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Packet

A packet is a sequence of binary data. It has a defined format, with some additional bits of information forming a “head” preceding the data, and a “tail” following it. These carry information that the network router needs to know about the packet, including its destination and source. The packets are formed by the controller in the source computer and the data is extracted and reassembled by the controller in the destination computer.

Packets are used in two forms of packet communication:

- Packet broadcasting sends the packet data simultaneously to several remote stations. Each one examines the packet address. Only the recipient downloads the entire packet. The rest ignore it.
- Packet switching networks use routers that direct packets to their destinations.

Pacman

See

Arcade-Style Games

Page Control Keys

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These keys, which appear only on **extended keyboards** , give you one-button control over your document for such actions as **scrolling** up or down, moving your **cursor** to the beginning or end of a document, deleting, and invoking the **Help** feature contained in many programs. Page Control keys are not supported by all applications.

See Also

Cursor; End Key; Extended Keyboards; Help Button; Home Key; Page-Down Key; Page-Up Key; Scroll

Page Description Language

Macs use special programming languages to communicate with output devices, mainly **QuickDraw** and **PostScript** . The latter is the standard for laser printers and high-resolution imagesetters, while the former is the Macintosh's native graphics language and is usually used to communicate with less-expensive inkjet printers. QuickDraw also creates the on-screen image that users see, even if they're working in a PostScript-based drawing or page layout program. PostScript has more functions and can thus produce more complex graphics with greater precision than QuickDraw.

See Also

PostScript; QuickDraw

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Page Down Key

The Page Down key, which appears on extended keyboards, **scrolls** down one screen in the **active window** or open document

See Also

Active Window; Scroll

Page Imposition

See

Prepress

Page Layout

See

Graphic Design

Page Layout Applications

The basic tool of the desktop publisher is the page layout application, which replaces the pasteboard and X-acto knife of old. Using these programs, users create documents that range in size from one to hundreds of pages, incorporating both text and graphics.

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One of the most hotly debated questions in desktop publishing is—and has been for years—which page layout package is the best?

The answer is simple: It depends. All professional page layout packages include certain features, but each implements them differently, so each program is particularly appropriate for some kinds of design and production work. Every designer has a preference, too, and that's what leads to so many friendly arguments. While applications are often marketed by their laundry lists of features, the way they work is often more important than how many different things they can do.

The three most popular page layout applications, as well as their less expensive cousins, all start with a basic metaphor of pages. Each lets users determine the size of the pages in a document, and each allows for customized margins and text areas. **PageMaker** and **QuarkXPress** have virtual pasteboards next to their pages for placing items that aren't needed right away (see the following figure), while **FrameMaker** instead offers extra reference pages where users can store graphics that will be used throughout a document.

Master pages in each application hold elements that will be applied to all the pages in a document. For example, a chapter of a book might have master pages for the first page, the right and left pages, and maybe special pages such as those holding full-page graphics. In **PageMaker** and **FrameMaker**, when a master page is applied to one of a document's body pages, the items from the master page can't be deleted or changed on the body page—the only

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way to change them is to apply a different master page. QuarkXPress allows users to change or remove master page items on body pages.

Rulers in each program help users position items on the page, and PageMaker and QuarkXPress have movable guides (non-printing colored lines) that can be pulled onto pages. For more precision, all three programs let users type in the exact desired position of any element using a **dialog box**, while QuarkXPress and PageMaker also have **floating palettes** where this information can be entered.

All three programs support **style sheets**, which can change the attributes—font, leading, spacing, and indents—of text paragraphs with one click. FrameMaker also offers character-level style sheets, which allow users to change the style of individual words or characters. These are useful, for example, in math texts with lots of characters in a symbol font.

Each program has tools for making rules, different-shaped graphic boxes, and text boxes. QuarkXPress requires that each graphic be located inside a box, while FrameMaker and PageMaker don't. Text, on the other hand, must be inside a box in FrameMaker and QuarkXPress, but PageMaker uses a “window-shade” analogy for text that allows it to be placed directly on the page without drawing a text box first.

Importing graphics files created in other programs is a fundamental part of working with a page layout application. FrameMaker and PageMaker give users the choice of copying the contents of such a file into page layout files or just **referencing** the file, so that both files have to be present to print

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the document. QuarkXPress only allows referencing.

If users don't find the features they need in these programs, PageMaker and QuarkXPress both support **add-on software** that supplies more features. Adobe calls them **Plug-Ins**, and Quark calls them **XTensions**. One thing to keep in mind, however, is that there are many more of these for QuarkXPress than for PageMaker, and FrameMaker doesn't support this concept at all.

In the end, users have to decide which features are most important to them personally and for the projects they'll be working on. For example, PageMaker is popular because it's easy to learn—its **user interface** appeals to novices. It's also been around the longest of the three, and publisher Adobe has a portfolio of other applications that work well with it, such as Photoshop and Illustrator.

QuarkXPress, on the other hand, is commonly thought of as harder to learn, but its users tend to be devoted. Because it was the first page layout package to incorporate solid support for **process** and **spot color**, it's favored among designers of color pieces like magazines and brochures. Book designers like it because it allows many master pages.

FrameMaker, with its built-in **table** and **equation editors**, appeals to publishers of technical, scientific, and mathematical documents. Also, features such as automatic running heads and footers, floating anchored boxes, indexing, and cross-referencing make FrameMaker popular with anyone creating long documents that change constantly, because the program repositions graphics and updates heads, tables of contents, indexes,

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and cross-references automatically.

See Also

Add-On Software; Dialog Boxes; Equation Editors; Floating Palettes; FrameMaker; Master Pages; PageMaker; Plug-Ins; Process Color; QuarkXPress; Referencing; Rulers; Spot Color; Style Sheets; Table Editors; User Interface; XTensions

Page Proofs

See

Desktop Publishing Proofing and Printing

Page Setup Command

If you're using a printer with your computer, the Page Setup command on the **Desktop** gives you access to your printer's options for paper sizes, scaling, page orientation, and more, as shown in the figure (but depending on your particular printer's features). If you have access to multiple printers, each printer may display a different dialog window from the Page Setup command. The Page Setup command shows the options for the printer currently selected in the **Chooser** .

Many programs also enable you to access the Page Setup dialog from within the **File** menu. The **keyboard shortcut** to reach to Page Setup dialog from

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within a number of programs is Shift-F8.

To use the Page Setup command to set your printing options in the Finder, follow these steps:

1. Select Page Setup from the File menu at the Finder level.
2. The Page Setup dialog appears for the currently selected printer in the Chooser.
3. Select the options you require in the dialog box and click OK when complete. The Page Setup dialog box closes and update the current Page Setup options to your new settings.

See Also

Chooser; Desktop; File Menu; Keyboard Shortcut

Page Up Key

The Page Up key, which appears on extended keyboards, **scrolls** up one screen in the **active window** or open document.

See Also

Active Window; Scroll

PageMaker

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When most people think of desktop publishing, they think of PageMaker. It's dominated the DTP world almost since its release, and though it wasn't the first Macintosh **page layout application**, it's been the most influential and certainly the most popular.

Designers have long argued over which is better: **QuarkXPress**'s precision-planning approach to page layout, or PageMaker's on-the-fly approach. Those who favor the latter use PageMaker to create everything from business cards to full-length books. The competition between it and competitors, notably QuarkXPress, over the last several years has resulted in an extremely powerful program that's as easy to use as ever.

Documents in PageMaker start with a blank page. Users arrange margin and column **guides** as they wish, import text, then place it wherever they want by clicking a "loaded" cursor on the page. Unlike QuarkXPress or **FrameMaker**, there's no need to draw a text box before importing text, and graphics work the same way—just import and click on the page to position the graphic.

Earlier versions of PageMaker had only one set of **master pages**, left and right, which meant users had to recreate the layout of many special pages every time they occurred. With that problem remedied in PageMaker 6.0 and later versions, users can create multiple master page spreads in each document. Master pages can be laid out from scratch or based on existing body or master pages in a document. When applied, they don't affect items already on a page, and users have the option to hide master page items on

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individual pages.

Style sheets work the same as in other page layout packages: Users can define styles from scratch, base them on existing styles, import them from other documents, and apply them with a single click on a floating palette.

Like other applications, PageMaker supports add-on software, called **plug-ins**, that supplies additional features. For example, a plug-in called Galley Oops looks for typesetting errors such as multiple spaces, multiple punctuation marks, and mismatched quotes and brackets. Photoshop image-editing plug-ins are also available from within PageMaker, allowing users to modify imported images.

With PageMaker's long-document management features, users can automate some parts of the book composition process.

Automatic indexing is accomplished by placing invisible markers in the text of a publication; when the Index command is invoked, PageMaker scours the publication for markers and compiles an alphabetical list with page numbers. It supports up to three entry levels and can add cross-references automatically.

Tables of contents are generated by listing the style tags that should be included. For example, if chapter titles and first-level headings in each chapter were to be included in a table of contents, style sheets for those elements would contain the "Include in TOC" attribute. When a publication is complete, the "Create TOC" command lists all text tagged with that attribute,

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along with page numbers.

See Also

Add-On Software; FrameMaker; Guides; Master Pages; Page Layout Applications; Plug-Ins; QuarkXPress; Style Sheets

PageMill

See

SiteMill

Paint Applications

Applications designed for working with **bitmapped graphics** are generally referred to as “paint programs,” although the name may be misleading. Probably the great majority of work done with this class of software consists of **scanning** and retouching photos and other existing artwork—but it’s also possible to create fine art on the computer using these programs.

Images created in paint programs are made up of thousands of tiny dots. If the images are scanned, then each dot shows what the scanner “saw” when it looked at the corresponding location on the original. In the case of artwork created from within the paint program, each dot is colored when the user either “paints” over it or uses a **filter** that alters the artwork overall (such

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as lightening it or blurring it).

Images can be scanned by using software that comes with the scanner, or in many cases by “acquiring” the scan—operating the scanner—from within a paint program via **add-on software** .

Once the image is opened in the paint program, it can be retouched, using tools similar to those found in a traditional darkroom—burning and dodging—and many more. For great precision, users can edit images one **pixel** at a time, removing or altering features of the image at will. Paint programs usually offer several methods of adjusting the brightness and contrast of images, as well as adjusting individual colors or gray levels throughout an image or in only one section.

In general, paint programs offer many tools that let users change existing images into new ones, through processes as simple as colorizing or as complicated as completely rearranging the objects in an image. This capability has brought out two legal issues relating to copyrights (how much do you have to change an image before it belongs to you and not the original artist?) and credibility (when it’s so easy to make undetectable changes to a photo, how can anyone trust “photographic evidence”?).

Although paint programs are often used as “digital darkrooms,” artists have taken to the Mac like ducks to water, using this class of software to create everything from collages to “paintings” that can’t be distinguished from their natural-media counterparts. Often used in conjunction with tools like **graphics tablets** and scanners, paint programs offer the ability to paint,

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draw, airbrush, and more—and undo a mistake instantly. Artists can easily save work to go back to later (no brushes to clean and no drying time), add pieces of one work to another, and make dozens of changes to an image very quickly, with the ability to change their minds at any time and go back to a previous stage of a work.

High-resolution color printers, like the **Iris**, allow artists to produce prints of their work on demand, and new frontiers (like the **World Wide Web**) offer digital artists new venues for their work that traditional artists will never be able to penetrate.

For the sake of convenience, paint programs can be placed in three broad groups, although there's a lot of overlap within these. While they can be and often are used to create original artwork, programs like **Photoshop** and **Live Picture** are excellent choices for cleaning up or editing existing images. **Painter** can replace an entire artist's workshop with its faux **natural-media tools**, so it's great for creating original artwork. And **Collage** is a good example of a program that doesn't try to do it all and therefore does one thing very well—it's designed specifically for creating composite images.

Image-editing applications are heavy on selection tools that let users indicate what part of an image they want to change, as well as color-correction controls, sharpening and blurring filters, and other special-effects filters, such as Emboss and Posterize. They typically open and save to a variety of file formats; in fact, Photoshop has often been treated as a fancy file-conversion

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utility.

Artistic painting applications, on the other hand, are filled with features that emulate the artists' tools they replace. Chalk, oil paints, watercolors, scratchboard, charcoal—all are available to users of Painter and PixelPaint Pro, along with infinite variations in brush size, shape, and texture. Pressure-sensitive graphics tablets let artists draw just as they ordinarily would, only the advantages of working in a digital format.

Although some of its features are available in other programs, Collage defines a category all by itself: compositing applications. Collage includes powerful masking tools, and it allows users to treat parts of an artwork as individual objects. It speeds work up by displaying only 72-dpi (screen-resolution) images, so the software doesn't have to redraw high-resolution images every time an object is moved, while the high-resolution images are maintained and saved into the file behind the scenes.

Add-on software for paint programs, like Photoshop **plug-ins**, is what provides much of the power of this class of software. Filters modify an image in countless ways, from sharpening its outlines to turning it into a stereogram by hiding it behind a seemingly random pattern of dots. Some add-ons come with paint programs; others, like the Kai's Power Tools series, are from third-party developers. Some of these add-ons can even be used in **draw programs**.

Lesser-Known Paint Applications The range of paint programs is truly comprehensive, running all the way from \$20 packages that offer basic

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paint tools up to \$1000 programs used to produce the sophisticated graphics we see in national magazines, on TV, and on the World Wide Web.

At the low end of the price range, there's UltraPaint. This \$20 package offers basic color and black and white painting tools, with blended fills, a magic wand tool, masking, editable brushes, and an auto-trace tool. It also incorporates some image manipulation features, like contrast and brightness adjustment and sharpening, and some features only the high-end programs had until recently, like vector drawing tools and layers.

As its name implies, PhotoFix is designed for photo retouching and manipulation. It supports PICT, TIFF, EPS, GIF, and PhotoCD formats, allowing users to sharpen images and adjust their brightness, contrast, and color or gray levels. **Photoshop** plug-ins are supported, but PhotoFix doesn't come with any; other features include a clone tool similar to Photoshop's rubber stamp and the ability to create masks. Its High Quality Printing (HQP) feature optimizes results with low-end inkjet and laser printers by allowing users to calibrate the printers and by dithering color images ahead of time if they're to be printed on black and white printers. An included PhotoFix Browser can scan a disk and create a catalog of all PhotoFix-readable graphics files.

PhotoFlash offers similar features, including the ability to catalog images, but the image-editing tools are less comprehensive—no masking ability, and it doesn't support some of the more powerful Photoshop plug-ins. "DeDust" and "DeScratch" tools are particularly useful for cleaning up scanned images. When searching PhotoFix image catalogs, users can draw a quick

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sketch of the image they want and the program will attempt to find images similar to the sketch.

Designed primarily for manipulating photos, PhotoDeluxe is intended for home and small-office users with scanners. Its filters can distort, sharpen, and scale existing images, and it supports Photoshop plug-ins. Graphics formats supported include Photoshop, GIF, JPEG, TIFF, PICT, EPS, BMP, and PCX. To help out novices, PhotoDeluxe offers templates (like calendars and greeting cards) and step-by-step instructions on how to use its functions.

PixelPaint Pro combines features of Painter and Photoshop, with some of the natural media tools Painter offers (realistic-looking paints, pastels, and so on), brightness and contrast controls, and an innovative “Wet Paint” mode that lets users arrange shapes as they would in a draw program before applying paint effects.

Offering many of the functions of Photoshop for one-sixth the price is ColorIt!, which supports pressure-sensitive graphics tablets and offers less powerful but simpler controls for functions similar to Photoshop's, such as sharpening and adjusting color and gray levels. A convolution editor allows users to design their own filters for applying edge-detection and embossing-style effects.

Canvas and SuperPaint are hybrid programs that offer both paint and draw tools, with SuperPaint concentrating more on the paint side and Canvas more on the draw side.

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See Also

Add-On Software; Bitmapped Images; Collage; Draw Programs; Graphics Tablets; Iris; Live Picture; Natural-Media Tools; Painter; Photoshop; Pixel; Plug-Ins; Scanning; World Wide Web

PAL

PAL (Phase Alternation by Line) is a transmission standard made up of 625 lines— at 25 frames per second. On a computer screen, this translates into an image of 576 x 768 pixels. Note: this is why the **PhotoCD** format is based on images of this size.

PAL is used in Great Britain, Germany, and several other countries. Developed after NTSC, it is similar to that system, the primary difference being the way color information is encoded. This difference results in better quality color from PAL.

The systems are not interchangeable, but it is possible to convert between them. Although **VHS** and other recording and playback formats are available for both NTSC and PAL, you cannot play a PAL VHS tape on an NTSC VHS recorder unless the machine has been designed for that purpose.

See Also

Analog Video; Digital Video; NTSC; QuickTime

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Palo Alto Research Center

See

Xerox PARC

Pantone Matching System

The most popular **spot color** system in use in the United States, the Pantone system offers several selections of colors: Pantone Matching System, Pantone Pastel Color System, Pantone Metallics Color System, Pantone Textile Color System, Pantone Plastics Color System, and Pantone Hexachrome (for six-color printing). Similar in principle to the FocolTone and Toyo color systems, Pantone offers both printed swatchbooks and digital ones accessible through major graphics applications. The system allows designers to choose colors that can be reproduced by single inks (for best results) or converted to CMYK equivalents (usually imperfectly).

See Also

CMYK; Color Matching Systems; FocolTone; Spot Color; Toyo; TruMatch

Panzer General

See

Allied General

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Paper

See

Printing Papers, Types of

Paragraph Return

See

Soft Return

Paragraph Styles

See

Styles in Word Processors

Parameter RAM (PRAM)

See

Circuits, Parts of the Macintosh

PARC

See

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Xerox PARC

Parity

A simple, but relatively old-fashioned method of error checking used in data communications between computers connected via **modems** to the **Internet**.

A parity bit is used by a computer or other device to verify that it has accurately received a byte of information from a remote device. The transmitting computer processes the data bits in a byte of information according to a standard formula, and then sets the parity bit to even, odd, or none, depending on the result of the processing.

The receiving computer processes each byte it receives according to the same formula as the transmitting computer. Then it checks the parity bit to verify that it came up with the same result. If the result is in error, the receiving computer asks the transmitting device to resend.

Parity bits are set using the communications software you use with your modem. There are three possible settings:

1. Odd, which means that an odd number of data bits is always transmitted. If an even number of 1 bit is sent within a byte, the transmitting device adds an additional bit to maintain odd parity. The device on the receiving end then verifies that an odd number has

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been received.

2. Even, which means that the transmitting computer always sends an even number of bits. If an odd number of 1 bits is sent within a byte, an additional bit is added to maintain even parity. The device on the receiving end then verifies that an even number has been received.
3. None (the most common setting), which means no parity bit is sent or received.

Parity checking is a very basic method of error correction, and is no longer widely used for modem communications. Most modem connections now ask you to set the parity to None so that the parity bit is ignored, leaving error identification and correction to higher level protocols within the modem or within the terminal software. Parity is part of the modem protocol settings most often expressed simply as “N-8-1”. This stands for “No parity, 8-bit bytes, one stop bit”.

See Also

Asynchronous Data Transfers; Internet; Local Area Network; Modem; Packets

Parsing

See

Saving a File

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Pascal

Pascal is a highly-structured programming language designed by Dr. Niklaus Wirth at ETH (Eidgenössische Technische Hochschule) in Zürich, Switzerland.

In the early days of the Macintosh, virtually all high-level programming was done in Pascal. Much of the original **Toolbox** was written in Pascal, and the interfaces to most Toolbox routines use Pascal conventions to this day. In fact, all but the most recent volumes of **Inside Macintosh** include code samples in Pascal only. Apple even added some **object-oriented** additions to Pascal to create Object Pascal, in which the first two major versions of **MacApp** were written. However, the reign of Pascal has gradually given way to C and C++.

Pascal was designed to be a teaching language, one that would encourage (and enforce) a systematic discipline in programming style. Pascal is a strongly typed language; a variable of one type cannot be used as another type without an explicit conversion. An integer, for example, cannot be used directly as a **pointer**. As a result, many problems often associated with type conversions are avoided. Pascal also offers *range-checking* on arrays.

This Pascal program prints the words “Hello, World!” ten times:

```
PROGRAM HelloWorld(Input, Output);
```

```
BEGIN
```

```
    FOR index := 1 to 10 DO
```

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BEGIN

Writeln('Hello, World!');

END

END

Pascal is traditionally a **compiled language** , although several interpreted and byte-code versions have been used in the past. Over the years, Pascal has spawned a number of other languages, including Object Pascal, Clascal, and Modula-2.

A fair amount of Macintosh development still takes place using Pascal. Metrowerks includes a Pascal compiler in its **CodeWarrior** integrated development environment (IDE). Other Pascal compilers are available from Language Systems and Symantec, although the Symantec compiler (think Pascal) does not support Power Macintosh development, and no updates are planned.

See Also

C; C++; Compiled Language; Inside Macintosh; Interpreted Language; MacApp; Object-Oriented Programming; Pointer; Toolbox

Paste (Keyboard Shortcut)

To **Paste** an item stored in the **Clipboard** , press ⌘-V. You can paste this item

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for as long as it remains on the Clipboard.

To paste an item, follow these steps:

1. Select an insertion point in your document where you'd like the item pasted. If the item in your clipboard is a file or a folder, the copy will paste in the active window.
2. Press ⌘-V to paste the item currently residing in Clipboard.

See Also

Clipboard; Copy; Keyboard Shortcuts; Paste

Partitioning

See

Logical Volumes

Passive Matrix Displays

The passive matrix display is an economical type of liquid crystal display (LCD) used in lower-end PowerBooks. Passive matrix LCDs create images that are not as sharp as **active matrix displays** and redraw screen images at a slower rate.

See Also

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Active Matrix Displays; PowerBook Displays

Passwords

The password is the key that admits you to an online service, BBS, shared or networked file, or to any other semi-secure computer function. Some hard drive partitioning programs let you set passwords for some or all of the partitions on a drive. Passwords are only as secure as you let them be. If you write your passwords on little yellow stickies next to the computer screen, don't be surprised if your co-workers or family reads your email. The temptation to snoop, though rude and/or illegal, is nearly universal.

It's far safer to choose passwords you can remember, and to not keep them written down. When you choose a password, try to avoid the most obvious ones. It's easy for anyone who wants to get into your files to find out your birthdate, your social security number, the name of your spouse or child... It's much less likely they'd remember the name of your favorite teacher, childhood pet, or grandfather. The safest passwords of all are those which are random combinations of numbers and letters or even non-alphanumeric characters like %&*#. These are, of course, also the hardest ones to remember. To help protect your password, change it often. Don't use the same password for all your accounts, and never use the one you use for your bank card or phone card. That's asking for trouble.

Password Protection

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The requirement that a user enter a password for gaining access to a computer, **network**, or folder. Usually encountered in an environment where others might have access to your computer, such as in an office or school, or when connecting to the **Internet** or **commercial online services**.

That danger is that others might send information out across the Internet using your **certificates** (electronic documents that can be used to identify to others on the Internet that you are really who you say you are).

When you are using a password to get into a site, there are three things to remember:

1. Passwords do not provide security. They protect the site from unauthorized users, but they don't necessarily encrypt transmissions. Just because you've submitted a password to get to a page doesn't mean that the page is secure.
2. Do not use the same password at more than one site. If your password to a particular site on the Internet is somehow compromised, or if you submit a password to an untrustworthy person, your account at all other sites that use the same password are potentially compromised as well. It is especially important not to use the password to an account on a commercial service like **America Online** or **CompuServe** as a password for an Internet site.
3. Do not use passwords that are in the dictionary. Most passwords are

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stored on a host machine in encrypted form. If an intruder gains access to stored passwords, the simple encryption that protects the password is hard for a non-cryptographer to break. It's relatively easy to encrypt an online dictionary using common coding schemes and compare the words in the encrypted dictionary to the stolen encrypted passwords. If the hacker finds a match, your password is known.

See Also

Anonymous FTP; File Transfer Protocol; Internet; Secure Sockets Layer; S-HTTP

Password Security

This **control panel** was introduced with the **PowerBook 5300** series to add password protection security to control access to the PowerBook's **hard disk** and contents.

See Also

Control Panel; Hard Disk; PowerBook

Paste Command

The **Paste** command inserts the contents of the **Clipboard** into your document. If you're pasting text, the text appears at the location of your text cursor. This is ideal for rearranging blocks of text or copying and pasting a

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graphic from one location to another. The Paste command is usually preceded by either the **Copy** or **Cut** command, which places a selected item into the Clipboard to be pasted.

To paste an item from the Clipboard, follow these steps:

1. Place your cursor where you want the previously copied or cut item to appear in your document.
2. Select Paste from the Edit menu or use ⌘-V.
3. The contents of the Clipboard are inserted into your document at the location of your cursor.

See Also

Clipboard; Copy; Cut; Edit Menu

Paste Special Command

This command appears in the Edit menu of a number of applications (such as Microsoft Word and Excel). Many of the applications that use a Paste Special command implement it in a slightly different way. In Microsoft Word, for example, you can use Paste Special after you've copied an item from one document, such as a table of numbers, and you want to paste that information into a different document. By using Paste Special you can keep that pasted information linked back to the original document where it was created. If

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you go back to the original document and change the numbers in the table, they are updated in the new document because the pasted data has been linked back to the original through Paste Special. Microsoft Excel uses Paste Special to paste information between cells and enables you to choose whether to paste the value, formula, formatting, or all of these into the receiving cell. Check your software's manual to see if Paste Special is supported and what its particular features are for your application.

To used Paste Special, follow these steps:

1. Select the item you want to copy.
2. Select Copy from the Edit menu (⌘-C).
3. Switch to the document where you want the copied information to appear and choose Paste Special from the Edit menu. The Paste Special dialog box appears where you choose, from the pop-up list, the document you want the copied information linked to. You then choose to paste the information from another document, or you choose Paste Link to update the current document when any change is made to the original.

See Also

Clipboard; Cut; Edit Menu; Paste

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Pasteboard

Page layout and draw programs for the Mac generally use the metaphor of a page on which graphic elements and text can be placed. To further extend the parallel with traditional paste-up, these programs often also allow items to be placed on the area around the page, called the pasteboard. Items on the pasteboard don't print, but do contribute to the size of the file; it's a handy place to store elements not used in the current incarnation of a document that may be needed later.

Patch

See
MIDI

Pathologically Eclectic Rubbish Lister

See
Perl

Pax Imperia

Pax Imperia originally from Changeling Software (now distributed by Blizzard), is a **strategy game** set in outer space in which your goal is to

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conquer the galaxy. Because the game is so complex, it is a necessity to read through the excessive manual, but the end result will be worth it. Pax Imperia is a great game.

You are in charge of colonizing the galaxy, and conquering those areas that aren't complacent about your arrival. In addition to the strategic government decisions of a game like **SimCity 2000** , you've now also got to take into account the air quality and other standards of living that various forms of alien life need to survive on other worlds. This gets more and more complicated as you realize that, this being is a science fiction game, your "people" may not necessarily be human (This is where knowing the intricate descriptions of different life forms in the manual comes in handy). As with other strategy games, you operate on a budget and are constantly under the threat of potential attack or natural disaster. Pax Imperia is a great diversion and should provide many hours of distraction from earthly life. Pax Imperia II upgrades the graphics and gameplay and broadens the amount of universe available to settle.

See Also

Allied General; Chaos Overlords; Empire Deluxe; Sid Meier's Worlds; Spaceward Ho!; Strategy Games; V for Victory; Warcraft

PC Cards and Slots

PC Cards slots are small external expansion ports in some Macintosh

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PowerBook models, PC-compatible laptops, Apple's Newton, and other devices. The slots hold PC Cards, credit card-sized expansion devices that can contain such functionality as system memory, modems, networking interfaces, and other hardware. You can even buy tiny hard disk drives mounted on PC Cards capable of holding several hundred megabytes of data.

Both cards and slots are also referred to by the term *PCMCIA*, short for Personal Computer Memory Card International Association, the name of the standards group responsible for the PC Card standards. In Macintosh PowerBooks, PC Cards inserted into a slot show up in the Finder in the form of an icon. You eject a PC Card by dragging its icon to the trash, as you do with a floppy disk.

PC Card slots first appeared in Macs in the series 500 PowerBooks as an add-on device, the 3.8-ounce PowerBook PCMCIA Expansion Module (the term "PCMCIA" has since been dropped from the name). The PC Card module replaces the left battery and plugs into the PowerBook with a processor-direct slot connector.

PC Card slots are standard on 5000 series models and in the PowerBook 190 and 190cs. All PowerBooks with PC Card slots can hold up to two cards. The PCMCIA standards groups defines three types of PC Cards that can fit these slots. Type I PC cards are the oldest group, and are used mostly for memory (although they aren't used much today). The most common PC cards are Type II, which are 5 millimeters thick. Type II PC Cards can provide memory, modems, network interface, data acquisition, and other functions. It is quite common

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to find Type II cards that function as both a modem and an Ethernet interface. These dual-purpose cards have two connectors on the slim edge of the card, which sticks out of the PowerBook when the card is inserted.

PowerBooks with PC Card slots can hold one or two Type I or Type II cards. They can also accommodate a single Type III card in the two slots. Type III cards are about twice as thick as Type II cards, and are mostly used for miniature hard disks.

See Also

Expansion Cards; PowerBook 100 Series; PowerBook 500 Series; PowerBook 5000 Series

PC Exchange

This control panel, which now ships with **System 7.5** and higher, enables you to mount and format DOS compatible disks and drives. PC Exchange also enables you to choose how **PC files** are accessed on your Macintosh when you **open** them. If, for example, you are given a PC file, you can designate which Macintosh application opens that file based on the three letter **DOS suffix** it contains.

If you insert a DOS formatted disk into your disk drive, PC Exchange **mounts** the disk as if it were a Macintosh disk, except that the **icon** for the disk has the letters PC on it (sporting a typeface very similar to the one used for IBM's own logo). If you drag a Macintosh file onto a mounted PC disk, PC Exchange

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changes the file's name to match PC naming conventions and adds the necessary three-letter DOS suffix.

To use PC Exchange to open PC documents, follow these steps:

1. Select PC Exchange from the Control Panels submenu on the Apple menu (or System Folder).
2. Click the On radio button to activate PC exchange.
3. The default conversion is displayed. Any PC file with the DOS .txt suffix is opened in Apple's **SimpleText**. To change or remove that preference, click the application in the list and select Change to enter a new application, or click Delete to remove it from the application entirely. To add a new entry, click Add.
4. A new window appears, as shown in the following figure, where you assign the Macintosh application the DOS suffix of the DOS files it opens. To do this, type the three letter DOS suffix in the first field, choose the Macintosh application you want to open the files with in the selection box. Finally, indicate the PC document types that will be recognized by your application. When done, click OK and you're returned to the main PC Exchange window where you see your new selection in the list.
5. Close the PC Exchange Control Panel to activate your selections.

To use PC Exchange to format PC disks, follow these steps:

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1. Insert a Macintosh, PC, or unformatted disk into the disk drive.
2. Select **Erase Disk** from the **Special menu** in the **Finder** .
3. A dialog box displays asking you if you're sure you want to erase the selected disk. There's also a pop-up menu where you can choose to format the disk in either the Macintosh format or the DOS format, as shown in the figure. To format the disk as a PC disk, select DOS 1.4 and click Erase to erase the disk and reinitialize it.

See Also

Disks; DOS Suffix; Erase Disk; Finder; Icon; PC Files; PC Mount; SimpleText; Special Menu; System 7.5

PC Setup Control Panel

This control panel is used by Macintosh models that have Apple's **DOS Compatibility Card** installed. Options for using the PC card are accessed through this control panel.

See Also

DOS Compatibility Card

PCI Bus

See

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Power Macs, PCI Bus

PCI Slots

See

Power Macs, PCI Bus

PCM

PCM (Pulse Code Modulation) is a method for digitally recording sound on magnetic tape. This format is used with some tape formats, most notably Hi-8.

See Also

Hi-8; digital recording; analog recording

PCMCIA

See

PC Cards and Slots

PDS Bus

See

Power Macs, Logic Boards

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Peace Virus

See

MacMag Virus

Peachtree Accounting

A business that has more than a few employees and someone other than the boss keeping the books is ready for a more sophisticated accounting program. Peachtree Accounting fills the bill admirably, both for small businesses that intend to remain small and those that hope to grow.

Like **MYOB** (Mind Your Own Business), Peachtree Accounting for Macintosh (PAM, for short) walks you through the steps of starting up your business accounts. Begin by entering the company information—name, address, tax numbers, type of business (corporation, sole-proprietorship, sub s corporation, and so on) whether you'll use batch posting or real-time posting, and whether your books should be set up on an accrual or cash basis. If you don't know the answer to these questions, the Help button gives you additional information about your options, and there are also message boxes called SmartGuides that appear when you're about to begin a new step. These give you quick explanations of what the program does and how to put the right data into it at that point. Context-sensitive help is available on any of PAM's screens.

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PAM includes a set of templates for various businesses. Choose the one for the business that's most like yours. PAM copies its chart of accounts, and then helps you determine your accounting periods, quarterly or monthly, and the proper dates for the fiscal year. Having done all this, you must now enter beginning balances for all of your accounts. If you're not familiar with standard accounting procedures, this can be tricky. PAM isn't intended for the beginner or the family checking account. A setup checklist helps you make sure you've completed all of the steps, 15 in all.

After completing all the steps, you can finally begin to use the program. File folder tabs and miniature flowcharts give you access to most of the accounting functions. The rest can be opened from menus. Peachtree's payroll system can handle up to 100 employees and can distribute their wages over multiple jobs and multiple expense accounts. As you'd expect, it handles all kinds of payroll taxes and deductions and prints the necessary forms to file for federal, state, and local taxes. Updated tax information can be obtained from Peachtree. You're only entitled to one free tax update, though. After that, there's a charge for the disk. Peachtree also charges for telephone support. New users get 30 days for free, but after that, there's a \$3.00 per minute charge for phone support.

PAM also provides fully customizable forms and reports, although the customization process is far from intuitive. The Form Designer is meant to be used by an object-oriented programmer rather than a graphic artist. You build an image of your form on-screen using text objects, data objects, shape objects, picture objects, and command objects. It's not a task for a novice, and

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probably beyond the capability of the average bookkeeper/receptionist/office jack-of-all-trades. If your business requires many custom forms, consider hiring a consultant to do the programming and to set up your systems.

See Also

Accounting Programs; Financial Software; MYOB (Mind Your Own Business)

PegLeg

See

Crystal Crazy

Pen/Handwriting Devices

Pen input has become a popular solution for specialized needs, but still has many mainstream analysts and users confused about its future. Some people enjoy the convenience; others can't imagine why anyone would want pen input. These devices will never replace the keyboard, but they have an application, along with voice input and bar code readers. If you don't think so, check out what the UPS and Federal Express drivers carry with them (or at least watch the ads on TV.) These pen-input notebooks capture and transmit information for the package tracking system so that the company can tell you precisely where your package is at any given moment. Some systems

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even digitize your signature with time and date stamping.

In conditions such as these, pen input is far better than paper and pencil, but it is impractical for keyboard-based devices. So far, the Windows market has more pen input hardware and software than the Mac market. All Windows systems use single-character recognition software rather than word recognition software. Single character recognition is slower to input and recognize but is ideal for numerical entry purposes.

What can you do with pen input for the Mac? Consider a nurse checking on patients. He or she can write down the vital signs by filling out a series of electronic forms on a tablet. When finished, the nurse plugs the tablet into a docking station, which downloads all the data. Doctors can access each patient's information at their convenience from a computer connected to the system, or via modem. In the business world, a salesman making field calls can fill out an electronic order form and send it back to the office via modem. The form does all the calculations, and with no errors resulting from data re-entry. Shipping can take place within minutes of the form's reception, if necessary.

Pen-based input systems use a graphics tablet or touch screen (as illustrated below) to let you enter data by writing it or drawing it. Generally, they go one step further with software that converts your input into word processor-readable text and neater drawings (redrawing your squiggles into real circles, boxes, and straight lines).

There are currently two popular pen-based systems available to the general

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public (others are developed by vertical markets or specific companies, such as those used by UPS and Federal Express).

- **MacHandwriter.** MacHandwriter is a package that includes a cordless pen, an ADB tablet, and recognition software. This device uses a block printing system to recognize individual characters on a grid. MacHandwriter does not recognize cursive handwriting or entire words, only individual letters. For tasks such as filling out forms, taking sales orders, entering data into medical records, or taking inventory, MacHandwriter often is a better choice than a keyboard. You can also use it as a standard graphics tablet. The MacHandwriter has a street price of \$399.
- **Apple Newton MessagePad 130.** The Apple Newton Message Pad with the Newton Version 2.0 operating system can be used as an alternative input device for the Mac with the use of the Connection Kit. The Connection Kit gives you a direct route into your desktop Mac or PowerBook. The Personal Digital Assistant (PDA) provides a built-in notepad, to-do list, datebook, telephone log, address file, and Pocket Quicken software for financial information storage. The MessagePad 130 provides user-controllable backlighting and increased system memory from earlier versions. You can also receive faxes, pages and email, and connect to the Internet. The Newton Message Pad 130 has a street price of \$799.95

See Also

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Apple Desktop Bus; Graphics Tablets; Keyboards; Mice; Trackballs; Touchpads; Touch Screens

PEP

See

Modem Protocols/Modulation Protocols

Pepsi Generation

See

Sculley, John

Peregrine

See

Prograph

PerfectPartner Card Games

See

Traditional Games, Card Games

Performas

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See

Consumer Models, Macintosh Family

Perl

Perl is an **interpreted** programming language that is well-suited for manipulating text and files. It was developed on the UNIX operating system by Larry Wall at NASA's Jet Propulsion Laboratory. The Macintosh version, MacPerl, was developed by Matthias Neeracher and Tim Endres.

As with many UNIX-based tools, the meaning of the name "Perl" is at the center of a lighthearted dispute. Some claim it is the, "Practical Extraction and Report Language." Others believe it stands for, "Pathologically Eclectic Rubbish Lister." Either way, Perl is a powerful and relatively friendly language that has a tremendous following in the UNIX world, as well as a small but growing following on the Macintosh.

Perl combines the best features of C with the best features of the most commonly used UNIX shells and shell scripting languages. Because it is interpreted, it is generally considered a macro or **scripting** language, rather than a full-fledged programming language, but Perl can handle many tasks much more easily than C and doesn't suffer from the long development cycle of a **compiled language** .

The Perl syntax should look somewhat familiar to anyone who has programmed in C. Perl is very flexible in the syntax that it accepts, which

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makes it very forgiving to the kinds of mistakes that can drive C programmers crazy.

The simple listing prints the phrase “Hello, World!” 10 times:

```
Si = 1;  
while ($1 < 10) {  
    print “Hello, World!\n”;  
} continue {  
    Si++;  
}
```

Perl has excellent string and text-handling capabilities. It is well-suited for search-and-replace operations, as well as data processing applications in which large amounts of textual data need to be boiled down into a few short summaries. Perl includes excellent pattern-matching capabilities as well, so you can search for *patterns* rather than concrete strings (for example, all lines longer than 3 characters and ending in .html).

Because of its strength in handling text and file input and output, Perl is the favored language among many Internet **CGI** programmers. Perl CGIs are especially common on UNIX Web servers, but even Macintosh Webmasters turn to Perl occasionally.

MacPerl adds some Macintosh-specific features to the standard Perl

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distribution, including support for dialogs and Apple events. MacPerl is available on most major online services and Internet archive sites, as well as directly from the distribution directory at <ftp://nic.switch.ch/software/mac/perl> or <ftp://ftp.eunet.ch/software/mac/perl>. The MacPerl Web page is at <http://err.ethz.ch/members/neeri/macintosh/perl.html>.

See Also

C; CGI; Compiled Language; Interpreted Language; Scripting

Permanently Locked Disk, Using

If you have a disk with the **write protect tab** released and the disk drive still won't let you alter the disk's contents, put a small piece of tape or a Post-it over the write protect tab. This should solve the problem. If not, bite the bullet and buy a new disk.

See Also

Locking a Disk

Personal File Sharing

See

Servers/File Server

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Peter and the Wolf

Sergei Prokofiev's classic orchestral fairy tale for children comes to the Mac screen by way of an Oracion CD-ROM, part of the Claris Family Entertainment collection. The artwork is lovely, although the music really needs to be heard through external speakers. This program does a fine job of introducing the story and the instruments in the symphony orchestra. The instruments, and the musical phrases they play, can be studied in depth, with a line of the actual score.

The familiar themes can be played over and over by solo piano or the full orchestra, and the story can be read separately. Of course, the whole production is the centerpiece of the program, from introducing the instruments on stage through the telling of the story against a backdrop of animated characters and scenes. For kids used to Disney-style animation, the very limited movement in the story scenes may be a disappointment. Equally disappointing is the quiz section, which ought to be, but isn't necessarily about the music or the story. Still, it's worthwhile and kids who like music will adore it.

See Also

Juilliard Music Adventure; Kid Music

Peter's Player

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A **QuickTime** player application that is optimized for smooth movie playback. It can load and play a movie from RAM (if there is enough available), and it can adjust the monitor bit-depth for best playback. Amongst other options, Peter's Player displays movies on a black background without a menu bar.

The software is free for personal use and available from many online services.

See Also

CameraMan; MoviePlayer; Movie Play; Multimedia Utilities; QuickTime

Peter Rabbit's Math Garden

The art and music are lovely in this educational game from Mindscape. Beatrix Potter's classic characters, Peter Rabbit, mean old Mr. McGregor, Mrs. Tiggywinkle, and all the rest lead youngsters through various counting and arithmetic activities. The program is rated for ages 4-8, but will appeal most to kids on the younger end of the scale. The activities are scaled at three levels. The most difficult problems are at about a second grade level. This figure shows Jeremy Fisher catching fish.

You must help by clicking the fish that match his baskets while they're nibbling the bait. After he catches a fish, you click the basket to show Jeremy where to put the fish. When the baskets are full, you must solve an equation related to the numbers, such as $5 + 3 > 6$, by putting the correct signs

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in it.

The trickiest part of the game is to catch the falling radishes that are your reward for solving a set of problems. The radishes can be swapped with Peter for plants to put in your on-screen garden. However, they fall very fast, and it's extremely difficult to click them before they disappear. Kids may find this frustrating. This adult did. Without the right number of radishes, you can't plant your garden, but you can always cheat. Pressing Control-R adds radishes to your basket while you're in the garden. This may, however, teach your children a lesson you'd rather they didn't learn.

PGA Tour Golf

People who are serious about golf probably wouldn't be satisfied with any version of the game that involves a mouse instead of a mashie niblick. However, PGA Tour Golf is a fine way to spend a rainy day, and enables you to play against some of the big names in pro golf on courses you've more likely read about than set spiked foot on. You can watch the big-leaguers play, or choose your partner and play a round yourself. But first visit the driving range and the practice tee. After you've mastered the art of clicking the mouse at the split-second to send the ball in a straight line rather than off into the rough, the bunker, or the pond, you're well on your way to the leader board. It's more edutainment than education.

If you're looking for golf tips, check out Sportware's *Golf*. It puts less

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emphasis on play and more on learning the terms, etiquette, and demonstrating the proper stance, grip, swing, and follow through. It also gives information about many well known US golf resorts and suggests tours for the golfer, with play at several interesting courses.

PGA Tour Golf III

PGA Tour Golf III from Electronic Arts is right up there with its main competitor **Links Pro CD for Macintosh** , but lacks the add-on capability of Links. Regardless, if you don't get sick of the three courses offered with PGA, this will keep any golf enthusiast occupied.

Unlike Links, PGA offers you the chance to go head to head with pro golfers like Tom Kite and Fuzzy Zoeller. Like Links Pro CD from Access, the key to PGA is timing your swing to the meter. Instead of being at the bottom of the screen as it is in Links, PGA's meter follows the actual arm of the animated golfer. PGA III's graphics are fully detailed and look as great as those in Links Pro, but the game falls short in the group play aspect. PGA Tour Golf III is not networkable and you have fewer options, and fewer courses, than Links.

See Also

Links Pro CD for Macintosh; Sports Games

P

PG:PRO

See

FutureBASIC

ph Server

A served database of **email** addresses and other personal information about users on a particular **network**, often maintained by educational institutions. “ph” is the name of the software often used to access a ph server. Designed to provide fast access to information held in a database, especially information that changes often, such as names of personnel or students.

See Also

World Wide Web, Searching/Navigating

PhoneNet

A device by Farallon Computing that allows Macs to connect to each other and to printers on LocalTalk networks using telephone-style wire and jacks. Each PhoneNet connector uses standard modular accessories such as extension cables, RJ-11 snap-in plugs, and telephone wall jacks.

See Also

LocalTalk; Network

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Phong Shading, See Rendering

PhotoBubble

A competitor to **QuickTime VR**, PhotoBubble produces navigable panoramic movies containing hotspots that the user can click. Unlike QuickTime VR, which builds parameters from multiple single images taken with a regular wide-angle lens, PhotoBubble stitches together two images taken with a 180-degree fish-eye lens. This has two advantages: it creates a view that covers the entire field (QuickTime VR is limited to about 95 degrees depending upon the lens used to take the images), and it also reduces the number of pictures you have to take. Taking only two pictures, however, might not be a blessing; lighting interior spaces becomes much more difficult with such a wide area to photograph (requiring more lights than you need when using QuickTime VR) and the lens is much more expensive. Also, you have to use a paint program to remove the legs of the tripod from the image (although you also might have to do some of this in QuickTime VR).

Another limitation is that PhotoBubble does not support 3D object movies (movies of objects you can examine from any angle) and the files are generally larger than **QuickTime** movies.

PhotoBubble is scheduled to ship both Macintosh and Windows versions starting at \$500, and will include plug-ins for **Director**. Demos are available from the company Web site.

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PhotoBubble

Price:\$500 and up

Phone:(423) 690-5600

Web: <http://www.usit.net/omniview>

See Also

QuickTime VR; 3D

PhotoCD

Marketed to both desktop publishers and consumers, PhotoCD is an easy and inexpensive way to transfer photographs to compact discs in the form of high-quality color scans.

For consumers, PhotoCD has two advantages over printed photographs: PhotoCD images can be displayed like slide shows on a television, and compact discs don't deteriorate the way printed photos do. For desktop publishers, who use scanned photos anyway, PhotoCD scans are much cheaper than scans done by a service bureau—just a couple dollars apiece—although the jury's still out on whether the quality is the same.

Images stored on PhotoCDs are scanned at five different resolutions, from a tiny preview image to an 18 MB file that can be used for magazine work. Each disc holds about 100 images, scanned either from a roll of film or existing photo prints, and images don't have to be added all at the same time. Processors range from service bureaus to traditional photo processors—like

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the corner drugstore.

When PhotoCDs first came out, not all CD-ROM drives supported their proprietary format. That's changed since then; all drives sold in the last few years read PhotoCDs just fine, and most graphics applications can work directly with PhotoCD files.

See Also

Kodak PhotoCD

PhotoEnhancer

If you have a Kodak DC 40 camera, this software is for you. PhotoEnhancer was designed to address the output of the Kodak Digital 40 camera, but this product from PictureWorks also can be used to treat your images on file. In fact, for smaller tasks that don't require a lot of adjustment, PhotoEnhancer is a good choice.

If no Kodak camera is plugged into a serial input on the capture board, the specific items that address the camera are dimmed, leaving you to explore the other commands and processes. The software has one dedicated Camera menu for Kodak Digital 40 interactions. Here you can view all of the slides in the camera as a series of thumbnails, or move them to the disk. They are in the TIFF format. The camera controls are accessible via the computer. You can use them to snap pictures using the computer as a remote controller and change the setting of the camera (erasing slides, for example, and setting

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other parameters). You also can open the slide table or separate slides from the File menu.

The ToolBox The ToolBox features eight choices: Move Page, Zoom, four selection drawing marquees tools (Rectangular, Polygonal, Lasso and Magic Wand), Sharpen and Blur, and a Lighten and Darken brush. PhotoEnhancer does not apply color. A small floating palette of four brush sizes accompanies the tools.

Selection Menu and Tools Outside of the four selection tools in the ToolBox, there is no separate selection menu.

Layers PhotoEnhancer has no capacity to incorporate layers.

Native Effects Filters Surprisingly, the software has quite a few native filters, and although they are basic and not adjustable, they can be used in normal image manipulation as well as with a camera connected. The filters are listed under the Enhance and Smart Pix menus. Enhance lists Adjust (Negate, Lighten, Darken, and Equalize), Soften, Sharpen, Intensify, and Lighten Shadows. SmartPix, geared towards adjusting light anomalies that effect color in photos, applies the following filters as either Faster or Better: Daylight (Bright or Cloudy), Shadow (Light or Heavy), Inside, Inside Flash, and Fluorescent. These tools also can be used non-DC 40 images.

PhotoEnhancer's best feature is a By Example photo editing dialog that enables you to control the color palettes of the image, as indicated by a visual display of twelve adjustable possibilities. The visual displays can be set for

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Focus, Exposure, Brightness/Contrast, and Color, and can display a spectrum of options, from Fine to Coarse.

Work Modes The software enables you to work in Millions of Colors, Thousands of Colors, 256 Colors or Grays, 16 Grays, or Black and White.

File Save/Load Conventions **JPEG** , **TIFF** , **PICT** (with compression choices of None, Least, Average, and Most), and **EPSF**, as well as the DC 40 native format are addressed.

See Also

Chinon; Digital Still Cameras

PhotoFix

Microspot's PhotoFix is an image processing program dedicated to photo retouching and print output. It features an Image Corrections dialog with a before and after preview of the selected image. You can adjust the RGB mix and the brightness/contrast of the image with sliders. A special Auto setting allows the machine to apply some intelligence on its own. PhotoFix has a Feather/Transparency tool that seamlessly pastes images on images, performing an invisible transition from the border of the pasted graphic to the background. The same dialog has an opaque setting.

The ToolBox The ToolBox is designed with all of the standard Tools, with the exception of a selection arrow. Most of the Tools have associated settings

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dialogs that appear in response to a double-click of the mouse. The Magic Wand can be set to alternate parameters, Light or Color. This is very useful, and adds to PhotoFix's mission as a professional retouching tool.

Selection Menu and Tools The rectangular selector has an interesting list of options in its dialog. Besides custom and Clipboard choices, you can choose Passport Photo, Postcard, or US Letter for constrained sizes.

Layers PhotoFix does not support layers. Selected items are moved with the arrow keys instead of a selection arrow. PhotoFix enables you to separate images into individual RGB layers that can be edited separately and combined back into RGB for archiving.

Native Effects Filters Although PhotoFix doesn't ship with any of its own filters, it accepts **Photoshop** compatible **plug-ins** without a hitch. It also enables you to change plug-in directories without quitting the program, unlike all other software. This is very useful if you need to group your plug-ins in separate folders.

Work Modes PhotoFix addresses RGB, Indexed Color, Grayscale, and Bitmaps.

Other Considerations PhotoFix provides up to 32 levels of undo. The software also contains an extensive browser/cataloging utility to help you find and group your images. The color palette is easier to adjust than in most other software, enabling you to change foreground and background colors with an included picker and slider. PhotoFix ships with a PhotoCD titled "Scenes of France," which is loaded with images you can use and explore.

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PhotoFix also boasts a special Floating Color palette that can save up to sixteen colors for easy access. PhotoFix conveniently locates the zoom and DPI settings on a pop-out menu connected to the viewframe.

HQP is a PhotoFix term that means High Quality Printing, and it is unique to this software. HQP can dither an image to look like 256 grays even though your printer doesn't support grayscale output. Also, it is capable of adjusting the image to fit the requirements of your printer as far as color hue and density. The printers it supports include: StyleWriter, StyleWriter II, ImageWriter, DeskWriter 550c, DeskWriter C, DeskWriter, LaserJet 4ML, StyleWriter 2400.

File Save/Load Conventions PhotoFix saves images as **TIFF** (LZW compressed or uncompressed) and **PICT** (JPEG compressed or uncompressed). When it comes to loading images however, the choices include: PICT PhotoFix, PICT, TIFF, Photoshop, **AIFF**, **Freehand** 3.11 Preview, EPSF, **GIF**, GIF 87 and 89, JPEG, PhotoCD, MacPaint, TIFF PC, PIC, PCX, Quark 3.2, **QuickTime** Movie(s), RIFF, Scitex CT, Sound Edit, Targa, and **BMP**.

PhotoFusion

PhotoFusion is a product normally targeted at videographic producers, but because the software can be used for quality image compositing, it has uses for the artist/photographer and animator as well. PhotoFusion works with the technology called *blue/green screen compositing*, the same technology

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that Hollywood has used for years to make Superman and spaceships fly across impossible background scenes, along with many other special effects uses.

PhotoFusion is an Adobe **Photoshop** Acquire module, and its hardware key must be plugged in for it to operate. PhotoFusion is a resolution independent module that takes over after it is accessed in Photoshop, and then sends its results back to Photoshop for image saving. Images are loaded into PhotoFusion, and then saved to Photoshop.

The Process

- First, selected images are photographed against a greenscreen or bluescreen background, scanned into your system, and saved to disk. You also can cut imagery out of paper and, using either the green or blue colorcards provided, scan the desired images.
- Next, open PhotoFusion and add a foreground and background image. Backgrounds must be equal to or greater than the size of the foreground imagery. A sample is then taken of the background color. Multiple samples can be taken in any order desired. PhotoFusion then creates a grayscale linear mask (an **alpha channel**) of the data, with areas darker than whiter ones in the composite.
- Preview the composited image. Save it to Photoshop for final saving or other image processing. There are several options for saving the picture and the newly created mask back to Photoshop.

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Complete control over the density of both the foreground and background masks is offered in PhotoFusion, leading to explorations of multiple transparencies and fog effects. Animators can use this process to composite image sequences behind the foreground plane. Digital photographers especially will like the quality of the composites that are generated without having to use the Magic Wand tool. Animators who have a video capture card in their systems can use a video camera to shoot against a PhotoFusion legal color greenscreen or bluescreen. This footage, saved as numbered PICT frames, then enables animated foregrounds over animated or still backgrounds.

Other Considerations You are advised to use the PhotoFusion suggested blue or green colors as the drop out colors. To this end, the software includes a card listing three companies that manufacture the required blue and green color paint or cloth that PhotoFusion users can employ in the chroma keying process.

File Save/Load Conventions PhotoFusion saves images as RGB files to Photoshop. If you want to bring them into PhotoFusion again, they must be saved as Photoshop 2.0 or 2.5 images from within Photoshop. You can view the four associated PhotoFusion image layers at anytime (foreground, background, Alpha mask, Composited Result).

Photomechanical Process

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See
Prepress

Photoshop

Adobe's Photoshop is the image editing software that everyone else tries to emulate. Although it may lack some of the tools and tricks that other competitive packages have and allow, it remains the most widely used image editing software in the world. Photoshop has set the standard for image editing interface design, the standardization of the tool set, and the way that it can be depended on to produce files that are ready for professional printing applications. It is also the central application that plug-in developers write for most, so that other software that uses plug-ins usually has to be Photoshop compatible. Although Photoshop prefers to leave the vector image creation and manipulation to its sister software, Illustrator, it does have a full complement of vector (path) creation and editing tools.

For the professional, it's not a question of whether or not you should own Photoshop or another package, but what other software you may want in addition to Photoshop. Adobe's Photoshop remains the standard against which competing software, in fact all image dedicated software, is judged.

The Toolbox Photoshop's Toolbox contains both selection and painting options. Headed by three selection tools and a move operator, plus the ubiquitous "hand" for moving the page, the balance of the tools are used for

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image retouching and creation. A zooming feature is accessed by the standard magnifying glass option. Next comes Flood Fill, Line, Gradient Fill, the Color Picker Eyedropper, Eraser, pencil, Airbrush, Brush, Stamper, Cloning, Smudge, Focus, and Toning. The bottom of the Toolbox features the Foreground/background color swatches, standard screen mode and the masking screen mode. At the very bottom are the toggles for zooming the work area. You may think that there's nothing too special about these tools because Adobe has made them the standard expectation over the years, but all of them are able to interact with the image to produce quality transformations. Double-clicking on the icons in the Toolbox brings up the options and brushes dialog where finer control over the tools parameters can be set.

Selection Menu and Tools Work on an imported graphic can be accomplished in two ways: globally or on a selected area. Selection options therefore become very important for image editing. Photoshop has limited area selection brushes: an oval/rectangle selector and a freehand selector. The freehand selection tool may be constrained to draw a straight-edged polygon if the Option key is held down while it is being used.

The selection menu contains items that interact with the area of the graphic outlined by the selection tools. You can select All (the whole picture), None (turns off all selections), or Inverse (inverts the selected area with the rest of the picture). The inverse option is important when retouching a graphic because it's often easier to outline the inverse selection and then to use this menu option than to operate in the opposite fashion. "Float Controls" brings

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up the dialog that allows you to control the opacity and blending of the floating selection or the composited layer; it's vital when creating collages and composites. "Color Range" is another unique Photoshop selection feature, allowing you to select areas of the image by color and tone for selection and masking. Feathering and other modification choices allow for the incremental adjustment of the selected image area. The marquee that surrounds an area can also be toggled on or off, and the selection can be saved and loaded later as a separate graphic.

Layers A separate dialog is dedicated to Layers, Channels, and Paths. Layers are separate graphic elements, and they may be composited and combined in a myriad of ways to attain a new graphic using the Float Controls dialog. Channels refer to the color separation of the graphic. In RGB mode, the Channels represent RGB and then R, G, and B separately. Any channel or group of channels can be toggled on and off for specific image manipulation operations, and then switched back on. DTP users will want to work in the CMYK channel mode. Paths are the most important connection selection process in Photoshop, greatly expanding the potential variety of the selection tools, and adding the capacity to incorporate vector graphics inside Photoshop. The paths section of the layers-Channels-Paths dialog is where these operations are centered. Here, an area selection on-screen can be transformed into a Path and adjusted to fit any desired shape, something not possible with the selection tools alone. This is all done with Bézier curve pen tools that create, add to, delete, and move points on the selection. The Photoshop manual contains excellent tutorials that walk you through the

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process. Selections can be interchanged with paths, edited, and turned back into selections.

Native Effects Filters Photoshop features a good number of its own special effects and other filters, even without considering the hundreds of filters that may be purchased from other developers. Photoshop native filters include: Blurs, Color (Change Color, Colorize, remove Color), Distortions (Pinch, Polar Coordinates, Ripple, Shear, Spherize, Twirl, Ripple, ZigZag), Noise modes, Pixelations (Color Halftone, Crystallize, Facet, Fragment, Mezzotint, Mosaic, Pointillize), Sharpen, Stylizations (Diffuse, Emboss, Extrude, Solarize, and more), and Video (De-Interlace and NTSC “legal” colors). A very important set of imaging filters is listed under “Render.” The five items here are Clouds, Difference Clouds, Lens Flare, Lighting, and Texture Fill. Clouds/Difference Clouds adds fractalized clouds to the selected area, and Lens Flares can be sized and customized before painting down in accordance with a visual preview. The Lighting Effects filter is one of the most extensive in both options and customizing controls. Texture Fill applies a previously saved grayscale graphic as an alpha channel layer over the picture. Photoshop also lists a number of image altering choices to fill its internal filter list.

Work Modes Photoshop enables users to incorporate and work in the following graphics modes: Bitmap, Grayscale, Duotone, Indexed Color, RGB, CMYK, LAB, and Multichannel. It also includes a Color table and CMYK previewing. It is always possible to switch modes back and forth.

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Other Considerations Photoshop contains a Print Preview screen that is much more full featured than much of its competition. Its Image sizing and Canvas sizing capabilities are first rate and very fast. Images that have been altered can be instantly reverted to their original features.

File Save/Load Conventions Photoshop loads Photoshop, Illustrator, Amiga, BMP, CompuServe, EPS, Filmstrip, JPEG, CMS, MacPaint, PCX, PICT, Pixar, PixelPaint, RAW, Scitex CT, Targa, and TIFF files. It saves all but Illustrator files, but it does export paths to Illustrator. It also exports Amiga HAM. A number of other import/export converters for Photoshop are available from Internet sources as freeware or shareware.

Picture Fonts

They're not really typefaces, but they're definitely **fonts**. Picture fonts, with drawings instead of letters, are handy to use for icons and spot illustrations as an alternative to **clip art**, and there's an incredible variety to choose from.

Some have specific purposes. Logo fonts contain common corporate logos, credit card logos, and TV network logos, while other pictorial fonts show hands spelling out the American Sign Language alphabet (Mini Pics ASL Alphabet), symbols used on maps (Carta), or playing cards and dice (Linotype Game Pi).

Other picture fonts are strictly for fun. The style of these varies from

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cartoons to woodcuts to human outlines similar to those shown on restroom doors. A good example is Giddyup Thangs, a collection of Western-style images (cacti, horses, cowboy hats, and a six-shooter) intended to be used with Adobe's Giddyup font, in which the letters appear to be formed from ropes.

The convenience of using picture fonts comes from the fact that they're available simply by choosing the font name from a menu, and they can be sized simply by typing in a point size—no importing, no scaling. Apply color just as you would to text. Individual elements in the pictures can't be colored, unless you convert the letters to outlines using a draw program like **Illustrator** or **FreeHand**.

See Also

Clip Art; Fonts; FreeHand; Illustrator; Ornament and Dingbat Fonts; Typeface Categories

PictShow

This freeware application displays **QuickTime** movies, sound, as well as **PICT** and **GIF** images in a presentation format. Simply place the files in a folder and PictShow does the rest. There aren't a lot of features. You can specify whether the program automatically advances to the next item or waits for a mouse click, but the price is right!

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Pilot Simulators

See

Sim Games

Pinball Games

If you think it's a lost cause to try and recreate pinball on the computer, Loony Labyrinth and Crystal Caliburn (distributed by StarPlay) should change your mind. The realism is as close as you can get on-screen and the themes are as hokey as the ones you'd find on any real life pinball table. In Loony Labyrinth, you play inside the Minotaur of Crete's maze. Crystal Caliburn is loosely based on Arthurian Legend, sending you in search of the Holy Grail. The best thing about these two titles, aside from the detail that went into such standard pinball elements as strategy shot accuracy, are the lush graphics and realistic flipper and bumper action.

Loony Labyrinth is a bit less of a challenge, but great for less experienced players. If you are a real aficionado of the original pinball machines, nothing is really going to compare to the real thing, but both Loony Labyrinth and Crystal Caliburn should be able to capture your attention if you give them a chance. Maxis, creators of **SimCity 2000** and other best-selling **Sim Games** like **SimTower** are also currently working on FullTilt! Pinball.

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See Also

3D Ultra Pinball; Arcade-Style Games

Pirates!Gold

See

Sid Meier's Worlds

Pitfall

See

Lode Runner: The Mad Monks Revenge Online

Pivoting Monitors

See

Portrait and Pivoting Monitors

Pixar

Best known for its motion picture success *Toy Story*, a fully computer-animated motion picture, Pixar, based in Richmond, CA, has long been known in the 3D computer modeling world for the quality of its **rendering**

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software, called RenderMan. Pixar has released a version of RenderMan for the Macintosh called **MacRenderMan** , as well as two end-user tools: Typestry and ShowPlace. Unfortunately, Pixar has since abandoned the Macintosh market.

Pixar

1001 W.Cutting Blvd.

Richmond CA 94804

Fax: (501) 236-0388

Phone: (510) 236-4000

Web: <http://www.pixar.com>

See Also

MacRenderMan; ShowPlace; Typestry

Pixar Typestry

Pixar is known more as a high-end animation house than as a developer of marketable computer graphics products, the only exception being their proprietary "RenderMan" software (used by many Hollywood studios to produce state-of-the-art computer rendered animations). Typestry doesn't pretend to be an all-around 3D program, but centers instead upon one narrow targeted aspect of 3D graphics, 3D text graphics and animation.

Features Drawing from their Renderman technology and experience, Typestry exhibits more professional options than many programs that claim

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to be full featured 3D art and animation programs. We will look at its features under four separate headings: importation of text objects, addition of backdrops and lights, rendering options, and animation capacity.

Text Objects Importing a text object into Typestry couldn't be more straight forward. Just select any typeface you have, write your message (any number of lines that will fit on the screen), and render. This will give you a front faced 3D text rendering. A digital object has no personality without a texture, and Pixar calls Typestry textures "looks". Typestry comes with a special Looks CD whose libraries are "unlocked" as you purchase them. There are dozens of textures in each separate library. A default Looks Library comes with the software. Included are metals, marbles, woods, and other more esoteric algorithmic textures that take on the personality of organic textures, skin, glass, and non-earthly looks. Any objects stored as a font file can be translated into a Typestry element. Adobe Illustrator saves can be imported into Typestry as text objects, rendered with any chosen Look, and animated.

3D text can be built as a normal extrusion, as a tubular arrangement, or as a 3D "Flag". Extrusions come with their own bevel editor, so one need not be chained to default extrusion samples. Tubular text has the look of outline-only text. The tubular outline's cross section may be circular, square, or scooped out. "Flags" in Typestry are special 3D surfaces (wavy flags, banners, disk, sphere, cylinder) upon which the text is placed. You can choose to see only the text, the text as a cutout on the surface, or just the surface. A "PixarPerfs" font is installed with the program that allows you to create all sorts of interesting objects for use as props or for integrating with the text.

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Animation can be targeted to Typestry flags so that they move over time.

Typestry renderings can be set to “quick and dirty” modes or very high quality renderings. Typestry eats up a lot of RAM in its rendering process, so the more RAM you are able to have on your system when using Typestry, the better. It's not a good idea to multitask while Typestry is running unless you have more than 30MB of RAM available.

Backgrounds and Lights You can select backgrounds from Typestry's background effects or use one of your own saved graphics as a Typestry background. Typestry's internal backgrounds are specialized graphics designed to highlight foreground text. You can select from "Wall", "Floor", or both "Wall and Floor". Selecting both gives you the appearance of a 3D perspective environment. Walls and/or Floors may be texturized just like any 3D text object, and either may be placed at different distances from the eye or "camera". Your original graphics can be painted to a background as a planar surface or as seen through a fish-eye lens.

Typestry's Lights is represented by a graphic matrix with paired sliders that address nine separate lighting positions plus ambient lighting and environment mapping. The lights can act as slide projectors for images in addition to other more esoteric options, an effect that causes subtle light changes in an animated sequence. Shadows can be toggled on or off, and the intensity and color of all lights can be set. Full front lighting and back lighting are also supported.

Animation As with most other 3D computer animation software, you deal

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with keyframe events and timelines to produce animations in Pixar's Typestry. The whole process is called "composing a score". Numbered single frames are saved out to a file, then composited into an animation by a utility called "Movie Maker". This process is used to create both QuickTime or Video for Windows animations.

Particle Effects

Typestry has a fully implemented particle system on board that allows you to add animated particles, from sparks to marbles, to finished renderings. The particle generator is accessed by a specific series of commands, all of which are given high visibility in the documentation.

Pixar's Typestry is a complex high end package. Don't expect to master it quickly. Getting walls and floors to render logically by understanding their placement is a difficult task, as is understanding how to apply pictures to backdrops or objects (reflection settings). You will not be able to produce the fancy graphics shown in the manual without some long effort and dedicated study.

Pixel

This word is derived from the term Picture Element. It refers to the individual dots that make up the image on a computer screen or in a bit-mapped image.

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PlainTalk Speech Recognition

This technology, for AV Macs or Power Macs, enables the user to activate certain **commands** on the Macintosh by speaking into a microphone connected to the Mac. With PlainTalk enabled, your Mac can respond to your verbal commands using the PlainTalk Speech Editor and Speech Setup control panels.

To use verbal commands, turn on PlainTalk in the Speech Setup Control Panel. This control panel enables you to toggle speech recognition on or off, and has a slider to let you adjust how tolerant or strict you want speech recognition to be. (If you work in an environment with a lot of background noise, you may want to move the slider closer to the Strict setting, so the computer doesn't accidentally pick up commands from co-workers.)

You can also designate verbal confirmation (or feedback) from your Mac and choose from a pop-up menu of male or female voices to use for this feedback.

When PlainTalk is activated, a speech recognition feedback window appears that shows you the status of PlainTalk and the name of the command being carried out. If PlainTalk doesn't recognize a spoken command, it displays the phrase, "Pardon me?"

Because PlainTalk uses AppleScript to execute your commands, setting up a speakable command is very much like setting up an AppleScript macro, and PlainTalk's speech editor looks like a close cousin of the AppleScript Script Editor used for creating or editing AppleScript scripts. For an application to

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accept speech commands, it must be AppleScriptable. If not, PlainTalk enables you to use QuicKeys (the commercial product from CE Software) macros to carry out the spoken commands.

After you've created a script to carry out a command, these scripts are stored in the Speakable Items folder, and the scripts are named by the verbal command you'll use to activate the scripts. If, for example, you created a script that will launch ClarisWorks, you might name the script "Open ClarisWorks." And when you have PlainTalk active and speak the sentence "Computer, Open ClarisWorks" into the Power Mac's or AV Mac's microphone, the Open ClarisWorks runs and opens ClarisWorks for you. Incidentally, the term "Computer" is the default word that snaps the PlainTalk recognition to attention, so verbal commands should be preceded by the word "Computer." You can change this default name in the Speech Setup Control Panel.

See Also

AV Macs

PlainTalk Speech Recognition Extension

This extension, for AV Macs or Power Macs, is designed to incorporate speech recognition into the Macintosh system. It is used in conjunction with the Speech Editor and Speech Setup control panels to enable the user to activate certain **commands** through spoken voice commands via a microphone connected to the Mac.

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See Also

AV Macs; Commands; PlainTalk

Plan & Track

A project planning and management program from Mainstay, Plan & Track makes Gantt charts for project planning. A Gantt chart is a timeline, with bars representing aspects of a project set on a calendar scale to show how long each is expected to take from start to completion. Plan & Track, however, goes beyond the Gantt chart to add other powerful management tools, including spreadsheet and cost estimate integration.

It's fully compatible with the Windows version and supports drag-and-drop editing. Plan & Track has been accelerated for Power Mac, but will run on any Mac with a hard drive, System 6.0.7 or later, and at least 4MB RAM. It's easily installed, because there's only one 800K floppy disk.

Use Plan & Track whenever you need to relate tasks and events over a period of time. The graphics, usually depicting task bars and milestones, show how long a planned activity is expected to last, and when particular events occur during the timeframe shown. You can add art to your charts to make them more attractive, and use colored bars to help differentiate one person or group's task from another.

Plan & Track can incorporate spreadsheets and graphs into the plan, enabling you to relate numerical data, such as costs over time or predicted

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earnings from a program. It also adds an earned value system, which is based on a plan, and shows how value is earned or expended throughout a project. The planned value summary serves as a cost estimate calendar that shows the result of each task within the overall plan and its associated costs. This enables management to adjust timing of certain project aspects to allow for anticipated income, or to delay if cash flow problems occur. The earned value variances are computed automatically, based on no adjustments and show how cost over-runs and schedule deviation can result in a project coming in late and over-budget. The information helps managers plan and track projects of all kinds and all sizes, from an hourly roofing job to a multi-year agricultural project, or virtually anything that takes time and costs money.

See Also

Business Software; Calendar Programs; Charting and Graphing Programs; Claris Impact

Plates

See

Printing Methods, Traditional

Playthrough

Playthrough is a parameter in the **Sound** Control Panel that can be set when

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choosing between **microphone** and **CD-ROM** player as the input device when recording audio. This is also a parameter available in some sound digitizing applications programs such as **SoundEdit** .

If playthrough is set, the sound can be played through the Macintosh speaker, whether or not it is being recorded. With this parameter set, you play a CD and perform other tasks while listening to the audio.

In most cases, only Macintosh models with internal CD-ROM drives can play CD audio through the internal speaker and the stereo headphone jack on the back panel of the computer. This is because the sound from the CD drive is fed through a **sound-input connector** on the logic board.

Alternatively, if the Macintosh has an external microphone jack, you can feed the sound from an external CD player into the jack, or you can purchase speakers with dual inputs, such as Apple's **AppleDesign Speakers** . You then can listen to both CD audio and the sound coming from the computer.

For other Macintosh computers that don't support internal CD-ROM drives but do have a **sound-in jack** , the freeware **PlayThrough** (by Andreas Pardeike) may help. Connect a cable from the headphone output of the CD player to the input jack on the back of the Macintosh. Note that you may have to use an **attenuating cable** to adjust the volume of the output.

See Also

CD; Sound Control Panel

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PlayThrough (Application)

A shareware application that provides playthrough capabilities to many Macintosh models with an external CD-ROM player. Available from online services.

See Also

Playthrough

Plug-Ins

Often used as a generic term for **add-on software**, “plug-ins” originally referred to add-ons specifically used by **Photoshop**. Now the term is used for add-ons used by all Adobe programs, including **PageMaker**.

Plug-ins for Photoshop allow the program to import and export additional image formats (such as PCX and JPEG), control scanners, and apply special effects to images. The third category offers the splashiest products, like Kai’s Power Tools (and other assorted KPT packages), Gallery Effects (which can turn an ordinary photo into a fresco or a pen-and-ink drawing), and Paint Alchemy, which applies natural-looking brushstrokes to an image.

PageMaker plug-ins (formerly called Additions) offer functions like automatic drop caps, expert kerning, grouping, and automatic running headers and footers.

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See Also

Add-On Software

Plug-In Effects

Just as plug-ins can expand the uses of painting programs, so vector drawing possibilities can be widened by plug-in use. There are not quite as many plug-in libraries available for vector drawing software as there are for raster (bitmap) painting programs, but the plug-ins that are available create hundreds of new variations for targeted vector selections. Three vendors stand out as major developers of vector graphics plug-ins: BeInfinite Software, Letraset Corporation, and MetaTools. Each of the three vector plug-in suites that these companies market is unique in its own respect, helping the vector artist to create truly original designs. If you are planning to use these effects in programs other than Adobe **Illustrator** or Macromedia **Freehand**, check with the developer first to ascertain compatibility.

InfiniteFX BeInfinite Software's InfiniteFX (version 1.5) lists 55 separate and unique vector effects. At any time during the manipulation of an effect, you can trade that effect for another in the list. The visual interface allows you to preview all the alterations and adjustments as they are being made, so there are no unpleasant surprises afterwards. The InfiniteFX interface features a visual preview screen and four sliders. Depending on the effect chosen, one to four of the sliders are active and are associated with altering one of the dimensions addressed by the selected effect. As the sliders are

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moved, the changes in the parameter of the effect can be seen on the visual preview screen. InfiniteFX filters are envelope filters that apply a range of Bézier curves to the selected graphic's outlines. The interface allows for zooming in on the preview, and customized effects can be saved and loaded again. A help button brings up text that explains what an effect does.

Infinite FX are associated with subgroups, so we will list them within the groups they appear in:

1. Pure Transformation.
2. Cornerize (and inward/outward), continuous one way and other way, exaggerate, Flip-Flop, Perp, Rocker, TCB.
3. Wiggle (Everything, Corners, Rockers, Inbound, Outbound, Horizontal, Vertical, Horizontal/Vertical Corner, Horizontal/Vertical Inbound).
4. Balloon (Up & Down, Sideways, Everywhichway), bend Up/Sideways, Shear Vertical/Horizontal, taper (Up/Down/Left/Right).
5. Twist (Horizontal/Vertical), Waves (Atmospheric/Oceanic), Rippling (Vertical/Horizontal).
6. Antispin, Blast, Fisheye, Motion Blur, Pinch, Pond Ripples, SpinIt, Zig Around, Zoom
7. Smart Addpoints, Cylinder Wrap, Metabloat, Metacalligraphy, Metapunk, Polar to rectangular, Rectangular to Polar

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Most of the effect names give you some idea of the visual shapes, while others have no logical connection. Experimentation is the key. InfiniteFX runs in both Illustrator and Freehand.

Envelopes Letraset's Envelopes plug-ins give you the capability to edit the Bézier curves until you get the exact shape you're looking for. The plug-in filters are grouped in separate libraries that define their general similarity. The libraries are named: Envelope Library, Curved Perspectives, Straight Perspectives, Super Perspectives, and Twists and Spirals. Having the capacity to tweak the assigned shapes instead of just accepting them as applied increases the possibility of getting never-before-seen results. Any new shape you discover can also be saved as an archetype for further experimentation. Because the default shapes are identified by code numbers, it's wise to keep the documentation handy to find the initial shape. After a numerically indicated shape is chosen, however, the full visual library associated with it comes to the screen, so selecting the exact shape to explore is simple. The Envelopes interface enables you to turn the object off so that the Bézier manipulations are made clearer. New Bézier nodes can be added to the outline simply by clicking the line with the Option key held down. The Illustrator and Freehand Envelopes plug-ins are not interchangeable, so you will have to purchase separate versions of these plug-in libraries if you want to run both Illustrator and Freehand. The Freehand Envelopes also include shapes not found in the Illustrator version.

VectorFX VectorFX from MetaTools gives the vector artist a clear way of achieving effects normally associated with bitmap graphics. This program

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takes a very different approach than the other plug-ins take, preferring to add elements to a shape rather than sculpt them into a new form. VectorFX will work with both Illustrator and Freehand. Thirteen plug-ins are included, and it should be noted that all effects include a large library of preset parameters.:

1. **3D Transform:** This effect adds 3D depth to the selected graphic. Rotation on any plane, “metallicity” (reflective property), color variations, degree of depth and beveling, and perspective alignment can be adjusted. This effect is probably the most desired one that vector artists need and ask for. A full-featured help screen is available.
2. **Colortweak:** This effect allows you to adjust and apply color to the selected graphic or to its “shadow”. A full panel of color parameter controls is included. The effect can be applied through the VectorFX interface or “live” via a small on-screen menu. A full-featured help screen is available.
3. **Emboss:** Embossing adds the feel of chiseling to a graphic, as if it were cut out of stone. VectorFX Embossing allows you to adjust the contrast, angle, and amount of the effect. Soft Embossing is also possible, giving a grainy airbrushed feel to the selected graphic. A full-featured help screen is available.
4. **Flare:** Flares are seldom associated with vector graphics, being a more common application in bitmap art. VectorFX applies flares determined

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by your adjustment of Radius, Halo, and Amount of spokes in the flare. Flares may be moved around on the preview screen. A full-featured help screen is available. The flare is written over the selected graphic area.

5. Neon: Neon adds a gradient glow around the selected graphic, a smoothing effect that adds both depth and texture. Brightness and Amount can be adjusted. A full-featured help screen is available.
6. Inset: This effect bloats out the selected graphic, ballooning it and smoothing the edges. The Amount is adjustable and can be previewed. A full-featured help screen is available.
7. Point Editor: This effect allows discrete control over all of the Bézier control points on the selected object. They can be selectively targeted and moved by numeric input without disturbing those points that you desire to remain in place. A full-featured help screen is available.
8. Resize and Reposition: This effect does just what it says, resizes and repositions the selected graphic. A full-featured help screen is available.
9. Shadowland: This is another much requested effect. Both cast and dimensional shadows can be added to the selected object. Multiples of the shadow can be cloned, and a spiral angle can be added to them. A full two-color gradient can be targeted to the shadow, and the halosity, size, and brightness adjusted. Hundreds of shadow effects can be

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created with this single plug-in. A full-featured help screen is available.

10. **ShatterBox:** (Not available for Freehand) This effect shatters the selected image in response to your input parameters, causing explosions and the breaking of symmetries. The degree and extent of the effect is user controlled. A full-featured help screen is available.
11. **Sketch:** This effect applies a randomness to the selected graphic, so that the result can be compared to a child's crayon drawing. If the effect is applied too generously, the result is tangled chaos. A full-featured help screen is available.
12. **Vector Distort:** This effect applies adjustments to the vector graphic normally associated with Photoshop bitmap effects: Swirl, Spherize, Rotate, Magnify, Zig, Zag, Zig Zag, and Warp Frame. A full visual preview constantly updates the view, and any or all of these effects can be applied at once. A full-featured help screen is available.
13. **Warp Frame.** Full control over the selection's Bézier control arms is possible here, with the ability to warp the selection in any direction. A full-featured help screen is available.

Extensis' DrawTools Extensis Draw Tools enables you to warp the selected graphic on either a splined or a Bézier controlled plane in addition to other effects. Draw Tools gives you three groups of effects that can be applied to either or both Adobe Illustrator and Macromedia Freehand: Draw Tools Color,

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Draw Tools Move, and Draw Tools Shape.

DrawTools Color is a collection of five filters that allow you to edit color ramps, mix and replace colors, convert objects to grayscale, and create duotones, tritones, and multitone in the selected graphic. Draw Tools Colors supports RGB, CMY, and IHS color models in addition to CMYK and K (black and white, grayscale). When addressing color models not supported by Illustrator or Freehand, Draw Tools Colors converts the results to CMYK before applying them to the illustration. Certain caveats and restrictions apply when working with color gradients. The color mixer filter provides quick and easy color mixing tools, and the filters color graph transformation files can be loaded and saved. Selected full color graphics or the entire page may be converted to grayscale in one easy step. There is also a randomizing feature that replaces all selected colors in an illustration, or just those in the selected object. Layers can also be exchanged with one another.

DrawTools Move saves you time when the task is to move the order and position of any number of selected graphics in the illustration. By clicking the backward or forward buttons as many times as need, the selected object, group, or multiselection is moved to the appropriate layer in accordance with the number of mouse clicks. Objects can also be repositioned anywhere on the page by altering their coordinates as displayed in a DrawTools Move dialog, which also displays the selected measurement system being applied (inches, centimeters, and so on). Selected objects may be resized according to either their dimensions or to mathematical operators (add to, subtract from, multiply by, and divide by).

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DrawTools Shape filter works on single, grouped, and multiple object selections. When multiple objects are transformed, their hierarchical structure is retained. Smooth and precise alterations are assured because Shapes translates all linear components to splines and then to Béziers. In Illustrator, Shape options are brought to the screen with separate menu selections, while in Freehand a global dialog appears with all options visually displayed. The following Shape transformation options are included:

- **Globe**—Makes it appear as if the selected graphic has been wrapped on a 3D globe, the height, width, and angle of which are user controlled.
- **Cylinder**—Causes the selected object to be wrapped on a 3D-like cylinder with user controls for height, diameter, interpolation (extent of view from top or bottom), and angle.
- **Cone**—Wraps the selected object into a 3D-like cone shape with user controls over height, base diameter, top diameter, interpolation (extent of view from top or bottom), and angle.
- **Water/Amplified Waves**—Allows the selected object to be affected by wavelike transforms, where the user controls the frequency and amplitude of the wave.
- **Diamond**—Transforms the selected object into a diamond-like shape with user controls over height, width, and angle.
- **Free Projection**—Enables the user to transform the selected object by using spline and Bézier controls to reshape a grid that controls the

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objects shape.

PlugInfinite

PlugInfinite is a plug-in utility that should be owned by everyone who is overwhelmed by the number of plug-ins that reside in their library. Often, when called upon to do a specific image manipulation task, it's necessary to use only a few plug-in effects, if any. At those times, the digital artist may wish that the plug-in list could be customized for specific projects. PlugInfinite from BeInfinite Software does just that. Most importantly, all of PlugInfinite's effects can be removed if you find that your plug-ins aren't acting right. Smaller plug-in groups also require less memory from your system.

The process is straightforward. First, use the Add button on PlugInfinite's window to search and add selected plug-ins from your plug-ins folder. Selecting Save or Save As from the window brings up a save dialog. Select a new name to save the plug-ins group to, and you now have a selection that will appear in your effects menu that will list only the plug-ins you grouped under that heading. You can configure as many new groups as you'd like, customizing selected plug-ins for specific tasks.

Plug-ins and plug-in menus can also be renamed, so that their function more correctly matches your understanding of what they do when applied. If you have plug-ins that you never use, and that you think you never will, they

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can be disabled by PlugInfinite. You can also use this software to get more information about the plug-in. PlugInfinite can display the following plug-in data:

- **Label**—Descriptive information.
- **Original Name**—The name before you changed it. You can use Restore to change it back.
- **Original Menu**—The original menu before you changed it. You can use Restore to change it back.
- **Type**—Type categories are Acquire, Export, File Format, Accelerator, Parser, General, and Filter. Your plug-in will probably be listed as a Filter type.
- **Requires Host**—Shows if the plug-in requires a specific host program to run.
- **PowerPC**—States if PowerPC code is resident.
- **Animatable**—States if plug-in has animation capabilities.
- **Filename**—Complete file and path names of plug-in location.
- **Size/version**—Size/version of the plug-in.
- **Modes**—States if the plug-in addresses any or all of the following modes: Bitmap, Grayscale, Indexed color, RGB, CMYK, HSL, HSB, Multichannel, Duotone, and LAB.

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PMS

See

Color Matching Systems

Point

See

Typesetting Terms

Point to Point Protocol

See

MacPPP

Point Size

Type size is specified in points: 10-point type, 18-point type, 72-point type, and so on. When points are used to measure other things, there are 12 points to the pica and six picas to the inch, and therefore 72 points to an inch, but one of the mysteries of type is that 12-point type isn't 12 points tall, and 72-point type isn't one inch tall.

At one time, 12-point type was likely to be 12 points tall—if measured from the bottom of the descenders up to the top of the ascenders. However, this is no longer true for most typefaces.

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See Also

Fonts

Pointer

A pointer is simply a variable that contains the location of a block of memory. It is often more convenient to work with a pointer than with the original block of memory itself. For one thing, pointers are typically quite a bit smaller than most blocks of memory. (On the Macintosh, pointers are 32-bits long—4 bytes.) Rather than passing around the entire block of memory, programs just pass around the pointer.

Because the data pointed to by a pointer cannot be moved in memory without making the pointer invalid (the pointer would continue to point where the data used to be), this data must be fixed in memory. The fixed data is called nonrelocatable and it can cause havoc with the **heap**. If you allocate many pointers without paying attention to where they are in the heap, the Memory Manager might have a hard time moving relocatable blocks to consolidate the free memory in the heap. The nonrelocatable blocks get in the way.

See Also

Handle; Heap; Toolbox

Pointer Mode

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The Pointer Mode Control Panel was designed for use with the Power Mac 7200 model, and it enables the **cursor** to remain visible on screen when taking a **screen capture** (Shift-⌘-3). It may also reduce the flickering that occurs when the cursor is over a graphic.

See Also

Cursor; Screen Capture

POP3 Protocol

A protocol or set of standards designed to allow the retrieval of electronic mail messages from a central mail server.

POP3 (Post Office Protocol, Version 3) allows mail messages to be retrieved from a machine that holds such messages. POP3 is designed to operate in environments where an electronic mail system operating with **SMTP** (Simple Mail Transfer Protocol) is impractical due to cost constraints or the lack of a computer with an **IP address** connected to the Internet.

All popular email **clients** support POP3, including **Eudora** and **Netscape Navigator**.

For more information see the Internet Working Group Request for Comments (RFC) 1460 (<ftp://ds.internic.net/rfc/rfc1460.txt>).

See Also

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Electronic Mail; Eudora; Internet; IP Address; Netscape Navigator; SMTP; TCP/IP; World Wide Web

Pop-Up Menu

Menus in a **dialog box** or window are pop-up menus. Pop-up menus have a downward-pointing black triangle right after the menu's title that tells you it's a pop-up menu. When you **click and hold** a pop-up menu, a menu appears offering a list of selections to choose from.

Pop-up menus, for example, are the menus in the **Find File** dialog box that enable you to select what criteria you want to use for your file search. The first pop-up menu defaults to a "name" search, but because you can see a black triangle pointing downward, you know that "Name" is an item on a pop-up menu. Clicking and holding the name title causes a menu to appear where you can choose to search by: size, kind, label, date created, date modified, version, comments, and lock. You select items from a pop-up menu the same way you select items from a **pull-down menu** in the menu bar; by holding the mouse button and dragging the **arrow pointer** until the selection you want is highlighted and then releasing the **mouse button** .

See Also

Arrow Pointer; Dialog Box; Find File; Menu; Menu Bar; Mouse Button; Pull-Down Menu

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Port Number

An **Internet** server or **host** computer uses port numbers to designate specific channels for accessing particular kinds of information.

Port numbers sometimes appear in Universal Resource Locators (**URLs**) when a user accesses a server on the Internet. In order to get **World Wide Web** information from that server, the user's computer needs to access port number 80 on the server. To get **Gopher** information, port 70 is used, and so on.

Port numbers are not physical SCSI ports or serial ports, but virtual channels leading to information on a computer. A few of the common port numbers used on the Internet are given in the following table.

Common Internet Port Numbers

*Port Number**Description*

20, 21 File Transfer Protocol (data on 20, control on 21)

23 Telnet

25 Simple Mail Transfer Protocol

53 Domain Name Server

70 Gopher

79 Finger

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- 80 World Wide Web
- 110 Post Office Protocol - Version 3
- 119 Network News Transfer Protocol
- 123 Network Time Protocol
- 194 Internet Relay Chat Protocol

Port number access happens behind the scenes during Internet communications, so users do not have to configure ports themselves.

See Also

Client; DNS; FTP; Host; Internet; IP; IP Address; Internet Relay Chat; NNTP; POP3; SMTP; Telnet; URL; World Wide Web

Portrait Display Labs Pivot 1700

See

Monitors, Common Models

Portrait and Pivoting Monitors

Portrait monitors are the oddballs of computer display monitors, in that they

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are designed to display a letter-sized page in its entirety. Most display monitors, regardless of size or picture resolution, have the same aspect ratio, the ratio of the width to the length. The standard aspect ratio most monitors use is about 4-to-3. Because the width is longer than the length, ordinary monitors are often called *landscape monitors*. Portrait monitors, on the other hand, are taller than they are wide, with an aspect ratio of 4-to-5.4375. The standard WYSIWYG picture resolution for a portrait monitor is 640 x 870 pixels.

Pivoting monitors, invented by Radius, work as both a portrait and a landscape monitor. When oriented vertically, the monitor displays in portrait mode. You can grab the display and rotate it 90 degrees, and the monitor automatically changes to landscape mode. The pixel resolution is slightly different from either portrait or landscape monitor, but is closer to the former.

Portrait monitors are useful for people dealing with text, such as writers and editors. However, many of the people who needed portrait monitors have been moving to **two-page monitors**, which have been dropping in cost over the past few years. As such, portrait monitors have been losing popularity.

See Also

Cables and Adapters for Monitors; Energy-Star Monitor Issues; Monitors; Monitors, Common Models; Monitors, Image Quality; Multimedia Monitors; Multisync Monitors; Monitors, Size of; VGA Monitors, Using

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Ports, Future Trends

With the advent of the fast PCI bus as well as storage that requires high-performance input and output, the Mac's **small computer system interface (SCSI)**— the so-called **SCSI-1** architecture, and **Apple desktop bus (ADB)** protocols are beginning to show their age. There are various ways to increase the throughput of peripherals to keep up with the new storage system drives and meet the data transfer demands of color imaging, multimedia, and networking. SCSI supports a throughput rate of 5 Mbps on 50-pin connectors supporting 25 wires, including 8 each for data and grounding. Newer technologies have doubled and quadrupled the data transfer rates. The following technologies are competing to replace SCSI-1.

- **SCSI-3.** A new specification for SCSI that supports existing SCSI protocols as well as new implementations of cabling, connector, and data transfer schemes.
- **Universal Serial Bus (USB).** Intel's new PC standard for serial ports may replace the Mac's ADB or GeoPort.

Portable Computers, Macintosh Family

Apple Computer is the leading supplier of laptop computers with its PowerBook series. The PowerBook family of Macintoshes come in two types: a portable all-in-one computer and a dockable system that combines the

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portability of the laptop with the connectability and flexibility of a desktop system. Apple also is moving its laptops to the PowerPC RISC chip and is using the IBM/Motorola/Apple designed PowerPC 603e, a special chip designed to use less power and produce less heat. The following figure shows the PowerBook 160.

Both the laptop and dockable models have several common features:

- Apple PowerBooks use a liquid-crystal display (LCD) screen. There are several types of LCD displays: **backlit supertwist**, active-matrix, and **passive-matrix displays**. All have been used in PowerBooks, depending upon the model, and whether it has a color version. PowerBooks are moving to an **active-matrix display** because the passive-matrix displays are prone to a problem called ghosting or shadowing where objects that are moved around the screen leave a trail of images in their wakes. Only the PowerBook 190 and 5300 still use a passive-matrix LCD, all of the rest of the PowerBook models use an active-matrix color or dual-scan color LCD system.
- PowerBooks use a different type of pointing device than the mouse that is standard on a desktop system. All current models of the PowerBook use a unique pointing system called a **trackpad** that senses your finger's movements on the pad and repeats that movement on the screen using coupling capacitance.
- PowerBooks contain a built-in microphone and support 16-bit stereo sound input and output.

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- PowerBooks support **PC Cards** via a **PCMCIA port** that provide enhancements, such as telecommunications, Ethernet connections, faxes and modems, as well as additional RAM or removable storage.
 - PowerBooks are powered on the road by a rechargeable battery or AC adapter. Battery power life depends upon many factors, such as the brightness of the screen and how much input/output activity to hard and floppy drives occurs, but you can expect two to four hours of power from a **Nickel-metal-hydride battery** .

The following table provides an overview of the PowerBook family.

The PowerBook Series of Macintoshes

Model Number	Processor - Memory/Storage - Display - Options - Battery
PB 190	33 MHz 68LC040 4 or 8M/500M, SuperDrive 1.4M floppy 9.5" Passive-matrix grayscale PC Card slot for 2 type I or Type II PC cards or 1 Type III PC Card; IDE connector for third-party solutions, ADB Port, SCSI Port 3-5 hr. NiMH
PB 190cs	33 MHz 68LC040 8M/500M, SuperDrive 1.4M floppy 10.4" dual-scan passive-matrix color display PC Card slot for 2 type I or Type II PC cards or 1 Type III PC Card; IDE connector for third-party solutions, ADB Port, SCSI Port 3-5 hr. NiMH

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PB Duo 2300	100 MHz PowerPC 603e	8 or 20M/750M or 1G	9.5"
	active-matrix color display	Docking connector,	2
	serial ports, PC Card slot for 2 type I or Type II PC cards or		
	1 Type III PC Card; IDE connector for third-party		
	solutions, ADB Port SCSI port	2-4 hr. NiMH	
PB 5300	100 MHz PowerPC 603e, 16K data cache, 16K level-2 cache		
	8M/500M, SuperDrive 1.4M floppy	9.5"	passive
	-matrix gray scale display	PC Card slot for 2 type I or Type	
	II PC cards or 1 Type III PC Card; IDE connector for third-		
	party solutions, ADB Port, SCSI Port	3-5 hr. NiMH	
PB 5300cs	100 MHz PowerPC 603e, 16K data cache, 16K level-2 cache		
	8 or 16M/500 or 750M, SuperDrive 1.4M floppy	10.4"	dual
	scan passive -matrix color display	PC Card slot for 2	
	type I or Type II PC cards or 1 Type III PC Card; IDE		
	connector for third-party solutions, ADB Port, SCSI Port		
	3-5 hr. NiMH		
PB 5300c	100 MHz PowerPC 603e, 16K data cache, 16K level-2 cache		
	8 or 16M/500 or 750M, SuperDrive 1.4M floppy	10.4"	active
	-matrix color display	PC Card slot for 2 type I or Type	
	II PC cards or 1 Type III PC Card; IDE connector for third-		
	party solutions, ADB Port, SCSI Port	3-5 hr. NiMH	
PB 5300ce	117 MHz PowerPC 603e, 16K data cache, 16K level-2 cache		
	32M/1.1G, SuperDrive 1.4M floppy	10.4"	active
			-

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matrix color display PC Card slot for 2 type I or Type
II PC cards or 1 Type III PC Card; IDE connector for third-
party add-ons, ADB Port, SCSI Port 3-5 hr. NiMH

See Also

Duo Docks; PC Card; PCMCIA Card; PowerBooks; PowerPC

Portrait Orientation

See

Orientation

Poser

One of the most difficult tasks in drawing is creating realistic human forms. Making realistic 3D models of human forms can be even harder. Artists traditionally used small wooden models as guides for the human form. Enter Poser from Fractal Design; it's the 3D equivalent of the artist's model.

Poser provides a collection of body shapes than can be adjusted and posed as desired. From the Figure Type menu you choose between a variety of body styles: from Male and Female to Skeleton and Stick. You then adjust the height and proportions of the figure to customize the shape. You can choose between different body parts, but while the major parts of the body (arms and legs) can be manipulated, individual parts of the hands and feet cannot

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be adjusted.

After the figure is selected, it can be easily twisted and adjusted to the desired pose. Poser uses **inverse kinematics** to make adjusting the figure into realistic poses very easy.

Lights can be added, and the camera can be moved to view the figure from different angles. There are also some simple static objects that can be added to the scene. A completed body shape and pose can be saved to be used again later, and a saved pose can be applied to another figure.

The program supports **Phong** shading to render the final image, and adds an **alpha mask** for use in another program, such as Fractals' **Painter** or Adobe **Photoshop** .

While Poser is used primarily to create 2D artwork for use in other illustration programs, it can also export models in **RIB** (Renderman Interface Bytestream) and **DXF** format. Unfortunately, when imported into a 3D program, you can't manipulate the figure; it's exported as a single shape.

For those who need realistic looking human figures, whether for 2D or in 3D illustration, Poser could be the answer to you biggest nightmares.

Fractal Design Corp.

Aptos, CA

Price: \$99

Fax: (408) 688-8836

Phone: (408) 688-5300

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Web: <http://www.fractal.com>

See Also

3D; Alpha masks; inverse kinematics; Photoshop; Painter; rendering

PosterWorks

S.H.Pierce and Company has developed the solution for artists who need proof prints and final copy large enough for billboards or gallery displays. PosterWorks is a printing program that manipulates your output to target both high end commercial printing services as well as desktop printers. PosterWorks output can be printed to a series of smaller pages, which can then be pasted together for a view of the final enlargement. The main edit screen shows a display grid and a preview of the imported graphics, both of which can be toggled off or on. Graphics files can be placed on top of each other for composite printouts. The view of the finished work can be altered by percentage or measurement equivalents, and a straight line drawn anywhere on the screen returns its measurement.

Files can be saved as PosterWorks native or as Bureau files for transference to professional printing facilities. The art can be calibrated for Cyan, Magenta, Yellow, Press Curves, Gray Balance, UCR, GCR, Black, and Color Check. The output saturation and scanner matrix can be enhanced and Halftone Corrections set. After the art is set, it can be targeted to your on-site printer, or saved as a Bureau file and sent off-site.

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PostScript

PostScript is Adobe Systems' page description language. PostScript printers use controllers which reside in the printer's body. The controller is a computer, usually based upon a RISC chip or Motorola CISC chips and using two or more megabytes of **Random Access Memory** (RAM), as well as **Read Only Memory** (ROM) chips containing the printer fonts stored in outline form.

When you send a document to the printer by selecting the **Print** command in your application, the Macintosh **Printer Manager** checks to see if there is a communications link to the printer. (Under System 7.5.1 and higher, you can see this happen by double-clicking the desktop printer icon—the resulting Printer window displays the status of the printing processing commencing with a message saying "Looking for LaserWriter." Earlier System 7 versions required you to open the PrintMonitor under the Apple menu to view similar information.)

Under System 7, the Macintosh has deleted the LaserPrep utility required under System 6 to download the custom PostScript Dictionary to the printer before the first use of the printer each time you turn it on. The PostScript Dictionary contains translations for QuickDraw's shorthand commands which speed up the printing process over AppleTalk networks. During the process of downloading, the PrintMonitor shows the message "Initializing Printer." Under System 7, only those portions of the PostScript Dictionary required to perform a specific print job are downloaded as needed. This also enables you

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to mix System 6 and System 7 versions of printer drivers on a network connected to the same printer.

When initialization is complete, the Printer Manager sends the application's QuickDraw routines translating the page layout specifications to the printer driver, which in turn translates QuickDraw into PostScript commands. The PrintMonitor or Desktop Printer displays the alternating messages "Processing Job" and "Preparing data" during this process. During the transmission of the PostScript program, the printer's controller receives the code and it is read by the PostScript interpreter and scan converts the image into a bitmapped page which is stored in the controller's page buffer. The interpreter uses the font outlines stored in ROM to create the required fonts specified in the code. The controller then uses the bitmap to govern the engine's imaging mechanism, and flushes the image and the PostScript code after the page is printed.

PostScript Printers provide extensive benefits in terms of performance, cost savings, and flexibility. Because PostScript scan converts the QuickDraw code, the application program does not have to know the resolution of the printer you are using. You can therefore print on many different PostScript printers using the same file and application program. The difference will be the quality of the output. In addition, each bit mapped page takes up at least one megabyte of memory.

Because the controller performs the scan, the page is stored in the printer's page buffer and not on the Macintosh, requiring less storage on the

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Macintosh to be dedicated to printing. Multiple Macintoshes and personal computers can share one printer, since the PostScript and page buffer resides in the printer. Each PostScript printer contains print server software in its ROM allowing up to 32 machines to share the printer. The print server software acts as the interface between the Macintosh and the controller during the printing process. PostScript is a programming language, and as such can be upgraded and improved to provide extended features, such as shading, gradients, special effects, and other modifications to fonts and graphics.

Hewlett-Packard, Apple, QMS, DataProducts, and NEC specialize in manufacturing PostScript laser printers for many market niches. The popular HP LaserJet 4MP Printer is illustrated here.

PostScript is the industry standard because it enables text and graphics created in a computer software application to be printed at very high resolutions through a PostScript interpreter and **raster image processor (RIP)**. PostScript is essentially a coded output language consisting of commands that instruct a device to draw lines, fill shapes, render type, and so on. The following are lines of PostScript code randomly chosen from the instructions to create an **Adobe Illustrator** pattern called Art Deco:

```
%!PS-Adobe-3.0
```

```
%%Creator: Adobe Illustrator(TM) 5.5
```

```
%%Title: (Art Deco)
```


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```
%%BeginSetup
```

```
%%IncludeFont: Helvetica
```

```
/egrave/ecircumflex/edieresis/iacute/igrave
```

```
/icircumflex/idieresis/ntilde
```

Of course, this code would not produce any results when processed by a printing device. A large amount of code must be processed to provide even simple shapes, patterns, and text. Occasionally, the PostScript processors attached to laser printers and imagesetters encounter errors and cannot finish the output. A PostScript error can be caused by any number of things, and even an experienced programmer may not be able to find the cause. Difficulty in PostScript output can be mostly avoided by proper software usage and by following certain guidelines.

System 7 has enhanced the performance of PostScript Laser Printers by providing new Toolbox managers for printing and positioning text. These managers increase the fidelity of a document's page description between different types of printers.

Creating PostScript Files The process of printing to a **PostScript** printer goes something like this: The user issues a Print command, the application creates a temporary PostScript spool file, PrintMonitor sends the PostScript file to the printer, and the printer turns the PostScript code into dots of toner on paper.

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Sometimes, though, there are good reasons for splitting that process into two parts—creating the PostScript file, but not sending it to the printer until a later time. For example, a lot of high-end prepress software (for **trapping**, color correction, and **imposition**) needs to be fed PostScript files to work on, rather than native application files. Service bureaus can output PostScript files without having the graphics placed in the documents, and there's no chance that an element will be accidentally moved or changed when the file is opened to be output. And if you know what you're doing, you can even “hack” the PostScript code to make changes in the document.

Making a PostScript file is a pretty simple task.

1. After choosing the Print command, change the destination in the Print dialog box from “Printer” to “PostScript file.” This changes the Print button to a Save button.
2. Click on Save.
3. The dialog box that comes up next will vary depending on the printer drive you're using. If you're using LaserWriter 7, it looks like a standard Save dialog box, as shown in the figure. Type a name for the file, choose a folder to save it in, and click on Save again.
4. Under LaserWriter 8, other options will be presented at this point. You can choose to generate a plain PostScript job, or you can create an **EPS** file that can be imported into other files as a graphic. EPS files can have standard, enhanced, or no previews. If you generate a PostScript

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file, you can use ASCII or binary encoding (ASCII is the default). Finally, you must choose whether you want to include font information in the PostScript file. If the fonts are included, they don't need to be present in order to print the file later. PostScript files can include no fonts, all the fonts, all fonts except the standard 13 (like Times), or all fonts except those mentioned in the printer description file.

5. After assigning a name, choosing your options, and clicking on Save, you'll see the document spool to disk, just as though it were printing.

Be aware that PostScript files can be pretty large, especially if they include a lot of graphics and fonts.

See Also

Adobe Type Manager; Desktop Publishing Industry Standards; Fonts; PostScript Level 2; Preflight and File Hand-Off; Printer Drivers; Printing, Laser; Service Bureau Dos and Don'ts for Desktop Publishers

PostScript Fax

See

PostScript Level 2

PostScript Level 2

In 1993, Adobe updated PostScript to PostScript Level 2 to add support for color printing and other new printer features, as well as to enhance existing features. PostScript Level 2 drivers (either LaserWriter 8.3 from Apple or PSPrinter 8.3.1 from Adobe) support the following features:

- **The addition of color extensions to the base language.** This gives PostScript the ability to describe and print colors as they are seen on the screen. Display PostScript (the screen-description language version of PostScript) is also included in the base language.
- **Compresses and decompresses documents.** Also, printers that support Level 2 can fax PostScript documents, cache patterns and forms between multiple printings of the same document, and generate accurate screen angles for smoother halftone printing.
- **Device-independent color support.** This feature provides a way to view documents on any monitor, print them on any printer, and have the colors appear the same from machine to machine. Apple's **ColorSync** technology in System 7.5.1 and higher manages color by providing support for the translation of RGB screen color schemes to CMYK data used by printers to define colors. Full color translation is not yet available except where applications provide the exact matches between color profiles used by the printer and the Macintosh. ColorSync and PostScript Level 2 are not 100 percent compatible in

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this regard, since they do not use the same device profiles to describe RGB colors. Each version of ColorSync (now at version 2.0) and the printer driver (now at version 8.3) comes closer to using the same profiles or substituting correct versions if profiles are not available.

- **Enhanced halftoning algorithm.** PostScript Level 2 describes more lines per inch and smaller angles on screen, and can thus generate a higher-resolution image. Since there is more color and halftone information available, color separations are smoother. You can also create a low-resolution version of a document for fast draft printing.
- **The inclusion of printer-specific features within printer drivers.** Each printer now provides a **printer page description (PPD)** document, a portable ASCII file that tells the printer driver about the printer's specific features, such as what type of paper is in which tray, or how long the printer stays awake before shutting down to save energy. Printer vendors can more easily upgrade their printers and not worry about a new driver by simply adding new features to the PPD for the driver to read. Any information located on the PPD is reflected in the Print and Page Setup windows in your applications.
- **Support for PostScript faxing.** **PostScript Fax** supports a base resolution for a fax of 200 dots per inch by 100 dots per inch (the CCITT Group III fax protocol) and includes the Error Correction Mechanism

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used by Group III faxes. If you purchase the PostScript Fax card, you can turn your PostScript printer into a fax machine.

- **Increases the speed and efficiency of printing.** PostScript Level 2 rewrote the way that memory is allocated by the printer so that all printer memory is allocated to all printer tasks and not partitioned to separate tasks in a linear fashion as was the case in Level 1 PostScript. The addition of pattern and form caching, the ability to render and download forms and patterns that are used repeatedly (such as logos) to an area of printer memory lets them be used multiple times when printing multiple versions of the same document.
- **Faster rasterizing** . Adobe incorporated a revamped **Adobe Type Manager (ATM)** rasterizer into Level 2. ATM is a set of PostScript subroutines that generates scaleable font outlines on the fly for display on the screen, speeding up font rendering for non-PostScript output devices. Level 2 also supports TrueType font rendering.

See Also

Fax; Fonts; PostScript; PostScript Printers, Laser; Printer Drivers

PostScript Print Servers

See

Printers, Color PostScript

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PostScript Printers

See

Desktop Printing, Printing Methods, Digital

PostScript Interpreters

See

Printers, Color PostScript

PowerBooks

Macintosh PowerBook is the name Apple gives to its line of laptop computers. Designed for portability, the various models of PowerBooks have all weighed under eight pounds including battery, built-in display, and built-in keyboard. PowerBooks contain all of the basic components of desktop Macs: **processor** , **RAM**, **hard disk** , **ROM**, and ports, and they can run either on batteries or on AC power. PowerBooks are fully-functional Macintoshes, and can run the same software as desktop models.

PowerBooks are typically not top-of-the line Macintoshes, mostly because they need to run on a low-power version of a Mac microprocessor that is not as fast as the full-power versions used in desktops. Any new PowerBook model is as powerful as the contemporary mid-to-lower-end desktop Macs

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designed for home and school. In addition, faster new processors usually show up in desktop Macs several years before the low-power versions become available for PowerBooks. Power limitations also mean that PowerBooks don't hold as much RAM as desktop models.

When the PowerBook was first introduced in 1991, it was an innovative and influential development in the PC laptop market. Features that PowerBooks pioneered have now become standard on most PC laptop models. These features include a keyboard that has an area for wrist placement and an integrated pointing device. The first PowerBooks included trackballs, although most current models have a trackpad.

Conversation with Perry Fox

As Manager of PowerBook Quality and Reliability, Perry Fox has put his computers through more torture tests than most of us can imagine. Much of what he does would violate the warranty, so he cautions the rest of us to leave these stunts to professionals.

Maclopedia: How did you get involved with Apple?

Perry: Back in 1984-85 when the Mac first came out, my wife was working at Apple, and she was able to use the employee discount program, and I started using it for work I was doing for another company. People deemed it a toy, and I thought, "If this is a toy, it is a pretty cool toy." I'm able to do presentations, word processing, put some spreadsheets together. It was making my life a lot easier. Then my wife met someone in the service

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organization at Apple, and they were looking for a product manager. And I thought, “There is one company I would go to because of the really cool things they were doing.” And there was a match. I started ten years ago working in the service area, for five years, and then made the transition to research and development (R&D). PowerBooks are under R&D, along with desktop and imaging.

Maclopedia: When do you get involved testing the PowerBooks?

Perry: We work early on with the products when they are coming up to speed, taking a shape that begins to look like a user’s type of model, where there is actually some functionality built in, and it’s fairly stable. We look at design margin testing, where we take the product and accelerate the lifecycle by increasing the temperature in a small chamber, and inducing vibration as well, to find out where in the product does it break? Where is the weakest link? This is real true reliability testing.

Then, when we get to the point where the design is stable, we look at oddball testing. These things are not warranted. They fall under the category of abuse. But we want to find out what will happen if we do violate the warranty. For instance, a lot of people use PowerBooks on an airplane; they are eating peanuts and having a Coke, and you have to play out that scenario. We oil up our fingers to find out what happens to the trackpad. We’ll pour a Coke over the keyboard and see what happens; can we just wash it off, or dry it off, and have it still

function? Turns out, yes, it does. But not in all cases. Don't try this at home. Then we take mayonnaise and hand lotion and rub it over the trackball and trackpad, and find out how they respond.

Whenever we come out with a new box, we do something we started early on as a benchmark. We'll get a car and drive over it. We've evolved the PowerBook line, and throughout those iterations, we have driven over a PowerBook 140, and PowerBook 180, and then the Duo line. We haven't done the 5300 yet. Or we rely on our customers to do this test, and send us anecdotes. "I was driving fifty miles an hour and I forgot that my PowerBook was on top of the car." Or one woman was in the big earthquake in Northridge, California and her apartment was completely destroyed. She was madly looking for her PowerBook because it had so much important data on it, and the cops were urging her to get out, and she found it crushed under a bunch of stuff, and it started functioning. She used the backlight as a flashlight to pick out some other things before they herded her out.

We had a letter come in recently. This person was dropping off her fiancé in Massachusetts. He's a grad student at Harvard, has written eight books, and all of them are on the PowerBook. "So I proceeded to back up onto Massachusetts Avenue, and I ran over something on the road that went bump bump. It was George's PowerBook." Amazingly, it booted up. There was no damage, except for tire tracks on the screen. We've had PowerBooks submerged in water, dried out with hairdryers, work fine. In one Jacques Cousteau project, it fell overboard. Somebody

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dove over and got it out. They dried it out and it continued to work.

Up in space, they use PowerBooks on the shuttle to tell where they are. Looking down you wonder, where am I in relation to that? So somebody developed a program that runs on a PowerBook and tracks their shuttle and where they are in relation to the earth. Now we don't *position* the PowerBook this way. It violates the warranty. We test them, typically, at an altitude spec of about 8,000 feet, which is what you would see inside a pressurized airplane at 35,000 feet, but we have had people take PowerBooks up to the top of Mount Everest, at 22,000 feet. That definitely violates the spec.

Maclopedia: Do you go out and see how customers are treating their PowerBooks?

Perry: Yes, we try to spend time with our customers. What we did one time was send an engineer off with one of our customers, for a day in the life of sales force automation, a fly on the wall. We watched how this person took the PowerBook, threw it in a bag, threw the bag in a van, and went off to their next account. So the engineer could report, "Here is how they are really using it." And that affects how we test, to make sure we are testing it the way people use it.

Maclopedia: But you don't have time to test it for years, right?

Perry: No, so we accelerate the product life. If its life cycle is 5-8 years, we have to test it in six weeks. So we put it in a walk-in oven at elevated

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temperatures and find out what temperatures it can withstand. Humidity and vibration. The machines are stacked up, and shaken. In the past, the standard was you put it on the shelf and let it run. But you can't assume a customer will put a PowerBook on a shelf, unless you give them SuperGlue and glue it to the desk. (Then that usage pattern would be valid!) It could go up to 140 degrees, it could go down to zero degrees, and people still expect certain things—that even if I am in Minnesota in the middle of winter, and I have the PowerBook in the trunk of my car, I can pull it out, go into a conference room at seventy degrees, and it better work!

We found out that the extendible feet were breaking off. For the latest PowerBook, we spent a lot of time designing feet that don't break, and, if they do break, it is a 25 cent part. You just pop it off, and pop it back in. So there was extensive testing of feet. "Let's make it robust, and let's make a backup plan, just in case someone does damage it."

Maclopedia: Do you have to invent your own torture test equipment?

Perry: Yes, we come up with fixtures to test out products. With the 5300 we came out with the PCMCIA slot, and the thinking there was that we don't know if people are going to do this but they can plug in the cards multiple times, so we came up with a fixture that pushes the card in, runs some software, accesses the card, ejects the card, and then pushes it back in, to make sure we can do this thousands of times.

Our biggest challenges are with the new technologies coming out and

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the new computing paradigms. You look at the notebook market. The first breakthrough was we can take a desktop and shrink it down, and make it portable. Then the PowerBook 140 and 170 came out, running on batteries, so you can use them on an airplane, and everywhere you want, so that was a new way for users to use the product, and we had to meet their expectations. There's probably going to be another paradigm to address from the reliability perspective. We are involved during the development of the products, when the new paradigm is evolving, so we hear all the early scoping, product marketing, and design engineering, and we are looking at our piece of the pie asking ourselves, "How are we going to test it? How are they going to use this thing?" So we have to really understand how customers are going to use the machine, and what their expectations will be, and design new test methodologies to stay ahead of the customer.

Another innovation was the **PowerBook Duo**, a smaller, lighter version of the PowerBook meant to function as both a portable and a desktop computer. As a portable Mac, the Duos weigh several pounds less than standard PowerBooks. The reason for this weight difference lies in the fact that they don't include a floppy drive or many of the ports found in standard PowerBooks. As a desktop Mac, PowerBook Duos can plug into one of several types of **Duo docks**, which include ports such as video and Ethernet. A full-sized Duo Dock from Apple contains all the ports of a desktop Mac, as well a floppy disk drive and NuBus slots that can accept expansion cards.

Most standard PowerBook models contain many of the same ports as desktop

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Macs. You can connect Mac keyboards and mice to a PowerBook's **Apple Desktop Bus (ADB) port** and external hard disk, or CD-ROM drives to the **SCSI port**. You can plug a PowerBook into a **LocalTalk** network or printer, and some models contain an **Ethernet** port as well. All except the earliest PowerBook models can connect to external monitor displays. All of the ports are the same as desktop Macs, except for the SCSI port and monitor ports, which are square on the PowerBook.

In addition to the ports, more recent PowerBook models have expansion slots made for laptop computers. While earlier PowerBooks contained internal expansion slots, more recent models use externally accessible **PC Card slots**, which accept credit card-sized modems, networking cards, and other expansion cards.

PowerBook Series The model numbers of PowerBooks may seem mysterious at first, but Apple has always followed a standard naming convention that identifies the type of PowerBook. This naming convention is similar to that used for desktop Macs. PowerBook models with three digits (such as the 520) have 680x0 processors. PowerBooks with four digits (such as the 5300) have PowerPC processors. PowerBook Duos begin with a "2" (as in 2xx and 2xxx). The designation "c" (as in 2300c) means that the model has a color display screen.

The lowest-powered model was the PowerBook 100. Increasingly higher model numbers are indicative of the relative power and feature set of the unit, not necessarily the chronological order of the introduction of the

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models. For example, the PowerBook 150 came out several years after the PowerBook 170.

So far, Apple has produced five lines of PowerBook models: the **PowerBook 100 series** , the **PowerBook Duo 200 series** , the **PowerBook 500 series** , the **PowerBook Duo 2000 series** , and the **PowerBook 5000 series** (see Table below). Models in the 100 series, the 2300 series and the 5000 series are currently in production. The original three PowerBooks introduced in 1991 were the 100, 140, and 170. The 200 series introduced the PowerBook Duos. The 500 series were the first PowerBooks with 68040 processors, and the 2000 and 5000 series were the first PowerPC processors. PowerBooks use batteries that are made of the nickel cadmium (NiCad) type or one of several types of Nickel metal hydride (NiMH).

The PowerBook Families

<i>Series</i>	<i>Processor</i>	<i>Weight</i>	<i>Battery</i>	<i>Max RAM</i>	<i>Pointing</i>
100	68030*	5.5-7 lbs	NiCad**	8,14,or40MB	trackball***
Duo 200	68030/040	4-5 lbs	NiMH	24 or 40 MB	trackball
500	68LC040	6.5-7.5 lbs	NiMH	36 MB	trackpad
Duo 2000	PPC 603e	4.8 lbs	NiMH	64MB	trackpad
5000	PPC 603e	5.5-6.2 lbs	NiMH	56MB	trackpad

*except the PowerBook 100, which had a 68HC000, and the 190, which has a

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68LC040

****except the 100, which had a lead-acid, and the 190, which has a NiMH**

*****except the 190, which has a trackpad**

The future direction of PowerBooks depends both on the technology of desktop computers and laptop computers. Like desktop Macs, the speed of PowerBooks will continue to increase as processors and RAM get faster, providing more power for each dollar.

On the laptop front, display technology will continue to provide better displays and decreasing costs. While the first PowerBooks had black-and-white screens, today's models have either grayscale or color screens. In addition, battery life improves as battery weight shrinks. The next battery type will probably be lithium ion, which will add several hours of battery life. However, the biggest change in the short term may be the introduction of Mac-compatible laptop clones produced by companies other than Apple. The additional competition should produce innovation and drive costs down.

See Also

PowerBook 100 Series; PowerBook 500 Series; PowerBook 5000 Series; PowerBook Duo 200 Series; PowerBook Duo 2000 Series; PowerBook Batteries; PowerBook Display; PowerBook Floppy Disk Drive; PowerBook Hard Drives; PowerBook Internal Modems; PowerBook RAM; PowerBook Trackballs and Trackpads

PowerBook 100 Series

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As Apple's longest running line of PowerBooks, the PowerBook 100 series is Apple's most diverse line. The first PowerBooks belonged in the 100 series, and Apple continued to add new technology in additional 100 series current models. Today, the 100 series represents the low end of the PowerBook choices available.

Most of the 100s share a similar set of basic specifications (see table that follows). Most models use 68030 processors and nickel cadmium (NiCad) batteries. Some models also have a 68882 floating point math coprocessor. All models come with either 2 or 4MB of RAM on the logic board, with a single RAM slot to add a RAM expansion card. The type of RAM expansion card varies between models. Most PowerBook 100 models have a standard set of Mac ports, as well as a floppy drive. The displays vary widely in type, size, number of colors, and resolution.

Specifications, PowerBook 100 Series

Model	CPU Speed	Display type	Colors/Resolution	RAM
100	16 MHz	9" passive matrix	black & white@640X400	2/8 MB
140	16 MHz	10"passive matrix	black & white@640X400	2/8 MB
145	25 MHz	10"passive matrix	black & white@640X400	2/8 MB
145B	25 MHz	10"passive matrix	black & white@640X400	4/8 MB
150	33 MHz	9.5"passive matrix	4 grays@640x480	4/40 MB

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160	33 MHz	10" passive matrix	16 grays@640x400	4/14 MB
165	33 MHz	10" passive matrix	16 grays@640x400	4/14 MB
165c*	33 MHz*	9" passive matrix	256 colors@640x400	4/14 MB
170*	25 MHz	10" active matrix	black & white@640X400	2/8 MB
180*	33 MHz	10" active matrix	16 grays@640X400	4/14 MB
180c*	33 MHz	8.5" active matrix	256 colors@640x480	4/14 MB
190	66 MHz	9.5" passive matrix	16 grays@640x480	4/40 MB
190cs	66 MHz	10.4" dual scan	256 colors@640x480	4/40 MB

*Also include 68882 floating point math coprocessor

All 100s have the standard Mac ports, including LocalTalk (printer) SCSI and Apple Desktop Bus (for keyboards and mice). The PowerBooks 160, 165, 165c, 180, 180c, 190, and 190cs have an external video output to which you can connect an external display monitor. (The video output is optional on the 190 and 190cs.)

The two oddballs of the 100 series are the PowerBook 100 itself, the least powerful model, and the PowerBook 190, the most recent and the most powerful in the series. The PowerBook 100 was one of the first three PowerBooks, along with the 140 and 170. It is unique, however, in that it is the only PowerBook with a 68HC000 processor, the low-power version of the 68000. The 100 was also the only PowerBook that could run versions of Mac OS

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earlier than System 7.x. It was the only PowerBook with a lead-acid battery, and was the only non-Duo PowerBook not to have a built-in floppy drive. Instead, it had a special port connector that allowed you to plug in an external floppy drive. At 5.1 pounds, the PowerBook 100 was the lightest non-Duo model made.

The recent PowerBook 190 and 190cs also have different processors and batteries than the rest of the line. They are the only PowerBooks of the 100 series run by a 68LC040, the low-power version of the 68040 processor. The 190s are also the only PowerBook 100s that are upgradable to a PowerPC 603e processor. (Even the higher-end 500 series PowerBooks are not upgradable to PowerPC processor.) The 190 models are the first in the series to use nickel metal hydride batteries, which hold a charge longer than NiCad batteries. They were also the first of the series to use a **trackpad** cursor control device.

The 190s include some of the features of the PowerBook 5000 series. They include two **PC Card** slots (also known as PCMCIA slots) for use with the credit card-sized PC Card expansion cards. The slots can accommodate two Type I or Type II cards, or a single Type III card. A 16-bit, CD-quality sound output port is another feature of the two 190 models. The 190cs is the only series 100 model to use a **dual-scan display**, a type of screen that produces images of better quality than does passive matrix, but not as good as those produced on active matrix displays.

Another recent model, the 150, also has some unique features. The 150 plays the role that the 100 did in the early days, in that it is the lowest cost and

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lightest PowerBook (5.5 pounds) now available. Like the earlier PowerBooks, it uses a trackball for its cursor control device and a NiCad type battery.

See Also

PowerBooks

PowerBook 500 Series

The four models of the PowerBook 500 series (see figure) offer bigger screens, faster processors, and lighter-weight plastic than the previous 100 and 200 series models (see table). The 500 series PowerBooks increase battery life over previous models with the ability to hold two nickel metal hydride batteries and by using batteries that contain their own microprocessors and built-in power management circuitry.

Table of Specifications

Model	CPU	Display type	colors/resolutions	RAM: min/Max
520	25 MHz	9.5"passive matrix	16 grays@640x480	/36
520c	25 MHz	9.5"dual scan	256 colors@640x480	/36
540	33 MHz	9.5"active matrix	64 grays@640x480	/36
540c	33/66 MHz	9.5"active matrix	256 colors@640x480	/36
			32,768 @640x400	/36

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The 500-series PowerBooks has some other firsts as well. They added function keys to the keyboard for the first time, and are the only models to include built-in Ethernet ports. **Trackpads** first appeared in 500-series models. PowerBook 500 models were the first Mac that enabled users to change their own RAM and hard disk drives. You can obtain access to the 500's interior by removing a few screws and lifting up the keyboard. In previous models, only Apple-licensed technicians could make changes in RAM and hard disk configurations, or the warranty would be voided.

PowerBook 500 models were also the first Macs that could use **PC Cards**, the credit card-sized expansion cards you insert without opening the computer. PC Card functionality is an option installed as a 3.8-ounce adapter, called the PowerBook **PCMCIA** Expansion Module. (PCMCIA, which stands for the Personal Computer Memory Card International Association, is an older name for PC Card hardware.) The adapter installs into the left battery bay and plugs into the 500s' processor-direct slot (PDS). The PC Card adapter can hold two Type II cards, or one thicker Type III card. You also need to install software that comes with the adapter.

The PowerBook 500 models sound better than earlier PowerBooks, with built-in stereo speakers and CD-quality audio. PowerBook 500s can also record in stereo through the use of an external microphone (the built-in microphone is mono only) and stereo recording software, such as Farallon's SoundEdit Pro or Opcode Systems' AudioShop.

In one way, the 500 is inferior to some of the 100 series models. For example,

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none of the PowerBook 500s contain a floating point math unit, as do several of the 100 series. This means that the 500 series PowerBooks can't run software that requires floating point math, such as certain CAD and graphics programs. Although the 68040 processors used in some desktop Macs have built-in floating point, the low-power 680LC40 processors don't. The PowerPC-based PowerBooks (the series 2000 and 5000) do have floating point units built into their processors.

The PowerBook 500s are upgradable to PowerPC processors via Apple's Macintosh PowerBook Processor Card Upgrade Kit with PowerPC 603e for PowerBook 500. The card contains a 100 MHz processor, and replaces the CPU card that plugs into the logic board.

See Also

PC Cards and Slots; PowerBooks; PowerBook 100 Series; PowerBook Duo 2000 Series; PowerBook 5000 Series

PowerBook 5000 Series

The PowerBook 5000 series are PowerPC-based laptops with a modular design. The 5000-series PowerBooks use PowerPC 603e processors. Running PowerPC native software, the low-power 603e models run two to four times faster than the 68030 and 040-based PowerBook 100 and 500 models can. The 603e in the 5300 runs at 100 MHz, and is slightly than the 100 MHz **PowerPC 601** found in desktop models such as the Power Mac 7500. There is also a model with a

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117 MHz processor (see table).

Table of Specifications

Model	CPU Speed	Display type	grays/colors	RAM: min/Max
5300	100 MHz	9.5"passive matrix	16 grays@640x480	8/64 MB
5300cs	100 MHz	10.4"dual scan	256 colors@640x480	8/64 MB
5300c	100 MHz	10.4"active matrix	256 colors@640x480 32,768*colors@640x480	8/64 MB
5300ce	117 MHz	10.4"active matrix	32,768colors@800x600	32/64 MB

*with 1 MB VRAM installed

Series 5000 PowerBooks give you a choice of passive matrix, **dual-scan** , and active matrix flat panel displays. The dual scan screens produce images of better quality than passive matrix, but not as good as those produced on active matrix displays.

The 5000 series also contain two **PC Card** slots (also known as PCMCIA slots) for use with the credit card-sized PC Card expansion cards. The slots can accommodate two Type II cards, or a single Type III card. Unlike most other PowerBooks, the 5000 models don't have an internal modem slot, so a PC Card modem is your only option.

Another import feature of the 5000 series is the modular design, which

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enables the units to be reconfigured by the user. If you remove three torx screws on the bottom of the unit, the keyboard lifts up for easy access to RAM and hard disk.

The floppy disk drive sits in an expansion bay and can also be easily removed. You can pop out the floppy drive by pushing a latch on the bottom of the unit. You can replace the floppy drive with other storage devices, for example, additional hard drives or removable cartridge drives such as the Fujitsu PowerBook DynaMO 230, a 3.5" magneto optical drive that uses 230 MB cartridges. The floppy slot uses a standard IDE connector. You can even plug in Apple's PC Card Storage Tray, which holds four Type II PC Cards or two Type III PC Cards. The PowerBooks weigh 0.4 pounds less with the storage tray installed than with the floppy drive installed.

Other features include the capability to put the PowerBook to sleep by closing the lid. A blinking LED lets you know the unit is in sleep mode. You'll find a useful assortment of ports, including SCSI, LocalTalk, sound-out and built-in microphone, and optional video out port. The built-in Ethernet port of the 500 series is missing here. Apple expects you to use an Ethernet interface on a PC Card if you need it. There are many such cards that also contain a modem, as well.

One interesting port is an infrared window for moving files between PowerBooks through the air. The infrared window uses **AppleTalk** network protocols running at **LocalTalk** speeds, 230.4 kbps. The infrared window can also connect the PowerBook to a wired AppleTalk network through the use of

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Farallon's AirDock. This gives the PowerBook user access to printers and file servers.

The keyboard includes 12 half-sized F keys, an escape key, and a power-on key. Hold the power key down a second or so, and you'll bring up the Restart dialog box, which gives you an option to Restart, Sleep Cancel, or Shutdown.

See Also

PowerBooks, PowerBook 100 Series, PowerBook Duo 2000 Series

PowerBook Batteries

PowerBooks have used three basic technologies: lead acid, nickel cadmium (NiCad), and nickel metal-hydride (NiMH), with some variations of the NiMH. Certain types of NiMH batteries types are interchangeable in different models. All types of PowerBook batteries can be recharged in a PowerBook plugged into an AC receptacle or in an external battery recharger.

With each new generation of PowerBooks, Apple uses a new type of battery to support more powerful and power-consuming features in PowerBooks. Battery life depends on how much power the PowerBook draws (see table) as much as it has to do with the type of battery. Color screens draw more power than grayscale or black-and-white, and the PowerPC 603e processor uses more power than 680x0. How a user operates the PowerBook also affects battery life. These factors include the brightness of the screen, how much the user accesses the hard drive and floppy drive, and whether the user runs

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a RAM disk, which can save a considerable amount of power.

Apple PowerBook Battery Specifications

PowerBook	Battery	Hours	Charged Voltage	Part/Model Number
100	lead-acid	2-to-4	6.0 V	661-0782/M3053
140, 145, 170	NiCad	2-to-3	6.75 V	661-0754/M5417
145B	NiCad	2-to-3	6.75 V	661-0789/M5653
140, 145, 170	NiCad	2-to-3	6.75 V	661-0013/M5654
165c, 180c	NiCad	1-to-2	6.75 V	661-0013/M5654
190, 190cs	NiMH	2.5-to-4.5	16.1 V	661-1028/M3254
Duo 210,230	NiMH Type I	2.5-to-4	13.5 V	661-1656/M7782
Duo250,270c	NiMHTypeII	2-to-4	13.5 V	661-1735/M1499
Duo 280	NiMHTypeII	2-to-4	13.5 V	661-1735/M1499
Duo 280c	NiMHTypeIII	2-to-4	13.5 V	661-0053/M1499
520, 520c	NiMH PBIB*	2-to-3.5	10.8 V	661-0055/M1906
540, 540c	NiMH PBIB*	2-to-3.5	10.8 V	661-0055/M1906
Duo 2300c	NiMHTypeIII	2-to-4	13.5 V	661-0053/M1499
5300	NiMH	2.5-to-4.5	16.1 V	661-1028/M3254

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*PBIB=PowerBook Intelligent Battery

The original PowerBook 100 is the only PowerBook that uses a lead acid battery, the same type of battery technology used in automobiles. Like the no-maintenance automobile batteries, PowerBook 100 batteries were sealed. Lead-acid batteries can hold a charge longer than NiCad batteries, and can last through a large number of recharges, but contain more hazardous materials than other types and therefore represent more of a disposal problem.

NiCad batteries were used in most of the PowerBook 100 line, except for the PowerBook 100 itself and the 190 and 190cs. NiCad batteries hold a charge for a shorter amount of time than any other type of batteries. In addition, they have a shorter total life than other types of batteries because the amount of usable power stored in the battery reduces with each recharge. At the end of a NiCad battery's life span, a charged battery can only run the PowerBook for a half hour or less. You can lengthen the overall life span of a NiCad battery by letting it discharge completely before recharging it.

Nickel Metal-Hydrate (NiMH) batteries are the most commonly used batteries in PowerBooks today. They recharge more quickly than NiCad batteries do, and have longer life spans. As you can see from the above chart, they hold a greater voltage, and hold more power per unit volume than NiCad batteries.

Apple has used several types of NiMH in PowerBooks over the years. The Original NiMH, called Type 1, was first used in the PowerBook Duo 210 and 230. A Type II was used in the PowerBook Duo 270c, 280, and 250. Eventually, Type

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II NiMH replaced the Type I battery in the 210 and 230 as well.

Type III NiMH was introduced in the 280c, and used in the Duo 2300. It holds about 15 percent more power than Type II. You can use Type III batteries with the other Duos with the addition of a System Enabler file that comes with the battery.

PowerBook 500 series introduced another version of the NiMH battery, the PowerBook Intelligent Battery. These batteries contain their own processors to actively manage the power flow to the PowerBook and to give the PowerBook an accurate indication of how much power is left.

The most advanced type of battery used in a PowerBook, the lithium ion battery, was never seen by the general public. Lithium ion battery technology received a setback when Apple pulled them out of PowerBook 5300s in the summer of 1995, several months before the introduction of the 5300 series. Several of the lithium ion batteries caught fire at Apple, so the company quickly replaced them with nickel metal hydride batteries. Lithium ion batteries are the most advanced type of battery, and were supposed to provide 3-to-5 hours of use in the PowerPC-based PowerBooks. It is possible we will see new versions of the lithium ion battery in the future.

See Also
PowerBooks

PowerBook Control Panel

The PowerBook control panel is designed to help the PowerBook user manage and conserve battery power. The control panel itself has two modes; Easy (which collapses the control panel down to a small window with only a slider visible for setting your choice between better conservation or better performance; and Custom, which expands the control panel to its full size and enables access to additional conservation features, set by using sliders, like:

- How many minutes of inactivity until the PowerBook goes into a state of sleep.
- How many minutes of inactivity until the screen dims.
- How many minutes of inactivity until the hard disk spins down.

On certain models of PowerBook, this control panel will also give you the option, through a checkbox, to reduce the processor speed to conserve battery power.

PowerBook Displays

PowerBook displays are flat-panel screens that use variations of liquid crystal display (LCD) technology. The displays in PowerBooks create better pictures than desktop CRT display monitors, with brighter, sharper images and more vivid colors. However, flat panel displays are quite a bit more expensive to produce than CRT monitors, which is why you don't see many flat-panel LCD displays on desktop computers.

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If you're using your **PowerBook** in a presentation and you want to have the image on the presentation screen to appear on your PowerBook screen as well, you can select **video mirroring** in the PowerBook Display Control Panel and toggle video mirroring on. You can also use video mirroring with an external monitor. On some newer models of PowerBook, there's a screen-dimming control in this control panel.

Like desktop monitors, PowerBook displays are made up of tiny dots called pixels, about 72 of them per inch. Unlike desktop monitors, the pixels in LCD screens are square and sharply defined.

The screens used in the first PowerBooks, the 100, 140, and 170, were black-and-white screens, which display one-bit of color information, or two colors (black and white) per pixel. Black-and-white screens have not been used in PowerBook models for many years, but grayscale screens are still available. Grayscale adds values of gray that are in between black and white. A 2-bit grayscale screen can display 4 grays and a 4-bit screen can display 16 grays.

When you add color, you drive up the cost and use more power, but you enhance the user experience. Color displays start at 8-bits per pixel, or 256 colors. The highest-resolution LCD screens can display up to 32768 colors (16-bit).

Regardless of how many colors or grays a screen can display, all PowerBook displays are one of two basic types: active matrix screens and passive matrix screens. Active matrix produces the highest quality images, and are the best computer display devices. Each pixel in an active matrix display has its own

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transistor to determine the level of intensity. Active matrix colors are bright with good contrast, and the objects are sharp and well-defined. These displays can react quickly to rapidly changing graphics, and can be seen clearly from wide viewing angles, which makes them the best displays to use for presentations.

Passive matrix, which used to be called supertwist, is a more economical LCD technology. Images on passive matrix screens are usually unviewable at wide angles. Passive matrix screens don't draw as fast as active matrix screens, so quickly-moving objects can blur. Small objects, such as the arrow cursor, can disappear from view when you move them.

Some PowerBooks come with an enhanced type of passive matrix screen called a dual-scan display. A dual-scan display draws (or *scans*) the top and bottom half of the screen at the same time, thus achieving an effective refresh rate nearly twice that of a standard passive-matrix display. It draws images on the screen faster, reducing the blurring or disappearing effects of fast-moving objects. It also makes colors appear brighter than ordinary passive matrix displays.

TIP All PowerBook displays are lit from behind, or backlit. If you are using a PowerBook in bright light, you can save battery power by turning the backlighting partially or all the way down.

See Also

Monitors; PowerBook 100 Series; PowerBook 500 Series; PowerBook 5000 Series; PowerBook Duo 200 Series; PowerBook Duo 2000 Series

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PowerBook Duo 200 Series

The PowerBook Duos are designed to function as two computers—a laptop Mac when away from your desk, and a desktop Mac when at your desk. As laptops, the Duos are lighter, thinner, and easier to carry than standard PowerBooks because they don't contain floppy drives and many of the ports of standard PowerBook. Instead, the Duos contain one serial port(LocalTalk-enabled) and a special 152-pin connector for connecting to a Dock. The Duos all contain a slot for an optional internal modem.

A Duo functions as a desktop Mac when you plug it into Apple's **Duo Dock** (see figure).

A Duo Dock provides the standard ports of a desktop Mac, including video circuitry and **VRAM** to support an external monitor. The Duo Dock also contains a floppy disk drive, an internal hard drive, and several NuBus Expansion ports. Smaller, portable docks that plug into the 152-pin connector are also available. Sometimes called minidocks, these portable connectors can add various combinations of ports and a connector for an external floppy disk drive.

PowerBook Duo 210 and Dock The 200 series of Duos make up most of the Duo models. At press time there was one other Duo model, the 2300, which has a PowerPC processor. The Duo 200 series models use either a 68030 or 68LC040 processor (see table), the lower power version of the 68040 used in desktop models, such as the Quadra line. Software that requires floating point math

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(such as some drawing and CAD programs) will only run on the Duo 270c because it is the only series 200 Duo that contains a 68882 floating point math coprocessor. While the 68040 processor in some desktop Macs includes a built-in floating point math processing unit, the 68LC040 used in the Duo 280 and 280c does not have a floating point math unit.

Table of Specifications

Model	CPU	Display Type	Colors/Resolution	RAM: Min/Max
210	25 MHz 030	9.1" passive matrix	16 grays@640x400	4/24 MB
230	33 MHz 030	9.1" passive matrix	16 grays@640x400	4/24 MB
250	25 MHz 030	9" active matrix	16 grays@640x400	4/24 MB
270c	33 MHz 030*	8.4" active matrix	256 colors@640x480 32,768 colors @640x400	4/32 MB
280	66 MHz 040	9" active matrix	16 grays@640x400	4/40 MB
280c	66 MHz 040	8.4" active matrix	256 colors@640x480 32,768 colors @640x400	4/40 MB

*Also includes 68882 floating point math coprocessor

You can upgrade any of the models in the Duo 200 series to a PowerPC processor by replacing the logic board with Apple's Logic Board Upgrade Kit, which includes a 100 MHz PowerPC 603 chip and 8 MB of built-in RAM

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(expandable to 56 MB). This upgrade gives an old Duo the functionality of a Duo 2300.

The Duo 200 PowerBooks all come with a 19-mm trackball that is smaller than the trackballs in the PowerBook 100 series. They also use several types of nickel-metal-hydride batteries. The Duo 210 and 230 use a Type I nickel-metal-hydride battery for 2 to 4.5 hours of power and a recharging time of 2 hours. The Duo 250, 270c, and 280 use a Type II nickel-metal-hydride battery, which provides 2.5 to 6 hours (4 hours on the color 270c) of power. The 280c uses a Type III battery, which provides 2-to-4 hours of use on this color machine.

See Also

PowerBooks; PowerBook 100 Series; PowerBook Duo 2000 Series

PowerBook Duo 2000 Series

At press time, there was only one 2000 series PowerBook Duo model, the 2300c. It has most of the same features (see the following table) of the **PowerBook Duo 200 series**, such as light weight (4.8 pounds) and a slim profile for easy portability, and a 152-pin processor-direct slot connector for connecting to a PowerBook Duo Dock Plus. This connects the Duo 2300c to desktop peripherals such as monitor, keyboard, floppy and hard disks, and full-sized expansion cards, or smaller minidocks.

Table of Specifications

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Model	CPU Speed	Display type	colors/resolutions	RAM: min/Max
2300c	100 MHz	9.5" active matrix	256 colors@640x480 32,768 colors @640x400	8/56 MB

The main difference between the 2300c and the series 200 Duos is the former's PowerPC processor, the 603e, which runs PowerPC native software two to four times faster than the 68030 and 040-based PowerBook Duo 200 models can. (In effect, the 2300c is the Duo version of the PowerBook 5300.) The 603e in the 2300 runs at 100 MHz, and is slightly faster than the 100 MHz **PowerPC 601** found in desktop models such as the Power Mac 7500.

The Duo 2300c uses a Type III nickel-metal-hydride battery with an estimated battery life of 2-to-4 hours. It includes a **trackpad** that is more advanced than the trackpad in the PowerBook 500 and 5000 series. The 2300c's trackpad is clickable, so you can use it for click-and-drag actions, as well as for opening files and folders. The Duo 2300c includes the LocalTalk (printer) port found in most Mac models, and has an internal slot for an optional fax modem card. The 2300c comes with a 750MB or 1.1GB hard disk.

See Also

PowerBooks; PowerBook 5000 Series; PowerBook Duo 200 Series

PowerBook Duo Docks and MiniDocks

Duo Docks are desktop docking bays for PowerBook Duos that connect a Duo

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with all the ports, peripherals, expansion capabilities, and networking and communication facilities of a desktop Mac. The docks connect to the Duo via a 152-pin processor-direct slot connector. You install a PowerBook Duo in a Duo Dock by closing the lid and inserting it into the slot in the Dock. A key lock prevents a “collector” from removing the Duo from the Duo Dock. There are also smaller docks called minidocks, which are connectors that provide the Duo with more ports.

There are two Duo Docks, the original PowerBook Duo Dock created for the PowerBook Duo 200 series, and the PowerBook Duo Dock Plus used with the Duo 2000 series. The original Duo Dock can hold a floppy disk drive, an optional 3.5" SCSI hard drive, and an optional 68882 math coprocessor. It includes built-in video circuitry and 512k of VRAM, for connecting external Apple RGB, VGA, and SVGA display monitors and displaying up to 256 colors (8 bit). If you expand the RAM to 1 MB, the Duo Dock can display 32,000 colors (16 bit). Users usually place the monitor on top of the Duo Dock, which is designed to support up to 85 pounds.

The Duo Dock contains ports, including an HDI-30 SCSI port, sound-in and out ports, and an Apple Desktop Bus (ADB) port for a keyboard, mouse, and other input devices. There are two standard Mac serial ports (a LocalTalk-enable printer port and a modem port), and a pass-through port for the optional modem in the PowerBook Duo 200 models. Inside, there are two internal NuBus expansion slots that can hold standard Mac expansion cards.

The PowerBook Duo Dock Plus contains the same ports and slots but with

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expanded capacity. For example, 1 MB of VRAM is standard, supporting thousands of colors on monitors up to 17 inches and 256 colors on 20- and 21-inch monitors. The Duo Dock Plus also supports **multiscan monitors**. In addition to the ports on the original Duo Dock, the Plus has an Ethernet port.

Apple's Duo MiniDock is a bar that measures about 10.6" long by 3.2" and plugs in the back of the Duo. Unlike the Duo Dock, the MiniDock is designed to be carried around with the PowerBook Duo, weighing only 1.24 lb. It contains the circuitry and 512k VRAM for a video out port, an ADB port, two serial ports, an HDI-30 SCSI port, and an HDI-20 port for the external 1.4MB floppy disk drive. It also has a modem pass-through port to support a modem in the PowerBook Duo notebook computer, and sound in and out ports.

PowerBook Floppy Disk Drive

PowerBooks use **floppy disk drives** with similar capabilities to those used in desktop Macs, but they are usually lighter and slimmer. Like those in the desktop Macs, PowerBooks floppy drives can read Mac 1.44 MB, 800K, and 400K diskettes, as well as 1.44 MB DOS-formatted diskettes.

The floppy disk drive in most PowerBook models is permanent; however, the PowerBook 5300s have a removable floppy drive that sits in an expansion bay. You can pop out the floppy drive by pushing a latch on the bottom of the unit. You can then replace the floppy drive with other storage devices, such as additional hard drives or removable cartridge drives.

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The PowerBook 100 and the PowerBook Duos don't have a built-in floppy drive. The PowerBook 100 has an HDI-20 connector to which you can connect an external floppy drive. For Duos, you can add an HDI connector by plugging in a minidock.

See Also

PowerBook 100 Series; PowerBook 5000 Series; PowerBook Duo 200 Series; PowerBook Duo 2000 Series; and PowerBook Duo Docks and MiniDocks

PowerBook Hard Disk Drives

Hard disks inside of PowerBooks have ranged in capacity from 20MB in the first PowerBook 100 to over a gigabyte in some current models. All PowerBook models except the Power Duos have a SCSI port for connecting external hard drives, CD-ROM drives, and other removable storage devices.

The internal hard disk drive of the PowerBook 150 uses the **IDE** interface instead of the more standard **SCSI** bus. (Internal IDE drives are also used on some desktop models, such as the Performa 630.) IDE is less expensive and faster than SCSI. However, you can't daisy-chain IDE drives together the way you can SCSI devices. This is why the PowerBook 100 also has an external SCSI port, as do all PowerBooks except the Duo models.

The PowerBook SCSI port does not use the standard 25-pin connector of the desktop Macs, but instead uses a small, square HDI-30 connector. To connect external hard drives to this port, you need a PowerBook SCSI cable, which has

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an HDI-30 on one end and a standard 50-pin SCSI connector at the other end. You can also get PowerBook SCSI cables that have a 25-pin connector instead of the 50-pin for devices that require the former connector.

SCSI Mode All PowerBook and PowerBook Duo models except the 140, 145, 145B and 170 have a feature called SCSI mode, sometimes called SCSI direct, which allows the PowerBook to act as an external disk drive to a desktop Mac. In SCSI mode, you connect the SCSI ports of a desktop Mac and a PowerBook together, and the PowerBook appears as a hard disk icon in the desktop Mac's Finder. You can then transfer files between the two machines simply by dragging the file icons. SCSI is much faster than a network connection, making SCSI mode a good method for backing up or transferring large amounts of data between the desktop Mac and the PowerBook.

To connect the two machines together, go to the laptop's PowerBook control panel, turn SCSI mode on, and shut the PowerBook down. You must also shut down the desktop Mac. You'll need a cable with an HDI-30 connector at one end and a 25-pin SCSI connector at the other end. You can also use two SCSI cables that don't have a common connector, joined by an adapter. Once connected, you can start up both Macs, and the PowerBook's hard disk will mount in the desktop Mac's Finder.

See Also

Hard Disk Drives; PowerBooks; SCSI

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PowerBook Infrared Beaming

The PowerBook 500 and 5000 series have the capability to beam data through the air using infrared (IR) signals. Infrared beaming is optional on the 190 and 190cs. The infrared window can move files between PowerBooks using **AppleTalk** network protocols running at **LocalTalk** speeds, 230.4 Kbps. The PowerBooks must be within a 30 degree angle of the IR window. The PowerBooks that are within range automatically recognize each other by using a piece of software called IRTalk. Each PowerBook then creates a new folder for any other PowerBook it sees within IR range. To transfer a file to the other user, you drag the file to the other user's folder.

The infrared window can also connect the PowerBook to a wired AppleTalk network through the use of Farallon's AirDock. This gives the PowerBook user access to printers and file servers.

See Also

AppleTalk

PowerBook Internal Modems

Many PowerBook models contain an internal expansion slot that holds a modem card (see figure). Functionally, these modems are nearly identical to the external modems used with desktop Macs, minus the blinking LEDs. Internal modems contain a single RJ-11 connector for plugging in a standard

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telephone line cable. Although most modem cards come with instructions on how to install the modem, a user can void the warranty by opening a PowerBook's case on all models except the 500 series, the 5000 series, and the Duo 2000 series.

Later models with PCMCIA slots did away with the modem slot because it is easier to insert a PC Card modem than to install an internal expansion card. The types of connectors for interfacing with the telephone cable vary with the manufacturer. Some PC Card modems use a thin connector called an X-Jack that directly accepts the cable's RJ-11 plug. X-Jacks are retractable and disappear into the PC Card when not in use. Other PC Card modems use a special adapter cable that plugs into the edge of the card on one end and accepts the RJ-11 plug on the other end.

See Also

Modems; PC Cards and Slots

PowerBook RAM

PowerBooks come with some RAM soldered to the logic board, and some on a RAM card. PowerBooks don't use SIMM modules, as do desktop Macs, but instead use special RAM expansion cards. As might be expected, these expansion cards cost more than standard SIMM modules. In addition, PowerBooks have a single RAM connector for this card. This means that adding RAM in a PowerBook requires that you replace one RAM card with a

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bigger-capacity RAM card, rendering the existing card useless.

RAM cards come in three basic styles that vary in thickness. PowerBook 500 series models require the thinnest type of RAM cards, the so-called thin small-outline package (TSOP) cards. These cards can also fit into any other type of PowerBook. The 1.2 millimeter thick RAM chips on TSOP cards sit on both sides of the card. The next thickest RAM cards are small-outline J-lead (SOJ) RAM cards, which use chips that are 2.5 millimeter thick, but the chips only sit on one side of the card. The thickest RAM cards are the flat-pack cards, which use chips on both sides of the card that vary in thickness between 1.2 and 2.7 millimeters. SOJ and flat-pack RAM cards can fit in certain PowerBook models. RAM card shapes also vary with different models.

Installing RAM PowerBook RAM first became user-upgradeable with the PowerBook 500 series. The RAM in PowerBook 5000 and 2000 series models can also be installed by the user. In these models, you can access the RAM by removing three Torx screws on the bottom of the PowerBook. This enables you to remove the keyboard, which exposes the RAM. In other PowerBook models, opening the case voids the warranty unless it's done by an Apple-certified technician. However, if the warranty has already expired, you can do it yourself.

To access the RAM card in the PowerBook 100, first remove the battery. Close the PowerBook (screen down) and lay it top down on a table. Remove the screws and rubber tabs from the bottom of the case. Some screws can be removed with a Phillips screw driver. Flip the unit over and release the

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monitor fasteners before opening the case. The monitor should now be free and the keyboard can be lifted out.

To open a PowerBook 140, 145, 150, 160, 165, 165c, 180, 180c, 190, and 190cs, remove the battery and close the unit. Lay it top down. Using T-8 and T-10 Torx drivers, remove the screws on the bottom and the one under the rear flap near the internal modem port. Separate the two pieces of the case carefully. There are very delicate cables inside the case that have to be disconnected gently. The case comes apart as a clam-shell fitting. Flip the unit over so that the screen is up and open the case. Expert RAM installers do not have to completely remove the top of the PowerBook's case or disconnect the ribbon cables to install the RAM cards. If you separate the case about two inches, you should have enough room to install the RAM card.

Disassembly of the Duo 200s is similar, except that after the screws are removed from the bottom of the case, flip the unit over and open the screen. The keyboard should be loose. Lift the keyboard up and fold it over gently. The RAM card installs in the upper right corner of the interior of the case.

See Also

PowerBooks; PowerBook 100 Series; PowerBook 5000 Series; PowerBook Duo 200 Series; PowerBook Duo 2000 Series

PowerBook Setup

This control panel enables you to configure the **internal modem** for your

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PowerBook and select a **SCSI ID number** for the PowerBook's hard disk. This enables you to connect it to another Macintosh computer as an external hard-disk drive, as you would an other SCSI peripheral. You can set a time for an automatic **wake-up** as well.

To use the PowerBook Setup Control Panel, follow these steps:

1. Select PowerBook Setup Control Panel from the Control Panels submenu on the Apple menu (or System Folder).
2. Choose between a Compatible or Normal modem setting by clicking the appropriate radio button. (Apple describes the difference between normal mode and compatible mode this way: "In the Normal mode, the modem is addressed via the System 7 Communication Toolbox, and this leaves your external serial port available for use. If your communication program is NOT compatible with the Communication Toolbox, set the PowerBook Setup control panel to Compatible. This mode prevents the external serial port from being addressed by other programs, as well as preventing communication with a serial printer.")
3. To set a SCSI ID, click the radio button by the ID number to which you want the PowerBook's internal hard-disk drive assigned.
4. To set an automatic wake-up, click the Wake-Up checkbox. To enter a new time and date for the wake-up, click the value you want to change to select it and up and down arrows will appear enabling you to click

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the up arrow to increase the value, or the down arrow to decrease it. After you've selected the value you want to change, you may find it easier to just enter the numbers by typing them in from the keyboard.

See Also

Internal Modem; PowerBook; SCSI-ID Number; Wake Up/Sleep

PowerBook Trackballs and Trackpads

PowerBooks all include either a built-in trackball or trackpad centered in front of the keyboard. Both are cursor control devices that can be used instead of a mouse. A mouse button is located surrounding or adjacent to trackballs and trackpads to enable you to click.

Older PowerBooks come with the trackball, which is basically an upside-down mouse; Instead of dragging the mouse's ball around a desk, you drag your hand across the ball. The ball turns two roller bearings, which measure how much the ball was moved and its acceleration. The ball in the PowerBook 100 series measures 31 millimeters, and is easier to handle than the 19 millimeter trackballs in series PowerBook Duo 200 models.

Trackballs occasionally require cleaning, as dust can jam the trackball's roller bearings. You can remove a PowerBook trackball by turning the collar around the trackball in a counter-clockwise direction. The ball will then lift out, exposing the roller bearings.

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Apple no longer ships PowerBooks with trackballs. The PowerBook 190, the PowerBook 500 series, the Duo 2300, and the PowerBook 5000 series all use trackpads. You control the cursor by dragging a finger over the trackpad. As with a mouse or a trackball, dragging your finger faster moves the cursor a farther distance on the screen. The most advanced trackpads are on the Duo 2300. These trackpads are clickable, so you can use them for click-and-drag actions, as well as for opening files and folders, without the need to hit a separate button.

Trackpads contain two sets of wires at 90 degrees to each other with current flowing through both sets. This creates an electromagnetic field above the trackpad. When your finger touches the trackpad, it disturbs the field, which in turn changes the current in the wires nearest your finger through an effect called coupling capacitance. The PowerBook trackpad circuitry uses the altered currents to detect where the cursor should be at any given moment. You must use your finger, rather than fingernail, pencil end, or other object. Otherwise, the trackpad won't register your input.

See Also

Mouse

PowerBook Video Out Port

Many PowerBook models have the capability to connect to an external monitor through a monitor port. These models are the PowerBooks 160, 165,

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165c, 180, 180c, 190, 190cs, the 500 series, and the 5000 series, as well on many Duo docks. (The video out port is optional on the 190 and 190cs.) The video out port on PowerBooks doesn't use the same 15-pin connector as the monitor port on desktop Macs, but it requires the use of a converter cable.

Some PowerBooks have two modes for external display. The first is called dual display, which allows the external monitor and the built-in screen to display different images or different applications at the same time. This is the same type of display you get when you connect two monitors to a desktop Mac.

The other type of external PowerBook display is called video mirroring, which simultaneously displays the same image on both screens. Video mirroring is useful for giving a presentation to an audience. In this case, the external display might not be a monitor, but a video projection system.

PowerFPU

See

SoftwareFPU

Power Key

The Power key **starts up** (or boots) certain Macintosh computers. Although this Power key appears on most Apple keyboards, only those computers that support the **soft boot** feature can use the Power key to start up.

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The Power key can be used with other **modifier keys** to **restart** any model of Macintosh by pressing the ⌘-Control-Power key regardless of whether it can startup with the Power key. This performs the same action as choosing Restart from the **Special menu** . In **System 7.5** , you can use the Power key to **shutdown** or restart by pressing the Power key while the computer is running. When you press the Power key, you get a **dialog box** asking, "Are you sure you want to shut down your computer now?" The dialog box offers three buttons: Shut Down (which confirms your intention to shut down), Restart (which restarts your machine as if you selected Restart from the Special menu at the Finder), and Cancel, if you press the PowerOn Key accidentally or if you just changed your mind.

See Also

Cancel; Dialog Box; Modifier Keys; Restart; Shutdown; Soft Boot; Special Menu; Startup; System 7.5

Power Macs

See

Desktop Models, Macintosh Family

Power Mac Card

Macintosh computers with a 68040 processor direct slot (such as Quadras) can

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be upgraded to a PowerPC processor through a PowerPC upgrade card. The upgrade card comes with a Power Macintosh Card Control Panel that enables the user to choose which processor to use, the 68040 or the PowerPC processor, by toggling on or off the upgrade card. If you turn the card on or off, the switch of processors won't take effect until the Mac is restarted.

Power Macs, Compatibility with

The Power Macs have had a remarkably smooth introduction history, considering the amount of 680x0-based software that exists. Application software incompatibility rarely occurs with the PowerPC chips in Power Macs. In fact, more compatibility problems occurred when the first 040 Macs were launched than with Power Macs.

The incompatibilities that do occur with Power Macs are usually older System extension files or control panels. If you do have problems with an older piece of software or hardware, call the manufacturer to see if an update or patch has been written to address the problem.

Another workaround for addressing error messages accompanying 68K software on a Power Mac is to turn off the Modern Memory mode in the Memory control panel and restart the Mac. Applications that say they are "Accelerated for PowerPC" or programs that are written specifically for the PowerPC perform better with the Modern Memory Manager selected.

When the Power Macs were first introduced, the following incompatibilities

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occured, and may still occur on first-generation Power Macs (for example 6100, 7100, and 8100s).

- PDS expansion cards designed for 68K Macs will not fit or work on Power Macs.
- If your 68K program uses a floating-point processor (FPU), such as Microsoft Excel or Adobe PhotoShop, they will not operate because the older System 7.5.1 emulator does not include an FPU. You can add a piece of shareware called SoftwareFPU or upgrade to a PowerPC version of the program that does take advantage of the PowerPC's built-in FPU.
- Audio-visual software that takes advantage of the AT&T DSP chip in the 68K AV Macs will not work, since the Power Mac handles digital signal processing without using a specialized chip.
- Some older hard drives do not support the SCSI Manager Version 4.3 used in System 7.5.1 and later Power Mac operating systems. If you are using an older Apple hard drive, use the HD SC Setup version 7.3 or later (that comes with your Power Mac) to update the hard drive.

The following programs do not work on a Power Mac:

- Claris MacDraw 1.0.
- Berkeley's After Dark Screen Savers, versions 1.0 and 2.0.
- PageMaker 4.2 will not work, upgrade to versions 5.0 or 6.0.

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- Symantec's Think C before version 6.0.1.
- AppleTalk Remote Access version 1.0.
- AppleSearch 1.0.
- AppleShare 4.0.
- Apple A/UX (Apple's version of UNIX). Apple's PowerOpen based on IBM's AIX UNIX will operate on a Power Mac.
- Connectix RAM Doubler version 1.0 doesn't work because they make direct calls to the 68030/40's Memory Management Unit. Versions 1.5 and later have fixed this problem. Use the PCI patch, version 1.6 on PCI-based Power Macs.

There is a difference between being “compatible” with PPC and being “PPC Software” in terms of performance. Almost all programs will operate with the 680x0 emulator built-in to the Power Macs, but those programs that are written in native PPC code take advantage of the special instructions and properties of the PowerPC chips and run many times faster than emulated programs. Those native PPC programs will not run on older 680x0-based Macs.

Certain applications provide two versions of their code on the installation disks—one for 68K Macs and one for PPC Macs—along with an installer program that recognizes what type of Mac you are using. These applications install a Fat Binary version of their programs that will run faster on a Power

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Mac or will run on a 68K Mac. Other applications sell separate versions of their applications. Look for the “Accelerated for Power Macintosh” red label for optimized versions of the programs.

See Also

Emulation; Logic Boards; Power Mac; PowerPC Processors

Power Mac Logic Boards

There are two different logic boards, also called motherboards, used on Power Macs: a NuBus Power Macintosh Logic Board and a PCI Power Macintosh Logic Board. All 6100, 7100, 7200, 8100 non-AV, and PowerPC Performa models use the NuBus motherboard. In fact, all Macs that use either the 601 or 603e chips use NuBus motherboards. All newer PCI-based Power Macs that run on the 604 chip, namely the 8500 and 9500 models, use the PCI-based motherboard.

NuBus is a standard that was developed at MIT and refined in 1985 by a committee composed of representatives from MIT, AT&T, Texas Instruments, Apple, and other companies. The NuBus standard specifies how expansion boards access the internal bus to the physical qualities of the NuBus slots. Motherboards for NuBus-based Power Macs contain the same chips as PCI-based motherboards, only the expansion bus structure is radically different. The expansion bus is a path that an add-on expansion card's data travels from the card to the computer and back. The fastest expansion cards use local bus designs because the cards have direct access to the CPU, PDS and PCI bus

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designs use this method. NuBus requires a controller to grant permission before its data gains access to the CPU.

Power Mac Logic Boards, NuBus-Based MotherBoard Components

The basic mother or logic board consists of several functional parts: Read-Only Memory (ROM), Memory Arrays, Internal Cache, Processor Direct Slots (PDS) for expansion, NuBus controller and card slots, Squidlet, High-Speed Memory Controller (HMC), Input/Output Controller (Apple Memory-Mapped I/O Controller or AMIC), Internal Floppy Disk Connector (SWIM III), Fast SCSI Driver and internal SCSI bus, Cuda, Ariel II, and AWAC (the last three components being the controllers of the multimedia and AV portions of the Power Mac).

The NuBus logic board contains the following components.

- **Read Only Memory (ROM).** A 4MB Read-Only Memory chip contains hard-wired instructions that performs such functions as startup tests and partitioning memory for the use of the system. ROM contains those portions of the operating system that is basic to the Mac, such as reading, writing, understanding peripheral locations, and so forth. The rest of the operating system is software and consists of such components as resource files, control panels, extensions, and the Finder. ROM-based firmware is sometimes called the **Macintosh toolbox**.
- **Random Access Memory (RAM).** Dynamic Random Access Memory (DRAM) is special volatile memory that is refreshed frequently.

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NuBus-based Power Macs ship with 8MB of RAM soldered on to the logic board. Other slots are available to upgrade the amount of RAM. RAM is installed into NuBus Macs via 72-pin single in-line memory modules (SIMMs). These SIMMs must have an access time of at least 80 nanoseconds (ns). All Power Macs do not have the same number of expansion slots for RAM upgrades. SIMMs are installed in pairs. You need to ensure that the SIMMs are called “non-composite, fast-paged RAM” so that they will fit in the Power Mac’s slots.

- **Level-2 Cache.** You can add another 256K of volatile memory to store frequently used instructions or data by inserting a 160-pin SIMM cache card in the Level-2 cache slot. The Power Mac 8100 came with a 256K Level-2 cache card already installed. The 6100 and 7100 made installing this cache optional.
- **Processor Direct Slots (PDS).** The PDS card you place in the PDS slot has direct access to the CPU’s control, address, and data buses. This fast, local-bus design makes PDS an efficient method for adding accelerator or video upgrade cards, because it is faster than NuBus. There is only one PDS expansion card option available on any Mac and the PDS has no design standards, because the card has direct access to many different microprocessors, each PDS card is designed for a separate PowerPC microprocessor. All Power Macs use the PDS to insert AV capabilities (the Digital Signal Processor) into the 6100, 7100, and 8100 AV Macs. Other 7100 and 8100s that are not AV-capable, use the PDS to upgrade the video RAM (VRAM). Macs use up to 640K of system

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RAM to store video frames, limiting 14 and 15 inch monitors to the display of 32,768 colors and 16 and 17 inch displays to 256 colors. Larger monitors are not supported. By adding a VRAM expansion card containing 1, 2, or 4MB of VRAM, you can gain access to up to 16.7 million colors on a 20 or 21 inch monitor.

- **NuBus Slots** . The 7100 and 8100 Power Macs contain three NuBus slots for system expansion. NuBus cards do not directly access the CPU, but instead use a special NuBus bus that connects to a Versatile Interface Adapter (VIA) chip. Because NuBus cards can add many different capabilities to the Mac, it needs a controller to play traffic cop and limit access to the CPU to requested instructions. The NuBus cards are controlled by a bus master called the BART Controller. The Bus Master works with the High-Speed Memory Controller to regulate access to the CPU and avoid bottlenecks and other priority problems. NuBus cards are self-configuring. Information stored on ROM on the card is read by the System 7.5 Slot Manager to identify itself and to manage its data flow. NuBus cards contain 96 pins in three rows of 32 pins. All Macintosh II NuBus cards fit the Power Mac NuBus slots. The self-configuring nature of the card means that you do not have to set dip switches or add jumper cables to ensure that the expansion card operates correctly.
- **Squidlet**. The Squidlet is a chip that synchronizes the operations of the six clocks used in the Power Mac to control the CPU and subsystems on the logic board. There are two other clocks on every Power Mac: a

system clock that controls the rate of execution of instructions within the CPU (this is the clock that sets the speed of the computer) and a CPU bus clock that controls the rate of data transfer across the system bus. The Squidlet chip controls the operations of six other clocks: Cuda that provides timing for the real-time clock; a pixel clock that controls the rate of redraws on 16 inch monitors; an Ethernet and SCSI clock; an I/O clock that controls the timing of data transfers across input and output components, serial communications, and the 12 inch monitor of all-in-one Macs; a Sound clock that controls sound sampling; and a VGA clock that provides controls for VGA monitors.

- **High-Speed Memory Controller (HMC).** The HMC chip controls all memory operations that are not directly handled by the PowerPC 601 or 603e **memory-management unit (MMU)**. For example, the HMC arbitrates requests for control of the CPU bus between NuBus expansion cards. The HMC also manages transfers between RAM and the CPU, L-2 cache and the CPU, and ROM and the CPU; as well as providing support for the built-in memory input/output features of the 601 chip.
- **Apple Memory-Mapped I/O Controller (AMIC).** Power Macs support high-level direct memory access (DMA) services for most peripheral devices that lets these I/O devices transfer data to and from memory without requiring access to the computer. The AMIC chip works in conjunction with the HMC chip to manage this data transfer. The peripheral device must be DMA-compliant (an most modern SCSI,

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Ethernet, floppy disk drives, monitors, and serial devices are compliant) for the direct memory transfer to operate.

- **SWIM III**. This is the controller that operates the floppy disk drive. The SWIM III controller supports DMA and can read the format used by DOS diskettes automatically if PC Exchange software is running in the System folder.
- **Curio**. This chip controls the operations of input/output between Ethernet, serial, and SCSI ports and the Mac. Each port has its own controller that works with the Curio I/O chip to transfer data between the port and the AMIC chip. Ethernet communications are handled by the Media Access Controller for Ethernet (MACE) chip on either an Ethernet network interface card or via built-in Ethernet hardware support. Most Power Macs provide built-in support for two types of Ethernet (coaxial and 10Base-T) ports, along with a LocalTalk port. The Serial Communications Controller (SCC) on the Curio chip manages I/O for the two GeoPort serial ports of every Power Mac. Both ports support fax/modem or printing (LocalTalk) connections. The Curio chip also controls the small computer system interface (SCSI) device access to the computer for both internal and external SCSI devices. All floppy, CD-ROM, and hard disk drives are SCSI drives.
- **Cuda**. This chip manages the 4-pin **Apple Desktop Bus (ADB)** serial port, as well as manages other functions such as powering the Mac on and off and managing reset commands.

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- **AWAC.** The Audio Waveform Amplifier and Convert (AWAC) chip manages the stereo sound input and output on all Power Macs. Power Macs support 16-bit sound sampling. This gives the Power Mac the sound fidelity of a good CD-player.
- **Ariel II.** This chip provides the built-in video capabilities for the high-density, 45-pin AudioVision monitor port on all Power Macs. This port supports Apple's AudioVision 14-inch monitor that integrates video input and sound input and output via built-in stereo speakers and a built-in Apple PlainTalk microphone for sound output.

See Also

601 Processor; PCI Slots; PCI-Based Logic Boards; Power Macs; PowerPCs

Power Mac Logic Boards, ROM System Enablers

Every Macintosh since its advent in 1984, has placed a portion of its operating system into Read-Only Memory (ROM). These hard-wired instructions are common to all Power Macs. Prior to System 7, every time that Apple introduced a new Macintosh model, it had to redesign its ROM chips to support that unique hardware configuration. System 7 liberated the Mac hardware slightly from its ROM by incorporating a machine-specific startup code, called an **Enabler**. Machines released prior to System 7 are powered by

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a single enabler, and those that were introduced after System 7 (a plethora), each have their own enabler file stored in the System folder that provides hardware information about that specific model to the Start Manager. The following table tells you what enabler to use with what Mac.

System Enablers for Macintosh Computers

IIvi, IIvx

Enabler 001, latest version 1.0.1 - Improved support for high speed serial communications and improved accuracy of the system clock. Also addressed a rare problem where floppies may not be ejected properly at shutdown.

LC III

Enabler 003, latest version 1.0

Centris 610, 650, Quadra 610, 650, 800

Enabler 040, latest version 1.1 - Added support for Quadra 610 and Quadra 650.

LC 475, LC 575, Quadra 605

Enabler 065, latest version 1.0

Centris 660AV, Quadra 660AV and 840AV

Enabler 088, latest version 1.1 - Added support for Quadra 660AV.

PowerBook 160, 165c, 180, 180c

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Enabler 131, latest version 1.0.3 - System Enabler 131 replaces System Enabler 111 and System Enabler 121. Corrected a problem involving the serial driver. If a user has the serial driver open, but is not transmitting, and then puts the PowerBook to sleep, any attempt to transmit upon waking, would cause the system to hang. Added support for the PowerBook 165.

Performa 450, 460, 466/7

Enabler 308, latest version 1.0 - No enabler is required under System 7.5.

Performa 550, 560

Enabler 332, latest version 1.1 - No enabler is required under System 7.5.

Performa 475, 476, 575, 577/8

Enabler 364, latest version 1.1 - No enabler is required under System 7.5.

Color Classic

Enabler 401, latest version 1.0.5 - Fixed a problem involving erratic mouse movement with Apple II mouse based applications running on the Apple IIe card installed in the PDS slot.

LC 520, LC 550

Enabler 403, latest version 1.0.1

Macintosh TV

Enabler 404, latest version 1.0

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Performa 630, 635CD, Quadra 630, LC 630

Enabler 405, latest version 1.0 - No enabler is required under System 7.5.

Performa 5200CD, Power Mac 5200/75 LC, Performa 6205CD

Enabler 406, latest version 1.0 - No enabler is required under System 7.5.

Power Mac 9500/120/132, 7200/75/90

Enabler 701, latest version 1.1

Power Mac 7500/100, 8500/120

Enabler 701, latest version 1.2

PowerBook 150

PB 150 Enabler, latest version 1.1 - No enabler is required under System 7.5.

PowerBook 520, 520c, 540, 540c

PB 500 Series Enabler, latest version 1.0.2 - No enabler is required under System 7.5.

PowerBook 190, 5300

PB 5300/2300/190 enabler, latest version 1.2.1

PowerBook Duo 210, 230, 250, 270C

PowerBook Duo Enabler, latest version 1.0

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Power Mac 6100/60, 7100/66, 8100/80

PPC Enabler, latest version 1.0.2 - No enabler is required under System 7.5.

Power Mac 6100/66, 7100/80, 8100/110/110

PPC Enabler, latest version 1.1.1 - Requires System 7.5 and Finder 7.1.5.

See Also

Power Mac Logic Boards; System 7.5

Power Macs, PCI Bus

The second generation of Power Macs arrive with a new expansion bus design called Peripheral component interconnect (PCI). The PCI standard provides a faster, wider bus architecture than NuBus, but also brings with it Intel standards that could be incompatible with Macintosh systems. The following graphic illustrates the PCI bus design.

Like the NuBus architecture, the PCI bus architecture uses an auto-configuration model so that dip switches and jumper cables are not required. The bus architecture depends on a cache-based bridge chip that manages the transfer of data from multiple PCI devices. The PCI card has direct access to the CPU, like the PDS card, but the bridge chip caches the card's data if the CPU is busy. In some ways, the PCI bus is a cross between NuBus and PDS, only more expandable. Unlike the NuBus' use of arbitration cycles via the VIA chip and BART controller, PCI directly accesses the CPU, setting up one data

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transfer while the previous is still running. PCI is rapidly becoming the standard bus architecture in personal computers. This provides inter-compatibility between DOS-based PCs and Macs, the same PCI card can be used in either machine, as long as the PCI card comes with a Macintosh software driver.

See Also

Motherboards; NuBus Slots; PDS Slots; Power Mac Logic Boards

Power Macs, PCI Models

In the Summer of 1995, Apple introduced the second generation of Power Macintoshes. These Power Macs incorporate the PCI expansion slots, as well as other innovations that increased the flexibility and performance of the computers. There are currently four PCI-based Macintoshes: the 9500, 8500, 7500, and 7200; each with varying PowerPC performance rates and other configuration differences. Each PCI-based Mac has the following features in common.

- The use of the **Peripheral Component Interconnect (PCI)** architecture in these Macs provides significant performance over the slower, but more downwardly compatible NuBus architecture of the first generation of Power Macs (the discontinued 6100, 7100, and 8100 models). Because PCI is a stable standard architecture used by many vendors for PC expansion cards, there will be more willingness to

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manufacture expansion cards meeting the same standards for Macs, thus increasing the availability and lowering the price of the cards.

- A shift from **SIMMs** to **DIMMs** (**dual in-line memory modules**) for memory expansion cards. SIMMs contain 72 pins and transfer data in 32-bit chunks. Because the Power Mac had a 64-bit memory architecture, you needed to install SIMMs in pairs. DIMMs contain 168 pins to support 64-bit data transfers, so provide a more flexible and efficient memory expansion design.
- The PCI-based Power Macs included two Ethernet ports, retaining the AAUI port, but adding a port for 10Base-T Ethernet that does not require an adapter.
- The SCSI bus of the 9500 and 8500 Power Macs is faster than that used in the first generation Power Macs. In addition, true **direct-memory access (DMA)** schemes are used to by-pass the CPU when transferring data over SCSI and PCI buses, as well as through the serial and Ethernet ports.
- The ROM included in the second generation Power Macs includes a new 680x0 emulator that uses **dynamic recompilation emulation (DME)** rather than linear recompilation, to speed up the performance of 680x0 programs running on the Power Mac.
- System 7.5.2 that was included on these PCI-based Macs contained more PowerPC-native code than earlier versions, and so performed better

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with the new hardware.

- Apple has defined a structure for graphics acceleration. The new standard provides a basis for third-party developers to design accelerators without having to reinvent acceleration schemes for each new card. Prices for video cards should reflect the lower research and development costs.
- The PCI-based Macs, as well as the Performas based on the PowerPC 603e chip, include power-saving features similar to those found on PowerBooks.
- The PCI-based Power Macs also were redesigned to provide easier upgrade paths to the next level of processor. These Macs place the CPU on a four by seven-inch card that can be unplugged and replaced by a faster one (for example the next iteration of 604e chips can be placed in the 7500, 8500, or 9500 chassis by slipping out the old **daughterboard** and installing a new one containing the faster chip). Each processor upgrade slot is identical, allowing a 7500 to be upgraded to an 8500 by replacing its daughterboard with that of the 8500, and so forth. Multiprocessing is available by adding a second CPU on to the daughterboard. When a faster chip is added, the internal busses will run faster as well, boosting video and memory-accessing performance, as well as SCSI performance. This is because the buses are only operating at a third of the speed of the processor. Each time you up the processor speed, the buses can go faster (up to their limit of 50 MHz).

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The following table provides an overview of the various configurations available for PCI-based Power Macs.

The PCI-Based Power Mac Family

Model/Clock Rate	CPU, RAM (Max RAM), DIMM slots, Hard Drive, etc.
7200/75	PowerPC 601, 8MB RAM(256MB Max), 4 DIMM slots, 500MB hard drive, 3 PCI slots, no L-2 cache, 1MB (4MB max) vram.
7200/90	PowerPC 601, 8MB RAM(256MB Max), 4 DIMM slots, 500MB hard drive, 3 PCI slots, no L-2 cache, 1MB (4MB max) vram.
7500/100	PowerPC 601, 16MB RAM(512MB Max), 8 DIMM slots, 500MB hard drive, 3 PCI slots, no L-2 cache, 2MB (4MB max) vram.
8500/120	PowerPC 604, 16MB RAM(1.5G Max), 8 DIMM slots, 1G hard drive, 3 PCI slots, 256K L-2 cache, 2MB (4MB max) vram.
9500/120	PowerPC 604, 16MB RAM(1.5G Max), 12 DIMM slots, 1G hard drive, 6 PCI slots, 512K L-2 cache, 2MB (4MB max) vram.
9500/32	PowerPC 604, 16MB RAM(1.5G Max), 12 DIMM slots, 2G hard drive, 6 PCI slots, 512K L-2 cache.

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See Also

Desktop Models, Macintosh Family; PCI Bus; Power Macs; PowerPC 601; PowerPC 604

Power Mac, Upgrading from 680x0

See

Upgrade Paths, Types of

PowerPC Chips

See

Processors, PowerPC

PowerPC Platform (PPCP)

In the Fall of 1996, new **Macintosh Operating System** (OS)-compatible machines based on a new hardware architecture will be available. The new architecture, called the **PowerPC Platform (PPCP)** , is a universal standard developed by Apple, IBM, and Motorola that if followed, will enable the compliant computer to run PowerPC-native versions of Windows NT, Solaris (Sun Microsystems' version of UNIX), AIX (IBM's flavor of UNIX), OS/2, Novell Netware, and Macintosh OS without recompiling the software. The computers

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will be manufactured not just by Apple or its licensed clone-makers, but by many more vendors, including IBM, Motorola, Canon, DayStar Digital, Pioneer, IPC Technologies (parent company of Austin Direct), Zenith Data Systems, and Umax, along with smaller computer vendors and international consortiums such as TNPC (Taiwan New PC Consortium). This should provide consumers with a wider range of price, performance, and configurations and open the Macintosh to the total world of PC peripherals, keyboards, mice, printers, and so forth. The secret of PPCP is that it will be based on industry-standard components available from numerous suppliers.

The PPCP's goal is to bring down the price of PowerPC-based systems to compete with Intel-based hardware by increasing the availability of components and flexibility of hardware. Chip sets and their supporting architecture will be available from well-known suppliers, such as National Semiconductor, Motorola, Texas Instruments, and VLSI Technology. Apple demonstrated the first PPCP system running the Mac OS in late January 1996 and plans to ship the first system in November 1996. Other vendors are expected to also deliver their first versions in the same time frame. Umax, Power Computing, and DayStar Digital plan to offer PPCP machines.

A consortium of hardware manufacturers will certify systems as PPCP-compliant. PPCP-compliant systems should be able to run the Mac OS. There will be three types of PPCP boxes: server, desktop, and laptop machines: designs for the latter two are required to run the Mac OS; servers are not. Apple plans to offer its OS for retail sale, and Mac ROMs will be available for users whose PPCP systems did not come with a ROM in the Mac slot. With the

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advent of Copland, the Mac's next operating system, the Mac ROM will no longer be required, because the goal of the operating system is to be hardware-independent.

As the following diagram shows, the PPCP (formerly called Common Hardware Reference Platform or **CHRP**) 1.0 describes a hybrid system with a PowerPC processor, **PCI slots**, and interchangeable Mac and Intel I/O options. Minimum memory requirements for desktop and laptop systems is 8MB, expandable to at least 32MB; an Apple desktop bus (ADB) or PS/2 connector (or both) for keyboard and a two-button mouse; 16-bit stereo, full-duplex audio; and a SCSI, IDE, or PC Card hard drive. To be PPCP-compliant, the computer requires a Centronics port (the latest version of the PC parallel printer port). Desktop and portable units should have either the Mac 4MB ROM or at least a socket where it can be added. Many vendors will go beyond the minimum requirements listed in the table and include ISA slots (a low-cost expansion card option for cards that do not require a high-speed bus).

Apple has pledged to modify the Mac OS to support the alien drivers. You should be able to “plug and play” PC peripherals if those vendors supply Macintosh drivers for their devices.

The beauty of the PPCP specification is Apple's capability to configure machines to fit specific market niches more cheaply and with more availability of components. There are still questions about licensing the Mac OS to PPCP vendors and the actual shipping dates of systems, but the price of Mac-compatible systems should come down as more vendors offer this

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versatile computer.

See Also

CHRP; Macintosh Operating System; PCI slots; PowerPC; System 7.5

Power Pete

Billed as a children's game, from StarPlay, Power Pete is an action figure come to (animated) life in a little toy shop of horrors. Killer clowns, crazed robots, maddened monkeys, and an army of evil toys are out to destroy the innocent fuzzy bunnies. Armed only with an arsenal of toothpaste guns, foam ball shooters, exploding birthday cakes, and other toy shop weapons, you—as fearless Power Pete—must rescue the bunnies, through 15 levels of mayhem. Fast scrolling action and digitized speech, along with a full musical soundtrack, add to the fun. It may be a bit much for younger kids.

See Also

Lode Runner: The Mad Monks Revenge Online

PowerPlant

PowerPlant is a C++ programming framework included with **CodeWarrior** by Metrowerks. Compared to the other major players in the Macintosh framework world—**MacApp** and the **Think Class Library**—PowerPlant is a newcomer. As a result, it is less mature than the others. On the other hand,

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because it was developed recently, it includes many new Apple technologies at its core.

PowerPlant, for example, has had support for Macintosh drag-and-drop, **scripting**, and the Power Macintosh from the start. It also supports Apple's **PowerTalk** software, **QuickTime** and multiple **threads** of execution.

PowerPlant, an **object-oriented** framework, makes excellent use of multiple-inheritance in its object hierarchy. Utility functions needed by several classes are implemented as “mix-in” classes that can be inherited in order to add that functionality to any class. As a result, code written with PowerPlant is not burdened with functions it does not need. Combined with the overall design of the framework, this makes it possible to use just a part of the framework—just the part that handles menu management, for example—without the overhead of the whole framework. It also makes it possible to use PowerPlant to create non-application code, such as **plug-ins** or **Control Panels**.

PowerPlant is complemented by Metrowerks' **Constructor**, an interface builder that works with PowerPlant's visual aspects. Other tools can also be used to create the interface for PowerPlant applications, such as Bowers Development's **AppMaker**.

See Also

C++; CodeWarrior; Constructor; Control Panels; Framework; MacApp; Object-Oriented Programming; Plug-Ins; Think Class Library; Threads

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PowerPoint

Microsoft PowerPoint is a powerful desktop presentation program, available as a stand-alone or as part of the Microsoft Office suite. It takes you from an outline of your presentation through making the slides, speaker's notes, and audience handouts. PowerPoint can display your presentation on the Mac screen, or output it as 35mm slides, overhead transparencies, as well as on paper.

Working with PowerPoint is made easier by its collection of automated features. Like its office mates, Word and Excel, PowerPoint comes with a collection of pre-formatted templates. It also uses Wizards, Microsoft's quick start helpers that ask you a series of questions about your project and then give you the appropriate templates to get you started. PowerPoint even has an Auto-Content Wizard to help you outline your program, based on the kind of message you're trying to convey. There's one for sales, one for training, one for recommending strategies, even one for delivering bad news, with six in all. Choose the one that's closest to your purpose, and it will open in outline view, with the suggested outline topics already in place. Add your own topics and ideas.

After your outline is fleshed out, consider the format of the slides. You can see what text appears on a slide by clicking the small slide icon to the left of the outline topic. Choose a look for your presentation either by using the Pick a Look Wizard or by selecting and applying one of the templates provided in the PowerPoint folder. After you've looked at your slides, you

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might move some of the text around, edit the text, or add more slides and more points to your speech. All of this is done easily in the outline view. At this point, it's also a good idea to run the spelling checker. It's right there on the toolbar, just as it is in Word. It can use the same custom dictionaries you may have already created for Word, saving you the time otherwise spent re-entering them. The program ships with five OLE servers, including Graph 5.0 for designing graphs, Equation 2.0 for building mathematical formulas, and an application called Organization Chart for creating common types of org charts.

As you look through your slides, decide whether any of them would benefit from added graphics. You can use art from any available source; import it on the Clipboard, use the Picture command on the Import menu, or select from PowerPoint's clip art collection. Drawing tools within the program enable you to add shapes, colors, and lines to your slides without importing them. There is no freehand drawing tool, however, so your options are somewhat limited.

When you're satisfied with the appearance and content of the slides, think about how to get from one to the next. In the Slide Sorter view, you can add special effects, including builds in which you pop on a bullet list one item at a time, and transitions of various kinds. Transitions are selected from a pop up list which has too many to count. You'll see a preview of the effect in the Transitions box, as shown in the following figure. You can set times for the slides to remain on-screen, so that the show runs automatically, or you can change slides manually with a mouse.

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Review your show to make sure it's the way you want it. If you're going to run it from the computer, make sure you've saved your work. Putting a backup copy on a floppy disk is a good idea. If you'll be turning your visuals into multicolored overhead projection slides or 35mm slides, you'll need to print them to a Postscript file to take to a service bureau. Black line overhead slides can be printed on a laser printer. Some color inkjet printers can handle colored overhead transparencies, but the colors are rarely satisfactory. Print the handouts and speaker's notes. Finally, rehearse your show several times to be sure you've got the timing right and that you've covered all the points you intended to cover.

PowerPoint includes a run-time viewer that can be distributed with your program, so that others may view it without installing the whole application. Although it lacks many of the animation features found in Adobe Persuasion, it's easier to learn and has the major advantage of seamless integration with both Macintosh and Windows versions of the other Office suite components.

See Also

Astound; Director; Layout Templates with PowerPoint; Multimedia; Persuasion; Presentations; Slide Show with PowerPoint, Running

PowerTalk Extension

This extension enables the integration of Apple's PowerTalk technology into your system. PowerTalk, introduced in **System 7 Pro**, and now part of

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System 7.5 and higher, enables users on a **network** to send **email** to network users and brings a range of messaging and telecommunications features to the Mac.

When PowerTalk is installed, it adds three new **icons** to the Mac **desktop** : A mailbox, for receiving incoming email messages from the network or via modem; A catalog containing the names of the services you're connected to and the info for signing on to each, which keeps you from accessing the **Chooser** each time you want to sign on to a network; and the PowerTalk Keychain, which contains your personal passwords for signing on networks and services. (The last icon, PowerTalk Keychain, doesn't appear on the desktop until you've made your first connection to a service. It appears after that point.)

See Also

Chooser; Desktop; Email; Icons; Network; System 7 Pro; System 7.5

PowerTalk Setup

This control panel, which works on any Mac that supports **PowerTalk** , enables you to toggle PowerTalk collaboration services on or off using a **radio button** (Changes take effect upon restart). There is also a checkbox that enables you to lock your keychain after a specified number of minutes of inactivity. There's a box for you to type in how many minutes of activity until the keychain is locked.

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The keychain automatically locks when you shut down your Mac, but if you to specify that the Mac will ask you for your keychain access code at startup by clicking on the appropriate checkbox.

Lastly, you can access your PowerTalk keychain through a button in the control panel where you can add services to your keychain or change your password, among other options.

See Also

PowerTalk; Radio Button

Power Translator

Teachers of foreign languages will be upset, if not unemployed, when the word gets out about this program. In less than a minute, Globalink's Power Translator can do a better translation than a high school student after three years of studying German, French, or Spanish. Power Translator can translate over 20,000 words per hour, at up to 90% accuracy. It has a vocabulary of about 250,000 words and phrases in its online dictionary, and can be customized to speak your occupational jargon, favorite slang, or pet phrases. It can work with virtually any **word processor** that can save a file as text and with all popular **OCR scanning programs** and Macintosh-compatible **scanners**. And it translates in both directions—English to Spanish, French, or German and Spanish, French, or German into English. (You do need a separate program for each foreign language you intend to

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translate.)

Using Power Translator is simple. After you start the program, open any text file. It will appear in an editable window. Flag proper names and any words you don't want the program to try and translate. Select the text and choose translate from the menu, or use the command key shortcut. A progress bar will appear in a dialog box. Depending on how much text you're working with, in a few seconds to a minute or two, your translation will be complete. It will show up in a second window alongside the original. At this point, you can touch up any awkward or incorrect phrases. Because word order in English is often different from word order in another language, some phrases get turned inside out, but these are easily untangled. You can make any corrections you deem necessary before saving the translated file. Words the program doesn't recognize will be marked with @@ signs. If the program can't produce the correct form of a verb, it will provide the infinitive marked @+. The figure shows a sample translation in Spanish

The manual is bilingual, which enables use by French, German, or Spanish speakers using the software to translate their words into English. Menus can also be translated into the language you've installed.

Inexplicably, the program *will* read back the text it has translated, but only in English. It will not attempt to pronounce the French, German, or Spanish equivalent. You may choose to ignore this "feature" by doing a custom installation of the program rather than a full installation. In doing so, you can avoid cluttering your system folder with Macintalk Pro and all the voices

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that come with it.

PPD

See

Printer Drivers

PPP

PPP stands for Point to Point Protocol, a way of establishing a temporary, low-speed connection to the **Internet** through a dial-up **modem**.

Both **PPP** and **SLIP** (Serial Line Internet Protocol) accounts are designed to work with much slower connection methods than the dedicated network connections to the Internet enjoyed by government, educational, and nonprofit organizations. But because they work with low-cost modems, PPP and SLIP provide decent performance in normal situations to large numbers of people.

PPP is generally considered a preferable protocol than SLIP because PPP is more carefully designed and more flexible than SLIP. Both, however, support popular and widely used **MacTCP**-based programs such as **Anarchie**, **Fetch**, and **TurboGopher**.

Two different programs provide PPP connections for the Macintosh:

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MacPPP from Merit Network, Inc., and **InterPPP** from InterCon Systems. **InterPPP** supports AppleTalk over PPP, which is not true of **MacPPP**. If you do not have an Internet connection, you can obtain the software when you establish an account with an **Internet service provider** . You can also get **MacPPP** from the disk that accompanies **Internet Starter Kit**.

When establishing an account with an Internet service provider certain information in order to configure PPP or SLIP, as shown in the table included with the entry for **SLIP** .

Some PPP **host**s cause a computer “timeout” to occur if your computer has been idle for a certain amount of time while connected to the Internet. This might be considered a courtesy, especially if you are paying for connection time and forget to disconnect before leaving your workstation.

If your connection hangs up before you are finished (and if you use manual addressing, where you specify an **IP address** when you dial in), simply switch back to the **ConfigPPP** or other PPP setup control, disconnect, and then reconnect. If, however, you use server addressing (in which the server assigns an IP address to you each time you log in), you must quit all active **MacTCP** programs before you reconnect via PPP. Otherwise, your **MacTCP** program (such as a Web browser) will get confused when you reconnect with a different IP address than you had before.

See Also

Asynchronous Data Transfers; Internet; InterSLIP; Modem; Network; Packets; Parity; MacPPP; SLIP

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Practical Extraction and Report Language

See
Perl

Practical Peripherals MacClass 288MT II V.34

See
Modems

Precision Bitmap Alignment

See
Printing_Technology, PostScript Lasers, Halftoning

Preemptive Multitasking

See
Multitasking

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Preferences

The Finder has its own set of preferences (as do most applications) that are accessed in a number of different ways. Control panels enable users to choose options, or preferences, for how they want certain features of the Finder set up. The Views Control Panel, for example, enables users to set their preferences for how much information is displayed in windows when they are in a list view, as well as what size the icons will be in list views. Users also get to choose what font they'd like for their system font (used for folder and filenames). These are all preferences for the Finder, even though they don't appear under a section or menu called preferences.

The following table contains a list of some of the most common Finder preferences and explains how to set them.

Preferences Settings

Set sound volume

Sound - Use slider to raise or lower overall speaker volume.

Set the Date

Date & Time - The current date will be displayed. Click the day, month, or year and change by typing in new info or using the Up/Down Arrows in the dialog box to scroll higher or lower.

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Set the Time

Date & Time - The current time will be displayed. Click the hour or minutes to make a change by typing in new info, or use the Up/Down Arrows in the dialog box to scroll higher or lower.

Choose color mode for your monitor

Monitors - You can choose to set your monitor to Black and White or Color, and choose to display 4-bit, 8-bit, 16-bit (thousands of colors), or 24-bit (millions of colors), depending on how much VRAM you have installed.

Change the desktop background pattern

Desktop Patterns - Scroll through the list of installed patterns and click "Set Desktop Pattern" to confirm your selection.

Add submenus to the Apple menu

Apple Menu Options - Toggle submenus on or off by clicking the appropriate radio button.

Select the color for highlighting text

Color - Choose a color from the pop-up menu or create a custom color by choosing Other.

Choose which extensions will load during startup

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Extensions Manager - A scrolling list of extensions will appear. Click to toggle on/off any extension. The check mark means the extension will load at startup.

Protect the System Folder or Applications folder from access

General Controls - Click the checkbox beside your choice of security.

To choose how long the delay is before a key repeats itself

Keyboard - Click radio buttons ranging from slow to fast. You can choose the key repeat rate here as well.

Change the colors or names in the Labels menu

Labels - To change the name, just highlight the name and type over it with a new name. To choose a color, click a color in the list, and the Apple color picker will appear where you can click to choose the color of your choice.

To turn on Virtual Memory

Memory - Toggle Virtual Memory on and choose the disk you want to use as a "virtual disk" from the pop-up menu. Then choose how much memory you want to have upon restart using Virtual Memory.

To set how fast the mouse till track

Mouse - Clickradio buttons ranging from slow to fast, and you can also choose which speed the Mac will interpret as a double-click.

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To change the number format to support a foreign currency

Numbers - Use the pop-up menus to select separators and currency symbols.

To choose which folders will be shared across a network, and the access privileges of network users

Network - Use the pop-up menus to choose the users and use the checkboxes to determine each users level of access.

To roll up an active window to just its title bar

WindowShade - Click radio buttons to choose how many clicks necessary to "roll up" a window. Also you can choose to use Modifier Keys if you don't want to double-click, and you can toggle on/off the WindowShade sound.

To choose which disk will be the startup disk

Startup Disk - Click the icon of the mounted disk you want to use as the startup disk.

To have icons snap to an invisible grid for alignment

Views - Click "Snap to Grid" and choose whether you want a straight grid or a staggered grid.

To adjust how fast the insertion point will blink

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General Controls - Click radio buttons ranging from slow to fast, and you can also choose how fast the selection bar will blink in menus when you make a selection.

To increase or decrease the size of the disk cache

Memory - Click the arrows in the dialog box to move the disk cache size higher or lower.

To put a folder with aliases of recently used items in the Apple menu

Apple Menu Options - Toggle Recent Items on and choose how many items you want to be available to typing in the number in the available boxes.

Most applications enable you to choose your favorite settings, or preferences, for certain features or tools in the application. These preferences enable you to configure the program to suit your personal tastes. When you open an application the first time, the default preferences are activated. You can set your own preferences by selecting Preferences, which usually appears under the **File** or **Edit menus** .

The preference settings for an application are stored as a file in the Preferences folder **nested** in the **System Folder** . Having preferences stored as a file is advantageous for a number of reasons. If you set preferences for an application and then decide you want to return to the default preferences, remove the application's preference file from the

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Preferences folder, and the next time you **launch** the application, it automatically builds a new preferences file using the default preferences. Having a preference file is also advantageous when multiple people work on the same Mac. Each person can put their own preferences file into the preferences folder before they launch, giving them their own customized settings while they work. When they quit the application, they can remove their preferences file, and the next user can add theirs.

See Also

Commands; Edit Menu; File Menu; Launching; Nested Folders; System Folder

Preferences File

Most applications create a preferences file that contains the default settings for the program. These files are stored in the **Preferences folder** within the **System Folder** . Many applications enable users to adjust an application to suit their own personal tastes. In Microsoft Word, for example, you can choose which **commands** appear under which menus, and you can choose certain commands to appear as buttons on a ribbon at the top of your window for one-click access. Once these choices, or preferences, have been made, they are written and stored in the preferences file. You do not need to open the Preferences folder again to make these changes. They are saved for you. The average user doesn't really use the Preferences folder; it's really for use by the applications themselves.

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If you have selected your own preferences for an application, and then decide that you want to return to old default preferences, find the application's preference file in the Preferences folder, and **delete** it. The next time you **launch** the application, it will build a new preferences file using the application's default preferences. The following figure shows an example of what you might find in the Preferences folder in your System Folder.

See Also

Commands; Delete; Launch; Preferences; System

Preferences Folder

The Preferences folder, located in the **System Folder** , is where the preference files created by applications and utilities are stored. These preference files contain the settings for any user-definable controls of the application. These files are not really for use by the user, they

Each application has its own set of preferences and they are usually accessed in the applications File or Edit menu.

See Also

Preferences; System Folder

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Preflight and File Hand-Off

Preflight is the process of checking an electronic publication for possible output problems before it is handed off to a service provider. In some instances, preflight may be part of the service provided by a service bureau or trade shop; however, it makes more sense (and is more economical) if one performs a preflight check on electronic publication files before they are sent to the service provider. Preflight is a term borrowed from aeronautics where a pilot performs a preflight check for airworthiness. A digital preflight check insures that your document will print and that you have done everything required by the service provider to output your document correctly.

Although proofing a publication is important, it constitutes a separate activity and is covered in the **Proofs** entry. We will concentrate here on preflight and hand-off and discuss the steps necessary for a smoother transition from your computer to the printed page. Adequate communication with the service provider is a critical part of the preflight process. You should always seek their advice and recommendations if you are not absolutely sure of the correct procedures. The final disposition of a publication project should always be in mind from the beginning. That means understanding the requirements of final output and reproduction and how they affect the design and prepress stages of a publication. As a rule, the later a problem must be corrected in the publication process, the more costly it is. Recognizing and fixing problems early is the goal of preflight.

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The following steps are recommended in preparing a document for imaging (preflight):

- Printing your publication on your own desktop printer (preferably a PostScript-compatible one) is the first step. If the document will not print on your own printer, it probably will not print at the service bureau. Besides, you should always include a laser proof when you hand the files off to the service provider.
- Prepare a report for the service provider that contains information about your document. The report should be a summary of all the aspects of your publication. Describe the publication in ordinary terms, such as: "Pamphlet, 8[1/2]x11 inches, printed 2 sides, no bleeds, accordion fold, 2-colors (PMS 186 & black)." Mention technical aspects of output you may have discussed with the service provider. These may include output resolution, halftone screen frequency, trapping amounts, **PPD** (PostScript printer description) used, UCR or GCR settings, and the use of any image replacement scheme such as APR or OPI. List all fonts used in the publication, including those used in imported **vector images**. List all the pages of a multiple page publication by page number and indicate general page contents and any special graphics treatments such as **bleeds**. You should also indicate the presence of imported graphics and whether an individual graphic is "live" or "FPO (for position only)." List all file names used in a multiple-file document. Identify the locations of all files and what software created them. In **process color** and **spot color** jobs, list the

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number of **color separations** that will be needed for each page, including **varnishes**. Mention any special printing effects such as blind embossing and foil stamping or the use of special paper stock. Any information you can think of should be in the report. It is better to have too much than not enough.

- Delete all unnecessary pages from the publication file.
- Check all linked graphics to make sure they are still linked and updated.
- Make sure that all print and page setup dialog box settings are appropriate for the final output device. This means you must know exactly what device will be used at the service bureau and have its PPD installed on your computer.
- Check all colors and make sure they are named correctly. Delete any unused colors. In spot colors, each color must have only one name.
- Make sure all bleed elements actually extend off the edge of the page about one pica or the amount specified by your service provider.
- Check **trap** specifications.
- Find out whether the service provider wants the publication file in **PostScript** format or native format. Giving them the file in native format allows them to open the file and make changes or adjustments. If you give them a PostScript file, the service provider cannot make

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any corrections. Converting the publication file to PostScript converts all page layout information, embedded and linked graphics, and fonts into a single PostScript language file ready to be downloaded directly to a **raster image processor** (RIP). This is a good thing to do if your service provider does not have the page layout software you used or does not have the same fonts you used. Do not try it unless you are absolutely sure you know what you are doing. Get detailed instructions from the service provider.

Handing off your publication files to a service provider can occur through telecommunications or an online service, but most people copy them to diskettes, SyQuest, Bernoulli, or Zip cartridges, or a portable hard drive. Be sure to copy all linked graphics files along with the publication files. If a linked graphic is not present when the publication is output, a low-resolution screen image will be substituted. Use a data-compression program to reduce file sizes if necessary. Make sure your service provider will have no difficulty expanding the files.

See Also

Proofs; Service Bureau Do's and Don't's for Desktop Publishers

Premiere

The most popular QuickTime editor for the Macintosh, Premiere provides many features, including hundreds of transitions and filters and support for

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time code and batch processing. Primary competitor is Strata's **VideoShop** .

If you need to do simple editing (**cuts** rather than **transitions** , no sound editing), you can edit movies using Apple's **MoviePlayer** application.

To use Premiere effectively, you should understand **video editing principles**.

The primary working window in Premiere is the Construction window, where clips are arranged and transitions and filter effects added. Premiere displays in the Construction window a visual segment representing the length of each video clip. Clips are arranged in either the A or the B channel in the construction window. **Transitions** are added by dragging them from the Transition window into the Transition channel of the Construction window. A Transition occurs over the length of the overlap between two clips that are in channels A and B. If you have ever worked with traditional video editing equipment you will quickly grasp how to use Premiere; if you haven't, you may have to spend a bit of time getting comfortable with how the software works.

Premiere includes a large selection of Transitions, from wipes and dissolves to unusual effects such as a paint splatter.

Filters Whereas a transition is an effect that takes place between two clips, most filters work on a single clip. These effects are much like the image filters found in Photoshop, although they can be different in that an effect can change over the length of the clip (perhaps becoming more pronounced

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further along the clip). Filters range from effects such as

Premiere provides basic sound editing tools, including some filters. The most important capability, apart from cutting the audio, is being able to adjust the sound volume of a clip, fading the sound in or out. There are also some third party sound effects available which greatly expand Premiere capabilities.

While it sounds like a simple program (all you do is drag a few clips into the Construction window and have Premiere build your movie), Premiere is actually a very complex program. This is most obvious in the large selection of filters and transitions provided. Premiere also includes such features as support for automatically digitizing clips, generating **EDLs** (Edit Decision Lists), and a utility designed specifically for creating movies that play from CD-ROM (see **CD-ROM Movie Maker**).

See Also

CD-ROM Movie Maker; QuickTime; VideoShop

Premier and Animation

There are three ways to engage in “painting on movies.” The first is to be able to use actual digital painting tools to do the trick, such as those found in Strata’s **MediaPaint** . The second is to paint with animated visual effects, which MediaPaint also allows you to do, in addition to Adobe’s **After Effects** software. The third method that can be defined as “painting on a movie” is when you use another movie as the tool, in essence, painting on a movie with

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a movie. MediaPaint is also good at this method, as is Adobe's Premier. Premier is usually thought of as video editing software, but the digital artist and computer animator must not be chained to software categories at the expense of taking some creative risks.

In addition to stitching image sequences together, as any editing software is built to accomplish, Premier also offers the computer animator a way to paint with video on video. It can accomplish this in several ways. The first is to simply use its editing capabilities to make an animation stronger by presenting the same scene over again from a different vantage point. This saves time and adds interest—two seemingly opposing forces. The computer animator saves time by recording the same scene from two or more vantage points. Nothing in the scene is moved. You have seen this effect when Hollywood movies show you expensive scene setups, like a building blowing up, several times in a row but from different angles. In the same way, a computer animator can record the action in the same scene through two or more cameras. In Premier, the scenes can be sewn together. Even if you plan to add effects to the scene in MediaPaint or AfterEffects, all that's needed is to add the effects from different vantage points; you don't have to set the scene up all over again.

Premier has a very deep list of Filters, effects that can be applied to images and image sequences in either or both the A and B channels. The selected image clip is highlighted in the Premier Construction window, and the Filters list can be found in the Clips menu. A Filter is chosen and applied to the clip. Filters can be stacked, and their order in the apply list affects the

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visual outcome of the effects process. Many items in the list of filters that ship with Premier look a lot like the list of filters that ship with Photoshop, except that Premier applies these filters to moving as well as still images. The filters are the following: Antialias, Backwards Video, Bend, Black and White, Blur, Blur More, Brightness and Contrast, Camera Blur, Color Balance, Color Offset/Pass/Replace, Convolution Kernel, Crop, Crystallize, Emboss, Extract, Field Interpolate, Find Edges, Gamma Correction, Gaussian Blur, Gaussian Sharpen, Ghosting, Horizontal Flip, Hue and Saturation, Image Pan, Invert, Levels, Mesh Warp, Mosaic, Pinch, Pointillize, Posterize, Posterize Time, Radial Blur, Replicate, Resize, Ripple, Roll, Sharpen Edges, Sharpen More, Solarize, Spherize, Tiles, Tint, Twirl, Vertical Flip, Video Noise, Wave, and Zig-Zag. From this list, you can see the image processing applications, and should think of Premier as an artist's tool, comparable to Photoshop for animated sequences.

In addition to sewing animations together in a linear fashion, you can have one scene “disclose” another. The first scene can wash off the screen and reveal the second, and the second animation can fall away like leaves and reveal the third, and so on. These segues are called “wipes” in video terms, but to the animator, they are known as transition effects. What they do is to add immediate interest, even if the same subject matter is being repeated before and after the transition. Premier comes loaded for action with its list of ready-made transitional wipes, and each can be customized further to fit the animators' needs. They are as follows (when we use the word “image” in the following descriptions, it is used to mean either static pictures or

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animations):

- Additive Dissolve—Image A fades into B.
- Band Slide—Image A slides over B in horizontal/vertical bars.
- Band Wipe—Image B is revealed under A from the center out.
- Barn Doors—B is revealed under A from the center out.
- Center Merge—Image A splits into four parts and slides to the center to reveal B.
- Center Peel—Image A curls from the center with a shaded back and reveals B.
- Center Split—Image A splits into four parts and slides to the corners to reveal B.
- Checkerboard—Alternating boxes wipe to reveal B under A.
- Clock Wipe—Center wipe from A reveals B.
- Cross Dissolve—Image A fades into B.
- Cross Stretch—Image B stretches as A shrinks.
- Cross Zoom—Image A zooms in, B zooms out.
- Cube Spin—A spins to reveal B, as mapped on two faces of a cube.
- Curtain—Image A is drawn back to reveal B.

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- Direct —Image B is passed through.
- Displace—Red and Green channels of A displace pixels of B.
- Dither Dissolve—Image A dissolves into B.
- Doors—Image B swings in over A on Horizontal or vertical doors.
- Fold Up—Image A repeats folds to reveal B.
- Funnel—Image A is pulled through a funnel to reveal B.
- Inset—Corner wipe reveals A under B.
- IrisCross/Diamond/Points/Round/Square/Star—Shaped wipe reveals B under A.
- Luminance Map—Luminance of A is wrapped onto B*.
- Multi-Spin—Image B spins in from rectangles.
- Non-Additive Dissolve—Luminance of A is wrapped onto B*.
- Page Peel—Image A curls back to reveal B.
- Page Turn—Image A turns back to reveal B.
- Paint Spatter—Image B revealed under A by paint spatters.
- Peel Back—Image A curls in four parts to reveal B.
- PICT Mask—A user-selected PICT is used to mask B onto A.

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- Pinwheel—Multiple wipes sweep to reveal B under A.
- Push—Image B pushes A to one side.
- Radial Wipe—Image B revealed under A by radial sweep.
- Random Blocks—Random boxes reveal B under A.
- Random Wipe—Random wipe reveals B under A.
- Roll Away—Roll reveals B under A.
- Slash Slide—B slides over A in sections.
- Slide—B slides over A.
- Sliding Bands—B is revealed under A by sliding bars.
- Sliding Boxes—Sliding boxes reveal B under A.
- Spin—B spins over A.
- Spin Away—B spins in to reveal A.
- Spiral Boxes—Spiral wipe reveals B under A.
- Split—Image A splits to reveal A.
- Stretch—B stretches over A.
- Swap—Images swap places.
- Swing In/Out—B swings over A.

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- Swirl—B spins in swirling.
- Take—Image B is passed through.
- Texturize—A is mapped onto B*.
- Three-D—Source images are mapped onto red and blue channels (creates art for 3D glasses!).
- Venetian Blinds—Horizontal wipes reveal B under A.
- Wedge Wipe—Wedge wipe from A reveals B.
- Wipe—A wipes to reveal B.
- Zig-Zag Blocks—Blocks wipe to reveal B under A.
- Zoom—B zooms to cover A.

*The asterisked items indicate how a composited image may be built from animated files, giving the Premier user another method for creating a collage.

Premier also features a special channel reserved for image and animation compositing, complete with drop out screening that reveals one image or animation under another. The artist can use this capacity to build a composited graphic or animation. Adobe Premier has a long list of special video options as well, which will be discussed under the Premiere heading. It is absolutely vital that the computer animator keep in mind the fact that animations (after they are broken up into single frame sequences, which

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Premier can do) can be mapped to any 3D surface or object in most Mac 3D animation software. This is what makes Premier as much the animator's tool as the videographer's.

See Also

After Effects; MediaPaint; Premier

Prep File (Keyboard Shortcut)

When you choose to **print** a document, the Mac sends a prep file to the printer to initialize the printer. In **System 6**, if you needed to create a **PostScript** file for printing, you had to use the key command ⌘-K after you chose the Print command. Choosing ⌘-K meant a prep file was with the PostScript file for printing that would initialize the printer for you. With **System 7** and higher, you don't need to use a key command to create PostScript files because PostScript files are a **checkbox** in the application's Print **dialog box**.

If you wanted to create a PostScript file *without* the prep file, you used the keyboard shortcut ⌘-F after you chose the Print command to create a PostScript file. This keyboard shortcut should only be used after the printer has been initialized, as it will not include the prep File within the PostScript file.

See Also

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Check Box; Dialog Box; Keyboard Shortcuts; PostScript File; Print; System 6; System 7

Prepress

Prepress is a broad term covering many technologies, old and new, but it specifically applies to activities performed for the purpose of preparing things to be printed. At one time, this included many skillful manual activities for which individuals were specifically trained, usually through apprenticeship. Today, the term must include electronic activities, and many of the individuals performing them have no training at all and may, unfortunately, have only a dim understanding of the processes. Sometimes, understanding how a thing used to be done is helpful in understanding the new way. With that in mind we will look first at the traditional prepress procedures and then contrast the new electronic prepress techniques.

Traditional —It should be noted that traditional prepress is by no means a thing of the remote past. In many places all over the United States and the world it is still practiced as a routine part of the printing process. Electronic methods are steadily replacing traditional methods, but the transition is not complete. This is another good reason for desktop publishers to gain a better understanding of the processes involved. Traditional prepress picks up where the graphic designer or paste-up artist leaves off. That is, the paper **mechanical** created by these individuals is handed-off to a prepress trade shop or, more likely, to a commercial printing firm with inhouse prepress

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facilities. (A mechanical is a construction of paper-based text and **line art** graphic elements “pasted-up” on a piece of poster board. Overlays are used for **color separations** , **type reverses** , and windows for **halftones** .)

The paper mechanical is then photographed with a special graphic arts camera called a **process camera** . This results in loose pieces of negative (and sometimes positive) film. Photographs or other **continuous-tone** art to be included in the publication are photographically recorded on film also but with a difference. Unlike the black and white line art on the mechanical, continuous-tone images must be converted to **halftones** . This is done either through the process camera or a with contact exposure device. Any background tints of color must also be created with halftone screens. Full color continuous-tone images must also be converted to halftones by separating them into the process color components of cyan, magenta, **yellow** , and black. A separate piece of halftone film is required for each color because a separate printing plate will be created for each color. A piece of film used to make a printing plate for a specific color is called a “**printer** ,” that is, cyan printer, magenta printer, and so on. Film for color halftones can be obtained from a process camera, but color scanners were used even before the advent of desktop publishing.

All the loose pieces of film containing line and halftone images must be assembled and attached to each other before plates can be made to print the images on paper. In fact, the actual pages of the publication must be laid out to print in a specific orientation to the paper stock. These procedures are known as **image assembly** , **stripping** , and **page imposition** ,

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respectively. Image assembly and stripping involve much precise hand work. The pieces of film are brought together on a light table, and using special knives, scissors, various kinds of tape, and a special orange mounting paper, the stripper carefully assembles everything into a complete unit called a **flat**. At this stage, proofs are made to show the client how the elements have been assembled, and time is allowed for adjustments or corrections.

Each color in a multicolor printing job dictates a separate flat, and extreme care must be taken to insure that the colors will **register** properly with one another when printed. Even after highly accurate stripping, colors may not register properly on the press. Any misregistration must be anticipated and compensated for by making slight reductions and/or enlargements of graphic elements during the camera process. This is called **trapping**, and it results in slight overlapping of colors on the press, preventing any show-through of paper.

Page imposition is the process of arranging the pages of a publication to print in a certain way on a sheet of paper. Economics, color requirements, press availability, paper stock size, printing quantity, and binding method are all factors that help determine page imposition. There may be from two to 64 pages on each side of a sheet of paper. This is called a press form. Various kinds of page arrangements are used in a press form, depending on the size and type of press. Pages are arranged to minimize paper waste and take advantage of press capabilities. The figure shows an eight-page form where the same printing plate produces two copies of the publication on the same

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sheet. After the first pass through the press, the sheet must be turned over from left to right to print the other side. With the making of printing plates, the traditional prepress process is ended, and the printing stage begins.

Electronic—The electronic prepress process is much simpler because computers do most of the work. Nearly all page layout and other graphics work is now done on a computer so the traditional mechanical is out of the picture. The publication files created on a computer are electronic mechanicals which require no camera processing; they are output directly to devices which provide film negatives on which all the page elements are fully assembled with trapping allowances automatically included. Some manual stripping may be required for the page imposition of very large printed sheet sizes, but electronic stripping is increasingly the norm. Color separation is controlled by software, as are halftones of every kind. Even film may become unnecessary as **direct-to-plate** techniques become more common. Totally digital presses even eliminate the need for printing plates. Some electronic prepress activities, such as high-resolution scanning, color correction, color separating, trapping, and page imposition, are performed at **service bureaus**, trade shops, or inhouse facilities at printing firms. Expensive proprietary systems known as **CEPS** (Color Electronic Prepress Systems) developed by traditional prepress vendors such as Linotype-Hell, Scitex America, DuPont Crosfield, and Screen are, to some extent, replacing traditional prepress equipment. These same companies have developed less expensive electronic prepress systems that utilize off-the-shelf software and hardware. However, the originators of electronic publication files, whether

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experienced or not, are frequently responsible for prepress activities such as halftone production and trapping. The separate procedures of prepress are being absorbed in automatic software functions as desktop publishing and electronic prepress technologies become ever more sophisticated with each passing year.

See Also

Color Separations; Desktop Publishing and Color Electronic Prepress Systems (CEPS); Digital Halftones; Mechanical; Printing; Printing Methods, Digital; Printing Methods, Traditional; Printing Presses, Types of; Proofs

Presentation Software

Whether you're speaking to a room full of people or making a one-to-one sales pitch, having some kind of visual reinforcement helps get the message across. For many years, public speakers relied on slides or overhead transparencies. They were awkward, but they did the job as long as they didn't get out of order, were inserted right side up, and were colorful and legible enough to hold the viewer's interest. Good slides or overhead transparencies were generally produced by artists or graphic arts companies at a cost of anywhere from \$10-100 per slide.

Laser printer s and **word processor s** or outlining programs opened up the world of presentation graphics to non-artists. Anybody could set type on the screen and run a sheet of transparency film through the printer. But

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options were limited. The sheets came in only a few colors as well as clear. To add a line to the text already shown, you could flop a second piece of film over the first, but in the age of MTV and video effects, that just wasn't exciting. Soon, software designers realized that the same tricks they used to create graphics for titles and video games could be applied by ordinary people to create slide shows and presentations right on the computer screen. And very soon the Mac was making **multimedia** .

There are two kinds of presentation software for business use. The traditional method for displaying business graphics is still essentially a slide show, although it may incorporate **QuickTime** movie clips and sounds. **Adobe Persuasion**, **Claris Impact**, and **Microsoft PowerPoint** are traditional presentation programs, designed to produce programs of slides full of charts, bulleted lists, and clip art graphics. Of course, quite a few other programs also can handle at least a limited form of slide show, including **DeltaGraph Pro**, **Excel** and even **KidPix** . The non-traditional way is to use a multimedia program, such as **Passport Producer** , **Macromedia Director**, or **Gold Disk Astound**.

The differences between the traditional and non-traditional are significant. Traditionally, you would plan your speech by starting with an outline. **Persuasion** and **PowerPoint** both include outliners with robust text-handling features. **PowerPoint's** outliner is shown in this figure.

Begin by entering the main topics of your speech, and below them enter the sub-topics and points you want to make. Each topic becomes a slide.

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Formatting the slides is simple, especially if you're willing to accept one of the template "looks". Select one and then view your slides in that format. If it's not quite what you had in mind, try a different one. Typical presentation programs give you a variety of traditional, modern, and casual looks. If you can't find one that suits your message, use the tools provided to create your own. Start with a colored background and a readable font. Add a graphic, perhaps a company logo or a symbol.

A bar in a contrasting color helps direct the reader's eye to the type. Keep the same master layout for all of your slides. Switching colors or layouts from one slide to the next distracts the viewer from your message. Stick to 8-bit color, if possible, because it processes faster, and there won't be a delay between slides. If you'll be running the presentation on someone else's Mac, stick to common fonts like Helvetica. Otherwise, you run the risk of having the slides appear in some illegible font that's been substituted for your own favorite custom typeface. Avoid using too many special effects, animated transitions, and so on. Aside from distracting the audience, they'll slow down the Mac to the point where your show becomes jerky and might even crash.

Presentation programs can do a good deal more for you than just putting slides on a screen. They also can convert the outline into speaker's notes for you and make the slides into audience handouts containing thumbnails of the visuals and selected explanatory text.

Although traditional presentation programs expect you to do the talking, even though they might add some sound effects or music, multimedia

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programs generally can stand on their own. They use more sound, more animation, more QuickTime clips, and inevitably more memory. Many are interactive, making them good choices for kiosk displays, as well as training materials or overviews of new products or services. The viewer can choose what to look at next or can follow a branching path through the information. Still, the typical multimedia program doesn't require a degree from film school to operate. Some are based on the familiar outline model. Others use a simple timeline, letting you control the duration of events on the screen.

You might make the company logo bounce in and jump around for five seconds while some bouncy music plays to grab the audience's attention, and then dissolve to a title slide, followed by a graph that grows as the narrator talks about the expanding market for your new product, which pops in...and so on.

More complicated or seriously interactive multimedia shows might require an **authoring program**, such as **Macromedia Director** or even **HyperCard**. They're more difficult, but allow you to insert many interactive options for the viewer.

See Also

Astound; Claris Impact; Director; HyperCard; Multimedia; Persuasion; Passport Producer; PowerPoint

Presentations, Adding Sound with

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Astound

A well-executed sound track makes your presentation appear much more professional and makes it more effective for stand-alone use. It's not difficult to add music, sound effects, and narration with Astound. Adding sound to your presentations is also a good way to add emphasis to key points, even when you're doing the narration in person.

If your system has the capability to record sound (a built-in or external microphone), you can record your own sound effects and narration. You can also import sounds from other sources in any of the following formats: the Mac's own **SND** resources, **SoundEdit** or SoundEdit Pro files, Audio IFF or compressed IFF (**AIFF** or **AIFFc**), Amiga IFF, and Waveform Audio (PC/Windows .WAV) sound file formats.

You must load a sound into memory before you can work with it. After it's loaded, you can use it anywhere in your presentation, as many times as necessary. Astound's sound tool can be opened from the toolbar. (The sound tool is represented by the speaker icon.) The left side of the Sound dialog box (see preceding figure) holds the options for the current slide, and the right side lists any sounds currently available in Astound's memory, and gives you options for loading and working with them. To load a sound, click the Load... button to open the Load Sound dialog box.

Select the sound you want to use. The Sound's information is displayed at the bottom of the dialog box, and you can hear it by clicking the Play Sounds

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checkbox, or the Loop box to hear it repeated continuously. To change the volume, click the speaker icon. The number of sound waves shown indicates the relative volume level (1–3). Clicking the Open button adds it to the list of sounds available on the right side of the dialog box.

To add a sound to a slide, return to the Sound dialog box. Select a sound and click the Add button. Enter the percentage of volume for playback, and adjust the timeline for the length of time the sound should last. Click Done. The sound will play when the slide comes on.

To add sound across multiple slides, select the slides while you're looking at the presentation in Slide Sorter view and then open the Sound dialog box. Select the sound and click the Add...button. The sound is added to the slide(s) selected. To make it play uninterrupted, be sure the Play in background checkbox is enabled. If the sound file isn't long enough, enable the Loop checkbox. Click Done. The sound will play during the selected slides.

The Sound Editor function enables you to edit existing sounds and record new ones. To open it, select Edit...or New...from the Sound dialog box. The sound is represented by its wave shape. You can select a piece of it by dragging a marquee around the desired section with the mouse, and can use the Cut, Copy, and Paste commands to shorten or lengthen it.

To insert silence in the middle of a sound, click the Command button. It is located on the bottom right side of the sound edit window, and marked with the cloverleaf command symbol (⌘). Clicking it opens a popup menu of

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sound editing commands. Select the place where you want the silence, and select Silence...from the pop-up menu. The selected piece of sound is replaced with silence. As an alternative, you can add blank space, which is silent, without cutting any of the sound. Select the insertion point, and choose Insert Blank Space from the pop-up menu. Enter the length of time for the silence in the window that appears.

To record new sounds, return to the Sound dialog box and click the Record button to open the Sound Recording options and Record boxes. The Options box selects the input device and the format. Higher sample rates and sizes sound better but use more memory. The Record box has tape recorder style buttons. Click Record, Stop, and Play as needed.

To record narration over your slides, click the Add Narration button in the Sound dialog box. Choose whether to add it to the current slide only or to the whole presentation. When ready, click the Begin button. A record level indicator appears on the screen. Start talking. Use the spacebar to toggle the recording on and off. When you're done, if the presentation is still playing, press the Esc key to bail out.

See Also

Astound; Claris Impact; Multimedia; Presentation Software; Sound Control Panel; Sound Recording

Press

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You can press an item on-screen by using the **mouse** to place the arrow pointer over the item, and pressing the **mouse button** . When you need to access a **menu** , you press and hold the mouse button it until the menu **pops down** for you to make a selection. You can use the mouse to press buttons in **dialog boxes** by moving the **arrow pointer** over a button and pressing the mouse button.

See Also

Arrow Pointer; Dialog Box; Menu; Mouse; Mouse Button; Pop-Down; Selecting

Press Any Key

If you have a **PowerBook** and it is in **sleep mode** , you can awaken the PowerBook for use by pressing any key. Any Key is not an individual key on your keyboard, it is an actual reference to pressing any key on the keyboard. For example, if your PowerBook is in sleep mode you can wake it by pressing the L key, or the R key, a number, a letter, return, delete, it doesn't matter, literally pressing any key will wake the computer. Don't worry, the key you press will only act to wake the PowerBook, it will not perform an action, so if you press the letter M to wake the PowerBook, and you had a word processor open, rest assured that it will not type a letter M in your document.

If you are using a **desktop Mac model** and you use a **screen saver** to protect your screen from burn-in, you can also press any key to deactivate the screen saver and return your screen to normal operation.

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See Also

Desktop Model; PowerBook; Screen Saver; Sleep Mode

Press Form

See

Prepress

Press Registration

See

Registration

Previous File (Keyboard Shortcut)

If you're viewing the contents of an active **window** in a **list view**, you can move backwards alphabetically through the files and folders in the list by using the keyboard shortcut Shift-Tab. For example, if you're using the **tab** key to move through alphabetically through a window's list of contents, and you pass an item you're looking for, you can use the keyboard shortcut Shift-Tab to move backwards alphabetically to previous file in the list. Each time you press Shift-Tab it will move backwards alphabetically one file at a time.

See Also

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Keyboard Shortcuts; List View; Tab Key; Views; Window

Primes (Keyboard Shortcut)

The keyboard shortcut for the Prime symbol is found by pressing the apostrophe key while disabling any type of curly quote, or typographer's quotes feature. The double Prime symbol is found by using Shift-Apostrophe Key, also while any curly quote or typographer's quotes feature are disabled. There is some disagreement whether these symbol's should be italicized (Command) to be correct Prime symbols, so you may see Prime symbols used both ways.

See Also

Desktop; Disk; Folders; Keyboard Shortcuts; Open

Prince of Persia

From Brøderbund, Prince of Persia I, II, and soon III, are fairly typical “fight your way through the maze and rescue the princess” games. The art and animation places them a cut above average. Cut is a good word, too, when the prince lands on a trap full of sharp knives or gets run through by a scimitar. Death is frequent and graphic in these arcade-style games. Parental attention is advised, especially for younger players.

See Also

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Arcade-Style Games; Lode Runner: The Mad Monks Revenge Online

Print Command

When you want to print a document, use the Print command found on the **File menu** (⌘-P) to tell the program how many copies you want, which pages to print, and other necessary printing information. When you select Print, a print **dialog box** is displayed, as shown in the figure. Each program's print dialog box may look somewhat different, depending on the program and which printer you're using, but they all share similar characteristics.

Most Print dialog boxes ask you how many copies you want and if you want to print all of the pages in your document or just print a range, such as pages 5 through 8. Often there is a **radio button** or checkbox asking you to select the quality of print output from draft to best quality. The dialog box often asks if your paper source is a paper cartridge or you are going to manually feed the paper into the printer. These and many more choices are often available in the Print dialog box. One thing is consistent; after you've made your selections for number of copies, page range, and so on, you click the button "Print" to start the print cycle in motion.

As you're printing, often a status bar appears to show the progress of your printing, moving from left to right as your document nears completion. You can cancel your print job at any time during this period by pressing ⌘-. on

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your keyboard or clicking a **Cancel** button on the status bar, if one is available.

To print a document, follow these steps:

1. While the document is in the active window, select **Print** from the **File** menu (⌘-P).
2. When the print dialog box appears, enter the number of copies of your document you want and which pages are to be printed. There may be other questions to be answered; read the entire dialog box.
3. When you've entered the information, click **Print**.
4. A number of applications now have a **Print One Copy** command that's a real time-saver. This command lets you print one copy of the current document without having to go into a **Print** dialog box. **Print One Copy** is found under the **File** menu of certain applications. Apple's **SimpleText** is an example of an application that has the **Print One Copy** command.

See Also

Cancel; **Dialog Box**; **File Menu**; **Radio Button**

Print Catalog Command

This command, available only in **System 6.x**, enables you to print the

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contents of all open windows on the **Desktop** , even if the window is not the **active window**.

To use Print Catalog, select Print Catalog from the File menu at the desktop.

See Also

Active Window; Desktop; System 6

Print Desktop Command

If you're at the **desktop** and have no windows active, you can print a screen capture of your desktop using the Print Desktop command. To find the Print Desktop command, click the desktop (making the desktop active), or close all open windows, and look on the **File menu**. The command that used to say **Print Window** has now changed to Print Desktop. Select Print Desktop and the standard Print **dialog box** appears. To print the desktop, click Print.

To Print your desktop, follow these steps:

1. At the Finder level, click the desktop or close all open windows, either of which makes the desktop active.
2. Select Print Desktop from the File menu.
3. Enter the desired number of copies in the Print dialog box and click Print.

See Also

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Desktop; Dialog Box; File Menu; Print Window Command

Print Dialog Box

When you select Print on the **File Menu** (Command-P), a print **dialog box** appears, as shown in the figure. Different program's might have different print dialog boxes depending on the program and printer you're using, but they all share similar characteristics.

Most print dialog boxes ask you how many copies you want, and whether you want to print all the pages in your document or just a range, such as pages five to eight. Often there is a **radio button** or check box asking you to select the quality of print output from draft to best quality. Often you are asked if your paper source is a paper cartridge or paper you're going to manually feed the printer. These and many more choices are available in a print dialog box. One thing is consistent; after you've made your selections for number of copies, page range, and so on, you click the button "Print" to start printing.

If you have a fax/modem, which can send faxes directly from your computer, these are often partially controlled from the Print dialog box. Some popular fax/modem software, for example, enables you to access a fax command by holding down the Option key, which changes the Print command change to the Fax command. You still will use the print dialog box, but instead of printing the page out to paper, it now prints it to an electronic file sent by modem as if it were faxed from a traditional fax machine.

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See Also

Dialog Box; File Menu; Radio Button

Print Monitor Extension

This extension enables the user to print documents in the background while working on a different application in the foreground. The Print Monitor works in the background unless there is a problem that needs attention or you select Print Monitor from the **Application menu** while a document is being printed in the background. **Background printing** is enabled from within the **Chooser** on the **Apple menu** .

See Also

Apple Menu; Application Menu; Background Printing; Chooser

Print Options Box

The Options button in the **print dialog box** (Command-P) brings up a dialog box enabling you to specify certain options for printing, page orientation, and so on. The particular set of options you see, and the layout of the print Options dialog box itself, vary depending on the printer you are using. The print Options dialog box is usually accessed by clicking the Options button in the Print dialog box.

Each printer has it's own set of options. If, for example, you're printing to an

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Apple StyleWriter II and you click the Print Options box, it opens a dialog enabling you to choose to clean the ink cartridge before it prints the job.

If you're using a LaserWriter, you'll be greeted with a wider range of options. You might, for example, have the choice of adding a cover page (before of after the document), of choosing between a black and white, color/grayscale, or calibrated color/grayscale. And you may be able to request special reporting for PostScript errors.

Some applications have their own customized print dialog boxes that add a wide array of choices. Applications such as QuarkXPress and Adobe PageMaker have added their own print dialog boxes, and their print options include things such as tiling large documents, printing non-consecutive pages, adding copy marks and registration marks for use by a print shop, printing negatives, choosing which colors will print, and a wide array of specific options that would not be available in a standard Print dialog box.

When your desired options are set, click the OK button, which returns you to the Print dialog box. From there you can click OK to start printing.

See Also

Dialog Box; Print Dialog Box; Printing

Print Server

If you're on a network with users who all use the same printer, or a number

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of different printers, a print server acts as a storage device for spooled files and as a printing traffic manager for sending jobs to the selected printers in the background for you. A print server works something like Apple's **background printing** , but instead of **spooling** the print files to your own computer, the files are spooled to a print server that holds and directs the files to the proper printer for you.

To use background printing, you don't have to be connected to a network. The spooled file is stored on your computer until it is printed. However, network users can take advantage of a Print Server and have the spooled files stored on the print server until they are printed.

See Also

Background Printer; Printing; Spooling

Print Spooler

A print spooler enables you to **print** documents in the background by making a temporary copy of your document and sending the copy to the printer. Your document prints in the background while you continue to work in the foreground. This copy is referred to as being spooled. Print spooling is used with Apple's **background printing** and with a **print server** that spools files over a **network** . There are a number of third-party spoolers available that enable background printing and management of spooled documents to be printed.

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See Also

Background Printing; Chooser; Network; Print; Spool File

Print Window Command

This command enables you to print the active window in the **Finder**. The Print Window command is found on the **File menu**. To print a window, open the window you want to have printed, select Print Window from the File menu, enter the number of copies you want to print, and click Print. This command prints the entire contents of the selected window, even if you cannot see the entire contents on your screen without **scrolling**. The Print Window command prints the window in the **view** format you have selected. If, for example, you have your window view set to **icon view**, your window prints the icon view. If you have the view set to **view by name**, that view prints.

To print a window, follow these steps:

1. On the Finder level, open the window you want to print.
2. Select Print Window from the File menu. (This command appears only when a window is active.)
3. Enter the desired number of copies in the Print dialog box and click Print.

See Also

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File Menu; Finder; Icon View; Print Desktop Command; Scrolling; View By Name; Views

Printers, Color

There are many color printers on the market. They range in price from “personal printers” under \$500 to high-end publishing tools that can cost over \$10,000. The cost per page for color output also is higher than that for monochrome output. Laser and inkjet printers based their resource usage (the amount of toner required per page) on a budget of five percent of a page. Thermal Wax output costs more because each page uses a new ink ribbon, regardless of its contents. Pages can cost up to \$25 to \$50 with these high-end printers, although they cost less if you are printing onto transparencies that use more wax pigments to cover the page, and so produce less waste.

In the table that follows, notice that there is a significant difference in the speed with which a printer can print black and white pages (often four to 16 pages per minute) versus colored pages (which can take several minutes per page). Producing colored images takes more processing time for the RIP, because it must calculate how much cyan, yellow, magenta, and black to apply to create the colors on your screen. The printer takes longer as well, since even single-pass systems take longer to apply four colors than to apply one color.

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PostScript Options for Color Printers — Some use the Macintosh as the controller, such as the color inkjets, others are more expensive because they contain a PostScript RIP. You can also add a software PostScript RIP to your Mac by installing TeleTypesetting Company's T-Script. This is a software-based PostScript interpreter that runs on your Mac. Another option available for Apple's inkjets is a true Adobe PostScript Level 2 interpreter that runs on the Mac. Hewlett-Packard sells a PostScript RIP driver kit for the DeskWriter 560c. Each of these interpreters let you print encapsulated PostScript illustrations, such as those from Adobe Illustrator or Macromedia FreeHand, on your color printer even if it does not contain a PostScript RIP. Another option is to use software that turns your Mac into a print server, such as GDT Softworks StyleScript. High-end color printers rely on Adobe's Configurable PostScript Interpreter (CPSI) to process color PostScript print jobs and send them to printers.

The following table provides an overview of the kinds of color printers available at different price ranges. Note that this list is not exhaustive and that the technology is changing constantly.

Color Printers for the Macintosh

Color Inkjet, Apple Color StyleWriter 2200, Portable, 720 by 360 dpi, monochrome, 360 dpi color printer, \$419

Color Inkjet, Apple Color StyleWriter 2400, Color and Black cartridges, 360 dpi \$525

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Color Inkjet, Epson America, Stylus Pro 720 dpi, 1 ppm, Ethernet option, \$849 w/ software RIP for Mac

Color Inkjet, Hewlett-Packard, DeskJet 340cm, 600 by 300 dpi, 3 ppm, 30 sheet feeder, HP ColorSmart and RET technologies, \$299

Color Inkjet, Hewlett-Packard, Deskjet 850c, 300 dpi, 1 ppm, Ethernet optional, \$499

Color Inkjet, Hewlett-Packard, Deskjet 1600CM, 300 dpi, 6M RAM, 2 ppm, Ethernet standard, PostScript standard, \$1,999

Color Inkjet, Hewlett-Packard, Deskjet 855c, 600 dpi, 3 ppm color, 7 ppm black, ColorSmart and Color RET technologies, \$498

Color Inkjet, Hewlett-Packard, DeskWriter 660c 600 dpi, 1.5 ppm, 27 Scaleable fonts, 512K RAM \$379

Color Inkjet, Lexmark, Color Jetprinter 4079 Plus 360 dpi, 4M RAM, 1 ppm, Ethernet optional, PostScript standard \$2,699

Color PostScript Laser, Lexmark, Optra C 600 dpi, 8M RAM, 3 ppm, Ethernet optional \$6,400

Color PostScript Laser, QMS Magicolor CX/32 600 dpi, 32M RAM, 6 ppm, Ethernet standard \$7,999

Color PostScript Laser, Tektronix Phaser 550 600 dpi, 8M RAM, 4 ppm, Ethernet optional \$6,995

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Color PostScript Laser Xerox XPrint 4925 600 dpi, 24M RAM, 3 ppm,
Ethernet optional \$8,546

Color Thermal Wax Fargo Pictura 310e 300 dpi, 4 ppm, Ethernet standard
\$5,995 w/ software RIP for Mac

Color Thermal Wax Fargo Primera Pro 600 by 300 dpi, 1.5 ppm, Ethernet
optional \$1,895 w/ software RIP for Mac

Color Thermal Wax General Parametrics Spectra*Star 240 300 dpi, 6M
RAM, 2ppm, Ethernet optional, PostScript standard \$2,795

Color Thermal Wax General Parametrics Spectra*Star 280 600 by 300
dpi, 10M RAM, 2 ppm, Ethernet optional, PostScript standard \$3,650

Color Workgroup PrintersApple Color LaserWriter 12/600 PS 600 dpi,
12M RAM, 3 ppm, Ethernet standard \$6989

Dye sublimation Fargo Electronics Pictura 310 300 dpi, Adobe
Configurable PostScript Interpreter (CPSI) server program optional
\$4,995

Dye sublimation General Parametrics SpectraStar DSx 600 by 300
dpi, color image setter, PostScript standard \$7,695

Dye Sublimation Nikon Electronic ImagingNikon Coolprint 300 dpi,
Adobe Configurable PostScript Interpreter (CPSI) server program optional
\$2,350

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Dye sublimation Seiko Instruments Professional Colorprint 300 dpi,
combination dye-sub and thermal-wax technologies under \$10,000

See Also

CPSI; PostScript Printer Servers; Printers, Color InkJet; Printers, Color PostScript; Thermal Wax Transfer

Printers, Color PostScript

Most color printers contain RISC processors, ROM-based fonts, and PostScript interpreters and many megabytes of RAM, some printers depend on a print server system where software—typically Adobe's **Configurable PostScript Interpreter (CPSI)** resides. CPSI turns the Mac it resides on into a PostScript controller that converts the PostScript commands that describes the print job, generates a bit mapped image of the document, and transmits it via SCSI or parallel cable to the printer.

CPSI can run on a Mac Quadra 950, but performance is greatly enhanced if you run the software on a PowerMac, such as a 7200 or 7500 with at least 40MB of RAM. CPSI requires a minimum of 6MB of RAM, but its performance is extra slow until you add at least 24MB of RAM. Many service bureaus run CPSI on Macs configured with 96MB of RAM. Some printers require that you print your documents to disk at PostScript files and then process these files through CPSI. In this case it is important to indicate on the original document which type of printer it will run on, or CPSI will not recognize it as

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a PostScript file.

See Also

CPSI; Interpreters; PostScript Level 2; Print Servers

Printers, Connecting to Non-Macintosh Laser

The Macintosh can run on non-Macintosh compatible laser printers, especially the popular HP LaserJets. The LaserJet uses the Macintosh's QuickDraw routines to convert bitmap graphics and text to images that can be printed by the laser. The HP uses its standard font cartridges which are interpreted by special Macintosh software.

The easiest way to connect a Macintosh to a HP LaserJet is to add LocalTalk and PostScript to the printer. LocalTalk is the Macintosh's implementation of AppleTalk network protocol which is built into every Macintosh. HP markets a LocalTalk port called an **Interface Kit for AppleTalk/HP LaserJet**. You can also run the printer off of an external bridging device. You can install PostScript by using a PostScript font cartridge or use a **PostScript emulator** software on your Macintosh.

Pacific Data Product markets PacificTalk and Extended Systems markets BridgePort, two good external LocalTalk bridging devices which appear on the **Chooser** in the Macintosh enabling you to select the LaserJet as the

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printer.

Freedom of the Press from Custom Applications is a PostScript emulator software package which runs on your Macintosh to simulate the behavior of PostScript. Custom also markets a less expensive, slimmed down version of Freedom of the Press, called Freedom of the Press Light. This lighter version, when operating with Adobe Type Manager or TrueType, provides extensive font support.

If you are not running on a network, you use a Macintosh printer driver to connect to the LaserJet. Insight Development markets MacPrint bundled with the required serial port cable you need to hook into the HP printer. MacPrint uses QuickDraw to convert fonts to bitmapped images for the printer and supports dozens of HP cartridges, as well as the built-in fonts which come with the laser. You cannot use a PostScript font cartridge when using MacPrint. The package also includes a utility called Font Mapper which creates bitmapped screen fonts corresponding to the HP's cartridge fonts. It supports 63 cartridges and internal LaserJet fonts. With TrueType you do not need to use this utility.

JetLink Express from GDT Softworks is a similar product to MacPrint, but supports Type 1 and 3 fonts and automatic font substitutions. Its printer driver supports **Apple's Communications Toolbox** which is part of System 7. Grappler from Orange Micro is another printer driver software package.

These non-Macintosh options are not as fast as PostScript or QuickDraw laser

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printer performance, but enable you to run Macintoshes in personal computer environments.

See Also

Personal Printers, Laser; PostScript; Printers, Inkjet

Printer Descriptions (PPDs)

A number of applications, especially graphics-related applications, ship with an installed list of printer descriptions designed to be used with that particular application. Many of these printer description files (called PPDs) can be accessed through the Chooser (Apple includes printer drivers for most of its printers with the operating system); others are built into the Print dialog box of the application.

By having printer descriptions built into the application, the software developer can have the printer take advantage of special printing features included in the application, such as the capability to print non-consecutive pages, or to tile large images onto multiple sheets of paper to be pasted together to make a full-sized image. If, for example, you're using Adobe PageMaker and select the **Print** command, the **Print dialog box** offers a **pop-up menu** of printer descriptions for you to choose from. **Click and hold** to find the name of your printer and select it as your printer description. By making this selection, the application now knows which printer you'll be using and can take advantage of any special printing

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features PageMaker offers.

See Also

Click and Hold; Dialog Box; Pop-Up Menu; PostScript; Print Command

Printers, Dot-Matrix

The basic dot-matrix for the Macintosh is manufactured by Apple and is called the ImageWriter II (the ImageWriter is now obsolete).

The ImageWriter II contains a slot for an AppleTalk card to hook up the printer for sharing on a network, and has a better paper feed mechanism than the original ImageWriter. The ImageWriter II provides high-quality dot-matrix printing because it uses nine very small pins in its print head.

Apple also manufactured a 27-pin print head printer it called the ImageWriter LQ. which was not successful because of its awkward use of fonts three-times larger than the specified font to generate its bitmap images and other printing problems. The printer has been discontinued.

Other vendors also manufacture dot-matrix printers which will operate with QuickDraw on the Macintosh. Seikosha markets the SP-1000AP made by Epson and Seiko. This is a highly reliable, inexpensive printer which uses Tandy ribbons and parts. The printer is quiet, but relatively slow (15 characters per second) versus the ImageWriter's 45 characters per second. The upside of this lack of speed is the precision of its printing quality. Olympia markets the

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NP30APL which is more expensive than the Seikosha, but cheaper than the Apple printer. The performance of the Olympia is close to that of the ImageWriter I. The NP30APL also runs off of personal computers.

The Macintosh is compatible with the Epson LQ family of impact printers. All that you need is a serial port on the printer (this may be optional), an Epson printer driver software, and the proper cable (the same cable used to connect the ImageWriter I to the Macintosh). Toshiba America Information Systems, Inc. markets MacMatrix, a Macintosh printer driver which can be used with any of its four 24-pin dot-matrix impact printers which also run off of personal computers.

PrintLink Collection from GDT Softworks is a collection of Macintosh printer drivers which enable you to interconnect your Macintosh to hundreds of 24-pin and 9-pin printers, including those made by Okidata, NEC, Epson, Diconix, and Panasonic. The package also includes the cable you need to complete the hook up.

Compatibility of Macs with Non-Apple Dot-Matrix Printers: A Warning

The top margin of non-Apple dot-matrix printers is not compatible with the ImageWriter printer driver's code. A solution is to reset the margins in your documents to .67 inches (four lines from the top) and 1.33 inches on the bottom (eight lines) so that you do not have to waste the first page of paper and manually wind the second page to the top of the print head each time you print (a standard personal computer activity).

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See Also

Printing, Dot-Matrix; Printers, Non-Macintosh

Printer Drivers

A *printer driver* is the intermediary program that translates the QuickDraw commands used by the application to specify how a document should look into commands that can be used by a specific printer to print the document. Each printer has its own **printer page description file (PPD)** that tells the printer driver about specific features of that printer. These features, in turn, are displayed on the **Page Setup** and **Print** dialog boxes in all programs.

The application program does not speak directly to the printer driver, but uses the resources of the System's **Printer Manager** to pass the QuickDraw-based document appearance specifications to the printer driver you selected via a system utility called the **Chooser**. By dividing the responsibilities for printing between the application program and the System, the application program does not have to have its own printing routines for each printer. The application uses QuickDraw and the printer drivers translate QuickDraw into the specific language used by its printer. By using printer drivers, the Macintosh maintains its important consistent interface between programs.

The Printer Driver also provides the Page Setup and Print dialogs used in the application program to initiate the printing process.

System 7 upgraded the LaserWriter printer driver, changing the **Page**

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Setup and **Print** dialog boxes to include an increased variety of paper sizes and types, including envelopes. The Version 8.3 driver also creates a desktop printer (as displayed in the illustration below) that you can use to drag and drop files from the desktop to the printer without having to actually open the application. The desktop printer also manages the print job in the same fashion as the Print Monitor did in older versions of the LaserWriter driver.

The introduction of QuickDraw GX in 1994, further enhanced the Macintosh printing experience by allowing the printing of individual pages sizes and formats, partial pages, unique page sizes, and an easy way to specify different printers for different portions of a project (for example an inkjet for proofing and an imagesetter for final output). In 1995, Apple introduced a new printer drivers, **LaserWriter 8.3**, **StyleWriter 1200**, **2200**, **2400** , and **2500**, that incorporated many of the printer features of QuickDraw GX.

See Also

Desktop Printers; Page Setup Dialog Box; PDFs; Print Commands; Printer Description Files; QuickDraw GX

Printer Fonts

If you're using Type 1 PostScript fonts, there are two files necessary for viewing and **printing** the font: A screen font and a printer font.

The screen font, whose **icon** appears to be a small suitcase with the letter "A" on its side as shown in the figure, contains bit-mapped versions of the font

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that are used by the Macintosh to display the typeface on the screen, henceforth the name screen fonts. These bit-mapped fonts are designed for viewing on-screen (where the resolution of your monitor is 72 dots per inch), but if you tried to print screen fonts on a 300-dot-per-inch laser printer, the fonts would seem jaggy and be unacceptable as they're resolution (dpi) is too low. That's where printer fonts come in.

The printer font, shown in the figure, contains the mathematical PostScript instructions that any PostScript printer needs to create clean, smooth outlines for printing the font. If you have a PostScript-compatible printer, this printer font is actually downloaded from your computer to your printer during the print cycle.

Both the screen font and the printer font should be together in the Fonts folder (within the System Folder), or together in a separate folder outside the System Folder, if you're using a font management utility such as Suitcase (from Symantec) or Master Juggler (from Alsoft). The printer font is also used by Adobe Type Manager, a very popular font utility from Adobe Systems, which enables users to view and resize **fonts** to any size on-screen, or print to non-PostScript printers without having the fonts print jagged.

Apple invented their own font technology called TrueType, which is designed to use just one part (a printer font and screen font in just one suitcase) that can be resized, viewed on-screen, and printed without any jaggies. The capability to use TrueType fonts is built into System 7 and higher, but you can also use TrueType fonts with System 6.07 or 6.08 by

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adding Apple's TrueType extension to the system. Although TrueType didn't unseed PostScript Type 1 fonts as the standard on the Mac, Apple did license the TrueType technology to Microsoft for use on the PC platform with Windows 3.1, and TrueType is now the font standard on the PC platform.

QuickDraw GX, an enhanced printing and font technology from Apple released in System 7.5 and higher, introduces a new font format called GX fonts. These GX fonts enable users to employ advanced typographic features such as ligatures and precise kerning. Like TrueType, GX fonts use only one part (not a separate screen and printer font), and they have a special version of Adobe Type Manager called ATM GX designed to enhanced display and printing features. QuickDraw GX is a part of System 7.5 but requires a separate installation and is not installed during a standard installation.

See Also

Fonts; Icons; Printing; QuickDraw GX

Printers, Hardware Issues

Before the advent of the Macintosh with its WYSIWYG environment and graphical user interface, displaying a document and printing it were two separate operations. Because the WYSIWYG screen display uses similar technologies to that used in printing a document, this is no longer true. **QuickDraw** guides both processes ensuring that both text and graphics are drawn as specified.

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Before the advent of desktop publishing and electronic typesetting, computer users used the term *letter-quality* to define their printing requirements. Letter quality meant output which looked typewritten. Printers which produced this output were called formed-letter printers and used actual metal or plastic type brushed with ink which was pressed into the paper. Some of the type cartridges were removable, which allowed you to slightly vary your type characters, but they all looked typewritten versus typeset. Today, because users have seen examples of computer output which looks like it was typeset, letter-quality has come to refer to high-quality dot-matrix printing. The Macintosh has changed user's perceptions of what is acceptable output.

The Macintosh was sold originally with a dot-matrix printer called the ImageWriter. In 1986, Apple replaced the first ImageWriter with an updated one called the ImageWriter II which included a connection for sharing the printer over a network. As time progressed, users required a higher quality, faster, quieter printing process for the Macintosh's graphics and text. Vendors introduced laser printers which increased the quality of the output. These lasers used either Adobe's **PostScript** page description language to rasterize fonts, or more recently, use the Macintosh's QuickDraw to rasterize their images. Vendors have also developed bridges to enable Macintosh to print on non-PostScript laser printers, thermal printers, and ink jet printers. Color QuickDraw and PostScript Level 2 has been used to enable Macintoshes to print out in color, as well. Lastly, the Macintosh also supports high-end electronic typesetters such as Linotronics to produce extremely high-quality but expensive print-outs.

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Today, printers are proliferating so fast and the technology for electronic typesetting is developing at such a rapid rate that truly paperless publishing is becoming more of a reality rather than hyperbole. The following table provides an overview of the types of printers and their features available to Macintosh users.

Macintosh Printer Features

<i>Printer Type</i>	<i>Features</i>	<i>Price Range</i>	<i>Suggested Usefulness</i>
Dot-matrix	144 dpi, print wires and ribbon-based	under \$200	printing mailing labels or any other print job that requires continuous-feed paper stock. Does not support individual paper sheets or envelopes.
Inkjet	360 to 720 dpi, microscopic nozzles spray solid or liquid ink, uses Mac to control print job. Can support a software-based PostScript RIP	\$200 to \$500	Home computing, draft printing, mailing labels or low-quality printing jobs, limited paper-stock weights supported.
QuickDraw Laser printers	300 to 600 dpi, photocopier technology that uses the Mac to control the printing process	under \$700	Good for printing text-heavy documents that do not rely on encapsulated

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	PostScript for graphics and lack emulators for other printers so can only be used with Macs.
PostScript Laser printers	300 to 1,200 dpi, photocopier technology uses on-board computer to control printing under \$1,000 and up Desktop publishing and proofing output due to high resolution and accuracy of font and image reproduction.
Color printers: Color Laser, Thermal-Wax, Dye-Sublimation, Color Inkjet, and Hybrid Color Imagesetters	300 dpi on up to 1200 dpi, \$500 on up Color presentations using transparencies or film or business graphics, proofing color publications, scanned images and illustrations before submitting to four-color printing processes.

See Also

PostScript; Printing, Color; Printers, Inkjet; Printers, Laser; Printers, QuickDraw; Printers, Workgroup

Printers, Inkjet

In 1990, Apple introduced the StyleWriter inkjet printer which is based upon the Canon BJ-10e Bubble-Jet. The lightweight StyleWriter provides a 360-dpi

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resolution for the same price as the ImageWriter II. The printer performs slightly slower than the dot-matrix printer, (half a page per minute in best mode) but is much quieter. Ink cartridges cost about \$22.99 and last for up to 500 pages of letter-size paper. The printer requires high-grade cotton bond paper to perform at its highest levels.

Today, there are many inkjet printers priced under \$300. Inkjets use the Mac's QuickDraw routines to perform the calculations needed to print a document, and therefore contain relatively simple mechanisms for printing. Inkjets use a disposable print head that contains a supply of water-based ink connected to an array of microscopic nozzles. The print head moves right to left across a page spraying dots through the nozzles. Today's technology is such that inkjet printers can print to a precision of 720 by 600 dots per inch (dpi). The downside of this precision is that on plain paper, the ink spreads causing fuzzy output. The best quality output requires that you use special coated papers that do not absorb the ink.

Hewlett-Packard manufactures the DeskWriter 520 inkjet printer which produces output at a resolution of 600 by 300 dpi on plain paper by using a print head consisting of 50 jet heads (the horizontal resolution is achieved by finely controlling the left to right position of the print head via HP's **Resolution Enhancement Technology (RET)** that smooths character edges by adjusting the position of the dots (dithering). The HP DeskWriter uses its own set of outline fonts (Helvetica, Courier, Times, and Symbol) and you can upgrade the fonts to include the rest of the 35 Apple fonts. The HP printer is has a very economical footprint and contains a recessed cable well

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enabling you to place it against a wall. The HP is slower than most laser printers, but very quiet. The ink is water-soluble, which makes it prone to smearing if the paper gets wet. The HP DeskWriter also comes with an AppleTalk connection enabling you to share it among several Macintoshes on a network. The DeskWriter automatically senses envelopes and adjusts its print head to accommodate the extra thickness, making it a superior office machine.

The Apple StyleWriter series is slightly cheaper than HP's DeskWriter series price tag, but it produces a similar quality output with 360 dpi and a smaller weight and footprint for the printer mechanism. There are currently four StyleWriters: 1200, 2200, 2400, and 2500, each associated with a different market niche. The StyleWriter 1200 is the printer for low-end use. It is a monochrome printer that provides good quality output at 720 dpi. The StyleWriter 2200 can be run on batteries and is color-capable (meaning that you can add a color cartridge to allow this printer to produce spot color output). The StyleWriter 2400 is a color inkjet that produces 720 by 380 dpi output via two cartridges—a black and a three-color cartridge. You can also replace both cartridges with Apple's high-performance Ink Cartridge that increases the speed and quality of the output considerable for monochrome printing.

Brother International manufactures the HJ-400, though this printer is not the best option because it does not handle grayscale printing.

Another cheaper alternative to inkjet printing is purchasing the standard

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HP DeskJet Plus along with GDT Softwork's JetLink Express software. The JetLink software enables you to run all of HP's laser and inkjet printers off of your Macintosh. The package also comes with the cables required to connect your Macintosh and the same outline fonts as come with the DeskWriter. The DeskJet is the generic HP inkjet printer, and therefore is much cheaper than the DeskWriter which has been modified for use with the Macintosh.

Kodak markets the Diconix M150 portable inkjet printer which runs on nickel-cadmium batteries and is the size of a thick novel. GCC markets the Diconix M150 as the WriteMove and bundles it with BitStream TrueType fonts. The Kodak Diconix printer has been upgraded to the M150 Plus and bundled with Adobe Type Manager and 13 Type 1 fonts in residence. Both Diconix printers print at resolutions of 192 dpi and weigh 3 3/4 pounds, including batteries.

The following table provides an overview of monochrome inkjet printers available for the Macintosh. The list is by no means exhaustive.

Monochrome Inkjet Printers

<i>Manufacturer</i>	<i>Model Name</i>	<i>Features</i>	<i>Street Price</i>
Apple	StyleWriter 1200	Monochrome 720 dpi	\$269
Apple	StyleWriter II	Monochrome 360 dpi	\$289
Hewlett-Packard	DeskWriter 520	Monochrome 600 by 300 dpi	\$365

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Hewlett-Packard DeskWriter 600 600 dpi, optional color print cartridge

\$239

Hewlett-Packard DeskWriter 560c 600 by 300 dpi, color print cartridge,
PostScript optional \$259

See Also

Printers, Color Inkjets; Printing Technology, Inkjet

Printer Page Description Document (PPD)

See

PostScript Level 2

Printers, PostScript Lasers

In 1985, Apple introduced the first laser printer to incorporate PostScript. It was called the LaserWriter and was based upon the Canon CX engine. Apple upgraded the LaserWriter's engine to a higher-level Canon engine and added PostScript version 47, naming the upgrade the LaserWriter Plus. Both the LaserWriter and LaserWriter Plus were configured with 1.5MB of RAM which limited their capability to use downloaded fonts.

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Apple next introduced the LaserWriter II family, based upon Canon's second generation of printer engines, the SX. The LaserWriter IINT was the lowest level of PostScript laser in this family. It was built around the Motorola 68000 chip running at 12 MHz. It came with 11 resident Type 1 fonts. The next level of performance was provided by the LaserWriter IINTX which is based upon the 68020 chip and was configured with 2M of RAM, expandable up to 12M. The NTX also came with 11 resident fonts, but you could connect a hard disk to the printer's SCSI port to store additional fonts. These printers are discontinued.

Today, Apple manufactures a range of PostScript Laser printers to fit every marketing niche. The LaserWriter 4/600 PS is the grandson of Apple's original PostScript laser printers. This printer is marketed for home office users and provides PostScript Level 2 laser printing with 64 resident PostScript and TrueType fonts and can be upgraded from 2 to 4MB of RAM.

Today's PostScript laser printers are based on RISC processors that provide enhanced performance at lower costs. Adobe is not the only producer of PostScript, since third-party vendors have created clones that interpret PostScript commands for their printers.

PostScript printers have proliferated on the market. The table below lists "personal lasers"—those which can be connected to up to 32 Macs in small network situations. Note that the list is representative but not exhaustive.

Personal PostScript Laser Printers

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Apple	Personal LaserWriter 320	RISC engine, 300 dpi, FinePrint and PhotoGrade (w/memory upgrade)	\$949
Apple	LaserWriter Select 360	10 ppm RISC engine, 600 dpi, PostScript Fax option	\$1,400
Apple	LaserWriter 4/600 PS	4ppm, 600 dpi, PostScript Fax option	\$780
Digital Equipment Corp.	DEClaser 1152	17 fonts, 70 sheet feeder, 300 dpi	\$699
Hewlett-Packard	LaserJet 5MP	600 dpi, 3M RAM, 6 ppm, RISC processor	\$1,049
Hewlett-Packard	LaserJet 4ML	300 dpi, RISC engine, Printer Control Language	\$1,279
NEC	SilentWriter 640	300 dpi, 6 ppm RISC engine, 250 sheet feeder	\$799
NEC	SilentWriter 1097	600 dpi, 10 ppm RISC engine, 250 sheet feeder	\$1,399
QMS	420 Print System	600 dpi, 70 sheet feeder, 68020 engine	\$1,195

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Texas Instruments	MicroWriter	23 fonts, 250 sheet feeder, 300 dpi	\$799
Texas Instruments	MicroWriter PS65	65 fonts, 250 sheet feeder, 300 dpi	\$1,099
Texas Instruments	MicroLaser Pro 600	8 ppm RISC engine, 600 dpi, 2 250 sheet feeders, optional Ethernet	\$1,599

See Also

Printers, Color PostScript; Printing, Laser; Printers, Workgroup

Printer Port

See

Serial Port

Printers, QuickDraw Lasers

Laser printers that rely on the Macintosh for their processing are called “Personal” or “QuickDraw” printers. With the advent of **Adobe Type Manager** and **TrueType fonts**, this type of printer has become a viable option for work that does not require the printing of extensive graphics. Laser printers print faster than inkjets because its photocopier engine

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prints an entire page at one pass. Most QuickDraw laser printers print four to six pages per minute (the actual performance is based on the complexity of the job, of course). Laser printers give sharper output than inkjet printers because their technology does not depend on spraying ink on to the paper and they often come with software that smoothes character edges and produces sharper halftone images.

Apple manufactures the series of LaserWriter Select QuickDraw Laser printers, each for under \$1,000. The \$719 LaserWriter Select 360 provides resolution enhancement for both text and graphics (with the addition of 4MB of memory for graphics rendering). Apple **PhotoGrade** image-enhancement technology sharpens scanned images and fonts. The LaserWriter Select 360 uses a Fuji-built print engine that processes five pages per minute on the average.

See Also

Adobe Type Manager (ATM); Printing Technology, Lasers; TrueType fonts

Printers, Workgroup Lasers

Workgroup printers are the work horses of organizations. These are printers that must be fast (process at least 8 pages per minute), dependable, networkable, and high quality (at least 600 dpi output). These printers also must be able to handle large print jobs, and therefore have a large sheet feed capacity (at least 250 sheets per tray). All of these printers run PostScript

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Level 2 and come with a LocalTalk connection and at least an option of an Ethernet connection.

The following table provides an overview of the prices and features available for workgroup printers. Note that this list is not exhaustive as this is a very competitive printer market.

Workgroup PostScript Laser Printers

Apple	LaserWriter 16/600 PS 600 dpi, PostScript Fax option, 16 ppm \$2,299
Apple	LaserWriter Pro 810 400 dpi default, capable of 800 dpi; tabloid and legal size printing, 8M RAM, 20 ppm, Ethernet and PostScript fax standard \$4,899
GCC Technologies	Elite XL 1208 Super Size 1200 dpi, legal size page, RISC engine, 32M RAM, PostScript standard \$5,999
GCC Technologies	Elite XL 608 600 dpi, 8 ppm, legal size page, RISC engine, 6M RAM, PostScript standard \$2,399
GCC Technologies	Elite XL 808 800 dpi, 8 ppm, AccuGray technology, RISC engine, 12M RAM, PostScript standard \$2,999
GCC Technologies	Elite XL 1208 1200 dpi, 8 ppm, AccuGray technology, RISC engine, 24M RAM, PostScript standard \$4,299

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GCC Technologies	Elite XL 616	600 by 300 dpi, 16 ppm, Ethernet standard, RISC engine, PostScript standard	\$2,599
Hewlett-Packard	LaserJet 4MV	600 dpi, tabloid-size paper	\$3,549
Lexmark	Optra Lx	1200 dpi, legal-size paper	\$3,298
DataProducts	Typhoon 20	800 dpi, tabloid-size paper full bleed, optional PostScript fax modem	\$4,495
Xante	Accel-a-Writer 8200	1200 dpi (additional RAM upgrade is required), full tabloid-size bleed	\$5,299

See Also

PostScript Level 2; Printers, PostScript Laser; RISC Engines

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PRINTING

Printing is essentially the process of transferring an image to a two-dimensional surface. The operative word is “transferring” because that is how printing differs most markedly from original two-dimensional art. Printing also implies multiple copies, but in digital printing, one copy may be sufficient. Printing is a blend of art and technology. This is true even of older printing techniques such as lithography—practiced now only in fine arts printmaking—but which, not so long ago, was the height of technology. If traditional processes are used, manual skill is necessary to create a paper **mechanical** , operate a **process camera** , perform **prepress** procedures, generate **proofs** , make **plates** , and run the press—not to mention folding and binding. Even the new digital techniques require some manual skill, although not nearly to the extent that older techniques do. There is only slight comparison between operating a mouse and cutting and pasting.

The printing industry is doing very well. In spite of predictions of a paperless society in the future, we are printing things at an unprecedented rate today. The proliferation of books and magazines (and bookstores) is remarkable. In addition, millions of laser, inkjet, and other desktop printers

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are thrusting out sheet after sheet of printed matter all over the world. There is no longer any doubt that the desktop publishing phenomenon is a vital force driving the printing industry today. Many futurists agree that it is only a matter of time until traditional printing presses, with their noise and harmful chemicals, go the way of linotype machines and other recently viable technologies that people under fifty associate with the remote past. In fact, change is so rapid in the field of electronic publishing that one is hard-pressed to keep up. Newer, better, and (sometimes) cheaper hardware and software appear yearly or even bi-annually. Desktop publishing and printing is hugely popular and is routine in many business and institutional environments. Ironically, graphics industry professionals were slow to embrace the new technology, but one cannot get a job as a graphic designer in the United States today without some level of expertise in graphics and page layout software applications. The Internet is responsible for a new direction in mass communications, but old-fashioned paper printing will no doubt be around for a good while longer.

Conversation with Sandy Benett

Wondering whether the Newton operating system and Apple's Message Pads are succeeding? Sandy Benett, who worked at Go when they were creating a pen-based operating system, is acting Vice President of Apple's Newton Systems Group.

Maclopedia: So you've recently rolled out a new version of the Newton operating system. How is it better than the earlier ones?

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Sandy: In the past, we definitely had a problem. The way we first marketed the message pads, we put a lot of emphasis on handwriting recognition, and people were disappointed, so we got a lot of negative feedback. We have moved away from marketing the Message Pad as a handwriting recognition device; it is much more than that.

We have learned that 95 percent of the people who buy Message Pads have desktop computers, so what we are trying to do now is to deliver and market products that allow you to take information from your desktop with you in a mobile fashion. We don't believe they want to take their desktop with them; if they did, they would take a laptop. But they want the information, so we have been working with Now, Act, Meeting Maker, and others to provide applications that run on the Message Pad and the Mac or PC, and the data can be shared with each other.

We've also been targeting specific markets where there are, or will be specific off-the-shelf solutions. Take, for example, forms for the insurance industry. We work with a third party so that you can create a form in Newton, fill in the forms on the Message Pad, and upload to an application that runs on the desktop. This takes out the whole problem of transcription for claims adjusters, meter readers, census bureau people—anyone out of the office filling out forms.

Maclopedia: Where are you testing this idea?

Sandy: We have about 200 pilot programs from service people to delivery

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people to medical records. We have installations at Johns Hopkins Hospital in Baltimore and Brigham and Women's Hospital in Boston. Residents carry Message Pads with PCMCIA cards with the Physician's Desk Reference, so instead of having to lug around the big medical books they just plug in the appropriate card—and because it is all electronic, you can search on it and follow hyperlinks from one subject to the next. I can do research right at the bedside.

Maclopedia: How do you prepare electronic versions of books for the Newton?

Sandy: Two ways. Using a product we have just put on the market called Newton Press, you can take any word processing or graphic file on your desktop, drop it on top of this icon, and it creates a Newton book. You can do more formatting there, modifying it for the Newton screen. The second way is part of the Newton toolkit, BookMaker, which allows you to create professional quality books that are formatted for the Newton and load them into the cards.

Maclopedia: What other applications are being developed?

Sandy: Harris has developed an application for telephone repair people. They have ruggedized a device based on the Message Pad 120 with a geographical positioning satellite device and an RF radio. The repair guy gets the form over the radio, climbs up the pole, does the repair, fills out the forms up there, and radios the information back to the home office.

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Digital Ocean, another licensee, is working with American Airlines looking at giving out Message Pads to platinum and gold travelers. [The travelers] can make online reservations, query their Advantage account, check their itinerary—over the phone or wirelessly—while they are on the road. That's in a pilot stage. The software will call directly into the SABRE system, so the first option is always American flights.

Maclopedia: So you are licensing the Newton operating system to other vendors?

Sandy: Yes, we're aggressively licensing the Newton technology. We have 7 or 8 active licensees right now, and we have different kinds of relations—people who are developing products from scratch, people who are licensing actual boards and modifying existing designs to cover markets in which we are not adept or don't have the resources to attack, or don't have expertise, like the ruggedization Harris and Digital Ocean are doing. We are trying to create a platform for these devices, and we don't have the expertise in all the areas, but we want this to be the standard. We've been very active in licensing it, so it will be more pervasive. We are still on the hook to create the [Newton] market because it is our technology, and our licensees are watching the market reaction.

Maclopedia: Are you still suffering from people's disappointment with the original Newton?

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Sandy: Yes, we went out too early and hyped the device too much, and got some negative reactions. That has put doubts in a lot of people's minds. I think 2.0 answers a lot of those questions. Reviews have been uniformly positive—Best OS at Comdex, Mobility Award for Best OS. A lot of people who gave us negative reviews have now published positive reviews and say, "The Newton has finally arrived."

Maclopedia: So, what about the handwriting recognition? Has that been improved?

Sandy: It's significantly better and fitter. We have two different handwriting recognition engines. One is the paragraph engine; it's not as dictionary dependent, and the dictionary has gone from 10KB to well over 30KB in the current operating system. Word segmentation and printed characters also work better. In addition, we have added some work done here by our Advanced Technology Group on a printed character recognizer; it works very well on printed handwriting—as long as you don't connect your characters—above 90 percent. So the user has the option now to write connected characters with the paragraph engine, or to print and use the character recognizer.

And then Palm Computing has developed an application called Graffiti, which recognizes a restricted character set. You learn to write each character in one stroke. You have to learn a slightly different alphabet, but you can write in the little window, or on the main one, and people who use it find it to be one hundred percent accurate. The

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other engines are more like handwriting. With Graffiti, you write a character, and then you write another, so you don't get the spatial relationship. Some people say it is like typing with one finger. But the Palm guys say everyone in their office writes memos with it because it becomes that fluid after a while.

Maclopedia: So I'm on the road and I've written a note. How do I send it?

Sandy: That depends on what service you want. You can have a modem PCMCIA card and plug the phone into it and do email over it as you would from a PC. You can attach to a cellular phone and do your email from your car. Motorola has created an integrated product based on our Message Pad 110, using the Motorola wireless modem card, the ARDIS wireless network, and RadioMail's gateway services. A lot of companies already use that network to communicate with their sales force and do email. With so many standards, we are still evaluating the market, staying flexible. We may come out with an integrated product when one of these emerging technologies comes out ahead. In Europe, GSM is ahead, a digital cellular standard that works throughout the European Economic Union. I can have a GSM phone in France and while I am in Sweden, someone dials my French number but reaches me in Sweden. GSM is a clean, digital cellular network, and handles data well, and short messages; it's a world standard except in the U.S. and even in the U.S. a similar system, called PCS, a subset of GSM, is gaining acceptance. We're hoping that one standard will emerge in the U.S.

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Maclopedia: Where does the Newton technology stand in relation to the Internet and the Web?

Sandy: We have the potential to make a big impact. We are working on including a TCP/IP stack in the Newton; that should be shipping in June, and when that ships, All Pen Software will have a net browser that runs on the Newton. We also have Eudora for Internet mail, and they will have a client, so you can do remote Internet access and do browsing. But browsing will be limited. You cannot download pictures of Jupiter; they're too big and in color. But for text browsing and research, these devices will be used very well, particularly with our new attachable keyboard. You go to your meeting with the Message Pad and a pen and take notes, then back in the hotel you have to do email, so you attach the keyboard—it's 90 percent normal size, very light—and take care of your email. You don't have to lug a laptop around. I just put it in my carry-on luggage and it just goes through the scanners because it is all solid state. Once or twice people ask me to turn it on, and I just turn it on. It isn't like asking you to turn on a PowerBook, where you have to wait three minutes, or the battery is low so you have to find the cord and find an outlet.

Printing Methods, Digital Digital printing eliminates many of the labor-intensive aspects of traditional printing. In digital printing, **prepress** and **makeready** are compressed into software functions. At its simplest level, digital printing means no more than pressing Command-P-Return on the Mac keyboard. (Command-P-Return is the universal keyboard shortcut for

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printing a single copy with the default settings of the Printing dialog box in most Macintosh software.) The Adobe **PostScript** page description language is behind most digital printing today. PostScript is an output code which is processed by computers to convert digital images to printed images. The PostScript-compatible Apple LaserWriter was the first digital printer to make graphics industry professionals sit up and take notice. The first PostScript LaserWriter was not much of a machine compared even to today's low-end laser printers, which are less expensive, faster, and print at higher resolutions, but it contributed to the ultimate success of desktop publishing. Now, digital printing has moved into the realm of process color with digital presses that can actually compete with traditional printing presses. One of the benefits of digital printing is that it is more feasible to print small quantities (short-run printing). It is still more economical to use traditional printing methods for large quantities. The economics are changing, however, as digital printing technologies mature. For the foreseeable future, traditional printing presses will probably always be used for huge printing jobs and premium color printing—national magazines, mass-marketing materials, catalogs, and so on—but digital printers will no doubt come into their own and be utilized for much of the “small-time” printing.

Desktop Printers —The majority of digital printing still takes place on black and white desktop printers, although color printers are appearing on more and more desktops. Desktop printers are no doubt often used for small-quantity reproduction, but they have limitations. They are very slow compared to printing presses, duplicators, and high-speed copiers. Only a few

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models have the ability to automatically print on both sides of a sheet (duplexing). Most are limited to automatic paper feed of U.S. letter and legal size sheets only, although tabloid and full-bleed tabloid-size laser printers are increasingly common. Envelopes and smaller pieces of paper usually have to be hand-fed to the printer. On the plus side, nearly all desktop printers—whether laser, inkjet, thermal-wax, or dye-sublimation—provide good image quality. Black and white laser printers with 1200 dpi and 1800 dpi output resolution can even reproduce good quality halftone images. All color desktop printers are getting better and less expensive, but the color laser printer is seen by some as the paragon of color desktop publishing. Working on the same principle as regular laser printers, these printers may represent the largest area of growth in desktop digital color printing in the next few years.

Copiers—Next to desktop printers, copiers are the most common type of digital printers. To qualify as a digital printer, a copier must have a direct interface with a computer and **raster image processor** (RIP). Probably the most common RIP found on color copiers is the Fiery from EFI (Electronics for Imaging). The RIP enables a color copier to process PostScript files in a manner similar to other digital printers. Color copiers with the Fiery RIP can produce good-looking color images at 400 dpi due to 8-bit color resolution and special **halftone** algorithms. New technology color copiers from Canon and other manufacturers print at much higher speeds than older models, making them more competitive with printing presses for short-run color printing. A new color model developed by Xerox and Scitex

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America called the Spontane can print up to 40 pages per minute with excellent image quality. High-speed black and white copiers can definitely compete with offset duplicators and other small printing presses and have replaced them in some instances. Taking data directly from a network server or computer workstation, these copiers produce good quality printing in the 300 to 600 dpi range. Some systems, manufactured by companies such as IBM and Seimans, print 8[1/2]x11-inch duplex pages in the 300 to 450 pages per minute range. High-speed copier systems can provide a turnkey solution to **on-demand printing** by combining all necessary functions into one unit.

Digital Presses —The terms “digital press” and “digital printer” are somewhat interchangeable, and we make a distinction here mainly for the sake of discussion. For the lack of any major differences between the two, we will specify that a digital press is larger, more sophisticated, much more expensive, and more likely to be found only at commercial printing firms and trade shops. Two early entries in this field have the trade names Xeikon and Indigo. Both can utilize a Macintosh workstation. The Xeikon DCP-1 uses dry toners to simultaneously print 600 dpi full-bleed 6-bit color on both sides of an 11 by 17-inch sheet of paper. Much like an ordinary laser printer, it uses the electrostatic process and heat fusing but has ten imaging cylinders. Paper is fed into the printer from a roll (**web**). The DCP-1 has optional binding features for folding, stacking, inserting, stitching, and trimming. Xeikon is based in Belgium, and the DCP-1 is distributed in North America by AM Multigraphics. The Agfa Chromapress is a similar device that uses the Xeikon technology. Another electrostatic digital press called the Indigo E-

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Print uses a unique liquid toner called ElectroInk. This is a special polymeric ink that hardens on the paper quickly without heat. The Indigo's printing process differs slightly from other electrostatic devices in that the image is transferred from the drum to an offset blanket which transfers the image to paper. The E-Print 1000 is sheet-fed and has only one imaging cylinder, requiring a separate pass through the press for each color. Another model, the E-Print 4000 has four imaging cylinders and can print four colors at once but only on one side of the sheet. Both models print up to 11x17 inches at 800 dpi resolution and can be interfaced to a Macintosh workstation. Another digital press which appeals more to the traditional segment of the printing industry is made by Heidelberg, a well-known manufacturer of high-quality printing presses. The Heidelberg GTO-DI is a modified offset lithography press which allows printing plates to be imaged directly on the press cylinders. This is accomplished with a plate-imaging technology called Presstek Pearl which uses laser diodes to "burn" the plate. These plates use silicon instead of water to repel ink, making the GTO-DI a "waterless" printing press. Being an actual offset press, the Heidelberg GTO-DI lives up to its name by producing superior image quality at very high speeds.

Printing Methods, Traditional The early stages of traditional printing are described in the **Prepress** entry, but we will briefly review them here before discussing printing methods. Before desktop publishing made it possible to set type, create and scan graphics, and combine the two in electronic page layouts, paper mechanicals, or paste-ups, were required. The mechanicals were converted to many pieces of film (negatives and positives)

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which included both line and halftone images. This was usually done with a special graphics camera. These pieces of film were then combined in a process called image assembly and stripping. The complete assembly of film is called a flat. The combined film was then used to create proofs and, after any corrections or adjustments, used to make printing plates. In some cases, plates were made directly from the paste-up, bypassing the film stage, but this was done primarily on low-budget “quick-print” jobs. The traditional prepress process is by no means totally in the past. It is certainly being rapidly replaced by digital methods but is still used in some areas.

The majority of printing is done by the offset lithography process, but significant publications, such as *National Geographic*, are printed on a gravure press. Other printing methods, such as letterpress, flexography, and screen printing also exist, and we will describe each of them here.

Offset Lithography is something of a misnomer because “lithography” literally means “writing with stone.” Both parts of the word have their roots in Greek—*lithos* (stone) and *graphia* (writing). In fact, smooth limestone blocks were first used as printing plates in the lithography process, but today plates are made from metal (or paper and plastic in some cases). The word “offset” comes from the fact that the plates do not directly contact the paper. The image on the plate is transferred to a rubber blanket and then transferred to the paper from the blanket. In the original lithography using limestone blocks, paper was pressed directly onto the inked stone, then pulled away to reveal the printed image. This ancient method is still used in fine art printmaking. The offset process is preferred for modern printing

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presses because the rubber blanket conforms better to tiny surface variations in the paper, and it is easier on the paper at high speeds. Another reason for using an offset blanket is that the images to be printed can be “right reading” on the plate itself. This simply means that one can read text and other images on the plate in the same manner that they will be read on the paper. Applying the plate directly to the paper would result in a mirror image. Right reading plates are easier to work with because the image is exactly the same as on the paper.

The lithography process is based on the fact that oil and water do not mix. A thin film of water coating the non-image areas of the plate prevents oil-based ink from adhering to that area. Ink can only adhere to the image area of the plate because it has an ink-receptive coating. Waterless printing plates that use silicone to repel ink have been developed. An offset printing plate has a photosensitive surface, and images are created on it by exposing it to light through an assembled film flat. The exposure is performed in a special platemaking device, and technicians refer to the process as burning the plate. A flat is aligned to the plate with a pin register system. The exposed areas fuse to the plate material and become ink-receptive. The plate is developed with a chemical that removes the non-fused areas. Even when digital methods have been used to generate the film, offset printing plates are still made in this manner. Of course, direct-to-plate imaging is becoming more common, but a digitally-imaged offset printing plate still behaves the same on the press.

The printing unit of an offset press is a series of rollers that carries the ink

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and water from trays called fountains and applies them to the plate, which is mounted on a cylinder. The plate transfers the ink to the blanket cylinder which in turn makes an impression on the paper. The paper is pressed against the blanket by an impression cylinder to insure complete ink transfer. Paper is sometimes referred to as **substrate**—a more generic term which could include any printable material. Other units built into the press load paper and **register** it in the correct position for each impression. Delivery units remove and stack the printed material. See the bibliography following the **Printing** entry for sources of more information.

Gravure printing differs from offset printing mainly in the type of plate used. Also called rotogravure, gravure printing uses cylindrical plates bearing images composed of microscopic ink-filled cells. The cells vary in size and depth and create impressions that are essentially **halftone** images—even solid areas. One of the benefits of gravure printing is high-quality color on even relatively low-grade papers, as long as they are smoothly finished. Because gravure plates are more expensive than offset plates, it is used primarily for large print runs (over 100,000 copies), but it can be very economical in that milieu. Gravure printing is not as common as offset and is usually available only in large metropolitan areas or industrial centers.

Letterpress printing is very much like using a rubber stamp. Images are printed by inking a raised image area and applying this to paper. The most famous printer in western culture, Johannes Gutenberg, used a letterpress made from a wine press. In 1440, Gutenberg created a sensation by mounting

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movable type in his press and printing with ink on paper. Printing with movable type actually appeared much earlier (11th century) in China and Korea. The oldest printed text preserved for us to see was printed by the letterpress method in Korea in 1397. Before Gutenberg, all books in Europe were manuscripts, laboriously handwritten by scribes. Gutenberg may not have been first to invent the printing press, but he must be given credit for recognizing and developing its commercial aspects.

Three methods are used in letterpress: platen, rotary, and flatbed. A platen press opens and closes like a clamshell and can print only one sheet at a time. The rotary press prints by rolling paper between two cylinders where one cylinder holds the plate and the other provides pressure. A flatbed press rotates a cylinder holding the paper over a moving flat plate. The platen press is still sometimes used to print very short run jobs such as invitations or personal stationery. It is also used for embossing, die-cutting, and scoring. The market for letterpress is very small, and it has declined almost to obsolescence.

Screen Printing is a simple method requiring only a fabric screen (silk is often used), ink, and a device called a squeegee. Screen printing is often done manually and is a favorite technique for fine arts printmaking. Whether manual or mechanized, the process is basically the same. The screen is mounted in a frame and carries an image which is formed by blocking some parts of the fabric and leaving others open. This is accomplished with hand- or machine-made stencils or by spreading a light-sensitive emulsion over the screen and exposing it through a negative. Ink is forced through the

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screen with the squeegee, a flexible rubber blade wiped with moderate pressure across the image, carrying ink along with it. Even coarse halftones can be printed, and screen printing is widely used for small quantities of signs, posters, bumper stickers, T-shirts, caps, and many other surfaces that cannot be printed any other way. In fact, just about any surface can be screen printed. Large automated screen printing operations can be found even in small or medium-sized cities.

Flexography is a way to print on nonporous substances such as plastic or foil. It is done on a special press that uses flexible rubber or polymer plates, and the image is applied directly to the substrate. Flexography inks are more liquid than offset inks, and they dry very quickly. Flexography is used to print packaging materials in large quantities. Plastic bags are printed with flexography, but it is also used to print labels, decals, and even porous substances like corrugated cardboard and wallpaper.

Embossing and Debossing are ways to add a third dimension in printing. By pressing paper between two dies, an image is molded from the paper fibers. An image raised above the paper surface is embossed; a depressed image is debossed. Embossing an image with no ink or foil present is called blind embossing.

Die Cutting creates shapes such as holes or irregular edges in the paper. This is usually done in a letter press with thin metal strips embedded in wood. The metal strips are bent to the desired shape and pressed into the paper to cut the shape.

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Foil Stamping uses a die with a raised image to press a thin film of pigment-bearing plastic against the paper. The pigment is bonded to the substrate with heat resulting in a very opaque image that can cover any underlying color. Many foils are shiny and metallic in appearance but are available in matte finishes, pastels, and even wood grain. Any material that will not be damaged by heat and pressure can be foil stamped.

Engraving is a very old printing process but is still used all over the world to print currency. It is sometimes used for prestige stationery or wedding invitations. Engraving requires a metal plate with the image cut (engraved) into the surface. Ink is applied to the plate and wiped away leaving some in the engraved areas. The press forces paper against the plate, picking up the ink. Because engraving ink is very viscous, the resulting image is slightly raised above the surface of the paper. Halftones cannot be printed with engraving, but engraved art using a crosshatch technique was developed to a high level in past centuries. Take a close look at your paper money.

Thermography is a form of raised printing intended as an inexpensive substitute for engraving. In thermography, an offset press is used to apply slow-drying ink which is sprayed with a special resin powder that will blend with the ink and swell under heat.

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Printing and Binding Terminology

Basis Weight is the weight in pounds of a ream of paper in the basic size for its grade.

Binding is the process of fastening together sheets or **signatures** of paper with glue, wire, or thread.

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Blanket refers to the thick rubber sheet used to transfer ink from the plate to the paper in an **offset press** .

Bleed is the appearance of a printed element seeming to run off the edge of the page.

Blind Embossing is **embossing** that does not involve any ink or **foil** .

Blueline is a type of proof where all colors show as blue images on white paper.

Bulk is an expression of the thickness of paper in thousandths of an inch.

Burn is a term describing the exposure of a photosensitive surface, such as an offset printing **plate** , to light.

Case Binding is the process of gluing **signatures** to a hard cover to create books.

CastCoated is coated paper stock with a very shiny surface similar to that of a glossy photograph.

Coated Paper , also called coated stock, is paper coated with clay to improve ink holdout.

Collating is assembling sheets of paper into proper sequence.

Color Bar refers to the strip of colors printed near the edge of a press sheet to help evaluate ink density.

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Color Correction is the process of adjusting and enhancing color prior to printing.

Color Swatch is a sample of an ink color.

Comb Binding is a book binding process that uses a plastic comb inserted through holes in the paper.

Comp is the abbreviation of *comprehensive dummy*, a simulation of a printed piece.

Contrast (in graphic design) refers to a noticeable difference between two elements, such as large and small, dark and light, smooth and textured. In image manipulation and printing, contrast is the difference between the lightest lights and darkest darks of an image.

Corner Marks are lines printed to show the corners of a page.

Cromalin is the DuPont trade name for an integral color proof.

Crop marks , also called tick marks, indicate the part of an image to be cropped.

Cropping is eliminating portions of an image around its edges.

Cyan is one of the process colors (blue).

Density Range is the range of tones between the darkest and lightest areas of an image.

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Dot Gain is the phenomenon of **halftone** dots printing larger on paper than they are on negatives or plates.

Dummy refers to a preliminary drawing or layout roughly showing pagination and the approximate placement of visual elements.

Embossing is the process of pressing an image into the paper so that it is raised above the surrounding surface.

Emulsion is the coating of chemicals on paper, film, or printing plate that is sensitive to light.

Finish is the surface characteristic of a paper.

Flat refers to an assembly of film taped to masking material ready for making a printing plate.

French Fold refers to folding a printed piece with two folds at right angles to each other.

Ghosting is the phenomenon of a faint image appearing in the wrong place on a printed sheet.

Gripper Edge is the edge of a sheet of paper that a press grips as the sheet is fed into it. The gripper edge must contain no images.

Halftone is a term for converting a grayscale or color image into a pattern of dots for printing. Digital halftone dots are composed of a cell of smaller spots made by the output device.

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Highlights are the lightest areas in a **halftone** .

House Sheet is the general purpose paper always kept in stock by a printing firm. It is economical to use because they order it in large quantities.

Image Assembly is the prepress process of **stripping** together separate pieces of film prior to platemaking.

Imposition is the arrangement of pages on a press sheet.

Ink Holdout is a characteristic of paper that allows ink to dry on its surface rather than be absorbed.

Line Art is any image to be printed that is not a **halftone** .

Live Image refers to any graphic in an electronic publication file that should print as is or is linked to a source file stored with the publication.

Magenta is one of the process colors (pinkish red).

Matchprint is the 3M trade name for an integral color **proof** .

Mechanical refers to a paste-up of camera-ready copy composed of type, graphics, and other line copy elements. Instructions to the printer are often included on overlays.

Moiré is an undesirable pattern in **halftones** resulting from improperly aligned screens.

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Overprinting is printing over a previously printed image.

Paper Grain is the direction in which fibers are aligned when the paper is made.

Paste-up refers to the process of adhering type and other elements to a mounting board to make up a **mechanical** .

Perfect Binding uses glue to bind **signatures** together with a cover.

Point is a unit of measure. In paper, it refers to one thousandth of an inch. In typography and graphic design, it refers to one seventy-second of an inch. In graphic design and production, points are the basic units of **picas** . One pica contains 12 points.

Press Check refers to looking at the first sheets to come off the press for the purpose of final authorization for the print run.

Press Proof refers to a proof made on the printing press using the same plates, ink, and paper to be used in the actual print run.

Progressive Proof is a **proof** showing each color of a job separately and in combination with other colors.

Register is the position of printed elements in relation to the edges of the sheet and other printed elements. Properly printed elements are said to be “in registration”.

Register Marks are cross-hair lines that aid strippers and printers in

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registering **color separations** —sometimes called printer's marks.

Reverse is the act of printing type or other images reversed out of a background color so that paper color shows through.

Rough, also called “pencil rough” is the term applied to a simple sketch showing approximate placement of text and graphics in a publication.

Saddle Stitch is a **binding** method that uses staples to hold the folded pages of a publication together at the **spine** —often used for magazines.

Scoring is a finishing process in printing that helps heavy paper fold cleanly along a straight line.

Screen Ruling is the number of rows of dots per inch in a **halftone** —also called *screen frequency* and measured in lines per inch (lpi).

Screen Tint refers to a printed area of **halftone** dots that are all the same size, resulting in a shade or tint of color less than 100 percent.

Self-mailer is a printed piece designed to be mailed without an envelope.

Shadow is the other end of the tonal range from the **highlight** of a **halftone**, also called the shadow point and the highlight point. The complete tonal range established by these two points determines the contrast of a reproduction and should match the contrast of the original image.

Side Stitching is a **binding** method that uses staples through one edge of the pages.

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Signature is the term used for a sheet of printed pages that is folded and combined with other signatures to make up a publication. Signatures may have from 2 to 64 pages on each side of the sheet.

Slurring is an undesirable effect in printing **halftones** where the dots become slightly elongated.

Spine refers to the binding edge of a **signature** or publication.

Spiral Binding is the use of wire or plastic spirals looped through holes in the paper.

Stochastic dots are **halftone** dots in a random arrangement rather than a pattern.

Stripping is the process of assembling film into **flats** prior to making plates. A person who performs this prepress activity is called a *stripper*.

Substrate is a generic term for anything that is printed upon.

Thumbnail is often used to describe a small rough sketch.

Transfer Key is a type of integral color proof developed by 3M.

Trim Size is the size of a printed piece after excess paper has been cut away.

Watermark describes an image created in paper during its manufacture. Watermarks can usually only be seen if the paper is held up to a light. Some DTP and word processing applications can add a printed watermark to the page, by printing an image in a very light **screen tint**.

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Printing Papers, Types of

In both traditional and digital printing, paper has obvious importance. Its effects are often subtle, sometimes flashy, and, when used incorrectly, can be disastrous. Different papers print differently whether on an offset press or a laser printer. Therefore, several factors may compete with one another in the choice of papers—aesthetics, practicality, and economics. Fortunately all printing paper is designed to be both reasonably beautiful and practical at the same time, so the choice may often fall along economic lines. In any event, beware of the grossly inappropriate, such as a soft absorbent sheet fed to the inkjet printer or a glossy coated stock that repels the glue on Cheshire mailing labels.

There are many different categories, or grades, of printing paper, and the grading can be confusing. Papers are graded according to their use and each comes in a basic size. The widely respected *Pocket Pal Graphics Arts Production Handbook* published since 1934 by International Paper names eleven different categories. Other sources name some of the same grades, leave some out, add others, or use different names. We will attempt a consensus by identifying eight different categories: bond, text, book, offset, cover, board, newsprint, and specialty. Alternative names for the same grade will be noted. An excellent account of how paper is made and finished can be found in the book, *Getting It Printed* by Beach, Shepro, and Russon. This book also provides many more details about paper characteristics in easy to understand language. See the bibliography following the **Printing** entry.

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Many sources, including the venerable *Pocket Pal*, list “coated” along with the others as a separate grade of paper, but some of the other clearly defined grades, such as book and cover, come either coated or uncoated, so we will consider them generic categories rather than specific grades of paper. Coated paper is so named because it is actually coated with a layer of clay. The amount of clay and a process called calendering that compresses the paper’s surface has a great effect on the appearance of coated stock. The basic characteristic of coated paper is that ink does not soak in very much, staying on the surface to dry. This makes images look sharper and have better detail. Ink also looks more glossy on coated paper. Coated papers are classified according to how they look and feel, as are most other papers. Gloss coat is shiny. Dull coat is, well, dull. It is sometimes referred to as suede or velvet. Matte coat is somewhere between gloss and dull. Coated paper usually comes only in white or shades thereof. It is designed to show off color printing and needs no strong color of its own. On the other side of the coin is uncoated paper. Its surface is all paper, and it absorbs ink much more than coated stock. Printed images tend to be a little fuzzier-looking on uncoated paper, but ink dries quickly on it, and this is a definite advantage in many cases. Uncoated paper also comes in several shades of white, but, unlike coated paper, it can easily be obtained in colors. Now, we will briefly discuss each of the specific paper categories. The basic size of each grade in inches is shown in parenthesis.

Bond (17x22)—This is the category with which we are all most familiar. Inexpensive bond papers are commonly used in copiers, fax machines, and

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laser printers. There are many different types and finishes of bond papers. They are often distinguished by their cotton fiber content, and expensive stationery bond is usually made from 100 percent cotton fiber. Today, many bonds contain varying amounts of recycled fiber. Stationery bond papers often have either a laid or linen finish.

Text (25x38)—Text refers to the textured surface of paper in this category. Text papers also come in many attractive colors, and with their interesting textures, they are among the most beautiful papers. Most text papers are treated with **sizing** to make them more suitable for offset printing. (Sizing is a chemical added to the paper to protect it from the water present in offset printing.)

Book (25x38)—Book papers are the workhorses of the printing industry. They are available either coated or uncoated and are certainly found in most books. Book papers are considered general purpose papers and are less expensive than text papers. They come in a wider range of weights and bulk than other papers. They usually have either a smooth finish or a slightly textured surface called antique. Uncoated book papers are available in six to eight standard colors.

Offset (25x38)—Offset is another name for book paper, but technically, there is a difference between the two. Offset paper is book paper that has been treated with sizing to make it resistant to the moisture present in offset printing. Unsized book paper can be used for letterpress and gravure printing and any other process that does not involve high moisture levels,

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but most of the book paper used every day can be classified as offset.

Cover (20x26)—Cover paper is really just heavy-weight book or text paper. It is made to complement these papers and is used for covers on booklets, brochures, and so on. It is also frequently used for many special jobs such as pocket folders and cards of various kinds.

Board—Board stock is very heavy and rigid paper. Several subcategories of board stock are common. Index (22[1/2]x35 and 25[1/2]x30[1/2]) is inexpensive, very stiff paper that is good for writing on with an ink pen. Tag (24x36) is an inexpensive paper especially manufactured for tags. It is not a glamorous paper but very good at what it does. Bristol (22[1/2]x28[1/2]) is softer and more attractive than either index or tag and even comes in semi-attractive colors. It is inexpensive and makes a good low-budget substitute for book and text cover stocks.

Newsprint (24x36)—You guessed it! Newsprint is used in printing newspapers (and by budding artists in drawing classes). It is characterized by a soft absorbent finish and not-quite-white color.

Specialty—Carbonless paper, onionskin paper, Bible paper, Kraft paper (used for grocery bags), dry-gum labels, pressure-sensitive labels, and synthetic paper all qualify as specialty papers because they don't fit neatly anywhere else.

See Also

Printing Methods, Traditional

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Printing Plates

See

Printing Methods, Traditional

Printing Presses, Offset

Offset lithography presses are either sheetfed or webfed. This refers to the manner in which paper is fed to the press, and it is the only real difference between the two. On a sheetfed press, paper is inserted and printed one sheet at a time, but the web press gets its paper from a large roll mounted on the press. The paper from the roll is printed as a continuous piece (the “web”) and not cut into separate sheets until just before it comes off the press. Offset presses are further distinguished by the largest size of paper they can print. The smallest sheetfed offset presses are called duplicators and can print sheets of paper up to 12 by 18 inches. Duplicators are often used to print only one color of ink on uncoated paper and are most frequently found at quick-print and inhouse shops. Some are capable of multicolor printing, but duplicators were designed to print small jobs quickly and cannot be expected to attain the same quality as larger presses. Large sheetfed presses are manufactured in a variety of sizes. The 25 by 38-inch press size is very common, but sheetfed presses are available in sizes ranging from 12 by 18 inches to 55 by 78 inches.

Web presses also come in a variety of sizes relative to the paper size they can

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handle. The forms web press is the smallest and is designed to print business forms using a 17-inch wide roll of paper. The half web press uses paper rolls up to 26 inches wide. Full-size web presses use 38-inch rolls. Web presses can be operated at very high speeds, and the sight and sound of the web of paper flying through the press rollers and cylinders is an impressive one. Web presses are generally used to print larger quantities than sheetfed presses because they are more economical at a certain point. Any print job needing over 20,000 press sheets might be a candidate for the web press. A quantity of 100,000 sheets would certainly call for a web press. In many cases, a press sheet carries more than one copy of the publication. The appropriate size and type of press is part of the economic equation that is usually worked out by a printing cost estimator.

Many sheetfed and web presses can print more than one color in one pass through the press. Some large presses have as many as eight ink units. Each unit is capable of applying a separate color or varnish as the paper runs through. A multicolor press that can print both sides of the sheet in one pass is called a perfecting press.

See Also

Color Printing; Printing Methods, Traditional

Printing Problems

Why is it that the times you can't get your document to print are also the

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times you most need it to print—*now*? That's a mystery, but there are a few things you can try when your printer refuses to budge and you can't fathom the error messages PrintMonitor is giving you. Note that these tips are for those of us who haven't yet made the switch to QuickDraw GX, which is a whole different story in some ways.

- If the printer is running out of memory (you might get a message about this, or it might just refuse to print), try unchecking “Larger print area” in Page Setup. Imaging that extra area around the edges of the page can be just enough to send a printer over the edge.
- The higher the number of fonts, the greater the chances that you'll run into printing problems. Try reducing the number of fonts in a single document. Also, checking “Unlimited downloadable fonts” in Page Setup will force the Mac to download each font every time it's used on a page, and the printer will flush that font from its memory at the end of each use.
- Printing one page at a time can help in two ways. First, if there's a problem graphic or font in a document, this can help you find it. Second, it can keep the printer's memory from getting overloaded.
- Watch out for PICT files, which can causes mysterious output problems on PostScript printers, and stick with TIFF and EPS graphics as much as possible.
- Vector graphics with too many points (this is a problem with

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autotraced graphics and with some clip art) can really tax a printer.

- If you suspect the problem lies with the graphics in your file, try suppressing printout of them when you print. Deleting and reimporting graphics can sometimes flush out problems.
- Try different printer drivers: LaserWriter 7, LaserWriter 8, Adobe's PSpriinter (almost but not quite identical to LaserWriter 8), and maybe a proprietary one that came with your printer. And if your application uses PDF files (like QuarkXPress—you select one in Page Setup) make sure you're using the right one.

Printing Technology, Color

All color printers mix three pigments—cyan, yellow, and magenta—to produce all other colors. These colors are called the primary colors and serve as the basis for all color printing. When all three colors are mixed equally, the result is a type of black. Many color printers add a real black for a richer mix. The resulting system is called **CMYK** or **process color**.

Color printers can take several forms: they can use liquid or solid ink sprayed on the page (**inkjet** and **phase change inkjet**), solid wax that is melted on a page (**thermal wax**), and pigments that are burned at different temperatures to produce the colors (**dye sublimation**). Lastly, some laser printers mix powdered toner in the four process colors. Printers are categorized by how they apply their pigments, so we speak of dye

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sublimation printers, thermal wax printers, color laser, and inkjet printers.

Halftoning and Dithering to generate color output — Like monochrome inkjet and laser printers, these color printers apply pigments by overlaying dots of their primary colors. Thus, a red dot is composed of a yellow dot overlaid by a magenta dot. Eight-colors are relatively easily produced by overlaying two primary colors together for a resulting palette of cyan, yellow, magenta, black, red, green, blue, and white (the application of no pigment). Other colors are created by a process called **dithering** .

Color dithering is the application of the primary color dots in complex patterns that create an optical illusion that one is seeing other colors. It is very difficult to hide the dot patterns, since all of the dots are the same size and different pattern arrangements cause different qualities of results. Only high-end printers can apply color to continuous areas of paper and avoid the dotting affect.

The other way that color printers gain the effect of various color hues is through **color halftoning** . This is mostly used to print scanned images. First the image is separated into its cyan, yellow, black, and magenta components (called color separations). Halftoning is the use of dots of different sizes to represent the different amounts of gray in a picture. Color halftoning varies the amounts of cyan, yellow, magenta, and black in each separation to gain the illusion of various hues. Each separation screen is rotated to a different angle, causing their dots to overlap and form small circles called **rosettes** . Because the rosettes and dithering are noticeable to

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the naked eye at 300 dpi (the standard output quality of a color printer), these outputs are not usable to proof a color balance or the details of a color picture.

Color Printing, Inkjet Technology — Inkjet printers are the cousins of dot-matrix printers. Rather than use wires tapping a ribbon, inkjet printers spray ink out of microscopic nozzles in the print head. **Bubble-jet printers** use a heating element to create bubbles that expand to force drops of ink to fall from the print head. The **Hewlett-Packard DeskWriter** series and **Apple StyleWriter** series use this technology. Other inkjet printers send an electronic signal to a piezoelectric diaphragm within the print head that forces a drop of ink to be ejected from the nozzles. The colors of ink (cyan, magenta, yellow, and black) are all laid down on a single pass, causing fewer registration problems than printers that make four passes and lay each color down separately. Because the ink is a liquid, plain paper absorbs the ink, making clear images difficult to produce.

A second type of color inkjet printer uses a slightly different technology to lay down its colored dots. The **Phase Change Ink Jet** melts blocks of cyan, magenta, yellow, and black wax in ink reservoirs. The melted ink is sprayed onto the page through microscopic nozzles in the print head. Phase change ink jet printers also lay down the colored inks in a single pass. Because the inks are wax-based they solidify much more rapidly than liquid inks dry, allowing these printers to print more easily on plain papers. The downside is that less ink is absorbed by the paper and the use of a high-pressure roller to flatten the solidified ink, causes the printing of images that are not as sharp

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as other technologies.

Color Printing, Color Laser Technology — Color lasers apply color by using a four-chamber toner developer unit containing cyan, magenta, yellow, and black toner powder. The image exposed by light on to the photosensitive drum take on an electrical charge. Those charged areas attract toner as the drum rotates past the developing unit. Because only one type of toner can be released at a time, the drum must make four passes past the developer to apply four colors. After each exposure, the paper is passed across the toner-coated drum. After the four passes, the resulting colored image's toner is fused to the paper using a heated roller. The problem with this technology is **registration** errors. If the paper is not aligned perfectly on to the photosensitive drum the colors will not be applied accurately, leaving fuzzy borders between colored areas.

Color laser printers can print color at higher resolutions than thermal wax or dye sublimation systems. The Apple Color LaserWriter series prints true 600 dpi resolution output. Many printers also use resolution-enhancement technologies, such as Color PhotoGrade from Apple or Hewlett-Packard's Resolution Enhancement Technology to sharpen the text or images by fine-tuning the dot sizes used to create the output.

Color Printing, Thermal Wax Technology — Thermal wax transfer printers use a system where wax-based pigments of each process color (cyan, yellow, magenta, and black) are positioned on a roll of transfer ribbon, one after another. The transfer ribbon is placed between the print head's

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thousands of heating elements and the paper. The heating elements in the print head are turned on and off, causing the different colors to melt on to the paper as dots. One color is applied for each of four passes of the paper over the print heads and transfer ribbon. The same problem of registration as occurs in the color laser process occurs here, since if the paper is not aligned perfectly with the ribbon, colors will have fuzzy edges or areas of no color where the match was not made.

A newer technology used by Seiko's Professional ColorPoint PSF and Fargo's Primera Pro and Pictura 310 printers mix thermal wax transfer technology with dye sublimation technology. These hybrid thermal wax/dye-sublimation machines remove the thermal wax ribbon and paper and replace them with the dye sublimation's plastic film. These printers produce more realistic colors, since the plastic film coated with process colors can produce continuous color, whereas the thermal wax system cannot. The system is cheaper than dye sublimation, since less-expensive thermal-wax paper can be used for rough proofs and dye-sublimation paper can be used for final prints.

Color Printing, Dye Sublimation Technology — Dye sublimation and film recorders on the upper end of the color printing world do not have these drawbacks. Dye sublimation printing is performed by passing a plastic film coated with cyan, yellow, magenta, and black dye across a print head containing approximately 2,400 heating elements. Each heating element can produce 255 different temperatures, with more dye being transferred the hotter the element gets. The special polyester-resin coated paper is passed

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over the heating elements four times for the four dyes; and the dyes are sublimated into gases and diffused on to the coatings, producing dots of color. The variation in the density of the dyes that are transferred to the paper create continuous tones. Film recorders use red, green, and blue lights to produce images on 35mm slide film. A filter wheel controlled by Mac produces the correct amounts of primary colors which is then placed on the 4-by-5-inch Polaroid print or transparency film.

See Also

Bitsmoothing; Halftoning; Color Inkjet; Color Laser; Dithering; Dye Sublimation; Printing, PostScript Lasers; Imagesetters; Process Color; Thermal Wax

Printing Technology, Dot-Matrix

Dot-matrix printers produce images by hitting an inked ribbon with very small, moveable pins (called *print wires*). Each pin in the printer's print head produces a single dot. The pins are arranged in a matrix. The printer controls which pin strikes the ribbon and which ones remain stationary to direct the pattern on the paper. The resolution (clarity and crispness of the output) depends upon the number of pins and their size.

Apple used to sell several dot-matrix printers under the name *ImageWriter*. The ImageWriter II is the most popular product, and the only one still available. The ImageWriter II has a nine-pin printer head and produces a

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resolution in Best Quality mode of 144 horizontal dpi by 160 vertical dpi.

Dot Matrix printers can print in three modes: draft, faster-print, and best. In draft mode the Macintosh sends the printer straight ASCII code and its spacing requirements only. The printer supplies the font by which it prints the document. Draft mode was designed to show you where each word would begin on the page if the actual bitmapped characters and graphics were used, making the spacing of the printer's internal font characters very disproportional. When you use the faster-print mode, the Macintosh does send the printer bitmapped images of fonts and graphics, but as a page image. Because the page image is too large to send in one piece, the Macintosh System's Print Manager generates the bitmap in stages in a process called *banding*. It flushes each section out of its memory after it sends it to the printer. In best quality the Macintosh also uses banding to transmit the bitmapped image to the printer. The quality is increased because the Macintosh generates a bitmap image that is twice the size of the page and then scales the image down to size before sending it to the printer. Because the larger image takes more memory, banding this image takes 47 passes to the printer.

Fonts and Dot-Matrix Printing

The scaling process impacts how the Macintosh uses fonts to print on a dot-matrix printer in best mode. When you select best mode, the Macintosh selects a font twice the size of the one specified and then shrinks its bitmap 50 percent. If you have not installed a font twice the size of the specified

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font, the Macintosh uses one four-times the required size, and if that font is not available, the Font Manager scales the next appropriate size. ImageWriter fonts typically provide fixed fonts for 9, 10, 12, 14, 18, 20, and 24 point sizes. Other sizes require the system to approximate the scaling using an available font size. This causes the output to look distorted.

Best mode increases the quality of the print out an additional measure by causing the print head to make twice the number of passes over the paper. Before the second pass the printer rolls the paper up one-half a dot, thus causing the second pass to slightly overlap the first, filling in images and increasing the intensity of the print.

TrueType fonts increase the number of high-quality fonts which can be printed on the dot-matrix printer because QuickDraw scales the font to whatever size you specify using the outline font files as a template. Using TrueType you can print any point size font. In best mode QuickDraw rasterizes the bitmap image creating a font twice as large as required so that less hinting is required to build an accurate representation of the character. Larger fonts carry more information than their smaller counterparts. The font is reduced 50 percent in the scanning process to produce a denser, sharper print image.

Hints to Make Your Printing Easier

One way of making your images clearer when printing bitmapped graphics on a dot-matrix printer is to select the Tall Adjusted option in the Page Setup message dialog box. This option adjusts the Macintosh output from 72 dpi to

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the 80 dpi vertical resolution of the printer, thus generating a proportional image.

To avoid the irregular word spacing which occurs in draft mode, change your document's font to a monospaced font, such as Monaco, for printing out a draft. The fixed-spaced font on the screen will then match the spacing of the printer's internal font, making the draft easier to read. Change your document to a more professional bitmapped font when you are ready to print your final copy.

To increase the quality of your printout in Best mode, select fonts with uniform stroke widths, such as Geneva, Monaco, and Courier. These fonts scale more clearly than variable-stroke fonts, such as New York.

Always install fonts in groups of twos—9 point with 18 point, 10 point with 20 point, etc. so that the Font Manager has the larger font available for scaling in best mode.

The clearest text font for use with the ImageWriter family is Boston II which is a shareware font available from Apple Macintosh user's groups. Use fonts with city names for best results, since these fonts were designed to be printed and displayed at 72 to 80 dpi.

The highest quality output in best mode is produced by using an older printer ribbon, since there is less smudging of characters from the double-pass process due to high levels of ink on the ribbon. Dot-matrix printers use inked ribbons which dry out over time. Do not stock-pile your ribbons, but buy

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them one at a time.

See Also

Bitmapmed Fonts; TrueType; Type 1 Fonts

Printing Technology, Inkjet

Inkjet printers operate on the same principles as dot-matrix printers, only they use tiny squirts of ink instead of pins to print their dots on the page. Inkjet resolutions are better than dot matrix printers, but most are not as good as laser printing resolutions. Inkjet resolution averages 360 dpi on best mode, but Apple manufactures a color inkjet that averages 720 dpi in best mode for black and white text.

Most inkjet printers come bundled with **Adobe Type Manager** to rasterize **Type 1 fonts** on the Macintosh. They also come with their own set of outline fonts (Helvetica, Courier, Times, and Symbol) and can be upgraded to 35 or more resident fonts. Inkjets, like dot-matrix printers, receive rasterized images of **TrueType fonts**, which they use in conjunction with, or in the place of their resident fonts. Inkjet printers are therefore not limited in their ability to print Adobe and TrueType fonts, since all of the hinting and scan conversion processes occur on the Macintosh. Their only limitation is that they do not support PostScript-based graphic formats, such as Encapsulated PostScript, Adobe Illustrator, or Macromedia FreeHand graphics. You need a PostScript add-on card or interpreter to print PostScript

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graphics.

Inkjets use special inks which tend to bleed on regular printer paper, although the technology is better today than when inkjets were first introduced in the late 1980s. Most vendors recommend printing on special coated papers made for inkjet printers when printing in best mode.

Inkjet printers are very compact, since their printing mechanism is very simple. There are several portable inkjet printers.

Apple's StyleWriter family and Hewlett-Packard's DeskWriter family (displayed in the illustration below) are popular desktop inkjet printers that offer both color and monochrome machines.

Older StyleWriters, such as the StyleWriter II or the newer StyleWriter 2400, connect via a serial cable to the Mac's modem or printer ports. StyleWriters use drivers that incorporate GrayShare or ColorShare technologies that allow you to share the printer over a network. The StyleWriter is connected to the modem port and the network is attached to the LocalTalk printer port. You will need a port splitter box, such as Port Juggler, if you also use a modem. Use the Chooser's Setup screen to turn on printer sharing. The GrayShare or ColorShare option (turned on by clicking the Share This Printer check box in the StyleWriter Sharing Setup dialog box) turns your Mac into a print server. Note that performance slows way down, since it is your Mac that is processing any other user's print job.

The Hewlett-Packard DeskWriters connect to the LocalTalk port and can be

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shared on a network like any other printer via the Chooser.

See Also

Fonts; Networking; PostScript; Print Servers; Printers, Color Inkjet; Printers, Inkjet; TrueType Fonts; Type 1 Fonts

Printing Technology, Laser

Laser printers produce output which is better able to render the subtleties of electronic type as well as the details of a graphic drawing, because it prints at a resolution of 1,200, 800, 600, or 300 dpi versus the 144 dpi of high-quality dot-matrix printers or 720 by 360 dpi of inkjets. Laser printing is also faster than dot-matrix printing and quieter.

Laser printers are more complex than dot-matrix printers because they use a laser to shine a light creating the dots on the page. The laser printer consists of an engine (a type of photocopier which manages the paper feeding and prints the image) and a controller (which accepts printing instructions from page description languages and governs the engine following those routines). The difference between PostScript printers and other printers is that the controller is housed in the printer in PostScript laser printers versus using the Macintosh's QuickDraw to control the printing process.

The printer engine consists of the following components:

- A light-sensitive rotating drum or belt.
- A laser assembly which is aimed at the drum through a series of

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mirrors and lenses.

- A toner reservoir. Toner is a fine plastic powder coated with a polymer causing it to retain a negative electric charge. Some laser printers separate the toner from a developer (a second powder).
- Wires carrying high voltages called charging coronas. Charging coronas electrically charge the drum as it rotates the paper through the engine, allowing the toner to be transferred to the paper.
- A fusing assembly to melt the toner particles so that they adhere to the paper.

Raster Image Processors (RIPs) Laser printers which contain controllers use them to manage the rasterizing of images. Laser printers, like Macintosh video screens, are raster devices. A 300 dpi resolution laser inscribes over 3,300 scan lines per page on the photo-conductive surface of the drum. Because the controller manages this process, it is sometimes called a *raster-image processor (RIP)*.

There are two types of RIPs, depending upon the language they use to communicate an application program's page specifications—PostScript printers and QuickDraw printers.

Laser printers which do not have resident controllers to control the print engine are called *QuickDraw* laser printers. They do not use PostScript as their page description language, but rather use the power of QuickDraw to rasterize TrueType outline fonts or Type 1 fonts with Adobe Type Manager

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before sending the bitmap image to the printer. These printers are becoming the most popular printers in the Macintosh market.

The problem with some of the QuickDraw printers is that they cannot connect to the Apple LocalTalk networks, thus cannot be shared among Macintoshes. They are also slower than PostScript printers and require more overhead storage on the Macintoshes because they perform their rasterizing, hinting, and scan converting on the Macintosh. It is quite possible to run out of memory during a print job when using a non-PostScript printer.

The benefit of using a non-PostScript printer is that it is cheaper, since it does not have the expensive microprocessor and software components required of a PostScript printer. It is usually smaller and lighter for the same reason, so takes up less desk space.

See Also

PostScript; PostScript Level 2; Printers, Laser; QuickDraw

Printing Technology, PostScript and Fonts

Many PostScript printers use outline fonts burned into ROM to support the scan conversion process. These fonts are called *resident fonts*. The printers can contain from 17 to 35 or more resident fonts and these fonts are then organized into font families, such as Helvetica, Times, Garamond, and so

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forth.

These resident fonts can be supplemented by downloading outline fonts from your Macintosh. System 7 includes a utility called the LaserWriter Font Utility for use in downloading, memory checking, and font listing on your laser printer. These downloaded fonts are stored in a reserved area of printer memory called *virtual memory*. There is a limited supply of VM on the printers (approximately 400 to 500 kilobytes on a 2MB RAM printer), enough to store approximately eight fonts (depending upon their sizes). You can also attach a hard disk to many PostScript printers via its SCSI port to store downloaded fonts. The printer takes the fonts it needs automatically during the printing process. Many Macintoshes can share these fonts, reducing the required storage space dedicated to font storage on individual Macintoshes.

The use of a SCSI hard disk on the printer provides a larger font cache, because the overflow from the RAM cache is automatically sent to the hard disk. The printer uses half of the hard disk for downloadable font storage and the other half for font caching. Many font vendors also market fonts on compact disks (CDs) and will release the locks on fonts selectively via telephone after charging a fee for each font it unlocks. You can then download the font from the CD to the Macintosh or printer's hard disk.

The PostScript interpreter in the printer's controller creates a bitmapped image of the outline font using a process called hinting. The resulting bitmap is stored in a reserved area of printer memory called the *font cache*. The controller uses the font's bit map as needed during the scan conversion

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process. Using a font stored in the font cache speeds up the conversion process immeasurably. The controller manages the font cache by flushing font bit maps on a "least recently used" basis. The larger the font cache, the more storage space is available for storing font images. In addition, added performance is provided to the printing process through the use of pre-built bit maps of commonly used fonts and sizes which are stored on the ROM chips of most printers.

This image collection includes the full ASCII character set in Courier 10 point, as well as letters, numbers, and common punctuation in 12 point Helvetica and Times. Many printers also build font images when they are not performing an actual print job. This is called *idle-time font-scan conversion*. Fonts created during this process are stored in the font cache. The number of pre-built fonts depends upon the size of the font cache.

When you try to print a document which contains TrueType fonts on a PostScript printer, these pre-built Type 1 fonts take precedence over your TrueType raster images. The output from the printer will not contain TrueType images, but rather these pre-built images. TrueType scan conversion works best on non-PostScript laser printers where no conflict with built-in fonts can arise.

See Also

Adobe Type Manager; Fonts; PostScript Level 2; TrueType Fonts; Type 1 Fonts

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Printing Technology, PostScript Lasers, Halftoning

A laser printer can't automatically produce shades of gray. This is a problem with the prevalence of scanned images and gray-scale monitors which can produce millions of shades of gray. The printer uses a process called **halftoning** which converts the image into dot patterns, with gradations of dots representing the gradations of gray. Halftoning is also called **screening**, since the shades of gray are reproduced through the illusion of patterns of dots of black ink on white paper. Halftone screens are defined in the number of lines per inch (lpi), the more lines per inch available, the more precise the image reproduced. The laser printer combines printer dots into cells to produce its halftones. The higher the printer resolution, the better the quality of its halftones (since each cell can be smaller—more dots per inch). The practical limit of a 300 dpi laser printer is 53 lpi (a magazine's halftones are measured at 120 lpi, and a newspaper's at 65 lpi, so these halftone images from the laser are not as legible). When you print halftones on a 600 dpi printer, you can create 71 lpi halftones, like those a newspaper produces. Typesetters which operate at resolutions of 2450 dpi and higher can produce magazine-quality 120 lpi halftone images. When you scan an image you need to know the line screen used by the printer that will output your job.

The halftones are variations in the size of the dots produced by the laser.

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Depending on the arrangement of the dots and their variability, you are able to get different grayscale qualities.

Bit-Smoothing on PostScript Laser Printers

Some applications, notably Adobe PageMaker, smooth the jagged edges of bitmapped images. When you print a paint application's output which has been drawn at 72 dpi, the laser printer scales the output to 300 dpi, or higher. Because the 300 dpi is not a multiple of 72 dpi, the image will be distorted. To repair this problem, always select the **precision bitmap alignment** option in the Page Setup dialog box. The precision bitmap alignment option rescales the image to 288 dpi, which is a multiple of 72 dpi, thus avoiding the distortion.

See Also

PostScript Level 2; Printing, Color; Printing, Laser

Printing Text

All word processors print, and all do so in pretty much the same way. When you've entered and formatted your text, and are ready to print, select **Print** from the File menu, press ⌘-P, or click the printer icon on your word processor's toolbar, if it's available. This opens the Print dialog box, or if you have just changed printers, you'll see a reminder to check your **page setup**. Checking page setup before you print is always a good idea, especially if you

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have more than one printer, or use fax software and a modem. The Page Setup dialog box is used to change document-specific and/or printer-specific settings, like paper size and **orientation** .

The Page Setup settings are stored in the Mac's memory with the pages to which they relate. The Page Setup dialog box looks different, and may contain different options, depending on which word processor you happen to be using. The Print dialog box also varies with the printer you use, as well as with the word processor and your system software. (If QuickDraw GX is installed, you'll see an additional menu item called Print One Copy. It should be self-explanatory.)

Another good idea, and one which most of the current word processors support, is Print Preview. This File menu item lets you see on-screen what your printed page will look like before you commit to printing it.

All print dialog boxes ask you how many copies you want, whether you want to print the entire document or only selected pages, and any special instructions such as collating the pages of multiple copies or printing to a **PostScript file** instead of to a printer.

When you select the print command, the print **dialog box** appears, as shown in the following figure, enabling you to choose from a variety of printing options based on the printer you have selected in the **Chooser** and the application you're in.

The **Chooser** , appearing on the **Apple menu** , enables you to tell your

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Macintosh which printer you want to print your document. If, for example, you have a laser printer and a color inkjet printer, icons for both of these printers appear in the Chooser, and you can select the printer you want to use, as shown in the figure.

For users using QuickDraw GX, Apple's new advanced architecture for printing available as a separate install in System 7.5 and higher, you can put printer icons on the desktop, which enables you to drag documents onto the desired printer icon to print the document.

The Print dialog box enables you to choose how many copies of the document you would like, which pages you would like to print, and other options such as print quality and paper tray selection. Some applications, particularly graphics programs, have their own print dialog boxes that replace the Apple print dialog box, adding special features and options specific to that application. Also, some applications (including Apple's own Stickies and NotePad) now have an additional command in the File menu called Print One, or Print One Copy, which enables you to print one copy of the current document without having to access the Print dialog box.

The Macintosh uses two basic types of technology to print a page: **PostScript**, an advanced page description language developed by Adobe; and **QuickDraw**, Apple's proprietary technology that the Mac uses to draw text and graphics on-screen. A QuickDraw printer essentially draws what appears on-screen on a piece of paper. Since QuickDraw technology is built into the Mac, rather than the printer, like PostScript, the speed that a document

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prints at on a QuickDraw printer has a lot to do with the speed of the Mac that is printing the document.

PostScript printers work in an entirely different way. The PostScript technology is built into the printer. PostScript is a computing language developed by Adobe Systems as a way to display and print text or graphic images that are resolution-independent (meaning the same file that shows up on your screen at 72 dpi can be printed to a PostScript laser printer at 300 or 600 dpi, and then output to a PostScript laser printer at 1200 or 2540 dpi, enabling the page to be printed at the maximum resolution of the printer that is printing the page. Graphics applications such as Adobe Illustrator and Macromedia FreeHand rely on this technology to render high-resolution, object-oriented images, rather than bitmapped images. Images are interpreted by the Postscript RIP (raster image processor) in the printer to give you a high-resolution printout of your page, which can be made-up of either text or graphics. **Fonts** designed to take advantage of Postscript printing are called Postscript or Type 1 fonts.

In System 7.5, Apple also introduced a new page description language, printing, and font technology called QuickDraw GX that improves upon QuickDraw by adding the capability to have advanced typographic features implemented automatically, the capability to have desktop printer icons for drag-and-drop printing, and many other advanced printing and typographic features.

See Also

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Apple Menu; Chooser; Desktop; Dialog Box; File Menu; Fonts; Icon View; List View; Orientation; Page Setup; PostScript; Print Command; QuickDraw, QuickDraw GX

PrintOpen ICC

Linotype-Hell, long a manufacturer of high-end prepress equipment including imagesetters and scanners, has its own entry in the **color management** field: PrintOpen ICC, designed to generate ICC-compliant **device profiles** that can help make color output more accurate.

Linotype's color technology is the basis for Apple's **ColorSync** 2.0 system software, which has become the standard for color management applications. Running on top of ColorSync, PrintOpen ICC comes in two versions, regular and PrintOpen Lite. The latter eliminates a couple of the more obscure features of PrintOpen ICC, offering most of the same functionality with much simpler controls.

Profiles are created through a standard process: Print a supplied file then measure the results with a spectrophotometer so the software can quantify the difference between what the color's supposed to be and what a particular printer actually produces.

See Also

Color Management; ColorSync; Device Profiles; Measuring Color

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Printout

See

Hard Copy

Private Key

A **Web** user's personal key, which is never distributed on the **Internet**, used in public/private key transactions on the Internet. A key is a very complicated encrypted series of numbers that would take so long to decode that it's essentially unbreakable. Allows users to read encrypted messages while others cannot.

Private and **public keys** are generated by the individual computer user. The **freeware** program Pretty Good Privacy (PGP), which is available for the Mac and other platforms, enables a user to generate both private and public keys at a user-specified level of encryption complexity.

See Also

Internet; Public Key; Secure Sockets Layer

Problem Analysis

Problem analysis is the first phase of any programming project. Unfortunately, this phase is often overlooked to the peril of the

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programming team working on the project.

The purpose of problem analysis is to get a complete understanding of the programming project to be undertaken. This phase is primarily a time to ask questions about the project as a whole and answer them before continuing.

The most basic question to answer is, “What will the program do?” Not *how* will the program go about doing it, but *what* it will do. Will it be a killer spreadsheet application or a niche utility? A totally new concept in personal productivity or a plug-in for an existing product? This seems like common sense—and it is—but many programming projects are doomed to failure because different members of the development team have very different ideas about the need the program will fill.

Just as important is whether the need is already filled by another solution. Unless you are specifically setting out to challenge another application, you should question whether or not you should even pursue a new programming project if a solution is already available.

After you’ve identified the overall purpose of the project, it’s time to work on some of the details. If you’re creating a new widgetmaker application, decide what it takes to make a widget. What kind of widgets? How fast does the program have to run? Who is the target audience? Keep asking questions until you’ve fully defined the problem. Then you can begin to break the problem down further and ask the same questions about each separate part of the problem. But remember, you should do all of this before you’ve written a single line of code or even begun to think about which **algorithms** to use to

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accomplish the program's purpose.

There are a number of more formal methods of problem analysis, especially in the area of **object-oriented programming** . These methods use a rigorous series of steps to create an analytical overview of the problem to be solved then break down the problem further into its constituent parts. Object-oriented analysis uses the techniques of object-oriented programming to define a problem in object terms.

By spending time completing a thorough problem analysis, you can save yourself a lot of time and agony later in the development process.

See Also

Object-Oriented Programming; Programming; Program Design

Process Color

Process color refers to the use of four standard ink colors to print the spectrum of colors represented in original **full-color** , **continuous-tone** images. The original images are usually photographic transparencies, prints, or negative film, but they may also be paintings or other original works of art. These four standard ink colors are **cyan** , **magenta** , **yellow** , and black. They are often represented by their first letters: CMYK. Original continuous-tone images must be converted to this CMYK model to be printed on a **printing press** or **digital printing device** . If the images are to be printed on a traditional printing press, they must be color-separated because

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each color requires a separate printing plate.

In process-color printing, **halftone** screens of these four colors are printed in different combinations. The colored dots of the halftone images combine visually to give the impression of a full spectrum of colors. The position of each halftone screen relative to the others is critical in process color printing. Actually, black and white halftone screens are also printed at some angle deviating from absolute horizontal and vertical—usually 45 degrees—but in process color printing the angles are crucial. The overlapping process color screens can create an undesirable secondary pattern called a **moiré**. The best screen angles have been worked out over the years for both photomechanical and digital halftones. A one-tenth degree error in screen angle can cause serious moiré effects.

See Also

Color Printing; Color Separations; Halftones

Processors, 680x0s Family

In the past twelve years of Macintosh development, Apple has worked with Motorola to develop ever more powerful processors. The performance of a microprocessor is measured in the number of electronic pulses the processor's clock emits per second. This speed is spoken of as million cycles per second, or megahertz (MHz). The first Macintoshes, the 128K, 512K, 512KE, Plus, SE, Classic, and PowerBook 100, used the MC68000 that was rated at 8 to

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16.67 MHz. The last chip used from the 680x0 family, the 68040, was rated at 33 MHz—a four-fold increase in performance.

The dance of chip and computer manufacturers to make faster chips and then to makes computers that can make use of these increases in efficiencies has been the driving force of the so-called Information Age.

History of the 680x0 Family In 1979, Motorola introduced the MC68000 microprocessor. Although the Mac was not the first computer to use the chip (computers such as the Apple Lisa and Xerox Star also ran on this graphically-oriented chip), the Macintosh's future was firmly tied to it when it was selected as the brains for the Macintosh.

In 1984, Motorola introduced the successor chip to the 68000, the **68020**. This processor offered faster performance while remaining downwardly compatible with software written for the 68000. This chip was used in the first modular Macs: the Macintosh II and LC.

In 1987, Motorola introduced the **68030**. This chip was not much faster than the 68020, but offered design innovations, such as a built-in **Paged-Memory Management Unit (PMMU)** that provided support for System 7's **virtual memory**. Apple incorporated the 68030 into its second generation Macintosh II line of computers: The Macintosh IIfx, IIfx, IIfx, IIfx, IIfx, Performa 400 and 600, and SE/30, as well as most of the first generation PowerBooks (the 145, 170, 180, and so forth).

In 1990, Motorola introduced what would be the last **Complex Instruction**

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Set Computer (CISC) chip used in Macs: the **68040**. This chip was considerably faster than the 68030 and included further design innovations, such as a built-in math coprocessor. The Centris and Quadra 605, 610, 630, 650, 660AV, 840AV, and 950 all were based on the 68040 processor. Today, the 63x line of Performas, the PowerBook 190, and the 640 DOS-compatible all use the 68040 chip. In addition, each 68040 Mac can be upgraded to a specialized 68040, the 68LC040, that includes a built-in floating-point processor for enhanced computational performance.

The 68000 Chip The 68000 processor seems very antiquated today with its 68,000 transistors and its hybrid 16- and 32-bit buses, but at the time of its development it was leading-edge. The processor could handle information internally in 32-bit chunks, although it transferred its data back to RAM or I/O in 16-bit chunks. The 68000 did not have room for cache memory, and ran at 16.67 MHz.

The 68020 Chip The 68020 provided several innovative features over the 68000, producing a clock rate of 33 MHz (or twice the performance of its predecessor).

- The 68020 provides both internal and external 32-bit data and instruction buses, or twice as much data in the same amount of time as the 68000.
- The 68020 contains a 256-byte instruction cache. This is a small area of the chip reserved for storing the most recently used instructions so that they can be used by the CPU again without calling out to memory

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for their retrieval. Motorola claimed that performance was boosted 40 percent by the inclusion of the instruction cache.

The 68030 Chip Although the 68030 did not show an improvement in performance, this chip took a leap in design that formed the backbone for the System 7 operating system.

- The 68030 included a built-in **paged memory-management unit (PMMU)**, mentioned previously. The PMMU enables 68030-based Macs to swap chunks of information (called pages) between the hard disk and RAM, thus artificially increasing the amount of volatile memory available to programs. This “virtual memory” scheme allowed these Macs to run larger programs and background programs.
- The 68030 added a 256-byte **data cache** to the existing instruction cache to hold the most recently used data which can be sent to the CPU without calling on RAM or disk.
- The 68030 introduced a **parallel bus** design, called the **Harvard-style bus architecture**, that consisted of two 32-bit address and data buses. The address and data buses operate in parallel, letting the CPU perform multiple tasks simultaneously. Using this bus design, the CPU can simultaneously access its data and instruction caches, as well as external memory simultaneously.

The 68040 Chip The 68040 chip consisted of 1.2 million transistors, four times the number used in the 68030 and six times the number used in the

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68020 chip. In addition, the 68040 retained the PMMU of its predecessor and added a subset of the 68882 math coprocessor that was an optional add-on in earlier Macs (chips with this feature are called 68LC040s). The built-in math coprocessor lets the 68040 handle some of the mathematical computations that would ordinarily be off-loaded to the math coprocessor.

- The 68040 used two built-in 4K caches: one for data and one for instructions. In addition to their much larger capacity, these caches operate in a fast mode called copy-back.
- The 68040 retained the Harvard-style bus architecture of the 68030.
- The 68040 included a six-stage pipeline design, enabling the CPU to decode and execute several program instructions at the same time (during a single CPU clock cycle).

See Also

Cache; Coprocessors; Macintosh Family; PowerPC; RAM

Processor Direct Slots (LC Slots)

See

Power Mac Logic Boards

Processors, Future Prospects

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Apple recently announced a speed boost for its second generation Power Macs, as well as the introduction of a new model. According to the March 11, 1996, edition of *MacWeek*, as shown in the table that follows, the new Power Macs will run on up to 150 MHz 604 chips.

Power Mac Speed Boost Models*

Model	Processor	Old Clock Time	New Clock Time	Configuration
7200	601	90 and 100 MHz	120 MHz	8 or 16MB/1.2G/CD/Level 2 cache
7500	601	100 MHz	none	discontinued
7600	new model	none	604 at 120 MHz	16MB/1.2G/CD/Level 2 cache
8500	604	120 MHz	132 MHz	16MB/1.2G/CD/Level 2 cache
8500	604	132 MHz	150 MHz	16MB/2G/CD/Level 2 cache
9500	604	120 and 132 MHz	150 MHz	16MB/2G/CD/Level 2 cache

*chart taken from "Speed bump ahead for Power Macs," by Joanna Pearlstein, page 1, *MacWeek* (March 11, 1996, Volume 10, Number 10).

Even with the previously stated speed boosts, the future belongs to the **PowerPC Platform (PPCP)**- based Macs along with multiprocessing Macs and faster 604 chips, as well as future chip designs such as the 64-bit 620 and the universal 615. According to *MacWeek's* March 18, 1996 edition, in November 1996, Apple will introduce its first PPCP Mac.

This Mac, currently code-named Orient Express, will use a 166 MHz 604e

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processor with a possible configuration of 16MB RAM, 1.2G hard drive, CD-ROM drive, and Level-2 cache. *MacWeek* says that Apple plans to move its mid-range and high-end Power Macs to the PowerPC Platform by mid-1997. Apple also is entering the multiprocessing arena currently supported by the DayStar Digital Genesis clones. Apple will release a Power Mac 8500 and a 9500 with two 200-MHz PowerPC 604e chips at a price of \$6,500 to compete against the Genesis MP that uses four 100 MHz 601 chips for its multiprocessing, priced at \$24,000.

The following table presents other developments for Macintoshes in 1996.

Future Power Mac Speed Boost Models*

<i>Model Name</i>		<i>Processor</i>	<i>Old Clock Time</i>	<i>New Clock Time</i>
<i>Configuration</i>				
7200	604e	120 MHz	166 MHz	16MB/1.2G/CD/Level 2 cache
7600	604e	120 MHz	180 MHz	16MB/2G/CD/Level 2 cache
8500	604e	150 MHz	200 MHz	16MB/4G/CD/Level 2 cache
9500	604e	150 MHz	200 MHz	16MB/4G/CD/Level 2 cache

*chart taken from "Apple Plots 1996 CPU paths: PPC 604e engine to drive Macs," by Joanna Pearlstein, page 1, *MacWeek* (March 18, 1996, Volume 10, Number 11).

See Also

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Multiprocessing; Power Macs; PowerPCs; Processors

Processors, PowerPC

The **PowerPC** is an architecture, a design for a computer system, and not strictly a particular chip set. The architecture tells computer manufacturers what standards to follow when designing all of the computer systems that comprise the CPU: processor, memory, registers, and so forth. The PowerPC architecture began as an IBM research project to design a **Reduced Instruction Set Computer (RISC)** for its RS/6000 workstations. IBM was seeking to design a computer that would fit on a single chip, a uniprocessor.

The result was the first PowerPC chip: the 601. All 601 chips are manufactured by IBM, although they are purchased by Apple and Motorola. This made the 601 more expensive than later PowerPC chips (because they are made by a single vendor) and was considered a bridge chip to newer technologies. This is why there has been a rapid jump to faster, cheaper 603 and 604 chips that are not only manufactured by IBM, but by Motorola, and other companies. The more competition for Apple's business (because Apple is the main user of PowerPC chips and one of the largest individual manufacturers of personal computers), the cheaper and more available the product.

Back in the 1970s, when the RISC technology was being studied by IBM, computer scientists analyzed which instructions were most used by

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programs. The scientists also realized that the more space there is near the processor to store instructions and data that is being used, the higher the performance of the computer. To make room for the added registers and cache, they jettisoned all but 39 instructions. RISC chips imitate complex instructions by connecting simple instructions together into modules. These “emulated” complex instructions could run rapidly because of the increased cache and registers. By the time that the chips were ready for manufacturing in the early 1980s, the manufacturing technology had improved so much, that rather than not having enough space for instructions on a chip that could hold ten thousand transistors, chip makers could build chips that could hold three or four million transistors in the same or smaller space. Because of this increase, the manufacturers put all of the instructions back on the chips, and even added some additional instructions.

They also had room to keep the increased registers, at least 32, and cache. RISC is thus a misnomer, because the chips have as many or more instructions as older CISC chips. The difference is in how the instructions are stored and loaded, as well as in redesigns of other components because there was less concern with backward compatibility than was the case with each iteration of CISC chip.

The PowerPC consists of six parts, as displayed in the figure that follows: Branch Processor (BPU), Instruction Cache, Fixed point (integer) Processor (IU), Floating Point Processor (FPU), Data Cache, and Main Memory.

One example of the flexibility of the design of the PowerPC is that fact that it

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can store its data streams arranged in series of eight characters (called a byte) either like a Macintosh or like an Intel PC, making it easier to run different existing system software, such as DOS, Windows 3.1, OS/2, Windows NT, AIX, and Macintosh OS without having to recompile the operating systems. (In computer parlance, the storage of data in registers in a particular order is a technical operation termed *byte ordering*.)

There are currently three PowerPC processors: the 601, the 603 (and its child the 603e), and the 604.

Processors, PowerPC, The 601 Chip As stated previously, the 601 is a bridge chip between the CISC processors and more innovative later RISC processors. It is 132 square millimeters, or 40 percent larger than the Intel 486 chip, but it contains approximately 2.8 million transistors on four layers of metal—nearly twice the number of transistors as the 486. Yet, the 601 also contains a 32K cache, whereas the Intel 486 chip only has room for an 8K on-chip cache. In order to manufacture such a tightly packed chip, IBM used an advanced technology that was able to etch one-half micron (0.5-millionth of a meter) electrical-current pathway (called a trace width) into the silicon wafer. With such small trace widths, IBM was able to pack many more transistors on to a single chip. In addition, because the chips could be small, IBM could cut many more 601 chips without flaws from its 8-inch wafers, thus lowering the price of the chip.

The 601 processor supports 69 new instructions, mostly to improve the management of cache, single-precision, floating-point operations, and bit-

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shifting operations. In addition, the 601 increases its performance because it includes fully interlocking hardware between its execution units and all its pipelines (the number of instructions that can be processed during a clock cycle, in this case, three). The processor also provides a 64-bit wide data bus (although it only supports 32-bit wide instructions). The 601, like all later PowerPC processors, contains an on-board floating point processor. FPU's are used by graphically-intense programs, such as Adobe Photoshop, many games, and mathematically-intense applications such as computer-aided-design (CAD). Many Macintosh applications have been optimized to take advantage of the built-in FPU, thus further increasing the performance of the Power Macintosh.

The 601 processor contains a 32K on-chip cache. Instructions and data are stored on the same cache, called a unified cache scheme. Later RISC processors use a split-cache scheme that increases the CPU performance by splitting the data from the instructions into two separate 16K cache.

IBM released the 601 chips at five clock speeds: 60, 66, 80, 100, and 110 MHz. These speeds are achieved with a very low power consumption of 7 watts, further lowering the price of the chip. The 601 chip is currently used in Power Macintosh models 6100, 7100, 8100, and 7200.

Processors, PowerPC, The 603 Chip The 603 chip was designed by IBM and Motorola to be used as a low-cost, low-power consuming PowerPC chip. These chips were to be used in laptop computers and other computers that require low power consumption. The 603 as originally designed could not

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support 68K emulation, which is necessary to run the Macintosh operating system. IBM and Motorola went back to the drawing board and came up with the 603e processor. At 75 MHz base speed, the 603e is slightly faster than the base speed of the 601 and 603 (which was clocked at 66 MHz). The benefit of the 603e is that it operates as a computer with 3.3 volts (as compared to most chip sets on desktop computers that require 5 volts). The 603e processor integrates 1.6 million transistors on an 85 square-millimeter wafer. It also uses the .5-micron fabrication technology used by the 601, so is smaller and thinner than the 601. It further lowers its power requirements by added more functional units over and above the three-instruction pipeline of the 601. As shown in the logical data and instruction flow diagram that follows, the 603e adds a Load/Store Unit (LSU) and a system-register unit (SRU) to manage power consumption. The LSU and SRU can be separately disabled if not in use, further saving power. There are three built-in power saving modes: doze, nap, and sleep. All of these features provides the 603e chip with a power consumption of 3 watts, less than half the dissipation of the 601.

The 603 was meant for use in PowerBooks, but has also been used in new Power Macintosh Performa models, specifically the Performa, 6300, and 5300 families, as well as the PowerBook 5300. Note that the Performa and LC 5200 and 6200 Macs still use the 603 chip.

Processors, PowerPC, The 604 Chip The PowerPC 604 processor is the backbone of the Power Mac and PowerPC Platform. It is designed for use in everything from low-end workstations to Web servers. The 604 chips are the successor chips to the 601, and are used in the newest PCI-based Power

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Macintoshes: the 7500, 8500, and 9500 systems.

The 604 processor is the first chip that is able to issue four instructions in parallel (as compared to the three-way pipeline of the 601 and 603 chips)—a very high level of superscalar performance. In fact, the 604 actually has a six-way pipeline that can execute and retire up to six instructions simultaneously: a floating-point unit (FPU), a branch-processing unit (BPU), a load/store unit (LSU), and three integer units (IUs). The three IUs are set up so that two can process single-cycle instructions and the third handles multiple-cycle instructions. This design makes the 604 the fastest integer and float-point processing computer on the market.

The 604 has redesigned the unified cache of the 601 to create a separate 16K data cache and a 16K instruction cache for better CPU throughput. The instruction cache can issue four instructions per clock cycle while the data cache supplies two words (each word being eight bytes) per cycle. The 604 also uses functional units to manage the flow of instructions through the processor and execution units to further increase its efficiency.

The 604 processor contains 3.6 million transistors on a 196 square-millimeter wafer and can operate at 3.3 volts. It also contains a nap mode like the 603 for power savings. Because of the number of transistors available, the 604 chip contains all of the 32-bit instructions defined by IBM's PowerPC architecture.

The 604 processor has been rated to run at 120, and 132 MHz and currently is implemented on the 8500 and 9500 Power Macs.

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In 1995, Motorola and IBM announced an extended version of the 604 chip, called the 604e processor. This processor is for use in high-performance power Macs and for upgrades to existing 601 Power Macs. The 604e achieves 150 MHz speeds, yet is smaller and operates cooler than the 604. The new .35-micron fabrication technology allows IBM and Motorola to pack more transistors into a smaller space. The 604e returns to the concept of a unified cache, only double the size of the 601's cache at 64K. This 64K data and instruction cache improves the performance of 68K Mac emulation.

See Also

FPU; Internal Cache; Level-2 Cache; Power Macs; PowerPC

Professional Organizations

See

Desktop Publishing Professional Organizations

Profiler

An application used to monitor and record the performance characteristics of an application or other software.

It is often difficult or impossible for programmers to determine the performance of a certain section of code without running it. But even if you do run it, it can be tough to determine just how much time is spent in each

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routine and how often each routine is called without adding significant amounts of extra code to your program. Profilers make this job much easier by “watching” your program and reporting on its behavior.

Metrowerks CodeWarrior includes an excellent profiler. This profiler keeps track of your program using small stubs of code that are automatically added to your program by the **compiler**. The only changes you need to make to your source code are a couple of lines at the beginning and end of your application to initialize the profiler and dump the results to a file. This approach adds some overhead to the program, but this overhead typically is evenly distributed over the entire program and very small compared to the time spent in your own code.

After you’ve exercised your program in whatever way you want, you can view the results of the profiling.

This simple application includes four functions: test, test2, test3, and test4. The profiler displays the functions in a hierarchy much like list views in the **Finder**. According to the display, test called test2, which in turn called both test3 and test4. The function test4 was also called by test3. The profiler lists test4 twice, so that you can tell whether it behaves differently depending on which function calls it.

For each function, the profiler displays the total number of times it is executed and the total and average time spent in each function (both alone and with all its subfunctions, or children). In this example, it’s easy to see that most of the program’s time is spent in functions test2 and test3. Armed

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with this information, you can focus your optimization efforts on these functions and avoid wasting time optimizing other, less time-consuming functions.

See Also

CodeWarrior; Compiler

Program Design

Program design is the second major phase of a programming project. After the problem has been defined in the **problem analysis** phase, you can move on to program design. As with problem analysis, many programmers skimp on program design and pay the consequences later in the development process.

A thorough problem analysis should give you an excellent picture of the features, needs, and overall purpose of a project. In program design, you take that picture and use it to create a blueprint for building the actual program. Many times, the program design flows naturally from the problem analysis.

This is the part of a programming project in which you determine how to go about accomplishing the purpose of a new program. What **algorithms** will be used? What limits will the program have? What development environment, programming language, and other development tools will you use?

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The program design should be completed before any actual coding begins. If you jump into writing code before the program design is complete, you are likely to implement things in non-optimal ways, or in ways that compromise the design of other parts of the program. It's easy to fall into the trap of “just trying something out” before the design is finished. In some cases—such as in the design of an application's human interface—this may be appropriate, but in most cases, you run the risk of creating something that will be difficult to change later should the overall design require it.

Problem analysis and program design are the foundations of a successful programming project. Like a building's foundation, skimping on this part of the project can bring the whole project crumbling to the ground later.

See Also

Algorithm; Problem Analysis; Programming

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PROGRAMMING

Programming is the act of making a computer do what you want it to. It includes everything from creating a simple macro in a word processor to writing the word processor program itself. It can be a lifetime career, a weekend pastime, or something that goes unnoticed in your day-to-day computer use. It can be one of the most rewarding aspects of computing (as you watch the computer do exactly what *you* told it to do) and one of the most frustrating (as you stare in amazement as the computer does something you *know* you didn't tell it to do).

There are two major kinds of programming: **scripting** , and everything else. Scripting generally involves creating programs—or scripts—that control other applications. Some scripts do not control other applications, but are little programs in themselves. The other kind of programming involves creating those other applications.

Conversation with Dave Mark

Dave Mark has introduced thousands of folks to Macintosh programming through a series of books starting with *The Macintosh C Programming*

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Primer, affectionately known as “The Primer.” In his latest, *Learn HTML on the Macintosh*, he reflects on his early experiences programming for the Mac and gives tips on how to get started.

Maclopedia: How did you first get involved with the Mac?

Dave: I bought my first Mac during the Mac’s “first 100 days.” I fell in love with it right off the bat. It has been my personal computer of choice since then. In the beginning, I was just fascinated by MacWrite and MacPaint. I loved the fact that I could write a letter with all these different fonts and then go into MacPaint, draw a picture, and paste it into the letter. Unbelievable! The first thing I did with my Mac was this great picture of my dog, a great pyrenees. I copied the picture, pasted it into a letter, printed it and sent it to my mom. MacWrite and MacPaint blew me away—the consistency across applications, the crisp, clean, high-contrast graphics, I loved Chicago 12 point, the squareness of the pixels...

As soon as I started using the Mac, I knew that I had to figure out how to program it. I already had a relationship with Apple because I had done a series of educational games for the Apple II. I got in touch with them, and they promised to send me their technical documentation. What they sent was a loose-leaf binder filled with all these Xeroxed pages. This binder was the first incarnation of Inside Macintosh (at least the first version of IM that I ever saw). The first thing I learned was that programming the Mac was hard. Very hard.

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I started to develop friendships with other people, and a community of wannabe developers started forming. We would call each other and ask, “Well, how did you do this, and how do you bring up a dialog box at boot time, and how do you write an extension?” UCSD Pascal was the first environment I used, then I moved on to Aztec C. Aztec C was a miniature UNIX-like environment that ran on the Mac. Incredibly, it ran on a 128K Mac. One thing I remember about those early days is this sense of pioneering spirit that everyone had. Folks were taking apart their Macs and attaching things to it, like hard drives and color monitors. Back then, floppy disks were like gold. Back in 1984, floppies were expensive (or maybe I was just a lot poorer!) and not that plentiful.

Eventually, I made my way to Think C, and then finally to what I use now, Metrowerks CodeWarrior. Code Warrior has become the development environment of choice, the darling of Mac programmers. CodeWarrior supports C, C++, Pascal, Java—all the major programming languages. It allows you to produce applications that run on the Mac, Windows 95, Windows NT, Magic Cap (the hand-held device), the Be box, and some other platforms as well. CodeWarrior was the first development environment to generate native PowerPC code (code that runs native on a Power Macintosh). When the Power Macs were first being built, Apple didn’t even have their own compilers finished. Developers had this cool new machine, but no way to take advantage of its speed. So along comes this upstart company, Metrowerks, and they

save the day. Cool!

I've worked on a lot of different applications over the years. One application I really enjoyed was this front end for a natural language processing engine. Basically, you'd feed messages into this engine and it would analyze the messages using rules of English grammar. It would turn the message contents into entries in a database. We'd then turn this expert system loose on the database and it would make sense of all the data pulled from the messages. Pretty crazy stuff.

Since the Mac came out, I've pretty much spent most of my waking hours learning how to program it. From 1984 to about 1987, I filled up these notebooks with notes on Mac programming. From the basics to the arcane tricks that were guaranteed to be incompatible with the next system release, I wrote it all down. My friend Cartwright and I got the idea to try to write a book that would take people through the process of writing a Mac application. We hooked up with Addison-Wesley, and that was when the first Macintosh C Programming Primer (the "Primer") came out. We discovered that programming the Mac was not really hard (as I originally thought), but there were just a lot of details you had to be aware of. Cartwright and I gathered up all those details and put them in one place.

There was clearly a need for books like that. When it came out, it definitely found its readership. It was a popular book, so I got the chance to write more of them. Eventually, writing Mac programming

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books became my full-time job. Teaching people to program is incredibly gratifying.

Maclopedia: Is it getting easier for people from the Windows side to program for the Mac?

Dave: It is getting easier for Windows programmers to understand the Macintosh way (to borrow a phrase from Guy Kawasaki) because Windows 95 has come such a long way; it's such an improvement over Windows 3.1. When Windows first came out (I think it was in 1986), I spent some time learning how to program in it. At the time, the PC was still a pretty primitive beast. A lot of the Windows design seemed to parallel the Macintosh programming model. For example, Windows had adopted the event loop model of programming, something that was revolutionary back when the Mac started using it. So from the beginning there were some similarities, but Windows and Macs were still so different, it was like pairing apples and oranges. In the beginning, Windows was a pane-based system, not a true windows system; as it matured, it became more and more a true windows system. Finally, Windows 95 seems to have brought real layered windowing sophistication to the masses. To be fair to Apple, they've had this level of sophistication pretty much from the very beginning. I think they just never got their marketing right.

The point is, now Windows programmers are dealing with an operating system that is much closer to the MacOS than they've ever

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had before. It is no longer such a heavy change to move from Windows to the Mac. In addition, we have seen languages like C++ come of age, and programming frameworks like PowerPlant become generally available. A framework like PowerPlant does most of the dirty work of running and administering your application, so you can concentrate on the plugging in the code that implements the behavior of objects like windows, menus, buttons, and icons.

A framework is like a generic application. Your job is to customize this generic application, to shape it so it fits your vision. The generic application knows how to put a window up on the screen, for example. It doesn't know how to draw in the window, but it probably knows how to resize and relocate the window. So you need to provide the code that draws inside the window. By taking advantage of the framework, you don't have to rewrite the code that creates, resizes, or relocates the window. So one thing a framework gives you is reusable code. More importantly, an object framework makes it really easy to attach your code to the framework. For example, it is relatively easy to add code that draws the contents of a window. So both Windows programmers and Mac programmers are learning how to do things the same way: how to build applications using frameworks.

Maclopedia: What would you recommend to a new programmer or a Windows programmer coming to the Mac?

Dave: There are basically four steps to becoming a Mac programmer: Learn

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C, learn the Mac Toolbox, learn C++, learn a framework like PowerPlant. What you do first depends on where you fit on this curve. If you are brand new to programming or to the C programming language, check out *Learn C on the Macintosh* published by Addison-Wesley. Once you get beyond the basics, go to your bookstore and check out the Mac programming section. There are a lot of really good Mac programming books out there. Find one you like and stick with it.

Metrowerks has a product called Discover Programming for the Macintosh, which is a nice way to get started with CodeWarrior, even if you don't have any programming experience at all. It sells for about \$79, and it comes with a whole series of electronic books, including *Learn C on the Macintosh*. I'm part of the team that put the Discover products together, and I'm pretty proud of them.

Maclopedia: What do you think about Java?

Dave: Java is really cool! Java is a very C++-like programming language used to develop applications that you can download from the Internet, typically from someone's Web page. The language is designed to be completely platform independent, so if you develop your Java applet on a Mac, it will run on a UNIX box or under Windows; and if you develop on a Windows machine, it will run on a UNIX box or under MacOS.

Basically, the way this works is that the Java source code is compiled into Java byte code. To run Java byte code, you run it on top of the Java

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Virtual Machine, or VM—a byte code interpreter. There is a Java VM written for the Mac, for Windows, and UNIX. As long as you have the Java VM running on your machine, you just throw the Java applet at the Java VM, and it interprets the applets differently, depending on what machine you are on. The byte code that says “Create a new window” will create a Mac-like window on a Mac, or a Windows-like window on a Windows machine. The beauty of Java is that it is completely cross-platform. If you are interested in Java, you might check out Discover Programming with Java, another Metrowerks product.

Maclopedia: So what are you working on these days?

Dave: I’m keeping myself busy. Besides working on creating new Discover products, I’m part of a team that has opened an Internet cafe at 322 Montezuma St. in Santa Fe, New Mexico. The cafe is called Zuma’s. The phone number is (505) 820-2729. The Web address is <http://www.nets.com/zumacafe/>

Zuma’s is actually a restaurant with a bunch of Internet-connected computers and a lot of really friendly people. We are trying to create an environment where people can come and have a good time, but we are also trying to create an environment that fosters learning, community involvement, and community awareness. I hope that everyone who reads this will stop by and say hello the next time they are in Santa Fe.

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There are many computer users who program by scripting more than by any other way. Macintosh users can use **AppleScript** , which is included with the MacOS, to script many everyday tasks. Using the script recording feature, it is possible to create scripts without knowing a thing about the **programming language** used to create the scripts. More advanced scripters may turn to UserLand **Frontier** , which offers a different approach to scripting.

Although scripting can be used to solve many of the programming problems that arise, it is often impractical (or impossible) to create much of the software used everyday by scripting. Large applications like Photoshop or Microsoft Office cannot be created without more sophisticated programming methods.

Any programming project goes through a series of steps from the conception of the idea to the final release of the software. Programmers first do a **problem analysis** to identify exactly what the software will do. This is followed by the **program design** , when the design details of the program are completed. Only then do programmers begin **writing code** , **compiling** that code, and **debugging** it. If performance is an issue, they may then **profile** the code to identify slow sections that need optimization.

The Macintosh hosts a tremendous selection of **programming tools** from which to choose. From self-contained **integrated development environments (IDE)** , such as Metrowerks' **CodeWarrior** and Symantec **C++**, to the massive **MPW** environment, there is a tool to suit every style.

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Programmers turn to a wide variety of **programming language**s to create applications, system software, Extensions, and other software. Every language limits the programmer's code to a well-defined vocabulary with which to write a program. This enables a special kind of program, a **compiler**, to convert the code into the **machine language** that the computer can understand. A large percentage of all Macintosh development is done in three languages: C, C++, and **Pascal**.

The Macintosh is the first successful mainstream computer built from the ground up with a graphical interface, making programming on the Macintosh unique. The MacOS includes a vast **toolbox** of routines that programmers call upon to do things such as create windows and menus, draw into the window, manipulate files, or even play a QuickTime movie. The toolbox is documented in **Inside Macintosh**, an every-growing set of hefty books that includes the details of virtually every routine in the toolbox.

Macintosh programs must repeatedly check for user actions such as mouse clicks and key presses by asking the operating system for them. Responding to this stream of **events** is at the core of every Macintosh application. Another feature that makes the Mac unique is the way the Mac extensively uses **handles** for dynamically allocated memory.

Part of the Mac's ease of use comes from the consistency of applications. Although a few bad programs inevitably make their way into the world, most programs follow Apple's Macintosh **human interface guidelines**, a set of specific do's and don'ts for programmers. The guidelines are responsible for

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virtually every Macintosh program starting its menu bar with the Apple, File, and Edit menus; command keys for actions such as saving and opening being consistent; and why it's unusual to see a Macintosh program that is disturbing visually.

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MacTech Magazine

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Programming Languages

In this day of intelligent agents and voice recognition, you might think it is easy to get a computer to do what you want: just tell it in plain English (or any other human language). Sadly, that day is a long way off. Computers don't really understand any human languages yet. A programmer has to tell a computer what to do in the *computer's* language, and the best computer languages are still quite different than human languages.

At the most basic level, computers only understand one language: **machine language**. This is the set of instructions the computer's microprocessor is designed to understand. On the Macintosh, this instruction set can be either the PowerPC instruction set for Power Macs, or the 68000 instruction set for older Macs. Within each processor family, the instruction sets are nearly identical. For example, the MC68000 microprocessor used in the original Mac understands virtually the same instruction set used by the MC68040 processor in the Quadra models. Similarly, the PowerPC 601 understands the same instruction set as the PowerPC 620.

Despite the fact that computers only understand machine language, programs written in machine language are extremely rare. This is because no one wants to memorize all of the individual numerical codes for each instruction and keep track of where each variable is stored in memory. The closest thing to programming in machine language is using **assembly language**. In assembly, each machine language instruction is given a mnemonic name so that, for example, addition uses the add instruction and

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subtraction uses the sub instruction. Assembly also enables the use of abstract, named variables in place of concrete memory locations. After the programmer has completed the assembly program, a special program, called an assembler, converts the mnemonics and variables into **object code**, the machine language version of the program.

For example, here's a little routine called EasyGetMoreMasters:

EasyGetMoreMasters: link a6,#\$0000 4E560000

+ \$04 move.l d3,-(sp) 2F03

+ \$06 move.w \$0008(a6),d 362E0008

+ \$0A bra.s EasyGetMoreMasters+\$10 6004

+ \$0C _MoreMasters A036

+ \$0E subq.w #\$1,d3 5343

+ \$10 tst.w d3 4A43

+ \$12 bgt.s EasyGetMoreMasters+\$0C 6EF8

+ \$14 move.l (sp)+,d3 261F

+ \$16 unlk a6 4E5E

+ \$18 rts 4E75

The right-hand column is the machine code for the routine (in

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hexadecimal notation). It has no real meaning to most programmers. On the left, however, is an assembly version of the same code. Although it still might not seem very intelligible, it is clear that with a little training, it could be understood.

Assembly language is a low-level language, one in which much of the programming burden is put on the programmer and the vocabulary of the language is relatively similar to machine language. Further up the programming food chain are high-level languages such as **C**, **Pascal**, and **Dylan**. These languages provide the programmer with a much richer vocabulary with which to write programs. They also tend to be much closer to human language than machine language.

Programs written in a high-level language must be converted into machine language before they can be run on a computer. If the high-level instructions are converted one at a time as they are executed, it is an **interpreted** language. If, on the other hand, the program is converted all at once before execution, it is a **compiled** language. The programs that perform the translation are known as interpreters and **compiler**s respectively.

With very few exceptions, there is nothing inherent in a language that determines whether it is interpreted or compiled. **BASIC**, for example, is available most commonly as an interpreted language, but the original BASIC, as well as several recent implementations, are compiled.

High-level languages are processor independent. The compiler is designed to

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translate the language into object code specific to a particular processor. Before the advent of high-level languages, programmers had to learn a new language for each kind of computer they wanted to program; now they just need to use a different compiler for each kind of computer.

The rich vocabulary of high-level languages enables them to communicate the same instructions much more quickly and concisely. A single line of C code might expand into a full page or more of machine language instructions.

The EasyGetMoreMasters routine looks like this in C:

```
void EasyGetMoreMasters (short numberMasterBlocks)
{
    while (numberMasterBlocks > 0)
    {
        MoreMasters();
        numberMasterBlocks--;
    }
}
```

This version contains only four functional lines of code compared to the 11 lines in the assembly version. In addition, if the subroutine MoreMasters()

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(which is actually a Macintosh **Toolbox** routine) was implemented on another type of computer, this same code could be compiled for that computer. The same thing can't be said for the assembly version.

High-level languages are as diverse as human languages. Many of these are considered *general-purpose* languages designed to solve a wide variety of problems. C, Pascal, and BASIC are all in this category. Others are tailored to certain types of problems. FORTRAN, for example, is designed to be used for numerical calculations. Conversely, **LISP** isn't designed to work with numbers at all; it is designed to work with *lists* of things.

Other languages are even more specialized. **SQL**, for example, is designed exclusively to query and manipulate relational databases.

See Also

Assembly Language; BASIC; C, Compiled; Compiler; Dylan; FORTRAN; Hexadecimal; Interpreted; LISP; Machine Language; Object Code; Pascal; SQL

Programming Tools

Programmers rely on a wide variety of applications and other tools to help create the world-class programs that make the Macintosh what it is today. Each phase of the programming process has its own set of tools to make the programmer's job easier.

During the design phase of most projects, programmers rely primarily on

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the tools in their head: their brain and reasoning powers. And perhaps more importantly, programmer's use the thoughts and opinions of their program's target audience to complete the problem analysis and program design.

Prototyping tools can also come in handy in the early phase of a programming project. These tools enable the programmer to quickly mock-up the look, feel, and basic functionality of a program without much effort. Using these tools, the programmer can eliminate many potential design flaws before the real development work begins.

There are several kinds of prototyping tools available. The first are separate from a programmer's primary development environment. They provide quick prototypes, but these prototypes generally cannot be carried forward into later phases of the development process. **HyperCard** and **FaceSpan** are excellent examples of this kind of prototyping tool.

Other types of prototyping tools integrate with other development tools to create prototypes that can be built upon to create finished programs. **Visual interface builders** are often used in conjunction with a **framework** to create this type of prototype.

Following the design and prototyping phase of a project is the real meat of the development cycle. At this point, programmers rely on a full-fledged development environment. These tools provide a centralized application from which other tools can be run. In the Macintosh development world, most development tools use the Macintosh Programmer's Workshop (**MPW**) environment or their own integrated environment. **Integrated**

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Development Environment s (IDEs) pull many development tools into a single application (see following figure).

Whether the development environment is integrated or not, it includes many of the same parts. First, an **editor** is included to enter and modify source code. Most IDEs include a built-in editor, but external editors that run as a separate application are also popular. Many programmers use a **browser** to view code in a more structured and organized way.

Browsers are especially useful for programs written using a **framework** . These code collections are like scaffolding upon which you build your application. By using a framework, you can side-step much of the routine drudgery involved in programming basic functionality for each application you write.

One set of tools unique to the Macintosh are **resource editors** . These tools enable you to edit the menus, dialog boxes, test strings, and other user-interface tidbits in your application independent of the source code.

Next are **compilers** and **linkers** . These are the tools that convert source code into **object code** that can be run as an application or other type of program. Each kind of compiler recognizes a single programming language and generates code for a single kind of computer (for example, a **C** compiler for the Power Macintosh, or a **Pascal** compiler for 68K Macs). Many development environments include several compilers.

After you've written and compiled a program, you must make sure it works

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properly and flush out any **bugs** that made their way into your code. At this point, you would turn to the wide array of **debugging tools** , including **debuggers** and stress-testing tools (which put extra stress on your program to help make subtle problems more obvious).

After a programming project is stable and usable, you may want to use a **profiler** to identify slow parts of the program. It's important to rely on a profiler rather than trying to optimize every part of the program from the start because many parts of a program have little effect on the overall speed of the finished product.

There are a wide variety of other specialized development tools beyond the scope of this discussion. The best way to learn the intricacies of development and the interactions among various development tools is to start programming!

See Also

Browser; Bug; C; Compiler; Debugger; Debugging Tools; Development Environment; Editor; FaceSpan; Framework; HyperCard; Integrated Development Environment; Interface Builder; Linker; MPW; Object Code; Pascal; Profiler; Resource Editor

Prograph

A uniquely graphical **programming language** and **IDE** from Pictorius, Prograph is unlike any other programming language. Rather than

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programming by editing text files that are compiled into machine code, you program in Prograph by editing graphical flow diagrams. These diagrams aren't just a representation of the program, like a flow chart, they *are* the program. This avoids many of the trivialities of text-based programming.

This simple function uses a dialog box to ask the user to enter a number, and then it calculates the sum of all numbers between zero and the number entered. Finally, it displays the result in another dialog.

Prograph isn't limited to this sort of simple stuff, either. You have full access to the Macintosh **Toolbox** from within Prograph, so it is as powerful as any text-based programming language.

Prograph is a dynamic **object-oriented** language, and includes an extensive application **framework**. Because it is dynamic, you can edit programs while they're running. The commercial versions include compilers for both 68K and Power Macintosh applications.

The Prograph IDE includes an integrated **compiler**, **interpreter** and **debugger**. When you're in the process of creating an application, you can run the application (or any part of it) in the IDE using the interpreter. After you've got all the kinks worked out, you can compile it to a stand-alone application just as you would in any other development environment.

There are three "flavors" of Prograph available. Prograph Classic is freeware. It is the predecessor of the current commercial versions. Prograph CPX is a full-strength professional development environment, and Prograph

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Peregrine is specially tailored to developing client-server applications and databases. All three versions use the same graphical language.

Prograph is published by Pictorius.

Pictorius Incorporated

Email: sales@pictorius.com

Fax: (902) 455-2246

Phone: (800) 927-4847 or (902) 455-4446

Web: <http://www.pictorius.com/>

See Also

Compiler; Framework; IDE; Interpreter; Object-Oriented; Toolbox

PROmotion

PROmotion, from Motion Works International, is a 2D paint, sound editing, and animation program. It is designed especially for multimedia producers, but may be used for any task that requires animated output. It has a three module interface: Paint, Sound, and Action.

Paint The Paint module has a selection of media brushes for painting and drawing operations, and a Patterns application. Props can be loaded and edited with the paint tools and saved out to the library for later use. The painting tools are basic, so it might be a better idea to use another paint program to create the graphics, and import them into PROmotion.

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The Paint palette appears whenever a new Actor or Prop is added or needs to be edited. The tools contained include the Pencil (draws thin freeform lines), Brush (paints with a selected brush shape), Paint Bucket (area fills), Spray Can (pixelated air-brush), Text (adds text blocks), Eraser (removes data), Color Pick-up (selects a color from art), Line (draws straight lines), Shapes (draws oval, rounded rectangle, enclosed curves, rectangle, and polygonal shapes).

Sounds PROMotion has a built in sound module that records, edits, and adds a wealth of special effects to sounds. It requires a MACrecorder sound digitizer on board with a mic attached for sampling real world audio. The PROMotion software can help you play back up to 16 sounds simultaneously, as long as your system hardware is up to it.

Animations PROMotion includes an Animation Options Setup window. Here, you may select the FPS and total number of frames, Hide or Show Cursor, Menu Bar and Palettes, and choose other settings. two types of graphics can be imported, Actors and Props. An actor can be an animated multi-framed sequence, but a Prop is always a single frame graphic. Animated transitions can be attached to Props so that they enter and/or exit in a step-by-step (Stamp, Scroll, Dissolve, Zoom Rectangles, Angular Wipe, Checker Board, Iris, Circle and Rectangular Wipe, fade, Pixelize).

The Actors in a PROMotion animation can be either single images or multiple image sequences (called ANIMbrushes in the industry). Either way, they can be animated by setting them on a path that moves them around and in and out of the frame. Everything in a PROMotion animation is controlled by the

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Media Controller palette. It allows you to create, edit, and manipulate the Actors, Props, Sounds, Cues, and Events that make the animation what it is. From the media Controller, you gain access to the libraries where all of the components of the animation are stored.

Timelines PROmotion's Timeline Editor allows you to see all of the tracks in the animation at a glance, so that you can edit exactly where specific events are to occur and how long they are to last. All of this is accomplished interactively with click and drag features that make editing a snap. If you need to modify any elements data, just double click on its icon in the Timeline Editor.

Included Libraries PROmotion includes dozens of animated Actors and Props that can be placed instantly in the animation environment.

File Load/Save Conventions PROmotion imports previously saved Actors, Props, Sounds, and paths. In addition, you can bring in new actors from PICS files, Props from PICT files, and sounds from SND files. You can export Actors as PICS, Props as PICTs, and edited sounds as SND files. Animations can be exported as PICS, QuickTime Movies, After Dark Screen Saver modules, and Stand Alone Player movies (that you can distribute). You can also save out PROmotion project files and numbered PICTs.

Proofs

See

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Desktop Publishing Proofing and Printing

ProPhone

ProPhone is a phone number **database** for the Macintosh **CD-ROM** by Pro CD, Inc. When you need to find a phone number in a hurry, ProPhone can help. After you type in a name, the database will give you a list of all phone numbers and addresses for that name.

ProPhone can be quite useful for small business owners to help them find new customers. Searches can be run by name, address, state, zip code, phone number, and type of business. You can also search by proximity—for example, to find all the newspapers within a 100 mile radius or the 50 closest doctors. Data is geo-coded to six decimal places, following the GPS mapping system, for extreme accuracy. Locations are pinpointed as closely as ten feet. Lists of names, addresses, and phone numbers can be exported to any word processor, or put into a database.

Pro CD, Inc. comes out with update phone CDs quarterly, containing updated phone book listings, on everything from the white pages, yellow pages, business listings, and Canadian phone books. The current version, as of this writing, includes 38 million updated listings and a total of 100 million listings.

In addition, ProPhone can print mailing labels in a variety of formats with a click of the mouse and connect to your modem to dial numbers at the touch of

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a button. It will even sort your mailing labels by zip code (or ZIP + 4) before printing them, so that you can save money on bulk mailings. ProPhone is published by Pro CD, Inc.

Proportional Fonts

On most typewriters, each character is the same width. Most digital fonts are proportional. Each character is drawn to look its best, which means that some are narrower or wider than others. Digital fonts in which the characters are the same width are called **monospaced fonts**.

See Also

Fonts; Monospaced Fonts

Protected Memory

The most common application **bugs** are memory-related errors. These bugs result from simple mistakes with **pointer s** or **handles** and can be very difficult to track down. Part of the problem is that there is nothing to keep an errant application from reading or writing to memory that doesn't belong to it. Memory that is a part of the system or another application, for example, is not protected. This sort of mistake can cause an innocent application to crash because of something another application did, often making these bugs very difficult to track down. This also makes it risky to continue using the

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computer without restarting following a crash..

There are two ways to avoid this sort of trouble: force programmers to write perfect code, or keep applications from touching memory that doesn't belong to them. The first, while a noble concept, is impossible. The second is at the heart of protected memory. A system with protected memory can prevent one process from accessing the memory of another process without specifically requesting such access.

Because of these restrictions, no application can cause another to crash because of an improper memory access. That is not to say that one application cannot cause another to crash, but because many such situations are the result of memory bugs, the likelihood is much lower. It's important to realize that protected memory is not a silver bullet that stops all bugs dead in their tracks. Applications that misbehave under a protected memory system still won't work. In fact, bugs that had previously gone undetected could become showstoppers.

System 7.5 (and all earlier versions of the MacOS) lack memory protection. Some degree of memory protection is expected in the **Copland** release of the MacOS, with complete memory protection in a future release.

See Also

Bug; Copland; Handle; Pointer

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Protocol Encapsulation

See

Tunneling

ProView

ProView is a simple tool for creating slide show presentations. The program imports only **PICT** and **JPEG** files, and there are no paint tools for editing images or draw tools for creating simple objects, such as lines and rectangles. Text must be pasted via the **Clipboard** or created in the program. A button tool adds buttons that link between screens, but there are no transition effects, which is probably the biggest weakness of this product. The program also plays **QuickTime** movies.

E-magine

345 West 58th St, Suite 10T

New York NY 10019

Price: \$70

Email: magazine@panix.com

Phone: (212) 262-0223

Web: <http://www.e-magine.com/>

See Also

Presentation Software

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Public Key

Widely distributed key used in public/**private key** transactions on the **Internet** . A key is a very complicated encrypted series of numbers that would take so long to decode that it's essentially unbreakable. The benefit of a public key is that it is widely available. The fact that a public key is widely available does not lessen security because the public key works only with a private key.

See Also

Private Key; Secure Sockets Layer

Public News Server

Most **Internet service provider** s offer their users an **NNTP** server that provides access to **Usenet** newsgroup postings.

However, so many newsgroups exist that most news servers do not offer them all. If your Internet provider either doesn't offer access to Usenet, or does not include a newsgroup you want to connect to, you may still be able to gain access via a public news server.

Public news servers offer a free **NNTP** connection to a limited number of users on a first-come, first-served basis. Many of these servers are read-only; that is, they do not allow posting of messages.

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A list of public news servers can be found at

<http://www.phoenix.net/pdn/datanet/news.html>.

See Also

Internet; Newsgroups; Posting; News Article; News Article, Posting; News Article, Replying To; Newswatcher; Usenet; World Wide Web

Publish and Subscribe

Publish and subscribe is an Apple technology introduced in System 7 that enables you to have automatic updating in a document by linking documents together. This way, when you update an item in the first document, publish and subscribe updates the same item in the linked document. It's somewhat similar to copying and pasting an item between two documents, with the exception that a link exists between the two documents.

If, for example, you create a pie chart using a spreadsheet application, you could import that pie chart into a word processing document using Publish and Subscribe. Then the next day, if you went back into the spreadsheet application and modified the pie chart, the word processing document would automatically be updated with the new pie chart. That's the beauty of Publish and Subscribe. Unfortunately, even though the Publish and Subscribe technology is now built into the system, not all applications support it, and those that do all seem to implement it in a slightly different way with different commands appearing in different places from application to

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application. Maybe that's why Publish and Subscribe hasn't become a very popular feature on the Mac.

The way publish and subscribe works is first you **select** which items in your document you want to publish (make available for linking). If, for example, you have a table in your word processing document, you would select the table and choose **Create Publisher**, which makes your document the publishing document and creates a separate file of the table called an edition file. You can name this edition file and save it anywhere you want. This edition file is linked to the original document that created it, the publishing document. This way, if you make any changes to the table within your document, the edition file is updated when you save your document.

This edition file of the table can now be used in other documents (which will be called the Subscribing document). You import the edition file into your document by using the **Subscribe To** command from within an application. If you are working on a different document, for example, and decide you want to use the table you created earlier, you can select Subscribe To from within your application and choose the edition file of the table to import the table into your new document. If the next day you go back to your original document (the publishing document) and change some of the figures in the table, they are updated in your new document automatically because you imported the edition file in your new document. You could use that same table (the edition file) in as many documents as you'd like, and when you update the publisher documentation, any document that imported that table is updated.

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Publish and Subscribe is also ideal for **network** users, where multiple people are working on the same document. If one network user updates a particular graphic on a page, it is updated on everyone's copy on the network as well.

To publish an item, follow these steps:

1. Select the item you want to publish and choose the Create Publisher command from the **Edit menu** .
2. This brings up the Create Publisher dialog box enabling you to name and **save** the selected item. This saved item becomes the edition file, and your document is now referred to as the publisher.
3. To use the edition file in another document, choose Subscribe To from the Edit menu. The Open dialog box appears, enabling you to choose the edition file and import it into your document. Highlight the edition file you want and click the Subscribe button.
4. This imports the Edition file into your document. If any changes are made in the original publisher document, the edition file is updated in your document.

See Also

Create Publisher; Dialog Box; Edit Menu; Network; Save; Select; Subscribe To

Publishing, Traditional

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Traditional publishing began in the fifteenth century when a German artisan named **Johann Gutenberg** invented **movable type** which could be inked and pressed onto paper. There is some evidence that this process actually dates back to ancient China, but Gutenberg and others developed it to the extent that it revolutionized the way information was disseminated. After the invention of movable type, printed material could be widely distributed for the first time in western history. The most famous publication from this period is the Bible that Gutenberg printed on his printing press. Other types of early publications included scholarly and popular books, periodicals, newspapers, and the broadside—a kind of early advertising flyer.

Prior to the development of the printing press by Gutenberg and other European artisans, written communication was extremely limited. Books and other documents had to be laboriously hand written and copied, a task often performed by monks and other members of religious orders. Such documents were often highly embellished with art and were greatly treasured. These handmade documents are called manuscripts, and many are preserved today in museums.

Printing presses and the publishing process have continued to evolve over the centuries, but **desktop publishing** is the first major revolutionary development since Gutenberg. Desktop publishing is rapidly replacing **traditional publishing** throughout the world but is especially predominant in the United States.

The traditional publishing process involves many separate procedures. These

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procedures are usually carried out by specialists, such as writers, editors, graphic designers, typesetters, reprographics camera operators, paste-up artists, prepress technicians, printing press operators, bindery workers, and others. In contrast, desktop publishing requires fewer separate stages; and, consequently, fewer individuals are involved.

In the traditional publishing process, a publication begins with a rough draft which shows pagination and preliminary content. A **comprehensive**, or **comp**, layout is then developed to approximate how the publication will look when it has been printed. At this stage, the production of page **mechanicals** begins with **typesetting** and **reprographics camera** work for artwork, illustrations, logos, and other graphic elements. Page mechanicals, also called **camera-ready art** or **paste-ups**, are the final stage of **page layout**. In a mechanical, all the type and graphic elements are mounted on a layout board. Type and camera-ready line art are pasted down with adhesive, and film overlays are used to incorporate windows for **halftones** or to provide **color separation**. The page mechanicals are then used to begin the process of making printing plates.

The platemaking process begins with the mechanicals being photographed by a reprographics camera using very sensitive film that can capture the smallest detail. The film is assembled into pages in a process known as **stripping**. Metal or plastic printing plates with a photosensitive surface are prepared by exposing them to light through the assembled film. The publication is then printed and folded or bound into a book.

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See Also

Color Printing; Color Separations; Desktop Publishing, An Introduction to; Desktop Publishing, Present Day; Desktop Publishing, The Beginnings of; Desktop Publishing, The History of; Prepress; Printing; Printing, A Brief History of

Pull-Down Menu

Most of the commands to operate your Macintosh and software applications are accessed through pull-down menus. Pull-down menus appear in the **menu bar**, the white horizontal bar at the top of your screen. To access a pull-down menu, you **click and hold** the title, of your choice in the menu bar and a corresponding pull-down menu appears with a listing of commands that are available to you. You can choose a command from the pull-down menu by holding the **mouse button** and dragging the **arrow pointer** down until the command you want is highlighted, and then release the **mouse button**.

See Also

Arrow Pointer; Click and Hold; Menu Bar; Mouse Button

Punchdown Block

A punchdown block is a connection system that enables you to easily connect

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twisted pair wiring, the kind that is used for LocalTalk and similar network cabling. Wires for up to 12 devices can be punched down to each of the two fifty pin Telco connectors wired on the sides of the block. The punchdown block uses a special punch tool, which strips and inserts the wire into its connector in one easy motion. The tools are available wherever electronic supplies are sold. Blocks can also be purchased through telephone supply stores and electronics stores. The punchdown block is frequently used as a connector for passive star networks.

Put Away Command

If you need to **eject** a disk or move an item back to its original location, Put Away is the best method. When you click a **disk** on your **desktop** and choose Put Away from the **File menu** (⌘-Y), the disk is ejected and its icon removed from your desktop. If you use Eject Disk from the **Special menu**, the disk is ejected, but a **ghosted** version of the disk remains on your desktop. This can cause a number of problems. So Put Away is the preferred way to eject a disk.

Put Away is also an excellent housekeeper. If you drag a file out of a folder and on to your desktop for easy access, when you're through you can use Put Away to put that file back exactly where you brought it from. Also, if you put a file in the **Trash**, and later decide that you *don't* want to delete that file, you can click the file in the Trash and choose Put Away. It removes the selected item from the Trash and puts it back where it was before you dragged it into

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the Trash.

If you're on a **network**, Put Away is also good for disconnecting you from a **shared disk**. Just select the shared disk and choose Put Away and you're disconnected.

To use the Put Away command to eject a disk, follow these steps:

1. Click the disk on your desktop.
2. Select Put Away from the File menu (⌘-Y).
3. The disk ejects without leaving a ghosted disk icon on your desktop.

To use the Put Away command to put a file back to its original location, follow these steps:

1. Click the file, even if it's in the Trash.
2. Select Put Away from the File menu (⌘-Y).
3. The file returns to the last place it was before its current location.

See Also

Desktop; Disk; Eject; Eject Disk; File Menu; Ghosted Disk; Network; Shared Disk; Special Menu; Trash