4th Dimension

Design Reference

4th Dimension
by
Laurent Ribardière

4th Dimension Design Reference

Version 6.0

Contents

Preface

4th Dimension is a powerful relational database application and development tool.

You can use 4th Dimension to manage your own data or develop custom applications for different kinds of database management tasks.

For example, you can:

- Create a database structure of tables and fields,
- Design forms for entering, modifying, and displaying records,
- Search and sort records,
- Create reports and labels from information in the database,
- Import and export data between 4th Dimension databases and other applications,
- Publish your database on the World Wide Web.

With 4th Dimension, you can enhance conventional data management tasks with the following features:

- The powerful Form Wizard that lets you create sophisticated forms and reports with only point-and-click operations,
- A password access system to protect sensitive data,
- The capability to create custom applications with your own menus, dialog boxes, toolbars, and buttons,
- A full-featured programming language that lets you incorporate routines written in other languages.

Novice users can quickly create databases and begin managing their data. Experienced users can customize their databases with

4th Dimension's development tools. More experienced developers can use 4th Dimension's powerful programming language to add sophisticated features and capabilities to their databases, including file transfer, communications, and World Wide Web capabilities.

When you create a custom database, you can use custom menus and dialog boxes, button palettes, toolbars, and multiple windows to enhance your databases and make users more productive.

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.

Discovering 4th Dimension leads you through the process of creating 4th Dimension databases. These examples provide hands-on experience to help you become familiar with the concepts and features of 4th Dimension and 4D Server.

The *User Reference* provides a description of the User environment — the built-in environment in which you can use databases to enter and manage data.

The *Design Reference* is a reference guide to the Design environment. It provides detailed descriptions of the operations that you use to build a database. You should use it in conjunction with the other volumes in your documentation package.

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

About This Manual

This manual describes the 4th Dimension Design environment. The Design environment is where you create a database before you enter data into records. This manual assumes that you are familiar with basic operations such as clicking, double-clicking, and choosing a menu command. To use the *Design Reference* effectively, you should do the following:

- Use *Discovering 4th Dimension* to work through the database examples as needed.
- Begin creating a database, referring to the *Design Reference* and *Language Reference* when you need to review a topic.
- Refer to the other manuals as needed.

Cross-Platform

This manual explains the use of 4th Dimension on both the Macintosh and Windows platforms. Although the concepts and functionality of both versions of 4th Dimension are nearly identical, the manual addresses any differences where necessary. Such differences include the graphical user interface and keyboard commands.

This manual contains graphics illustrating the Windows environment. If there is a substantial difference in the appearance of the Macintosh version of a window or dialog box, it is also presented.

Chapter Descriptions

This manual is divided into the following eleven chapters:

- Chapter 1, "4th Dimension Basics," introduces basic 4th Dimension operations such as starting 4th Dimension, setting database properties, using the Design environment menus, and using the 4th Dimension Explorer. It also describes the 4th Dimension environments and provides an overview of the Design environment editors.
- Chapter 2, "Designing a Database Structure," introduces the Structure editor and explains how to create tables, fields, and related tables.
- Chapter 3, "Creating Forms," introduces the Form Wizard and explains how to create forms.
- Chapter 4, "Form Editor Basics," explains how to use the Form editor to set form properties, create and modify form objects, and set object properties.

- Chapter 5, "Working with Fields and Active Objects," explains how to set and enforce business rules for fields and enterable objects and how to add custom interface elements such as drop-down lists, hierarchical lists, tab controls, and picture buttons.
- Chapter 6, "Output Displays and Reports," explains how to create a form for printing a report. It includes an explanation of how to create subtotals and other summary calculations using methods.
- Chapter 7, "Creating Methods," introduces the two 4th Dimension Method editors, the Listing editor and the Flowchart editor, and explains how to use them to create methods.
- Chapter 8, "Creating Custom Menus," explains how to use the Menu Bar editor to create custom menus. It also explains how to use connected menus to simplify menu management.
- Chapter 9, "Managing Password Access," explains how to use the Password Access editor to create a system that controls access to tables, table operations, forms, methods, menu commands, and plug-ins.
- Chapter 10, "Creating Lists," explains how to use the List editor to create lists.
- Chapter 11, "Working With Processes," introduces the concept of multi-tasking in 4th Dimension using processes. It explains how to start a process and how to use the Process List editor to view process information and control process execution.

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.

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

In addition, names of tables in a database are shown in brackets in the text to help distinguish them from the names of fields, forms, and other items. For instance, the Companies table is written as the [Companies] table.

Using Hypertext

If you are reading this manual on-line, you will find that the entries in the table of contents and the index are hypertext buttons. Click a table of contents entry or a page number in the index to jump to that page. Throughout the body of the manual, cross-references to other sections are also hypertext buttons. They are printed in blue. Click a cross-reference to jump to that section and use Adobe Acrobat's **Back** button to retrace your steps.

1 4th Dimension Basics

This chapter provides basic information about 4th Dimension and the Design environment. The chapter includes the following:

- Instructions for starting 4th Dimension,
- Instructions for managing 4th Dimension desktop files,
- Instructions for backing up 4th Dimension databases,
- A description of the three 4th Dimension environments,
- An overview of the Design environment editors you use to create a database,
- Instructions for performing standard 4th Dimension operations with menus, windows, and lists,
- Instructions for using the 4th Dimension Explorer,
- Instructions for setting database properties.

Unless otherwise noted, all instructions and explanations apply to both 4th Dimension and 4D Server.

Starting 4th Dimension

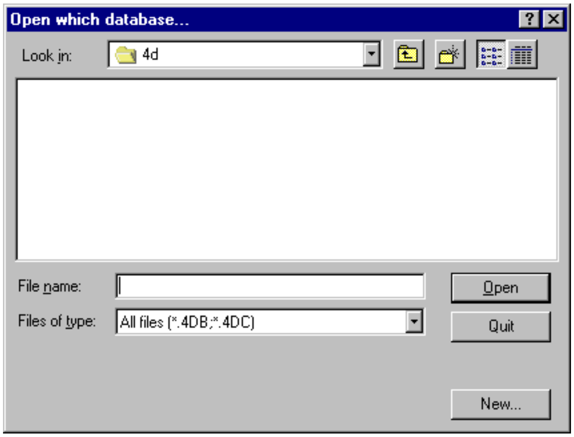
When you start 4th Dimension, you can either create a new database or open an existing one.

Creating a New Database

If you want to start 4th Dimension and create a new database, follow these steps:

1 **Double-click the 4th Dimension application icon.**
OR
Select the 4th Dimension application icon and choose Open from the File menu.

4th Dimension displays an open-file dialog box, as shown below.



Open which database...

Look in: 4d

File name:

Files of type: All files (*.4DB;*.4DC)

If no 4th Dimension databases exist in the same directory as the application, no filenames appear in the list of files and the **Open** button is disabled.

2 **Click the New button.**

4th Dimension displays a create-file dialog box so that you can enter the filename for the new database.

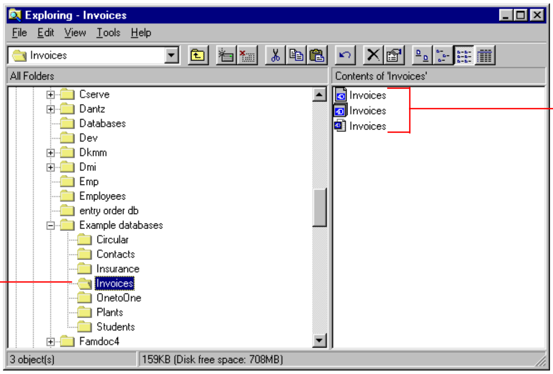
3 **Type the name of your database and click the Save button.**

You can use any filename that is valid for your operating system.

When you click the **Save** button, 4th Dimension creates a new database with the name you have given it.

4D Server For information about creating a new database using 4D Server, refer to the *4D Server Reference* manual.

Although you cannot see the operation, 4th Dimension creates a directory for the new database and also creates the desktop files it needs to maintain the database, as shown in the following illustration.



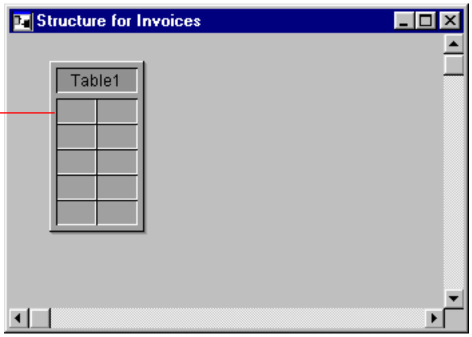
Windows files for the database

4th Dimension database directory

The name of the directory is your database name. 4th Dimension saves the desktop files in this directory.

4D Server These files are stored on the server machine when you first create the database using 4D Server. You then modify the database design by accessing the database from any client machine using 4D Client. When you open the database from the client machine, the Structure window shown in the figure below is displayed.

4th Dimension displays the Structure window for the new database.



4th Dimension table image

The Structure window displays the image of the first table. You can now begin adding fields to this table and creating additional tables. For detailed information about creating a database structure, see the section "Creating a Database Structure" on page 69.

Opening an Existing Database

If you are starting 4th Dimension and want to open an existing database, follow these steps:

- **Double-click the desired structure file (On Windows, the .4DB file).**

OR

1 **Double-click the 4th Dimension application icon.**

4th Dimension displays an open-file dialog box. The dialog box contains a file list from which you can choose the name of the database you want to open.

If the database is not in the same directory as the application, change directories (or disk drives) until the directory appears in the window.

2 **Select the database and click the Open button.**

If a password is required, you are prompted to enter your password. The database opens in the environment specified in the Database Properties dialog box. By default, the database opens in the Design environment.

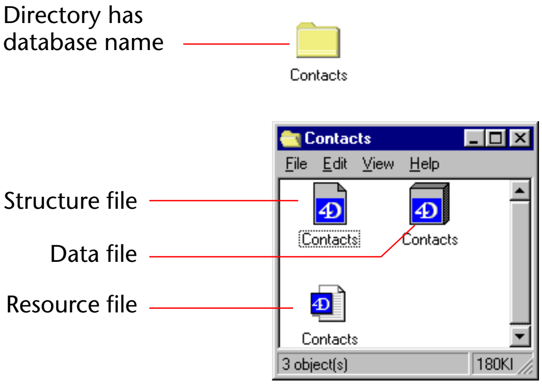
4D Server For information about opening a database using 4D Client, refer to the *4D Server Reference* manual.

4th Dimension Desktop Files

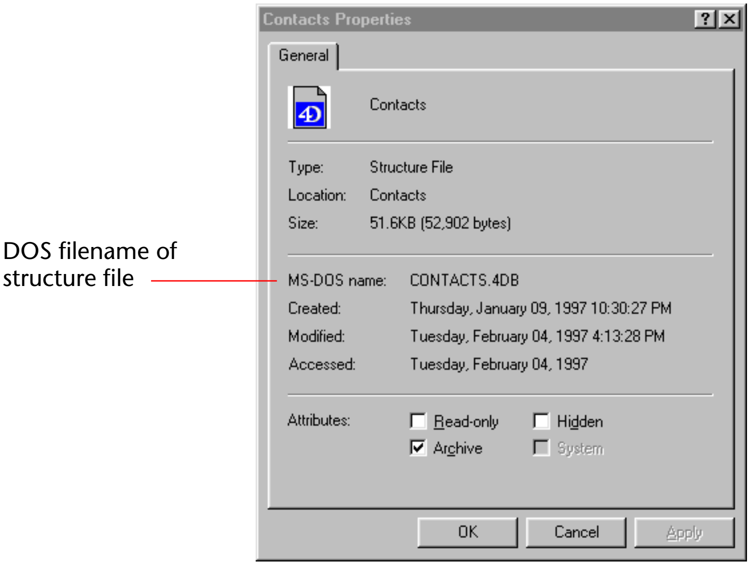
On Windows, 4th Dimension creates three files for each database: a structure file, a resource file, and a data file. They are initially placed together in a new directory when the database is created. You may place these files in different locations.

The structure file contains all the specifications for the database structure (tables, fields, field properties), forms, methods, menu bars, password access groups, pictures, and lists. The resource file contains the Macintosh resources associated with the database. The data file contains the data that has been entered into records and any record-dependent information such as indexes.

On Windows, the DOS name of each file has an extension that identifies whether it is a structure file, resource file, or a data file. The structure file has the same DOS name as the database, followed by “.4DB”. The resource file has the same DOS name as the database, followed by “.RSR”. The data file’s DOS name is the database name followed by “.4DD”.



The DOS filename appears when you display the file’s properties:



Contacts

Type: Structure File
Location: Contacts
Size: 51.6KB (52,902 bytes)

MS-DOS name: CONTACTS.4DB
Created: Thursday, January 09, 1997 10:30:27 PM
Modified: Tuesday, February 04, 1997 4:13:28 PM
Accessed: Tuesday, February 04, 1997

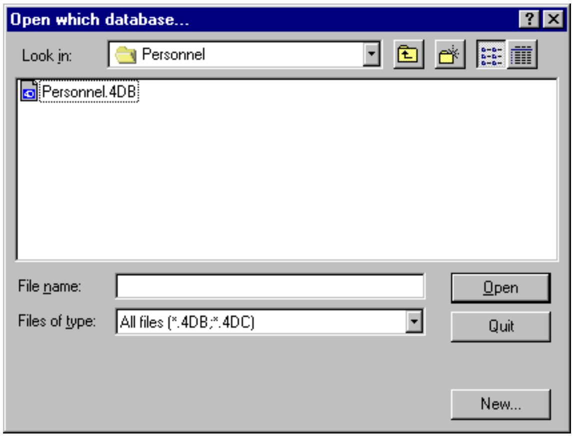
Attributes: □ Read-only □ Hidden ☑ Archive □ System

Note On Macintosh, the structure file does not have a suffix and contains both the design objects and the Macintosh resources. There is no .RSR file on the Macintosh. The data file has the suffix “.data”. The database folder has the same name as the structure file, followed by an “*ƒ*”.

In theory, you can use any data file with any structure file. The data file does not have to have the same name as the structure file, but the data contained in it must be compatible with the structure you want to use. That is, the data must fit into the fields; the number of fields in the structure must be at least as large as the number in the data file, and the data must agree with the field types.

The .4DB and .RSR files must have the same names and be in the same directory. Otherwise, you will not be able to open the database.

When you open a 4th Dimension structure file, the application opens the data file in the directory that has the same name as the structure file followed by ".4DD". If you change the name or location of the data file, the application will not be able to find the data file. An open-file dialog box will appear to allow you to select the data file you want to use or to create a new data file.



Open which database...

Look in: Personnel

Personnel.4DB

File name:

Files of type: All files (*.4DB;*.4DC)

You can force 4th Dimension to allow you to specify a new or different data file by holding down the **Alt** key (on Windows) or **Option** key (on Macintosh) while opening any database to display the Open Data File dialog box. If you choose to create a new data file, 4th Dimension opens the database using the original structure but with no records.

When you use a different data file or create a new data file, 4th Dimension records the absolute path to that data file. The path specifies the location of a file. For example, if the data file "CONTACTS.4DD" is located in the CONTACTS directory in the WORK directory on the C volume, the path to the data file would be:

C:\WORK\CONTACTS\CONTACTS.4DD

Once you have used the Open Data File dialog box to locate a data file for a particular database, 4th Dimension subsequently opens that same data file in the same path, unless it finds a data file with the same name as the structure file followed by .4DD located in the same directory as the structure file. If it does not find *StructureName*.4DD in the same directory as the structure file, it then attempts to locate the data file based on the path you gave it.

If you move or rename the data file again, you will need to locate it again.

Note On Macintosh, the same data file located on the hard disk named "Hard Disk" would be accessed by the path:
Hard Disk:Work:Contacts:Contacts.data.

Linking a Data File to a Structure File

In most cases you would not want a user to be able to open a different data file. One important reason for this is that if the structure file is incompatible with the data file, the data file will be reconfigured to match the structure file. To avoid this, use the WEDD resource to lock a data file to the appropriate structure file. Locking a data file with a structure file prevents the structure file from opening a data file with a different WEDD resource. It does not, however, prevent the structure file from opening a data file without a WEDD resource. For more information about the WEDD resource, refer to "Customizer Plus" in the *4th Dimension Utilities Guide*.

Making Backups

As you work on databases, it is essential to develop a consistent method of backing up your work. In rare cases, unexpected interruptions such as a power failure or computer failure can damage a database. Although 4th Dimension and 4D can often recover your database after such damage, having a backup is necessary insurance.

After working in the Design environment, you should make a copy of the structure file (the file with the suffix ".4DB") and the resource file (the file with the suffix ".RSR"). After entering or modifying data, you should make a copy of the data file (the file with the suffix ".4DD").

Note On Macintosh, the data file has the suffix ".data".

The data file changes as new records are added and old records are modified or deleted. If a database is used infrequently, with perhaps only a few changes each day, backing up the data file once a week or even less often is probably sufficient. If a database is used often, a more structured backup system is needed.

For example, you may want to use the following system:

► To make daily backups:

1 **Make a backup at the end of each day. Use five separate disks, tapes, or other media — one for each day.**

2 **At the end of the week, store the last backup permanently in a safe place.**

3 **Reuse the first four backups from the previous week for the next week's backups.**

A backup system like the one above ensures that you always have at least five backup copies available.

You can also use the 4th Dimension plug-in, 4D Backup, to protect your database against damage. With 4D Backup, you create a backup of your database and a special log file that keeps track of changes to your database since the backup was made. If necessary, 4D Backup can restore the database to its state at a point in time before the damage occurred.

For information about creating a log file, refer to the *4th Dimension User Reference*. For information about using 4D Backup, refer to the documentation that comes with the plug-in.

The Environments

You work with 4th Dimension in three environments. Each environment is a system of editors, toolbars, windows, and pull-down menus that allow you to perform database operations. The three environments are:

- Design,
- User,
- Custom Menus.

The Design Environment

You use the Design environment to write databases. You implement all aspects of your database design in the Design environment. You use the Design environment to create tables and fields, define relations among tables, create forms for data entry, display, and printing, implement a password access system, create custom menus, and attach methods to database objects.

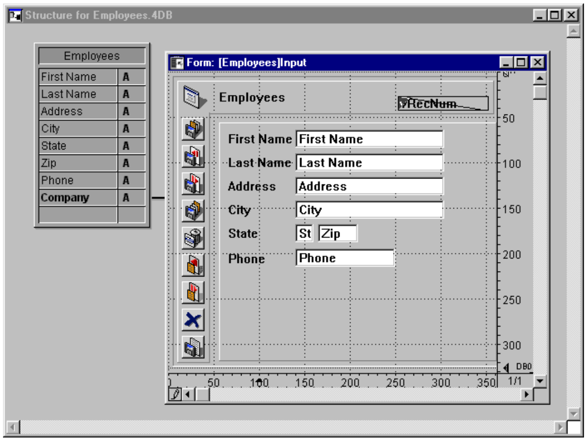
For example, you might want to keep track of information about each of the employees in a company. In the Design environment, you create an [Employees] table and add fields to that table to store employee data, such as the employee's name, job title, start date, and salary.

You might also add a [Departments] table that contains information about each department in the company. You could then create a *relation* between these tables that allows users to view or modify department information from an [Employees] record and view or modify the list of [Employees] in a department from a [Departments] record.

You can use the Design environment to do the following:

- Create tables and fields in which to store data,
- Establish relations between tables,
- Create forms for entering, displaying, and printing data,
- Create lists of choices that simplify and control data entry,
- Write methods to attach actions to database objects,
- Create custom menus that use methods to automate database operations,
- Create and manage multiple processes, allowing users to perform multiple database operations at the same time,
- Specify database properties such as the default startup environment and the number of minutes between each automatic save of data,
- Set up a system of passwords to control access to information.

The following illustration shows the Design environment being used to create a database. Complete information about each of the Design environment features is found in this manual.



From the Design environment, you can switch to the User environment to try out your database structure. To do this, choose **User** from the **Use** menu.

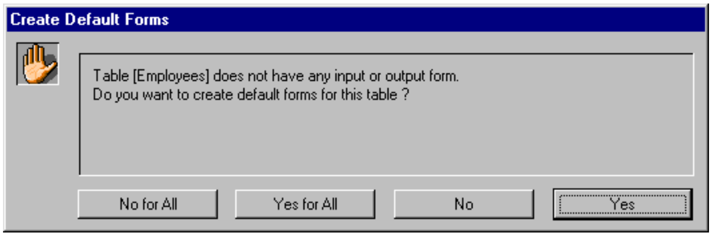
When you switch from the Design environment to the User environment, the Design environment is still running and the Structure window goes to the background. If you do not want to view the Structure window, choose **Exit Design Environment** from the **File** menu in the Design environment. Otherwise, the Design environment will run concurrently with the User or Custom Menus environments.

The User Environment

The User environment is a generic end-user database application that you can use to enter and manage data. You can use this environment for tasks such as entering data, searching and sorting records, importing and exporting data, and printing reports and mailing labels. If you are in the process of developing a custom database application, you can use the User environment to enter or import a few records or test your methods before the custom database is finished.

The User environment includes generic editors that you need to import, enter, and export records, search and sort, and create reports, labels, and graphs. Also, the 4th Dimension programming language includes commands that let you incorporate the User environment's editors into your custom applications.

You can take advantage of the User environment to get a simple database up and running very quickly. To use the User environment, you only need to create your required tables and fields in the Design environment. If you switch to the User environment before you create forms for all tables, 4th Dimension will ask you whether you would like it to create them automatically.



Create Default Forms

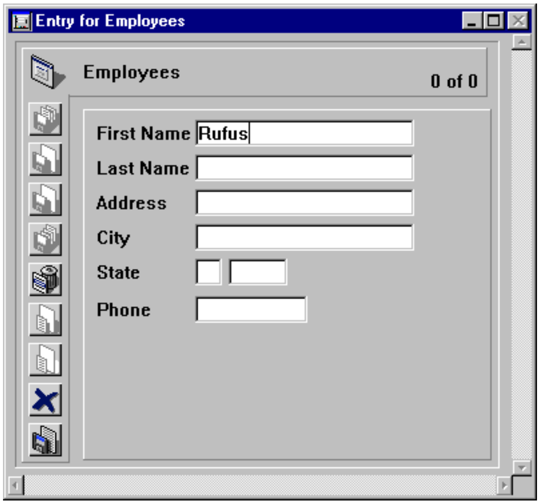
Table [Employees] does not have any input or output form.
Do you want to create default forms for this table ?

Since the User environment has its own editors for all standard database functions, you do not have to build any of these functions yourself.

The User environment allows you to do the following:

- Enter and modify data,
- View and print data,
- Search and sort records,
- Create reports and labels,
- Create graphs,
- Import and export data,
- Execute methods,
- Start processes,
- Publish a database on the World Wide Web,
- Work with any 4th Dimension plug-ins installed in the database.

The following illustration shows the User environment being used to enter a new record.



Entry for Employees

Employees

0 of 0

First Name Rufus

Last Name

Address

City

State

Phone

From the User environment, you can switch to the Custom Menus environment or return to the Design environment by choosing either **Custom Menus** or **Design** from the **Use** menu.

Note You must have created at least one custom menu in the Design environment to be able to enter the Custom Menus environment. If you have not created a custom menu, the **Custom Menus** command is disabled or missing.

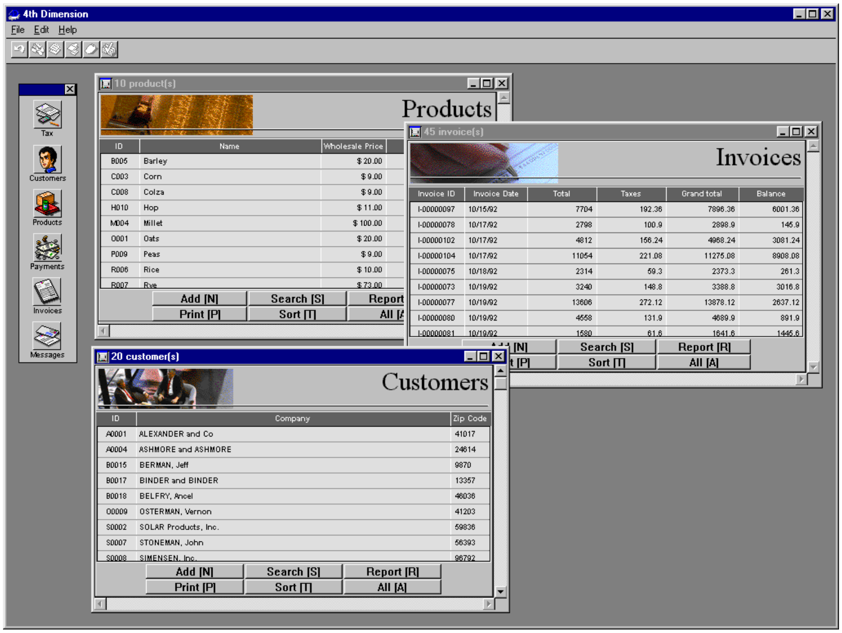
The Custom Menus Environment

The Custom Menus environment is the environment that you use to run a custom application — an application that uses 4th Dimension but has its own menu system and screen design. The application behaves exactly as if it were deployed and running on 4D Server and 4D Client. Use the Custom Menus environment to preview the operation of a custom application that will eventually be deployed.

In a custom application you control everything in the application, from the menus and forms it uses to the methods used to accept, process, and display data. You are responsible for providing menu items and methods that manage basic tasks such as data entry and modification, searching and sorting, and reporting. You can utilize any or all of the generic tools from the User environment or create your own screens and editors[1].

[1] You cannot use the User Environment's Import and Export data dialog boxes in custom applications.

The Custom Menus environment can be completely different for each application you create. From the user’s standpoint, the Custom Menus environment is a complete application for a specific kind of information management. The following illustration shows an invoicing application running in the Custom Menus environment. It uses a floating palette that gives the user access to each of the application’s modules. Each module runs in a separate process with its own menu system. The user can open as many modules as needed and move among them simply by clicking on their windows.



ID	Name	Wholesale Price
B005	Barley	$ 20.00
C003	Corn	$ 9.00
C008	Colza	$ 9.00
H010	Hop	$ 11.00
M004	Millet	$ 100.00
O001	Oats	$ 20.00
P009	Peas	$ 9.00
R006	Rice	$ 10.00
R007	Rye	$ 73.00

Invoice ID	Invoice Date	Total	Taxes	Grand total	Balance
I-00000097	10/15/92	7704	192.36	7896.36	6001.36
I-00000078	10/17/92	2798	100.9	2898.9	145.9
I-00000102	10/17/92	4812	156.24	4968.24	3081.24
I-00000104	10/17/92	11054	221.08	11275.08	8908.08
I-00000075	10/18/92	2314	59.3	2373.3	261.3
I-00000073	10/19/92	3240	148.8	3388.8	3016.8
I-00000077	10/19/92	13606	272.12	13878.12	2637.12
I-00000080	10/19/92	4558	131.9	4689.9	891.9
I-00000081	10/19/92	1580	61.6	1641.6	1445.6

ID	Company	Zip Code
A0001	ALEXANDER and Co	41017
A0004	ASHMORE and ASHMORE	24614
B0015	BERMAN, Jeff	9870
B0017	BINDER and BINDER	13357
B0018	BELFRY, Ancel	46036
O0009	OSTERMAN, Vernon	41203
S0002	SOLAR Products, Inc.	59836
S0007	STONEMAN, John	56393
S0008	SIMENSEN, Inc.	96792

From the Custom Menus environment, you can return to the User environment by choosing **Quit** from the **File** menu.

After entering the User environment, you can return to the Design environment by choosing **Design** from the **Use** menu.

Changing Environments

As you have seen, you can change from one environment to another using the **Use** menu. A check mark in the menu indicates which environment you are in.

With the **Use** menu, you can move between the Design and User environments at any time. Once you have created a custom menu, you can enter the Custom Menus environment from the User environment. If no custom menu exists, **Custom Menus** in the **Use** menu is disabled (or does not appear at all).

If you have windows from more than one environment open at the same time, you can switch between environments by clicking their windows. When you click a window, 4th Dimension brings the appropriate window to the front of the screen and makes it the active environment. In this manner, you can switch directly from the Custom Menus to the Design environment without having to enter the User environment first.

Design Environment Editors

You use 4th Dimension editors to create and modify the various components of your database design. Each editor is dedicated to one aspect of a design.

The Design environment contains the following editors:

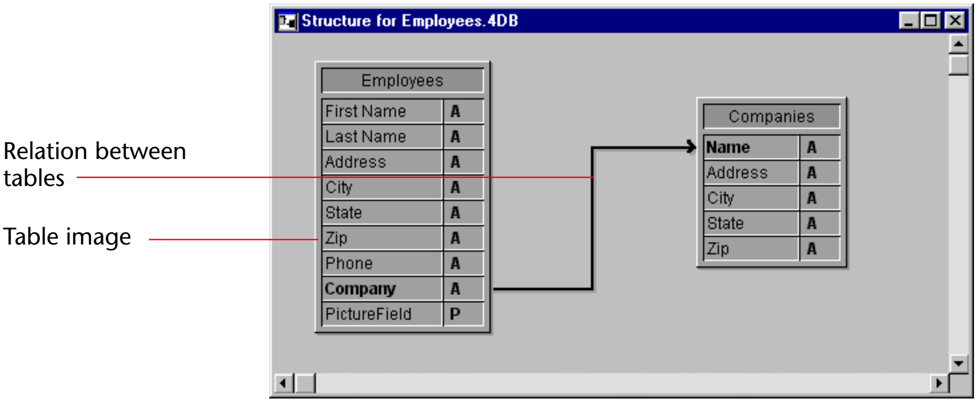
- Structure editor,
- Form editor,
- Method editors,
- Menu Bar editor,
- Password Access editor,
- List editor,
- Process list,
- Break list,
- Picture library.

Each editor has its own window with appropriate tools, menu commands, and toolbars.

The Structure Editor

The Structure editor is your starting point for all design operations. Use the Structure editor to create tables, fields, and relations between tables.

The Structure editor displays the images of the tables in the database and graphically shows the relations (if any) among the tables. The following illustration shows the Structure editor window.



Employees	
First Name	A
Last Name	A
Address	A
City	A
State	A
Zip	A
Phone	A
Company	A
PictureField	P

Companies	
Name	A
Address	A
City	A
State	A
Zip	A

Use the Structure editor to:

- Create tables and subtables in a database,
- Specify table properties,
- Create fields and subfields,
- Specify field types and properties,
- Relate tables and set relation properties,
- Establish access privileges to tables and fields,
- View the structure of a database.

Refer to Chapter 2 for more information about using the Structure editor.

The Form Editor

You use the Form Wizard to create forms and the Form editor to modify forms — both on-screen forms and printed reports. The Form editor lets you create sophisticated forms for managing data.

Use the Form editor to:

- Add fields and variables to a form,

- Add buttons, combo boxes, drop-down lists, tab controls, and other interface objects to forms,
- Specify display formats and entry filters for data displayed and entered on the form,
- Add methods that enforce business rules during data entry or manage interface elements,
- Add graphic objects to the form — including text, lines, rectangles, and ovals — or paste in pictures or graphics that were digitized or created in another application,
- Specify fonts and font styles for objects containing text,
- Specify drag and drop actions,
- Specify automatic resizing and repositioning actions,
- Establish access privileges for forms.

Refer to Chapter 3 and Chapter 4 for a detailed discussion of how to create a form with the Form Wizard and how to modify forms with the Form editor. Refer to Chapter 5 for information about using the Form editor to control data entry and add interface elements to data entry forms. Refer to Chapter 6 for information about using the Form editor to design output forms, reports, mail-merge documents, and forms for mailing labels.

The Method Editors

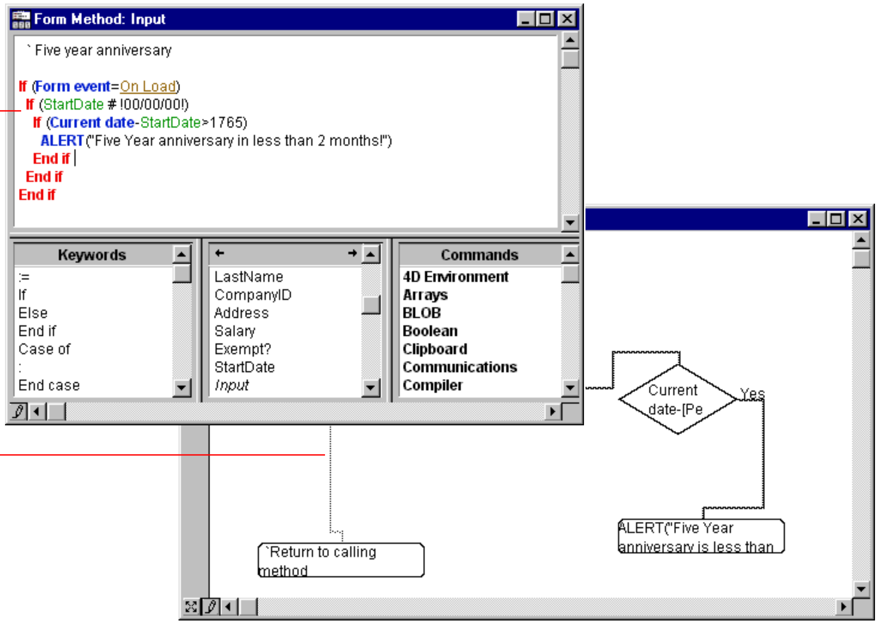
Methods are instructions that process data or perform actions. Methods can perform tasks such as calculating the values of fields or validating data as it is entered. Methods also perform actions such as displaying custom dialog boxes, starting processes, searching, sorting, displaying, or printing records.

4th Dimension provides a Pascal-like language for writing methods, two different Method editors, and a library of commands and functions.

The two Method editors are the Listing editor and the Flowchart editor. Either editor can be used to create methods. However, it is recommended that you use the Listing editor since only methods created with the Listing editor can be compiled. Chapter 7 describes the use of each editor.

Note Except in sections that compare the Listing and Flowchart editors, this documentation set uses the term “Method editor” to refer to the Listing editor.

The figure below shows both editors being used to create methods.



Listing editor

Flowchart editor

Form Method: Input

```
` Five year anniversary

If (Form event=On Load)
 If (StartDate # !00/00/00!)
  If (Current date-StartDate>1765)
   ALERT("Five Year anniversary in less than 2 months!")
  End if
 End if
End if
```

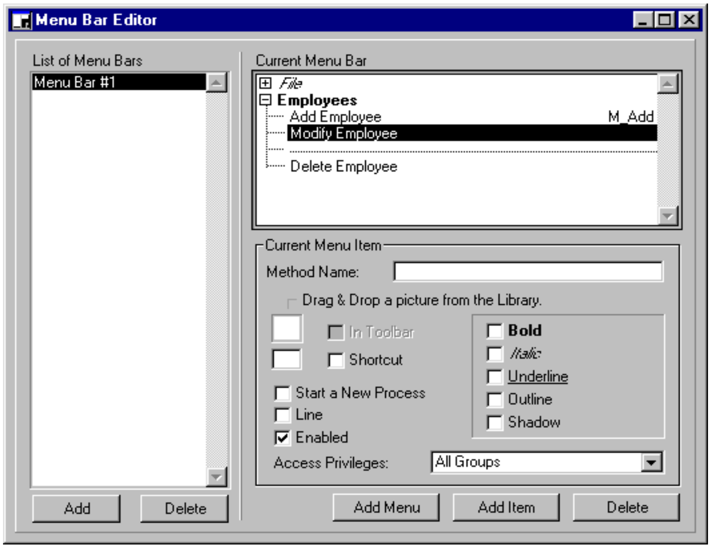
You can use either Method editor to:

- Write database methods that run automatically when particular work-session-related events occur,
- Write triggers that run automatically when particular database engine events occur,
- Create form methods that run automatically when a form is used,
- Create project methods that can be attached to custom menus, called by other methods, or executed by users in the User environment,
- Create object methods that are associated with fields or other form objects.

Refer to Chapter 7 for overviews of each type of method and the Method editors. See the *4th Dimension Language Reference* for detailed information about writing methods.

The Menu Bar Editor

When you create custom applications with 4th Dimension, you use the Menu Bar editor to create menu bars, menus, and menu commands. You can also attach menus to any form that you use for data entry. The figure below shows the Menu Bar editor being used to create a menu bar.



Menu Bar #1

⊞ *File*
⊟ **Employees**
Add Employee M_Add
Modify Employee
Delete Employee

Method Name:

Drag & Drop a picture from the Library.

☐ In Toolbar
☐ Shortcut
☐ Start a New Process
☐ Line
☑ Enabled

☐ **Bold**
☐ *Italic*
☐ Underline
☐ Outline
☐ Shadow

Access Privileges: All Groups

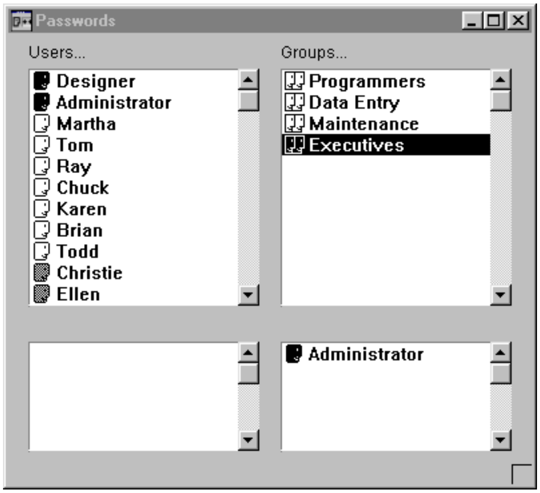
Use the Menu Bar editor to:

- Create menu bars,
- Create and modify custom menus and menu commands,
- Attach icons to menu commands to create a custom toolbar,
- Assign project methods to menu commands,
- Create connected menus that allow you to use the same menu definition in several menu bars,
- Preview the menus and menu bars as they will appear in the custom application,
- Include graphics for splash screens that display with menu bars,
- Establish access rights to menu commands,
- Set keyboard equivalents for menu commands,
- Enable or disable menu commands,
- Start a new process from a menu command.

Refer to Chapter 8 for a detailed discussion of adding custom menus and menu bars to your applications.

The Password Access Editor

4th Dimension lets you add passwords so that you can control access to aspects of your databases. The figure below shows the Password Access editor.



Designer
Administrator
Martha
Tom
Ray
Chuck
Karen
Brian
Todd
Christie
Ellen

Programmers
Data Entry
Maintenance
Executives

Administrator

Use the Password Access editor to:

- Create users and give them passwords,
- Allow designated people to add users and change user passwords,
- Place users in groups,
- Give groups access to parts of the database, such as the Design environment and particular forms, menu commands, methods, and plug-ins,
- Monitor database use by individual users.

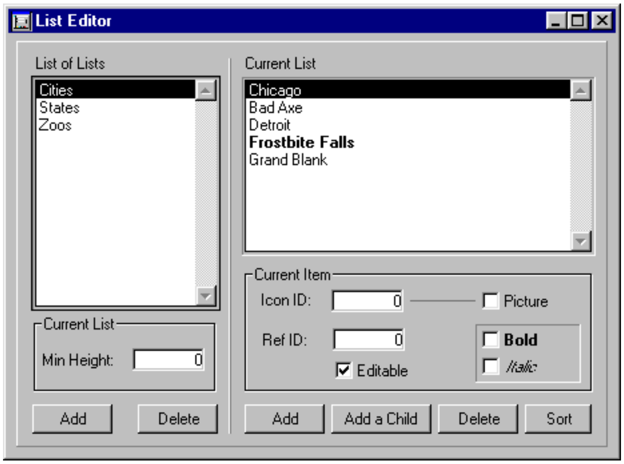
Refer to Chapter 9 for a detailed discussion of the Password Access editor.

The List Editor

You use the List editor to create lists. Lists can be used for several purposes in a database. Here are the most common uses:

- You can attach a list to a field. A user can select an entry from a choice list instead of typing it. With a choice list, you prevent entry of misspelled words and incorrect data.
- You can use a list to specify the items in pop-up menus, drop-down list boxes, combo boxes, scrollable areas, or tab controls.
- You can create hierarchical lists to populate hierarchical lists or pop-up menus.
- You can access the elements of a list in your methods or transfer the elements of an array to a list (and vice versa).

The figure below shows the List editor being used to create a list.



List Editor

List of Lists

Cities
States
Zoos

Current List

Chicago
Bad Axe
Detroit
Frostbite Falls
Grand Blank

Current List

Min Height: 0

Current Item

Icon ID: 0 □ Picture

Ref ID: 0 □ **Bold**

☑ Editable □ *Italic*

Use the List editor to do the following:

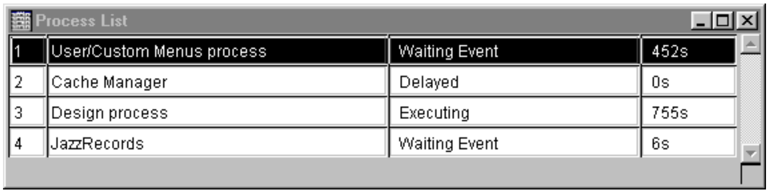
- Create choice lists,
- Add items to a choice list,
- Add small icons to list items,
- Delete choice lists or individual items in a list,
- Sort choices in a list,
- Make a choice list modifiable by the user.

Refer to Chapter 10 for a detailed discussion of lists.

The Process List Editor

You use the Process List editor to view and control processes. Processes are separate 4th Dimension tasks that control an aspect of database operations. The actions that a process takes depends upon the commands in the method connected to the process.

4th Dimension uses a few default processes (shown in the following illustration) to handle basic Design, User, and Custom Menu environment operations. If you publish your database as a Web server, 4th Dimension also creates a separate process to manage Web services. You can also create your own processes to create a multi-window or multi-tasking system. Any processes that you create are listed below any default 4th Dimension processes in the Process List editor window.



1	User/Custom Menus process	Waiting Event	452s
2	Cache Manager	Delayed	0s
3	Design process	Executing	755s
4	JazzRecords	Waiting Event	6s

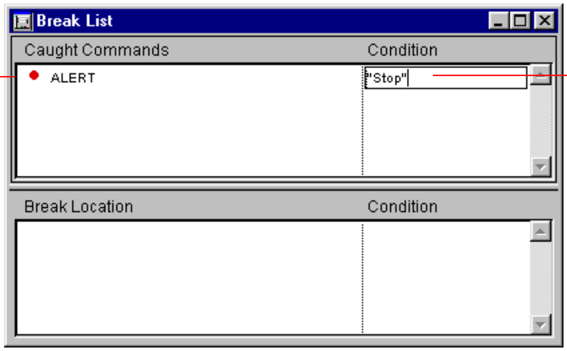
Use the Process List editor to do the following:

- View the list of current processes, the status of each process, and the amount of time each process has taken since it started,
- Control process execution by pausing, resuming, or aborting a process,
- Debug a process method by bringing up the Debug window,
- Hide or show a process,
- Bring a process to the front so that its window is the frontmost window in the User or Custom Menus environments.

Refer to Chapter 11 for a detailed discussion of processes.

Break List

The Break list lets you set breakpoints in your code to facilitate debugging. When an executing method encounters a breakpoint, execution stops and the 4th Dimension debugging window is displayed. The following illustration shows the break list with one breakpoint.



Command on which to break

Debug window appears only when condition is true

With the Break list, you can:

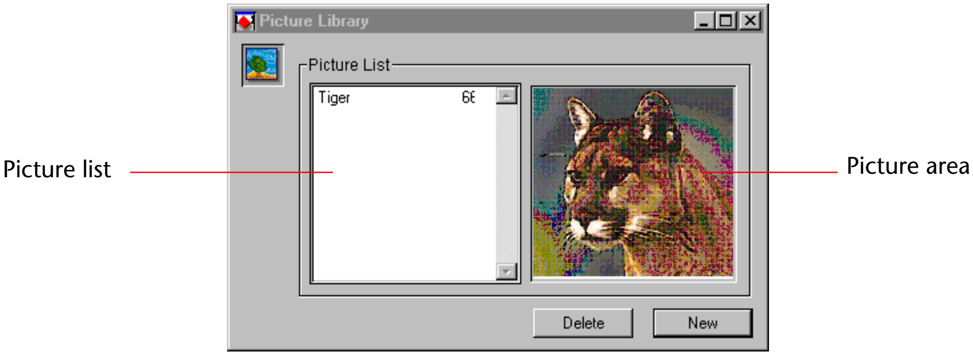
- Add a new breakpoint,
- Enable or disable a breakpoint,
- Delete breakpoints.

For a complete description of the Break list, see the *4th Dimension Language Reference*.

Picture Library

Use the Picture library to store graphics that you can use as design elements in forms, as toolbar or list icons, picture menu items, or picture buttons. With the Picture library, you can use a graphic in several places in your database but you need to store it in only one place. When you update an image in the Picture library, all references to the image are updated automatically. This feature can reduce the size of your Structure files and make changes to the database easier to manage.

The Picture library is shown in the following illustration.



▶ To add a picture to the Picture library:

1 **Copy the picture to the Clipboard.**

2 **Select the Picture library and click New.**

A new row is added to the picture list area named New Picture.

3 **Click on the picture area to select it.**

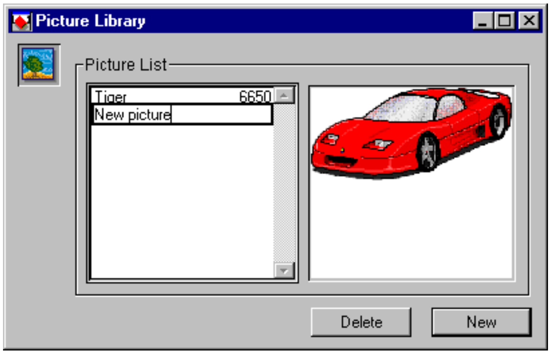
The picture area becomes black to indicate that it is selected.

4 **Paste the picture into the area.**

The new picture appears in the area. It may appear distorted because it is scaled to fit.

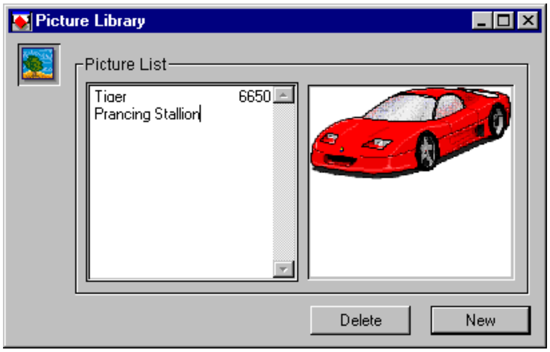
5 **To name the picture, hold down the Command key (on Macintosh) or the Control key (Windows) and click on the name area.**

The default name becomes editable.



6 **Replace the default name and press Tab or click anywhere outside the name area to deselect the text.**

The new picture is saved in the library with the name you chose.



Tiger 6650
Prancing Stallion

Picture Reference

The number to the right of the picture name is the reference number for the picture. You use this number to reference the picture when creating Picture menus, Picture buttons, and adding icons to items in lists or menu commands. For information, see the sections “Picture Menus” on page 307, “Buttons” on page 293, “Adding an Icon to a Menu Command” on page 427, and “Adding a Small Icon to an Item” on page 469.

Using a Picture in Forms and Toolbars

You can use a picture in a form simply by dragging it from the Picture library to the form in the Form editor. If you drag a picture to several forms, it is actually stored only once.

When you are designing a custom application, you can create a custom toolbar for each menu bar. You associate an icon to a menu command by associating a picture in the Picture library to each menu item. For more information, see the section “Adding an Icon to a Menu Command” on page 427.

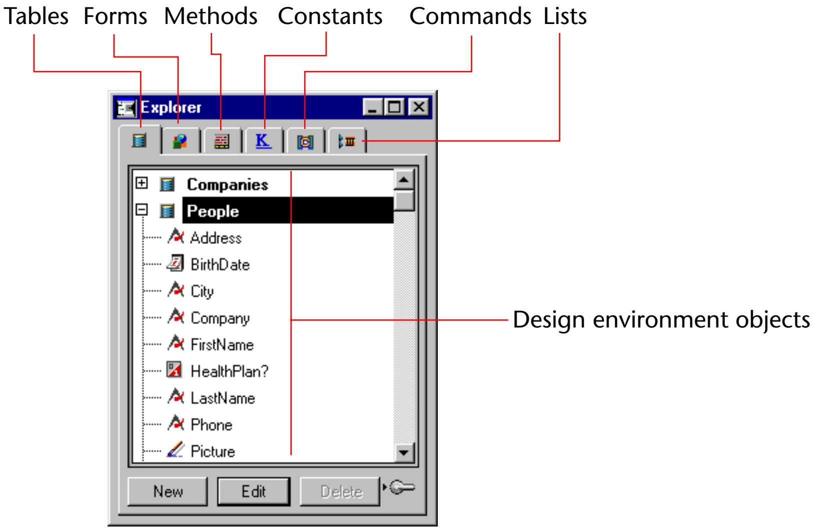
The Explorer

The Explorer is a window that gives you convenient access to tables and fields, forms, methods, constants, built-in 4th Dimension commands, and lists. You can display the Explorer at any time by:

- Choosing **Explorer** from the **Tools** menu,
- Pressing **Ctrl+Space bar** (on Windows) or **Command–Space bar** (on Macintosh).

Working with the Explorer

The tabs at the top of the Explorer let you access different groups of Design environment objects. The Explorer has separate pages for tables, forms, methods, constants, commands, and lists.



Displaying Different Explorer Pages

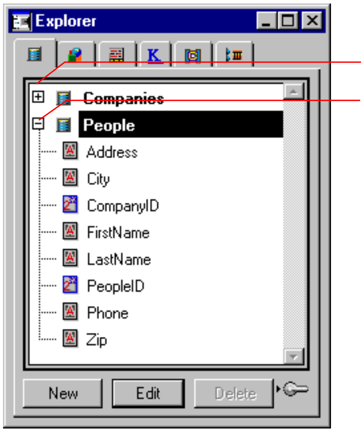
Click a tab to display either the Tables, Forms, Methods, Constants, Commands, or Lists page. When you display a particular page, the appropriate Design environment objects are listed in the Explorer window. On most pages, the objects are displayed as a hierarchical list.

Expanding and Collapsing Hierarchical Lists

You can expand an object in the list by clicking the plus sign (on Windows) or the triangle (on Macintosh) to its left or by highlighting the object and pressing the right arrow key. You collapse an expanded item clicking its downward-pointing triangle (on Macintosh) or minus sign (on Windows) or by highlighting it and pressing the left arrow key. You can also expand or collapse an object by double-clicking the object.

The following illustration shows both expanded and collapsed topics.

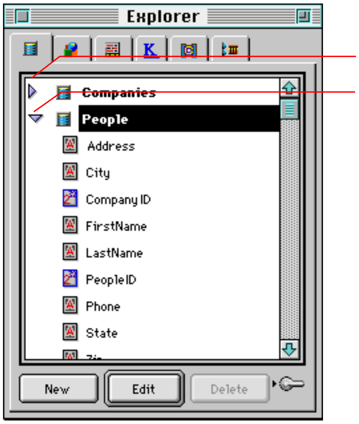
Windows



Click a plus sign to expand a topic

Click a minus sign to collapse a topic

Macintosh



Click an arrow to expand a topic

Click a downward pointing arrow to collapse a topic

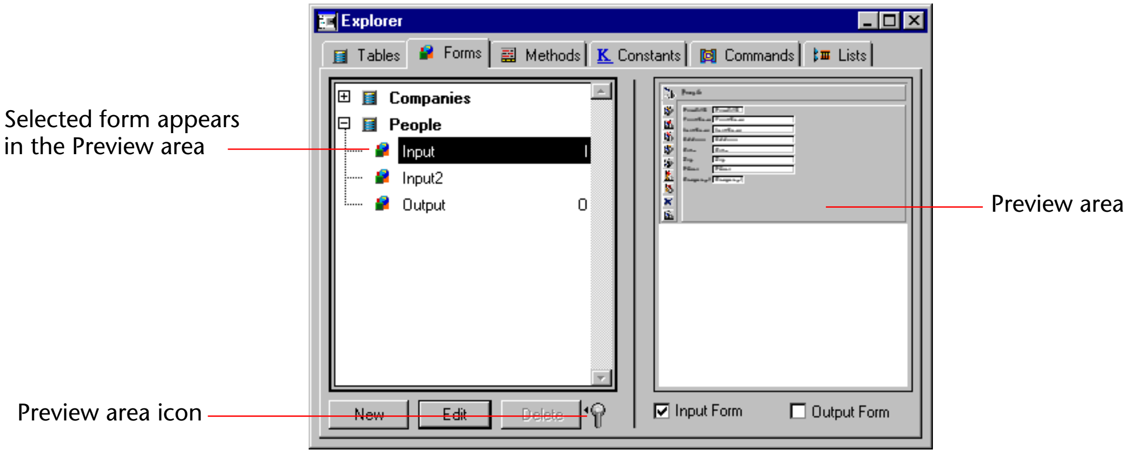
Renaming a Form or Method

If you need to rename a form or method, hold down the **Command** key (on Macintosh) or the **Ctrl** key (on Windows) and click the name of the form or method. The text becomes editable. Make your changes and then click anywhere outside the text area to save your changes.

The Explorer always lists forms and methods alphabetically. If the new name changes the sort order, 4th Dimension will resort the list when you click outside the entry area.

Displaying and Hiding the Preview area

You can display or hide the Explorer preview area by clicking the Preview area icon . The Preview window lets you preview table images, forms, and methods. It also provides additional information about commands and constants. The following illustration shows a form being previewed.



To hide the Preview area, click the Preview area icon again.

Note When the Preview area is shown, labels are added to the tabs. The labels automatically disappear when you hide the Preview area.

Resizing the Explorer Window

You can resize the Explorer by dragging the lower-right corner of the window.

Note If the Preview area is not displayed, you cannot display it by resizing the window. You must use the Preview area button.

If the Preview area is not displayed, you can only expand the Explorer window vertically. If the Preview area is displayed, you can expand the Explorer window both horizontally and vertically.

Using the Delete, New, and Edit buttons

The **Delete**, **New**, and **Edit** buttons below the list can be used to create, modify, or remove Design environment objects. These buttons are disabled automatically whenever an action is not possible. For more information on using these buttons, refer to the section on the appropriate Explorer page.

Using Drag and Drop

In many instances, you can use drag and drop to add a database object to an editor window. For example, you can add a field to a form by dragging a field name from the Tables page of the Explorer to an open form in the Form editor. When you are working with the Method editor, you can add the names of tables, forms, fields, project methods, constants, and commands to a method using drag and drop.

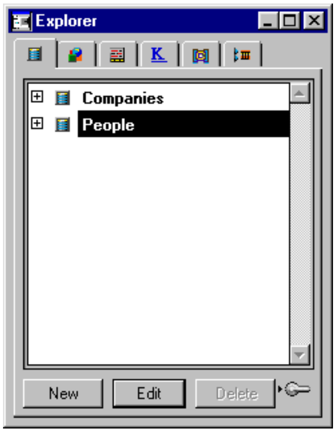
The sections that describe each Explorer page give specific information on the drag and drop options for that page.

Each Explorer page is described briefly in the following sections. More detailed information is presented in the chapter that deals with the appropriate topic.

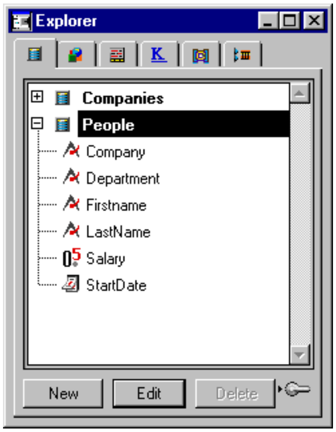
Tables Page

The Tables page lists all the tables and fields in the database. It can be used as an alternative to the Structure window to access table and field properties. When a table is expanded, the fields in the table are shown.

Collapsed View



Expanded View



The field type is indicated by an icon. Double-click a field name to open the Field Properties window. For more information on field properties, see “Creating Fields and Setting Field Properties” on page 80.

Using Drag and Drop

You can add a field to a form by dragging the field name from the Tables page onto the form. You can add either a table name or a field name to a method by dragging the name to the method. When you do so, the name appears using the correct syntax. For example, if you drag the field “First Name” in a [Customers] table, it appears in the Method editor as “[Customers]First Name”.

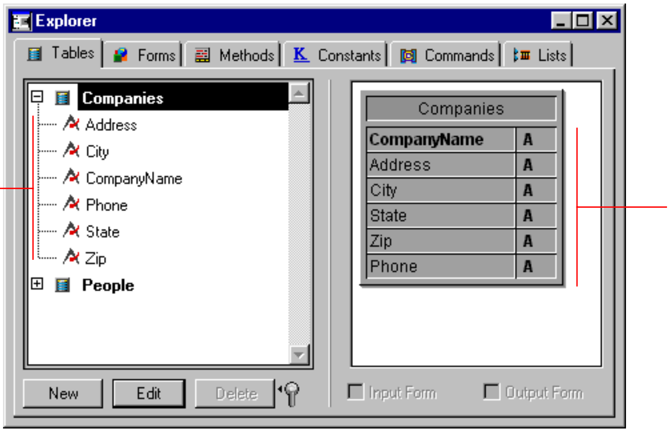
You can create a relation between two tables by dragging a field from the Tables page of the Explorer to the field that uniquely identifies the other table in the relation. For more information, see the section “Creating a Relation Between Tables” on page 110.

Viewing a Table Image

You can bring a a table image in the Structure editor window into view by double-clicking the table name in the Explorer. When you double-click a table name, 4th Dimension centers the table image you clicked in the Structure editor window. This feature is useful if you have a large structure and would otherwise need to scroll the Structure editor window to view a particular table image.

Previewing a Table Image

You can also preview the table image for a selected table. To preview a table image, highlight a table and click the Preview area icon (if the Preview area is not already displayed). The following illustration shows a table image being previewed.



Companies	
CompanyName	A
Address	A
City	A
State	A
Zip	A
Phone	A

Fields listed alphabetically

Fields listed in the order they were created

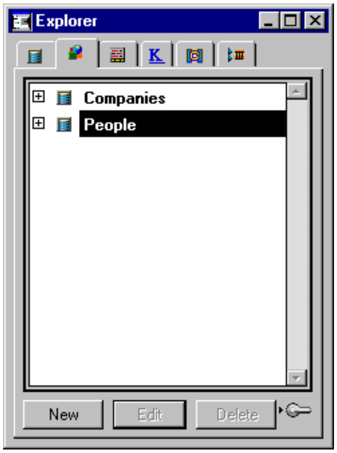
Setting Table Properties

You can view or modify a table's properties from the Tables page. Double-click a table or highlight a table in the hierarchical list and click **Edit**. The Table Properties window for the selected table appears. For information on setting table properties, see the section "Setting Table Properties" on page 74.

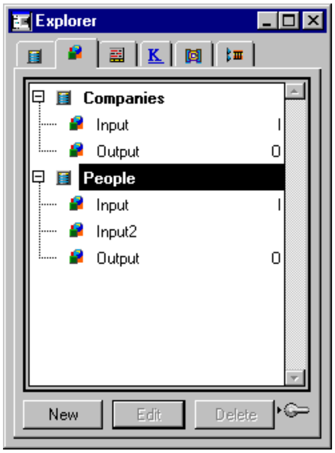
Forms Page

The Forms page lists all the tables and forms in the database. When a table is expanded, the forms for that table are shown:

Collapsed View



Expanded View



The Forms page is displayed automatically when you choose **Edit Form** from the **Design** menu.

Creating a New Form

To create a new form, highlight the desired table and click **New**. The Form Wizard appears, ready for you to create the new form. For more information about using the Form Wizard, see "Creating a New Form" on page 141.

Note You can also create a new form by choosing **New Form** from the **Design** menu.

Editing a Form

To edit an existing form, expand the table containing the form, highlight the desired form, and double-click the form or highlight it and click **Edit**. You edit forms using the Form editor. For information about editing forms, see Chapter 4, "Form Editor Basics" on page 171 and Chapter 5, "Working with Fields and Active Objects" on page 235.

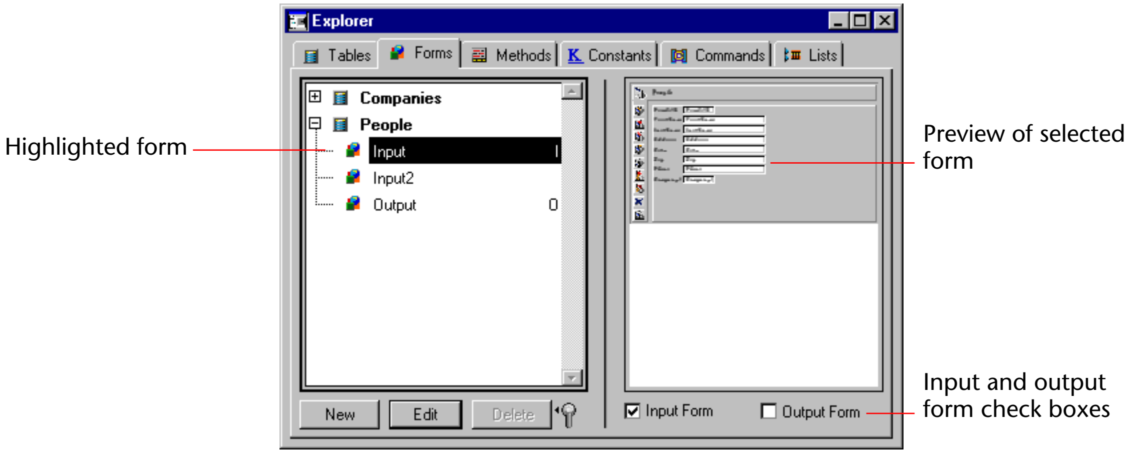
Deleting an Existing Form

To delete an existing form, highlight the undesired form and click **Delete**.

Note You cannot delete a form if it is either the current default input or output form for the table.

Previewing a Form

To add the preview area to the Explorer, click the Preview area icon to add a preview window to the Explorer. Highlight a Form to preview it:



If you highlight a Table name in the Forms page, a preview of the table image from the Structure editor will appear in the Preview area.

Designating a Form as the Current Input or Output Form

When the Preview area is shown, you can select the default input and output forms. The default forms are used when you switch to the User environment. Click the desired form name in the hierarchical list and then click either the Input Form or Output Form check box under the Preview area. For information on default input and output forms, see “Setting the Current Input and Output Forms” on page 168.

Using Drag and Drop

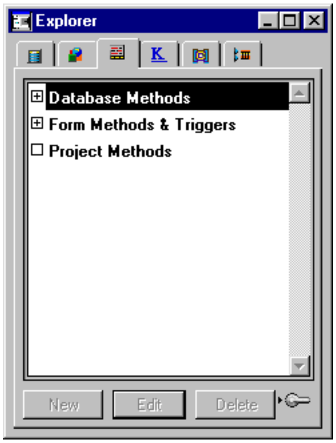
You can add a form name to a method by dragging. When you do so, it form name appears using the correct syntax. For example, if you drag the form “Input” in the [Companies] table, it will appear in a method as “[Companies]Input”.

You can add a subform to another form by dragging the name of the List form from the Forms page of the Explorer to the open form in the Form editor. You can add a Detail subform by holding down the **Shift** key and dragging the name of an input form from the Forms page of the Explorer to the subform area on the form. For more information, see the section “Adding a Subform to the Form” on page 324.

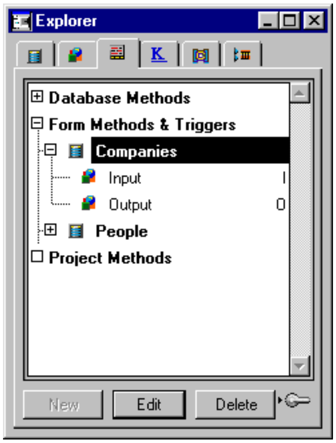
Methods Page

The Methods page lists the database, project, table (trigger), and form methods for the database. The three types of methods are grouped into the categories, Database, Project, and Trigger/Form.

Collapsed View



Expanded View



Creating a New Method

Here is a description of how to create each type of method.

- **Project method** To create a new Project method, highlight the Project Methods item in the hierarchical list and click the **New** button.

Note You can also create a new project method by choosing **New Method** from the **Design** menu.

- **Trigger** To create a Trigger, expand the Form Methods & Triggers element in the hierarchical list and then highlight the desired table. Click the **New** button.
- **Form method** To create a Form method, expand the Form Methods & Triggers element in the hierarchical list, expand the desired table, and then highlight the desired form. Click the **New** button.
- **Database method** You cannot create new Database methods. Instead, you add code to an existing blank Database methods. To do so, expand the Database method item and double-click the desired Database method or highlight it and click the **Edit** button.

If you have selected a default Method editor in the Database Properties[1] dialog box, a new untitled Method opens. If you have not selected a default Method editor, 4th Dimension first gives you a choice of editors.

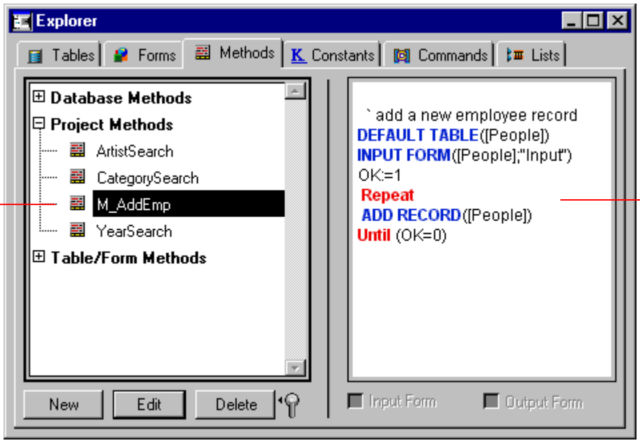
[1] For more information on selecting a default Method editor, see the section "General" on page 46.

Modifying a Method

To modify an existing method, double-click its name or highlight it and click **Edit**. The method opens in the Method editor.

Previewing a Method

Click the Preview area icon to display the Preview area and highlight the method you want to preview.



```
` add a new employee record
DEFAULT TABLE([People])
INPUT FORM([People];"Input")
OK:=1
Repeat
 ADD RECORD([People])
Until (OK=0)
```

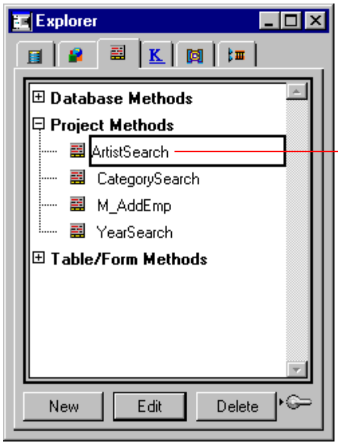
Highlighted method

Preview area

Once the Preview area is open, you can preview other methods by highlighting them in the hierarchical list.

Renaming a Method

Hold down the **Command** key (on Macintosh) or the **Ctrl** key (on Windows) and click a method name. The text becomes editable.



Editable method name

Enter the new name and click anywhere outside the entry area to save the new name. 4th Dimension then resorts the list of methods alphabetically.

Using Drag and Drop

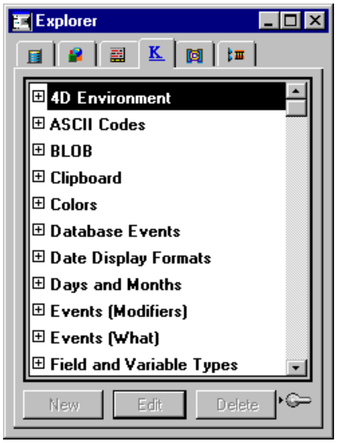
When you are writing a method, you can add the name of another project method using drag and drop. Highlight the desired method name in the Explorer and drag it to the Method editor window.

When you are creating custom menus, you need to assign a project method to each menu command. You can do so by dragging a project method name from the Explorer to the Menu Bar editor. For more information, see the section "Assigning Methods to Menu Commands" on page 422.

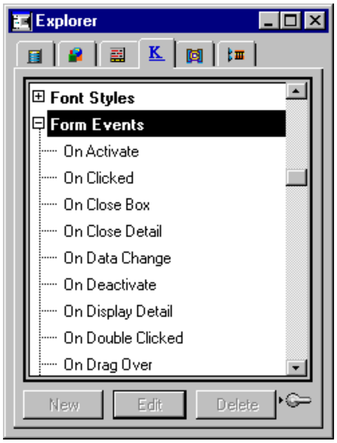
Constants Page

The Constants page contains a hierarchical list of all the constants that can be used in methods.

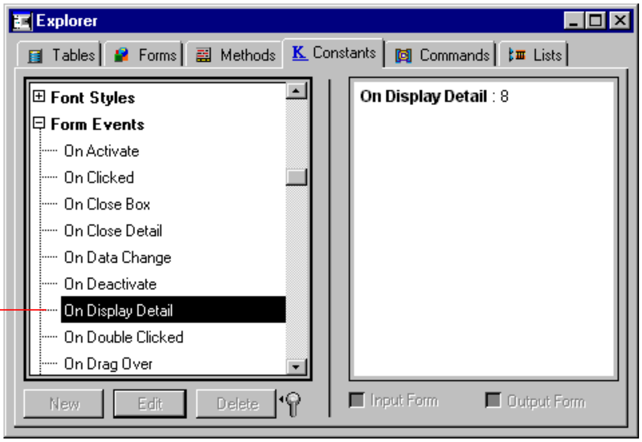
Collapsed View



Expanded View



If the preview area is displayed, it shows the value of the highlighted constant.



Highlighted constant

For information on using constants in methods, see the section “Constants” in the *4th Dimension Language Reference*.

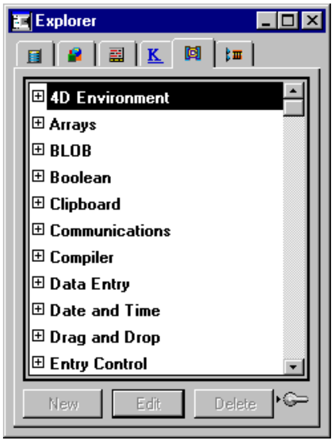
Using Drag and Drop

You frequently use constants in your methods. Instead of typing the constant you can add a constant to a method from the Explorer. Highlight the desired constant and drag it to the Method editor window. When the Method editor parses the line of code, the constant will be underlined.

Commands Page

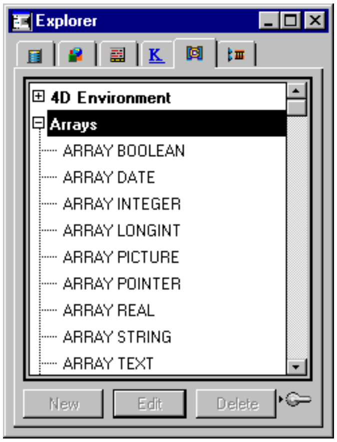
The Commands page displays all built-in 4th Dimension commands, grouped by category. It is equivalent to the list of commands shown in the bottom-right scrollable area of the Method editor.

Collapsed View



⊞ 4D Environment
⊞ Arrays
⊞ BLOB
⊞ Boolean
⊞ Clipboard
⊞ Communications
⊞ Compiler
⊞ Data Entry
⊞ Date and Time
⊞ Drag and Drop
⊞ Entry Control

Expanded View



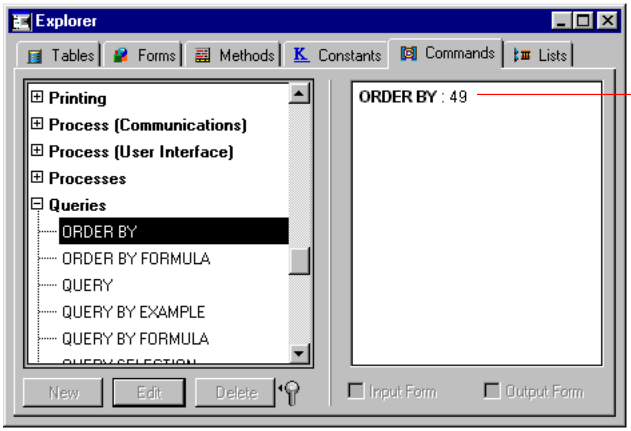
⊞ 4D Environment
⊟ Arrays
ARRAY BOOLEAN
ARRAY DATE
ARRAY INTEGER
ARRAY LONGINT
ARRAY PICTURE
ARRAY POINTER
ARRAY REAL
ARRAY STRING
ARRAY TEXT

Using Drag and Drop

Using drag and drop, you can add a command to a method. Highlight the desired command and drag it to the Method editor window.

Displaying Command Tokens

If the Preview area is displayed, it displays the token belonging to the selected command:

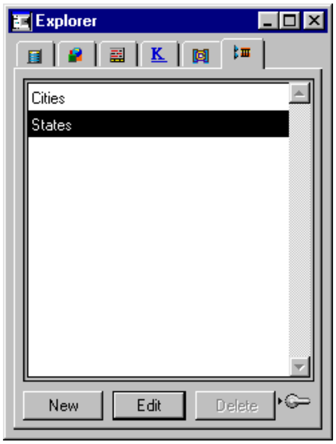


Token

The token is used as a parameter to the Command name function. Command name returns the text of the command whose token you pass to it. Command name is useful in databases that require localization. For more information on the role of Command name, see the description of this command in the *4th Dimension Language Reference*.

Lists Page

The Lists page lists all the lists that you have created using the Lists editor. There is no expanded view of lists.



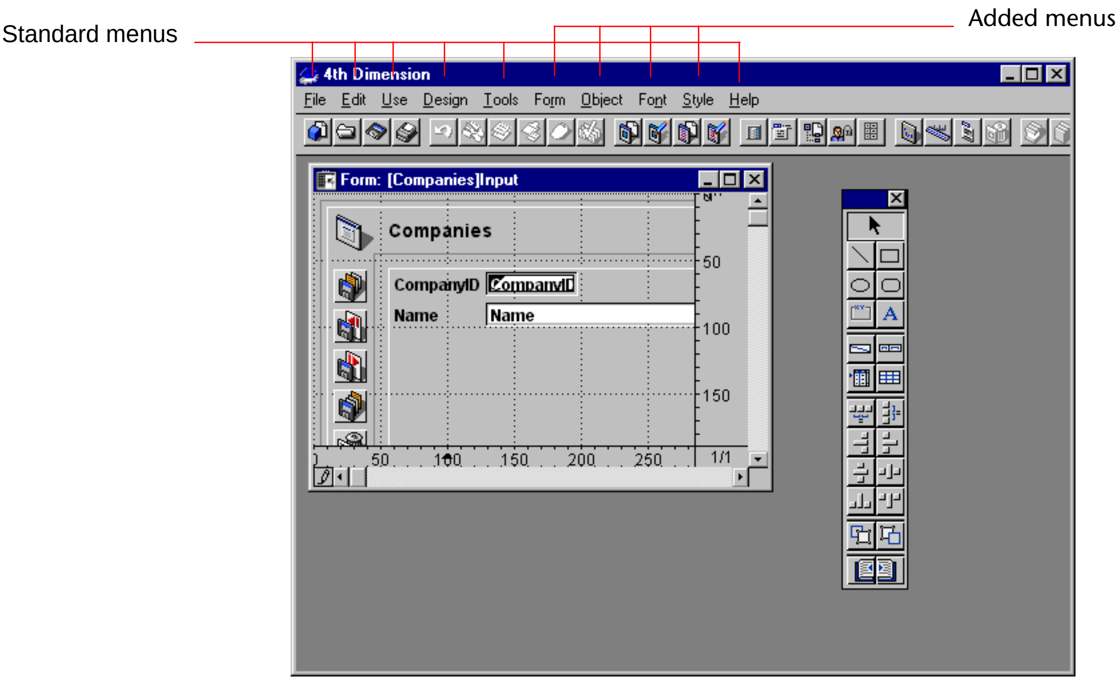
You can modify an existing list or create a new list. To modify a list, click the name of the list; to create a new list, click **New**.

The Design Environment Interface

In the Design environment, you interact with 4th Dimension using its menus, toolbars, and windows. This section describes how to use these interface elements.

4th Dimension Menus

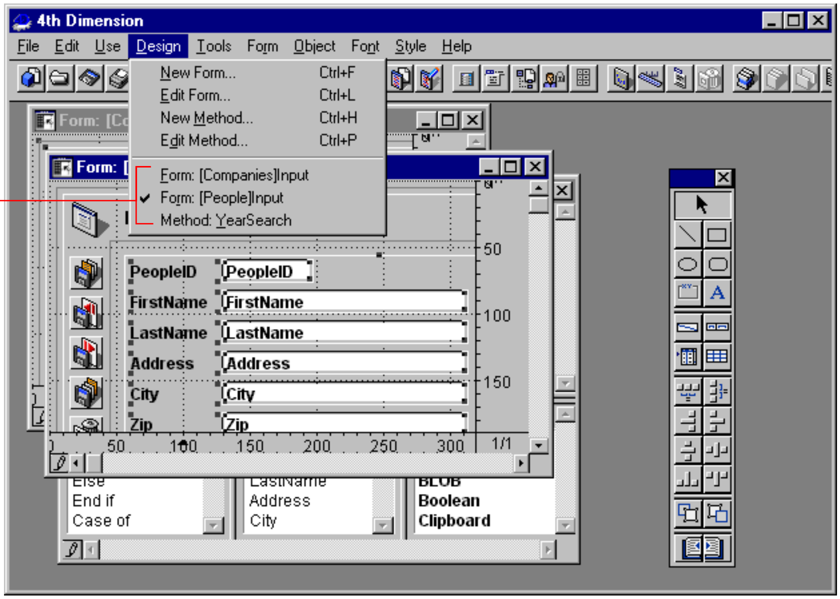
The five leftmost Design environment menus are always displayed no matter which editor you are using. Additional menus are added to the right side of the menu bar for each editor. The added menus provide menu commands for the editor you are using. The figure below shows the additional menus added when the Form editor is open.



When several editor windows are open, the menus belonging to the frontmost editor window appear. You choose menu commands from these menus as you would in any application. For complete instructions for choosing from a menu, see the documentation that came with your computer.

4th Dimension Editor Windows

Each 4th Dimension editor is displayed in a separate window. There may be several editor windows open at once. You can have more than one editor open at one time and some of the editors can display several windows at the same time. A list of open windows is displayed at the bottom of the **Design** menu.



Open windows

You can move between the open windows as you work. Only one editor window is active at any time. The active editor determines which menus are added to the right of the menu bar.

To make a window active, you can click anywhere in the window or you can choose the window's name from the **Design** menu. You can move a window anywhere on the screen by dragging its title bar.

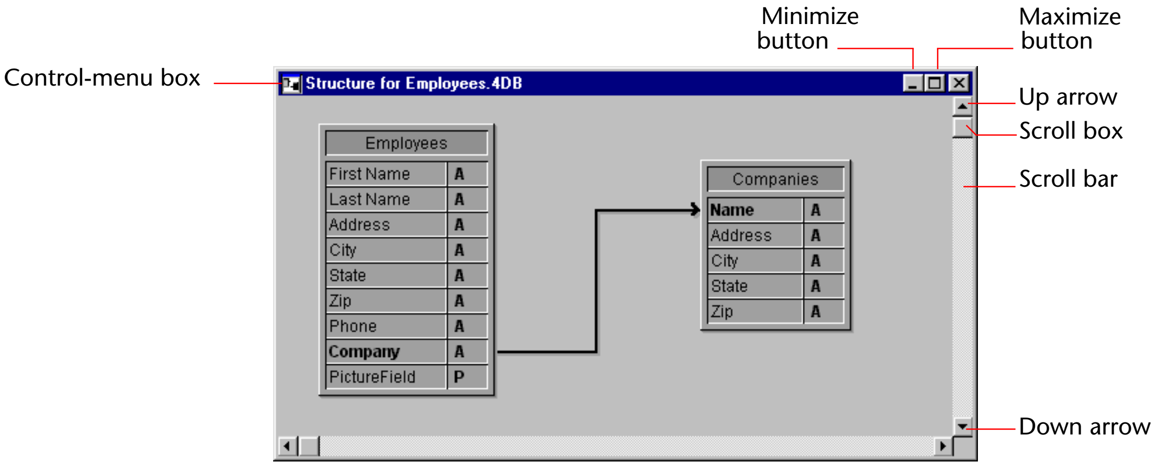
You can expand the window to full-screen size by clicking the maximize box in the upper-right corner of the window. You can make the window any size you want by dragging the Size box in the lower-right corner of the window. On Windows, you can drag the edge of a window to resize it.

You close a window by clicking the Close box (on Macintosh) or double-clicking the Control-menu box in the upper left corner of the window (on Windows), or by choosing **Close *EditorName*** from the **File** menu.

To close all the open windows of the Design environment, choose **Exit Design Environment** from the **File** menu.

Scrolling

As you build a database, the contents of some of the editors can become so large that it is difficult to view the entire structure or form.



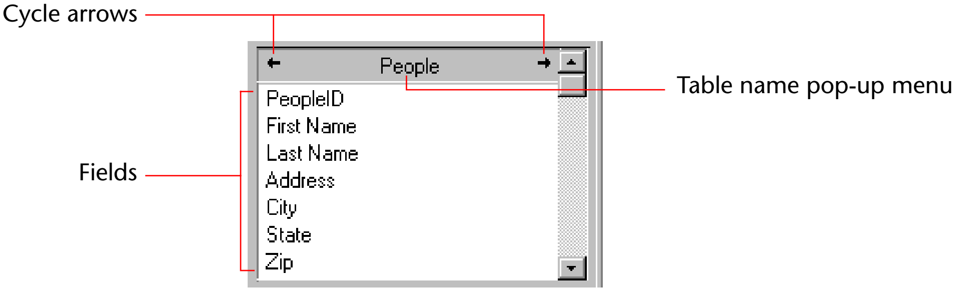
Employees	
First Name	A
Last Name	A
Address	A
City	A
State	A
Zip	A
Phone	A
Company	A
PictureField	P

Companies	
Name	A
Address	A
City	A
State	A
Zip	A

You scroll the window with the scroll bars as you would in any application.

Displaying a Different Table

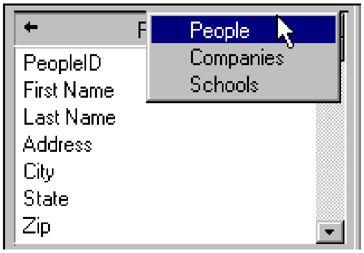
In some editors, such as the Method editor, 4th Dimension allows you to change which table is displayed in two ways: by clicking either of the cycle arrows on the table name bar or by choosing a table from a pop-up menu. The following figure shows the list of fields in the Method editor. You can use either the cycle arrows or the table pop-up menu to display the fields from a different table.



PeopleID
First Name
Last Name
Address
City
State
Zip

Click either arrow to cycle through the tables in the database. 4th Dimension displays the tables in the order in which they were created. When you cycle through all the tables, the first table is displayed again.

You can also change tables using the pop-up menu. If you click on the table name between the cycle arrows and hold the mouse button down for a moment, a pop-up menu of all the tables is displayed.



You can then choose one of the table names to switch to that table.

The Design Environment Menus

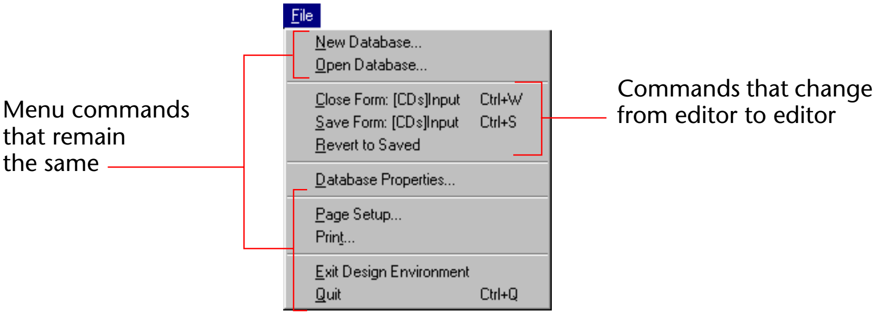
The Design environment has five permanent menus:

- File
- Edit
- Use
- Design
- Tools

Additional menus are active for different editors.

The File Menu

The **File** menu provides standard file operations.


File
New Database...
Open Database...
Close Form: [CDs]Input Ctrl+W
Save Form: [CDs]Input Ctrl+S
Revert to Saved
Database Properties...
Page Setup...
Print...
Exit Design Environment
Quit Ctrl+Q
Menu commands that remain the same
Commands that change from editor to editor

These File menu commands remain the same for every editor:

- **New Database** You can create a new database at any time. 4th Dimension automatically saves changes to the current database before opening the new database.

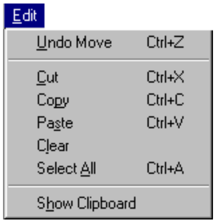
- **Open Database** You can open an existing database at any time. 4th Dimension automatically saves changes to the current database before opening the next database.
- **Database Properties** You can set database properties at any time. For complete information, see the section "Setting Database Properties" on page 45.
- **Page Setup** You can set the specifications for printing at any time. Page setup information is stored with each form.
- **Print** You can print the contents of any editor window at any time.
- **Exit Design Environment** You can put away the Design environment at any time. Exit Design Environment puts away all the Design environment windows and switches to the User environment. From the User environment, you can return to the Design environment by choosing **Design** from the **User** menu.
- **Quit** You can quit 4th Dimension at any time. 4th Dimension automatically saves your work before quitting.

These **File** menu commands change depending on the active editor:

- **Close *EditorName*** You can close editor windows at any time. 4th Dimension saves the contents of each window before closing it. If the Structure window is frontmost, choosing **Close Structure** closes the Structure window. If there are no other Design environment windows open, it also switches to the User environment. If there are other Design environment windows open, it only closes the Structure window. To close all Design environment windows, use Exit Design Environment.
- **Save *EditorName*** You can save the contents of an editor's window at any time without closing the window. 4th Dimension automatically saves the contents of an editor when you close the window, change to a new environment, or exit the application.
- **Revert to Saved** You can revert to the last saved version of a form or method. This menu command replaces the contents of the Forms or Method editor with the last version saved.

The Edit Menu

The **Edit** menu provides standard editing operations.

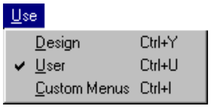


These are the menu commands provided by the **Edit** menu:

- **Undo** Use **Undo** to go back one step while working with an editor. This menu command is useful when you make a mistake and want to redo something.
- **Cut, Copy, Paste** You can select something on the screen and either cut or copy it. In either case, a copy of the selected object is placed on the Clipboard. You can then paste the object into a new location in the same window or in another window.
- **Clear** Use **Clear** to erase a selected object. No copy is placed on the Clipboard.
- **Select All** Use **Select All** to select every object in the current editor. For example, use **Select All** before adjusting all the elements of a form.
- **Show Clipboard** You can view the current contents of the Clipboard at any time. Sometimes you will want to view the Clipboard prior to pasting its contents.

The Use Menu

The Use menu lets you switch environments.

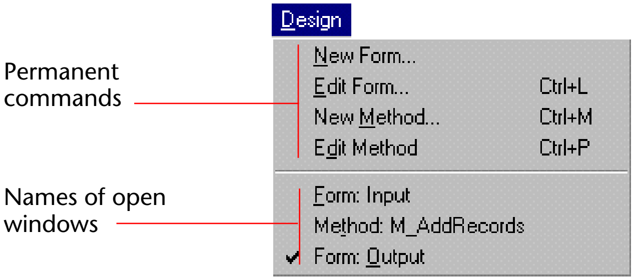


A check mark appears to the left of the current environment. To switch to another environment, choose the environment from the Use menu.

The Custom Menus environment is not available until you create at least one custom menu.

The Design Menu

The Design menu has a divider that separates the permanent menu commands from the list of open windows:



The four permanent commands let you create or edit forms and methods:

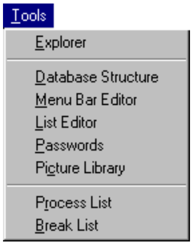
- **New Form** Opens the Form Wizard, ready for you to create a new form. For information about creating new forms with the Form Wizard, see “Creating a New Form” on page 141.
- **Edit Form** Opens the Forms page of the Explorer, ready for you select a form to open. For information about opening forms, see the section “Forms Page” on page 30.
- **New Method** Opens a blank Method editor window, ready for you to create a new project method[1]. For information on creating a new method, see the section “Using the Listing Editor” on page 395.
- **Edit Method** Opens the Methods page of the Explorer, ready for you to open an existing method. For information on opening methods, see the section “Methods Page” on page 32.

The menu commands below the divider bring a Design environment window to the front. This list depends on the number and names of the open Design environment windows. A check mark indicates the active window.

[1] If you have not chosen a default Method editor, the New Method command displays a dialog box in which you can choose a Method editor and name the method. For information on choosing a default Method editor, see the section “Design Environment” on page 51.

The Tools menu

The Tools menu provides access to the Explorer and the various Design environment editors:



The Explorer menu command displays the Explorer. For information about the Explorer, see the section "The Explorer" on page 24.

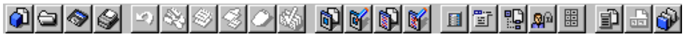
The middle set of menu commands opens the corresponding editor windows.The bottom set of menu commands opens the Process list and the Break list. For information on each editor, see the following chapters or sections:

Editor	Reference
Structure editor	Chapter 2
Menu Bar editor	Chapter 8
List editor	Chapter 10
Password editor	Chapter 9
Picture Library	"Picture Library" on page 22
Process List	Chapter 11
Break List	See the *4th Dimension Language Reference*

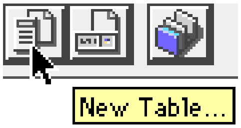
The Toolbar

The Design environment displays a toolbar just below the standard menubar. The toolbar provides convenient access to all the Design environment menu commands.

The Toolbar contains buttons for all the standard menu items. The buttons are arranged in groups, with each group corresponding to a menu. Each Design environment editor has its own toolbar; the toolbar buttons correspond to the editor's menu commands. Toolbar buttons are grouped by menu and appear in the same left-to-right order as the menus.When you are working with an editor window that adds commands to the standard Design environment menu bar, the corresponding buttons appear in the toolbar to the right of the standard toolbar buttons. The following illustration shows a Design environment toolbar:



To obtain help for a button, position the pointer over a button. The following illustration shows help for a Structure menu button.



If you don't want to use the toolbar, you can hide it by deselecting the Show Toolbar database property in the General Page of Database Properties. For more information, see "General" on page 46.

When you create custom menus, you can create custom toolbars and add buttons corresponding to your custom menu items. For information on creating custom toolbars, see the section "Adding an Icon to a Menu Command" on page 427.

Setting Database Properties

You can set database properties in the Design environment and the settings apply only to the current database — not all databases opened by that copy of 4th Dimension.

The specifications that you select in the Database Properties dialog box take effect immediately except for those that cannot take effect until the database is opened again (such as Startup environment).

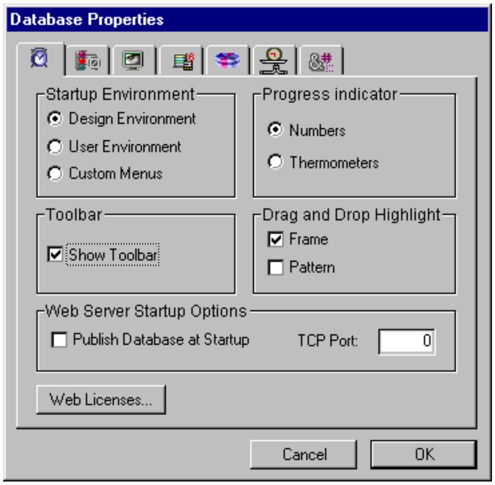
4D Server Object locking occurs when two or more users try to modify the settings in the Database Properties dialog box at the same time. Only one user can use the Database Properties dialog box at a time. For more information about object locking, refer to the section "4D Server Considerations" on page 61.

The Database Properties dialog box has six pages: General, Data Control and Access, User Interface, Design Environment, Tune Up, and Connections. Use the tabs to move from page to page.

General

General properties allow you to specify the environment that is displayed when the database is opened, the default Method editor, Design environment printing, and turn on Web publishing using a specified TCP port.

The General page is shown in the following illustration:



Database Properties

Startup Environment
● Design Environment
○ User Environment
○ Custom Menus

Progress indicator
● Numbers
○ Thermometers

Toolbar
☑ Show Toolbar

Drag and Drop Highlight
☑ Frame
☐ Pattern

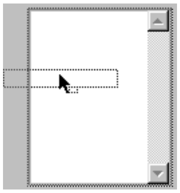
Web Server Startup Options
☐ Publish Database at Startup
TCP Port: 0

- **Startup Environment** Select the environment in which you want the database to open. By default, 4th Dimension opens the database in the Design environment, unless the database has been compiled or your user password prevents you from accessing the database in the Design environment. For information about the password access system, see Chapter 9.

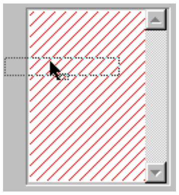
- **Progress Indicator** Select a progress indicator. You can tell 4th Dimension to display the progress of an operation (such as sorting or indexing) through a numeric display or a graphic thermometer. The thermometer is slower, but easier to read. The numbers are faster, but they do not always refer to the number of records processed. For example, when 4th Dimension performs a sort, the numbers actually show the number of comparisons made.

- **Show Toolbar** This property controls whether the toolbar is displayed in the Design and User environments.

- **Drag and Drop Highlight** These options let you set the appearance of the drop area (the area that is receiving a dragged object). The Drop area takes on the appearance you specify when a dragged object is on top of it and it is “eligible” to receive the dragged object. You can choose to highlight the area with a frame or a pattern (or both). A frame is a dotted-line marquee; a pattern is a diagonal pattern of red lines. The following illustration compares the effects of these two options.



Frame

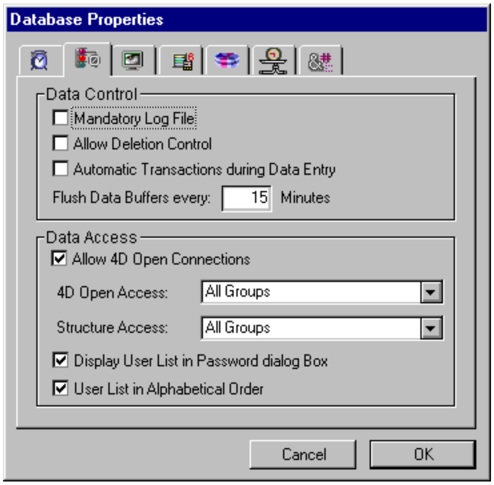


Pattern

- **Publish Database at Startup** Choose whether to publish the current database on the Web. If this check box is selected, 4th Dimension translates forms into HTML and acts as a Web server. Using a Web browser, users can perform most database functions as 4th Dimension clients. For complete information on publishing a 4th Dimension database on the web, see the section "Web Server" in the *4th Dimension Language Reference*.
- **TCP Port** Set the TCP port to be used if the database is to be published on the Web. If you specify 0, the default value is used. The default value is 80. Setting the TCP port allows you to run several Web servers on the same computer. To do so, select different TCP ports for each Web server. This option also allows you to let the OS (i.e., Windows NT) provide Web services on port 80, while you are using 4th Dimension as a Web server on another port.

Data Control

The Data Control page lets you specify several options regarding data integrity. The Data Control page is shown below:



Database Properties

Data Control

□ Mandatory Log File

□ Allow Deletion Control

□ Automatic Transactions during Data Entry

Flush Data Buffers every: 15 Minutes

Data Access

☑ Allow 4D Open Connections

4D Open Access: All Groups

Structure Access: All Groups

☑ Display User List in Password dialog Box

☑ User List in Alphabetical Order

- **Mandatory Log File** Requires that the database be opened with a log file. The log file is designed to keep track of changes to a database since the last backup. The 4D Backup plug-in is required to use this feature.
- **Allow Deletion Control** Allows the you to use the Deletion control options in the Relation Properties window for each relation you define. If the **Allow Deletion Control** check box is not selected, the Deletion control options are disabled. For more information, see the section "Relation Types" on page 119.
- **Automatic Transactions During Data Entry** Automatically start a multi-transaction when an input form is first opened if the form has a subform. *This option is intended only for 4D First users who upgrade to 4th Dimension. It should not be used for 4th Dimension custom applications (i.e., databases that work in the Custom Menus environment).*
- **Flush Data Buffers Every ... Minutes** Specify a time period to save data automatically. 4th Dimension saves your data at regular intervals. You can specify any time interval between 1 and 120 minutes. As a default, 4th Dimension saves your data every 15 minutes. The application also saves your data each time you change to another environment or exit the application.

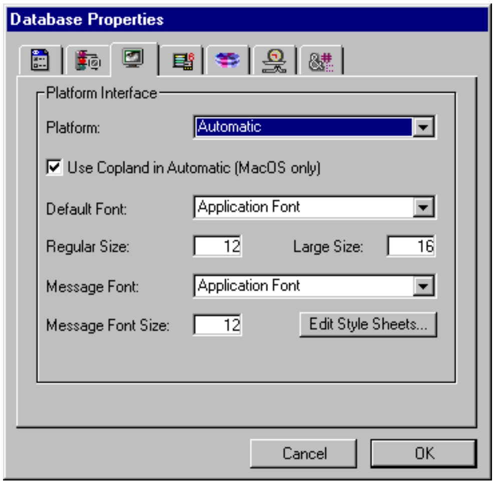
  When you anticipate entering a lot of data, consider setting a short time period between saves. In case of a power failure, you will lose only the data entered since the previous save.

If each save involves a pause for disk activity, it's a sign that you should adjust the setting. The long pause means that 4th Dimension is saving many records to disk. A shorter period between saves is thus more efficient.

- **Allow 4D Open Connections** Gives the specified group the ability to log on to 4D Server from a 4D Open application. 4D Open is the API (Application Programming Interface) that allows non-4D Client applications to connect to 4D Server.
- **Structure access** Gives the specified group the ability to enter the Design environment. For information about users and groups, see Chapter 9, "Managing Password Access" on page 437.
- **Display list of users in Password dialog box** Gives users the opportunity to choose their name from a list when logging onto a Password-protected database. If this check box is selected, a user can select his or her name from a list of user names in the Enter Password dialog box. If you deselect this option, each user must enter both his or her name and password in the Enter Password dialog box. For more information about the two versions of the Enter Password dialog box, see the section "Access System Overview" on page 438.
- **User List in Alphabetical Order** Sorts the list of users in the Password dialog box.

User Interface

User Interface properties allow you to customize the appearance of the user interface. The User Interface page is shown below:



Database Properties

Platform Interface

Platform: Automatic

☑ Use Copland in Automatic (MacOS only)

Default Font: Application Font

Regular Size: 12 Large Size: 16

Message Font: Application Font

Message Font Size: 12

- **Platform Interface** The Platform Interface property provides a way to control the appearance of forms and form objects in the database.

  Five platform interface options are available:

  - Automatic (default option)
  - MacOS
  - Windows 3.1
  - Windows 95
  - Copland

  If you choose Automatic, you can then choose between the MacOS (System 7) interface and the “Copland” interface. If you check **Use Copland in Automatic**, 4th Dimension will use the Copland interface rather than the System 7 Macintosh interface whenever the database runs on a Macintosh or Macintosh clone computer.

  For complete information on Platform Interface options, see the section “Platform Interface” on page 57.

- **Default Font** The default font is specified for the platform chosen in the Platform drop-down list.

  The Default font and default font size are used in the Structure editor as well as the Method editor.

- **Message Font and Font size** This allows you to specify the font and font size that will be used for messages.

- **Edit Style Sheets** A style is a font, font size, and style specification. You can use style sheets to specify font attributes when creating or editing forms. When you click the Edit Style Sheets button, 4th Dimension displays the Styles dialog box. For more information about creating and using styles, see the section “Creating a Style Sheet” on page 165.

Design Environment

The Design Environment page allows you to set options that control several aspects of the Design environment. The Design Environment page is shown below:

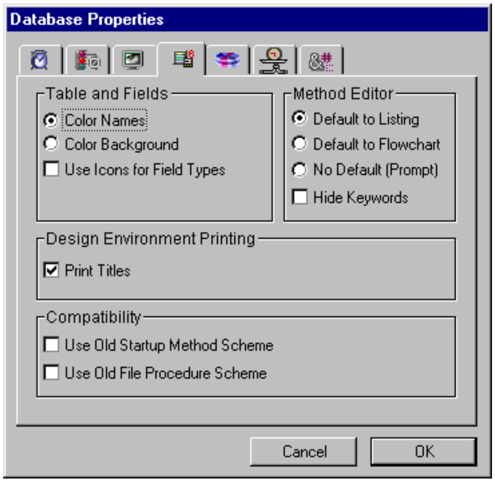


Table and Fields

● Color Names
○ Color Background
□ Use Icons for Field Types

Method Editor

● Default to Listing
○ Default to Flowchart
○ No Default (Prompt)
□ Hide Keywords

Design Environment Printing

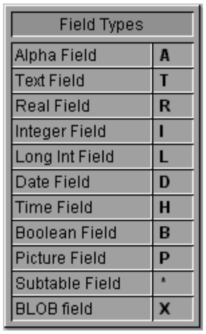
☑ Print Titles

Compatibility

□ Use Old Startup Method Scheme
□ Use Old File Procedure Scheme

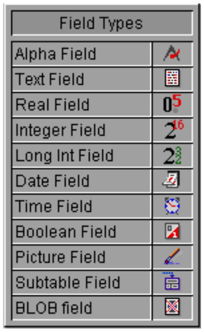
- **Color Names or Background** These options let you choose between coloring either the table and field names or the table image in the Structure editor. You use the Color page of the Table and Field Properties windows to assign a color to either the names or the table image background. For information on setting the color, see the sections "Setting the Color of the Table Image" on page 79 and "Setting the Color of the Field" on page 95.
- **Use Icons for Field Types** Select this check box to display icons rather than letters to designate the field type in the second column of the table image. The following illustration shows the effects of this property.

Letters



Field Types	
Alpha Field	A
Text Field	T
Real Field	R
Integer Field	I
Long Int Field	L
Date Field	D
Time Field	H
Boolean Field	B
Picture Field	P
Subtable Field	*
BLOB field	X

Icons



Field Types
Alpha Field
Text Field
Real Field
Integer Field
Long Int Field
Date Field
Time Field
Boolean Field
Picture Field
Subtable Field
BLOB field

For more information on field types, see the section "Field Types" on page 84.

- **Method Default** Select a default Method editor for creating methods. 4th Dimension provides two editors for creating and modifying methods: the Listing editor and the Flowchart editor. Unless you specify a default editor in the Database Properties dialog box, 4th Dimension asks you to select an editor when you create a new method.
  4th Dimension always gives you the option of selecting an editor for a new method when you name the method. See Chapter 7 for more information about creating and editing methods.

- **Hide Keywords** Select whether to hide keywords in the Method editor. By default, 4th Dimension displays scrollable lists of keywords, fields and forms from each table, and 4th Dimension commands and user-written methods. If you select the **Hide Keywords** check box, 4th Dimension displays the Method editor with the lists hidden. You can bring them into view by dragging the window divider. For more information on working with the scrollable lists, see the section "Managing the Listing Editor Window" on page 406.

- **Print Titles** Select whether or not to print window titles when you print from the Structure, Form, Method, and Password Access editors. Unless you specify otherwise, 4th Dimension automatically prints window titles, the date on which the window was printed, and the page number. If you deselect the **Print Titles** check box, 4th Dimension omits the title when printing from these editors.

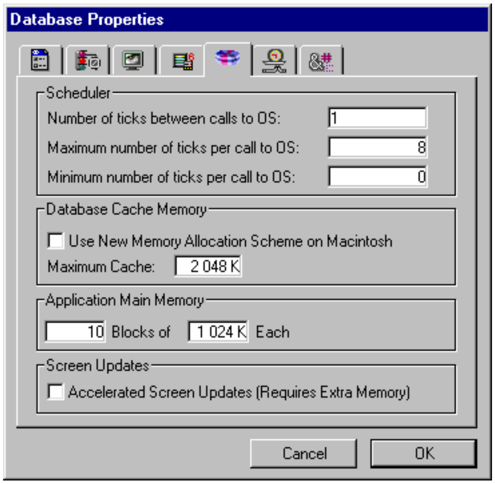
- **Use Old Startup Method Scheme** The Use Old Startup Method Scheme property allows you to let the *STARTUP* method be called automatically on startup, as in previous releases of 4th Dimension. The Database methods (new in version 6) are active only if this property is *not* selected. If you are converting an old database and want to use the new Database methods architecture, you can copy your *STARTUP* procedure into the On Startup database method and deselect this property. For more information about database methods, see "Database Methods" on page 373.

- **Use Old File Procedure Scheme** If this property is selected, Table methods (triggers) run according to the rules established for File procedures in previous releases of 4th Dimension. File procedures were executed for input forms only. They executed before the Layout procedure was executed for every input layout. File procedures were also executed whenever anything in the input layout was used (e.g., a button was pressed or data was entered in a field). This property can be used for either converted databases or databases created with the current release of 4th Dimension.

For information on the new trigger architecture, see the section "Triggers" on page 371.

Tune Up

The Tune Up page lets you optimize the performance of 4th Dimension:



Database Properties

Scheduler

Number of ticks between calls to OS: 1

Maximum number of ticks per call to OS: 8

Minimum number of ticks per call to OS: 0

Database Cache Memory

□ Use New Memory Allocation Scheme on Macintosh

Maximum Cache: 2 048 K

Application Main Memory

10 Blocks of 1 024 K Each

Screen Updates

□ Accelerated Screen Updates (Requires Extra Memory)

Tune Up contains the following options:

- **Scheduler** This area allows you to modify the number of ticks between calls from 4th Dimension to the operating system while running your database in interpreted mode.
- **Database Cache Memory** This area allows you to define the number of kilobytes you want to allocate to the database's cache memory. This option was previously in Customizer Plus.

  The Use New Memory Allocation Scheme on Macintosh check box allows you to take the database's cache memory from the MultiFinder of the Macintosh system instead of the amount of memory allocated to 4th Dimension in the Get Info dialog box. The memory allocated to 4th Dimension will be used if not enough memory is available at the Finder level.

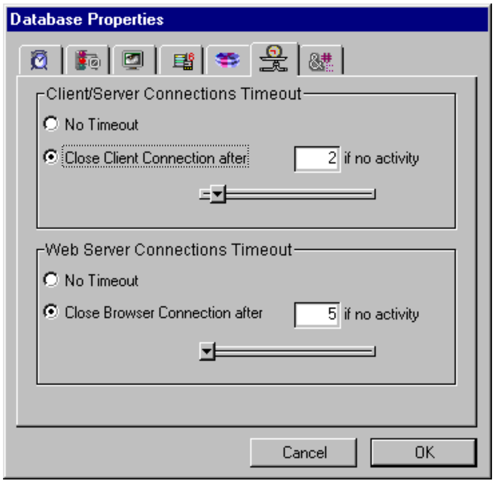
You must restart your Macintosh for this memory allocation scheme to take effect.

- **4D Main Memory** This area allows you to define how much memory to allocate to 4th Dimension for your database while running under Windows. This option was previously in Customizer Plus.
- **Faster Screen Redraw** Faster Screen Redraw creates an offscreen bitmap of your screen to enable faster redraw. The amount of extra memory depends on the size of your monitor (number of pixels) and the pixel depth. The formula for computing the size of the offscreen bitmap area is:

  Size in KB=(Screen width X Screen height X Screen depth) / 8 / 1024.

Connections

The Connections page contains options for managing databases running on 4D Server/4D Client installations and databases used as Web servers.



Database Properties

Client/Server Connections Timeout

○ No Timeout

● Close Client Connection after 2 if no activity

Web Server Connections Timeout

○ No Timeout

● Close Browser Connection after 5 if no activity

With the Connections page you can set different timeout values for each type of client.

- **No timeout** This property eliminates activity control. An inactive client will remain connected indefinitely. Do not use this option for Web Server connections. When 4th Dimension is functioning as a Web server, Web browsers remain connected until the timeout limit is reached. For complete information on the issues involved in terminating Web browser sessions, see the section “Web Server” in the *4th Dimension Language Reference*.

- **Close Client/Browser Connection after** *XX* **minutes** The server will close the connection to a client or browser that does not send any requests to the server within the specified amount of time.

  If you choose the latter property, you can set the timeout by entering a value into the entry area or dragging the slider control.

- **Character set** This option is designed for use in countries, such as Japan or Korea, that use specific character tables. It allows the user to choose the character set that will be used by 4D to communicate with Web browsers that connect to the database. The value set in the drop-down list defines the conversion of the ASCII characters processed by the Web engine when receiving or sending HTML documents (dynamic or static pages). In US and French versions of 4D, the default value is ISO-8859-1, which corresponds to the standard encoding in the US and in Europe (latin1). The values available in 4D are:

  - ISO-8859-1: Western encoding 1
  - Shift_JIS: Japanese encoding
  - Big5: Chinese encoding
  - euc-kr: Korean encoding
  - x-user-defined: any type of encoding (user defined)

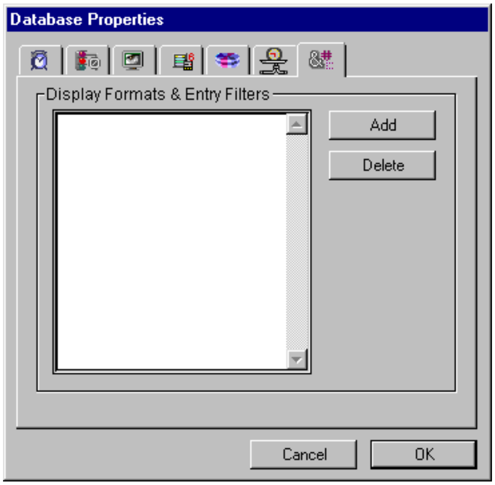
  4D tells the Web browser which encoding is used for the HTML data. In other words, it is not necessary to set specific encoding, except for the x-user-defined value.

  x-user-defined encoding
  This value is designed for use in countries with particular alphabets (Iceland, Greece, etc.). This setting allows the use of any specific encoding system.
  When this value is selected, the 4D Web engine uses the conversion table defined in the **Conversion** resource. This resource can be modified using Customizer Plus. For more information, please refer to Customizer Plus documentation.
  4D does not tell the Web browser which encoding is being used. It is up to the user that connects to the database to select it for the browser used. (If you use Netscape Navigator, this parameter is accessible using the **Encoding** command menu in the **View** menu).

Note If the x-user-defined value is selected and no conversion resource is defined using Customizer Plus, ISO-8859-1 encoding will be used.

Display Formats and Entry Filters

The Display Formats and Entry Filters page lets you create custom display format and entry filters.



After you create a custom format or filter, you can refer to it by name instead of having to recreate the format or filter every time. For information on custom formats and filters, see the section "Creating Custom Display Formats and Entry Filters" on page 257.

Platform Interface

The Platform Interface property lets you display any form using the conventions of the graphical user interface (GUI) of a selected platform. Specifying a Platform Interface for a form or object does not actually modify the form or object. The selected platform interface affects only the way the forms are displayed on the screen. A form can look like a Macintosh (System 7 or Copland), a Windows 3.1, or a Windows 95 screen depending on the option you choose.

The Platform Interface option in Database Properties sets the platform interface for all forms in the database. You can also set the platform interface for individual forms and for individual objects on a form. At the form and form object level, you can choose to inherit the setting from the next highest level or override it with a custom setting.

The Platform Interface for individual forms is set in the Form Properties window. You can set the platform interface for the form when you are creating it using the Form Wizard or you can change it using the Form editor. For information on setting the platform interface when the form is being created, see the section "Customizing the Appearance of Form Objects" on page 153. For information on modifying the platform interface settings of a form using the Form editor, see "Setting the Platform Interface" on page 186. For information on changing the platform interface of individual objects, see "Platform Interface and Appearance" on page 214.

Platform Interface Settings

The **Automatic** option is the default and displays forms as they appear on the host platform: If you use the database on Macintosh, the forms look like Macintosh screens; if you use the database under Windows 3.1, the forms will look like Windows 3.1 screens, and so on.

Choosing another option allows you to handle the following situations:

- You are designing forms on one platform and you would like to see how they will look on the other platforms or operating systems.
- No matter which platform you are using, you want your layouts to always look the same, overriding the default GUI of the platform.
- You would like to control the platform interface using the language. The command SET INTERFACE allows you to choose the platform interface. With SET INTERFACE, you can simply let the user(s) of the database choose the GUI they like.

The Platform Interface property affects only 4th Dimension forms. It does not change standard 4th Dimension dialog boxes such as the Query and Order By editors. 4th Dimension always displays standard dialog boxes using the platform's GUI regardless of the Platform Interface setting. On Macintosh, standard dialog boxes are displayed on a white background and the controls use the Macintosh system control definitions. On any Windows platform, standard dialog boxes are displayed on a gray background and controls use the 3D effects Windows methods if the Windows 3D effects DLL (CTL3D32.DLL) is installed. Otherwise they are displayed on a white background with gray buttons and non-3D check boxes and radio buttons. Note that on Windows 95, 3D effects are always available. Buttons and graphical elements (such as surrounding rectangles) are displayed using the colors set in the Colors Windows Control panel.

4th Dimension displays your forms according to the current Platform Interface setting rather than the actual platform's GUI on which the database is run (except if the Automatic option is selected.)

This setting acts on the following objects and form properties:

- Fields
- Buttons (push buttons)
- Check boxes
- Radio buttons
- Objects whose foreground and/or background colors are automatic
- Form background color

Here are descriptions of each setting:

MacOS setting

- Buttons are displayed as MacOS round rectangle buttons.
- Check boxes and radio buttons are displayed as MacOS controls.
- The automatic foreground color of layout objects is set to black.
- The automatic background color of layout objects is set to white.
- Each form's background color is white.

Windows 3.1 setting

- Buttons are displayed as 3D effects push buttons (using the Windows 3.1.x method).
- Checkboxes and radio buttons are displayed as regular Windows 3.1.x controls.
- The automatic foreground color of layout objects is set to black.
- The automatic background color of layout objects is set to white.
- Each form's background is white.

Windows 95 setting

- Buttons are displayed as 3D effects push buttons (using the Windows 95 method).
- Check boxes and radio buttons are displayed as 3D effects (using the Windows 95 method).
- The automatic foreground color of form objects is set to the Button Text color chosen by the user in the Windows Color Control panel.
- The automatic background color of form objects is set to the Button Face color chosen by the user in the Windows Color Control panel.
- Each form's background is set to the Button Face color chosen by the user in the Windows Color Control panel.

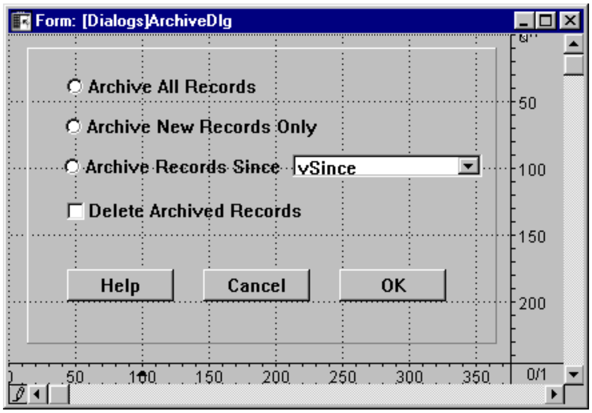
Note For more information about the automatic foreground and background colors of objects, see "Foreground and Background Colors" on page 222.

On Windows, if you change colors in the Windows Color control panel while a 4D session is running, the program immediately updates the forms displayed in all running processes according to the new color settings. If you choose Windows 95 as the Platform Interface setting on a Macintosh, the automatic foreground and background colors are dark gray and light gray, respectively.

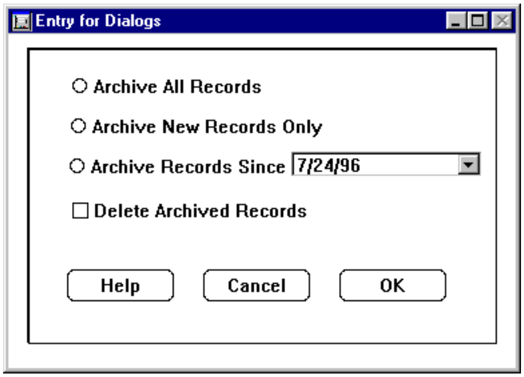
On any platform, changing the Platform Interface setting (using the Database Properties dialog box or the SET INTERFACE command) has an immediate effect: all the forms in any environment and in any process are redrawn to reflect the selected option.

4D Server Under 4D Server, several 4D Client stations can concurrently use different Platform Interface settings.

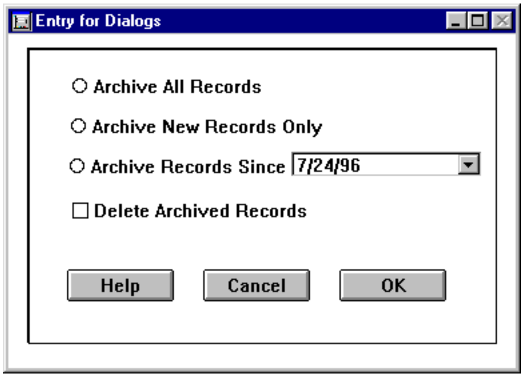
- This example illustrates how a form appears under the MacOS, Windows 3.1, and Windows 95 settings. The form contains buttons (push buttons), radio buttons, and check boxes:



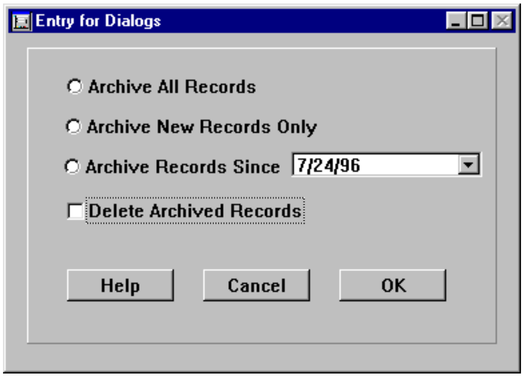
MacOS setting



Windows 3.1 setting



Windows 95 setting



Entry for Dialogs

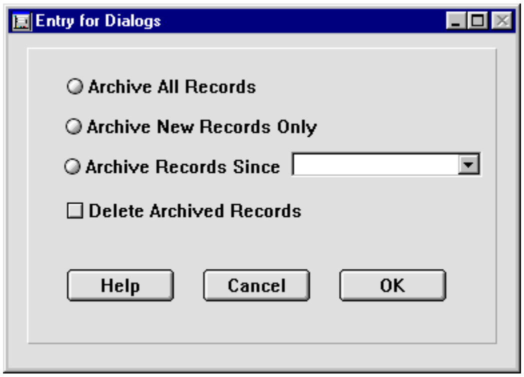
○ Archive All Records

○ Archive New Records Only

○ Archive Records Since 7/24/96

□ Delete Archived Records

Copland setting



Entry for Dialogs

○ Archive All Records

○ Archive New Records Only

○ Archive Records Since

□ Delete Archived Records

4D Server Considerations

4D Server supports the continuing development of a database that is currently in use by allowing you to modify the design of a database in the Design environment while users continue to work with the database in the User or Custom Menus environments. Changes to the design are visible to users as soon as they are saved (when you close the editor window or choose **Save *EditorName*** from the **File** menu).

In addition, 4D Server allows several users to work on the database design concurrently. 4D Server protects against users erasing each other's changes in the Design environment by providing an object-locking system in which structure objects are locked while they are being modified by a user. Structure objects include the following: field definitions, table definitions, forms, methods, menus, passwords, database properties, and lists. During the time that an object is locked, other users cannot modify it. An object is unlocked when it is closed.

For more information about how object locking works with a particular structure object, refer to the appropriate chapters in this manual.

2 Designing a Database Structure

This chapter tells you how to use 4th Dimension's Structure editor to create and modify database structures. The structure of a database consists of tables and fields. If a database has more than one table, the structure might include the relations between the tables.

The structure of a database is like the foundation of a house — it provides the basis for everything else. This chapter gives a general description of databases and of how to design database structures to meet different information management needs.

This chapter tells you how to:

- Manipulate table images in the Structure window,
- Create tables and set table properties,
- Create fields and set field types and properties,
- Relate tables.

Database Basics

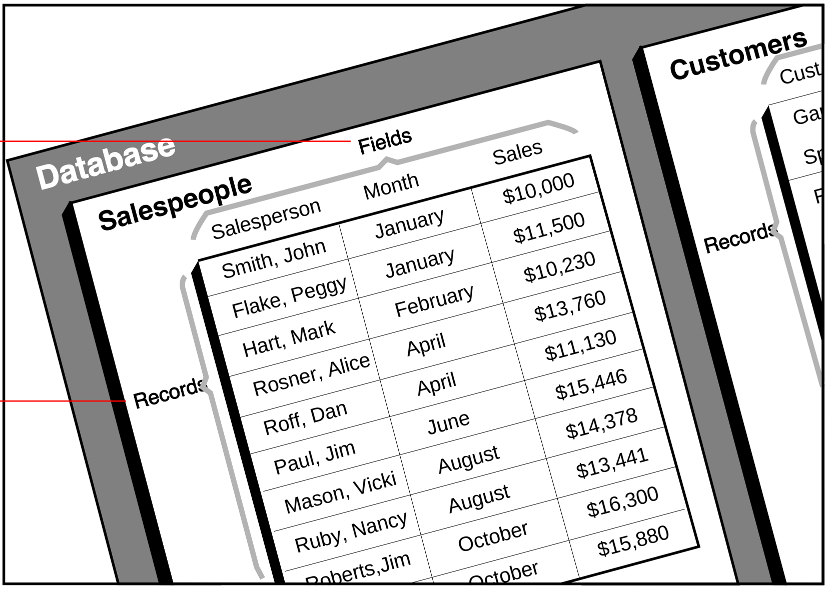
A database is any collection of information, organized so that it can be used efficiently. A telephone directory is a good example of a database. So is a dictionary, a calendar, or a cookbook.

The information in a database is organized in the form of records. Each record contains all of the information about one person or thing in the database. For example, each record in a telephone directory contains one person's name, address, and telephone number.

Each record contains fields. A field is used to store a particular piece of information. For example, in the telephone directory database, one field contains the person's name; a second field contains the person's address; and a third field contains the person's telephone number. Every record contains each of these fields and every record can have information in these fields.

A field name usually identifies the information that goes into the field. A field name is usually something like Name, Address, or Phone Number. Each field has a field type that identifies the kind of information that can be entered in a field: numbers, dates, alphanumeric characters, and others. Because each field contains a specific type of data, you can perform calculations and other operations on the information in the fields. For example, numbers from two fields can be added. A date in one field can be compared to a date in another field. A person's first name (stored in one field) can be displayed in front of the last name (stored in another field) to make the first line of an address label.

All the records together make up a *table*. Each database can contain many tables. The following figure shows how these concepts are related.



Fields define categories of information

Records are added one at a time

Salesperson	Month	Sales
Smith, John	January	$10,000
Flake, Peggy	January	$11,500
Hart, Mark	February	$10,230
Rosner, Alice	April	$13,760
Roff, Dan	April	$11,130
Paul, Jim	June	$15,446
Mason, Vicki	August	$14,378
Ruby, Nancy	August	$13,441
Roberts,Jim	October	$16,300
	October	$15,880

4th Dimension can reorganize records and perform calculations on the information so that the information is useful. For example, 4th Dimension can calculate the total values in a field and present the total in a report. It can calculate a total for each salesperson and display a graph that compares sales figures.

Tables

When you create a new database, 4th Dimension automatically creates one table and names it *Table1*. You can rename the table and add fields to it. To use the database, you must add at least one field.
4th Dimension allows you add additional tables to the structure and establish relations among tables. This gives you the ability to create a structure that meets your exact needs.

Single-Table Structures

Some databases use only one table. You use a single table for a single category of information such as people, companies, or inventory. You can have as many fields in a table as you need (up to 511). Non-relational database applications sometimes refer to a single table database as a *flat-file database*.

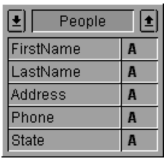
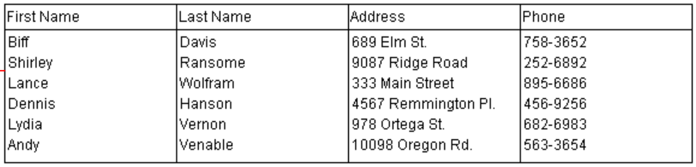


Table image in the Design environment

People	
FirstName	A
LastName	A
Address	A
Phone	A
State	A



Records in the User environment

First Name	Last Name	Address	Phone
Biff	Davis	689 Elm St.	758-3652
Shirley	Ransome	9087 Ridge Road	252-6892
Lance	Wolfram	333 Main Street	895-6686
Dennis	Hanson	4567 Remmington Pl.	456-9256
Lydia	Vernon	978 Ortega St.	682-6983
Andy	Venable	10098 Oregon Rd.	563-3654

In the figure above, every person's record needs the same types of data. The database grows in accordance with the number of people stored.

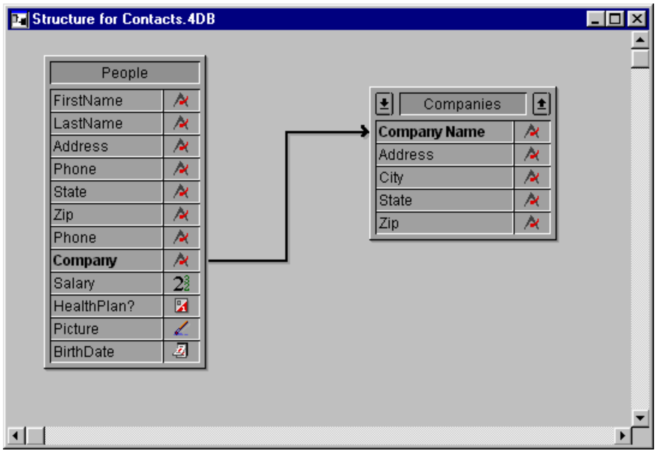
Multiple-Table Structures

A database can often store and access data more efficiently by using more than one table. A good rule to remember is that different types of information should be stored in different tables.

A database that keeps track of both people and companies is a good example. The records for the people and the companies are stored in different tables. If the address of a company changes, you need only change that company's record. You do not need to enter that new address for every person who works for the company.

With a single table, you would have needed to enter the address in each individual record; with two tables, you need to enter that information only once. When a company name is entered in a person's record, 4th Dimension can search for the company's record and automatically display the correct address.

The figure below shows the structure of a multiple-table database in which two tables are related. The arrow drawn between the Company field and the Company Name field shows that relationship.



The data for each person is stored in the [People] table. Data about each company is stored in the separate [Companies] table.

4th Dimension is called a *relational database* application because it can use multiple tables and relate them in various ways. For example, you can create a report for the [People] table that searches the [Companies] table and automatically displays and prints information about each person's company. The relationship between the tables allows information from each table to be available to the report.

You can also enter data directly into related tables. For example, an invoicing database can write information to a [Line Items] table from within an Invoicing screen. You can also write data to related tables using 4th Dimension's language.

For information on creating and using related tables, see the section "Relating Tables" on page 97.

Sometimes you need a multiple-table structure in which tables are not directly related. It may be convenient to have one database store different kinds of information such as a contact list and an expense table.

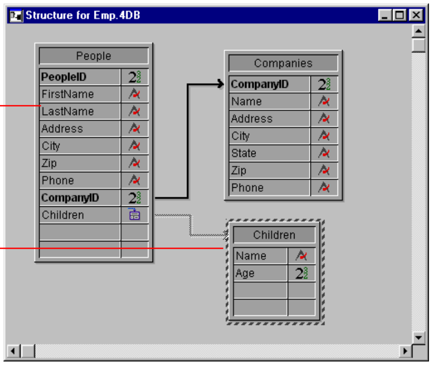
4th Dimension allows up to 255 tables in each database. A table can have up to 511 fields. Using multiple tables, virtually any kind of database structure is possible.

Subtables

Occasionally you will need to store a variable amount of information for each record in a table. 4th Dimension allows you to create a table structure that includes a subtable — a table subordinate to a parent table. Information in the subtable is available only when the parent record is in use.

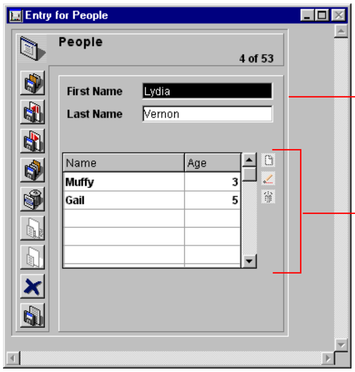
For example, suppose you want to keep track of the children of the people in your table. Some people have no children and some people have many children. You can use a subtable to store this information.

The figure below shows a subtable and form that displays subrecords belonging to the parent record.



[People] table

Children subtable



First Name Lydia
Last Name Vernon

Name	Age
Muffy	3
Gail	5

Parent record in the [People] table

Subrecords in the Children subtable

This subtable allows you to create as many subrecords as you need for each record in the [People] table. If a person has three children, you create three subrecords for that record. If a person has no children, you create no subrecords.

A subtable structure is useful when you need to see and use the subrecords *only* when its parent record is being used. For example, using subtables you could easily find the average age of one person's children, but it would be difficult to find the average age of everyone's children. Similarly, it would be difficult to do a search across all children in the whole database (e.g., to find all five-year-old children). If performing these kinds of operations on the data is a requirement, it would be better to use a separate table for children, not a subtable.

Note Whenever a parent record is loaded, 4th Dimension loads all the subrecords belonging to that parent record. If there are many subrecords belonging to the parent record, this can be undesirable. In this case, it is recommended that you use a related table to store the information and that you control the loading of records using the language.

You cannot access information contained in a subtable from a 4D Open application. 4D Open is the API (Application Programming Interface) that allows non-4D Client applications to connect to 4D Server.

Creating a Database Structure

Every database has a structure that consists of at least one table and at least one field. These elements must exist before the database can store records.

► Typically, you create a structure with the following basic steps:

1 **Create a new database.**

For more information, see "Creating a New Database" on page 2.
4th Dimension automatically creates the first table.

2 **Rename the automatically created table (optional) and assign table properties.**

For more information, see "Renaming a Table" on page 76 and "Setting Table Properties" on page 74.

3 **Create fields for the table and assign field properties.**

For more information, see "Creating New Fields" on page 80.

4 **Add additional tables and fields as necessary.**

For more information, see "Creating a New Table" on page 74.

5 **Relate one table to another, if necessary, by drawing a line between fields in the two tables and setting relation properties.**

For more information, see “Relating Tables” on page 97.

The remainder of this chapter describes these steps in detail.

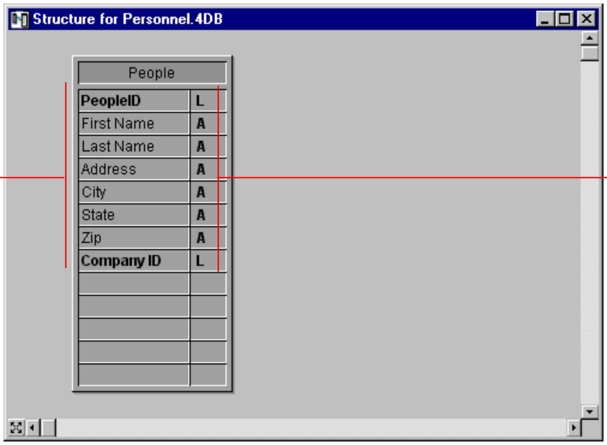
Using the Structure Editor

The Structure editor lets you manage the database structure — the tables and their relationships. It gives you control over such things as tables, table properties, fields, field properties, and table relations.

The Structure editor gives you a graphic view of a database’s structure and provides menus for performing design operations.

Each table is represented by a table image in the Structure editor. It shows the fields and their types. 4th Dimension automatically creates the first table. You can add tables as necessary.

The following illustration shows the Structure editor window with one table image.



Structure for Personnel.4DB

People	
PeopleID	L
First Name	A
Last Name	A
Address	A
City	A
State	A
Zip	A
Company ID	L

Field names

Field type symbols

Selecting a Table Image

To work with a table in the Structure editor window, you first need to select it[1]. You can then add or modify fields, view the table’s properties, move, or resize the table image.

- **To select a table, click the table image.**

[1] If the desired table image is not in view, you can double-click its name in the Tables page of the Explorer to bring it into view.

4th Dimension draws a flashing marquee around the table image. Subsequent actions affect the selected table.

Note Unless a table is selected, the Table Properties and New Field menu commands in the Structure menu are disabled.

The figure below shows a selected table.

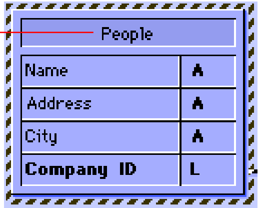
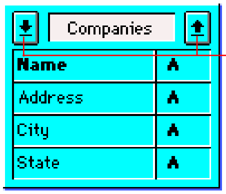


Table name

Marquee

Scrolling the Field List

As you add fields to a table, you may add more fields than are visible in the table image displayed in the Structure editor window. When this happens, 4th Dimension automatically adds scroll arrows to the title area of the table image.



Click a scroll arrow to scroll the field list upward or downward

You can scroll the field list within the table image by clicking on a scroll arrow.

Resizing a Table Image

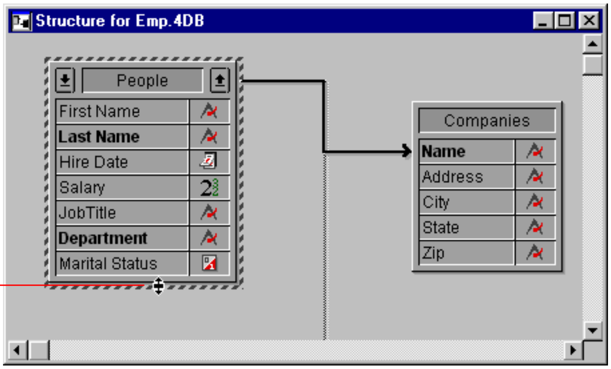
You can also expand a table image to show more fields in the table.

► To expand a table image:

1 **Position the pointer at the bottom edge of the table image until it changes to a table resizing pointer ‡.**

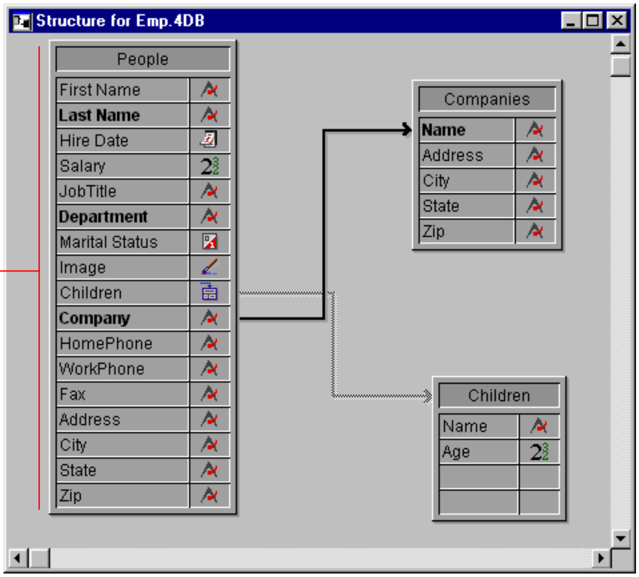
2 **Drag the bottom edge down.**

The following illustration shows a table image being resized.



Drag downward to expand the table image

As you drag, the table image expands in increments of one field at a time. When all fields become visible, the scroll arrows in the title bar of the table image automatically disappear.



Expanded table image

4D Server If you resize a table image when using 4D Server, the table appears resized for all users in the Design environment.

Moving a Table Image

As you add tables to your structure, you may need to move the table images around to make room or reorganize the table images. You can do so by dragging the table name area. The illustration below shows a table image being dragged.

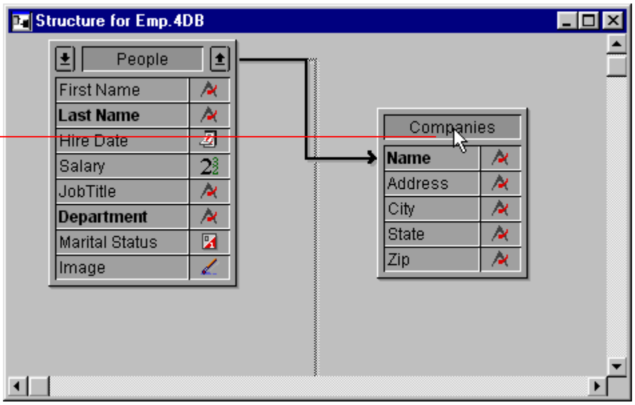


Table image being dragged

- **To move a table image, drag the table name bar.**

Drag the table name bar only. Dragging other parts of the table image may produce different effects, such as creating a new table relation or changing the size of the table image.

If the table image that you move is related to another table or subtable, the connecting lines move correspondingly, maintaining their attachment to the other table or subtable.

4D Server If you move a table image when using 4D Server, the table appears in its new location for all users in the Design environment.

Creating a New Table

When you create a new database, 4th Dimension automatically creates the first table in the database. You can create additional tables at any time.

4th Dimension names the first table [Table1]. 4th Dimension names additional tables sequentially, up to [Table255]. You can rename the tables at any time. See "Renaming a Table" on page 76 for more information about naming tables.

You cannot delete tables. However, if you create an unwanted table, you can make it invisible to users (for more information, see the section "Setting Table Properties" on page 74). If you accidentally choose New Table, you can cancel the operation by immediately clicking in the menu bar.

▶ To create a new table:

1 **Choose New Table from the Structure menu.**
OR
Press Ctrl+N (on Windows) or Command–N (on Macintosh)
OR
Click the New Table button in the toolbar.

The pointer becomes a miniature table icon ▤ .

If you want to cancel the operation, move the pointer to the menu bar and click.

2 **Move the pointer to the location in the Structure window where you want the upper-left corner of the new table image to be and click.**

4th Dimension creates a new table image. It becomes the selected table image in the Structure editor window.

3 **Repeat steps 1 and 2 for each table you want to add to the database.**

Setting Table Properties

You use the Table Properties window to set several properties of each table. With the Table Properties window, you can

- Rename a table,
- Set access privileges,
- Specify the events for which the table's trigger is active,
- Customize the appearance of the table image in the Structure editor window.

Displaying the Table Properties Window

The Table Properties window displays the properties of the selected table. If it is not displayed, you first need to open it.

► If the Table Properties window is not displayed:

1 **Click on the table image whose properties you want to set.**

A marquee surrounds the selected table.

2 **Choose Table Properties from the Structure menu.**
OR
Double-click the title bar of the table image.
OR
Press Ctrl+R (on Windows) or Command–R (on Macintosh).

4th Dimension displays the Table Properties window, showing the properties for the selected table.

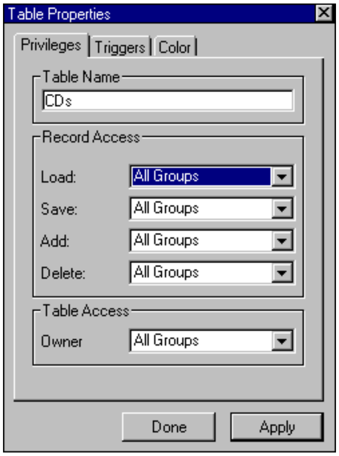


Table Name: CDs

Record Access
Load: All Groups
Save: All Groups
Add: All Groups
Delete: All Groups

Table Access
Owner: All Groups

Note You can also display the Table Properties window by double-clicking the table name in the Tables page of the Explorer or highlighting the table name and clicking **Edit**.

► If the Table Properties window is displayed but shows the properties of another table:

■ **Click on the table image whose properties you want to set.**

Renaming a Table

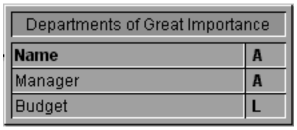
You will usually want to rename a table so that the table name identifies the information it will contain. For example, if [Table1] will contain customer records, you might rename it [Customers].

You can rename tables at any time. If you have used the old table name in a method, 4th Dimension automatically changes it to the new name *provided the method is closed*. If the method is open, you must make the changes yourself.

Do not use the same name for two tables in the same database. If you inadvertently create a duplicate table name, 4th Dimension recognizes only the table you created first, ignoring any tables subsequently created with the same name.

- **To rename a table, enter a name in the Table Name area.**

You can enter up to 31 characters in the Name area. The table name must begin with a letter. The remainder of the table name can contain any combination of letters, numbers, spaces, and underscores.



Departments of Great Importance

Name	A
Manager	A
Budget	L

4th Dimension truncates table names longer than 31 characters and removes spaces at the beginning or end of the name.

Setting Record and Table Access Privileges

The drop-down lists in the Record Access area allow you to assign groups access to various operations in the User and Custom Menus environments. Members of the group assigned Load privileges can view records in the table, members of the group assigned Add privileges can add records to the table, and so on.

The **Owner** drop-down list in the Table Access area allows you to give a group the ability to modify the table properties in the Design environment.

For complete information about creating a password access system and assigning access privileges, see Chapter 9, “Managing Password Access” on page 437.

Setting Trigger Events

A trigger is a method that runs automatically when certain events occur at the database engine level. The events are:

- Saving a new record,
- Saving a record,
- Deleting a record,
- Loading a record.

You create the trigger by creating a Table method. In the Triggers page of the Table Properties window, you specify when you want the trigger to run.

For more information about creating and editing triggers, see the section "Triggers" on page 371.

► To set the events for which the trigger is active:

- **Click one or more trigger check boxes.**

  The trigger you enter in the Method editor will run only when the events you check occur.

Note In the Design Environment page of the Database Properties dialog box, you can choose to execute triggers according to the rules for File procedures in previous releases of 4th Dimension. For more information, see the section "Design Environment" on page 51.

Setting Table Attributes

You can set the following two table attributes:

- **Invisible table** This check box allows you to make a table invisible in the User and Custom Menus environments. Use this option when a table is no longer being used in the database.

  Making a table invisible allows you to limit the operations that a user can perform on a table by making the table and its fields invisible in all editors and some dialog boxes that appear in the User and Custom Menus environments.

  These editors and dialog boxes include the following:

  - All query editors,
  - Order By editor,
  - Chart editor,
  - Label editor,

- Quick Report editor,
- Import and Export dialog boxes,
- Apply Formula dialog box.

In each of these editors, the user is unable to see or choose the table or any of its fields. For instance, the user cannot sort a table based on a field from an invisible table.

Note When using the editors, users have the option of saving their specifications (e.g., the query or sort they created) to disk files. In this case, any invisible tables or fields specified will be used in the operation. In addition, users can type the names of invisible tables and fields in the Apply Formula dialog box.

In the Design environment, invisible tables and fields are displayed in italics in the Structure editor window.

4D Server Object locking occurs when more than one person tries to modify the same table's properties at the same time.

If a user is modifying a table's properties, the properties are locked and cannot be modified by other users. The properties remain locked until the first user finishes modifying the properties (i.e., by clicking the **Cancel** or **Apply** buttons).

- **Completely Deleted** This option in allows you to optimize the deletion of a selection of records that are deleted with the DELETE SELECTION command.

  When 4th Dimension deletes a selection, the tags of the deleted records are also cleared. A tag is a header attached to a record that carries information about that record.

  When both records and tags are deleted, the process is significantly slower than only deleting the records. Therefore, you may not always wish to have the tags cleared automatically. You can choose whether or not this action is automatic.

  To accelerate the deletion of a large selection of records with the DELETE SELECTION command, uncheck the **Completely Deleted** check box. Deselecting this option tells 4th Dimension not to clear tags when it deletes.

  This option cannot be set using the language.

By default, 4th Dimension deletes records and tags. If you deselect this option, 4th Dimension will not delete the record tags. Therefore, if you perform a recover by tags, you will recover the deleted records or whatever has been put in the holes corresponding to the deleted records. For this reason, it is recommended that you deselect this option only for tables that are not important, such as temporary tables. If you deselect this option and you must repair by tags, you can avoid recovering the deleted records by compacting the data table before performing the recover by tags (see the documentation for 4D Tools for information about compacting).

Setting the Color of the Table Image

The third page of the Table Properties window lets you set the color of either the table name or the background of the table image in the Structure editor. You use a Design Environment property in the Database Properties dialog box to determine whether the color you choose applies to the name or to the background. For more information, see the section “Design Environment” on page 51.

The Color property lets you use color to help organize the structure of a large database. For example, you could use one color for all tables that relate to customers and customer records another color for tables that relate to inventory and inventory records.

► To set a color:

■ **In the Color page, deselect Default Color and click the desired color in the Color palette.**

When you click **Apply,** either the table name or the table background changes to the color you selected (depending on the Database Property you selected).

Creating Fields and Setting Field Properties

For each table, you need to create the fields that hold the data you want to store and manage.

When you create a field, you assign it a field type that describes the kind of information that will be stored in the field. 4th Dimension uses the field type to perform different kinds of operations on the contents of the field. For example, if a field will contain a date, you will want to create it with a Date field type. Subsequently, 4th Dimension can compute date values, such as length of service or qualification for benefits. In addition, 4th Dimension can sort records in chronological order using the dates in this field. Field types are described in detail in the section "Field Types" on page 84.

In addition to the field type, each field in a table can possess any of six attributes. Attributes determine conditions for entering, displaying, or modifying data in the fields. They are described in the section "Field Attributes" on page 90.

With the exception of Subtable fields, after you create a field, you can return to it to change the field type or any of its attributes.

Creating New Fields

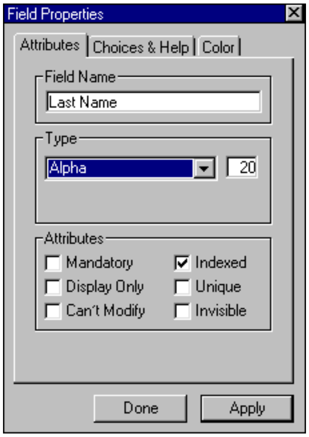
Each time you add a new field to a table, you

- Name the field,
- Specify the field type,
- Set field properties (optional).

You can add up to 511 fields to a table or subtable. 4th Dimension adds fields to the table in the order that you create them. You cannot reorder or delete fields. You can, however, order the fields any way you want in the input and output forms you will use to enter and manage the data.

Refer to Chapter 3 for information about creating forms.

You create new fields and set field properties using the Field Properties window. The Field Properties window has three pages, Attributes, Choices & Help, and Color. The pages are shown in the following illustration.

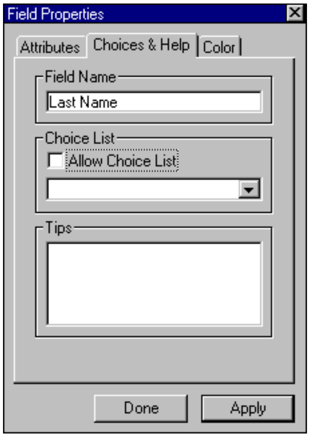


Field Name: Last Name

Type: Alpha 20

Attributes
- □ Mandatory
- ☑ Indexed
- □ Display Only
- □ Unique
- □ Can't Modify
- □ Invisible

Attributes
Set field name, type, and attributes.

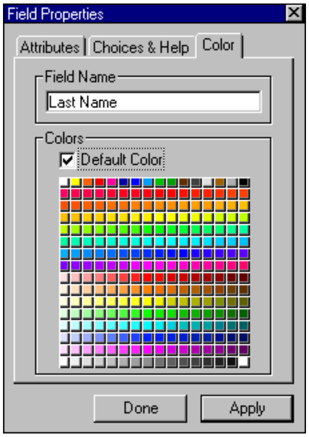


Field Name: Last Name

Choice List
- □ Allow Choice List

Tips

Choices & Help
Assign a choice list and enter a help message.



Field Name: Last Name

Colors
- ☑ Default Color

Color
Set the field color in the table image.

Do not use the same name for two fields in the same table. If you inadvertently create a duplicate field, 4th Dimension recognizes only the field you created first, ignoring the subsequently created field. Do not leave a field name blank or use any reserved words in the field name. Reserved words include command names (e.g. Date, Subtotal) and keywords (e.g. If, While, Repeat).

You cannot delete fields. However, if you create an unwanted field, you can make it invisible to users by choosing the Invisible attribute. For more information, refer to "Field Attributes" on page 90.

▶ To create a field:

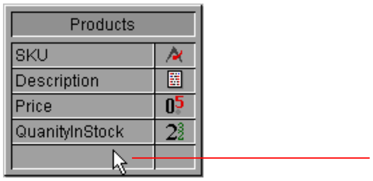
1 **Select the table image in the Structure editor[1].**

You create fields within tables. Before you can create a field, you must select the table you want it to belong to.

2 **Double-click an empty row in the table image below the existing field names.**
OR
Choose New Field from the Structure menu.
OR

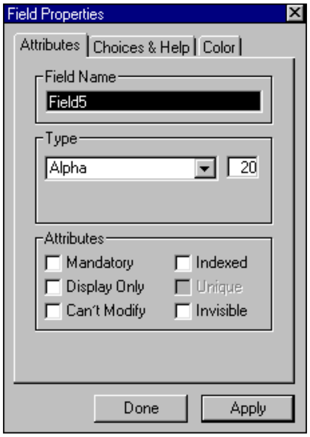
[1] If the desired table image is not in view, you can double-click its name in the Tables page of the Explorer to bring it into view.

Press Ctrl+F (on Windows) or Command–F (on Macintosh).
OR
Click the New Field button in the Toolbar.



Double-click on a blank area to create a field

4th Dimension displays the Attributes page of the Field Properties window.



Field Name: Field5

Type: Alpha 20

Attributes:
☐ Mandatory ☐ Indexed
☐ Display Only ☐ Unique
☐ Can't Modify ☐ Invisible

3 **Type the field name in the Field Name area.**

You can enter up to 31 characters in the Field Name area. The field name must begin with a letter. You can use any letters or numbers, the space, and the underscore. 4th Dimension truncates field names longer than 31 characters and removes spaces at the beginning or end of the name.

Tip Although you can include spaces in field names, entering a field name that does not include any spaces allows you to double-click to select the field name in the Method editor. Use the underscore character instead of a space.

4 **Select a field type and, if necessary, modify the maximum field length.**

For more information on field types and field lengths, see the section "Field Types" on page 84.

5 **Select any attributes (optional).**

For more information, see the section "Field Attributes" on page 90.

6 **Click the Choices & Help tab and enter a help message for the field or assign a choice list (optional).**

Balloon Help can be viewed only when the database is used on a Macintosh. A tip is displayed on all platforms. For more information, see the section "Help" on page 94.

A choice list is displayed automatically when the field is selected for data entry or when the field is used in the Query editor. A choice list can be assigned in the Field Properties window or can be assigned on a form-by-form basis in the Form editor. For more information, see the section "Using Choice Lists" on page 246.

7 **Click the Color tab to assign a color to the field (optional).**

The field color can be used in the Structure editor to distinguish fields. For example, you can use a color to highlight the field that uniquely identifies each record. The color is applied to either the text of the field name or the background rectangle containing the field name, depending on the Color Field Names or Background database property. For more information, see the section "Setting the Color of the Field" on page 95.

8 **When you are finished assigning properties, click the Apply button to save the field properties.**

You do not have to click **Apply** separately on each page. Clicking Apply once after you have entered all your field properties saves the properties on all three pages.

When you click **Apply** after creating a new field, 4th Dimension automatically displays default properties for another new field. The default name is *FieldN*, where N is the sequence number of the field in the table. If you want to create the new field, modify the default properties.

When you are finished creating fields, click **Done** instead of Apply. When you click **Done**, 4th Dimension puts away the Field Properties window.

With the Field Properties window on-screen, you can modify the properties of any existing field simply by clicking the field in its table image or double-clicking its name in the Tables page of the Explorer.

4D Server Object locking occurs when more than one user tries to modify the same field definition at the same time. Field properties are modified in the Field Properties window, which appears when you choose either **New Field** or **Field Properties** from the **Structure** menu.

If a user is modifying a field's properties, the properties are locked and cannot be modified by other users until the first user unlocks the field properties by clicking the **Done** or **Apply** buttons).

In addition, while the field properties are locked, other users cannot modify the properties of other fields in that table. Other users can, however, modify the table properties and the properties of other fields and tables in the database.

Field Types

You must specify a field type for each field. Field types affect how 4th Dimension manipulates and stores data in a field and how you enter or display data in forms. 4th Dimension supports the following field types:

- **Alpha** Alphanumeric text between 2 and 80 characters,
- **Text** Text up to 32,000 characters,
- **Real** Floating point number in the range of 1.9E-4951 to 1.1E4932,
- **Integer** Number in the range of plus or minus 32,767,
- **Long integer** Number in the range of plus or minus 2,147,483,647,
- **Date** Date between the year 100 and the year 32,767,
- **Time** Time in hours:minutes:seconds format,
- **Boolean** A field that can only take the values TRUE or FALSE,
- **Picture** A PICT image,
- **BLOB** Any binary object such as a graphic, another application, or any document.

You set the field type in the Field Properties window. Here are complete descriptions of each field type.

Alpha

An Alpha field contains alphanumeric characters (letters and numbers), punctuation marks, and special characters such as the asterisk (*), percent sign (%), hyphen (-), and so on. Use an Alpha field to contain any information that must be treated as text and does not exceed 80 characters in length.

An Alpha field can be indexed (whereas a Text field cannot be indexed). For information about indexing, see the section "Indexed" on page 91.

Alpha is the most common field type. Typically, you use this field type for names, addresses, telephone numbers, postal codes, and so forth. During data entry, an Alpha field accepts any character, number, punctuation mark, or special character.

Zip codes are best placed in an Alpha field for two reasons: Numeric fields do not display leading zeros and some zip codes contain a hyphen. The general rule for deciding between a numeric field type or an alphanumeric field type is make it an alphanumeric field unless it will be used in a numerical calculation or searched or sorted based on numeric values.

You can set the maximum length of an Alpha field to be between 2 and 80 characters long. For example, if you use a field for state abbreviations, you could limit it to 2 characters.

You can concatenate two or more Alpha fields. For instance, you might want to join a person's first name and last name for the first line in a label form. You can do so using a one-line method, such as:

```
FullName:=First_Name+" "+Last_Name
```

The variable FullName can be displayed or printed. You can also extract part of the information for use in another place (extraction of a substring). The substring can be displayed or printed.

Text

A Text field can hold up to 32,000 alphanumeric characters. You use a Text field to hold blocks of text longer than 80 characters such as comments or descriptions.

In an input form, a Text field can be given a vertical scroll bar. In a printed report, the Text field area can expand as necessary to print all the information, even if it covers several pages.

During data entry, Text fields provide basic text editing features: scrolling, word wrapping within the area set for the field display, double-clicking to select a word, moving the insertion point with the arrow keys, and standard cut, copy, and paste operations. A Text field accepts a carriage return during data entry to create a new paragraph (an Alpha field does not).

You can paste text into Text fields, including text from word processors.

You cannot index a Text field, but you can perform a search based on characters in the field.

Another way to store text with a record is to use the 4D Write plug-in. With 4D Write, you can use different font attributes, paragraph alignments, and other word processing features that are not available in standard Text fields. For more information about using 4D Write, refer to the documentation that comes with 4D Write.

Real

A Real field stores real numbers, that is, decimal numbers (price, salary, expenses, and so on). Real number fields can hold any number in the range of 1.9E-4951 to 1.1E4932.

Note In the United States, the decimal separator in real numbers is the decimal point (.). In other countries, it is often a different character such as the comma (,). If you are using a non-U.S. version of 4th Dimension, real numbers are stored based on the decimal separator specified in the operating system of your machine.

Integer

Use an Integer field type for any field that stores whole numbers, that is, numbers without decimals (record number, invoice number, and so on). Integer fields can contain whole numbers between ±32,767.

Long Integer

Use a Long Integer field type for any field that stores whole numbers that are too large for an Integer field. They can contain whole numbers (no decimal) between ±2,147,483,647.

Date

Use a Date field to store date values such as Start Date, Date Purchased, Birthdate, and so on. A Date field can store any date value (month, day, year) entered in a *MM/DD/YYYY* format between the year 100 and the year 32,767.

Note In the United States, dates are specified in the month/day/year (*MM/DD/YYYY)* format. Other countries use different formats such as *DD/MM/YYYY* for British systems and *YY/MM/DD* for Swedish systems. If you are using a non-U.S. version of 4th Dimension, 4th Dimension stores the date based on the date format specified by the operating system of your computer.

Time

Use a Time field type to manage times such as Current Time, Meeting Time, Billed Time, and so on. A Time field can store any time value entered in *HH:MM:SS* format.

Boolean

Boolean fields (sometimes called logical fields) contain TRUE or FALSE values.

You can format a Boolean field as either a check box or as a pair of radio buttons. A check box that contains a check is TRUE; empty, it is FALSE. Either the first radio button is selected (TRUE), or the second button is selected (FALSE).

You should name a Boolean field so that you can ask the question, “Is *field name* true?” This question is useful for searching because during a search, 4th Dimension looks for a TRUE and FALSE value in a Boolean field. For example, you might want to name a field “Male” instead of “Sex.” Your search condition can then be written “Male is equal to true,” instead of “Sex is equal to true.”

Picture

Picture fields are used for several purposes in 4th Dimension. Creating a Picture field allows you to save the following types of data.

- **Pictures** You can store digitized photographs, diagrams, maps, and illustrations created using a graphics application. Some graphic applications store extra information with pictures that may provide special instructions for output devices such as a PostScript™ printer. This information “tags along” when the picture is copied or pasted into a Picture field and is used by 4th Dimension when printing the picture to an appropriate output device.
- **Data from 4th Dimension plug-ins** You can store data created with some of the 4th Dimension plug-ins — 4D Chart, 4D Write, 4D Draw, and 4D Calc. For more information about using a 4th Dimension plug-in a Picture field, refer to the documentation that comes with the plug-in.

- **Data from third-party plug-ins** You can also store data from third-party plug-ins (if the plug-in supports saving data). For more information about storing data from a plug-in in a Picture field, refer to the documentation included with the 4th Dimension Plug-ins Kit.

Blob

Blob (**B**inary **L**arge **Ob**ject) fields store binary documents of any kind. For example, you can store documents created by other applications, scanned images, or other applications. A Blob can be as large as 2 gigabytes. When you are working with a record that contains a Blob field, the entire Blob is loaded into memory. You can use a Blob field to store entire desktop documents within your database. You can also write the contents of a Blob field to a desktop document. For example, you can use a Blob field in a document management system that stores documents in the database and delivers them to users upon request.

You use Blob commands in 4th Dimension's language to manage Blob fields. Use the DOCUMENT TO BLOB and BLOB TO DOCUMENT commands to read and write documents to and from Blob fields. The commands COMPRESS BLOB, EXPAND BLOB, and BLOB PROPERTIES let you work with compressed Blobs. For more information about working with Blobs, see the section on Blobs in the *Language Reference*.

The contents of a Blob field is not displayed on-screen since a Blob can represent any type of data.

Subtable

A Subtable field is a field that associates a subtable with each individual record in a table. For example, a [People] table could include Children as a Subtable field. The subtable associated with the field — also called Children — could contain fields that store data on each person's children (their names, ages, birth dates, and so on). A single subtable can contain up to 32,767 subrecords and each subrecord can have as many as 511 subfields.

The record to which a subtable is attached is called the parent record and the table that contains the parent record is called the parent table. Each subtable has its own set of fields, called subfields.

You can use subtables to manage a variable number of subrecords. For example, you may want to create a student table in which each record contains data about the student's honors and the dates of the awards. Instead of having to create a number of fields such as Honor 1, Honor 2, and so on, you can create a subtable to which you can add subrecords as the awards accumulate.

In many cases, however, it is best to use a related table instead of a subtable. Subtables have several limitations that related tables do not. First, a subtable cannot be viewed without opening the parent record. Second, it is difficult to use information across subrecords. For instance, you could easily produce a sorted list of each student's honors but it would be difficult to produce a sorted list of all honors awarded to all students. If you need to generate this type of sorted list, you should use a related table.

In general, you should not use a subtable to store information that you will need to search on, access directly, or use for calculations.

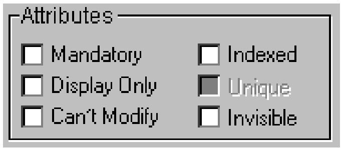
Because 4th Dimension loads subtables into memory when it loads their parent records, the number of subtables and subrecords is limited by the amount of available memory. A good rule of thumb is to allow no more than 100 subrecords per parent record. If processing speed is of concern, allow no more than 25.

You add subfields to a subtable the same way that you add fields to tables. You cannot create more than one level of subfields.

After you define a field as a Subtable field, you cannot assign it another field type. However, you can make the field invisible in the User or Custom Menus environment (for more information, see the section "Invisible" on page 92).

Field Attributes

Field attributes determine conditions for entering, displaying, or modifying data in the field. Each field can have several attributes.



Attributes

☐ Mandatory ☐ Indexed

☐ Display Only ☐ Unique

☐ Can't Modify ☐ Invisible

You set the field attributes in the Attributes page of the Field Properties window. Attributes that cannot be selected for a particular field type are disabled. A description of each of the field attributes follows.

Mandatory

When the Mandatory attribute is set for a field, the user must enter a value in that field during data entry. 4th Dimension does not accept a record that contains an empty mandatory field. You would set the Mandatory attribute for a field that contains essential information for your database. The field that uniquely identifies each record is a good candidate for the Mandatory attribute. Social Security numbers, invoice numbers, certain dates, or employee numbers might need to have the Mandatory attribute set to protect the integrity of the records.

You can also set the Mandatory attribute for a field in a particular form. If you select the Mandatory attribute in the Structure editor, you cannot deselect it on a particular form. However, you can apply the Mandatory attribute on a form to a field that does *not* have this attribute in the Structure editor. For information about setting the Mandatory attribute for a field in a form, see the section “Setting the Enterable and Mandatory Attributes” on page 245.

Display Only

The user cannot enter values from the keyboard into a field that has the Display Only attribute set. You must use a default value for such a field or write a method that inserts a value in the field. A field with the Display Only attribute is useful for displaying values that you do not want database users to modify, such as calculated totals or a sequence number assigned by a method.

You can also make any field non-enterable on a particular form. For information about making a field non-enterable, see the section “Setting the Enterable and Mandatory Attributes” on page 245.

Can’t Modify

If the Can’t Modify attribute is set for a field, 4th Dimension accepts the value initially entered in the field, but does not allow the user to modify the value after the record has been saved. The user can edit an entry in such a field only during the initial creation of the record, before the record is accepted. Once the user saves the record, the value in the field not editable. The value can be modified by a method or by returning to the Design environment and removing the attribute.

Use Can’t Modify for fields that must provide an audit trail such as Date Received, Date Paid, and so on. The Can’t Modify attribute is often used for the field that uniquely identifies each record in the table.

Indexed

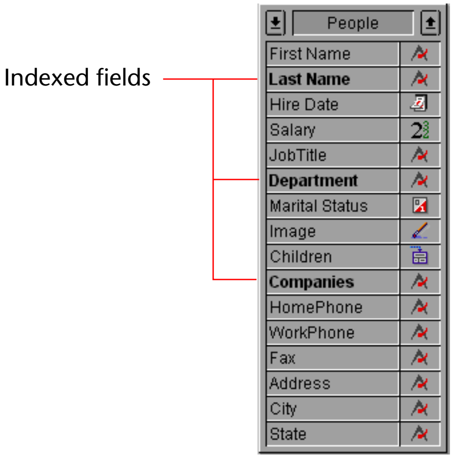
You should use the Indexed attribute for fields that you frequently use for searching and sorting. For example, you might index Last Name, Company name, or Product name if you plan to search for specific records or sort the records by these fields. You also use this attribute for fields that establish relations between tables. For more information, see “Setting Relation Properties” on page 103.

The Indexed attribute causes 4th Dimension to create an internal index table for the field. The table allows 4th Dimension to perform rapid searches and sorts on the field. When searching or sorting on a unindexed field, 4th Dimension moves through data sequentially, examining each record in order. An index allows 4th Dimension to search and sort without going through every record.

You can index Alpha, Real, Integer, Long Integer, Time, Boolean, and Date fields. As you add and delete records, 4th Dimension automatically updates its index table. If you assign the Indexed attribute to an existing field, 4th Dimension automatically indexes the existing data when you leave the Design environment. You can specify as many indexed fields as you want.

Do not index every field. An index increases the size of the database, using more space on disk. Using many indexes also increases the time needed to save a record since 4th Dimension updates the index table with each entry.

Indexed fields are displayed in bold type in the Structure window.



Unique

Use the Unique attribute when you want to be certain that each record has a different (unique) value in this field. The Unique attribute should be used for the field that uniquely identifies each record in the table. The Unique attribute is useful to validate fields that store Employee numbers, Social Security numbers, Purchase Order numbers, and so on.

If you want to set the Unique attribute for a field, you must first make it an indexed field. The Unique attribute is disabled unless the Indexed attribute is set.

The Unique attribute prevents duplication of empty values as well as actual entries. An empty field cannot be duplicated in another record.

Note If you apply the Unique attribute to a subfield (a field in a subtable), the attribute ensures that no subrecord contains a duplicate value. The Unique attribute applies to all subrecords, not just the subrecords for each parent record.

Invisible

You can make a field invisible in the User environment and custom applications by selecting the Invisible attribute for the field. Use the Invisible attribute if you inadvertently create an “extra” field or if a field is no longer needed in the current structure. The Invisible attribute hides the field from the user. A field with this attribute does not appear in all standard 4th Dimension editors and dialog boxes that appear in the User and Custom Menus environments.

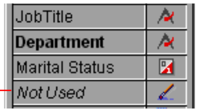
These editors and dialog boxes include the following:

- All query editors,
- Order By editor,
- Chart editor,
- Label editor,
- Quick Report editor,
- Import and Export dialog boxes,
- Apply Formula dialog box.

In each of these places, the user is unable to see or choose the field. For instance, the user cannot choose an invisible field for a report created with the Quick Report editor.

Note When using the editors, users have the option of saving their specifications (e.g., the query or sort they created) to disk files. In this case, any invisible fields specified will be used in the operation. In addition, users can type the names of invisible fields in the Apply Formula dialog box.

Invisible fields are displayed in italics in the Structure editor window.



JobTitle

Department

Marital Status

Not Used

Invisible field

Compression (picture and MacOS only)

The compression mechanism uses QuickTime. It is only available on Mac OS.

The Attributes page includes a **Compression** check box. This check box is only activated for the image fields. The **Options...** button, also available on this palette, allows the user to set QuickTime compression options.

Note In order to take advantage of this feature, QuickTime must be installed on the machine on which the database is run.

If you check the **Compression** option without defining a compression option, the default compression will be used.

Choices and Help

The second page of the Field Properties window lets you assign a choice list to the field and enter a help message.

Choices

Use the Choices attribute if you want to display a choice list for entering information in the field. To use this attribute, you first need to create the choice list using the List editor.

Use the Choices attribute when you want to standardize entries in the field and avoid misspellings. Use a choice list for a field that has a limited number of valid entries or a limited number of usual entries. Using a choice list does not necessarily prevent the user from typing a different value (one that does not appear on the choice list). For more information about choice lists, see Chapter 10.

You can also assign a choice list to a field on a particular form. However, when you assign a choice list only on a form, the list is not displayed in other editors and dialog boxes, such as the Query editor. For information about using a choice list in a form, see the section "Using Choice Lists" on page 246.

Help

You can provide users with additional information about a field by adding a Tip or Balloon Help to the field. When the database is used on a Macintosh with Balloon Help turned on, the Balloon Help appears next to the field whenever a user places the pointer over the field in any form in which the field is included. A Tip is displayed on all platforms.

Note You can create Balloon Help when you are designing a database on Windows, but the Balloon Help can be displayed only on Macintosh running System 7.0 or greater, with Balloon Help turned on.

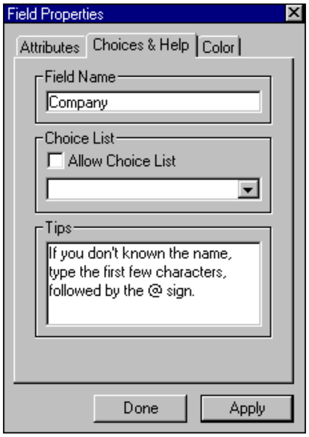
► To add a help message to a field:

1 **Click the Choices & Help tab in the Field Properties window.**

The Choices & Help page appears.

2 **Enter the text in the Help message area and click Apply.**

The figure below shows text being entered into the message area. In this example, the help message is prompting the user about using the wildcard character during data entry.

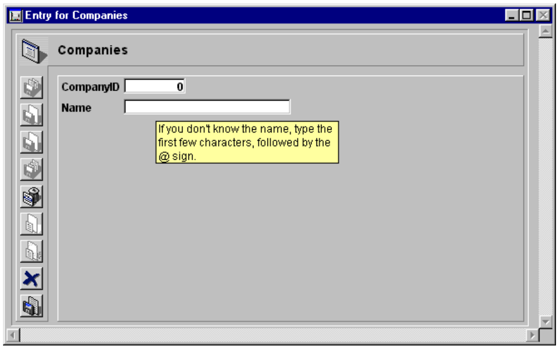


Field Name: Company

Choice List: □ Allow Choice List

Tips: If you don't known the name, type the first few characters, followed by the @ sign.

When the user selects the field, the tip appears below the field, as shown below.



CompanyID 0

Name

If you don't know the name, type the first few characters, followed by the @ sign.

Setting the Color of the Field

The Color page of the Field Properties window lets you set the color of either the field name or the background of the row in the table image in which the field appears. You use a Design Environment property in the Database Properties dialog box to determine whether the color you choose applies to the name or to the background. For information on the Color Names or Background properties, see the section "Design Environment" on page 51.

► To set a color:

- **In the Color page, deselect Default Color and click the desired color in the Color palette.**

  When you click **Apply,** either the field name or the row of the table image background changes to the color you selected (depending on the database property you selected).

Modifying Fields and Field Properties

You can change a field's name or properties at any time, whether or not you have entered data into the field.

If you change the field name, 4th Dimension automatically updates the name anywhere the field is used (e.g, forms, methods, and disk files containing specifications from the 4th Dimension editors). Field labels on forms are not changed.

Field names are updated in methods as long as the methods are closed when the name is changed.

If you change field properties, the change does not usually affect data already entered into the field. For example, if you set the Unique attribute, only entries made after that are checked for uniqueness; field entries made up to that point may include duplicates. However, if you set the Indexed attribute, all field values (both old and new) are included in the index.

If you change the field type before entering any data into the field, 4th Dimension simply changes the field type. The only restriction is on the Subtable field type which cannot be changed to any other field type.

If you change the field type after entering data into the field, 4th Dimension converts the data to the new type if possible, when the data is loaded for the first time after the change. Data from a Picture field converted to any other type does not display. Data from a field converted to a Picture or Subtable field type does not display.

When you convert a field type, 4th Dimension retains the field's original value until you modify the record. For example, if a Text field contains text such as "over 10" and you change the field type to Integer, the modified field displays "10." If you change the field back to a Text field without editing the field value, 4th Dimension displays "over 10" again.

► To modify a field's properties:

1 **Double-click the field name in the Structure editor.**
OR
Select the field you want to modify and choose Field Properties from the Structure menu.
OR
Double-click the field name in the Tables page of the Explorer.

OR

Click the field name in the Tables page of the Explorer and click Edit.

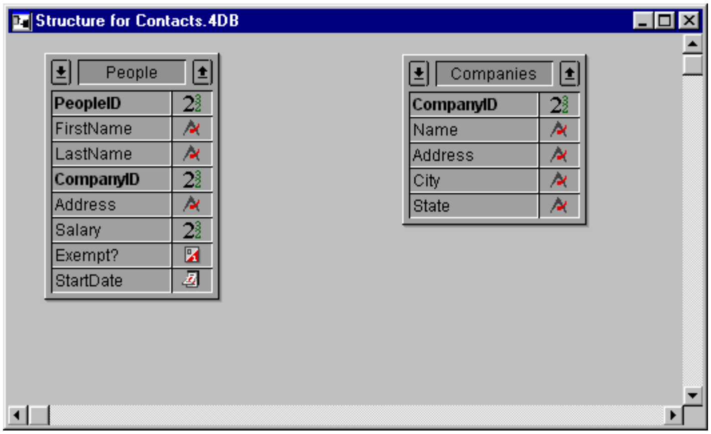
4th Dimension displays the Field Properties window for that field. The window displays the field name and properties that you have previously assigned to the field.

2 **Make any necessary changes.**

3 **Click Apply to save the changes to the field properties.**

Relating Tables

You will usually need to create structures in which several tables share information. For instance, suppose you create a database to keep track of people and their companies. The database structure, shown below, contains a [People] table for storing people information and a [Companies] table for storing company information.



People
PeopleID
FirstName
LastName
CompanyID
Address
Salary
Exempt?
StartDate

Companies
CompanyID
Name
Address
City
State

Although useful, the information stored in each separate table does not fulfill your information tracking needs. When you are viewing a record from the [People] table, you need to be able to view information about the company for which that person works and when you are viewing a record from the [Company] table, you need to be able to view information about all the people who work for that company.

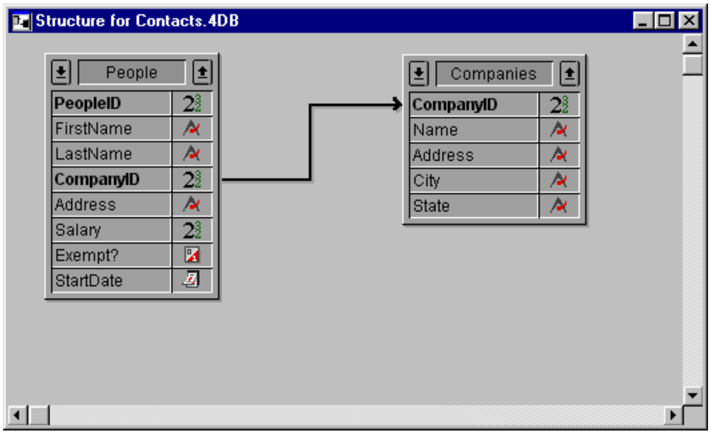
To allow two tables to share information in this way, the tables can be related to each other — in other words, a relation can be established between the data in each table.

In 4th Dimension, *table relations* allow data stored in one table to be accessed from another table. Tables that share information by means of a relation are called *related tables*.

Relating tables allows you to do the following:

- Store data efficiently,
- Update data in one place and have the change reflected everywhere the data is used,
- View related information,
- Perform queries and sorts in one table that are based on data in another table,
- Create, modify, or delete records in related tables.

The figure below shows a relation created between the [People] table and the [Companies] table in the Structure editor.



The [People] table contains one record per person. The [Companies] table contains one record per company. The relation between the two tables allows you to access, enter, modify, or delete information from both tables. For example,

- When a person's record is onscreen, you can view or modify the corresponding company information — the address, city, state, zip code, and company telephone number.
- When you add a new person, you can link the person's record to the appropriate company record (if the company is already entered), or, if the person's employer is not in the database, create the new company

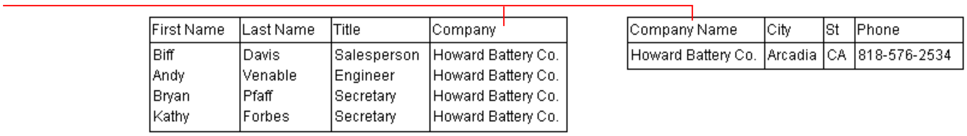
record while creating the person record. For more information, see "Entering Data in Related Tables" on page 115.

- For each company, you can view or modify information for each person in the company — name, title, telephone number, and so forth. You can also add a person record from within the company record. For more information, see "One to Many Properties" on page 106.

Related Fields

You are able to display information from related tables by means of the related fields — the fields that connect the two tables in a relation.

The basic purpose for relating tables is to instruct 4th Dimension which record or records to make current in one table based on which record is current in the other table. The related tables make use of data in two related fields to identify corresponding records. In the following example, the company name is stored in both the [People] table and the [Companies] table.



Related fields

First Name	Last Name	Title	Company
Biff	Davis	Salesperson	Howard Battery Co.
Andy	Venable	Engineer	Howard Battery Co.
Bryan	Pfaff	Secretary	Howard Battery Co.
Kathy	Forbes	Secretary	Howard Battery Co.

Company Name	City	St	Phone
Howard Battery Co.	Arcadia	CA	818-576-2534

The Company field in the [People] table and the Company Name field in the [Companies] table relate the two tables. The Company Name field in the [Companies] table is the *primary key field* for [Companies]. It uniquely identifies each company record. A primary key should have the Indexed and Unique attributes. The Company field in the People table is a *foreign key field*. Each value of the foreign key field matches exactly one value of the primary key field in the related table. A foreign key should have the Indexed attribute. If both the primary and foreign key fields do not have the Indexed attribute when you create the relation, 4th Dimension assigns this attribute automatically.

Each value in a foreign key field is equal to one value of the primary key field in another table. In this example, a value of the foreign key field in [People] matches exactly one value of the primary key field in [Companies]. The foreign key field is also indexed but its values are non-unique (e.g., several people may work for the same company).

In some database designs, the values of the primary key field are assigned by the database automatically — either by assigning a sequence number that 4th Dimension generates or by a user-written method. Such a procedure guarantees the uniqueness of the key field. For example, if the primary key field in the [Companies] table is a sequence number rather than the company name, it would be possible for users to enter several companies with the same name but different addresses. Also, if a company name changes, the user could make the change to the database without disturbing the relation between the two tables.

If the user is permitted to enter the value of the primary key field, you should use both the Unique and Can’t Modify attributes to check for uniqueness of the initial entry and to prevent users from subsequently changing the entry to a non-unique value. If you elect not to use the Can’t Modify attribute, you will need to take other measures to prevent users from creating “orphaned” records in any related tables by making changes to the values of the primary key field.

When relations are established, you can read and write values in one table while working in the related table. For example, when you enter a company name in a person’s record, 4^{th} Dimension searches for that company in the [Companies] table and displays the company address and phone number in that person’s record. When you view a company’s record, 4^{th} Dimension searches in the [People] table for all the people who work at that company and displays their records in the company record.

These relations can be invoked automatically (i.e., with no programming on your part) or you can choose to use manual relations. In the latter case, you use methods to load and unload related records and control the creation, modification, or deletion of related records. Manual relations are sometimes preferable in complicated structures in which more than two tables are related to one another and you need to control the loading and unloading of related records.

You can choose to use automatic relations by selecting the appropriate properties at the time the relation between the tables is specified. For more information, see the section “Automatic and Manual Relations” on page 115.

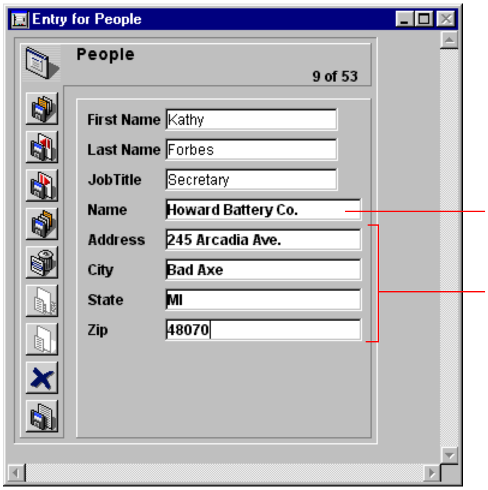
The One Table and the Many Table

When you create a relation between two tables, the table containing the primary key in the relation is called the *One table* and the table containing the foreign key in the relation is called the *Many table*. The tables are called the One table and the Many table because one record in the One table relates to many records in the Many table and many records in the Many table relate to one record in the One table. This type of table relation is called a *Many to One* relation.

In the relation between people and companies, the [Companies] table is the One table and the [People] table is the Many table. One company record relates to several people (i.e., all the people who work for that company) and several people relate to one company (i.e, the company for which they work). For instance, there may be one record for Acme in the [Companies] table but many records of people employed by Acme in the [People] table.

When any record in the [People] table is made current, 4th Dimension loads the corresponding single record from the [Companies] table. If any fields have been included from the [Companies] table, the values for these fields are automatically displayed. For information about including fields from other tables, see the section "Selecting Fields from Related One Tables" on page 144.

The figure below shows how the company name in a [People] table record specifies one record in the [Companies] table so that the [People] table record can display the company's address and phone number.



Entry for People

People

9 of 53

First Name	Kathy
Last Name	Forbes
JobTitle	Secretary
Name	Howard Battery Co.
Address	245 Arcadia Ave.
City	Bad Axe
State	MI
Zip	48070

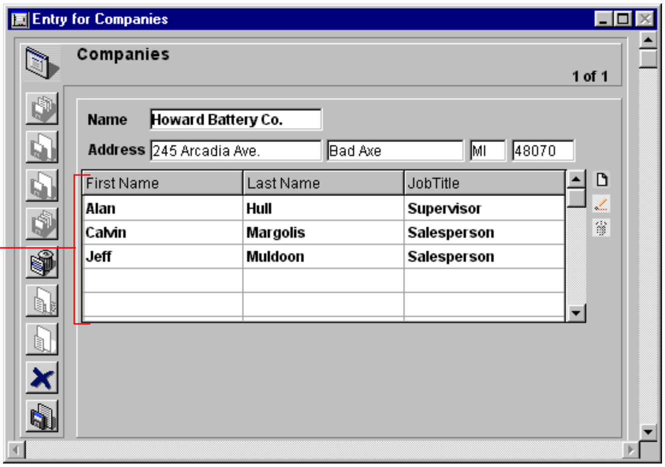
Company name specifies one company in [Companies] table

Data from [Companies] table displayed on [People] form

Conversely, when a record in the [Companies] table is made current, 4th Dimension creates a selection of records in the [People] table and displays them on the form. Because the relation specifies several records in the other table, the names and titles of many people can be displayed.

Note Only those records currently displayed on the form are loaded into memory.

The figure below shows how a company name in a record in the [Companies] table specifies several records in the [People] table so that the [Companies] table record can display a list of people employed by that company.



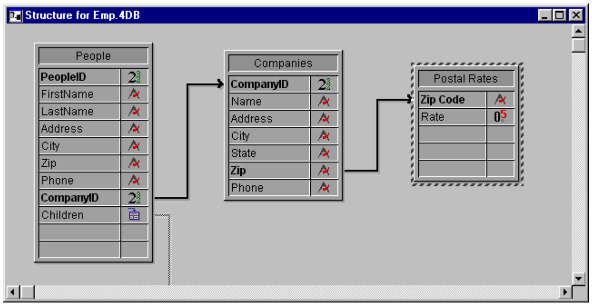
Name Howard Battery Co.
Address 245 Arcadia Ave. Bad Axe MI 48070

First Name	Last Name	JobTitle
Alan	Hull	Supervisor
Calvin	Margolis	Salesperson
Jeff	Muldoon	Salesperson

Records from [People] table displayed on [Companies] form

The distinction between the One table and the Many table is specific to a particular relation. A table may be the One table in one relation and the Many table in another. A table in a relation need have only one primary key, but it can have several foreign keys.

For example, suppose you decide to send a package of sample merchandise to everyone in your [People] table. You add a [Postal Rates] table that contains zip codes and the postal rate for each zip code. Using this structure enables you to print an address label for each person that includes the amount of postage needed to mail the package. The figure below shows the [Postal Rates] table added to the database structure.



The Zip Code field in the [Postal Rates] table is its primary key, so the [Postal Rates] table is the One table. The Zip field in the [Companies] table is the foreign key field for this relation. Since the Zip field is a foreign key, it can have non-unique values. The Zip field will contain duplicate Zip codes for companies that are near each other. The [Companies] table is therefore the Many table in relation to the [Postal Rates] table.

Whether a table is a One table or a Many table, therefore, depends on its relation to the other table. The [Companies] table is the Many table in relation to the [Postal Rates] table and it is the One table in relation to the [People] table.

Setting Relation Properties

You must have at least two tables in your database to create a relation. You create a relation by drawing a line between two fields.

The field where you start drawing must be a foreign key field in the Many table and the field where you end must be the primary key field in the One table. Using the Company database example in this chapter, you would start drawing in the [People] table and end in the [Companies] table. Remember,

You always draw a relation from the Many table to the One table.

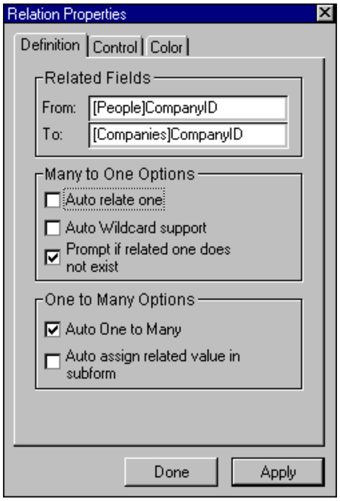
The related fields must have the same field type. For example, the Company field in the [People] table and the Company Name field in the [Companies] table can be related because they are both Alpha fields.

You can use these field types for the primary and foreign key fields:

- Alpha,
- Number (Real, Integer, or Long Integer),
- Time,
- Boolean,
- Date.

Primary and foreign key fields must be indexed. If the fields do not have the Indexed attribute set, 4th Dimension automatically indexes them when you switch to the User environment.

You specify various properties of the relation with the Relation Properties window. It has three pages, Definition, Control, and Color.

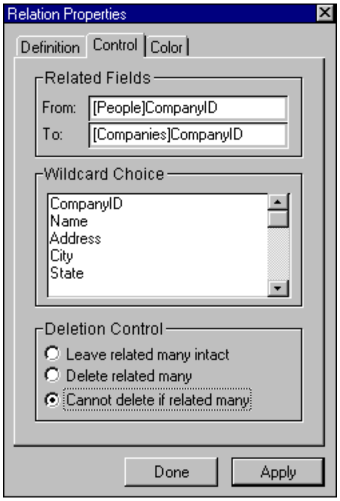


Related Fields
From: [People]CompanyID
To: [Companies]CompanyID

Many to One Options
☐ Auto relate one
☐ Auto Wildcard support
☑ Prompt if related one does not exist

One to Many Options
☑ Auto One to Many
☐ Auto assign related value in subform

Definition Page
Specify the primary and foreign keys.
Set automatic relation options.

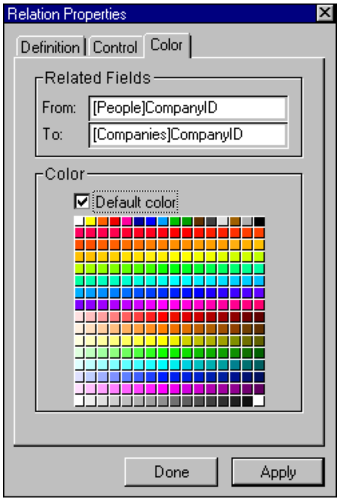


Related Fields
From: [People]CompanyID
To: [Companies]CompanyID

Wildcard Choice
CompanyID
Name
Address
City
State

Deletion Control
○ Leave related many intact
○ Delete related many
● Cannot delete if related many

Control Page
Specify the wildcard choice field in the One table.
Set Deletion Control options.



Related Fields
From: [People]CompanyID
To: [Companies]CompanyID

Color
☑ Default color

Color Page
Specify the color of the relation line in the Structure editor.

Here are descriptions of the relation properties:

Related Fields

The Related Fields area identifies the foreign and primary key fields:

- The “From” field is the foreign key field in the Many table for this relation,
- The “To” field is the primary key field in the One table,

You draw the relation line *from* the foreign key field in the Many table *to* the primary key field in the One table.

Many to One Properties

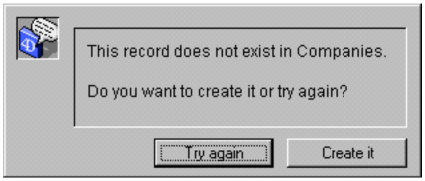
The Many to One properties affect what happens when a record from the Many table is opened:

- **Auto Relate One** This check box establishes automatic relations from the Many table to the One table. For example, when a record from the [People] table is opened in the User environment, the related company in the [Company] table is selected. This allows 4th Dimension to display information about the company for which the employee works if you so desire.

  If you deselect Auto Relate One, you can manage the loading and unloading of the related One record using commands in the language.

- **Auto Wildcard Support** This check box has the effect of invisibly appending the wildcard character (@) to any value entered in the foreign key field from the Many table when the user tabs or clicks out of the field. If the user enters a partial value, 4th Dimension looks for a matching value in the related One table. If 4th Dimension finds only one match, it automatically completes the entry. If 4th Dimension finds more than one possible match, the user is presented with a list of values from which to choose. For a complete description of this process, see “Entering Data in Related Tables” on page 115.

- **Prompt if related One does not exist** This check box forces 4th Dimension to display a dialog box that lets a user create the related One record if it does not exist. By default, when you enter a value in a related field from the Many table, 4th Dimension checks to see if a matching record already exists in the related One table. If 4th Dimension cannot find a match, the following dialog box is displayed:



This record does not exist in Companies.

Do you want to create it or try again?

This dialog box allows the user to create a corresponding record in the One table while you are entering a record in the Many table.

For instance, suppose that you have an Invoicing database that contains an [Invoices] table and a [Customers] table. If you enter an invoice in the [Invoices] table and the customer to whom the invoice belongs does not already have a record in the [Customers] table, 4th Dimension will ask you if you want to create the corresponding record in the [Customers] table when you validate the record in the [Invoices] table.

You can suppress this dialog box by unchecking the **Prompt if related One does not exist** check box. Suppressing this dialog box is useful when you need to manage the creation of the related One record using a method.

One to Many Properties

The One to Many properties control automatic relations in the other direction.

- The **Auto One to Many** check box establishes automatic relations from the One table to the Many table. For example, when a record from the [Company] table is opened in the User environment, the related records in the [People] table are loaded. This enables 4th Dimension to display the records of the people that work for the company in a subform.

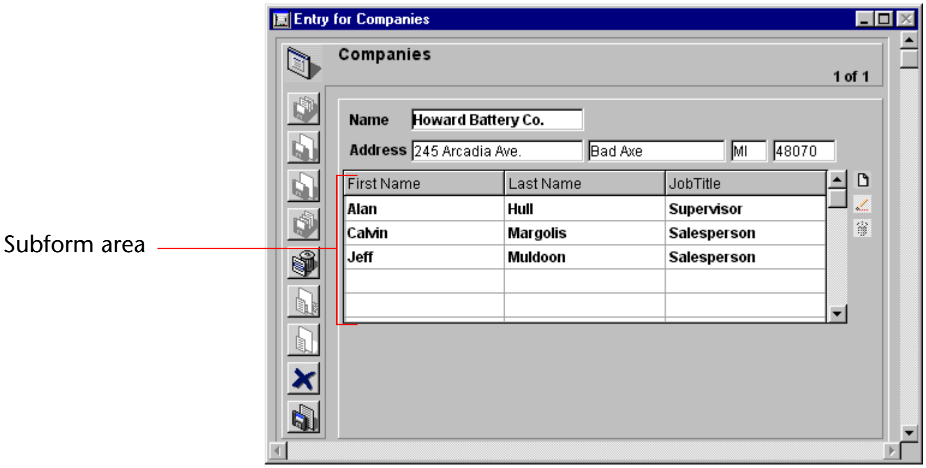
  When you create a relation, the automatic relation check boxes are already selected. If you want to turn off automatic relations from the Many table to the One table, deselect the **Auto Relate One** check box. If you want to turn off automatic relations from the One table to the Many table, deselect the **Auto One to Many** check box.

- **Auto Assign Related Value in Subform** is used to automatically assign the value of the primary key field in the One table to the foreign key field in the Many table during data entry. This option is available only if automatic One to Many relations are established.

  This option affects data entry when an input form in a One table has a subform of a related Many table (for information on subforms, see

"Adding a Subform to the Form" on page 324). If **Auto Assign Related Value in Subform** is selected, a user can add records to the subform (i.e., the related Many table) and have the relating value assigned automatically[1]. This occurs as long as the record is added by typing **Ctrl+/** (**Command–Tab** on Macintosh) or by pressing the **Add to Subform** button.

In the relation between the [Companies] table and the [People] table, the [Companies] table is the One table and the [People] table is a related Many table. Each company has one record in the [Companies] table and several records in the [People] table. The data entry screen for the [Companies] table is shown below.



Subform area

Name Howard Battery Co.

Address 245 Arcadia Ave. Bad Axe MI 48070

First Name	Last Name	JobTitle
Alan	Hull	Supervisor
Calvin	Margolis	Salesperson
Jeff	Muldoon	Salesperson

If you want to add a person record from this screen, you need to assign the Company name to the foreign key field of the person's record. Otherwise, the new record would not be related to the correct record in the [Companies] table. **Auto Assign Related Value in Subform** does this automatically. If you deselect this option, you would need to make the assignment using a method.

Note If you double-click in a blank area of the subform and proceed directly to the input form to add a new record, or if you modify the relating field value in the One table after you have created records in the Many table, **Auto-assign Related Value in Subform** has no effect and you must either manually assign the relating field value or use the language.

[1] This works when the foreign key field is *not* displayed in the subform.

Wildcard Choice

The Wildcard Choice list allows you to select an additional field to display in the Wildcard choice list (which appears when the user enters the 4th Dimension wildcard symbol (@) in the relating field during data entry). Usually, you will want to select the field that best identifies the record. For more information about the wildcard choice field, see the section "Using Wildcard Choice Lists" on page 116.

Deletion Control

The Deletion control options regulate record deletion in the Many table when a record is deleted in the One table. Normally, the user cannot delete records in a table unless it is the current table. This means, for example, that to delete records from the [People] table, it must first be made the current table. You make a table the current table by choosing it in the Choose Table/Form dialog box in the User environment.

When tables are related, 4th Dimension allows you to specify one of three special cases for records deleted from the One table.

The following deletion control options can be set only if the Allow Deletion Control check box in the Database Properties dialog box is checked. For more information, see "Data Control" on page 48.

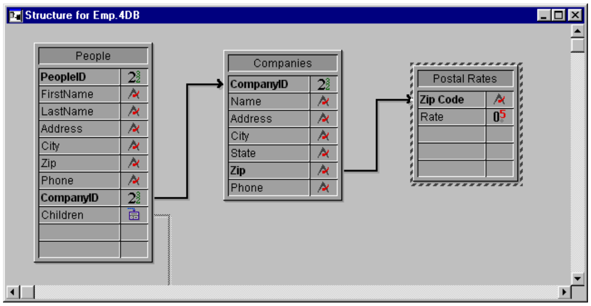
- **Leave Related Many Intact** Selecting this radio button allows the user to delete a record in the One table, leaving the corresponding records in the Many table intact. This leaves records in the Many table without any corresponding related record in the One table. The only effect is to render the information from the One table unavailable. No record from the One table is loaded when a record corresponding to the deleted record is loaded in the Many table.
- **Delete Related Many** Selecting this radio button instructs 4th Dimension to automatically delete all related records in the Many table when the user deletes a record in the One table. This property ensures that no related Many records become "orphaned" when the corresponding related One record is deleted.
- **Cannot Delete if Related Many** Selecting this radio button instructs 4th Dimension to prohibit the user from deleting a record in the One table if there are related records in the Many table. This property ensures that no records are mistakenly deleted.

Notice that you can freely delete records from the Many table, no matter which choice is made.

The **Delete Related Many** and **Cannot Delete if Related Many** radio buttons enforce what is called *referential integrity* in database theory. When referential integrity is in effect, 4th Dimension ensures that each record in a related Many table will always be associated with exactly one record in the related One table.

If you set the Deletion control option to either **Delete Related Many** or **Cannot Delete if Related Many**, 4th Dimension automatically adds the Indexed, Can't Modify, and Unique attributes to the primary key field in the One table. You cannot remove these attributes unless you first change the Deletion control setting to **Leave Related Many Intact**.

If you have several related tables, deletion control is activated for each relation as in a chain. For instance, suppose you have the structure shown below. If a Zip code is deleted from the [Postal Rates] table (a One table) and **Delete Related Many** has been selected for each relation, 4th Dimension first deletes the records for the corresponding companies in the [Companies] table and then deletes the records of all the people who work for those companies in the [People] table.



When confronted with contradictory Deletion control settings, 4th Dimension does not allow the deletion to occur. For instance, if **Delete Related Many** is selected for the relation between the [Companies] table and the [Postal Rates] table but **Cannot Delete if Related Many** is selected for the relation between the [People] table and the [Companies] table, no deletion will occur and the records in the [Companies] and [People] tables will remain intact.

The Deletion control choice is made when the relation is established. To change the choice, you can modify the relation's properties. For complete information about establishing and reestablishing relations, see the section "Creating a Relation Between Tables" on page 110.

Color

The Color property controls the color of the relation line in the Structure editor. The color of the relation line does not signify any other property of the relation.

Creating a Relation Between Tables

You create a relation by dragging from the foreign key field to the primary key field. You can do this using either the table images in the Structure editor window or the Explorer.

It is convenient to use the Explorer to create the relation when your structure is large and the table images of the tables that you want to relate are not adjacent to each other. Using the Explorer method, only one of the two table images must be visible in the Structure editor window.

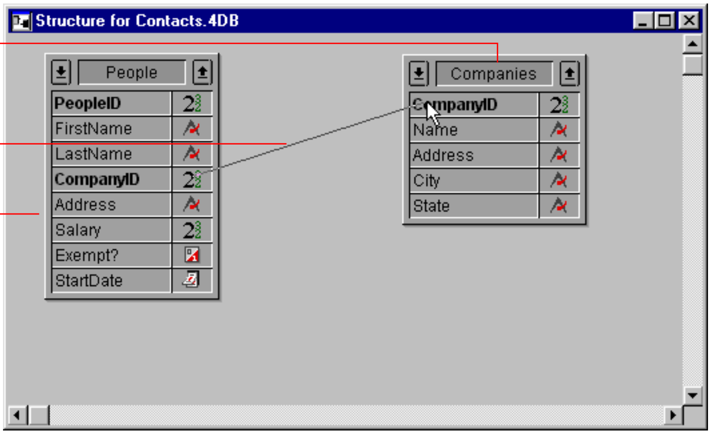
Tip To center a table image on-screen in the Structure editor window, double-click its name in the Tables page of the Explorer.

► To create a relation using the Structure editor window:

1 **In the Structure editor window, move the pointer over the foreign key field for this relation.**

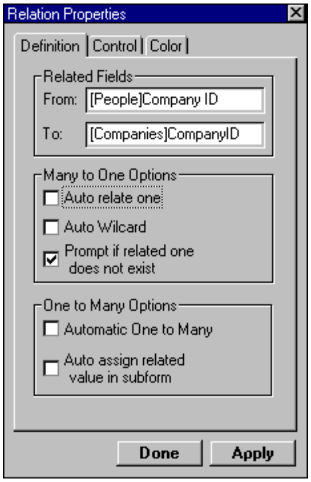
2 **Hold down the mouse button and drag toward the table to be related.**

As you move the pointer, 4th Dimension selects the field and draws a thin line, as shown below.



3 **Drag to the primary key field in the One table and release the mouse button.**

The Definition page of the Relation Properties window appears.



Related Fields
From: [People]Company ID
To: [Companies]CompanyID

Many to One Options
□ Auto relate one
□ Auto Wilcard
☑ Prompt if related one does not exist

One to Many Options
□ Automatic One to Many
□ Auto assign related value in subform

For information on setting properties for the relation, see the section “Setting Relation Properties” on page 112.

► To create a relation using the Explorer:

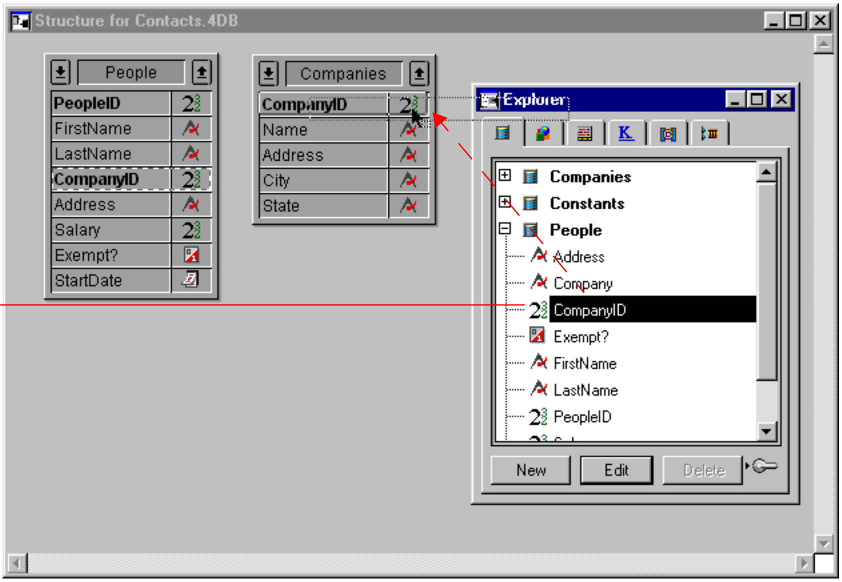
1 **Open the Explorer to the Tables page.**

2 **Expand the table that contains the foreign key field.**

This table will be the related Many table in the relation.

3 **Drag the foreign key field in the Explorer to the primary key field in the Structure editor window.**

The following illustration illustrates the process.



[People]CompanyID is the foreign key field in the new relation

The Definition page of the Relation Properties window appears.

Note If you hold down the **Shift** key, you can drag from the primary key field in the Explorer to the foreign key field in the Structure editor window.

For information on setting relation properties, see the following section.

Setting Relation Properties

This section describes the process of setting relation properties. The properties are the same regardless of the method you use to create the relation.

► To set relation properties:

1 **Check to make sure that the foreign and primary key fields are correct.**

Remember:

- The “From” field is the foreign key in the Many table for this relation,
- The “To” field is the primary key in the One table.
- The primary and foreign key fields must be of the same data type.

2 **Select the desired automatic relation check boxes to establish automatic relations between the tables.**

OR
Deselect the check boxes to establish manual relations.

In automatic relations, whenever a record from the One table is used, the related record or records in the other table is made the current selection for that table.

3 **Click the Control tab and use the Wildcard Choice list to select the additional field to display in the Selection window.**

For information on how the Wildcard choice field works during data entry, see the section "Using Wildcard Choice Lists" on page 116.

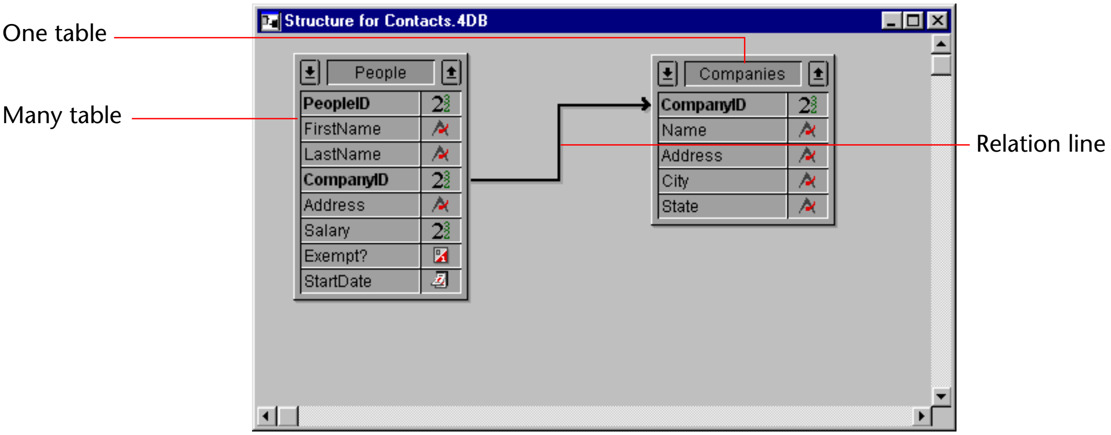
4 **Select a Deletion control option by clicking the radio button for the choice you want.**

The Deletion control radio buttons allow you to determine what happens when you delete a record in the One table. The **Leave Related Many Intact** radio button is the default. To be able to change this default option, you must have selected the **Allow Deletion Control** check box in the Database Properties dialog box. Otherwise, the deletion control options are dimmed. For more information about deletion control options, see the section "Deletion Control" on page 108.

5 **Click the Color tab and set the color of the relation line (optional).**

6 **Click the Apply button.**

4th Dimension displays the Structure window with a line between the two fields, as shown in the following illustration.



The arrow on the relation line points to the One table.

Removing Relations

4th Dimension lets you remove a relation by deleting the line that relates the two fields.

► To remove a relation:

1 **In the Structure editor window, move the pointer over the name of the foreign key field in the Many table.**

2 **Hold down the mouse button and drag over any empty area between table images.**

3 **Release the mouse button.**

4th Dimension removes the arrow and the tables are no longer related.

Reestablishing Relations

You can reestablish any relation at any time. You would do so, for example, if you mistakenly draw the relation between the wrong fields or if you want to change a relation property. 4th Dimension lets you reestablish a relation simply by drawing the relation line again.

To reestablish a relation using the same two fields, draw the relation line again. 4th Dimension displays the Relation Properties window so that you can make any necessary changes.

To reestablish a relation using a different field in the Many table, first remove the faulty relation and then draw the correct relation line again.

Modifying Relation Properties

If you need to view or change the properties of a relation, you can do so without having to recreate the relation.

► To modify a relation's properties:

1 **Move the pointer to the relation line until it changes to a relation icon .**

2 **Double-click the relation line.**

The Relation Properties window appears, showing the selected relation's properties.

3 **Modify the relation properties as necessary and click Apply.**

Automatic and Manual Relations

Relations can be either automatic or manual.

In an automatic relation, whenever a record in a related table is made current, 4th Dimension selects the corresponding record or records. The record or records so specified can then be viewed, printed, modified, or used in searches and sorts. No programming is required.

In a manual relation, you control whether 4th Dimension loads the corresponding record or records into memory. To exercise this control, you use methods. For complete information about creating the methods that control related tables, see the *4th Dimension Language Reference*.

You would use a manual relation if you wanted to optimize the performance of specific applications that do not need all corresponding records loaded each time. For example, if your structure relates three or more tables together, you may want to control when related records are loaded into memory. You would also use a manual relation if you wanted to relate two tables with two separate relations. Only one automatic relation can exist between two tables. Any number of manual relations can exist between two tables.

Entering Data in Related Tables

You can display fields from the One table on a form for a related table. The user can use these fields to enter and edit the data directly while in the records of the related table.

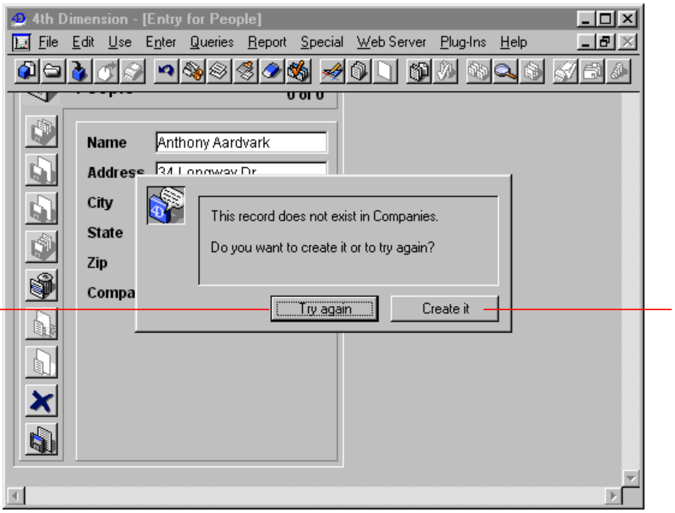
If the relation is automatic, information entered into the related fields is automatically saved in the related field's table. For complete information, see the section "Selecting Fields for the Form" on page 143.

If the relation is manual, you use the language to display values in related fields and to save the information entered into related tables. You use methods to transfer and save any entered data.

The user enters records in the One table as in any other table — by typing information into an input form or by importing the data. For instance, you might have a subform in the [Companies] table that displays employee data from the [People] table. If automatic Relate Many relations have been established, any information you add or modify in the subform is automatically updated in the [People] table. For more information about subforms, see the section "Adding a Subform to the Form" on page 324.

Occasionally, a user needs to create a new record for the One table while creating a record in the Many table. For example, suppose that, while creating a record in the [People] table the user enters a company name that doesn't exist in the [Companies] table. If automatic Relate One relations have been established, 4th Dimension automatically gives the user the opportunity to create a new record in the [Companies] table.

If the **Prompt if Related One does not Exist** property is selected, 4th Dimension displays the following message when a user enters a company name that does not exist in the [Companies] table.



Name: Anthony Aardvark

Address: 34 Longway Dr

City

State

Zip

Compa

This record does not exist in Companies.

Do you want to create it or to try again?

Click **Try Again** to enter a different value in the foreign key field

Click **Create It** to enter the new related record

4th Dimension requires that the corresponding record exist in the related table. The chance to create a new record in the One table is automatically provided to the user.

For complete details on entering data into fields from related tables, see the *4th Dimension User Reference*.

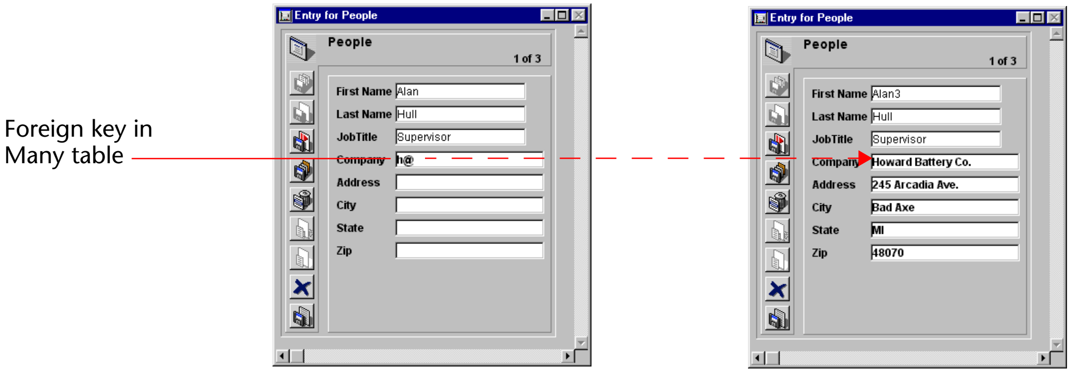
Using Wildcard Choice Lists

When tables are related, 4th Dimension allows the user to look up values in the One table when entering data into the foreign key field in the Many table. The user simply uses the standard wildcard character (@) in the related field. Doing so causes 4th Dimension to search for the corresponding entry in the related One table.

The wildcard character can be used in two ways: to complete a partial entry or to display a list of valid entries. When a list is displayed, the user can select the entry from the list. An additional field can be displayed with the related field.

For example, suppose the user is creating a record in the [People] table. Instead of typing ACI US, Inc. in the Company field, the user can type Ac@ and then press Tab to move to the next field. Because @ is the 4th Dimension wildcard character, this entry means “this value starts with “Ac” and is followed by anything else.” 4th Dimension looks in the related table for the record which matches this entry. If it finds one, it completes the entry and selects the next field in the data entry order.

The figure below shows how this use of the wildcard works.

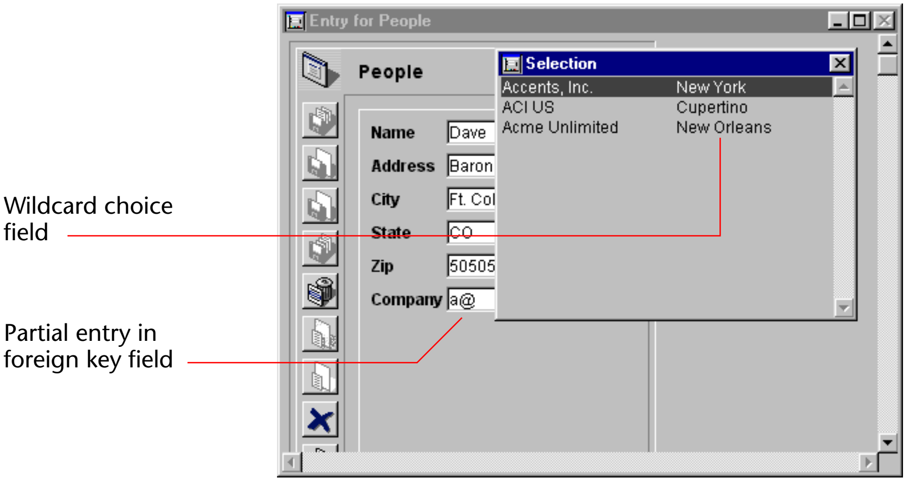


Foreign key in Many table

First Name: Alan
Last Name: Hull
JobTitle: Supervisor
Company: h@
Address:
City:
State:
Zip:

First Name: Alan3
Last Name: Hull
JobTitle: Supervisor
Company: Howard Battery Co.
Address: 245 Arcadia Ave.
City: Bad Axe
State: MI
Zip: 48070

If 4th Dimension finds more than one entry that meets the requirement, it displays a list of entries so that the user can select the correct one. The figure below shows such a list being displayed.



Wildcard choice field

Partial entry in foreign key field

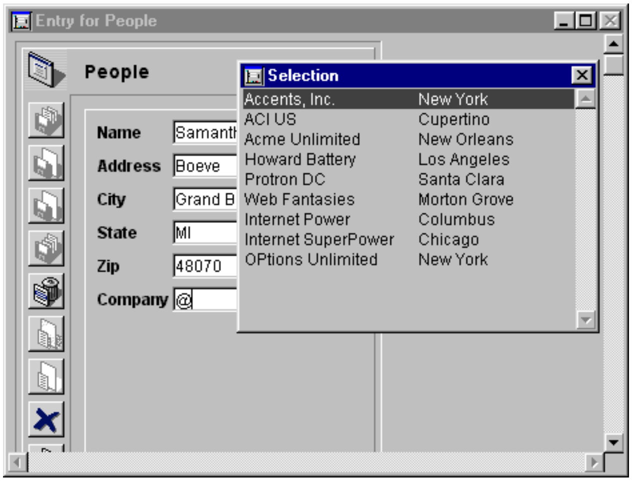
Name: Dave
Address: Baron
City: Ft. Col
State: CO
Zip: 50505
Company: a@

Accents, Inc.	New York
ACI US	Cupertino
Acme Unlimited	New Orleans

You can specify a second field for the list to help the user decide which company to select. The second field is the wildcard choice field you selected in the Relation Properties window when you created the relation.

The figure above shows the list of companies displaying the city as well as the company name. This wildcard choice field assists the user who doesn't know whether the company is named ACI US or Acme Unlimited, but remembers that the company is located in Cupertino.

To see a list of all companies in the [Companies] table, the user enters @ only. 4th Dimension then displays a list of all the companies so that the user can select the correct one. The figure below shows a complete list of companies being displayed.



Name Samanth
Address Boeve
City Grand B
State MI
Zip 48070
Company @

Accents, Inc.	New York
ACI US	Cupertino
Acme Unlimited	New Orleans
Howard Battery	Los Angeles
Protron DC	Santa Clara
Web Fantasies	Morton Grove
Internet Power	Columbus
Internet SuperPower	Chicago
OPtions Unlimited	New York

Relation Types

Until now, we have been discussing the process of creating the most common type of relation — a relation between a One table and a Many table — called a Many to One relation. However, you can also create One to One and Many to Many relations. These types of relations are described in this section.

One to One Relations

One to One relations are used only in special cases since tables that are related on a one-to-one basis could be combined into a single table. Here are some reasons to use a one-to-one relation:

- You have large BLOB fields in the database. BLOBs would slow down the database if they were loaded into memory when a record is made current. By placing the BLOBs in another table, you can load the BLOBs only when needed.
- You have a very large number of fields and need to divide them into logical groups. Separate tables can make the database faster and easier to use.
- You want to limit access to certain fields. If you use separate tables, you can assign different access privileges to each table.

Many to Many Relations

Sometimes you need to relate many records in one table to many records in another table. This is called a Many to Many relation.

An example of a Many to Many relation is a database that tracks class enrollment. Suppose that this database has two tables, [Students] and [Classes]. A student may enroll in many classes and a class may have many students. You want to see all the classes that a student has enrolled in and you want to see all the students enrolled in each class.

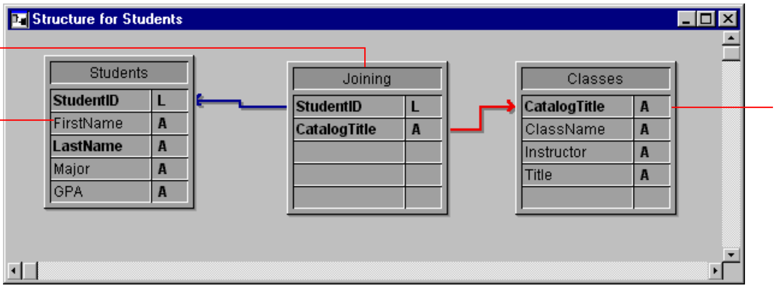
Other examples of Many to Many relations include the following.

- **[Suppliers] and [Products]** Each supplier provides many products and each product may be provided by several suppliers.
- **[Employees] and [Account]** Each employee works on many accounts and each account may be worked on by several employees.
- **[Movies] and [Actors]** Each movie involves several actors and each actor may appear in several movies.

You can use 4th Dimension to create automatic Many to Many relations. The key is to create an intermediate table which is related to the other tables using Many to One relations. You can then create input and output forms that handle all the necessary record tracking and data display.

This section describes how to use automatic relations to handle a Many to Many relation.

The figure below shows the enrollment database with three tables, [Students], [Classes], and [Joining]. This database structure is used throughout this section to explain how an automatic Many to Many relation works.



Many table

One table

One table

Students	
StudentID	L
FirstName	A
LastName	A
Major	A
GPA	A

Joining	
StudentID	L
CatalogTitle	A

Classes	
CatalogTitle	A
ClassName	A
Instructor	A
Title	A

The [Students] table is a One table. It contains one record for each student, including the name, major, and GPA. The Student ID field identifies each student uniquely.

The [Classes] table is also a One table. It contains one record for each class, including the class name and the instructor. The CatalogTitle field identifies each class uniquely.

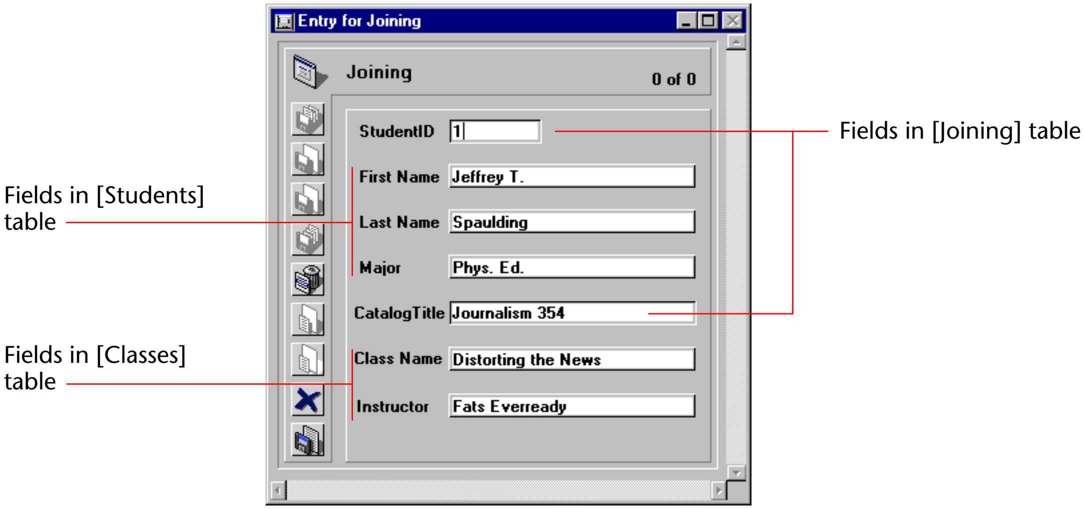
An intermediate table, [Joining], is the Many table for both of the other tables. It contains records for many students and many classes. Forms for this table are used for entering data into both of the other tables, and for displaying information in each of the other tables.

The use of three tables ensures that the data is stored efficiently. A student's complete record is stored only once. Each class has one record, stored only once. Records that relate students to classes are stored once for each enrollment. All of the information, however, is available in any combination.

Entering Data with Many to Many Relations

You use the intermediate table — in this example the [Joining] table — to enter and display information from both of the other tables. Each record that you enter in the [Joining] table is related to both of the other tables (a student and a class). The records from the [Joining] table contain only the two pieces of information that establish the relation: the student ID and the catalog title.

Here is an example of a new record being entered in the [Joining] table.



Entry for Joining

Joining 0 of 0

StudentID: 1
First Name: Jeffrey T.
Last Name: Spaulding
Major: Phys. Ed.
CatalogTitle: Journalism 354
Class Name: Distorting the News
Instructor: Fats Everready

Fields in [Joining] table

Fields in [Students] table

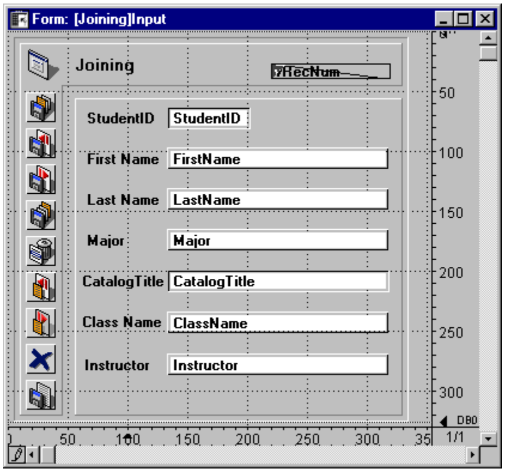
Fields in [Classes] table

This record defines Jeffrey T. Spaulding as enrolled in a Journalism class. This record actually combines information from the other two tables.

A similar record exists for each class in which the student is enrolled. Only the Student ID and Catalog Title fields are actually stored in the [Joining] table. Each record catalogs a particular student taking a particular class.

Note When a record in the [Joining] table is loaded (as in creating such a record), it automatically creates a selection of records in the related tables. The selection consists of the corresponding student and class records. If you switch to either of the other tables, only a single record is displayed. To display all the records, choose **Show All** from the **Queries** menu.

The input form for this record is shown below. Notice that it contains fields from both the [Students] and [Classes] tables.



Form: [Joining]Input

Joining

?RecNum

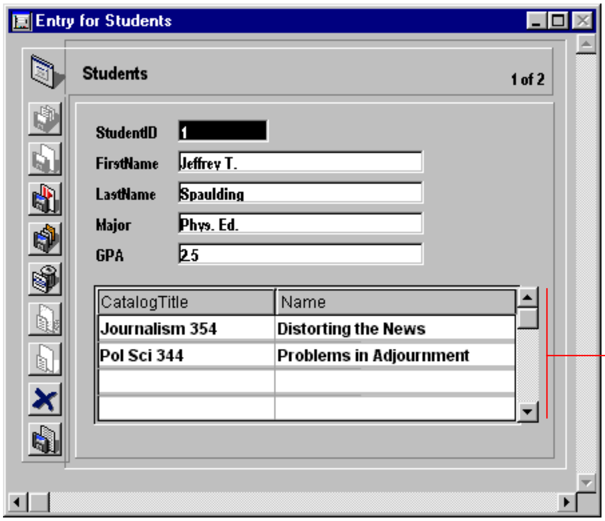
StudentID	StudentID
First Name	FirstName
Last Name	LastName
Major	Major
CatalogTitle	CatalogTitle
Class Name	ClassName
Instructor	Instructor

Data is entered only in the Student ID and Catalog Title fields. When a student ID is entered, 4th Dimension finds the student information in the related Students table and displays it in the Last Name, First Name, and Major fields. Likewise, when a Catalog Title is entered, 4th Dimension finds class information in the [Classes] table and displays it on the input form.

Displaying Information in a Subform

You can display information from these three tables using subforms. You can display all the classes a student is enrolled in on the student's record. You can display all the students enrolled in a particular class on the class record.

To display classes on a student's record, you use a subform. For information about creating subforms with the Form Wizard, see the section "Adding a Subform to the Form" on page 160. For information on creating a subform using the Form editor, see "Adding a Subform to the Form" on page 324.



Entry for Students

Students — 1 of 2

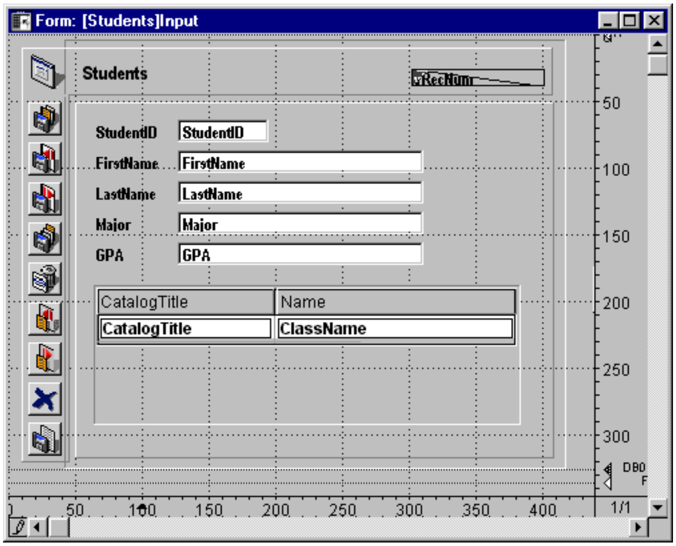
StudentID: 1
FirstName: Jeffrey T.
LastName: Spaulding
Major: Phys. Ed.
GPA: 2.5

CatalogTitle	Name
Journalism 354	Distorting the News
Pol Sci 344	Problems in Adjournment

Records from [Joining] table

The record shown above is in the [Students] table. It shows information about the student at the top of the record. The information about the two classes that he is enrolled in is drawn from the [Joining] table where the enrollment information is kept.

Here is the form for this record:



Form: [Students]Input

Students — vRecNum

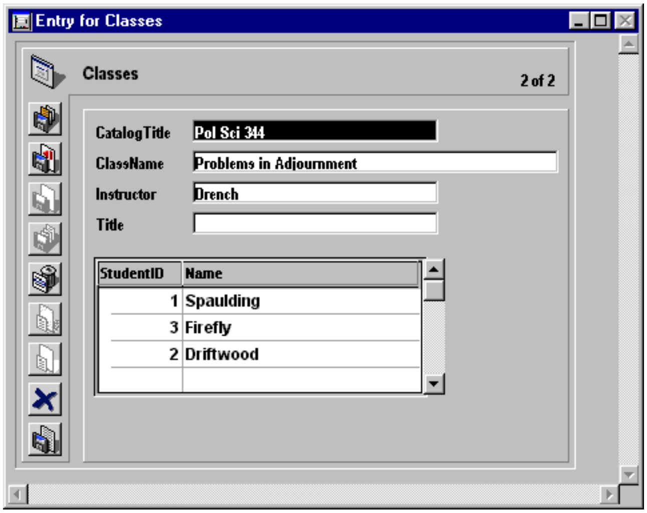
StudentID: StudentID
FirstName: FirstName
LastName: LastName
Major: Major
GPA: GPA

CatalogTitle	Name
CatalogTitle	ClassName

Notice that the subform is for the [Joining] table, not the [Classes] table. The [Joining] table contains the records that relate the student's record to the class records. The subform contains the ClassName field from the

[Classes] table. Because of the relation between the [Joining] and [Classes] tables, 4th Dimension can display the correct class name automatically.

Here is a record that shows the students who are enrolled in a class:

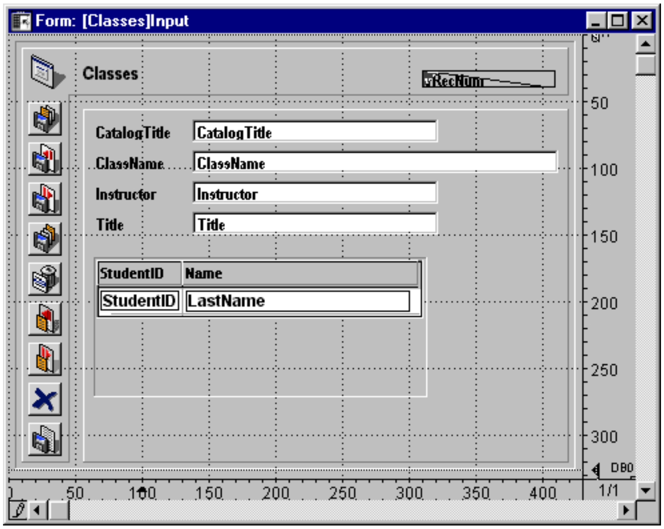


CatalogTitle Pol Sci 344
ClassName Problems in Adjournment
Instructor Drench
Title

StudentID	Name
1	Spaulding
3	Firefly
2	Driftwood

This is a record from the [Classes] table. It shows class information and lists the students enrolled in the class. The information about the students is also drawn from the [Joining] table since that table contains the records that relate the classes to the students enrolled in them.

Here is the form for the record shown above:

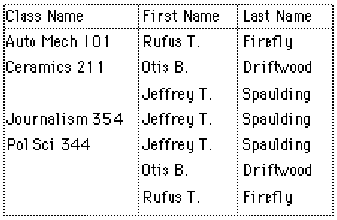


In the above examples of subforms, you can enter records in any of the fields shown. For example, to enter a new student into a class record, you simply tab to the last student record shown in the subform and press **Ctrl+/** (on Windows) or **Command–Tab** (on Macintosh) to create a new record. When you enter the appropriate catalog title, the remainder of the information is entered in the record. For information about entering and deleting records in subforms, refer to the *4th Dimension User Reference*.

Creating Reports

Quick reports that include information from both the [Classes] and [Students] tables are typically generated from the intermediate table. If you create form reports for printing, you can use subforms to print information from either of the related One tables.

Here is a simple quick report that lists all the classes and the students that are enrolled in each class.



Class Name	First Name	Last Name
Auto Mech 101	Rufus T.	Firefly
Ceramics 211	Otis B.	Driftwood
	Jeffrey T.	Spaulding
Journalism 354	Jeffrey T.	Spaulding
Pol Sci 344	Jeffrey T.	Spaulding
	Otis B.	Driftwood
	Rufus T.	Firefly

For complete information about creating and printing quick reports, refer to the *4th Dimension User Reference*. For complete information about using forms for printing reports, refer to Chapter 6 of this manual.

Analyzing Database Relations

The relations that you establish in a database play an important role in the operation of the database by controlling the flow of information between the tables.

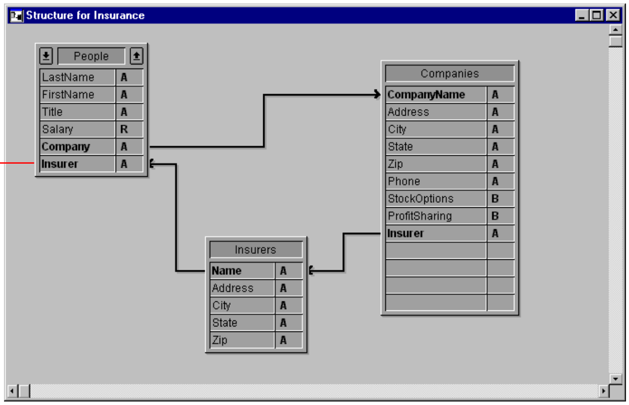
If a record with an automatic relation is loaded from disk using an input form, the corresponding record or records from the related table are selected. If a relation selects only one record in a related table, that record is loaded from disk. If a relation selects more than one record in a related table, a new current selection of records is created for that table and the first record in the current selection is loaded from disk. The record that is loaded from disk is called the *current record* for the table.

In the examples in this chapter, relations have been established between no more than three tables. In the real world, relations are often created between several tables and are activated one after the other, as in a chain. Each time a relation is activated, 4th Dimension creates a selection of records in the related table and loads a record from disk. The record that is loaded from disk becomes the current record for the table and — if the table has an automatic relation — 4th Dimension creates a selection and loads a current record in the next related table in the chain, and so on.

If the table relations have not been set up properly, the circulation of information between tables can become disorderly or corrupt. The following cases alert you to relational structures of which you should be aware.

Circular Relations

A circular relation is one in which table relations are set up so that the transfer of information will loop indefinitely. The figure below shows a circular relation in which the [People] table relates to the [Company] table, which relates to the [Insurer] table, which relates back to the [People] table.



Structure for Insurance

People	
LastName	A
FirstName	A
Title	A
Salary	R
Company	A
Insurer	A

Companies	
CompanyName	A
Address	A
City	A
State	A
Zip	A
Phone	A
StockOptions	B
ProfitSharing	B
Insurer	A

Insurers	
Name	A
Address	A
City	A
State	A
Zip	A

Table relations stopped here

When a record in the [People] table is loaded from disk, 4th Dimension loads the related company record from the [Companies] table. This becomes the current record for the [Companies] table, which in turn loads the related insurer record from the [Insurer] table.

If the table relations were allowed to continue, the records related to this insurer (all the people insured by the company) would be selected in the [People] table and the first record in that selection would be the current record. Note that this current record may be different from the current record that started this progression. In this situation, 4th Dimension has no way of knowing which record is really the current record.

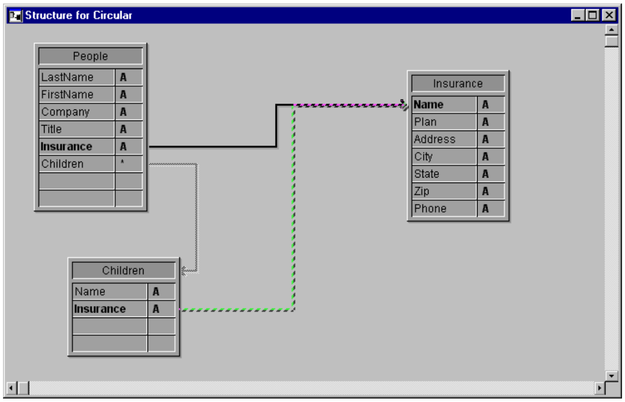
When 4th Dimension encounters this kind of circular relation, table relations are stopped at the last table in the chain. In this case, the relation between the [Insurer] table and the [People] table is not carried out.

Multiple Links to the Same Table

A similar conflict between current records occurs if you have more than one link to the same table.

Since you cannot have more than one current record at a time, you cannot manage an automatic table relation in which two or more tables are related to the same table.

The following illustration shows a database structure in which a table and its subtable both relate to the same table.



When a user is working with a record in the [People] table, the related record is loaded in the [Insurance] table and it is made the current record for that table.

However, there is also a relation between the [Children] subtable and the [Insurance] table. This means that another related record is loaded in the [Insurance] table based on the current record (the first record) in the [Children] subtable. If the child's insurance company is different from the parent's, this relational structure will cause problems.

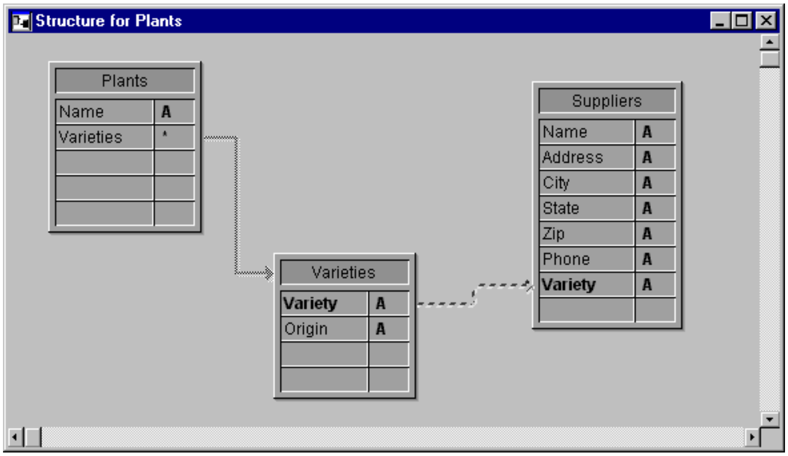
In this case, 4th Dimension does not stop the relations from proceeding. Both the relations are carried out, but not at the same time.

If you want to use this kind of structure, you must use manual table relations and control the relations using the commands described in the *4th Dimension Language Reference*.

Another example of a relational structure that cannot be managed by automatic relations is a structure in which one table has more than one relation to another table. Each time a user modifies either of the related fields in one table, the current record in the other table may change. In this situation, you cannot tell which relation is being activated.

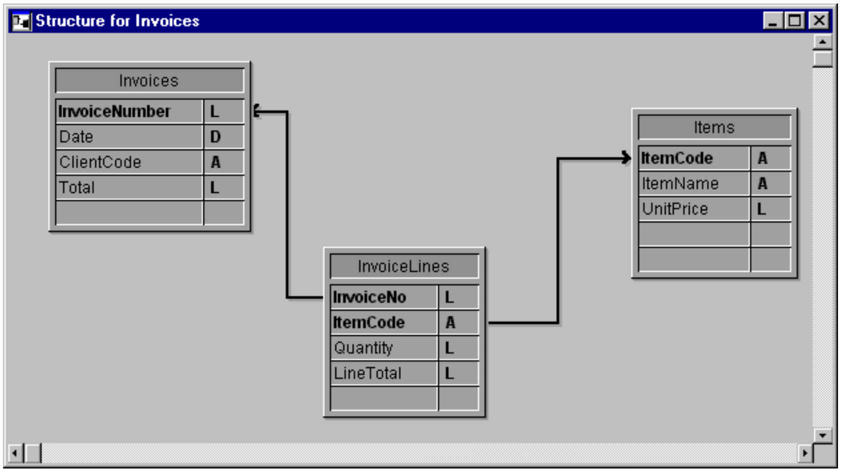
Relations from Multiple Records

Since there is only one current record in a table, relations are not established for all of the records in a selection. For instance, in the following figure, the records in the [Varieties] subtable are related to the records in the [Suppliers] table.



This structure implies that several varieties of plants are related to several suppliers and that the supplier records are loaded for all varieties of a plant species. However, the related supplier records are loaded for only the first record (i.e., the current record) in the subtable.

A similar case occurs in the Invoices database shown in the structure below.



When a record in the [Invoices] table is being used, a selection of records is created in the [InvoiceLines] table that contains all of the lines for that invoice. But the corresponding record in the [Items] table is selected only for the first item in the [InvoiceLines] table. The selection in the [Items] table does not include information about all the items in the invoice, only the first item.

However, if you place [InvoiceLines] in a subform in the [Invoices] table, *4th Dimension* calls each invoice line, one at a time, and activates the relationship for each one of them.

3 Creating Forms

Forms provide the interface through which information is entered, modified, and printed. A user interacts with the data in a database using forms and prints reports using forms.

Each table in your database generally has at least two forms. One form is for listing records on-screen and the other form displays one record at a time and is used for data entry and modification. The form that lists records is called the *output form* or *list form* and the form that displays one record at a time is called the *input form* or *detail form*. When you are viewing records using the list form, you can double-click a record to view the record using the current detail form.

This chapter covers the following topics:

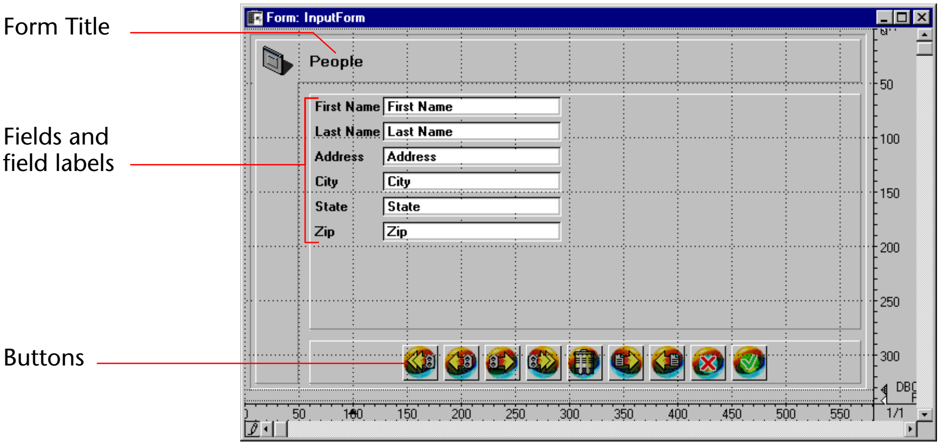
- Creating forms for data entry and display,
- Establishing default input and output forms,
- Deleting forms,
- Renaming forms.

For information about customizing forms, see Chapter 4, “Form Editor Basics” on page 171 and Chapter 5, “Working with Fields and Active Objects” on page 235. For information on creating and customizing list forms for listing records on-screen and for printing see Chapter 6, “Output Displays and Reports” on page 333.

About Forms

The form is the interface object that you use for data entry, for listing records, for printing reports and mailing labels[1], and (in custom applications) for custom dialog boxes and palettes.

4th Dimension lets you create standard forms quickly. It also provides powerful tools that let you create forms that implement sophisticated interfaces. Your forms can provide exactly what your database needs. With only point and click operations, you can create a basic form as shown below.



4th Dimension has two tools for creating and modifying forms, the Form Wizard and the Form editor.

The Form Wizard

The Form Wizard is your starting place for creating any type of form. With the Form Wizard, you can create a new form by choosing the desired fields from a list and the desired form template from a drop-down list. Form templates control the appearance of forms. A template specifies such characteristics as form size, platform interface, font attributes, and buttons.

The Form Editor

The Form editor is an object-oriented drawing environment that lets you customize forms by manipulating objects on the form directly. For example, you can reposition objects, add objects not supported by the

[1] You can also print reports and labels with the User environment's Quick Reports and Labels editors. These editors can also be added to a custom application.

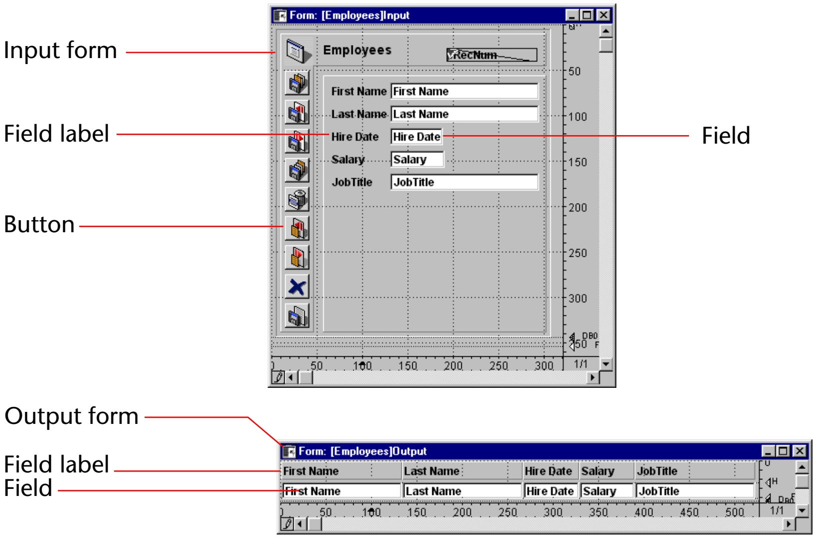
Form Wizard, create multi-page forms with tab controls, enforce business rules by specifying data entry constraints, specify form access privileges, associate a custom menu bar with a form, and write form and object methods that run automatically when the form is used.

This chapter discusses creating forms for data entry and display using the Form Wizard. Chapter 4 and Chapter 5 discuss the Form editor.

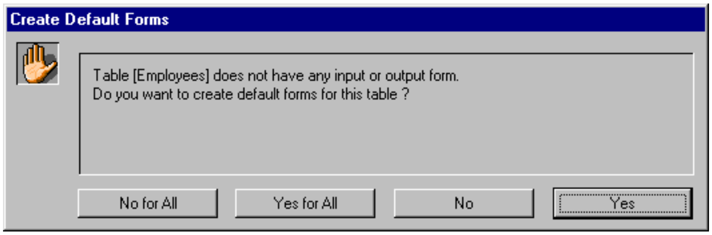
Forms, Tables, and Fields

Every form is attached to a table. The table to which a form is attached is called its *master table*. Each table must have at least one form so that information can be entered into fields and displayed on screen. Typically, a table has separate input and output forms. The input form is the one used for data entry. It displays one record per screen and typically has buttons for saving and canceling modifications to the record and for navigating from record to record (i.e., First Record, Last Record, Previous Record, Next Record). The output form displays a list of records, with one line per record. The results of queries are shown in the output form and the user can double-click a row in an output form to display the input form for that record.

The following illustration shows a typical input form and a typical output form.



If you switch to the User environment before creating a form for a table, 4th Dimension asks you if you want to it to create default input and output forms for you.



Create Default Forms

Table [Employees] does not have any input or output form.
Do you want to create default forms for this table ?

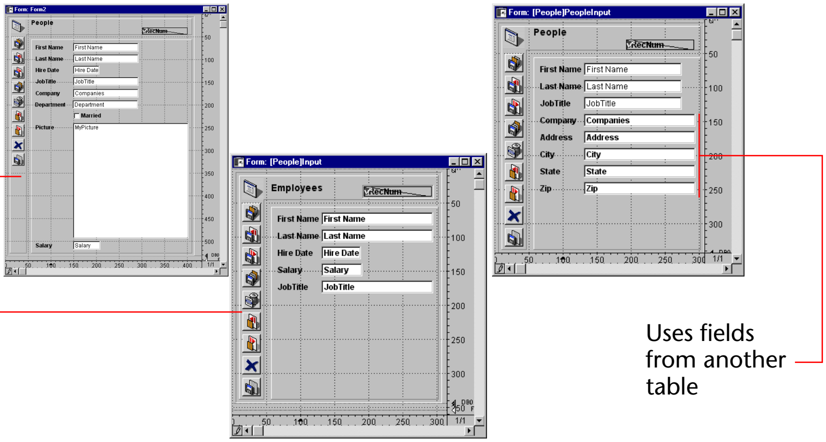
Click **Yes** to create default forms. You can always return to the Design environment and modify them or replace them with more sophisticated forms. Without making any modifications, you can start using these forms to enter and display data in your database.

Your database can use a large number of forms that perform specific functions. In custom applications you can use the language to control which forms are the active input and output forms. For example, you may want to switch sets of forms depending on whether the user is using a monochrome or color monitor. You can also use the language to use different sets of forms for Web browsers and 4D Client users. When you write a custom application you can create forms for use as custom dialog boxes or floating palettes. In custom applications, you can also use multiple processes to allow users to work with several forms simultaneously.

A form can display fields from more than one table. You can place fields from a related One table on a form and allow users to enter values directly into the related One table. You can also include a *subform* that displays a list of records from a related Many table. A subform displays a list of records from another table or a subtable in the master table. With a subform, the user can view, enter, and modify records in another table. This is sometimes known as a *master-detail relationship*. For example, an invoicing application would use a subform on the invoicing input form that lets the user enter line items for the invoice. Although the line items appear on the invoicing screen, the line item records are actually stored in a related Many table.

A form used for data entry can have more than one subform. For example, a contacts manager database can use a subform for telephone numbers, another subform for ToDo’s, and another subform for prior contacts with the person. Each subform displays records from a different related Many table.

A particular form can use some of the fields in a table or all of the fields. You might have two input forms, for example — one for use by a clerk and one for use by supervisors — neither of which contains all the fields. You might use another group of fields for the screen display and yet a fourth group for a printed report.



Uses all [People] fields

Uses some [People] fields

Uses fields from another table

Forms can be modified at any time, whether or not you have entered data into the database. Changes to a form do not affect the data stored on disk in any way.

Each form has one or more display pages in which fields and other enterable objects appear. If your fields don’t fit on one page, you can create additional pages. When you create a multi-page form, you also add buttons or a tab control to allow users to move from one page to another.

Each form also has a background page (a page zero) on which you place objects that appear on all display pages. Use the background page to place background graphics, buttons, a tab control, and other graphic objects that define the “look” of the page, such as rectangles and labels.

Note When a multi-page form is used as an output form (e.g., when it is printed), only the first display page appears.

Active Objects and Graphic Objects

There are two kinds of objects in a form: active objects and graphic objects.

Active objects perform operations on data or provide a customized user interface. Active objects include the following:

- Fields, including fields from other tables,
- Enterable and non-enterable areas (variables) for entering or displaying data,
- Buttons that perform actions,
- Tab controls,
- Combo boxes,
- Pop-up menus and drop-down lists,
- Hierarchical pop-up menus and hierarchical lists,
- Radio buttons and check boxes used for entering values into Boolean fields or variables,
- Thermometers, rulers, or dials that show relative values,
- Lists and hierarchical lists, that allow the user to select from the list or drag elements to or from the list,
- Plug-ins,
- Subforms that display data from other tables and subtables.

Graphic objects are geometric or textual elements that enhance the appearance of the form. Graphic objects include the following:

- Rectangles, ovals, and circles for enhancing the appearance of a form,
- Text, for labelling areas in the form,
- Grids, for aligning other objects,
- Graphics from applications other than 4th Dimension, including pictures stored in the Picture library.

All objects, whether active or graphic, are handled in the same way in the Form editor — they are created by being drawn or dragged and dropped; they can be selected and moved or resized; they can be duplicated, cut, copied, and pasted; they can be aligned to each other or to an invisible grid; and their appearance can be changed.

Object Properties

Each object has a set of properties. For graphic objects, properties include foreground and background color, line width and fill pattern, and resizing and repositioning options. For active objects, properties may also include the object's relationship to data, the object's "action" when it is used, and the object's method. When the Form Wizard generates a form, it assigns appropriate default properties to both graphic and active objects[1]; you can modify these properties in the Form editor.

Graphic objects have no impact on the data. You can create a graphic object on a form simply by drawing it and making any necessary modifications to its appearance. For example, when you create a text area, you draw the area, then you type the text you want to display. You can change the text at any time without affecting the data.

Active objects require instructions about their relation to the data or instructions on the actions that they are to perform. In simple cases, The Form Wizard does everything for you. Entry areas for fields are automatically associated with the appropriate field in the database structure and buttons automatically perform the appropriate actions. In other cases, you can specify additional instructions in the Form editor using the Object Properties window. For example, you can assign special instructions to a button by writing a method. The method remains attached to the object as one of its properties. If the object is copied and pasted, it retains all its properties, including its method.

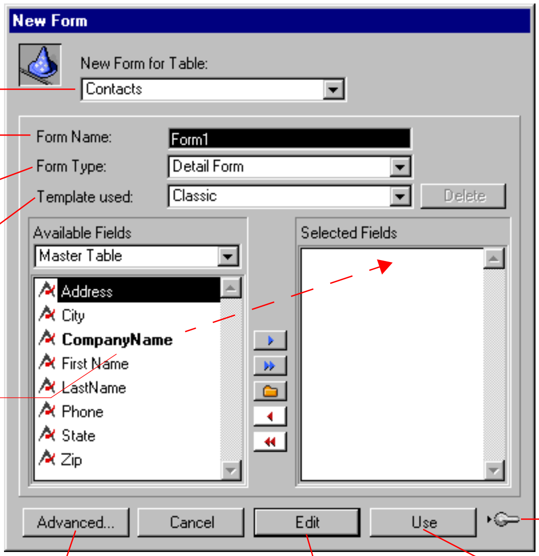
Chapter 4 provides detailed information about working with the Form editor. Chapter 5 provides complete information about active objects.

[1] For example, the Form Wizard generates buttons that perform automatic actions and assigns appropriate resizing and repositioning options to decorative rectangles.

The Form Wizard

You can create new forms quickly with the Form Wizard. You can use a new form immediately after creating it or choose to edit the form using the Form editor.

The Form Wizard has two screens. The Basic screen lets you create new forms with a few simple operations. The steps for creating a form are shown in the following illustration.



New Form

New Form for Table: Contacts

Form Name: Form1

Form Type: Detail Form

Template used: Classic

Available Fields: Master Table

Selected Fields

1 **Choose** the master table

2 **Name** the form

3 **Choose** a Form type

4 **Choose** a Form template

5 **Add fields** to the form by dragging fields to the Selected Fields list

Click to display a preview of the form

6 Click **Advanced** to create the new form using the Wizard's Advanced options OR Click **Edit** to edit the new form in the Form editor OR Click **Use** to switch to the User environment to use the form

If you want to create a standard form quickly, use the Basic screen. Here are the basic operations:

- Name the new form by filling in the Form Name area.
- Choose a form type from the Form Type drop-down list. Your choices are:
  - **Detail Form** an input form for entering and modifying individual records,
  - **List Form** an output form for listing records on the screen,

- **Detail Form For Printing** a form for printing individual records with one page per record,
- **List Form for Printing** a form for printing a list of records, with several records per page.

- Choose a template from the Template drop-down list. A template controls many aspects of the appearance of the form. The Template drop-down list includes a variety of templates that ship with 4th Dimension and any user-defined templates that you create with the Advanced options in the Form Wizard. For information on adding templates to this list, see the section "Creating a Form Template" on page 163.

- Choose the fields for the form by dragging the desired fields in the Fields area to the Selected fields area (to its right).

  As you add fields or change the form type or template, your changes are reflected in the Preview area on the right.

  If you need more control over the appearance of the new form, you have two choices:

- **Use the Advanced options in the Form Wizard** Click **Advanced** to customize the new form with the Form Wizard. The Advanced options let you set the font attributes of fields and labels, the platform interface for the form, appearance of fields and field labels, form size, the form background, associate a menu, choose custom buttons, and add a subform.

- **Use the Form editor** Click **Edit** to continue designing the form using the Form editor.

  If you are finished creating the form, you can click **Use** to switch to the User environment to use the form.

  For complete information on using the Form Wizard, see the section "Creating a New Form" on page 141.

The Form Editor

The Form editor is a powerful object-oriented drawing environment. Each of your forms can be displayed in a separate window and several forms can be open the same time. Objects on the form can be created or manipulated with the tools in the Form editor's Tools palette. You can set each form's properties and each form object's properties. While you are designing a form in the Form editor, you can switch to the User environment to test the form without having to first close the Form editor.

The Form editor offers many customization options that are not available in the Form Wizard, including the ability to:

- Set access privileges for the form,
- Assign properties to each object,
- Attach a method to the form and to each form object,
- Add pictures from the Picture library to the form,
- Resize and reposition each object directly,
- Add types of interface objects that are not supported by the Forms Wizard, including tab controls, drop-down lists and pop-up menus, picture buttons, combo boxes, check boxes and radio buttons, hierarchical menus and hierarchical lists, scrollable areas, plug-ins, graphs, and additional subforms.[1]
- Set drag and drop properties for individual objects,
- Set data entry controls such as minimum, maximum, and default values, entry filters, and choice lists,
- Customize automatic resizing and repositioning options for each object.

For a complete description of the Form editor, see Chapter 4 and Chapter 5.

[1] The Advanced options in the Form Wizard lets you add only one subform.

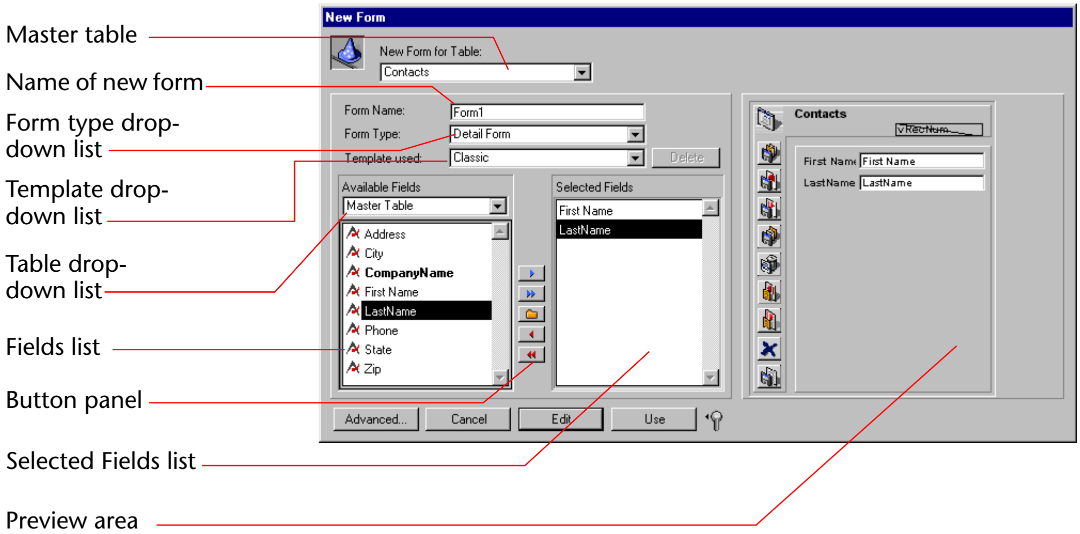
Creating a New Form

This section gives the basic steps for creating a form using the Basic screen of the Form Wizard. For information on the Advanced options of the Forms Wizard, see “Using the Form Wizard’s Advanced Options” on page 149.

► To create a new form:

■ **Choose New Form from the Design menu.**
OR
Highlight the table name in the Forms page of the Explorer and click New.

4th Dimension displays the Basic screen of the Form Wizard.



New Form for Table: Contacts

Form Name: Form1

Form Type: Detail Form

Template used: Classic

Available Fields: Master Table

Address
City
CompanyName
First Name
LastName
Phone
State
Zip

Selected Fields:

First Name
LastName

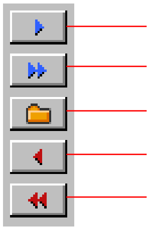
Contacts

vRecNum

First Name: First Name

LastName: LastName

The name of the master table is shown at the top of the screen. Its fields are listed in the Fields list. The Button panel contains shortcut tools for moving fields to and from the Selected Fields list.



Moves the highlighted field to the Selected Fields list

Moves all fields to the Selected Fields list

Creates a new Group into which you add fields

Removes the highlighted field from the Selected Fields list

Removes all fields from the Selected Fields list

4 **If you need to change the master table, choose the master table from the New Form for Table drop-down list.**

5 **Name the form by filling in a name in the Form Name area.**

You can refer to the form by name using the language.

6 **Choose a Form Type from the Form Type drop-down list.**

Your choices are:

- **Detail form** a form for data entry and modification.
- **List form** a form for listing records on the screen.
- **Detail form for Printing**[1] a printed report with one page per record, such as an invoice.
- **List form for Printing**[1] a printed report that list records.

7 **Choose a template for the form.**

The template controls several aspects of the appearance of the form, including font attributes, field label placement, the design of decorative rectangles surrounding fields, and platform interface.
4th Dimension ships with several templates and you can add use the Form Wizard to add custom templates to this list. For more information about adding custom templates, see the section "Creating a Form Template" on page 163.

8 **Select the fields you want on your form.**

For complete information about selecting fields for the form, see the following section, "Selecting Fields for the Form."

9 **If you want to edit the new form in the Form editor, click Edit.**
OR
If you want to switch to the User environment to use the form, click Use.
OR
If you want to customize the new form with the Forms Wizard's advanced options, click Advanced.

For information about the Advanced options, see the section "Using the Form Wizard's Advanced Options" on page 149.

[1] For information on creating forms for printing, see Chapter 6.

Selecting Fields for the Form

You select the fields that you want to appear in the form in the Form Wizard. You can also use the Form editor to add fields to the form after it has been created.

You can select any fields of any type, except Blob fields.

You can create forms that include fields from:

- The master table,
- A related One table.
- Any table.

The Subforms page in the Advanced options screen lets you create subforms that display fields from:

- Subtables of the master table,
- A related Many table,
- Unrelated tables.

The following sections explain how to select fields from the master table and from a related One table.

Selecting Fields from the Master Fable

When Master Table is selected in the Table drop-down list, the Fields list displays a list of fields in the master table. Indexed fields are shown in bold.

► To select fields from the master table:

1 **If it is not already selected, choose Master table from the Table drop-down list.**

The master table is the table to which the form belongs.

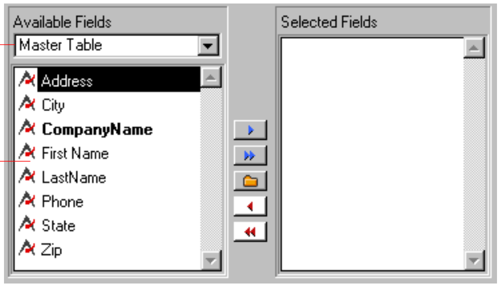


Table drop-down list

Fields in the master table

2 **Drag a field from the Fields list to the Selected Fields list.**
OR
Click the field in the Fields list and click the Append button ▶.
OR
Double-click the field in the field list.

4th Dimension moves the selected field to the Selected Fields list adds the field to the Preview area (if you have expanded the Form Wizard view).

Note If you want to include all fields on the form, click the **Add All** button ▶▶.

After you have selected fields for the form, you can reorder fields by dragging them vertically within the Selected Fields list.

3 **Repeat this process for each field you want to add to the form.**

To remove a field, select it and click the **Remove Field** button ◀. To remove all fields, click the **Remove All** button ◀◀.

If you are adding fields by dragging, you can insert a field in the list by dragging to the desired position in the Selected Fields list. Otherwise, 4th Dimension appends each field you add to the end of the list.

Note You can reorder fields in the Selected Fields list by dragging a field up or down.

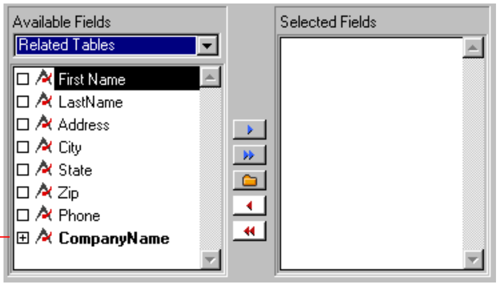
Selecting Fields from Related One Tables

You can select fields from related One tables. 4th Dimension allows you to enter values directly into related One fields.

► To add fields from a related One table:

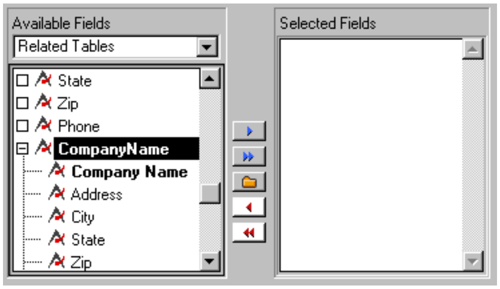
1 **Choose Related Tables from the Tables drop-down list.**

The Fields list changes to display a hierarchical list of fields in the master table. The foreign key fields are shown in bold and have a plus sign (on Windows) or an arrow (on Macintosh).



Foreign key field

2 **Expand a foreign key field to display the related One fields in the related table.**



Related One fields

3 **Add related One fields to the form using any of the methods used for adding fields from the Master table.**

As you add related One fields, they are shown in the Preview area.

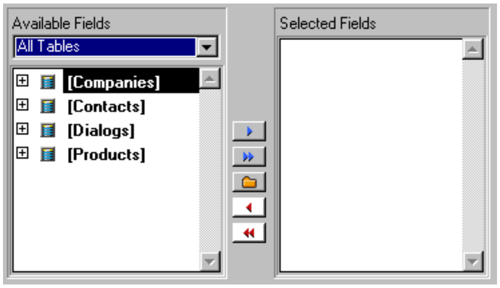
Selecting Fields From Other Tables

You can select fields from any table in the database. However, if the table is not the master table or an automatic related One table, you will need to use the language to manage data entry and display in the fields you select.

▶ To add fields from any table:

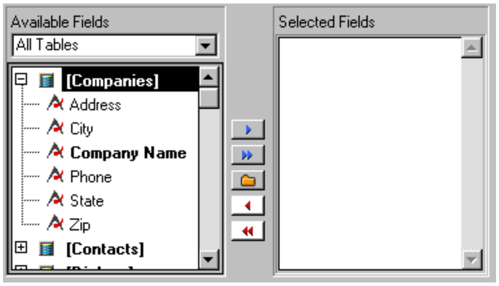
1 **Choose All Tables from the Tables drop-down list.**

A hierarchical list of all tables in the database appears in the Fields list.



2 **Expand the desired table to view its fields.**

The fields belonging to the table appear.



3 **Add the desired fields to the form using any of the methods described in the previous section.**

As you add fields, they appear in the Preview area.

Reordering Fields

After you have added fields to the form, you can reorder them by dragging fields up or down in the Selected Fields list. Reordering a field list affects its position on the form. When you reorder fields, the Preview area shows the effects of your changes.

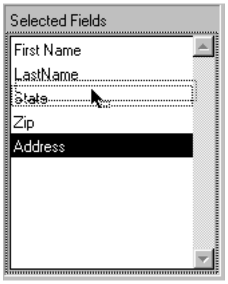
Note With the Form editor, you can rearrange fields by manipulating them directly.

▶ To reorder a field:

1 **Select the field to be reordered in the Selected Fields list.**

2 **Drag the field up or down.**

As you drag, the outline of the field indicates its new position. The following illustration shows the Address field being moved between the LastName and State fields.

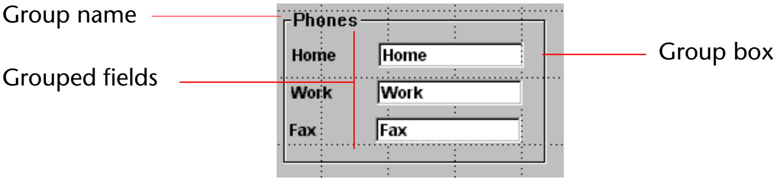


3 Drop the field at the desired location.

When you drop the field, the Selected Fields list changes to show the new field order and the Preview area reflects your changes.

Grouping Fields

When you are creating a Detail form, you can define a group of fields. A group has its own label and set of fields in the group. A group looks like this:



You can create several groups in each form.

Note With the Form editor, you can also create group objects and move fields or other objects into or out of groups.

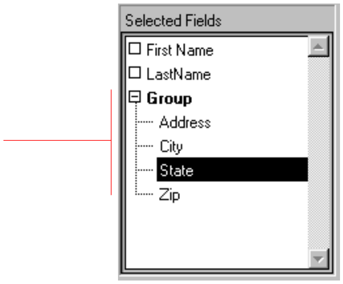
► To create a group:

1 Click the Group button 📁.

A new group is created in the Selected Fields list. Its default name is "Group."

2 Add fields to the group by dragging the fields to the group name.

As each field is added to the group, it appears below the group name.



Selected Fields

□ First Name
□ LastName
⊟ **Group**
Address
City
State
Zip

Fields in the group

When you are finished adding fields to the group, you can:

- Create another group,
- Add more ungrouped fields,
- Edit the form, use the form, or use the Advanced options.

- **To create another group, click the Group button and repeat the process of adding fields to the group.**
- **To add ungrouped fields, collapse the Group item in the Selected Fields list and continue adding fields.**
- **To edit the form, use the form, or use Advanced options, click the desired button at the bottom of the Form Wizard screen.**

Renaming the Group

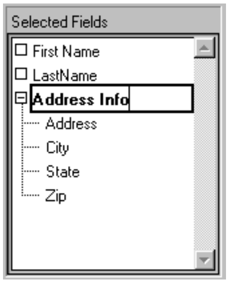
Unless you rename the group, the name of the group on the form will be the default name, "Group."

► To rename the group:

1 **Hold down the Command key (on Macintosh) or Ctrl key (on Windows) and click the group name in the Selected Fields area.**

The name becomes editable.

2 **Type the new group name and click anywhere outside the text entry area to save the new name.**



Selected Fields

□ First Name
□ LastName
⊟ **Address Info**
Address
City
State
Zip

When you save the new name, the preview area reflects your changes.

Reordering Fields in the Group

You can reorder fields in the group in the same way as ungrouped fields. Select a field to be reordered and drag up or down as described earlier in the section “Reordering Fields” on page 146.

Moving Fields from the Group

You can also move a field from a group to make it an ungrouped field or move the field to a different group.

- **To make a field an ungrouped field, drag the field from the group and move it diagonally in the direction of other ungrouped fields — to the above-left or below-left.**
- **To move a field to another group, drag the field to the field list in the other group.**

4th Dimension updates the preview area to reflect your changes.

Removing Fields

To remove a field from a form, highlight the field in the Selected Fields list and click the **Remove** button ◀. To remove all fields from the form, click the **Remove All** button ◀◀.

Using the Form Wizard’s Advanced Options

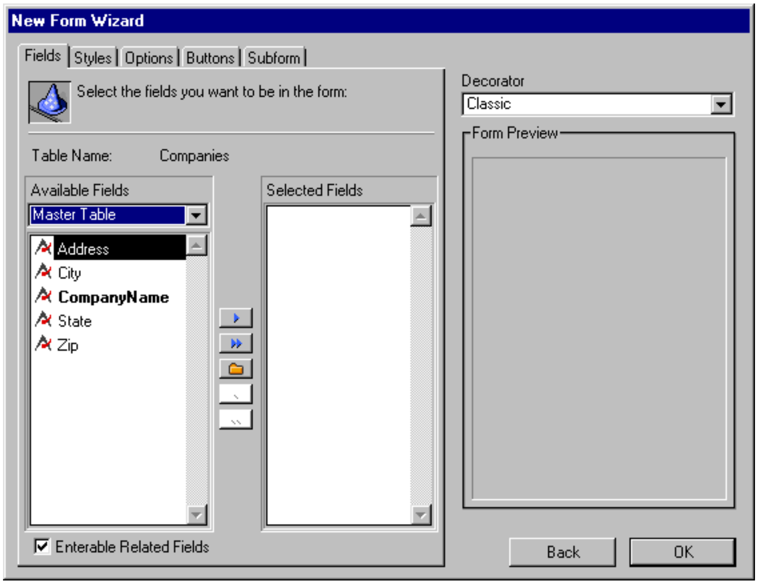
The Form Wizard’s Advanced screen also lets you create new forms with point-and-click operations but offers a wider variety of customization options. The customization options depend on the form type that you select in the first screen of the Form Wizard. The Form Wizard supports the following form types:

- Detail forms
- List forms
- Detail forms for printing
- List forms for printing

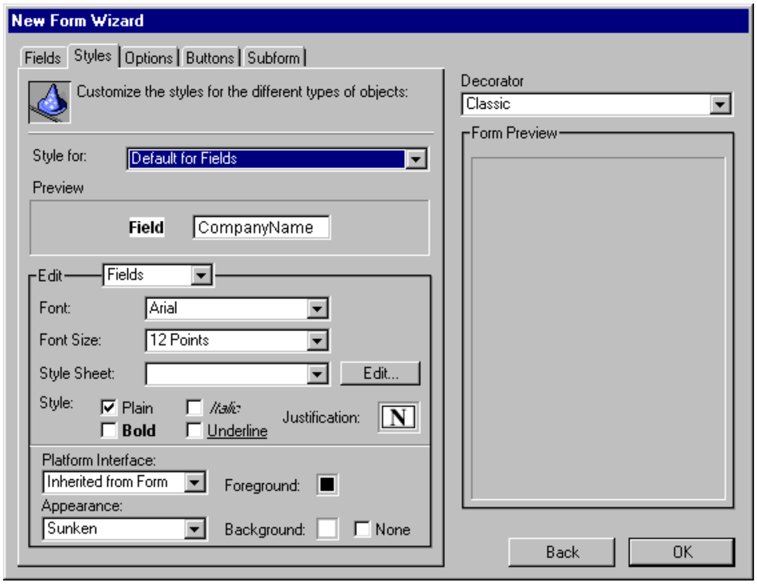
In addition, the Form Wizard lets you save your customization options as a template. The template name is added to the Template drop-down list that appears on the Basic screen of the Forms Wizard. With user-defined templates, you can quickly create highly customized forms from the Basic screen of the Form Wizard simply by selecting the desired fields and your custom template.

This section describes the advanced options available for creating Detail forms. The Advanced screen contains the following pages:

- **Fields page** Choose the fields for the form and the Form Decorator. This page is similar to the Basic screen of the Form Wizard.



- **Styles page** Set the appearance of form objects and their labels. You can specify font attributes, foreground and background colors, platform interface, and appearance of decorative rectangles surrounding fields and field labels. You can also define or apply Style Sheets to specify font attributes.



New Form Wizard

Fields | Styles | Options | Buttons | Subform

Customize the styles for the different types of objects:

Style for: Default for Fields

Preview

Field CompanyName

Edit: Fields

Font: Arial

Font Size: 12 Points

Style Sheet: Edit...

Style: ☑ Plain ☐ *Italic* ☐ **Bold** ☐ Underline

Justification: N

Platform Interface: Inherited from Form

Foreground: ■

Appearance: Sunken

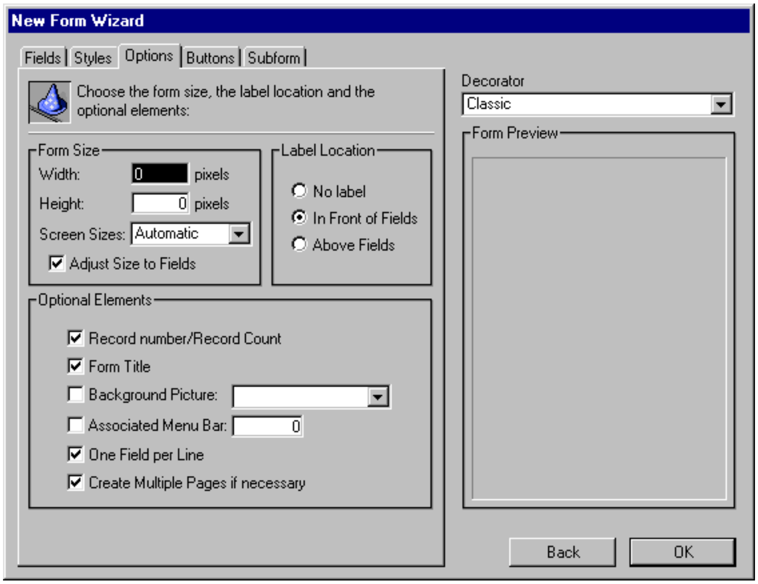
Background: □ ☐ None

Decorator: Classic

Form Preview

Back OK

- **Options page** Set the form size, placement of field labels relative to fields, associate a background image, associate a menu, and add a title or record count.



New Form Wizard

Fields | Styles | Options | Buttons | Subform

Choose the form size, the label location and the optional elements:

Form Size

Width: 0 pixels

Height: 0 pixels

Screen Sizes: Automatic

☑ Adjust Size to Fields

Label Location

○ No label

● In Front of Fields

○ Above Fields

Optional Elements

☑ Record number/Record Count

☑ Form Title

☐ Background Picture:

☐ Associated Menu Bar: 0

☑ One Field per Line

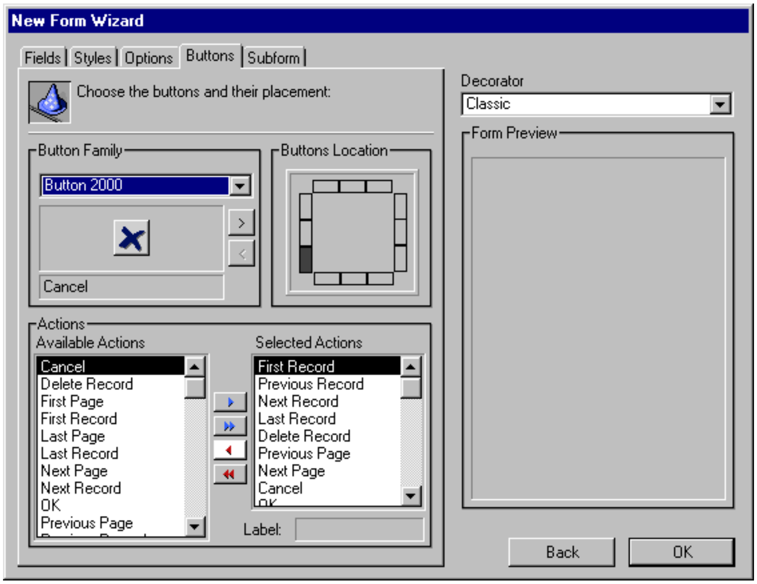
☑ Create Multiple Pages if necessary

Decorator: Classic

Form Preview

Back OK

- **Buttons page** Choose a set of buttons to be added to the form, assign automatic button actions, set the placement of the buttons on the form, and (optionally) label the buttons.



New Form Wizard

Fields | Styles | Options | Buttons | Subform

Choose the buttons and their placement:

Button Family: Button 2000

Cancel

Buttons Location

Actions

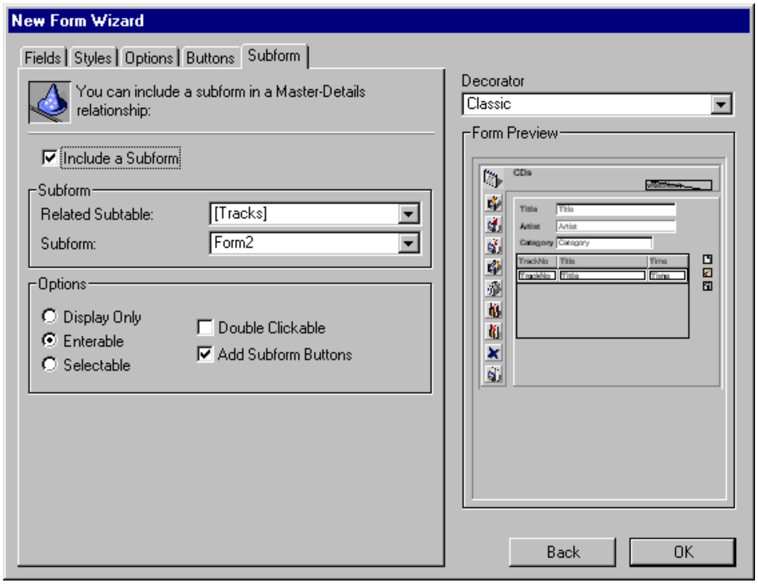
Available Actions	Selected Actions
Cancel	First Record
Delete Record	Previous Record
First Page	Next Record
First Record	Last Record
Last Page	Delete Record
Last Record	Previous Page
Next Page	Next Page
Next Record	Cancel
OK	OK
Previous Page	

Label:

Decorator: Classic

Form Preview

- **Subform page** Add a subform from a related Many table or subtable to the form.



New Form Wizard

Fields | Styles | Options | Buttons | Subform

You can include a subform in a Master-Details relationship:

☑ Include a Subform

Subform

Related Subtable: [Tracks]

Subform: Form2

Options

○ Display Only
● Enterable
○ Selectable

□ Double Clickable
☑ Add Subform Buttons

Decorator: Classic

Form Preview

Adding Fields

Use the Fields page to perform the following operations:

- Add fields to the form,
- Set the form Decorator.

You add fields to the form in exactly the same way as on the Basic screen of the Forms Wizard. This functionality is duplicated for users who want to skip the Basic screen and go directly to the Advanced options screen. For a complete description of the process of adding fields to the form, see the section "Selecting Fields for the Form" on page 143.

If you have already added fields to the form using the Basic screen, you can modify your selections using the Fields page. For more information, see the sections "Reordering Fields" on page 146, "Grouping Fields" on page 147, and "Removing Fields" on page 149.

Setting the Form Decorator

Your choice of form Decorator affects the appearance of decorative objects on the form. Several options are shipped with 4th Dimension.

Customizing the Appearance of Form Objects

The Styles page of the Forms Wizard lets you customize the appearance of the following types of objects:

- Related fields
- Non-enterable fields
- Mandatory fields
- Indexed unique fields
- Group box text
- The form title
- Information: Form elements that provide information using internal variables, such as page number, record number, and records in selection. Several of the default templates add such variables automatically.
- Check boxes and radio buttons
- Default: Fields and field labels not specified by other items in the Type drop-down list.

  For fields, you can specify the appearance of the field and the field's label separately.

For each object type, you can customize the following properties:

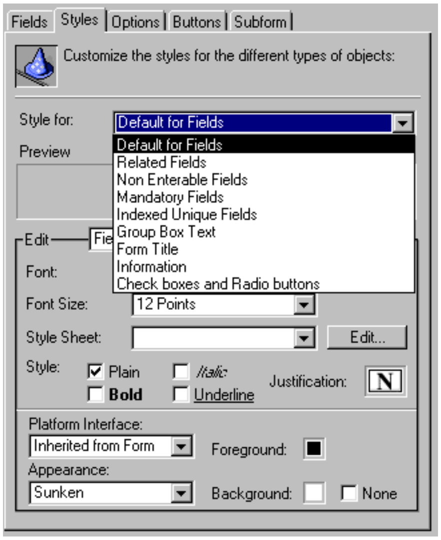
- Font attributes,
- Platform interface,
- Appearance of decorative rectangles surrounding the object,
- Text justification,
- Foreground and background colors.

► To customize the appearance of the form's objects:

1 **Click the Styles tab in the Advanced options screen.**

The Styles page appears.

2 **Choose the type of object whose appearance you want to customize from the Style For drop-down list.**



Fields | Styles | Options | Buttons | Subform

Customize the styles for the different types of objects:

Style for: Default for Fields

- Default for Fields
- Related Fields
- Non Enterable Fields
- Mandatory Fields
- Indexed Unique Fields
- Group Box Text
- Form Title
- Information
- Check boxes and Radio buttons

Preview

Edit: Fie

Font:

Font Size: 12 Points

Style Sheet: Edit...

Style: ☑ Plain ☐ Bold ☐ *Italic* ☐ Underline

Justification: N

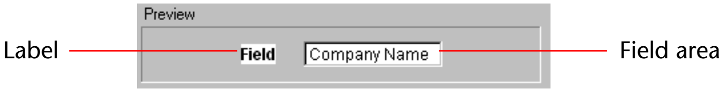
Platform Interface: Inherited from Form

Foreground: ■

Appearance: Sunken

Background: ☐ None

When you make your selection, the Preview area changes to show a preview of the type of object you selected. If you selected a field type or Default, the preview area shows preview images for both the field and the field label.



3 **Choose either Labels or Fields in the Edit pop-up menu.**

4 **Choose the desired font, font size, and font style.**
OR
Choose a style sheet or click Edit to create a style sheet.

For information on creating and using styles, see "Using the Style Sheet Editor" on page 165.

The selected object type appears in the Style For area. The Preview area shows a preview of the object. If the object is a field, only the label or the field will be previewed, depending on whether you are modifying the object or the label.

5 **Choose the Platform Interface for the object from the Platform Interface drop-down menu.**

Your choices are:

- **Inherited from Form** The platform interface for the object is the same as the platform interface of the form. The Platform Interface of the form is set in the Form Properties window. For information on setting the Platform Interface for the form, see "Setting the Platform Interface" on page 186.
- **Automatic** The platform interface is based on the platform on which the database is currently running. For more information on the Automatic option, see "Platform Interface Settings" on page 57.
- **MacOS** The object will be displayed as a Macintosh object (System 7.5).
- **Windows 3.1** The object will be displayed as a Windows 3.1 object.
- **Windows 95** The object will be displayed as a Windows 95 object.
- **Copland** The object will be displayed as a Macintosh object that uses the "Copland" user interface guidelines.

For complete information on how the Platform Interface options affect the appearance of objects, see "User Interface" on page 49.

6 **Choose the Appearance of decorative rectangles surrounding the object or label.**

Your choices are:

- None
- Plain
- Dotted
- Raised
- Sunken
- Double

For illustrations of the effects of these choices on various object types, see the sections, "Fields and Field Labels" on page 164, "Buttons" on page 293, and "Button Actions" on page 295.

7 **Choose the desired text justification.**

Your choices are:

- **Left**, **Right**, or **Centered** alignment,
- **Default** Right-aligned numbers and left-aligned text, dates, and times.

For more information on justification options, see the section "Using the Style Sheet Editor" on page 165.

8 **Choose a foreground and background color or click the None check box for automatic background (Optional).**

The foreground color is the color of text in an area. The background color is the color of the area itself. For more information, see the section "Foreground and Background Colors" on page 222.

9 **Choose another object type from the Style For drop-down list and repeat steps 3 to 8.**

10 **When you are finished, click another tab to customize another aspect of the new form.**
OR
If you are finished with all Advanced pages, click OK to generate the new form.

Customizing Buttons on the Form

Detail forms use buttons that allow the user to save and cancel changes to a record, move from one record to another (first record, last record, next record, previous record), or one page to another in a multi-page form, add or delete records in a subform, or delete the current record. With the Buttons page in the Advanced options screen, you can choose a button design, choose the desired button actions, specify the position of the buttons on the form, and label each button.

Note In the Form editor, you can add, delete, or reposition individual buttons and attach a method to a button that specifies its action when clicked. For more information, see "Buttons" on page 293.

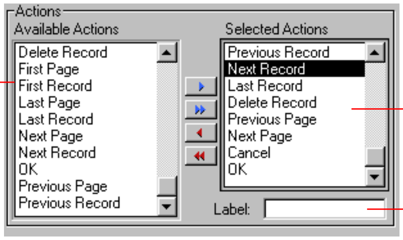
Automatic Button Actions

4th Dimension provides a set of built-in button actions. When you assign a built-in button action to a button, you don't need to write a method to specify what happens when a user clicks the button.

The built-in button actions are:

- **OK** Save a new record or save changes to an existing record,
- **Cancel** Discard the new record or discard changes to an existing record,
- **Delete Record** Deletes the current record from the database,
- **Next Record**, **Previous Record**, **First Record**, **Last Record** Save the current record and display the desired record,
- **Next Page**, **Previous Page**, **First Page**, **Last Page** Display the desired page in a multi-page form,
- **Open Subform** Open a Detail form for a related Many table or a subtable for data entry and modification,
- **Add to Subform** Add a new record to a related Many table using the subform,
- **Delete Subform** Delete the currently selected record in the subform,
- **No Action** Assign no action. Use this option when you need to specify the button action with an object method.

The buttons are listed in the Available Actions area of the page.



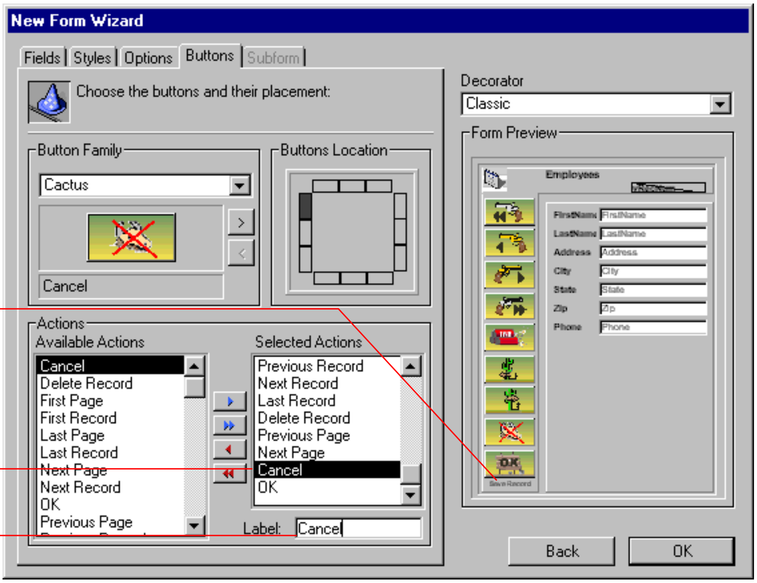
List of automatic buttons

Buttons that will appear on form

Label area

You can select and deselect automatic buttons in the same way that you can add or delete fields from the form on the Fields page. The buttons that you add to the Selected Actions area appear on the form.

If you want to label a button, highlight the button in the Selected Actions list and enter a label in the Label area. The following illustration shows a Cancel button being labelled. The OK button has already been labelled and the Preview area shows the label.



Choose the buttons and their placement:

Button Family: Cactus

Cancel

Buttons Location

Decorator: Classic

Form Preview

Employees
FirstName
LastName
Address
City
State
Zip
Phone

Actions

Available Actions:
Cancel
Delete Record
First Page
First Record
Last Page
Last Record
Next Page
Next Record
OK
Previous Page

Selected Actions:
Previous Record
Next Record
Last Record
Delete Record
Previous Page
Next Page
Cancel
OK

Label: Cancel

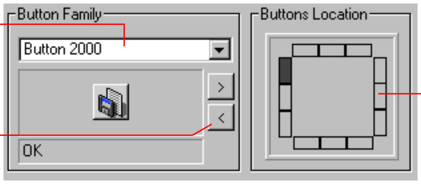
Preview area shows label added to OK button

Selected button

Label associated with selected button

After entering the label, press **Tab** or click another button in the Selected Actions list. The label you entered is then displayed in the Preview area, as shown above.

The Button Family and Button Location areas let you choose the style and location of the buttons.



Button Family: Button 2000

OK

Choose a button family

Click > or < to preview a different button in the family

Click a rectangle to set the location of the button panel

Choose a family from the Button family drop-down list and click the > or < buttons to preview each button.

► To customize the buttons added to the form:

1 **Click the Buttons tab to display the buttons page in the Advanced screen.**

The Buttons page appears.

2 **Choose a button style from the Button family drop-down list.**

The Preview area shows your selected button family.

3 **In the Available Actions area, click each button action that you want to include on the form or click the Append button ▶.**

If you want to label a button, highlight it in the Selected Actions area and enter a label in the Label area.

4 **Select the location of the button palette by clicking on a rectangular area in the Button Location area.**

The preview area indicates the effects of your choice.

5 **When you are finish adding buttons and button actions to the form, click another tab to customize another aspect of the form.**
OR
Click OK to generate the form.

Setting the Form Size

The Options page of the Advanced screen lets you specify the form size. This section allows you to adjust the form size or set the form to a fixed size either by entering in its maximum width and height or by selecting a screen size.

The Screen Size drop-down list gives you the following choices:

- Low Resolution,
- 9" Macintosh[1]
- 9" Macintosh Powerbook,
- 13"
- 15" Macintosh,
- 15" Windows,
- 17",
- 20" Macintosh,
- 20" Windows.

When you enter a screen size or choose a size from the drop-down list, the preview area changes to reflect your selection. The Form Wizard will try to adjust field and object placement on the form so that all the form objects will fit in the selected screen size. Otherwise, it will generate multiple display pages to fit all the field on the form. If it generates multiple pages, it places buttons, the form title, and decorative rectangles on the background page.

[1] Screen size of original one-piece “Classic” Macintosh.

Adjust Size to Fields

If you check this check box, the Form Wizard will shrink the background items around the fields so that less blank space is left.

Field Label Placement

The Field Labels area in the Options screen allows you to control where a field label is placed in relation to the field. If you want labels, they can be placed either in front of or on top of the fields.

Optional Form Elements

The Optional Elements area on the Options screen lets you add several elements to the form. Your choices are:

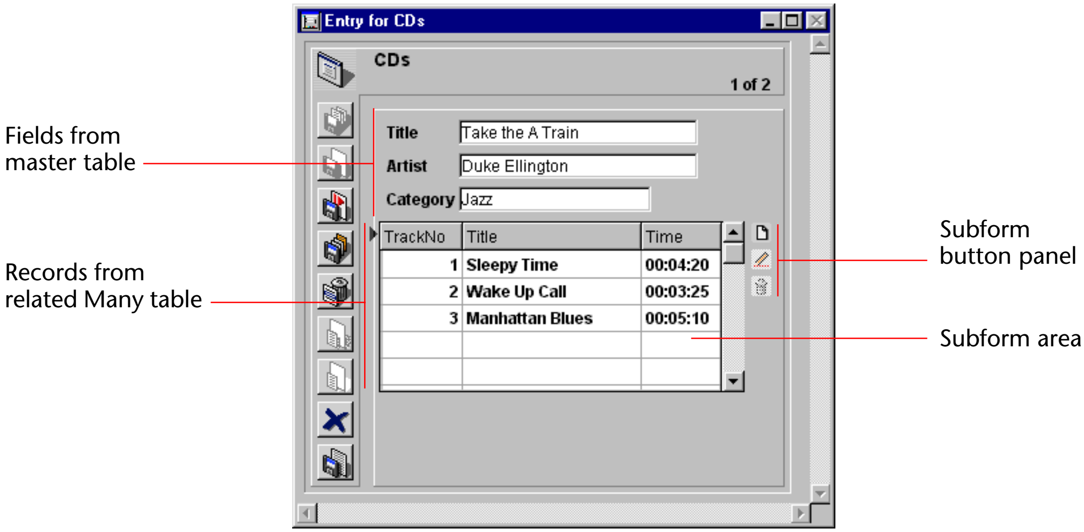
- **Record Number/Record Count** Adds variables to the form that display the current record number and the total number of records.
- **Form Title** Adds the name of the table as the title of the form above the fields.
- **Background Picture** Click the Background Picture check box and choose a background from the drop-down list to add a background to the entire form. Several interesting background patterns are shipped with 4th Dimension.
- **Associated menu bar** Enter the number of a menu bar that you want to associate with the form[1]. For more information about associated menu bars, see the section "Creating Form Menus" on page 331.
- **One Field per Line** Check to arrange the fields vertically. If this option is not checked, the Form Wizard will try to arrange fields in rows.
- **Create Multiple Pages if Necessary** Check to have the Form Wizard create extra pages automatically if the fields don't fit on one page. If you use this option, the Form Wizard places the appropriate objects on the background page.

Adding a Subform to the Form

When you want to use fields from a related Many table or from a subtable, you add a subform to the form. The subform lists several records at once.

Using a subform allows you to view the related records or subrecords. You can also enter information into records and subrecords that are displayed in the subform. The figure below shows a Detail form with a subform during data entry.

[1] You can also associate a menu bar with a form using the Form editor.



Entry for CDs

CDs

1 of 2

Title: Take the A Train

Artist: Duke Ellington

Category: Jazz

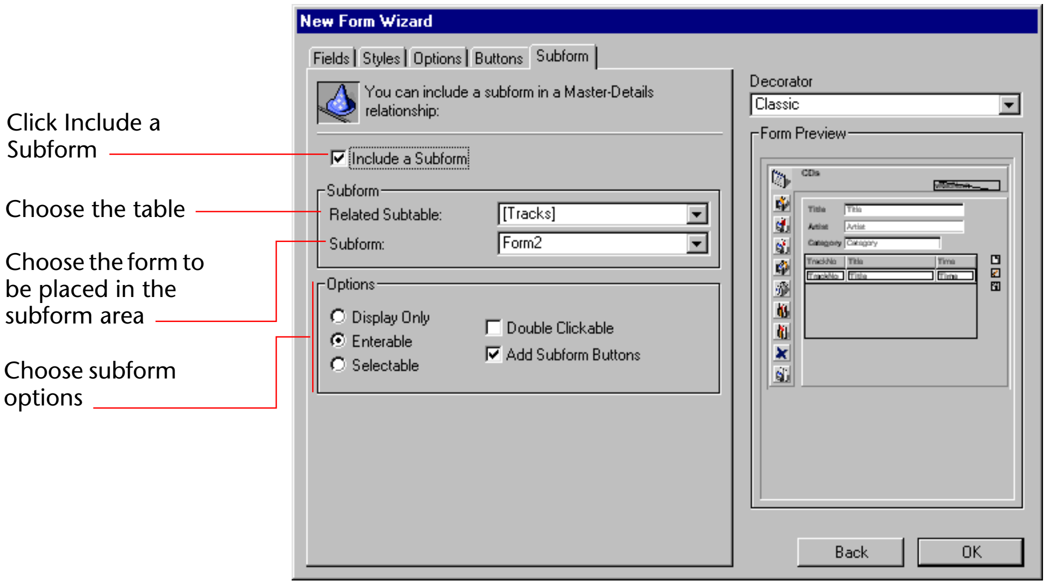
TrackNo	Title	Time
1	Sleepy Time	00:04:20
2	Wake Up Call	00:03:25
3	Manhattan Blues	00:05:10

You can display fields from a subtable, a related Many table, or an unrelated table in a subform. If you include fields from a related Many table, the relation determines which records are displayed. If you include fields from an unrelated table or from a table with a manual relation, by default the current selection of records from that table is displayed. You can also control the selection of records using a method.

You can include subfields from a subtable in a subform. The subrecords for the parent record are displayed in the subform. Only those subrecords that belong to the parent record are displayed.

The Subform page[1] of the Advanced screen lets you add a subform to the form, specify subform options, and add buttons to allow users to work with the subform.

[1] The Subform page is available only if the master table contains a subtable or has a related Many table.



Click Include a Subform

Choose the table

Choose the form to be placed in the subform area

Choose subform options

New Form Wizard

Fields | Styles | Options | Buttons | Subform

You can include a subform in a Master-Details relationship.

☑ Include a Subform

Subform

Related Subtable: [Tracks]

Subform: Form2

Options

○ Display Only
● Enterable
○ Selectable

□ Double Clickable
☑ Add Subform Buttons

Decorator: Classic

Form Preview

► To add a subform to the form:

1. **Click the Include a Subform check box.**

   If there is only one candidate related Many table or subtable, 4th Dimension adds the subform to the form. It appears in the preview area and the related Many table or subtable is shown in the Subform area.

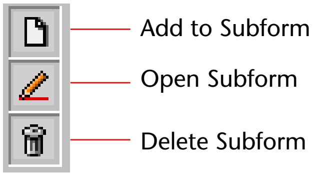
2. **If necessary, choose the desired related Many table or subtable from the drop-down list.**

3. **Choose the desired form to use as the subform from the drop-down list.**

4. **Choose any desired options from the Options area.**

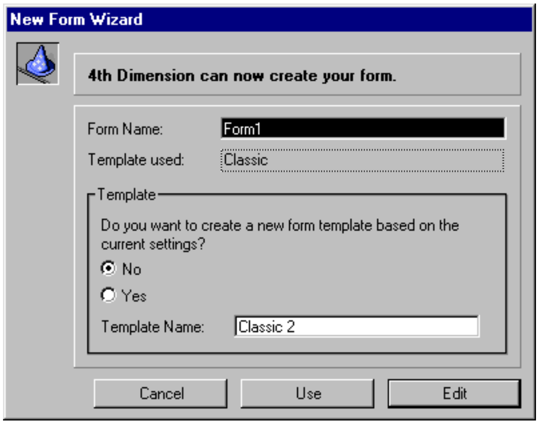
   For information on subform options, see the section "Data Entry Options for Subforms" on page 326.

   The **Add Subform Buttons** check box adds a standard subform button panel to the form. The button panel contains **Add to Subform**, **Open Subform**, and **Delete Subform** record buttons. The standard subform button panel is shown in the following illustration.



Creating the New Form

When you have finished specifying all properties of the new form, click **OK** on any page to create the new form. When you click **OK**, the following dialog box appears:



New Form Wizard

4th Dimension can now create your form.

Form Name: Form1

Template used: Classic

Template

Do you want to create a new form template based on the current settings?

● No

○ Yes

Template Name: Classic 2

To create the new form, click either **Use** to switch to the User environment to test the form or **Edit** to open the new form in the Form editor.

Creating a Form Template

The Accept Form dialog box gives you the option of creating a new form template using the current Advanced settings. If you create a form template, its name will be added to the Form Template drop-down list in the Basic screen of the Form Wizard. The form template is saved in addition to the form itself.

► To create a form template:

1 **Click the Yes radio button in the Template area and enter a name in the Template Name area.**

2 **Click either the Use or Edit buttons.**

Edit opens the new form in the Form editor, ready for further customization. **Use** switches to the User environment so that you can begin using the new form.

If you click **Use**, you can return to the Design environment and open the form in the Form editor at any time.

Setting the Appearance of Form Objects

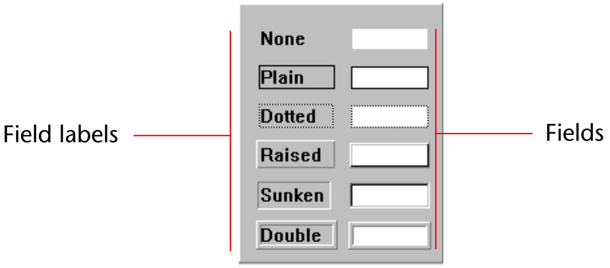
The Styles page of the Form Wizard lets you specify the platform interface, appearance, and font attributes of fields and field labels, text, and check boxes and radio buttons. This section describes the available options.

Fields and Field Labels

The **Appearance** drop-down list in the Styles page lets you customize the look of the fields you place on the form. Your choices are:

- **None** All objects appear with their normal graphical settings according to the selected Platform Interface and user choices.
- **Plain** The non-framable objects appear with their normal graphical settings according to the selected Platform Interface. The framable objects appear with a solid 1-pt frame.
- **Dotted** The non-framable objects appear with their normal graphical settings according to the selected Platform Interface. However, the dotted appearance overrides the selected pattern. The framable objects appear with a dotted 1-pt frame.
- **Raised** All objects (or their frames) appear with a 3D raised effect.
- **Sunken** All objects (or their frames) appear with a 3D sunken effect.
- **Double** On Macintosh, the objects or their frames appear with a double-line: two 1-pt solid lines separated by one pixel. On Windows, the objects or their frames appear with one black and one white lines offset by one pixel.

The following illustration compares the six appearance settings.



You can customize the appearance of the field and the field label separately.

After you create the form, you can set the Appearance of individual objects using the Object Properties window in the Form editor. For more information, see the section “Changing the Appearance of Objects” on page 214.

Using the Style Sheet Editor

The Style Sheet editor lets you save sets of font attributes — font, font size, and style — as a named style sheet. The style sheet can then be used to specify font attributes in the Styles page of the Forms Wizard or the Font page of the Object Properties window.

Each named style sheet saves separate sets of font attributes for each platform interface supported by 4th Dimension. For example, the Macintosh platform interface could use Geneva as the font, while the Windows 95 and Windows 3.1 platform interfaces could use Arial. Similarly, the font sizes can be specified separately for each platform interface.

Creating a Style Sheet

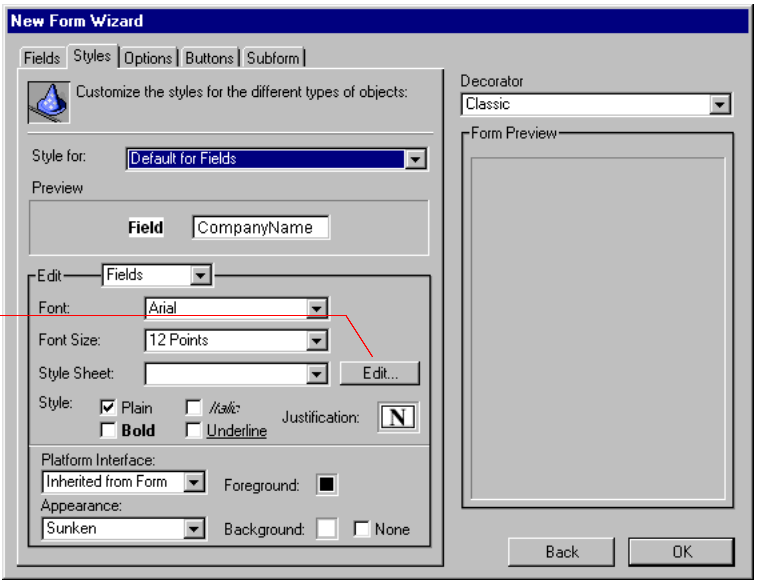
You can create style sheets from several places in 4th Dimension:

- From the User Interface page of the Database Properties dialog box. For information, see the section “User Interface” on page 49.
- From the Styles page in the Advanced screen in the Form Wizard.
- From the Font page of the Object Properties window.

The dialog box used for creating style sheets is the same.

► To create a style sheet:

1 **Click the Style Sheet Edit button.**



Click to create a new style sheet

New Form Wizard

Fields | Styles | Options | Buttons | Subform

Customize the styles for the different types of objects:

Style for: Default for Fields

Preview

Field CompanyName

Edit: Fields

Font: Arial

Font Size: 12 Points

Style Sheet:

Edit...

Style: ☑ Plain ☐ *Italic* ☐ **Bold** ☐ Underline

Justification: N

Platform Interface: Inherited from Form

Foreground: ■

Appearance: Sunken

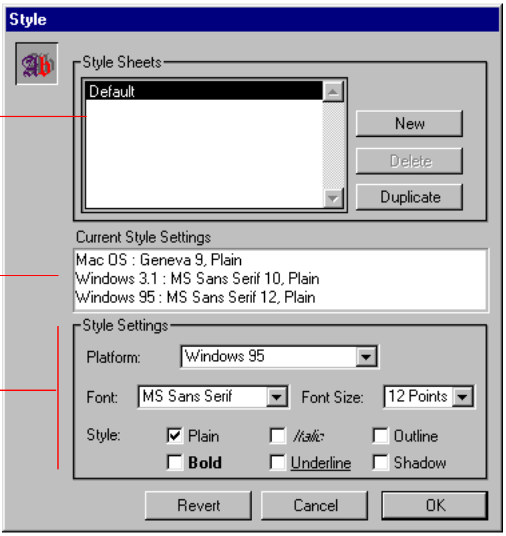
Background: ☐ None

Decorator: Classic

Form Preview

Back OK

The Style Sheet Definition dialog box appears:



List of existing styles

Definition of selected style sheet

Style sheet definition area

Style

Style Sheets

Default

New

Delete

Duplicate

Current Style Settings

Mac OS : Geneva 9, Plain
Windows 3.1 : MS Sans Serif 10, Plain
Windows 95 : MS Sans Serif 12, Plain

Style Settings

Platform: Windows 95

Font: MS Sans Serif

Font Size: 12 Points

Style: ☑ Plain ☐ *Italic* ☐ Outline ☐ **Bold** ☐ Underline ☐ Shadow

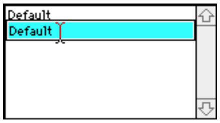
Revert Cancel OK

2 Click New.

A new style sheet appears in the list of existing styles. Its default name is “Default.”

3 **To rename the new style, hold down the Command key (on Macintosh) or the Ctrl key (on Windows) and click the new style sheet name.**

The text becomes editable.



4 **Rename the style sheet and press Tab or click anywhere outside the entry area to save your changes.**

5 **In the Style Sheet definition area, choose a platform whose font attributes you want to define.**

6 **Choose the desired font, font size, and font style options.**

The Definition area changes to reflect your changes.

7 **Repeat steps 5 and 6 for each platform (optional).**

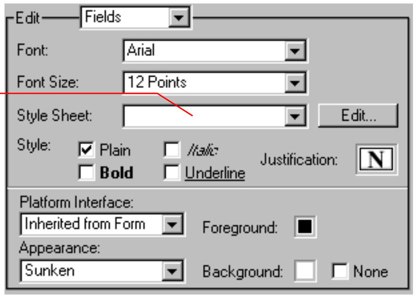
When you are finished defining the style sheet, you can click **New** to create another style sheet or click **OK** to save the new style sheets and put away the Style Sheet Definition dialog box.

Note If you like, you can begin a new style sheet definition by duplicating an existing style sheet by clicking **Duplicate** rather than by clicking **New**.

When the Styles page of the Form Wizard reappears, the new style sheet names appear in the Style Sheet drop-down list. You can then specify font attributes by choosing a style sheet rather than by making font, font size, and style selections.

Applying a Style Sheet

To apply a style sheet to an object, choose the name of the style sheet from the Style Sheet drop-down list.


Edit: Fields
Font: Arial
Font Size: 12 Points
Style Sheet:
Style: ☑ Plain ☐ Bold ☐ Italic ☐ Underline
Justification: N
Platform Interface: Inherited from Form
Foreground: ■
Appearance: Sunken
Background: □ ☐ None

Style sheet drop-down list

Your selection sets the font, font size, and font style attributes for the currently selected label or object.

Setting the Current Input and Output Forms

Each table has one current input form and one current output form. The input form is used for entering and modifying records, and the output form is used to list records. Usually, you use a Detail form for input and a List form for output.

You can change which form to use for input and output at any time. You can change these designations in both the Design and User environments as well as using the commands INPUT FORM and OUTPUT FORM.

► To designate input and output forms:

1 **Choose Edit Form from the Design menu.**
OR
If the Explorer is already displayed, click the Forms tab to display the Forms page.
4th Dimension displays the Forms page of the Explorer.

2 **If the Explorer is not already displaying the Preview area, click the Preview area icon.**

3 **Select the table whose form you want to set and expand it to view the forms for that table.**

4 **Select the form you want to use for input.**
The Preview area shows the form.

5 **Click the Input Form check box below the Preview area.**

6 **Select the form you want to use for output.**
Its preview appears in the Preview area.

7 **Click the Output Form check box.**

Deleting a Form

You can delete any form that is not currently designated as an input form or an output form (or both). The **Delete** button is disabled when you select the current input or output form.

► To delete a form:

1 **Choose Edit Form from the Design menu.**
OR
If the Explorer is already displayed, click the Forms tab to display the Forms page.
4th Dimension displays the Forms page of the Explorer.

2 **Select the table that contains the form you want to delete and expand it to view the forms for that table.**

3 **Select the form you want to delete.**
When you select a form that is not the current input or output form, the **Delete** button becomes active.

4 **Click the Delete button.**
4th Dimension asks you to confirm the deletion.

5 **Click the OK button.**
4th Dimension deletes the form.

Renaming a Form

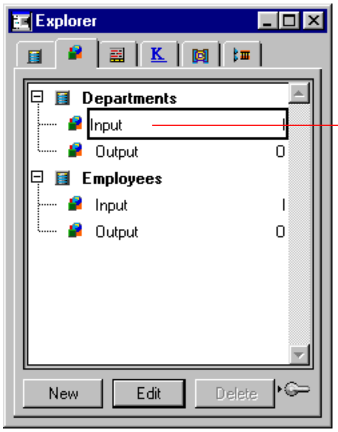
You rename a form in the Explorer.

► To rename a form:

1 **Choose Edit Form from the Design menu.**
OR
If the Explorer is already displayed, click the Forms tab to display the Forms page.
4th Dimension displays the Forms page of the Explorer.

2 **Select the table that contains the form you want to rename and expand it to view the forms for that table.**

3 **Hold down the Command key (on Macintosh) or the Ctrl key (on Windows) and click the form name you want to rename.**
The name becomes editable.



Editable form name

4 **Type a new name.**

5 **Press Tab or click anywhere outside the entry area to save your changes.**

4th Dimension changes the name of the form.

Note Changing a form name can invalidate any methods or formulas that use the previous form name. Each of these items has to be updated in order to function.

4D Server The form name is changed on the server when the user clicks outside the entry area to save the new name. If more than one user is modifying the form name at the same time, the final form name will be the name specified by the last user to save the name.

You may want to specify a form owner so that only certain users can change the form's name. For more information about specifying owner privileges for a form, refer to the section "Setting Form Access" on page 185.

4 Form Editor Basics

When you create a new form with the Form Wizard, you can choose many customization options. Using templates, you can control the font, font size, and style of text, control the appearance of fields and field labels, and add a set of automatic buttons.

This is only the beginning though, since 4^{th} Dimension provides a full-featured Form editor that allows you to modify your form until you achieve the effect that you want. With the Form editor, you can create and delete objects, manipulate objects directly, and set form and object properties.

This chapter provides an introduction to the Form editor. It covers:

- The Form editor window,
- The Form editor Tools palette,
- The Form editor Objects palette,
- The Form editor menus,
- Form properties.

The following operations are explained in detail:

- Opening a form in the Form editor,
- Setting form properties,
- Creating and managing objects,
- Moving and resizing objects,
- Grouping and ungrouping objects,
- Aligning objects,
- Copying objects,

- Layering objects,
- Creating text areas on a form,
- Adding a picture from the Picture library to the form,
- Creating a multi-page form,
- Changing the data entry order of the fields.

Chapter 5 covers fields and other active objects in detail.

4D Server Object locking occurs when two or more users attempt to modify the same form simultaneously. If a user is modifying a form in the Design environment, the form is locked. Other users cannot modify that same form until the first user frees the form by closing it.

Using The Form Editor

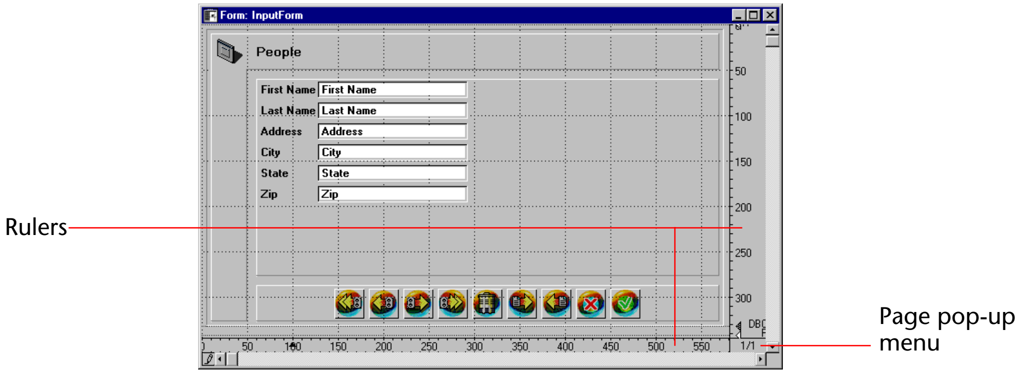
This section provides an overview of the Form editor and describes the tools available for editing forms. Subsequent sections describe in detail how to work with the Form editor's tools.

This section introduces the four components of the Form editor:

- The Form editor window,
- The Tools and Objects palettes,
- The Form editor menus,
- Form and object properties.

Form Editor Window

4th Dimension's Form editor is a powerful object-oriented graphics editor that includes special features for working with fields and interface objects. The following illustration shows an input form in the Form editor window.



Form: InputForm

People

First Name First Name
Last Name Last Name
Address Address
City City
State State
Zip Zip

The Form editor displays each form in its own window. You can have several forms open at the same time. The rulers on the side and bottom help you position objects in the form. You can change the units the ruler uses so that it measures in inches, centimeters, or pixels. The Page pop-up menu lets you display the background page (page zero) or any display page. Hold down the mouse button on the page indicator to display the Page pop-up menu.

When a form is open, the Form editor's Tools and Objects palettes are available. You can modify any open form using the palettes or menu commands. For more information about the palettes, see the sections "The Tools Palette" on page 174 and "The Objects Palette" on page 175.

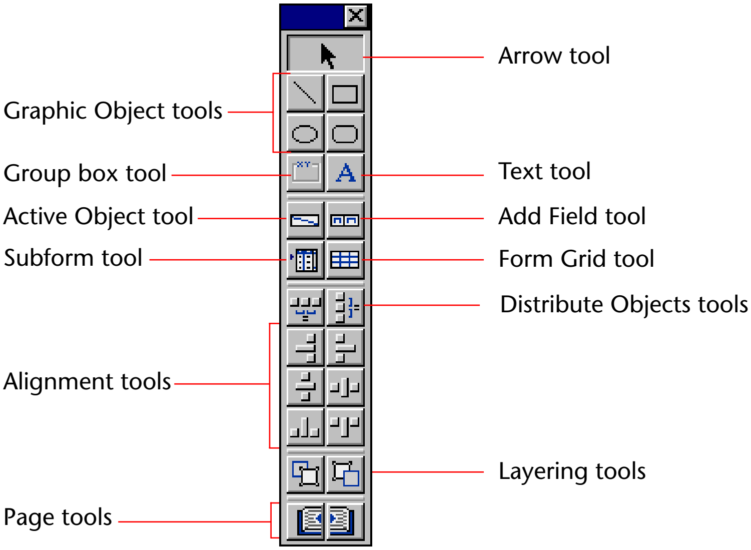
Note The output control lines are relevant only for output forms. They control the information that is listed and define header and footer areas. The label width triangle on the horizontal ruler controls the width of a label when you create a form for printing mailing labels. For information on working with output control lines, see the section "Output Control Lines" on page 336.

The Form editor menus added to the 4th Dimension menu bar provide menu commands that allow you to change the data entry order of the fields, hide and display the rulers, control the line width, fill pattern, and color of objects, and change the font and style for displaying information. For more information, see the section "Form Editor Menus" on page 176.

The Tools Palette

The Tools palette provides a collection of tools for creating and manipulating form objects. The Tools palette appears automatically when you open the Form editor.

The following illustration shows the Tools palette.



Here is a brief description of the tools in the Tools palette:

- **Arrow tool** Used to select, move, and resize objects in the form. For more information, see the section "Managing Form Objects" on page 192.
- **Text tool** Used to create or edit text on the form for labels, titles, instructions, and so on. For more information, see the section "Creating and Editing Text Areas" on page 216.
- **Graphic object tools** Used to draw graphic objects such as circles, lines, and boxes. For more information, see the section "Creating Objects" on page 200.
- **Subform tool** Can be used to create an area that displays multiple records from another table or a subtable. For more information, see the section "Adding a Subform to the Form" on page 324.
- **Add Field tool** Used to add a field to a form. For more information, see the section "Fields on a Form" on page 236.

- **Active Object tool** Used to create active objects such as buttons, drop-down list boxes, and tab controls. For more information, see the section "Active Objects on a Form" on page 281.
- **Form Grid tool** Used to create a grid object on which you can arrange a series of active objects, such as buttons or fields. For more information, see the section "Objects on Grid" on page 317.
- **Group Box tool** Used to create a box with a built-in label in the upper left corner.
- **Alignment tools** Used to align objects in the form. For more information, see the section "Aligning Objects" on page 205.
- **Layering tools** Used to move objects to the front or back when objects overlap. For more information, see the section "Layering Objects" on page 211.
- **Page tools** Used to move to the background page, next or previous display pages, or to add additional display pages to the form. For more information, see the section "Creating a Multi-page Form" on page 225.

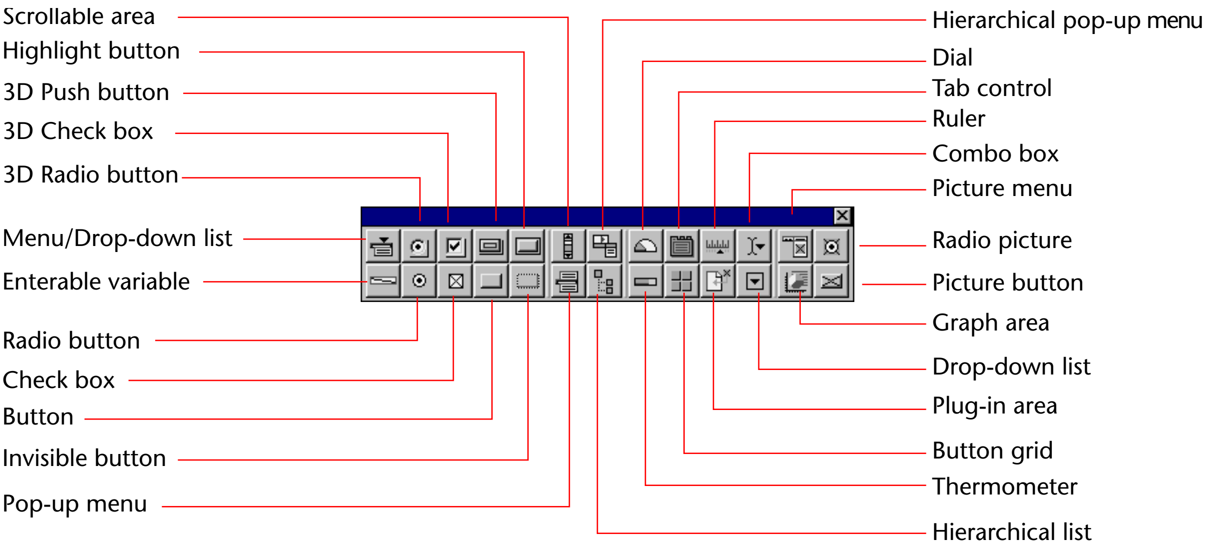
The Objects Palette

The Objects palette provides the most common active objects. You can add an object to a form by dragging an object from the Objects palette to the form.

Note You can also create any type of active object using the Active Object and Subform tools in the Tools palette.

The Objects palette appears automatically when you open the Form editor. If you put away the Objects palette, you can display it by choosing **Show Objects Palette** from the **Form** menu.

The following illustration shows the Objects palette:



To add an object using the Objects palette, drag the object from the palette to a form. When you release the mouse button, the new object appears on the form. Double-click the object to display the Object Properties window for the object. Modify the object's properties as needed. For complete information on setting the type and properties of an object, see the section "Types of Active Objects" on page 291.

Note If you create an object using a tool in the Objects palette, you can change the object type using the Object Properties window after you add the object to the form.

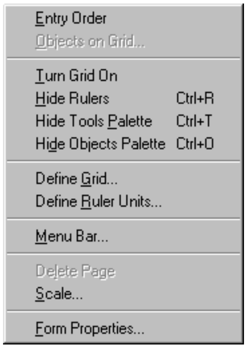
Form Editor Menus

When a Form editor window is the active window, the following menus are added to the menubar:

- Form,
- Object,
- Font,
- Style.

The Form Menu

Use the **Form** menu to organize form elements. The figure below shows the **Form** menu.



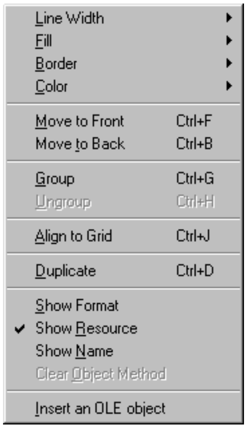
The following is a description of the menu commands in the **Form** menu, with a brief description of their use:

- **Entry Order** Used to create a custom entry order for data entry objects in an input form. For more information, see the section "Data Entry Order" on page 229.
- **Objects on Grid** Used to create a series of active objects on a form grid. For more information, see the section "Objects on Grid" on page 317.
- **Turn Grid On/Off** Used to turn on or off the invisible grid to which objects can be aligned. For more information, see the section "Aligning Objects" on page 205.
- **Hide Rulers/Show Rulers** Used to hide or display the rulers. For more information, see the section "Using the Rulers" on page 199.
- **Show/Hide Tools Palette** Used to show or hide the Tools palette. For more information, see the section "The Tools Palette" on page 174.
- **Show/Hide Objects Palette** Used to show or hide the Objects palette. For more information, see the section "The Objects Palette" on page 175.
- **Define Grid** Used to define the scale of an invisible grid to which objects are aligned. For more information, see the section "Aligning Objects" on page 205.
- **Define Ruler Units** Used to set the scale of the form rulers. For more information, see the section "Using the Rulers" on page 199.

- **Menu Bar** Used to assign a menu bar to appear with the form. For more information, see the section "Creating Form Menus" on page 331.
- **Delete Page** Used to delete a page from the form. For more information, see the section "Deleting a Page" on page 228.
- **Scale** Enlarge or reduce all form objects by a specified factor. For more information, see the section "Scaling a Form" on page 212.
- **Form Properties** Set or modify form properties. For more information, see the section "Setting Form Properties" on page 184.

The Object Menu

Use the **Object** menu to modify and manipulate form objects. Some **Object** menu commands display a hierarchical menu of choices. The following illustration shows the **Object** menu.



Here is a description of the menu commands in the **Object** menu, with a brief description of their use.

- **Line Width** Displays a hierarchical menu of line width choices for lines and borders. For more information, see the section "Line Widths" on page 219.
- **Fill** Displays a hierarchical menu of fill-pattern choices for objects. For more information, see the section "Fill Patterns" on page 220.
- **Border** Displays a hierarchical menu of border-pattern choices for objects. For more information, see the section "Border Patterns" on page 221.

- **Color** Displays a hierarchical menu of color choices for objects. For more information, see the section “Foreground and Background Colors” on page 222.
- **Move to Front** Used to move an object in front of all other objects. For more information, see the section “Layering Objects” on page 211.
- **Move to Back** Used to move an object in back of all other objects. For more information, see the section “Layering Objects” on page 211.
- **Group** Used to combine multiple objects in the form into groups that you can manipulate as a single object. For more information, see the section “Grouping Objects” on page 204.
- **Ungroup** Used to separate grouped objects into individual objects. For more information, see the section “Grouping Objects” on page 204.
- **Align to Grid** Used to align an object to an invisible grid in the form. For more information, see the section “Aligning Objects” on page 205.
- **Duplicate** Used to duplicate objects. For more information, see the section “Duplicating Objects” on page 209.
- **Show Format**, **Show Resource**, **Show Name** Controls what is displayed on the form for objects whose text is actually stored in resources. Show Resource shows the STR# resource in which the text of the object is actually stored.
- **Clear Object Method** Used to remove an object method from a selected object. To remove a method, select the object and choose **Clear Object Method** from the **Object** menu.

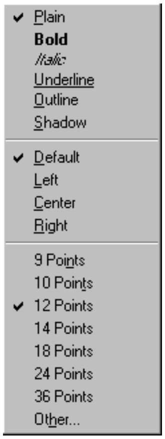
The Font Menu

Use the **Font** menu to apply a font to objects on the form and to specify a default font for text objects that you subsequently add to the form. The appearance of the **Font** menu depends on the screen fonts that you have installed on your system.

For more information, see the section “Changing the Appearance of Objects” on page 214.

The Style Menu

Use the **Style** menu to apply a text style, alignment, and font size to objects in the form or to specify these attributes as defaults for objects that you subsequently add to the form.



For more information, see the section "Changing the Appearance of Objects" on page 214.

You can set text attributes using either the **Font** and **Style** menus or the Fonts page of the Object Properties window.

Form and Object Properties

Both forms and form objects have properties that control access to the form, the appearance of the form, and the behavior of the form when it is used. This section provides an overview of form and object properties. Detailed information on setting and using properties is found elsewhere in this manual.

Form Properties

When a form is in the active window, you can view or set its properties by choosing **Form Properties** from the **Form** menu. The following properties can be set:

- **Owner and Access** Determines which access group can modify the form and which access group can use the form in the User environment and in custom applications.
- **Name and Window Title** Name the form and provide a default window title that is used when the form is displayed in a custom application.

- **Platform Interface** Determines the platform interface for individual forms. A form can inherit the platform interface from the database[1], use the platform interface for the platform on which the database is currently running, or be specified on a form-by-form basis.
- **Events** Sets the events that will be executed when the form is in use. You can write a form method using the Method editor. The form method executes when the form is used and the events that you select in Events take place.
- **Sizing options** Enables automatic resizing when the form is resized in a custom application and sets automatic resizing options.

  For more information on setting form properties, see the section "Setting Form Properties" on page 184.

Object Properties

Each object on a form has its own properties. When a form is active, you can double-click the object to view or set its properties in the Object Properties window or press **Ctrl+Shift+Space** (**Command–Shift–Space** on Macintosh). The following properties can be set:

- **Sizing, resizing, and repositioning options** Determine the size and position of the object by entering coordinates and enable automatic resizing and repositioning. Resizing and repositioning is useful in custom applications in which users can resize the windows in which forms are displayed.
- **Object Name** Name the instance of the object on the form. Using the Object Properties commands in the language, you can control certain object properties by referring to this name.
- **Foreground and background color** Set the colors of the object. The foreground color is the color of text in an area and the background color is the color of the area itself.
- **Line width and border and fill patterns** Set the line width, border, and fill patterns for the object. These options can also be set using the corresponding commands in the **Object** menu.
- **Platform Interface** Determines the platform interface for individual objects. An object can inherit the platform interface of the form, use

[1] The platform interface for the database is set in Database Properties. For more information, see "User Interface" on page 49 and "Platform Interface" on page 57.

the platform interface of the computer on which the database is currently running, or be specified on an object-by-object basis.

- **Appearance of decorative rectangles** Determines the style of decorative rectangles that surround fields or entry areas.
- **Focus** Determine whether the user can select the object by pressing Tab (Tabable) and whether the object will indicate that it has focus (Show Focus).
- **Drag and drop properties** Enable drag and/or drop properties for the object.
- **Picture and Text object attributes** Enable picture scaling or truncation or text field variable frame printing or add a vertical scroll bar to a text object on a Detail form.
- **Data entry controls** Set minimum, maximum, and default values for fields, set an entry filter or a display format, assign a choice list, or set the enterable or mandatory properties.
- **Events** Activate the events that will be executed when the object is used. You can write a method for each object, called an *object method*, which is run when the events you select in Events occur.
- **Object Method** Attach a method to the object.
- **Help** Write help text that will be displayed either as a Tip or Balloon Help (Balloon help is displayed only on Macintosh, but can be written on any platform).
- **Subform** Specify the properties of a subform object on the form.
- **Variable** Choose the type of the variable, name it, and assign an automatic action.

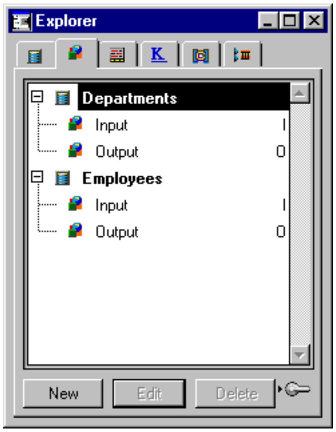
Opening a Form in the Form Editor

You can edit an existing form in the Form editor at any time.

► To open a form in the Form editor:

1 **Choose Edit Form from the Design menu.**
OR
Press Ctrl+L (on Windows) or Command–L (on Macintosh).
OR
Hold down the Ctrl key (on Windows) or the Command key (on Macintosh) and double-click the table title in the Structure window whose forms you want to open.

4th Dimension displays the Forms page of the Explorer. You can expand any of the table names to display the forms associated with it.



2 **If necessary, expand the table name that contains the form you want to modify.**

3 **Select the name of the form you want to modify and click the Edit button.**
OR
Double-click the name of the form.

4th Dimension displays the form in a Form editor window.

4D Server Object locking occurs when two or more users attempt to modify the same form simultaneously. If a user is modifying a form in the Design environment, the form is locked. Other users cannot modify that same form until the first user frees the form by closing it.

Setting Form Properties

This section tells you how to set various form properties.

Naming the Form

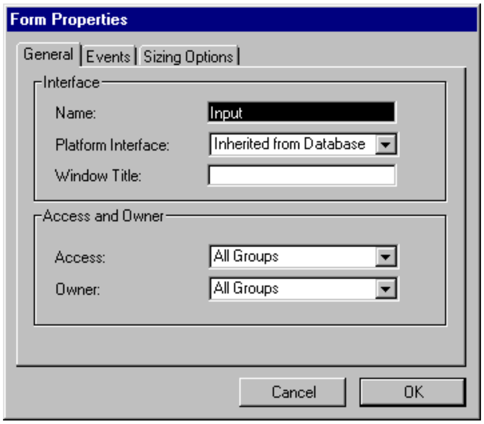
You can give the form a name in the Form Properties window. You can also rename a form using the Explorer. You use the names of forms when you are establishing default input and output forms for a table and in commands that accept a form name as a parameter, such as INPUT FORM and OUTPUT FORM.

You should not use the same name for more than one form per table. This will confuse 4th Dimension when you try to refer to a form by name. You can, however, use the same name in different tables. For example, you can name all your input forms “Input” and all your output forms “Output.”

► To name a form using the Form Properties window:

1 **With the desired form in the frontmost window, choose Form Properties from the Form menu.**

The Form Properties window appears.



Form Properties

Interface

Name: Input

Platform Interface: Inherited from Database

Window Title:

Access and Owner

Access: All Groups

Owner: All Groups

2 **Enter a name in the Name area.**

Form names can be up to 31 characters.

3 **When you are finished setting form properties, click OK to put away the Form Properties window.**

► To rename a form using the Explorer:

1 **Click the Forms tab to display the Forms page.**

A hierarchical list of tables and forms appears.

2 **Expand the table containing the form you would like to rename.**

3 **Hold down the Ctrl key (on Windows) or the Command key (on Macintosh) and click on the form name.**

The form name becomes editable.

4 **Replace the current form name with the new name.**

5 **Press Tab or click anywhere outside the entry area to save the new name.**

If you rename a form that is referred to elsewhere in the database (such as in methods), update the references to the form.

Setting Form Access

You can control access to a form by setting Access and Owner privileges for groups of users. A single group can be assigned for each privilege using the Access and Owner drop-down menu in the Form Properties window. For information about creating a password access system with users and groups, see Chapter 9, “Managing Password Access” on page 437.

The Access drop-down list controls which group can use the form in the User environment or in custom applications. If a user that is not in this group attempts use the form, 4th Dimension displays a message saying that the user’s password does not allow him or her use the form.

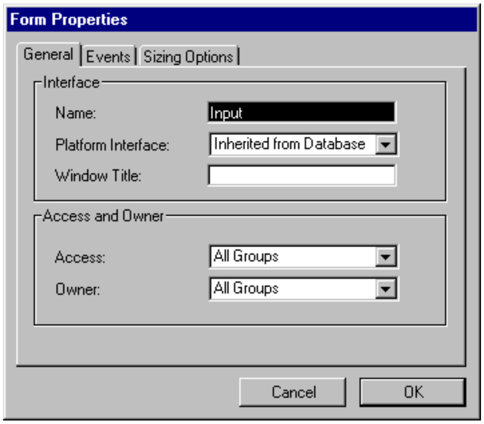
The Owner drop-down list controls which group can edit the form in the Design environment. If a user who is not in this group attempts to edit the form in the Design environment, 4th Dimension displays a message saying that the user does not have the access privilege to edit the form.

Users who are assigned to both groups can use the form in both the User and Design environments and in custom applications.

► To set access privileges for a form:

1 **With the desired form in the frontmost window, choose Form Properties from the Form menu.**

The Form Properties window appears.



Name: Input

Platform Interface: Inherited from Database

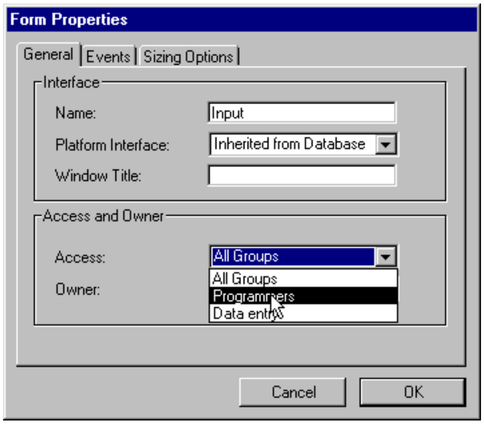
Window Title:

Access: All Groups

Owner: All Groups

2 **Use the Access and Owner drop-down lists to make the desired access privileges assignments.**

The names of existing groups are displayed in each drop-down list.



Name: Input

Platform Interface: Inherited from Database

Window Title:

Access: All Groups

Owner:

All Groups
Programmers
Data entry

3 **When you are finished setting form properties, click OK to put away the Form Properties window.**

Setting the Platform Interface

You can set the platform interface for the entire database (in the Database Properties dialog box) and for individual forms in the Form Properties window. At the form level, your choices are:

- **Inherited from Database** Use the platform interface selection you made in the Database Properties dialog box.
- **Automatic** Use the platform interface for the platform on which the database is currently running. That is, if the database is deployed on

Macintosh, the form will be displayed using the Macintosh platform interface, and so forth.

- **Macintosh**, **Windows 3.1**, **Windows 95**, or **Copland** Choose a specific platform interface that will be used regardless of which platform on which the database is actually running.

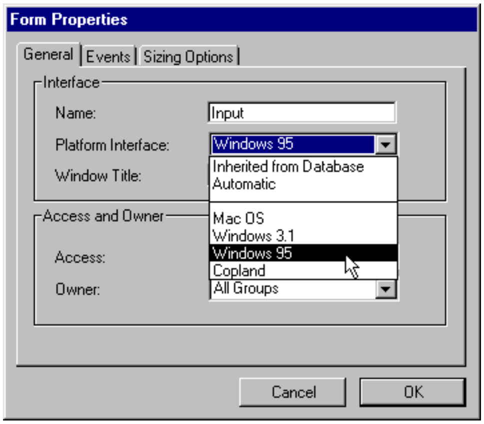
  The default platform interface setting for a form is **Inherited From Database**.

► To set a platform interface:

1 **With the desired form in the frontmost window, choose Form Properties from the Form menu.**

The Form Properties window appears.

2 **Choose the desired platform interface from the Platform Interface drop-down list.**



Name: Input

Platform Interface: Windows 95

Owner: All Groups

3 **Click OK to put away the Form Properties dialog box.**

Setting the Default Window Title

The default window title is used when the form is opened using the Open window function in custom applications. The default window title appears in the Title bar of the window. To set the default window title, enter it in the Window Title entry area.

Setting Sizing and Resizing Options

When an input form is displayed in a custom application, you ordinarily open the form using the Open window function. Open window lets you specify the top, left, bottom, and right coordinates of the window as well as the window type. If you do not use any resizing options, the user's ability to resize the window depends on the window type. The window type is specified as a parameter to the Open window statement.

The sizing and resizing options available in the Form Properties window give you greater control over sizing and resizing of the window.

Default Window Size

The Default Window Size area gives you control over the initial size of the window. Your choices are:

- **Automatic size** The size calculated by 4th Dimension based on the size necessary to display all objects on the form.
- **Set size** The size you enter in the width and height entry areas.
- **Size based on selected form object** The size based on a selected form object. 4th Dimension uses the smallest size necessary to display the selected object. For example, if you choose an object that is placed at the bottom-right corner of the area to be displayed, 4th Dimension will open a window just large enough to include the object.

  Choose this option if you need to place some active objects in an offscreen area (i.e., outside the bounding rectangle). When you use this option, these objects will not affect the size of the window.

When you select either automatic size or size based on a selected object, the Width and Height areas change to Horizontal Margin and Vertical Margin, respectively. You can then enter a margin (in pixels) that defines a border area so that the edges of the object in the bottom-right corner of the form is not flush against the edge of the window.

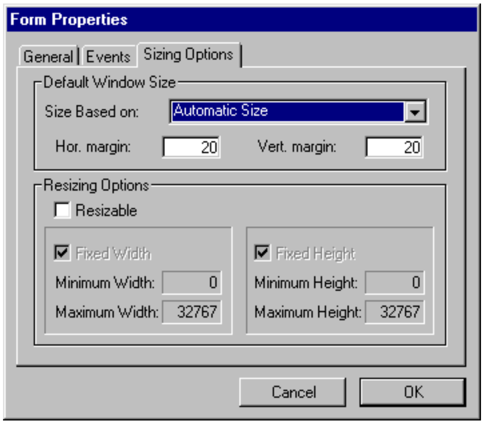
► To set the sizing options:

1 **With the desired form in the frontmost window, choose Form Properties from the Form menu.**

The Form properties window appears.

2 **Click the Sizing Options tab.**

The Sizing page appears.



Size Based on: Automatic Size

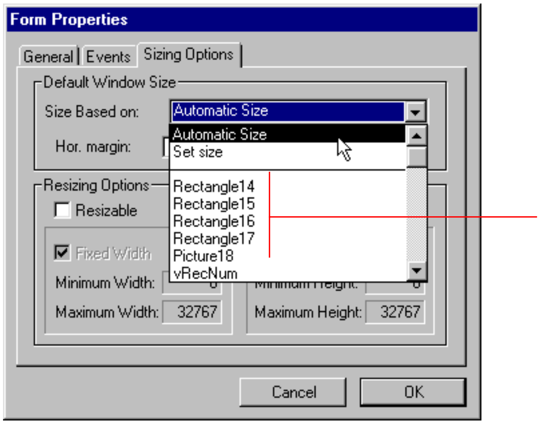
Hor. margin: 20 Vert. margin: 20

□ Resizable

☑ Fixed Width
Minimum Width: 0
Maximum Width: 32767

☑ Fixed Height
Minimum Height: 0
Maximum Height: 32767

In the Default Window Size area, the Size Based On drop-down list controls the initial size of the window.



Size Based on: Automatic Size

Automatic Size
Set size
Rectangle14
Rectangle15
Rectangle16
Rectangle17
Picture18
vRecNum

□ Resizable

☑ Fixed Width
Minimum Width:
Maximum Width: 32767

Maximum Height: 32767

Names of objects on the current form

The two options above the dividing line let you choose either Automatic or Set Size. If you choose Set Size, you need to enter the desired Width and Height into the entry areas below the Sized Based On drop-down list.

All the objects on the current form are listed below the dividing line in the drop-down list. To size the window based on a form object, choose the desired form object from the drop-down list.

3 **Choose the desired sizing option from the drop-down list.**

If you did not choose Set Size, the Width and Height areas change to Horizontal Margin and Vertical margin.

4 **If you chose Set Size, enter the desired width and height in the entry areas.**
OR
If you chose either Automatic Size or a form object, enter the desired horizontal and vertical margins (in pixels) in the appropriate entry areas.

Resizing Options

The resizing options in Form Properties let you make windows of any type resizable in custom applications and let you set the minimum and maximum sizes. Setting the minimum size is a way of preventing users from resizing a form so that the button panel or other essential objects are no longer visible.

► To make the window resizable:

1 **Click the Resizable check box.**

When you click Resizable, the Fixed Width and Fixed Height checkboxes are enabled and the minimum and maximum entry areas become enterable.

2 **Click either Fixed Width or Fixed Height to prevent resizing in either direction (Optional).**

For example, you may have a column of buttons and you want to prevent the user from resizing the window so that some of the buttons are no longer visible. You would choose Fixed Height.

3 **Enter a minimum value in either dimension to prevent the user from making the window too small (Optional).**
OR
Enter a maximum value to prevent the user from making the window too big (Optional).

You would use this option to prevent the user from hiding necessary entry areas or controls.

4 **When you are finished setting form properties, click OK.**

Form Events

You can write a form method using the Method editor. If you do so, you should indicate which form events should be executed. You do this in the Events page of the Form Properties window. When the form is used, only the events that you select will actually occur.

For information on the available events, see the section “Form and Object Events” on page 377.

Your database will run faster if you deselect superfluous events.

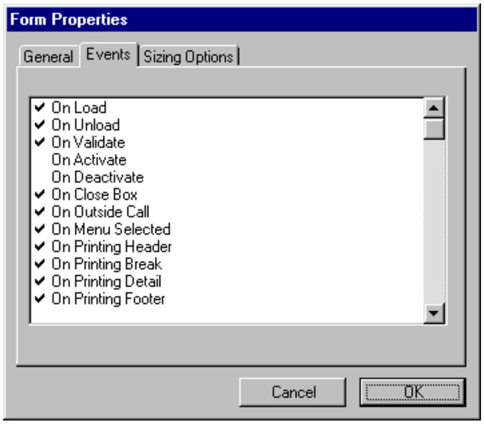
► To activate events for the form:

1 With the desired form in the frontmost window, choose Form Properties from the Form menu.

The Form Properties window appears.

2 Click the Events tab.

The Events page appears.



✓ On Load
✓ On Unload
✓ On Validate
On Activate
On Deactivate
✓ On Close Box
✓ On Outside Call
✓ On Menu Selected
✓ On Printing Header
✓ On Printing Break
✓ On Printing Detail
✓ On Printing Footer

A check box next to the event indicates that the event will occur when the form is used.

3 Select only the events that are needed.

To select or deselect all events, hold down **Ctrl** (**Command** on Macintosh) and click an event.

4 When you are finished setting Form properties, click OK.

Managing Form Objects

You customize a form by creating and manipulating objects in the form. You use the Form editor to draw the objects, modify them, arrange them, set their properties, or delete them.

You can select and modify any object in a form, including the fields, buttons, and graphic objects created by the Form Wizard.

Selecting Objects

Before you can perform any operation on an object (such as changing a line width or font), you need to select the object that you want to modify.

When the Form Wizard creates a form, it creates one or more display pages and a background page. The Form Wizard may place buttons, the form title, and decorative rectangles on the background page. Objects on the background page are selectable only from the background page. If you have difficulty selecting an object that was created by the Form Wizard, switch to the background page and try again.

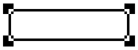
► To select an object using the Tools palette:

1 **Click the Arrow tool in the Tools palette.**

When you move the pointer into the form area, it becomes a standard arrow-shaped pointer.

2 **Click the object you want to select.**

Resizing handles identify the selected object.



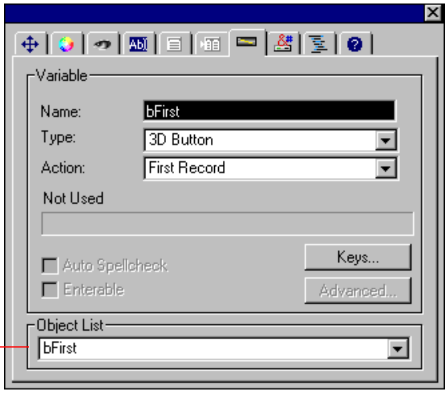
► To select an object using the Object Properties window:

■ **Choose the object's name from the Object List drop down list.**

With the Object Properties window, you can select an object that is hidden by other objects.

Viewing or Modifying Object Properties

You view or modify an object's properties using the Objects Properties window. If it is not on-screen, double-click the object or press **Ctrl+Shift+Space** (**Command–Shift–Space** on Macintosh). If the Object Properties window is already on screen, click the object or select it from the Object List drop-down list. The name of the selected object appears in the Object List area at the bottom of the page.



Variable

Name: bFirst

Type: 3D Button

Action: First Record

Not Used

□ Auto Spellcheck

□ Enterable

Object List

bFirst

Name of selected object

The Object List drop-down list contains the names of all the objects on the page. You can select an object and view its properties by choosing its name from this list.

Viewing or Modifying an Object's Method

To view the object's method or create a new method for the object hold down the **Alt** key (on Windows) or **Option** key (on Macintosh) and click the object[1]. For more information about object methods, see the section "Using Object Methods with Fields and Objects" on page 319 and "Object Methods" on page 370.

To deselect an object, click outside the object's boundary or **Shift+click** the object.

Selecting Multiple Objects

You may want to perform the same operation on more than one form object — for example, to move the objects, align them, or change their appearance. 4th Dimension lets you select several objects at the same time. There are four ways to select multiple objects:

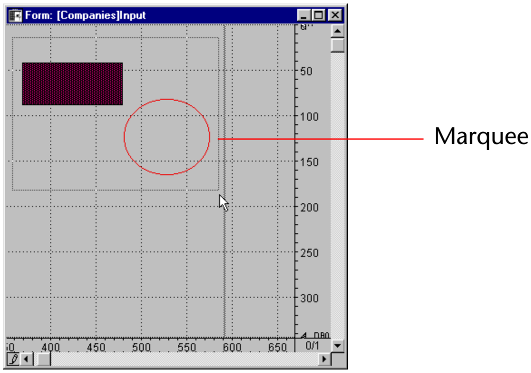
- Choose **Select All** from the **Edit** menu to select all the objects.
- Hold down the **Shift** key and click the objects you want to select.
- Start at a location outside the group of objects you want to select and drag a marquee (sometimes called a selection rectangle) around the objects.

[1] Only active objects can have methods, but all objects have properties. If an object cannot have a method, the Events tab in the Object Properties window is dimmed.

- Hold down the right mouse button (on Windows) or the **Control** key (on Macintosh) and draw a marquee. Any object that is completely enclosed by the marquee is selected.

  You draw a marquee with the arrow pointer. A marquee defines a rectangular region that select objects it surrounds or touches.

To select objects by drawing a marquee around them, you must press the mouse button down and start dragging *in an area that contains no objects*. When you release the mouse button, if any part of an object lies within the boundaries of the selection rectangle, that object is selected. The figure below shows a marquee being drawn to select two objects.



To deselect an object that is part of a set of selected objects, hold down the **Shift** key and click the object. The other objects remain selected. To deselect all the selected objects, click outside the boundaries of all the objects.

Moving Objects

You can move any graphic or active object in the form including fields and objects created with a template.

When moving an object, you have the following options:

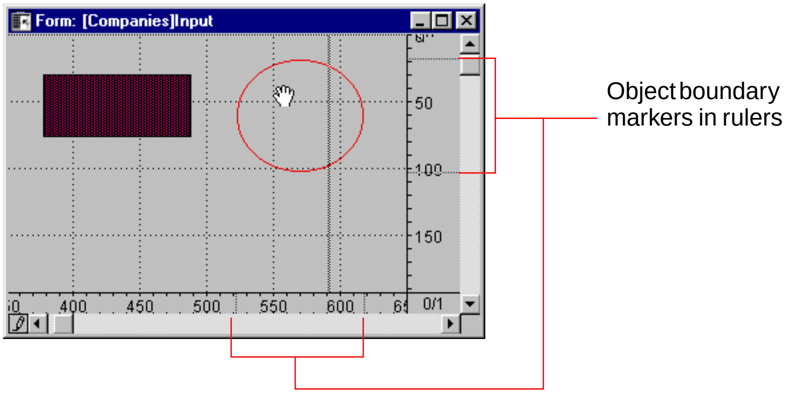
- Move the object by dragging it.
- Move the object one pixel at a time using the arrow keys.
- Move the object *x* pixels at a time using the **Control** and arrow keys (right mouse button on Windows).
- Use the Coordinates page of the Object Properties window (described in the section “Resizing Objects” on page 196).

▶ To move an object by dragging:

1 **Select the object or multiple objects that you want to move.**

2 **Move the pointer over the selected object or one of the objects in a selected set of objects and drag to the new location.**

4th Dimension displays markers that show the location of the object's boundary in the rulers so that you can place the object exactly where you want it. As you begin dragging the selected object, its handles disappear.



Object boundary markers in rulers

Be careful not to drag a handle. Dragging a handle resizes the object.

3 **Release the mouse button to complete the move.**

▶ To move an object one pixel at a time:

1 **Select the object or objects you want to move.**

2 **Use the arrow keys on the keyboard to move the object.**

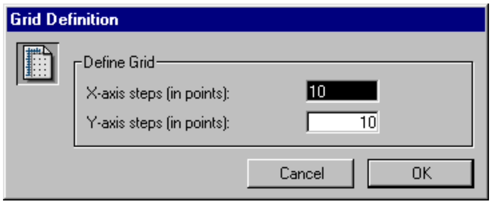
Each time you press an arrow key, the object moves one pixel in the direction of the arrow.

You can also use the arrow keys to move an object x pixels at a time, when x is a value set in the Define Grid dialog box.

▶ To move an object *x* pixels at a time:

1 **Choose Define Grid from the Form menu.**

The Grid Definition dialog box appears.



Grid Definition

Define Grid

X-axis steps (in points): 10

Y-axis steps (in points): 10

2 **Enter the desired values in the X-axis and/or Y-axis entry areas and click OK.**

3 **Right-click the object (on Windows) or hold down the Control key (on Macintosh) and press an arrow key.**

Resizing Objects

You can change the size of any object that appears on the form. 4th Dimension lets you stretch or shrink objects on the form.

When resizing objects, you have the following four options:

- Resize an object by dragging a resizing handle.
- Resize an object one pixel at a time by using the **Ctrl** key (on Windows) or the **Command** key (on Macintosh) and the arrow keys.
- Resize an object *x* pixels at a time
- Use the Coordinates page of the Object Properties window.

► To resize an object by dragging:

1 **Select the object you want to resize.**

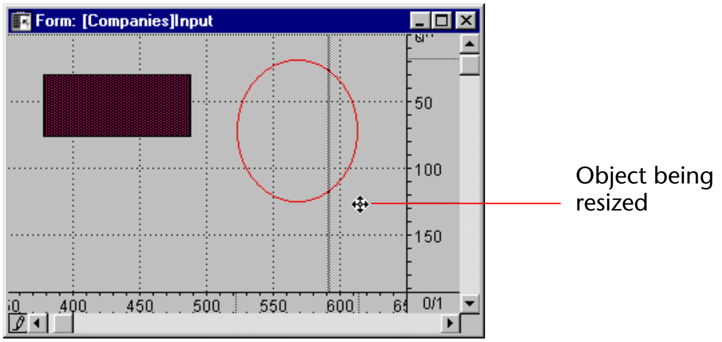
2 **Move the pointer over one of the four handles that appear on the selected object.**

The pointer changes into a multi-directional arrow ✥ and the handles disappear.

3 **Drag the handle toward the center of the object to shrink it.**
OR
Drag the handle away from the object's center to enlarge it.
4th Dimension resizes the object.

As you drag the handle, the corner of the object opposite the dragging handle remains stationary.

The following illustration shows an object being resized.



Object being resized

Note If you press **Shift** and then drag the handle, the movement is constrained. Lines can then be only vertical, 45°, or horizontal, rectangles can be only square, and ovals can be only circular.

► To resize an object one pixel at a time:

1 **Select the object you want to resize.**

2 **Hold down the Ctrl key (on Windows) or Command key (on Macintosh) and use the arrow keys to resize the object.**

Pressing the up or down arrow keys resizes the object's height while pressing the left or right arrow keys resizes the object's width.

► To resize an object *x* pixels at a time:

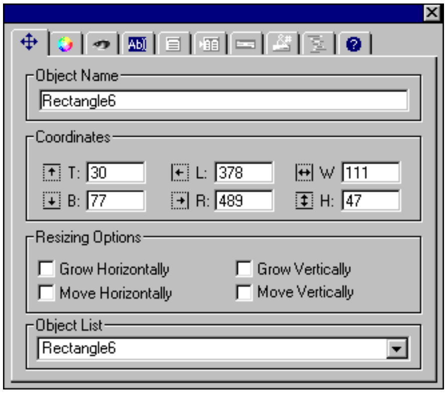
1 **Right-click the object and hold down the Ctrl key (on Windows) and use an arrow key.**

The object is resized by the number of pixels set in the Grid Definition dialog box.

► To resize an object by entering coordinates:

1 **Double-click the object.**

The Coordinates page of the Object Properties window appears, displaying the selected object's coordinates in pixels, centimeters, or inches (depending on the ruler units). The upper-left coordinates of the form area are 0,0.



Object Name

Rectangle6

Coordinates

T: 30	L: 378	W 111
B: 77	R: 489	H: 47

Resizing Options

□ Grow Horizontally □ Grow Vertically

□ Move Horizontally □ Move Vertically

Object List

Rectangle6

2 **Enter new values in the coordinate entry areas.**

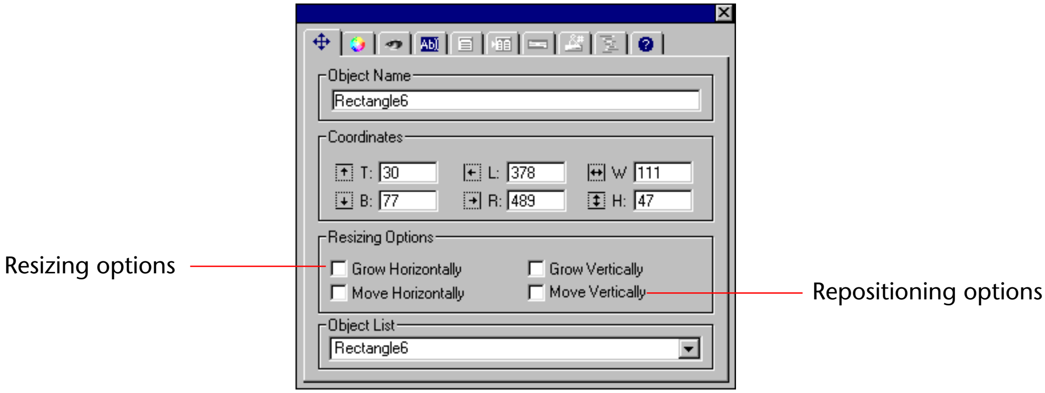
4th Dimension moves the boundaries of the object to the positions you entered. Depending on the values you use, the object may be resized or moved (or both).

Automatic Resizing and Repositioning

Automatic resizing works when a user resizes a window that displays a form. Automatic resizing causes an object to grow as the form is enlarged (or become smaller as the enlarged window is reduced). For example, if you use a rectangle that encloses the fields on an entry form, automatic resizing causes the rectangle to grow to the edges of the window as the user enlarges the window.

You can also enable automatic repositioning. Automatic repositioning moves an object either horizontally or vertically as the form is resized. When automatic repositioning is on, 4th Dimension tries to keep the object in view as the user reduces the size of the window. For example, if the user resizes a row of buttons so that some of the buttons become obscured, automatic repositioning tries to move the buttons either horizontally or vertically, so that they remain in view.

You enable automatic resizing or repositioning in the Coordinates page of the Object Properties window.



Resizing options

Repositioning options

Object Name: Rectangle6

Coordinates

T:	30	L:	378	W	111
B:	77	R:	489	H:	47

Resizing Options

□ Grow Horizontally □ Grow Vertically

□ Move Horizontally □ Move Vertically

Object List: Rectangle6

The resizing options enable the object to grow in the direction that the window is being resized. In the above example, the selected object is a rectangle that encloses a vertical button panel. Since Grow Vertically is selected, the rectangle will grow as the height of the window is increased.

The repositioning options enable the object to move in the specified direction to try to remain visible.

Using the Rulers

The Form editor rulers extend along the height and width of the form. A dotted grid appears in the Form editor whenever you have rulers showing. This feature helps you position objects in precise locations.

You can hide the rulers to increase your working area in the Form editor window. You can display the rulers again when necessary. To hide or display rulers, choose **Hide Rulers** (or **Show Rulers**) from the **Form** menu. When you hide the rulers, you also hide the dotted lines that indicate the major ruler divisions.

The rulers contain markers that show the position of the pointer when creating or resizing an object. While you are moving the object, the markers change to show the top and bottom and left and right sides of the object.

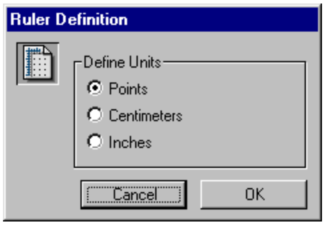
The object markers allow you to align other objects to the same position on the rulers.

You can change the units the rulers use to suit your preference.

► To define ruler units:

1 **Choose Define Ruler Units from the Form menu.**

4th Dimension displays the Ruler Definition dialog box, shown below.



Ruler Definition

Define Units

- ● Points
- ○ Centimeters
- ○ Inches

2 **Click the measurement scale you want to use.**

- Click **Points** to display rulers that provide measurement in points. One point is equal to the width of one pixel. There are 72 points in an inch.
- Click **Centimeters** to display metric scale rulers.
- Click **Inches** to display rulers that use feet and inches.

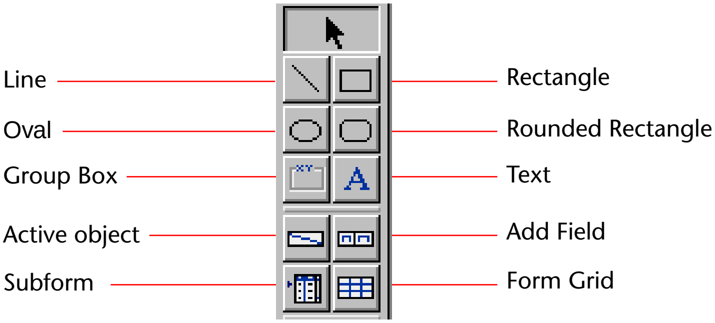
3 **Click OK.**

4th Dimension changes the measurement units to the scale you have selected. The Coordinates page of the Object Properties window uses the same units. For information about the Object Coordinates dialog box, see the section "Resizing Objects" on page 196.

Creating Objects

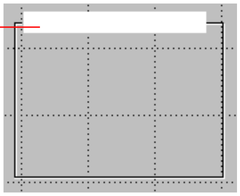
You can use either the Tools palette or the Objects palette to add objects to a form. The Tools palette lets you create and manipulate any type of object. The Objects palette lets you create active objects by dragging.

The following illustration identifies the drawing tools on the Tools palette.



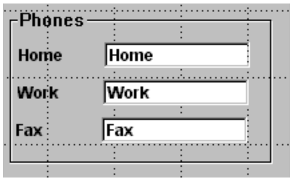
Here is a description of the drawing tools that create graphic objects:

- **Line tool** Used to draw a straight line. The line is drawn in the selected line width. Holding down the **Shift** key constrains the line to horizontal, vertical, or 45°.
- **Oval tool** Used to draw an oval. The oval is drawn with the selected line width and fill pattern. Holding down the **Shift** key constrains the object to a circle.
- **Text Area tool** Used to create a static text area anywhere in the form. Use the text tool to add elements such as titles, field labels, and instructions.
- **Rounded Rectangle tool** Used to draw a rectangle with rounded corners. The rectangle is drawn with the selected line width and fill pattern. Holding down the **Shift** key constrains the object to a rounded square.
- **Rectangle tool** Used to draw a rectangle. The rectangle is drawn with the selected line width and fill pattern. Holding down the **Shift** key constrains the object to a square.
- **Form Grid tool** Used to draw a visible grid in the form. The grid is drawn with the selected line width and fill pattern.
- **Group Box tool** Used to draw an empty group box on the form. The new group box has an area for the group box title, but has no fields. In the Form editor, a group box looks like this:



Group box title area

Empty group box



Phones

Home Home

Work Work

Fax Fax

Group box with group title and fields

Enter a group box title and then drag or add objects to the group box area.

The following drawing tools create active objects. These tools are discussed in the following chapter.

- **Add Field tool** Used to add an existing field to the form.
- **Active Object tool** Used to draw an area for an active object on the form.

- **Subform tool** Can be used to add a subform from another table or a subtable to the form.

Creating an Object Using the Tools Palette

You can create any type of object (graphic or active) by drawing.

► To create an object with the Tools palette:

1 **Select the type of object you want to draw by clicking its tool in the palette.**

The pointer becomes a crosshair when it is in the over the area in which you can draw the object. The pointer becomes an arrow again when it is positioned over a menu, ruler, or the palette so that you can use it to select.

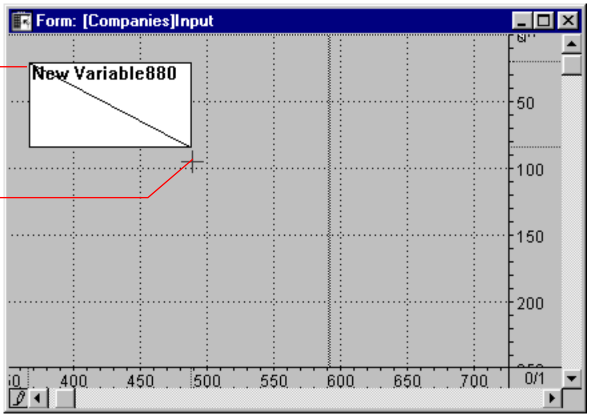
Tip If you hold down the **Ctrl** key (on Windows) or **Command** key (on Macintosh) when you click in the form area, the editor automatically selects and uses the last object tool that you used. This allows you to draw several objects of the same type without having to click on the object tool before drawing each one.

2 **Drag to create an area for the object.**

For two-dimensional objects (ovals, rectangles, fields, grids, text areas, active objects, and subform areas), drag diagonally.

1 Hold down the mouse button at the top left corner

2 Drag to draw the object



These objects are created within a dotted rectangle that follows the pointer as you drag it. Lines are created between the beginning and end points. Text areas are sized in steps according to the current font and size.

Note Hold down the **Shift** key as you draw to constrain the object to a regular shape. Lines are constrained to horizontal, 45°, or vertical, rectangles are constrained to squares, and ovals are constrained to circles.

3 **When you have finished drawing the object, release the mouse button.**

4th Dimension creates the object and makes it the currently selected object. The Arrow tool is automatically selected and the pointer becomes an arrow.

If you created a field or active object, 4th Dimension also displays the Object Properties window. You can use it to specify additional information. If you created a grid, the Define Grid dialog box appears.

To delete the object, put away the Object Properties window and press the **Backspace** key (**Delete** key on Macintosh) while the object is selected. If the Object Properties window is open, you can cut the object by pressing **Ctrl+X** or **Command–X** (on Macintosh).

Creating an Object with the Objects Palette

The Objects palette lets you create active objects by dragging:

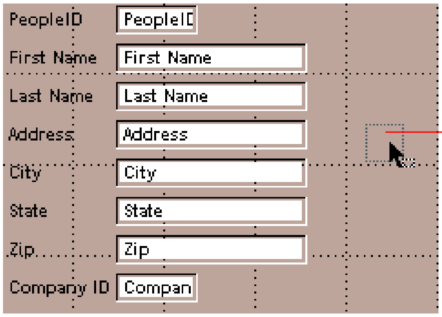
► To create an object with the Objects palette:

1 **Click the desired object in the Objects palette and hold down the mouse button.**

For a description of the tools in the Objects palette, see the sections “The Objects Palette” on page 175 and “Types of Active Objects” on page 291.

2 **Drag the object from the Objects palette to the area on the form where you would like to place the object.**

As you drag, an outline of the object you are creating appears.



Outline of new object

3 Release the mouse button.

4th Dimension creates the object. Since the new object is a variable, you need to specify object properties to link it to data or give it an action.

4 Double-click the object to specify its properties using the Object Properties window.

You can set any object property. If necessary, you can even change the object type.

Grouping Objects

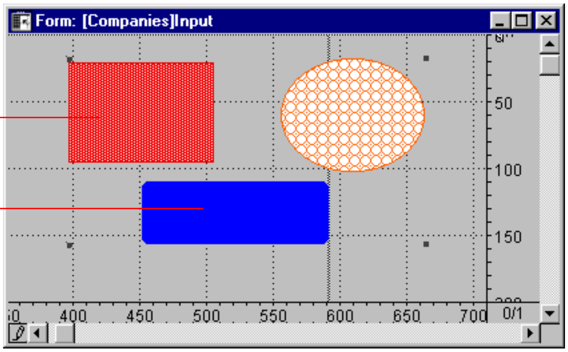
4th Dimension lets you group objects so that you can select, move, and modify the group as a single object.

Objects that are grouped retain their position in relation to each other. You would typically group a field and its label, an invisible button and its icon, and so forth.

When you resize a group, all the objects in the group are resized proportionally (except text areas, which are resized in steps according to their font sizes).

Grouping is also used for grouped scrollable areas. For more information, refer to the *4th Dimension Language Reference*.

Groups can be part of other groups. The following illustration shows grouped objects.



Group has handles

Individual objects in group do not

You can ungroup a group of objects to treat them as individual objects again.

An active object that has been grouped must be ungrouped before you can access its properties or method.

Grouping affects objects only in the Form editor. In the User environment, all grouped objects except for scrollable areas act as if they were ungrouped.

► To group objects:

1 **Select the objects that you want to group.**

2 **Choose Group from the Object menu.**
OR
Press Ctrl+G key (on Windows) or Command–G (on Macintosh).

4th Dimension marks the boundary of the newly grouped objects with handles. No handles mark the boundary of any of the individual objects within the group.

Now, when you modify the grouped object, you change all the objects that make up the group.

► To ungroup an object:

1 **Select the grouped object that you want to ungroup.**

2 **Choose Ungroup from the Object menu.**
OR
Press Ctr+H (on Windows) or Command–H (on Macintosh).

If **Ungroup** is dimmed, this means that the object is already separated into its simplest form.

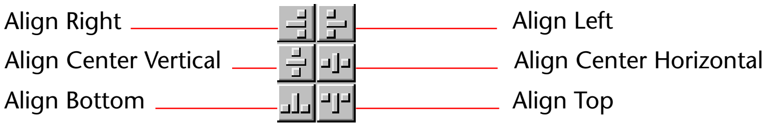
4th Dimension marks the boundaries of the individual objects with handles.

Aligning Objects

The Form editor's alignment tools and grid tools let you align objects to each other or to an invisible grid on the form. When you align one object to another, you can align it to the top, bottom, side, or horizontal or vertical center of the other object. When you use the invisible grid, you can align an object or collection of objects to grid points on the form.

Using the Alignment Tools

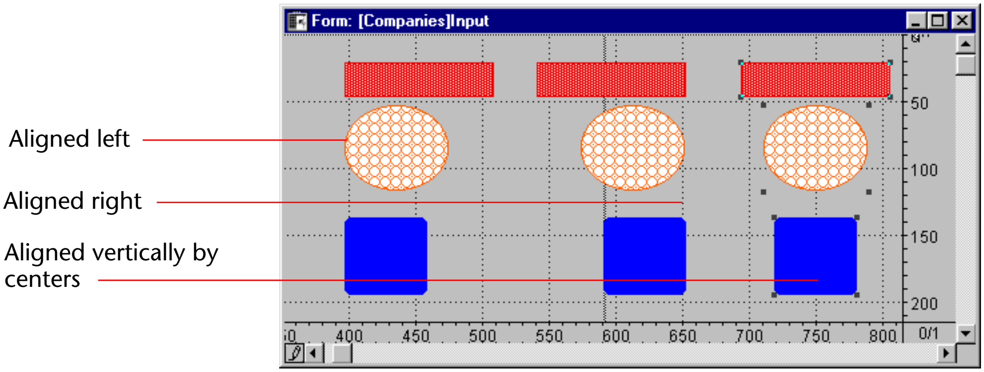
The alignment tools on the Tools palette allow you to quickly align selected objects with each other.



The arrangement of lines represents the function of each tool. For example, the Align Right icon shows the lines aligned vertically on the right side of the box. The Align Center Vertical icon shows the lines aligned vertically in the middle.

When 4th Dimension aligns objects, it uses the backmost object as the “anchor” to which the other objects are aligned. You can use the **Move to Back** menu item or tool to establish the backmost object.

The figure below shows aligned objects.



► To align a set of objects:

1. **Select the object to which you want the other objects to align.**
2. **Click the Move to Back tool or choose Move to Back from the Object menu.**
   4th Dimension uses the backmost object as the “anchor” to which other objects are aligned.
3. **Select the objects that you want to align to the first object.**
   You can select one object or several objects. For information about selecting objects, see “Selecting Objects” on page 192.
4. **Click the alignment tool that corresponds to the alignment you want.**

4th Dimension aligns the selected objects according to the alignment you selected.

Using the Invisible Grid

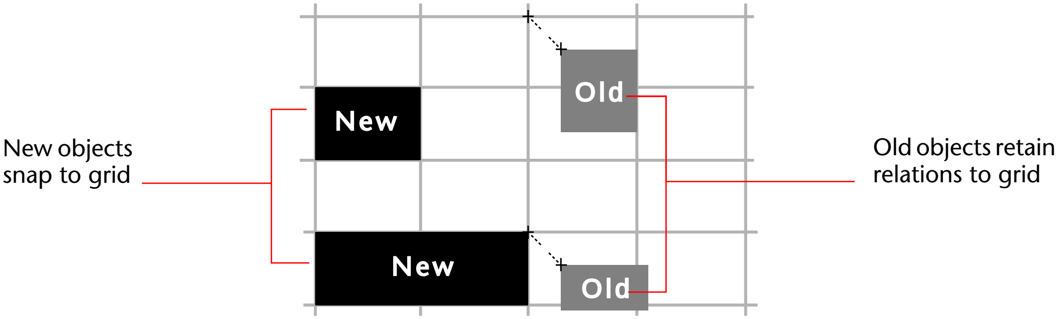
The Form editor provides a grid of invisible horizontal and vertical lines that help you place and align objects in a form. You can do the following:

- Specify the dimensions of the grid,
- Turn the invisible grid on or off.

If you add an object to the form while the grid is on, it aligns to the invisible grid as you draw it. Each corner of the object's defining rectangle jumps to the nearest intersection of the grid.

Existing form objects are not aligned to the grid when it is turned on. Instead, 4th Dimension remembers each object's relation to the nearest intersection. If you then move or resize the object, 4th Dimension aligns the object to the nearest intersection of the grid using the original relation. To align these objects to the new grid, you use the **Align to Grid** menu item.

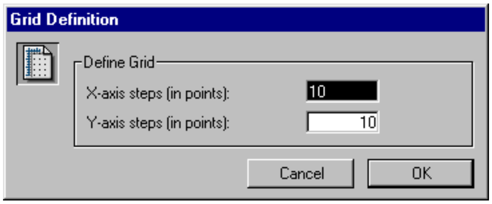
The figure below depicts the invisible grid used to align objects.



► To define the invisible grid:

1 Choose Define Grid from the Form menu.

4th Dimension displays the Grid Definition dialog box, shown below.


Grid Definition

Define Grid

X-axis steps (in points): 10

Y-axis steps (in points): 10

2 **Enter a number of points (72 points to an inch) for each step on the x-axis and y-axis.**

Grids are always defined in points. In effect, you are defining rectangles that are *x* points wide and *y* points high. For example, you might specify 10 points for x-axis steps and 20 points for y-axis steps.

If you want the x-axis and y-axis steps to be equal, enter identical point values in the boxes.

The fewer the number of points in a step, the denser the grid. Whatever the density of the grid, it is always invisible.

3 **Click the OK button to accept the grid settings.**
OR
Click the Cancel button to cancel the settings.

To turn the grid on, choose **Turn Grid On** from the **Form** menu. When the grid is on, there is a check mark next to the Turn Grid On menu item.

► To align existing objects to the grid:

1 **With the grid turned on, select the object or objects you want to align to the grid.**

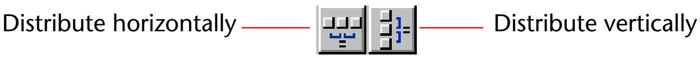
2 **Choose the Align to Grid from the Object menu.**
OR
Press Ctrl+J (on Windows) or Command–J (on Macintosh).

4th Dimension aligns the upper-left corner of the object or of each object, to the nearest point on the invisible grid.

If you subsequently move the objects, they snap to align with intersections of the invisible grid.

Distributing Objects

The Tools palette includes two tools that let you distribute three or more objects evenly. When you use either distribution tool, the distances between adjacent sides of the objects are equalized.



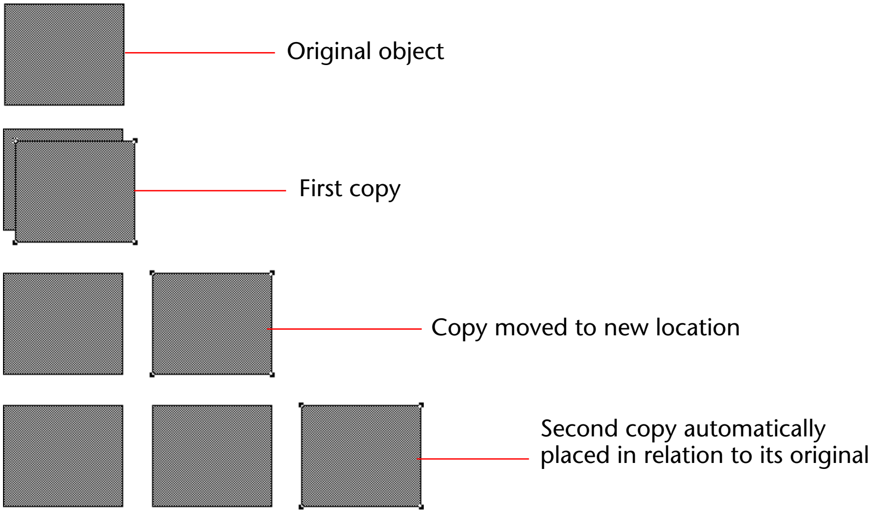
To distribute objects with equal spacing, select three or more objects and click the desired Distribute tool. All objects between the outermost objects are distributed evenly among themselves and the outermost objects. That is, the outermost objects do not move.

Duplicating Objects

You can duplicate any object in the form, including active objects. Copies of active objects retain all the properties of the original, including name, type, automatic action, display format, and object method.

If you need to distribute copies of the object along a line, you should use the following procedure. Duplicate the original object, move the copy to another location in the form, and then duplicate the copy. The second copy is automatically placed in the same relation to the first copy as the first copy was in relation to the original object. Subsequent copies are also placed in the same relation to their originals.

The figure below shows how this relative placement of copies works.


Original object
First copy
Copy moved to new location
Second copy automatically placed in relation to its original

► To duplicate an object:

1 **Select the object or objects that you want to duplicate.**

2 **Choose Duplicate from the Object menu.**
OR
Press Ctrl+D (on Windows) or Command–D (on Macintosh).
4th Dimension creates a copy of each selected object and places the copy in front and slightly to the side of the original.

3 **Move the copy (or copies) to the desired location.**
If you choose the **Duplicate** menu item again, 4th Dimension creates another copy of each object and moves it the exact same distance and direction from the first copy.

Copying Objects on a Form

You can copy all, some, or one of the objects on a form using the **Copy** menu item in the **Edit** menu. You can use the copied objects in another form in the database or in another database.

Like objects duplicated using the **Duplicate** command, each object copied using the **Copy** command is a complete copy of the original object and retains all the properties of the original. Copies of active objects such as fields and buttons retain all the properties of the original including name, type, action, display format, and the method associated with the object.

Objects copied using the **Copy** command are copied to the Clipboard while objects duplicated with the **Duplicate** command are reproduced on the current form page.

You can copy objects and save them in the Scrapbook for later use. For example, suppose you create several custom buttons. You can use the same buttons with their corresponding actions in any form in any database simply by copying them to the Scrapbook and then pasting them into another form.

Note A method that is copied with an object and pasted in a different form may lose its meaning unless it is updated. For example, if the method refers to a specific field and you paste the object in a database that does not have that field, the method loses its meaning.

► To copy all the objects in a form and paste them into a new form:

1 **Choose Select All from the Edit menu.**

4th Dimension selects every object on the current form page.

2 **Choose Copy from the Edit menu.**

4th Dimension places a copy of the form on the Clipboard.

3 **Open a blank page or create a new form using the Form Wizard.**

For information on creating a form, see Chapter 3.

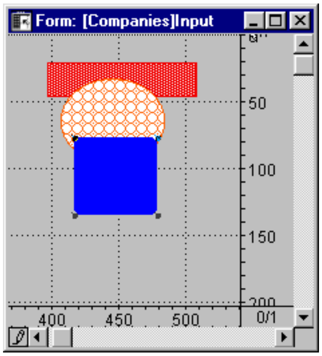
4 **Choose Paste from the Edit menu.**

The new form contains copies of all objects in the previous form.

Note If the form is to be used as an output form, you may need to adjust the output control lines. The output control lines are not associated with objects, so they must be repositioned on the new form. For information about working with output control lines, see “Moving Output Control Lines” on page 338.

Layering Objects

You will sometimes have to rearrange objects that are obstructing your view of other objects in the form. For example, you may have a graphic that you want to appear behind the fields in a form. 4th Dimension provides two menu items, **Move to Back** and **Move to Front**, that let you “layer” objects on the form. The figure below shows objects in front of and behind other objects.



► To move an object to the back:

1 **Select the object or objects that you want to move to the back.**

2 **Click the Move to Back tool in the Tools palette.**
OR
Choose Move to Back from the Object menu.
OR
Press Ctrl+B (on Windows) or Command–B (on Macintosh).
4th Dimension moves the selected object or objects behind all the other form objects.

Note When you move an object to the back, it may be hidden by objects in front of it. To see the object, select the object in front and send it to the back.

► To move an object to the front:

1 **Select the object or objects that you want to move to the front.**

2 **Click the Move to Front tool in the Tools palette.**
OR
Choose Move to Front from the Object menu.
OR
Press Ctrl+F (on Windows) or Command–F (on Macintosh).

4th Dimension moves the selected object or objects in front of all the other objects.

Deleting Objects

You can delete any object on a form. If you want, you can place a copy of the deleted object on the Clipboard. Objects placed on the Clipboard can later be pasted to new locations in the form. If the Object Properties window is open while you try to delete an object, the deletion will affect the contents of the Object Properties window.

► To delete an object:

1 **Select the object or objects you want to delete.**

2 **Choose Clear from the Edit menu.**
OR
Press the Backspace key (on Windows) or the Delete key (on Macintosh) on your keyboard.
4th Dimension deletes the selected object or objects.

To cut an object to the Clipboard, choose **Cut** from the **Edit** menu. 4th Dimension removes the selected object or objects and places a copy on the Clipboard. The Cut command works even if the Object Properties window is open.

If you change your mind, choose **Undo** from the **Edit** menu before performing another action. 4th Dimension restores the deleted object or objects.

Optimizing the Appearance of Text and Picture Objects

You can resize static text areas and pictures for optimal display. A static text object will be resized to fit the text. A picture object will be adjusted to display the picture without horizontal or vertical distortion. **Ctrl+click** (on Windows) or **Command-click** (on Macintosh) the bottom right corner of the object to resize the object.

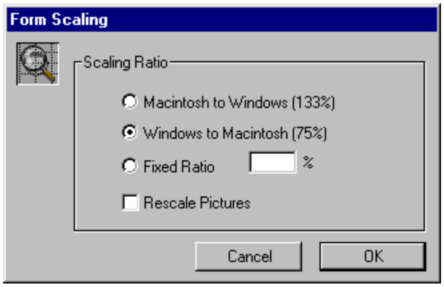
Scaling a Form

The Form editor includes a feature for rescaling form objects so that they look good when a database is transported to another platform.

Form objects created on Macintosh will look smaller when viewed on Windows, and vice versa — even though the objects are actually the same size. This is because the Windows screen resolution is about 25% greater than the Macintosh resolution. For instance, 12-point text on a Macintosh will appear as 9-point text on Windows. If the font size is just large enough on Macintosh, it may be too small on Windows.

Conversely, if a font size on Windows is adequate, it may be too large on Macintosh.

To compensate for screen resolution differences, you need to rescale objects. With the **Scale** item on the **Form** menu you can proportionally resize all the form objects in one operation. When you choose **Scale**, the Form Scaling dialog box appears.



Form Scaling

Scaling Ratio

○ Macintosh to Windows (133%)

● Windows to Macintosh (75%)

○ Fixed Ratio %

□ Rescale Pictures

You can choose among the following options:

- **Macintosh to Windows platform (133%)** This option is the default option when you use 4th Dimension on Macintosh. Use this option when you want to resize a form that was created according to the Macintosh screen resolution so it will look like it was created according to the Windows screen resolution. To do so, the program increases the size of all the form objects by one-third. For instance, 9-point text will become 12-point text.
- **Windows to Macintosh platform (75%)** This option is the default option when you use 4th Dimension on Windows. Use this option when you want to resize a form that was created according to the Windows screen resolution so it will look like it was created according to the Macintosh screen resolution. To do so, the program decreases the size of all the form objects by one-quarter. For instance, 12-point text will become 9-point text.
- **Fixed Ratio scaling** This option lets you resize a form using the percentage you type in the “%” enterable area. With this option you can resize a form so it will look good on any unusual screen resolution you may encounter on either the Macintosh or Windows platform. You can also use this option to change the size of all the form’s objects for the platform you are using. For example, it you want to double the size of all objects, enter 200%; if you want to halve the size, enter 50%.

- **Rescale pictures** This option is not selected by default. Usually, decreasing or increasing the size of bitmapped pictures does not provide good results from a cosmetic point of view. For this reason, the program, does not resize any static pictures in a form unless you select this option. Instead it moves them to their new “center relative” positions. If you know that rescaling bitmaps will produce pleasing results or if you use non-bitmapped pictures, you may chose to rescale the pictures.

When you have selected your options, click **OK** to resize the form, otherwise click **Cancel**. If you resize a form by mistake or with the wrong option, choose **Undo** from the **Edit** menu to recover the form as it was before the rescaling.

Changing the Appearance of Objects

You can change the appearance of any object in a form. Each object has its own platform interface and appearance setting. For any object that uses text (a field, a text area, a button, and so forth), you can change the following attributes:

- Platform interface,
- Appearance,
- Font,
- Style,
- Size,
- Alignment within the object’s area.

For any object that uses lines, fill patterns, or colors, you can change the following attributes:

- Line width,
- Fill pattern,
- Border pattern,
- Foreground and background color.

Platform Interface and Appearance

You can set the platform interface and appearance on an object-by-object basis. For platform interface, you have the following choices:

- **Inherited from Form** The platform interface for the object is the same as the platform interface of the form. The platform interface of the form is set in the Form Properties window.
- **Automatic** The platform interface is based on the platform on which the database is currently running.
- **MacOS** The object will be displayed as a Macintosh System 7 object.
- **Windows 3.1** The object will be displayed as a Windows 3.1 object.
- **Windows 95** The object will be displayed as a Windows 95 object.
- **Copland** The object will be displayed as a Macintosh object using the Copland user interface guidelines.

For information on setting the Platform Interface for the form, see "Setting the Platform Interface" on page 186. For information on each platform interface option, see "User Interface" on page 49.

For Appearance, you have the following choices:

- None,
- Plain,
- Dotted,
- Raised,
- Sunken,
- Double.

For illustrations of the effects of these choices on various object types, see the sections, "Fields and Field Labels" on page 164, "Buttons" on page 293 and "Button Actions" on page 295.

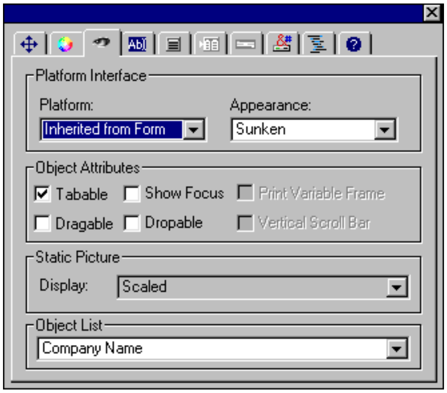
Platform interface and appearance are set using the Display page of the Object Properties window.

► To set Platform Interface or Appearance:

1 **Double-click the object.**

The Object Properties window for the object appears.

2 **Click the Display tab and choose the desired platform interface and appearance from the drop-down lists.**



Platform Interface

Platform: Inherited from Form

Appearance: Sunken

Object Attributes

☑ Tabable ☐ Show Focus ☐ Print Variable Frame

☐ Dragable ☐ Dropable ☐ Vertical Scroll Bar

Static Picture

Display: Scaled

Object List

Company Name

Working with Text Areas

You can make the following changes to text areas.

- Establish default settings for font attributes,
- Create text areas and add or edit text,
- Setting the text area’s platform interface, appearance, and font attributes.

Creating and Editing Text Areas

Use text areas to provide labels, titles, and descriptions in your form.

Text you create in a text area is different from the text contained in a Text field. A Text field contains data stored in the database. The contents can be different in each record. A text area is a graphic object; it is not active. Text in a text area remains the same whenever the form is displayed.

There is one exception to this rule. You can embed field names or variable names in text areas. Then, when the text area is displayed or printed, the values of the fields or variables from the current record are substituted. Use embedded fields and variables to create mail-merge documents and in report headers and footers. For complete details, see the section “Creating Mail-Merge Documents” on page 348.

The Form Wizard automatically creates text areas that contain field labels for the fields and, optionally, a title for the form. You can modify these labels as you would modify any other text area you add to the form.

Note You can assign a STR# resource to a Text area. Use the format *:STR# ID, line ID* in place of static text. When you choose **Show Resource** from the **Object** menu, the text in the resource appears in the Form editor.

As you draw a text area, it snaps to a size that reflects the font size.

After you create a text area, the text box displays a text insertion point.

Text Area

Type text in the text area. When the text you are typing reaches the edge of the text area, 4th Dimension automatically wraps the text to the next line in the area.

If you enter more text than the area can display, the text is not visible until you resize the text area.

► To modify text in a text area:

1 **Click the Text Area tool** A**.**

2 **Select the text you want to modify or click to insert an insertion point.**

Use the standard text editing operations to edit the text.

Default Settings for Text Objects

When you create any object, 4th Dimension uses the default settings for these features. You can establish new default settings at any time.

For example, if you establish a new default font, 4th Dimension uses that font for any object you subsequently create that displays text.

You can change the settings for a selected object without changing the default settings. 4th Dimension changes the appearance of the selected object, but the change affects only that object. 4th Dimension continues to use the default settings for objects created in the form.

For example, if you change the font for one text area, the change affects only that area, not subsequently created fields or text areas.

This section gives the basic steps for establishing default settings and for changing the settings for selected objects. It then describes in detail each option for the appearance of objects in a form.

► To establish default settings:

1 **Make sure that no object in the form is selected.**

2 Use the items in the Font, Style, and Object menus to choose the font, size, style, text justification, line width, fill pattern, border pattern, or color.

These settings will be used as the default settings for any new objects that use text that you create.

The following sections describe how to change these attributes for selected objects.

Setting a Text Object's Platform Interface and Appearance

You can set the platform interface, appearance, color, border, and fill pattern of a text object.

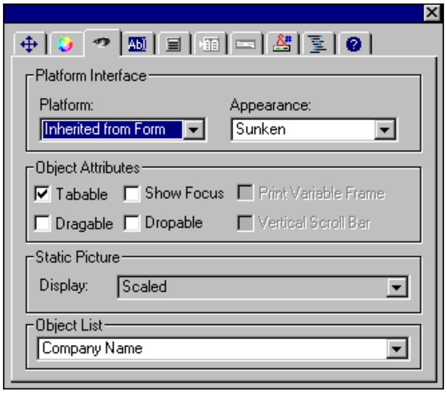
► To set the text object's appearance:

1 Double-click the object to display its properties.

The Object Properties window for the selected object appears.

2 Click the Display tab.

The display properties for the object appear.



Platform Interface

Platform: Inherited from Form

Appearance: Sunken

Object Attributes

☑ Tabable ☐ Show Focus ☐ Print Variable Frame

☐ Dragable ☐ Dropable ☐ Vertical Scroll Bar

Static Picture

Display: Scaled

Object List

Company Name

3 Use the Platform and Appearance drop-down lists to set the desired appearance of the text object.

For information on these options, see the section "Platform Interface and Appearance" on page 214.

Setting Text Attributes

You can set text attributes for text objects using either the Object Properties window or the Font and Style menus.

► To set text attributes using the Font and Style menus:

1 Select the object or objects whose text attributes you want to change.

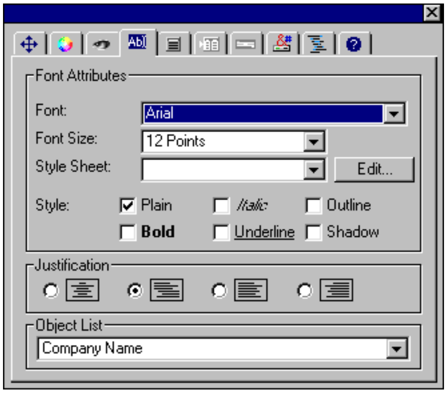
2 Make the appropriate selections from the Font and Style menus.

► To set text attributes using the Object Properties window:

1 **Double-click the object whose text attributes you want to change.**

The Object Properties window appears.

2 **Click the Font tab to view the current text attributes.**



Font Attributes

Font: Arial

Font Size: 12 Points

Style Sheet:

Style: ☑ Plain □ *Italic* □ Outline □ **Bold** □ Underline □ Shadow

Justification: ○ ● ○ ○

Object List: Company Name

3 **Make the appropriate font, font size, and font style selections.**
OR
Choose a style sheet from the Style Sheet drop-down list.

4 **Choose a justification by clicking a Justification radio button.**

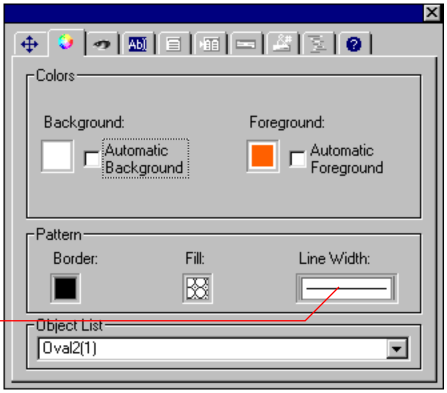
5 **To set text attributes for another text object, choose the desired object from the Object List or click another object on the form.**

The settings in the Font page change to reflect the settings of the new object. If you select several text objects, the Object List area changes to "Selected Objects."

Line Widths

4th Dimension lets you specify different widths for lines and objects that have lines such as ovals, grids, and rectangles.

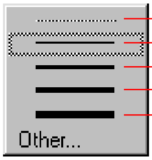
You can specify line widths using either the **Line Width** menu item on the **Objects** menu or the Colors page of the Object Properties window.



Object List: Oval2(1)

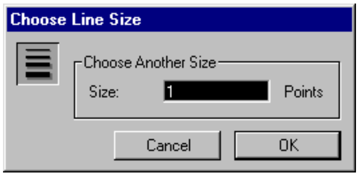
Line width menu

Choose one of the line widths displayed in the **Line Width** menu of either the **Object** menu or the Colors page.



Hairline
1 point
2 points
3 points
4 points

If you choose **Other**, 4th Dimension displays a dialog box in which you can specify any line width up to 72 points.



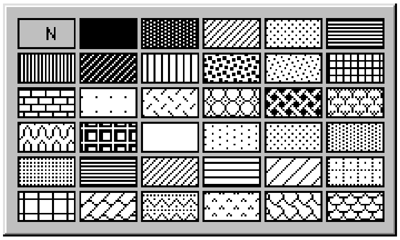
Size: 1 Points

Fill Patterns

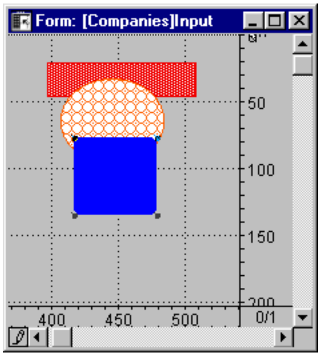
You can apply a fill pattern to any two-dimensional graphic object in the form such as an oval, a rectangle, a line, a grid object, and the enclosed area of a text object.

You can choose the fill pattern using either the **Fill** menu item in the **Object** menu or the Fill Pattern pop-up menu in the Colors page of the Object Properties window.

Select an object and choose one of the patterns displayed in either **Fill** menu item.



The figure below shows examples of areas filled with patterns.

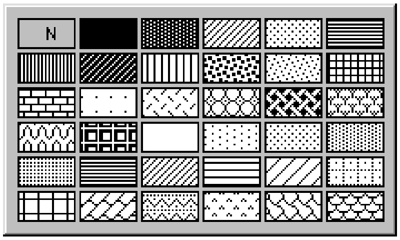


Border Patterns

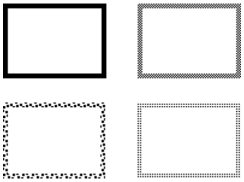
You can set patterns for the borders of any object in the form that has a border — such as an oval, a rectangle, and a grid object. The border patterns available are the same as the fill patterns. The appearance of the border also depends on the line width you have specified for the border.

You can set the border pattern using either the **Border** item of the **Object** menu or the Border menu in the Colors page of the Object Properties window.

Choose one of the patterns displayed in the either **Border** menu item.



The following illustration shows examples of borders.



Foreground and Background Colors

4th Dimension lets you add colors to objects for display on a color monitor or (if your printer supports color) for color printing.

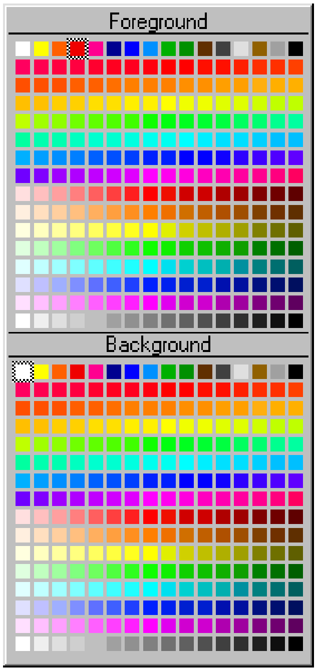
Note Colors appear black and white on a black and white monitor. They appear as shades of gray on a gray-scale monitor. The color palettes display shades on a gray scale monitor.

You can specify different colors for foreground pixels (pixels that appear black on a black-and-white monitor) and background pixels (pixels that appear white on a black-and-white monitor). On a color display, the mixing of foreground and background colors allows you to create custom tints and shades.

You can set foreground and background colors using either the Colors page of the Object Properties window or the **Color** item in the **Object** menu.

Choose the desired foreground and background colors from either **Color** menu. The upper palette determines the color of the foreground and the lower palette determines the color of the background. Choosing the word “Foreground” or “Background” selects automatic foreground or background.

The following illustration shows the **Color** picture menu.



If your monitor supports 16 colors, choose the colors from the first 16 colors on each palette. If your monitor supports 256 colors (or more), any colors you choose will display properly.

Placing a Picture from the Picture Library

The Picture library stores images that you can use as graphic elements on forms, as picture menu items, as picture buttons, as small icons in lists, and as custom toolbar icons. When you want to place a bac-kground graphic on a form, you should add it to the Picture library and then place the picture on the form. If you use a picture in the Picture library on more than one form, it is stored only once. Also, if you update a picture in the Picture library, references to it will be updated automatically throughout the database.

If you place a picture on the background page of a multi-page form, it will appear automatically as a background element on all pages. Therefore, your database will run faster.

► To place a picture on a form:

1 **Open the form to which you want to place the picture.**

If necessary, navigate to the page on which you want to place the picture. For information on navigation, see the section “Moving from Page to Page” on page 227.

2 **Open the Picture library and click on the name of the desired picture.**

3 **Click on the picture to select it.**

4 **Drag the picture from the Picture library to the form.**

5 **When it is at the desired location, release the mouse button.**

Reposition the picture, as desired. The picture has a set of object properties, just as any object on the form. If you like, you can modify those properties. Changing the picture’s background so that it blends in with the background of the form is a common operation. This is described in the following section.

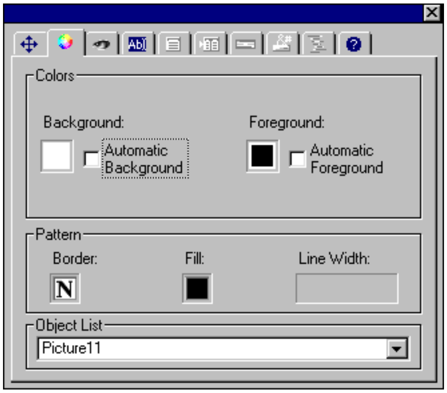
Modifying the Background of the Picture

You can change the picture’s background to Transparent so that it takes the form’s background color.

► To modify the picture’s fill pattern:

1 **Double-click the picture to display its properties.**

The Object Properties window appears.



Colors

Background: ☐ Automatic Background

Foreground: ☐ Automatic Foreground

Pattern

Border: N

Fill: ■

Line Width:

Object List: Picture11

2 **If necessary, click the Colors tab.**

3 **Use the Fill Pattern picture menu to modify the picture’s fill pattern.**

If you change the fill pattern to Transparent (None in the picture menu), the picture’s background will take on the pattern and color of the form.

Creating a Multi-page Form

You can create multiple pages for an input form. If you have more fields than will fit on one screen, you may want to create additional pages to display them. Multiple pages allow you to do the following:

- Place the most important information on the first page and less important information on other pages,
- Organize each topic on its own page,
- Reduce or eliminate scrolling during data entry,
- Provide space around the form elements for an attractive screen design.

Note Multiple pages are a convenience used for input forms only. They are not for printed output. When a multi-page form is printed, only the first page is printed.

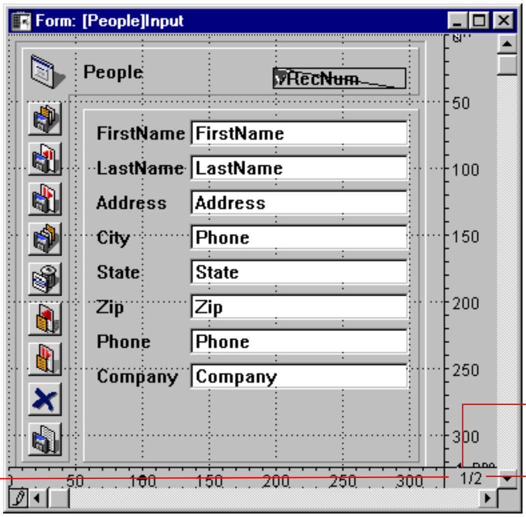
There are no restrictions on the number of pages a form can have. The same field can appear any number of times in a form and on as many pages as you want. However, the more pages you have in a form, the longer it will take to display the form.

A multi-page form has a both a background page and several display pages. Objects that are placed on the background page are visible on all display pages, but can be selected and edited only on the background page. In multi-page forms, you should put your button palette on the background page. You also need to include one or more objects on the background page that provide page navigation tools for the user. For information on adding page navigation tools, see the section "Adding Page Navigation Controls" on page 229.

This section tells you how to add and delete pages, how to add objects to the background page, how to move from page to page, and how to add fields to a new page.

Adding a Display Page to a Form

Every form has at least one display page[1] and a background page. You can either add objects to the background page or add more display pages. The current page number appears in a box in the lower-right corner of the form window. The background page is numbered zero (0).



Page pop-up menu

Form page number

Number of display pages

▶ To add a display page:

1 Move to the last page of the form, then click the Next Page icon in the Tools palette.

4th Dimension displays a dialog box asking if you want to add a page.

2 Click the OK button to add another page to the form.

A new, blank display page appears in the Form editor window. The page indicator box in the lower-right corner of the window displays the number of the page you are viewing.

You can now add fields and other form elements to the new page.

▶ To display the background page:

■ **Move to the first page of the form and click the Previous Page icon in the Tools palette.**

[1] The Options page of the Form Wizard contains an option that instructs the Form Wizard to create a multi-page form automatically if the fields you select don't fit on one page. If you selected this option, your form may initially have more than one display page. When the Form Wizard creates more than one display page, it puts buttons, variables, the form title, and decorative rectangles on the background page.

OR
Use the Page pop-up menu to move to page 0.

4th Dimension displays the background page. The page number of the background page is zero (0).

Objects that you place on the background page appear on all pages. Use the background page for such objects as:

- Background images,
- Decorative graphic objects, such as rectangles,
- Buttons,
- Tab controls.

If you want to use a graphic as a background image, add it to the Picture library and then place it on the background page. For information on the using the Picture library, see “Picture Library” on page 22 and “Placing a Picture from the Picture Library” on page 223.

Moving from Page to Page

When you want to display the background page or move to another display page, you can either use the page navigation tools in the Tools palette or the page pop-up menu in the Form editor window.

▶ To use the page navigation tools:

- **To move to the next page, click the Next Page icon in the Tools palette.**
- **To move to the previous page, click the Previous Page icon in the Tools palette.**

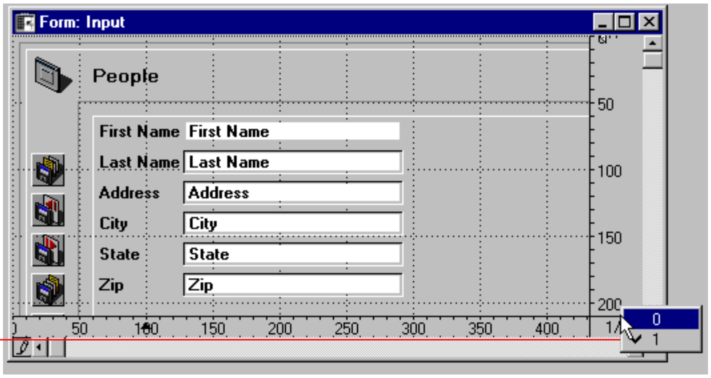
4th Dimension displays the page immediately following or prior to the current page.

If you click **Previous Page** while viewing the first page of the form, the background page appears. If you click **Previous Page** while viewing the background page, nothing happens. If you click **Next Page** while viewing the last page of the form, 4th Dimension asks if you want to create another page for the form.

▶ To use the Page pop-up menu:

1 **Hold down the mouse button on the page indicator at the bottom-right corner of a Form editor window.**

The Page pop-up menu appears.



Page pop-up menu

2 **Choose the desired page number.**

Deleting a Page

You can delete unwanted display pages from a multi-page form. Any fields or other objects on the deleted pages will be deleted as well. The remaining pages are renumbered. You cannot delete the first page or the background page.

► To delete a page from the form:

1 **Use either the page navigation tools or the page pop-up menu to display the page you want to delete.**

2 **Choose Delete Page from the Form menu.**

A dialog box appears asking if you are certain that you want to delete the page from the form.

3 **Click OK.**

4th Dimension removes the page and any objects on the page from the form.

Adding Fields to a Blank Page

When you add a new page to a form, it is blank. You can add fields in the following ways:

- Use the Add Field tool to place each field.
- Copy or duplicate fields from other pages or from other forms, paste them onto the new page, and change the copied fields' properties.
- Drag fields from the Tables page of the Explorer onto the form.

Adding Page Navigation Controls

When you create a multi-page form, you need to provide a way for users to move from one page to another. 4th Dimension provides three ways that you can use to add navigation tools:

- **Tab control** The tab control object gives users random access to individual pages. You place the tab control on the background page of the form and use its properties to provide page navigation controls.
- **Automatic buttons** You can add automatic page navigation buttons to the form — First Page, Last Page, Previous Page, and Next Page. These buttons should be placed on the background page.
- **Object methods** In addition, the language includes the GOTO PAGE command. You can use this command as part of an object method to create custom navigation controls using any suitable object type. For example, you can choose to use a picture button or pop-up menu to provide page navigation controls.

Adding Page Navigation Buttons

You can include page navigation buttons when you generate the form using the Buttons page of the Form Wizard. After the form is generated, open it in the Form editor and add the necessary pages. If you need to add the page navigation buttons after the form is created, you can do so using either the Active object tool in the Tools palette or a button tool in the Objects palette. For more information, see “Creating an Active Object” on page 285.

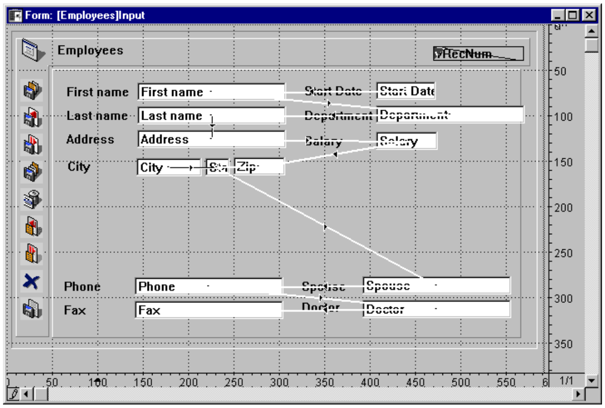
Using a Tab Control

The tab control provides a visual indication of the current page and the remaining pages. For information on creating and activating a tab control, see the section “Tab Controls” on page 310.

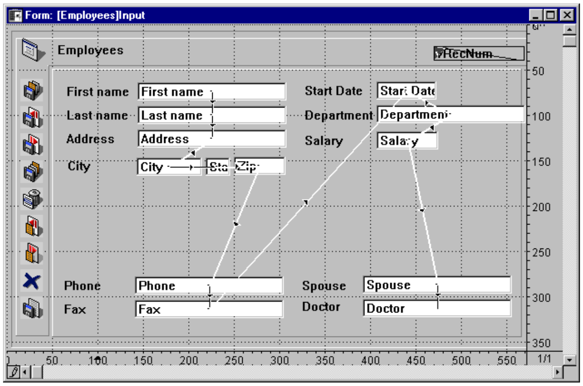
Data Entry Order

The data entry order is the order in which fields, subforms, and other tabable objects are selected as you tab through an input form. If you don’t specify a custom entry order, 4th Dimension always selects the upper-left object first and subsequently moves to the right and down. If two objects are exactly the same distance from the top, 4th Dimension selects the leftmost object first. If an object is even one pixel higher than an object to the left, the slightly higher object will be selected first.

In some forms, a custom data entry order is needed. For example, the following figure shows fields from an employee database. The fields are placed in groups. However, the standard data entry order forces the user to enter the information in an awkward manner.



The custom data entry order allows you to enter the information in a more logical order.



Viewing and Changing the Data Entry Order

The **Entry Order** menu item lets you view the current entry order of all fields in a form and allows you to create a custom entry order.

► To view or change the entry order:

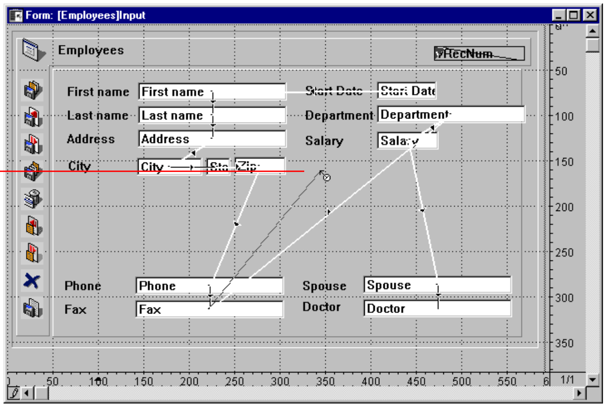
1 Choose Entry Order from the Form menu.

The pointer turns into an entry order pointer ↖, and 4th Dimension draws a line in the form showing the order in which it selects objects during data entry.

Viewing and changing the data entry order are the only actions you can perform until you click any tool in the Tools palette.

2 **To change the data entry order, position the pointer on an object in the form and drag to the object you want next in the data entry order.**

4th Dimension adjusts the data entry order accordingly.



Dragging to the Start Date field

3 **Repeat step 2 as many times as necessary to set the data entry order you want.**

4 **When you are satisfied with the data entry order, click any unselected tool in the Tools palette or choose Entry Order from the Form menu.**

4th Dimension returns to normal operation of the Form editor.

Setting the First Object in the Data Entry Order

All enterable objects are part of the data entry order.

► To establish one of the objects as the first in the data entry order:

1 **Select the object you want to be first in the entry order.**

2 **Choose Move to Back from the Object menu or click the Move to Back tool in the Tools palette.**

The object will be placed in back of any other form element. This is temporary.

3 **Choose Entry Order from the Form menu.**

The selected object becomes the first object in the entry order and the object that was first becomes second. You can now drag from object to object in order to create the data entry order you want.

4 **When you have finished, click any unselected tool in the Tools palette.**

The Form editor returns to normal operation.

The object you selected to make first in the entry order has returned to its previous location (it is no longer moved to the back of the form).

Using a Data Entry Group

While you are changing the data entry order, you can select a group of objects in a form so that the standard data entry order applies to the objects within the group. This allows you to easily set the data entry order on forms in which fields are separated into groups or columns.

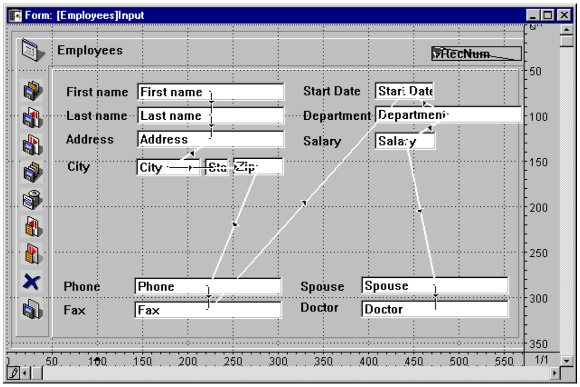
► To create a data entry group:

1 **Choose Entry Order from the Form menu.**

2 **Draw a marquee around the objects you want to group for data entry.**

When you release the mouse button, the objects enclosed or touched by the rectangle follow the standard data entry order. The data entry order for the remaining objects adjusts as necessary.

The figure below shows the resulting data entry order.



Restoring the Standard Data Entry Order

You can restore the standard data entry order at any time.

1 **Choose Entry Order from the Form menu.**

2 **Draw a marquee around all the objects on the form.**

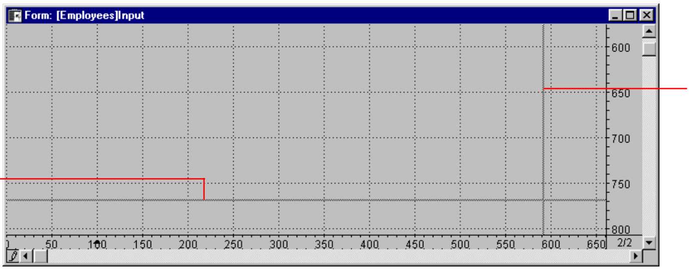
When you release the mouse button, the objects enclosed or touched by the rectangle take the standard data entry order.

Viewing and Printing Forms

Each form has an area of about 1245 square feet. You scroll to bring hidden portions of the form into view. For viewing on screen, your form design can use this entire area. You can scroll to view any element you place in the form.

For printing, form elements must fit within a single page width, but may be several pages in length. The actual size of a page depends on your printing device, the paper it is using, and the specifications you enter in the Page Setup dialog box. 4th Dimension displays page border lines in the Form editor. These lines indicate the page limits. The page border lines respond to any page setup changes. The page setup specifications are stored with the form when it is closed.

The figure below shows the page border lines.



Right side of page

Bottom of page

Saving Forms

It is a good idea to save any changes you make to a form, especially when using 4D Server with multiple users. You can save a form by closing or saving it. You can close a form by clicking its Control-menu box or by choosing **Close Form: *Name*** from the **File** menu.

To save a form without closing it, choose **Save Form*: Name*** from the **File** menu.

Once a form has been saved, you can continue to work on it. If you make a mistake or do not like the changes you have made, you can revert to the last saved version of the form. This makes the form appear exactly as it did the last time that it was saved. To do this, choose **Revert to Saved** from the **File** menu.

4D Server When a form is saved in the Design environment, users are able to see your changes the next time they open the form.

5 Working with Fields and Active Objects

4th Dimension allows you to customize data entry forms so that your interface includes exactly those features that you need. You can add interface elements such as picture buttons, tab controls, drop-down lists, combo boxes, and hierarchical lists to your data entry forms. You can also implement drag and drop operations. You can use triggers, form methods, or object methods to enforce business rules during data entry.

This chapter tells you how to do the following:

- Place fields and other active objects in the form,
- Set display formats and data entry filters,
- Use data entry constraints such as maximum, minimum, default, or required values,
- Write form or object methods,
- Add interface objects such as buttons, pop-up menus or drop-down lists, combo boxes, scrollable areas, and tab controls,
- Add subforms to forms,
- Attach custom menus to forms.

Active Objects Defined

An active object is anything on a form that performs a database task or an interface function. There are many kinds of active objects. Fields are considered active objects. Other active objects — enterable objects (variables), combo boxes, drop-down lists, picture buttons, and so on — store data temporarily in memory or perform some action such as opening a dialog box, printing a report, or starting a background process.

In some cases, you can specify the active object's action by making selections in the Object Properties window. For example, you can use built-in automatic button actions to specify the action of a button. In other cases, you specify the object's action by writing a method that is automatically attached to the object.

There are also instances in which you will want to manage active objects at a higher level. For example, data validation tasks can be handled by the trigger that runs automatically when a record is saved. The trigger can examine the values in each field for possible violations of business rules.

Fields on a Form

Fields provide locations on the form where you can enter data into a record or display the values of a field.

When you create a new form with the Form Wizard, you select the fields to include in the form. Once the form exists, you use the Form editor add or remove fields, specify field properties, and customize the fields' appearance.

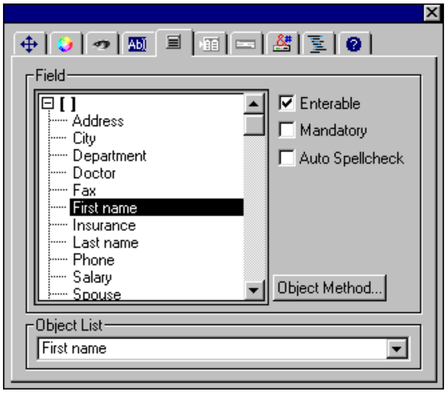
These properties apply only to the fields on the current form. You can set the same properties for other forms or you can use different specifications. You can modify the field properties at any time and you can place additional fields in or delete fields from any form.

Setting Field Properties

As with any active object, you set the properties of a field using the Object Properties window. This window provides many options that affect data entry or display of a field.

The following pages in the Object Properties window are relevant for fields.

- **Field** Set the field that will be displayed in the currently selected form object, choose the Enterable, Mandatory, or Auto Spellcheck properties, and attach a method.



Field

[ ]
- Address
- City
- Department
- Doctor
- Fax
- First name
- Insurance
- Last name
- Phone
- Salary
- Spouse

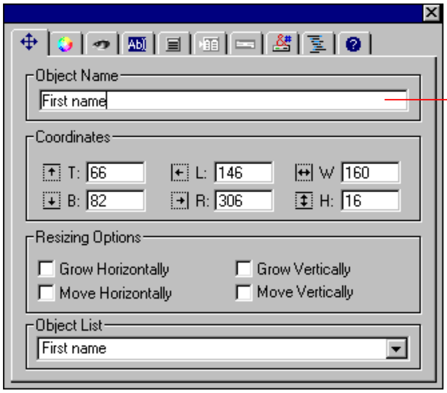
☑ Enterable
☐ Mandatory
☐ Auto Spellcheck

Object Method...

Object List: First name

For more information on choosing a field, see the section “Adding Fields to a Form” on page 241. For information on field attributes, see the section “Setting the Enterable and Mandatory Attributes” on page 245. For information on writing a method, see the section “Using Object Methods with Fields and Objects” on page 319.

- **Coordinates** The Coordinates page specifies the location and size of the field on the form and controls automatic resizing and repositioning options. For more information on resizing and repositioning objects, see the section “Resizing Objects” on page 196.



Object Name area

Object Name: First name

Coordinates

T: 66	L: 146	W: 160
B: 82	R: 306	H: 16

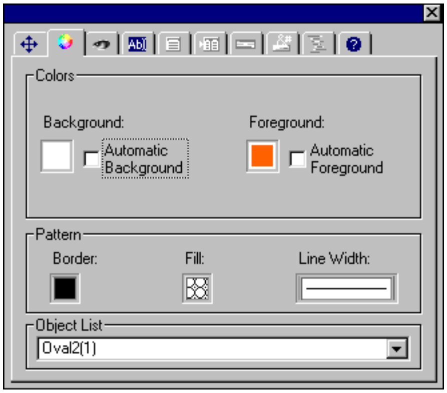
Resizing Options

☐ Grow Horizontally ☐ Grow Vertically
☐ Move Horizontally ☐ Move Vertically

Object List: First name

With the Object Name area, you can give the object on the form a different name from the object’s permanent name. This name enables you to manipulate the instance of the object on the form using the language. For more information, see the section “Object Properties” in the 4th *Dimension Language Reference*.

- **Colors** Set the foreground and background color of the field. The foreground is the color of the text.



Colors

Background: □ Automatic Background

Foreground: □ Automatic Foreground

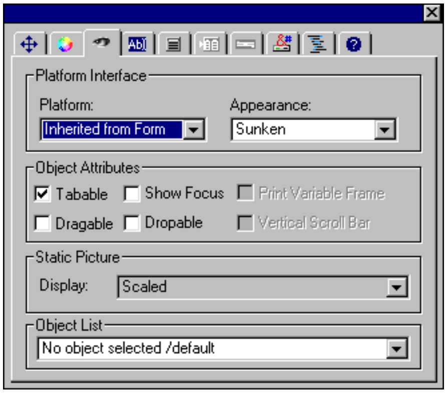
Pattern

Border: Fill: Line Width:

Object List: Oval2(1)

For information on the options in the Colors page, see the sections “Foreground and Background Colors” on page 222, “Border Patterns” on page 221, “Fill Patterns” on page 220, and “Line Widths” on page 219.

- **Display** Set the platform interface for the field, the appearance of decorative rectangles around the field, and field attributes.



Platform Interface

Platform: Inherited from Form

Appearance: Sunken

Object Attributes

☑ Tabable □ Show Focus □ Print Variable Frame

□ Dragable □ Dropable □ Vertical Scroll Bar

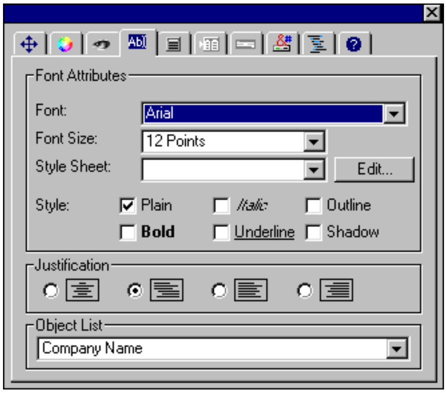
Static Picture

Display: Scaled

Object List: No object selected /default

For information on the options in the Display page, see the section “Setting the Platform Interface” on page 186, “Platform Interface and Appearance” on page 214, “Setting the Tabable and Show Focus Properties” on page 289, “Enabling Drag and Drop” on page 291, and “Setting Object Properties” on page 281.

- **Font** Set the font attributes for the field.



Font Attributes

Font: Arial

Font Size: 12 Points

Style Sheet: Edit...

Style: ☑ Plain ☐ *Italic* ☐ Outline ☐ **Bold** ☐ Underline ☐ Shadow

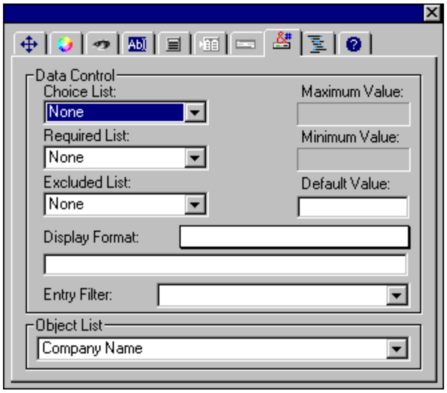
Justification ○ ● ○ ○

Object List

Company Name

For information on setting font attributes, see the sections “Setting Text Attributes” on page 218 and “Using the Style Sheet Editor” on page 165.

- **Data Control** Set data entry constraints and provide a display format.



Data Control

Choice List: None

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

Display Format:

Entry Filter:

Object List

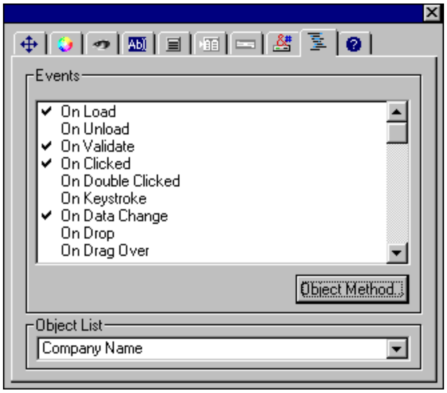
Company Name

For information on the following topics, refer to these sections:

Topic	Section
Choice lists	“Using Choice Lists” on page 246
Required lists	“Required Lists” on page 247
Excluded lists	“Excluded Lists” on page 248
Minimum and maximum values	“Setting Maximum and Minimum Values” on page 260
Default values	“Setting Default Values” on page 261

Topic	Section
Display formats	“Display Formats for Enterable Objects” on page 288
Entry filters	“Using Entry Filters” on page 248

- **Events** Activate the events that will be executed for the object when the form is used and attach a method to the object.



Events

✓ On Load
On Unload
✓ On Validate
✓ On Clicked
On Double Clicked
On Keystroke
✓ On Data Change
On Drop
On Drag Over

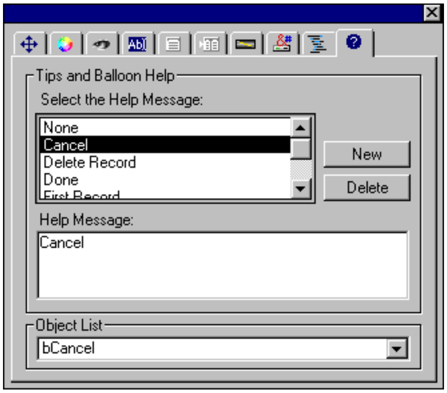
Object Method...

Object List

Company Name

For information on object methods, see the section “Using Object Methods with Fields and Objects” on page 319.

- **Help** Write Balloon help and a Tip and attach the help message to the field.



Tips and Balloon Help

Select the Help Message:

None
Cancel
Delete Record
Done
First Record

New

Delete

Help Message:

Cancel

Object List

bCancel

For information on writing help messages, see “Adding Help to a Field or Object” on page 265.

Adding Fields to a Form

You can add or delete fields from a form at any time. For example, you may decide to add fields to a form when the following occurs:

- You discover you need a field you did not choose in the Form Wizard.
- You add a field to the database structure and need to add it to a form so that you can use it.

When you place a field in a form, you can immediately set its properties. You can add a field to a form using either the Tools palette or the Explorer.

Note You can also add a field by duplicating an existing field and then modifying the duplicate's properties.

► To add a field to a form using the Tools palette:

1 **If the field does not exist in the database, use the Structure editor to create the field.**

For information on adding a field to a table, see the section "Creating Fields and Setting Field Properties" on page 80.

2 **Open the form to which you want to add the field.**

For information on opening a form, see the section "Opening a Form in the Form Editor" on page 183.

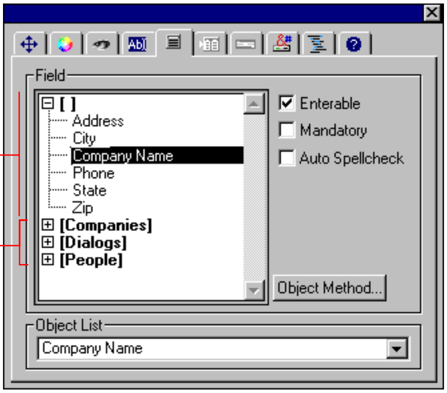
3 **Click the Add Field tool in the Tools palette.**

When you move the pointer into the form area, it becomes a crosshair.

4 **Position the crosshair where you want to place one corner of the field.**

5 **Drag diagonally to define the size of the field and then release the mouse button.**

4th Dimension displays the Field page of the Object Properties window. Select the field you want from the field list. A typical Field page is shown in the following illustration.



Fields from master table

Tables that can be expanded

Field

⊟ [ ]
- Address
- City
- Company Name
- Phone
- State
- Zip

⊞ [Companies]
⊞ [Dialogs]
⊞ [People]

☑ Enterable
☐ Mandatory
☐ Auto Spellcheck

Object List: Company Name

If the field name you want is not visible, scroll the list until you see it. If the field you want is in another table, expand the list of fields in that table.

Note Fields from the master table appear twice, once at the top of the list of fields (beneath the empty brackets), and once in the table name's expanded list. If you select the field from the top list, 4th Dimension takes this to mean "field in this position in the master table." If you select the field from the table name's expanded list, 4th Dimension takes this to mean "this field from this table." For example, if you select the third field from the top list and then copy and paste the field into another table's form, in the new form it would become the third field in the new master table. If you select the field from the table name's expanded list and then copy and paste the field into another table's form, it would remain the same field from the same table.

6 Select the field you want from the Field list.

7 If desired, select the Enterable, Mandatory, or Auto Spellcheck attributes on the Field page.

After creating the field, you generally need to set additional properties. You can set data entry controls, write help text, attach a method, set resizing or repositioning options, set platform interface, font, or appearance options.

For information on field attributes, see the sections "Field Attributes" on page 90 and "Setting the Enterable and Mandatory Attributes" on page 245.

8 If desired, click another tab in the Object Properties window to set additional field properties.

Refer to the section "Setting Field Properties" on page 236 for more information on field properties.

The new field appears in the form where you drew the field area. The field area displays the name of the field you selected.

► To add a field using the Explorer:

1 **Open the form to which you want to add the field.**

For information on opening a form, see the section "Opening a Form in the Form Editor" on page 183.

2 **Open the Explorer and click the Tables tab to display the hierarchical list of tables and fields.**

3 **Expand the table that contains the field you wish to add.**

The fields belonging to that table appear.

4 **Drag the desired field from the Explorer to the form.**

5 **Double-click the field to modify its properties (optional).**

After you place a field in a form, you can modify it as you would any other form object. You can resize it, change the font, choose colors for display on a color monitor, and so on. You can return to the Object Properties window to modify the field's properties at any time.

Modifying a Field in a Form

You can modify the properties of any field placed on a form.

► To modify a field's properties:

1 **Select the field you want to work with and double-click it or press Shift+Ctrl+Space bar (Shift-Command-Space Bar on Macintosh)[1].**

The Field page of the Object Properties window appears.

You can use the Object Properties window to change any setting. You can even select a new field to appear in the form.

2 **Make any changes you like.**

Your changes take effect immediately.

Note If the field has been grouped with another object, you must ungroup it before you can display the Object Properties window.

[1] If the Object Properties window is already onscreen, simply click the desired field.

Data Entry Controls

You can establish data entry controls for fields and enterable objects at the form level. Data entry controls restrict what the user can enter into the field or enterable object on a particular form. You can do the following:

- Set the Enterable or Mandatory attributes,
- Attach a choice list,
- Establish a list of required or excluded values,
- Set an entry filter that defines allowable characters,
- Set maximum and minimum allowable values,
- Set default values,
- Write an object method.

You can also establish data entry controls at a higher level. You have the following options:

- **Field properties** The Field Properties window (accessed from the Structure editor window) lets you set field attributes at the table level. Field properties are enforced throughout the database. In some cases, you have the option of setting a particular attribute at either the table or form level. You can set the following attributes at the table level:
  - **Mandatory** Set the Mandatory attribute for a field that is required for all records.
  - **Display Only** Set the Display Only attribute for calculated fields or other fields that are not enterable.
  - **Can’t Modify** Set the Can’t Modify attribute for fields that accept an initial entry but should not be changed after the record is first saved.
  - **Indexed** Set the Indexed attribute for fields on which you will be searching and sorting frequently. Also, use the Indexed attribute for primary and foreign key fields.
  - **Unique** Set the Unique attribute for the field that must be used to uniquely identify the record.
  - **Choice list** You also can associate a choice list with the field. When the choice list is assigned at the table level, it is used on all entry forms and in the Query editor.

- **Relation properties** The Relation properties window contains the Deletion control option that lets you set and enforce referential integrity. You can
  - Prevent 4th Dimension from deleting a related One record if there are related Many records,
  - Automatically delete the related Many records if the related One record is deleted,
  - Allow the user to delete a related One record even if related Many records exist (turn off referential integrity).
- **Triggers** You can create triggers that manage the process of loading, saving, and deleting records. Triggers run if a record is loaded, saved, or deleted programmatically, using any form, or during data imports and exports. With triggers, you can enforce complex business rules in a very comprehensive and systematic way. For information on using triggers, see the section "Using Triggers" on page 376 and the section "Triggers" in the *4th Dimension Language Reference*.
- **Form methods** You can create form methods that manage the use of the form.

  The following sections review the data entry control options that you have at the form level. Use these options in conjunction with data entry controls that are available at the database and table levels.

Setting the Enterable and Mandatory Attributes

The Enterable and Mandatory attributes are similar to the field attributes you set in the Structure editor. If you want these attributes to be different on a particular form, you can change them here. These attributes can be set on the Field page of the Object Properties window.

These attributes do not override the field attributes set in the Structure editor. If a field already has the Display Only attribute assigned in the Structure editor, you cannot make it enterable with the Enterable form attribute. If a field already has the Mandatory attribute assigned in the Structure editor, you cannot make it non-mandatory by deselecting the Mandatory form attribute. The Enterable and Mandatory check boxes do not necessarily reflect the attribute settings in the Structure editor.

The Enterable Attribute

Every field is enterable by default. If you want to make a field non-enterable for that form, you can deselect the **Enterable** check box in the Object Properties window.

A field from a related table may not be enterable if you deselected the **Enterable Related Fields** check box in the Form Wizard. You can make the related field enterable by selecting the **Enterable** check box.

For enterable objects, the **Enterable** check box is checked. You can make an enterable object non-enterable by changing the definition of the object from enterable to non-enterable by choosing non-enterable from the Type drop-down list or by unchecking the **Enterable** check box. For information about enterable objects, see the section "Enterable and Non-enterable Objects" on page 292.

The Mandatory Attribute

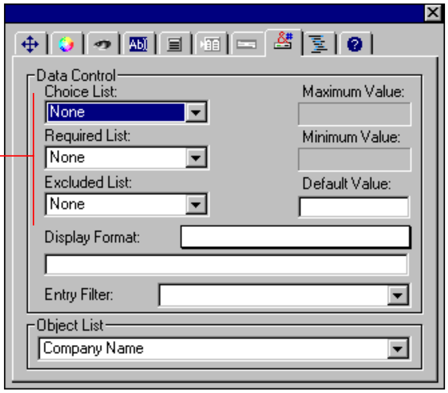
No field or enterable object is mandatory by default. To make the field mandatory for all forms, set the Mandatory attribute in the Field Properties window in the Structure editor. If you want to make a field or enterable object mandatory for a particular form, you can select the **Mandatory** check box in the Object Properties window.

Selecting the **Mandatory** check box makes a field or enterable object mandatory for that form. 4th Dimension does not accept a record if the field or object does not contain a value. For information about enterable objects, see the section "Enterable and Non-enterable Objects" on page 292.

Using Choice Lists

You can assign a choice list to a field at either the table or form level. If you want to assign the choice list at the table level, use the Field Properties window in the Structure editor. The choice list will then be available on all forms and in the Query editor in the User environment and in custom applications (assuming you use the Query editor in the custom application).

You can also attach a choice list at the form level. The list can serve as a choice list for that form, as a list of required entries, or as a list of excluded entries. Choice lists can be associated with a field at the form level using the Data Control page of the Object Properties window.


Choice List drop-down lists

Data Control

Choice List: None

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

Display Format:

Entry Filter:

Object List

Company Name

Assigning a list at the form level gives you the freedom to vary data entry constraints from form to form. For example, a field in one input form that is used only by managers can display a comprehensive choice list while the same field in the form that is seen only by drudges has fewer choices.

If a field is already assigned a choice list at the table level, you can override the choice list at the form level. If you assign a different list to the field at the form level, then that list is used for that form only.

Before you can assign a choice list, you must have created the list in the List editor. For more information about creating choice lists, see Chapter 10, “Creating Lists” on page 461.

Choice Lists

Assigning a choice list to a field with the Choice List drop-down list causes 4th Dimension to display the choice list during data entry. The choice list appears when the field or enterable object is selected in the User environment or in custom applications. The user can then select an entry from the list. The user can overwrite the entry chosen from the choice list by typing (unless the list is also a required list).

Required Lists

A Required choice list to limit the valid entries to the items on the list. For example, you may want to require a list of job titles so that valid entries are restricted to titles that have been approved by management.

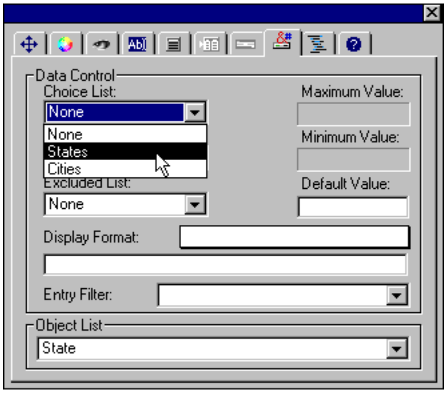
Note Making a list required does not automatically display the list when the field is selected. If you want to display the required list, assign the same list with the Choice List drop-down list.

Excluded Lists

An Excluded choice list prevents the items on the list from being entered. For example, for a field on an input form used only by drudges, you may want to attach a list of choices that can only be authorized by a manager.

► To assign a choice list to a field or enterable object:

■ **In the Data Control page of the Object Properties window, choose the desired list from the appropriate drop-down list.**



Data Control

Choice List: None

Excluded List: None

Object List: State

4th Dimension assigns the list you have selected to the field or enterable object.

In theory, you can make selections from all three drop-down lists.

Using Entry Filters

An entry filter controls exactly what the user can type during data entry. Unlike the data entry controls discussed earlier in this section, entry filters operate on a character-by-character basis. For example, if a part number always consists of two letters followed by three digits, you can use an entry filter to restrict the user to that pattern. You can even control the particular letters and numbers.

An entry filter operates only during data entry. It has no effect on data display after the user deselects the field. Usually, you use entry filters and display formats together. The filter constrains data entry and the format ensures proper display of the value after data entry. For complete information about display formats, see the section "Data Entry Controls" on page 244.

During data entry, an entry filter evaluates each character as it is typed. If the user attempts to type an invalid character (a number instead of a letter, for example), 4th Dimension simply does not accept it. The null character remains unchanged until the user types a valid character.

Entry filters can also be used to display required formatting characters so that the user need not enter them. For example, an American telephone number consists of a three-digit area code, followed by a seven-digit number that is broken up into two groups of three and four digits, respectively. A display format can be used to enclose the area code in parentheses and display a dash after the third digit of the telephone number. When such a format is used, the user does not need to enter the parenthesis or the dash.

An Introduction to Entry Filter Codes

Entry filter codes usually start with an ampersand (&). This character tells 4th Dimension to use what follows as an entry filter. If the code starts with a tilde (~), it means the same thing as “&” except that any letter is automatically made uppercase.

The & is usually followed with an “A”, an “a”, or a “9”, meaning allow only uppercase letters (A), allow lowercase and uppercase letters (a), or allow only numbers (9). For example, &9 allows only numbers and &A allows only capital letters.

The number sign (#) tells how many digits or characters is allowed by the code. If the code uses no number signs, the filter allows as many digits or characters as you want. For example, &9 allows as many digits as is entered. The filter &9## allows only two digits.

The exclamation point (!) is sometimes used to change which character will appear on screen to indicate the number of characters the user can enter. Without an !, 4th Dimension displays an underscore for each digit or character the user can enter. For example, !?&9## displays question marks in both of the places the user will type and it allows only numbers and only two digits.

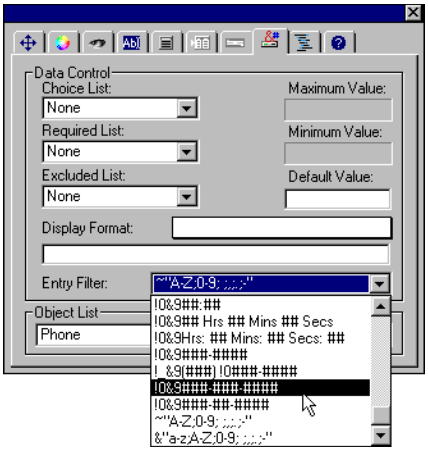
For information about creating entry filters, see the section “Entry Filter Codes” on page 252.

Choosing an Entry Filter

You create the entry filter by choosing a built-in or custom filter from the Entry Filter drop-down list or by typing an entry filter code into the Entry Filter Display area. The Entry Filter drop-down list contains filters for date, time, and alpha fields. The names of any custom filters you create are added to the entry filter drop-down list. For information on creating custom filters, see the section “Creating Custom Display

Formats and Entry Filters” on page 257. Most often you will find a suitable entry filter in the drop-down list.

The figure below shows an entry filter being chosen from the drop-down list.



Data Control
Choice List: None
Required List: None
Excluded List: None
Maximum Value:
Minimum Value:
Default Value:
Display Format:
Entry Filter: ~"A-Z;0-9; ;,.:;-"
Object List
Phone

Here is a table that explains each of the entry filter choices in the Entry Filter drop-down list.

Entry Filter	Explanation
~A	Allow any letters, but convert to uppercase.
&9	Allow only numbers
&A	Allow only capital letters
&a	Allow only letters (uppercase and lowercase)
&@	Allow only alphanumeric characters. No special characters.
~a##	State name abbreviation (e.g., CA). Allow any two letters, but convert to uppercase.
!0&9##/##/##	Standard date entry format. Display zeros in entry spaces. Allow any numbers.
!0$9 Month: ## Day: ## Year: ##	Custom date entry format. Display zeros in entry spaces. Allow any number. Two entries after each word.

Entry Filter	Explanation
!0&9##:##	Time entry format. Limited to hours and minutes. Display zeros in entry spaces. Allow any four numbers, separated by a colon.
!0&9## Hrs ## Mins ## Secs	Time entry format. Display zeros in entry spaces. Allow any two numbers before each word.
!0&9Hrs: ## Mins: ## Secs: ##	Time entry format. Display zeros in entry spaces. Allow any two numbers after each word.
!0&9###-####	Local telephone number format. Display zeros in entry spaces. Allow any number. Three entries, hyphen, four entries.
!_&9(###)!0###-####	Long distance telephone number. Display underscores in first three entry spaces, zeros in remainder.
!0&9###-###-####	Long distance telephone number. Display zeros in entry spaces. Allow any number. Three entries, hyphen, three entries, hyphen, four entries.
!0&9###-##-####	Social Security number. Display zeros in entry spaces. Allow any number.
~"A-Z;0-9; ;,;.;-"	Uppercase letters and punctuation. Allow only capital letters, numbers, space, comma, period, and hyphen.
&"a-z;0-9; ;,;.;-"	Upper and lowercase letters and punctuation. Allow only lowercase letters, numbers, space, comma, period, and hyphen.
&"0-9;.;-"	Numbers. Allow only numbers, decimal point, hyphen (minus sign).

You can modify an entry filter after you choose it from the drop-down list. For example, if you want to use a filter that allows upper and lowercase letters, but also need to allow the wildcard character (@), you could choose the filter:

&"a-z;0-9; ;,;.;-"

and change it to:

&"a-z;0-9; ;,;.;-;@"

For more information about modifying entry filters, see the section "Entry Filter Codes" on page 252.

Using Entry Filters and Display Formats Together

You often create a matching display format when you use an entry filter. An entry filter operates only during data entry. It has no effect on how the data is displayed after you tab out of the field.

For example, if you use the Social Security number entry filter (&9###-##-####), you should also choose the matching Social Security number display format (###-##-####). Without the display format, only the numbers, not the hyphens, are displayed in the field. Display formats can be used in both input and output forms and in quick reports.

Here are some suggested entry filters and matching display formats for common types of fields.

Field Type	Entry Filter	Display Format
State	~a##	(none needed)
Zip Code (standard)	&9#####	(none needed)
Zip Code (extended)	&9#####-####	#####-####
Phone number	&9###-#### &9(###) ###-#### &9 ###-###-####	###-#### (###) ###-#### ###-###-####
Social Security number	&9###-##-####	###-##-####
Date	!0&9##/##/## &9Month: ## Day: ## Year: ##	(Any Date Format)
Time	!0&9##:## !0&9##Hrs##Mins##Secs !0&9Hrs:##Mins:##Secs:##	(Any Time Format)

You can use display formats on input forms, output forms, and quick reports. For information about using display formats in quick reports, refer to the chapter on quick reports in the *4th Dimension User Reference*.

Entry Filter Codes

Often, you create an entry filter simply by choosing it from the entry filter drop-down list. If you need a filter for a type of field not covered by the choices in the drop-down menu, you can create a filter or modify an existing one.

This section describes how to write the code for an entry filter.

An entry filter code has three parts, in this order:

initiator "argument" placeholders

The *initiator* informs 4th Dimension that the subsequent argument is to be used as a filter during data entry in the field. The *argument* defines the allowable characters. The *placeholders* define the places available for the characters.

For example, the following entry filter allows only the letters “a”, “b”, “c”, or “g” to be entered in two places:

&"a;b;c;g"##

In this example, the ampersand (&) is the initiator; the “a;b;c;g” is the argument; and the number signs (#) are the placeholders. The filter can be read as, “Allow the letters ‘a’, ‘b’, ‘c’, or ‘g’ in two places.” Thus the user may enter “ag”, “gc”, “ba”, “ab”, “aa”, “ac”, or any other combination of the four allowed characters.

Entry filters can be combined. The following entry filter allows only the letters “a”, “b”, “c”, or “g” to be entered in two places, followed by the numbers 1, 3, or 8 in one place:

&"a;b;c;g"##&"1;3;8"#

The user must use two of the allowed letters, followed by one of the allowed numbers.

Characters that Initiate a Filter

Two characters initiate a filter: the ampersand (&) and the tilde (~). These characters instruct 4th Dimension to use the argument that follows immediately as the filter for the subsequent placeholders.

In addition, the tilde (~) also instructs 4th Dimension to make any letters uppercase. It does not prevent a lowercase letter from being typed; it simply changes it to an uppercase letter.

The following entry filters are equivalent in their effects:

&"P"#

~"p"#

The difference between them is that the filter initiated with the ampersand (&) does not accept a lowercase p. The filter initiated with the tilde (~) accepts the lowercase p but converts it to uppercase.

Because no letters are involved, the following entry filters are equivalent:

&"1;5;8"#

~"1;5;8"#

Arguments

A filter argument follows the initiator and defines the characters that are allowed in the subsequent placeholders. To create a filter argument, surround the allowable characters with quotation marks.

Arguments are made up of lowercase letters, uppercase letters, numbers, punctuation marks, and special characters (!@#$%^&*(){}[]":';?><,./`~). If you use a lowercase letter in the argument, only the lowercase form of the letter can be typed by the user. If you use an uppercase letter in the argument, only the uppercase form of the letter can be typed by the user.

An argument may be a single character (a letter or a number), for example, “j”, “J”, or “6”.

An argument may be a set of characters separated by semicolons, for example, “a;r;t” or “1;5”.

An argument may include ranges of characters. A range is defined by the first character, a hyphen, and the last character. Examples are, “a-c” and “1-5”. The “a-c” argument is equivalent to “a;b;c”, and “1-5” is equivalent to “1;2;3;4;5”.

An argument may include single letters, single numbers, and one or more ranges, for example, “a;m-z;3;5-9”.

The following table shows useful shorthand versions of arguments. They are used in filters without quotation marks.

Character	Meaning	Equivalent
9	Allow numbers	"0-9"
a	Allow lowercase and uppercase	"a-z;A-Z"
A	Allow uppercase	"A-Z"
@	Allow alphanumeric	"a-z;A-Z;0-9"

The following entry filters are equivalent:

&9#

&"0-9"#

&"1;2;3;4;5;6;7;8;9;0"#

The following entry filters are equivalent:

&a#

&"a-z;A-Z"#

The following entry filters are equivalent:

&A#

&"A-Z"#

Placeholders

The number sign (#) is the only placeholder. You use one number sign for each character the user can enter in the field.

For example, the following entry filter allows the user to enter letters in four places:

&a####

The following entry filter allows the user to enter uppercase letters in three places, followed by numbers in two places:

&A###&9##

If you show no placeholders, the filter code allows any number of characters. The following entry filter allows the user to enter only numbers, but it does not limit the length of the entry:

&9

You can set the maximum number of characters allowed in an Alpha field in the Structure editor.

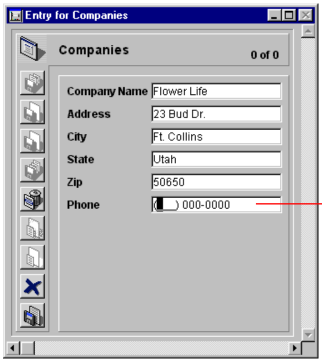
Display Characters

When a field with an entry filter is selected for data entry, 4th Dimension displays an underline (_) for each placeholder. As the user types a valid character, each underline is highlighted and replaced with the typed character.

You instruct 4th Dimension which character to substitute for the underline by beginning the entry filter with an exclamation point (!) and the character you want.

You can substitute any character for the underline. For example, if you display “XXXX” and the user types only two of the allowed characters (say they are “AA”), the field will contain “AAXX” when the record is saved.

The following illustration shows a selected field displaying underlines and zeros.



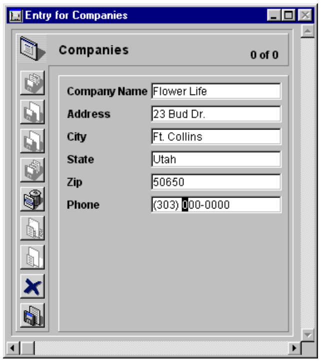
Company Name: Flower Life
Address: 23 Bud Dr.
City: Ft. Collins
State: Utah
Zip: 50650
Phone: ( ) 000-0000

Dead Characters

Any characters, punctuation marks, and spaces can be used as dead characters. Dead characters are displayed during data entry, but they are skipped over by the insertion point and are not entered as part of the data.

The characters you want to use as dead characters are placed before, after, and between placeholders. They are displayed during data entry for clarity.

The phone number entry filter (&9(###) ###-####) uses parentheses, a space, and a dash as dead characters. After you enter a digit immediately preceding a dead character, the insertion point moves directly to the first character following the dead character. The following figure shows how the insertion point skips over the parenthesis and space after the area code to allow the user to enter the next digit in the phone number.



Company Name: Flower Life
Address: 23 Bud Dr.
City: Ft. Collins
State: Utah
Zip: 50650
Phone: (303) 000-0000

Custom Entry Filter Formats

You can use a custom format to enter an entry filter. All custom formats are automatically displayed on the Entry Filter drop-down list. To use a custom format as an entry filter, choose its name from the Entry Filter drop-down list or type a vertical bar followed by the format name in the Entry Filter Display area. For example, the entry:

|Part Number

installs the custom format named Part Number as the entry filter for the field.

For information about creating custom formats, see "Creating Custom Display Formats and Entry Filters" which follows immediately.

Creating Custom Display Formats and Entry Filters

You can create custom display formats and entry filters that you can refer to by name. You can use a custom format or filter name in place of the code for display formats and entry filters. Custom formats and filters are useful when you use the same display formats or entry filters in several places. If you use fields with the same entry filter in several forms, you can create the entry filter once and specify it by name wherever you need it. In addition, if you decide to change a format or filter, you need only change it in one place and it is updated wherever it is used.

You can also create display formats that correspond to the entry filters and use styles to install them as well.

You create a style in the Display Formats and Entry Filters page of the Database Properties dialog box.

► To create a custom format or filter:

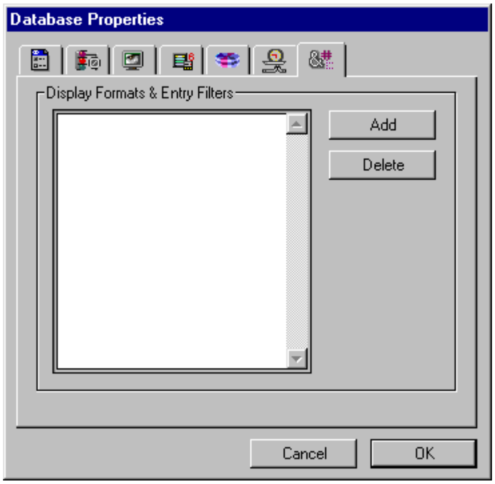
1 **Choose Database Properties from the File menu.**

4th Dimension displays the Database Properties dialog box.

For information about the Database Properties dialog box, see the section "Setting Database Properties" on page 45.

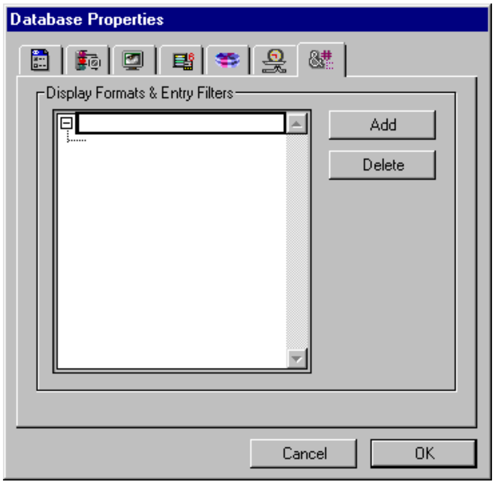
2 **Click the Display Formats and Entry Filters tab.**

The Formats and Filters page appears.



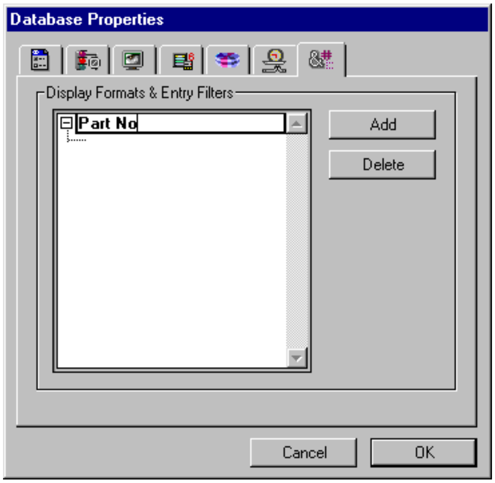
3 **Click Add.**

A blank item is added to the hierarchical list.



4 **Type the format or filter name.**

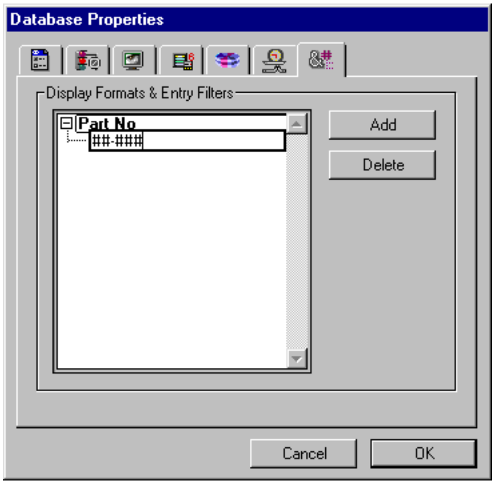
You can use up to 31 characters.



Part No

5 **Click the subitem area below the name, hold down the Ctrl key (Command key on Macintosh) and type the display format or entry filter.**

You create a display filter or an entry filter just as if you were typing it into the Data Control page of the Object Properties window.



Part No
##-###

For information about creating display formats and entry filters, see the sections "Data Entry Controls" on page 244 and "Using Entry Filters" on page 248.

For example, if you wanted to create a format for a local telephone number, you would use the following:

###-####

For example, if you wanted to create a Part Number entry filter for a part number with the format XA-654-1, you would use the following filter:

!X&"A-Z"##-!0&"0-9"###-#

and the corresponding display format is “##-###-#”.

6 **If you want to create another filter or format, click the Add button.**

You most often create filters and formats in pairs — one for the entry filter and the other for the display format.

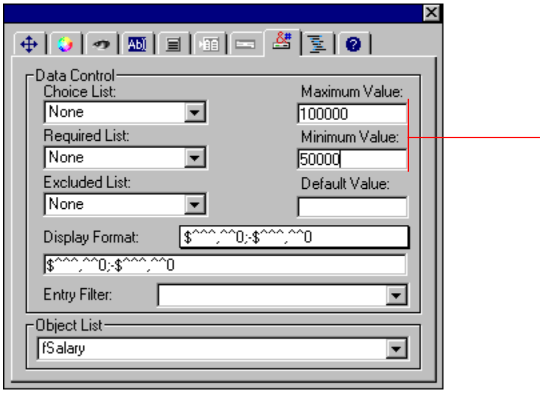
7 **When you have finished adding filters and formats, click another tab to set other database preferences or the OK button.**

You can edit any filter or format by selecting it and changing the name or the code. You can delete any style by selecting it and clicking the **Delete** button.

Tip Include the word “filter” or “format” in the name to indicate its purpose.

Setting Maximum and Minimum Values

You can restrict a Number, Date, or Time field or enterable object by entering maximum and minimum values in the corresponding entry areas in the Data Control page of the Object Properties window.



Data Control

Choice List: None

Required List: None

Excluded List: None

Maximum Value: 100000

Minimum Value: 50000

Default Value:

Display Format: $^^^,^^0;-$^^^,^^0

$^^^,^^0;-$^^^,^^0

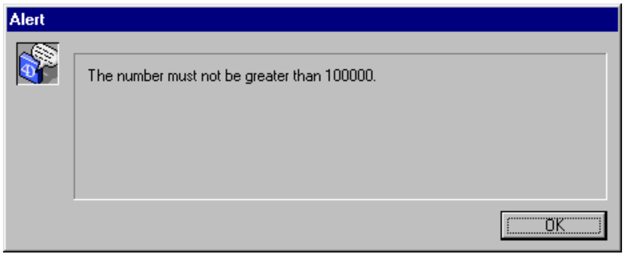
Entry Filter:

Object List

fSalary

Minimum and maximum value entry areas

During data entry, if the user enters a value below the minimum or above the maximum, a warning message is displayed. 4th Dimension returns the user to the field so that a valid entry can be made.



Alert

The number must not be greater than 100000.

To set a maximum or minimum value, type the value you want to define the limit. Use the data entry format appropriate for the type of field or enterable object for which you are setting a limit. For example, for a Date field or object, use the date entry format to set the maximum or minimum value.

The values you set are inclusive. That is, if the user enters the same value you have set as a maximum or minimum value, the entry is allowed. Only entries lower than a minimum or higher than a maximum are disallowed. For example, if the value you set as a maximum is 15, the user can enter 15, but not 16.

4D Server Setting a maximum or minimum value changes the maximum or minimum value for all users.

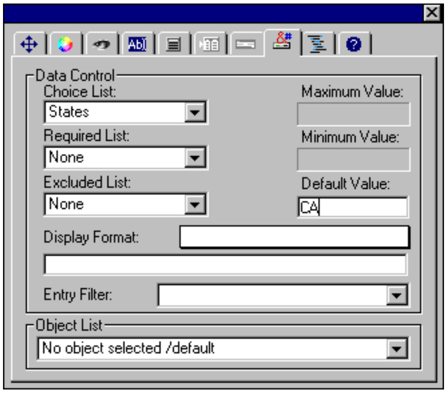
You can also use methods to restrict the values that the user can enter. With a method, you can give more precise and informative feedback to the user or set minimum or maximum values based on other values in the database. For example, a method can check a customer's credit limit before validating a new transaction.

You can also use a required choice list to create unusual ranges of allowable values. For more information, see the sections "Required Lists" on page 247 and "Creating Lists" on page 465.

Setting Default Values

You can assign a default value to be entered in a field or enterable object. The default value is entered when a new record is first displayed. You can change the value unless the field or entry area has been defined as non-enterable.

You create a default value by typing the value you want in the Default Value entry area in the Data Control page of the Object Properties window. The default value must be appropriate for the field type.



Data Control
Choice List: States
Required List: None
Excluded List: None
Maximum Value:
Minimum Value:
Default Value: CA
Display Format:
Entry Filter:
Object List
No object selected /default

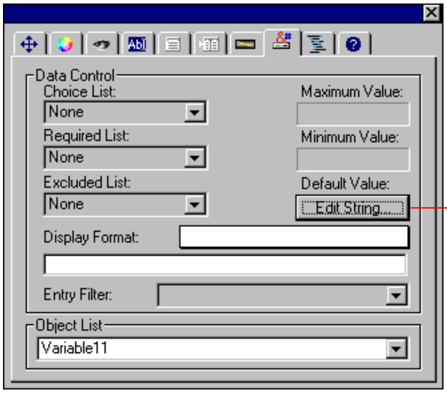
4th Dimension provides stamps for generating default values for date, time, and sequence number. The date and time are taken from the system date and time. 4th Dimension automatically generates any sequence numbers needed. The table below shows the stamp to use to generate default values automatically.

Stamp	Meaning
#D	Current date
#H	Current time
#N	Sequence number

You can use a sequence number to create a unique number for each record. A sequence number is an integer (whole number) that is generated for each new record. The numbers start at one (1) and increase incrementally by one (1). A sequence number is never repeated even if the record it is assigned to is deleted from the table. Each table has its own set of sequence numbers.

Default Lists of Values

If the object displays a list of values (such as a combo box, scrollable area, pop-up menu, tab control, or drop-down list), you can specify a list of values that will be used as default values. The list will be loaded into the object prior to its being displayed on the form. For objects that accept a list of default values, the Default Value area becomes a button:



Data Control

Choice List: None

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

Display Format:

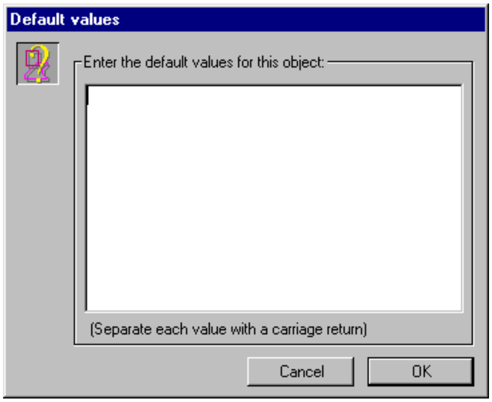
Entry Filter:

Object List

Variable11

Edit String button

When you click the Edit String button, the Default Values dialog box appears.



Default values

Enter the default values for this object:

(Separate each value with a carriage return)

Enter the list of default values. Each value should be on a separate line. Click **OK** to put away the Default Values dialog box and return to the Object Properties window.

When you enter default values into the Default Values dialog box, the values are automatically loaded into an array whose name is the name of the object. Using the language, you can manage the object by referring to that array.

4D Server Setting a default value in the Object Properties window sets the default value for all users.

Using a List to Set Default Values

If the object is a hierarchical list or a tab control, you can use a list that you created using the List editor to set default values.

► To set default values using a list:

1 **Open the Object Properties window for the object and click the Data Control tab.**

2 **Choose the desired list from the Choice List drop-down list.**

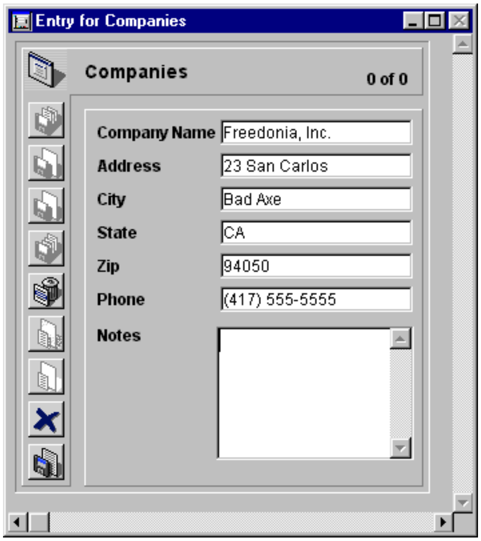
The user can overwrite an item in the list by Ctrl+clicking (Command-clicking on Macintosh), but the changes are not saved to the actual list.

Setting Default Values Using the Language

You can also set default values using a method. For objects that accept one value, you can assign the default value when the On Load event executes in the object or form method. For objects that accept lists, you can enter the default values using the List editor and then load the contents of the list into an array using the LIST TO ARRAY command. You can load the lists into array when the On Load event occurs or load all lists into arrays when the On Startup database event occurs.

Adding a Scroll Bar to a Text Object

Text fields and enterable objects can contain up to 32,000 characters. 4th Dimension allows you to attach a scroll bar so that the user can scroll the information. The figure below shows an input form with a text area with a scroll bar.



Company Name Freedonia, Inc.
Address 23 San Carlos
City Bad Axe
State CA
Zip 94050
Phone (417) 555-5555
Notes

You add a scroll bar by selecting the **Vertical Scroll Bar** check box on the Display page of the Object Properties window.

Note If a text field or enterable object does not have a scroll bar, the user can scroll the information using the arrow keys.

Adding Help to a Field or Object

You can add Balloon Help or a Tip to fields and active objects in your forms to help users work with your database more productively.

Balloon Help can be viewed only when the database is used on a Macintosh running System 7 (or greater), with Balloon Help turned on. However, you can create Balloon Help even when you are designing a database on Windows. Tips are displayed on all operating systems.

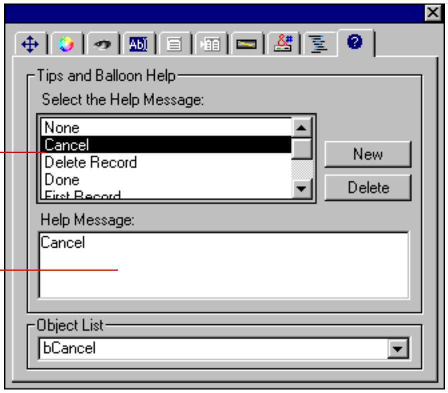
For example, you can create a help message for a Date field which reminds the user to include a separator such as the slash mark (/) between the month, day, and year when entering data. The tip appears in the form whenever the field or object is used.

You add help to a field or object in the Help page of the Object Properties window. The help message appears only in this particular form. For information about adding Balloon Help to a field in all forms in which it appears, see the section “Choices and Help” on page 94.

► To add help message to a field or object:

1 Click the Help tab in the Object Properties window.

The Help page appears.



Tips and Balloon Help

Select the Help Message:

- None
- Cancel
- Delete Record
- Done
- First Record

Help Message: Cancel

Object List: bCancel

Message List area

Message area

The list of messages contains the names of all current help messages.

2 **Click New to create a new help message.**
OR
Click an existing help message to edit it.

The names of any new help messages are added to the end of the message list.

3 **Enter or edit the message in the Help Message area.**

The help message appears as a Balloon help on a Macintosh with Balloon Help turned on and as a Tip on any operating system.

4th Dimension stores the text for the help message so that you can reuse the message for other fields and objects.

Editing a Help Message

To edit an existing help message:

1 **Click the name of the message you want to modify in the Message List area.**

2 **Edit the help message.**

4th Dimension stores your changes to the help message.

Changing the Name of a Help Message

To change the name of any help message:

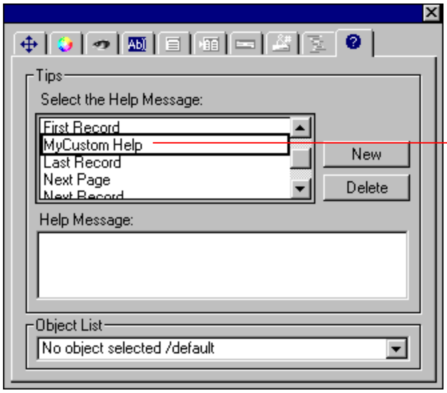
1 **Display the Object Properties window for the desired field or active object and click the Help tab.**

The Help Message page appears.

2 **Hold down the Ctrl key (on Windows) or Command key (on Macintosh) and click the name of the message in the Message List area.**

The name of the message becomes editable.

3 **Type the new help message name.**



Renamed help message

Deleting a Help Message

To delete a help message so it no longer appears in the list of messages:

1. **Click the name of the message you want to delete in the list of messages.**

   The message name is highlighted.

2. **Click the Delete button.**

   The help message is removed from the list of messages.

Selecting a Help Message

To select the help message you want to use:

- **Click the name of the message you want to select in the list of messages.**

  The message you selected appears as Balloon Help and a Tip for the field or object.

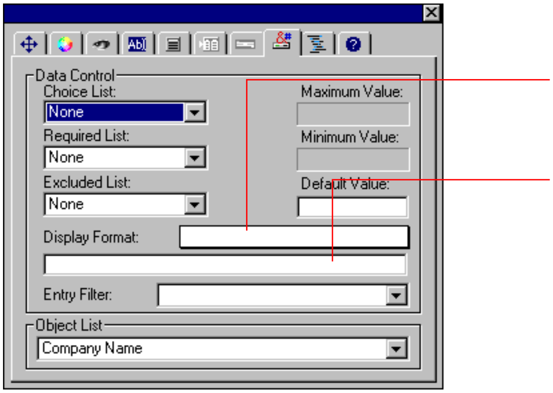
To cancel the help message, select **None** in the Message list area.

Display Formats

The display formats provided by 4th Dimension give you many choices for screen display and printing. Display formats can be applied to both fields and enterable or non-enterable areas (variables). The format you use to display the contents of a field does not affect the actual value stored by 4th Dimension.

The display format for a field can be different in each form. For example, you may want to show a value without dollar signs in an input form and display it with dollar signs in an output form.

You set display formats in Data Control page of the Object Properties window.



Data Control

Choice List: None

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

Display Format:

Entry Filter:

Object List: Company Name

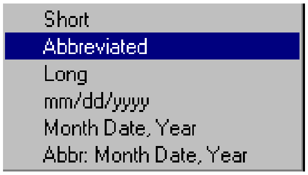
Display format pop-up menu

Format Display area: Displays selected format or allows entry of a custom format (for number and alpha fields or variables)

Different formats appear in the Display Format pop-up menu depending on the type of field you select. The built-in formats always appear. Any display formats that were added using the Formats and Filters editor appear in the pop-up menu along with the standard 4th Dimension formats.

Date Field Formats

Date formats control the way dates appear when displayed or printed. For data entry, you enter dates in the *MM/DD/YYYY* format, regardless of the display format you have chosen. The figure below shows date formats in the Format pop-up menu.



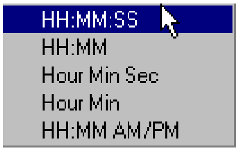
The table below shows the Date field display formats and gives an example of each format.

Choice	Example
Short	3/25/95
Abbreviated	Wed, Mar 25, 1995
Long	Wednesday, March 25, 1995
mm/dd/yyyy	03/25/1995
Month Date, Year	March 25, 1995
Abbr: Month Date, Year	Mar 25, 1995

Note Unlike the Alpha and Numeric display formats, the Date display format must be one of the formats shown in the Format pop-up menu.

Time Field Formats

Time formats control the way times appear when displayed or printed. For data entry, you enter times in the 24-hour *HH:MM:SS* format or the 12-hour *HH:MM:SS AM/PM* format, regardless of the display format you have chosen. The figure below shows time formats in the Format pop-up menu.



The table below shows the Time field display formats and gives examples.

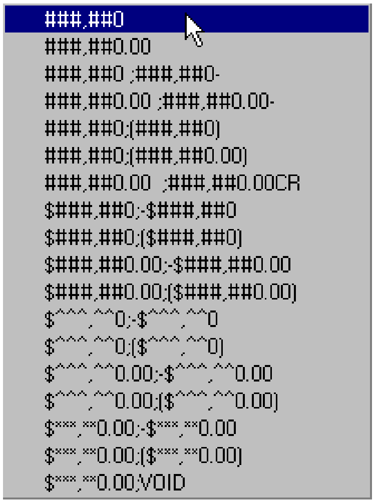
Choice	Example
HH:MM:SS	02:15:34
HH:MM	02:15
Hour Min Sec	2 hours 15 minutes 34 seconds
Hour Min	2 hours 15 minutes
H:MM AM/PM	2:15 AM

Note Unlike Alpha and Numeric display formats, the Time display format must be one of the formats shown in the Format pop-up menu.

Number Field Formats

Number formats control the way numbers appear when displayed or printed. For data entry, you enter only the numbers (including a decimal point or minus sign if necessary), regardless of the display format you have chosen. Number fields include Real, Integer, and Long Integer fields.

The following illustration shows the number formats in the Format pop-up menu.



You can choose the format from the pop-up menu or type it in the Format Display area. You can edit any number format in the Format Display area.

A number field can use any format including a custom format you create with the symbols you see on the Display pop-up menu. Creating a custom number display format is discussed in the following sections.

Creating a Custom Number Format

In each of the number display formats, the number sign (#), zero (0), caret (^), and asterisk (*) are used as placeholders. You create your own number formats by using one placeholder for each digit you expect to display.

For example, if you want to display three numbers, you could use the format ###. If the user enters more digits than the format allows, 4th Dimension displays <<< in the field to indicate that more digits were entered than the number of digits specified in the display format.

If the user enters a negative number, the leftmost character is displayed as a minus sign (unless a negative display format has been specified). If ##0 is the format, minus 26 is displayed as –26 and minus 260 is displayed as <<< because the minus sign occupies a placeholder and there are only three placeholders.

Note No matter what the display format, 4th Dimension accepts and stores the number entered in the field. No information is lost.

Each placeholder character has a different effect on the display of leading or trailing zeros. A *leading zero* is a zero that starts a number before the decimal point; a *trailing zero* is a zero that ends a number after the decimal point.

Suppose you use the format ##0 to display three digits. If the user enters nothing in the field, the field displays 0. If the user enters 26, the field displays 26.

The table below explains the effect of each placeholder on leading and trailing zeros.

Placeholder	Effect for leading or trailing zero
#	Displays nothing
0	Displays 0
^	Displays a space[1]
*	Displays an asterisk

[1] The caret (^) generates space character that occupies the same width as a digit in most fonts.

Decimal Points and Other Display Characters

You can use one decimal point in the format. If you want the decimal to display whether or not the user types it in, it must be placed between zeros.

You can use any other characters in the format. When used alone, or placed before or after placeholders, the characters always appear. For example, if you use the following format:

$##0

a dollar sign always appears because it is placed before the placeholders.

If characters are placed between placeholders, they appear only if digits are displayed on both sides. For example, if you define the format:

###,##0

a comma appears only if the user enters at least four digits.

Spaces are treated as characters in number display formats.

Formats for Positive, Negative, and Zero

A number display format can have up to three parts allowing you to specify display formats for positive, negative, and zero values. You specify the three parts by separating them with semicolons as shown below:

Positive;Negative;Zero

You do not have to specify all three parts of the format. If you use just one part, 4th Dimension uses it for all numbers, placing a minus sign in front of negative numbers. If you use two parts, 4th Dimension uses the first part for positive numbers and zero and the second part for negative numbers. If you use three parts, the first is for positive numbers, the second for negative numbers, and the third for zero.

Here is an example of a number display format that shows dollar signs and commas, places negative values in parentheses, and does not display zeros:

$###,##0.00;($###,##0.00);

Notice that the presence of the second semicolon instructs 4th Dimension to use nothing to display zero.

The following format is similar except that the absence of the second semicolon instructs 4th Dimension to use the positive number format for zero:

$###,##0.00;($###,##0.00)

In this case the display for zero would be $0.00.

Scientific Notation

If you want to display numbers in scientific notation, use the ampersand (&) followed by a number to specify the number of digits you want to display. For example, the format

&3

would display 759.62 as

7.60e+2

Note The scientific notation format is the only format that will automatically round the displayed number. Note in the example above that the number is rounded up to 7.60e+2 instead of truncating to 7.59e+2.

Hexadecimal Formats

You can display a number in hexadecimal using the display format “&x” or “&$”. If the user enters “10”, it is displayed as “A”.

Displaying a Number as a Time

You can display a number as a time (with a time format) by using “&/” followed by a digit. Time is determined by calculating the number of seconds since midnight that the value represents. The digit in the format corresponds to the order in which the time format appears in the Format drop-down menu.

For example, the format:

&/5

corresponds to the 5th time format in the pop-up menu, specifically the AM/PM time. A number field with this format would display 25000 as:

6:56 AM

Custom Number Formats

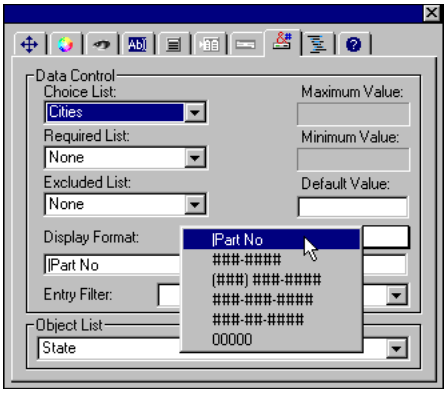
You can use a custom format to enter a number display format. Enter a vertical bar (|) before the name of the format in the Format Display area. For example, entering the following:

|Dollars

tells 4th Dimension to use the custom Dollars format.

The names of any custom formats that you have created are always added to the Format pop-up menu.

You choose custom formats from the pop-up menu just like you choose a built-in format.



Data Control

Choice List: Cities

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

Display Format: |Part No

Entry Filter:

Object List: State

For information about creating custom formats, refer to “Creating Custom Display Formats and Entry Filters” on page 257.

Examples

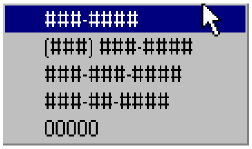
The following table shows how different formats affect the display of numbers. The three columns — Positive, Negative, and Zero — each show how 1,234.50, –1,234.50, and 0 would be displayed.

Format Entered	Positive	Negative	Zero
###	<<<	<<<	
####	1234	<<<<	
#######	1234	–1234	
#####.##	1234.5	–1234.5	
####0.00	1234.50	–1234.50	0.00
#####0	1234	–1234	0
+#####0;–#####0;0	+1234	–1234	0
#####0DB;#####0CR; 0	1234DB	1234CR	0
#####0 ;(#####0)	1234	(1234)	0
###,##0	1,234	–1,234	0
##,##0.00	1,234.50	–1,234.50	0.00
^^^^^^^	1234	–1234	
^^^^^^0	1234	–1234	0
^^^,^^0	1,234	–1,234	0
^^,^^0.00	1,234.50	–1,234.50	0.00
*******	***1234	**–1234	*******
******0	***1234	**–1234	******0
***,**0	**1,234	*–1,234	******0
,0.00	*1,234.50	–1,234.50	*****0.00
$*,**0.00;–$*,**0.00	$1,234.50	–$1,234.50	$****0.00
$^^^^0	$ 1234	$–1234	$ 0
$^^^0;–$^^^0	$1234	–$1234	$ 0
$^^^0 ;($^^^0)	$1234	($1234)	$ 0
$^,^^0.00 ;($^,^^0.00)	$1,234.50	($1,234.50)	$ 0.00
&2	1.2e+3	-1.2e+3	0.0e+0
&5	1.23450e+3	-1.23450e+3	0.00000

Alpha Field Formats

Alpha formats control the way the alphanumeric characters appear when displayed or printed. You can choose a format from the Format pop-up menu or type a display format into the Format Display area. After choosing a format from the pop-up menu, you can edit it in the Format Display area.

The figure below shows an alpha format being chosen from the format pop-up menu.



The Format pop-up menu contains formats for some of the most common alpha fields that require formats: US telephone numbers (local and long distance), Social Security numbers, and zip codes.

The following table shows the Alpha field formats and the types of fields they are typically used for.

Format	Field type
###-####	Telephone number (local)
(###) ###-####	Telephone number (long distance)
###-###-####	Telephone number (long distance)
###-##-####	Social Security number
00000	Zip Code

You can also enter and edit a format in the Format Display area. You can edit a format after choosing it from the Format pop-up menu, but you can edit a style only in the Styles editor.

The number sign (#) is the placeholder for an Alpha field display format. You can include the appropriate dashes, hyphens, spaces, and any other punctuation marks that you want to display. You use the actual punctuation marks you want and the number sign for each character you want to display.

For example, consider a part number with a format such as:

RB-1762-1

The alpha format would be:

##-####-#

When the user enters “RB17621,” the field displays:

RB-1762-1

The field actually contains “RB17621.”

If the user enters more characters than the format allows, 4th Dimension displays the last characters. For example, if the format is:

(###)

and the user enters “HAPPY,” the field displays:

(PPY)

The field actually contains “HAPPY.” 4th Dimension accepts and stores the entire entry no matter what the display format. No information is lost.

Custom Alpha Formats

You can use a custom format for Alpha fields. Any custom formats that you have created are automatically added to the Format pop-up menu. You can choose a custom format just as you would choose a built-in format.

For information about creating custom formats, see the section “Creating Custom Display Formats and Entry Filters” on page 257.

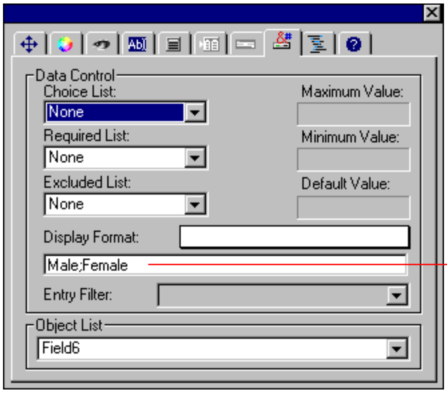
Boolean Field Formats

Boolean fields can contain one of two values: TRUE or FALSE. A Boolean field can be displayed as either a pair of radio buttons or as a check box. If you do not create a display format for a Boolean field, 4th Dimension automatically displays the field as a pair of radio buttons labeled Yes and No.

You use the Format Display area in the Data Control page to create other labels for radio buttons or a check box with any label. If you want to display only the button labels and not the field name, you can delete the field label in the form.

Formatting a Boolean Field as Radio Buttons

You format a Boolean field as a pair of radio buttons by entering two labels separated by a semicolon (;) in the Format Display area. For example, a field for sex could have one button named Male and one button named Female. To create these buttons, you would type, “Male;Female.”



Data Control

Choice List: None

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

Display Format:

Male;Female

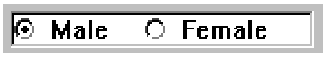
Entry Filter:

Object List

Field6

Custom display format

The buttons are displayed in the Form editor side by side as shown below.



● Male ○ Female

If you use labels with different first letters, you can select the radio button by typing the first letter during data entry. For example, you can press “M” to select Male or “F” to select Female when the field is selected.

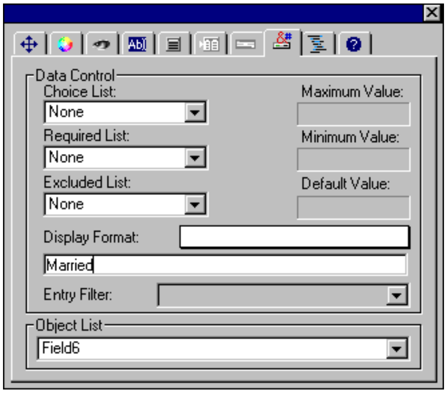
The following rules apply when the field is being used for data storage: if the first button is selected, the field is true; if the second button is selected, the field is false. The field is false by default.

Formatting a Boolean Field as a Check Box

You create a check box by entering a single label in the Format Display area. For example, a field for Paid could have one check box labeled Yes. To create this check box you would enter “Yes.” To create a check box with no label, enter a space in the Format Display area.

The following rules apply when the field is being used for data storage: if the check box is selected, the field is true; if the check box is deselected, the field is false. The field is false by default.

The following illustration shows how a Boolean field is formatted as a check box.



Data Control

Choice List: None

Maximum Value:

Required List: None

Minimum Value:

Excluded List: None

Default Value:

Display Format:

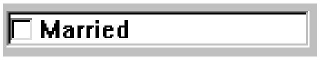
Married

Entry Filter:

Object List

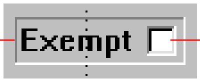
Field6

In the User environment, this field is displayed as a check box:



□ Married

You can format a Boolean field as a check box with no label by entering a space as the display format. In this case, you add the label for the check box as a separate object. In the following example, the Boolean field is on top of the text object.



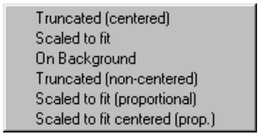
Text object

Exempt □

Boolean field

Picture Field Formats

Picture field formats control how pictures appear when displayed or printed. For data entry, the user always enters pictures by pasting them from the Clipboard, regardless of the display format. The figure below shows the picture formats in the Format pop-up menu.

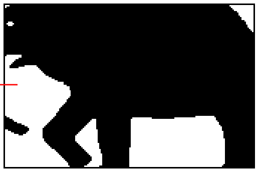


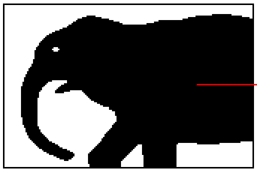
The truncation and scaling options do not affect the picture itself. The contents of a Picture field is always saved. Only the display on the particular form is affected by the picture display format.

Truncated (Centered and Non-centered)

The Truncated (Centered) format causes 4th Dimension to center the picture in the field and crop any portion that does not fit within the field area. 4th Dimension crops equally from each edge and from the top and bottom.

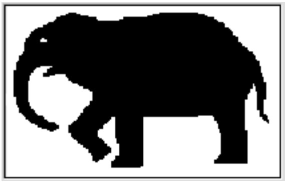
The Truncated (Non-centered) format causes 4th Dimension to place the upper-left corner of the picture in the upper-left corner of the field and crop any portion that does not fit within the field area. 4th Dimension crops from the right and bottom. The figure below compares the Truncated Centered and Non-centered formats.

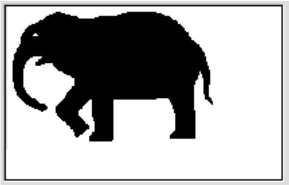

Truncated centered

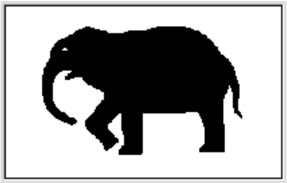

Truncated non-centered

Scaled to Fit

The Scaled to Fit formats cause 4th Dimension to resize the picture to fit the dimensions of the field area. The figure below compares the three Scaled to Fit formats.


Scaled to Fit


Scaled to Fit (Proportional)


Scaled to Fit Centered (Proportional)

When you use Scaled to Fit (Proportional), the picture is reduced proportionally on all sides to fit the area created for the picture. The Scaled to Fit Centered (Proportional) option does the same, but centers the image in the picture area.

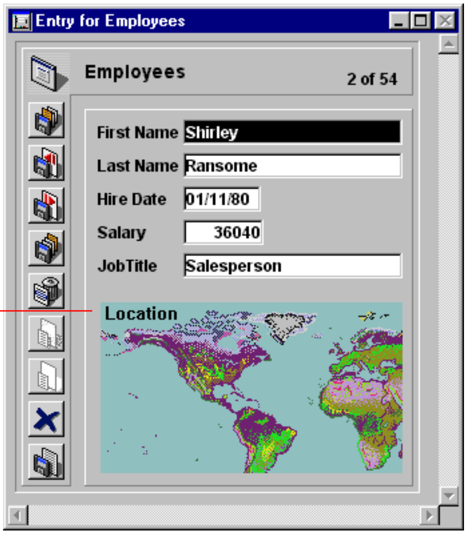
If the picture is smaller than the area defined in the form, the picture will not be modified.

If the picture is bigger than the area defined in the form, the picture is proportionally reduced. Since the picture is proportionally reduced, it will not appear distorted.

On Background

On Background makes the picture transparent. Any objects placed behind the graphic such as fields or variables are visible through the graphic. When a Picture field is in this format, the user can move the picture around the inside of the Picture field by dragging it. 4th Dimension remembers the object's position on the background.

The figure below shows a form that includes a picture with the On Background format.



Entry for Employees

Employees 2 of 54

First Name Shirley

Last Name Ransome

Hire Date 01/11/80

Salary 36040

JobTitle Salesperson

Note If you are printing pictures with the On Background format, they will be printed as bitmaps.

If your intent is to use the picture only as a background object for the form (not as data), you can instead paste the picture into the Picture library and then add the picture to the form by dragging. For more information, see "Picture Library" on page 22 and "Adding Fields to a Blank Page" on page 228.

Active Objects on a Form

This section is devoted to the active objects you can use on a form to control database and interface functions. Active objects include buttons, tab controls, pop-up menus, drop-down lists, hierarchical pop-up menus and hierarchical lists, combo boxes, scrollable areas, graph areas, and plug-ins. Enterable objects (variables) are treated much the same as fields and are described in the previous section.

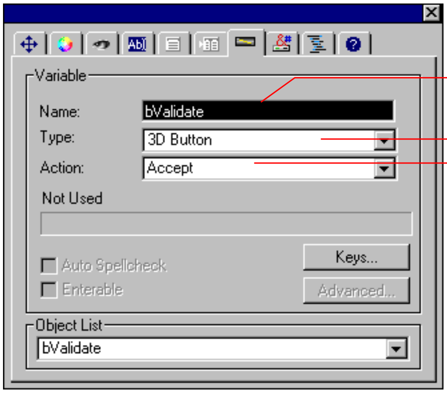
This section explains how to create and modify active objects other than fields and enterable objects. The different active object types are discussed in detail in the section, "Types of Active Objects" on page 291.

Setting Object Properties

Whenever you create an object on a form or modify an object's properties, you use the Object Properties window. Use the Object Properties window to name the object, specify its type, define its action, drag and drop properties, resizing or repositioning options, platform interface and appearance, and attach a method for the object.

The following pages in the Object Properties window are relevant for active objects:

- **Variable** Name the active object, choose its type, and select other options.



Variable

Name: bValidate

Type: 3D Button

Action: Accept

Not Used

☐ Auto Spellcheck

☐ Enterable

Object List

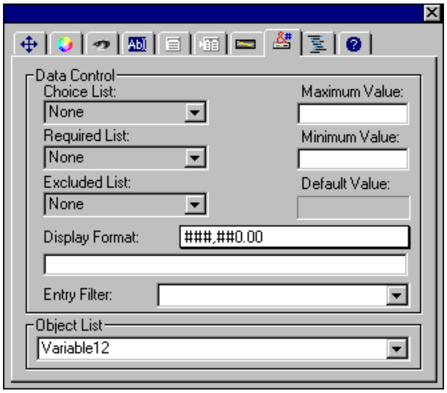
bValidate

Name the object

Set the object's type

Specify an automatic action, if appropriate

- **Data Control** For enterable objects, set data control options.



Data Control

Choice List: None

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

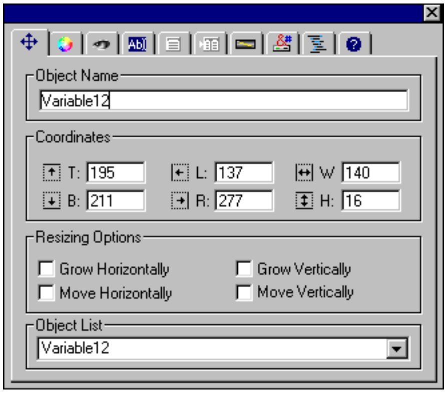
Display Format: ###,##0.00

Entry Filter:

Object List

Variable12

- **Coordinates** Set the size and location of the object and control resizing and repositioning options.



Object Name

Variable12

Coordinates

T: 195	L: 137	W 140
B: 211	R: 277	H: 16

Resizing Options

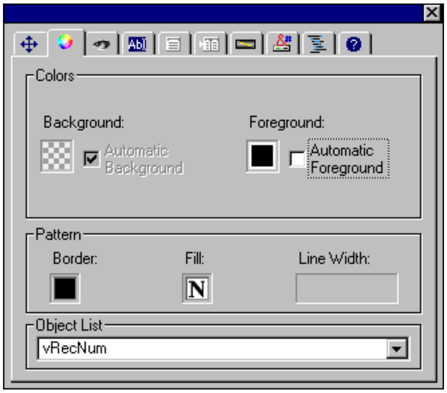
□ Grow Horizontally □ Grow Vertically
□ Move Horizontally □ Move Vertically

Object List

Variable12

With the Object Name area, you can also give the instance of the object on the form a different name from the permanent name of the object. With this name, you can use the language to set various object properties programmatically. For more information, see the section “Object Properties” in the *4th Dimension Language Reference*.

- **Colors** Set the foreground and background color.



Colors

Background: ☑ Automatic Background

Foreground: ☐ Automatic Foreground

Pattern

Border: ■

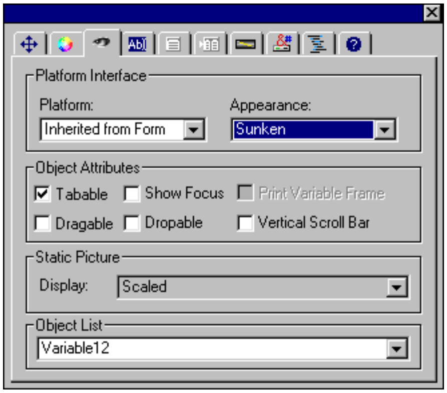
Fill: N

Line Width:

Object List

vRecNum

- **Display** Set the platform interface, appearance of decorative rectangles, drag and drop properties, focus properties, and properties of text and picture objects.



Platform Interface

Platform: Inherited from Form

Appearance: Sunken

Object Attributes

☑ Tabable ☐ Show Focus ☐ Print Variable Frame

☐ Dragable ☐ Dropable ☐ Vertical Scroll Bar

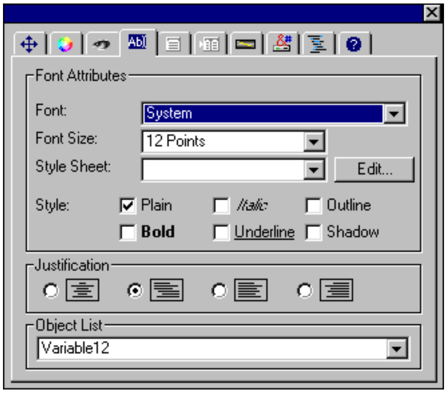
Static Picture

Display: Scaled

Object List

Variable12

- **Font** Set the font and justification attributes for the object.



Font Attributes

Font: System

Font Size: 12 Points

Style Sheet:

Style: ☑ Plain ☐ *Italic* ☐ Outline ☐ **Bold** ☐ Underline ☐ Shadow

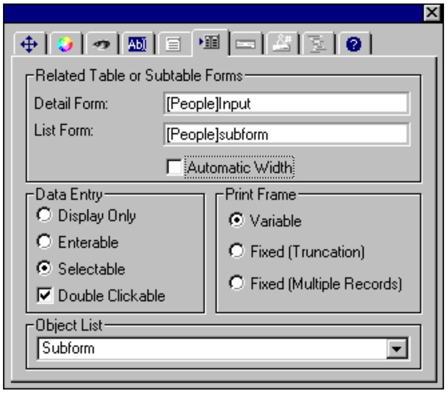
Justification

○ ● ○ ○

Object List

Variable12

- **Subform** Set the properties for subforms (enabled only for subform objects).



Related Table or Subtable Forms

Detail Form: [People]Input

List Form: [People]subform

☐ Automatic Width

Data Entry

○ Display Only

○ Enterable

● Selectable

☑ Double Clickable

Print Frame

● Variable

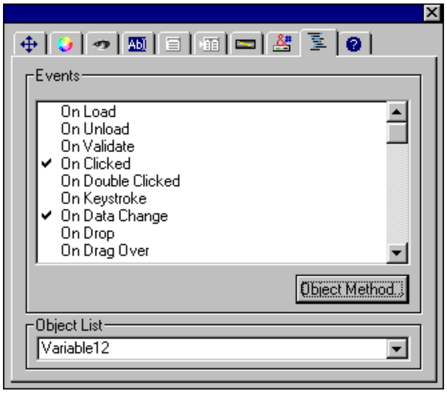
○ Fixed (Truncation)

○ Fixed (Multiple Records)

Object List

Subform

- **Events** Activate the events that will be executed when the object is used and write a method.



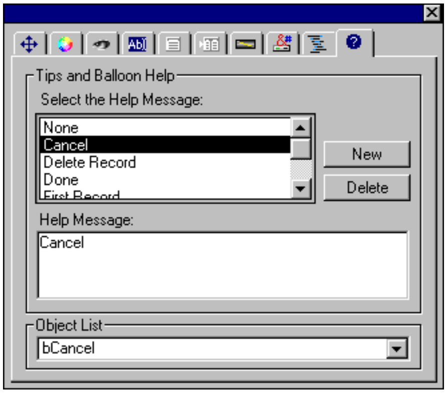
Events

On Load
On Unload
On Validate
✓ On Clicked
On Double Clicked
On Keystroke
✓ On Data Change
On Drop
On Drag Over

Object List

Variable12

- **Help** Add Balloon help and a tip to the object.



Tips and Balloon Help

Select the Help Message:

None
Cancel
Delete Record
Done
First Record

Help Message: Cancel

Object List: bCancel

Creating an Active Object

You can create an active object using either the Tools palette or the Objects palette. With the Tools palette, you create an active object by drawing the object on a form using the Active Object or Subform tool. With the Objects palette, you create the object by dragging the object from the palette to the form. You then set the properties for the new object.

When you use the Active object tool in the Tools palette, you must specify the type of active Object in the Variable page of the Object Properties window. If you use the Objects palette, you select the desired object type from the palette; the object type you select is assigned automatically.

The following tools in the Tools palette create new active objects[1]:

- **Active Object tool** Creates an object of any type except subform. This includes enterable and non-enterable areas, buttons, check boxes and radio buttons, tab controls, pop-up and drop-down menus (including hierarchical pop-up menus and hierarchical lists), combo boxes, scrollable areas, graphs, indicators (thermometers, rulers, and dials), picture menus, button grids, and plug-in areas.[2] Select the tool, draw a mar-

[1] Obviously, the Add Field tool adds a field to the form. For information about adding fields and modifying the properties of existing fields, see the section "Adding Fields to a Form" on page 241.

[2] For complete information on each type of object, see the section "Types of Active Objects" on page 291.

quee on the form where you want to position the object, and set the object's properties in the Object Properties window.

- **Subform** Can be used to create subforms. For information on creating subforms, see "Adding a Subform to the Form" on page 324.

► To create an active object with the Active Object tool:

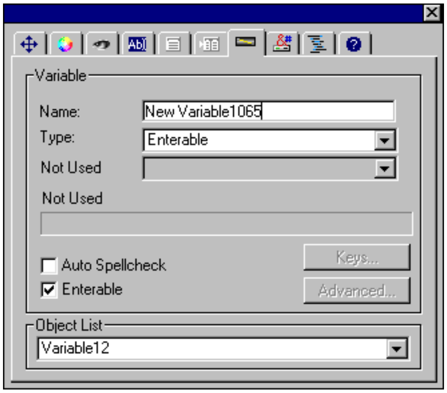
1 **Click the Active Object tool in the Tools palette.**

When you move the pointer into the form area, it becomes a crosshair.

2 **Position the crosshair where you want to place one corner of the object.**

3 **Drag the crosshair diagonally to define the size of the object and then release the mouse button.**

4th Dimension displays the Variable page of the Object Properties window.



Variable

Name: New Variable1065

Type: Enterable

Not Used

Not Used

□ Auto Spellcheck

☑ Enterable

Object List

Variable12

4 **Define the object by entering a name in the Name box and choosing a type from the Type drop-down list.**

You use the name of the object to refer to it in methods. You should name all objects. For that reason, 4th Dimension provides default names. Be sure the name is unique, so that 4th Dimension will understand any references to it.

When you choose the type, 4th Dimension changes the remainder of the page to suit the object type you have chosen.

5 **Continue setting specifications in the Object Properties window.**

For complete information on creating each type of object, see the section "Types of Active Objects" on page 291.

The object appears in the form where you drew it. It takes the shape appropriate to its type and it displays the name you gave it or the text you entered for it to display.

After you create an object, you can handle it as you would any other form object. You can resize most objects, apply a font, define a color for display on a color monitor, and so on.

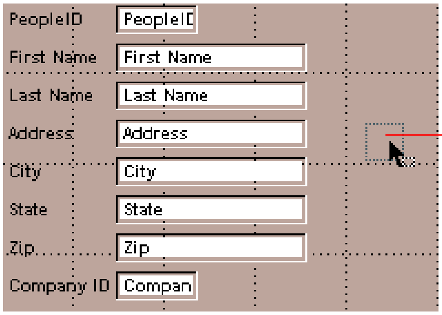
► To create an active object using the Objects palette:

1 **Click the desired object in the Objects palette and hold down the mouse button.**

For a description of the tools in the Objects palette, see the sections "The Objects Palette" on page 175 and "Types of Active Objects" on page 291.

2 **Drag the object from the Objects palette to the area on the form where you would like to place the object.**

As you drag, an outline of the object you are creating appears.



PeopleID PeopleID
First Name First Name
Last Name Last Name
Address Address
City City
State State
Zip Zip
Company ID Compan

Outline of new object

3 **Release the mouse button.**

4th Dimension creates the object. Since the new object is a variable, you need to specify object properties to link it to data or give it an action.

4 **Double-click the object or press Shift+Ctrl+Space bar (Shift-Command-Space bar on Macintosh) to display the Object Properties window.**

The object type that you selected in step 1 is preselected.

5 **Specify the desired object properties using the Object Properties window.**

You can set any object property. If necessary, you can even change the object type.

Modifying an Active Object

You can modify the properties of any object on a form.

► To modify an object's properties:

1 Select the object you want to work with and double-click it.

The Variable page of the Object Properties window appears, displaying the properties for that object.

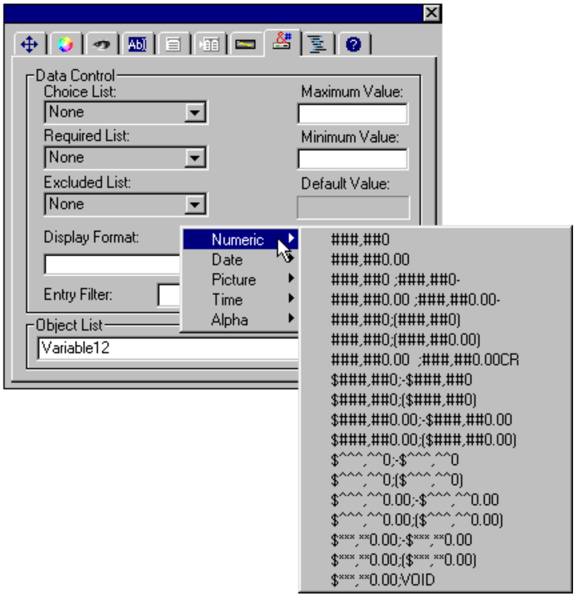
Note If the object has been grouped with another object, you must ungroup it before you can display the Object Properties window.

2 Make any changes you like.

4th Dimension sets new properties for the object.

Display Formats for Enterable Objects

The Object Properties window provides the same display formats for both enterable and non-enterable objects as it does for fields. The difference is that 4th Dimension does not know what data type is to be displayed or used in the object. For variables, the Display format pop-up menu is a hierarchical pop-up menu. You choose the data type (Numeric, Alpha, Date, Time, or Picture) and then the display format.



Choice List: None

Required List: None

Excluded List: None

Object List: Variable12

The selected format is displayed in the Display Format area. If you choose a numeric or alpha object type, you can edit the format in the usual way. You can type formats for objects directly into the Display

Format area or you can use custom formats to set formats. For more information about display formats, see the section “Display Formats” on page 267.

Data Entry Controls for Enterable Objects

The Object Properties window provides data entry controls for enterable objects as well as for fields. These controls allow you to:

- Set an entry filter that defines allowable characters,
- Display a choice list,
- Establish lists of required values or excluded values,
- Set maximum and minimum allowable values,
- Set default values or default lists of values.

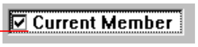
These controls work for enterable objects exactly as they work for fields. For complete information, see the appropriate sections earlier in this chapter.

Setting the Tabable and Show Focus Properties

The Display page of the Object Properties window has two controls that are related to the process of selecting an object for data entry.

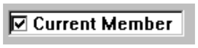
The Focusable property controls whether the object indicates visually that it is selected (i.e, that the object “has focus”). For example, the following illustration shows the effect of the Focusable property on check boxes.

Marquee



☑ Current Member

Check box shows focus when selected



☑ Current Member

Check box is selected but cannot show focus

The lower check box is enterable (the user can check or uncheck the check box) but the object doesn’t display a marquee when it has focus.

If an object has the Tabable property, it can gain the focus with the Tab key. A focusable object is not necessarily Tabable. For example, you may wish to make a drop-down list or combo box focusable but not Tabable. To use the control, the user would have to select it using the mouse.

An object that is not set as focusable cannot be tabable.

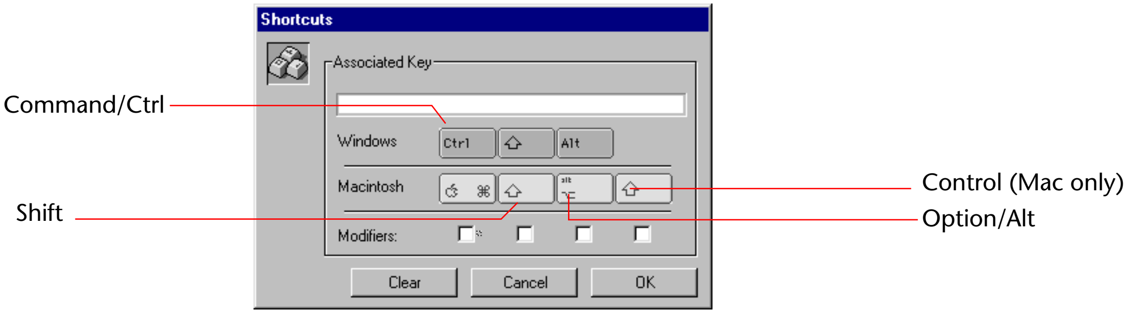
Assigning a Keyboard Equivalent

The Variable page of the Object Properties window allows you to assign a keyboard shortcut for buttons and check boxes. The user can then activate the button or select the check box using the keyboard instead of having to use the mouse.

► To assign a keyboard shortcut:

1 **Click the Keys button in the Variables page of the Object Properties window.**

The Shortcuts dialog box appears.



2 **Type the keyboard shortcut.**

For example, if you want to use Ctrl+h, hold down the **Ctrl** key and press h. The letter h will then appear in the Associated key area and the check box below the Ctrl key will be checked.

You are not required to use modifier keys. You can use any key alone as the shortcut, although this is not recommended in most cases.

If you like, you can manually modify the selection of modifier keys by selecting or deselecting any of the modifier key check boxes.

To start over again, click **Clear**.

3 **When you have finished, click OK.**

If you want to change the shortcut later, simply open the Shortcuts dialog box and type the key combination you want to use.
4th Dimension displays the new combination in the Shortcuts dialog box.

Enabling Drag and Drop

Active objects on a form may have drag and drop properties. Two options on the Display page of the Object Properties window are related to drag and drop.

- **Dragable** controls whether the user has the ability to drag the object,
- **Dropable** controls whether the object has the ability to “receive” a dragged object.

If you want to enable drag and/or drop for a particular object, enable the appropriate property. You then must manage the drag and drop action using a method. For more information, see the section on Drag and Drop commands in the *4th Dimension Language Reference*.

Types of Active Objects

4th Dimension provides the following types of active objects (in addition to fields):

- Enterable object (i.e., a variable),
- Non-enterable object,
- Button,
- Radio button,
- Check box,
- Pop-up menu,
- Scrollable area,
- Invisible button,
- Highlight button,
- Radio picture,
- Graph,
- Plug-in,
- Thermometer,
- Ruler,
- Dial,
- Tab control,

- Picture menu,
- 3D button,
- 3D check box,
- 3D radio button,
- Picture button,
- Drop-down list,
- Button grid,
- Hierarchical list,
- Hierarchical pop-up menu,
- Combo box.

The sections that follow describe each kind of object in detail.

Enterable and Non-enterable Objects

An enterable object (i.e., a variable) allows the user to enter a value into a variable and display the value. A non-enterable object allows you to display the value of a variable.You use methods to manage enterable and non-enterable objects.

Variables are used for temporary storage of data. One common use for a variable is to display calculations that are done using a method such as:

```
vTotal := Quantity * Price
```

You create an object that displays the result of the calculation, name the object vTotal, and use a method to do the calculation.

An enterable object accepts data. You can set data entry controls for the object as you would for a field. The entered data is associated with the object name. You can manage the data with object or form methods using the object's name as a variable.

A non-enterable object only displays data. The displayed data is associated with the object's name. You control the data with methods, using the object's name as a variable.

Enterable and non-enterable objects can be of any size. Since they display characters, when the object area is resized, it snaps to a size depending on the object's font size. Objects that contain alphanumeric characters, numbers, dates, times, and pictures can make use of display formats. Text objects can use a scroll bar and can be printed with variable frame. Picture objects can be scaled or truncated.

Buttons

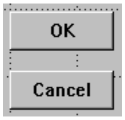
The Form editor lets you add a wide variety of buttons to your forms. When you add buttons to a form, you can associate an automatic action to each button. Automatic buttons let the user accept, cancel, or delete records, move between records, move from page to page in a multi-page form, and open, delete, or add records in a subform.

You normally add buttons when you create the form using the Form Wizard. You can modify these buttons' actions by opening the Buttons page of the Object Properties window and making any changes you like. For example, you can remove an automatic action from a button and write an object method that specifies the button's action.

You can also add buttons and assign button actions with the Form editor. For example, if you need more than one subform on the form, you can add the necessary additional subforms and automatic buttons in the Form editor. You simply add each button to the form and associate the automatic action with each button.

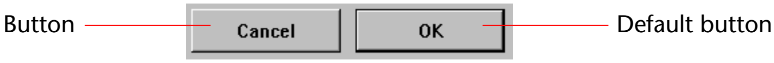
You can associate automatic button actions to the following types of buttons:

- **Buttons** These are standard text buttons that are displayed as boxes. Button text is displayed in the selected font, font size, style, and color.



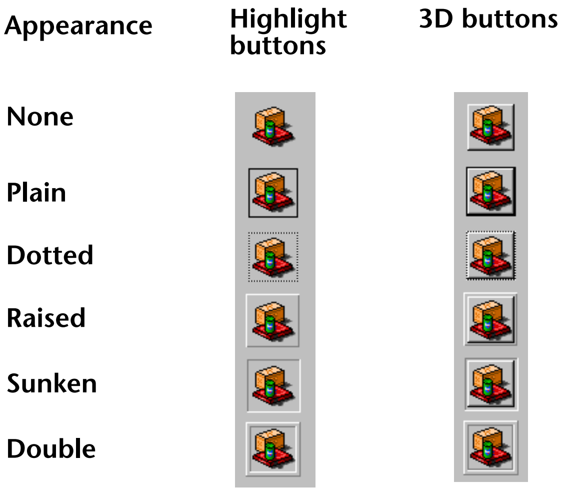
When you create a button, you should type a label into the Button Text area. The label appears inside the button when the form is used in the User environment or custom applications. You can change the text that appears in the button at any time by returning to the Object Properties window and modifying the text in the Button text area.

- **Default Buttons** A default button looks exactly like a button, except that is border is thicker. This indicates to the user that the button is the recommended choice. The following illustration compares a button to a default button.



- **Highlight buttons and 3D buttons** These buttons are designed to be placed on top of graphic objects. They are invisible until clicked. When the user clicks a highlight button, the button is highlighted. Highlight buttons are dimmed in appropriate circumstances in the User environment and in custom applications.

  The appearance of highlight and 3D buttons depends on the Appearance settings of the form on which the button appears and the button's Appearance settings. The diagram below illustrates the variations.

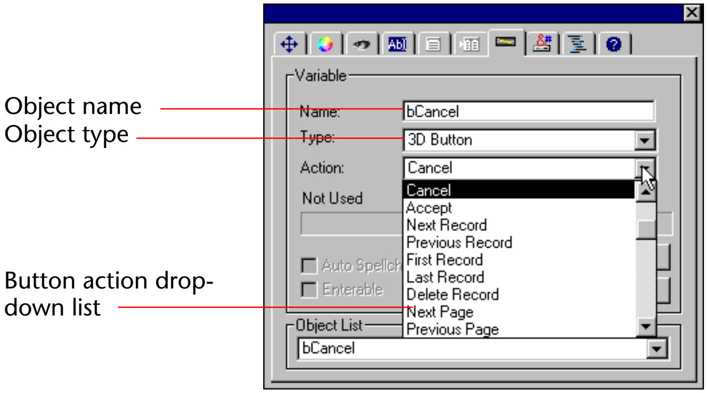


- **Invisible buttons** These buttons are invisible and do not highlight when clicked. The resulting action, such as displaying a different page, should indicate that the button has been clicked. An invisible button should be placed on top of text or a graphic that denotes its function; the user clicks on the text or graphic, and the button is activated.

  Employee Info **Review Info** **Address Info**

  Buttons are dimmed when appropriate in the User environment or custom applications. For example, if the first record of a table were displayed, a First Record button would appear dimmed.

  You create a button by choosing the desired button type from the Type drop-down list. You then choose the automatic button action you want from the Action drop-down list.



Variable

Name: bCancel

Type: 3D Button

Action: Cancel

Not Used

☐ Auto Spellch

☐ Enterable

Object List

bCancel

Regardless of the type of button, you must select an item from this drop-down list. If you want the button to perform an action not listed in the Action drop-down list, choose “No Action” and write a method that specifies the button’s action. Normally, you would activate the On Clicked event in the Events page and the method would run only when the button is clicked.

Note All variables associated with buttons (including regular buttons, highlight buttons, invisible buttons, radio buttons, radio pictures, or check boxes) are initialized to 0 when the form is first opened in the User environment. When the user clicks a button, it becomes 1. You can associate a method with any button.

Button Actions

This section discusses each automatic action that can be assigned to a button.

- **No Action** Use a **No Action** button for a button that does not perform an automatic action. Choose No Action when you need to write a method to manage the button. For example, a button that displays a custom Find dialog box in a custom application would have a No Action automatic action because you must write a method to open the custom dialog box.
- **Accept and Cancel Actions** Clicking an **Accept** button saves a record. It triggers an On Validate event. Clicking a **Cancel** button exits the current record without saving any changes.
- **Delete Record Action** Clicking a **Delete Record** button displays an alert asking the user to confirm the deletion. Clicking Yes in the alert deletes the current record. If the user is using the input form for a subrecord, **Delete Record** deletes the current subrecord.

After the user clicks a **Delete Record** button, 4th Dimension automatically returns to the output display.

Note A button with this action is automatically disabled when a new record is being added.

- **Record Navigation Actions** The **Next Record**, **Previous Record**, **First Record**, and **Last Record** buttons first accept the current record and then make the specified record current. The specific record made current by these buttons depends on the sort order.

  These buttons perform the appropriate actions for subrecords when the user is entering subrecords.

  A button of this type is automatically disabled when its action is inappropriate. For example, if the user displays the first record, the **Previous Record** button would be disabled.

- **Page Navigation Actions The First Page**, **Last Page**, **Next Page**, and **Previous Page** buttons display the appropriate page in a multi-page form. If there is only one page, these buttons are inactive.

  A button of this type is automatically disabled when its action is inappropriate. For example, if the user displays the first page, the **Previous Page** button would be disabled.

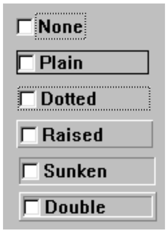
- **Subform Actions** The **Subform** buttons affect records in subforms. You can open, delete, or add to records displayed in subforms. Placed on a parent record's form, they affect subrecords or related records in a subform. The following are the Subform button actions:
  - **Open Subform** This button is active when a record in a subform is selected. If the user selects a record and clicks the **Open Subform** button, the Full Page form for that record opens and the user can modify the record.
  - **Delete Subform** This button is active when a record has been selected in a subform. The **Delete Subform** button does not display an alert, but erases the record immediately.
  - **Add to Subform** This button is active when a subform has been selected. When the user clicks an **Add To Subform** button, 4th Dimension creates a new record in the related table or subtable, scrolls to the record, and places the insertion point in the first enterable field in the subform.

For more information about using the Subform buttons, refer to "Adding a Subform to the Form" on page 324.

Check Boxes and 3D Check Boxes

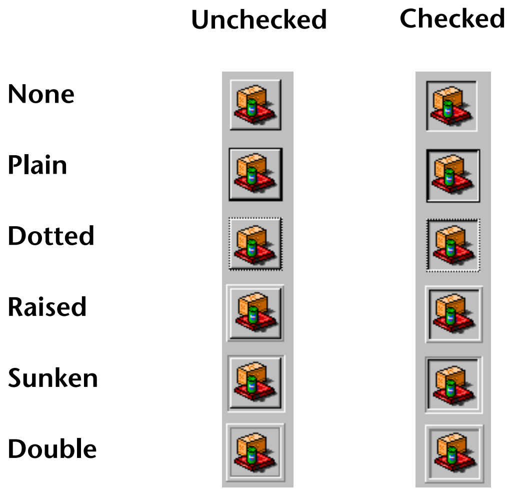
A check box is used to enter or display binary (true-false) data. A check box is a type of button. A check box is either selected or deselected. The effect of a check box is controlled by a method. Like all buttons, a check box is initialized to 0 when the form is first opened. The method associated with a check box executes when the check box is selected.

A check box displays text next to a small square. When the user selects the check box, the square is checked (an "X" is placed in it). When a check box is selected, it has the value 1. When deselected, it has the value 0. Any or all check boxes in a form can be selected or deselected. A group of check boxes allows the user to select several items. The following illustration shows the effect of each Appearance setting on check boxes.



A 3D check box is similar to a highlight button. You place it on top of a graphic that indicates the function of the check box. When a 3D check box is clicked, its appearance changes according to the Appearance settings in the Display page of the Object Properties window. A 3D check box retains its state (0 or 1) until the user clicks it again.

The following illustration shows the effect of each Appearance setting.



Unlike a Boolean field that is formatted as a check box, the values of the check box variable are not stored automatically. You use a method to manage the variable.

Radio Buttons, 3D Radio Buttons, and Radio Pictures

Radio buttons, 3D radio buttons, and radio pictures are objects that allow the user to select one of a group of buttons or pictures. A radio button shows a small bull's-eye and text. 3D radio buttons and radio pictures display an icon or picture. They are placed on top of a graphic.

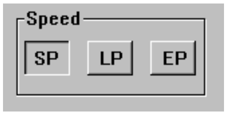
Each type of radio button is selected the same way — you click the object to select it. You can also click a selected radio picture to deselect it, but you cannot do this with a radio button.

3D radio buttons and radio pictures are similar to a highlight button in that it is transparent until selected. When selected, it highlights the picture behind it until it is deselected or another radio picture is selected. The user can move the pointer off the radio picture to avoid selecting it.

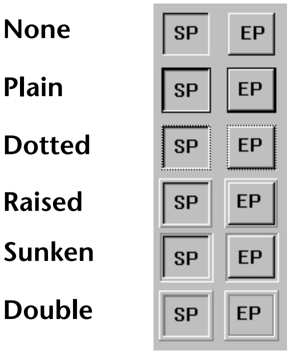
The remainder of this section uses the term "radio button" to mean any type of radio button.

Radio buttons exist in exclusive sets. The name of each object in a group of radio buttons must begin with the same letter (e.g., bRadio1, bRadio2, bRadio3). The effects of radio buttons are controlled with methods. Like all buttons, a radio button is initialized to 0 when the form is first opened. A method associated with a radio button executes when it is selected.

The following is an example of a group of 3D radio buttons used in a video collection database to enter the speed of the recording (SP, LP, or EP).

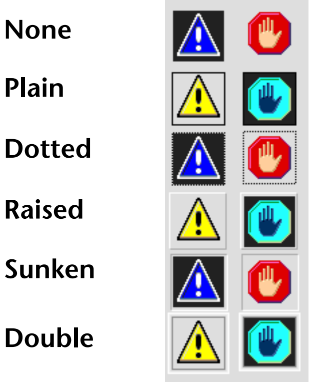


The labels are provided by separate Text objects that are placed on top of each 3D radio button. The “None” Appearance setting was used in the above example. The following illustration shows the effects of each Appearance setting. In each case, the SP tape speed is selected.



Selecting one radio button in a group sets that button to 1 and all the others in the group to 0. Only one radio button can be selected at a time.

The following illustration shows the effects of each Appearance setting on radio pictures. The selected radio picture is black on white.

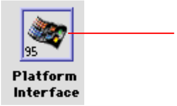


3D radio buttons retain their state (0 or 1) until another radio button in the set is clicked.

Picture Buttons

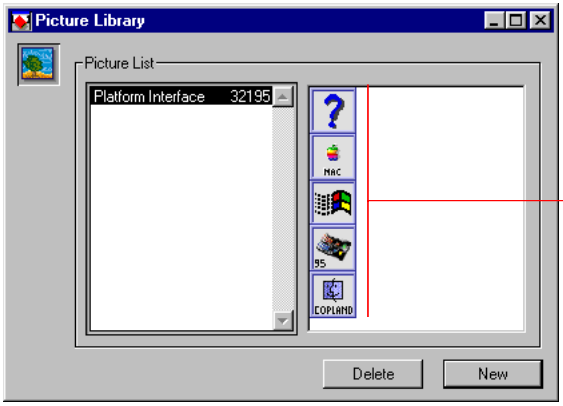
A picture button lets the user choose among several choices. As the name indicates, each choice is represented by a picture. A picture button can be used in place of a picture menu. With a picture menu, all choices are displayed simultaneously (as the items in the pop-up menu), while the picture button displays the choices consecutively (as the user clicks the button).

Here is an example of a picture button. Suppose you want to give the users of a custom application the opportunity to choose the platform interface for the application. You implement the option as a picture button in your custom Database Properties dialog box, as shown below.



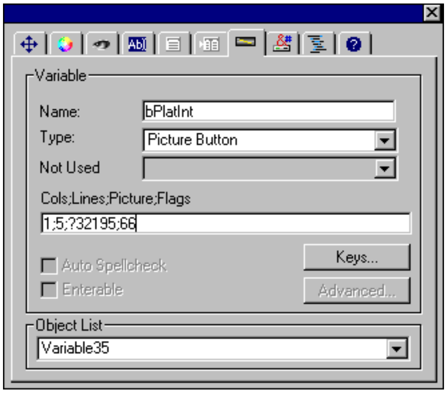
Clicking the object changes the picture

You implement the picture button in the following manner. First, you prepare *one* graphic in which the series of pictures is arranged in a row, column, or row by column grid. You can add the graphic to the Picture library or as a PICT resource (on Macintosh). The following illustration shows the graphic in the Picture library.



The picture button is designed to display only one picture in the series at a time

Next, add a picture button object to your form. In the Object Properties window, you choose Picture Button as the object type and set the parameters as follows.



Variable

Name: bPlatInt

Type: Picture Button

Not Used

Cols;Lines;Picture;Flags

1;5;?32195;66

□ Auto Spellcheck

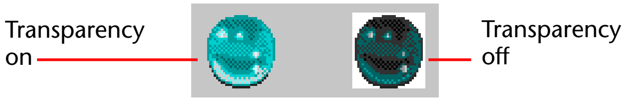
□ Enterable

Object List

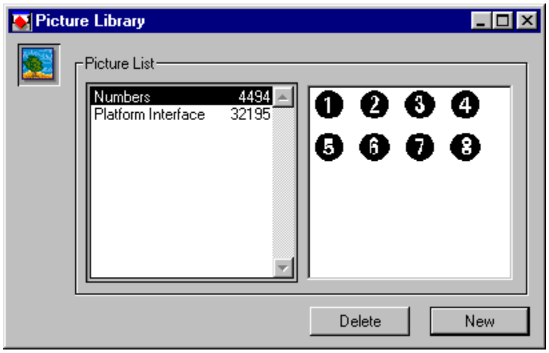
Variable35

- *Cols* and *Lines* give the dimensions of the array of pictures. Since this example arranges the pictures in a column, the specification is 1 column by 5 rows.
- *Picture* identifies the picture in the Picture library or in the resource file. If the picture is in the Picture library, precede its number with a question mark “?”; if the picture is a resource, precede the resource ID with a colon “:”.

- *Flags* controls the appearance of the object and the behavior of the object when the user clicks on the object. *Flags* is the sum of the following values:

Value	Description
0	Displays the next picture in the series when the user clicks; it displays the previous picture in the series when the user holds down the **Shift** key and clicks. When the user reaches the last picture in the series, the picture does not change when the user clicks again. That is, it does *not* cycle back to the first picture in the series
1	Is similar to 0 except that the user can hold down the mouse button to display the pictures continuously (i.e., as an animation). When the user reaches the last picture, the object does *not* cycle back to the first picture.
2	Is similar to 0 except that the pictures are displayed in a continuous loop. When the user reaches the last picture and clicks again, the first picture appears, and so forth.
32	Displays again the first picture after the user has clicked on it. In other words, the button displays the button will display the A picture as a default picture, it will switch to the B picture when the button is being clicked on and then will switch back to the A picture when the mouse button is released. This mode allows you to create a button that displays pictures according to its states (raised or sunken). You can then create a custom 3D effect or an image that is actually symbolizing the action. The format for such a button will typically be: 1;2;?15000;32
64	Controls transparency. If you use 64, the picture button background is transparent. The effect of transparency is shown in the following illustration: 

You would normally arrange the pictures in a row or column as shown here, but you can also arrange the pictures in a two-dimensional array, as shown below.



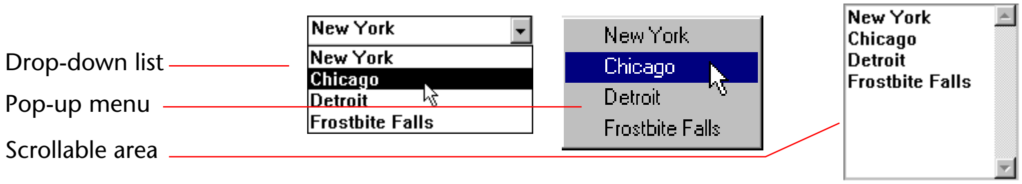
With the graphic shown above, you would use the parameters "4;2;?4494;66". With these specifications, the object would cycle continuously from 1 to 8 as the user clicked.

The name of the object contains the number of the picture that is clicked. The first picture is number zero (0). In this way, you can use an object method to test for the selected picture and take appropriate action.

Menu/Drop-down Lists, Pop-up Menus, Drop-down Lists, and Scrollable Areas

Pop-up menus, drop-down lists, and scrollable areas are objects that allow the user to select from a list. You manage the items displayed in the pop-up menu or scrollable area using an array. An array is a list of values in memory that is referenced by the name of the array. A pop-up menu displays an array as a pop-up menu. A drop-down list displays an array as a Windows drop-down list. A menu/drop-down list displays an array as a pop-up menu on Macintosh and a drop-down list on Windows. A scrollable area displays the array in a list box that can be scrolled and used to select an item.

The figure below shows a pop-up menu, a drop-down list, and a scrollable area:



You initialize the object by loading a list of values into an array.

You can do this in several ways:

- In the Data Control page of the Object Properties window, click the **Edit Strings** button to enter the list into the Default Values dialog box. For more information, see "Default Lists of Values" on page 262. The default values are loaded into an array automatically. You can refer to the array using the name of the object.
- Before the object is displayed, execute code that assigns values to the array elements. For example.

  ```
  ARRAY TEXT (aCities;6)
  aCities{1}:="Philadelphia"
  aCities{2}:="Pittsburg"
  aCities{3}:="Grand Blanc"
  aCities{4}:="Bad Axe"
  aCities{5}:="Frostbite Falls"
  aCities{6}:="Green Bay"
  ```

  This code could be placed in the object's method and executed when the On Load form event runs.
- Before the object is displayed, load the values of a list into the array using the LIST TO ARRAY command. For example,

  ```
  LIST TO ARRAY ("Cities";aCities)
  ```

  This code would be run in place of the assignment statements shown above.

  If you need to save the user's choice into a field, you would use an assignment statement that runs after the record is accepted. A complete Case statement in the object method might look like this:

  ```
  Case of
    :(Form event=On Load)
      LIST TO ARRAY ("Cities";aCities)
      If (Record number ([People])<0)  `new record
        aCities:=3  `display a default value
      Else   `existing record, display stored value
        aCities:=Find in array (aCities;City)
      End if
    : (Form event=On Clicked)  `User modified selection
        City:=aCities {aCities}  `field gets new value
    :(Form event=On Validate)
      City:=aCities {aCities}
    :(Form event=On Unload)
      CLEAR VARIABLE (aCities)
  End Case
  ```

In the Events page of the Object Properties window, you would select each event that you test for in your Case statement.

Arrays always contain a finite number of items. The list of items is dynamic and can be changed by a method. Items in an array can be modified, sorted, and added to.

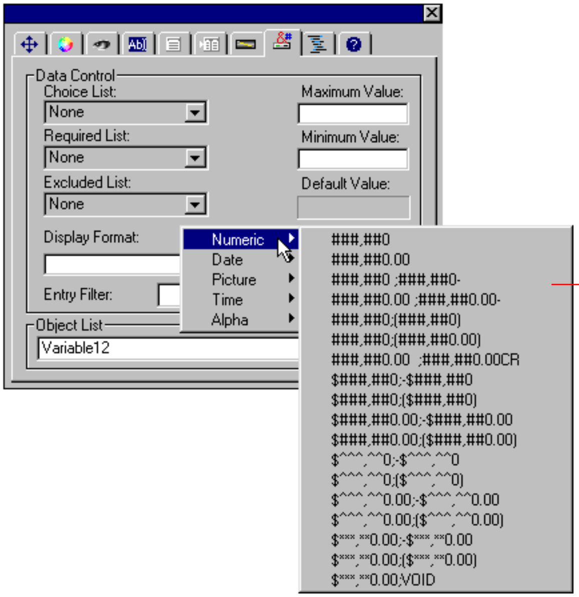
For information about creating and using an array, refer to the chapter on arrays in the *4th Dimension Language Reference*.

Combo boxes

A Combo box is similar to a drop-down list, except that the object accepts text entered from the keyboard. You initialize a combo box in exactly the same way as a drop-down list. If the user enters text into the combo box, it fills the 0th element of the array. In other respects, you treat a Combo box as an enterable area that uses its array as a set of default values. Use the On Data Change event to manage entries into the enterable area, as you would an enterable area object.

Hierarchical Pop-up Menus and Hierarchical Lists

A hierarchical pop-up menu has a submenu associated with each item in the menu. Here is an example of a hierarchical menu:



Choice List: None

Required List: None

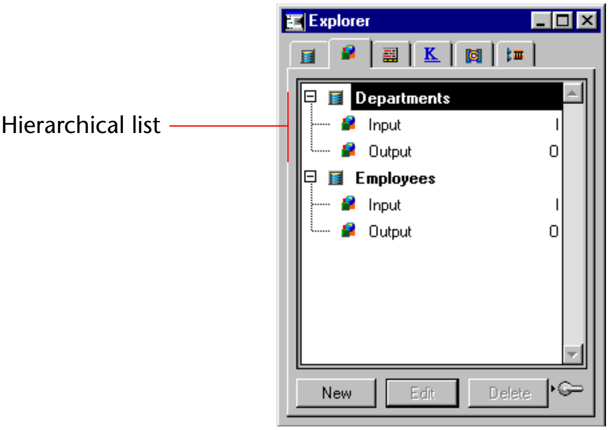
Excluded List: None

Object List: Variable12

Submenu

Similarly, a hierarchical list has a sublist associated with each item in the list.

The Explorer is an example of a series of hierarchical lists:



In this example, each item in the list of tables has a sublist of forms. You can expand or collapse the hierarchical list by clicking on the plus or minus sign (on Windows) or arrows (on Macintosh).

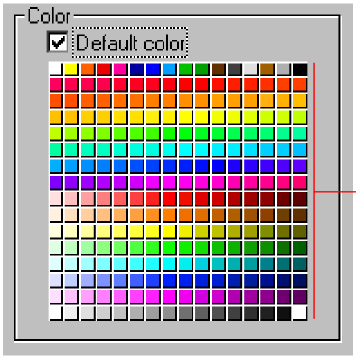
You can control whether an item in a hierarchical list can be modified by the user. If an item in a hierarchical list is modifiable, the user can hold down the **Ctrl** key (**Command** key on Macintosh) to edit the text of the item. If you populate a hierarchical list using a list created in the List editor, you control whether an item in a hierarchical list is modifiable using the Enterable check box in the List editor. For more information, see the section "Making a Hierarchical List Modifiable" on page 473.

You manage hierarchical pop-up menus and hierarchical lists using the Hierarchical list commands in the language. For more information, see that section of the Language reference.

Button Grids

A button grid is a transparent object that is placed on top of a graphic. The graphic should depict a row by column array. You can use a button grid object to determine where the user clicks on the graphic. Your object method would use the On Clicked event and take appropriate action depending on the location of the click.

In 4th Dimension, a button grid is used as a color palette:



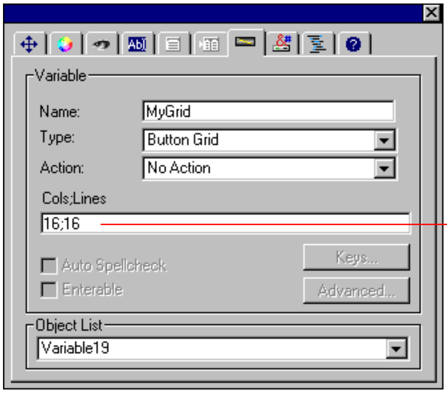
Color

☑ Default color

Button grid object on top of background graphic

The buttons on the grid are numbered from top left to bottom right. In this example, the grid is 16 columns across by 16 rows down. The button in the top-left position returns 1 when clicked. If the red button at the far right of the second row is selected, the button grid returns 32.

To create the button grid, add a background graphic to the form and place a button grid on top of the graphic. In the Variable page of the Object Properties window, specify the number of rows and columns of the grid and the gap between elements of the grid.



Variable

Name: MyGrid

Type: Button Grid

Action: No Action

Cols;Lines

16;16

□ Auto Spellcheck

□ Enterable

Object List

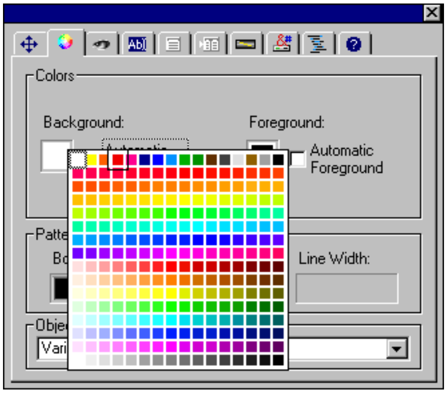
Variable19

Enter the number of columns and rows

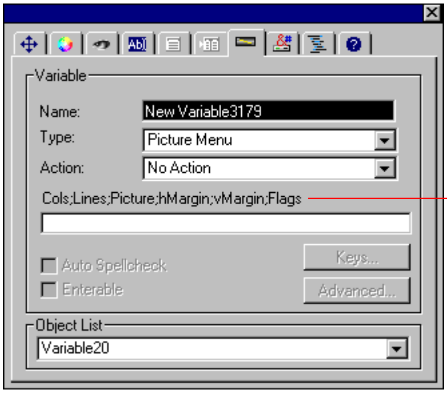
Picture Menus

A Picture menu is a pop-up menu that displays a two-dimensional array of images. The concept is the same as a button grid, except that the graphic is used as a pop-up menu instead of a form object.

The following illustration shows the color palette displayed as a Picture menu.



To create a Picture menu, you need to refer to an image. The reference is one of the parameters that you supply in the Variable page of the Object Properties window.


Variable

Name: New Variable3179

Type: Picture Menu

Action: No Action

Cols;Lines;Picture;hMargin;vMargin;Flags

□ Auto Spellcheck

□ Enterable

Object List: Variable20

The third parameter is a reference to the image

There are three ways to reference a picture in the Var parameter:

- For a variable, enter the name of the picture variable,
- For a PICT resource in your database, enter the PICT’s reference ID as “:1234”. Remember to include a colon, “:”, before the picture’s reference ID.
- For a PICT in your Picture library, enter the reference ID[1] of the picture preceded by a question mark, as shown in the example on the following page.

[1] The Reference ID is displayed in the Picture library.

The parameters vMargin and hMargin create a gap between the border of the menu and the picture. Enter values in pixels.

The parameter *Flags* can be:

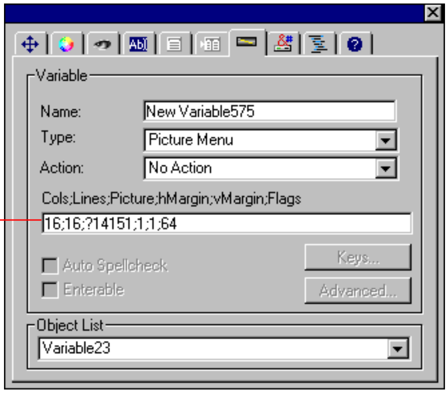
- 0 the pop-up menu box is not transparent, or
- 64 the pop-up menu box is transparent.

This parameter affects bitmapped pictures. If the picture is already transparent, the pop-up menu box will be transparent.

Make the following selections in the Variables page of the Object Properties window:

- The Object Type is Picture menu.
- The Action is No Action or Goto Page (page).

Enter parameters for the object. The parameters are given just above the entry area:



Variable

Name: New Variable575

Type: Picture Menu

Action: No Action

Cols;Lines;Picture;hMargin;vMargin;Flags

16;16;?14151;1;1;64

□ Auto Spellcheck

□ Enterable

Object List

Variable23

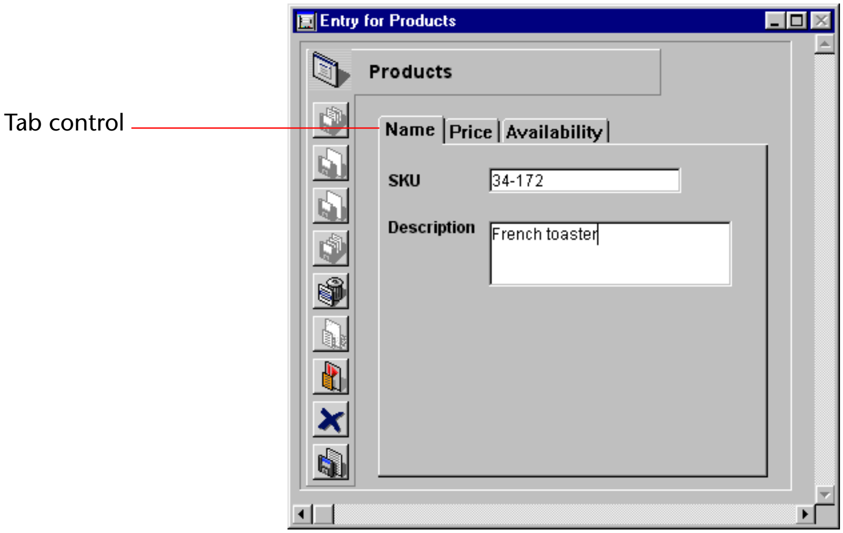
Picture menu parameters

This example uses a picture in the Picture library whose reference number is 14151.

The value of the picture menu object is zero (0) if no item is selected or the selected item number (1 to N). The items are numbered from left to right and top to bottom.

Tab Controls

A tab control creates an object that lets the user choose among a set of virtual screens that are enclosed by the tab control object. Each screen is accessed by clicking its tab. The following multi-page form uses a tab control object.



SKU 34-172

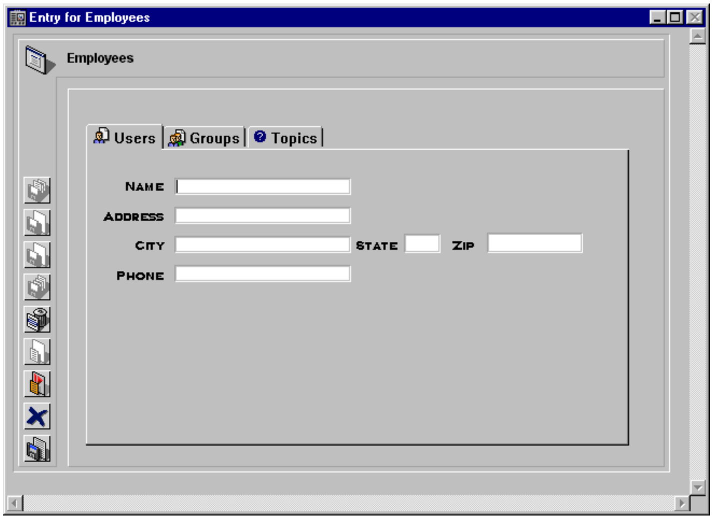
Description French toaster

To navigate from screen to screen, the user simply clicks the desired tab.

The screens can represent pages in a multiple-page form or an object that changes when the user clicks a tab. If the tab control is used as a page navigation tool, then the GOTO PAGE command would be used when a user clicks a tab.

Another use of the tab control is to control the data that is displayed in a subform or grouped scrollable arrays. For example, a rolodex could be implemented using a tab control. The tabs would display the letters of the alphabet and the tab control's action would be to load the data corresponding to the letter that the user clicked.

Each tab can display labels or labels and a small icon. If you include icons, the icons appear to the left of each label. Here is an example of a Tab control that uses icons:



When you create a tab control,4th Dimension manages the spacing and placement of the tabs. You only need to supply the labels in the form of an array or the icons and labels in the form of a hierarchical list.

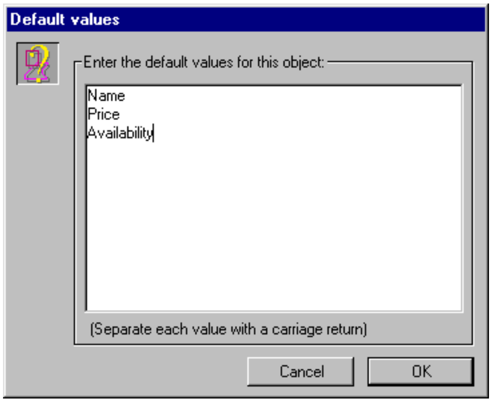
If the tab control is wide enough to display all the tabs with both the labels and icons, it displays both.

If the tab control is not wide enough to display both the labels and icons, 4th Dimension displays the icons only. If it can't fit all the icons, it places scroll arrows to the right of the last visible tab. The scroll arrows allow the user to scroll the icons to the left or right.

Adding Labels to a Tab Control

There are several ways to supply the labels for a tab control.

- Use the **Edit Strings** button on the Data Control page of the Object Properties window. Here is the Default Values dialog box that creates labels for the Products Tab control.



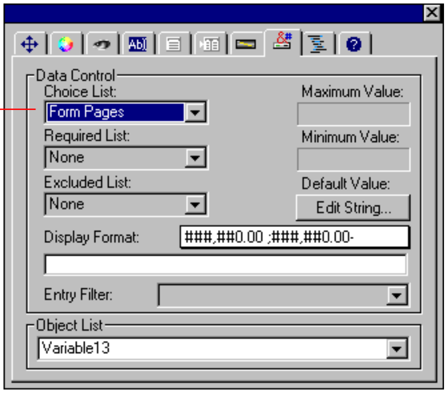
Default values

Enter the default values for this object:

Name
Price
Availability

(Separate each value with a carriage return)

- Create a list using the List editor and assign the list to the tab control as a choice list, as shown below.



List

Data Control

Choice List: Form Pages

Required List: None

Excluded List: None

Maximum Value:

Minimum Value:

Default Value:

Display Format: ###,##0.00 ;###,##0.00-

Entry Filter:

Object List

Variable13

If you like, you can associate a small icon with each list element using the List editor.

- You can create a Text array that contains the names of each page of the form. This code must be executed before the form is presented to the user. For example, you could place the code in the object method of the tab control and execute it when the On Load event occurs.

```
ARRAY TEXT (asPages;3)
asPage {1}:="Name"
asPage {2}:="Address"
asPage {3}:="Notes"
```

You can also store the names of the pages in a list and use the LIST TO ARRAY command to load the values into the array.

You could also enter the names of the pages as default values using the Object Properties window. For more information, see "Default Lists of Values" on page 262.

- Use the GOTO PAGE command in the Tab control's method:

  ```
  GOTO PAGE (asPages)
  ```

  The command is executed when the On Clicked event occurs.

- You then clear the array on the On Unload event occurs.

  Here is an example object method:

```
Case of
  :(Form event=On Load)
    LIST TO ARRAY ("Tab Labels";asPages)
  :(Form event=On Clicked)
    GOTO PAGE (asPages)
  :(Form event=On Unload)
    Clear variable (asPages)
End Case
```

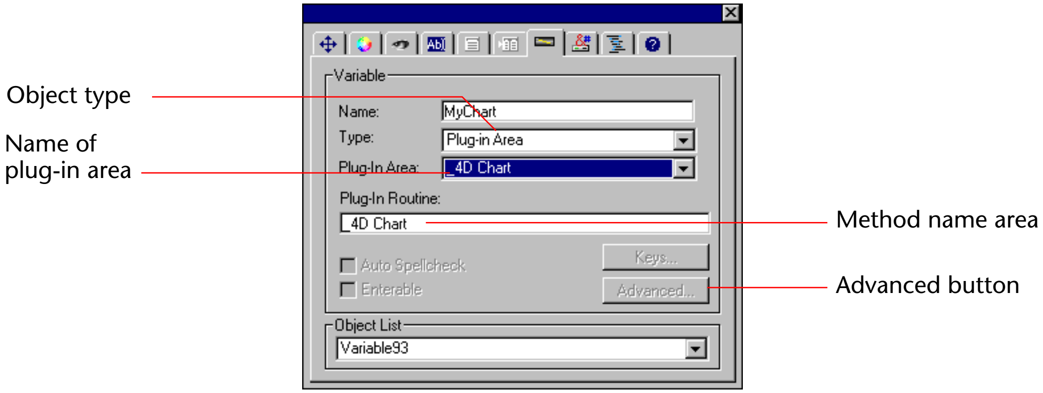
Graph Areas

A graph area can be used to display a graph in a form. There are many ways to bring values to the graph area for calculation and display, all of which are controlled by the graphing commands in the language. The subject is covered in the *4th Dimension Language Reference*.

Plug-in Objects

A *plug-in object* is an area on the form that is completely controlled by a 4D plug-in written in C or Pascal.

When opening a database, 4th Dimension creates an internal list of the plug-ins installed in your database. Once you have chosen Plug-in Area in the Type drop-down list, 4th Dimension lists the plug-ins in the second drop-down list. When you select the plug-in from this drop-down list, 4th Dimension automatically inserts it in the Method name enterable area.



Variable

Name: MyChart

Type: Plug-in Area

Plug-In Area: 4D Chart

Plug-In Routine:

4D Chart

□ Auto Spellcheck

□ Enterable

Object List

Variable93

When the object type is Plug-in Area, the Advanced button may be enabled. Advanced options may be provided by the author of the plug-in. If the plug-in provides additional options, you can click this button to set those options. Because the Advanced options dialog is under the control of the author of the plug-in, information about the Advanced options is the responsibility of the distributor of the plug-in. If the plug-in has no Advanced options, the Advanced button is disabled.

Installing Plug-ins

On Windows, you install a plug-in by copying the .4DX and .RSR files implementing the plug-in into the Win4DX directory located at the same level as the structure file (.4DB) of your database. If this directory does not exist, you create it using the Windows File Manager.

If, for instance, you have a database named MyDB located in the C:\WORK directory and you want to add the plug-in called XAreas, you end up with the following directory organization:

Pathname	Type of file
C:\WORK\MyDB\MyDB.4DB	Database structure file
C:\WORK\MyDB\MyDB.RSR	Database resource file
C:\WORK\MyDB\MyDB.4DD	Database data file
C:\WORK\MyDB\Win4DX\XAreas.4DX	XArea plug-in DLL file
C:\WORK\MyDB\Win4DX\XAreas.RSR	XArea plug--in resource file

Once you have copied these files and reopened the database, the plug-ins implemented by the XAreas plug-in are available in the Form editor.

On Macintosh, install the plug-in by copying it into your Mac4DX folder located in the same folder as your structure file.

Using Plug-ins

The ability to incorporate plug-ins into forms gives you unlimited possibilities when creating custom applications. A plug-in can perform a simple task such as displaying a digital clock on a form, or a complex task such as providing full-featured word processing, spreadsheet, or graphics capabilities.

Many of these capabilities are already available for the 4th Dimension environment in the form of plug-ins. The ACI productivity plug-ins set includes:

- 4D Write, a word processing application,
- 4D Draw, an object-oriented drawing application,
- 4D Calc, a spreadsheet application.

For more information, refer to the documentation that comes with the ACI Productivity Plug-ins.

If you are interested in designing your own plug-ins, you can receive extensive information about writing and implementing plug-ins. ACI provides the following information sources:

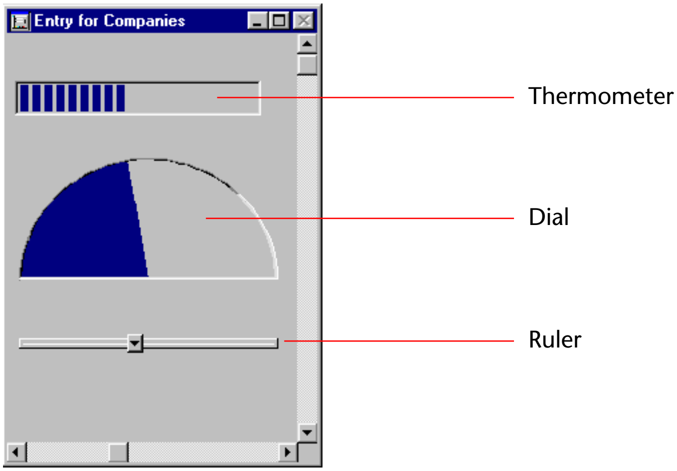
- **Platform Independent 4D Plug-ins Kit** The 4D Plug-ins kit teaches you how to write Plug-ins for 4th Dimension on both Windows and Macintosh.
- **Developer Tools** These developer mailings provide information and examples of plug-ins that can be used and modified for the developer's own needs.

For more information, contact ACI.

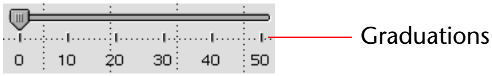
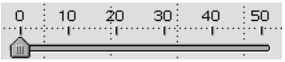
Indicators

Thermometers, rulers, and dials are objects that display a value graphically. The three objects work in the same way; they differ only in their appearance. We refer to these three objects as *indicators*.

You can use indicators either to display or set values. For example, if a thermometer is given a value by a method, it displays the value. If the user drags the indicator point, the value changes. The value can be used in another object such as a field or an enterable or non-enterable object.



You use the Object Properties window to enter the indicator’s parameters, *Min*, *Max*, *Unit*, *Size*, *Flags*. You set the minimum value, the maximum value, the units for the tick marks on the scale, the minimum steps that the indicator will allow, and a flag that controls how the indicator will be labelled and when the On data change event will be executed. *Flags* is the sum of values from the following table.

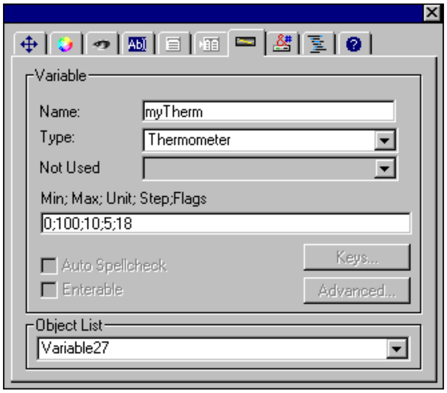
Value	**Description**
2	Display the units on the right or below the indicator. 
3	Display the units on the left or above the indicator. 
16	Display graduations adjacent to the units, as shown in both illustrations above. Used only if 2 or 3 is also selected.
32	On data change is executed while the user is adjusting the indicator. If this value is not used, On data change occurs only after the user is finished adjusting the indicator.

The two illustrations in the table are produced with graduations (vertical lines perpendicular to the ruler) on, so the values of *Flags* are 18 and 19, respectively.

For example, if you enter:

0;100;10;5;18

the object sets the minimum to 0, the maximum to 100, places tick marks every 10 units on the indicator, and increments the display when the value changes 5 units. The figure below shows these values being set for a thermometer.



Variable

Name: myTherm

Type: Thermometer

Not Used

Min; Max; Unit; Step;Flags

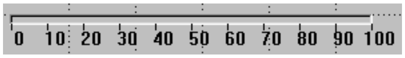
0;100;10;5;18

□ Auto Spellcheck

□ Enterable

Object List

Variable27



The variable associated with the indicator controls the display. You place values into, or use values from, the indicator using methods. For example, a method for a field or enterable object could be used to control a thermometer. The method:

```
vTherm:=[Employees]Salary
```

assigns the value of the Salary field to the vTherm variable. This method would be attached to the Salary field.

Conversely, you could use the indicator to control the value in a field. The user drags the indicator to set the value. The method:

```
[Employees]Salary:=vTherm
```

assigns the value of the thermometer to the salary field. As the user drags the indicator, the value in the Salary field changes.

Objects on Grid

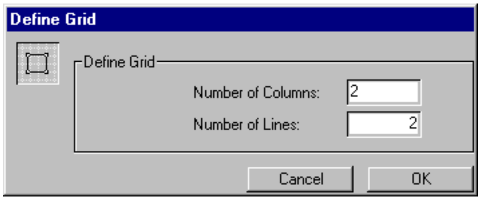
Sometimes you may want to place several similar active objects in a form at the same time, numbering them sequentially so that their names are unique. For example, you may want to create a series of buttons that perform database operations.

The form Grid tool and the **Objects on Grid** menu item work together to provide a quick and easy way to place objects on a grid.

► To create an array of active objects:

1 **Select the form Grid tool and draw a rectangle large enough to contain the objects you want to place in the form.**

4th Dimension displays the Define Grid dialog box.



Define Grid

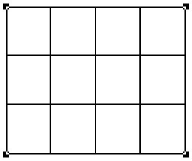
Define Grid

Number of Columns: 2

Number of Lines: 2

2 **Enter the number of rows (lines) and columns you want in the grid and click OK.**

4th Dimension creates a grid with the specified number of rows and columns. The grid is a graphic object that uses the current line width, fill pattern, and border pattern.

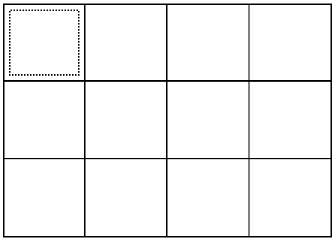


3 **Resize the grid if necessary, making each cell in the grid a little larger than the size of the object you want to display.**

Resizing an object is described in Chapter 4.

4 **Create a new active object of the size and type you require and position it in the upper-left cell in the grid object.**

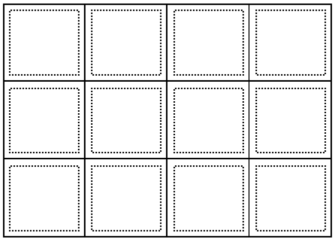
Give the new object a name without a number at the end.



5 **Select both the grid and the active object.**

6 **Choose Objects on Grid from the Form menu.**

4th Dimension copies the active object to each cell in the grid, giving each active object a unique number.



4th Dimension numbers the active objects from top to bottom in each column. These numbers are added to the object name for each object, thus creating a unique object at every grid cell.

Note To number the series of active objects from left to right in each row, hold down the **Alt** key (on Windows) or **Option** key (on Macintosh) when you choose **Objects on Grid**.

You can now use methods to refer to these objects by the names they have been given. You can delete the grid or leave it in the form.

Using Object Methods with Fields and Objects

You can attach a method to any active object in a form. Methods that are attached to individual objects on a form are called *object methods*.

The following are some of the more common uses of object methods:

- Enforce data entry constraints,
- Initialize and manage interface objects such as tab controls, pop-up menus, drop-down lists, combo boxes, hierarchical lists, and pop-up menus.
- Specify the action that takes place when an object is clicked or double-clicked,
- Manage drag and drop operations.

The previous section on types of active objects gives several simple examples of how methods are used to manage various kinds of objects. Here are some simple examples that perform operations on data:

The following method calculates a total based on data in two other fields:

```
Line Total := Price * Quantity
```

Here is a method to make all characters in a Name field uppercase:

Name := **Uppercase** (Name)

Note Built-in functions are displayed in boldface and user-written functions are displayed in italics. For a list of built-in functions, see the *4th Dimension Language Reference*.

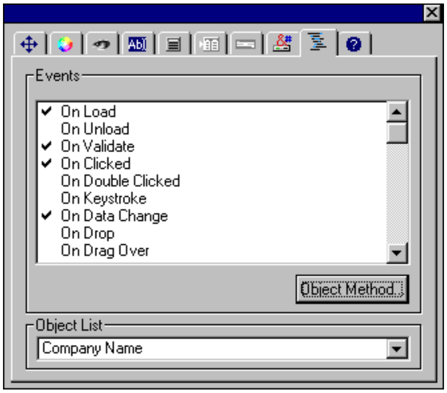
The following method concatenates values from a First Name field and a Last Name field and assigns the results to a variable named vName:

vName := First Name + " " + Last Name

Because each object method is attached to its object, you create object methods from within the Form editor. For information on how to use the Method editor, see the section "Using the Listing Editor" on page 395.

Object Events

Object methods run when certain events occur. For example, the action associated with a tab control makes sense only when a user clicks a tab. In a scrollable area, you may want the method to execute only when the user double-clicks an item. You can specify which events will be executed for a particular object in the Events page of the Object Properties window.



Events

- ✓ On Load
- On Unload
- ✓ On Validate
- ✓ On Clicked
- On Double Clicked
- On Keystroke
- ✓ On Data Change
- On Drop
- On Drag Over

Object List: Company Name

The Events list displays all possible events that can be executed. Here are the events that are relevant for forms that are displayed on-screen:

- **On Load** 4th Dimension is about to display the form on-screen or print the form.
- **On Unload** The form is about to be closed and released.

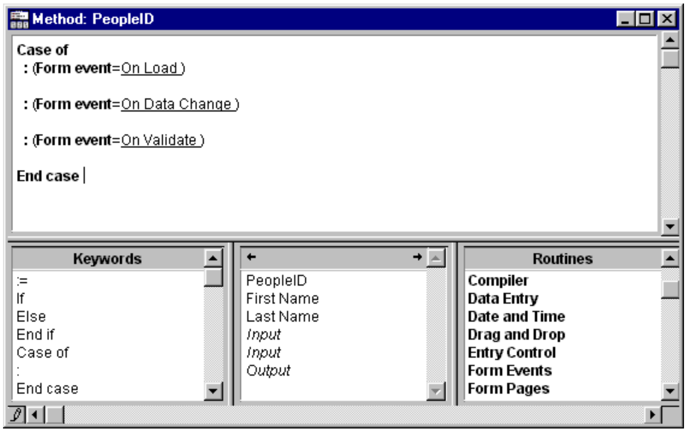
- **On Validate** After the user clicks OK or a navigation button.
- **On Clicked** The user clicks the object that has focus.
- **On Outside Call** When the form receives a call from CALL PROCESS.
- **On Activate** When the form's window becomes the frontmost window.
- **On Deactivate** When the form's window is no longer the frontmost window (i.e., when another window becomes the frontmost window).
- **On Double-clicked** The user double-clicks an object.
- **On Getting Focus** When a form object gets focus (i.e., the user presses Tab to select the object or clicks the object to select it).
- **On Losing Focus** When a form object loses focus (i.e., the user presses Tab to select the next object in the entry order or clicks another object to select it).
- **On Drop** When the user drops an object on a dropable object.
- **On Keystroke** When the user presses a key in the object that has focus.
- **On Menu Selected** A menu item has been chosen.
- **On Plug-in Area** A plug-in requested that its object method be executed.
- **On Data Change** When the user changes the value of an object.
- **On Drag Over** When a dragged object can be dropped on the object (i.e,. the dragged object is in position to be dropped on the object).
- **On Close Box** The window's Close box has been clicked.
- **On Display Detail** A record is about to be displayed in an output form.

You activate an event by clicking the desired event. A check mark appears to the left of the events you select.

If you need to execute different code segments for several different events, use a Case statement in your method and test for each event you checked in the Events page. To test for an event, you use the Form event function and the Form Event constants in the Constants page of the Explorer.

You can add a constant to your code by opening the Explorer to the Constants page and dragging the desired constant to the desired point in the code. When the Method editor parses the line of code, all constants are underlined.

An example shell for an object method might look like this:



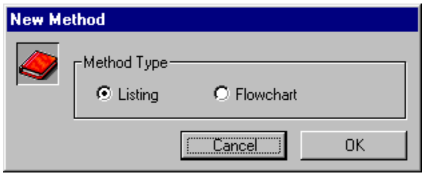
```
Case of
  : (Form event=On Load )

  : (Form event=On Data Change )

  : (Form event=On Validate )

End case
```

For more information on object methods, see “Object Methods” on page 370 and the section on Form Events in the *4th Dimension Language Reference*.

► To add an object method:

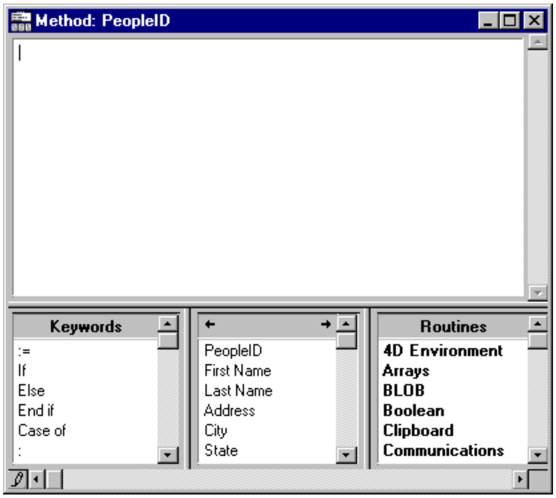
1 **Click the Object Method button in either the Events page or the Field page of the Object Properties window.**
OR
Hold down the Alt key (on Windows) or Option key (on Macintosh) and click the field or object.

If you are creating a new method and if you have not set a default editor type in the Database Properties dialog box, 4th Dimension displays the Method Type dialog box where you can select the preferred Method editor.



Method Type
● Listing ○ Flowchart

When you click **OK**, 4th Dimension displays a blank Method editor window. The name of the new window includes the word “Method” and the name of the object or field.



Note If an object or field is grouped with another object, it must be ungrouped before you can open its method.

2 Write the method.

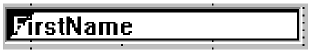
You can use several techniques to enter text into the Method editor. You can:

- Type text into the editor,
- Click on keywords, field or table names, or routines in the three scrollable areas below the text area,
- Drag table names, field names, form names, constants, built-in commands, plug-in commands, or project methods into the editor from the Explorer.

For more information on how to use the Method editor, see the section "Using the Listing Editor" on page 395.

3 Close the Method window (optional).

The method is now associated with the field or active object. When an object has a method, a triangle appears in the top left corner of the object.



You can view or modify a method at any time.

► To open a method for viewing or modification:

1 **Hold down the Alt key (on Windows) or the Option key (on Macintosh) and click the object to which the method is attached.**
OR
Click the Object Method button in the Field or Events page of the Object Properties window.

The Method editor appears with your method, ready for you to make any changes.

Deleting an Object Method

If you create an object method and then find that you do not need it, you can use the **Clear Object Method** item in the **Object** menu to remove the method. To do so, select the object to which the method is attached and then choose **Clear Object Method** from the **Object** menu.

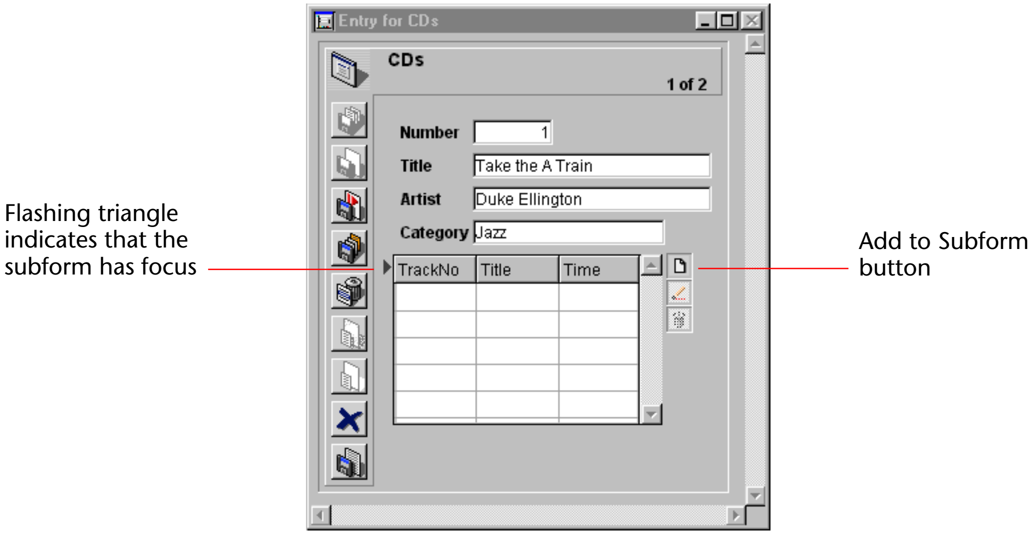
Adding a Subform to the Form

A subform is a List form from another table or subtable in the Master table that is displayed in a Detail form. A subform lets you enter, view, and modify data in other tables. You usually use subforms in databases in which you have established One-to-Many relations. A subform on a form in a related One table lets you view, enter, and modify data in a related Many table. You can have several subforms on the same form and they can belong to different tables or subtables.

For example, a Contacts manager database might use a subform to display all the telephone numbers for a particular contact. Although the telephone numbers appear on the Contacts screen, the information is actually stored in a related table. Using a One-to-Many relation, this database design makes it easy to store an unlimited number of telephone numbers per contact. With automatic relations, you can support data entry directly into the related Many table without programming.

In the figure below, a subform in a Detail form has focus. A small flashing triangle points to the subform title bar and the Add to Subform button is enabled[1].

[1] If you have more than one subform on a Detail form, the subform that has focus has a small flashing triangle at its top left corner.



Entry for CDs

CDs

1 of 2

Number 1

Title Take the A Train

Artist Duke Ellington

Category Jazz

TrackNo	Title	Time

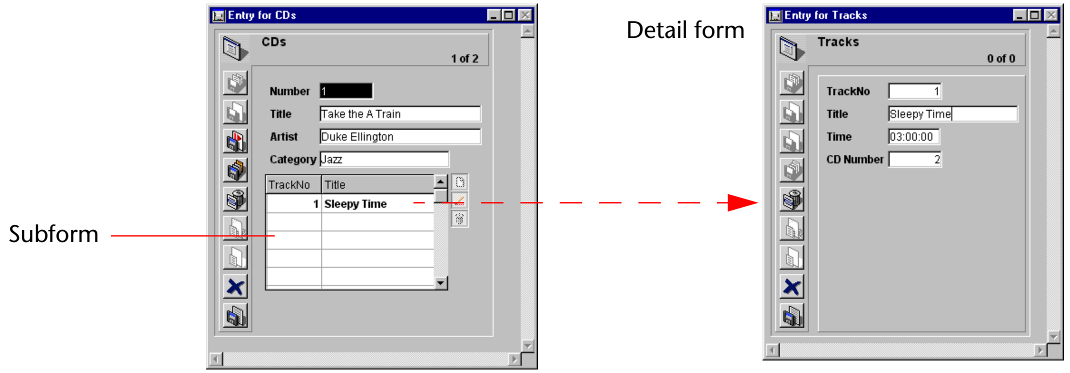
To add a record to the related Many table, the user clicks the **Add to Subform** button or presses **Ctrl+/** (**Command–Tab** on Macintosh).

You can create a subform with the Form Wizard when you create a new form or you can add one or more subforms to an existing form using the Form editor. You must have first created the List form you want to use.

Adding a subform using the Form Wizard is described in the section "Adding a Subform to the Form" on page 160.

Entering Data in a Subform

Subforms can be used for data entry in two ways: the user can enter data directly in the subform or enter it in an input form. The figure below shows both a subform and an input form associated with it.



Entry for CDs

CDs

1 of 2

Number 1

Title Take the A Train

Artist Duke Ellington

Category Jazz

TrackNo	Title
1	Sleepy Time

Entry for Tracks

Tracks

0 of 0

TrackNo 1

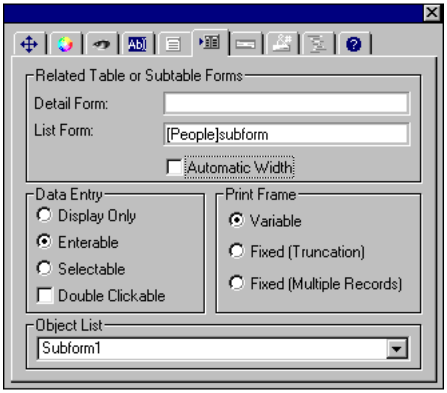
Title Sleepy Time

Time 03:00:00

CD Number 2

The form used as the subform is referred to as the *List form*. The input form is referred to as the *Detail form*.

You can allow the user to enter data through the List form and you can allow the user to double-click a row in the List form to display the Detail form. The following illustration shows the Subform page.



Related Table or Subtable Forms

Detail Form:

List Form: [People]subform

□ Automatic Width

Data Entry

○ Display Only

● Enterable

○ Selectable

□ Double Clickable

Print Frame

● Variable

○ Fixed (Truncation)

○ Fixed (Multiple Records)

Object List

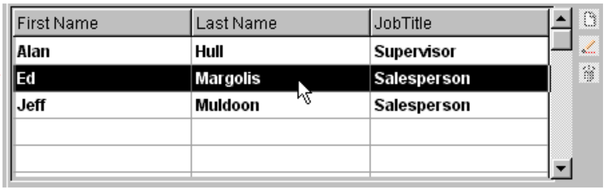
Subform1

The Related Table or Subtable area shows the List form and Detail form for the subtable area. You specify these forms by dragging them from the Forms page of the Explorer to the subform area on the form.

Data Entry Options for Subforms

The Data Entry area in the Subform page includes the following controls:

- **Enterable** Allows data entry in the List form. If **Enterable** is not checked, the List form is used for display only.
- **Display Only** Allows the user to view the records in the List form but not perform data entry.
- **Selectable** During data entry, clicking on a selectable subform highlights an entire record — similar to highlighting a record in an output form. However, unlike its behavior in an output form, the selected record becomes the current record for its table (or subtable).



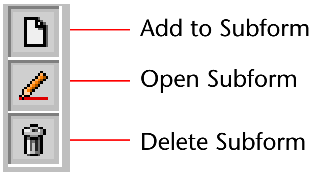
First Name	Last Name	JobTitle
Alan	Hull	Supervisor
Ed	Margolis	Salesperson
Jeff	Muldoon	Salesperson

With **Selectable** and **Double-Clickable**, a user can double-click to use the Detail form

- **Double Clickable** Allows data entry in the full page form. If **Double Clickable** is not checked, the user cannot use the Detail form.

You normally use an output form as the List form and an input form as the Detail form. If you do not specify a Detail form, 4th Dimension automatically uses the default input form for that table.

You can add custom buttons to control data entry for records in a subform. These button actions are **Open Subform**, **Delete Subform**, and **Add To Subform**. Any type of button—Button, Highlight, or Invisible—can be used. For more information about adding these buttons, refer to “Buttons” on page 293.



Displaying Data in a Subform

A subform typically displays related Many records using an automatic One to Many relation.

4th Dimension places a scroll bar on the right of the subform so that you can scroll through the list of records displayed. The scroll bar extends all the way up the right side, even alongside the column headings in the subform.

You can adjust the subform as necessary to display the records. The wider you make the area, the more columns can be displayed. The taller you make the area, the more records can be displayed. A subform area automatically displays a scroll bar so that the user can scroll through the records or subrecords.

Creating a Subform

You can create a subform in two ways:

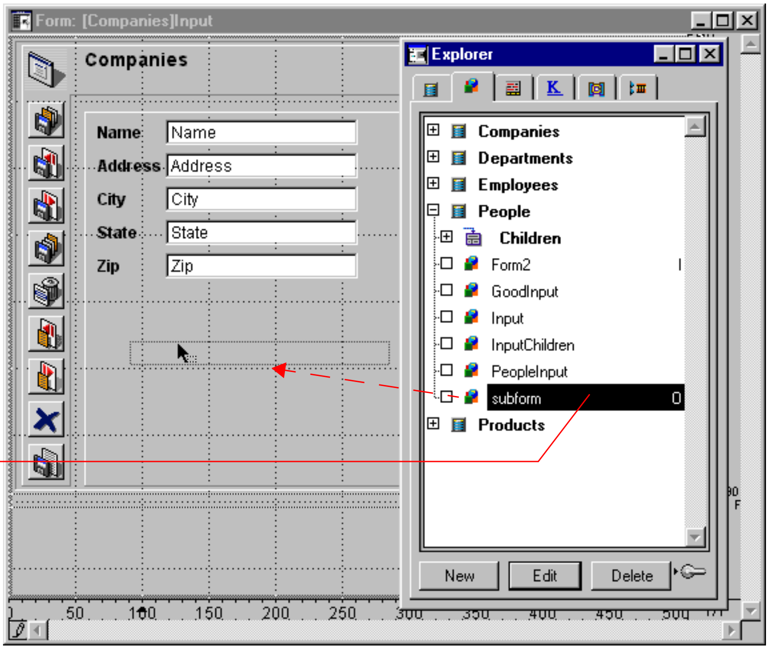
- In the Form Wizard, using the Subform page in Advanced options,
- In the Form editor, using the form and the Forms page of the Explorer.

  For information on the Subform page of the Form Wizard, see the section “Adding a Subform to the Form” on page 160.

▶ To create a subform in the Form editor:

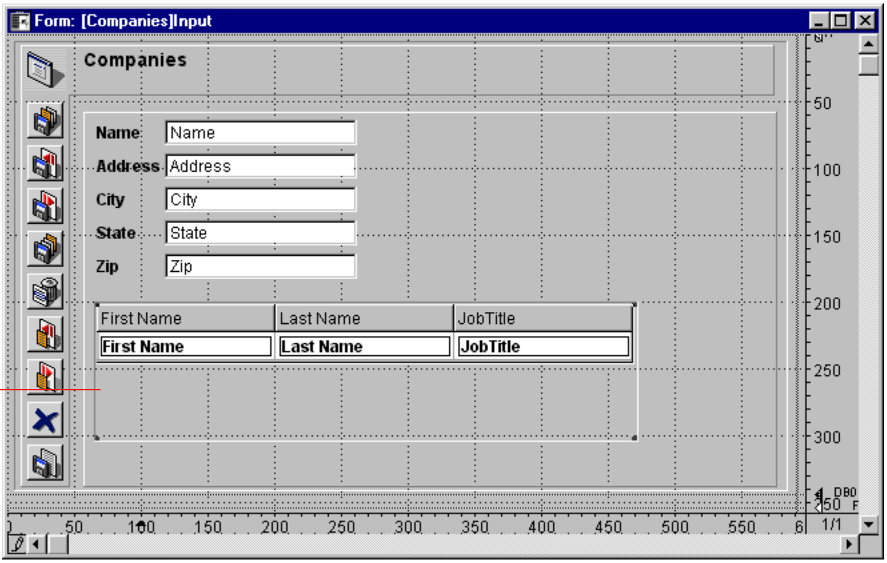
1 **Open the Forms page of the Explorer and expand the table that contains the records you want to display.**

2. **Drag the List form you want to use as the subform from the Forms page of the Explorer to the input form.**



Drag the List form from the Explorer to a blank area on the form

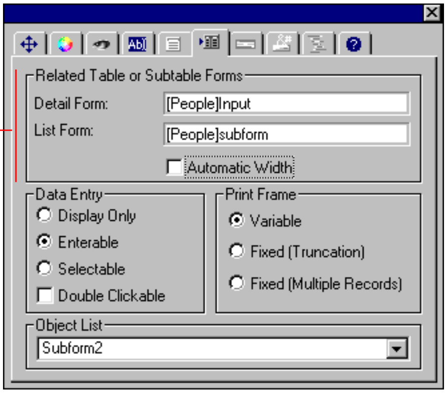
4th Dimension creates a subform area on the form and displays the List form in the subform area.



Subform area

3 **If you intend to make the subform area double-clickable, hold down the Shift key and drag the name of the Detail form you want to use from the Forms page of the Explorer to the subform area on the form.**

The names of both forms appear in the Related Tables area on the Subform page of the Object Properties window.


Related Table or Subtable Forms

Detail Form: [People]Input

List Form: [People]subform

☐ Automatic Width

Data Entry

○ Display Only

● Enterable

○ Selectable

☐ Double Clickable

Print Frame

● Variable

○ Fixed (Truncation)

○ Fixed (Multiple Records)

Object List

Subform2

Related Tables area

Dragging the Detail form name does not change the appearance of the subform area on the form itself.

If you drag the wrong List or Detail form to the subform area, you can replace it by dragging the correct form.

Setting the Type of Data Entry for the Subform

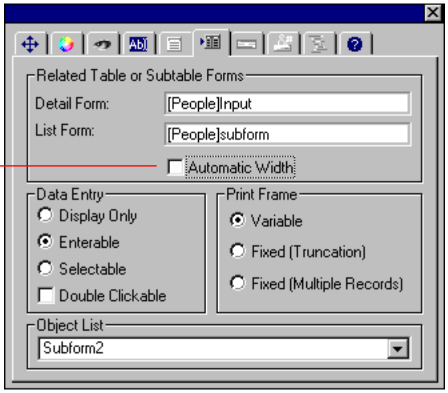
You can use the **Enterable**, **Display Only**, and **Selectable** radio buttons to specify the kind of data entry you want to have available for the subform.

- If you deselect the **Enterable** radio button, the user cannot enter data into the List form.
- If you select the **Selectable** radio button, the user can highlight a record in the List form. To allow data entry, you also need to check the **Double-Clickable** check box to give the user access to the Detail view.

Setting Automatic Width

When you create a subform area, 4th Dimension automatically sizes the subform area so that all the fields in the List form are displayed and a scroll bar appears to the right of the subform area. If you use an Appearance setting other than None, the border surrounds both the subform and the scroll bar. In other words, 4th Dimension does exactly what you would want it to do.

However, you can resize a subform area as you can any other object. Since any adjustment of the width of the subform will nullify 4th Dimension's automatic sizing feature, you can use the Automatic Width property in the Object Properties window to prevent designers from changing the width of a subform area.



Automatic Width check box

Related Table or Subtable Forms

Detail Form: [People]Input

List Form: [People]subform

□ Automatic Width

Data Entry

○ Display Only

● Enterable

○ Selectable

□ Double Clickable

Print Frame

● Variable

○ Fixed (Truncation)

○ Fixed (Multiple Records)

Object List

Subform2

If you click the Automatic Width check box, you only change the height of the subform area when you drag a resizing handle, leaving the width correct. Changing the height allows you to display more or fewer records.

Changing other Subform Properties

After you have specified the List and Detail forms for the subform and set the data entry and printing properties, you can set other properties of the subform area. The other pages of the Object Properties window work as for any other active object type. For example, you can set the platform interface, appearance, and sizing and resizing options. Use the other pages of the Object Properties window to set any other properties you like. For more information, see “Setting Object Properties” on page 281.

Modifying a Subform

You can modify the properties of a subform at any time:

► To modify a subform:

1 **Double-click the subform area in the form.**

4th Dimension displays the Subform page of the Object Properties window.

2 **Make any necessary changes.**

You can specify different data entry options or make changes to the way the frame is printed.

Creating Form Menus

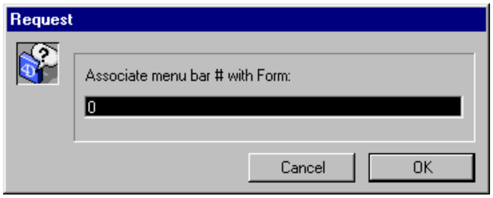
When you create a custom application, you create custom menus. By creating your own menus, you can add menu commands that automate actions associated with a particular form, such as generating a report from the data.

You use the Menu Bar editor to create custom menu bars. Each menu bar contains one or more menus. Each menu bar you create has a number. You use the menu bar number to associate the menu bar with a form. For complete information about creating menu bars, menus, and menu commands, see Chapter 8, “Creating Custom Menus” on page 413.

In the User environment, a form menu bar is appended to the right of the User environment menu bar. A form menu bar is displayed only when the form is used for input.

In the Custom Menus environment and custom applications, a form menu bar is appended to the right of the current menu bar. The appended form menu bar disables the other menus on the menu bar unless you precede the form menu bar number with a minus sign. If a form menu bar is the same as the current menu bar, it is not appended. (The user would not get two sets of the same menus.) A form menu works in both input and output forms.

To associate the menu bar with a form, choose **Associate Menu Bar** from the **Form** menu in the Form editor and specify a menu bar for the form by entering the menu bar number.


Request

Associate menu bar # with Form:

0

Subsequently, when this form is displayed in the User or Custom Menus environments, the menus on the menu bar you have associated with it are appended to the right of the current menu bar.

If you are associating a menu bar with a form for use in custom applications, precede the menu bar number with a minus sign. The minus sign instructs 4th Dimension to keep the current menu bar active. In the absence of the minus sign, a form menu bar disables whatever menu bar is current, leaving only the form menu bar active.

6 Output Displays and Reports

Output forms are used for two purposes: listing records on screen and printing reports. This chapter explains the following operations:

- Using the Form Wizard to create output forms for listing records on-screen,
- Using the Form Wizard to create forms for output forms and printed reports,
- Using the Form editor to customize output forms and printed reports.

In many cases, you can create a report more quickly using the Quick Report editor. However, the Form editor gives you greater control over the final appearance of your report. For more information about using the Quick Report editor, refer to the *4th Dimension User Reference*.

Output Forms for Listing Records

A form that displays records as a columnar list contains separate areas:

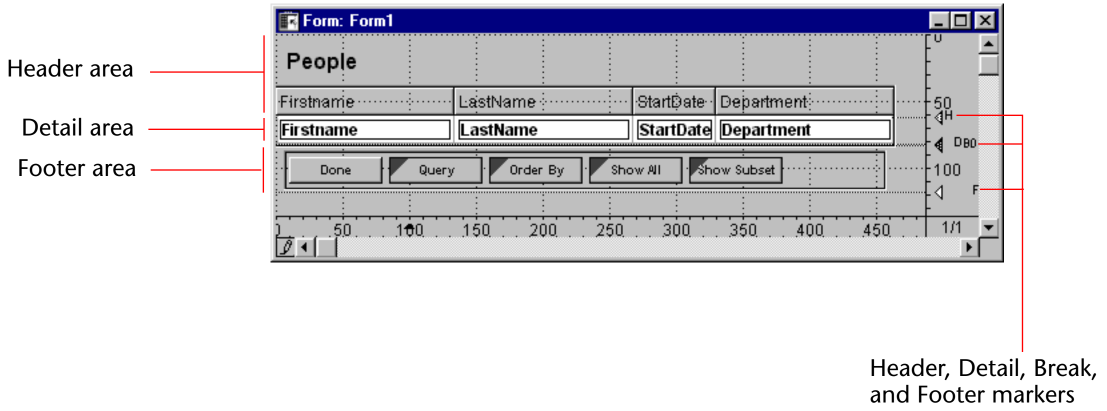
- **Header area** contains the report title and column headers,
- **Detail area** contains the body of the report,
- **Footer area** contains buttons or summary calculations based on all the records in the report
- **Break area** contains text or graphics that appear after the list of records and summary calculations based on all the records or sub-groups of records.

When you create a List form using the Form Wizard, it automatically creates these areas for you. It places the form title (the table name) and the field names in the Header area and a one or more buttons in the Footer area[1]. The fields you select are placed in a row in the Detail area. A small Break area is created but the Form Wizard puts nothing in it.

When you open the form in the Form editor, you can modify the size of each of these areas, modify the contents of any area, add objects to the Break area, and create additional Break areas for summary calculations.

The areas of the form that function as the Header, Detail, Break, and Footer areas are controlled by *output control lines*. By dragging the output control lines vertically, you can change the size of each area.

The following illustration shows an output form that was created using the Basic screen of the Form Wizard.

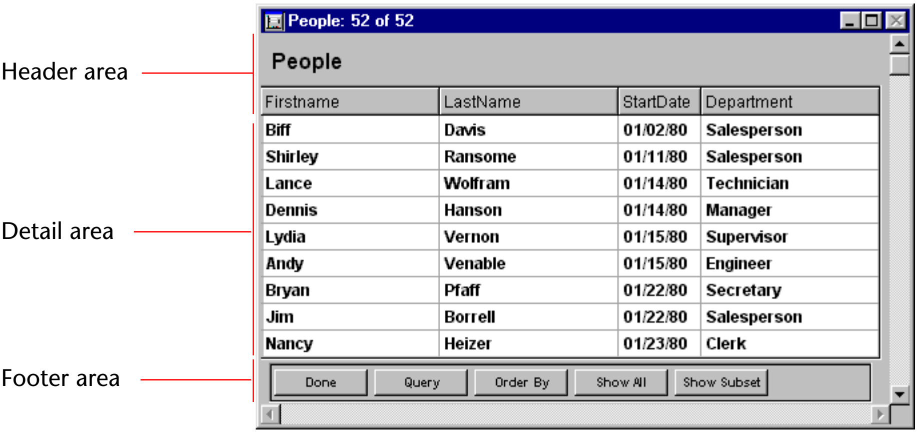


The dotted horizontal lines divide the report into Header, Detail, Break, and Footer areas. The area from the top of the form to the Header line is the Header area. Similarly, the area between the Header and Detail lines is the Detail area, and the Footer area extends from the top of the Break line[2] (labelled B0) to the Footer line. You adjust the

[1] The exact contents of the Header and Footer areas depend on the specific Form Wizard options that you select.
[2] The Form Wizard creates a small Break area. This area appears after the last record of the report. Initially, the area has nothing in it. For information on adding summary calculations to the Break area, see "Reports with Breaks" on page 352.

sizes of each area by dragging the Header, Detail, Break, or Footer markers vertically.

When this form is used in the Custom Menus environment or a custom application, it looks like this:



People: 52 of 52

People

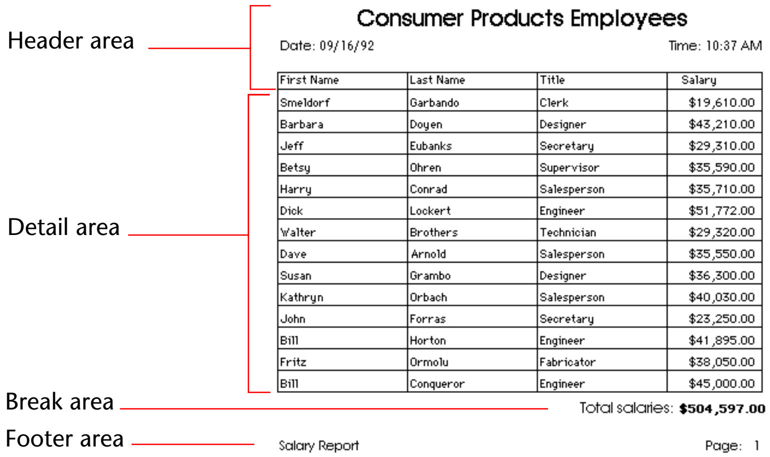
Firstname	LastName	StartDate	Department
Biff	Davis	01/02/80	Salesperson
Shirley	Ransome	01/11/80	Salesperson
Lance	Wolfram	01/14/80	Technician
Dennis	Hanson	01/14/80	Manager
Lydia	Vernon	01/15/80	Supervisor
Andy	Venable	01/15/80	Engineer
Bryan	Pfaff	01/22/80	Secretary
Jim	Borrell	01/22/80	Salesperson
Nancy	Heizer	01/23/80	Clerk

The Detail area expands dynamically as the window is resized, while the Header and Footer areas remain a fixed size.

These areas work slightly differently in the User and Custom Menu environments. For more information, refer to the next section, “Output Control Lines” on page 336.

In a printed report, a Header area often contains the date, the time, and a running title as well as column labels. Records appear in the Detail area. A calculated total may appear in the Break area. The Footer area often contains the page number.

The following illustration identifies the different areas as they appear in a printed report.


Header area
Detail area
Break area
Footer area

Consumer Products Employees

Date: 09/16/92 Time: 10:37 AM

First Name	Last Name	Title	Salary
Smeldorf	Garbando	Clerk	$19,610.00
Barbara	Doyen	Designer	$43,210.00
Jeff	Eubanks	Secretary	$29,310.00
Betsy	Ohren	Supervisor	$35,590.00
Harry	Conrad	Salesperson	$35,710.00
Dick	Lockert	Engineer	$51,772.00
Walter	Brothers	Technician	$29,320.00
Dave	Arnold	Salesperson	$35,550.00
Susan	Grambo	Designer	$36,300.00
Kathryn	Orbach	Salesperson	$40,030.00
John	Forras	Secretary	$23,250.00
Bill	Horton	Engineer	$41,895.00
Fritz	Ormolu	Fabricator	$38,050.00
Bill	Conqueror	Engineer	$45,000.00

Total salaries: **$504,597.00**

Salary Report Page: 1

A report may have additional Break areas for subtotals and other calculations. A report may also have additional Header areas that appear within the body of the report. The additional Header areas are used to identify subgroups. For an example of a report with several Header and Break areas, see the section "Creating Additional Control Lines" on page 353.

Output Control Lines

You control the Header, Detail, Break, and Footer areas with the output control lines in the Form editor. You move the control lines vertically to allow more or less space for each area. Any object that you place in these areas is displayed or printed at the appropriate location.

The following explains how these areas work when the form is displayed or printed:

- **Header area** The Header area is displayed at the top of each screen in the User and Custom Menus environments and is printed at the top of each page of a report. The Header area is defined as the area above the Header control line (H). You make the Header area smaller or larger by dragging the Header control marker vertically. You can use the Header area for column names, for instructions, additional information, or even a graphic such as a company logo or a decorative pattern.
- **Detail area** The Detail area is displayed on the screen once for each record in the User and Custom Menus environments and is printed once for each record in a report. The Detail area is defined as the area

between the Header control line and the Detail control line (D). You make this area smaller or larger by dragging the Detail control marker vertically. Whatever you place in the Detail area is displayed or printed once for each record. Most often you place fields or variables in the Detail area so that the information in each record is displayed or printed, but you can place other elements in the Detail area as well.

- **Break areas** Break areas are displayed once at the end of the list of records in the User and Custom Menus environments and are printed once after the records have been printed in a report. In the report above, the Break area is defined as the area between the Detail control line and the Break control line (labeled B0). There can be other Break areas in your report. You make Break areas smaller or larger by dragging the Break control marker vertically. You can use a Break area to display information that is not part of the records (instructions, current date, current time, etc.) or to display a line or other graphic element that concludes the screen display. In a printed report, you can use a Break area for calculating and printing totals and other summary calculations.
- **Footer area** The Footer area is displayed on screen only in the Custom Menus environment and in custom applications. It is always printed at the bottom of every page of a report. The Footer area is defined as the area between the Break control line (B0) and the Footer control line (F). You make this area smaller or larger by dragging the Footer control marker vertically. You can use the Footer area to print graphics, page numbers, the current date, or any text you want at the bottom of each page of a report. For output forms designed for use on screen, the Footer area typically contains buttons that give the user options such as doing a search or sort, printing records, or putting away the current report.

Whenever any form is used for output, either for screen display or printing, the output control lines take effect and the areas display or print at designated locations. The output control lines also take effect when a form is used as the List form in a subform area.

The output control lines have no effect when a form is used for input.

Methods that are associated with objects in these areas are executed when the areas are printed or displayed as long as the appropriate events have been activated. For example, a object method placed in the Header area is executed when the On Printing Header event takes place.

You can create additional control lines to define additional Break areas and Header areas for a report. These additional areas allow you to print subtotals and other calculations in a report and to display other information effectively. Additional control lines are discussed in the section "Reports with Breaks" on page 352.

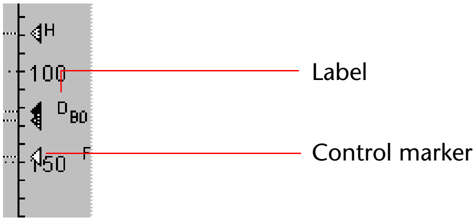
Working with the output control lines and the areas they define are described in detail in subsequent sections of this chapter.

Moving Output Control Lines

You adjust the size of the Header, Detail, Break, and Footer area by moving the output control markers.

Output control lines are displayed as dotted lines across each form. Each control line has an identifying marker and label that is displayed in the ruler. The control marker is the triangle in the ruler and the label is the letter or letters next to the marker.

The figure below identifies control markers and labels.



In order to move a control line, the ruler must be displayed.

To move a control line, drag the control marker or the marker label vertically.

Holding down the **Shift** key while dragging a control marker moves all control lines below that control marker. For example, to drag all control lines together, hold down **Shift** and drag the Header marker. To move all control lines except the Header control line, **Shift+drag** the Detail marker.

The control lines cannot be dragged out of order. For example, if you attempt to drag a Footer control line higher than a Break control line, the drag operation automatically stops when the Footer marker reaches the Break marker.

You can place markers and control lines on top of one another. Placing one marker on top of another reduces its area to nothing, removing it from the report. For example, if you have nothing to print in a Break area, you can drag the Break marker on top of the Detail marker. Doing so prevents 4th Dimension from creating space for a Break area. The report can thus utilize all the space available on the page.

If you don't want to print any details, drag the Detail marker on top of the Header marker. If you don't need a Header, drag the Header marker to the very top of the form (at point 0).

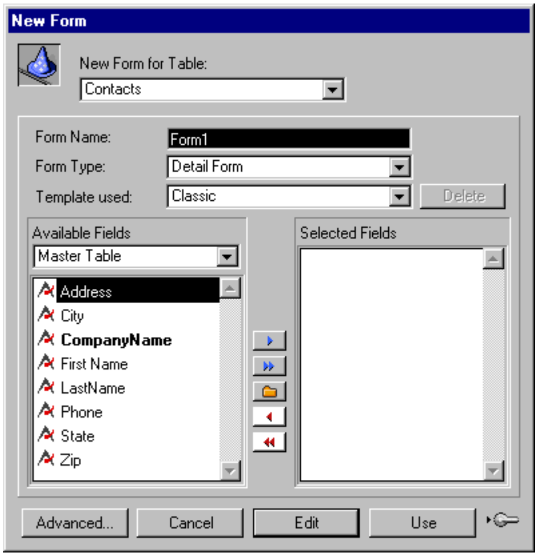
Creating Output Forms

You use the Form Wizard to create an output form for each table in your database. The process is similar to the process you use for creating input forms. You simply select a different form type. If you use the Wizard's Advanced screen, a different set of options is available.

As with input forms, you can create an output form using either the Basic or Advanced screens of the Form Wizard.

► To create an output form:

1 **Choose New Form from the Design menu.**
OR
Select the master table for the form in the Forms page of the Explorer and click New.
The Basic screen of the Form Wizard appears.



New Form

New Form for Table: Contacts

Form Name: Form1

Form Type: Detail Form

Template used: Classic

Available Fields: Master Table

2 **If necessary, use the New Form for Table drop-down list to select the master table for the form.**

The Fields list changes to reflect your selection.

3 **Name the form by filling in a name in the Form Name area.**

You can refer to the form by name using the language.

4 **Choose List form from the Form Type drop-down list.**

This selection instructs the Wizard to place the output control lines in the correct locations for lists, place the fields in a row in the Detail area, and add buttons to the Footer area (for use in custom applications only).

5 **Choose a template that is appropriate for output forms.**

The template controls several aspects of the appearance of the form, including font attributes, field label placement, the design of decorative rectangles surrounding fields, and platform interface.
4th Dimension ships with several templates. You can also create custom templates with the Form Wizard and add them to this list. For more information about adding custom templates, see the section "Creating a Form Template" on page 163.

6 **Select the fields you want on your form.**

For complete information about selecting fields for the form, refer to the section, "Selecting Fields for the Form" on page 143.

7 **If you want to edit the new form in the Form editor, click Edit.**
OR
If you want to switch to the User environment to use the form, click Use.
OR
If you want to customize the new form with the Forms Wizard's advanced options, click Advanced.

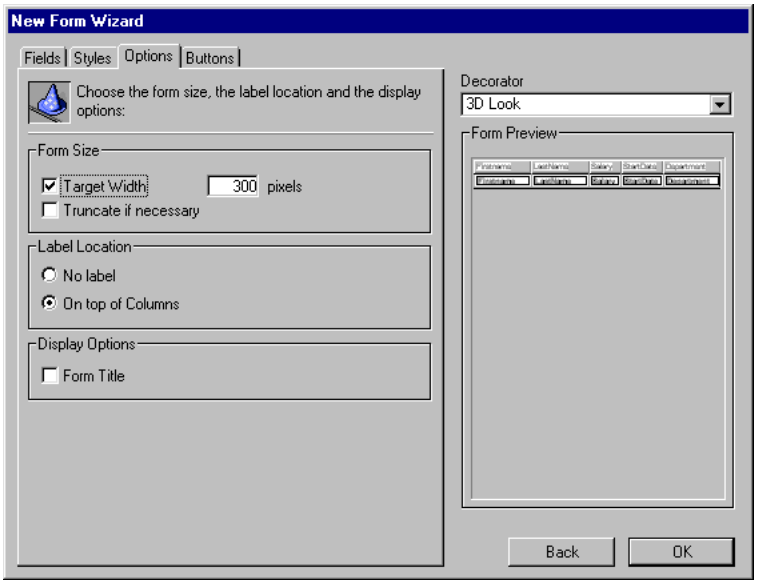
Using the Form Wizard's Advanced Options

When you create a List form, the Advanced screen of the Form Wizard has the following pages:

- **Fields** Similar to the Fields page for Detail forms, except that grouping fields is not relevant for List forms and is not available.
- **Styles** Same as the Styles page for Detail forms.
- **Options** Similar to the Options page for Detail form type, with the following differences.

- In the Detail and List Form for Printing form type, the Form Size area has a Page Setup button. This button lets you choose the page size for the printed report. When you choose the page size, 4th Dimension adjusts the size of the form and preview area.
- In the List form type, the Form Size area has a Target Width area. When you use these options, 4th Dimension tries to fit the fields in a particular width. For more information, see the section "Using the Target Width Option" on page 343.
- In the Display Options area, you can add variables to printed reports that display the page number, printing date, and printing time.

List Form



New Form Wizard

Choose the form size, the label location and the display options:

Form Size

☑ Target Width 300 pixels

□ Truncate if necessary

Label Location

○ No label

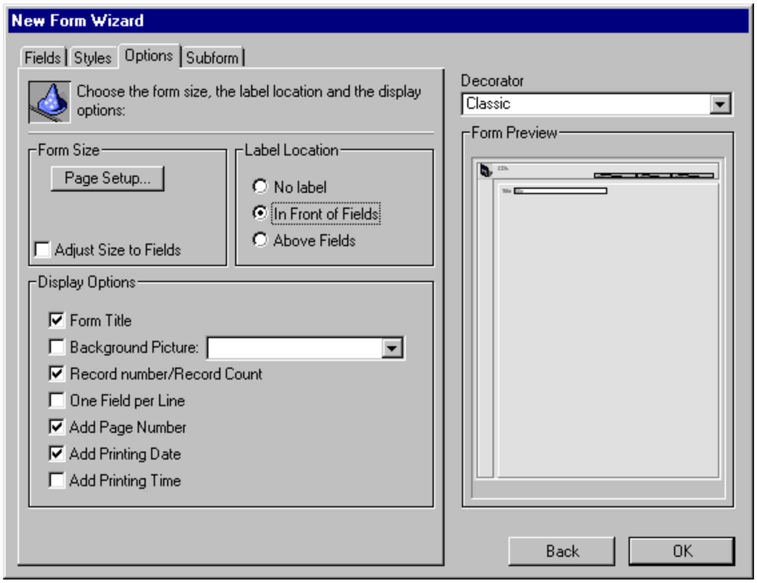
● On top of Columns

Display Options

□ Form Title

Decorator: 3D Look

Detail Form for Printing



New Form Wizard

Fields | Styles | Options | Subform

Choose the form size, the label location and the display options:

Form Size

Page Setup...

□ Adjust Size to Fields

Label Location

○ No label
● In Front of Fields
○ Above Fields

Display Options

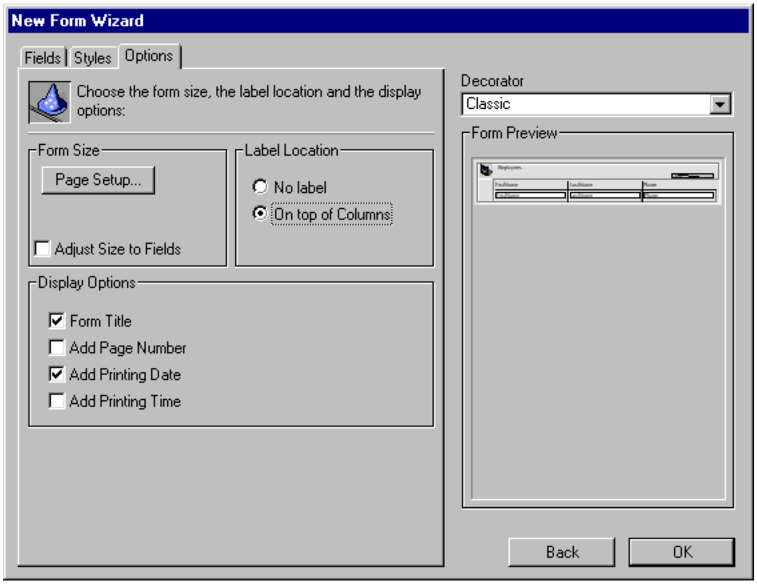
☑ Form Title
□ Background Picture:
☑ Record number/Record Count
□ One Field per Line
☑ Add Page Number
☑ Add Printing Date
□ Add Printing Time

Decorator: Classic

Form Preview

Back | OK

List Form for Printing



New Form Wizard

Fields | Styles | Options

Choose the form size, the label location and the display options:

Form Size

Page Setup...

□ Adjust Size to Fields

Label Location

○ No label
● On top of Columns

Display Options

☑ Form Title
□ Add Page Number
☑ Add Printing Date
□ Add Printing Time

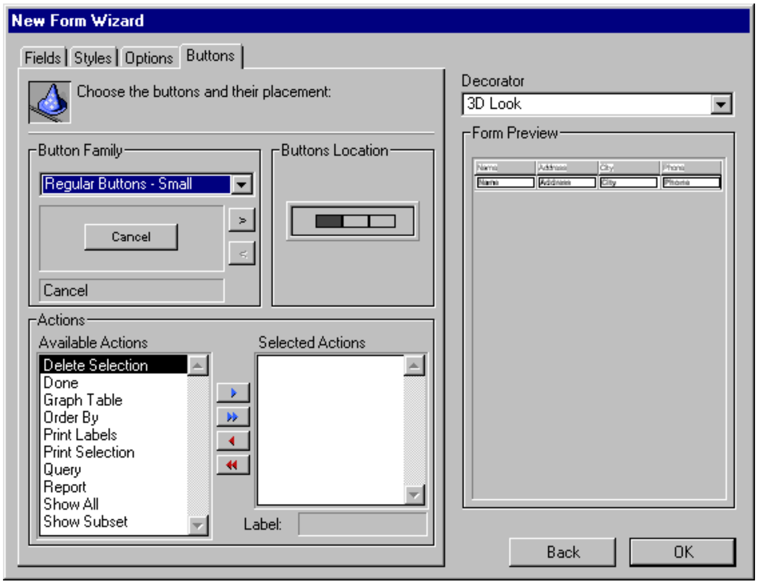
Decorator: Classic

Form Preview

Back | OK

- **Buttons** Similar to the Buttons page for Detail forms, except that different buttons are available. The Buttons page is not available for the List and Detail forms for Printing form types.

List Form



New Form Wizard

Choose the buttons and their placement:

Decorator: 3D Look

Button Family: Regular Buttons - Small

Cancel

The buttons are not automatic in the same sense as buttons for input forms; instead, 4th Dimension automatically creates an object method for each button. Using the Form editor, you can edit the object methods.

For more information on working with the Buttons page, see the section “Customizing Buttons on the Form” on page 156.

Using the Target Width Option

When you create a List form for screen display, you can use an Advanced option to tell the Form Wizard to take a target width into account when it creates the form. If you do not use this option, the width of the output form will be based on the sum of the field lengths of the fields that you add to the form.

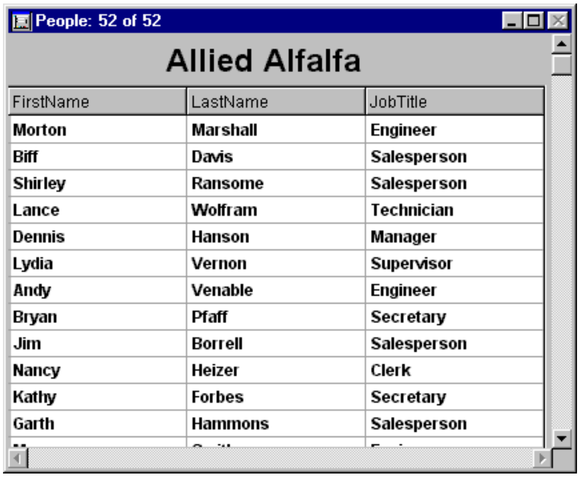
If you click Target Width and enter a target width in pixels, the Form Wizard will try to fit all the fields on the form by reducing the widths of the fields. If you also click Truncate if Necessary, the Form Wizard will also remove one or more fields to make the form width less than or equal to the target width. If you don’t check Truncate if Necessary, the form’s width may be slightly larger than the target width.

Modifying an Output Form in the Form Editor

A List form that is created using the Form Wizard works well as a listing of records. If needed, you can make the following simple modifications:

- Replace fields with variables and add methods,
- Use the platform interface, appearance, font attributes, fill, border, or color options to modify individual objects on the form,
- Change the widths of the fields or variables,
- Move the output control lines,
- Add a custom graphic in the Header area.

The following is a custom output form being used for displaying records in the User environment. At the top of the screen is a company name as well as column names for the information below.

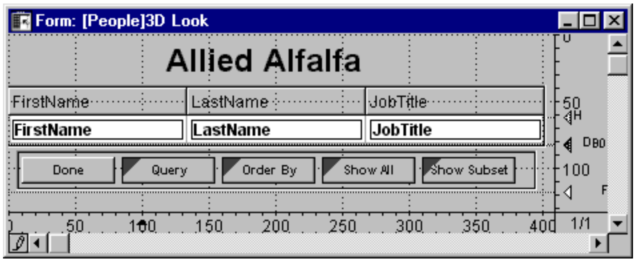


People: 52 of 52

Allied Alfalfa

FirstName	LastName	JobTitle
Morton	Marshall	Engineer
Biff	Davis	Salesperson
Shirley	Ransome	Salesperson
Lance	Wolfram	Technician
Dennis	Hanson	Manager
Lydia	Vernon	Supervisor
Andy	Venable	Engineer
Bryan	Pfaff	Secretary
Jim	Borrell	Salesperson
Nancy	Heizer	Clerk
Kathy	Forbes	Secretary
Garth	Hammons	Salesperson

Here is what the design for this form looks like in the Form editor:



The control lines have been moved to accommodate the company name. This form uses the 9-point font size so that more records fit on a screen.

Displaying Several Lines Per Record

You may want to display fields on more than one line. 4th Dimension allows you to use several lines for each record. Expand the Detail area so that more than one line appears in this area. When you use several lines for a single record, graphic elements such as lines and boxes can be useful to separate fields and records.

Modifying Output Forms for Reports

Printed reports, unlike screen display forms, can make use of the Break area at the end of the report. For material that appears at the bottom of each page, printed reports use the Footer area.

This section provides suggestions and directions specifically for designing forms to be used for printing. It covers lists, reports that print one record per page, expandable areas for printing invoices and variable text fields, form letters, and custom mailing labels.

Printed Columnar Reports

Lists that display columns of information are common in printed reports. You might publish lists of telephone numbers, prices, results, specifications, or parts.

When you create a columnar report using the Form Wizard, you choose **List Form for Printing** as the Form Type.

Like the lists you design to display records on the screen, a printed list presents columns of information, can include column headings above each column, and can use graphic elements to enhance or clarify the report. The Break area, which is printed once at the end of the report, is used for calculating totals. For a discussion of using methods for calculating totals, see the section “An Example Report” on page 359.

One Record Per Page Reports

You may need to print one record per page. For example, you may want to use an invoicing database to print a copy of each invoice for your records.

When you need to create such a report, you choose **Detail Form for Printing** as the Form Type in the Form Wizard.

Place the Header (H) control line at the top of the page and arrange the fields and other report elements below it.

If your form displays records in a subform, be sure that the subform is set to print with fixed frame so that the records do not wrap onto additional pages. For information about printing with fixed frame, see the section "Printing Subforms, Pictures, and Text Fields" on page 362.

Drag the Detail (D), Break (B0), and Footer (F) control lines to the bottom of the page to ensure that only one record is printed per page.

Using Subforms

You are probably very familiar with an invoice. A typical invoice shows a name and billing address, a shipping address, a series of items or services purchased, and a total.

An invoicing database includes an output form for printing full-page invoices. For example, an invoice draws information from two tables: an [Orders] table that provides the customer information (bill to and ship to addresses) and a [Line Items] table that provides the line items. The total for the order is calculated and kept in the [Orders] table.

The form for an invoice is created in the [Orders] table and uses a subform area for the line items. The subform area can expand during printing to print all the line items, even if the invoice requires a second page. For more information, see the section "Printing Subforms, Pictures, and Text Fields" on page 362.

The Detail area is expanded to the full-page size. One invoice is printed for each sales order, but as many line items as necessary are printed in the line items area of the invoice.

Report with a Text Field

Many databases allow the user to enter notes or descriptions in a text field. That same text field can be printed as an expandable area on the report.

Text fields can be expanded during printing to accommodate all of the data. For more information about printing text fields, see the section "Printing Subforms, Pictures, and Text Fields" on page 362.

Custom Mailing Labels

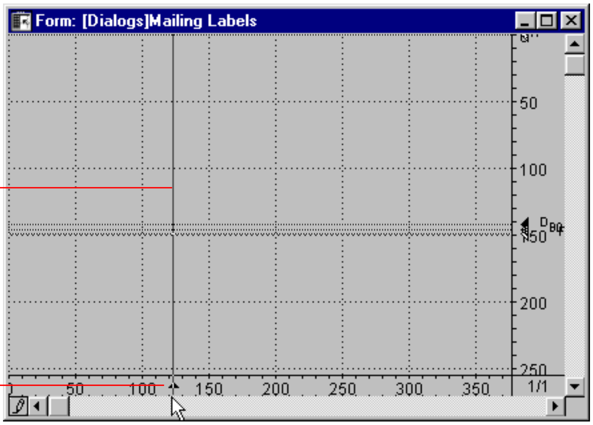
If you want to create special mailing labels, you can design a custom output form for them. The design can use graphic elements, any available fonts, and variables.

Tip It is often quicker and easier to create mailing labels using the Label Wizard in the User environment. For more information about the Label Wizard, refer to the *4th Dimension User Reference*.

► To create a label report form:

1 **Set the label width by dragging the width marker on the bottom ruler of the Form editor.**

The label width determines how many labels 4th Dimension prints across the page. The width marker is shown in the figure below.



Width line visible by clicking width marker

Width marker

2 **Design the label form to the left of the width marker.**

Labels can contain fields, active objects, graphic objects, text, and methods. A subform cannot be printed in a label.

3 **Go to the User environment.**

4 **Choose Labels from the Report menu.**

4th Dimension displays the Label editor.

5 **Choose the form from the Form to Use drop-down list in the Label editor.**

For complete information about using the Label editor, refer to the *4th Dimension User Reference*.

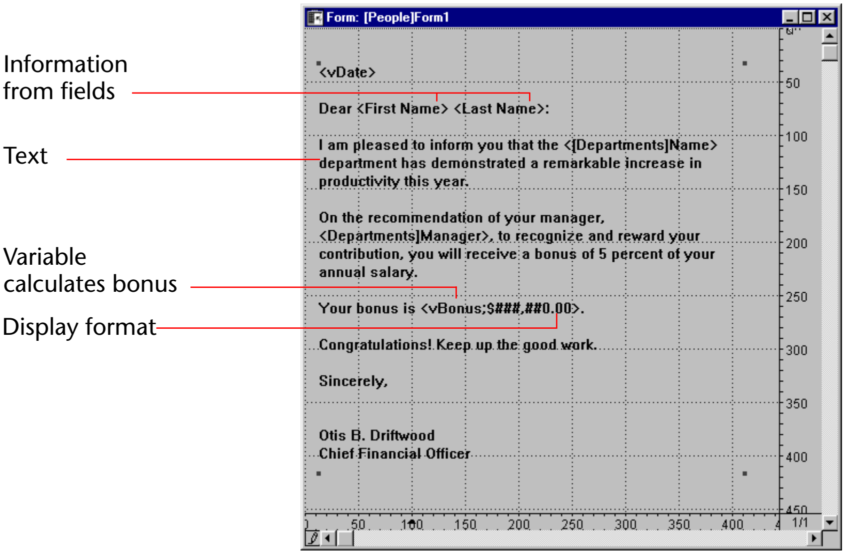
Creating Mail-Merge Documents

You can handle mail-merge tasks using an output form that embeds fields or variables in a static text area. You can create documents that are the same in every respect except for names, addresses, and any special calculations you want to perform.

Mail-merge documents may be useful when you want to announce a special offer or inform your customers or clients of a business development (such as a move to a new location or a significant personnel change). Another typical use of mail-merge is to inform people that their account is due. You can create a variable and a method to calculate the exact amount.

When you create a form that does mail-merge, use the **Detail Form for Printing** option in the Form Type drop-down list in the Form Wizard. In the Form editor, create a text area that will contain both the static text and the fields or variables that will change for each record. You then embed fields or variables in the text area. During printing, values from the fields or variables are inserted in the text.

The figure below shows fields and variables placed in a text area.



Information from fields

Text

Variable calculates bonus

Display format

<vDate>

Dear <First Name> <Last Name>:

I am pleased to inform you that the <[Departments]Name> department has demonstrated a remarkable increase in productivity this year.

On the recommendation of your manager, <Departments]Manager>, to recognize and reward your contribution, you will receive a bonus of 5 percent of your annual salary.

Your bonus is <vBonus;$###,##0.00>.

Congratulations! Keep up the good work.

Sincerely,

Otis B. Driftwood
Chief Financial Officer

► To create an output form for mail-merge:

1 In the Form Wizard, create a new form using the Detail Form for Printing option in the Form Type drop-down list.

2 Click Edit to open the form in the Form editor.

3 Select the Text Area tool and create a text area in the Detail area.

4 Type the text you want in your form letter, placing field and variable names between less than (<) and greater than (>) symbols where you want information from fields or variables.

You can use a field from any table in the database. Fields from the master table do not have to specify the table name; they can be entered like this: <*field*>. Fields from other tables must specify the table name; they are entered like this: <*[tablename] field*>. When the form is printed, the information from the field for each record replaces the <*field*> element in the text area.

A variable must be assigned a value in an object or form method.

You can specify how an embedded field or variable is displayed by inserting a semicolon followed by a display format directly after the field or variable name. For example, the mail-merge document shown above includes a display format for the vBonus variable. The embedded variable <vBonus;$###,##0.00> calculates the amount of the person's bonus and displays it in a dollar format. For more information about display formats, see the section "Display Formats" on page 267.

4th Dimension provides a shortcut for inserting fields in a text area. The shortcut allows you to choose the field name from a drop-down menu.

► To insert a field using the shortcut:

1 Click to place the insertion point where you want the field.

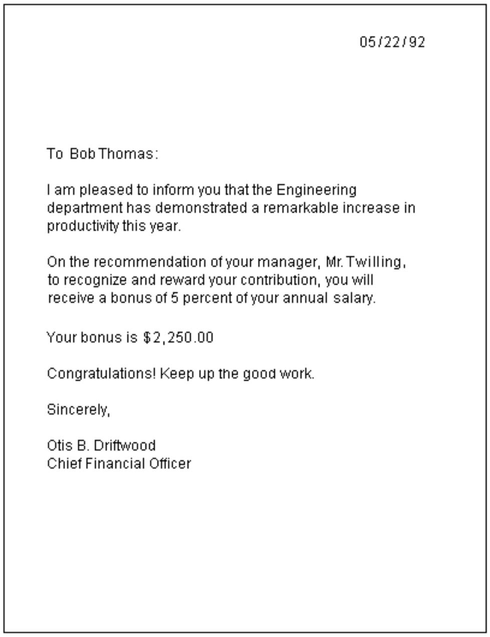
2 Position the pointer in the text area and hold down the Alt key (on Windows) or Command key (on Macintosh) while you press and hold down the mouse button.

4th Dimension displays a pop-up menu of fields from the master table from which you can choose the field you want.

To choose a field from another table in the database, hold down **Shift+Alt** (on Windows) or **Shift-Command** (on Macintosh) while you press and hold down the mouse button. 4th Dimension displays a hierarchical menu of tables and fields in the database. You can choose the table and field you want.

4th Dimension places <*field*> or <*[table]field*> in the text area at the insertion point.

When the report is printed, the values of the fields and variables embedded in the letter appear.



05/22/92

To Bob Thomas:

I am pleased to inform you that the Engineering department has demonstrated a remarkable increase in productivity this year.

On the recommendation of your manager, Mr. Twilling, to recognize and reward your contribution, you will receive a bonus of 5 percent of your annual salary.

Your bonus is $2,250.00

Congratulations! Keep up the good work.

Sincerely,

Otis B. Driftwood
Chief Financial Officer

Basic Steps for Creating a Printed Report

You can perform most or all of these steps depending on the nature of the report you want to print. The actual order of steps is not critical. Typically, you design a report, preview it on screen, and then return to the form to make adjustments. The order given here is typical:

1 **Create a form using the Form Wizard.**

For information about creating a form, refer to Chapter 3.

2 **Move the control lines so that you will have enough space to place the various elements of the report.**

For information about moving control lines, see the section "Moving Output Control Lines" on page 338.

3 **Move elements into position.**

You can place fields, text, non-enterable objects, and graphic objects. Take time to align the objects to one another and to check the justification of data to be displayed in fields and active objects.

4th Dimension displays page size guidelines in the form so that you can place elements for printing.

For information about placing fields and active objects in a form, refer to Chapter 5.

4 **Adjust the control lines if necessary.**

Working with the relationship between control lines and elements to be printed, you can create the right amount of space for printing the Header, Detail, Break, and Footer elements.

5 **If necessary, create methods to calculate values, concatenate strings of characters, print additional text, and display the date, time, and page numbers.**

For information about creating methods, refer to "Using Object Methods with Fields and Objects" on page 319. For complete information about using object methods, refer to the *4th Dimension Language Reference*.

For information about calculating subtotals and other summaries (averages, counts, etc.), refer to "Reports with Breaks" on page 352.

Be sure that you activate the appropriate events in the Events page of the Object Properties window for each method you use; otherwise the method will not execute during printing.

6 **Go to the User environment to test the report.**

7 **Create the selection of records you want to use for the report.**

For information about creating a selection of records, refer to the *4th Dimension User Reference*.

8 **Sort the records according to how you have designed the report.**

For information about sorting records, refer to the *4th Dimension User Reference*.

9 **Preview the report by printing it to the screen.**

The report form uses the Page Setup settings that were in effect when the form was created in the Design environment. If you make any changes to the Page Setup dialog box, be sure to make the same changes in the Design environment.

If the report form needs to be adjusted, return to the Design environment to make any necessary changes.

10 **Print the report.**

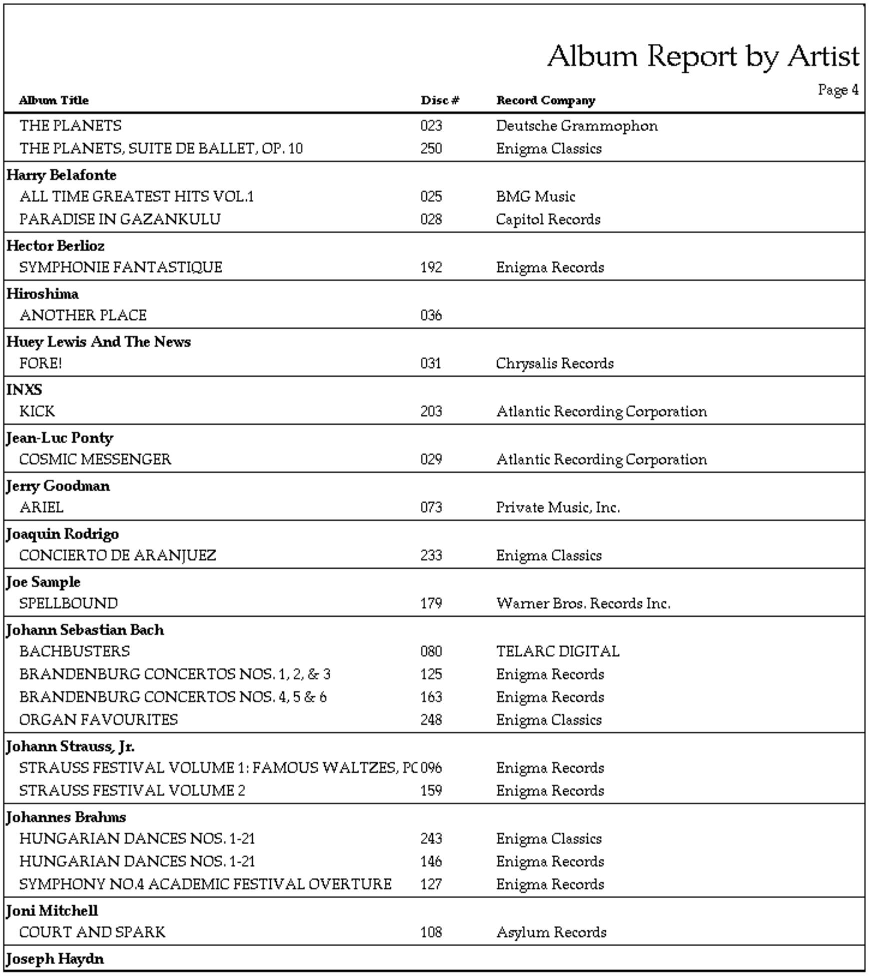
For information about printing in the User environment, refer to the *4th Dimension User Reference*.

Reports with Breaks

4th Dimension can print reports that work with Breaks and Break Headers. A Break is created when you sort the records.

Suppose you have a collection of compact discs that you keep track of in a 4th Dimension database and you want to print a list that arranges the information by artist. When you sort the records by artist, all the records fall into distinct groups. The “Break” occurs after the last record in each group is printed.

Here is how the report looks when previewed to screen:

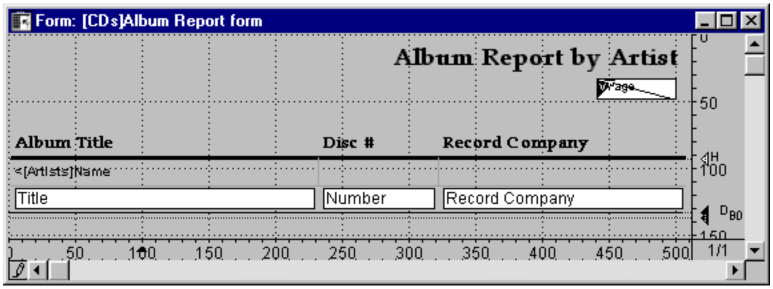


Album Report by Artist

Page 4

Album Title	Disc #	Record Company
THE PLANETS	023	Deutsche Grammophon
THE PLANETS, SUITE DE BALLET, OP. 10	250	Enigma Classics
Harry Belafonte		
ALL TIME GREATEST HITS VOL.1	025	BMG Music
PARADISE IN GAZANKULU	028	Capitol Records
Hector Berlioz		
SYMPHONIE FANTASTIQUE	192	Enigma Records
Hiroshima		
ANOTHER PLACE	036	
Huey Lewis And The News		
FORE!	031	Chrysalis Records
INXS		
KICK	203	Atlantic Recording Corporation
Jean-Luc Ponty		
COSMIC MESSENGER	029	Atlantic Recording Corporation
Jerry Goodman		
ARIEL	073	Private Music, Inc.
Joaquin Rodrigo		
CONCIERTO DE ARANJUEZ	233	Enigma Classics
Joe Sample		
SPELLBOUND	179	Warner Bros. Records Inc.
Johann Sebastian Bach		
BACHBUSTERS	080	TELARC DIGITAL
BRANDENBURG CONCERTOS NOS. 1, 2, & 3	125	Enigma Records
BRANDENBURG CONCERTOS NOS. 4, 5 & 6	163	Enigma Records
ORGAN FAVOURITES	248	Enigma Classics
Johann Strauss, Jr.		
STRAUSS FESTIVAL VOLUME 1: FAMOUS WALTZES, PC	096	Enigma Records
STRAUSS FESTIVAL VOLUME 2	159	Enigma Records
Johannes Brahms		
HUNGARIAN DANCES NOS. 1-21	243	Enigma Classics
HUNGARIAN DANCES NOS. 1-21	146	Enigma Records
SYMPHONY NO.4 ACADEMIC FESTIVAL OVERTURE	127	Enigma Records
Joni Mitchell		
COURT AND SPARK	108	Asylum Records
Joseph Haydn		

4th Dimension provides features that you can use to display the information attractively. Here is this form in the Design environment.



In order to generate a report that uses Break levels and Headers, you must first initiate Break processing. For more information about the methods you can use to initiate Break processing, refer to "Initiating Break Processing" on page 355.

A Break Header is printed once before the group of records it refers to and a Break is printed once after the group of records it refers to. In the illustration on the previous page, the Break is called a "level 1 Break" and the Break Header is called a "level 1 Break Header," because the Break occurs as a result of the first sort field.

You can use up to nine break levels. If you use Subtotal to initiate Break processing, you need to sort on one more field than the number of Breaks you use. In this case, if you use one Break level, you must sort on two fields. If you use three Break levels, you must sort on four fields.

This section explains how to create reports using Breaks. A full-scale example is provided at the end of this section. If you have any trouble understanding anything in this section, try reading the whole section and then coming back to the trouble spot. The concepts are interrelated and are often easier to understand in context than by themselves.

Creating Additional Control Lines

The report examples shown in this section use Break levels and Break Headers. To create areas for these features, you create additional control lines.

The Form editor always starts with the original control lines, labeled H, D, B0, and F. B0 stands for "Break at level 0." Level zero takes in all the records; it occurs after all the records are printed. Additional Break control lines are designated with numbers. A control line labeled B1 stands for “Break at level 1.” A level one Break occurs after the records grouped by the first sort field are printed.

Label	Explanation	Prints after groups created by:
B1	Break at level 1	First sort field
B2	Break at level 2	Second sort field
B3	Break at level 3	Third sort field

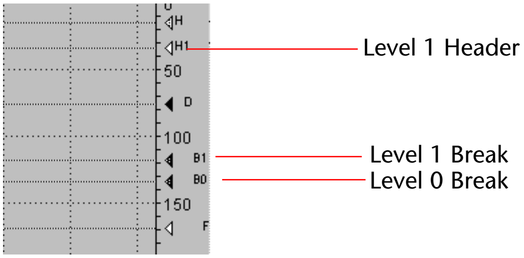
H stands for “Header,” which is printed at the top of each page. Additional Header control lines are associated with Breaks. H1 stands for “Header at level 1.” A level 1 Header is printed just before the records grouped by the first sort field are printed.

Label	Explanation	Prints before groups created by:
H1	Header at level 1	First sort field
H2	Header at level 2	Second sort field
H3	Header at level 3	Third sort field

You create additional control lines by holding down the **Alt** key (on Windows) or **Option** key (on Macintosh) while clicking the appropriate control marker. You use a Break control line to create a Break area for the designated level. You use a Break Header control line to create a Break Header area at the designated level.

If you use the Subtotal function to initiate Break processing, you should create a Break area for every level of Break that will be generated by the sort order, minus one. If you do not need anything printed in one of the Break areas, you can reduce its size to nothing by placing its marker on top of another control line. If you have more sort levels than Break areas, the last Break area will be repeated during printing.

The figure below shows additional control lines.



► To create a new Break or Break Header control lines:

1 **Hold down the Alt key (on Windows) or Option key (on Macintosh) and click any Break (B) or Break Header (H) marker.**

4th Dimension creates a new Break or Break Header control line.

The new line is positioned behind the existing control line; to see the new control line, you need to drag the existing line off of it.

2 **Drag the existing line away from the new line.**

3 **Position both lines where you want them.**

► To delete Break or Break Header control lines that you have created:

1 **Hold down the Ctrl key (on Windows) or Command key (on Macintosh).**

2 **Click on the Break or Break Header control line that you want to delete.**

4th Dimension deletes the control line and, if necessary, renumbers the remaining lines.

You cannot delete the original control lines H, D, B0, and F.

Initiating Break Processing

To allow 4th Dimension to print Break Header areas, accumulate subtotals, and perform other aspects of Break processing, you must first initiate Break processing in the report form. You initiate Break processing by either:

- Placing the Subtotal function in an object or form method,
- Executing the BREAK LEVEL and ACCUMULATE commands before printing the report.

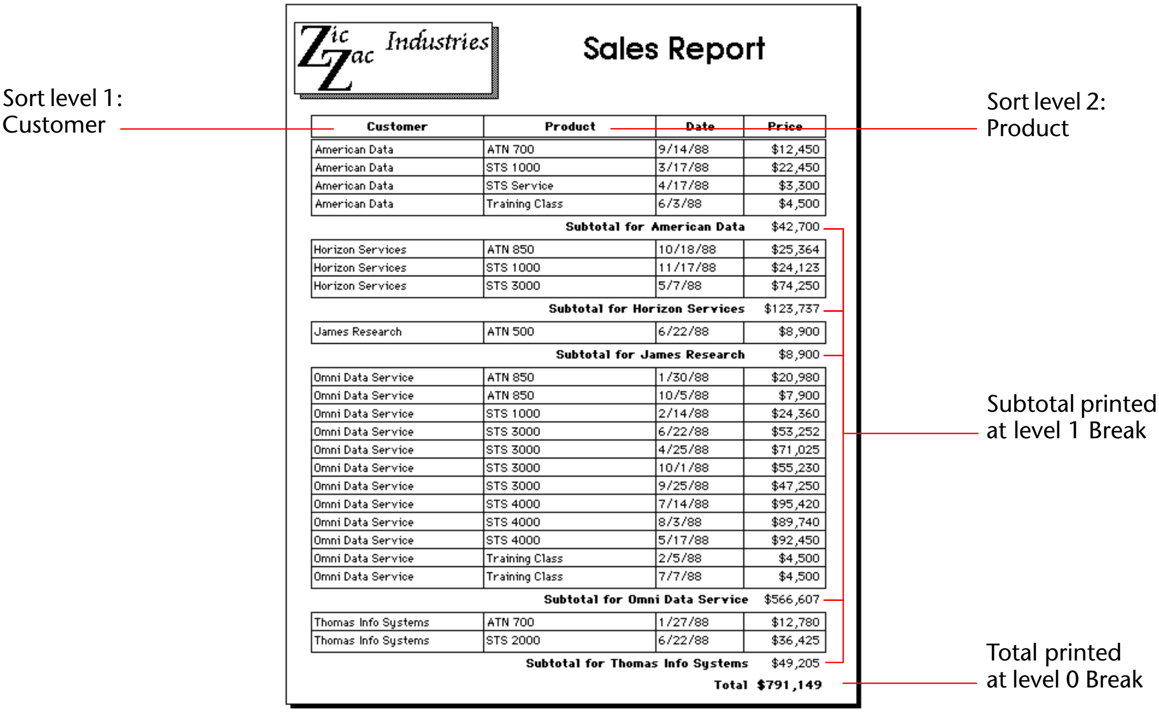
If the database will be used in interpreted mode only, you can use whichever method you prefer. However, you must use BREAK LEVEL and ACCUMULATE to initiate Break processing if the database will be used in compiled mode. In addition, if you use the Subtotal function, you must also sort the records on one more sort field than the number of Break levels you use. For example, if you use two levels of Breaks in your report, you must sort on three fields.

For more information about initiating Break processing, refer to the *4th Dimension Language Reference*.

Reports with Subtotals

This section describes in detail how the sort order affects reports and how to use additional Break areas for creating subtotals.

4th Dimension can automatically calculate and print totals and subtotals. The figure below shows a report that calculates subtotals for each customer and a total at the end of the report.



Zic Zac Industries

Sales Report

Customer	Product	Date	Price
American Data	ATN 700	9/14/88	$12,450
American Data	STS 1000	3/17/88	$22,450
American Data	STS Service	4/17/88	$3,300
American Data	Training Class	6/3/88	$4,500
		Subtotal for American Data	$42,700
Horizon Services	ATN 850	10/18/88	$25,364
Horizon Services	STS 1000	11/17/88	$24,123
Horizon Services	STS 3000	5/7/88	$74,250
		Subtotal for Horizon Services	$123,737
James Research	ATN 500	6/22/88	$8,900
		Subtotal for James Research	$8,900
Omni Data Service	ATN 850	1/30/88	$20,980
Omni Data Service	ATN 850	10/5/88	$7,900
Omni Data Service	STS 1000	2/14/88	$24,360
Omni Data Service	STS 3000	6/22/88	$53,252
Omni Data Service	STS 3000	4/25/88	$71,025
Omni Data Service	STS 3000	10/1/88	$55,230
Omni Data Service	STS 3000	9/25/88	$47,250
Omni Data Service	STS 4000	7/14/88	$95,420
Omni Data Service	STS 4000	8/3/88	$89,740
Omni Data Service	STS 4000	5/17/88	$92,450
Omni Data Service	Training Class	2/5/88	$4,500
Omni Data Service	Training Class	7/7/88	$4,500
		Subtotal for Omni Data Service	$566,607
Thomas Info Systems	ATN 700	1/27/88	$12,780
Thomas Info Systems	STS 2000	6/22/88	$36,425
		Subtotal for Thomas Info Systems	$49,205
		Total	**$791,149**

Sort level 1: Customer

Sort level 2: Product

Subtotal printed at level 1 Break

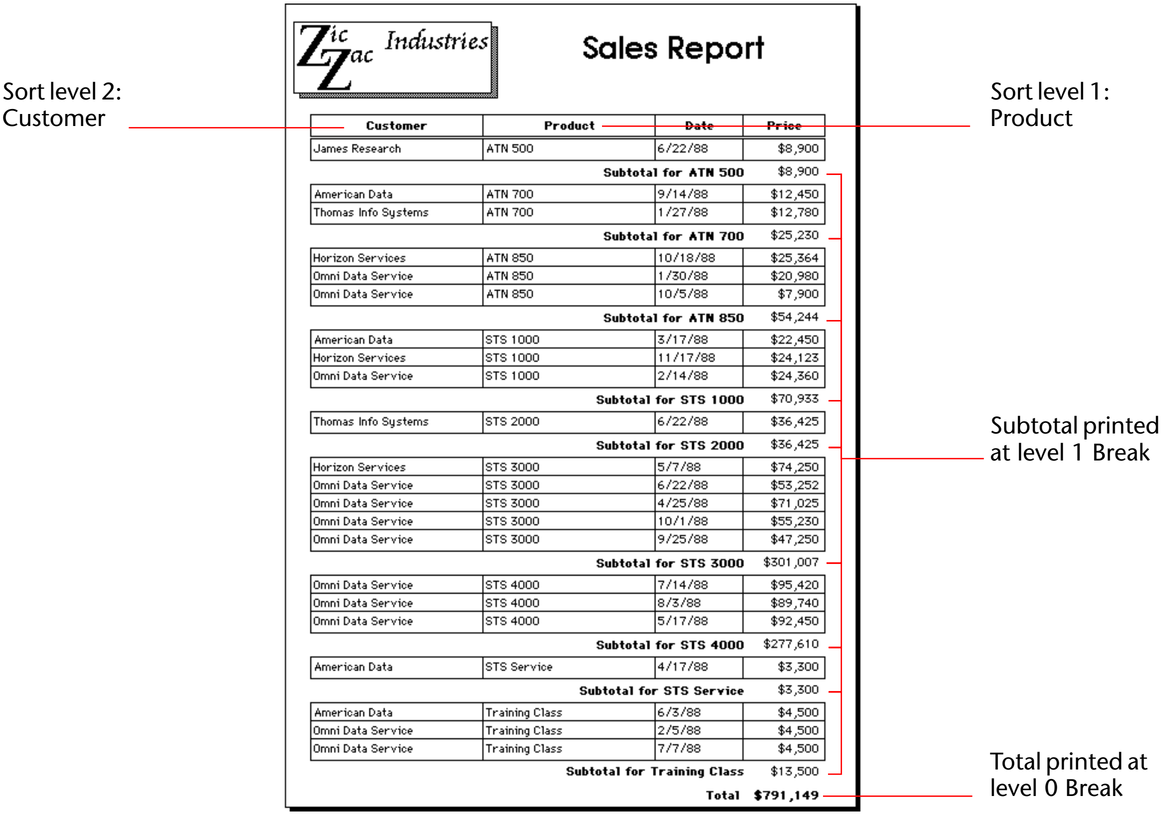
Total printed at level 0 Break

These records have been sorted by customer and product. After the records for each customer have been printed, the subtotal for the customer is calculated and printed. After the records for the entire report have been printed, the total is calculated and printed.

As you can see in the figure above, the subtotals are calculated and printed after the records for each customer. 4th Dimension knows when to perform the calculation and print the subtotal because it has been instructed to do so when the value in the first sort field changes (where it “breaks”).

The customer subtotal is calculated in what is called a level 1 Break because it is based on a change in the first sort level (in this case, the Customer field). The grand total is calculated in a level 0 Break. A level 0 Break includes all the records and occurs at the end of the report.

The figure below shows another example of calculations during a Break, using the same records, but with a different sort order to create a different Break. This time the records have been sorted by product and customer. The subtotals are calculated when the value in the Product field changes. This is still a level 1 Break, but the Break is on a different field.



Sort level 2: Customer

Sort level 1: Product

Subtotal printed at level 1 Break

Total printed at level 0 Break

Zic Zac Industries

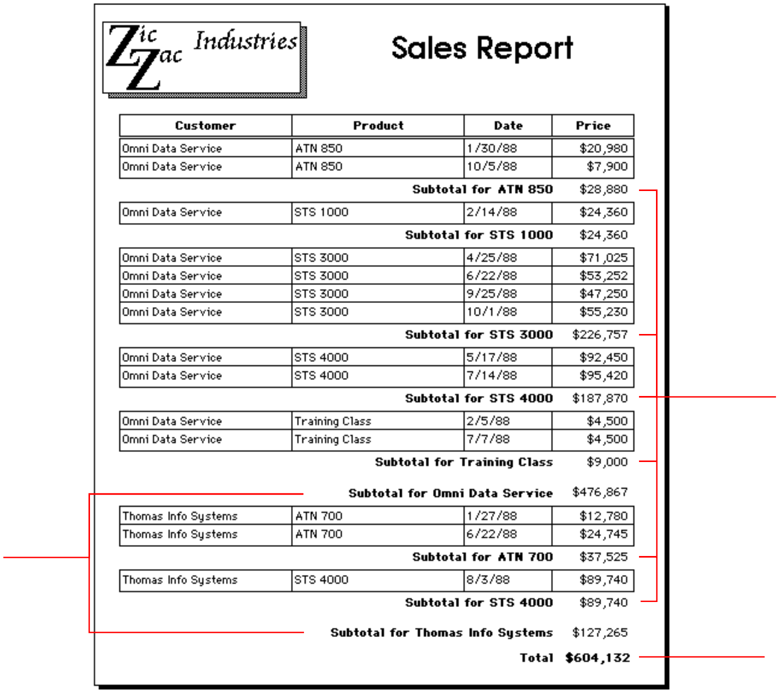
Sales Report

Customer	Product	Date	Price
James Research	ATN 500	6/22/88	$8,900
		Subtotal for ATN 500	$8,900
American Data	ATN 700	9/14/88	$12,450
Thomas Info Systems	ATN 700	1/27/88	$12,780
		Subtotal for ATN 700	$25,230
Horizon Services	ATN 850	10/18/88	$25,364
Omni Data Service	ATN 850	1/30/88	$20,980
Omni Data Service	ATN 850	10/5/88	$7,900
		Subtotal for ATN 850	$54,244
American Data	STS 1000	3/17/88	$22,450
Horizon Services	STS 1000	11/17/88	$24,123
Omni Data Service	STS 1000	2/14/88	$24,360
		Subtotal for STS 1000	$70,933
Thomas Info Systems	STS 2000	6/22/88	$36,425
		Subtotal for STS 2000	$36,425
Horizon Services	STS 3000	5/7/88	$74,250
Omni Data Service	STS 3000	6/22/88	$53,252
Omni Data Service	STS 3000	4/25/88	$71,025
Omni Data Service	STS 3000	10/1/88	$55,230
Omni Data Service	STS 3000	9/25/88	$47,250
		Subtotal for STS 3000	$301,007
Omni Data Service	STS 4000	7/14/88	$95,420
Omni Data Service	STS 4000	8/3/88	$89,740
Omni Data Service	STS 4000	5/17/88	$92,450
		Subtotal for STS 4000	$277,610
American Data	STS Service	4/17/88	$3,300
		Subtotal for STS Service	$3,300
American Data	Training Class	6/3/88	$4,500
Omni Data Service	Training Class	2/5/88	$4,500
Omni Data Service	Training Class	7/7/88	$4,500
		Subtotal for Training Class	$13,500
		Total	$791,149

Additional Break Levels

You can provide additional summary calculations by adding another sort level and another Break level.

The following figure shows sales records sorted by customer, product, and salesperson. Summary calculations show two sets of subtotals: one subtotal for each customer, and, within each customer, subtotals for each product for the customer. Finally, this report calculates a total for the entire company. These are examples of calculations performed at level 2 Breaks, at level 1 Breaks, and at the level 0 Break.



ZicZac Industries

Sales Report

Customer	Product	Date	Price
Omni Data Service	ATN 850	1/30/88	$20,980
Omni Data Service	ATN 850	10/5/88	$7,900
	Subtotal for ATN 850		$28,880
Omni Data Service	STS 1000	2/14/88	$24,360
	Subtotal for STS 1000		$24,360
Omni Data Service	STS 3000	4/25/88	$71,025
Omni Data Service	STS 3000	6/22/88	$53,252
Omni Data Service	STS 3000	9/25/88	$47,250
Omni Data Service	STS 3000	10/1/88	$55,230
	Subtotal for STS 3000		$226,757
Omni Data Service	STS 4000	5/17/88	$92,450
Omni Data Service	STS 4000	7/14/88	$95,420
	Subtotal for STS 4000		$187,870
Omni Data Service	Training Class	2/5/88	$4,500
Omni Data Service	Training Class	7/7/88	$4,500
	Subtotal for Training Class		$9,000
	Subtotal for Omni Data Service		$476,867
Thomas Info Systems	ATN 700	1/27/88	$12,780
Thomas Info Systems	ATN 700	6/22/88	$24,745
	Subtotal for ATN 700		$37,525
Thomas Info Systems	STS 4000	8/3/88	$89,740
	Subtotal for STS 4000		$89,740
	Subtotal for Thomas Info Systems		$127,265
	Total		**$604,132**

Subtotal printed at a level 2 Break

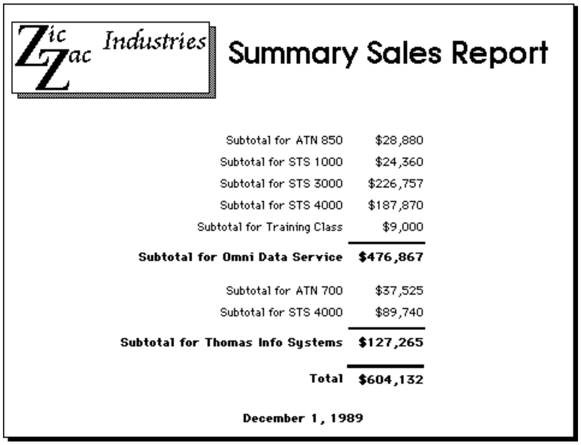
Subtotal printed at a level 1 Break

Total printed at a level 0 Break

The subtotal calculations are performed only for the group of records that precedes the Break. For example, a subtotal is calculated for each product sold to each customer. The subtotal for the customer is calculated for all products sold to that customer.

Summary Reports

You can create a report that prints only summary information. Such a report displays only the subtotals and totals with appropriate additional text. The following illustration shows a report with only summary information.



Zic Zac Industries

Summary Sales Report

Subtotal for ATN 850	$28,880
Subtotal for STS 1000	$24,360
Subtotal for STS 3000	$226,757
Subtotal for STS 4000	$187,870
Subtotal for Training Class	$9,000
Subtotal for Omni Data Service	**$476,867**
Subtotal for ATN 700	$37,525
Subtotal for STS 4000	$89,740
Subtotal for Thomas Info Systems	**$127,265**
Total	**$604,132**

December 1, 1989

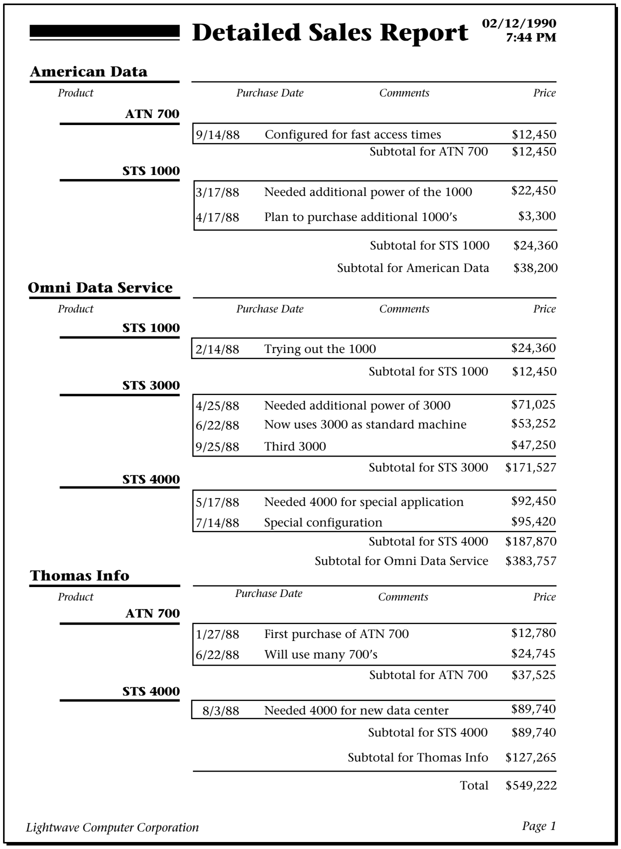
In this report, the records are sorted by customer, product, and date and the calculations are performed during the Breaks created by the sort order. The Detail area for each record is not printed; the records are used only to provide values for the calculations. Notice that 4th Dimension goes through the records from the first to the last during the printing of the report so that it can calculate these figures. (You create this kind of report by placing the Detail control line on top of the Header control line, leaving no space for details to print.)

You can ask 4th Dimension to perform additional calculations on a list including subtotals, averages, maximum and minimum values, page totals to be printed in a footer, and weighted averages. These calculations, and others, use 4th Dimension's summary functions. For information about how to use summary functions, refer to the *4th Dimension Language Reference*.

An Example Report

This section describes an example report and shows how the finished report is related to a form in the Form editor and to the methods that control the printing.

The following illustration shows a finished report.



```
                          Detailed Sales Report      02/12/1990
                                                        7:44 PM
American Data
     Product         Purchase Date      Comments                       Price
          ATN 700
                     9/14/88   Configured for fast access times       $12,450
                                             Subtotal for ATN 700     $12,450
          STS 1000
                     3/17/88   Needed additional power of the 1000    $22,450
                     4/17/88   Plan to purchase additional 1000's      $3,300
                                             Subtotal for STS 1000    $24,360
                                        Subtotal for American Data    $38,200
Omni Data Service
     Product         Purchase Date      Comments                       Price
          STS 1000
                     2/14/88   Trying out the 1000                    $24,360
                                             Subtotal for STS 1000    $12,450
          STS 3000
                     4/25/88   Needed additional power of 3000        $71,025
                     6/22/88   Now uses 3000 as standard machine      $53,252
                     9/25/88   Third 3000                             $47,250
                                             Subtotal for STS 3000   $171,527
          STS 4000
                     5/17/88   Needed 4000 for special application    $92,450
                     7/14/88   Special configuration                  $95,420
                                             Subtotal for STS 4000   $187,870
                                   Subtotal for Omni Data Service    $383,757
Thomas Info
     Product         Purchase Date      Comments                       Price
          ATN 700
                     1/27/88   First purchase of ATN 700              $12,780
                     6/22/88   Will use many 700's                    $24,745
                                              Subtotal for ATN 700    $37,525
          STS 4000
                      8/3/88   Needed 4000 for new data center        $89,740
                                             Subtotal for STS 4000    $89,740
                                          Subtotal for Thomas Info   $127,265
                                                             Total   $549,222

Lightwave Computer Corporation                                         Page 1
```

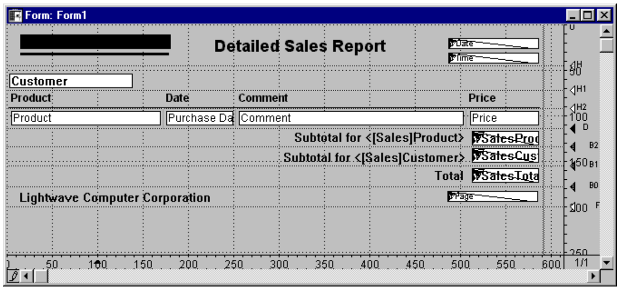
In this example, the page Header contains the date, the time, and the report title. The Break Headers contain the customer name and column headings for the information presented during the first Break. The Detail areas contain data drawn directly from the records. The level 2 Break areas contain subtotals for products for each customer. The level 1 Break areas contain subtotals for each customer and the level 0 Break area contains a total for the report. The Footer contains the page number.

The report is sorted on one more level than Break levels. In this report, the sort fields are Customer, Product, and Date.

4th Dimension requires one more sort level than Break level for the Break processing method used in this report.

The Report Form

The following illustration shows the report form that created the report shown on this page.



Each control line in the form defines the bottom of its area. Whatever is placed in the form is printed at the appropriate place in the report. The Header area contains the elements that will be printed at the top of each page, the Detail area contains the elements that will be printed for each record, and so on. The following table shows what each of these control lines means.

Label	Explanation	Effect
H	Header area	Printed once at the top of each page
H1	L1 Header area	Printed once before each level 1 Break
H2	L2 Header area	Printed once before each level 2 Break
D	Detail area	Printed once for each record in the selection
B2	L2 Break area	Printed once at each level 2 Break (when the value in the second Sort field changes)
B1	L1 Break area	Printed once at each level 1 Break (when the value in the first Sort field changes)
B0	L0 Break area	Printed once at the end of the report
F	Footer area	Printed once at the bottom of each page

You can have additional Break areas and additional Break Header areas.

The Report Object Methods

The non-enterable objects that are placed in the Header, Break, and Footer areas are controlled by object methods. This section describes the methods used to print values in these locations.

Note The following code can be used only in object and form methods. It cannot be used in project methods.

The date is drawn from the system date by placing a non-enterable object named vDate in the Header area with this method:

vDate := **Current Date**

The time is drawn from the system clock by placing a non-enterable object named vTime in the Header area with this method:

vTime := **Current Time**

The subtotal for sales in the level 2 Break area is calculated and displayed in an object named vSalesProd with the following method:

vSalesProd := **Subtotal** (Sales)

The subtotal for sales in the level 1 Break area is calculated and displayed in an object named vSalesCust with the following method:

vSalesCust := **Subtotal** (Sales)

The total for sales in the level 0 Break area is calculated and displayed in an object named vSalesTotal with the following method:

vSalesTotal := **Subtotal** (Sales)

Note that even though all three objects use the same calculation, they produce different results. Because they are placed in different Break areas, they are executed at different times and perform their calculations for different groups of records. For an explanation of Break levels, see the section "Reports with Breaks" on page 352.

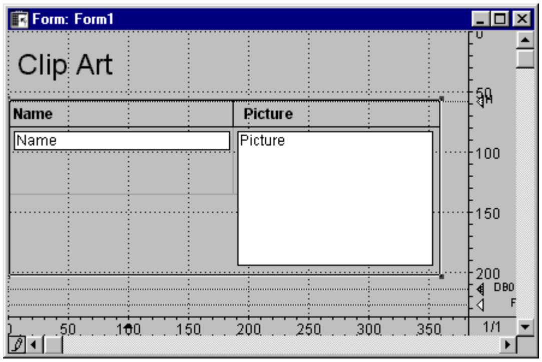
vPage := "Page " + **String** (**Current form page**)

The Current form page function returns the page number.

Printing Subforms, Pictures, and Text Fields

You can use subforms, picture fields, and text fields in a report. These objects can be set to print with either a fixed or variable frame. Fixed frame objects print within the confines of the object as it was created on the form. Variable frame objects expand during printing to include the entire contents of the object.

You cannot place more than one variable frame object side-by-side on a form. You can place non-variable frame objects on either side of a variable frame Picture or Text field provided that the variable frame object is at least one line longer than the other objects and that all objects are aligned to the top, as shown in the following illustration.



Otherwise, during printing, the contents of the other fields will be repeated for every horizontal slice of the variable frame object.

You cannot place objects on either side of a variable frame subform.

Printing Subform Areas

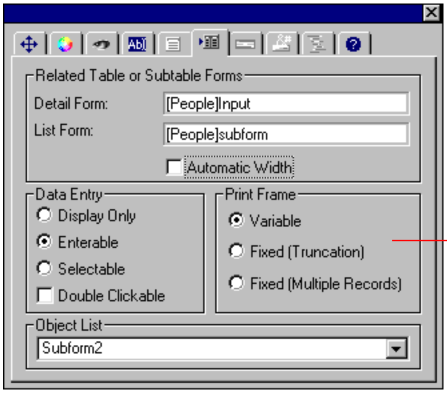
You usually use an output form to print records in a subform.

▶ To set the print option for a subform:

1 Double-click on the subform in the Form editor.

The Object Properties window for the subform appears.

2 Click the Subform tab and select a print option as shown below.



Related Table or Subtable Forms

Detail Form: [People]Input

List Form: [People]subform

☐ Automatic Width

Data Entry

○ Display Only

● Enterable

○ Selectable

☐ Double Clickable

Print Frame

● Variable

○ Fixed (Truncation)

○ Fixed (Multiple Records)

Object List

Subform2

Print Frame options

Because there may be more records than can fit in the subform area, 4th Dimension provides the following three check boxes for controlling how records in a subform are printed:

- Variable,
- Fixed (truncation),

- Fixed (multiple records).

  If you select the **Variable** radio button, 4th Dimension expands or contracts the subform area to print all the records.

  If you select the **Fixed (truncation)** radio button, 4th Dimension prints only the records that fit into the area of the subform. The form is printed only once and those records that are not printed are ignored.

  If you select the **Fixed (multiple records)** radio button, the frame remains the same size, but 4th Dimension prints the form several times to include all the records.

Note You cannot place any objects on either side of a variable frame subform. Objects placed on either side of the subform will be repeated for every line of the subform.

Printing Picture Fields

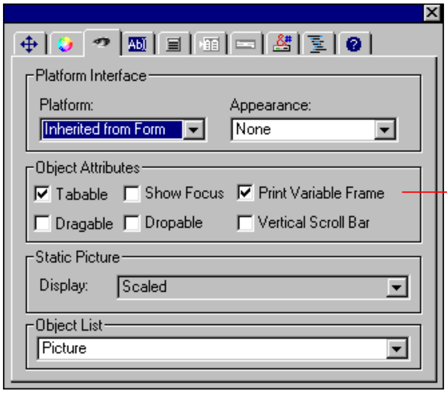
Pictures can be printed with either fixed or variable frames.

► To set a print option for a picture field:

1 Double-click the picture field in the form.

The Object Properties window appears.

2 Click the Display tab.



Platform Interface

Platform: Inherited from Form

Appearance: None

Object Attributes

☑ Tabable □ Show Focus ☑ Print Variable Frame

□ Dragable □ Dropable □ Vertical Scroll Bar

Static Picture

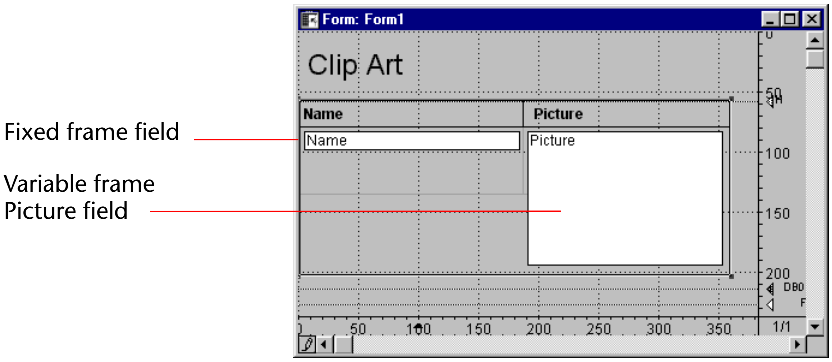
Display: Scaled

Object List

Picture

Print Variable Frame selected

The figure below shows an output form from a Clip Art database.



3 **Select the Print Variable Frame check box to print the picture with a variable frame.**

When the **Print Variable Frame** check box is selected, the print frames expand to show the entire picture.

OR

Deselect the check box to print the picture with a fixed frame.

Printing Text Fields

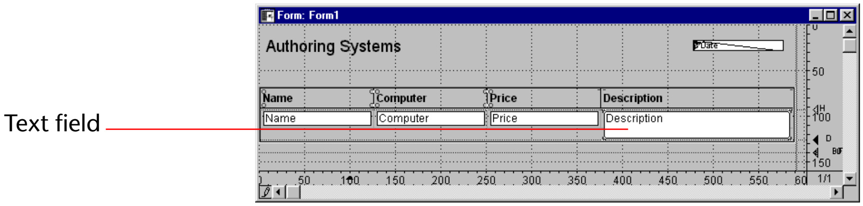
Text fields can be printed with either Variable frame or Fixed frame. Print options for Text fields are selected exactly as they are for Picture fields.

► To select a print option for a Text field:

1 **Double-click the Text field in the form.**

The Object Properties window for the text field appears.

In the form below, the Text field is two lines high in the Detail area and is aligned to the top of the fields to the left of it.



2 **Select the Print Variable Frame check box on the Display page of the Object Properties window to print the text field with a variable frame.**

If the **Print Variable Frame** check box is selected, the Text field expands dynamically to display as many lines as necessary to accommodate the amount of text that was entered.

Printing Labels

You can generate labels with either the Label editor in the User environment or a custom report form. If you use a report form, you have more extensive customization options. You can use variables on the label and any of the graphics tools available in the Form editor.

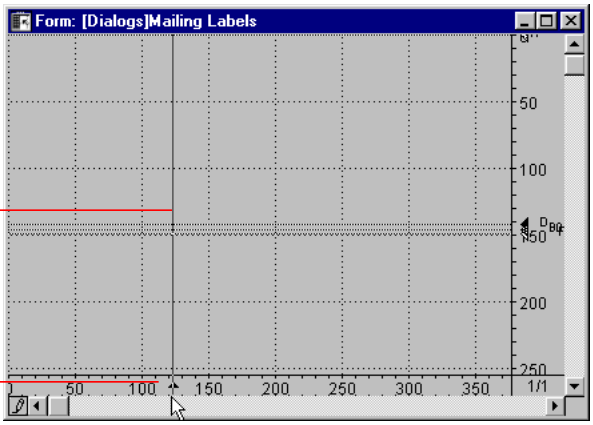
The report format described here can also be used for unusual reports that require side-by-side placement of text.

► To create a label report form:

1 Set the label width by dragging the width marker on the bottom ruler of the Form editor.

The width marker determines how many labels 4th Dimension prints across the page. The placement of the width marker should correspond to the width of your labels. Be sure to take into account the left and right margins of your labels.

You can determine these margins by calculating the space between each label and dividing this number by two. If you have labels that are 2.25 inches wide with a margin of .125 inches (1/8 inch) on either side of each label, the label width marker should be placed at 2.625 inches (2 3/8 inches) to ensure that the label text is placed correctly on the labels.



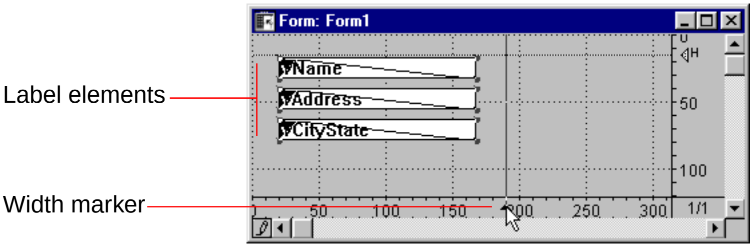
Width line visible by clicking width marker

Width marker

Note You may want to change the ruler units in the form to inches to make it easier to determine the proper placement of the label width marker. To change the ruler units, choose **Define Ruler Units** from the **Form** menu and select Inches.

2 Design the label form to the left of the width marker.

Labels can contain fields, active and graphic objects, text, and object methods. A subform cannot be printed in a label. These elements should be centered between the left edge of the form and the width marker so that the space on either side equals the size of the label margins as shown in the label design below.



This design includes variables (active objects) whose values are assigned by object methods. For example, the method for the vName variable concatenates the first name and last name of each person and places a space between the two names.

For more information about object methods, see the section “Object Methods” on page 370.

3 **Set the control lines so that the Header control line is above the label and the Detail, Break, and Footer control lines are below the label.**

The Header control line should be set at zero inches and the Detail control line should be set to the height of the label. To center the text within the label, center the form elements between the Header control line and the Detail control line.

When you print the labels in the User environment, everything between the Header and the Detail control lines appears on the labels.

4 **Return to the User environment to print the Labels.**

5 **Choose the label form from the List of Tables window to make it the current output form for the table.**

You can display the List of Tables window by pressing **Ctrl+Space bar** (on Windows) or **Command–Space bar** (on Macintosh).

Note If you have multiple operating systems installed on your PC and are using **Ctrl+Space bar** to switch between systems, use **Ctrl+Shift+Space bar** to display the List of Tables window.

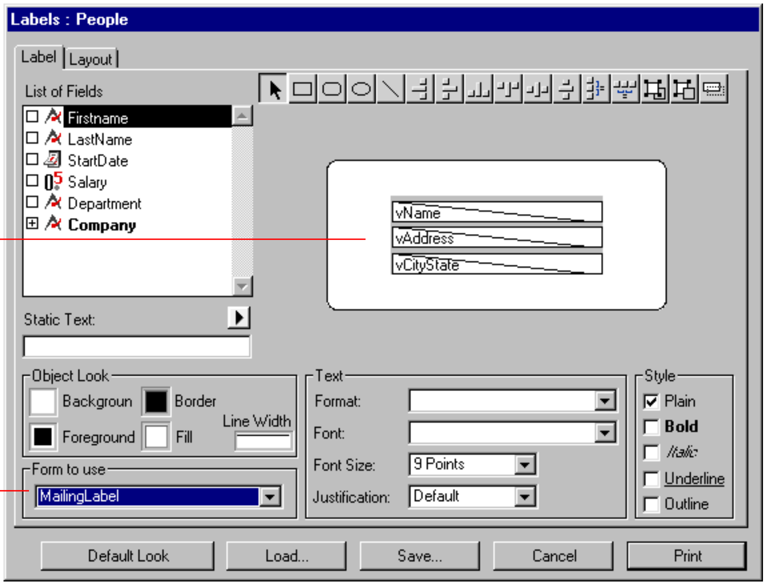
For more information about using the List of Tables window, refer to the *4th Dimension User Reference*.

6 **Choose Labels from the Report menu.**

The Label Wizard appears.

7 **Choose the label form you designed from the Form To Use drop-down list.**

This tells 4th Dimension to use this form to print the labels.



Form to use: MailingLabel

Font Size: 9 Points

Justification: Default

☑ Plain

Preview of label design on form

Form to use drop-down list

8 **Make any other changes to the Label editor such as setting the label margins or specifying the font in which the text appears.**

For complete information about using the Label editor, refer to the *4th Dimension User Reference*.

9 **Click the Print button.**

4th Dimension prints the current selection of records using your label report design.

7 Creating Methods

You can attach a method to a 4th Dimension object to specify the object's action. A method is a series of instructions that tell the object to do something. For example, you can use methods to:

- Enforce business rules during data entry,
- Calculate values for fields and variables,
- Manage interface elements such as combo boxes, hierarchical lists, and tab controls,
- Manage drag and drop actions,
- Assign actions to custom menu commands,
- Create and manage multiple processes,
- Manage transactions,
- Manage custom reports,
- Regulate multi-user database access.

This chapter provides information about using 4th Dimension's Method editors to create and modify methods. To learn more about 4th Dimension's programming language, refer to the *4th Dimension Language Reference*, which provides detailed information about the programming commands and syntax.

4th Dimension Methods

You can create the following four types of methods:

- **Object methods** Object methods are associated with individual objects on a form, such as fields, buttons, drop-down lists, and tab controls. They can be used for such purposes as assigning initial values, managing and validating data entry, or managing drag-and-drop actions.
- **Form methods** Form methods are attached to individual forms. A Form method can manage everything that happens when a form is used for data entry, screen display, or printing. Alternatively, you can use Object methods to manage individual objects on the form.
- **Table methods** Table methods (triggers) are run when specific events occur at the database engine level. For more information, see "Triggers" on page 371 and "Triggers" on page 375.
- **Database methods** Database methods run automatically when certain worksession-related events occur. For more information about Database methods, see "Database Methods" on page 373.
- **Project methods** Project methods can be called by other methods anywhere in the database. Project methods are also attached to custom menu items to specify the menu item's action.

Object Methods

An object method is attached to a field or other active object on a form. You create object methods in the Form editor. The object method executes when certain events occur. The method is bound to the object to which it is attached and moves with it when copied.

An object method can perform calculations, get related information from other tables, concatenate data, validate data, display a specific page in a multi-page form, and more. The following are some examples of things you can do in an object method:

- Display the current date on screen or print it in a report,
- Manage data entry from a combo box,
- Display a custom dialog box when the user presses a button on a form,
- Specify the action when a user drags an item in a scrollable list to another object.

An object method can perform data entry control similar to the built-in data entry features (in the Data Control page of the Object Properties window). For example, you can write an object method to perform data validation, set the display format, or establish an entry filter.

Form Methods

A form method is a method attached to a form. Each form can have one form method. It is executed whenever the form is used. The method is bound to the form, but does not move with it when a form is copied (form elements are copied, not entire forms).

Note Only certain events occur when a form is used as an output form. For information about events, refer to the *4th Dimension Language Reference*.

A form method manages a form at a higher level than do object methods. Form methods are used to control the interaction between different objects and the form as a whole. One use for a form method is to calculate values based on more than one field. Since the calculation must be performed whenever any of the values involved changes, you place the calculation in a form method.

For example, you might place the following statement in a form method:

```
vTax:= TotalSales * TaxRate
```

As a form method, this statement can be executed every time anything on the form changes. This ensures that the variable vTax is always up-to-date.

Triggers

Triggers are methods that run automatically when certain events occur at the database engine level. Those events are:

- **On Saving New Record** The trigger will be invoked when a record is added to the table. This happens when:
  - Adding a record in data entry (in the User environment or using the ADD RECORD command).
  - Creating and saving a record with CREATE RECORD and SAVE RECORD. The trigger is invoked when you call SAVE RECORD, not when it is created.
  - Importing records (in the User environment or using an import command).

  - Calling any other commands that create or save new records (i.e., ARRAY TO SELECTION, SAVE RELATED ONE, etc.)
  - Using a plug-in that calls the CREATE RECORD and SAVE RECORD commands.
- **On Saving an Existing Record** The trigger will be invoked when a record of the table is modified. This happens when:
  - Modifying a record in data entry (in the User environment or MODIFY RECORD command).
  - Saving an already exiting record with SAVE RECORD.
  - Calling any other commands that save existing records (i.e., ARRAY TO SELECTION, APPLY TO SELECTION, MODIFY SELECTION, etc.).
  - Using a plug-in that calls the SAVE RECORD command.
- **On Deleting a Record** The trigger will be invoked when a record of the table is deleted. This happens when:
  - Deleting a record (in the User environment or calling DELETE RECORD or DELETE SELECTION).
  - Performing any operation that deletes related records through the Deletion control options of a relation.
  - Using a plug-in that calls the DELETE RECORD command.
- **On Loading a Record** The trigger will be invoked when a record of the table is loaded. This includes all situations in which a current record is loaded from the data file. You will this option less often than the three previous ones.

Note This option does not cover the creation of a new record; it only applies to the loading of existing records.

The trigger is a new type of method introduced in version 6. In previous releases of 4th Dimension, table methods (called File procedures) were executed only when a form for a table was used for data entry, display, or printing — they were rarely used. Triggers execute at a much lower level than File procedures. No matter how a record is created, modified, or deleted — by user actions (such as data entry) or programmatically (such as a call to SAVE RECORD) — the trigger will be invoked.

Database Methods

Database methods run when certain worksession-related events occur. Those events are:

- On Startup (equivalent to the *STARTUP* procedure in previous releases of 4th Dimension)
- On Web connection
- On Server startup
- On Server shutdown
- On Server open connection
- On Server close connection
- On Exit

4th Dimension ships with empty methods that are associated with these events. You can add code to any or all of these methods. For complete information on the uses of database methods, see the section "Database Methods" in the *4th Dimension Language Reference*.

Note If you are converting a database written with an earlier version of 4th Dimension, it may have a *STARTUP* procedure. If you want that procedure to run automatically at startup, select "Use Old Startup Procedure Scheme" in the Design environment page of the Database Properties dialog box and ignore the new database methods architecture[1]. Alternatively, you can deselect this option, paste the code from your *STARTUP* procedure into the On Startup database method, and use the new database methods scheme.

Project methods

A project method can be called by any other method or associated with a menu item. A project method can also be executed by choosing **Execute Method** from the User environment's **Special** menu. When a project method is called by another method, the statements in the project method are substituted for the method's name in the method which is calling it.

Project methods are not associated with a table, form, or object. You can create as many project methods as you need.

[1] For more information on this option, see the section "Design Environment" on page 51.

The following is an example of a project method.

```
  `Adds a record to the [Employees] table
INPUT FORM ([Employees];"Input")
OK:=1
While (OK=1)
  ADD RECORD ([Employees])
End while
```

This method is attached to a menu item that is used for entering new records. The method lets the user add new records to the [Employees] table using the form named Input. The user is able to add new records until he or she clicks the Cancel button[1].

A method can also be used as a formula that you apply to the current selection. For information about applying formulas, refer to the *4th Dimension User Reference*.

Events

Database, Table (trigger), Form, and Object methods run only when certain events occur. You specify those events when you set the properties for each object. The Table, Form, and Object Properties windows each have pages in which you specify the events that will run for the object. The following illustration shows those pages.

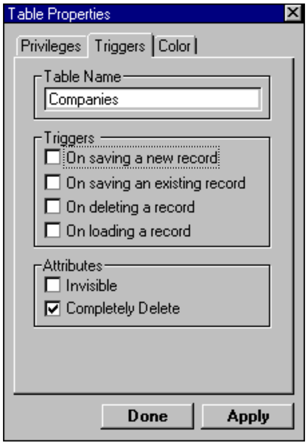
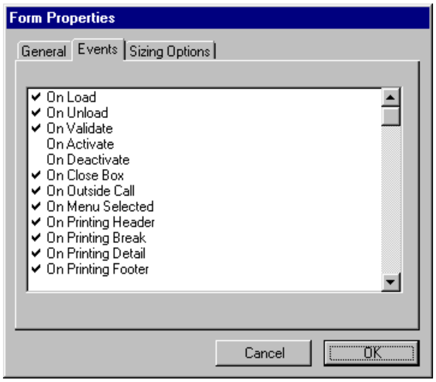


Table Name
Companies

Triggers
☐ On saving a new record
☐ On saving an existing record
☐ On deleting a record
☐ On loading a record

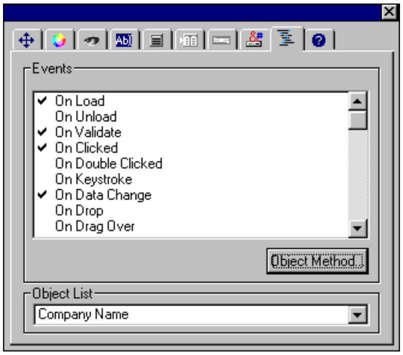
Attributes
☐ Invisible
☑ Completely Delete

Triggers page of Table properties window



✓ On Load
✓ On Unload
✓ On Validate
On Activate
On Deactivate
✓ On Close Box
✓ On Outside Call
✓ On Menu Selected
✓ On Printing Header
✓ On Printing Break
✓ On Printing Detail
✓ On Printing Footer

Events page of Form properties window



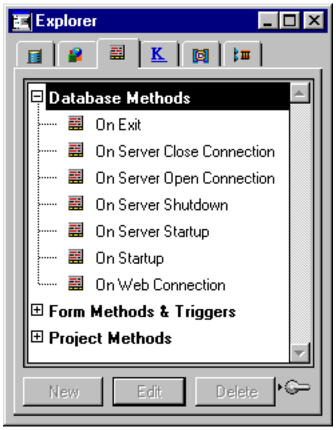
Events
✓ On Load
On Unload
✓ On Validate
✓ On Clicked
On Double Clicked
On Keystroke
✓ On Data Change
On Drop
On Drag Over

Object List
Company Name

Events page of Object properties window

[1] Clicking Cancel sets the system OK variable to 0.

In addition, 4th Dimension provides blank Database methods which are listed in the Methods page of the Explorer. Each Database method runs only when the corresponding worksession-related event occurs. You can open a blank database method from the Methods page of the Explorer:



Database Methods

You write a Database method by opening the desired blank Database method and entering your code. When you are converting a database written with an earlier release of 4th Dimension, you can copy the code in your *STARTUP* procedure and paste it into the On Startup method.

Triggers

Table events (triggers) are run when particular events regarding saving, deleting, and loading records occur. If you want a trigger to run when a particular event occurs, you must check the appropriate event in the Triggers page of the Table properties window. You then create the trigger by creating a Table method from the Explorer. For more information about creating a Table method, see the section "Creating a Trigger" on page 389.

In the Trigger, you generally need to test for each event that you checked in the Triggers page. To do so, you can use a Case statement and the Database event function. The Constants page of the Explorer lists constants associated with each Table event.

Your Case statement shell would look like this:

```
Case of
  :(Database event=Save New Record Event)
     ` Perform actions for saving a new record
  :(Database event=Save Existing Record Event)
     ` Perform actions for saving an existing record
  :(Database event =Delete Record Event)
     ` Perform actions for deleting an existing record
  :(Database event=Load Record Event)
     ` Perform actions for loading a record into memory
End case
```

Note The Design environment page of Database Properties has an option that lets you run Table methods (triggers) according to the rules that were established for File procedures in previous releases of 4th Dimension. If you wish to use Table methods in this manner, select the Use Old File Procedure Scheme property.

Using Triggers

A trigger has two basic functions:

- Performing actions on a record before it is saved, modified, deleted, or just after it is loaded.
- Accepting or rejecting a database operation, such as a save record operation.

In the first case, you can use a trigger to stamp a record when it is saved or modified, or post information to another table. For example, the following code stamps a record using the object method *Timestamp*:

```
` Trigger for table [Documents]
Case of
  : (Database event=Save New Record Event)
     [Documents]Creation Stamp:= Timestamp
     [Documents]Modification Stamp:= Timestamp
  : (Database event=Save Existing Record Event)
     [Documents]Modification Stamp:= Timestamp
End case
```

In the second case, you use the trigger to enforce business rules systematically. Because a trigger is executed whenever a record is saved, modified, or deleted, the trigger does not leave any “loopholes” thorough which an invalid database operation can slip.

Here is a simple example. Suppose you have the rule that all records in the [Employees] table must have a valid Social Security number. You have written a function, *GoodSSNumber*, that validates Social Security number entries. The following trigger ensures that *GoodSSNumber* is run no matter how an [Employees] record is saved or modified.

```
` Trigger for [Employees]
$0:=0
$dbEvent:=Get database event
Case of
  : (($dbEvent=Save New Record Event) | ($dbEvent=Save Existing Record Event))
     If (Not(Good SSNumber ([Employees]SS number)))
       $0:=-15050
     Else
` ...
  End if
End Case
```

When this business rule is violated, the line SAVE RECORD ([Employees]) will generate a database engine error -15050 and the record will not be saved. You can trap for this error number using ON ERROR CALL.

For complete information on using triggers, see the *4th Dimension Language Reference*.

Form and Object Events

Form and object methods run when particular form and object-level events occur. If you want a form or object method to run when a particular event occurs, you must activate the appropriate event in the Events page of the Form or Object Properties window.

The following is a list of events for forms used for screen display:

- **On Load** 4th Dimension is about to display the form on-screen or print the form.
- **On Unload** The form is about to be closed and released.
- **On Validate** After the user has accepted the record.
- **On Clicked** The user clicks the object that has focus.
- **On Outside Call** When the form receives a call from CALL PROCESS.
- **On Activate** When the form's window becomes the frontmost window.

- **On Deactivate** When the form's window is no longer the frontmost window (i.e., when another window becomes the frontmost window).
- **On Double-clicked** The user double-clicks the object.
- **On Getting Focus** When a form object gets focus (i.e., the user presses Tab to select the object or clicks the object).
- **On Losing Focus** When a form object loses focus (i.e., the user presses Tab to select the next object in the entry order or clicks another object to select it).
- **On Drop** When the object receives a dragged object.
- **On Keystroke** When the user presses a key in the object that has focus.
- **On Menu Selected** A menu item has been chosen.
- **On Plug-in Area** A plug-in requested that its object method be executed.
- **On Data Change** When the data in the object changes.
- **On Close Box** The window's Close box has been clicked.
- **On Display Detail** A record is about to be displayed in an output form.
- **On Open Detail** A record is double-clicked in an output form and 4th Dimension is about to display the record in the current input form.
- **On Close Detail** 4th Dimension is putting away the input form and is about to redisplay the output form.

For printed reports only, the following events occur:

- **On Printing Header** The form's Header area is about to be printed.
- **On Printing Detail** The form's Detail area is about to be printed.
- **On Printing Break** The form's Break areas are about to be printed.
- **On Printing Footer** The form's Footer area is about to be printed.

For complete information on form events, refer to the discussion of the Form event function and the form event constants in the *Language Reference*.

When you write a form or object method, you generally need to test for each event that you activated in the Form or Object Properties window. To do so, you can use a Case statement and the Form event function. The Constants page of the Explorer lists constants associated with each Form event. Your Case statement would look like this:

```
Case of
  :(Form event=On Load)
     ` Perform appropriate actions here...
  :(Form event=On Data Change)
     ` Perform appropriate actions here...
  :(Form event =On Validate)
     ` Perform appropriate actions here...
  :(Form event=On Clicked)
       ` Perform appropriate actions here...
.
.
.
End case
```

Introduction to Methods

A 4th Dimension method is a series of instructions that causes 4th Dimension to perform an action or a series of actions. For example, the following project method allows users to add records to a table:

```
INPUT FORM ([Customers];"Input")
Repeat
  ADD RECORD ([Customers])
Until (OK=0)
```

This method would be attached to a menu item in a custom application. When the user chooses that menu item, 4th Dimension runs this method. It makes the [Customers]Input form the current Input form and presents it to the user as a blank form, ready for data entry. The user could continue to enter new record until he or she presses the Cancel button on the form. During data entry, any table, form, or object methods would run when the appropriate events occur.

4th Dimension methods are created with components of a *procedural language*. The following are the elements of the language:

- **Fields** You can use fields from any table. For example, a method can use a value that is stored in a field or it can change that value and store a new value in that field.

- **Object names** You can use the names of objects on a form. For example, you can resize an object, change its color, enable or disable buttons, or modify the font, font size, or style.
- **Variables** You can temporarily store a value in a variable and use it later in the same method or in a different method. You can create a variable in any method and you can use or change its value in any method.
- **Pointers** Pointers let you write generic code that doesn't refer to database objects by name. Instead, a pointer to each object is used. Each time the generic code is used, you can "point" to different database objects. For example, if you substitute a pointer to a table for the table name "[Customers]" in the previous example, you could then reuse the code for any table. For more information on pointers, see the chapter "Arrays and Pointers" in the *4th Dimension Language Reference*.
- **Operators** You can use symbols to instruct 4th Dimension to carry out an operation such as multiplication, addition, and so on.
- **Commands** You can use commands in the language to instruct 4th Dimension to perform an action. For example, the ALERT command displays a message in an alert dialog box. The NEXT PAGE command displays the next page of a multi-page form and the ORDER BY command sorts the records in the current selection.
- **Functions** You can use functions in the language to calculate values. For example, you can calculate an average of several values with the Average function. You can calculate a subtotal for a report with the Subtotal function.
- **Flow of control** You can control when code executes with flow of control structures. The 4th Dimension language includes the following control structures:
  - If…Else…End If
  - Case of…Else…End Case
  - While…End While
  - Repeat…Until
  - For…End For

  You use logical tests in these structures to determine whether or how many times code executes. All of these elements are discussed in detail in the *4th Dimension Language Reference*.

Examples

This section describes features common to all types of methods.

Statements

A method is composed of statements, each statement consisting of one line in the method. A statement is an instruction for 4th Dimension to carry out. For example, the following line is a statement:

```
[People]Start Day := Current date
```

This statement places the current date in the Start Day field of the [People] table. Current date is a function that returns the date based on the system date. [People]Start Day is a field.

Notice that the statement specifies the table name, surrounded by square brackets, with the field. When writing project methods, you specify the table name to which a field belongs to avoid possible confusion with other fields with the same name. However, when in a form or object method, you can specify fields from the form's table without specifying the table name. Table names are written within square brackets.

The previous statement is typical of statements that calculate or work with values. It starts with the field in which the value is to be placed and uses the assignment operator to point at the calculation that determines the value. The calculation is performed by whatever follows the assignment operator. The assignment operator is a colon and equals sign (:=).

You use the assignment operator whenever you need to store a value in a field, an object, or a variable. It takes the following form:

Field/Object/Variable := *Calculation*

The value container is the field, object, or variable in which you want to place the value. The calculation is the operation that results in the value you want to store. The assignment operator assigns the value that is calculated on its right into the container on its left. You will see several examples of this in the next few paragraphs.

A statement may be simple or complex. Although a statement is always one line, that one line can be as long as needed (up to 32,000 characters).

The following method displays the third page in a multi-page form:

```
GOTO PAGE (3)
```

When you use the GOTO PAGE command, you instruct 4th Dimension to display the page indicated in the parentheses.

Notice that the command is in bold capital letters; this is the way that 4th Dimension displays commands in the Method editor. This convention is used in all examples in the 4th Dimension documentation. You do not have to type commands in all capital letters; 4th Dimension automatically changes the display.

Most commands require additional information to carry out the instruction. This additional information is called an argument to the command. An argument contains data that a command needs in order to complete its task. In this case, the GOTO PAGE command needs the page number to go to. An argument is always placed within parentheses following a command.

Executing the Method

The execution of statements in a method always follows a strict order. In a listing method, the order is always line-by-line. When the method is executed, it begins at the first line and works its way down to the last line (Obviously, the order of execution is determined by the flow of control structures in the method). In a flowchart method, the execution order is determined by the path of the flowline (i.e., the line with arrows) and the results of test statements.

This section examines a multi-line method in detail in order to establish some of the terminology, concepts, and common aspects of methods.

The following method computes the total amount due on an invoice:

```
vSales Tax := Total Purchases * Tax Rate
vTotal := Total Purchases + vSales Tax
[Report]Total Due := Round (Total; 2)
```

This method is attached to an object that will be printed on an invoice. As you follow the method line-by-line, you will see that the later lines depend on previous lines. Because of the strict order in which statements are executed, you can depend on a value being available when it is needed.

Here is the first line of the method. It calculates the sales tax for the purchase:

```
vSales Tax := Total Purchases * Tax Rate
```

In this method, “vSales Tax” is a variable. You can create a variable at any time by typing its name. You name the variable on the left of the assignment operator and calculate a value on the right. Subsequently, whenever you need that value, you can simply use the variable name. A variable can be created at any time in a method. It can be assigned a value, as here, which can then be used by a later statement.

The variable “vSales Tax” is a *process variable*. A process variable is a variable which works within the current process. In 4th Dimension, everything occurs within a process, even if the process is one created by 4th Dimension. (You will learn about processes in Chapter 11.).

When a statement creates a process variable such as vSales Tax, a portion of memory is set aside and assigned the name “vSalesTax.” Since it is a process variable, any method in the current process can use the value in vSalesTax. The variable remains in memory until the process is closed. *Local* variables temporarily store values that can be used within the method, but which cannot be used by any other method.

Variables follow the same rules of naming as fields. Typically, you would use a consistent convention so that you know that you are using a variable. In the previous example, the variable is indicated by a lowercase v as the first letter in the variable vSales Tax. For more information about variables and the different types of variables, refer to the *4th Dimension Language Reference*.

For the vSales Tax variable the assignment operator (:=) assigns it the result of a calculation. In this case we would say, “vSales Tax *gets* Total Purchases times Tax Rate.” The Total Purchases field contains the total amount of purchases for the current invoice and the Tax Rate field contains the tax rate to be used to calculate the tax. (A Tax Rate field could contain different rates based on the address of the customer.)

When an object method uses field names, the instruction is to use the value in that field on the current record. When another record is displayed, used, or printed, the method is executed again, using values in the new record.

The first line of our example method multiplies the values in the Tax Rate and Total Purchases fields and stores the result in the variable vSales Tax for each record that is used (a value entered or an invoice printed).

```
vSales Tax := Total Purchases * Tax Rate
```

Here is the second line of the method. It creates a variable that contains the grand total of purchases plus sales tax:

```
vTotal := Total Purchases + vSales Tax
```

The first component of the statement above is the vTotal variable. It is assigned the value generated by the addition of Total Purchases (a field) and vSales Tax (a variable). It does not matter to 4th Dimension whether a value is stored in a field or in a variable. As long as the field and the variable store data of the same type, the addition operator (+) simply adds the two values together.

Notice that this statement uses the vSalesTax variable that was created in the previous line. It also creates the vTotal variable which will be used in the following line.

Notice also that the value of Total Purchases has been used twice: first in the previous line to calculate the vSales Tax, and second in this line to calculate the vTotal. Nothing happened to the value in the field in either case. In each of these two lines, the assignment operator placed a value in a variable. These statements use the value in the Total Purchases field, but do not change that value.

The assignment operator (:=) places a value in the field, object, or variable to its left.

Nothing will happen to fields, objects, or variables to the right of the assignment operator.

Here is the third line of the method. It stores a value in a field in a different table:

```
[Report]Total Due := Round (vTotal; 2)
```

The first component is a field. Notice that the table name has been specified because it is different from that of the master table. Table names are always placed in square brackets [like this]. If you have to use parentheses as well, you would use both ([like this]).

The calculation is performed by the Round function. The Round function rounds off a value to a specified number of places.

Most functions require additional information to carry out the calculation. Additional information for a function is the argument to the function. A function may have several arguments. In this case, the Round function needs two arguments: the number to round and another number specifying how many places to round to. Here, the number to round is the value of the vTotal variable, and the number of places to round to is 2. The two arguments are separated by a semicolon. The variable vTotal and the number 2 are *arguments* to the Round function.

Notice that the function's name has only the first letter capitalized. This is the naming convention used for 4th Dimension functions. Just as with commands, you do not need to enter the capital letter. When you press the **Enter** key or click on another line in the method, 4th Dimension automatically capitalizes the first letter of the function and makes it bold.

Where to Put an Object Method

You can attach an object method to any field or other active object. An object method can refer to values in other fields and objects. The general rule is to attach an object method to the active field or object, the one that receives the data entry or the one that is clicked or otherwise activated. An object method that is to be executed when a button is clicked should be attached to the button object. An object method that capitalizes entries in a field should be attached to the field.

However, if you placed the method

```
Grand Total := Total + Sales Tax
```

in the Grand Total field, the method would not function properly since you would have to type something in the Grand Total field in order for the method to be executed.

You need the statement to be executed whenever the values in the Total or Sales Tax fields change. In order for the calculation to take place, you should place the statement in the form method or use it in object methods for both the Total and Sales Tax fields.

Creating Methods

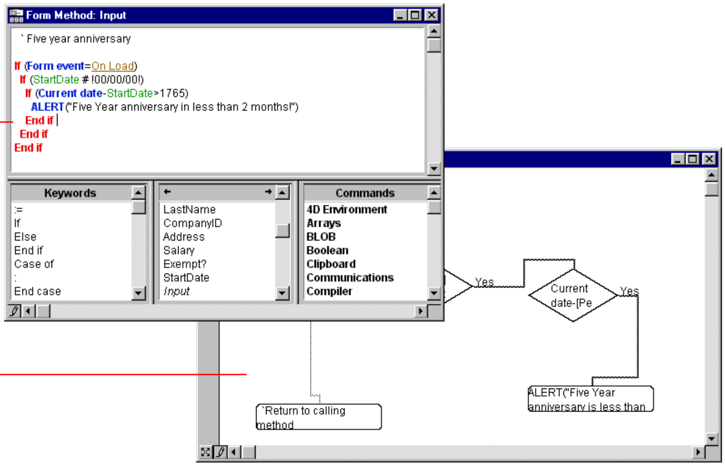
When you create a method, you use one of the two Method editors. The Method editors provide you with tools to create, test, and edit a method.

The Method Editors

4th Dimension provides two editors in which you can build, modify, and test your methods. They are the:

- **Listing editor** You can use a text editor in which the method appears as a list of statements.
- **Flowchart editor** You can use a graphically-oriented editor in which the method appears as a chart of graphic symbols.

The figures below show how the two Method editors appear on screen.



Listing editor

Flowchart editor

```
 ` Five year anniversary

If (Form event=On Load)
 If (StartDate # !00/00/00!)
  If (Current date-StartDate>1765)
   ALERT("Five Year anniversary in less than 2 months!")
  End if
 End if
End if
```

It is advantageous to use the Listing editor unless you are familiar with the flowchart method of programming and like to create methods as flowcharts. After you create a method, you can open the method only with the same Method editor.

The Listing editor has one additional advantage:

Only methods created using the Listing editor can be compiled.

In the General page of the Database Properties dialog box, you can set a default editor for new methods (for more information, see the section "General" on page 46). If you do not set a default editor, you must choose which Method editor to use just before you create the method.

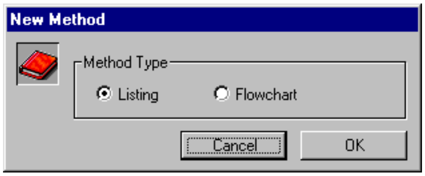
Creating an Object Method

Object methods are created for an object on a form. You start in the Form editor, with a form displayed on the screen.

► To create an object method:

1 **In the Form editor, hold down the Alt key (on Windows) or the Option key (on Macintosh) and click the object.**

If you haven't specified a default editor type in the Database Properties dialog box, 4th Dimension displays the Method Type dialog box so that you can select the preferred Method editor.

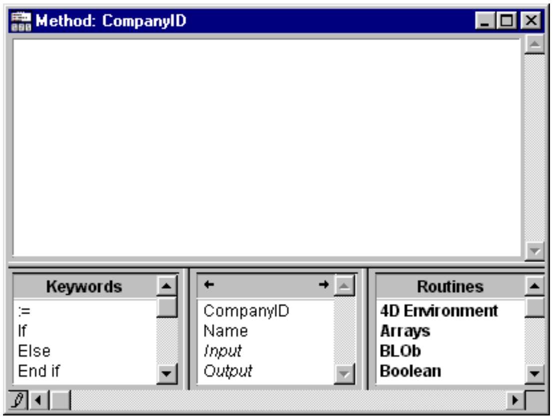


New Method

Method Type
● Listing ○ Flowchart

2 **Select the desired Method editor and click OK.**

Your preferred Method editor window appears.



Method: CompanyID

Directions for using the Listing or Flowchart editor are provided in the sections "Using the Listing Editor" on page 395 and "Using The Flowchart Editor" on page 406.

4D Server If another programmer tries to open a method that is being modified by another programmer, the method is displayed in read-only mode. The second programmer can carry out copy operations but he or she cannot modify the method.

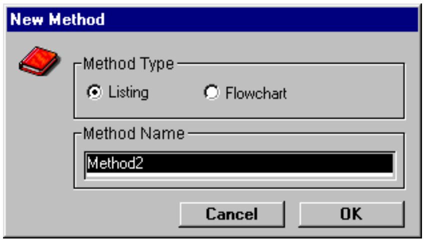
Creating a Project Method

You can create a new project method using a menu command or the Methods page of the Explorer.

► To create a project method from the Design menu:

1 **Choose New Method from the Design menu.**

4th Dimension displays the New Method dialog box.



New Method

Method Type

● Listing ○ Flowchart

Method Name: Method2

2 **Enter a method name.**

Method names can be up to 31 characters long. They can include letters, numbers, the space character and the underline character.

3 **Click the OK button.**

4th Dimension opens an blank Method editor window where you can begin writing the new method.

► To create a new project method from the Explorer:

1 **Click the Methods tab in the Explorer.**

The hierarchical list of Database, Project, and Table/Form methods appears.

2 **Highlight the Project Methods item.**

3 **Click New.**

The New Method dialog box appears.

4 **Click the Listing button and enter the method name.**

Directions for using the Listing or Flowchart editor are provided in "Using the Listing Editor" on page 395 and "Using The Flowchart Editor" on page 406.

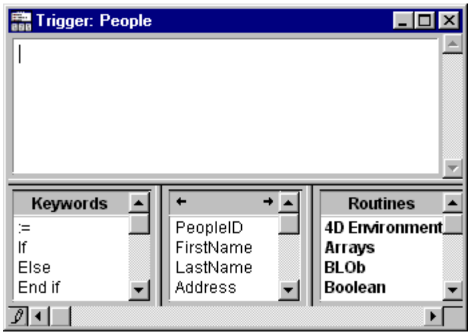
Creating a Trigger

You can create a trigger using a shortcut in the Structure editor or you can create the trigger directly in the Explorer:

► To create a trigger from the Structure editor window:

1 **Hold down the Alt key (on Windows) or Option key (on Macintosh) and double-click the table title in the Structure editor window.**

If you have specified a default Method editor in Database Properties, the Method editor appears, ready for you to write the trigger.



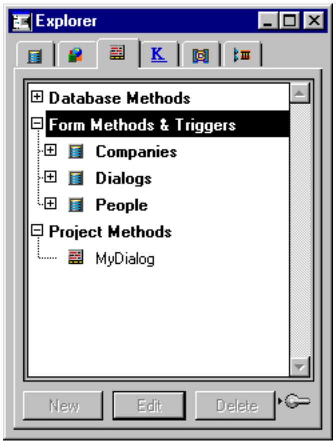
Otherwise, the Method Type dialog box appears.

► To create a trigger from the Explorer:

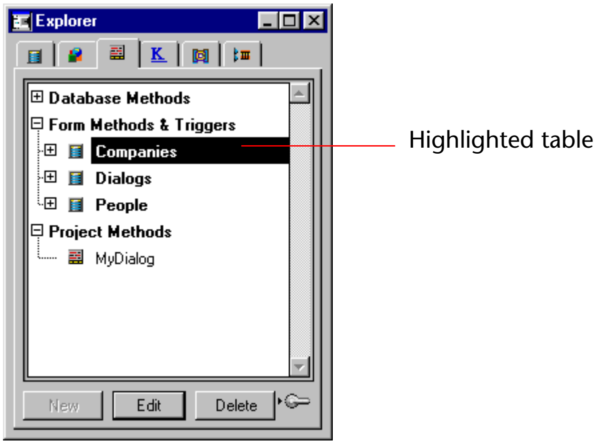
1 **If the Explorer is not displayed, choose Explorer from the Tools menu.**

2 **Click the Methods tab.**

The hierarchical list of Database, Project, and Form Methods & Triggers appears.



3 **Highlight the desired table and click Edit.**



If you have specified a default Method editor in Database Properties, a blank Method editor window appears, ready for you to write the trigger.

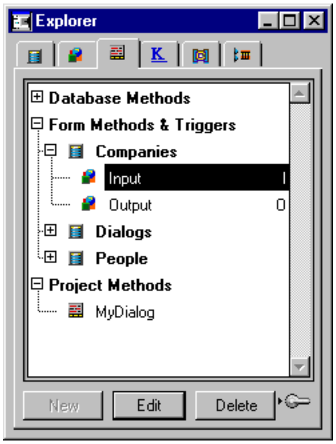
Creating a Form Method

You create a Form method from the Methods page of the Explorer.

► To create a Form method:

1 **Click the Methods tab in the Explorer.**

2 **Expand the table to which the form belongs and highlight the desired form.**



3 **Click Edit.**

If you haven't specified a default Method editor in Database Properties, 4th Dimension displays the Method Type dialog box. Otherwise, 4th Dimension opens a blank Method editor window.

4 **If no Method editor is set as the default, click the Listing radio button and click OK.**

4th Dimension opens a blank Method editor window where you can begin writing the new method.

Renaming a Project Method

You can change the name of a project method in the Explorer. Database methods cannot be renamed. Triggers, form methods, and object methods are bound to objects and take their names from the object.

► To change the name of a project method:

1 **Display the Methods page of the Explorer.**

2 **Expand the list of project methods so that the one you want is displayed.**

3 **Hold down the Command key (on Macintosh) or Ctrl key (on Windows) and click the project method name.**

The method name becomes editable.

4 **Type a new name.**

5 **Press Tab or click anywhere outside the entry area to save your changes.**

If a method with the same name already exists, 4th Dimension displays a message saying that the method name has already been used. Otherwise, 4th Dimension changes the name of the method and, if necessary, resorts the list of methods.

Note Changing a method name can invalidate any methods or formulas that use the old method name. Each such item has to be updated in order to work.

4D Server The method name is changed on the server when you finish editing the name. If more than one user is modifying the method name at the same time, the final method name will be the name specified by the last user to finish editing the name.

You may want to specify a method owner so that only certain users can change the method's name.

Setting Access Privileges

You can control access to methods by setting Access and Owner privileges for groups of users. A single group can be assigned for each privilege using the Access and Owner drop-down list in the Method Properties dialog box. For information about creating a password access system with users and groups, see the section "An Access Hierarchy Scheme" on page 441.

The Access drop-down list controls which group can execute the method in the User or Custom Menus environment. If a user that is not in this group attempts to execute the method, 4th Dimension displays a message saying that the user's password does not allow him or her to execute the method.

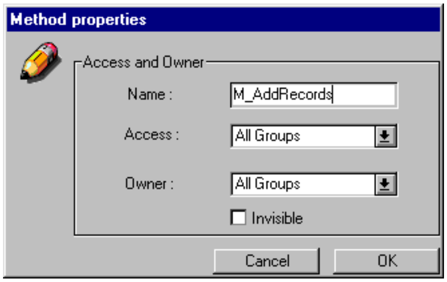
The Owner drop-down list controls which group can edit the method in the Design environment. If a user who is not in this group attempts to edit the method in the Design environment, 4th Dimension displays a message saying that the user does not have the access privilege to edit the method.

Users who are assigned to both groups can use the form in the User, Custom Menus, and Design environments.

► To assign access and owner privileges for a method:

1 **With the desired method in the frontmost window, choose Method Properties from the Method menu.**

The Method Properties dialog box appears.



Method properties

Access and Owner

Name : M_AddRecords

Access : All Groups

Owner : All Groups

☐ Invisible

2 **Choose the desired Owner and Access groups from the drop-down lists.**

3 **Click OK to save your changes and put away the Method Properties dialog box.**

Access or Owner privileges are assigned to the new group.

Making a Method Invisible

There are two menu commands in the User environment that give users the ability to run project methods — the **Execute Method** command in the **Special** menu and the **Apply Formula** command in the **Enter** menu. If you don't want any users to run a project method, you can make it Invisible in the Method Properties dialog box. An invisible method does not appear in either the Execute Method dialog box or the Formula editor.

When you make a project method invisible, it is still available to database programmers. It remains listed in the Methods page of the Explorer and in the list of routines in the Method editor.

Opening an Existing Method

After you create a method, you can open it and make changes. 4th Dimension automatically opens the same Method editor that you used to create the method. You can open any existing database, project, table, or form method from the Methods page of the Explorer. You can open object methods only through the Form editor.

4D Server Object locking occurs when more than one user attempts to modify the same method at the same time. If a user is modifying a method in the Design environment, the method is locked. Other users cannot modify that same method until the first user frees the method by closing it.

To be able to open a method, you must have access privileges.

Note You cannot delete form methods or triggers. To disable such a method, erase all the statements in the method or precede each line with a ` symbol (used to distinguish comments from executable code). For information about deleting an object method, see the section "Clearing Unwanted Object Methods" on page 394.

Editing a Method

You can open an existing database, project, trigger, or form method using the Explorer. Object methods must be opened from the form on which the object is used.

► To open a database, project, or trigger/form method:

1 **Choose Edit Method from the Design menu or, if the Explorer is open, click the Methods tab.**

2 **Expand the desired topic (database, project, or trigger/form).**

3 **Select the method you want to use and click the Edit button.**
OR
Double-click the method name.
4th Dimension displays the method in the Method editor window.

Opening an Object Method

You open an object method from the form on which the object is placed.

► To open an object method:

1 **Use the Explorer or the Edit Form menu item to open the form that contains the object to which the object method is attached.**

2 **Double-click the object to open the Object Properties window, click the Events tab, and click the Edit Method button.**
OR
Hold down the Option key (on Macintosh) or Alt key (on Windows) as you click the object on the form.
4th Dimension displays the object's method in the Method editor window.

Clearing Unwanted Object Methods

You can clear unwanted object methods using the Form editor. In some cases, clearing unneeded object methods can make the database run faster.

► To delete an unwanted object method:

1 **Display the form that contains the method(s) you want to clear.**

2 **Select the object(s) that have unwanted Object methods attached to them.**

3 **Choose Clear Object Method from the Object menu.**
4th Dimension removes the Object methods from the selected objects.

Note If you clear Object methods by mistake, choose **Undo** from the **Edit** menu.

Using the Listing Editor

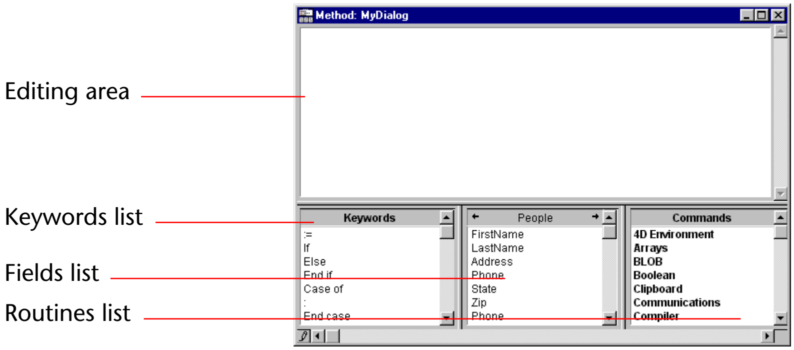
4th Dimension's Listing editor works like a text editor. That is, you can enter and edit text in the editor.

When you create a method with the Listing editor, you write the method as a series of statements. You can also select components of the method from lists provided by the editor.

You can also drag and drop table names, field names, form names, project method names, commands, and constants from the Explorer to the Listing editor.

You can scroll through the method. You can enter up to 32,000 characters in a method.

The figure below shows the Listing editor.



Editing area

Keywords list

Fields list

Routines list

Keywords	People	Commands
:=	FirstName	4D Environment
If	LastName	Arrays
Else	Address	BLOB
End if	Phone	Boolean
Case of	State	Clipboard
:	Zip	Communications
End case	Phone	Compiler

The Listing editor contains four areas: an editing area, a keywords list, a field list, and a routines list.

Editing Area

The editing area contains the text of the method. You enter and modify the method text in this area. The editor automatically indents method text for clear program structure. You can include comments inside the method text for reference.

Keywords List

The Keywords list is a scrollable area that provides the commonly used programming keywords, such as the assignment operator and the flow of control structures. A keyword is a word, symbol, or phrase that has a specific use in a method statement. When you click a keyword, 4th Dimension inserts it at the location of the insertion point in the editing area.

Fields List

The Fields list displays the names of fields and forms in the database. You click field names to enter them at the location of the insertion point in the editing area. The area's title bar displays the name of the table whose fields and forms appear in the list. If no table name appears in the title bar, the fields displayed are from the master table.

You can display fields and forms from other tables by clicking the cycle arrows in the title bar. You can also press and hold the mouse button down on the title bar and choose a table from the pop-up menu of table names that appears. Clicking a table name inserts it in the method at the location of the insertion point.

When you include a field name in the method by clicking in the Field list, 4th Dimension automatically provides the correct field syntax, adding table names or subtable names as required. If you click the name of a subtable, 4th Dimension opens a window where you can select a subfield name.

Form names are added to the end of the list of fields for each table. Clicking a form name inserts it in the method at the location of the insertion point.

Routines List

The Routines list displays the names of all 4th Dimension commands and functions. The routines are grouped into "themes" according to their function. Each theme is a pop-up menu from which you can choose an individual command or function. To display the commands and functions in an alphabetical list, click the title bar of the Routines list.

In addition to 4th Dimension's built-in commands and functions, you can access your own methods. The names of your project methods and functions appear at the end of the list of routines.

If you have installed any plug-ins that add their own commands, you can use those plug-in routines in a method. Plug-in routines can include the following:

- **4D Chart commands** These are the routines that make up the 4D Chart language.
- **4th Dimension plug-in commands** These are commands that belong to optional plug-ins available for use with 4th Dimension, such as 4D Write, 4D Draw, and 4D Calc.

- **Third-party plug-in commands** These are commands that belong to plug-ins written by third parties for use with 4th Dimension.

  Plug-in commands appear after the list of user-written methods.

If you prefer writing methods without selecting components from the Keyword, Field, and Routines lists, you can hide these lists by selecting Hide Keywords in the Design Environment page in the Database Properties dialog box. For more information about setting preferences, see the section "Design Environment" on page 51. You can also hide these lists by dragging the window divider downward.

Writing a Method

Writing a method is usually a combination of typing text, selecting components, and dragging elements from the Explorer. You can create methods by typing text, selecting components of the method from the Keywords, Fields, and Routines lists, or dragging and dropping components from the Explorer. You can also use the "at" sign (@) wildcard to speed the creation of methods. For more information, see the section "Using the Wildcard Character" on page 400.

The 4th Dimension method editor provides basic syntax error-checking. Additional error-checking is performed when the method is executed.

Typing Text

4th Dimension uses standard text editing techniques for typing and editing in the Listing editor. As you type, the characters appear at the location of the insertion point. You end each line by pressing the **Return** key (on Macintosh) or **Enter**[1] key (on Windows).

Note To enter a numeric value in hexadecimal, type 0x (zero + "x"), followed by the hexadecimal digits.

The Listing editor uses the following conventions for displaying routines, plug-in routines, and user-written methods:

- 4th Dimension keywords and routines are displayed in bold,
- Plug-in routines are displayed in bold-italic,
- Constants are underlined,

[1] The Enter key on the numeric keypad behaves differently than the Enter key on the main keyboard. Use the Enter key on the numeric keypad to force 4th Dimension to check the syntax of the line of code without moving the insertion point to the next line.

- User-written methods are displayed in italic.

  If you are using a color monitor, you can use the Color menu to colorize various types of text elements.

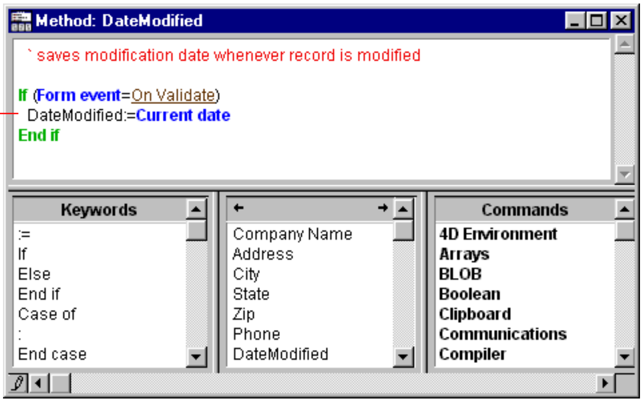
Note The font and font size are specified in the User Interface page of the Database Properties dialog box. The regular size font is used in the Method editor. For more information, see the section "User Interface" on page 49.

When you press the **Return/Enter** key, 4th Dimension evaluates the text of the line and formats any routines, constants, keywords, plug-in commands, or methods appropriately. If you are using color to colorize various language elements, the appropriate color will be applied at this time. If you are using flow of control structures, 4th Dimension indents each line to its proper level in relation to the preceding line.

You can move the insertion point by clicking at the location you want. You can select words, whole lines, or several lines by dragging the I-beam over them.

You can use the arrow keys to quickly move from line to line. Using the arrow keys to move across several lines is quicker than clicking because the editor delays evaluating the line for errors.

The following figure shows a method in the Listing editor. This is an object method attached to the DateModified field in an invoicing database. The value of the field is set to the current date only after the current record is changed (by moving to another record) or accepted.



Line indented to show level

```
  ` saves modification date whenever record is modified

If (Form event=On Validate)
  DateModified:=Current date
End if
```

Brace Matching

The Listing editor has a brace matching option that helps you balance braces, parentheses, quotes, and brackets. There are two levels of brace matching:

- **Small Brace Matching** affects only the opening and closing characters.
- **Big Brace Matching** affects the entire expression enclosed by the opening and closing characters.

When brace matching is active, 4th Dimension tries to find the matching brace, quote, or parenthesis when you type the closing character. When 4th Dimension finds matching characters, either the characters or the entire expression flashes.

For example, when you type

For ($i;1;**Records in selection** ([Line Items

and you press the closing bracket "]" to finish the table name expression, 4th Dimension will try to find the opening bracket. When it finds it, it flashes either the opening and closing brackets (Small brace matching) or the table name itself (Big brace matching).

As you continue to type the closing parentheses

For ($i;1;**Records in selection** ([Line Items]))

brace matching continues to provide feedback as you complete the arguments for the Records in selection function and the For keyword.

► To use brace matching:

- **Choose either Small Brace Matching or Big Brace Matching from the Method menu.**

A check mark appears next to the menu command you select. Turn off brace matching by choosing **No Brace Matching** from the **Method** menu.

Adding Method Components from the Scrollable Lists

You can quickly enter keywords, table names, fields, commands, and functions by selecting them from the Keywords, Fields, and Routines lists in the lower portion of the window. Select components from these lists to ensure accuracy and improve speed.

When you click a component, 4th Dimension inserts it at the insertion point in the editing area, using the correct syntax for that component. The component can then be modified as normal text.

Adding Method Components from the Explorer

You can add components from the Explorer by dragging and dropping components. You can add:

- Table names and field names from the Tables page,
- Table names and form names from the Forms page,
- Project methods, table names, and form names from the Methods page,
- Constants from the Constants page,
- 4th Dimension commands from the Commands page.

When you drag and drop a component, 4th Dimension always uses the correct syntax for the component. For example, if you drag the field name “First Name” from the [People] table, it appears in the Method editor as “[People]First Name”. Similarly, if you drag the Form name “Input” from the People table, it appears in the Method editor as “[People];"Input"”.

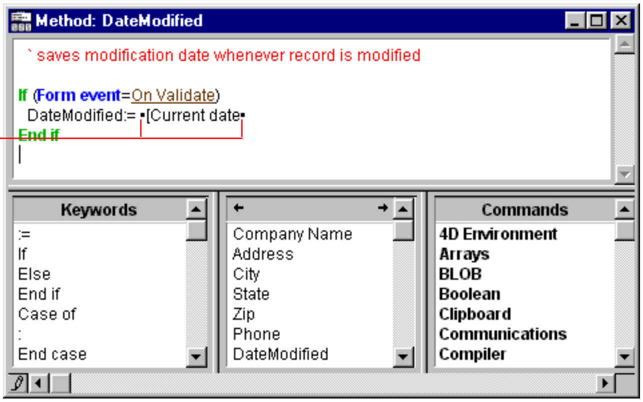
Using the Wildcard Character

You can enter most commands and table names by typing the first few characters and the wildcard character (@). 4th Dimension automatically searches the Keywords, Fields, and Routines list and enters the component that begins with those characters.

Double-check each entry. You must type enough of the name so that it is distinct from any other name. If more than one name fits the instruction, 4th Dimension picks the middle one in the list of possibilities.

Checking and Correcting Syntax Errors

4th Dimension automatically checks the method syntax to see if it is correct. If you enter text or select a component that is not syntactically correct and then press the **Enter** key (**Return** key on Macintosh) to end the line, 4th Dimension marks the error with bullets, as shown in the following illustration.



```
 ` saves modification date whenever record is modified

If (Form event=On Validate)
  DateModified:= •[Current date•
End if
```

Bullets indicate error

You can immediately check the syntax of the current line (without advancing to the next line) by pressing the **Enter** key (on Macintosh) or **Enter** key on the Windows numeric keypad. 4th Dimension evaluates the line, formats it, marks any errors, and places the insertion point at the end of the line.

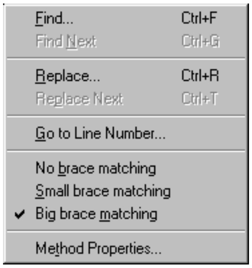
When a line of a method is marked as having improper syntax, fix the entry and press the **Return** or **Enter** key or click any other line in the method. If the line is now correct, 4th Dimension removes the bullets.

The Listing editor can check only for obvious syntax errors (misspellings and the like). It does not check for errors that occur only during execution. Execution errors are trapped by 4th Dimension when the method is executed. 4th Dimension provides a debugger for handling and correcting these errors. For information about the debugger, refer to the *4th Dimension Language Reference*.

Finding and Replacing Text

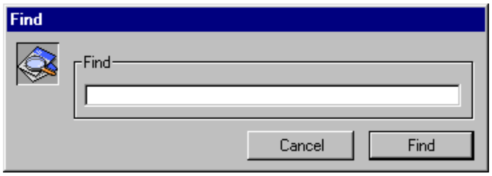
When the Listing method editor is active, 4th Dimension provides the **Method** menu for performing find-and-replace operations on a method. You can use the **Method** menu to locate character strings in a method and, if necessary, replace these characters with new ones. You can also use the **Method** menu to locate a specific line in a method. When you use Find or Replace, 4th Dimension searches only from the current position of the insertion point to the end of the method.

The figure below shows the **Method** menu.



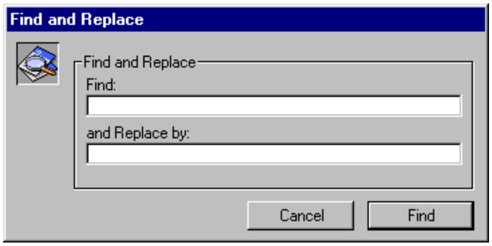
Here is a description of the **Method** menu commands:

- **Find** Opens a dialog box in which you specify a character string for a search.



When you click the **Find** button, the editor begins searching from the current text insertion point and selects the first occurrence it finds. If you select text prior to choosing **Find**, the text is entered as the string to search for. You can use this text or replace it by entering another string.

- **Find Next** Performs the previously defined search again. It begins searching from the point of the last found occurrence of the string.
- **Replace** Opens a dialog box in which you specify a character string for a search-and-replace operation.



The Method editor searches from the current location of the text insertion cursor to the end of the method. When it finds text that matches the character string, it replaces it with the new character string. If you select text prior to choosing **Replace**, the text is entered as the string to search for. You can use this text or replace it by entering another string.

- **Replace Next** Performs the previously defined search-and-replace operation again. It begins searching from the point of the last found occurrence of the string.
- **Goto Line Number** Opens a dialog box in which you specify the line number that you want to find. When you click **OK**, the editor finds and highlights that line in the method. This is especially useful when used with 4D Compiler which flags runtime errors by the line number in which they occur.
- **No Brace Matching, Small Brace Matching,** and **Big Brace Matching** Controls brace matching in the Method editor. For more information, see the section "Brace Matching" on page 399.
- **Method Properties** Opens the Method Properties dialog box, where you can rename the method and set access privileges. For more information about method properties, see the section "Setting Access Privileges" on page 392.

Assigning Colors to Method Elements

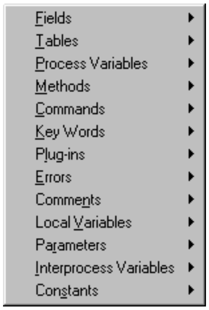
When the Listing method editor is active, 4th Dimension provides the **Colors** menu. This menu allows you to set a different color for each of the various elements of a method (fields, tables, interprocess variables, constants, keywords, plug-in commands, and so on). When a color is set for an element, every instance of that element appears in the selected color.

The use of color to separate different types of elements in a method can be very helpful in maintaining clear code and in debugging methods.

► To set the color of an element:

1 **Choose the name of the element from the list of elements in the Colors menu.**

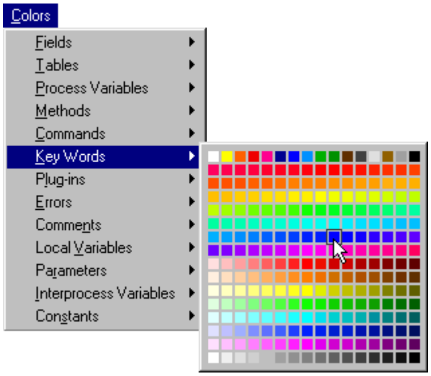
The following illustration shows the **Colors** menu.



Each element has its own color palette submenu.

2 **Select the desired color from a color palette submenu.**

The figure below shows a color being selected for Keywords.



Color settings are made for the copy of 4th Dimension that you are running and will appear in methods for all databases opened with that copy. To apply the color setting to the database — regardless of which copy of 4th Dimension is being used, hold down the **Alt** key (**Option** key on Macintosh) while making your color selections.

You must have a color monitor to use the **Colors** menu. The number of colors that you can choose from depends on the number of colors to which your monitor is set. If your monitor is set to 16 colors, you can use only the first sixteen colors in the cascading menu. If your monitor is set to 256 or 16 million colors, you can use any of the colors in the picture menu.

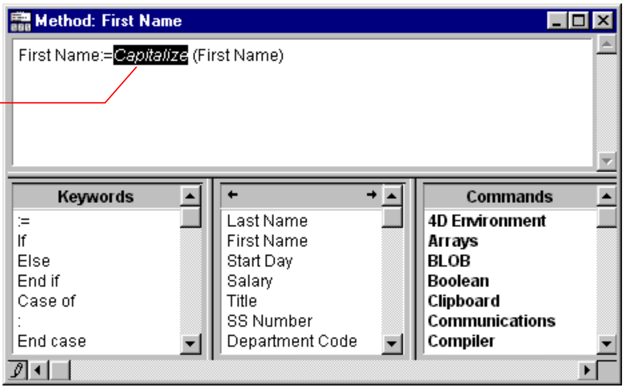
Opening Methods and Forms

When you are working in the Listing editor, you may find that you need to look at another method or open one of your forms. 4th Dimension provides a quick way to do this with keyboard equivalents.

► To open a method from the Listing editor:

1 **Highlight the name of the method that you want to open.**

The figure below shows a method name being selected in the Listing editor.



Highlighted method

```
First Name:=Capitalize (First Name)
```

2 **Press Command–P (on Macintosh) or Ctrl+P (on Windows) to open the method.**

The method appears in a Method editor window.

► To open a form from the Listing editor:

1 **Highlight the name of the form that you want to open.**

Be sure to select the surrounding quotation marks. If you select only the name, the name must be unique to that method or form. If you select the table name along with a form name, 4th Dimension will open the form for the specified table.

2 **Press Command–L (on Macintosh) or Ctrl+L (on Windows) to open a form.**

4th Dimension highlights the form name in the Forms page of the Explorer.

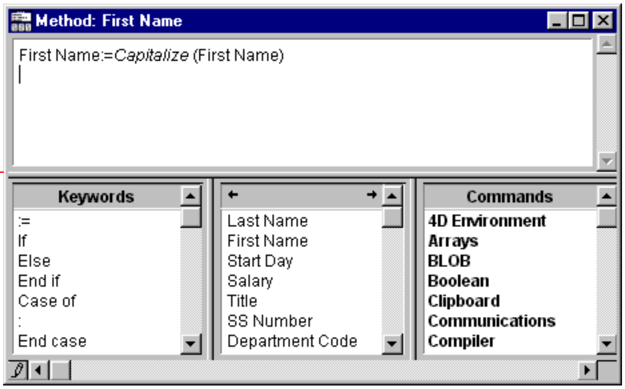
3 **Press Enter to open the form in the Form editor.**

If you have several forms with the same name, 4th Dimension opens the first occurrence of that form.

Managing the Listing Editor Window

You can change the relative sizes of the Editing area and the other scrollable areas in the method window to fit your needs. Place the pointer over the divider until the pointer changes to a divider pointer ⇳ and drag the divider that separates the Editing area from the list areas.

The following illustration shows the Keywords divider.



Keywords divider

```
First Name:=Capitalize (First Name)
```

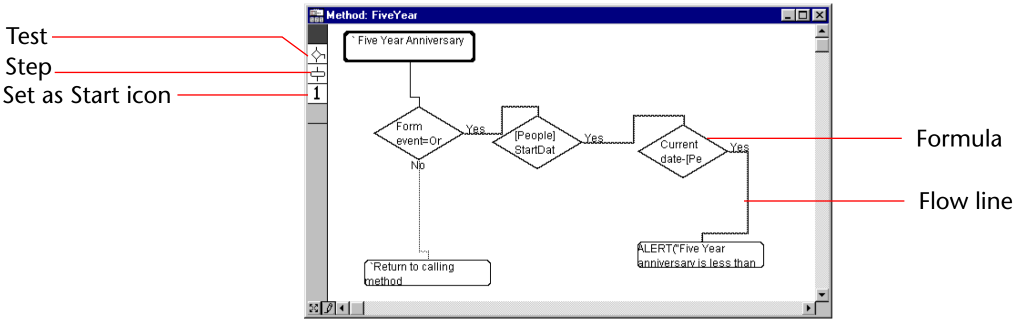
By dragging the divider up, you increase the number of keywords, fields, and routines that you can see. By dragging the divider down, you reduce or remove the Keywords, Fields, and Routines lists completely. You can also hide the Keywords and the other lists by selecting Hide Keywords in the Database Properties dialog box.

Using The Flowchart Editor

The Flowchart editor lets you create and edit 4th Dimension methods graphically by adding steps and tests to a flowchart. The Flowchart editor lets you create the same kinds of methods that you create with the Listing editor, except that you build your methods visually.

You can think of a flowchart as resembling plumbing in a house. The method, like water, flows through the pipes and its movement is determined by the state of valves in the plumbing. If a valve is open (TRUE), the water (method) will flow through. If the valve is not open (FALSE), the flow will stop at that point, or go elsewhere.

The following illustration shows an example flowchart method.



In a flowchart, there are two types of objects: steps and tests. In addition, there are flow lines that connect steps and tests. Each step and test also has a formula that defines the operation of the step or test. The formula is written in a dialog box. The flowchart palette provides icons that you click to create steps and tests, to set a new starting point, and to duplicate objects.

The following are descriptions of the four major Flowchart method components.

- **Step object** Directs 4th Dimension to perform a specific operation or calculation (a statement). For example, a step can use the NEXT PAGE command to make the next page in the form the current form. Or it can be an assignment statement that assigns a value to a field or variable. Unlike a test, a step is not conditional — the event in the step occurs each time the method executes the step.
- **Test object** Tells 4th Dimension to evaluate a condition (a Boolean condition) to determine the direction that the method will follow. A test must evaluate to TRUE or FALSE. Each test object has two flow lines leading to other steps or tests — a Yes flow line and a No flow line. For example, a test can be associated with a condition such as “Salary >= 50000.” When 4th Dimension reads the contents of the Salary field, it will follow the Yes flow line if the field contains a value greater than or equal to 50,000.
- **Flow lines** Flow lines connect the steps and tests in the flowchart and provide the direction of movement through the flowchart.

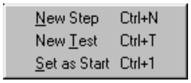
  The direction of movement is shown by the way a flow line enters and leaves a step or test. The flow line that connects the top of a step or test brings information or instructions to the step or test. The result of a step flows out the bottom of a step. The Yes result of a test flows out the side of a test; the No result of a test flows out the bottom of a test.

- **Formulas** Each step and test must be associated with a one-line formula. The formula defines the precise step to be carried out or test to be performed. The process of creating a formula is described later in this section.

The Flowchart Menu

When the Flowchart editor is active, 4th Dimension provides a menu for performing flowchart operations on a method. These menu commands duplicate the functions of the icons in the flowchart palette.

The figure below shows the commands on the **Flowchart** menu.



The **Flowchart** menu contains the following menu commands:

- **New Step** Adds a new step object to the flowchart,
- **New Test** Adds a new test object to the flowchart,
- **Set as Start** Specifies a new starting point in the flowchart.

Creating a Flowchart Method

There are three basic steps for creating a method with the Flowchart editor:

1 **Use the icons in the palette or the Flowchart menu commands to add steps and tests in the Flowchart window.**

2 **Create a formula for each step and test in the window.**

3 **Draw flow lines between the objects.**
4th Dimension provides basic syntax error-checking. Other error-checking is performed when the method is executed.

These basic steps are described in detail in the following sections.

Creating Steps and Tests

To create steps and tests:

1 **With the Flowchart editor active, click the Step or Test icon in the palette ◇▭.**
OR
Choose New Step or New Test from the Flowchart menu.
When you move the pointer into the Flowchart area, it becomes a crossbar.

2 **Position the crossbar where you want the upper-left corner of the object to appear and click on the location.**

4th Dimension creates the test or step. The crossbar becomes the standard pointer again.

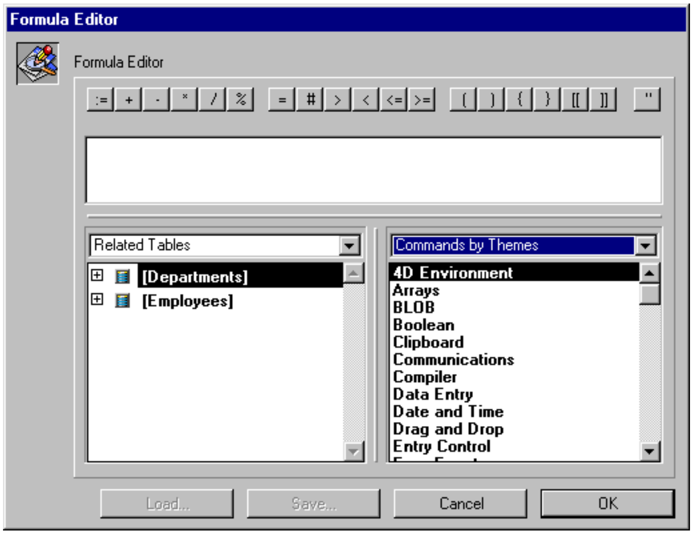
Creating a Formula

You use a formula (a one-line method) to control each step or test.

► To create a formula:

1 **Double-click the Step or Test object for which you want to create a formula.**

4th Dimension displays the Formula editor as shown in the following illustration.



You use the Formula editor in the same way as the Listing editor, except that the Formula editor exists in a dialog box, not an editor window, and it allows only one-line statements. You cannot move or resize the dialog box, nor can you change the relative size of the editing area and the lists at the bottom.

A formula, like a method, can contain up to 32,000 characters.

A step formula must result in an instruction for the computer to do something. The NEXT PAGE statement is an example of a step formula.

A test formula must result in TRUE or FALSE (a Boolean condition). The statement “Salary>50000” is an example of a test formula.

As you create formulas for steps and tests, 4th Dimension automatically checks the formula syntax to see if it is correct. If you enter text or select an object that is not compatible with proper syntax, 4th Dimension marks the error with bullets.

2 **Write the formula, and then click OK.**

4th Dimension displays the Flowchart editor. The formula is displayed in the step or test for which it was created.

Drawing Flow Lines

To define the flow of a method through the chart, you need to draw flow lines between the objects in the Flowchart window.

► To draw a flow line:

1 **Position the pointer on the lower boundary of a step object or on one of the corners of a test object.**

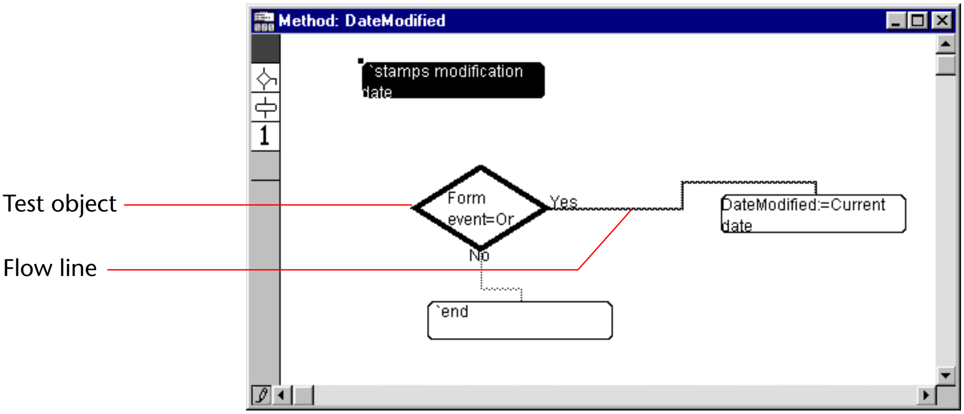
The pointer becomes a small, upward-pointing arrow.

To draw a Yes line from a test, position the pointer on the left or right corner. To draw a No line from a test, position the pointer on the bottom corner.

2 **Drag away from the object and towards the object to which you want to connect the flow line.**

3 **Release the mouse button at the border of the object you want to connect.**

4th Dimension draws a flow line between the two objects.



4th Dimension lets you draw through other objects to connect objects in the flowchart. If you are drawing flow lines from a test object, 4th Dimension automatically labels the lines as Yes and No.

► To erase a flow line:

1 **Position the pointer on the flow line you want to delete.**

2 **When the pointer becomes a small, upward-pointing arrow, drag the line to an area between objects (so that the pointer is not touching any object) and release the mouse button.**

The selected flow line disappears.

Specifying a First Step

When you create a flowchart method, the first step you create is shown in bold outline indicating that it is the first step. The first step is where the method begins when it executes. You can change the first step at any time. Setting a new first step is a way to isolate parts of the flowchart method in order to debug problems.

When you set a new first step, 4th Dimension ignores all steps and tests before the new starting point.

► To set a new first step:

1 **Select the step you want to specify as the first step in the method.**

2 **Click the Set as Start icon 1 in the palette.**
OR
Choose Set as Start from the Flowchart menu.

4th Dimension displays the step in bold as the new starting point.

Editing a Flowchart Method

You can change the way a flowchart is displayed by moving and resizing components so that the flowchart is clear and easy to read. You can also change the formulas that define the steps and tests.

The following are several ways to select flowchart objects:

- Click the test or step in the Flowchart editor window so that 4th Dimension highlights the selected object.
- Select multiple objects by dragging a selection rectangle around the tests or steps you want to select.
- Select multiple objects by holding down **Shift** while clicking the tests or steps you want to select.

Moving an Object

To move an object:

1 **Select the object in the Flowchart editor window.**

2 **Drag the object to its new location in the window.**

If there are flow lines connected to the object you are moving, they follow the object.

Resizing an Object

To resize an object:

1 **Select the object in the Flowchart window.**

4th Dimension highlights the step or test and displays a resizing handle in the upper-left corner.

2 **Move the pointer over the resizing handle on the selected object.**

The pointer changes into a multi-directional arrow.

3 **Drag the handle toward the center of the object to shrink it, or away from the center to enlarge it.**

4th Dimension resizes the object.

Deleting an Object

To delete an object:

1 **Select the object or objects that you want to delete.**

2 **Choose Clear from the Edit menu.**
OR
Press the Backspace key.

4th Dimension deletes the selected object or objects. The deletion also removes any flow lines connected to the deleted object.

Editing a Formula

To edit a formula for a step or test:

1 **Double-click the test or step object whose formula you want to edit.**

4th Dimension displays the Formula editor. The existing formula appears in the Formula area.

2 **Edit the formula, using the editing techniques described in "Creating a Flowchart Method" on page 408.**

3 **Click the OK button to accept the formula and return to the Flowchart window.**

Click the **Cancel** button to discard the formula or editing changes and return to the Flowchart window.

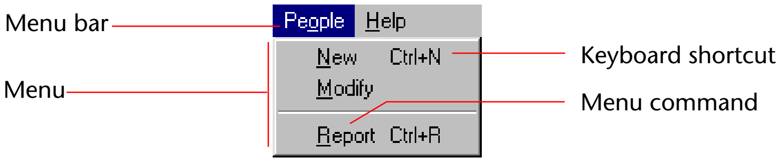
8 Creating Custom Menus

You can create custom menus for your databases and custom applications. Because pull-down menus are a standard feature of any desktop application, their addition will make your databases easier to use and will make them feel more familiar to users. When you create custom menus, you can also create custom toolbars. With custom menus and toolbars, your databases will perform more like “stand-alone” applications.

When you create a custom application, you must create at least one menu bar with at least one menu. For detailed information about creating custom applications, refer to the *4th Dimension Language Reference*.

Designing Menus

In general, menus provide menu commands that the user chooses to perform database tasks: modifying records, searching for records, printing reports, and so on. The figure below shows an example of a custom menu.



A menu bar is a group of menus that can be displayed on a screen together. Each menu on a menu bar can have many menu commands in it, including separator lines that divide the menu commands into groups and keyboard equivalents. When the user chooses a menu command, it calls a project method that performs an operation.

You can have many separate menu bars for each database. For example, you can use one menu bar that contains menus for standard database operations and another that becomes active only for reporting.

One menu bar may contain a menu with menu commands for entering records. The menu bar appearing with the input form may contain the same menu, but the menu commands are disabled because the user doesn't need them during data entry.

You can also use the Menu Bar editor to create custom toolbars. To do so, you associate an icon with a menu command. The icon appears in the toolbar and the text of the menu command is used as the icon's Tip.

When you use the same menu for more than one menu bar, you can take advantage of the concept of "instances" of a menu to simplify the process of managing menus. For complete information about this method of managing menus, see the section "Working With Instances of a Menu" on page 424.

When you design menus, keep the following two rules in mind:

- **Use menus for functions that are suited to menus** Menu commands should perform tasks such as adding a record, searching for records, or printing a report.
- **Group menu commands by function** For example, all menu commands that print reports should be in the same menu. For another example, you might have all operations for a certain table in one menu.

You use the Menu Bar editor to create menus. You can perform the following operations in the Menu Bar editor:

- Specify styles for menu commands,
- Specify keyboard equivalents for menu commands,
- Add dividing lines to menus,
- Assign password groups to menu commands,
- Enable or disable menu commands,
- View sample menus while you are creating the menu bar,
- Paste in a custom graphic associated with each menu bar that will be displayed as a splash screen,
- Create a custom toolbar that uses an icon for each menu command,
- Create a connected menu,
- Specify that a new process start when a menu command is chosen.

Each of these tasks is explained in this chapter.

Creating Menus

4th Dimension allows you to create entire menu bars. A menu bar is the collection of menus that appears at the top of your application window. The menu bar displays the menu titles and the menus pull down to display the menu commands. Every menu command should be associated with a project method.

4D Server Object locking occurs when two or more users attempt to modify the same menu bar at the same time. If a user is modifying a menu in a menu bar, the menu is locked. Other users can modify different menus in that menu bar, but they cannot modify the same menu. In addition, if a user is modifying any aspect of a menu bar, other users cannot add any new menus to the menu bar.

Basic Steps for Creating Menus

The following are the basic steps for creating custom menus:

1 **Create one or more menu bars.**

See the next section, "Creating a Menu Bar" on page 416.

2 **Create the menus that will pull down from the menu bar.**

See the section "Adding Menus" on page 418.

3 **Add menu commands to each menu in the menu bar.**

See the section "Adding Menu Commands" on page 420.

4 **Assign a project method to each menu command.**

When the user chooses that menu command, 4th Dimension executes the method. See the section "Assigning Methods to Menu Commands" on page 422.

5 **Write the project methods that perform the menu commands.**

For more information about using the Method editor, see the section "Using the Listing Editor" on page 395. Refer to the *4th Dimension Language Reference* for detailed information about 4th Dimension's programming language.

6 **Make any enhancements you want such as special font styles, separator lines, keyboard shortcuts, a toolbar icon, and so on.**

See the section "Enhancing Menus" on page 427.

7 **Assign password access groups to menu commands (optional).**

See the section "Assigning a Group To Database Objects" on page 453.

8 **Specify that a new process be started when q menu command executes (optional).**

See the section "Assigning Methods to Menu Commands" on page 422.

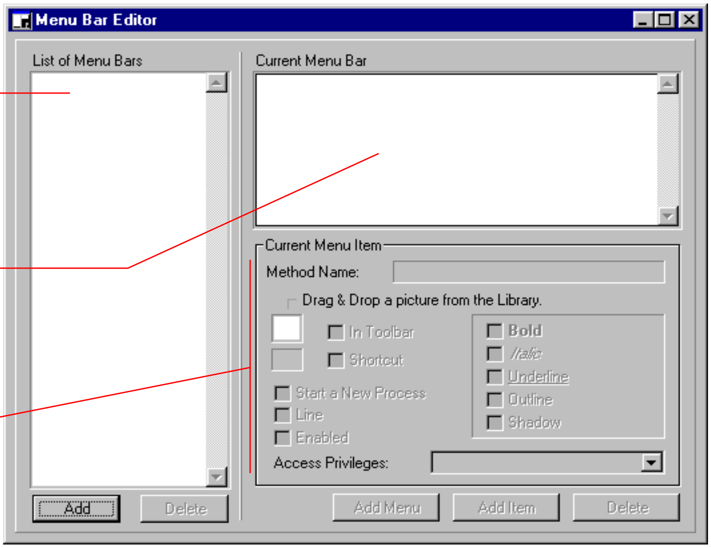
Creating a Menu Bar

This section describes the process of creating a custom menu bar.

▶ To create a menu bar:

1 **Choose Menu Bar Editor from the Tools menu.**

4th Dimension displays the Menu Bar editor. If there are any existing menu bars, they are displayed in the panel on the left.



The List of Menu Bars shows the existing menu bars

The Current Menu Bar area shows the menus belonging to the selected menu bar

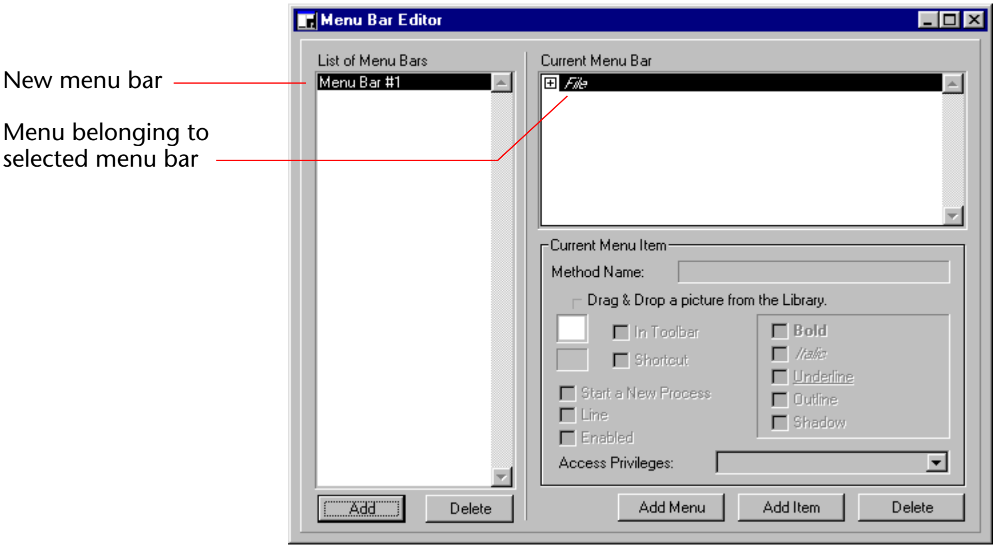
The Current Menu Item area shows the properties of the selected menu command

4th Dimension assigns menu bar numbers sequentially — Menu Bar #1 appears first. You cannot change menu bar numbers.

If you delete a menu bar, 4th Dimension automatically renumbers any remaining menu bars. If you refer to menu bars in a method, you may need to update the method to reflect new menu bar numbers.

2 **Click the Add button.**

The new menu bar appears in the List of Menu Bars, as shown in the following illustration.



At this point, you can begin assigning menus to the menu bar and adding menu commands to the menus.

The Menu Bar editor displays menu information in the following three lists:

- **List of Menu Bars** displays the name of each menu bar.
- **Current Menu Bar list** displays the name of each menu in the menu bar currently selected in the List of Menu Bars. The Current Menu Bar list is a hierarchical list; each menu can be expanded to display the menu commands belonging to the menu.
- **Current Menu Item Properties area** displays the properties of the selected menu command.

Notice that the **File** menu appears italicized in the Current Menu Bar list. The italics indicate that the text for the menu title is being retrieved from a string resource. If you select the **File** menu, the string resource number ":79, 1" appears.

The **Edit** menu is not listed, but is automatically added to the menu bar when it is displayed. You can add menu commands to the **File** menu, but you cannot edit the **Edit** menu. When the menu bar is in use, the **File** and **Edit** menus occupy the first two places at the left end of the menu bar.

Note The **File** menu usually includes **Quit** as the last menu command.

Adding Menus

You can add menus to either a new or an existing menu bar. You can add a menu to a menu bar in the following two ways:

- Create a new menu,
- Create a connected menu.

  When you create a connected menu, you are attaching an exact duplicate of an existing menu to a menu bar. This duplicate is called an *instance* of that menu. For information about creating an instance of a menu, see the section "Creating Connected Menus" on page 424.

  Before you can create a connected menu, the first instance of that menu must be created in the Menu editor window.

  You can create a menu in the following two ways:

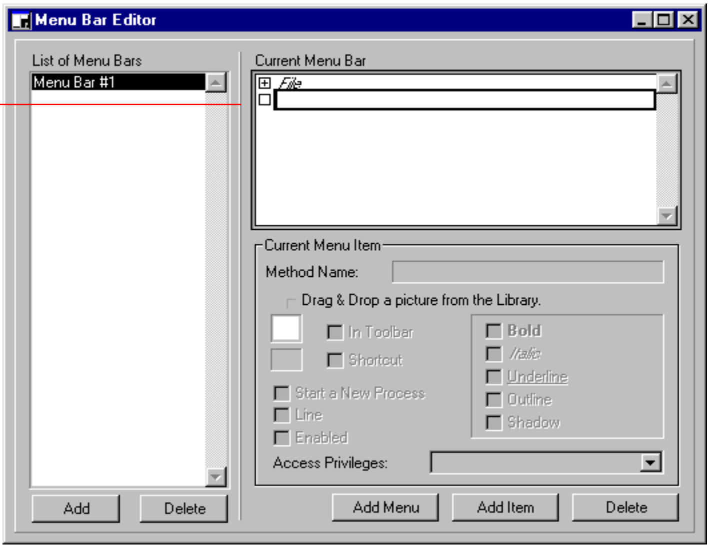
- Append a new menu to the end of the current list of menus,
- Insert a new menu anywhere in the current list of menus.

  You don't have to create the menus in the order that they will eventually appear. You can rearrange menus after you've created them using drag and drop. For more information, see the section "Rearranging Menus and Menu Commands" on page 421.

▶ To add a menu:

1 **Choose Add Menu from the Menu menu.**
OR
Click the Add Menu button.

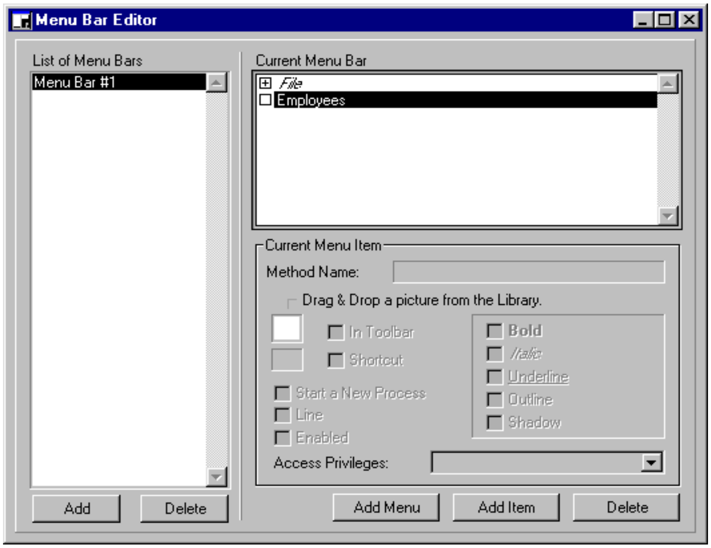
4th Dimension adds a new menu to the Current Menu Bar list so that you can enter the menu title.



New menu

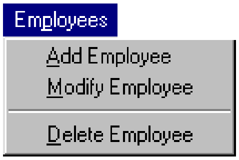
2 **Type the name of the new menu in the entry area.**[1]

The maximum length for a menu title is 15 characters. Additional characters are ignored.



[1] You can use a STR# resource instead of text. To do so, enter the STR# in the format *STR#, line #* in place of the text of the menu title. When you press tab, the string resource appears in italics. You can also use an interprocess variable containing the STR# resource number in place of *STR#*.

As you enter the menu name, 4th Dimension displays the name to the right of the current menu bar to show how it will look in the finished application. You can pull down this sample menu in the same way that you pull down active 4th Dimension menus. When you add menu commands, they appear in this sample menu.



3 **Repeat steps 1 and 2 to add more menus.**

Adding Menu Commands

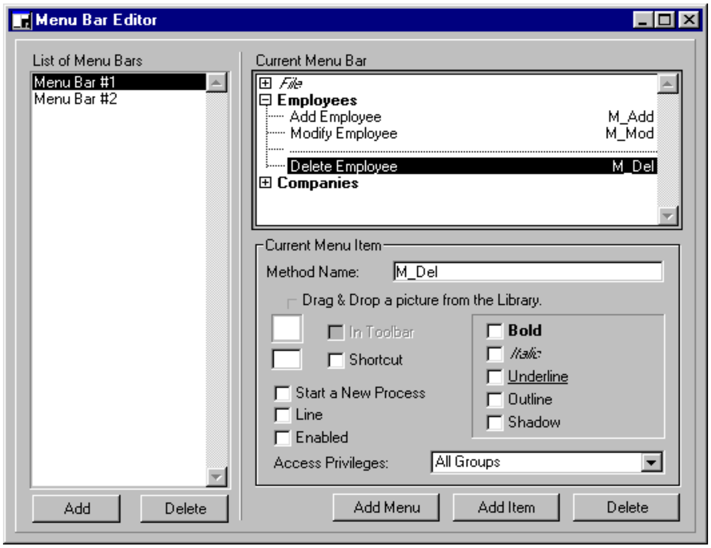
For each menu in the menu bar, you must create the menu commands that appear when the menus are pulled down.

▶ To add a menu command:

1 **Select the menu that you want to provide with a menu command.**

2 **Click Add Item.**
OR
Choose Add Item from the Menu menu.
4th Dimension adds a new item to the Current Menu Bar list.

3 **Type the name of the new menu command.**
The figure below shows **Delete Employee** being added as a menu command.

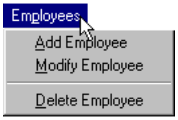


Method Name: M_Del

Access Privileges: All Groups

Notice that the third menu command appears blank. This menu command is a placeholder for a disabled separator line. For information about creating a separator line, see the section “Adding Separator Lines” on page 429.

The figure below shows the menu commands and the separator line in the sample menu.



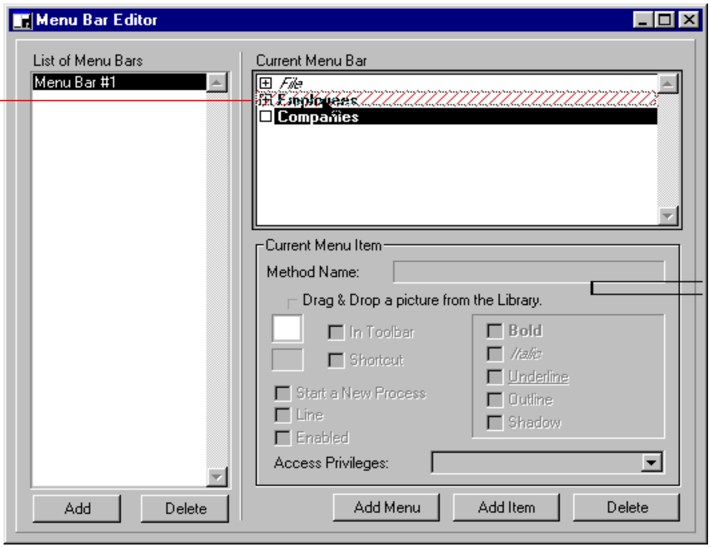
4 **Repeat steps 1 through 3 to add more menu commands to the Items list.**

Rearranging Menus and Menu Commands

After you create the menus for a menu bar and the menu commands for a menu, you can reorder them using drag and drop. To insert a menu command at a different place in the order, simply drag the menu command to the new location. To move a menu, simply drag a menu to another location in the list of menus.

The following illustration shows a menu being dragged.

Companies menu being dragged between File and Employees menus



Assigning Methods to Menu Commands

To enable a menu command to perform its function, you must assign a project method to it. These methods perform the functions indicated by the menu commands. For example, the **Monthly Report** menu command can call a project method that prepares a monthly report from a table containing financial data. When a menu command is chosen, 4th Dimension executes the project method assigned to it.

You create the project method in the Method editor. You can create it either before or after you assign it to the menu command. You can assign the method when you create the menu command or at a later time. If you do not assign a method to a menu command, when that menu command is chosen in the Custom Menus environment, 4th Dimension automatically returns to the User environment.

When you have assigned a method to a menu command in the Menu editor, you can open that method by simply selecting the menu command in the Current Menu Bar area and pressing **Ctrl+P** (on Windows) or **Command–P** (on Macintosh).

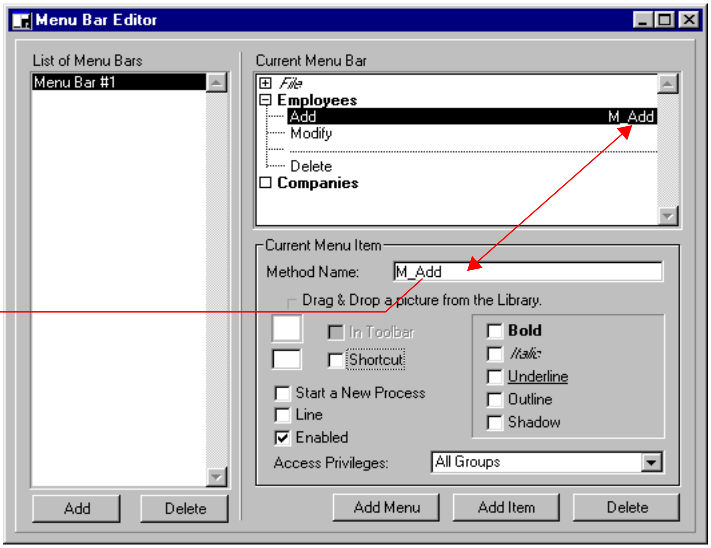
► To assign a method to a menu command:

1 **Create the menu command.**
OR
Select it if it already exists.

4th Dimension highlights the selected menu command. The Current Menu Item area changes to show the properties of the selected menu command.

2 **Drag a method name from the Methods page of the Explorer to the Method Name area in the Menu Bar editor or type the name of the method in the Method Name area.**

If you typed the method name, press Tab or click outside the entry area to save the method name.



Method Name: M_Add

□ Start a New Process

□ Line

☑ Enabled

Access Privileges: All Groups

Method name area

You can add a method name before you write the method.

When you finish entering the name, it appears in the Current Menu Bar area.

Note If you change the name of a method that is used in a menu, you must update the method name here in the Menu Bar editor.

3 **Click the Start a New Process check box (optional).**

If you click the **Start a New Process** check box, a new process is created when the menu command is chosen.

Normally, a method attached to a menu command executes within the current process unless you explicitly call New process in your code. The **Start a New Process** check box makes it easier to start a new process.

If you click the **Start a New Process** check box, 4th Dimension will create a new process when the menu command is chosen. In the Process list, 4th Dimension assigns the new process a default name using the format *M_ProcessNumber*. The names of processes started from a menu are created by combining the prefix “M_” with the process number.

For more information about processes, see Chapter 11, “Managing Processes” on page 475.

Working With Instances of a Menu

When you write a custom application, you will usually find that you reuse certain menus in several places in your application. The same menu may be attached to several menu bars.

If you create a menu from scratch each time you use it in a menu bar, you must manage each menu separately, on a menu bar by menu bar basis. If you want to change a menu (disable or enable a menu command, place a check mark next to a menu command, and so on), you must change it every place that it occurs.

If you take advantage of the concept of "instances" of a menu by creating connected menus, managing menus becomes much easier. With connected menus, it is possible to update a menu *wherever it occurs* in a single step.

Creating Connected Menus

When you create a menu using the **Add Menu** command in the **Menu** menu or the **Add Menu** button, you create the first instance of that menu.

When you want to reuse the menu in another menu bar, you connect the menu to that menu bar. Connecting the menu attaches another instance of the menu to the menu bar.

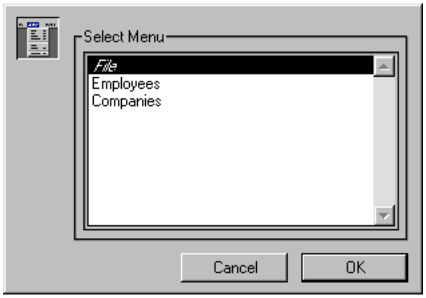
► To connect a menu to a menu bar:

1 Make sure that the menu bar to which you want to connect is the currently selected menu bar in the Menu Bar editor.

2 Select the menu that you want to appear below the connected menu.

3 Choose Connect Menu from the Menu menu.

The Select a Menu dialog box appears.



Select Menu

File
Employees
Companies

4 Select the name of the menu you want to connect.

5 **Click the OK button.**

This connects another instance of the menu to the menu bar. The connected menu appears directly above the currently selected menu in the Menu Bar editor.

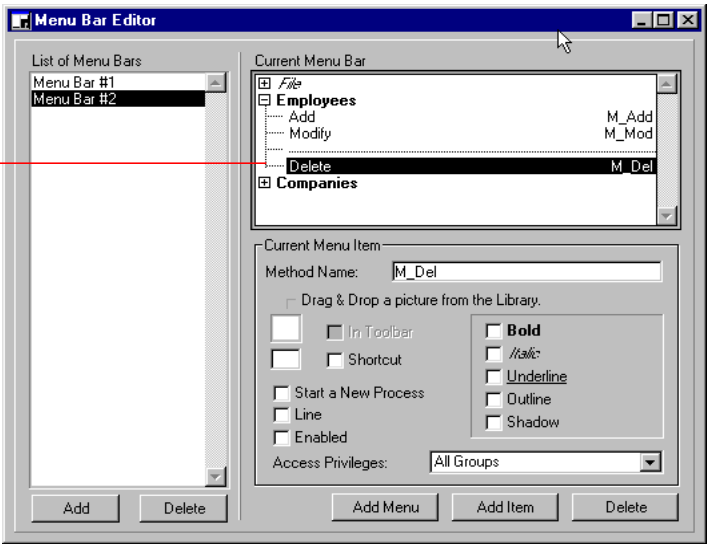
Modifying Connected Menus

The most important thing to remember about connected menus is that all instances of a menu refer to a single menu description. If you modify any instance of a menu, all instances of the menu reflect the change.

Modifications include the following:

- Changes to the name of the menu, menu commands, or methods,
- Enhancements to the menus, such as adding separator lines, disabling or enabling menu commands, changing fonts or styles, and assigning keyboard equivalents,
- Modifications produced with the 4th Dimension language, such as disabling a menu command by using the DISABLE ITEM command.

The following illustration shows a menu command that has just been disabled in a connected menu.



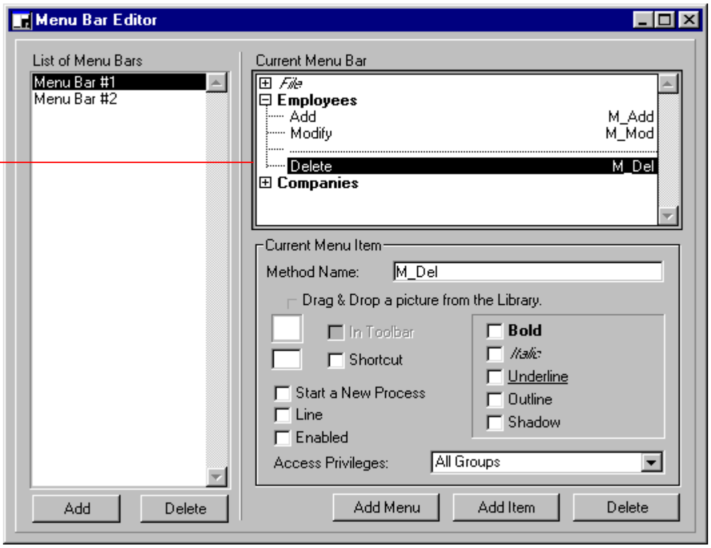
Disabled menu command

Method Name: M_Del

☐ In Toolbar
☐ Shortcut
☐ Start a New Process
☐ Line
☐ Enabled
☐ Bold
☐ Italic
☐ Underline
☐ Outline
☐ Shadow

Access Privileges: All Groups

The menu command is disabled in menu bar #2, but since the menu command belongs to a connected menu, the modification appears in all other instances of that menu. The following illustration shows the same change reflected in the Employees menu in menu bar #1.



Menu	Item	Method
File		
Employees	Add	M_Add
	Modify	M_Mod
	Delete	M_Del
Companies		

Method Name: M_Del

□ In Toolbar
□ Shortcut
□ Start a New Process
□ Line
□ Enabled
□ Bold
□ *Italic*
□ Underline
□ Outline
□ Shadow

Access Privileges: All Groups

Disabled menu command

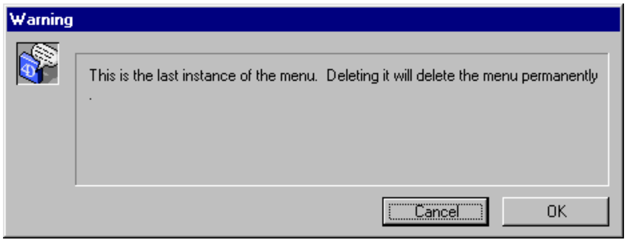
For more information about disabling a menu command, see the section “Enabling and Disabling Menu Commands” on page 429.

Deleting Connected Menus

Although connected menus refer to a single menu description, there is no main instance of a menu to which other instances refer.

When you delete a menu, you are only deleting an instance of the menu. The menu is not removed from the database — it is only deleted from a single menu bar — unless you delete the last instance of a menu.

If you attempt to delete the last instance of a menu in your database, a confirmation dialog box appears to remind you that it is the last reference to the menu and that deleting it will remove the menu from your database permanently.



This is the last instance of the menu. Deleting it will delete the menu permanently
.

For complete information about deleting menus, see the section “Deleting Menus and Menu Commands” on page 433.

Enhancing Menus

You can change the font style of menu commands, add separator lines between groups of menu commands, assign a keyboard equivalent for a menu command, and enable or disable menu commands. You can also create a custom toolbar by assigning icons to menu commands.

Adding an Icon to a Menu Command

You can associate an icon with a menu command. When you do so, the icon is used as a button in the toolbar that is displayed whenever the menu bar is displayed.

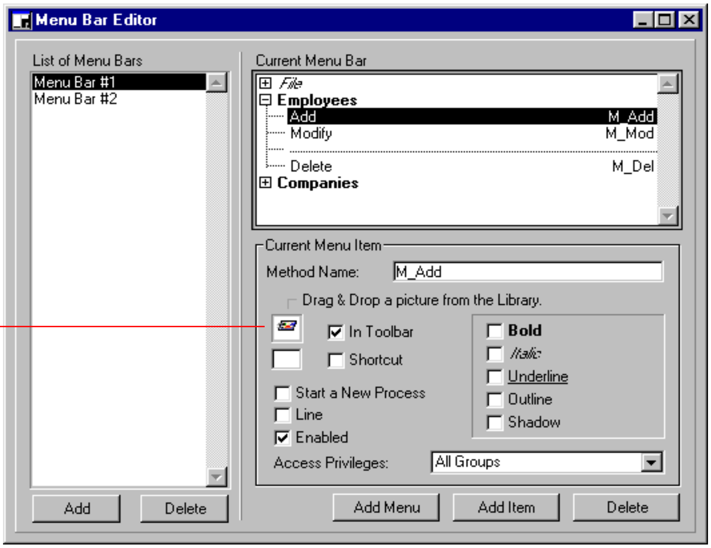
► To add an icon:

1 **Highlight the menu command to which you want to associate an icon.**

The Current Menu Item area changes to show the properties of the selected menu command.

2 **Open the Picture library, select a graphic, and drag the picture from the Picture library to the In Toolbar area.**

4th Dimension displays the icon in the area.



Method Name: M_Add

☑ In Toolbar
☐ Shortcut
☐ Start a New Process
☐ Line
☑ Enabled
☐ Bold
☐ *Italic*
☐ Underline
☐ Outline
☐ Shadow

Access Privileges: All Groups

Icon from Picture library added to menu item

When the menu bar is used in the Custom Menus environment, 4th Dimension displays the icon in the toolbar and automatically uses the text of the menu command as the Tip for the toolbar button.

Changing Font Styles

4th Dimension lets you customize menus by applying different font styles to the menu commands.

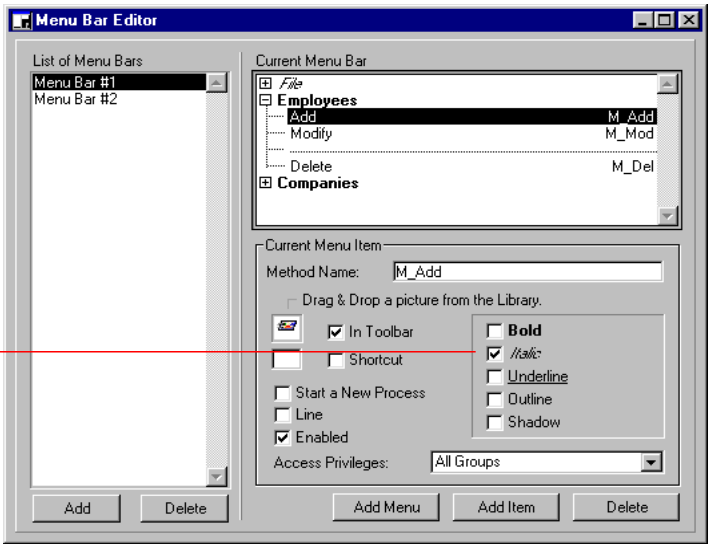
You can customize your menus with these styles:

- Bold,
- Italic,
- Underline,
- Outline (displayed on Macintosh only),
- Shadow (displayed on Macintosh only).

Be cautious when applying font styles to your menus — too many styles will be distracting to the user and give a cluttered look to your application.

To apply a style, select the menu command you want to modify and then choose the style from the check boxes.

The following illustration shows an italic style being applied to a menu command.



List of Menu Bars: Menu Bar #1, Menu Bar #2

Current Menu Bar:

⊞ *File*	
⊟ **Employees**	
Add	M_Add
Modify	M_Mod
Delete	M_Del
⊞ **Companies**	

Method Name: M_Add

Drag & Drop a picture from the Library.

☑ In Toolbar

☐ Shortcut

☐ Start a New Process

☐ Line

☑ Enabled

☐ **Bold**

☑ *Italic*

☐ Underline

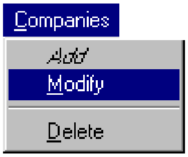
☐ Outline

☐ Shadow

Access Privileges: All Groups

Italic check box

The sample menu appears like this:



Enabling and Disabling Menu Commands

You can specify whether a menu command will appear enabled or disabled. An enabled menu command can be chosen by the user; a disabled menu command is dimmed and cannot be chosen. Unless you specify otherwise, 4th Dimension automatically enables each menu command you add to a custom menu[1].

Note You can also enable or disable menu commands using methods.

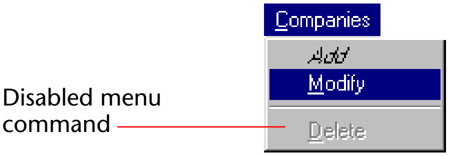
► To enable or disable a menu command:

1 **Select the menu command you want to enable or disable.**

2 **To enable the menu command, select the Enabled check box.**

To disable the menu command, uncheck the **Enabled** check box.

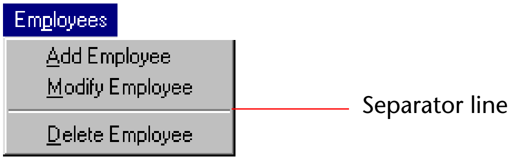
If the **Enabled** check box is checked, the menu command appears normally in the menu. If the **Enabled** check box is unchecked, the menu command appears dimmed, signifying that it cannot be chosen.



Adding Separator Lines

Groups of menu commands in a menu can be separated by a separator line. This convention is useful for grouping associated menu commands by function.

The figure below shows a menu with a separator line.



[1] If you add a separator line, the Menu Bar editor automatically disables the line.

You add a separator line by creating a menu command. Instead of entering the menu command's text in the Current Menu Bar area, you simply select the Line property. Instead of text, the line appears in the Current Menu Bar area.

► To add a separator line:

1 **Select the menu you want to change in the Current Menu Bar list.**

The menu commands for that menu appear in the Items list.

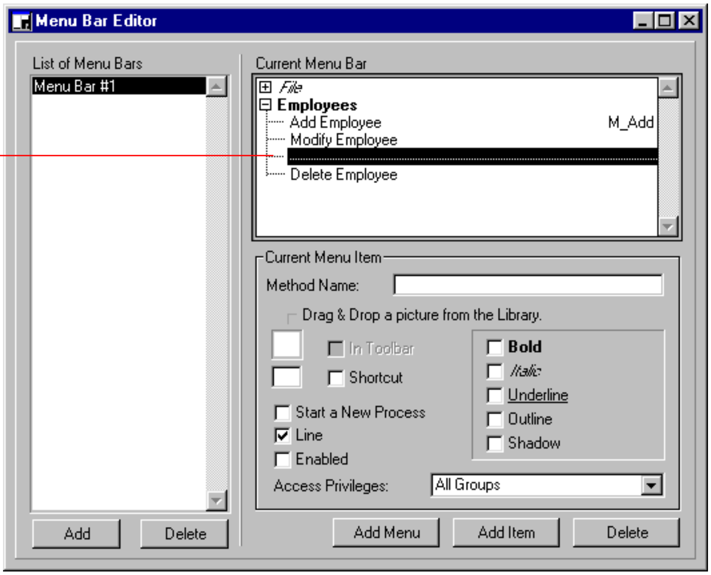
2 **Choose Add Item from the Menu menu.**
OR
Click Add Item.

4th Dimension creates a new menu command.

3 **If necessary, drag the new menu command to the location where you want to place the separator line (optional).**

4 **Click the Line check box property in the Current Item properties area[1].**

The line appears in the Current Menu Bar area.



Separator line

□ In Toolbar
□ Shortcut
□ Start a New Process
☑ Line
□ Enabled
□ Bold
□ Italic
□ Underline
□ Outline
□ Shadow

Access Privileges: All Groups

[1] On Macintosh, if you use the dash "-" as the first character of a menu item, it will appear as a separator line.

Assigning Keyboard Equivalents

You can add keyboard equivalents to any menu command. If a menu command has one of these keyboard shortcuts, users will see a symbol for it next to the menu command. For example, "**Ctrl+C**" appears next to the **Copy** menu command on the **Edit** menu. This means you can copy a selection by holding down the **Ctrl** key and pressing **C**.

4th Dimension lets you assign keyboard equivalents to the menu commands in your custom menus. You can use any alphanumeric keys in combination with the **Ctrl** key (**Command** key on Macintosh) as a keyboard equivalent, except for the keys reserved by standard menu commands that appear in the **Edit** and **File** menus and the keys reserved for 4th Dimension menu commands. These reserved key combinations are listed in the following table.

Key[1]	**Operation**
Ctrl+C	Copy
Ctrl+Q	Quit
Ctrl+V	Paste
Ctrl+X	Cut
Ctrl+Z	Undo
Ctrl+. (period)	Stop action
Ctrl+W	Flushes records to disk in User or Custom Menus environments

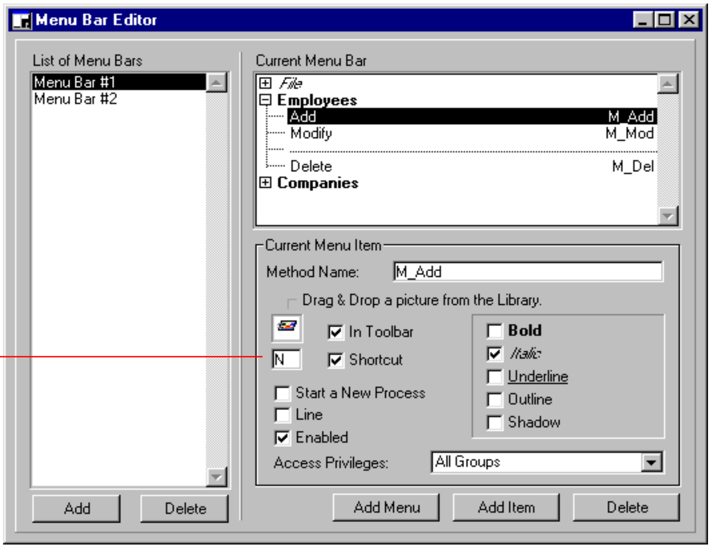
[1] On Macintosh, use Command instead of Ctrl.

► To assign a keyboard equivalent:

1 **In the Current Menu Bar area, select the menu command to which you want to assign a keyboard equivalent.**

2 **Click the Shortcut check box.**

3 **Type the alphanumeric character that you want to associate with the menu command in the keyboard equivalent entry area.**



Method Name: M_Add

☑ In Toolbar
N ☑ Shortcut
□ Start a New Process
□ Line
☑ Enabled
Access Privileges: All Groups

□ Bold
☑ *Italic*
□ Underline
□ Outline
□ Shadow

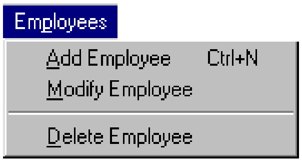
Keyboard equivalent entry area

Tip If the text of a menu item is followed by the slash and a letter, the Menu Bar editor will automatically use the letter as the keyboard equivalent. For example, if you enter “Add Employee/N” as the text of a menu item, the Menu Bar editor will automatically use Ctrl+N as the keyboard equivalent.

The user can choose the menu command by holding down the **Ctrl** key (on Windows) or **Command** key (on Macintosh) and pressing the assigned key.

Note On Windows, keyboard equivalents using the Alt key are automatically handled by the system, not by 4th Dimension.

4 Pull down the sample menu to see how the keyboard equivalent appears in the menu (optional).



Note An active object can also have a keyboard equivalent. If Ctrl key assignments conflict, the active object takes precedence. For information on assigning keyboard equivalents to active objects, see the section “Assigning a Keyboard Equivalent” on page 290.

Deleting Menus and Menu Commands

You can delete an instance of a menu at any time. A deleted menu no longer appears on the menu bar. You might not want a particular menu on a certain menu bar. You might delete a menu after you have placed its menu commands on other menus. Or, you might delete menus that you have placed on different menu bars.

For information about deleting connected menus, see the section "Deleting Connected Menus" on page 426.

► To delete a menu:

1 **Select the menu you want to delete in the Current Menu Bar list.**

When you select a menu, the names of menu commands assigned to the menu appear in the Items list.

Double-check to make sure this is the menu you want to delete.

2 **Click Delete.**
OR
Choose Delete from the Menu menu.

4th Dimension removes the menu from the menu bar. The deleted menu will no longer appear in the application's menu bar.

You can delete a menu command at any time. You might delete a menu command that is out of date. You might delete a menu command after you have placed it on another menu. Or, you might delete a menu command that has been replaced by another menu command.

► To delete a menu command:

1 **Select the menu command you want to delete.**

2 **Choose Delete from the Menu menu.**
OR
Click Delete in the Current Menu Bar area.

4th Dimension removes the menu command from the Current Menu Bar list.

Previewing Menus and Adding a Splash Screen

As you develop your custom application, 4th Dimension lets you view the custom menus and menu bars as they will appear in the application.

You can also embellish each menu bar with a “splash screen,” a custom graphic displayed under the menu bar when it appears. A splash screen can include a company logo or other design elements.

Before you can add a splash screen, you need to create the graphic using a graphics application, by scanning, or by some other means.

► To preview the menu bar and add a splash screen:

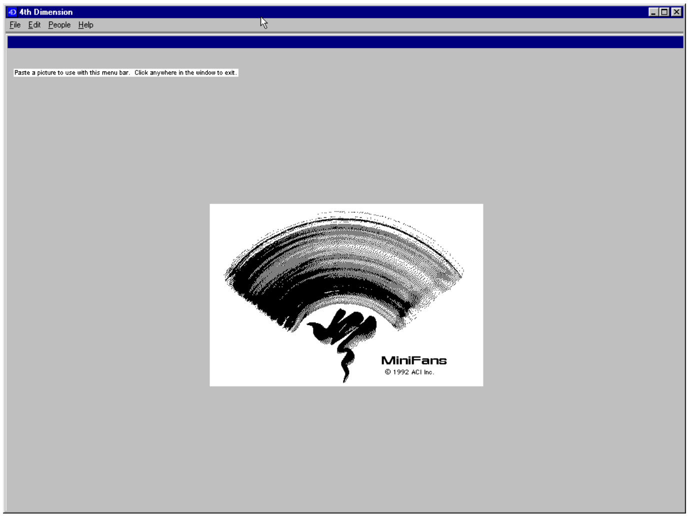
1 **Choose Show Custom Menus from the Menu menu.**

4th Dimension displays the menu bar as it will appear in the custom application and prompts you to copy a picture to accompany the menu bar.

2 **Open the menus listed on the menu bar to preview the contents of the menus.**

3 **If you are going to add a splash screen, copy the graphic to the Clipboard and paste it into the Splash Screen area.**

4th Dimension centers the graphic image beneath the menu bar. The following illustration shows an example of a custom splash screen.



Paste a picture to use with this menu bar. Click anywhere in the window to exit.

4 **When you are satisfied with your splash screen, click anywhere in the screen to exit the preview.**

The splash screen will appear whenever this menu bar is used in the custom application when no form is displayed.

Menus and Custom Applications

Menu bars provide the major interface for custom applications. For each custom application, you must create at least one menu bar with at least one menu. See the *4th Dimension Language Reference* for more information about creating custom applications.

You can create menu bars for the Custom Menus environment regardless of whether you are creating a custom application or simply creating menus for use in the Custom Menus environment. By default, Menu Bar #1 is the menu bar displayed. You can change which menu bar is displayed using a method.

If you define a menu command without assigning it a method, choosing that menu command exits the Custom Menus environment. If you are using the application with 4D Runtime, leaving the Custom Menus environment takes you to the Program Manager (on Windows) or Finder (on Macintosh).

If you are using the full 4th Dimension application, a password access system can be set up to control where each user is placed after leaving the Custom Menus environment. Users who are not assigned startup methods in the password access system are placed in the User environment when they choose a menu command that does not have a method assigned. These users can also enter the User environment at any time by choosing **Close** from the main 4th Dimension window's Control-menu box.

Users who are assigned startup methods cannot enter the User environment. When these users choose a menu command without a method or choose **Close** from the main 4th Dimension window's Control-menu box, 4th Dimension quits.

Note On the Macintosh, pressing **Option–F** is the equivalent of choosing **Close** from the 4th Dimension Control-menu box.

9 Managing Password Access

If more than one person uses a database, you may want to control access to the database or provide different capabilities and interfaces to different users. If you are designing applications for use in a multi-user environment or the World-Wide Web, it may be essential that you provide security for sensitive data. You can provide this security by assigning passwords to users and creating access groups that have different levels of access to information in the database or database operations.

This chapter provides information about 4th Dimension's Password Access editor. You use the Password Access editor to:

- Specify the users of a database,
- Provide users with passwords,
- Create groups of users with different levels of access to the database,
- Nest groups of users within other groups to create a hierarchy of users,
- Specify the group which owns the objects each user creates,
- Assign a startup method for each user,
- Specify a group owner.

After you create access groups, you can manage access to:

- The Design environment,
- Table properties,
- Record operations,

- Forms,
- Methods,
- Menu commands,
- Plug-ins.

In addition to providing security for your databases, the access system also maintains a user history — the Password Access editor can tell you how many times a user has used the database and the date of the most recent use.

4D Server Object locking occurs when two or more users attempt to modify the password access system at the same time. Only one user can use the Password Access editor at a time.

Access System Overview

4th Dimension's password access system is based on users and groups. You create users and assign passwords, put users in groups, and assign each group access rights to appropriate parts of the database.

The figure below shows table owner privileges being assigned to a group. Groups can be assigned access privileges to operations on records in the table and to the table definition.

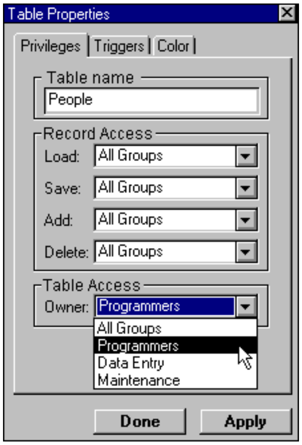


Table Properties

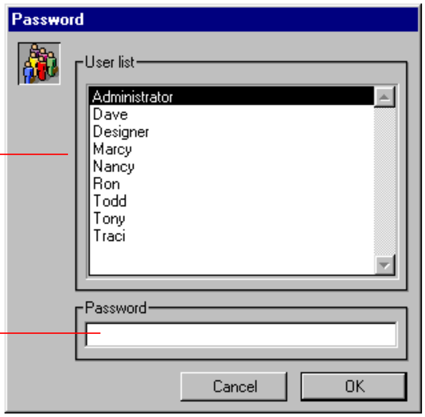
Table name: People

Record Access
Load: All Groups
Save: All Groups
Add: All Groups
Delete: All Groups

Table Access
Owner: Programmers

To open the database, a user either selects or types his or her user name and types his or her password. Then, depending on which groups the user belongs to and to which parts of the database the groups have been assigned, the user can operate the parts of the database that were specified by the access system.

The Data Control page of the Database Properties dialog box allows you to choose which dialog box appears when the user opens the database. By default, the following Enter Password dialog box is displayed.

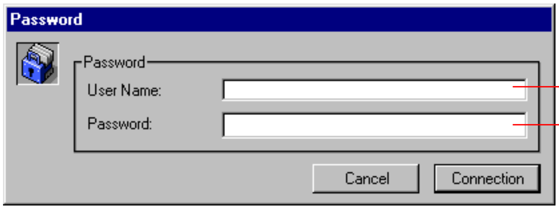


List of users

Password entry area

In this dialog box, the user selects his or her name from the list of users and types his or her password in the password entry box.

If you deselect **Display List of Users in Password Dialog Box** in the Database Properties dialog box, the Enter Password dialog box shown below will be displayed.



User Name entry area

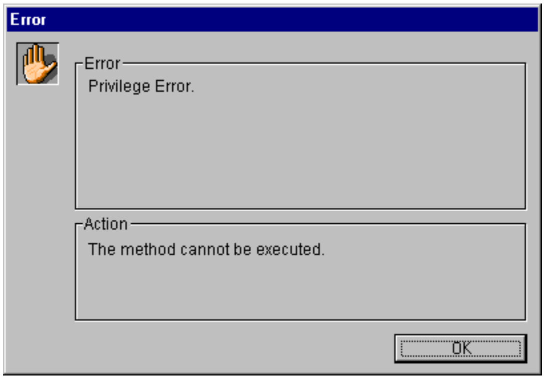
Password entry area

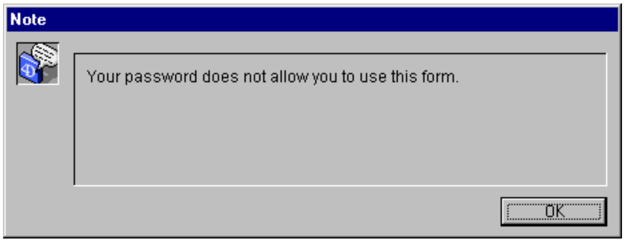
In this dialog box, the user must type both his or her name and password.

4D Server After logging in to the database using either of the above dialog boxes, the user may choose to save the location of the server database (the pathname) and (optionally) the password used to log in to the database. The next time that the user double-clicks the 4D Client application icon, the database is automatically run and, if the user has saved his or her password, the user is automatically logged in to the database. For more information, refer to the *4D Server Reference* manual.

The user operates the database in a normal fashion. When the user attempts to use a form, menu command, method, or table that the group is not permitted to use, 4th Dimension displays an error message.

4th Dimension uses two types of dialog boxes to display messages. An example of each type is shown below.





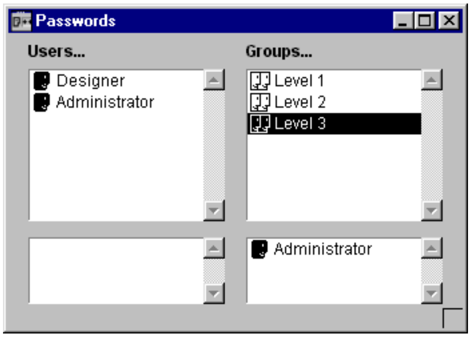
Note If an *ON ERR CALL* method is installed, the error message for methods and tables is not displayed. Refer to the *4th Dimension Language Reference* for more information.

An Access Hierarchy Scheme

The best way to ensure the security of your database and provide users with different levels of access is to use an access hierarchy scheme. Users can be assigned to appropriate groups and groups can be nested to create a hierarchy of access rights. This section discusses some approaches to such a scheme.

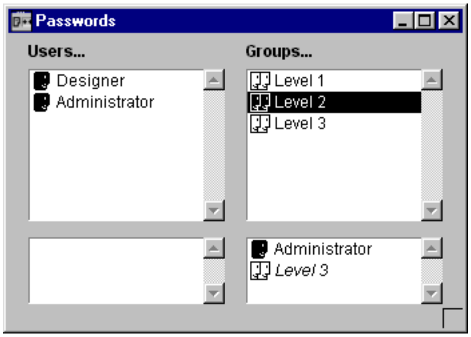
In this example, a user is assigned to one of three groups depending on the user's responsibility. Users assigned to group Level 1 are responsible for data entry. Users assigned to group Level 2 are responsible for maintaining the data, including updating records and deleting outdated records. Users assigned to group Level 3 are responsible for analyzing the data, including performing searches and printing analytical reports.

The groups are then nested so that privileges are correctly distributed when the groups are assigned. Level 3 contains only high-level users.



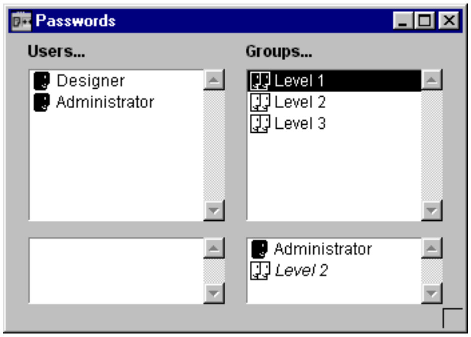
Users: Designer, Administrator
Groups: Level 1, Level 2, Level 3 (selected)
Members of Level 3: Administrator

Level 2 contains data maintenance users as well as Level 3 users so that the users in Level 3 have the privileges of Level 2 as well.



Users: Designer, Administrator
Groups: Level 1, Level 2 (selected), Level 3
Members of Level 2: Administrator, *Level 3*

Level 1 contains data entry users as well as Level 2 users so that users who belong to Level 2 and Level 3 enjoy the privileges of Level 1 as well.



You can decide which group to assign access privileges to based on responsibility. If you assign group Level 1 to an input form, for example, it means that everyone can use this input form. If you assign group Level 2 to the form, it is restricted to members of Level 2 and Level 3. If you assign group Level 3, only members of Level 3 can use the form.

Such a hierarchical system makes it easy to remember to which group to assign a new user. You only have to assign each user to one group and you use the hierarchy of groups to determine access.

As part of designing your access system, another consideration to keep in mind is the level at which a user should be restricted. You can think of each of the parts of a database to which access can be controlled — methods, forms, tables and table operations — as being part of a natural hierarchy. For example, if only a table is restricted, a user may try to display a form only to be restricted at the table level.

Your access scheme should restrict access at the highest appropriate level, usually at the form level.

The Designer and the Administrator

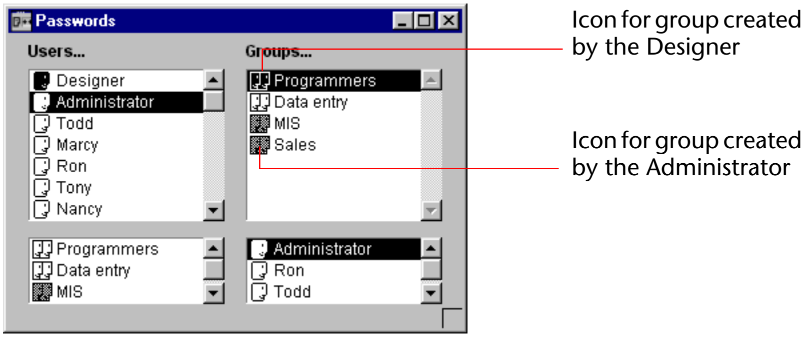
4th Dimension provides users with certain standard access privileges to the two environments and certain powers within each environment. Once a password access system has been initiated, these standard privileges take effect.

The most powerful user is named Designer. The Designer has control over the design of the database. The Designer can create users and groups, assign access privileges to groups, and use the both the User and Design environments. No aspect of the database is closed to the Designer, except for users or groups created by other users.

After the Designer, the next most powerful user is the Administrator, who is usually given the task of managing the password access system. When the Password Access editor is first opened, both the Designer and Administrator appear in the list of users. At this point, the Administrator is just a regular user with no special access privileges. To be able to use the password access system, the Administrator must be given the ability to enter the Password Access editor. For information about allowing the Administrator to enter the Password Access editor, see the section "Administrator and Group Owner Access" on page 458. The Administrator is the only user with the ability to save and load groups. For information about saving and loading groups as the Administrator, see the section "Saving and Loading Groups" on page 452.

The Administrator's access to other parts of the database is limited by group membership — the Administrator must be part of one or more groups to have access privileges in the database. The Administrator is placed in every new group, but you can remove the Administrator's name from any group.

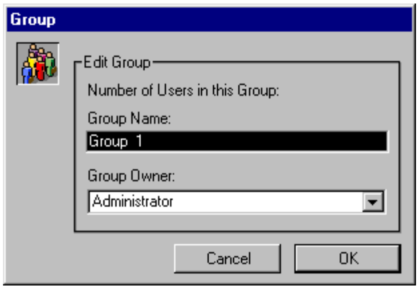
You can distinguish between users and groups created by the Designer and Administrator by the color of their icons. The icons for users and groups created by the Designer are white while those created by the Administrator are grey. The icons for the Designer and Administrator themselves are both black.



Icon for group created by the Designer

Icon for group created by the Administrator

The figure below shows a group being created by the Administrator. The default name of the group is Group 1.



Number of Users in this Group:

Group Name: Group 1

Group Owner: Administrator

The group owner can change the default name at any time.

The Designer and the Administrator can each create 16,000 groups and 16,000 users.

Group Owners

You can designate an owner for each group. Usually, the owner is the Administrator, but you can designate any group member as the owner.

The group owner can be given the ability to add and remove users from any group he or she owns. The users to be added must already exist. Group owners cannot create users or create or change user passwords. Group owners cannot add or remove other groups.

Like the Administrator, the group owner must be given the ability to enter the Password Access editor, normally reserved to the Designer of the database. For information about allowing a Group owner to enter the Password Access editor, see the section “Administrator and Group Owner Access” on page 458.

Giving Users Design Environment Access

Normally, the Designer of a database is the only user who has access to the Design environment. However, if you have a number of users who need to be able to modify the database design, you can place those users in a group and give the group access to the Design environment.

You give a group access to the Design environment by selecting the group from the Structure Access drop-down list in the Data Control page of the Database Properties dialog box. For more information, see the section “Data Control” on page 48.

All other users are ordinary users. When a user opens the database, it opens in the User environment. The access of a user is limited by group membership.

Initiating the System

You initiate the 4th Dimension password access system by assigning a password to the Designer.

Until you give the Designer a password, 4th Dimension allows anyone to use any part of the database.

When a password is assigned to the Designer, all the access privileges you have assigned to tables, forms, menus, and methods take effect. In order to open the database, users must enter a password.

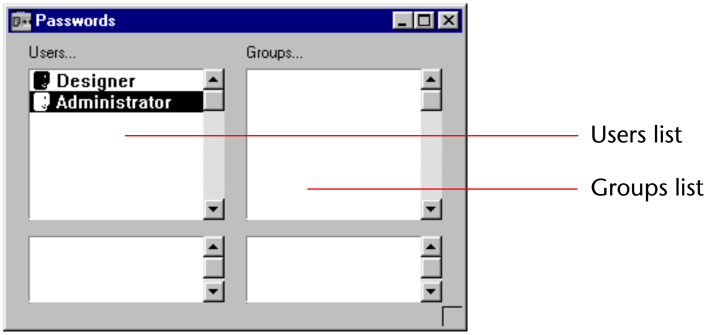
Important ***Do not forget the Designer's password! If you do, you will be unable to open the database in the Design environment.***

Assigning Users and Groups

You use the Password Access editor to create access groups and users and to assign passwords to users.

- **To open the Password Access editor, choose Passwords from the Tools menu.**

  4th Dimension displays the Password Access editor window.



The Password Access editor window displays four scrollable areas. The upper Users list displays user names. The users designated Designer and Administrator appear at the top of the list. The lower Users list displays the names of any groups a selected user belongs to.

The upper Groups list displays the names of access groups. The lower Groups list displays the names of users who belong to a selected group.

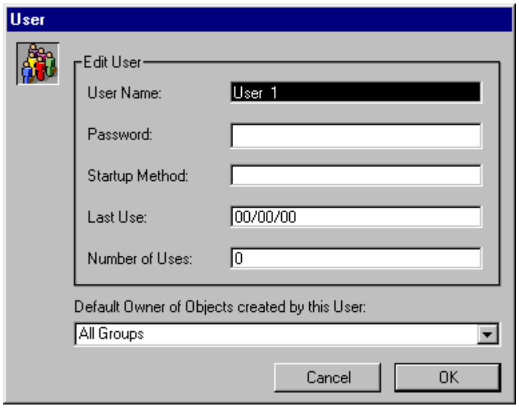
When the Password Access editor is active, the **Passwords** menu is available. You use the menu commands on this menu to add users and groups.

Adding Users

To add a user and assign user information:

1 Choose New User from the Passwords menu.

4th Dimension displays the Edit User dialog box.



User Name: User 1

Password:

Startup Method:

Last Use: 00/00/00

Number of Uses: 0

Default Owner of Objects created by this User: All Groups

The dialog box provides areas for entering a user name, password, startup method, and the group which owns the objects that the user creates. In addition, the Designer or Administrator can view information about an individual's use of a database or database application.

2 Type a new user name.

3 Type a password for the user.

You can use up to 15 alphanumeric characters for a password. The Password Access editor is case sensitive — the user must enter the password exactly as it is entered in the Edit User dialog box. For example, if you define a user's password as "HolyCow", the user must enter it with a capital H and capital C, or 4th Dimension will not accept the password.

After you specify a user password, that password is not available for view the next time you open the dialog box. Asterisks display in place of the password characters.

4 **Type a startup method to be executed when the user opens the database (optional).**

5 **Choose a group from the Default Owner of Objects Created by This User drop-down list.**

This group owns any objects (tables, forms, methods, and so on) that the user creates. For instance, you might specify that the MIS group owns the objects created by each user in the MIS group. If a user from another group attempts to modify a form created by a member of the MIS group, a message appears stating that the user does not have privileges to edit the form.

6 **Click the OK button to save the user information.**

► To change user names and passwords:

1 **From the Password Access editor, select the user name in the list of users and double-click the user name.**
OR
Select the user's name and choose Edit User from the Passwords menu.
4th Dimension displays the Edit User dialog box.

2 **Make the modifications you want in the dialog box.**

3 **Click the OK button to save the changes you made to the user profile.**

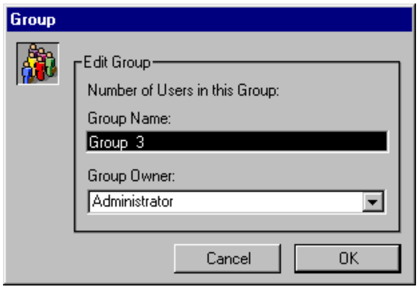
Users added by the Designer cannot be removed. To remove users added by the Administrator, see the section "Saving and Loading Groups" on page 452.

Creating Access Groups

When you create a group, you can designate a group owner from among the users.

► To create a group:

1 **Choose New Group from the Passwords menu.**
4th Dimension displays the Edit Group dialog box.



Group

Edit Group

Number of Users in this Group:

Group Name: Group 3

Group Owner: Administrator

2 **Enter a group name in the Group Name box.**

The group name can be up to 15 characters in length.

3 **Click on the Group Owner box and select a user from the drop-down list of users.**

The group owner can add users to and remove users from the group.

4 **Click the OK button to add the group to the access system.**

The name of the new group appears in the group list.

► To change access groups:

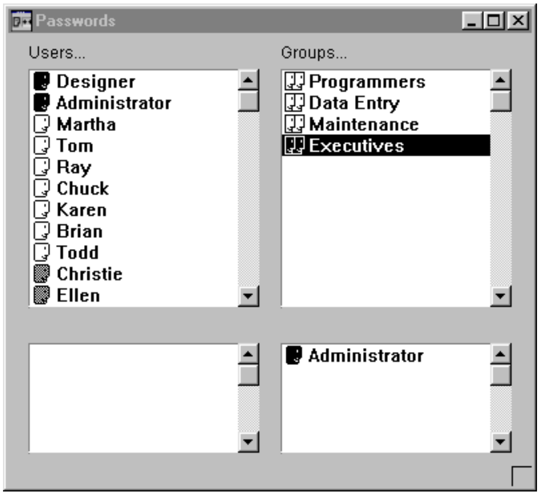
1 **From the Password Access editor, double-click the group name in the list of groups.**
OR
Click on the group name and choose Edit Group from the Passwords menu.

4th Dimension displays the Edit Group dialog box.

2 **Enter a new group name or specify a new group owner in the dialog box.**

3 **Click the OK button to save the changes you made to the group.**

The following illustration shows the Password Access editor after a new executive group has been created.

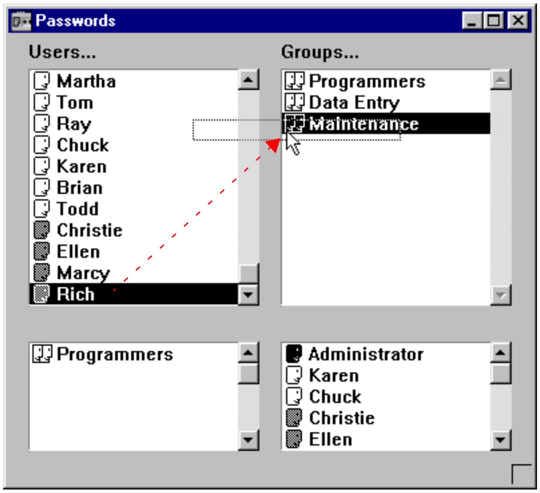


Assigning Users to Groups

You can assign users to any group and you can assign a user to several access groups. You are not required to assign a user to a group.

To assign a user to a group, drag the user name from the Users list over the name of the desired group in the Groups list and release the mouse button.

The figure below shows a user name being added to a group.



The user name appears in the lower Groups list of users assigned to the selected access group. The group name appears in the lower Users list of groups assigned to a selected user. The assigned user now has all the privileges that you provide that group.

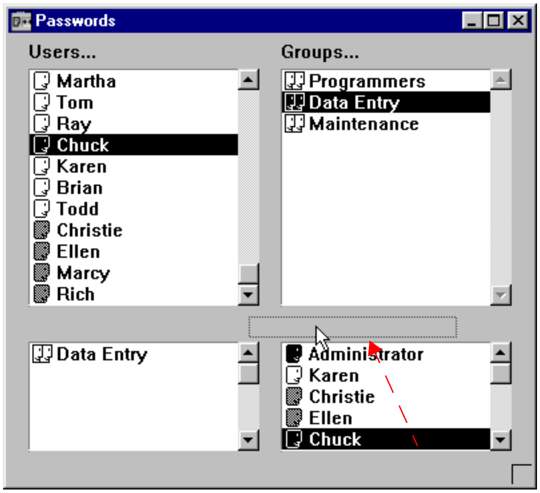
Click any group name to see a list of users who belong to that group.

Removing Users from Groups

To remove a user from an access group:

1. **Click the group name in the upper Groups list to view the names of users assigned to the group.**
2. **Drag the user name from the lower Groups list to the Users list and release the mouse button.**

   The figure below shows a user being removed from a group.



The user no longer has the privileges that you provide that group.

Nesting Groups

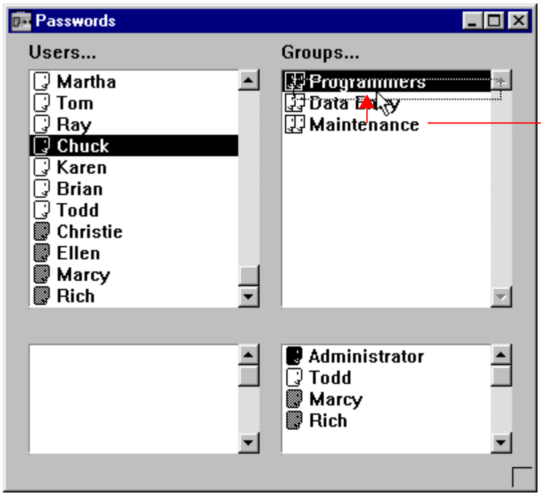
To create a user hierarchy, you nest groups, placing one group within another. The users of the nested group obtain the privileges of both groups. For example, if you nested the Executive group inside the Data Entry group, users assigned to the Executive group would automatically get the privileges of Data Entry in addition to the privileges accorded to Executive. However, users inside Data Entry are denied access to the privileges of the Executive group — they have only the privileges assigned to Data Entry.

For further explanation of how a hierarchical access system works, see the section “An Access Hierarchy Scheme” on page 441.

► To assign a group to another group:

- **Drag the group name from the list of groups over the name of the group whose privileges you want it to assume and release the mouse button.**

The figure below shows a group being added to another group.



Maintenance group being added to Programmers group

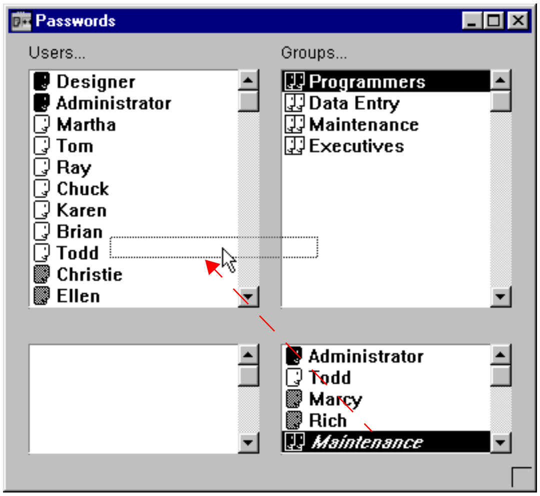
The nested group name appears in italics in the list of users assigned to the selected group. In addition to its assigned privileges, the nested group now has all the privileges of the group it has been placed in.

Removing Nested Groups

To remove a group from another group:

1. **Select the group name in the upper Groups list to display the names of users and groups assigned to the group.**
2. **Select the group name in the lower Groups list, drag the name to the Users list, and release the mouse button.**

   The following illustration shows the Maintenance group being removed from the Programmers group.



The group name disappears from the list of users for the selected group.

Saving and Loading Groups

4th Dimension allows the Administrator to save and load any groups that he or she has created or modified. When groups are saved, everything about the current users and groups are saved. Later, when loaded again, the original users and groups are installed.

The ability to save groups means that the Administrator can save the access system of a database and transfer it to a modified version of the same database or to a new database. This is extremely useful for restoring the access system after the Designer has provided a new, updated version of the database. Because the groups can be reloaded, users of the database do not have to learn a new access system. All the user names, passwords, startup method names, groups, group owners, and group memberships are preserved.

Note The Designer cannot save or load groups.

► To save the current groups:

1 **Enter the database as the Administrator.**

2 **Choose Save Groups from the Passwords menu.**
4th Dimension displays a create-file dialog box so that you can name and save the group.

► To load groups:

1 **Enter the database as the Administrator.**

2 **Choose Load Groups from the Passwords menu.**

4th Dimension displays an open-file dialog box so that you can open the Groups file.

Assigning a Group To Database Objects

After you define users and access groups, you can assign groups to the following objects:

- Table properties and operations,
- Forms,
- Methods,
- Menu commands,
- Plug-ins.

You may assign only one group to each object. For this reason, it is important to design the access groups so that more powerful users belong to all the groups below them in the access hierarchy.

For a discussion of how to organize users and access groups, see the section "An Access Hierarchy Scheme" on page 441.

Assigning Access To Record Operations

You can assign different groups to each of the four record operations. You can thus specify which groups can load, save, add, or delete records from a table. These privileges can be very sensitive for some databases.

The following are the record operations that groups can be assigned to:

- **Load** This operation allows users to load and view records. It does not provide the right to modify records, create new records, or delete records.
- **Save** This operation allows users to save modified records. It does not provide the right to load records, add new records, or delete records.
- **Add** This operation allows users to create new records. It does not provide the right to load records, modify existing records, or delete them.
- **Delete** This operation allows users to delete records. It does not provide the right to load records, modify existing records, or add new records.

You must provide Load privileges for any group that has Save or Delete privileges.

You can allow some users the right to add records without being able to load and view any other records. You can allow others the right to modify records, but not add any new ones.

For each table in a database, you can assign a group to be the owner of the table definition. Users in this group can modify specifications for the table, including the groups given access to record operations.

► To assign access privileges to record operations for a table and to the table's definition:

1 **In the Structure window, select the table image of the table whose access privileges you want to edit[1].**

The selected table image is surrounded by a marquee.

2 **Double-click the table title.**
OR
Choose Table Properties from the Structure menu.
OR
Press Ctrl+R (on Windows) or Command–R (on Macintosh).

4th Dimension displays the Privileges page of the Table Properties window.

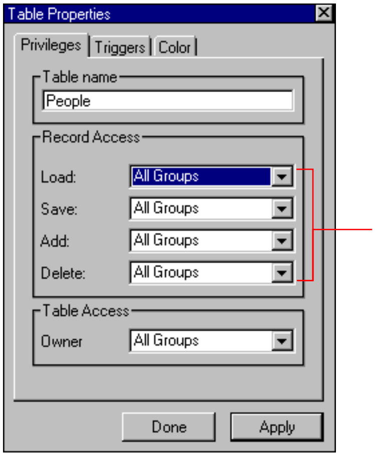


Table name: People

Record Access

Load: All Groups

Save: All Groups

Add: All Groups

Delete: All Groups

Table Access

Owner: All Groups

Drop-down lists for assigning access groups

3 **Choose a group for each database operation from the drop-down lists in the Record Access area.**

[1] You can also double-click the name of the table on the Tables page of the Explorer to view the table properties for the table.

4 Choose a group from the Owner drop-down list in the Table Access area.

Users in this group can modify the definition of the table in the Table Properties window.

5 When you have finished, click the Apply button.

Assigning a Group to a Form

When you assign a group access privileges to a form, only users belonging to that group can use that form for data entry. When you assign a group owner privileges to a form, only users belonging to that group can modify that form in the Design environment.

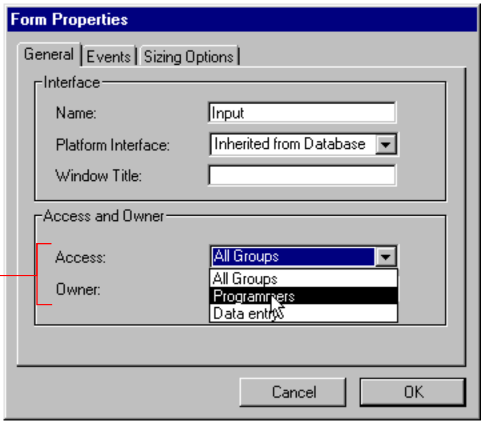
► To assign access and owner privileges:

1 Open the form in the Form editor.

For directions on opening a form, see the section "Opening a Form in the Form Editor" on page 183.

2 Choose Form Properties from the Form menu.

The General page of the Form Properties window appears.



Form Properties

General | Events | Sizing Options

Interface

Name: Input

Platform Interface: Inherited from Database

Window Title:

Access and Owner

Access: All Groups

Owner:

Access and Owner drop-down lists

3 Choose a group from the Access drop-down list.

If you do not choose a group, all groups retain access privileges to the form (the default).

4 Choose a group from the Owner drop-down list.

If you do not choose a group, all groups retain owner privileges to the form (the default).

5 Click the OK button.

Assigning a Group to a Project Method

When you assign a group access to a project method, only users belonging to that group can use that method. When you assign a group ownership of a project method, only users belonging to that group can modify that method in the Design environment.

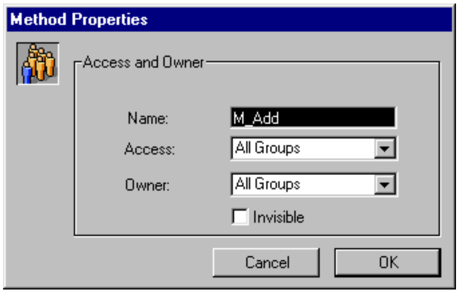
► To assign access and owner privileges:

1 **Open the method in the Method editor.**

For directions on opening a project method, see the section “Opening an Existing Method” on page 393.

2 **Choose Method Properties from the Method menu.**

The Method Properties dialog box appears.



Method Properties

Access and Owner

Name: M_Add

Access: All Groups

Owner: All Groups

□ Invisible

3 **Choose the group from the Access drop-down list.**

If you do not choose a group, all groups retain access privileges to the method (the default).

4 **Choose a group from the Owner drop-down list.**

If you do not choose a group, all groups retain owner privileges to the method (the default).

5 **Click the OK button.**

Assigning a Group to a Menu Command

You can assign an access group to a menu command so that only users in that group can use the menu command in the User or Custom Menus environments.

► To assign an access group to a menu command:

1 **Choose Menu Bar Editor from the Tools menu.**

The Menu Bar editor appears.

2 **Select a menu bar.**

The Current Menu Bars area shows the menus belonging to this menu bar.

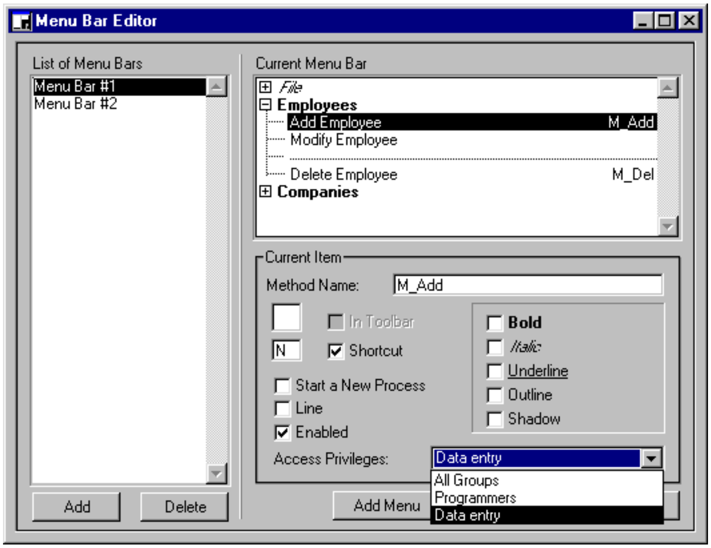
3 **Expand a menu in the Menus list.**

The menu commands and methods for this menu appear.

4 **Select the menu command for which you want to specify an access group.**

5 **Select the group from the Access Privileges drop-down list.**

The figure below shows the Data Entry group being given access privileges to the Add Employee menu command.



Method Name: M_Add

☐ In Toolbar

N ☑ Shortcut

☐ Start a New Process

☐ Line

☑ Enabled

☐ Bold

☐ Italic

☐ Underline

☐ Outline

☐ Shadow

Access Privileges: Data entry

Assigning a Group to a Plug-in

You can assign a group privileges to any plug-ins installed in the database. This includes all the 4th Dimension plug-ins and any third-party plug-ins.

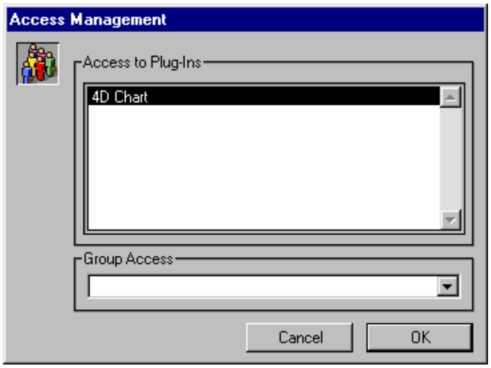
► To assign an access group to a plug-in:

1 **Choose Passwords from the Tools menu.**

The Password Access editor appears.

2 **Choose Plug-Ins Access from the Passwords menu.**

The Access to Plug-ins dialog box appears with a list of the plug-ins installed in the database.



3 **Choose the plug-in for which you want to assign a group.**

4 **Choose the group from the Group Access drop-down list.**

5 **Click the OK button.**

System Maintenance

Once a password access system is in place, occasional maintenance of the system is necessary. Users must be added, groups need new members, and passwords need to be changed. The Designer has access to the Design environment and can make any necessary modifications using the Password Access editor.

The Administrator and the Designer can also view the usage history of each user as necessary for maintenance.

Administrator and Group Owner Access

The Administrator does not necessarily have access to the Design environment. However, if the Designer creates a project method that contains the EDIT ACCESS command, the Administrator and group owners can have limited power to control users and groups.

The EDIT ACCESS command can be included in a method that is attached to a custom menu or can be executed by choosing **Execute Method** from the **Special** menu in the User environment. If the method is executed by a user who is not the Administrator or another group owner, it has no effect.

When the method is executed, the result depends on whether the user is the Administrator or a group owner.

If the Administrator executes the method that contains the EDIT ACCESS command, 4th Dimension displays the Password Access editor. The Administrator can use the Password Access editor to create users and groups; edit any users or groups he or she created, including changing user passwords; and add or remove users from any groups he or she created.

The Administrator cannot assign groups to forms, tables or table operations, menu commands, methods, or plug-ins. Only the Designer can assign these access groups.

If a group owner who is not the Administrator executes the method that contains the EDIT ACCESS command, 4th Dimension displays the Password Access editor, but displays only the groups that the group owner owns. The group owner can add or remove users from the groups. The group owner cannot create users, edit user information, or add groups. The menu commands for adding and editing users and groups are dimmed.

Viewing Usage

The Edit User dialog box contains the date of the user's last use of the database and the total number of uses. The Administrator or Designer can view this information by opening the Edit User dialog box for any user.

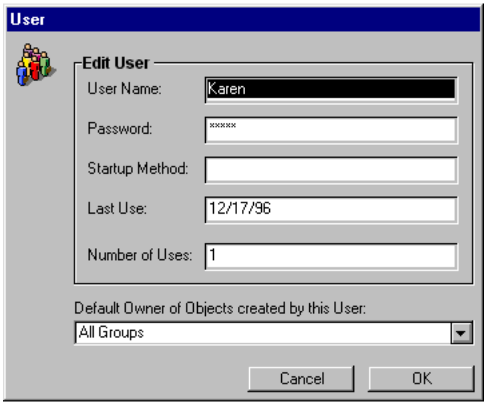
► To open the Edit User dialog box:

1 **Choose Passwords from the Tools menu.**
OR
Execute the method that contains the Edit Access command.

4th Dimension displays the Password Access editor.

2 **Select the user name you want to see from the Users list and choose Edit User from the Passwords menu.**

The Edit User dialog box displays the date of the user's last use of the database as well as the number of times the user has opened the database.



User

Edit User

User Name: Karen

Password: *****

Startup Method:

Last Use: 12/17/96

Number of Uses: 1

Default Owner of Objects created by this User: All Groups

10 Creating Lists

This chapter tells you how to create and use lists. A list is a set of possible values. You can use a list to do the following:

- Provide the user choices from which to select an entry for a field or enterable object,
- Restrict the valid entries to those in the list,
- Exclude the entries in the list from being entered.

4th Dimension lets you associate a small icon with each item in a list or hierarchical list. Where appropriate, the small icon is displayed to the left of the item. For example, you can display the small icons in hierarchical lists.

When a list is used as a choice list for a field or enterable object, the user can simply select from the list instead of typing the entry. For example, you may want to create a choice list for entering job titles in a personnel database.

You can also use lists to provide restrictions on data entry. One list may provide the required values for a field, excluding all others. Another list may provide the excluded values for a field, preventing any value in the list from being entered.

You can also create hierarchical lists. A hierarchical list associates a sublist with each element of the list.

Your lists can offer up to 8,000 choices in a single database and each choice can contain up to 30 characters.

For information about adding a choice list to a field as a field attribute, see the section "Choices and Help" on page 94. For information about using lists with data entry controls, see the section "Using Choice Lists" on page 246.

Lists are often used in methods. For example, a list is a convenient place to store the elements of an array. An array stores a list of values in memory. You can use lists to store the elements of pop-up menus, hierarchical lists, combo boxes, tab controls, and other multi-valued interface objects. You transfer the contents of the list to the interface object using a method or by assigning the list to the object in the Object Properties window.

You create 4th Dimension lists with the List editor. You use the List editor to do the following:

- Create lists and hierarchical lists,
- Add items to lists,
- Associate small icons with list items,
- Delete lists,
- Delete items from a list,
- Sort items in a list,
- Make a choice list user-modifiable
- Make hierarchical list items editable,
- Specify the spacing between hierarchical list elements.

4D Server Object locking occurs when two or more users attempt to modify the same list at the same time. If a user is modifying a list in the Design environment, the list is locked. Other users cannot modify the list, the list name, or any of the items in the list, until the first user frees the list by closing it.

Designing Lists for Data Entry

One use of lists is to provide the user with a list of values from which to choose during data entry. The following are some considerations about lists that stem from this purpose:

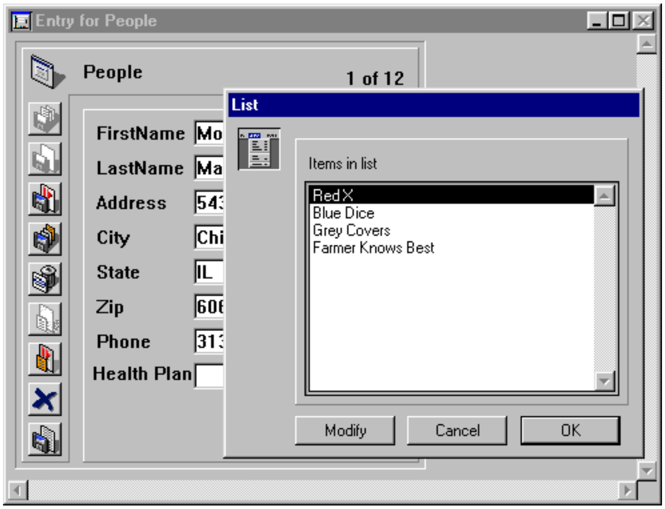
- You can make a list available for every form or for selected forms.
- You can restrict the possible entries to those in the list or you can allow the user to type additional entries.

- You can allow the user to modify the list or you can prevent the user from modifying the list.

You can attach a list to a field as one of the field properties. Attaching a list to a field causes the list to appear whenever that field is selected during data entry or whenever an output form is used in the Enter in List mode. The user can select an entry from the list. If the list is sorted, the list automatically scrolls as the user types characters at the keyboard. For instance, if the user types "N," the list scrolls to the first entry starting with "N." The user can stop typing when the desired choice appears and select it from the list.

If you attach a list to a field using its Field Properties in the Structure editor, the list will also appear when the field is selected in the Query editor. For information, see the section "Creating New Fields" on page 80.

You can also attach the list to the field as a data entry control in a form. The list will appear only when the field is selected in this input form, not in all forms or the Query editor. The figure below shows a choice list being displayed.



Mo
Ma
543
Chi
IL
606
313

Red X
Blue Dice
Grey Covers
Farmer Knows Best

Required and Excluded Values

Some data entry tasks are not crucial. If you enter a value that does not appear in a list, it may be perfectly acceptable. However, you may have an application in which an entry must be one of the values in a list. Any different value would cause a serious consequence such as delaying bill payment.

4th Dimension allows you to make a list required as part of the data entry controls on a form. This type of data entry control prevents a user from entering any value other than the ones in the list. For example, your company may have a specific group of job titles that are allowable in a personnel database.

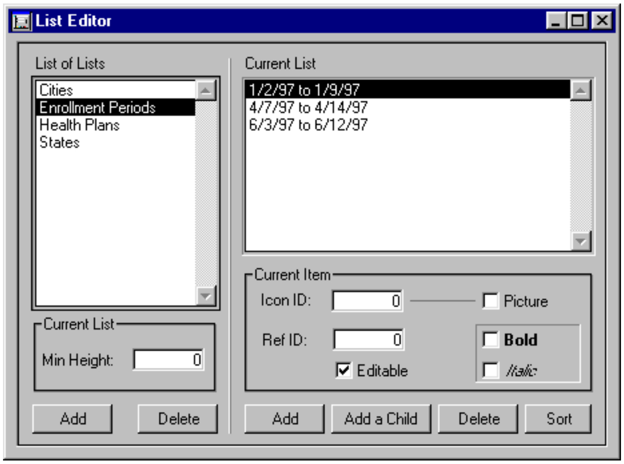
Another data entry control makes it possible to exclude the values in a list. The user then cannot type in a value that should not appear in the field. For example, your company may be prevented from doing business in certain countries. Placing them in an excluded list prevents them from being entered.

Non-Sequential Ranges of Values

One of the most useful data entry controls is the Maximum and Minimum setting for a number, date, or time field. Setting a maximum and minimum value prevents a user from entering a value outside this range.

Suppose you have three acceptable ranges for the field. You can use a list to create such non-sequential ranges. If you then make this list required for a field, values outside the three ranges are not accepted.

The figure below shows a list of ranges.



List Editor

List of Lists

Cities
Enrollment Periods
Health Plans
States

Current List

1/2/97 to 1/9/97
4/7/97 to 4/14/97
6/3/97 to 6/12/97

Current List
Min Height: 0

Current Item
Icon ID: 0
□ Picture
Ref ID: 0
☑ Editable
□ Bold
□ Italic

Conversely, you could create a list that specifies the ranges that are not valid. If you then make this list an Excluded list for a field, any entry within the ranges is not accepted.

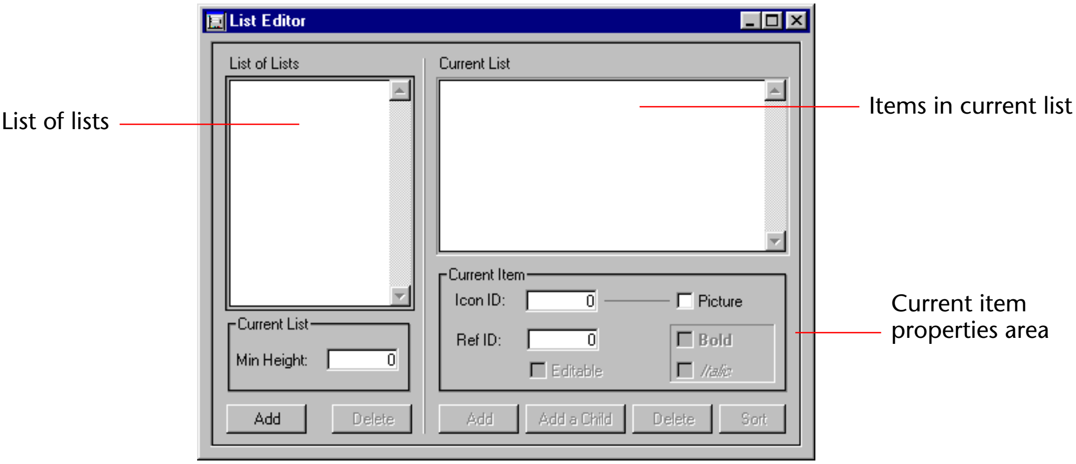
Creating Lists

You create lists with the List editor. You can modify any list at any time by returning to the List editor and making changes.

► To create a list:

1 **Choose List Editor from the Tools menu.**

The List editor appears.



The List editor displays the names of existing lists on the left. On the right side of the editor, a list of items in the selected list is displayed. The menu bar provides two menus: **Lists** and **Items**.

2 **Choose New from the Lists menu.**
OR
Click Add.

4th Dimension creates an empty frame in the Lists of Lists and displays an insertion point in the frame.

3 **Type the list name.**

You have created a new empty list. Now, you will create the items that will appear in the list as described next.

Adding Items to Lists

When you are adding items to a list, you can append new items to the end of the list or insert them anywhere in the existing list.

► To append items to a list:

1 **Select the name of the list to which you want to add items.**

If the list already contains items, they appear in the Current List area.

2 **Choose New from the Items menu.**
OR
Click Add in the Current List area.

4th Dimension creates an empty frame in the Current List area and displays an insertion point in the frame.

3 **Type the item name.**

4 **To add additional items, repeat the above steps.**

5 **When you have finished, double-click the Control-menu box to save the current lists and close the editor window (click the Close box on Macintosh).**

► To insert an item in a list:

1 **Select the item that is to appear above the item you are adding.**

4th Dimension inserts the new item above whichever item is currently selected. This allows you to insert a new first item.

2 **Click Add in the Current list area.**

4th Dimension creates an empty frame in the Items column below the previously selected item.

3 **Type the item name.**

4 **Double-click the Control-menu box to save the current lists and close the editor window (click the Close box on Macintosh).**

Creating a Hierarchical List

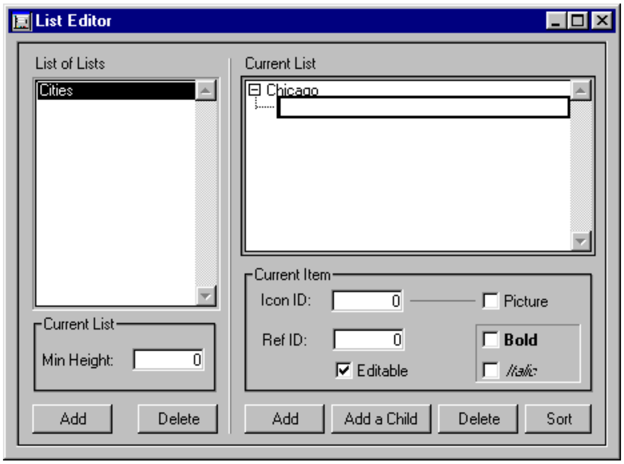
You can add a list to any list element. The hierarchy is not limited to two levels. You can use a hierarchical list to specify the contents of a hierarchical list interface object.

► To create a hierarchical list:

1 **Select the list item to which the sublist will be attached.**

2 **Click Add a Child.**
OR
Choose New Child from the Items menu.

4th Dimension expands the selected list element and creates an entry area for the first item on the sublist.



Cities

⊟ Chicago

Icon ID: 0 □ Picture

Ref ID: 0 □ **Bold**

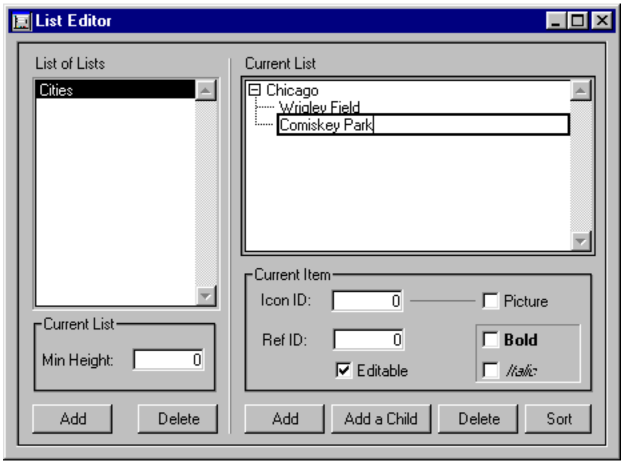
☑ Editable □ *Italic*

Min Height: 0

3 **Enter the item.**

4 **To add another item to the sublist, click Add or choose New from the Items menu.**

Repeat these steps as necessary.



Cities

⊟ Chicago
Wrigley Field
Comiskey Park

Icon ID: 0 □ Picture

Ref ID: 0 □ **Bold**

☑ Editable □ *Italic*

Min Height: 0

If desired, you can attach sublists to sublist items to continue the hierarchy.

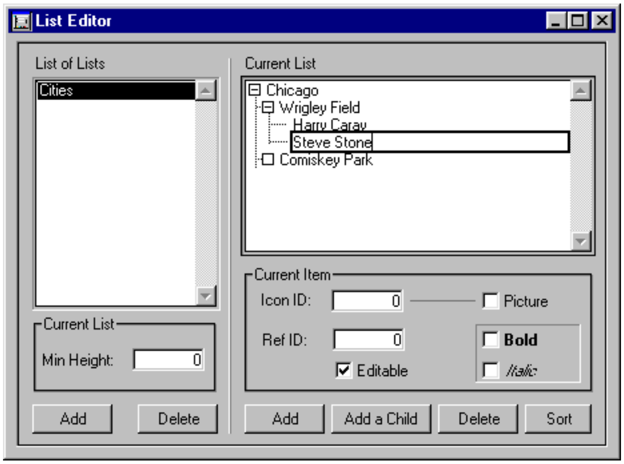
► To attach a sublist to a sublist item:

1 **Select the sublist item.**

2 Click Add a Child.
OR
Choose New Child from the Items menu.

3 Enter the item normally and repeat the process of entering items or attaching sublists to items, as desired.

The following illustration shows a three-level hierarchy.



List of Lists: Cities

Current List:
- Chicago
  - Wrigley Field
    - Harry Caray
    - Steve Stone
  - Comiskey Park

Min Height: 0

Icon ID: 0 □ Picture

Ref ID: 0 □ **Bold**

☑ Editable □ *Italic*

Deleting Items and Lists

You can delete items at any level of the hierarchy.

► To delete an item:

1 With the List editor window open, select the list that contains the item you want to delete.

2 Select the item you want to delete from the Current List area.

If necessary, expand the list.

3 Click Delete in the Current List area.
OR
Choose Delete from the Items menu.

4th Dimension deletes the item from the list and removes the space it occupied in the list.

► To delete a list:

1 With the List editor window open, select the list you want to remove.

2 **Click Delete in the List of Lists area.**
OR
Choose Delete from the Lists menu.

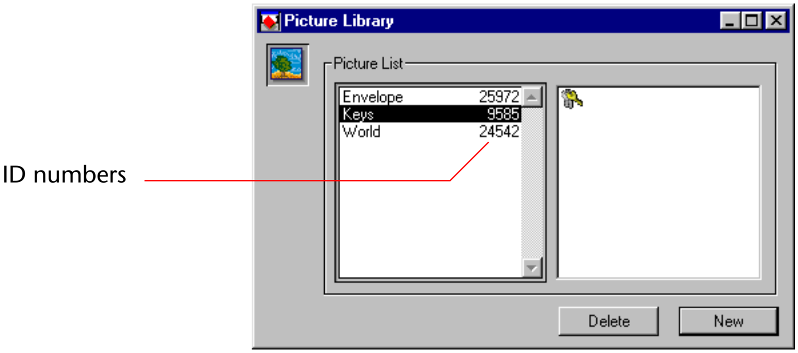
4th Dimension deletes the list and removes the space it occupied in the list.

Adding a Small Icon to an Item

You can associate a small icon with an element in a list. The small icons that you use are stored in the Picture library.

Picture library items

When you add a picture to the Picture library, it automatically assigns it an ID number. You use this number to associate the picture with an item in a list.



Envelope	25972
Keys	9585
World	24542

► To associate a small icon with an item:

1 **Select the item in the desired list.**

If necessary, first select the list from the list of lists and expand a list element.

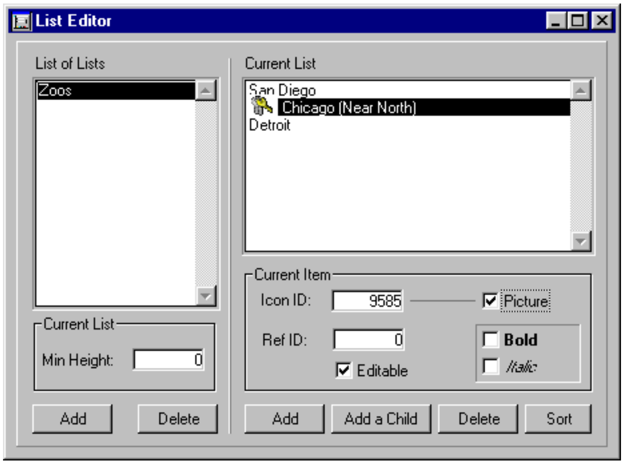
The Current Item properties area changes to show the properties of the selected item.

2 **Check the Picture check box and enter the ID number of the picture in the Icon ID area.**

3 **Press Tab to save the ID number.**

The Current List area changes to show the small icon associated with the selected list item.

The following illustration shows the picture with the ID of 9585 (from the Picture library shown above) associated with a list item.



List of Lists: Zoos

Current List: San Diego, Chicago (Near North), Detroit

Current List — Min Height: 0

Icon ID: 9585 ☑ Picture

Ref ID: 0

☑ Editable

□ **Bold**

□ *Italic*

Adding a Reference ID to an Item

The Current Item Properties area contains an entry area for the item's Reference ID. The Reference ID is designed as a unique identifier for the item. It is of use only when you manage lists using methods.

When you need to use the language to determine which item in a list a user selects (e.g., which item in a hierarchical menu is selected), you can identify the user's choice using the Reference ID of the item. For more information, see the section "Hierarchical Lists" in the *4th Dimension Language Reference*.

Specifying Ranges in a List

4th Dimension allows you to enter ranges of numbers, dates, and times in a list. You can use these ranges as data entry validation ranges by making the list required or excluded in a form.

► To create ranges in a list:

1 **Create the list you want to use for ranges.**

2 **For each item, enter the minimum value of the range, two periods (..), and the maximum value.**

For example:

100..150

defines the range between 100 and 150, inclusive.

3 **Continue specifying ranges as separate items until you have defined as many as you need.**

Sorting a List

4th Dimension maintains the list of items in the order in which you enter them. You can sort the list alphabetically so that entries are more easily accessible to database users. Since a sorted list automatically scrolls to match characters typed at the keyboard, sorting usually makes data entry easier.

► To sort a list:

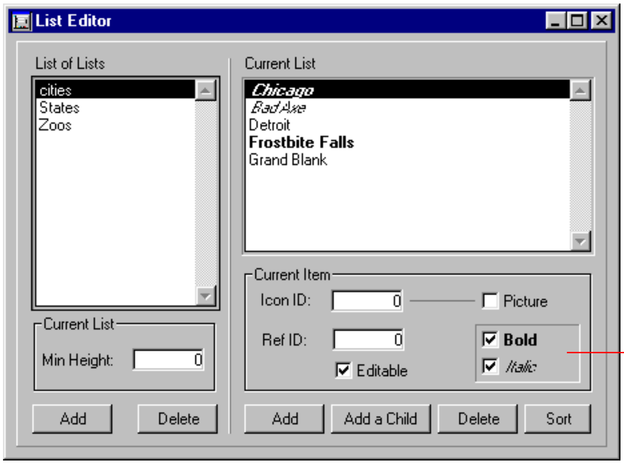
1 **In the List editor, select the list that contains the choices you want to sort.**

2 **Click Sort.**
OR
Choose Sort from the Items menu.
4th Dimension sorts the list in ascending order.

To sort the list in descending order, hold down the **Shift** key when you choose the **Sort** menu command.

Specifying Font Attributes

When a list is used as a choice list, you can display list items in bold, italic, or bold-italic. The following illustration shows bold, italic, and bold-italic attributes applied to Frostbite Falls, Bad Axe, and Chicago, respectively.



List Editor

List of Lists
cities
States
Zoos

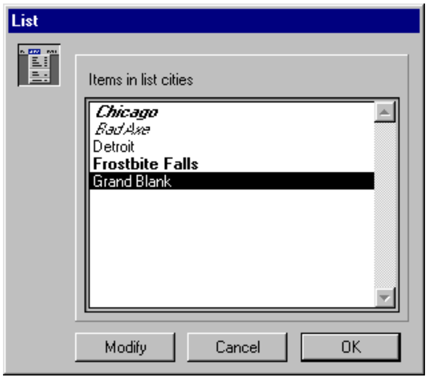
Current List
Chicago
Bad Axe
Detroit
Frostbite Falls
Grand Blank

Current Item
Icon ID: 0
☐ Picture
Ref ID: 0
☑ **Bold**
☑ *Italic*
☑ Editable

Current List
Min Height: 0

Bold and italic check boxes

To apply font attributes, select the desired item in the Current List area and click the Bold or Italic check boxes. Check both check boxes if you want to use bold-italic. When the list is used as a choice list, the selected style attributes will be used, as shown in the following illustration.



List

Items in list cities

Chicago
Bad Axe
Detroit
Frostbite Falls
Grand Blank

Making a Choice List Modifiable

4th Dimension allows you to specify whether a list of items can be changed by the user when the list is displayed as a choice list. By default, a list is modifiable. 4th Dimension places a check mark in the Lists menu to show that the list is user-modifiable.

If you allow a list to be user modifiable, the user has access to a special List editor in the User environment. The special List editor is for the assigned list only. The user cannot add lists, delete lists, or change any other list. If a list is modifiable, the user can make any change to that list's items.

► To make the list user-modifiable:

1 **Select the list that you want to make modifiable.**

2 **Pull down the Lists menu.**

If **User Modifiable** has a check mark, the list is user modifiable. Release the mouse button without making a menu choice.

If **User Modifiable** does not have a check mark, go to the next step.

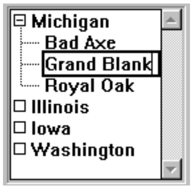
3 **Choose User Modifiable from the Lists menu.**

4th Dimension adds a check mark to the menu command. The list can now be modified in the User environment.

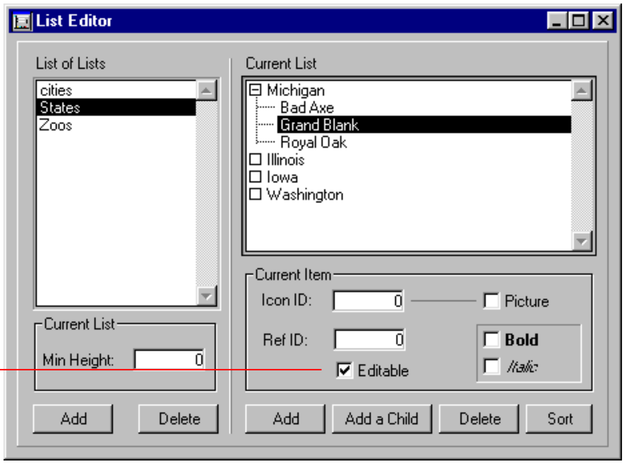
To prevent the user from modifying a list, select the list and choose **User Modifiable** to remove the check mark.

Making a Hierarchical List Modifiable

A list can also be used to specify the items in a hierarchical list. When the list is used in this manner, you can control whether each item in the list can be edited by the user. If a list item is editable, the user can hold down the **Ctrl** key (**Command** key on Macintosh) and click on the item to get an insertion point. An editable item in a hierarchical list is shown below.



If you want to allow users to modify an item in a hierarchical list, click the **Editable** check box in the List editor while the desired list item is highlighted, as shown here:



Min Height: 0

Icon ID: 0

Ref ID: 0

☑ Editable

Editable check box

When the user edits a list item, the list itself is not changed. The change affects only the text that is displayed until the user accepts or cancels the record. Use a method to manage any user modifications to list items.

Setting the Minimum Height of a Hierarchical List

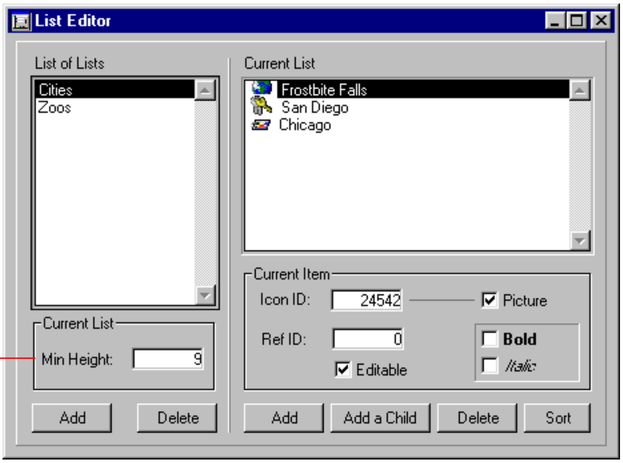
When 4th Dimension displays a hierarchical list, it uses the font size of the hierarchical list object to determine the vertical spacing between adjacent list items. If you use a list to specify the values of a hierarchical list, you can specify a larger vertical spacing. The main reason you would want to do this is to provide additional space for icons that are attached to list items. Or, you can use this feature simply to spread out the list items.

► To specify a minimum height:

■ **Enter a value in points in the Min. Height entry area.**

The effects of this value are displayed immediately in the Current List area. The following illustrations show the effect of increasing the minimum height.

Minimum Height: 9



Min Height: 9

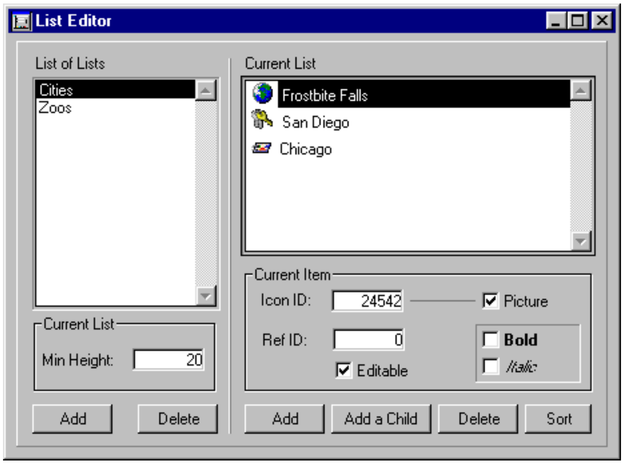
Icon ID: 24542 ☑ Picture

Ref ID: 0 ☐ **Bold**

☑ Editable ☐ *Italic*

Minimum height entry area

Minimum Height: 20



Min Height: 20

Icon ID: 24542 ☑ Picture

Ref ID: 0 ☐ **Bold**

☑ Editable ☐ *Italic*

11 Managing Processes

You can increase the functionality of a database by taking advantage of 4th Dimension’s multi-tasking capabilities. In a multi-tasking system, database operations can run in separate *processes* — separate 4th Dimension tasks — that operate independently and concurrently.

Multiple processes are executed at the same time, allowing 4th Dimension to carry out several operations simultaneously. For example, one process might print a selection of records while another process allows a user to enter new records. In custom applications, multiple processes are used to manage a multi-window interface. Each window is managed by a different process. The process has its own current selection of records — even if two processes access data in the same table. The number of processes that can be executed at the same time is limited only by available memory.

This chapter explains how to do the following:

- Start a new process,
- View process information including the name, number, status, and total amount of time used by each process,
- Control process execution,
- Control whether a process is visible to users,
- Specify the frontmost process,
- Debug a process.

Processes

A process can be thought of as a 4th Dimension task that is carrying out some action — searching for some records, printing a selection, allowing a user to enter data, and so on. The exact operation that the process performs depends on the method with which it is connected.

As a separate 4th Dimension task, each process has the following elements for data management:

- A current selection for each table,
- A current record for each table
- Process variables,
- Locked records.

In addition, each process can have the following elements:

- Current input and output forms for each table,
- A menu bar,
- One or more windows,
- One active window (the frontmost window).

For a complete list of process elements and information about creating windows and menu bars, refer to the *4th Dimension Language Reference*.

You may notice that all of these elements are found in the 4th Dimension User environment. All processes have the same basic properties as the User environment and allow you to perform the same operations that you can in the User environment.

However, instead of having to perform the operations directly in the User environment, processes allow you to use methods to specify the actions you want 4th Dimension to take.

Anything that can be done with the 4th Dimension language — any user interface that can be created or operation that can be performed — can be done from a process.

Having multiple processes open at once gives you the ability to perform different actions or work with different aspects of a database simultaneously.

Opening multiple processes allows the user to do the following:

- **Work with more than one active window** You can have several active windows open at the same time. For example, you can enter data in one window and receive messages from colleagues in another window.
- **Work with more than one current selection at a time** Because each process has its own current selection, each process can have a different current selection from the same table. For example, an Employees database might contain a list of employees and their occupations. In a single-process database, you could display all engineers at once, or all accountants at once, but you could not make both selections the current selection for the same table. In a multi-process database, you can display the records of all engineers in one process and the records of all accountants in another process.
- **Work with more than one current record at a time** Each process can have a different current record. For example, you might want to compare one employee to another using an input form. In a single-process database, you can display only one employee's record. In a multi-process database, you can display each employee's record in a different process.
- **Start a lengthy operation in a separate process** You can perform a time-consuming operation such as printing a large selection of records in a separate process while you continue to work on your database.
- **Work with more than one input or output form at a time** You can view data in several different forms at once. For example, you could display a selection of records in a standard output form in one process and in a special report form in another process.

Processes Created and Managed by 4th Dimension

4th Dimension automatically creates and manages the following processes which control the operation of 4th Dimension:

- **User/Custom Menus** This process controls the User and Custom Menus environments.
- **Cache Manager** This process controls flushing or caching data to disk.
- **Design** This process controls the Design environment.

The User/Custom Menus and Cache Manager environments are created automatically when you open a database. The Design process is created automatically when you enter the Design environment.

In addition, 4th Dimension creates and manages the following processes:

- Indexing process,
- On Serial Port Manager process,
- On Event Manager process,
- Web server process.

Unlike user-created processes, the processes created by 4th Dimension are always running and cannot be frozen or aborted. For more information about viewing processes in the Process List editor, see the section "Using The Process List Editor" on page 483.

For more information about the processes created by 4th Dimension, refer to the *4th Dimension Language Reference*.

Time-Sliced Execution

Since in reality more than one process cannot execute at the same time, when you open multiple processes, 4th Dimension slices the total processing time so that execution is divided between all open processes. Execution alternates between processes so rapidly that the processes appear to be executing simultaneously. For instance, processing time is split between the Design process, the User/Custom Menus process, and the Cache Manager so that some milliseconds might be devoted to the User/Custom Menus process, the next to the Design process, the next back to the User/Custom Menus process, and so on.

Starting a New Process

4th Dimension allows you to start your own processes from the User or Custom Menus environments.

Each process that you start can perform a different task or present a different aspect of the data contained in your database.

The functionality of the process can be enhanced by a user interface created using any of the editors in the Design environment or using the 4th Dimension language. For instance, you can display an input form in a process to allow a user to enter records.

► Two start a new process:

1 **Create a method.**

The specific operation that each process performs depends on the commands and functions in the method. For more information about the 4th Dimension commands, refer to the *4th Dimension Language Reference*.

2 Specify that 4th Dimension start a new process when the method executes.

You can tell 4th Dimension to start a new process in the following three ways:

- Using the New process command in another method,
- Using the Menu Bar editor,
- Using the Execute Method dialog box.

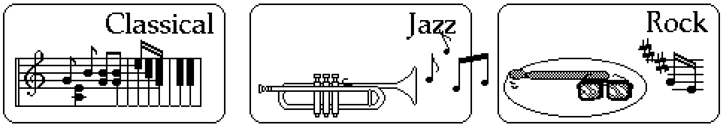
The alternative you select depends on what you are trying to do. Each alternative is described in detail in the following sections.

Starting a New Process Using New Process

There are many circumstances in which you might want to start a new process with the New process command. For instance, you might want to start a new process when a user clicks a button.You can do this by starting the process in the button's object method.

When you start a new process using the New process command, you should place the New process command in the method from which you want to start the new process. When that method executes, 4th Dimension starts a new process for the method specified in the parameters of the command and continues executing the original method.

The figure below shows a set of buttons in a compact disc database.



The object method for the **Jazz** button uses the New process command to start a new process for the method, *JazzSearch*:

```
myProcess := New process ("JazzSearch";16000;"JazzRecords")
```

The new process, myProcess, carries out the actions specified in the method *JazzSearch*. The method *JazzSearch* creates a selection of Jazz compact discs and displays them in a window. It contains the following statements:

```
QUERY ([Compact Discs];[Compact Discs]Category="Jazz")
If (Records in selection ([Compact Discs])>0)
  RefNo:=Open window (50;50;300;250;8)
  MODIFY SELECTION ([Compact Discs])
  CLOSE WINDOW
End if
```

When a user clicks the **Jazz** button, 4th Dimension opens a window and displays all the compact discs that contain Jazz music.

The window is running in the new process, myProcess.

If a different button is clicked, another process is started. If the user clicks the **Jazz** and **Rock** buttons, 4th Dimension starts two processes and displays the selection for each in its own process window.

The user can double-click records in either window to modify them in the current input form for that process.

For more information about the New process command, refer to the *4th Dimension Language Reference*.

Starting a New Process Using the Menu Editor

You will often find that you want a new process to start whenever a user chooses a menu command. For instance, you might have a menu command that prints a group of records. Since printing records can be time-consuming, you specify that 4th Dimension start a new process whenever that menu command is selected.

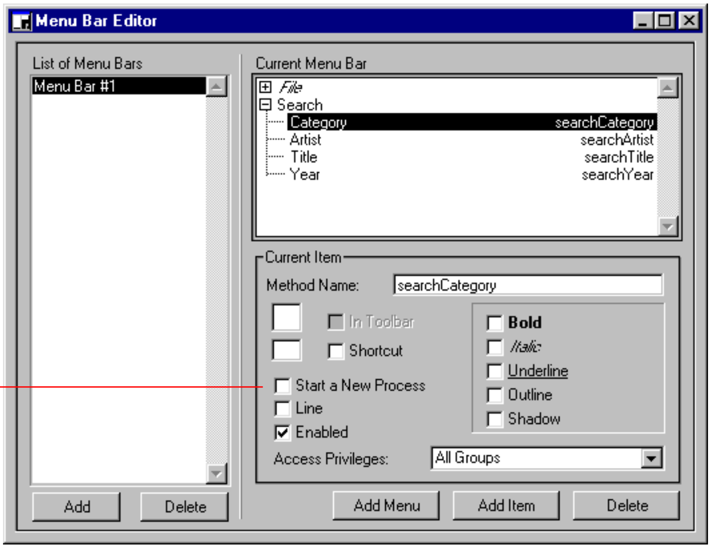
► To start a new process using the Menu Bar editor:

1 **Choose a menu bar in the Menu Bar editor.**

2 **Select a menu from the Menus list.**

The menu commands and methods for that menu are displayed in the Menu editor.

The following illustration shows a menu from the compact disc database.



Menu Bar #1

Method Name: searchCategory

□ In Toolbar
□ Shortcut
□ Start a New Process
□ Line
☑ Enabled

□ Bold
□ *Italic*
□ Underline
□ Outline
□ Shadow

Access Privileges: All Groups

Start a New Process check box

3 Select the menu command for which you want to start a new process.

When you select a menu command, the Current Item Properties area changes to show the properties of the selected menu item.

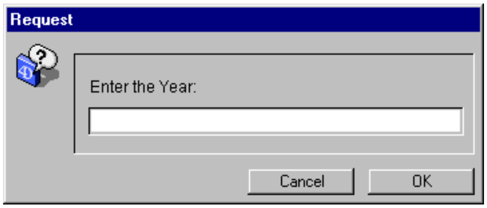
4 Click the Start a New Process check box.

This specifies that a new process should be started whenever that menu command is selected.

The **Search** menu allows users to perform various searches. In the above example, the method for the **Year** menu command allows the user to enter the year. It then searches for all compact discs produced in that year and displays the selection in a window.

```
vYear := Request ("Enter the Year:")
If (OK=1)
  QUERY ([Compact Discs];[Compact Discs]Year=vYear)
  If (Records in selection ([Compact Discs])>0)
     RefNo:=Open window (50;50;300;250)
     MODIFY SELECTION ([Compact Discs])
  End if
End if
```

When the user chooses **Year** from the **Search** menu in the Custom Menus environment, a dialog box appears requesting that the user enter a year.



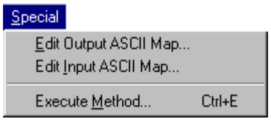
When the user clicks the **OK** button, 4th Dimension displays the selection of compact discs produced the year the user entered. If the user chooses **Category** from the **Search** menu, the user can perform another search based on the type of music the compact disc contains.

Starting a New Process Using Execute Method

You can choose to start a new process when you execute a method using the Execute Method dialog box in the User environment. One of the advantages to using this method to start a new process is that you can decide on a case-by-case basis whether you want to start a new process for a method.

► To start a new process in the Execute Method dialog box:

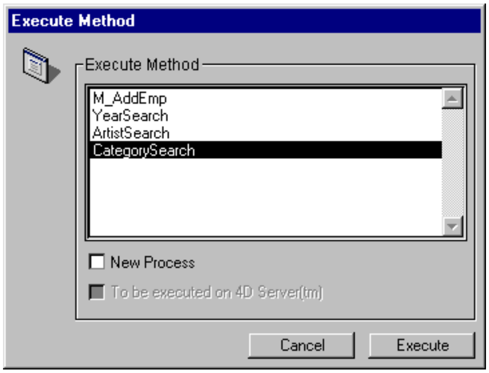
1 Choose Execute Method from the Special menu in the User environment.



The Execute Method dialog box appears.

2 Select the method for which you want to start a new process.

The figure below shows the *CategorySearch* method being selected.



3 **Click the New Process check box.**

Clicking the **New Process** check box tells 4th Dimension to start a new process when the method executes.

4 **Click the Execute button to execute the method.**

4th Dimension executes the method within a new process.

The *Modified Today* method shown below creates a selection of all records created or modified on the current date. The method then prints the selection using the current output form.

QUERY ([Compact Discs];[Compact Discs]Date_Modified = **Current date**)
PRINT SELECTION ([Compact Discs])

While the records are printing, you could start a process that performs another task. For example, the process could update an inventory table to reflect compact discs acquired or sold.

Using The Process List Editor

4th Dimension automatically lists processes in the Process List editor window as soon as they are started. Each process is given a process ID, which is the same as the process number (discussed in the next section). You use this process ID to identify a specific process in commands and functions.

► To view the Process List editor window:

- **Choose Process List from the Tools menu.**

When you first run a database, the only processes that are executing are the User/Custom Menus process, the Cache Manager, and, if you have entered the Design environment, the Design process. The User/Custom Menus and Cache Manager processes are always the first two processes listed in the Process List editor window. Any user-created processes are listed below 4th Dimension's processes.

For each process, the Process List editor window gives the following information:

- Process number,
- Process name,
- Current status of the process,

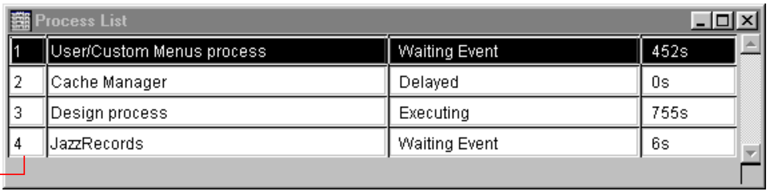
- Total amount of execution time in seconds the process has taken since it was started.

These process attributes are explained in detail in the following sections.

4D Server 4D Client's Process List editor controls processes for a particular client. 4D Server's Process List editor controls processes for all clients connected to the server. For information about the features of 4D Server's Process List editor, refer to the *4D Server Reference* manual.

Process Number

The default processes, the User/Custom Menus Process, Cache Manager, and Design Process, are listed first in the window and are processes 1, 2, and 3, respectively[1].



Process List

1	User/Custom Menus process	Waiting Event	452s
2	Cache Manager	Delayed	0s
3	Design process	Executing	755s
4	JazzRecords	Waiting Event	6s

Process number

When you start your own process, the process either appears as the next process in sequence or takes the place of a process that has been aborted. For example, suppose processes 4 and 5 are executing. If process 4 is aborted, the next process to be started becomes process 4.

Note Processes are automatically aborted upon completion. You can abort a process before it has completed using the Process List editor. For more information about aborting a process, see the section "Aborting a Process" on page 487.

Process Name

If you start a new process using New process, you can specify its name as a parameter to the New process function. The name specified in the parameter appears as the process name in the Process List editor, as shown above. For more information about the New process command, refer to the *4th Dimension Language Reference*.

If you do not specify a process name using the New process command, 4th Dimension automatically assigns the process a default name. Default names are based on the method used to start the process, as follows.

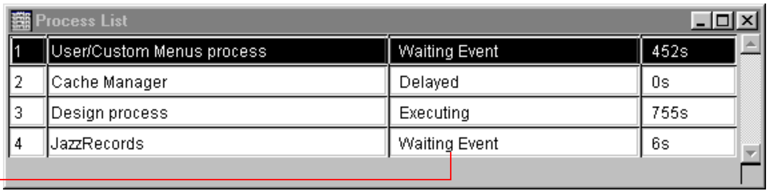
[1] The Design process does not appear until you enter the Design environment.

- **Processes started from a menu command** If you start a process from a menu command, the process is given the default name "M_*ProcessNumber.*" For instance, if process number 7 is started when a menu command is selected, the process is given the name "M_7".
- **Processes started from the Execute Method dialog box** If you start a process from the Execute Method dialog box, the method is given the default name "M_*ProcessNumber.*" For instance, if process number 5 is started programmatically, the process is given the name "M_5".
- **Processes started using New process, but not explicitly named** If you start a process using a method but do not specify the name as a parameter to the New process command, the process name is left blank.

  If the name of a process begins with a dollar sign ($), it is a local process that does not have access to tables or 4D Server.

Process Status

The status of a process is the current state of its execution—what the process is actually doing.



1	User/Custom Menus process	Waiting Event	452s
2	Cache Manager	Delayed	0s
3	Design process	Executing	755s
4	JazzRecords	Waiting Event	6s

Process status

The following is an explanation of each status that can appear in the Process List editor window.

- **Executing** The process is currently executing.
- **Delayed** The process is delayed for a specific amount of time. During the period that the process is delayed, it does not take up any processing time. For information about how to delay a process, refer to the *4^th^ Dimension Language Reference*.
- **Waiting event** The process is waiting for an action from the user such as a button being clicked or a menu command chosen.
- **Waiting for input/output** The process is waiting for some input or output to occur. For example, a process might need to wait while a group of records is being updated to disk.
- **Waiting for internal flag** The process is waiting for the cache manager to finish executing internal database tasks.

- **Paused** The process is paused until you tell it to resume execution. During the period that the process is paused, it does not take up any processing time. For more information, see the section "Pausing and Resuming a Process" on page 486.
- **Aborted** The process has been terminated. When a process is aborted, 4th Dimension frees any locked records, cancels any transactions opened by the process but not yet validated or canceled, and frees the current selection and current record. Processes are automatically aborted upon completion. You can also abort a process before it has completed by using the Process List editor. For more information about aborting a process, see the section "Aborting a Process" on page 487.
- **Hidden With Modal** A process which was displaying a modal dialog box has been hidden so that the user can no longer view the dialog. The process will remain in this state until the dialog is shown.

Process Time

In managing processes, 4th Dimension divides processing time among existing processes so that no single process is executing at every moment. Thus, the process time is the total amount of execution time a process has taken (in seconds) since it started executing. Note that the process time does not reflect the total amount of time that has elapsed since the process started executing since, in reality, execution alternates between all open processes.

Controlling Process Execution

The Process List editor allows you to control the execution of processes by pausing, resuming, or aborting a process. These operations are covered in detail in the sections below.

Note You can also delay a process for a specific period of time. For more information about delaying a process, refer to the *4th Dimension Language Reference*.

Pausing and Resuming a Process

You can temporarily suspend the execution of a process by pausing it. You may want to pause a process to give other processes more execution time or to allow an event upon which the process is dependent to occur.

For instance, suppose you start a process that prints a selection of records. You then realize that you want to modify the data in one of the records so you first pause the process, finish your modifications, and then resume the process to continue printing the records.

► To pause a process:

1 **Select the process in the Process List editor window.**

2 **Choose Pause from the Process menu.**

The status of the process in the Process List editor window automatically changes to “paused.” The process remains paused indefinitely until you tell it to resume execution.

► To resume execution of a process:

1 **Select the process in the Process List editor window.**

2 **Choose Resume from the Process menu.**

The status of the process returns to the status the process had at the time it was paused. For example, if the process was executing before it was paused, the process begins executing again. If the process was waiting for an event before it was paused, it continues waiting for an event.

Aborting a Process

A process is automatically aborted upon completion. However, you may need to abort a process before it completes for debugging purposes. Processes should not be aborted for any other reason. To stop the process from continuing execution, you abort the process in the Process List editor.

When a process is aborted, 4th Dimension frees any locked records, cancels any transactions opened by the process but not yet validated or canceled, and frees the current selection and current record.

► To abort a process:

1 **Select the process in the Process List editor window.**

2 **Choose Abort from the Process menu.**

The status of the process in the Process List editor automatically changes to “aborted.”

Tracing a Process

You can debug a process by monitoring its execution in the 4th Dimension debugger.

► To debug a process:

1 **Select the process you want to debug in the Process List editor window.**

2 **Choose Trace from the Process menu.**

The 4th Dimension Debug window appears, allowing you to debug the process by stepping through its execution and evaluating expressions such as the value of fields and variables used in the method. For information about using the Debug window, refer to the *4th Dimension Language Reference*.

You cannot debug the Cache Manager or Design processes.

Hiding a Process

You can make a process invisible in the User and Custom Menus environments by hiding it. When a process is hidden, any windows or menus created by the process are invisible to the user while the process is executing.

Hiding a process is useful for operations in which you open a window which you later want to close. Instead of aborting the process to close the window, you can make the window invisible to the user by hiding the process that opened it. Even though the window is hidden, the process continues to execute and complete the operation it began.

► To hide a process:

1 **Select the process you want to hide in the Process List editor.**

2 **Choose the Hide menu command from the Process menu.**

The process is now hidden from view in the User and Custom Menus environments.

Note The process continues to execute even though it is hidden.

Bringing a Process to the Front

You can make a window the frontmost window by bringing its process to the front. For instance, if the User/Custom Menus Process is brought to the front, the User or Custom Menus environment is brought to the front of the screen.

You can bring any user-created processes to the front. If you have created a window for a process, the window becomes the frontmost window on the screen. If a menu bar is attached to the window, 4th Dimension brings the menu bar to the front of the screen and makes its menus the current menus. The current menu bar is replaced by the menu bar of the process that is brought to the front.

► To bring a process to the front:

1 **Select the process in the Process List editor.**

2 **Choose the Bring to Front menu command from the Process menu.**

Any windows attached to the process are brought to the front of the screen. In addition, 4th Dimension displays the menu bar for the frontmost process window.

A Segmenting Data Files

4th Dimension allows you to create data files as large as 128 gigabytes. However, no current microcomputer operating system supports this file size and hard disks of this capacity are not available. For these reasons 4th Dimension and 4D Server allow you to partition your data file into a maximum of 64 segments of 2 gigabytes each. Each segment can be located on a different physical volume. To increase the size of the data file beyond 2 gigabytes, you add data segments. This allows you to place different segments of a data file on different physical volumes.

Segmenting Data Files

You can either segment a data file at the time you create the database or after you begin to use it. You will want to segment a new data file if you expect the data file to become very large. Segmenting a data file allows a virtually unlimited amount of data to be stored.

Note You do not need to create any data segments unless you have more than 2 gigabytes of data or your hard disk cannot accommodate the size of your data file.

When segmenting a data file, you divide the data file into segments and then specify on which volume each segment is to be stored. For example, 4 gigabytes of data could be divided into 2 segments of 2 gigabytes each. Each segment can be limited in size, so you can reserve space on your hard disk for other files and avoid a completely full volume.

4th Dimension transparently fills the data segments in the order in which they were created. When a segment is full, 4th Dimension automatically moves to the next one. If by deleting records you make room in a data segment, the holes created in the segment will be reused.

When all of the data segments are full, you will be prompted with a message stating that there is no more room on the volumes where the segments are located. At this point, you would want to add a data segment.

You can create data segments:

- When you create a new data file,
- By adding data segments to an existing data file.

The following sections describe how to segment both new and existing data files.

Segmenting a New Data File

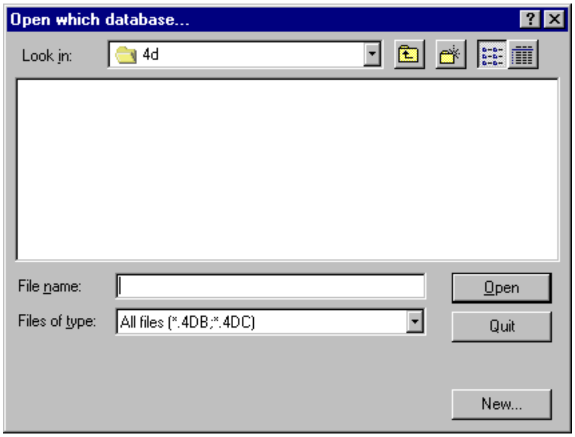
You can segment a data file when you create it. You create a data file when you create a database using 4th Dimension or 4D Server.

Note You can also create a new data file for an existing database. If the data file is missing or has been removed from the database folder, a dialog box appears asking you to either locate your data file or create a new one. You can also force 4th Dimension to allow you to create a new data file by holding down the **Alt** key (on Windows) or **Option** key (on Macintosh) while opening the database.

► To segment a new data file when creating a new database:

1 **Launch 4th Dimension or 4D Server.**

An open-file dialog box appears.



Open which database...

Look in: 4d

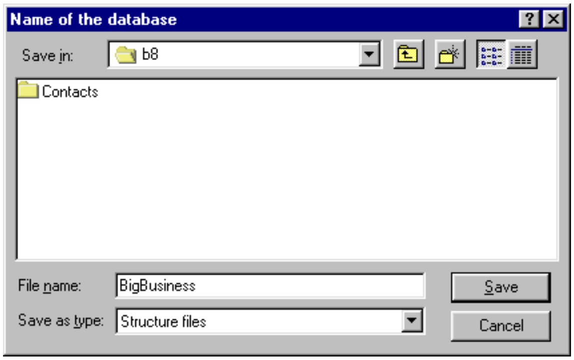
File name:

Files of type: All files (*.4DB;*.4DC)

2 **Click New to create a new database.**

A save-file dialog box appears for you to name your database.

3 Type the name of your database.



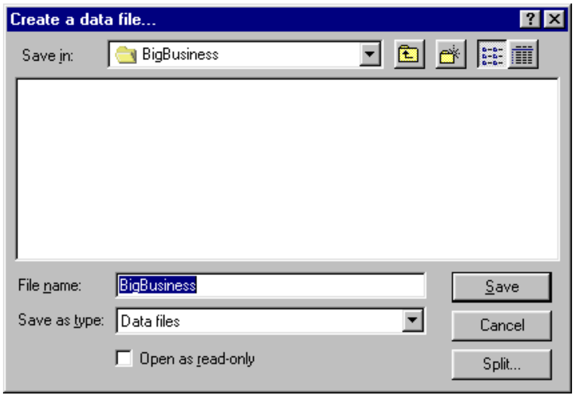
Save in: b8

File name: BigBusiness

Save as type: Structure files

4 Click the Save button.

The Create a Data File dialog box appears. This dialog box contains a button, **Split**, that allows you to divide the data file into segments.



Save in: BigBusiness

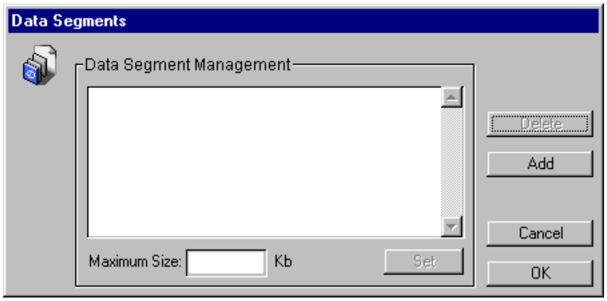
File name: BigBusiness

Save as type: Data files

☐ Open as read-only

5 Click the Split button.

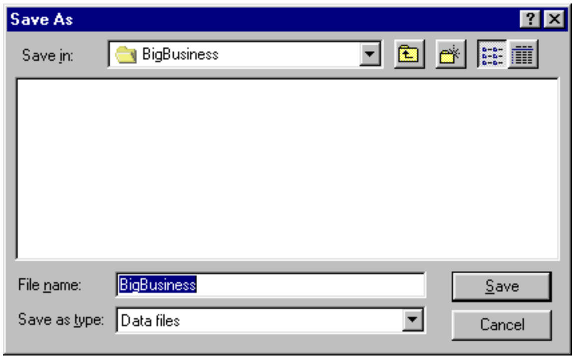
The Data Segment Management dialog box appears.



Maximum Size: Kb

6 Click the Add button to create a data segment.

A save-file dialog box appears.



Save As

Save in: BigBusiness

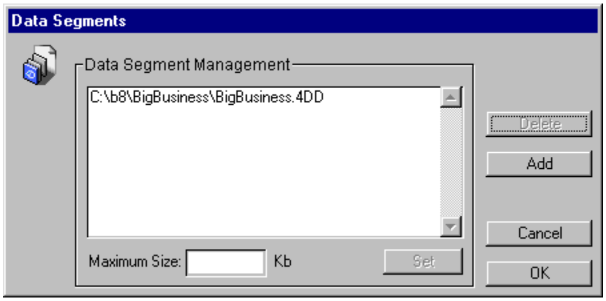
File name: BigBusiness

Save as type: Data files

7 Enter the segment name.

8 Click the Save button.

The Data Segment Management dialog box reappears and displays the segment you just created.



Data Segments

Data Segment Management

C:\b8\BigBusiness\BigBusiness.4DD

Maximum Size: Kb

You can continue to create data segments by clicking the **Add** button and repeating the process.

Segmenting an Existing Data File

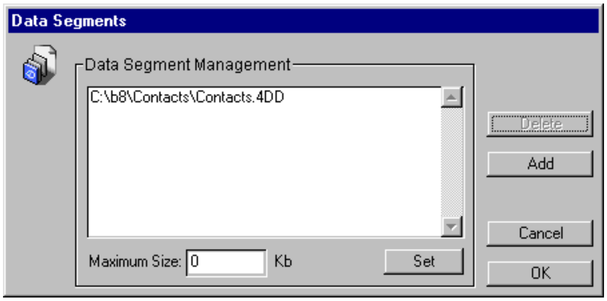
To increase the size of an existing data file beyond 2 gigabytes, you can add data segments, each of which can contain up to 2 gigabytes of data.

You create segments for existing data files in the Design environment. If you are using 4D Server, you create data segments on the server machine.

► To segment an existing data file:

1 **Choose Data Segments from the Structure menu.**

The Data Segment Management dialog box appears.



Data Segments

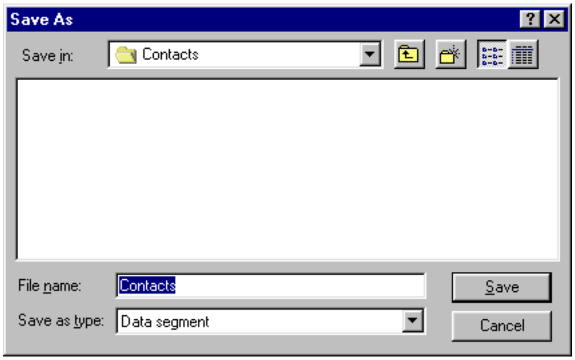
Data Segment Management

C:\b8\Contacts\Contacts.4DD

Maximum Size: 0 Kb

2 **Click the Add button to create a segment.**

3 **Enter the segment name.**



Save As

Save in: Contacts

File name: Contacts

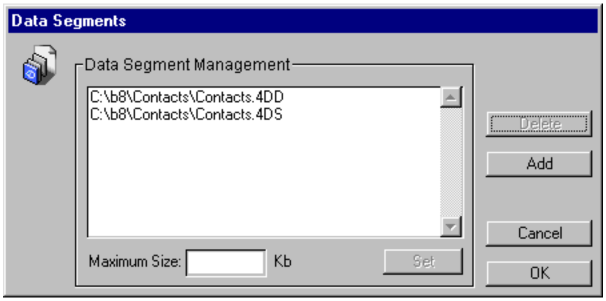
Save as type: Data segment

4th Dimension provides a default name for the segment, which is the name of the database followed by the number of the data segment, followed by the prefix“.4DS” (on Windows) or.data (on Macintosh). This naming convention allows you to easily distinguish each data segment. You can change the names of the data segments at any time.

If you are using an operating system that allows only eight characters before the prefix, your filename may be truncated in order to add the segment number. For example, a data file named CONTACTS.4DD will produce the following data segments: CONTACT1.4DS, CONTACT2.4DS, and so on.

4 **Click the Save button.**

The Data Segment Management dialog box reappears, displaying the new data segment.



C:\b8\Contacts\Contacts.4DD
C:\b8\Contacts\Contacts.4DS

Limiting Data Segment Size

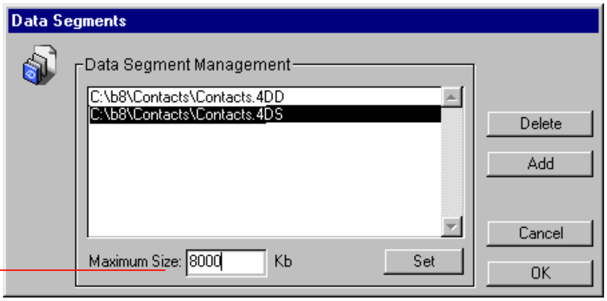
If you do not specify a size limit for data segments, 4th Dimension will fill the data segment until the volume on which it is located is full or until the limit of 2 gigabytes is reached.

Note You can change the limit of a data segment that already contains data. In this case, the limit cannot be less than the size of the data already present in the segment. If you specify a lower size, 4th Dimension will automatically adjust the limit to the current size of the data file when you validate the new limit.

► To specify a maximum size for a segment:

1 **Select the data segment in the Data Segment Management dialog box.**

2 **Enter a size (in kilobytes) in the Maximum Size box.**



C:\b8\Contacts\Contacts.4DD
C:\b8\Contacts\Contacts.4DS

Maximum Size: 8000

Maximum Size box

3 **Click the Set button.**

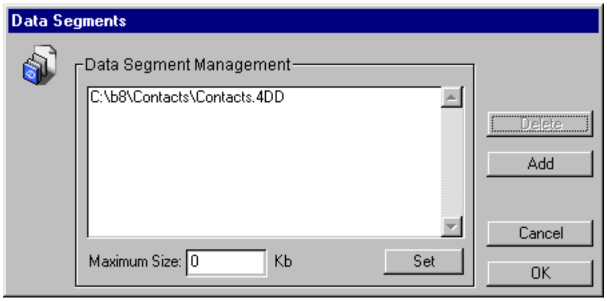
This limits the size of the segment and allows you to reserve space on your drive for other files.

Adding a Data Segment While Indexing

If 4th Dimension reaches the maximum size of the last data segment during an indexing operation, it will present a dialog box allowing you to change the segmentation of the data file.

4D Server If you are using 4D Server, this error message appears on the server machine.

When you click the **Add Segment** button, 4th Dimension displays the Data Segment Management dialog box, which allows you to change the maximum size of a data segment or add new data segments.



C:\b8\Contacts\Contacts.4DD

Maximum Size: 0 Kb

Note The Add Data Segment button is available only if you have access privileges to the Design environment. For more information on access privileges, see Chapter 9, “Managing Password Access” on page 437.

Deleting Data Segments

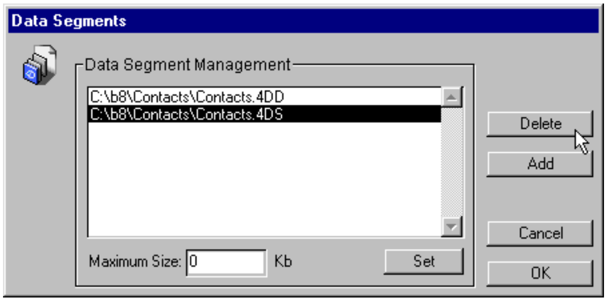
You may want to delete data segments if a large database suddenly decreases in size, or if you initially created more segments than are ultimately necessary. The method that you use to delete a data segment depends on whether it is a new or existing data segment.

Do not delete a data segment in the File Manager or the Finder. For more information, see the section “Missing Data Segments” on page 498.

Deleting a New Data Segment

A new data segment is a data segment that you just created in the Data Segment Management dialog box. You can delete a data segment only while the dialog box is still open. Once you leave the dialog box, the segment becomes part of the data file (in this case, see the following section).

To delete a data segment, click the segment you just created and then click the **Delete** button.



C:\b8\Contacts\Contacts.4DD
C:\b8\Contacts\Contacts.4DS

Maximum Size: 0 Kb

Deleting an Existing Data Segment

You can delete an existing data segment by using 4D Tools to compact the data file. Once you compact the data file, you can reconfigure the segmentation of your data file. For more information on reconfiguring data segments, see the section "Reconfiguring Data Segments" on page 499.

Missing Data Segments

Do not delete data segments using your operating system! Do not use the File Manager or the Finder. If you delete a data segment using your operating system, 4th Dimension will ask you to locate the missing data segment.

Click the **OK** button. An Open File dialog box appears.

If you no longer have the data segment, click the **Cancel** button. Since you could not locate the data segment, 4th Dimension will not allow you to open the database. In this case, you will need to use 4D Tools to repair the database.

Open your database with 4D Tools. The application will ask you to find the missing data segment.

Click the **OK** button.

In the Open File dialog box, click the **Skip** button.

4D Tools displays an alert stating that it is going to repair the database by tags.

Click the **OK** button.

Click the **OK** button to repair the database by tags.

When you repair by tags, 4th Dimension recreates the data file with the segments present on your disks. This new data file will allow you to reopen your database, but does not guarantee the integrity of your data.

Reconfiguring Data Segments

You may want to reconfigure the segmentation of your data file to accommodate a change in disk size or to change the number of data segments.

For example, suppose you have a 1 gigabyte data segment and you need to switch to two 500 megabyte drives. To do this, you must divide the 1 gigabyte segment into two segments.

The most efficient way to reconfigure data segments is to compact your database using 4D Tools. This method is described in this section.

Before you begin, be sure that you have enough room on your disk for another copy of your database. The process of compacting a database creates a new copy of both the structure and data files. Also, because the compacting process can take some time, be sure to plan accordingly. We recommend that you give 4D Tools the largest possible memory allocation to quicken the compacting process.

► To compact your database and reconfigure your segmentation:

1 **Launch 4D Tools and open your database.**

2 **Choose Compact from the Utilities menu.**
A save-file dialog box appears.

3 **Enter a new name for the structure and select a drive.**

4 **Click the Save button.**
4D Tools creates a copy of your structure file.

A save-file dialog box containing the **Split** button appears.

5 **Click the Split button.**

The Data Segment Management dialog box appears.

You can use this dialog box to add new data segments, configuring the data segments as you wish.

Index