

This chapter introduces the primary features of printing with QuickDraw GX and gives you the overview you need to begin designing your application with printing in mind.

Before reading this chapter, you should be familiar with the general QuickDraw GX capabilities, and especially, you should be familiar with the use of objects. For an overview of QuickDraw GX and objects, see the introductory chapter of *Inside Macintosh: QuickDraw GX Objects*.

This chapter begins by showing how QuickDraw GX printing works and which phases of printing are of interest to the application developer. It also provides background information to set the stage for the remaining sections. This chapter then

- introduces QuickDraw GX objects that directly support printing
- describes how these printing-related objects are used with other QuickDraw GX objects
- describes a strategy for implementing QuickDraw GX printing features
- discusses compatibility between QuickDraw GX printing and the Macintosh Printing Manager

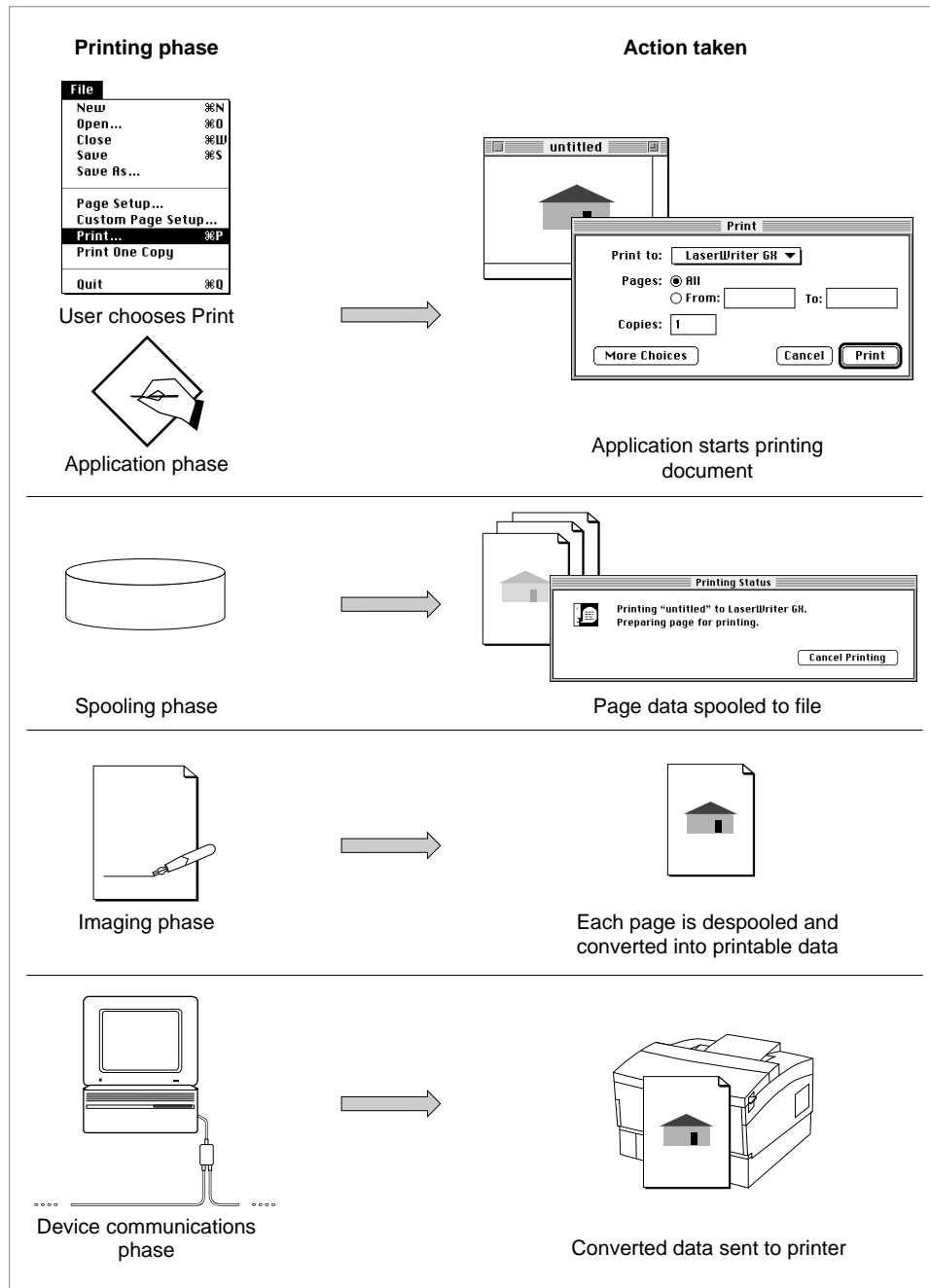
About QuickDraw GX Printing

Printing with QuickDraw GX involves the interaction of your application program with components that QuickDraw GX provides, or components that may be provided by a printer manufacturer or other vendor. These components are

- printer drivers that translate QuickDraw GX shapes into instructions for rendering the shapes on a device
- printing extensions that provide additional capabilities for the printing system

QuickDraw GX actually performs most of the translation work itself so that the developer of a printer driver or printing extension can concentrate on the unique features or characteristics of a printing device. As an application developer, your work primarily consists of responding to printing-related menu selections and dialog boxes within the application.

To understand the division of labor, consider the model of QuickDraw GX printing phases in Figure 1-1.

Figure 1-1 QuickDraw GX printing phases

There are four phases of printing:

- The **application phase**, in which the application calls QuickDraw GX functions in response to the user choosing a menu item or changing an item in a dialog box. For example, when the user selects Print from the menu, the application calls functions to

display the Print dialog box and respond to the user's choices. One of the application's responses is to print the requested pages of a document, which leads to the spooling phase of printing.

- The **spooling phase**, in which the requested pages are placed in a spool file. The application calls QuickDraw GX functions to perform this task, which is carried out collaboratively by QuickDraw GX, the printer driver, and any printing extensions that are active. From the application developer's point of view, it is seldom necessary to know how the work is divided between QuickDraw GX, a printer driver, or a printing extension. Thus, in this book, all collaborative efforts by these components are considered as being performed by the printer driver.
- The **imaging phase**, in which the requested pages are despoiled by the printer driver and the contents are translated into instructions for the printer.
- The **device communications phase**, in which the instructions are actually sent to the printer hardware.

As an application developer, you are primarily concerned with the application phase of printing. You may be interested indirectly in events in other phases because some of those events can be controlled by the application. For example, your application can provide alternative instructions for rendering output, rather than use the instructions generated by the printer driver. These alternative instructions are called **synonyms**. As another example, the application can retrieve and modify the contents of a file after it has been spooled.

This book provides all the information you need to implement QuickDraw GX printing in an application. For information about implementing printer drivers or printing extensions, see *Inside Macintosh: QuickDraw GX Printing Extensions and Drivers*. The following sections introduce topics that provide conceptual background for implementing QuickDraw GX printing features. The topics are

- Core printing-related objects, which are objects that are used in every application and work together to support QuickDraw GX printing.
- Desktop printers, which represent printers to the user as icons on the desktop.
- Print files, which are the output of the spooling phase. A special kind of print file that can be opened and displayed without needing the fonts or application with which it was created is called a **portable digital document**, or PDD.
- Printer drivers, which are responsible for defining the characteristics of the printing environment in addition to providing translation between the QuickDraw GX graphics representation of a page and the instructions that render it on a printer.
- Printing extensions, which are add-on software that provide an additional level of customization to QuickDraw GX printing.
- Dialog boxes, which are extensible in QuickDraw GX and, if extended, use additional resource types. Dialog boxes also require additional support because they are movable, requiring the screen behind them to be redrawn when they are moved.
- Message passing, which is the basic technique used by the QuickDraw GX printing system to communicate between the application, printer driver, and printing extensions. It is also the technique used to notify the application when dialog boxes are moved.

Core Printing-Related Objects

QuickDraw GX uses objects to represent printing-related data in the same way it uses objects in its other major components, graphics and typography. The core QuickDraw GX printing-related objects are job objects, format objects, and paper-type objects. There are other printing-related objects that provide additional information in support of the core objects or represent printers and files.

Because printing-related objects are interrelated, this section briefly describes how these objects work together to provide a complete specification for printing a document. For a more detailed description of each object, including those that support the core printing-related objects, see “About QuickDraw GX Printing-Related Objects” on page 1-16. The other chapters in this book provide a complete description of the printing-related objects and show how to use them.

In QuickDraw GX printing, a job object specifies everything QuickDraw GX needs to render a document. The most important specifications include the following ones; however, there are many others:

- which pages to print
- which printer is to receive the output
- how to format the document; for example, for a particular page size and orientation, such as 8.5-by-11 inches and landscape

The pages to print and the printer on which to print them are typically straightforward specifications. The formatting specification can be more involved, however, because QuickDraw GX provides these formatting features:

- You can print to a printer other than the one the document is formatted for; in other words, you can print without automatically reformatting the document.
- You can specify a different format for each page of a document.

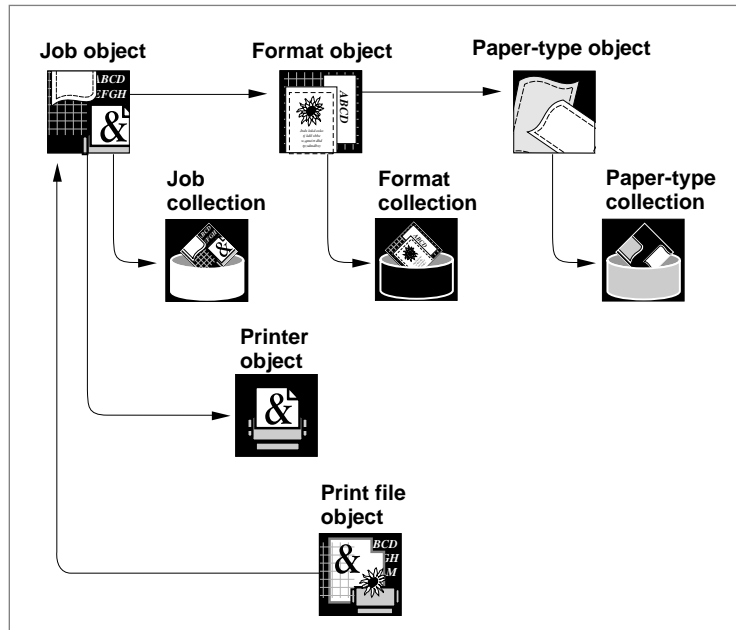
To support the first feature, the job object retains the formatting information for the formatting printer separately from the formatting information for the output printer. This allows a print job to be associated with two printers at the same time. The formatting printer specifies the document’s format. The output printer is the printer to which the document is sent to be printed. The document retains the format specified by the formatting printer even though the output printer may affect the appearance of the printed document. This feature is useful, for example, if you have formatted a long document for a typesetter but want to make a final check of a page or two on a StyleWriter printer.

To support the second feature, QuickDraw GX provides a format object. A format object can be specified for each page as it is printed. All pages can use the same format object, or selected pages can use different format objects. If desired, each page could use a different format object. You might also print the same page several times, each time specifying a different format object.

Associated with a format is a paper-type object. A paper-type object specifies the characteristics of the paper on which a page is printed. A paper-type object is separate from a format object because several format objects can share the same paper-type object.

Collection objects contain additional but less frequently used information about the job, formats, and paper types. The printer object represents a printer, and the print file object represents the spooled document or a portable digital document. Figure 1-2 shows the relationship between the core printing-related objects, the collection objects that support them, and the printer and print file objects.

Figure 1-2 QuickDraw GX printing-related objects

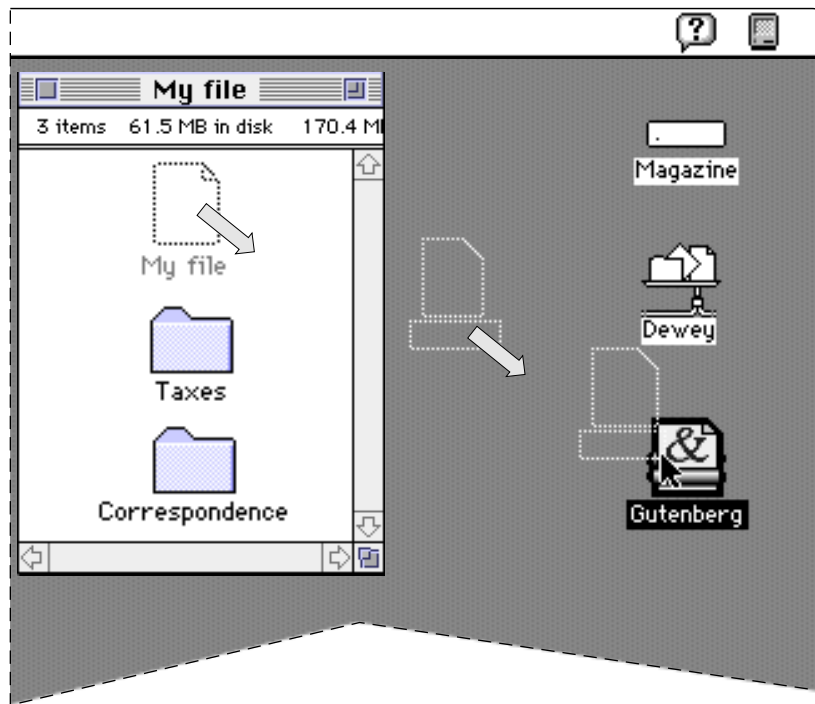


For more information about each object, see “About QuickDraw GX Printing-Related Objects” on page 1-16.

Desktop Printers

In QuickDraw GX, a printer is represented by an icon on the desktop, which is similar to the way a hard disk or a shared volume is represented on the desktop. Thus, in QuickDraw GX, printers are often called **desktop printers**. A desktop printer is more than just an icon, however, because a desktop printer is associated with a queue to which print jobs are sent. A desktop printer also provides the ability to control the queue and to control the hardware itself with software.

A user can print from the Finder by dragging the document to the desktop printer icon. Figure 1-3 shows the user dragging the document “My file” to the desktop printer icon named “Gutenberg.” When the user releases the mouse, QuickDraw GX puts the print file representation of the document into the printer’s queue.

Figure 1-3 Dragging a document to a desktop printer icon

Your application must implement the Print Document Apple event that allows Finder printing. For more information about Finder printing, see the chapter “Core Printing Features” in this book.

Print Files

A **print file** is a document that has been spooled to a file through the printing process. The only way to create a print file is to print from the application, which causes the document’s contents to be spooled in a print file. If you wish, your application can retrieve a print file and insert, delete, or replace pages.

One kind of file an application might retrieve is a portable digital document, which is the kind of file that is created by selecting the PDD Maker GX desktop printer icon and then printing the document or by dragging the document to the icon. For an example of this icon, see Figure 1-4 on page 1-9.

Printer Drivers

A QuickDraw GX **printer driver** defines the characteristics of a printer and the services the printer provides. The printer driver also translates QuickDraw GX shapes into instructions or operators that the printer understands, such as PostScript™. In reality,

much of a printer driver's standard functionality, such as PostScript conversion, is performed by QuickDraw GX for the printer driver.

From the application developer's point of view, it is useful to group printer driver-supplied features, printing extension-supplied features, and QuickDraw GX rendering features together because they are represented by the printer object. You can query the printer object for the characteristics of a printer, whether set by the printer driver, printing extension, or QuickDraw GX.

For example, your application can query the printer object to determine how best to print to the device that the printer object represents. Many of the default settings, such as page size and landscape or portrait orientation, are specified by the printer driver.

The printer driver is responsible for providing the printer icon to display on the desktop. Figure 1-4 shows examples of desktop printer icons for various devices.

Figure 1-4 Default QuickDraw GX desktop printer icons



These devices need not represent actual physical devices on the system. In particular, the portable digital document printer driver, represented by the PDD Maker GX icon, is used only to create a document that is packaged ready-to-view on another computer.

Printing Extensions

A QuickDraw GX **printing extension** defines add-on functionality that may be useful for several applications and whose usefulness is not restricted to a particular printer driver. For example, you may want a light-gray “Confidential” banner to appear as the backdrop on each printed page. Because several applications may need this kind of feature and these applications may print to a variety of printers, this kind of feature typically is implemented in a printing extension rather than as part of the application or printer driver.

Note

If you wish to provide functionality similar to a printing extension, such as a backdrop banner specific to your application, you can create a form shape and attach it to your format object. For an example of a form shape, see Figure 1-11 on page 1-17. For information about the form property of the format object, see the chapter “Page Formatting and Dialog Box Customization” in this book. ♦

Dialog Boxes

QuickDraw GX print dialog boxes provide several key features:

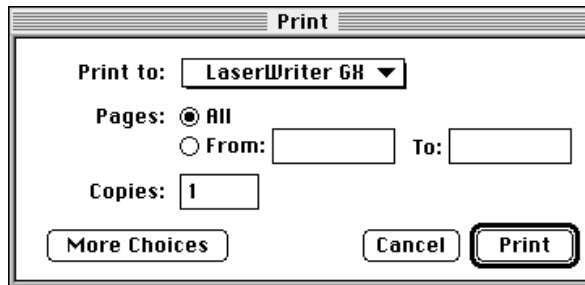
- They are extensible, which allows you to collect or display information that is not in the default dialog boxes.
- They are movable in addition to being modal. The ability to drag a dialog box around the screen overcomes some of the inconvenience of modality in that the user can move the dialog box if needed information in an underlying window is obscured. The user is allowed to switch to a different application while the dialog box is active, as well.
- They can be set up to provide cut, copy, and paste editing operations.
- The application’s response to user choices in a dialog box can be automated by specifying actions in resources associated with the dialog box; less procedural code is required in the application.

QuickDraw GX provides three kinds of print dialog boxes that you can access in your application:

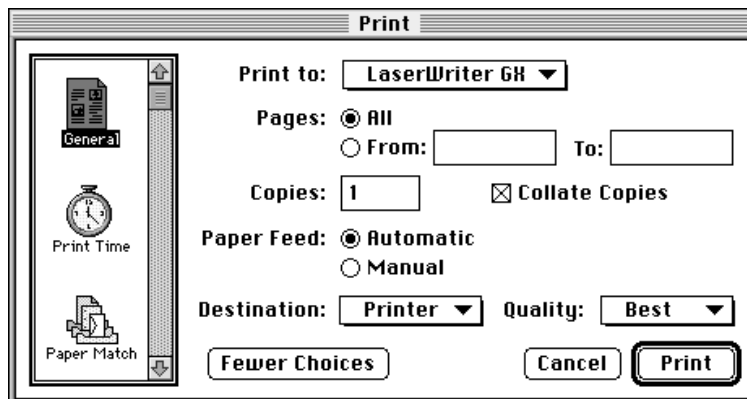
- The Print dialog box appears in response to a request to print a document.
- The Page Setup dialog box appears in response to a request to change the default formatting for the document.
- The Custom Page Setup dialog box appears in response to a request to change the formatting of individual pages within a document.

In addition to these dialog boxes, the Printing Status dialog box appears when the application is spooling a document to a print file.

Most dialog boxes display in both a normal view and an expanded view. You use the normal view to display and accept the minimum amount of information that allows the user to conveniently proceed with the task. Figure 1-5 shows the default Print dialog box in its normal view.

Figure 1-5 The Print dialog box

The expanded view displays the complete range of options. Figure 1-6 shows the expanded view of the Print dialog box.

Figure 1-6 The expanded Print dialog box

Expanded views are divided into **panels**, which are subsets of the dialog box used to display and collect related pieces of information. You can add panels to a dialog box in the same way that a printer driver or printing extension may add panels. In Figure 1-6, the expanded view is currently displaying information in the General panel. Each panel is associated with an icon that displays in a scrolling list to the left of the panel. The name of the panel appears underneath its icon.

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Figure 1-7 shows the Print Time panel. This panel allows a user to specify information related to a particular print job, such as the print job's priority and designated time to print.

Figure 1-7 The Print Time panel

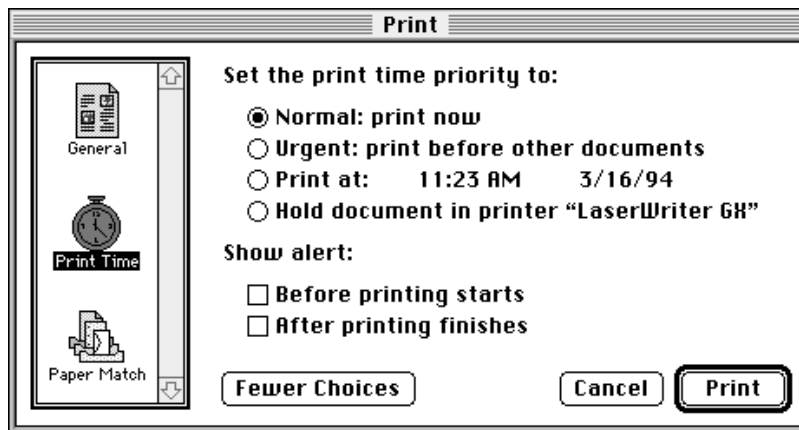
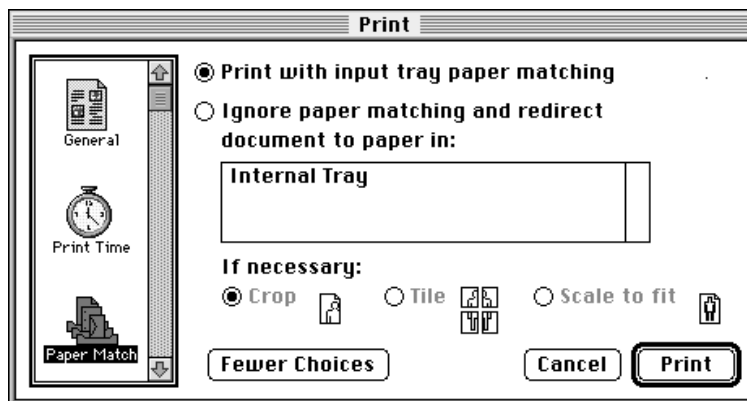


Figure 1-8 shows the Paper Match panel. This panel allows a user to specify information related to a print job's paper type, such as standard or special paper mapping.

Figure 1-8 The Paper Match panel



You can use the following resources to add panels to dialog boxes:

Resource	Type	Description
Item list resource	'DITL'	Specifies a list of items in a dialog box, as described in the Dialog Manager chapter of <i>Inside Macintosh: Macintosh Toolbox Essentials</i> .
Panel resource	'ppnl'	Names a panel and associates it with an item list resource and an icon resource. For more information, see the chapter "Page Formatting and Dialog Box Customization" in this book.
Extended item list resource	'xdtl'	Specifies the actions to take when an item is manipulated; for example, when the user clicks a radio button. For more information, see the chapter "Page Formatting and Dialog Box Customization" in this book.

Additional resources may be needed. For example, many items in a dialog box are themselves defined as control or menu resources.

As mentioned previously, QuickDraw GX print dialog boxes are movable as well as being modal. When a user moves a dialog box, you are responsible for redrawing the screen that was behind it. QuickDraw GX notifies you that an update event occurred when this happens. The notification is provided by QuickDraw GX passing a message to the application, as described in the next section.

Message Passing

QuickDraw GX printing features are based on a message-passing architecture. The messaging technology used with QuickDraw GX is described in the Message Manager chapter of *Inside Macintosh: QuickDraw GX Environment and Utilities*. This section provides you with a brief overview so that you can respond to messages passed to your application.

QuickDraw GX sends **printing messages** when certain printing-related tasks need to be accomplished or when certain printing-related conditions arise, such as when a print dialog box is displayed or the user moves the dialog box. A printing message is a value that QuickDraw GX passes down a chain of message handlers. A **message handler** is the recipient of a message and can include the application, the printer driver, and any printing extensions. The **message chain** consists of eligible message handlers.

The application can install itself as a message handler for particular messages. Typically, these messages relate to dialog boxes. The message handler specifies the code to execute when the message is received. This code is called an **override function** because it overrides the actions of the other message handlers by changing the behavior associated with the message.

The override function can forward the message so that other message handlers can act on it. This situation is described as a **partial override**. If the function does not forward the message, the situation is described as a **total override** because other message handlers do not have a chance to act on the message.

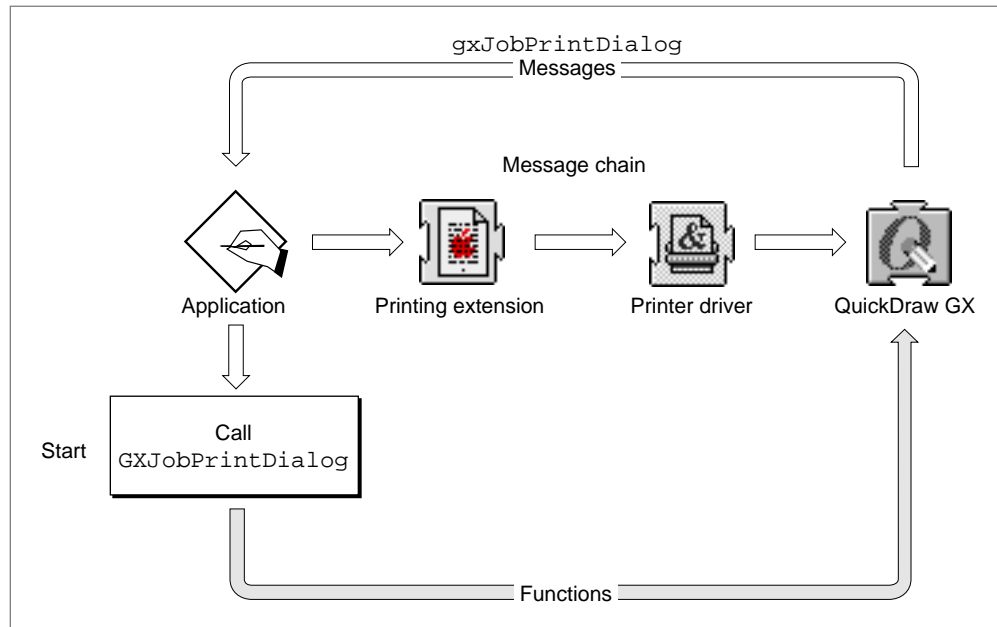
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If you are in doubt about whether to create a total override or not, try a partial override first because a total override may prevent an overlooked piece of code from being executed. For example, someone could provide a printing extension after your application has been distributed. The printing extension may rely on intercepting a message that was not previously required to be forwarded by your application and, thus, create an incompatibility between your application and the printing extension.

Two examples follow that show the typical cases in which an application needs to override QuickDraw GX messages. The first example shows how messages are involved in displaying a dialog box. The second example shows how a message is involved in handling movable dialog boxes.

When the user chooses the Print menu item, your application may wish to add a panel to the Print dialog box before it is displayed. Because you want the printer driver to provide the default dialog box, you install a message handler so you can override the Print dialog box message, `gxJobPrintDialog`. Figure 1-9 shows how this override happens with several message handlers in a message chain: the application, a printing extension, a printer driver, and QuickDraw GX.

Figure 1-9 Message handlers in a message chain

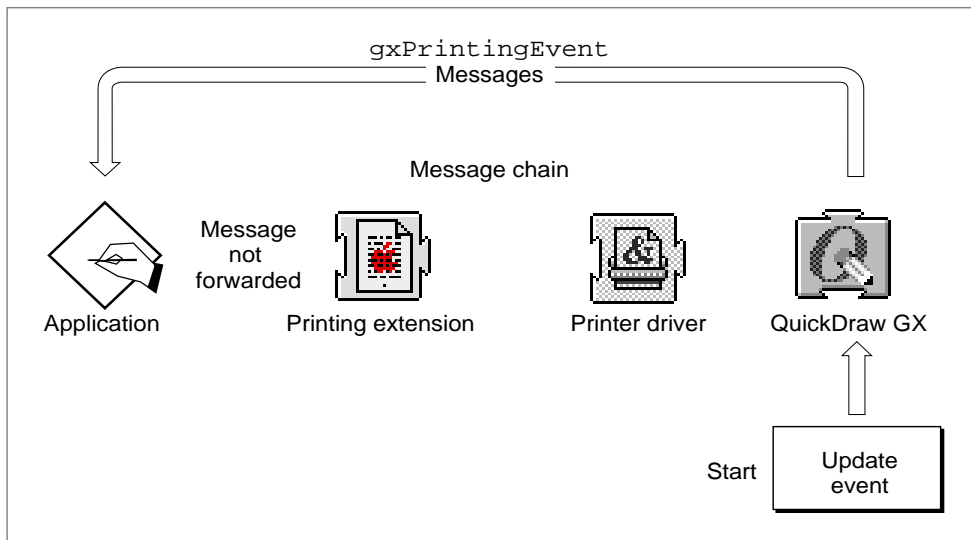


The application calls the `GXJobPrintDialog` function to display the dialog box. This function also causes QuickDraw GX to pass the `gxJobPrintDialog` message down the message chain, starting with the application. Because the application installed a function to respond to this message, the application's override function is called. (The override function is not shown in Figure 1-9.)

The override function is an application-defined function that is executed when QuickDraw GX sends the application the `gxJobPrintDialog` message. The override function adds a panel to the dialog box and forwards the message. By forwarding a message, each handler in the message chain—the application, printer driver, and printing extensions—participates in building the dialog box. The chapter “Page Formatting and Dialog Box Customization” in this book discusses the messages your application must override to add panels to QuickDraw GX movable modal dialog boxes.

Figure 1-10 shows an application that installs a function to be called when QuickDraw GX sends the `gxPrintingEvent` message. QuickDraw GX sends this message in response to an event, which allows the application to redraw a portion of the screen if the event is an update event caused by the user moving the dialog box.

Figure 1-10 Overriding the `gxPrintingEvent` message



The override function that responds to the message has the responsibility to determine the kind of event that occurred and to redraw the invalid part of its windows if the event is an update event. This override function does not need to forward the message in this case because once the task is done, no other handler needs to take action. Thus, the function provides a total override of the `gxPrintingEvent` message in this case. For an example of an override function for this message, see the chapter “Core Printing Features” in this book.

About QuickDraw GX Printing-Related Objects

The section “Core Printing-Related Objects” on page 1-6 describes how the job, format, and paper-type objects interrelate to define the printing environment for a document. The following sections describe each of the QuickDraw GX printing-related objects in more detail. At the end of these sections is a summary.

Job Objects

The **job object** represents a print job that controls the way a document is printed. It contains properties to reference a formatting printer and an output printer. The **formatting printer** controls how the document is formatted. The **output printer** is the printer on which pages are printed. These specifications allow a document to be printed on the output printer yet retain the format specified by the formatting printer.

The job object also specifies additional properties, which include the following:

- **Reference constant.** This property can be used for any application-specific purpose. For example, it can point to the contents of a document. It is discussed in the chapter “Advanced Printing Features” in this book.
- **Error.** This property contains the last error associated with the print job. For information about accessing the error code, see the chapter “Core Printing Features” in this book.
- **Format list.** This property specifies all of the formats that may be used with this print job. The first format in the list is the default format. For information about accessing the format list, see the chapter “Core Printing Features” in this book.
- **Paper-type list.** This property specifies all of the paper types that may be used with this print job. The printer driver specifies the paper types in this list, although you can create new ones and add them to the list.
- **Format mode.** This property specifies the preferred mode of printing the document associated with the print job; for example, using QuickDraw GX shape rendering, using raw PostScript, or using built-in fonts in the printer. For more information about the job format mode, see the chapter “Advanced Printing Features” in this book.
- **Page range.** This property specifies the pages to print. For information about determining the page range, see the chapter “Core Printing Features” in this book.
- **Panel dimensions.** This property specifies the size of panels in print dialog boxes, such as the Print and Page Setup dialog boxes. It is useful if you do not use the extended dialog item list resource to process events in dialog boxes and need to know where an event, such as a mouse-down event, occurred.

A job object also refers to a collection of items that can be specified for a print job. For more information about the job collection, see “Collection Objects” on page 1-18.

Most other objects refer to the job object. The reference allows the other objects to obtain information about the print job with which they are associated, and it especially allows them access to the reference constant property that points to application-specific information.

Format Objects

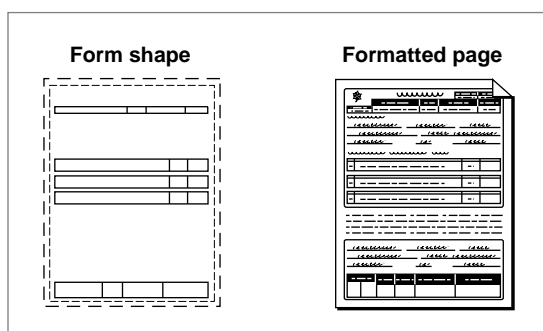
A **format object** specifies how a document or page of a document is to be formatted. The format object includes the following properties:

- **Dimensions.** This property specifies size of the printable area. For more information about the dimensions property, see the chapter “Core Printing Features” in this book.
- **Mapping.** This property determines the scale and orientation of the page. The mapping also determines the translation, skewing, and perspective as well; however, these are seldom changed. For more information about the mapping property, see the chapter “Page Formatting and Dialog Box Customization” in this book.
- **Form.** This property specifies a shape object to print as a backdrop on each page of output and a mask shape that defines erasable areas within the form. For example, a form shape may provide a template so that each page of the document appears as if it is positioned within the template, or the form shape may appear as a logo or banner behind the contents of a page. For more information about form shapes, see the chapter “Page Formatting and Dialog Box Customization” in this book.
- **Paper-type.** This property contains a reference to the paper-type object associated with this format. Because the paper-type object can restrict the printable area, you can use a paper-type object to change the printable area. For more information about the paper-type property, see the chapter “Advanced Printing Features” in this book.

A format object also refers to a collection of items that can be specified for a format. For more information about the format collection, see “Collection Objects” on page 1-18.

In the format object itself, you may change only the form property and the paper types. Figure 1-11 shows a form shape and how it can be used to format a document.

Figure 1-11 Effect of specifying a shape in the form property of a format object



Paper-Type Objects

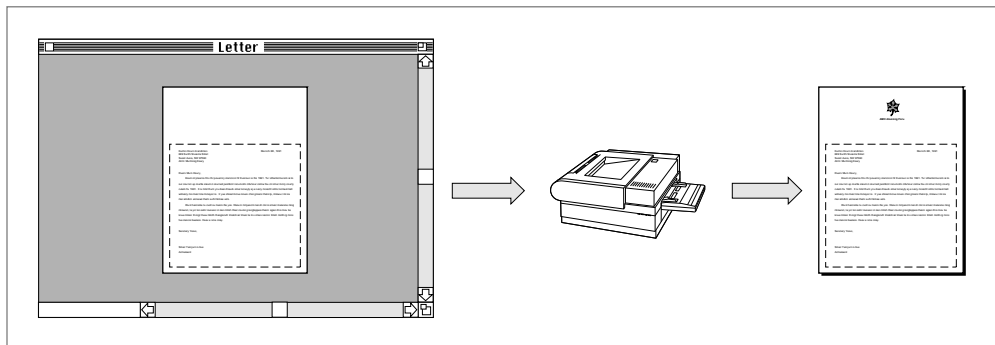
A **paper-type object** defines a paper type for a format. The paper-type object includes the following properties:

- **Name.** This property specifies the name of the paper type. This name can be used to allow the user to select a paper type in a dialog box and is also used for paper matching.
- **Dimensions.** This property specifies the size of the paper and the size of the printable area within the paper. This property allows you to specify a printable area that is different from the area specified by the dimensions property of the format object.

A paper-type object also refers to a collection of items that can be specified for a paper type. For more information about the paper-type collection, see the next section, “Collection Objects.”

Figure 1-12 shows an example of a paper type that restricts the printable area for printing on letterhead paper.

Figure 1-12 A paper type for printing on letterhead paper



Paper-type objects are introduced in the chapter “Core Printing Features” in this book. Their use in defining different paper sizes is described in the chapter “Advanced Printing Features” in this book.

Collection Objects

Collection objects are repositories for additional information associated with the core printing-related objects. Each piece of information is called an item. The print collection objects are

- The **job collection**, which contains items of information that are relevant to a print job. These items include information about how to print the document; for example, how many copies, how to collate them, paper feed options, whether the document is to be printed to disk, and file information.

- The **format collection**, which contains items of information related to printing a page from the document. It specifies the orientation of a page, whether a halftone should be applied, the scale, and other items related to formatting a page.
- The **paper-type collection**, which contains items of information related to the kind of paper to which the format applies. For example, it specifies the base paper type, such as US letter or legal, and the units in which the paper is measured, such as inches or millimeters.

Figure 1-13 on page 1-21 shows the items that QuickDraw GX defines for these collection objects. They are discussed completely in the chapter “Page Formatting and Dialog Box Customization” in this book.

Typically, an item in a collection object is set by the printer driver. The user can change the item by setting values or controls in a dialog box. For example, the value in the copies information item of the job collection is set by the printer driver. The default Print dialog box allows the user to change the value. The value in the item is then used by the printer driver to determine how many times to print the pages associated with the job object.

You only need to be concerned about the information in collection objects in the following situations:

- when you are printing without dialog boxes and need to set an item in a collection object
- when you want to allow the user access to an item that is not provided by a printer driver in a dialog box

For an example of the first situation, to implement the Print One Copy menu item, you need to set the copies item in the job collection to 1 before printing and reset it to its previous value afterwards.

Consider the following example that applies to the second situation. The job object specifies the pages to print, which the printer driver uses, by default, in its Print dialog box. The job collection object provides a page-range information item that allows a complex range of pages to be specified. To support the complex page range, you must customize the Print dialog box to display the range from the collection item and store the new values back in the collection object when the user changes them. Of course, the printer driver must be set up to use the collection item too.

A printer driver can define additional items and store them in the appropriate collection. Your application can do likewise. You should consider whether these collections are appropriate for the kind of information you wish to manage. You can also create your own special-purpose collections. For more information about collections, see the Collection Manager chapter of *Inside Macintosh: QuickDraw GX Environment and Utilities*.

Printer Objects

A **printer object** represents the characteristics of a printer. They are set by the printer driver. You can determine these characteristics by referring to the output or formatting printer in a job object. You cannot change these characteristics.

The printer object includes the following properties:

- **Printer name.** This property contains the printer's name; for example "All Mine."
- **Printer type.** This property contains the kind of printer; for example, 'lwscl' for the LaserWriter II SC.
- **Printer driver name.** This property contains the printer driver's name; for example, "LaserWriter II SC."
- **Printer driver type.** This property contains the kind of printer driver; for example, 'post' for a Postscript printer.
- **View device list.** This property refers to view devices that define a printer's resolution (dots-per-inch) and color space.

For information about each of these properties, see the chapter "Advanced Printing Features" in this book.

Print File Objects

A **print file object** represents a file that is created by QuickDraw GX as the data is spooled to disk for printing. A special kind of print file is the portable digital document, which is created by the PDD Maker GX printer driver.

A print file is self-contained. When you open it, you specify a job object that QuickDraw GX sets up to match the characteristics of the job that printed the file. Thus, a print file retains information about the output and formatting printers, its format, paper types, and so on.

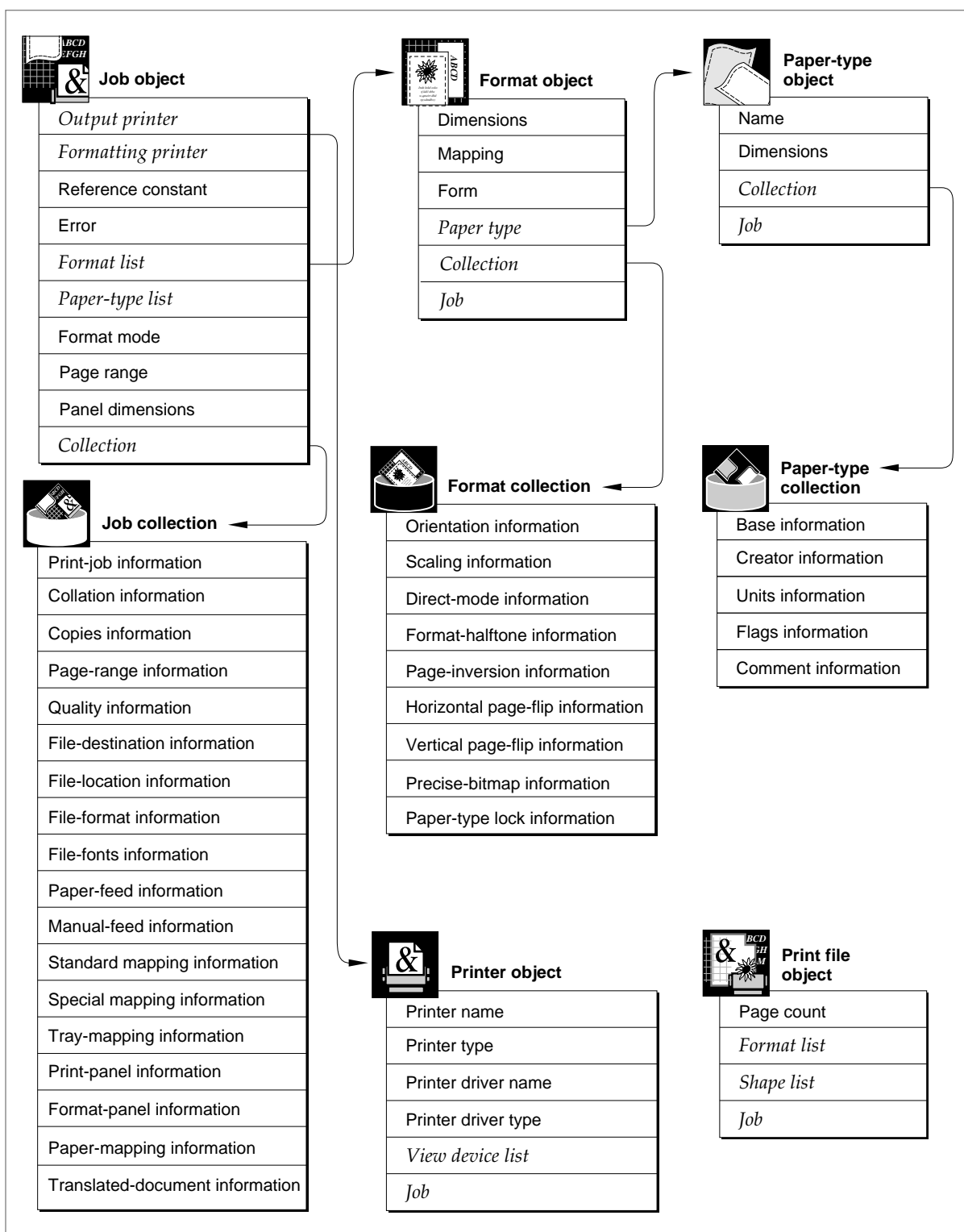
The print file object contains the following properties:

- **Page count.** This property specifies the number of pages in the file.
- **Format list.** This property specifies the format object for each page.
- **Shape list.** This property specifies the picture shape object associated with each page.

For information about each of these properties, see the chapter "Advanced Printing Features" in this book.

Summary of QuickDraw GX Printing-Related Objects

Figure 1-13 shows all the QuickDraw GX printing-related objects and collection objects. In this figure, references are represented by arrows. References to job objects, however, are not shown. Note that these are objects, not structures. The order of the contents is arbitrary. You access the contents procedurally by calling functions, not by accessing fields in a data structure.

Figure 1-13 QuickDraw GX printing-related objects

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Table 1-1 describes the printing-related objects.

Table 1-1 QuickDraw GX printing-related objects

Printing-related object	Description
Job	Holds the primary printing information for a document. Every printable document has a job object associated with it. The job object specifies the number of copies and a page range and includes references to one or more format objects and two printer objects.
Format	Specifies page-formatting characteristics such as scaling and page dimensions and includes a reference to a paper-type object.
Paper type	Specifies a paper-type name (such as “US Letter”), the physical dimensions of the paper, and the printable area within it.
Printer	Represents the capabilities of a physical printer and includes a name and type, a printer driver name and type, and a reference to one or more view device objects from which you can retrieve information about the printer’s characteristics.
Print file	Represents the file that results from printing, such as a spool file or a portable digital document.
Job collection	Contains items of information that are relevant to a print job. These items include information about how to print the document; for example, how many copies, how to collate them, paper feed options, whether the file is to be printed to disk, and file information.
Format collection	Contains items of information related to printing a page from the document. It specifies the dimensions for the page, the orientation, whether a halftone should be applied, the scale, and other items related to formatting a page.
Paper-type collection	Contains items of information related to the kind of paper to which the format applies. For example, it specifies the base paper type, such as US letter or legal, and the units in which the paper is measured, such as inches or millimeters.

Using Printing-Related Objects With Other QuickDraw GX Objects

QuickDraw GX printing-related objects serve only one purpose—to support printing. The parts of your application unrelated to printing do not require the use of or access to printing-related objects. The parts of your application that do support printing, however, require the use of other QuickDraw GX objects. These objects include

- shapes
- tags
- view ports
- view devices

The use of these objects to support QuickDraw GX printing is well structured. The following sections discuss how these objects are used in QuickDraw GX printing.

Shape Objects

Shape objects specify the content of what you want to render on a page of output. The format object, for example, allows you to specify a shape to be printed as a backdrop to the document's contents.

The document's contents are also represented as shapes. For example, text is typically represented as glyph or layout shapes. Graphics are specified by graphics shapes, such as lines, rectangles, polygons, paths, and so on. QuickDraw GX represents each page of output as a picture shape that contains these other shapes.

Either you can create a picture shape that represents the contents of the entire page, or you can allow QuickDraw GX to collect into a page the shapes you specify. For example, if you choose to create a picture shape and print it as a page, you pass the picture shape to the `GXPrintPage` function, which spools the page to the printer.

If you choose to specify individual shapes to be included in the page, you call the `GXStartPage` function to start building a picture shape and call the `GXDrawShape` function for each shape you want to render. When you call the `GXFinishPage` function, QuickDraw GX spools the picture shape for the page.

For an example of each way of printing using shape objects, see the chapter “Core Printing Features” in this book.

Tag Objects

QuickDraw GX allows you to directly control the way that printing is performed through the use of synonyms stored in tag objects. You specify the action to take in a tag object and attach it to another object, such as a shape, ink, or transform. Here are two of the uses of tag objects:

- Halftone specifications can be placed in a tag that is referred to by a shape's ink object. When the shape is drawn, QuickDraw GX draws it with the specified ink using the halftone in the ink's tag object.
- PostScript operators can be placed in a tag that is referred to by the shape itself or by its style, ink, or transform objects. When the shape is drawn, the PostScript operators are used directly, in place of QuickDraw GX data.

For information about how to set up and attach tag objects to shapes, see the tag objects chapter of *Inside Macintosh: QuickDraw GX Objects*.

View Port Objects

View ports are used to restrict the parts of shapes that are spooled during printing. They also specify how to associate a shape with a view port when reading the shapes from a print file. For example, when you call the `GXStartPage` function to build your picture shape of the page, you specify a view port list. This view port list controls which shapes are printed. When you call the `GXDrawShape` function for a shape in order to add the shape to the picture shape, only the part of the shape that shows through a view port in this list is added to the picture shape. When a print file is read, the picture shape is associated with the view ports in the list you specify.

Note

The `GXDrawShape` function may also cause the shape to be drawn onscreen. If you draw a shape with view ports that are in the onscreen view group but not specified in the view port list when calling the `GXStartPage` function, the shape is displayed on the screen. ♦

For more information about using view ports with the `GXStartPage` function, see the chapter “Core Printing Features” in this book. For more information about using view ports when reading print files, see the chapter “Advanced Printing Features” in this book.

View Device Objects

Printer objects refer to view devices that are created by the printer driver. You can examine a printer's view devices to determine its characteristics, such as resolution, color set, and color profile. You cannot change these characteristics. For more information about accessing a printer object's view devices, see the chapter "Advanced Printing Features" in this book.

Implementing QuickDraw GX Printing Features

As you prepare to implement QuickDraw GX printing, you need to consider which printing-related services your application will provide and what features QuickDraw GX provides to implement your services. Typically, the user expects to control printing through menus and dialog boxes in the application or by printing from the Finder. These are the core printing features that every application needs to implement. Figure 1-14 shows the File menu of a typical application that contains the printing-related menu items.

Figure 1-14 Printing-related items in the File menu

File	
New	⌘N
Open...	⌘O
Close	⌘W
Save	⌘S
Save As...	
Page Setup...	
Custom Page Setup...	
Print...	⌘P
Print One Copy	
Quit	⌘Q

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As a core feature, of course, you allow the user to print the document. You also allow the user to format all the pages in a document the same way. The user chooses the Page Setup menu item to specify document formatting.

You may allow the user to customize the format of individual pages using the Custom Page Setup menu item. You may also wish to change the content of the dialog boxes from the defaults provided by the printer driver, printing extensions, and QuickDraw GX. You are implementing customization features when you provide page-by-page formatting and dialog box customization.

Other features that you may provide, but are probably not necessary to implement in most applications, are considered advanced printing features. Advanced printing features are not necessarily harder to implement than other features; it just is less likely that your application needs to provide them.

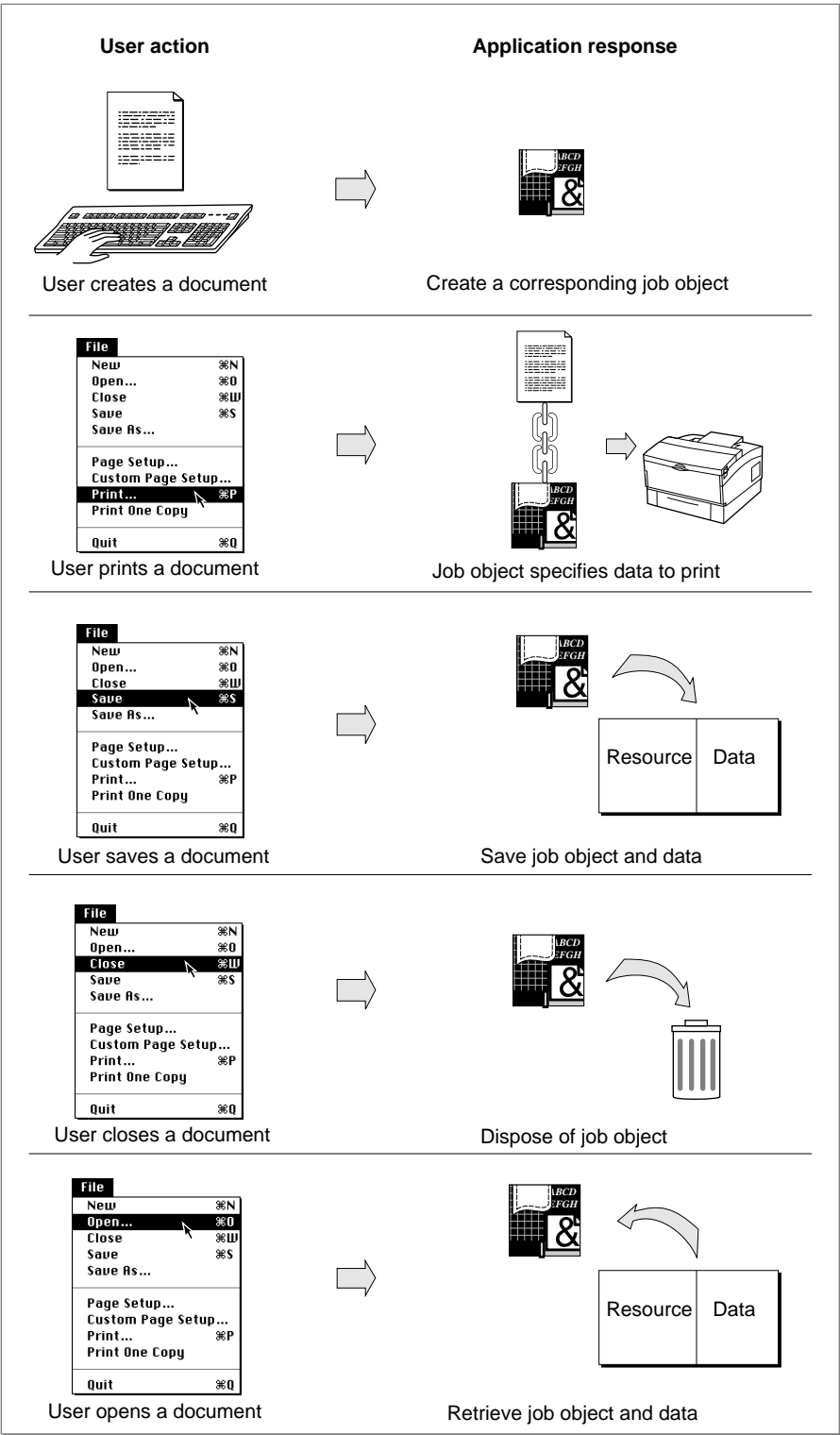
The following sections describe three classes of printing features:

- core printing features
- customization features
- advanced printing features

Core Printing Features

Generally, you work with printing-related objects when a user creates, saves, closes, or opens a printable document. A job object represents the primary association between a document, which is application-defined, and QuickDraw GX printing features. The job object represents a **print job** in the sense that it specifies the parameters for printing a document. Thus, core printing features require you to manipulate the job object. Figure 1-15 shows how you manipulate the job object in response to user actions.

Figure 1-15 Manipulating the job object in response to user actions



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When you create a job object, QuickDraw GX automatically provides you with default format and paper-type objects. The initial values of these objects are determined by the output printer that is currently selected when the job is created. These values can change if the user later changes the output printer.

You associate your document's data with the job object. QuickDraw GX maintains the relationship between the job, format, paper-type objects, and their collections. This is useful when you save or open a document because these objects must be flattened or unflattened, respectively.

Flattening and unflattening QuickDraw GX printing-related objects is very similar to flattening and unflattening a shape object. When you flatten a shape object, the style, ink, and transform objects are flattened with it. For printing-related objects, QuickDraw GX flattens all related objects with the job object, including multiple format, paper-type, and collection objects. They may be flattened in the form of a handle, which is convenient for writing the objects to the resource fork, or you can use your own procedure to store the job object and related objects wherever you wish.

You are responsible for displaying the Print and Page Setup dialog boxes. Because these dialog boxes are movable, your application must install a handler for the `gxPrintingEvent` message to update the screen if a dialog box moves.

Actual printing, which from the application's perspective means spooling the document to the printer driver, involves looping through the pages to be printed, and perhaps looping through the shapes to be included on each page. The work of applying formatting instructions and such is the responsibility of the printer driver.

There are several other things you must do to implement core printing features:

- Identify the location of the Edit menu and its items to allow QuickDraw GX to support the Cut, Copy, and Paste menu items when a print dialog box is active.
- Support printing from the Finder, which requires that your application support the Print Documents ('pdoc') Apple event and support this Apple event's optional attribute to allow the user to drag a copy of the document to a desktop printer for printing.
- Allow users to print documents originally created to print with the Macintosh Printing Manager.

None of these tasks are conceptually difficult. The chapter "Core Printing Features" in this book shows you how to perform each of these tasks.

Customizing QuickDraw GX Printing Features

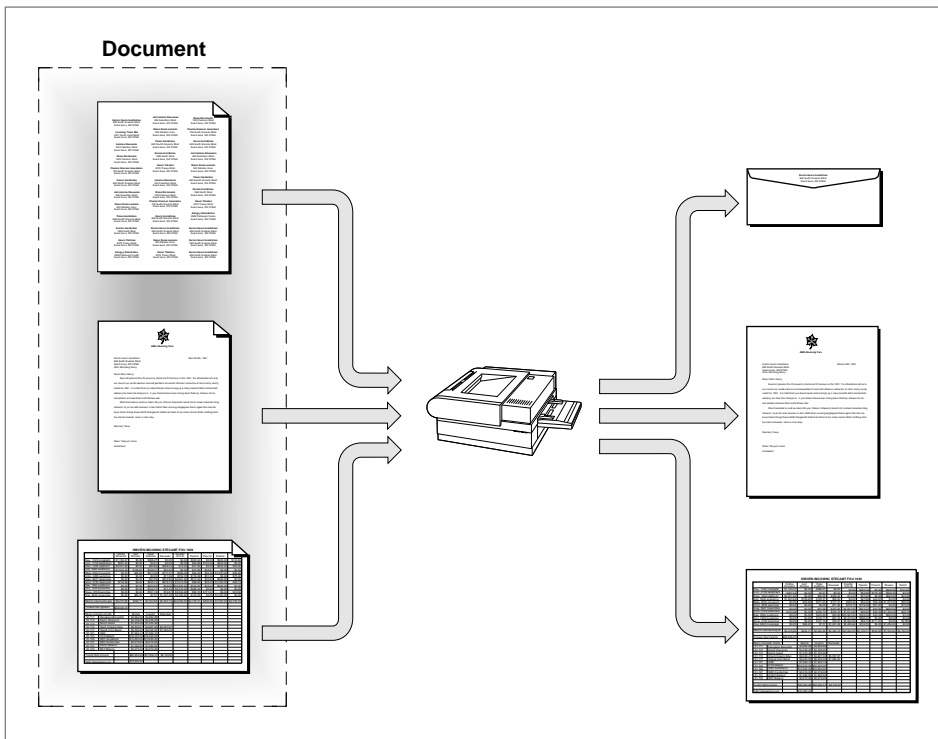
QuickDraw GX allows you to customize some of its features to address the needs of your particular application. If you want to manipulate the objects that QuickDraw GX uses to format the pages of a document or if you want to add panels to QuickDraw GX print dialog boxes, you need to read the chapter "Page Formatting and Dialog Box Customization" in this book.

Through QuickDraw GX, your application can allow users to specify unique formats for the individual pages of a printable document. For example, using QuickDraw GX, your

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application can allow a user to create and print a single document that consists of an address page on an envelope, a business letter on a sheet of paper in portrait orientation, and a spreadsheet on a sheet of paper in landscape orientation. Figure 1-16 shows an example.

Figure 1-16 Printing a document containing multiple formats



In addition, QuickDraw GX allows you to add panels to its dialog boxes to provide special features that require additional user specification. A **panel** is a portion of a dialog box in which an application can provide additional options for users. These specifications are stored as items in collection objects. For example, your application may add a panel that provides special color features, such as color separation and color choices or halftone information, which need to be stored with a job or format. QuickDraw GX dialog boxes are introduced in “Dialog Boxes,” which begins on page 1-10. For information about collections, see “Collection Objects” on page 1-18.

Advanced Printing Features

QuickDraw GX provides several features that allow your application to provide additional control for users and allows the application to take advantage of features in particular printers. These features allow you to

- provide access to and perhaps modify the contents of a portable digital document or other print file
- use different paper-type objects, including those created with the PaperType Editor
- take advantage of a printer's built in features, such as fast text-streaming using built-in fonts by way of a **direct job-formatting mode**
- directly specify methods of rendering data with alternative representations of QuickDraw GX graphics objects, such as with raw PostScript (These alternative representations are called **synonyms**, which are stored in tag objects. For a brief introduction of how you implement synonyms, see "Tag Objects" on page 1-24.)
- set up halftones on a shape-by-shape basis by specifying halftones for the inks they use
- provide users with feedback about vector device capabilities
- examine the characteristics of a printer, such as its resolution and color-rendering capabilities
- change the job properties if the user switched printers
- change or prevent the display of the Status dialog box

The chapter "Advanced Printing Features" in this book describes each of these features.

Compatibility With the Macintosh Printing Manager

Non-QuickDraw GX versions of Macintosh system software use the Printing Manager, which QuickDraw GX replaces. The Printing Manager encompasses several concepts for which QuickDraw GX printing introduces parallel vocabulary. Old and new printing architecture terms include the following:

Printing Manager term	QuickDraw GX term
Printer driver	Printer driver and printing extensions
System printer	Default desktop printer
Print record	Job object
Spool file	Print file

To enable the printing of QuickDraw documents on QuickDraw GX printers, you must convert the document with the QuickDraw GX Translator, which is described in the environment chapter of *Inside Macintosh: QuickDraw GX Environment and Utilities*, and convert the print record by calling the `GXConvertPrintRecord` function, which is described in the chapter "Core Printing Features" in this book.

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Note

Printer drivers created with different versions of the Macintosh printing architecture can be present in a computer along with QuickDraw GX printer drivers. If QuickDraw GX is installed, the QuickDraw GX printer drivers are active; otherwise, the QuickDraw GX printer drivers are not active. ♦

