

4th Dimension

Tutorials

4^e Dimension[®] - Author : Laurent Ribardière.
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Before you start these tutorials, you should have worked through the *4th Dimension Quick Start* manual. The *Quick Start* chapters provide you with a complete basic introduction to the program. Even if you are familiar with 4th Dimension, you should read it through.

This book begins where the *Quick Start* manual leaves off. The *Quick Start* manual teaches you the basic skills you need to use 4th Dimension productively in your own work. The *4th Dimension Tutorials* manual is designed to help you take advantage of 4th Dimension's more advanced features.

ABOUT THE MANUALS

The manuals described below provide a guide to the features of both 4th Dimension and 4D Server. The only exception is the *4D Server Reference* which describes features exclusive to 4D Server and is included only in the 4D Server documentation package.

The *4th Dimension Quick Start* and *4th Dimension Tutorials* manuals lead you through example lessons where you create and use a 4th Dimension database. These examples provide hands-on experience to help you become familiar with the concepts and features of 4th Dimension and 4D Server.

The *4th Dimension User Reference* provides a description of the User environment—the environment in which you use databases and layouts to enter and manipulate data.

The *4th Dimension Design Reference* is a reference guide to the Design environment which provides detailed descriptions of the operations you can perform in this environment. You should use it in conjunction with the other volumes in your documentation package.

The *4th Dimension Language Reference* is a guide to using the 4th Dimension language. Use this manual to learn how to customize a database by

incorporating 4th Dimension commands and functions.

The *4D Server Reference* is a guide to installing and managing multi-user databases with 4D Server. This manual is included only in the 4D Server documentation package.

The *4th Dimension Utilities Guide* provides a guide to the utilities available with 4th Dimension and 4D Server, such as 4D Tools, and Customizer Plus.

The *4th Dimension Glossary and Master Index* contains a glossary of terms and an index to all 4th Dimension manuals.

Additional important information is provided online. The electronic documentation is installed on your hard disk when you install 4th Dimension.

ABOUT THIS TUTORIAL

This book offers you a series of tutorials, step-by-step explanations that teach you how to use many of 4th Dimension's advanced features. Be sure to work through the whole book since later chapters assume knowledge of earlier chapters.

The tutorials provide specific steps for you to follow, as well as general information that explains 4th Dimension. The steps are usually accompanied by a short comment or explanation. The format for steps and explanations looks like this:

1. A numbered step tells you exactly what to do.

Following the numbered step is a separate paragraph that offers a pertinent explanation or comment.

When a numbered step asks you to type something, the characters you should type are enclosed in quotation marks:

2. Type “Garbondo” in the Last Name field.

Type exactly what is enclosed in the quotation marks, including any spaces or punctuation.

4D Server: Unless otherwise noted, the tutorials work the same for 4th Dimension and 4D Server. However, 4D Server users should be aware that conflicts may occur if two or more people work on the tutorials at the same time.

Conventions

All the manuals in your documentation package, including this one, use certain conventions to help you understand the material.

The following explanatory notes are used:

NOTE: Text emphasized like this provides annotations and shortcuts that will help you use 4th Dimension more productively.

4D Server: Throughout the manual, 4th Dimension and 4D Server/4D Client are referred to simply as 4th Dimension. Differences between the operation of the two products are explained in 4D Server notes which provide information about using 4D Server/4D Client. This information is provided only when the operation of 4D Server/4D Client differs from that of 4th Dimension.

Notes like this alert you to important pieces of information.

Warnings like this alert you to situations where data might be lost.

In addition, all filenames are shown in brackets in the text to help distinguish them from the names of fields, layouts, and other items. For instance, the Companies file is written as the [Companies] file.

Database: People01

Estimated time to complete: 25 minutes

In the *4th Dimension Quick Start* manual you created a personnel database in which you used default layouts automatically created by 4th Dimension to enter and display employee data. In this chapter, you will learn how to create your own layouts and how to modify them using the Layout editor.

4th Dimension's Layout editor includes a simple but powerful drawing program that allows you to make the screen design for your database exactly the way you want it. In addition, the Layout editor provides many additional functions that affect fields and how they work with information.

In this chapter you will learn how to:

- Create layouts,
- Select, move, and change elements on a layout,
- Change text on a layout,
- Draw lines and shapes,
- Use fill patterns,
- Set the display format for numbers and dates.

CREATING AN INPUT LAYOUT

In this section, you will create an input layout for entering employee data into your personnel database. Later on, you will modify this layout to improve data entry and create an effective user interface.

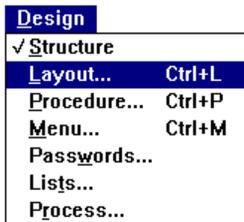
1. If you have not done so already, start 4th Dimension and open the People01 database.

The tutorials databases are located in the Tutorials directory in the 4th Dimension directory.

People01 starts in the Design environment.

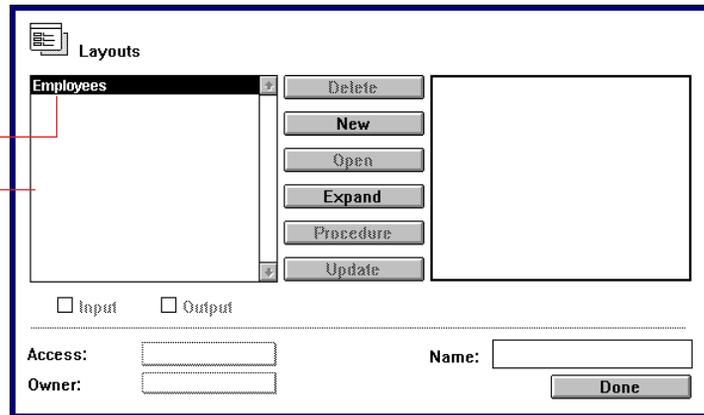
2. Choose Layout... from the Design menu.

4th Dimension displays the Layout dialog box which you will use to create your input layout.



Filename

List of Files



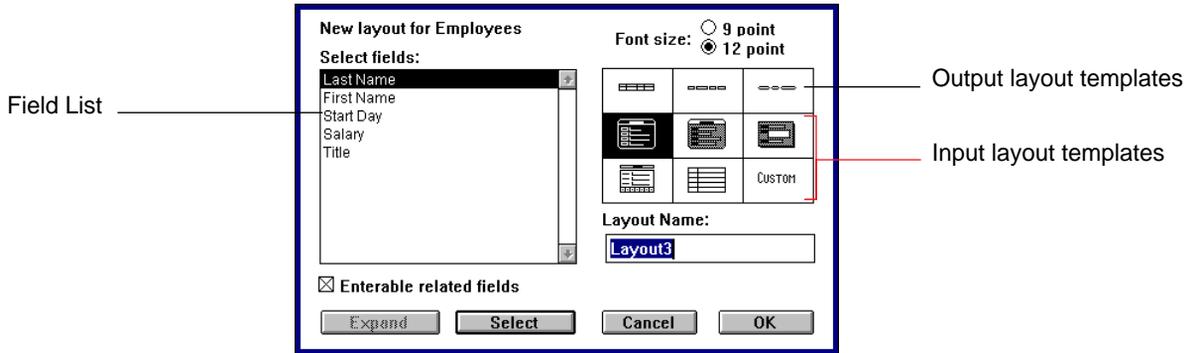
The List of Files displays the names of all files in the database. Since there is only one file in the database, [Employees], only one filename is displayed. After you create a layout, the layout name will be displayed beneath the [Employees] filename.

The [Employees] filename should be highlighted. If it is not highlighted, select it.

You are now ready to create a layout for this file.

3. Click the New button.

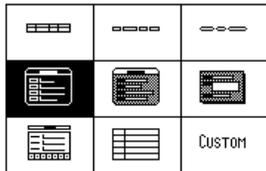
4th Dimension displays the New Layout dialog box.



The New Layout dialog box is where you name the layout, choose the fields that you want to include, and specify the font size and layout template you want to use. A layout template is a pattern 4th Dimension uses to create a layout.

The layout templates have been designed to display information effectively. 4th Dimension provides three output layout templates for listing information in a row-and-column format and five input layout templates for displaying one record at a time. You will usually start with one of these templates for your layout and then modify the layout to suit your needs exactly. If you wanted to design an original layout yourself, you would choose Custom from the group of templates.

4th Dimension automatically places all the fields in the layout unless you select specific fields you want to use. Since you will use all the fields for your input layout, you do not need to select any fields. Later in this chapter you will learn how to use the New Layout dialog box to select only the fields you want and place them in the order you want them.



For this layout, you will use layout template #4, which is already selected.

4. Type “Employee Input” as the name of the layout you are creating.

The Layout Name text box is preselected when the dialog box opens so that you can type the layout name immediately.

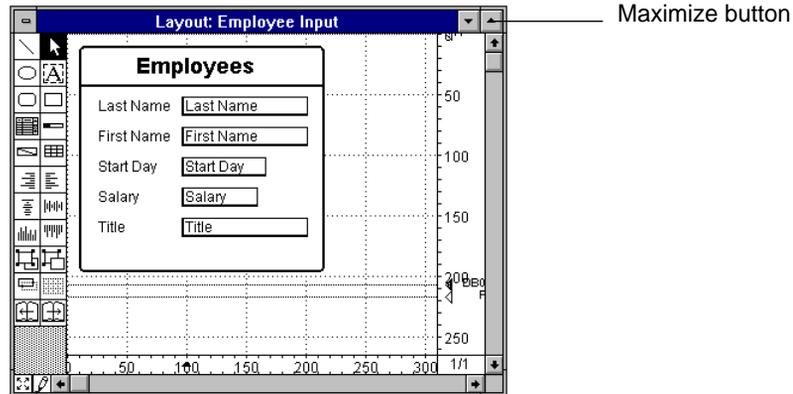
5. Click OK.

4th Dimension creates the layout and displays it in the Layout editor. The Layout editor allows you to modify any layout. You can modify a layout immediately after you create it or at a later time.

Your layout includes all the fields, displayed in the order they were created.

6. Click the maximize button so that the Layout window fills the entire screen.

The **maximize** button is in the upper right corner of the Layout window.



You have just created your own input layout. Your input layout is ideally suited to enter information. Records appear on the screen one at a time. When you have entered the information in the fields for one record, you go on to the next record.

You can leave this window open while you continue the tutorial. 4th Dimension allows you to open as many windows as you want, limited only by the memory available on your machine.

In the next section, you will create an output layout that displays several records at a time in a list format.

CREATING AN OUTPUT LAYOUT

To view as much information at one time as possible, you need a display that lists records in rows and columns. A list layout lets you display and print many records.

To create a second layout, you use the Layout dialog box and the New Layout dialog box again.

1. Choose Layout... from the Design menu.

4th Dimension displays the Layout dialog box. The [Employees] filename is highlighted.

2. Click the New button in the Layout dialog box.

4th Dimension displays the New Layout dialog box.

3. Enter "Employee List" as the layout name.

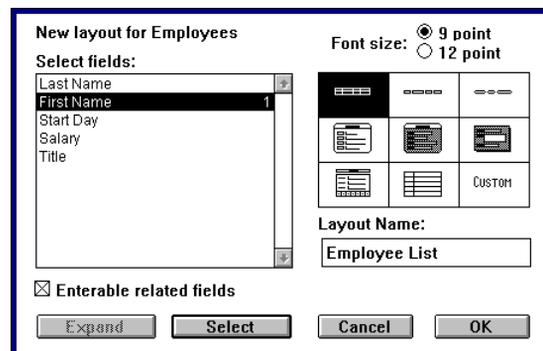
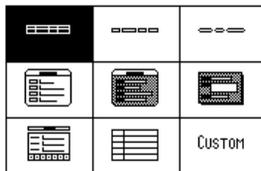
4. Select the first layout template (in the upper left corner of the template choices) and make the font size 9-point.

The first three standard layout templates are for output layouts. They display the records in rows and columns. The first template, the one you have chosen, shows the field names at the top of the columns.

For your output layout, you want the employees' first names to appear in the first column instead of the second column. You need to select the fields manually to place them in a different order on the layout.

5. Select First Name in the fields list and click the Select button.

4th Dimension places a number 1 next to First Name. The number indicates the selection order for the field.



6. Select Last Name and click the Select button.

4th Dimension places a number 2 next to Last Name.

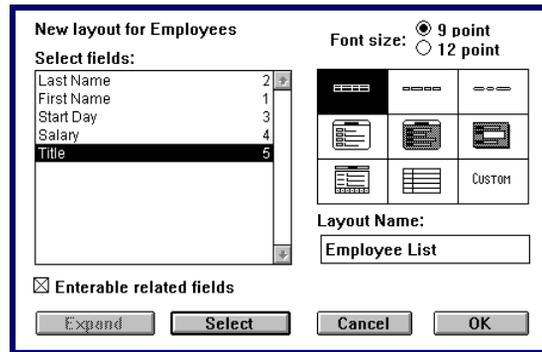
NOTE: As a shortcut, you can double-click a field to select it.

7. Double-click Start Day.

Double-clicking selects the field for the layout.

8. Select Salary and Title.

You can either use the **Select** button or double-click the field names to select them.

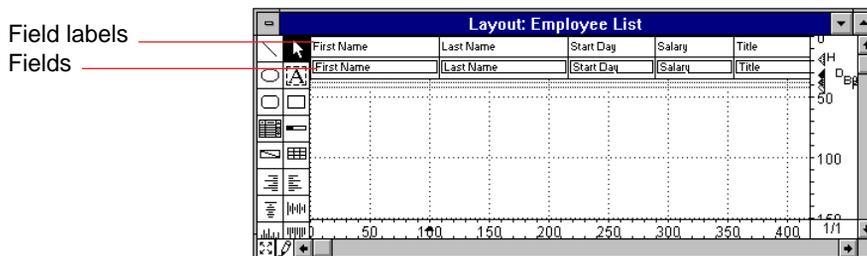


9. Click OK.

4th Dimension creates the output layout for you.

10. Drag the window to expand it so that you can see how the layout is designed.

Dragging the windows is an alternative to using the **maximize** button.



This layout shows all the fields for a single record. The fields are placed below the field labels. When this layout is used, it will automatically generate a row-and-column listing of records with a field label at the top of each column.

11. Minimize the layout windows by clicking the minimize button in the upper right corners of the windows.

OR

Double-click the Control-menu box of each layout window to close the windows.

4th Dimension automatically saves the layouts and returns to the Structure window.

You can use the Layout editor to create many different layouts. However, when you are entering and managing information in the User environment, you will always use one input layout and one output layout. 4th Dimension displays the input layout when you enter or modify information. It displays the output layout when you want to display the records as a list.

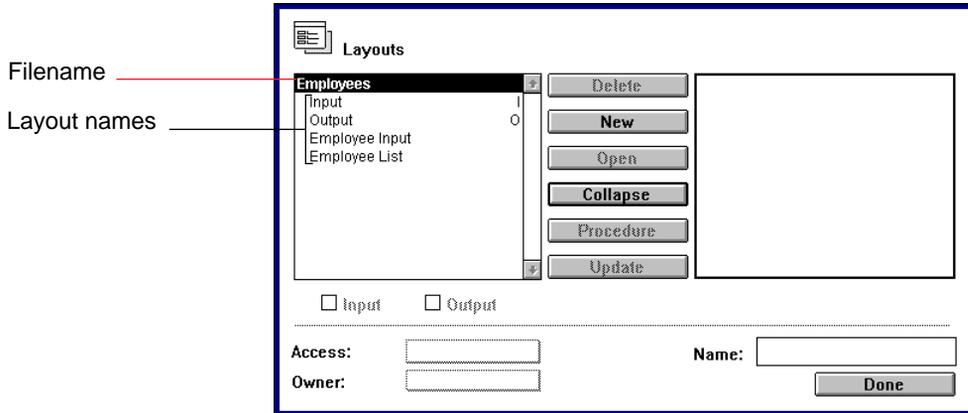
MODIFYING THE LAYOUT

Once you create a layout, you may want to modify it using the tools in the Layout editor. These tools give you complete control over the appearance of your screens and printed reports.

1. Choose Layout... from the Design menu.

4th Dimension opens the Layout dialog box. You can open any layout from this dialog box.

2. Click the Expand button to show the [Employees] file layouts.



Notice that there are two other layouts in addition to the layouts you just created. The input and output layouts listed first under the [Employees] file are the default layouts 4th Dimension automatically created for the file. The Employee Input and Employee List layouts listed below them are the layouts you created.

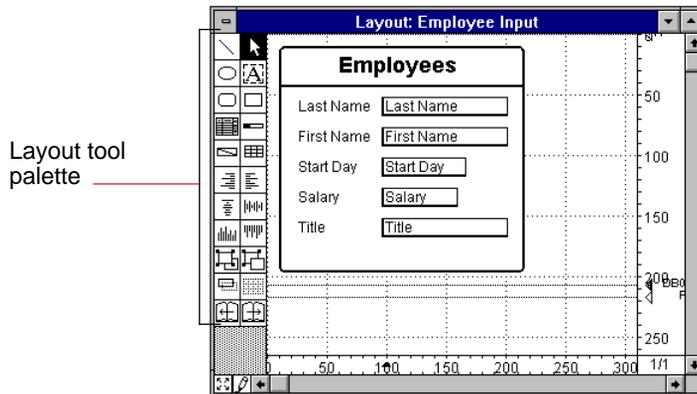
3. Select the Employee Input layout and click the Open button.

OR

Double-click the Employee Input layout name.

4th Dimension displays the layout in its own window.

4. Expand the window by clicking the maximize button or by dragging the window so that the layout window fills the entire screen.



The Layout editor is similar to a Windows drawing program. You can change the background patterns and line widths, enter descriptive text, and change the style and font of the typeface. The layout palette and the Layout editor menus allow you to create exactly the layout you want to use. And, if you make a mistake, you can simply choose **Undo** from the **Edit** menu and your last action is undone. You can also use the other menu commands in the **Edit** menu to perform standard Windows cut and paste operations in your layout.

Notice that this layout has been given a title that is the same as the filename, "Employees." Because this particular layout will be used to enter and modify information for each employee, you decide to change the title to "Employee Information."

Each element on the layout is an object that you select in order to change it. You can move the object simply by selecting it and dragging it to its new location. You use the handles that appear on the boundary of an object (an invisible rectangle enclosing the object) to change the size of the object.

5. Make sure you click the Arrow tool  if it is not already selected.

The Arrow tool allows you to select objects on the layout. In the next step you are going to select the layout title.

6. Click once on the title Employees.

Be sure to click on the word itself.

4th Dimension displays handles around the title.

Employees

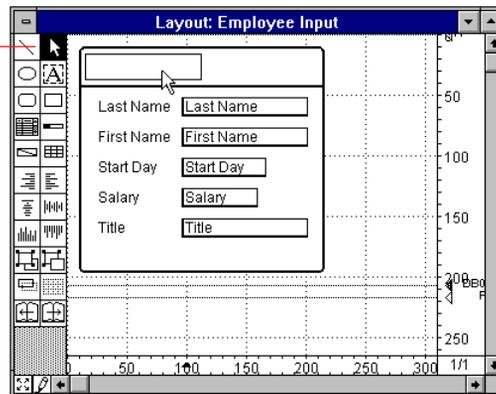
The title area is a graphic object. When it is selected, handles appear on each corner of the boundary. In the next step, you will use one of the handles to resize the title area.

If you wish, select different objects in the layout area. You will see that the handles always show the selected object. Be sure to select the title again before going on to the next step.

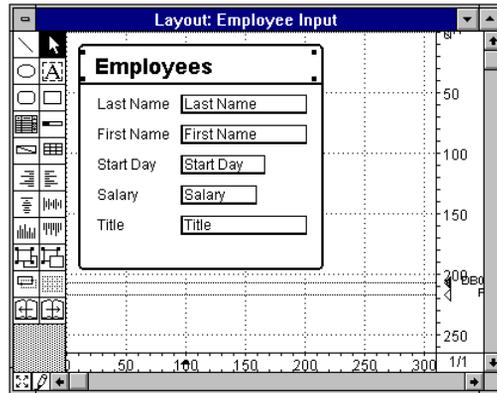
7. Drag the title area to the left, placing it just within the border of the layout.

When you start to move the title area, it becomes a blank rectangle.

Arrow tool



8. Resize the title area by making it as wide as the border of the layout.



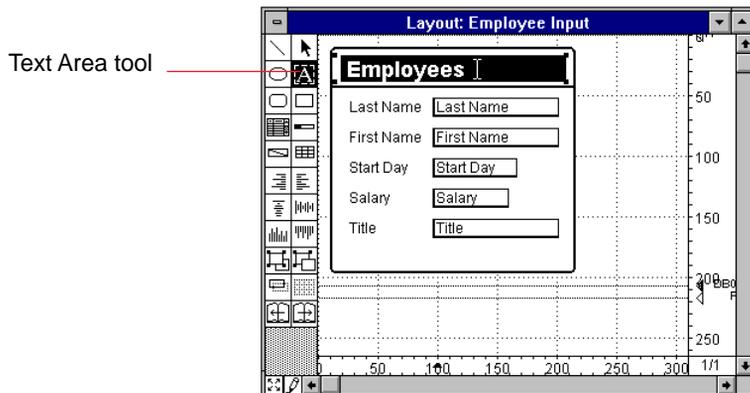
You resize an object by placing the tip of the pointer on one of the handles so that the pointer changes into a multi-directional arrow . You then drag the handle to resize the object.

Feel free to resize several of the objects on the screen. You can always return to the original layout by choosing **Revert to Saved** from the **File** menu. At any point, you can go back one step by choosing **Undo** from the **Edit** menu. Be sure to leave your screen looking like the previous illustration before continuing.

9. Select the Text Area tool  from the layout palette.

10. Drag the I-beam pointer across the entire title.

You are going to replace the title with “Employee Information”.



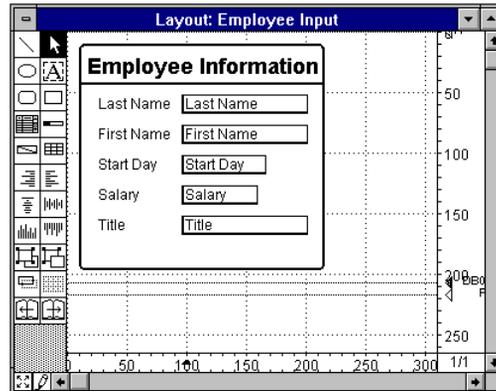
11. Type “Employee Information”.

The new title replaces the old one.

*NOTE: The layout title has nothing to do with the layout name; the title is strictly a text element added to the layout. If you refer to this layout in procedures, you will use **Employee Input**, the name you gave this particular layout.*

12. Choose Center from the Style menu to center the new title.

Your final screen should look like this:



13. To prepare for the next steps, click the Arrow tool.

The pointer changes to an arrow.

Using the Layout Editor Drawing Tools

The 4th Dimension Layout editor has graphic design features that allow you to create borders, lines, and patterns to enhance your layout. Objects can be layered, that is, placed on top of or beneath other objects. Any object on the layout can be moved backward or forward so that it appears beneath or on top of other objects.

In this section, you will explore some of the Layout editor's graphic capabilities.

1. Choose Save Layout: Employee Input from the File menu.

It is always a good idea to save a layout you are happy with so that if you do not like the changes you make, you can return to the previous version of the layout.

2. Click within the border of the layout (but not on another object) so that the border is selected.

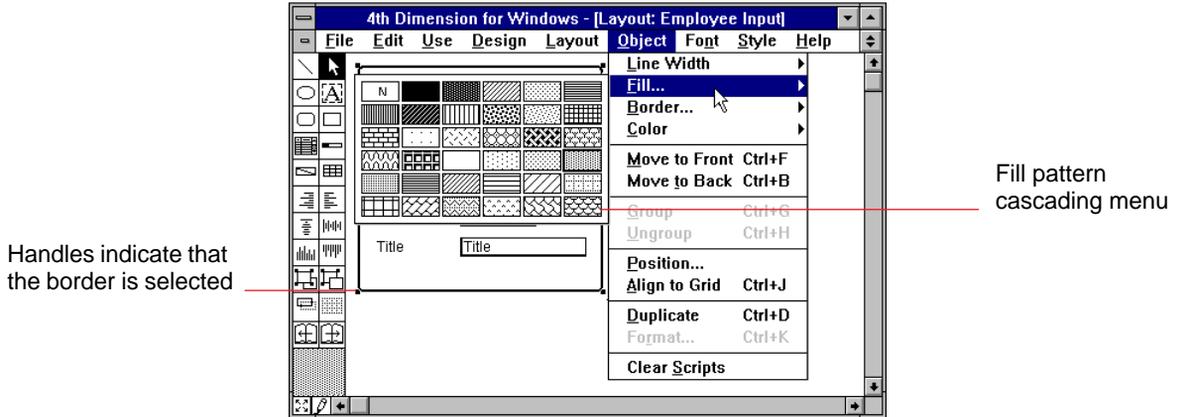
Handles appear at the corners of the layout border.

In the next step, you will choose a fill pattern for the layout from a cascading menu. Choosing from a cascading menu is a two-step process.

3. Choose Fill... from the Object menu.

The Fill Pattern cascading menu appears next to the **Object** menu.

4. While holding down the mouse button, drag the pointer to the pattern you want to use and then release the mouse button.



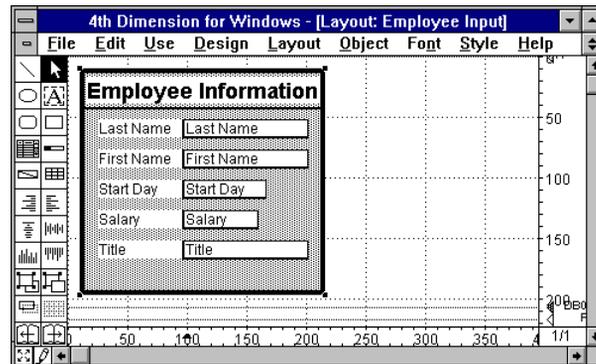
4th Dimension displays the border rectangle with the fill pattern you have chosen. As you see on your screen, the title, field labels, and fields are not obscured by the fill pattern. This is because they are in front of the background and the border.

In the next step, you will choose a new line width for the border from another cascading menu. Make sure that the border is still selected before you go on.



5. Choose Line Width from the Object menu and select the widest line width from the Line Width cascading menu.

4th Dimension displays the background with the new line width.



In the next steps, you will draw some shapes and experiment with the

Move to Front and Move to Back tools.

6. Click the Oval tool  in the layout palette and draw an oval below the border of the layout.

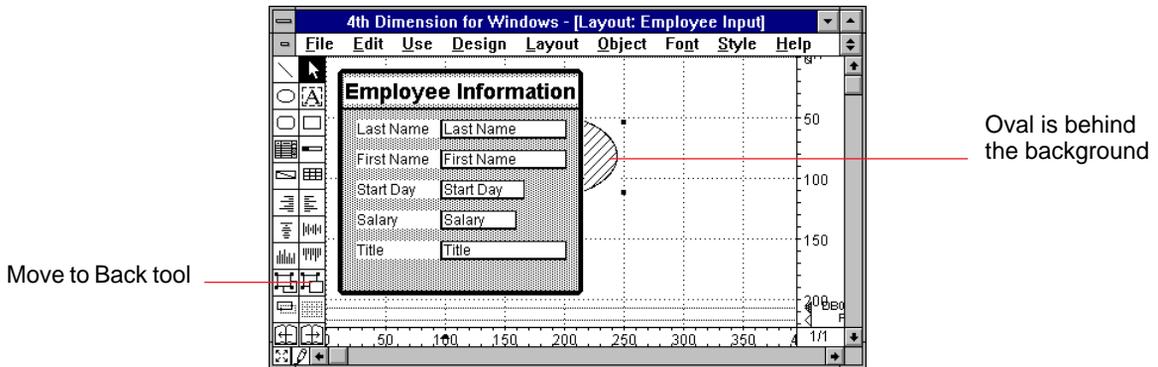
The screen scrolls to make room for the oval if you draw below the bottom of the window.

7. Choose a new fill pattern from the Fill... cascading menu.

8. Drag the oval onto the layout.

The oval covers whatever is beneath it.

9. Click the Move to Back tool  to move the oval beneath the layout.



Feel free to use the other drawing tools to draw any lines, rectangles, or rounded rectangles you wish. You can drag them to different locations and resize them into different shapes. This kind of experimentation can spark ideas for how to use the different shapes to create interesting and useful layout designs.

10. When you are finished, choose Revert to Saved from the File menu.

11. Click the Yes button to confirm that you want to revert to the last saved version of the layout.

The layout you have been working on is replaced by the version you saved at the beginning of this section.

Using the Alignment Tools

When you modify a layout by moving, adding, or rearranging layout elements, you often want to align objects in relation to one another. 4th Dimension provides alignment tools that allow you to align selected objects precisely.

In this section, you will explore the effects of the alignment tools.

1. Use the Rectangle tool  to create a rectangle below the current layout border and fill the rectangle with a pattern.
2. Deselect the rectangle by clicking somewhere outside of the layout. You will use this rectangle to see how the alignment tools function.
3. Hold down the Shift key while you click each of the fields on your layout.

Be sure to select just the fields, not the field labels.

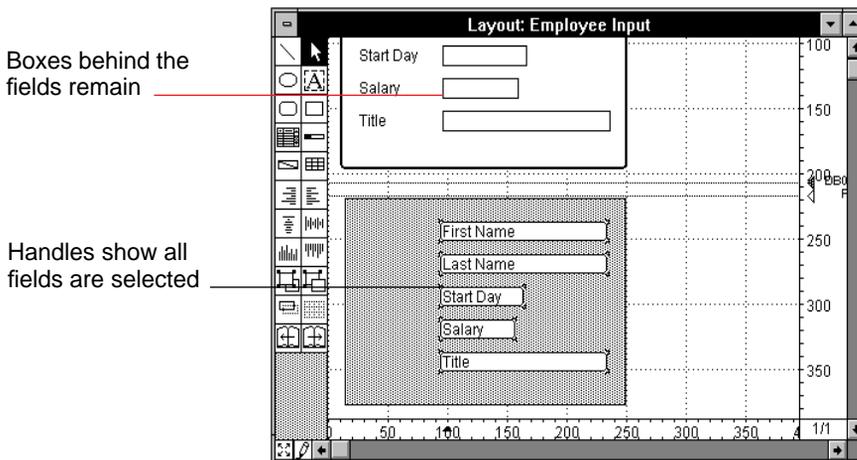
Shift-clicking is one way to select more than one object at a time.

4. Drag the selected fields into the new rectangle.

When you drag any one field, the others follow along.

5. Click the Move to Front icon  to place the fields on top of the rectangle.

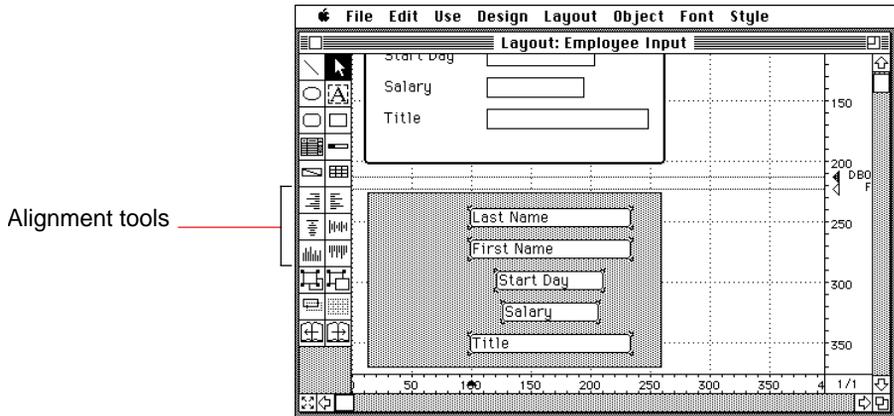
Dragging the fields off the layout background leaves boxes that were automatically placed beneath the fields by 4th Dimension. These boxes are the blank field spaces on the data entry screen.



6. Leaving the fields selected, click the Align Right icon . The right edges of the fields are vertically aligned.

7. Click the Align Center Vertical icon .

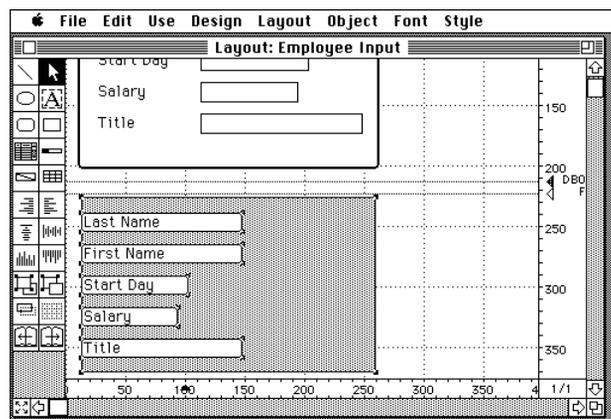
The centers of the fields are vertically aligned.



You have been using the vertical alignment tools because the objects you are aligning are arranged vertically. If you use any of the horizontal alignment tools, the fields will be aligned but you will be able to see only one of them because they will be aligned to the same horizontal location. If you inadvertently use a horizontal alignment tool, drag the fields off the stack one at a time or choose **Undo** from the **File** menu.

8. Shift+click, as in step 3, to add the rectangle to your selection and then experiment with the alignment tools.

4th Dimension aligns the fields and the rectangle.



9. When you are finished, choose Revert to Saved from the File menu to restore the Layout.

10. Click the Yes button.

Setting Display Formats

4th Dimension allows you to set the display format for data. The display format determines how the entries in each field are displayed on your screen and printed.

You set the display format using the Layout editor. Each layout can use a different format for the same information. On one layout you may want numbers to be displayed in one of these formats:

- 1234.567,
- 1,234.57,
- \$1,234.57.

On another layout you might want the format to include dollar signs, commas, and a row of asterisks for printing the number on a check:

\$*****1,234.57

Display formats are separate from the data you enter in the fields. The display format does not affect the way you enter the information or the way the information is stored—only the way it is displayed.

For the Employee Input layout, you will set the display formats for the Start Day and Salary fields. For our example database, you have decided to show the start date in this format:

Sat, June 13, 1992

For the Salary field, you want a dollar sign, a comma, and two digits to the right of the decimal:

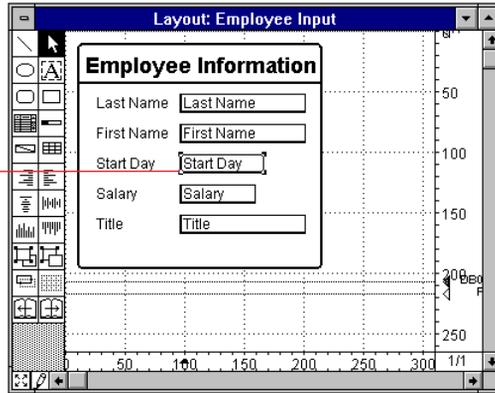
\$35,550.00

To set the display formats, follow these steps:

1. Select the Start Day field.

You can select the field by clicking on it. Be sure to select the field (not the field label). The field has a box around it; the field label is a text element without a box.

Handles on
selected object

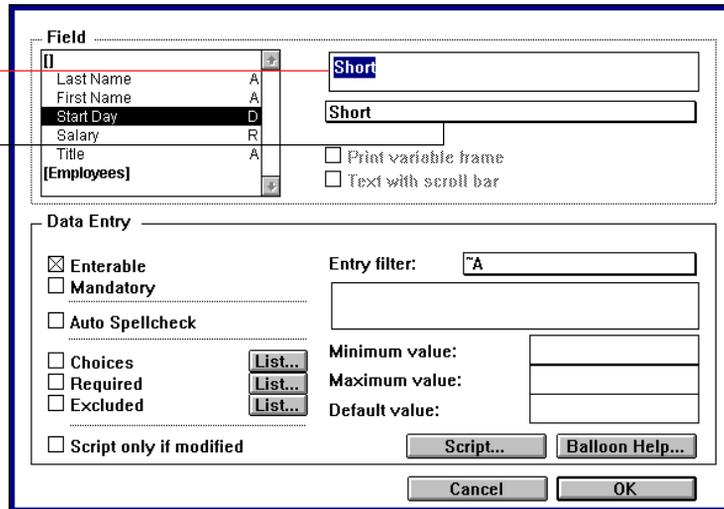


2. Choose Format... from the Object menu.

4th Dimension displays the Field Definition dialog box.

Format Display area

Format drop-down
list box

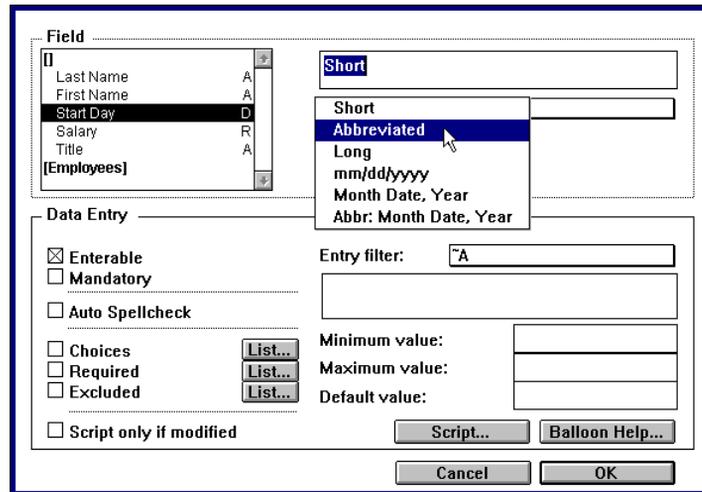


The Field Definition dialog box allows you to set the display format and control other aspects of data entry and display. You will find an introduction to the advanced features of this dialog box in later chapters. For now, we will use only the boxes in the upper portion of the panel.

The fields in the file are listed in the Field area on the left. The Start Day field is highlighted and the date format choices appear in a drop-down list box on the right. You set the format for the field by choosing it from the drop-down list box. The current format for the Start Day field is shown in the list box.

Drop-down list boxes are indicated by a drop shadow below the box. You choose from a drop-down list box just as you do from any menu. The only difference is that the menu appears on the screen, not on the menu bar

3. Choose Abbreviated from the Format drop-down list box.



The Abbreviated choice displays the date in the *Sat, Jun 13, 1992* format. The Long format would show it as *Saturday, June 13, 1992*. The Short format would show it as *6/13/92*.

4. Click OK.

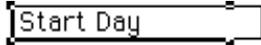
4th Dimension displays the layout again. Although the layout appears the same, 4th Dimension has accepted your instruction for displaying the Start Day. When you use this layout, the start date will be displayed in the format you have chosen.

Since the Abbreviated date format displays more characters than the Short date format, the date field needs to be enlarged to accommodate the display format you have chosen.

5. Select the Start Day field (not the field label) and drag the handle on the lower right corner to the right to make the field longer.

Notice that the border around the field remains in the same position as before. You need to drag the border around the field to the same position as the field so that the date box displays correctly during data entry.

6. Select the border around the field and drag the handle on the lower right corner to the right to match the size of the field.

Start Day 

You are now ready to set the display format for salaries.

7. Double-click on the Salary field.

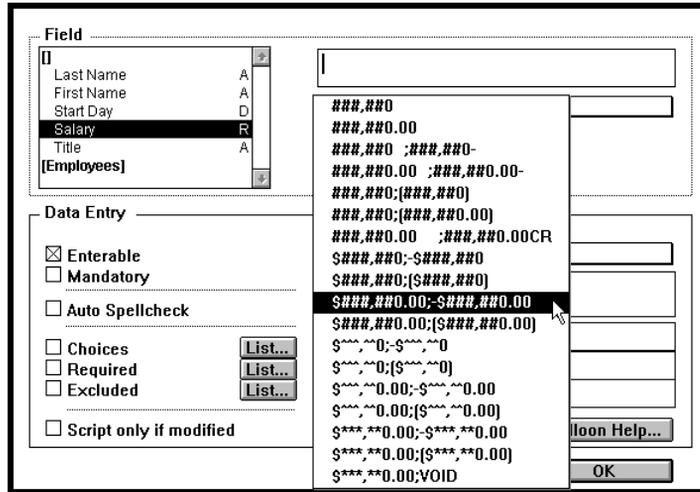
Double-clicking is a shortcut to display the Field Definition dialog box. 4th Dimension displays the dialog box again, this time highlighting the Salary field.

8. Hold down the mouse button on the Format drop-down list box to see the format choices.

You can set the display format by selecting it from the choices shown by selecting and modifying it, or by entering the format, character by character, in the Format Display area.

The formal structure of the number display format has three parts—the first is for positive numbers, the second is for negative numbers, and the third is for the number zero.

9. Choose **\$###,##0.00;-\$###,##0.00** from the Format drop-down list box.



4th Dimension displays the format in the Format Display area. The number signs show that you can display up to six digits. The zeros show that 4th Dimension automatically displays two digits after the decimal point. If no digits are entered, 4th Dimension displays two zeros after the decimal point. A negative number is preceded by a minus sign and there is no special format for zero.

10. Click **OK**.

4th Dimension displays the layout. You have now established the display format for the Salary field.

SEEING THE LAYOUT IN ACTION

You can go directly to the User environment to see the results of your changes.

1. Choose User from the Use menu.

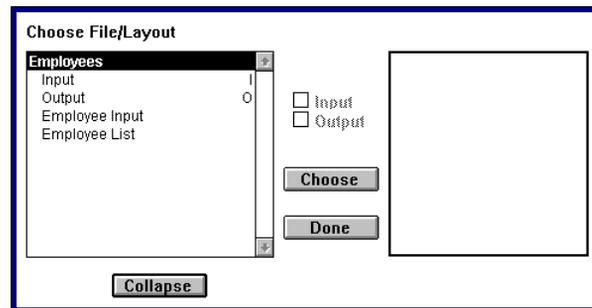
4th Dimension automatically saves your layout, including the display formats you have selected, and displays the [Employees] file records using the default output layout Output.

To see how the input and output layouts you created work, you must first make them the default layouts for the [Employees] file.

2. Choose Choose File/Layout... from the File menu.

The Choose File/Layout dialog box appears with the [Employees] file selected.

3. Click the Expand button to display the layouts for the [Employees] file.



4. Select Employee Input and then select the Input check box.

Employee Input is now the default input layout for the [Employees] file. Whenever you add, modify, or view a record in this file, the Employee Input layout will be used.

5. Select Employee List and then select the Output check box.

Employee List is now the default output layout for the [Employees] file. Whenever the records in the file are displayed in a list, this layout will be used.

6. Click the Done button to return to the output layout.

7. Select any record and choose Modify Record from the Enter menu.

The record appears on the input layout you have been working with. Notice that the layout title has been changed and the Start Day and Salary fields are displayed in the formats you selected.

THE NEXT STEP

You often modify layouts in 4th Dimension when you add fields, rearrange layout elements, or design a custom layout. The palette tools provide the power to make any layout clear, attractive, and useful.

If you wish, you can change the display format for Salary on your output layout as well. You can use the same format as the one on the input layout or you can use a different one.

In the next chapter, you will learn how to add custom buttons to the layout.

If you wish to take a break now, you can choose **Quit** from the **File** menu to quit 4th Dimension. In the next chapter, you will run 4th Dimension and open the People02 database.

Database: People02

Estimated time to complete: 15 minutes

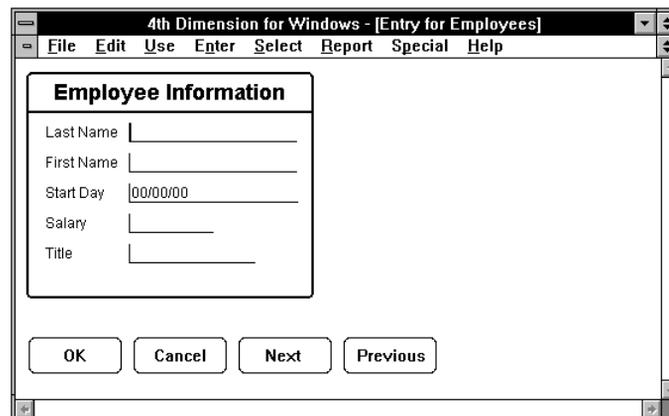
4th Dimension provides more than a dozen automatic buttons that you can use to perform functions such as accepting a record, displaying the first record, going to the next page in a multi-page layout, and deleting the current record.

In this chapter you will learn how to:

- Create buttons on a layout,
- Use your custom buttons to save, cancel, and move between records.

Up to now, when you entered or modified a record, you used 4th Dimension's control panel to accept, cancel, and move from record to record.

Your custom buttons will automatically replace the control panel. When you have finished with this tutorial, your data entry screen will look like this:



In this tutorial, you will add four buttons to your layout: **OK**, **Cancel**, **Next Record**, and **Previous Record**. A button is one of several special

Windows features you can include on your layouts. Other objects you can include are check boxes, graph areas, rulers, dials, thermometers, and scrollable areas from which you can select items in a list.

CREATING AN OK BUTTON

You are now going to replace the **Enter** and **Cancel** buttons provided by the control panel with your own custom buttons. In this section, you will create an **OK** button.

1. If you have not done so already, start 4th Dimension and open the People02 database.

OR

If you are already in 4th Dimension, choose Open Database from the File menu and open the People02 database.

People02 starts in the Design environment.

2. Double-click the [Employees] filename.

A screenshot of a database table structure window titled "Employees". The table has five columns: "Last Name" (A), "First Name" (A), "Start Day" (D), "Salary" (R), and "Title" (A). The window has a scroll bar on the right side.

4th Dimension displays the Layout dialog box. Double-clicking a filename in the Structure window is a shortcut that opens the Layout dialog box with the file already expanded to show the layouts for that file.

3. Open the Buttons layout.

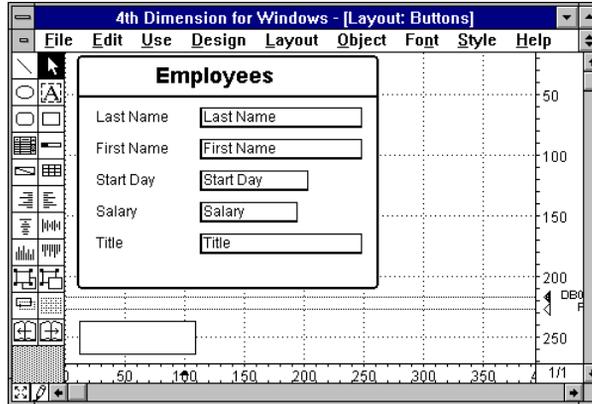
4. Click the maximize button or drag the window to expand it to fill the entire screen.

You are going to position the buttons below the border so that the buttons are separate from the portion of the layout that contains the fields.

5. Click the Active Object icon  on the layout palette.

Clicking this icon informs 4th Dimension that the next area you define on the layout will contain an active object.

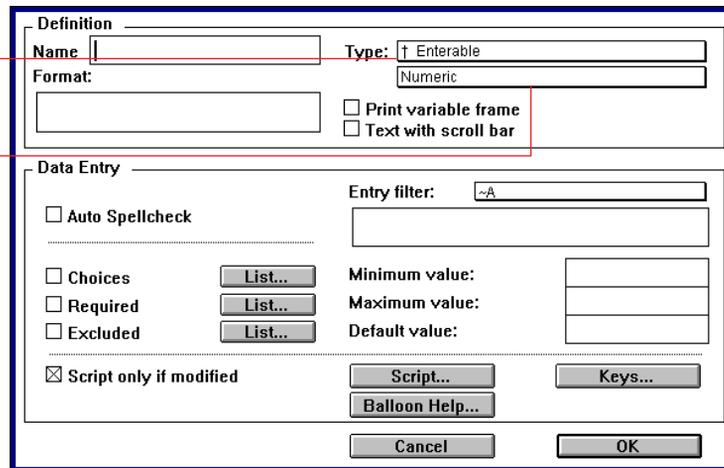
6. Draw a rectangle about 1 inch long and 1/2 inch high below the frame. The rectangle should be aligned with the left edge of the data entry border.



When you release the mouse button, 4th Dimension displays the Object Definition dialog box. The Object Definition dialog box is similar to the Field Definition dialog box you used in Chapter 1.

Object Type drop-down list box

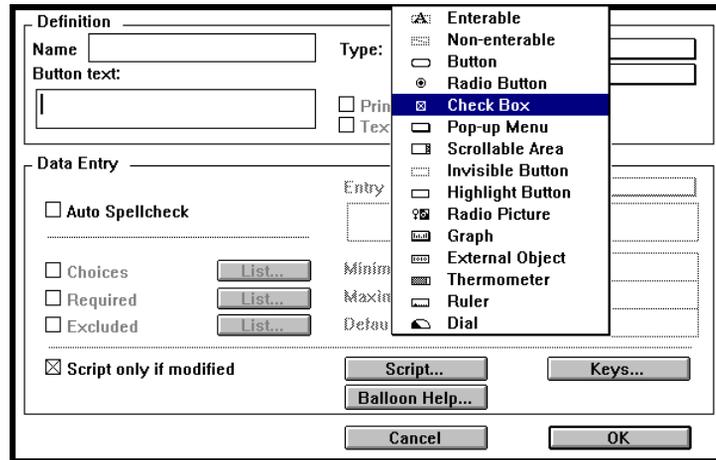
Object Action drop-down list box



An active object can perform many actions, from displaying data to working as a button or drop-down list box. You are going to use this active object as a button.

7. Choose Button from the Object Type drop-down list box.

There are 15 types of layout objects to choose from in the Object Type drop-down list box. For complete information about these choices, refer to the *4th Dimension Design Reference*.



8. Name the button “bOK” and press Tab.

Notice that the Text area is selected and has been given a new title, Button text. This is the area in which you will type the text that you want displayed in your button.

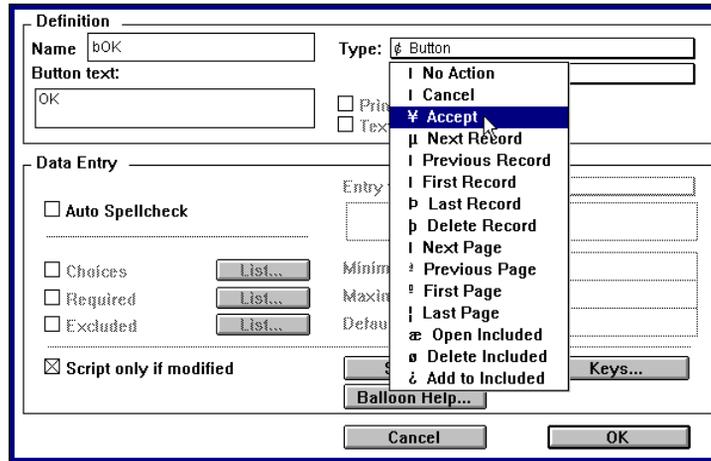
9. Label the button “OK”.

You can type any text that conveys the message you want, such as **Enter**, **Accept Record**, and so on.

10. Choose Accept from the Object Action drop-down list box located below the Object Type drop-down list box.

Just as Button is one type of object, the choices in the Object Action drop-down list box are different actions that you can assign to a button. You will choose four actions for buttons in this tutorial. For complete

information about these actions, refer to the *4th Dimension Design Reference*.



4th Dimension displays Accept as the action. The button you are defining will cause a record to be accepted when it is clicked.

11. Click OK.

4th Dimension displays the layout again, this time with your button on it. You have added the first of your buttons to the layout. In the next section, you will create additional buttons the same size as this one.

DUPLICATING AND EDITING BUTTONS

For your screen design, you want all your new buttons to be the same size. The easiest way to accomplish this is to duplicate the button you just created and then edit the definition of each of the copies.

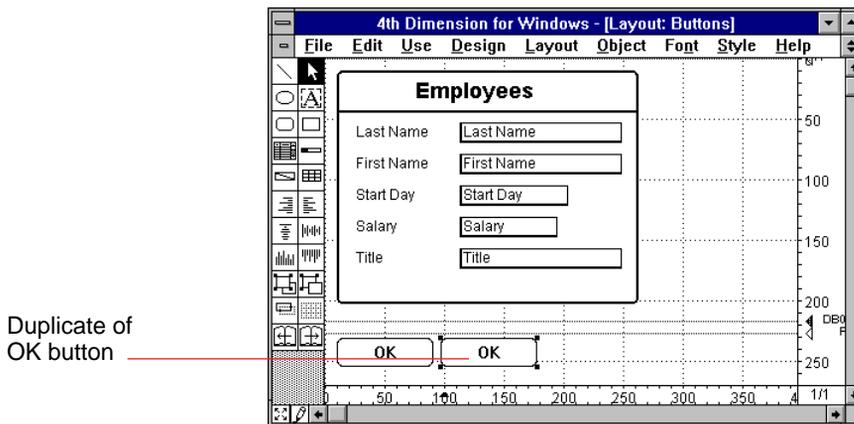
Remember, you are adding **OK**, **Cancel**, **Next Record**, and **Previous Record** buttons to your layout. You have already added **OK**, so you need three more buttons.

1. If necessary, click the OK button you just created to select it and then click the Duplicate icon .

4th Dimension creates a copy of the **OK** button. The copy has all the instructions you specified for the first **OK** button. When 4th Dimension duplicates a layout element, all the instructions for the element are copied as well (for example, a field's display format is copied).

2. Drag the new button to the right of the first button.

When you position this button and keep it selected, you prepare to use 4th Dimension's smart duplicate feature. When you use this feature, 4th Dimension remembers where you positioned the button in relation to the first button and automatically places the next copy in the same position relative to the selected object.



3. Click the Duplicate icon two more times.

4th Dimension creates two more buttons, each placed to the right of the previous copy. If for some reason the duplication does not place the new button to the right of its original, you may have inadvertently selected something else before duplicating. In this case, delete any copies you have made and start over again at step 1.

4. To align the four buttons exactly, **Shift+click** all four to select them as a group and then click the **Align Top** icon .

4th Dimension aligns the buttons in relation to each other.

If you make a mistake, don't forget that you can go back a step by choosing **Undo** from the **Edit** menu.

5. **Click anywhere other than the four selected buttons.**

The four buttons are deselected.

6. **Double-click the second button.**

Double-clicking the button displays the Object Definition dialog box for that button. You are going to make this button the **Cancel** button. The instructions in the dialog box are the ones you entered for the **OK** button. To make this button the **Cancel** button, all you need to do is choose **Cancel** for the action and change the button's name and display text.

7. **Name the button "bCancel" and label it "Cancel".**

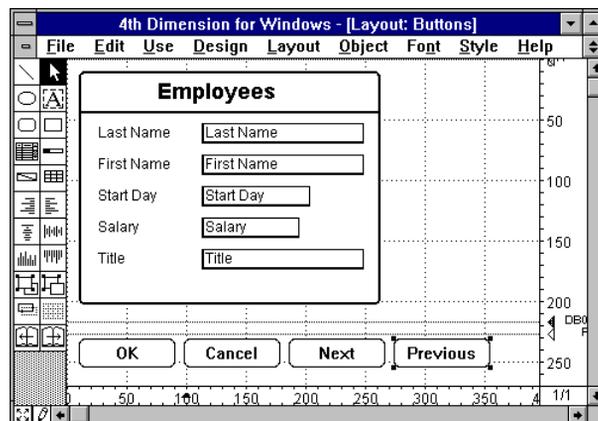
8. **Choose Cancel from the Action drop-down list box and click OK.**

4th Dimension displays the layout again. Notice that the second button is now a **Cancel** button.

9. **Make the third button a Next Record button by double-clicking it, changing the button name to "bNext", the button action to Next Record, and the button text to "Next".**

10. **Make the fourth button a Previous Record button by double-clicking it, changing the button name to "bPrevious", the button action to Previous Record, and the button text to "Previous".**

Your layout is finished. It now includes the set of custom buttons you have created.



SEEING THE CUSTOM BUTTONS IN ACTION

As you learned in the previous chapter, you can go to the User environment to check on work you have done in the Design environment.

Since 4th Dimension removes the standard control panel when you create your own buttons, you want to see how the new buttons affect the appearance and functionality of your layout.

Marlys Wilson has been promoted in the Art Department. Her new title is Supervisor and her new salary is \$36,500. You are going to use your new layout to modify her employee record.

1. Choose User from the Use menu.

4th Dimension displays the records in the List layout.

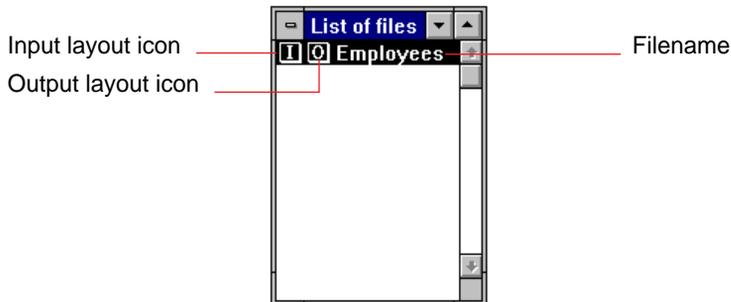
2. Select the record for Marlys Wilson and choose Modify Record from the Enter menu.

4th Dimension displays your previous input layout. Because you have created another input layout, you need to tell 4th Dimension to use the new layout instead.

Here is a new method for changing the input layout. It is usually much faster than using the Choose File/Layout dialog box.

3. Press Ctrl+Space bar.

The List of files window is displayed in front of the Employee records window. The List of Files window is always open, waiting behind the window you are using. If you make the Employee records window smaller, you can see the List of Files window and can activate it by clicking on it.

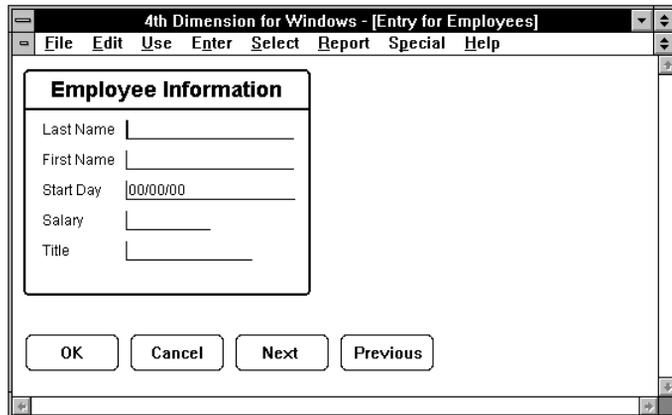


The layout icons are drop-down menus showing the layouts you have created for the file. You use the Input Layout icon to set a new input layout for that file and you use the Output Layout icon to set a new output layout for that file.

4. Click and hold down the mouse button on the Input layout icon and choose Buttons from the drop-down menu.



4th Dimension displays the Buttons layout, ready for you to enter information.



Notice that 4th Dimension has removed the standard control panel from the left side of the screen. Your custom buttons are now arranged across the bottom of the screen.

5. Press **Ctrl+Space** bar to hide the List of Files window.

6. Enter the new information for Marlys Wilson:

Salary:"36500"

Title:"Supervisor"

7. Click the **Next** button.

4th Dimension saves the new information for Marlys Wilson and displays the next record in the database.

8. Click the Previous button.

4th Dimension displays the record you just modified. You can use **Previous** and **Next** to move from record to record as often as you wish.

9. Click OK.

4th Dimension returns to the output layout for this database.

THE NEXT STEP

You have added buttons to your layout that allow you to accept and store the information on the current record or to cancel the information that has been entered or modified. The other buttons you added allow you to navigate through the records in your database by moving to the next or previous record.

In the next chapter you will work more in the Layout editor. You will add a new page to a layout and then change the data entry order.

Database: People03

Estimated time to complete: 20 minutes

4th Dimension allows you to control virtually everything about your layouts. For example, if you have too many fields to conveniently display on one screen, you can add additional pages.

During data entry, when you use the Tab key to move from field to field, 4th Dimension automatically selects the next field according to the data entry order. If this order is not convenient for entering data on your layout, you can change the data entry order to fit your needs.

In this chapter you will learn how to:

- Add a page to your layout to make it a multi-page layout,
- Change the data entry order.

SINGLE-PAGE AND MULTI-PAGE LAYOUTS

4th Dimension's layouts provide a large "page" on which to place fields and active and graphic objects such as buttons and text. A single-page layout can be as much as 144 inches wide and 142 inches high (almost 144 square feet). To move around the layout in the Layout editor, you use the scroll bars.

You may want to divide a large layout into two or more separate pages. 4th Dimension calls such a layout a *multi-page* layout.

When you use a multi-page layout, you can do the following:

- Reduce the amount of scrolling necessary to work with a layout,
- Create a more attractive layout,
- Group related fields together on a particular page so you can quickly update related information (for example, placing all the fields that need regular modification on the first page of a layout),
- Design each page of the layout to fit the size of the display monitor used by your system,
- Replicate your company's current multi-page forms.

Many standard forms, such as employment applications, contracts for real estate, and insurance forms, consist of several pages. Just like turning to the appropriate page in a multi-page paper form, when you use a multi-page layout, you can display the page that contains the information you want to view or change.

Adding a Page

Suppose you have been working with another layout for the People database, one that keeps track of emergency information for each employee. The layout you are now using takes up more than the entire screen. You decide to add a page to the layout so you can more conveniently display the information. Two pages allow you to create a more attractive display for the information and reduce the amount of scrolling you have to do during data entry.

You plan to place official information on the first page (name, salary, department, and so on) and personal information on the second page (address, spouse's name, doctor's name, and telephone).

In this section, you will learn how to add a page, how to choose the parts of the layout you want to display on the new page, and how to transfer

them to the new page.

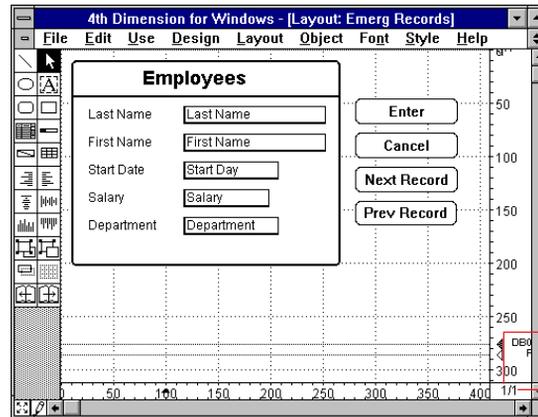
1. If you have not done so already, start 4th Dimension and open the People03 database.

People03 starts in the Design environment.

2. Display the Emerg Records layout by double-clicking the [Employees] filename and then double-clicking the Emerg Records layout.

3. If necessary, click the maximize button to expand the window.

Expanding the window reveals all the icons.



Page number
Total number of
layout pages

4. Add a page to the layout by clicking the Next Page icon .

Since there is no next page, 4th Dimension asks if you want to create one.

5. Click OK.

4th Dimension creates a blank page. The number of the page and the total number of pages is displayed in the bottom right corner of the layout.

You can now select the fields you want to place on the second page.

Layout	
Entry Order...	
Objects on Grid...	
Turn Grid On	
Hide Rulers	Ctrl+R
Define Grid...	
Define Ruler Units...	
Menu Bar...	
Add to Layout...	
Delete Page	

Adding Fields to the Layout

4th Dimension provides a way to go back to the New Layout dialog box so that you can add fields to an existing layout. To add the personal fields to the new second page:

1. Choose Add to Layout... from the Layout menu.

The pointer changes to a corner marker Γ .

2. Click near the upper left corner of the screen.

This spot marks the upper left corner of the layout that will appear. When you release the mouse button, 4th Dimension displays the New Layout dialog box.

3. Double-click the following fields: Spouse, Address, City, State, Zip Code, Phone, Doctor, and Emergency Phone.

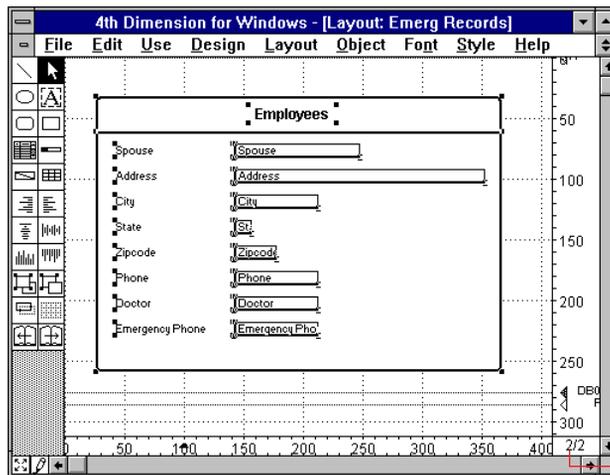
OR

Select each field and click the Select button.

Layout #4 is already selected for you so you need only change the font size.

4. Select the 9-point font size and click OK.

4th Dimension adds the fields you selected to the second page of your layout.



Layout page number

Adding Next Page and Previous Page Buttons

You have created a second page and placed the elements you want on it. Now you need to add buttons that allow you to move between the two pages.

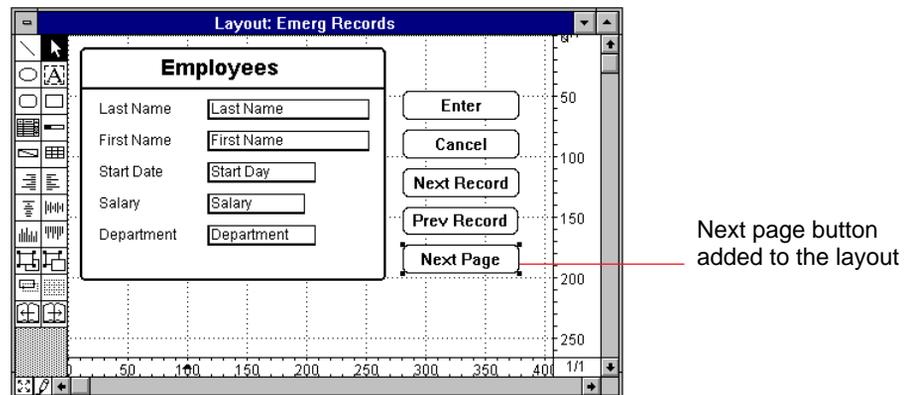
1. Go back to the first page of your layout by clicking the Previous Page icon .
2. Use the Active Object icon  to add a Next Page button to the first page of your layout.

The Object Definition dialog box appears.

3. Name the button “bNext”, choose Button from the Object Type drop-down list box, choose Next Page from the Object Action drop-down list box, and enter “Next Page” for the button text.

4. Click OK.

The layout should now look like this:



5. Copy the button by selecting it and choosing Copy from the Edit menu.
6. Go to the second page and paste the copied button by choosing Paste from the Edit menu.
7. Drag the button to any position on the layout and click anywhere outside the button to deselect it.
8. Change the name of the copied button to bPrevious, the action to Previous Page, and the button text to “Previous Page”.

*NOTE: You should give each button in your database a unique name. For example, if you have both **Previous Record** and **Previous Page** buttons on a layout, be sure to give them different names.*

Your new layout is complete.

Seeing the Multi-Page Layout in Action

Now that you have created a multi-page layout, you can see how it works.

1. Go to the User environment and change the input layout to Emerg Records in order to see your multi-page layout.

Changing the layout is described in Chapter 2.

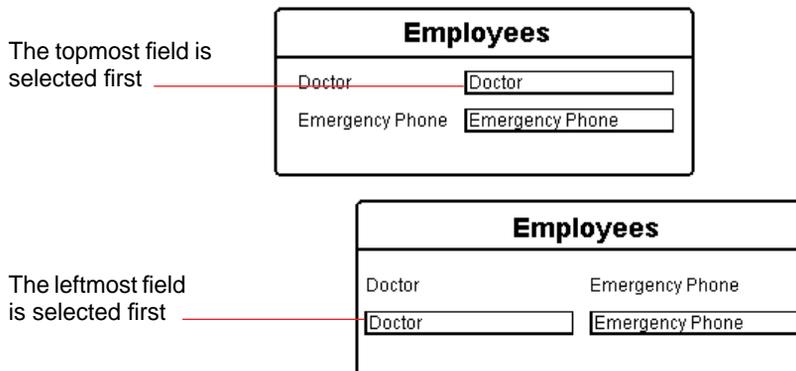
2. Add a new record.

Use the Next Page and Previous Page buttons to move between the two pages of your single layout. Switch to the Design environment when you are finished.

DATA ENTRY ORDER

You may have noticed that 4th Dimension automatically selects the fields on your layout as you use the Tab key to move from one field to the next. The order in which the fields are selected, the *data entry order*, is determined automatically by 4th Dimension. To change this order, you use the Layout editor.

The default data entry order 4th Dimension uses is based strictly on the position of the fields on a layout. The order proceeds from left to right and from top to bottom. If one field is above another, it is selected first; if one field is to the left of another, it is selected first. Precedence is given to a field if it is even one pixel (one dot) above another field.



Changing the data entry order allows you to do the following:

- Select fields in a logical order,
- Select fields in the order the information is presented for data entry (for example, a form that a customer fills out may display information in a different order from the fields on the screen),
- Place fields that are rarely updated last so they can be easily skipped.

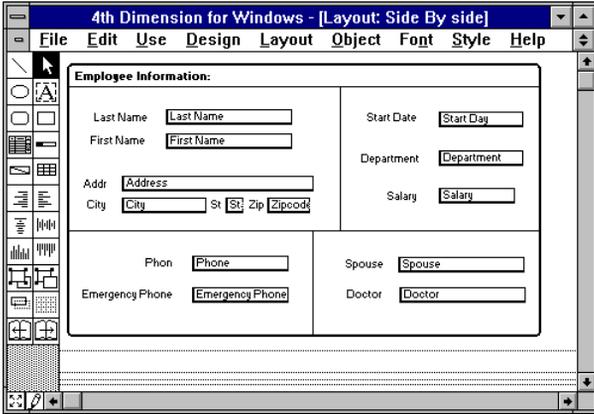
Changing the Data Entry Order

In this section, you will use a layout that displays the information conveniently but has an awkward data entry order. You will then change the data entry order to make data entry easier.

1. Choose Layout... from the Design menu and open the Side By Side layout.

4th Dimension displays the layout in another Layout editor window.

2. If necessary, click the maximize button to expand the window.



The screenshot shows a window titled "4th Dimension for Windows - [Layout: Side By side]" with a menu bar (File, Edit, Use, Design, Layout, Object, Font, Style, Help) and a toolbar. The main area displays an "Employee Information" form with the following fields:

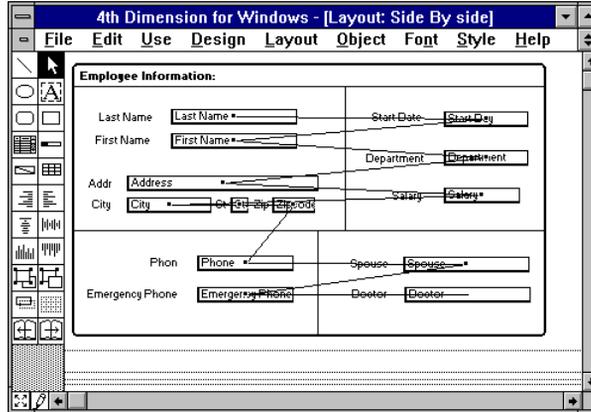
Last Name	<input type="text" value="Last Name"/>	Start Date	<input type="text" value="Start Day"/>
First Name	<input type="text" value="First Name"/>	Department	<input type="text" value="Department"/>
Addr	<input type="text" value="Address"/>		
City	<input type="text" value="City"/>	St	<input type="text" value="St"/>
	Zip	<input type="text" value="Zipcode"/>	
Phon	<input type="text" value="Phone"/>	Spouse	<input type="text" value="Spouse"/>
Emergency Phone	<input type="text" value="Emergency Phone"/>	Doctor	<input type="text" value="Doctor"/>

As you can see, this layout provides an attractive visual display of fields, exactly like the paper form used by your employees. Unfortunately, the data entry order makes it difficult to enter information.

Layout	
Entry Order...	
Objects on Grid...	
Turn Grid On	
Show Rulers	Ctrl+R
Define Grid...	
Define Ruler Units...	
Menu Bar...	
Add to Layout...	
Delete Page	

3. Choose Entry Order... from the Layout menu.

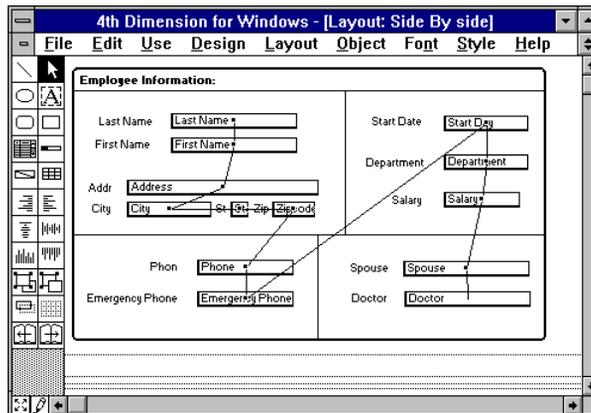
4th Dimension displays the data entry order and the pointer changes to a small arrow ↖. The data entry order is indicated by arrows that point from field to field.



As you can see, the order goes across the screen before going down. Ideally, you want to enter information into the fields on the left first, then into the fields on the right.

The selection order arrows extend from the middle of one field to the middle of the next. You change the order by drawing new selection order arrows from one field to another.

Here is the order you want to have:



4. Move the pointer to the Last Name field on the left side and drag the pointer to the First Name field.

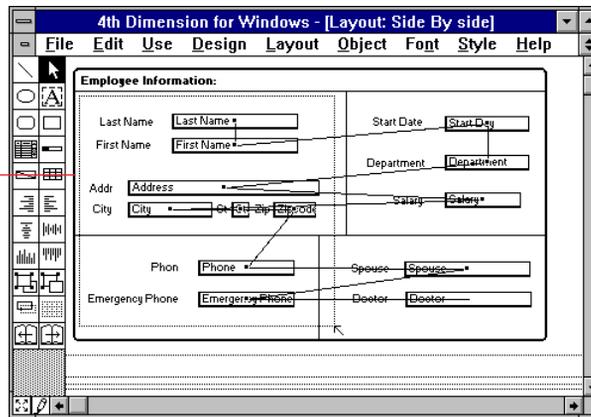
When you release the mouse button, 4th Dimension redraws the selection order arrows for all affected fields.

You could continue in this fashion, drawing the new data entry order from field to field. However, 4th Dimension provides a way to quickly change whole groups of fields.

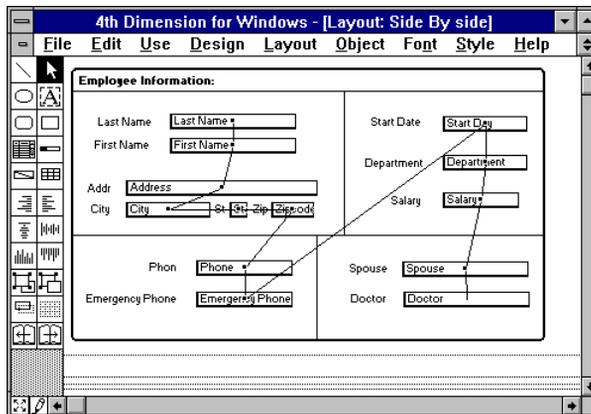
5. Drag a marquee around the group of fields on the left.

You create a marquee by clicking in an empty area on the layout and dragging to enclose the group of objects you want to select.

Marquee



When you release the mouse button, 4th Dimension automatically redraws the data entry order. The order goes down the left group first, then up to the right group and down again.



6. Click the Pointer tool  to return to normal layout editing.

7. Try out your new custom data entry order in the User environment.

Remember that you have to change the current input layout to “Side By Side” to use your new data entry order.

THE NEXT STEP

The Layout editor is a flexible design tool. You can create layouts that assist the data entry process, display information effectively, and look attractive.

Practice using the Layout editor to learn more about what you can do with lines, shapes, and fill patterns. You can find complete information about the tools available in the Layout editor in the *4th Dimension Design Reference*.

In the next chapter you will add a field to the People database and to a layout. You will then use the Lists editor to create a list from which you can select an entry for the field.

Database: People04

Estimated time to complete: 20 minutes

You can add new fields to a 4th Dimension file at any time. You add a field to a database when you discover that you need to store an additional piece of information about each record.

You already learned how to create a field in the *4th Dimension Quick Start* manual. Adding a field is essentially the same process, except that you must remember to place it on any existing layouts in order to enter and view the data.

Instead of having users enter information into the field manually, you may decide to create a list of entries from which users can choose items. The list is displayed during data entry, allowing users to choose an entry from the list. Choosing from a list simplifies data entry and ensures that the entry is valid, spelled correctly, and contains no extra spaces or other punctuation errors.

You can have multiple lists in a database and can use the lists for several fields and enterable objects. You can make a list mandatory so that only entries appearing on the list can be entered. Or, you can make a list excluded so that entries appearing on the list cannot be entered.

In this chapter you will learn how to:

- Create a list,
- Add a field to a database,
- Place a field on a layout,
- Attach a list to a field,
- Use the list for data entry.

CREATING A LIST

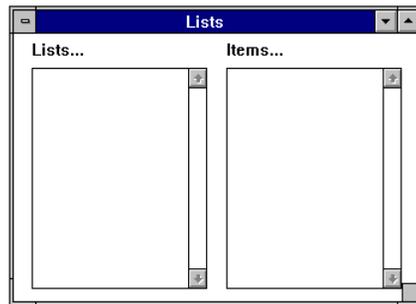
Your company offers several health plans for its employees. You have decided to keep track of which health plan each employee has selected. In this section, you will make a list of the plan names. This list will provide data entry choices for the new field you plan to add to the database.

1. If you have not already done so, start 4th Dimension and open the People04 database.

People04 opens in the Design environment.

2. Choose Lists... from the Design menu.

4th Dimension displays the List editor.



The names of the lists you create appear in the Lists area and the choices on each list appear in the Items area.

3. Choose New from the Lists menu.

4th Dimension displays a dotted-line box in the Lists area.

4. Type “Health Plans”.

Health Plans is the name of this choice list. You will use this name whenever you want to activate this list.

Having created the list, you now will add items to it.

5. Choose New from the Items menu.

4th Dimension displays a dotted-line box in the Items area.

6. Type “White Cross”.

White Cross is one of the health plans an employee can join.

7. Choose New from the Items menu.

4th Dimension adds the first item to the Items list and displays a second dotted-line box.

8. Type “King HMO” and press the Enter key.

4th Dimension adds the second item to the Items list and displays another dotted-line box. Pressing the Enter key is a shortcut for choosing **New** from the **Items** menu.

9. Complete the list by entering the following choices:

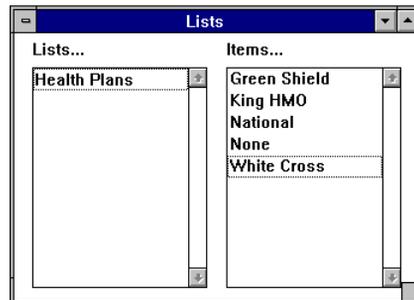
“Green Shield”

“National”

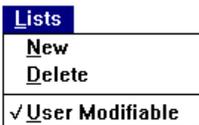
“None”

10. Choose Sort from the Items menu to arrange the choices in alphabetical order.

4th Dimension sorts the titles.



When you create a list, 4th Dimension assumes you want to be able to modify the list during data entry. Since your company might add a new health plan in the future, you decide to allow the list to be modified.



11. Pull down the Lists menu to ensure that User Modifiable has a check mark.

The check mark indicates that the list is modifiable. If the check mark does not appear next to **User Modifiable**, choose **User Modifiable**.

12. Double-click the Control-menu box to close the List editor.

That is all there is to creating a choice list. In the following sections, you will see how to attach this list to a field and how to use it during data entry.

ADDING A NEW FIELD

You have created a list that offers health plan choices. In this section you will add a field and attach the list to it so that the list appears during data entry.

1. If necessary, choose Structure from the Design menu to view the Structure window.

2. Double-click beneath the last field of the [Employees] file.

Double-clicking is a shortcut for choosing **New Field** from the **Structure** menu. 4th Dimension displays the Field Attributes dialog box, ready for you to add a new field to the file.

If you accidentally click one of the existing fields in the file, 4th Dimension displays the Field Attributes dialog box for that field. If this happens, click the **Cancel** button and try again.

3. Create a field called “Health Plan” and use the default field type and size, Alpha 20.

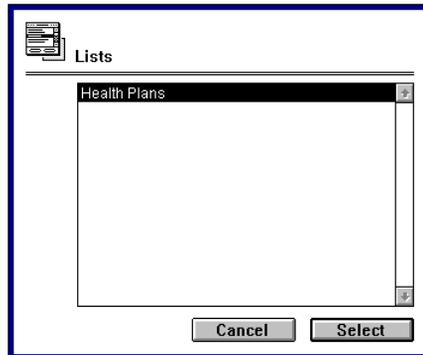
As you did in the *4th Dimension Quick Start*, type the field name in the Field Name text box.

4. Click the Choices check box.

When you select **Choices**, the **List** button becomes active.

5. Click the List button.

4th Dimension displays the Lists dialog box. This dialog box displays all the lists that have been created for this database. Since you have created only the Health Plans list, it is the only one displayed.



6. With the Health Plans list highlighted, click the Select button.

4th Dimension displays the Field Attributes dialog box. Whenever you select this field during data entry, the Health Plans list will appear so that you can select that employee’s plan.

7. Click OK.

4th Dimension displays the Structure window. You have successfully added the Health Plan field to the file. However, the new field does not yet appear on any layout. You need to add it to an existing layout to be able to enter and view data in the field.

PLACING THE NEW FIELD ON A LAYOUT

Now that your new field exists, the next step is to add this field to a layout. To do this, you use the Layout editor.

1. Double-click the title bar of the [Employees] file.

Employees	
Last Name	A
First Name	A
Start Day	D
Salary	R
Title	A
Health Plan	A

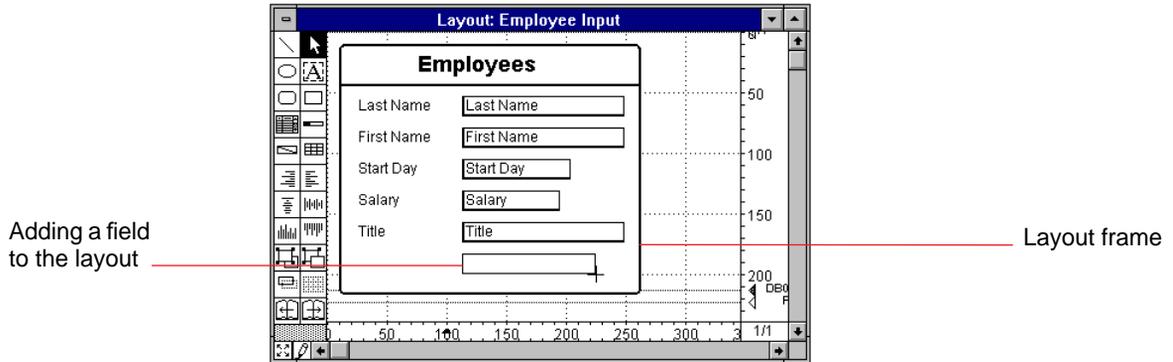
Double-clicking the file’s title bar in the Structure window tells 4th Dimension that you want to see a layout for that file. When 4th Dimension displays the Layout dialog box, the [Employees] file is already expanded to show the layouts for that file.

2. Double-click the Employee Input layout.

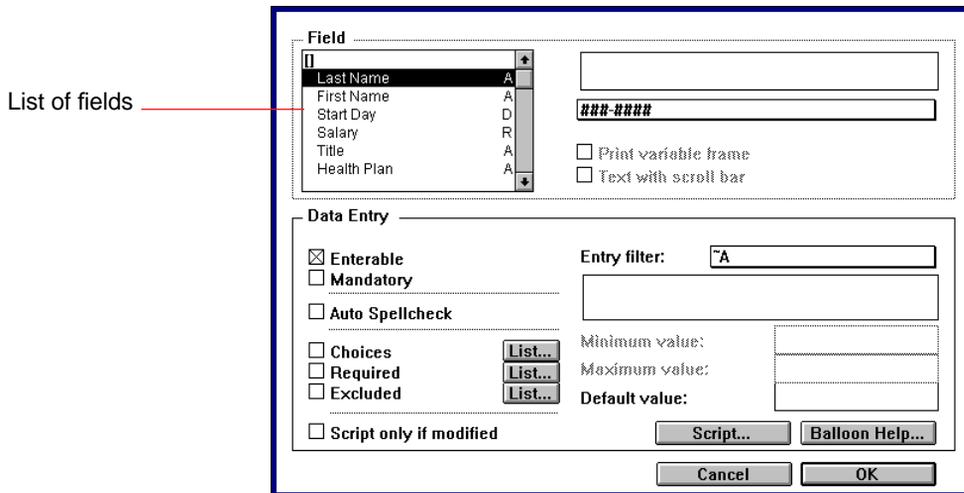
4th Dimension displays the Employee Input layout. You are going to add the Health Plan field to this layout.

3. Select the frame of this layout and make it bigger by dragging the lower right corner toward the bottom of the screen.

4. Click the Add Field icon  on the palette and draw a rectangle in the space you have added.



As soon as you finish drawing the field area, 4th Dimension displays the Field Definition dialog box. You use this dialog box not only to set the field display format (as you have done before), but also to choose the field for the field area you have just drawn and to set any data validation instructions for that field.



5. Select Health Plan from the list of fields and click OK.

4th Dimension displays the layout with the added field.

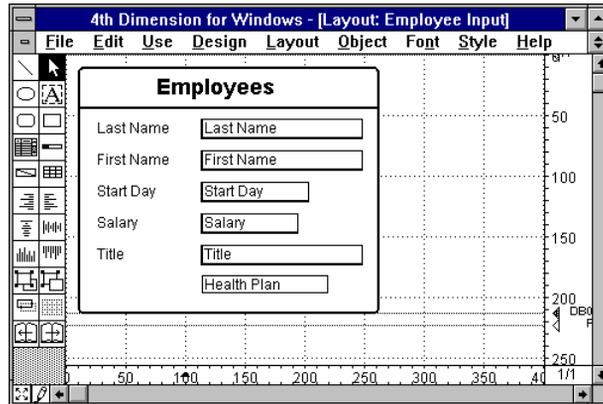
6. Select 12-point from the Style menu.

7. Use the Text Area tool  to create a field label, “Health Plan”, and make the label 12-point.

8. Align the text to the field with the Align Top tool .

Remember to select both the new text area and the Health Plan field before you click the Align Top tool.

9. Select the Health Plan field and press Ctrl+1 to create a border around it.



This tutorial has taken you through adding a field to a layout to emphasize this point: new fields are not automatically added to layouts.

You must add a new field not only to the structure of the database, but also to any layouts on which you want to use the field.

Of course, any new layouts you create can automatically include the new field, along with the other fields in the file.

SEEING THE CHOICE LIST IN ACTION

As you found in the previous chapters, you can go quickly to the User environment to check on work you have done in the Design environment.

You want to see how the new choice list affects how you enter information into your layout.

1. Choose User from the Use menu.

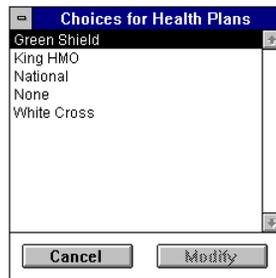
4th Dimension displays the records in the List layout.

2. Select a record and choose Modify Record from the Enter menu.

4th Dimension displays your modified input layout.

3. Select the Health Plan field.

4th Dimension displays the choice list.



4. Click National.

4th Dimension enters National in the field and removes the choice list. The Health Plan field remains selected.

Feel free to experiment with the choice list. You can select a different field and then select the Health Plan field to display the choice list again. You can select a different entry from the list to replace whatever has been previously entered or click the **Modify** button to return to the List editor and add or delete items from the list.

5. When you have finished, click the Enter or Cancel button.

4th Dimension returns to the output layout for this database.

THE NEXT STEP

Choice lists provide a convenient and fast way to enter data into a field accurately. You create a choice list in the List editor. In this chapter, you attached the choice list to a field as a field attribute. In the next chapter, you will learn additional ways of using choice lists for data validation.

Database: People05

Estimated time to complete: 15 minutes

How important is correct information? An incorrect mailing address can be either frustrating or disastrous, depending on the information that is delayed or not delivered. An incorrect total in your checking account statement can be annoying; if it goes unnoticed, it can be ruinous.

There are many ways incorrect information can find its way into a database. Information can become outdated, it can be entered incorrectly, calculated with an incorrect formula, and so on.

The purpose of data validation is to check the information before the record is accepted into the database.

4th Dimension provides many ways to validate data. You can create lists of values that are either mandatory or optional. Using field attributes, you can ensure that each record contains a unique entry in a field. You can establish a range of acceptable numeric values, rejecting any entry that does not fall between the upper and lower limits. Or, you can use a script to perform almost any type of data validation.

In this chapter you will learn how to:

- Use field attributes for data validation,
- Create an entry filter to reduce typing errors in a field,
- Create upper and lower limits for a numeric field,
- Use a list to set required entries for a field.

USING FIELD ATTRIBUTES FOR DATA VALIDATION

Field attributes provide several ways of validating the information that you enter into your database. For example, applying the Mandatory attribute to any field makes it impossible to enter a record that does not have an entry in that field.

The People05 database has a new field for the employee's social security number. You will specify attributes that help to validate the entries in that field.

1. If you have not done so already, start 4th Dimension and open the People05 database.

People05 opens in the Design environment.

2. Double-click the SS Number field in the [Employees] file.

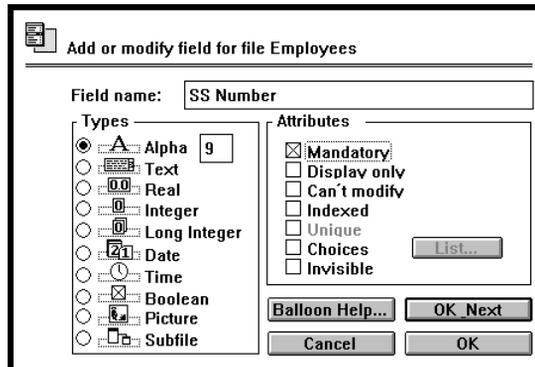
Double-clicking is a shortcut for choosing **Edit Field** from the **Structure** menu. 4th Dimension displays the Field Attributes dialog box for the SS Number field, ready for you to make any changes to the field's instructions.

If you accidentally click another field in the file, 4th Dimension displays the Field Attributes dialog box for that field. If this happens, click **Cancel** and start over.

Notice that the SS Number field is an Alpha 9 field. All social security numbers have nine digits. You will use 4th Dimension's special formatting features to allow space for the two hyphens.

3. Select the Mandatory check box.

The Mandatory attribute prevents a record from being accepted without a Social Security number.



You will now add other attributes to further protect the integrity of the

Social Security numbers in your records.

4. Select the Indexed check box and then select the Unique check box.

When you select Indexed, the Unique attribute becomes available. Unique prevents any duplicate entries from being entered in the SS Number field.

5. Click OK.

4th Dimension displays the Structure window. You have successfully changed the attributes of a field. The attributes affect the SS Number field on every layout on which it appears.

Since the next sections contain additional data validation techniques, you may want to wait until the end of this session to see the results of these field attributes in the User environment.

USING AN ENTRY FILTER AND A DISPLAY FORMAT

An entry filter checks information entered in a field against a pattern. If it matches the pattern, it is accepted; if it does not match the pattern, it is rejected. An entry filter can standardize what appears in a telephone number field, or, in the case of social security numbers, can ensure that the correct number of digits is entered.

An entry filter can be used to set any sort of pattern for entering data. You set an entry filter using the Field Definition dialog box, which you can display for any field in a layout. 4th Dimension then applies the pattern in the entry filter whenever a value is entered into this field on the layout.

The patterns are made up of symbols on your keyboard. The following is a short table of the symbols and their meanings:

Symbol	Meaning
&	Signals that the filter begins
#	Placeholder symbol; allows a character
9	Allows any number
a	Allows any letter
A	Allows any capital letter
~	Forces capital letter
!	Signals that a display character follows

For more information about creating entry filters, refer to the *4th Dimension Design Reference*.

Generally, when you specify an entry filter, you should also specify a display format. The entry filter affects data entry only; it has no effect on the way a field value is displayed and printed. If you use hyphens in your data entry filter, for example, they will be printed only if you also create a display format for the field that includes the hyphens.

Entry filters and display formats can be assigned to a field by using either drop-down list boxes or by typing. The drop-down list boxes include formats and filters for some of the most common types of data that you will be using.

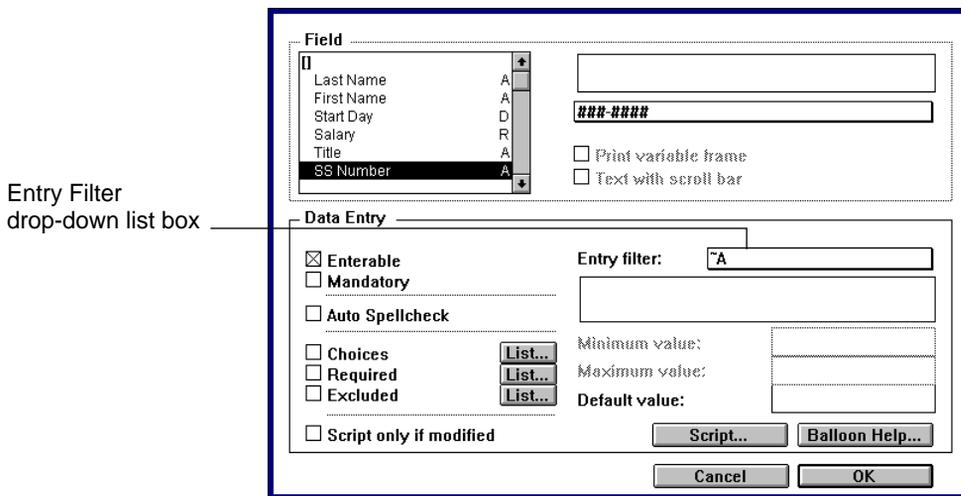
1. Double-click the title bar of the [Employees] file.

2. When the Layout dialog box appears, double-click the Validate layout.

4th Dimension displays the Validate layout. You are going to use this layout for data validation controls.

3. Double-click the SS Number field.

4th Dimension displays the Field Definition dialog box for the SS Number field.



4. Choose the filter !0&9###-##-#### from the Entry Filter drop-down list box.

This entry filter specifies the entry format for the SS Number field. Each entry is forced into this format. Only nine characters can be entered and each character must be a number.

Note that this entry filter has no effect on the way a value is displayed. In order to display the Social Security number with hyphens, you need to specify a display format.

5. Choose ###-##-#### from the Format drop-down list box.

The display format appears in the Format Display box.

Format Display box

Format drop-down list box

The screenshot shows a dialog box with two main sections: 'Field' and 'Data Entry'.
 In the 'Field' section, there is a list of fields: Last Name (A), First Name (A), Start Day (D), Salary (R), Title (A), and SS Number (A). The 'SS Number' field is selected. To the right of this list is a 'Format drop-down list box' showing '###-##-####'. A red line points from the text 'Format drop-down list box' to this box. To the right of the 'Format drop-down list box' is a 'Format Display box' showing '###-##-####'. A red line points from the text 'Format Display box' to this box. Below the 'Format drop-down list box' are two checkboxes: 'Print variable frame' and 'Text with scroll bar'.
 In the 'Data Entry' section, there are several options: 'Enterable' (checked), 'Mandatory' (unchecked), 'Auto Spellcheck' (unchecked), 'Choices' (unchecked), 'Required' (unchecked), 'Excluded' (unchecked), and 'Script only if modified' (unchecked). There are three 'List...' buttons next to 'Choices', 'Required', and 'Excluded'. To the right of these options is an 'Entry filter' box containing '!0&9###-##-####'. Below the 'Entry filter' box are three input fields for 'Minimum value:', 'Maximum value:', and 'Default value:'. At the bottom of the dialog box are buttons for 'Script...', 'Balloon Help...', 'Cancel', and 'OK'.

This display format ensures that the Social Security number will be displayed and printed with hyphens. Without the display format, only the numbers would be displayed.

6. Click OK.

4th Dimension displays the layout again.

This data validation technique helps prevent data entry errors from affecting this field.

ADDING A VALIDATION RANGE

Salaries in your company range from \$15,500 to \$105,000. These are the lower and upper limits of acceptable salary figures. To set these limits to validate entries in the Salary field, you enter the Field Definition dialog box from the layout again.

1. Double-click the Salary field.

4th Dimension displays the Field Definition dialog box for the Salary field.

You have already used this dialog box to set the display format for this field. You will now use it to enter upper and lower limits for an employee's salary.

2. Select the Minimum box and type "15500".

The lower limit for Salary is set at \$15,500.

3. Select the Maximum box and type "105000".

The upper limit for Salary is set at \$105,000.

The screenshot shows the 'Field Definition' dialog box for the 'Salary' field. The 'Field' list on the left includes Last Name (A), First Name (A), Start Day (D), Salary (R), Title (A), and SS Number (A). The 'Data Entry' section contains several options: 'Enterable' (checked), 'Mandatory' (unchecked), 'Auto Spellcheck' (unchecked), 'Choices' (unchecked), 'Required' (unchecked), 'Excluded' (unchecked), and 'Script only if modified' (unchecked). The 'Entry filter' is set to '~A'. The 'Minimum value' is 15500 and the 'Maximum value' is 105000. The 'Default value' is empty. Buttons for 'Script...', 'Balloon Help...', 'Cancel', and 'OK' are visible at the bottom.

4. Click OK.

It's that easy. Whenever a value outside these limits is entered into the Salary field, 4th Dimension will refuse the entry and display an alert. You will see what the alert looks like on the screen later in this chapter.

MAKING A LIST REQUIRED

You created a list for the Health Plan field in the previous chapter. The People05 database also includes a list for the Title field. You want to ensure that only these titles and no others are used in the employee records.

A list is commonly used to provide a quick, accurate method for entering data. However, unless you make the list itself required, another title can be typed in (a feature you would want in many cases).

Since you want users to enter only valid titles for employees, you are going to make the choices on the Titles list required on this layout, which means that 4th Dimension will accept only those entries and no others.

1. Double-click the Title field.

4th Dimension displays the Field Definition dialog box for the Title field. There are two field attributes you can set on each layout—Enterable and Mandatory. These are the same as the Enterable and Mandatory field attributes, except that they affect the field only on this layout.

Below the layout field attributes are the lists features. You can attach a list to a field for only this layout, make a list required for a field on this layout, or exclude a list of values for a field on this layout.

2. Click the Choices check box.

3. Click the List button next to the Choices check box.

4. Select Titles from the list and then click the Select button.

By making Titles a Choice list, the user will be presented with a Choices window containing a list of valid employee titles. The Titles list and the entries that appear in the list were created for you for this tutorial.

5. Click the Required check box in the Lists section.

The screenshot shows the 'Lists' dialog box in 4th Dimension. It is divided into two main sections: 'Field' and 'Data Entry'.

Field Section:

- A list of fields is shown on the left: Last Name (A), First Name (A), Start Day (D), Salary (R), Title (A), and SS Number (A). 'Title' is selected.
- On the right, there are two input fields: an empty one and one containing '###-####'.
- Below these are two checkboxes: 'Print variable frame' and 'Text with scroll bar', both of which are unchecked.

Data Entry Section:

- Checkboxes for 'Enterable' (checked), 'Mandatory' (unchecked), and 'Auto Spellcheck' (unchecked).
- An 'Entry filter' field containing '~A'.
- Checkboxes for 'Choices' (checked), 'Required' (checked), and 'Excluded' (unchecked). Each has a 'List...' button next to it.
- A checkbox for 'Script only if modified' (unchecked).
- Buttons for 'Script...', 'Balloon Help...', 'Cancel', and 'OK'.

A red arrow points from the text 'Required check box' to the 'Required' checkbox in the 'Data Entry' section.

6. Click the List button next to the Required check box.

4th Dimension displays the Lists dialog box.

7. Select Titles from the list and click the Select button.

Now 4th Dimension will accept only entries from the Titles list for this field on this layout.

8. Click OK.

VIEWING THE RESULTS

Now that you have added these data validation features to your layout, you can see the results in the User environment.

1. Choose User from the Use menu.

4th Dimension displays the output layout. Before using these data validation features, you must tell 4th Dimension to use the Validate input layout.

2. Press Ctrl+Spacebar to display the List of Files window.

You will use the List of files window to change the input layout for the [Employees] file.

3. Click and hold down the mouse button on the Input Layout icon for the [Employees] file and choose Validate from the drop-down menu.



4th Dimension changes the current input layout to the Validate layout.

4. Press Ctrl+Spacebar again to bring the output layout to the front.

OR

Just click on the output layout.

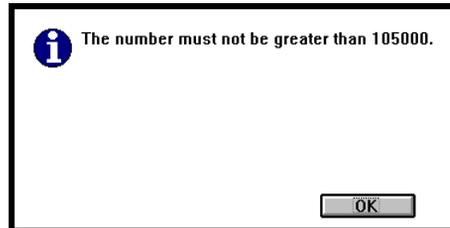
When you press Ctrl+Spacebar again, 4th Dimension hides the List of Files window.

5. Choose New Record from the Enter menu.

4th Dimension displays the Validate input layout.

6. Try entering “106000” into the Salary field.

As soon as you press Tab or Enter, or click on another field, 4th Dimension displays an alert box warning that the Salary value is outside the valid range of entries for this field.



This is exactly what you want to happen.

7. Enter a valid salary.

8. Select the Title field, click the Cancel button for the choice list, backspace over your entry, and try to type a job title that does not appear on the Titles choice list.

4th Dimension refuses the entry.

9. Click in the Title field again to select one of the valid choices from the Choices list.

10. Try entering letters in the SS Number field.

4th Dimension rejects these characters when you type them.

11. Enter a valid number.

12. Click the Cancel button to cancel the record.

THE NEXT STEP

The data validation techniques you have used prevent inadvertent errors from affecting the information in your database. You may want to try out additional techniques. Complete information about using the options in the Field Definition dialog box for data validation can be found in the *4th Dimension Design Reference*.

The next chapter gives you an introduction to using scripts and default values. A script uses 4th Dimension procedures to perform operations on a field or object. A default value is the initial entry which appears in a field. Unless it is modified before the user accepts the record, the default value is entered into the field.

Database: People06

Estimated time to complete: 10 minutes

A **script** is an instruction or series of instructions for 4th Dimension to execute. You can use a script to calculate a value for a field, ensure that text entries are capitalized, validate an entry, display a timely warning to the user, and so on.

A **default value** is an entry that automatically appears in a field when a record is first opened. It remains that field's value until you change it by entering a different value. You can set a static value for a field's default value, or you can use a dynamic default value calculated by 4th Dimension. 4th Dimension provides a calculated default value for current date, current time, and current sequence number.

In this chapter you will learn how to:

- Create scripts to calculate values,
- Enter and use default values.

ABOUT SCRIPTS

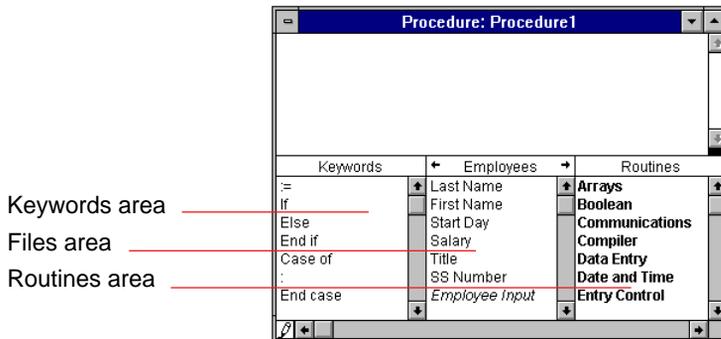
A script is one type of 4th Dimension procedure. A script is usually short, from one line to only a few lines long and is always associated with an object on a layout (a field, a button, or some other active object). When 4th Dimension executes a script, it carries out the instructions provided by the script.

The Procedure Editor

When you write a script, you do so using one of 4th Dimension's two Procedure editors. You have the choice of using the Flowchart editor or the Listing editor.

The Flowchart editor is a graphically oriented procedure editor in which the instructions are presented as a series of steps and tests that are connected with flowlines. The Listing editor is a line editor in which the steps and tests are written as text.

If you have used flowcharts to diagram procedures, you may find the Flowchart editor more useful to you. However, most people are familiar with procedures written as a listing. You should also keep in mind that only those procedures written using the Listing editor can be compiled. The tutorials in this book use the Listing editor.



The upper portion of the Procedure editor is where you enter and edit the commands, functions, and other elements that make up the script. You type the script into the text area. You can select many of the script's elements from the selection panels in the lower portion of the window.

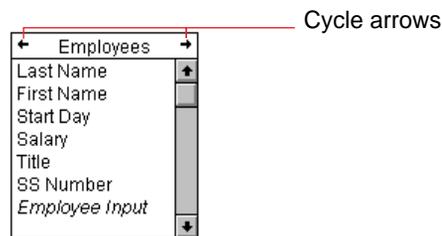
The lower portion of the Procedure editor contains the following selection panels:

Keywords: The Keywords list contains symbols and phrases you use to build your procedure. The most commonly used symbol is “:=”. It is called the *assignment operator*. Use it to instruct 4th Dimension to place a value in a field (or in a variable). For example, the statement:

```
[Employees] Monthly Salary := [Employees] Salary/12
```

reads “Monthly Salary gets Salary divided by 12.” This statement instructs 4th Dimension to take the value in the Salary field, divide it by 12, and place it in the Monthly Salary field.

Files: You can select fields or layouts from the current file by clicking them in the Files list. You can display fields and layouts from other files in the database by clicking on the cycle arrows on either side of the file name.



Routines: The Routines list contains commands and functions provided by 4th Dimension. By default, these commands and functions are grouped into subjects, or *themes*, which are listed in alphabetical order. You choose commands and functions from these themes as you do from a drop-down list box.

Commands for any 4th Dimension modules you have installed appear at the end of the Routines list, in their own themes.

A *command* carries out a task. For example, the ALERT command displays text in an alert window. A *function* returns a value. For example, the Round function rounds off a number and returns the new value.

Writing a Script

You have decided to add the monthly salary of each employee to the database. You are going to use a script to calculate the value by dividing each employee's yearly salary by 12.

You are first going to create a new Monthly Salary field.

1. If you have not done so already, start 4th Dimension and open the People06 database.

The People06 database opens in the Design environment.

2. Create a new field called Monthly Salary. Make it a Real field and select the Display Only attribute.

The Monthly Salary field will contain a calculated value. You make this field Display Only to prevent a different value from being accidentally entered into it. Creating a field is described in Chapter 4 of this manual.

The new field does not yet appear on any layouts. You need to add it to an existing layout in order to display the monthly salary for each employee.

3. Open the Scripts layout.

You are going to add the new field to this layout.

4. Use the Add Field tool  to place the Monthly Salary field on the layout below the SS Number field.

Placing a field on a layout is described in Chapter 4 of this manual. 4th Dimension displays the Field Definition dialog box.

5. Select Monthly Salary from the list of fields.

6. Set the numeric display format by typing "\$###,###.00" into the Format Display box.

Typing this set of symbols is another method of setting the numeric display format instead of choosing it from the drop-down list box.

Format Display box

The screenshot shows the 'Field Definition' dialog box. The 'Field' section contains a list of fields: First Name (A), Start Day (D), Salary (R), Title (A), SS Number (A), Monthly Salary (R), and [Employees] (R). The 'Format Display' area shows the format '\$###,###.00' entered in the text box. The 'Data Entry' section has 'Enterable' checked, 'Mandatory' unchecked, 'Auto Spellcheck' unchecked, 'Choices' unchecked, 'Required' unchecked, and 'Excluded' unchecked. There are 'List...' buttons next to 'Choices', 'Required', and 'Excluded'. The 'Script only if modified' checkbox is unchecked. Buttons for 'Script...', 'Balloon Help...', 'Cancel', and 'OK' are visible at the bottom.

Although you could choose this format from the Format drop-down list box, you normally use the Format Display area to enter formats not in the drop-down list box. You can also use the Format Display area to modify entries that you choose from the drop-down list box.

7. Click OK.

8. Make the field 12-point.

9. Create a text area next to your new field and type “Monthly Salary”.

You are now going to add a script to the Salary field that computes a value for Monthly Salary.

1. Double-click the Salary field.

4th Dimension displays the Field Definition dialog box for Salary.

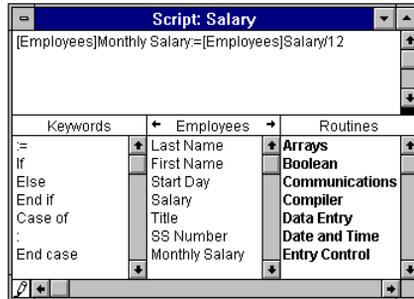
2. Set the numeric display format by typing “\$###,###.00” into the Format Display box.

3. Click the Script button.

4th Dimension displays the Procedure Type dialog box, which offers you a choice of using the Flowchart or Listing method for writing the script.

4. Leave the Listing radio button selected and click OK.

4th Dimension displays the Procedure editor in a window entitled “Script: Salary.”



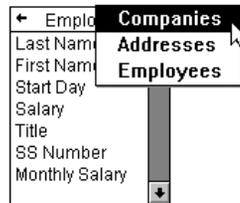
The script you will enter is as follows:

```
[Employees]Monthly Salary := [Employees]Salary/12
```

This script reads “Monthly Salary gets Salary divided by 12.” You can often write a script simply by clicking items in the three panels at the bottom of the window. In the next steps you will select the field names from the middle panel and the assignment operator (:=) from the left panel. You will type the division symbol and the number.

5. Click and hold down the mouse button on the filename area.

The File drop-down menu appears.



6. Select the [Employees] file.

7. Click Monthly Salary.

4th Dimension enters the file and field name in the top part of the window.

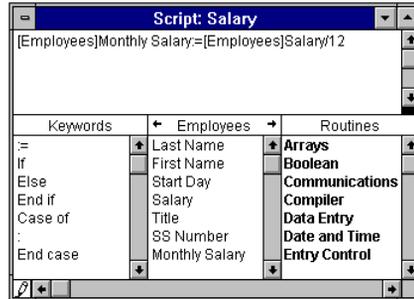
8. Click the := symbol at the top of the Keywords list in the left panel.

4th Dimension enters the symbol next to the Monthly Salary field name.

9. Click **Salary** in the middle panel.

10. Type: **“/12”** and press the Enter key on the keyboard (not on the numeric keypad).

The script is now complete.



11. Double-click the **Control-menu** box to close the Procedure editor window.

4th Dimension displays the Scripts layout in its window. A triangle in the Salary field indicates that a script is attached to it.

Salary

In a later section you will view the results of this script in the User environment.

USING A DEFAULT VALUE

You normally enter an employee's record on the first day that the employee starts work. The Start Day field, therefore, almost always contains the current date on the day the record is first created. You have decided to enter a default value to make data entry for this field faster.

1. Double-click the Start Day field.

4th Dimension displays the Field Definition dialog box for the Start Day field.

2. Click in the Default box and type "#D".

This is a code for setting the current date as the default value for a field. If the record for a new employee is entered on April 23, 1995, the Start Day field will contain the date Apr 23, 1995 (the date in Abbreviated format) as a default value.

3. Click OK.

4th Dimension displays the layout again. Subsequently, when you create a new record, the current date will already be entered in the Start Day field. You can type over the default value if necessary.

4th Dimension also lets you use default values for the current time (#H) and for a sequence number (#N). For more information about default values, refer to the *4th Dimension Design Reference*.

SEEING THE RESULTS IN THE USER ENVIRONMENT

Now that you have added a field, script, and default value to the layout, you can see the results in the User environment.

1. Choose User from the Use menu.

You modified the Scripts input layout. Before you can see the results of your work, you need to switch input layouts.

2. Change the input layout by choosing Scripts from the List of Files window.

You display the List of Files window by pressing Ctrl+Space bar. Choosing the input layout from the List of Files window is described in Chapter 2 of this manual.

3. Choose New Record from the Enter menu.

4th Dimension displays the Scripts input layout. The current date is displayed in the Start Day field.

4. Enter “74000” in the Salary field.

4th Dimension calculates the new monthly salary figure and displays it in the Monthly Salary field.

The Monthly Salary field now contains information that can be used in another place. If your payroll were set up to obtain the monthly salary figure from this field, any changes to an employee’s salary would be immediately reflected on the payroll.

5. Click the Cancel button to cancel the record.

THE NEXT STEP

Scripts and default values can reduce the amount of time spent during data entry and increase the accuracy of the information in your database.

In Chapters 7 and 13 of this manual, you will see more examples of using scripts. You will use the scripts to capitalize the entries in a field and to calculate totals and subtotals for a report.

In the next chapter you will use the Procedure editor to create a global procedure which you can then use in scripts for several fields.

Database: People07

Estimated time to complete: 20 minutes

Now that you have created a script in Chapter 6, you may begin to see how useful 4th Dimension procedures can be. A script is a procedure that is associated with a field or other object in a layout. In addition to using commands and functions in a script, 4th Dimension allows you to write procedures that can be used within a script to perform a specific function. A global procedure can be written once and used in many scripts and procedures.

In this chapter you will write a procedure that capitalizes the first letter of a field entry. You will then use this procedure in scripts that you attach to two different fields.

You will learn how to:

- Open the Procedure editor,
- Write a global procedure,
- Use the global procedure in scripts.

4TH DIMENSION PROCEDURES

4th Dimension uses several kinds of procedures:

- **Global procedures:** A global procedure can be used in other procedures or be activated by a menu command. Use a global procedure when you need to perform the same task more than once.
- **Layout procedures:** A layout procedure is associated with a particular layout. It is executed before the layout is displayed, whenever a field or other object is selected or modified, and again after the record is accepted.
- **Scripts:** A script is a procedure that is associated with an object on a layout. It can be executed as often as a layout procedure, or only when the object is used.
- **File procedures:** A file procedure is associated with a file. A file procedure is executed before any input layout for that file is used.

In this chapter you will create a global procedure. You have already created and used scripts in Chapter 6, “Using Scripts and Default Values.” File and layout procedures are not covered in this book. For complete information about these types of 4th Dimension procedures, refer to the *4th Dimension Design Reference*.

OPENING THE PROCEDURE EDITOR

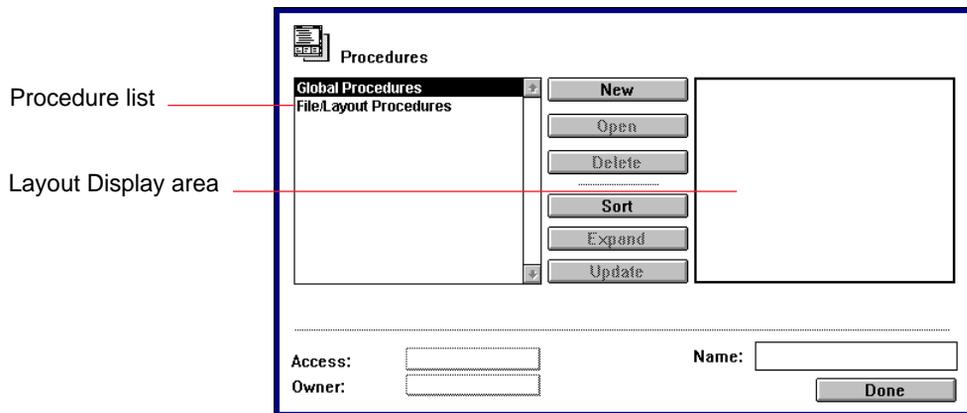
Whenever you write a procedure, you use 4th Dimension's Procedure editor. For a script, you open the Procedure editor from within the Layout editor. For the other types of procedures, however, you use the **Procedure** menu command in the **Design** menu.

1. If you have not done so already, start 4th Dimension and open the **People07** database.

People07 opens in the Design environment.

2. Choose **Procedure...** from the **Design** menu.

4th Dimension displays the Procedures dialog box.



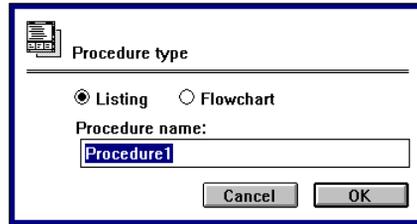
The Procedures dialog box shows all the global, file, and layout procedures associated with this database. At this point, there are no procedures to list. Later you will be able to expand and collapse the lists to see the procedures that you have created. You use the **Expand/Collapse** button as in the Layout dialog box to expand and collapse layout names. When you highlight a layout procedure, 4th Dimension displays the layout it is associated with in the Layout Display area.

You must choose in this dialog box whether your procedure is to be a global, file, or layout procedure. Because you are writing a procedure that will be called by other procedures, you make it a global procedure.

The Global Procedures choice is already selected, so you do not need to change it. If you have deselected the Global Procedures choice, be sure to select it before continuing.

3. Click the New button.

4th Dimension displays the Procedure Type dialog box.



Here you name your global procedure and choose whether to use the Listing or the Flowchart method for writing your procedure.

If you are accustomed to using flowcharts to map out or diagram procedures, you may find the Flowchart method appropriate. However, most people are familiar with a listing format in which the procedures are written out line by line.

The choice between the two methods is available only for a new procedure (such as this one). Subsequently, you can edit the procedure only in the form in which you first write it.

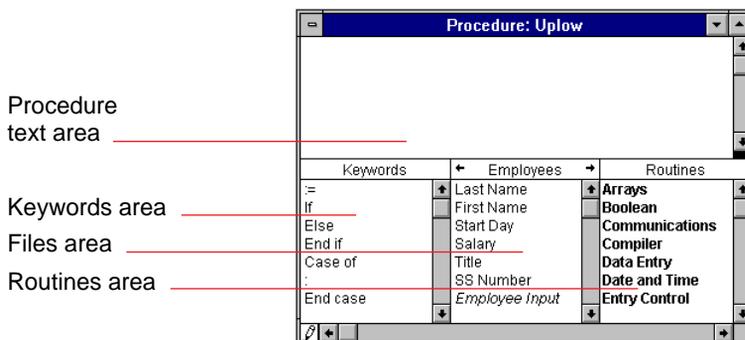
Since most people prefer the Listing method, it is preselected. For the purposes of this tutorial, do not change the selection.

4. Type “Uplow” in the Procedure Name box.

Uplow is a descriptive name for the procedure you will write. It makes the first letter uppercase and the remainder of the letters lowercase.

5. Click OK.

4th Dimension displays the Procedure editor in a window entitled Procedure: Uplow. You use the Procedure editor to write and edit procedures.



The upper portion of the Procedure editor is where you enter and edit the commands, functions, and other elements that make up the procedure. You can select most procedure elements from the selection panels in the lower portion of the window.

- **Keywords:** The Keywords list consists of symbols and phrases you use to construct your procedure.
- **Files:** You can select fields and layouts from the current file by clicking them in the Files list. You can display fields and layouts from other files in the database by clicking on the cycle arrows on either side of the file name to change files.
- **Routines:** Commands and functions provided by 4th Dimension are listed in the Routines list. Commands and functions can be listed in alphabetical order or by groups (the default), also called *themes*. You click the word Routines at the top of the panel to select either an alphabetic or a grouped listing of the routines.

CREATING A CAPITALIZATION FUNCTION

You are now going to write a function to capitalize field entries. This function is useful for preventing typing errors from being stored in your database. When you use this function in scripts, you can be sure that the names are capitalized properly.

The procedure you will enter is as follows:

```
If ($1 # "")  
  $0 := Lowercase ($1)  
  $0_<1>_ := Uppercase ($0_<1>_)  
End if
```

The second line in the procedure changes all characters in the field to lowercase and the third line converts the first character in the field to uppercase. These actions are performed by two built-in 4th Dimension functions, Lowercase and Uppercase.

The names \$0 and \$1 are the names of variables that you create automatically by using them. By convention, \$1 is reserved for the value that is *passed to* a function, while \$0 is reserved for the value that is *returned by* a function.

In other words, the *input to* the function is contained in \$1 and the *output from* the function is contained in \$0.

A version of *Uplow* can be written simply by using the field names that you

want to use. For example, you could write the procedure as follows:

```
If (LastName # "")
  Last Name := Lowercase (Last Name)
  Last Name_<1>_ := Uppercase (Last Name_<1>_)
End if
```

This function would work fine, but only for the Last Name field. It would not work for any other fields. You would have to rewrite the function for each field you wanted to capitalize. Using the names \$1 and \$0 allows you to reuse the *Uplow* procedure for any alphanumeric field or variable.

In this tutorial, you will write the *Uplow* procedure and then use it in scripts for *both* the First Name and Last Name fields.

The following steps do not specify whether to select or type the elements of the procedure. Try both ways. You will soon be able to decide which method works best for you.

- 1. Click the maximize button to expand the Procedure editor window.**
- 2. Type the following comment to identify the purpose of the procedure: “Uplow capitalizes the first letter of the field entry”.**

The leading accent mark indicates that this is a comment and not part of the instructions. The accent mark appears in different places on different keyboards. Do not confuse this accent mark with the apostrophe or backslash.

- 3. Press the Enter key on the keyboard.**

When you press Enter, the comment is entered and automatically indented. The insertion point moves to the next line.

- 4. Type “If (\$1 # ”).**

This line guarantees that \$0_<1>_ is a valid character reference.

You begin on the third line with the first local variable and the assignment operator (:=).

- 5. Type “\$0:=”.**

This can be read as the “value returned gets.” The value returned will be the lowercase version of the contents of the field. The remainder of the first line will create the lowercase version.

- 6. Type “Lowercase (\$1)” and press the Enter key.**

This part of the function tells 4th Dimension to make the first value passed to the procedure (\$1) lowercase. You begin by making all the characters lowercase so that when you make the first character uppercase, the entry is correct.

7. Type “\$0_<1>_:=”.

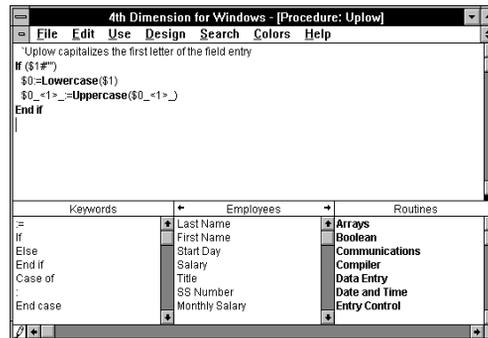
This portion of the line can be read as “the character in the first position of the value returned gets.”

8. Type “Uppercase (\$0_<1>_)”.

This part of the procedure tells 4th Dimension to make the letter in the first position (and only the first position) uppercase. The entries in the parentheses instruct 4th Dimension to change the first character of the value returned by the first line of the procedure.

9. Type “End if”.**10. Press Enter to end the line.**

The completed procedure looks like this:

**11. Close the procedure by double-clicking the Control-menu box.**

The *Uplow* procedure is now finished. In the next section, you will use this procedure within scripts to capitalize field entries.

USING THE GLOBAL PROCEDURE IN SCRIPTS

Now that you have a procedure that capitalizes the first letter of a word, you can use it in scripts to see how it works.

1. Choose Layout from the Design menu and open the Scripts layout.

2. Hold down the Alt key and click the Last Name field.

4th Dimension displays the Procedure Type dialog box.

3. Select Listing and click OK.

Holding down the Alt key while you click a field or object is a shortcut used to open the Script editor. It is equivalent to double-clicking a field or object and then clicking the **Script** button in the Field or Object Definition dialog box.

4. Create the following script for this field:

```
"Last Name := Uplow (Last Name)"
```

Placing the field name in parentheses after the name of the procedure instructs 4th Dimension to pass the contents of the field to the function. In this case, the \$1 variable in the *Uplow* procedure is a placeholder for the Last Name field. The final \$0 value returned by the function is placed in the Last Name field.

5. Press the Enter key on the keyboard.

After you press Enter, *Uplow* is displayed in italics. The names of procedures are always italicized in the Procedure editor.

In addition, the name of each global procedure you create is automatically added to the end of the Routines list in the Procedure editor. Scroll through the Routines list to see *Uplow* listed.

6. Close the script by double-clicking its Control-menu box.

7. Create a similar script for the First Name field by holding down the Alt key, clicking on the First Name field, and typing:

```
"First Name:=Uplow (First Name)"
```

In this case, \$1 in *Uplow* is a placeholder for the First Name field. Using the local variables \$0 and \$1, you can write a global procedure without naming the specific fields that will be used with it.

You can now test your scripts.

8. Go to the User environment and enter a new record.

Be sure to use random uppercase and lowercase letters for the field entries for Last Name and First Name. You will see how the script corrects the entries as soon as you select another field.

THE NEXT STEP

The global procedure you have written will capitalize any field entry consisting of a single word. Global procedures such as this one can be used in any other procedure or script. You can use it in any script on any layout to ensure uniform capitalization.

In Chapter 15 of this manual you will write a global procedure that you attach to a menu command for a runtime 4th Dimension application.

Database: PEOPLE08

Estimated time to complete: 25 minutes

In this chapter you will create a second file to store information about the departments in your company. On each employee's record, you want to include the name of the department for which the employee works and the name of the department manager.

However, you do not want to duplicate the information in each employee record. Duplicating information is inefficient, creates extra work in the long-run, and takes up more memory. For instance, if a department hires a new manager, you would have to change the manager's name on every employee record for that department.

To avoid this, you can combine information from the two files, relating them so that you can display information from the [Departments] file in a layout for the [Employees] file. Relating the files allows you do things such as print a list of employees and their managers or sort the employee records by department.

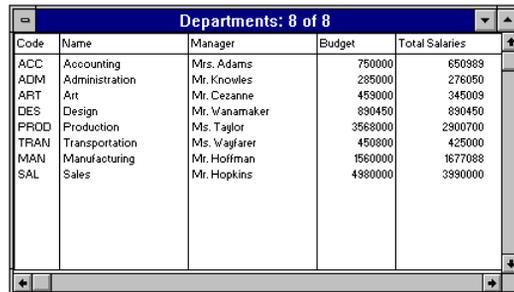
If you keep the department name in a related file, you need to enter it and store it on disk only once. You can then display the department name on each employee record. If you need to change the information, you need change it in only one place, in the [Departments] file. The change is then automatically reflected in the other files that use it.

In this chapter you will learn how to:

- Create a second file,
- Relate one file to another,
- Create a layout that displays information from a related file.

This is how relating works: You use fields and layouts to store information about each department in the [Departments] file. After you enter the data,

the information looks like this:



Code	Name	Manager	Budget	Total Salaries
ACC	Accounting	Mrs. Adams	750000	650989
ADM	Administration	Mr. Knowles	285000	276050
ART	Art	Mr. Cezanne	459000	345009
DES	Design	Mr. Vanamaker	890450	930450
PROD	Production	Ms. Taylor	3580000	2900700
TRAN	Transportation	Ms. Wayfarer	450000	425000
MAN	Manufacturing	Mr. Hoffman	1560000	1677088
SAL	Sales	Mr. Hopkins	4980000	3990000

Each department has one record. Each record contains the department name, the department code, the manager's name, the department budget, and the total department salaries.

You use the Department Code field to relate the [Employees] file to the [Departments] file. Because the department code identifies a unique record in the [Departments] file, 4th Dimension can locate and use the information in that one record automatically.

Whenever a record in the [Employees] file is displayed (or otherwise made the current record), 4th Dimension uses the department code in the employee record to locate the corresponding record in the [Departments] file and then loads the record. The information in the department record can be used in many ways. For example, it can be displayed on the layout for each employee's record or printed together with other employee information.

In this relation, the department code identifies one record in the [Departments] file and many records in the [Employees] file. This is called a Many-to-One relation. Many employee records have the same department code, but that code is entered in only one department record. You may be familiar with calling these files the One file and the Many file.

CREATING A NEW FILE

In this section you will create a second file to store information about departments.

1. If you have not done so already, start 4th Dimension and open the PEOPLE08 database.

4th Dimension displays the Structure window with the [Employees] file in it. A new Department Code field has been added to the [Employees] file. This is the field you will use to relate the [Employees] file to the [Departments] file.

2. Choose New File... from the Structure menu.

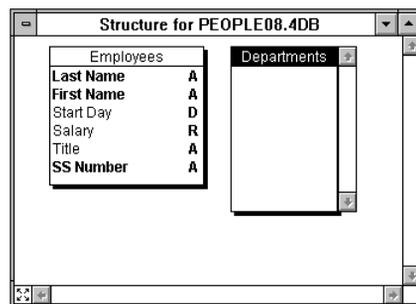
The pointer changes to a square file icon  (the same shape that 4th Dimension uses to display a file). It remains file-shaped until the next step.

3. Position the pointer to the right of the [Employees] file and click the mouse button.

[File2] is created at that location. You can move a file to any location by dragging its filename.

*NOTE: If you change your mind about creating a file after you have chosen **New File** from the **Structure** menu, you can cancel the menu command by moving the file-shaped pointer into the menu bar and clicking. The pointer returns to an arrow.*

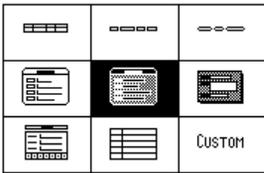
4. Name the file “Departments” by choosing Edit File from the Structure menu, typing the filename in the dialog box, and then clicking OK.



You now have two files. You can create up to 255 files in a single database.

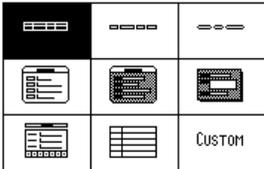
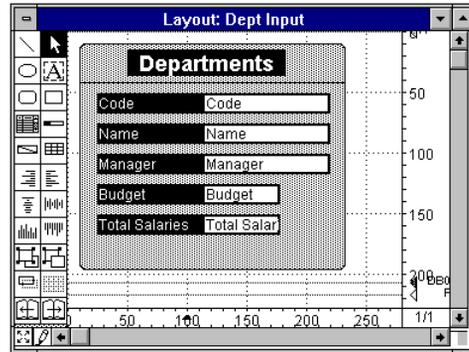
5. Create the following fields for the [Departments] file:

Field name	Type	Attribute
Code	Alpha 5	Indexed
Name	Alpha 15	
Manager	Alpha 15	
Budget	Real	
Total Salaries	Real	Display Only



6. Create an input layout in the Departments file named “Dept Input” that includes all the fields in the file.

Use layout template #5 (the one in the middle) to see what it looks like and to differentiate the [Departments] layout from the [Employees] layout.



7. Create an output layout in the Departments file named “Dept Display” that includes all the fields in the file. Use layout template #1 (the one in the upper-left corner).

You are now ready to relate the two files.

RELATING TWO FILES

First you will relate the [Employees] file to the [Departments] file. Then you will create a new layout for the [Employees] file that includes information from the [Departments] file.

You establish a relation between two files by drawing a line that connects the related fields, that is, the fields that have information in common. In this case, the related fields are the Department Code field in the [Employees] file and the Code field in the [Departments] file. The two fields that you relate do not have to have the same name, but they must have the same field type. In addition, both fields must be indexed. If you do not index them, 4th Dimension will index them the first time you switch to the User environment.

1. Position the pointer on the Department Code field name in the [Employees] file.

Because the [Employees] file is the Many file, you start with it.

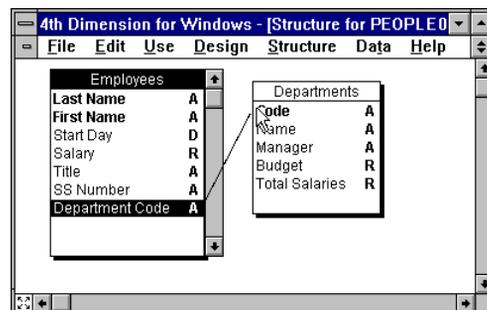
Whenever you draw a line to relate two files in 4th Dimension, you always start with the Many file.

The Many file contains many instances of the common information, in this case, many instances of the department code. The Code field in the One file contains only a single instance of each code.

The Department Code field will be related to the Code field in the [Departments] file. These fields will contain the information that allows 4th Dimension to find corresponding records.

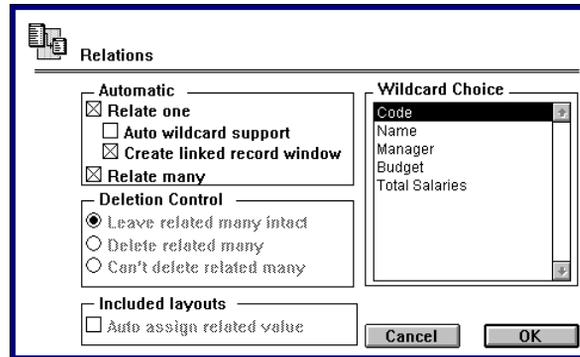
2. Press and hold down the mouse button on the Department Code field in the [Employees] file and drag the pointer to the Code field in the [Departments] file.

A line follows the pointer.



3. With the pointer positioned on the Code field in the [Departments] file, release the mouse button.

4th Dimension displays the Relations dialog box.



The line you have just drawn establishes the relation between the two files. 4th Dimension can locate the record in the One file that corresponds to a record in the Many file (the relation is many records related to one record). 4th Dimension can also locate the records in the Many file that correspond to a record in the One file (the relation is one record related to many records).

The Deletion Control options tell 4th Dimension how to treat related records in the Many file when their related record in the One file is deleted. For more information about these options, refer to the *4th Dimension Design Reference* and the *4th Dimension User Reference*. For now, leave the default Deletion Control option selected.

4. Click Name in the Wildcard Choice list.

For complete information about the Wildcard Choice list, refer to the *4th Dimension Design Reference*.

5. Click OK.

4th Dimension displays the Structure window again with an arrow pointing from the [Employees] file to the [Departments] file. The arrow shows that the two files are related. The arrow points from the Department Code field in the [Employees] file (where you started) to the Code field in the [Departments] file (where you ended).

If you made an error in drawing the line, you can correct it by simply removing the relation and then redrawing it. To remove a relation, click on the field at which you started the relation and drag the pointer to any blank area on the Structure window. When you release the mouse button over the blank area, the relation disappears.

LAYOUTS WITH FIELDS FROM THE RELATED FILE

You have related the [Employees] file to the [Departments] file. Whenever you enter a department code on a layout for the [Employees] file (or otherwise make that record current), 4th Dimension loads the corresponding record from the [Departments] file. You can then use information from that [Departments] record.

Your next step is to create a layout to display information from both files. This will be a new input layout for the [Employees] file.

1. To open the Layout dialog box, double-click the title of the [Employees] file.

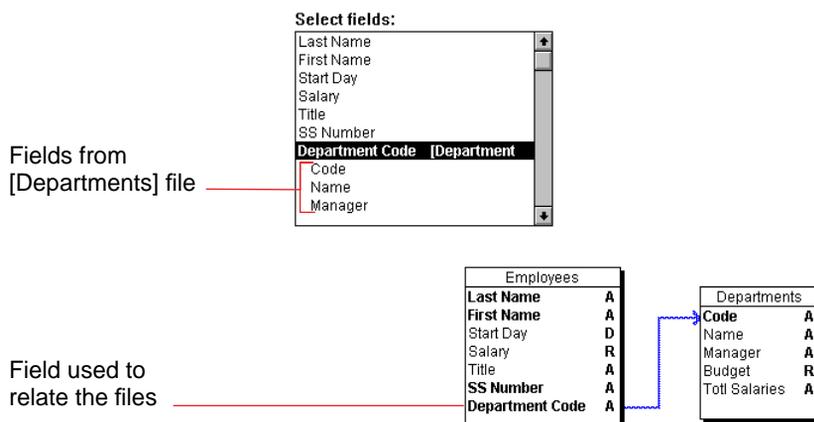
4th Dimension displays the Layout dialog box, showing the layouts for the [Employees] file already expanded. Because you double-clicked the [Employees] file, only the layouts for that file are shown.

2. Click the New button to display the New Layout dialog box.

Notice that the field that you used to relate the two files (Department Code) is now in bold type and the file it is related to ([Departments]) is shown in brackets next to it. The [Departments] file is also shown at the end of the list of fields. This second listing allows you to create an included layout. You will work with the second listing of a file in the next chapter.

3. Double-click the Department Code field name.

4th Dimension expands the list to show the fields from the [Departments] file. You can include any of these fields in the layout you are now creating.



When you are creating a layout that includes fields from a related file, you must select all the fields you want to display. The fields will appear in your layout in the order you select them.

To select a field for your layout, you can either click the field name and then click the **Select** button or you can simply double-click the field.

4. Select these fields from the [Employees] file in the following order:

Last Name
First Name
Start Day
Salary
Title

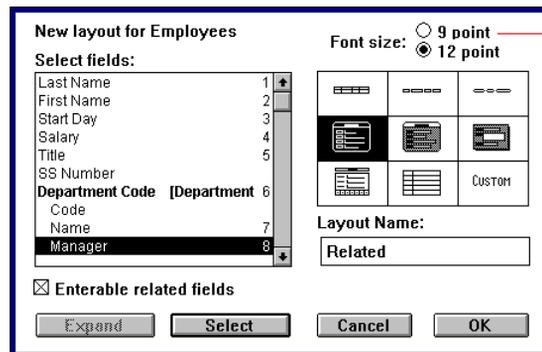
5. Select the Department Code field in the [Employees] file by clicking the Select button.

6. Select the following fields from the [Departments] file:

Name
Manager

4th Dimension displays numbers beside the selected fields. These numbers show the order in which the fields will appear on the layout.

7. Type “Related” as the layout name and choose the 9-point font size.

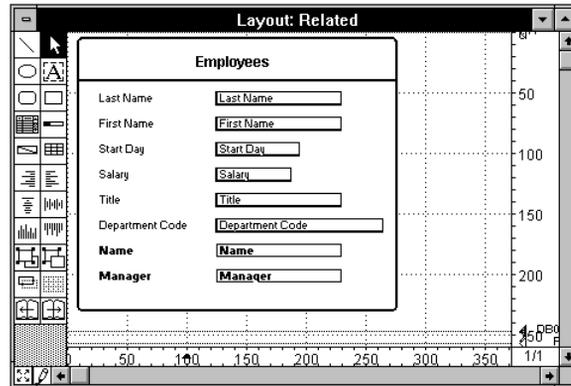


Layout font size

8. Click OK.

4th Dimension displays the new layout you have created. The two field labels for the fields you selected from the [Departments] file are displayed

on this layout in bold type and the field labels from the [Employees] file are shown in plain type.



You can now enter records in the User environment.

IMPORTING DEPARTMENT RECORDS

Now that you have related the two files and have created a layout that includes fields from both files, you can see the result as you enter additional records.

You must first add records for the [Departments] file. A text file of department records is included in the PEOPLE08 directory.

1. Choose User from the Use menu.

4th Dimension displays the list of employee records you have been using.

2. Make [Departments] the current file.

Before you can import data, you must make the file that will contain the data the current file.

To change the current file, press Ctrl+Space bar and select the file you want to make current from the List of Files window. Then press Ctrl+Space bar again to hide the List of Files window.

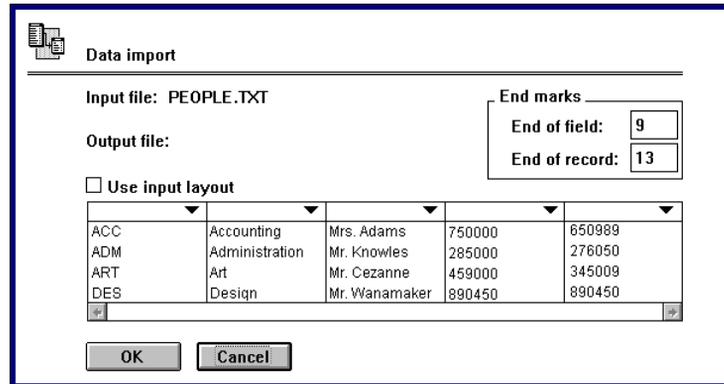
3. Choose Import Data... from the File menu.

An Open File dialog box appears.

4. Open the PEOPLE08 directory, and then select the DEPTMENT.TXT file in the file list.

5. Click OK.

4th Dimension displays the Data Import dialog box. You are going to use this dialog box to import data into the [Departments] file from a text file.

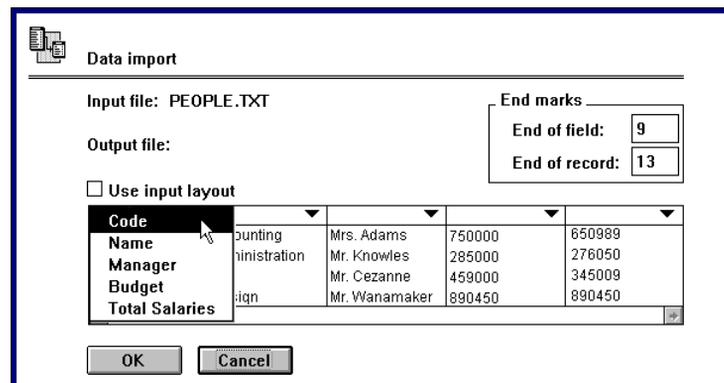


Columns in the upper portion of the dialog box preview the data in the text file by showing the first four lines of text. If the text file contained more than five columns of data, you would use the scroll bar at the bottom of the columns to see additional columns.

In this dialog box, you need to specify into which fields you want to import data. All of the fields in the [Departments] file are contained in the drop-down list boxes that appear at the top of each column. To select a field for each column of data, you choose a field name from the drop-down list boxes.

For this exercise, you want to import data into all fields in the [Departments] file in the order that they appear in the file.

1. Choose the Code field name from the drop-down list box in the first column.



4th Dimension places “Code” at the top of the column.

2. Choose Name from the drop-down list box in the second column, Manager from the third, and so on.

3. Click OK.

A progress indicator appears and counts the records as they are being imported into the [Departments] file.

Once all the records are imported into the [Departments] file, 4th Dimension displays the records in the output layout.

Code	Name	Manager	Budget	To
ACC	Accounting	Mrs. Adams	750000	
ADM	Administration	Mr. Knowles	28500	
ART	Art	Mr. Cezanne	459000	
DES	Design	Mr. Wanamaker	890450	
PROD	Production	Ms. Taylor	356800	
TRAN	Transportation	Ms. Wayfarer	450800	
MAN	Manufacturing	Mr. Hoffman	1560000	
SAL	Sales	Mr. Hopkins	4980000	

For further information about importing records, refer to the *4th Dimension Quick Start*.

SEEING THE RELATION IN ACTION

In this section you will see that when you enter the department code on an employee record, 4th Dimension immediately displays the information from the [Departments] file.

To see how the automatic relation works, you will need to use the Related layout you just created.

1. Press Ctrl+Space bar to display the List of Files window.

2. Click the Input Layout icon for the [Employees] file and choose Related from the drop-down menu.

4th Dimension changes the current input layout to the Related layout you just created.

3. Press Ctrl+Space bar again to bring the Records window to the front.

4th Dimension hides the List of Files window.

4. Choose New Record from the Enter menu.

5. Enter some practice information:

Last Name: "Ormolu"

First Name: "Fritz"

Start Day: "4/1/89"

Salary: "38050"

Title: "Fabricator"

6. Select the Department Code field.

7. Enter "DES" and press the Tab key.

4th Dimension enters the department name (Design) and the manager's name (Mr. Wanamaker) in their fields. This information came from the [Departments] file. You can now see the first benefit of the relation you have established: automatic, instantaneous, and accurate data retrieval.

8. Click the Enter button.

4th Dimension accepts the record and displays a blank record for further data entry.

ACCESS TO THE RELATED FILE

You will occasionally need to access a related file. You may need to create a record for a new department, for example. 4th Dimension makes this easy to do. When you enter a new department code, 4th Dimension gives you access to the input layout of the related file so that you can create the new record.

Suppose your company hires an engineer as the first employee of a new engineering department. You enter this record before the department record is created.

In this section, you will enter a new department code and then create the corresponding department record.

1. Enter some practice information:

Last Name: "Conqueror"

First Name: "Bill"

Start Day: "10/1/88"

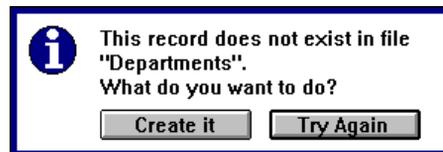
Salary: "45000"

Title: "Engineer"

2. Enter "ENG" in the Department Code field.

When you tab out of the field, select another field, or click the **Enter** button, 4th Dimension looks for this code in the [Departments] file. When it does not find the record, it decides that you have either made a mistake or you want to create a new record.

A confirmation dialog box appears asking if you want to create a new department record or try to enter an existing department code in the employee record.



3. Click the Create It button.

4th Dimension displays the input layout for the [Departments] file, ready for you to enter information about the Engineering department.

Departments	
Code	ENG
Name	
Manager	
Budget	0
Total Salaries	0

The new department code is already entered in the correct field. To create a new record in the [Departments] file, you need only fill out the rest of the form.

4. Enter the Engineering department information:

Name: "Engineering"

Manager: "Mr. Sturges"

Budget: "175000"

You can ignore the Total Salaries field for the moment. This field has a Display Only attribute that prevents any value from being entered. Later you will instruct 4th Dimension to calculate a value for this field.

5. Click the Enter button to accept the record.

4th Dimension accepts the record, returns to the input layout for the [Employees] file, and displays the department and manager information

in the related fields. This information has been drawn from the record you created in the [Departments] file.

6. Click the Enter button.

The employee records are listed in the output layout for the [Employees] file.

THE NEXT STEP

You have seen how related files allow you to share information between files. Your employee records now include the appropriate department and manager names. You will see in the next chapter that the department layouts can include information about the employees in each department.

Since the files can share this information, data that might have been repeated many times is stored only once. The advantages of this structure are reduced data entry time, less chance of error, ease of updating, and usage of less disk space.

You can create reports that use information from the related file. You can also search and sort records based on information in the related file. For example, you can sort the records in the [Employees] file by department or by manager even though the department name and manager's name are in the [Departments] file. You will see these operations in later tutorials.

Database: PEOPLE09

Estimated time to complete: 10 minutes

In this chapter you will use the relation you established in Chapter 8 to display records from the [Employees] file in a layout for the [Departments] file. This is called a *One to Many* relation.

Relating One to Many means that whenever a record in the [Departments] file is made current, 4th Dimension loads all the [Employees] file records that have the same department code. This capability allows you to use information from many employee records from within each of the records in the [Departments] file. Many records contribute information to one record

In this chapter you will learn how to:

- Create a layout that includes records from the Many file,
- Modify an employee record from within the [Departments] file.

CREATING AN INCLUDED LAYOUT

You want to create a layout that displays all employees belonging to a department on that department's record. To do this, you need to create a layout for the [Departments] file that includes space for [Employees] records. 4th Dimension provides an automatic method for including records from another file which is similar to the way you created the Related layout to display information from the [Departments] file.

1. If you have not done so already, start 4th Dimension and open the PEOPLE09 database.

PEOPLE09 opens in the Design environment.

2. Double-click the title of the [Departments] file to open the Layout dialog box and click the New button.

4th Dimension displays the New Layout dialog box for the [Departments] file.

This dialog box shows the field names from the [Departments] file. The [Employees] filename is shown in bold and in brackets at the bottom of the list of fields. You will select two [Departments] fields and several [Employees] fields to display on the same layout.

3. Select Name and Manager from the [Departments] file.

4. Click the [Employees] filename and click the Select button.

5. Double-click the [Employees] filename.

4th Dimension lists the fields in the [Employees] file.

6. Select Last Name, First Name, Start Day, and Salary in that order from the [Employees] file.

Be sure to select them in that order so that they appear in that order on the layout. If you make a mistake, you can deselect any field name by reselecting it.

The numbers for the fields from the [Employees] file start over again from number 1. This is because the fields are numbered within the included layout area.

7. Select the fifth layout pattern (the one in the middle), make the font size 9-point, and type “Included” as the layout name.

New layout for Departments

Font size: 9 point
 12 point

Select fields:

Code	1
Name	1
Manager	2
Budget	
Total Salaries	
[Employees]	3
Last Name	1
First Name	2
Start Day	3
Salary	4

Enterable related fields

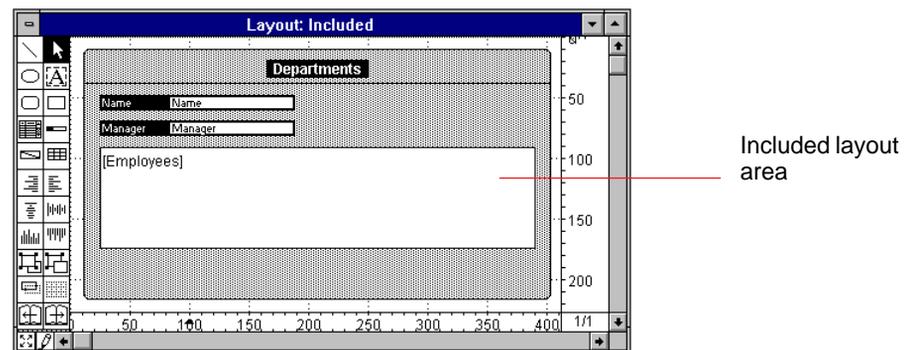
Layout Name: Included

Expand Select Cancel OK

8. Click OK.

4th Dimension displays the new layout.

9. Drag the window to display the included layout area.



4th Dimension has automatically placed an included layout area on the new layout. An included layout area displays records from another file. On this layout, the included layout area will show the employee records in a multi-line scrollable list format. At present, no fields are visible in the included layout. You will see them in the User environment.

VIEWING AND ENTERING RECORDS

You can now go to the User environment to view department records that contain employee information. Each time a particular record is made current, 4th Dimension searches for all the employee records that match the department code and selects them. 4th Dimension then displays the information in the fields that you have selected.

1. Choose User from the Use menu.

4th Dimension displays the employee records. You need to change the file and layout.

2. Press Ctrl+Space bar to display the List of Files window.

3. Click the Input Layout icon for the [Departments] file and choose Included from the drop-down menu.

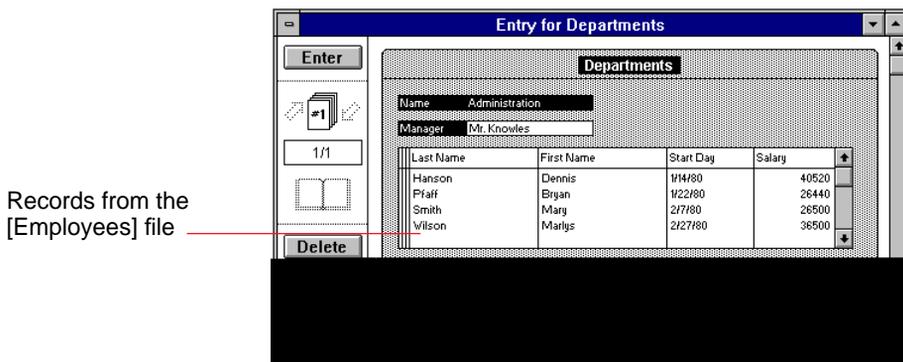
4th Dimension changes the current file to [Departments] and the input layout to the Included layout.

4. Press Ctrl+Space bar again to send the List of Files window to the back.

4th Dimension displays the department records in the [Departments] file output layout.

5. Select the Administration Department record and choose Modify Record from the Enter menu.

4th Dimension displays the new input layout, including a scrollable list of Administration Department employees.



You can modify the employee records from this layout. Suppose one employee, Mary Smith, has received a raise of \$3,000 per year. You can change the salary figure here.



Database: PEOPLE10

Estimated time to complete: 25 minutes

In this chapter you will use 4th Dimension to store information about each employee's performance reviews. You have no way of knowing in advance how many reviews a particular employee has had. New employees have had no reviews; others who have been with the company a long time have had many reviews. You need to keep track of varying amounts of information for each record.

A 4th Dimension subfile handles this problem. A **subfile** is a subordinate file that can contain any number of records associated with a single record in the parent file. It lets you keep track of a variable amount of information for each record, from no entries to as many as necessary. In effect, each employee record will have an entire data file in which to store that person's performance review information.

The file to which a subfile is attached is called the **parent file**. The records in the parent file are called **parent records**. The fields in a subfile are called **subfields** and the records in a subfile are called **subrecords**.

Each parent record has its own subfile and the subrecords in each subfile are automatically linked to the parent record.

A parent file can have many subfiles.

In this chapter you will learn how to:

- Create a subfile,
- Create a layout that displays information from the subfile,
- Enter information into the subfile.

WHY USE A SUBFILE?

You use a subfile when you need to keep track of a varying number of additional entries for each record. A subfile is an excellent place to store information limited to one record. You might use a subfile to keep track of your employee's children, articles published, or social service awards.

The subrecords (the records in the subfile) are stored with the parent record. When the parent record is made the current record, the subrecords are placed in memory. The number of subrecords a subfile can contain is limited only to the number that will fit in memory.

Note that the information in a subfile is available only when its parent record is current. Therefore, it is difficult to summarize information from subrecords belonging to different parent records. (Do not use a subfile when you need to collect information from all the subrecords.)

For example, an invoice file might seem to be a good candidate for using a subfile because each set of purchased items could be associated with a specific customer record. However, since you usually need direct access to such purchase records, you would need to use a normal file and an automatic relation to store the sales information. You would then relate the sales file to the customer file to prepare invoices.

CREATING A SUBFILE

You create a subfile in two steps: first, you add a field with a subfile field type to the parent file ([Employees]). Second, you add fields to the subfile in the normal way. Once the subfile exists, you can create a new layout for the [Employees] file that includes the subfile.

Notice that creating a subfile is quite different from creating a relation between two files that already exist. You cannot convert a file that already exists into a subfile.

In the following steps you will create the subfile.

1. If you have not done so already, start 4th Dimension and open the PEOPLE10 database.

PEOPLE10 opens in the Design environment.

2. Double-click in the space below the field names in the [Employees] file.

4th Dimension displays the Field Attributes dialog box.

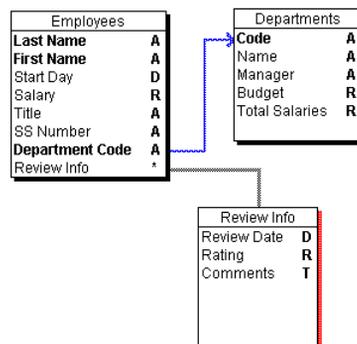
3. Type “Review Info” for the field name.

This is the name 4th Dimension will use for the subfile as well as the field.

4. Select the Subfile field type.

5. Click OK.

4th Dimension creates the subfile below the [Employees] file and connects it to the Review Info field with a gray line.



The gray line connects the top of the subfile to the parent file. Notice that this is different from the arrow that connects two related fields.

Next, you create fields in the subfile (subfields) to contain the information. These steps are the same as those for a regular file.

1. Double-click within the subfile.

4th Dimension displays the Field Attributes dialog box.

2. Create the following subfields:

Subfield	Type
Review Date	Date
Rating	Real
Comments	Text

The Review Date subfield will contain the date the performance review is approved.

The Rating subfield is for the numerical rating your company uses for performance reviews.

The Comments subfield will contain the text of the performance review itself. You have made it a Text subfield so that it can hold a substantial amount of text (up to 32,000 characters).

3. Click OK after creating the Comments subfield.

The three subfields are linked automatically to each parent record.

4. Using the same layout pattern (#5) you used for the previous input layouts, create an input layout for the Review Info subfile and name it "Input". Use all three subfields.

5. After creating the layout, double-click the Comments field.

4th Dimension displays the Field Definition dialog box.

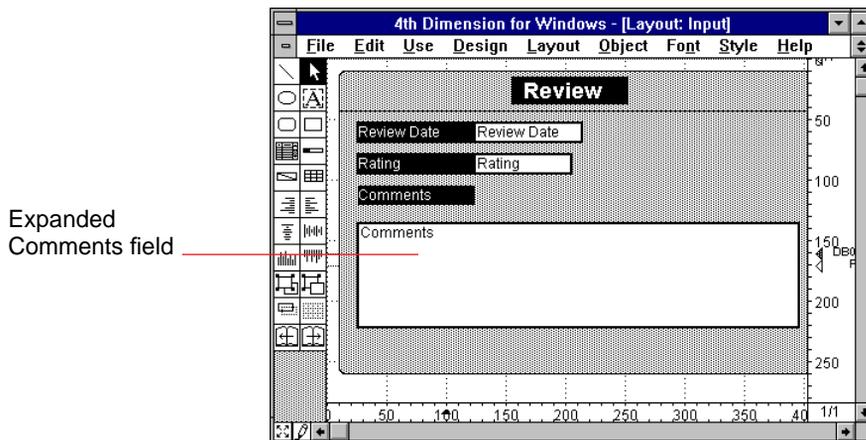
6. Select the Text with Scroll Bar check box.

7. Click OK.

This layout will be referred to later as a full-page layout because it provides access to a record on a full page.

8. Drag the layout frame down to just past 250 and increase the size of the comments field to accommodate paragraphs of text.

9. With the Comments fields selected, press Ctrl+1 to draw a border around the expanded Comments field.

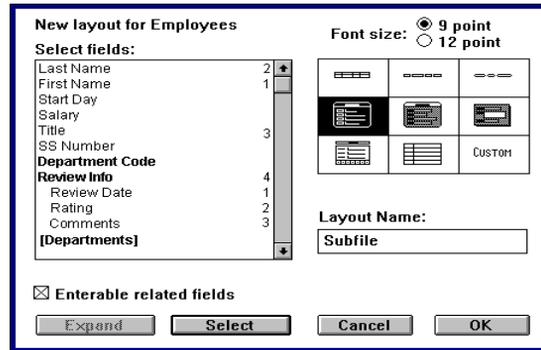


Now that you have created an input layout, you can proceed to create a layout for the [Employees] file that includes the layout for the subfile.

1. **Create a new input layout for the [Employees] file and name it "Subfile". Select the 9-point font size.**
 2. **Select the First Name, Last Name, and Title fields from the [Employees] file.**
 3. **Double-click the Review Info field and click the Select button.**
- 4th Dimension lists the subfields in the Review Info subfile.
4. **Select the Review Date, Rating, and Comments subfields.**

You create an included layout area for a subfile in the same way you created an included layout area for a related file in Chapter 9. You select the subfile as one of the fields to be displayed and then select the fields you want from the subfile.

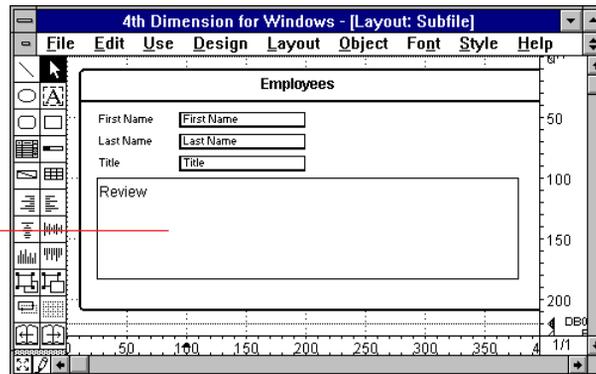
Be sure your New Layout dialog box matches the one shown below before proceeding.



5. When you have finished, click OK.

4th Dimension creates a new layout that automatically includes a multi-line layout area for the subfields.

Included layout area
for the subfields



Whenever you enter information for an employee, you will see the subfile displayed in the subfile display area.

You now need to associate the subfile input layout with the included layout area.

1. Double-click the included layout area.

4th Dimension displays the Included Layout dialog box. You use this dialog box to tell 4th Dimension which of the subfile layouts to use for input.

The Review Info subfile name is highlighted. The asterisk next to the subfile name shows that Review Info is associated with the included layout area.

2. Click the Expand button to show the list of layouts you have created for Review Info.

3. Select the Input layout and click the Full Page check box.

This step makes the input layout the full-page layout that “waits behind” the subfile display area until you signal to enter more data. You will see this feature in action in the next section of this chapter. Ignore the buttons for the different frame displays. They are used only during printing.

4. Select the Double-clickable check box in the Data Entry area.

This step makes it possible to double-click the included layout. When the included layout is double-clicked, the full-page layout is displayed.

5. Click OK.

4th Dimension displays the layout on which you have been working.

6. Close the Layout editor window.

ENTERING INFORMATION INTO THE SUBFILE

Now that you have created the subfile and an [Employees] file layout with a subfile display area, you can use the new layout to enter and display information. In the following steps you will add review information to a record that already exists.

1. Choose User from the Use menu.

4th Dimension lists the employee records in the output layout.

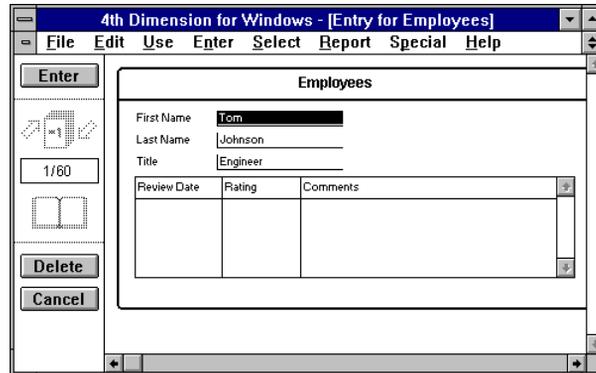
2. Make the new layout, Subfile, the current input layout.

You change the current layout by choosing it from the List of Files window. To display the List of Files window, press Ctrl+Space bar.

3. Select the first record in the list of records.

4. Choose Modify Record from the Enter menu.

4th Dimension displays the record, including the added subfile display area.



As you can see, the subfile display area uses a multi-line layout pattern.

5. Double-click anywhere within the subfile area.

4th Dimension displays the full-page layout for the Review Info file. This is what was meant by the Review Input layout “waiting behind” the subfile area.

6. Enter the following information for this employee:

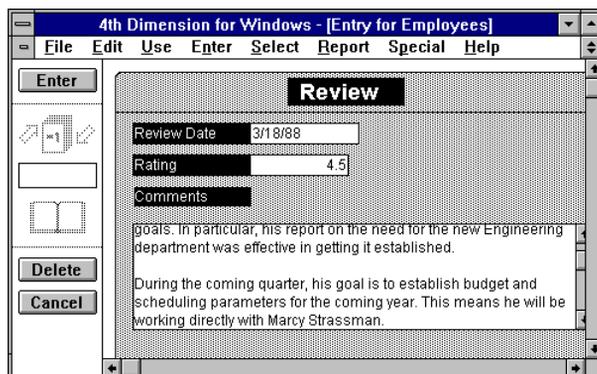
Review date: “3/18/88”

Rating: “4.5”

Comments: “Tom has had a very successful quarter, meeting all his stated goals. In particular, his report on the need for the new Engineering department was effective in getting it established.

During the coming quarter, his goal is to establish budget and scheduling parameters for the coming year. This means he will be working directly with Marcy Strassman.”

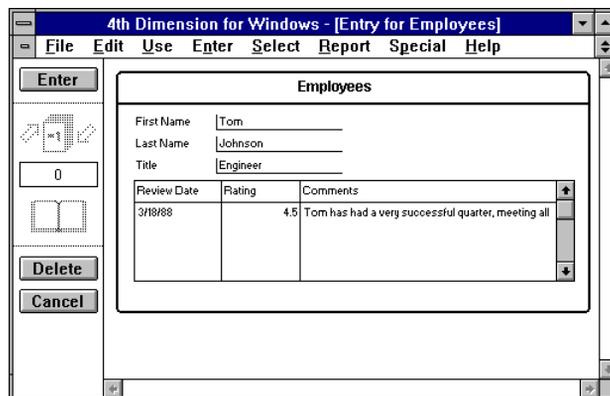
Notice that the text area for comments works like a text processor. The words wrap from line to line within the borders of the field area.



7. Click the Enter button.

4th Dimension displays a blank input layout for the subfile. Click the **Cancel** button to return to the parent record.

Although you can see only a few lines of the text you have entered, the text area contains all the words.



After you enter additional subrecords, you can move any of them into view with the scroll bar on the right of the subrecord display area.

8. Click the Enter button to return to the output layout.

THE NEXT STEP

You have seen how to create a subfile in which you can store many pieces of information about an employee. The subfile can accommodate any number of subrecords.

All of these reviews can be viewed on an employee's record in an included layout area. In addition, information about an employee's review can be entered directly into the Subfile layout using the included layout.

Database: PEOPLE11

Estimated time to complete: 10 minutes

In this chapter you will learn how to use 4th Dimension's Search editor to search for a group of records based on a set of search conditions.

In the *4th Dimension Quick Start* you used the **Search by Layout** menu command to search for a specific record. When your search conditions are more complex, you use the Search editor. You would use the Search editor, for example, if you wanted to find all the records whose entry date field contains values between two dates.

In this chapter you will learn how to:

- Enter search conditions in the Search editor,
- Create complex search conditions,
- Search on a field in a related file.

USING SEARCH CONDITIONS

You often need to isolate a specific group of records to view them together, to update a field in each record in the group, to perform a calculation, or to print a report based on that subset of records. The subset of records isolated by searching is called the *selection*.

A search is based on *search conditions*, instructions to 4th Dimension that identify the basis on which the records are included or excluded from the selection. The current selection is made up of records that meet the search conditions.

Suppose you want to see all the records for employees with salaries greater than \$30,000. The condition you would enter to isolate those records is "Salary greater than 30000."

This simple example illustrates both the nature of a search condition and the ease with which you can write search conditions in 4th Dimension. Using this search condition, 4th Dimension tests the condition against the value in the Salary field for each record. If the condition is true (the salary is greater than 30000), the record is included in the selection. If the condition is false (the salary is 30000 or less), the record is excluded from the selection.

A search condition always has three elements in this order: *field name*, *operator*, and *value*. The field name is from the current file or from a related file. The operator is a comparison, such as equal to, greater than, less than, and so on. The value is the value to which each record is compared. In the Search editor, the search condition is displayed in the text area so that you can easily view and edit it as necessary.

You can save search conditions or load conditions you have previously saved. If you need to perform the same search on a regular basis, 4th Dimension allows you to enter the search conditions once, save them, and then have them available whenever you need them.

4th Dimension searches indexed fields more rapidly than non-indexed fields because it can use the index tables specially created for the fields to quickly find any matching records.

USING THE SEARCH EDITOR

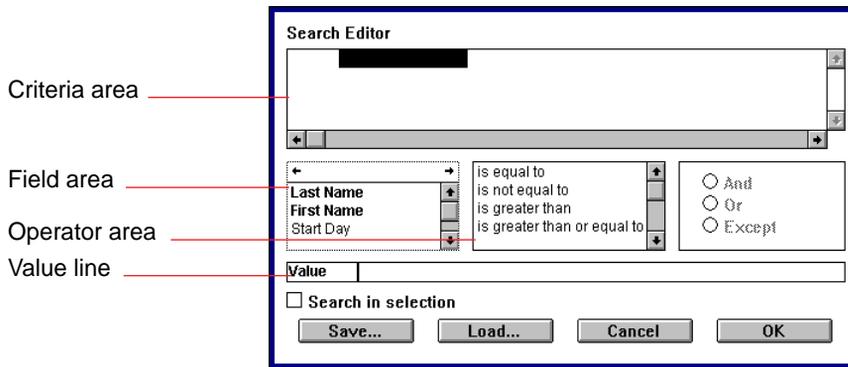
Suppose you want to see all records of people earning more than \$30,000 a year. You can create a selection of just these records using the Search editor.

1. If you have not done so already, start 4th Dimension and open the PEOPLE11 database.

PEOPLE11 opens in the User environment.

2. Choose Search Editor from the Select menu.

4th Dimension displays the Search editor in which you enter the condition you want to use to search.



3. Click Salary in the Field area.

4th Dimension enters the field name in the Criteria area.

4. Click “is greater than” in the Operator area.

5. Type “30000” in the Value line at the bottom of the dialog box.

This completes your search condition.

6. Click OK.

4th Dimension performs the search based on the condition you have entered. The records of all employees earning more than \$30,000 are displayed on the screen.

7. To see all the records in the file again, choose Show All from the Select menu.

Using a Condition with And

You use the *And* conjunction to join two search conditions. The *And* conjunction restricts the search to fewer records than either condition alone. In order to meet the compound condition, a record must satisfy both conditions.

Suppose, to take a simple example, you want to view the record for Mary Smith. You can use *And* to create a compound search condition for this task. You want to see the record that has *Smith* in the Last Name field *And* that has *Mary* in the First Name field. The record selected must meet both conditions, not just one.

1. Choose Search Editor from the Select menu.

4th Dimension displays the Search editor. The previous search condition is still displayed in the editor text area.

2. Choose Clear from the Edit menu to erase the previous search condition.

3. Click Last Name.

4th Dimension enters the field name in the Criteria area.

4. Click “Is Equal To” in the Operator area.

5. Type “Smith”.

The first search condition is complete. So far your condition states that you want to see records that have a last name of Smith. You now need to enter the conjunction and add the second condition.

6. Click the And button.

This step prepares the editor to receive the second condition.

7. Click First Name, then click Is Equal To, and then type “Mary”.

Both conditions are complete.

The screenshot shows the 'Search Editor' dialog box. At the top, there is a text area containing the search criteria: 'Last Name is equal to Smith' followed by 'And First Name is equal to Mary'. Below this is a list of field names: 'Last Name', 'First Name', and 'Start Day'. To the right of the list is a list of operators: 'is equal to', 'is not equal to', 'is greater than', and 'is greater than or equal to'. Further right are three radio buttons labeled 'And', 'Or', and 'Except'. Below the list is a 'Value' field containing the text 'Mary'. At the bottom, there is a checkbox labeled 'Search in selection' and four buttons: 'Save...', 'Load...', 'Cancel', and 'OK'.

8. Click OK.

4th Dimension performs the search based on the conditions you have entered. The record you want is displayed on the screen.

Using a Condition with Or

You use the *Or* conjunction to join two search conditions. The *Or* conjunction expands the search to more records than either condition alone. In order to meet the compound condition, a record can satisfy either condition.

Suppose, for example, you want to see the records for several employees who have recently received social service awards of various kinds. You can join them into one compound search condition with *Or*.

Your conditions will state that you want to see records that have a Last Name entry of *Davis*, or *Wilson*, or *Tracy*, or *Arnold*, or *Martin*. In ordinary English you might say, "I want to see the records for Davis, and Wilson, and Tracy, and Arnold, and Martin." However, you are writing logical conditions. Clearly no record contains Davis, Wilson, Tracy, Arnold, *and* Martin. Each record has just one of these last names. In this case, you need *Or* to expand the number of records that meet the condition.

1. Choose Search Editor... from the Select menu.

4th Dimension displays the Search editor again.

2. Choose Clear from the Edit menu to remove your previous search conditions.

4th Dimension clears the Search editor.

3. Click Last Name, click Is Equal To, and then type "Davis".

4. Click the Or button.

5. Enter the condition "Last Name is equal to Wilson" and click the Or button again.

6. Continue using the Or condition for the remaining last names:

"Tracy"

"Arnold"

"Martin"

You have entered a five-part search condition joined with *Or*. A record can meet any of these conditions and be included in the selection. The

principle at work here is that using *Or* expands the number of records in the selection.

Search Editor

Or	Last Name	is equal to	Wilson
Or	Last Name	is equal to	Tracy
Or	Last Name	is equal to	Arnold
Or	Last Name	is equal to	Martin

← →

← →	is equal to	↑ ↓	<input type="radio"/> And <input type="radio"/> Or <input type="radio"/> Except
Last Name	is not equal to	↑ ↓	
First Name	is greater than	↑ ↓	
Start Day	is greater than or equal to	↑ ↓	

Value Martin

Search in selection

Save... Load... Cancel OK

7. Click OK.

4th Dimension performs the search and displays the selection of records on the screen. Notice that the search was of the entire file, not of just the selection created by the previous search. 4th Dimension assumes you want to search the entire database. To search just the current selection, you would select the **Search in Selection** check box before you click the **OK** button.

*NOTE: If you need to use a Search condition again, you can save the condition to a disk file by clicking the **Save** button. When you need to reuse the search condition, open the Search editor and click the **Load** button instead of entering the search condition manually.*

SEARCHING ON A FIELD IN A RELATED FILE

The [Employees] file is related to the [Departments] file. As you saw in Chapter 8, this means that every employee record has one corresponding department record. The relation allows you to perform searches of the employee records based on entries in the [Departments] file.

In this section you will perform two searches, the first on the department code and the second on the department managers name.

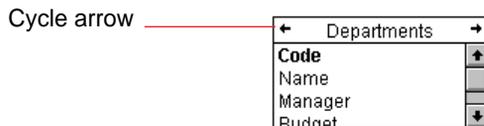
1. Choose Search Editor... from the Select menu.

4th Dimension displays the Search editor again. Your previous search condition remains in the Search editor.

2. Choose Clear from the Edit menu.

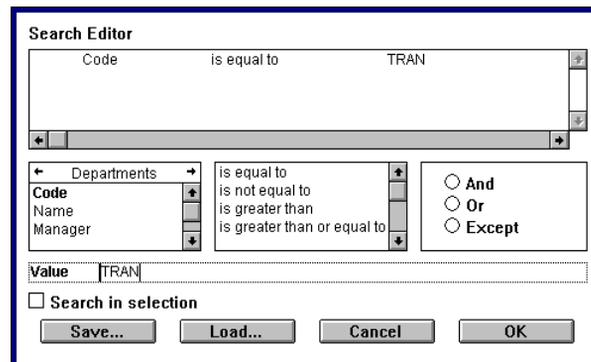
4th Dimension clears the Search editor.

3. Click either of the cycle arrows at the top of the list of fields until the [Departments] file is displayed.



NOTE: You can also change to the [Departments] file by pressing and holding down the mouse button between the cycle arrows. A drop-down menu of filenames appears, allowing you to choose the file to which you want to change.

4. Enter the search condition “Code is equal to ‘TRAN’”.



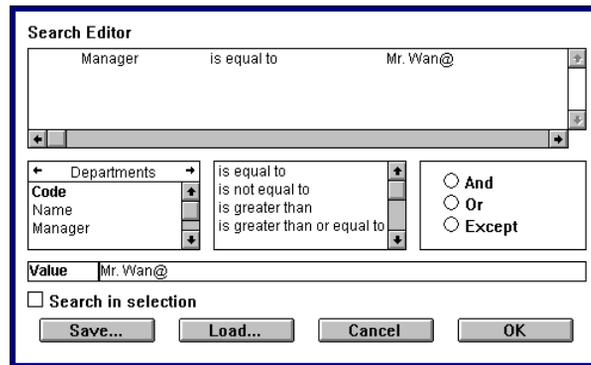
5. Click OK.

4th Dimension searches for the records in the [Employees] file that are related to the [Departments] record with TRAN in the Code field and displays them.

You have searched on the department code to isolate all the records for members of the Transportation department. Suppose, however, you want to see the employees reporting to Mr. Wanamaker, but you do not know his department code. You can search on another field from the related file, not just the related field.

6. Open the Search Editor, clear it, and enter the search condition “Manager is equal to ‘Mr. Wan@’”.

You have used the “@” wildcard character so that you do not have to spell out the whole name.



7. Click OK.

4th Dimension searches for the records in the [Employees] file that are related to the [Departments] record with Mr. Wanamaker in the Manager field and displays them. These are all the employees who report to Mr. Wanamaker.

THE NEXT STEP

The Search editor is designed to perform any kind of search, from simple searches to the kind of compound searches that are covered in this chapter to even more complex combinations of Or, And, and Except. Using the Search editor, you can create a search based on fields in the current file and on fields in any related files.

As you can see from the **Select** menu, using the Search editor is just one of four ways to search for records in a database.

Select	
Show All	Ctrl+G
Show Subset	Ctrl+H
Search Editor...	Ctrl+S
Search by Layout...	Ctrl+L
Search and Modify...	
Search by Formula...	
Sort Selection...	Ctrl+T

4th Dimension provides the Search by Layout editor which you used to perform a simple search for a record in the *Quick Start* manual. You can perform a more complex search in the Search by Layout editor by entering values in more than one field to generate a compound search. In addition, you can use special symbols such as "<" (the less than symbol) that allow you to qualify your search.

You use the Search and Modify editor to search for a specific record that you want to modify. When the record you are searching for is found, 4th Dimension opens the record in the input layout to allow you to make any necessary modifications.

4th Dimension also provides the Search by Formula editor. This editor is designed for searches based on formulas created using 4th Dimension's built-in functions and commands. You would use Search by Formula to search on particular characters in a string (for example, the last seven characters of a Telephone number field) or on the results of arithmetic operations (for example, companies whose ratio of profits to sales is greater than a specified value).

For more information about the Search, Search by Layout, Search and Modify, and Search by Formula editors, refer to the *4th Dimension User Reference*.

Database: PEOPLE12

Estimated time to complete: 10 minutes

You often need various printed versions of the records in your database. You may need to print a list of names and phone numbers or create mailing labels. You might be called upon to prepare reports that present the information in several ways. With 4th Dimension, you have all the flexibility you need to perform these tasks.

In this chapter you will learn how to:

- Create a quick report that includes subtotals,
- Use fields from a related file in a report.

USING THE QUICK REPORT EDITOR

Reports allow you to communicate the information contained in records. 4th Dimension's Quick Report editor allows you to print all the information, some of it, or just summaries of it (total sales for October, for example). You can design and save reports that you use again and again or you can quickly design a special report that you use only one time.

Using the Quick Report editor, you can design and print tabular reports quickly. You can choose the fields you want to print, arrange them in any order, calculate totals and subtotals, and print additional text. Here is a typical report:

Header row		
Name	Last Name	Salary
Accounting	Baldwin	\$43,990
	Johnson	\$18,250
	Subtotal for Accounting:	
Administration	Hanson	\$40,520
	Pfaff	\$26,440
	Smith	\$26,500
	Terry	\$16,190
	Wilson	\$36,500
Subtotal for Administration:		\$146,150
Art	Forbes	\$18,840
	Tompkins	\$19,770
	Venable	\$43,520
	Voltz	\$25,150
	Subtotal for Art:	
Grand Total:		\$315,670

Detail rows contain information drawn from fields

Totals row

This report was created by the following *report design*. The report design is the set of instructions that tells 4th Dimension what to print.

Quick Report Editor Report with frame

	Name	Last Name	Salary	
H	Name	Last Name	Salary	
D			\$###,###	
B1	Subtotal for #:		Σ Sum	
I	Grand Total:		Σ Sum	

Sort

Name ↑

Last Name ↑

<<Add Sort>>

Sum Average Min
 Max Count
 Auto column width Repeated values

Header row

Break row

Detail row

Totals row

By comparing the report design with the final printed output, you can see that the Header row is shown at the top of the design and that it is printed at the top of the columns of field information. The Detail and Break rows appear in the middle of the design and affect the middle of the printed report. The Totals row is shown at the bottom of the design and is printed at the bottom.

DETAILS AND BREAKS

When your report is printed, 4th Dimension looks through the records in the current selection one at a time. The sort order determines the order in which the records appear in the report and how records are divided into groups.

The report design in this chapter sorts the records by Department. 4th Dimension looks at all the records for one department, then at all the records for the next department, and so on. This sort order allows 4th Dimension to calculate a subtotal for each department. If the records were sorted by job title, 4th Dimension could calculate a subtotal for each job title.

Whenever the value in the sort field changes, a *break* is generated. The word break comes from the idea of interrupting. When 4th Dimension comes to the end of the records for the Art department, a break occurs (an interruption in the sequence of Department entries). Before 4th Dimension prints the first record in the next department, it performs whatever calculations you have instructed it to do.

Records can be sorted into many levels. If you sort the records by department and then by job title, you can create a break whenever the job title value changes as well as when the department value changes. You could therefore calculate additional subtotals for job titles within the department.

You must have at least as many sort levels as break levels. But you do not have to create a break level for every sort level. In the example in this chapter, there are two sort fields—Department Name and Last Name—but only one break level. The break level corresponds to the first sort field, Department Name. Therefore, records are broken up into groups using the Department Name field, but not the Last Name field. The Last Name field is used to sort records so that within each department the employees appear in alphabetical order.

CREATING A QUICK REPORT

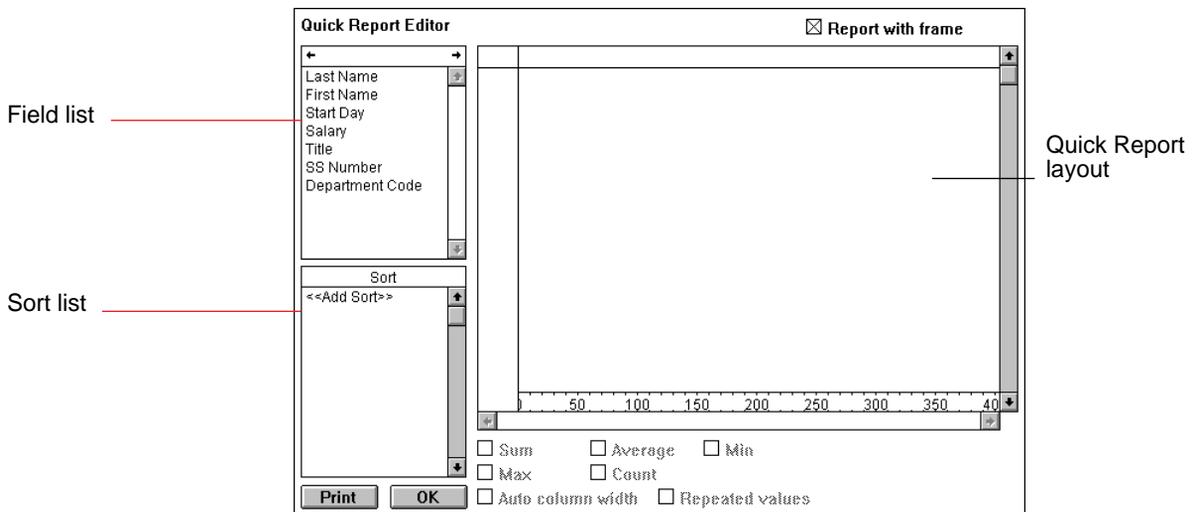
For this quick report, you will create a list of employees and their salaries, grouped by department. You plan to calculate the total salaries for all employees as well as subtotals for each department.

1. If you have not done so already, start 4th Dimension and open the PEOPLE12 database.

PEOPLE12 opens in the User environment.

2. Choose Quick from the Report menu.

4th Dimension displays the Quick Report editor.



In the next steps you will drag the fields from the field list into the Quick Report layout. Since the first field you want (Name) is in another file, use the cycle arrows at the top of the list to display the [Departments] file.

3. Click the right cycle arrow until the [Departments] filename is displayed in the box.

The [Departments] file fields are displayed in the Field list.

4. Drag the Name field from the Field list into the Quick Report layout area.

When you release the mouse button, 4th Dimension creates a column for department names.

5. Click the left cycle arrow once to return to the [Employees] file fields.
6. Drag the Last Name field from the Field list and place it to the right of the Name column in the Quick Report layout.

4th Dimension creates a column for employees' last names.

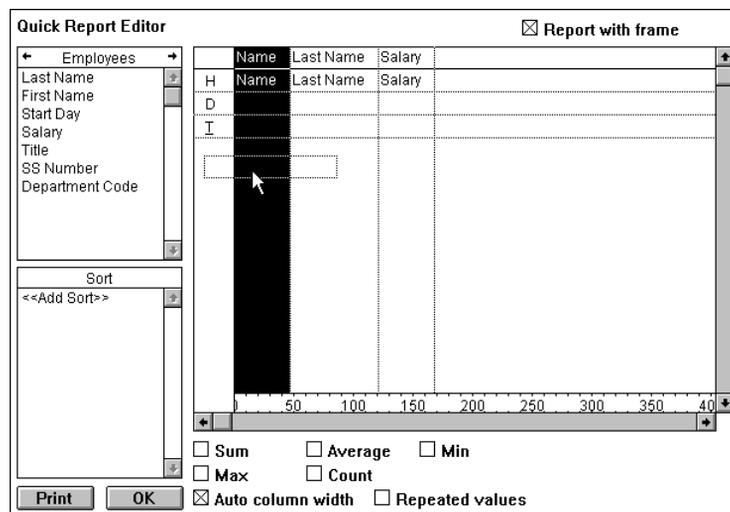
7. Drag the Salary field from the field list and place it to right of the Last Name column in the Quick Report layout area.

4th Dimension creates a column for employees' salaries.

You now need to establish the sort order, both to determine the order in which the records will be printed and to allow you to create a break row. You will use Name and Last Name for your sort fields.

1. Drag the <<Add Sort>> phrase from the Sort list onto the Name column in the Quick Report layout area.

4th Dimension adds the Name field to the Sort list.



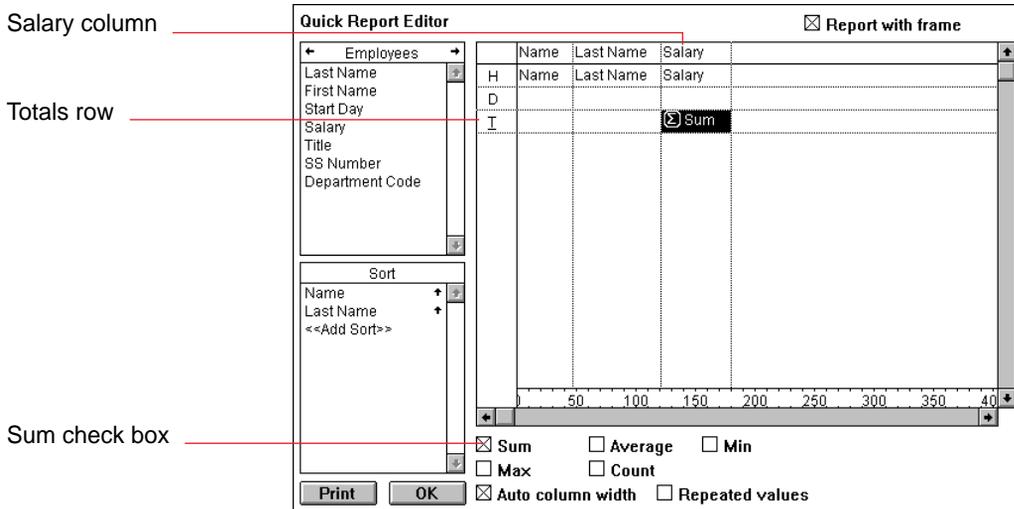
2. Drag the <<Add Sort>> phrase from the Sort list onto the Last Name column.

You have created a two-level sort. The primary sort field is the department name. Within each department the records are sorted by the employees' last names.

You want to have 4th Dimension calculate a total for salaries. You do this the same way as you did in the *4th Dimension Quick Start*.

1. In the Salary column, select the cell intersected by the Totals row and click the Sum check box.

4th Dimension adds a sum symbol (Σ) to the selected cell, instructing the program to calculate the total of all the salaries when the report is printed. The total will be printed in the Salary column.



2. Select the cell to the left of the calculated cell you just created, click again to create an insertion point, and type “Grand Total:”.

3. Choose Left from the Style menu.

Edit	
Undo	Ctrl+Z
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Clear	
Insert Column	Ctrl+I
Insert Break	Ctrl+B
Delete Column	
Delete Break	
Hide Line	Ctrl+H

You can now create a Break row so that you can instruct 4th Dimension to calculate a subtotal.

1. Select the Totals row by clicking on the “T” or by clicking in the Totals row to the right of the fields.

2. Choose Insert Break from the Edit menu.

4th Dimension creates a Break row just above the Totals row and adds a sum symbol to the Salary cell in the Break row. This action instructs the program to calculate the subtotal (all the salaries in the preceding department) when the report is printed. The same symbol is used for both summing operations (total and subtotal). The difference between the instructions depends on the row in which the Sum instruction is placed: placed in a Totals row, the Sum calculates over the entire report (totaling salaries for every record in the selection); placed in a Break row, the Sum

calculates over only the records printed since the previous break (totaling salaries for records in each department).

You can now add some additional text next to the subtotal. Placing the text in the Break row ensures that it will be printed each time the subtotal is calculated.

3. Select the cell to the left of the subtotal cell you just created, click again to create an insertion point, and replace the existing text with “Subtotal for: #”.

The number sign, #, tells 4th Dimension to substitute the name of the department whose sum is being printed. For example, when 4th Dimension prints the subtotal for the Engineering department, the label will read, “Subtotal for Department: Engineering.”

4. Choose Right from the Style menu.

The subtotal text is aligned right.

5. Click in the Detail cell in the Salary column, click again to create an insertion point, and type the format: “\$#,###,###”.

This tells 4th Dimension how to format the employees’ salaries. This format will also be applied to the subtotals and the grand total.

6. Click in the Totals cell in the Last Name column, click again to create an insertion point, and type “Grand Total:”.

Here is your final report design:

Display format added to Detail line

Quick Report Editor Report with frame

	Name	Last Name	Salary
H	Name	Last Name	Salary
D			\$#,###,###
B1		Subtotal for #:	Sum
T		Grand Total:	Sum

Sum Average Min
 Max Count
 Auto column width Repeated values

You are now ready to print your report.

1. Choose Print... from the File menu.

2. Select the Preview on Screen check box and click the Print button.

4th Dimension previews the report on the screen. You can click the **Zoom** button to examine the report more closely.

Name	Last Name	Salary
Accounting	Baldwin	\$43,990
	Johnson	\$19,250
	Subtotal for Accounting:	\$62,240
Administration	Hanson	\$40,520
	Praff	\$26,440
	Smith	\$26,500
	Terry	\$16,190
	Wilson	\$36,500
	Subtotal for Administration:	\$146,150
Art	Forbes	\$18,840
	Tompkins	\$19,770
	Venable	\$43,520
	Voltz	\$25,150
	Subtotal for Art:	\$107,280
Design	Doyen	\$43,210

3. When you are finished examining the report, click the Stop Printing button and then click OK to quit.

You have created a useful report in just a few minutes. If you wanted to print such a report each month or each quarter, you could save this report and reuse it. To do so, you would simply load the report design and print it again. The printed output would reflect any changes you had made to the database in the meantime.

THE NEXT STEP

The Quick Report editor can also print text at the top and bottom of each page, provide automatic page numbers, and apply any font, size, and style to text on the report. For complete information about using the Quick Report editor, refer to the *4th Dimension User Reference*.

The Quick Report editor is one of 4th Dimension's two major report methods. You can also design a report using the Layout editor. The Quick Report editor can handle many of your reporting needs, but not all of them. In Chapter 13, you will design a more complex report using the Layout editor.

Database: PEOPLE13

Estimated time to complete: 45 minutes

One of the major functions of a database is to produce reports. In Chapter 12 you used the Quick Report editor to create a report. In this chapter you will use the Layout editor to create a custom report.

There are several advantages to using a layout for a report: you can use graphic elements on the layout, control the placement of report elements precisely, use scripts to perform calculations, and use headers at each break. The advantage of the Quick Report editor is that you can use it to quickly create standard reports.

You will next create a report that shows the employees, their salaries, and the total salaries for each department. This report is similar to the quick report you produced in the previous chapter. Using the Layout editor, you will create separate header areas for each department.

In this chapter you will learn how to:

- Create a report layout including header, footer, break header, detail, and break areas,
- Print the time, date, and page number,
- Create scripts that calculate subtotals and totals.

REPORT LAYOUTS

Here is an example of a report produced from a layout:

Header area

Break Header area

Detail area

Break area

Consumer Products Employees		
Date: 03/03/95	Time: 3:26 PM	
Accounting		
Name	Title	Salary
Baldwin, Steve	Supervisor	\$43,990
Johnson, John	Clerk	\$18,250
Total Salaries for Accounting		\$62,240
Administration		
Name	Title	Salary
Hanson, Dennis	Manager	\$40,520
Pfaff, Bryan	Secretary	\$26,440
Smith, Mary	Engineer	\$26,500
Terry, Don	Clerk	\$16,190
Wilson, Marlys	Supervisor	\$36,500
Total Salaries for Administration		\$146,150
Art		
Name	Title	Salary
Forbes, Kathy	Secretary	\$18,840
Tompkins, Andy	Technician	\$19,770
Venable, Andy	Engineer	\$43,520
Voltz, Scott	Technician	\$25,150
Total Salaries for Art		\$107,280
Design		
Name	Title	Salary
Doyen, Barbara	Designer	\$43,210
Eubanks, Jeff	Secretary	\$29,310
Grambo, Susan	Designer	\$36,300
Johnson, Tom	Engineer	\$26,500
Krause, Mike	Designer	\$33,340

The report lists the salaries of the employees in each department. The departments are listed alphabetically and the employees within each department are listed alphabetically by last name.

The report contains the following areas:

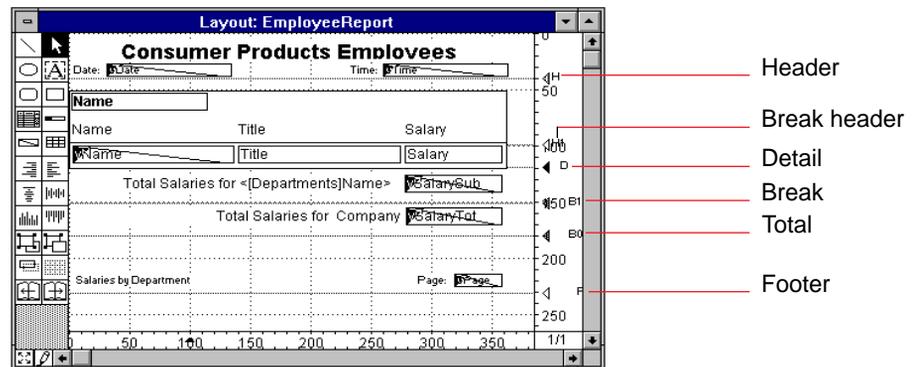
- **Header area:** This area contains the title of the report (“Consumer Products Employees”) and includes date and time stamps.
- **Break Header areas:** These areas contain the department names and provide headings for the column listings.
- **Detail areas:** These areas contain information about each employee appearing in the report.
- **Break areas:** These areas report the subtotal for each department.

The following areas appear on the last page of the report:

- **Totals area:** This area reports the grand total for all departments at the end of the report.
- **Footer area:** This area contains the footer that appears on each page of the report.

Notice that the Break Header, Detail, and Break areas repeat for each department in the report. The Department field is called the break field because it causes a new section of the report to be generated when its value changes (from “Accounting” to “Administration”).

Here is the output layout for this report:



The areas of the report—the Header, Break Header, Detail, Break, and Footer—are controlled by the report control lines on the layout. The report control lines are in the ruler on the right.

You are familiar with these terms already:

- **Header (H):** The header is printed at the top of each page.
- **Break Header (H1):** A break header contains material that is printed once at the beginning of each break. This type of header is useful to label information at each major division of a report.
- **Detail (D):** The detail area usually contains data that comes directly from each record. Whatever appears in the detail area on the report layout is printed once for each record.
- **Break (B1):** A break area contains subtotals and other calculations performed during a break in the Sort field. You can specify what calculations you want performed and any additional text you want printed whenever a break occurs.

■ **Total (B0):** The total area usually contains subtotals and other calculations performed on all the records in the report. You can specify what calculations you want performed and any additional text you want printed.

■ **Footer:** The footer is printed at the bottom of each page.

The report control lines define areas on the layout. The elements you place in each of these areas—fields, text, and variables—are printed at the appropriate places in the report. You can use scripts to perform any necessary calculations.

*NOTE: The layout rulers are marked in pixels, which are the smallest dots your screen can display. The rulers can be changed to inches or centimeters by choosing **Rule Units** from the **Layout** menu.*

WORKING WITH REPORT CONTROL LINES

In Chapter 1 you created an output layout to display your records on the screen. This time, you will create an output layout designed for printing.

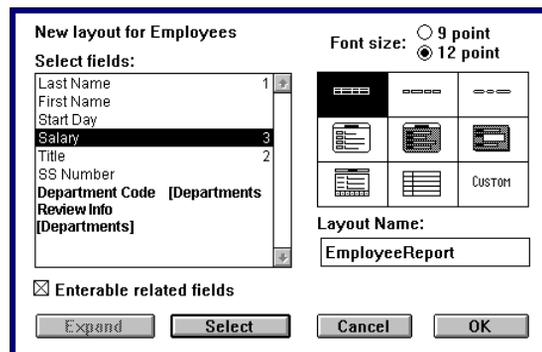
1. If you have not done so already, start 4th Dimension and open the PEOPLE13 database.

PEOPLE13 opens in the User environment.

2. Choose Design from the Use menu.

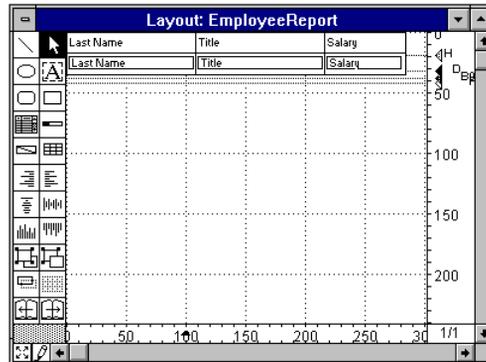
3. Create a new output layout for the [Employees] file named EmployeeReport.

Include these fields in this order: Last Name, Title, and Salary. Use the layout template in the upper-left corner of the pattern choices. Make sure your New Layout dialog box looks like this:



4. Click OK.

The layout is displayed in the Layout editor.



5. Expand the window either by clicking the maximize button or by dragging the window.

6. To prepare to add elements to the report, drag the Footer line down to 230 and the Break line down to 150.

To move the line, drag the letter or the triangle of each line. A dotted line extends from each line across the layout to show the location of each area.

The Footer line, a triangle labeled F, shows the bottom of the Footer area. Anything you enter on the layout between the Footer line and the Break line will be printed at the bottom of each page of the report. You usually use footers for page numbers and running titles or comments.

The Break line, a triangle labeled B0, shows the bottom of the Break area. The Break area is equivalent to the Total (T) row in the Quick Report editor. B0 stands for the level zero break.

7. Hold down the Alt key and click the Break line.

The level one Break line, labeled B1, appears on top of B0.

8. Drag the B0 line down to 180.

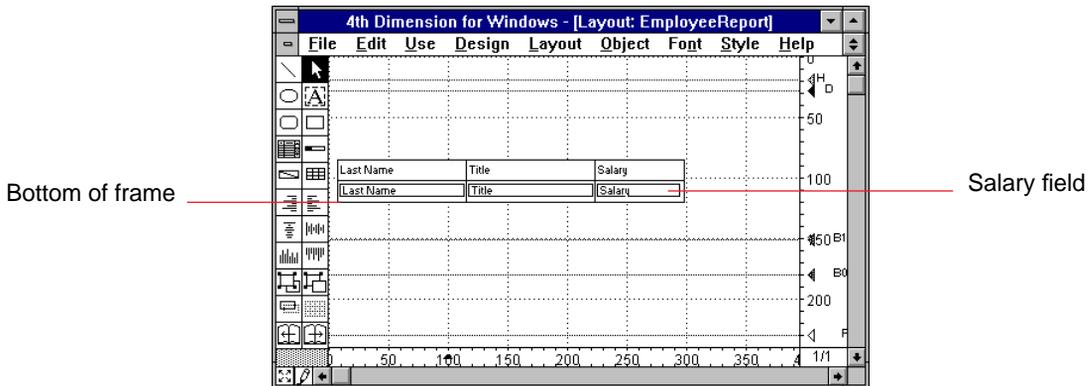
Anything you enter on the layout between the B1 Break line and the Detail line will be printed each time the value in the sort field changes. You will sort the records before printing to create the necessary Sort field break.

NOTE: If you inadvertently create an extra Break line (B2, B3, and so on), you can delete it by holding down the Ctrl key as you click the unwanted letter or triangle of the line.

9. Choose Select All from the Edit menu.

All of the elements are selected, allowing you to move them as a group.

10. Drag all the elements so that the bottom line of the frame is at about 120.



11. Deselect the elements by clicking on the layout.

12. Format the Salary field with the \$###,##0 format by double-clicking on the field and choosing the format from the Format drop-down list box.

13. Drag the Detail line down to just above the bottom line of the frame (just above 120).

The Detail line, a triangle labeled D, shows the bottom of the detail area. Anything you enter on the layout just above the Detail line will be printed once for each record in the selection you print. You use this area for data drawn directly from the records.

14. Drag the Header line until it is at 40.

The Header line, a triangle labeled H, shows the bottom of the header area. Anything you enter on the layout just above the Header line will be printed at the top of each page of the report. You usually use headers for the title of the report and date or time stamps.

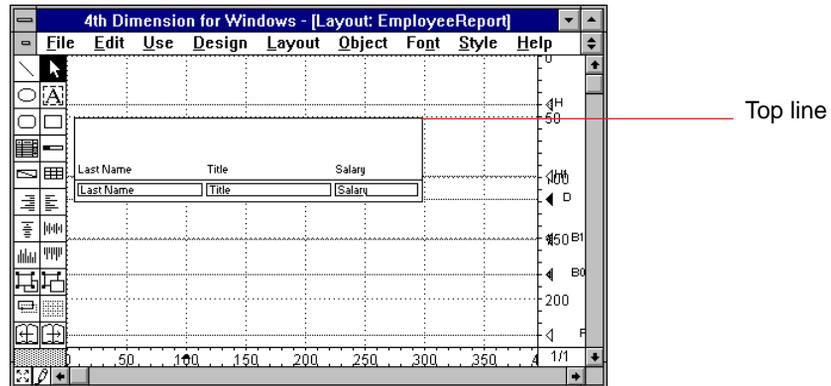
15. Hold down the Alt key and click the Header line.

The level one Break Header line, labeled H1, appears.

16. Drag the H1 line just below the middle line of the frame and above the fields (just above 100).

The Break Header line, labeled H1, is at the bottom of the break header area. Anything you enter between the Break Header and Header lines will be printed once above each group of records. You will use this area to label each group of records and the columns of the report.

17. Raise the top line of the layout box up to 50 and delete the two vertical bars inside the layout box that separate the fields.



18. Click the Add Field tool  and draw a rectangle in the upper-left corner of the layout box.

The Field Definition dialog box appears.

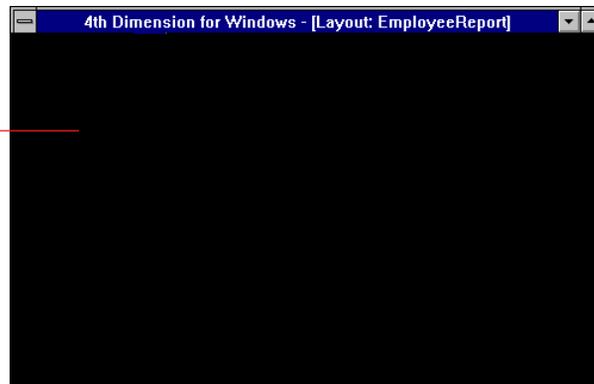
19. Select the Name field from the [Departments] file by double-clicking on the [Departments] file name and scrolling down the list of fields to Name.

When you click **OK**, your report layout reappears. The name field appears where you placed it on the layout.

20. Make the field 12-point and bold.

You have now defined areas on your layout for elements to be printed in the Header, Break Header, Detail, Break, and Footer areas of your report. Anything entered in these areas prints at the appropriate time.

[Departments]
Name field



WORKING WITH NON-ENTERABLE OBJECTS AND SCRIPTS

You worked with one type of active object in Chapter 2 when you added buttons to your layout. You will now use objects and scripts to perform tasks on this report layout.

1. Select the Last Name text area and change it to “Name”.

Use the Text Area tool  to select text within the text area.

2. Delete the Last Name field by selecting it and pressing the Backspace key.

3. Replace the Last Name field with an active object.

To add an active object, you click the Active Object icon  and draw a rectangle where you want to place the object. You will name the object and add other instructions in the Object Definition dialog box.

You selected the Last Name field for inclusion only so that the layout would provide room for this object. In its place, you are going to write a script for the object that joins each employee’s first and last names.

4. In the Object Definition dialog box, type “vName” for the name, select the Non-enterable object type, and deselect the Script Only if Modified check box.

Be certain to deselect the **Script Only if Modified** check box. **Script Only if Modified** applies only to an input layout. If you leave it selected, the script will not execute when the report is printed.

5. Click the Script button and select the Listing type for the procedure. Enter the following one-line procedure:

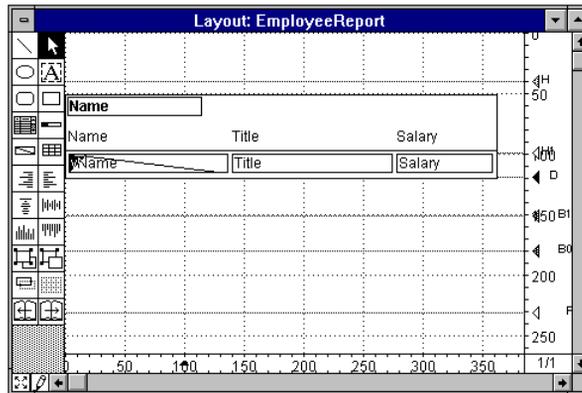
```
vName:=Last Name+", "+First Name
```

This script instructs 4th Dimension to print the value from the Last Name field, then a comma and a space, and then the value from the First Name field. This is better than using two fields on the layout because the comma and the first name come immediately after the last name. Two fields would leave extra spaces after most last names.

6. Double-click the Control-menu box to close the procedure.

7. Make vName 12-point.

The vName variable is in the Detail area of the report. It will be processed and printed once for each record you print. The script you have written will cause the report to include the last and first names for each employee.



Now you will work on the header of the report.

1. In the Header area above the column headings, create a large text area and enter a report title: “Consumer Products Employees”. Set the font and size of the title to Helvetica 18 and make it bold.

2. Create a text area and type “Date:”.

3. Create an active object, name it “vDate”, and make it a non-enterable object. Deselect the Script Only if Modified check box and select Short from the Format drop-down list box.

4. Click the Script button and enter the following script:

```
vDate:=Current date
```

This script instructs 4th Dimension to print the current date in the object.

5. Create a text area and type “Time:”.

6. Create an active object, name it “vTime”, and make it a Non-enterable object.

7. Deselect the Script Only if Modified check box and use the HH:MM AM/PM format.

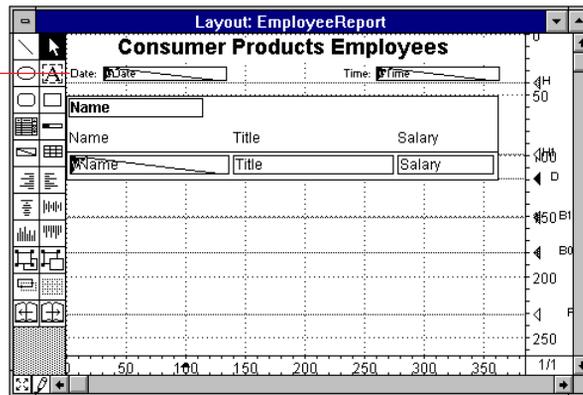
8. Click the Script button and enter the following script:

```
vTime:=Current time
```

This script instructs 4th Dimension to print the current time in the object.

Your layout should now look like this:

Elements added in the Header area



Next, you will create the break area of the report, where the salaries are subtotaled.

1. In the B1 Break area (between the Detail line and the B1 Break line), create an active object for the salary subtotal.
2. Make the object the same size as the Salary field above it and name the object "vSalarySub".

See the figure on the next page for placement.

3. Make vSalarySub a non-enterable object, deselect the Script Only if Modified check box, and enter "\$#,###,###" as the numeric display format.
4. Click the Script button and enter the following script:

```
vSalarySub:=Subtotal(Salary)
```

The Subtotal function instructs 4th Dimension to calculate the total for the current break. Because the object is located in the B1 Break area, Subtotal will calculate a subtotal for each department.

The portion of the script in parentheses is called the argument for the Subtotal function. It instructs 4th Dimension to use the Salary field for the subtotals.

The Subtotal function is necessary for creating a report with an output layout. In order to generate a layout report with breaks (i.e., to print break headers, the records under each break header, and the elements in the break areas), you must activate break processing somewhere in your layout.

Placing the Subtotal function somewhere in your output layout is the simplest method of activating break processing. For complete

information about activating break processing, refer to the *4th Dimension Language Reference*.

5. Make vSalarySub 12-point.

6. Create a text area to the left of vSalarySub.

An insertion point appears in the text area.

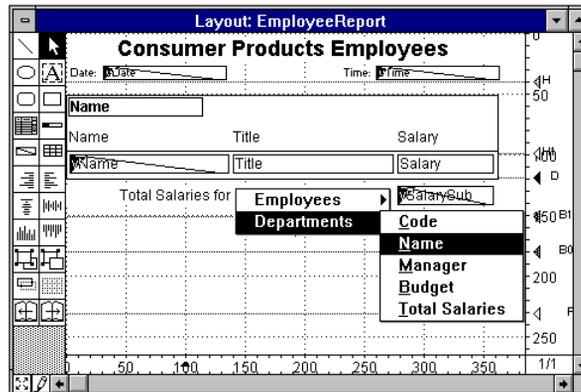
7. Type the following label: “Total Salaries for”.

Be sure to press the Space bar after typing the label.

8. While holding down the Shift and the Alt keys, press and hold down the mouse button.

A drop-down menu appears.

9. Choose the Name field in the [Departments] file from the drop-down menu.

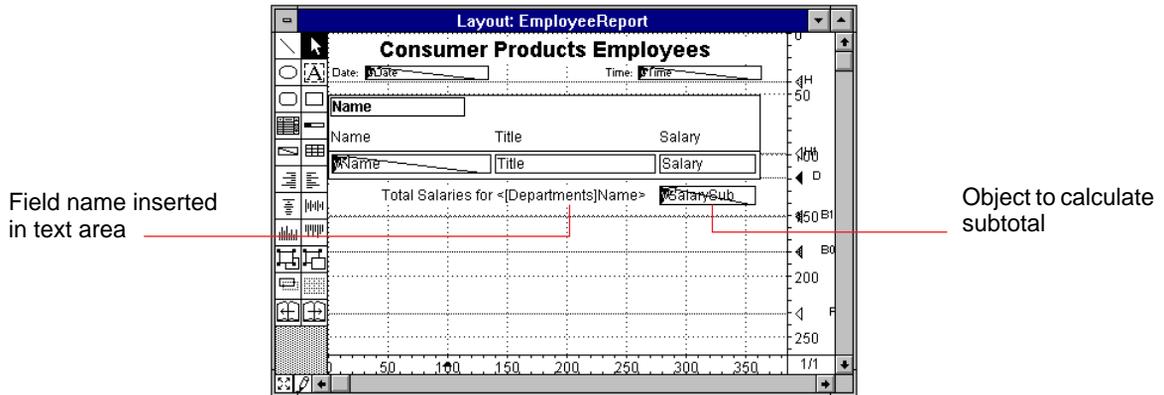


4th Dimension appends the Name field to the text. When you print the report, the name of the department is inserted where the <[Departments]Name> phrase appears in the output layout.

*NOTE: You can use this technique of embedding the values of fields in text areas in other kinds of reports. For example, you can create a mail-merge letter using one large text area. For more information, refer to the *4th Dimension Design Reference*.*

10. Choose 12-point and Right from the Style menu.

The text area should now look like this:



Next, you will create a place in the report to display the grand total of all the salaries.

1. Create an active object in the B0 Break area to calculate the total salaries.

The active object, named “vSalaryTot”, can be created by duplicating vSalarySub, and then editing the name and the script. The script to calculate the total is as follows:

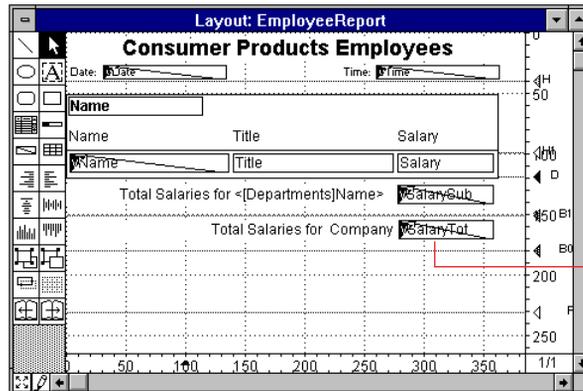
```
vSalaryTot:=Subtotal(Salary)
```

The Subtotal function instructs 4th Dimension to calculate the total for the current break. Because the object is located in the B0 Break area, the Subtotal will calculate the grand total for all records.

Before closing the Object Definition dialog box, be sure to deselect the Script Only if Modified check box and give vSalaryTot the display format “\$#,###,###”.

2. Create a text area to the left of vSalaryTot and type “Total Salaries for Company”.
3. Choose 12-point and Right from the Style menu.

The report layout should now look like this:



Object to calculate grand total

Finally, you will create a footer for the report that will be printed at the bottom of each page.

1. In the left side of the Footer area (between the B0 Break line and the Footer line), create a text area and enter a running title: “Salaries by Department”.

This running title will print at the bottom of each page of the report.

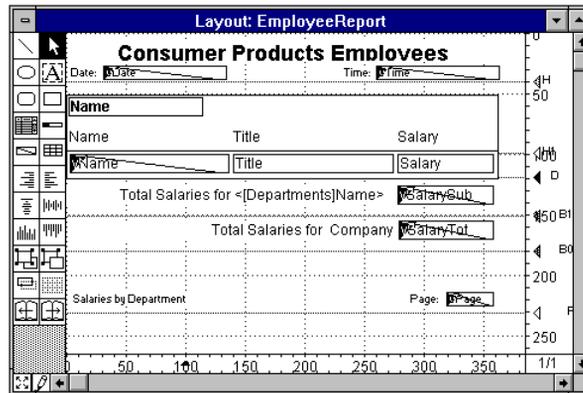
2. On the right side, create a text area and type: “Page:”.
3. Create a non-enterable active object to contain the page number. Name this object vPage and deselect the Script Only if Modified check box.

4. Click the Script button and enter the following script:

```
vPage:=Printing page
```

This script causes 4th Dimension to print the page number.

This figure shows the completed report layout. Make sure your layout looks similar to the layout shown here before you continue.

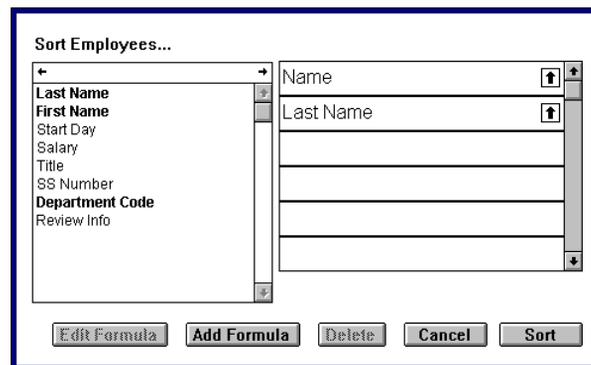


PRINTING THE REPORT

You have created the layout, objects, and scripts for your report. You can now see the result.

1. Choose User from the Use menu.
2. Choose Sort Selection from the Select menu and sort the records by [Departments] Name and [Employees] Last Name.

Use the cycle arrows to choose the [Departments] Name field.



You can sort the records in the [Employees] file by a field in the [Departments] file because the two files are related.

This sort order is required so that a break is generated after each department. Since you are using the Subtotal function to activate break

processing in your layout, 4th Dimension requires that you sort on at least one more sort level than break level. In this case, you are using two sort levels so that the names that appear within each department are in alphabetical order.

4th Dimension requires that you sort on at least one more sort level than break level in order to activate break processing using the Subtotal function.

For more information about the Subtotal function, refer to the *4th Dimension Language Reference*.

3. Click the Sort button.

You are now ready to print your report.

4. Choose Print... from the File menu.

The Print File dialog box appears. Here you choose which layout you want to use to print.

5. Select EmployeeReport, the layout you just designed, from the list of layouts.

6. Click OK.

Two printer instruction dialog boxes appear, one after the other. If you have a printer connected to your computer, you can print your report. Click the **Preview on Screen** check box on the second dialog box to send your report to the screen instead.

7. Click OK.

8. Click the Zoom button to see the report close up.

The screenshot shows a window titled "Printing Employees" with a subtitle "Consumer Products Employees". It displays a report with the following data:

Accounting		
Name	Title	Salary
Baldwin, Steve	Supervisor	\$43,990
Johnson, John	Clerk	\$18,250
Total Salaries for Accounting		\$62,240
Administration		
Name	Title	Salary
Hanson, Dennis	Manager	\$40,520
Pfaff, Bryan	Secretary	\$26,440
Smith, Mary	Engineer	\$26,500
Tracy, Dan	Clerk	\$16,100

You have created a working report. The scripts perform the necessary

calculations for subtotals and totals. They display the proper department name for each subtotal as well as the date, time, and page number of the report. You can view the third page of the report to see that the text for the grand total is also correct.

THE NEXT STEP

You have created a report layout and printed a report with it. The Layout editor gives you more power and flexibility in designing a report than the Quick Report editor, but it can take longer to design the customized report.

In the next chapter, you will learn how to further customize your database by adding custom menus that automate actions commonly performed by users. One of the menu commands you will create will allow users to generate the report you created in this chapter at any time, using current data from your files.

Database: PEOPLE14

Estimated time to complete: 15 minutes

You can create your own Windows applications, called **runtime applications**, using 4th Dimension. You can work with a runtime application in 4th Dimension's Runtime environment or use it as a stand-alone application that you run with a special Runtime version of 4th Dimension.

A runtime application uses many elements you are already familiar with such as fields, choice lists, objects, scripts, formats, procedures, and layouts. To create a runtime application, you combine these elements with custom menus.

In this chapter you will learn how to:

- Create custom menus,
- Add a unique graphic background to an application.

RUNTIME APPLICATIONS

A runtime application is an extension of a database. With a runtime application, you create the files, fields, and layouts you need. You then complete the application by adding customized menus and procedures that control the database. You use input layouts for the user to enter data, output layouts to display data, and reports for printing data.

Menu commands and procedures allow the user to perform the operations that you provide such as searching, sorting, and graphing. Your procedures can use the same editors used in the User environment. You can use the 4th Dimension Search and Sort editors, the Quick Report editor, the Graph editor, and the Label editor.

You can also create more functions than the User environment offers. For instance, you can add a special search dialog box that performs exactly the search you want with just a click of the mouse button.

You can make a simple program that accepts information and stores it in records. Or, you can make a multi-functional program that includes some of the features with which you have already worked: data validation, reports, sorting, searching, and so on. You can create an application that includes several different reports, the ability to add, modify, and delete information, and the option to send the output to desktop publishing programs.

If you have a multi-user setup (several PC clients connected to a 4th Dimension server), you can create a program that users in different departments each use with different access privileges. The manager of the Accounting department might be able to display information from any file in the database, while an order entry clerk might be able to see and use only one layout in a single file.

You can create programs that take advantage of the whole range of Windows interface features—windows, menus, custom dialog boxes, and so on.

Getting to the Menu Editor

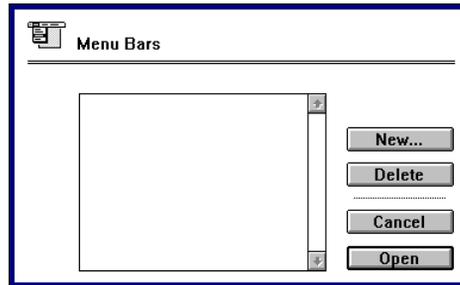
To create these menu titles and menu commands, you use 4th Dimension's Menu editor.

1. If you have not done so already, start 4th Dimension and open the PEOPLE14 database.

PEOPLE14 opens in the Design environment.

2. Choose Menu from the Design menu.

4th Dimension displays the Menu Bars dialog box.

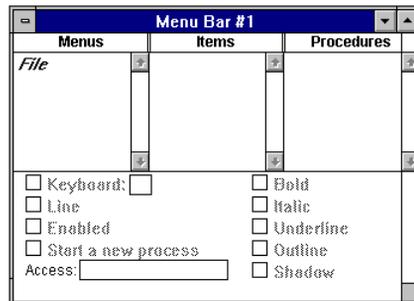


This dialog box will eventually list all the menu bars you create for this database. You can then select the one you want to modify. Because this is your first custom menu, the menu bar display area is blank.

3. Click the New button.

4th Dimension displays the Menu editor window, entitled Menu Bar #1. You cannot change this name.

On every menu bar, 4th Dimension automatically enters the **File** menu as the first menu. It contains one menu command, **Quit**.



Notice that the **File** menu appears in italics. The **File** menu is italicized because 4th Dimension retrieves the text for the menu title from a string resource. For the purposes of this tutorial, you do not need to know anything about string resources. The only thing you need to know is that when you select the **File** menu (as you will in the next step), the number of the string resource used for the menu (:79,1) appears in its place. For information about using string resources for menus and menu commands in your own databases, refer to the *4th Dimension Design Reference*.

4. Select the File menu title.

As you can see, the Menu editor displays the menu commands in the selected menu to the right of the menu title in the Items list. In this case, there is only one menu command, **Quit**, and there is no procedure. The absence of a procedure tells 4th Dimension to quit the application.

It is always a good idea to leave the **Quit** menu command on the **File** menu because that is where users expect it to appear.

5. Pull down the File menu on the far right side of the screen.



The menu preview shows the order and style of the menu commands on the selected menu. Later you will preview the menus you create.

Entering Menu Titles and Menu Commands

You create the menus you want by entering the menu titles in the Menus column in the order you want them to appear. You then enter the menu commands for each menu in the Items column. For each menu command (except **Quit**), you enter a procedure name in the Procedures column. If you do not enter a procedure name, 4th Dimension will automatically return to the User environment.

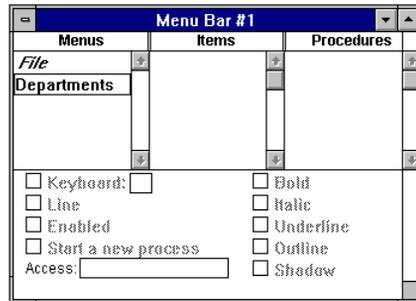
The menu titles you create appear across the top of the screen in your application. 4th Dimension automatically shows the **Edit** and **Help** menus.

1. Choose Append Menu from the Menu menu.

A blank box containing an insertion point appears in the Menus column.

2. Type “Departments”.

This is the first of your custom menu titles. You will enter the menu commands for this menu later.



3. Double-click in the Menus column just below the Departments menu title.

Double-clicking creates another menu title box, just as if you had chosen **Append Menu** again.

4. Type “Employees”.

5. Double-click below this menu title to create another blank menu title box.

6. Type “Reports” and this time press the Enter key.

Pressing Enter also creates another blank menu title box.

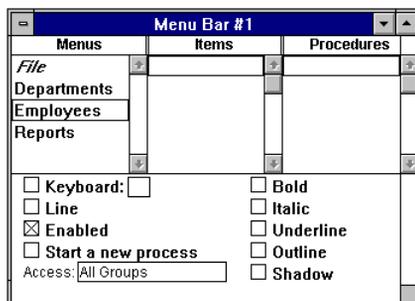
You have now finished entering your custom menu titles. You can go on to enter the menu commands for each title and the procedure name for each menu command.

7. Select the Employees menu title.

Use the scroll bar to move this menu title into view, if necessary, before selecting it.

8. Choose Append Item from the Menu menu.

A blank menu command box appears in the Items column and a blank procedure box appears in the Procedures column.



4th Dimension always adds both these boxes at the same time because each menu command must have a procedure entered in the Procedures column.

9. Type “Add Employee” in the menu command box and press the Enter key.

The insertion point moves to the procedure box.

10. Type “Add Empl” and press Enter.

Add Empl is the name you will give the procedure to add an employee record to the database.

Another menu command box and procedure box are added on the next line.

For each menu command, you type in the menu command as you want it to appear and then enter a procedure name. You can use any procedure name you want.

11. Complete the menu bar by adding the following menu commands and procedures.

You will use these menus and menu commands in the next chapter.

Menu	Menu Command	Procedure
Departments	Add Department	Add Dept
	Modify Department	Mod Dept
	Remove Department	Remove Dept
Employees	Add Employee	Add Empl
	Modify Employee	Mod Empl
	Remove Employee	Remove Empl

Menu	Menu Command	Procedure
Reports	Monthly	Monthly Rep
	Quarterly	Quarter Rep

When you have finished, the menus look like this:

Menu Bar #1		
Menus	Items	Procedures
<i>File</i>	Add Department	Add Dept
Departments	Modify Departme	Mod Dept
Employees	Remove Departm	Remove Dept
Reports		

Menus	Items	Procedures
<i>File</i>	Add Employee	Add Empl
Departments	Modify Employee	Mod Empl
Employees	Remove Employee	Remove Empl
Reports		

Menus	Items	Procedures
<i>File</i>	Monthly	Monthly Rep
Departments	Quarterly	Quarter Rep
Employees		
Reports		

Changing the Style and Adding a Shortcut

On the lower half of the Menu editor window are menu commands to change the look and function of a menu command. Users of this application will most often choose the **Add Employee** menu command. You can add a keystroke to activate the menu command as well.

1. **Select Add Employee.**
2. **Select the Keyboard check box.**

You want this menu command to be accessed by a keystroke as well as by choosing the menu command from the menu. You want the keystroke to be Ctrl+N.

3. **Select the Keyboard entry box and type "N".**

4th Dimension will automatically insert "Ctrl+".

4. Preview the menu display by pulling down the menu preview on the far right of the menu bar.



You have now made it possible to use the Ctrl+N keystroke combination to start the procedure that allows a user to add an employee record to the database.

Note that there are three additional check boxes on the bottom of the Menu editor, **Enabled**, **Line**, and **Start a New Process**. Menu commands are enabled by default when you enter them in the Items list. If you want to disable a menu command, select the menu command and deselect the **Enabled** check box. The menu command appears dimmed in the menu and remains disabled until you select **Enabled** again.

You can enter a line between menu commands by creating a blank box between the menu commands in the Item list and then clicking the **Line** check box. This feature allows you to effectively separate menu commands into groups of menu commands for the convenience of the user, as is done in the standard Windows **Edit** menu.

You use the last check box, **Start a New Process**, to tell 4th Dimension to start a new process when a menu command is chosen. By having menu commands execute within different processes, you can create a multi-tasking system within your database that allows you to perform multiple operations at the same time. In the next chapter, you will use this check box to enable you to display a selection of records and a graph at the same time.

The Access drop-down list box at the bottom of the Menu editor allows you to control which group of users can use a specific menu command. Creating access groups for a password access system is covered in Chapter 17.

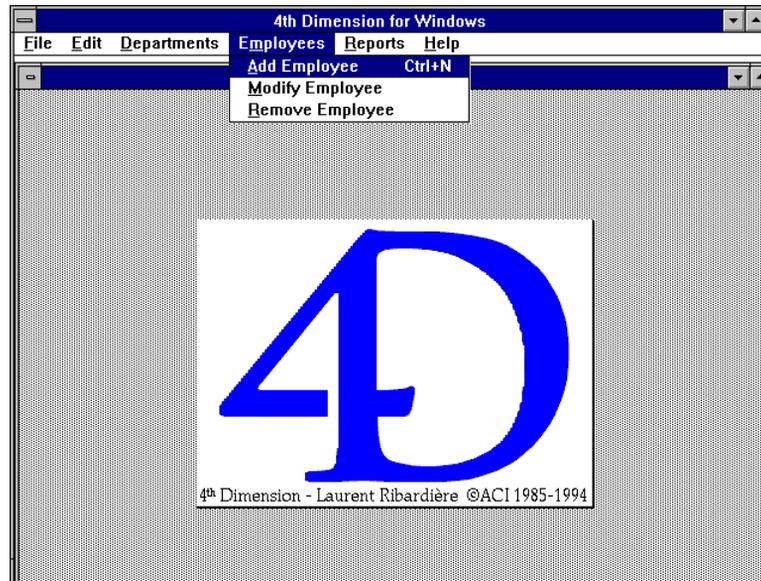
PREVIEWING THE MENUS AND ADDING A GRAPHIC

You use 4th Dimension's Menu editor to preview your menu bar and and to paste a picture to display with it.

1. Choose Show Custom Menus from the Menu menu.

4th Dimension displays the menu bar you have just designed.

2. Pull down the Employees menu that you have just created.



Choosing a menu command from this screen does not activate the menu command (and it wouldn't activate it even if you had already written the procedure). You must be in the Runtime environment to start a menu command from a custom menu.

If you have a picture in your Clipboard, you can paste it here. This picture will be displayed each time this menu bar is shown in the Runtime environment. You can use this feature of 4th Dimension to personalize your database applications with designs, patterns, and pictures that suit the company, person, or department that will be using the application.

3. Click anywhere in the screen below the menu bar to return to the Menu editor.

4. Double-click the Control-menu box to close the Menu editor and return to the Structure window.

THE NEXT STEP

In this chapter you have seen how to create and preview a set of custom menus and menu commands for use in the Runtime environment. Proceed to the next chapter to learn how to create the global procedures that are called by these menu commands.

It does not matter in what order you create the custom menus and the procedures they use. You can write the procedures first or create the menus first. In the case of the **Add Employee, Monthly**, and the other menu commands in this chapter, you created the menu commands before the procedures.

You now need to give the correct name to each procedure you create. If you wish, you can keep the Menu editor window open on the screen when you name the procedures in order to see which name you have used.

Database: PEOPLE15

Estimated time to complete: 25 minutes

If you want to use the Runtime environment or the Runtime version of 4th Dimension, you need to create custom menus to add and modify records, search, sort, print, and so on. To associate these operations with menu commands in your application, you attach global procedures that perform the actions when menu commands are chosen.

To write the procedures, you use the commands and functions in the 4th Dimension language. Perfectly suited for creating runtime applications, the language is both simple enough to allow you to easily perform basic database operations and comprehensive and flexible enough to allow you to control every aspect of your application.

In this chapter, you will create procedures to:

- Add records,
- Search for records,
- Print a report.

In addition, you will learn how to perform more than one operation at a time by starting a new process when a menu command is chosen

This tutorial is based on the menu structure you created in Chapter 14. You will write three of the procedures you specified in Chapter 14. After you write these procedures, three of the menu commands you created in Chapter 14 will work.

PROGRAMMING IN 4TH DIMENSION

A series of statements that tell a computer what to do is called a *program*. In 4th Dimension, a series of statements is called a *procedure*. When you write procedures for 4th Dimension runtime applications, you can choose from over 300 commands in the 4th Dimension language.

The 4th Dimension language is a high-level language, that is, one command in the language performs a series of actions within the computer. The ADD RECORD command, for example, automatically performs all the steps necessary to display an input layout and accept the record when you click **OK**.

4th Dimension's language has many components in common with other programming languages, such as the following:

- **Tests:** Conditions that are evaluated so that the program knows what to do next.
- **Loops:** Statements that require the program to repeat an action until a test is evaluated as true.
- **Parameters:** Pieces of information given to a procedure so that it knows what to do or what to act upon.
- **Functions:** Statements that result in a value (a number, date, time, or series of characters) that can be used by the program. A function returns a value.
- **Commands:** Statements that instruct the program to do something. For example, ADD RECORD is a command.

4th Dimension functions and commands are called *routines*. The routines available in 4th Dimension appear in a list so that you can place them in a procedure by clicking.

A complete discussion of programming with 4th Dimension is beyond the scope of this book. Further information can be found in the *4th Dimension Language Reference*.

CREATING A GLOBAL PROCEDURE

You are now going to write the procedure to add an employee record to the database. This is the procedure you named *Add Empl* in the previous chapter.

1. If you have not done so already, start 4th Dimension and open the PEOPLE15 database.

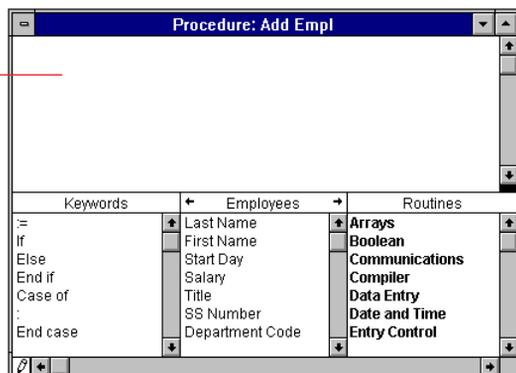
PEOPLE15 opens in the Design environment.

2. Open the Procedure editor and create a new global procedure called Add Empl.

If you need to review the beginning steps for creating a procedure, see Chapter 7, “Using Procedures.”

4th Dimension displays the Procedure editor in a window entitled “Procedure: Add Empl.” You use the Procedure editor to write and edit procedures.

Procedure text area



You can most easily learn how to write 4th Dimension procedures by carefully considering what the program needs in order to work. Here are the most important points to keep in mind:

- A global procedure is executed from beginning to end, from the first line to the last line of the procedure (when the last statement has been executed, the procedure stops running).
- Since a database can have more than one file containing records, you need to specify the file on which commands operate.
- Since each file can have several layouts, you need to specify which layout to use.

To instruct 4th Dimension to add a new record, you will use the ADD RECORD command and specify the [Employees] file and the Empl Input layout.

In Chapter 7 of this manual, you saw how 4th Dimension allows you to enter commands and other elements of a procedure by selecting them from the three panels on the bottom portion of the Procedure editor. You can select the filenames, field names, and layout names that appear in the center panel, the keywords that appear in the left panel, and the routines that appear in the right panel.

The following steps do not specify whether to select or type the elements of the procedure. You will decide which method works best for you.

3. Type the following comment to identify the purpose of the procedure:

```
`The Add Empl procedure adds a record to the Employees file
```

The leading accent mark indicates that this is a comment and not part of the instructions. The accent mark appears in different places on different keyboards. Do not confuse this accent mark with the apostrophe or backslash.

4. Press the Enter key on the keyboard (not the one on the numeric keypad).

When you press **Enter**, the comment is entered and automatically indented. The insertion point moves to the next line.

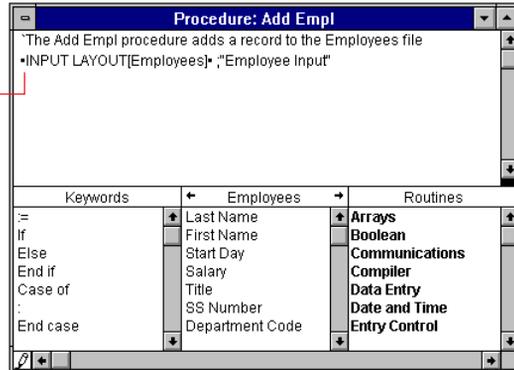
5. Define the file and input layout you want to use by entering the following code:

```
INPUT LAYOUT ([Employees]; "Employee Input")
```

Employee input is the name you gave the input layout you designed earlier in this manual. The layout names appear at the bottom of the list of fields in the file panel.

If you should omit any necessary part of a command, 4th Dimension displays large dots on either side of the incorrect statement. The following figure shows 4th Dimension flagging an error in the first line of code. This error is caused by the absence of parentheses around “[Employees]; “Employee Input” .”

Dots indicate error

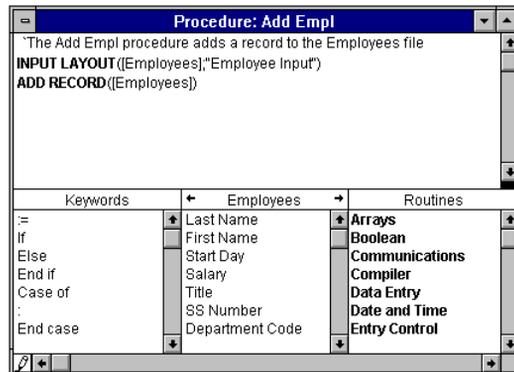


When you correct the statement and press the Enter key on the keyboard (or move the insertion point to a new line), the dots are removed.

6. Enter the following command:

ADD RECORD ([Employees])

This command displays an input layout for the specified file so you can add a record.



SEEING THE PROCEDURE IN ACTION

Now that you have a procedure that can be called by a menu command, you can use the Runtime environment to see how it works.

1. Choose User and then Runtime from the Use menu.

You cannot enter the Runtime environment directly from Design environment using the **Use** menu. You must switch first to the User environment and then to the Runtime environment.

When you enter the Runtime environment, the menu bar you have created is displayed. If you pasted a graphic to this screen from the Menu editor, the Runtime window displays it too.

2. Choose Add Employee from the Employees menu.

The input layout you specified in the procedure is displayed.

3. Type some practice information and click the Enter button.

The initial screen reappears. The record has been accepted just as if you had entered it in the User environment. Your procedure works fine.

However, there is still some work to do. Typically, you would be adding several records to the employee file at the same time. As it stands now, your application returns to the starting screen after you enter each record. In the next section, you will alter your global procedure slightly so that it keeps the input screen active until you have finished entering records.

4. Choose Quit from the File menu.

4th Dimension returns to the User environment. Quitting from the Runtime environment returns control to the User environment. The record you have entered is displayed.

5. Choose Design from the Use menu.

MODIFYING THE PROCEDURE

The *Add Empl* procedure you have written works fine for adding a record to the correct file. However, if you have three records to add, you have to choose the menu command three times. With a slight modification of the procedure, you can leave the input layout on the screen until you have finished entering as many records as you want.

This modification requires that you write a loop for the ADD RECORD command, making the command active until you click the **Cancel** button. This loop is called the While loop. Essentially, it requires 4th Dimension to repeat a series of commands while a test is satisfied. The following steps show you how to edit the procedure you have already written.

1. **Choose Procedure:Add Empl from the Design menu.**
2. **Click just to the left of the ADD RECORD command to move the insertion point to that spot.**
3. **Enter “OK:=1” and press the Enter key on the keyboard.**

This statement sets the initial value of the OK variable, discussed later in this section.

4. **Enter “While (OK=1)” and press the Enter.**

4th Dimension automatically indents the ADD RECORD command. The indentation means that the command has moved down one level and will be executed only under the control of the loop that will surround it.

5. **Move the insertion point to the line below the ADD RECORD command.**

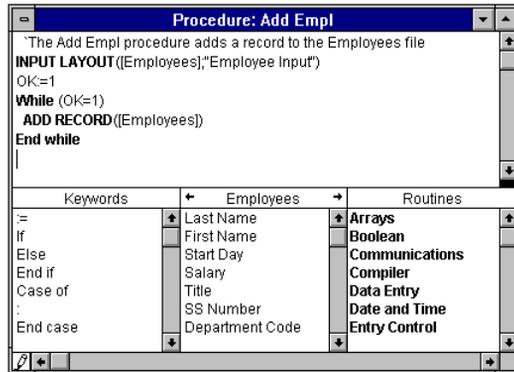
You can either click the mouse button to move the insertion point or use the down arrow on your keyboard.

6. **Enter “End While” and press the Enter.**

This step completes the loop. The meaning of the loop you have inserted in the procedure is that 4th Dimension must enter the loop at least once and repeat the ADD RECORD command as long as the **OK** or **Enter** button has been pressed (OK=1). Not until you click the **Cancel** button will the ADD RECORD command stop repeating. Clicking the **Cancel** button sets the OK variable to 0 (zero).

The OK variable is a variable that 4th Dimension creates automatically. You can use it in any procedure to test whether a user has clicked the

Cancel button.



7. Return to the Runtime environment to see the difference this loop makes to the task of entering records.

The input layout remains displayed and ready to accept additional records until you click **Cancel** (OK=0).

USING THE SEARCH EDITOR IN AN APPLICATION

You have several more procedures to write before your application is finished. In this section you will see how to bring the Search editor from the User environment into your own application. You will use the Search editor as part of the *Mod Empl* procedure.

The steps described here show you how to create a procedure that does the following:

- Displays the Search editor to create a selection of records,
- Displays the selection as a list from which you can select records to modify.

1. Return to the Design environment and create a global procedure called **Mod Empl**.

The steps for creating a procedure are explained earlier in this chapter. *Mod Empl* is the procedure name you entered for **Modify Employee** in the previous chapter.

2. Type the following comment for your procedure:

```
`The Mod Empl procedure displays a selection of records
```

3. Indicate the file and input layout to use by entering the following:

```
INPUT LAYOUT([Employees];"Employee Input")
```

Now you want to instruct 4th Dimension to use its own Search editor.

4. Press the Enter key on the keyboard and enter the following command:

```
SEARCH ([Employees])
```

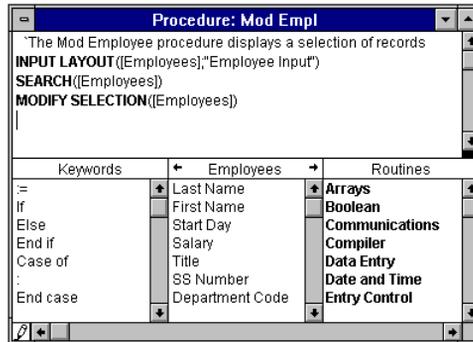
The **SEARCH** command, without any search parameters, displays the Search editor. 4th Dimension will use the search conditions that you enter in the Search editor to create *a selection of records*.

5. Instruct 4th Dimension to display the selection of records and prepare to modify those selected by entering the following command:

```
MODIFY SELECTION ([Employees])
```

This command allows you to modify the records in the selection. To display a record in the input layout, the user simply double-clicks on the record that needs to be modified.

Before continuing, make sure that your procedure looks like the one shown below.



6. Now return to the Runtime environment to see how this command works.

When you choose **Modify Employee** from the **Employee** menu, the Search editor is displayed. You use the Search editor just as you used it in the User environment. After you enter the search conditions to isolate the records you want to modify and click **OK**, 4th Dimension displays the selection of records.

CREATING THE REPORT PROCEDURE

In this section you will see how to write a procedure that sorts records and then print them for a monthly report. You will use the report layout you designed in Chapter 13.

1. Return to the Design environment and create a global procedure called **Monthly Rep**.

The steps for creating a procedure are explained earlier in this chapter. *Monthly Rep* is the procedure name you entered for **Monthly** in Chapter 14.

2. Indicate the file and report layout to use by entering the following:

OUTPUT LAYOUT([Employees];"EmployeeReport")

3. Enter the following command to make the selection include all the records in the database:

ALL RECORDS ([Employees])

4. Sort the records by entering the following:

SORT SELECTION([Employees];[Departments]Name;>:[Employees]Last Name;>)

Sort Selection is a very powerful command in 4th Dimension. It can be used to sort a selection based on fields you specify in the argument to the command or to sort based on fields you enter in the Sort Selection dialog box.

Here, you have instructed 4th Dimension to sort the records in the [Employees] file according to the department name in the [Departments] file and then by the employee's last name. Note that you first specify the name of the file you want to sort; you then specify the filename for each sort field.

The greater than sign (>) instructs 4th Dimension to perform an ascending sort.

You need to sort the records because the report you are printing calculates subtotals for each department. Therefore, the records must be sorted by department before printing. You must sort on at least one more level than the number of breaks you are using. In this case, you are sorting on two levels and using only one break level.

5. Instruct 4th Dimension to print the selection of records by entering the following:

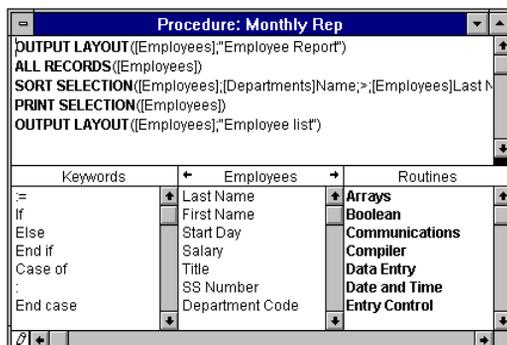
PRINT SELECTION ([Employees])

This command prints the selection, just like the **Print** menu command in the User environment.

6. Restore the output layout by entering the following:

OUTPUT LAYOUT ([Employees];"Employee List")

This command instructs 4th Dimension to use the previous output layout to display the records.



7. Return to the Runtime environment and see how the command works by choosing Monthly from the Report menu.

4th Dimension sorts the records and prints the report you have designed.

CREATING PROCESSES WITH MENU COMMANDS

4th Dimension allows you to create a multi-tasking system—a system in which more than one operation can take place at the same time—by performing database tasks within separate processes. A *process* can be thought of as another 4th Dimension environment that executes whatever commands you give it.

A process can open a layout, print a report, display a selection, display menus and windows, and so on. Basically, anything that can be done with the 4th Dimension language can be done in a process.

By opening more than one process at a time, you can perform more than one task at a time.

One way to open a process for an operation is to start a new process when a menu command is selected. When you select the menu command, the global procedure attached to it executes within a separate process. Since the procedure is executing in a separate process, you are free to continue working with your database.

In this section, you are going to tell 4th Dimension to start a new process when the **Graph** menu command is chosen. The **Graph** menu command and its global procedure, *Graphing*, have already been created for you.

1. Return to the Design environment by double-clicking the Control-menu box of the main 4th Dimension window, and then choose Design from the Use menu.

You cannot move directly from the Runtime to the Design environment. You must first enter the User environment and then go to the Design environment.

2. Choose Menu from the Design menu and open Menu Bar 1.

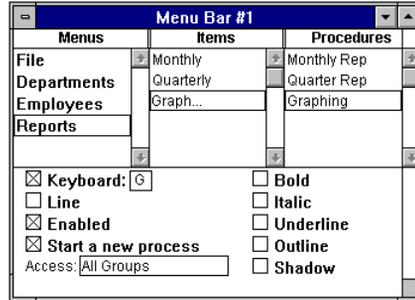
Menu Bar 1 is displayed in the Menu editor.

3. Select the Reports menu.

The menu commands and procedures for this menu appear to the right.

4. Select the Graph menu command and select the Start a New Process check box.

When this menu command is chosen in the Runtime environment, 4th Dimension executes the *Graphing* procedure in its own process.



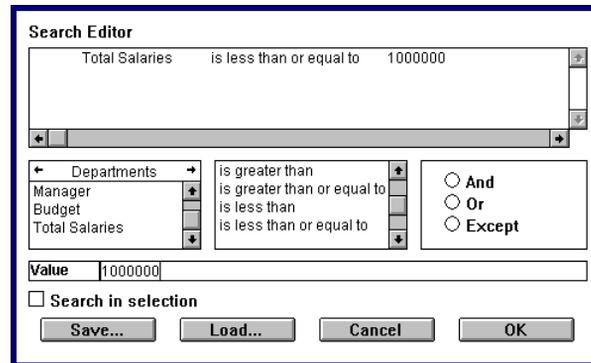
You are now going to switch to the Runtime environment to test out your process.

5. Return to the Runtime environment by choosing User and then Runtime from the Use menu.

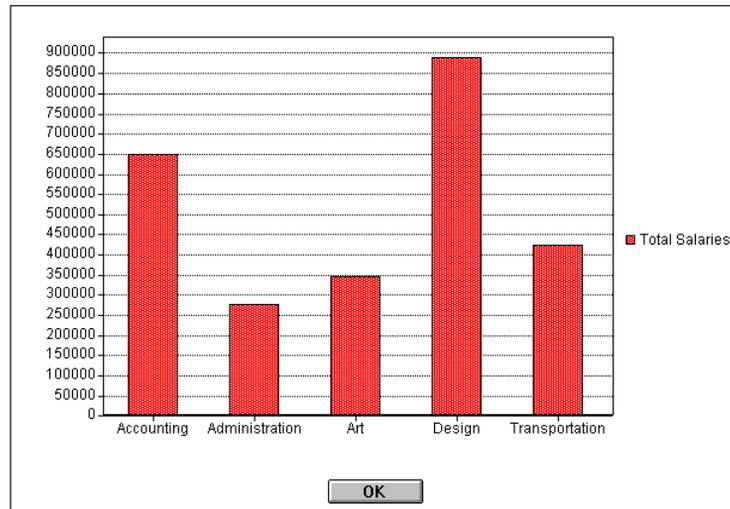
6. Choose Graph... from the Reports menu.

The Search editor appears.

7. Enter the search criteria “Total Salaries, is less than or equal to, 1000000” and click OK.



4th Dimension finds the records of all departments whose total salaries are less than or equal to \$1,000,000 a year and graphs their total salaries in a separate window.



Feel free to open the *Graphing* procedure in the Design environment to find out how this graph was created. Descriptions of all of the commands in the *Graphing* procedure can be found in the *4th Dimension Language Reference*.

THE NEXT STEP

You need to write a global procedure for each menu command you use in your runtime application. With 4th Dimension's procedural language, you can create programs with great power and flexibility that allow you to control the processing of your information.

In addition, you can enhance information processing by performing tasks in separate processes. This allows you to perform multiple operations at the same time, such as displaying a graph of your data in one window while you continue to choose other menu commands to perform other tasks.

This chapter has introduced you to one of the most powerful features of 4th Dimension. For complete information about all the commands available in 4th Dimension, refer to the *4th Dimension Language Reference*.

*PEOPLE16 Database**Estimated time to complete: 30 minutes*

In the last chapter, you created several global procedures that were attached to menu commands. When you chose the menu commands in the Runtime environment, the procedures executed and performed certain actions—in other words, each of the procedures worked.

Suppose, however, that you create a procedure that does not work or does not produce the results that you expected. You have an error in your code, otherwise known as a *bug*.

Using the 4th Dimension debugger, you can easily locate and correct bugs in your code. Instead of puzzling over the procedure, you can use the debugger to execute the code line by line and determine what is happening at each step of the procedure.

In this chapter, you will learn how to:

- Enter and use the Debug window,
- Step through a procedure, executing it one line at a time,
- Use 4th Dimension functions to analyze the code.

DEBUGGING CODE

When you execute a procedure that has errors, or *bugs*, one of two things may happen:

- The procedure stops executing and the Syntax Error window appears.



- The procedure continues to execute but does not bring about the expected results.

In the first case, the Syntax Error window appears because of the incorrect usage of a command or function, known as a *syntax error*. When the Syntax Error window appears, you have the option of editing the procedure or entering the debugging environment to determine the cause of the error.

In the latter case, when a procedure executes but does not do what you expect, the bug is caused by an error in logic or design. This is the most difficult kind of error to detect. When you encounter this type of error, you can enter the debugger by inserting a command in the procedure.

ENTERING THE DEBUGGER FROM A PROCEDURE

In this section, you will create a global procedure to print a list of employees who make less than \$15,000 a year. You will then use the 4th Dimension debugger to find the error in this procedure and correct it.

1. If you have not done so already, start 4th Dimension and open the PEOPLE16 database.

PEOPLE16 starts in the Design environment.

2. Choose Procedure... from the Design menu.

The Procedure dialog box appears.

3. Select Global Procedures and click the New button.

The Procedure Type dialog box appears.

4. Select Listing as the procedure type and type “Employee List” as the procedure name.

You can now begin typing the code in your procedure.

5. Enter the following procedure:

```
`Global procedure Employee List prints a list of employees earning less than
`$15000 a year
```

```
OUTPUT LAYOUT([Employees]; “Emp Salary Rep”)
```

```
SEARCH ([Employees];[Employees]Salary<15000)
```

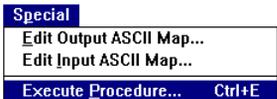
```
SORT SELECTION([Employees];[Employees]Last Name)
```

```
PRINT SELECTION ([Employees])
```

```
OUTPUT LAYOUT ([Employees]; “Employee List”)
```

6. Choose User from the Use menu.

You are now going to execute your procedure in the User environment.



7. Choose Execute Procedure... from the Special menu.

The Execute Procedure dialog box appears.

8. Select the Employee List procedure and click the Execute button.

Nothing happens. You expected a report to be printed, but instead 4th Dimension displays a message indicating that are no selected records for the [Employees] file.

Since the Syntax Error window did not appear, you know that the error is in the design of the procedure. In other words, there was a difference between what you thought the procedure would do and what 4th Dimension interpreted and actually did. To determine what is really happening as the procedure executes, you decide to examine the procedure using the 4th Dimension debugger.

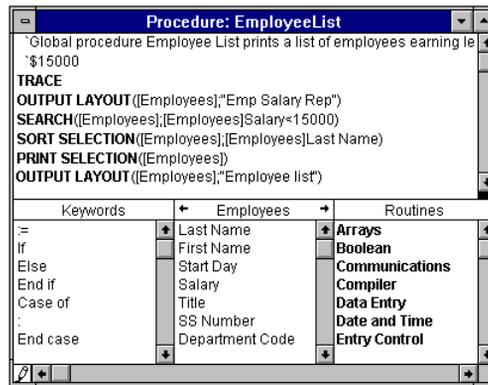
The easiest way to enter the debugger is by using the TRACE command.

9. Before returning to the Design environment, choose Show All from the Select menu to restore the current selection to all records in the file.

10. Return to the Design environment and open the Employee List procedure.

11. Insert the TRACE command at the beginning of the procedure, directly after the initial comment.

The TRACE command allows you to trace the execution of a procedure by opening the procedure in the Debug window.



12. Choose User from the Use menu.

4th Dimension returns to the User environment.

You will now execute the procedure again so that the TRACE command activates the debugger.

13. Choose Execute Procedure.. from the Special menu.

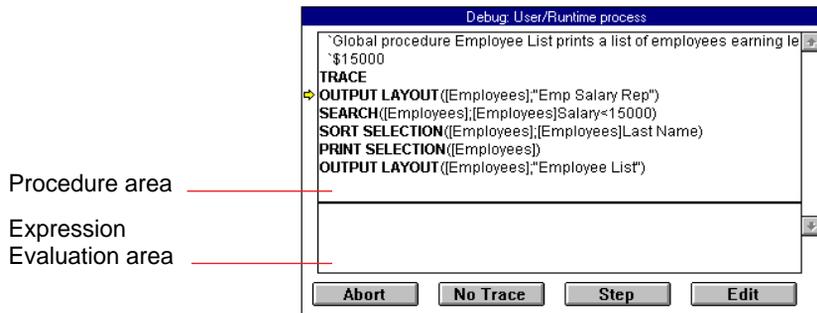
14. Select Employee List and click the Execute button.

The Debug window appears, displaying the procedure in which the TRACE command was inserted. In the next section, you will use the Debug window to locate the error in your procedure.

*NOTE: You can also enter the Debug window by Alt-clicking while code is executing. Execution is interrupted at this point and the User Interrupt window appears. Clicking the **Trace** button in this window opens the Debug window.*

USING THE DEBUG WINDOW

The Debug window consists of three main areas: the Procedure area, the Expression Evaluation area, and the buttons.



The Procedure area contains the contents of the procedure, including any comments that you have inserted. You use this area to view your procedure and to see which line is going to be executed next.

The Expression Evaluation area is a special area which returns the result of any 4th Dimension function you enter. It can also return the results of mathematical expressions (e.g., 4 + 7) and the value of the current field (e.g., [Employees] Last Name). This feature of the debugger is extremely useful for determining exactly what 4th Dimension is thinking or doing at any point in any executing procedure.

The bottom of the Debug window contains the following buttons:

- **Abort:** Halts procedure execution and returns you to where you were before procedure execution started.
- **No Trace:** Stops tracing (i.e., closes the Debug window) and allows procedure execution to proceed normally.
- **Step:** Executes the current procedure line and stops at the next line.
- **Edit:** Opens the procedure in the Design environment for editing.

In this section, you are going to learn how to type expressions in the Expression Evaluation area. You will then step through the procedure, one line at a time, to see how the results of the expressions change.

1. Enlarge the Debug window to full size by dragging it.

This will allow you to see the entire procedure and will give you more room to work in the Expression Evaluation area.

2. Enlarge the Expression Evaluation area by holding down the Alt key and dragging the Resize line upward.



3. Click in the Expression Evaluation area.

The cursor should now be blinking in the Expression Evaluation area.

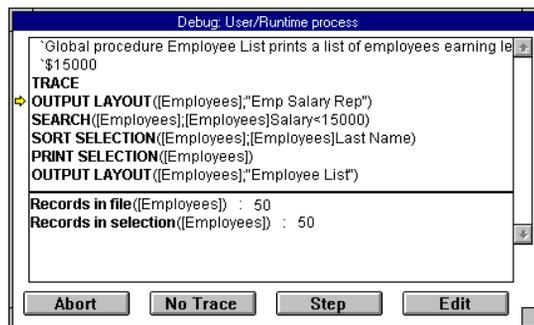
The Expression Evaluation area is initially empty, waiting for you to type in a function or other expression. When you click off of the expression, the result of the debug expression is returned for the current line of code.

You are now going to enter an expression in this area.

4. Type "Records in File ([Employees])" and click anywhere off of the line to evaluate the expression.

Be sure to click off of the line to evaluate the expression—pressing the Enter key on the keyboard will evaluate the expression but will also cause a line of code to be executed.

When you click off of the line, the Records in file function returns the number of records in the [Employees] file to the right of the expression.



The value returned by the expression, 50, tells you that there are records in the [Employees] file. However, the command used to print the list of employees is the PRINT SELECTION command. When you read the description of the command in the *4th Dimension Language Reference*, you

find that PRINT SELECTION prints the records in the current selection of the file—not all of the records in the file.

*NOTE: If you incorrectly type an expression in the Expression Evaluation area, the Syntax Error window appears when you click off of the line. If this happens, you must click the **Abort** button to return to the Expression Evaluation area. When you do so, your expression is removed from the Expression Evaluation area, allowing you to retype the expression correctly.*

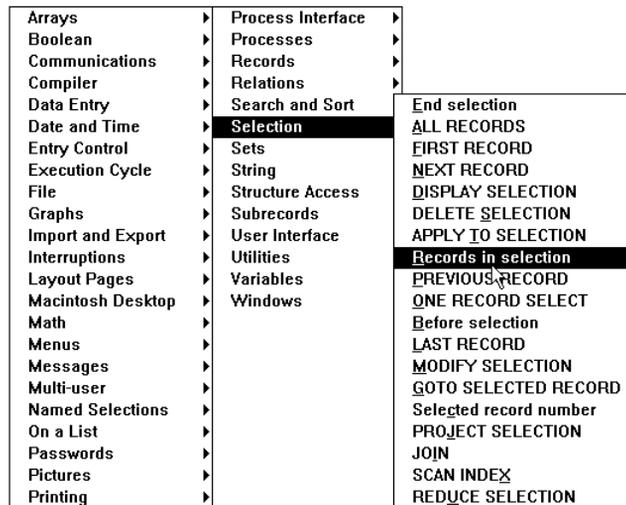
To determine why the list of employees did not print, we need to determine whether there are any records in the current selection.

5. Move to the next line by clicking under “Records in file.”

The cursor should now be blinking.

6. Click the mouse button and hold down the Ctrl key to display a drop-down menu of 4th Dimension commands and functions.

7. Select “Selection”, and then “Records in selection” from the cascading menu. Release the mouse button.



The Records in selection function appears on the line. You now need to enter the name of the file for which you want to return the number of records in the current selection.

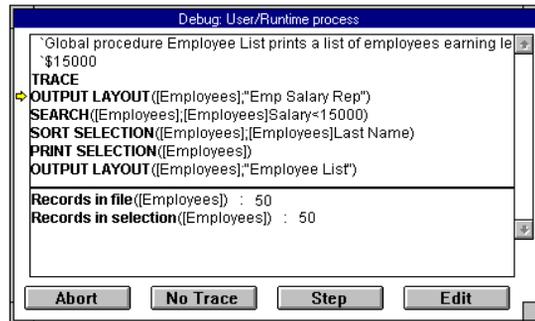
8. Type “([Employees])”.

The line should now be as follows:

Records in selection ([Employees])

9. Click off of the line.

The expression is evaluated, indicating that there are 50 records in the current selection for the [Employees] file (each file in a database has its own current selection).



Since there are 50 records in the file, this means that all of the records in the file are in the current selection. If the PRINT SELECTION command were executed at this point, all of the records in the file would be included in the printout

However, Records in selection is being evaluated at the beginning of the procedure, before any lines of code have been executed. The current selection may be changed by some of the commands in the procedure. To determine the value of the current selection at each point in the procedure, you step through the code.

Stepping Through Code

You can use the **Step** button to step through a procedure, one line at a time. When you step through a line of code, 4th Dimension executes only that line and then stops at the next line to give you time to evaluate what has happened.

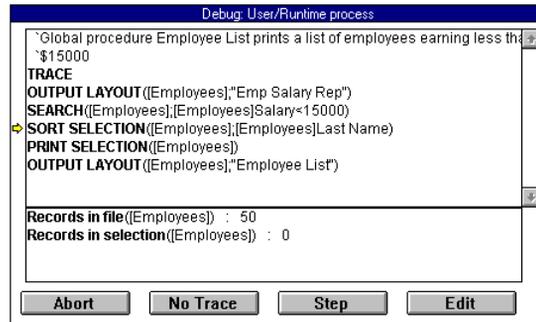
An arrow shows which line of code will be executed next. The arrow is now located to the left of the first line of the procedure, showing that the first line has not yet been executed.

1. Click the Step button to execute the first line of code.

The first line of code is executed. A value of 50 is returned for Records in selection, indicating that all of the records in the file are in the current selection.

2. Click the Step button again.

The value of Records in file remains the same, but the value of Records in selection changes to 0 after the search criteria ([Employees]Salary<15000) is evaluated.



The value of Records in Selection is 0 because there are no employees in the company earning less than \$15000 a year. Since the current selection is empty at this point, there are no records to be printed by the PRINT SELECTION command.

Although this is just an example, you would usually want to guard against such confusing errors by checking whether there are any records in the current selection and, if not, displaying an alert message that states the problem.

3. Click the Edit button to edit the procedure in the Design environment.

4. After the SEARCH statement, insert the following If statement:

```
If (Records in selection ([Employees]) # 0)
```

This line is equivalent to the sentence, "If the number of records in the current selection is not zero, then execute the following lines."

5. Append the following statements after the last line of the procedure:

```
Else
```

```
  ALERT ("There are no records to print.")
```

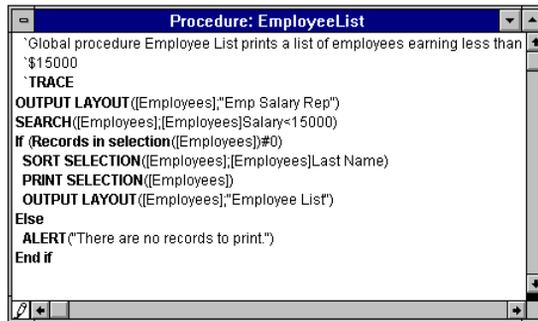
```
End If
```

These lines are equivalent to the sentence, "Otherwise, present an alert stating that there are no records to print."

6. Insert the comment character (`) before the TRACE command.

This disables the TRACE command by making it a comment. Comments are not executed by 4th Dimension.

The finished procedure should look like this:



```
Global procedure Employee List prints a list of employees earning less than
$15000
TRACE
OUTPUT LAYOUT ([Employees], "Emp Salary Rep")
SEARCH ([Employees], [Employees]Salary < 15000)
If (Records in selection ([Employees]) # 0)
SORT SELECTION ([Employees], [Employees]Last Name)
PRINT SELECTION ([Employees])
OUTPUT LAYOUT ([Employees], "Employee List")
Else
ALERT ("There are no records to print.")
End if
```

7. Return to the User environment and choose Execute Procedure... from the Special menu.

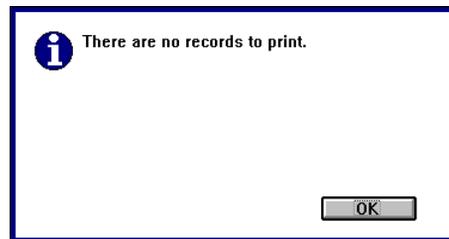
8. Select Employee List and click the Execute button.

The Debugger reappears because when you previously clicked the **Edit** button in the Debugger you were in TRACE mode. Now that you have returned to the User environment to execute the procedure, you are still in TRACE mode.

9. Click the No Trace button.

This allows you to continue executing your procedure without the interruption of the debugger.

An Alert box appears, as shown below.



10. Click OK to close the Alert box.

USING THE SYNTAX ERROR WINDOW

In this section, you are going to write a global procedure that creates a unique code for each employee in the company. The code will be created by combining the employee’s last name and start date.

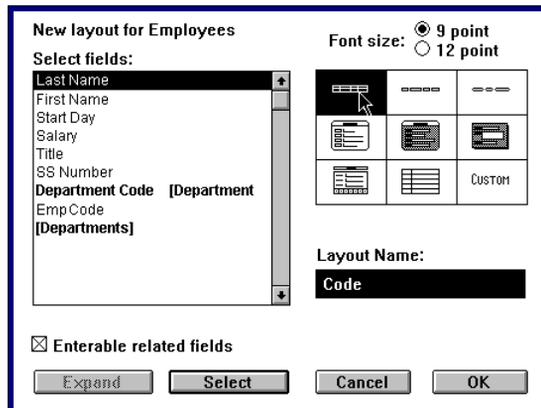
Code such as this is frequently used for tracking employees. For instance, you could use the code to identify which employee entered a given invoice or purchase order. You could use this same code to link related employee files, such as employees and their expenditures.

Your first task is to create the field that will store the employee code and then place the field on a layout.

1. Return to the Design environment by choosing Design from the Use menu.
2. Create a new field named “EmpCode” and make it Alpha 25. This field will store the code for each employee.
3. Choose Layout... from the Design menu and click the New button to create a new layout.

Since Employee Code is a new field, you need to create an output layout that includes the field.

4. Choose layout template #1 and name the layout “Code”.
5. Make the font size 9-point.



6. Select the First Name, Last Name, Start Day, and EmpCode fields and click OK.

The output layout appears, containing these four fields.

7. Double-click the Control-menu box to close the layout.

Now that you have a layout that includes the EmpCode field, you need to enter a code into each employee's record. Since the code is created from information already in your database, the way to update the field is to apply a global procedure as a formula to all employee records.

In the next step, you are going to create the global procedure that will generate an employee code for each record. Remember that when entering the procedure, you can use the panels in the lower portion of the screen to enter the field names and the “:=” and “+” operators. For more information about using the Procedure editor, refer to Chapter 6.

1. Create a new global procedure named “CreateCode” and enter the following statements:

```
`CreateCode creates a code by adding employees' last name and start day  
[Employees]EmpCode:=[Employees]Last Name + [Employees]Start Day
```

Translated literally, the last statement means that “the EmpCode field gets the value of the employee's last name plus the employee's start date.” For instance, the code for Rick Jones, whose start date is 10/30/89, would be Jones103089.

2. Go to the User environment by choosing User from the Use menu.

You now want to apply the *CreateCode* procedure as formula to all records in the database so that a code is created for each employee.

3. Press Ctrl+Space bar to bring up the List of Files window.

You are going to use this window to make Code the default output layout.

4. Hold down the mouse button on the Output layout icon for the [Employees] file and choose the Code layout from the drop-down menu.

If you repeat this step, you will see that Code is now underlined, indicating that it is now the default output layout.

5. Press Ctrl+Space bar again to hide the List of Files window.

6. Choose Show All from the Select menu.

This ensures that all of the records in the [Employees] file are currently selected. This is important since formulas are applied to the current selection of a file—not necessarily to the entire file.

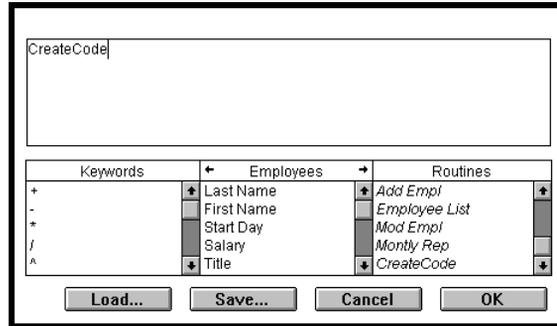
7. Choose Apply Formula... from the Enter menu.

The Formula editor appears, allowing you to build a formula which you can then apply to the current selection of the file.

You can also apply a global procedure as a formula. You are going to select the *CreateCode* procedure which contains the formula for creating the employee codes.

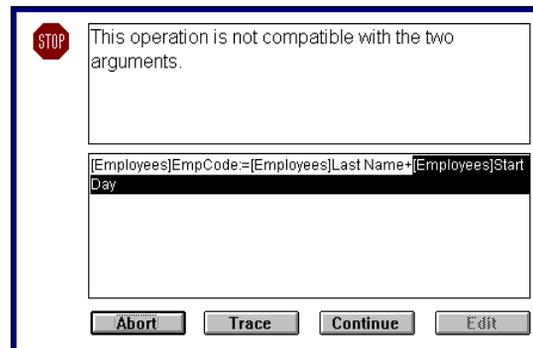
8. Scroll to the end of the Routines list and click CreateCode, the name of the global procedure you want to apply.

The names of all global procedures appear at the end of the Routines list in italics.



9. Click OK to apply the formula to the employee records.

The Syntax Error window appears with the message “This operation is not compatible with the two arguments,” as shown below. Notice that 4th Dimension highlights the part of the command which contains the error, in this case, the [Employees]Start Day field.



The buttons at the bottom of the Syntax Error window give you the following four options:

- **Abort:** Halt procedure execution and return to where you were before procedure execution started.
- **Trace:** Use the Debug window to trace (i.e., step through) the procedure’s execution.
- **Continue:** Continue executing, skipping any portion that cannot be executed.

■ **Edit:** Open the procedure in the Design environment so it can be corrected.

10. Click the Trace button to enter the Debug window.

The Debug window appears, displaying the contents of the *CreateCode* procedure.

DEBUGGING A SYNTAX ERROR

You know that the bug in the procedure is due to a syntax error concerning the [Employees] Start Day field. The field is somehow incompatible with the operation you were trying to perform—the addition of the two fields.

In the *4th Dimension Quick Start* manual, you learned that fields can have different data types. For instance, a field that stores a name is usually an *Alpha* field, meaning that it stores alphanumeric data (A-Z; 0-9). A field that stores a salary is usually a *Real* field, meaning that it stores numbers with decimal points.

Since operations sometimes require fields of particular data types, you decide to determine the data types of what the Syntax Error window calls the *arguments* of the statement, the [Employees] Start Day and [Employees] Last Name fields.

1. Click in the Expression Evaluation area.

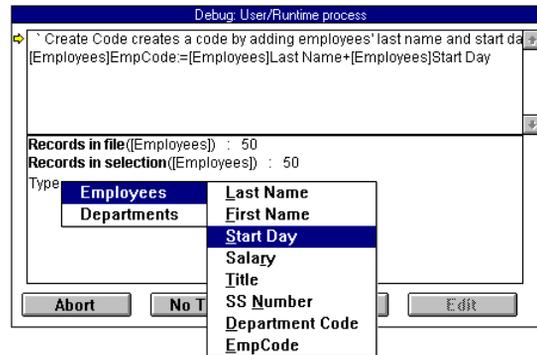
The cursor should now be blinking.

2. Enter “Type (“.

The Type function returns the data type of the specified field. For more information about the Type function, refer to the *4th Dimension Language Reference*.

3. Alt+click to display a drop-down menu of file and field names.

Alt+clicking in the Expression Evaluation area is a shortcut for entering file and field names.



4. Choose “[Employees] Start Day” from the drop-down menu and type a closing “)”

The final statement should look like this:

Type ([Employees]Start Day)

*NOTE: Remember that if you enter the Type function incorrectly, the Syntax Error window will appear indicating the error. When you click the **Abort** button in this window to return to the Expression Evaluation area, the function will be removed and will need to be retyped.*

5. Click off of the line to evaluate the expression.

The first function returns the value 4, which means that the Start Day field is of type Date. A table containing a list of data types that can be returned by the Type function can be found in the *4th Dimension Language Reference*.

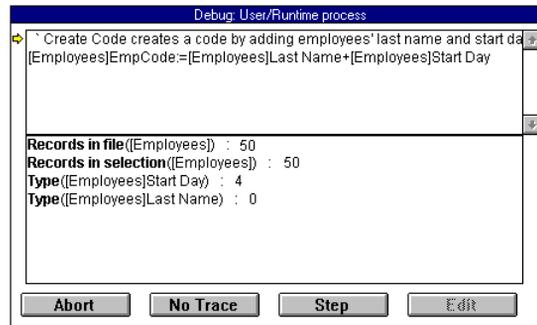
6. Enter the following function in the Expression Evaluation area.

Type ([Employees]Last Name)

You can either type the entire statement or use some of the shortcuts discussed in this chapter, such as Ctrl+clicking to choose the Type function and Alt+clicking to choose “[Employees] Last Name”.

7. Click off of the line.

The second function returns the value 0, which means that the Last Name field is of type Alpha.



The two fields, Start Day and Last Name, have different data types. Since “+” can only be used to add fields of the same data type, it cannot be used to add a date and an alphanumeric string. To add these two fields, you must first convert the Start Day field into a string.

8. Click the Abort button.

The *CreateCode* procedure is aborted.

9. Return to the Design environment and choose Procedure from the Design menu.

10. Select the “CreateCode” procedure and click the Open button to open the procedure in the Procedure editor.

11. Insert the String function after the “+” and place parentheses around [Employees]Start Day.

The final procedure should look like this:

```
[Employees]EmpCode:=[Employees]Last Name+String([Employees]Start Day)
```

The String function that you inserted converts the Start Day field from a date to a string. Note that this has no effect on the data stored in the Start Day field—it simply converts the data into a string temporarily so that it can be used in this operation.

For more information about the String function and how it converts data, refer to the *4th Dimension Language Reference*.

You can now return to the User environment to execute your procedure again.

12. Choose User from the Use menu.

13. Choose Apply Formula from the Enter menu, select the CreateCode procedure, and click OK.

This time the procedure works properly. The output layout for the [Employees] file is displayed with the new values in the EmpCode field.

Employees: 50 of 50			
First Name	Last Name	Start Day	Employee Code
Tom	Johnson	1/2/80	Johnson1/2/80
Alice	Bentley	3/6/87	Bentley3/6/87
Biff	Davis	1/2/80	Davis1/2/80
Shirley	Ransome	1/11/80	Ransome1/11/80
Dennis	Hanson	1/14/80	Hanson1/14/80
Lydia	Vernon	1/15/80	Vernon1/15/80
Andy	Venable	1/15/80	Venable1/15/80
Jim	Borrell	1/22/80	Borrell1/22/80
Bryan	Pfaff	1/22/80	Pfaff1/22/80
Nancy	Heizer	1/23/80	Heizer1/23/80
Kathy	Forbes	1/28/80	Forbes1/28/80
Garth	Hammons	2/6/80	Hammons2/6/80
Marg	Smith	2/7/80	Smith2/7/80
Frederic	Bell	2/14/80	Bell2/14/80
John	Martin	4/25/83	Martin4/25/83
Shirley	Nalevanko	2/21/80	Nalevanko2/21/80
Marlys	Wilson	2/27/80	Wilson2/27/80
George	Lyle	2/28/80	Lyle2/28/80
Smeldorf	Garbando	3/6/80	Garbando3/6/80

THE NEXT STEP

The 4th Dimension debugger is a valuable tool for locating and correcting bugs in any procedure. In this chapter, you created two example procedures for the purpose of learning how to find the two types of bugs that you may encounter in your procedures: syntax errors and errors in logic or design. In each case, you entered the debugger and used the Expression Evaluation area to enter functions that helped you detect the errors.

Now that you have finished adding features to your database, you will want to protect your employee data by implementing a password access system. In the next chapter, you will learn how to create different levels of access that can be used to restrict users to certain parts of the database.

Database: PEOPLE17

Estimated time to complete: 15 minutes

When you create a database that will be used by more than one person, you may need to set up a password access system to limit access to data. An access system requires each person who uses an application to enter a password and, based on what privileges the person has been given, controls what portions of the database the person can use.

For example, you may hire a temporary employee to enter some information into your database. You can easily provide that person access to enter or modify records, but you may want to reserve other parts of the database for authorized employees only.

In this chapter you will learn how to:

- Use 4th Dimension's Password Access editor,
- Set up an access system for users of your personnel application,
- Specify which users can enter the Design environment,
- Specify which users have access to each menu command,
- Specify how users enter their name—whether they choose their name from a list or whether they must type their name.

USERS AND GROUPS

The password access system provided by 4th Dimension is based on the concept of users and groups. Users are assigned to groups and groups are given access rights to different parts of a database.

You can create user names and passwords for as many users as you want. When you create a database, 4th Dimension defines two users who are given special access privileges:

■ **Designer:** This user has access to everything in all environments—Design, User, and Runtime. The Designer can create and delete groups, assign and change group access privileges, and reassign users to different groups.

■ **Administrator:** This user is responsible for overseeing the application on a daily basis. The administrator can add and delete users and assign them to groups.

Groups can contain any number of users and can even contain other groups. Once you have placed users in groups, you can restrict access to the database by giving groups access to different parts of the database.

One common way to limit access to a database is to restrict record operations to different groups, based on their need. Records in each file can be loaded, saved, added, or deleted, depending on which group is given access to each function.

The screenshot shows a dialog box titled "File attributes". It has a title bar with a file icon and the text "File attributes". The dialog is divided into several sections:

- Filename:** A text box containing "Employees".
- Record Access:** Two checkboxes: "Invisible file" (unchecked) and "Completely delete" (checked).
- File Definition Access:** A section containing four dropdown menus:
 - Load:** All Groups
 - Save:** All Groups
 - Add:** All Groups
 - Delete:** Executive
- Owner:** A dropdown menu containing "All Groups".

At the bottom of the dialog are two buttons: "Cancel" and "OK".

As you can see from the File Attributes dialog box in the figure above, all groups have the right to load, save, or add records, but only users belonging to the Executive group can delete records.

You can restrict access to other parts of your database, depending on your needs. For instance, you might want to restrict access to different layouts in your database so that you can control which data users can enter and

view. The elements of the database for which you can restrict access include the following:

- Design environment,
- Record operations (loading, saving, adding, and deleting),
- Layouts,
- Procedures,
- Menu commands,
- External packages, such as the 4th Dimension modules.

In this chapter, you are going to add users and groups to the password access system. You are then going to restrict users to different portions of the database by assigning access to each of the menu commands in your runtime application and to the Design environment.

Adding Users and Groups

You know that there are several likely users for your application—yourself, members of the MIS department, the head of the Human Resources department, her secretary, and possible temporary workers.

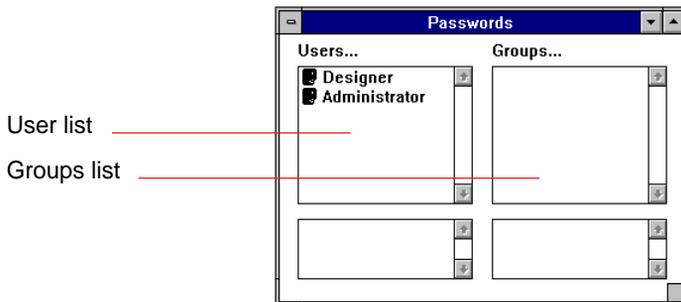
You need to enter these people as users and assign each of them a password. You then need to assign the users to the appropriate groups.

1. If you have not done so already, start 4th Dimension and open the PEOPLE17 database.

PEOPLE17 starts in the Design environment.

2. Choose Passwords... from the Design menu.

4th Dimension displays the Password Access editor.



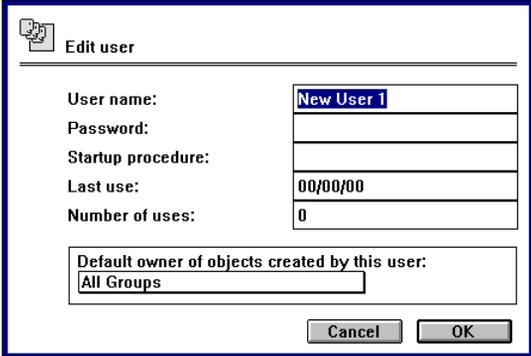
The Password Access editor shows two sets of boxes. The Users box displays the list of users. Currently, it contains the Designer and Administrator. Later, it will also display the users you add. The groups a

selected user belongs to are displayed in the box below the Users box.

The Groups box displays the list of groups you create. The names of users belonging to a selected group are displayed in the box below the Groups box.

3. Choose New User... from the Passwords menu.

4th Dimension displays the Edit User dialog box. You enter information in this dialog box for each user you add to the system.



The screenshot shows a dialog box titled "Edit user". It contains the following fields and values:

User name:	New User 1
Password:	
Startup procedure:	
Last use:	00/00/00
Number of uses:	0

Below these fields is a section titled "Default owner of objects created by this user:" with a dropdown menu showing "All Groups". At the bottom right are "Cancel" and "OK" buttons.

The Edit User dialog box allows you to enter and edit user names and passwords. You can also use this dialog box to assign a startup procedure that executes when the user opens the database and to allow members of a specified group to modify any objects (layouts, procedures, and so on) that the user creates. In addition, you can view the last date and the number of times the user has entered the database.

For more information about these features, refer to the *4th Dimension Design Reference*.

4. Enter "Alice" as the user name and "Restaurant" as the password.

For extra security, you capitalize two letters in the password.

4th Dimension's access system is case-sensitive so Alice (the head of the Human Resources department) will have to capitalize both the first and last letters of the word "restaurant" when she enters her password.

Do not change the other boxes. Leaving the Startup Procedure box blank allows Alice to use the User environment as well as the Runtime environment.

5. Click OK.

4th Dimension closes the Edit User dialog box and adds Alice to the list of users.

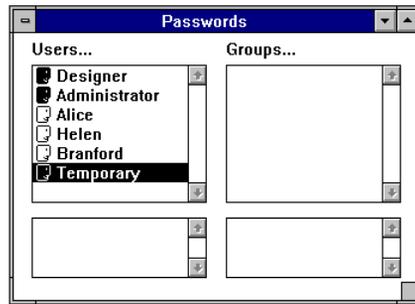
6. Add the following users and passwords to the password access system.

User Name	Password
Helen	Gos6h
Branford	sixER
Temporary	Temp

Notice that the password for Helen, the Human Resources department secretary, includes a number. This is another way to ensure password security.

The password for the temporary worker is simple, easy to remember, and appropriate. If necessary, you can change it.

You do not need a user name for yourself since you plan to use the Designer name.



You are now going to create the groups you want to use.

7. Choose New Group... from the Passwords menu.

4th Dimension displays the Edit Group dialog box.



4th Dimension allows you to name the group and to choose a group owner from among the users already created. The group owner can add and delete users from the group. Normally, you leave the Administrator (the

default) as the group owner.

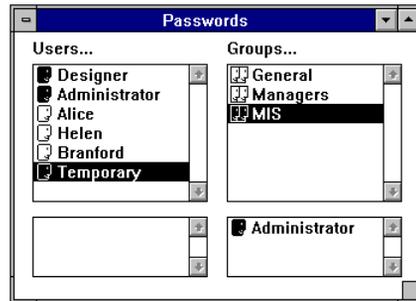
8. Enter “General” as the group name and ignore the Group Owner box.
This is the group that will contain all users.

9. Click OK.

General is added to the list of groups.

10. Create two more groups with the names “Managers” and “MIS”.

Your completed list of users and groups should look like this:



You are now ready to assign users to various groups.

Placing Users into Groups

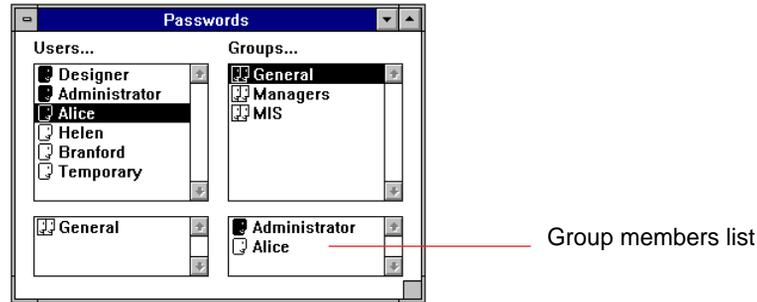
You place users into groups by dragging their names from the Users list to a group in the Groups list. Once a name is in a group, it appears in the group members list.

You are going to place Alice, Helen, and Temporary in the General group, Alice in the Managers group, and Branford in the MIS group. You do not need to place Designer in a group, since the Designer has access to

everything.

- 1. Select Alice from the Users list and drag her name to the General group.**

When you release the mouse button, Alice appears in the list of group members.



- 2. Place Helen and Temporary in the General group.**

These names are added to the group members list.

- 3. Place Alice in the Managers group and place Branford in the MIS group.**

If you accidentally add a user to the wrong group, simply select the user name in the Group list and drag it back to the same name in the Users list.

ASSIGNING GROUPS ACCESS

You have now created the user names you need and assigned the users to groups. Now you need to assign the groups to different portions of the application. This step will complete the installation of your access system.

You have named the groups so that you know who is in each group. You need to assign the Managers group to those portions of your application that you want only the head of the Human Resources department to be able to use. You also want to ensure that only you (the Designer) and members of the MIS group can enter the database in the Design environment to make modifications.

- 1. Open the Menu editor to show Menu Bar #1 which contains the menus for your application.**

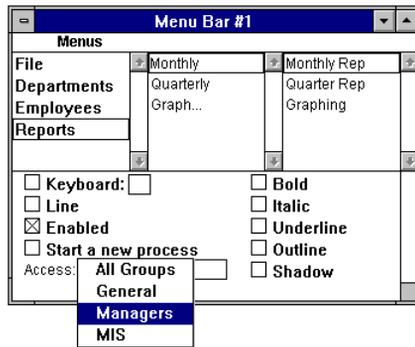
These are the menus you created in Chapter 14.

2. Select the Reports menu and then select the Monthly menu command.

Selecting a menu command activates the Access drop-down list box. Currently, the drop-down list box displays “All Groups.” This means that users in any group can access the menu command in the Runtime environment. You want to change this so that only Alice, the Human Resources manager, can generate a monthly report of the employees and salaries in the company.

3. Choose Managers from the Access drop-down list box.

The Managers group now has access to the Monthly menu command. Only Alice will be able to use this menu command.



4. Assign Managers to the Quarterly and Graph menu commands.

Remember to select the menu command and then choose Managers from the Access drop-down list box each time.

5. In a similar way, assign the following groups and menu commands:

Menu	Menu Command	Group
Department	Add Department	Managers
	Modify Department	General
	Remove Department	Managers
Employees	Add Employee	General
	Modify Employee	General
	Remove Employee	Managers

When your application is used in the future, only those users belonging to these groups will be able to use the assigned functions.

6. Close Menu Bar #1.

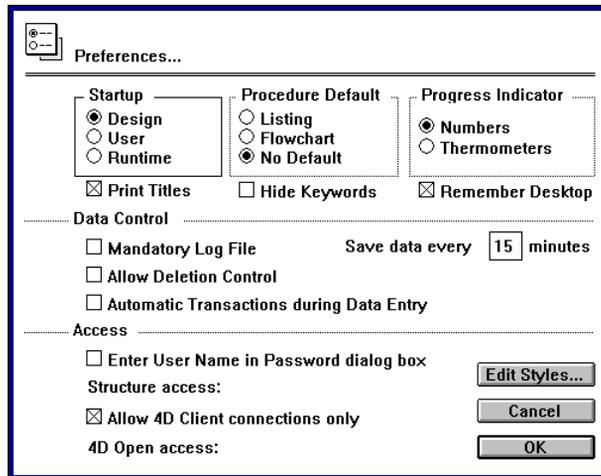
Now that you have specified which menu commands can be used in the Runtime environment, you want to specify which group can enter the

database in the Design environment. As the Designer, you will always be able to enter the Design environment. However, you would also like to give access privileges to Branford, a member of the MIS group.

7. Choose Preferences... from the File menu.

The Preferences dialog box appears.

8. Choose MIS from the Structure Access drop-down list box.



The MIS group is now assigned access privileges to the Design environment.

9. Click OK to close the Preferences dialog box and save your preferences.

SEEING THE SYSTEM IN ACTION

There is actually one more preliminary step to establish the access system for your application. This step is the key to the whole system:

You must give the Designer a password to initiate the access system.

Only when the Designer has a password does the system take effect—not before. To disable the access system, simply remove the password from the Designer.

1. Click on the Password Access editor to activate it and select Designer from the Users list.

2. Choose Edit User... from the Passwords menu.

The Edit User dialog box is displayed.

3. Give the Designer the password “BillbOw”.

OR

Make up one of your own.

If you make up your own password, be sure it is a password you can remember. Otherwise, you will not be able to reenter this database.

4. Click OK.

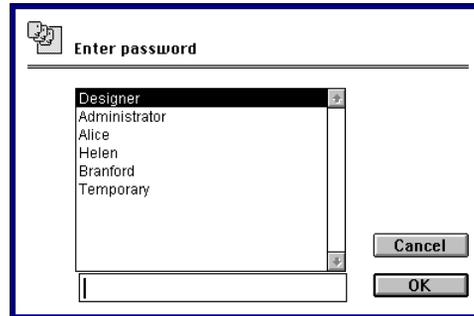
Giving the Designer a password activates the access system. You can now proceed to test the system.

5. Choose Quit from the File menu.

You must quit from 4th Dimension because the access system takes effect on startup.

6. Run 4th Dimension and open the PEOPLE17 database again.

This time, after the initial screen, 4th Dimension displays the Enter Password dialog box. The list contains all the user names you have created, plus the Designer and the Administrator.



You are going to enter the database as the Designer. Since Designer is already selected, you need only enter the Designer's password.

7. Type "BilbOw" as the password.

Remember that the password is case-sensitive. You must use a capital B and O.

As you type the password, 4th Dimension displays icons instead of characters. The icons are displayed instead of the characters so that no one can read your password when you type it.

8. Click OK.

4th Dimension opens in the Design environment. You can use your application by changing to the Runtime environment. Entering as the Administrator, by the way, starts in the User environment.

Notice that when the Enter Password dialog box appeared, you were able to select your name from a list of users. For security reasons, you would like to change this so that users must type both their name and their password.

9. Choose Preferences... from the File menu.

The Preferences dialog box appears.

10. Select the Enter User Name in Password Dialog check box.

This changes the password access system so that users are required to enter their name instead of simply selecting it from a list.

11. Click OK to close the Preferences dialog box and save your preferences.

12. Choose Quit from the File menu.

13. Run 4th Dimension again, this time typing “Helen” as the user name and “Gos6h” as the password.

14. Click OK in the Enter Password dialog box.

The database opens in the User environment. You could create a Startup procedure to make the database open directly in the Runtime environment.

15. Pull down the Use menu.

Notice that the **Design** menu command is dimmed, indicating that Helen cannot enter the Design environment.

16. Switch to the Runtime environment and choose several menu commands.

The menu commands that have been assigned to the General group can be used at this time since Helen belongs to this group. The menu commands that have been assigned to the Manager group cannot be used.

Feel free to play around with the access system, creating new user names and passwords, adding groups, assigning them to different parts of the system. You can even write startup procedures [such as **ALERT**(“Hello there Phil! Welcome to my personnel application!”)] to be displayed at the beginning of a user’s session.

THE NEXT STEP

The 4th Dimension access system is flexible, yet simple. Using this system, you can provide complete security for your application and for your information. Once you have created a few user names and groups, protecting different parts of your program is easy.

You maintain the access system by adding new users to the proper groups, deleting users who no longer need to be in a particular group, and by creating new groups for special purposes.

Even if you do not create a runtime application, you can protect your data by assigning the Designer a password. No one can open the database without knowing the password.

For more information about creating a password access system, refer to the *4th Dimension Design Reference*.

Congratulations! You have finished the tutorials in this manual and are now ready to apply your knowledge to your own databases. Have fun with 4th Dimension!

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