemaking. (See Chapter 9, "What Makes Printing Possible," for more details about film separations.)

What Else Can the Printer Suggest?
Once you’ve thought about and asked the printer the questions above, inquire if there is anything else that would make your piece run more smoothly on press or save you money. This should help bring up any other issues that haven’t already been covered.

The Service Bureau or You
Once you have a pretty solid design concept and you’ve gotten the production specifics from the printer, you should check with the service bureau again to see if their role in the process is going to change. By now you may find that you need more services than you originally planned, or possibly fewer.

Either call your service bureau or stop by and show the representative your design. Go over the services that you’ll need. If you’ve changed the number of colors, tell the service bureau how may colors you will be outputting, whether they’re process, spot or both. If you’re going to have the service bureau do the trapping, show the representative your design concept and any illustrations or photographs that will be included in the file. He or she will tell you if you need to do anything special and if the bureau is capable of trapping your file with its software. (See Chapter 10, "Registration, Dot Gain, and Paper," for more details on trapping.) If you’re having the
service bureau do the high-res scanning and separating, give the bureau the separation settings you got from the printer. Once you've given the new specifications, ask the representative to re-estimate their charges.

**PROOFING DESIGN**

Before you get too far into production, you need to show the client what you're up to and get your design approved. How you present your ideas at this point—either on screen, with a laser print, a digital color proof, or in a sketch—depends on what the client expects to see. Each of these methods of presentation has its advantages and disadvantages. Remember to tell your client that your comps are only an indication of what the final piece will look like when it's printed—not an exact replica. It's obvious if your comps are hand drawings or sketched layouts, but if you create a digital color proof, your comps can appear more final than you really want them to look at this stage of the game. Clients may expect the final offset print to look exactly like the digital print, which may not be possible.

*Reviewing the Design on Screen*

Some publishing professionals like to show their clients design concepts on the screen, in lieu of creating a color print. This is generally not a good idea unless your final piece—a computer interface design, for instance—is intended to be viewed only on the screen. Colors on screen tend to have a brilliance that you can't get in printed matter (partly because the RGB color gamut is larger than the CMYK gamut and partly because the color on the screen is created with transmitted light.) If you need to show the client a piece on the screen, point out how the color relates to your printed color selector books and how the paper may change the way the color is reproduced. It's generally better to have a lower resolution color comp or at least a black-and-white comp available for your client to check the layout and type.

*Reviewing Laser Printer Proofs*

Laser prints are the easiest and most common way to proof a job. They give you an idea of what the final pages will look like but in lower resolution and in black-and-white. Laser proofs provide a good way to review:

- Image and type placement, font selection, type kerning, and overall design (although to get a really accurate look at kerning, stroke weight, and other fine points of type, you should output paper positives from an imagesetter at the final output size).
• Copywriting in context with illustrations. (How copy is used with images to strengthen or weaken the message.)

• Whether fonts and images print correctly. (If fonts are missing, have conflicting IDs or are corrupt, they may default to Courier or some other typeface, or not print at all. You should reload the font if this happens. If image files are not properly linked to the page layout file, they may look bitmapped. When this happens, you should check the links in your program and relink the images. Sometimes images look great on the screen but when they are printed out they have jagged edges or a white background. This can happen in QuarkXPress if boxes that contain images are filled with None rather than 0 percent black.)

• Trim and registration marks. Make sure they are present and that they are in the correct position. You can check with a ruler where the edge of your page is by drawing a line from crop mark to crop mark. Once you've done this, make sure you have enough bleed on images and solid shapes and that text is not running off the page.

With laser-printed separations (pages output so you get a sheet for each color that will print) you can also check color breaks (how many different colors are specified in your file). Laser printer separations are discussed later in this chapter.

**Reviewing Digital Color Proofs**

Digital color proofs can be used to show your client the overall look of the final printed piece, particularly general color relationships, font selection, and copy layout. They also give designers the opportunity to specify colors and print them all on one piece of paper—no more colored markers, pens or paper.

Many service bureaus have high-end digital color proofing systems (by companies like Kodak and 3M). Some can even simulate the dot structure of AM and FM screens and show overprinting effects. Calibrated systems produce more accurate color proofs, but because digital color printers put color on the paper differently than a printing press, digital color will never exactly predict the color and look of the printed piece. When you show a client a digital color proof:

• Always present swatches of the actual colors you'll be printing, from a color matching system (like Pantone), along with the digital proof.
If you’re buying a color printer, an inexpensive machine may be all you need to print design comps. For example, a Hewlett Packard Deskwriter 560C with PostScript software (a must-have) can give you great 8 1/2 x 11-inch color prints, adequate for representation of work in progress.

- Explain that a digital color proof cannot account for dot gain on press or for the halftone or random screen patterns of real printing.

One drawback of high-end digital color proofs is that they sometimes look better than the final printed piece. This is because some digital color printers create more intense (saturated) colors than a four-color printed piece. For example, turquoise blue can be much more intense and dramatic in a digital proof than in a CMYK print. The special glossy paper supplied by the manufacturers of the proofing printers enhances the color as well. When you get color prints to use as design comps, try to use a service bureau with a printer that will accept a variety of paper stocks and print on the actual paper that you’ll be using on the press.

**Reviewing Hand Sketches**

You may not like to work on the computer until the client has approved the design concept. Sometimes this is a great way to go because the client sees the idea for what it is—an idea—rather than looking at a color comp as if it were the final piece.

How you prepare your hand sketch depends on the client, but you’ll probably want to create tight sketches and use color swatches so the client has fewer questions regarding design details.

If you haven’t worked with the client before and the client is accustomed to seeing computer sketches or digital color proofs it may be difficult to present only a hand-drawn comp. That is, unless the client had seen your portfolio and had a better idea of how your designs translate into the final printed piece.

**GETTING THE CLIENT’S APPROVAL**

Once you’ve shown your design ideas, it’s important to get the client to approve it and any new estimates before you move on to the next stage. If the client is not happy with what you’ve come up with, identify and acknowledge the issue and discuss why you created the design the way you have. Make practical arguments. For example, while you were designing you may have changed the page size. If you explain that you’ve changed the page size to fit on the press sheet more economically, the client will probably accept it as a good idea. But if you say you’ve changed the size because you thought it looked better, you may not get as far. When changes are necessary, arrange for another meeting to discuss the revisions and get final approval before continuing with production.
GATHERING ALL THE ELEMENTS
When you have client approval of the design concept, you can begin gathering all the final elements for your file—text, images and other artwork. Your client, or the writer, will usually supply a disk with text or copy. (See Chapter 11, "Components of the Digital Mechanical," for more details on converting and transferring text.) Unless the client is supplying images or artwork you’ll have to buy them, commission them from other artists, or create them yourself. Luckily there are lots of ways to get good images—some even in ready-to-use digital form. Once you’ve got your text and artwork, you may need to order some fonts, if, for example, your client’s logotype uses one you don’t have. (See "Type Foundries," in the "Sources" section for font suppliers.)

Images and Illustrations
There are many sources for photographic images—national and library archives as well as photo stock houses and stock Photo CDs. If you have access to a digital camera or video camera and the appropriate hardware, you may be able to acquire images without scanning, although in most cases, these images are not good enough for print work. Because some of the images you acquire are not Mac-ready, you’ll need to get them into a digital format by scanning. (See Chapter 12, "Image Resolution and Scanning," for information on doing it yourself or having the service bureau do it.)

Buying Images
Some companies supply their customers with catalogs from which images can be ordered, usually in transparency form. More and more companies are supplying their images, clip art and typefaces on CD-ROM. Not only is this artwork already in digital form, but your images are delivered on a disk that provides handy access and permanent storage. (See "Stock Photography and Clip Art" in the "Sources" section.)

Clip-Art Books
Clip-art books are probably one of the most easily accessible sources of copyright-free images that can be scanned into the computer. You can get them in your local art store or book store. Some books are devoted to one subject, like food or animals, and others contain a variety of images. The images can range from corny to elegant and intricate line art (usually from the early 1900s and before).
There are several sources for illustrations, photographic images, clip art and typefaces. With the increased competition and the market demand for type and artwork, a variety of materials are available on CD for easy access at any time. There are many companies marketing a large variety of stock material. Acquiring a library of ready-to-order art can save time and money.

**National Archives**

The National Archives, Still Image Branch, is a depository for government resources. You can find a variety of images from a number of different groupings, such as the Revolutionary War, the Civil War, Indians in the United States, African Americans During World War II and the American West. The images come in sets of 140 slides or more, and cost between $50 and $120.

**Library Archives**

Many library archives contain historical images that are in the public domain (free for anyone to use). See your local library for more information. You may also be able to access the archives of other libraries through your local branch (some libraries are even connected by online services).

**Stock Photo Catalogs and Photos on CD-ROM**

Stock photo catalogs contain a variety of images—usually organized by subject. Each image is coded in some way, so if you decide to order one, you can reference it by number. To order an image, you call the stock photo company and request the transparency for that image. Then you need to have the transparency scanned. There are usually very strict licensing agreements that regulate use of these images. It can cost hundreds of dollars to use an image only once. For more extended usage, extra fees are usually charged. A stock photo catalog can be a good source if you need a certain image but can become very expensive when you need to license and scan more than one image. (See "Stock Photography and Clip Art" in the "Sources" section for a list of stock photo vendors.)

Many stock photo vendors are beginning to put their images onto CD-ROM. Some companies allow you to choose to pay one price and have access to all the images on a disk or pay for them one at a time. Some vendors include low-resolution versions of the images that you can use for placement to create your design comps. The high-resolution versions are also on the disk, but they are locked. When you decide on an image, you call the company, give them a credit card number and they provide an access code you can use to unlock the image(s) you ordered. This service is convenient, eliminates the cost of extra postage, and more importantly, eliminates the wait for images to be shipped.

**Creating Your Own**

As outlined in Chapter 3, there are countless illustration, paint, and specialty programs available for you to create your own artwork or design your own fonts. Some create bitmapped continuous-tone images or
object-oriented art made up of shapes, lines, and fills. (See Chapter 11, "Components of the Digital Mechanical," for more detail on both types of artwork.) The type of program you use, either object or bitmap, depends on what your design criteria are and the look you're after. Regardless of the type of program you use, a few things you need to keep in mind are outlined on the next few pages.

Video Capture and Digital Cameras
Another way to obtain images is through either a video capture card or digital camera. (As discussed in Chapter 2, "The Essential Hardware," the high-quality, expensive digital cameras produce better quality digital images.) If you have access to either video capture or digital camera, review the quality and resolution of the final image before you commit to using it in your final design. You can do this by taking proofs of test images. (Keep in mind that you need to check into the copyright for any still images that you capture from video.)

Working With Object-Oriented Images and Type
There are many challenges you face any time you work with object-oriented files. These include color selection, complexity of objects, flatness settings, working with type, embedding bitmapped images, and exporting to another program. Before beginning your illustration, read the pointers below. And as usual, make sure you read your program manuals to ensure the best use of your program.

Selecting Colors
If you will be importing artwork from the program it was created in, into a page layout program, it's important to make sure your color names (palettes) are consistent. This check is important because when you import the artwork, you also import its color palette. Even the slightest difference in color names can cause problems. To avoid this situation create the color palette in your illustration program. (Creating squares filled with the colors you want to use will be enough.) Then import that file into your page layout program. This way the color palettes in the two programs will be the same. Specify colors based on a color-matching swatch booklet because the color on the screen may be inaccurate.

Complexity of Objects
Don't use more detail (extra points and lines) than you need for the curves that make up your object-oriented artwork. (The tutorials that come with the applications usually tell you how to keep files simple.) Make sure that
objects and shapes have the minimum number of points needed to create the desired shape. Continuous complex paths that contain a lot of points can often cause printing problems. When this happens, you’ll usually see a “limitcheck PostScript %%” error message when you print to a laser printer or an imagesetter. (See Chapter 4, “Managing the Desktop,” for PostScript errors and their definitions.) There are basically three ways to deal with this problem. You can either reduce the number of points that make up the path, split the path or change the flatness settings.

**Keep the Number of Points Small**
The first way to avoid a limitcheck problem is to create images with as few control points as possible. Or after drawing, eliminate as many points as you can without changing the shape of your graphic.  

**Split Paths**
If you can’t delete points without losing the distinguishing characteristics of the shape, then split the path to avoid imagesetter problems later. You can split the path manually or rely on Illustrator and FreeHand, which both have an automatic Split Path option. Illustrator’s is under the Document Setup dialog box but has no effect on stroked paths, masks, or compound paths. Those have to be dealt with manually. FreeHand’s is in the Output Options dialog box under the File menu. (Refer to your program manual for more details.)

**Change the Flatness Setting in Your Drawing Program**
The third approach to making efficient drawings is to change the flatness setting in your drawing program. In illustration programs, curved lines are represented as a series of straight line segments between adjacent points. The smaller the line segments, the smoother the curve will appear; the larger the segments, the more angular the curve will appear. Increasing the flatness reduces the number of points but makes the curves less smooth. Both Illustrator and FreeHand have flatness adjustment options. You’ll need to experiment with flatness settings and, of course, read the manuals to achieve the look you need.

**Embedded Bitmapped Images**
If you can, avoid embedding bitmapped graphics in object-based illustrations and then importing them into layout programs. Doing so creates a complex maze of instructions that the imagesetter needs to deal with in order to process your file. It may result in increased processing time or PostScript errors, or the file may not print at all. If you need to use this kind
of combined artwork, it's best to do the rest of your layout in the illustration program so you can to avoid importing problems (of course, this will not be possible with some documents' designs).

**Outlining Type**

Convert headlines and other large type in your file to outlines, especially if the letters have been rotated. Drawing programs have a command that allows you to convert type to outlines. You can purchase an extension or addition for your layout program to do the same thing. This is also a good technique for illustrations with type that will be imported into a page layout program. That way, you don't have to worry about whether your service bureau has your fonts, kerning table, and so on.

**Don't Over-Use Blends and Patterns**

Blends, gradations, and patterns are relatively memory-intensive. They can cause long output times or may cause the imagesetter to run out of memory before it can output the page at all. So if you're intent on using a lot of them, create blends with the minimum number of steps that will still make the blend look smooth. (Read your program manual to see what those settings will be.)

**Working With Bitmapped Images**

Unless you buy bitmapped images that are already in digital form, use a digital camera or video capture card, or create bitmapped images from scratch, you'll need to have your continuous-tone (photographic) images scanned. (See Chapter 12, "Image Resolution and Scanning," for more information on scanning.) Once you have your image in digital form you need to think about the following points:

- Make sure you know your target print resolution. It's important to know what resolution your image needs to be before you start working on it. Creating or scanning your image at the target resolution may eliminate having to re-create it in the production stage of the project. (Chapter 12, "Image Resolution and Scanning," explains how to calculate your target print resolution—the formula is also on the inside cover of the book.)

- Make sure you have enough RAM and disk space, because bitmapped images can be very large and time consuming to work with at high resolutions.
Whether you're working with existing images or creating new ones, keep a list of each adjustment you make. Try to use the fewest steps to get to the desired effect. It may be useful to work with a smaller copy of the original until you determine exactly what you want. This way, you'll be able to work a lot faster. Once you know what you want, create the final high-resolution image. If, after you've placed your image into a layout, you decide that it needs to be rotated, cropped or otherwise adjusted, go back into the original program and make the appropriate changes to get the image exactly as it will appear in the layout program. This will eliminate extra processing time when the image is being printed.

Once you're finished in the image-editing program, make sure you choose the right format (usually EPS) for importing into the page layout or illustration program you intend to use.

Don't Bite Off More Than Your Computer Can Chew
Bitmapped images can get quite large at higher resolutions. For instance if you needed to create an 8 1/2 x 11 inch CMYK image at 300 dpi, the file size would be 34.1 MB. In Photoshop it is recommended that you have free space on your drive that is three to five times the size of the image. If you have just enough space to store the image, you may not have enough to work with it or even open it. It's important to understand what your computer can handle.

RAM also plays an important role in working with images efficiently. To be able to work with the image at optimal speed, Photoshop requires three times as much RAM as the image size. Other programs like Live Picture and Xres work differently and require less RAM to work at optimal speeds. Always check the program manual for your image-editing software to make sure you have the hardware needed so the program works properly.

Taking It Step by Step and Documenting
When working in a paint or photo-manipulation program, it's important to document your actions step by step. Stopping to record every move may be difficult for some artists, because it interrupts the work flow, but it can be important if you or someone else has to re-create an image or effect later in the production stage of the project or for a series of pieces.

For example, let's say you're creating a series of ads that each will include a headline image. You generate the headline type in Illustrator, then import it into Photoshop where you create a drop shadow, then paste an image that you've created into the type outlines. Bingo! Instant headline image. Now you have to create three more headlines for different but matching ads. If
you didn’t document what you did, it may be difficult to remember the exact steps and settings you used. Regardless of whether you decide to create the other images yourself or hand them over to someone else to produce, without a step-by-step description it will take longer than necessary to create the others, and if you’re getting a fixed fee for all four ads, it could wind up costing you.

**Do Image Manipulation in Original Programs**

Do your manipulations—like major cropping, rotation, color and tonal corrections, and special effects—in the original imaging program before you import images into a layout or illustration program. 7 Even though several illustration and page layout programs include some image manipulation controls, using them can cause printing problems because more calculations have to be made by the output device. If you’re working with FPO images while you design, write down any changes you’ve made (the cropped dimensions, scaling, angle of rotation, and so on), and then go back and make the changes to the final images in the original program.

Here’s a list of image-preparation steps to be carried out before importing into a layout your final artwork:

- Make a copy of the original image.
- Set the image resolution.
- Crop, scale, and rotate images.
- Make any color or tonal corrections.
- Apply a Sharpen or Unsharp Mask filter to the image. (A Sharpen filter is appropriate for line art and an Unsharp Mask filter is appropriate for images.) *(See Chapter 12, "Image Resolution and Scanning," for more information about sharpening.)*
- Create outline clipping paths with low flatness settings for silhouetted images. (Photoshop recommends that you use a flatness setting for clipping paths of between 8 and 10. Some service bureaus suggest using a setting of 6, which retains sufficient curve around most images).
- Convert from RGB format into CMYK unless you are separating through Adobe PrePrint, or unless the service bureau tells you otherwise. If the
Most designers and technicians have had the best luck using TIFF images in PageMaker and EPS in Quark. (There is no explanation from Quark or Adobe regarding this matter. Each claims to accept both formats with no problems.)

Keep in mind that it's best to make all the appropriate adjustments at one time. Some programs, like Cachet, allow you to save all the image adjustments and apply them in one pass. After you've applied your adjustments, the image may appear soft. To sharpen the image in Photoshop, apply an Unsharp Mask filter. Apply the equivalent effect if you're working in another program.

**Choose the Right Image Format**

Never save final images in PICT format for output in print. PICT files are not well-suited for use in PageMaker, QuarkXPress, or separation utilities. Save bitmapped images as TIFF or EPS files and object-oriented artwork as EPS files. Check with your service bureau to see what file format its operators prefer. (See Chapter 10, "Registration, Dot Gain, and Paper," for more information on compensating for dot gain.)

Adobe Photoshop gives you the option of saving some image-adjustment settings such as Levels, Curves and others. You can experiment on low-resolution versions of the scan, save the settings, open your high-resolution version and apply the same changes with the confidence of knowing what you're going to get.

`BUILDING THE DIGITAL MECHANICAL`

Once you have your text, fonts, artwork, and all other design components, else including hardware and software together, you can start building the digital mechanical. The digital mechanical should be assembled in a program that will allow you to import all images, illustrations and text. PostScript, object-oriented applications work much better than raster-based applications because they take advantage of the imagesetter's maximum output resolution. Page layout and illustration programs also, are much better-suited to combine the elements that make up your digital mechanical than are image-editing programs. Selecting which object-oriented program to use usually depends on the length of your document and the nature of the design.

**Short Documents**

For short documents, either a layout or an illustration program will work. But in order to make the best decision, you need to think about how many pages you'll be creating, whether you need to create master pages and style
sheets (discussed later in this chapter), what kind of elements are on those pages, and what your service bureau is most comfortable outputting.

When To Use An Illustration Program
Because illustration programs offer some of the same features as page-layout programs—like the ability to spell check, create columns of text, kern type and adjust leading—you can use them to create short documents fairly easily. You can benefit from using an illustration program when:

· you're designing a one-page piece that contains illustrations and type that you want to manipulate in different ways—outline, fill with a gradation, fit to a curved line and so on.
· you want to create an ad that will be used in several different sizes in different magazines. Using an illustration program will give you the ability to resize all elements in the ad at once. This way, you can create one ad and then resize it if necessary to fit different formats.
· you're creating a short multi-page document, especially if the layout is different from page to page. (See Chapter 14, "The Working Color Gallery," for an example of using Illustrator to create an entire book.)

When To Use a Page Layout Program
If you're creating a multi-page document with imported bitmapped images and columns of text, a page layout program is probably the way to go. It's best to use a page layout program for short documents when:

· your service bureau has more luck outputting from a layout program than an illustration program. (Technically, your service bureau should be able to output from both types of programs. Some service bureaus actually import illustrations into QuarkXPress to output them to their imagesetter because it has such good separation capabilities).
· creating style sheets, master pages and running headers and footers would make your job easier (as discussed later in this chapter).
· there are lots of imported images and illustrations—for example, if you're creating a two-page flyer with artwork from different illustrators and photographers. Layout programs are designed to handle a wide variety of imported graphics.
· you're using several different fonts. A page layout application will let you keep track of the fonts being used within the file. This is helpful
when you are gathering your fonts and files for output at the service
bureau, also discussed later in this chapter.

Long Documents
Long documents like books, magazines, and multi-page brochures should
be created in a page layout program, especially if these documents contain
common graphics, grids, and columns on each page and type with consis-
tent styles throughout the document. Layout programs are the best choice
because they give you the ability to create master pages that contain ele-
ments common to each page and to define style sheets for consistently
specifying type and making universal edits.

The way you set up a long document depends on what kind of document it
is, the design criteria, and the program being used. Two popular layout
programs, QuarkXPress and PageMaker include features to streamline your
long document design efforts. So be aware of the many features available
by reading the manuals and use them to make your life easier. (See Chapter
3, "The Essentials of Software," for more information about different
layout programs.)

The following information is designed to give you tips for setting up long
documents. If you’re creating a free-form layout, where styles of headers
and text change from page to page, much of the information in the next few
pages may not be applicable. But, if you’re creating a document where some
level of consistency is needed, the following steps will probably help when
setting up your document:

· Create a color palette.
· Create master pages.
· Set up style sheets.
· Create a template.
· Place and link text and assign styles.
· Import and arrange images throughout the document.

Your program manual will give you more specific details about setting up
your document and about the features the application offers.
Create a Color Palette

First, eliminate all unnecessary colors (the native Green, Red, Blue and any extra colors you may have created during the design stage) and then establish your new color palette within the layout program. There are two ways to do this:

- First, (as described earlier) if you’re creating artwork in an illustration program, it’s best to set the color palette at the same time and import it into the page layout application later. This will establish a consistent color palette between the illustration program and the layout program. You can always add more colors later but you’ll at least have a solid base to work from.

- If you don’t have an illustration to import, set up your colors as normal, custom colors in the color palette. If you are using spot colors just select the color from the color matching system of your choice, such as TruMatch. If you want to create a process color, type the CMYK values into the color dialog box and name the color. This way, if you want to change any of the colors later, the change can be made universally throughout the document, by editing the definition (CMYK values of the named color).

Setting up Master Pages

Setting up master pages is a way to include elements that will appear in the same location, consistently throughout the document, like grids, gutters, columns, page numbers, headers, footers, and other repetitive graphic elements. It’s good practice to experiment with your master page setups. Make a few variations and place your final text and images into the layout. Format the text and size the images to fit the grid. Once you have a master page set-up that works the best for your design, set up a final document and create the master pages accordingly.

Setting Up Style Sheets

As well as setting up master pages you can also define a style for each text element you’ll be using consistently throughout the document.

For example, this book uses the same header, subheader, text, and caption styles throughout. By defining styles when the document is created and applying those styles as you go, you can save yourself time, both up front and later, if you need to make changes. Say you decide that you want to make all the subheaders 14 pt instead of 16 pt, you can simply edit the style definitions and the changes will be made throughout the document. If you
Master pages usually include repetitive elements that appear in the same place on each document page: consistent grids, page numbers, and columns.

These are the styles that were defined for this book. Each style has its own typeface, size and so on.

Don't use style sheets, you'll have to change all the subheads from 16pts to 14pts individually, which could take hours in a long document.

Also, determine how you would like the words to break at the end of lines in the paragraph. You may not want words to break at all. Or you might specify that no more than two consecutive lines can contain breaks. Or you may want to specify that a single word can't fall on a line by itself (creating a widow). Making these specifications at the beginning of your project can save you time later because you won't have to manually eliminate widows or several word breaks in a row at the ends of lines. Each program lets you set these parameters in a different way. Read the manual of your layout program for the specifics.

Create a Template

A template is a generic file that contains the master page(s), color palette, style definitions and other attributes you intend to use. It can be used as a default to create other documents that require the same specifications. PageMaker, QuarkXPress, and FreeHand allow you to create templates.

When you save a file as a template and close it, it will re-open as an untitled document ready to create a new document in the template format. Templates are created to:

• make it easy to create a series of newsletters, flyers, or ads that share common design elements and production parameters. With templates, you can create files more efficiently and avoid design inconsistencies.
keep your document files to a reasonable length. For example, if you're creating a book like this one, where each chapter is between 10 and 45 pages, you can create and save each chapter as a separate file (to avoid having files that are too large), maintaining a consistent format by starting each chapter from the same template. These smaller, separate files can be run independently through the service bureau's imagesetter and may be easier to troubleshoot.

**Placing and Linking Text and Assigning Styles**

Once you've created the specifications for your document and made a template if needed, decide whether you're going to automatically flow text into your document. You may want the text to import and automatically flow from page to page as linked text, or your design may require text to be placed manually. For magazines and long brochures, for instance, flowing or linking text manually may be preferred, because information will be broken up into short chunks that start at different places on each page. For long documents like books where the tops, bottoms, and widths of text columns are the same from page to page, you'll want to set your program to automatically flow the text. An automatic flow will eliminate your having to manually link the text from one page to the next. For example, this book was set up so that the main body text would flow in the main text columns in the center of the page (sidebars and tips were inserted manually). To do this (using QuarkXPress), linked text boxes were set up on the master pages.

Once you import the text, the styles should be applied. It's easiest if you first select all the text and apply the body copy style (because it's the style for the bulk of the text). From there you can select each instance of a header, subheader, caption, and so on and change it to the appropriate style. If you're creating a series of styles that use some of the same attributes, you can create your first style then base other styles on the first one. For example, if you create a text style that is 10 pt Garamond with 12 pt leading and then create a a subheader style that is 10 pt Garamond with 12 pt leading and all capitals, you can base the subhead style on the text style and only add the all capitals specification to the style. Everything else is already set up. Once your styles are set up and each text element has a specified style the attributes of any style can be edited and applied to the entire document at once. And if you later decide to change the typeface, size, and leading, you only make one change for the base style (the text in this case), and all the styles based on that will change automatically.
Importing and Arranging Images Throughout the Document

Once your document is set up, you should determine how you’re going to import and link your images and illustrations. Both QuarkXPress and PageMaker let you place a low-resolution screen version of your image or illustration into the layout file with the full-resolution image file automatically linked to the layout file. If the original image is not properly linked when you print the file, only the low-resolution screen version will print. Both programs allow you to update the links for the images in your file if the file is moved or if the graphic has been changed since you first placed it.

PageMaker also gives you the option to include the full-resolution image or illustration as part of your file, rather than linking it. PageMaker has a default setting under Preferences (in the File menu) that includes any image smaller than 256K as part of the layout file. (You can make this setting lower or higher depending on what size image you want to automatically include as part of your document.) If you leave the default of 256K, then when you import anything larger than 256K, a dialog box pops up asking if you want to link the image or include it as part of your file.

The advantage of including images as part of your file is that you don’t have to worry about keeping the original image files around and linking, because they’re already part of the file. The disadvantage is that if final images are included, the layout file size increases and becomes more difficult to work with.

Place Repetitive Items on the Paste Board

Now that you know what graphics you’re going to import into your file, and if you’re working in PageMaker you’ve decided whether you were going to include them or link them, it’s time to bring them in.

At this point you should place all repetitive graphic elements onto the pasteboard of your layout program. For example, in this book the icons in the sidebars occur throughout each chapter. When this chapter was set up, the template was opened, then the icons were placed on the pasteboard next to the first spread. As they were needed, they were copied from that location instead of being imported again and again each time they were used.

As you work with each spread, the graphic can be placed onto the pasteboard next to that spread. That way as you work, you can see all the graphics that need to fit into that spread and you can place them as needed.
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FINAL CHECKLIST AND CLEAN-UP

Once you've created the perfect design, you've printed it on your laser printer, it looks great, you show it to the client and get approval. Then you save the file to a disk with what you assume to be the right fonts and images and it's off to the service bureau. A day later the service bureau calls and says they had a PostScript error in your file and it's holding up their other jobs so they're taking it out of the work flow. They can't do any additional trouble-shooting without getting your permission and informing you that there is an extra charge of $25 per hour. But they can't get to it until tomorrow, which blows your deadline for today.

If you haven't been through this scenario before, you're lucky. It's common, even with professionals who take hours to prepare their files. The key is never to take your final file preparation lightly. Don't assume that because you've prepared it carefully and it prints on your laser printer it will output from an imagesetter. Imagesetters have different RIPs (raster image processors), which may react differently to your files than your laser printer did. However, if you take these steps before going to the service bureau, it will make the process less painful:

- Eliminate extras.
- Check and update links to your files.
- Check that the correct page size is selected.
- Check bleeds and gutters.
- Proof copy.
- Line up and adjust all details.
- Set up Imposition if necessary.

Eliminate Extras

Even if you planned your design carefully on paper before creating the digital mechanical on the computer, you probably went through several variations of fonts, styles, colors, and arrangements before deciding on the final layout. In the process, extra colors may have been left in the color palette, type styles left in the style palette, unused elements left on the pasteboard, and unneeded empty pages left within the document. Even if you work very neatly and clean up as you go, it's important to double-check after the file is completed and make sure you have deleted any unnecessary extras.
Delete Unused Fonts

During the design and production stage, there's a good chance you've changed typefaces several times. It's common to accidentally leave spaces or returns that are still specified as the original typeface. You probably won't notice that there are extra fonts included in your document because they don't show up on the laser printer printout. But, when your file goes to the service bureau, if the technician doesn't have all the fonts that are used in the file, a warning will come up when he or she tries to open the document. If this happens, your job goes on hold while the bureau searches for the font or calls you to provide it. QuarkXPress has a built-in utility to show the fonts that are used in your document (Utilities, Font Usage). PageMaker has an Addition under the Utilities menu called "Display Pub Info." Use these utilities in the layout programs to list the fonts in the document. If you see any that shouldn't be there, use the "change" or "search-and-replace" function to find and eliminate them. In drawing programs, you may need to select each block of type and check its specs.

Delete Unused Colors and Check Color Specifications

Delete any extra colors that are not used within your document. For example, if you only plan to print a two-color piece on press, then you need to make sure that only two colors (besides the standard CMYK colors in Quark and Paper, Black, and Registration in PageMaker) appear in the color palette and are used within your document. If you find any extra colors, delete them. When you're deleting unwanted colors, a dialog box may come up to tell you that the color you're deleting is used somewhere within your document. If you didn't mean to use it, track down any objects that were assigned an unwanted color and reassign the color. If you don't, the text or graphic that was specified with that color will default to black unless you assign another color. Search through your document for the element(s) that defaulted to black and specify their color as one of the colors you want to print.

Delete Unused Pages

Delete any extra blank pages in your document. If you're printing only certain pages from a document, you may want to create a new document with only the pages to be printed. This will avoid any confusion with the service bureau outputting blank or incorrect pages. If you don't want to break up the file, make sure that you clearly specify on the service bureau's order form which pages should print. If you don't, they'll charge you for those extra blank pages!
Delete Elements Left on the Pasteboard
When you’re done, delete any extra elements on pages or the pasteboard. If you’re working on a document that someone else created, take extra care to find and eliminate stray elements. Don’t cover items with a white box—even though you can’t see them, the imagesetter still has to process these items. Unfortunately, out of sight isn’t out of mind when you’re preparing files for output.

Check and Update Links to Your Files
It’s important to make sure that you have all your final files linked and in the right format. Even if you’ve moved all your final image files into your Final Folder from, say, a Process Folder, you’ll probably need to update the links. Otherwise, your layout application will still be looking for them in the last place you stored them. If you’re using FPO images either from a Photo CD or a service bureau, or ones you created, make sure you exchange them for the high-resolution files. (Make sure you’ve done all the cropping, scaling, rotating tonal and color correction on the high-res files in your image manipulation program and have selected the correct file format.)

If you’re working in QuarkXPress, you can check the link status by opening the Picture Usage dialog box under the Utilities menu. This box will tell you which images are in the document and whether or not they’re linked. It will also give you the option to relink, if needed. (When you print in Quark, an alert will come up if images are not linked that asks you to relink them.) In PageMaker you can open the Links dialog box under the File menu for all the graphic and linking information. If you want to check individual images, select the image and open the Link Info dialog box under the Elements menu. The dialog box will give you the file location, file type, and date of creation and allow you to relink the image if needed.

Check That the Correct Page Size Is Selected
Sometimes when you’re working with a file that’s too large to output on your laser printer at full size, you may reduce the file dimensions to print it out. Before you send the file to the service bureau, make sure that the pages are at the exact size you want for final output.

Check Bleeds and Gutter
Make sure the bleeds and gutters are set to the printer’s specifications. Usually, bleeds should extend at least 1/8 inch beyond the edge of the page.
If you have images or other graphic elements that cross the gutter between pages, check with your service bureau on how best to set up your file.

**Proof Copy**
Proof the document against the original and then spell-check, search and replace double spaces, spaces before punctuation, and so on. Make sure type was not accidentally deleted or images accidentally moved. After you are satisfied with your proofing effort, make sure your client has proofed and authorized it as final. This is the last opportunity to check copy before the file is sent to the service bureau.

**Line Up and Adjust All Details**
As a final check, proof your document on screen at 400 percent (even higher if your program allows it) so you can view exactly where each element is placed. As you zoom in, proof the elements systematically. For example, if you have lined up five pictures in a row, zoom in and check that each is aligned properly. Then check that all text blocks line up on the correct grid lines, check that colors are specified correctly. Create your own systematic approach. If you proof without a system, you can lose track of what you've checked. Create a checklist that includes the following items for proofing each document:

- Check the kerning or spacing between characters.
- Snap text, lines, and pictures to the grid.
- Make sure that type is not cut off at the end of lines or paragraphs.

**Setting Up Imposition**
Now that you've completed your design and cleaned up the file and you know what size the press sheet will be and how it will be arranged, you, or the service bureau, may be able to impose the pages together the way the printer needs to run them on the press. This will reduce the printer's stripping time and the number of film separations output at the service bureau. If the service bureau does the imposition, you must provide the plate sketch the printer gave you, showing how the pages should be arranged on press. (See Chapter 6, "The Service Bureau as Your Partner," for an example of reader's and printer's spreads.) If you do the imposition, ask the service bureau what the standard film sizes are, and carefully set up the pages using an add-on for your layout program or separate imposition software.
For example, you may be designing an eight-page brochure that’s 14 x 5-inch flat and the printer is printing on a 17 x 24-inch sheet. Knowing this information, ask the service bureau what standard page sizes can be printed on their imagesetter (usually 8 1/2 x 11, 8 1/2 x 14, 11 x 17, 16 x 17, 16 x 20 or 18 x 24 inch). Since they have a film size that’s 18 x 24 inches, you could impose all four spreads (or eight pages) to fit on one piece of film, (which would eliminate the stripping all together). You can do this one of two ways:

- The first way is to set up a page size that’s 18 x 24 inches in your layout or illustration program. Then fit all the different pages of your document onto that page in the way the printer needs it on press. However, there is a drawback to doing it this way. Because the page is larger than what your desktop printer will print out, you need to tile the page (print it in sections) and tape the pieces together to proof the file (unless you use LaserCheck by Systems of Merritt, discussed a little later).

- The second way to impose your files is with an extension for QuarkXPress, an Addition for PageMaker, or a stand-alone imposition program. The advantage of stand-alone programs is they allow you to impose pages from different documents together. But imposition programs are very expensive. The add-ons for QuarkXPress and PageMaker only work with the pages from one document at a time, but the cost is reasonable and they are simple to use.  

**Proofing the Digital Mechanical and Gathering Files**

Now that you’ve built your digital mechanical and double-checked and cleaned-up the file, you want to print it out for you and your client to proof the hard copy. If the document has more than one color you should print separations to check that colors are specified correctly. If you’re really conscientious you may want to use a program called LaserCheck, to print out your files. This program actually simulates the way an imagesetter will react to your file.

Once you print and proof the hard copy and get the client’s approval, gather all the necessary files and put them on a disk. Then print a listing of the contents.
of the disk. Do this by double-clicking on the disk so the window appears displaying the contents of the disk. Then select "Print" from the File menu to print the disk's highlighted window. Next fill out an output request form, either one supplied by the service bureau or one you create yourself.

PRINTING LASER PROOFS AND LASER SEPARATIONS

Always print out a hard copy of your final file for the service bureau. If you have to print the design at a reduced size to fit the entire piece on the page, make sure you note the actual size on the output request form so the service bureau doesn't get confused.

If your piece contains two or more colors, print color separations on your laser printer. (All the major layout and illustration programs allow you to print color separations. Read the manual if you're not sure how to do it within the program you're using.) If your program doesn't have separation ability, you may need to use an independent separation program like Adobe Separator. It's best to print the first separation out on plain white paper and the rest of the colors on acetate designed to be used with laser printers. This way you can stack the color separations, one on top of the other, to form the entire picture. If you notice that one color element doesn't print on the specified color separation, check the color definition and assignment in the document file.

LASERCHECK

Because desktop laser printers don't print the same way imagesetters do, they really can't give you a completely accurate indication of whether your file will output correctly. They really only give you a proof for the service bureau to use for layout comparison, to make sure all elements appear on the page. LaserCheck, created by Systems of Merritt, was developed to show how your file will output.

LaserCheck downloads a software file to your laser printer that tricks the printer into thinking it's your target imagesetter (you select the imagesetter type to match your service bureau's from a list of imagesetter models that includes machines from Varityper, Linotype, Agfa-Compugraphic, Monotype and many others). Then it handles your file in the same way that the specified imagesetter would. The printed output shows crop marks, registration marks, separation information, and file name just the way they will appear on film output. If your file with crop marks is larger than 8 1/2 x 11 inches, it will automatically reduce the printed size so the crop marks and registration
marks can fit on the page. It also reports virtual memory usage, font requests, job name, and amount of time needed to print. If there will be problems with reproducing your file on the selected imagesetter, LaserCheck will report the error, and the documentation will help you eliminate it. If you want the most accurate indication of how your file will print on an imagesetter, this is it. Some service bureaus even give discounts to clients who deliver their electronic files with a LaserCheck proof.

GETTING THE CLIENT'S APPROVAL
Once you output your file and proof it yourself, it's important to have your client review the color proof and approve it by initialing it. (Remember the "Approved Final" stamp created in Chapter 5?) Stamp your proof on the back if there is not room on the front. This will give the client a place to sign.  

GATHERING FILES AND PRINTING LISTS
Now that you have a printout of your final file—either a laser print, laser separations or a LaserCheck proof—and the client's approval, it's time to gather all the files that are part of your job. These include:

- the main file to output
- unusual or custom-made fonts (Most service bureaus have the major type libraries, but in some cases they might not have the fonts used in your design. Legally, fonts with a copyright can't be passed around and are usually limited to use on one printer at at time.)
- images (object-oriented and bitmapped)
- special kerning and hyphen and justification tables or Preference Files (See "Setting Up Styles" earlier in this chapter.)

There are a couple of choices for gathering your files. You can do it manually, use application functions (either built-in or add-ons) or use separate utilities. If you have files in one folder, gathering them will be pretty straightforward. Of course, you still have your fonts to think about. If you've organized your fonts as suggested in Chapter 4, it should be very easy for you to gather them. If not, you could be in for quite a chore.

QuarkXPress has a built-in utility called "Collect for Output." When you select "Collect For Output" under the File menu, QuarkXPress will update all links and place all your files in a folder on your drive. Then you can review the fonts used through the "Font Usage" dialog box under the Windows
menu to determine what fonts are used in your document. (Picture Usage is also available under the Windows menu.) You'll have to write down the names of the fonts because you can't print a copy of the window. Afterwards, you can gather the fonts manually. Still another option is to purchase separate extensions to gather the files for you, including fonts. One such program is Bureau Manager by CompuSense. (Look under XChange in the "Source6s" section at the back of the book for more information.)

PageMaker 5 has a helpful addition, "Display Pub Info," found under the "Additions" menu. It lists the fonts, styles, and linked elements for the file. You also have the option of printing this page to send along with your document when it's output. There is no command in PageMaker that automatically gathers files, but you can buy a separate utility called Checklist from Adobe that will gather all your files including fonts. It will also alert you to any problems with fonts and linked graphics and let you add notes to the file.

OUTPUT REQUEST FORM
You should never send files to the service bureau without an output request form. If you do, you're asking for the job to be shelved and not processed. Your service bureau should be able to supply you with an output request form. If they don't, it's your responsibility to make your own form. The following list explains what you need to include in your output request form. (The back inside cover of this book contains a complete service bureau output request form.)

- **Contact information:** Include your name, address and phone number (evening phone if you need to have the output the next day).

- **Delivery address:** Include the address to deliver final output to.

- **Date and time due:** Specify when the output is due. Be very specific about the time, especially if you need it before the last overnight carrier pick-up, for instance. You may want to call in advance and ask what normal turn-around time is and what rush service is, in case you need it.

- **Files to be printed:** List the files that need to be printed, and indicate the exact name of each file. Also include the number of pages and the page numbers themselves.
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- **Software and version:** Always list the software and the version so the service bureau knows right away what to use to open the file.

- **Page set-up:** Specify the page size, scale of the pages for output, and number of copies.

- **Line screen:** Indicate the line screen value the printer gave you.

- **Imagesetter output resolution:** Specify whether you want film or paper, right-reading emulsion-up or -down, positive or negative, and the resolution: 1,200, 2,400, 3,600 dpi or other. If you select an imagesetter resolution of 1,200 you may get 1,270, depending on the equipment the service bureau uses, or if you ask for 2,400 you may get 2,540. If your piece contains only solid colors 1,200 dpi may be enough, but if you have continuous-tone images or gradations, you'll need to calculate the resolution based on your line screen. (See the table on the inside front cover for Standard Output Resolutions as they relate to line screen.)

- **Trapping:** If you want your file to be trapped, make sure to talk to the service bureau first to see what your options are and what they will cost.

- **Separations:** If your job is printing in more than one color, specify whether you need spot colors, or process (CMYK) separations. If you're using spot colors specify the spot colors that need to be separated.

- **Color proofs from film separation:** If you need color proofs made from your films, make sure you request them. There are basically two types of proofs made from film separations: overlaid or laminated. (Overlays only come in process colors and a few spot colors but may be appropriate if you need to see an exact color match.)

- **Contact proofs:** If you're outputting a one-color job, you may want to get contact proofs from the service bureau. (That way you will have a positive print for the client to approve.)

- **Digital color proofs:** Some vendors offer digital color proofs. Ask to see samples, and ask if you can supply your own paper to test the color.

- **Font usage:** Always list all the fonts used and the manufacturers' names (for example, Adobe, ITC, or others). Most service bureaus will have the main type libraries like ITC and Adobe. It's unlikely, however, that they will have all of the fonts sold by small type houses. Legally, they are required to purchase these fonts before using them. Call your service bureau and ask for a list of fonts they currently own. If your...
service bureau does not have the fonts you need to use, tell them so they can make arrangements to acquire them.

- **Image usage**: Note whether your images require file replacement (FPO versions replaced with high-resolution versions the service bureau scanned in for you earlier in the project) and the format of the images (TIFF, EPS and so on).

- **Files and hard copy included**: Include a printout of the disk contents and a hard copy of the final files. Include laser print separations if your job is made up of more than one color.

- **Number of disks and type, or modem**: List the number of disks and what type they are (floppy, optical, SyQuest and so on). Call ahead of time and make sure the service bureau will accept your transfer disks.

- **Comments**: Include any other special notes regarding your file, turn-around-time, and other pertinent information.

If the service bureau form doesn’t include all of this add your own notes.

**You’re Not Done Until the Piece is Printed**

At this point you may feel like your job is complete. Well, it’s definitely not. Giving your job to the service bureau is only the start of the transition from your desktop to the printed piece. Even if you’ve prepared your files correctly and communicated with the printer and service bureau, things can still go wrong or need to be adjusted or modified at the last stages of the project. It’s important to keep an eye on your project all the way through to the printing stage to avoid hang-ups.

With this in mind, once you get the films and proofs back from the service bureau, thoroughly review them, have the client approve them, and have the printer check that they were run properly.

**CHECK BEFORE YOU ACCEPT SERVICE BUREAU OUTPUT**

Before you accept the films and proofs from the service bureau, take them out and look them over. Don’t sign off until you’ve done so. If you’re at the service bureau ask to use their light table. Check that all design elements (type and images) are present on the film and printed properly. Make sure that the type has not changed to Courier or printed with unusual spaces between letters. Also check that the images have smooth (not jagged) edges and that bitmapped images are not pixelized. Review the color proof for
color. If the colors on the proof look a little dark, have a technician review them with you. Then check the values of the film with a densitometer to ensure that the exposure is correct. Look at the films for spots caused by "stale chemicals." If there are problems, you can give the output back to the service bureau immediately instead of making an extra trip later.

If films and proofs are delivered to you, take a few minutes and look the job over, even if the driver is standing at the door waiting. Make sure the registration is correct and there are no moiré patterns. (If the proof looks out of focus or colors don't line-up, you need to send the films back to be redone at the service bureau.) If you sign off without checking and then realize later that there's a problem, the driver will have to come back to pick them up again, which wastes a lot of time if you're in a hurry. (However, don't be a pest and take 20 minutes to review the delivery. If you're not sure whether the job is all right or not, sign with a note that says something like, "Received but not fully checked." If you're still not sure after further checking, you should show the output to your printer for the final OK.)

GETTING THE CLIENT'S APPROVAL
Again, after you review the films and proofs yourself have the client approve and initial them. (Remember, in the output request form you should have requested an overlay or laminate proof pulled from the films. Even though this adds to the expense it gives the client an accurate color proof to sign off on. Most clients have difficulty reviewing negative films.) Once again, stamp your proof on the back, if there isn't room on the front, with the "Approved Final" stamp discussed in Chapter 5. This will give the client a place to sign.

HAND DELIVER TO THE PRINTER
Once you've checked the film and proofs and the client has approved them, it's time to go to the print shop. Take along:

- the films and color proofs
- the original estimate form
- a Print Request form

The Print Request form should include:

- Colors: Write down or include swatches of any custom colors you've used.
· **How the color prints**: Indicate how the colors are distributed. For example, if you have a cover of a booklet that will only print two colors on the outside and one color on the inside front cover, make sure you tell the printer.

· **Paper Stock**: Write down the paper company, brand and weight.

· **Quantities**: Write down the final quantities you want.

· **Due date**: Write down the due date the client expects to see the final pieces delivered (or a day or two earlier for safety).

· **Blueline required**: Indicate that you want to see a blueline for approval before printing.

· **Press proof required**: If you want a press proof, expect to pay extra unless the cost was built into your original contract. A press proof is expensive because it’s created right on press with the correct inks and paper. They’re usually only used for critical projects with large press runs that can absorb the cost, or if you are unavailable to make an on-site press check, however you require a proof.

· **Press check required**: Indicate whether you want to make a press check. It’s always a good idea to be available as the first pieces come off the press. You know what you ultimately expect of the piece, so you should be there to approve it. A very particular client should also be present at the press check (if possible) and should be the person to approve the job.

It’s always best to make an appointment and deliver the films and proofs to the printer personally if you can. This way, you can review them with the printer, who will know what to look for and can spot problems. Have the printer check:

· **film density**—basically check to make sure that the 10 percent gray box you specified is 10 percent. Sometimes dot gain can occur if the imagesetter is not set up correctly. You’re also checking to make sure the tonal range is compressed to compensate for dot gain. (See Chapter 12, "Image Resolution and Scanning," for more details.)

· whether the dot gain has been adequately compensated for.

· whether the films register properly.

· whether trapping is adequate.
When the printer has checked and approved the films, review the job specifications again and double-check the original estimates. Once everything has been approved, the printer can process your job and prepare to print.

**Proofing the Last Steps**

Once you review the original estimate, films, proofs and Print Request form with the printer, you’re in the last stages of the job. However, you’re not quite done. You still have a few things left to do. You need to proof the blueline and review the job on press (or possibly review a press proof).

**BLUELINE**

Once the films are stripped into flats (see Chapter 7, “The Printer As Your Partner.” for more details) a special kind of material is exposed to create a one-color proof. This material usually results in a blue or brown print. If your project requires binding, the printer folds and trims the blueline to simulate the final bound document. The blueline is the last proof before the printing plates are made.

**ON-PRESS PROOFING**

Whether you’re getting a press proof or you’re present at the press check, it’s important to be very attentive to details (without being a nuisance to the pressperson). There are certain printing problems that can’t be perfectly resolved. For example, if you specified small type in process colors, it’s going to be very difficult to get the process colors to register perfectly in those small type areas. Or if you print on a paper that has inconsistent color, the ink may not look the same from page to page. Many adjustments can be made on press but there are limits, so don’t be too hard on the pressperson. Nevertheless, there are a number of things that you should look for in the press proof and expect the pressperson to be able to compensate for, including making sure:

- the colors are in register. If you created traps or otherwise compensated for misregistration and you check the laminate proof made from the film, the only concern now should be whether the pressperson is getting the plates lined up correctly and the paper running smoothly.

- the ink coverage is consistent. The ink color and coverage should be the same from one end of the sheet to another. Then once the first side of a sheet is run, make sure that the second side also has the same ink coverage.
· the images are retaining their detail. If not, the ink may be getting applied too heavily. Ask the pressperson to ease up on the ink and see if it helps. If not, at this point you either live with dark images or stop the press and get new files (a very expensive proposition)!

If you had films created with FM screens, the color can't really be adjusted on press. So if the images are too dark, making color adjustments at this point will not make much of a difference. If your film was produced with conventional AM screens, it's possible to make color adjustments on press. If there's too much magenta in the skin tones of the photo of the person in your piece, you can have the printer run less magenta ink on press. However, this may affect the color of the other images on the page. Watch the color changes in all the images not just the one you want to adjust. If you're running a lot of black solids on the piece, you may want to increase the black on press. But by bumping up the black, you may make color images too muddy, or fine detail will start to fill in. When it comes to adjusting color on press, you need to look for a happy medium.

When you're checking the press proof, it's best to have the client proofing with you. This way you can go through the details together and make sure he/she is satisfied with what is going to print. At this point, all changes to the text and the design should have been made, so the client should just be approving the fine-tuning that needs to happen on press.

The Job's Not Over Until a Satisfied Client Sends You a Check

Once the specified quantities of the piece are printed, make sure you let the client know when it will be delivered. One to five days will be needed for the piece to dry, then it will be trimmed and sent to a bindery if any special finishing work is required. Make sure the client understands why the piece will not be delivered the day after it's printed!

Once the finished pieces are delivered, ask your client to check each box of printed materials. They should check the samples from the top; middle and bottom of each box. Usually the boxes will be labeled with the number of pieces inside and counting is probably not necessary. But if the client is going to count them, it should be done on delivery, not four months later.

If there were special requirements for the piece that needed to be dealt with on press, the client should make sure the requirements were met in the final printed pieces. For example, if the client ordered 5,000 postcards—2,500
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printed with trade show information on the back and the other 2,500 left blank on the back, it's important to check to make sure that's what was delivered.

Once the client has received printed pieces and is satisfied, review the job from start to finish to gather the information you need to write the invoice. If you kept good records like those suggested in Chapter 5, you should have the original estimate and change orders for any modifications requested by the client or required by the design. With all this information in hand you can calculate the final client invoice. Your invoice should include:

- your name, company name and address. If you want the client to send the check to a different address than what's on your stationery, make sure you say so on the invoice.
- a brief summary of the project and what was delivered. It's always good to summarize what the job was and what was delivered.
- a list of services and the associated costs. Itemize the costs and give a brief description of what each is for, especially if there were change orders during the project that were beyond the scope of the original estimate. This way, if the client has a question about the total cost, offer to review the itemized list so he or she will understand how the total was calculated. If the client was made aware of all changes and cost updates during the project, there should be few questions about the final invoice.
- terms of payment. It's common business practice to expect payment within 30 days of the date on the invoice, and payment on delivery is not uncommon. Some businesses have different payment schedules, which may be up to 60 days. If you have to pay your vendors in 30 days it may be impossible for you accept payment in more than 30, unless you got half of the fee up front from the client. You should have discussed payment schedules with your client earlier during the estimating stage, so your client should not be surprised by the terms of payment that appear on your invoice. (See Chapter 5, "Project Planning and Management," for more details.)

Finally, you should ask the client what he or she thinks about the project and if there is anything that could be done better or differently in the future. If the client makes suggestions, especially if the suggestions relate directly to the printed piece, you should write them down. It's actually a good idea to create a follow-up form for your files that lists all the sugges-
tions that the client makes, as well as any that you may have yourself. This form should include the following:

- client suggestions, criticisms or praises.
- any problems that may have resulted during the job or things that would make it easier next time. These might include problems with the client making too many changes, you not keeping the client up-to-date regularly or the service bureau outputting films that had to be rerun for some reason. Or you may have done your own trapping and then found that the service bureau had to do it over. Document anything that kept the job from running through the process smoothly.
- a description of the changes you would make if you were to do the job again. Mark a sample of the finished piece with the client's and your own comments. If there are design, copy, color corrections, or any other changes that you would like to make the next time the piece is printed, this is a good time to indicate that on the printed piece. Even if you don't expect to be printing the job again, documentation may be useful to review for other similar jobs. It's important to make these comments while they are fresh in your mind.

**Summing Up**

Once a piece is printed, the job reviewed and the client invoiced, you're finished—with that job. In the design and publishing fields, you're never truly finished. There are always new programs to learn, new processes to try, and communication and relationships that have to be established with new clients and vendors. (Don't forget you have to keep up with the old ones too.) It can be daunting to know that your work is never done, but it can also be exciting to think that you're part of the evolution of Mac-based publishing. As you build your digital mechanicals, keep the following in mind:

- Organize your job folders on and off the computer before you begin a project.
- Before you start to design and plan for production, review the project and the design concept that was established when the project was estimated for the first time. This will ensure that you start out on the right foot.
- Plan how you're going to design your piece by creating sketches with the production aspects of the job in mind.
CHAPTER 13: PREPARING THE DIGITAL MECHANICAL

- Always proof your work carefully on and off the computer and explain what the client needs to be checking and approving.

- Once you have the design proof, or comp, in development take it to the printer to get the production details you need to print your piece most successfully.

- Review your design concepts with the service bureau and see if there is any way their operators can help you develop it better.

- Build a digital mechanical in a way that will make production of the job run more smoothly.

- Carefully review, clean up, and proof the final digital mechanical, and make sure that all the necessary files are included before it goes to the service bureau. Don’t wait for the service bureau to tell you there’s problem. Using the output summary and gathering features in your software or using software specifically designed for the task will help. Always remember to include a completed output request form with your files along with a final, approved hard copy.

- Always follow your job through to the finish. Proof at each step of the process. Make sure you see a proof pulled from your films (at least a blueline proof) before the plates are made.

- Make a point of having the client approve each stage of the process. Also make him or her aware of any changes in design and production and how they affect the price. Don’t wait until the job is finished to tell the client what caused a price increase.

- Always follow up with the client after the job is printed and delivered. Make sure the client is satisfied with the results and got everything that was ordered.

- Always review your job when you’re finished and before you write the invoice. Make sure you have all the charges that you need to bill to the client. Also write down any changes that you want to make the next time the job is printed, or for future reference with other projects.
SECTION III
DETAILS OF THE PROCESS

CHAPTER 14
THE WORKING COLOR GALLERY

To this point, the entire process of going from design to production has been described in black and white. In this chapter, a Working Color Gallery has been assembled to illustrate many of the basic color issues and printing concepts presented earlier and to show actual examples of the process and how they were done. The Gallery is divided into three main parts. The first part addresses the basic issues of color models, digital image types, scanning, screening, and trapping. The central part of the Gallery presents a step-by-step description of how the cover of this book was created using desktop hardware and software. The final part presents examples of printed pieces ranging from brochures to posters done on the Macintosh by graphic designers, illustrators, and photographers.
Color

The spectrum (or gamut) of colors that the human eye can perceive is larger than the color gamut projected by TVs and computer monitors or captured by scanners that are based on the RGB color model. RGB is an additive color model that uses the three primary colors of red, green, and blue to create full color. The color gamut that can be reproduced by four-color printing is even more limited and is based on a subtractive color model using the subtractive primary colors of cyan (C), magenta (M) and yellow (Y). When CMY are combined, they can theoretically create black. Because this theory can't be realized in practice, actual black ink (K) is used. To make black appear richer, CMY inks are sometimes printed underneath.

<table>
<thead>
<tr>
<th>CMY black</th>
<th>100% black (K)</th>
</tr>
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<tbody>
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<td></td>
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</tbody>
</table>
Bitmapped images are one of the two main digital image types. They are essentially composed of a grid of picture elements (or pixels) where the location and color of each pixel is known. The greater the number of pixels, the higher the image resolution. Therefore, bitmapped images are resolution dependent. The amount of memory needed to store high-resolution bitmapped images can be very large.

Object-oriented images are resolution independent—created with mathematical instructions so they can be scaled up or down without affecting quality. The top image was scanned at 266 ppi, then converted to an object-oriented image in Adobe Streamline and edited in Adobe Illustrator to reduce the number of control points. Even with the same dimensions and format (EPS), the bitmapped image file is more than five times as large.

Object-oriented images are created using mathematically defined lines and shapes filled with color. The outlines of individual objects can be edited using the control points of Bezier curves that are the basis of most PostScript-type illustration programs. The fewer the number of control points and gradient colors, the smaller the illustration file will be and the faster it will print.
Scanning

The same 4 X 5-inch color transparency was scanned for best results by a drum scanner, Photo CD, and desktop flatbed scanner (with a transparency adapter). The wider dynamic range of the drum scanner provides better detail in dark areas than either the Photo CD or the flatbed scanner.

Screening

The image on the right is a 133 lpi conventional AM halftone screen separated using Adobe Photoshop. The image on the left is a 900 dpi FM screen created with ICCfields by Isis Imaging. Both were processed by the same imagesetter. At a 400 percent blow-up, the halftone pattern of the AM screen becomes visible. The random (stochastic) dot placement of the FM screen, although visible, has less effect on the appearance of the image.
Ways to Avoid Trapping

Trapping is the process of creating strategic overlaps where two colors butt against one another to compensate for misregistration on press. Unfortunately, trapping is not always a simple process. There are ways to design to avoid trapping, including designing without colors that touch, using similar colors, overprinting colors, and using black outlines around colors. Make sure to consult your printer to determine what alternative may be best for you. Examples of each of these methods are shown at the right.

This book was printed on a web press where some misregistration is normally expected. As an experiment, the bug illustration at the right was set up with no trapping. Check to see if it made it through without noticeable misregistration problems.
CHAPTER 14: THE WORKING COLOR GALLERY

When two colors with no common process colors touch, you need to trap. The purple is knocked out to provide a place for the lighter green, which is spread onto the purple.

When a gradation abuts solid color, a trap can be created by placing an object along the edge. Here the green was outlined and set to overprint. Ideally, the trap would "slide" from yellow spreading (bottom) to green spreading (top).

Using process colors to create rich black can require trapping to keep the underlying colors away from the edges where they may become noticeable if misregistration occurs. One way is to outline the rich black object (like the frame shown above) with a 100 percent black outline and set it to overprint. Any misregistration of the underlying process colors would be covered by the overprinting line.

Common Trapping Scenarios

The common trapping scenarios shown at the left are designed to give you an idea of when trapping is needed. (See page 216 for a chart that describes each in more detail.) In the two examples below, trapping can cause problems with type. When too much trapping is applied, the shapes of serif type can become distorted (thick) or not as clear as they should be (thin). The two colors being trapped can sometimes combine to create dark outlines. Always remember to discuss trapping and color selections with your printer before you design.

When two gradations are adjacent it's best to use a sliding trap where the edge object is filled with a gradient of an intermediate color (left). Trapping with a solid color (right) creates an unwanted band. Here again, raster-based trapping software would be the most effective trapping choice.

Colors creating dark traps
Book Cover

Design, Illustration and Production:
Betsy Kopshina
A Design Garden

Prepress:
R.R. Donnelley

Printer:
R.R. Donnelley

Software:
Adobe Photoshop 3.0
Adobe Illustrator 5.5
Adobe Streamline 3.0
Fractal Design Painter 2.0
QuarkXPress 3.1

Hardware:
Quarda 600
40 MB RAM
2 GB Hard Drive
RasterOps 20/20T Monitor
UMAX 630 Scanner

Production Notes

The front cover image for this book was created using desktop software and hardware. The 3-D objects (mouse, keyboard, leaves, and apple) were photographed in-house.

1. The CD, brush and knife were scanned directly on the flatbed scanner. 2. The monitor photo was taken with an ancient Polaroid Land Camera in the studio. 3. The French curve was hand-traced, scanned and retraced using Streamline. 4. The items were individually adjusted in Photoshop and saved as separate layers. A background was created using the lighting controls in Painter and imported into Photoshop. The frame was created using the Border and Contrast controls. Half of the background inside the frame was selected and inverted to get a complementary color to the original background. All the elements were then brought in and repositioned until the final layout was chosen and the layers were "merged." The final illustration was placed into QuarkXPress, where the type was added. The final layout file was saved as an EPS file and was approximately 21 MB in size.

A. Prints from a 35 mm photo were scanned and then lightened using Photoshop (Image, Adjust, Levels).

B. Once enough detail was brought out, the image was outlined using the Pen tool. The outline was saved as a Path 1. The path was then selected (under the Pen dialog box, Make Selection). The selection was inverted (Select, Invert) and the background was deleted.

C. The image was selected (Command A) and inverted (Command I) to create a negative image. Path 1 was then selected from the paths menu, and then Make Selection was chosen from under the Pen dialog box. The selection was inverted again (Command I) and the background deleted.

D. The CD was created like the mouse except it was scanned with a black background so when inverted, the center of the CD was white instead of black.
E. Two flat background colors were created in Photoshop—one for outside the frame (C100, M0, Y47, K47) and one for inside the frame (C100, M0, Y0, K5). Each background was imported into Painter where lighting effects (Effects, Surface Controls, Lighting Effects) were used to create the spotlight effect. A center spotlight was used for both background colors.

F. Once the backgrounds were created, they were imported back into Photoshop. Two masks were created and stored in channels, one each for the french curve and for the monitor. Each channel mask was loaded into the background image (Select, Load Selection) and the brightness and contrast were adjusted to bring the image into the foreground. While the images were still selected, the color was slightly adjusted using the Hue/Saturation dialog box to make the objects stand out from the background color even more.

G. The leaves and the apple were combined in Photoshop by cutting and pasting from one file to another. Color was added with the paint brush to the stem, leaves, and apple. Using the Smudge tool, the apple and the leaves were adjusted to look hand-painted.
SECTION III: PUTTING IT ALL TOGETHER

II. The frame around the inset background was created using Photoshop's Border command (Select, Modify, Border) with a border thickness of 30 pixels. The border was lightened using the brightness and contrast controls. Another border was created inside of the first and lightened as well. The area between the light borders, a border of 10 pixels, was selected and darkened to create the appearance of a frame.

I. Once the frame was created, half the inside image was selected and inverted (Command I). While the image was still selected, the color was adjusted using the Hue/Saturation control (Image, Adjust, Hue/Saturation) until it matched a target color selected from the AGFA Process Color Guide. The color values were checked using Photoshop’s Eyedropper tool.
CHAPTER 14: THE WORKING COLOR GALLERY

J. Layers were created in Photoshop. The green background was placed on the background layer. Then the framed image was placed on layer 1 and the other images were placed onto separate consecutive layers. Each was adjusted, cropped, and the layers were merged. The image was saved as an EPS file.

K. Once the front cover image design was completed, it was saved and copied into a new file for the back cover. The center was created by selecting the framed area and filling the selection with a gradation. Then both images were placed into QuarkXPress, where copy was added and the pages were laid out.
SECTION III: PUTTING IT ALL TOGETHER

Capabilities Brochure

Design Direction:
David Carson
David Carson Design

Design and Production:
Betsy Kopshina
Illustration:
John Weber

Service Bureau
and Printer:
Bordeaux Press

Software:
Adobe Photoshop 2.5
QuarkXPress 3.2

Hardware:
Quadra 800
40 MB RAM
500 MB Hard Drive

Production Notes
This capabilities brochure was designed for a brand-naming consultant and as a paper sample for French Paper. It is 8 1/2 x 11 inches and printed in four-color process inks. Starting from the back of the brochure, each page was 1/2 inch narrower than the one before. The overlaps served as tabs for the topics on each spread. Folding was critical because the different page widths didn't allow for trimming.

The original illustrations, CMYK TIFFs created by John Weber, were shown in full on the back page. 1 Parts of the images were used as design elements throughout the brochure. The partial images were created using overlapping boxes in QuarkXPress with the boxes filled with None. 2 When the boxes containing TIFF images were filled with None, jagged edges occurred when a test was run. To fix this problem, the desired shapes were recreated in Adobe Illustrator and imported into Photoshop as masks. The original images were resized, rotated, and pasted inside. 3 Then the shapes were arranged to match the QuarkXPress layout. The images were saved in CMYK EPS format and dropped into white boxes in the layout. This procedure eliminated the jagged edges in the final piece.
CHAPTER 14: THE WORKING COLOR GALLERY

Production Notes

This cover was designed for Issue 17 of RayGun Magazine and was used to demonstrate Specular Collage for a product promotion. The final cover was 10 x 12 inches and was printed in four-color process inks.

The three images in the upper right were scanned in full size at 300 dpi using a flatbed scanner. The images were adjusted in Photoshop to get rid of a dark cast created by the scanner. Separate masks were created to outline the plane and dog images. The portrait served as the background. The images were imported into Collage, composed, and blended together. Low-resolution proxies of the original high-resolution images were used during design, so it was easy to create several cover options very quickly. Final rendering took less than an hour.

Magazine Cover

Design and Art Direction:
David Carson
David Carson Design
Production:
Betsy Kopshina and Norbert Schulz
Illustration:
Melodie McDaniel (top)
Jason Lamotte (middle)
Dan Conway (bottom)
Software:
Adobe Photoshop 2.5
Specular Collage 2.0
QuarkXPress 3.2
Hardware:
Quadra 800
40 MB RAM
500 MB Hard Drive
Umax UC810 Scanner
Life-Size Posters

Production Notes
These are two of four posters designed for the Student Travel Association (STA), printed in four colors at 40 x 60 inches. The photos were scanned in CMYK Color at 110 dpi in full size (roughly 94 MB for each poster). The images needed to be adequate for multiple uses such as large format output and Digicolor (large format color output). The type channel was duplicated to create a third new channel.

The feathered photo edge was created in Photoshop by making an irregular selection around the edge of the photo. The selection was inverted and feathered (Select, Feather). The feather radius was noted for future images. The outside edge was deleted to create the irregular fuzzy border. The headline type was created in Illustrator, imported into a new channel and inverted (Command I), creating white type with a black background.

The type channel was duplicated to create a second channel. The Gaussian Blur filter was applied. The blurred type channel was duplicated to create a third new channel. The type channel was loaded into the blurred channel and inverted to black, which left a mask that would select the drop shadow only.

This shadow channel was loaded into the CMYK image. The curve dialog box (Image, Adjust, Curves) was used to darken the image in the shadow area. Finally, the type selection was loaded and lightened with the curves command until it had the desired look.

LIFE IS TRAVEL. SO WHEN WOULD YOU LIKE TO START?

LIFE IS

1

LIFE IS

2

LIFE IS

3

WHEN YOU COME TO A FORK IN THE ROAD, TAKE IT
CHAPTER 14: THE WORKING COLOR GALLERY

Production Notes
This booklet cover was designed by Bennett Peji. Design for the International Printing Week. It is a 16-page, 7 x 11-inch booklet printed in six colors (four-color process plus silver and an aqueous coating). The image was photographed in a studio set-up. The transparency was scanned at the service bureau on a Hell 3010 drum scanner and imported into PageMaker as an RGB TIFF (Aldus Preprint was being used so the images could remain in RGB and be converted and separated by Preprint. The image was retouched in Photoshop, and the Mosaic filter was applied to the upper right and lower left corners of the image to create the pixelated look. All text and symbols were created in FreeHand. Trapping requirements were kept to a minimum. Most of the type was either knocked out to white or a 1/2 point stroke was created for the colored type in FreeHand and set to overprint. When the type was brought into PageMaker, trapping was not needed. Because some type was reversed to white out of the image, registration on press had to be watched closely.

Booklet Cover
Design & Production: Bennett Peji and Chakra Kinama
Bennett Peji Design
Photographer: John Schulz
Service Bureau: Laser Express
Printer: Partner Press
Software: Adobe PageMaker 5.0
Adobe FreeHand 3.1
Adobe Photoshop 2.5
Hardware: Mac II Ci
8 MB RAM
330 MB Hard Drive
Organic Coffee Collateral

Production Notes
The collateral material shown below was designed to promote organic coffee. It was printed in two spot colors. The final size of the poster is 11 x 17 inches, the brochure is 8 1/2 x 11 inches, the table tent is 6 x 4 inches, and the bin sign is 3 x 6 inches. The sizes were chosen so all the items would fit onto one press sheet to reduce waste and save the client money.

The illustration was first drawn by hand, then scanned and outlined in Streamline. The streamlined image was opened in Illustrator and the shapes were filled with gradations of the two spot colors. Once the illustration was completed, it was resized and placed into the different formats for each piece. Then the design was approved by the client. The green spot color was converted to cyan and the red-brown spot color to magenta. This was done so the service bureau could run the films out on a Scitex imagesetter (which is designed to output process colors). Because the illustrations were so detailed and had to be resized, the service bureau set up automatic trapping on the Scitex. The printer stripped the films together so all the items would fit on one press sheet. On press, the registration had to be watched carefully because of the high stretch factor of the 100 percent recycled paper that was used.

Design, Illustration and Production:
Betsy Kopishina
A Design Garden

Service Bureau:
Color1

Printer:
Impressions In Ink

Software:
Adobe Illustrator 5.0
Adobe Streamline 2.0
QuarkXPress 3.2

Hardware:
Quadra 800,
40 MB RAM,
500 MB Hard Drive
Wacom Tablet
Umax UC 610 Scanner

Adobe Streamline Z.0
QuarkXPress 1.2
Illustrator: 7 x 4 inch.

Hardware:
Quadra 800,
40 MB RAM,
500 MB Hard Drive
Wacom Tablet
Umax UC 610 Scanner
Production Notes
The example above is a children's book designed and illustrated for Jostens Learning. The book is 16 x 16 inches and was printed in four colors. The illustrations in the book were designed to look like they were created traditionally—not on the computer. The outlines for the images were hand-drawn in black ink, scanned, and the line art was outlined with Streamline. To create the splattered effect giving the illustration a more traditional look, splattered paint was scanned, streamlined and edited in Illustrator.

The book was laid out one spread at a time in Illustrator, because the illustrations were so detailed and their size so large. Most of the work had to be done in artwork mode (black-and-white lines). Scott Ramsey has since upgraded to a PowerMac to increase the speed of his system to keep up with the demands of his work.

Children's Book
Design, Illustration and Production: Scott Ramsey
Scott Ramsey Design
Service Bureau: Laser Express
Printer: Commercial Press
Software: Adobe Illustrator 5.0
Adobe Streamline 2.0
Hardware: BCI
20 MB of RAM
80 MB Harddrive
Umax UC 840 Scanner
Image Manipulation

Production Notes
The illustration was composed for use as a photographer’s portfolio piece and as experimentation. *Bougainvillaea* leaves were arranged on the flatbed scanner. The lid was propped open so the leaves would not be crushed. When the image was scanned it had a neutral gray background and appeared flat. In Photoshop the neutral background was selected with the marque tool. The selection was feathered (Select, Feather). Then the background was altered using the Procedural Blend filter from Kai’s Power Tools (Filter, KPT, KPT Texture Explorer, Procedural Blend). The entire image was then selected and lighted, and the contrast was adjusted (image, adjust, brightness contrast) to compensate for the dull tones that the flatbed scanner had produced.

Composition:
Rick Starkman

Rick Starkman Photography

Software:
Adobe Photoshop 2.5
Kai’s Power Tools 1.0

Hardware:
Quadra 800
40 MB RAM
500 MB Hard Drive
Microtech DEX Scanner
Production Notes

The text of this book was written in WordPerfect using a Quadra 800, or a PowerBook when we were away from the studio. The first complete draft of the text was imported into QuarkXPress and laid out. The book was designed in QuarkXPress where master pages were set up, styles were defined, and a template was created. The typefaces used throughout the book are Matrix and Matrix Script from Emigre.

Each chapter was written in a separate file and handled individually in QuarkXPress. Design consistency was maintained by using the established template. Key words for the Index of the book were selected and organized manually. Index pagination was done using a QuarkXPress Xtension called Bookends by Sonar.

Most of the illustrations were originally created in Illustrator 5.5 as line drawings. Some of the hardware drawings began as outlines from the Image Club CD-ROM. The outlines were filled with gradations to achieve a more three-dimensional look. When finished, each of the illustrations was brought into Photoshop and converted into a bitmapped EPS file. The Noise filter was applied to give them texture.

Once the design was complete, the final negative films for the inside black-and-white pages were output by R.R. Donnelley in Crawfordsville, Indiana, on an Orbotech imagesetter at a line screen of 120 lpi and a resolution of 2,540 dpi. The paper used in printing was Prima Opaque 50 lb. book weight.

The final negative films and off-press proofs for the color section pages were output by R.R. Donnelley in Crawfordsville, Indiana, on a Seitz Raystar imagesetter at a line screen of 133 lpi and a resolution of 3,600 dpi. The paper used in printing was 80 lb. Sterling Web Gloss Coated.

The printer indicated that the expected dot gain was 20 percent in the color section and 25 percent on the black-and-white pages. The images were adjusted using the Levels dialog box in Photoshop to compensate for dot gain. The entire book was printed on a web press by R.R. Donnelley.

Book

Design and Production

APPENDIX

SOURCES

- Book Clubs
- Books and Pamphlets
- Color
- Contributors
- Hardware Companies
- Mail Order Companies
- On-line Services
- Organizations
- Paper Companies
- Periodicals and Newsletters
- Software Companies
- Stock Photography and Clip Art
- Training, Classes, and Conferences
- Type Foundries
The following source list includes all of those who contributed products, services, or artwork to the development of this book. It also includes additional sources of helpful information about online services, organizations, type foundries, mail order companies, and so on. To find where each listing was referenced in the book, see the index under the company name or book title.

**Book Clubs**

**Graphic Design Book Club**

1507 Dana Avenue
Cincinnati, OH 45207
(513) 531-8250

**Oak Knoll Books**

414 Delaware Street
New Castle, DE 19720
(302) 328-7232

**Print (RC Publication)**

3200 Tower Oaks Boulevard
Rockville, MD 20852
(800) 222-2654
(301) 984-3203 Fax

**Books and Pamphlets**

**Business and Legal Forms for Graphic Designers**

Tad Crawford and Eva Doman Bruck
Allworth Press, 1990

*Distributed by:*

North Light Books
1507 Dana Avenue
Cincinnati, OH 45207
(800) 289-0963

**Color Publishing on the Macintosh:**

*From Desktop to Printshop*

Kim & Sunny Bake
201 E. 50th Street
New York, NY 10022
(212) 751-2600

*Designer Photoshop:*

*From Monitor to Printed Page*

Rob Day
201 E. 50th Street
New York, NY 10022
(212) 751-2600

*The Desktop Color Book: A Verbium Guide*

Michael Gosney & Linnea Dayton
MIS: Press, 1994
115 West 18th Street
New York, NY 10011

*Digital Color Prepress Series and PostScript Process Color Guide*

Agfa PrePress Education Resources
P.O. Box 7917
Mt. Prospect, IL 60056-7917
(800) 395-7007
(708) 296-6703

*Electronic Design and Publishing Business Practices*

Liane Sebastian
Allworth Press, 1992

*Distributed by:*

North Light Books
1507 Dana Avenue
Cincinnati, OH 45207
(800) 289-0963
**APPENDIX: SOURCES**

*Four Colors/One Image: Getting Great Color Output with Photoshop, QuarkXPress, and Cachet*

Mattias Nyman
Peachpit Press, Inc., 1993
2414 Sixth Street
Berkeley, CA 94710
(800) 283-9444
(510) 548-5991 Fax

*Graphic Artists Guild Handbook, Pricing and Ethical Guidelines*

Graphic Artists Guild, Inc.
11 West 20th Street
New York, NY 10011
(212) 463-7730
(212) 463-8779 Fax

*The Graphic Artist's Guide to Marketing and Self-Promotion*

Sally Prince Davis
F&W Publications, 1991
Distributed by:
North Light Books
1507 Dana Avenue
Cincinnati, Ohio 45207
(800) 289-0963

*How to Boss Your Fonts Around*

Robin Williams
Peachpit Press, Inc., 1994
2414 Sixth Street
Berkeley, CA 94710
(800) 283-9444
(510) 548-5991 Fax

*How to Start and Run a Successful Graphic Design Studio*

Nat Baker
Art Direction Book Company
10 E 39th Street
New York, NY 10016
(212) 889-6500

*Learning PostScript: A Visual Approach*

Ross Smith
Peachpit Press, Inc.
2414 Sixth Street
Berkeley, CA 94710
(800) 283-9444
(510) 548-5991 Fax

*The Photoshop WOW! Book*

Linnea Dayton & Jack Davis
Peachpit Press, Inc., 1995
2414 Sixth Street
Berkeley, CA 94710
(800) 283-9444
(510) 548-5991 Fax

*Pocket Pal: A Graphic Arts Production Handbook*

International Paper
6400 Poplar Avenue
Memphis, Tennessee 38197
(800) 854-3212
(901) 373-8411 Fax


*PostScript Language Tutorial*

*PostScript Language Design*

Adobe Systems
Addison-Wesley Publishing Company
1 Jacob Way
Reading, MA 01867
(800) 447-2226
(617) 944-3700
(800) 333-3328 Fax
Production Essentials
Adobe Systems (authored by)
Distributed by:
Hayden Books
201 West 103rd Street
Indianapolis, IN 46290
(800) 428-5331 To order from MacMill
(317) 581-3500

Real World FreeHand 4
Olav Kvern
Peachpit Press, Inc., 1994
2414 Sixth Street
Berkeley, CA 94710
(800) 283-9444
(510) 548-5991 Fax

Real World PostScript-Techniques from PostScript Professionals
Edited by Steven F. Roth
Addison-Wesley Publishing Company
1 Jacob Way
Reading, MA 01867
(800) 447-2226
(617) 944-3700
(800) 333-3328 Fax

Real World Scanning and Halftones
David Blatner and Steven F. Roth
Peachpit Press, Inc., 1993
2414 Sixth Street
Berkeley, CA 94710
(800) 283-9444
(510) 548-5991 Fax

The Ultimate Portfolio
Martha Metzdorf
FGW Publications, 1991
Distributed by:
North Light Books
1507 Dana Avenue
Cincinnati, OH 45207
(800) 289-0963

Zap!
Don Sellers
Peachpit Press, Inc., 1994
2414 Sixth Street
Berkeley, CA 94710
(800) 283-9444
(510) 548-5991 Fax

Color
Pantone, Inc.
590 Commerce Boulevard
Carlstad, NJ 07072
(201) 935-5500
(201) 896-0242

Toyo Ink Manufacturing Company Ltd.
3-13, 2-chome Kyobashi
Chuo-ku, Toyko 10
Japan
(81) 3-2722-5721

TruMatch, Inc.
25 West 43rd Street, Suite 802
New York, NY 10036-7402
(212) 302-9100
(212) 302 0890 Fax

Contributors
A Design Garden
703 Stratford Court, Suite 4
Del Mar, CA 92014
(619) 755-3913
(619) 755-4761 Fax

Bennett Peji Design
110 Torey Pines Road, Suite B
La Jolla, CA 92037
(619) 456-8071
<table>
<thead>
<tr>
<th><strong>Conklin Litho</strong></th>
<th><strong>Isis Imaging Corporation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>3739 Sixth Avenue</td>
<td>2505 East Kent Avenue North</td>
</tr>
<tr>
<td>San Diego, CA 92103</td>
<td>Vancouver, BC</td>
</tr>
<tr>
<td>(619) 297-1696</td>
<td>Canada V5S 2H7</td>
</tr>
<tr>
<td>(619) 294-3379 Fax</td>
<td>(604) 323-0033</td>
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<tr>
<td></td>
<td>(604) 325-8406 Fax/Modem</td>
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<th><strong>Commercial Press</strong></th>
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<td>955 Gateway Center Way</td>
<td>2187 Newcastle Avenue, Suite 102</td>
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<tr>
<td>San Diego, CA 92102</td>
<td>Cardiff, CA 92007</td>
</tr>
<tr>
<td>(619) 527-4600</td>
<td>(619) 634-1886</td>
</tr>
<tr>
<td>(619) 527-4670 Fax</td>
<td>(619) 634-0896 Fax</td>
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<tr>
<th><strong>David Carson Design</strong></th>
<th><strong>Rick Starkman Photography</strong></th>
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<tr>
<td>432 F Street, Suite 503</td>
<td>Post Office Box 1366</td>
</tr>
<tr>
<td>San Diego, CA 92101</td>
<td>Solana Beach, CA 92075</td>
</tr>
<tr>
<td>(619) 339-8080</td>
<td>(619) 943-1468</td>
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<td>(619) 339-9393 Fax</td>
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<th><strong>SBK Pictures</strong></th>
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<tr>
<td>400 South Sierra Avenue, Suite 100</td>
<td>711 Montgomery Avenue</td>
</tr>
<tr>
<td>Solana Beach, CA 92075</td>
<td>Narberth, PA 19072</td>
</tr>
<tr>
<td>(800) 545-454</td>
<td>(610) 667-7171</td>
</tr>
<tr>
<td>(619) 794-4044 Fax</td>
<td>(610) 667-5705 Fax</td>
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<th><strong>Elan Organic Coffees, Inc.</strong></th>
<th><strong>Scott Ramsey Design/Illustration</strong></th>
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<td>344 7th Avenue</td>
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<tr>
<td>San Diego, CA 92101</td>
<td>San Diego, CA 92128</td>
</tr>
<tr>
<td>(619) 239-8383</td>
<td>(619) 485-8017</td>
</tr>
<tr>
<td>(619) 239-8384 Fax</td>
<td>(619) 592-9257 Fax</td>
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<th><strong>Image Club Graphics, Inc.</strong></th>
<th><strong>Spitfire Computer Company</strong></th>
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<td>729 24th Avenue South East</td>
<td>12300 Perry Highway, Suite 206F</td>
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<tr>
<td>Calgary, Alberta T2G 5K8</td>
<td>Wexford, PA 15090</td>
</tr>
<tr>
<td>Canada</td>
<td>(412) 934-4774</td>
</tr>
<tr>
<td>(800) 661-9410</td>
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<td>6400 Poplar Avenue</td>
<td>2551 Old Dobbin Drive East</td>
</tr>
<tr>
<td>Memphis, TN 38197</td>
<td>Mobile, AL 36695</td>
</tr>
<tr>
<td>(800) 854-3212</td>
<td>(205) 660-1240</td>
</tr>
<tr>
<td>(901) 373-8411 Fax</td>
<td>(205) 660-7740 Fax</td>
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## Hardware Companies

### Agfa Division of Miles Inc.
200 Ballardvale Street
Wilmington, MA 01887
(508) 658-5600

### Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, CA 95041
(800) 776-2333
(408) 996-1010

### APS Technologies
631 Deramus
P.O. Box 4987
Kansas City, MO 64120-0087
(800) 846-9948
(816) 920-4109 International
(816) 483-3077 Fax

### CalComp
2411 West La Palma Avenue
Anaheim, CA 92801
(714) 821-2000
(714) 821-2832 Fax

### Canon USA
One Canon Plaza
Lake Success, NY 11042-1113
(516) 328-5000

### Eastman Kodak Company
343 State Street
Rochester, NY 14650
(716) 724-4000
(716) 724-9829 Fax

### EFI (Electronics for Imaging, Inc.)
2855 Campus Drive
San Mateo, CA 94403
(800) 245-4565
(415) 286-8600
(415) 286-8686 Fax

### Farallon Computing, Inc.
2470 Mariner Square Loop
Alameda, CA 94501-1010
(510) 814-5000
(510) 814-5023 Fax

### FITS Imaging
8 Rue Remusat
75016 Paris, France
(33) 1-4520-3304
(33) 1-4524-6394

### Hewlett-Packard Company
19091 Pruneridge Avenue
Cupertino, CA 95014
(800) 752-0900

### Heidelberg, USA
355 Valley Drive
Brisbane, CA 94005
(415) 468-6040

### Iomega Corporation
1821 Wes 4000 South
Roy, UT 84067
(800) 456-5522

### IRIS Graphics, Inc.
Six Crosby Drive
Bedford, MA 01730
(617) 275-8777
(617) 275-8590 Fax
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<tr>
<td>Letraset USA, Inc.</td>
<td>40 Eisenhower Drive, Paramus, NJ 07653</td>
<td>(201) 845-6100, (201) 845-5047</td>
<td></td>
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<tr>
<td>Wacom Inc.</td>
<td>501 South East, Columbia Shores Boulevard, Suite 300, Vancouver, Washington 98661</td>
<td>(800) 922-6613</td>
<td></td>
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<tr>
<td>NEC Technologies, Inc.</td>
<td>1414 Massachusetts Avenue, Foxborough, MA 01719</td>
<td>(508) 264-8743</td>
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<tr>
<td>Mail Order Companies</td>
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<tr>
<td>QMS, Inc.</td>
<td>One Magnum Pass, Mobile, AL 36618</td>
<td>(205) 633-4300, (205) 633-4866</td>
<td></td>
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<tr>
<td>APS Technologies, Inc.</td>
<td>6131 Deramus, Kansas City, MO 64120-0087</td>
<td>(800) 233-7550, (816) 920-4109</td>
<td>(816) 483-3077 Fax</td>
</tr>
<tr>
<td>Radius, Inc.</td>
<td>215 Moffett Park Drive, Sunnyvale, CA 94089</td>
<td>(408) 541-6100, (408) 541-6150</td>
<td></td>
</tr>
<tr>
<td>Club Mac</td>
<td>7 Hammond, Irvine, CA 92718</td>
<td>(800) 258-2622</td>
<td></td>
</tr>
<tr>
<td>RasterOps Corporation</td>
<td>2500 Walsh Avenue, Santa Clara, CA 95051</td>
<td>(800) 729-2656, (408) 562-4200</td>
<td>(408) 562-4066 Fax</td>
</tr>
<tr>
<td>Creative Computers' Macmall</td>
<td>2645 Maricopa Street, Torrance, CA 90503-5144</td>
<td>(800) 222-2808, (310) 222-5800</td>
<td>(310) 222-5800 Fax</td>
</tr>
<tr>
<td>Selenium Instruments USA</td>
<td>1130 Ringwood Court, San Jose, CA 95131</td>
<td>(408) 922-5840, (408) 922-5950</td>
<td>(408) 922-5950 Fax</td>
</tr>
<tr>
<td>Global Computer Supply</td>
<td>11 Harbor Park Drive, Port Washington, NY 11050</td>
<td>(800) 8-GLOBAL</td>
<td></td>
</tr>
<tr>
<td>Teaktronix Inc.</td>
<td>P.O Box 1000, Wilsonville, OR 97070</td>
<td>(800) 835-6100, (503) 627-7111, (503) 682-2980</td>
<td></td>
</tr>
<tr>
<td>MaeConnection</td>
<td>14 Mill Street, Marlow, NH 03456</td>
<td>(800) 800-2222, (603) 446-7711, (603) 446-7791</td>
<td>(603) 446-7791 Fax</td>
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Mac's Place
100 Financial Drive
Kalispell, MT 59901
(800) 908-0009
(800) 881-3090 Fax

The Mac Zone
15815 South East 37th Street
Bellevue, WA 98006
(800) 248-0800
(206) 603-2550 Fax

Tiger Direct
One Datran Center, Suite 1500
9100 South Dadeland Boulevard
Miami, FL 33156
(800) 666-2562

Online Services

America Online
8619 Westwood Center Drive
Vienna, VA 22182-2285
(800) 227-6364

CompuServe, Inc.
5000 Arlington Center Boulevard
P.O. Box 20212
Columbus, OH 43220
(614) 457-8600

eWorld
Apple Computer, Inc.
P.O. Box 4493
Bridgeton, MO 63044-9718
(800) 775-4556

Organizations

American Institute of Graphic Arts (AIGA)
National Office
1059 Third Avenue
New York, NY 10021
(212) 752-0813

Association for Development of Electronic Publishing Technique (ADEPT)
360 North Michigan Ave., Suite 1111
Chicago, IL 60601

Adobe Technology Exchange and International Digital Imaging Association
5601 Roanoke Way, Suite 605
Greensboro, NC 27409
(919) 854-5697
(919) 632-0200 Fax

Graphic Arts Guild (GAG)
National Office
11 West 20th Street, 8th Floor
New York, NY 10011
(212) 463-7730
(212) 463-8779 Fax

Graphic Arts Technical Foundation (GATF)
4615 Forbes Avenue
Pittsburgh, PA 15213
(412) 621-6941
(412) 621-3049 Fax

Human Factors and Ergonomics Society
P.O. Box 1369
Santa Monica, CA 90406-1369
(310) 394-1811
(310) 394-2410 Fax
APPENDIX: SOURCES

**International Prepress Association**
552 West 167th Street
South Holland, IL 60473
(708) 596-5110
(708) 596-5112 Fax

**QuarkXPress Users International (QUI)**
P.O. Box 170
Salem, NH 03079
(603) 898-2822
(603) 898-3393

**Paper Companies**

**Ingram Paper**
P.O. Box 60003
City of Industry, CA 91745-0003
(818) 854-5400

**Kirk Paper Company**
7500 Amigos Avenue
Downey, CA 90241
(800) 222-KIRK

**Nationwide Papers**
3100 East 44th Street
Los Angeles, CA 90058
(800) 835-5469

**Spicers Paper Inc.**
12310 East Slauson Avenue
Santa Fe Springs, CA 90670
(310) 698-8199 Extention 3

**Unisource Corporation**
6650 Top Gun Street
San Diego, CA 92121
(800) 621-2222
(619) 452-8222

**Zellerbach**
3131 Newmark Drive
Miamisburg, OH 45352
(800) 367-6323

**Periodicals and Newsletters**

**Adobe Magazine**
(formerly Aldus Magazine)
411 First Avenue South
Seattle, WA 98104
(206) 628-2321

**American Printer**
650 South Clark Street
Chicago, IL 60605-9960
(312) 726-2802
(312) 922-3165 Fax

**Communication Arts**
94306 Sherman Avenue
P.O. Box 94303
Palo Alto, CA 94303
(415) 326-6040

**Computer Graphics World**
Executive and Editorial Offices
10 Tara Boulevard, 5th Floor
Nashua, NH 03062-2801
(603) 835-3161
(603) 831-9497 Fax

**Design Tools Monthly**
2111 30th Street, Suite H
Boulder, CO 80301
(303) 444-6876
(303) 440-3641 Fax
Ask for a free newsletter
<table>
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<tr>
<th>Digital Imaging</th>
<th>Micro Publishing News</th>
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<td>21150 Hawthorne Blvd #104, Torrance, CA 90503</td>
<td>21150 Hawthorne Blvd #104, Torrance, CA 90503</td>
</tr>
<tr>
<td>(310) 371-5787</td>
<td>(310) 371-5787</td>
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<tr>
<td>(310) 342-0849 Fax</td>
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<td>F&amp;W Publications Inc.</td>
<td>355 Lexington Ave, New York, NY 10017</td>
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<tr>
<td>1507 Dana Ave, Cincinnati, OH 45207</td>
<td>(212) 682-0830</td>
</tr>
<tr>
<td>(800) 333-1115</td>
<td></td>
</tr>
<tr>
<td>(513) 531-2222</td>
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<td>PrePress Information Inc.</td>
<td>P.O. Box 5039, Brentwood, TN 37024-9815</td>
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<tr>
<td>12 Burr Rd, Westport, CT 06880</td>
<td>(800) 685-3435 In TN or outside the U.S.</td>
</tr>
<tr>
<td>(203) 227-2357</td>
<td>(615) 377-3322</td>
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<tr>
<td>(203) 454-4962</td>
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<tr>
<td>One Park Ave, New York, NY 10016</td>
<td>P.O. Box 644, Media, PA 19063</td>
</tr>
<tr>
<td>(609) 786-8230</td>
<td>(800) 325-3830</td>
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<td>(610) 565-2480 Outside the U.S.</td>
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<th>MacWorld</th>
<th>Step-By-Step Graphics Magazine and Step-by-Step Electronic Design: The How-To Newsletter for Desktop Designers</th>
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<td>P.O. Box 54529</td>
<td>6000 North Forest Park Dr, Peoria, IL 61614-3592</td>
</tr>
<tr>
<td>Boulder, CO 80322-4529</td>
<td>(800) 255-8800</td>
</tr>
<tr>
<td>(800) 288-6848 Mainland U.S.</td>
<td>(309) 688-8515</td>
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<td>(303) 447-9330 All other locations</td>
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<tr>
<td>950 Tower Ln, 18th Fl, Foster City, CA 94404</td>
<td>866 Second Ave, 3rd Fl, New York, NY 10017</td>
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<tr>
<td>(415) 378-5600</td>
<td>(212) 371-0699</td>
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<td>Radio Technology Publications Inc.</td>
<td>520 Third St, 4th Fl, San Francisco, CA 94107</td>
</tr>
<tr>
<td>6-12-5 Shinjuku-shinjuku-ku, Tokyo 160, Japan</td>
<td>(415) 222-6200</td>
</tr>
<tr>
<td>(81) 3-5269-7180 Fax</td>
<td>(415) 222-6209</td>
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<td>6-12-5 Shinjuku-shinjuku-ku, Tokyo 160, Japan</td>
<td>(415) 222-6200</td>
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<tr>
<td>(81) 3-5269-7180 Fax</td>
<td>(415) 222-6209</td>
</tr>
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</table>
Software Companies
(Only the products discussed in earlier chapters of this book are listed below each software company.)

Alias Research Inc.
(Alias Sketch)
110 Richmond Street East
Toronto, Canada M5C IPI
(800) 447-2542

Adobe Systems, Inc.
(Acrobat, Illustrator, Photoshop,
Premiere, Streamline, Dimensions)
1585 Charleston Road
P.O. Box 7900
Mountain View, CA 94039
(415) 961-4400

Adobe System, Inc.
(formerly Aldus Corporation)
(Gallery Effects, PageMaker, Photostyler,
Texture Maker)
411 First Avenue South
Seattle, WA 98104
(206) 622-5500

Aladdin Systems, Inc.
(Subscript)
Deer Park Center, Suite 23A-171
Aptos, CA 95003
(408) 685-9175

Adobe Developers Cooperative
(formerly Aldus)
(PageMaker Additions and add-ons)
411 First Avenue South
Seattle, WA 98104-2871
(800) 685-3547
(206) 489-3446 Fax

Alsoft
(Masterfugger)
P.O. Box 927
Spring, TX 77383
(800) 257-6381
(713) 353-9868 Fax

Altsys Corporation
(Fontographer, Metamorphosis)
269 West Renner Parkway
Richardson, TX 75080
(214) 680-2060

Andromeda Software
(Series 1 Photography Filters,
Series 2 Three-D Filters)
849 Old Farm Road
Thousand Oaks, CA 91360
(800) 547-0055
(805) 379-409 Fax

Apple Computer Inc.
(System 7.5)
20525 Mariani Avenue
Cupertino, CA 95041
(800) 776-2333
(408) 996-1010

Ares Software Corporation
(Fontmonger, Chameleon)
565 Pilgrim Drive, Suite A
Foster City, CA 94404
(415) 578-9090
(415) 378-8999 Fax

Caere Corporation
(Omnipage)
100 Cooper Court
Los Gatos, California, 95030
(408) 395-7000
(408) 354-2743 Fax
<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Phone Numbers</th>
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<tr>
<td>Casady &amp; Greene, Inc.</td>
<td>22734 Portola Drive, Salinas, CA 93908-1119</td>
<td>(408) 484-9228, (408) 484-9218 Fax</td>
</tr>
<tr>
<td>Central Point, Inc.</td>
<td>15220 N.W. Greenbrier Parkway, Suite 150, Beaverton, OR 97006-5799</td>
<td>(503) 690-8090, (800) 873-7409, (800) 626-277B Fax</td>
</tr>
<tr>
<td>CE Software</td>
<td>1801 Industrial Circle, West Des Moines, IA 50265</td>
<td>(515) 221-1801</td>
</tr>
<tr>
<td>Connectix</td>
<td>2600 Campus Drive, San Mateo, CA 94403</td>
<td>(800) 950-5880, (415) 571-5195</td>
</tr>
<tr>
<td>Dantz Development Corporation</td>
<td>4 Orinda Way, Building C, Orinda, CA 94563</td>
<td>(510) 253-3000</td>
</tr>
<tr>
<td>DayStar Digital, Inc.</td>
<td>5556 Atlanta Highway, Flowery Branch, GA 30542</td>
<td>(800) 962-2077, (404) 967-3018 Fax</td>
</tr>
<tr>
<td>Deneba Software</td>
<td>7400 Southwest 7th Avenue, Miami, FL 33173</td>
<td>(800) 733-6322, (305) 596-5644</td>
</tr>
<tr>
<td>Eastman Kodak Company</td>
<td>343 State Street, Rochester, NY 14650</td>
<td>(716) 724-4000, (716) 724-9829 Fax</td>
</tr>
<tr>
<td>Electronics for Imaging, Inc.</td>
<td>2855 Campus Drive, San Mateo, CA 94403</td>
<td>(800) 285-4565</td>
</tr>
<tr>
<td>Faure Software</td>
<td>975 Walnut Street, Suite 242, Cary, NC 27511</td>
<td>(800) 898-ARTS, (919) 380-9933, (919) 380-0110 Fax</td>
</tr>
<tr>
<td>Fifth Generation Systems</td>
<td>10049 North Reiger Road, Baton Rouge, LA 70809</td>
<td>(800) 441-7234</td>
</tr>
<tr>
<td>Fractal Design Corporation</td>
<td>P.O. Box 2380, Aptos, CA 95001-2380</td>
<td>(800) 297-COOL, (408) 688-8800, (408) 688-8836 Fax</td>
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MACINTOSH DESIGN TO PRODUCTION: THE DEFINITIVE GUIDE
**Frame Technology**  
*FrameMaker*  
1010 Rincon Circle  
San Jose, CA 95131  
(408) 433-3311  
(408) 431-1928 Fax

**FNB Software, Inc.**  
*Hard Disk Tools*  
2040 Polk Street, Suite 215  
San Francisco, CA 94109  
(415) 474-8055  
(415) 775-2125 Fax

**HSC Software**  
*Live Picture*  
6303 Carpinteria Avenue  
Carpinteria, CA 93013  
(805) 556-6200  
(805) 566-6385 Fax

**Isis Imaging Corporation**  
*ICEfields*  
2505 East Kent Avenue North  
Vancouver, BC  
Canada V5S 2H7  
(604) 323-0033  
(604) 325-8406 Fax/Modem

**Island Graphics Corporation**  
*Island Trapper*  
4000 Civic Center Drive  
San Rafael, CA 94903  
(415) 491-1000  
(415) 491-0402 Fax

**Jump Development Corporation**  
*OptiMem*  
1228 Malvern Avenue  
Pittsburgh, PA 15217  
(412) 681-2692  
(412) 681-2163 Fax

**Light Source Inc.**  
*ColorTron, Ojoto*  
17 East Sir Francis Drake Boulevard, Suite 100  
Larkspur, CA 94939  
(800) 231-7226  
(415) 461-8011 Fax

**Maeromedia, Inc.**  
*FreeHand*  
600 Townsend Street  
San Francisco, CA 94103  
(415) 442-0200

**Microsoft Corporation**  
*Microsoft Word, Microsoft Excel*  
One Microsoft Way  
Redmond, WA 98052  
(206) 882-8080  
(800) 426-9400

**Now Software**  
*Now Utilities*  
520 S.W. Harrison Street, Suite 435  
Portland, OR 97201  
(503) 274-2800  
(503) 274-0670 Fax

**Pixar**  
*Typestr*  
1001 West Cutting  
Richmond, CA 94804  
(510) 236-4871  
(510) 236-0388 Fax

**Quark Inc.**  
*QuarkXPress*  
1800 Grant Street  
Denver, CO 80203  
(303) 894-8888  
(303) 894-3999 Fax
APPENDIX: SOURCES

Stock Photography and Clip Art

The Artmaker Company
1420 North Claremont Boulevard *205-D
Claremont, CA 91711
(909) 626-8065
(909) 621-1323 Fax

Artbeats
P.O. Box 709
Myrtle Creek, OR 97457
(503) 863-4429
(503) 863-4547 Fax

The Classic Archives Company
3 West Rocks Road
Norwalk, CT 06851
(203) 847-0930
(203) 845-0679 Fax

Comstock
The Comstock Building
30 Irving Place
New York, NY 10003
(800) 225-2727
(212) 353-8600
(212) 353-3383

DiAMAR Interactive Corporation
600 University Street
1701 One Union Square
Seattle, WA 98101
(800) 2-DIAMAR
(206) 340-5975
(206) 340-1432 Fax

Digital Stock Corporation
400 South Sierra Avenue, Suite 100
Solana Beach, CA 92075
(800) 545-4514
(619) 794-4041 Fax

Dynamic Graphics Inc.
6000 North Forest Park Drive
Peoria, IL 61614-5592
(800) 255-8800
(309) 688-5873 Fax

Edueerp
7484 Trade Street
San Diego, CA 92121
(800) 843-9497

Image Club Graphics, Inc.
729 24th Avenue South East
Calgary, Alberta T2G 5KB
Canada
(800) 661-9410

Index Stock Photography, Inc.
126 Fifth Avenue
New York, NY 10011
(800) 729-7466 NJ
(800) 729-7477 LA

National Archives
(Still Picture Branch)
8601 Adelphi Road
College Park, Maryland, 20740
(301) 713-6660

PhotoDise Inc.
2013 Fourth Avenue, Suite 402
Seattle, Washington 98121
(800) 528-3472
(206) 441-9355
(206) 441-9379 Fax

PhotoPaq
1077 Bridgeport Avenue
Shelton, CT 06484
(800) 222-WEKA
(203) 944-3663 Fax
The Stock Solution
307 West 200 South, #3004
Salt Lake City, UT 84101
(801) 363-9700
(801) 363-9707 Fax

Tony Stone Images Inc.
Chicago, New York,
Los Angeles, Seattle
(800) 234-7880

Seattle Support Group
20420 84th Avenue South
Kent, WA 98032
(800) 995-9777
(206) 395-1484

Training, Conferences,
and Classes

Collins and Lawler Seminars
(Seminar & Exposition)
P.O.Box 4459
Downey, CA 90241
(800) 451-1120

Digital Resources
(System Configuration and Installation)
14545 Friar Street, Suite 106
Van Nuys, CA 91411-2357
(818) 901-4848
(818) 901-4844 Fax

Educorp
(Training and Educational Tapes)
7434 Trade Street
San Diego, CA 92121-2410
(800) 843-9497

Seybold Exhibition
(Conference and Exposition)
SoftBank Expositions
303 Vintage Park Drive, Suite 201
Foster City, CA 94404
(415) 578-6900

MacWorld
(Conference and Exposition)
Mitch Hall and Associates
260 Milton Street
Dedham, MA 02026
(617) 361-8000
(617) 361-3941 MacWorld Information
(617) 361-3389 Fax

Type Foundries

Adobe Systems Inc.
1585 Charleston Road
P.O. Box 7900
Mountain View, CA 94039-7900
(800) 294-1724
(800) 833-6687
(415) 961-4400

Agfa/Compugraphic Division
90 Industrial Way
Wilmington, MA 01887
(800) 424-8973
(508) 658-0200

Alphabets, Inc.
804 Dempster Street
Evanston, IL 60202
(800) 326-type

Autologic, Inc.
1050 Rancho Conejo Boulevard
Thousand Oaks, CA 91320
(805) 498-9611
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512 West Burlington Avenue
La Grange, IL 60525
(708) 352-3800
(708) 579-5902 Fax

Bitstream Inc.
Athenaeum House
215 First Street
Cambridge, MA 02142
(800) 522-font
(617) 497-6222

Casady & Greene, Inc.
22734 Portola Drive
Salinas, CA 93908-1119
(408) 484-9228
(408) 484-9218 Fax

Digital Typeface Corporation
7156 Shady Oak Road
Eden Prairie, MN 55344
(612) 944-6069

Emigré
4475 D Street
Sacramento, CA 95819-2840
(800) 944-9021

FontBank, Inc.
2620 Central Street
Evanston, IL 60201
(708) 328-7370

Font Bureau
18 Tremont Street
Boston, MA 02108-2103
(617) 742-9070

The Font Company Inc.
(see Precision Type)

Fentlhaus Inc.
1375 Kings Highway East
Fairfield, CT 06430
(800) 942-9110
(203) 367-1860 Fax

The FontShop USA
47 West Polk, #100-310
Chicago, IL 60605
(800) type-USA

Fester & Horton
1205 de la Vina Street
Santa Barbara, CA 93101
(805) 962-3964

GarageFonts
703 Stratford Court #4
Del Mar, CA 92014
(619) 755-4761 Fax and phone

Image Club Graphics, Inc.
729 24th Avenue South East
Calgary, Alberta T2G 5KB
Canada
(800) 661-9410

International TypeFounders, Inc.
1915 Hour Hall Road
(215) 584-1011
(215) 584-8859 Fax

ITC (International Typeface Corporation)
866 Second Avenue
New York, NY 10017
(800) 634-9325
(212) 371-0699
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<th>Company</th>
<th>Address</th>
<th>City, State, Zip</th>
<th>Phone Numbers</th>
</tr>
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<tr>
<td>Letraset</td>
<td>40 Eisenhower Drive</td>
<td>Paramus, NJ 07653</td>
<td>(800) 343-8973, (201) 845-6100</td>
</tr>
<tr>
<td>Letter-Perfect</td>
<td>P.O. Box 785</td>
<td>Gig Harbor, WA 98335</td>
<td>(206) 851-5158, (206) 851-1158 Fax</td>
</tr>
<tr>
<td>Linotype-Hell Company</td>
<td>425 Oser Avenue</td>
<td>Hauppauge, NY 11788</td>
<td>(800) 633-1900</td>
</tr>
<tr>
<td>Monotype Typography Inc.</td>
<td>150 South Wacker Drive, Suite 2630</td>
<td>Chicago, IL 60606</td>
<td>(800) 666-6897, (312) 855-1440, (312) 855-9475 Fax</td>
</tr>
<tr>
<td>Olduvai Corporation</td>
<td>9200 Dadeland Boulevard, Suite 725</td>
<td>South Miami, FL 33156</td>
<td>(305) 665-4665</td>
</tr>
<tr>
<td>Phil's Fonts, Inc.</td>
<td>2380 Champlain Street North West</td>
<td>Washington, D.C.</td>
<td>(800) 424-2977, (202) 328-4141</td>
</tr>
<tr>
<td>Precision Type</td>
<td>47 Mall Drive</td>
<td>Commack, NY 11725</td>
<td>(800) 248-3668, (516) 543-5721 Fax</td>
</tr>
<tr>
<td>Richard Beatty Designs</td>
<td>2312 Laurel Park Highway</td>
<td>Hendersonville, NC 28739</td>
<td>(704) 696-8316</td>
</tr>
<tr>
<td>T-26 (Digital Type Foundry)</td>
<td>540 North Lake Shore Drive, Suite 324</td>
<td>Chicago, IL 60611</td>
<td>(312) 670-type</td>
</tr>
<tr>
<td>Tegra Varityper Inc.</td>
<td>II Mount Pleasant Avenue</td>
<td>East Hanover, NJ 07936</td>
<td>(800) 526-0767</td>
</tr>
<tr>
<td>Treacyfaces, Inc.</td>
<td>P.O. Box 26036</td>
<td>West Haven, CT 06516</td>
<td>(203) 389-7037</td>
</tr>
<tr>
<td>U-Design Type Foundry</td>
<td>270 Farmington Avenue</td>
<td>Hartford, CT 06105</td>
<td>(800) 945-3648</td>
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About the Authors

Betsy Kopshina and Norbert Schulz are principles of A Design Garden and a font company, GarageFonts, in Del Mar, California. Betsy Kopshina is a graphic designer and artist with a BFA in Graphic Design from Carnegie Mellon in Pittsburgh and has spent years designing and producing print materials on the Macintosh.

At Giltspur Exhibits in Pittsburgh, Betsy created and managed an in-house graphic design department and produced large format graphics from the desktop as well as printed collateral. Through necessity, and determination, she has developed an understanding of electronic publishing to support her abilities in art, design and photography.

Norbert Schulz is an environmental consultant and has specialized in technical writing for over ten years. His four year association with Betsy Kopshina has led him deeply into the field of Macintosh-based art and communications.
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<td>5.250</td>
<td>52.500</td>
</tr>
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<td>6</td>
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</tr>
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</tr>
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<td>.90625</td>
<td>6.25</td>
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</tr>
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<td>.921875</td>
<td>6.375</td>
<td>63.75</td>
</tr>
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<td>.9375</td>
<td>6.5</td>
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<tr>
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<td>.953125</td>
<td>6.625</td>
<td>66.625</td>
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<td>.96875</td>
<td>6.75</td>
<td>67.5</td>
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<tr>
<td>63/64</td>
<td>.984375</td>
<td>6.875</td>
<td>68.75</td>
</tr>
<tr>
<td>1</td>
<td>1.0</td>
<td>7</td>
<td>70.0</td>
</tr>
</tbody>
</table>

To force quit an application if it freezes press:

- **option (alt)**
- **command (⌘)**
- **escape (esc)**

= FORCE QUIT

To rebuild your desktop (once a month for regular maintenance or when you're having problem hold down):

- **option (alt)**
- **command (⌘)**
- **restart**

= REBUILT DESKTOP

To turn off your extensions (before you install new software or when you're having INIT conflict problems hold down):

- **shift**
- **command (⌘)**

= EXTENSIONS OFF

To zap your PRAM which cleans out corrupt settings in the ROM (this is good to do if you have unusual problems not fixed by rebuilding the desktop hold down):

- **option (alt)**
- **command (⌘)**
- **(alt) + (alt)**

= ZAPPED PRAM

---

**Image Resolution Formula (Based on Amplitude Modulated Screening)**

- **Screen Frequency (lpi) x 2 + Scanning Resolution**
- **Final Image Width / Original Image Width x Screen Frequency x 2 + Scanning Resolution**

**Output Resolution Formula (Based on Amplitude Modulated Screening)**

- **Required Output Resolution (dpi) = Screen Frequency (lpi) x 16**
- **Screen Frequency (lpi) = Required Output Resolution (dpi) / 16**
# Service Bureau Output Request Form

**Date/time** ...........................................  
**Date/time due** .....................................  
**Client** .............................................  
**Fax** .................................................  
**Phone** ...............................................  
**Project/job number** ................................  
**Invoice number** ....................................  
**Will pick-up/call** ..................................  
**Deliver to** .........................................  
**Address** .............................................  

## Payment Specifics

<table>
<thead>
<tr>
<th>Payment Specifics</th>
<th>Items Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ COD</td>
<td>☐ Hard copy supplied</td>
</tr>
<tr>
<td>☐ Bill to account</td>
<td>☐ Disk print supplied</td>
</tr>
<tr>
<td>☐ Resale</td>
<td>☐ Optical</td>
</tr>
<tr>
<td>☐ Taxable</td>
<td>☐ Application</td>
</tr>
<tr>
<td>☐ PLI</td>
<td>☐ Optical</td>
</tr>
<tr>
<td>☐ Fax</td>
<td>☐ Fleppy</td>
</tr>
<tr>
<td>☐ Phone</td>
<td>☐ Floppy</td>
</tr>
<tr>
<td>☐ Must make Fed-ex</td>
<td>☐ Modem</td>
</tr>
<tr>
<td>☐ Normal turn-around</td>
<td></td>
</tr>
</tbody>
</table>

## Job Specifics

- **File name**
- **Software/version**
- **Page Size**
- **% of output**
- **No. of copies**
- **Line screen**
- **Resolution**
- **Film neg**
- **Film pos**
- **Separations (how many?)**
- **Color proof**
- **Contact proof**

## Fonts Used

- **Hard copy proof included**
- **Normal turn-around**

## Images Used

- **Hard copy Printout of images included**

## Comments

- **Overlay**
- **Laminated**
- **Digital**
- **Other**

---

# Print Request Form

**Date/time** ...........................................  
**Date/time due** .....................................  
**Client** .............................................  
**Fax** .................................................  
**Phone** ...............................................  
**Project/job number** ................................  
**Invoice number** ....................................  
**Will pick-up/call** ..................................  
**Deliver to** .........................................  
**Address** .............................................  

## Included

- ☐ Films
- ☐ Color Proof
- ☐ Comp

## Final Print Quantity

- ☐ Blue line
- ☐ Press Proof
- ☐ Press Check

## Colors

- ☐ Process
- ☐ Spot

## Comments

- **Color names:**

## Bindery

- ☐ Saddle stitch
- ☐ Perfect bound
- ☐ Spiral bound
- ☐ Other:

## Final Size

- ☐ Flat
- ☐ Folded
- ☐ Additional:

## Paper

- **Company:**
- **Name:**
- **Weight:**

---
### Service Bureau Output Request Form

**Date/time** | **Project/job number**
---|---
**Date/time due** | **Invoice number**
**Client** | **Will pick-up/call**
**Fax** | **Deliver to**
**Phone** | **Address**

**PAYMENT SPECIFICS**

- [ ] COD
- [ ] Bill to account
- [ ] Resate
- [ ] Taxable

**ITEMS INCLUDED**

- [ ] Hard copy supplied
- [ ] Disk print supplied
- [ ] PLI
- [ ] Optical
- [ ] Happy
- [ ] Modem

- [ ] Must make Fed-ex
- [ ] Normal turn-around

**JOB SPECIFICS**

- **File name**
- **Software/version**
- **Page Size**
- **% of output**
- **No. of copies**
- **Line screen**
- **Resolution**
- **Film neg**
- **Film pos**
- **Separations (how many?)**

**COLORS**

- [ ] Process
- [ ] Spot
- [ ] Black overprints

**FONTS USED**

- [ ] Hard copy printout of fonts included

**IMAGES USED**

- [ ] Hard copy Printout of images included

**COMMENTS**

- [ ] Overlay
- [ ] Laminated
- [ ] Digital
- [ ] Other

---

### Print Request Form

**Date/time** | **Project/job number**
---|---
**Date/time due** | **Invoice number**
**Client** | **Will pick-up/call**
**Fax** | **Deliver to**
**Phone** | **Address**

**INCLUDED**

- [ ] Films
- [ ] Color Proof
- [ ] Comp

**FINAL PRINT QUANTITY**

- [ ] Blueline
- [ ] Press Proof
- [ ] Press Check

**PROOFS REQUIRED**

**COLORS**

- [ ] Process
- [ ] Spot

**BINDERY**

- [ ] Saddlestitch
- [ ] Perfect bound
- [ ] Spiral bound
- [ ] Other

**FINAL SIZE**

- [ ] Flat
- [ ] Folded

**PAPER**

- [ ] Additional

**COMMENTS**

- [ ] Company:
- [ ] Name:
- [ ] Weight:
Macintosh Design to Production

the DEFINITIVE GUIDE

For many electronic publishers, the production process can seem like a trip through the digital Bermuda Triangle. This book will help graphic designers, desktop production artists, photographers, illustrators, and anyone else who wants to produce work effectively on the Macintosh.

YOU'LL LEARN HOW TO:

- Buy the right hardware and software
- Optimize your working environment
- Troubleshoot and keep up to date with the latest technology
- Communicate with clients and vendors
- Prepare and produce files
- Work with service bureaus and printers

Plus step-by-step explanations and examples of the important stages of production

Inside you'll also find a comprehensive listing of additional resources like professional organizations, periodicals, online services, image services, and more.

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Used, Good (uG)