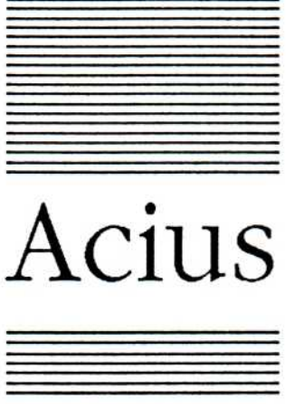
User's Guide

ACCOLADE

4th DIMENSION™



Acius 4th Dimension™ User's Guide

4th Dimension by Laurent Ribardière

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Preface

Using 4th Dimension

Welcome to 4th Dimension.

The 4th Dimension™ program is a multiple-file, relational database package for developing custom applications on Apple Macintosh™ computers. This manual, *4th Dimension User's Guide,* shows you how to use the various parts of the program. It is a companion volume to *4th Dimension Tutorial.* Think of *4th Dimension User's Guide* as your guide to the program's user interface, and turn to *4th Dimension Programmer's Reference* for programming and technical information.

How to use this book

4th Dimension User's Guide is organized according to the parts of the program you would use in different phases of developing a database application: building, testing, adding custom details to your application, testing again, querying, and maintaining. Use this manual as your step-by-step how-to guide: how to create a database, develop layouts and menus, link files, enter data, and produce reports.

To take advantage of many of the more advanced capabilities of 4th Dimension, you must develop custom procedures for your database application using the built-in programming language. Cross-references to *4th Dimension Programmer's Reference* are provided in the text to help you find more technical information on particular topics. Other cross-references refer you to different parts of this manual.

Chapter descriptions

4th Dimension User's Guide has six chapters and four appendixes.

- Chapter 1, "Database Structures," contains the basic mechanics of designing and building a database. You'll learn about the Structure window and defining files, fields, field types, subfiles, and the relational link between files that makes 4th Dimension so powerful.
- Chapter 2, "Layout Design Basics," discusses layouts—the way you control how users may enter, display, and print information. Chapter 2 covers different ways of displaying data and introduces several of the customizing features of 4th Dimension that are explained at greater length in Chapters 3, 4, 5, and 6.
- Chapter 3, "Basics for the User Environment," shows you how you can test, run, and maintain your database with generic commands. The User environment provides general data entry, report writing, graphing, mailing label, search, and sort functions.
- Chapter 4, "Procedures," introduces 4th Dimension's programming language and its two editors, the Listing editor and the Flowchart editor. The main how-to reference for the programming language is *4th Dimension Programmer's Reference*.
- Chapter 5, "Relational Structures," shows how to develop multiple file, relational systems with 4th Dimension: different file linking arrangements, how layouts use links, and how link programming works.

- Chapter 6, "Creating a Custom User Interface," puts procedures and layouts together with menu systems to create a custom application, including password security, dialog boxes, and graphics.
- The four appendixes contain a chart of 4th Dimension's specifications, a menu command reference that defines all the menu choices in the program, an explanation of the files of the database that the program creates for you, and shortcuts for several procedures.

Chapter organization

Two kinds of explanations make up each chapter. Contextual explanations tell what a feature does and how it fits in with the rest of 4th Dimension. How-to explanations (three narrow columns of text to a page) take you step by step, keystroke by keystroke through how to create, invoke, or use each feature of the program.

The two kinds of explanations allow you to use the manual sequentially or randomly. Later contextual explanations assume that you are familiar with the contents of earlier chapters; but how-to sections assume no such prior knowledge.

Aids to understanding

Text set in the margin like this defines terms, refers you to other manuals or other parts of this manual, or provides explanations that are not strictly necessary to operating the program.

Look for these visual clues throughout the manual:

- *By the way:* Text set off in this manner presents sidelights, interesting pieces of information, tips, or parenthetical comments.

Important Text set off this way—and with the **Important** tag in the margin—presents information you will need to know to successfully use 4th Dimension to develop database applications.

Warning Warnings like this alert you to conditions that could damage software or hardware, damage your developing application, corrupt your data, or result in a loss of data.

4th Dimension User's Guide represents text you enter on screen like this:

APPLY TO SELECTION or **If (Before)**

Text that appears as part of listings or formulas appears like this:

```
If (Before)
  LOAD LINKED RECORD (Department)
  AM2:=[Department]Name
End if
```

The names of menu commands and dialog boxes appear like this:

Choose the New Field command from the Structure menu. Or, 4th Dimension displays its Add or Change Field dialog box.

Menu command keyboard equivalents

Many menu commands in 4th Dimension have corresponding keyboard equivalents. Because these commands appear on the menus themselves, *4th Dimension User's Guide* lists only the actual menu commands in the contextual and how-to sections.

You'll find a compendium of all menu command keyboard equivalents for 4th Dimension in Appendix B.

You use a command keyboard equivalent by holding down the Command key on the keyboard and simultaneously typing another character. For example, to quit 4th Dimension from the Design environment, hold down the Command key and press the Q key. This action is called Command-Q.

What you need to start

The *recommended* hardware configuration for *developing* an application for 4th Dimension is

- A Macintosh Plus personal computer. 4th Dimension does its own optimized disk caching. You should run 4th Dimension *without* a RAM cache.
- A hard disk.
- System software version 4.1 or above; Finder version 5.4 or above.
- A printer is also recommended, such as an Apple ImageWriter® or LaserWriter® Plus printer. Database programs are great users of printed output, and 4th Dimension in particular is a graphically oriented program that can use a printer very effectively.

The minimum hardware configuration for a runtime application of 4th Dimension depends partly on the size of the application and partly on the peripheral devices (printer, hard disk, network) you wish to require of your application users. The minimum Macintosh remains the same, as do the System and Finder versions.

Where to go for more information

4th Dimension User's Guide assumes you have completed the *4th Dimension Tutorial,* are familiar with database terminology, and (in general terms) know what each of the three 4th Dimension environments does during the application development process. If you have not yet read *4th Dimension Tutorial,* you should do so now.

Besides *4th Dimension User's Guide*, there are several other sources of information in this package about the 4th Dimension program, and about developing applications with it:

- *4th Dimension Tutorial* will coach you through several simple 4th Dimension applications, including one with communications. It will acquaint you with the terminology of the program and its major concepts such as **linking, layouts,** and **procedures.**
- The disk of sample applications will help you learn 4th Dimension programming techniques. You may be able to develop your own applications from some of these seeds. The disk will also introduce you to the execution cycle.
- *4th Dimension Programmer's Reference* and *4th Dimension Command Reference* are your written resources for all technical information.

Apple's *Human Interface Guidelines* may help you design applications with 4th Dimension that will be familiar to your users and easy to use. It's available from Apple Programmer's and Developer's Association.

What is 4th Dimension?

4th Dimension is

- A multiple-file relational database program designed to take full advantage of the Macintosh family of Apple computers. It includes a thorough control of the computer's human interface and networking capabilities.
- A complete application development system. With 4th Dimension, you can quickly create database applications that are in most ways indistinguishable from programs you would otherwise have to create with more traditional programming languages such as Pascal or C.
- A powerful and flexible program for those "power users" who are advanced in their understanding of databases and programming. You have available a high-level programming language, extensive file import and export capabilities, communications capabilities, and access to externally programmed procedures.
- A way for you to create custom applications for your clients, for your company, and for yourself.

For more information on 4th Dimension specifications—for example, the sizes of records, fields, and databases—see Appendix A, "4th Dimension Specifications."

4th Dimension provides you with up to 99 simultaneously open files that you may link relationally in an almost unlimited number of ways. You may have 511 fields per record, including picture and date type fields.

How do you use 4th Dimension?

As you'll see in more detail, the process of developing an application with 4th Dimension is a simple one:

- **Develop:** Use the five parts of the Design environment to create the design of your application: the files; the fields within each file; the relationships between files; input, output, and dialog layouts; procedures (programming); custom menus; and password security.
- **Test, query, and maintain:** In the User environment, you may test portions of your application as you develop them, or use the "generic" user interface it provides for ad hoc queries and database maintenance. Many users find the User environment sufficient for their own work without having to create a custom application.
- **Deploy:** Your application in the Custom environment runs like a stand-alone program—with its own pull-down menu system, password protection, and available runtime version.

What you can do with 4th Dimension

Using 4th Dimension as the underlying processing engine for your applications, you can create many different kinds of accounting packages, inventory control systems, time and billing packages—an inexhaustible range of applications for specific vertical markets or for general use.

Applications you create with 4th Dimension are fully in control of Apple's desktop user interface, the graphics-oriented system of menus, dialog boxes, and windows. This command of the system lets you add some very useful touches to your database applications: specialty calculators, graphs, pictures, terminal emulators, and interactive maps, to name a few examples.

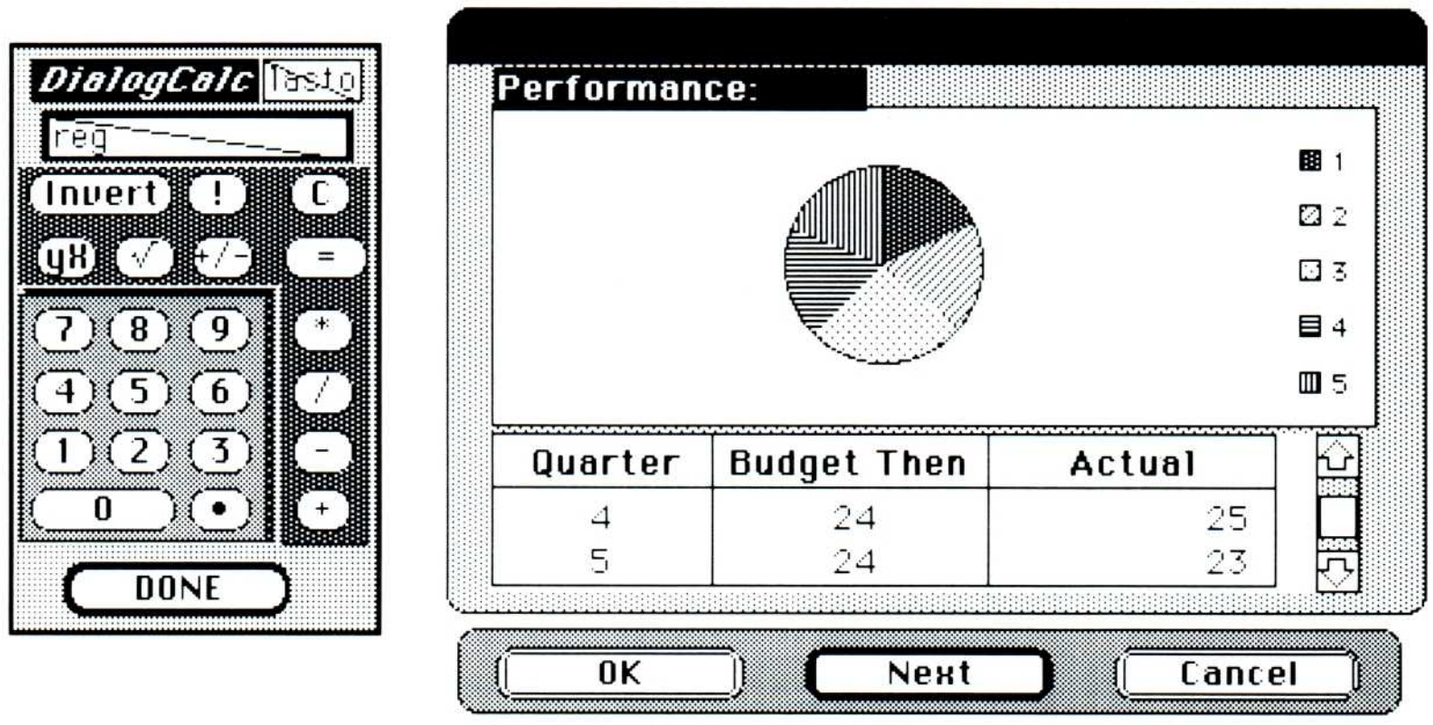


Figure P-1
Layouts created with 4th Dimension

The calculator at left in Figure P-1 is part of the Personnel database on the example disk. You can prepare its graphics in the Layout window of the Design environment, and create all its functions entirely in 4th Dimension's high-level language. The graph and data at right show how 4th Dimension can display graphic information within the layout of an individual record.

Custom menus, files of pictures, and on-screen graphs that respond to your immediate input are all part of the new vocabulary of productivity that 4th Dimension brings to database applications.

Versions of 4th Dimension

There are two versions of the 4th Dimension product: the development version and the runtime version.

Development version

The development version of 4th Dimension is the version in this package, discussed in this manual and in *4th Dimension Programmer's Reference*. With it, you can develop applications, debug them, and run them either in a semicustom manner in the User environment, or in the Custom environment under your own menu system.

Runtime version

A **custom application** must always use its own menu system. Custom applications may run in the Custom environment of the development version of 4th Dimension, or under the runtime version.

The runtime version of 4th Dimension supports custom applications only. A **custom application** is one that uses its own menu system. To the user, a custom runtime application is indistinguishable from any other application program running on the computer; the user starts it from the desktop, and quits to the desktop.

Important Any application that runs in the Custom environment will run with no modification under the 4th Dimension runtime system.

Chapter 1

Database Structures

This chapter details the basics of developing database applications with 4th Dimension. Specifically, it covers the mechanics of creating files, fields, subfiles, and links. There is much detail in these tasks, and there are many options.

For information on the programmatic uses for variables, see *4th Dimension Programmer's Reference,* Chapters 2 and 4.

For completeness, Chapter 1 touches occasionally on more advanced topics. Where it mentions such topics, it provides a cross-reference to other chapters. For instance, variables are discussed at greater length in Chapter 2, "Layout Design Basics," and in Chapter 5, "Relational Structures," where they bear immediately on displaying information, on linked files, and on the 4th Dimension procedures that do the linking.

Five windows of the Design environment

There are five windows in the Design environment, each with its own editor. The Procedure window has two editors for creating procedures, the Listing editor and the Flowchart editor. You will create your application among these five windows.

The five Design environment windows are

- **Structure window:** In the Structure window, you create files and subfiles; assign fields, field types, and attributes; and create relational links between files.
- **Layout window:** By using the Layout window, you create the visual and printed input and output for your application. The Layout window is a graphic editor that also has the ability to set how 4th Dimension displays data—numeric formats, date formats, and picture formats.
- **Procedure window (two editors):** There are three types of procedures (global, file, and layout) and two editors to handle them (Listing and Flowchart). Either editor can create any type of procedure. Procedures control how the application processes your data.
- **Menu window:** With the editor in the Menu window, you create the system of custom menu bars that your application will use when running in the Custom environment, or under a runtime system. Each menu command calls a procedure; the procedure controls the processing.

- **Passwords window:** Use the editor in the Passwords window to set password protection for individual menu choices and layouts. In the development version, passwords can restrict access from the Custom environment to the other environments.

The Structure window remains open whenever you are working in the Design environment. There is only one Structure window. But there may be many layouts, procedures, or menus you wish to work on simultaneously. For this reason, you may open Layout, Procedure, or Menu windows, and work interchangeably among them.

The maximum number of open windows depends on the amount of RAM memory in the computer. It's a good practice to close windows you are not using.

Starting 4th Dimension

Appendix C lists all the files that 4th Dimension produces and describes what each represents.

4th Dimension creates several desktop files for each database application, even if you create only one file for your application structure. The program stores these files in a folder with the name *basenamef*, where *basename* is the name you give to the database and *f* is a character denoting a folder.

Warning All the 4th Dimension files for a given database must be in the same folder, whether or not that is the original folder that 4th Dimension created. The 4th Dimension application icon may be in any folder on any drive (open or not), or on the desktop.

Starting an existing application

You may start an existing application in any one of several ways.

- ☐ Double-click any one of the database application's icons.
- ☐ Double-click the 4th Dimension icon.
- ☐ Select the 4th Dimension icon, or any one of the database application's icons, and choose Open from the File menu.
- ☐ Select the 4th Dimension icon, or any one of the database application's icons, and press Command-O.

Command-O is a "command key." You'll find a compendium of command keys in Appendix B.

Important If you are using a development system, 4th Dimension will start an existing application in the environment set by Preferences. If you are using a runtime system for your application, 4th Dimension will always start in the Custom environment. See the section "Setting Preferences" later in this chapter.

If you open the 4th Dimension icon *without* double-clicking or otherwise opening a database application icon, 4th Dimension displays its Welcome dialog box, as shown in Figure 1-1.

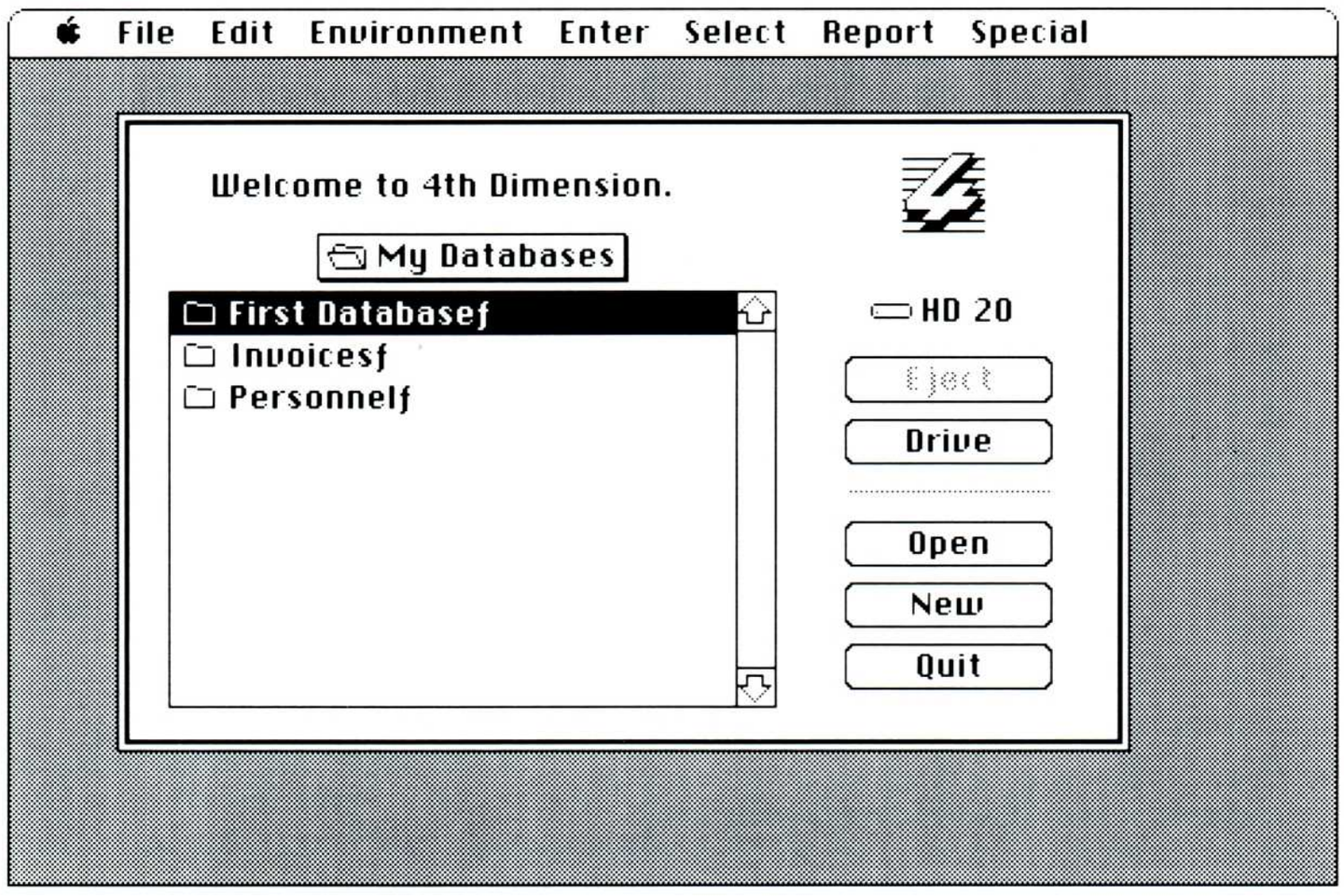


Figure 1-1
4th Dimension's Welcome dialog box

□ When 4th Dimension displays the Welcome dialog box, select the application you wish to open and click Open.

Or: Double-click one of the applications.

Or: Click Quit to return to the Finder.

4th Dimension starts the application you select.

Starting a new application

When you start 4th Dimension to create a new application, you must name the new application. 4th Dimension creates a folder called *basenamef* where *basename* is the name you give the database and *f* is a character denoting a folder. 4th Dimension places all the files for the new application in this folder.

To start 4th Dimension and create a new application:

1. Double-click the 4th Dimension icon.

   Or: Select the 4th Dimension icon and choose Open from the File menu.

   Or: Select the 4th Dimension icon and press Command-O.

   4th Dimension displays its Welcome dialog box.

2. Click New. 4th Dimension displays its Name of the database dialog box. Figure 1-2 illustrates this dialog box.

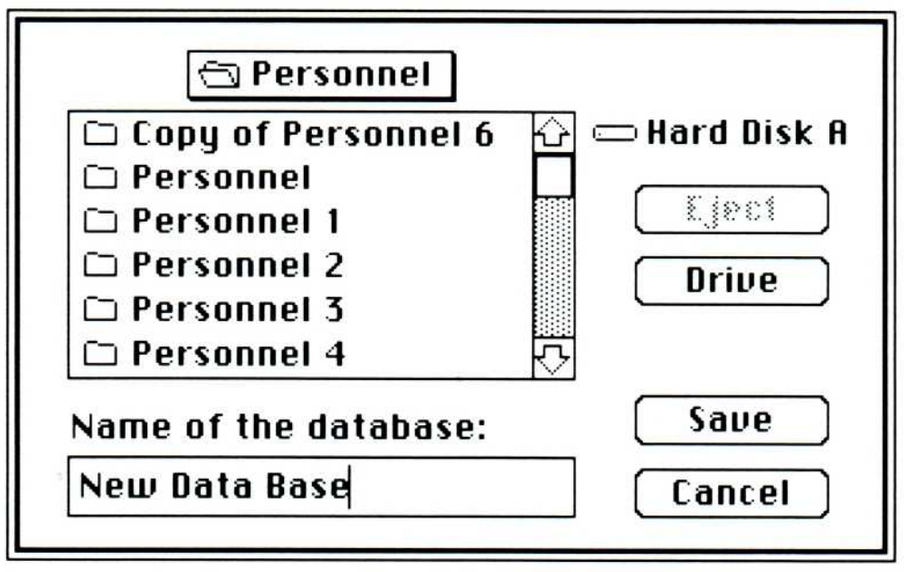


Figure 1-2
Name of the database dialog box

3. Enter the name you wish to give to your database and click Save. The name may be from 1 to 16 characters long, and may be longer, depending on the filename extension.

   Or: Click Cancel to return to the Welcome dialog box.

See Appendix C for filename extension.

4th Dimension creates a folder with the name you give it. Inside the folder are the 4th Dimension database files. 4th Dimension then displays the Structure window for your new database file, including a graphic representation of the first file of your database with the default filename File1. Figure 1-3 shows what the Structure window looks like after you've opened your first file.

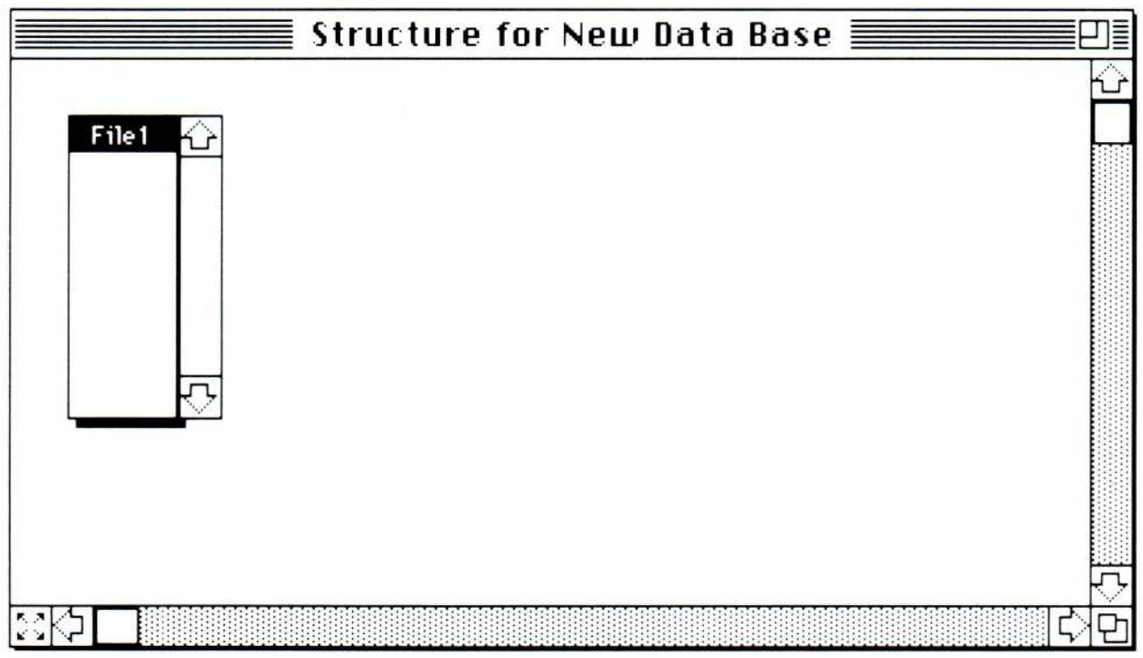


Figure 1-3
Structure window showing the default file, File1

When 4th Dimension displays the Structure window and the first default file, you may begin to design your database.

Quitting 4th Dimension

Depending on whether you are using a development version of 4th Dimension or a runtime system, and depending on your password level and on whether any passwords have been set for the custom application you're using, choosing Quit from the File menu in the Custom environment may return you to the Finder or to the User environment.

Quit returns you to the User environment from the Custom environment if you have no password system.

- From the Design environment, choose Quit from the File menu. 4th Dimension first saves your work, closes any open windows and then returns you to the Finder.

- From the User environment, choose Quit from the File menu. 4th Dimension returns you to the Finder.
- To allow the user to quit from any custom application, the application developer should create a quit command on the File menu. Any menu choice without a procedure to call acts as a Quit.

Warning As with any database program, you may damage your files if you turn off the computer without quitting the program properly. *Always* quit 4th Dimension by making the appropriate menu choice.

Backing up 4th Dimension applications

You should back up your database regularly using HD Backup or other hard disk backup utilities.

Important You may, of course, delete *all* 4th Dimension filenames in a folder—but only as a quick way of deleting an entire database application. Never delete only some of the names, and never partially delete a database as a way of deleting the data.

Setting up a database

See "Starting 4th Dimension" earlier in this chapter for the steps to create a new database.

Creating the first file of a database with 4th Dimension is automatic; the program produces the first file for you and places it in the open Structure window during the startup procedure.

Although not mandatory, your first action when developing a new database should be to set Preferences. The Preferences dialog box controls (among other details) the environment in which your application will start.

Whenever you create a new file, you should rename that file. 4th Dimension always provides a sequentially numbered default filename, File*n*, where *n* is a number from 1 to 99. It's easier to remember what information the files in a database hold when you name them something meaningful.

Important The Structure window remains open as long as you are in the Design environment, signifying that your database is likewise open for design work. There is only one Structure window that may be opened, although you may open several Layout, Procedure, or Menu windows. You may open only one Passwords window.

Structure refers specifically to the files and fields displayed in the Structure window. **Design** refers more to the overall interaction of the various elements of the application—layouts, menus, and procedures—but encompasses the files and fields too.

Once you begin working on your database application, you should periodically save the **structure** by choosing Save Structure from the File menu.

4th Dimension saves the **design** automatically whenever you switch environments or when you quit. Periodically saving, however, allows you to recover more easily from power failures and similar hazards.

Important 4th Dimension saves the database design automatically when you switch environments or when you quit.

Setting preferences

The Preferences dialog box lets you set major ways in which your database will behave when working in the development version of 4th Dimension. Figure 1-4 shows the Preferences dialog box. Preferences are available only in the Design environment.

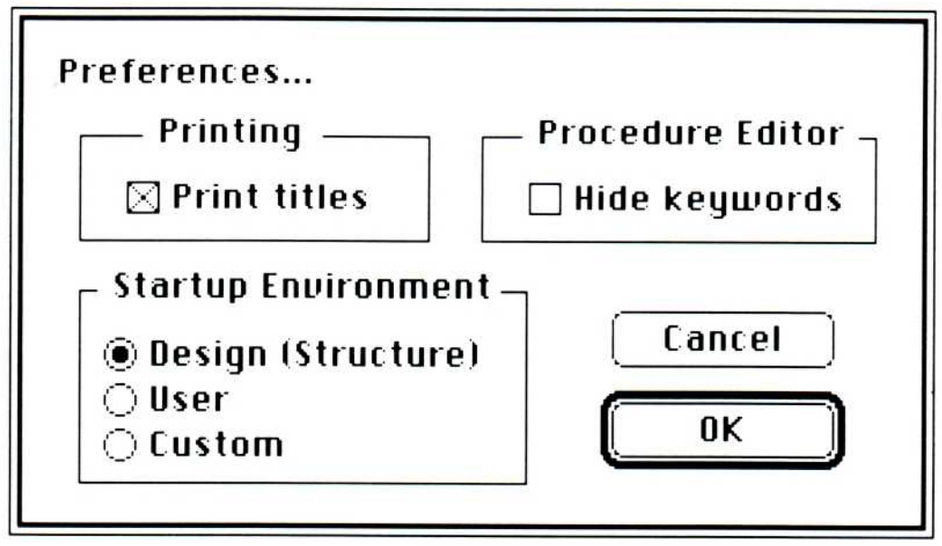


Figure 1-4
Preferences dialog box

You should always make sure that you set Preferences to suit your developing application and your own method of working.

Keywords are general names for any 4th Dimension command, function, procedure name, or routine used in the programming language.

- Check the Hide keywords check box to conceal the scrolling lists of **keywords** in 4th Dimension's Listing editor. Other editors are unaffected. 4th Dimension's default is to show the editor keywords. Even if you have elected to hide the keywords as the program's default, you may still display them at will.
- Click one of the Startup Environment radio buttons to determine which of the three environments will be in effect when your application starts *the next time*. 4th Dimension's default is to start in the Design environment, specifically in the Structure window.

See Chapter 4, "Procedures," for more information on operating 4th Dimension's procedure editors.

- Check the Print titles check box to determine whether 4th Dimension will print the titles of programming procedures and layouts when you ask for a printout. 4th Dimension's default is to print titles.

Important If you specify Custom as your startup environment, you should ensure that there is a custom quit command available to you. Any custom menu command without an associated procedure also acts as a quit. If you find yourself in the Custom environment with no quit command and all menu choices have procedures, you may use Option-F to leave the program.

How to set up the database

The following sections provide you with step-by-step instructions for starting to work with 4th Dimension. You'll find many how-to reference sections like this throughout *4th Dimension User's Guide*.

Each of the how-to sections appears as three columns of text to a page, which makes them easy to recognize. Each section begins with a brief introduction to the task it covers. Following the introduction, each column of text has a heading that describes the actions that you should follow.

Setting up the database

To create the first file of your database, start 4th Dimension according to the steps in the section "Starting a New Application," earlier in this chapter.

4th Dimension automatically opens the Structure window and presents you with your first file. It uses the default name File1 for this file.

The Structure window is always open in the Design environment.

You should periodically choose the Save Structure command from the Design menu.

Set Preferences

1. Choose Preferences from the File menu.

   You can set three preferences:

   "Hide keywords." Check the box to hide the keywords.

   "Startup Environment." Select the radio button for the environment in which you want your application to start.

   "Print titles." Checking the box indicates you want the titles to print.

2. Finish up. Click OK to confirm the Preferences you have set or click Cancel to return to the Design environment without making changes to Preferences.

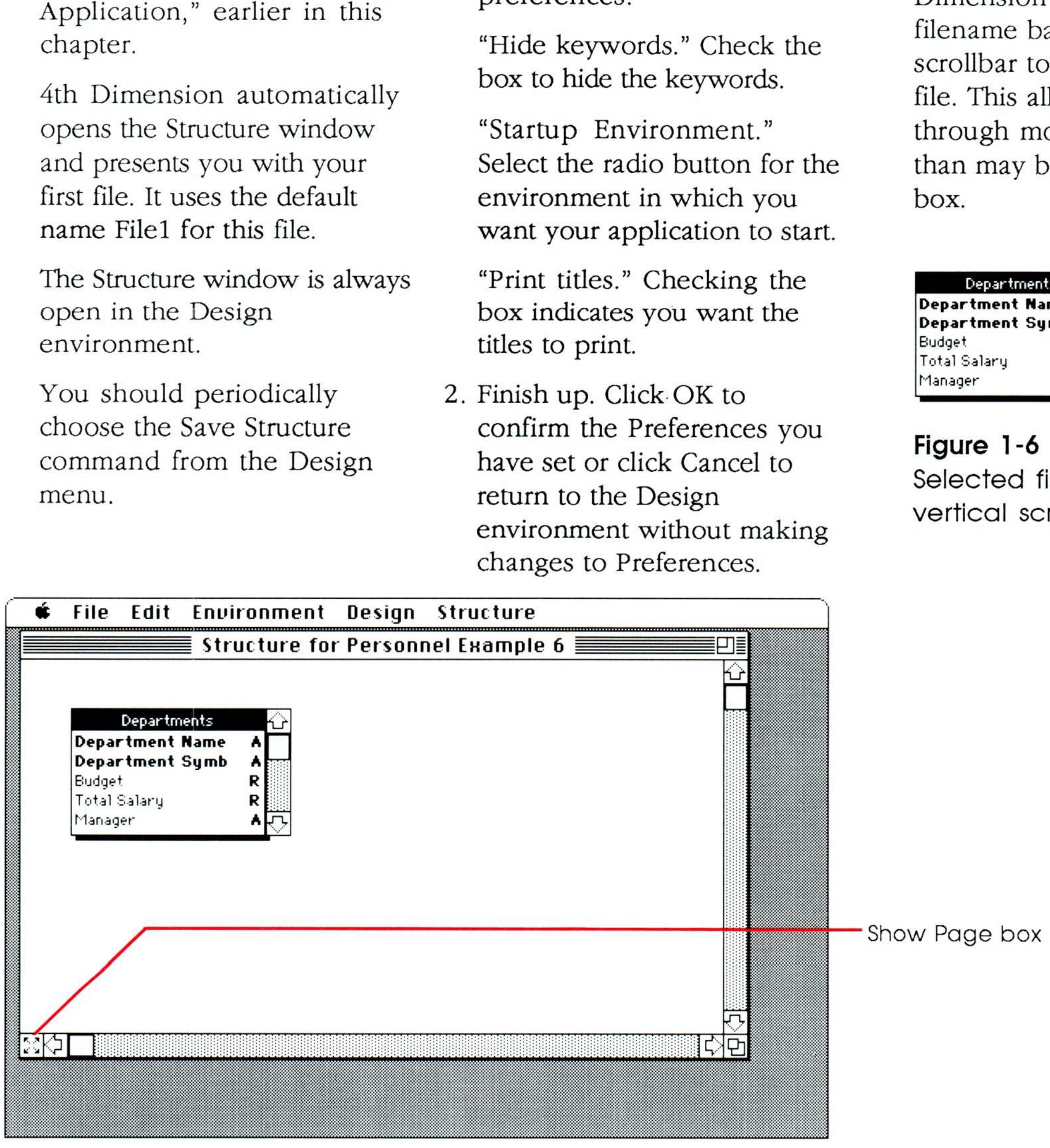


Figure 1-5
Structure window

Select a file

- To select a file, click the filename bar once.

  When you select a file, 4th Dimension highlights the filename bar and places a scrollbar to the right of the file. This allows you to scroll through more field names than may be visible in the file box.

Figure 1-6
Selected file showing vertical scrollbar

Rename a file

1. Click the filename bar once to select the file. It highlights and a scroll bar appears at the right of the file box.
2. Choose Rename file from the Structure menu. 4th Dimension displays the Name of File dialog box with the proposed File*n* name ready for you to type over.
3. Type the new filename and click OK.

   Your filename may be up to 15 characters long. 4th Dimension truncates longer filenames, and ignores leading and trailing space characters. You may include spaces in your filename.

Move a file

- To move a file around the Structure window, position the pointer in the filename box and drag.

  Clicking or dragging the pointer on parts of the file box other than the filename will have other effects, such as creating a new field or changing the size of the file box.

Resize a file box

1. To lengthen or shorten a file box, position the pointer along the bottom border of the box.

   The pointer will change into an up-down arrow.
2. Using the up-down arrow, drag the lower edge of the file box to decrease or increase its size. Changing the size of the file box reveals fewer or more field names.

   Using the up-down arrow to drag right and left along the lower border of the file box has no effect. 4th Dimension sets the maximum width of the file box to the 15-character maximum length of the field name, plus a space for a character denoting the field's type. It maintains this width automatically.

Show the page

1. To show an overview of the database file structure, click the Show Page box.

■ Drag the frame to determine the field of view you will have when you return to the Structure window.

2. Click OK to return to the Structure window within the field of view set by the frame, or click Cancel to return with the field of view left unchanged.

   The relative sizes of frame, page, and file boxes will change depending on whether you have zoomed the window, and on the rectangularity of your structure.

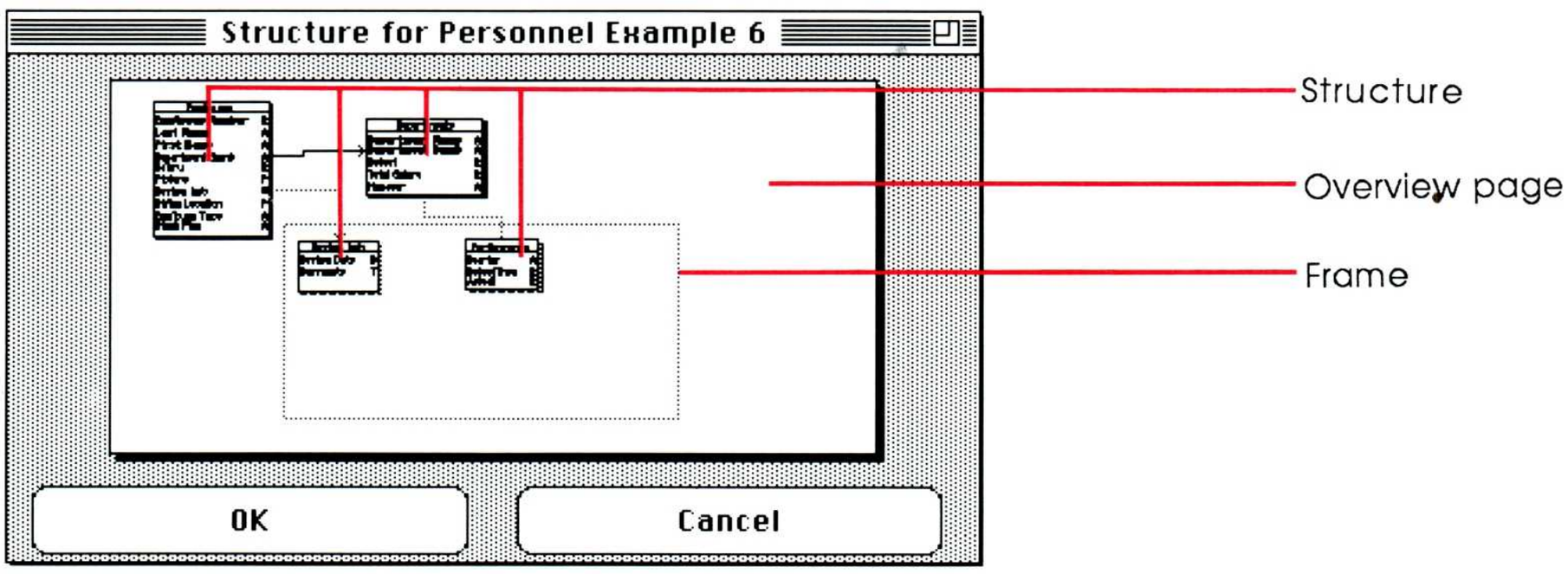


Figure 1-7
Show Page for overview of large or complex structures

Creating additional files

4th Dimension produces one file for you automatically when you begin a new database.

After you have begun the database, you must create additional files yourself.

You may create up to 99 files in any one database. The 99 file limit does not include subfiles.

Figure 1-8
Choose New File from the Structure menu to create an additional file

1. Choose New File

- From the Structure menu, choose New File.

  The pointer becomes a miniature file box.

- If you decide you don't want a new file while the pointer is still in the shape of a file box, move the pointer to the menu bar and click. When you bring the pointer into the Structure window again, it will have the usual arrow shape.

2. Position the file

- When the pointer has turned into a miniature file box, move it into the Structure window. Do not hold the mouse button down while you do it.
- Place the file-box pointer where you want the upper-left corner of the new file box.
- Click. The new file box appears.

  4th Dimension gives each new file the default filename File*n*, where *n* is a number from 1 to 99. Even if you have renamed all previously created files, 4th Dimension continues to number newly created files sequentially.

Files, subfiles, links, and fields

A file is a collection of records, each record containing the data prescribed by the types of fields it contains—alphanumeric, text, real, integer, long integer, date, picture, or subfile type. You can have as many as 511 fields in a file.

Every subfile has one **parent file** to which it belongs.

A file that has a subfile is the **parent file** of the subfile. Each record of the parent file may have up to 32,767 records belonging to it in the subfile.

A subfile may contain the same types of fields as any other file. As far as the parent file is concerned, however, a subfile is simply another type of field.

❖ *By the way:* Subfiles are not the relational aspect of the 4th Dimension relational database. Links provide the relations between files and you may include subfiles in your linked structures. You may wish to think of a subfile as a field that can hold multiple entries.

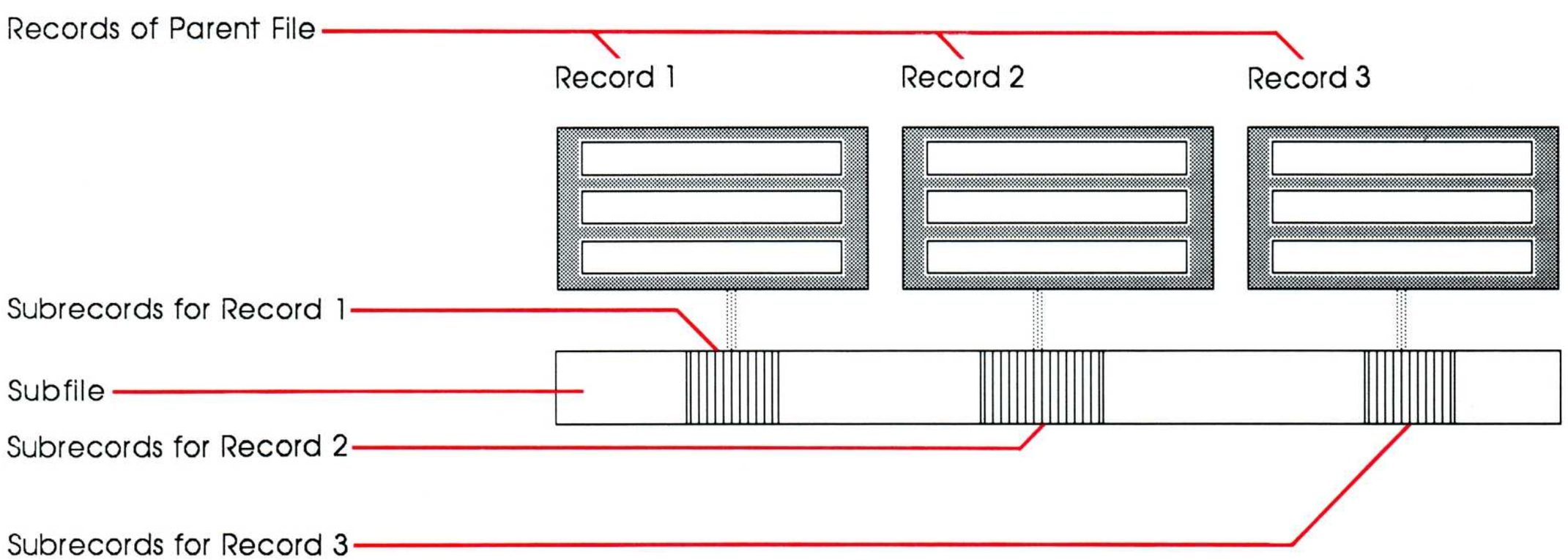


Figure 1-9
Subrecords and different parent records

Appendix A details 4th Dimension's capacities and limits.

Because a record can have 511 fields, and each field can be a subfile, a parent file may have 511 subfiles attached to it (to the limit of RAM).

For a list of field types, see "Setting Field Types and Attributes," later in this chapter.

The parent record to which the subfile is attached "sees" it as another type of field. Consequently, you create a subfile as you would any other field. *Subfile* is one of the eight field type categories. After you have created a subfile, you can add fields to it. Each subfile may also have up to 511 fields.

Levels of subfile

A file may have up to 511 fields. Any or all of those fields may be subfiles.

Each subfile may also have up to 511 fields. Any or all of *those* fields may be subfiles. You may "nest" subfiles in this way to five levels. Figure 1-10 illustrates how nested subfiles appear in the Structure window.

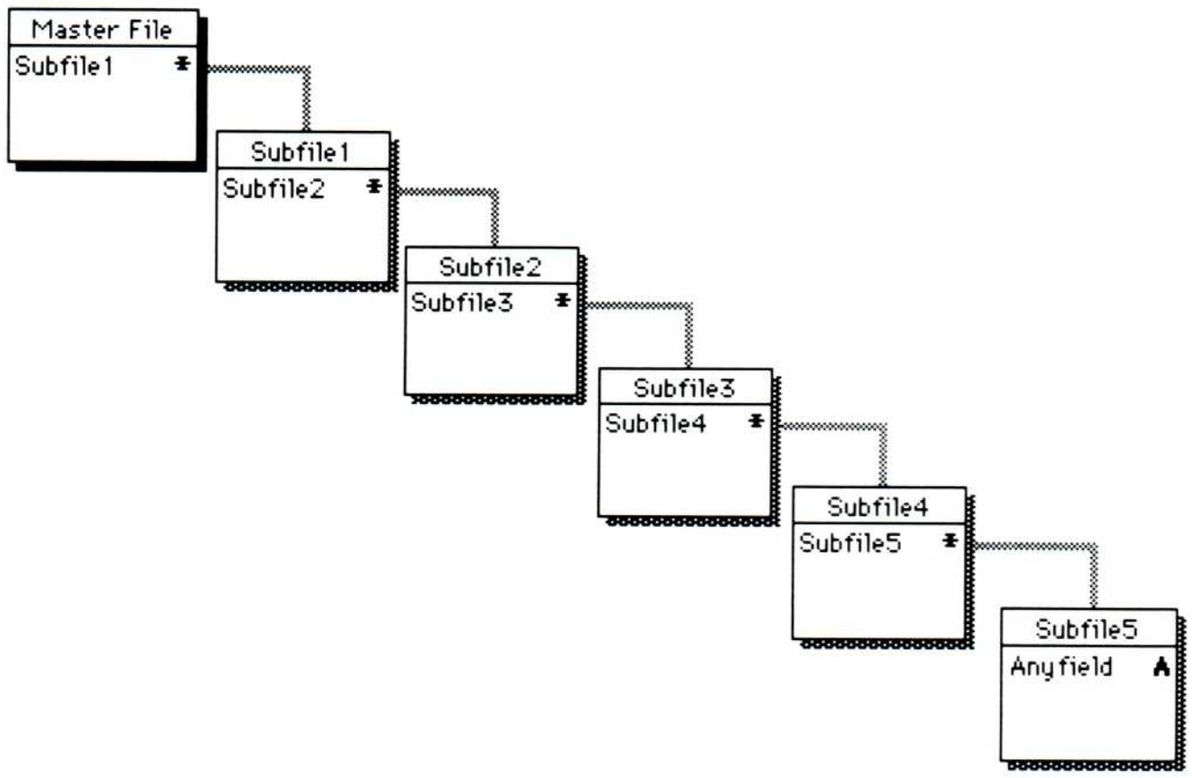


Figure 1-10
Subfiles nested to five levels

When to use a subfile

It's difficult to state categorically when and when not to use a subfile—every database application is different. Rules of thumb are

- **Use a subfile for lists within an individual record.** For example, in an invoice record, there may be an variable number of line items. You can handle such line items with subfiles.
- **Don't use a subfile when you may want to access the information in a subfile *without* going through the parent file.** You may access subfiles only through their parent files, and must identify the parent record before using the subfile records attached to it.
- **Don't use a subfile when RAM memory is limited.** 4th Dimension loads all the subfile records for each parent record into RAM when it loads the parent record. For a Macintosh computer with 1 megabyte of memory, about 100 subfile records per parent record is a "reasonable" number.

For a further discussion of subfiles see Chapter 5, "Relational Structures." See also Chapter 3 in *4th Dimension Programmer's Reference*.

Links

Links have their own chapter: Chapter 5, "Relational Structures."

Links are connections between files that allow you to use the data from the fields of another file. You create a link by drawing a link arrow from a field in a file that requires information to a field in another file that will supply the information. Figure 1-11 illustrates the parts of a link found in the Structure window.

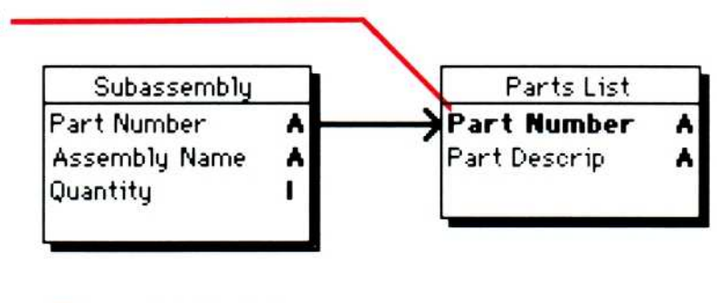


Figure 1-11
Parts of a link

You *must* index the linked field. 4th Dimension will automatically index the linked field if you don't.

A **view** of the database is a tabular organization of data *in relation* to other data in the database.

The combination of layouts and linking allows the database application developer to create a wide variety of database **views** for users. By using links, layouts, included layouts, and variables, you can even enter data into database views.

When to use linked files

As with subfiles, it is difficult to state categorically all the instances when to use and not to use linked files. There are several general situations when the linked file approach is more or less appropriate.

- **Use linked files to avoid needlessly saving the same data several times.** Links *point* to data in other files, rather than actually transferring it.
- **Use linked files where large lists exist to which many records (in one or more files) will refer.** When several files need to refer to the same data—customer addresses, for instance—it's easier to maintain overall database integrity by centralizing these data in linked files.
- **Use linked files for recursive applications.** Horse breeding, for example, requires links back many generations. The farther back you must go, the larger and more unwieldy your file structure will become without links.
- **Do not use linked files for "flat file" (single file) applications.** Name and address files and similar applications become needlessly complex with multiple linked files.
- **Do not use linked files for lists within individual records** (as in the example of an invoice with several line items). Subfile structures more accurately reflect the transactions such database applications are modeling.
- **Do not use linked files if you wish to search or sort records in one file on the basis of data they receive from other files.** For example, if you enter a part number into a layout that uses it to link into another file to retrieve and display a part name, you will not be able to sort the resulting list of parts by name—only by the part number that is part of the linking file.
- **Do not use linked files where there are relatively few members of a list that other records will refer to.** A list of 50 state abbreviations, for example, is a candidate for Standard Choices, not a linked file.

Standard Choices lists are covered later in this chapter.

Setting field types and attributes

Each field that you add to your file must be one of eight field types: Alpha (alphanumeric), Text, Real, Integer, Long Integer, Date, Picture, and Subfile. Each field may possess none, one, or more of six field attributes: Mandatory, Display only, Can't modify, Indexed, Unique, or Standard Choices.

Whenever you create a new field or alter an existing one, 4th Dimension displays its Add or Change Field dialog box. That dialog box sets a 20-character-wide alphanumeric field as its default field type, and proposes sequentially numbered field names of the form Field*n*, where *n* is an integer from 1 to 511.

You create a new field by selecting a file and choosing New Field from the Structure menu, or by double-clicking in an area of the file box not already occupied by a field name. 4th Dimension displays a dialog box that allows you to name the field and select field type and attributes. The following sections describe these processes in detail.

Figure 1-12 shows 4th Dimension's Add or Change Field dialog box.

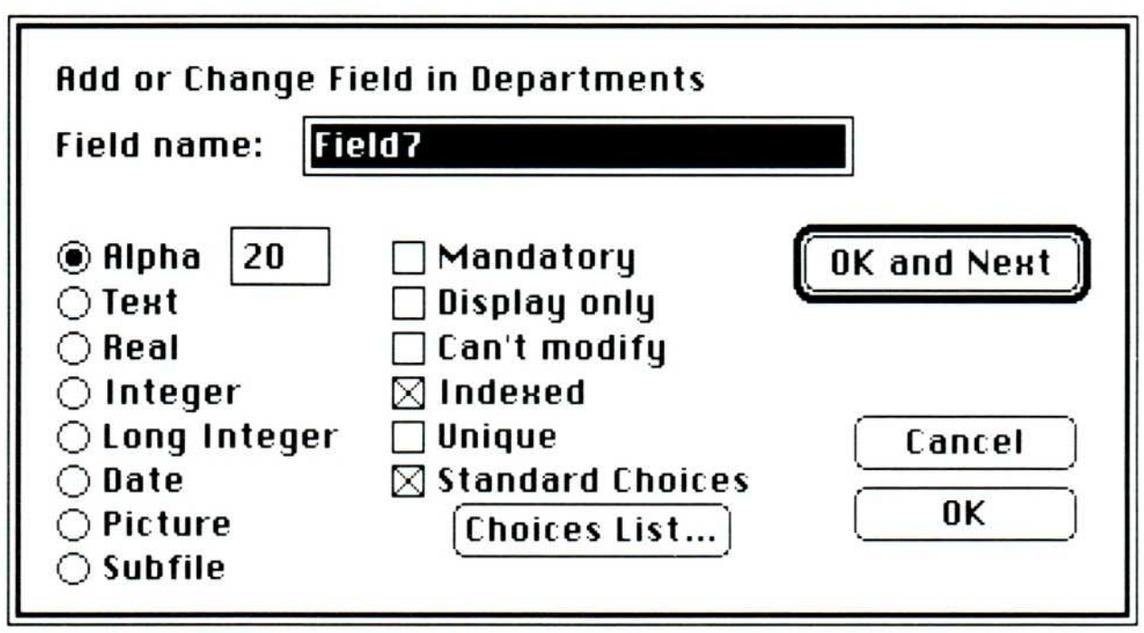


Figure 1-12
Add or Change Field dialog box

Field types

The eight field types are

- **Alpha:** Alpha is an alphanumeric field. The field contents can be between 2 and 80 characters long. Entering the Tab or Return characters moves the data entry cursor to the next field in the layout.
- **Text:** Text fields hold as many as 32,767 alphanumeric characters. Unlike fields of type Alpha, Text fields provide basic editing facilities, including the ability to scroll and word wrap. Text fields will accept a carriage return and move the data entry cursor to the beginning of the next line *within* the field. Double-clicking within a text field selects a word.

  You may paste documents into Text fields, such as those created by MacWrite™ (although you will lose formatting). You cannot index a Text field, but you may perform a non-indexed sequential search based on as many as all 32,767 characters of the field.
- **Real:** Real numbers are double-precision reals with a range of ±1E1022. They have an accuracy to 19 digits. You may have decimal places in Real number fields.
- **Integer:** An integer is a short (16-bit) integer. Its range is ±32,767. Integers have an accuracy to 4 digits. You may not have decimal places in Integer fields.
- **Long Integer:** A long (32-bit) integer has a range of ±2,147,483,647. It has an accuracy to 9 digits. You may not have decimal places in Long Integer fields.
- **Date:** Date fields can manage dates from the year 0 through the year 32,767.

- **Picture:** A Picture field stores documents (technically called *bit images,* or *pictures*) created by or manageable by MacPaint™, MacDraw™, digitizers, and other graphics programs. A Picture field has a maximum capacity of 32K bytes; however, whether a given picture will fit is dependent on the size *and* complexity of the picture. Pictures range in complexity from simple bit images to lists of MacDraw commands.
- **Subfile:** A Subfile field is a file attached to an individual record of a field. A single parent record's subfile can itself have up to 32,767 records, each record having as many as 511 fields of its own. Any of these fields may also be subfiles. Subfiles nest to five levels. 4th Dimension loads subfiles into memory when it loads their parent records. Use of subfiles is limited by RAM.

Warning 4th Dimension loads into memory all the subfiles for a given parent record. Consequently, an application with many subfiles or many subfile records may exceed the memory capacity of your computer. This is another good reason for restraint when designing systems that use subfiles.

Changing field types

You may alter field types even after you have entered data into your database application. 4th Dimension converts any existing data when you switch environments from Design (where you've changed the field type) back to User or Custom. There are some restrictions. You may not change a field of type Subfile into anything else, even if you have not placed any fields in it, although you may delete the subfile.

Data converts according to Table 1-1.

Table 1-1
How 4th Dimension converts existing data when you alter field types

Old field type	Restrictions	New field types	Converts to
Alpha, Text	Numerals only	Long Integer, Real	Equivalent value
Alpha, Text	Numerals only	Integer	Value *modulo* 65536
Alpha, Text	Mixed numerals/alphabetic	Long Integer, Real	Concatenates all numerals into a number and throws away alphabetics
Alpha, Text	Mixed numerals/alphabetic	Integer	Concatenates all numerals into a value and produces the value *modulo* 65536.
Real, Integer, Long Integer, Date		Alpha, Text	Alphanumeric of value
Real		Integer, Long Integer	Truncates value
Integer, Long Integer		Real	Value
Integer		Long Integer	Value
Long Integer		Integer	Value *modulo* 65536

For example,

- The Alpha or Text field "1234567890" becomes the Real field 1234567890, and the Long Integer field 1234567890; but it becomes the Integer field 722.
- The Alpha or Text field "Now is the 1234 time for 5678" becomes the Real field 12345678, and the Long Integer field 12345678.
- The Real field 12345.67890 becomes the Integer or Long Integer field 12345.
- The Long Integer field 65,536 becomes the Integer field 0; the Long Integer field 32,768 becomes the Integer field -32,768. A 0 value remains 0.

Important 4th Dimension retains the original value of the field if you do not modify the record. For example, if you change the Alpha field containing "This is the time 1234" to Real and arrive at 1234, you can change the field *back* to Alpha and recapture the alphabetic part of the entry.

Field attributes

Each field may have none, one, or more attributes. Unlike field types, attributes are optional. Figure 1-13 points out the check boxes for field attributes in the Add or Change Field dialog box.

Figure 1-13
Field attribute check boxes

The Mandatory field attribute affects linking. See Chapter 5, "Relational Structures."

The six field attributes are

- **Mandatory:** 4th Dimension will not save a record if the user has failed to make an entry in a Mandatory field.
- **Display only:** You may not manually enter a value in a Display only field. You may create a procedure, however, that can enter a value for you.
- **Can't modify:** 4th Dimension accepts an *initial* entry into a Can't modify field, and will allow you to change and edit the entry until you save the record of which it is a part. Afterward, you cannot modify the value in that field.
- **Indexed:** Indexing a field makes searching on that field faster than 4th Dimension's sequential search. You may index Alpha, Real, Integer, Long Integer, and Date fields. There is no primary index that 4th Dimension creates as a default; you must specify which fields you want indexed. 4th Dimension has no default sort organization of records.

  4th Dimension creates and automatically updates an Index table as you add and delete records. If you add indexing as an attribute to an existing field, 4th Dimension indexes the existing data when you leave the Design environment for the User or Custom environment. The Structure window displays Indexed fields in boldface.

  An index creates a desktop file that increases the size of the database. Do not arbitrarily index fields; they are much faster at searches and sorts but increase database storage requirements and data entry time.
- **Unique:** A user may not manually enter duplicates among Unique field values. A procedure, however, may successfully enter more than one identical value. You must index a field *before* you may check Unique.

  Subfile fields that are checked Unique will ensure a unique value *throughout the entire subfile,* not just that portion of it pertaining to an individual parent record.
- **Standard Choices:** If you give a field the Standard Choices attribute, the Choices List button becomes active. Click this button for a dialog box in which to enter a list of choices for the field.

❖ *By the way:* You may index as many as 32,767 fields in a database. However, 4th Dimension's own Search by Index dialog box will show only the first six indexed fields for each file. You may create your own dialog box to specify any set of indexes, and may write your own procedure to search through records based on them.

You *must* index linked fields. If a linked field is also mandatory, an attempted link to a non-existent record will cause 4th Dimension to give you the choice of creating that record or not.

See Chapter 5, "Relational Structures," for more information on linking, the importance of indexing, and the effect of mandatory fields.

Standard Choices

The Standard Choices attribute allows you to create a list of prepared entries from which your users may pick when entering data. Using the Standard Choices attribute

- ☐ Provides a suggested list from which your users may select.
- ☐ Speeds the data entry process.
- ☐ Helps ensure correct spelling and eliminate typos.
- ☐ Clears up user uncertainty about abbreviations.

In either the User or Custom environments, when the pointer comes to a field where the Standard Choices attribute is set, the Choices window opens and displays the list of choices. A user may click one of the choices, which 4th Dimension immediately enters into the proper field.

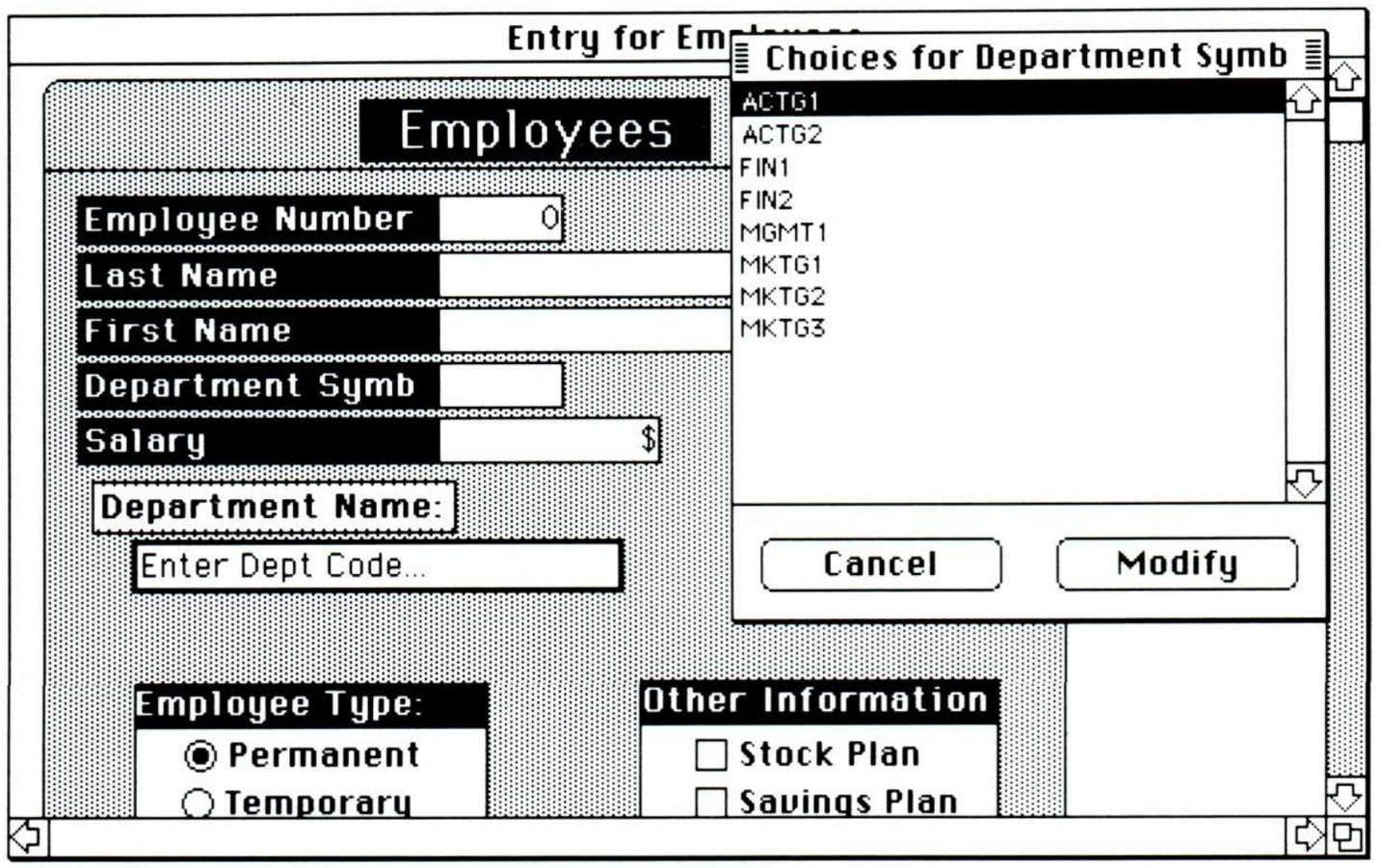


Figure 1-14
Standard Choices box for a typical application

Using Standard Choices does not preclude entering a nonstandard choice into a field. The user may cancel the window and enter a field value manually, or, if you have allowed it when setting up the Standard Choices list, modify the available choices by adding or deleting a choice or changing an existing choice.

You may select one of the choices in several ways. If you have sorted the entries in a list of Standard Choices, you may enter the first few characters of the choice and 4th Dimension will select it (4th Dimension will also make a selection if you have *not* sorted the list, but this is far less effective because 4th Dimension selects the *first* choice that matches what you type).

4th Dimension permits up to 8,192 Standard Choices entries per database, each a maximum of 30 characters long. When you select a choice from the list, 4th Dimension enters it in the appropriate field. 4th Dimension enters the value itself by copying the value from the list; it does *not* use a pointer to the value. Consequently, if you change a value in a list of standard choices, no other values in the database will change.

During data entry, you can immediately edit fields with standard choices.

When to use Standard Choices

For a technique that emulates a Standard Choices window with linking, see the section "Linking to Duplicate Records" in Chapter 5, "Relational Structures."

Use the Standard Choices attribute whenever you want to standardize your users' input, avoid misspellings, and keep entries to a relative few common selections (8,192 is a large number of items to have in a single list). If the possible list of choices for a field contains hundreds of items, or if you must enter a single item in several different fields, use files and links to emulate the Standard Choices list. Using links also circumvents the 30-character entry length limit of the Standard Choices list.

Using the Standard Choices editor

When you click the Standard Choices check box in the Add or Change Field dialog box, 4th Dimension activates the Choices List button. You may click the Choices List button then, or return to it later.

If you click the Choices List button, 4th Dimension displays the editor for Standard Choices. Figure 1-15 illustrates the editor.

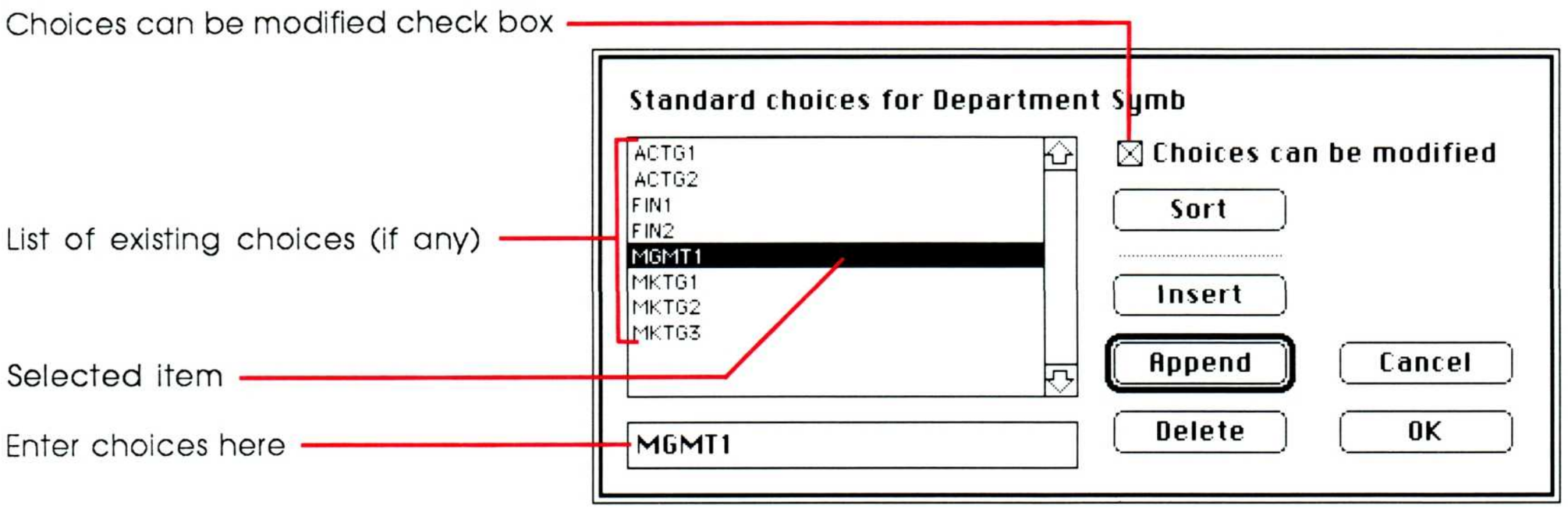


Figure 1-15
Editor for Standard Choices box

How to add and modify fields

The following how-to sections tell you step-by-step how to add fields to your database, how to modify that field description once you have created it, how to create the link arrow between files, and how to save and delete individual fields and files.

Adding a field

To add a new field to your file, you must name the field, select a field type, and optionally select field attributes.

You may have up to 511 fields per file, including fields of type Subfile.

4th Dimension always adds new fields to the end of the list of fields in the file box.

Important: You cannot reorder the names of fields once they are in the file box. You may only delete fields and enter new ones.

1. Add a new field

1. Select a file by clicking that file's filename bar.
2. Choose New Field from the Structure menu.

   Or: You may double-click in the unoccupied white area of the file box to create a new field.

   4th Dimension displays the Add or Change Field dialog box.
3. Enter the name of the field into the Field name area.

   Field names may be up to 15 characters long. You may use spaces in your filename.

   Important: 4th Dimension removes leading and trailing spaces from field names.

2. Select a field type

1. Click a field type radio button from the list on the left side of the dialog box.

- To set the size of the Alpha field, enter a number from 2 to 80 in the box adjoining the Alpha button. This represents the number of characters you will permit the user to enter into the field.

See also Chapter 4 in *4th Dimension Programmer's Reference*.

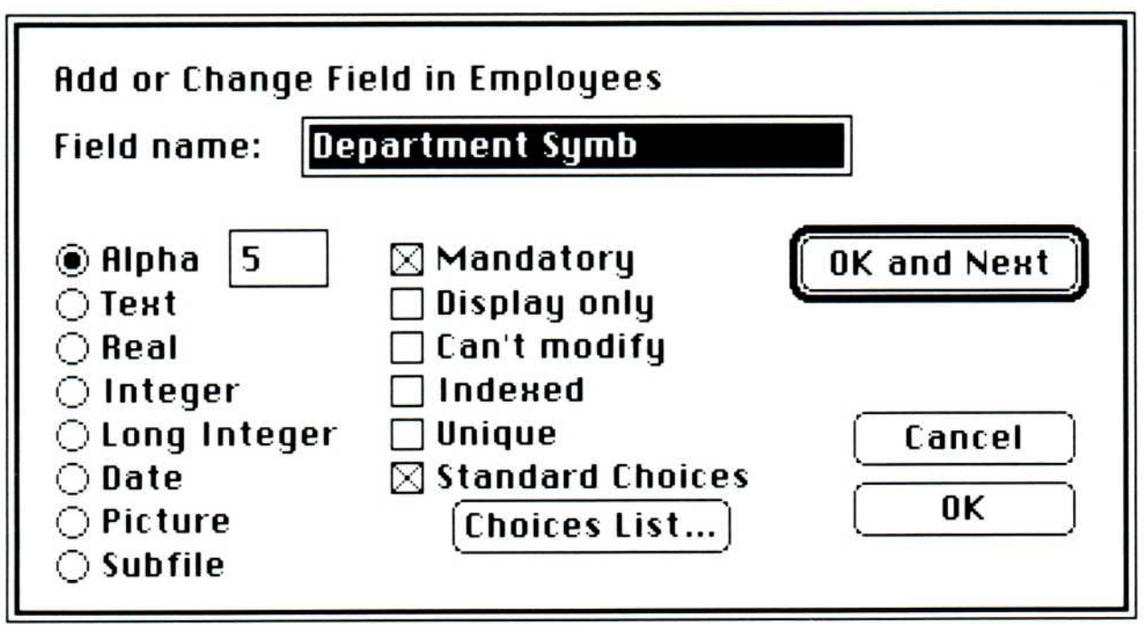


Figure 1-16
Add or Change Field dialog box

3. Select field attributes

- Click field attributes from the list of check boxes in the dialog box. You may select none, one, or several attributes for any one field.
- To click Unique, you must first click Indexed.
- To create a list of enumerated choices for the field you are defining, click the Standard Choices check box, then click Choices List.

  See also Chapter 4 in *4th Dimension Programmer's Reference*.

4. Add more fields or return to Structure window

- To go on immediately and create another field, click the OK and Next button. This button is also the default choice; pressing Return also acts as OK and Next.
- To return to the Structure window with the current field name, type, and attributes (if any) set, click OK.
- Click Cancel to return to the Structure window without having added a new field.

  You may create up to 511 fields per file, including subfile fields.

Modifying a field description

You may wish to modify an existing field description by changing an Alpha field to Text, an Integer field to Real, and so forth.

You may modify field types even after you have data in your database.

You may rename fields.

Important: Do not use the same name for two different fields. 4th Dimension will only recognize the first.

See also Chapter 4 in *4th Dimension Programmer's Reference.*

1. Select the field name

- Double-click the field name. 4th Dimension displays the Add or Change Field dialog box.

  Or: Select the field name by clicking it, and choose Modify Field from the Structure menu.

2. Change the field description

- Change the field name, field type, list of standard choices, or field attributes by clicking or entering as appropriate in the Add or Change Field dialog box.

3. Finish up

- Click OK to accept your changes, click OK and Next to accept them and create another field, or click Cancel to abandon your changes.

  If another field already follows the one you're modifying, clicking OK and Next allows you to modify the next field, rather than create a new field.

Setting Standard Choices

Standard Choices lets you present your users with a set of prepared entries.

You may have up to 8,192 choices per database, each a maximum of 30 characters long.

1. Display the Standard Choices editor

1. Create a field or modify an existing field.

   4th Dimension displays its Add or Change Field dialog box.

2. Click the Standard Choices check box. If the Standard Choices check box is already clicked, do not *un*click it.

   4th Dimension activates the Choices List button.

3. Click the Choices List button.

   4th Dimension displays the editor for the Standard Choices list.

2. Enter choices

1. Enter a choice in the editing area.

   4th Dimension echoes the text you enter by simultaneously placing it in the list.

2. Click Append to select the next unoccupied line for another entry.

   Or: Press Return to select the next unoccupied line and prepare for another entry.

   Or: Double-click the existing selection to select the next unoccupied line for entry.

3. Continue entering choices in this fashion.

4. Click on Choices can be modified if you want the user of the application to be able to modify and add to the list.

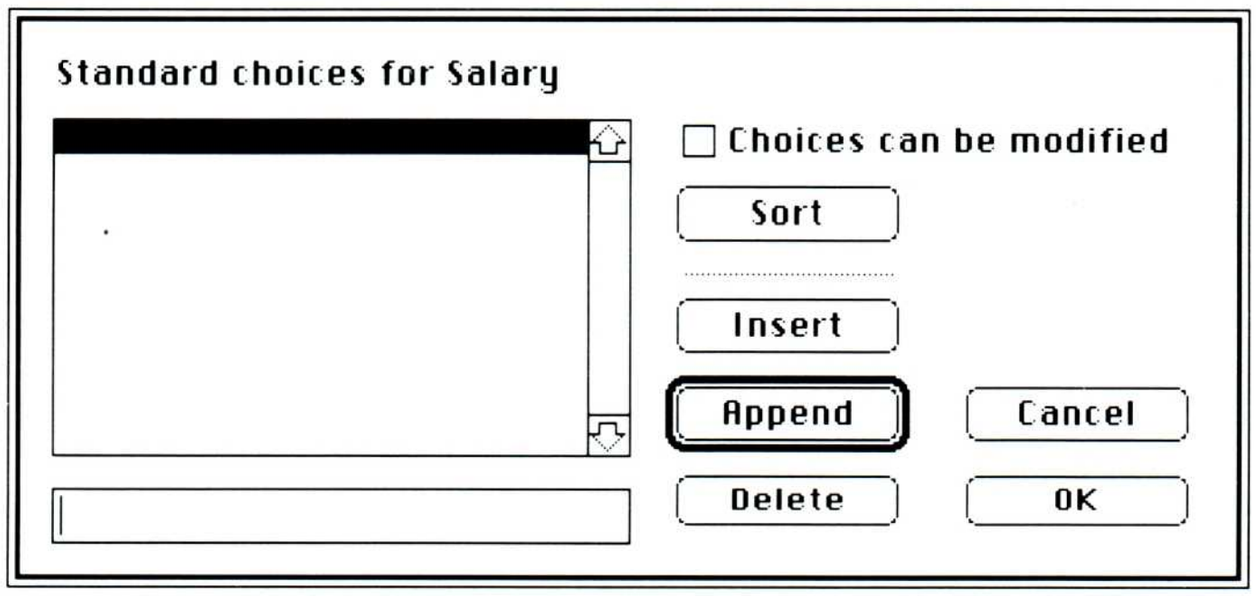


Figure 1-17
Blank Standard Choices editor dialog box

Insert a choice

1. Open the Standard Choices editor for a field with an existing list of choices, or create a list.
2. Select a choice before which you wish to enter a new choice.
3. Click Insert.

   4th Dimension opens an unoccupied line by moving down the choice you selected earlier and all following choices. The unoccupied line remains the selection.
4. Enter the new choice.

Sort the choice list

1. Open the Standard Choices editor dialog box for a field with an existing list of choices, or create a list.
2. Click Sort.

   4th Dimension sorts the list of choices alphabetically.

   If you have a list of numerals (not *numbers*) as your choices, 4th Dimension sorts *them* alphabetically, too, by ASCII code. Numerals do not sort numerically; only numbers sort numerically.

   Important: The first item will be the default selection when 4th Dimension displays the list to the user. A user may select it by pressing Return.

Delete a choice

1. Select a choice.
2. Click Delete.

   4th Dimension deletes the choice and closes ranks.

Finish up

- Click OK to accept the Standard Choices list as you have prepared it. 4th Dimension returns you to the Add or Change Field dialog box.
- Click Cancel to return to the Add or Change Field dialog box without creating a list of standard choices.

Creating a subfile

Any or every field in a file may be a field of type Subfile. Each such subfile may hold up to 511 fields, any or all of which may also be fields of type Subfile. You may nest up to five subfiles.

Each parent record may hold up to 32,767 subfile records.

1. Select a file

- Select an existing file from the files in the Structure window, or create a new file.

  Select a file by clicking the filename bar or by selecting any field name within the file.

2. Make a field of type Subfile

1. Choose New Field from the Structure menu. 4th Dimension displays its Add or Change Field dialog box.
2. Enter the name of the new field of type Subfile. This will also be the name of the subfile itself.
3. Click Subfile as the field type. Notice that the normal field attributes are no longer available. This is because Subfile is a different type of field.
4. Finish up the field of type Subfile definition. Click OK to accept the new subfile and return to the Structure window. 4th Dimension displays the new subfile in the database structure.

   Or: Click Cancel to return to the Structure window without creating a new subfile.

   Or: Click OK and Next to create another field for the same file. The next field need not be a field of type Subfile.

3. Build the subfile

1. Select the subfile from the database structure in the Structure window.
2. Choose New Field from the Structure menu. 4th Dimension displays its Add or Change Field dialog box.
3. Define the first field of the new subfile by filling in the dialog box as you would for any field.
4. Finish up after you have defined the fields you wish.

Making a link

Drawing a link arrow between fields is the first step in creating linked files.

Unless you're creating a recursive link, you must have at least two files in your database.

For more details on linking, see Chapter 5, "Relational Structures," and Chapter 5 in *4th Dimension Programmer's Reference.*

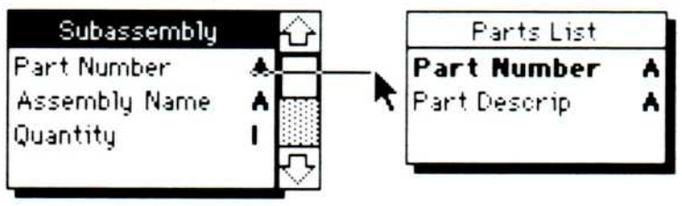


Figure 1-18
In the process of linking files

1. Draw a link arrow

1. Position the pointer on the field name of the linking field.
2. Press and hold the mouse button. Drag a short distance.

   4th Dimension displays a thin, elastic line. 4th Dimension also selects the field and file you're working with.
3. Continue dragging the pointer to the linked field.

   The linked field may be in another file, or in the same file (for a recursive link).

   You may link from a subfile to a file; but links from a subfile to the subfile of another parent file must also go through that other subfile's parent file.
4. Release the button. 4th Dimension draws a heavy, black linking arrow between the linking field and the linked field.

❖ *By the way:* A heavy black line connects linked files from field to field. A gray line connects a parent file's Subfile type field with the *top* of the subfile's file box.

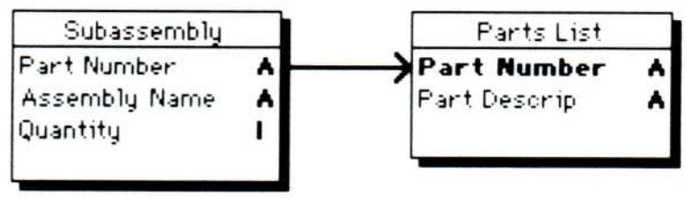


Figure 1-19
Files after linking

2. Index the linked field

1. Select the linked field and choose Change Field from the Structure menu.

   Or: Double-click the linked fieldname.

   4th Dimension displays its Add or Change Field dialog box.

2. Click the Indexed check box.

   You cannot index a Text field.

3. Finish up. Click OK to index the linked field. 4th Dimension displays an Indexed field in boldface.

   Or: Click OK and Next to index the linked field and move on to the definition of the following field (you may index that field too, but it will have no effect on this link).

   Or: Click Cancel to return to the Structure window without indexing the linked field.

Make the linking field Mandatory

1. Display the Add or Change Field dialog box for the *linking* field.
2. Make the linking field Mandatory by clicking the Mandatory field attribute.
3. Finish up by clicking OK to make the linking field Mandatory.

If a linking field is Mandatory and the linked field has no match, 4th Dimension will ask if you want to create that record.

See Chapter 5, "Relational Structures," and the section "Linking to 'Duplicate' Records" in that chapter regarding Mandatory fields and using the @ character as a wildcard.

Remove a link arrow

1. Position the pointer on the linking field and drag as you did to create the link arrow.

   4th Dimension extends the thin elastic line again.

2. Drag the elastic line to an area of the Structure window between file boxes.
3. Release. 4th Dimension removes the link arrow.

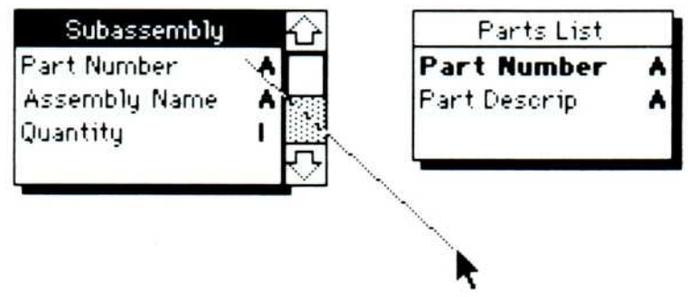


Figure 1-20
Removing a link arrow

Deleting files and fields

Although you may not reorder the field names within a file box, you may delete individual fields. You may also delete entire files from a database.

Warning: Back up your database before deleting either fields or files. Deleting considerably alters the structure of your database. It takes 4th Dimension a few moments to complete the process. Should power fail, you would likely lose your database and all its data.

Delete a file

1. Select the file you wish to delete from the Structure window by clicking the filename bar.
2. Choose Delete File from the Structure menu.

Delete a field from a file

1. Select the field you wish to delete by clicking it while in the Structure window.
2. Choose Delete Field from the Structure menu.

❖ *By the way:* If you remove a field from a linked file, 4th Dimension removes all the linking arrows pointing to that file.

Chapter 2

Layout Design Basics

A layout is the route by which information goes into and comes out of 4th Dimension. Layouts control what users see on the screen, what they print on the printer, and what they import and export.

Layouts are inherently graphic. You may use elements as diverse as pictures, radio buttons, check boxes, and business graphs along with more traditional database form elements such as alphanumeric character fields of limited length, long editable text fields, and formatted numeric fields. Figure 2-1 shows a simple layout, and Figure 2-2 shows a layout that uses many of the more graphic elements available to you.

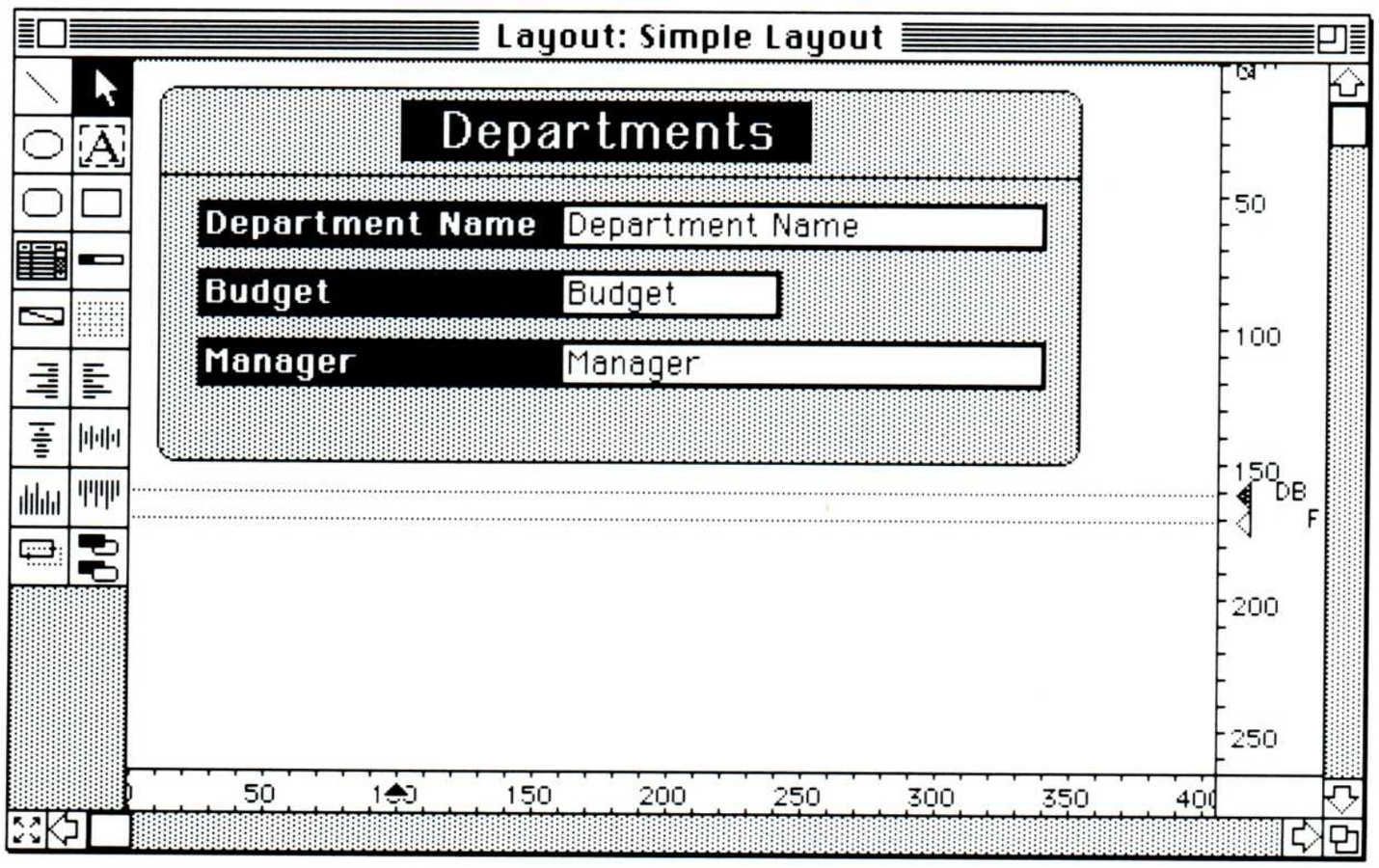


Figure 2-1
Simple layout

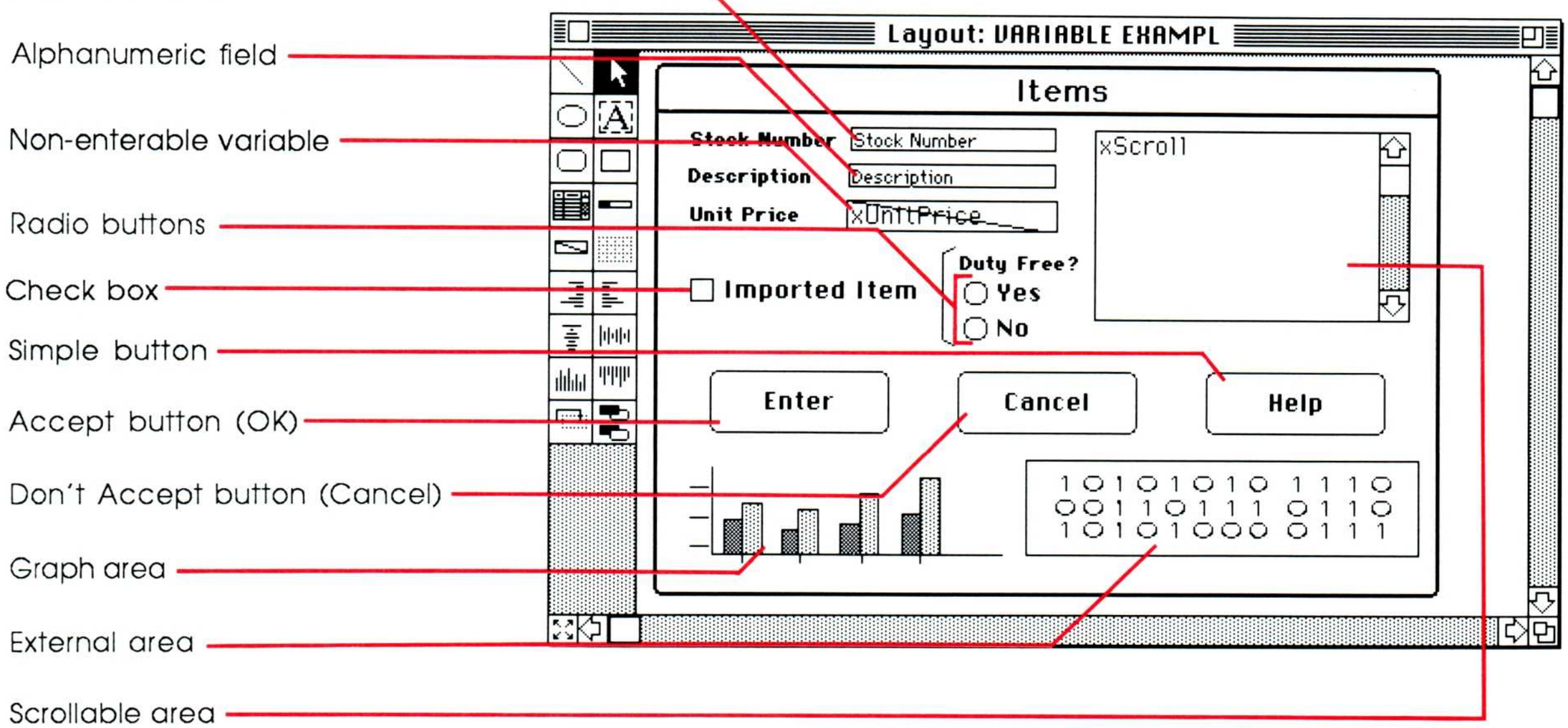


Figure 2-2
Complex layout

An **included layout** is a layout displayed within another layout. **Control lines** appear in the Layout window. A **layout element** is any object used in a layout.

This chapter concerns itself with layout design and with operating the commands that produce buttons, **included layouts,** fields, and variables. *Applying* those buttons, included layouts, **control lines,** and other **layout elements** is left to be described in other chapters (particularly Chapter 6, "Creating a Custom User Interface") and in *4th Dimension Programmer's Reference*.

File, record, and layout

For more on how to create files and describe the fields they contain, see Chapter 1, "Database Structures."

A **file** is a collection of records, each record containing data organized according to the type and order of the fields specified for the file. Any record belongs only to one file, and there may be many similarly constructed records in that file.

A layout also belongs to a specific file. The fields and other layout elements in the layout usually refer to the fields of the file to which the layout belongs. A layout, however, is not necessarily a direct representation of a record. Layouts are *decoupled* from a file's records. They are templates through which you enter and view the data that is actually stored in the records. They are not the records themselves. Consequently, different layouts can display the same record in different ways, and you can use the same layout to enter different records. Figures 2-3 and 2-4 show this conceptually.

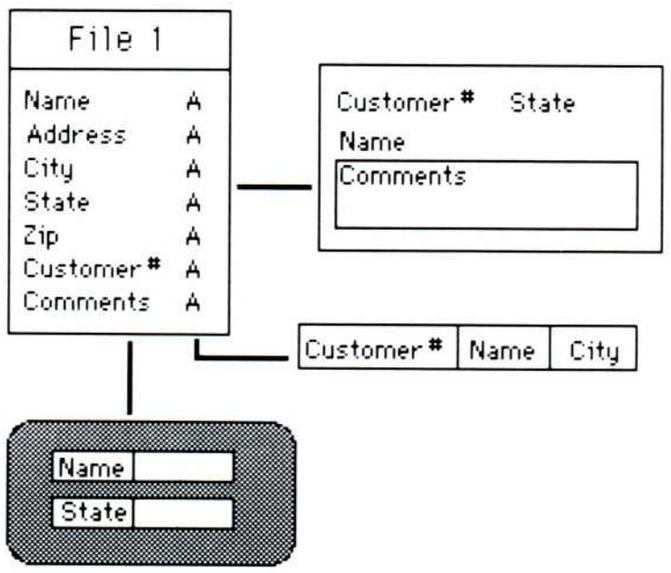


Figure 2-3
Same record displayed differently by different layouts

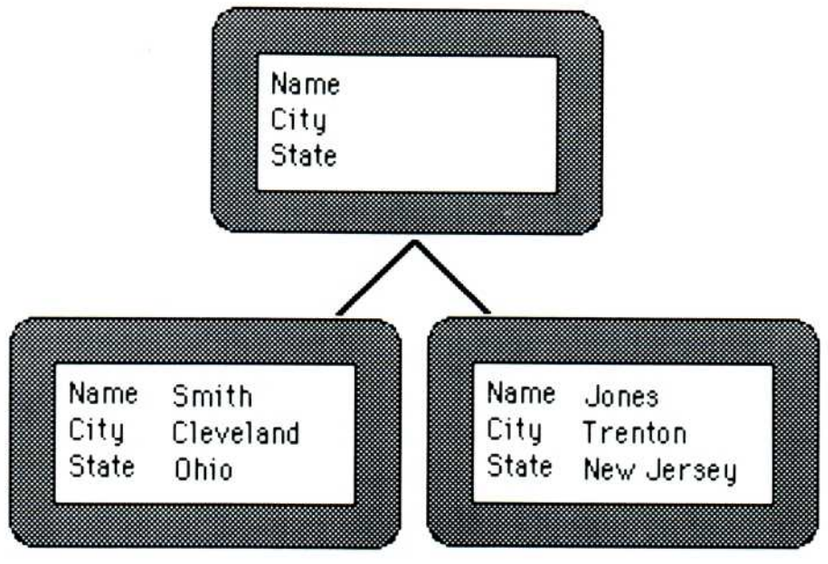


Figure 2-4
Different records created by same layout

When you design a layout, you may pick and choose the fields you display. You may elect to use variables, radio buttons, check boxes, or other elements, and a **layout procedure,** to read and write—or even *deduce* from input—field values that are not actually entered by the user. There are instances when fields need not appear on a layout at all.

A **layout procedure** is a series of programming statements that execute each time the program displays a particular layout. Layout procedures are mentioned later in this chapter, covered in more detail in Chapter 4, "Procedures," and covered extensively in *4th Dimension Programmer's Reference*.

With layouts, you also have the capability of displaying fields from other files, displaying and changing values from linked files, and including entire layouts from subfiles or other files in the database structure.

Important Layouts are decoupled from a file's records, but still belong to only one file.

A layout need bear little resemblance to the individual record it represents; it may be an exact representation of each and every field in the record; or it may fall somewhere in between. It is your choice as a 4th Dimension designer.

Because layouts and records are separate entities, you may use many different layouts to obtain different views of the same database. A 4th Dimension database application may have as many as 32,767 different layouts (to the storage capacity of your media).

Layouts and procedures

Each layout you create may have one (and only one) procedure, called a layout procedure. A layout procedure is a series of 4th Dimension programming statements that the application executes each time its associated layout is active on screen. A layout is not required to have any procedure; but if it does, one is all it may have.

A layout may or may not correspond directly to the fields in the record it represents—because of buttons, as only one example, which are not fields. In that case, the layout procedure interprets the button clicks and determines the field value. Other reasons for using a layout procedure include the following:

You can find a more detailed explanation of layout procedures in Chapter 4, "Procedures," and in *4th Dimension Programmer's Reference*.

- ☐ You may have chosen not to represent every field of the record in your layout. The fields you do not represent may require a default value before you add the record to the database; a layout procedure can supply such a value.
- ☐ The file whose layout you're working with may link to another file. You may want the layout for File1 to read data from a record in linked File2. The layout procedure makes the link and reads the correct data from the correct record in the other file.
- ☐ You may wish to validate input as your user enters it.
- ☐ You may wish to calculate values such as extended pricing on invoices. In 4th Dimension, you may also compute graphs based on data in the record.
- ☐ You may wish to deduce correct field values based on other fields or variables. For an extreme example, consider a "symptoms" layout for medical diagnosis. The layout procedure would make the diagnosis and place its finding in the Diagnosis field—a field that never appears on the data entry layout.

Because a layout procedure is a series of programming statements, there are six events or conditions that are tied to a layout's use and control when particular statements are valid. These events comprise 4th Dimension's **execution cycle.** Six Boolean functions determine when the events or conditions are valid.

Chapter 4, "Procedures," describes the **execution cycle** at some length.

Three of the events depend on displaying the layout. These events are

- **Before:** Before is true *before* 4th Dimension displays a layout. Use it for linking, or for clearing and initializing variables, for example.
- **During:** During is true *while* 4th Dimension is displaying a layout, and *while* a user is entering data.
- **After:** After is true *after* the user presses Enter or clicks the Accept button to signify that data entry for a layout is complete. You may wish to validate input when After becomes true. By convention, there is no valid After condition for output layouts.

Three other conditions pertain primarily to printed output (although they, too, apply to layouts displayed on screen). You can control what part of the layout 4th Dimension prints while these conditions are valid by setting the layout control lines. Check whether the appropriate condition is true in the layout procedure, and execute any processing for those areas of the layout (subtotals in footers, for example).

See the section "Rulers, Margins, and Control Lines" later in this chapter for information on setting Header, Break, and Footer positions.

- **In Header:** For output, In Header controls the processing at the top of the page or screen. There is one header per page.
- **In Break:** In Break controls the processing during a break-on-field-change condition for sorted fields when printing a report. You may wish to calculate a subtotal during a break-on-field-change condition and at the end of a report.
- **In Footer:** In Footer controls the processing at the bottom of the page or screen. It usually contains formulas for totaling columns and similar calculations. There is one footer per page.

A layout procedure uses the six Boolean functions to see whether to execute its statements.

A **file procedure** is a procedure that executes before any input layout in its file. See Chapter 4, "Procedures."

Another type of procedure connected with layouts is the **file procedure.** A file may have one file procedure. The file procedure executes whenever 4th Dimension displays *any* of the input layouts belonging to the file (there are two instances when it does not; see Chapter 4, "Procedures"). It executes before the first statement of any layout procedure. File procedures are useful when you wish to execute programming statements every time 4th Dimension displays any layout from a particular file.

Important The complete execution cycle is far more complex than represented here, and a detailed exposition is beyond the scope of this manual. You should refer to *4th Dimension Programmer's Reference* for a detailed discussion of precisely when in a layout procedure the different conditions become valid. In particular, included layouts and nested subfiles introduce another level of complexity.

Types of layout

Layouts are of different "types" depending on the use to which you put them. Design, the setting of the control lines, use of fields and variables, and, most importantly, the nature of the layout procedure, determine the "type" of layout you create. There are layouts for input, for output to the screen, for output to the printer, for use as included layouts, and for dialogs.

The layouts themselves are really all the same. That is, it is possible for you to use one layout for every purpose in your application—input, output, printing, and so on. It is also possible to apply a layout you designed with one purpose in mind (input, for example) to another purpose (say, output). You can easily understand, however, that a layout that makes extensive use of buttons would be of very little use when sent to a printer.

Another factor that determines the layout type is the underlying layout procedure. Layout procedures make a layout more than a simple form. They validate input, calculate output, and perform linking. The nature of the layout procedure is a critical determiner of the type of layout you create.

Important While you can use the same layout for different purposes, features such as buttons, variables, and the layout procedure will make that layout more or less appropriate to its new role.

The following points describe the distinguishing characteristics of the different types of layouts.

- **Input layouts:** Input layouts appear one at a time on the screen. A user may display and enter data directly into fields, may use buttons or check boxes, and may use variables (other than buttons) only to display data.
- **Output layouts (to screen):** Several output layouts may appear on the screen at one time. There is no After condition for output layouts; 4th Dimension ignores layout programming meant to execute in the After condition. 4th Dimension *will* execute programming in the In Header/In Footer conditions set by the control lines.
- **Output layouts (to printer):** Control lines manage details such as page headers, footers, and calculations at field breaks for layouts intended for printer output.
- **Included layouts:** On screen, several included layouts may appear at the same time in a scrollable area. When included layouts are part of another layout sent to a printer, they behave according to the Frame setting in the Format for an Included Layout dialog box. You must be able to use included layouts for both input and output, which puts both input and output restrictions on the use of variables, buttons, and the layout procedure for the included layout.
- **Dialogs:** Dialog layouts appear one at a time on the screen when called by 4th Dimension's DIALOG command. A user must enter data into a dialog layout through variables, buttons, and check boxes, and can use fields to display data only.

The Format for an Included Layout dialog box appears in the section "Including One Layout in Another Layout" later in this chapter, and again in Chapter 5, "Relational Structures."

Layout styles

When you create a new layout, 4th Dimension presents you with nine choices for layouts in the New Layout dialog box. Figure 2-5 illustrates the choices as they appear in the dialog box.

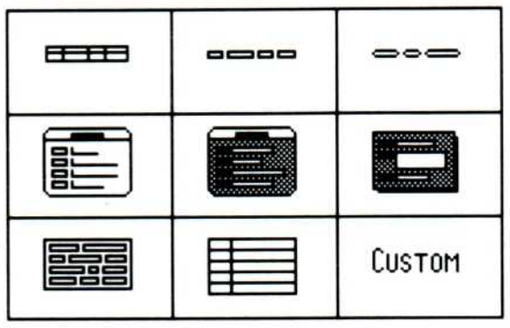


Figure 2-5
Nine choices for layouts

While you may use any of the layout styles to produce any kind of layout or dialog box, note the following guidelines:

- Use the rectangular layouts with rounded corners or with square corners primarily as input layouts (they resemble forms). Input layouts appear one at a time.
- Use the single-line layouts primarily as output layouts. They allow you to construct tables, with one record to a line—especially useful for the typically tabular output from databases.
- The custom layout choice requires you to construct a layout manually, element by element.

The first eight choices produce automatic layouts. An automatic layout is one in which 4th Dimension arranges for you the fields you select in the form of the layout style that you pick. You may then alter the layout to suit your application. If you select no fields, 4th Dimension assumes you want to include *all* fields.

The ninth choice is for a custom layout. You must create a custom layout. The custom layout choice is useful for preparing dialog layouts and other layouts of nonstandard shapes, sizes, and contents.

Important If you select fields from a linked file for 4th Dimension to place in your layout, 4th Dimension automatically generates a linking procedure. See Chapter 5, "Relational Structures," for details on automatic linking procedures.

Figures 2-6 through 2-21 show in turn the type of layouts that each one of the first eight layout styles produces in order that they appear in the New layout dialog box. Style 9 is the custom layout. You must decide how a custom layout looks.

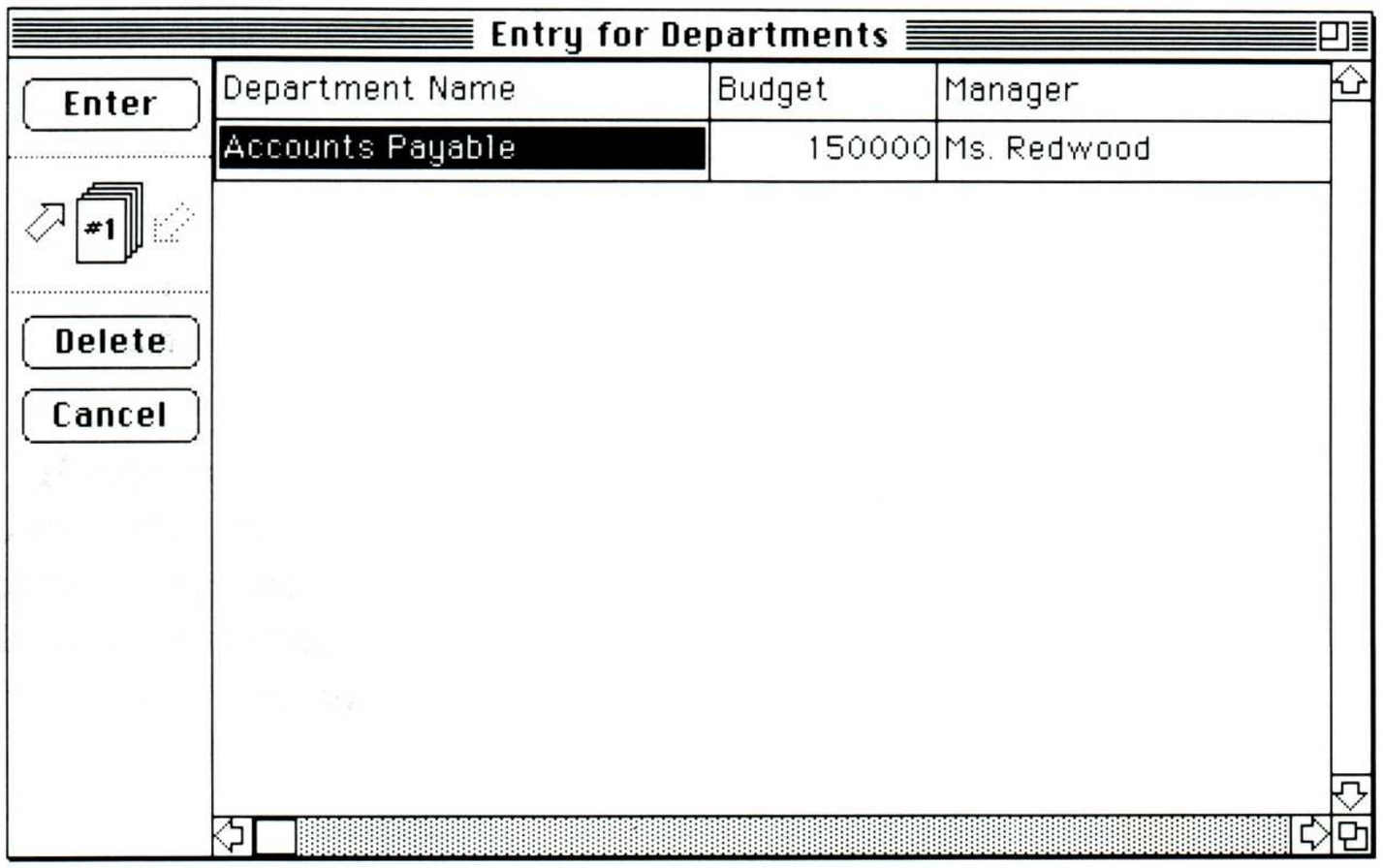


Figure 2-6
Style 1 as input layout

Departments : 7 of 7

Department Name	Budget	Manager
Accounts Payable	150000	Ms. Redwood
Accounts Receivable	255750	Ms. Worthington
General Management	350000	Mr. Roberts
Product Development	230000	Mr. Handel
Loan Department	115000	Ms. Abrams
Advertising	475000	Ms. Halcomb
Forecasting	153000	Mr. Knowitall

Figure 2-7
Style 1 as output layout

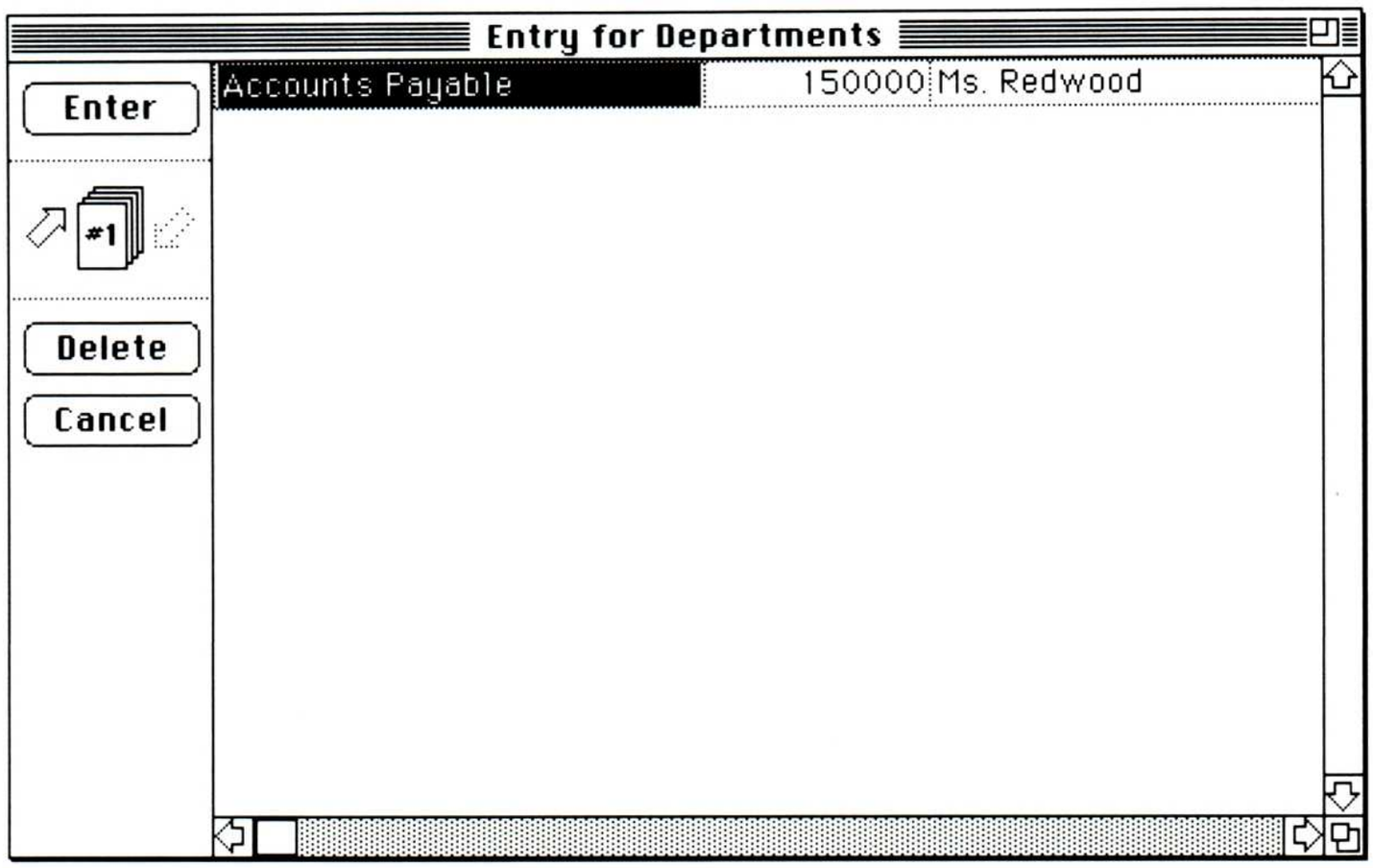


Figure 2-8
Style 2 as input layout

Departments : 7 of 7

Accounts Payable	150000	Ms. Redwood
Accounts Receivable	255750	Ms. Worthington
General Management	350000	Mr. Roberts
Product Development	230000	Mr. Handel
Loan Department	115000	Ms. Abrams
Advertising	475000	Ms. Halcomb
Forecasting	153000	Mr. Knowitall

Figure 2-9
Style 2 as output layout

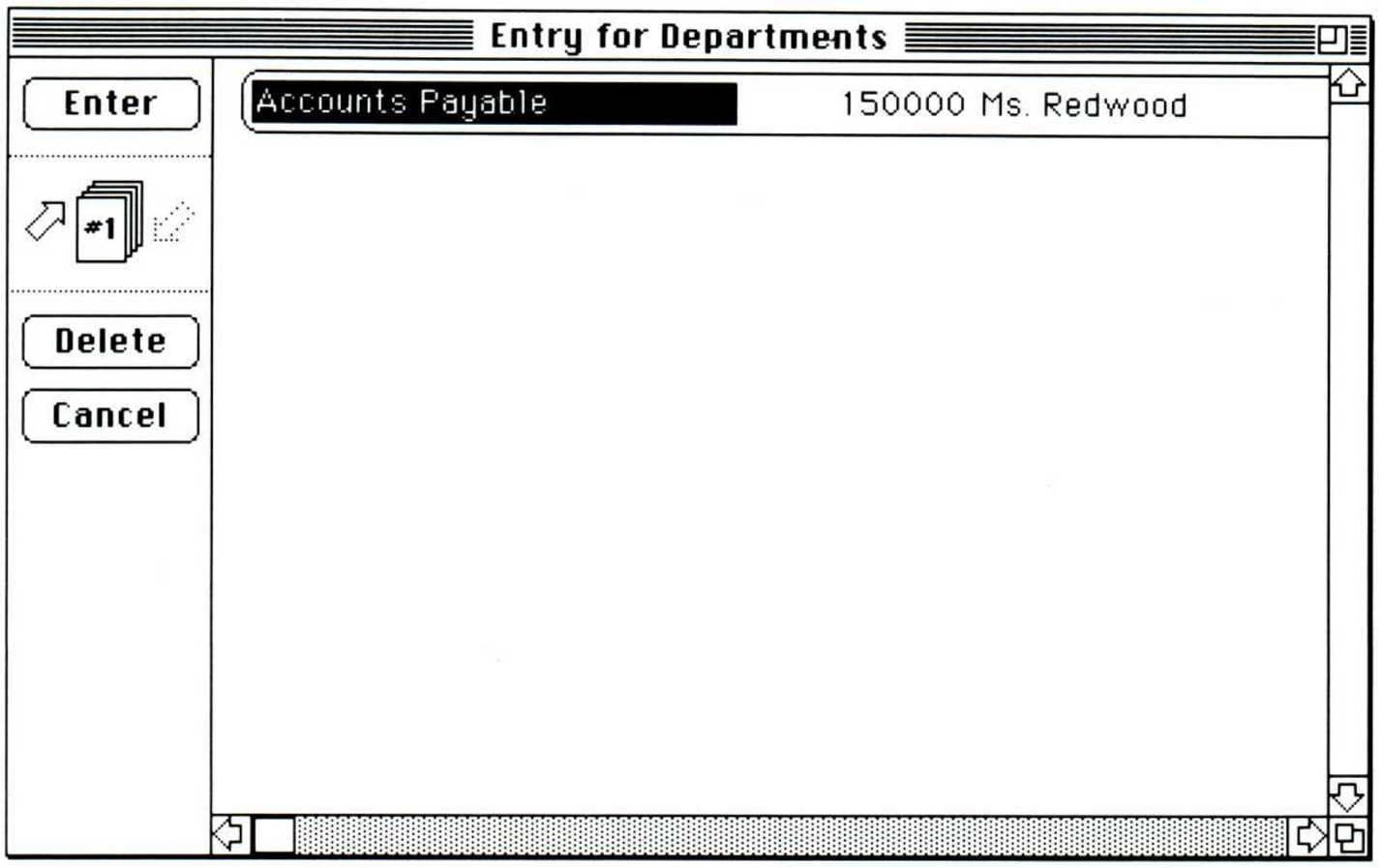


Figure 2-10
Style 3 as input layout

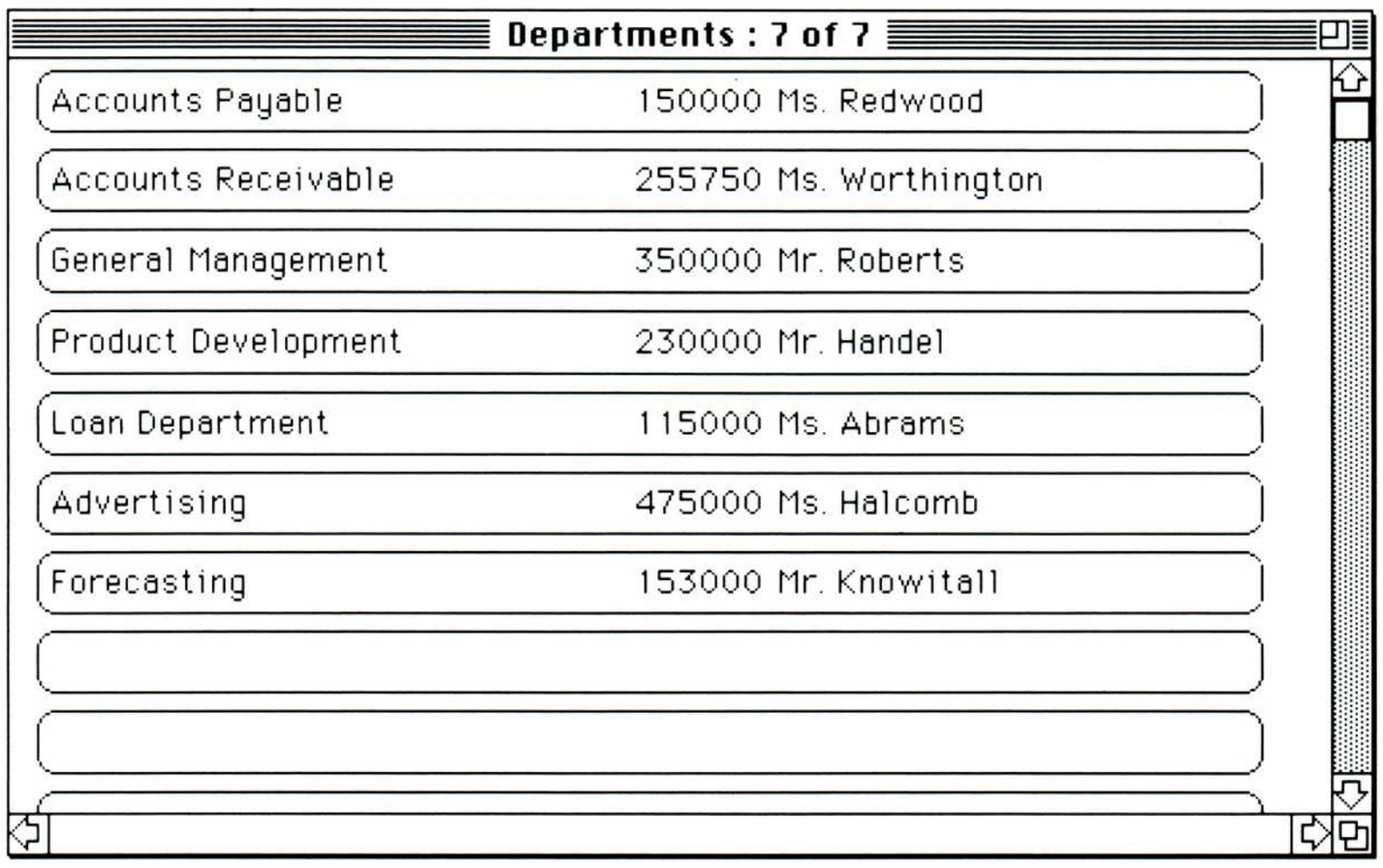


Figure 2-11
Style 3 as output layout

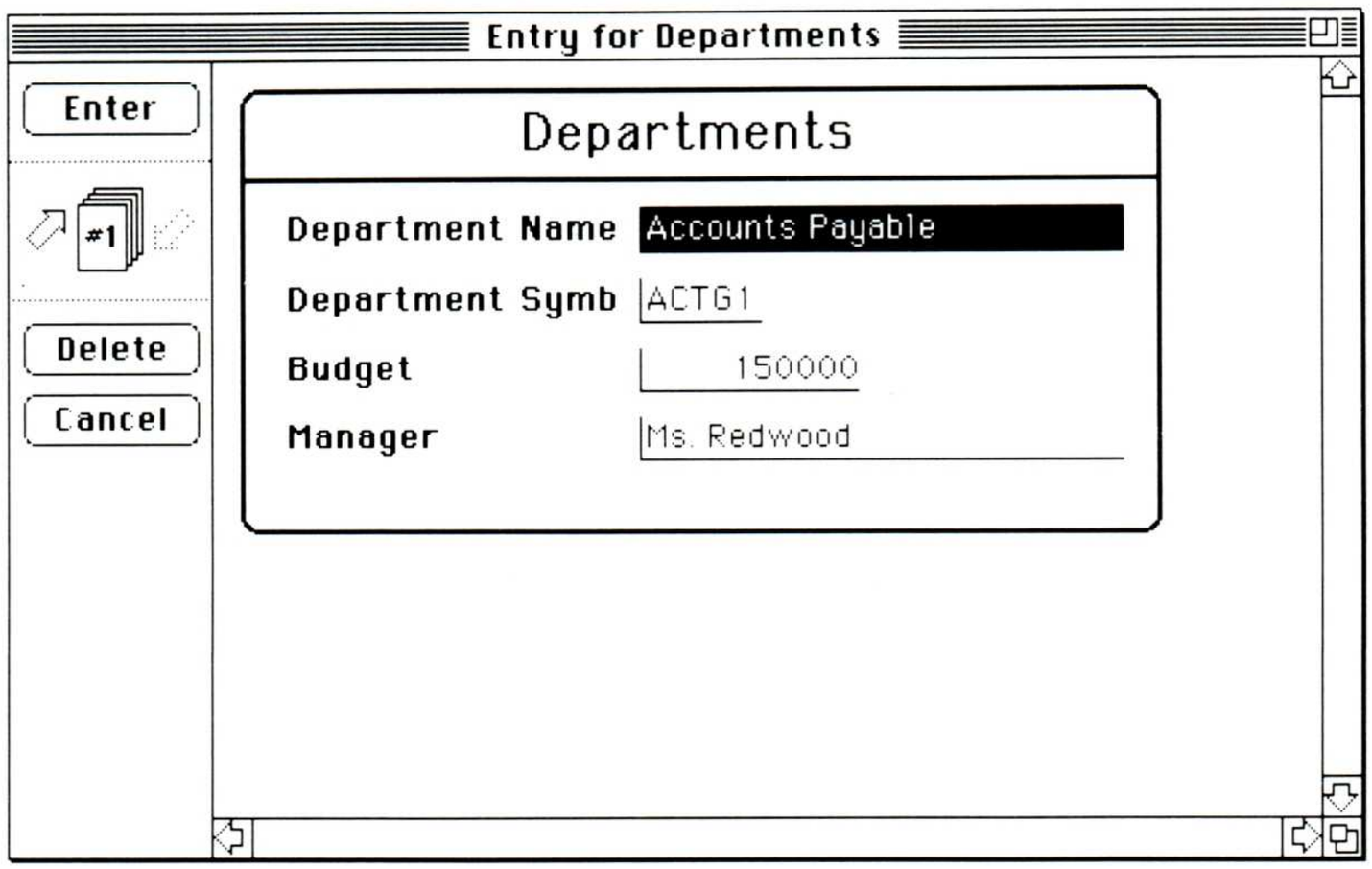


Figure 2-12
Style 4 as input layout

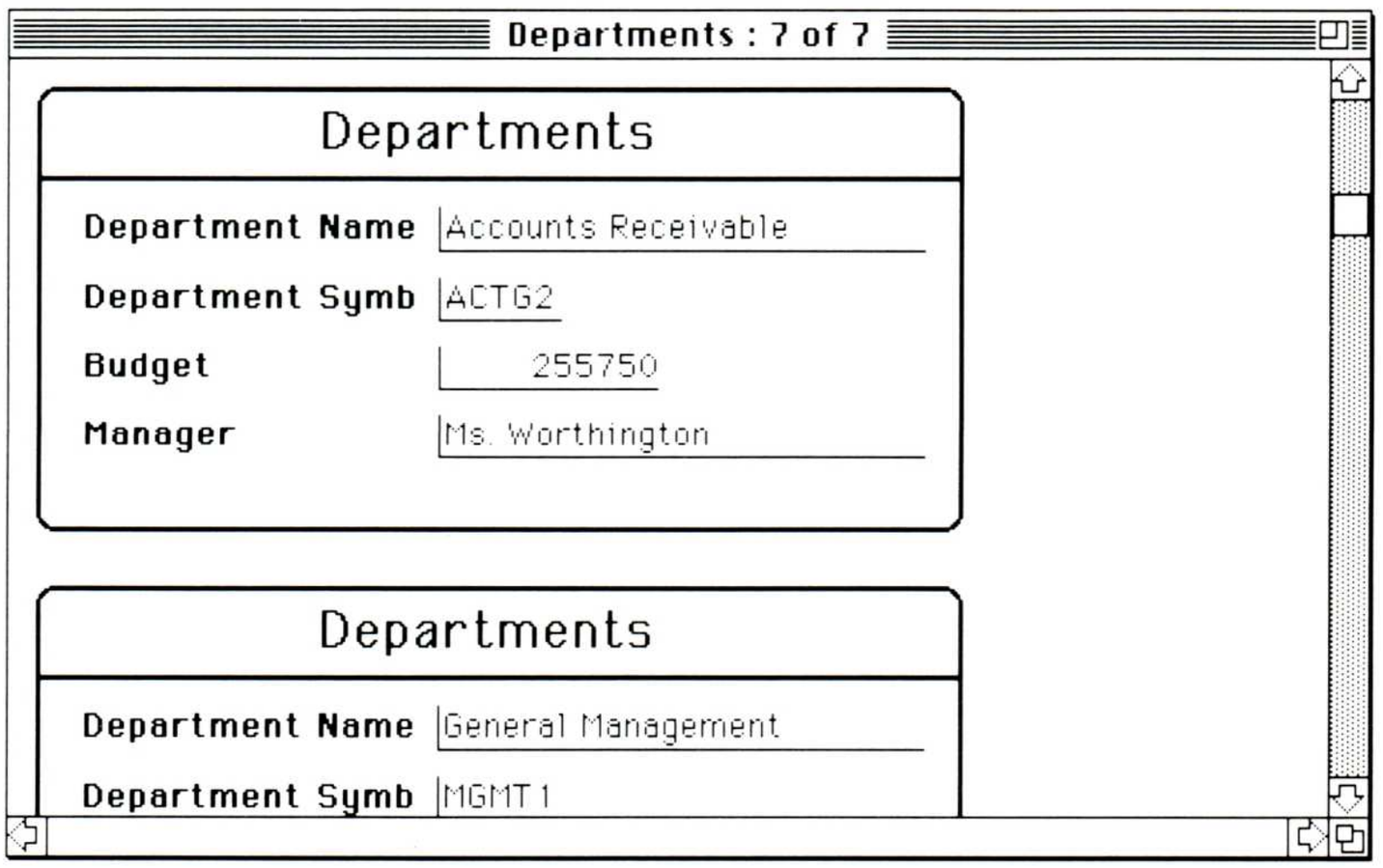


Figure 2-13
Style 4 as output layout

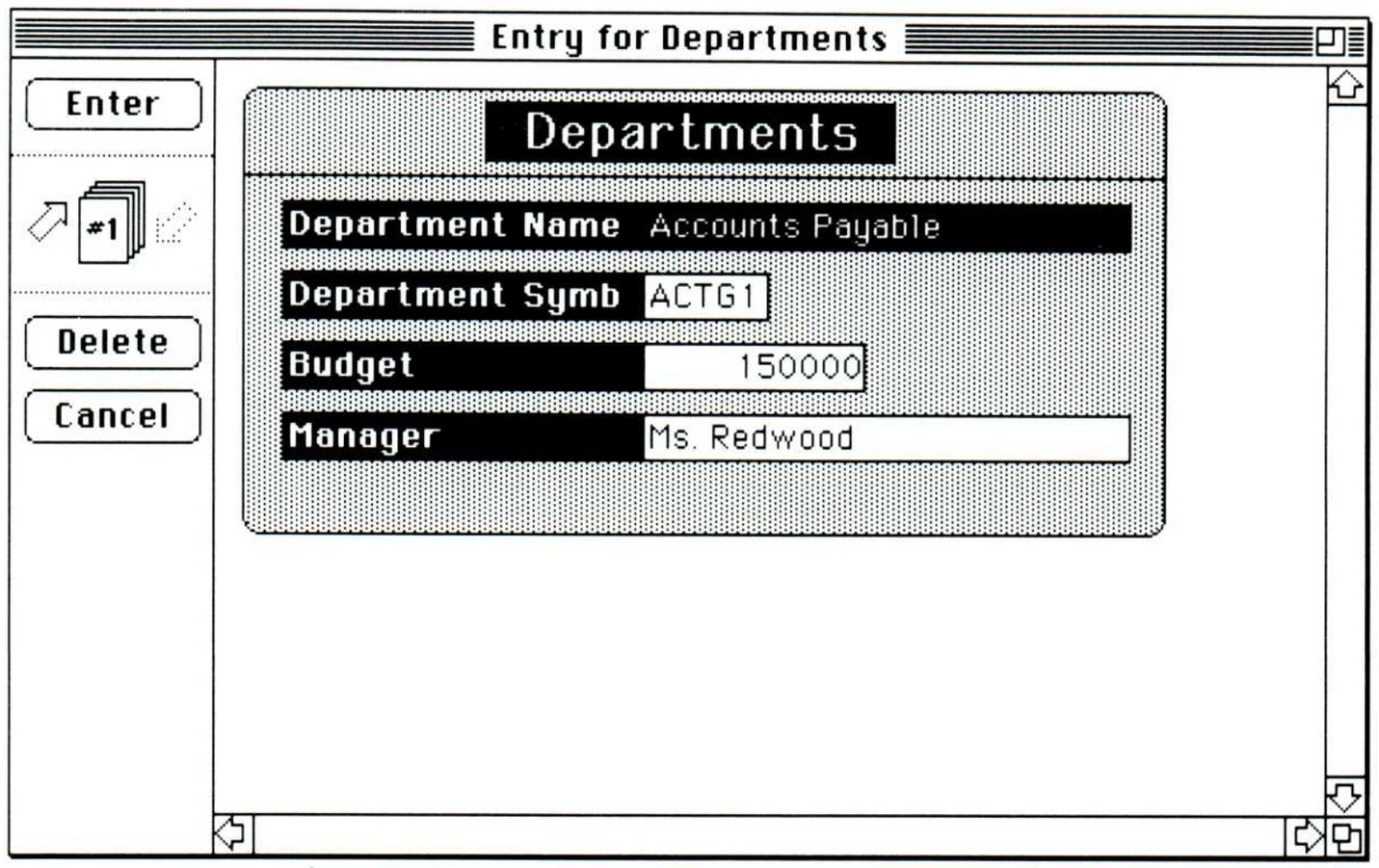


Figure 2-14
Style 5 as input layout

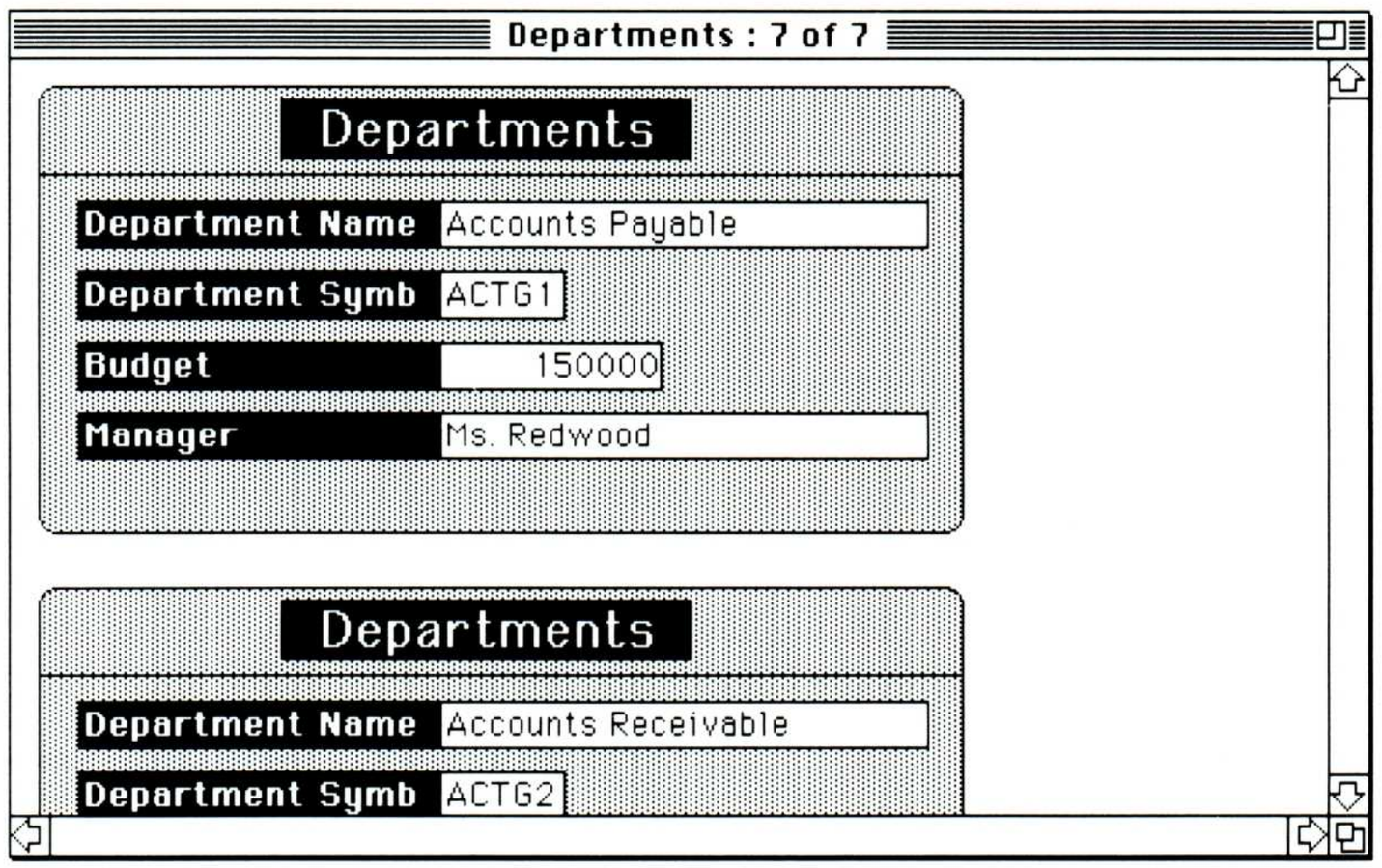


Figure 2-15
Style 5 as output layout

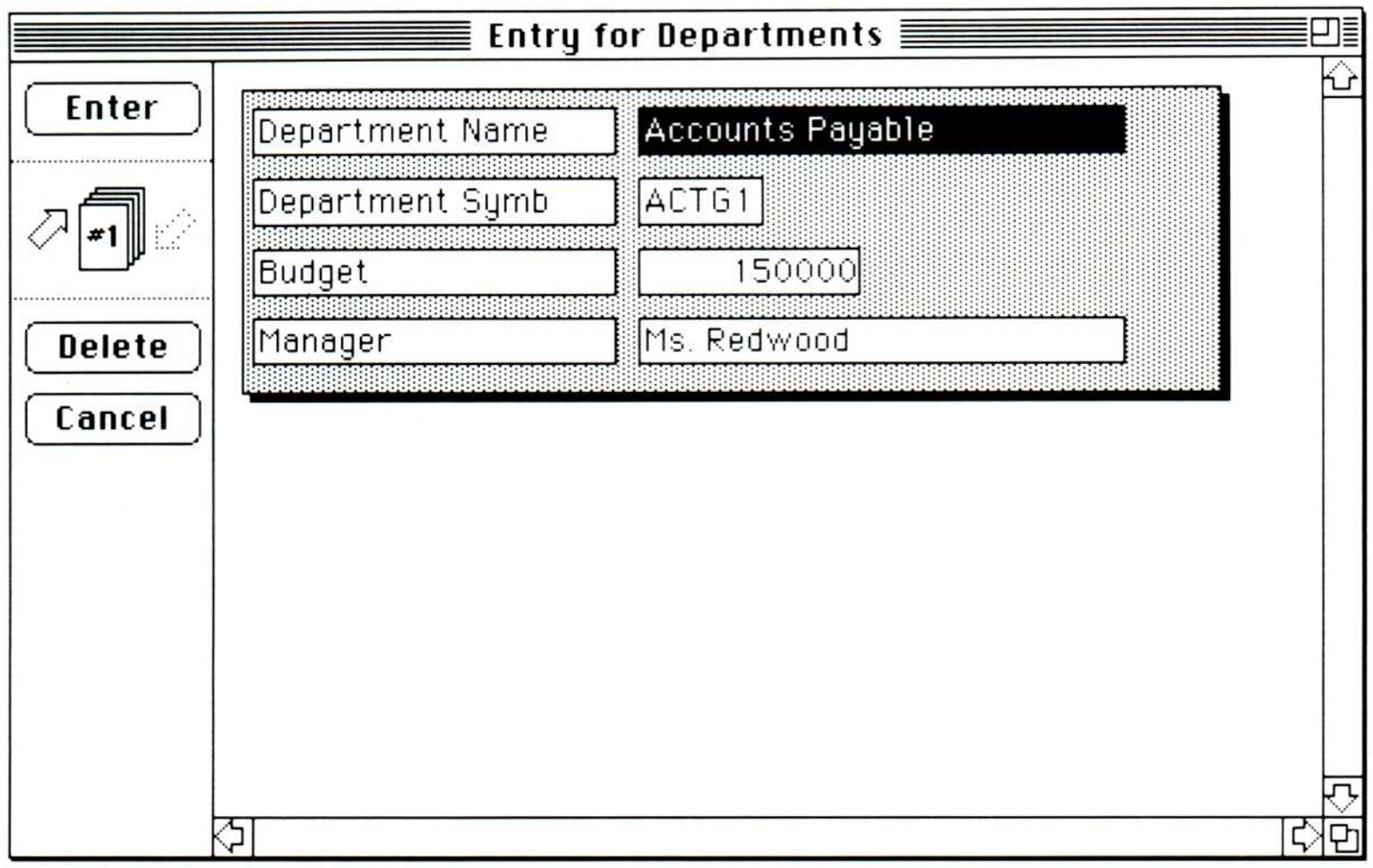


Figure 2-16
Style 6 as input layout

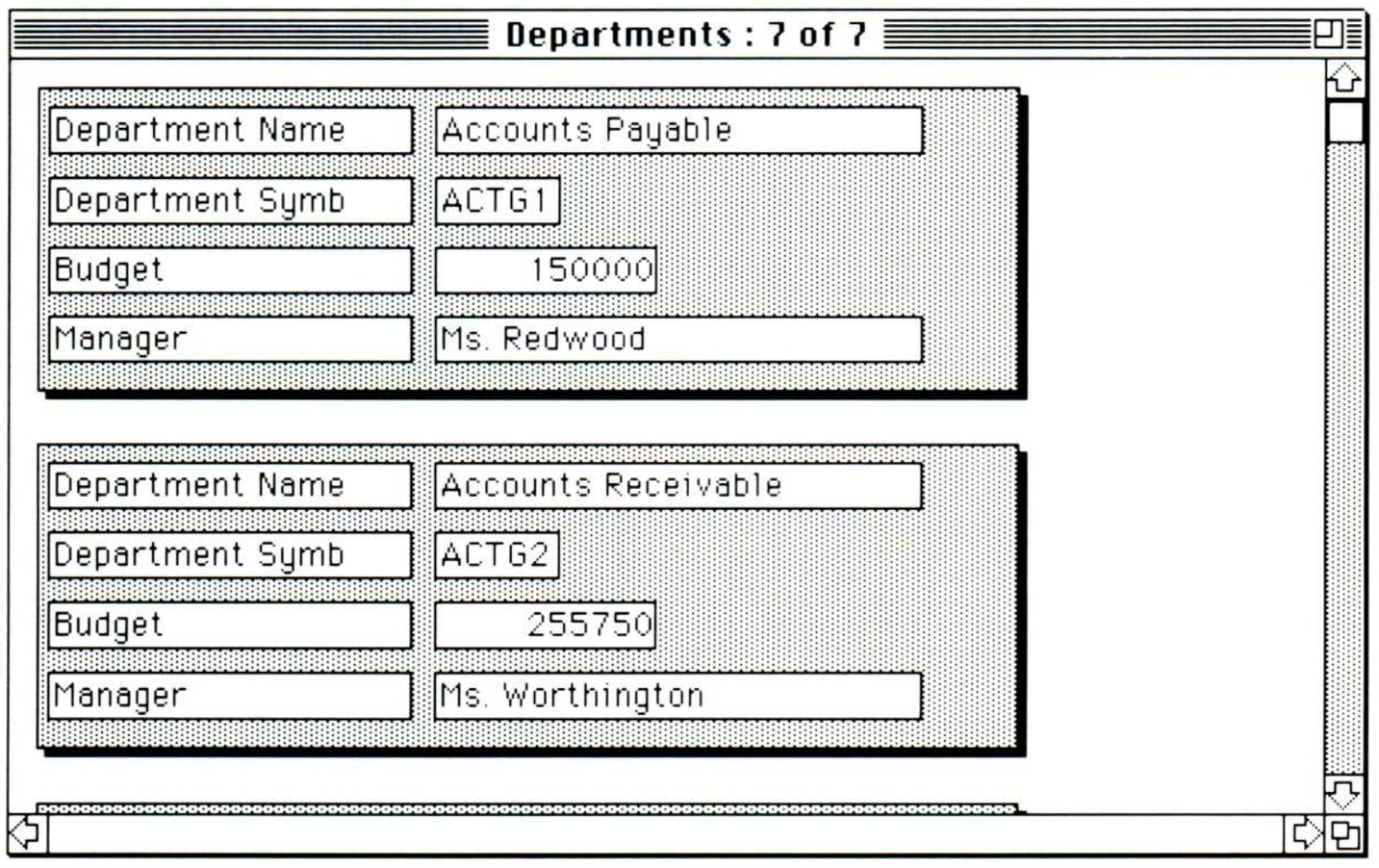


Figure 2-17
Style 6 as output layout

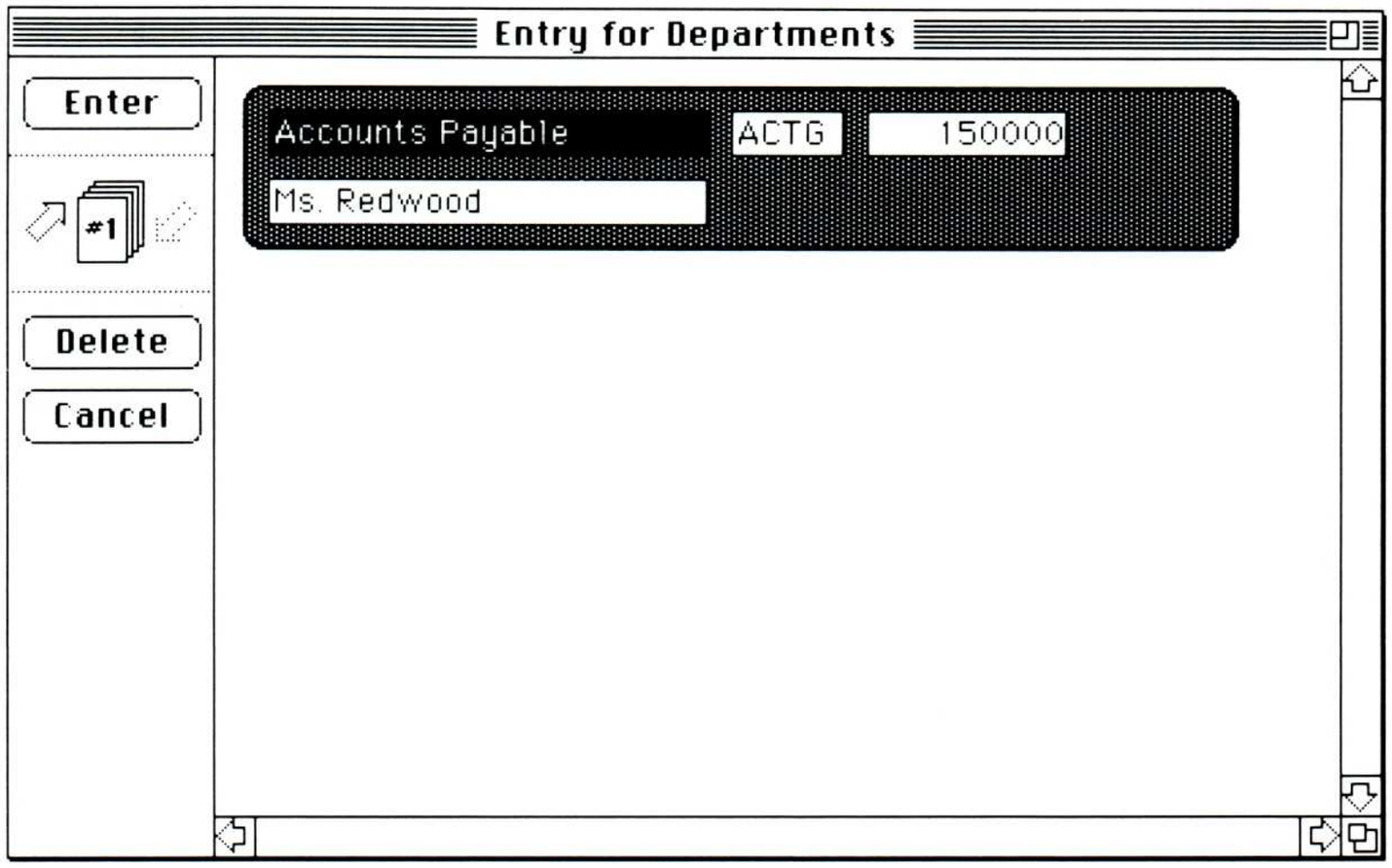


Figure 2-18
Style 7 as input layout

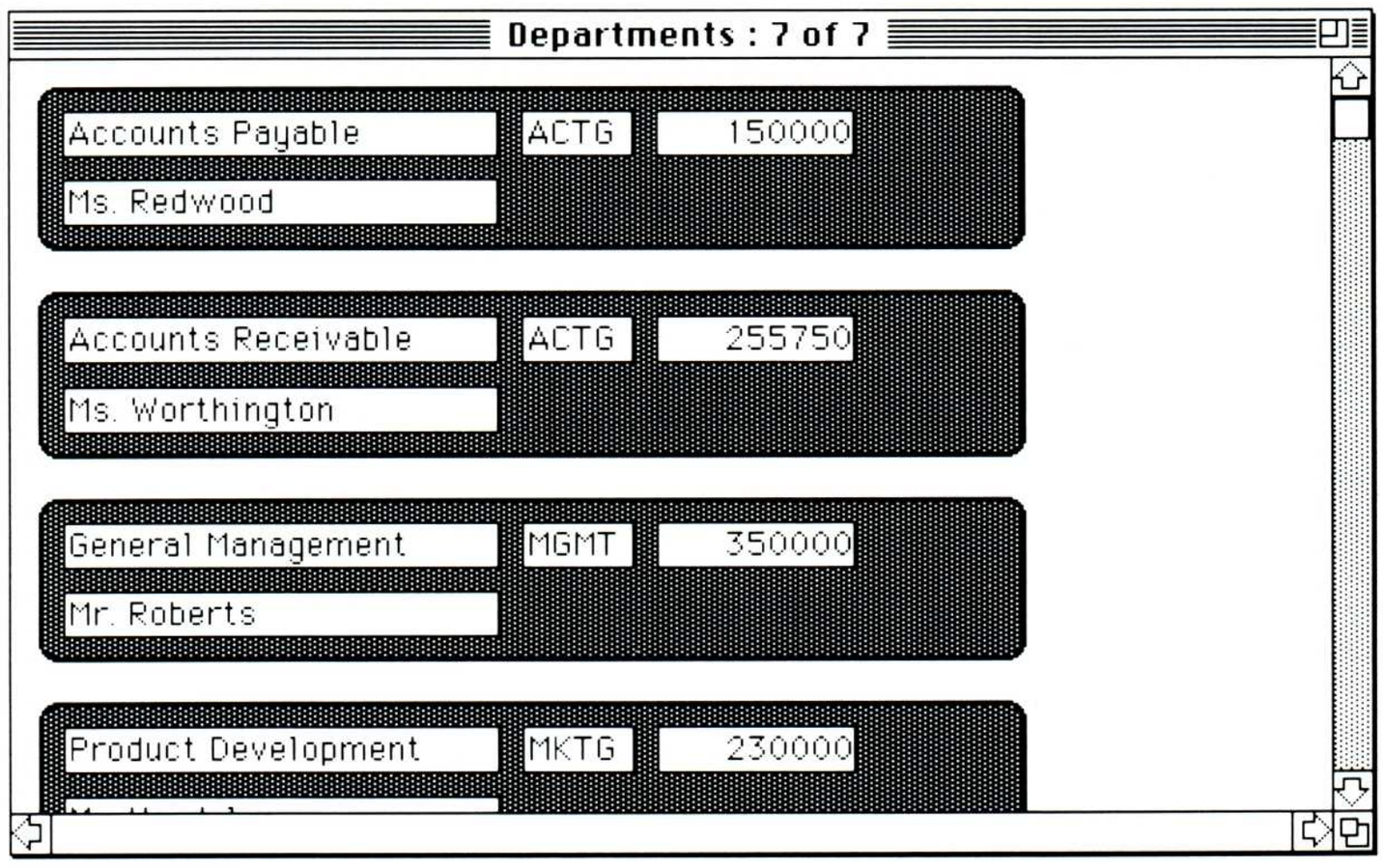


Figure 2-19
Style 7 as output layout

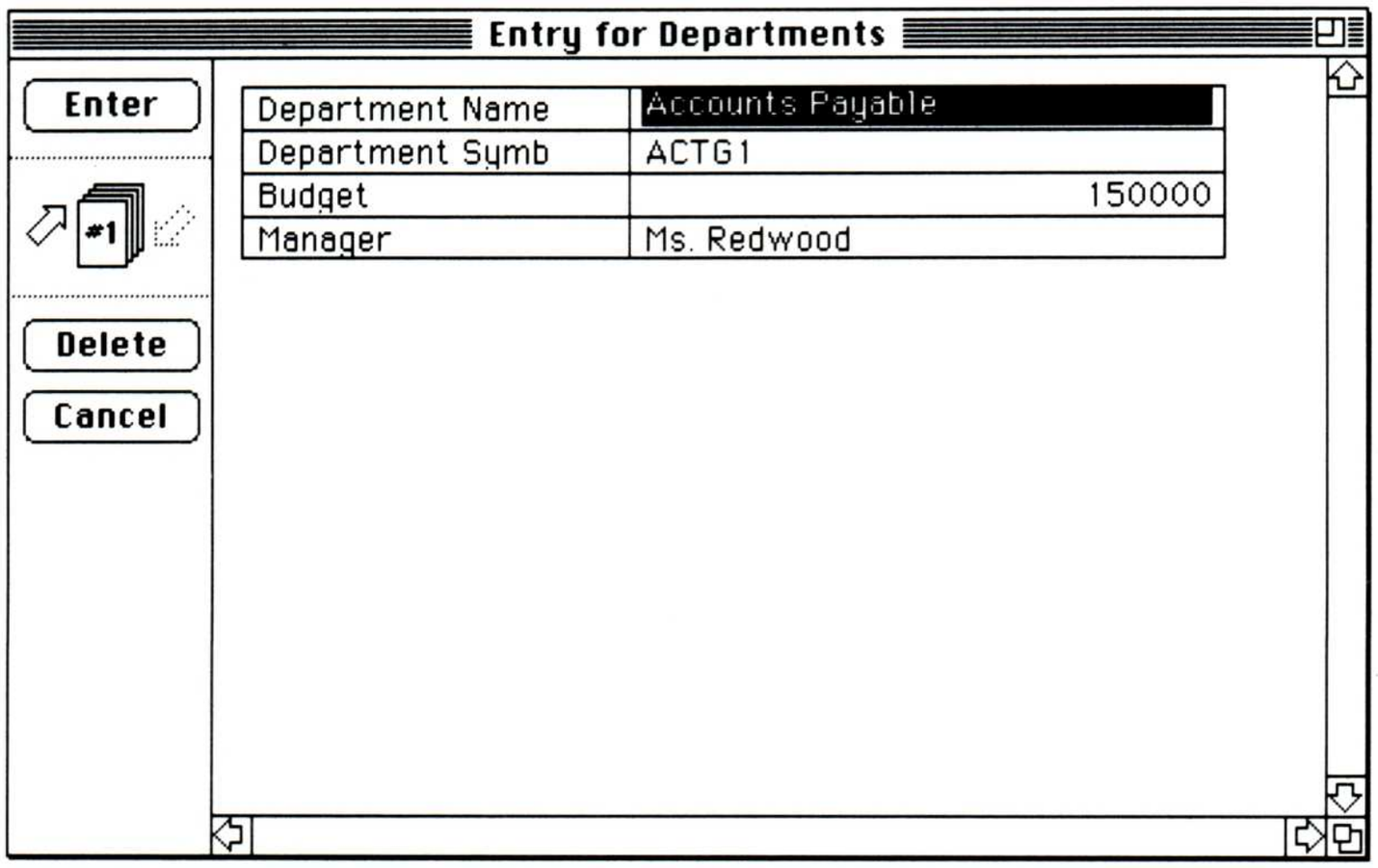


Figure 2-20
Style 8 as input layout

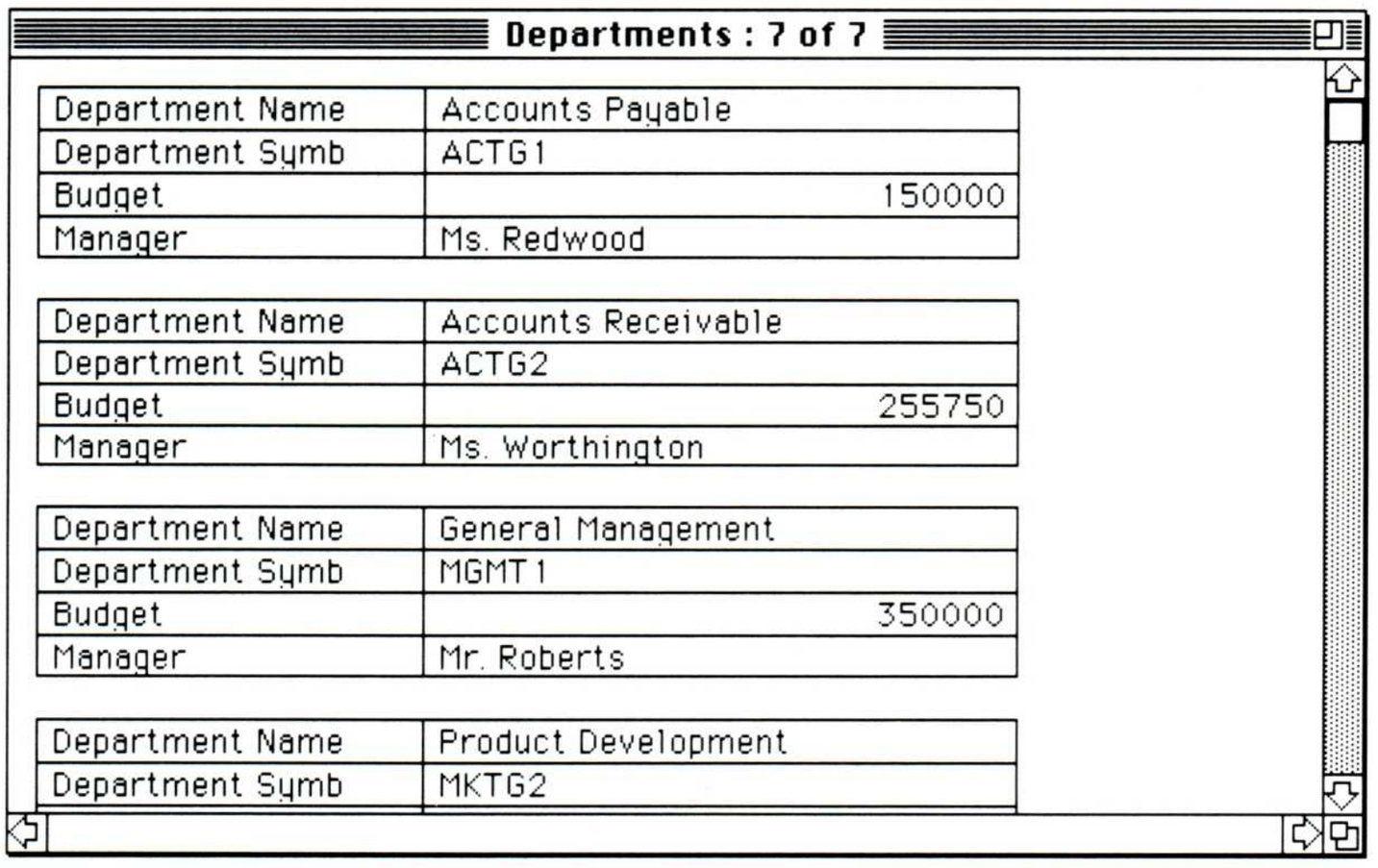


Figure 2-21
Style 8 as output layout

Creating and modifying layouts

The next two how-to sections tell you how to create a layout and how to display an existing one so that you may modify it.

The contextual information that follows the how-to section will acquaint you with the parts of the Layout window. A how-to section on manipulating layouts follows that.

Important Every working database must have at least one input layout and one output layout. They may be the same layout.

❖ *By the way:* Once you have created *any* layouts for your database, 4th Dimension prevents you from deleting both the last remaining input and the last remaining output layout. You may change this last layout, or define a new one and then delete the old; but you may not remove the last remaining input and output layouts.

Creating a new layout

Before you can create a layout, you must select a file to which it will belong.

1. Start the layout process

- Double-click on the filename bar of the file for which you want to create a layout.

  Or: Click a filename bar to select a file for which you want to create a layout and choose Layout from the Design menu.

  Or: Choose Layout from the Design menu without selecting a file.

  4th Dimension displays the Layout dialog box.

  If you have selected a file, 4th Dimension highlights your file in the scrollable box at left in the dialog box and displays the layouts (if any) you have already created for that file.

  If you did not select a file, 4th Dimension highlights the first filename in the list.

- You may click Done at this time to return to the Structure window without creating any layout.

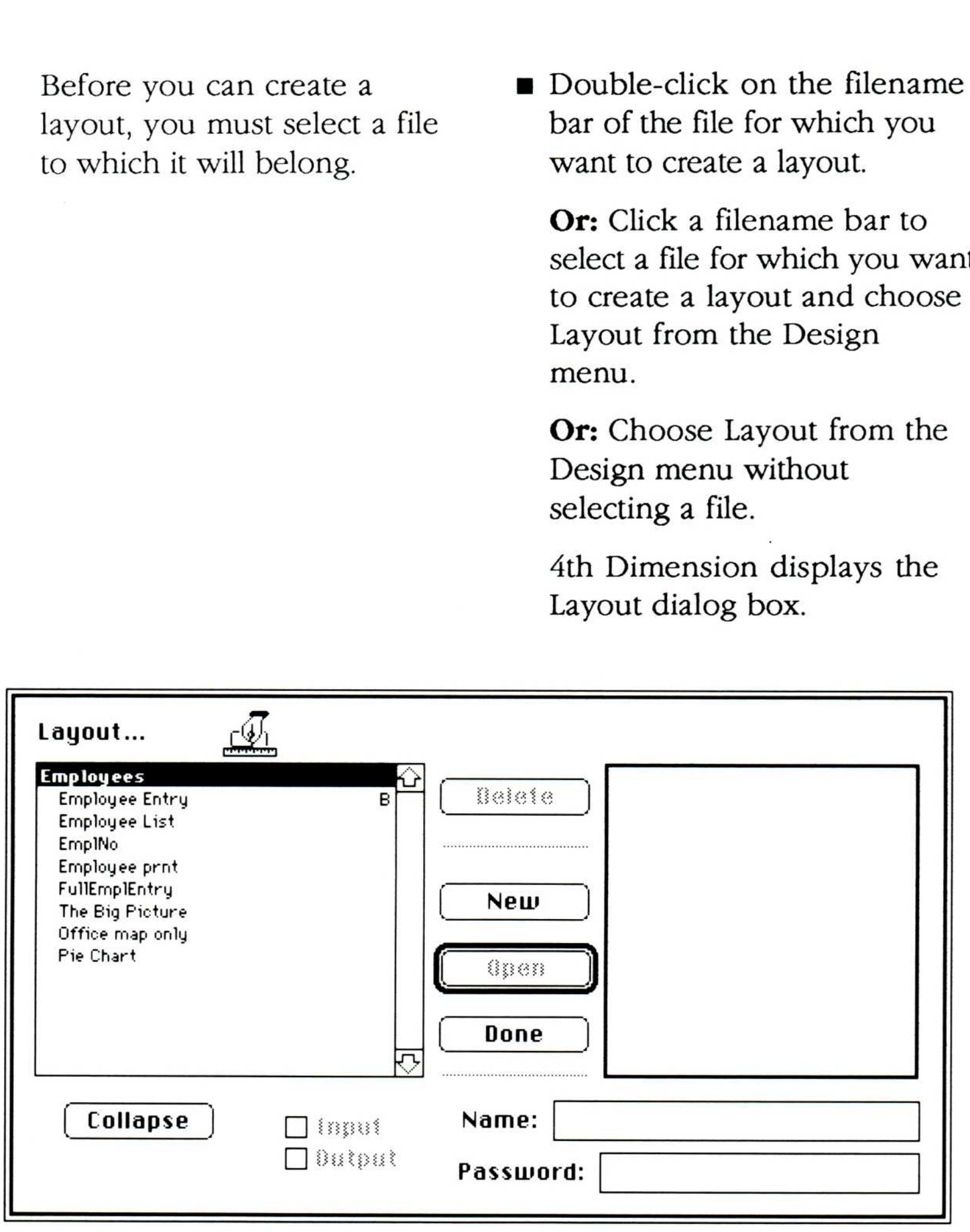


Figure 2-22
Layout dialog box

Expand and collapse filenames

1. Click a filename to select it. The up and down arrow keys also move the selection up and down through the list of filenames.
2. Click Expand to see the name of any existing layouts associated with that file.

Or: Double-click a filename to expand it and see the names of any existing layouts associated with the file.

Or: Use the right and left arrow keys to expand and contract the list of existing layouts. The left arrow key contracts the list, and the right expands it.

If you click the name of an existing layout, 4th Dimension displays a graphic representation of that layout in the graphics area at the right side of the dialog box.

- Double-click an expanded filename, click the collapse button, or use the left arrow key to collapse the layout listings back into the filename.

2. Name the new layout

1. Click the filename for which you want to create a new layout. The New button remains gray unless you have selected a filename (not an existing layout name).

❖ *By the way:* Double-clicking an existing layout immediately opens that layout in the Layout window.

See "Parts of the Layout Window," later in this chapter.

- Name the new layout by entering the name into the Name box.
- You may enter a password for this layout, if you have created a password system.

2. Click New.

4th Dimension displays its New layout dialog box.

If you have not named the new layout, 4th Dimension uses a default name such as "Layout3." You may rename the layout at this time if you wish by entering the new name in the Layout name area.

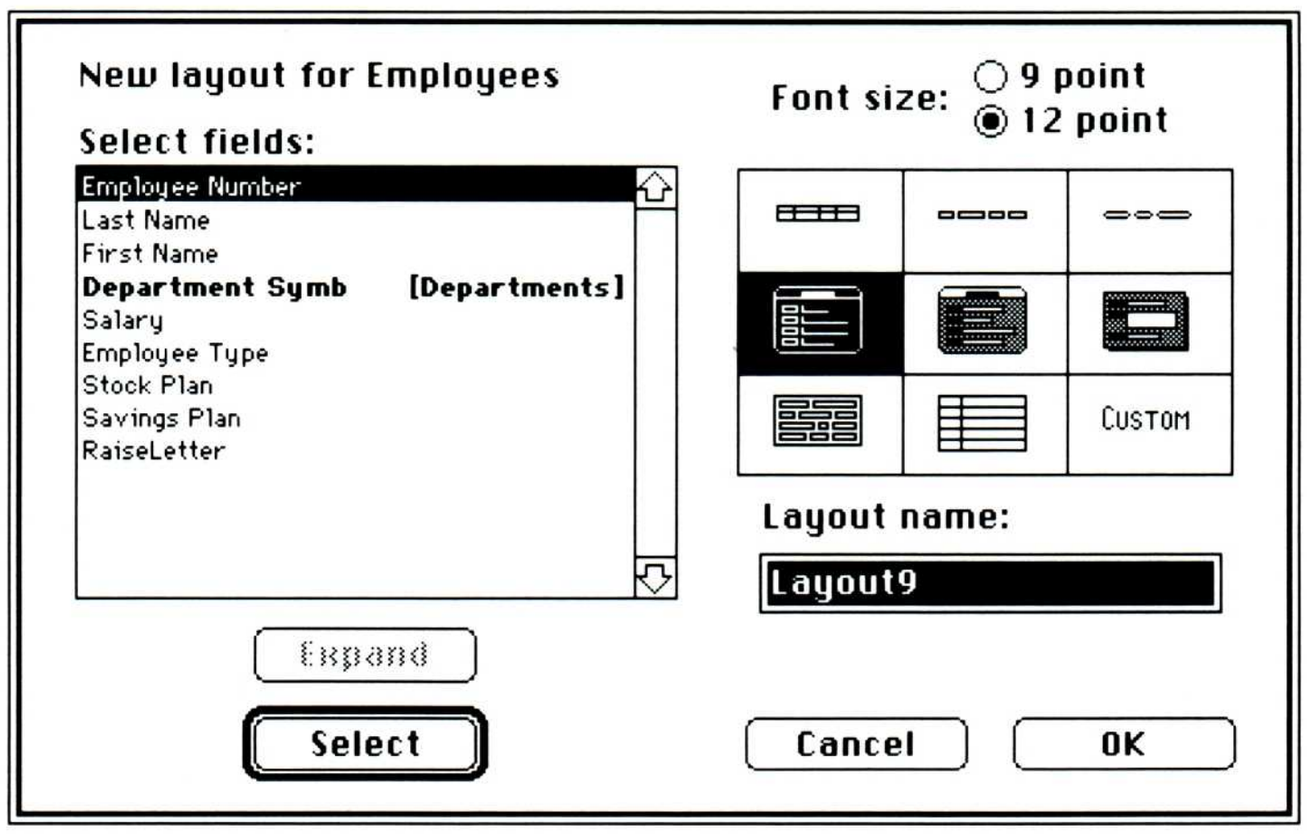


Figure 2-23
New layout dialog box

Display fields

- If the Select fields area contains filenames as well as field names, you may click a filename to select it, then click Expand to see the name of the fields within that file.

  Or: Double-click a filename to expand it and see the names of the fields within that file.

  Or: Use the up and down arrows to select and the right and left arrows to expand and collapse.

- Double-click the filename again to collapse the field names back into it, click Collapse, or use the left arrow.

Select fields:

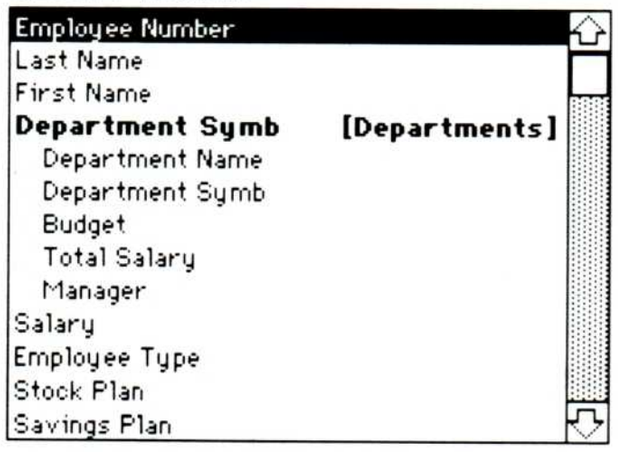


Figure 2-24
How fields from a linked file appear in New layout dialog box

3. Select fields

- Click the name of each field you want to include in your layout. As you select each field, click the Select button.

  Or: Double-click the name of each field you want to include in your layout.

The order in which you select the fields determines the order in which they will *originally* appear in the automatically generated layout (you may move them afterward). 4th Dimension displays the order number for each field to the right of each name in the Select fields area.

Selecting fields has no effect on a custom layout. In a custom layout, you must select your fields individually from within the Layout window.

Boldface filenames in brackets signify linked files. Selecting the names of linked fields includes them in your layout as variables and displays the Listing editor with an automatic linking procedure.

See Chapter 5,"Relational Structures," for an explanation of linking, using variables, and the automatic linking procedure.

If you select no fields, 4th Dimension creates an automatic layout that includes all fields *except* those from linked files.

Important: You cannot automatically include picture fields or fields of type Subfile in any layouts; you must add them manually when 4th Dimension displays the layout in the Layout window.

4. Select layout type

- Click one of the nine types of layout.

  See "Layout Styles" earlier in this chapter.

Select a default font size

- Click either 9 point or 12 point as the default font size for text in your layout.

  You may alter specific font sizes and styles when you are working with your layout in the Layout window.

  See also "Using the Palette" and "Using Fonts and Styles" later in this chapter.

Finish up

- Click OK to continue with creating the layout design. 4th Dimension displays the Layout window, showing the fields you selected in the layout style you chose.
- Click Cancel to return to the Structure window.

Modifying an existing layout

You may change the name, the input or output designation, or the design of an existing layout.

Select an existing layout

1. Open the Layout dialog box by double-clicking the filename bar, selecting a file, and choosing Layout from the Design menu, or by choosing Layout from the Design menu with no filename selected.

   - If you chose Layout with no filename selected, select from the Layout dialog box the filename for which you want to modify a layout. If you have already selected a file before opening the dialog box, 4th Dimension displays that file's layouts only.

2. Click Expand to see the name of any existing layouts associated with that file.

   Or: Double-click a filename to expand it and see the names of any existing layouts associated with the file.

   Or: Use the right and left arrow keys to expand and collapse.

3. Click the name of the layout from the expanded list of layouts.

   4th Dimension displays a representation of the existing layout you have selected in the graphic area on the right side of the dialog box. The Open button becomes active.

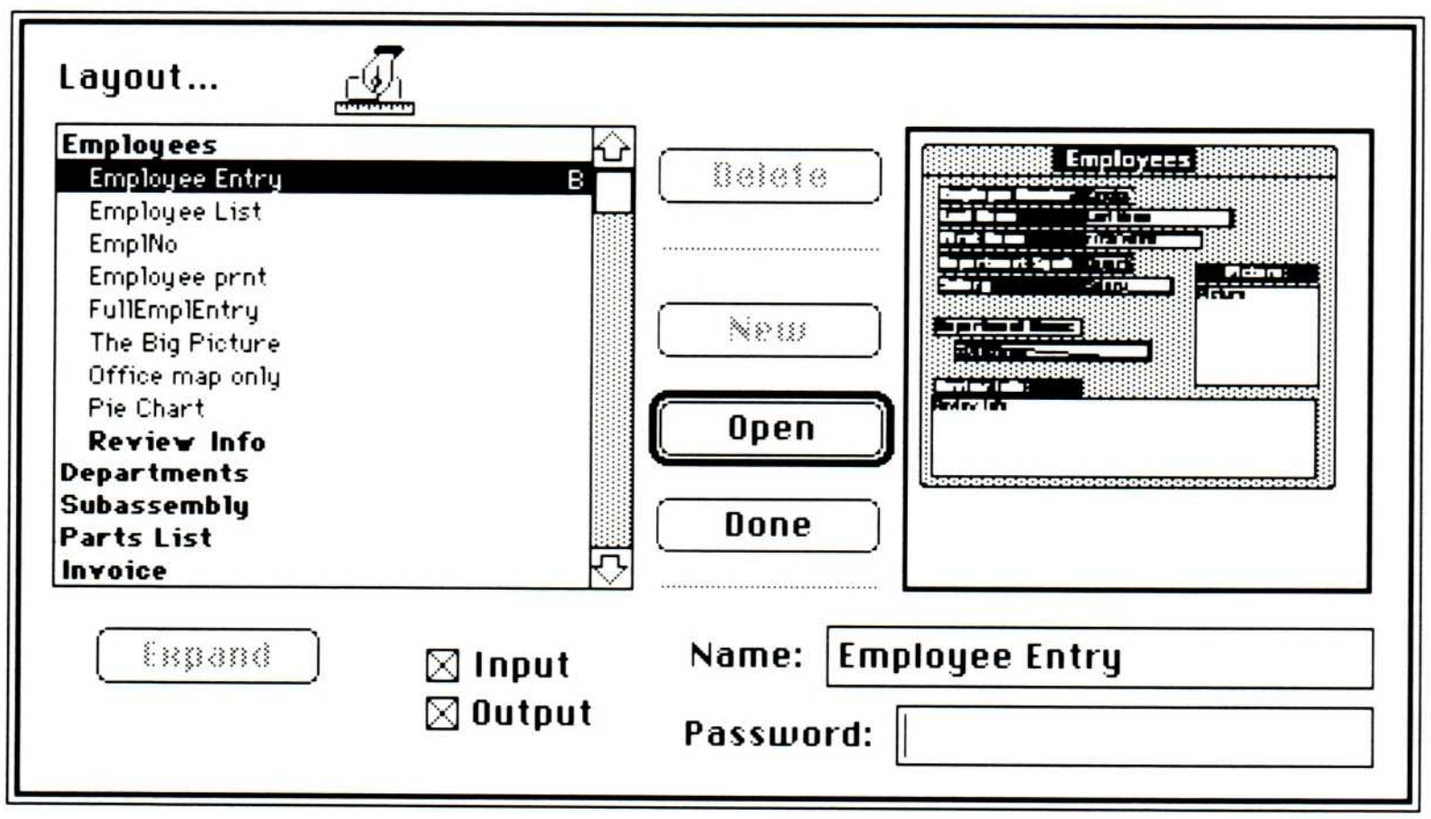


Figure 2-25
Layout dialog box

Change input and output

- Click Input, Output, or both check boxes.

  4th Dimension makes the selected layout the default layout for input, output, or both, as you have checked.

  4th Dimension requires a default layout for the User environment. There is one default layout for input, and one for output, per file or subfile.

  You may manually alter which layouts are the default layouts while in the User environment.

  See Chapter 3, "Basics for the User Environment."

Delete an existing layout

1. Select an existing layout from the list of layouts.
2. Click Delete.

   4th Dimension displays a small dialog box asking "Are you sure?" Click OK or Cancel as necessary.

Important: You cannot delete any default input or output layout. Obviously, the last input layout and last output layout would be the defaults; consequently, you cannot delete the last input or output layout.

Display an existing layout

1. Open the Layout dialog box by double-clicking the filename bar or selecting a file and choosing Layout from the Design menu.
2. Select an existing layout from the list of layouts.
3. Click Open.

   4th Dimension displays the Layout window and the layout that you have selected, ready for your modification.

   See also "Parts of the Layout Window," "Using the Palette," and the remainder of this chapter for more information on working with layouts in the Layout window.

Parts of the Layout window

There are five "types" of layout—input, output (screen), output (printer), included layout, and dialog—but you create all of them in the Layout window using the same tools and commands.

Much of the Layout window helps you adjust your layout for precise output. For example, the horizontal and vertical rulers (size of layout), control lines (headers and footers), and label width triangle (number of labels to a page) all help you position your layouts within an area that is potentially 12 feet high by 12 feet wide when printed out. There is a lot of room in a 4th Dimension layout. Figure 2-26 shows a simple layout in the Layout window.

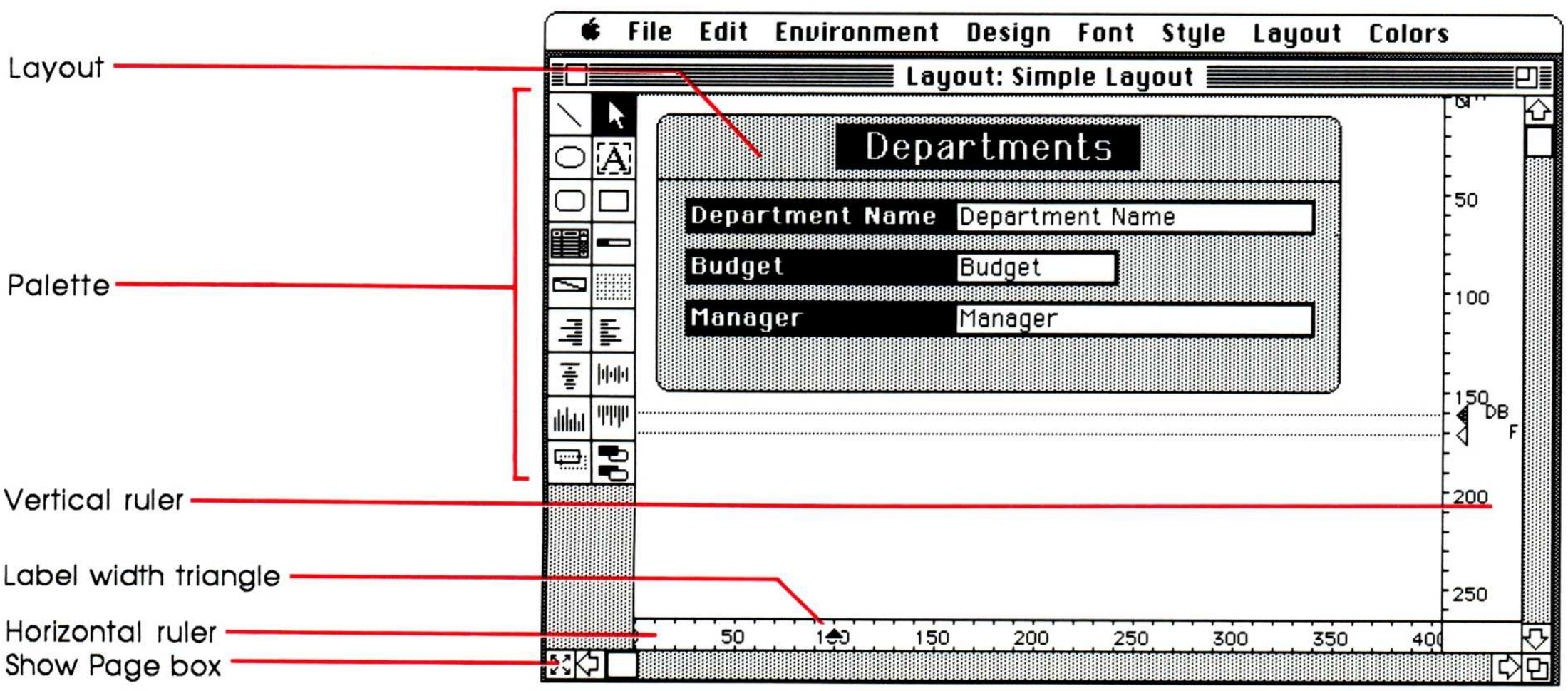


Figure 2-26
Parts of Layout window

A **layout element** is any one of the graphic items you work with to create a layout. The **current layout** is a layout displayed in an active Layout window.

The term **layout element** is a general name for any of the shapes, outlines, variables, fields, areas, boxes, buttons, graphs, or fill patterns in the Layout window. You work with layout elements to create your layout. Any layout in an active window on screen is the **current layout.**

Controlling the layout

In addition to the standard items that control Macintosh windows—close box, zoom box, and scroll bars—there are several features unique to 4th Dimension, or that 4th Dimension applies uniquely.

- **Palette:** The palette contains a set of 18 icons. Some of the icons allow you to enter text or draw lines and shapes. Others place fields, variables, or other layouts into the current layout. Still others act as commands, and immediately execute a function such as aligning selected layout elements flush left, or moving one behind another.
- **Rulers:** 4th Dimension displays rulers horizontally and vertically on the screen unless you specifically hide them. The rulers help you determine how large your layout is. Rulers can measure in inches, centimeters, or in printer's points (1/72 inch, equivalent to one pixel on screen). 4th Dimension provides a virtual layout display area of just under 144 square feet (12 feet by 12 feet).
- **Control lines:** You may use the four control lines to divide your layout into four areas, one each for header material, footer material, record detail, and break activities (such as totaling). An automatic layout will place the Header line *above* your layout, and the other lines *below*. This is fine for many layouts. You must adjust them yourself if you want to use their capabilities.
- **Label width triangle:** The label width triangle, which appears on the horizontal ruler at the bottom of the Layout window, controls the width of a layout only when you use that layout as a mailing label. It has no effect on layouts used for any other purpose.

Formatting fields and variables

You may specify display formats for the contents of several types of fields and variables. The formats control how the values appear when the layout displays them; different layouts may have different formats for the same field, without affecting the actual value stored in the record.

You may format the three types of numeric field, Integer, Long Integer, and Real; Date fields; and Picture fields. You may similarly format variables holding those types of data.

You may format Alpha and Text fields through layout procedures and in a limited way through field display formats.

See "Setting Field Display Formats," "Variable Types," and "Using Variables in Text Areas" all in this chapter. See the section "Pictures, Graphs, and Layouts" in Chapter 6, "Creating a Custom User Interface."

Selecting, moving, and handling layouts

You may resize, move, select, and alter the elements in your layout in virtually any order.

Standard Macintosh windowing operations in addition to those specifically mentioned here include scrolling, zooming, sizing, and closing.

Show the page

1. Click the Show Page box to show an overview of the size and shape of your layout in relation to the printed page.

   The scale of your layout on the Show Page overview changes depending on the scaling factor you set on Page Setup under the File menu.

2. To change the area of your layout that you'll see in the closeup view provided in the Layout window, drag the frame.

3. Click OK to return to the Layout window with the new view. Click Cancel to return to the Layout window without changing the view, even if you have moved the frame.

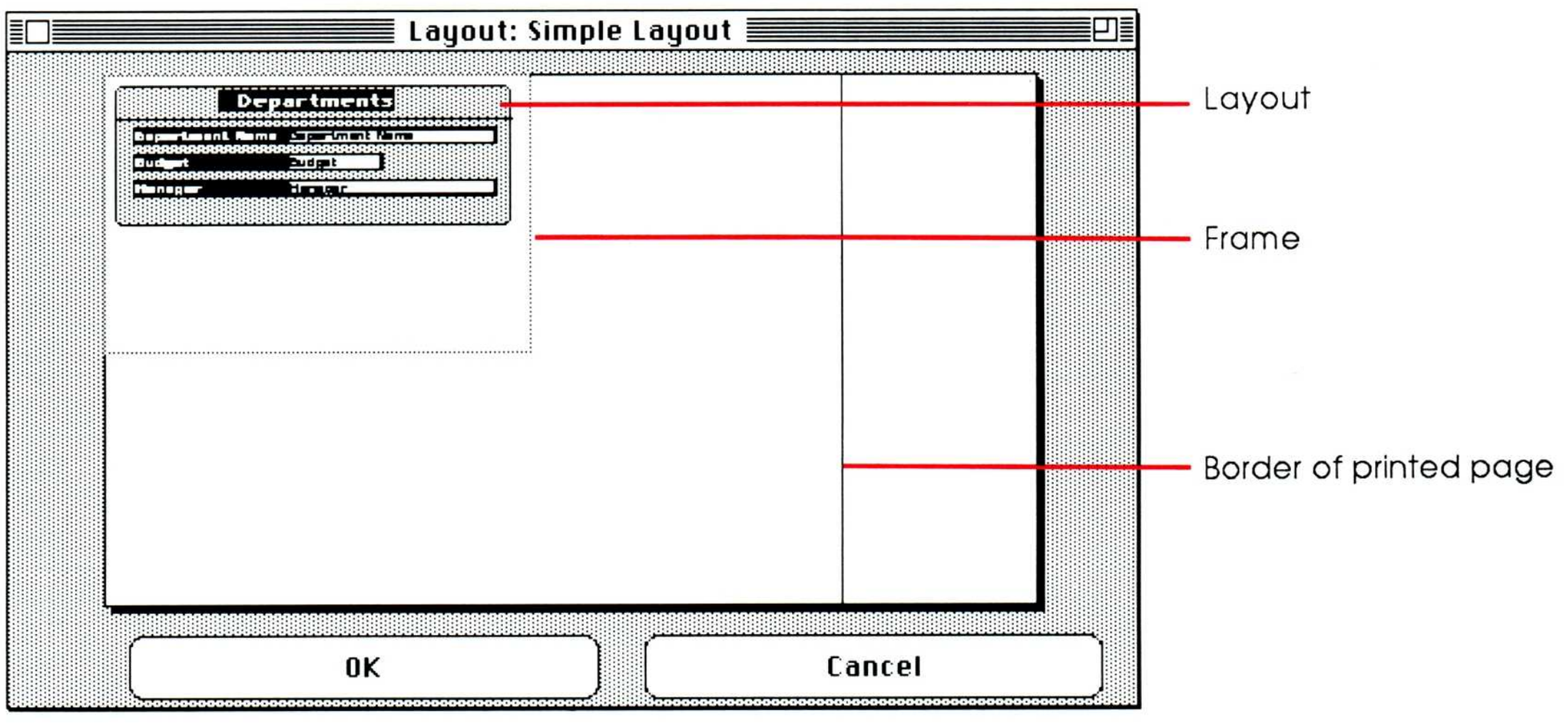


Figure 2-27
Show Page box

Select a layout element

1. Select the selection pointer from the palette. The selection pointer icon is usually in effect as a default.
2. Click on or within the boundary lines of the layout element you wish to select. Four resizing handles delimit an element you have selected.

Boundary lines may occasionally be invisible.

If you attempt to select an element with another palette icon selected, 4th Dimension automatically selects the Select icon for you on your first click. If you have previously selected the Text icon, 4th Dimension will not select the Select icon.

- Select more than one item by Shift-clicking.
- To deselect a layout element, click outside its boundary lines.

  See "Using the Palette" elsewhere in this chapter for information on Group 1 and Group 2 icons.

Move a layout element

1. To move a layout element, first select the element.
2. Position the screen pointer on or within the element's boundary lines, and drag.

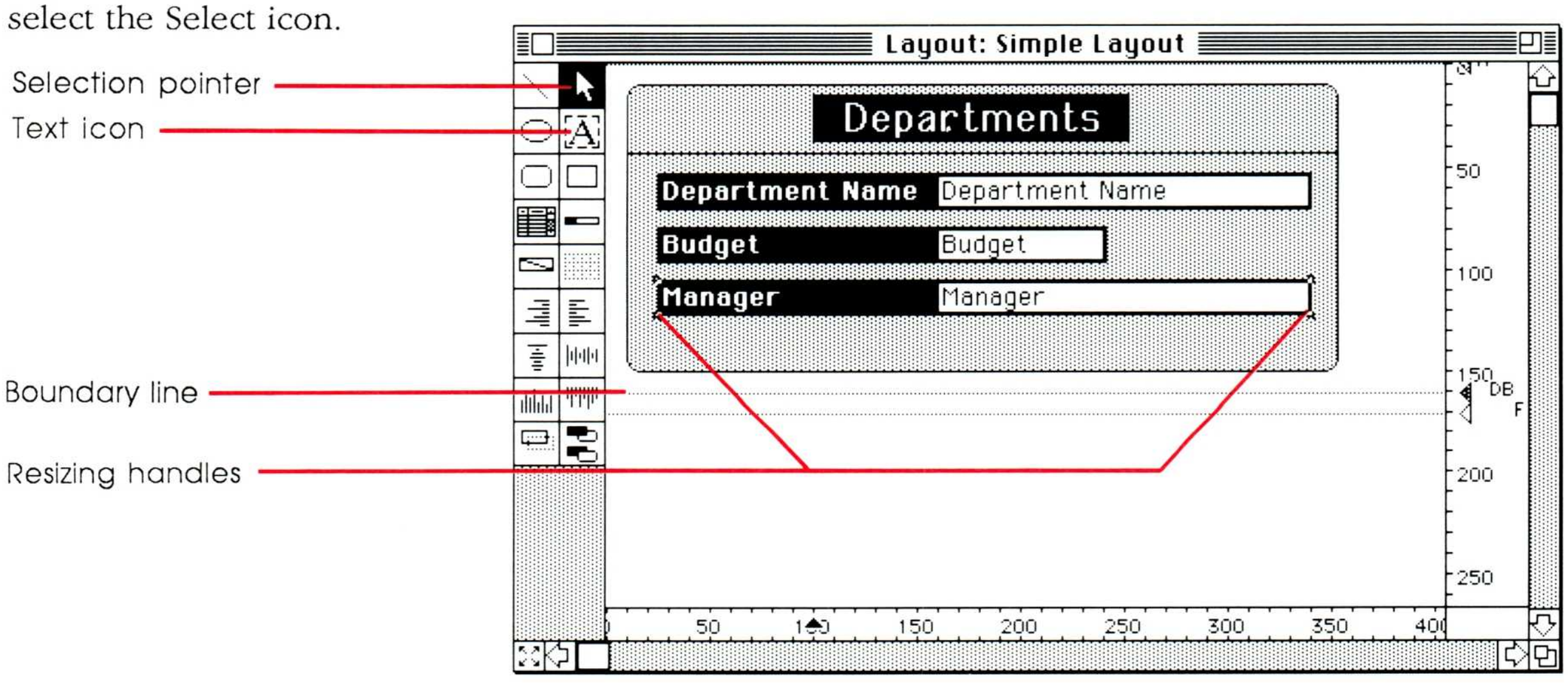


Figure 2-28
Selecting a layout element

Resize a layout element

1. To stretch or shrink (resize) a layout element, select the element.
2. Position the pointer at one of the four resizing handles. The pointer becomes a four-directional arrow.
3. Drag the resizing handle.

   The diagonally opposite resizing handle remains anchored.

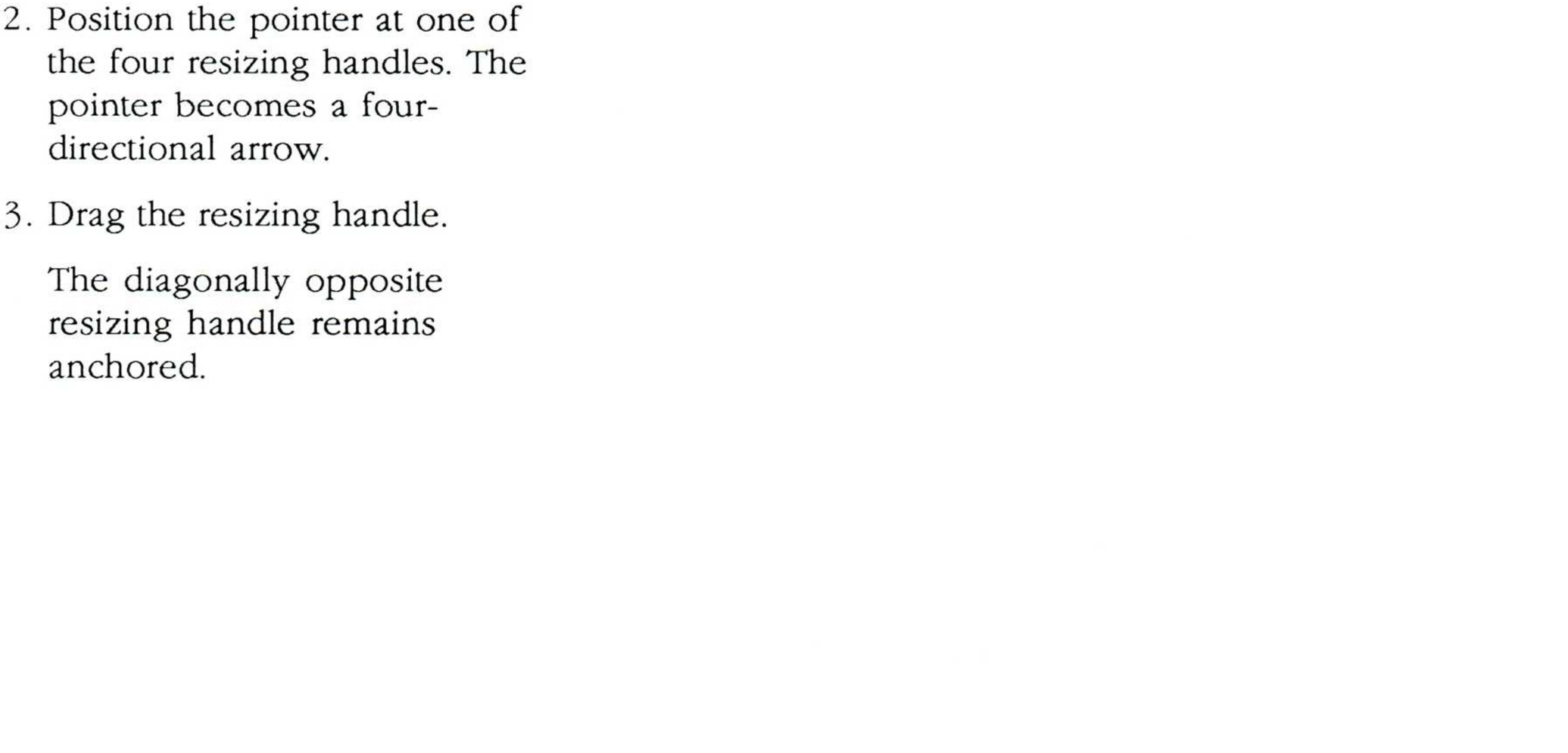


Figure 2-29
Resizing a layout element

Using the palette

The **palette** is a set of icons denoting graphic tools that help you construct a layout. The icons signify such operations as being able to select layout elements, draw lines and shapes, add elements such as fields and variables, align layout elements, and more. Figure 2-30 shows 4th Dimension's Layout palette and names each icon.

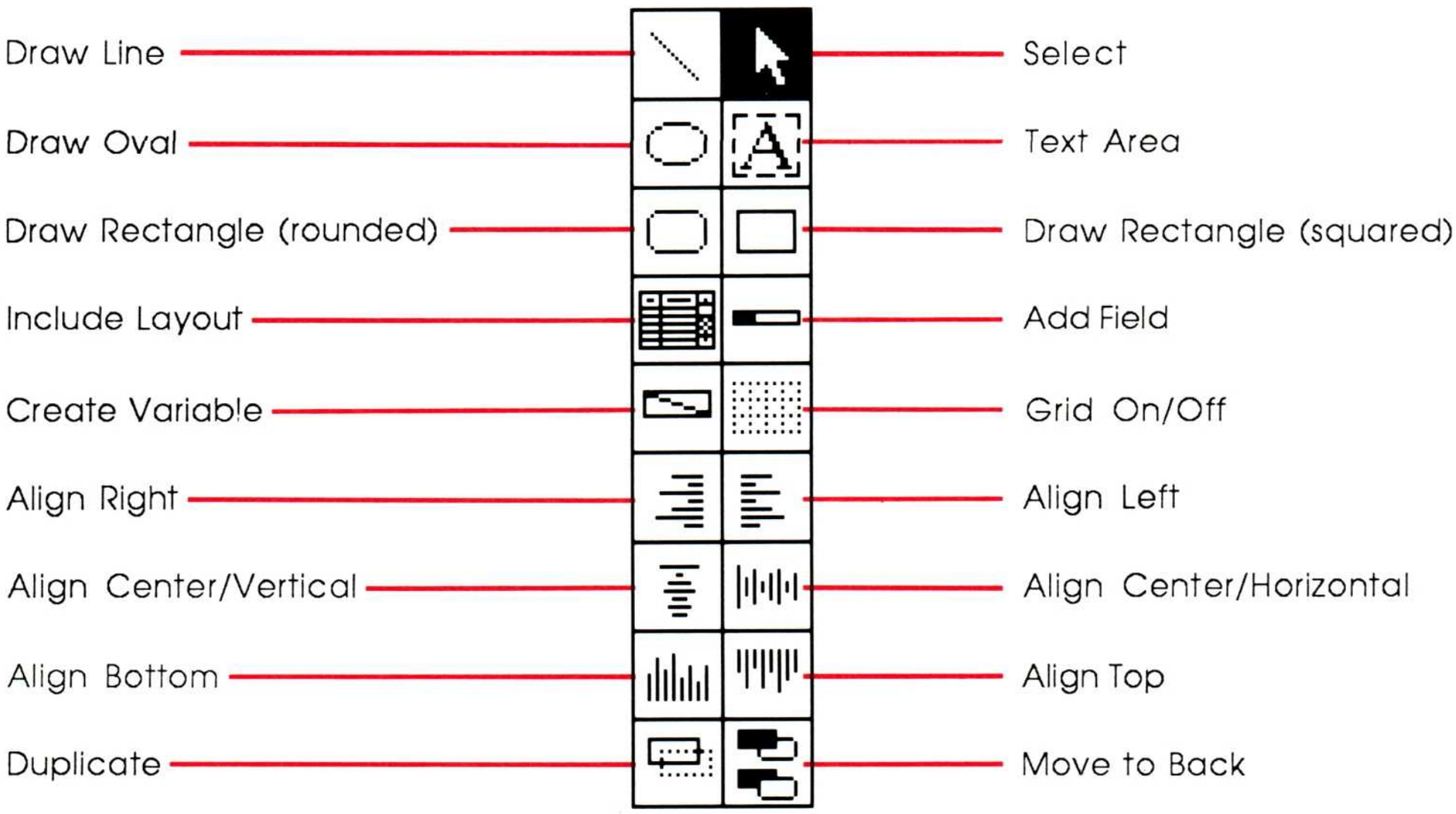
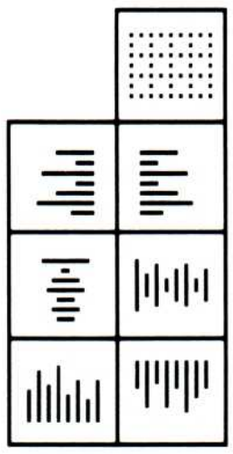


Figure 2-30
Layout palette

The importance of aligning fields

Aligning your fields can be important when you're preparing a layout for tasks such as importing data, or when you are cloning a layout (both topics discussed elsewhere in this chapter).



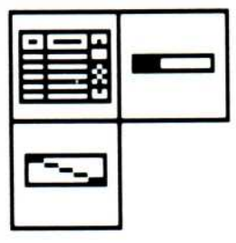
4th Dimension maintains a strict pixel-by-pixel system of field precedence starting at the upper-left corner of a layout and moving horizontally across and down the layout from left to right and top to bottom. If fields are out of alignment, 4th Dimension *may* interpret their sequence differently that you do.

About the Text Area icon

The Text Area icon on the palette creates an area on your layout in which you may create and edit text. The text you create becomes part of the background of the layout itself, although remaining a distinct and editable layout element.

See "Using Variables in Text Areas," later in this chapter.

Do not confuse text produced through the Text Area palette icon with text that is part of a Text field. You'll use Text Area text to label various parts of your layout and to create letter-like layouts for mass mailings (also called *mail-merge documents*).



Field, Variable, and Included Layout icons

During the process of creating a new layout you select the fields you want to appear in that layout. Occasionally, you may accidentally leave out a field, or you may choose the "Custom layout" style and must build your layout field by field. The Add Field icon lets you add a field to the current layout. You may add a duplicate of a field already in the layout or add one that you have not yet displayed.

Automatic layouts will not include Picture fields. Add them to the generated layout later by using the Add Field icon.

Important To add a field to your layout, that field must already exist in the Structure window.

Variables can look and act similarly to fields, or you may use variables as buttons, graphs, scrollable lists, and for a host of other purposes. To display a variable (other than those embedded in Text Area text) on your layout, use the Create Variable icon. Automatic layouts can create variables for you, and can include them on the generated layout, but *only* when you select fields from a linked file to include in your automatic layout. When you do this, 4th Dimension also creates an automatic linking procedure for you, too.

See the sections "Setting Field Display Formats," and "Variable Types," later in this chapter. While the present chapter explains how to use included layouts, but Chapter 5, "Relational Structures," explains the theory behind them.

An included layout is one layout displayed *within* another layout. This technique is useful when you want to produce a layout enclosing a variable-length list—an invoice with an indeterminate number of line items, for example. The included layout may be from a subfile, from a linked file, or from another file in the database, connected or unconnected.

Duplicate and Move to Back icons

It's usually easier to duplicate a layout element than to recreate it. For example, you may have created a variable with special formatting characteristics, and require six more just like it for your layout. The Duplicate command icon replicates any selected layout item or group of selected items with one click.

The Move to Back icon visually moves one layout element "behind" another one. This is useful for creating shadow boxes and other graphic effects.

Using Select and Text Area icons

The Select and Text Area icons control whether you may select layout elements by pointing and clicking, and whether (and where) you may place text on your layouts.

Important: Don't confuse the text produced through the Text Area icon with the text from a Text field. Text Area text is written onto the layout directly and does not change from record to record (except when you use embedded variables).

Select a layout element

1. Click the Select icon to be able to select a layout element. The pointer changes into the standard arrow-shaped pointer.
2. Point and click to select.

Unless you have been using another of the Group 1 icons, the Select icon should be in effect. It is the default.

If you have clicked another icon from Group 1, and then try to select a layout element, 4th Dimension switches to the Select icon on your first click, and actually selects the element you want upon your second click.

See also "Selecting a Layout Element" in the how-to section "Selecting, Moving, and Handling Layouts."

Add a Text Area

1. Click the Text Area icon on the palette. When you move the pointer back over your layout, the pointer becomes a crossbar.
2. Position the crossbar where you want to locate one corner of the Text Area.
3. Drag the crossbar to create a box. The box contains an I-beam text insertion point.
4. Enter your text. Text wraps when it encounters the edge of your Text Area.

   Your Text Area text may not be large enough to display the word wrapping. You can resize the Text Area by dragging one of the four resizing handles until you display the text.

Figure 2-31
Adding a Text Area to a layout

Resize a Text Area

1. To stretch or shrink (resize) the area displaying your text, first select it.
2. Position the pointer at one of the four resizing handles. The pointer becomes a four-directional arrow.
3. Drag the resizing handle.

   The diagonally opposite resizing handle remains anchored.

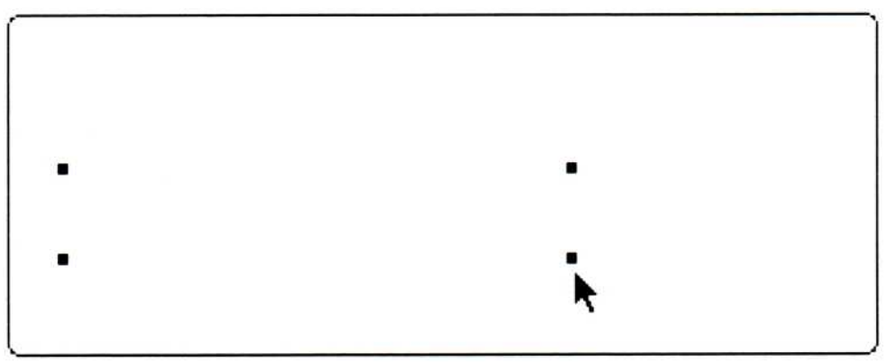


Figure 2-32
Resizing a Text Area

Change font size and style

1. Select the Text Area you wish to change.
2. Choose a font from the Font menu.

   4th Dimension changes the font it uses in the Text Area text to the new font.

- Select a type style, alignment, and point size from the Style menu.

Drawing lines and shapes on your layout

Use lines and shapes to divide areas of your layout, and to help arrange and display buttons on your layout such as Accept, Cancel, and radio buttons.

See also "Using the Layout Menu," "Placing a Field on Your Layout," and "Variable Types," all in this chapter. See Chapter 6, "Creating a Custom User Interface." See also *4th Dimension Programmer's Reference* regarding programming with buttons and variables.

Draw a line

1. Click the Draw Line icon. When you bring the pointer into the layout area, it changes into a crossbar.
2. Position the crossbar where you want one end of the line.
3. Drag the crossbar to create the line.

   When you create a line, 4th Dimension automatically clicks the Select icon and selects the line you have just created.

- You may create one line segment at a time. To create a corner, for example, you must create two separate line segments.
- To change the pixel width of the fill pattern of a line using the Layout menu, you must first select the line. 4th Dimension creates all lines in its default pixel width.

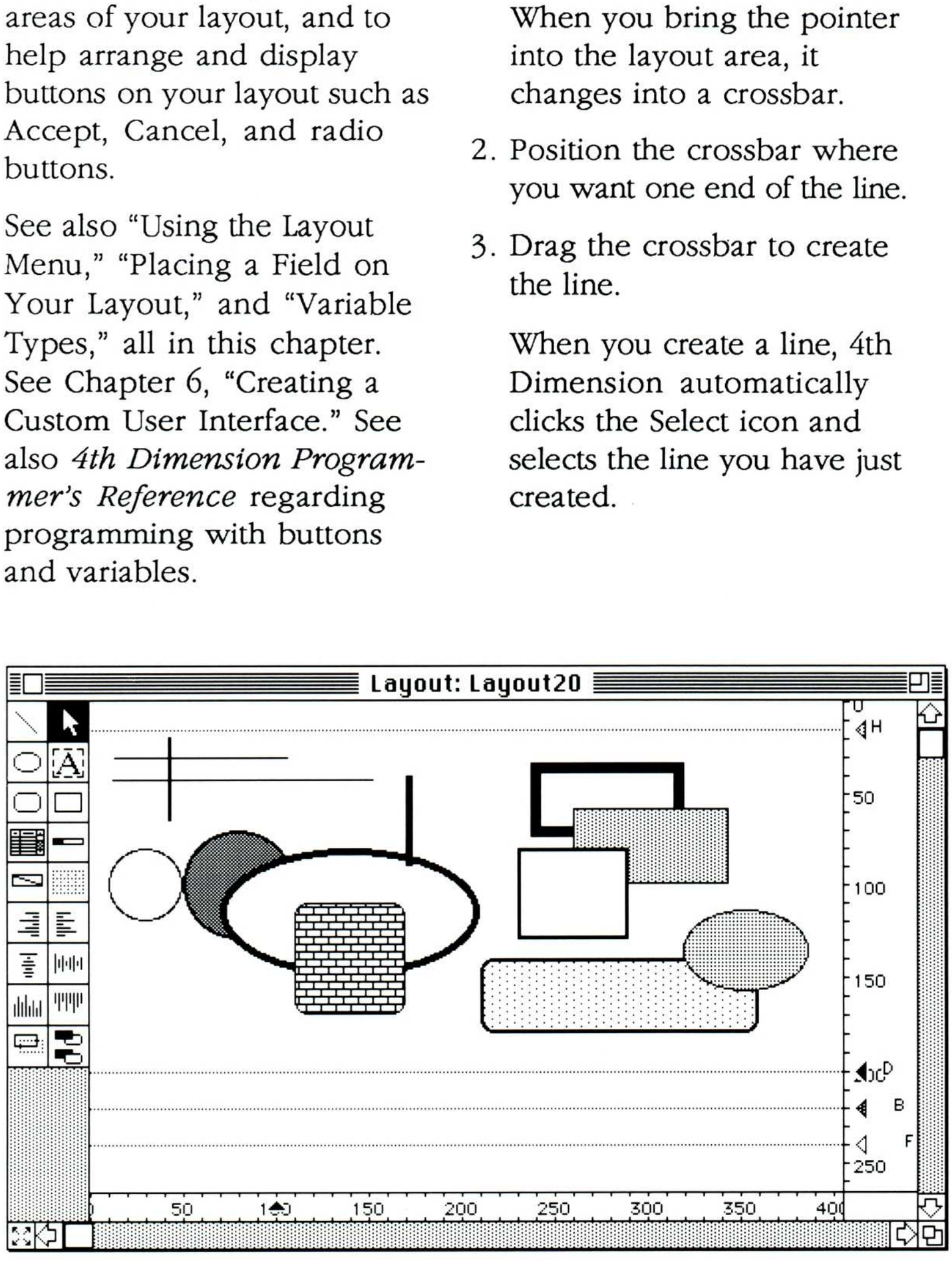


Figure 2-33
Lines and shapes on a layout

Draw a circle or an oval

1. Click the Draw Oval icon. When you bring the pointer into the layout area, it changes into a crossbar.
2. Position the crossbar where you want to anchor one of the four resizing points that bound a shape.
3. Drag the crossbar to create the shape.

   Click Grid On to make it easier to draw a circle. The direction and distance you drag the crossbar will determine whether you draw a circle or an oval.

   When you create a shape, 4th Dimension automatically clicks the Select icon and selects the shape you have just created.

- To change the pixel width or fill pattern of a shape, you must first select it. 4th Dimension creates all shapes in its default pixel width.

Draw rectangles and squares

1. Click one of the Draw Rectangle icons.

- Click the Draw Rectangle icon with the rounded corners to create a rectangle with rounded corners.
- Click the icon with square corners to create a rectangle with square corners.

  When you bring the pointer back into the layout area, it changes into a crossbar.

2. Position the crossbar where you want to anchor one of the four resizing points that bound a shape.
3. Drag the crossbar to create the shape.

   Click Grid On to make it easier to draw a square.

   When you create a shape, 4th Dimension automatically clicks the Select icon and selects the shape you have just created.

- To change the pixel width or fill pattern of a shape, you must first select it. 4th Dimension creates all shapes in its default pixel width.

Change the default pixel width

1. Make sure that no layout element is selected. Do this by clicking the Select icon and then clicking in an blank part of the layout area *outside* any layout.

   No element is selected if none shows resizing handles.

2. From the Layout menu, choose 1, 2, 4, or 6 as the width of the default lines in pixels.
3. Draw a shape. It and succeeding shapes will display lines in the new default pixel width.

Including one layout in another layout

You may include a layout from another file or subfile in your current layout. When these layouts appear in another layout, they are called *included layouts*.

See "Included Layouts" in Chapter 6, "Creating a Custom User Interface."

Layouts from other files or subfiles occupy rectangular areas on the current layout. Included layouts must already exist for you to use them. You must have a layout prepared in order to include it in another layout. You may bring up a layout window to create it while the including layout is open in another window.

Included layouts are much like the layouts that include them: you must decide whether they are input or output layouts. In the case of included layouts, the options are "Full Page" (one layout to a screen) or "Multi-line" (several layouts to a screen).

Important: The same layout that carries a "Multi-line" setting when included in another layout may carry an "Input" setting when used by itself. Layouts and included layouts are two different creatures—even when they're the same layout.

1. Click the Included Layout icon, and position

1. Click the Included Layout icon on the palette. When you move the pointer into the Layout area, it will change into a crossbar.
2. Position the crossbar where you want to place one corner of the included layout.
3. Drag the crossbar to create a rectangular area for the included layout.

4th Dimension displays the Format for an Included Layout dialog box.

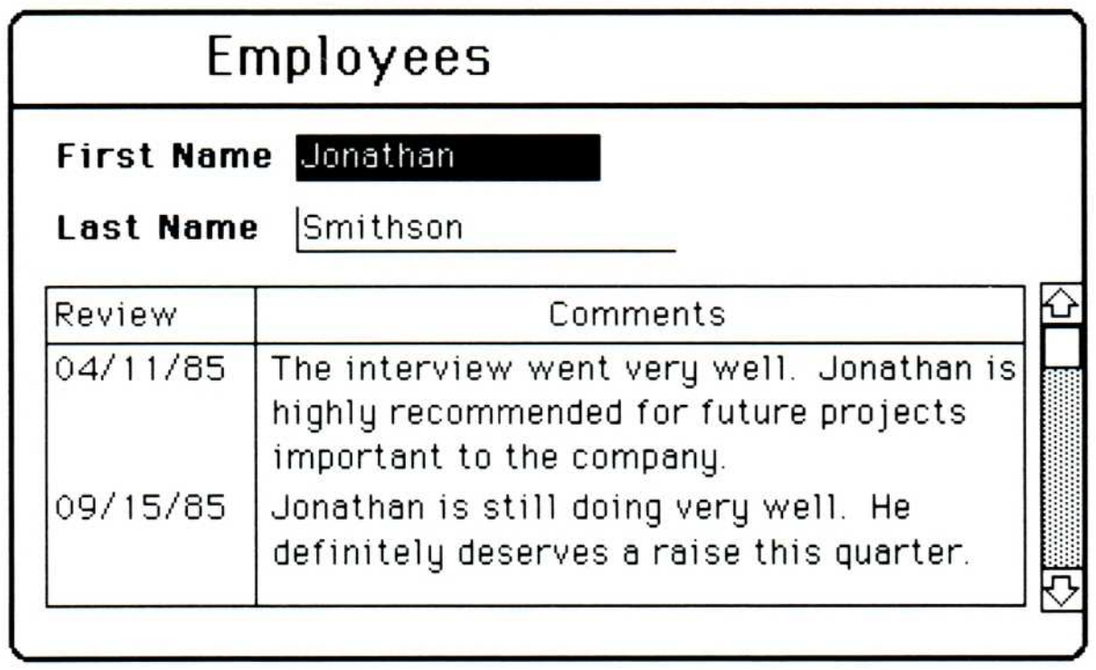


Figure 2-34
Layout enclosing an included layout

2. Select the source file for the included layout

- Double-click an included layout *already* placed on your current layout to display the Format for an Included Layout dialog box.
- Click Cancel to return to your current layout. You may press the Backspace key, or choose Cut from the Edit menu to dispose of the unformatted but selected area that 4th Dimension leaves on your layout.

1. In the Format for an Included Layout dialog box, select the file or subfile whose existing layout you wish to include within your current layout.

   4th Dimension displays filenames in **boldface** and brackets [ ] and displays subfile names in **boldface.**

2. Click Expand to see the names of all the layouts associated with the file you have selected.

   Or: Double-click the file name to expand the list of available layouts beneath it.

   Or: Use the up and down arrows to select a filename, and the right and left arrows to expand and collapse it.

3. Click the Select button to formally select the file (or subfile) from which you want to include a layout. You must *both* click Select for the file *and* eventually select the specific layout.

   4th Dimension places an asterisk next to the selected file name. The asterisk remains with the name of the file you have selected, even though you select a layout.

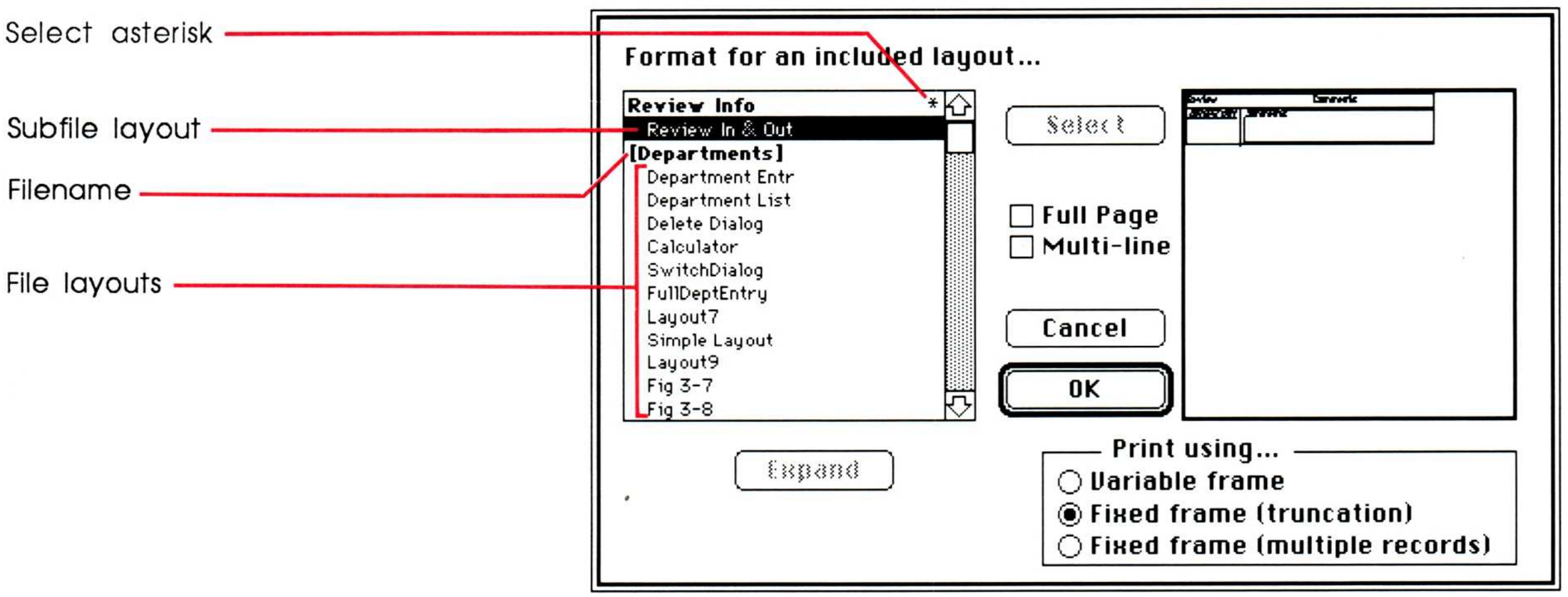


Figure 2-35
Format for Included Layout dialog box

3. Set the display for Included Layout

- Click Full Page, Multi-line, or both of them to tell 4th Dimension which layouts for the selected file are the default layouts. 4th Dimension displays an F, an M, or a B next to the selected layout.

  You may not unclick Full Page or Multi-line. To change them, select another layout as the default included layout for the selected file. If there is only one included layout for that file, you will have to select another file.

4. Set Print using

- Click a Print using button. Print using determines how 4th Dimension will treat the included layout during printing.
- Click the Variable frame button to allow the included layout to grow and shrink as needed when printed by your current layout.
- Click the Fixed frame (truncation) button to hold the included layout to a precise area when printed by your current layout.

  4th Dimension truncates (clips) any part of the included layout that extends beyond the limits of the area you allow on your current layout.
- Click Fixed frame (multiple records) button to truncate the printout of included layouts in any individual layout, but permit printing multiple layouts until all included layout information has been printed.

5. Finish up

- Click OK to accept your selection as the layout you wish to include in the current layout.
- Click Cancel to return to your current layout with no changes.

  4th Dimension returns you to your current layout with the rectangular area selected. If you have not selected an included layout, this area will still be selected, even though no included layout is intended for it.

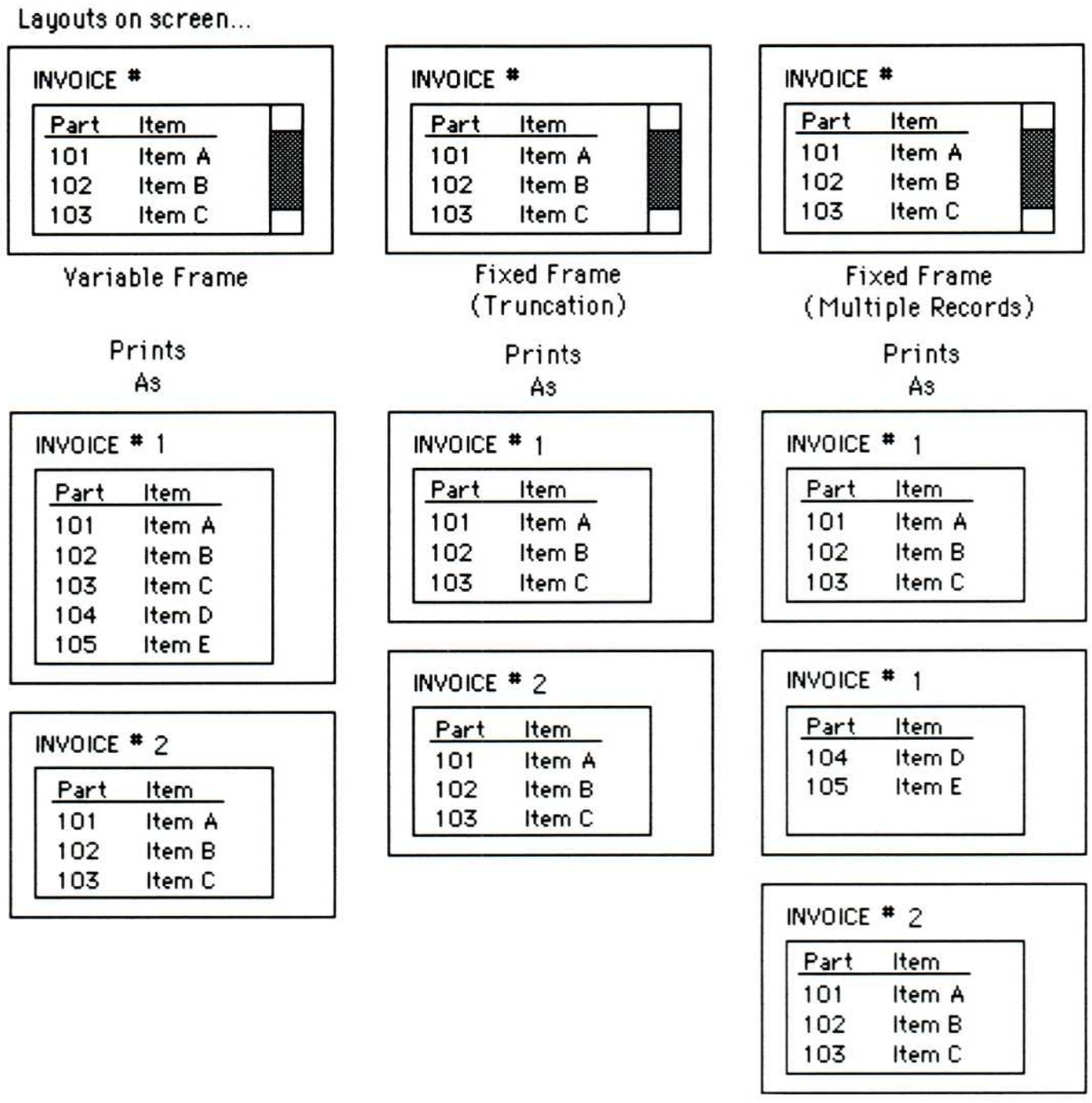


Figure 2-36
How different Print using frames behave

Working with layout elements

Each object on a layout—shape, Text Area, line, field, or variable—is a layout element. In addition to the palette, four menus in the Layout window affect layout elements. These menus are Layout, Font, Style, and Color.

- **Layout menu:** The Layout menu controls several disparate features. These are the width of borders and lines, fill patterns, manipulation of layout elements, control of the grid and rulers, and setting formats. Manipulation, patterns, and formats offer alternative ways of executing commands that you can also access via the palette.
- **Font menu:** Select any of your installed fonts from the Font menu and apply them to the text in fields, variables, and text areas on the layout.
- **Style menu:** The Style menu governs the type style of the font you have chosen—Plain, Bold, Italic, Underline, Outline, and Shadow. It also controls justification and the point size of the face.

A later section in this chapter explains the Color menu in more detail.

- **Color menu:** The Color menu provides a way for you to set the computer's internal color value for the On and Off pixels in your layout. An Apple ImageWriter II printer with a color ribbon can use these values to print layouts in color. On a black-and-white monitor, of course, all colors other than white are black.

Using the Layout menu

The Layout menu sets layout defaults such as width of lines, area fill and line patterns, grid spacing, and ruler units.

It also performs several manipulations on elements you have selected, such as duplicating, moving front to back, and aligning to the grid.

See also Appendix B in this manual, "Menu Command Reference," for more information on the Layout and other menus.

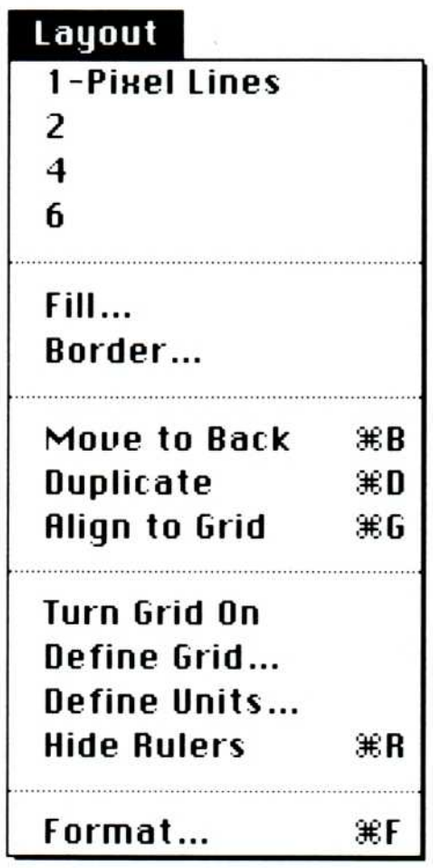


Figure 2-37
Layout menu

Set the line width

1. Select a layout element with a border. A field, variable, box, or even the layout itself will do.
2. From the Layout menu, choose Pixel Lines. Your choices are 1-, 2-, 4-, and 6-pixel-wide lines. The original default is for 1-pixel lines.

You may choose only one line width at a time.

Pixel Lines acts immediately on any element you have selected. If you have no element selected in the layout, Pixel Lines sets the default for the layout.

Appendix D outlines an alternative way of creating borders.

Fill an area or line with a pattern

1. Select the element you wish to fill. You cannot fill a field or a variable.
2. From the Layout menu, choose Fill.

   Or: Double-click the element you wish to fill. 4th Dimension displays the Pattern dialog box.
3. Click a fill pattern. 4th Dimension fills the element you have selected with the fill pattern you click. The Pattern dialog box closes automatically.

   4th Dimension fills the area up to but not including the element's boundary lines, whether or not those lines are visible. 4th Dimension will not fill outside the boundary lines.

- Click Cancel to return to the Layout window without having selected a fill pattern.

Important: The None pattern in the Pattern dialog box is different from the White pattern. None is an absence of pattern. White fills the element with white.

Set the pattern for borders

1. Select the element with the borders whose fill you wish to set.
2. From the Layout menu, choose Border. 4th Dimension displays the Pattern dialog box.
3. Click a fill pattern. 4th Dimension fills the outlines of the element you selected with the fill pattern you click. The Pattern dialog box closes automatically.

❖ *By the way:* Double-clicking an element tells 4th Dimension to fill the *area* of the element, not its borders.

■ Click Cancel to return to the Layout window without having selected a fill pattern.

Duplicate a layout element

1. Select the element you wish to duplicate.
2. Choose Duplicate from the Layout menu. 4th Dimension overlays the duplicate on the original.

   Or: Click the Duplicate icon on the palette.

   4th Dimension selects the new element automatically.

■ Move the duplicated item where you want it or set a new pattern for the duplicate and click the Move to Back icon to make a shadow box.

   4th Dimension has a "smart" duplicate command. It remembers the spatial relationship between the graphic element and its duplicate, and duplicates that relationship along with the element.

Move one layout element behind another

1. Select the element you wish to move.
2. Choose Move to Back from the Layout menu. 4th Dimension moves the element "behind."

   Or: Click the Move to Back icon from the palette.

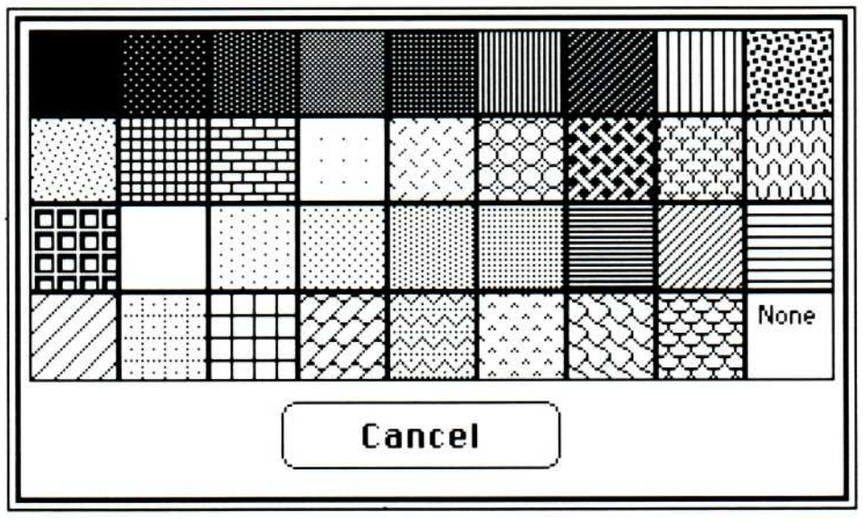


Figure 2-38
Pattern dialog box

Define the grid

1. Choose Define Grid from the Layout menu. 4th Dimension displays the Define grid dialog box.
2. Set the number of points in each X-axis and Y-axis step by entering an integer into the corresponding boxes.

   "Points" are printer's points: one point equals 1/72 inch.
3. Click OK to accept your settings, click Cancel to abandon them.

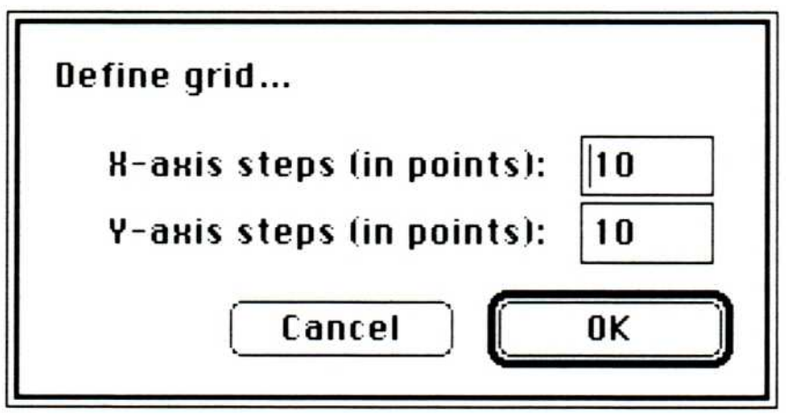


Figure 2-39
Define grid dialog box

Turn the grid on and off

- To turn the grid on, choose Turn Grid On from the Layout menu.
- To turn the grid off, choose Turn Grid Off from the Layout menu. This choice alternates with Turn Grid On.

  Turning the grid on and off changes the Grid icon on the palette from gray to black.

  Or: Click the Grid icon on the palette. This will change one setting to the other.

Align an element with the grid

1. Select the element(s) you wish to align.

   Shift-click on several elements to select them all.
2. Choose Align to Grid from the Layout menu. This aligns the elements you have selected to their nearest common grid line.

- By clicking the Align icons on the palette, you can control the direction in which the elements align.

Define the ruler units

1. To define the units that both the horizontal and vertical rulers use for measurement in the Layout window, choose Define Units from the Layout menu. 4th Dimension displays the Define units dialog box.
2. Click one of the three buttons—measurement in points, centimeters, or inches.
3. Click OK to accept your choice. Click Cancel to abandon your settings and return to the previous ones.

   The default ruler measurement is in points.

   Important: The Define units dialog box has no effect on the grid settings.

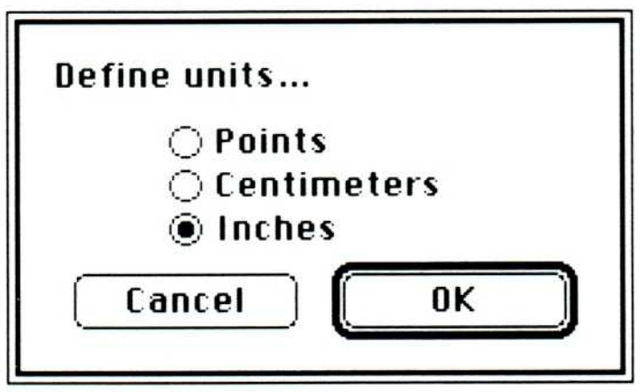


Figure 2-40
Define units dialog box

Hide and show the rulers

- To hide the rulers in the Layout window, choose Hide Rulers from the Layout menu.
- To display the layout rulers, choose Show Rulers from the Layout menu.

  These choices alternate with each other.

  4th Dimension's default is to show the rulers. There is no palette equivalent.

Format fields and variables

1. Select a field or variable whose format you wish to change.
2. Choose Format from the Layout menu.

   Or: Double-click the field or variable whose format you wish to change.

   4th Dimension displays either its Format of field or Format of variable dialog box, depending on which you selected, field or variable.
3. Select the format you wish.
4. Finish up by clicking OK to accept the format, or by clicking Cancel to abandon any changes.

   The sections "Working With Fields" and "Working With Variables" later in this chapter explain the formatting process in considerable detail.

Using fonts and styles

You may choose fonts and display styles for any of the text on your layout, including variables and fields, either before you create it or after the fact.

You may also add incidental text (text that is neither a field name nor the field contents) anywhere on the layout.

Figure 2-41 shows the Style menu. The Font menu holds only those fonts you have installed in your system.

Figure 2-41
Style menu

Choose a font

1. Select the element or elements whose font you wish to change. You may wish to select no element in order to set a default font.
2. From the Font menu, choose a font.

4th Dimension applies that font immediately to the element(s) you have selected.

If you have selected no elements on the layout, choosing a font sets the default for any text you add later.

Important: When first creating your layout, you should click either the 9-point or the 12-point radio button in the New layout dialog box. While this sets the point size for any fields and variables included in an automatic layout, any *new* text elements you enter will revert to a 12-point font *unless* you have set a point size default.

Choose a style

1. Select a layout element or elements whose style you wish to change.

- You may select no elements if you wish to set a default style for the entire layout.

Any format, justification, or point size you do not choose and change remains at the default. Layout elements you do not select for changing will remain at the default. New layout elements you add later will conform to the default.

Defaults remain in effect only for the layout in which they are set.

4th Dimension originally defaults to a Plain character format, the default justification of each of your fields (left for text and right for numeric), and 12-point Geneva.

2. From the Style menu, choose a typestyle, a justification, and a point size.

   4th Dimension applies the style you have chosen to your selection.

   Style menu choices remain in effect until you change them.

Place text in your layout

1. Click the Text Area icon on the palette. When you move your pointer back over your layout, the pointer becomes a crossbar.
2. Position the crossbar where you want to locate one corner of your text area.
3. Drag the crossbar to create a box. The box contains a vertical word processing cursor.
4. Enter your text. Your text will wrap when it encounters the edge of the Text Area. You may continue to enter up to 32,767 characters.

   Text will still wrap, and you may enter more text, even if your Text Area is not large enough to display all the text.

   Text takes the default font and style unless you set otherwise.

- Click the Select icon and use the resizing handles to change the shape of the Text Area. Your text will conform to the new area size.
- To delete a Text Area from the layout, click the Select icon, select the Text Area, and press Backspace.

  Or: Select the Text Area and choose Cut from the Edit menu.

Using the Color menu

The Color menu sets the computer's internal value for color.

The top part of the menu controls the color of Off pixels, and the bottom part controls the color of On pixels. By combining 4th Dimension's fill patterns—which consist of sequences of On and Off pixels—with the settings of the Color menu, you can obtain hundreds of different color and shade values. On pixels are those pixels which are displayed as white on a black and white monitor. Off pixels are those pixels that are displayed as black on a black and white monitor.

Set the color

1. Select the layout element for which you want to set the color.

■ You may select no element if you wish to set the default color for the entire layout.

2. From the Color menu, select a color from the upper set to control the Off pixels, and select a color from the lower set to control the value for the On pixels.

Working with fields

Fields in layouts are direct entryways into the corresponding fields in records and structures. Layouts are the templates of records, and placing a field in your layout lets that layout read and write directly to and from the record it's displaying.

You need not include every field from a file in any one layout. A data entry clerk, for example, does not need to view the salaries of the executive staff, even though those salaries may be part of the Personnel file. A report of aged accounts receivable need not display the extended price for every line item shipped—only the aggregate amount for one particular account.

Figure 2-42 shows a typical database structure. The Employees file has several fields including two Picture fields and a field of type Subfile.

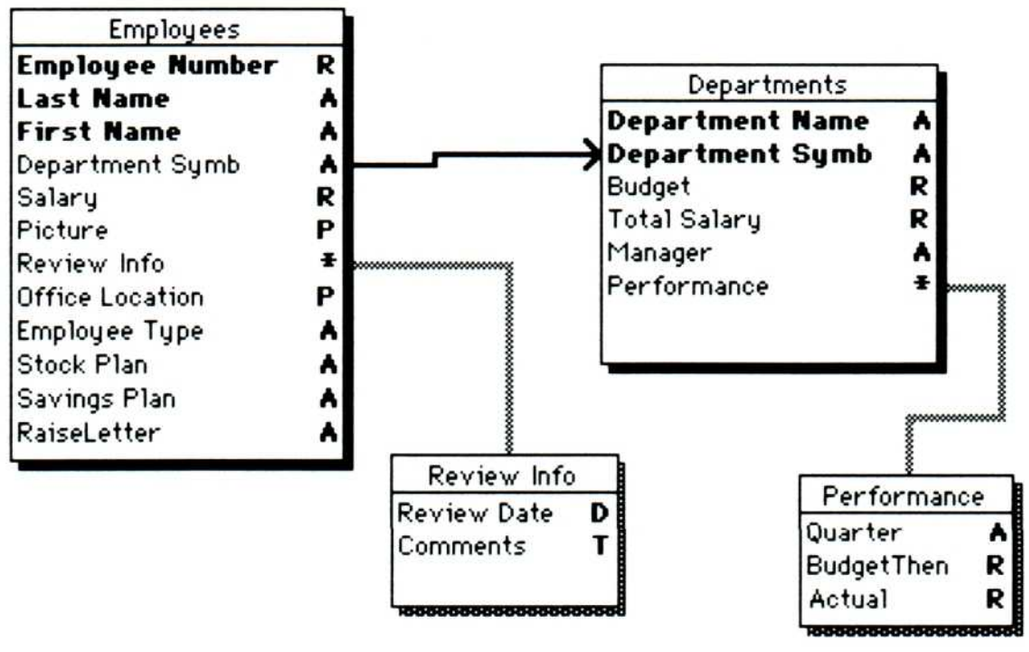


Figure 2-42
Structure showing Subfile, linked file, and Picture fields

When you create a new layout for the file, the Layout dialog box displays existing layouts, including those from the subfile called Review Info, a subfile of the Employees parent file. Figure 2-43 shows the Layout dialog box. The one layout available for the Review Info file is indented.

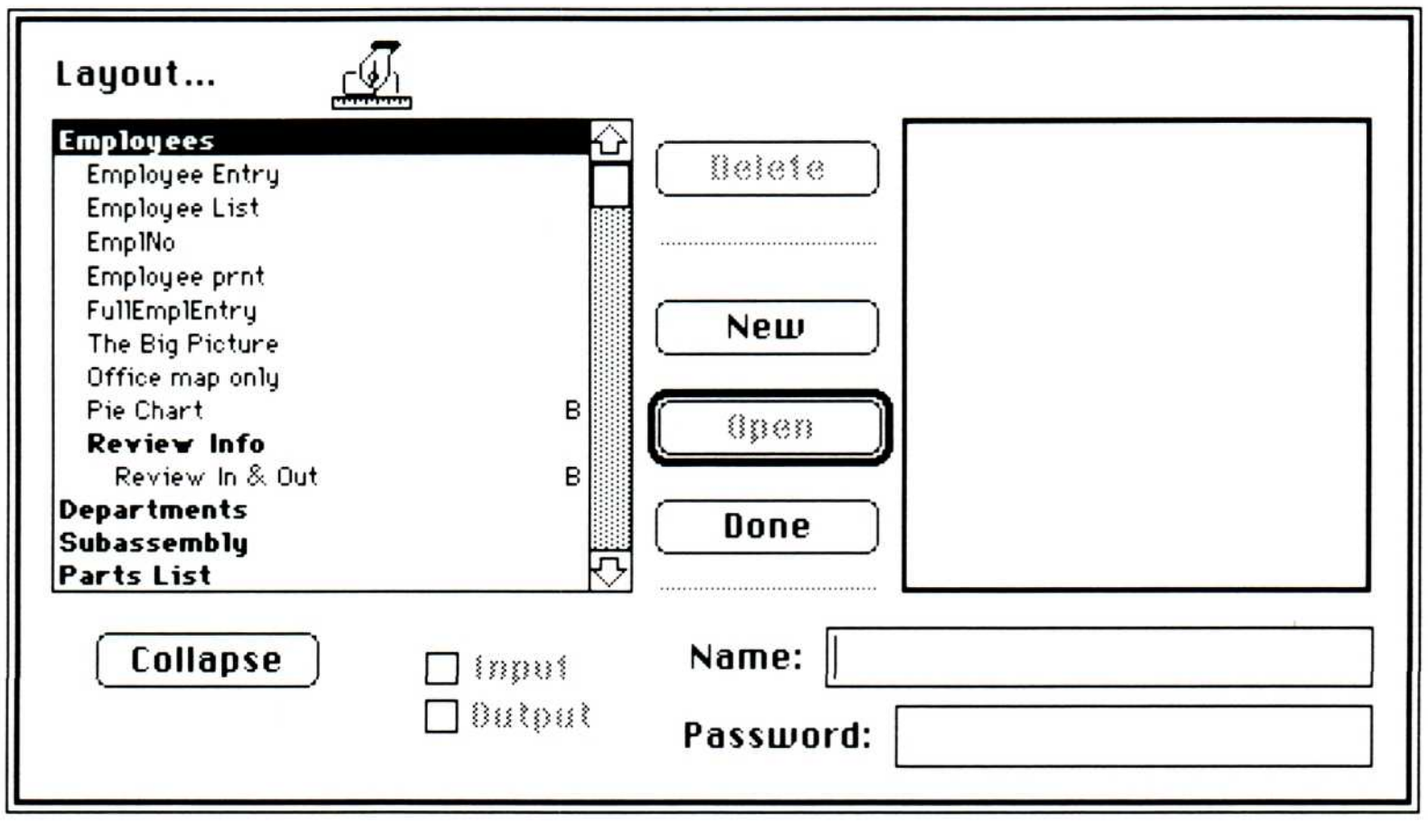


Figure 2-43
Layout dialog box showing subfile layout indented

When you click New, 4th Dimension displays the New layout dialog box. This is where you may select the fields you want to include in an automatically generated layout.

The Picture fields from the Employee file are apparently missing from the "Select fields" list in the New Layout dialog box. 4th Dimension will not include a Picture field when it first creates an automatic layout. 4th Dimension can't anticipate the size or scaling of the picture; you must help 4th Dimension *after* the program creates the layout by manually sizing the area into which you want the picture to go. Figure 2-44 shows the New layout dialog box and the fields you have available to select from in this example.

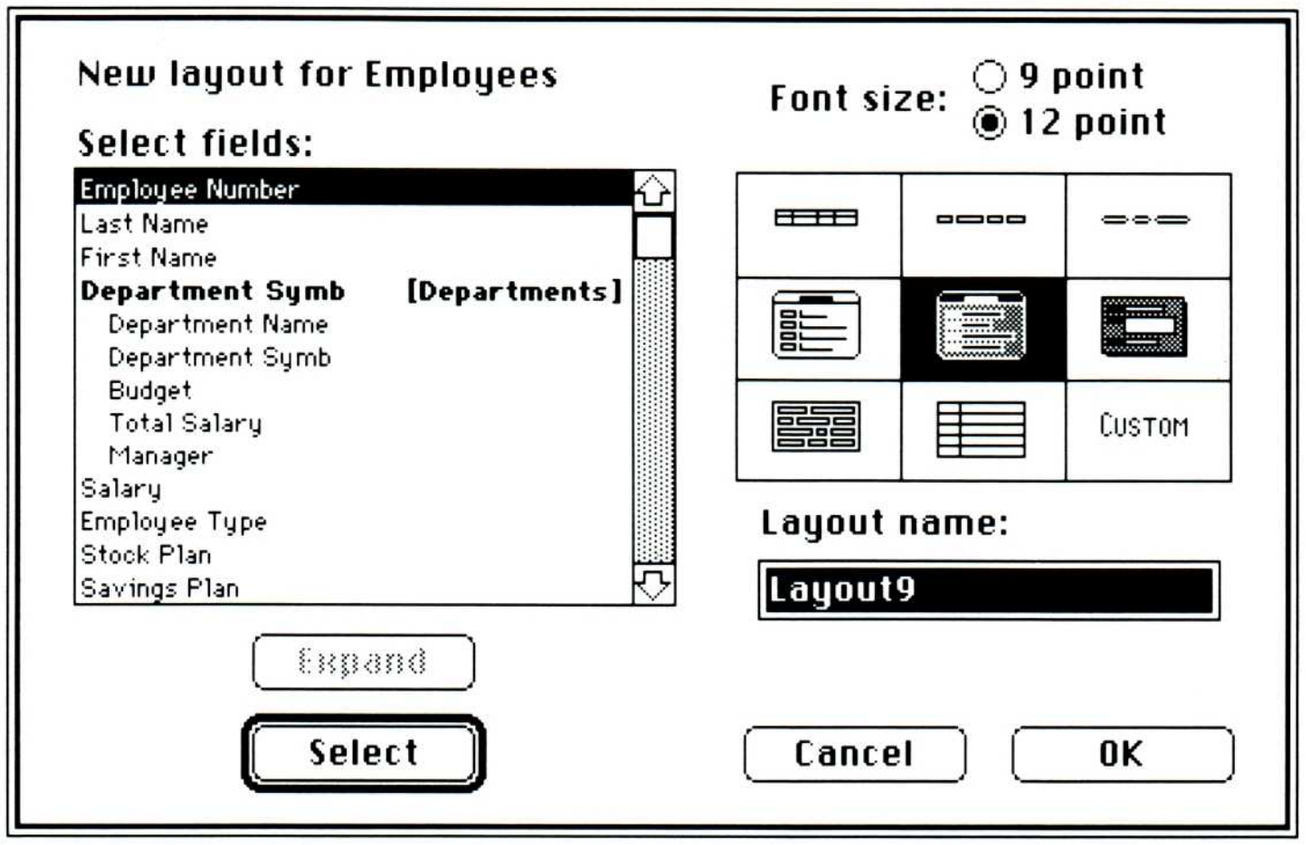


Figure 2-44
New layout dialog box

The other element apparently missing from the "Select fields" list is the set of fields contained by the Review Info subfile. Because 4th Dimension allows you up to 32,767 records in a subfile, the program must handle subfile data in a very specific way. If you wish to include subfile data in the layout of a parent file, you must first create a layout just for the subfile data and then add that layout as an included layout to the parent file's layout.

You may place in any given layout the included layouts from subfiles belonging to the given layout's file, or from other files in the database (linked or not linked).

Fields from linked files in the New layout dialog box are critical to creating layouts and procedures that link. See Chapter 5, "Relational Structures."

An "extra" element in the New layout dialog box is the list of fields contained in the Departments file. The Employees file links to the Departments file by way of the Department Symb field; because of that, fields in the other, linked file are available to the Employees layout. They are available through *variables*.

Fields from other files

A layout can display data from fields in its *own file,* from fields in *linked files* in the form of variables, from fields in its *own subfiles* in the form of included layouts, and from fields in *other files* in the database (which may or may not be linked files, but in either case are not subfiles) also in the form of included layouts.

Figure 2-45 is a closeup of the Select fields list in the New layout dialog box in Figure 2-44 (previous page). It notes the fields available from the Employees file, and the fields available—as variables only—from the Departments file.

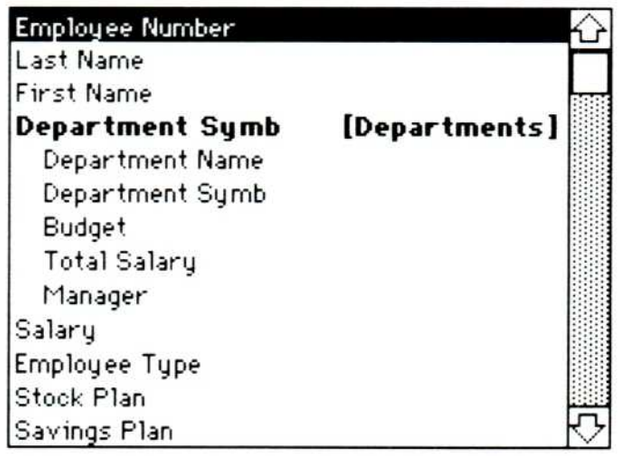


Figure 2-45
Closeup of Select fields list in New layout dialog box

If you select any of the fields from the Departments file to include in an automatically generated layout, 4th Dimension will create that layout, include the Departments fields as variables, and generate an automatic linking procedure.

For more information on linking procedures see Chapter 4, "Procedures," and especially Chapter 5, "Relational Structures."

The only way other than by linking to display fields from other files in your layout is to create and use an included layout from that other file.

Fields for input, output, and dialogs

Fields are the primary entry and exit for data in those layouts used for input and output (this is also true for included layouts used in their Full Page and Multi-line ways). Variables—other than those used for buttons and check boxes—are *for display only* in Input, Output, Full Page, and Multi-line layouts.

In layouts intended as dialog boxes, the orientation reverses. In Dialog layouts, fields can display values only and you must use variables for all interaction with the user, including data entry.

For more information on dialog boxes, see Chapter 6, "Creating a Custom User Interface," and see especially *4th Dimension Programmer's Reference*.

Placing a field on your layout

You may place an individual field on your current layout irrespective of any automatic layout 4th Dimension may have generated.

The field you place on the layout may be a duplicate of a field already there.

To place a field on your current layout, that field must already exist in the Structure window. If it does not already exist, you must display the Structure window and create it before you can add it to your layout.

See "Setting Field Types and Attributes" in Chapter 1, "Database Structures."

1. Click Add Field and position the field

1. Click the Add Field icon on the palette. When you move the pointer into the layout area, it changes into a crossbar.
2. Position the crossbar where you want to place one corner of the field.
3. Drag the crossbar to create the field.

   4th Dimension displays the Format of field dialog box.

- You may also double-click an existing field to display the Format of field dialog box.
- Click Cancel to return to your layout.

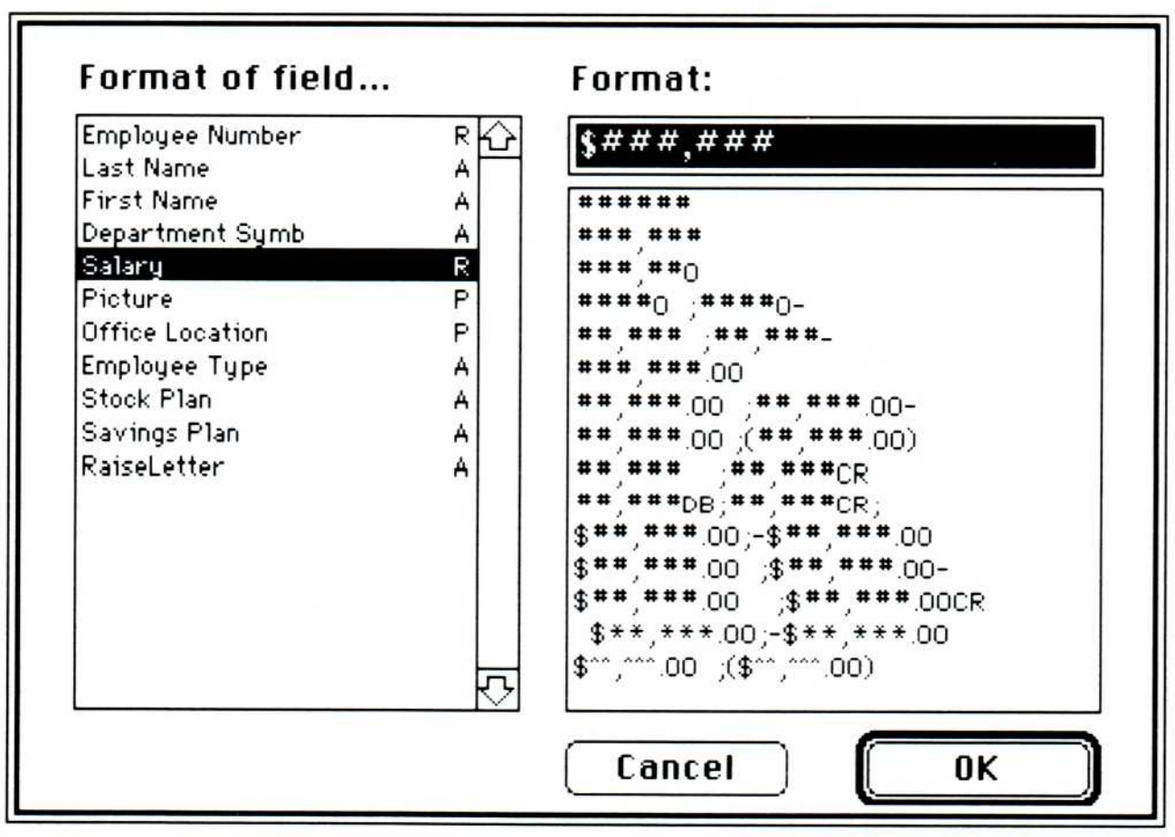


Figure 2-46
Format of field dialog box

2. Select the field to add

- Select a field to add to your layout from the list of fields in the Format of field dialog box.

  When you select a field, 4th Dimension displays a selection of possible formats appropriate to that field type (if any):

  Alpha and Text fields have no special format. The Format areas are blank.

  Real, Integer, and Long Integer fields share many similar numeric and monetary formats.

  Date fields may have one of several formats.

  4th Dimension may truncate Picture fields to fit the area available on your layout, may scale them to fit the area, or may place them on the layout background.

  See also "Pictures, Graphs, and Layouts" in Chapter 6, "Creating a Custom User Interface."

Select a format

- Select one of the formats in the format list.

  You may select a format only if 4th Dimension presents you with a list of formats appropriate for the type of field you have selected.

  When you select a format, 4th Dimension displays that format in the Format area.

Edit a field format

- You may edit a numeric field format in the Format area as you would any text. This allows you to create a format different from those provided in the format list.

  For a complete explanation of numeric field formats, see Table 2-2 and the section "Setting Field Display Formats" elsewhere in this chapter.

3. Finish up

- To accept the formatting for a field, click OK.
- To return to the current layout without having formatted the field, click Cancel.

  4th Dimension automatically clicks the Select icon, and the program selects the field whose format you just set (or did not set).

Setting field display formats

A **format** is the way 4th Dimension displays the contents of a field.

When creating a layout, you may control how 4th Dimension displays numeric, Date, and Picture fields and to an extent, how 4th Dimension displays Alpha and Text fields. You may determine the **format** for the fields that 4th Dimension creates for you when it generates an automatic layout, and you may determine the format for the fields you enter yourself when using the Add Field icon on the palette.

4th Dimension displays its Format of field dialog box if you double-click any field in the current layout. Double-clicking a numeric (Real, Integer, or Long Integer) field, a Date field, or a Picture field will display a list of possible formats appropriate to that field. Figure 2-47 shows the Format of field dialog box.

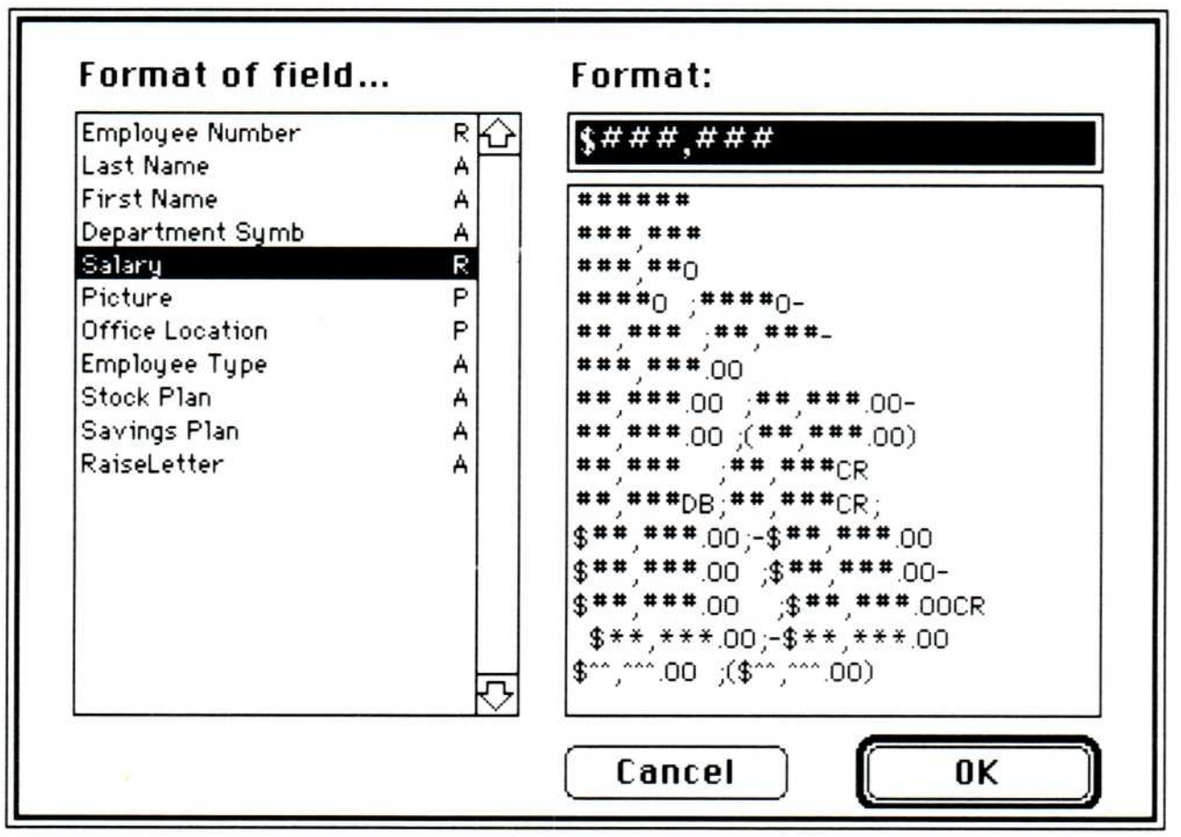


Figure 2-47
Format of field dialog box showing numeric formats

You may edit numeric formats to suit your application. Table 2-1, later in this section, lists some special characters you can use to create and change numeric formats. Table 2-2 lists the formats that 4th Dimension already provides, and shows how they display numbers.

For more information on the Picture field format and applying it, and graphs, to layouts, see Chapter 6, "Creating a Custom User Interface."

You may not alter the provided Date field formats.

You may select only from the provided Picture field formats.

4th Dimension by default formats Alpha and Text fields flush left. You may use the string-handling functions in 4th Dimension procedures to change the display of the text in these fields. You may turn off Alpha and Text field word wrapping through layout display formatting.

You may only display subfiles via an included layout. When you create the included layout, you may then format the subfile's component fields.

Important 4th Dimension display formats are valid only for the layout in which you set them. They are not global formats for the database. You do not format the actual data in the record when you set the display format for a field in a layout.

Date field formats

4th Dimension provides three date formats to control the display of Date fields in layouts. These formats control only the display; you must always enter dates as mm/dd/yy, no matter how you will be displaying them. The three formats are

- **Short:** produces the date 1/1/90
- **Abbreviated:** produces the date Mon, Jan 1, 1990
- **Long:** produces the date Monday, January 1, 1990

Figure 2-48 shows how the Format of field dialog box appears when you are formatting a date.

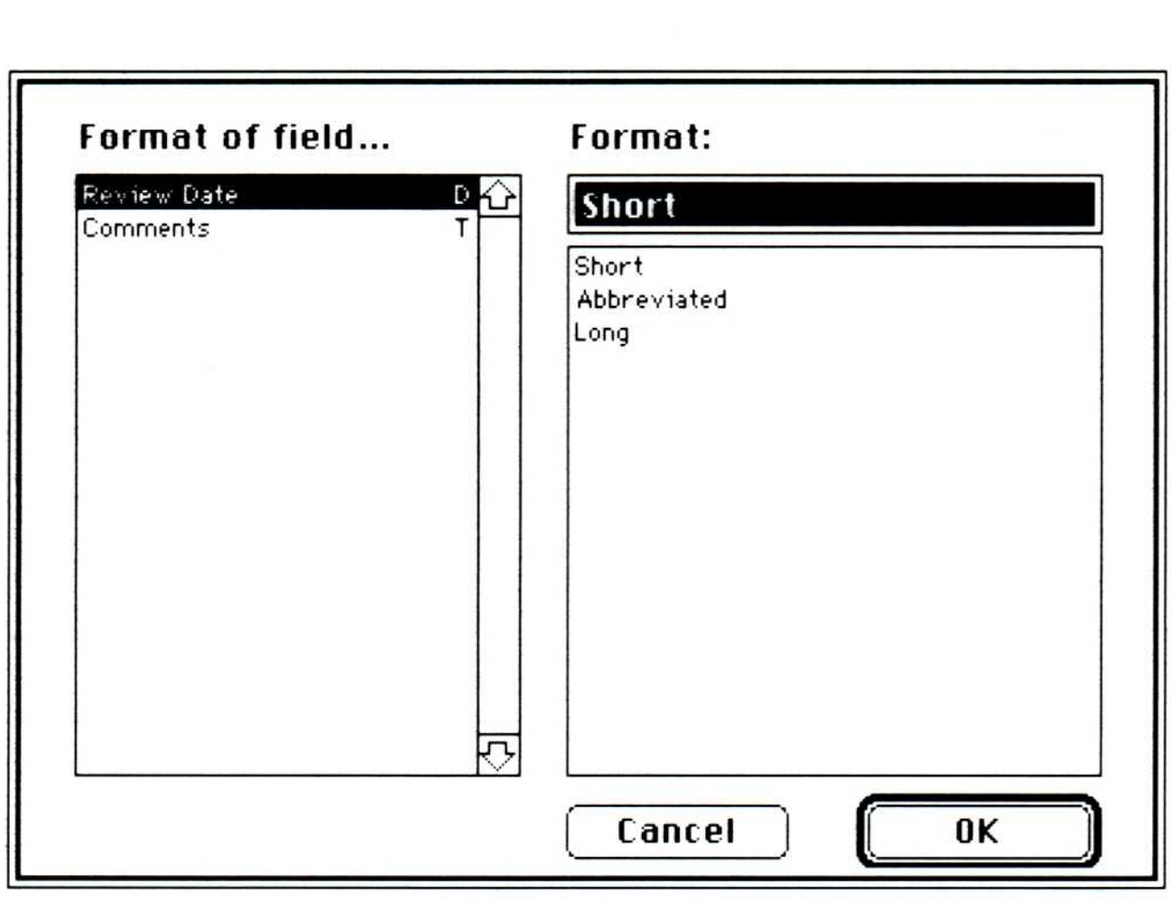


Figure 2-48
Format of field dialog box when formatting a date

Numeric field formats and configurations

4th Dimension allows you to specify three possible configurations for numeric field formats. These are the positive, negative, and zero configurations. Using the configurations, you can describe a different format for the field to display when the value of the field is positive, negative, or zero.

You need not specify all three configurations. If you include only one configuration, 4th Dimension assumes it is a positive format. Two formats denote positive and negative configurations. 4th Dimension treats the zero configuration as a positive format if you specify no zero configuration.

Use a semicolon (;) to separate the configurations.

Table 2-1 lists several characters that have special meaning when formatting numeric fields.

Table 2-1
Special characters for formatting numeric fields

Character	Represents
0	Any digit. If the digit value is 0, the field displays a 0.
#	Any digit. Displays nothing if the digit is a leading 0 or a trailing 0 after a decimal point.
^	Any digit. Displays a space if the digit is a leading 0 or a trailing 0 after a decimal point.
*	Any digit. Displays an asterisk if the digit is a leading 0 or a trailing 0 after a decimal point.
.	A decimal point. It must appear between digits.
;	A semicolon. This character separates the positive, negative, and zero configurations.

Table 2-2
How 4th Dimension displays numeric fields for various formats (for display purposes only) and in its three different configurations (positive, negative, and zero)

Format	1234	-1234	0
###	<<<	<<<	
####	1234	<<<<	
#####	1234	–1234	
#####.##	1234	–1234	
####0.00;-####0.00	1234.00	–1234.00	0.00
####0	1234	–1234	0
###0+;###0~; 0~	1234+	1234–	0~
###0~;###0–	1234~	1234–	0~
###0;###0–	1234	1234–	0
+###0;-###0;0	+1234	–1234	0
####0CR	1234CR	–1234CR	0CR
###0~~;###0CR	1234~~	1234CR	0~~
###0DB;###0CR; 0~~	1234DB	1234CR	0~~
###0CR;###0DB; 0~~	1234CR	1234DB	0~~
###0~;(###0)	1234~	(1234)	0~
##,##0	1,234	–1,234	0
##,##0.00	1,234.00	–1,234.00	0.00
^^^^^ (see *Note*)	~1234	–1234	~~~~~
^^^^0	~1234	–1234	~~~~0
^^,^^0	~1,234	–1,234	~~~~~0
^^,^^0.00	~1,234.00	–1,234.00	~~~~~0.00
*****	*1234	–1234	*****
****0	*1234	–1234	****0
,0	*1,234	–1,234	*****0
,0.00	*1,234.00	–1,234.00	*****0.00
$**,**0.00;–$**,**0.00	$*1,234.00	–$*1,234.00	$*****0.00
$^^^^0	$~1234	$–1234	$~~~~0
~$^^^0;–$^^^0	~$1234	–$1234	~$~~~0
~$^^^0~;($^^^0)	~$1234~	($1234)	~$~~~0~
~$^,^^0.00~;($^,^^0.00)	~$1,234.00	($1,234.00)	~$~~~~0.00

Note: When you use the ^ character in your format, it generates the non-breaking space character (ASCII 202) rather than the true space character (ASCII 20). Reals are accurate to 19 places total, on either side of the decimal point. The ~ character represents a non-breaking space (used here only to show that 4th Dimension shows a space). The <<< characters represent numbers too large for a given format to display.

Because fields as they are displayed in layouts are not necessarily the field values that actually occur in the records themselves, 4th Dimension occasionally encounters "error conditions." Errors caused by the format not having enough digits for the number are displayed as in Table 2-3. Numeric errors such as division by 0 are called Not a Number (NaN) errors and are in *4th Dimension Programmer's Reference.*

Table 2-3
Error indicators for numeric field displays

Character	Represents
<<<<<	The entire formatted value of the field cannot be displayed with the defined format.

Picture field formats

4th Dimension has many more graphics-oriented features than just Picture fields. See "Working With Layouts" later in this chapter, and "Pictures, Graphs, and Layouts" in Chapter 6, "Creating a Custom User Interface."

Picture fields contain pictures the way Integer fields contain integers. Because you cannot draw pictures into a Picture field the way you can enter a number, you must paste a picture in from the Clipboard.

There are three possible formats for a Picture field:

- **Truncated:** 4th Dimension uses the size of the Picture field as a "cookie cutter" on the picture you paste into the field. 4th Dimension always places the Picture field in the geometric center of the pasted image. The portions of the pasted image beyond the border of the Picture field are ignored.
- **Scaled to fit:** 4th Dimension compresses or expands one or both dimensions of the pasted image to fit the size and shape of the Picture field. There may be some distortion to the image.
- **On background:** You may superimpose another image over an image "On background." The image is not scaled and a user may move the picture by dragging.

You may paste only one element at a time onto a Picture field.

Figure 2-49 shows 4th Dimension's Format of field dialog box displaying the possible formats for a Picture field.

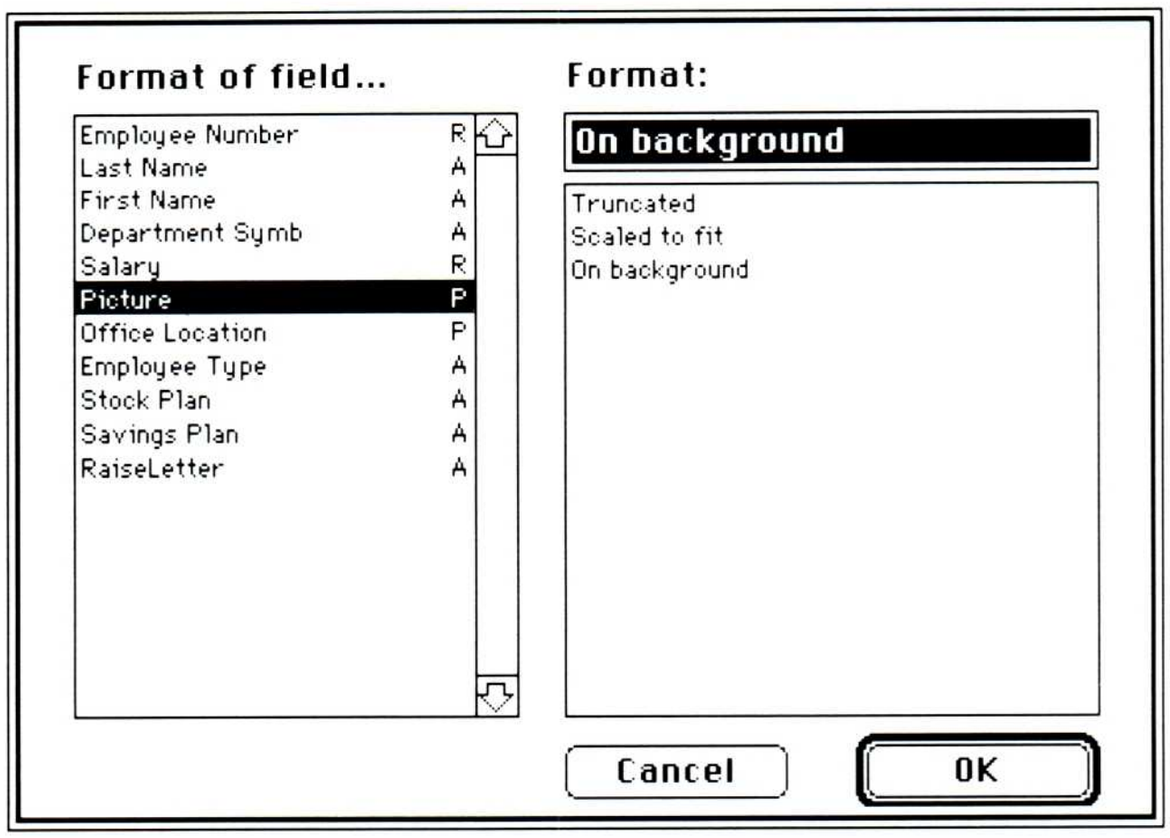


Figure 2-49
Format of field dialog box showing Picture field formats

Figures 2-50 and 2-51 show how the same image appears in Truncated, and Scaled to fit formats.

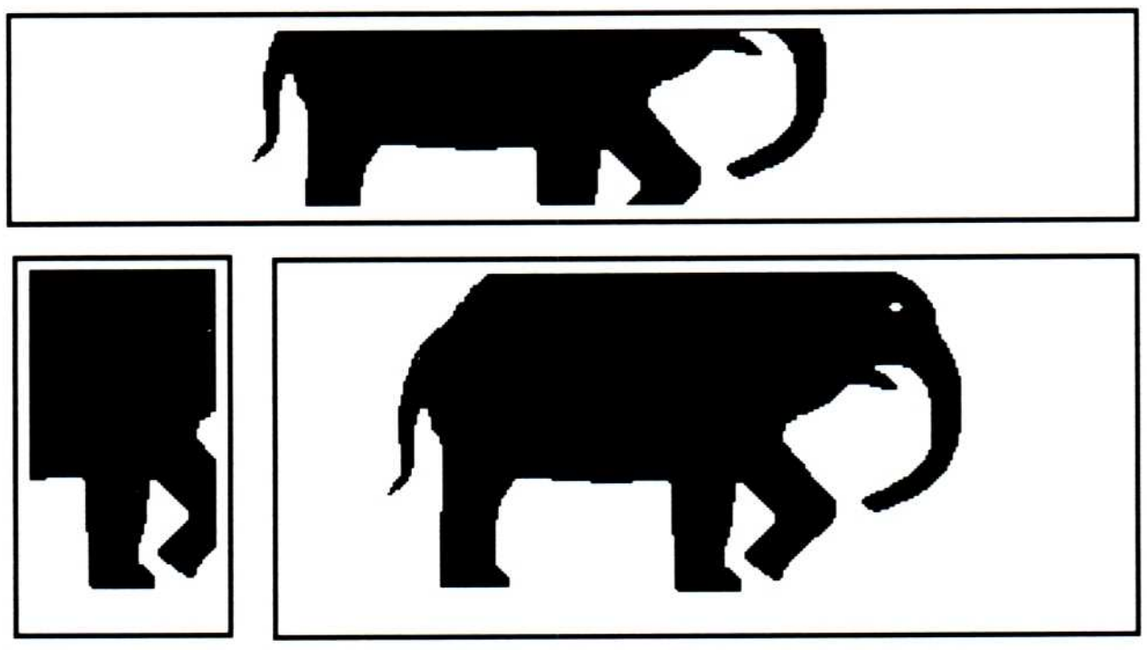


Figure 2-50
Truncated Picture field

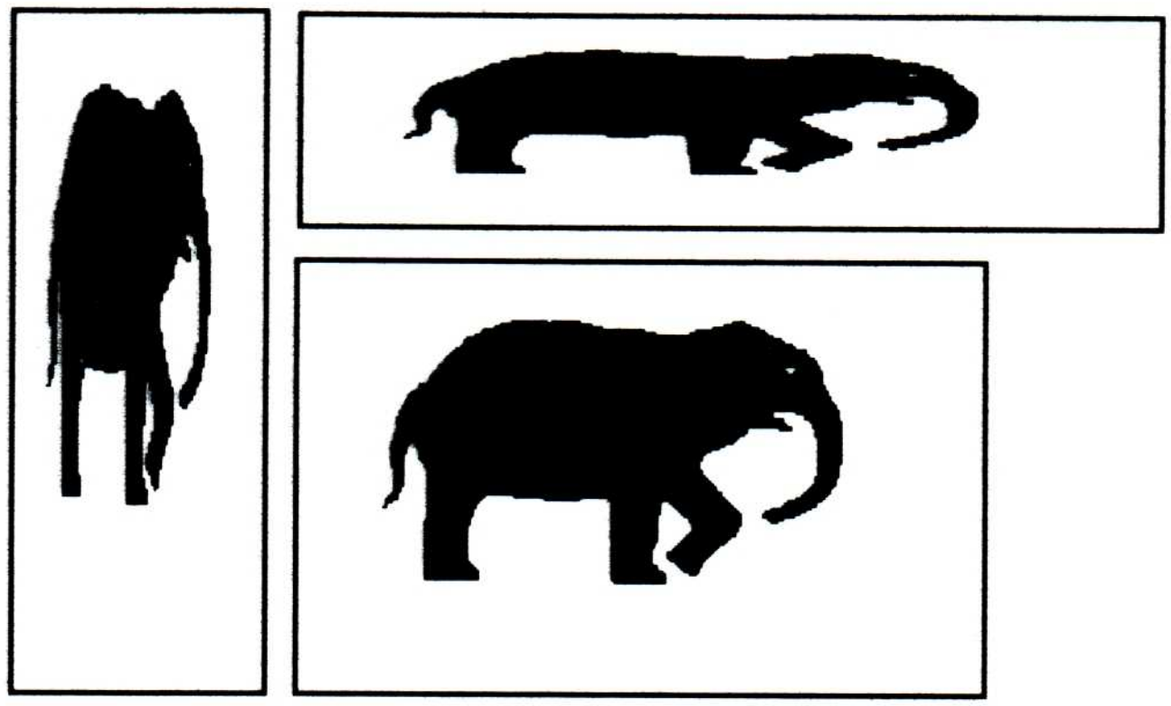


Figure 2-51
Picture fields scaled to fit

Working with variables

Variables placed in a layout are the visible side of the variables in 4th Dimension's programming language. As such, you can use variables to display values on screen similarly to a field, as well as use them to hold values in a procedure during calculations.

Variables hold, and let your layout procedure display, the values of check boxes and buttons including Accept buttons and Don't Accept buttons (controlling the system OK variable). Variables on the screen can show graphs, display a scrollable list, or call externally programmed procedures.

You should use in the layout procedure any variable you use in a layout; otherwise the variable on the layout will not do anything. You *do not* need to display on the layout, however, all the variables that you may use in any layout procedure.

In all cases, you cannot display any value through a variable in a layout until you have switched from the Design environment to either the User or Custom environment.

Important To obtain any benefit from the variables in your layout, you must use them in 4th Dimension procedures.

Declaring variables

You need not explicitly declare variable types in 4th Dimension. Use one when you need one. A variable takes on the type of the data you assign it: Integer, Long Integer, Real, Text, Alpha, Picture, or Date. Variables cannot represent subfiles.

For more information on variables and how 4th Dimension uses them in its programming language, see Chapters 2 and 4 in *4th Dimension Programmer's Reference*.

Although you need not declare the type of your variables in the data processing sense of Integer or Alpha, you must tell 4th Dimension how you use the variable *in the layout*. This manual uses the term *type* to refer to the way you use a variable in the layout (button, graph, check box, and so on.). This "layout type" itself does not restrict the kind of data you may actually assign to the variable; but it does control how you can use the variable in the layout (and therefore may restrict the data indirectly).

Variables and fields

For the steps that create a variable, see "Adding Variables to Your Layout" later in this chapter.

Unlike fields, which 4th Dimension can automatically include in a layout, you must create and name each variable individually when in the Layout window. Using a variable in a procedure also creates it. When you create a variable, 4th Dimension displays its Format of variable dialog box. The formats are similar to those fields use. Figure 2-52 illustrates the Format of variable dialog box.

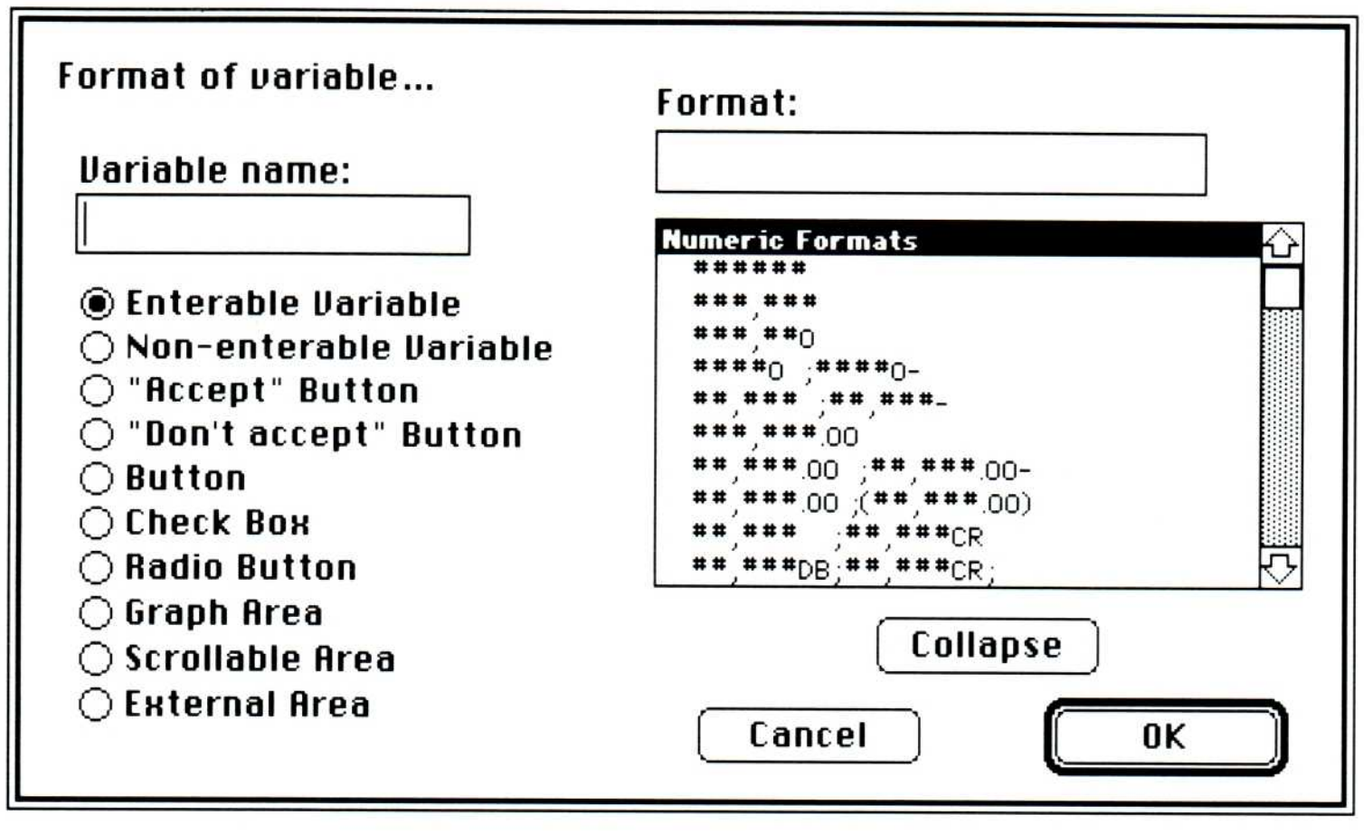


Figure 2-52
Format of variable dialog box

You may use variables—especially check boxes and buttons—as input devices. A layout procedure can interpret the values of the variables and assign appropriate field values.

Variables in dialog boxes

In "ordinary" usage (input, output, and included layouts), users enter data into fields and variables serve to display button settings and other data.

A dialog layout reverses these roles. There, you display data using fields, not enter it. You must enter all data through variables and interpret the variables in the layout procedure.

Variable types

You must name and state the layout type of every variable you use in a layout. There are ten possible variable types. They fall into three groups: field-like variables, button variables, and area variables.

Figure 2-53 shows the features of the Format of variable dialog box.

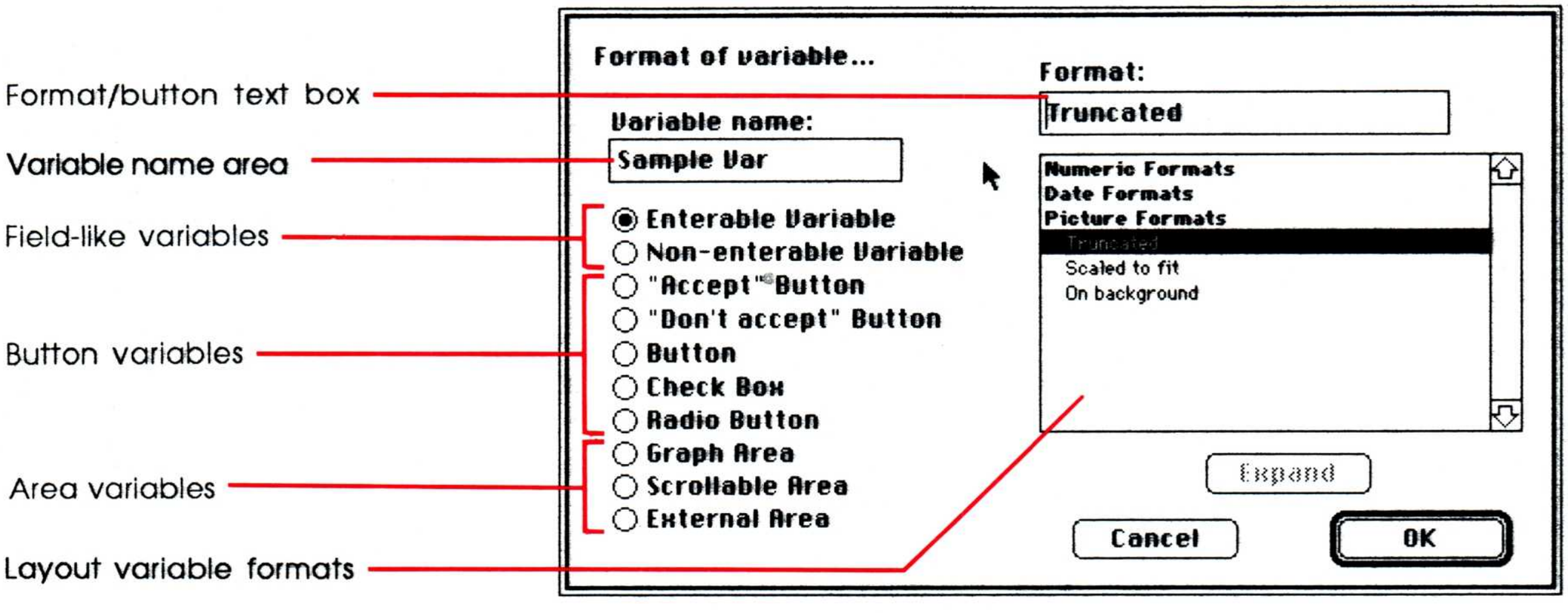


Figure 2-53
Format of variable dialog box showing features

Field-like variables

Field-like variables are most useful on dialog layouts, where they look and behave like fields. Despite the names—Enterable and Non-enterable variables—4th Dimension ignores the enterable quality of field-like variables *when they appear in an input layout.* You cannot enter values into these variable types in an input layout even though they resemble fields. (An output layout, of course, is for display only.)

Fields in a *dialog* layout will appear with the correct field values for the current record, but will themselves be non-enterable. In a dialog layout, you may directly enter data only through field-like variables (and indirectly through buttons and check boxes).

- **Enterable variable:** A user may enter values into and alter the contents of an Enterable variable. In dialog layouts, they look and act like fields. In all other types of layouts they look like fields; but Enterable variables are for display only.

- **Non-enterable variable:** A user may not enter values or alter the contents of a Non-enterable variable. Use it in dialog layouts to display data that you do not want the user to modify. In all other types of layouts, a Non-enterable variable continues to be for display only.

Button variables

Using any button in a layout—any button at all—will disable the button panel that 4th Dimension automatically supplies when you enter or modify data in the User environment. When you use *any* button in a layout, you must supply buttons for *all* the functions you wish; for example, you must supply your own button and corresponding procedure for saving a record.

Important If you use *any* buttons at all in your layout, they will cancel the button panel that 4th Dimension supplies automatically. The *Command* and *Enter* keystroke commands still work even without the button panel.

Buttons are an integral part of any user interface you design. For more on how the button panel functions, see Chapter 3, "Basics for the User Environment," and Chapter 6, "Creating a Custom User Interface."

Buttons and check boxes may have the value of 0 or 1. You set a button to 1 (on, or checked) by assigning 1 to the name of the button variable.

When 4th Dimension calls a layout procedure and displays a layout, it automatically sets the value of any buttons in the layout to 0 (off, or not checked). In each layout procedure for a layout with buttons, you should initialize the values of all buttons and check boxes. You may save the value of variables when you save each record, if you wish.

There is a label for each button on a layout. The label need not be the variable name. For example, you may have a variable bOK (for the Accept button), yet that button may read Save this Record on the layout itself.

Labels for Accept, Don't Accept, and Button buttons appear inside the buttons. Labels for Check Box, and Radio Button type buttons appear next to the button on the right. When you place buttons on your layout, you must leave enough room for this accompanying text. 4th Dimension automatically sizes buttons and check boxes (other than Accept or Don't Accept buttons), but you must leave enough room next to the button to display the text. Button text is 12-point Chicago. You may change the size of the button with a different size text, but the font will remain 12pt Chicago.

- **Accept button:** The Accept button is the same as a 4th Dimension System variable OK button. Clicking an Accept button alters the 4th Dimension System variable named OK to 1. The Accept button usually means that 4th Dimension will save a record.
- **Don't Accept button:** A Don't Accept button is the same as a 4th Dimension System variable Cancel button. It changes the 4th Dimension System variable named OK to 0. The Don't Accept button usually means that you are abandoning the current layout without changes.
- **Button:** Button is a generic toggle, and does not affect the value of the 4th Dimension System OK variable. A button may have a value of 1 or 0, depending on whether it is clicked or not clicked. You may assign your own interpretation to a button variable.
- **Check Box:** The Check box type produces a standard, non-exclusive check box in the layout. You may click as many check boxes in a given layout as you wish. A check box that has been checked has a value of 1. An unchecked box has a value of 0.
- **Radio Button:** Radio buttons exist in mutually exclusive sets of variables. Each set of radio buttons is grouped by first letter. (For example, bRad1, bRad2.) Radio button names are not case-sensitive.

Important 4th Dimension System variable OK is different from any 4th Dimension variable you may have named OK. Consult *4th Dimension Programmer's Reference* for technical information.

Area variables

Using the area variables, you may dedicate a portion of the layout to one of three different purposes: graphing, scrolling a list, or calling an external procedure.

- **Graph Area:** Use a Graph Area and 4th Dimension's Graph command for graphing data and displaying it within a layout. 4th Dimension sizes the graph to fit the area you define on the layout. 4th Dimension also has another graphing command, Graph File, for graphing data from several records and displaying it outside a layout.
- **Scrollable Area:** A Scrollable Area is actually an array-like list of data. You should ensure that the Scrollable Area is large enough to display all the items in the array. The items in the Scrollable Area list are non-enterable.
- **External Area:** Clicking an External Area variable in the User or Custom environment calls an external procedure. The name of the External Area variable should be the name of the external procedure; you must follow a process of installing the external procedure in your 4th Dimension application. The process is outlined in *4th Dimension Programmer's Reference*.

  4th Dimension turns over *complete* control to an external procedure when it calls one. Unlike Graph Area or Scrollable Area variables, there is no way to limit whether an external procedure is active only within the External Area. It can take over the entire screen and program, and do whatever you program it to do.

Warning Only experienced programmers should attempt to add external procedures to a 4th Dimension application. 4th Dimension turns over complete control to the external procedure; a bug in an external procedure therefore may damage a database.

Variable formats

For a list and explanation of formats for variables, see "Setting Field Display Formats" earlier in this chapter.

As with fields, you may format variables displaying numeric, Date, and Picture data. All three formats are the same for variables as they are for fields. You may enter and edit these formats in the Format of variable dialog box.

Using variables in Text Areas

You may embed a variable in the midst of text in a Text Area instead of displaying it as a field-like variable alone in a box on the layout. To embed a variable in text, create a Text Area and enter the text. You create a Text Area by clicking the Text Area icon on the palette and dragging the pointer to define the height and width of the area.

Write the name of the variable whose value you want to embed in the text between a greater-than symbol and a less-than symbol. In the example

```
Dear Ms. <vName>, we here at the Acme Bronze Cannonball Company
pride ourselves on our intensive personal attention to customers
such as you.
```

the variable <vName> can stand for any value a layout procedure sets—even a value that is not a string. In this example, many "personalized" letters can go out to Acme's customer list.

For detailed steps on how to create a Text Area and enter text into it, see "Using the Palette," earlier in this chapter.

Text "written to the background" of a layout occurs in Text Areas. These Text Areas may display one word, several words, a line, or many lines of text.

When you display an *output* layout containing a Text Area with an embedded variable, 4th Dimension replaces the variable name with the value of the variable. The layout procedure determines the value for the variable. Figure 2-54 illustrates the difference between a variable displayed in a box and a variable embedded in text.

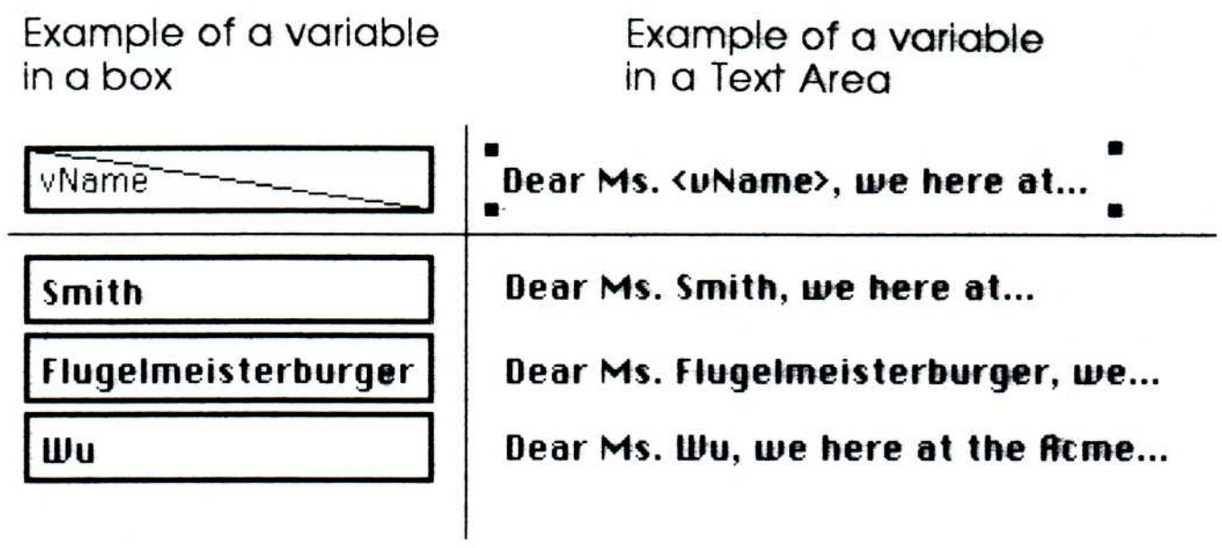


Figure 2-54
How field-like variables differ from embedded variables

The fixed-length display of field-like variables truncate data that is too long to fit. Variables embedded in a Text Area expand and contract according to the length of the value of the variable.

How variables work in Text Areas

There are several restrictions on variables embedded in text.

- An embedded variable is for display only. You cannot enter data into an embedded variable.
- Embedded variables may display only strings (Text), numeric (Integer, Long Integer, and Real), and Date data. (Variables that are *not* embedded in Text Areas can additionally display pictures, graphs, buttons, check boxes; can act as scrollable lists; and can accept input.)
- Embedded variables must be set before displaying the layout as an input layout. When you use embedded variables in an output layout, 4th Dimension sets them in the During portion of the Execution cycle.

- Embedded variables and their values assume the font, style, and point size of the text in which they're embedded.
- You cannot format the display of an embedded variable by double clicking, as you can a variable in a box. Consequently, you must add currency symbols, justification, and other details of formatting programmatically via the layout procedure.

For a discussion on how to format Alpha, Text, numeric, and Date variables programmatically, see *4th Dimension Programmer's Reference*.

Adding variables to the layout

The next two sections of how-to instructions cover the mechanics of adding variables to the layout and embedding variables in Text Areas.

Placing variables in your layout

You may place variables in your layout at any time during development; but writing a 4th Dimension procedure to make use of them is essential.

1. Click Create Variable and position the pointer

1. Click the Create Variable icon on the palette. When you move the pointer into the layout area, it will change into a crossbar.
2. Position the crossbar where you want to place one corner of the variable area.
3. Drag the crossbar to create a rectangular area for the variable.

   4th Dimension displays the Format of variable dialog box.

- You may also double-click an existing variable area to display the Format of variable dialog box.
- Click Cancel to return to your layout without having created a variable. You must separately delete the variable area that 4th Dimension has already placed on the layout. Use the Backspace key.

Figure 2-55
How variables appear on a layout

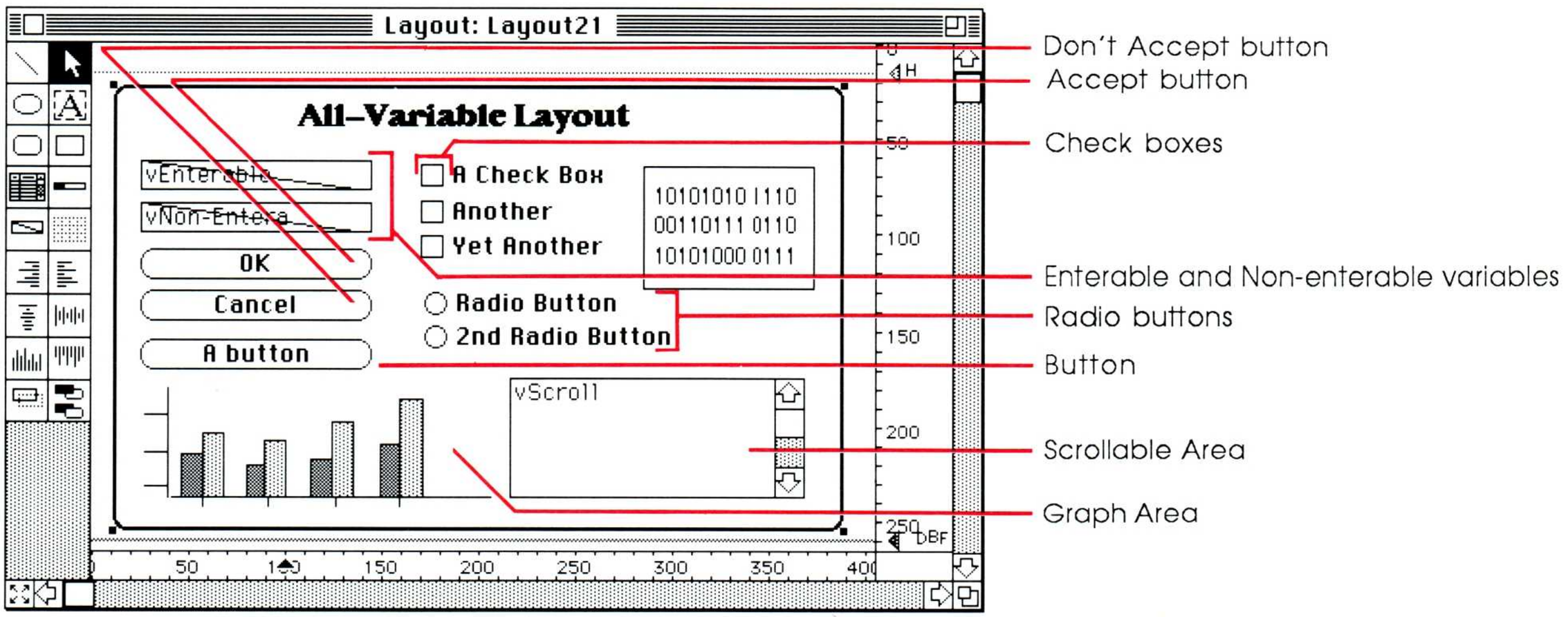


Figure 2-55
How variables appear on a layout

2. Name the variable

- Enter the name of the variable in the Variable name area.

  Because variables can generally hold any type of data (area variables being the exception), it's a good idea to use an initial character to indicate the type of variable you're using. For example, OK for an Accept button.

3. Select a variable type

- Click the type of variable you want to add to the layout from the list of variable types.

  If you select a field-like variable, the area above the format list will read Format and will echo the format that you select from the list.

  If you select a button variable or area variable, the legend above the format list will read Button Text. You need only enter text here if you are creating a button; area variables don't use it.

Select a variable format

- If your variable requires a numeric, Date, or Picture format, select it from the scrollable list.

  You may expand and collapse the available formats under each format type.

  You may edit numeric formats as you would for fields.

  See "Setting Field Display Formats" for a table illustrating the different ways to format numbers.

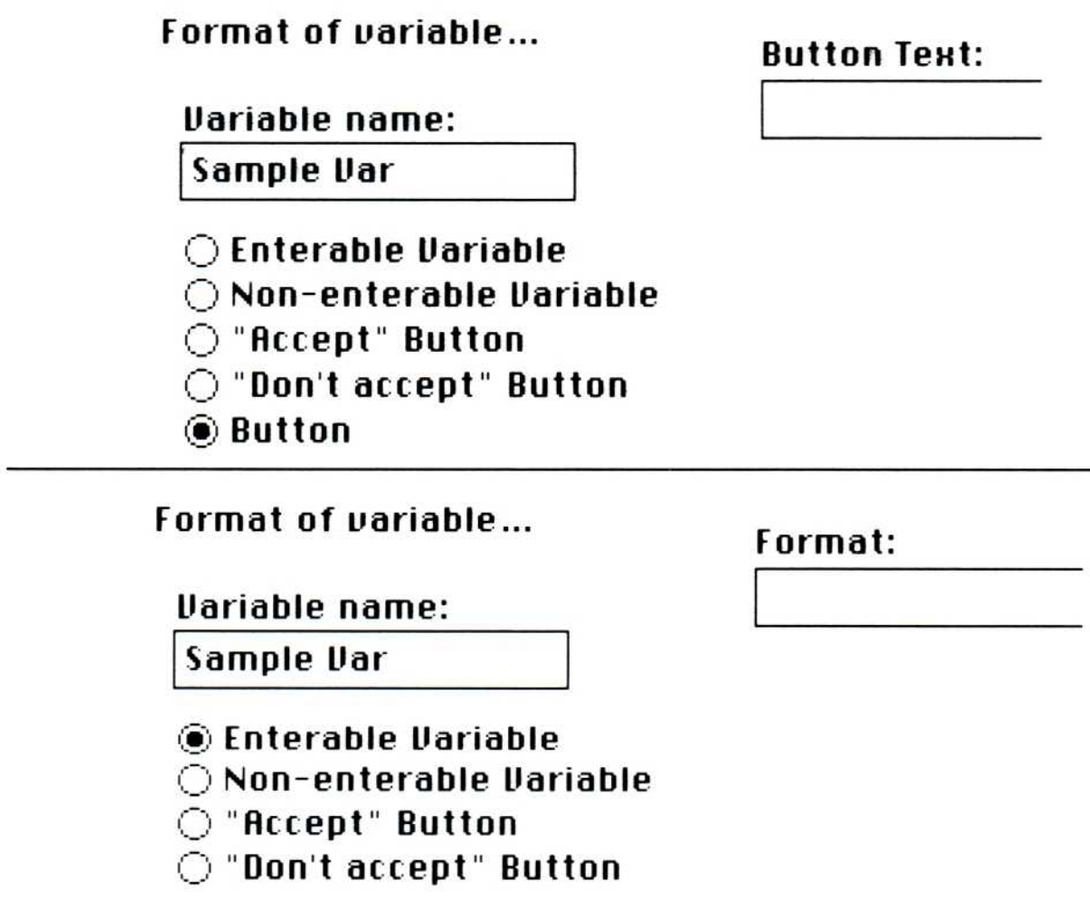


Figure 2-56
Variable type and Button Text or Format

Enter button text

- If your variable is a button type that requires text, enter that text in the Button Text area.

4. Finish up

- Click OK to apply your settings to the variable and return to the current layout.
- Click Cancel to return to the current layout without making any variable settings.

  When you return to the current layout, 4th Dimension automatically clicks the Select icon for you and selects your just-entered variable.

  Even if you click Cancel, 4th Dimension selects your just-entered variable. You must specifically delete the empty variable box.

Embedding a variable in text

Use variables embedded in text to create mail merge documents and to provide for changeable information and labels on layouts.

1. Display a layout

- Create a layout or select an existing layout.

  If your objective is to create a mail merge document, custom layouts work best because you can make them appear to be letters, proposals, and reports. Other layout styles display borders.

2. Create a Text Area

1. Click the Text Area icon on the palette.
2. Drag the crossbar pointer to create a Text Area appropriate to the document your layout will emulate.

   You can emulate a letter by creating a Text Area with a live (text) area equivalent to 6 by 9 inches.

3. Set the margins

1. Set the Header, Footer, and other control lines to suit the Text Area you will add to the layout.
2. Choose Page Setup from the File menu. 4th Dimension displays the standard printer dialog box. Which box 4th Dimension displays depends on the printer installed for your system.
3. Set the printer settings. They are saved with each layout.
4. Click OK to accept the printer settings, or click Cancel to return to the current layout without having changed them.

   The next section, "Rulers, Margins, and Control Lines," explains how to set 4th Dimension's output controls.

4. Enter text and variables

- Enter text.

  Enter text into the text field as though you were writing on a text editor.

  When you wish to embed a variable, place it between greater-than and less-than symbols. For example, the line

  Dear <vHon> <vName>

  could produce

  Dear Mr. Jones,

  Dear Ms. Penney,

  Dear Sir Arthur,

  depending on how the layout procedure set the values of the honorific and the name.

5. Finish up

- Close the Layout window or choose Save Layout from the File menu to save the layout with the document and embedded variables.

  Important: The developer or other person with access to the Design environment must prepare any layouts that emulate documents by using embedded variables.

Rulers, margins, and control lines

Along the bottom and on the right side of the Layout window run 4th Dimension's **rulers.** You can set the rulers to measure in points, in centimeters, and in inches.

The horizontal ruler at the bottom of the Layout window holds the label width triangle. It sets the width that your layout will print *when and only when* you use that layout as a mailing label—which is a very specific action in 4th Dimension.

Setting the label width triangle has no effect other than setting the width for mailing labels. When 4th Dimension uses a layout to print mailing labels, it automatically calculates how many labels across it can print, based on the setting of the label width triangle, the scale you set in Page Setup, and the size of the paper you're using.

For more on mailing labels see Chapter 3, "Basics for the User Environment," and *4th Dimension Programmer's Reference.*

- *By the way:* You may use *any* layout as a "mailing label"; and no matter how widely or narrowly you've set the triangle (or haven't set the triangle), it then becomes an active setting. This can engender strange results if you've set it carelessly or are using an inappropriate layout. It's a good idea, therefore, to plan specific layouts just to use as mailing labels. In the layout procedures for those label layouts, you can programmatically take care of details such as managing a variable number of address lines. (Some addresses require two or more street lines, and international addresses may require an extra line for country, for example.)

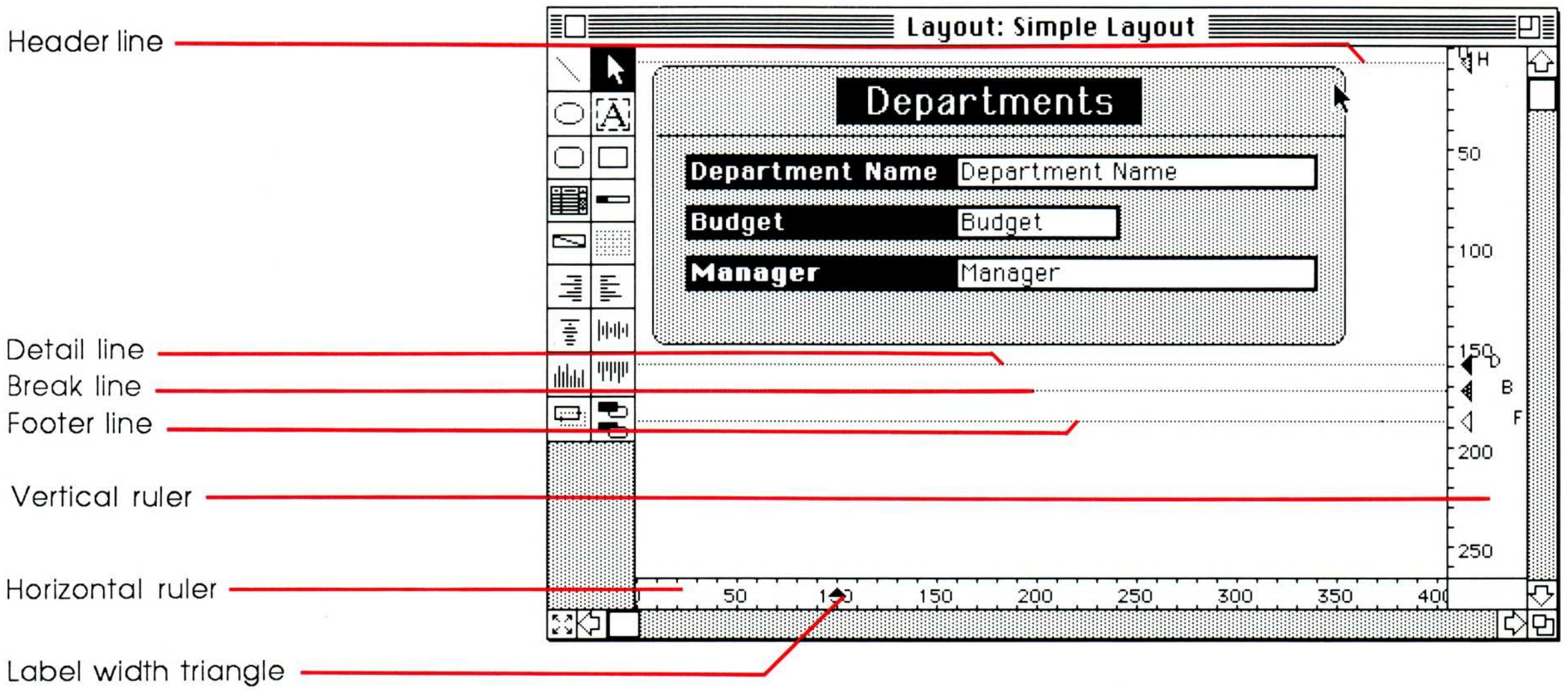


Figure 2-57
Layout window, rulers, and control lines

The vertical ruler at the right side of the Layout window holds four triangles and letters that set the position of the layout control lines. The lines themselves extend across the layout, but you may only move them by dragging the indicators inside the vertical ruler. The control lines set the position of any header or footer material, the part of the layout that represents the body of the layout, and the part of the layout that executes when the value of a sorted field changes, or *breaks*.

Change the measurement units of the rulers by choosing Define Units from the Layout menu. You may measure in points, centimeters, or inches.

Layout size

Table 2-4 shows the maximum width of the layout window in printer's points, in centimeters, and in inches. If you change the print scale in Page Setup under the File menu, 4th Dimension reduces or enlarges the layout when you print. You can see the effect of this change of scale if you click the Show Page box after altering the print scale.

Table 2-4
Maximum layout dimensions (approximate)

Dimension	Points	Centimeters	Inches
Horizontal	10,400	367	144
Vertical	10,250	362	142

The measurements above are approximate. They provide you with a printable area almost 12 feet by 12 feet, or 144 square feet.

Important The page setup values are different for different printing devices. For example, the Apple LaserWriter printer uses a slightly narrower page width than does the Apple ImageWriter printer. When creating your layouts, be sure they suit the printer to which users send them. 4th Dimension will automatically create a second page for material that will not fit on the first. Total available layout area is 144 square feet.

Layout control lines

The control lines directly *govern* the way 4th Dimension prints a layout but only *affect* the way it displays a layout on screen. They divide every layout into four arbitrarily sized rectangular areas. These areas are the Header, Detail, Break, and Footer areas; they control the layout whether or not you write a layout procedure, and whether or not you specifically set the control lines yourself or accept 4th Dimension's defaults.

4th Dimension's programming language provides four corresponding Boolean functions to let you determine what processing may take place in each geographical portion of the layout. These functions are In Header, In Detail, In Break, and In Footer. Because the different parts of the layout print in a predetermined sequence, you can use these programming statements to determine the order of processing in the layout procedure. The order in which 4th Dimension handles its processing is called the **execution cycle,** and much more than the layout control lines affect it. The execution cycle may be the single most important programming concept to understand in 4th Dimension. For a complete explanation and graphic flow chart of the execution cycle, see *4th Dimension Programmer's Reference.*

The **execution cycle** is the order in which 4th Dimension handles processing.

Important Included layouts also have control lines you may set. Generally speaking, it's best if they do not use headers and footers.

The four control line areas

Not all layouts need to use the control lines and their areas in other than a default manner, although all four are present in every layout. Nor do you need to set the control lines yourself; 4th Dimension can do it for you when you create automatic layouts. You may need to change the position of the lines from the way 4th Dimension provides them if you add headers and footers, add new fields or variables, or change the size of your layout.

Figure 2-58 shows the four control lines and the areas they create in their proper relative positions. The lines must appear in this order if you wish to use them. 4th Dimension ignores "out of order" control lines.

If you don't want to use a particular control line, move it on top of the control line above it. To ignore the header, place it at the 0 setting of the right ruler.

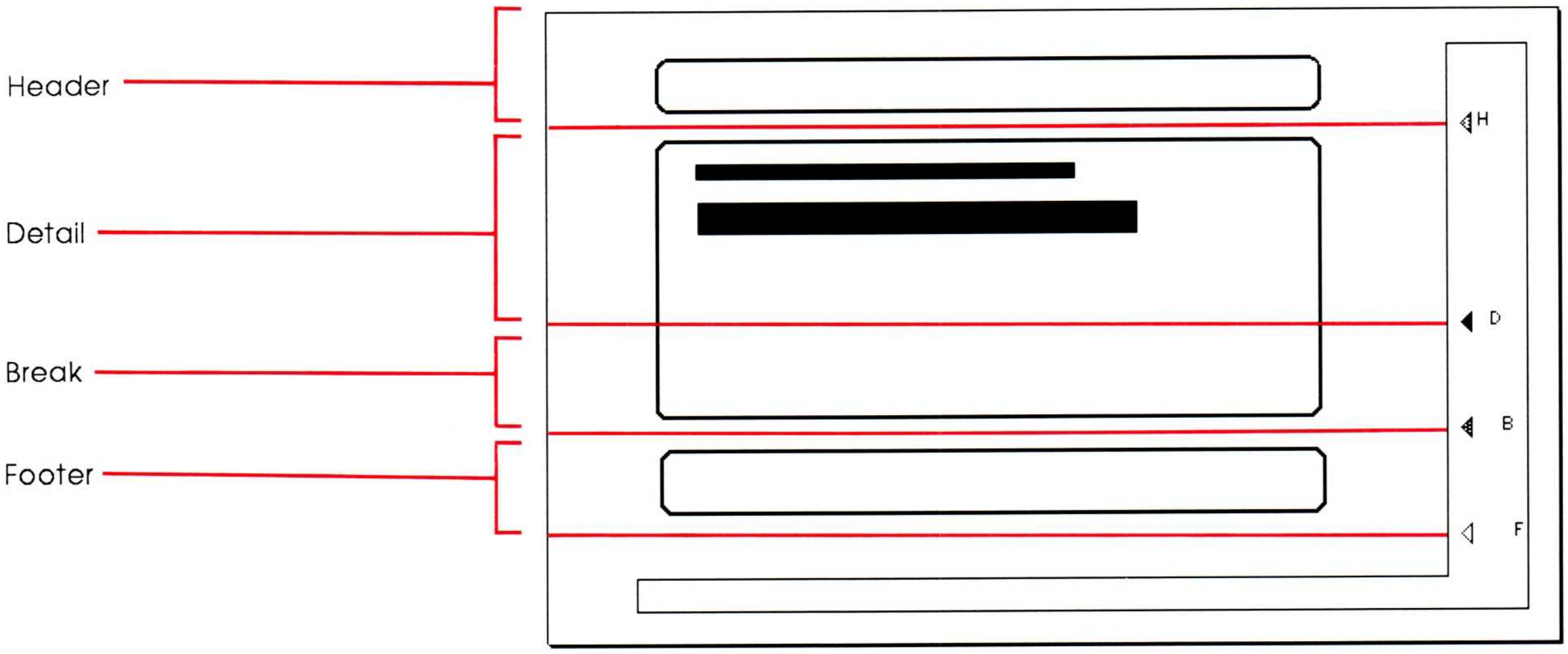


Figure 2-58
Control lines

The four control lines are

- **Header (H):** The Header area controls the height of the part of the layout that will print as a header on the page. Header material prints once at the start of each page, and will appear at the top of both input and output screens. Typical uses include report titles, date, and pagination. Any 4th Dimension procedure statements controlled by a TRUE value for the In Header Boolean function in 4th Dimension's programming language will execute at this time.

- **Detail (D):** Detail material is the body of the layout, and encompasses included layouts. Detail material prints once for each record that fits on the page. When During becomes TRUE, 4th Dimension statements controlled by that Boolean function will execute.
- **Break (B):** Break material comprises the part of the layout that prints, and the calculations that take place, when the value of a sorted field changes. Break material will print *only* if you've assigned a Subtotal variable to the values of a sorted selection. On the screen, this area appears once at the bottom part of the layout window, above the footer. Break statements execute when the In Break Boolean becomes TRUE.
- **Footer (F):** Footer material prints once at the end of each page. Footers behave like Breaks on the screen. 4th Dimension will print no material that appears below the Footer line. Footer statements execute when the In Footer function returns TRUE.

Control lines and printing

The control lines determine what portion of the layout you dedicate to the Header, Detail of the layout, Break on field change calculations, and Footer.

Standard print sequence

When you have *not* sorted the records in a file, and have *not* included the command Subtotal in the layout procedure, the layout will print as in Figure 2-59.

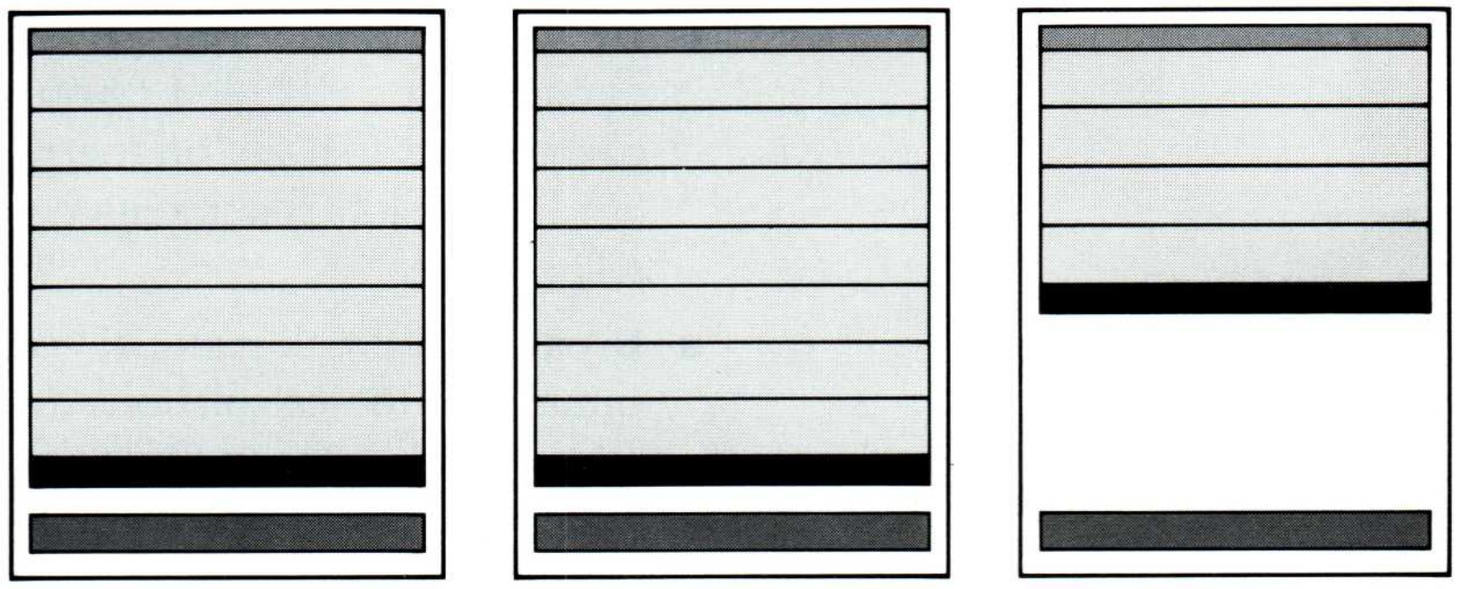


Figure 2-59
How an unsorted file, without command Subtotal, will print

The contents of the Header area will print at the top of every page; Detail will print as often as there are records on a page; Footer will print at the bottom of every page; and Break will print beneath the last record on every page.

4th Dimension prints the Break material beneath the last record on a page to allow you to create a graphic "frame" or "finish" beneath the Detail of the records—*not* because the layout must calculate in the Break area. In the example above, 4th Dimension actually cannot calculate in the Break portion of the layout because the file is not sorted, and the command Subtotal is not included in the layout procedure.

Subtotal print sequence

Using the command Subtotal in a layout procedure determines whether 4th Dimension will print Break area calculations *as* Break calculations (and not simply to finish off graphically the bottom of a line of records). To make rational use of Break as a true Break, you must also sort the file. After all, if you're going to calculate subtotals by category, it's beneficial first to create the different categories by sorting.

Important To use Break as a true Break on field change, you must *both* sort the file and use the Subtotal command in the layout procedure.

Headers still print at the top of every page, and footers still print at the bottoms. As Figure 2-60 shows, however, the Break material prints after one or more Detail records—whenever a given field changes its value. This time, Break calculates the subtotal. Break also prints at the end of all the records to supply a grand total.

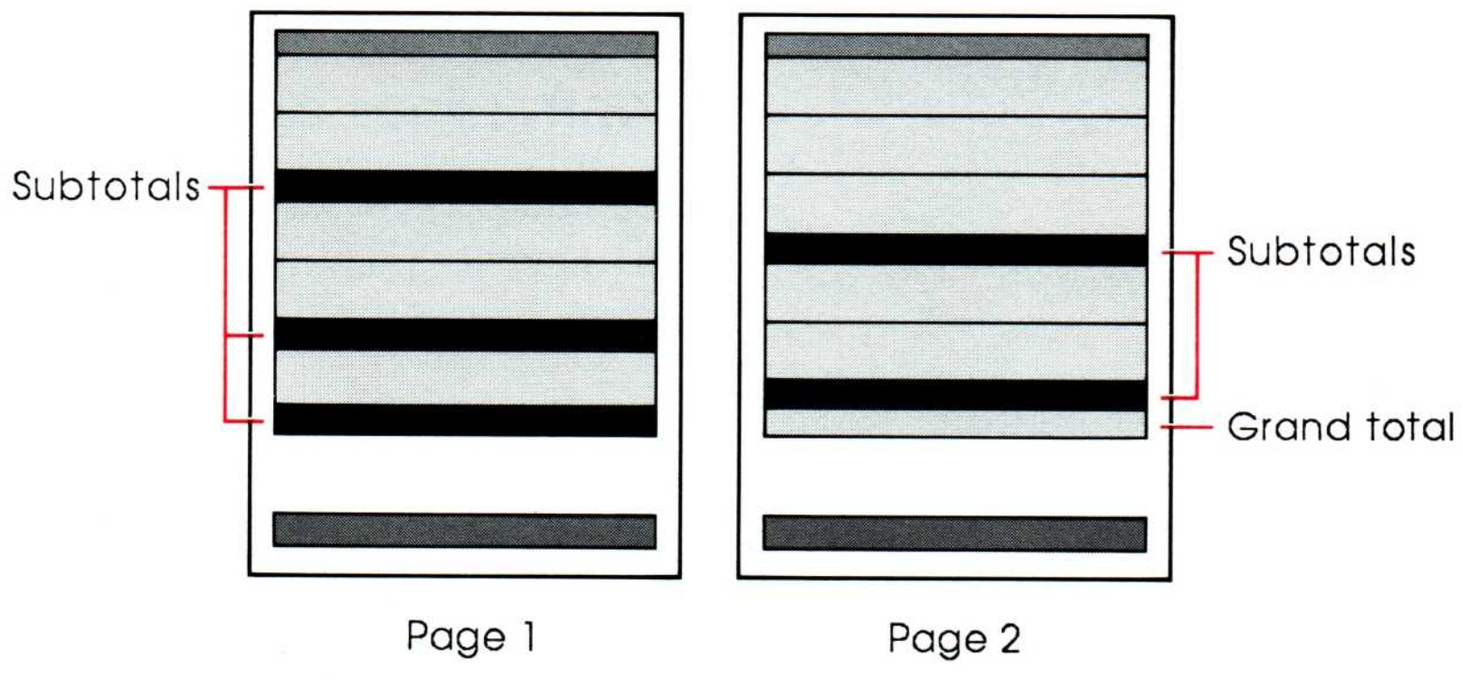


Figure 2-60
Subtotal command in a layout procedure

Using 4th Dimension's programming language, you may also create a page feed on Break. Figure 2-61 shows how this will print.

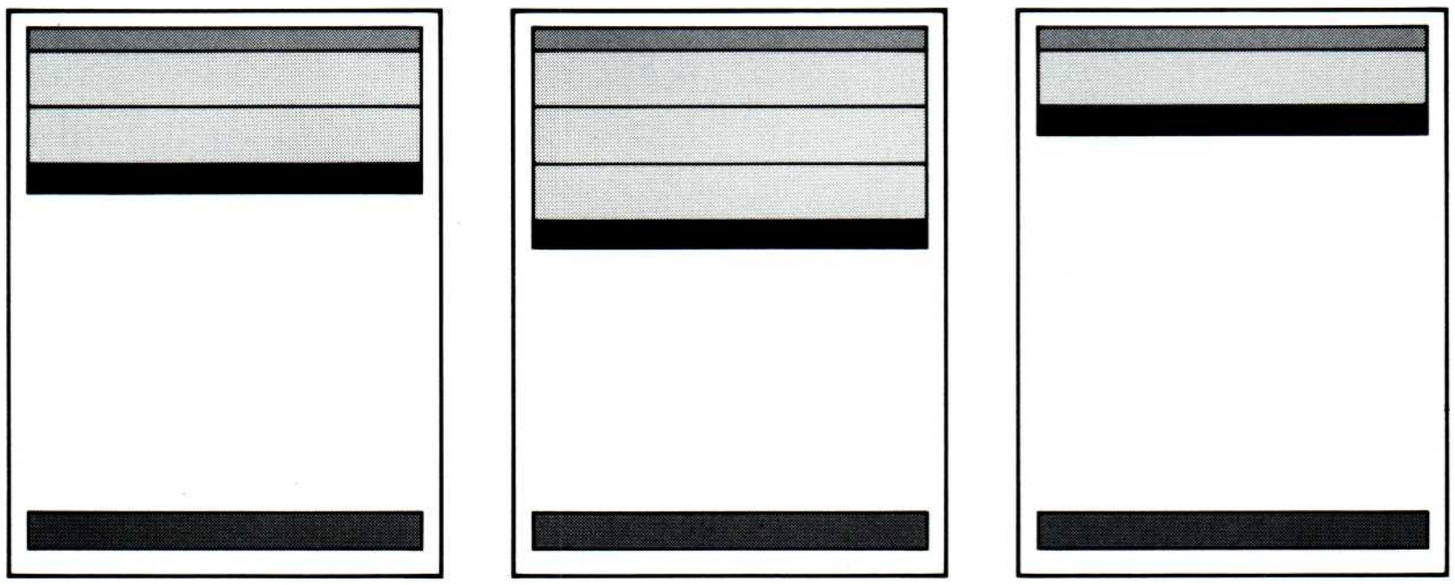


Figure 2-61
How 4th Dimension will print a sorted field with subtotals and page feed in the break

Control lines and the screen

The same layout control lines that produce the printout in Figure 2-61 have a different effect when you display that layout on the screen.

Layouts for screen output

When you use a layout for screen output, the Header continues to appear (and any calculations in it to execute) on every screen. You may need more than one screenful of data to hold the current selection of records. 4th Dimension places on the screen at any one time as many layout Detail areas as will fit. The program displays no Footer in output to the screen.

As in the simple printout, 4th Dimension also places any Break area under the last layout Detail area on the screen. You may use this for the graphic "frame" at the bottom of the layouts, or you may execute Break calculations. Figure 2-62 shows how such a layout will appear in screen output.

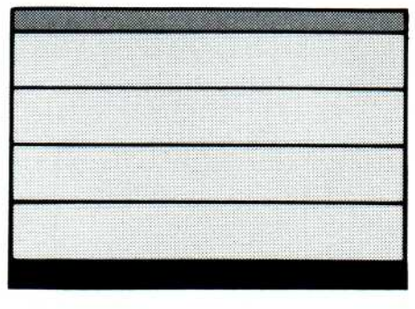


Figure 2-62
Output to screen, with Header, Detail, and Break

Layouts for input

A layout that you use for input purposes displays all of its four areas. Often, 4th Dimension developers will place buttons in the Footer part of a layout if they plan to use the layout for displaying a selection.

For more explanation of 4th Dimension's execution cycle, see Chapter 4, "Procedures," and *4th Dimension Programmer's Reference*.

The layout control lines are only part of 4th Dimension's execution cycle. The Boolean functions Before, During, and After also play a part in sequencing procedures. You may use these functions along with the Booleans In Header, In Break, and In Footer on a non-exclusive basis.

Important The layout procedure has an overriding effect on how a layout behaves. A layout procedure that makes a layout especially useful for output to a printer may make it completely inappropriate for input. The comparison here among output layouts for printing, output layouts for the screen, and input layouts, assumes a neutral effect from the layout procedure.

Using the rulers

Use the rulers to estimate the size of your input layout and to set the label width and the areas of the Header, Footer, Detail, and Break.

Hide and show the rulers

- To hide rulers, choose Hide Rulers from the Layout menu.

  If you choose Hide Rulers, 4th Dimension displays no rulers in the window for the current layout while that window is open.

  If you close the window for the current layout and then reopen it, 4th Dimension again displays rulers.

  Any open window for other layouts continues to display rulers, or not, as you have set for that particular window.

  Hide Rulers also hides a ruler's Header, Footer, and other control lines.

- To again show the rulers for the window of the current layout, choose Show Rulers from the Layout menu.

  Show Rulers is the default condition.

Define the ruler units

1. Choose Define Units from the Layout menu. 4th Dimension displays the Define units dialog box.
2. Click the measurement unit you wish.

- Click Points to measure your layout in printer's points (72 points to the inch).
- Click Centimeters to measure your layout in centimeters.
- Click Inches to measure your layout in inches.

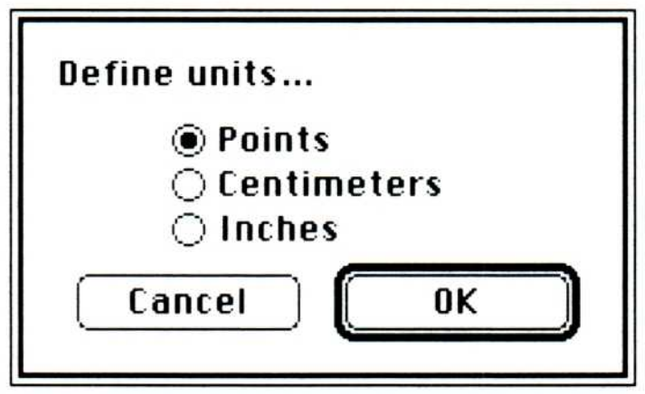


Figure 2-63
Define units dialog box

Set the output width for mail labels

1. Place the pointer on the label width triangle in the horizontal ruler.
2. Drag the triangle to the number representing the width at which you want your mailing label layout to print.

When you print mailing labels using the current layout for output, 4th Dimension scales your layout to fit the width you specify.

If you set a scaling factor in the Page Setup dialog box under the File menu, be sure to take into consideration the reduced or enlarged size of your printed form.

For use on the screen for input, your form will remain the same size that you create it.

Set the Header

1. To define the area for header material in your layout, place the pointer on the H in the vertical margin.
2. Drag the H indicator to a position where you want to divide the main body of your layout from the body of your Header.

The parts of your layout above the Header line will always appear at the top of each new printed page.

Any procedure you may have written pertaining to the Header will execute as 4th Dimension prints it at the top of each new page.

Set the Detail area

1. To set the detail indicator, place the pointer on the D in the vertical ruler.
2. Drag the D and its indicator line to a position that signifies the bottom of a particular record. The Detail area encompasses included layouts.

The Detail area defines the body of the record when displayed by the current layout.

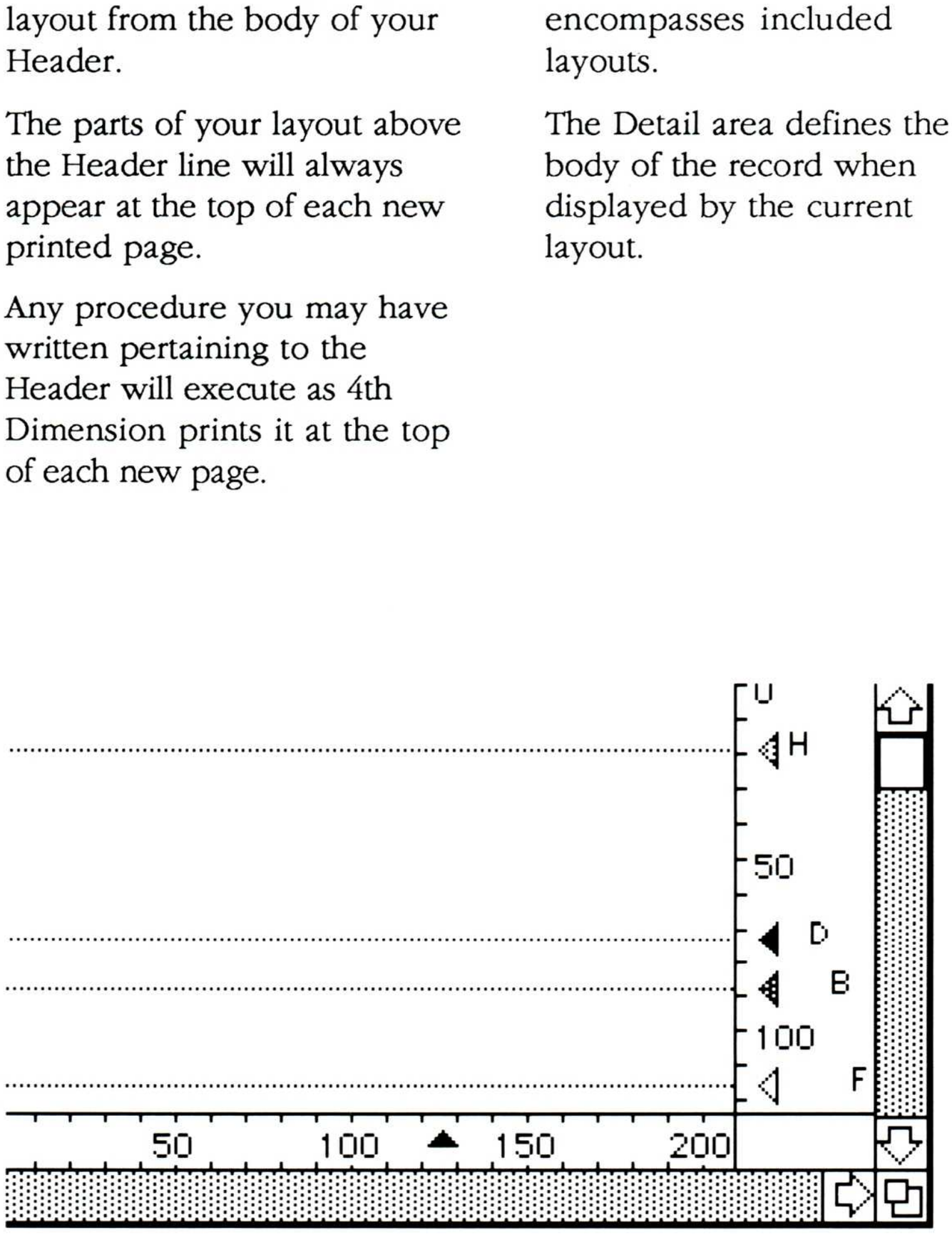


Figure 2-64
Horizontal and vertical margin settings

Set the Break area

1. To set the Break indicator and define the Break area, place the pointer on the B in the vertical ruler.
2. Drag the B and its indicator line to a position that divides the main body of your layout from the material you want printed when the value of a sorted field changes.

The Break area is active only upon a value change in a sorted field during printout when the Subtotal command is used in the layout procedure. It also prints once beneath the last record on each page when you have *not* sorted the file and you have used *no* Subtotal command.

Any procedure you may have written pertaining to the Break indicator will execute each time a field value changes.

Set the Footer

1. To set the Footer, place the pointer on the F in the vertical ruler.
2. Drag the F and its indicator line to a position that divides the Detail and Break areas of your layout from the Footer material.

Footer material will print at the bottom of each page. 4th Dimension displays the Footer material on screen when displaying a selection of records.

Any procedure you may have written pertaining to the Footer will execute as 4th Dimension reaches the bottom of each page and prints the footer.

Working with layouts

When you're working with a layout in the Layout window, three of the commands in the File menu change to suit the window. These are the Close Layout, Save Layout, and Revert to Saved commands. The Close Layout and the Save Layout commands are specific to the current (active) Layout window, even though you may be displaying several different layouts in different Layout windows. Figure 2-65 shows the commands of the File menu in a Layout window.

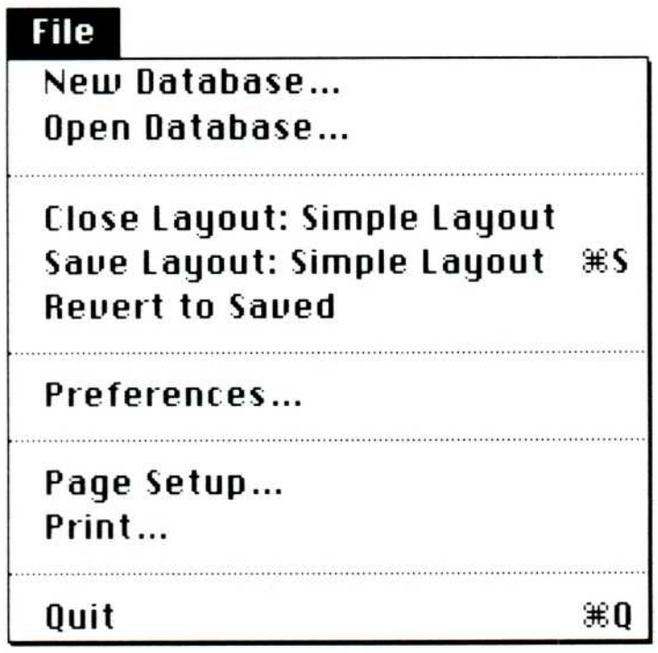


Figure 2-65
File menu in Layout window

Cloning a layout

Because you can save the graphics of entire layouts, you can clone or duplicate a layout for several purposes. For example, you may wish to construct an input layout and an output layout that look very similar, but which have completely different layout procedures behind them.

Rather than build the second layout from scratch, you can copy the layout elements from one layout—say, the input layout—and paste them into a custom layout window, add Header, Footer, and Break material, position the control lines, and *voilá:* an output layout that looks like its input counterpart, but which works very differently.

When you clone a layout between two different files (whether or not they are in the same database), 4th Dimension assigns new field names to the layout based on the order the fields occupy in the layout. For example, Table 2-5 shows the field order of two different files. The field names have no meaning and come from the international aviation alphabet.

Table 2-5
Field order for two different files*

File 1	File 2
Alpha	Whiskey
Bravo	X-Ray
Charlie	Yankee
Delta	Zulu

* The names have no meaning.

When you clone a layout from File 1 to File 2, field Alpha in File 1 becomes field Whiskey in File 2, Bravo becomes X-Ray, Charlie becomes Yankee, and Delta becomes Zulu. The structure of the two files (not the layout) detemines the correspondence.

This correspondence between the fields of the two files holds true *no matter where on the layout the fields appear, and no matter in what order the fields appear on the layout.* Anywhere on the layout, the field that will represent Whiskey in the layout for File 2 is *always* the field that used to represent Alpha in File 1. You can mix up the field positions and the correspondence will still hold.

If there are more fields in File 2 than in File 1 (and not enough fields on the cloned layout), you may add them to the layout using the Add Field icon from the palette. If there are fewer fields in File 2 than in File 1 (and too many fields in the cloned layout), those fields will be undefined and you must delete them or add more fields to the File 2 structure.

Important You must make sure that the fields and variables in the cloned layout correspond in type and format to the fields they represent in the structure of the new file.

Pixel precedence

For more information on how to enter data into layouts, see Chapter 3, "Basics for the User Environment."

In any layout, automatic, custom, or cloned, the position of the fields on the layout determines the sequence of data entry. The order of the fields in the Structure window is only incidental; an automatic layout will adopt the order of the structure fields as a default, and consequently it may seem that field order in the structure has some bearing on the layout. It does not.

Data entry proceeds through a layout from left to right and top to bottom. The sequence of fields depends on which field is leftmost, and which is closer to the top of the layout.

In most layouts, such a sequence is easy to see. However, 4th Dimension is very precise about it, and you may not get the results you immediately expect in "close-call" situations. For example, Figure 2-66 shows two fields in a layout. The right field is 1 *pixel* closer to the top of the layout than the left layout.

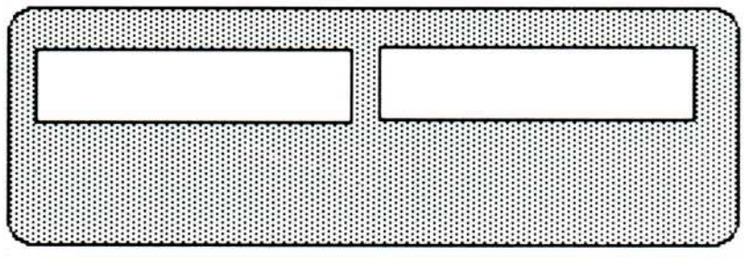


Figure 2-66
Right field is 1 pixel higher than the left

This 1-pixel difference is all that 4th Dimension needs to decide that the field on the right is first for data entry, followed by the field on the left. The field on the right is higher on the layout, based on a pixel-by-pixel precedence.

Saving layouts

You should save your work in the Layout window from time to time.

Save a layout

1. Make the Layout window you wish to save the active window either by clicking it, by choosing an open Layout window from the list in the Design menu, or by choosing Layout from the Design menu and selecting a layout from the Layout dialog box.
2. Choose Save Layout from the File menu.

   Or: Close the Layout window. Closing a Layout window also saves the current layout.

Revert to saved

If you have saved the current layout and have remained in the Layout window, you may throw away any changes you have made to the current layout since the most recent save by choosing Revert to Saved from the File menu.

Deleting layouts

You may delete whole layouts or any layout element from a layout.

Important: There is no Undo command when deleting layouts. Any layout you delete is gone.

Delete a layout

1. In the Structure window, select the file whose layout you wish to delete.

   You may double-click the filename in the Structure window, select the filename and choose Layout from the Design menu, or choose Layout from the Design menu without selecting a file. 4th Dimension displays its Layout dialog box.

2. Select the layout you wish to delete from among the list of layouts.

   You may have to expand, collapse, or scroll through the list of available layouts.

   When you select a layout, 4th Dimension displays a representation of that layout in the Graphic Area.

3. Click Delete. 4th Dimension presents its Are you sure? dialog box.

   If you click Yes, 4th Dimension deletes the layout. There is no Undo command for a deleted layout. When 4th Dimension deletes a layout, you remain in the Layout dialog box and are able to select further layouts for deletion.

   If you click No, 4th Dimension returns you to the Layout dialog box.

4. Finish up by clicking Done in the Layout dialog box. 4th Dimension returns you to the Structure window.

Delete an element from the layout

1. Click the Select icon on the palette, if it is not clicked already.
2. Click to select the layout element you want to delete. This selects it.
3. Press the Backspace key.

Or: Choose Cut from the Edit menu.

You may restore an element you have deleted by immediately choosing Undo from the Edit menu.

You may cut and paste all types of layout elements.

Chapter 3

Basics for the User Environment

A database **query** is a combination of actions that usually includes a search to pick out records that match certain criteria, and a display or report that organizes the picked records in a particular fashion.

The User environment provides a generic user interface for your database structure. The generic interface lets you do ad hoc (unplanned) **queries** that you may not have prepared for in a custom application, and lets you test layouts and procedures without having to create a custom application in which to do it.

Custom environment users can query the database only in the ways the developer has provided for in the application, and can display only those layouts that the application has been programmed to use. But in the User environment, people have more control over which layouts they display for input and output purposes, and more control over when they call procedures.

In the User environment, you may

- ☐ Enter, modify, and delete records.
- ☐ Search through, select, and sort records.
- ☐ Apply formulas and 4th Dimension procedures to the contents of records.
- ☐ Produce several different reports and graphs.
- ☐ Produce mailing labels.
- ☐ Export and import data to and from other programs.
- ☐ Execute global procedures.
- ☐ Trace and debug procedures as they execute.

Important You must create a structure for your database in the Design environment before you may switch to the User environment. The structure need not be complete and in its final form (you can return to the Design environment and change things as your application develops); but you must have created at least one file with at least one field in it, and have created at least one layout, before you may use the User environment.

When you enter the User environment, 4th Dimension displays the default output layout. Figure 3-1 shows a typical default output layout and the User environment menu commands. This display is the User output screen, and varies depending on the layout you have selected as the current default.

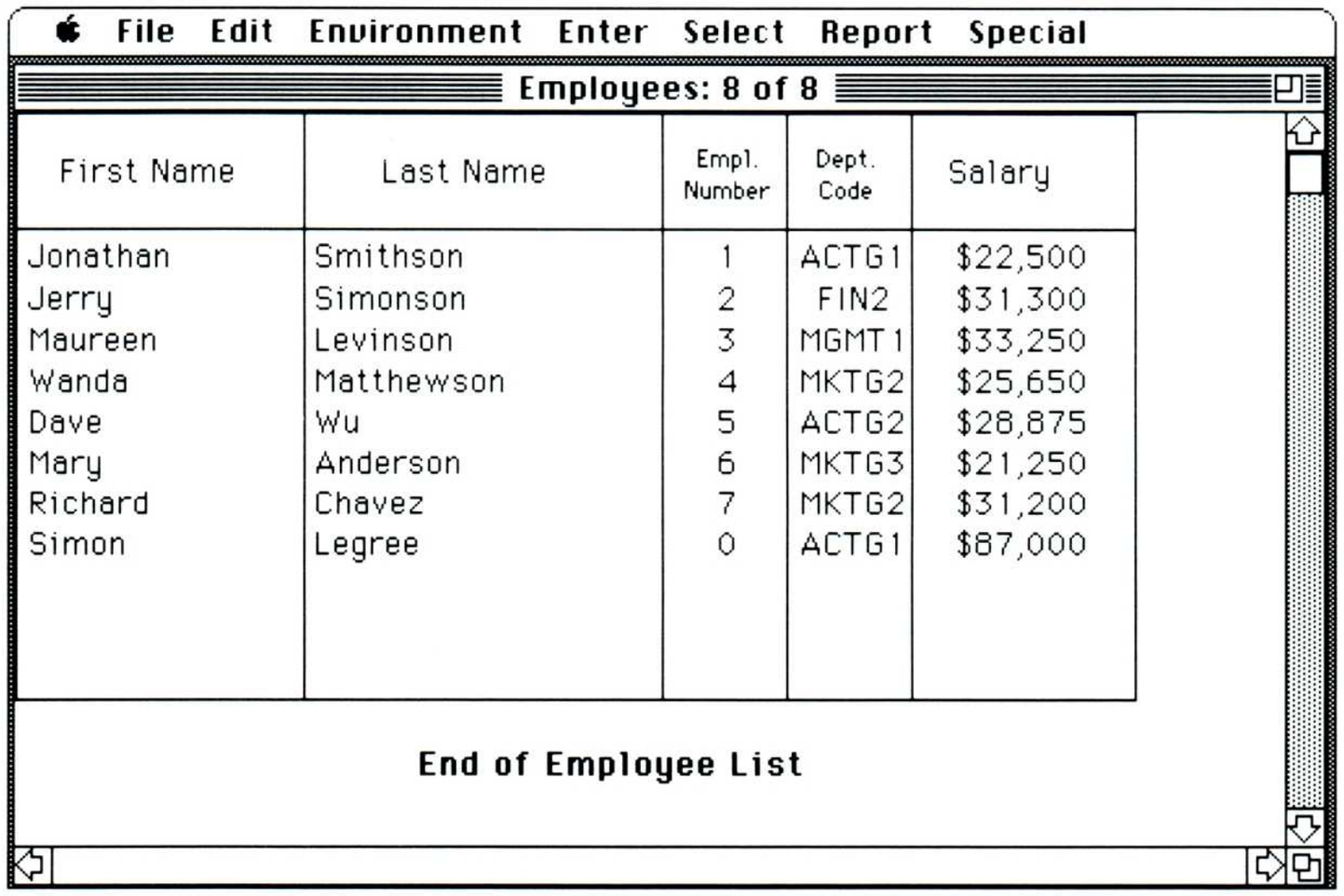


Figure 3-1
User output screen

This chapter covers all of the functions and features you may take advantage of in the User environment *except for* procedures and passwords.

Procedures are the subject of Chapter 4.

Switching to the User environment

To enter and make use of the User environment from the Design environment, you must have created at least one file with at least one field, and you must have created at least one layout. To switch environments, choose User from the Environment menu.

For an explanation of 4th Dimension's password system, see Chapter 6, "Creating a Custom User Interface."

To enter the User environment from the Custom environment, you must be using a development version of 4th Dimension (and not a runtime version), and, if you are using a password system, you must have logged on to the application with the main password or a password with no startup procedure.

In the Custom environment you will not have an Environment menu available (even as a developer, you cannot provide a true Environment menu). Switch to the User environment by choosing Quit from the File menu, or an equivalent command. When you quit from the Custom environment, you enter the User environment or the Finder, depending on whether you are using a development version of 4th Dimension and depending on your password level.

Any custom menu command without an associated procedure acts as a quit command. See Chapter 6, "Creating a Custom User Interface," for information on how to create a custom menu system.

Another way to enter the User environment is to set Preferences to start the application in the User environment. This will work only for applications running under the development version of 4th Dimension; the runtime version of the program provides an emulation of the Custom environment only.

Important 4th Dimension will not start an application in the User environment if the application is running under the runtime version (no matter how you have set Preferences). To start up in or to enter the User environment, you must use the development version of 4th Dimension.

When you switch to the User environment from the Design environment, 4th Dimension chooses as its default file

- The first file you created in the Design environment (the first time you switch, only).
- The file you have chosen with the Choose File/Layout command.

When you switch to the User environment from the Custom environment, 4th Dimension chooses as its default file

- The file that was last active in the Custom environment.
- The last file specified by an operating procedure.

If you switch to the Design environment from the User environment, then back to the User environment, the **current selection** of records and the default file that you set in the User environment remain intact.

The **current selection** of records is a subset of all the records in a file, and may include all the records in the file.

❖ *By the way:* When you switch to the Custom environment from the User or Design environments, the application's custom programming takes over and determines which file is active and which layouts 4th Dimension displays.

Input and output layout defaults

More about setting the default layouts are covered later in this chapter. See also Chapter 2, "Layout Design Basics," for more information about setting the input and output layouts.

When you enter the User environment, 4th Dimension displays the default output layout. Every file in a 4th Dimension database has a default input and a default output layout. You set the defaults for each file in the Design environment. They are marked with an I for input, O for output, and B if the layout is for both input and output. In the User environment, 4th Dimension automatically uses the default input layout when you enter data into a database. It uses the output layout whenever it displays data from the database on the User output screen.

You may choose new default layouts for input, output, or both through the Choose Layout command under the File menu in the User environment. If you have only one layout in a file, 4th Dimension automatically sets the default layout for that file to that one layout. In any case where 4th Dimension is called on to decide, it selects the shortest layout from top to bottom for its default output.

❖ *By the way:* In a custom application running in the Custom environment, only procedures may control which layouts the application calls—the user cannot directly choose from among them.

You can set default input and output designations only in the Design environment. If you change them in the User environment (using the Choose File/Layout command) and do not return to the design environment, 4th Dimension will use the default settings when you start the application again.

Switching environments

You may switch to the User environment from the Design environment, you may set Preferences so that your application starts in the User environment, or you may switch to the User environment from the Custom environment.

You may switch to the User environment from the Design environment if you have

- Created at least one file, and that file contains at least one field.
- Created at least one layout for that file.

You may switch to the User environment from the Custom environment if you

- Are using the development version of 4th Dimension, and not the runtime version.
- Have provided a quit command or equivalent in the application you are using.
- Have logged on to the application by using the main password or by using a password with no startup procedure.

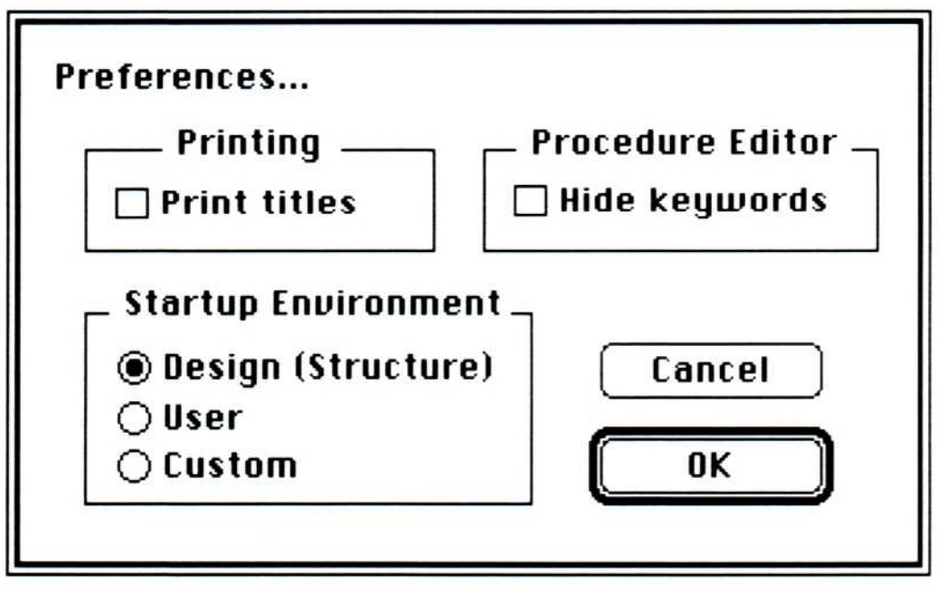


Figure 3-2
Preferences dialog box

Switch to the User environment

- From the Design environment, choose User from the Environment menu.

  4th Dimension closes all open windows, including the Structure window, and saves the contents.

  If you have any records in your database, 4th Dimension displays the records of the default file through that file's default output layout.

  If you have no records in your database, 4th Dimension displays the message: "There are no selected records for *database name*" (where *database name* is the name of the database you built in the Design environment).

- From the Custom environment, choose Quit from the File menu.

  Or: From a menu provided with the application, choose a command equivalent to Quit, or a command that has no associated procedure.

Start up in the User environment

1. In the Design environment, choose Preferences from the File menu. 4th Dimension displays the Preferences dialog box.
2. Set Preferences by clicking User.
3. Click OK to accept the new setting for Preferences.

   The next time you start your database application, it will start up in the User environment.

- To restart your application immediately in the User environment, while still in the Design environment, choose Open Database from the File menu and select your database application.

  Or: Switch environments by choosing User from the Environment menu.

Changing the default layout

Each 4th Dimension file has a default input layout and a default output layout. They may be the same layout.

4th Dimension displays the default layouts for a file when that file becomes active; for example, when you select a file for input.

You may change the default layouts for the files in the database from the User environment.

1. Choose a file and layout

- From the File menu, choose the Choose File/Layout command.

  4th Dimension displays its Choose File/Layout dialog box. The box holds a list of filenames in the database application.

2. View the layout names

1. Select the name of the file whose layouts you wish to view.
2. Click Expand to view any layouts associated with the selected file.

   Or: Double-click the filename whose layouts you wish to view.

   When you expand a filename, the Expand button changes into a Collapse button.

   4th Dimension displays the names of the layouts associated with the file you have selected. The letter *I* for input, *O* for output, or *B* for both input and output may appear beside one or more layout name indicated that it is the default layout for its file.

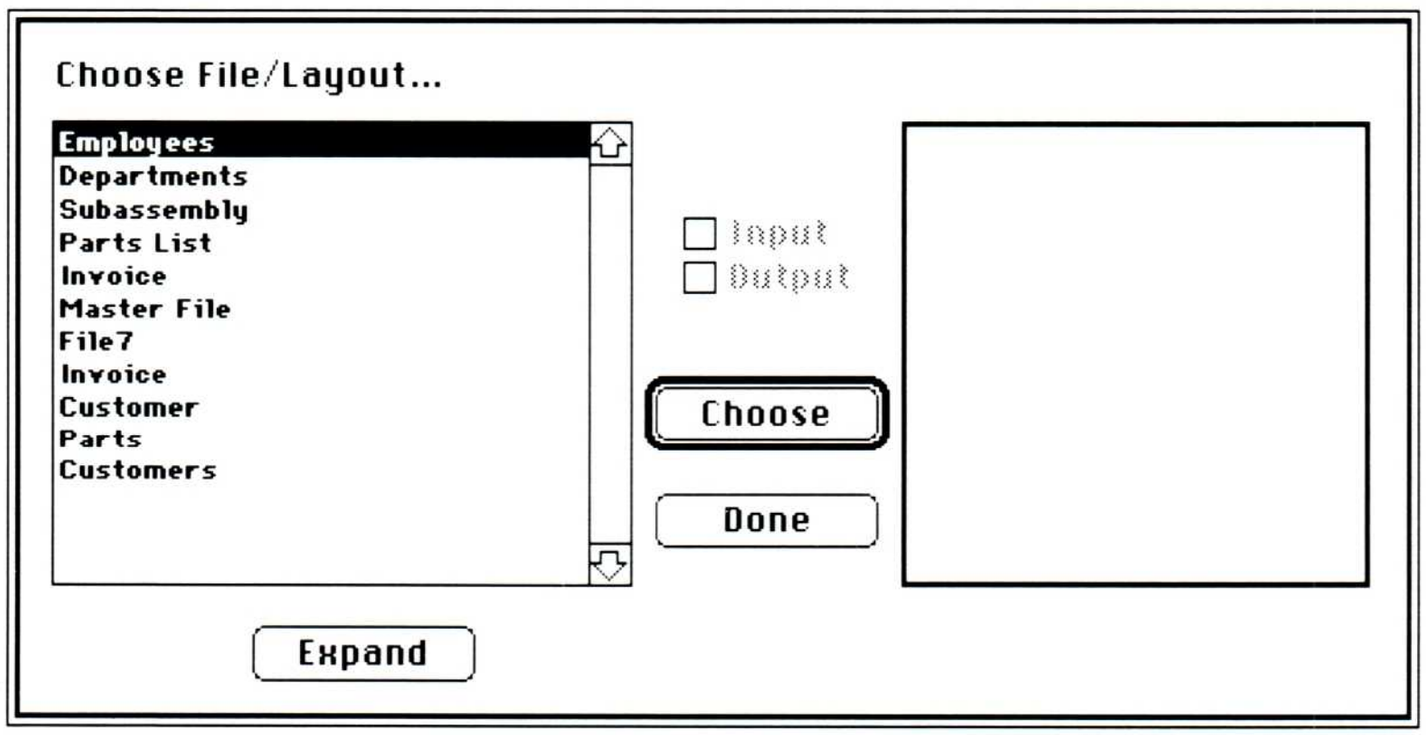


Figure 3-3
Choose File/Layout dialog box

3. Select a layout

1. Click a layout name.

   4th Dimension displays the layout you have selected in the Graphic Area on the right of the dialog box.

   If the layout is already a default layout, 4th Dimension checks the appropriate Input or Output check box.

2. Click Input, Output, or both of the check boxes.

   4th Dimension adjusts the I, O, and B indicators on the list of layout names so that there is only one layout per file handling input or output. You cannot "uncheck" either of the check boxes.

❖ *By the way:* There may be one layout handling *both* input and output duties; but there can only be one layout handling input for a given file, and one layout handling output.

3. Click Choose to set both the default file and the default layouts. The default file will be the file whose name or whose layouts you have currently selected.

Or: Click Done to return to the User output screen with the default file as you left it (no new default file), but with the input and output defaults for various files as you have set them.

Entering data into records

Every time you manually enter a new record or modify an existing record, you do it through an input layout. In the User environment, 4th Dimension displays the default input layout for the default file when you choose New Record from the Entry menu.

❖ *By the way:* Records and layouts are two different things. A layout is a template through which you may add data to the different fields of the actual record. Two different layouts may show the same record in two very different ways.

You may also enter data by using a procedure, a 4th Dimension **formula,** or by importing data from other programs.

A 4th Dimension **formula** is a statement that uses 4th Dimension programming commands and functions, but is one logical line long, rather than constructed in block form as is a procedure.

Parts of the Entry window

When 4th Dimension displays an input layout that has no buttons on it, 4th Dimension displays a button panel for the layout. The button panel includes an Enter button, a Cancel button, a Delete button, and a three-part Paging icon that lets you move forward or backward or jump to the first record of a set of records (the current selection). Figure 3-4 shows a typical layout in the Entry window.

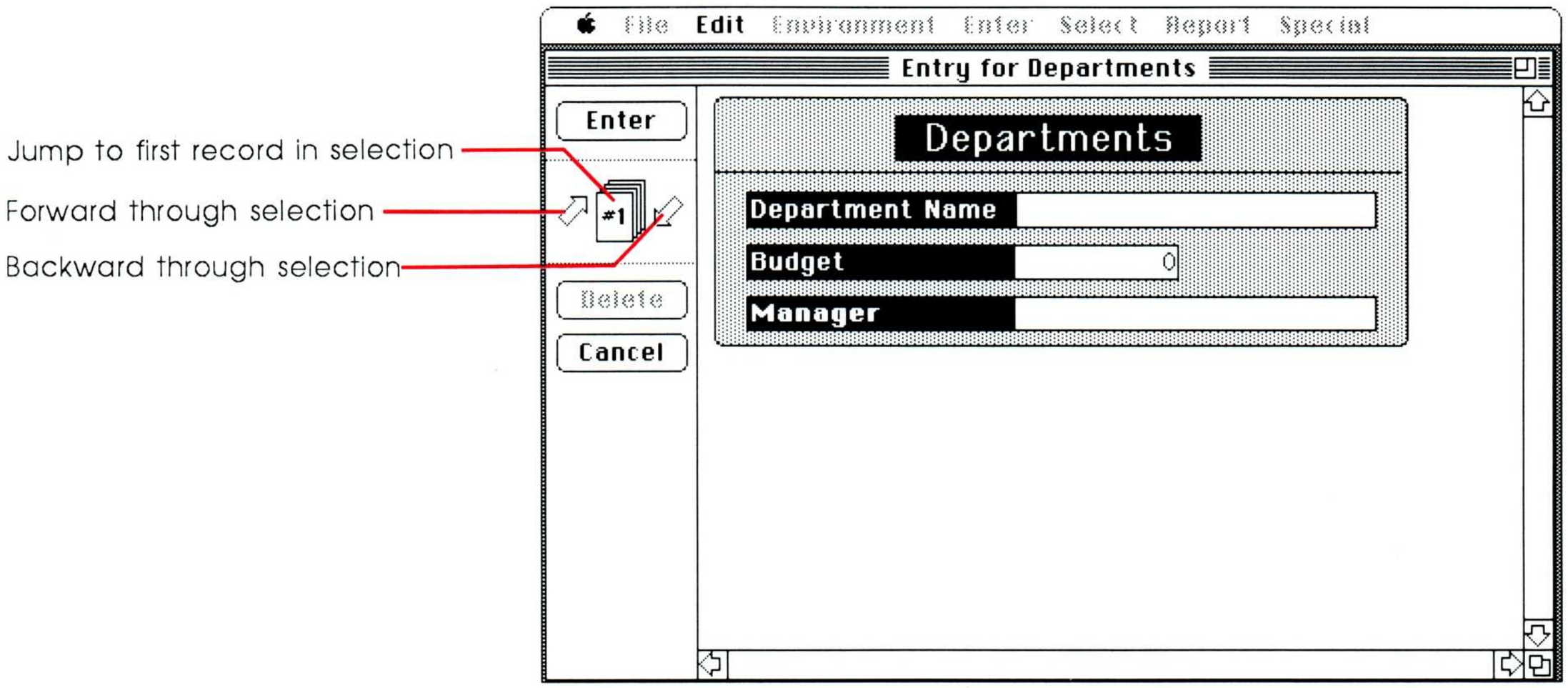


Figure 3-4
Layout in Entry window

Entering data

Enter data into a 4th Dimension layout by typing the characters, clicking radio buttons or check boxes, or pasting an image into a Picture field. You may also

- Move from field to field sequentially in one direction by pressing Tab or Return (not Enter), and sequentially in the other direction only by pressing Shift-Tab (sometimes called "Back-Tab").
- Click any field into which you want to enter data.
- Enter data into an included layout for a subfile by clicking the included layout or pressing Command-Tab. Double-clicking an included layout for a subfile displays the subfile's own input layout, without the surrounding layout.
- Accept your complete layout entry by clicking Enter or by pressing the Enter key (not the Return key).

- Cancel your complete or incomplete layout entry by clicking Cancel or by pressing Command-. (the Command key plus the period character).

The Enter and Cancel buttons on the button panel set to the 4th Dimension System OK variable. 4th Dimension only accepts an entry into the database when you click Enter, press the Enter key (not Return), or click an Accept button.

Entering data from Standard Choices

During entry, when you click a field that has the Standard Choices field attribute set, 4th Dimension displays the Standard Choices window and the list of choices that the developer created in the Design environment. Figure 3-5 shows how the Standard Choices window looks when 4th Dimension displays it.

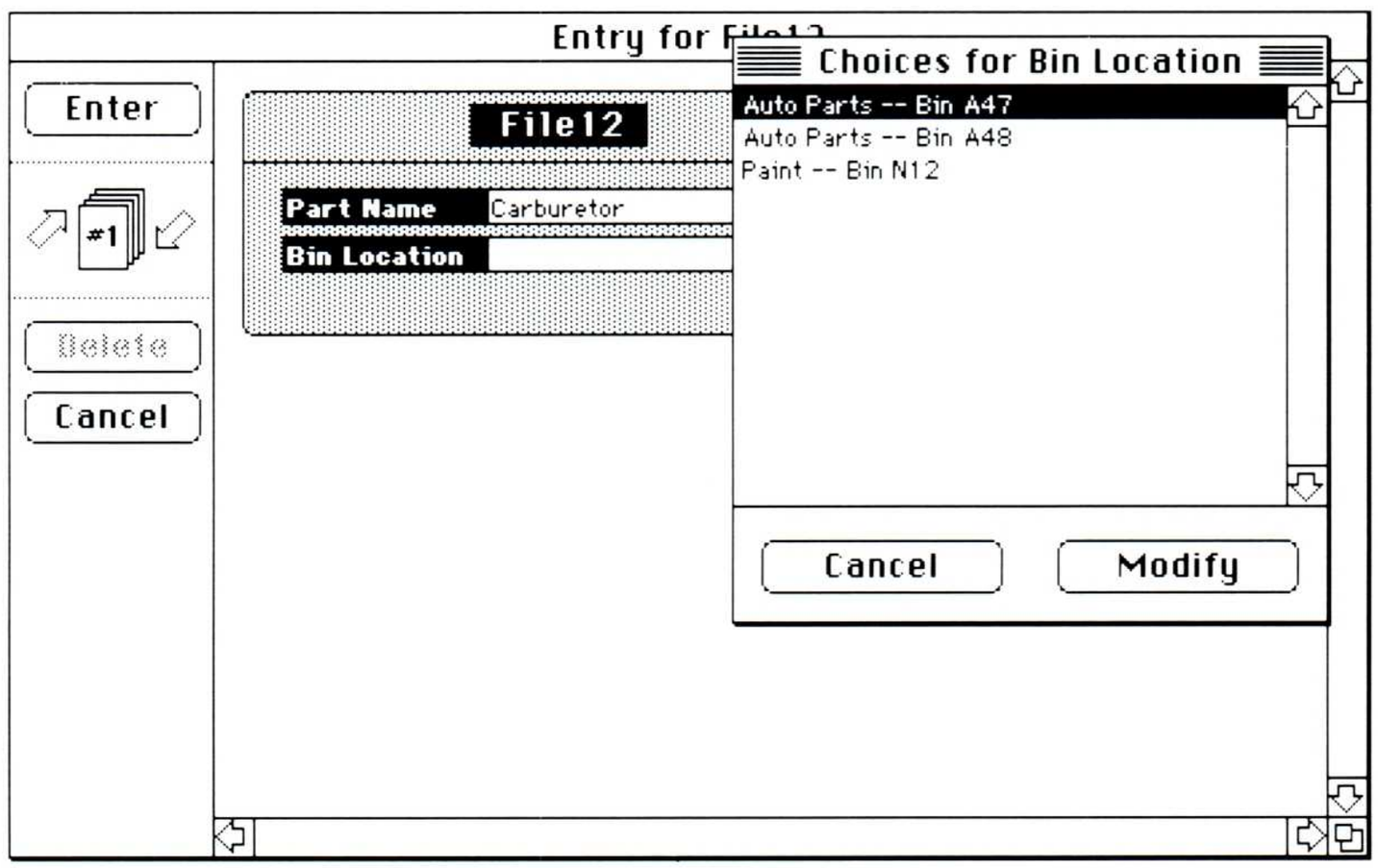


Figure 3-5
Layout displaying Standard Choices window

4th Dimension shows the list of choices with the first choice selected. You can enter this choice into the highlighted field in your layout by clicking the choice, by typing to match a choice, or by selecting a choice with the arrow keys and pressing Return.

If the developer has allowed the list to be modified, you may display the Standard Choices editor by clicking the Modify button on the layout. Figure 3-6 shows the Standard Choices editor.

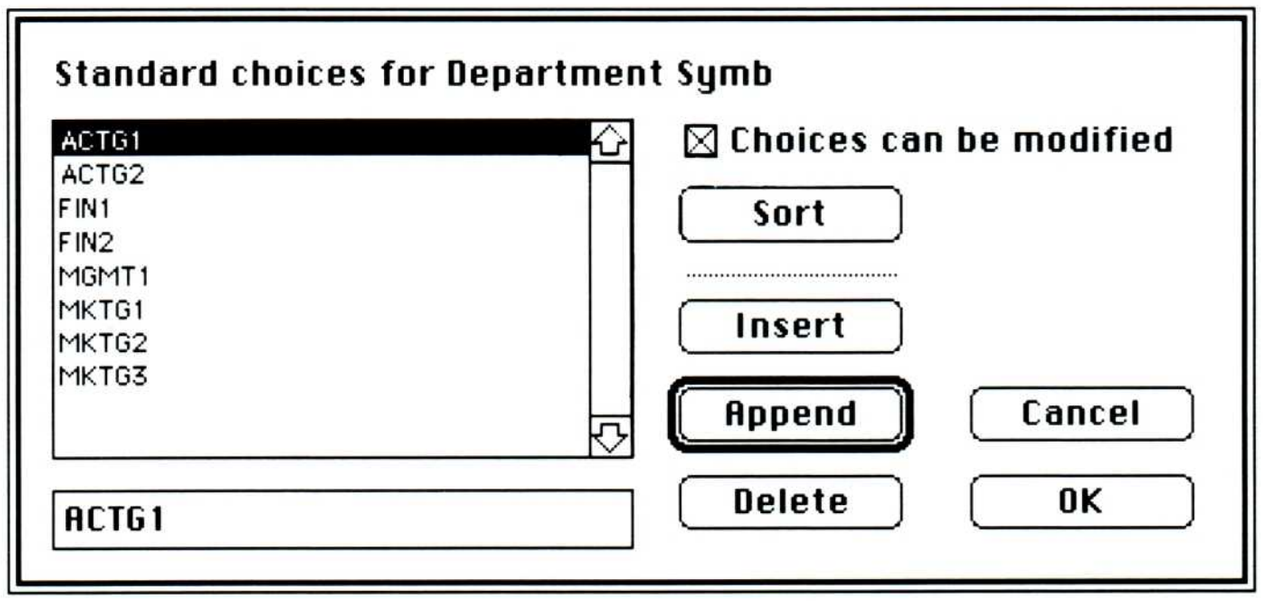


Figure 3-6
Standard Choices editor

Entering data into a record

You may enter records into 4th Dimension one by one, by using a procedure, or by importing data created by other programs or other computers.

You may also use these techniques to enter data when modifying an existing record.

In addition to fields, you may need to click radio buttons, check boxes, and call external procedures by clicking on External Area variables.

This how-to section covers entering data into fields through individual records in the User environment.

See also "Applying a Formula" and "Importing and Exporting Data" in this chapter, and Chapter 4, "Procedures." For technical information on importing data, see *4th Dimension Programmer's Reference*.

1. Display an input layout

- From the Enter menu, choose New Record.

  4th Dimension displays the form you have selected as the default input layout.

  If you have no buttons in the input layout, 4th Dimension displays a button panel with Enter, Cancel, and Delete buttons and a paging icon. The Enter and Cancel buttons set the 4th Dimension System OK variable.

  If you have buttons in the layout, 4th Dimension displays no button panel.

  4th Dimension highlights the first field in the layout for data entry.

Enter data (general)

- Click any field to highlight that field and position the data entry pointer (a text editing I-beam pointer) at the beginning of the field.
- Click within any field to edit the text within it. 4th Dimension conforms to standard Macintosh editing practices.
- Move from field to field sequentially in one direction by pressing Tab or Return (not Enter), and sequentially in the other direction only by pressing Shift-Tab (sometimes called "Back-Tab").

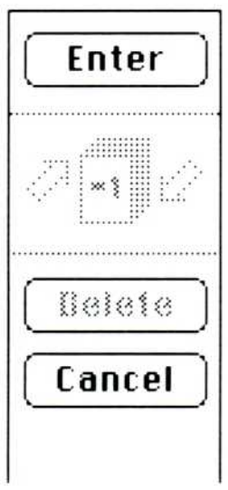


Figure 3-7
Button panel

- To enter the same data into several fields in one record, or into the same field in several records, select it and use the Copy and Paste commands from the Edit menu.
- Accept your complete layout entry by clicking Enter or by pressing Enter (not Return).

  4th Dimension accepts an entry into the database when you click Enter. This changes the 4th dimension System OK variable to 1.
- Cancel your complete or incomplete layout entry by clicking Cancel or by pressing Command-. (the Command key plus the period character).

Enter a date

1. Click a field of the Date type on an input layout.
2. Enter the date in the form mm/dd/yy.

   For example, 26 December 1986 would be 12/26/86. April 18, 1987 would be 04/18/87.

   No matter how the Date field is formatted, you must enter the date information in the mm/dd/yy fashion.
3. Press Return, Tab, or Shift-Tab or click another field to move to another field. Accept or cancel the current record.

Enter picture data

1. Copy an image to the Clipboard. Usually, you'll copy an image from the Scrapbook.
2. Click a Picture field.
3. Paste the image from the Clipboard to the Picture field.

   See also Chapter 6, "Creating a Custom User Interface," for more information about Picture fields.

Enter data into an included subfile

1. Press Command-Tab to enter the area of the included subfile and to simultaneously create a new subfile record.

   4th Dimension places the text editing pointer within the new record in the included file area. You can press Command-Tab with any field in the parent layout selected.

   Or: Double-click the included layout area. 4th Dimension displays the Full Page layout for the included subfile.

   4th Dimension only displays the Full Page layout for an included subfile. There is no similar action for the included layout of another file.

2. Enter the data into the included subfile's layout.

   You can use Tab and Shift-Tab to move from field to field and from existing record to existing record *within* the included layout. Command-Tab still creates a new record within the subfile's included layout.

- To return to the parent layout from within an included layout, click any of the parent record's fields.

  Or: Press Tab to move the selection through the subfile records and to the next field of the parent record.

  Or: Press Shift-Tab to move the selection backwards through the subfile records and back to the last field of the parent record before the included layout.

  If you have displayed the Full Page layout for input, clicking the Enter button or pressing Enter will return you to the parent layout—and will not create a new blank layout for you to fill in.

Maneuvering with an included subfile

- Press Tab to move the selection from field to field within the parent layout and into the first field of the included subfile's layout.
- Press Tab to move the selection from field to field and from existing record to existing record within the included subfile's layout.

  Pressing Tab enough times eventually brings the selection to the next field of the parent record.
- Press Shift-Tab to move backwards through the fields and records of the included subfile's layout.

  Pressing Shift-Tab enough times eventually brings the selection back to the last field of the parent record previous to entering the included layout.

  You cannot use Shift-Tab in order to enter the last field of the included layout.

Enter data from Standard Choices

1. Select a field on the layout that has a set of Standard Choices.

   There is no particular way to tell in advance if a field has a set of Standard Choices associated with it; the Standard Choices window will appear when you select the field.

2. Select a Standard Choice by using the up and down arrow keys or by entering the first few characters of the choice.

   The most usual, or default, choice should be the first one in the list, so that you may select it and enter it simultaneously in the layout by pressing Return.

- If the list of Standard Choices is modifiable, and you wish to modify the list by adding, deleting, or changing an entry, click Modify in the Standard Choices window.

  4th Dimension displays the Standard Choices editor.

- If you wish to close the Standard Choices window *without* making a choice, click Cancel. 4th Dimension returns you to the layout, and you may enter any allowable value into the field.

3. Press Return to enter the choice you have selected into the layout which you're on working.

   Or: Click one of the choices in the list to both select and enter it in the layout.

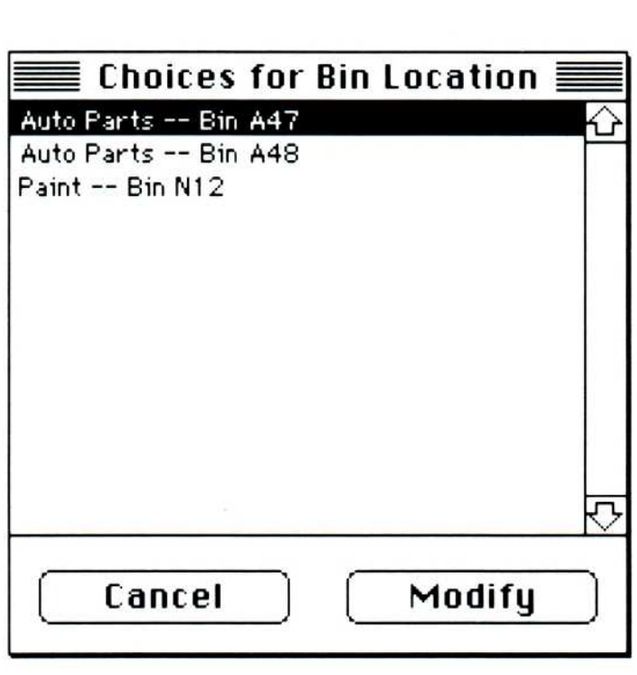


Figure 3-8
Standard Choices window

Enter data into a linked field

- Enter data into the layout as you would normally.

  Generally, the best technique is to work down sequentially from the top of the layout. Most linked fields occur at the top of the layout.

When you enter data into a linked field, 4th Dimension uses that data as an index into another file. The program then displays any data from the other file that the layout procedure has called for and that the layout itself is built to display.

2. Finish up

- You may use the at sign (@) as a wildcard character. Wildcard characters substitute for one or several letters.

  If the **LOAD LINKED RECORD** command uses a second argument, then using the @ sign calls up 4th Dimension's Selection window which lists a subset of the records in the linked file that correspond to the value in the linking field.

  Using an @ sign *without* a second argument to the **LOAD LINKED RECORD** command will cause 4th Dimension to select the linked values of the *first* corresponding record that it finds.

  You cannot add, delete, or alter the list in a Selection window.

- To select a record that appears in the Selection window, double click the selection, or single click to select the record, then press Return.

- Click Enter to accept the record as you have completed it, and to add that record to the database.

  Or: Press Enter (*not* Return).

  Both actions set the system OK value to 1. 4th Dimension adds no record to a file in the database until you have pressed Enter or have clicked the Accept button.

- Click Cancel to return to the User output screen. 4th Dimension will not add the most recent record to the database.

  Or: Press Command-. (the Command and Period keys, together).

  Canceling sets the system OK value to 0.

  The standard method of returning to the User output screen is to enter your final record, wait for 4th Dimension to display an empty layout, and cancel the empty layout.

- The Delete button is active only when you are modifying an existing record.

For an explanation of the current selection, see *4th Dimension Programmer's Reference*.

Concept of the current selection

The current selection is a working subset of all records in any file of the database. The current selection may be, but is not necessarily, made up of all the records in the file. Each file has its own current selection.

The current selection of a file remains intact even though that file may not be active. Even switching between environments does not alter the current selection of a file.

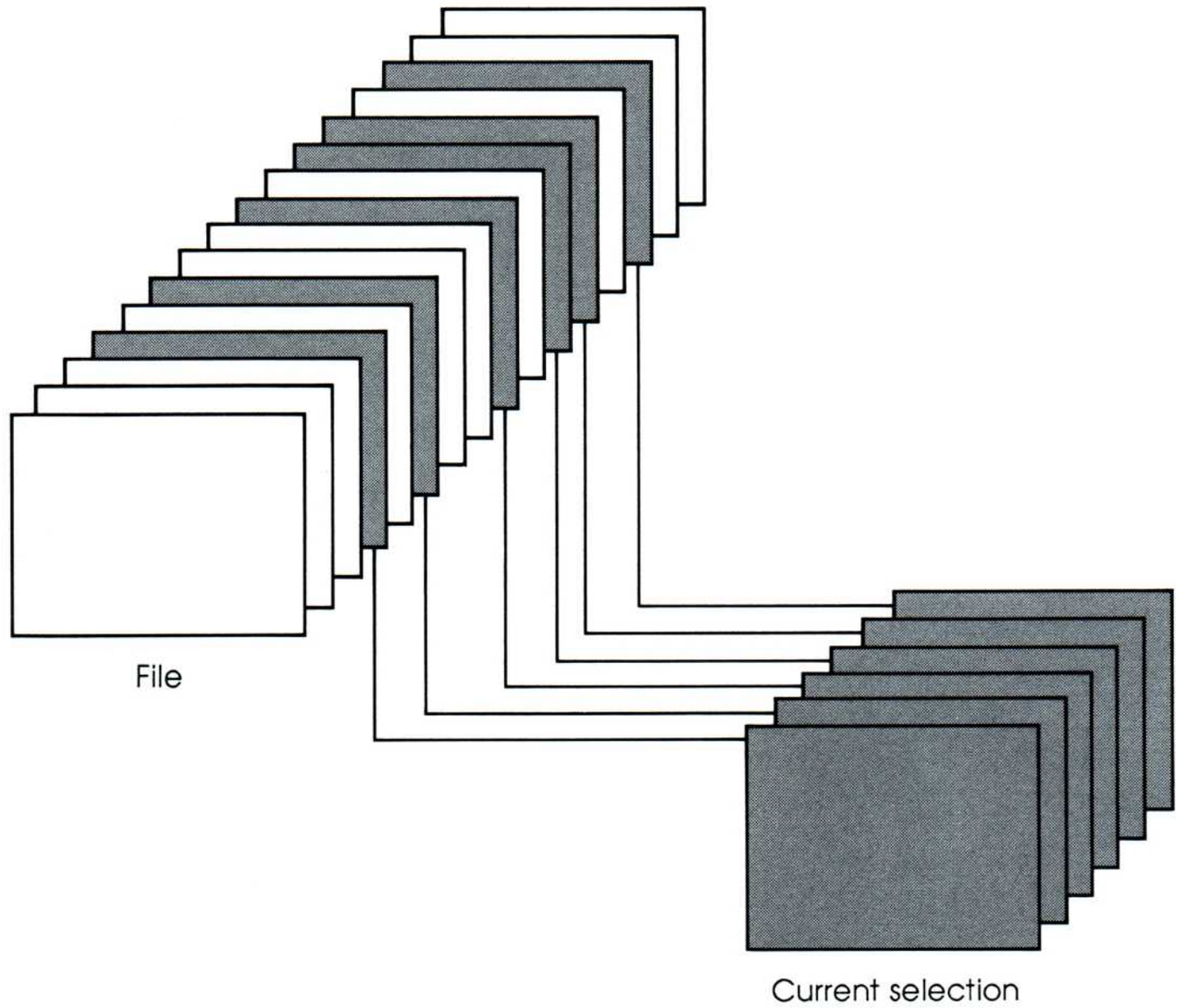


Figure 3-9
Concept of current selection of records

Each file also has one current record; the record currently being saved, modified, or linked with. The current record is always a member of the current selection of records, but is only one record. The current selection is a group that may include one or many records.

Important The current record is always in memory. The records of the current selection may or may not be in memory.

Changing the current selection

Startup initializes the current selection to all records in the file. After that, your activities as a user may limit the current selection to fewer records than all.

You may change the current selection of records, for example, when you search through the database to find several records—or no records—that meet your search criteria.

There are two important facts you should remember about the current selection:

1. 4th Dimension will apply formulas or make reports based *only* on the current selection of records.

   If you perform a search, arrive at 0 records in your current selection, and then call for a report, 4th Dimension will base that report on 0 records, no matter how many records are in the file.

2. In the User environment the Search command and Search and Modify command always search the entire file for records that meet your search criteria.

Important You change the current selection for a file any time you perform an action that creates a subset of the records in the file. These actions include selecting an individual record, selecting groups of records, selecting all records, or performing searches.

Selecting records

You create a new current selection every time you take an action that creates a subset of the records in the default file. This includes creating a subset that contains all the records in the file.

These actions may be as complex a searching through a file by some criteria, or as simple as clicking a given record.

Once you have a current selection, you can graph it, modify the contents of its component records, print reports based on it, and perform many other operations.

The User output screen displays in its title bar the number of records in the current selection and the number of records in the default file.

Figure 3-10
Select menu

Display all records

- Choose Show All from the Select menu.

  4th Dimension changes the current selection to include all records from the default file.

  You can change the default file with the Choose File/Layout command in the File menu.

  The Show All command always creates a current selection of all the records in the default file.

Make a subset

1. Select from one to all of the records in the current selection.

   - Choose Select All from the Edit menu to select all of the records in the current selection.

     The Select All command selects only those records already in the current selection. It ignores other records that are in the file but not in the current selection.

   - Shift-click any two records to select those two and all the records between them.

   - Command-click several records to select more than one. Command-click also de-selects records.

2. Choose Show Subset from the Select menu.

   4th Dimension creates a new current selection containing only those records you have picked out from the previous current selection.

Select by searching

- Choose Search, Search and Modify, or Search by Formula from the Select menu to create a current selection.

  4th Dimension displays the appropriate dialog box.

Printing the current selection

When you print the records of the current selection, you do so through a layout that you choose at print time expressly for that purpose. This layout is the "print layout." The print layout need not be the default output layout for the file.

You may also send the printout to the screen, rather than to the printer. In the printer dialog box that contains the Quality of printout setting, 4th Dimension provides a check box called Preview on Screen.

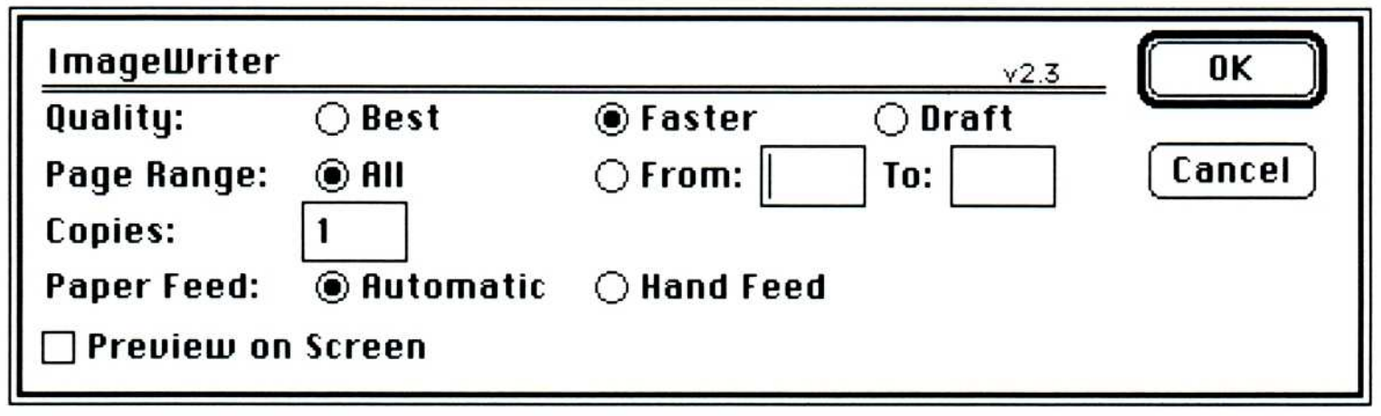


Figure 3-11
Print dialog box with Preview on Screen check box

❖ *By the way:* Different printing devices, for example the Apple LaserWriter and the Apple ImageWriter printers, use different printer setup values. They may print the same layout differently. The LaserWriter uses a narrower page width than does the ImageWriter, and may create two pages during a printout where the ImageWriter only creates one.

Printing

You may print the current selection in the form of any layout associated with the file.

4th Dimension will print all the records in the current selection.

1. Prepare to print

- Make sure that the current selection is the group of records that you want to print.
- Change the current selection by a search, by choosing Show All from the Select menu, or by formally selecting individual records and choosing Show Subset from the Select menu.
- To be able to print all the records in a given file of the database, first choose Show All from the Select menu.

2. Select a print layout

1. Choose Print from the File menu.

   4th Dimension displays its Choose print layout dialog box. The dialog box displays the names of the available layouts for the default file. The default file is the file of the default output layout. The default output layout is automatically shown as selected in the list.

2. Select the name of a layout. Its image appears in the Graphic Area at the right of the dialog box.

3. Finish up by clicking OK to use the selected layout for printing and to continue with the printing process, or by clicking Cancel to return to the User output screen without printing.

   Or: Double-click a layout name to both select it and continue with the printing process.

   4th Dimension displays the standard Page Setup dialog box.

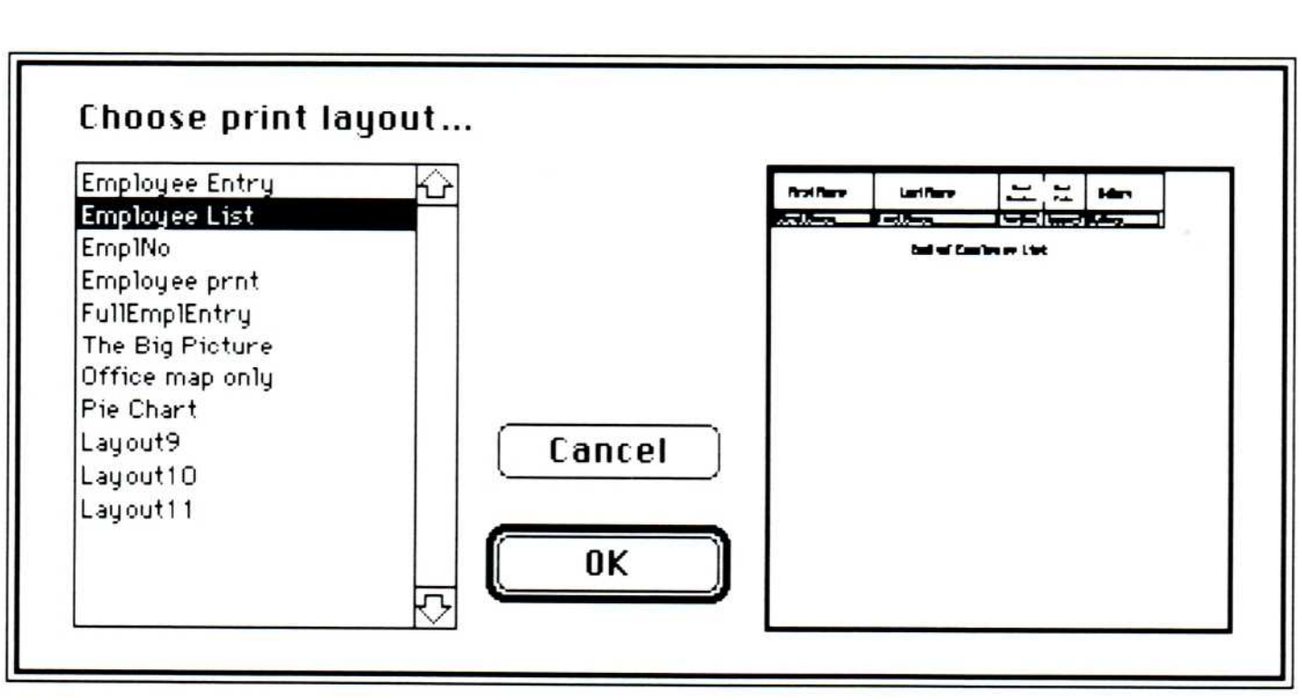


Figure 3-12
Choose print layout dialog box

3. Set the print information

1. Select the printer settings to suit your printer, layout, and paper.
2. Click OK to accept the settings and continue the printing process; or click Cancel to return to the User output screen.

   4th Dimension displays the Print quality dialog box. On this dialog box is the Preview on Screen check box.

   - Check the Preview on Screen check box if you wish to send your printout to the screen either before printing or simply to view it.
3. Click OK to continue the printing process, or Cancel to return to the User output screen.

   4th Dimension presents a Printing in progress message while it prints, either to the printer or to the screen.

   - You may halt the printing process by clicking Stop Printing.

   If you print to the screen, 4th Dimension presents a page overview when it finishes printing.

Use the page overview

- Drag the frame to change different zoomed views of your onscreen printout.
- Click Zoom for a closeup of the portion of your printout inside the frame.

  When you have zoomed the page, click anywhere on it to return to the page overview.
- Click Next Page to see the next page of the onscreen printout if the printout uses more than one page. If your printout only uses one page, clicking Next Page returns you to the User output screen.
- Click Stop Printing to abandon the printing process and to return to the User output screen.

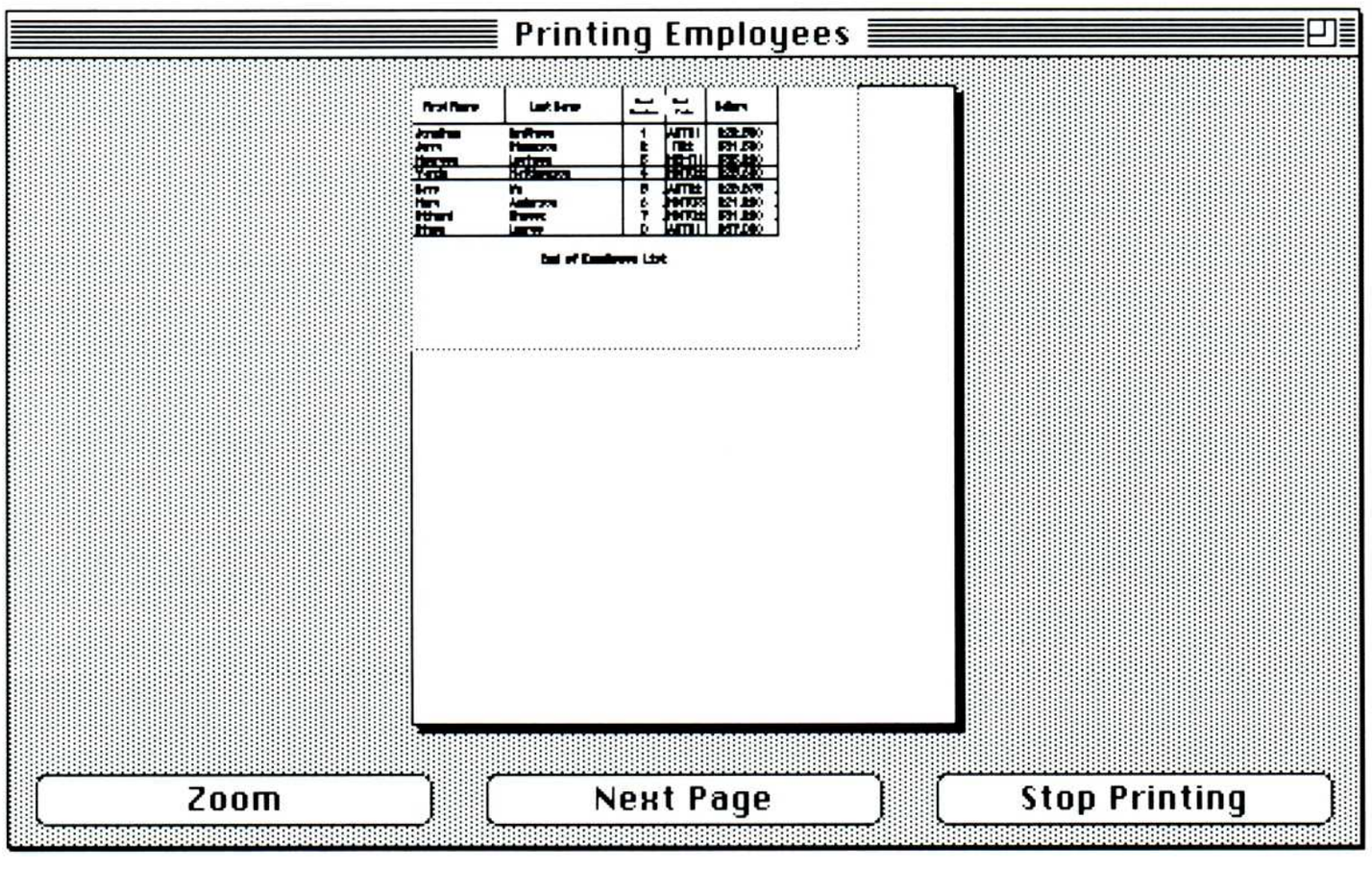


Figure 3-13
Page overview

Sorting the current selection

4th Dimension's sort command sorts the records in any file's current selection up to 30 levels deep, in ascending or descending order. 4th Dimension sorts in the sequence you specify, not necessarily the order in which the fields appear in the layout or in the structure.

Important There is no primary index or primary field by which 4th Dimension sorts as a default. The records of a file are sorted if you have sorted them and only if you have sorted them; otherwise they may—or may not—remain in the order in which they were entered. The only way to be sure of their order is to sort them.

4th Dimension will sort alphanumeric type fields, the three numeric field types, and Date fields. 4th Dimension's sorting command ignores Text fields, Picture fields, and fields of type Subfile.

Figure 3-14 shows the Sort dialog box.

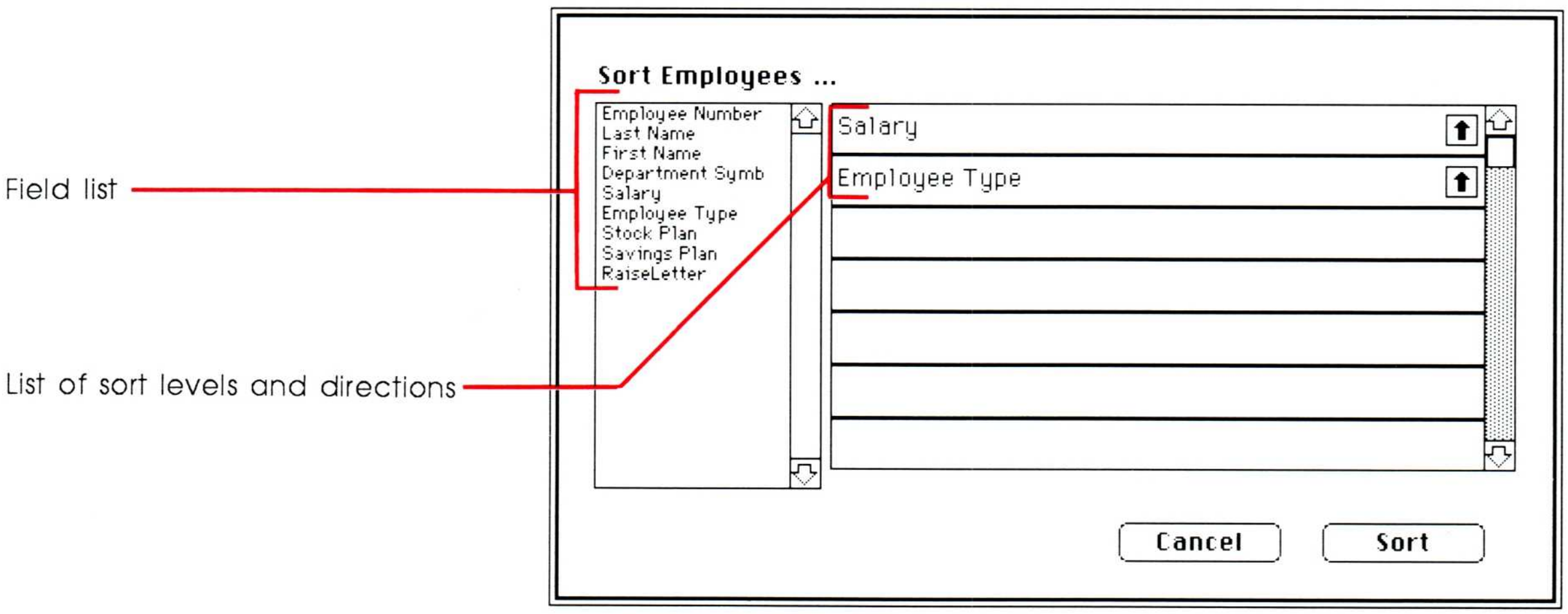


Figure 3-14
Sort dialog box

Sorting

The Sort command sorts the current selection of the default file only.

You may sort as many as 30 levels, in any combination of ascending and descending order.

4th Dimension sorts the current default output file (the default file) by field in the order you enter the field, and in the direction of the sort.

1. Prepare to sort

1. Make sure that the current selection represents the subset of records you wish to sort.

■ To make the current selection include all records in the default file, choose Show All from the Select menu.

2. Choose Sort from the Select menu.

   4th Dimension displays the Sort dialog box.

2. Enter the sort levels

1. Click the name of the field by which you want to sort.

   The field name and a sort direction arrow indicator appear in the criteria list.

   4th Dimension's default is to sort by ascending order.

■ To change the direction of the sorting order for any one level, click the arrow indicator.

■ To replace one field name with another in the list of sort levels, click a level to select it. Then click another field name from the list of field names. 4th Dimension will replace one with the other.

■ You cannot delete a sort criterion.

■ Continue adding additional sort levels.

2. Finish up by clicking Sort to sort your current selection, or by clicking Cancel to return to the User output screen without having conducted a sort.

The Search commands

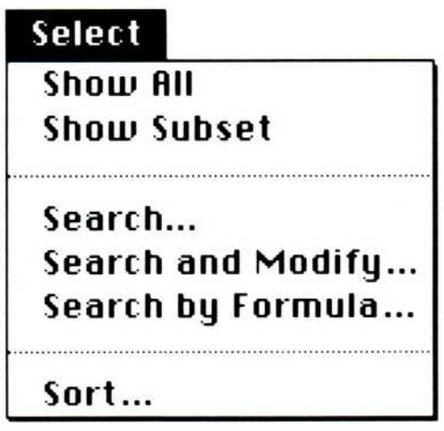
A search examines all the records of a file and compares them to certain criteria that you have posed, usually the values potentially contained in particular fields. The records that meet the criteria become the new current selection.

You must search subrecords with a different technique. See "Searching Subrecords," later in this chapter.

A search *always* examines all the records of a particular file regardless of the records in the current selection. Because of this, a search may create a new current selection that contains records from the file that were not a part of the previous current selection.

4th Dimension will search by a database's indexes when possible.

In the User environment, you may search through the records of a file three different ways.



- **Search:** You may develop a set of search criteria that will examine a file for ranges of field values, and which use And and Or functions between fields. You may also use this choice to save and call up one of a number of such sets of criteria that you have stored on a disk.
- **Search and Modify:** 4th Dimension searches a file based on the indexes that the program creates. The command quickly finds and presents records for modification. You must have indexed fields in the structure of your database in order to use Search and Modify. Such searches are very fast when compared to sequentially searching nonindexed files.
- **Search by Formula:** You may use 4th Dimension's built-in programming language and a Formula editor to create a search **formula.** Formulas are always one logical line long. Search by Formula is useful when preparing very complex searches. Use this choice also to call on one of a number of such formulas you have prepared with the Formula editor and stored on a disk.

A **formula** is different from a procedure in that a formula is always *one logical line long.* Some commands are inappropriate in formulas. See *4th Dimension Command Reference.*

Searching by criteria

When you choose the Search command from the Select menu, 4th Dimension presents you with a Search Criteria editor. Figure 3-15 shows the editor.

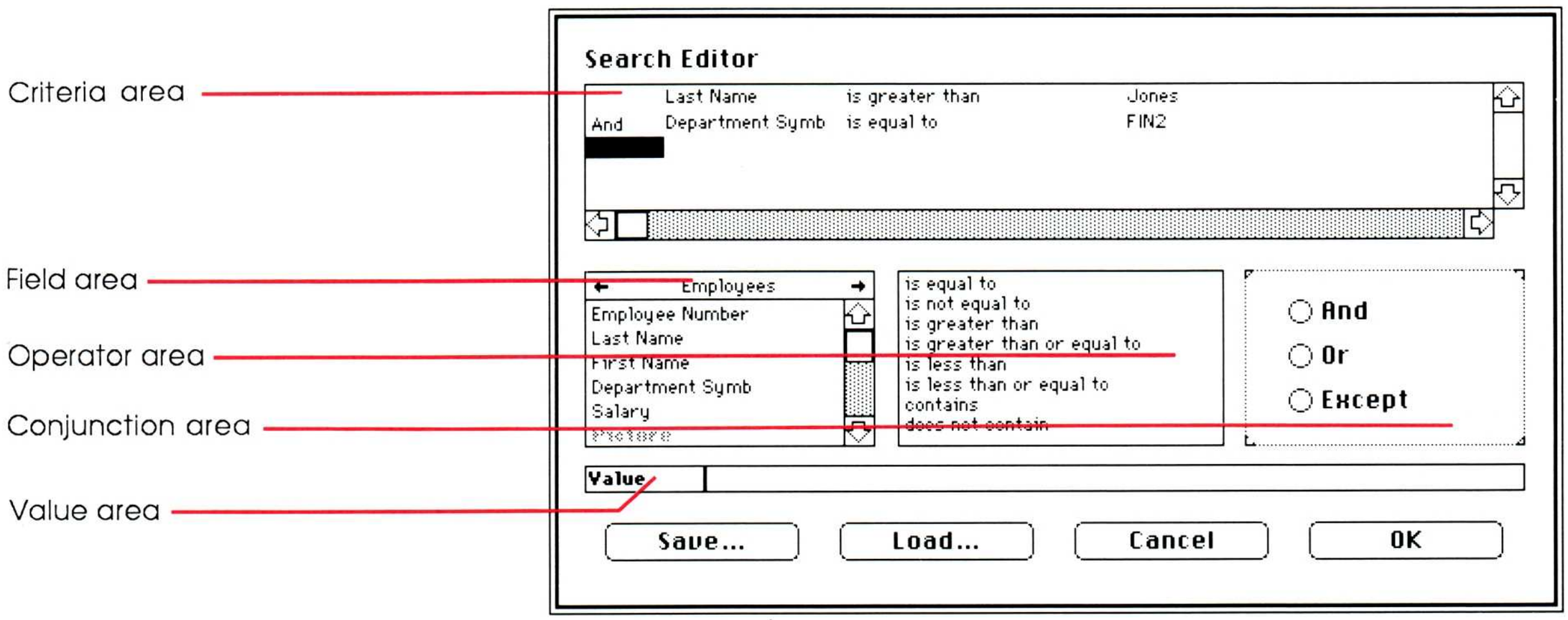


Figure 3-15
Search Criteria editor

With the Search Criteria editor, you may construct a statement that searches for records in a file based on the values contained in a particular field or in a combination of fields.

Search sets of criteria may become fairly complex. You may save these sets of criteria to a disk, build a collection of them for your application, and reload one when you need it.

Don't confuse these sets of criteria with the procedure-like search formulas created under the Search by Formula command.

The Search Criteria editor has five areas and four buttons:

- **Criteria area:** The Criteria area displays the search criteria as you create them, or after you load them from a disk. If you load criteria from a disk, they will replace any criteria you have in the Criteria area.
- **Field area:** The Field area displays the names of the fields in the default file that you may select for use in criteria. The Field area displays no field names from subfiles. You cannot search through subfiles using the Search menu command.
- **Operator area:** The Operator area displays the list of operators that restrict the search to a range or to an exact value.
- **Conjunction area:** The Conjunction area holds three radio buttons corresponding to the conjunctions And, Or, and Except. The conjunctions let you join several phrases into a single search statement.
- **Value area:** The Value area is where you enter the value of each field by which you are restricting the search.
- **Buttons:** The buttons allow you to save a set of criteria, load one from a disk, cancel the editing session and return to the User output screen, or execute the search.

Criteria syntax

4th Dimension's Search criteria editor automatically provides the correct syntax for criteria by guiding you step by step. In the following example, a name enclosed with angle brackets (< >) denotes a single term; items in square brackets ([ ]) denote optional terms. The syntax of a set of Search criteria is

<fieldname><operator><value>[<conjunction><criteria set>]

where

- *fieldname* is a field you select from the list in the Field area. It must be a field in the file which 4th Dimension will search.
- *operator* is an operator you select from the list in the Operator area. It defines how 4th Dimension will apply the value for *fieldname* during the search.

- *value* is a term you enter into the Value area. Values may be any 4th Dimension field type except Picture or Subfile (that is, they may be type Alpha, Text, Real, Integer, Long Integer, or Date). You may enter a value by typing it, or by selecting from an enumerated list of Standard Choices if one is available for the field. If the application has a list of Standard Choices available for the field, 4th Dimension will display it automatically.
- *conjunction* is one of the three conjunctions And, Or, and Except. Conjunctions control how 4th Dimension joins phrases into a single statement.
- *criteria set* signifies a complete statement also formed according to 4th Dimension search criteria syntax. Thus, conjunctions optionally join sets of criteria to other sets of criteria—each of which can contain conjunctions that join them to further sets.

Conjunctions join pairs of criteria.

- **And:** The And conjunction requires 4th Dimension to locate those records which satisfy *both* criteria joined by the conjunction.
- **Or:** The Or conjunction requires 4th Dimension to locate those records which satisfy *either* of the criteria it joins.
- **Except:** The Except conjunction requires 4th Dimension to locate all records in the first criterion except for those that meet the second criterion.

4th Dimension pairs search criteria as it finds them. For example, if you create the formula

Name is greater than Jones

and Salary is less than 40000

or Review date is equal to March

4th Dimension will locate all people in the file whose names fall later in the alphabet than does Jones, and of those, will locate all whose salary is less than $40,000. It will also locate anybody in the file, *Jones or not,* whose Review Date is equal to March.

Creating Search criteria

When you choose Search from the Select menu, 4th Dimension displays the Search Criteria editor. There is a highlighted bar in the Criteria area and the Field area is flashing.

To create a set of Search criteria:

1. Click a field name. 4th Dimension displays the field name in the Criteria area and advances the highlight to the next position. The Operator box flashes.
2. Click an operator. 4th Dimension places it in the Criteria area, advances the highlight, and flashes the Value area.
3. Enter a value. The value need not be an entire string; you may use the at character (@) as a wildcard in substitution of any character or group of characters. Use @ to replace any character or characters in a sequential search; use @ only at the end of an indexed search.

There is no "wildcard character" for Integer, Long Integer, or Real field type values. Simply select an operator such as "is greater than or equal to." If the field name you clicked has a list of Standard Choices, 4th Dimension will display them, and you may select one as the value.

There is no selectivity between uppercase and lowercase characters.

- To add a conjunction and another phrase to the set of criteria, click a conjunction button or press Return or click the far left side of the next line. 4th Dimension flashes the Conjunction area.
- Click one of the conjunction buttons. 4th Dimension places the conjunction you select in the Criteria area and advances the highlighted area to the Field area. Continue creating another phrase.
- Click a term anywhere in the formula area to reenter or change it. You may delete any term you have already entered, or you may click Cancel to abandon this set of criteria. Select Clear from the Edit menu to delete a line.

4. Click one of the four buttons:
   - Save to save the set of criteria to a file on a disk
   - Load to erase the current set of criteria and load in one already saved to a disk
   - Cancel to return to the User output screen without having saved the criteria or executed the search.
   - OK to execute the Search.

The equivalent to the Search menu command in 4th Dimension's programming language is the Search command. You may display 4th Dimension's Search dialog box in your own applications if you use the Search command without parameters. See the Search command in *4th Dimension Command Reference*.

Important If you're working on even a moderately complex set of search criteria, it's a good idea to save before you execute. Once you execute a set of search criteria, they're gone.

Searching by criteria

You may search all the records of the default file based on the potential contents of any field or group of fields.

You may search using ranges of possible contents, in addition to making exact matches.

You may search on combinations of fields joined by the And, Or, and Except conjunctions.

A search will restrict the subset of records called the current selection. An unsuccessful search may restrict the current selection to 0 records.

Searches always search all records in the entire file.

A search makes no distinction between uppercase and lowercase letters.

Create a set of search criteria

1. Choose Search from the Select menu.

   4th Dimension displays the Search Criteria editor.

2. Use the criteria editor to create a set of search criteria.

   See the section "Searching by Criteria" earlier in this section.

3. Finish up by clicking OK to execute the search, or by clicking Cancel to abandon the editor and return to the User output screen.

Save the search criteria

1. Choose Search from the Select menu.

   4th Dimension displays its Search Criteria editor.

2. Create a set of search criteria using the Search Criteria editor.

3. Click Save.

   4th Dimension displays a standard Save dialog box that allows you to name the set of criteria and store it to disk.

4. Enter the name of the criteria in the Name of document area. Click Save to save the criteria to a disk.

   4th Dimension returns you to the Search Criteria editor.

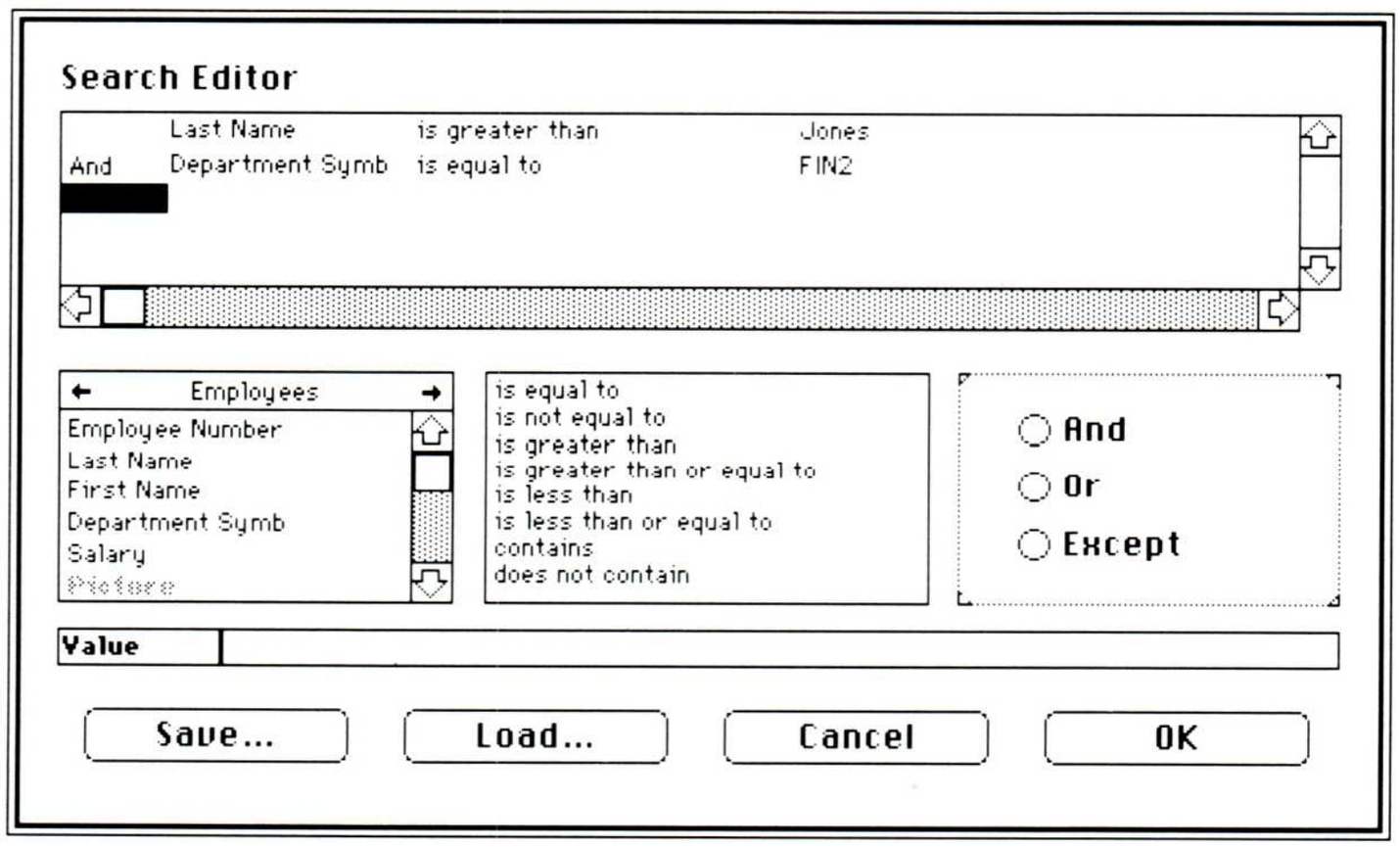


Figure 3-16
Search Criteria editor

Load the search criteria

1. Choose Search from the Select menu.

   4th Dimension displays its Search Criteria editor.

2. Click Load.

   4th Dimension displays a standard Load dialog box.

3. Select a set of search criteria and click Open.

   Or: Double-click the name of a set of criteria you want to use.

   4th Dimension loads the stored set of criteria into the editor.

   You may add, replace, or delete items from the Criteria area.

   You may save the edited formula to the same or a different filename.

4. Finish up by clicking OK to execute the search, or by clicking Cancel to abandon the Search Criteria editor.

Search and Modify

This command searches for records and presents them for modification. When you specify in the Design environment that 4th Dimension index a field, it maintains special index files on the disk as you add, modify, or delete records that contain the indexed field. Indexed fields allow 4th Dimension to conduct searches based on those fields much more quickly than it can conduct a sequential search. You may have up to 32,767 indexed fields in a single database.

For information on conducting an indexed search with 4th Dimension's programming language, see *4th Dimension Programmer's Reference*.

In the User environment, 4th Dimension displays its Search and Modify dialog box when you choose the Search and Modify command from the Select menu. As with the other Search commands, 4th Dimension *always* searches an entire file.

Figure 3-17 shows the Search and Modify dialog box.

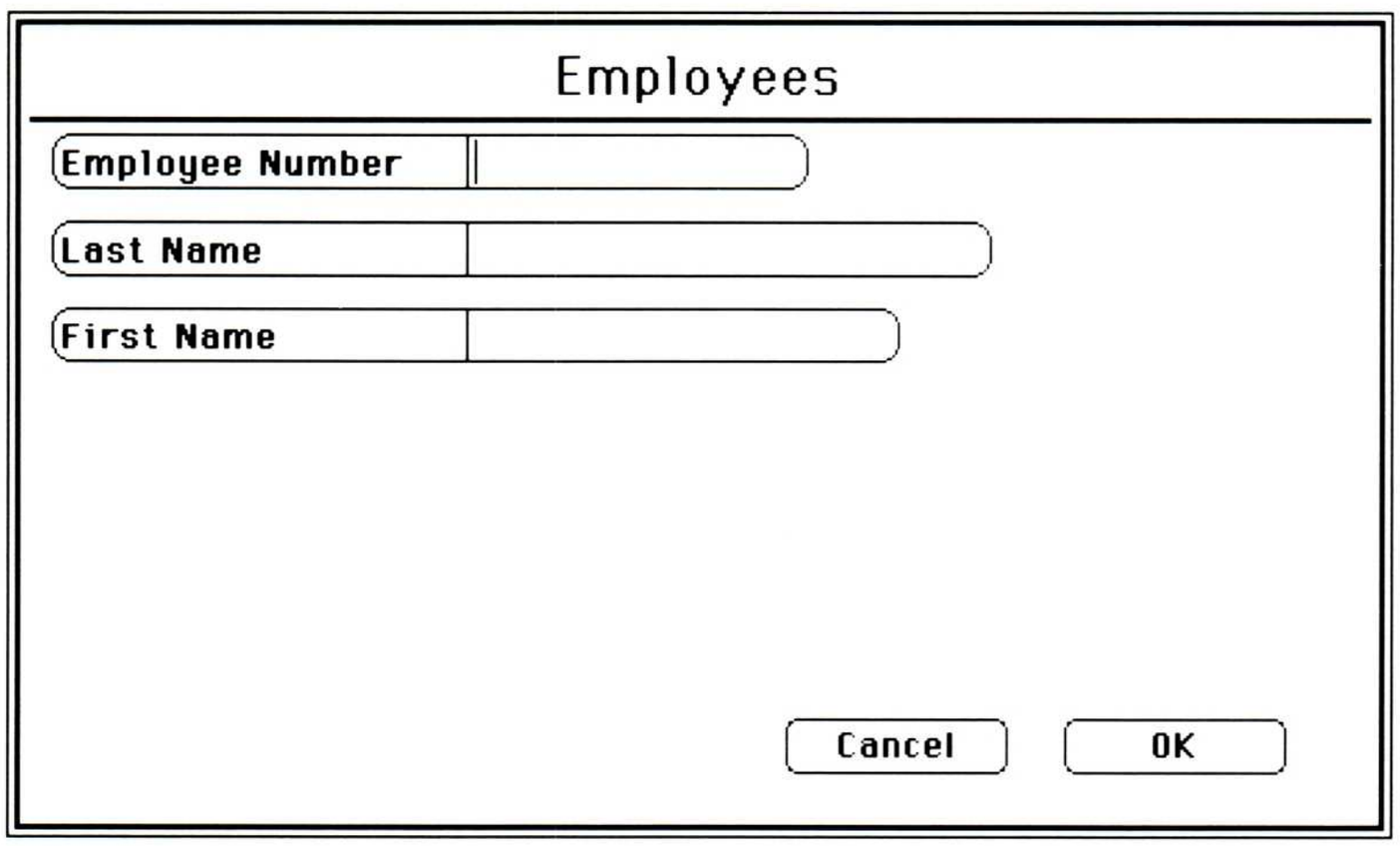


Figure 3-17
Search and Modify dialog box

Important You may index a field only in the Design environment. You may not index a Text field or a Picture field.

Some pointers about indexes

There are several advantages and limitations of the Search and Modify menu command that you should bear in mind:

- Search and Modify is unique among the three Search commands in that a successful search automatically opens the Entry window and allows you to begin modifying the records in the new current selection. Canceling the Entry window returns you to the Search and Modify dialog box.
- The Search and Modify dialog box includes a maximum of six areas in which you may enter the criteria against which you want 4th Dimension to search. You cannot enter more than six criteria at one time, even though 4th Dimension supports 32,767 indexes in a single database.
- The Search and Modify criteria implicitly use the And conjunction. When you enter more than one criterion, 4th Dimension will locate the records that meet *all* criteria.
- Because 4th Dimension implicitly uses the And conjunction between indexed fields in a Search and Modify, you need not create special compound indexes. 4th Dimension will search several indexes in a single search.

Searching and modifying

You may use Search and Modify only on a file with at least one indexed field.

If you attempt to do a Search and Modify without having any indexed fields in your default file, 4th Dimension gives you the message "There are no indexed fields in filename," where *filename* is the name of the default file.

When you Search and Modify, 4th Dimension always searches the entire database.

The records that Search and Modify locates become the new current selection.

Important: If there are any buttons of any type in the default input layout for the default file, 4th Dimension will not display a button panel in the Entry window.

1. Start the search

- Choose Search and Modify from the Select menu.

  4th Dimension displays a dialog box containing the names of the first six indexed fields in the default file (according to their order in the Structure window), and a criteria entry area for each.

2. Enter the search criteria

1. Click the right-side criteria entry portion of the field by which you want to search.

   You may search by more than one indexed field at a time, if the file has more than one. If you do, 4th Dimension implicitly joins your criteria with an And conjunction.

2. Enter a search criterion in the entry portion of the field.

   If you are searching an Alpha field, you may use 4th Dimension's wildcard character (@) to represent one or several characters.

   You may use a wildcard character only once at the end of each entry.`

3. Finish up by clicking OK to conduct the search, or by clicking Cancel to return to the User output screen.

3. Page through or modify records

If 4th Dimension successfully locates more than one record, it will activate the paging icon along with the other Entry window buttons. When you leave a record, you save it.

- Click the 1 (top page) icon to save the current selection and jump to the first record in the new current selection.
- Click the back-pointing arrow to save the current selection and jump to the next record in the current selection.
- Click the forward-pointing arrow to save the current selection and jump to the record before the current one being displayed.
- Click Delete to delete the record being displayed in the Entry window.
- Use 4th Dimension's data entry functions to change any record displayed on the screen.
- Finish up by clicking Enter to accept whatever changes you have made to an individual record, or by clicking Cancel to abandon the Entry window.

While you may page forward and backward between records, if you click Enter or Cancel for any record, 4th Dimension returns you to the Search and Modify dialog box.

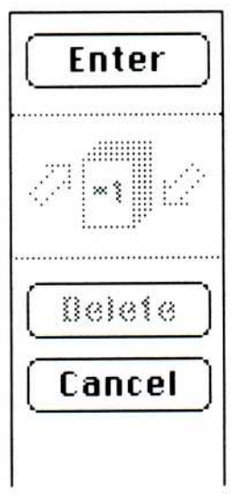


Figure 3-18
Standard button panel

Search by Formula

Search by Formula is a function that applies a calculation to each record and if it evaluates to true adds that record to the current selection.

4th Dimension's Search by Formula command lets you create a search formula using 4th Dimension User's Guide's programming language. A formula is a statement that uses most of the programming language's commands and functions, its syntax, and a Formula editor that is very similar to the Listing editor you use to create procedures. However, unlike procedures, formulas may be only one logical line long.

The Search by Formula menu command is for writing complex search procedures that may involve operations such as

- Parsing strings and making evaluations based on them
- Date arithmetic
- Multiple-field relations

or many other 4th Dimension procedure capabilities.

You may display the Search by Formula editor in your own procedures by using the Search Selection command without its parameters.

Figure 3-19 shows the Search by Formula dialog box and editor.

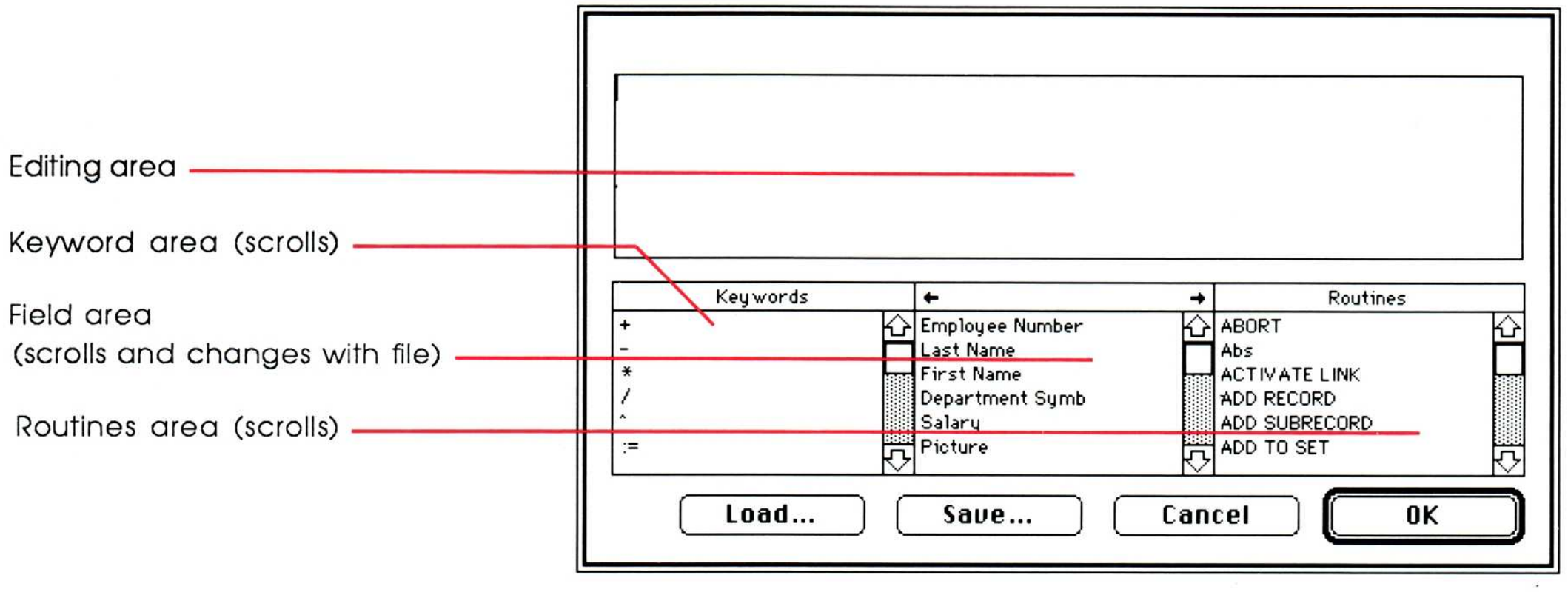


Figure 3-19
Search by Formula editor

Parts of the Search by Formula editor

The Search by Formula editor contains four areas and four buttons.

- **Editing area:** The Editing area contains the formula as you build it, or when you edit it. You may delete, type over, insert, and do general editing in the Editing area.
- **Keyword area:** The Keyword area contains a list of operators. See Table 3-1 for the definitions of these operators.
- **Field area:** The Field area displays the names of the fields in the default file and names from other files that you may select for use in the formula. The Field area displays names of subfiles along with the fields of the files to which they belong. When you select one, 4th Dimension opens a further area to allow you to select from among the subfile field names.
- **Routines area:** The Routines area contains a list of all the commands that a 4th Dimension procedure may execute. Some are inappropriate for a search formula; but the area includes them all for completeness. The Routines area will also display in uppercase and lowercase italics any 4th Dimension procedures you may have created; and displays in bold italics any external procedures. Procedures and external procedures appear at the end of the list of routines.

- **Buttons:** The Cancel button returns you to the User output screen, and the OK button executes the search. The Save and Load buttons save the formula to a disk and load it back again.

Table 3-1
Keyword operators in Search by Formula editor

Operator	Meaning
+	plus; addition
-	minus; subtraction, negative number
*	multiply
/	divide; both integer and real division
^	exponentiation
:=	assignment; assigns a value to a variable
(	open parenthesis; argument delimiter
)	close parenthesis; argument delimiter
=	equality; tests the equality of two expressions
#	inequality; tests the inequality of two expressions
>	greater than; compares two expressions
>=	greater than or equal to; compares two expressions
<	less than; compares two expressions
<=	less than or equal to; compares two expressions
§	indirection; signifies array operation (see note)
!	date delimiter; as in !06/06/87!
"	double-quotes; denotes a string expression
'	single quote; subfile or subfield separator
[	open square bracket; delimits filenames
]	close square bracket; delimits filenames

Note: The indirection braces ({}) don't appear in the Operator area, but you can still use them in a formula. See *4th Dimension Command Reference* for details.

Editing

Each 4th Dimension command that you may wish to use in your search procedure has its own syntax and its own number and kind of parameters. Unlike Search's criteria editor, the Search by Formula editor provides no predefined path.

The editor works by clicking and entering.

- Click a keyword operator, a field name, or the name of a routine. 4th Dimension will display it in the editing area.
- Enter any combination of letters and characters, including punctuation. You may enter keyword operators, field names, filenames, or the names of routines and procedures by typing rather than clicking, if you wish.

Important You cannot move the pointer to the next line in the editing area either by clicking that line or by pressing Return. Pressing Return is equivalent to clicking OK. 4th Dimension will assume you have finished editing your formula. Remember that a formula is one logical line in length. This rules out block structure. If your formula is too large for one line, it will wrap automatically—but you cannot force it to wrap.

Searching by formula

You have most of the capabilities of 4th Dimension's programming language at your disposal when you choose Search by Formula from the Select menu. With it, you may create a 4th Dimension formula (a procedure of one logical line), store it on a disk, and execute it when you wish.

You may save and load the search formulas you create with the Search by Formula editor only with the Search by Formula editor.

Because Search by Formula may use the full 4th Dimension programming language, see *4th Dimension Programmer's Reference* for syntax, commands, and capabilities.

Create a new formula

1. Choose Search by Formula from the Select menu.

   4th Dimension displays the Search Formula editor, an adaptation of its full procedure editor.

2. Use the Search Formula editor to write a search formula.

   Write the formula according to the syntax and parameter information in *4th Dimension Command Reference.*

3. Finish up by clicking one of the four buttons.

- Click Cancel to return to the User output screen without saving or executing any formula.
- Click OK to execute the formula.
- Click Save to save the formula.

  4th Dimension displays a Save dialog box. You may name the new formula and save it after which 4th Dimension will return you to the User output window. You may cancel the save by clicking Cancel.
- Click Load to load a new formula from disk. The new formula will replace the formula, if any, already in the editor.

Edit an existing formula

1. Choose Search by Formula.
   4th Dimension displays the search by Formula editor.
2. Click Load.

   4th Dimension displays a list of search formulas and folders.
3. Select a formula and click Open.

   Or: Double-click the name of a formula.

   4th Dimension loads an existing formula and displays it in the Search by Formula editor.
4. Edit the formula, change it, delete parts, or add to it.
5. Finish up by saving the formula, executing it, canceling and returning to the User output screen, or loading a new formula.

Execute a formula

1. Choose Search by Formula.
   4th Dimension displays the Search by Formula editor.
2. Click Load.

   4th Dimension displays an Open dialog box that lists search formula names.
3. Select the name of a search formula and click Open.

   Or: Double-click the name of an existing Search formula.
4. Click OK.

   4th Dimension executes the Search formula and returns you to the User output screen.

Searching subrecords

A **top level parent** record is simply a record in the ultimate parent file from which the subfile that you are searching descends. There may be up to five levels of subfiles beneath a top level file.

You can do the same kinds of operation on the records of a subfile that you can do on the records of its **top level parent** file. You can add, modify, delete, search, sort, and print all or some of the subrecords belonging to a record in a file.

To search for specific subrecords in the user environment, you must use the Search by Formula command in the Select menu. When you search subrecords, you create a current selection consisting of top level parent records that contain at least one subrecord each that meets your search criteria. Figure 3-20 illustrates this conceptually.

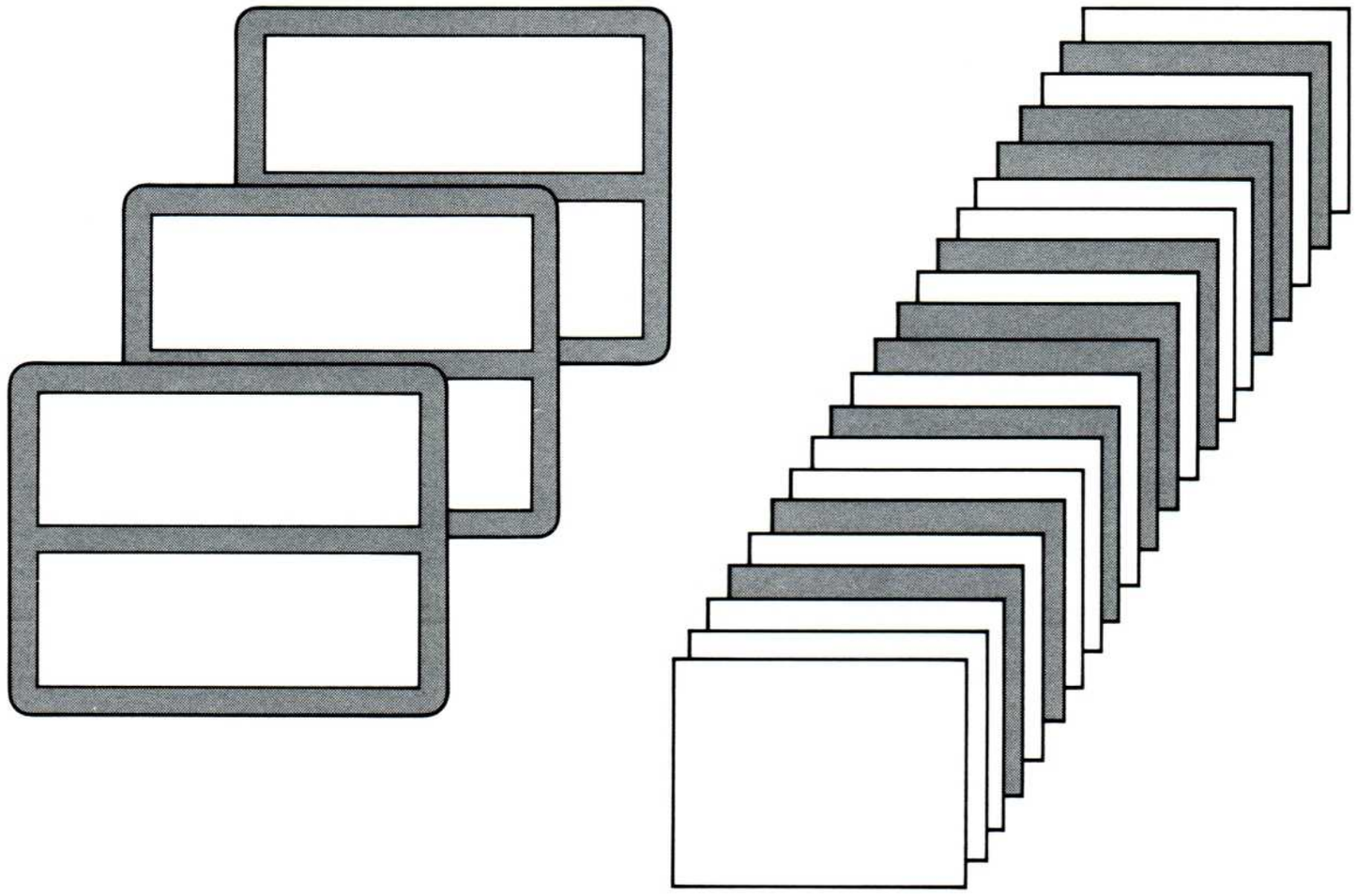


Figure 3-20
Searching subrecords

To create a current selection of records, each of which holds at least one subrecord that matches the criteria, use as a formula in the Search by Formula editor, like this:

([*filename*] *subfilename' subfieldname=value*)

Where

- *filename* is the name of the top level parent file through which you are searching.
- *subfilename* is the name of the subfile to the file of records through which you are searching. You may need more than one subfilename, depending on the depth of the subfile you plan to search.
- *subfieldname* is the name of a field within the subfile. The subfile belongs to the file though which you are searching.
- *value* is the value you are matching against the values in the file.

Applying a formula to the records in a file

You may use a formula to modify the records in a file. The Apply Formula command works on the current selection of records only; but because it is a formula, you may include complex algorithms or call other 4th Dimension procedures to determine whether a particular record is one you want to modify.

See "Apply to Selection" in *4th Dimension Command Reference*.

Apply Formula in the User environment works similarly to the command **Apply to Selection** in the 4th Dimension programming language.

When you choose Apply Formula from the Enter menu, 4th Dimension presents its Formula editor. As with Search by Formula, the Apply Formula editor is an adaptation of the Listing procedure editor available in the Design environment.

The Apply Formula command is for Applying to the current selection complex formulas that may involve

- Parsing strings and making evaluations based on them
- Date arithmetic
- Modifying records based on the contents of their fields

or many other 4th Dimension procedure capabilities.

For more on how to use the Apply Formula editor see "Searching by Formula" earlier in this chapter.

The Apply Formula menu command gives you an "intelligent" way for 4th Dimension to modify records for you. It comes in especially handy if you must globally alter data in a file, or when you must alter classes of data.

For more on how to use the Apply Formula editor see "Searching by Formula" earlier in this chapter.

For example, you may

- Increase all the prices in a price list by 10 percent
- Set a mature or past due flag on all accounts past a certain date
- Combine (concatenate) the values for First Name and Last Name into a new field called Full Name

Apply Formula will operate on *all* records in the current selection.

Important As with the Search by Formula editor, 4th Dimension displays in the editor the names of all its routines and any available procedures for your use. However, many commands are inappropriate to use when modifying existing records. To use 4th Dimension's commands correctly (and without endangering your data), you must be familiar with 4th Dimension's programming language and when to use its various commands and functions.

Applying a formula

You may create a formula that will modify the records of the current selection for you. You may create several of these formulas and use them when you wish.

The first column in this how-to section ("Select Records") is mandatory when using Apply formula; the others are optional.

See "Search by Formula" earlier in this chapter for an explanation of how to use the Apply Formula editor. The two editors are identical.

Select the records

- Make sure that the current selection is the subset of records you do want to modify.

  Select first, and carefully, when you apply a modification formula to a current selection. There is no command that "undoes" the modification.

- Select by searching, or by directly selecting a working subset of records as your current selection.

Create a new formula

1. Choose Apply Formula from the Enter menu.

   4th Dimension displays the Apply Formula editor.

2. Create a formula to modify the existing records in the current selection.

   4th Dimension will modify *all* the records in the current selection, and will *not* modify any records outside the current selection.

3. Finish up by clicking one of the four buttons.

   - Click OK to execute the formula.
   - Click Cancel to abandon the formula and return to the User output screen.

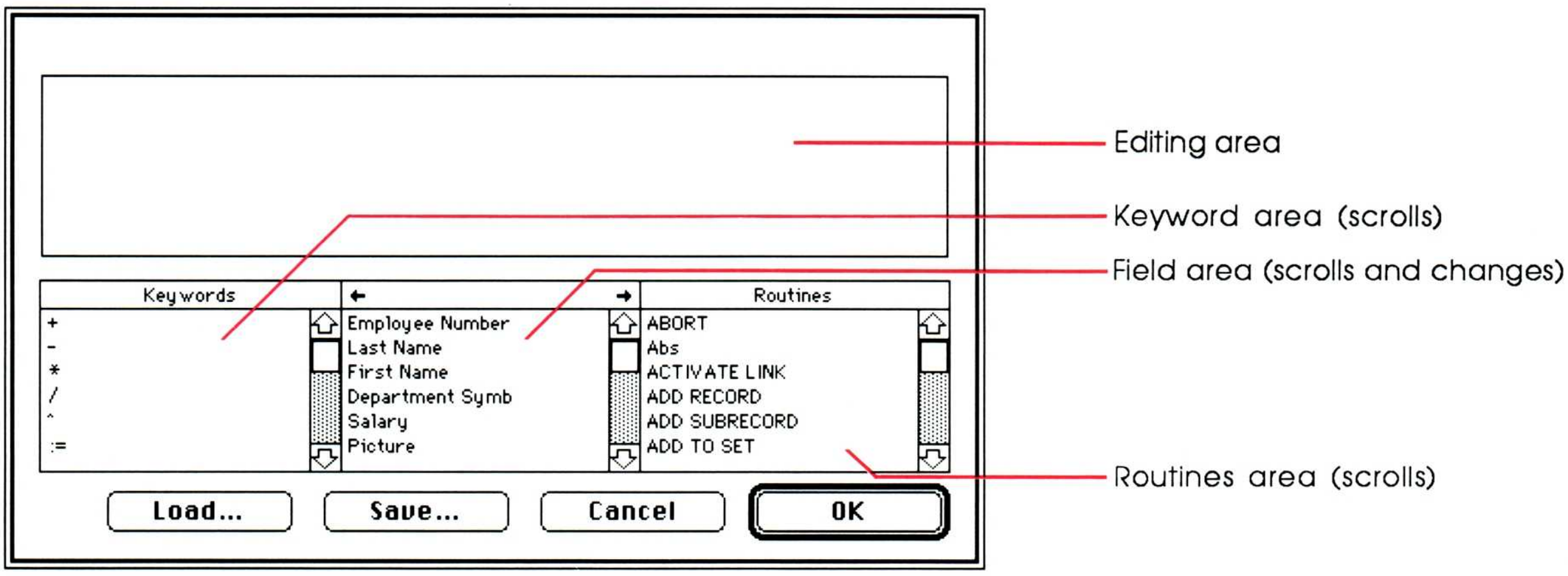


Figure 3-21
Apply Formula editor

Edit an existing formula

- Click Save to save the formula to a disk. 4th Dimension displays a Save dialog box and allows you to name the formula.
- Click Load to load a formula from a disk. 4th Dimension displays an Open dialog box.

  If you load a formula from a disk, it replaces any formula in the editor.

1. Choose Apply Formula from the Enter menu.

   4th Dimension displays the Apply Formula editor.

2. Click Load.

   4th Dimension displays an Open dialog box.

3. Select an existing formula name, and click Open.

   Or: Double-click a formula name.

   4th Dimension loads the formula and displays it in the editing area.

4. Edit the formula as you wish.

5. Finish up by clicking one of the four buttons.

- Click OK to execute the formula.
- Click Cancel to abandon the formula and return to the User output screen.
- Click Save to save the formula to a disk. 4th Dimension displays a Save dialog box and allows you to rename the formula or save it under the same name.
- Click Load to load a formula from a disk. 4th Dimension displays an Open dialog box.

  If you load a formula from disk, it replaces any formula in the editor.

Execute an existing formula

1. Choose Apply Formula from the Enter menu.

   4th Dimension displays the Formula editor.

2. Click Load.

   4th Dimension displays an Open dialog box.

3. Select an existing formula name, and click Open.

   Or: Double-click a formula name.

   4th Dimension loads the formula and displays it in the editing area.

4. Finish up by clicking one of the four buttons.

- Click OK to execute the formula.
- Click Cancel to abandon the formula and return to the User output screen.
- Click Save to save the formula to a disk. 4th Dimension displays a Save dialog box and allows you to rename the formula or save under to the same name.
- Click Load to load a formula from disk. 4th Dimension displays an Open dialog box.

  If you load a formula from a disk, it replaces any formula in the editor.

Deleting records

You may delete an entire file of records, delete single records, or delete groups of records. You prepare the database somewhat differently (for convenience) in each case, depending on how many records you wish to delete.

There are three different ways to delete selected records.

4th Dimension will only delete records from the current selection, and of those, only records you have *formally selected*.

You must prepare to delete records by formally selecting them.

See also *4th Dimension Programmer's Reference* for a discussion of how 4th Dimension handles deleted records in files on a disk.

Prepare to delete: many records

1. Make sure that the current selection contains only those records you wish to delete.

- You may change the current selection with a search or by selecting records directly.

2. Choose Select All from the Edit menu.

4th Dimension highlights all the records in the current selection. You have formally selected all records for deletion.

Prepare to delete: a few records

1. Narrow the current selection so that you may consider which records you wish to delete.

- Narrow the current selection with a search or by directly selecting certain records.

2. Formally select records for deletion by clicking an individual record, or by Shift-clicking a group of records or by Command-clicking separate records.

Delete method 1

1. Formally select records.
2. Choose Clear from the Edit menu.

Delete method 2

1. Formally select records.
2. Choose Show Subset from the Select menu.
3. Choose Select All from the Edit menu.
4. Choose Clear from the Edit menu.

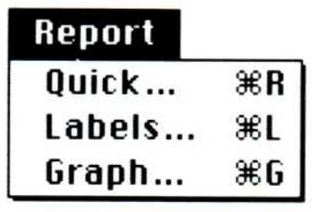
Delete method 3

1. Formally select a record.
2. Choose Modify Record from the Enter menu.

   4th Dimension displays the entry screen for the default file.

   - Click the different parts of the paging icon to move about the list of records.

5. Click Delete to delete the individual record on screen.



Producing User reports

In addition to printing a file in the form of any one of its layouts, you may produce three different types of reports in the User environment. These are

- **Quick:** Quick reports are simple tabular reports with limited formatting and calculation capabilities.
- **Labels:** The Labels command prints mailing labels using one of a file's available layouts.
- **Graph:** The Graph report prints up to five data series to the screen or printer in one of eight graph formats.

Important All 4th Dimension User reports base their data on the current selection of records. Always make sure that the current selection is the subset of records about which you want to produce your report.

User reports are the simplest ways to extract organized information from a 4th Dimension database—one step up from printing each record of your current selection. To obtain custom reports from 4th Dimension, you should plan on creating procedures with the built-in programming language.

Quick reports

Quick reports create tabular listings up to 511 columns (not characters) wide, each column derived from a field in the default file. You may display the columns created by the fields in any order—you're not limited to the organization of a layout or the structure of the file—but you may show any column only once in a report.

4th Dimension creates Quick reports only from the current selection. If you have sorted the current selection, a Quick report will adopt that sort.

Quick report itself sorts a current selection if you specify break fields in the report (even if you have not sorted the current selection previously). When the Quick report sorts a current selection, it sorts by break level and *always* in ascending order. When you return from the Quick report feature to the User output screen, the sorted order remains.

Quick report must sort when you have break levels set because break levels assume sorted categories. You may set up to seven such break levels per report. 4th Dimension breaks on every sorted field except the final one. 4th Dimension groups together field values for which the break is set, and will calculate a subtotal at breaks for any numeric fields and display a grand total at the end of the report. You may also call for a new page when a field breaks so that a new category can begin on a fresh page.

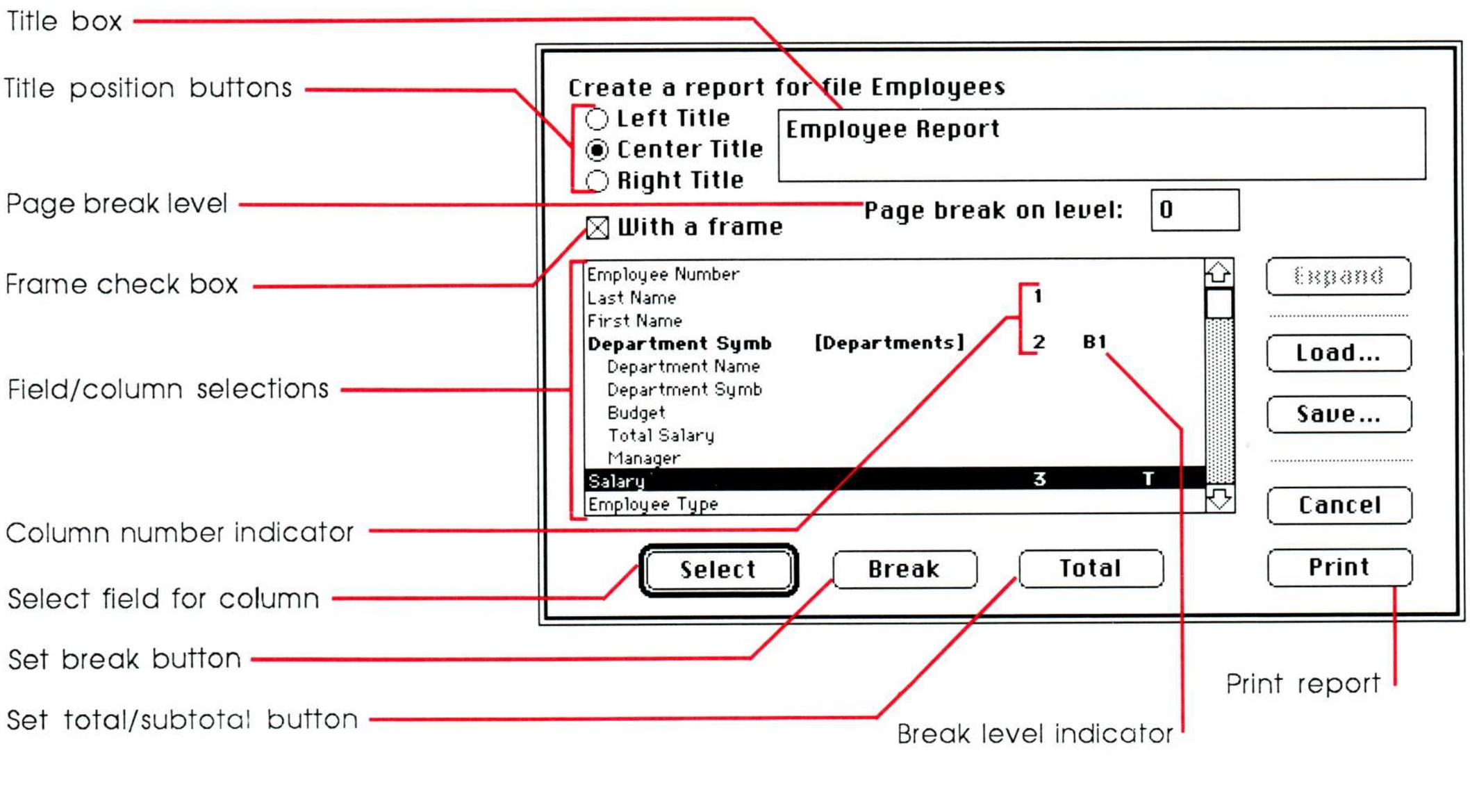


Figure 3-22
Quick report dialog box

You may set three different titles for a Quick report: Left- , Center- , and Right-justified. All three titles can coexist. 4th Dimension's default is to center a title. You may also time- and date-stamp the report title by using the number sign (#) followed by a character. Table 3-2 shows which symbols to use and what they effect.

Table 3-2
Quick report title stamps

Stamp	Effect
#P	Places a sequential page number in the title
#T	Places the time of printing in the title
#D	Places the date of printing in the title

Printing labels

4th Dimension produces mailing labels from your default output layout. You may have to change the default output layout in order to print labels in the format you want. For mailing labels, 4th Dimension

- Prints labels only for those records in the current selection.
- Prints labels for the default output layout in the width set by the Label width triangle. You may set the Label width triangle only in the Design environment.
- Alters the page orientation, and reduces or enlarges the labels based on your settings in Page Setup under the File menu.
- Can print labels to the screen or to the printer.

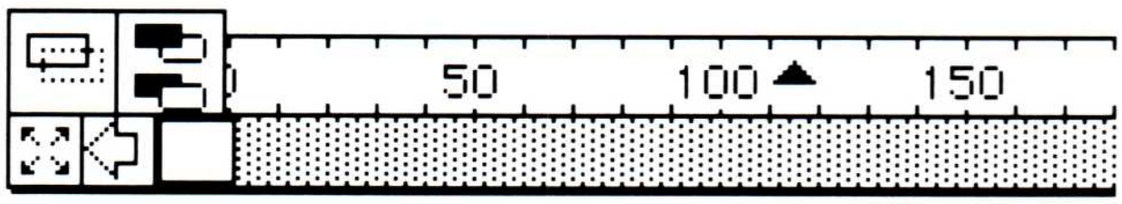


Figure 3-23
Label width triangle in Layout window

4th Dimension prints as many labels as it can fit across the width of a page. It determines how many labels it can fit from the information you have given it in Page Setup under the File menu, and from the label width triangle setting for the layout you wish to use.

If you have not set the label width triangle for a particular layout, or if you have set it too narrowly, 4th Dimension will "overlap" the labels horizontally.

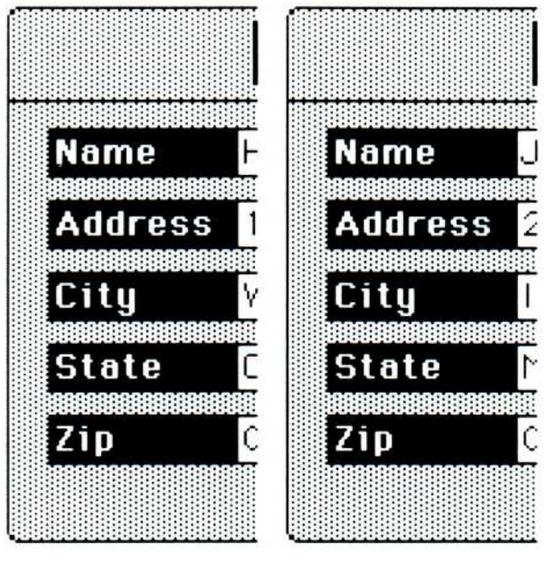


Figure 3-24
Overlapped labels

To overcome the overlapping, switch to the Design environment and move the label width triangle for that layout farther to the right. This increases the horizontal distance that 4th Dimension allows for each label and may change the number of labels 4th Dimension can print across the width of the page.

Important 4th Dimension does not create its own mailing labels. As the developer you must create a layout to use as a mailing label, and as user must ensure that you have selected that layout as the default output layout *before* you choose Labels from the Report menu. Otherwise, 4th Dimension will try to print labels using whatever layout happens to be the default output layout, often with strange results.

Graph reports

4th Dimension's Graph report provides output for up to five data series at a time in one of eight business graphic formats:

- **Column:** 4th Dimension displays the series you select as one to five side-by-side columns.
- **Proportional Column:** 4th Dimension stacks the data that corresponds to each X-axis item or period, and scales all bars equally so that you may compare the series that make them up as percentages of the total, rather than as values.
- **Stacked Column:** 4th Dimension stacks the data that correspond to each X-axis item or period on the basis of their value, negative or positive.
- **Line:** 4th Dimension connects the data points of each series with a line.
- **Area:** 4th Dimension shades the area below the line created by connecting the data points of each series.
- **Scatter:** 4th Dimension places the data points from each series where they fall in an X-Y quadrant.
- **Pie:** 4th Dimension creates a circular pie chart with each data point represented by a proportionately sized slice.
- **Picture:** 4th Dimension produces an X-Y chart similar to a bar chart, where it represents the data points of each series by a proportionately sized picture taken from the scrapbook or other picture source.

Figure 3-25 shows the Graph report dialog box and editor.

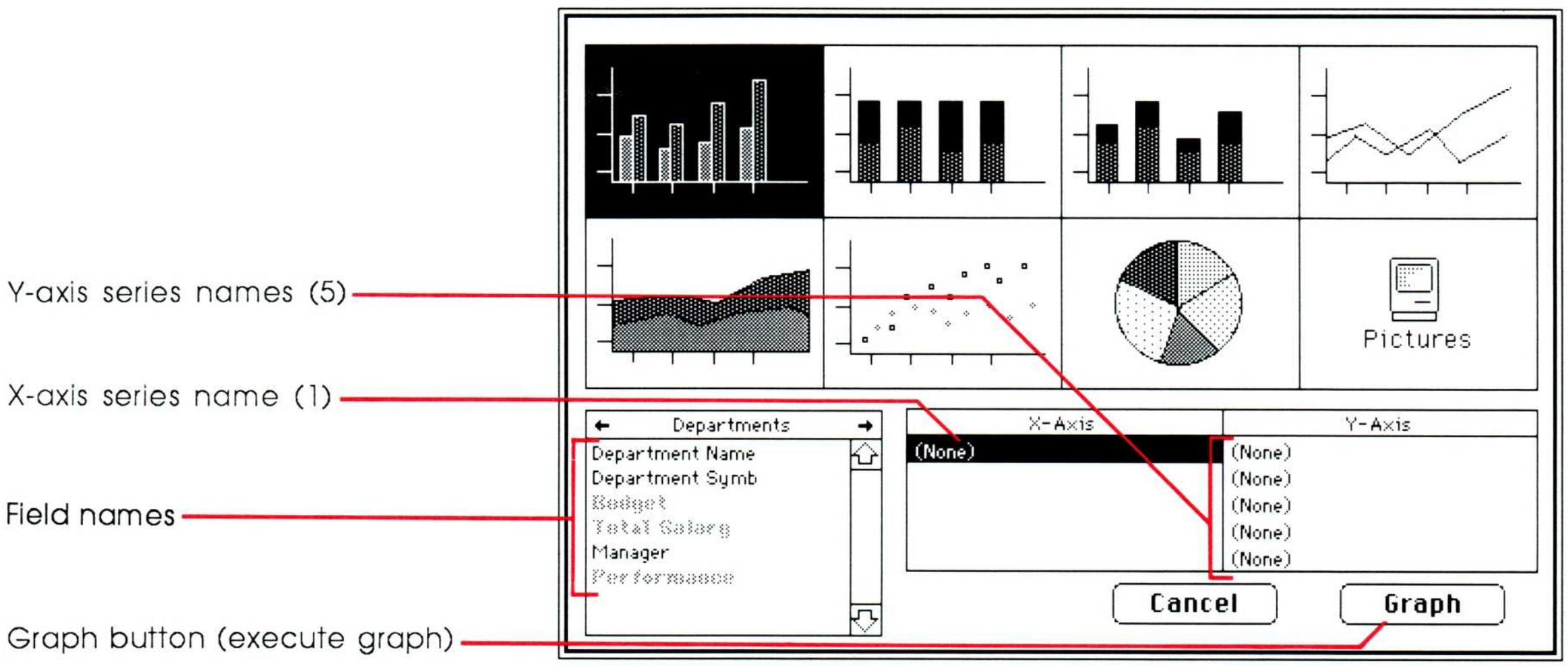


Figure 3-25
Graph report dialog box and editor

4th Dimension graphs only data taken from records in the current selection. It will graph a maximum of 100 data points.

The X axis of a Graph report is always an alphanumeric field. 4th Dimension uses it for labels. The Y axis of a report always shows the scale of numeric fields (Integer, Long Integer, or Real). 4th Dimension will not accept an alphanumeric field on the Y axis nor a numeric field on the X axis. Additionally, 4th Dimension makes inactive (grays out) any fields you cannot graph in the default file, such as Picture fields or fields of type Subfile.

To print a Graph report, first create it, then print it when 4th Dimension displays the graph on the screen.

Important If your application requires smoothing, lead/lag analysis, graphing from a beta and a Y intercept, any statistical derivations (R-bar squared, and so on) accumulating several records into a single data point, or math work in general, plan on creating a procedure to derive the information for you. Then select the modified records and graph them, or have the procedure draw its own graph to your specifications.

Creating Quick reports

The Quick report menu command produces tabular reports.

Quick reports include only those records in the current selection of the default file.

You may delete a Quick report definition only from the Finder. The report appears as a file bearing the name you give it.

1. Set the current selection

- Make certain that the current selection includes only those records for which you want a report. You may narrow the current selection with a search or by directly selecting the records.

See the sections on searching, selecting, and the current selection, earlier in this chapter.

2. Create a report definition

- Choose Quick from the Report menu.

  4th Dimension displays its Create a report dialog box and editor. The field area displays the names of the fields from the default file, and can display the names of the fields from linked files.

If a field in the default file is a linking field, 4th Dimension shows the name of the linked file in square brackets and boldface, next to the name of the linking field.

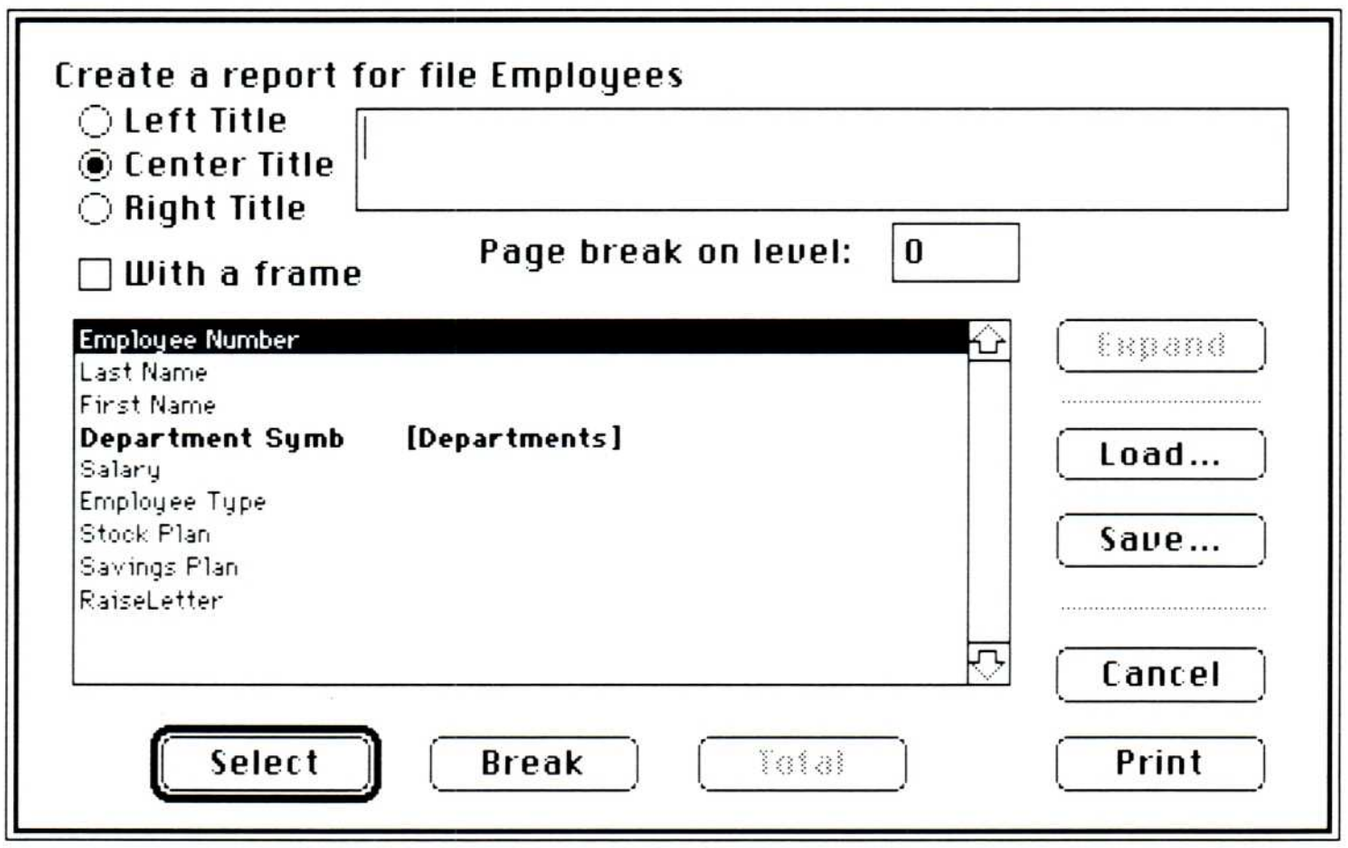


Figure 3-26
Quick report editor and dialog box

3. Expand any linked field names

- Expand any linked field name to see the names of the fields in the linked file.

  To expand, click a linked field name to select it and then click Expand.

  Or: Double-click the linked field name to expand it.

- Collapse an expanded linked field name by double-clicking again, or by clicking Collapse.

4. Select the fields

1. Decide on the column order in which you want to display the contents of each field.
2. Click the name of the field for the first column in the report. 4th Dimension highlights the name.
3. Click Select. Silver Sufer places a numeral next to the name, signifying the column order.

   Or: Double-click the name of the field.

   If you double-click a linked field name, you will expand or collapse it. Select linked field names with the Select button only.
4. Continue to select fields in the order in which you want them to appear in the report columns.

- To deselect a field, double-click it or click the Select button again. 4th Dimension renumbers the remaining fields in order.

Set the break and total

1. To set the break level, click to select the name of the field on which you want the break to occur.
2. Click the Break button.

   4th Dimension places a B and a sequential number next to the column number in the field name area.

- To indicate a numeric field for which you want to create totals and subtotals at the end of the report, click a field name and click the Total button. 4th Dimension places a T in the fieldname area.

  If you have set Break for any field, 4th Dimension also subtotals numeric fields that were set for total when any breaking field changes. If you have more than one break field, and more than one total field, 4th Dimension subtotals all total fields at all breaks.

- To call for a new page of printout when the value of a field changes, enter the break number for that field in the Page break on level box.

Set the title and frame

- Enter a title for the report into the Title box.

  You may enter one line of text for each title.

- Click Left Title, Center Title, or Right Title. The default is Center Title.

  You may enter one title of each kind, for a total of three titles in any one report.

- You may enter title stamps to number pages and to time- and date-stamp your reports. Enter #P to produce a page number, #T to time-stamp, and #D to date-stamp the title.

- Click the With a frame check box if you want 4th Dimension to surround your report and any break categories with a hairline border.

Save a report definition

1. Create a report definition or modify one that you have already saved to a disk and reloaded.
2. Click Save.

   Silver Sufer displays the Save dialog box.
3. Name the report definition by entering it into the Name box.
4. Click Save in the Save dialog box. 4th Dimension saves the report definition to a disk.

   If a report definition with the same name already exists on a disk, 4th Dimension asks whether you wish to replace the existing one with the new one.

   Important: If you are creating a report definition of any complexity, you should save it to a disk before you execute it. Once you execute a Quick report definition, the definition is gone.

Load a report definition

1. Click Load. 4th Dimension displays the Open dialog box containing names of existing report definitions.
2. Click the name of a report definition to select it, and click Open.

   Or: Double-click the name of a report definition to both select it and open it.

The report definition you load replaces any definition that may already be in the dialog box.

Printing

1. Click Print.

   The Quick report will execute either to the printer or to the screen.

2. Fill in the Printer Setup and Page Setup dialog boxes.

   If you wish to print to the screen, click the Preview to Screen check box.

You may click Cancel at either of these dialog boxes to return to the User output screen.

When printing either to a printer or to the screen, 4th Dimension displays a page overview to show that printing is in progress.

If you elect to print to the screen, 4th Dimension will also display a page overview showing the first page of the report.

Overview and zoom

- Drag the frame to indicate any area in the onscreen page of the report.
- Click Zoom for a closeup of the area indicated by the frame. Click anywhere on the closeup to return to the overview.
- Click Next Page to move to the following page of a multipage report.

  On a single-page report, Next Page returns you to the User output screen.
- Click Stop Printing to return to the User output screen. You may also click this button to halt printing in the middle of a report.

  Important: If you have not saved the report definition before previewing on the screen, you will have to recreate the report definition if you wish to print it again.

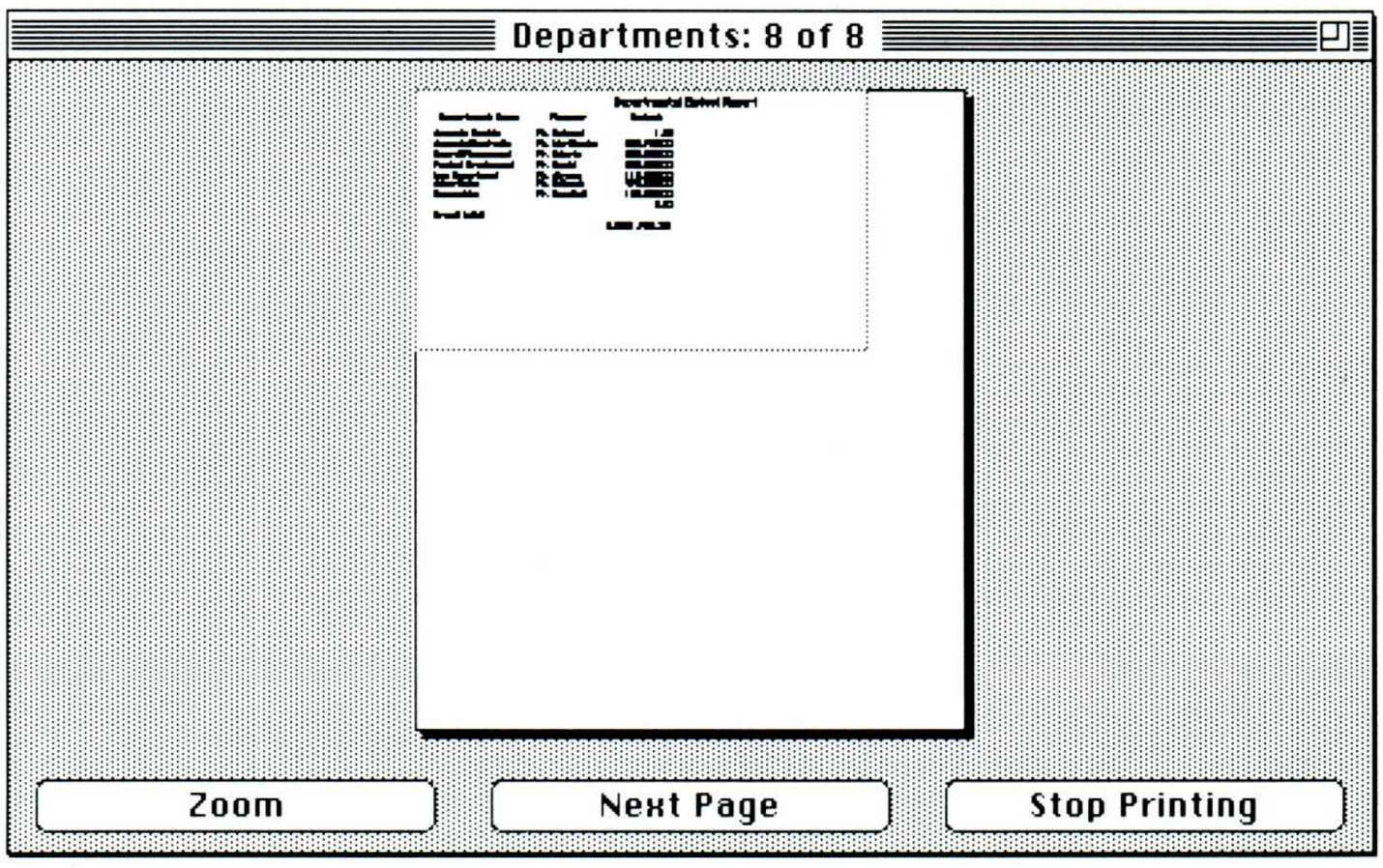


Figure 3-27
Page overview

Printing labels

To produce mailing labels with 4th Dimension, you must have created a mailing label layout for the file you wish to print from.

When you print labels, that layout must be the default output layout.

4th Dimension prints labels for the current selection only.

1. Set the current selection

- Make certain that the current selection is the set of records you want to use for mailing labels.
- Change the current selection with a search, or by directly selecting records.

2. Set the default output layout

1. Choose the Choose File/Layout command from the File menu.
2. Select a default output layout from the list. The default output layout you select should be your mailing label layout.

4th Dimension changes the default output layout and displays the current selection.

See "Changing the Default Layout" earlier in this chapter.

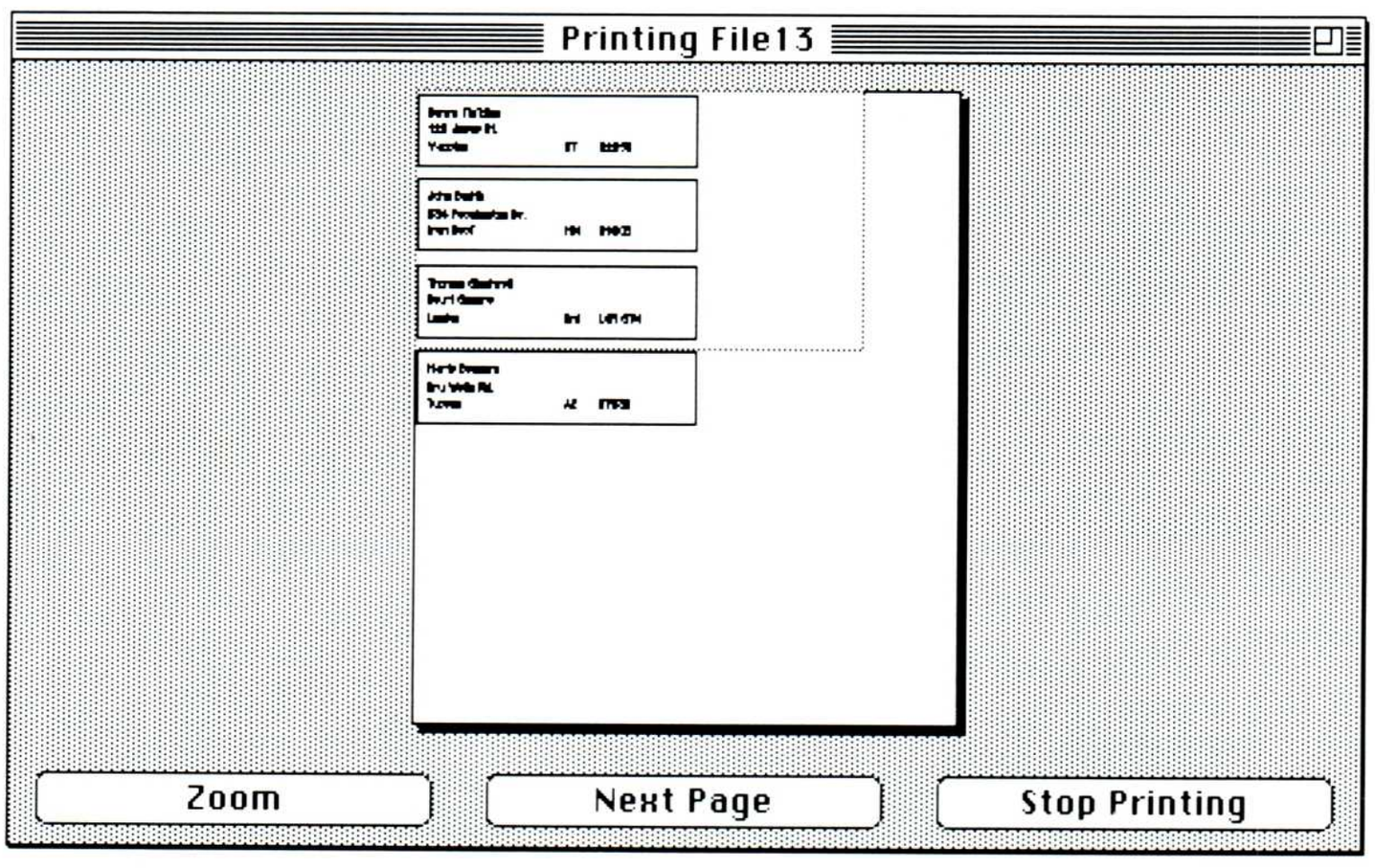


Figure 3-28
Printing labels

3. Print labels

1. Choose Labels from the Report menu.

   4th Dimension displays in succession the Printer Setup and Page Setup dialog boxes.

2. Click the Preview to screen check box if you wish to view the labels on the screen.

   You may click Cancel at either of these printer dialog boxes to return to the User output screen.

   If you click OK, 4th Dimension displays a Printing in progress screen, whether you are printing to the screen or to a printer.

   If you print to the screen, 4th Dimension displays a page overview showing how the first page labels will print.

Overview and zoom

- Drag the frame to indicate any area in the onscreen page of the label printout.
- Click Zoom for a closeup of the area indicated by the frame. Click anywhere on the closeup to return to the overview.
- Click Next Page to move to the following page of a multipage printout of labels.

  On a single-page printout, Next Page returns you to the User output screen.
- Click Stop Printing to return to the User output screen. You may also click this button to halt printing in the middle of a printout.

Creating a graph

4th Dimension creates eight different types of graph, all but the pie chart able to display up to five different data series for the same period (over the same X-axis labels).

4th Dimension can create a column, Proportional column, stacked column, line graph, shaded area chart, scatter graph, pie chart, and picture chart.

4th Dimension graphs only the records in the current selection

1. Set the current selection

- Make certain that the current selection is the set of records you want to use for graphing.
- Change the current selection with a search, or by directly selecting records.

2. Set the X and Y axes

1. Choose Graph from the Report menu. 4th Dimension displays the Graph editor. The series name for the X axis is empty.
2. Click the field name of a single field of type Alpha. 4th Dimension uses the contents of this field as labels along the X axis. The name of the field appears in the X-axis listing.

   Any field names you *cannot* use will be gray and inactive. You *must* select an X-axis field name before proceeding to the Y-axis names.

   You may change the name of any series by clicking the series name in the X-axis or Y-axis column to select it, then selecting another active fieldname.
3. Click a numeric field to use as a Y-axis series. The name appears in the Y-axis listing.

- You may click up to five field names to use as Y-axis data series.

  You must select only numeric fields for the Y axis.

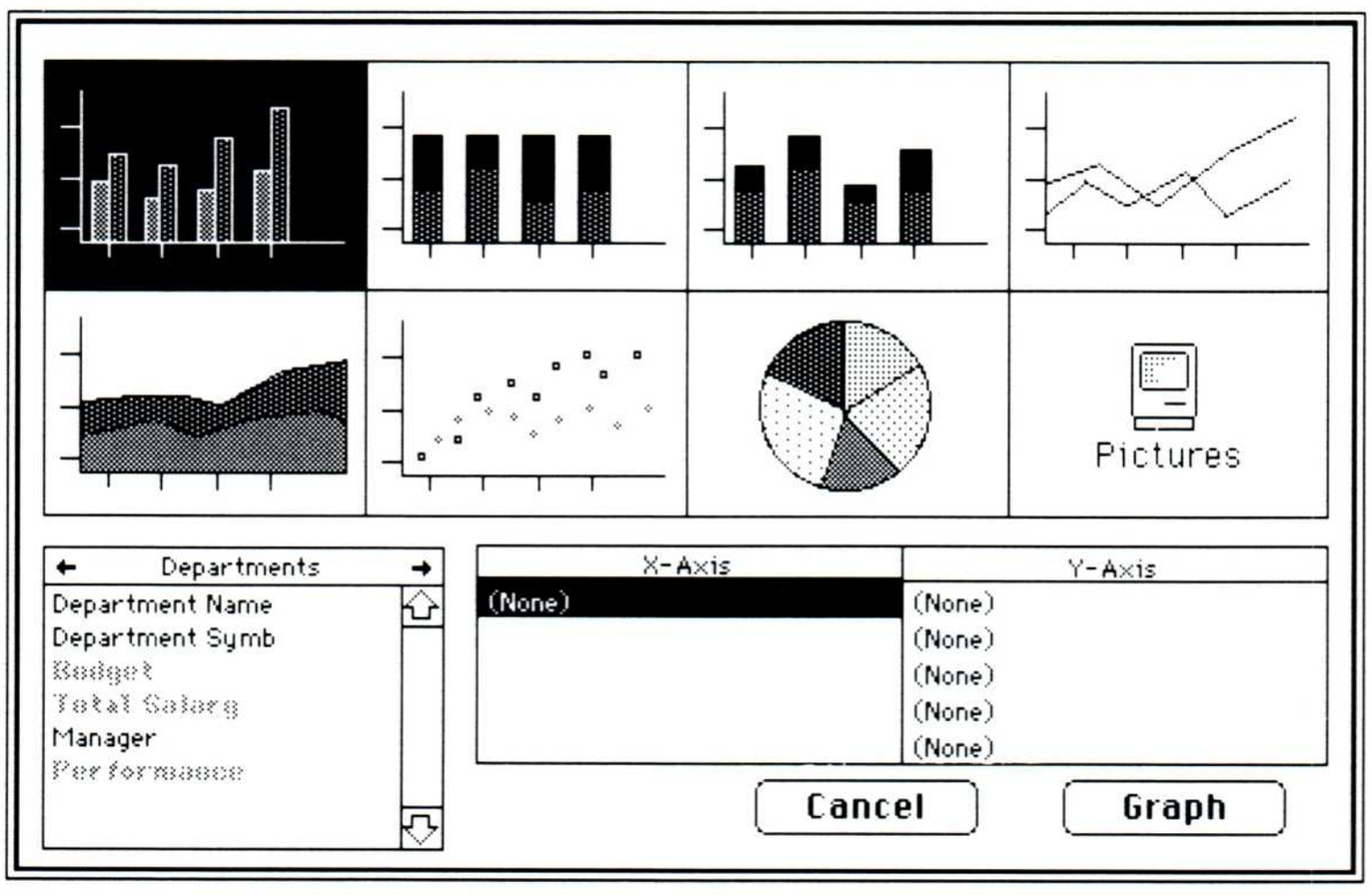


Figure 3-29
Graph dialog box

3. Select the graph type

- Click one of the eight graph types.

  Seven of the graph types can display up to five data series. The pie chart can display one data series at a time.

  If you select the Pictures graph type, 4th Dimension uses a default picture or the picture you used most recently.

  You may change the picture after 4th Dimension has drawn the graph.

  See the next how-to section, "Changing and Printing Graphs."

4. Finish up the graph description

- Click Graph to draw the graph on the screen.

  To print the graph, you must first display it on screen.

- Click Cancel to return to the User output screen without having drawn a graph.

  If you click Graph without having selected an X and a Y axis, 4th Dimension returns you to the User output screen.

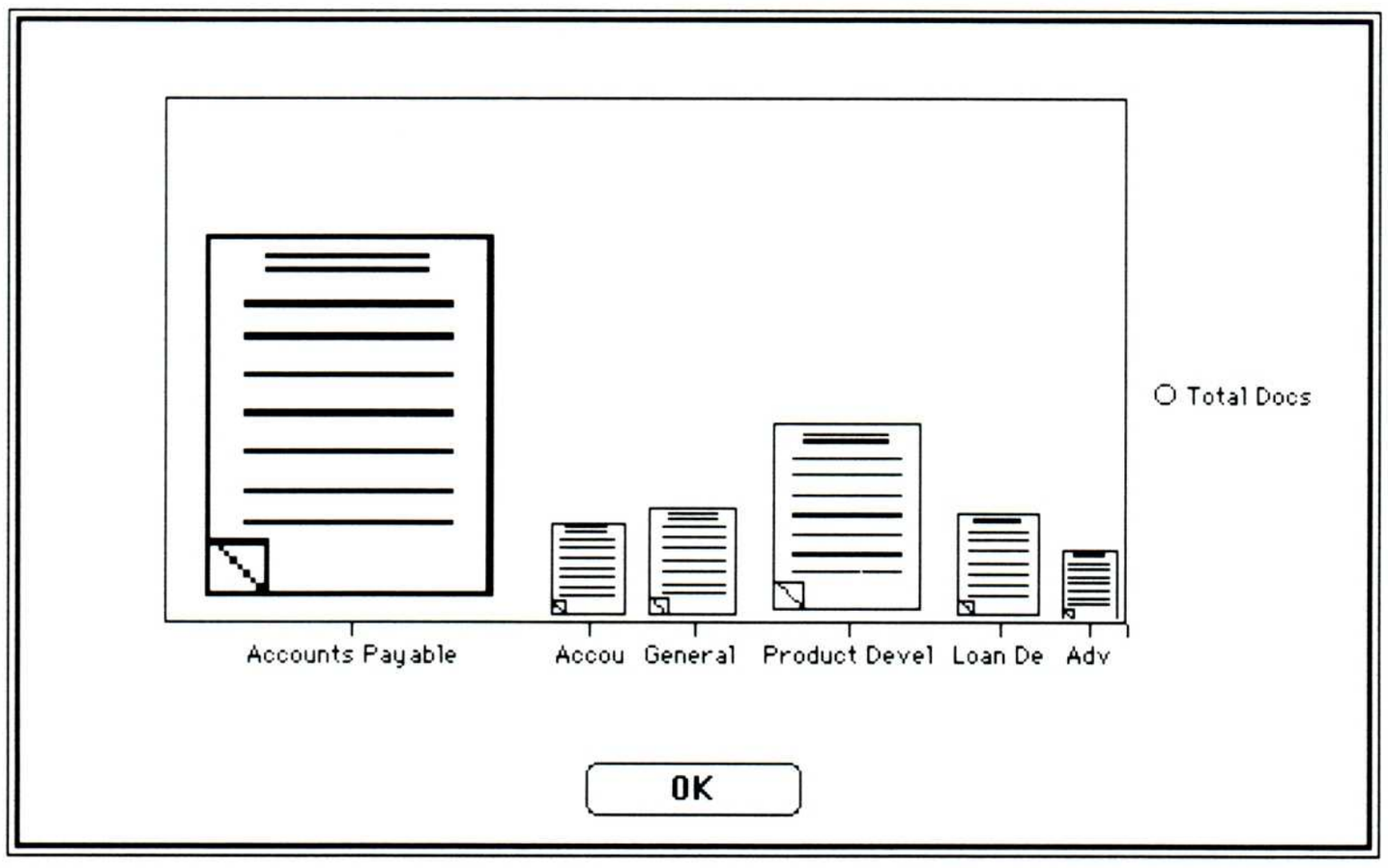


Figure 3-30
Pictures graph

Changing and printing graphs

After 4th Dimension has drawn a graph report, you may change graph type, print the graph, or change 4th Dimension's default graph picture to a picture from your Scrapbook.

When 4th Dimension displays a graph report, the menu bar changes to include the menus Pictures and Graph Type.

The Pictures menu controls the data series to which you may paste a picture.

The Graph Type menu controls in which of the eight graph types 4th Dimension displays its data.

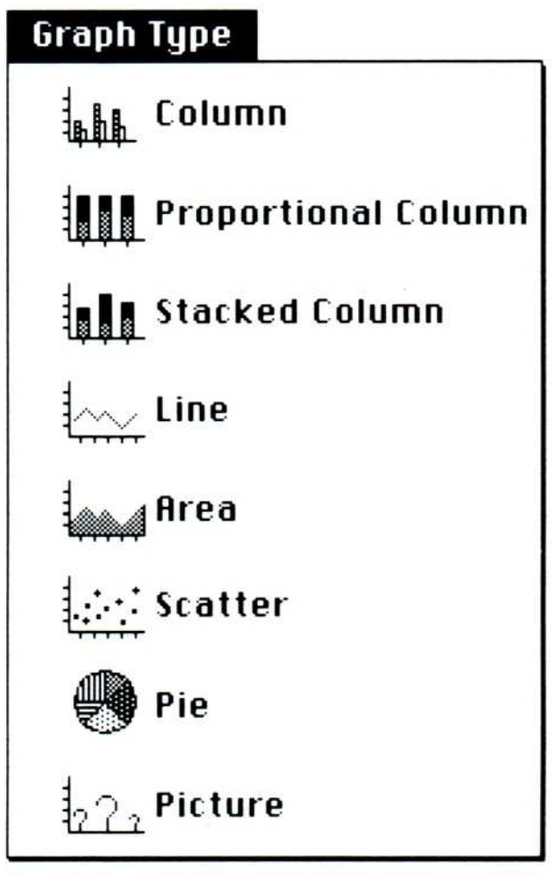


Figure 3-31
Graph Type menu

Print a graph

1. Choose Page Setup from the File menu.

   4th Dimension presents the Page Setup dialog box. Fill it out to suit your needs.

2. Click the OK button on the Page Setup dialog box.

   Or: Click Cancel to return to the graph.

3. Choose Print from the File menu. Fill in the printer dialog box and click OK. Clicking Cancel returns you to the graph.

   You may check the Preview on Screen check box, but it will have no effect. You're already viewing the graph.

4. As 4th Dimension prints, it displays its Printing in progress screen. You may stop the printing by clicking the Stop Printing button.

   When 4th Dimension has finished printing, it returns you to the graph you printed.

Change the graph type

1. Create a graph and display it.
2. Choose any of the eight graph types from the Graph Type menu.

   4th Dimension redraws the same data series you have selected in the form of the new graph type.

If you change to a pie chart after creating a graph with several series, 4th Dimension displays the first series in the pie chart. If you then display another multiple series graph, 4th Dimension again displays the original multiple series.

If you choose Pictures as the new graph type, 4th Dimension uses its default picture set. You may add custom pictures from your Scrapbook to a Pictures graph.

Add custom pictures

1. Create and display a Pictures graph.
2. From the Apple menu, choose and copy a picture from the Scrapbook. You may wish to create your own picture by using MacPaint or a similar product.
3. From the Pictures menu, choose the Y-axis data series to which you want to paste the picture.

   4th Dimension redraws the Pictures graph using the Scrapbook picture you select.

Finish up

- Click OK to return to the User output screen.

  Or: Print the graph.

Importing and exporting data

Importing and exporting refers to a program's ability to exchange data with another program. For example, you may wish to export a text file of names and addresses to use with a word processing program for doing mass mailings.

It is often necessary for one program to exchange data with another. Ideally, you should know the storage file format of both the source and destination programs, and convert directly between the two.

Such formats are rarely available, however; and you're never quite sure *which* programs you may have to convert between in the future. To solve this problem, programmers have agreed on three "standard" data file transfer formats. 4th Dimension supports all three. They are

- **SYLK:** The name SYLK stands for **SY**mbolic **L**in**K** Format. SYLK is a row-and-column oriented format that includes field display formatting information such as decimal point and justification. Because SYLK applies to a wide range of programs—from spreadsheets to graphics to databases—not all programs that support SYLK support every capability it offers.
- **DIF:** DIF stands for **D**ata **I**nterchange **F**ormat. DIF is also a row-and-column-oriented format, but does not support data formatting or formulas as does SYLK.
- **Text:** Text-formatted files contain 8-bit ASCII characters numbered 0 through 255.

By convention, many programs can read and write these three formats and exchange data through them. 4th Dimension can read and write all three. This allows 4th Dimension to be able to communicate with other programs through its own import and export capabilities.

Important 4th Dimension can communicate with more than other Apple-based programs. By using the communications commands in 4th Dimension's programming language, you can create an application that connects to and can exchange data with other computer—including mainframes and other personal computers. See *4th Dimension Command Reference* for information on how to program telecommunicating applications.

See the section "ASCII Maps," later in this chapter. See also the appendixes in *4th Dimension Command Reference* for a table of ASCII codes.

None of the interchange formats is a cure-all. For example, you cannot use any of them to transfer a layout.

However, you may save a layout as a picture, and transfer it via the Scrapbook to other programs capable of displaying pictures (whether that other program could make use of a layout is another question).

A complete discussion of each of the three file formats is beyond the scope of this manual.

Export, import, and layouts

When you export data or import data, you do it through the default layout and only for the records of the default file. The fields of the layout that 4th Dimension displays when you export are the only fields it will export—in essense, the layout becomes the file. The same is true when importing data. The layout must match the data you're bringing into the program.

You must make sure that the default layout is the proper one for the export and import operations you want to accomplish.

Important When exporting data, you must use an output layout. When importing, you must use an input layout. 4th Dimension ignores subfiles in layouts.

You cannot use the Import Data or Export Data commands in the User environment with layouts that have included layouts or subfiles. To import or export subfile data, you must write a global procedure using the 4th Dimension commands **Send Packet** (for exporting) or **Receive Packet** (for importing).

For more about the commands Send Packet and Receive Packet see *4th Dimension Command Reference*.

4th Dimension imports and exports data field by field, starting in the upper-left corner of the layout, moving across from left to right, and down the layout. 4th Dimension uses a strict system of pixel-by-pixel precedence to determine which is the "next field." A field that appears on the left side of a layout—*but is even one pixel below a field on the right*—counts as being on the "next line down."

Important When creating layouts to use in importing and exporting data, you must make sure that the fields on the layout appear in precisely the order in which you want to trade data with another program.

Exporting

Delimiter characters specify the ends of fields and records without actually being part of a field or a record.

The ASCII text file format requires a special character to signify the end of each field and the end of each record. These characters are called **delimiters.** 4th Dimension defaults to ASCII 09 (the tab character) to end fields, and to ASCII 13 (the return character) to end records. When you export a 4th Dimension database, your fields and records will usually have these characters between them.

Not all destination programs may expect to find these characters embedded in your file. For example, some programs have fixed field lengths for the fields in each record, and use no field delimiters at all. A destination program may use some other characters for its delimiters.

When exporting with 4th Dimension, you may change either or both of the End-of-field and End-of-record characters to better match the destination program.

Important You can have a return character within a Text field. If you're exporting Text fields, you may wish to use a different end of record delimiter to avoid interrupted records.

Importing

Because it is usual to find characters that represent the end-of-field and end-of-record delimiters embedded in an ASCII text file, 4th Dimension looks for them when you're importing the ASCII text file created by another program.

However, not all programs use 4th Dimension's default values of ASCII 09 (the tab character) and ASCII 13 (the carriage return character) for End-of-field and End-of-record, respectively. While these are the most common characters for the purpose, some source programs may use no special characters—for example, fixed field length files—and some may use different characters.

4th Dimension allows you to set the ASCII value for either or both the end-of-field and end-of-record characters. It will look for them when importing a file from another program.

Important When you import data through a layout—and you must—the layout procedure for that layout is active, just as though you were entering data from the keyboard. Importing is an activity that starts the execution cycle.

You may wish to create a special import layout that has no layout procedure associated with it. That way, the layout procedure won't be trying to validate the incoming data, and the import operation may go more quickly and smoothly. You may conversely wish to create a layout procedure for validation of the incoming data.

SYLK and DIF

The SYLK and DIF formats use different methods than the end-of-field, end-of-record characters to determine where each record and field lie in a file. A discussion of the SYLK and DIF formats is beyond the scope of this manual.

Importing and exporting fixed field length data

A fixed field length file is one where the length of each field in number of characters is constant for every record, and each record length is also constant. Where the contents of the field fail to fill the length allowed, space characters (ASCII 20) or null characters (ASCII 00) pad out the field. Lengths of each field within the record may be different from each other.

To import a fixed field length file, you must know the individual field and record lengths. Import the record into a layout with one large variable. The layout procedure should then parse the text into its component fields and strip any extraneous space or null character from it. Then the layout procedure should assign the parsed fields to their 4th Dimension fields.

In exporting, create a layout procedure that assembles one variable from the component fields of the 4th Dimension record, padding with spaces or nulls as appropriate.

Exporting data

4th Dimension will only export the data in the current selection, and will do it through the default layout—the layout displayed by the User output screen.

1. Set the selection and layout

1. Set the current selection so that the working set of records are the records you wish to export.
2. Choose the Choose File/Layout command from the File menu and set the default layout to an output layout that contains the fields of the file you wish to export.

   You must use an output layout for exporting data.

2. Choose Export Data

- From the File menu, choose Export Data.

  4th Dimension displays the Export dialog box.

Figure 3-32
Export dialog box

3. Name the file and set the format

- Enter the name for the exported file in the Save as area.
- Click SYLK, DIF, or Text, depending on the format in which you want to export the data.

Set the delimiter characters

- If you need to reset the end-of-field and end-of-record delimiters, double-click on each one and enter the new ASCII decimal equivalent of the required character.

  If you enter ASCII characters, 4th Dimension treats them as nulls.

4. Finish up

- Click Save to save the current selection as a data file of the type you have selected.

  Or: Click Cancel to abandon the export.

  In either case, 4th Dimension returns you to the User output screen.

Importing data

You must set the default layout to the input layout you have prepared to accept the fields from the imported file.

1. Set the default layout

1. Set the default layout to the input layout you have prepared to accept the fields of the file you are importing.
2. Choose the Choose File/Layout command from the File menu and set the default layout to an input layout that contains the fields of the file you wish to import.

You must use an input layout for importing data.

2. Choose Import Data

- From the File menu, choose Import Data. 4th Dimension displays its Import dialog box.

Figure 3-35
Import dialog box

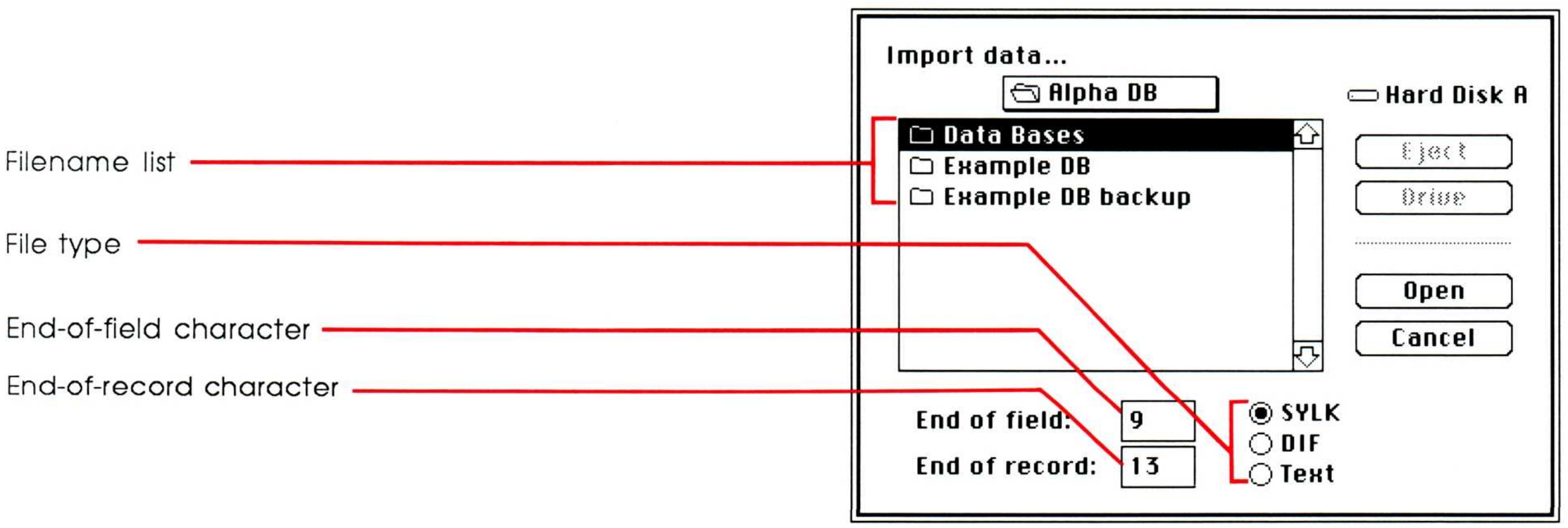


Figure 3-33
Import dialog box

Set the format

- Click SYLK, DIF, or Text, depending on the nature of the file you are importing.

Set the delimiter characters

- If you must reset the end-of-field and end-of-file delimiters, double-click each one and enter the new ASCII decimal equivalent of the required character.

3. Select the file to import

- Click the name of the file you wish to import. Click Open to begin importing it.

  Or: Double-click the filename to begin importing it.

- Click Cancel to return to the User output screen without importing a file.

ASCII maps

A 4th Dimension ASCII map is a table that translates from one ASCII code to another during the storage or communications input and output of the program. You may edit an ASCII map in the User environment, and save it to a disk, or load an existing one from a disk.

When you load an ASCII map into 4th Dimension, or change the one that's in memory, all characters entering or leaving the program are translated by the map.

4th Dimension's default ASCII map does no translation.

Important You should save 4th Dimension's default ASCII map so that you have a map with no changes available to you. Loading a "normal" ASCII map is a quick way of eliminating all changes you may have made to the map in memory.

An ASCII map applies to import and export operations, and to such programming commands as **Send Packet** and **Receive Packet.**

ASCII maps do not affect input from the keyboard.

Editing an ASCII map

When you edit a 4th Dimension ASCII map, you're changing an internal table that translates an incoming character to a corresponding character, and translates those internal characters into outgoing characters when exporting.

- To edit, load, or save an ASCII map, choose Edit ASCII Map from the Special menu.

  4th Dimension displays the Edit an ASCII map dialog box.

Change an ASCII character code

1. Click an ASCII code in the scrolling window to select it.

   The number in the ASCII Code area changes to reflect the selected code.

2. Enter the new ASCII code for the character in the ASCII Code area. 4th Dimension immediately changes one of the sets of ASCII codes and characters in the list.

   4th Dimension immediately interprets that ASCII code as its corresponding standard character for input and output.

Save an ASCII map

- Click Save to save to a disk the ASCII map in memory.

  4th Dimension displays its Save dialog box. Enter the name under which you want to save the ASCII map, and click Save in the Save dialog box to store the ASCII map on a disk.

  Or: Click Cancel to return to the Edit an ASCII map dialog box.

- Click Cancel on the Edit an ASCII map dialog box to return to the User output screen.

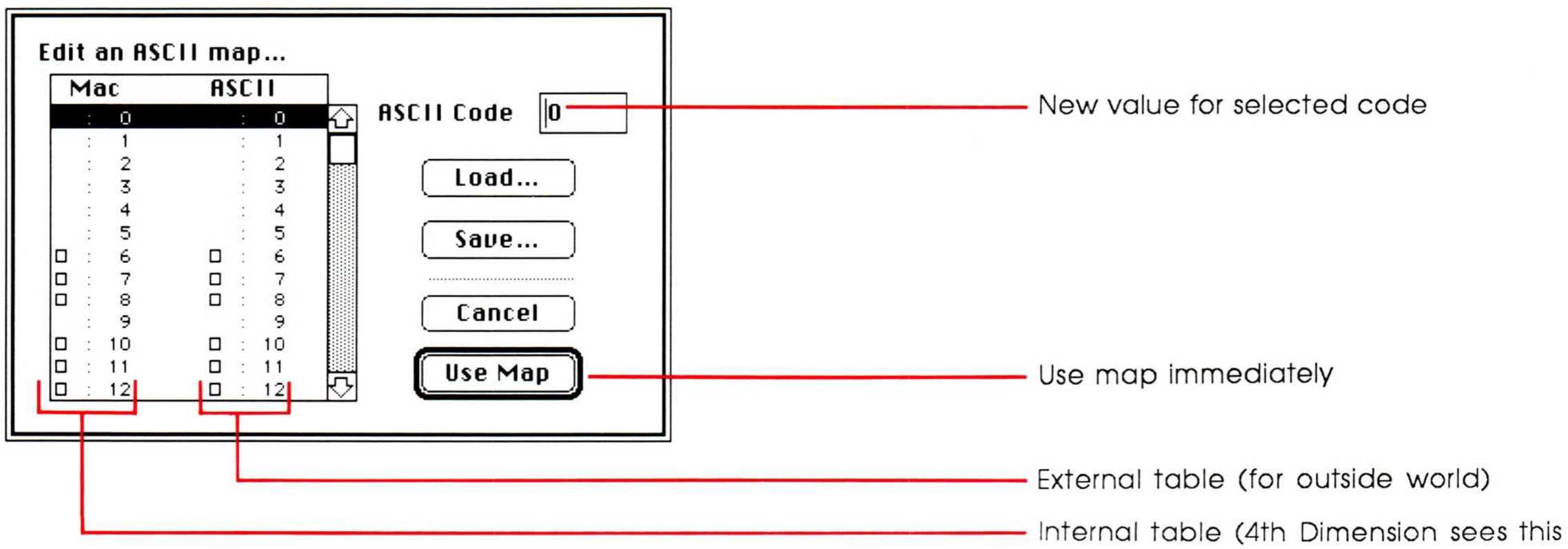


Figure 3-34
Edit an ASCII map dialog box

Load an ASCII map

- Click Use Map to immediately apply the map you have edited.

  4th Dimension returns you to the User output screen. 4th Dimension retains any changes you have made to the ASCII map while the program is running; but it reverts to its default ASCII map when you start it again.

1. Choose Edit ASCII Map from the Special menu.

   4th Dimension displays its Edit an ASCII map dialog box.

2. Click Load. 4th Dimension displays its Open dialog box.

3. Select the name of an existing ASCII map and click Open.

   Or: Double-click the name of an existing ASCII map to open it.

   4th Dimension returns you to the Edit an ASCII map dialog box, showing the loaded ASCII map. You may edit it further if you wish and save it to the same or a different filename.

4. Click Use Map to apply the ASCII map immediately. 4th Dimension retains the ASCII map in memory as long as the program is active.

- Click Cancel to return to the User output screen and revert to 4th Dimension's default (or previously loaded) ASCII map.

Executing a procedure

You may execute any global procedure you have created with 4th Dimension's programming language.

The Execute Procedure menu command will not be available (it will be gray) unless you have written a global procedure.

See Chapter 4, "Procedures."

Execute

1. Choose Execute Procedure from the Special menu.

   4th Dimension displays its Execute procedure dialog box.

2. Click the name of a global procedure from the scrolling list, and click Execute to execute it.

   Or: Double-click the name to both select it and execute it.

   4th Dimension executes the procedure and returns you to the User output screen.

   Warning: Global procedures can change the default file. You may find that 4th Dimension is displaying a different file on the User output screen.

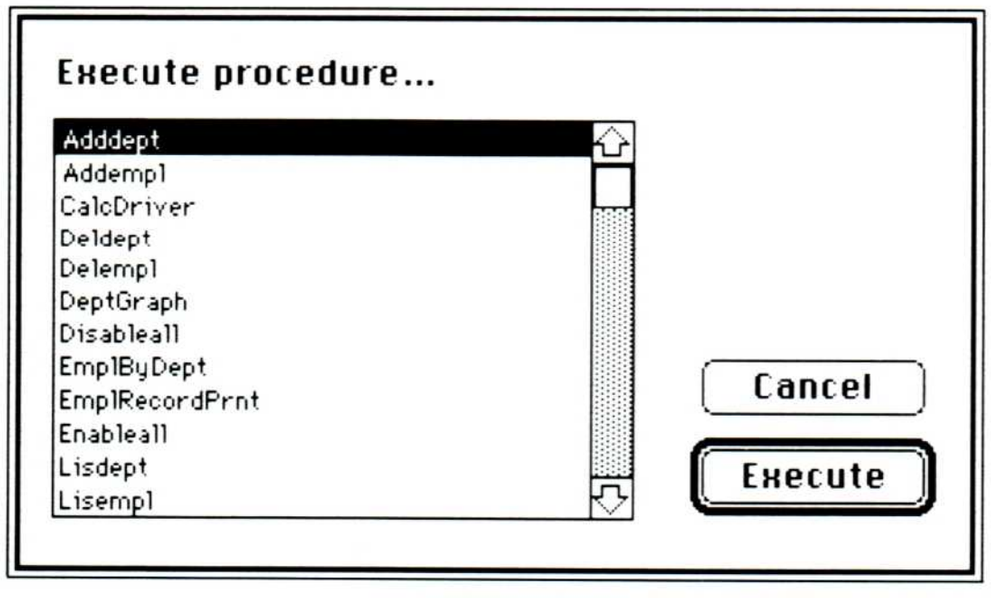


Figure 3-35
Execute procedure dialog box

Chapter 4

Procedures

This chapter defines what procedures are and generally explains how they operate, what they do, and what they can control within 4th Dimension. The chapter also describes how to use the two procedure editors and the debugger. It does not tell you how to program with 4th Dimension.

Important Before programming with 4th Dimension, you should be familiar with standard programming concepts such as variables, looping, and branching. You should understand the commands available to you in 4th Dimension's programming language (described in *4th Dimension Programmer's Reference* and *4th Dimension Command Reference*). You should also have a general understanding of 4th Dimension's database structure and layouts, and how the programming commands work with structure and layouts in the computer's memory.

Create procedures in the Design environment. You can reach the dialog box that opens the procedure editors by choosing Procedure from the Design menu.

4th Dimension's procedures

A **procedure** is a set of programmed instructions written by the database designer. Procedures allow you to control many aspects of your application, and to customize it to meet your exact needs. By using procedures in conjunction with custom menus and the 4th Dimension runtime system, you can create a complete turnkey application package that is almost indistinguishable from applications developed with a traditional programming language such as Pascal.

4th Dimension has three types of procedures: layout, file, and global.

Layout procedures

A **layout procedure** is a set of instructions associated with a particular layout. 4th Dimension executes these instructions whenever you use that layout for data entry or reporting. The instructions of a layout procedure apply only to that specific layout. A layout and its procedure may belong only to one file.

Use layout procedures for data validation, range checking, saving records, analyzing user input from dialog boxes, doing calculations, getting information from and updating linked files, and handling the values of variables.

4th Dimension's execution cycle controls layout procedures.

File procedures

Like a layout procedure, a **file procedure** is associated with one particular file. The program uses a file procedure during data entry only; it executes when 4th Dimension displays an input layout from that file on the screen. A file procedure, however, applies to *every* layout pertaining to a file. You may have only one file procedure per file or subfile.

Important File procedures are not called when 4th Dimension performs output actions such as displaying records in the User output screen (equivalent to the **Display Selection** command).

Before 4th Dimension executes the first statement of the layout procedure, it first executes the entire file procedure associated with that layout's file. File procedures *always* execute first, and they *always* execute for every input layout in the file.

Use a file procedure for any processing you want to do for *every* input layout and want to do *before* the layout procedure executes.

You need not prepare a file procedure for every file. If a file does not have an associated file procedure, there is no effect and you need not "work around" in any way.

The execution cycle controls file procedures.

Global procedures

The **default file** is the file in which the next activity will take place; for example, a search to limit the current selection.

Global procedures are procedures that are available to the application as a whole. They can set the **default file,** change the current selection, and conduct searches and sorts. They can apply formulas.

Global procedures act in two ways: as command loops, "main" programs, or "menu procedures" that control other actions; or as subroutines that any of the three procedure types *anywhere* in the application can call. Global procedures are not associated with any one file, hence the name "global."

When a custom menu command or the Execute Procedure command (under the Special menu in the User environment) calls a global procedure, the global procedure acts as a controlling program. It can control details such as the default file, which layout to display and use, and searching, sorting, and manipulating selections of records. As a controlling program, it can display layouts and execute their procedures as well as other global procedures.

See *4th Dimension Programmer's Reference* on how to pass parameters between procedures.

When you use a global procedure as a subroutine, any procedure can call it. Create such a global procedure subroutine when you need the same set of instructions within several procedures.

Call a 4th Dimension procedure by using its name, exactly as you would use any of 4th Dimension's other commands or functions. Procedures are commands and functions that you write yourself.

You may nest procedure calls. For example, a global procedure may call a layout and its procedure. That layout procedure may call a global procedure which in turn calls another global procedure.

The execution cycle

4th Dimension's execution cycle causes layout and file procedures to execute.

For a description of the Layout window's connection with the execution cycle see Chapter 3, "Basics for the User Environment." *4th Dimension Programmer's Reference* covers the execution cycle at some length.

A layout procedure is a series of programming statements, as are the file and global procedures. But layout procedures are intimately connected with data entry and report output. It's important to be able to manage when events happen. For example, you must be able to determine when you validate user input, when you initialize variables, or when a layout from one file links with the records in another file.

The execution cycle starts when you add, modify, import, export, print or display a layout.

Six execution cycle conditions

There are six events or conditions that control when particular programming statements are valid in a layout or file procedure. The periodic execution of these events comprise 4th Dimension's execution cycle. Six Boolean functions determine if the events or conditions are valid.

Three of the events depend on displaying the layout. These events are

- **Before:** Before is TRUE *before* 4th Dimension displays a layout. Use it for linking or for clearing and initializing variables.
- **During:** During is TRUE *while* 4th Dimension is displaying a layout, and *while* a user is entering data.
- **After:** After is TRUE *after* the user presses Enter or clicks the Accept button to signify that data entry for a layout is complete. You may wish to validate input before After becomes True. By convention, there is no valid After condition for dialog or output layouts.

The Before, During, and After conditions are mutually exclusive, although you may create a statement that depends on "**If (Before)** or **(During)**...", for example.

Three other conditions, Before and During pertain primarily to printed output (although they, too, can apply to layouts displayed on the screen). You can control which part of the layout 4th Dimension prints while these conditions are valid, by setting the layout control lines in the Layout window of the Design environment. Check whether the appropriate condition is True in the layout procedure and execute any processing for those areas of the layout (subtotals in footers, for example).

- **In Header:** For output, In Header controls the processing at the top of the page or screen. There is one header per page.
- **In Break:** In Break controls the processing during a break-on-field-change condition for sorted fields when printing a report. You may wish to calculate a subtotal during a break-on-field-change. For unsorted reports, break occurs at the end of each page.
- **In Footer:** In Footer controls the processing at the bottom of the page or screen. It usually contains formulas for totaling columns and similar calculations. There is one footer per page.

You may also use the Before and During conditions for printed output.

The In Header, Detail, Break, and Footer conditions are also mutually exclusive, although, as with Before, During, and After, you may join them with Or.

4th Dimension Programmer's Reference gives several examples of layout procedures using both sets of Booleans.

You may mix Before, During, and After statements with In Header, Detail, Break, and Footer statements in the same file or layout procedure.

Important By convention, there is no After condition in a dialog or an output layout.

How the execution cycle works

4th Dimension executes the programming statements in a layout procedure at least once—and often many times—as the layout displays, enters, or modifies data.

Generally, the execution cycle proceeds like this:

1. 4th Dimension sets Before to TRUE and calls the layout and its procedure.
2. The program sets the Before Boolean to TRUE, and executes the *entire* layout procedure. 4th Dimension executes the statements following **If (Before)** or in a case statement where the case is **(Before)**; statements controlled by other conditions are ignored.
3. 4th Dimension sets the During Boolean to TRUE, and again evaluates the entire procedure.
4. The procedure is evaluated with the After Boolean set to TRUE.

If an included layout is part of the parent layout, 4th Dimension will set each Before and During to TRUE for each subrecord as you enter it through the included layout. It will then batch-execute the included layout procedures with After set to TRUE once per record when the parent layout is validated and saved.

Important All the After statements for the records you enter through included layouts are executed *together* after you've finished entering those records and before you save the parent record.

Managing procedures

4th Dimension's Procedure dialog box is the central facility for managing your existing procedures and for creating new ones.

You may delete, sort, create, edit, or rename procedures.

The New button is active only when you are creating new global procedures. Because layout procedures are associated with a specific layout, you create or edit layout procedures with the open button.

The first step is mandatory in managing procedures; the others are optional.

❖ *By the way:* If you come to the Procedure dialog box from an open Layout window, 4th Dimension automatically displays the layouts for that file and the name of the layout you had displayed is selected.

Open the Procedure dialog box

■ From the Design environment, choose Procedure from the Design menu.

4th Dimension displays its Procedure dialog box. The dialog box lists Global Procedures and File/Layout Procedures in boldface text.

Expand the procedure names

1. Select Global Procedures or File/Layout Procedures, depending on which you want to create, delete, or edit.
2. Click Expand to view the names of the existing procedures of that type.

   Or: Double-click Global Procedures or File Layout Procedures to expand the list of existing procedures.

   Expanding the Layout Procedure list first reveals a list of filenames in boldface. Under them will be subfile names.
3. Expand filenames to reveal the list of existing layout procedures for that file.

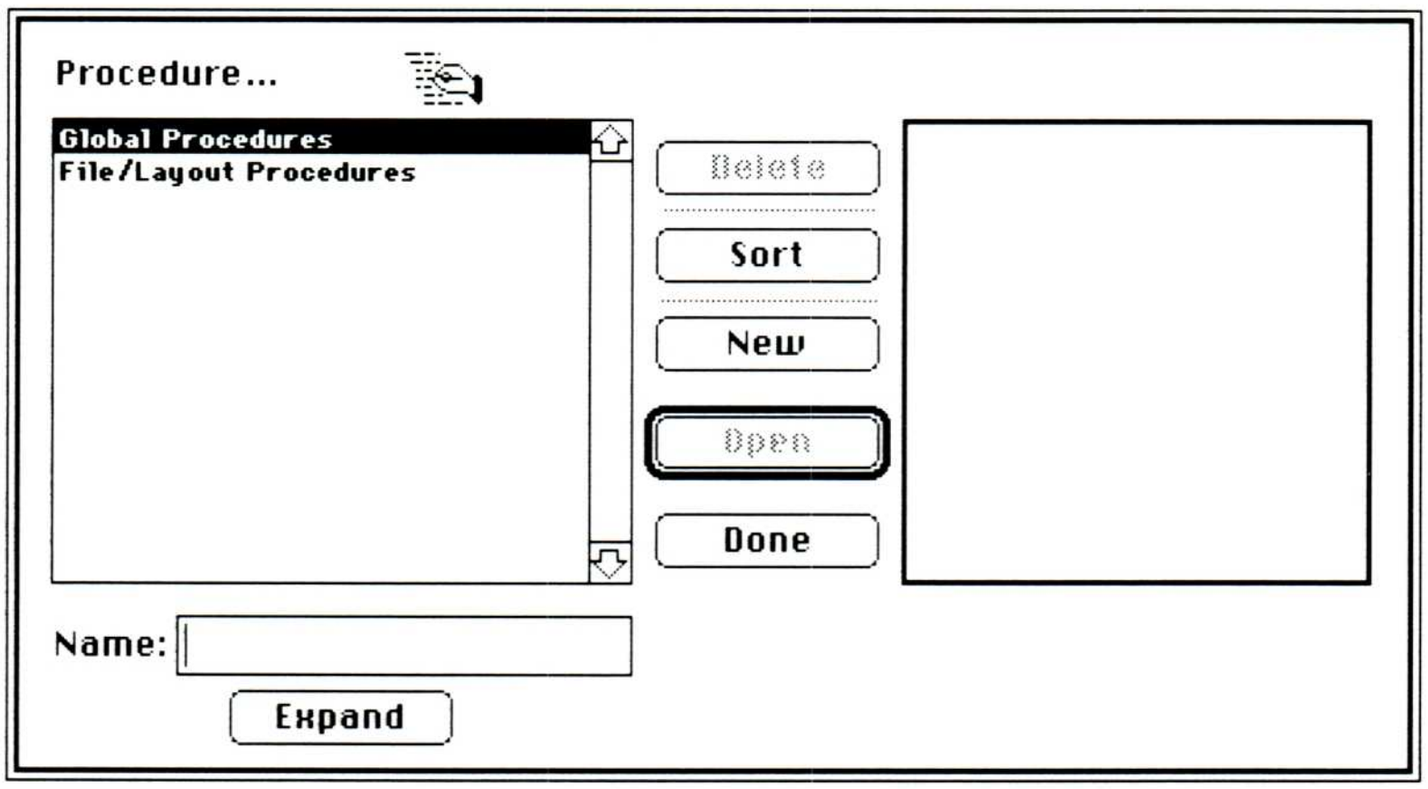


Figure 4-1
Procedure dialog box

Create a new global procedure

1. From the Procedure dialog box, select the heading Global Procedures.
2. Click New.

   4th Dimension displays its Procedure Type dialog box. 4th Dimension proposes the Listing editor and a numbered procedure name as its defaults.

- Click Listing or Flowchart depending on the editor you wish to use. Listing is the default editor.

  Once you have created a procedure in either editor, you cannot display that procedure in the alternate editor.

- Enter a procedure name, or accept the numbered default name that 4th Dimension provides.
- Click OK to enter the Editor window, or Cancel.

Create a new layout procedure

1. From the Procedure dialog box, select File/Layout Procedures.
2. Click the Expand button to show the names of the files in the database.

   Or: Double-click File/Layout Procedures to display the names of the files in the database.

   If you have come to the Procedure dialog box from an open Layout window, the dialog box will already have selected the name of the open layout. You may wish to collapse that filename and expand some other filename.
3. Expand the name of the file that contains the layout to which you want to add a procedure.

   You may add a procedure to or modify the procedure of an existing layout only.
4. Select the layout for which you want to write a procedure or the layout whose procedure you want to modify.
5. Click Open, whether or not a layout procedure currently exists for the layout.

   If no procedure exists, 4th Dimension displays its Procedure Type dialog box. Click either Listing or Flowchart, as you prefer.

   There is no naming area in the Procedure Type dialog box for a layout procedure. Layout procedures automatically take the name of their associated layout.

   If a procedure does exist, 4th Dimension displays the Procedure window, the correct procedure editor, and the procedure.

Create a new file procedure

1. In the Procedure dialog box, select File/Layout Procedures.
2. Expand File/Layout Procedures to display the names of the files in the database.
3. Select a filename for which you want to create a file procedure.

   There is no need to display the layout names for that file unless you want to verify that you have the correct file selected.
4. Click Open.

   If you have already created a file procedure for the file, 4th Dimension displays the file procedure in the appropriate editor.

   If you have created no file procedure for the file, 4th Dimension displays its Procedure Type dialog box. A file procedure takes its name from the file.
5. Click Listing or Flowchart, as you prefer.

   If you create a file procedure in one editor, you will be unable to view it in the other editor.
6. Create the procedure.

Delete a global procedure

1. In the Procedure dialog box, select the name of a global procedure.

   You may have to expand Global Procedures to see the list of procedure names.

   The name you select appears in the Name area at the bottom of the procedure list.
2. Click Delete.

   4th Dimension displays a dialog box asking whether you are sure.
3. Click Yes if you still wish to delete the procedure.

   Or: Click No if you do not wish to delete the procedure.

Delete a layout procedure

- You cannot delete a layout procedure from the Procedure dialog box. To delete a layout procedure, you must delete the layout to which it belongs.

  You may display the existing layout procedure and delete all text. This does not delete the procedure, but it does prevent 4th Dimension from doing any processing based on the former text.

- Choose Layout from the Design menu, select a layout, and click Delete.

- You cannot delete the default input or output layout, or the last input or output layout in the list of layouts.

  See also: "Deleting Layouts" in Chapter 2, "Layout Design Basics."

Delete a file procedure

- You cannot delete a file procedure.

- You may delete the file to which the file procedure belongs, or you may display the file procedure and delete all text.

Rename a global procedure

1. In the Procedure dialog box, select a global procedure.

   You may have to expand Global Procedures in order to see the list of existing procedures.

   The name of the procedure you select appears in the Name area at the bottom of the procedure list.

2. Delete, overtype, insert, or otherwise edit the name.

   As you enter it, the new name appears in the procedure list.

3. Click Done. 4th Dimension closes the procedure dialog box.

   Or: Select the name of another procedure, or click another button.

Sort global procedures

1. In the Procedure dialog box, select Global Procedures.
2. Expand the list of Global procedures.
3. Click Sort.

   4th Dimension sorts the names of the global procedures alphabetically in ascending order.

You cannot sort layout procedure names.

Edit an existing procedure

1. In the Procedure dialog box, select the name of an existing procedure.
2. Click Open.

   Or: Double-click the procedure name.

   4th Dimension displays the existing procedure in the Procedure window and in the appropriate editor.

Procedure editors

4th Dimension supplies two procedure editors, the Listing editor and the Flowchart editor. Both editors can accomplish the same thing—creating global, file, and layout procedures for your 4th Dimension applications. Which editor you use depends on your personal taste.

However, if you create a procedure in one editor, you cannot view that procedure in the other editor.

Aside from the graphic–versus–text difference in the two editors, the major programming difference between them is that the Listing editor is a document–oriented editor, with scrolling and a 32,767 character capacity. The Flowchart editor provides a page–oriented editor in which you create formulas. Formulas in 4th Dimension are one logical line long. The flowchart graphics join the formulas into steps.

❖ *Note:* Changes to the Structure window are not reflected in any open Procedure window. If you make any changes to your database stucture, you should first close any open Procedure windows, make the changes and then reopen the windows.

The Listing editor

The Listing editor is a text editor for the preparation of 4th Dimension procedures. It's called the Listing editor because the procedure appears as a program listing, rather than as a flowchart. You can use it to write global, file, and layout procedures. Figure 4–2 shows the Listing editor and its various parts.

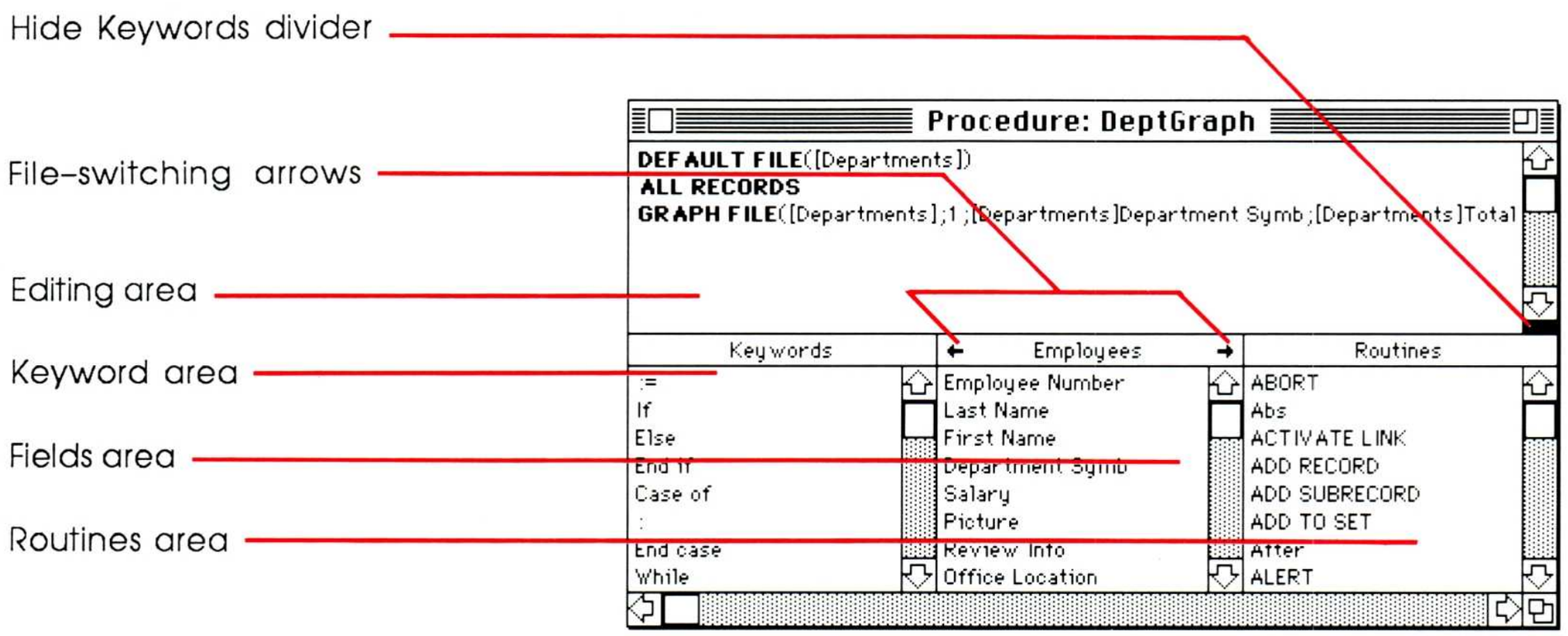


Figure 4-2
Listing editor showing a procedure

The Listing editor contains four scrollable areas.

- **Editing area:** The Editing area contains the text of the procedure as you create it or when you edit it. Procedures may be up to 32,767 characters long. Good programming practice limits line length. The Listing editor provides automatic indentation for proper programming structure. Comments are a maximum of 80 characters.

  You have available to you all the standard Macintosh editing features such as delete, overtype, insert, cut, and paste. You cannot paste graphics into the text of a listing procedure.

- **Keyword area:** The Keyword area contains a list of often used programming keywords, such as **If** and **While.** You may enter these keywords into your procedure by clicking them as well as by entering them manually at the keyboard. This saves you the effort of continually typing the same words.

- **Field area:** The Field area displays the names of the fields in the default file (shown with no name in the center of the area title), or in other files of the database. Click a field name to enter it into the procedure in the editing area at the editing pointer. When you click a field name, 4th Dimension maintains the correct syntax of filename, field name, subfilename, and subfield name for you.

  When you click the name of a field of type Subfile, 4th Dimension opens a window to allow you to select from among the subfile field names.

Click either the right or left arrow of the Field area to bring the fields from another file into view. 4th Dimension shows the default filename two ways: with a filename and without. When writing a layout procedure, choose the field name from the list *without* a filename. Click the filename in the title to add that to the text of the procedure.

- **Routines area:** The Routines area lists in alphabetical order all the 4th Dimension built–in programming commands and functions, as well as developer–prepared procedures. You can tell which they are by the font 4th Dimension uses to display them. Table 4–1 lists the faces.

  All names of routines are reserved words.

Table 4-1
How 4th Dimension displays commands, functions, and procedures

Routine	Examples
Commands	**LOAD LINKED RECORD, SORT SELECTION**
Functions	**Before, Month of, End selection**
User procedures	*Addemployee, Disableall*
External procedures	***RunVideodisk, Playmusic***

In addition to using the four scrollable areas, you may

- Drag the size box to resize the Procedure window.
- Click the zoom box to expand the Procedure window to full screen size, or shrink it back to its default size.
- Change the relative sizes of the Editing area and the Keyword, Field, and Routines areas. Drag the black bar—the Hide Keywords divider—located between the upper and lower portions of the window. You may eliminate the procedure keywords, fields, and routines as a default (and still may reveal them) by clicking the Hide Keywords check box in the Preferences dialog box.

Editing with 4th Dimension

The Listing editor conforms to standard Macintosh text-handling conventions and in addition has an automatic indent function which preserves 4th Dimension's own programming style and automatically places keywords, commands, and functions in boldface.

You may scroll through the list of routines by clicking or by entering the first *n* letters of the command you're looking for at the keyboard. To enter letters and scroll alphabetically, press the Shift and Command keys simultaneously and enter the first *n* letters of the command. 4th Dimension's routines list jumps to display at the top of the area the first word in its list that matches what you have entered.

You can also speed up entering commands manually in the editing window by using 4th Dimension User's Guide's wildcard character, the at symbol (@). You can use the @ symbol within words, and may use multiple @ symbols on the same line. Press Enter to evaluate the line. Press Return to evaluate the line and move to the next line. 4th Dimension replaces what you've entered with its "best guess" at the command you mean. For example, enter **Bee@** and 4th Dimension replaces it with **Beep.**

Search and replace

The Listing editor provides a search-and-replace feature under the Search menu in the Procedure window. There is no practical length limitation. You may search for and replace strings up to 32,767 characters in length.

Figure 4-3 shows the Find dialog box of the Search command, and Figure 4-4 shows the Replace With dialog box.

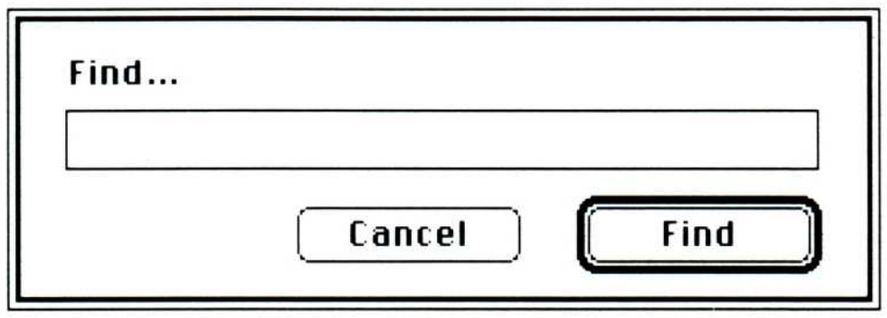


Figure 4-3
Find dialog box

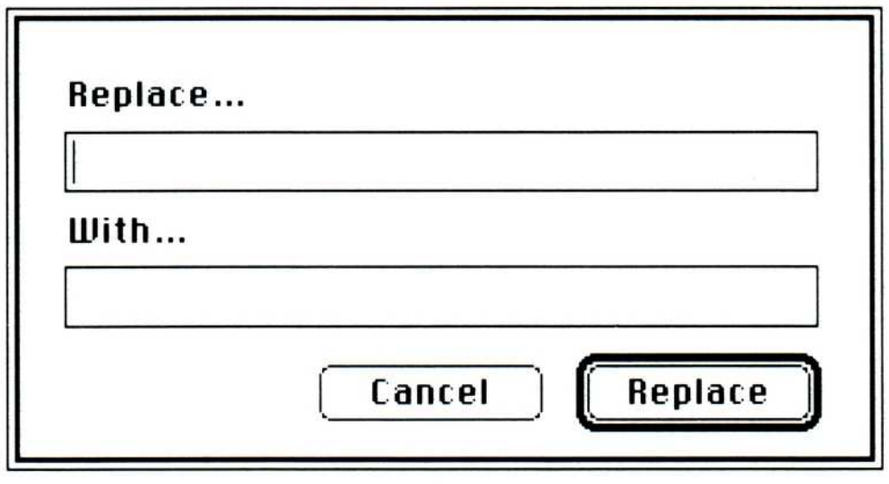


Figure 4-4
Replace With dialog box

❖ *By the way:* If you select some text and then do a Find or a Find and Replace, 4th Dimension will make your text the default entry for the commands.

The Find Next and Replace Next commands in the Search menu reiterate the most recent Find and Replace commands, respectively, without opening a dialog box.

Using the Listing editor

Open the Listing editor in the Procedure window as described in "Managing Procedures" earlier in this chapter.

If you create a layout that uses fields from a linked file, 4th Dimension automatically displays the Listing editor for you. You may redisplay a layout procedure—or any other procedure—by opening the Procedure window yourself.

Enter text

- Begin typing. 4th Dimension enters text at the insertion point in the editing area.
- Click between letters in existing text to insert. Highlight and press the Backspace key to erase, or overtype to replace highlighted text.
- Click a keyword, a field name, or a routine to enter that item at the insertion point in the Editing area.

  4th Dimension does some syntax checking on input. It brackets the syntax error with bullet characters and will remove the bullets when you have corrected the error.

Hide or display keywords

- Drag the black bar between the upper and lower halves of the Listing editor to increase or decrease the size of the keyword display.

  Or: Set Preferences in the File menu of the Design environment to Hide Keywords. 4th Dimension hides the bottom half of the Listing editor when you next open the Procedure window, and saves that setting for future use.
- If you have hidden keywords, field names, and routines through setting Preferences, you may still display them by dragging the black bar.

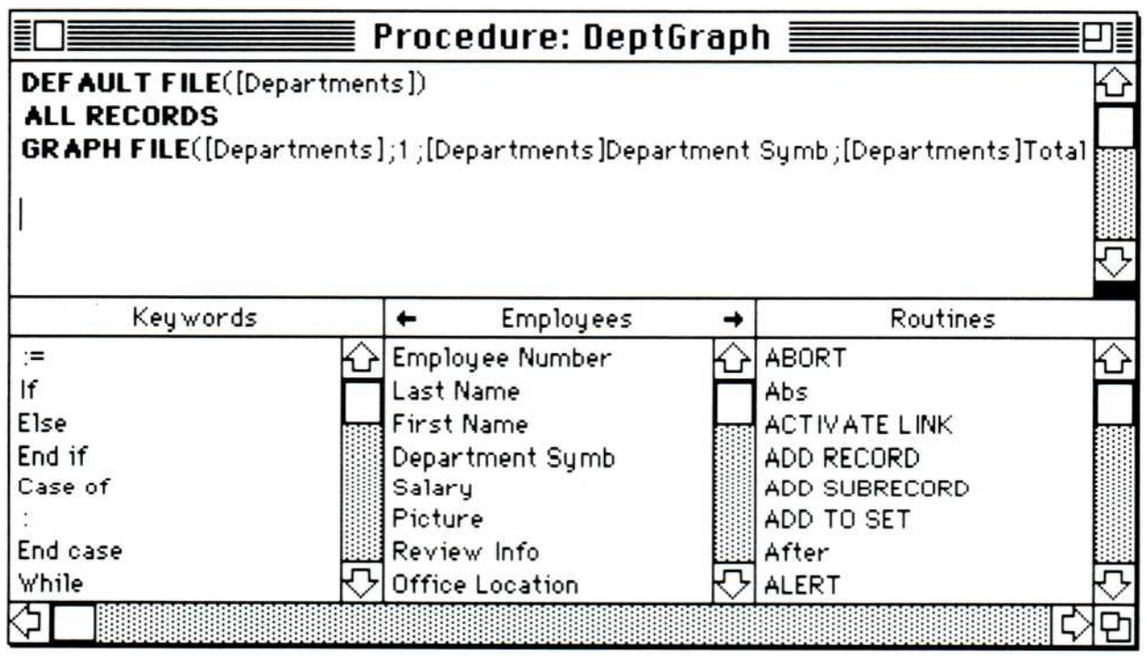


Figure 4-5
Listing editor

Find a string

1. Choose Find from the Search menu.

   Or: Select text from the procedure and choose Find.

   4th Dimension displays its Find dialog box. If you have used it previously, the entry area will display your most recent target string.

2. In the entry area, enter the target string.

   A target string may be made up of alphanumeric characters or numbers, and may be as many as 32,767 characters long.

3. Click Find to find the first match at or below the current position of the editing pointer.

   Or: Click Cancel to return to the Listing editor.

   4th Dimension's Find command searches only from the current position of the editing pointer to the end of the procedure.

4. To find the same string value again, choose Find Next from the Search menu. 4th Dimension does not display the Find dialog box when it executes Find Next.

Replace a string

1. Choose Replace from the Search menu.

   Or: Select text from the procedure and choose Replace.

   4th Dimension displays its Replace With dialog box. If you have used it previously, the entry areas will display your most recent target and replacement strings.

2. In the entry area labeled Replace, enter the target string for which you are searching. In the area labeled With, enter the string with which you want to replace the target.

   A string may be made up of alphanumeric characters or numbers, and may be as long as 32,767 characters.

3. Click Replace to replace the first match with the replacement string.

   Or: Click Cancel to return to the Listing editor.

   4th Dimension's Replace command replaces only from the current position of the editing pointer to the end of the procedure.

   By using Find Next with Replace Next, you can examine each occurrence of a target string individually and decide whether to replace it.

Save a procedure

- Save a procedure in the Listing editor by clicking the close box of the Procedure window, or by choosing the Close Procedure command from the File menu.

  4th Dimension closes the Listing editor.

- Choose Save Procedure from the File menu.

  4th Dimension saves the procedure, but does not close the Listing editor.

- If you choose Save Procedure (and have left the Listing editor active), you may later choose Revert to Saved from the File menu.

  Revert to Saved restores the text to its previously-saved condition.

  Important: To use Revert to Saved, you must not have closed the Listing editor. Revert to Saved applies when the window is active.

The Flowchart editor

The Flowchart editor combines 4th Dimension formulas with a graphic layout of procedure flow.

Each figure in the flowchart is either a step or a test. A step makes a calculation or an assignment; a test makes a decision in procedure flow based on a logical test such as equality, inequality, or reaching a range value.

There are three basic steps to creating procedures using the Flowchart editor.

1. Click a step or test icon and position the pointer where you want the step or test to be. Click.
2. Double-click inside a box to create a formula for the step.
3. Draw flowlines between steps and tests.

Using the Flowchart editor is the subject of a how-to section following this section. Figure 4-6 shows the Flowchart editor.

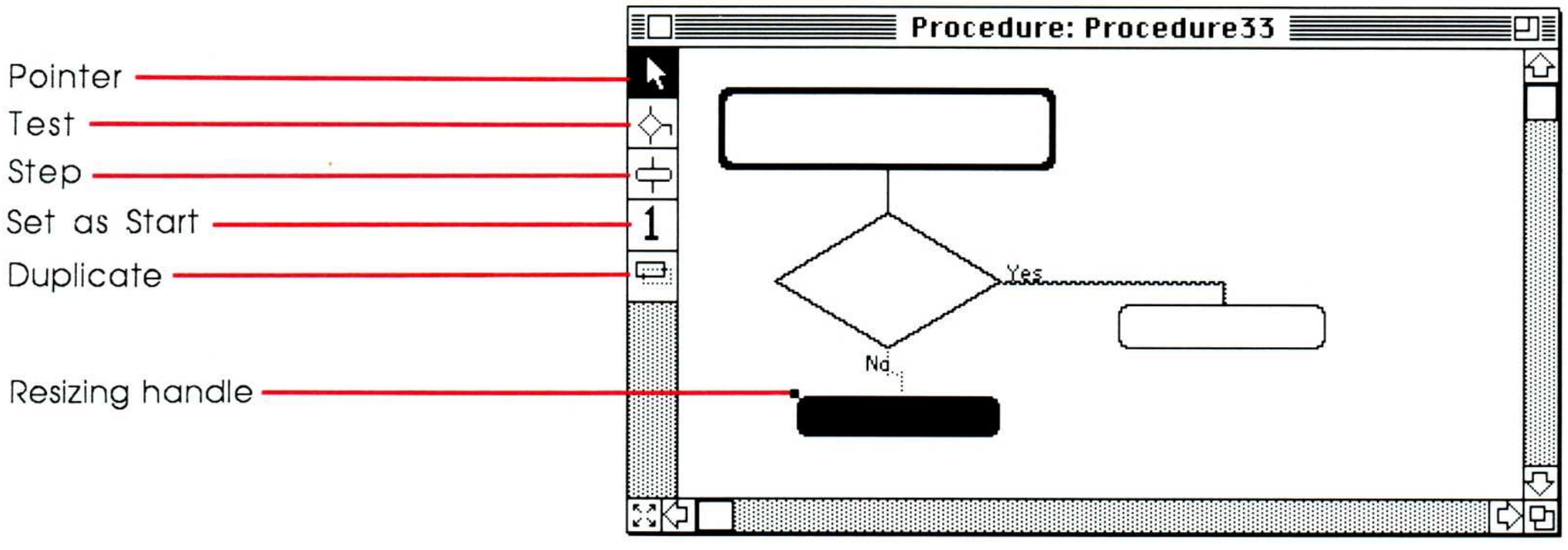


Figure 4-6
Flowchart editor

When you double-click a flowchart step, 4th Dimension displays its Formula editor, which resembles the Listing editor. A formula differs from a text procedure in that a formula may be only one logical line long. A procedure may be many lines long. Figure 4-7 shows the Formula editor 4th Dimension uses with the Flowchart editor.

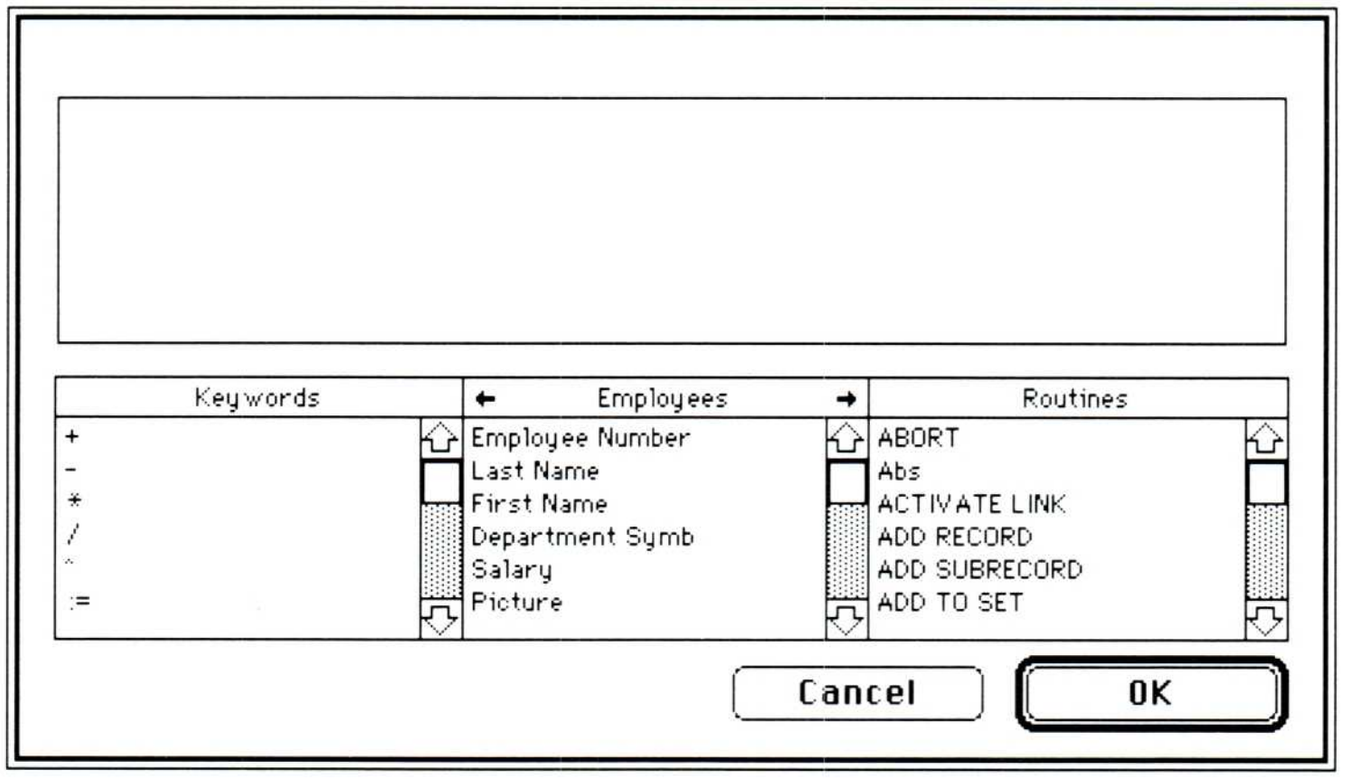


Figure 4-7
Flowchart Formula editor

Parts of the Flowchart Formula editor

The Flowchart Formula editor contains three scrollable areas and a nonscrollable Editing area. The scrollable areas are Keywords, field names (titled by the name of their file), and Routines.

- **Keyword area:** The keyword area contains a list of symbols. They are different from the keywords in the Listing editor. You may enter these keywords into your procedure by clicking them as well as by entering them manually at the keyboard. This saves you the effort of continually typing the same symbols.

- **Field area:** The Field area displays the names of the fields in the default file (shown with no name in the center of the area title) or in other files of the database. Click the filename or a field name to enter it into the formula in the editing area and at the editing pointer. When you click a field name, 4th Dimension maintains the correct syntax of filename, field name, subfilename, and subfield name for you.

  When you click the name of a field of type Subfile, 4th Dimension opens a window to allow you to select from among the subfile field names.

  Click either the right or left arrow of the Field area to bring the fields from another file into view. 4th Dimension shows the default filename two ways: with a filename and without.

- **Routines area:** The routines area lists, in alphabetical order, all of the 4th Dimension built-in programming commands and functions, as well as any developer-prepared procedures. You may call a procedure from within a formula. Table 4-1, earlier in this chapter, lists the faces. You can jump to a command by holding down command-shift and entering the first few letters of the command.

  All names of built-in commands and functions are reserved words.

The Editing area in 4th Dimension's Formula editor does no scrolling because a formula may be only one line long. 4th Dimension's Formula editor automatically wraps your text at the right edge of the Editing area—but pressing Return at any time tells 4th Dimension that you have "finished" entering text.

4th Dimension checks the syntax of each formula, and indicates any syntax errors by placing them between black bullet characters (•).

You have available to you all the standard Macintosh editing features such as delete, overtype, insert, cut, and paste. You cannot paste graphics into the text of a formula.

Important You may cut and paste flowchart graphics only in the Flowchart editor.

Flowchart symbols and constructions

While the Flowchart editor uses only two basic symbols—the step and the test—you may combine them for If-Else, case state-ments, While-loop, and other types of constructions. Figures 4-8 through 4-11 show how typical programming statements appear in the Flowchart editor.

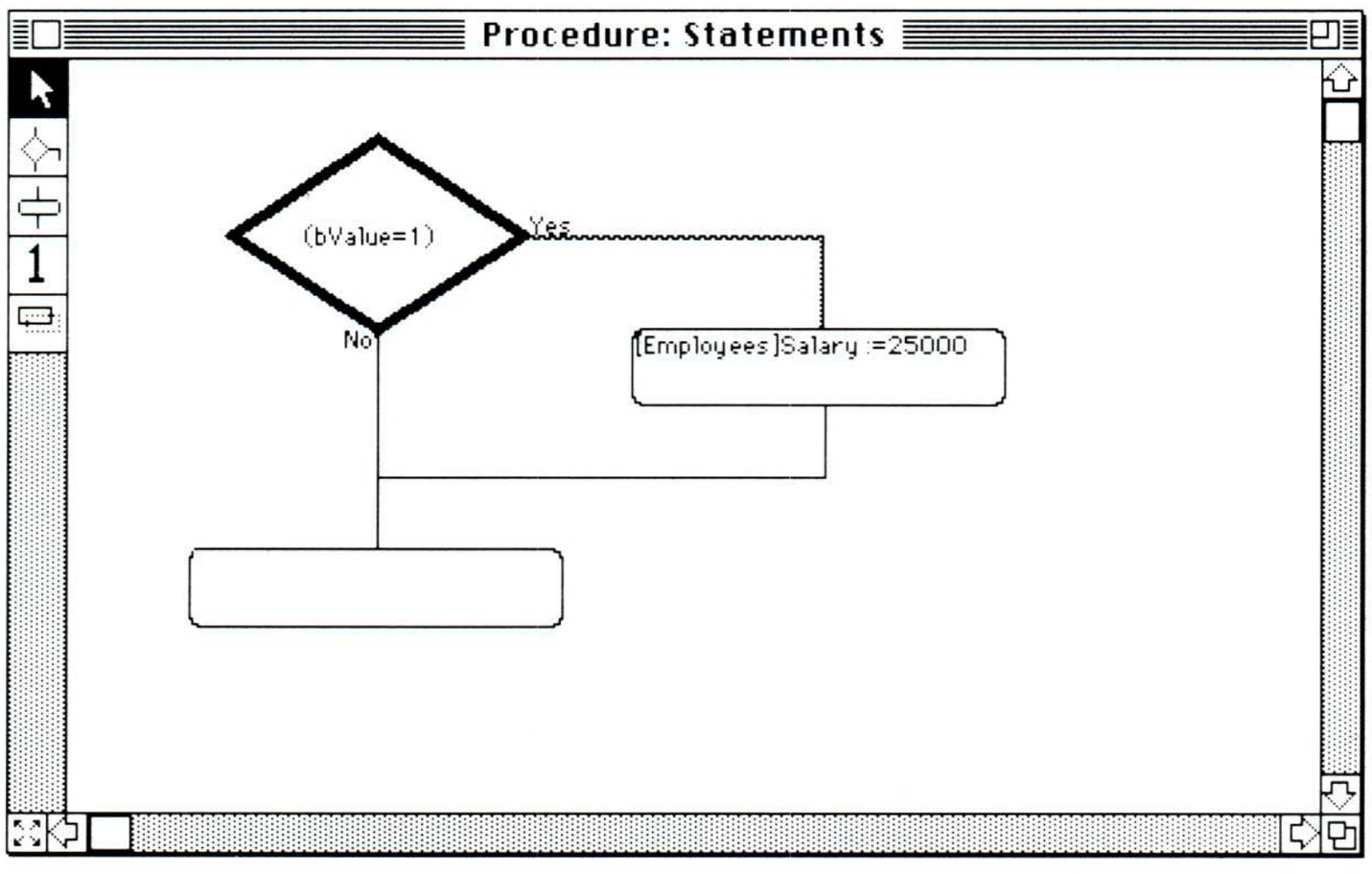


Figure 4-8
If statement

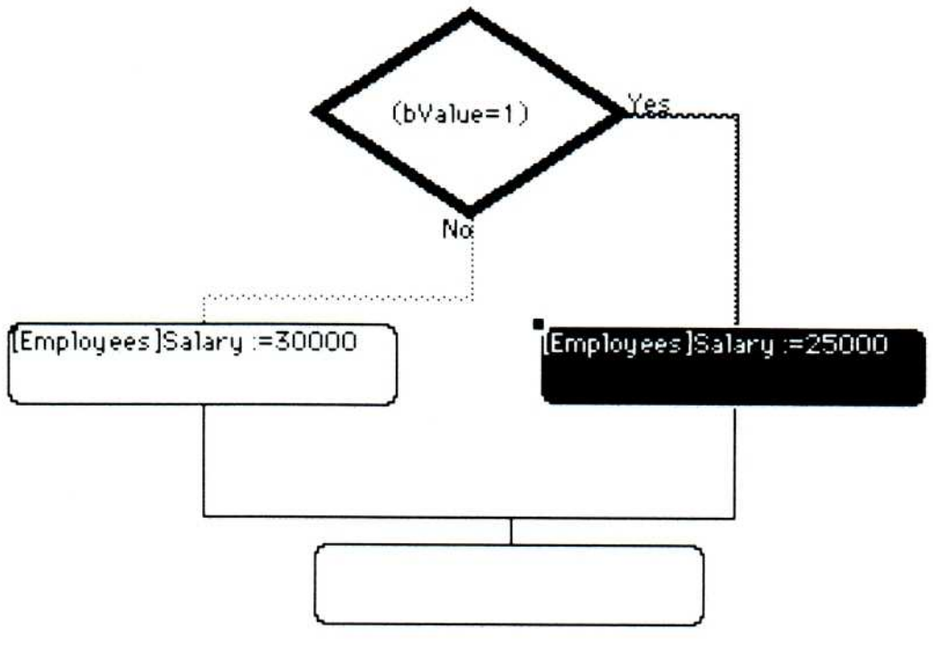


Figure 4-9
If-Else statement

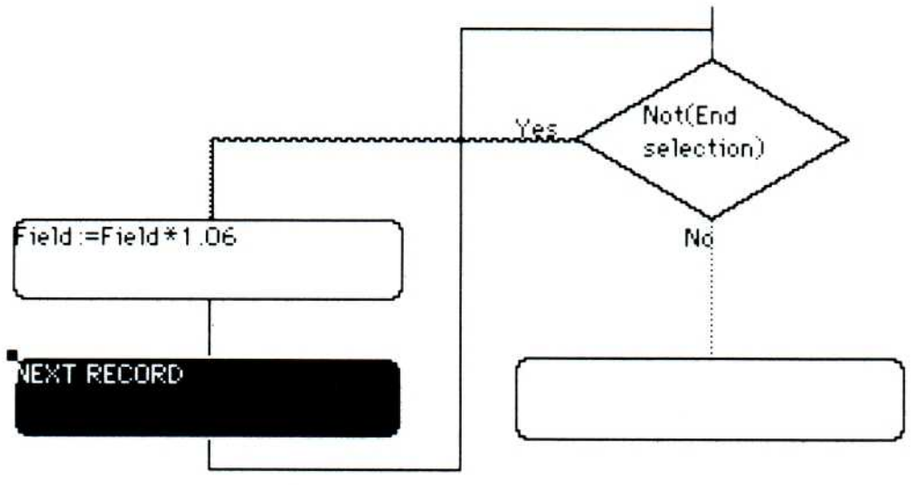


Figure 4-10
While statement

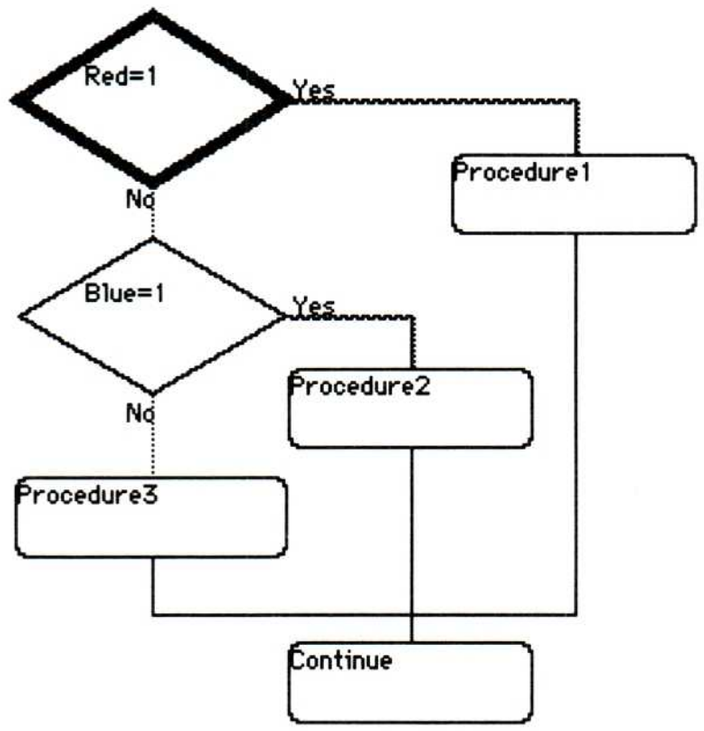


Figure 4-11
Case statement

Setting the first step

Setting the first step acts as a way of "commenting out" portions of a procedure created by the Flowchart editor.

Setting the first step, either through clicking the 1 icon on the flowchart palette or by choosing the Set as Start command from the Flowchart menu, makes 4th Dimension ignore all statements prior to that step or test. The statements before the first step remain intact, but unexecuted.

Using the Flowchart editor

Building a procedure with the Flowchart editor is mainly a process or clicking, pointing, and writing formulas with 4th Dimension's Formula editor.

The Flowchart menu duplicates the functions of the palette—creating a new test, creating a new step, and setting a step as the first step.

Generally, the actions you must perform in the editor to create and manipulate a step are equally valid for creating and manipulating tests.

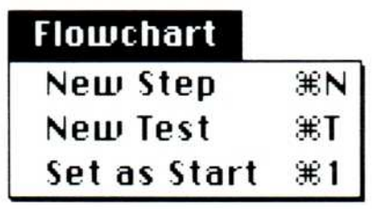


Figure 4-12
Flowchart menu

Create a test or step

1. Click the test or step icon on the command palette. When you bring the pointer back to the Flowchart window, it becomes a crossbar

   Or: Choose New Step from the Flowchart menu to create a new step, or choose New Test from the Flowchart menu to create a new test box.

   When you choose New Step or New Test, 4th Dimension clicks the appropriate icon for you, and changes the pointer into a crossbar.

2. Position the pointer where you want the upper-left corner of the step or test.

3. Click again. 4th Dimension creates the test box or step box for you and automatically reselects the pointer icon.

Change the size of a step

1. Click an existing step to select it.

   4th Dimension highlights the step. In the upper-left corner of the step is a resizing handle.

2. Place the pointer on the resizing handle.

   The pointer changes into a four-direction arrow.

3. Drag the sizing box to create the size step you require. You may wish to resize a step or test box when the formula inside does not have enough room to display fully.

Selecting a step

- Position the pointer on a step or a test box and click.
- To select several steps or texts, drag a box around them.

Fill in or edit the step

1. Double-click a step or test box.

   4th Dimension displays its Formula editor. A formula differs from a procedure in that it may be only one logical line long.

   If you double-click a step with an existing formula, the Formula editor will contain that formula.

2. Create or edit the formula in the Formula area.

   You edit in the Formula window much as you do in 4th Dimension's procedural editor.

   See *4th Dimension Programmer's Reference* for information on specific programming commands and functions.

3. Click OK to accept the formula and apply it to the step, or click Cancel to return to the Flowchart editor without creating or changing a formula for the step.

Move a step

- Place the pointer on the step you wish to move, and drag it to its new position.

  If there are any connections between steps, they will move too.

  The Flowchart editor automatically provides an alignment grid to help you position steps and tests neatly.

Duplicate a step

1. Click an existing step to select it.
2. Click the Duplicate icon on the command palette.

   4th Dimension duplicates the step. If you have created a formula for the step, the duplicate will also have that formula.

Connect steps with flowlines

1. Move the pointer to the bottom of a step, or to the bottom and sides of a test, until it becomes a small, upward-pointing arrow.
2. Drag from the edge of a step, extending the expanding line to the next step.

   The line may pass through other steps on its way to its destination; 4th Dimension draws the line around or behind them.

   4th Dimension automatically and correctly labels the lines leaving a test box as Yes and No.

- Erase a flow line by placing the small upward pointer at the beginning of an existing line and dragging the extending line between steps so that it does not connect with one.

Delete a step

1. Click an existing step to select it.
2. From the Edit menu, choose Clear.

   Or: Press the Backspace key.

   4th Dimension erases the step. Any connecting flowlines disappear.

You cannot paste non-flowchart graphics into the flowchart editor.

Set the first step

1. Click to select the step you want to execute first in the procedure.
2. Click the Set as Start icon on the command palette.

   Or: Choose Set as Start from the Flowchart menu.

Setting a first step effectively "comments out" any earlier steps in the procedure and can help with debugging.

Show the page

1. Click the Show Page button for an overview of the flowchart.
2. Drag the frame to a place on the flowchart you want to see in detail.
3. Click OK. 4th Dimension returns to the Flowchart window, centered on the area you selected with the frame.

Or: Click Cancel. 4th Dimension returns to the Flowchart window and displays the area of the flowchart it had been displaying previously.

Print the flowchart

1. From the File menu, choose Page Setup. Make the page settings you wish.
2. From the File menu, choose Print. Make the print settings you wish.

■ Click Cancel to return to the Flowchart window.

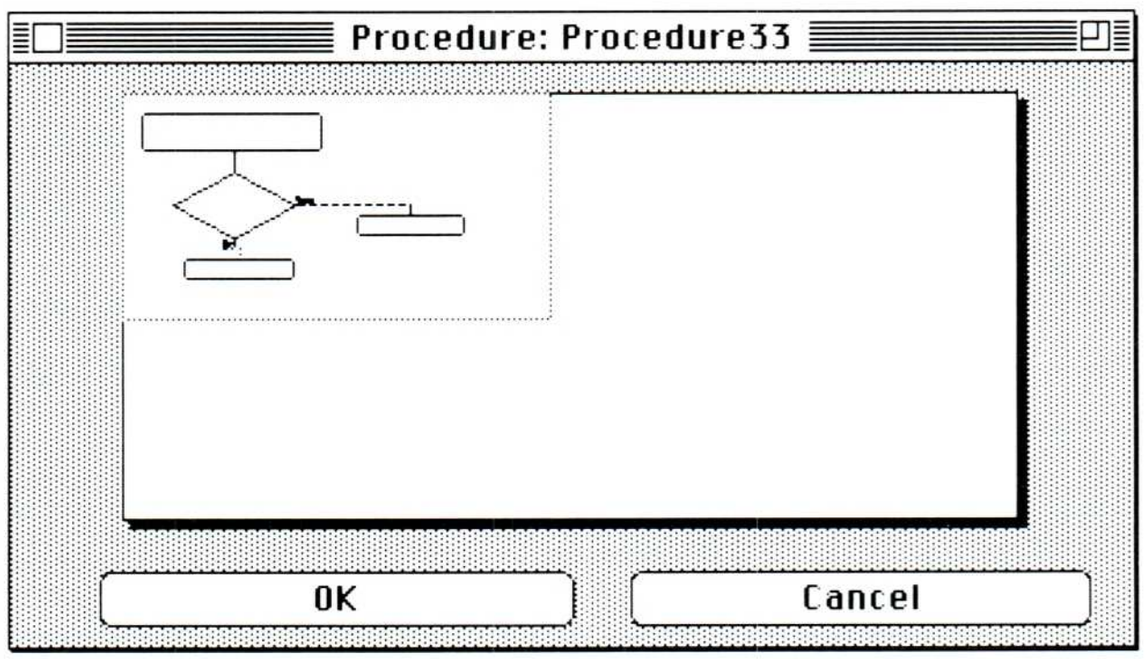


Figure 4-13
Overview of flowchart

Save the procedure

- Save a procedure in the Flowchart editor by clicking the close box of the Procedure window, or by choosing the Close Procedure command from the File menu.

  4th Dimension closes the Flowchart editor.

- Choose Save Procedure from the File menu.

  4th Dimension saves the procedure, but does not close the editor.

- If you choose Save Procedure (and have left the Flowchart editor active), you may later choose Revert to Saved from the File menu.

  Revert to Saved restores the flowchart procedure to its previously saved condition.

The 4th Dimension debugger

A **debugger** is a feature of a program that lets you examine programming statements, and their effects, as they happen.

4th Dimension's built-in debugger locates errors in your procedure listings, lets you step through a working procedure, and helps you trace the values of fields, variables, and expressions in your procedures. You may also use the debugger to set **break points** in your programming while testing parts of your application.

A **break point** is an indication to 4th Dimension that the procedure should stop and that the debugger should display the programming statements currently being executed.

4th Dimension checks the syntax of programming statements as you enter them, and indicates errors with black bullet characters (•). Some statements may have perfect syntax, but cause logic or other errors (calling a non-existent procedure, for example). 4th Dimension's debugger helps track down these errors, too.

The debugger has two parts: the debugger message window and the Debug window itself.

When something triggers the debugger, it first displays the debugger message window. The message window tells you what type of condition triggered the debugger, shows you the line of procedure that was executing when the debugger was called, and gives you an opportunity to proceed with debugging, or to cancel and return to your application.

The message window can appear when using a 4th Dimension application with the runtime system; but you cannot enter the debugger using the runtime system.

The Debug window shows the statements of the procedure and provides a way to trace the values of variables, fields, functions, and expressions as they execute.

The debugger is available only in the development version of 4th Dimension.

Entering the debugger

You may enter the debugger four ways:

- **Discovering an error:** If 4th Dimension discovers a syntax or logic error while executing the procedure in either the User or Custom environment, it will open the debugger message window. The debugger cannot open in the Design environment (procedures don't execute there).
- **Setting TRACE:** Place the commands **TRACE** and **NO TRACE** in your procedure statements to force 4th Dimension to activate the debugger at a particular place in your programming, and to deactivate the debugger at another place.
- **Setting a break point:** You can set a break point at one or several specific commands. This makes 4th Dimension halt execution at that line and display the debugger. You can set a break point only in the debugger.
- **Issuing a user interrupt:** When a proedure is executing you may call the debugger yourself by pressing Option-click.

When you have entered the debugger, 4th Dimension displays the debugger message window.

Debugger message window

When you enter the debugger, by whatever means, 4th Dimension displays the debugger message window. Figure 4-14 shows the debugger message window for a typical application.

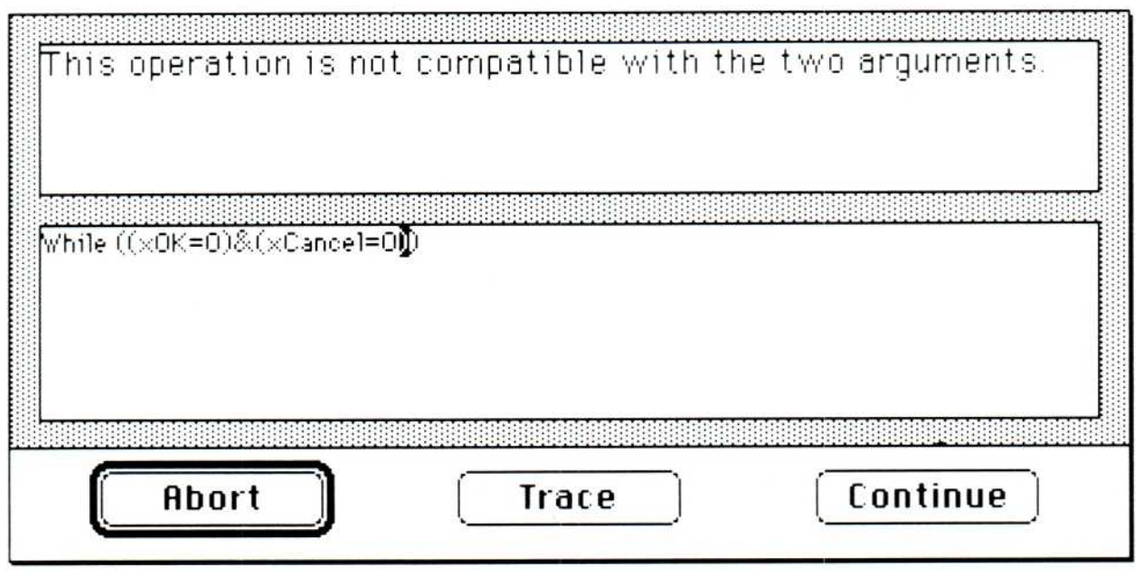


Figure 4-14
Debugger message window

4th Dimension Command Reference provides a list of possible debugger messages.

There are three areas in the message window. (The top one tells which error or condition opened the debugger—program interrupted by user, syntax error, or others.)

The middle area shows the programming statement that was executing when 4th Dimension called the debugger. This statement may or may not actually be in error. 4th Dimension tries to highlight the position of any error if one has occurred.

The lower area in the debugger message window displays three buttons, Abort, Trace, and Continue.

- **Trace:** Clicking the Trace button displays the debugger window.
- **Abort:** When you click the Abort button, 4th Dimension aborts the currently executing procedure. The effect is the same as jumping to the end of the procedure.
- **Continue:** The Continue button returns you to the procedure you were executing and continues to execute the procedure from the next statement.

Debug window

If you elect to Trace your procedure, 4th Dimension displays its Debug window.

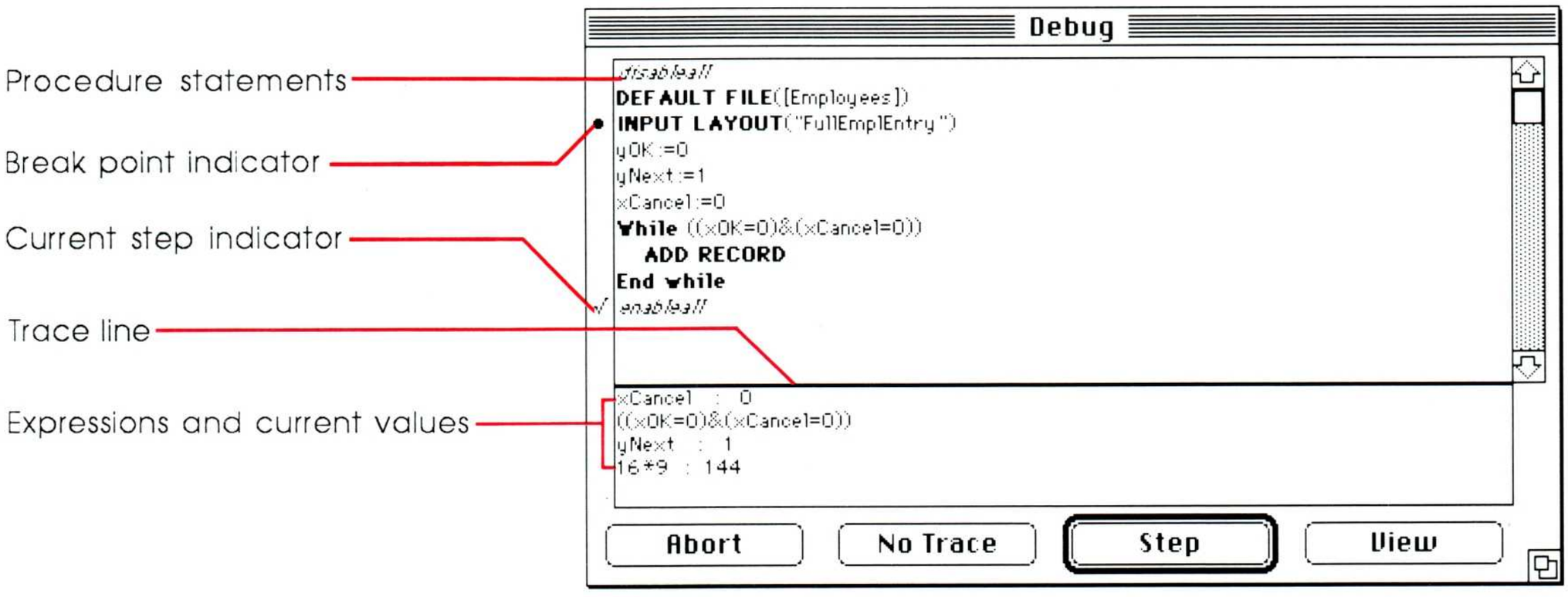


Figure 4-15
Debug window

Parts of the Debug window

There are four main areas in the Debug window.

- **Procedure statements:** The area of procedure statements shows the programming statements that surround the current step. 4th Dimension automatically advances the current step indicator and the surrounding statements; you may also scroll the window.
- **Below the Trace line:** The Trace line divides the procedure's statements from the values of the expressions you are tracing. Place the names of variables, fields, functions, and other expressions below the Trace line, and 4th Dimension will track their changing values. You may move the Trace line up and down (with Option-drag or Option-Click) to make more or less room for expressions. Expressions remain beneath the Trace line until you specifically remove them.

- **Left Margin:** The left margin displays the checkmark indicator of the current step and any break points you may have set for any of the statements on screen.
- **Control buttons:** Control buttons determine how you proceed with the debugging operation.

Beneath the Trace line, you may use an expression that is not in the procedure you are tracing or debugging. For example, you may display a substring of a string expression, even though that substring is used nowhere in your database application.

Be careful with what you place below the Trace line. Whatever you place there will be executed and evaluated. This includes your procedures and built in commands.

Controlling the Debug window

Four buttons in the Debug window control how you proceed with debugging.

- **Abort:** When you click the Abort button, 4th Dimension aborts the currently-executing procedure. The effect is the same as jumping to the end of the procedure.
- **No Trace:** No Trace closes the Debug window.
- **Step:** The Step button steps through the procedure statments, line by line. Between steps, the Debug window alternates with the active screen displays of the application.
- **View:** View displays a static screen from the application as affected by the current step in the procedure. The screen view is not active—click anywhere to return to the Debug window. View is especially useful with graphics.

Debugging flowchart procedures

While the debugger is most useful for the Listing editor, you can use it with the Flowchart editor. Figure 4-16 shows a small portion of a procedure written with the Flowchart editor as it appears in the Debug window.

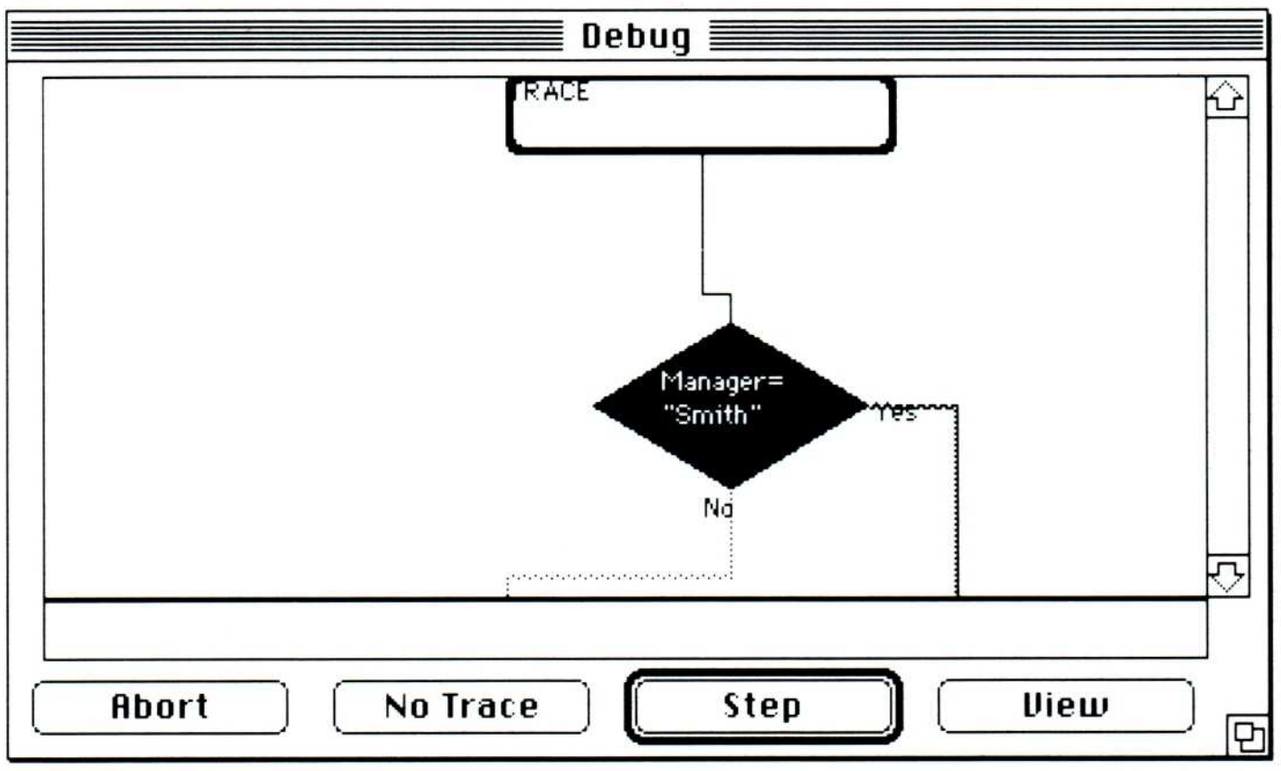


Figure 4-16
How flowchart procedure appears in Debug window

It works the same way, with these few differences and similarities:

- **Graphics:** The debugger displays the flowchart graphics, rather than a sequential list of statements. Inside each step or test is its formula.
- **Current step:** 4th Dimension displays the current step near the center of the Debug window. The program highlights the current step.
- **Break points:** You may set break points for any other step in the field of view *except* for the current step. (In debugging a listing procedure, you can set a break point for the current step.)
- **Trace line:** You may trace variables, fields, functions, and expressions below the Trace line exactly as you would when the debugger shows a listing procedure.

Using the debugger

The debugger lets you step through your procedures to better analyze any problems you may have in creating an application.

Call the debugger

The debugger will open if one of the following happens:

- If there is an error in a procedure.
- If you place the **TRACE** command in a procedure. **NO TRACE** cancels debugging.
- If the debugger encounters any break points you have set in a previous session with the debugger.
- If you press Option-click and if a procedure is executing.

Step through a procedure

1. Call the debugger. 4th Dimension displays the debugger message window first.
2. Click Trace.

   4th Dimension displays the Debug window. The checkmark pointer indicates the current statement. (In a flowchart layout, 4th Dimension highlights the current step.)
3. Click Step.

   4th Dimension executes each statement in order and pauses, displaying the Debug window.

   - Click View to see the screen without the Debug window. The screen is inactive; click again to return to the Debug window.
   - Click No Trace to turn off the tracing function and return to normal operation.
   - Click Abort to leave the debugger and abort the execution cycle of the current procedure.

Set the break points

1. Open the Debug window.
2. Move the pointer into the margin. The pointer becomes a bullet. Position the bullet opposite the step for which you want to set a break point.
3. Click. The pointer places a bullet in the margin. The bullet signifies a break point.

   When a procedure reaches a break point, 4th Dimension displays the Debug window whether or not you have set the **TRACE** command.

- To erase a break point, click it again.

Trace expressions and variables

1. Open the Debug window.
2. Move the pointer beneath the Trace line and click.

   4th Dimension places an insertion point beneath the Trace line.
3. Enter the name of a variable, field, function, or other expression beneath the trace line.

   4th Dimension continues to display the current value of the expression or variable as you step through the procedure.

- Move the Trace line higher or lower in the window by dragging it with the Option key pressed, or pressing the Option key and clicking.

  Important: 4th Dimension's debug facility retains the name of all variables, fields, functions, and expressions you trace—even if you switch back to the Design environment and return to the Custom or User environment.

Leave the debugger

- To leave the debugger, click the No Trace button. If you have set any break points, they will continue to trigger the debugger.
- Click Abort to leave the debugger.

Chapter 5

Relational Structures

4th Dimension is a multiple-file, relational database. Creating the relations between files is entirely in the hands of the application developer.

This chapter covers the relational aspects of 4th Dimension, the process of linking files, and the different ways you can link files for different views of your database.

The role of multiple files

Multiple files and a relational database system allow you to create highly efficient database applications. By using multiple files, and by linking one file to another, you can approach the *ideal* condition of having to store data only once. Multiple files provide you with several practical advantages. With multiple files, you

- **Save time during data entry.** In an invoicing application, linking from the invoice file to the customer list file can provide you with a full customer address by using your entry of the customer's name and the linking routine in the layout procedure. You need manually enter only the details that are unique to the file you're working with.
- **Save storage space on disks.** 4th Dimension saves a record on a disk with each field containing the information you entered. Linked information displays through variables, not in fields, and displays only when the linking record is on the screen. When stored, the linking record saves a pointer to the information in the linked file—and does not save the possibly lengthy contents of the linked record itself.
- **Add flexibility to your application.** Different layouts and reports can show different relationships between the data in the various files. You get different views of your database, and greater understanding of the data.

What is a link?

For information on how to link fields in the structure window see Chapter 1, "Database Structures." See also "Using the Automatic Link," later in this chapter.

A **link** is the connection between files along which data flows from one file to the other. You can write data to a linked record, although when setting up a database, it's easiest to think of (and program) a link as a one-way flow. Figure 5-1 shows how a link appears in the Structure window.

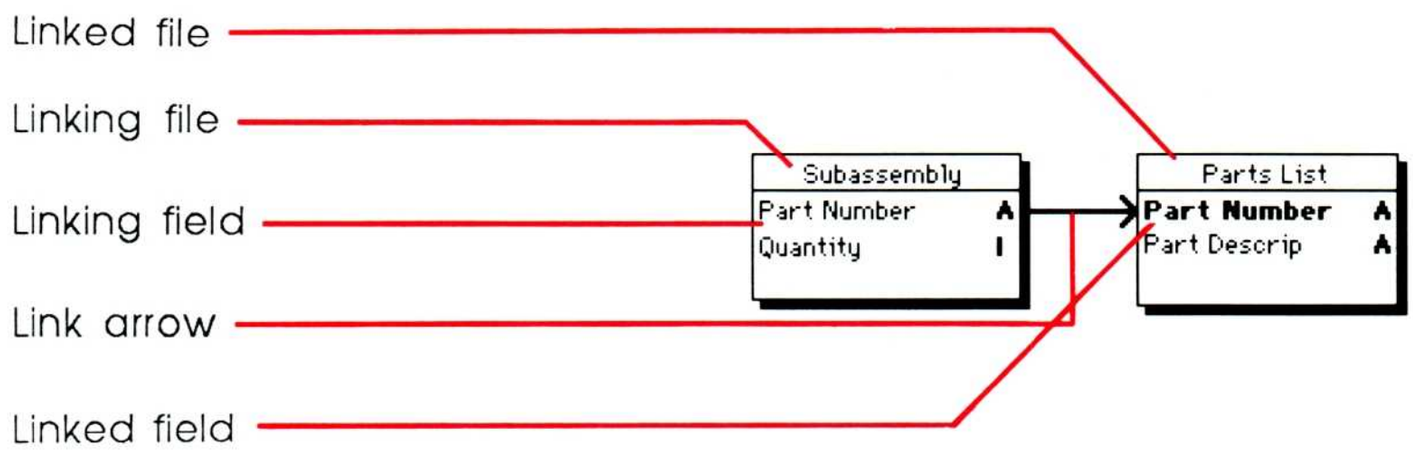


Figure 5-1
How a link appears in the Structure window

You can always tell a subfile from a linked file. A file connects to its subfile by a gray line that enters at the top of the subfile box. A file links to another file by a black arrow that connects from side to side. Figures 5-2 and 5-3 show the difference between a connection to a subfile and a link.

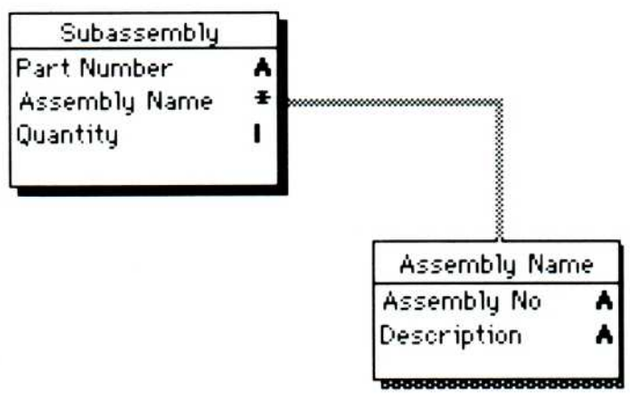


Figure 5-2
Connection to a subfile

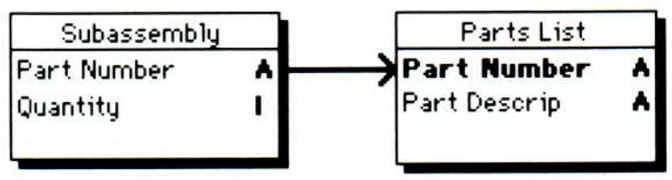


Figure 5-3
Link between files

Figure 5-4 shows what a link actually does. 4th Dimension uses the data you enter into the linking field in File1 of the diagram to locate the single record in the linked file—File2—that contains the data you want to transfer back to File1.

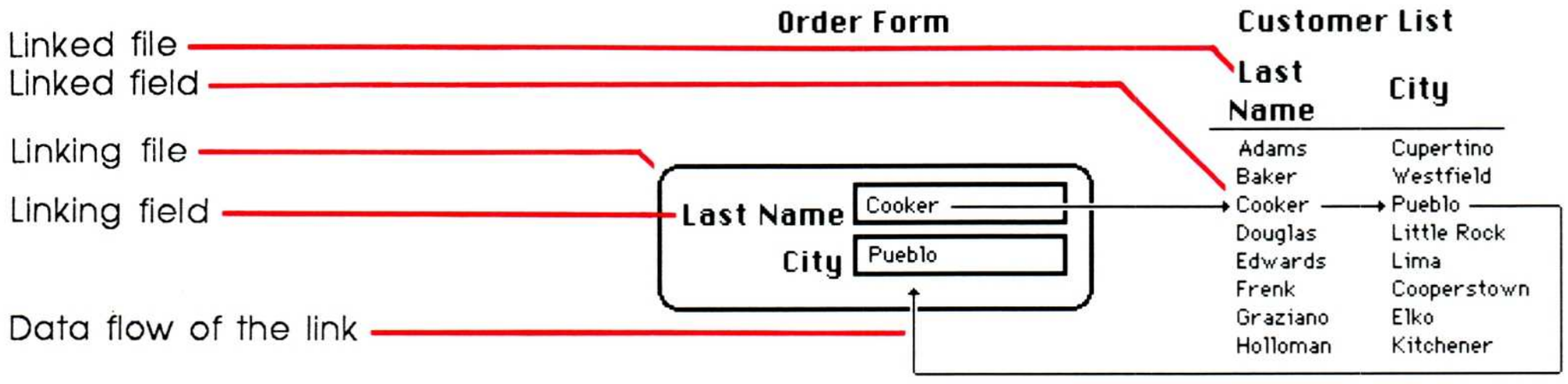


Figure 5-4
How a link works

In the Structure window, always draw the link arrow from the linking file to the linked file. The linking file is always the file whose layout procedure does the programmatic work of transferring the data from one file to the other. This is true even in the much less usual instance of the linking file updating data to (writing data *back* to) the linked file.

Important Draw the link arrow *from* the linking field *to* the linked field.

Another way of looking at this is to draw the link arrow from the field you want to inform to the corresponding field in the file containing the information.

In determining which direction to draw the link arrow, it helps some people to remember that when the application is working, the one record on screen in the *linking* layout must search among many possible off-screen records in the *linked* file to find the one that has the correct data.

Other people find it easier to think of one record in the *linked* file being tapped for its information by many different *linking* records.

In any case, the arrow goes from the linking field to the linked field, and the layout procedure of the linking file conducts the link.

Here are some other guidelines for linking:

- You must link fields of the *same type* only: Alpha to Alpha, Date to Date. You may *not* link an Alpha to a Real, for example.

Indexing and field attributes are explained in Chapter 1, "Database Structures."

- □ You *must* index the linked field. You *may* index the linking field. Giving the linking field a Mandatory attribute lets you create a linked record when none exists.

- ❖ *By the way:* Indexing the linked field is so important that 4th Dimension will do it automatically when you leave the Design environment for another environment, or to quit.

Drawing the link arrow in the Structure window causes 4th Dimension to keep track of the relationship between the two files. 4th Dimension maintains an internal pointer from the linking file to the matching record in the linked file.

To retrieve data from or update data to a linked file, you must write a layout procedure 4th Dimension User's Guide's programming language. The layout procedure of the linking file controls the link. 4th Dimension generates a *minimal* linking layout procedure for you when you create an **automatic layout** that incorporates a linked field. The minimal linking layout procedure does perform a link; but it may not do it in the most efficient way for your application.

An **automatic layout** is one where 4th Dimension positions the fields for you. See Chapter 2, "Layout Design Basics," for information on creating an automatic layout.

Types of links

There is only one way of linking and that is between files, but, there are different ways of combining parent files and subfiles and using the link arrow to achieve different results. With up to 99 simultaneously open files and up to five levels of subfiles; plus a virtually unlimited number of links, you can create complex database structures.

The combination of file, subfile, and link break down into five different configurations:

- □ File-to-file link
- □ Link via a subfile
- □ Link to another file's subfile
- □ Recursive link
- □ No link

File-to-file link

The file-to-file link is 4th Dimension's most common connection. Figure 5-5 shows a simple link where File1 reads the part description from File2, based on the part number that is common to both files.

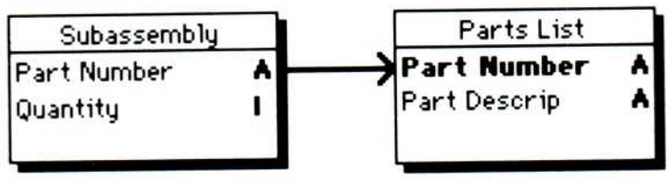


Figure 5-5
File-to-file link

Because of the link connection through the Part Number field, the part description is available to File1 once 4th Dimension finds the right part number in File2.

Link via a subfile

Figure 5-6 shows the structure of a salesperson's appointment calendar with an indefinite number of people stored in the subfile.

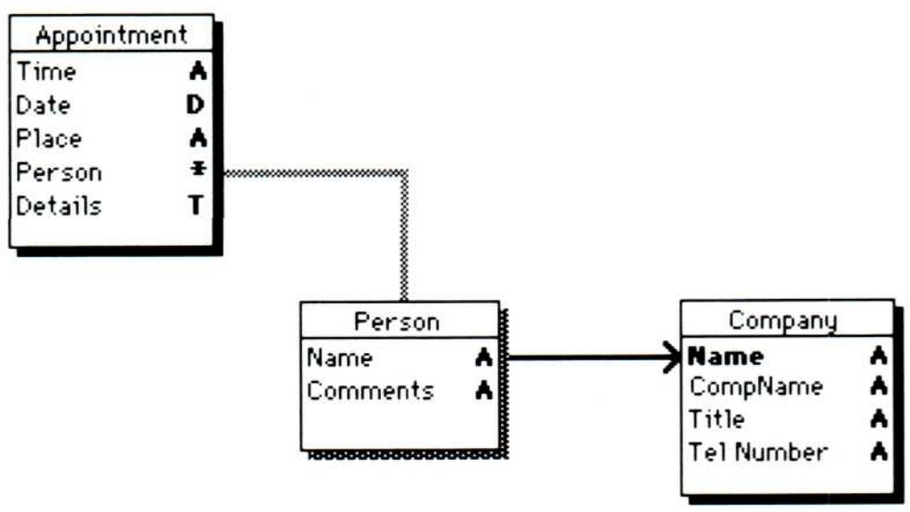


Figure 5-6
Link via a subfile

Linking via a subfile is a two-step process. In this example, the Appointment file displays its subfile (Person) in an included layout. The link from the Person subfile to the Company file takes place when you begin data entry in the included layout. Figure 5-7 shows this conceptually. You can also link from Person file to Company file when showing a Person layout on its own.

❖ *By the way:* To display an included layout on its own, without the surrounding layout, double-click it.

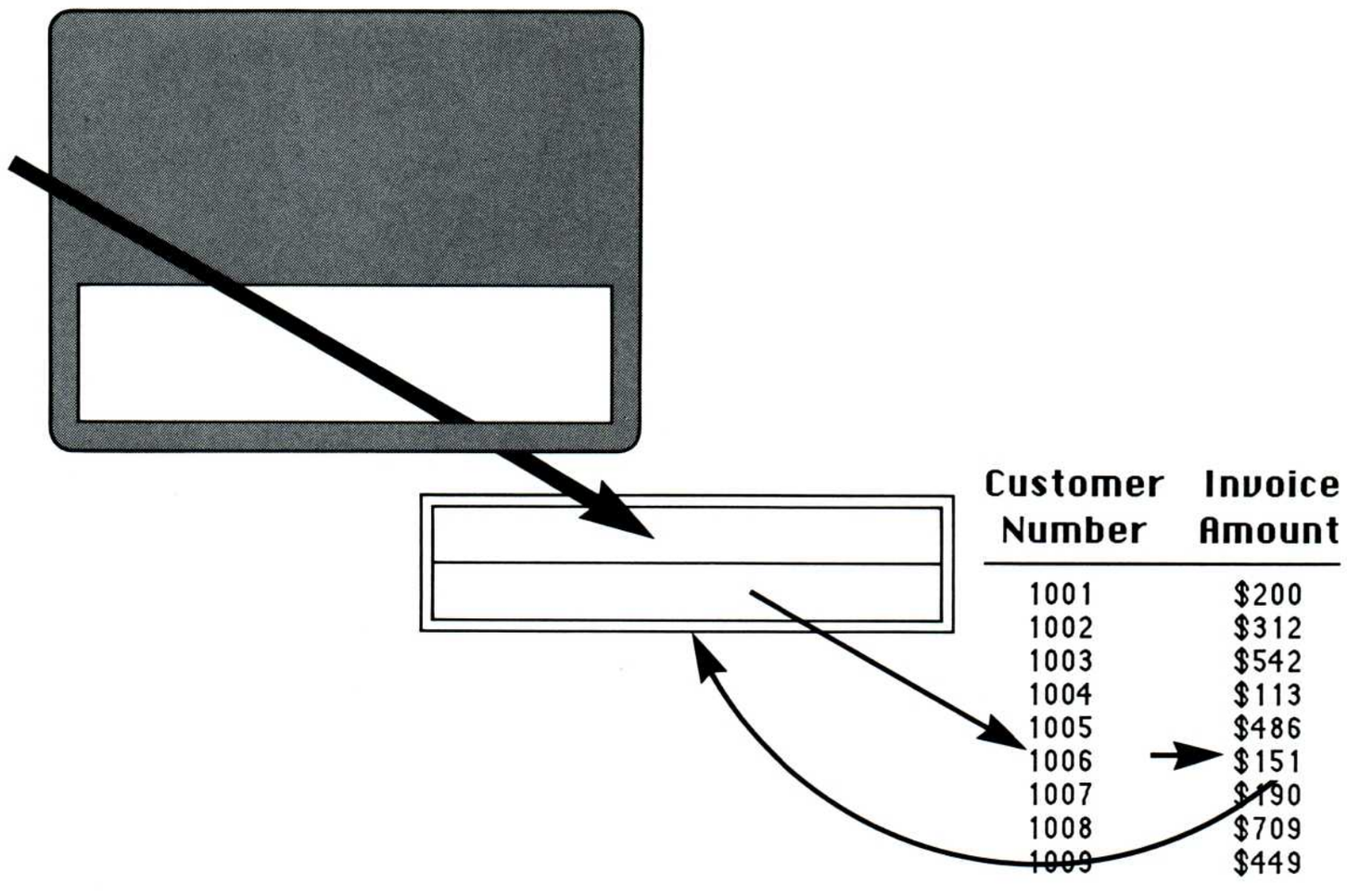


Figure 5-7
How the link takes place via a subfile

Link to another file's subfile

You may use a link to gain access to the data in another file's subfile, but only by linking to the other file first. You can link to another file's subfile by creating the link shown in Figure 5-8.

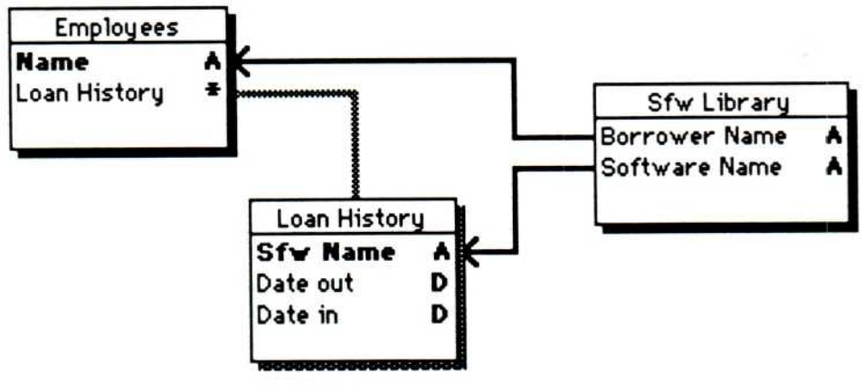


Figure 5-8
Linking to another file's subfile

To link from one file or subfile to another file's subfile, you must link to the other file as well. This is because you must first activate the link to the file before activating the link to the subfile.

Recursive link

A recursive link connects a record to another record in the same file. Figure 5-9 illustrates a typical use for a recursive link—a breeding history for horses. Other uses might be to record chemical compounds derived from other compounds, or genetically engineered organisms created from other organisms.

In the example, each horse has a name, a sire, and a dam. Each sire has a name, a sire, and a dam. Each dam has a name, a sire, and a dam—and so on.

Figure 5-9
Recursive link (link arrows show as small dots)

With the recursive structure, you can develop a report to show a particular horse's bloodline as far back as you care to maintain records.

No link

The final relationship between two files in the same database is no link at all. In the example in Figure 5-10, there is no reason to link the two files, one that keeps data on various farms and another that records statistics on corn growth.

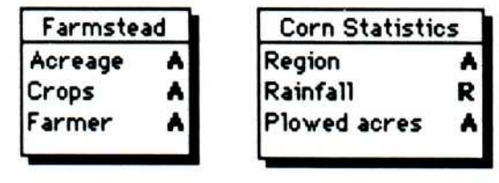


Figure 5-10
No link

Despite having no direct relationship between the files, a layout for the Farmstead file may display a listing of records from the Corn Statistics file and vice versa—perhaps for referral during data entry.

See "The Execution Cycle" in Chapter 4, "Procedures," and *4th Dimension Programmer's Reference* regarding layout procedures, the execution cycle, linking, and variables.

The automatic link procedure

If you have included linked fields when 4th Dimension creates an automatic layout for you, 4th Dimension will also automatically create a linking procedure for the layout. The linking procedure that 4th Dimension creates includes the command **LOAD LINKED RECORD** and a variable (or variables, depending on how many linked fields you include in the layout) to contain the data from the linked record. The variable 4th Dimension creates also appears in the layout.

The variable names 4th Dimension creates during the automatic link are arbitrary and designed to prevent contention with more meaningful variable names you may create.

4th Dimension uses the Listing editor in the Procedure window to create the automatic link procedure.

- *By the way:* If you want to produce a linking layout procedure in the *Flowchart* editor without the automatic link procedure—and its use of the Listing editor—build your layout yourself, and then create a layout procedure in the Flowchart editor to do the linking. If you elect to use an automatic layout and include linked fields, 4th Dimension will *always* use the Listing editor.

The automatic link procedure is just enough to do the job of linking two files.

4th Dimension creates the automatic link procedure at the same time it creates the automatic layout that displays the link. Both the Layout window and the Procedure window will be on the screen at the same time, with the Procedure window active.

You need not always use the automatic link procedure. You may create a layout and display variables on it, at any time, then create a layout procedure—either in the Listing or the Flowchart editor—that performs the link.

Important 4th Dimension will create the necessary procedure statements for loading the linked record and displaying the requested fields from the linked file (through variables) in the layout. To update the linked record, or perform any other operations, you must modify the procedure.

Using the automatic link

You can understand the linking process best through example. Consider a Master Parts file and the pick ticket that tells a worker which parts to take from inventory. These files might be part of a larger inventory management system.

Structure and linking

The Master Parts file lists part numbers and a description of each part for which there is a number. The Pick Ticket file lists Part_Number—the linking field—and the quantity required for any one "pick." It is the Pick Ticket file that will transfer the data; the Pick Ticket file is the *linking* file in this example.

See Chapter 1, "Database Structures," for the steps required to create files, set field types, and draw the link arrow between linking and linked fields.

For simplicity, even the numbers in this example are Alpha fields and all Alpha fields are 20 characters in length. In practice, the linking field and linked field must be of the *same* type, but may be *any* type except Picture fields or fields of type Subfile.

To create the two files in this example, you must start in the Structure window. Figure 5-11 shows how these two files appear.

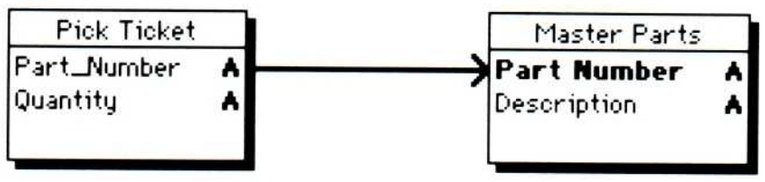


Figure 5-11
Master Parts file and Pick Ticket file

There are several points to note about the structure of this simple database:

- The Pick Ticket file is the linking file, and the Master Parts file is the linked file. This is because our application will produce many pick tickets that always refer to the same list of parts and descriptions in the master file. Individual pick tickets will "look up" the part description data in the Master Parts file.
- The Part_Number and Part Number field names are slightly different. 4th Dimension allows you to use the same field name in different fields, but it will be easier *for you* to tell them apart if they are different in some way.
- The Part Number field in the Master Parts file is Indexed; 4th Dimension shows it in boldface. A linked field must be Indexed.
- The Pick Ticket file contains no field for part description. The Pick Ticket layouts will read any description from the Master Parts file, and place the data in a variable.
- The link arrow extends from Part_Number in the Pick Ticket file (the *linking* field and file) to the Part Number field in the Master Parts file (the *linked* field and file).

Important 4th Dimension will automatically index the linked field for you if you leave the Design environment without doing it yourself.

Input layout for the Master Parts file

The Master Parts file is simply a list of part numbers and their corresponding descriptions. The input layout for the Master Parts file is equally simple: an automatic layout that contains the two fields. You create a layout in the Layout window.

Figure 5-12 shows what such a layout might look like.

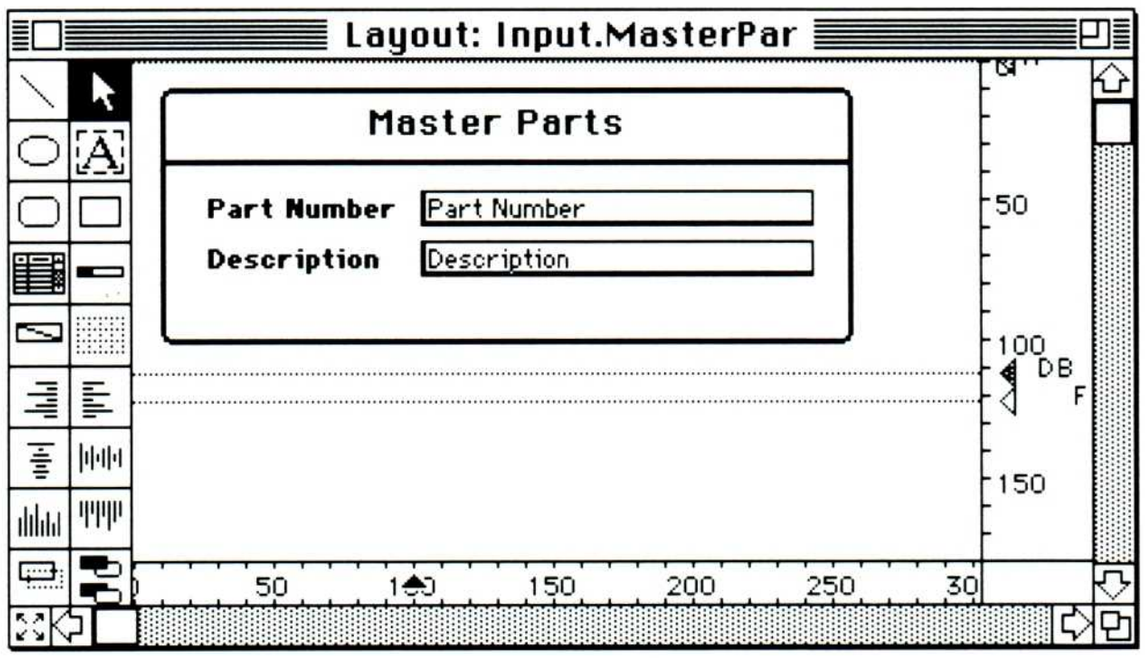


Figure 5-12
Input layout for Master Parts file

Output layout for the Master Parts file

The output layout for the Master Parts file also shows the part number and description for each record. As shown in Figure 5-13, the output layout is a single line. Several such single-line records create a table effect.

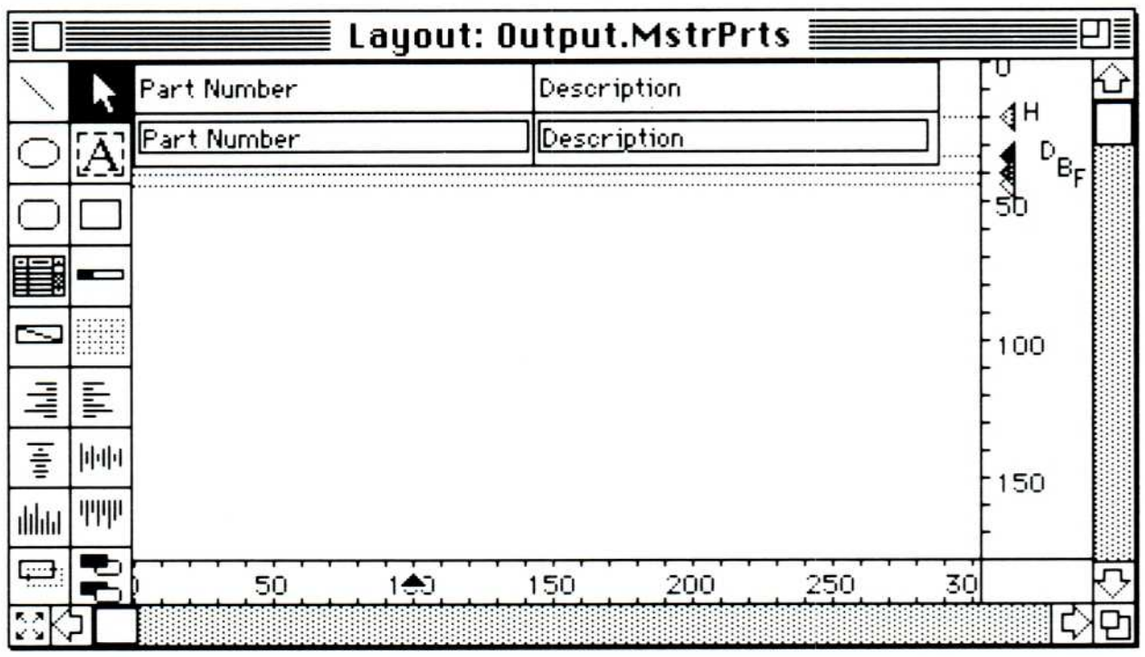


Figure 5-13
Output layout for Master Parts file

Entering Master Parts file records

At this point in the example, you may wish to enter data into the Master Parts file.

Switch to the User environment and enter some data similar to that in Figure 5-14, the User output screen for the Master Parts file.

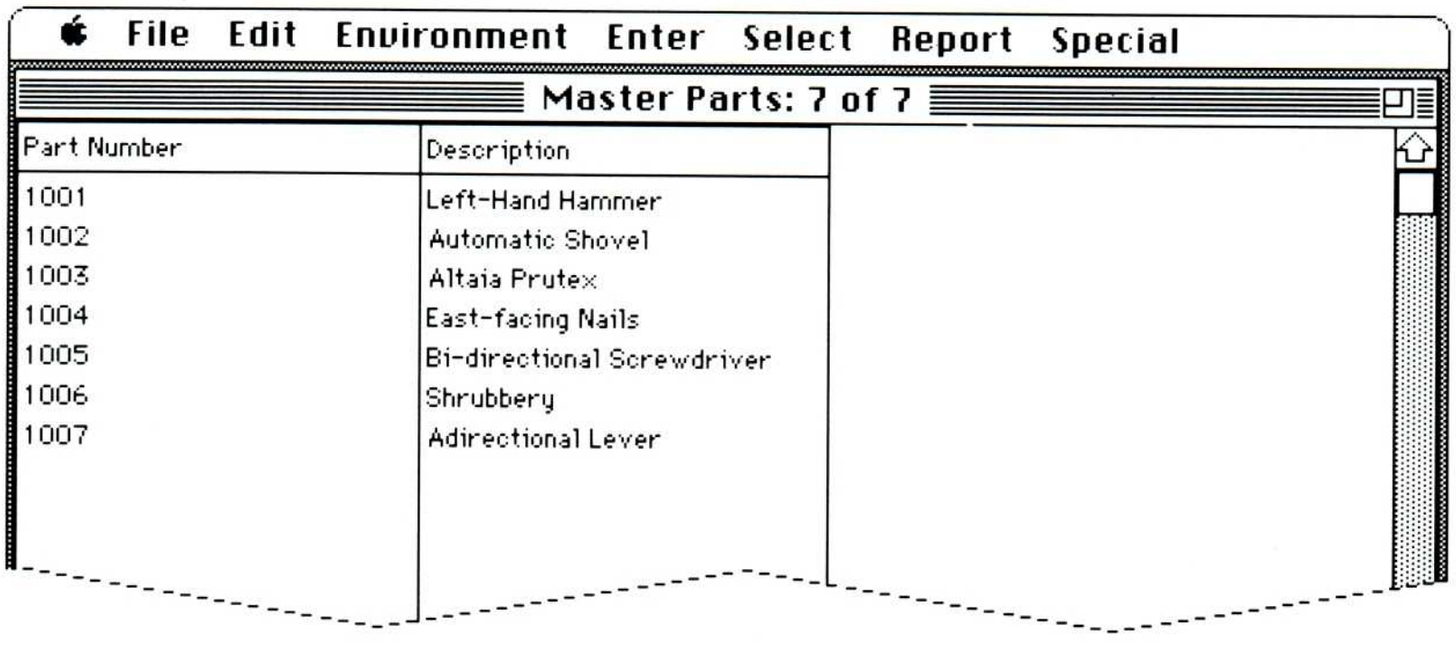


Figure 5-14
User output screen for Master Parts file

When you've finished, switch back to the Design environment.

Important Do not enter duplicate part numbers in the Master Parts file for this example. 4th Dimension does provide a trap for this condition. See the section "Linking to 'Duplicate' Records," later in this chapter. If you don't use the trap, 4th Dimension simply links to the first record it locates.

Pick Ticket file layouts

Preparing the layouts for the Pick Ticket file is more complex than for the Master Parts file—you must consider which fields you want to use from the Pick Ticket file, and which fields you want to use from the Master Parts file.

Figure 5-15 shows how 4th Dimension displays fields for the file whose layout you are creating, and how it shows you which fields are available from the file to which it links. Fields that belong to the *linked* field (in this case, the Master Parts file) are indented beneath the linking field name.

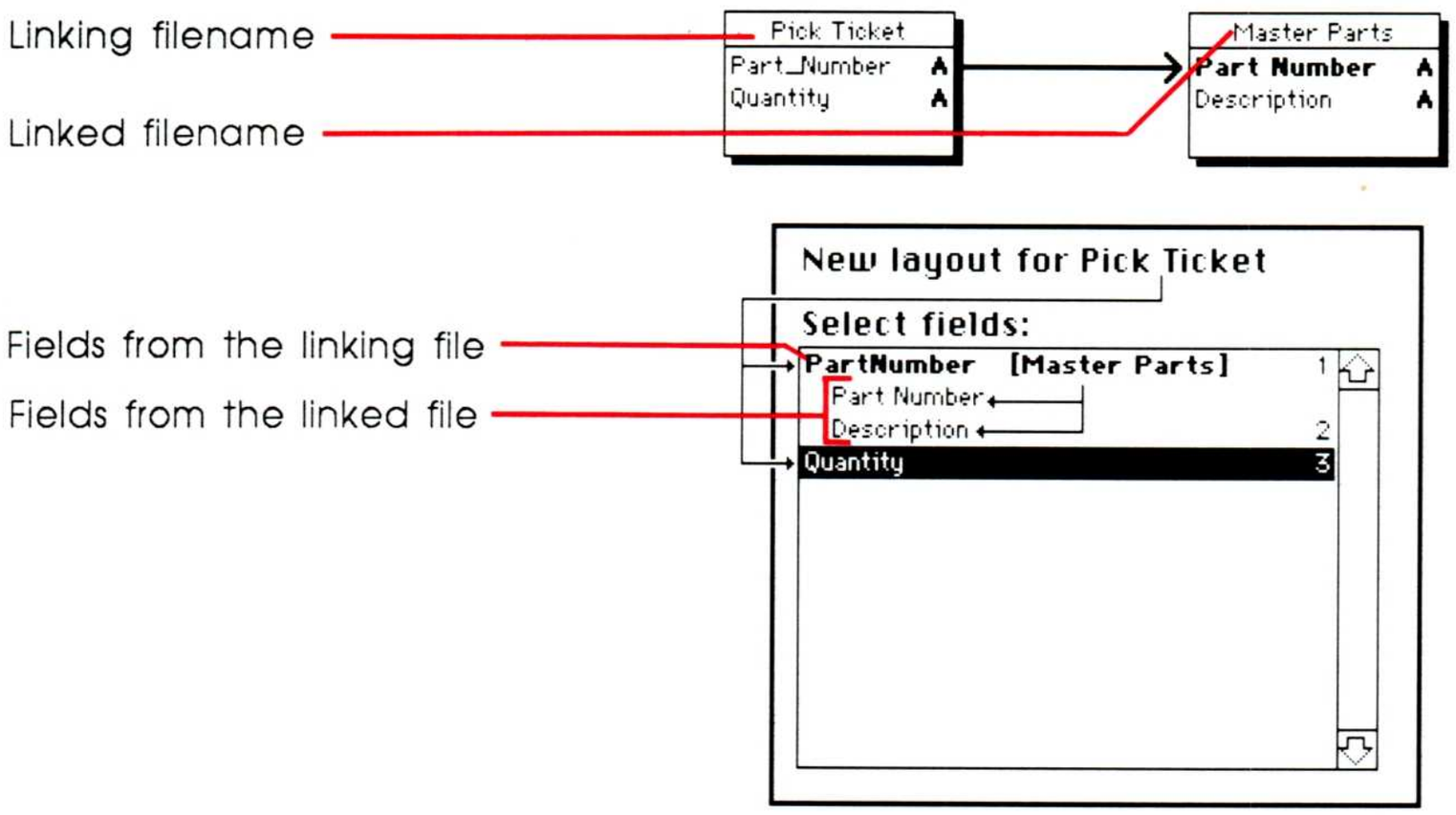


Figure 5-15
Relationship of fields in a layout to the overall database structure

Indented field names belong to the file enclosed by brackets (the linked file). Flush-left field names belong to the file for which you are creating the layout—named in the New layout dialog box title. Boldface indicates the linking field names. The numbers (1,2, and 3) indicate the order in which the fields will appear in the layout. Note that the layout takes its field 2 (part description) from the linked file.

Input layout for the Pick Ticket file

When you create a layout and specify that the layout use a field from a linked file, 4th Dimension will automatically generate a layout procedure to perform the linking. Figure 5-16 illustrates the New layout dialog box for the input layout (Pick Request) for the Pick Ticket file.

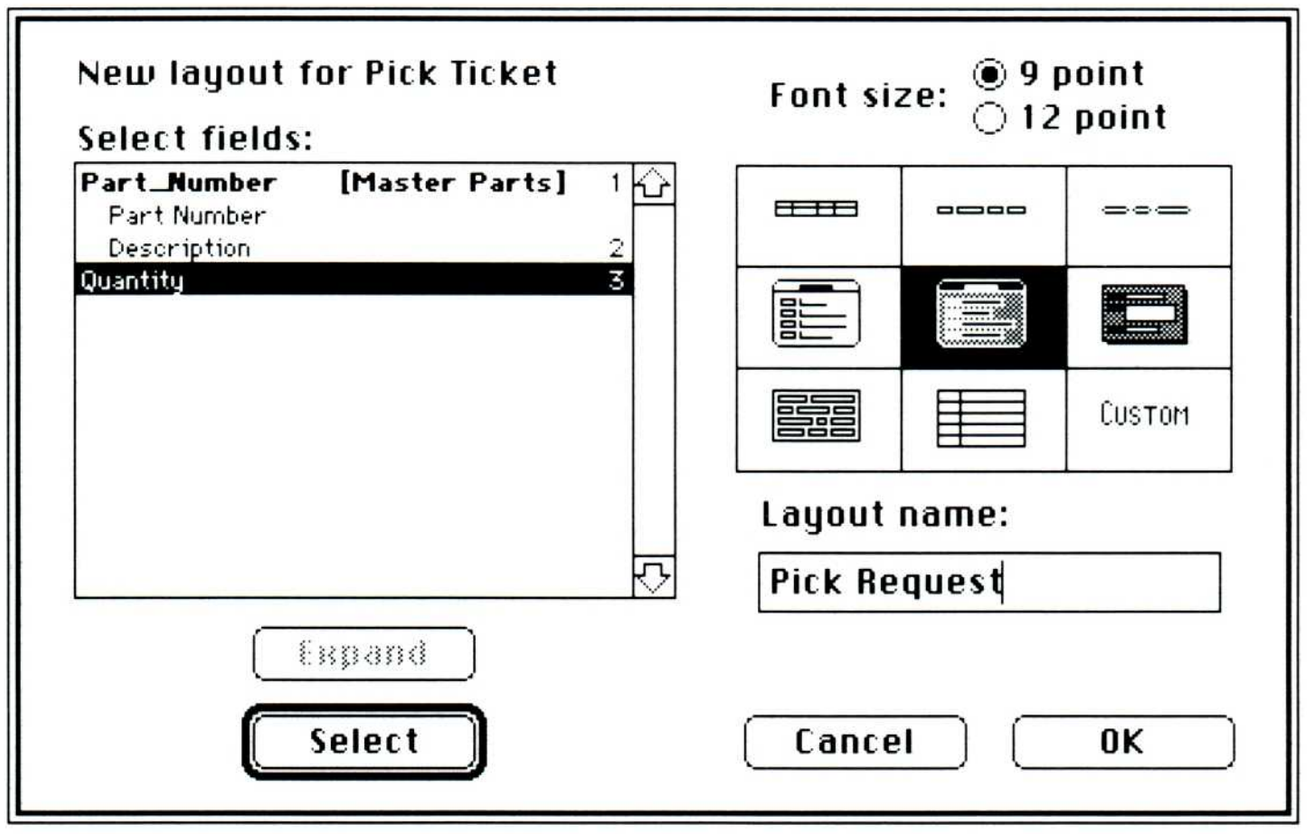


Figure 5-16
New layout dialog box for Pick Request layout

Automatic layout procedure

When you click OK in the New layout dialog box, 4th Dimension displays its Layout window with the automatic layout, and then displays its Procedure window (using the Listing editor) and the automatic linking procedure.

Figure 5-17 shows 4th Dimension in the Design environment, displaying the Structure window, the Layout window, and the Procedure window with the automatic link procedure that it produced for you. 4th Dimension will automatically create and name the variable.

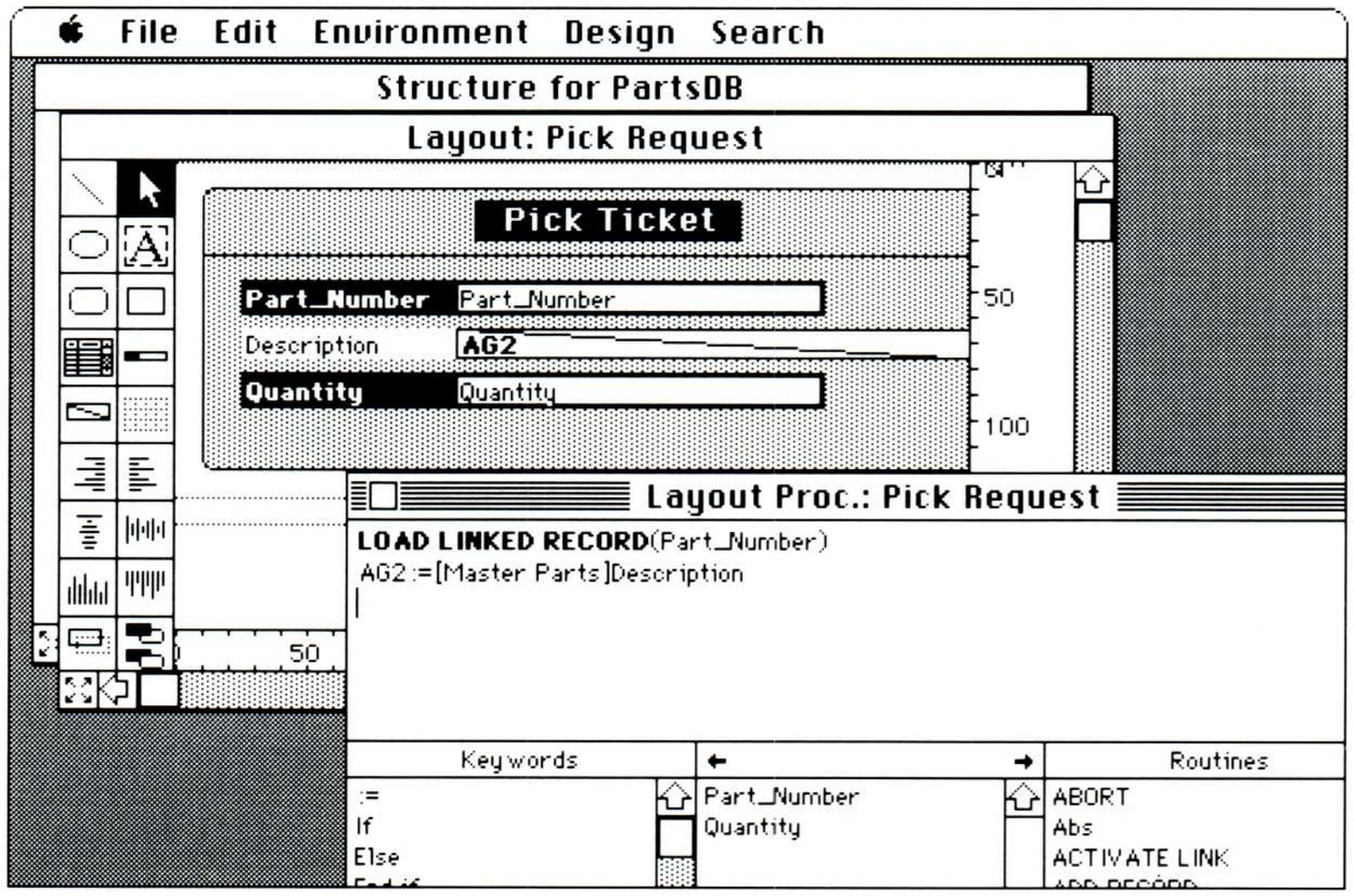


Figure 5-17
Pick Request layout and link procedure

Output layout for the Pick Ticket file

The output layout for the Pick Ticket file uses the same fields in the same order as the Pick Request (input) layout; but the format of the layout is a single line to produce tabular output. Figure 5-18 shows the New layout dialog box for the Pick Ticket List (output) layout.

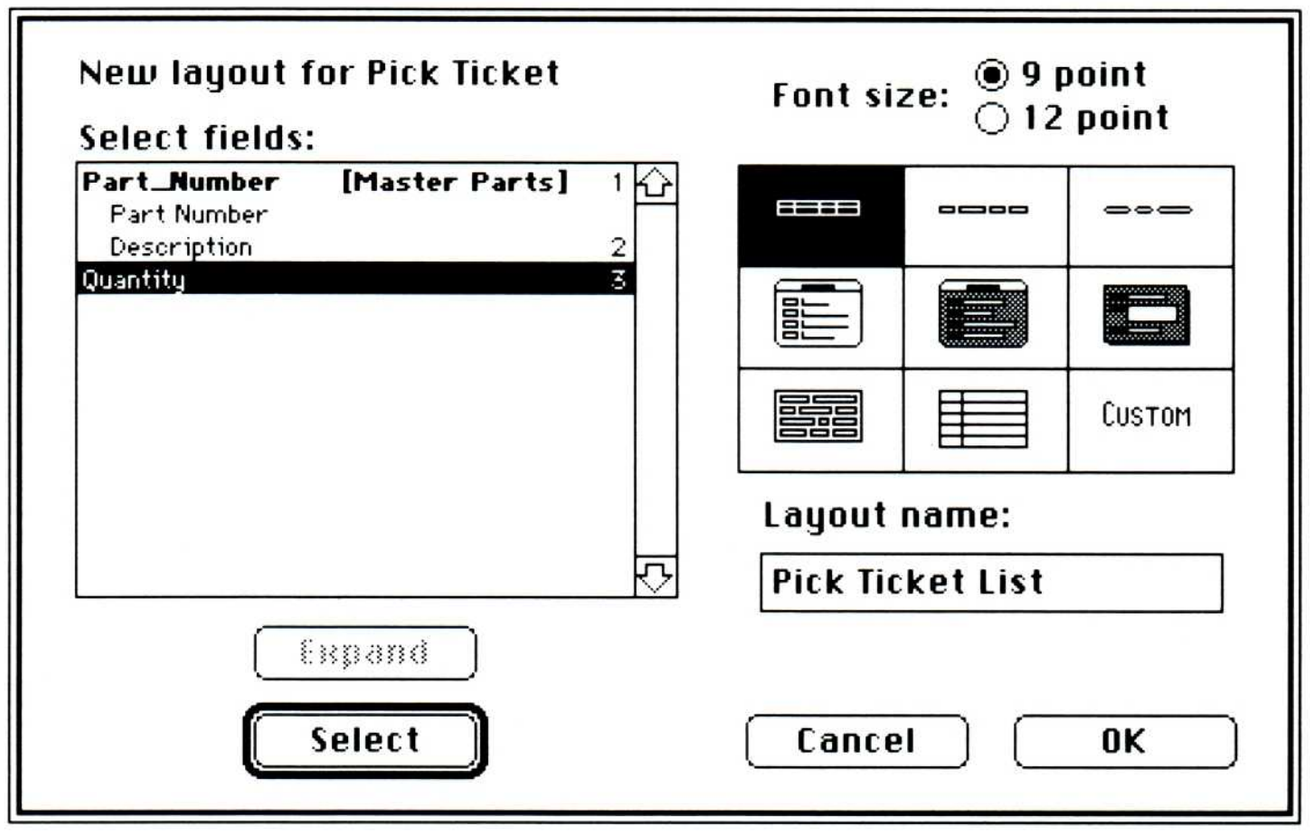


Figure 5-18
Pick Ticket List layout for Pick Ticket file

Automatic link procedure for the Pick Ticket List

When you click OK on the New layout dialog box, 4th Dimension again creates a layout and a link procedure automatically. The automatic layout procedure that 4th Dimension creates for the Pick Ticket List layout is the same as it produced for the input layout.

Figure 5-19 shows the Structure, Layout, and Procedure windows for the Pick Ticket output layout.

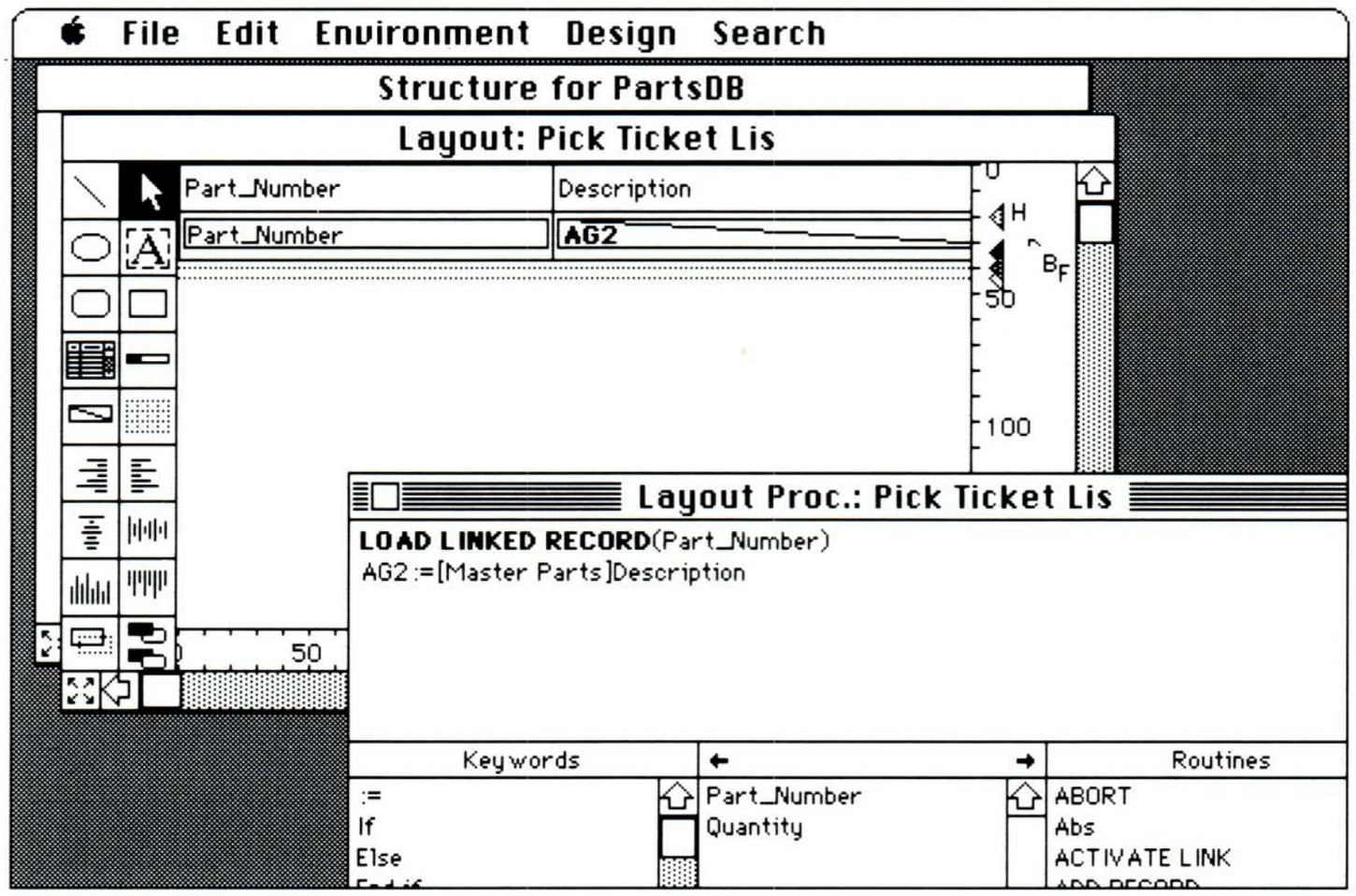


Figure 5-19
Automatic output layout and link procedure

Entering pick tickets

At this point, you may switch to the User environment and enter some number of entries into the Pick Request layout. For this example, enter only part numbers that you know exist; you may enter pick requests for the same part number more than once. Figure 5-20 shows how the Pick Request layout appears on the screen.

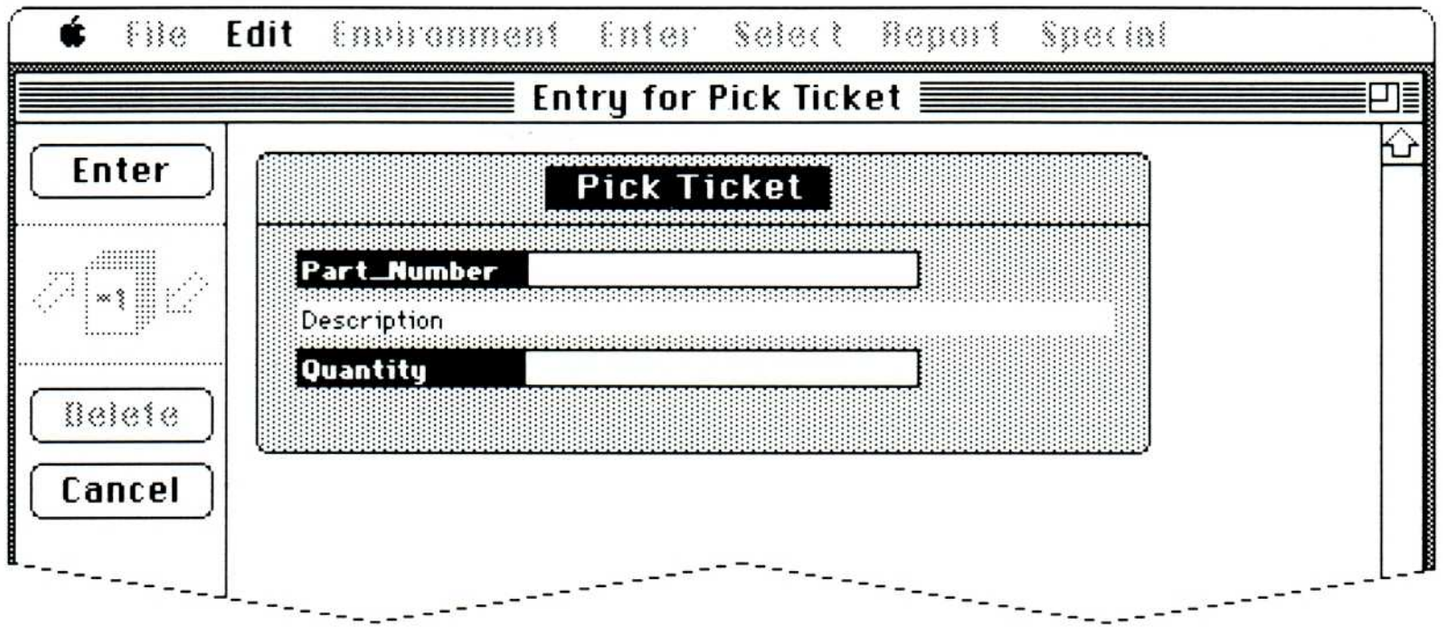


Figure 5-20
How Pick Request layout appears on screen in User environment

For details on how to enter data into layouts, see Chapter 3, "Basics for the User Environment."

When you have finished entering pick requests, click the Cancel button while 4th Dimension is displaying a fresh, empty layout. 4th Dimension will display the User output screen; in this case, the Pick Ticket List layout.

Important As this example exists, if you enter the part number for a part that does not exist, 4th Dimension simply fails to link or assign any value to the description variable. If you wish to trap this condition, give the linking field a Mandatory field attribute. Then, when you enter a non-existent part number, 4th Dimension will warn you "That record does not exist. Do you want to create it?" If you do, 4th Dimension will display the default input layout for the linked file, allow you to create the new record, and then return you to the input layout for the default file.

You may also find that there are duplicate records in the linked file. 4th Dimension provides a trap for this condition, too. See "Linking to 'Duplicate' Records," later in this chapter.

Pick Ticket List

Figure 5-21 is a listing of pick ticket entries. For each part number, the layout procedure obtains the part description from the Master Parts file.

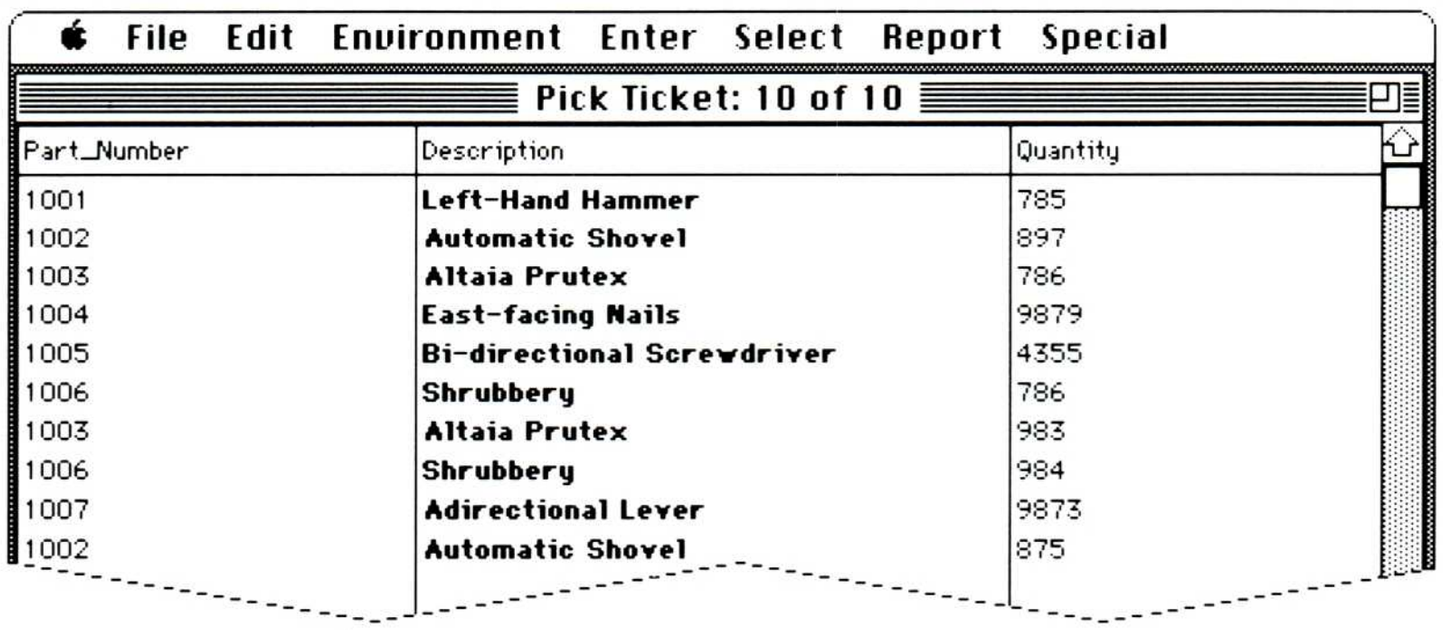


Figure 5-21
Pick Ticket List layout appears as table of data

Efficiency versus utility

An efficient database avoids storing data twice. In the Pick Ticket example, the Pick Request and Pick Ticket List layouts always read the part description from the Master Parts file. You can produce a Pick Ticket layout that is indistinguishable from one actually carrying the part description in each record.

You may create linked records where the information is actually transferred, rather than just displayed in a variable. Replace the variable that 4th Dimension provides, with the name of a new Pick Ticket field named Part Description. However, this would be inefficient for two reasons:

- Using many pick tickets will cause you to replicate the same part description many times. *Every* pick ticket record for part 1003 would store the 13-character string Altaia Prutex. This takes up extra room in memory and on the disk (not to mention defeating the purpose of a multiple-file, relational database: flexibility).

- If the name or description of the part changes, or if one part replaces another part, you would perhaps have the problem of changing numerous records.

You the developer must weigh the efficiency of displaying data in other files, through variables, against the users' application. For example, in the Pick Ticket example as shown, *you cannot sort the part descriptions alphabetically* in the Pick Ticket file.

The reason should be clear: The part descriptions come from another file and only mirror their part numbers. Sorting the Master Parts file alphabetically does not help; the sort order of the Pick Ticket file remains unchanged.

Linking to "duplicate" records

Many times you may use another file as a giant "look-up" table. Based on a value in the field of a record in one file, you'll want a procedure to return (hence to "look up") a value from a particular record in another file.

This is the essence of linking between files: The value in a field in one file gives you access to the values in many fields of the linked record.

The Pick Ticket example earlier in this chapter uses the value in the Part_Number field in the Pick Ticket file to look into the Master Parts file for a part number that corresponds to the one entered by the user. When the part numbers match, the linking procedure returns the value in the description field as a variable.

Figure 5-22 graphically illustrates a similar example of looking up a link. Here, the Last Name field in the Order Form file is the linking field. It links to the Last Name field in the Customer list file. Because the last name of each customer in the Customer List file is unique, the layout procedure in the Order Form file immediately retrieves the only City name possible, and places that name in the variable called City in the Order Form layout.

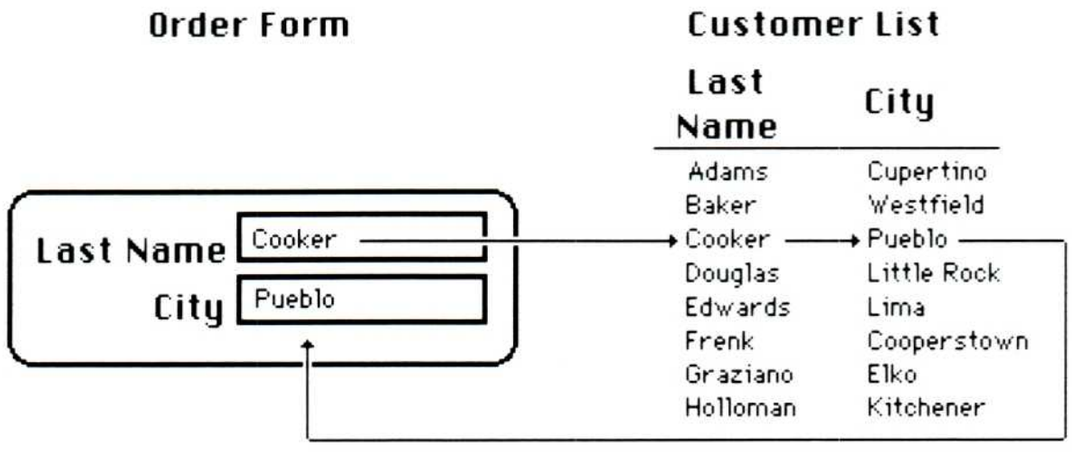


Figure 5-22
Order Form and Customer List files

However, all your applications may not be so orderly. Linked files may not always have unique field values against which you can match the value of a field in another file. You may find yourself trying to link to duplicate records.

For example, consider an application where there are hundreds of customer names in the list. Almost certainly there will be some duplicate names. In such a case, the Last Name of the Order Form will not correspond to only one customer record in the Customer List file. Yet 4th Dimension must link between a single linking record and a single linked record. Figure 5-23 shows the problem with multiple records.

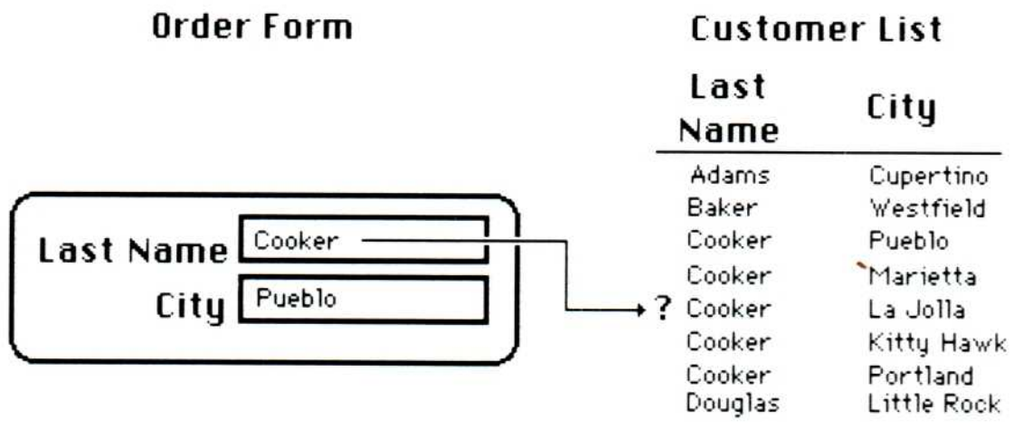


Figure 5-23
A problem with duplicates

You can resolve the problem by using the second parameter to the **LOAD LINKED RECORD** command. This activates 4th Dimension's Selection window.

The Selection window displays the *potential* linked fields that match the data in the linking field, and makes it possible for you to select from among them. By adding the second parameter to the **LOAD LINKED RECORD** command, you determine what data the Selection window displays in addition to the data in the linked field. Figure 5-24 shows graphically how the Selection window interposes itself between the linking record and the linked record.

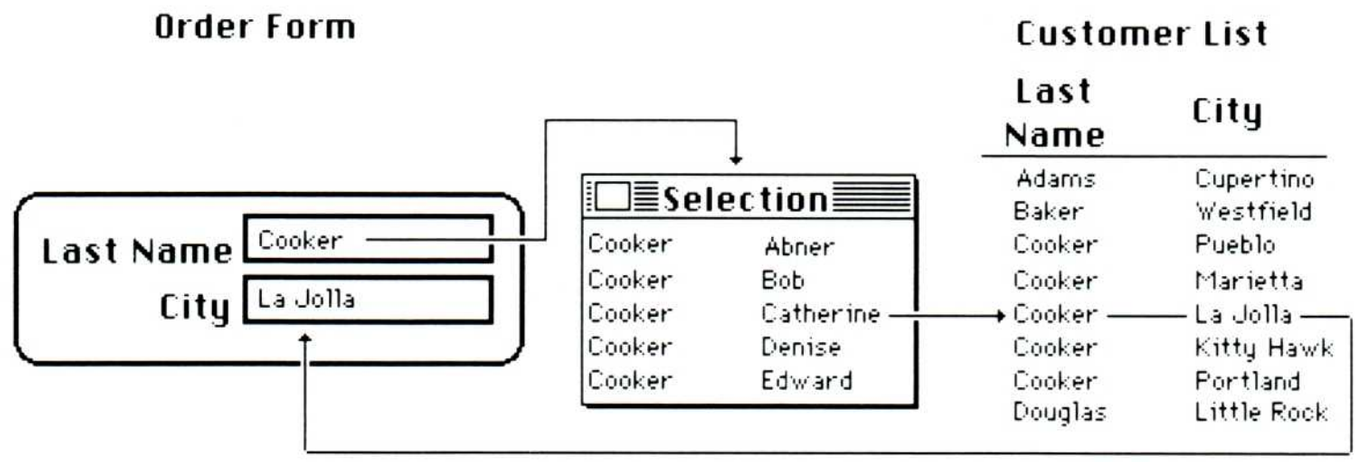


Figure 5-24
Selection window

To be able to use the Selection window, you must use the second parameter to **LOAD LINKED RECORD** command.

LOAD LINKED RECORD parameters

The **LOAD LINKED RECORD** command takes two parameters. The first is the filename and the field name of the linking field. The value of the linking field is the value that the layout procedure uses as a way to find the correct record in the other, *linked,* file.

The second parameter is the filename of the linked file and the field name of the field you wish to display in the Selection window. The second parameter need not be the name of the field to which the linking field points; it should be a field that will help the user identify which of the duplicate records is the correct one.

Using the Selection window

In both the User and Custom environments, you may call on the Selection window to clear up any ambiguity about linking records. If you have used the second parameter, 4th Dimension will automatically display the Selection window when the user's entry fails to point to only one possible linked record.

When entries are too numerous to fit the fixed size of the Selection window, the window displays an active scroll bar.

Another way to display the Selection window in either the User or Custom environments is to enter the at sign (@) in the linking field. The @ sign acts as a wild card character; you may use it with other characters to limit the choices that the Selection window displays. For example, if you enter

```
Ana@
```

the Selection window will display all linked values corresponding to Anaconda, Analog, Analysis, and so on. The @ sign alone will call up a scrolling Selection window that displays every entry in the linked file.

To select one of the values in the Selection window, point and click. 4th Dimension will enter it into the proper field for you.

Chapter 6

Creating a Custom User Interface

This chapter covers the user interface features in 4th Dimension over which you have control. These include

- Custom menus
- A selection of boxes and window types
- Using buttons, check boxes, and scrollable lists
- Included layouts
- Pictures and graphing
- Security systems

Apple's *Human Interface Guidelines* will help you create custom applications that conform to the desktop metaphor. It's available from Apple Programmer's and Developer's Association.

You should bear in mind that any application's user interface should be part of a ***planned and consistent system of control.*** You the developer must plan the system for your own custom application.

To this end, the desktop user interface provides a universe of menus, commands, boxes, and buttons. No one feature is entirely appropriate for controlling every type of action you may wish to program. It is difficult to discuss the overall interaction of all the elements of a user interface system without discussing a specific application. Consequently, this chapter supplies rules of thumb and suggestions, rather than directions to "do it this way."

❖ *By the way:* Applications for the custom environment and applications used under the runtime system will work identically.

How elements of the user interface work together

There is a synergy between custom menus, layouts, and procedures. They work together in the Custom environment to create an application that is virtually indistinguishable from a program written in a programming language such as Pascal or C.

A **menu bar** is the list of pull-down menus at the top of the screen. A **menu** is the list of commands that you can "pull down" from the menu bar.

The key that unlocks the Custom environment is the custom menu. You must create at least one **menu bar** holding at least one **menu** in order to switch to the Custom environment.

Important To switch to the Custom environment, to set Preferences to start an application in the Custom environment, or to create an application that will work with the 4th Dimension runtime system, you must create at least one menu bar holding at least one menu. Menus allow access to the Custom environment.

Menus generally control access to the different functions of a custom application (Inventory Report, List All Employees). Buttons generally control layouts (Save, Cancel). Because the functioning of the custom application focuses on menus and layouts, 4th Dimension's password security controls those two elements.

Custom menus

The term *custom menu* refers to one or more pull-down menus located in the menu bar at the top of the screen.

See "Default Menus" later in this chapter.

You create custom menus for your application in the Menu window of the Design environment by using the Menu editor. You may not alter or remove the Apple menu or the Edit menu. You may change the name of and alter the default File menu, but this is not recommended. (The File menu is where people look for the Quit command.)

Use custom menus to control the major functions of your database application. Each custom menu command may call a global procedure. Depending on your own programming, menu commands may lead to an immediate action, may display a dialog box or alert message, may display a layout, or may take any other action you wish to program.

Generally speaking, there are two uses for custom menus:

- **Custom menu commands do something.** They cause an activity to take place. For example, a menu command might be Sort by Weight. The menu command calls a sorting procedure.

- **Custom menu commands specify an attribute.** For example, "18-point type." The menu command calls a procedure that sets the type size. A checkmark on the menu command signals that an attribute is in effect. You must place that checkmark there with a 4th Dimension programming command. Attributes stay in effect until a user changes them.

❖ *By the way:* Generally, menus control functions and buttons control layouts. There is no specific prohibition against using menu commands to control layouts. However, custom menus are not available in the User environment—4th Dimension supplies its own set of generic database menus there. If you expect that your application may be used in both the Custom and the User environments, do not use menus to control layouts.

Figure 6-1 shows a menu with many features. You would not use most of these features on the same menu.

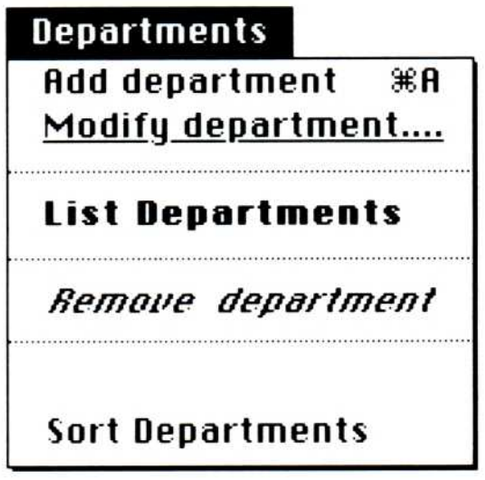


Figure 6-1
Menu with many features

Default menus

4th Dimension automatically provides an Apple menu, a File menu, and an Edit menu. Of the three, only the File menu appears in the Menu editor. The Apple menu (desktop accessories) and the Edit Menu (cut, copy, and paste) are not altered by 4th dimension.

Quitting from a custom application

For each new menu bar, 4th Dimension supplies a default File menu consisting only of the command Quit. (You may add to this menu.) The Quit command has no associated procedure. *Any* custom menu command without an associated procedure also acts as a quit.

Important Any custom menu command without an associated procedure acts as a quit command.

What happens when you quit a 4th Dimension custom application depends on whether you are using a development or runtime system, and depends on your password.

- In the development system, with no password system set up, you'll quit to the User environment. You may operate in the User environment, switch to the Design environment, or quit the program.
- In the development system, with a password system set up, and having logged on with the main password, you'll quit to the User environment, just as with no passwords.
- In the development system, with a password system, and with a password *other* than the main password, you'll quit to the Finder. You cannot reach the Design environment from a custom application that uses passwords unless you have the main password.
- In the runtime system you always quit directly to the Finder.
- In the development system, if there is no startup procedure associated with the logon password, the user can switch to the User environment but not to the Design environment. To prevent even entering the User environment, give the password the name of a non-existent, "dummy" startup procedure (like "x").

The main password is the topmost level of password. All files and environments are open to the user of the main password. Passwords and startup procedures are detailed in the "Passwords and Security" section later in this chapter.

4th Dimension's Menu editor

You create and edit menus in groups called menu bars. A menu bar is the collection of menus that fits at the top of one screen. A 4th Dimension database application may have up to 32,767 menu bars of menus.

Important You may create more menus than will fit in a single menu bar but if you do it prevents you from using those menus that extend off the right side of the screen. Plan your application and its system of menus so that a maximum of seven or eight menus (depending on length) belong to any one menu bar.

4th Dimension automatically numbers menu bars in the order you create them, starting with Menubar #1. 4th Dimension begins a custom application by displaying Menubar #1 unless a startup procedure calls for some other menu bar. You may delete menu bars, but you may not insert one into the list or change their order. When you delete a menu bar, 4th Dimension automatically renumbers the menu bars *after* the one that you deleted.

Warning Procedures and programming commands always refer to numbered menu bars. 4th Dimension renumbers menu bars when you delete one. *You* must check any procedure that refers to the menu bar you delete *or to any of the later menu bars in the menu system.* Make sure that procedures still call the correct menu bar. 4th Dimension will not "clean up" menu bar references for you.

Parts of the Menu editor

The Menu window displays the Menu editor. The editor shows the menus for one menu bar at a time. When you select one of the menus, the editor shows the component commands for that menu. Figure 6-2 illustrates the Menu editor.

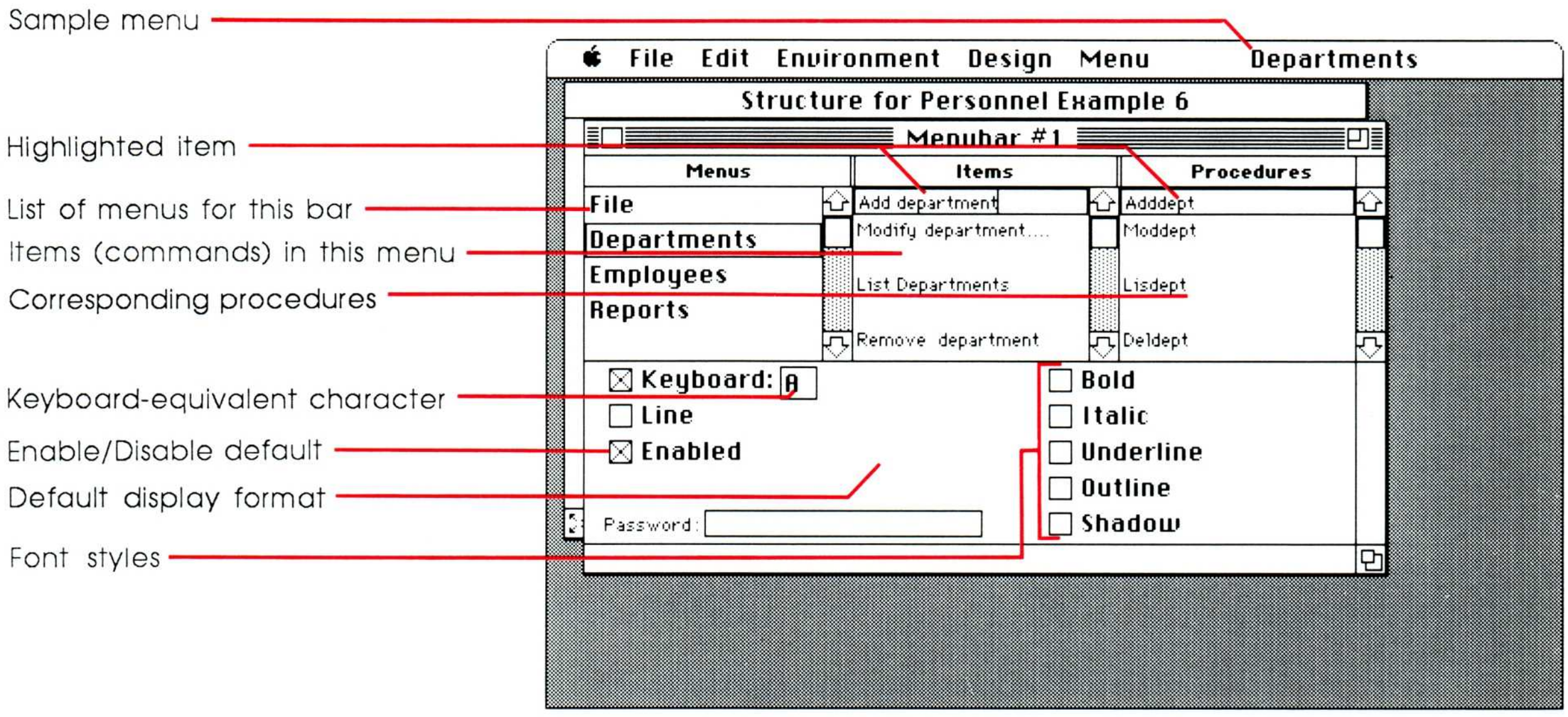


Figure 6-2
Menu editor

The Menu editor has five parts:

- **List of menus:** The Menus list displays the names of all the menus in the menu bar you're editing. Neither the Apple nor the Edit menus are ever included in the Menu editor, but will appear on the actual menu bar. 4th Dimension includes a default File menu, which consists of a Quit command and no corresponding procedure.
- **Items in selected menu (commands):** The Items list displays the commands available from the highlighted menu. It scrolls independently of the list of menus.

- **Corresponding procedures:** The corresponding procedures area lists the names of the global procedure that each menu command calls. Each menu command may call one global procedure or may call no procedure. A command that calls no procedure acts as a quit. The name of a procedure may be different than the name of the menu command that calls it.
- **Settings:** The settings area determines the type style of the menu command, the applicable password if any, and whether the default condition for the command is enabled (black), disabled (gray), is a line between commands, or has a keyboard-equivalent command (such as Command-Q for Quit).
- **Sample menu:** The sample menu appears at the right side of the menu bar that the editor itself displays. It shows you what the menu you're creating will look like.

Menus and procedures

Each menu command must call a global procedure or no procedure at all. Several commands may call the same procedure (although this is usually redundant, your application may require such a capability).

Commands that call no procedure act as quit commands.

See Chapter 4, "Procedures," for details on how layout procedures and global procedures may call each other.

When a command calls a global procedure, that procedure acts as a "main program" or "command loop," and controls details such as the default file and displaying a layout.

Menu commands

See *4th Dimension Command Reference* for a complete description and syntactical explanation of these commands.

You may manipulate menu bars and their component commands from inside procedures. You may enable or disable commands, place a checkmark (√) next to commands, and determine which menu bar your application is currently displaying.

Reserved keyboard equivalents

The Apple desktop user interface can use command characters, called "keyboard equivalents," to duplicate menu command functions on the keyboard. Command-Q, for instance, duplicates the Quit command under the File menu. It lets you quit a program properly if you suffer a mouse malfunction.

Because quitting database applications correctly is so critical (not doing so can damage your database), you should strongly consider using keyboard equivalents in your application at least for any function that affects saving records or quitting the program.

You assign keyboard-equivalent characters in the Menu editor. Select the Keyboard check box and enter the equivalent character in the small area to its right. Figure 6-3 illustrates how to enter a keyboard equivalent.

Figure 6-3
Entering a keyboard equivalent

Keyboard equivalents are always uppercase characters.

The desktop user interface reserves a small number of keyboard equivalents for particular menu functions. You should not alter or duplicate these equivalents when you create your own menus. Other characters are assigned, but not strictly reserved.

Table 6-1
Reserved keyboard-equivalent characters

Reserved	Assigned
C: Copy	B: Boldface
Q: Quit	I: Italic
V: Paste	O: Outline
X: Cut	P: Plain text
Z: Undo	S: Shadow
.: Stop action	U: Underline

Important Reserved characters appear in the Edit menu. You cannot change the Edit menu, and you should not duplicate the keyboard equivalents of the Edit menu. You may use the assigned characters if you do not also intend to use them in their assigned meanings.

Title graphics and splash screens

When looking at a menu bar using the Show Custom Menus command, you can add an opening title graphic or splash screen to each menu bar of your custom application. Use the splash screen for a company graphic, copyright notice, or for user instructions that you want displayed whenever a menu bar is on the screen.

4th Dimension displays the splash screen automatically when it displays the menu bar, and until you take any action that will alter the screen display (such as displaying a layout).

Add a splash screen by choosing Show Custom Menus from the menu in the Menu editor. This command also lets you see how all the menus in your menu bar will look.

Paste artwork or text onto the splash screen from the Clipboard. 4th Dimension automatically centers the artwork on the background.

Because you can copy layouts to the Clipboard while in the Layout window, you can draw your custom splash screens there, if you wish, or use any other drawing program such as MacPaint or MacDraw. Copy the art to the Clipboard.

Using the Menu editor

To create a menu system for your application, create each menu bar separately.

Create global procedures to perform the commands you plan to use in your menu bar.

On each menu bar, name the menus you want, and name each command under each menu.

Set the defaults for each menu command and, finally, allocate a global procedure for each menu command except Quit.

Create a new menu bar

1. In the Design environment, choose Menu from the Design menu.

   4th Dimension displays the Menubars dialog box.

2. Click New.

   4th Dimension displays the Menu window and the Menu editor. The Menu window shows the name and number of the new menu bar.

   4th Dimension names and numbers menu bars automatically in the order of their creation. You cannot change the name or order of a menu bar, although you may delete one.

   4th Dimension displays Menubar #1 first, unless you are using a password system that calls a startup procedure to display a different menu bar.

Edit an existing menu bar

1. From the Design environment, choose Menu from the Design menu.

   4th Dimension displays the Menubars dialog box which includes a list of existing menu bars.

2. Click the name of one of the menu bars to select it. Click Open to display the Menu editor and the existing menu bar you have selected.

   Or: Double-click the name of the menu bar you wish to edit.

Create a new menu

1. Open the Menu editor.

   If you are creating a new menu bar, 4th Dimension only displays File in the list of menus.

2. Choose Append Menu or Insert Menu from the Menu menu.

   Or: Double-click at the end of the list.

   Append Menu places the next menu you create at the end of the current list of menus. Insert Menu inserts the new menu on the line *above* the highlighted menu.

   If you have no highlighted menu, Insert Menu places the new menu at the end of the list.

   4th Dimension highlights an area in the Menus list. Inside the highlight box is an editing pointer.

3. Enter the name of the new menu.

   As you enter the name, the same name appears as a sample menu on the existing menu bar at the top of the screen. You can later pull down the sample menu to see what the menu you are creating will look like.

Create a list of menu commands

1. Select a menu and choose Append Item or Insert Item from the Menu menu.

   Or: Double-click at the end of the list.

   4th Dimension highlights an area in the Items list and in the Procedures list. It places a pointer in the highlighted line of the Items list.

   If you choose Append Item, 4th Dimension places the new line at the end of the list. If you choose Insert Item, 4th Dimension places the new lines above the line you selected. If you choose Insert Item with no menu selected, 4th Dimension ignores the command.

2. Enter the name of the menu command in the Items list.

- Enter as many menu commands in this way as you wish. If the list of commands becomes too long to display on the sample menu, the commands will scroll.

Set defaults for menu commands

1. Select one of the menu commands in the Items list.

   4th Dimension activates the default setting portion of the Menu editor.

2. Click one, more, or none from the text formatting check boxes.

   The menu command you select takes on the text attributes you click.

3. Click Enabled if you want the menu command to be active as its default condition. Leave the box unchecked if you want the menu command to be disabled (gray) as its default.

   You may change the condition of a menu item programmatically.

4. Click Line if you want a menu item to be a dividing line across a list of menu commands.

   If you click line, you should also leave the Enabled check box unclicked.

5. Click Keyboard if you want to add a keyboard-equivalent character to the command.

- Enter the character in the box to the right of Keyboard.

  4th Dimension automatically precedes the character with the command symbol.

Enter procedure names

1. Create a menu, enter a list of menu commands, and set defaults for each of them.
2. Select a menu command.

   4th Dimension also highlights the Procedures list to the right of the Items list.

3. Click the highlighted line in the Procedures list corresponding to the menu command you selected.

   4th Dimension places an editing pointer in that highlighted line.

4. Enter the name of the global procedure that you wish the corresponding menu command to call.

Copy and paste in the Menu editor

- You can copy an entire menu and all its constituent commands and procedure names. Use the highlight box to select the menu name and choose Copy from the Edit menu. You can paste the menu in the same or another menu bar.
- You can copy a menu, command, or procedure name by selecting that name and choosing the Edit menu.
- When you paste a menu or a name, 4th Dimension appends it to the list.

Enter a password

1. Click the Password box.
2. Enter a password you have already created with the Passwords editor.

   Entering a password into the Menu editor that you have not already created with the Passwords editor has no effect.

   See "Passwords and Security," later in this chapter.

Delete a menu bar

1. From the Design environment, choose Menu from the Design menu.

   4th Dimension displays its Menubars dialog box.
2. Select an existing menu bar from the list.
3. Click Delete.

   4th Dimension asks whether you are sure. If you are, click Yes and 4th Dimension will delete the menu bar you selected.

   If you delete a menu bar other than the last one on the list, 4th Dimension closes ranks and renumbers the remaining menu bars sequentially.

   Important: When 4th Dimension deletes a menu bar, it renumbers the remaining menu bars. You must make sure that your procedures still call the correct menu bars.

Delete a menu

1. Open the Menu editor with an existing menu bar.
2. Select a menu from the Menus list in the editor.
3. Choose Delete Menu from the Menu menu.

Delete a menu command

1. Open the Menu editor with an existing menu bar.
2. Select a menu from the Menus list.

   4th Dimension displays all the menu commands for that menu.
3. Choose Delete Item from the Menu menu.

Add a splash screen

1. Choose Show Custom Menus from the Menu menu.

   4th Dimension displays the menu bar you have created, a gray background, and the legend "Paste a picture to use with this menu. Click anywhere in the window to exit."
2. Paste a picture from the Clipboard. It will appear centered in the window.

   4th Dimension will display that picture as its splash screen until your application takes an action that will change the display—such as displaying a layout.

Boxes and windows

Menus are not the only means you have of calling a 4th Dimension procedure. You can equip your layouts with buttons and call several procedures from a layout procedure based on which buttons your users click, and on what information they fill in on the layout.

Types of boxes and windows

There are six types of boxes and windows that you can use in your 4th Dimension applications. They are

- **Alert box**
- **Confirm box**
- **Request box**
- **Message box**
- **Dialog box**
- **Window**

There are other options you also have with 4th Dimension, such as turning the program's own messages on and off and using buttons in your layouts.

Alert box

An alert box notifies you of a condition. You must click an OK button to acknowledge the alert. 4th Dimension draws the box and supplies the OK button for you. The OK button does not correspond to one of your variables.

There are actually three types of alert boxes: Note, Caution, and Stop. They differ in urgency and in the face graphic that appears in the box. 4th Dimension supports the Note as its Alert box.

You can create the alert box shown in Figure 6-4 by inserting the following statement in a procedure:

ALERT("You have entered 100 records.")

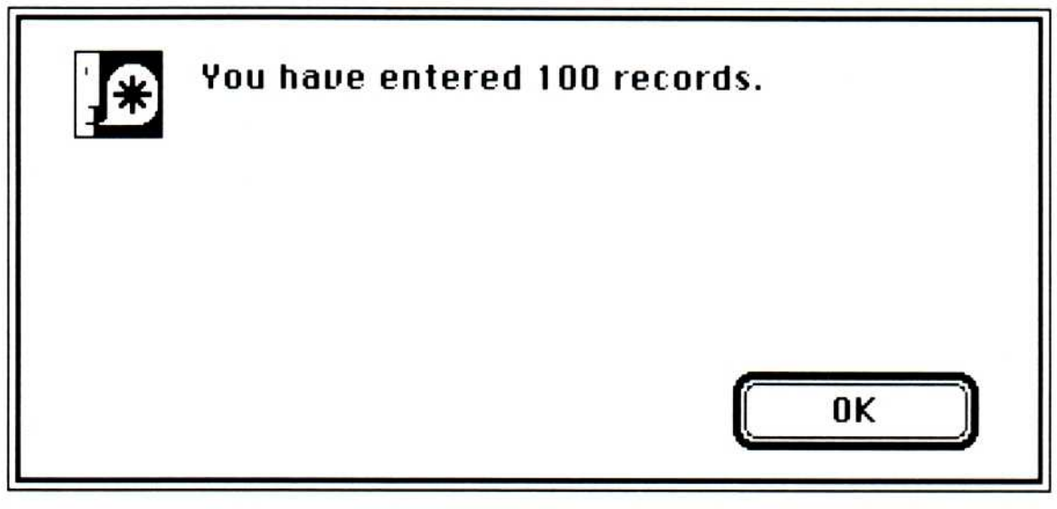


Figure 6-4
Alert box

Confirm box

A confirm box is like an alert box, but supplies both an OK and a Cancel button. Use confirm boxes when a command might harm the user's data, but when the user might mean exactly what he says.

The confirm box sets the 4th Dimension System OK variable.

CONFIRM("Archive last month's transactions?")

Figure 6-5
Confirm box

Request box

REQUEST creates a type of dialog box that has a Cancel button, an OK button, and one area for the user to enter up to 255 characters of text. Use request boxes for single items of information (perhaps the user forgot to complete one field on a form). If you want the user to fill out a more detailed form, supply the form in a layout.

You assign the result of a **REQUEST** command to a variable.

```
Name := REQUEST("What is your name?")
```

Figure 6-6
Request box

Message box

The **MESSAGE** command displays a message box until some other command modifies the screen. Use message boxes for chores such as letting your users know how their search is progressing, or how many records are left to modify. There is no OK or Cancel button displayed by a message box—only the message.

```
MESSAGE("Saving record number "+String(RecNo)+".")
```

Figure 6-7
Message Box

Dialog box

A dialog box is potentially the most complex box you can put on a screen. A 4th Dimension dialog box is actually a layout; you create it in the Layout editor and, unlike the alert and confirm boxes, you may add a layout procedure to control the dialog and interpret it.

Because they are layouts, you prepare dialog boxes ahead of time (rather than simply issuing a command and a string). Also, dialog boxes are associated with particular files. You must use the filename and the dialog box name when calling the dialog box.

Important Unlike input or output layouts, all user interactivity is through variables—buttons, check boxes, radio buttons, area variables, and so on. Fields may display data only in a dialog box; most dialog boxes use no fields. Using Accept and Don't Accept buttons may change the 4th Dimension System OK variable.

The **DIALOG** command displays the layout named by the file-name (in brackets) and the quoted string (the name of the layout).

```
DIALOG([Employees];"Dialogcalc")
```

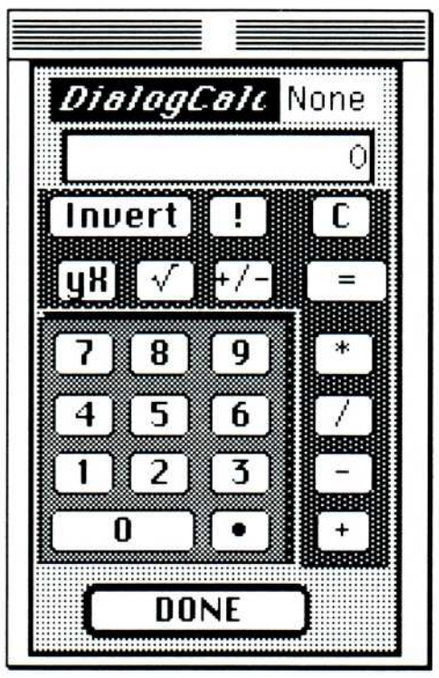


Figure 6-8
Dialog box

Window

All the window types of the desktop user interface are available to you with the **OPEN WINDOW** command. 4th Dimension allows one programmer-defined window to be open at a time.

Use windows for layouts, dialog boxes, and for messages to the user. You can write directly to an open window and position the text insertion point within it.

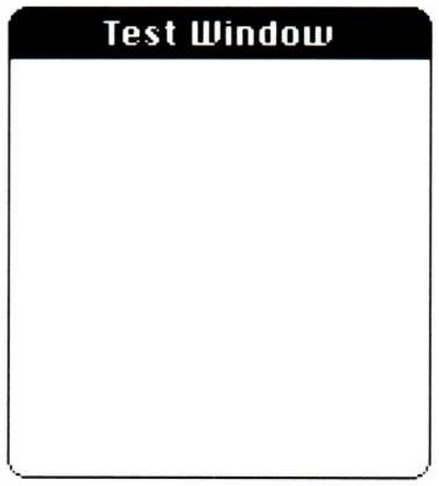


Figure 6-9
Window

Controlling other interface functions

The commands **MESSAGES ON** and **MESSAGES OFF** turn on and off 4th Dimension's own built-in message screens, such as the sorting dialog. The two commands work globally on all 4th Dimension messages.

Using buttons

Buttons in layouts and dialog boxes can speed a user through an application.

For variable type information see Chapter 1, "Database Structures." For how to place variables in layouts and set variable formats see Chapter 2, "Layout Design Basics."

Buttons are variables. 4th Dimension draws them for you when you're designing a layout in the Layout window. 4th Dimension uses the proper style for the type of button you've asked for, according to the *Human Interface Guidelines*.

You may name the button variables according to your own programming conventions; the buttons, as you display them on screen, may have entirely different—and a good deal more explanatory—text.

Tips on using buttons

You may wish to bear in mind some tips on using buttons in your layouts:

- Only Accept and Don't Accept buttons have an effect on the 4th Dimension System OK variable.
- Using any button of any type *at all* in a layout will stop 4th Dimension from displaying the default button panel in either the User or the Custom environment.
- Only the Accept and Don't Accept buttons will permit you to leave a layout when they are clicked.
- Use buttons to control your layouts; if you use menus to control the layout, you will not be able to operate the layout in the User environment where 4th Dimension supplies its own menus.
- You must verify button values in the layout procedure. 4th Dimension initializes all buttons to 0 at the start of each procedure—you must reset them if you want different values. The Begin phase of the execution cycle is usually the best place to initialize buttons.
- Button variables are global.
- Buttons placed between the Break and Footer lines of a layout will appear at the bottom of the screen when output is sent to the screen rather than to the printer.

Scrollable areas

Scrollable areas are array-like lists of variables that you may display in a layout. A user may not enter data directly into the component variables of a scrollable area, although you may change the values progammatically on the basis of other input to the layout.

See *4th Dimension Programmer's Reference* on scrollable areas, arrays, and indirection.

The scrollable area and its individual variables share the same name. For example, you may have a scrollable area named MyVar. MyVar0 holds the total number of variables belonging to the MyVar scrollable area. The variables MyVar1...MyVar*n* hold the values you wish to display in the scrollable area. The variable MyVar with no subscript holds the number of the currently selected item.

Included layouts

An included layout is a layout that appears within the layout of another file, in a special area that you create for it. Because of programming considerations, you should prepare special included layouts for their task input, output to the screen, or printing. Figure 6-10 shows an included layout on the screen.

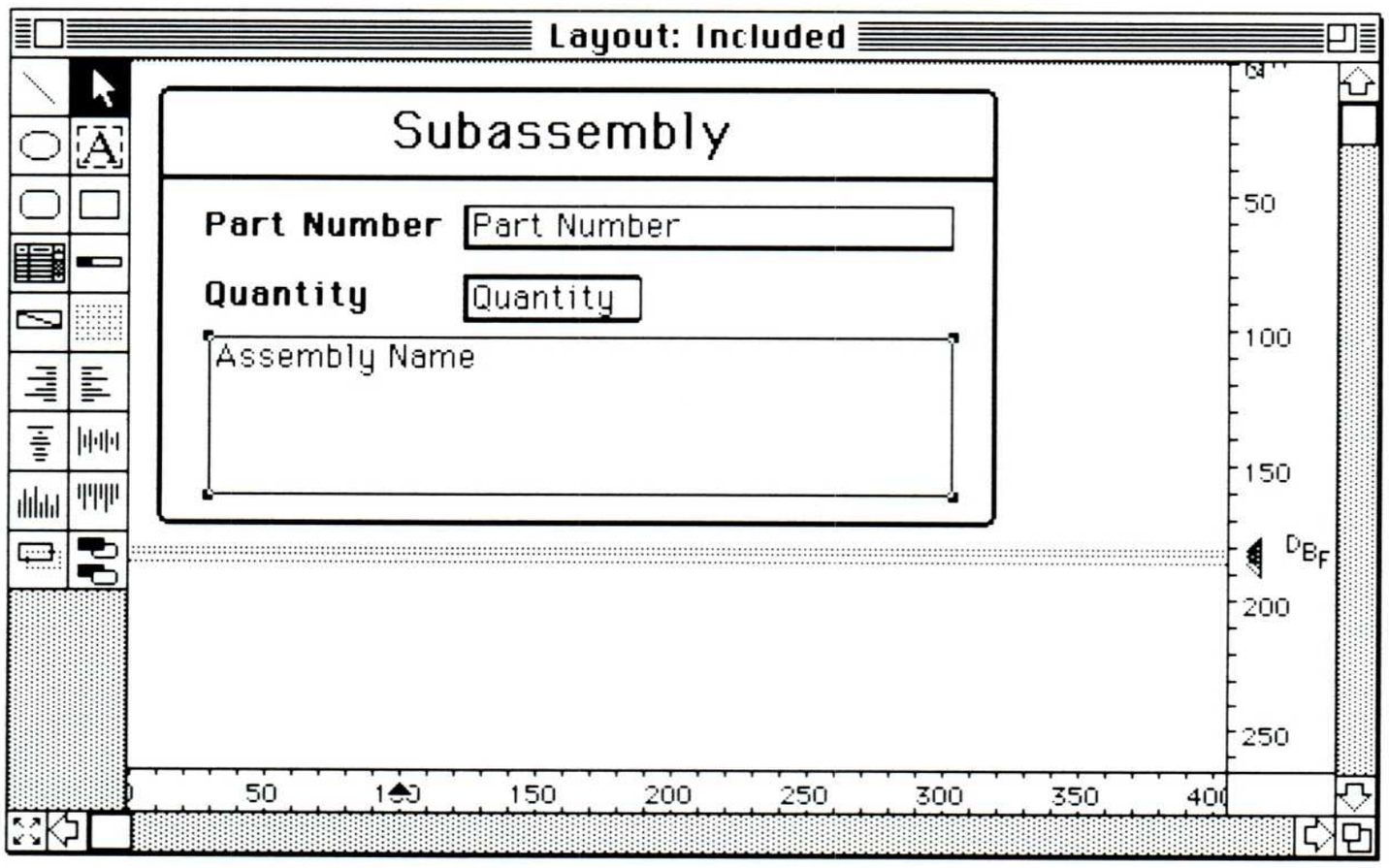


Figure 6-10
Included layout on screen

See Chapter 2, "Layout Design Basics," for the steps that create included layouts.

You may use included layouts to display the records from subfiles or from other files in the database. You may use them to enter data into subfile records. You cannot use them to enter data into files. In an included layout, you cannot display records from the file of the including layout.

Included layouts work differently when used on the screen than they do when used for printing. On the screen they appear as a scrolling list of records within a small window or area. You may display them three different ways when printing.

When you create an area for an included layout on a parent layout, 4th Dimension displays its Format for an included layout dialog box. Figure 6-11 illustrates this dialog box. It points out the Full Page and Multi-line check boxes, and the Print using radio buttons that determine how an included layout appears in print.

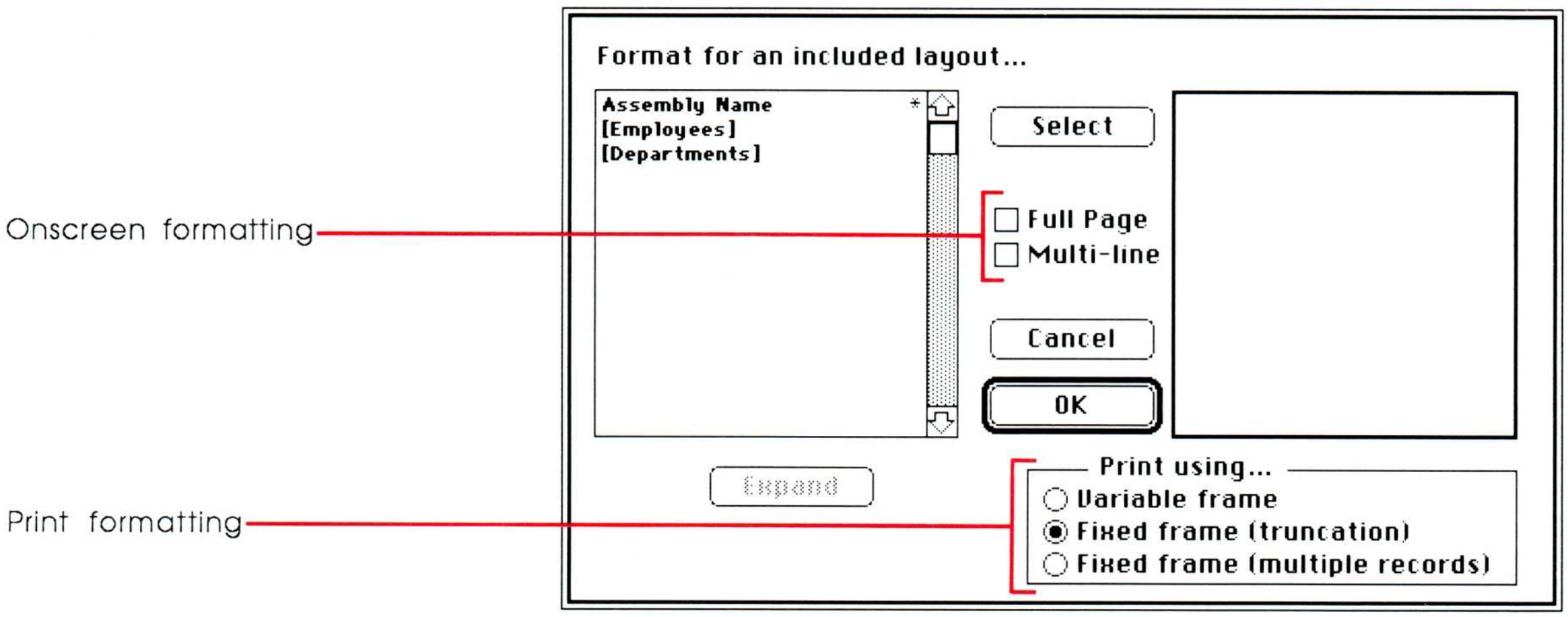


Figure 6-11
Format for an included layout dialog box

Included layouts on the screen

A parent layout will display any layout you create for an Included Layout area—formlike or tabular. Figure 6-12 illustrates the concept of scrolling an included layout "behind" the parent layout, and viewing the records of the included layout *through* the Included Layout area on the parent layout.

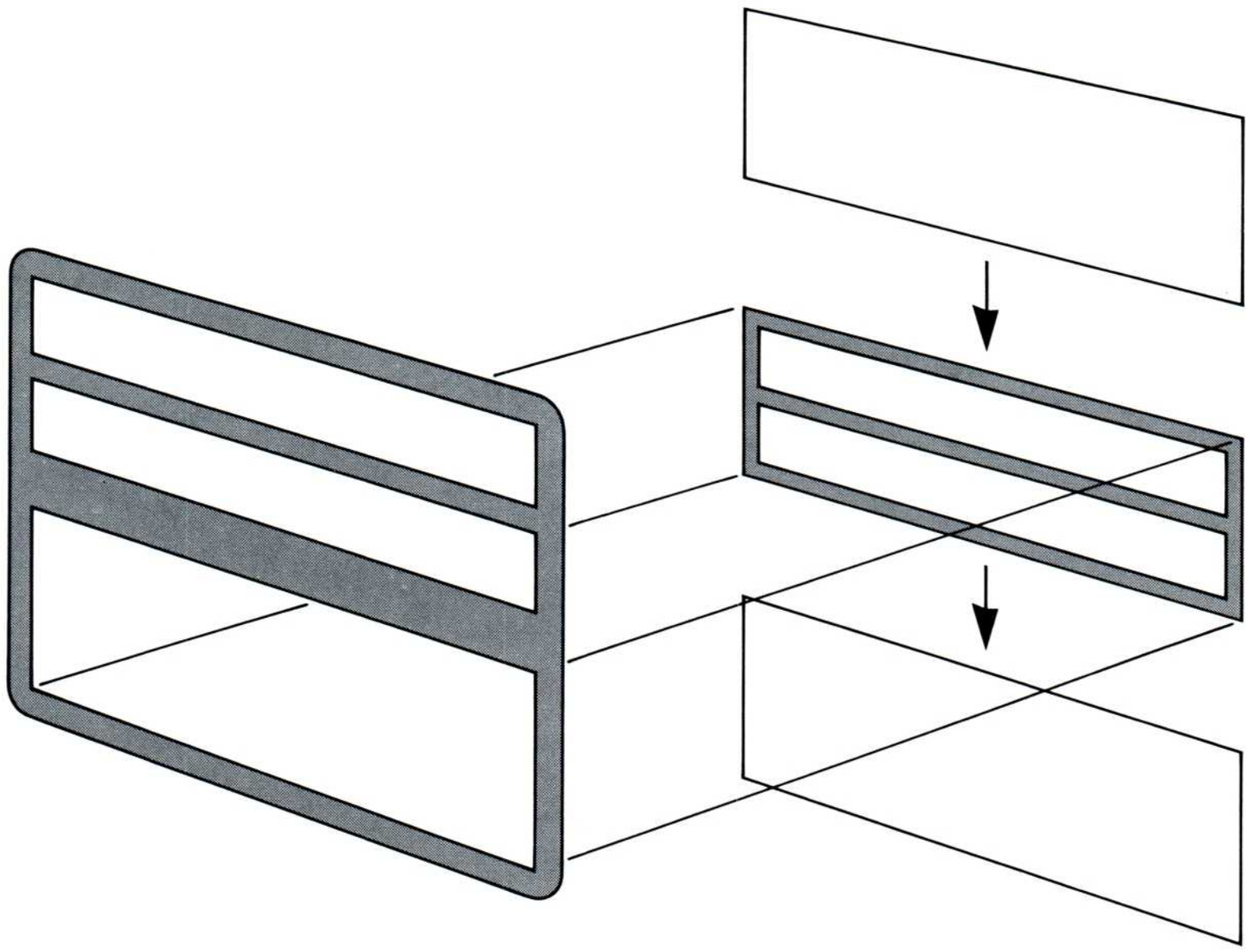


Figure 6-12
Viewing an included layout scrolling behind a parent layout

It usually makes a better display if you use a tabular layout in an Included Layout area, but you may use any type of layout. To create a tabular layout, select a single-line layout format when you first create the layout you plan to include in another.

Important The Multi-line check box in the Format for an included layout dialog box signifies the layout that the included area displays within the parent layout. This is its only meaning.

When you select a layout in the Format for an included layout dialog box and click the Multi-line check box, that layout is the layout that 4th Dimension will display in the Included Layout area in the parent layout. A Multi-line layout may be a tabular or a formlike layout. Normally a Multi-line layout is tabular. Multi-line refers only to the layout you have selected to display in the Included Layout area.

If you select no Multi-line layout, 4th Dimension selects the shortest layout as a default.

If it is a subfile the layout that appears in the Included Layout area of a parent layout is for both input and output.

Important If you create a subfile layout procedure for a Multi-line included layout, you should program it for the application to use as *both* an input and an output layout.

Double-clicking a record displayed in an Included Subfile Layout area causes 4th Dimension to clear the screen and display an Entry window for the same file as the records in the Included Layout area.

You can specify the layout that 4th Dimension displays in the Entry window by selecting a layout in the Format for an included layout dialog box, and clicking the Full Page check box.

Important The Full Page check box specifies the layout 4th Dimension will display if you double-click a record within an included layout.

The name Full Page means only that 4th Dimension displays the layout on the full screen of the Entry window. Usually Full Page layouts will be form-like. As with Multi-line, the actual layout you designate may be of any size or shape. If you do not specify Full Page layout, 4th Dimension selects the largest layout (or displays the same one used for Multi-line).

When you have finished entering information into a Full Page included layout, 4th Dimension returns you to the parent layout.

Printout frames

The Print using frame information, controls how 4th Dimension prints included layouts. It requires this information because included layouts can't scroll on paper. There are three choices:

- **Variable frame:** The Variable frame choice vertically extends the Included Layout area on a printed layout to make room for as many included layout records as there are. When 4th Dimension reaches the bottom of the page, it issues a page feed, and continues printing the included records in this way until finished for that parent record. It then prints the next parent record and its included layout records.
- **Fixed frame (truncation):** Fixed frame (truncation) is the default choice for printing. 4th Dimension prints as many included records as will fit in the area you have allowed in the parent layout. It ignores any further included records.
- **Fixed frame (multiple records):** Fixed frame (multiple records) is a combination of the other two frame formats. 4th Dimension prints out as many included records as you have allowed for in the parent layout. If there are more included records, 4th Dimension will print out another copy of the same parent layout and continue printing included records.

The Print using frames have no effect on how 4th Dimension uses the layouts on screen.

Figures 6-13 through 6-15 show the differences among these three print schemes.

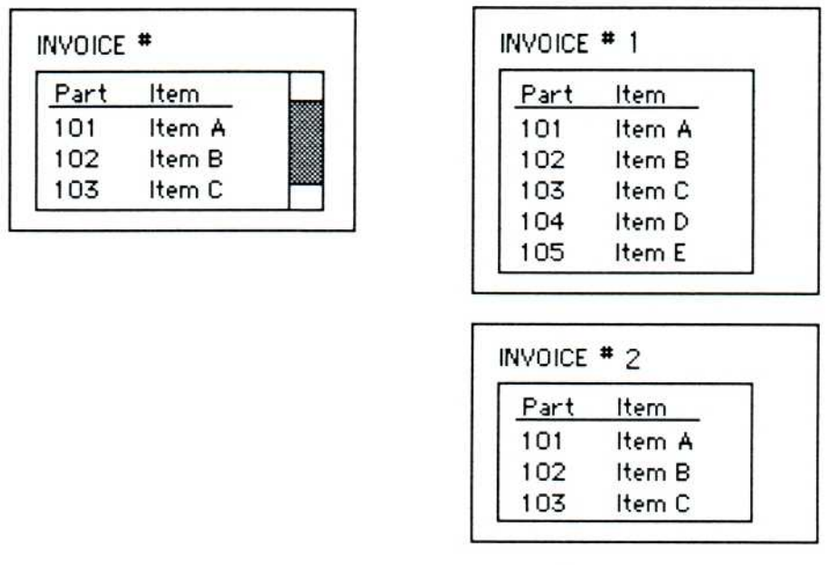


Figure 6-13
Printing with Variable frame

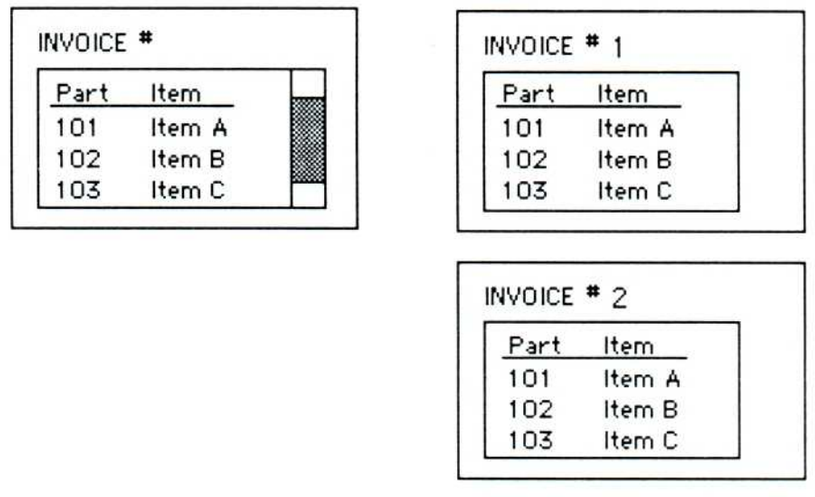


Figure 6-14
Printing with Fixed frame (truncation)

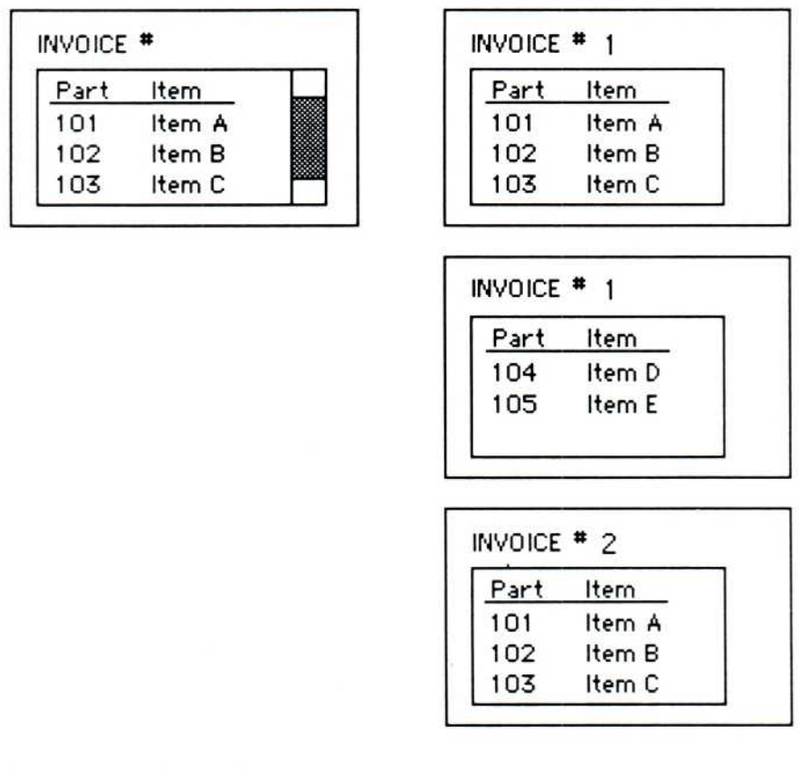


Figure 6-15
Printing with Fixed frame (multiple records)

Pictures, graphs, and layouts

You may paste graphics from your Scrapbook as background into 4th Dimension layouts and dialog boxes, and for use as picture data in records. You may also create graphs as onscreen reports, and very effectively include interactive graphs in your layouts.

To include pictures and graphs in layouts for your custom applications, there are three different methods.

- **Layout graphics:** You may paste any graphic element from your Scrapbook onto a 4th Dimension layout. *This includes entire layouts, or parts of layouts*. You can save Scrapbooks of favorite button arrangements, dialog boxes to use in later applications, or even complete layouts.

See Chapter 2, "Layout Design Basics," for tips on transferring layout elements between layouts.

- **Pictures:** Include 4th Dimension's Picture field type in a layout and a graphic element (digitized photograph, drawing, map), and it can become an active part of each record. By using Picture fields and layout graphics, you can create a graphic area on the screen—a map, for example—that your user can alter and save as part of each record.

- **Graphs:** With a one-line command and 4th Dimension's Graph variable type, you can create a graph for a report or include a graph on a layout. For example, include a graph of sales by territory on the product line layout.

See *4th Dimension Programmer's Reference* for information on programming graphics.

You can program with 4th Dimension graphics too. 4th Dimension's programming language provides a set of commands expressly for manipulating graphics. Graphics are under program control down to the pixel level.

Layout graphics

You can paste pictures to layouts in the Layout window. Picture graphics become part of the layout background.

Pasting a picture to the layout background is one step in the process of creating interactive Picture fields.

If you copy layouts or layout elements to the Scrapbook, you can later paste them into the Layout window. They will act as though you had entered them directly. Retain a Scrapbook of button layouts to save time when creating new, complex layouts.

Picture fields

Picture fields contain pictures the way Integer fields contain integers. Because you can't draw pictures or digitized images directly when entering data into or modifying a layout, you enter a picture into a Picture field by pasting it from the Clipboard (you may first need to copy it to the Clipboard from the Scrapbook).

For the steps to define a structure that includes a Picture field see Chapter 1, "Database Structures." For instructions on how to place a Picture field in a layout, format the field, and enter data into it, see Chapter 2, "Layout Design Basics."

You create a Picture field the same way that you create any other field. In the Structure window, choose New Field or Change Field from the Structure menu. In the Add or Change Field dialog box, click Picture as field type. You may also wish to make the picture field nonmodifiable, so that some office wag doesn't later paste a picture of J. Fred Muggs over the portrait of the company president.

There are three formats for Picture fields:

- **Truncated:** A graphic element pasted into a truncated Picture field remains at its full height and width; but 4th Dimension displays only that portion of the graphic element that shows through the frame of the Picture field. Depending on the size of the picture and the field, the edges of a truncated Picture field may cut off the view of some of the graphic element. 4th Dimension centers pictures pasted into truncated Picture fields. Figure 6-16 displays several truncated Picture fields.

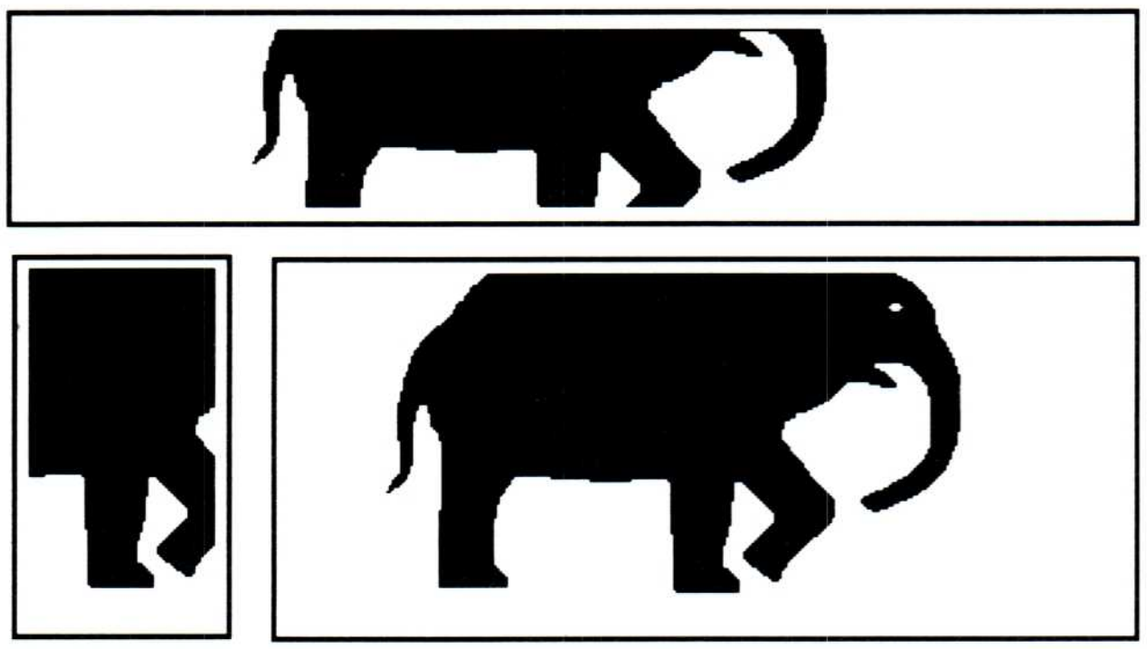


Figure 6-16
Truncated Picture fields

The **aspect ratio** of a graphic element is the relationship between the height and the width. Changing the aspect ratio may distort one or both dimensions.

- **Scaled to fit:** 4th Dimension compresses or expands a graphic element pasted into a "Scaled to fit" Picture field. Depending on the **aspect ratio** of the graphic element, there may be some distortion as 4th Dimension changes the height and width to fit. Figure 6-17 shows several Picture fields that have been scaled to fit.

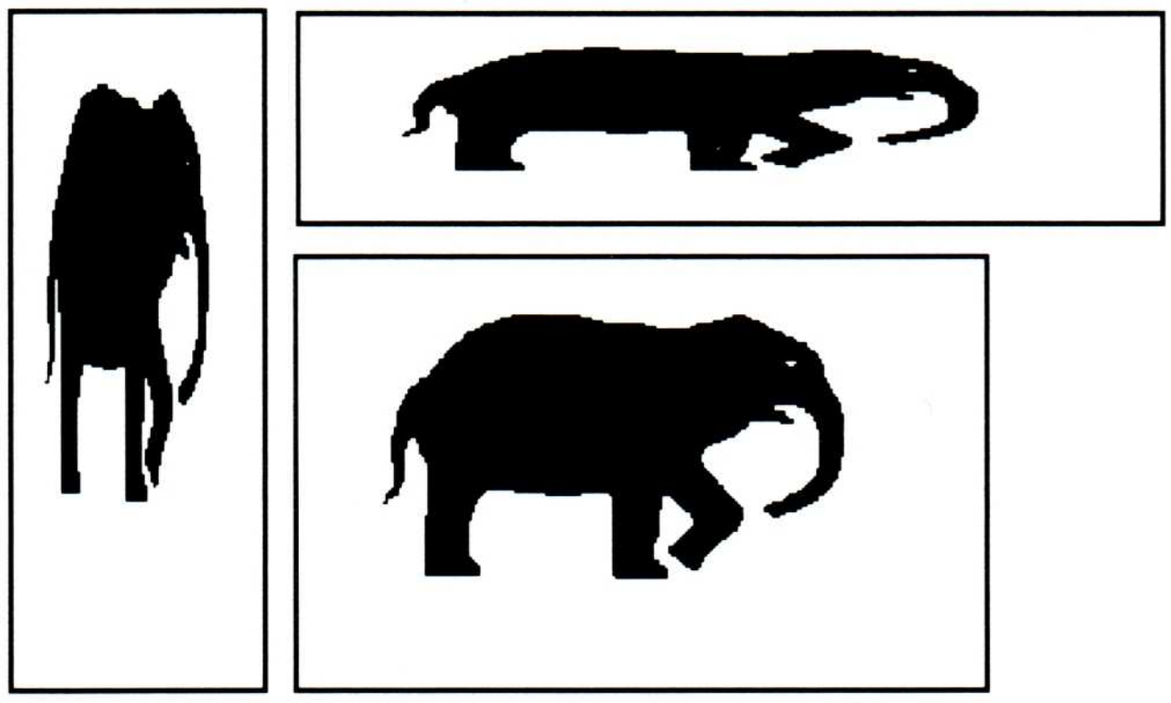


Figure 6-17
Picture fields scaled to fit

- **On background:** A picture field placed "On background" acts as a pane of glass that superimposes a pasted graphic element over the background of the layout. It allows you to see the background of the layout even after you have pasted a graphic element on it. Further, you may move the pasted graphic element around the Picture field. Use a Picture "On background" for maps or diagrams, or any recordkeeping application where you must track spatial relationships. Figure 6-18 conceptually shows how a Picture "On background" field works.

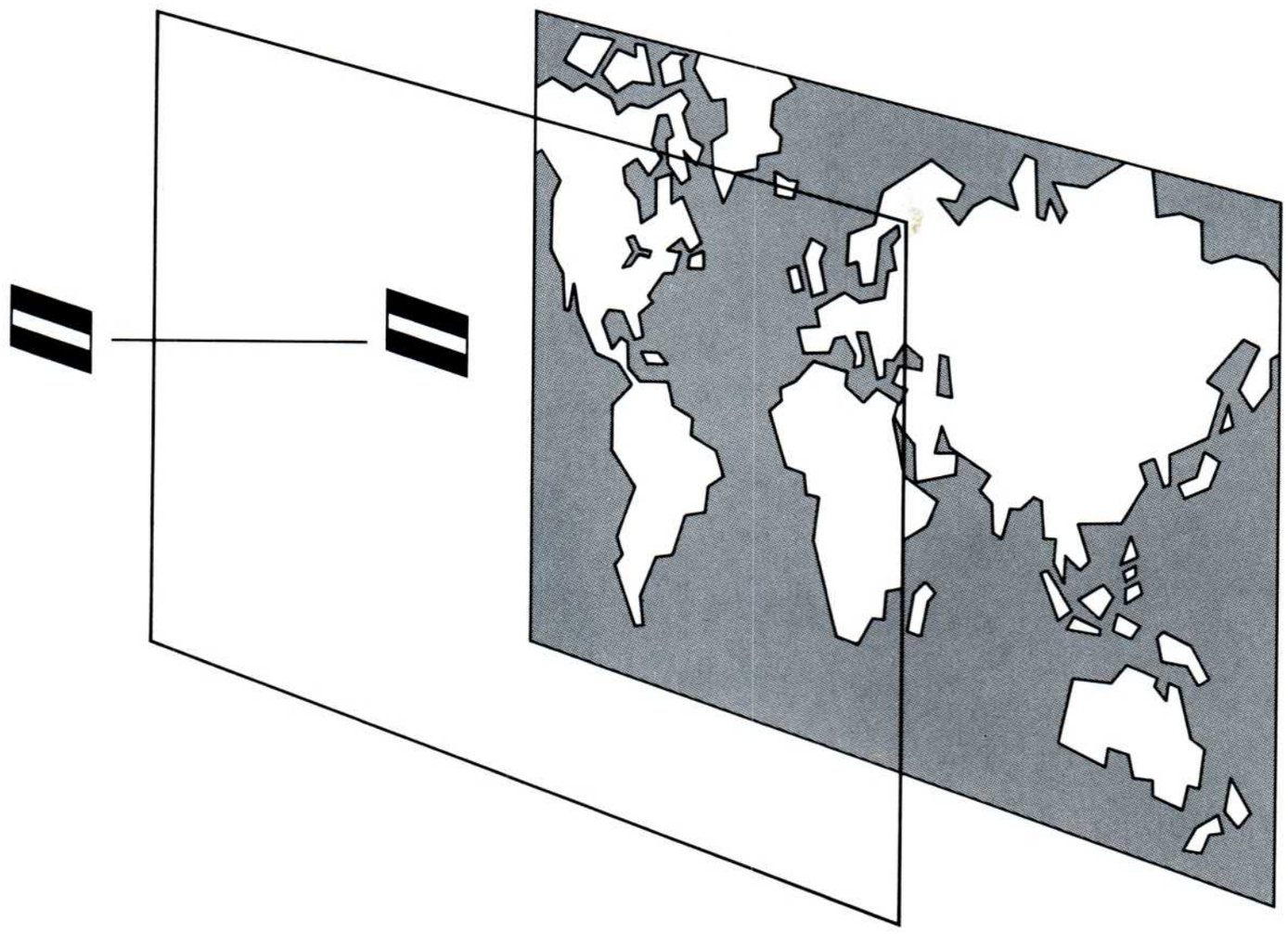


Figure 6-18
Pasting a graphic element onto a Picture field "On background"

Important In a record using a Picture "On background" as in Figure 6-18, you may accidentally move the graphic element "off the field." Retrieve it by dragging anywhere on the Picture field until it comes back into view.

You may paste only one element at a time to a Picture field "On background," but you may divide the background graphic element itself into many smaller Picture fields. Figure 6-19 shows a map divided into many Picture fields.

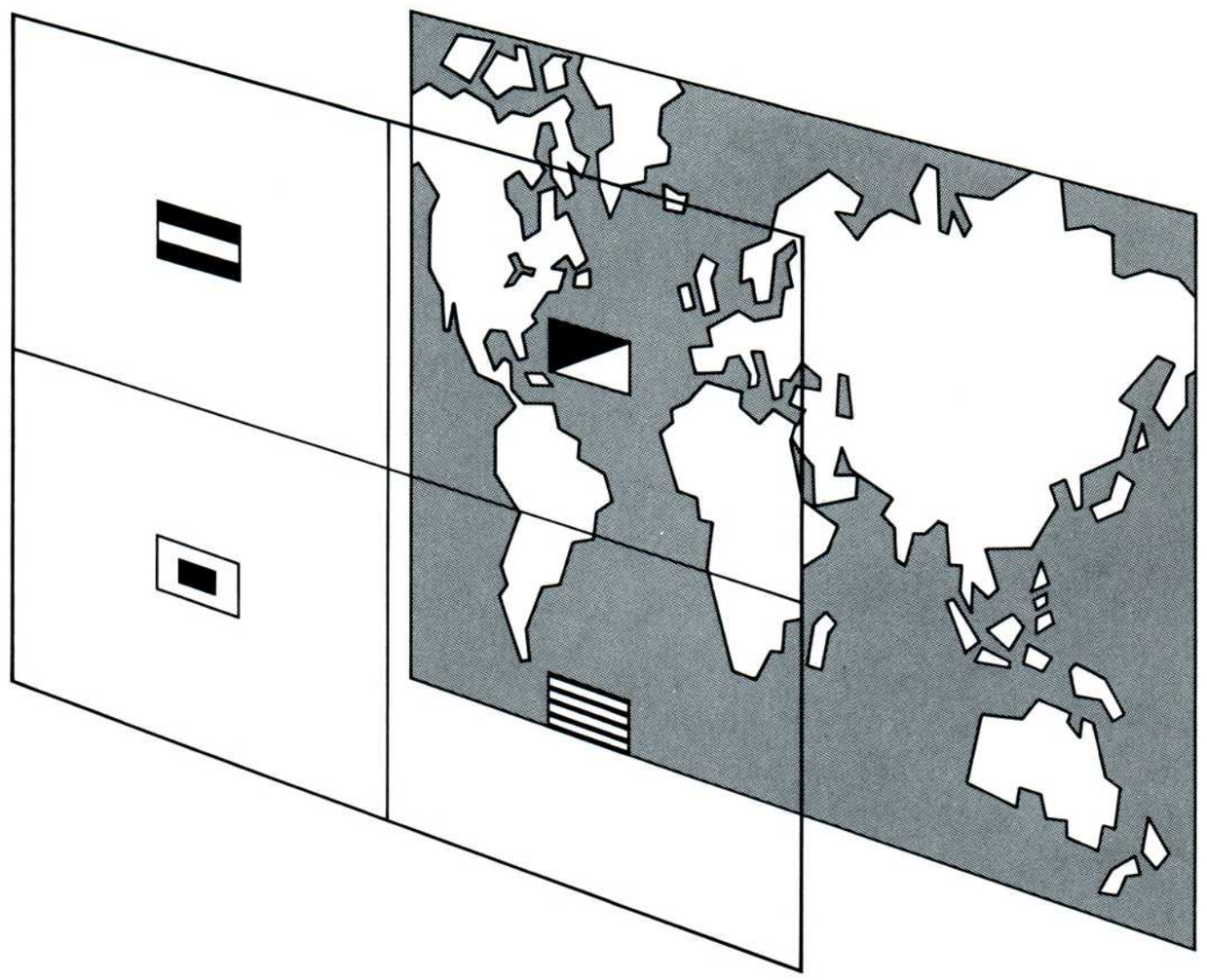


Figure 6-19
Picture field divided into many smaller areas

Pasting a new graphic element to any one Picture field will replace the old element. This is straightforward and obvious when you think of a Picture field as a digitized photograph of an employee (truncated or scaled to fit). It may be less obvious in the case shown in Figure 6-19, where the temptation may exist to paste several flags.

A second flag pasted to a single Picture "On background" field will replace the first. If you create a graphic element with several flags on it, and paste that to the field, all flags will move around the graphic element in formation. If you need more than one graphic element pasted to a single picture, use the method illustrated in Figure 6-19.

Pixels and contrast

When you use a Picture "On background" in a layout, the contrast betwen the graphic element you paste to the field and the background of the layout becomes important.

Control the contrast during data entry with the Choice of mode dialog box. Strictly speaking, the Choice of mode dialog box controls the And, Or, and Exclusive-Or functions between pixels.

- To display the Choice of mode dialog box, double-click a Picture "On background" field when you are entering data in the Custom environment. Select the contrast you want to use by clicking one of the eight proposed contrasts.

Figure 6-20 shows the Choice of mode dialog box.

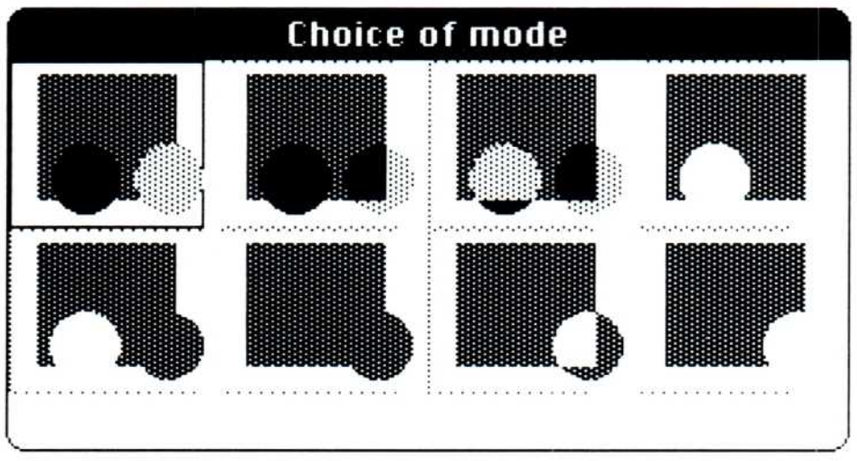


Figure 6-20
Choice of mode dialog box

Graphs and graph variables

You may create a graph as a report, or include a graph in a layout. Both techniques are similar and each requires only a short procedure. You create a graph as a report through a global procedure; to include a graph in a layout you must use a layout procedure.

Each type of graph in 4th Dimension has a number.

Table 6-2
Graph types

Graph type	Graph number
Column	1
Proportional column	2
Stacked column	3
Line	4
Area	5
Scatter	6
Pie	7
Picture	8

Graphing as a report

See *4th Dimension Command Reference* for more information on the commands Graph and Graph File.

To create a graph as a report, use the 4th Dimension command **GRAPH FILE** in a global procedure. The syntax of the **GRAPH FILE** command is:

GRAPH FILE(*filename;numexpr;fieldnameX;fieldnameY*)

where *filename* is the name of the file whose data you're graphing, *numexpr* is the number of the graph, *fieldnameX* is the name of the field containing the alphanumeric text for the X axis, and *fieldnameY* is the name of the field containing the data to graph.

For example, the global procedure

```
DEFAULT FILE([Departments])
SELECT ALL
GRAPH FILE([Departments];1;Salesperson;Sales)
```

would produce a graph like that shown in Figure 6-21.

The **GRAPH FILE** command uses the data in the Departments file to produce a bar graph (type 1). The X-axis labels come from the Salesperson field, and the numeric Y-axis data from the Sales field (you may name as many as five Y-axis fields).

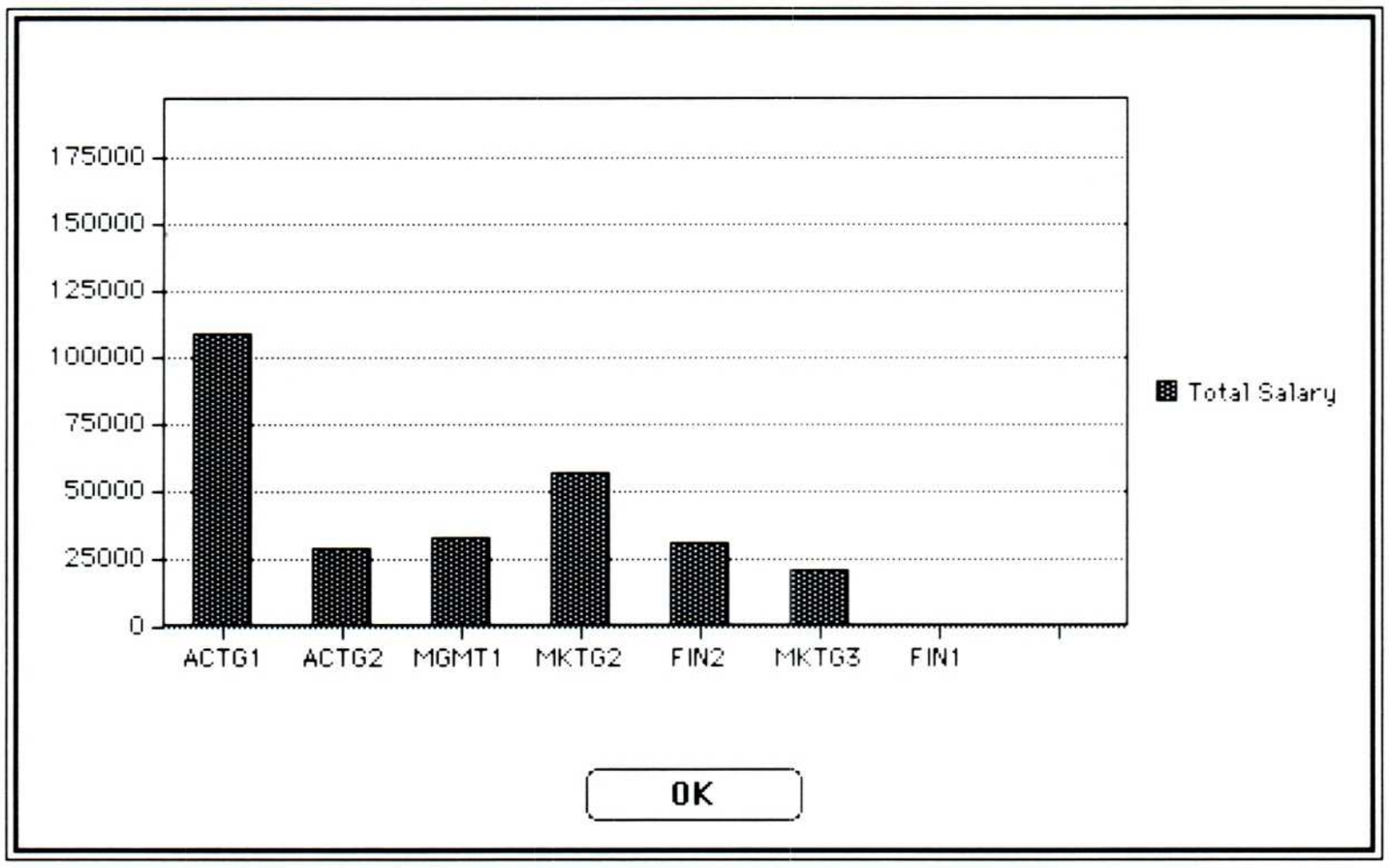


Figure 6-21
Graph report produced by the GRAPH FILE command

In programming with the **GRAPH FILE** command, if you do not give the parameters, 4th Dimension will display the Graph definition dialog box. If you do give the parameters, 4th Dimension assumes that the graph is meant for the printer.

See "Placing a Variable on a Layout" in Chapter 3.

Including a graph in a layout

To create a graph in a layout, you must first place a variable of the Graph type on a layout. You do not have to set a graphic format for a Graph variable; it automatically scales to fit.

Create a layout procedure using the 4th Dimension **GRAPH** command. The syntax of the **GRAPH** command is

GRAPH(*var;numexpr;nameX;nameY*)

where *var* is the name of the Graph type variable, *numexpr* is the number of a 4th Dimension graph (see Table 6-2), *nameX* is the filename and field name or subfilename and subfield name of the field containing the alphanumeric text for the X axis, and *nameY* is the name of the file and field or subfile and subfield containing the data to graph. You may have as many as five *nameY* expressions in the **GRAPH** command.

For example, the layout procedure

```
If(Before)|(During)
  GRAPH(vSales;7;Salesperson;Sales)
End if
```

will create a pie chart (type 7) in the *vSales* Graph type variable. Each pie segment will represent one salesperson; the size of the segment, their sales. 4th Dimension will automatically size the pie to fit the layout size of the *vSales* variable. Figure 6-22 shows what this could look like on the screen.

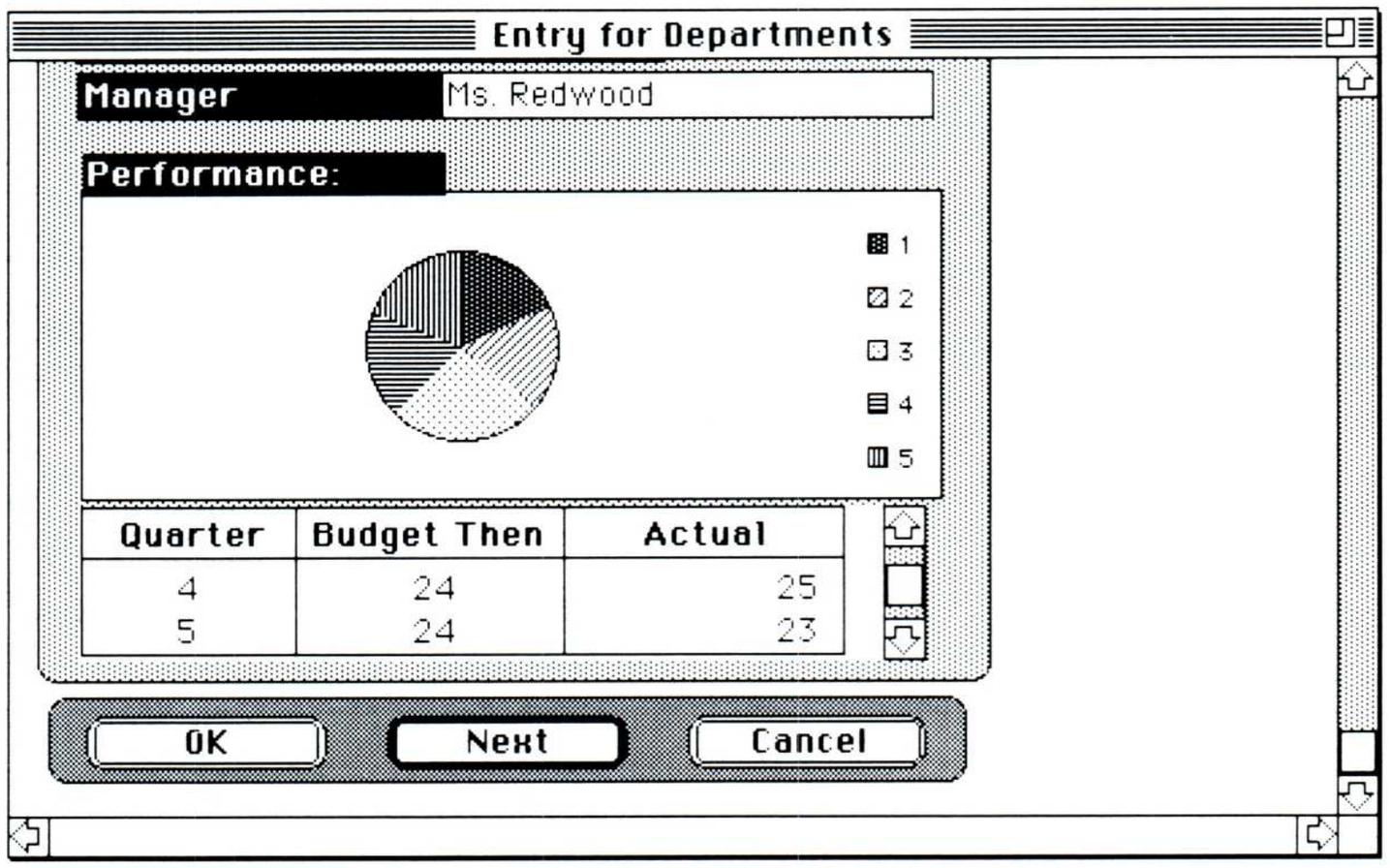


Figure 6-22
Pie chart in a layout

Passwords and security

Passwords provide a measure of protection against unauthorized access to your database application. Use them where

- Several people share a single 4th Dimension application.
- Several people share a single computer—*whether or not* they share the 4th Dimension application running on it.

How 4th Dimension passwords work

With 4th Dimension's Passwords editor, you the developer create a hierarchical password system along with and as part of your application, then assign the passwords you have put in that system to the various layouts and menu commands.

By limiting access to layouts and menu commands, you control access to the entire application. Layouts and layout procedures control input and output, and menu commands control global procedures.

4th Dimension will ignore any passwords you may assign to layouts and menu commands if you have *not* created a password system.

Important All passwords are case sensitive.

4th Dimension passwords do more than stand guard when a user logs on. The password system also keeps a user history: how many times each password is used, and the date that the most recent use took place.

You may also specify a startup procedure for each password other than the main password. A startup procedure can limit access to a small part of the overall application, so that different password holders see only the area they are concerned with.

To prevent a custom application user from switching to the User environment, specify a dummy startup procedure name (for example, X).

4th Dimension will not execute a Startup procedure for the main password, but you may create a global procedure named Startup that will execute before all password startup procedures including the main password.

Important After you assign passwords, only the holder of the main password (the top level) will be able to enter the Design environment. To holders of all other passwords, 4th Dimension will start up in the Custom environment, even if Preferences specify Design. If a password has a startup procedure, the environment is accessible after Quit, and you must start your application in the Custom environment.

Password hierarchies and paths

Passwords are hierarchical. When you assign a password to a layout or menu command, you define the *lowest level* password that can access that layout or menu command, and you define the path *above which* users can access the layout or menu command.

Warning If there is a password box anywhere in the hierarchy tree without a password, anyone can enter the application by clicking OK.

Figure 6-23, for example, shows passwords as names of departments (rather than as the meaningless phrases they *should* be). In the figure, Accounting has access to both Receivables and Payables because the passwords that tag Receivables' and Payables' layouts are *lower* than the Accounting password.

You may have up to 32,767 levels of password.

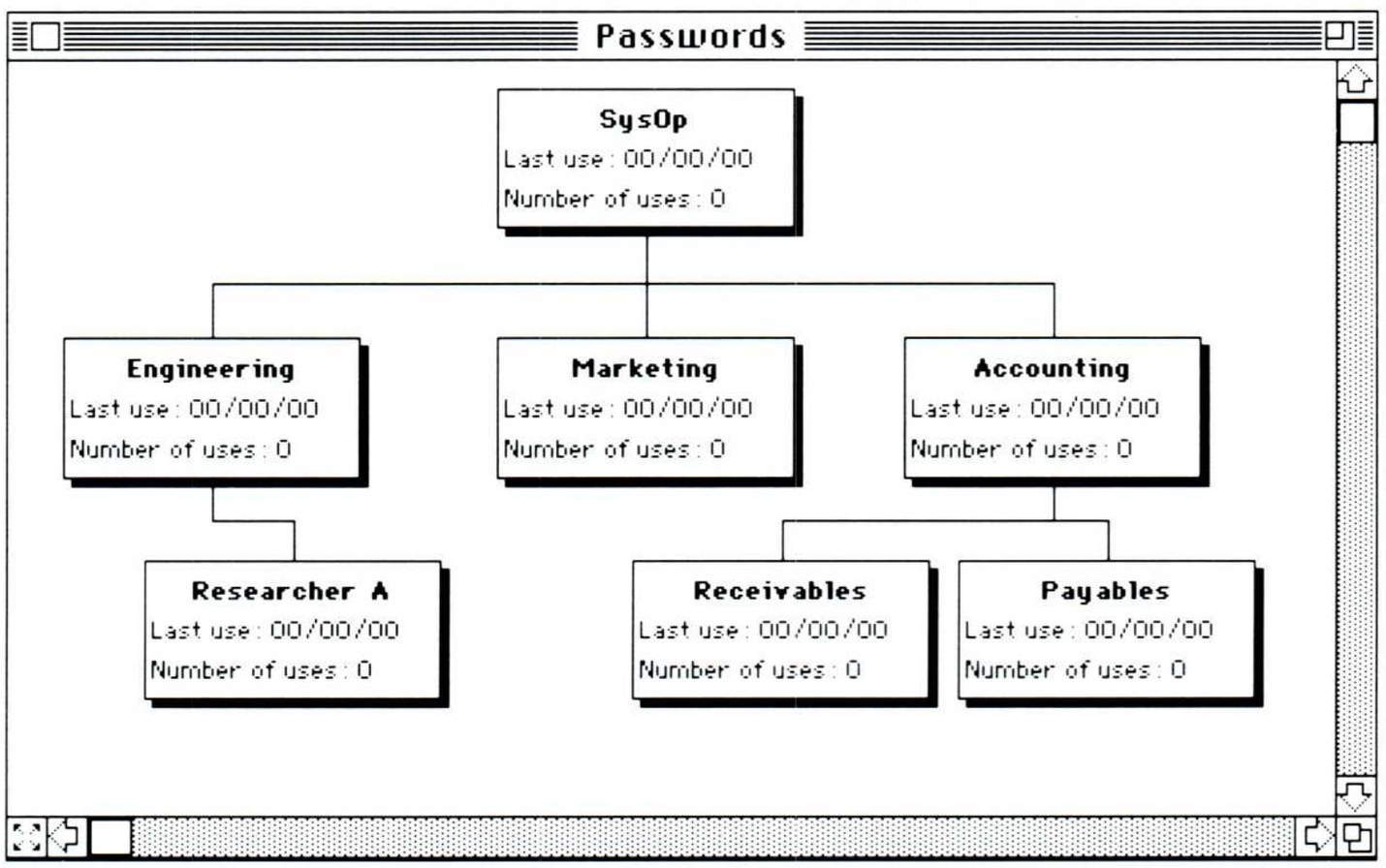


Figure 6-23
Typical password hierarchy

Don't choose the kind of password shown in Figure 6-23 for your own database application; passwords should be meaningless. Note that the Accounting manager does not have access to Researcher A's files in Engineering, even though the Accounting manager is one level higher. Accounting and Engineering are on *two different paths.*

All paths lead of course to the main password, represented in Figure 6-23 by SysOp (System Operator). The holder of the main password has access to the entire database. When any passwords exist, only the main password can gain entry to the Design environment.

Any startup procedure attached to the main password is ignored by 4th Dimension. Startup procedures are global. 4th Dimension executes them *before* entering the Custom environment.

Warning Bear in mind that runtime database applications provide no way to change passwords (there is no Design environment for the holder of the main password to gain access to). You may add or change passwords only on a full development system in the Design environment.

Assigning passwords to layouts and menus

After you have developed a password system, assign passwords to the layouts and menu commands you wish to protect.

You may assign only one password to any layout or menu command. To allow more than one password holder access to the feature, assign it the lowest level of password authority in the proper path. The password should be one of the passwords you have already included in the password hierachy. Other words will have no effect. Figure 6-24 shows assigning a password to a layout. Figure 6-25 shows assigning a password to a menu.

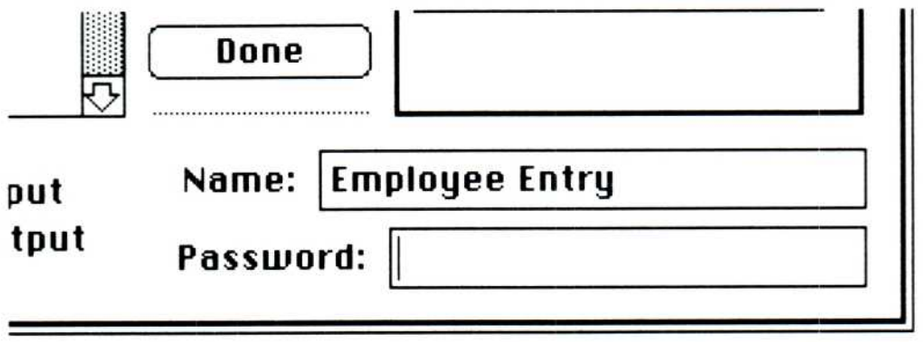


Figure 6-24
Assigning a password to a layout

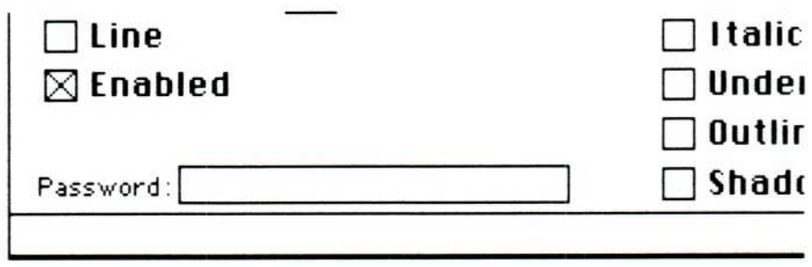


Figure 6-25
Assigning a password to a menu

User and Custom environments

When you have created a password system, 4th Dimension will start up in the Custom environment. The exception is for the main password *if* Preferences specify starting in the Design environment and *if* the database application is running on a development system (and not a runtime system).

Passwords window

The Passwords window consists of the password boxes, the lines that connect parent boxes to child boxes, and the Passwords menu choices Modify and New Sub-Password. The Modify choice is duplicated by double-clicking an existing password box. Figure 6-26 illustrates the Passwords window.

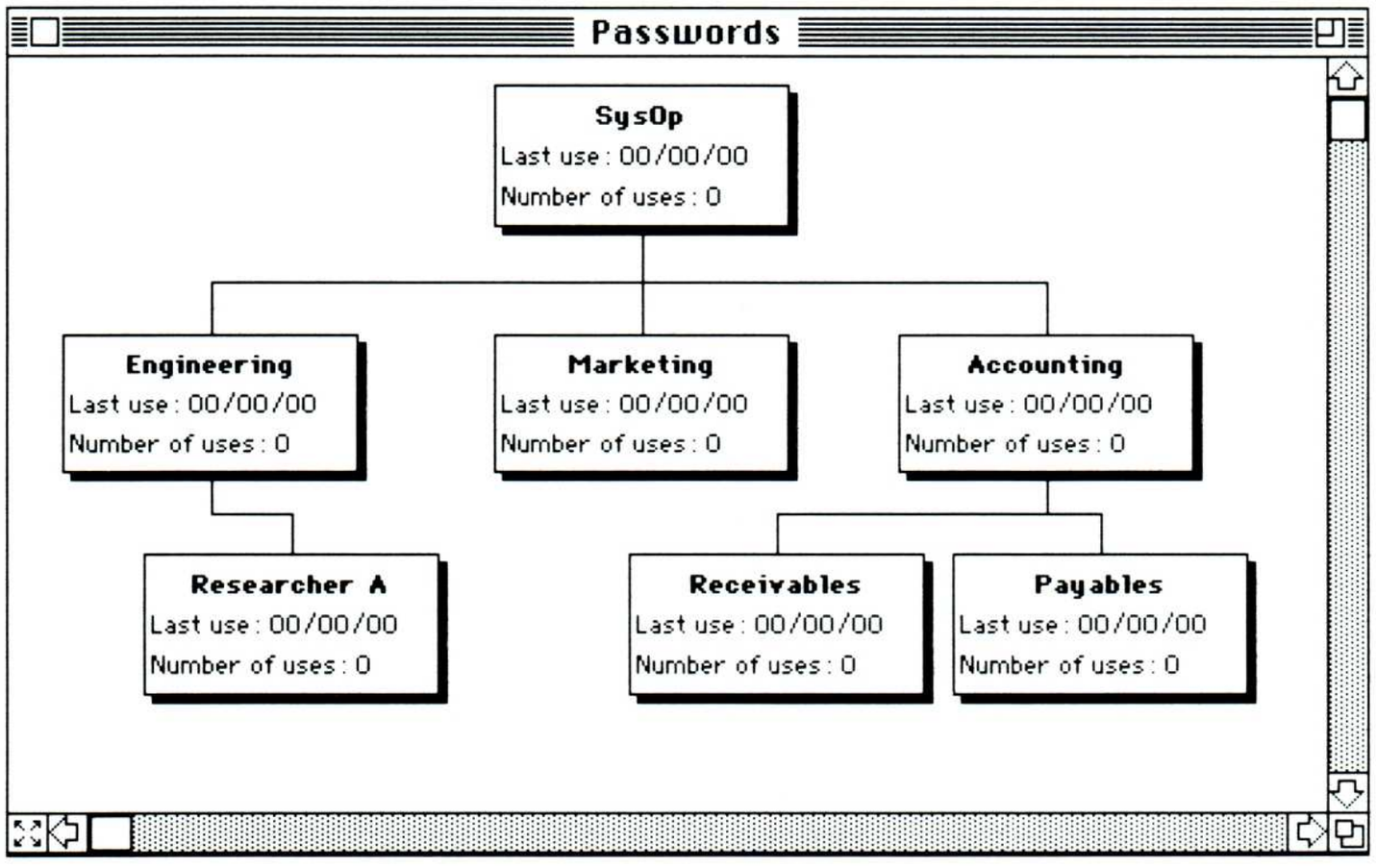


Figure 6-26
Passwords window

Creating a password system

The box for the main password is always present (whether or not there is a password set in it).

1. Open the Passwords editor

■ Choose Passwords from the Design menu.

4th Dimension displays the Passwords window. If you are creating a new password system, the Passwords window will contain only the main password.

There is only one Passwords window and one password system in any 4th Dimension database application.

2. Enter or modify a password

1. Double-click the box for a password.

   4th Dimension displays the Modify password dialog box.

   Or: Click a password box to select it and choose Modify from the Passwords menu.

2. Enter the password you wish in the box labeled Password.

   A password may be up to 15 characters long. You may enter more characters than that in the Modify password dialog box, but 4th Dimension will truncate the excess characters. During startup, 4th Dimension considers excess characters to be an incorrect password. Passwords are case sensitive.

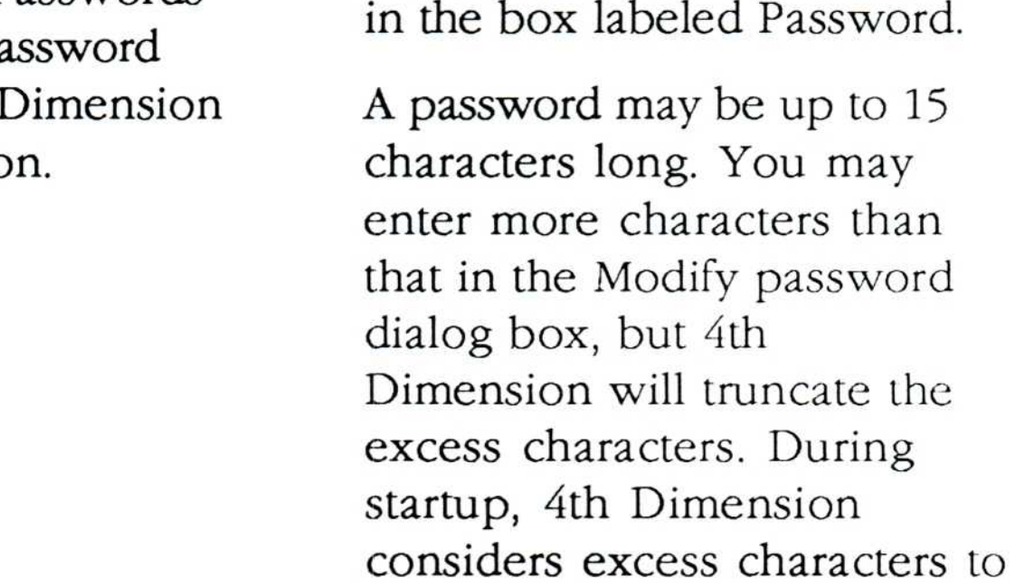


Figure 6-27
Modify password dialog box

- You may assign a startup procedure to execute when a user enters this password. Enter the name of the procedure in the Startup Procedure area.
- You may enter a date in the Last use area. 4th Dimension will place a date here for you the first time a user enters this password, and will update it each time a user enters the password thereafter.

Create a sub-password

1. Click an existing password box to select it.

   The password box you select will be the parent password of the sub-password you create.

2. Choose New Sub-Password from the Passwords menu.

   4th Dimension creates a new sub-password beneath the password you had originally selected. 4th Dimension automatically selects the new sub-password box for you.

3. Enter the password into the new sub-password box.

Moving password boxes

1. Click to select the password box you wish to move.

   Or: Shift-click to select several password boxes, or drag to frame several password boxes.

2. Drag the boxes to their new location.

   When you drag several boxes, they all move in relative formation.

Delete a password

1. Double-click a password box, or select one and choose Modify from the Passwords menu.

   4th Dimension displays its Modify password dialog box.

2. Erase the password, startup procedure, date of last use, and number of uses.

3. Click OK to accept your changes, or click Cancel to ignore them.

Remove a password from the system

1. Select a password box or several password boxes by clicking, Shift-clicking or dragging a frame.

2. From the Edit menu, choose Clear.

   4th Dimension removes from the system the password boxes you have selected.

Appendix A

4th Dimension Specifications

The tables in this appendix use the following abbreviations:

Abbreviation	Meaning
K	Kilobyte; 1,024 bytes
M	Million; 1,000,000
Mb	Megabyte; 1,048,576 bytes
Gb	Gigabyte; 1,073,741,824 bytes
hz	horizontal
vt	vertical

Table A-1
Structural maximums

Structure	Maximum number
Files per data base	99
Fields per file	511
Subfiles per file	511
Fields per subfile	511
Nested subfile levels	5
Complete data base	4 Gb
Bytes per record	4 Gb
Records per file	16M
Records per parent record in a subfile	32,767
Total indexes	32,767
Total links	Unlimited
Standard choices	8,192
Characters per choice	30
Layouts per data base	32,767
Size of layout	Points: 10,400 (hz) x 10,250 (vt) Centimeters: 367 (hz) x 362 (vt) Inches: 144 (hz) x 142 (vt)
Total variables	32,767
Local variables per procedure	32,767
Characters in a procedure	32,767
Total procedures per data base	32,767
Menu bars per data base	32,767
Password levels	32,767
Total passwords	32,767

Table A-2
Naming conventions

Name or title	Maximum length (chars)	Case sensitive?
Field name	15	No
Filename	15	No
Layout name	15	No
Menu item (command)	30	No
Menu title	15	No
Password	13	Yes
Procedure name	15	No
Variable name	11	No
Radio button	11	No

Table A-3
Field type specifications

Field type	Maximum size (bytes)	Range	Accuracy (digits)
Alpha	80		
Text	32,767		
Real	10	±1E1022	19
Integer	2	±32,767	4
Long integer	4	±2,147,483,647	9
Date	6	32,767	
Picture	32,767		
Subfile	(See Table A-1)		

Appendix B

Menu Command Reference

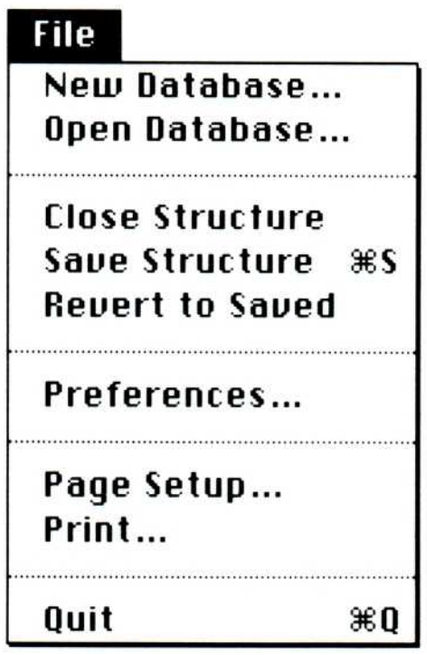
This reference lists 4th Dimension menu choices, menu by menu. Generally speaking, the File menu changes minimally, depending on the environment and any open windows; The Edit menu does not change.

Keyboard-equivalent characters appear in parentheses, like this: **(Z)** and designate the key combination Command-*key,* where *key* is the character in parentheses.

Design environment

In addition to the Apple, File, and Edit menus, the Design environment menu bar includes the Environment and Design menus. A sixth menu position changes depending on the active window. That position is variously

- **Structure window:** Structure menu
- **Layout window:** Font, Style, and Layout menus
- **Procedural editor:** Search menu
- **Flowchart editor:** Flowchart menu
- **Menu editor:** Menu menu
- **Password window:** Passwords menu



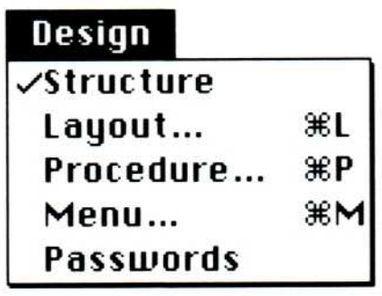
File menu

- **New Database:** 4th Dimension saves and closes the open database and displays its New Database dialog box that lets you name and create a new database.
- **Open Database:** 4th Dimension saves and closes the open database and displays its Open Database dialog box that lets you select an existing database to open.
- **Close *windowname:*** 4th Dimension saves and closes the currently active Design environment window named in *windowname,* where *windowname* refers to the Layout, Procedure, Menu, or Password window. You cannot close the Structure window. Closing a window saves its contents. *Windowname* varies automatically with the active window.
- **Save *windowname* (S):** 4th Dimension saves the contents of the window named in *windowname*. *Windowname* varies automatically with the active window.
- **Revert to Saved:** 4th Dimension loads the most recently saved version of the active window, and replaces its current contents with the contents it loads from the disk. Works only with procedures and layouts.
- **Preferences:** Preferences determine how your database application starts: in Design, User, or Custom environment; with the procedure editor keywords hidden, and printing or not printing procedure and layout titles. Using passwords may cause 4th Dimension to start in an environment other than Design.
- **Page Setup:** Page Setup is the standard setup dialog box for printing preferences.
- **Print:** 4th Dimension prints all the material in the active Design environment window (not limited only to the material *displayed* by the active window). The Print choice opens the standard print dialog box for quality, range, number of copies, and paper feed.
- **Quit (Q):** Quit returns you to the Finder. Before 4th Dimension quits, it saves all parts of your database design.

Environment menu

- **Design (Y):** In the Design environment, you create your data base application. If you have created and assigned passwords, only the holder of the main password may enter the Design environment.
- **User (U):** In the User environment, you may run your application using 4th Dimension's menus.
- **Custom (I):** By choosing Custom, you run your application as a turnkey system. You cannot enter the Custom environment without creating at least one custom menu.

4th Dimension will place a checkmark next to the name of the active environment. If you are in the Design environment and switch environments, 4th Dimension saves and closes all windows before switching.



Design menu

The Design menu lists the five parts of the Design environment. Each choice corresponds to a window. You may have open more than one window of any type except for Structure and Password. The menu lists any open windows by name under the original Design environment commands.

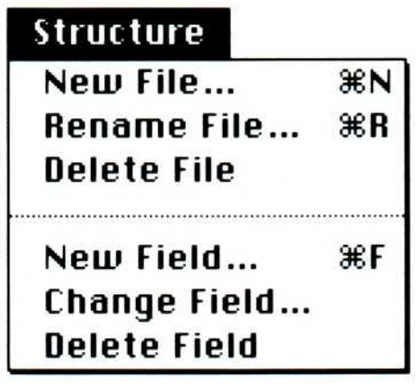
- **Structure:** The Structure window is where you create the underlying structure of the database application: the files, fields, and links. Choose Structure to display the Structure window. The Structure window is always open while you are in the Design environment.
- **Layout (L):** Choose Layout to open the Create Layout dialog box leading to the Layout window. The Layout window is where you draw the input and output layouts for your database application.
- **Procedure (P):** Choose Procedure to open either the Listing editor or the Flowchart editor. You may create both layout and global procedures with either editor.
- **Menu (M):** The Menu window allows you to create custom menus. Choose Menu to open the Menu editor.

- **Passwords:** The Passwords window is where you may create a password system for your database application.
- ***Windowtype: Name:*** *Windowtype* is the type of window you may have open: Layout, Layout Procedure, Procedure, Menu, or Password. *Name* is a named layout or procedure. If you have one or more windows other than the Structure window open, 4th Dimension will list those windows here with several choices. If the window displays a procedure, layout, or menu bar, 4th Dimension will list that also by name with its window type.

4th Dimension will place a checkmark next to the active window.

Window-dependent menus

The rightmost area in the Design environment menu bar varies with the active window. It may become one or more additional menus.



Structure window: Structure menu

- **New File (N):** New File adds a new file to the database.
- **Rename File (R):** Rename File changes the name of an existing file. Choose rename file routinely after creating a new file. 4th Dimension supplies all new files with a sequentially numbered filename.
- **Delete File:** Delete File removes a file and its data from the database. It rebuilds the structure and places you in the User environment.
- **New Field (F):** New Field creates a new field in the file you have selected.
- **Change Field:** Change Field opens 4th Dimension's Add or Change Field dialog box and allows you to change the name, type, and attributes of an existing field.
- **Delete Field:** Delete Field removes an existing field and its data from a file. 4th Dimension removes any links going to the file from linking files, rebuilds the structure, and places you in the User environment.

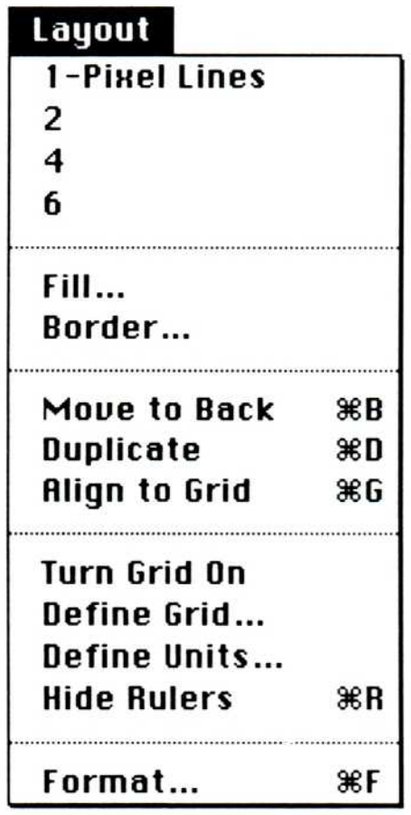
Layout window: Font, Style, and Layout menus

Font menu: From the Font menu, you may select one of the fonts you have in your system. The next text you enter into a layout will use the font you choose.

Style menu: From the Style menu, you may select a type style—plain, bold, italic, and so on; placement of text; and point size.

Layout menu: The Layout menu duplicates several of the tools available on the Layout window palette, such as Move to Back, Duplicate, and the Grid commands.

Layout window: Layout menu



- **Pixel Lines:** Choose one of the pixel lines to control the width of any line you draw or select on a layout.
- **Fill:** Fill opens a pattern dialog box. From it, choose the pattern you want to use to fill the selected area on your layout.
- **Borders:** Borders opens a pattern dialog box. Use this choice to set the fill pattern of selected lines.
- **Move to Back (B):** Move to Back immediately moves the selected graphic element "behind" the backmost element.
- **Duplicate (D):** Duplicate creates an exact copy of the selected graphic element.
- **Align to Grid (G):** Align to Grid takes the selected graphic elements and brings them into alignment with a system of invisible horizontal and vertical lines.
- **Turn Grid On/Off:** Turn Grid On/Off is a toggling menu choice that enables or disables the system of invisible horizontal and vertical lines.
- **Define Grid:** Define Grid opens 4th Dimension's Define grid dialog box. In it, you may set the fineness of the X and Y axes of the grid in points.
- **Define Units:** Define Units opens 4th Dimension's Define units dialog box. Use it to set whether you want the layout rulers measured in points, centimeters, or inches.
- **Hide Rulers/Show Rulers (R):** Hide Rulers/Show Rulers is a toggling menu choice that alternately clears and displays the marginal layout rulers.

- **Format (F):** Format displays the format dialog box in which you may set the format of the field, variable, or included layout you have selected (equivalent to double-clicking.)

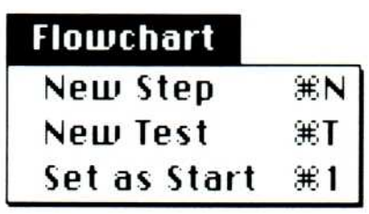
Layout window: Color menu

The Color menu provides a way for you to set the computer's internal color value for the On and Off pixels in your layout. The top part of the menu controls the color of the Off pixels, and the bottom controls the color of the On pixels.

Procedure window/listing: Search menu

- **Find (F):** Find opens a dialog box that accepts a string. 4th Dimension will search through the open listing, from the current pointer position to the end of the listing only, looking for a match.
- **Find Next (G):** Choose Find Next and 4th Dimension does the previous search again.
- **Replace (R):** With Replace, 4th Dimension presents a dialog box that accepts a string on which to search, and a string with which to replace the search string if and when it's found. 4th Dimension will only search and replace one instance at a time.
- **Replace Next (T):** Replace Next again does the Find and Replace action with the same values.

Procedure window/flowchart: Flowchart menu



- **New Step (N):** New Step lets you create a new flowchart statement. Choose New Step, and the pointer becomes a crossbar so that you can locate the step where you wish in the flowchart.
- **New Test (T):** New Test lets you create a new test, or decision box. Choose New Test, and the pointer becomes a crossbar so that you can locate the test where you wish in the flowchart.
- **Set as Start(1):** Choose Set as Start to make a step or test the starting point for the procedure. Set as Start acts on any step or test you have selected.

Menu window: Menu menu

- **Append Menu:** Append Menu creates a blank menu command at the end of the list of menus for the menu bar you're editing. Enter the name of the new menu in this area.
- **Insert Menu:** Insert Menu creates an editable area immediately before any menu you have selected. Enter the name of the new menu in this area.
- **Delete Menu:** Delete Menu removes the menu you have selected, and closes ranks in the list of menus if necessary.
- **Append Item:** Append Item creates two editable areas, one each in the Items list and the Procedures list, at the end of their respective lists. You must have selected a menu to which to append the item. Enter the names of the menu item and its corresponding procedure in these areas.
- **Insert Item:** Insert Item creates two editable areas, one each in the Items list and the Procedures list, immediately before any Item or Procedure you may have selected. Enter the names of the menu item and its corresponding procedure in these areas. You must have selected a menu to which to apply the item.
- **Delete Item:** Delete Item removes the names of both the item and its corresponding procedure from the Items and Procedures lists. 4th Dimension closes ranks in the list of Items and Procedures if necessary. You may only delete the items of the menu choice you have selected.
- **Show Custom Menus:** Show Custom Menus illustrates how the menu bar you are editing would appear on the screen. You may also paste in a title page graphic at this time.

Passwords window: Passwords menu

- **Modify:** Modify opens a dialog box that allows you to enter or change the password, a startup procedure, the date of last use, and the number of uses logged to date, for the password box you have selected.
- **New Sub-Password (N):** New Sub-Password creates a new, empty password box subsidiary to the password box you have selected.
- **Quit (Q):** The Quit command Quits the Application.

User environment

The User environment menu commands are 4th Dimension's own database handling commands.

File menu

The File menu changes only slightly between the Design environment and the User environment.

- **New Database:** New Database creates a new database.
- **Open Database:** Open Database opens an existing database.
- **Import Data:** Import Data copies in a file of data in the SYLK, DIF, or ASCII text file format, with end-of-field and end-of-record delimiting characters set to ASCII values as you specify them. You must have already created a 4th Dimension file and layout with the required fields, field types, and lengths to receive the import information. Import works through the current input layout.
- **Export Data:** Export Data saves the data of your currently selected file in the SYLK, DIF, or ASCII text format, with end-of-field and end-of-record delimiting characters set to ASCII values as you specify them. Export Data exports through a specific 4th Dimension layout. Export works through the current output layout.
- **Choose File/Layout (F):** Choose File/Layout opens a dialog box that lets you select the file with which you want to work, and determine which of the layouts for that file will be the input and which the output layout. You may have only one input and one output layout at a time; they may be the same layout. The input and output layouts for the selected file are called the default layouts.
- **Page Setup:** Page Setup opens the standard Page Setup dialog box.
- **Print:** Print opens a dialog box that allows you to select which of the layouts for the selected file you wish to use to print the records of that file.

Environment menu

The Environment menu in the User environment fulfills the same functions it does in the Design environment.

- **Design (Y):** Choose Design to switch to the Design environment and automatically open the Structure window.
- **User (U):** Choosing User has no effect in the User environment.
- **Custom (I):** Choose Custom to begin using the application as a custom system. You may choose Custom only if you have created at least one custom menu.

4th Dimension places a checkmark next to the active environment.

Enter menu

The New Record and Modify Record choices in the Enter menu display the default input layout for the selected file.

- **New Record (N):** New Record displays a blank input layout for the user to fill out.
- **Modify Record (M):** Modify Record displays a selected record in the default input layout for the user to modify. If you have selected several records, Modify Record will display them sequentially as long as you continue to click the Next arrow.
- **Apply Formula:** Apply Formula displays 4th Dimension's Formula editor (similar to the Listing editor) for you to construct a formula to modify the current selection.

Select menu

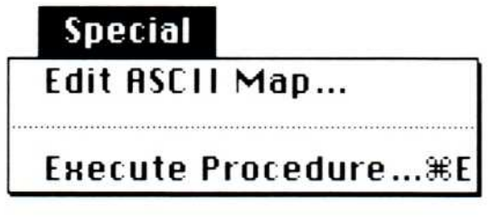
The Show and Sort menu commands operate on the current selection of records, which may or may not be all the records in the database.

- **Show All:** The Show All command displays a scrollable list of all the records in the database. Show All uses the default output layout for the selected file.
- **Show Subset:** Show Subset displays the current selection of records. Show Subset uses the default output layout for the selected file.
- **Search:** Choosing Search displays 4th Dimension's Search editor. Searching alters the current selection by selecting records that meet various field content criteria in And, Or, and Except combinations. You may save and load Search formulas.
- **Search and Modify:** Search and Modify displays a dialog box that lists the first indexed fields in the file and provides an editable area for you to enter the value for those fields on which you want to search. Search and Modify operates on the selected file and on the entire database. It presents the input layout of the first record in the new current selection it produces for you to edit. You must have at least one indexed field in the file for Search and Modify to operate.
- **Search by Formula:** Search by Formula conducts a record-by-record search by formula. Choosing Search by Formula displays a Formula editor. You may create a new formula, save and load formulas, or execute a formula.
- **Sort:** Choosing Sort displays a sorting dialog box. Sort operates on the current selection. 4th Dimension will display the sorted records through the default output layout.

Report menu

The Report menu produces three reports based on the current selection.

- **Quick (R):** Quick displays a dialog box that allows you to define a basic columnar report from the selected file and any file in the database linked to it. The reports may include break on field change, column totals, and column subtotals at field breaks. You may "dress" the report with a border frame and titles. You may save and load report definitions.
- **Labels (L):** The Labels command assumes that the default output layout is intended to produce mailing labels, and prints them.
- **Graph (G):** Graph displays a dialog box that allows you to create eight different kinds of graphs and name X-axis labels (an Alpha field) that match up to five data series (numeric fields) in your database. Graph operates on the selected file and current selection only.



Special menu

- **Edit ASCII Map:** Choose Edit ASCII Map to alter the way 4th Dimension associates the ASCII characters it uses to communicate externally with the ASCII characters it uses internally. The ASCII map acts as a filter, interpreting all characters input and output by the program.
- **Execute Procedure (E):** Execute Procedure displays a dialog box that lists all the global procedures for the database. Execute Procedure provides a way to execute these global procedures.

Custom environment

In the Custom environment, the menu bar and its menus are under developer control. There are three default conditions:

- ☐ The developer cannot alter the existing Apple menu.
- ☐ The File menu will have a quit command.
- ☐ The developer cannot alter the Edit menu.

Appendix C

4th Dimension Files

4th Dimension creates a minimum of five files for every database. These files hold Preferences, the structure, the data, and any procedures and layouts.

When you transfer a 4th Dimension application from one disk to another, you must transfer all the files. All files must remain in the same folder, although the 4th Dimension program may be in any folder, or even on another disk.

Files and their contents

Assuming you had produced an application called TestFile, 4th Dimension would create the following files (the colons are not part of the filenames):

- **TestFile:** This file holds the custom menus and passwords.
- **TestFile.data:** The .data file contains the data for all the files in the database.
- **TestFile.enum:** The .enum file holds the enumerated (standard) choices for the database. You may have up to 8K of enumerated choices.

- **TestFile.Index*n*:** There is one .Index file for every indexed field in the database. *n* signifies the number that 4th Dimension gives each file. 4th Dimension supports 32,767 indexes per database, so this number can become quite large.
- **TestFile.res:** The .res file houses all layouts and procedures.
- **TestFile.struct:** The .struct file contains all file structures, field descriptions, and link information.

The 99 files that 4th Dimension supports in its applications do not appear as 99 separate files on the desktop. 4th Dimension combines them in its own system.

4th Dimension file icons

The 4th Dimension application icon.

The main database file. Double-click to open a database.

The database structure files. There are four for each database.

A database index file.

A search file. Can be either search criteria or a search formula.

A Quick Report.

An Apply Formula file.

An ASCII Map file.

Any text files, including export and send packet.

Saved Variables.

A saved set.

The multi-user database flags.

Appendix D

4th Dimension Shortcuts

4th Dimension has several shortcuts that fall into the category of "tricks." Most of these commands revolve around the Option-Command-click key combination, with the pointer at a particular place on a layout or in a window.

Creating arrays of variables

If you wish to create several similarly sized and named variables (as buttons on a large calculator layout, for example), 4th Dimension provides a shortcut to create the array.

1. In the Layout window, create one variable of the size and type you wish. Name the variable (something like "x," for instance). Set any formatting at this time.
2. Duplicate the variable. Position it beneath the first variable.
3. Click Duplicate again. Another variable appears, this time positioned beneath the second the same distance that the second was below the first. Continue to duplicate until you have a column of variables. Select all the variables in the column, duplicate them, and move the second column alongside the first column. Continue until you have as many variables as you will need.
4. Choose Select All, or drag a frame around all the variables.

5. Press the Option and Command keys, and click. 4th Dimension displays a dialog box requesting the first number of the array. The default is 1.
6. Enter the number at which you want to start numbering the array. Click OK. 4th Dimension displays another dialog box requesting the increment by which you want to increase the number of each successive variable. The default is 1.
7. Enter the number by which you want to increment the variables. Click OK. 4th Dimension adds the number to the name you gave the original variable. 4th Dimension will not name your original variable, even though it was included in the selection.

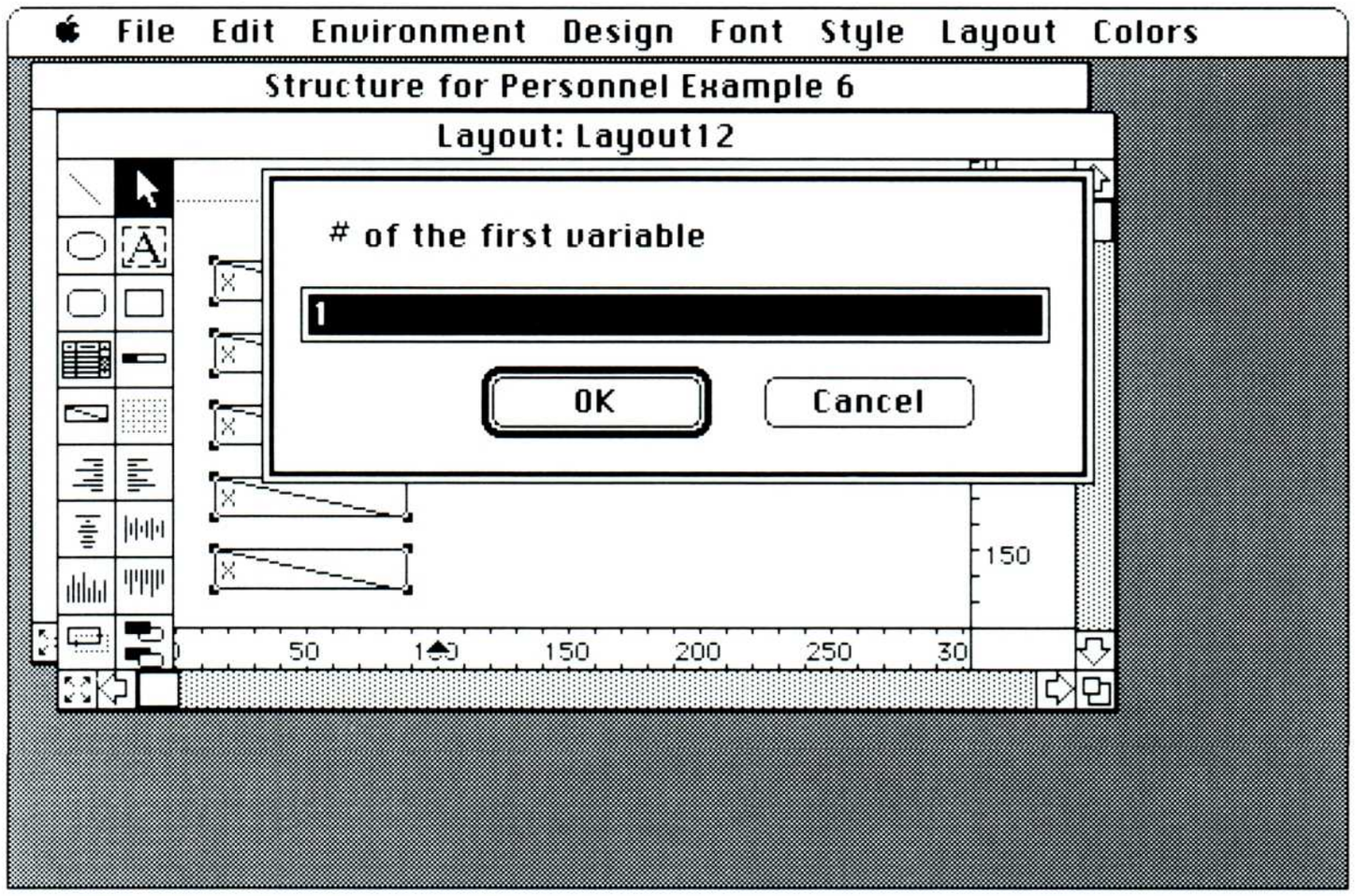


Figure D-1
Creating an array of variables

Boxes around variables and fields

When creating a layout, you may wish to outline your variables and fields as 4th Dimension does, with a two-pixel line. There is an easier way than drawing such a border line by line.

1. Select the object or objects you wish to outline.
2. Press the Shift and Command keys, and click.

Or: Select the field, and press Shift-Command-click.

4th Dimension will outline the field or variable for you.

Boxes of different widths

After selecting an object or objects, the keystrokes Command-1 through Command-9 will make boxes one to nine pixels larger than the selected elements.

Calling the debugger

While an error or the TRACE statement will call the debugger in both User environment and Custom environment, you can summon the debugger yourself when a procedure is running.

To call the debugger while a procedure is executing, press Option, and click.

Pixel handling in Picture fields

When you lay one graphic element upon another, as you would when pasting a graphic element onto a Picture field on background in the Custom enviroment, 4th Dimension must decide how to And, Or, or Exclusive-Or the pixels. Anding, Oring, and Exclusive-Oring are logical operations that result in either a black or a white pixel at any particular point in the graphic element.

In essence, what the program must determine is how to handle the contrast between the underlying image pasted to the background and the new image that the user is pasting to the Picture "On background" field.

- To set the contrast between an image pasted to a Picture "On background" field and its underlying graphic element, double-click the Picture "On background" field. 4th Dimension will display its Choice of Modes dialog box.
- Click one of the eight choices.

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