# 4th Dimension

*User Reference*
*Windows®/Mac OS®*

4th Dimension®
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# *4th Dimension User Reference*
## *Mac OS® and Windows® Versions*

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# Preface

4th Dimension is a powerful relational database for the Macintosh and Windows platforms. As an integrated database environment, 4th Dimension offers a complete solution for your Web publishing and database needs.

## 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.

*4th Dimension QuickStart* leads you through example lessons where you create and use a 4th Dimension database. These examples provide hands-on experience that helps 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 environment in which you use databases and forms to enter and manipulate data.

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

The *Language Reference* is a guide to using the 4th Dimension language as well as the Web Server. Use this manual to learn how to customize a database by incorporating 4th Dimension commands and functions.

The *XML Keys-BuildApplication* manual lists and describes the XML keys that can be used to configure the application builder of 4th Dimension.

The *XML Keys-Backup* manual lists and describes the XML keys that can be used to set the 4th Dimension backup preferences.

The *4D Server Reference* is a guide to installing 4D Server and managing multi-user databases with 4D Server.

Supplemental manuals are also available. These manuals are particularly in reference to utility programs packaged with 4th Dimension and 4D Server (4D Chart Language, 4D Tools, etc.).

# About this Manual

This manual serves as a reference to 4th Dimension's User environment and provides detailed descriptions of the operations that you can perform in this environment. It should be used in conjunction with the other manuals in the 4th Dimension package.

To use this manual effectively, you should first work through the exercises in *4th Dimension QuickStart* and start to create your own database, referring to the *4th Dimension Design Reference* when you need to review a process or explanation.

You can then proceed to enter and manipulate data in your database, referring to this manual when you need to review a process.

## Windows/Mac OS Versions

This manual details use of 4th Dimension both on the Mac OS 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 Mac OS version of a window or dialog box, it is also presented.

### Right-click and Control+click under Mac OS

Certain functions are activated (for instance, the display of contextual menus) by carrying out a **right-click**, i.e. a click with the right button of the mouse, under both Windows and Mac OS.
Under Mac OS, the same result can be obtained by using a **Control+click** combination. This alternative is necessary when you are using a single-button mouse.

## Chapter Descriptions

This manual is divided into the following chapters and appendices.

- Chapter 1, "Introduction to the User Environment" introduces you to some basic User environment concepts such as the current selection, using tables and forms, and processes. It also describes some basic operations, such as entering a password-protected database, and provides an overview of the User environment menus.
- Chapter 2, "Managing Structure and Data Files" provides an overview of 4th Dimension desktop files.
- Chapter 3, "Data Entry" describes how to use input and output forms and how to access forms from different tables.
- Chapter 4, "Selecting Records" explains how to create a selection of records using the commands in the **Records** menu and how to use the various search methods to select a specific record or group of records.
- Chapter 5, "Working with Records" explains how to add, modify, and delete records. It also describes how to use the Formula editor to automatically update records based on a formula (for instance, adding two days to the vacation balance in each employee's record).
- Chapter 6, "Sorting Records" describes how to place a selection of records in order by sorting them based on the values in one or more fields.
- Chapter 7, "Modifying User Forms" describes how to adapt certain forms to the specific needs of users.
- Chapter 8, "Form Reports" explains how to print reports that use forms created in the Design environment.
- Chapter 9, "Quick Reports" explains how to use the Quick Report editor to print data in a columnar report. The chapter describes how to design the report using fields from your database as columns in the report and how to enhance the report by dividing data into sorted groups and performing summary calculations for each group.
- Chapter 10, "Labels" explains how to use the Label Wizard to design and print labels.
- Chapter 11, "Graphs" explains how to create, modify and print various types of graphs using 4D Chart. It also describes how to add a variety of objects to your graphs, and how to add dynamic references to field values or to 4th Dimension expressions.

- Chapter 12, "Executing Methods" provides instructions on how to execute a project method in the User environment and how to start a new process for the method or run it on the server computer as a stored procedure.
- Chapter 13, "Backup and Restoring of the Database" explains how to set up and schedule backups, as well as how to ensure data integrity using the log file and the automatic restore parameters.
- Chapter 14, "Importing and Exporting Data" explains how to import and export records via files or ODBC data sources.
- Chapter 15, "Web Server" provides an overview of 4th Dimension's capabilities as a Web server and explains how to start and stop a Web service from the User environment.

## Conventions

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

The following explanatory notes are used:

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

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

***Notes like this alert you to important pieces of information and situations where data might be lost.***

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

## Using Hypertext

You can take advantage of the hypertext buttons that have been added to this manual. All hypertext buttons are printed in blue text. A hypertext button looks like this: “For information on using 4th Dimension as a Web server, see Chapter 15, “Web Server”.

You can click a hypertext button to read additional information about the topic. You can then use the Adobe Acrobat **Go Back** button to retrace your steps.

# 1 Introduction to the User Environment

This chapter provides an overview of the 4th Dimension User environment. It describes important User environment concepts and the User environment menus.

In this chapter, you will learn about:

- The 4th Dimension environment
- The 4th Dimension plug-ins
- The 4th Dimension components
- 4D Server and 4th Dimension
- The User environment
- User environment concepts such as the current selection, tables and fields, and multi-tasking
- Opening a database with another data file
- Entering and using a password-protected database
- The User environment menus.

# The 4th Dimension Environments

4th Dimension manages data, performs calculations on that data, and produces output such as summary reports and graphs. These types of operations are performed in 4th Dimension's User environment.

The *User environment* is the environment in which you enter and manage data. You use the User environment to:

- Add, modify, and delete records
- Search for a specific record or group of records
- Modify the forms used for entering, displaying or printing data
- Create labels, reports, and graphs that use the information in your database
- Import and export data between 4th Dimension and other applications
- Execute methods
- Launch database backups and analyze the log
- Control the Web server of your application.

You perform these operations on databases that have been created in the Design environment. The *Design environment* is the environment in which you create a database. You design its structure by creating tables and fields to store data, forms for data entry and reports, and other features such as a password access system.

You can also use the Design environment to create a custom application. A custom application has its own menu bars, entry screens, and editors. By creating menus and menu bars in the Design environment, you can design an application that suits your needs exactly and includes only the features you want.

A custom application can be used in 4th Dimension's *Custom Menus environment* or deployed on 4D Server and 4D Client.

Using the 4th Dimension language, you can include some or all of the functions of the User environment in a custom application. For example, a custom application can include menu commands that display the User environment's Quick Reports and Labels editors.

To create a stand-alone Windows or Macintosh application, you can compile your application and merge it with a 4D Runtime.

# The 4th Dimension Plug-ins

In addition to the built-in functionality of 4th Dimension, 4D offers several plug-ins that work with your database to enhance its capabilities. These plug-ins include the following:

- 4D Chart, a graphing application that is included with 4th Dimension,
- 4D Write, a word processing plug-in,
- 4D Draw, an object-oriented drawing plug-in,
- 4D View, a spreadsheet and data presentation plug-in,
- 4D ODBC Pro, a developer's tool that allows you to communicate directly with an ODBC database,
- 4D for OCI, a developer's tool that allows you to communicate directly with an Oracle's OCI8,
- 4D Open for 4D, a developer's tool that lets 4th Dimension (single-user) databases access data in 4D Server.

These products are designed to be used within your 4th Dimension database. For example, 4D Write and 4D Draw plug-ins allow you to include such things as letters and drawings in special areas called plug-in areas. These areas appear as part of your data, just like a name or any other piece of information. The 4D Chart plug-in is already built into 4th Dimension to facilitate graphing of your database information.

You can also treat the 4D View, 4D Write, 4D Draw, and 4D Chart plug-ins as if they were separate applications by using them in their own windows. Your work within these windows can be independent of your database or linked to information in your database or in other plug-ins.

# The 4th Dimension Components

You can install 4D components within any 4th Dimension database. A component adds one or more additional functions to the database. For example, it is possible to develop, and install, an e-mail component within a 4th Dimension database.
Unlike plug-ins, 4D components are composed uniquely of 4D objects (tables, methods, forms, menu bars, etc.)

4D components are managed and installed using 4D Insider. Each component object is defined as either "public," "protected," or "private," which determines whether it is visible or able to be modified once installed. Components allow developers to commercialize original solutions in total security. For more information on components, please refer to the *4D Insider Reference* manual.

# 4D Server and 4th Dimension

You can create single-user and multi-user databases with:

- 4th Dimension (single-user)
- 4D Server and 4D Client (multi-user).

4th Dimension is a single-user database application. In a single-user database, operations such as entering data into a record or searching for a specific record are performed by one user at a time, working on a single computer. Both 4th Dimension and the database on which the user is working are stored locally on the user's machine.

4D Server and 4D Client together form a multi-user database application in which database operations can be performed by several users at a time. The users connect to databases from client computers that are connected over a network to a dedicated computer (a server) running 4D Server.

To set up a multi-user database, you install 4D Server along with the database on a separate computer. A copy of 4D Client is then installed on each user's computer. A user accesses the database by launching his or her copy of 4D Client.

Whenever a user performs an action such as entering data or generating a report, 4D Server updates the tables on the server computer and performs all necessary calculations. Changes made by one user are updated on the server so that all users view the most recent information. For more information about 4D Server and 4D Client, refer to the *4D Server Reference* manual.

However, the single-user version of 4th Dimension is comparable to a multi-user environment when the database is published as a Web server. In this case, if custom menus or specific methods have been created, Web browsers that connect to the database via the Internet or Intranet will have access to the data, in the same way as client machines (creation, deletion and modification of records). However, unlike 4D Client, a Web browser cannot gain access to the structure of the database.

Of course, 4D Server can also publish your database as a Web server, which gives both 4D Client machines and browsers simultaneous access to it. Moreover, each 4D Client machine can also become a Web server.
For more information about Internet or Intranet operation on your database, refer to **chapter 15, "Web Server,"** as well as the *Language Reference* manual of 4th Dimension.

# The User Environment

The User environment is where you work with your data. The menus and editors in this environment provide a complete set of tools for managing information. You can use the User environment to:

- Import or export data
- Enter, modify, or delete records
- Search for records and sort lists of records
- Create and print reports, labels, and graphs
- Customize user forms
- Run processes that enable you to perform more than one operation simultaneously, also known as *multi-tasking*
- Launch backups and display the contents of the log file
- Start and stop the built-in Web Server.

Multi-tasking is discussed later in this chapter. All other User environment features are explained in the remainder of this manual.

## Tables and Forms

In a 4th Dimension database, you store information in *tables*. Ideally, each table stores a different type of information. For example, a Contacts database might have one table that stores information about people and another table that stores information about companies.

In the User environment and custom applications, you use *forms* to enter and manage data. Each table in your database has an input form and an output form.

An *input form* displays one record at a time. You use an input form to enter, view, and modify information in a single record. In the User environment and custom applications, the input form is sometimes called the *Detail form*.

An *output form* displays several records as a list. You use an output form to browse through records, select and sort records, and print a selection of records. You can also enter and modify records directly in an output form. In the User environment and custom applications, the output form is sometimes called the *List form*. When you are working with a List form, you can display an individual record in its Detail form by double-clicking it.

You can switch from one table to another and change the input and output forms with which you work. You will learn how to do this in Chapter 3.

## The Current Selection

When managing data, you select the group of records with which you want to work. This group of records is called the *current selection*. The current selection can contain none, one, some, or all of the records in a table. Every table has a current selection of records.

The current selection is an important concept in 4th Dimension. The most common data management operations are performed on the records in the current selection.

These operations include:

- Sorting records
- Viewing and modifying individual records
- Updating a group of records
- Printing a report
- Generating labels
- Graphing data
- Exporting records.

The current selection of records is always the set of records most recently selected. For instance, you might have a company database that uses an Employees table to keep track of employee records. Suppose that you decide to search for the records of all engineers in the company.

When this query begins, the current selection may contain the records of all employees in the company — salespeople, production personnel, engineers, and so on. When the query is completed, the current selection contains *only the engineers' records*.

If you were to print a list of records, the list would contain only the records in the current selection — in this case, the records for all of the engineers in the company. If you were to graph employee salaries, your graph would display the salaries for all of the engineers in the company.

The current selection remains the same until you perform an operation that changes it. You change the selection of records in a table whenever you select records manually or do a query that selects records. Search operations are performed by menu commands in the **Records** > **Query** sub-menu, such as **Query by Example**, which searches for records based on the entries you specify for fields in a form.

To restore the current selection to all of the records in the table, you choose **Show All** from the **Records** menu.

For more information about selecting records, refer to Chapter 4.

# Multi-tasking in 4th Dimension

When you are working with a database, you typically perform a single action at a time — one query, one sort, printing one report.

At times, you might like to be able to perform several actions at once. For example, you might want to enter data into an employee's record while a large group of records is printing. You might also want to view two selections from the same table (such as engineers in one window and salespeople in another) simultaneously.

4th Dimension provides such multi-tasking capabilities by enabling you to perform operations in separate processes. A *process* is a 4th Dimension task that executes actions specified by a method.

Although you write methods in the Design environment, you can execute them in the User environment. When you do so, you can choose to start a new process for the method. The method then executes in a separate process, allowing you to continue working in another process.

You can start as many processes as you want. The number of processes open concurrently is limited only by the amount of memory on your computer.

For information about executing a method that starts a new process, refer to Chapter 12 of this manual. For complete information about creating and managing processes, refer to the *4th Dimension Design Reference* manual.

# 4th Dimension Desktop Files

A 4th Dimension database consists of four disk files: a structure file (extension ".4DB"), a structure resource file (extension ".RSR"), a data file (extension ".4DD"), and a data resource file (extension ".4DR").

*Note* If you use backup functions (active by default), additional elements will be present: the log file (extension ".4DR"), the backup journal and the Preferences folder. For more information, refer to Chapter 13, "Backup and Restoring of the Database," on page 319.

When you create a new database, 4th Dimension places the structure and data files in the same folder. If you check the **Create Database Folder** check box in the Welcome dialog box, all the database files will be saved in a new folder having the same name as the database.

- The structure file contains all of your specifications for the design of the database.
- The structure resource file contains resources used by the structure file. These resources might include pictures or strings.
- The data file contains your data and any indexes you build.
- The data resource file contains resources used by the data file.

Please refer to Chapter 2 for details on database files.

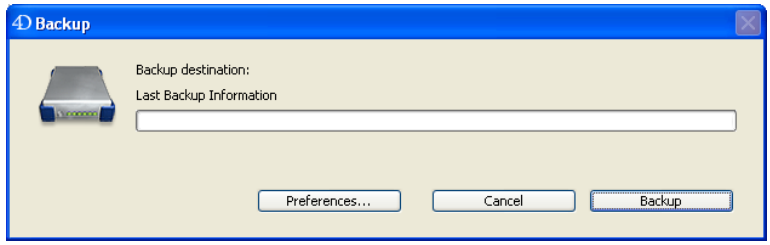
# Database Backup and Use of the Log File

For most databases, it is essential that the data are protected against risks like file corruption or human error. When data have been erased or modified accidentally by a user, this can mean consequences ranging from the additional work needed to re-enter the data, up to the irremediable loss of information.

In order to limit these risks, 4th Dimension includes a complete database backup and restore module, which lets you back up a database during its use, without it being necessary to exit the application. Each backup file can include the structure file, the data file (including any segments), as well as any additional files or folders.

The backup module also allows the use of a log file. This file keeps track of each operation carried out on the data and thus ensures complete security between two backups.

The **Backup...** command of the 4th Dimension **File** menu displays a dialog box that can be used to launch a backup at any time (**Backup** button) or to display the backup preferences:




All the backup settings (files to be saved, location of archives, log file, etc.) are defined beforehand in the application Preferences and used when the backup is launched. Backups can also be scheduled to take place automatically at regular intervals, or launched by programming.

The backup and restore functions of 4th Dimension databases are detailed in Chapter 13, “Backup and Restoring of the Database,” on page 319.

# Password Protection

4th Dimension’s Design environment includes a comprehensive password access system. This access system is used to selectively grant access to parts of a database. Access can be granted to tables, record operations (e.g., adding, modifying, deleting, and viewing records), forms, menu commands, methods, and plug-ins.

The password access system is based on the notion of user groups. Each group has specific access rights and each user belongs to one or more groups. The users inherit the access rights of the groups to which they belong.

Each user of the database is given a user name and a password. Depending on the type of access system implemented in your database, the user must do one of three things:

- Select a user name from a list and type a password, or
- Type both a user name and password, or
- Type a password only, or type nothing (if the database is in the “Default User” mode and no password has been assigned).

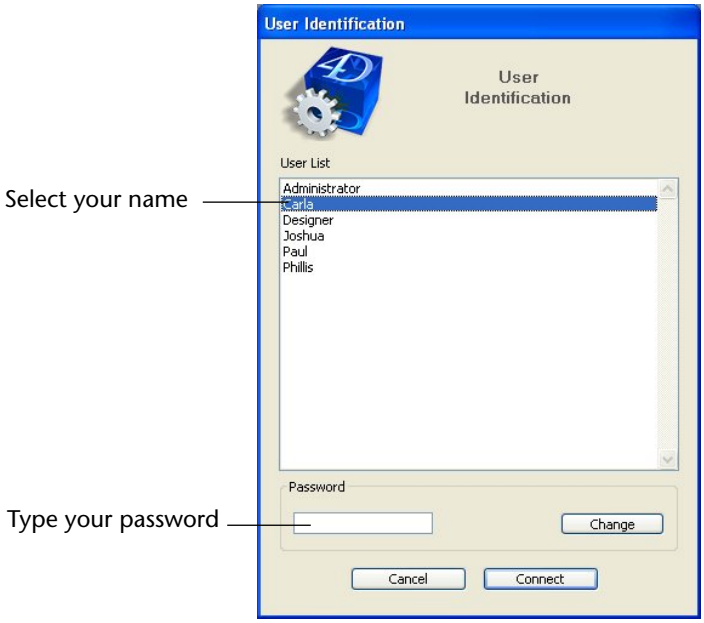
The second option provides extra security for a database by requiring that users enter both a valid user name and password. For more information about designing the password access system, refer to the *4th Dimension Design Reference* manual.

If a database is password-protected, you must identify yourself as a valid user before you are permitted access to the information in the database. 4th Dimension automatically displays an User Identification dialog box whenever you open a password-protected database. You will be required to either enter your password or enter both your name and password.

► To enter a database protected by a password access system:

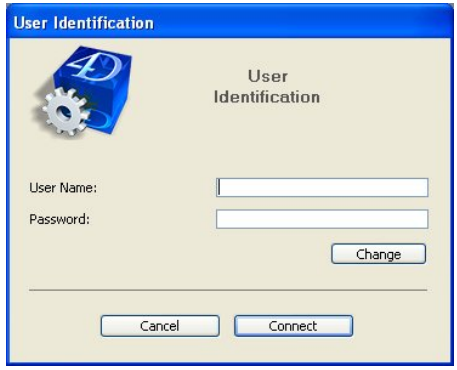
1 **Open or connect to the database as you normally would.**

2 **If 4th Dimension displays the following User Identification dialog box, select your user name from the user list and type your password in the Password entry area at the bottom of the dialog box.**



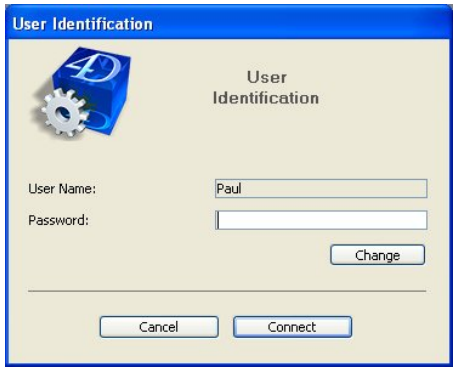

**OR**

**If 4th Dimension displays the following User Identification dialog box, type both your user name and password in the entry areas.**




**OR**

**If 4th Dimension displays the following User Identification dialog box, the Default User mode[1] is activated; type the password for the default user in the entry area.**




Note that in the dialog boxes, an asterisk is displayed in place of each character you type in the password entry area.

*Note* Because the password access system is case sensitive, be sure to type your password using the correct uppercase and lowercase characters.

If you type the password correctly, you are given the level of access to the database that was specified when the access system was designed. If you type the password incorrectly, the computer beeps and does not allow you to open the database.

1. In the Default User mode, the password access system may be configured so that no dialog box is displayed.

## Using a Password-protected Database

After you have entered a password-protected database, you can use any part of the database to which you have been granted access. Unless you are the designer of the database or part of a group of users that has been given access to the Design environment, you will be unable to enter the Design environment.

The access system grants access to tables, record operations, forms, menus, methods, and plug-ins. If you try to use part of the database to which you do not have access, 4th Dimension displays an alert dialog box.

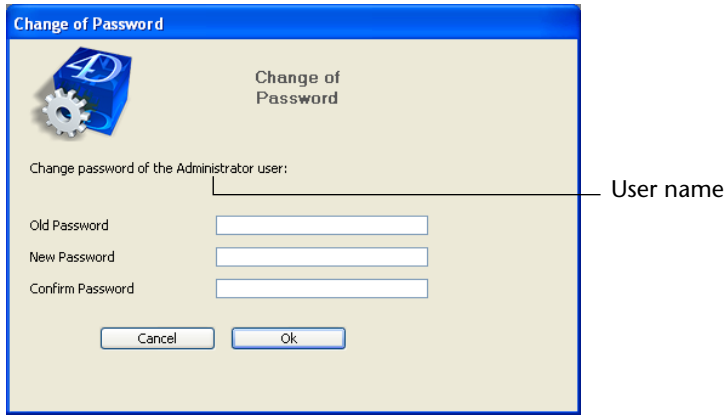
*Note* When the database is published as a Web server, the password system can be applied to browsers that connect to the database. For more information about this, refer to the "Connection Security" section in the *Language Reference* manual.

*4D Server* The 4D Client User Identification dialog box also includes a **Save** button that lets you store the access parameters to the 4D Server database. This option is detailed in the 4D Server Reference manual.

## Modifying Passwords

The User Identification dialog box by default includes a **Change** button which lets the current user modify their own password. If the list of users is displayed, the current user is the selected user. If the list is not displayed, the name of the current user must be entered beforehand in the User Identification dialog box.

When the user clicks the **Change** button, the following dialog box appears:



In order to modify their password, the user must indicate their old password. The new password is then entered and confirmed.

Once the dialog box is validated, if the entry is correct, the new password of the user replaces the old one and is stored in the database. The user then needs to enter his or her new password and click the **Connect** button in order to open the database.

*Note* It is possible to hide the **Change** button in order to prevent users from modifying their password. This option is found on the Application/Access page of the application Preferences (see the *Design Reference* manual).

# User Environment Menus

This section briefly describes the commands in the User environment menu bar.

## Menu Bar

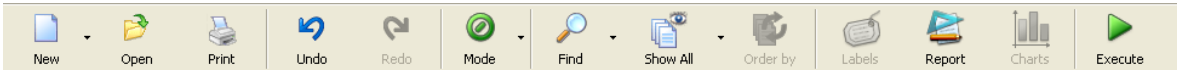
The User environment menu bar contains the following menus:

File Edit Mode Run Records Tools Window Help

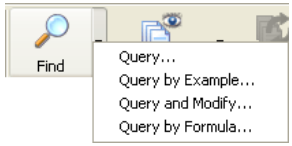
*Note* Under Mac OS, the application menu (named **4th Dimension**, **4D Server** or **4D Client** depending on the current application) is added to the left of the menu bar. It contains more particularly the **Preferences** and **Quit** commands, which are described below in the **Edit** and **File** menus.

## Toolbar

The User environment also includes a toolbar of command buttons for easy access to frequently used menu commands. To choose a command from the toolbar, click its button.




The buttons with a triangle icon to their right have associated menus offering different possible actions:

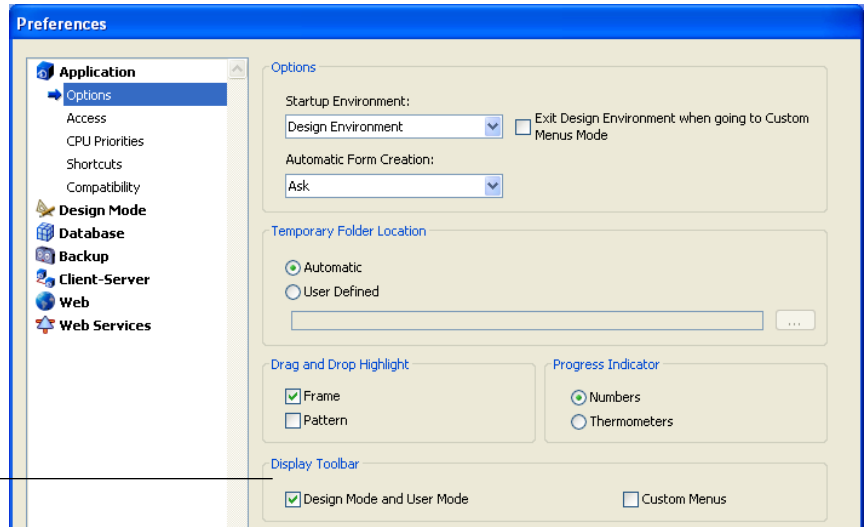


Clicking the button directly carries out the principal associated action. To display the menu and select a different action, click on the right-hand part of the button.

The toolbar is contextual; in other words, it changes according to the mode you are using (Design, User, Custom Menus).
For instance, the same tools are not available in Design and User mode. As a result, some buttons take the place of others depending upon your navigation within the application. In addition, when functions are not available, the corresponding buttons are dimmed to indicate that they are not enabled.

## Hiding the Toolbar

You can stop the display of the toolbar in your 4th Dimension application, both in Design and User modes, and in the Custom Menus mode as well.
These options are set on the Application/Options page of the application Preferences:




Toolbar display options

These settings will be applied to all your databases. For more information about this, refer to the *Design Reference* manual.

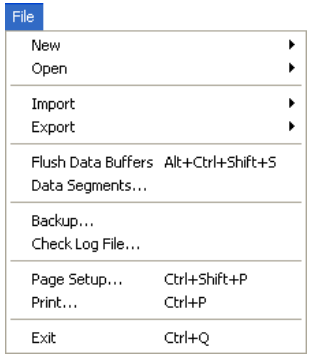
You can also remove or display the toolbars individually for each database using the language commands of the “Tool Bar” theme. For more information about this, refer to the 4th Dimension *Language Reference* manual.

## Custom Menus and Toolbars

In addition to the built-in User environment menus and command buttons, you can add custom menus and buttons that will appear in the menu bar and the toolbar when a form is displayed. You use these custom commands to simplify complex or time-consuming tasks.

## File Menu

The **File** menu contains the following commands for performing standard file operations:




- **New** > **Database...**: This command opens the Welcome dialog box of 4th Dimension on the "Create" page, which is used to create a new database.
- **New** > **Data File...**: This command displays the standard save file dialog box, which is used to create a new data file for the open database (see the "Opening a New Data File" paragraph on page 45).
- **Open** > **Database**: This command opens the Welcome dialog box of 4th Dimension on the "Open" page, which is used to open an existing database.
- **Open** > **Data File...**: This command displays the standard open file dialog box, which is used to change the data file for the open database (see the "Opening a Different Data File" paragraph on page 45).
- **Import** > **From File...**: This command displays a standard open file dialog box, which is used to specify a file containing data to be imported into the current table. For more information about importing data, refer to chapter 14, "Importing and Exporting Data," on page 361.
- **Import** > **From ODBC Source...**: This command displays the system dialog box for selecting a data source, which is used to specify the ODBC source containing the data to be imported into the current table. For more information about importing data, refer to chapter 14, "Importing and Exporting Data," on page 361.

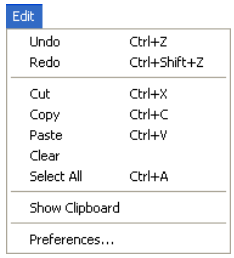
- **Export > To File...**: This command displays the standard export dialog box of 4th Dimension. For more information about exporting data, refer to chapter 14, "Importing and Exporting Data," on page 361.
- **Export > To ODBC Source...**: This command displays the system dialog box for selecting a data source, which is used to specify the ODBC source to which you want to export data from the database. For more information about exporting data, refer to chapter 14, "Importing and Exporting Data," on page 361.
- **Flush Data Buffers**: This command is used to "force" the writing of the data cache to disk.
  Before being written to disk, the operations carried out on the data are kept in the data cache for a certain period of time. This makes for faster data access. The cache is written to disk at regular intervals (every 15 minutes by default) or when the database is exited. In certain cases, you may want the cache to be written immediately to the disk. If so, you can use this command.
- **Data Segments...**: This command displays the dialog box for managing data segments, which can be used to configure or add data segments (see the "Segmenting Data Files" paragraph on page 47).
- **Backup...**: This command displays a dialog box that is used to launch a manual backup of the database. For more information, refer to the "Performing a Backup" paragraph on page 320.
- **Check Log File...**: This command opens a window displaying the contents of the current log file. For more information, refer to the "Managing the Log File" paragraph on page 339.
- **Page Setup...**: This command displays the configuration dialog box for the current printer selected in your operating system.
- **Print**: Displays the Choose Print Form dialog box so you can print reports using a form. For a discussion of printing reports using forms, refer to Chapter 8.
- **Exit**: Closes and saves the current database, then exits the 4th Dimension application.

*Note* Under Mac OS X, the **Quit** menu command is only available in the 4D application menu and not in the **File** menu.

*4D Server* In 4D Client, the operations found in the User environment **File** menu differ from those listed, due to the division of the application between 4D Server and 4D Client. Only the **Open** > **Database** command is available in the **File** menu of 4D Client — you cannot create a new database or manage data files using 4D Client.
Similarly, the **Backup** and **Check Log File** commands are found on the server machine.
When you want to exit the database that is currently open, you choose the 4D Client **Exit** menu command. This operation exits the database on your client machine but does not close the database on the server.

## Edit Menu

The **Edit** menu contains the following standard editing commands:

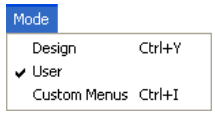



- **Undo/Redo**
- **Cut**
- **Copy**
- **Paste**
- **Clear**
- **Select All**
- **Show Clipboard**.
  Your system's standard editing operations are covered in the user guide that came with your system. You can use these menu commands when managing data with 4th Dimension.
- **Preferences...**: This command opens the application Preferences dialog box. These preferences determine the behavior of various aspects of the application (interface, security, backup, Web parameters, etc.) in all the modes (User, Design and Custom Menus). Consequently, you must take care when modifying the preferences.
  For more information about application preferences, refer to the 4th Dimension *Design Reference* manual.

*Note* Under Mac OS X, the **Preferences...** command is found in the application menu and not the **File** menu.

## Mode Menu

The **Mode** menu lets you change between the different environments of 4th Dimension: Design, User, and Custom Menus.




A checkmark is placed beside the current environment. Selecting a command that already has a checkmark has no effect.

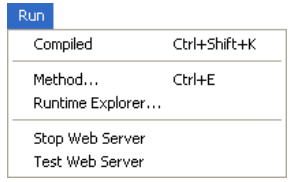
- **Design**: Switches to the Design environment. When you enter the Design environment, all of the Design environment menus and editors are available to help you design your database.

*Note* The Design menu command is dimmed if you do not have access privileges to this environment or if the database with which you are working has been compiled.

- **User**: Switches to the User environment.
- **Custom Menus**: Switches to the Custom Menus environment. When you enter the Custom Menus environment, only the custom menus defined for the database are displayed in the menu bar. By default, 4th Dimension creates a custom menu bar containing the **File**, **Edit** and **Mode** menus.

## Run Menu

The **Run** menu contains the command related to the execution mode of the database, as well as the launching of specific tasks in 4th Dimension.




*Note* The **Run** menu is the same in both Design and User mode.

The commands are as follows:

- **Compiled / Interpreted**: This command lets you change between execution modes. It is enabled if the database has been compiled at least once; otherwise, it is dimmed and the database automatically operates in interpreted mode.

When the database operates in compiled mode, the Design environment is no longer accessible. For more information about execution in compiled mode, refer to the *Design Reference* manual.

- **Method...**: This command displays the Execute Method dialog box. Use it to execute a project method. When you execute a method from this dialog box, you can choose to execute the method in another process or (4D Server only) on another 4D Client, and to start it in debug mode. For more information about processes, refer to "Multitasking in 4th Dimension" on page 24.
  The Execute Method dialog box is discussed in Chapter 12.

- **Runtime Explorer...**: This command displays the Runtime Explorer window. The Runtime Explorer is used to check the parameters of the database in real time and to check whether available resources are used correctly. This tool is particularly useful during development and analysis of a database.

*Note* Only the Designer and Administrator have access to the Runtime Explorer.

**Tip**: The Runtime Explorer can be displayed in a floating window, so that it always stays in the foreground. To do this, hold down the **Shift** key when selecting the **Runtime Explorer...** command or use the **Ctrl+Shift+F9** (Windows) or **Command+Shift+F9** (Mac OS) shortcut.

*Note* The Runtime Explorer is described in the 4th Dimension *Design Reference* manual.

- **Start Web Server / Stop Web Server**: These commands toggle between starting and stopping the integrated Web server of 4th Dimension.

- **Test Web Server**: This command is accessible when the Web server is launched. It displays the home page of the Web site published by the 4D application in a window of your default Web browser. This command is used to check the operation of the integrated Web server.

*Note* Web publication in 4th Dimension is described in Chapter 15.

## Records Menu

The **Records** menu contains the following commands used for entering, modifying, selecting, searching and sorting data in records:

- **New Record in List**: Adds a blank line in the current output form and places the cursor in the first field to begin data entry.
- **New Record**: Displays a blank input form and places the cursor in the first field to begin data entry.
- **Modify Record**: Displays the selected (highlighted) record using the current input form. Modify Record is dimmed if no records are highlighted or if you are currently using an input form.
- **Show All**: Displays all the records in the table you are working with in the output form. Show All is dimmed if you are currently using an input form.

*Note* For more information about modifying, updating and entering data in records, refer to chapter 5, "Working with Records," on page 107.

- **Show Subset**: Displays only the group of records that is highlighted in the output form. Show Subset is dimmed if no records are highlighted or if you are using an input form.
- **Query** > **Query**: Displays the Query editor. The Query editor is a general purpose search editor that you can use to perform many types of queries.
- **Query** > **Query by Example**: This menu command displays the current input form as a query-by-example window.
- **Query** > **Query and Modify**: This menu command also displays the current input form as a query-by-example window. When you use Query and Modify, the first record located by the query is displayed in the input form.

- **Query > Query by Formula**: This menu command displays the Formula editor. Use Query by Formula when you want to search for records based on the results of a formula.

*Note* For more information about selecting and searching for records, refer to chapter 4, "Selecting Records," on page 81.

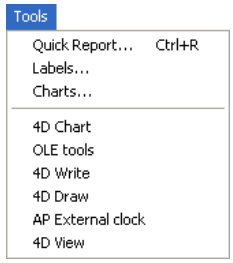
- **Order By**: This menu command displays the Order By editor. Use Order By to sort the current selection.

*Note* For more information about sorting records, refer to chapter 6, "Sorting Records," on page 123.

- **Tables List**: This command displays the List of tables window, which is used to move between the different tables and forms of the database. This window is described in the "Choosing Tables and Forms" paragraph on page 77.
- **Apply Formula**: Displays the Formula editor. Choose Apply Formula to make changes to the current selection of records using a formula.

## Tools Menu

The **Tools** menu contains the commands that call the Quick Report, Label and Chart editors of 4th Dimension and lists the plug-ins installed in your database.



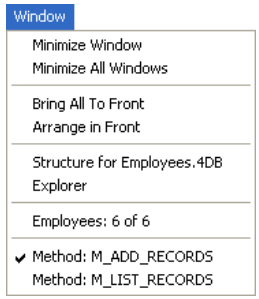

- **Quick Report**: Displays the Quick Report editor. Use it to create and print columnar reports.
- **Labels**: Displays the Label editor. Use it to create and print labels.
- **Charts**: Displays the Chart Wizard. Use it to graph data.

*Note* These editors are described respectively in chapters 8, 9 and 10.

The **Tools** menu also lists the different plug-ins installed in your database. When you select a plug-in from this menu, a new external window containing this plug-in is created.
By default, this menu contains the integrated **4D Chart** plug-in command, which is used to create and manipulate graphs, as well as the **OLE tools** command (under Windows only), which is used to insert OLE objects into your databases.

## Window Menu

The **Window** menu is used to manage the various windows open in the application. The first four menu commands are standard:

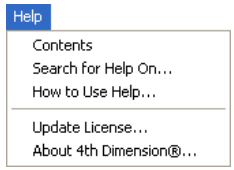



- **Minimize Window**: Minimizes the window in the foreground.
- **Minimize All Windows**: Minimizes all the open windows.
- **Bring All To Front**: Enlarges all minimized windows.
- **Arrange in Front**: Displays all the windows in a cascade.

All the open windows are then listed in this menu, regardless of their environment (Design, User or Custom Menus). To move a window to the foreground, simply select it from this menu.

## Help Menu

The **Help** menu gives you access to the on-line Help available for the application.

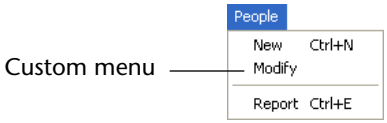



It also contains the **Update License...** command, which lets you add or delete serial and/or expansion numbers. For more information about this dialog box, refer to the *4th Dimension Installation Guide* manual.

Under Windows, the **Help** menu also contains the **About 4th Dimension** command; under Mac OS X, this command is found in the Application menu. The About dialog box provides various information about the 4th Dimension program being executed, the database, the system configuration and the 4D company.

## Custom Menus for Forms

The Form editor (available in the Design environment) lets you associate a menu bar with a form. Whenever the form is used as an input form or is displayed by programming, the menus on the custom menu bar are appended to the User environment's menu bar.




You use the menus and menu commands on the custom menu bar for specialized functions. For example, a custom menu might contain menu commands that display custom search dialog boxes, print reports, or import data using a special format. You use custom menu bars as you would use menus and menu commands in any application.

Refer to the *4th Dimension Design Reference* manual for more information about designing custom menu bars and associating menu bars with forms.

# 2 Managing Structure and Data Files

This chapter provides an overview of 4th Dimension desktop files.

## 4th Dimension Desktop Files

Under Windows, a 4th Dimension database consists of four desktop files: a structure file, a structure resource file, a data file, and a data resource file. When you create a new database, 4th Dimension places the structure, resource, and data files in the same folder. If you check the Create Database Folder check box in the Welcome dialog box, all the database files will be saved into a new folder.

- The structure file (denoted by the file extension .4DB) contains all of your specifications for the design of the database.
- The structure resource file (denoted by the file extension .RSR) contains resources used by the structure file. These resources might include pictures or strings.
- The data file (denoted by the file extension .4DD) contains your data and any indexes you build.
- The data resource file (denoted by the file extension .4DR) contains resources used by the data file.

On Macintosh, a 4th Dimension database consists of two desktop files, the structure file and the data file. The structure resource file is merged with the Macintosh structure file and the data resource file is merged with the Macintosh data file. The structure file has no suffix on Macintosh, while the data file has the suffix .data.

## Naming Directories

If you check the Create Database Folder check box in the Welcome dialog box, the directory (folder on Macintosh) is given the name you assign to the database. For example, if you name a database Contacts, the directory will be named Contacts, the structure file will be named Contacts.4DB, the structure resource file will be named Contacts.RSR, the data file will be named Contacts.4DD, and the data resource file will be named Contacts.4DR.

On Macintosh, the folder is given the name you assigned to the database, followed by an "*f*". The data file is also given the same name, followed by ".data". For example, if you name a database "Contacts," the folder will be named Contacts *f*, the structure file will be named Contacts, and the data file will be named Contacts.data.

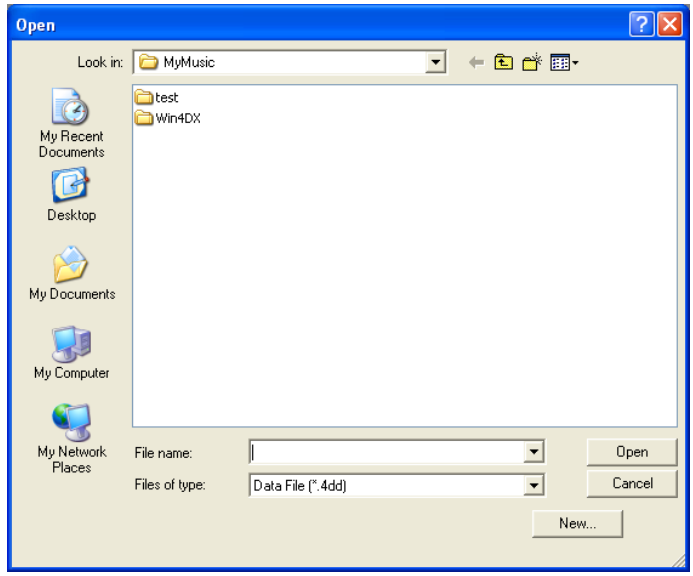
On Windows, the data resource file (denoted by the file extension .4DR) contains Macintosh resources pertaining only to the data file, such as the WEDD resource that links a data file with a particular structure file.

## Structure and Data File Locations

4th Dimension does not require that the structure and data files have the same names, be in the same directory, or be on the same volume. You can move either the structure or data file to new locations on the same hard disk or to different hard disks. However, the structure and resource files must always be in the same location. In the same way, the data resource file must be kept in the same location as the data file.

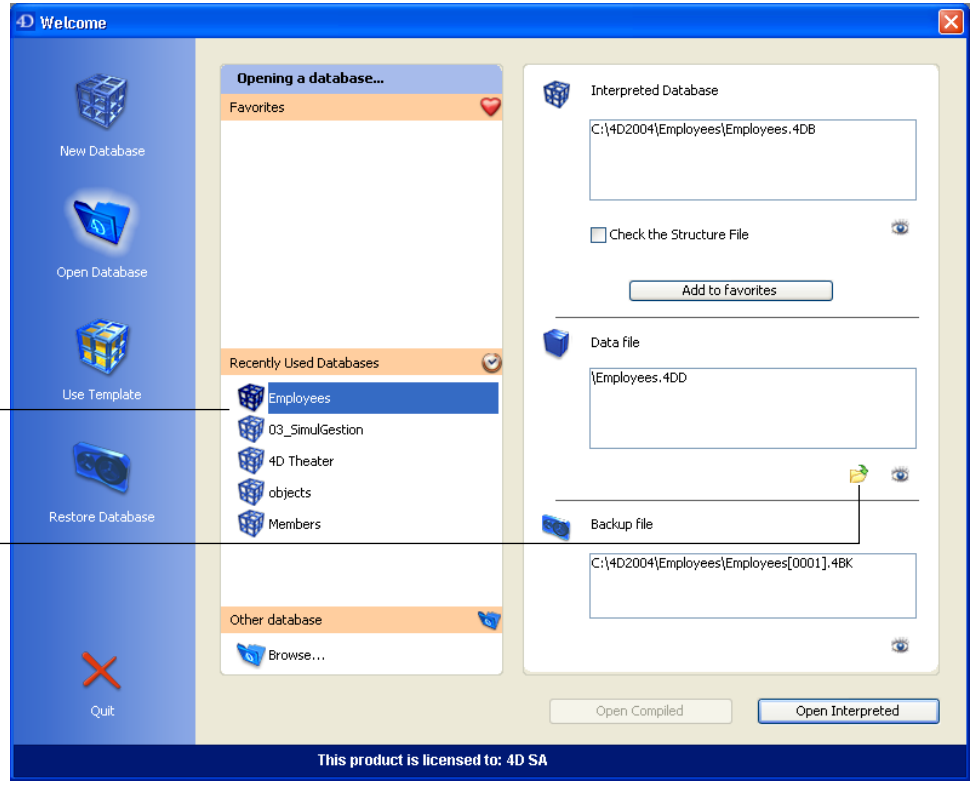
When you open a structure file, you can choose to use a data file other than the one you initially created or you can create a new data file. This option gives you the ability to use more than one set of data with the same structure file. For example, a developer can use a “dummy” data file while working on the database off-line and then redeploy the improved structure file with the “real” data file when the development is finished.

If you separate the data file from the structure file by moving it, you will need to indicate the data file’s new location. By displaying the Open Data File dialog box, 4th Dimension asks for the location of the data file the first time you open the structure file.



# Opening a Database

You can open a database by double-clicking the 4th Dimension application icon and using the Welcome dialog box to open the desired structure file.




Names of recently used databases

Icon for choosing a different data file

4th Dimension will then look in the directory that contains the structure file for a data file with the same name. If 4th Dimension finds the data file, it will open it automatically.

If the data file is not in the same directory or is missing, 4th Dimension displays the Select Data File dialog box. Open the data file by double-clicking its filename or by selecting the filename and clicking **Open**.

If you want to specify a different data file or create a new one, click the icon located beneath the Data file area. Clicking this icon opens the Open Data File dialog box. The data file chosen or created will become the default and will open automatically the next time you open the database.

*Note* For more information about this dialog box, refer to the *4th Dimension Design Reference* manual.

## Opening a Different Data File

You can prevent 4th Dimension from opening the default data file automatically.

► To open a different data file:

1 **Choose Open > Data File... in the File menu of 4th Dimension.**
**OR**
**Hold down the Alt key (Option key on Macintosh) while opening any structure file.**
**OR**
**In the Welcome dialog box, click the icon under the Data File area.**
4th Dimension displays the Open Data File dialog box.

2 **Double-click the desired data file name or select the data file and click Open.**

## Opening a New Data File

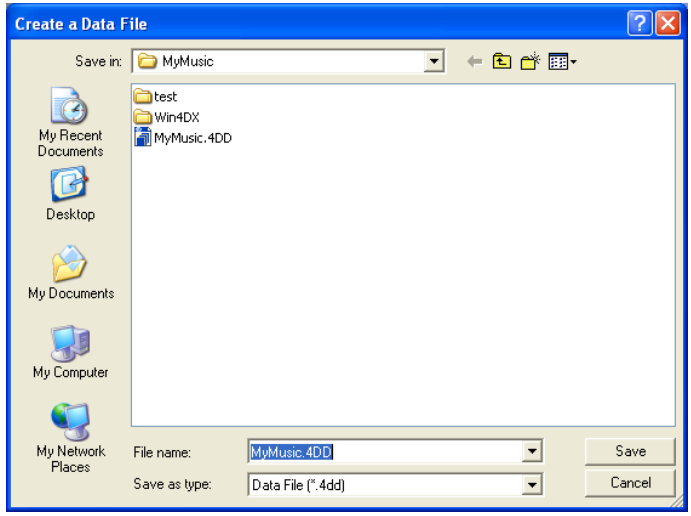
You can also create a new data file by preventing 4th Dimension from opening the default data file automatically.

► To create a new data file:

1 **Choose New > Data File... in the File menu of 4th Dimension.**
**OR**
**Hold down the Alt key (Option key on Macintosh) while opening any database and click the New... button.**
**OR**
**In the Welcome dialog box, click the icon under the Data File area.**

2 **In the Open Data File dialog box, click the New... button.**

4th Dimension displays a create-file dialog box.




In the File name text area, 4th Dimension automatically enters a name for the new data file based on the name of the current structure file.

3 **If you wish to enter a new name for the data file, type the name in the File name area then click Save.**

The names of any other data files in the directory are displayed. If you enter the name of an existing data file, 4th Dimension displays a message asking you if you want to replace the existing data file with the new data file.

4th Dimension will "remember" where the data file is from then on (4th Dimension stores the pathname of the data file). The Open Data File dialog box will not be displayed again unless you call it intentionally (as described above), move the data file to a new location, or change its name.

# Segmenting Data Files

If you are creating a data file that may become very large, you may need to segment the data file. You need to segment a data file if:

- The data file will not fit on your hard disk,
- The data file will become larger than 2 gigabytes.

Using data file segmentation, you can store a single data file on two or more volumes. Each segment can grow to a maximum of 2 gigabytes. The maximum size of a 4th Dimension data file is 128 gigabytes. You do not need to segment a data file when you first create it. You can wait until it becomes too large to manage on your hard disk.

For complete information on segmenting data files, see Appendix A of the *4th Dimension Design Reference* manual.

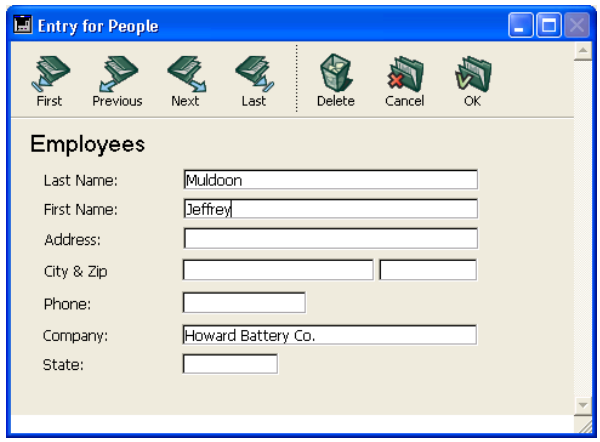
# 3 Data Entry

This chapter covers the basic skills required to manage information using input and output forms. These skills are used whenever you work with data — entering new records, modifying existing records, or working with a list of records.

## Input and Output Forms

Input and output forms provide access to the information in your database. You use forms to enter, view, modify, and print information.

Input forms display one record at a time. They have enterable areas for fields and buttons for working with records. For details, see the "Using Input Forms" section on page 54. Here is an input form that was created using a standard form template.



Output forms display several records as a list. Each row is a record and each column is a field. Typically, only a few fields appear in the output form. Output forms are described in detail in the "Using Output Forms" section on page 51. Here is an output form that was created using a standard form template:

Albums: 22 of 22

| Album Title : | Musician : | Format : |
|---|---|---|
| Rhapsody in Blue, An American in Paris | George Gershwin | CD |
| Sound of Jazz | Lionel Hampton | CD |
| Nat King Cole's Greatest Love Songs | Nat King Cole | CD |
| The Best of the Sylistics | Stylistics, The | Cassette |
| Johnny Mathis, 16 Most Requested Songs | Johnny Mathis | CD |
| Best of B. B. King | B. B. King | DVD |
| Carpenters - Their Greatest Hits | Carpenters, The | CD |
| Jazzis Magazine April 1995 Collection | Various | CD |
| Virtuoso - Ludwig Van Beethoven | Berliner Philharmoniker | CD |
| Temptations 25th Anniversary Volume II | Temptations, The | CD |
| Brahms Piano Quintet - Clarinet Quintet | Benda Musicians, The | CD |
| Best of Gladys Knight & the Pips, 1973-1988 | Gladys Knight & the Pips | Cassette |
| Bad | Michael Jackson | Video |
| Double Good Everything | Smokey Robinson | CD |
| Gettin' Ready | Temptations | CD |
| The Long Run | Eagles | CD |
| Kool & The Gang Spin Their Top Hits | Kool & The Gang | CD |
| Lucille and Other Classics by Kenny Rogers | Kenny Rogers | CD |

Although the above example shows the typical use of a form, any form can be designated as either an input or output form. For instance, a form that contains several fields set out vertically and one or more picture field(s) can be used perfectly well as an output form.

You use an output form to do the following:

- Scroll a list of records
- Highlight a subset of records
- Double-click a record to display it in the input form
- Enter or modify records directly in the list.

Input forms display one record at a time. You can enter and modify information, move from one field in the form to another, and move from one record to another.

An input form usually has buttons that you use to:

- Save a new record to disk or save modifications to an existing record
- Cancel changes to a record
- Navigate from one record to another
- Delete a record.

# Using Output Forms

An output form lists records. Although any form can be used as an output form, most output forms have these features:

- Each row is a record
- Each column is a field or a variable
- Each column is labeled at the top of the window. The columns can be resized using the splitters between each title area.
- The header and/or footer of the form may contain buttons, pop-up menus, etc.

The following is a typical output form.

## Working with Output Forms

There are five basic ways to work with output forms:

- Scrolling to locate records
- Resizing columns

- Highlighting to select records
- Double-clicking to view a record
- Entering and modifying data in fields.

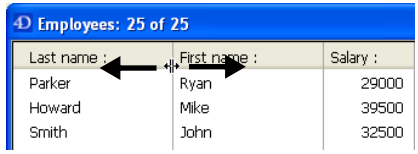
**Scrolling**

An output form has standard horizontal and vertical scroll bars. You can scroll records by clicking either of the scroll arrows, clicking the scroll bar, or dragging the scroll box. You can also use the **PgUp** and **PgDn** keys (to scroll through the list of records one screen "page" at a time) or the **Start** and **End** keys (to go directly to the start or end of the list).

If the output form has more fields than can be displayed in the window, you can scroll horizontally using the scroll bar at the bottom of the window.

**Resizing Columns**

You can resize the output form columns (except when this possibility has been removed in the form editor). To do so, place the mouse cursor over the title area of the columns; the cursor changes as follows ⇹ in order to indicate that the column can be resized. You can then click and move the edge of the column in order to reduce or enlarge it:




**Highlighting**

You highlight (select) a record by clicking it. You can highlight a single record, two or more adjacent records, or two or more non-adjacent records. After highlighting records, you can perform operations such as displaying them as a subset or deleting them.

► To highlight a record:

- **Click a record displayed in the output form or press the ↑ or ↓ keys.**

  The record you clicked is highlighted. If you use the arrow keys, the first or last record of the list is highlighted.

► To highlight several adjacent records:

1. **Click the first record you want to highlight.**
2. **Hold down the Shift key and click the last record you want to highlight (or press the ↑ or ↓ keys).**

   All records between the first and last ones you clicked are highlighted.

► To highlight several non-adjacent records:

1 **Click the first record you want to highlight.**

2 **Hold down the Ctrl key (Windows) or Command key (Macintosh) and click another record.**

3 **Continue clicking records while holding down the Ctrl key (Windows) or Command key (Macintosh).**

Each record you click is highlighted.

► To highlight the entire current selection of records in the output form:

■ **Choose Select All from the Edit menu or use the standard Ctrl+A (Windows) or Command+A (Mac OS) shortcut.**

All records displayed in the output form are highlighted. To highlight all the records in the table, choose **Show All** from the **Records** menu (or the corresponding icon in the toolbar) before choosing **Select All** from the **Edit** menu.

### Double-clicking

To view a record in the input form:

■ **Double-click the record in the output form.**

When you double-click a record, the input form replaces the output form in the frontmost window. The selected record is displayed in the input form, ready for modification.

### Adding and Modifying Records

You can add and modify records directly in an output form. The output form is especially useful for modifying a few adjacent records because several records are displayed on the screen simultaneously.

You can only enter or modify fields in the current table. You cannot enter or modify data in variables, fields from other tables, or subforms.

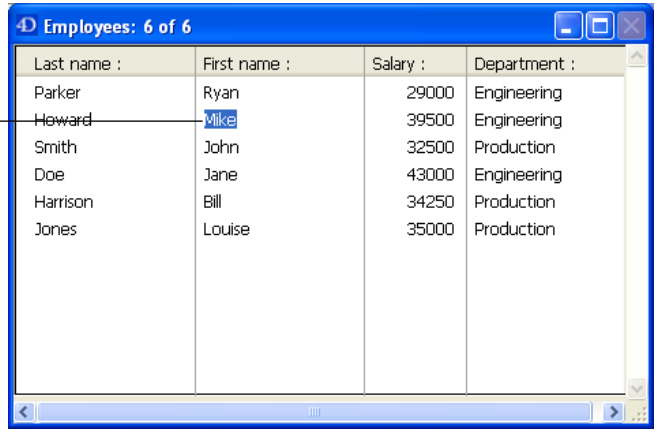
In the output form, you can:

■ Select and edit fields by clicking on them (you have to click twice if the record is not already selected),

■ Move from field to field and record to record using the **Tab**, **Enter** or **Return** keys,

- Add a new record, using the **Records** > **New Record in List** menu command or by clicking on the corresponding button in the toolbar.

Field being modified




Hitting the **Tab**, **Enter** or **Return** keys, or clicking on another field saves your changes.

# Using Input Forms

The input form is the primary tool for entering and modifying data. Most input forms have the following elements to manage information:

- **Enterable Areas**: Input forms have enterable areas (fields or variables) in which data can be entered. You use enterable areas to enter values into the database.
- **Accept Button**: A button for accepting the record. You use the **Accept** button to save a new record or to save changes to an existing record. When you *accept* a record, you request 4th Dimension to add the new record (or your changes to an existing record) to the database.
- **Cancel Button**: A button for canceling the record. You use the **Cancel** button to discard changes you made to an existing record or to discard a new record. If you press the **Cancel** button while entering a new record, 4th Dimension does not add the record to the database. If you press the **Cancel** button while modifying an existing record, 4th Dimension ignores any changes you have made. The record you were modifying is not affected by your changes.
- **Navigation Buttons**: Buttons to navigate from one record to another (e.g., First Record, Last Record, Next Record, Previous Record).

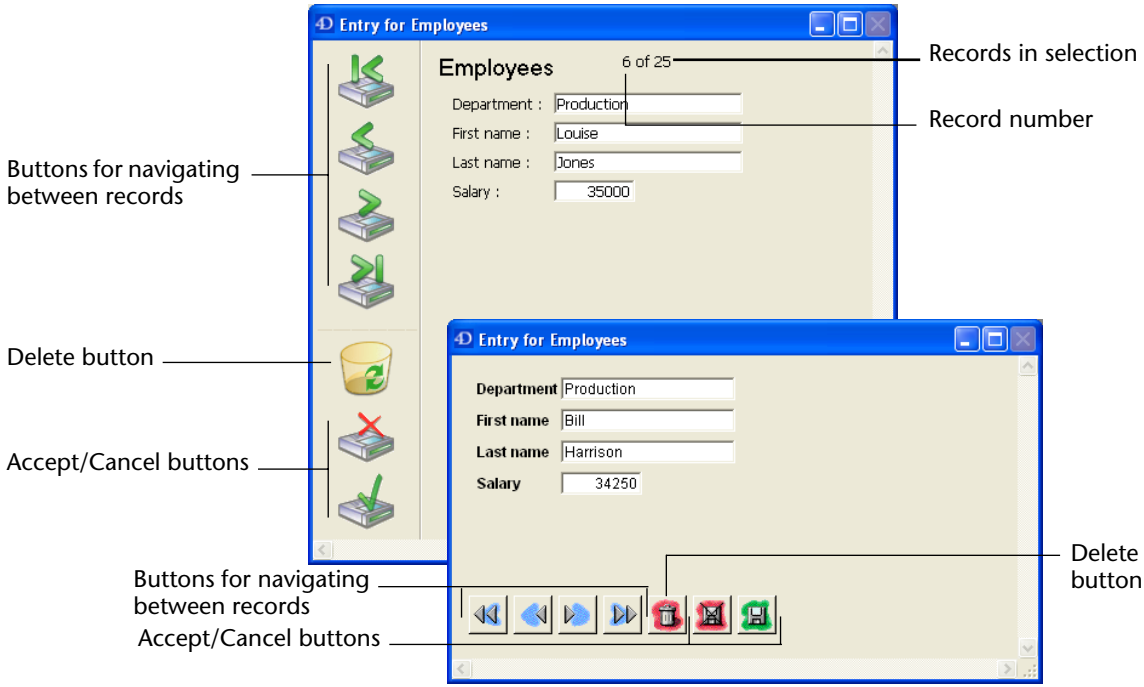
When you press a record navigation button, 4th Dimension accepts the record you were adding or modifying before displaying a new record.

- **Delete Button**: A button for deleting the record. You use the **Delete** button to permanently delete a record from the database.

## Buttons and Form Templates

The Design mode Form wizard lets you create forms quickly and easily based on the combination of a form type (detail form, list form, etc.) and a template (Mac OS, Windows, Web Aware, etc.). It is possible to create forms that are partly or entirely customized.
Depending on the type and template of the form, as well as any parameters that you may have set (number, location and family of buttons chosen, etc.), the accept, cancel and navigation functions will vary accordingly in their appearance.

Here are examples of detail form types using the Windows and Web Aware templates:



## Help Tips in Input Forms

In the 4th Dimension Form editor (Design mode), it is possible to associate help tips with fields and variables of input forms. A help tip can contain the title of a picture button, a data entry hint or, more generally, any information which the developer wishes to provide to the user. The Form wizard associates help tips with each button of input forms created by default.

In User mode, when you place the mouse cursor over an object which has an associated help tip, this tip will be displayed after a few moments in a small label.

For more information about associating help tips with form fields and variables, refer to the *Design Reference* manual.

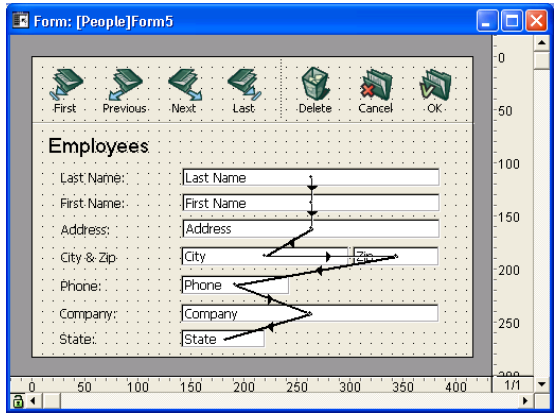
## Enterable Areas and the Data Entry Order

You enter data into enterable areas. An enterable area can be either a field or a variable.

When entering or modifying data, you move from one enterable area to another in a consistent order. This order is called the *data entry order.* Every enterable area into which you can type a value is included in the data entry order. Boolean fields (shown as radio buttons or check boxes), subforms, combo boxes, and areas that accept pictures are also included in the data entry order.

Thermometers, rulers, and dials can also be used to enter data. These objects, however, are not included in the data entry order. You select them by clicking on them.

The data entry order can be changed in the Design environment's Form editor. The data entry order for a particular form may not necessarily move from left to right or top to bottom. A form with a custom data entry order is shown below.



Refer to the *4th Dimension Design Reference* manual for information about changing the data entry order.

► To move forward in the data entry order:

■ **Press the Tab key or the Enter key on the alphanumeric keyboard.**

*Note* In a Text field, pressing the **Enter** key on the alphanumeric keyboard (**Return** key on Macintosh) ends the paragraph you are writing and moves the insertion point to the next line in the field. In this case, use the **Tab** key to move forward in the data entry order.

► To move backward in the data entry order:

■ **Hold down the Shift key and press Tab or Enter.**

► To select any enterable area:

■ **Click in the area or tab into it using either Tab or Shift+Tab (or Enter).**

## Accept Button

When you are satisfied with your entry, you can accept the record. When you accept a record, you tell 4th Dimension to add the record to the database.

► To accept a record:

■ **Click the Accept button.**
**OR**
**Press the Enter key on the numeric keypad.**

*Note* The default validation key can be modified in the application Preferences. Refer to the *Design Reference* manual for more information about this.

4th Dimension adds the record to the database.

Depending on the design of the input form, the **Accept** button may be represented in different ways.

In multi-page forms, the fields on all the pages are part of the same record. In a multi-page form, clicking the **Accept** button on any page saves the entire record. Similarly, pressing the **Enter** key on the numeric keyboard while on any page saves the entire record.

*Note* 4th Dimension updates the data file stored on your hard disk at regular intervals. You can specify this interval using the application Preferences. See the *4th Dimension Design Reference* manual for more information about setting Preferences.

## Cancel Button

If you decide you do not want to add a record to the database or save modifications to an existing record, you can cancel the entry. When you cancel an entry, the data you entered is not saved. If you were modifying an existing record when you canceled, 4th Dimension ignores the modifications. No changes are made to the record stored on disk.

► To cancel a record:

■ **Click the Cancel button.**
**OR**
**Press the Esc (Escape) key.**

*Note* The default cancellation key can be modified in the application Preferences. Refer to the *Design Reference* manual for more information about this.

4th Dimension discards any data you have entered or modified for that record and displays the output form.

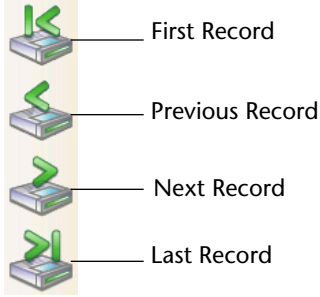
## Record Navigation Buttons

A form often contains buttons or icons for moving from one record to another. 4th Dimension automatically disables navigation buttons when appropriate.

The four navigation buttons are: First Record, Last Record, Previous Record and Next Record.

Clicking any of these buttons accepts the current record and then moves to another record.

The following illustration shows record navigation buttons from one button style that is shipped with 4th Dimension.



*4D Server* If a record to which you are attempting to move is being used by another user, 4D Client displays a message stating that the record is locked and you will be unable to modify it. The record remains locked while the other user is working with it. You will only be able to view the locked record until the other user frees it by clicking the **Cancel** or **Accept** button or by using the navigation buttons or icons to move to another record.

## Page Navigation Buttons

An input form can consist of more than one page. Multi-page forms must provide some way for the user to move from one page to another. The database designer may use page navigation buttons. The four page navigation buttons are: First Page, Previous Page, Next Page and Last Page.

Clicking a page navigation button displays another page in the form but does not accept or cancel the record.

Some forms contain the page navigation buttons shown below. You use these buttons to move to the previous or next page of the form.

Previous Page

Next Page

*Note* Page navigation buttons are not added to all input forms automatically. Your database may use other page navigation controls or not use multi-page input forms.

## Delete Button

An input form may have a **Delete** button. It is used to delete the record being displayed. Deleting a record cannot be undone. Before deleting the record, 4th Dimension displays a dialog box in which you can confirm or cancel the deletion.

To delete the record, click the **OK** button.

## Editing Data

While you are entering or modifying data, you can edit the values you enter before accepting the record. Highlight the value you want to edit and use standard text editing techniques. You can use the **Cut**, **Copy** and **Paste** commands in the **Edit** menu to modify any entry. You can select text by double-clicking or dragging the insertion point over it.

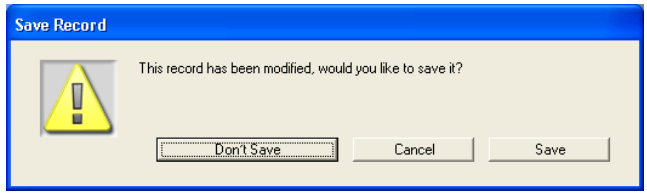
If you make a typing error, you can press the **Backspace** key (**Delete** key on Macintosh keyboards) to backspace over the incorrect characters. You can also choose **Undo** from the **Edit** menu to undo your last action.

For more information about data entry, see the "Entering and Modifying Different Types of Data" section on page 60.

## Interrupting Data Entry

When you use an input or output form, you can choose any menu command that is not dimmed. For example, you can do a query, print a quick report or a set of labels, or graph data.

If you choose a menu command while you are in the process of entering or modifying a record, 4th Dimension displays an alert box asking you whether you want to accept the record, discard the record, or cancel the menu selection and return to the record being entered.




# Entering and Modifying Different Types of Data

Each field in a form has a field type that dictates the kind of data you can enter. Most fields are numeric or alphanumeric. You enter data in these fields simply by typing. Other types of fields accept data only in particular formats.

Alpha, Numeric, Date and Time fields can have display formats associated with them. When you tab out of a field with a display format, 4th Dimension applies the format to the data you entered. For example, a salary field could have a format that displays a dollar sign ($) and two decimal places. If you entered 100.500, tabbing out of the field would produce $100.50.

For more information about the available formats for each data type, refer to the *4th Dimension Design Reference* manual.

*Note* The database designer can also use triggers, object methods, and form methods to process data as it is entered. These tools may be used to validate data, update the contents of other tables, or compute values of variables whenever data is saved or modified. The database designer may also use methods or triggers to provide customized feedback to the user. For more information about triggers, object methods, and form methods, see the *4th Dimension Design Reference* manual.

## Alpha Fields

An Alpha field can contain alphanumeric characters (letters and numbers), punctuation marks, and special characters such as *, %, and {. The maximum length of an Alpha field is set in the Design environment. If you type more characters than the maximum allowed, the extra characters are truncated.

An entry filter can be associated with an Alpha field. An entry filter validates the entries that you type on a character-by-character basis. See the "Fields with an Entry Filter" section on page 71 for more information.

It is possible to automatically spell-check the text being entered in an Alpha field. For more information about this, please refer to the *Design Reference* manual.

When an Alpha field contains a URL (string beginning with http:, ftp:, www. or mailto:), it is detected automatically; under Windows, it is displayed as blue and underlined:

You can **Ctrl+click** (Windows) or **Command+clicK** (Mac OS) the URL to execute it directly in your default Web browser.

## Numeric Fields

4th Dimension supports three types of numeric fields:

- **Real**: This type of field stores real numbers to ±1.7e±308 (15 digits).
- **Integer**: This type of field stores integers from -32768 to 32767.
- **Long Integer**: This type of field stores integers from $-2^{31}$ to $2^{31}$ -1.

If you enter a decimal point and numbers to the right of the decimal in an Integer or Long Integer field, the number will be truncated.

Numeric fields do not store formatting characters such as the dollar sign or the comma. If you enter a formatting character, it is ignored. To format a numeric field, assign a display format to the field in the Design environment.

The only non-numeric characters which are taken into account when entered in a number field are the following:

| Character | Purpose | Example |
|---|---|---|
| Decimal point (.) | Used as the decimal separator | 54.3321 |
| "e" or "E" | Used in scientific notation | 1.1e5 |
| Hyphen (-) | Used for negative numbers | -2090 |

*Note* In the United States, the decimal point (.) is used as the decimal separator in real numbers. Other countries use a different character such as the comma (,) as the decimal separator. When entering numbers in an international version of 4th Dimension, you should use the character specified by your operating system.

## Text Fields

A Text field functions like a text processor. It can hold up to 32,000 characters. Text fields are used for entering long blocks of text such as notes or comments. A Text field can have a vertical scroll bar.

A Text field provides basic text editing features: scrolling, word wrapping within the field, and double-clicking to select words. It also supports the use of the arrow keys and the standard cut, copy, and paste operations. Using the **Enter** key on the keyboard (or **Return** on Macintosh), you can type a Carriage return into a Text field to form paragraphs. If you press the **Enter** key (**Return** on Macintosh), the insertion point moves to the next line. You cannot insert Carriage returns in an Alpha field.

You cannot use tabs in a Text field. If you press the **Tab** key while in a Text field, the insertion point moves to the next enterable area in the data entry order.

4th Dimension lets you paste text into a text field. For example, you can paste the contents of a letter written in a word processor into a Text field.

As an alternative, you can install the 4D Write word-processing plug-in in the database. 4D Write supports multiple fonts, font sizes, styles, text alignment, and integrated mail-merge. For more information about using 4D Write, refer to the documentation that comes with the 4D Write plug-in.

It is possible to automatically spell-check the text being entered in an Text field. For more information about this, please refer to the *Design Reference* manual.

When a Text field contains a URL (string beginning with http:, ftp:, www. or mailto:), it is detected automatically; under Windows, it is displayed as blue and underlined. You can **Ctrl+click** (Windows) or **Command+clicK** (Mac OS) the URL to execute it directly in your default Web browser.

## Date Fields

A Date field accepts any date entered in the format specified by your operating system — for example the month/day/year format (*MM/DD/YYYY*). 4th Dimension stores dates between the year 100 A.D. and the year 32,767. You can enter the year using either two or four digits. If you use two digits for the year:

- 4th Dimension assumes the date is in the 20th century and adds "19" before the digits if the value is **greater than or equal to 30**. For example, for 01/25/97, 4D interprets the date as "January 25, 1997". For 01/25/30, the date is interpreted as "January 25, 1930".
- 4th Dimension assumes the date is in the 21st century and adds "20" if the value is **less than 30**. For example, 4D interprets the date 01/25/07 as "January 25, 2007". The date 01/25/29 is interpreted as "January 25, 2029".

*Note* The default century can be changed programmatically using the SET DEFAULT CENTURY command.

The month, day, and year can be separated by any character except a number. Some example date entries are shown below. The results are shown in the format *MM/DD/YYYY*.

| Entry | Result |
|---|---|
| 6:23:95 | 6/23/1995 |
| 6/23/95 | 6/23/1995 |
| 6 23 1995 | 6/23/1995 |
| 6/23/1995 | 6/23/1995 |

*Note* The United States specifies dates 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. When entering dates in 4th Dimension, you should use the format specified by your operating system.

## Time Fields

A time can be entered in 12- or 24-hour format. The time is stored in hours/minutes/seconds format (*HH:MM:SS*). The entries can be separated by any character except a number.

During data entry, 4th Dimension will attempt to interpret partial entries. For example, the entry "1 p" is interpreted as 1:00 PM or 13:00:00. The "p" tells 4th Dimension to add 12 hours to the value you enter. The entry "6 a" is interpreted as 6:00 AM or 6:00:00.

If you enter "36 3 7", 4th Dimension interprets the entry as "36 hours 3 minutes 7 seconds."

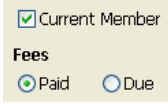
Some example time entries are as follows:

| Entry | Result |
|---|---|
| 11 a | 11:00:00 |
| 3 p | 15:00:00 |
| 3h 11m | 3:11:00 |
| 23:43 | 23:43:00 |
| 6:00:05 | 6:00:05 |
| 23 8 6 | 23:08:06 |

## Boolean Fields

A Boolean field takes on one of two values, TRUE or FALSE. A Boolean field is displayed as either a check box or a pair of radio buttons. Boolean fields can be in the data entry order. When a Boolean field is selected, it is outlined by a marquee on Windows (a border that surrounds the field).

4th Dimension interprets a check box that has been selected (checked) as a yes (TRUE) value and an empty box as a no (FALSE) value. If a Boolean field is displayed as a pair of radio buttons, the value of the Boolean field is TRUE if the first radio button is selected, and FALSE if the second is selected.




► To enter a value for a Boolean field displayed as a check box:

■ **Click the check box to enter the value of TRUE for the field.**

If there is a marquee surrounding the check box, you can press the Space bar to toggle between checked and unchecked or type "Y".

► To enter a value for a Boolean field displayed as a pair of radio buttons:

- **Click on either radio button.**

  If there is a marquee surrounding the radio button, you can press the Space bar to toggle between the two radio buttons or use the keyboard equivalents.

  The first letters of the labels for the radio buttons can be used as keyboard equivalents. For example, if the radio buttons are labeled “Male” and “Female,” you can use the “M” and “F” keys. Also, the “Y” and “N” keys can be used to enter values. Typing “Y” is equivalent to clicking the first radio button; typing “N” is equivalent to clicking the second radio button.

## Picture Fields

A Picture field accepts bitmapped or object-oriented graphics.

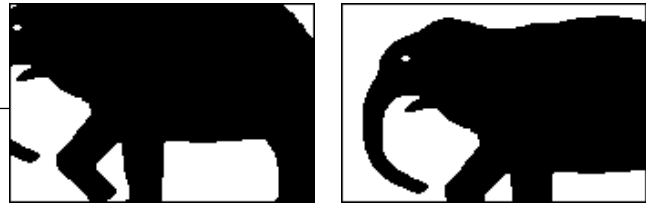
► To enter a picture into a Picture field:

1. **Copy the picture to the Clipboard.**
2. **Select the Picture field into which you want to paste the graphic.**

   Select the field either by clicking or by using the **Tab** key.
3. **Choose Paste from the Edit menu.**

   Graphics stored in a Picture field appear in one of the following display formats specified by the database designer:

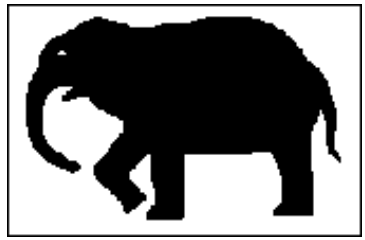
   - **Truncated (Centered and Non-centered)**: The boundaries of the Picture field act like a “cookie cutter” on the graphic that you paste into the field. If the format of the field is Truncated (Centered), the picture is centered in the field and any portions that do not fit in the field are cropped. If the format of the field is Truncated (Non-centered), the upper-left corner of the picture is placed in the upper-left corner of the field and any portions that do not fit in the field are cropped.



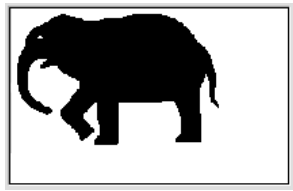

4th Dimension saves the entire picture, even if only a portion is shown on the input form.

If you print the form, only a portion of the picture will be printed unless the **Print with Variable Frame** check box has been selected for the Picture field. For more information about printing with a variable frame, refer to the *4th Dimension Design Reference* manual.

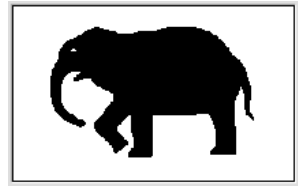
- **Scaled to Fit**: In this display format, 4th Dimension resizes the graphic to fit the dimensions of the field area. Because 4th Dimension may compress or elongate the graphic to fit the dimensions of the Picture field, the picture may appear distorted in the form.



- **Scaled to Fit (proportional and proportional centered)**: In this display format, the picture pasted into the form is reduced proportionally on all sides to fit the area created for the picture. If the picture is smaller than the area defined in the form, the picture will not be modified. If you use Scaled to Fit Centered (Proportional) the image will be centered rather than occupying the top-left area. If the picture is bigger than the area defined in the form, the picture is proportionally reduced, and will not appear distorted.



Scaled to fit (proportional)



Scaled to fit centered (proportional)

- **On Background**: In this display format, the graphic pasted into the form is transparent — any object behind the pasted graphic is visible through the graphic. When a picture is displayed in this format, you can move the pasted picture around the inside of the picture field by dragging it.

4th Dimension remembers the position of the picture after you save the record.

Background picture

- **Replicated**: When this format is applied, if the picture is smaller than the area, the picture pasted in the form is replicated as many times as necessary in order to fill the area entirely.

Replicated

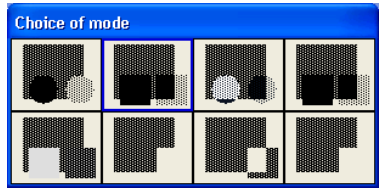
**Contrast of Background Pictures**

When the display format of the picture is **On Background**, you can modify the contrast between the picture and the background at any time.

► To change the contrast of a background picture:

1 **Double-click the field.**

The Choice of Mode palette appears.

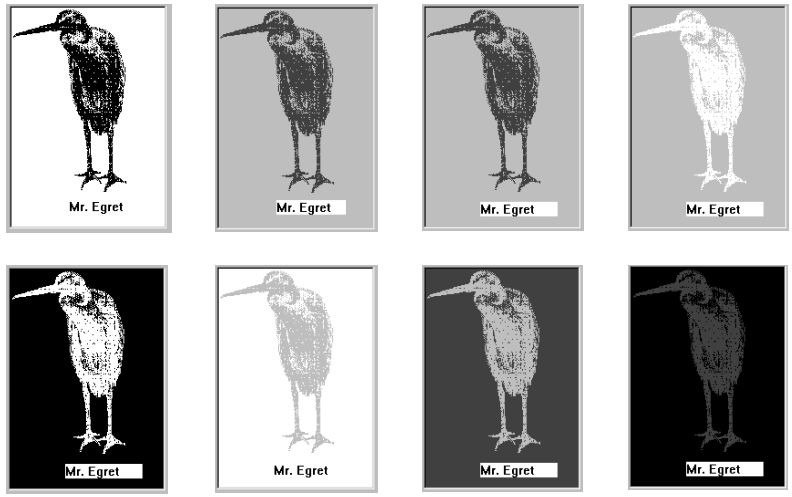



2 **Select one of the contrasts from the palette.**

4th Dimension applies the new contrast to the picture.

The following illustration shows the effect of each Choice of Mode selection. The examples are arranged in the same position as the buttons in the Choice of Mode palette. Each illustration shows how the picture field appears when it is *not* selected for data entry.

A variable that displays the name of the graphic is placed on top of the On Background picture.




You can produce additional combinations by setting the foreground, background, and fill properties of the objects placed on top of or behind the On Background picture field.

## QuickTime Compression

Once you have placed a picture in a picture field, you may compress the field if Apple QuickTime® (version 4 minimum) is already installed on your machine. This option allows you to reduce the space used by images on your hard disk.

In Design mode you can apply a "standard" compression to all images: simply check the **Compression** attribute for the picture field in the Design window of the database (for more information, refer to the *4th Dimension Design Reference* manual).

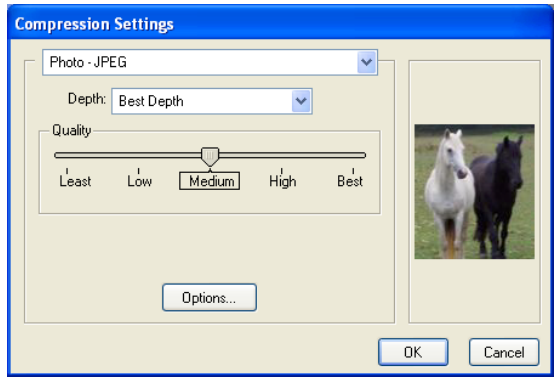
Additionally, you can apply specific compression settings to each image pasted within the Picture field, or just compress certain images.

► To apply specific compression settings to an image pasted in a picture field:

1 **Copy the image to the Clipboard.**

2 **Press the Alt key (Windows) or Option key (Mac OS) and select the Paste command in the Edit menu.**

The QuickTime Compression Settings dialog box appears.




3 **Select your settings and click OK.**

The image will be saved using the settings you just selected regardless of the initial attributes of the picture field.

For more information on QuickTime compression, refer to the *4th Dimension Design Reference* manual.

# Entering Data in Fields with Data Entry Controls

The database designer may have used certain standard data entry controls that restrict the values that can be entered into fields. The following standard data entry controls may be used:

- Mandatory attribute,
- Unique attribute,
- Range of acceptable values,
- Entry filters,
- Choice lists.

These constraints affect the way in which 4th Dimension processes data and provides feedback to users. This section discusses how standard data entry controls affect data entry.

*Note* In addition, the database designer may enforce business rules programmatically. In this case, the nature of the data entry constraint and the type of feedback provided to the user is under the control of the database designer. For example, he or she can build in the same types of constraints but provide more specific user feedback or build highly customized constraints. See your system administrator for information on custom data entry constraints.

## Mandatory Fields

Mandatory fields contain data that is essential to the database such as a field that uniquely identifies each record in a table. Any field type can be given the Mandatory attribute.

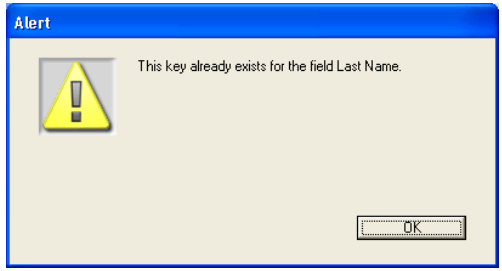
If a field is mandatory, you must enter a value for that field before the record can be accepted. If you do not enter a value into a mandatory field, 4th Dimension displays an alert box when you try to accept the record.

After you put away the alert box, you can enter a value into the mandatory field and accept the record. 4th Dimension will not let you accept the record until you have entered a value into the mandatory field.

## Unique Fields

A field with the Unique attribute accepts only entries that uniquely identify each record in the table. For example, the Unique attribute is usually assigned to the primary key field of a table such as a Social Security number or invoice number field.

When you enter a value into a unique field and press the **Tab** key, 4th Dimension determines whether or not the entry is unique. If you enter a value that already exists, 4th Dimension displays an alert box that informs you that the key value has already been entered.

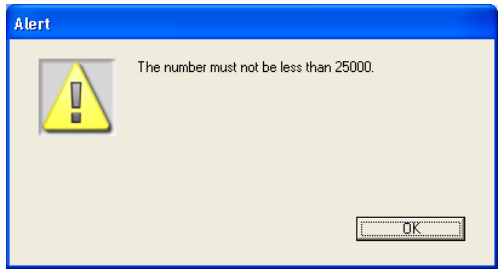



You can then enter a new value.

*Note* You cannot enter more than one record with a null value in a unique field.

## Fields with a Validation Range

A validation range specifies the minimum and maximum values that may be entered in an area. If you enter a value above the maximum value or below the minimum value, 4th Dimension displays an alert box when you press the **Tab** key. The alert box will tell you the minimum or maximum value you have exceeded.

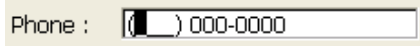



## Fields with an Entry Filter

An entry filter is a data validation tool. It examines each character as it is typed. As you type, 4th Dimension compares each character you enter to the set of characters specified by the entry filter. If you type an invalid character, 4th Dimension rejects the character and does not display it on the screen. Invalid characters are disregarded and valid characters are displayed normally.

When a field with an entry filter is selected for data entry, the display format appears. In the following illustration, a telephone number field uses an entry filter and display format. The display format specifies parentheses surrounding the area code, a space after the closing parenthesis, and a dash between the third and fourth characters. The entry filter itself accepts only numeric characters.

When the field is selected, the first enterable position is highlighted. Notice that the parenthesis is for display only; it cannot be selected or edited.




As you type numbers, 4th Dimension accepts your entries. If you type an alphabetic character, the character is filtered out. As you type each number, the next enterable position is highlighted.

If you want to delete a character, press **Backspace** (**Delete** on Macintosh). An entry filter can also specify the maximum number of characters that can be entered in a particular field. When you enter the last character, the insertion point automatically moves to the next enterable area. You do not need to press the Tab key to move to the next field in the data entry order. For instance, entering a state abbreviation such as "CA" in a two-letter State field automatically moves the text insertion point to the next field in which you can enter data.

The cut, copy, and paste functions do not work normally if an entry filter is associated with an enterable area. You cannot cut or copy more than one character and you cannot paste into a field with an entry filter.

## Fields with a Choice List

Moving the insertion point into a field with a choice list displays a list from which you can choose a value. The list is displayed in the choice list window. An example of a choice list window is shown below:

A choice list is often used to limit entries to specific values and prevent misspellings. For example, a Payment Type field in an Invoices database can be associated with a list of all the procedures used for payment.

A list can also be used to exclude values from a field or require that only certain values be entered. Excluded lists contain values that are not acceptable. If you type a value that appears on an excluded list, an alert box will be displayed indicating that the value you typed is not allowed.

► To enter data using a choice list:

1 **Select the field for data entry by pressing Tab or clicking in the field.**

The choice list for the field appears.

2 **Double-click the desired item to select and enter the item.**
**OR**
**Click the value you want to enter.**
**OR**
**If the list is sorted, type an entry.**
**OR**
**Use the Up and Down Arrow keys to highlight values on the list.**
If you type an entry, the list scrolls to match the value you type.

3 **Press Enter on the alphanumeric keyboard (Return on Macintosh) to select a highlighted value.**
To cancel the entry, click **Cancel** or press the **Tab** or **Esc** key.

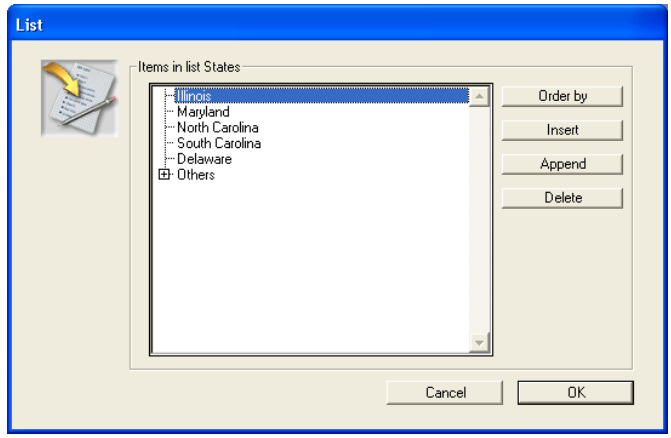
## Modifying Choice Lists

A choice list can be designated as modifiable. In this case, the **Modify** button in the choice list window is enabled. If a list is modifiable, you can do the following:

- Add items to the list
- Modify items on the list
- Delete items
- Sort the list alphabetically

► To modify a choice list:

1 **Click the Modify button in the choice list window.**
The Items in List dialog box appears.



The dialog box lists the items of the list. The buttons on the right side of the dialog box are used to modify the list.

**Adding Items**

If the value you wish to enter is not in the list, you can add it to the list. You should do so if the item will be used again.

► To add items to the end of the list:

1 **Click the Append button.**
4th Dimension adds an empty area below the last entry in the list and places the insertion point in it.

2 **Type an item and press Tab or click outside the entry area to save your changes.**

**Inserting Items**

If you insert an item rather than appending it, you can place it above a selected element.

► To insert an item in the list:

1 **Click an item on the list.**

2 **Click the Insert button.**
4th Dimension creates an entry area above the item you clicked on and places the insertion point in the entry area.

3 **Type an item and press Tab or click outside the entry area to save your changes.**

**Modifying Items**

You can also edit any item.

► To modify an item:

1 **Alt+click (Option-click on Macintosh) the item you want to modify**
**OR**
**Click twice on the item you want to modify.**
The item becomes editable.

2 **Edit the item as needed.**

3 **Press Tab or click outside the entry area to save your changes.**

**Deleting Items**

You can delete an item that is not appropriate for data entry.

► To delete an item:

1 **Click the item in the list and click the Delete button.**
4th Dimension deletes the item from the list and removes the space it occupied.

**Sorting the List**

You can sort the list to facilitate data entry.

► To sort the list:

1 **Click the Order By button.**

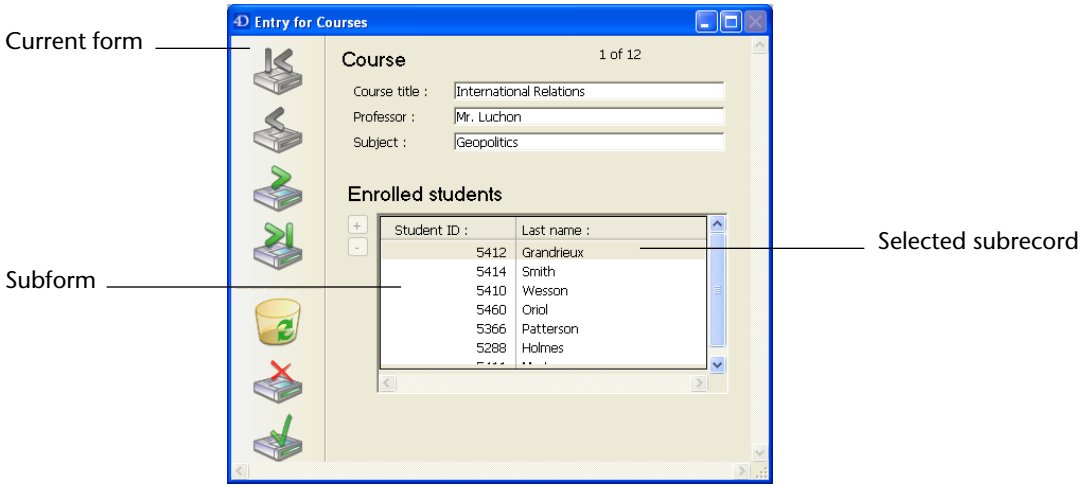
4th Dimension sorts the list alphabetically. Sorting the list allows you to select an item by typing.

Click **OK** to save the modified list, close the dialog box, and enter the selected item in the field. Or, click **Cancel** to discard any changes you made and close the dialog box.

# Using Subforms

Some of your forms may contain subforms — forms from other tables or subtables that are nested within the current form. The current form in this context is sometimes called the *parent* form.

Subforms provide a way for you to add data to a subtable or to a related table without switching tables or forms. Usually, subforms are shown as list areas included in the parent form.




The commands for selecting, creating and modifying sub-records (records displayed in subforms) differ according to the property set for the subform in the Design mode.

## Selecting Subrecords

Three selection modes can be set for a subform in the Design mode:

- **None**: In this case, it is not possible to select a subrecord. Clicking on the list has no effect unless the subform is "Enterable in List" (see below). Navigation keys will only allow you to scroll through the list.
- **Single**: In this case, only one record can be selected at a time. Clicking on a record highlights it. If you **Ctrl+click** (Windows) or **Command+click** (Mac OS) a record, it switches between a selected/deselected state. The **Up** and **Down** arrow keys select the previous/next record in the list. The other navigation keys scroll through the list.
- **Multiple**: In this case, more than one record can be selected simultaneously. Clicking on a record highlights it. The **Ctrl+click** (Windows) or **Command+click** (Mac OS) and **Shift+click** combinations can be used to create multiple selections. The **Up** and **Down** arrow keys select the previous/next record in the list. The other navigation keys scroll through the list.

## Entering Data in Subforms

Data entry and modification can be carried out in different ways depending on the properties set for the subforms in the Design mode.

### Modification

- If the **Enterable in List** property has been assigned to a subform, you can modify subrecord data directly in the list. To do this, just click on the field to be modified in order to switch to editing mode (click twice if the subrecord was not already highlighted).
  When you double-click a subrecord, you can display or modify its values in the detail form associated with the subform (unless double-clicking has been disabled, see below).
- If the subform does not have the **Enterable in List** property, data entry must be carried out in the detail form associated with the subform. This form is automatically displayed when you double-click on a line of the subform (unless double-clicking has been disabled, see below).

### Addition

To add a subrecord, select the subform area then press the **Ctrl+Shift+/** (Windows) or **Command+Shift+/** (Mac OS) keys, or click on the add button of the subrecord (displayed as follows + by default).

*Note* The shortcut used to add a subrecord can be modified in the application Preferences (for more information, refer to the *Design Reference* manual).

- If the **Enterable in List** property has been assigned to a subform, a new blank line is added below the existing lines, ready for data entry. The subrecord is saved as soon as you tab out of the subform area, or when you click outside of this area.
- If the subform does not have the **Enterable in List** property, the detail form associated with the subform will be displayed blank. The subrecord is saved as soon as you validate this detail form.

*Note* If the subform belongs to a subtable, the new subrecord will only be saved when you have validated the parent record.

**Action in the Case of a Double-click**

In the Design mode, it is possible to set the behavior of subforms in response to a double-click on a subrecord. The following behaviors can be set:

- *Nothing happens*: Double-clicking has been disabled (**Do nothing** option in the subform properties).
- *The detail form associated with the subform is displayed, ready for data entry*: Double-clicking causes the detail form to open with the page switched to editing mode (**Edit Record** option in the subform properties).
- *You stay in the list form and the first field of the subrecord switches to editing mode*: Double-clicking causes the list form to switch to editing mode (**Edit Record** and **Enterable in List** options in the subform properties).
- *The detail form associated with the subform is displayed as read only*: Double-clicking lets you display the data in the detail form (**Display Record** option in the subform properties).

# Choosing Tables and Forms

In the User environment, you can switch between tables whenever you need to work with data in another table. For example, while entering data into a company table, you may need to look up a home telephone number stored in an employee table.

Each table can have many forms attached to it. You can create different forms to meet specific needs. For example, different report forms can be used for different types of reports and different forms can be used for different monitor sizes. In the User environment, you can switch between tables and forms at any time.

Each table has a current input form and a current output form. You specify a default input and output form in the Design environment for each table in the database. These forms are used unless you specify different forms in the User environment.

To choose tables and forms in User mode, you must use the **List of tables** window. This window lets you change quickly from one table to another or from one form to another.

You can choose a new table or a new form while you are using either an input or output form. Your choices are implemented immediately.

*Note* The changes you make are temporary. The permanent selections are made using the Explorer in the Design environment.

► To choose a table using the List of Tables window:

1 **If the List of Tables window is not visible, choose the Tables List command in the Records menu.**

The List of Tables window moves to the front.

If necessary, use the scroll bar or the size box to view the names of additional tables.

Each table name in the List of Tables window is accompanied by two icons that represent input and output forms. The left icon represents input forms. The right icon represents output forms.

2 **Click the name of the table in the List of Tables window.**

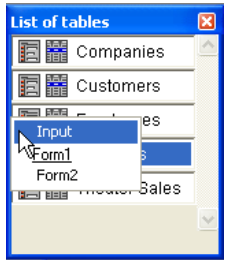
4th Dimension displays the current selection for that table using the output form.

► To change forms:

1 **Click either the input or output icons next to a table name in the List of Tables window and hold down the mouse button.**

A pop-up menu appears, listing the names of input or output forms belonging to that table.

An underline in the pop-up menu indicates the current input or output form.




2 **Select the name of the form you want to specify as the current input or output form.**

These settings will remain in effect until you replace them with others or until you exit the database.

# 4 Selecting Records

You select records in your database to access information that you want to use. For example, you might search a database of contacts to look up the telephone number of a person you need to call or to select the people to whom you want to send product information.

In 4th Dimension, the group of records you have selected is called the *current selection*. The current selection can be any subset of records in a table — from no records up to all the records. For more information about the concept of the current selection, see "The Current Selection" section on page 22.

You can change the current selection by:

- Selecting all records
- Selecting a subset of records
- Searching for records.

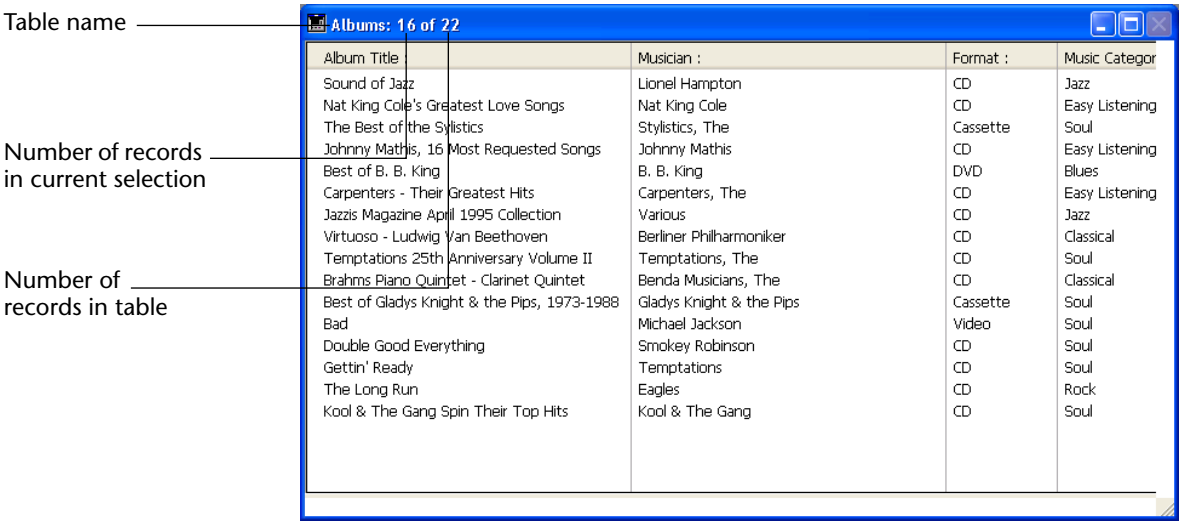
The current selection is the group of records on which operations are performed. For example, you can:

- Sort the current selection
- Perform a global update of records in the current selection
- Print the records using a form or a quick report
- Print labels
- Graph data
- Modify or delete records
- Export records.

In other words, creating a current selection in a table is the first step in many other data management operations.

The title bar of the output form tells you how many records are in the current table and how many records from the table are in the current selection.

*4D Server* With 4D Client, only the number of records in the current selection is displayed.




| Album Title | Musician : | Format : | Music Categor |
|---|---|---|---|
| Sound of Jazz | Lionel Hampton | CD | Jazz |
| Nat King Cole's Greatest Love Songs | Nat King Cole | CD | Easy Listening |
| The Best of the Stylistics | Stylistics, The | Cassette | Soul |
| Johnny Mathis, 16 Most Requested Songs | Johnny Mathis | CD | Easy Listening |
| Best of B. B. King | B. B. King | DVD | Blues |
| Carpenters - Their Greatest Hits | Carpenters, The | CD | Easy Listening |
| Jazzis Magazine April 1995 Collection | Various | CD | Jazz |
| Virtuoso - Ludwig Van Beethoven | Berliner Philharmoniker | CD | Classical |
| Temptations 25th Anniversary Volume II | Temptations, The | CD | Soul |
| Brahms Piano Quintet - Clarinet Quintet | Benda Musicians, The | CD | Classical |
| Best of Gladys Knight & the Pips, 1973-1988 | Gladys Knight & the Pips | Cassette | Soul |
| Bad | Michael Jackson | Video | Soul |
| Double Good Everything | Smokey Robinson | CD | Soul |
| Gettin' Ready | Temptations | CD | Soul |
| The Long Run | Eagles | CD | Rock |
| Kool & The Gang Spin Their Top Hits | Kool & The Gang | CD | Soul |

Every table in a database has its own current selection. In a relational database, changing the current selection in one table can change the current selections in related tables. For example, in a database consisting of related [Employees] and [Departments] tables, a opening an input form in the [Departments] table changes the current selection in the [Employees] table. That is, the employees belonging to that department become the new current selection in the [Employees] table. For more information about relations, see the *4th Dimension Design Reference* manual.

If you are using several processes to perform database tasks, you can have several current selections for a table simultaneously. Each process acts like a separate 4th Dimension environment, allowing you to perform separate tasks.

The ability to have more than one current selection per table can be very useful, especially when comparing two or more subsets of records, such as the monthly invoices from several sales territories. For more information about processes, see the "Multi-tasking in 4th Dimension" section on page 24. For information about creating processes, refer to the *4th Dimension Design Reference* manual.

# Selecting All Records

When using an output form to display records, you can reset the current selection so that it contains all the records in the current table.

► To select all records:

1 **Choose Show All from the Records menu or click the corresponding icon in the toolbar of the User mode.**

All the records in the current table are placed in the current selection.

*Note* **Show All** is dimmed if you are using an input form.

# Selecting a Subset of Records

You can create a new current selection directly in the output form by highlighting records and defining the highlighted records as the new current selection.

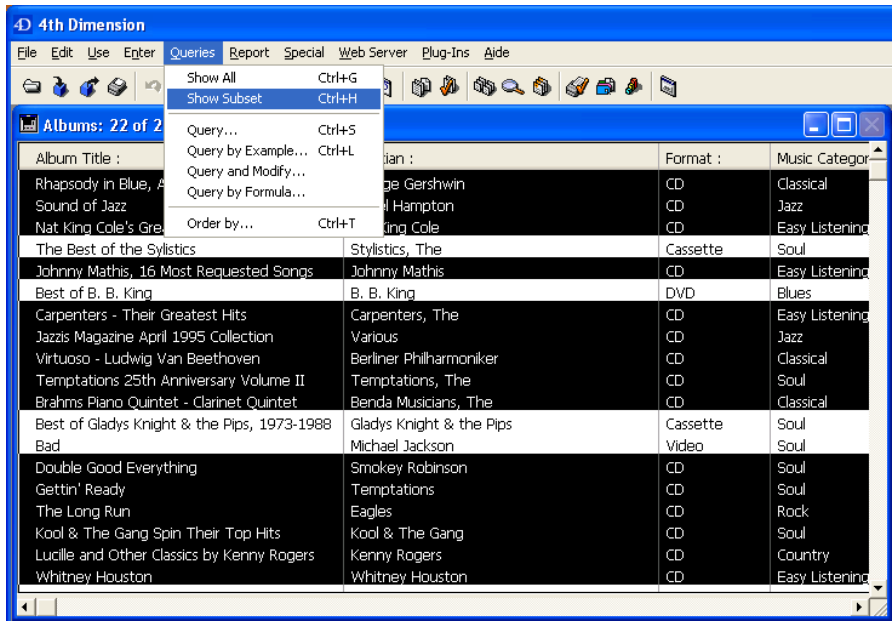
► To create a subset:

1 **Highlight one or more records.**

Instructions for highlighting an adjacent or non-adjacent set of records is found in the "Highlighting" section on page 52.

2 **Choose Show Subset from the Records menu or click the corresponding icon in the toolbar of the User mode.**

4th Dimension displays the new current selection in the output form.




# Searching the Database

Searching is one of the most common database operations. It is often the most convenient way to select the records with which you want to work.

The term *searching* refers to finding a group of records in the database based on the contents of one or more fields. You perform a search by specifying a query. A *query* is the set of instructions that tells 4th Dimension which records to include in the new current selection, such as “Company Name is equal to 4D.”

A query always has three elements: *field name*, *comparison operator*, and *value*. The field name is from the current table or a related table. The comparison operator tells 4th Dimension how to compare the contents of the field to the value you specify (equal to, greater than, less than, and so forth). The value specifies the number, string, or other value to which each record is compared.

Suppose you want to see all the records for employees with salaries greater than $30,000. The query you would use is “Salary is greater than 30000.” “Salary” is the field, “is greater than” is the comparison operator, and “30000” is the value.

When you search a database, 4th Dimension compares the contents of the field in the query to the value you specify. The new current selection is made up of records that satisfy the rules stated in the query. The new current selection can be no records, one record, a group of records, or all the records in the table.

You can perform a query while you are using either an input or an output form. If you perform a query while you are using an input form, the first record in the new current selection is shown in the input form. You can view, modify, or print the record. If the new current selection consists of more than one record, you can move through the records using the navigation buttons (Previous Record, Next Record, First Record, Last Record). If you modify a record before pressing a navigation button, 4th Dimension will save the modifications to disk.

In relational databases, you can search in fields from other tables, provided that a relation between the tables has been established. For more information about relations, see the *4th Dimension Design Reference* manual.

If you do the query while using an output form, the new current selection is displayed in the output form. You can reset the current selection to all the records in the current table by choosing **Show All** from the **Records** menu.

*Note* If a field in the database structure is not used in the current database, the database designer can elect to hide the field by giving it the Invisible attribute. Only tables and fields which are visible appear in the Query editor. For information about making tables and fields invisible, refer to the *4th Dimension Design Reference* manual.

## Indexed and Sequential Queries

4th Dimension can carry out queries very quickly if it has an ordered list of records to work from. An ordered list is called an *index*. An index is associated with a particular field and is stored on disk as part of the data file.

A query that is performed without an index is slower than an indexed query because the program must start at the beginning of the table and examine each record until it finds the records that meet the criteria you have set. To be sure that it has found all the records you are looking for, it must examine every record in the table sequentially. This process is called a *sequential* search.

If an index is available, the program "knows" where the target records are located. If you are searching for everyone whose last name is Smith, the program will know where in the table the Smiths are located. Thus, it doesn't need to examine every record in the table.

A good analogy for an index is a card catalog in a library. The card catalog is an alphabetized list of all the books in the library. Each record in the catalog contains information about the book's location. If you are looking for a particular book, it would be inefficient to conduct a sequential search of the library's entire holdings. It is much faster to consult the card catalog, obtain the location of the book, and then search the particular shelf on which the book is stored.

When you are designing a database, you should index the fields that you are likely to use often for searching. As you enter or import records, 4th Dimension automatically updates all indexes. When you do queries, 4th Dimension automatically uses indexes if they are available.

*Note* 4th Dimension allows you to choose between two indexing modes, depending on how the index will be used. For more information, refer to the *4th Dimension Design Reference* manual.

## Comparison Operators

When you write a query, you tell 4th Dimension how to compare the value you specify to the contents of the database. For example, the query, "Last Name equals 'Smith'" uses the "is equal to" comparison operator. It tells 4th Dimension to compare the values in the Last Name field to the string "Smith."

Comparisons involving alphanumeric values are not case-sensitive. A search on the last name "Smith" will find records containing "smith," "SMITH," "sMith," and so on.

The following comparison operators are available:

- Is equal to - Is not equal to
- Is greater than - Is greater than or equal to
- Is less than - Is less than or equal to
- Contains - Does not contain.

*Note* Queries using the Contains and Does Not Contain operators are always sequential queries.

### Wildcard Character

To make queries easier to specify, 4th Dimension has a wildcard character (@) that can replace one or more characters in a search involving an Alpha or Text field. For example, if you are looking for all occurrences of the name "Belmondo" in a field, you may specify the search value in several ways:

| A search for: | Finds |
|---|---|
| Bel@ | All values beginning with "Bel" |
| @do | All values ending with "do" |
| Bel@do[1] | All values starting with "Bel" and ending with "do" |
| @elm@ | All values containing "elm" |

1. In the Preferences dialog box, you can specify that 4th Dimension evaluates the @ character (the "at" sign) as a literal character in searches or character string comparisons when it is found within a word (but *not* at the beginning or the end of a word). This option is particularly useful for databases that store e-Mail addresses (which are usually "name@provider.com"). For more information, please refer to the *4th Dimension Design Reference* manual.

## Simple and Compound Queries

You can search on one or more fields. A query on one field is called a *simple* query. For example, the search "Last name equals 'Smith'" is a simple query. When you do a simple query, 4th Dimension examines the contents of one field when searching the database.

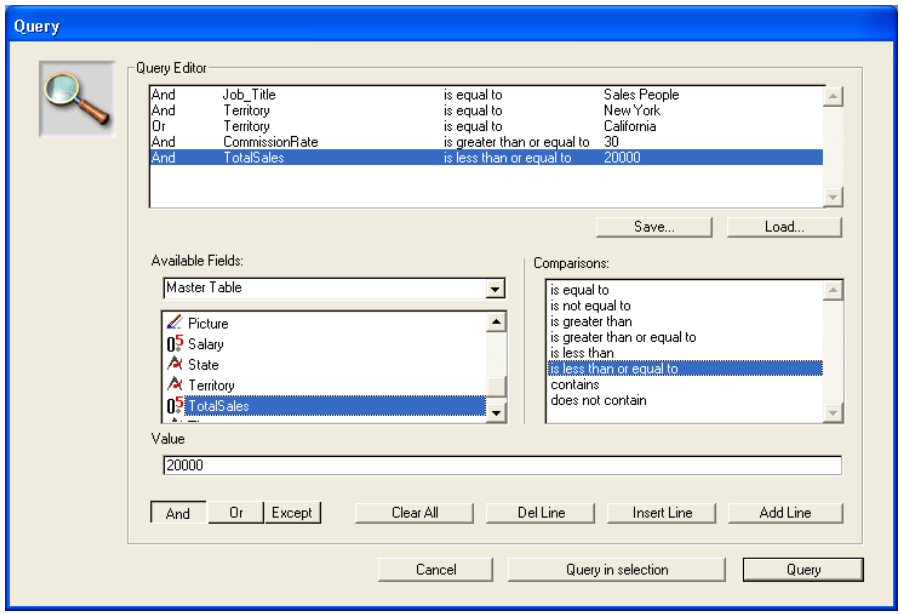
A query on two or more fields is called a *compound* query. When you do a compound query, you combine separate queries using a *conjunction operator.* The conjunction operator tells 4th Dimension how to combine the results of the individual queries.

There are three conjunction operators:

- **And**: This operator finds all the records that meet the two conditions simultaneously. For example, the query "Find all the employees who work in the engineering department *and* who make over $50,000" will find the records of only those engineering employees who make over $50,000.
- **Or**: This operator finds all the records that meet either of two simple queries. For example, the query "Find all the employees who work in the engineering department *or* who make over $50,000" will find the records of all the people in the engineering department, as well as all the people who make over $50,000 regardless of the department in which they work.
- **Except**: This operator is the equivalent of "not." The query "Find all the engineers *except* those who make over $50,000" will exclude the engineers making more than $50,000.

The conjunction operators let you create compound queries such as "Find the salespeople in New York *or* California *and* who have commission rates in excess of 30 per cent *and* who had sales volume less than $20,000."

The figure below shows this query being specified in the Query editor.



When this query is executed, 4th Dimension finds all the New York and California salespeople who may be getting high commissions for low volume sales. Additional examples of the uses of comparison and conjunction operators are given for each search method.

# Using the Query Commands

4th Dimension provides several powerful methods for searching a database. You can use any of the search methods to create a query. Records that meet the condition become the new current selection.

You can choose any search method when you are using either an input or output form.

The **Records** > **Query** menu provides four menu commands related to searching. Each menu command displays a different dialog box or window or provides different options. They differ in the types of queries they carry out and the way in which the current selection is displayed.

The four commands of this submenu represent four different search methods:

- **Query**: This menu command displays the Query editor. It is a general-purpose search dialog box that can be used to perform simple or compound queries. You can specify compound queries using the conjunctions. You can also save queries to disk and restrict the query to the current selection.
- **Query by Example**: This menu command displays the current input form for use as a search window. You specify a query by typing the values for which you want to search in the areas corresponding to the fields to be searched. You can specify compound queries by typing values into more than one area. The results of your query are displayed in the current output form.
- **Query and Modify**: This menu command is identical to the **Query by Example** menu command, the difference being that the first record of the selection from the query is loaded, ready to be modified. You can make changes and then browse among found records in order to modify them one by one.

- **Query by Formula**: This menu command displays the Formula editor. You use the Formula editor to construct a query that uses a formula as the query. For example, you can use Query by Formula to search on the last three digits of a six-digit part number. A valid formula returns a Boolean expression (TRUE or FALSE).

## Query Editor

The Query editor is a general-purpose editor that can be used to create simple or compound queries:

- You can create compound searches linked with the And, Or, or Except conjunctions. For example, you can use the Query editor to perform a query for all employees who are over 60 years old *or* who have an income in excess of $45,000.
- You have the choice of searching through the current selection of records or all the records in the table. The other three search methods always search the entire table.
- You can save queries to disk and open them when you want to repeat the query.
- The Query editor remembers your last query. You can edit the query or clear it and enter a new query.

  You can search in fields of the current table as well as fields of related tables. You can also search in subfields of the current table or subfields of related tables.

  If your database includes subtables, you can use subfields in your queries. A query on subrecords creates a new current selection of parent records, not subrecords. This group of parent records contains at least one subrecord that meets the query.

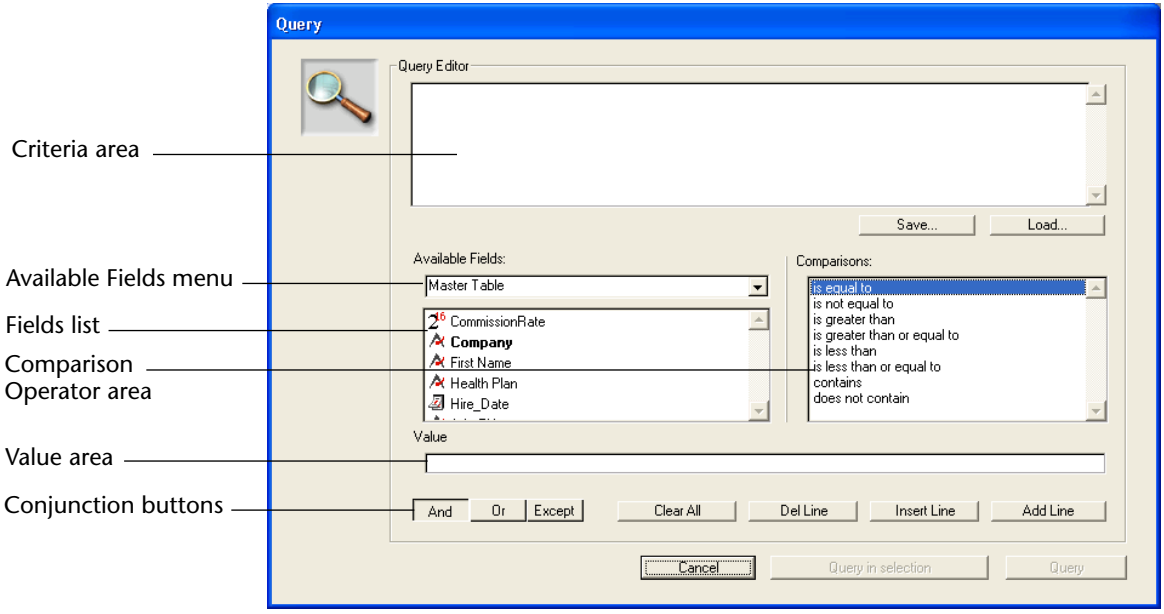
  However, the query does not remove the other subrecords from the parent record. All subrecords stay attached to their parent records.

  Suppose a database for employees includes a subtable for information about employee children. The fields in the subtable, called subfields, are First Name, Middle Name, and Last Name. To find all the employees with a child named John involves searching the subrecords for John in the First Name subfield. 4th Dimension finds all the parent records with at least one subrecord with the name “John” in the first name subfield. In this case, the selection contains the parent records — not just the subrecords themselves.

If your database includes related tables, you can include fields from related tables in your query. A query on a field in a related Many table works like a search of subrecords. The new current selection in the One table consists of all records that are related to at least one record in the Many table that meets the query. Queries on related tables are always sequential, even if the field being searched in is indexed.

For example, if employees are stored in the One table and children are stored in a related Many table instead of a subtable, a query for employees with children named John would produce the same current selection of employees.

The Query editor is shown below:




The Query editor contains the following areas:

- **Criteria area**: This area displays the query as you create it or after you load it from a disk file.
- **Available Fields menu**: This menu allows you to select the table or tables from which you want to display fields in the Fields list. You can display fields from the Master table, the Related tables, or All tables.
- **Fields list**: This area displays a hierarchical list of the fields in the selected table or tables. Indexed fields are shown in boldface.

- **Comparison Operator area:** This area displays a list of comparison operators.
- **Conjunction buttons**: This area contains three buttons that correspond to conjunction operators you can use to join the current simple query to the previous simple query.
- **Value area**: You enter the value for which you want to search in this area.
- **Query in selection button**: This button performs the query only on the records in the current selection.
- **Query editor buttons**: You use this area to save your queries, load other queries from disk, cancel the query, or execute the query.

► To create a query:

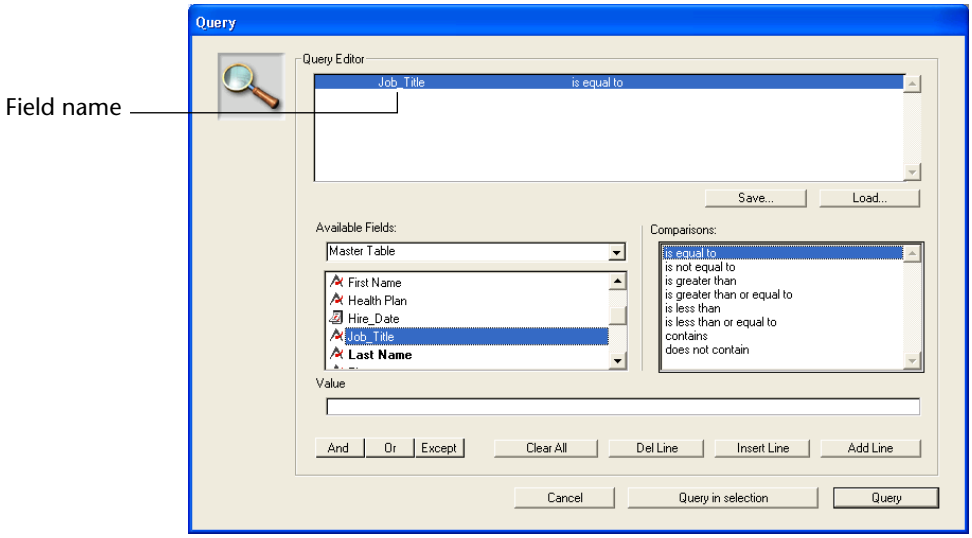
1 **Choose the subcommand Query > Query... from the Records menu or click the corresponding icon in the toolbar of the User mode.**

4th Dimension displays the Query editor, highlighting the first row of the Criteria area.

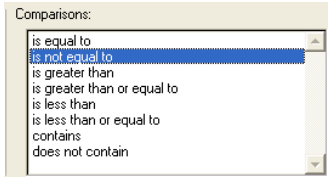
2 **Click a field name in the Fields list[1].**

1. If the desired field is in a related table, you need to display the fields of the related table. See the "Selecting a Field from Another Table" section on page 97.

4th Dimension displays the field name in the Criteria area and adds the "is equal to" comparison operator, as shown below.




**3 If you do not want to use the "is equal to" operator, click the desired comparison operator.**

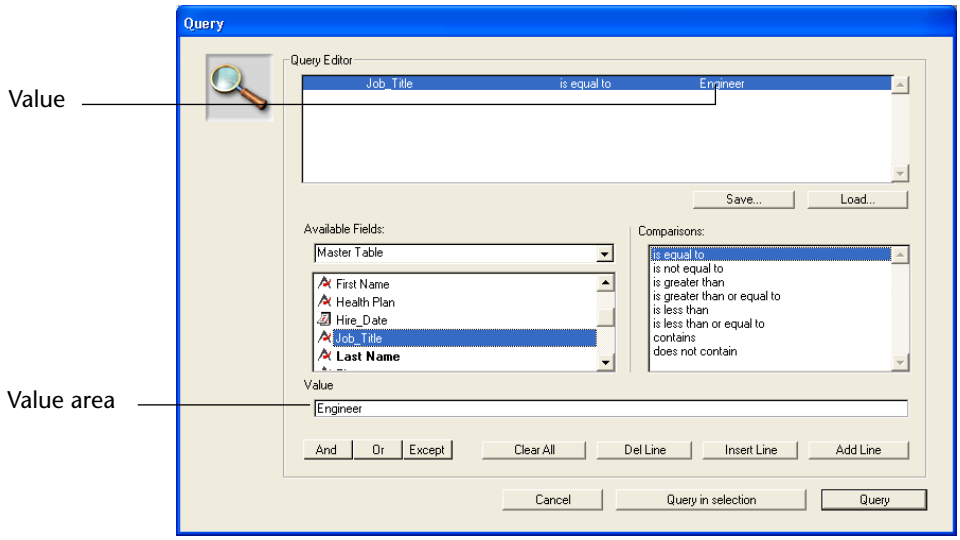



Your choices are:

- Is equal to
- Is not equal to
- Is greater than
- Is greater than or equal to
- Is less than
- Is less than or equal to
- Contains (Alpha and Text fields only)
- Does not contain (Alpha and Text fields only).

If you want to use the "starts with" comparison (on Alpha or Text fields only), see the "Using the "Begins With" Operator" section on page 97.

**4 Type the value you want to search for in the Value area.**




In a Text or Alpha field you can use the wildcard character (@) at the end of the value to request a "Begins with" search.

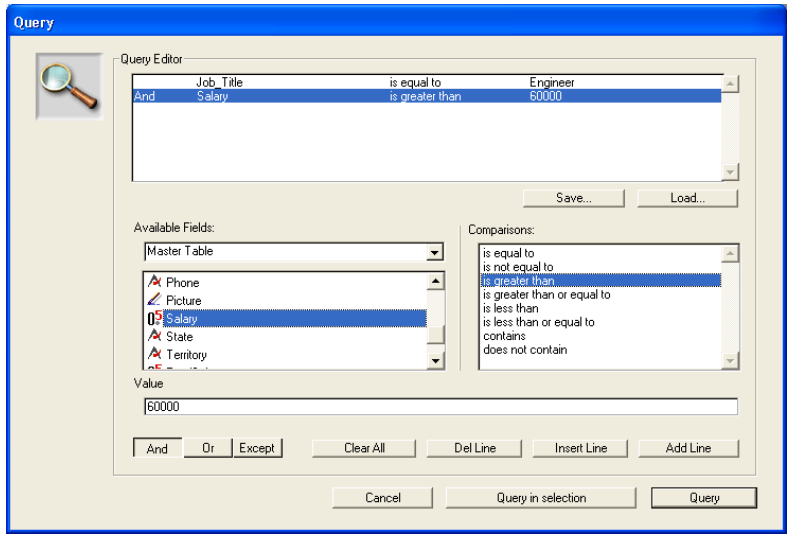
If the field you selected is associated with a choice list, 4th Dimension displays the list and prompts you to select a value. If the field you selected is a Boolean field, 4th Dimension displays a pair of radio buttons. If the field you selected is a subtable, a window listing the subfields is displayed.

**5 If you want to add another simple query, click Add Line.**

4th Dimension adds a new line using the "And" conjunction operator.

**6 If you want to use the "Or" or "Except" operator, click the desired conjunction operator button.**

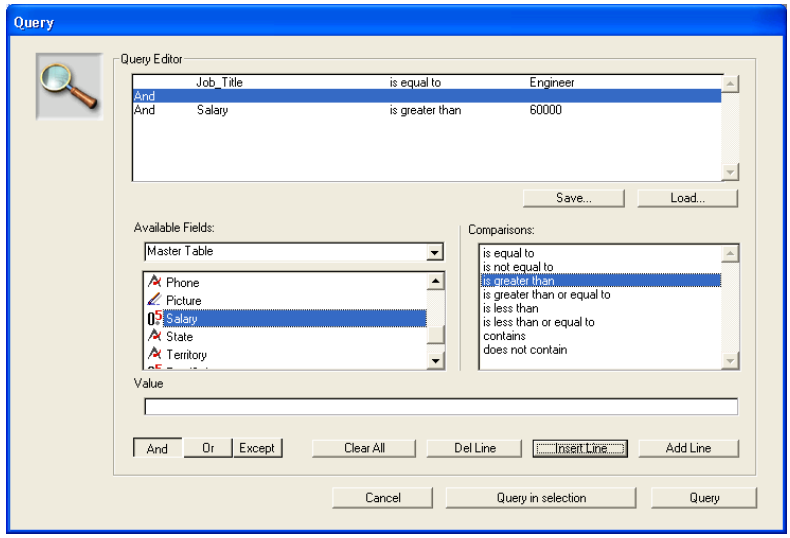
Repeat steps 2 through 4 to build the second simple query.




When you build a compound query, 4th Dimension evaluates the simple queries in the order in which they appear in the Query editor (i.e., from top to bottom). There is no precedence among the conjunctions. In other words, *And* does not have priority over *Or*. Therefore, if you use more than two simple queries when building the compound query, the order in which you enter the simple queries can affect the results of the query.

If you need to add a third simple query, you can choose to either add the condition to the existing compound query or insert the new simple query between the first two simple queries. To add the new query to the end of the existing queries, click **Add Line**. To insert the new query, highlight the last query and click **Insert Line**. The new query is inserted above the line you highlighted.

The following illustration shows the results of clicking **Insert Line**:




As you build the compound query, you can modify existing parts of the query by clicking the line you want to change and clicking a new field or operator, or typing a new value. For example, if you decided to replace the Salary search field with the Department field, you would select the second line and click the Department field.

You can remove a simple query by selecting the line and clicking **Del Line**. In a compound search condition, you can remove one line of the condition by clicking the **Del Line** button.

7 **(Optional) To save the query to disk, click the Save button and enter a filename in the create-file dialog box.**

You do not need to save your query to perform the search.

8 **Click Query to search the entire table.**
**OR**
**Click Query in Selection to restrict the query to the current selection.**

Click the **Cancel** button to put away the Query editor without doing a query.

### Selecting a Field from Another Table

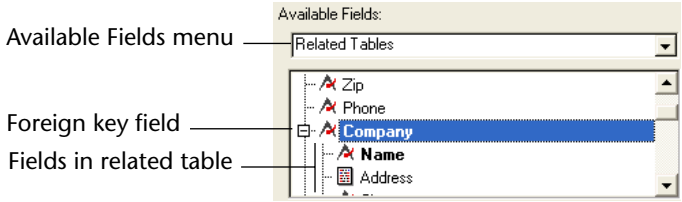
You can use the Query editor to search in related tables and subtables. If the field you want to search is in a related table, choose **Related Tables** in the Available Fields menu, or select **All Tables** and expand the foreign key field in the master table to display fields from the related table. The illustration in the following set of instructions shows an expanded foreign key field.

► To select a field from another table:

1 **Choose Related Tables from the Available Fields menu.**

2 **Expand the foreign key field by clicking the plus sign (on Windows) or arrow (on Macintosh) in the hierarchical list of fields.**

The fields belonging to the related table appear in the hierarchical list.



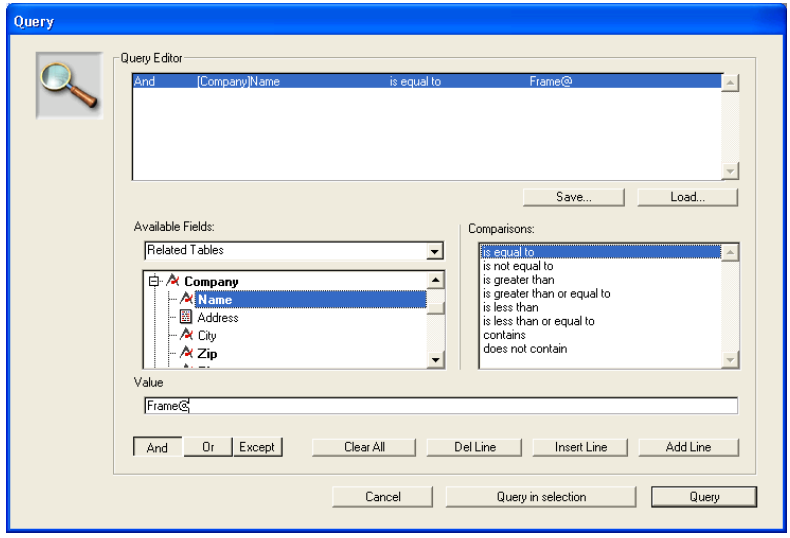

3 **Click the desired field in the related table.**

4 **Follow steps 3 through 7 at the beginning of this section for directions on creating the rest of the query.**

### Using the "Begins With" Operator

If you want to search for records that begin with a specified string, use the "is equal to" operator and enter the wildcard character ("@") at the end of the value to search for.

For example, if you want to search for companies whose names begin with the string “Frame”, you would use the following query:




**Saving a Query to Disk**

If you perform the same query often, you may want to save it to disk. When you save queries to disk, you only need to create them once. In subsequent uses of the Query editor, you can simply load the desired query from disk and click **Query** or **Query in Selection** to perform it.

► To save a query to disk:

1 **Click the Save button.**

4th Dimension displays a save-file dialog box where you can enter a filename.

2 **Click Save.**

The query is saved to disk. The next time that you want to perform this query, you need only load the query into the Query editor.

**Loading a Saved Query**

You can reuse a saved query at any time.

► To load a saved query:

1 **Click the Load button.**

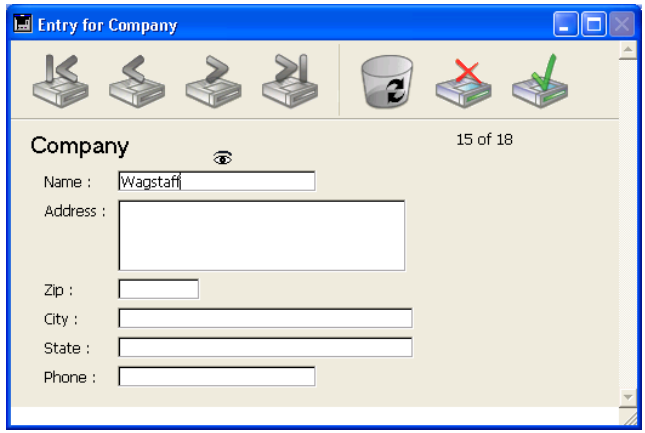
4th Dimension displays an open-file dialog box.

2 **Select and open the desired file.**

4th Dimension loads your query into the Query editor. When you load a file, it replaces any query that previously appeared in the Query editor.

## Query by Example

The Query by Example option is a convenient way to perform many queries. In this type of query, you use the current input form to enter values on which to base the search. You can only search in fields of the current table. Query by Example performs both indexed and sequential queries.

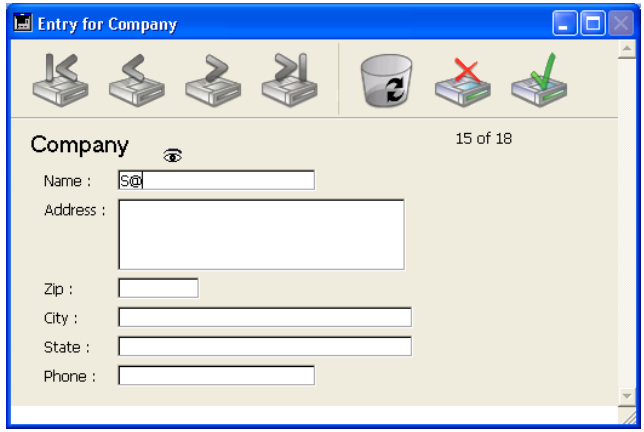



The Query by Example window shown is just an example. Your current input form is always used as the Query by Example window. The cursor changes to an eye when it passes over a button, in order to indicate that the form is being used for a query. You can control the appearance of the Query by Example window by changing the current input form using either of the methods described in Chapter 3.

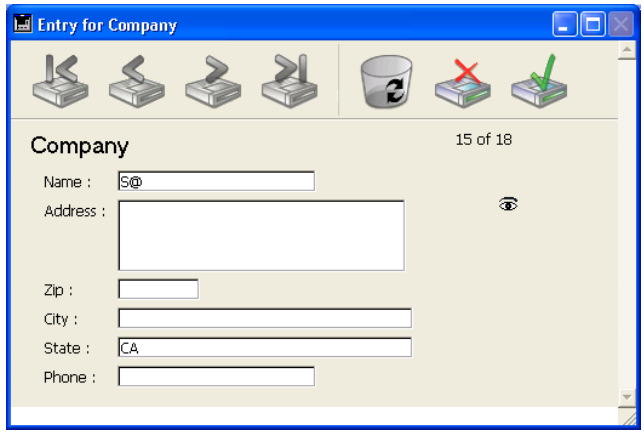
You can use comparison operators in Query by Example. For example, to use the "is equal to" comparison operator, enter the value to be searched for in the appropriate field. If you need a different comparison operator, precede the value with one of the following signs:

| Comparison | Operator Sign | Example |
|---|---|---|
| is not equal to | # | #Marketing |
| is greater than | > | >30000 |
| is greater than or equal to | >= | >=30000 |
| is less than | < | <30000 |
| is less than or equal to | <= | <=30000 |

You can request a “Begins with” query by placing the wildcard character (@) after the value to be searched for. The following figure shows the Query by Example window being used to search for all companies whose names begin with “S”.




You can create a **compound query** by typing values into more than one field. If you enter a compound query, the *And* conjunction is assumed (e.g., “Name starts with “S” *and* is in California”). The following Query by Example window illustrates a compound query:



► To use Query by Example:

1 **Choose Query > Query by Example from the Records menu.**

4th Dimension displays the input form for the current table as a Query By Example window. Only the Accept and Cancel buttons are enabled.

2 **Enter a value to search for in a field.**

For example, to find records for everyone with the last name "Smith," you would enter "Smith" in the Last Name field.

To use a comparison operator, precede the value by the comparison operator. To do a "begins with" search, follow the value by the "@" symbol.

3 **To perform a compound query, enter values in additional fields.**

4th Dimension uses the *And* conjunction if you enter values for more than one field.

4 **Click the Accept button or press the Enter key on the numeric keypad to do the query.**

To cancel the query, click the **Cancel** button or use the **Escape** key (or **Esc** key on Mac OS).

## Query and Modify

The Query and Modify command is intended for quickly finding and modifying records. Like Query by Example, it uses the current input form as a query window. You specify the query in exactly the same way as with Query by Example.

When a record or selection of records is found, 4th Dimension displays the first record in the input form for modification. When you accept the record, you are returned to the output form.

- Using Query and Modify, found records are displayed in the current output form. All records within the new selection are simultaneously displayed.
- Using Query and Modify, the current record of the new selection is also displayed in the current input form. Thus, you can directly replace the values as desired.

  If the new selection contains several records, you can click on the navigation buttons in the import form to scroll through each record and modify the values one by one.

► To use Query and Modify:

1 **Choose Query > Query and Modify from the Records menu.**

4th Dimension displays the current input form as a query window. Only the Accept and Cancel buttons are enabled.

2 **Click the entry area for the first field in which you want to search.**

3 **Enter a value in the criteria entry area.**

For example, to find records for everyone with the last name "Smith," you would enter "Smith" in the Last Name field.

To use a comparison operator, precede the value by the comparison operator. To do a "begins with" query, follow the value by the "@" symbol.

4 **To perform a compound query, enter values in additional fields.**

4th Dimension uses the *And* conjunction if you enter values for more than one field. For Alpha fields, you can also use the wildcard character (@) to perform a "Begins with" search. For example, entering "ACME@" in the Company area requests a search of all companies whose name begins with ACME.

5 **Click the Accept button or press the Enter key on the numeric keypad to begin the search.**

4th Dimension performs the query, sets the current selection, and displays the first record that meets the search criteria in the input form.

6 **Modify the records using standard text editing methods.**

7 **Click the navigation icons to move to other records in the current selection.**
**OR**
**Click the Accept button or press the Enter key on the numeric keypad to accept the modified record and return to the output form.**

4th Dimension saves each record as you move to another record.

Click the **Cancel** button to end the editing session — you do not have to modify every record in the current selection.

4th Dimension displays the output form.

## Query by Formula

Use the Query by Formula editor to find records based on the results of a calculation or data manipulation. You use the Formula editor to write the expression based on which the query will be performed. The expression you write must equal either TRUE or FALSE for each record. You can use any function in the language as well as any project methods specifically designated by the developer.

The Query by Formula command is useful for writing queries that involve operations such as the following:

- Performing operations or evaluations on alphanumeric strings
- Searching in the results of date computations
- Searching in the results of arithmetic computations.

Here are some examples of the uses of the Query by Formula editor.

▼ The following formula is used to search for records in which the last seven characters of the Phone number field are equal to “2524444.”

**Substring** ([Emp]Phone number;4;7) ="2524444"

▼ The following formula finds people born on the current date regardless of the year:

(**Day of** (**Current date**) = **Day of** ([Emp]Birthdate)) &
(**Month of** (**Current date**) = **Month of** ([Emp]Birthdate))

▼ The following formula divides annual sales by the cost of living and finds records whose calculated value is greater than 1,000:

([Stats]Annual Sales / [Stats]CostOfLiving) > 1000

However, the formula

[Stats]Annual Sales / [Stats]CostOfLiving

is incorrect because it returns a numeric value, not TRUE or FALSE.

### Formula Length

You can only write formulas that are one logical line long. That is, you cannot press the **Enter** key on the keyboard (**Return** key on Macintosh) and write a second line. The editing area, however, will wrap to the next line if the statement is too long.

If you need to use a formula that is more than one line, write it as a project method and use this method in the formula.

**Using the Char Function**

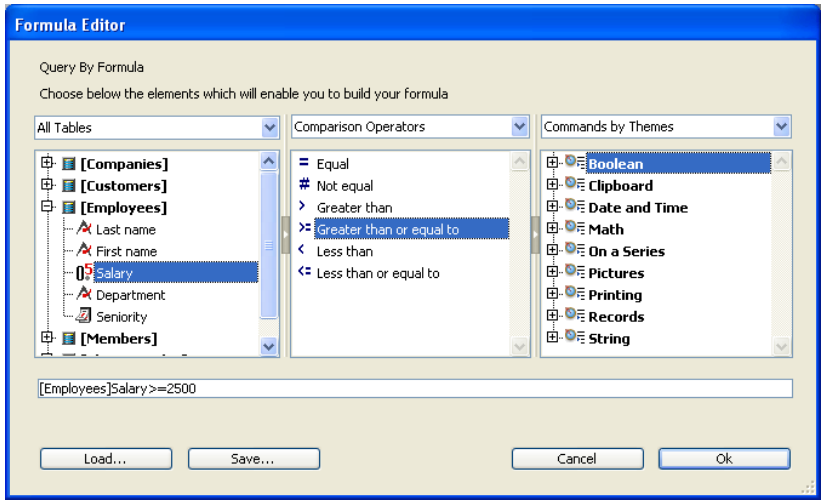
If you are searching for a character using the Char function, you must use Macintosh ASCII codes. For a detailed discussion of the Char function, and a list of Macintosh and Windows ASCII codes, refer to the *4th Dimension Language Reference*.

**Saving Formulas**

You can save formulas to disk and load saved formulas into the Formula editor.

**Using the Query by Formula Editor**

The Query by Formula editor enables you to create and use formulas to retrieve records. The following figure shows a query (search) formula in the Formula editor.




For a detailed description of the Formula editor, see the "Global Updates" section on page 113.

► To use the Query by Formula editor:

1 **Choose Query > Query by Formula from the Records menu.**

2 **Use the Formula editor to build a formula.**
**OR**
**Select the name of a user-written function from the Commands area.**
**OR**
**Click the Load button to retrieve an existing formula from disk.**

The expression you write must equal either TRUE or FALSE for each record.

*Note* You can resize the Formula editor window by clicking on its lower right-hand corner.

If you build a formula in the Formula editor, you can either type your function or use the list of operators and functions.
As you enter values, the editor checks the syntax used. If any syntax errors occur, a message describing the error will appear in the window.

If you click the **Load** button, 4th Dimension displays an open-file dialog box where you can select a file. When you load a file, it replaces any formula that appears in the Formula editor.

► To save a new formula to disk:

1 **Click the Save button.**
4th Dimension displays a dialog box and asks you to enter a filename for the new formula.

*Note* On Windows, the file extension for a formula file is ".4FR."

2 **Click Save to save the formula.**

# 5 Working with Records

This chapter discusses the major operations you perform when working with data. This includes the following:

- Adding records
- Modifying records
- Updating records
- Deleting records.

After you create a database in the Design environment, you can switch to the User environment and begin adding records. To add records to the database, you need only to create a table and one or more fields. You can then switch to the User environment, begin entering data, and return to the Design environment to add tables, fields, forms, methods, or to make any other changes you like.

After adding records to your database, you will usually need to modify the information. If you need to modify one or more records, you can use one of the record selection methods described in Chapter 4 to display them. You can then modify them using either the input or output form.

Sometimes you need to make exactly the same change to a group of records in a table. This is called a *global update*. In 4th Dimension, you can update the current selection of a table automatically — without having to make the change to each record individually.

You may also find that you need to delete one or more records. You can delete a record if you discover it is outdated or irrelevant. If the record is needed but the values stored in it are no longer correct, you should modify the record rather than deleting it. You can delete the current record from an input form or you can delete a subset of records in the current selection using the output form.

# Adding New Records

You can add records using either an input or output form. For a description of the basic operations you use to work with input and output forms, see Chapter 3.

## Input Forms

To add a new record using an input form:

1 **Choose New Record from the Records menu.**

You can choose **New Record** while you are using either an input or output form.

4th Dimension displays a blank input form and places the insertion point in the first enterable area in the form.

2 **Enter data into the first enterable area.**

3 **Press Tab.**

4th Dimension moves the insertion point to the next enterable area.

4 **Enter data into this area.**

5 **Press Tab.**

Repeat the process of entering data into each enterable area until all data for that record has been entered.

When you have finished entering data and are satisfied with the values you have entered, you can accept the record.

6 **Press the Enter key on the numeric keypad[1] or click the OK button on the input form to accept the record.**

By accepting the record, you are requesting that 4th Dimension add the record to the database stored on disk.

After you press enter, a new blank input form is displayed.

7 **Repeat the data entry process until you want to stop.**

8 **When you finish entering data, click the Cancel button on the form or use the Esc key when the next blank record is displayed.**

Either of these actions displays the output form.

## Output Forms

You can also add records directly in the Output form. Keep in mind that in this case you cannot enter data into variables, fields from other tables, or subforms.

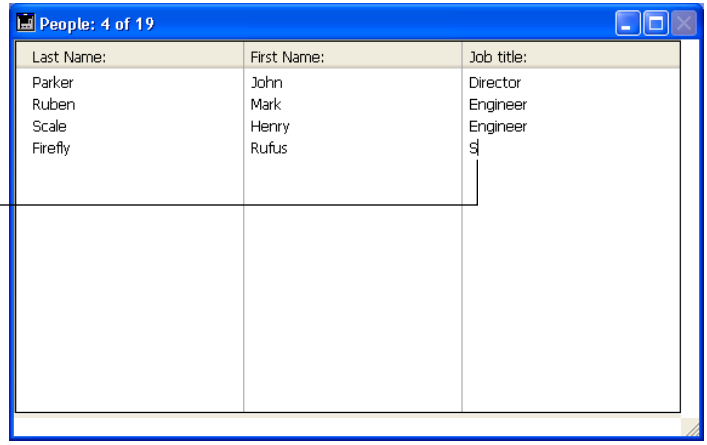
► To add a new record using an output form:

1 **Choose New Record in List from the Records menu.**

An insertion point appears in the first field below the last record displayed in the output form.

1. Keyboard assignments can be modified in the application Preferences.

2 **Type in the field and use the Tab or Enter key to move through the fields for that record.**




Firefly's job title being entered in List mode

*Note* Use **Shift+Tab** or **Shift+Enter** to move in the reverse direction among the fields of the records.

Any data validation controls that are attached to the fields of the output form will be used when you select those fields. For example, a field with a choice list will display the choice list when you tab into it.

3 **Press the Enter key on the numeric keypad to save the new record and create a new blank record.**
**OR**
**Click a field in another record.**
4th Dimension accepts the entries in the record you added.

# Modifying Records

You modify records when you need to update information or when you discover that the information originally entered is incorrect. Before modifying a group of records, select the records to modify as the current selection. You can search to select records for modification or select the records after highlighting them in the output form.

For information about selecting records and searching the contents of a database, refer to Chapter 4.

You can modify records using either the input or output form. The output form is convenient for modifying a group of records because several records are displayed at the same time. However, the output form typically does not include all the fields of the input form and may not duplicate the input form's data entry controls.

If a record is being modified in another process, the record is said to be *locked*. Locked records can be viewed, but they cannot be modified. If you open a locked record, you will be able to view the entries in the fields, but you will not be able to change any data. For a general description of processes, see the "Multi-tasking in 4th Dimension" section on page 24. For a more detailed discussion of what processes are and how to create them, refer to the *4th Dimension Design Reference* manual.

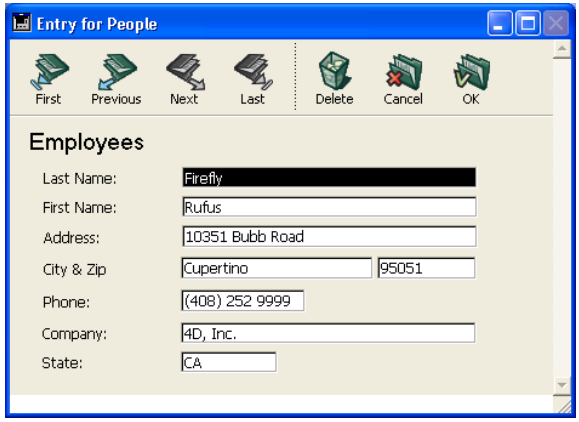
*4D Server* In 4D Server, record locking also occurs when a record is being modified by another user.

## Input Forms

You ordinarily enter and modify data using input forms.

► To modify records using an input form:

1 **Double-click the record on the output form.**
**OR**
**Highlight a record in the output form and choose Modify Record from the Records menu.**
4th Dimension displays the record in the default input form.



2 **Select certain fields and edit, replace, or delete the values.**

See Chapter 3 for more information about editing data.

Middle initial is added to First Name field

3 **Click the OK button or press the Enter key on the numeric keypad to accept the modified record and return to the output form.**
**OR**
**Click a navigation button (Previous Record, First Record, Next Record, Last Record) to accept the record and move to another record in the current selection.**

Clicking a navigation button moves between records in the current selection.

You can cancel your changes and return to the output form at any time by clicking the **Cancel** button or hitting the **Esc** key.

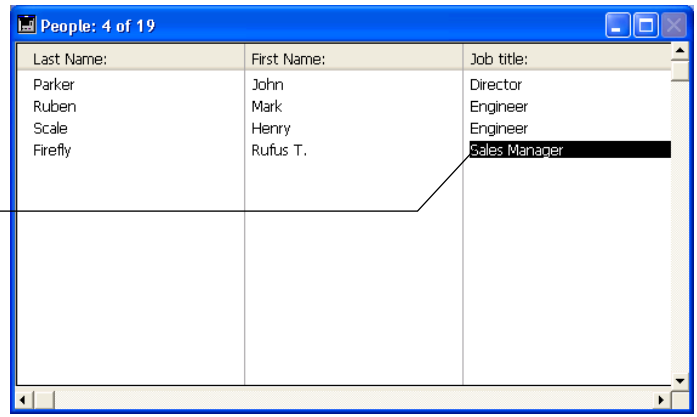
## Output Forms

You can modify the fields displayed directly in the output form. Keep in mind that in this case you cannot enter data into variables, fields from other tables, or subforms.

► To modify records using an output form:

1 **Select a record then click on the field to be modified.**

The field in the output form becomes enterable.




*Note* You can choose **Modify Record** from the **Records** menu at any time in order to modify the record in the input form.

2 **Type the new text and press Tab or the Enter key on the keyboard.**

In the example shown above, typing will replace the job title with a new value. 4th Dimension saves your changes to a field when you press **Tab** or **Enter** (**Return** on Macintosh) and selects the next field.

3 **Continue modifying fields as needed.**

4 **Click twice on a field in another record of the output form to modify it.**

# Global Updates

You do a global update when you want to make a specific change to a group of records. You perform a global update to automate changes to a group of records that would otherwise be tedious and time-consuming. For example, you would perform a global update if you wanted to do the following:

- Change all prices in an Inventory table by a certain percentage,
- Format a numeric or Alpha field.

The global update is done by “applying” a formula to the current selection of records. In other words, the formula is used to make the change to each record in the current selection.

Here are some example formulas and explanations of the functions they perform.

- The following formula multiplies the Salary field by 1.05. It could be used, for example, when a salary increase goes into effect.

  [Emp]Salary := [Emp]Salary * 1.05

- The following uses a built-in function to make the contents of the State field uppercase. It ensures uniformity in the way State appears in labels and reports.

  [Customer]State := **Uppercase** ([Customer]State)

- This formula includes a user-written function that formats the Last Name field. It sets the first letter of the Last Name field to uppercase and all the remaining letters to lowercase.

  [Emp]Last Name := *Capitalize* ([Emp]Last Name)

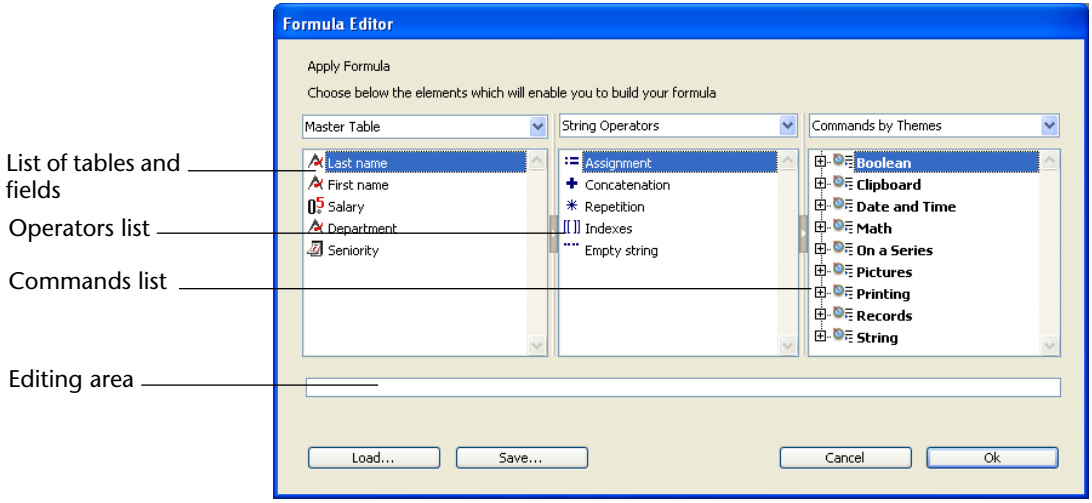
The ability to include user-written functions when carrying out global updates is a powerful feature of 4th Dimension. For security reasons, only project methods that are designated explicitly beforehand by the developer can be used in formulas.

To perform a global update, you use the Formula editor to write a formula that is applied to each record in the current selection.

You can use 4th Dimension's built-in language as well as project methods (declared "usable" in formulas by the developer) to create formulas. For more information about creating methods, see the *4th Dimension Design Reference* manual. See the *4th Dimension Language Reference* manual for detailed information about programming and the syntax to be applied to your formulas.

## Formula Editor

The Formula editor provides many shortcuts for writing formulas. You can click field names, operators and commands, as well as any project methods, to add them to the formula. You can also drag and drop items into the editing area.

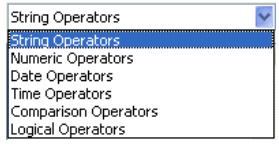



The Formula editor contains the following areas:

- **List of tables and fields**: This area displays the fields of the table. The menu located above the list lets you set the fields to be displayed. You can use fields of the current table, those of related tables or those of all the tables.

*Note* Only visible tables and fields appear in the list. For information about making tables and fields invisible, refer to the *4th Dimension Design Reference* manual.

- **Operators list**: The operators list lets you choose the operators to be used in the formula. The operators are grouped into themes found in the menu located above the list:



Each theme displays all the available operators for the corresponding type of data or operation. For example, the assignment operator := is available for all data types.
For a description of each operator, refer to the following paragraph.

- **Commands list**: The commands list contains the 4D functions that can be used in formulas, as well as any project methods allowed by the developer. The menu located above the list lets you display the commands by theme or by alphabetical order. Refer to the *4th Dimension Language Reference* manual for a description of the 4D commands that appear in this menu.

*Note* In principle, project methods that can be used in formulas must be declared beforehand using the 4D SET ALLOWED METHODS command. However, by default, the Designer and Administrator of the database have complete access to the 4D commands and user methods in the Formula editor. It is also possible to completely disable access control for all users. These options are set via the Preferences of the application (for more information, please refer to the *Design Reference* manual).

## Formula Operators

Here is a brief description of the different operators available in the Formula editor. For a more detailed description of the possibilities provided by these operators, refer to the “Operators” chapter of the *4th Dimension Language Reference* manual.

### String Operators

A and B are character strings; N is a number.

| Operator | Use | Description |
|---|---|---|
| := Assignment | A:=B | Assigns the value B to A |
| + Concatenation | A+B | Returns AB |
| * Repetition | A*N | Repeats the value of A N times |
| [[ ]] Indexes | [[A]]N | Returns the Nth character of A |
| "" Empty string | "" | Inserts a pair of quotation marks |

**Numeric Operators**

X and Y are numbers.

| Operator | Use | Description |
|---|---|---|
| := Assignment | X:=Y | Assigns the value Y to X |
| + Addition | X+Y | Returns X plus Y |
| - Subtraction | X-Y | Returns X minus Y |
| * Multiplication | X*Y | Returns X multiplied by Y |
| / Division | X/Y | Returns X divided by Y |
| \ Integer Division | X\Y | Returns the integer division of X by Y (X and Y must be integers) |
| % Modulo | X%Y | Divides X by Y and returns the remainder |
| ^ Exponentiation | X^Y | Returns X to the power of Y |

*Note* The modulo % operator returns significant values with numbers belonging to the long integer category (from -2^31 to +2^31 minus 1). To calculate the modulo of numbers outside of this interval, use the Mod command.

**Date Operators**

D1 and D2 are dates; N is a number.

| Operator | Use | Description |
|---|---|---|
| := Assignment | D1:=D2 | Assigns the value D2 to D1 |
| + Addition | D1+N | Returns D1 plus N days |
| - Difference | D1-D2 or D1-N | Returns the number of days between D1 and D2<br>Returns D1 minus N days |
| !//! Blank date | !00/00/00! | Inserts a blank date |

**Time Operators**

H1 and H2 are times; N is a number.

| Operator | Use | Description |
|---|---|---|
| := Assignment | H1:=H2 | Assigns the value H2 to H1 |
| + Addition | H1+H2 or H1+N | Returns H1 plus H2<br>Returns H1 plus N seconds, expressed in seconds elapsed since midnight |
| - Subtraction | H1-H2 or H1-N | Returns H1 minus H2<br>Returns H1 minus N seconds, expressed in seconds elapsed since midnight |
| * Multiplication | H1*N | Returns H1 multiplied by N, expressed in seconds elapsed since midnight |
| / Division | H1/N | Returns H1 divided by N, expressed in seconds elapsed since midnight |
| \ Integer Division | H1\N | Returns the integer division of H1 by N, expressed in seconds elapsed since midnight |
| % Modulo | H1%N | Divides H1 by N and returns the remainder |
| ?::? Blank hour | ?00:00:00? | Inserts a blank hour |

**Comparison Operators**

Z1 and Z2 can be of the string, numeric, date or time type.

| Operator | Use | Description |
|---|---|---|
| = Equal | Z1=Z2 | Returns True if Z1 equals Z2 |
| # Not equal | Z1#Z2 | Returns True if Z1 does not equal Z2 |
| > Greater than | Z1>D | Returns True if Z1 is greater than Z2 |
| >= Greater than or equal to | Z1>=Z2 | Returns True if Z1 is greater than or equal to Z2 |
| < Less than | Z1<Z2 | Returns True if Z1 is less than Z2 |
| <= Less than or equal to | Z1<=Z2 | Returns True if Z1 is less than or equal to Z2 |

**Logical Operators**

B1 and B2 must be Booleans (expressions that are TRUE or FALSE).

| Operator | Use | Description |
|---|---|---|
| & AND | B1 & B2 | Returns True if B1 is True and B2 is True |
| \| OR | B1 \| B2 | Returns True if B1 is True or B2 is True |

## Applying a Formula

You can build a formula by clicking fields, operators and commands or methods that you wish to use. When you click an item, it automatically appears in the Editing area, where you can modify it with standard cut, copy, and paste techniques. You can also type directly into the Editing area or add items using drag and drop.

A formula can be only one logical line long. You cannot press **Return** and type another line. However, methods declared usable in the Formula editor can be many lines long.

► To perform a global update by applying a formula:

1 **Set the current selection to the records to be updated.**

For more information about setting the current selection, refer to Chapter 4.

2 **Choose Apply Formula from the Records menu.**

3 **Use the Formula editor to build the formula.**

For more information, refer to "Formula Editor" paragraph on page 115.

**OR**

**Click the Load button to retrieve an existing formula from disk.**

- To add a field to the formula, double-click a field name or drag the field name from the Fields list to the editing area. If the field is in a related table, first expand the foreign key field to display the list of related fields. A foreign key field has a plus sign (on Windows) or arrow (on Macintosh) indicating that it can be expanded.
- To add an operator to the formula, click an operator button.
- To add a command or project method to the formula, click the command or method.

If you click the **Load** button, 4th Dimension displays an open-file dialog box so that you can select a file (".4FR" file extension on Windows). When you load a file, it replaces any formula that currently appears in the Formula editor.

After you load a formula, you can modify it in the editing area.

4 **(Optional) If you want to save a new formula to disk, click the Save button.**

4th Dimension displays a create-file dialog box and asks you to name the file in order to store the new formula.

5 **Click OK to apply the formula to the current selection.**

4th Dimension closes the editor and applies the formula to the records in the current selection.

Click the **Cancel** button to close the editor and return to the output form without applying the formula.

# Deleting Records

You may want to delete a record that is outdated or no longer necessary. If the record is needed but the values stored in the record are incorrect, you should modify the record rather than delete it.

You can delete records in two ways:

- Delete records individually from the input form,
- Delete one or more record(s) from the output form.

***Deleting records is permanent and cannot be undone. When you delete records, 4th Dimension displays a dialog box asking you to confirm the deletion.***

## Deleting Records Using the Input Form

Deleting records from the input form lets you verify the contents of each record before you delete it.

► To delete records using the input form:

1. **Use a query or a navigation button to select and then open the record you want to delete.**
2. **Click the Delete button to delete the record.**

   Depending on the design of the input form, the **Delete** button may be represented in different ways.

   When you click the **Delete** button, 4th Dimension asks you to confirm the deletion. You cannot undo the deletion after 4th Dimension removes the record.
3. **Click the Yes button to complete the deletion.**

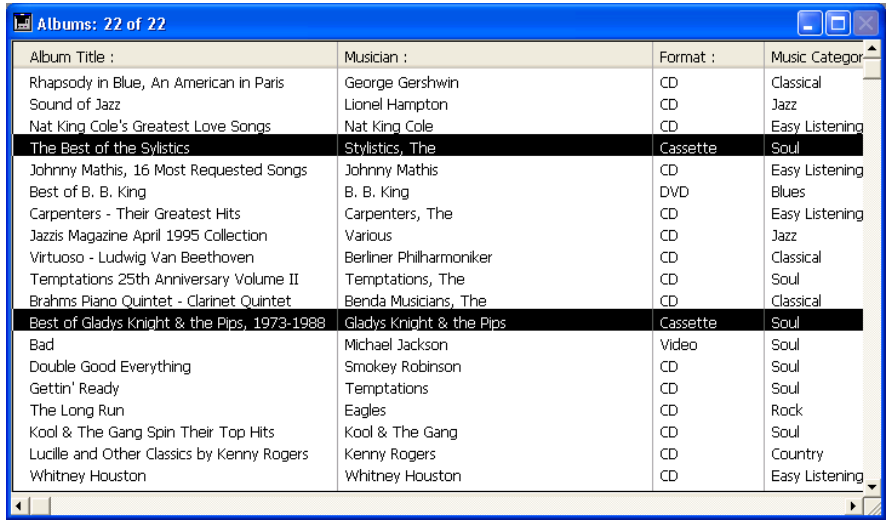
   4th Dimension removes the current record from the database and returns to the output form.

## Deleting Records Using the Output Form

Using the output form, you can delete several records in one operation. The records to be deleted must be highlighted in the output form. You can select records that you want to delete by clicking them or by doing a query.

► To delete records using the output form:

1 **Highlight the record or records that you want to delete.**



Albums: 22 of 22

| Album Title : | Musician : | Format : | Music Categor |
|---|---|---|---|
| Rhapsody in Blue, An American in Paris | George Gershwin | CD | Classical |
| Sound of Jazz | Lionel Hampton | CD | Jazz |
| Nat King Cole's Greatest Love Songs | Nat King Cole | CD | Easy Listening |
| The Best of the Sylistics | Stylistics, The | Cassette | Soul |
| Johnny Mathis, 16 Most Requested Songs | Johnny Mathis | CD | Easy Listening |
| Best of B. B. King | B. B. King | DVD | Blues |
| Carpenters - Their Greatest Hits | Carpenters, The | CD | Easy Listening |
| Jazzis Magazine April 1995 Collection | Various | CD | Jazz |
| Virtuoso - Ludwig Van Beethoven | Berliner Philharmoniker | CD | Classical |
| Temptations 25th Anniversary Volume II | Temptations, The | CD | Soul |
| Brahms Piano Quintet - Clarinet Quintet | Benda Musicians, The | CD | Classical |
| Best of Gladys Knight & the Pips, 1973-1988 | Gladys Knight & the Pips | Cassette | Soul |
| Bad | Michael Jackson | Video | Soul |
| Double Good Everything | Smokey Robinson | CD | Soul |
| Gettin' Ready | Temptations | CD | Soul |
| The Long Run | Eagles | CD | Rock |
| Kool & The Gang Spin Their Top Hits | Kool & The Gang | CD | Soul |
| Lucille and Other Classics by Kenny Rogers | Kenny Rogers | CD | Country |
| Whitney Houston | Whitney Houston | CD | Easy Listening |

*Note* If you want to delete all the records in the table, choose **Show All** from the **Records** menu and **Select All** from the **Edit** menu.

Highlighting records is described in the "Highlighting" section on page 52.

2 **Choose Clear from the Edit menu.**

4th Dimension displays a dialog box asking you to confirm the deletion. You cannot undo a deletion.

3 **Click the Yes button to complete the deletion.**

4th Dimension removes the highlighted record or records from the database.

## Deleting Locked Records

You cannot delete locked records. Records are locked when they are being used by another process. For instance, if a process opens a record for modification, 4th Dimension locks that record so that other processes cannot modify it.

*4D Server* Records are also locked when they are being used by another user.

Before deleting records, you create a selection of the records you want to delete. If your selection includes any locked records, the deletion will proceed but the locked records will not be deleted and will remain in the current selection after the deletion. You must wait until these records are unlocked (i.e., no longer being used) to delete them.

## Records Deleted in Another Process

The current selection may be altered by records being deleted in another process. For example, while you are working in your database, you might start another process that deletes certain records from a table. The records deleted in that process are permanently removed from the table. However, the records you see while working with the database in the User environment may not reflect those changes to the table until a new selection of records is created.

To illustrate this point, suppose that a table contains fifty records and that all of the records are in the current selection. At this point, the title bar of the output form says that “50 of 50” records are selected. If one of the records is deleted in another process, the title bar changes to say that “50 of 49” records are selected. There now appears to be more records in the current selection than in the table! The title bar will be updated when you change your current selection.

If you attempt to modify or delete the deleted record, a dialog box will appear saying that the record has been deleted.

*4D Server* Records deleted by another user have the same effect on the current selection. The records are deleted from the table, but not from the current selection. Thus, the current selection may appear to contain more records than actually exist in the table.

# 6 Sorting Records

A *sort* reorders records according to the values in the table. It is common to sort records:

- To view records on screen in a particular order
- Before printing a report or labels
- Before graphing data.

As you enter data into a new database, 4th Dimension stores the records in the order in which they were entered or imported. When you list records in an output form or print records, they appear in this order. Often, you want to view records in another order. For example, you might want to alphabetize a list of names in a report — a sort on the Last Name field reorders the records alphabetically by Last Name.

A sort can be done while you are using an input or output form. If you sort from an input form, the first record in the new sort order is displayed in the input form. Otherwise, the sorted records are displayed in the output form.

4th Dimension conducts indexed sorts very quickly. If you are sorting only one field and that field is indexed, 4th Dimension uses the index.

# Sort Levels

You can sort records in up to 30 different fields or formulas. Each field or formula you sort is referred to as a *sort level*. For example, the results of a two-level ascending sort of the last name and first name fields would produce a list such as this:

Aardvark, Anthony
Aardvark, Artemis
Aardvark, Arthur
.
.
Zygote, Elena
Zymosian, Elmer

When sorting the contents of fields, 4th Dimension is not case sensitive (i.e., “Smith” = “smith”) or diacritical sensitive (i.e., “Aá” = “Aa”).

*Note* If you are using an international version of 4th Dimension and your operating system is diacritical sensitive (e.g., “Aá” ≠ “Aa”), sorting operations will also take diacritical marks into account.

# Ascending and Descending Order

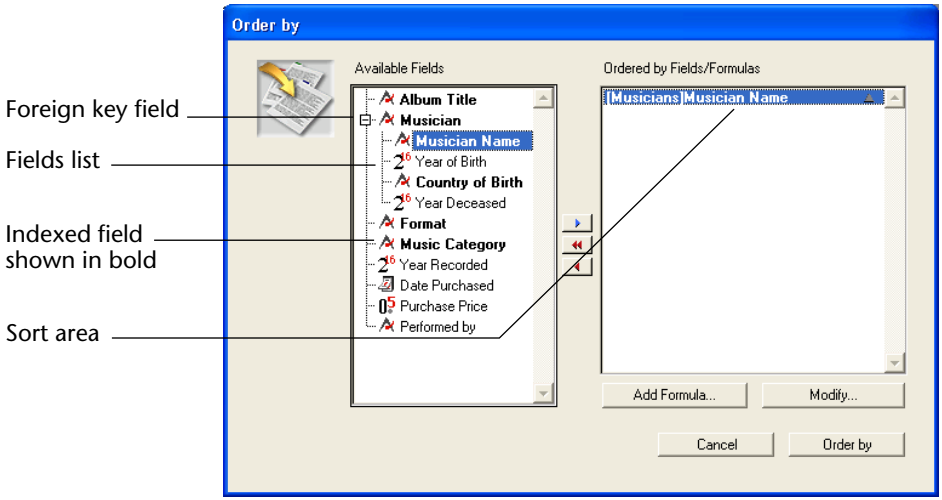
You can specify either an ascending or descending order for each field or formula that you are sorting. Sorting from A to Z or smallest to largest is known as an *ascending sort*. Sorting in the reverse order is called a *descending sort* — largest to smallest, latest to earliest, and Z to A.

If you are sorting more than one level, you can freely mix ascending and descending sort orders. A multiple-level sort can mix fields and formulas, and ascending and descending sort orders.

# The Order By Editor

You can sort the records in the current selection by using the **Order By** command in the **Records** menu or by clicking on the corresponding button in the toolbar in User mode. Sorting the current selection changes the order in which records are displayed or printed. This is a temporary sort; it does not affect the order in which the records are stored on disk.

When you choose **Order By**, the Order By editor enables you to specify the sort you want to perform.




The Order By editor contains the following areas:

- **Fields list**: This area displays a hierarchical list of fields in the current table. Indexed fields are shown in boldface. You can sort on fields from subtables and related tables (provided the relation is automatic). To use a field from a related table or subtable, expand the foreign key field by clicking on the plus sign (on Windows) or arrow (on Macintosh) to display the fields from the related table.

*Note* Only tables and fields that are visible appear in the Order By editor. For information about making tables or fields invisible, refer to the *4th Dimension Design Reference* manual.

- **Sort area**: This area displays the sort fields or sort formulas and the direction of each sort. The arrows on the right of this area are used to specify an ascending or descending sort.

- **Button panel**: The Button panel has buttons for adding or removing fields from the Sort list.

- **Add Formula button**: You use the **Add Formula** button to write a formula as one of the sort criteria. You use a formula when you want to sort something that is not a field — such as a calculated value or a portion of a field. For instance, you might sort a calculated failure rate for parts or the last four digits of a Part Number field.
- **Modify button**: When you click the **Modify** button, it displays the selected sort criterion in the Formula editor. If the selected criterion is a formula, the formula is presented for editing. If the criterion is a field, the field name appears in the editing window of the Formula editor.
- **Cancel button**: You use this button to cancel the sort and return to the form you were using.
- **Order By button**: You use this button to perform the sort.

*Note* The Quick Report editor can sort records that appear in a quick report. For more information about the Quick Report editor, see Chapter 9.

# Sorting a Selection

Use the **Order By** menu command to sort the current selection of records. This sort is temporary and applies only to the current selection; it does not affect the order in which records are stored in the database. The **Order By** command is commonly used immediately after a query and before printing a report or labels.

*Note* You can carry out a permanent sort of table records using the 4D Tools utility, which is supplied with 4th Dimension and 4D Server. For more information about this point, refer to the documentation for 4D Tools.

► To sort the current selection:

1 **Choose Order by from the Records menu or click on the corresponding button of the toolbar in the User mode.**

4th Dimension displays the Order By editor.

2 **Double-click the name of a field which you want to sort.**
**OR**
**Drag the field name from the Fields list to the Sort area.**
**OR**
**To sort based on a formula, click the Add Formula button.**

When you open the Order By editor, the Fields list displays the fields from the master table. You can choose fields from related tables or subtables by expanding the foreign key field or subtable field.

If you clicked the **Add Formula** button, 4th Dimension displays the Formula editor. For information on writing a formula, see the "Sorting Based on a Formula" section on page 128.

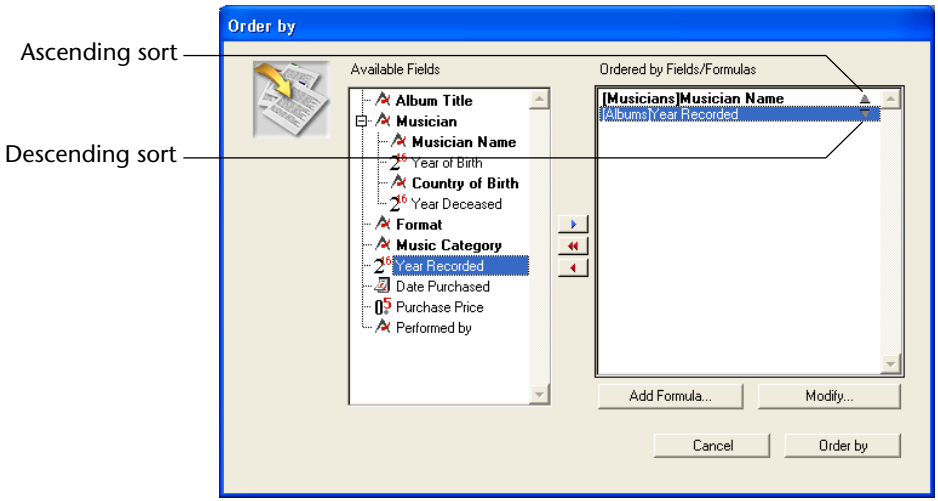
The field name or formula appears with a sort direction arrow in the Criteria area.

3 **If necessary, click the sort direction arrow in the Sort area to switch between ascending and descending sort order.**

Up is ascending; down is descending.

4 **If necessary, repeat steps 2 and 3 to add secondary sort levels to the list.**

For each sort level, you can specify ascending or descending order.




For example, the sort order shown requests a listing of musicians sorted by name. The albums of each musician are sorted by the year they were recorded, starting with the most recent.

5 **Click the Order By button.**

4th Dimension sorts the current selection. If you are using an input form, the first record in the sorted current selection is displayed.

## Sorting Based on a Formula

You can sort a field or sort based on a formula. For example, the following formula sorts the month of a birth date field:

**Month of** (Birth Date)

► To create a sort formula:

1 **In the Order By editor, click the Add Formula button.**

4th Dimension displays the Formula editor.

You use the Formula editor to create a formula that returns the values to be sorted. The formula can return values of any data type. For more information about how to use the Formula editor, see the "Global Updates" section on page 113.

2 **Click OK when you are finished writing the formula.**

4th Dimension displays the formula in the Sort area.

The formula appears with a sort direction arrow in the Sort area.

## Modifying a Sort Order

You can remove or reorder fields or formulas in the Sort area.

- **Removing a field or formula**: To remove a field or formula, highlight the field or formula in the Sort area and click the **Remove** button or press **Backspace** (**Delete** on Macintosh). To remove all fields or formulas, click the **Remove All** button.
- **Reordering the sort criteria**: To reorder fields or formulas in the Sort area, drag the field or formula up or down.

# Sorting While a Record is Being Modified

If a record in the current selection is being modified in another process at the same time that you are performing a sort, 4th Dimension uses the last saved value of the field in the sort.

For example, if an employee's job title is in the process of being changed from "Engineer" to "Staff Engineer" while you are sorting on Job Title, the employee record will still be listed as "Engineer" and sorted with the engineer records.

If you were to perform the sort again, after the record has been modified and saved, the new job title would be used and the employee record would be sorted as a staff engineer.

*4D Server* The last saved value of a field is also used if a record in the current selection is being modified by another user. If the sort is performed again, after the other user has finished modifying the record, the newly saved value of the field is used.

## Sorting While an Index is Being Built

Sorting an indexed field is extremely rapid, since the values of the field have already been organized by 4th Dimension. However, if the index for a field is being built or rebuilt at the same time that you are performing a sort on the field, 4th Dimension will be unable to use the index and the sort will be sequential.

# 7 Modifying User Forms

In 4th Dimension, the developer can let users modify certain forms of the database in order, for example, to create custom reports, add a specific logo or, more generally, adapt the forms to their own specific needs. Once saved, a "user form" is substituted for the original form on the user machine and can be used like any other 4th Dimension form.

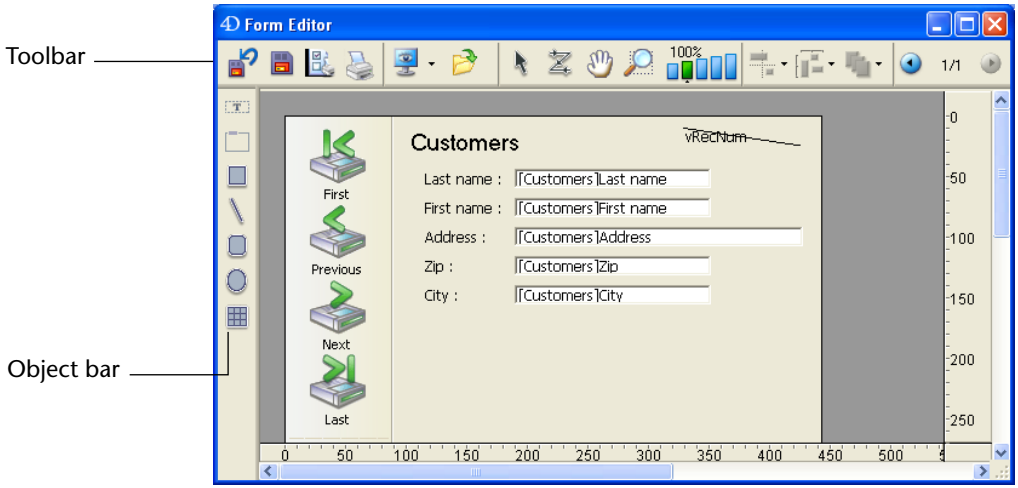
The possible modifications mainly concern graphic aspects. For example, the user cannot add object methods, variables or fields. They can, however, change the entry order or add active objects from an object library. The various possibilities are set up beforehand by the developer in the Form editor of the Design mode.

The mechanisms for setting up this system on the developer side (Design mode) are described in the "User forms" section of the *4th Dimension Language Reference* manual.
The current chapter describes the operation of the user form editor in User or Custom Menus mode.

## User Form Editor

The User form editor is displayed for a form when the EDIT FORM command is executed, if the **Editable by user** property was checked for the form. Generally, this editor is called from a database configuration or customizing command.

The editor window appears as follows:




This editor uses the standard 4th Dimension Form editor interface, in particular the two integrated toolbar concept (tools and objects). It also has its own specific functions.

When the editor is displayed, only the **Edit** menu of the menu bar is available. It is still possible to display a simplified Property List as well as a contextual menu.

The selection and move object mechanisms (when allowed) are identical to those in the standard 4th Dimension Form editor.

## Toolbar

The toolbar contains the following items:

**Revert to factory settings**: Returns to the original form as defined in the Design environment (deletes all changes made in the user form). When you click this button, an alert dialog box appears, allowing you to cancel or confirm the operation.

**Save**: Saves changes made in the user form.

**Print settings** and **Print**: These two commands allow setting and starting the printing of the user form.

**Display**: Allows selecting items to display and hide in the editor using a pop-up menu:

- **Page 0**: Shows or hides the objects from page 0 in the form's current page. This option allows you to distinguish between the objects on the form's current page and those on page 0. In a multi-page form, page 0 contains objects that are displayed on all the pages.
- **Paper**: Shows or hides the borders of the printing page, which are shown as gray lines. This option can have no apparent effect when the **Limits** (see below) option is selected. If the size of the form is smaller than the printing page, the page's borders are shown outside of the form's viewing area and therefore do not appear.
- **Rulers**: Shows or hides the rulers in the form editor's window.
- **Markers**: Shows or hides the output control lines and associated markers that show the limits of the form's different areas (header, body, footer). Markers are mainly used in output forms.
- **Limits**: Shows or hides the form's limits. When this option is selected, the form is displayed in the editor with its final dimensions.

**Library**: Allows loading the object library that can be used with the form (if any) (see the "Using an Object Library" paragraph on page 142).

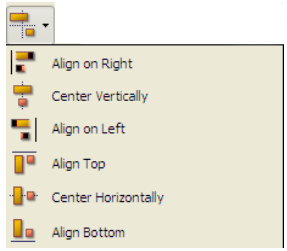
**Selection tool**: Allows selecting, moving and resizing form objects.

**Entry order**: Switches to "Entry order" mode, where it is possible to view and change the current entry order of the form (see the "Data Entry Order" paragraph on page 139).

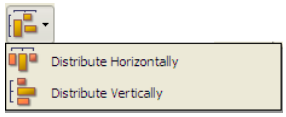
**Moving**: Passes into "Move" mode, where it is possible to quickly reach any part of the form by using drag and drop in the window. The cursor takes the shape of a hand. This navigation mode is particularly useful when zooming in the form.

**Zoom**: Allows modifying the form display percentage (100% by default). You can pass into "Zoom" mode by clicking on the magnifying glass or by clicking directly on the desired bar.
When you click on this button, the cursor takes the shape of a magnifying glass . To increase the zoom percentage one level, click inside the form. To reduce the zoom percentage a level, press **Shift** (the cursor is changed to ) and click inside the form.

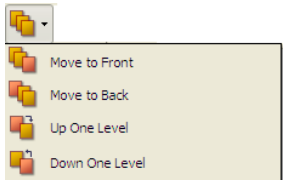
**Alignment**: This button is linked to a menu that allows aligning objects in the form. For this menu to be enabled, at least two objects must be selected in the form.



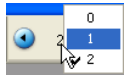
**Distribution button**: This button is linked to a menu that allows distributing objects in the form. For this menu to be enabled, at least three objects must be selected in the form.



**Level button**: This button is linked to a menu that allows changing the level of objects in the form.



**Display of pages**: This area allows passing from one form page to another. To do so, click the arrow buttons or click the central area and choose the page to display from the menu that appears:




It is not possible to add pages in the user form editor.

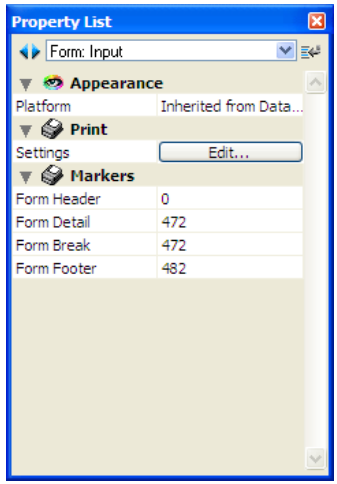
**Object Bar**

The object bar of the user form editor lets you add various graphic objects to the form:

To create an object in the form, select the corresponding button and then trace the object in the form.

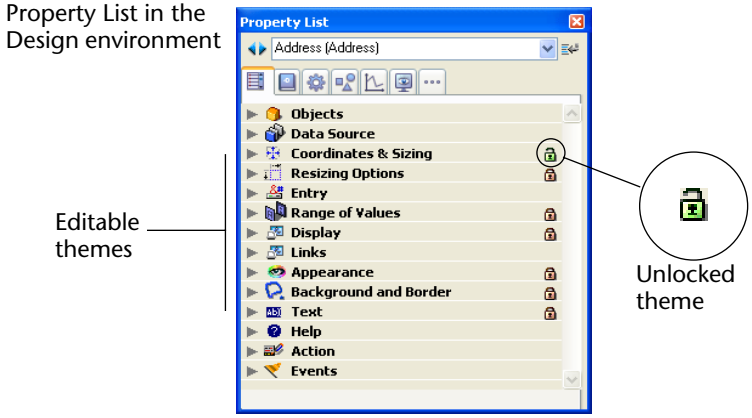
# Viewing and Editing Objects

The user can view and edit the properties of objects present in the form using a simplified Property List. To display the list, simply **double-click** the object or choose the **Property List** command in the contextual menu of the editor (right-click).

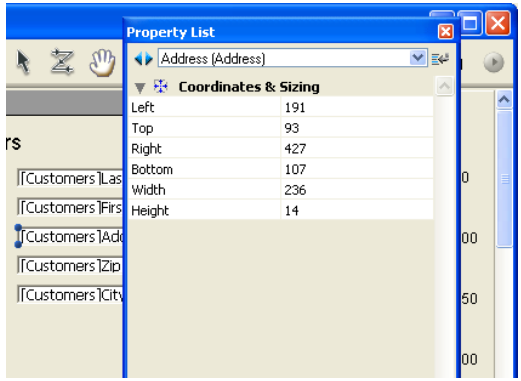



Only user-editable properties are displayed in the Property List.

- For graphic type objects added by the user using the object bar, all properties linked to the object type are available.
- For objects coming from the original form, two conditions must be met in order for a property to be editable in the User form editor:
  - The property must belong to a set of properties that can be declared editable for the object or form. For example, the properties related to managing form events or drag and drop are never editable by the user.
    In the Form editor of the Design environment, the editable property themes are distinguished with a padlock icon in the Property List (see the *Design Reference* manual).
  - The property theme must have been explicitly declared as editable by the developer for the object or form. To do that, the developer must have clicked on the padlock in the Property List in the Design environment to unlock it:




The unlocked properties then become accessible by the user in the User form editor:



This also works for other possible actions in the user form: for example, if the “Coordinates & Sizing” theme is unlocked, the user could move the object using the mouse or the keyboard.

## Edit Menu Commands

Only the **Edit** menu is active when the User form editor window is displayed in the User environment. When using customized interfaces (Custom Menus), the **Edit** menu is accessible if the commands it contains are managed using standard actions.

All editing commands (**Cut**, **Copy**, **Paste**, **Clear**, **Select all**) work without restrictions for objects added by the user.

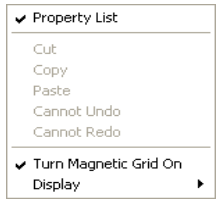
On the other hand, for reasons of consistency, the user is never allowed to remove an object from the original form. The use of the **Cut**, **Clear** commands or the **Del** or **Backspace** keys cause the display of an alert dialog box telling the user that this action is not allowed.

### Contextual Menu

Several commands are accessible using the User form editor contextual menu. It is not possible to control the contents of this menu.

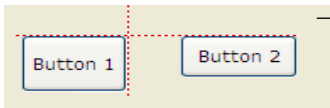
### Clicking Outside of Any Objects

When the user clicks outside of any object, the standard display and editing commands of the form editor are available: display of the Property List, Magnetic grid activation and display of the editor tools:

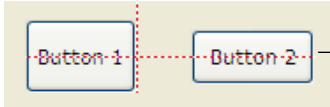



- **Turn Magnetic Grid On**: The magnetic grid offers you a visual aid for aligning and distributing objects in the form.
  The magnetic grid works as follows: when you drag and drop an object in the form, 4th Dimension indicates the possible locations for this object based on alignments relative to other form objects:
  - Horizontally possible locations are suggested when the edges or centers of two objects coincide,
  - Vertically possible locations are suggested when the edges of two objects coincide.

At this moment, 4th Dimension places the object at the location and displays a red line indicating the noticeable alignment taken into account:




Alignment on the top edges




Center alignment

Concerning the distribution of objects, 4th Dimension proposes a distance based on interface standards. Like with magnetic alignment, red lines indicate the noticeable differences once they are reached.

*Note* You can manually activate or deactivate the magnetic grid when an object is selected by pressing the **Ctrl** (Windows) or **Control** (Mac OS) key.

- **Display**: This menu has the same items as the Display button in the editor toolbar (see the "Toolbar" paragraph on page 132).

## Clicking on an Object

When the user clicks on an object, graphical commands are available (color, alignment, etc.).

Access to these commands can be restricted for objects that belong to the original form, depending on the type of object clicked as well as the settings made by the developer in the Design environment.

- **Color**: Displays two palettes for modifying the foreground and background colors of the object.

- **Align**: Provides access to commands for aligning and distributing objects. The alignment commands are only enabled if at least two “movable” objects are selected. The distribution commands are only enabled if at least three “movable” objects are selected.
- **Border Line Style**: Used to modify the border line style of the selected objects. Here are examples of the styles available:

Transparent Plain Dotted Raised Sunken Double

- **Automatic Size**: This option is used to resize text objects and pictures in order to obtain optimal display in keeping with their current graphic characteristics (font size, style, etc.) or to display them in their original size (pictures).
  You can obtain the same result by pressing **Ctrl** (Windows) or **Command** (Mac OS) + clicking on the lower right-hand corner of the object.
- **Level**: Used to change the level of objects.
- **Select Similar Objects**: Used to select all the objects that are the same type as the selected object.

# Data Entry Order

The data entry order is the order in which fields, subforms, and other tabable objects are selected as you tab through a form.

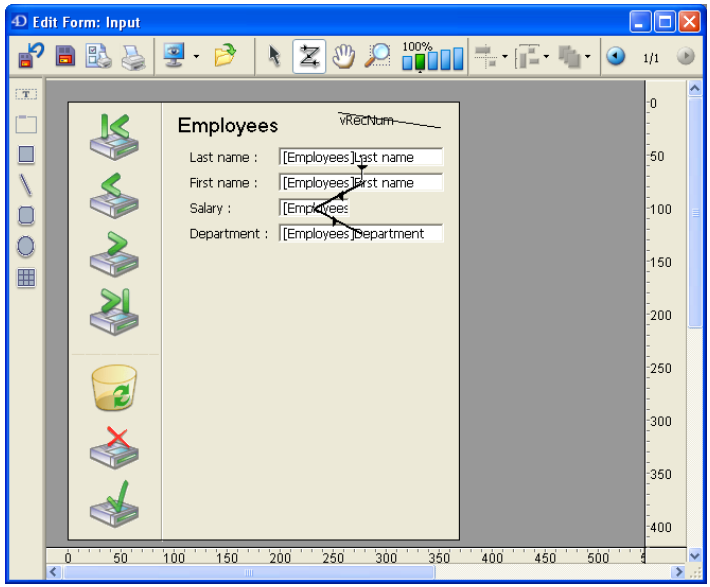
*Note* For more information about default data entry order in forms, please refer to the *Design Reference* manual.

In some cases, it may be necessary to modify the data entry order of a form, for example when you have added one or more objects and want to include them in a more logical order.

## Viewing and Changing the Data Entry Order

To view the current data entry order of a form, click the **Entry order** button in the toolbar of the user form editor:

The current data entry order appears as follows:




- To change the data entry order, position the pointer on an object in the form and, while holding down the mouse button, drag the pointer to the object you want to follow in the data entry order.
  4th Dimension will adjust the data entry order accordingly.
- When you are satisfied with the data entry order, click the **Entry order** button in the toolbar.

## Setting the First Object in the Data Entry Order

All enterable objects are part of the data entry order. To define the first object of the entry order, the Entry Order mode must be disabled.

► 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 and move it to the back.**

   You can use the **Level** > **Move to Back** command in the contextual menu or the corresponding command of the button in the editor toolbar.

   The object will be placed in back of any other form element. This is temporary.

2 **Click the Entry order button of the toolbar.**

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.

3 **When you have finished setting the entry order, click on the Entry order button of the toolbar again.**

4th Dimension returns to normal operation of the form editor.

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 **Click the Entry order button of the toolbar.**

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.

## Restoring the Standard Data Entry Order

You can restore the standard data entry order (based on the layering of the objects) at any time.

1 **Click the Entry order button of the toolbar.**

2 **Draw a marquee around all the objects on the form.**

When you release the mouse button, 4th Dimension re-establishes the standard data entry order for all the objects enclosed or touched by the rectangle.

# Using an Object Library

It is possible to use an object library with each user form being modified.

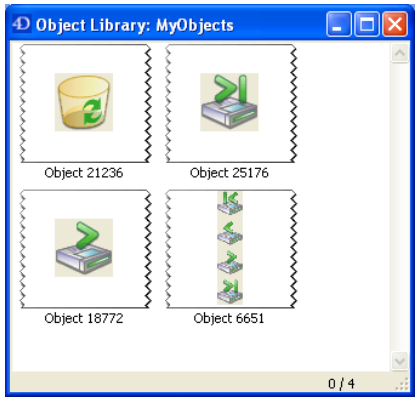
An object library is an external file created by 4th Dimension in the Design environment. It allows storing all types of objects that can be used in forms: buttons, texts, pictures, hierarchical lists, etc. Libraries are put together and used by a simple drag and drop or copy-paste from 4D forms. They are somewhat like a permanent clipboard.

*Note* For more information about object libraries, please refer to the *Design Reference* manual.

Objects are stored with all their properties and standard actions. It is not possible to use objects with associated object methods in the user form editor. Only objects that do not have associated object methods will be visible in the library from the user form editor.

The developer sets the library associated with the form using the last parameter of the EDIT FORM command which displays the user form. If this parameter is valid, the library can be displayed and used with the user form. To open the library, the user must click on the corresponding icon in the toolbar of the editor:

The library window is then displayed:




*Note* An object library can contain up to 32,000 items.

The user can add objects to the form by drag and drop or copy-paste from the library.
All the properties of objects inserted from the library are automatically accessible to users (coordinates, dimensions, appearance, etc.).

Each object library has a contextual menu that allows accessing basic editing commands. In the user form editor, only the **Copy** command is available. Moreover, it is not possible for the user to remove, rename or add objects in the library.

# 8 Form Reports

One of the major functions of a database is to produce reports. In 4th Dimension, you can produce a report using either a form or using the Quick Report editor. This chapter explains how to print a report using a form.

There are several advantages to using a form for a report: you can use graphic elements on the form, you can control the placement of report elements precisely, you can use methods to perform calculations, and you can use headers to identify each subsection of a break report. Form reports can also be customized by each user with the help of the user form editor (see Chapter 7, "Modifying User Forms," on page 131).

You can use a form to create reports that:

- Require a non-columnar format
- Display subforms
- Contain embedded graphics
- Require special graphic elements, such as hairlines.

Chapter 9 discusses designing and printing reports using the Quick Report editor. The Quick Report editor is excellent for printing tabular reports that use a standard columnar format.

This chapter assumes that you have already created a form for the report. For information about designing output forms for reports, see the *4th Dimension Design Reference* manual.

# Standard Reports and Reports with Breaks

There are two kinds of reports that can be printed using output forms, standard reports and reports with breaks. When you create a standard report, you simply print the current selection using a form. Reports with breaks separate records into groups. To create a report with breaks, you must sort the current selection before printing.

## Printing Standard Reports

4th Dimension prints the records in the current selection. Set the current selection to the subset of records you want to print. If you want the report to list the records in a particular order, sort the current selection before printing the report.

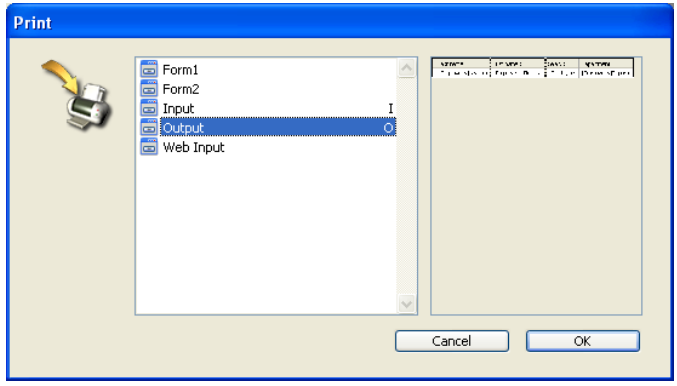
► To print a standard report:

1 **Select the records to be included in the report. If desired, sort the records.**

Selecting records is discussed in Chapter 4 and sorting records is discussed in Chapter 6.

2 **Choose Print from the File menu or click on the corresponding button in the toolbar.**

The Print Form dialog box appears.




3 **Choose the form you want to use.**

You can choose a form by clicking on it, using the arrow keys, or by typing the first letter of a form name.

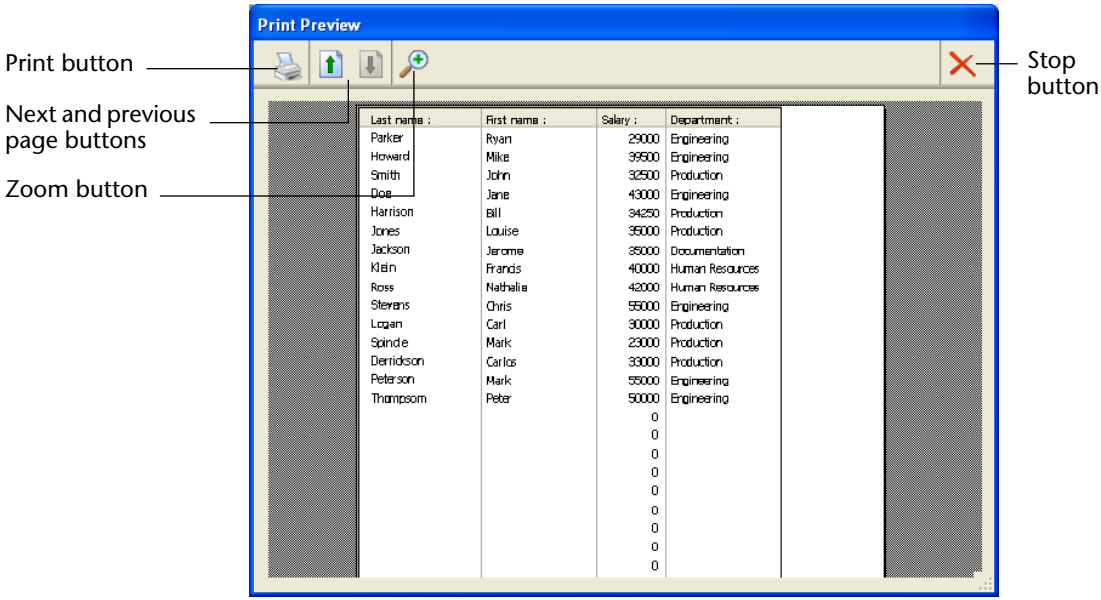
When you click on a form, a preview appears in the preview area.

4 **Click OK or press Enter.**

4th Dimension displays the Page Setup dialog box for your selected printer. Choose any desired options and click **OK**.

4th Dimension displays the Print dialog box for the printer you selected in the Print Manager. To preview the report on the screen, check the Preview on Screen check box.

If you checked the **Preview on Screen** check box, the report will be displayed on screen, one page at a time. The figure below shows a report previewed on screen.




When a page of the report is being previewed, you can do the following:

- View a close-up of the report by clicking the **Zoom** button. When you use Zoom, you can move around the page by dragging the hand pointer.
- View the next page of the report by clicking the **Next Page** button.
- Print the page being previewed by clicking the **Print** button.

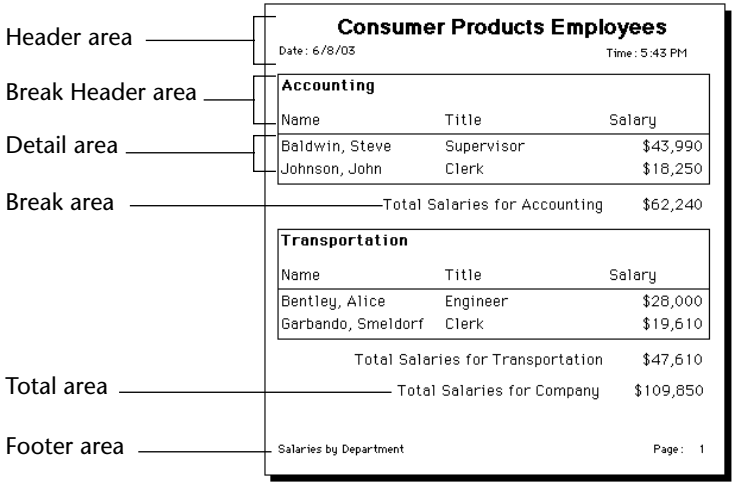
  If you did not check the Preview on Screen check box, the report will be sent to the printer you selected in the Print Manager (Chooser on Macintosh).

## Printing Reports with Break Levels

Break levels are used to separate records into groups and print summary calculations for each group. The output form used to print a report with break levels must contain at least one break area. For information about designing output forms with break levels, see the *4th Dimension Design Reference* manual.

If your report includes break levels, you must sort the current selection before printing. When sorting records for a report with break levels, you normally sort on at least one more sort level than the number of break levels in your output form. If your report has one break level, use at least two sort levels. For example, if your report lists employees by department, the report has one break level (Departments).

You can sort your break field (Department Name) and one more field — Last Name. Employees will be listed alphabetically by last name within each department.




When you print a report with break levels, you must turn on break processing. Break processing causes 4th Dimension to break the records into groups and compute summary calculations.

There are two ways to turn on break processing. If an object on the form uses the Subtotal function, break processing is turned on automatically. Break processing can also be turned on by executing a method when the report is printed. The method must contain two commands, ACCUMULATE and BREAK LEVEL. For more information about using these commands in a method, refer to them in the *4th Dimension Language Reference* manual.

For information about how to use the Subtotal function in output forms, see the *4th Dimension Design Reference* manual.

► To print a report with breaks:

1 **Select the records to be included in the report.**

Selecting records is discussed in Chapter 4.

2 **Sort the records by at least one more level than the number of breaks in the report.**

Sorting records is discussed in Chapter 6.

3 **Execute the method that turns on break processing.**

*Note* This step can be skipped if the output form turns on break processing automatically by using the Subtotal function.

4 **Choose Print from the File menu or click on the corresponding button in the toolbar.**

The Print Form dialog box appears.

5 **Choose the form you want to use.**

6 **Click OK.**

4th Dimension displays the Page Setup dialog box for your selected printer. Choose any desired options and click **OK**.

4th Dimension displays the Print dialog box for your selected printer. To preview the report on the screen, check the **Preview on Screen** check box.

If you checked the Preview on Screen check box, the report will be displayed on screen, one page at a time. See a description of the options available for previewing a report in the "Printing Standard Reports" paragraph on page 146.

If you did not check the Preview on Screen check box, the report will be sent to the printer you selected in the Print Manager (Chooser on Macintosh). A dialog box keeps you informed of the progress of the operation.

# 9 Quick Reports

## Introduction

One of the most important tasks in data management is report generation. The Quick Report editor is one of two tools made available by 4th Dimension for the purpose of designing reports. You use the Quick Report editor to create ad-hoc reports in the User environment. The other tool is the Form editor, which you can use to design reports in the Design environment (which can be altered subsequently in User or Custom Menus mode). You should use an output form to design reports that require complex designs or programmatic processing.

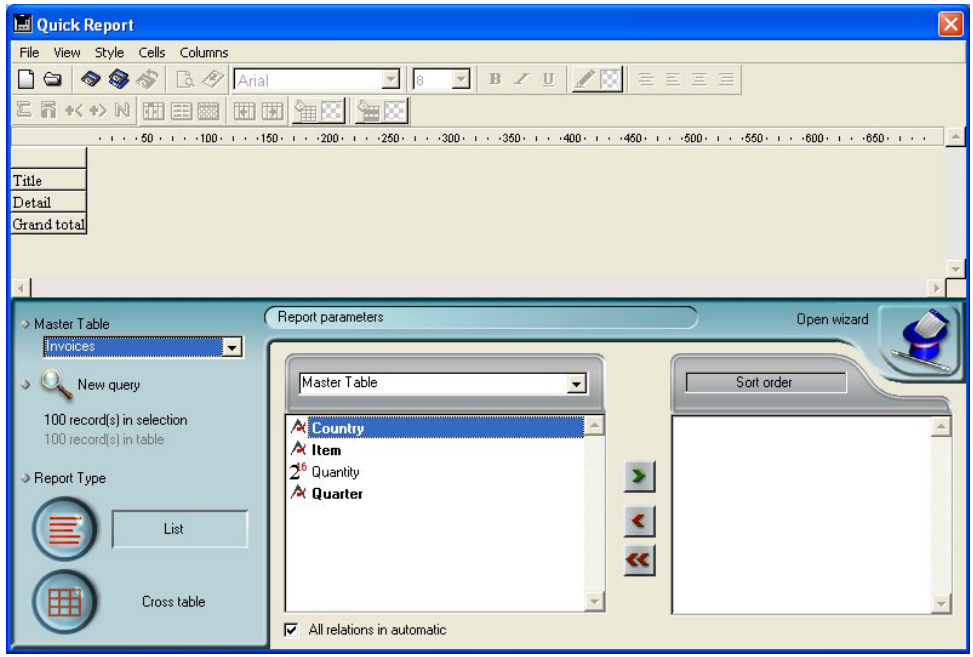
Using the Quick Report editor, you can:

- Produce lists of records.
- Create break areas.
- Produce cross-table reports.
- Compute summary calculations.
- Modify fonts and styles in the report.
- Define borders and background colors on a cell basis.
- Save and open quick report designs to disk.
- Select different output types such as HTML or text file, 4D View or 4D Chart area, printing or saving to disk.

The Quick Report editor produces reports from the current selection of records. Before generating a report, set the current selection of records that you want to include in your report.

## Overview of the Editor

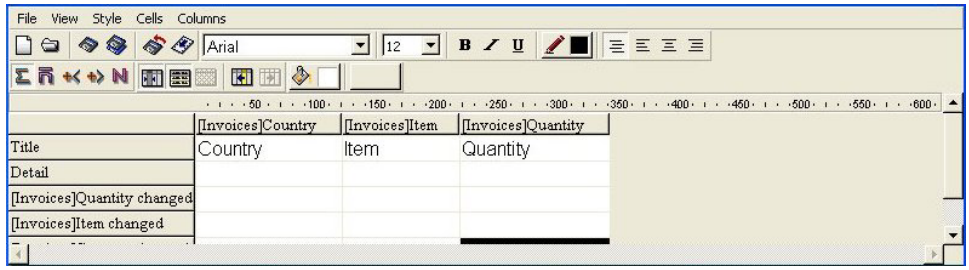
In the user environment, the Quick Report editor appears as follows:




It consists of two main areas:

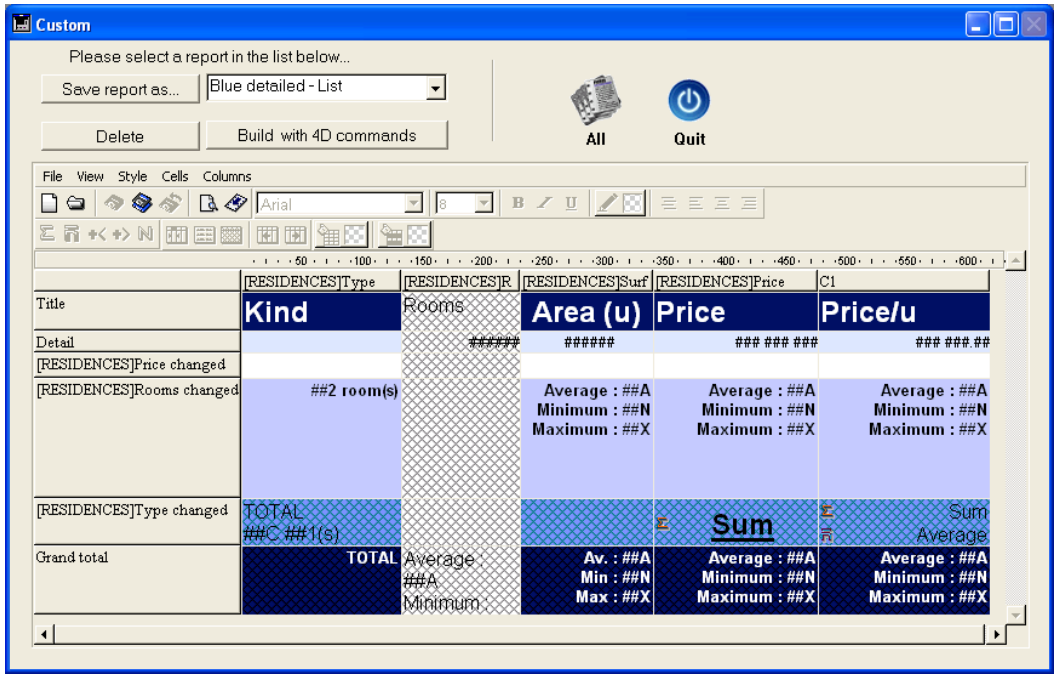
- The Quick Report data area that is used to specify the type of report to be built and the data to be integrated; it also can be used to access the Quick Report Wizard:

- The actual Quick Report area:



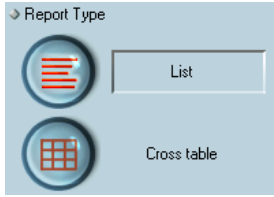

This shows the area as it appears when a Quick Report area is inserted in a form. This is where actual column and row contents are created, where sort orders are defined, etc. Also, this area includes various toolbars, its own menu bar and contextual menus.

For example, this area could be placed in a form as depicted below:



## List Mode and Cross-table Mode

In the Quick Report editor there are two operation modes available which generate two specific types of reports: **List** and **Cross table**.




- **List mode**
  This is the default mode. In this mode, reports would typically display records as a list with break levels where sums would be performed. The following is a typical List quick report.

| First Name | Last Name | Department Name | Salary |
|---|---|---|---|
| Biff | Davis | Accounting | 43780 |
| Smeldorf | Garbando | | 19610 |
| Alan | Hull | | 41460 |
| Bryan | Pfaff | | 26440 |
| Shirley | Ransome | | 36040 |
| Marlys | Wilson | | 36500 |
| | | Sum for Department : Accounting | 203830 |
| Kathy | Forbes | Engineering | 18840 |
| Dennis | Hanson | | 40520 |
| Mary | Smith | | 55000 |
| Andy | Venable | | 43520 |
| Lance | Wolfram | | 27300 |
| | | Sum for Department : Engineering | 185180 |

- **Cross-table mode**
  This mode allows you to display your report as a two-dimensional table. This is useful when you want to display data from a data source broken down into categories that are actually a function of two other data sources.

For example, a cross-table form would let you display in a table how many of each product type was sold in each quarter. The following is a typical Cross-table Quick Report.

| | AV Preamplifier | Power module | Remote control | Line Total |
|---|---|---|---|---|
| Q1 | 34 | 29 | 39 | 102<br>10526316 |
| Q4 | 48 | 64 | 21 | 133<br>66666667 |
| Q3 | 49 | 68 | 40 | 157<br>48148148 |
| Q2 | 64 | 74 | 47 | 185<br>66666667 |
| Grand total | 195<br>5.90909090909<br>1 | 235<br>5.875<br>1 | 147<br>5.4444444444<br>1 | 577<br>5.77<br>1 |

# Quick Report Basics

This section describes basic operations used when working with the Quick Report editor to design a report.

## Creating a New Quick Report

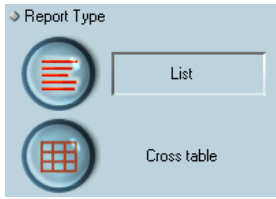
By default, the Quick Report editor lets you create reports in the User environment.
It is also possible to create reports from the Custom Menus mode, in particular by inserting a Quick Report area into a form.

► To design a quick report:

1 **Choose Quick Report... from the Tools menu or click on the corresponding button in the toolbar.**

4th Dimension displays the Quick Report editor. If a previous report has been defined, it appears in the window. To erase the contents of the window, choose **New** from the **File** menu or click the New icon in the standard toolbar of the editor to begin a new Quick Report design.

2 **Choose the type of report to be generated by clicking on either the List or Cross table button, located at the bottom left corner of the Quick Report editor:**




The List type is generally selected by default. The Quick Report area is modified according to the type selected.

## Loading and Saving a Quick Report Design

You can save a quick report design as a file that you can open from the Quick Report editor. The quick report design includes all of your specifications for the report, but not the data. By saving report designs, you can maintain a library of quick report designs that you can use according to your needs.

*Note* If you do not save your design, it is displayed the next time you open the Quick Report editor but only during the same work-session.

### Saving a Quick Report Design

► To save a quick report design:

1 **Choose Save as from the File menu.**
**OR**
**Click the Save as icon in the file management toolbar** **.**
4th Dimension displays a create-file dialog box in which you can name the quick report design.

*Note* Quick report files in 4th Dimension for Windows are denoted by the file extension .4QR.

2 **Enter a filename for the quick report and click OK.**
4th Dimension saves the report as a file that you can open with the Quick Report editor. You can save the file on your hard disk. If you modify the parameters of the report subsequently and want to save them again, you just need to choose the **Save** command in the **File** menu.

The new file will replace the previous one on the disk, without the standard save file dialog box appearing.

### Loading a Quick Report Design

When the Quick Report editor is open, you can load a saved design and use it to print a new report. You can use the same quick report design repeatedly to print different selections of records.

► To load a report design:

1. **Choose Open from the File menu.**
   **OR**
   **Click the Open icon in the file management toolbar** **.**
   4th Dimension displays an open-file dialog box displaying a list of available quick report designs.
2. **Double-click a filename or select a filename from the list and click OK.**

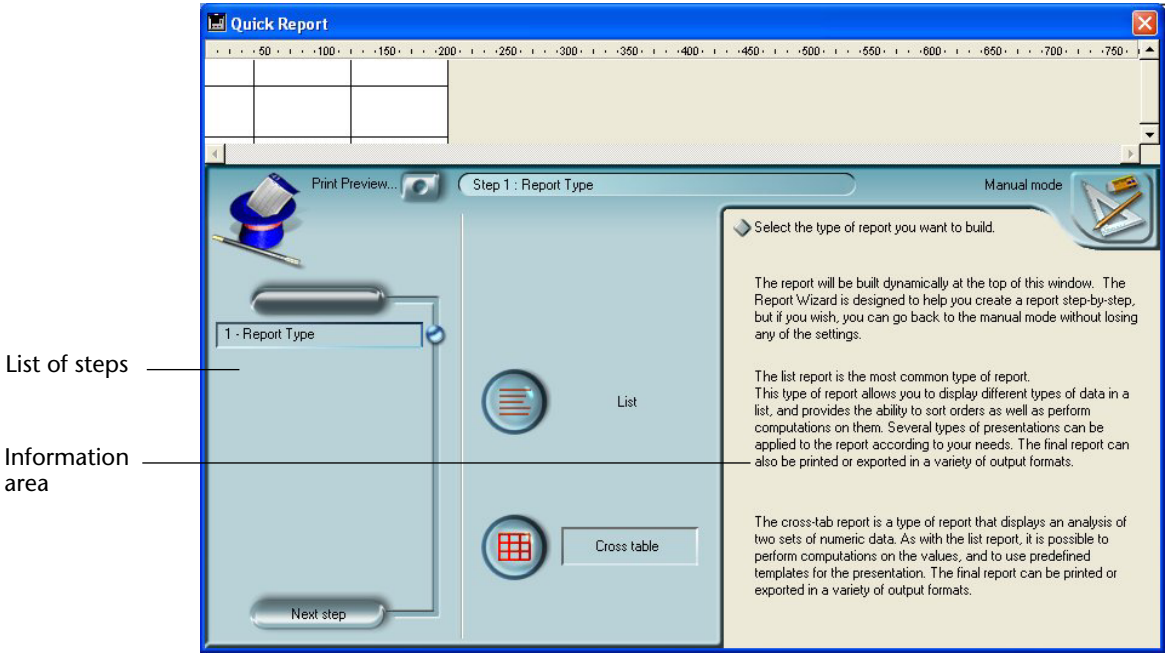
   4th Dimension replaces the current design with the design you opened.

## The Quick Report Wizard

When creating a manual Quick report in User mode, you can use the Wizard to guide you through the creation of the report.

To start the wizard, click the **Open wizard** button in the Quick Report editor:

The pages of the wizard then replace the data area in the window of the Quick Report editor:




The construction of the report is then carried out through detailed steps with comments appearing in the right-hand part of the window. To create a Quick Report using the wizard, follow the instructions displayed on the screen.

When you have finished constructing the report, the wizard offers you the possibility of generating the corresponding 4D code. For more information about this, refer to the"Generating 4D Code" paragraph on page 206.

To exit the wizard, click on the button to return to Manual mode:

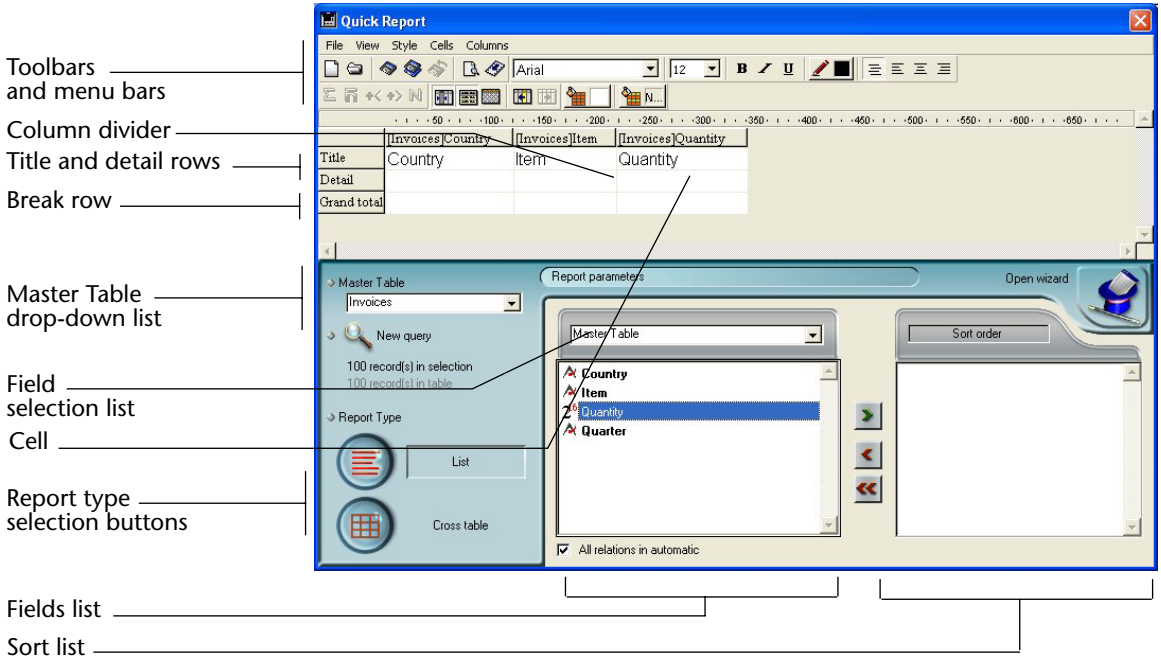
# Using the Quick Report Editor

## Interface

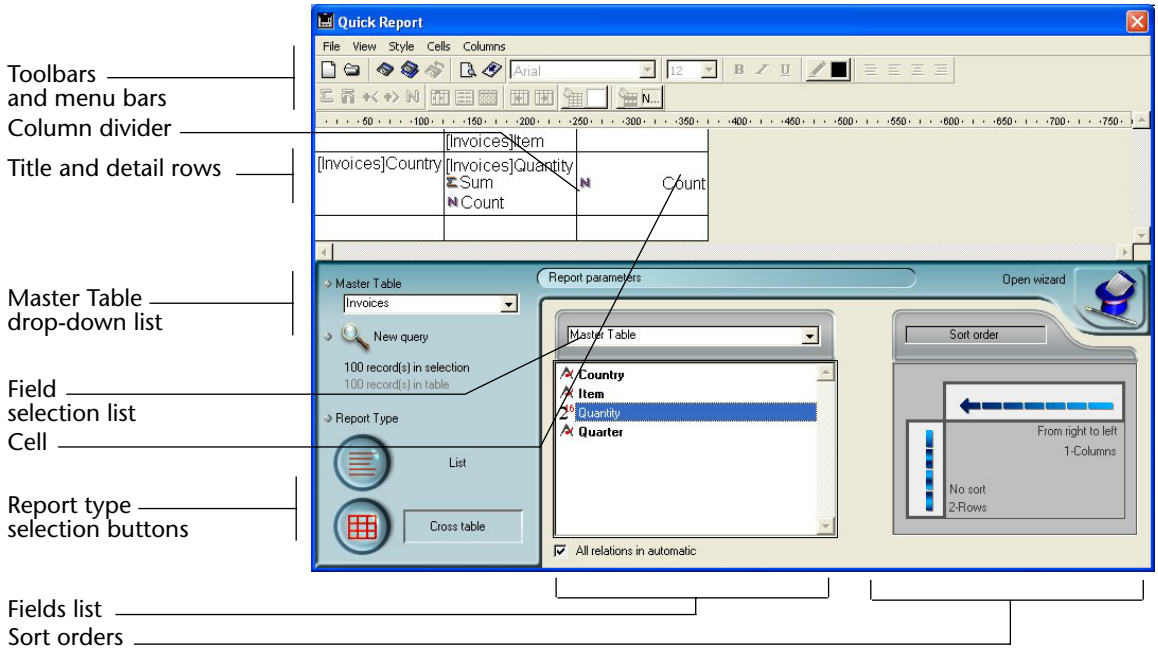
When you create a quick report, you can specify the following:

- Columns that display fields or formulas, either from the current table or from related tables,
- Sort levels and order (list mode),
- Summary calculations,
- Display format,
- Text for labels,
- Formats for numeric and Boolean data,
- Font, font size, style, and justification for labels, summary calculations, and data,
- Background colors on a cell column or row basis,
- Borders,
- Page headers and footers.

**List mode**:



**Cross-table mode**:




The Quick Report editor contains the following elements:

- **Master Table drop-down list**: This menu is used to specify the master table that will be used as a basis for generating the report. The fields of this table are displayed in the Fields list and the related fields will be displayed in relation to this table.
- **Fields list**: This list lets you select the fields to be inserted into the report by double-clicking or by drag and drop. It displays either the list of fields found in the master table, the hierarchical list of tables and related fields, or the hierarchical list of all the tables and fields of the database. You choose the type of display in the Field selection list located just above the area.
  Indexed fields appear in bold. You can also display and select the fields of related tables.

*Note* Only tables and fields which are not hidden appear in the Fields list of the Quick Report editor. For information about hiding tables and fields, refer to the *4th Dimension Design Reference* manual.

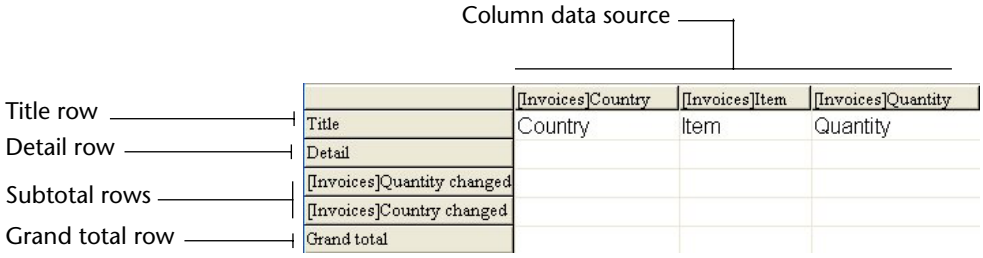
- **All relations in automatic**: This option is used to specify the way in which the Quick Report editor will make use of the relations between the different tables of the database.
  On principle, the editor can only use automatic relations. By default, the option is not checked and only automatic relations can be used by the editor.
  If the **All relations in automatic** option is checked, the Quick Report editor considers the manual relations of the database as automatic relations and will thus enable access to all the data related to the database.

*Note to developers*

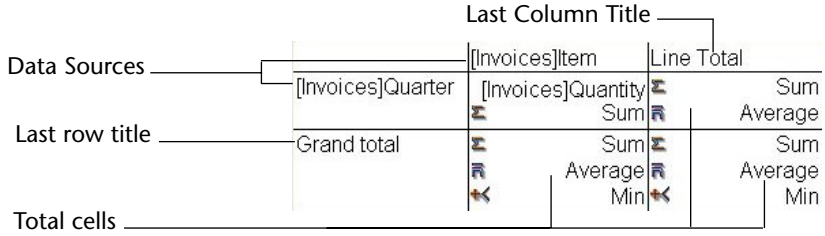
• The **All relations in automatic** option causes all the relations to pass into automatic for the current process, even after the Quick Report editor has been closed. If you want to make sure that all the relations will be manual after using the Quick Report editor, execute the statement AUTOMATIC RELATIONS(False;False).
• When the editor is called using the QR REPORT command, this option does not appear in order to allow the developer to manage the status of relations directly.

- **Column dividers**: These lines indicate the boundaries between columns of the report. They can be moved manually in order to enlarge or reduce the size of each column. Manual resizing deselects the **Automatic Width** option if it has been activated for the column concerned.
- **Cells**: A cell is the intersection of a row and a column.
- **Scroll bars**: You use the scroll bars to view parts of the quick report design that extend beyond the area of the quick report form.
- **Sort list/Sort order display area**:
  - In List mode, this list displays the fields of the report on which the sort will be carried out, as well as the sort order and whether it will be ascending or descending. Each field inserted into this list causes a sub-total row to be added in the Quick Report area.
  - In Cross-table mode, this area displays the sort order for each data source.

- **Quick Report area**: This area lets you build your report by inserting fields using drag and drop, double-clicking or via the contextual menu; you can also adjust the width of the columns added, or delete breaks or formulas, define the colors and borders of cells, etc.



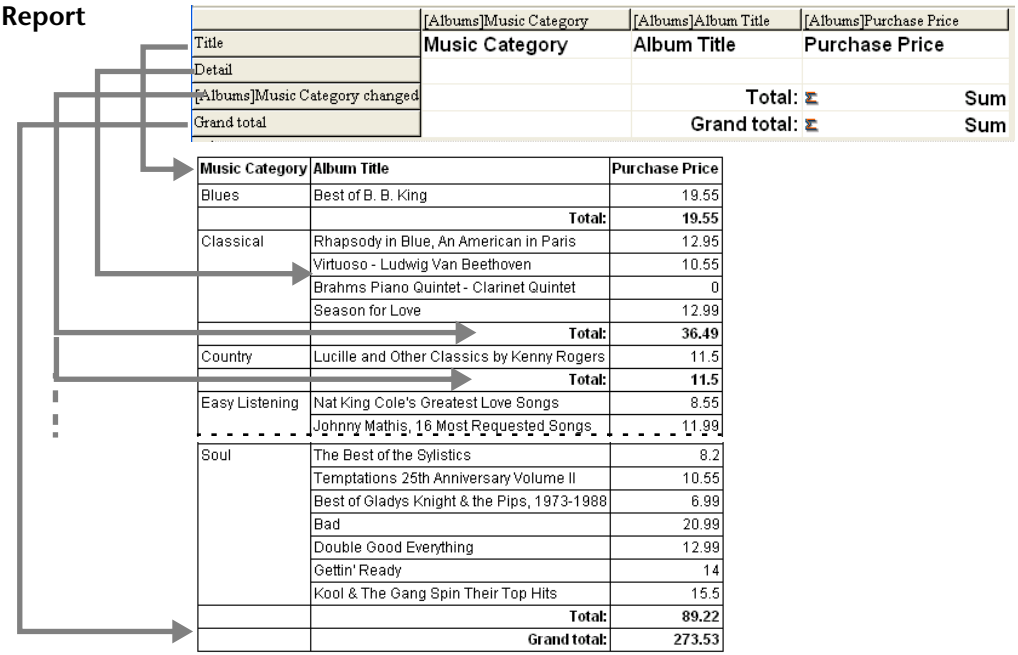

- **Title row**: This row displays the names of fields or formulas that have been inserted into the report. It is repeated for each page of the report. The Quick Report editor inserts field names by default, but you can modify the contents.
- **Detail row**: This row contains information drawn from each record and is repeated in the report for each record. You can associate a display format with it, depending on the type of data represented.
- **Subtotal rows**: These rows display intermediate calculations as well as the wording that is associated with them. A row is created for each sort order.
- **Column data sources**: These titles indicate the source of the data for each column.



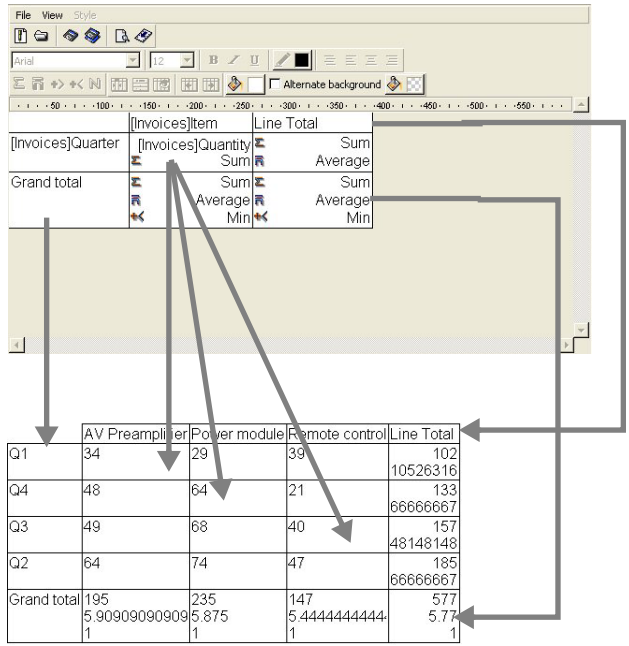

- **Data Sources**: These two cells will house fields that will be used for the two categories of the array. The center cell can also accept fields sources and calculations at the same time.
- **Total cells**: These cells are designed to house calculations on the column's contents.
- **Title cells**: These cells house the titles for the last column or the last row. Their contents can be modified.

The following figures shows completed quick report designs and the relationship between the specifications in the design and the printed output:

**List Report**




**Cross-table Report**



## Contextual Menus

The Quick Report editor has contextual menus that make it easy to access certain row, column, and cell operations. Instead of making menu selections or working with the Cell or Column properties areas, you can perform certain operations by displaying a Quick Report contextual menu.

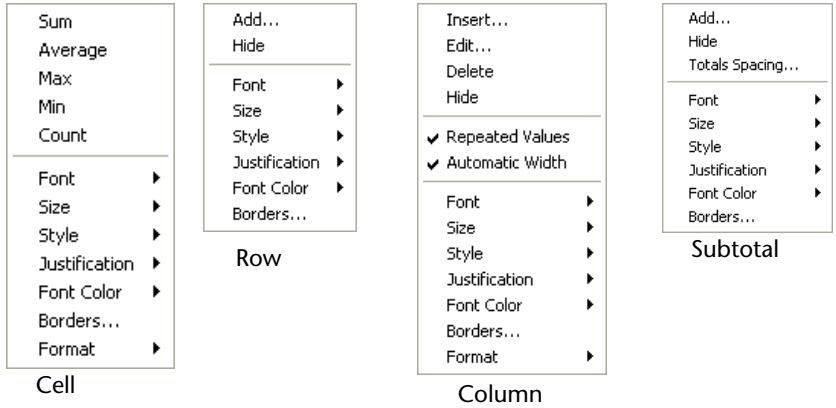
There are separate contextual menus for row, column, and cell operations.

► To use a contextual menu:

1 **Click with the right mouse button on a cell, a row title, or a column heading.**

A contextual menu appears. The commands in the contextual menu depend on where you click (column heading, cell, row or subtotal row title). In addition, menu commands that are not appropriate for the specific row, column, or cell are disabled.

2 **Choose the desired menu command:**




As with any contextual menu, this menu's contents vary depending on which cell type is highlighted. Items available break down into five main types:

- Font attributes,
- Display formats,
- Standard calculations,
- Column or row management items, and
- Cell borders.

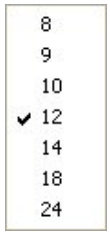
**Font Attributes**

These items appear in the contextual menu when a cell, column or row is selected. Selecting a font attribute will apply it to the current selection (cell, row or column). The Font attribute items appear as follows:

- **Font**
  Selecting this item displays the list of fonts installed on your machine from which you can select the font that will be applied to the items selected in the report area.

  Once an item in the list is selected, a check mark is displayed next to it.

- **Size**
  Selecting this item displays the list of font sizes from which you can select the font size that will be applied to the items selected in the report area.

  Once an item in the list is selected, a check mark is displayed next to it.

- **Style**
  Selecting this item displays the font styles (Plain, Bold, Italic, and Underline) from which you can select the font style that will be applied to the items selected in the report area.

  Once an item in the list is selected, a check mark is displayed next to it.

- **Justification**
  Selecting this item displays the list of justification attributes (Default, Left justified, Centered and Right justified).

*Note* Default is the default justification for this data type (left for numbers or, otherwise, right).

Once an item in the list is selected, a check mark is displayed next to it.

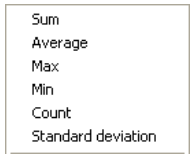
- **Font color**
  Selecting this item displays a palette of colors.

**Display Formats**

These items appear in the contextual menu when either a cell or a column is highlighted. From the menu, you can select one of the 4D default formats that match the data type of the column. Once selected, the format applies to the entire column, regardless of whether the current selection is a cell or a column.

**Summary Calculations**

These commands appear in the contextual menu when the current highlighted cell belongs to either the Grand total row or to a Subtotal row.



Selecting an item will insert the corresponding calculation in the highlighted cell (see the "Adding Summary Calculations" paragraph on page 189). Once an item in the list is selected for a cell, a check mark is placed next to it. It is possible to select several calculations successively.

**Column and Row Management Items**

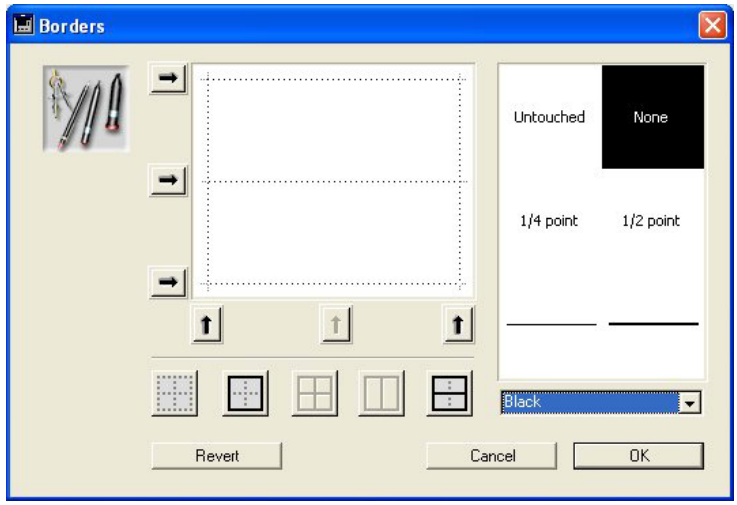
There are several items that are dedicated to column or row management:

- **Hide**
  Selecting this item hides the current column or row. Once it is hidden, a check mark is displayed next to the item, and the row or column is crossed out.
- **Add...**
  This item is displayed when a row is highlighted or nothing is highlighted. Selecting this item displays the formula editor to allow you to define the data source for a new column. Once this is done, the new column is added to the right of the right-most existing column.
- **Totals Spacing...**
  This item is displayed when you click on the title area of a subtotal row. It displays the Subtotals Properties dialog box. The options found in this dialog box are described in the "Subtotal Spacing" paragraph on page 188.
- **Insert...**
  This item is displayed only when a column is highlighted in list mode. Selecting this item displays the formula editor to allow you to define the data source for a new column. Once this is done, the new column is added to the left of the current highlighted column.
- **Delete**
  This item is displayed only when a column is highlighted in list mode. Selecting this item deletes the current highlighted column.
- **Edit...**
  This item is displayed only when a column is highlighted in list mode or when a cell is highlighted in cross-table mode. Selecting this item displays the formula editor to allow you to edit the data source for the current column (list mode) or for the current cell (cross-table mode).

- **Automatic Width**
  This item is displayed only when a column is highlighted in list mode, or when any cell is highlighted in cross-table mode. You can use this item to select or deselect the automatic width. When Automatic Width is selected, 4D will try to match the column size to the data so that the data fits on one line.

**Borders**

These items appear in the contextual menu when a cell, column or row is selected. Selecting Borders... displays the Borders dialog box:




For more information about this dialog box, refer to the "Setting Borders" paragraph on page 179.

Once defined, the border format is applied to the current selection (cell, row or column).

## Selecting Rows, Columns, and Cells

When designing a List quick report, you need to select rows, columns, and cells in the quick report form. A cell is the intersection of a row and a column.

► To select a row:

- **Click on the Title, Detail, Subtotal, or Grand total cells in the row label area.**

► To select a column:

■ **Click the Header row of a column.**

► To select a cell:

■ **Click on the cell.**

## Adding and Modifying Text

You can add or modify text in the quick report form to label parts of the report. For example, if you requested summary calculations, you can label them by adding text to other cells in the Subtotal and Grand total rows.

You can add and modify text as follows:

- Edit the text that 4th Dimension automatically adds to the Title row of the report,
- Insert text in empty cells of the Subtotal and Totals rows,
- Insert the value of a Subtotal field in the Subtotal rows,
- Specify the font, font size, justification, and style for any text that appears in the report.

### Adding Text

► To add text in a report cell:

1 **Click twice on an empty cell in the quick report form.**

A text insertion point appears in the cell.

If you are entering a label for a summary calculation, select a cell in the same row as the cell containing the calculation icons. You cannot enter text into the same cell that contains summary calculations.

2 **Type the text in the cell.**

### Modifying Text

► To modify text in a cell:

1 **Double-click in a cell to get an insertion point and drag across the text in the cell you want to modify.**

4th Dimension highlights the selected text.

2 **Type the new text in the cell.**

## Adding Columns

In List mode, you create columns by dragging field names from the Fields list into the quick report area. If you want to add a field from a related table, expand the foreign key field in the hierarchical list of fields to display the fields in the related tables (if you have selected **Related Tables** or **All Tables** in the drop-down menu located just above the list).
You can add fields from related tables, provided that the relationship is automatic. If you want to be able to use manual relations, check the **All relations in automatic** option: in this case, the editor changes all the relations of the database to automatic (see the "Interface" paragraph on page 159).

*Note* You cannot add or edit a column in cross-table mode, since the report comes with all the columns needed.

► To add a field:

■ **Drag the name of a field to the right of existing columns in the Quick Report area and release the mouse button.**

**OR**
**Double-click on the name of a field in the Fields list.**

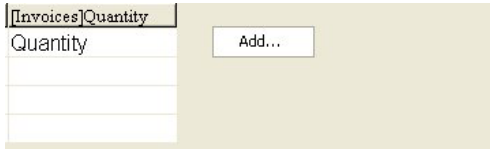
*Note* If you drag and drop a field onto an existing column, it will be replaced by the new column.

4th Dimension creates a column for the field and places the field name in both the column header and the cell in the Header row.

By default, 4th Dimension prints the field names as column heads at the top of each page in the quick report.

► To add a column using a menu command:

1 **Select the Add... command in the Columns menu of the editor.**
**OR**
**Right-click over an unused area of the Quick Report area, then select the Add... command.**




The standard 4th Dimension formula editor is displayed, allowing you to specify the data source of the new column (field or formula).

## Inserting Columns

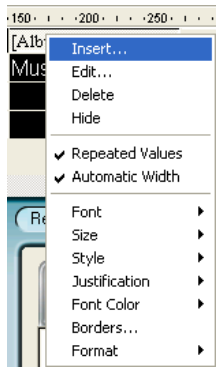
In List mode, you can insert an empty column into a quick report. After you insert the column, you can assign a field or a formula to it.

► To insert a column:

1 **Select a column.**

2 **Choose Insert... from the Columns menu.**

**OR**
**Right-click to display the Quick Report contextual menu and choose Insert.**




The standard 4th Dimension formula editor is displayed, allowing you to specify the data source of the new column (field or formula).

## Deleting Columns

In List mode, as you specify fields for your quick report, you may want to remove some columns to place them elsewhere. Or, you might want to delete the column from the report.

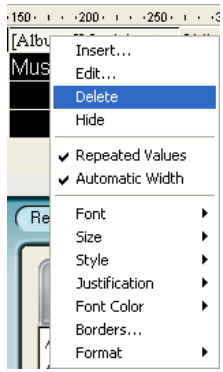
► To delete a column using the Quick Report menu bar.

1 **Select the column you want to delete.**

2 **Choose Delete from the Columns menu.**

**OR**

**Right-click on the header of the column to be deleted, then select the Delete command from the contextual menu.**




4th Dimension removes the selected column of the report.

## Replacing Columns

In List mode, you can replace a column in the quick report by dragging another field over it. You can also replace a field with a formula and vice versa.

► To replace a column by a field:

1 **Drag a field from the Fields list to the column you want to replace.**
The replacement is instantaneous. If the previous field was designated as the sort level, the field that replaces it will also be substituted in the sort order list.

► To replace a column using the formula editor:

1 **Select the column you want to replace and choose Edit... from the Columns menu.**
**OR**
**Right-click on the header of the column to be replaced, then select the Edit... command in the contextual menu.**
The standard Formula editor of 4th Dimension appears, allowing you to designate the new data source of the column (field or formula).

When you print the quick report, 4th Dimension will print the results of the formula for each record that appears in the Detail row. See the "Associating Formulas with a Quick Report" section on page 174 for information about adding a formula to a quick report.

## Sizing Columns

By default, the Quick Report editor sizes columns automatically, as reflected in the **Automatic Width** button. It sizes each column based on the maximum length of data displayed in the column and any labels typed into the column. The Quick Report editor sizes the columns when the report is printed.
This operation is enabled for a column when the **Automatic Width** attribute has been associated with it. You can set and view the activation of this option in the **Columns** menu, in the contextual menu of the columns or using the corresponding button in the Columns toolbar:

To view the widths of each column, preview the report on the screen. See the "Generating a Quick Report" section on page 200 for more information about previewing a report.

Because selecting the **Automatic Width** button or contextual menu item changes the width of a column based on the maximum width of data in the records being printed, selecting different records can change the size of the columns.

You can resize a column manually, which automatically causes the deselection of the **Automatic Width** option (where applicable).
When a column is set manually, text in the column wraps within the specified area.

► To manually resize a column:

1 **Select the column you want to resize.**

2 **Move the pointer over the column divider in the quick report to change the pointer into a column width cursor ⧺.**

3 **Drag the column divider to the left or right to resize the column.**

## Moving Columns

In List mode, as you specify fields for your quick report, you may want to move some columns to place them elsewhere.

► To move a column using the Quick Report toolbar:

1 **Select the column you want to move.**

2 **Click the move icon to move it to the right or to the left:**

**OR**

3 **Select Move right or Move left from the Columns menu to move the column as desired.**

4th Dimension moves the selected column.

## Associating Formulas with a Quick Report

You can add a formula to a column in a quick report. For example, you can add a formula that computes employees' monthly salaries from an Annual Salary field.

► To associate a formula with a column:

1 **Insert an empty column**
**OR**
**Click an existing column and choose Edit... from the Columns menu.**
**OR**
**Double-click an existing column's header.**
**OR**
**Right-click on an existing column header to display the Quick Report contextual menu and choose Edit.**

4th Dimension displays the Formula editor, which you can use to build a formula. If you selected an existing column, the formula you create will replace the previous contents of the column.

*Note* Make sure that the formula you create does not change the current selection. Changing the current selection will cause problems when you print the quick report since the report is based on the current selection. For information about commands and functions that change the current selection, refer to the *4th Dimension Language Reference*.

2 **Build the formula by selecting the fields, operators, commands and/or 4D methods, then enter the desired values in the editing area.**
**OR**
**Click the Load... button to retrieve an existing formula from disk.**

For more information about the formula editor, refer to the "Global Updates" paragraph on page 113.

If you click the **Load...** button, 4th Dimension displays an open-file dialog box and asks you to select a file. When you load a file, it replaces any formula that currently appears in the Formula editor. After you load a formula, you can modify it in the editing area.

To save the formula as a file that you can retrieve and use in another column or in another report, click the **Save...** button and enter a filename in the dialog box.

3 **Click OK to assign the formula to the column.**

4th Dimension adds a new label to the column that identifies it as a formula. You can relabel the column by typing a label into the header cell for that column. The formulas are labelled *C1* to *Cn*. These labels are the name of the variables containing the current value of the column. You can use these variables in other formulas.

# Modifying the Graphic Attributes of a Report

You can modify the graphic appearance of a quick report. The Quick Report editor lets you set the following attributes:

- the character font, as well as its size, justification, style and color,
- the background color of the cells,
- the cell borders.

In addition, 4th Dimension provides a set of predefined report templates that you can modify as desired.

*Note* Appearance specifications are only taken into account for the "Printer" and "HTML File" output destinations (colors only). With other types of output, the formatting of reports must be carried out after the report is generated, using the receiving applications (4D View, 4D Chart or a text editor). For more information about report destinations, refer to the "Generating a Quick Report" paragraph on page 200.

## Specifying Character Font, Size, Justification, Style, and Color Attributes

While designing your quick report, you can specify different fonts, font sizes, justification, styles and colors. You can then apply these specifications to text, data, and summary calculations within rows, columns, or cells in the quick report.

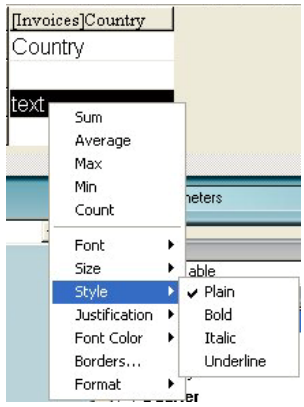
If you assign specifications to the Detail row of the report, you will not see the results until you preview or print the report.

You can specify font attributes using either the Quick Report menu commands or the Quick Report contextual menu.

► To specify a character font, font size, style, justification or color:

1 **Right-click on the row label, column header, or cell to which you want to apply the font attributes.**

A contextual menu appears.




2 **Use the Font, Size, Style, Justification or Font Color submenus to change the font attributes as desired.**
**OR**

1 **In the report, select the column, row or cell that you want to configure.**

2 **Choose a font in the drop-down font list and a size in the drop-down size list; then choose a style, justification and color in the Style toolbar:**

*Note* You can also assign a style and justification using the **Style** menu.

4th Dimension applies the parameters to the text, data or calculations included in the selected area.

## Specifying the Background Color of Cells

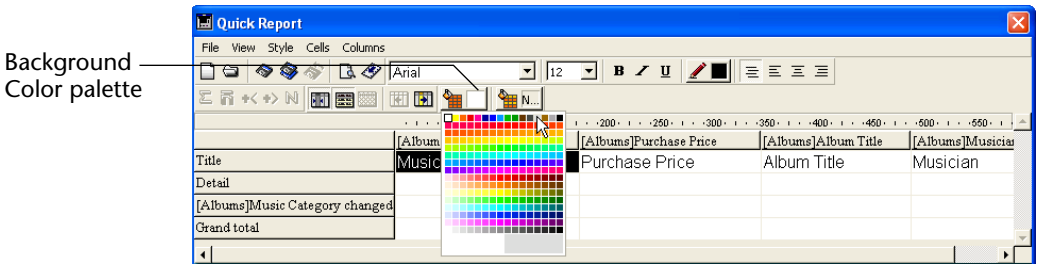
The Quick Report editor allows you to set a background color for each cell. You can set either a single color or two alternating colors, which provides better readability for tables.

It is possible to set background colors for both List and Cross-table reports.

Background colors are used with the “Print” and “HTML File” output destinations.

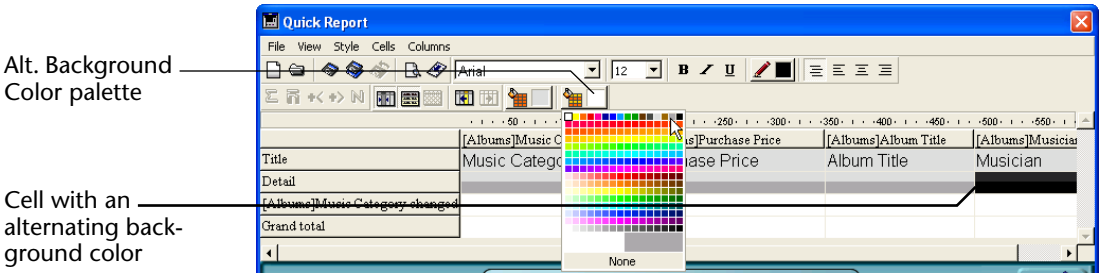
► To set a background color:

1 **Select a cell, column or row, then choose the main color in the "Background Color" palette of the toolbar:**



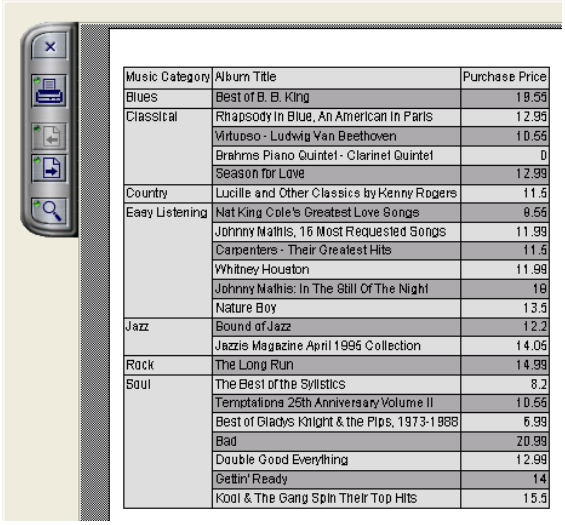

You can assign any color combination that you want to the rows, cells and columns.

2 **(Optional) If you want to use an alternating background color, choose it using the "Alt. Background Color" palette:**




The cells which have been assigned two alternating background colors will display both of them in the Quick Report editor.

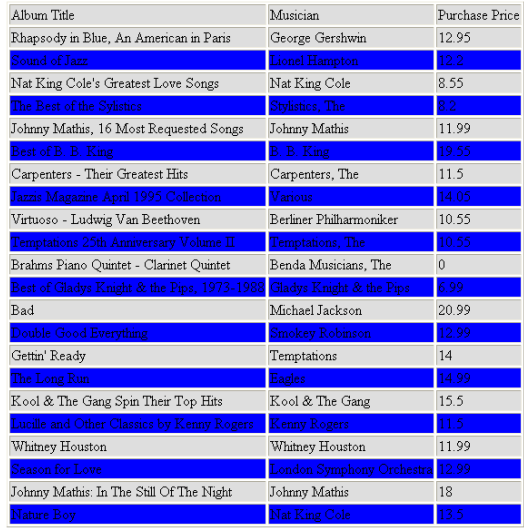
Here is an example of a generated report in List mode (preview) that has alternating background colors:



| Music Category | Album Title | Purchase Price |
|---|---|---|
| Blues | Best of B. B. King | 19.55 |
| Classical | Rhapsody In Blue, An American In Paris | 12.95 |
| | Virtuoso - Ludwig Van Beethoven | 10.55 |
| | Brahms Piano Quintet - Clarinet Quintet | 0 |
| | Season for Love | 12.99 |
| Country | Lucille and Other Classics by Kenny Rogers | 11.5 |
| Easy Listening | Nat King Cole's Greatest Love Songs | 8.55 |
| | Johnny Mathis, 16 Most Requested Songs | 11.99 |
| | Carpenters - Their Greatest Hits | 11.5 |
| | Whitney Houston | 11.99 |
| | Johnny Mathis: In The Still Of The Night | 18 |
| | Nature Boy | 13.5 |
| Jazz | Sound of Jazz | 12.2 |
| | Jazzis Magazine April 1995 Collection | 14.05 |
| Rock | The Long Run | 14.99 |
| Soul | The Best of the Sylistics | 8.2 |
| | Temptations 25th Anniversary Volume II | 10.55 |
| | Best of Gladys Knight & the Pips, 1973-1988 | 6.99 |
| | Bad | 20.99 |
| | Double Good Everything | 12.99 |
| | Gettin' Ready | 14 |
| | Kool & The Gang Spin Their Top Hits | 15.5 |

Background colors are also taken into account in reports generated in HTML format:

| | [Albums]Album Title | [Albums]Musician | [Albums]Purchase Price |
|---|---|---|---|
| Title | Album Title | Musician | Purchase Price |
| Detail | | | |
| Grand total | | | |



| Album Title | Musician | Purchase Price |
|---|---|---|
| Rhapsody in Blue, An American in Paris | George Gershwin | 12.95 |
| Sound of Jazz | Lionel Hampton | 12.2 |
| Nat King Cole's Greatest Love Songs | Nat King Cole | 8.55 |
| The Best of the Sylistics | Stylistics, The | 8.2 |
| Johnny Mathis, 16 Most Requested Songs | Johnny Mathis | 11.99 |
| Best of B. B. King | B. B. King | 19.55 |
| Carpenters - Their Greatest Hits | Carpenters, The | 11.5 |
| Jazzis Magazine April 1995 Collection | Various | 14.05 |
| Virtuoso - Ludwig Van Beethoven | Berliner Philharmoniker | 10.55 |
| Temptations 25th Anniversary Volume II | Temptations, The | 10.55 |
| Brahms Piano Quintet - Clarinet Quintet | Benda Musicians, The | 0 |
| Best of Gladys Knight & the Pips, 1973-1988 | Gladys Knight & the Pips | 6.99 |
| Bad | Michael Jackson | 20.99 |
| Double Good Everything | Smokey Robinson | 12.99 |
| Gettin' Ready | Temptations | 14 |
| The Long Run | Eagles | 14.99 |
| Kool & The Gang Spin Their Top Hits | Kool & The Gang | 15.5 |
| Lucille and Other Classics by Kenny Rogers | Kenny Rogers | 11.5 |
| Whitney Houston | Whitney Houston | 11.99 |
| Season for Love | London Symphony Orchestra | 12.99 |
| Johnny Mathis: In The Still Of The Night | Johnny Mathis | 18 |
| Nature Boy | Nat King Cole | 13.5 |

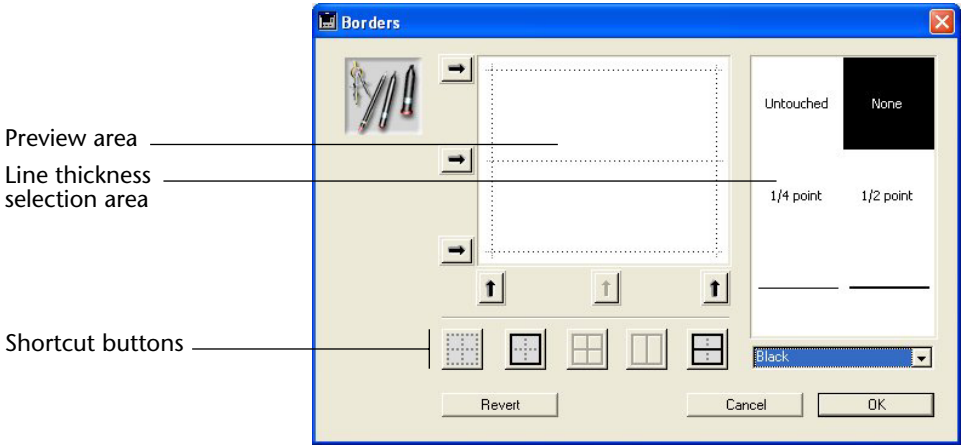
## Setting Borders

You can set the borders for cells in both cross-table and list reports.

► To set the borders for a cell, a column or a row:

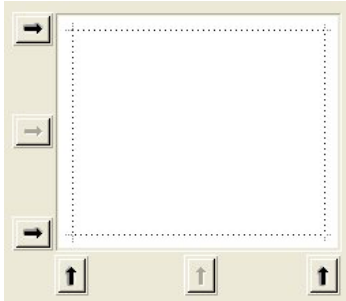
1 **Highlight a cell, column or row, and either select Borders... in the contextual menu or from the Style menu.**

The "Borders" dialog box is displayed:

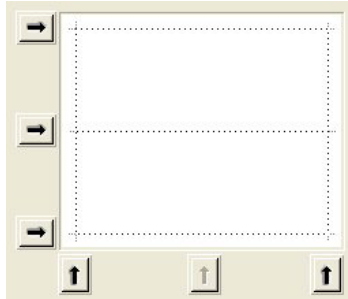



The preview area varies dynamically depending on the type of the selection: cell, column or row, but also whether a cell is in a list or cross-table type report. For example, the behavior of the center cell in a cross-table report is different from the behavior of a detail cell in a list report. The center cell is repeated both horizontally and vertically for a cross-table report, whereas the detail cell in a list report is going to be repeated only vertically. Also, other cells may not be repeated at all (titles, for instance).

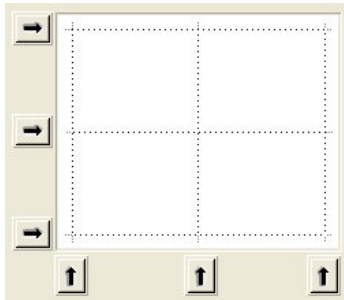
- If the selected cell is a title cell (which is not repeated), the outer lines represent the outer lines of the cell:



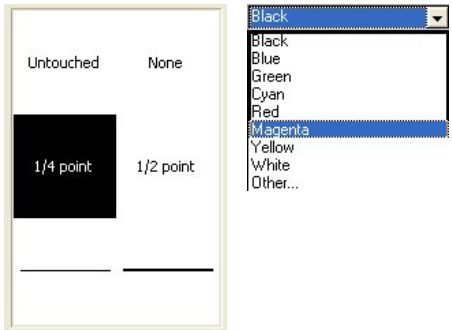
- If the selected cell is a detail cell in a List report (which is repeated vertically), the outer lines represent the outer lines of the cell repetition, and the inner horizontal line represents the border between two cells in the sequence:



- If the selected cell is the center cell in a cross-table report (which is therefore repeated both horizontally and vertically), the outer lines represent the outer lines of the repetition of cells, and the inner lines represent the borders between each cell generated from the center cell:



2 **Select the line thickness and color to use:**




You can use different colors for different borders.

3 **Select the borders using either the arrows or the shortcut buttons.**
You will notice that some shortcut buttons are disabled to match the type of the cell you are editing.

4 **Repeat steps 2 and 3 for each border to be configured.**

5 **Click OK to validate the changes.**
**OR**
**Click Revert to revert to the original border settings.**
**OR**
**Click Cancel to discard the changes and close the dialog box.**

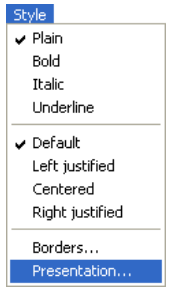
## Using a Predefined Report Template

The Quick Report editor contains a set of predefined templates providing various graphic approaches for the production of printed or HTML reports. You can use all of the template as is or you can use it as a basis for constructing your own reports. A template can be applied at any time.

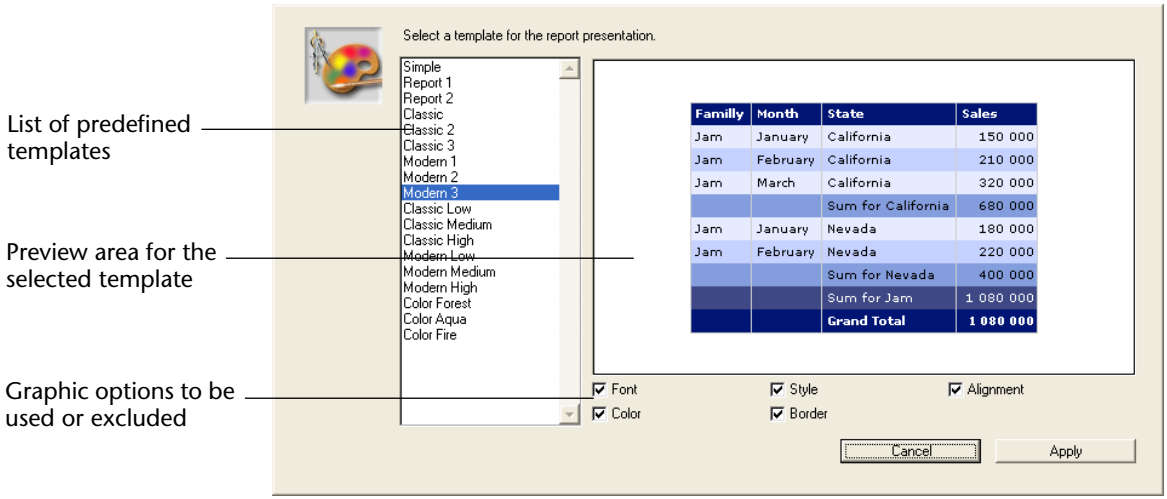
A report template combines a set of graphic characters: font, colors, style, borders and justification. You can use either all or part of the template characteristics.

► To use a predefined template:

1 **Choose the Presentation... command in the Style menu.**



The template selection dialog box appears:




2 **In the list of predefined templates, click on the one that you want to use.**

You can preview each template in the right-hand area of the dialog box. Choose the template that best corresponds to your needs, keeping in mind that you can always modify your report subsequently.

3 **If you do not want to use all the graphic options set by the template, you can uncheck each option that you do not want to be taken into account.**

By default, all the options are selected. If, for example, you uncheck the “Border” option, the borders defined by the template will not be applied to your report.

*Note* Only the “Color” option will be taken into account for reports whose output destination is an HTML file.

4 **Click on Apply.**

The selected characteristics are immediately applied to your report. If any graphic attributes were set previously, they will be replaced.

Keep in mind that certain characteristics will be only visible once the report has been generated.

# Sorting Records

An important feature of the Quick Report editor is the ability to sort the records in your report. You sort records for two reasons:

- To view records in a particular order,
- To create groups of records and subtotal areas in the report for the purpose of reporting summary calculations for groups.

## Specifying a Sort Order for a List Report

You can specify a sort order at any time; simply drag and drop a column into the Sort order list.
For example, if you wanted to sort the records of salespeople by the Sales Region field, you would drag and drop the Sales Region column into the Sort order area.

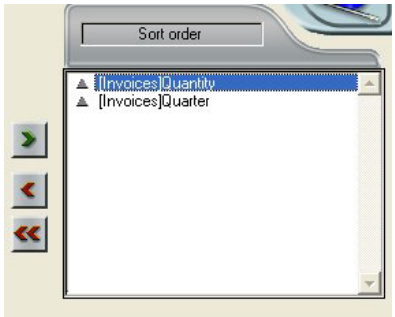
You can also sort based on a formula by selecting the column that contains the formula and placing it in the Sort order list. See the "Associating Formulas with a Quick Report" section on page 174 for more information about adding formulas to quick reports.

You can sort a report on several levels. The order in which the fields and formulas appear in the Sort order list indicates the sort level.

► To specify the sort order using the field list:

1 **Drag the Field you want to set as the sort level from the Fields list to the Sort order list.**
**OR**
**Highlight the field from the Field lists and click on the field insertion button:**

The field is then added to the Sort order list.

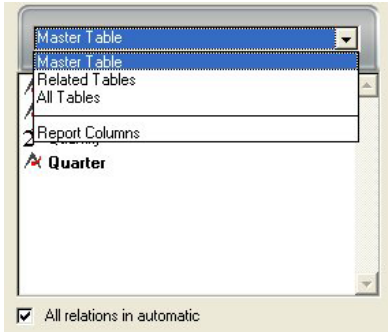


By default, sorts are carried out in increasing order (A -> Z). You can reverse the direction of the sort by clicking on the triangle next to the field in the Sort order list.

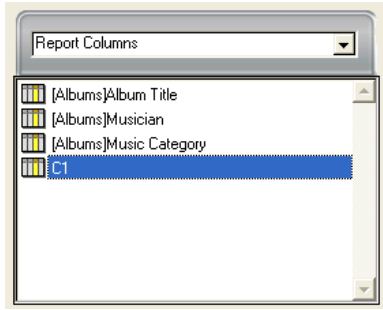
*Note* If the sorted field has not already been inserted into a report column, an additional column is automatically created in the Quick Report area.

► To specify a sort for a column (field or formula):

1 **Select Report Columns from the table selection drop-down list.**

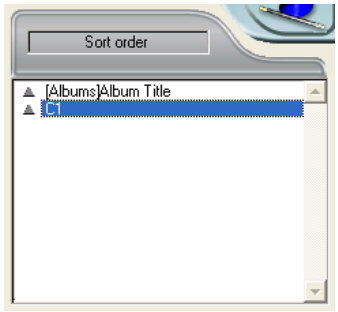



The list then displays the headers of the columns present in the report:




2 **Drag the column that you want to set as the sort level and drop it in the "Sort order" list.**
**OR**
**Highlight the field from the Field lists and click on the field insertion button:**

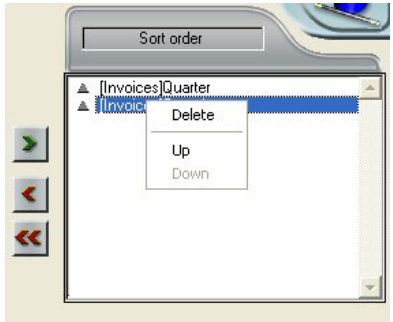
4th Dimension then displays the name of the column in the Sort order list:




## Changing the Sort Level

► To change the level of a sort:

1 **Right-click on the field in the Sort order list in order to display the contextual menu:**



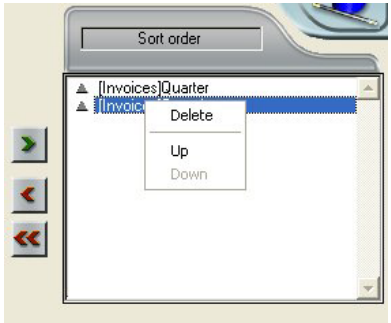

2 **Select Up or Down to move the field up or down (respectively) in the sort levels.**

## Deleting a Field or Formula from the Sort List

You can delete any field or formula from the Sort list.

► To remove a field or formula from the Sort order:

1 **Select the field or formula to be deleted in the sort list and display the contextual menu using a right-click:**




2 **Select Delete.**

The level is then removed.
Note that the associated column is not removed from the report. On the other hand, the associated subtotal row disappears.

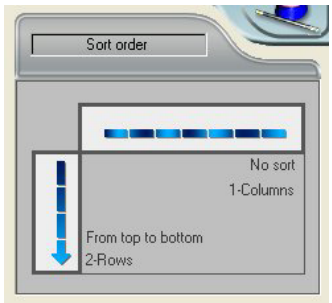
## Sorting the Cross-table Values

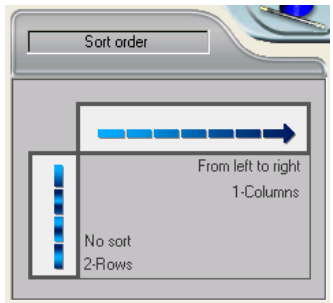
In a Cross-table report, the only values that can be sorted are the horizontal and vertical data sources (the two data sources that are used as categories in the final table).

► To sort the categories in a cross-table report:

1 **Click the sort indicators in the Sort order area.**

An arrow indicates the sort order specified:




To modify or delete the sort order of a data source, click on it again. The different possible reports appear successively.

When no arrow is displayed, no sort order is selected. In this case, values will be displayed in the order they appear in the selection.

## Subtotal Levels

In a quick report, you set break levels to separate or "break" records into groups according to values in one or more sort fields. A break area is printed at each break level. You can print summary calculations in the break area. The summary calculations — sum, average, minimum, maximum, count and standard deviation — are calculated for each group of records.

Break levels are determined by the sort levels and Break rows. For example, if you sort records by Sales Region, 4th Dimension inserts a break between each group of records that have the same sales region. These rows are automatically inserted when a sort is defined.

After you add a subtotal row to the quick report, you can request summary calculations on each break. For example, you can insert a summary calculation in a subtotal row to display subtotals for sales from each state in a marketing region. Refer to the "Adding Summary Calculations" section on page 189 for more information about adding summary calculations to Subtotal and Total rows.

Subtotal rows

| | [Invoices]Country | [Invoices]Item | [Invoices]Quantity |
|---|---|---|---|
| Title | Country | Item | Quantity |
| Detail | | | |
| [Invoices]Quantity changed | | | |
| [Invoices]Country changed | | | |
| Grand total | | | |

The label of a subtotal row indicates which change in value triggers the break.

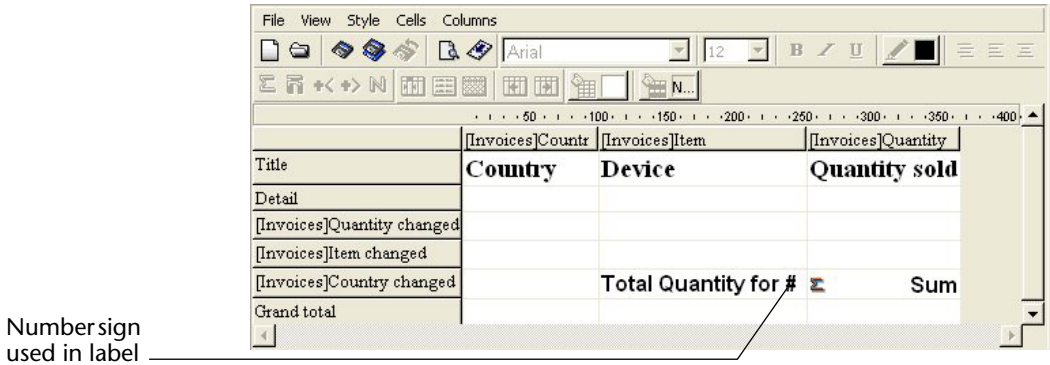
## Using the Values of Break Fields in Labels

You can improve the appearance and clarity of your reports by labeling each Subtotal row using the value of the Break field.

To request that the value of a Break field be printed in a label placed in the Break area, use the number sign (#) in the label. For example, the text "Total salaries for # department" will insert the department name (in this case, the value of the Department field) in place of the number sign when the report is printed.

The number sign does not need to be placed in the same column as the Break field. It will display the value of the Break field in any cell in the Subtotal row.

The following figure illustrates the use of the number sign in a label in the Subtotal row:



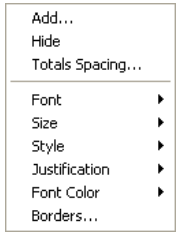

## Subtotal Spacing

It is possible to configure subtotal rows in order to control the page layout and appearance of the quick report. For example, you can generate a page break after each subtotal.

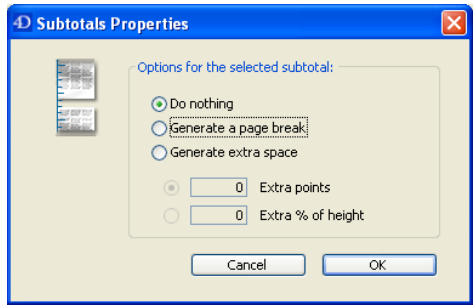
The subtotal page layout options can be used to visually set apart the different parts of the report.

► To set the spacing for a subtotal row:

1 **Select a subtotal row and choose the Totals Spacing command from the File menu of the editor.**
**OR**
**Right-click on the subtotal row title and choose the Totals Spacing command:**



The “Subtotals Properties” dialog box appears:




2 **Choose one of the three following options:**

- **Do nothing** (option selected by default): No specific property is applied to the subtotal row; it has the same spacing characteristics as the other rows of the report.
- **Generate a page break**: A page break is generated after each subtotal row in the report.
- **Generate extra space**: A specific amount of space is added below each subtotal row in the report.
  An additional option can be used to set the spacing mode:
  - **Extra points**: You set a specific height of extra space in points.
  - **Extra % of height**: You set the amount of extra space to be added as a percentage of the standard row height of the report. For example, to generate extra space corresponding to two empty rows, pass the value 200.

# Adding Summary Calculations

You can add summary calculations on the contents of fields and formulas to each Subtotal row and to the Totals row. In a cross-table report, calculations can be inserted in the center row.

The calculation buttons in the toolbars of the Quick Report editor identify the summary calculation options available for quick reports.

The following summary calculations are available:

- **Sum**: Totals the values in the report or break.

- **Average**: Calculates the average of the values in the report or break.

- **Minimum**: Displays the lowest value in the report or break.

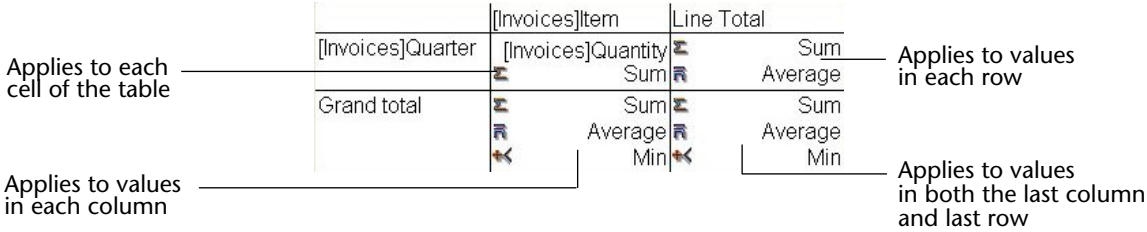
- **Maximum**: Displays the highest value in the report or break.

- **Count**: Calculates the number of records in the report or break.

- **Standard deviation**: Displays the square root of the variance of the report or break (the variance is a dispersion value around the average).

These options also appear in the Quick Report contextual menu for cells in the Subtotal and Total rows or, for a cross-table report, in the total cells and the center cell.

- List Reports
  When you place a summary calculation in the Totals row, the calculation is done for all records in the report. If you place the summary calculation in a subtotal row, separate calculations are done for the records in each break.
- Cross-table reports
  Summary calculations will apply as follows



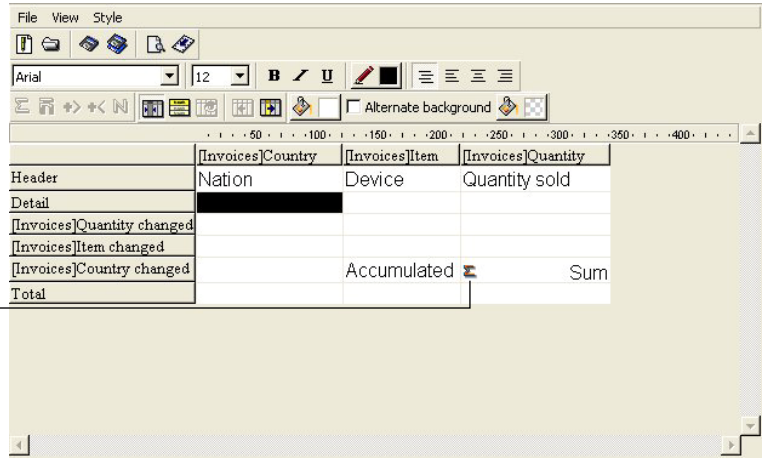
► To add a summary calculation:

1 **Select a cell where you want to insert the summary calculation.**

The Sum, Minimum, Maximum, and Average calculations work only on a numeric field or formula.

2 **Click as many summary calculation buttons as you like.**
**OR**
**From the contextual menu, choose the desired summary calculations.**

4th Dimension displays a calculation icon in the selected cell for each type of summary calculation you request. The following figure shows a Sum calculation icon in a Subtotal row:




If you add more than one summary calculation to a cell, 4th Dimension stacks the calculation icons on top of each other.

## Using Calculations and Column Values in Labels

You can insert summary calculations using the following codes.

- **##S** will be replaced by the **sum** in the sub-total or total row.
- **##A** will be replaced by the **average**.
- **##C** will be replaced by the **count**.
- **##X** will be replaced by the **max**.
- **##N** will be replaced by the **min**.
- **##D** will be replaced by the **standard deviation**.
- **##xx**, where *xx* is a column number. This will be replaced by that column's value, using its formatting. If this column does not exist, then it will not be replaced

These codes can be useful when you want to mix labels and data in a cell.

## Displaying Repeated Values for Break Columns

In a report with subtotals, the columns which are used to group records so that summary calculations can be done are called *Break columns*. In the report shown below, the Department field is a Break column since the records in the report are grouped by department.

When a report like this is printed, the values for the Break column are printed only once per break. In other words, a department name is printed only for the first record in the group and is not repeated until the department changes.

| First Name | Last Name | Department Name | Salary |
|---|---|---|---|
| Biff | Davis | Accounting | 43780 |
| Smeldorf | Garbando | | 19610 |
| Alan | Hull | | 41460 |
| Bryan | Pfaff | | 26440 |
| Shirley | Ransome | | 36040 |
| Marlys | Wilson | | 36500 |
| | | Sum for Department : Accounting | 203830 |
| Kathy | Forbes | Engineering | 18840 |
| Dennis | Hanson | | 40520 |
| Mary | Smith | | 55000 |
| Andy | Venable | | 43520 |
| Lance | Wolfram | | 27300 |
| | | Sum for Department : Engineering | 185180 |

Non-repeating break values

In some cases, you may want to repeat the values for the Break columns so that they appear for every record in the Break area. You do so by selecting the **Repeated Values** column property. This can be done either by clicking the **Repeated Values** button in the toolbars , by choosing the **Repeated Values** menu command in the Quick Reports contextual menu for that column, or by selecting Repeated Values from the Columns menu.

► To display repeated values for fields in a column:

1 **Select the column by clicking the header row for that column and choosing the Repeated Values command in the Columns menu or clicking the Repeated Values button in the "Columns" toolbar.**
**OR**
**From the contextual menu for that column, choose Repeated Values.**

The following figure shows the previous report after the **Repeated Values** check box has been checked for the Department Name column.

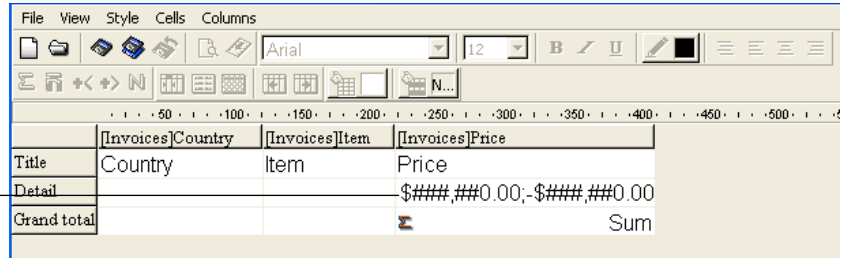
| First Name | Last Name | Department Name | Salary |
|---|---|---|---|
| Biff | Davis | Accounting | 43780 |
| Smeldorf | Garbando | Accounting | 19610 |
| Alan | Hull | Accounting | 41460 |
| Bryan | Pfaff | Accounting | 26440 |
| Shirley | Ransome | Accounting | 36040 |
| Marlys | Wilson | Accounting | 36500 |
| | | Sum for Department : Accounting | 203830 |
| Kathy | Forbes | Engineering | 18840 |
| Dennis | Hanson | Engineering | 40520 |
| Mary | Smith | Engineering | 55000 |
| Andy | Venable | Engineering | 43520 |
| Lance | Wolfram | Engineering | 27300 |
| | | Sum for Department : Engineering | 185180 |

Break values (repeated)

# Setting Display Formats

You can specify display formats for columns that contain numeric (integer, longint, real), alphanumeric (alpha), date, time and picture data.

For example, if you are displaying prices in a column, you can add a numeric format to the Detail cell for the Price field. The $###,##0.00;-$###,##0.00 format places a dollar sign ($) to the left of the number and can display dollar amounts from -$999,999.99 to $999,999.99:




Numeric format

If your report includes Alpha fields such as a telephone number or Social Security number, you can use an Alpha format. If your report displays dates, times or pictures, you can also assign display formats to them.

4th Dimension provides different default display formats. However, you can create your own display styles for numeric and alphanumeric formats. For more information about this point, refer to the *4th Dimension Design Reference* manual.

## Assigning the Display Format

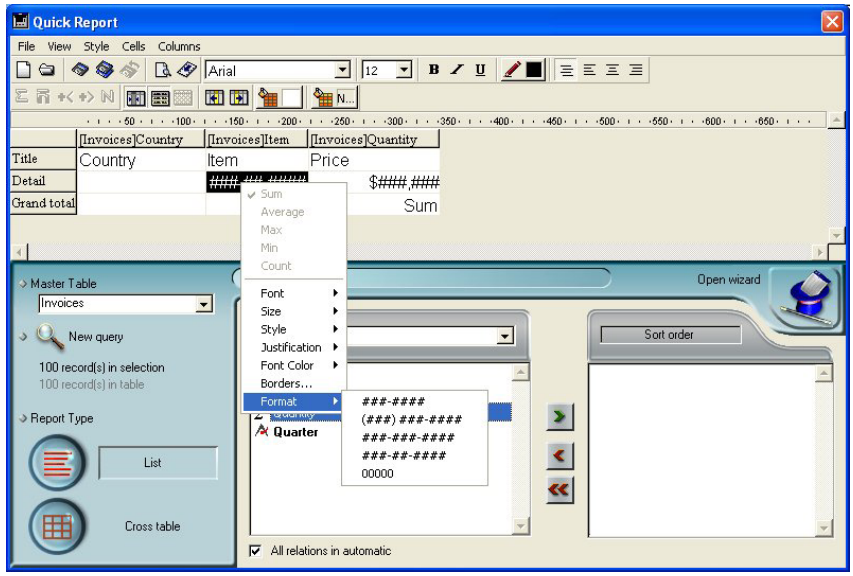
You can associate a display format with a cell by selecting it in the contextual menu or by entering it directly in the cell.

► To assign a display format to a numeric, alpha, date, time or picture field:

1 **Right-click on a cell of the column with which you want to associate a style.**

The contextual menu of the editor appears.

2 **Select the desired display format from the Format submenu:**




The contents of the submenu vary according to the type of data contained in the column: numeric, alphanumeric, date, time or picture. If the report column contains data that cannot be formatted, the Format command does not appear in the contextual menu.

*Note* For more information about display formats, refer to the *Design Reference* manual of 4th Dimension.

The format is entered in the Detail cell. If you have also requested summary calculations for the column, the format specified in the Detail cell will automatically be applied to the summary calculations. The only exception is the "Count" calculation which is always displayed as an integer and does not accept any formatting symbols such as the dollar sign.

You can also enter the formats to be applied manually by clicking twice in the cell and entering the elements of the format using the keyboard.

Different formats can be applied to different columns in the report.

# Hiding and Showing Rows and Columns

4th Dimension lets you hide rows or columns in a quick report in List mode. If desired, you can show a hidden column or row.

Hiding rows is useful when you want the report to include only summary calculations. For example, hide the Detail row if you want to display only the summary calculations that appear in the Totals and Subtotal rows. You can also use this feature to hide a Subtotal row or the Totals row.

You can hide a column if you need to use the column as a sort column, but do not want the report to display it.

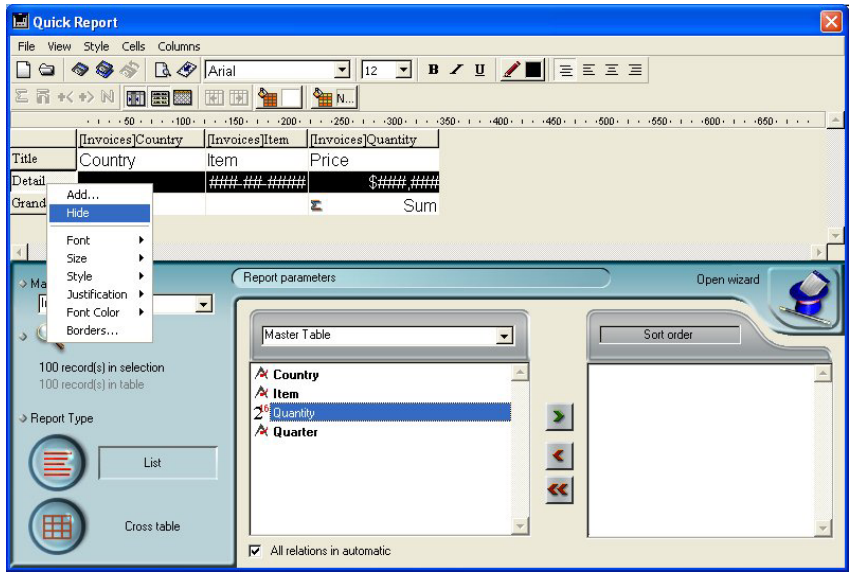
You can hide/display a row or column using either the Quick Report contextual menu, the Columns menu or the “Columns” toolbar.

*Note* You cannot hide a row or column in a cross-table report.

► To hide a row or column:

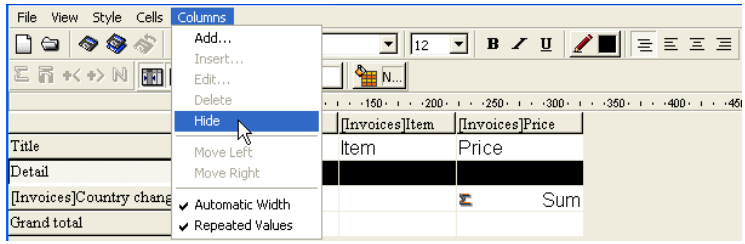
1 **Select the row or column you want to hide by clicking on its header.**

2 Right-click on the header of the row or column to be hidden, then choose Hide in the contextual menu:




OR

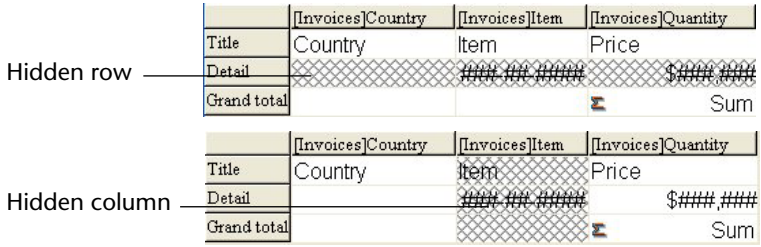
Choose the Hide command in the Columns menu of the Quick Report editor.




OR

Click on the button of the “Columns” toolbar.

4th Dimension displays the column in gray to remind you that the row will not appear when you print or preview the quick report.




### Showing a Hidden Row or Column

When a row or column is hidden, a check mark (√) is displayed next to the **Hide** menu command in the **Columns** or contextual menu. In addition, the corresponding button of the "Columns" toolbar is pressed in.

You can display a hidden row or column by choosing **Hide** again from either the **Columns** or contextual menu, or by pressing the corresponding button in the "Columns" toolbar again. When you do so, the row or column is displayed normally in the Quick Report area.

## Adding Page Headers and Footers

Before printing a quick report, you can add page headers and footers. You specify page headers and footers in the Headers and Footers dialog box. Use this dialog box to do the following:

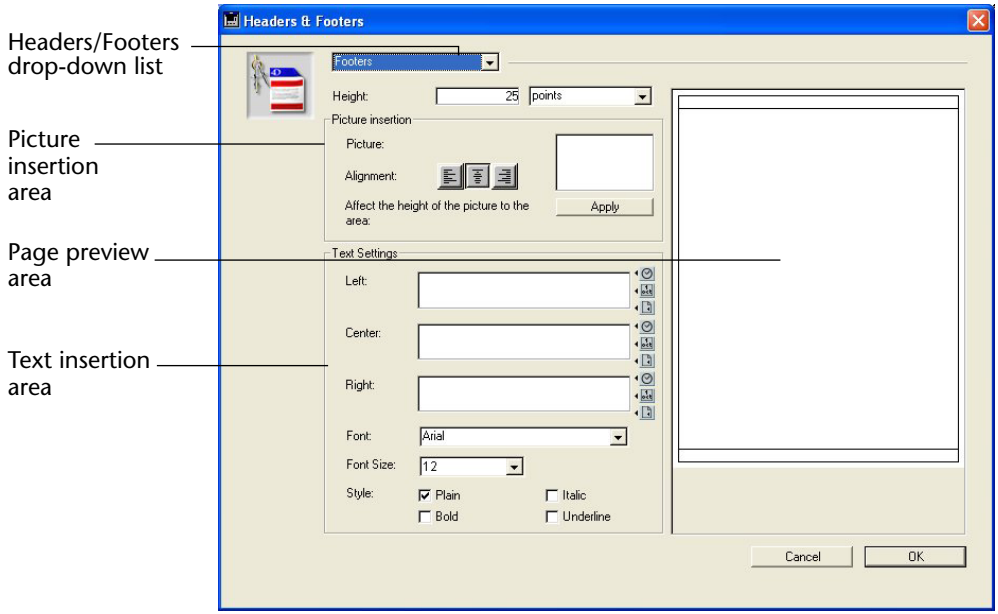
- Add page header and footer text or pictures,
- Specify the size of the page header and footer areas,
- Use separate text for left, center and right parts of the header and footer,
- Specify fonts, font sizes, and font styles for page header and footer text,
- Insert codes that add page numbers and the date and time to your reports.

You can only specify page headers and footers when printing to a printer. However, once they are defined, they are kept with the report, even if the destination is modified. See the "Generating a Quick Report" section on page 200 for more information about alternate output destinations.

► To add page headers and footers:

**1 Choose Header and Footer... from the File menu.**

The Headers and Footers dialog box appears.




*Note* The preview area takes the print format configuration into account.

The Headers and Footers dialog box lets you specify both headers and footers using the same screen. Use the Headers/Footers drop-down list to indicate the one you currently want to define.

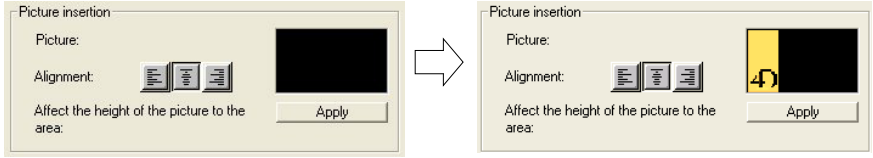
**2 Choose Headers or Footers from the selection menu.**

**3 Enter the header or footer height in the Height area.**

When you first enter the dialog box, the header and footer heights are set to 25 points each. You can not only change these values, but can change the measurement scale to enter values in inches or centimeters as well.

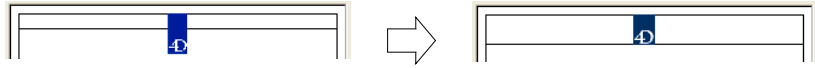
As you enter the header and footer height, the lines on the page preview area change to indicate the size of the header and footer as they will appear in the printed report.

4 **If you want to use a picture, paste it in the picture area (using standard copy-paste commands):**

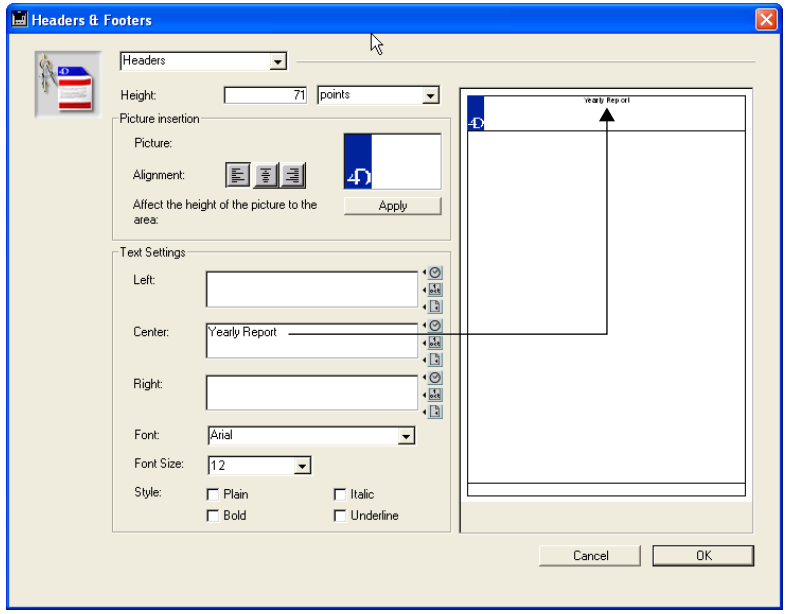



5 **Select its alignment by clicking on the alignment icons:**

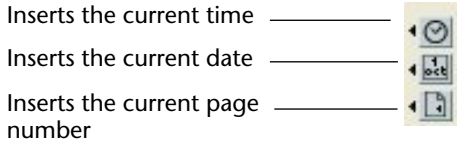
6 **If you want the height of the picture to become the height of the header/footer, click the Apply button:**



7 **Select an entry area and type the header or footer text.**



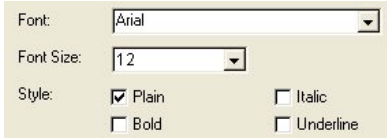
To the right of each entry area, there are three buttons that let you enter variables into the entry area.




You can insert the current page number, time of execution, or date of execution.

You can also use the code for the variables directly: #H for the time, #D for the date and #P for the page number.

8 **Assign the font attributes for the header/footer.**




9 **Click OK to validate the changes.**

# Generating a Quick Report

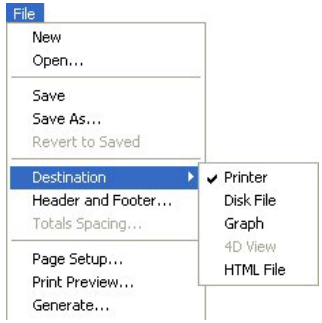
After you have completed your report design, you can "print" the quick report. You can print a quick report to a variety of output types:

- On the standard printer selected,
- To disk, in a Text file,
- To a graph,
- To a 4D View document,
- To an HTML document.

► To select an output destination:

- **Choose Destination from the File menu.**

The Destination submenu contains five items.




## Printer

This option uses the printer you have chosen in your current print settings. If you are printing to a printer, you can preview the report before printing it.

► To print to a printer:

1 **In the File menu, choose Printer from the Destination submenu.**

This option is selected by default.

2 **If necessary, select Page Setup from the File menu and specify your print parameters.**

*Note* This command is only available when the **Printer** destination is selected.

3 **If you want to preview your report, select Print Preview... in the File menu.**

*Note* This command is only available when the **Printer** destination is selected.

The print preview dialog box appears, containing the report that you have defined with the current data of the database.

4 **Select Generate... in the File menu.**

5 **Choose the settings that are appropriate for your report and click the OK button.**

## Disk File

This option sends your quick report to a disk file that you can open and modify with other applications, including text editors and spreadsheets. This option exports the records in the quick report to a text file.

When you use this option, 4th Dimension automatically uses the column headings as the first "record" that is exported.

► To generate the report in a Text file:

1 **In the File menu, choose Disk File from the Destination submenu.**

2 **Choose Generate... from the File menu.**

4th Dimension displays a standard create-file dialog box and asks you to enter a filename.

3 **Enter a filename and click OK.**

4th Dimension displays a dialog box that keeps you informed of the progress of the operation.

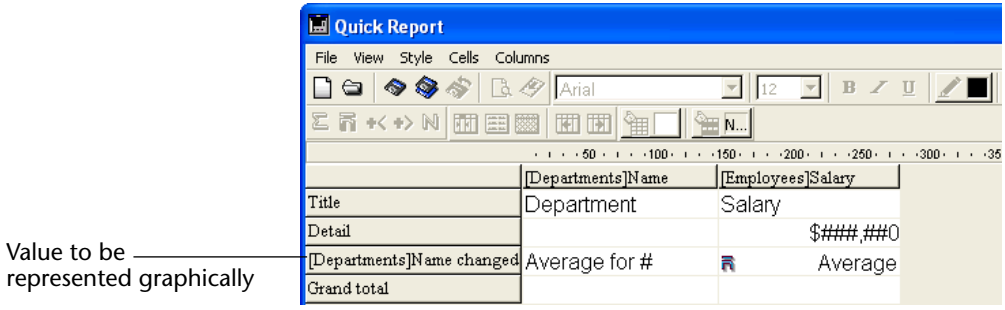
After the report is printed to a file, 4th Dimension returns you to the Quick Report editor. Remember to change the output device if you want to resume sending a quick report to a standard printer.

## Print to Graph

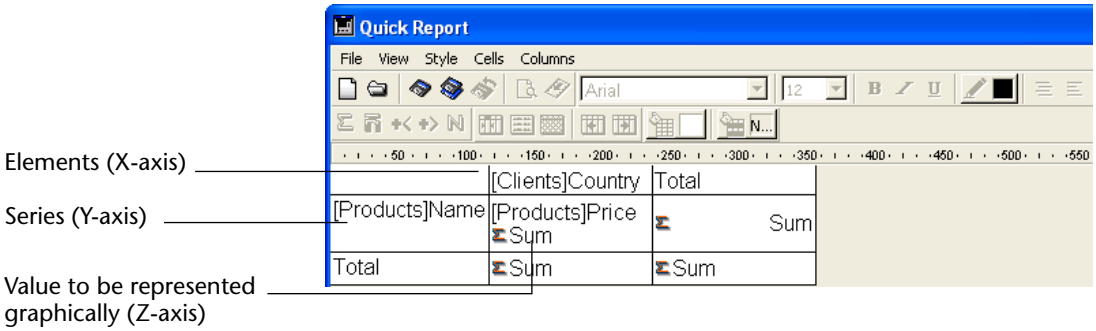
This option directs the report to 4D Chart, 4th Dimension's plug-in for plotting data. When you choose the Graph item in the Destination submenu, your report is presented as a graph rather than in table form. Your graph can then be printed using 4D Chart.

- In **list mode**, 4D Chart uses only the summary calculations and labels in the Subtotal row. It uses the leftmost non-numeric column for the Categories axis (the horizontal axis). To use the Graph feature, your report should:
  - Include from one to five numeric fields or formulas. These columns will be assigned to the values axis in the graph.
  - Use one type of summary calculation per numeric field.

For example, if you want to graph the average salary by department, you should create a quick report with two columns, Department Name and Salary as well as a Subtotal row consisting of the Average summary calculation for Salary:




- In **cross-table mode**, 4D Chart uses two data sources and the value cell. The last row and column are ignored.
  For example, if you want to show the amount of sales per country for a set of products, you can define the following report:

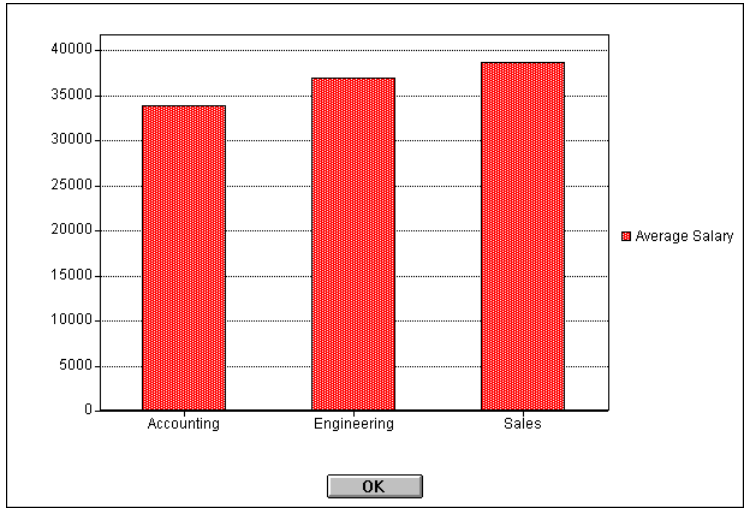



► To print to a graph:

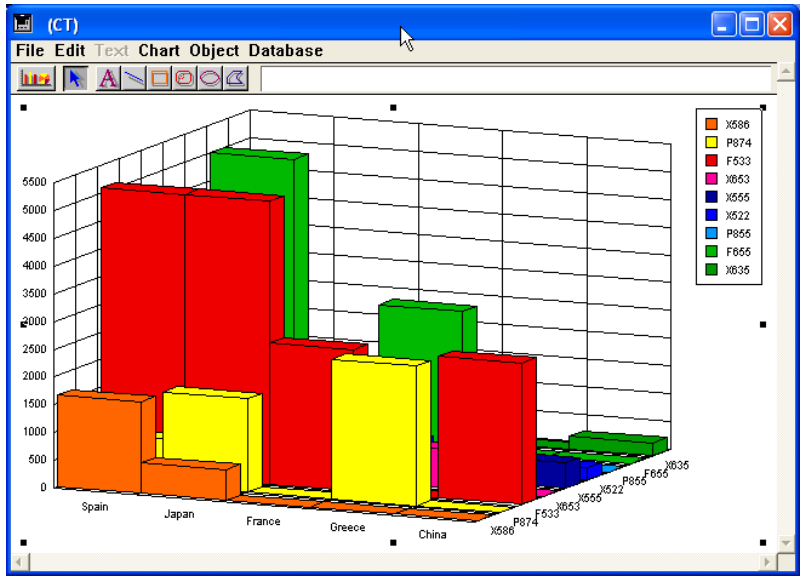
1 **In the File menu, choose Graph from the Destination submenu.**

2 **Choose Generate... from the File menu.**

- For list reports, 4th Dimension graphs your data as a 2D column graph.




- For cross-table reports, 4th Dimension graphs the data as a 3D column graph:




You can use 4D Chart to select another graph type or print the graph.

## Printing to a 4D View Document

This option directs the report to 4D View, 4th Dimension's plug-in for displaying data. When you choose the 4D View item in the Destination submenu, your report is presented as a 4D View window rather than in table form. 4D View uses all the data in the report.

*Note* The **4D View** destination is only available if this plug-in is installed in your 4th Dimension environment, and if you have the appropriate licenses.

► To generate a report in a 4D View document:

1. **In the File menu, choose 4D View from the Destination submenu.**
2. **Choose Generate... from the File menu.**

   4th Dimension creates a 4D View window containing the data. You can modify its contents, print it or save it using the 4D View menu commands.

## Printing to an HTML Document

This option sends your quick report to an HTML file. When you choose this option, it uses the default HTML template unless it was changed programmatically.

When you use this option, 4th Dimension automatically uses the column headings as the first "record" that is exported.

► To print to an HTML file:

1. **In the File menu, choose HTML File from the Destination submenu.**
2. **Choose Generate... from the File menu.**

   4th Dimension displays a standard create-file dialog box and asks you to enter a filename.
3. **Enter a filename and click OK.**

   4th Dimension displays a dialog box that keeps you informed of the progress of the operation.

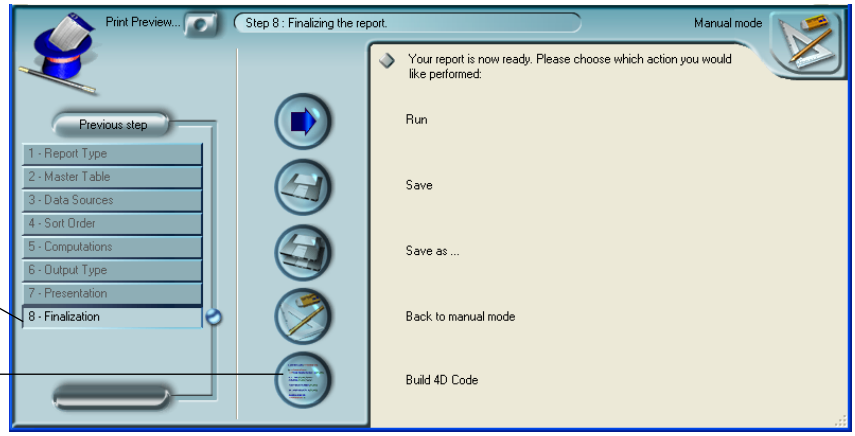
   After the report is printed to an HTML file, 4th Dimension returns you to the Quick Report editor. Remember to change the output device if you want to resume sending a quick report to a standard printer.

# Generating 4D Code

The Quick Report editor allows you to automatically generate the 4th Dimension code corresponding to a defined report and paste it in the Clipboard. This function allows manual building of quick report outlines that can be customized using 4th Dimension language.

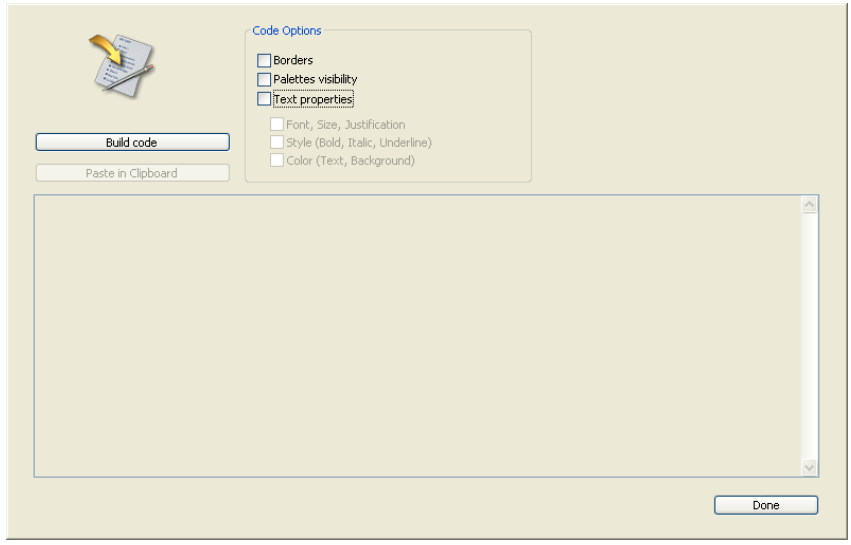
This feature is only available in User mode.

The button for code generation is located on the last page of the Quick Report Wizard:




Even if you built the quick report manually, you can use this feature by displaying the “Finalization” step of the wizard.

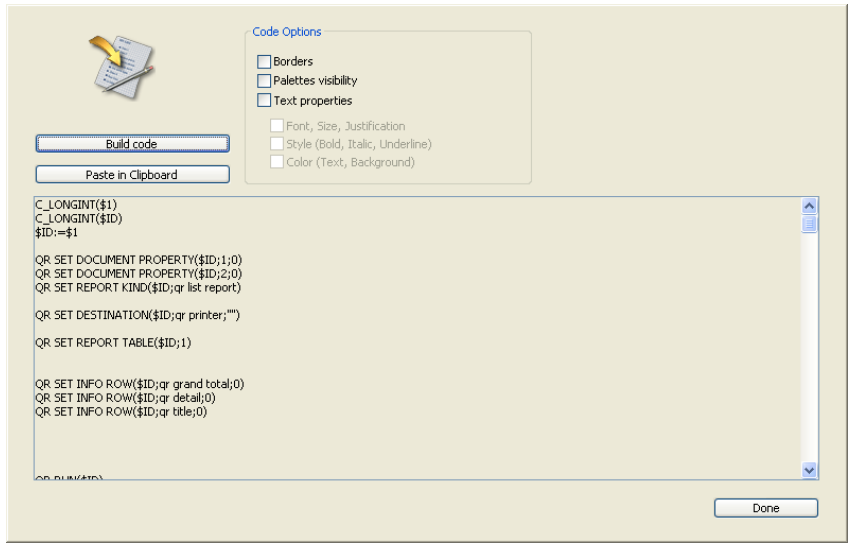
When you click on this button, a dialog box appears that allows you to set the parameters related to code generation:



The following options are available:

- **Borders**: Check this option to specify that you want to include the cell border properties in the generated 4D code.
- **Palettes visibility**: Check this option to specify that you want to include the current palettes display status (Standard, Styles, Columns...) in the generated 4D code.
  It is advisable to deselect this option if the code is intended for use in an offscreen area.
- **Text properties**: Use this option to specify that you want to include the font style definition of the report (font, style, etc.) in the 4D code.
  If this option is not checked, the three following options have no effect.
  - **Font, Size, Justification**: When this option is checked, the generated 4D code includes information regarding font, font size and font justification in the quick report template.
  - **Style (Bold, Italic, Underline)**: When this option is checked, the generated 4D code includes information regarding text styles in the quick report template.
  - **Color (Text, Background)**: When this option is checked, the generated 4D code includes information regarding the text colors in the quick report template.

  Once you have defined the options, click on the **Build code** button to generate the 4D code; the code is then displayed in the Preview area of the dialog box:



You can modify the code options and click again on the **Build code** button in order to update the preview area.

If you are satisfied with the code generated, click on the **Paste in Clipboard** button, then click on the **Close** button to close the dialog box.

You can then paste the code in a method or a text file using the standard shortcut **Ctrl+V** (Windows) or **Command+V** (Mac OS), or the **Paste** command in the **Edit** menu.

# 10 Labels

4th Dimension's Label editor provides a convenient way to print a wide variety of labels.

With the Label editor, you can do the following:

- Design labels for mailings, file folders and file cards, and for many other needs
- Specify the font, font size, and style to be used for the labels
- Specify the number of labels across and down on each page
- Specify the label page margins
- Load and save label designs
- Print labels.

Labels can also be created using the Form editor in the Design environment. Use the Form editor to design specialized labels that include variables or take advantage of the drawing tools available in the Form editor. For more information about using the Form editor to create labels, refer to the *4th Dimension Design Reference* manual.

## The Label Wizard

You use the Label Wizard to create, format, and print labels in the User environment. The Label Wizard contains settings for designing labels and positioning the labels on label paper. For example, when producing mailing labels, you might want a label design that includes the person's first and last name on the first line, the street address on the second line, and so on.

As part of the design, the Label Wizard enables you to specify the number of labels on the page and the margins of the label paper so that the label text is centered within the labels.

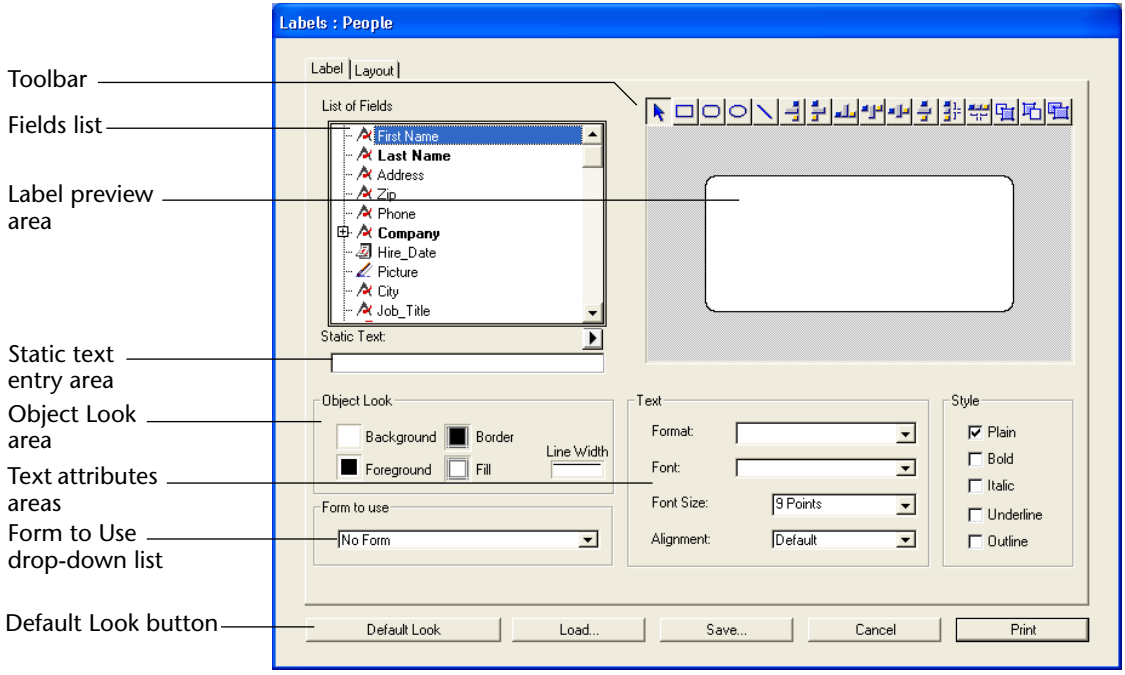
The Label Wizard consists of two pages, the Label page and the Layout page, each identified by a tab at the top of the dialog box. You use the Label page to specify the contents of the label and the Layout page to define the size and position of the labels on the page. When you create a satisfactory label design, you can save it to disk so that you can reuse it.

## Opening the Label Wizard

To open the Label Wizard:

**Choose Labels from the Tools menu or click on the corresponding icon in the toolbar of the User mode.**

4th Dimension displays the Label page of the Label Wizard.




## Label Page

The Label page contains settings for designing and formatting labels.

It contains the following elements:

- **Fields list**: This area displays the names of the fields in the current table in a hierarchical list. If this table is related to other tables, the foreign key fields have a plus sign (on Windows) or an arrow (on Macintosh).

You can display fields from the related table by expanding the related fields. The fields in the related table are indented.

*Note* Only tables and fields which are visible appear in the Label Wizard. For information about making tables and fields invisible, refer to the *4th Dimension Design Reference* manual.

- **Label preview area**: You use this area to design your label.
- **Toolbar**: The Label Wizard toolbar contains tools for drawing, selecting, aligning, distributing, layering, and duplicating objects. For complete information on the toolbar, see "The Label Wizard Toolbar" section on page 212.
- **Object Look area**: These controls let you specify foreground and background colors, fill patterns, and borders for individual objects on the label.
- **Default Look button**: This button applies the default set of Object Look attributes to the selected object.
- **Static Text entry area**: This area allows you to add static text objects to the label.
- **Text attributes areas:** These controls allow you to specify the font, font size, display format, and style of the text.
- **Form to Use drop-down list**: This drop-down list lets you bypass the Label Wizard and use a form to print the labels. If you are using the Label Wizard to create the label, choose No Form (default) from this list. If you want to use a form, choose it from this list. 4th Dimension will then ignore any other label specifications in the Label Wizard and print the labels according to the design of the specified form. As with any print job, it executes any form or object methods associated with the form. See the *4th Dimension Design Reference* manual for more information about designing forms for labels.

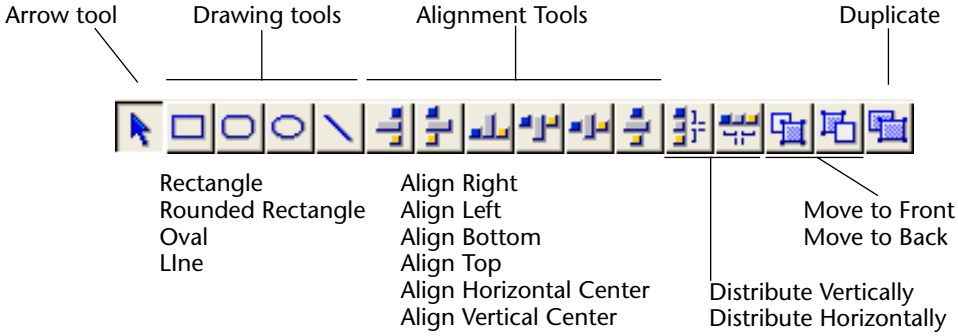
## Layout Page

The Layout page contains controls for printing labels based on the requirements of the printer you selected in the Print Manager (Chooser on Macintosh), so that it can format the page accurately.

For complete information on the Layout page, see the "Specifying the Label Layout" section on page 223.

## The Label Wizard Toolbar

The Label Wizard toolbar contains the following tools.




# Creating a Label Design

You create a label by dragging field names to the Label Preview area, adding static text, drawing graphic objects using the graphics tools in the toolbar, and pasting graphics from the Clipboard. You can edit the label by distributing, moving, resizing, layering, and aligning objects. With the Object Look and Text attribute areas, you can control the font attributes, foreground and background colors, fill patterns, and borders of individual objects.

The Label Preview area shows the approximate size and shape of the selected label. Before adding elements to the label, you may want to specify your label paper and label dimensions using the Layout page. For information, see the "Specifying the Label Layout" section on page 223.

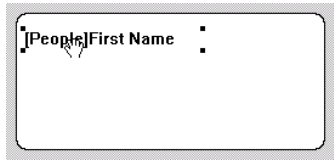
*Note* You cannot add a formula (a variable) to a label with the Label Wizard. If you need to use a variable on a label, use the Form editor.

► To create a label:

1 **Drag the first field you want to display in the label from the Fields list to the Label Preview area.**

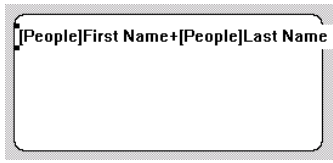
If the field is in a related table, expand the related field to display the fields in the related table.

Your field is added to the Label Preview area. Selection handles indicate that it is selected.

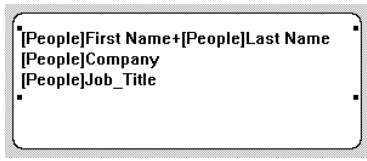



2 **If you want to concatenate a field to this field, drag the new field from the Field list to the existing field.**
**OR**
**If you want to concatenate two fields using the Carriage return as the separator, drag the new field by holding down the Shift key.**
**OR**
**Otherwise, continue dragging fields to the Label Preview area.**

- When you concatenate two fields by simply dragging and dropping them, the separator used is the one defined in 4th Dimension's resources. By default, the Space character is used. A "+" between field names in a field object indicates that the fields are concatenated on a single line. When 4th Dimension prints the label, it will insert a space between the fields on the same line. The following illustration shows the concatenation of the First Name and Last Name fields.




- If you concatenate two fields by dragging and dropping the second field while holding down the Shift key, the Carriage return is used as the separator. When the labels are being printed, if the second field is empty, its position is deleted and is replaced by the next field. If a field contains some text with Carriage returns, they are taken into account.



For example, this feature allows you to create address labels by using many concatenated fields ([Clients]Address1, [Clients]Address2, etc.) without generating an empty line when a field is blank.
You can automatically resize a group of concatenated fields so that it corresponds to the number of lines that it contains. To do so, **Ctrl+click** (Windows) or **Command+click** (Mac OS) on the lower right handle of the group.

As you add fields, you can reposition them by dragging or using the alignment tools in the toolbar.

3 **To add a text element to the label, enter the text in the Static Text area and click the arrow ▶.**

The static text object is added to the Label Preview area. The following illustration shows a static text element being added to the label:

After you add the element to the label, you can reposition it by dragging and aligning it with other objects.

4 **(Optional) Using a drawing tool, draw any graphic objects that you want to add to the label.**

For example, you could add different backgrounds to the "TO:" and "FROM:" sections of the label.

5 **(Optional) Paste a graphic from the Clipboard into the Label Preview area.**

For information on adding a graphic to the label, see the "Adding a Graphic to the Label" section on page 222.

After you add all required elements to the Label Preview area, you can use any of the editing tools to modify the label design. For complete information, see the "Working with Label Wizard Objects" section on page 215.

## How the Label Wizard Handles Blank Fields

Some records in your database may not contain entries for every field. When printing labels, the Label Wizard handles blank fields intelligently. Instead of leaving gaps where the data should be, the Label Wizard concatenates the data.

If a field in a line contains no data for a particular record, 4th Dimension concatenates the remaining fields in the line without leaving a blank space for the missing data.

If an entire line contains no data for a particular record, 4th Dimension vertically concatenates the remaining lines in the label without leaving a blank line.

4th Dimension automatically centers the text of the label inside the label area.

### Clearing Fields

If you make a mistake, you can remove one or more fields from the label.

► To remove an object:

1 **Select the object and press Backspace (Delete on Macintosh).**

The selected object is removed. If the object is a row of concatenated fields, pressing Backspace removes only the last field in the row. Continue pressing Backspace to remove more fields from the row.

## Working with Label Wizard Objects

This section discusses the techniques for editing objects placed on the label. It includes:

- Creating graphic objects,
- Aligning objects,
- Distributing objects,
- Layering objects,
- Duplicating objects,
- Moving objects,
- Resizing objects,
- Adding a border to an object,
- Adding foreground or background fill colors, patterns, and borders,
- Pasting a graphic into the label,
- Deleting objects.

## Creating Graphic Objects

You can create a graphic object by drawing.

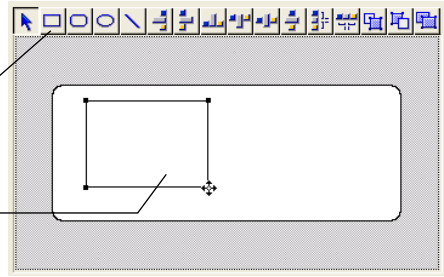
► To create an object:

1 **Select the type of object you want to draw by clicking its tool in the toolbar.**

The pointer becomes a crosshair when it is over the Label Preview area.

2 **Drag to create an area for the object.**

For two-dimensional objects (ovals, rectangles, and rounded rectangles), drag diagonally.




*Note* Hold down the **Shift** key as you draw to constrain the object to a regular shape. Lines are constrained to horizontal or vertical, rectangles are constrained to squares, and ovals are constrained to circles.

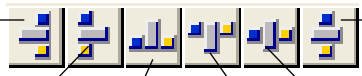
3 **When you have finished drawing the object, release the mouse button.**

4th Dimension creates the object and makes it the currently selected object. The Arrow tool is automatically selected and the pointer becomes an arrow.

## Aligning Objects

The alignment tools let you align objects to each other. 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.

The following illustration shows the Label Wizard's alignment tools.



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.

► To align a set of objects:

1 **Select the objects that you want to align.**
Shift-click to select several objects.

2 **Click the alignment tool that corresponds to the alignment you want.**
4th Dimension aligns the selected objects according to the alignment you selected.

## Distributing Objects

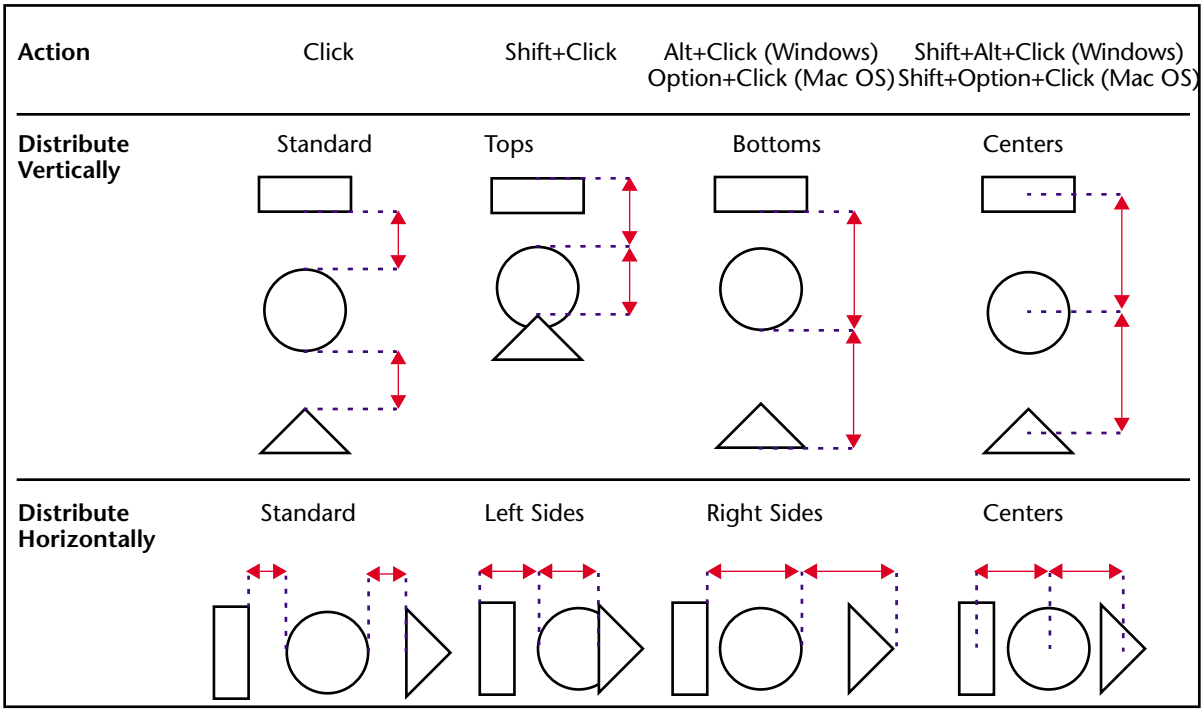
The toolbar includes two tools that let you distribute three or more objects evenly.

Distribute vertically Distribute horizontally

When you use either tool, you can modify its action by holding down the **Shift** or **Alt** keys when you click either tool.

- **Clicking**: Distributes the objects from their adjacent sides,
- **Shift+Clicking**: Distributes the objects from their left sides (horizontal) or tops (vertical),
- **Alt+Clicking**: Distributes the objects from their right sides (horizontal) or bottoms (vertical),
- **Shift+Alt Clicking**: Distributes the objects from their centers.

These rules are illustrated in the following diagram.




► To distribute a set of objects:

1 **Select the objects that you want to distribute.**

You must select at least three objects. Hold down **Shift** and click to select several objects.

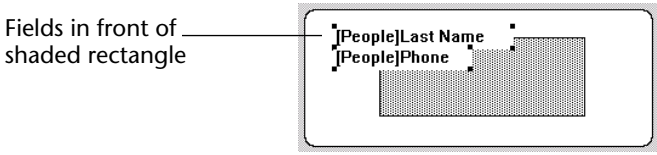
2 **If desired, hold down a modification key or key combination and click the Distribute Horizontally or Distribute Vertically tool.**

4th Dimension distributes the selected objects according to the rules you selected.

## Layering Objects

You may want to create a design that uses objects in different layers. For example, you may want to place a shaded rectangle behind the fields on a label. The Label Wizard provides the **Move to Back** and **Move to Front** tools that let you layer objects on the label.

The following illustration shows objects in front of other objects:




Clicking the **Move to Front** or **Move to Back** tools moves the selected objects to the top or bottom layer. If you want to move the object only one layer toward the front or back, hold down the **Shift** key when you click **Move to Front** or **Move to Back**.

► To move an object to the front or back:

1 **Select the object or objects that you want to move to the back.**
Hold down **Shift** and click to select several objects.

2 **Click the Move to Front or Move to Back tool in the toolbar.**
4th Dimension moves the selected object or objects to the front or behind all the other 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.

## Duplicating Objects

You can duplicate any object in the label. Copies of active objects retain all the properties of the original, including foreground and background colors and fill patterns, text attributes, and display format.

► To duplicate an object:

1 **Select one or more objects.**
Hold down **Shift** and click to select several objects.

2 **Click the Duplicate tool in the toolbar.**
4th Dimension duplicates the selected object or objects.

## Moving Objects

You can move objects by selecting them and dragging with the mouse. You can also use the arrow keys to move the object either one or ten pixels at a time.

- To move an object one pixel at a time, select the object and press an arrow key.
- To move an object ten pixels at a time, select the object, hold down the **Ctrl** key (on Windows) or **Command** key (on Macintosh), and press an arrow key.

## Resizing Objects

You can resize any object on the label by selecting it and dragging a selection handle.

► 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.

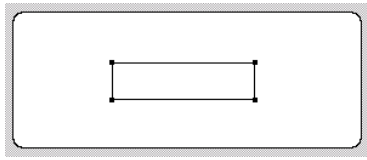
## Adding a Border to an Object

You can add a one-pixel border to an object. The border can be from one to nine pixels from the object.

► To add a border:

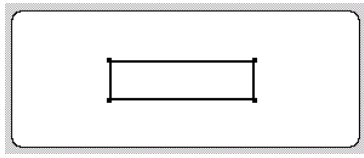
1 **Select the object.**

The selected object is indicated by selection handles.



2 **Hold down the Ctrl key (Command key on Macintosh) and press a number from 1 to 9 on the numeric keypad.**

A border is added to the object. The distance from the object (in pixels) is controlled by the number you pressed. The following illustration shows the results of pressing **Ctrl+1**.



## Adding Foreground or 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. By combining selected colors with fill patterns, you can display thousands of different color shadings.

*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). If the object is a field or static text, the foreground color controls the color of the text and the background color controls the color of the object's rectangle.

You set foreground and background colors using the **Background** and **Foreground** picture menus in the Object Look area of the Label Wizard.

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.

## Setting Fill Patterns

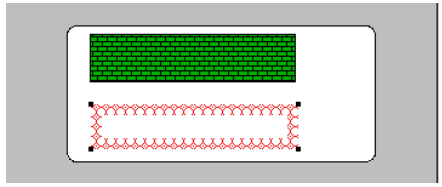
You can apply a fill pattern to any two-dimensional graphic object in the form such as an oval, a rectangle, a line, the enclosed area of a field or static text object, and a two-dimensional object's border.

The **Fill** picture menu controls the fill pattern for the selected object. The **Border** picture menu controls the fill pattern for the border.

## Setting Border Patterns

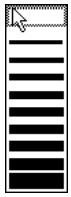
You can set patterns for the borders of any object in the form that has a border such as an oval, a rectangle, and a grid object. The border patterns available are the same as the fill patterns. The appearance of the border also depends on the line width you have specified for the border.

The following illustration shows a fill pattern applied to the upper rectangle and a border fill pattern applied to the bottom rectangle.



## Setting Line Width

The **Line Width** pop-up menu controls the width of a line or the width of the border of a two-dimensional object.



To set a line width, select the object and choose a line width from the **Line Width** pop-up menu.

## Restoring the Default Look

When you add an object to the label, it takes on the Object Look attributes of the most recently created object. If you want to assign the default Object Look attributes to this object (or any object), select the object and click **Default Look**. The foreground and background colors, fill patterns, and border width are reset to the default settings.

## Adding a Graphic to the Label

In addition to the drawing tools in the toolbar, you can paste a graphic from the Clipboard into the label.

► To paste a graphic into the label:

1. **Place the graphic on the Clipboard.**
2. **Choose Paste from the 4th Dimension Edit menu or press Ctrl+V (Command–V on Macintosh).**

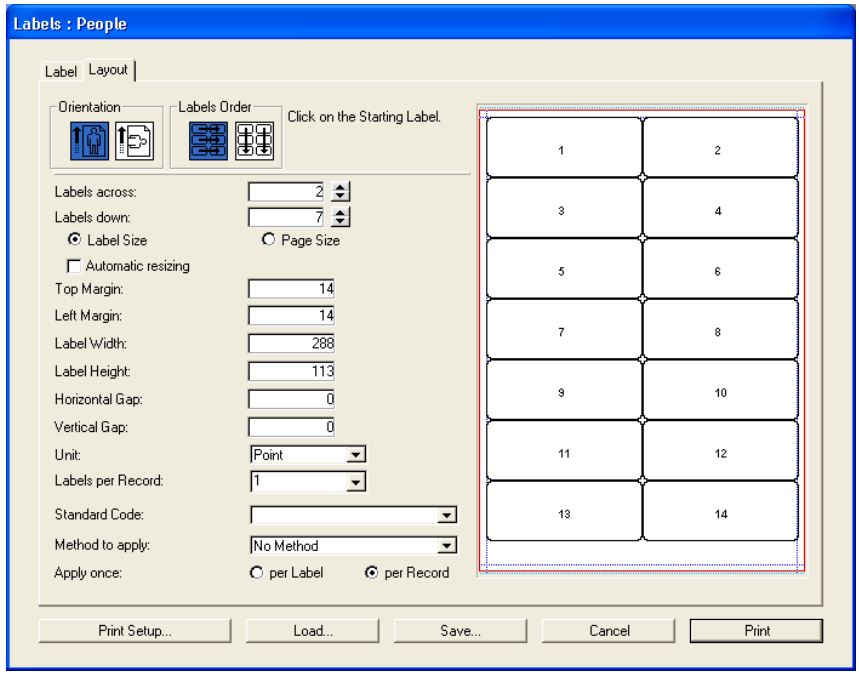
   The graphic appears in the Label Preview area with selection handles. You can then move, align, distribute, or resize the object like any other object.

## Deleting Objects

You can delete the selected object by pressing the **Backspace** key (**Delete** key on Macintosh). If the selected object contains concatenated fields, the last field is removed from the object. If you want to delete the entire object, continue pressing the **Backspace** or **Delete** key.

# Specifying the Label Layout

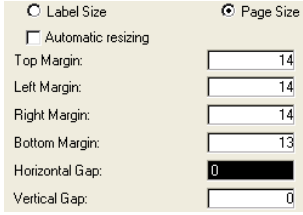
You specify the label layout with the Layout page of the Label Wizard. You can display the Layout page at any time by clicking its tab.




The Layout page contains the following elements:

- **Orientation and Labels Order buttons**: These buttons enable you to specify the page orientation and the order in which information is assigned to labels. Keep in mind that the orientation of the *sheet* is independent from that of the *page*. If you modify this parameter, be sure to change the configuration of the page accordingly in the standard print setup dialog box.
- **Labels across and down boxes**: These boxes are used to control the size of labels by specifying the number of labels that appear on your label paper.

- **Layout preview area**: This area provides a reduced view of how an entire page of labels will look, based on the dimensions you enter in the Label Wizard. The page preview also reflects the paper size selected in the Print Setup dialog box. You can also select the first label on the page to be printed. The red border indicates the size of the physical page and the blue border indicates the size of the printable area.
- **Label Size and Page Size radio buttons**: These buttons are used to select the label or the page for setting label and page dimensions. If you click Label Size, you can enter the label width and label height in the appropriate areas. If you click Page Size, you can enter values for right margin and bottom margin, as shown below.



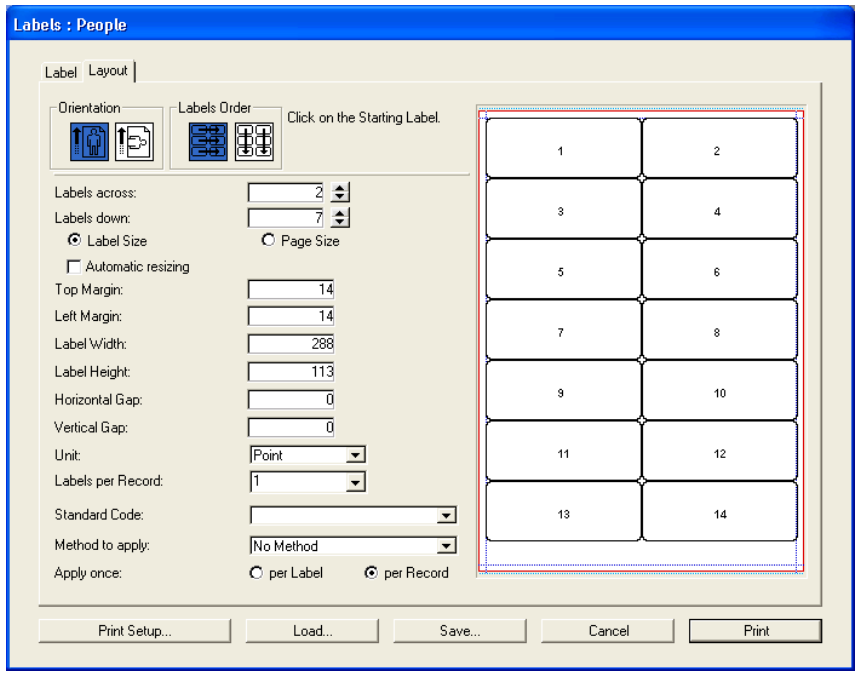

- **Margin boxes**: These boxes are used to specify the dimensions of the label and the page size, depending on the radio button you select. After you have entered the margins of your label paper, you may need to make some additional adjustments so that the label text is centered in the labels. You can use both positive and negative numbers in the Margin boxes to increase and decrease the margins.
- **Automatic Resizing**: If **Automatic Resizing** is checked, the values in the Label Width and Label Height entry areas are set automatically.
- **Horizontal Gap**: This area controls the amount of space between label columns.
- **Vertical Gap**: This area controls the amount of space between label rows.
- **Unit drop-down list**: This drop-down list allows you to change the units in which you specify your label and label page measurements. You can use pixels, millimeters, centimeters, or inches.

- **Labels per record drop-down list**: This control lets you print more than one copy of each label. If you print more than one copy, 4th Dimension prints the copies consecutively rather than making copies of the label pages.
- **Standard Code drop-down list**: This control lets you specify the label, page dimensions, and margins by choosing a standard commercial label paper from the drop-down list.
- **Method to apply**: This control lets you choose a method that will be run at print time. For example, you can execute a method that posts the date and time that each label was printed.
- **Apply Once radio buttons**: These radio buttons are used to specify whether to run the method once per label or once per record. This control has meaning only if you are printing more than one copy of each label and you are also executing a method at print time.
- **File buttons**: These buttons provide options for page setup, printing, saving, and loading label designs.

► To specify the layout of the label sheet you are using:

1 **Click the Layout page tab.**

The Layout page of the Label Wizard appears.



You can specify the design of the label sheet using the entry areas on the Layout page or choose a standard design from the Standard Code drop-down list. This drop-down list contains specifications for a wide variety of standard commercial label sheets.

2 **Click the Print Setup button.**

The Print Setup dialog box for your operating system appears.

3 **Choose the desired printer and click OK.**

If necessary, the Label Preview area changes to reflect your selection.

4 **If appropriate, choose the type of label paper you are using from the Standard Code drop-down list.**

The remaining entry areas on the page change to reflect the selected label paper's characteristics. If necessary, you can modify these specifications.

5 **Click the appropriate Orientation and Labels Order radio pictures.**

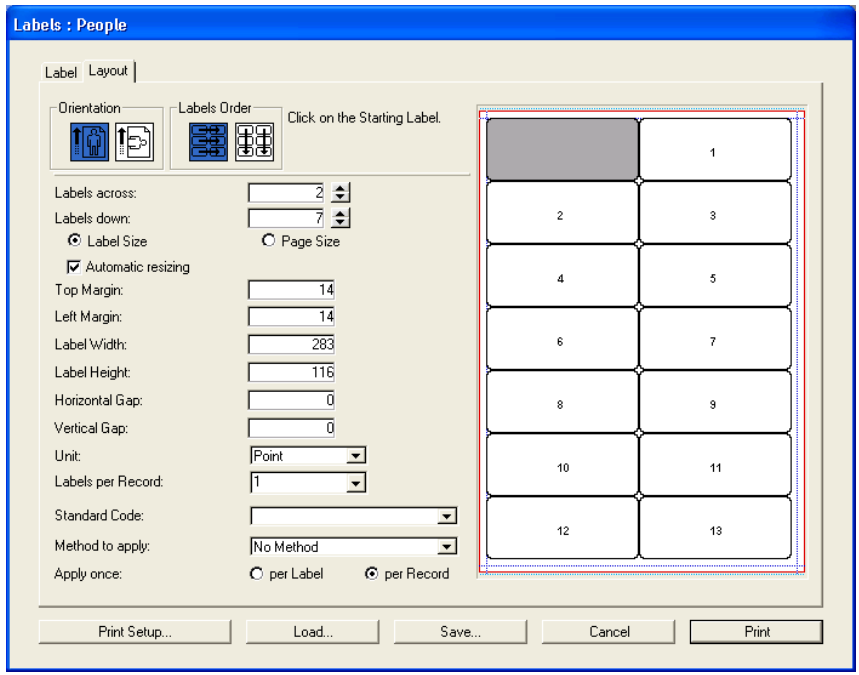
You can choose between portrait and landscape orientation and horizontal or vertical order. Remember that the orientation of the *sheet* is independent from that of the *page*. If you modify this parameter, be sure to change the configuration of the page in the standard print setup dialog box.

6 **Enter the number of labels in each row of your label sheet in the Labels Across box and the number of labels in each column in the Labels Down box.**

The Label Preview area adjusts to display the appearance of the labels on a printed page.

7 **If the first sheet of label paper is partially used, click on the first blank label in the Label Preview area.**

4th Dimension will begin printing labels on the label you indicated. The following illustration shows the Preview area after clicking on the second label area.




8 **If desired, choose a unit of measurement from the Unit drop-down list to use for entering margin sizes.**

9 **Enter values to reflect the margins on your label paper.**

Use the **Label Size** and **Page Size** radio buttons to control whether you use the entry area for the size of the label or the size of the page.

The size of the individual labels in the label page preview will adjust to accommodate the margins. For example, if you increase the size of your margins to two inches, top and bottom, the size of the individual labels will shrink to maintain the same number of labels that you specified earlier.

Because some printers use portions of the margin to hold the label sheet in place, the printer may not take the full margins into account when printing your labels. In this case, you may need to adjust the margin settings so the label text is properly centered in each label.

Since the printer uses part of the margins, the printer begins measuring the margins from a point that is not precisely at the edge of the label paper. When the labels are printed, the label text may appear skewed to the right or to the bottom of the label paper.

To compensate for this lost margin space, you can use negative numbers in some of the margin boxes. When placed in the Right margin box, negative numbers pull the label text to the right. When entered in the Top margin box, negative numbers pull the label text toward the top of the page.

*Note* As a rule, using a negative number in a margin box moves the label text toward the margin you are setting.

10 **(Optional) If you want to print more than one copy of each label, use the Labels per Record drop-down list to choose the number of copies to print.**

The copies are printed consecutively on the label paper. 4th Dimension does not duplicate the entire label page.

11 **(Optional) If you want to run a method when the labels are printed, choose the method from the Method to Apply drop-down list.**

12 **(Optional) If you are running a method and printing more than one copy of each label, click either the Once Per Record or Once Per Label radio button in the Apply Once area.**

This control has no effect unless you are using both the multiple copies and method features.

# Saving and Loading Label Designs

4th Dimension lets you save each label design as a file that you can open from the Label Wizard. By saving label designs, you can maintain a library of labels that you can use according to your needs.
Label designs store the parameters set on the Label and Layout pages.

**Saving a Label Design**

To save a label design:

1 **Click the Save button.**

4th Dimension displays a dialog box where you can enter a file name for the label design.

*Note* Label files on Windows are denoted by the file extension .4LB.

2 **Enter a filename for the label design and click the Save button.**

**Loading a Label Design**

You can load the label design whenever the Label Wizard is active.

► To load a label design:

1 **Click the Load button.**

4th Dimension displays an open-file dialog box where you can select the filename of a label design. Double-click the filename or select the filename and click **Open**.

4th Dimension replaces the current label design with the design you selected.

# Printing Labels

After you have completed your label design, you can preview or print the labels. You may want to print first on regular paper so that you can check the placement of text before you use the more expensive label paper.

► To print your labels:

1 **Click the Print button.**

The Print dialog box appears for the printer you selected in the Print Manager. If you check the **Print Preview** check box before clicking **OK**, the labels are previewed on screen.

If you are printing using a form, 4th Dimension will use the selected form to print the labels. 4th Dimension assumes that the form was designed to print labels.

After the labels are printed, 4th Dimension closes the Label Wizard and returns you to the form you were using when you opened the Label Wizard.

# 11 Graphs

4th Dimension allows you to create a wide variety of two- and three-dimensional plots without having to export the data to a graphics package. You can create graphs from the data in your database or from data that has been copied to the Clipboard from another application. You can graph data directly from fields or you can graph the results of calculations on data. You create graphs in 4th Dimension using the built-in 4D Chart plug-in.

Because graphing capability is fully integrated into 4th Dimension, you can graph data in your database and update your graphs when the information in the database changes. You can print your graphs or copy them to the Clipboard and paste them into other applications.

Finally, 4D Chart adds over 100 commands to the 4th Dimension language which enable you to control tasks that you normally perform manually. For example, you can use 4D Chart commands to create new graphs, modify graph features, open and save documents, and execute any 4D Chart menu command. For information on these commands, please refer to the *4D Chart Language Reference* manual.

## Managing 4D Chart Documents and Windows

4D Chart documents can be created in plug-in areas on forms or in separate plug-in windows. This section explains how to create, open, and save 4D Chart documents in both types of areas.

This section explains the basics of managing 4D Chart documents, including:

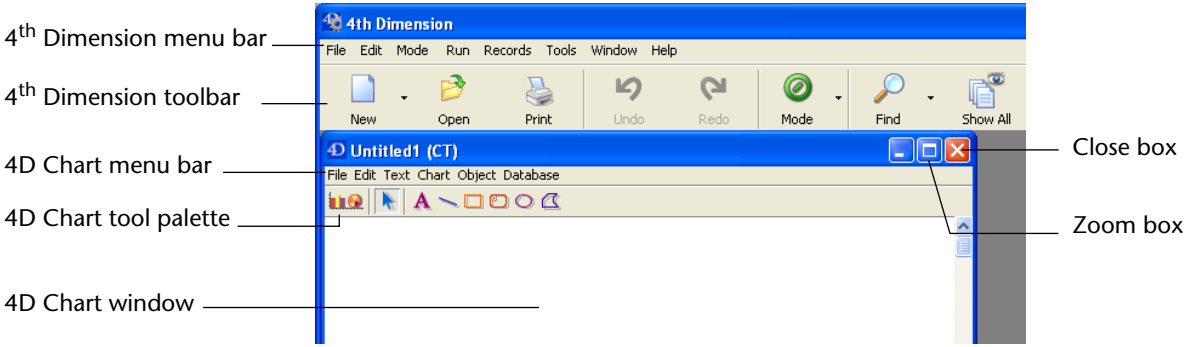
- Using 4D Chart in a plug-in window
- Using 4D Chart in a 4th Dimension form

- Hiding and showing 4D Chart features
- Creating a new document
- Opening an existing document
- Saving a document
- Setting the document size.

## Using 4D Chart in a Plug-in Window

You can use 4D Chart in its own window. When used in its own window, 4D Chart operates as if it were a separate application.

When you open 4D Chart in a plug-in window, the window has its own menu bar. 4th Dimension's menu bar remains at the top of the screen.




When you expand the window to full screen size by clicking the window's zoom box, 4th Dimension's menu bar remains at the top of the screen and 4D Chart's menu bar remains within the 4D Chart window.

To generate and modify a graph in an external 4D Chart window, you have two possibilities:

- Call the Chart Wizard directly from the User mode of 4th Dimension. After it has been set up, the graph is displayed in a new external window,
- Open a blank 4D Chart window then use the menus and functions of the plug-in to create your graph.

### Opening an External Window Displaying the Graph Directly

When you create a graph from the User mode of 4th Dimension, an external window is automatically opened to display it.

► To create an external window displaying the graph directly:

1. **Make sure that the current selection contains the records that you want to represent graphically.**
2. **Choose Charts... from the Tools menu of 4th Dimension or click on the corresponding icon in the 4th Dimension toolbar.**

   The Chart Wizard appears. The use of this wizard is described in the "Creating a Graph" paragraph on page 254.
3. **Set the parameters of your graph and click on OK.**

   An external 4D Chart window is created to display the graph.

### Opening a Blank 4D Chart External Window

You work with external windows in the User mode of 4th Dimension.

► To open 4D Chart in an external window:

1. **In the User environment, choose 4D Chart from the Tools menu.**

   A new 4D Chart document opens in an external window.

   You can open additional 4D Chart windows by choosing 4D Chart again from the **Tools** menu. Opening several 4D Chart documents at the same time allows you to compare documents, copy and paste between documents, and move from one document to another simply by clicking on the appropriate window.

   The titles of all 4D Chart windows appear at the bottom of the Window menu. You can bring any document to the front by choosing it from this menu.

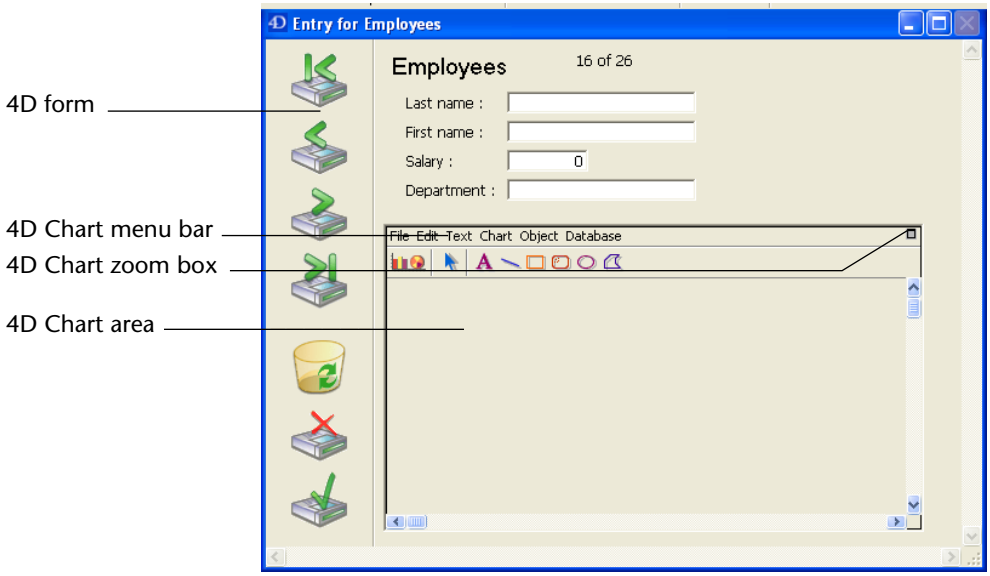
   When you save a document, its title bar displays the document name, plus the suffix "(CT)", which distinguishes 4D Chart documents from documents created by other plug-ins.

   You can close a plug-in window at any time by clicking the window's control-menu box (on Windows) or the close box (on Macintosh).

## Using 4D Chart in a Form

You can place a 4D Chart area in any form. When you use 4D Chart in an input form, you can display a graph for each record in the table. You can also use a 4D Chart area in an output form.

When 4D Chart is used in a form, the 4D Chart menu bar appears at the top of the 4D Chart area. You can choose menu commands from either the 4th Dimension menu bar or the 4D Chart menu bar.




► To expand a 4D Chart area:

1 **Choose Go to Full Window from the 4D Chart File menu.**
**OR**
**Click the 4D Chart area's zoom box.**

The document expands to fill the entire screen, and 4D Chart's menu bar temporarily replaces 4th Dimension's menu bar.

The expanded window has a size box and close box.

When the document window is expanded, the **Go to Full Window** menu item in the File menu changes to **Return to Form**.

► To reduce the window and return to the form:

1 **Choose Return to Form from the File menu.**
**OR**
**Click the close box.**

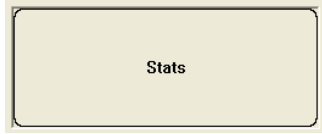
## Creating a 4D Chart Area in a Form

You can add a chart area in an input form and save a graph with each record in the table.

For more information about inserting a plug-in area into a form, refer to the *4th Dimension Design Reference* manual.

### Minimum Size of the 4D Chart Area

By default, if the size of the 4D Chart area included in the form is less than the minimum size (width 300 pixels, height 150 pixels), it will appear as a button. The button title is the name of the variable associated with the plug-in area.




When the user clicks on this button, the area is displayed in full-page mode.

It is possible to disable this operation using the CT SET ENTERABLE language command (the area is then never displayed as a button).

## Hiding and Displaying 4D Chart Features

You can choose to hide or display several of 4D Chart's features, including:

- The 4D Chart menu bar
- The Object Tool palette
- The Chart Tool palette
- Scroll bars
- Rulers.

Use the **Display** submenu of the **Edit** menu of the plug-in area to hide or display these items. Items that are checked in the Display submenu are displayed in 4D Chart.

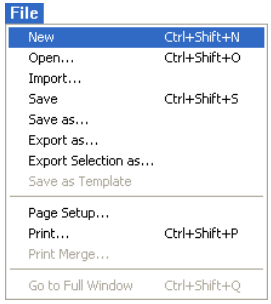
*Note* If you have hidden the 4D Chart menu bar, you can display it by pressing **Ctrl-Shift-M** on Windows or **Command-Shift-M** on Macintosh.

## Creating a New 4D Chart Document

You can create a new, blank 4D Chart document at any time. The new document replaces the current document. If you have made changes to the current document, you will be prompted to save them before opening a new document.

► To create a new document:

1 **Choose New from the 4D Chart File menu.**



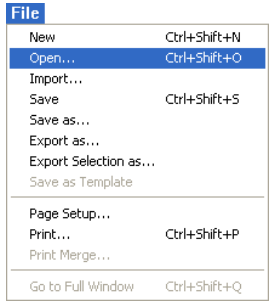

An empty document appears in which you can create a new graph.

## Opening a 4D Chart Document

You can open any previously saved 4D Chart document in a 4D Chart area. The newly opened document replaces any current document.

► To open a 4D Chart document:

1 **Choose Open from the 4D Chart File menu.**




A standard open-file dialog box appears.

2 **Select a document.**

3 **Click Open.**

The document opens in the current 4D Chart window.

*Note* You can also open a PICT file in your graph. This point is covered in the "Importing a PICT Document in a 4D Chart Window" paragraph on page 239.

## Saving a 4D Chart Document

You can save the contents of a 4D Chart document regardless of whether the document was created in a plug-in window or in a form. 4D Chart offers several ways to save documents:

- As a file
- As part of a record
- As a template for a 4D Chart area.

You can also save a selection of objects, for instance a graph, as a PICT document (Macintosh format). In this case, the document saved is a picture that can no longer be modified. This point is covered in the "Exporting a 4D Chart Document in PICT Form" paragraph on page 240.

### Saving a 4D Chart Document as a File

Any document that you create using 4D Chart can be saved as a separate document for use in another place — either in the same database, in another database that uses 4D Chart, or in an entirely different application. You use the standard **Save** and **Save As** menu items in the 4D Chart **File** menu to save and update individual documents.

Documents you save can be opened with the **Open** menu item in the 4D Chart **File** menu. It makes no difference whether a document is created in a plug-in window or in a form; a document can be saved and opened in either place.

If you save a 4D Chart document as a file, when you reload the file, the document appears exactly as it was when you saved it. To update the information in any graphs in the document, you must use the **Update** menu item in the **Chart** menu, which is described in more detail in the "Updating the Data in a Graph from the Database" section on page 262.

► To save a 4D Chart document:

1. **Choose Save As from the 4D Chart File menu.**

   Notice that you choose **Save As** from the 4D Chart **File** menu, not the 4th Dimension **File** menu. 4D Chart displays a save-file dialog box.

2. **Enter a filename for the document.**

3. **Click Save.**

   4D Chart saves the document with the filename you entered.

### Saving a 4D Chart Document as Part of a Record

If you have created a 4D Chart area in a form and want its contents to be saved with each record, you need to create a BLOB or Picture field in the table to which the form belongs in order to store the contents of the area. The contents of the area are then saved automatically with each record when it is validated.

For more information about creating 4D Chart areas on forms, refer to the *4th Dimension Design Reference* manual.

► To save a 4D Chart document as part of a record:

1. **Add a BLOB or Picture field to the table whose form contains the 4D Chart area.**

   For more information about creating a field, refer to the *4th Dimension Design Reference* manual.

2. **Give the field the same name as the external area that you have created on the form and add an underline (_) to it.**

   For example, if your external area is named MyArea, the field must be named MyArea_.
   Each graph is thus saved as a part of the record.

If you save a 4D Chart document as part of a record, when you reload the record, the document appears exactly as it was when you saved it. To update the information in any graphs in the document, you must use the **Update** menu item, which is described in more detail in the "Updating the Data in a Graph from the Database" section on page 262.

### Saving a 4D Chart Document as a Template

If you have inserted a 4D Chart area into a form, you can create a standard document that is the same for every record by saving the document as a template. You can only create templates for 4D Chart on forms.

When you save a document as a template, the template is used for every new record that is opened in the form.

Each document starts with the same template, but any unique modifications you make to it are saved with the record. There can be only one template for each 4D Chart area on a form.

If there is a graph in the document that is saved as a template, the graph is updated automatically for each record, if possible. 4D Chart can update a graph only if it was created from data stored in records in the database.

► To save a document as a template:

1 **Choose Save as Template from the 4D Chart File menu.**

4D Chart saves the document with a special filename. The filename is the name of the 4D Chart area on the form, plus an underscore.

For example, an area named "Document" will have a template file named "Document_".

Because 4D Chart automatically names the file and places it in the database directory; no save-file dialog box is displayed.

*4D Server* By default, 4D Chart templates are read from and saved to the client machines. You can use the 4D Chart language to specify that templates be read from and saved to the server machine.

If you make changes to the document and want to incorporate those changes in the template, choose **Save as Template** again.

You can create a template for a 4D Chart area without using the **Save as Template** menu item simply by saving the document with a filename that is the same as the name of the 4D Chart area, plus an underscore, and placing the file in the database directory. This feature allows you, for example, to create a document in one database and use it as a template in another database. You can also create a document in one document area and use it as a template in another document area.

You can temporarily disable the use of a particular template file by changing the template filename or moving the file out of the database directory.

## Importing a PICT Document in a 4D Chart Window

You can open documents of the PICT type in a 4D Chart window. These documents can come from different sources (export of a 4D Chart graph in PICT form, design software, etc.). The imported document behaves like a simple object; you cannot modify its attributes.

► To import a PICT document:

1 **Choose the Import... command in the File menu of 4D Chart.**

A standard open file dialog box appears.

2 **Select the PICT file you want to open (*.PCT extension under Windows) and click Open.**

If the imported file is valid, its contents are displayed in the 4D Chart window.

## Exporting a 4D Chart Document in PICT Form

You can export a 4D Chart document or a selection of objects in it as a PICT file. In both cases, the objects do not keep their unique 4D Chart properties; the exported document is a static picture of the objects in the 4D Chart area or in the external window. You can import it as a PICT in 4D Chart or any other application that opens PICT files.

► To export a 4D Chart document in PICT form:

1 **Choose the Export as... command in the File menu of 4D Chart.**

2 **Select a name and location for your file in the standard dialog box then click Save.**

► To export a selection of 4D Chart objects in PICT form:

1 **Select the object(s) that you want to export in PICT form.**

2 **Choose the Export Selection as... command in the File menu of 4D Chart.**

A standard save file dialog box appears.

3 **Select a name and location for the file and click Save.**

Whether you export a 4D Chart document or a selection of objects, a PICT file (*.PCT extension under Windows) is created on the disk.

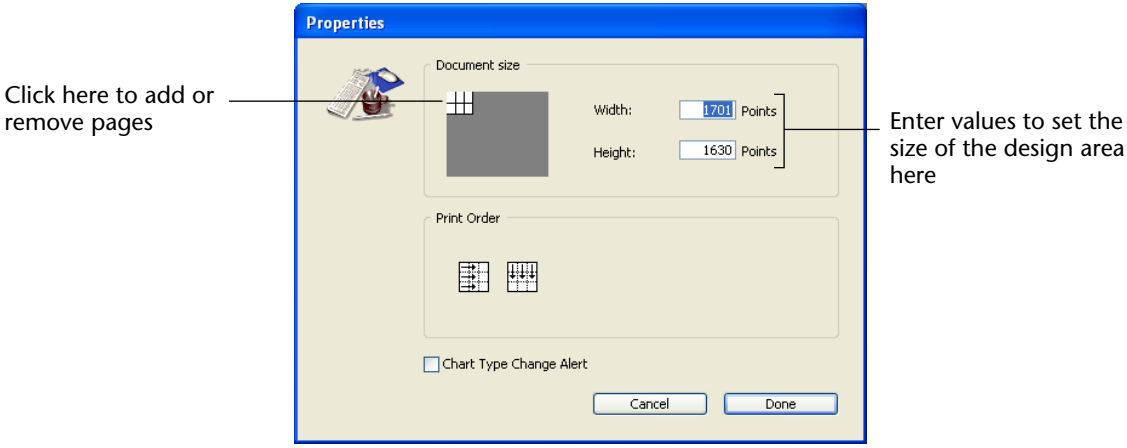
## Setting the Document Size

You can change the document size by changing the number of pages in the document or by specifying a new document size in points. The maximum drawing size is 3500 x 3500 points. You can add pages to the right of the first page, below it, or both.

► To change the document size:

1 **Choose Properties from the 4D Chart Edit menu.**

The following dialog box appears.




The document size is indicated by the point values to the right of the model document area and by the white rectangles in the model document area.

2 **Click in the Document size area to adjust the number of pages in the drawing.**
**OR**
**Enter the exact size of the document (in points) in the Width and Height text areas.**

# Choosing a Graph Type

4D Chart allows you to create two-dimensional and three-dimensional graphs from within your database. Once you decide what data you want to graph, you should think about what type of graph will best display that data.

The nature of the data that you are graphing will help indicate the type of graph you should choose. For example, a line graph is best suited for showing how values (such as “number of units sold”) change over time.

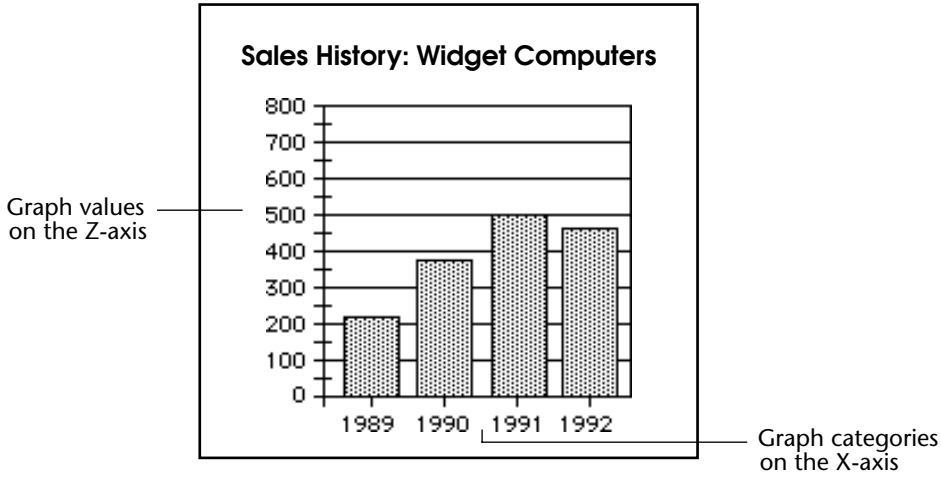
Don’t be afraid to experiment with different graph types. Once you have created a graph, you can easily convert it to another graph type. Creating graphs and changing their types are discussed in the “Creating a Graph” section on page 254.

This section discusses the types of two- and three-dimensional graphs that you can create using 4D Chart. The features of each type of graph are described, along with the type of data that the graph is best suited to show.

## Choosing a Two-dimensional Graph Type

This section briefly describes the parts of a two-dimensional graph and then presents each two-dimensional graph type.

The following diagram shows a two-dimensional (two-axis) graph:

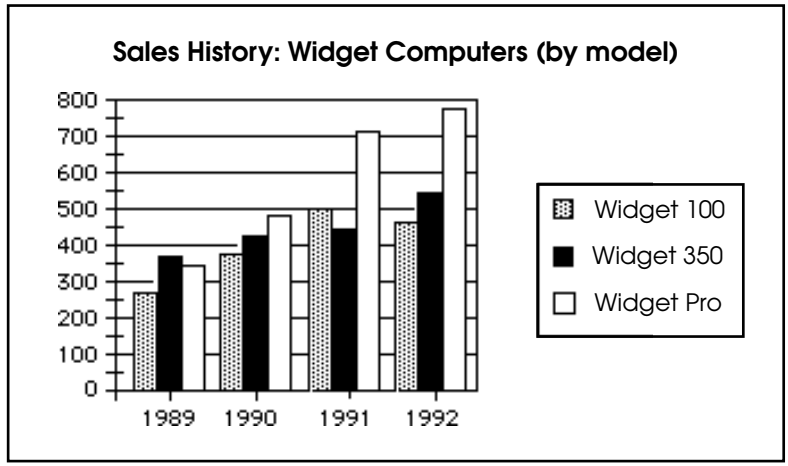



The X-axis is also called the *Category axis*. The X-axis displays the categories into which the information is divided. For instance, if you are graphing the number of computers sold per year, you would place the years on the X-axis.

The Z-axis is also called the *Values axis*. You use the Z-axis to display the values calculated for each category. In the computer sales example, the Z-axis would contain the values for the numbers of computers sold per year. For instance, if there were 500 computers sold in 1991, the Z-axis value corresponding to the X-axis category “1991” would be 500.

Another concept in graphing is the *data series* (or simply, *series*). Each category is composed of one or more series that further breaks down the information displayed in the graph. In this example, there was only one series, “computers sold.” Therefore, the series is not represented by a separate field or formula.

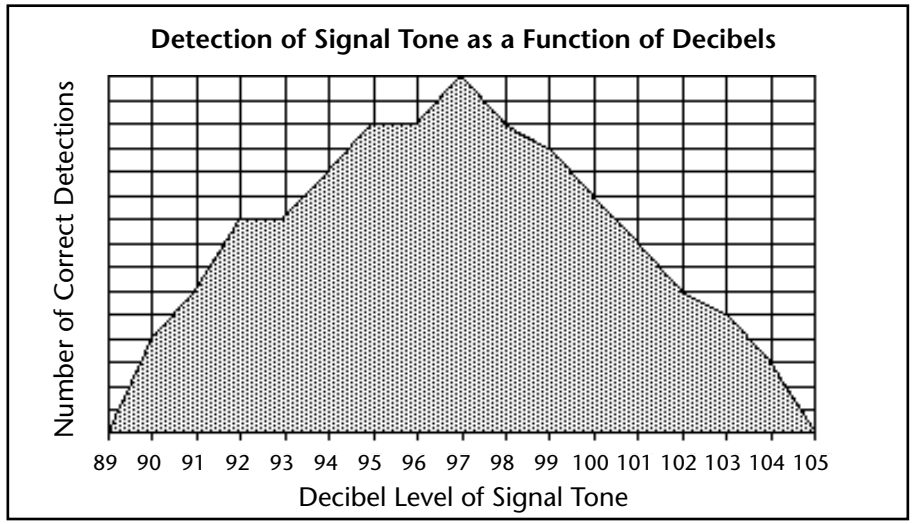
However, suppose you want to compare the sales volumes from 1989 to 1992 for three models of computers. In this case, each computer model becomes a distinct series on the graph. All series share the same categories (in this case, the years 1989 through 1992), but have their own values.




Another way to graph this data would be to create a three-dimensional graph of the data. This type of graph is discussed in the "Choosing a Three-dimensional Graph Type" section on page 249.

**Area Graphs**

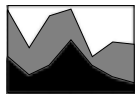
Area graphs are commonly used to show the magnitude of values over time, but can show values over any continuous category.



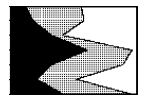
The categories on the X-axis should be continuous, such as times or temperatures. Discrete categories, such as salespeople or products, are better suited to column graphs.

*Options*
The following options are available for Area graphs:

- **Stacked**: When graphing multiple series, stack the areas for the series.
- **Stacked, proportional**: When graphing multiple, stacked series, show the series as proportions of a 100% whole.
- **Horizontal**: Make the X-axis the vertical axis and the Z-axis the horizontal axis.


Stacked

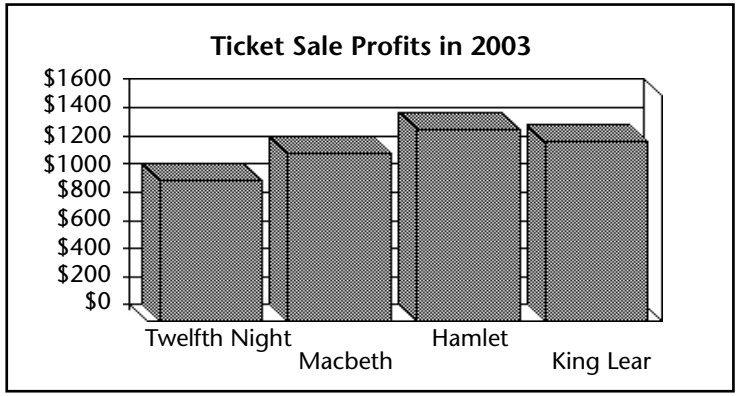
Stacked, proportional


Horizontal

## Column Graphs

Column and bar graphs are the most frequently used graph types for business data. They are usually used to compare one item to another, or one or more items over a period of time.

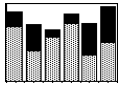
The following column graph uses the Depth feature, which makes each column look three-dimensional.



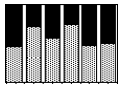

*Note* The Depth feature is discussed in more detail in the "Modifying Depth in a Two-dimensional Graph" section on page 284.

*Options*

The following options are available for Column graphs:



- **Stacked**: When graphing multiple series, stack the columns for the series in each category.

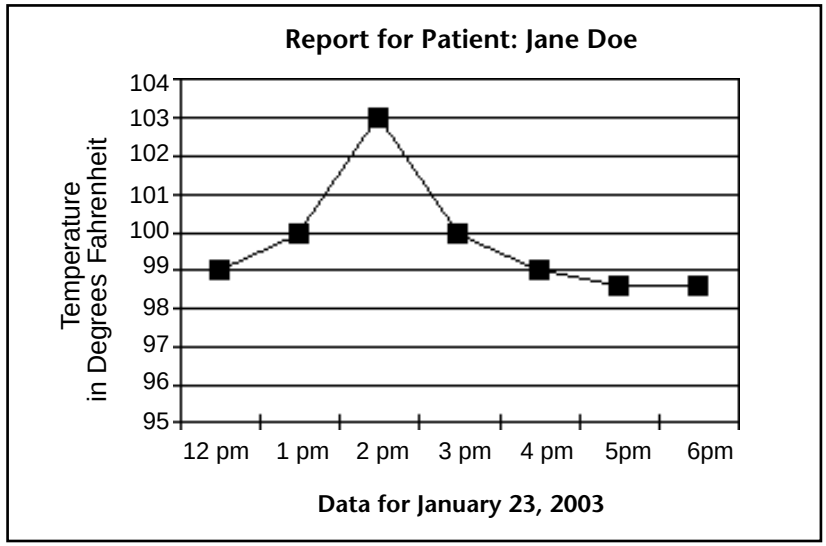


- **Stacked, proportional**: When graphing multiple, stacked series, show the series as proportions of a 100% whole.

- **Horizontal**: Make the X-axis the vertical axis and the Z-axis the horizontal axis. This option creates a bar graph. Bar graphs show the categories on the vertical axis, with the values expressed by the length of the bars. Bar graphs are often a useful alternative to column graphs, especially when the category labels are long.
- **Overlap**: When graphing multiple series, use this option to specify the percentage by which the series columns within each category overlap each other.
- **Gap Width**: Use this option to specify the spacial gap between the columns from one category to the next. The larger the gap, the narrower the columns for each category.

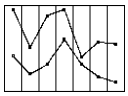
**Line and/or Scatter Graphs**

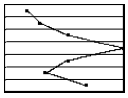
Line graphs are often used to show the rate of change of values over time. Scatter graphs can show relationships and trends in your data. Such graphs are most often used when there are a large number of different values of the X-axis field, as in a scientific study.



The values on the X-axis should be continuous or ordered, such as times or temperatures. Discrete categories or categories that do not have an order — such as salespeople or products — are better suited to column graphs.

*Options*
The following options are available for Line and/or Scatter graphs:



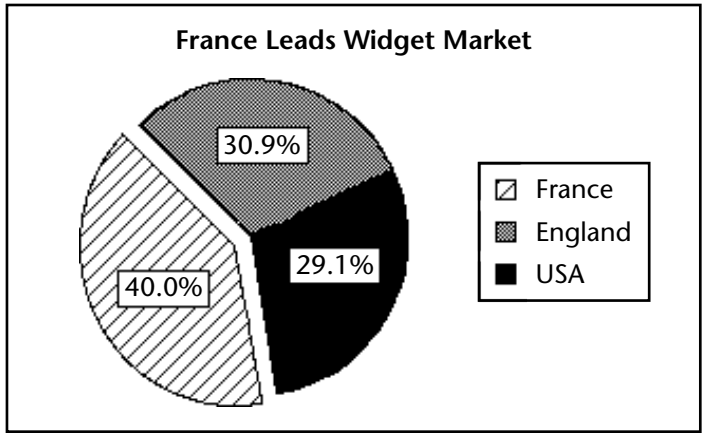


- **Stacked**: When graphing multiple series, stack the lines for the series in each category.
- **Horizontal**: Make the X-axis the vertical axis and the Z-axis the horizontal axis.
- **Displaying lines and/or points**
  You can:
  - **Show Points**: Each value appears as a dot in the graph.
  - **Show Lines**: Only lines appear in the graph.
  - **Show Both**: Lines and Points appear in the graph.

## Pie Charts

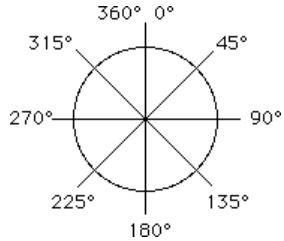
Pie charts show data as a percentage of a whole. Your data does not need to be expressed as percentages; 4D Chart automatically converts the data into percentages when it creates the pie chart.

Each pie chart can have only one series. Categories are displayed in the legend.



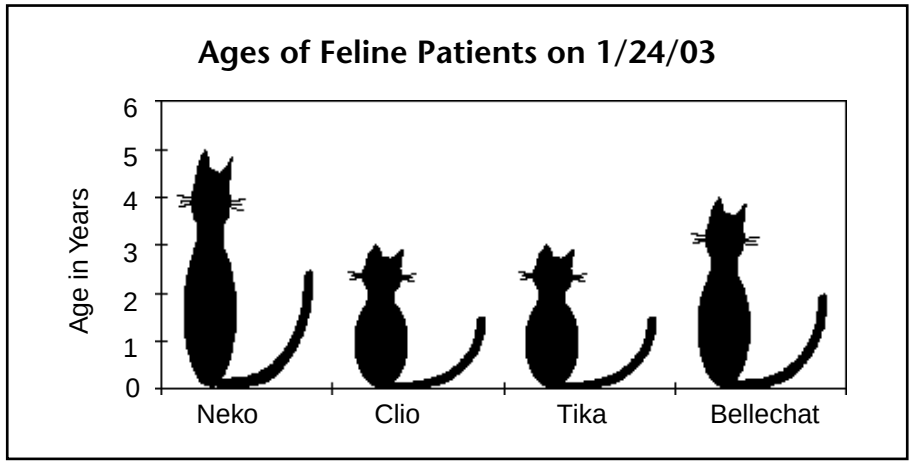
*Options*
The following option is available for pie charts:

- **Start Angle**: Use this option to specify the rotation of the chart. The specified angle determines the placement of the first edge of the first category in the chart.

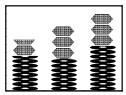



**Picture Graphs**

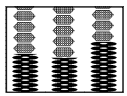
Picture graphs are similar to column graphs, except that you can substitute a picture for the column.



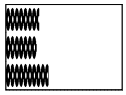

*Options*
The following options are available for Picture graphs in 4D Chart:



- **Stacked**: When graphing multiple series, stack the pictures for the series in each category.



- **Stacked, proportional**: When graphing multiple, stacked series, show the series as proportions of a 100% whole.



- **Horizontal**: Make the X-axis the vertical axis and the Z-axis the horizontal axis. This option creates a bar picture graph.
- **Overlap**: When graphing multiple series, use this option to specify the percentage by which the series within each category overlap.

- **Gap Width**: Use this option to specify the spacial gap between the picture columns from one category to the next. The larger the gap, the narrower the picture columns.

  Additional options for aligning and adjusting the pictures are discussed in the "Adding Pictures to a Picture Chart" section on page 291.

## 2D XY Graphs (Scatterplots)

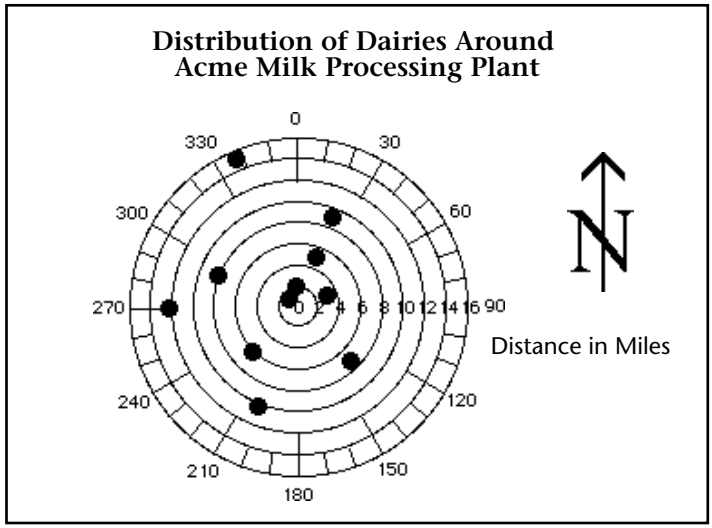
Each data point in a scatterplot represents a pair of values. The X-axis is also a value axis.

When the 2D XY type is selected, the option Category is replaced with Values (X) in the Chart>Axis, Chart>Grid Lines and Chart>Titles menus.

*Options*
The following options are available for 2D XY graphs in 4D Chart:

- **Plots shape**: You can display None, Circles, Squares, or Star plots.
- **Lines appearance**: You can display None, Straight, or Arrows lines.
- **Show Regression Line** (y = ax+b): Allows viewing the predictive relation between the X- and Y-axis values (if appropriate).
  There is one regression line for each series of points. Using **Ctrl+click** (Windows) or **Command+click** (Mac OS), you can select the points associated with the regression line.
- **2D XY variant: Polar charts**
  Polar charts are used to show the distribution of data around a central point. In a polar chart, each point is plotted in terms of degrees from the zero point and distance from the center.

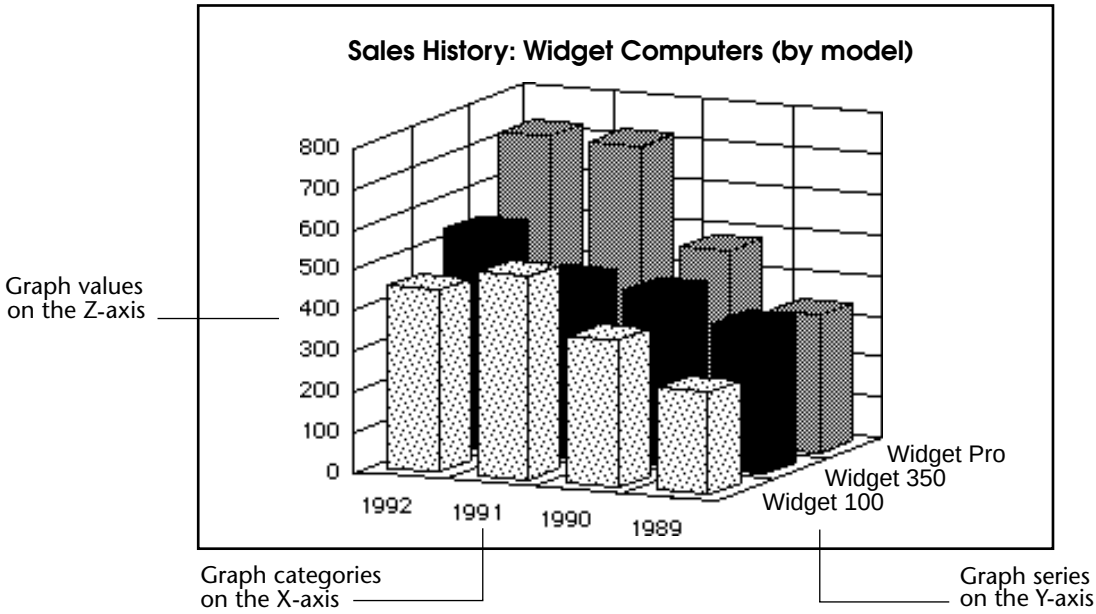
Each data point on a polar chart is plotted using one Z-axis field to specify the angle in degrees and a second Z-axis field to specify the distance from the center.




## Choosing a Three-dimensional Graph Type

This section briefly describes the parts of a three-dimensional graph and then presents each three-dimensional graph type.

The following diagram shows a three-dimensional (three-axis) graph:



As with a two-dimensional graph, the X-axis (or Category axis) displays the categories into which the information is divided. For instance, if you are graphing the number of computers sold per year, you would place the years on the X-axis.

In a three-dimensional graph, the Y-axis is also called the Series axis. Each category is composed of one or more series that further breaks down the information for each value of the X-axis field. Each data point in the graph is the intersection of one category and one series. In the example illustrated above, each computer model is a series.

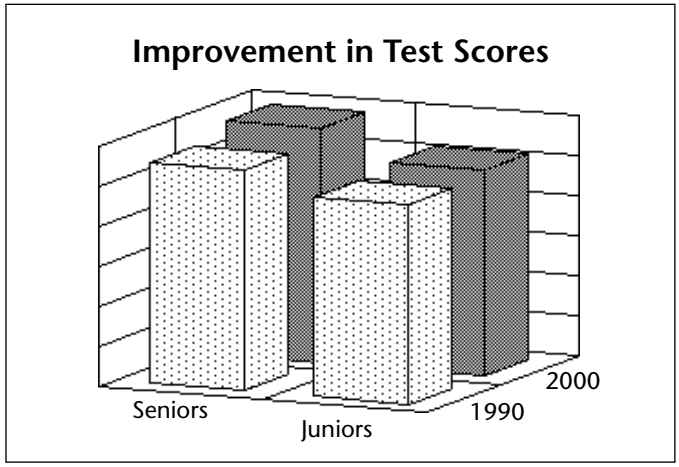
In a two-dimensional graph, the series remain on the X-axis. The columns representing each series are distinguished by their patterns. In a three-dimensional graph, the series are displayed on their own axis. Each series still has its own pattern, but now the series are also separated from each other in space.

The Z-axis displays the values calculated for each combination of category and series.

In the computer sales example, the Z-axis would contain the values for the numbers of each type of computer sold per year. For instance, if there were 725 Widget Pro computers sold in 1991, the Z-axis value corresponding to the X-axis category “1991” and the Y-axis series “Widget Pro” would be 725.

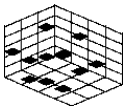
**3D Column Graphs**

3D Column graphs, like 2D Column graphs, compare one item to another, or one or more items over a period of time.



*Options*
The following options are available for 3D Column graphs:

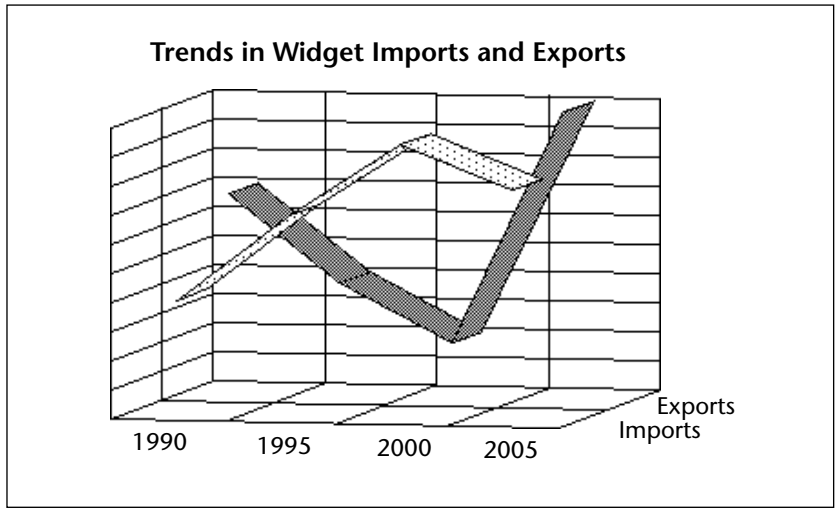
- **Category Gap/Width**: The gap between or width of the categories in the graph. The larger the category gap, the smaller the category width.



- **Series Gap/Width**: The gap between or width of the series in the graph. The larger the series gap, the smaller the series width.
- **Tops only**: Show only the top side of each column.

**3D Line Graphs**

3D Line graphs show trends in your data. They should be used for continuous categories, such as time.

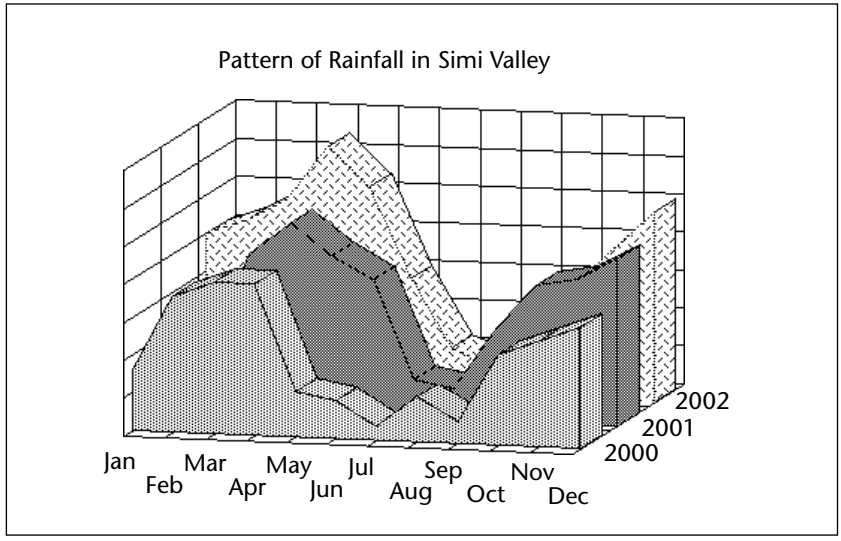



*Option*
The following option is available for 3D Line graphs:

- **Series Gap/Width**: The gap between or width of the series in the graph. The larger the series gap, the smaller the series width.

## 3D Area Graphs

3D Area graphs emphasize the volume or size of the series over a continuous category, such as time.



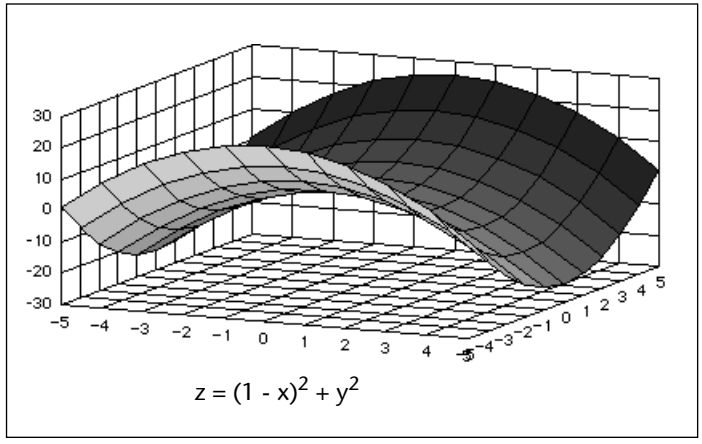

*Option*
The following option is available for 3D Area graphs:

- **Series Gap/Width**: The gap between or width of the series in the graph. The larger the series gap, the smaller the series width.

## 3D Surface Graphs

Surface graphs show three-dimensional data where the Z-axis value varies depending on the X- and Y-axis values. Surface graphs are commonly used to graph the results of mathematical formulas.

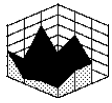
The following graph was created using a mathematical formula:



*Option*
The following option is available for 3D Surface graphs:

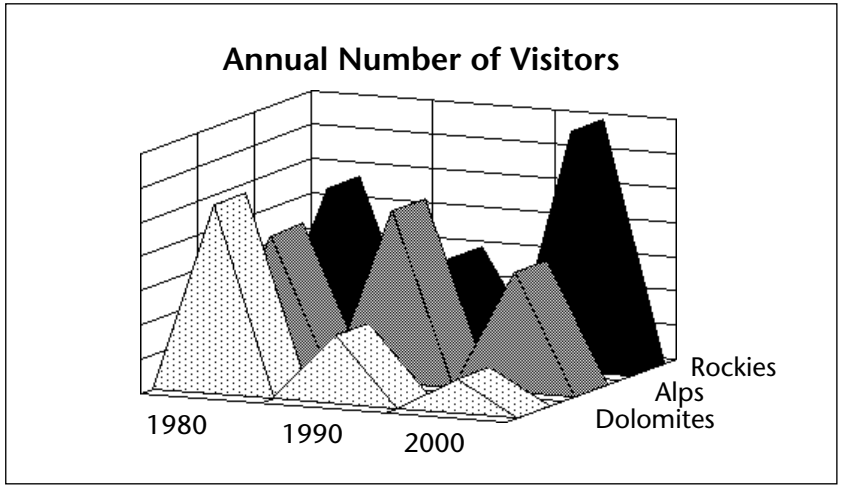
- **Tops only**: Show only the top side of the surface, not the sides. This option is used in the previous example graph.

Here is an example of a surface graph with sides:

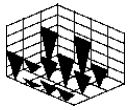


**3D Triangle Graphs**

3D Triangle graphs compare one item to another, or one or more items over a period of time. 3D Triangle graphs are an alternative to 3D Column graphs.



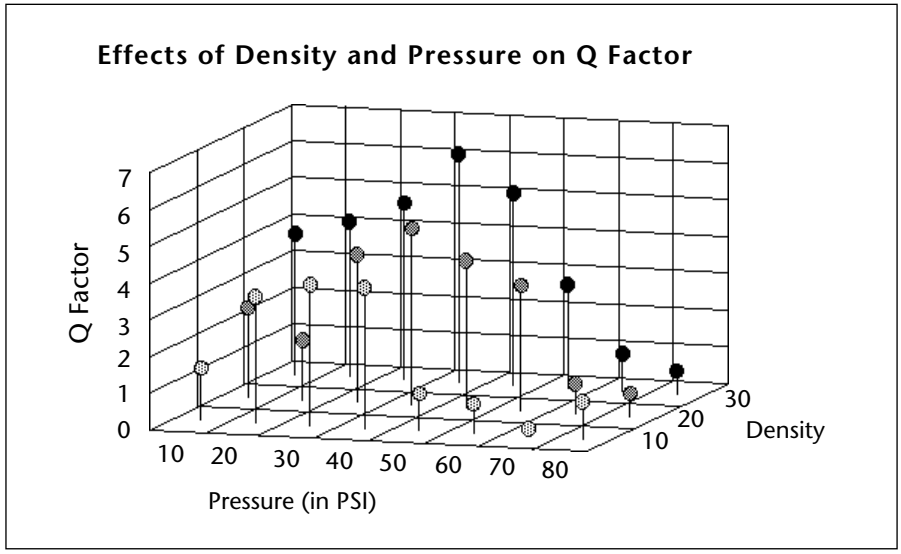

*Options*
The following options are available for 3D Triangle graphs:



- **Series Gap/Width**: The gap between or width of the series in the graph. The larger the series gap, the smaller the series width.
- **Flipped**: The triangles appear flipped vertically.
- **Plot Zero Values**: If this option is not selected, zero values will be omitted from the graph.

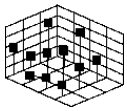
### 3D Spike Graphs

3D Spike graphs show the intersection of three values. Each data point is connected to the Category plane with a drop line.




*Option*

The following option is available for 3D Spike graphs:



- **Oval/Square Heads**: Use this option to specify whether the spike heads are oval or square.

# Creating a Graph

This section includes the basic steps for creating a graph. After reading this section, you will be able to:

- Create a two-dimensional or three-dimensional graph from data stored in the database or copied to the Clipboard
- Update a graph created from data in the database
- Change a graph's type
- Change the options specific to each graph type.

4D Chart allows you to create two-dimensional and three-dimensional graphs based on the data in fields in your database. You can graph the values in the fields themselves, or you can graph the values that result from formulas that use the fields.

Whatever the case, when you create a graph, you select the data that you want to graph on each axis. For each axis, there are certain restrictions on the data types that can be graphed. If a data type cannot be graphed on a certain axis, fields of that type cannot be selected in the Chart Wizard. The following table provides information on the types of data that can be assigned to the Categories or Series axis and the Values axis.

| Data Type | Category or Series Axis? | Values Axis? | Compatible Types on Values Axis |
|---|---|---|---|
| Alphanumeric | Yes | No | ------- |
| Text | Yes | No | ------- |
| Real | Yes | Yes | Integer, Long integer |
| Integer | Yes | Yes | Real, Long integer |
| Long integer | Yes | Yes | Real, Integer |
| Date | Yes | Yes | ------- |
| Time | Yes | No | ------- |
| Boolean | Yes | No | ------- |
| Picture | No | No | ------- |
| Blob | No | No | ------- |

## Creating a Selection of Records to Graph

Before you begin the process of creating a graph, you must create a selection of records to graph.

4D Chart can operate in its own window or in 4D Chart areas on forms. The following sections explain how to generate the selection of records to be graphed, depending on the 4D Chart location.

### Creating a Selection of Records in a Plug-in Window

4D Chart graphs the records in the current selection. Before you create a graph in a plug-in window, select the records you want to graph.

4D Chart will not create a graph unless there is at least one record in the current selection of the table whose data you want to graph.

### Creating a Selection of Records in an Input Form

A 4D Chart area in an input form can be used to graph data in other tables.

The table whose records you want to graph must have at least one record in its current selection. If the table that contains the form is automatically related to the table you wish to graph, the current record in the input form determines the selection of records in the related table.

Because you have a record loaded in an input form, you should avoid creating graphs from data in the current table. If you want to graph data from the same table as the input form, you must use PUSH RECORD and POP RECORD or create a new process with the New process function. For more information, see the descriptions of these commands in the *4th Dimension Language Reference* manual.

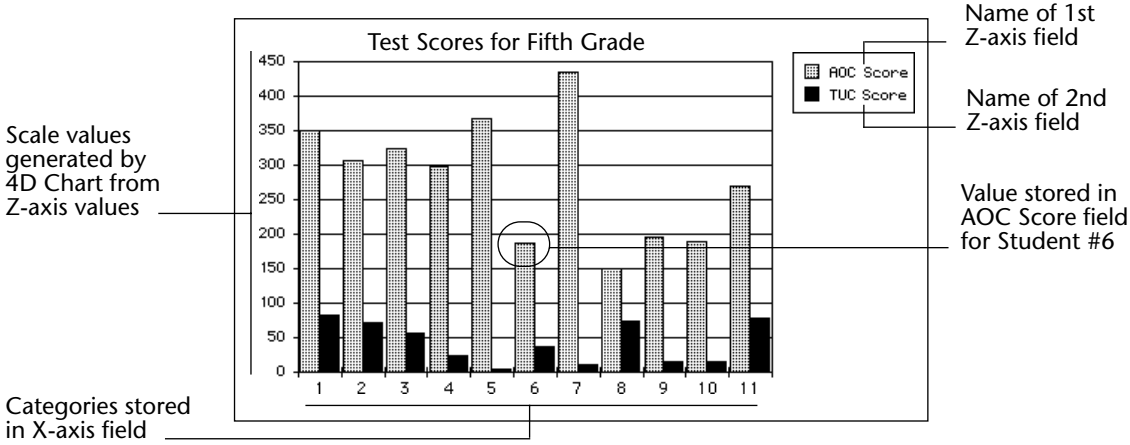
For more information about adding a 4D Chart area to a form, see the *4th Dimension Design Reference* manual.

## Creating a Graph from Data in the Database

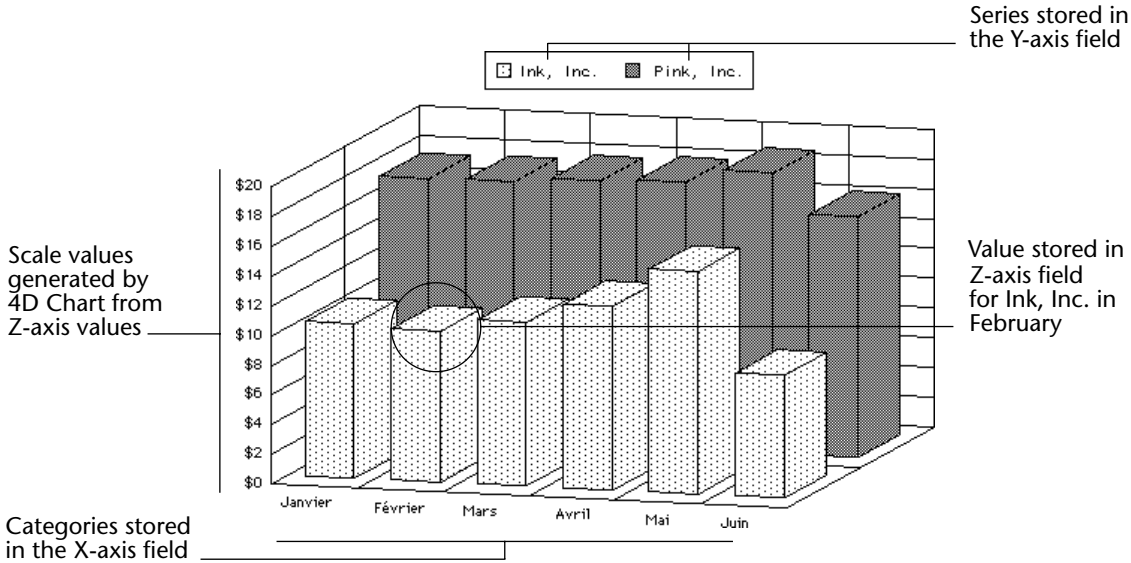
For a two-dimensional graph, you specify a field for the horizontal axis (X-axis) and one or more fields or formulas for the vertical axis (referred to in 4D Chart as the Z-axis).

For a three-dimensional graph, you will specify one field (or formula) each for the X-, Y-, and Z-axes.

The following example graph shows how 4D Chart uses the information in the database to create a 2D graph. The graph plots the scores on two tests for each of 11 students. The X-axis field is Student ID, and the Z-axis fields are AOC Score and TUC Score.



The following example graph shows how 4D Chart uses the information in the database to create a graph. The graph shows the average monthly stock value for two companies. The X-, Y-, and Z-axis fields are, respectively: Month, Company Name, and Average Price.




► To create a graph from data stored in the database:

1 **Make sure that no graph is currently selected in the 4D Chart area.**

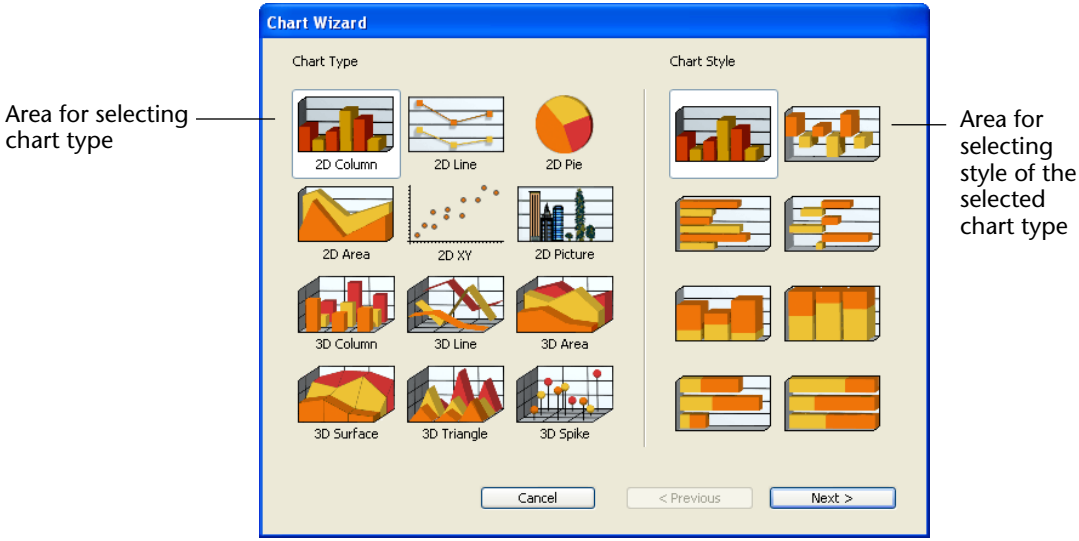
To deselect a selected graph, click anywhere in the 4D Chart area outside the graph.

2 **Choose the Charts... command in the Tools menu of 4th Dimension or click the Chart icon** **in the 4th Dimension toolbar.**

**OR**

**If you are in a 4D Chart area, choose New Chart from the Chart menu or click the chart creation icon** **in the 4D Chart tool palette.**

The Chart Wizard appears.




You can choose between 12 types of charts. Types 1-6 are two-dimensional and 7-12 are three-dimensional. By default, the first chart type is selected.

The Chart Wizard has two pages:

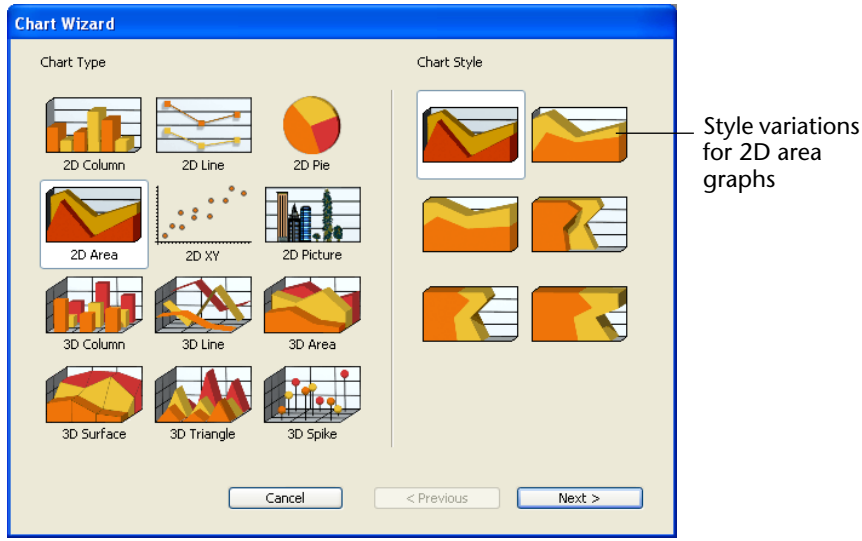
- **Chart Type/Chart Style**: Displays the 12 chart types and the variations on the type of graph that you selected in the Chart Type section. The Chart Style section changes depending on your choice of chart type.
- **Data Selection**: Lets you select the table that contains the data you wish to graph and a field list. Use the Data Selection page to assign fields or formulas to the graph axes. The Data Selection page changes depending on the graph type you chose.

You must choose a chart type and use the Data Selection page to assign appropriate fields or formulas to each axis that the chart type requires.

3 **Click a chart type.**

When you click on a chart type, the Chart Style section and Data Selection page change to match the requirements of the selected type. For complete information on the types of charts available in 4D Chart, see the "Choosing a Graph Type" section on page 241.

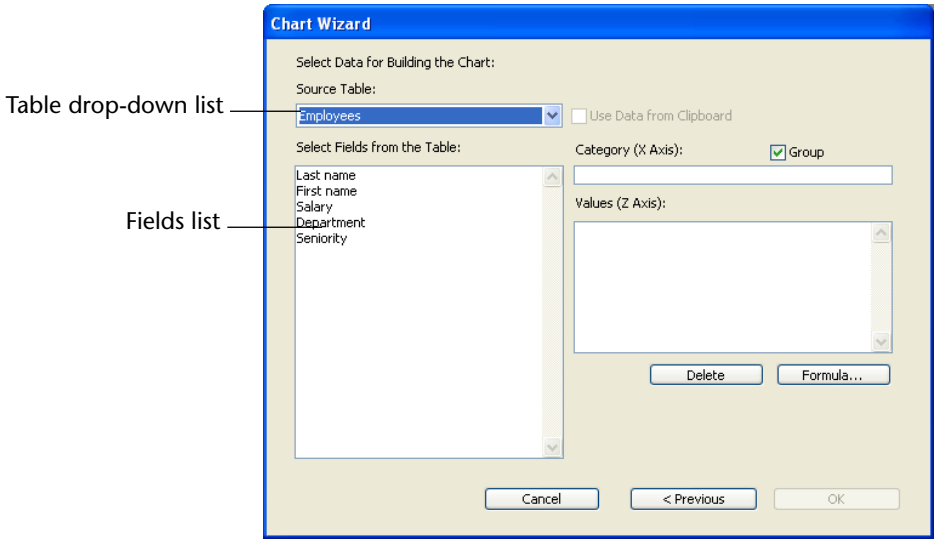
**4 Click on a chart style (Optional).**




*Note* Some chart types allow for only one style.

**5 Click the Next > button.**

The Data Selection page appears, displaying the appropriate options for the selected chart type. The names of database tables are placed in the "Source Table" drop-down list and the field names of the selected table are displayed in the "Select Fields from the Table" area.



*Note* If you are creating a graph in a 4D Chart area in an input form, the current table is not listed in the Tables list because you cannot graph data from the current table.

6 **Choose the desired table from the Source Table drop-down list.**

The Fields list changes to show the fields from the selected table.

*Note* Picture, subtable and BLOB fields cannot be included in a graphic representation.

7 **Drag the field that you want to assign to the Category axis to the Category box or double-click the field.**

*Note* If you make a mistake when choosing the X-axis field, replace the field by dragging the desired field to the Category box.

- If you want to create a three-dimensional graph, you must fill the "Second Category (Y-axis)" area. Go to the following step.
- If you want to create a two-dimensional graph, you only need to fill the "Values (Z-axis)" area. Go to step 9.

8 **If you are creating a 3D graph, drag the Series field to the Y-axis (Second Category) box or double-click the field.**

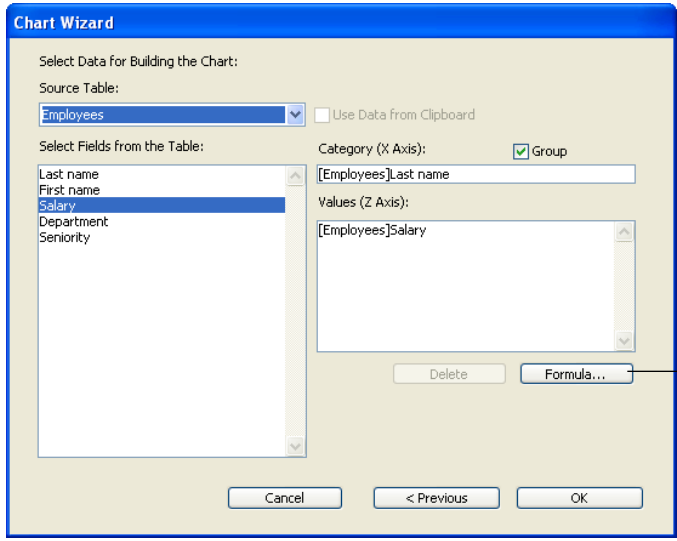
The name of the field appears in the Y-axis box.

*Note* If you make a mistake when choosing the Y-axis field, replace it by dragging the correct field to the Second Category box.

9 **Drag the field containing the values to be graphed to the Values (Z-axis) box or double-click the field[1].**
**OR**
**Click the Formula button (2D graphs only).**

1. With 2D graphs, you can add more than one field or formula to the Z-axis. Each field or formula becomes a series. For more information, please refer to the "Choosing a Graph Type" section on page 241.

The name of the field or the formula appears in the Z-axis (Values) box. For instructions on creating a formula, see the "Adding a Formula" section on page 267.




Button for adding a formula (2D graphs)

For two-dimensional graphs, you can add an unlimited number of fields and/or formulas on the Z-axis (Values). Each item placed in the **Values (Z-axis)** area becomes a series. For more information on series, refer to the "Choosing a Graph Type" paragraph on page 241.

*Notes*

- For three-dimensional graphs, to modify the field placed in the Z-axis area, you just need to drag and drop the name of another field onto the area.
- For two-dimensional graphs, you can delete a series, i.e., a field or formula placed in the Z-axis area: just select the series then click on the **Delete** button or press **Backspace**.

**10 If you want to have the Z-axis values summed for each X-axis category, click the Group check box.**

This option is used when the X-axis categories are not unique and you want each category to appear only once, with the values for each instance summed. For more information about this option, see the "Grouping Non-unique Categories and Series" section on page 266.

11 **If you want to have the Z-axis values summed for each Y-axis series, click the Group check box (3D graphs only).**

This option is used when the Y-axis series are not unique and you want each series to appear only once, with the values for each instance summed. For more information about this option, see the "Grouping Non-unique Categories and Series" section on page 266.

12 **When you have finished designing your graph, click OK.**

4D Chart creates the graph and displays it in the 4D Chart area.

### Updating the Data in a Graph from the Database

When you create a graph from data stored in the database, the data in the graph is static. Although the data in the database may change, the data in the graph remains the same until you update it.

You can tell 4D Chart to update a graph by choosing **Update** from the **Chart** menu. When you choose Update, 4D Chart regenerates the selected graph using the data in the current selection for the table whose fields you are graphing.

You will want to update a graph in the following situations:

- When you want to include more records in the selection
- When you want to include fewer records in the selection
- When you want to include different records in the selection
- When the data in the selection has been modified.

When you use **Update**, 4D Chart recreates the graph using the new current selection and the settings you chose for the original graph.

*Note* The **Update** menu item is available only for graphs created from data in the database.

## Creating a Graph from Data on the Clipboard

You can graph data from any application if it is correctly formatted and then copied to the Clipboard. This section describes how to format data in order to use it in a graph, and how to create a 4D Chart graph from this information.

### Formatting Data and Copying it to the Clipboard

You can graph data that is formatted in the Tab-Tab-Return (TTR) format. If you copy cells from any spreadsheet application, they will be in TTR format. You can also use data from a word-processing application if it is formatted with tabs between the fields and carriage returns between the records.

Following are examples of correctly formatted data:

TTR data (word-processing)

Names ⇥ Ages ↵
Helen ⇥ 25 ↵
Todd ⇥ 27 ↵
Norm ⇥ 22 ↵
Michele ⇥ 23 ↵

Spreadsheet data

| Names | Ages |
|---|---|
| Helen | 25 |
| Todd | 27 |
| Norm | 22 |
| Michele | 23 |

*Note* The ⇥ and ↵ symbols represent the invisible symbols used by many word-processing applications to indicate tabs and carriage returns, respectively.

The first row of data is used as the field names. Each column contains the data for one field.

*Note* If you want to use dates copied to the Clipboard, the dates must be in the same format as the System-level date format.

When you have prepared the data in your application, select the desired rows and columns and copy them to the Clipboard.

**Creating the Graph from Data on the Clipboard**

For a two-dimensional graph, you will specify a field for the X-axis and one or more fields or formulas for the Z-axis. The following illustration shows how 4D Chart interprets the information from the Clipboard.

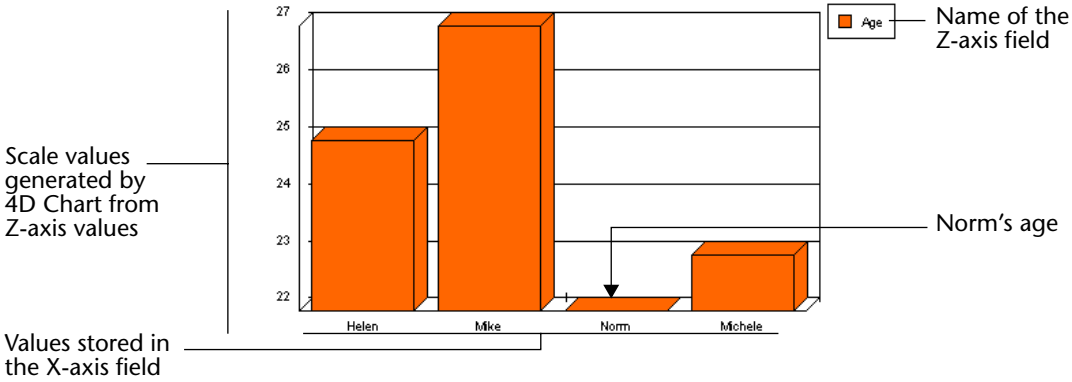
**Clipboard**

Field names

Records

| Names | Ages |
|---|---|
| Helen | 25 |
| Mike | 27 |
| Norm | 22 |
| Michele | 23 |

**2D Graph**



For a three-dimensional graph, you specify one field each for the X-, Y-, and Z-axes. The following illustration shows the spreadsheet data used for the example graph. The information details the total sales by two different stores to three types of customers.

**Clipboard**

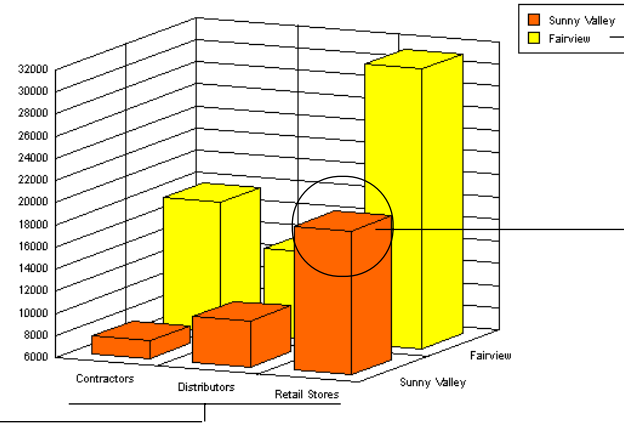
Categories
Series
Values

Field names

Records

| Customer Type | Store Location | Dollar Amount |
|---|---|---|
| Contractors | Sunny Valley | 7599 |
| Contractors | Fairview | 17722.5 |
| Distributors | Sunny Valley | 10132 |
| Distributors | Fairview | 13900 |
| Retail Stores | Sunny Valley | 18997.5 |
| Retail Stores | Fairview | 31275 |

**3D Graph**




Series

Total value of sales to retail stores at the Sunny Valley store location

Categories

► To create a graph from data stored on the Clipboard:

1 **Copy the data to be graphed to the Clipboard, using the format described in this section.**

2 **Follow the instructions provided in steps 1 to 5 in the "Creating a Graph from Data in the Database" section on page 256.**

The Data Selection page appears, configured for the selected chart type.

3 **Click the Use Data From Clipboard check box.**

Clicking Use Data From Clipboard disables the Source Table drop-down list and populates the Fields list with the field names from the Clipboard.

4 **Assign fields to the axes by dragging to the appropriate areas or by double-clicking the fields.**

When all areas have been assigned fields, the **OK** button is enabled.

*Note* With 2D graphs, you can add as many fields and formulas to the Z-axis as you like. However, be sure to choose only numeric fields. Do not mix date fields and formulas with number fields and formulas. Each item in the Z-axis (Values) box is plotted in the graph.

5 **If you want to have the Z-axis values summed for each X-axis category, click the Group check box.**

This option is used when the X-axis categories are not unique and you want each category to appear only once, with the values for each instance summed. For more information about this option, see the "Grouping Non-unique Categories and Series" section on page 266.

6 **When you have finished designing your graph, click OK.**

4D Chart creates your graph and displays it in the 4D Chart area.

## Updating Graph Data from the Database

When you create a graph using the contents of the database, the data it contains are static. Even when the contents of the database change, the data of the graph can only be modified by an update.

► To update a 4D Chart graph:

1 **Choose the Update command in the Chart menu of 4D Chart.**

This way 4D Chart regenerates the selected graph using the data found in the current selection of the table whose fields are being graphed.

You should update a graph in the following cases:

- To add records to the selection,
- To remove records from the selection,
- To put different records in the selection,
- When the data of the selection has been modified.

When you use the update, the graph remains the same with all the previously chosen options, but with a new selection of data.

*Note* The **Update** menu command is only enabled for graphs created using the contents of the database.

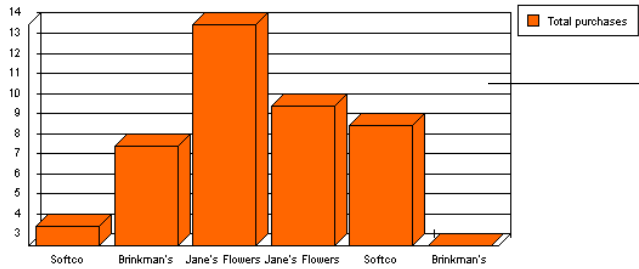
## Grouping Non-unique Categories and Series

Some categories or series may appear more than once in your data. For instance, suppose that you want to graph the total purchases made by each of your customers. Each customer may have made several purchases.

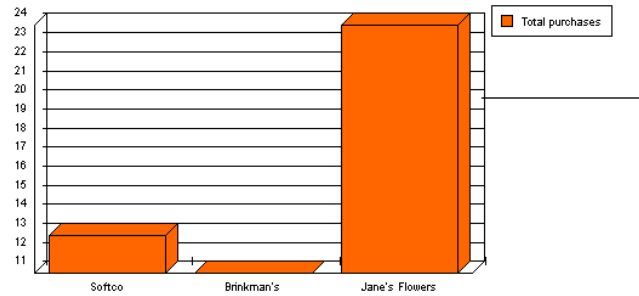
When you create a two-dimensional graph, you can choose to sum the values for non-unique categories, so that each category appears only once on the graph. When you create a three-dimensional graph, you can choose to sum the values for non-unique categories, non-unique series, or both.

To create the graph described in the example above, you might graph from the [Invoices] table, using [Invoices]Customer for the X-axis categories and [Invoices]SalesTotal for the Z-axis values. Because some customers may have more than one invoice, you would want 4D Chart to sum the values in the [Invoices]SalesTotal field so that there would be only one value (the total) for each customer.

The illustrations below show the same basic graph with and without the Group option:




Graph without Group option




Graph with Group option

To group data on the Category or Series axis, check the corresponding **Group** check box in the Data Selection page of the Chart Wizard.

## Adding a Formula

You can graph values that are not represented in your data but are obtained by performing calculations on the data or on other values in your database. For example, you can graph your profits by graphing the results of a formula that subtracts your unit cost from your retail price.

You can refer to any function or valid 4th Dimension method "allowed" in the formula editor and graph the result on the Values axis. The method must return a value to 4D Chart. If the categories are grouped, 4D Chart sums the values returned.

If there are fields or other formulas also being graphed on the Values axis, the data types of all the values must be compatible. For instance, if you are graphing a Date field and a formula on the Values axis, the formula must return a date.

***Formulas are available only for two-dimensional graphs.***

► To use a formula to calculate values for a graph:

1 **When you are ready to specify the Values field in the Data Selection page, click the Formula button.**

The 4D Formula dialog box appears.

2 **Type the formula.**

For more information about the Formula editor dialog box, please refer to "Formula Editor" section on page 115. Following are some examples of formulas:

| Formula | Syntax |
|---|---|
| Month of (Current date) | 4D function (4D function) |
| Day of ([Invoices]Invoice date) | 4D function (field) |
| Sin (vX) | 4D function (variable) |
| NumVisits | Method that returns a value in $0 This method must have been "allowed" in the Formula editor using the SET ALLOWED METHODS command |

3 **Click OK.**

4 **When you have finished designing the graph, click OK in the Chart Wizard to create the graph.**

## Changing the Chart Type

You can switch between chart types at any time. You can change from one two-dimensional graph type to another, or from one three-dimensional graph type to another. When creating a graph, feel free to experiment with chart types to find the best way to present your data.

► To change the chart type:

1 **Make sure that the graph is selected.**

You select a graph by clicking it. When a graph is selected, selection handles appear around it.

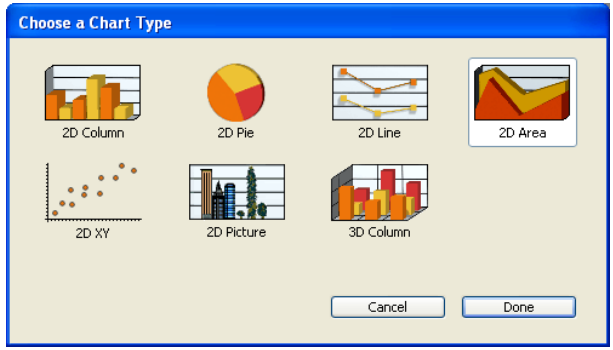
2 **Click the Chart button in the 4D Chart Tool palette.**

A pop-up menu appears, which lets you select another type of chart. This menu does not allow a preview of the chart types.

**OR**

**Choose the Chart Type item in the Chart menu of 4D Chart.**

The "Choose a Chart Type" window is then displayed.




You can select another chart type and click **OK**.

The graph is redrawn using the new chart type. Both the Chart drop-down list and the Choose a Chart Type window display only the chart types that are appropriate for the selection of data. You cannot, for example, plot 3D data using a 2D chart type. For information on the graph types available in 4D Chart, see the "Choosing a Graph Type" section on page 241.

## Setting the Chart Type Change Alert

You can have 4D Chart display an alert dialog box when the user attempts to change the type of a graph. The user then has the option to cancel or continue with the change.

► To display an alert dialog box when a new chart type is selected:

1 **Choose Properties from the 4D Chart Edit menu.**

The Properties dialog box appears.

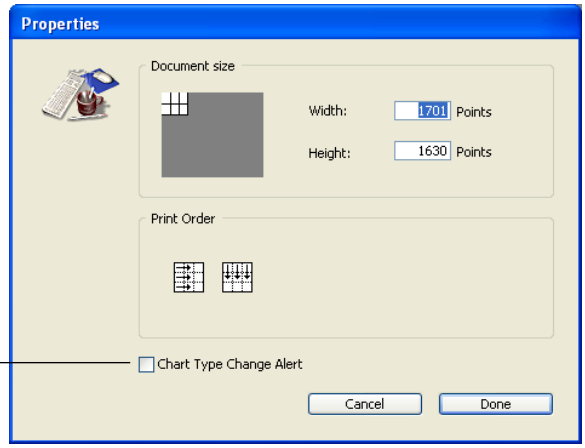



Chart Type Change Alert check box

2 **Check or uncheck the Chart Type Change Alert check box.**

3 **Click OK to close the Properties dialog box.**

## Changing the Options for a Chart Type

Each chart type has a particular set of options that you can change using the Options dialog box. By changing the chart options, you can, for example, change a column graph to a bar graph, or show the series in an area graph as proportions of a whole.

► To open the Options dialog box for a graph:

■ **Double-click the graph.**
**OR**
**Select the graph and choose Options from the Chart menu.**

For more information about the options for each chart type, see the "Choosing a Graph Type" section on page 241.

# Modifying Graph Features

This section explains how to modify graph features. After reading this section, you will know how to:

- Resize a graph
- Customize graph axes
- Show and hide grid lines
- Display the series values
- Customize legends
- Add depth to a two-dimensional graph
- Change the perspective of a three-dimensional graph
- Customize the tips of a graph
- Change the graphic attributes of graph objects
- "Explode" a wedge from a pie chart
- Add a picture to a picture chart.

## Resizing a Graph

When you create a graph, its initial size corresponds to the size of the window in which it is created.
If the graph is created using the **Tools>Chart...** menu command of 4th Dimension, its size corresponds to the default size of a 4D Chart external window .
If the graph is created from a 4D Chart window, its size corresponds to that of the window.

You can resize a graph in two ways:

- By resizing the window in which it is displayed.
A graph is "unified" with the window where it was created as long as its own dimensions have not been modified using the selection handles (see below).
- By directly resizing the graph in the window using the selection handles (black squares that appear around the object when it is selected). Once you have done so, the graph is no longer "unified" with the window (see above).

You can resize the height and width at the same time, maintaining the sizing proportion between the two.

► To resize a graph:

1 **Select the graph.**

2 **Hold down the mouse button on a selection handle and drag it up, down, or diagonally.**

If you drag a corner, the height and width change. If you drag a side, either the height or the width changes.

To resize the object so that the height and width retain the same proportion to each other, hold down the **Shift** key while you are resizing.

3 **Release the mouse button when you have finished.**

The graph is resized.

## Customizing the Axes

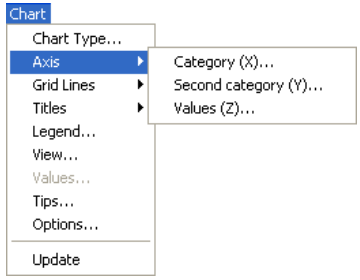
You can customize many aspects of each axis of a graph. This section contains information about:

- Customizing the axis labels
- Customizing the tick marks
- Changing the scale of the Values axis
- Reversing the order of data points on an axis
- Positioning the origin
- Adding axis titles.z

The following table explains the axes available in two-dimensional (2D) and three-dimensional (3D) graphs:

| Number of Axes | Axis Name | Axis |
|---|---|---|
| Two (2D Graph) | Category | X |
| | Series | N/A |
| | Values | Z |
| Three (3D Graph) | Category | X |
| | Series | Y |
| | Values | Z |

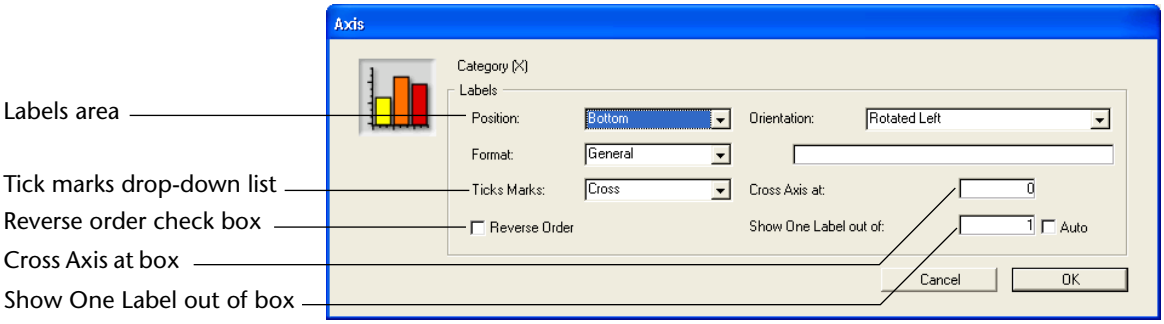
You can display the Axis dialog box for any axis by choosing the appropriate axis from the **Axis** submenu of the **Chart** menu.




Using the Axis dialog box, you can change the location of the axis labels, tick marks, and origin. You can also change the scale used for the Values axis and reverse the order of the items graphed on each axis.

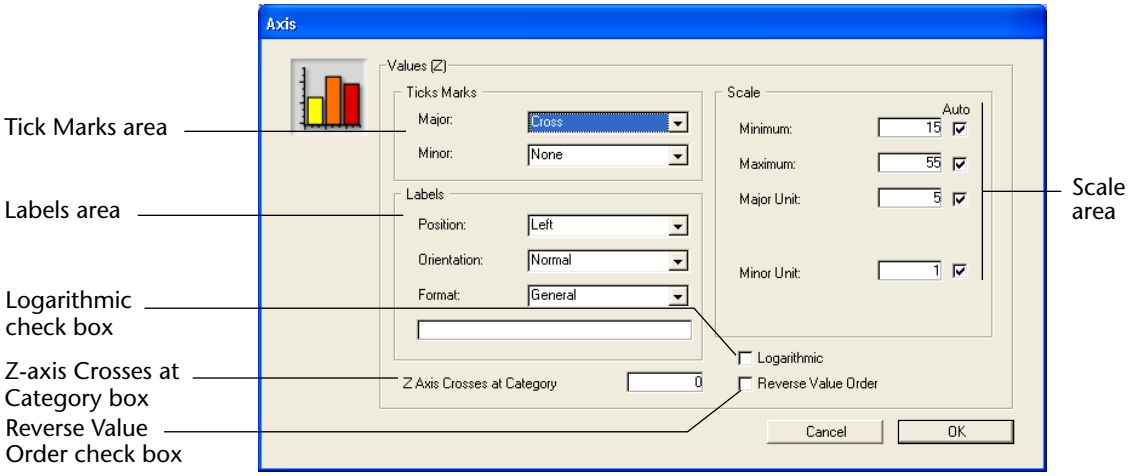
This section presents the dialog boxes that you use to customize the axes of your graph. It then provides details about each of the options.

The Category Axis dialog box enables you to customize the Category and Series axes:




*Note* The Tick Marks drop-down list, Reverse Order check box, and Cross Axis At text box are not available in the Category or Series Axis dialog box for three-dimensional graphs.

The following dialog box enables you to customize the Values axis:




*Note* Only the Labels and Scale areas are available in the Axis dialog box for three-dimensional graphs. The Date Increment drop-down lists are available only when dates are being graphed on the Values axis.

## Customizing the Axis Labels

4D Chart automatically labels the axes when it generates a graph. You can change the position, orientation, and format of the labels, or you can decide not to display them with your graph.

- **Label Positions**
  You can choose one of the following label positions from the **Position** drop-down list:
  - None
  - Top
  - Bottom
  - Left
  - Right.

  Depending on the orientation of the axis, either Top and Bottom or Left and Right will be unavailable.

  When the position is None, the label does not appear on the graph.

- **Label Orientation**
  The following label orientations are available for each axis:

| | Orientation | | | | | |
|---|---|---|---|---|---|---|
| | **Normal** | **Vertical** | **Rotated Left** | **Rotated Right** | **Staggered** | **Wrap** |
| **Result** | Label | Label | Label | Label | Label1 Label3<br>Label2 | Lab<br>el |

- **Label Formats**
  You can change the way data in your labels is displayed by using display formats. For instance, you can use a display format to display dollar amounts using the dollar sign ($), commas, and decimals.

  The following table shows some examples of the effects of display formats:

| Data in Default Format | Display Format | Data in Display Format |
|---|---|---|
| 3400 | $###,###.00 | $3,400.00 |
| 3/4/99 | Month Date, Year | March 4, 1999 |

  When you select one of the formats from the Format drop-down list, it is entered into the Format text box, located to the right of the drop-down list. If you want to use a custom format, you can enter it in that area.

  You can use one of 4th Dimension's built-in formats, edit a format, or create one of your own. For more information, see the *4th Dimension Design Reference* manual.

- **Labeling Data from Boolean Fields**
  If you create graphs using Boolean fields from the database, the default axis labels are "0" and "1", corresponding to FALSE and TRUE. You can label your graph more informatively by changing the label format.

  To create more meaningful labels for Boolean fields, change the label format to the following:

  *TrueLabel;;FalseLabel*

  For example, you might change the format to "Female;;Male" or "Experimental;;Control".

### Reducing the Number of Labels

You can reduce the number of labels displayed on the X-axis or Y-axis of a graph. This feature is useful when you create graphs with a large number of categories (more than 100).

When this option is used, 4D Chart displays only one label per N labels on the selected axis. To use this option, enter a value between 2 and 255 in the "Show One Label out of" box. For example, if you enter 10, 4D Chart will display one label per 10 categories. The value 1 is the standard setting (all labels are displayed).

- **Auto**: If you check the **Auto** box, 4D Chart will calculate the appropriate number of labels to display, according to the amount of room.

### Customizing the Tick Marks

Tick marks show the increments of the axes. You can choose among different styles of tick marks, or you can decide not to show the tick marks. You can customize this option for each axis in a two-dimensional graph.

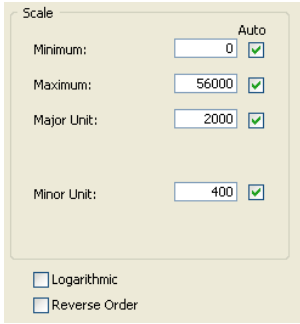
*Note* You cannot customize the tick marks for a three-dimensional graph.

The following tick mark styles are available:

- Cross ( ⊥ )
- Inside ( ⊥ )
- Outside ( ⊥ ).

### Changing the Values Axis Scale

You can change the minimum and maximum values. By default, 4D Chart uses the minimum and maximum value of the set of data being graphed. You can change these values, for example, to start the Z-axis at zero.



You can also modify the major and minor units for tick marks. By default, 4D Chart calculates these parameters based on the number of values to be shown and the size of the graph. If the values are dates, you can specify whether the major and minor units are measured in days, weeks, months or years.

For each scale display option, there is an **Auto** option which lets you enable the default operation of 4D Chart.
If you want to use custom values, remember to uncheck the **Auto** option, otherwise your parameters will not be taken into account.

*Note* The major and minor unit grid lines can be either hidden or displayed (see the "Showing and Hiding Grid Lines" paragraph on page 278).

- **Using a Logarithmic Scale**
  You can change the scale from normal to logarithmic by checking the **Logarithmic** check box, located in the Values axis dialog box.

## Reversing the Order of the Data

You can reverse the order of the data on an axis by checking the **Reverse Order** check box. This can only be done in a two-dimensional graph.

## Positioning the Origin

You can change the position of the origin — the place where one axis crosses another — for each axis in a two-dimensional graph.

- **Changing the Origin of the Values (Y) Axis**
  The origin of the Z-axis is the value at which the Category (X) axis crosses the Z-axis. Usually, the origin is the minimum value on the graph or zero. Sometimes you will want to change the position of the origin.

► To change the origin of the Values axis:

1. **Choose Category (X) from the Axis submenu of the Chart menu.**
   The Category (X) dialog box appears.
2. **Enter a value in the "Cross Axis At" area.**
   The value you enter is the numerical value of the desired origin position.
3. **Click OK to close the dialog box.**

- **Changing the Origin of the Category (X) Axis**
  The origin of the X-axis is the category at which the Values axis crosses the X-axis. Usually, the origin is placed to the left of the first category. Sometimes you will want to move the origin.

► To change the origin of the Category (X) axis:

1 **Choose Values (Z) from the Axis submenu of the Chart menu.**

The Values (Z) dialog box appears.

2 **Enter a number in the "Z Axis Crosses at Category" area.**

The number you enter is the number of the category at which the origin should cross. The categories are numbered from left to right, (or from bottom to top in a horizontal graph). The Z-axis crosses to the left of the specified category.

To move the origin to the right of the last category on the graph, specify the number of categories plus 1.

If the specified number is higher than the number of categories plus 1, the value is ignored and the origin is reset to the left of the first category.

3 **Click OK to close the dialog box.**

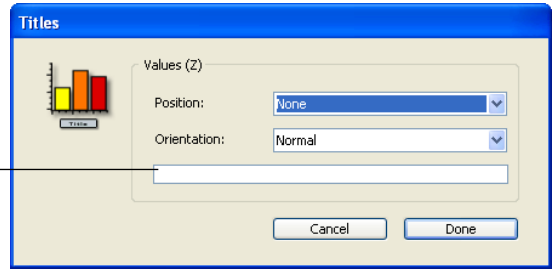
## Adding Axis Titles

You can add a title for each axis. Usually, the titles describe the data graphed on the axis.

► To add a title to any axis:

1 **Choose the appropriate axis from the Titles submenu of the Chart menu.**

The Titles dialog box appears.




Title text box

2 **Type the title into the "Title" text box.**

3 **Choose a position for the title from the "Position" drop-down list.**

This specifies the position of the title relative to the graph.

You can choose one of the following title positions:

- None
- Top
- Bottom
- Left
- Right.

The default position is None. When the position is None, the title does not appear on the graph.

Depending on the orientation of the axis, either Top and Bottom or Left and Right will be unavailable.

4 **Choose an orientation for the title from the "Orientation" drop-down list.**

The following orientations are available for each axis:

- Normal
- Vertical
- Rotated Left
- Rotated Right.

5 **Click OK.**

## Showing and Hiding Grid Lines

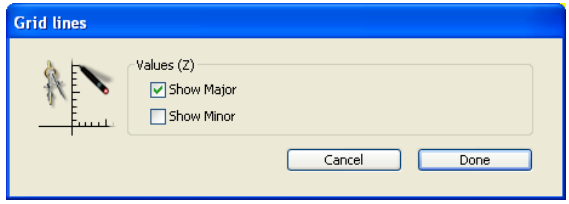
You can display grid lines for the major and minor increments of each axis. Grid lines can make a graph easier to read.

The major and minor increments are set in the Axis dialog box for the Values axis.

► To display the grid lines for any axis:

1 **Choose the appropriate axis from the Grid Lines submenu of the Chart menu**

The Grid Lines dialog box appears.



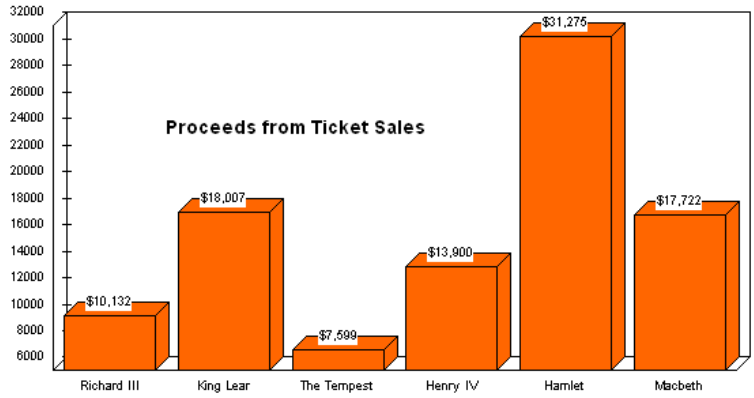

2 **Click the desired check boxes and click OK.**

## Displaying the Series Values

You can display information for each series directly in the graph. You can display the following information:

- **Values**: The actual number or date, in Arabic numerals. You can show the values on the graph instead of using labels on the Values axis, or use them to supplement the axis labels.
- **Percentages**: The value of the data point divided by the sum of all the values in the category, as a percentage.
- **Categories**: The name of the category, identical to the axis label for the category.

The following graph shows the values at the tops of the columns:



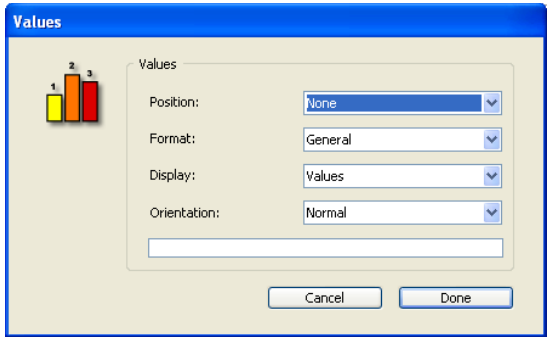

You can select the location at which the values, percentages, or category labels should appear, as well as their orientation and format.

This feature is not available for three-dimensional graphs.

► To display information about the data in a series:

1 **Choose Values from the Chart menu.**

The Values dialog box appears.



2 **Select the location at which the information should appear.**

You can select one of the following options from the **Position** drop-down list:

| Pie Charts | All Other Graph Types |
|---|---|
| None | None |
| Inside | Outside Top |
| Outside | Outside Bottom |
| | Inside Top |
| | Inside Centered |
| | Inside Bottom |
| | At Axis |

3 **Select the type of information you wish to display.**

You can select one of the following options from the Display drop-down list:

- Values
- Percentage
- Category
- Value & Percent
- Categories & Percent.

4 **If you wish, select a format from the "Format" drop-down list.**

You can change the way values are displayed by using display formats. For instance, you can use a display format to display dollar amounts using the dollar sign ($), commas, and decimals.

The following table shows some examples of the effects of display formats:

| Data in Default Format | Display Format | Data in Display Format |
|---|---|---|
| 3400 | $###,##.00 | $3,400.00 |
| 3/4/99 | Month Date, Year | March 4, 1999 |

When you select one of the formats from the Format drop-down list, it is entered into the Format text box, located below the drop-down list.

You can use one of 4th Dimension's built-in formats, edit a format, or create one of your own. For more information, see the *4th Dimension Design Reference* manual.

5 **Select an orientation from the "Orientation" drop-down list.**

You can select one of the following options:

- Normal
- Vertical
- Rotated Left
- Rotated Right.

6 **When you are finished making your selections, click OK.**

## Customizing the Legend

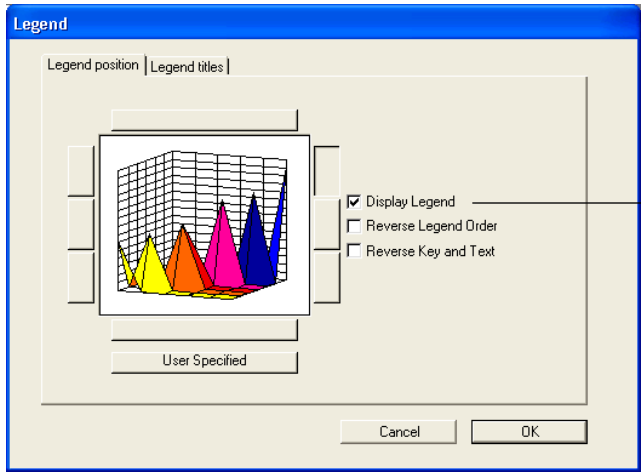
4D Chart automatically creates a legend for you when it generates the graph. By default, the legend is based on value labels. You can customize the legend's location, order, and text.

### Displaying and Hiding the Legend

To display or hide the legend for the selected graph:

1 **Choose Legend from the Chart menu.**

The Legend dialog box appears.




2 **Click the Display Legend check box.**

If this check box is checked, the legend is displayed as part of the graph object. If this check box is unchecked, the legend is hidden.

3 **Click OK to close the dialog box.**

The next section explains how to position the legend in the graph object.

## Positioning the Legend

The legend is part of the graph object. You can position the legend using the eight built-in legend locations, or you can move it using the mouse. You can move the legend anywhere in the document, including placing it inside the graph itself.

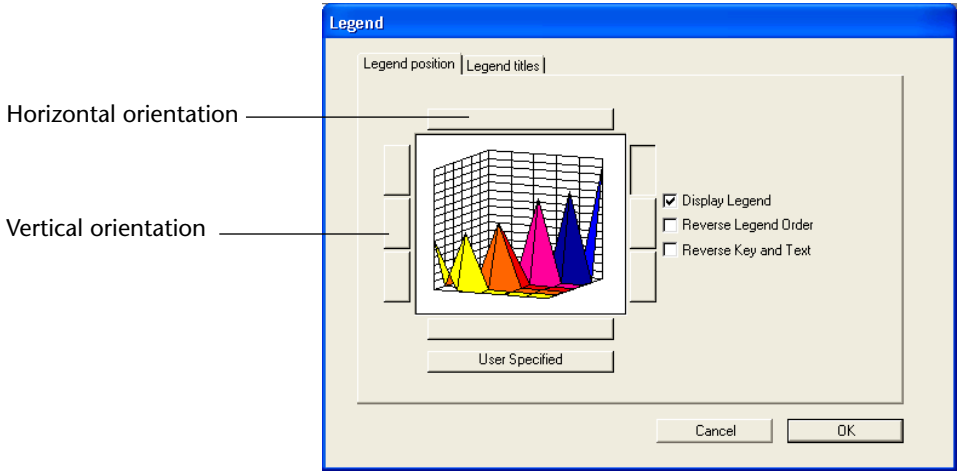
In addition, you can display the legend vertically or horizontally. In other words, the series in the legend can be placed left-to-right or top-to-bottom.

## Positioning the Legend Using the Built-in Locations

To use the built-in locations for the legend:

1 **Choose Legend from the Chart menu.**

The Legend dialog box appears.




2 **Select a legend position by clicking one of the model legends in the Location area.**

The location you choose will determines whether the orientation is horizontal or vertical.

3 **Click OK to close the dialog box.**

## Positioning the Legend with the Mouse

You can position the legend anywhere in the 4D Chart document by moving it with the mouse.

► To position the legend with the mouse:

1 **Hold down the Ctrl key (Command key on Macintosh) and click the legend to select it.**

2 **While continuing to hold down the Ctrl or Command key, click and drag the legend to the desired location.**

3 **Release the mouse button and the Ctrl or Command key.**

**Maintaining the Legend Location**

When you use the Legend dialog box, click the **User Specified** button to maintain the legend location. If you select one of the built-in locations, the **User Specified** option is automatically deselected.

**Setting the Legend Order**

You can reverse the order of the series in the legend. In addition, you can reverse the order of the legend key and legend text.

► To change these options:

1 **Choose Legend from the Chart menu.**

The Legend dialog box appears. The following options are available:

- **Reverse Legend Order**: Reverses the order of the series in the legend.
- **Reverse Key and Text**: If this check box is checked, the square containing the color or pattern code for each series is displayed after the series name.

2 **Check or uncheck the check boxes as desired.**

3 **Click OK to close the dialog box.**

**Customizing the Legend Text**

You can customize the text of any or all of the series in a legend.

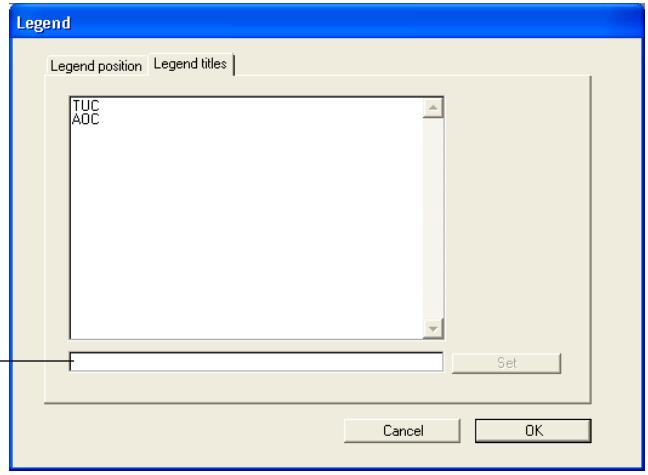
► To customize legend text:

1 **Choose Legend from the Chart menu.**

The Legend dialog box appears.

2 **Click the Legend Titles tab.**

The Legend Titles page appears.




The series labels for the legend are displayed in a list.

3 **Choose the series label to edit by clicking its name in the list.**

The series label is highlighted in the list and the text of the label appears in the Text Editing box.

4 **Edit the text in the Text Editing box.**

5 **Click the Set button.**

You must click **Set** in order for the changes to take effect.

6 **Repeat the previous steps until you have made all the changes you want.**

7 **Click OK.**

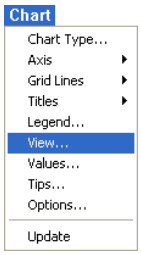
The Edit Legend dialog box closes. If you are displaying the legend, you will see your changes in the legend text.

## Modifying Depth in a Two-dimensional Graph

A three-dimensional graph plots three fields or variables in three dimensions. However, you can add the appearance of a third dimension to a two-dimensional graph by adding "depth." The third dimension does not represent the values of any of the fields or formulas plotted in the graph.

By default, 4D Chart adds the illusion of depth to two-dimensional graphs. You can remove it to make the values in the graph easier to read, or modify the three-dimensional illusion.

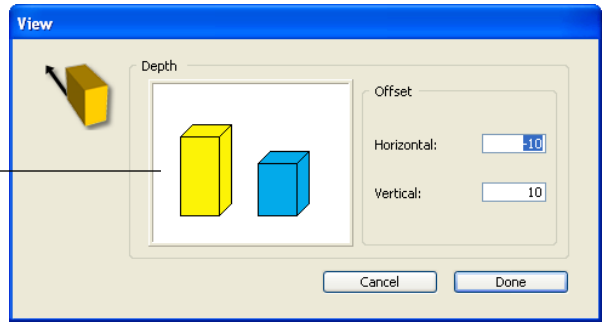
► To modify or remove the depth illusion in a two-dimensional graph:




1 **Choose View from the Chart menu.**

This menu item is enabled only when the currently selected object is a graph.

The Depth dialog box appears.




Depth preview area

2 **Modify the horizontal and vertical depth, measured in points, by typing values in the appropriate text boxes.**

To remove the depth illusion, enter zeros in both entry areas. You can also enter negative values to invert the axis of the three-dimensional illusion.

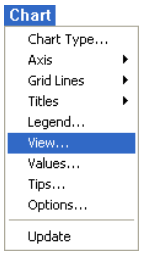
When you press **Tab** or click outside a text box, the value you have entered is reflected in the Depth preview area.

3 **Click OK.**

Your Depth specifications are applied to the graph.

## Changing the Perspective of a Three-dimensional Graph

You can change the perspective from which a three-dimensional graph is viewed. You can change both the rotation and the elevation of a graph.

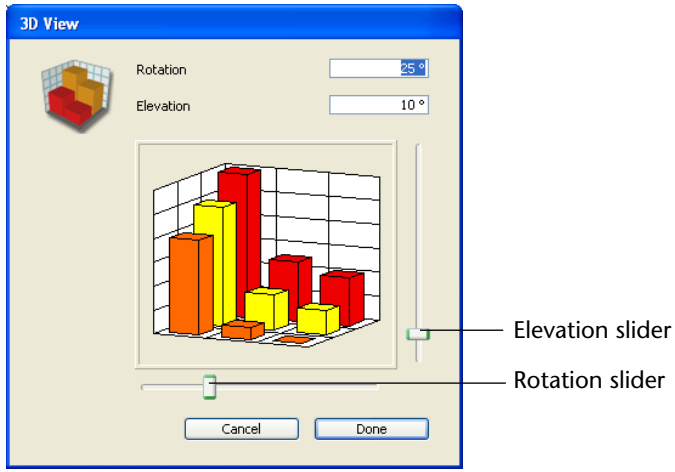



► To change the perspective from which a three-dimensional graph is viewed:

1 **Choose View from the Chart menu.**

The View menu item is enabled only when the currently selected object is a graph.

The 3D View dialog box appears.




2 **If you wish, you can change the rotation by entering a new value (from 0 to 90) in the Rotation text box or by moving the Rotation slider to the left or right.**

*Rotation* is the rotation of the graph around the Values axis.

The model graph reflects the changes you have made.

3 **If you wish, you can change the elevation by entering a new value (from 0 to 90) in the Elevation text box or by moving the Elevation slider up or down.**

*Elevation* is the rotation of the graph around a horizontal line perpendicular to the Values axis.

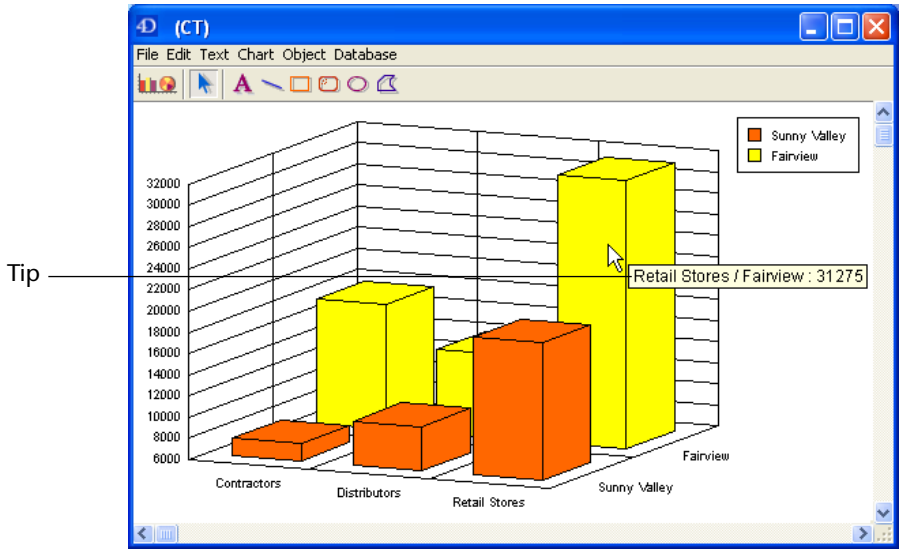
The model graph reflects the change you have made.

4 **Click OK.**

Your graph is redrawn from the new perspective.

## Customize Tips in Graphs

Tips — information about a graph and its data — are available for both XY and non-XY graphs. The user can display tips from any position of the pointer in the graph.




Tips display the following types of information:

- Value (on which the pointer is located).
- Ratio between a value (on which the pointer is located) and the total of values in that category. This ratio is expressed as a percentage.
- Category.

The following table lists the graph types and the information that can be displayed in the associated tips:

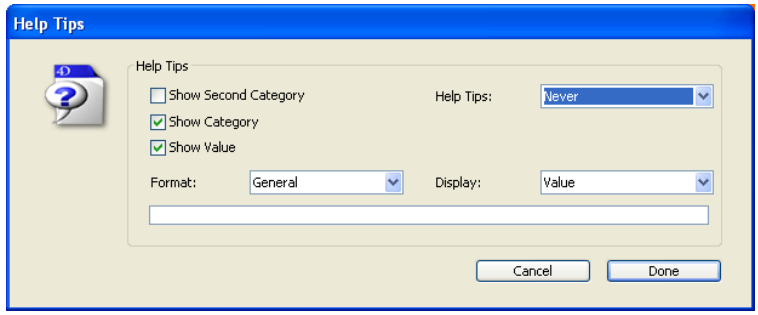
| Type of Graph | Tips |
|---|---|
| 2D Column | Values and percentages |
| 2D Line | None |
| 2D Pie | Values and percentages |
| 2D Area | None |
| 2D XY | Values only |
| 2D Picture | Values and percentages |
| 2D Polar | Values only |
| 3D Column | Values only |
| 3D Line | None |
| 3D Area | None |

| Type of Graph | Tips |
|---|---|
| 2D Column | Values and percentages |
| 3D Surface | None |
| 3D Triangle | Values only |
| 3D Spike | Values only |

The values in the tips are based on the data as displayed in the graph and thus may be approximations based on the screen resolution.

Tip attributes are accessed manually in the Tips dialog box (from the **Tips** item in the **Chart** menu) or programmatically using the CT GET TIPS ATTRIBUTES and CT SET TIPS ATTRIBUTES commands.

The Tips dialog box appears as follows:




*Note* In the case of XY type graphs, the dialog box contains a second **Format** drop-down list and an additional entry area for the Y-axis.

In the Tips dialog box, you can change the properties of the tips displayed for any graph.

The Tips list box enables you to select when to display tips. The choices are **Never**, **Always,** and **On Request**.

- If you select **Always**, tips appear when the user places the mouse cursor over part of the graph.
- If you select **Never**, tips are disabled.
- If you select **On Request**, tips will appear when the user places the mouse cursor over part of the graph while holding down the **Ctrl** (Windows) or **Command** (Mac OS) key.

By default, the **Never** option is selected.

Selecting the **Show Second Category** displays the value of the second Category axis in the tips. The default is to not show the second category. In the case of a 2D graph, selecting this option displays the field name of the Category axis value.

Selecting the **Show Category** option displays the value of the Category axis in the tips. The default is to display the Category axis value.

Selecting the **Show Value** option displays the value of the Values axis in the tips. The default is to display the Values axis value.

The **Format** list box enables you to select the display format for values displayed. The default is General. If the Format selected is General, the text box below the Format list box allows you to enter text for the Values axis. In the case of XY graphs, there are two Format list boxes and text boxes, to accommodate the X- and Y-Values axes.

The **Display** list box enables you to choose to display the category value, percentage (the ratio between the value on which the pointer is located and the total of values in that category), or both.

## Changing the Attributes of Graph Objects

This section describes how to select individual graph objects (axis lines, grid lines, series elements, etc.) and change their graphic attributes, such as color, pattern, and line width. You can also change the font attributes of graph text objects (such as axis labels and titles).

► To select an individual graph object:

- **Hold down the Ctrl key (Windows) or Command key (Macintosh) and click the object.**

  The following graph objects can be selected:

  - Each series in a two-dimensional graph
  - Each of the three visible sides of a series in a 3D graph

*Note* To select all sides of a series in a three-dimensional graph at once, hold down the **Shift** and **Ctrl** keys (Windows) or **Command** key (Macintosh) and click an object in the series.

  - Each axis (includes the tick marks)
  - Axis labels for each axis
  - Major grid lines for each axis
  - Minor grid lines for each axis

- Titles for each axis
- The legend
- Values displayed for the series.

## Changing Object Attributes

After you have selected an object, you can modify its graphic attributes using items in the **Object** menu.

Each of the following object attributes can be changed in the **Object** menu.

- **Fill Pattern:** The pattern displayed inside the border of an object. All objects except lines have fill patterns.
- **Fill Color**: The color displayed inside the border of an object.
- **Line Pattern**: The pattern of a line or border. The default line pattern is solid.
- **Line Color**: The color of a line or border. The default line color is black. The color palette used for Fill Color is also used for Line Color.
- **Line Width**: The width of a line or border measured in points. The default line width is 0.25 points (also called a hairline).

## Changing Text Attributes

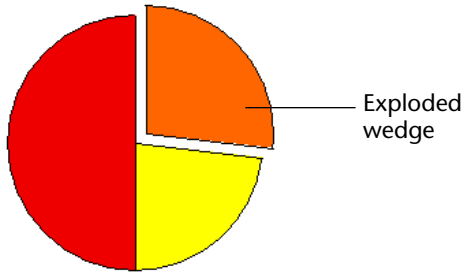
Text attributes apply only to axis labels, axis titles, legend text, and series values. Each of the following text attributes can be changed in the **Text** menu:

- **Font**: The typeface of the text.
- **Size**: Font size is measured in points.
- **Style**: Styles include plain, bold, and italic. The default style is plain.
- **Color**: The default color is black.

You cannot change the justification of graph text. You can only change the justification of text added with the Text tool. For more information about adding text with the Text tool, see the "Adding Text" section on page 297.

## Exploding Wedges from a Pie Chart

You can "explode" a pie chart by pulling one or more wedges away from the center of the pie.




► To explode a wedge from a pie chart:

1. **Hold down the Ctrl key (Windows) or Command key (Macintosh) and click a wedge of the pie chart to select it.**

   Selection handles appear around the wedge.

2. **While holding down the Ctrl key (Command key on Macintosh), click and drag the wedge away from the center of the pie.**

3. **When the wedge is where you want it, release the mouse button and the Ctrl key (Command key on Macintosh).**

## Adding Pictures to a Picture Chart

When you create a picture chart, the columns are filled with a default picture. You can add your own picture for each series by pasting it from the Clipboard.

► To paste a picture into the columns for a series:

1. **Make sure that the picture you want to paste into the column is on the Clipboard.**

2. **Hold down the Ctrl key (Windows) or Command key (Macintosh) and click a column of the desired series.**

   All the columns are then selected. By default, the picture for each series shows a building.

3. **Choose Paste from the 4th Dimension or 4D Chart Edit menu.**
   **OR**
   **Press Ctrl+V under Windows or Command+V under Mac OS.**

   The picture is pasted into each column for the series.

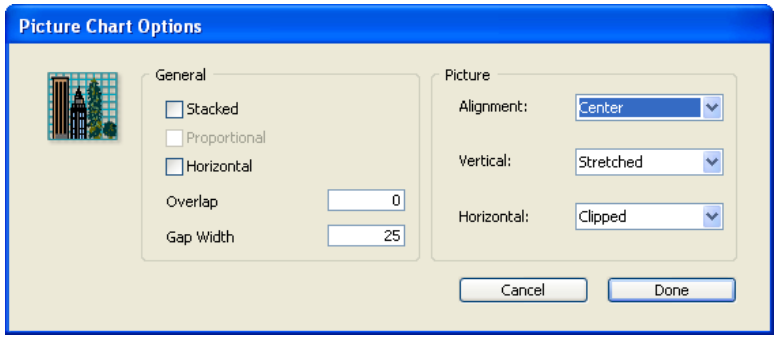
   You can repeat this process for each series.

*Note* To recover the standard picture, apply a different chart type then re-apply the 2D Picture type.

## Adjusting the Pictures within the Columns of Picture Charts

To customize the proportions of the pictures within the series columns:

1 **Double-click the graph to display the Options dialog box for picture graphs.**
**OR**
**Select the graph and choose Options from the Chart menu.**
The Picture Chart Options dialog box appears.




In addition to the chart options, which are discussed in the "Choosing a Graph Type" section on page 241, you will find the following options for aligning and adjusting the pictures:

- **Alignment**: This option specifies the horizontal alignment of the picture: center, left, or right.
- **Vertical**: This option specifies how the picture uses the vertical space of the column. The options are: clipped, stretched, and stacked. For more information about these options, see the table at the end of this section.
- **Horizontal**: This option specifies how the picture uses the horizontal space of the column. The options are: clipped, stretched, and stacked. For more information about these options, see the table at the end of this section.

The following table explains the Vertical and Horizontal options.

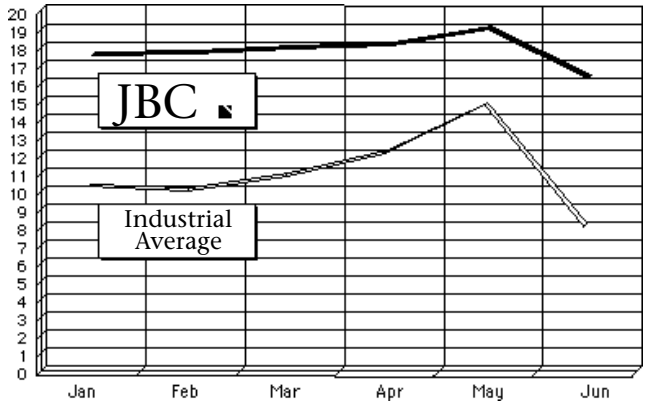
| Option | Description |
|---|---|
| Clipped | If the picture is too tall or too wide to be displayed in its entirety, it is truncated at the edges of the column. The proportions of the picture remain unchanged. |
| Stretched | The picture is stretched or shrunk so that its dimensions match those of the column. |
| Stacked | If the picture is either too short or too narrow to fill the column, the picture is repeated until the column's height or width is reached. When the edge of the column is reached, the picture is truncated. |

2 **Choose the desired options from the drop-down lists and click OK.**

# Adding Objects and Text

With 4D Chart you can add a variety of objects to your documents, including lines, rectangles, ovals, polygons, and text. You can also add dynamic references to fields or to 4th Dimension expressions by inserting expressions in text objects.

The following graph uses objects and text to identify the series.




Topics covered in this section include:

- Drawing objects
- Modifying object attributes
- Adding text

- Modifying text attributes
- Adding a dynamic reference to a 4th Dimension field or expression
- Resizing objects
- Arranging objects in a document.

## Drawing Graphic Objects

You can draw the following objects:

- Lines
- Rectangles
- Rounded rectangles
- Ovals
- Polygons .

### Selecting a Drawing Tool

To draw an object, you must first select a tool from the Object Tool palette. You make a tool active for drawing when you select it.

The mouse pointer changes depending upon its use. If the Arrow tool is selected, then the pointer is an arrow . You use the Arrow tool to select menu items and objects.

When you select any of the graphic object tools, the pointer changes to a crosshair +. You use the crosshair to draw graphic objects.

### Locking a Drawing Tool

When you select a tool, it is in effect only while you draw one object, after which the Arrow tool is selected. However, you can *lock* a tool so that you can continue to use it as long as you need it, by double-clicking it. When you lock a tool, it remains in use until you select another tool.

### Drawing an Object

► To draw all objects except polygons:

1 **Select a tool in the 4D Chart toolbar.**

1 **Hold down the mouse button in the document area and drag the mouse to draw the object.**

2 **Release the mouse button to finish drawing the object.**

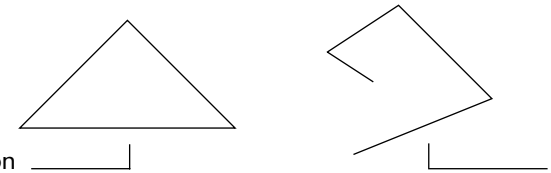
► To draw a polygon:

1 **Click to anchor the first vertex.**

2 **Drag the mouse to draw a side and then click to anchor the next vertex.**

3 **Continue anchoring vertices and drawing sides as necessary.**

4 **Close the polygon by clicking the first vertex to close the polygon, or by pressing Alt+Ctrl+Enter (Windows) or Option+Command+Enter (Mac OS).**
**OR**
**Leave an open side to the polygon by double-clicking the mouse button to anchor the last vertex or by pressing Enter.**



Closed polygon Open polygon

## Constraining Graphic Objects As You Draw

By constraining graphic objects as you draw, you can control the drawing process — in particular, the height and width of objects. For example, a square is really just a constrained rectangle.

The following table lists the effects of constraining each object:

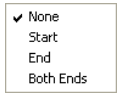
| Object | Key | Constraint |
|---|---|---|
| Lines | Shift | Constrain line to 45° angles |
| Rectangles | Shift | Draw a square |
| | V (for *vertical*) | Constrain height |
| | H (for *horizontal*) | Constrain width |
| Rounded Rectangles | Shift | Draw a rounded square |
| | V | Constrain height |
| | H | Constrain width |

| Object | Key | Constraint |
|---|---|---|
| Ovals | Shift | Draw a circle |
| | V | Constrain height |
| | H | Constrain width |
| Polygons | Shift | Constrain sides to 45° angles |

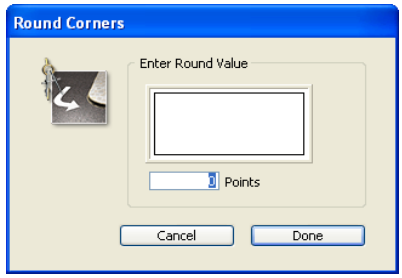
## Changing Object Attributes

Each of the following object attributes can be changed using commands in the **Object** menu:

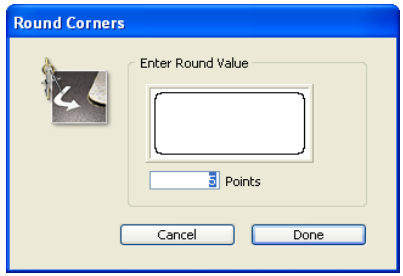
- **Fill Pattern**: The pattern displayed inside the border of an object. All objects except lines have fill patterns. The default fill pattern is solid white.
- **Fill Color**: The color displayed inside the border of an object. All objects except lines have fill color. The default fill color is black.
- **Line Pattern**: The pattern of a line or border. The default line pattern is solid.
- **Line Color**: The color of a line or border. The default line color is black.
- **Line Width**: The width of a line or border measured in points. The default line width is 0.25 points (also called a hairline).
- **Arrowhead**: The arrows that appear on one or both ends of a line; only lines have arrowheads. The default is to have no arrowheads. If the selected object is a line, the **Arrowhead** menu item is enabled. The Arrowhead submenu has the following items.




- **Round Corners**: The amount of rounding of the corner of a rounded rectangle. The default rounding is 1/4 inch. If the selected object is a rectangle that you created with a rectangle tool, the **Round Corners** menu item is enabled. When you choose **Round Corners**, the following dialog box appears:



When you enter a value in the entry area, the preview area shows the effect of the value:




## Adding Text

Most of the text that you want to add to a graph — such as axis labels, titles, legends — can be added using menu items in the **Chart** menu.

To add extra text to a graph, you must first create a text object and then enter the text. A text object is a container for text.

► To create a text object:

1 **Select the Text tool A.**

The pointer changes to an I-beam I.

2 **Hold down the mouse button and drag the mouse to create a rectangular text area.**

3 **Release the mouse button.**

You can also simply click in the window after you have selected the Text tool to create a text object of default size (three inches in width). The default height is determined by the font and font size you have selected.

4 **If you have not already done so, click inside the text object to insert the pointer.**

When you place the pointer in the text object, it becomes an insertion point | .

5 **Type your text.**

6 **When you have finished typing the text, select any other tool.**

Unlike other objects, text objects are not selected after you create them.

Once you have created a text object and added text, you can change the text by editing it — for example, copying, cutting, or pasting it. You can also change its attributes, such as its font, size, style, and justification. For more information about changing text attributes, refer to the next section, "Changing Text Attributes".

### Changing Text Attributes

Text attributes are applied only to text inside a text object. Each of the following text attributes can be changed in the **Text** menu:

- **Font**: The typeface of the text.
- **Size**: Font size is measured in points. The default size is 12 point.
- **Style**: Styles include plain, bold, and italic. The default style is plain.
- **Color**: The default color is black.
- **Alignment**: Text can be left, right, or center aligned. The default alignment left.

## Adding Dynamic References

Using field references and 4th Dimension expressions, you can create 4D Chart documents that incorporate information from your database. For example, you can use field information from the records to make graph titles. You can use 4th Dimension expressions to perform tasks such as computing numeric values or concatenating text information.

In this section, you will find information about the following topics:

- Inserting field values into a 4D Chart document,
- Inserting a 4th Dimension expression into a 4D Chart document,
- Displaying field and expression values,
- Formatting field and expression values,
- Changing a dynamic reference to static text.

### Understanding Values and References

You can display the information from 4th Dimension as either *values* or *references*. A value is the actual information stored in a field or calculated from an expression. A reference is the name of the field or the text of the expression.

When expressions and fields are displayed as references, they are surrounded by the following symbols: « and ».

For example, a reference to the First Name field in the [Stationery Order] table would appear as:

«[Stationery Order]First Name»

4D Chart inserts these symbols when a field is inserted into a text object. When you insert any other type of reference, such as a 4th Dimension function or variable, you must indicate that it is a reference. 4D Chart will then add the « and » symbols to differentiate the reference from normal text. For more information on referencing expressions, see the "Inserting 4th Dimension Expressions" section on page 302.

When references are displayed as values, the « and » symbols do not appear; for example, a field value for First Name might be:

James

The field value appears as standard text.

Field references and 4th Dimension expressions always refer to the current record and are updated whenever the current record changes. If there is no current record, no value is displayed.

## Inserting Field References

By inserting a field reference in a 4D Chart document, you add dynamic information to the document. As the field is updated, so is the value in 4D Chart. You can use fields from any table in the database, except subtables.

The field reference or value appears in a text object, except for references to picture fields. The text object containing a reference acts as any other text object; you can change its attributes, move it, and so on.

- **Using Field References in a Plug-in Window**
  When you insert a field reference in a 4D Chart plug-in window, the value that is displayed when you choose **Show Values** from the **Database** menu is the field's value for the current record. If no record is currently loaded there will be no value displayed in the 4D Chart plug-in window.

In order to show the value stored in a field for a particular record, make sure that the record is loaded — by displaying the record in an input form, for instance. If the current record changes, the value displayed in the field changes.

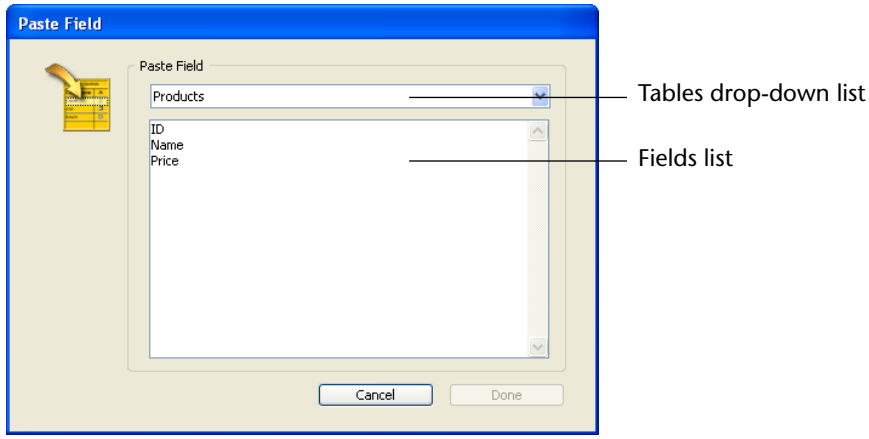
- **Using Field References in a 4D Chart Area on a Form**
  When you insert a field reference in a 4D Chart area on an input form, the value that is displayed when you choose **Show Values** from the **Database** menu is the field's value for the current record.

You can use the Paste Field dialog box to paste a field reference into a document.

► To paste a field reference into a 4D Chart document using the Paste Field dialog box:

1 **Click the mouse button where you want to insert the reference.**
If you click inside a text object, you cannot insert a Picture field.

2 **Choose Paste Field from the Database menu.**
The Paste Field dialog box appears. All tables in the database are listed in the Tables drop-down list. The fields for the selected table are displayed in the Fields list.




3 **Select the table from which you wish to paste a field reference from the Tables drop-down list.**
The fields in the selected table are displayed in the Fields list.

4 **Select the field you wish to paste from the Fields list and click OK.**
A reference to the field is pasted into the document in a text object.

You can select fields from a drop-down list containing all available tables and fields. You cannot paste references to Picture fields when you select a field from a drop-down list.

When you are working in a form, you can choose fields from a drop-down list that displays the fields in the current table, or from a drop-down list of fields for all tables in the database.

When you use 4D Chart in a plug-in window, the drop-down list always contains both tables and fields.

► To insert a field into a 4D Chart document using the Tables and Field pop-up menu:

1 **Create a text object where you want to paste the field.**

If you need information about creating text objects, see the "Adding Text" section on page 297.

2 **Position the I-beam pointer I over the text object.**

Make sure that the insertion point is in the text object.

3 **To choose a field from the same table as the form, hold down the Alt key (Windows) or Option key (Macintosh) as you press the mouse button.**

A pop-up menu of fields for the table in which you are working appears. If you are working in a plug-in window, the pop-up menu contains both tables and fields.

4 **To choose a field from another table, hold down the Shift and Alt (Windows) or Option (Macintosh) keys while you press the mouse button.**

If you are working in a plug-in window, you do not need to hold down the **Shift** key.

4D Chart displays a hierarchical pop-up menu of the tables in the database. Each table has a submenu containing its fields.

5 **Select a field.**

A reference to the selected field is pasted into a text object in the 4D Chart document at the insertion point location.

## Inserting 4th Dimension Expressions

You can insert any valid 4th Dimension expression into a document. The expression can be a 4th Dimension variable, a 4th Dimension function, a plug-in function, or a method that returns a value.

With expressions you can use the power of 4th Dimension's language within 4D Chart documents. You can perform calculations, concatenate information from several fields, and so on.

The following table contains some examples of expressions:

| Expression | Comment |
|---|---|
| vDate | A variable containing a date |
| **Current date** | A 4th Dimension function |
| **Current date**–vDate | A statement that performs a calculation |
| *DateCalc* | A method that returns a value |

An expression is evaluated only when you perform one of the following actions:

- Open the document
- Choose **Show Values** from the **Database** menu
- Print the document.

For more information about expressions, refer to the *4th Dimension Language Reference* manual.

► To insert a 4th Dimension expression into a 4D Chart document:

1 **Create a text object where you want to place the expression.**
Since the expression is created from text, you must first create the text object.

2 **Enter the expression text and then select it.**

3 **Choose Reference from the Database menu.**
The text is now enclosed in the « and » symbols, which indicate that it is an expression:

«Current date»

4 **When you have finished, select the Arrow tool.**
To display the value of the reference, choose **Show Values** from the **Database** menu.

## Displaying Values or References

When you display values, you show the actual values stored in referenced fields and the values calculated by referenced 4th Dimension expressions. For example, if the reference is «Current date», today's date is displayed.

► To display values:

■ **Choose Show Values from the Database menu.**

The value of each reference is displayed.

*Note* The values of all references are displayed, regardless of the selected reference.

► To display references:

■ **Choose Show References from the Database menu.**

The reference for each value is displayed.

## Changing the Value in a Reference to Text

You can change the value in a dynamic reference into static text that will not be updated when the value changes.

For instance, you can use the 4th Dimension expression «Current date» to display the date you created a graph, and then change that date to a static text object. No matter what the current date is, the text object will always display the creation date of the graph.

Changing a value to text is called *unreferencing* the value, because the value no longer has a dynamic reference to the database. Once you have unreferenced a value, you cannot change it back to a reference.

► To change a value in a field reference or expression to text:

1. **Choose Show Values from the Database menu to display all values.**
2. **Select the text block containing the value you want to unreference.**

   If the text block contains more than one field or expression, select only the value you want to change.
3. **Choose Unreference from the Database menu.**

   The value becomes text.

## Changing a Reference to Text

You can change a reference into text by unreferencing it. When you change a reference to text, you change the words of the reference, not the value to which the reference refers.

For instance, if you change the reference «Current date» to text, the text object displays the following:

Current date

When you choose **Show Values** from the **Database** menu, this text does not change, and the current date is not displayed, because the text no longer refers to a 4th Dimension expression.

You may want to edit a reference or permanently change it to standard text. If you want to edit a reference, you must unreference it, edit it, and then reference it again.

► To unreference a field reference or expression:

1 **Choose Show References from the Database menu to display all references.**

2 **Select the text block containing the reference you want to unreference.**

If the text block contains more than one field or expression, select only the reference you want to change.

3 **Choose Unreference from the Database menu.**

The « and » symbols are removed, and the reference becomes text.

## Formatting References

You can use a display format for the value of any numeric, date, or time field, or expression in 4D Chart. For instance, you can use a display format to display dollar amounts using the dollar sign ($), commas, and decimals.

The following table shows some examples of display formats:

| Data in Default Format | Display Format | Data in Display Format |
|---|---|---|
| 3400 | $###,##.00 | $3,400.00 |
| 3/4/03 | Month Date, Year | March 4, 2003 |

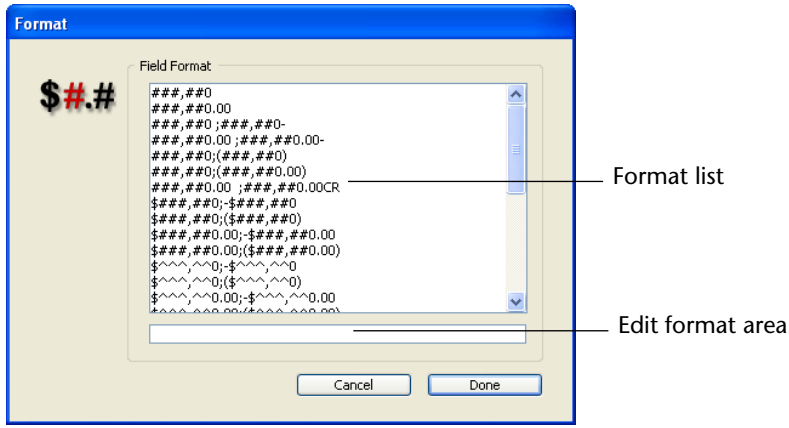
► To format a reference:

1 **Select the reference.**

Since the entire expression is a single value, you can select it by clicking it with the Text tool.

2 **Choose Format from the Database menu.**

The Field Format dialog box appears.




3 **Select an appropriate format from the list.**

The format appears in the text box below the list of formats.

If you want, you can edit a number format or enter a new number format in the Format text box. You cannot edit date or time formats.

For more information about display formats, refer to the *4th Dimension Design Reference* manual.

4 **Click OK.**

The format is listed after the reference. For instance:

«Current date; Abbr.: Month Day, Year»

When you choose **Show Values**, the value of the reference is displayed using the format.

## Resizing Objects

You can make an object larger or smaller by resizing it. You can select one or more objects to resize. If you select more than one object, all selected objects are resized by the same amount.

You can resize the height and width at the same time, maintaining the sizing proportion between the two.

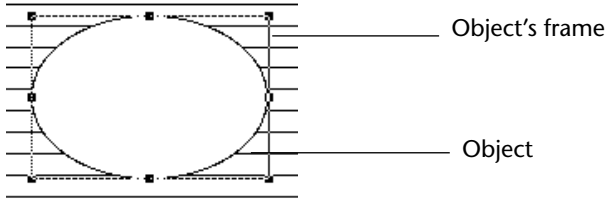
► To resize an object:

1 **Select the object.**

2 **Hold the mouse button down on a selection handle and drag it up, down, or diagonally to change the object's size.**

If you drag a corner, the height and width change. If you drag a side, either the height or the width changes.

To display the object's outline — rather than its rectangular frame — hold down the **Alt** key (**Option** key on Macintosh) while resizing.



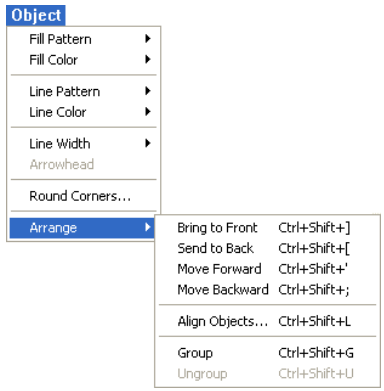

To resize the object so that the height and width retain the same proportion to each other, hold down the **Shift** key while you are resizing.

3 **Release the mouse button when you have finished.**

The object is resized.

## Arranging Objects

When you have two or more objects in a 4D Chart document, you can use the items in the **Arrange** submenu of the **Object** menu to arrange them. The **Arrange** submenu is shown below.




You can choose from the following actions in the **Arrange** submenu:

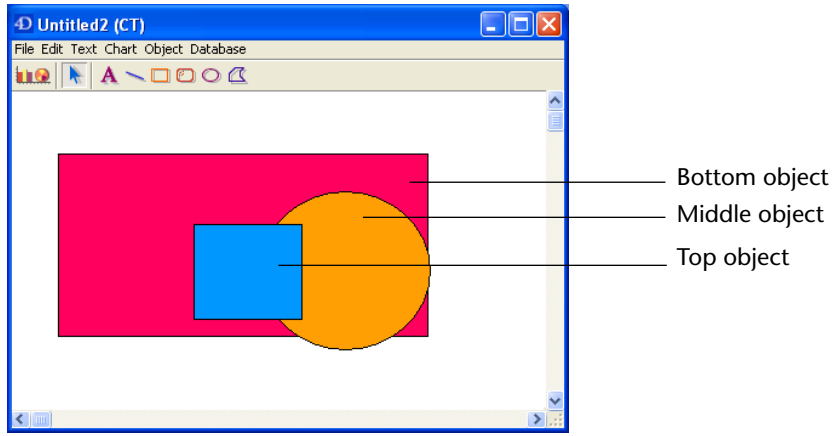
- Bringing an item to the front
- Sending an item to the back
- Moving an item forward one level
- Moving an item backward one level

- Aligning objects in relation to each other
- Grouping a set of objects
- Ungrouping a set of objects.

The following sections describe these actions in more detail.

## Changing the Stacking Order

When you draw objects, they can partially or entirely overlap one another. The order in which objects are placed when they overlap one another is called the *stacking order*. The example below displays several objects and their stacking order:




As you work with objects, you may want to change the stacking order of objects; to do so, you can move one or more objects in front of or behind other objects.

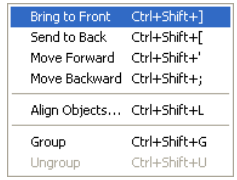
- **Moving an Object in Front of All Others**: By moving an object in front of all others, you move it to the top layer.
- **Moving an Object Behind All Others**: By moving an object behind all other objects, you move it to the bottom layer.
- **Moving One Object in Front of Another**: Moving an object in front of another object allows you to move the selected object one layer higher — that is, place it closer to the top layer.
- **Moving One Object Behind Another**: Moving an object behind another object allows you to move the selected object one layer lower — that is, place it closer to the bottom layer.

► To modify the stacking order:

1 **Use the arrow pointer to select an object.**

2 **Choose a command in the Arrange submenu of the Object menu.**

The **Arrange** submenu is shown below:

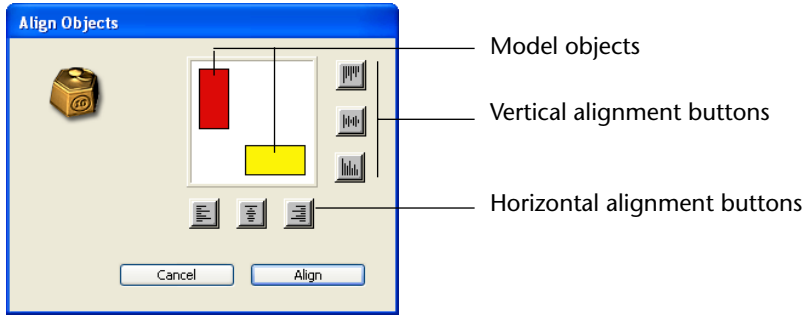



## Aligning Objects

When you align objects, you position them in relation to each other. Aligning objects ensures that they are placed precisely in relation to each other. You can align objects both horizontally and vertically.

The object that is farthest in the selected alignment direction is the reference for object alignment. For example, if you want to align the left sides of several selected objects, the selected object that is furthest to the left remains fixed, and the other objects are aligned with it.

When you select **Align Objects** from the **Arrange** submenu, the Align Objects dialog box appears:



Use the following icons to align the selected objects with each other:

| Icon | Meaning |
|---|---|
| | Align the left edges of selected objects. |
| | Align the centers of selected objects along a vertical axis. |
| | Align the right edges of selected objects. |
| | Align the top edges of selected objects. |
| | Align the centers of selected objects along a horizontal axis. |
| | Align the bottom edges of selected objects. |

Select a maximum of one vertical and one horizontal alignment. The model objects move to indicate the effects of the alignment.

*Note* To deselect an icon, click it again.

► To align objects:

1 **Select the objects to be aligned.**
Shift-click to select several objects.

2 **Choose Align Objects from the Arrange submenu of the Objects menu.**
The Align Objects dialog box appears.

3 **Click the desired alignment icons and click the Align button.**

## Grouping and Ungrouping Objects

By *grouping* objects, you can combine several objects into one. A grouped object acts like a single object when you manipulate or edit it. You can work with a grouped object as you would any other object; you can change its attributes, resize it, and so on.

When you group several objects, all attributes of the individual objects are retained. However, if you change any attribute of the group, that change affects all objects in the group. For example, if you select a new fill pattern for the group, it is applied to each object in the group.

*Ungrouping* an object breaks it into its component objects. When an object is ungrouped, each piece becomes a separate object again. Ungrouped objects retain any changes made to them while part of a group.

► To group objects:

1 **Select all objects to group.**

2 **Choose Group from the Arrange submenu of the Object menu.**
The objects become one object.

You can break a grouped object into its separate objects by ungrouping it.

► To ungroup objects:

1 **Select an object to ungroup.**

2 **Choose Ungroup from the Arrange submenu of the Object menu.**
The object is ungrouped and each object is selected.

# Printing 4D Chart Documents

You can print any 4D Chart document. This section discusses printing 4D Chart documents in the following ways:

- As a single 4D Chart document
- As part of a 4th Dimension form
- As a part of a print merge, in which you print a 4D Chart document for each record in a selection of records.

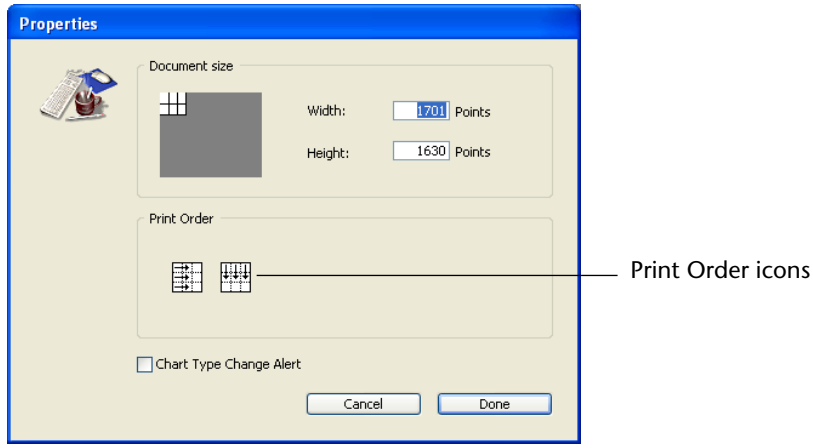
## Setting the Print Order

The order in which a multi-page document is printed (either horizontally or vertically) is determined by the print order selected in the Properties dialog box. You can select printing by row , or printing by column . The print order affects only the order in which the document prints; it does not affect the page orientation. The default is to print pages by row.

► To set the order in which a multi-page document is printed:

1 **Choose Properties from the 4D Chart Edit menu.**

The Properties dialog box appears:




2 **Click the desired Print Order icon.**

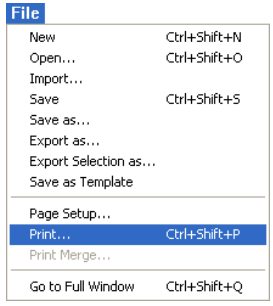
3 **Click OK.**

## Printing the Document

You can print 4D Chart documents from a plug-in window or from a 4D Chart area in a form. If the document is more than one page in length, you can select the pages you want to print.

► To print a document:

1 **Choose Print from the 4D Chart File menu.**




The Print dialog box appears.

2 **Select options as necessary.**

3 **Click the Print button to begin printing.**

## Printing a 4D Chart Area as Part of a Form

If a 4D Chart area is on a 4th Dimension form, you can print it with the record. In this case, you print from 4th Dimension, rather than from 4D Chart.

Before printing, be sure to select the records you want to print. For more information about selecting records in 4th Dimension, see Chapter 4, "Selecting Records," on page 81.

► To print a 4D Chart document as part of a record:

1. **Choose Print from the 4th Dimension File menu.**
   A dialog box appears so that you can choose the print form.
2. **Choose the print form.**
3. **Click OK.**
   The Page Setup dialog box appears.
4. **Select options from the Page Setup dialog box as necessary.**
5. **Click OK.**
   The Print dialog box appears.
6. **Select options as necessary.**
7. **Click the Print button when you want to begin printing.**
   The selected records are printed, including the 4D Chart documents.

## Creating a Print Merge

You can perform a print merge of a 4D Chart document. Performing a print merge allows you to print a 4D Chart document for each record in a selection of records.

*Note* The values in any graphs in the document are not updated for each record.

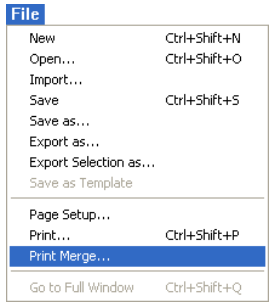
Print merges are most useful when performed from 4D Chart plug-in windows.

You can only perform print merges for documents that contain references to 4th Dimension fields. The value in a field reference is determined by the current record being printed. The advantage to performing a print merge is that you can print a document for an entire selection of records without having to load and print for each record separately.

*Note* For information on adding field references, see the "Inserting Field References" section on page 299.

► To perform a print merge:

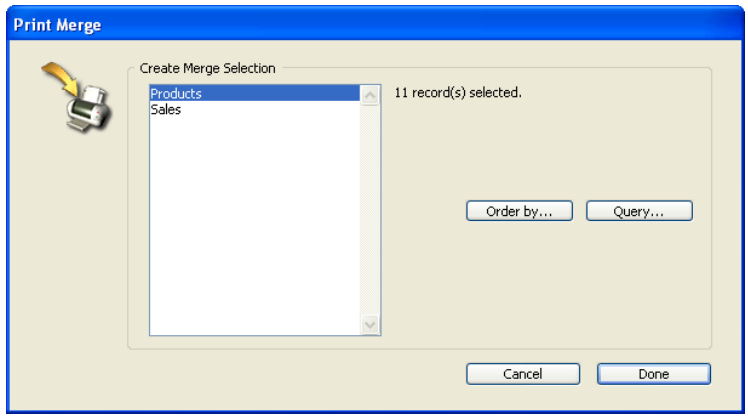
1 **Choose Print Merge from the 4D Chart File menu.**




The Create Merge Selection dialog box appears.

2 **Choose the table whose records should be included in the print merge.**

The dialog box displays the number of records currently selected for that table.




4D Chart will only print the document for the selected records.

3 **If you want to change the selection of records, click the Query button.**

The 4th Dimension Query editor appears. After you perform the query in the Query editor, you will return to the Create Merge Selection dialog box. For more information about the 4th Dimension Query editor, see the "Query Editor" section on page 90.

4 **If you want the selected records to be sorted, click the Order by button.**

The 4th Dimension Order By editor appears. After you sort the records, you will return to the Create Merge Selection dialog box. For more information about the Order By editor, see "The Order By Editor" section on page 125.

When you have selected the appropriate records, you can print them.

5 **Click OK in the Create Merge Selection dialog box.**

The Print dialog box appears.

6 **Select the appropriate options and click OK.**

4D Chart prints the document for each record in the selection.

# 12 Executing Methods

The **Method** command in the **Run** menu, as well as the corresponding button on the far right of the toolbar, are used to execute a method from the User environment. Once you have written project methods in the Design mode, you can execute them directly in User mode, for example to test them.

It is possible to execute methods directly in Trace mode, in order to debug them.

You can execute a method in a new process or, with 4D Server, indicate for it to execute this method on the server machine or on other clients' machines.

*Note* A project method can also be executed from the Custom Menus environment by assigning it to a menu command on the custom menu bar. When you choose a menu command on a menu bar, the associated method is automatically executed. For more information about form menu bars, see the *4th Dimension Design Reference* manual.

## Executing Methods

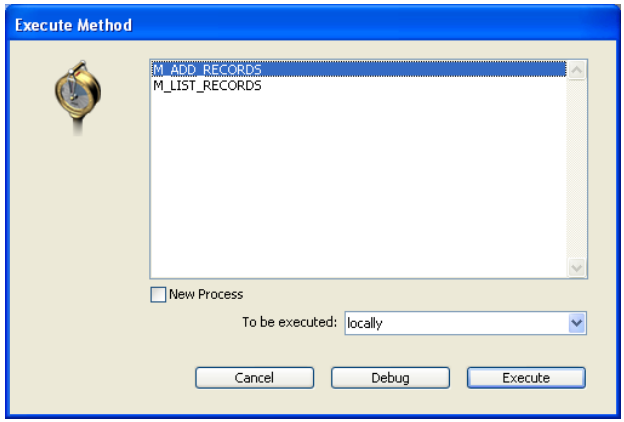
Use the **Method** command in the **Run** menu to select and execute a method created with the 4th Dimension language.

For more information about writing methods, see the *4th Dimension Design Reference* and the *4th Dimension Language Reference* manuals.

► To execute a method:

1 **Choose Method from the Run menu.**
**OR**
**Click the "Execute" button in the toolbar of the User mode.**

4th Dimension displays the Execute Method dialog box, as shown below:




2 **Select the name of a method in the list.**

3 **If you want to start a new process for the method, check the "New Process" check box.**

If you check the **New Process** check box, the method you selected executes in another process. If the method is performing a time-consuming task such as printing a large set of records, you can continue to work with your database, adding records to a table, creating a graph to display data, and so on.

For a definition of processes, see the "Multi-tasking in 4th Dimension" section on page 24. For a detailed description of processes, including how to create, use, and manage processes, refer to the *4th Dimension Design Reference* manual.

*4D Server*

• If you are using the database on 4D Client, you can choose to run the method on the server machine. To do so, select the **On 4D Server** option in the To be executed menu. Most methods can be executed on the server machine, unless the method must create or modify interface elements on a client workstation.

• You can also choose to run the method on another client workstation. Other client workstations will not appear in the menu, unless they have been previously "registered" (for more information, please refer to the description of the REGISTER CLIENT routine in the *4th Dimension Language Reference* manual, as well as the "Registering 4D Client" paragraph in the *4D Server Reference* manual.

By default, the **locally** option is selected. With 4D single-user version, this is the only option available.

**4 Click the Execute button (or double-click the method name).**
**OR**
**If you want to trace the method, click the Debug button.**

*4D Server* The **Debug** option is not available if you execute the method on the server.

4th Dimension executes the method. What happens next depends on what the method does. A method can perform calculations, change the current selection, print reports, and even exit the application and return to the Program Manager or Finder.

If you click **Debug**, the debug window appears in the foreground and you can execute the method step by step. For more information on the 4th Dimension debugger, refer to 4th Dimension *Language Reference* manual.

# 13 Backup and Restoring of the Database

## Introduction

4th Dimension includes a full database backup and restore module.

This module works with 4th Dimension single-user and 4D Server. It allows backing up a database currently in use without having to exit it. Each backup can include the structure file, the data file (as well as any segments) and any additional files or folders. These parameters are first set in the application Preferences.

Backups can be started manually or automatically at regular intervals without any user intervention. Specific language commands, as well as specific database methods, allow integrating backup functions into a customized interface.

Databases can be restored automatically when a damaged database is opened.

Also, the integrated backup module can take advantage of the log file. This file keeps a record of all operations performed on the data and also ensures total security between two backups. In case of problems with a database in use, any operations missing in the data file are automatically reintegrated the next time the database is opened. A specific window allows you to view the log file contents at any time.

The integrated backup module allows you to:

- Start a complete backup of database files at any time (structure file, data file, log file, attached files, etc.),

- Set up automatic backups at regular intervals — on a hourly, daily, weekly or monthly basis,
- Set advanced parameters for backups (number of sets, file compression, options for startup after a restore, etc.),
- Automatically restore a database and its attached files in case of incident,
- Automatically integrate missing operations stored in the log file into a restored database,
- Roll back operations performed on database data.

# Managing Backups

Backing up the database consists of generating a copy of the database and all its necessary files at a given moment. This copy is placed in one or more backup file(s).

Any backup file can later be opened using 4th Dimension in case of any incidents that damage the current database; the database will then be restored to its previous state (at the time it was copied).

## Performing a Backup

Each backup is performed while taking into account the parameters set in the application Preferences.

The Preferences can be used to define every aspect of the backup:

- Files to include in the backup (data / log, structure, user structure and attached files),
- Location of backup files (main backup file and log backup file).
- Management of log file,
- Backup scheduling,
- Backup options: number and rotation of backup sets; handling of active transactions or index operations; handling of failures; segmentation, compression and integrity of backup files,
- Setting automatic restore options.

These parameters are set at default values corresponding to standard use; changing these values is optional. For more information on these parameters, please refer to the "Configuration of Backup Files" paragraph on page 325 and the "Backup Settings" paragraph on page 330.

## Starting a Backup

In 4th Dimension, a backup can be started in three ways:

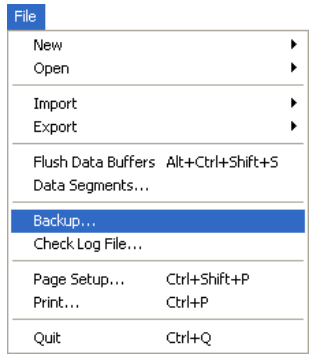
- Manually, using the **Backup...** command in the 4th Dimension (User environment) and 4D Server **File** menu.
- Automatically, using the scheduler that can be set in the application Preferences.
- Programmatically, using the BACKUP command.

The choice will depend on your use of the database and your backup strategy.

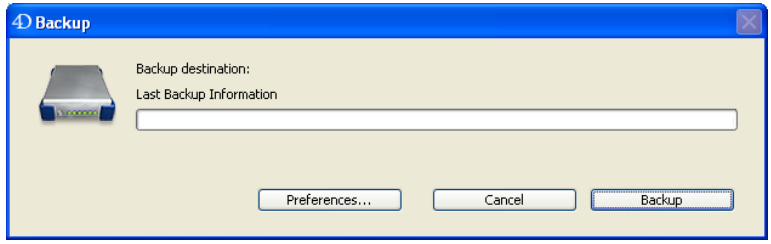
*4D Server* A backup can be started manually from 4D Client using a method that calls the BACKUP command. The command will be executed, in all cases, on the server.

► To perform a manual backup:

1 **Select the Backup... command in the 4th Dimension (User environment) or 4D Server File menu:**



The backup window appears:

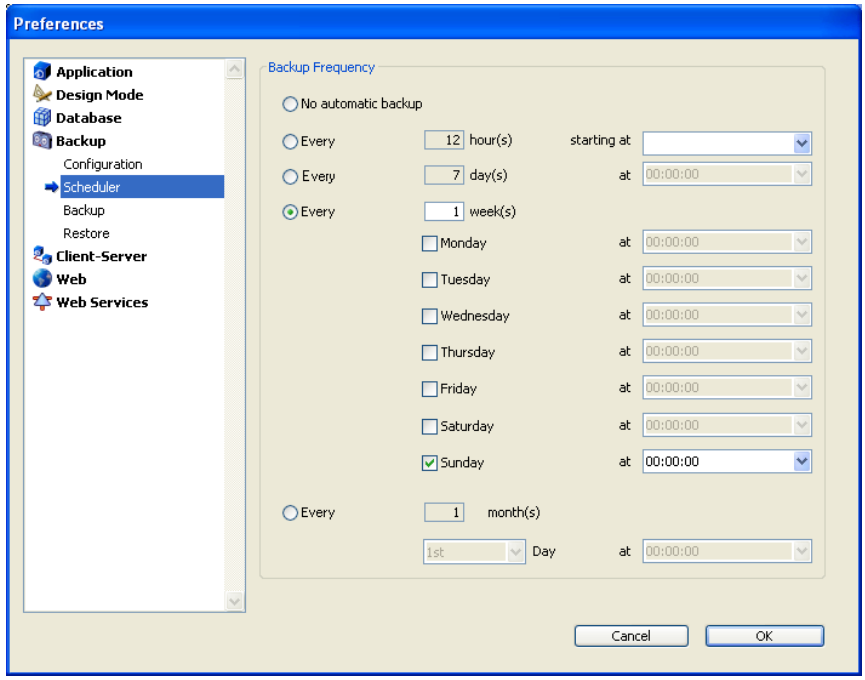



The **Preferences** button causes the general backup preferences to be displayed (see the "Configuration of Backup Files" paragraph on page 325). The **Cancel** button cancels the backup.

2 **Click Backup to start the backup using current parameters.**

► To perform a scheduled automatic backup:

1 **In the Scheduler page of the "Backup" Preferences, set the backup frequency:**




Backups are automatically performed at the times defined on this page without any type of user intervention.

*Note* For more information on using this dialog box, please refer to the "Scheduled Backup Settings" paragraph on page 336.

► To perform a scheduled backup using 4th Dimension language:

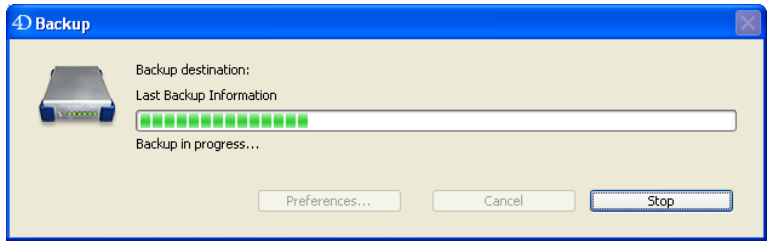
1 **Execute the BACKUP command in a method.**

The backup starts using the current parameters.

You can use the On Backup Startup and On Backup Shutdown database methods for handling the backup process.
For more information on this, please refer to the *4th Dimension Language Reference* manual.

## Executing a Backup

Once the backup is started, 4th Dimension displays a dialog box indicating the progress of the backup:




The **Stop** button lets the user interrupt the backup at any time (please refer to the "If Backup Fails" paragraph on page 334).

The result of the last backup (successful or failed) is stored in the "Last Backup Information" area of the **Backup/Configuration** page of the Preferences or in the main window of 4D Server (please refer to the "Last Backup Information" paragraph on page 329). It is also recorded in the database Backup journal (please refer to the "Backup Journal" paragraph on page 358).

## Accessing the Database During Backup

During a backup, access to the database is restricted by 4D according to the context.

4D locks any processes related to the types of files included in the backup: if only the structure file is being backed up, access to the structure is not possible but access to the data will be allowed.

Conversely, if only the data file is being backed up, access to the structure is still allowed. In this case, the database access possibilities are as follows:

- With the 4th Dimension single-user version, the database is locked for both read and write; all processes are frozen. No actions can be performed.

- With 4D Server, the database is only write locked; client machines can view data. If a client machine sends an add, remove or change request to the server, a window appears asking the user to wait until the end of the backup.
  Once the database is saved, the window disappears and the action is performed. To cancel the request in process and not wait for the end of the backup, simply click the **Cancel operation** button.

  However, if the action waiting to be executed comes from a method launched prior to the backup, you should not cancel it because only operations remaining to be performed are cancelled. Also, a partially executed method can cause logical inconsistencies in the database.

*Note* When the action waiting to be executed comes from a method and the user clicks the **Cancel operation** button, 4D Server returns error -9976 (This command cannot be executed because the database backup is in progress).

### Encountering Problems During a Backup

It may happen that a backup is not executed properly. There may be several causes of a failed backup: user interruption, attached file not found, destination disk problems, incomplete transaction, etc. 4th Dimension processes the incident according to the cause.

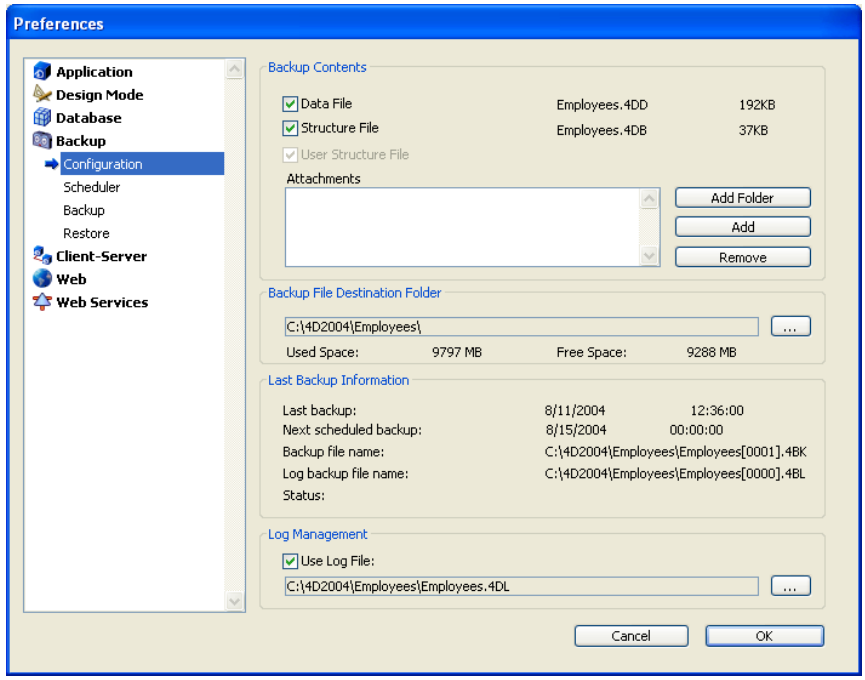
In all cases, the status of the last backup (successful or failed) is displayed on the **Configuration** page in the **Backup** preferences, in the 4D Server window and in the Backup journal (please refer to the "Last Backup Information" paragraph on page 329).

- **User interruption**: The **Stop** button in the progress dialog box allows users to interrupt the backup at any time. In this case, the copying of elements is stopped and an error is generated. You can intercept this error in the On Backup Shutdown database method.
- **Attached file not found**: When an attached file cannot be found, 4th Dimension performs a partial backup (backup of database files and accessible attached files) and returns an error.

- **Backup impossible** (disk is full or write-protected, missing disk, disk failure, incomplete transaction, database not launched at time of scheduled automatic backup, etc.):
  - If this is a first-time error, 4th Dimension will then make a second attempt to perform the backup. The wait between the two attempts is defined on the **Backup** page of the Preferences (please refer to the "If Backup Fails" paragraph on page 334).
  - If the second attempt fails, a system alert dialog box is displayed and an error is generated. You can intercept this error in the On Backup Shutdown database method.
  - Backups blocked due to an incomplete transaction or index operation are handled using a specific mechanism (please refer to the "If Active Transactions or Index Operations" paragraph on page 333).

## Configuration of Backup Files

The **Configuration** page of the application Preferences lets you set the backup files and their location, as well as that of the log file. It also provides information on the last backup:




*Note* You can display the application Preferences dialog box:
• by clicking on the **Preferences...** button in the backup dialog box,
• by choosing the **Preferences...** command in the **Edit** menu of 4th Dimension.

These parameters are specific to each database opened by the 4th Dimension application.

*4D Server* These parameters can only be set from the 4D Server machine.

**Backup Contents**

This area allows you to define which files and/or folders to copy during the next backup.

The upper portion of the area lists the 4th Dimension database files and indicates their current size. You must set each file to include in the backup by checking the corresponding option. A dimmed option means that the corresponding file is not available in the database. You can select the 4th Dimension files that you want, depending on how often they are updated, their strategic interest, their size, etc. No file is required.
The lower portion lists the file access paths of any attached files in the backup.

- **Data File**: Database data file.
  If the database contains several segments, only the name and size of the first segment are displayed. Of course, all segments are backed up. When this option is checked, the current **log file** of the database, if any, is backed up at the same time as the data. The backup causes the closing and backup of the current log file, then the creation of a new log file. This prevents the size of the log file from becoming excessively large.
  For more information on the log file, please refer to the "Managing the Log File" paragraph on page 339.
- **Structure File**: Database structure file.
  In cases where databases are compiled and merged with 4D Runtime Volume License, this option allows you to backup the .exe file (Windows) and the package (Mac OS).
- **User Structure File** (optional): Database User structure file that contains customized user forms (if any).

- **Attachments**: This area allows you to specify a set of files and/or folders to be backed up at the same time as the database. These files can be of any type (documents or plug-in templates, labels, reports, pictures, etc.).
  You can set either individual files or folders whose contents will be fully backed up. Each attached element is listed with its full access path in the "Attachments" area.
  - **Add Folder**: When you click this button, 4th Dimension displays a dialog box that allows selecting a folder to add to the backup. In case of a restore, the folder will be recuperated with its internal structure. You can select any folder or volume connected to the machine, with the exception of the folder containing the database files.
  - **Add**: When you click this button, 4th Dimension displays a dialog box that allows selecting a file to add to the backup.
    You cannot select a database file as an attached file.
  - **Remove**: This button allows you to remove the selected file from the list of attached files.

*Note* It is possible that one or more attached files are not accessible when the backup is executed (modified name or access path, disk disconnected, etc.). In this case, the backup is executed without the missing file(s) and an error is generated. You can intercept this error in the On Backup Shutdown Database Method. The error is also indicated in the Backup journal.

**Backup File Destination Folder**

This area allows defining the location where backup files and log files (if any) are stored.

4th Dimension generates two types of backup files: backup files and backup log files. Backup files are special for two reasons:

- They can contain several files (structure, data, attached files, etc.).
- They are secured using internal verification mechanisms (which can be set on the "Backup" page of the Preferences).

By default, 4th Dimension stores these files next to the database data file. It is strongly advised to set a location on another disk volume to reduce the risk of data loss in case of disk failure on the drive containing the database.

To modify the location where these files are stored, click the [...] button:

A selection dialog box appears, which allows selecting a folder or disk where the backups will be placed. The "Used Space" and "Free Space" areas are updated automatically and indicate the remaining disk space on the disk of the selected folder.
You should make sure that the free space is sufficient for all of your backups. If a backup fails due to a lack of disk space, an error is generated. You can intercept this error in the On Backup Shutdown Database Method. The error is also indicated in the information area and in the Backup journal.

## Backup File Names

4th Dimension names backup files using a specific naming system on which the automatic restore functions are based. This naming system cannot be changed.

Standard backups are named ***Databasename*[xxxx].4BK**, where *databasename* is the name of the database data file and *xxxx* is the number of the backup. For example, the 26th backup of the Invoices database is named *Invoices[0026].4BK*.
If the backup is segmented, 4th Dimension adds the segment number as *-xxxx*. For example, the 3rd segment of the 26th backup of the Invoices database is named *Invoices[0026-0003].4BK*.
For more information on segments, please refer to the "Archive" paragraph on page 335.

- Backups of log files are named ***Logname*[xxxx].4BL**, where *logname* is the name of the log file of the database and *xxxx* is the number of the backup (starting at 0). For example, the 13th backup of the Log log file is named *Log[0012].4BL*.
If the backup of the log file is segmented, 4th Dimension adds the segment number as *-xxxx*. For example, the 2nd segment of the 13th backup of the log file Log is named *Log[0012-0002].4BL*.
For more information on segments, please refer to the "Archive" paragraph on page 335.

Please note that log file backups start at 0 while database file backups start at 1. For the first database file backup (backup[0001].4BK for example), the log file backup is named log[0000]: it represents the changes made in the data file starting at its "empty" state and can only be integrated into an empty data file. Consequently, a log backup named, for example, log[0025].4BL must be interpreted as the "26th backup of the log file, corresponding to operations performed between the 25th and 26th database backup". log[0025].4BL thus corresponds to the backup[0025].4BK backup.

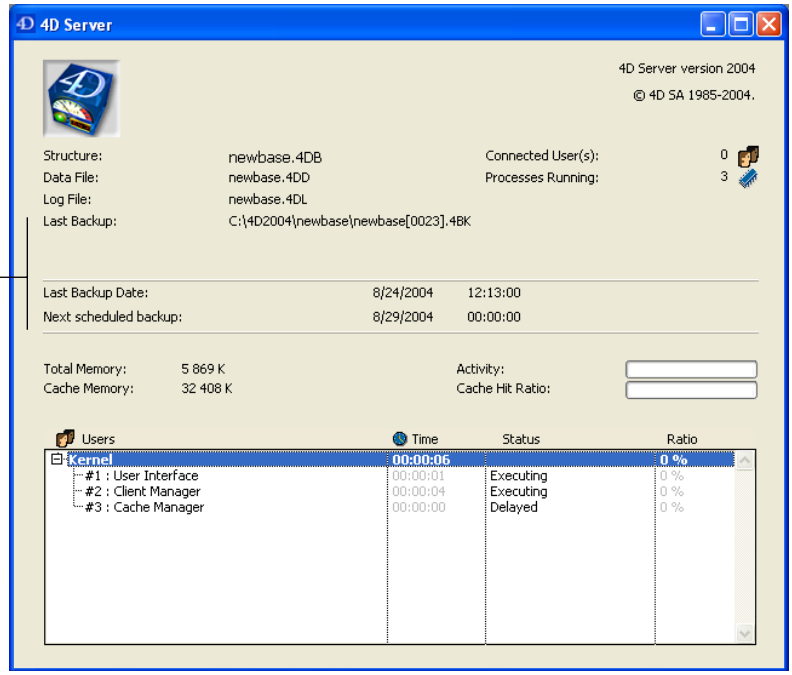
*Note* The backup numbering ranges are as follows:
- backup: 1 to 9999
- log file backup: 0 to 9998
- segment: 1 to 9999.

**Last Backup Information**

The "Last Backup Information" area provides information on the last database backup. Information is provided if at least one backup has taken place.

- **Last backup**: Date and time of the last backup.
- **Next scheduled backup**: Date and time of the next backup; information is provided in this area if a backup schedule has been put into place.
- **Backup file name**: Access path and file name of the last main backup. If the backup is segmented, the name of the first segment is displayed.
- **Log backup file name**: Access path and file name of the last log file backup (if any).
- **Status**: This area displays the error code of the last backup, as well as a description of this code. If the backup was executed properly, the area remains blank.
  For scheduled backups, you can use this area to verify that the last backup occurred as scheduled.

With 4D Server, this information is also displayed in the main server window:



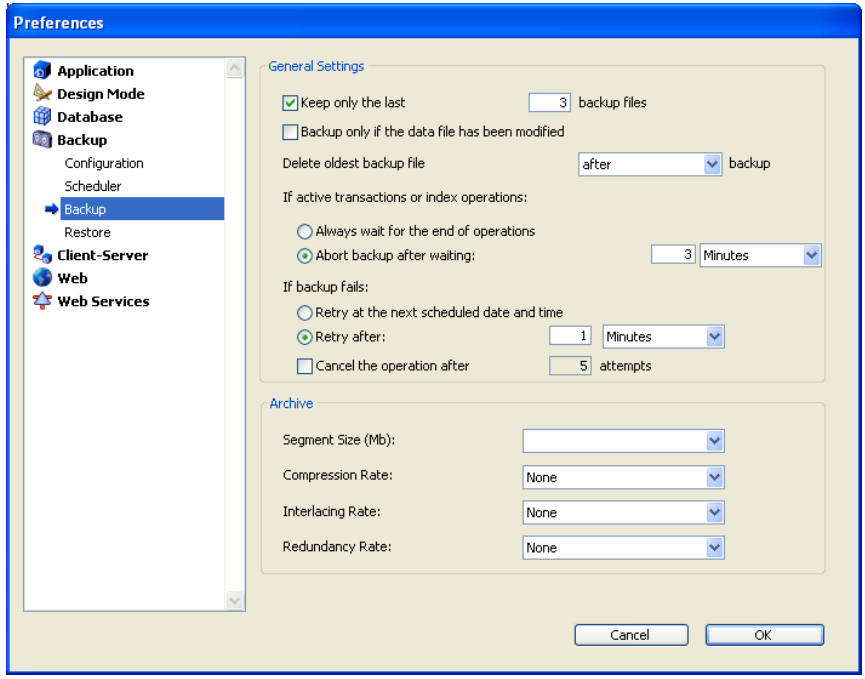

Information on the last backup

*Note* The parameters related to log file management are covered in the "Managing the Log File" paragraph on page 339.

## Backup Settings

Like the configuration settings, backup settings are used for each backup. Moreover, any changes to these settings are optional. Their default values correspond to the standard use of the backup function.

The backup settings are defined on the **Backup** page of the application Preferences:




*4D Server* The backup settings can only be set from the 4D Server machine.

These settings are specific to each database opened with the 4th Dimension application.

**Keep Only the Last X Backup Files**

This parameter allows activating and configuring the mechanism used to delete the oldest backup files. It lets you keep a specific number of the last backup files on the backup disk — the oldest file is then deleted at each new backup— and thus avoids the risk of saturating the disk drive.

This feature works as follows: once the current backup is complete, 4th Dimension deletes the oldest archive if it is found in the same location as the archive to back up and has the same name (you can request that the oldest archive be deleted before the backup in order to save space).
If, for example, the number of sets is set to 3, the first three backups create the archives MyBase-0001, MyBase-0002, and MyBase-0003 respectively. During the fourth backup, the archive MyBase-0004 is created and MyBase-0001 is deleted.

Based on the space on the disk that you set aside for your backups, you can determine the maximum possible number of backup sets using the following equation:

$$\text{Maximum number of sets} = \frac{\text{Space available for backups}}{\text{Maximum backup size}} - 1 \text{ set}$$

You must reduce the maximum number of sets by 1 because 4th Dimension, by default, first performs the current backup, then deletes the oldest archive from the disk. This behavior can be changed (please see the "Delete Oldest Backup File Before/After Backup" paragraph on page 333).

By default, the mechanism for deleting sets is enabled and 4th Dimension keeps 3 backup sets.

To disable the mechanism, simply deselect the option.

*Note* This parameter concerns both the database backup sets and the log file backup sets.

**Backup Only if the Data File has been Modified**

When this option is checked, 4th Dimension starts scheduled backups only if data has been added, changed or deleted in the database since the last backup. If not, the scheduled backup is cancelled and carried over until the next scheduled backup. No error is generated; however the backup journal notes that the backup has been postponed.
This option also allows saving machine time for the backup of databases mainly used for viewing purposes. Please note that enabling this option does not take into account any modifications made to the structure file or attached files.

*Notes*
- For more information on scheduled backups, please refer to the "Scheduled Backup Settings" paragraph on page 336.
- When this option is checked and backup starts manually, 4th Dimension displays a dialog box indicating that the data file has not been modified and lets the user confirm or cancel the operation.
- This parameter concerns both database and log file backups.

**Delete Oldest Backup File Before/After Backup**

This option is only used if the "Keep only the last X backup files" option is checked. It allows you to specify whether 4th Dimension should start by deleting the oldest archive before starting the backup (**before** option) or if the deletion should occur once the backup is completed (**after** option). In order for this mechanism to work, the oldest archive must not have been renamed or moved.

The **before** option allows you to save space. It is not necessary to reduce the number of backups allowed by 1, which lets you, for example, store two 2-GB archives on a 5-GB disk. Please also note that in cases of interruption during a backup, you can access neither the old backup (since it was previously deleted), nor the current backup, which is not yet completed. Since the database could not be modified during the backup, you can be sure that your data file is intact, even if you do not have a valid backup. Once the system restarts and the incomplete archive is destroyed, proceed immediately with a new backup.

The **after** option is an additional security measure but requires more space on the backup hard disk.

**If Active Transactions or Index Operations**

Transactions and index operations are critical operations that prevent the backup of a database as long as the operations are not yet completed. Before starting a backup (regardless of how it is started), 4th Dimension or 4D Server examines the database; if the program detects a critical operation in progress it suspends the backup procedure.

This parameter allows you to define the waiting period:

- **Always wait for the end of operations**: The backup is suspended as long as the operation is not completed; it is then started immediately. This guarantees that the backup is executed but does not allow precise verification of when the backup occurs.

- **Abort backup after waiting X (seconds or minutes)**: The backup is suspended for a limited time (3 minutes by default) to give the transaction or index operation time to finish. You can set a wait time in seconds or minutes using the corresponding menu. If, after this wait, the critical operation is still in progress, the backup is considered as failed and an error is noted in the backup journal. The mechanism defined for handling failed backups then takes over (see paragraph below).

*Note* It is important to avoid opening a transaction that is only validated or cancelled when quitting the database, at the moment a database is launched. You should also avoid presenting users with input or validation dialog boxes during a transaction. If the user happens to be absent when the time comes to validate the dialog box, and the backup starts at that moment, the database can no longer execute new transactions until the dialog box is validated.

**If Backup Fails**

This option allows defining the mechanism used to handle failed backups (backup impossible).

*Notes*
- Not all incidents result in a failed backup (please refer to the "If Backup Fails" paragraph on page 334).
- 4th Dimension considers a backup as failed if the database was not launched at the time when the scheduled automatic backup was set to be carried out (please refer to the "Scheduled Backup Settings" paragraph on page 336).

When a backup cannot be performed, 4th Dimension allows making a new attempt. Two options are available:

- **Retry at the next scheduled date and time**: This option only makes sense when working with scheduled automatic backups (please refer to the "Scheduled Backup Settings" paragraph on page 336). It cancels the failed backup and an error is generated.
- **Retry after X hour(s) or minute(s)**: When this option is checked, a new backup attempt is executed after the wait period. This mechanism allows anticipating certain circumstances that block the backup. You can set a wait period in hours or in minutes using the corresponding menu. If the new attempt also fails, an error is generated and the failure is noted in the status area of the last backup and in the backup journal file.
- **Cancel the operation after X attempts**: This parameter is used to set the maximum number of failed backup attempts.

If the backup has not be carried out successfully after the maximum number of attempts set has been reached, it is cancelled and the error 1401 is generated ("The maximum number of backup attempts has been reached; automatic backup is temporarily disabled"). In this case, no new automatic backup will be attempted as long as the application has not been restarted, or a manual backup has not been carried out successfully.
This parameter is useful in order to avoid a case where an extended problem (requiring human intervention) that prevented a backup from being carried out would have led to the application repeatedly attempting the backup to the detriment of its overall performance.
By default, this parameter is not checked.

**Archive**

This area allows setting archive generation options. These options apply to main backup files and to log file backup files.

- **Segment Size (MB):**
  4th Dimension allows you to segment archives, which is to cut an archive up into smaller sizes. This behavior allows you, for example, to store a backup on several different disks (CDs, ZIPs, etc.). During a restore process, 4th Dimension will automatically fuse the segments. Each segment is called *MyDatabase[xxxx-yyyy].4BK*, where *xxxx* is the backup number and *yyyy* is the segment number. For example, the three segments of the sixth MyDatabase database backup will be called MyDatabase[0006-0001].4BK, MyDatabase[0006-0002].4BK and MyDatabase[0006-0003].4BK.
  The **Segment Size** menu is a combo box that allows you to set the size in MB for each segment of the backup. You can choose one of the preset sizes or enter a specific size between 0 and 2048. If you pass 0, no segmentation occurs (this is the equivalent of passing **None**).

- **Compression Rate**
  By default, 4th Dimension compresses backups to help save disk space. However, the file compression phase can noticeably slow down backups when dealing with large volumes of data.
  The **Compression Rate** option allows you to adjust file compression:
  - **None**: No file compression is applied. The backup is faster but the archive files are considerably larger.
  - **Fast** (default): This option is a compromise between backup speed and archive size.

- **Compact**: The maximum compression rate is applied to archives. The archive files take up the least amount of space possible on the disk, but the backup is noticeable slowed.

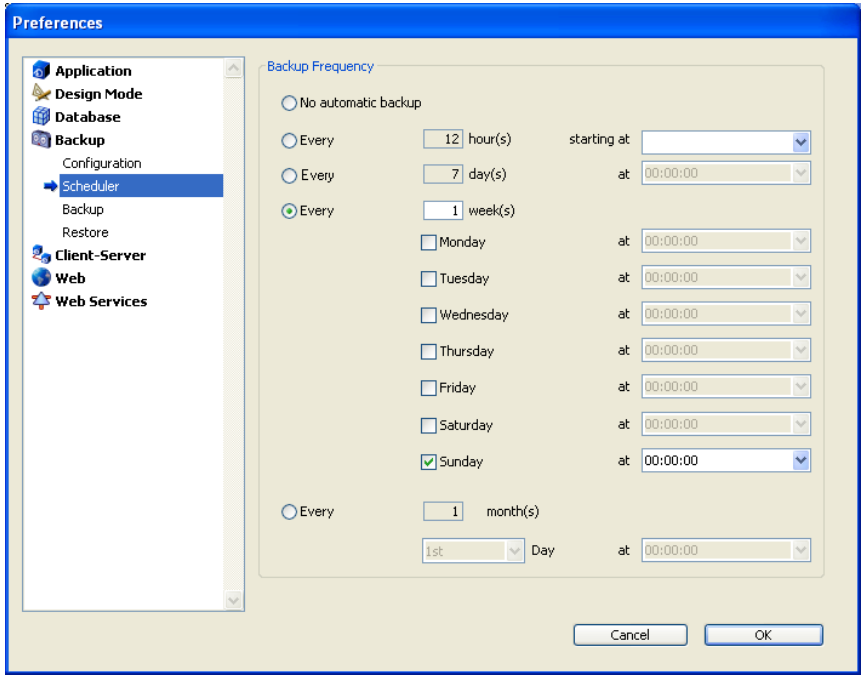
- **Interlacing Rate** and **Redundancy Rate**
  4th Dimension generates archives using specific algorithms that are based on optimization (interlacing) and security (redundancy) mechanisms. You can set these mechanisms according to your needs. For these two options, 4th Dimension provides a default rate **Medium**. The menus for these options also contain rates of **Low**, **High** and **None**.
  - **Interlacing Rate**: Interlacing consists of storing data in non-adjacent sectors in order to speed up their read time. However, the storage phase is slower.
  - **Redundancy Rate**: Redundancy allows securing data present in a file by repeating the same information several times. The higher the redundancy rate, the better the file security; however, storage is slow and the file size is large.

## Scheduled Backup Settings

You can automate the backup of databases opened with 4th Dimension or 4D Server (even when no client machines are connected). This involves setting a backup frequency (in hours, days, weeks or months); for each session, 4th Dimension automatically starts a backup using the backup settings defined in the Preferences.

If this application was not launched at the theoretical moment of the backup, the next time 4th Dimension is launched, it considers the backup as having failed and applies the appropriate configuration, set in the database Preferences (refer to the "If Backup Fails" paragraph on page 334).

The scheduler backup settings are defined on the **Scheduler** page of the application Preferences:




First select a frequency scale (days, weeks, etc.) by clicking on the corresponding radio button. You must then specify when to perform the backup.

- **No automatic backup**: The scheduled backup feature is disabled.
- **Every X hour(s)**: This option allows programming backups on an hourly basis. You can enter a value between 1 and 24.
  - **starting at**: Sets the time at which the first hourly backup will begin.
- **Every X day(s) at x**: This option allows programming backups on a daily basis. Enter 1 if you want to perform a daily backup. When this option is checked, you must enter the time when the backup should start.

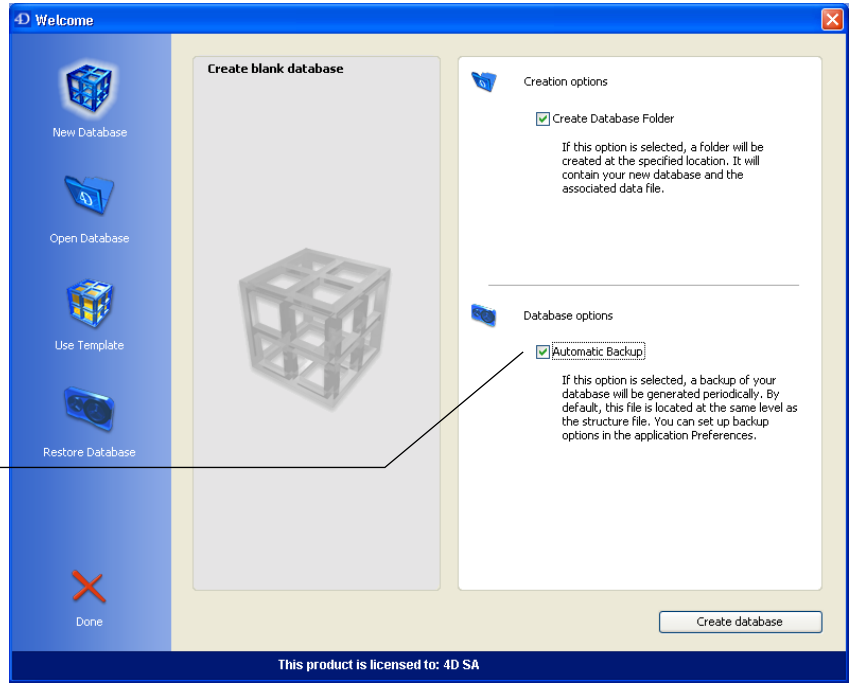
- **Every X week(s) day at x**: This option allows programming backups on a weekly basis. Enter 1 if you want to perform a weekly backup. When this option is checked, you must enter the day(s) of the week and the time when the backup should start. You can select several days of the week, if desired. For example, you can use this option to set two weekly backups: one on Wednesday and one on Friday.
- **Every X month(s), Xth Day at x**: This option allows programming backups on a monthly basis. Enter 1 if you want to perform a monthly backup. When this option is checked, you must indicate which day of the month and the time when the backup should start.

## Automatic Backup

4th Dimension provides a default backup strategy when a database is created. This strategy puts into place a set of backup parameters that assure minimum database security.

These settings can be changed once the database is created.

The backup strategy is enabled, by default, when a new database is created. To disable it, simply deselect the **Automatic Backup** option in the Welcome dialog box:




Option to use the default backup strategy

The default backup strategy includes the following settings:

- Creation and use of a log file (named *DataFileName.4dl*).
- Backup of all database files (data, log, structure and user structure) next to the database structure file.
- Automatic backup every Sunday at 00:00:00.
- Default backup settings (keeping last 3 backups, medium rates, etc.).
- All the automatic restore options.

# Managing the Log File

A continuously-used database is always recording changes, and record additions or deletions. Performing regular backups of data is important but does not allow (in case of incident) restoring data entered since the last backup. To respond to this need, 4th Dimension now offers a specific tool: the log file. This file allows ensuring permanent security of database data.

In addition, 4th Dimension works continuously with a data cache in memory. Any changes made to the data of the database are stored temporarily in the cache before being written to the hard disk. This accelerates the operation of applications; in fact, accessing memory is faster than accessing the hard disk. If an incident occurs in the database before the data stored in the cache could be written to the disk, you must include the current log file in order to restore the database entirely.

## Introduction

The log file generated by 4D contains all operations performed on a database, which are logged sequentially. As such, each operation performed by a user causes two simultaneous actions: the first one in the database (instruction is executed normally) and the second one in the log file (the description of the operation is recorded). The log file is created independently without disturbing or slowing down the work of the user. A database can only work with one log file at a time.

The log file records four types of operations:

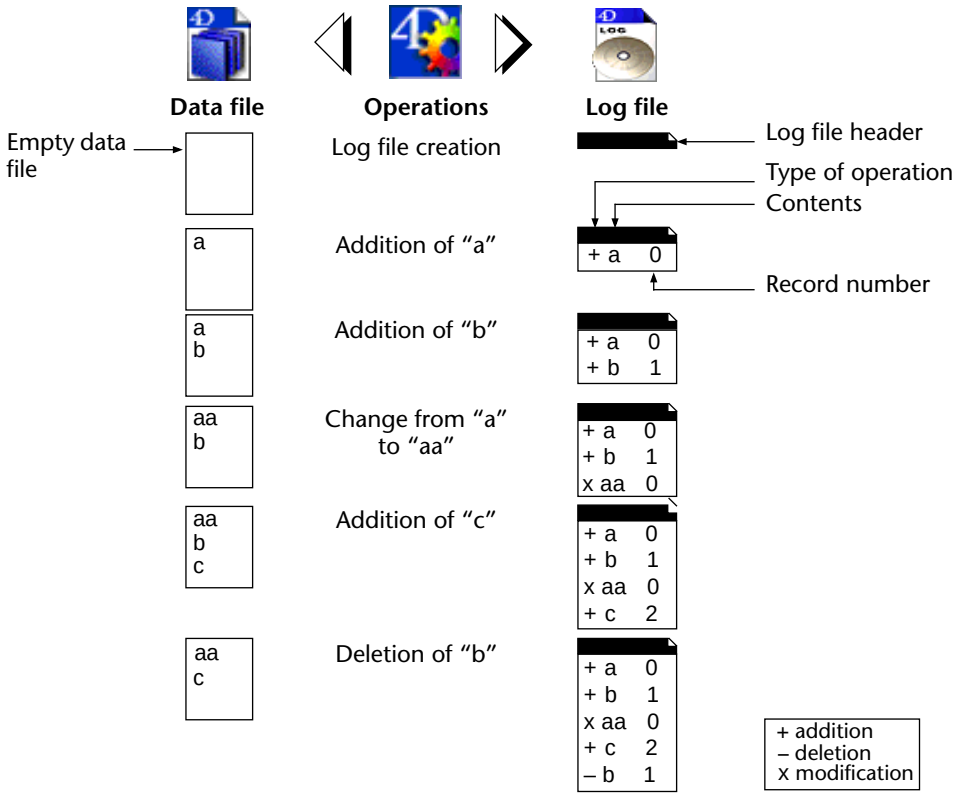
- Added records
- Modified records

- Deleted records
- Transactions.

*Note on transactions* A transaction is a set of operations executed all at once. For example, during a bank wire performed as part of a transaction, you must make sure that you debit one account and credit the second account in the same operation, without running the risk of interrupting the operation in progress. Either the entire operation is performed, or none of it, but it can never be partially done. The first account cannot be debited without the second account being credited. 4th Dimension considers transactions as single operations, just like an addition, update or deletion.

4th Dimension handles the log file. It takes into account all operations that affect the data file equally, regardless of any manipulations performed by a user (using 4th Dimension single-user or 4D Client), 4D methods, 4D plug-ins (4D Write, 4D View, 4D Draw, etc.), a Web browser or even 4D Open when using 4D Server.

The following illustration sums up how the log file works:



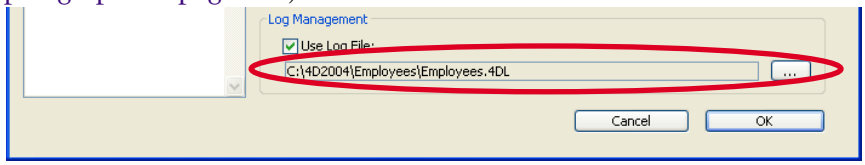
The current log file is automatically saved with the current data file. This mechanism has two distinct advantages:

- Its avoids saturating the disk volume where the log file is stored. Without a backup, the log file would get bigger and bigger with use, and would eventually use all available disk space. For each data file backup, 4th Dimension or 4D Server closes the current log file and immediately starts a new, empty file, thereby avoiding the risk of saturation. The old log file is then archived and eventually destroyed depending on the mechanism for managing the backup sets.
- It keeps log files corresponding to backups in order to be able to parse or repair a database at a later point in time. The integration of a log file can only be done in the database to which it corresponds. It is important, in order to be able to properly integrate a log file into a backup, to have backups and log files archived simultaneously.

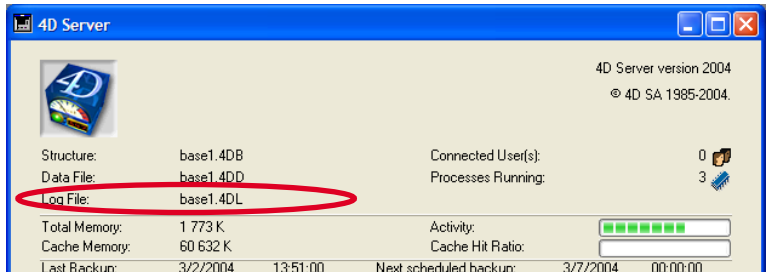
## Creating the Log File

By default, any database created with 4th Dimension uses a log file: the creation of this file is linked to the **Automatic Backup** option in the database creation dialog box (please refer to the "Automatic Backup" paragraph on page 338).
The log file is named **DataFileName.4DL** and is placed in the folder containing the database structure.

You can find out if your database uses a log file at any time: just verify whether the **Use Log File** option is checked on the **Configuration** page of the Preferences (please refer to the "Configuration of Backup Files" paragraph on page 325).



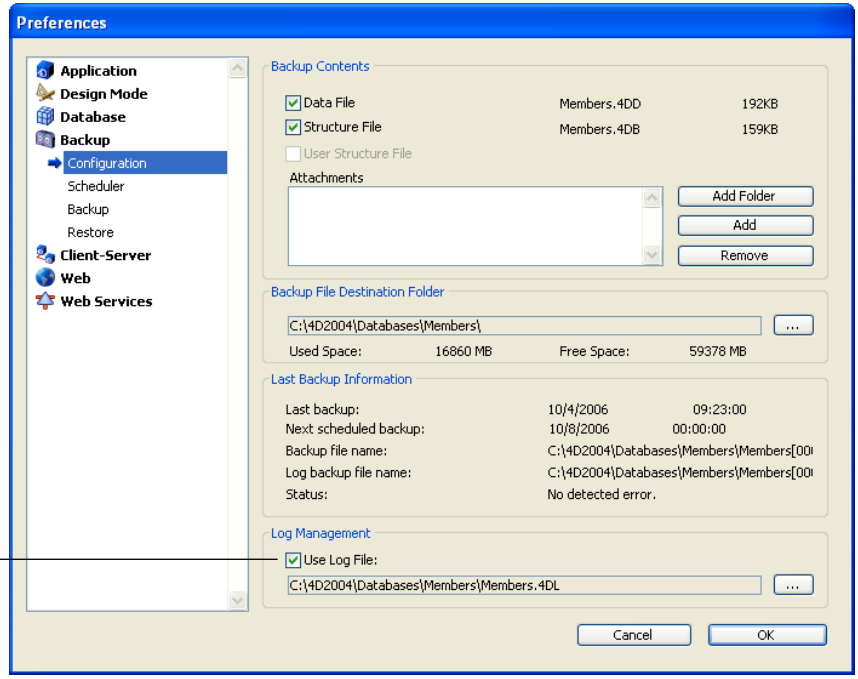
With 4D Server, the name of the log file is also listed in the server machine window:




If you deselected this option, or if you use a database without a log file and wish to set up a backup strategy with a log file, you will have to create one.

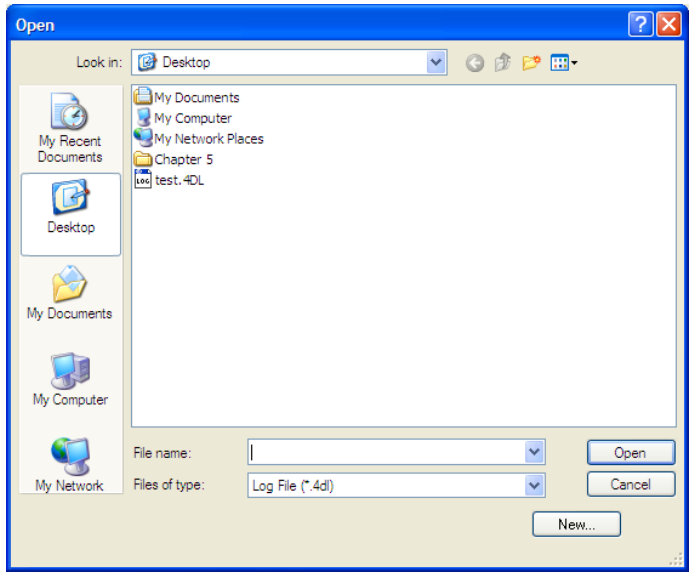
► To create a log file:

1 **On the Configuration page ("Backup" theme) of the application Preferences, check the Use Log File option.**




Use Log File option

The program displays a standard open file or new log file dialog box:




2 **Click New...**

A standard save file dialog box appears. By default, the log file is named **DataFileName.4DL**.

3 **Keep the default name or rename it, and then select the file location.**

If you have at least two hard drives, it is recommended that you place the log file on a disk other than the one containing the database. If the database hard drive is lost, you can still recall your log file.

4 **Click Save.**

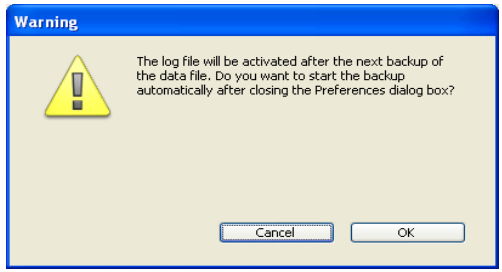
The access path and the name of the open log file are now displayed in the "Use Log File" area of the Preferences dialog box.

5 **Validate the Preferences dialog box.**

In order for you to be able to create a log file directly, the database must be in one of the following situations:

- The data file is blank,
- You just performed a backup of the database and no changes have yet been made to the data.

In all other cases, when you validate the Preferences dialog box, an alert dialog box will appear to inform you that it is necessary to perform a backup.




If you click **OK**, the backup begins immediately, then the log file is activated. If you click **Cancel**, the request is saved but the creation of the log file is postponed and it will actually be created only after the next backup of the database.
This precaution is indispensable because, in order to restore a database after any incidents, you will need a copy of the database into which the operations recorded in the log file will be integrated.

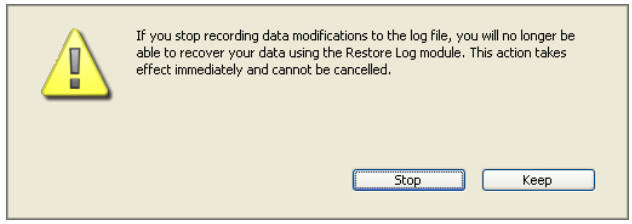
Without having to do anything else, all operations performed on the data are logged in this file and it will be used in the future when the database is opened.

- You must create another log file if you create a new data file.
- You must set or create another log file if you open another data file that is not linked to a log file (or if the log file is missing). To open another log file, click the [...] button to the right of the log file access path display area.

## Stopping a Log File

If you would like to stop logging operations to the current log file, simply deselect the **Use Log File** option on the **Configuration** page (“Backup” theme) of the application Preferences.

4th Dimension then displays an alert message to remind you that this action prevents you from taking advantage of the security that the log file provides:




If you click **Stop**, the current log file is immediate closed (the Preferences dialog box does not need to be validated afterwards).

If you wish to close the current log file because it is too large, you must perform a data file backup, which will cause the log file to be backed up as well. Note that there is an automatic mechanism that prevents the log file from becoming too large (see the following paragraph).

## Automatic Backup of Log File When Critical Size is Reached

When the log file approaches the critical size of 2 GB, 4D automatically triggers a backup of the database, in order to close the current log file and open a new one. This avoids a situation where the size of this file could alter application performance.

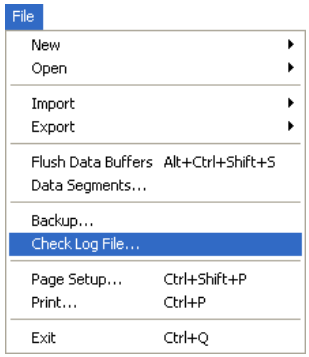
In this case, the backup carried out uses the current backup parameters and is the same as a manual backup.

## Parsing a Log File

4th Dimension includes a function that allows viewing the contents of the current log file. This function is useful for parsing the use of a database or detecting the operation(s) that caused errors or malfunctions. In the case of a database in client-server mode, it allows verifying operations performed by each client machine.

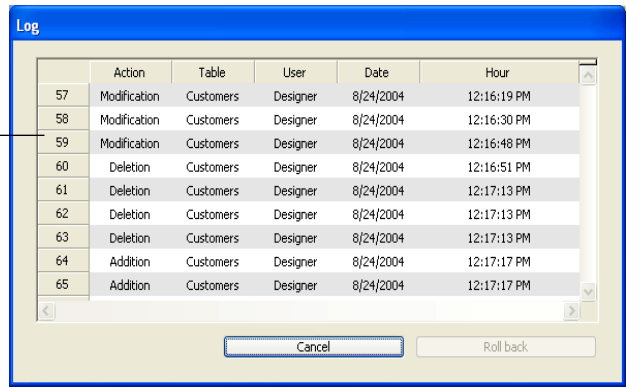
This function also lets you undo the operations performed on the database data. This possibility is detailed in the "Undoing Operations" paragraph on page 357.

To view the current log file, select the **Check Log File...** command in the **File** menu in 4th Dimension or 4D Server (this function is not available on the 4D Client machine):




*Note* Only the Administrator and Designer of the database have access to check the log file.

The following window appears:




Every operation recorded in the log file appears as a row. The columns provide various information on the operation. You can modify the default column display — for example, you can display field values — using the contextual menu of the window (see the "Setting the Column Display" paragraph on page 347).

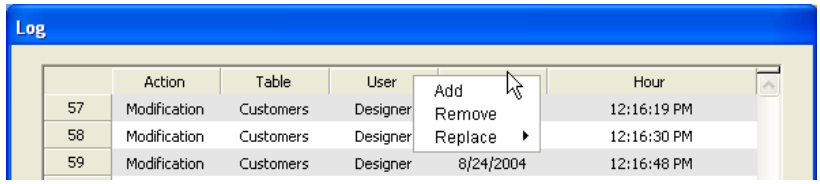
This information allows you to identify the source and context of each operation:

- **Action**: Type of operation performed on the data. This column can contain one of the following four operations: Addition, Deletion, Modification, and Transaction. For more information, please refer to the "Introduction" paragraph on page 319.
- **Table**: Table to which the added/deleted/modified record belongs.
- **User**: Name of the user that performed the operation. In client-server mode, the name of the client-side machine is displayed; in single-user mode, the ID of the user is displayed.
  If the 4th Dimension passwords are not enabled, this column uses Designer.
  If the operation was performed using 4D Open, the "4D Open" label is displayed.
- **Date** and **Hour**: Date and hour when the operation was performed.

## Setting the Column Display

You can customize the column display using the contextual menu of the Log file window. You can add or remove columns, or replace the contents of a column for the current window session (the customized window contents are reset when the window is closed).

To display the contextual menu of the window, click on a column header:



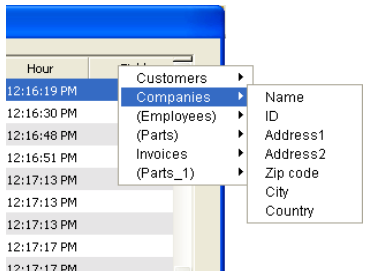

The following commands are available:

- **Add**: allows adding a column to the right of the existing columns. By default, the column is empty and is named "Field." It can then be assigned to a field of the database (see the next paragraph).
- **Remove**: allows removing the column from the window.
- **Change**: allows replacing the contents of the current column. You can either select one of the standard information fields (Action, Table, etc.), or select **Field** to add a column displaying the values of a database field.

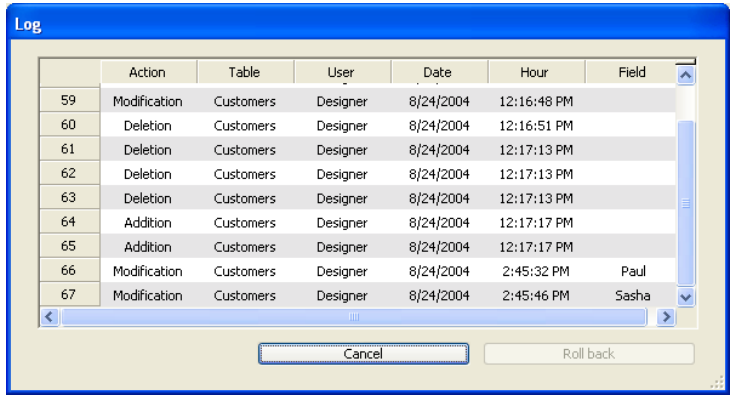
## Viewing Field Values

You can assign a database field to a column of the Log file window, so that the current value of the field is displayed for each logged operation. This feature is very useful, for example, to identify the moment when a specific record has been added.

To do this, add an empty **Field** column in the Log file window using the **Add** or **Replace** command of the contextual menu (see previous paragraph).
Click on the header of the Field column. A hierarchical menu containing the database tables and fields appears:



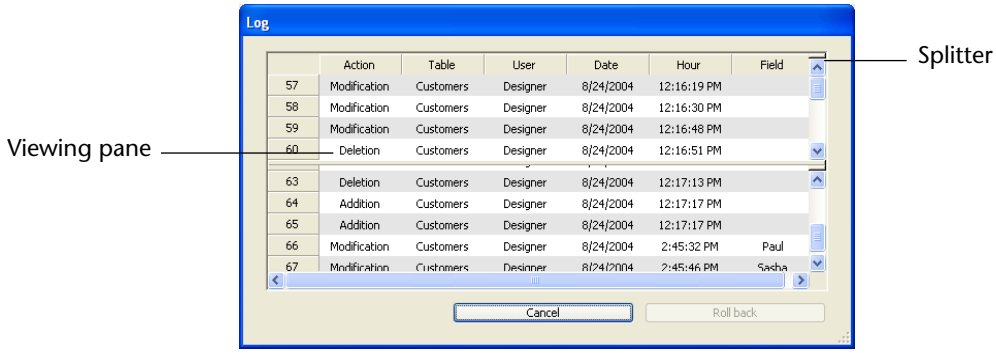

Select the field whose values you want to display. The values then appear for each added or modified record:




| | Action | Table | User | Date | Hour | Field |
|---|---|---|---|---|---|---|
| 59 | Modification | Customers | Designer | 8/24/2004 | 12:16:48 PM | |
| 60 | Deletion | Customers | Designer | 8/24/2004 | 12:16:51 PM | |
| 61 | Deletion | Customers | Designer | 8/24/2004 | 12:17:13 PM | |
| 62 | Deletion | Customers | Designer | 8/24/2004 | 12:17:13 PM | |
| 63 | Deletion | Customers | Designer | 8/24/2004 | 12:17:13 PM | |
| 64 | Addition | Customers | Designer | 8/24/2004 | 12:17:17 PM | |
| 65 | Addition | Customers | Designer | 8/24/2004 | 12:17:17 PM | |
| 66 | Modification | Customers | Designer | 8/24/2004 | 2:45:32 PM | Paul |
| 67 | Modification | Customers | Designer | 8/24/2004 | 2:45:46 PM | Sasha |

### Viewing Panes

You can create viewing panes in the log window. To do this, click on the splitter located at the top of the window and slide it toward the bottom.




To create several panes, simply repeat the operation as many times as necessary. You can create a pane below an existing pane by dragging its splitter.
To remove a pane, drag its bottom splitter toward the top or double-click on the splitter.

# Restoring Data

The built-in 4th Dimension backup module allows you to restore entire sets of database data in case of any incidents, regardless of the cause of the incident.

### Incidents and Diagnostic

Two primary categories of incidents can occur:

- **The unplanned stoppage of a database while in use.**
  This incident can occur because of a power outage, system element failure, etc. In this case, depending on the current state of the data cache at the moment of the incident, the restore of the database can require different operations:
  - If the cache was empty, the database opens normally. Any changes made in the database were recorded. This case does not require any particular operation.
  - If the cache contains operations, the data file is intact but it requires integrating the current log file.

- If the cache was in the process of being written, the data file is probably damaged. The last backup must be restored and the current log file must be integrated.

- **The loss of database file(s).**
  This incident can occur because of defective sectors on the disk containing the database, a virus, manipulation error, etc.
  The last backup must be restored and then the current log file must be integrated.

  To find out if a database was damaged following an incident, simply relaunch the database using 4th Dimension. The program performs a self-check and details the necessary restore operations to perform.
  In automatic mode, these operations are performed directly without any intervention on the part of the user (please refer to the "Automatic Restore" paragraph on page 350).

  If a regular backup strategy was put into place, the 4th Dimension restore tools will allow you to recover (in most cases) the database in the exact state it was in before the incident. Two main tools are at your disposal:

- Backup restore — which consists in extracting files contained in one or more backup file(s) and making them readable again for the application that created them.

- Log file integration.

  These two functions can be combined and automated.

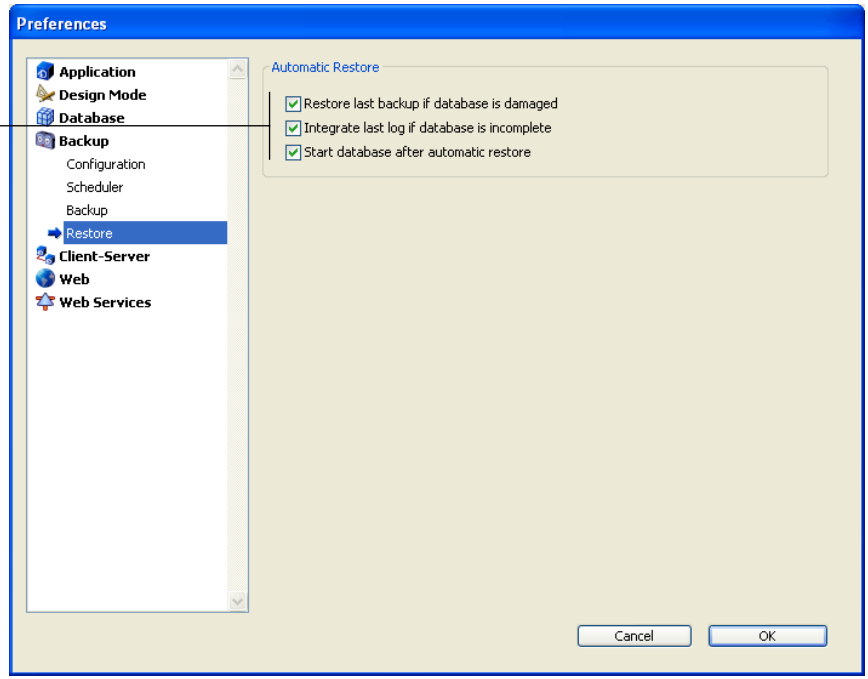
## Automatic Restore

By default, 4th Dimension automatically launches the database restore procedures after an incident. Three types of automatic features are used:

- Automatic restore
- Automatic log file integration
- Automatic restart of restored database.

These mechanisms can be disabled using the options available on the **Restore** page ("Backup" theme) in the application Preferences:

Automatic Restore features




**Restore Last Backup if Database is Damaged**

When this option is checked, the program automatically starts the restore of the data file of the last valid backup of the database, if an anomaly is detected during database launch. No intervention is required on the part of the user; the operation is logged in the backup journal (please refer to the "Backup Journal" paragraph on page 358).

*Note* In the case of an automatic restore, only the data file is restored. If you wish to recover the attached files or the structure file, you must perform a manual restore.

The steps of the automatic restore are as follows:

- First, 4th Dimension renames the damaged data file.
- 4th Dimension extracts the data file of the last backup and stores it in place of the previous one.

- If the "Integrate last log if database is incomplete" option is checked, 4th Dimension integrates the log file, if necessary (please refer to the "Integrate Last Log File if Database is Incomplete" paragraph on page 352).
- If the "Start database after automatic restore" option is checked, 4th Dimension relaunches the restored database (please refer to the "Start Database After Automatic Restore" paragraph on page 352).

**Integrate Last Log File if Database is Incomplete**

When this option is checked, the program automatically integrates the log file when a restored database is opened. No intervention on the part of the user is required.

- When opening a database, the current log file is automatically integrated if 4th Dimension detects that the operations stored in the log file are not present in the data. This situation occurs, for example, when a power outage occurs when there are operations in the data cache that have not yet been written to the log.
- When restoring a database, if the current log file or backup log file having the same number as the backup file is stored in the same folder, 4th Dimension examines its contents. If it contains operations not found in the data file, the program automatically integrates it.

  The user does not see any dialog box; the operation is completely automatic. The goal is to make use as easy as possible. The operation is logged in the backup journal (please refer to the "Backup Journal" paragraph on page 358).

**Start Database After Automatic Restore**

When this option is checked, 4th Dimension automatically opens a database that was just restored once the procedure is complete.

Note that when this option is used, it is important that all elements necessary for the database to work are accessible after the restore. If, for example, the database requires specific files next to the database structure file, they must be included in the backups so that they can be restored at the same time as the database. If the database uses plug-ins, it is better that they be installed next to the 4th Dimension application.

The combination of the three restore options (associated with the backup options) allows putting into place a semi-automatic or automatic system to get back on track after an incident.

- Semi-automatic: The administrator simply has to relaunch the database, the 4th Dimension application automatically performs the necessary restore and relaunches a trustworthy version of the application.
- Automatic (4D Server only): If you save the database as a service launched at system startup, it will be relaunched automatically by the machine when it is restarted. The application automatically performs the necessary restore.

This type of system is particularly well adapted to 4D Server databases. Note that each operation executed automatically is logged in the database backup journal (please refer to the "Backup Journal" paragraph on page 358).

## Manually Restoring a Backup

You can restore the contents of an archive generated by the backup module manually. A manual restore may be necessary, for instance, in order to reproduce the contents of an archive in full (structure files and/or enclosed attached files), or for the purpose of carrying out searches among the archives.

The manual restore can also be performed along with the integration of the current log file.

*Note* You can set 4th Dimension so that the database data are automatically restored in case of any incidents. For more information on this, please refer to the "Automatic Restore" paragraph on page 350.

The 4D application (4th Dimension, 4D Server, application merged with 4D Runtime Volume License, etc.) performs the backup restore itself using the **Restore** page of the Welcome dialog box.

*Note* An alternative solution consists in using the Open data file dialog box (see the "Manual Restoring via the Open Data File Dialog Box" paragraph on page 356).

► To restore a database manually:

1 **In the Welcome dialog box, click the Restore Database icon (4th Dimension and 4D Server only).**

**OR**

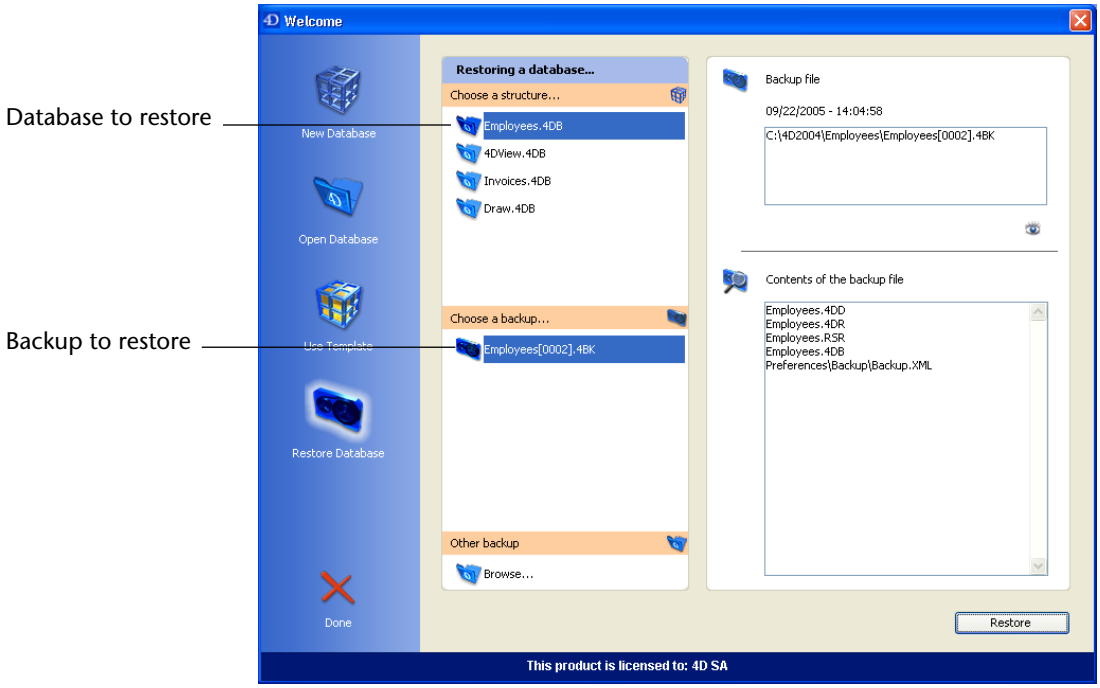
**Execute the RESTORE command from a 4th Dimension method (all 4D applications).**

**OR**

**Drag and drop the backup file to restore on the application icon (all 4D applications).**

In the latter case, a standard save file dialog box appears, which allows you to indicate the location where files will be restored. Go directly to step 3.

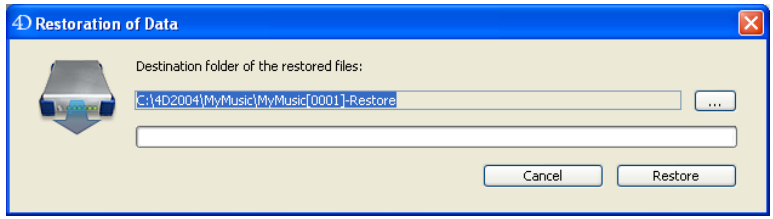
2 **Select the database, then the backup to restore, and click the Restore button:**




The right-hand area of the dialog box indicates the access path and the contents of the selected archive. You can view the location of the backup file on the disk by clicking the button. If the backup was segmented, the access path of the first segment is displayed.

**OR**
**To restore another archive, click Browse..., then set the backup file to restore in the standard open document dialog box.**

A dialog box appears, which allows you to specify the location where files will be restored:




By default, 4th Dimension restores the files in a folder named "*Archivename*-Restore" located next to the archive. You can click on the **[...]** button to specify a different location.

3 **If necessary, modify the location of the restored files and click on the Restore button.**
4th Dimension extracts all backup files from the specified location.

If the current log file or a backup log file with the same number as the backup file is stored in the same folder, 4th Dimension examines its contents. If it contains operations not present in the data file, the program asks you if you want to integrate these operations.

*Note* Integration is done automatically if the "Integrate last log file..." option is checked (please refer to the "Integrate Last Log File if Database is Incomplete" paragraph on page 352).

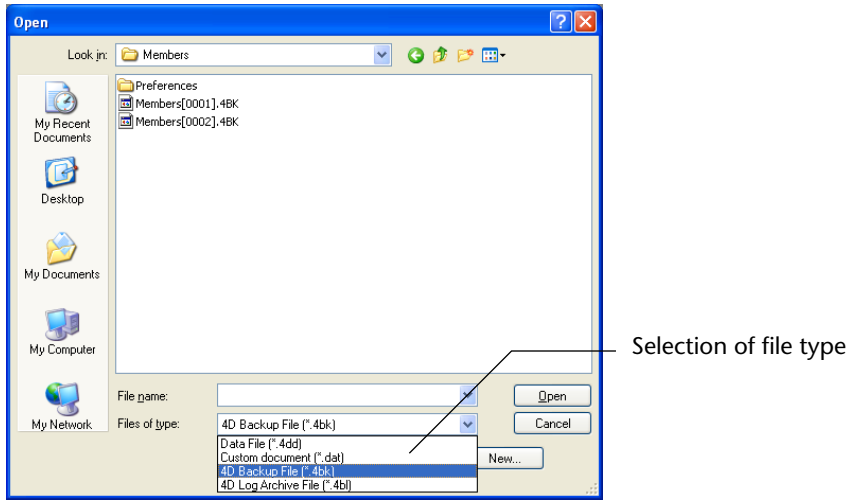
4 **(Optional) Click OK to integrate the log file into the restored database.**
If the restore and integration were carried out correctly, 4th Dimension displays a dialog box indicating that the operation was successful.

5 **Click OK .**

The destination folder is displayed. During the restore, 4th Dimension places all backup files in this folder, regardless of the position of the original files on the disk when the backup starts. This way your files will be easier to find.

## Manual Restoring via the Open Data File Dialog Box

It is possible to restore an archive in 4D application by holding down the **Alt** (Windows) or **Option** (Mac OS) key while launching the database. This displays the Open data file dialog box. The file type selection menu now contains two new options that can be used to access backup files (.4BK) and log archive files (.4BL):

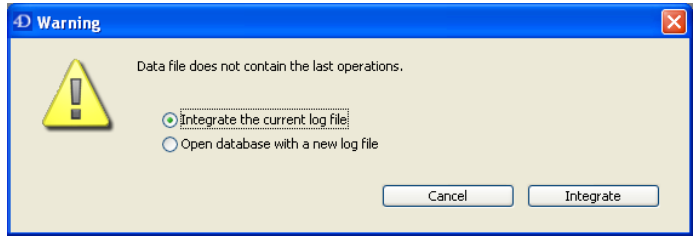



If you select an archive and click on **Open**, the restore process begins immediately.

This function, which is available for all 4D applications, is intended more particularly for those configurations that do not have a welcome dialog box, i.e. applications based on 4D Runtime, 4D Runtime Volume License and client-server applications.

## Manually Integrating the Log

If you have not checked the option for the automatic integration of the log file (see the "Integrate Last Log File if Database is Incomplete" paragraph on page 352), a warning dialog box appears during the opening of the database when 4th Dimension notices that the log file contains more operations than have been carried out in the database.



In order for this mechanism to work, 4th Dimension must be able to access the log file in its current location.

You can choose whether or not to integrate the current log file. Not integrating the current log file allows you to avoid reproducing errors made in the data.

## Successive Integration of Several Log Files

It is possible to integrate several log files successively into a database. If, for example, you have 4 log archives (corresponding to 4 database backups), you can restore the first backup then integrate the log archives one by one.

To carry out this operation, simply open the restored database into which you want to integrate the log files. 4th Dimension then displays the Open file dialog box which can be used to select the current log file (.4DL) or an archived log file (.4BL). If you select a valid .4BL file, 4th Dimension integrates it then displays the dialog box again so that you can select another .4BL file, and so on. This operation will be repeated until a valid .4DL file is selected, which will then lead to the database being opened.

## Undoing Operations

4th Dimension features a function that allows undoing operations performed on the log file. This function is similar to a multi-level cancel. It is especially useful when a record was deleted by error from a database.

In order for this function to be available, the database must have a log file.

► To restore a database to a previous state:

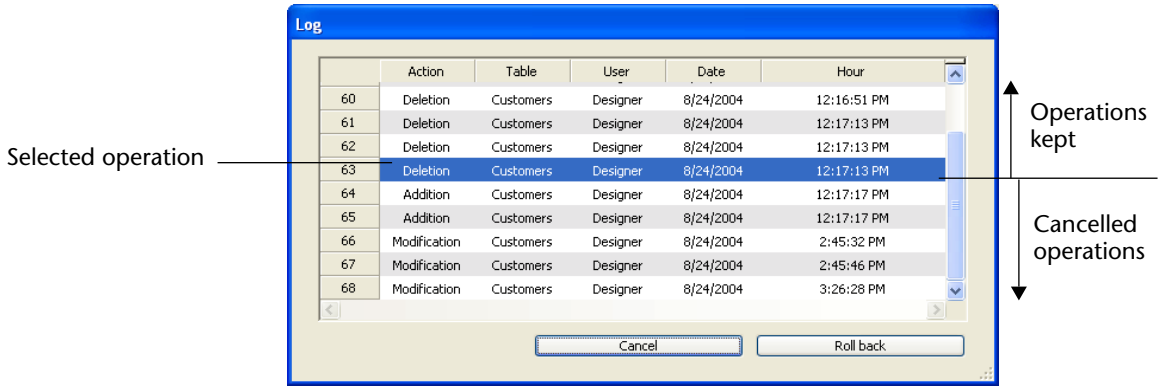
1 **Select the Check Log File... command in the 4th Dimension or 4D Server File menu (this function is not available on client machines).**

The log file operations dialog box appears. This window is detailed in the "Parsing a Log File" paragraph on page 345.

*Note* Only the Administrator and Designer of the database have access to check the log file.

2 **Select the row after which all operations must be cancelled.**

The operation of the selected row will be the last kept. If, for example, you wish to cancel a deletion, select the operation located just before it. The deletion operation, as well as all subsequent operations, will be cancelled:




3 **Click Roll back.**

4th Dimension asks you to confirm the operation.

4 **Click OK.**

The data is then restored to the exact state it was in at the moment of the selected action.

**How it Works**

When the user clicks the **Roll back** button, 4th Dimension shuts the current database and restores the last backup of the database data. The restored database is then opened and 4th Dimension integrates the operations of the log file up through to the selected operation.
If the database has not yet been saved, 4th Dimension starts with a blank data file.

# Backup Journal

To make following up and verifying database backups easier, the backup module writes a summary of each operation performed in a special file, which is similar to an activity journal. Like an on-board manual, all database operations (backups, restores, log file integrations) are logged in this file whether they were scheduled or performed manually. The date and time that these operations occurred are also noted in the journal.

When a backup takes place, the journal notes the following information:

For each archive:

Access path (for the archive, or the created or deleted log)
Size
Archive contents (data file, structure file, user structure file, index files, log file)

For each item in the archive:

File type
Original file size
Date/Time (starting time, scheduled time, ending time)

The backup journal is named “Backup Journal.txt” and is placed next to the database data file.

The backup journal can be opened with any text editor. To make parsing easier, information in the journal is separated with tabs and each line of information ends with a carriage return.

## Management of Backup Journal Size

In certain backup strategies (for example, in the case where numerous attached files are being backed up), the backup journal can quickly grow to a large size.
Two mechanisms can be used to control this size:

- Automatic backup,
- Possibility of reducing the amount of information recorded.

### Automatic Backup

An automatic mechanism can be used to limit the size of the backup journal: before each backup, the application examines the size of the current backup journal file. If it is greater than 10 MB, the current file is archived and a new file is created. The archived files are renamed “Backup Journal[xxx].txt”, where *xxx* is a number from 1 to 999. Once file number 999 is reached, the numbering begins at 1 again and the existing files will be replaced.

### Reduce Amount of Information Stored

It is possible to reduce the amount of information recorded in the backup journal. To do this, simply modify the value of the VerboseMode key in the *Backup.xml* file of the database. By default, this key is set to True.
If you change the value of this key to False, only the main information will be stored in the backup journal: date and time of start of operation and any errors encountered.

The XML keys concerning backup configuration are described in the *XML Keys-Backup* manual.

# 14 Importing and Exporting Data

4th Dimension's data importing and exporting capabilities provide a fast and reliable way to transfer information to and from your database. If you are upgrading to 4th Dimension from another database or a spreadsheet, you can avoid the work of re-entering the data from the keyboard by importing your data. You can import data from Windows data management applications, or any non-Windows application whose data has been transferred to Windows.

You can also export data from 4th Dimension so that it can be used in other types of programs that process information. For example, you can export data to a specialized graphics or statistics program. You can also transfer the exported data to another type of computer.

You can import or export data using the settings in the appropriate dialog boxes or using a form. Importing or exporting using the dialog boxes is faster than using a form. However, if you use a form you can use object and form methods to process data. When you import or export data using a form, the form and object methods are executed for every record that is processed.

When importing or exporting data via a file, you specify the file format, the field and record delimiters, and the fields to be imported or exported. Once you have defined your import or export settings, you can save or load them into or from Import/Export Settings files.

Finally, 4th Dimension lets you import and export data from and to an ODBC data source, without passing by an intermediary file. This point is covered in the "Importing and Exporting Data via an ODBC Data Source" paragraph on page 385.

*Note* You can also use the Quick Report editor to export records. See the "Disk File" section on page 202 for more information.

# File Formats

The file format describes the way in which fields and records are arranged in the import or export file. Some file formats also include formatting information. 4th Dimension supports the following file formats:

- **Text (ASCII)**: This format separates fields within a record with the end-of-field delimiter and records with the end-of-record delimiter. The default field and record delimiters are the Tab and Return, respectively. You can also include field names as the first row of an export Text file. If you include field names as the first row of an import Text file, you can tell 4th Dimension to use those names when it imports the file; otherwise, you can instruct 4th Dimension to ignore the row of field names.
- **Fixed Length Text Format**: The Fixed Length Text format allocates a specific number of characters per field. No end-of-field delimiter is used. All records have the same number of characters even if a the record's values can fit into fewer characters. When this happens, a fill character — usually a space — is used to pad fields. You can specify the fill character for each data type or use default characters (see the "Filling Page" sections on page 373 and page 384). However, if a value has more characters than the number of characters allocated to the field, the value will be truncated.
- **SYLK**: This stands for SYmbolic LinK format.
- **DIFF**: This stands for Data Interchange Format.
- **DBF (dBase)**: dBase is a file format commonly used in DOS and Windows database applications.
- **XML**: XML (eXtensible Markup Language) is a data exchange standard. This language is based on the use of tags that enable precise description of the exchanged data as well as its structure. XML files are Text format files; their content is parsed by the applications importing the data. Many applications support this format.
  For more information about XML terminology, refer to the *4th Dimension Design Reference* manual.
- **4th Dimension Format**: This format, which is specific to 4th Dimension, makes it easy to exchange records between different 4th Dimension databases. This format supports all of 4th Dimension's data types, including Picture and Blob. The 4D export file extension is ".4IE."

### Macintosh and Windows Files

When you import or export data, you can specify whether the import/export file will be for either the **Macintosh** or **Windows** environments. This option affects the choice of field and record delimiters[1] for Text files and whether an ASCII map is used:

- **Macintosh file**: The delimiters will be the standard ones used on Mac OS (End of field= **Tab**, End of record= **Return**, End of file= <**None**>).
- **Windows file**: The delimiters will be the standard ones used on Windows (End of field = **Tab**, End of record= **Return+Line feed**, End of file = <**None**>). In this case 4th Dimension's Mac OS/Windows conversion filter is used (remember that an internal filter ensures multi-platform compatibility of 4th Dimension databases by storing the data in Macintosh ASCII format).

For example, if you choose **Macintosh file**, the Carriage return (ASCII code 13) will be used as the record delimiter. When importing a Text file, 4th Dimension automatically converts any instances of Return plus Line Feed to Return only.

*Note* ASCII codes in 4th Dimension are given in decimal (base 10) numbers. A table of ASCII codes is included in the *4th Dimension Language Reference* manual.

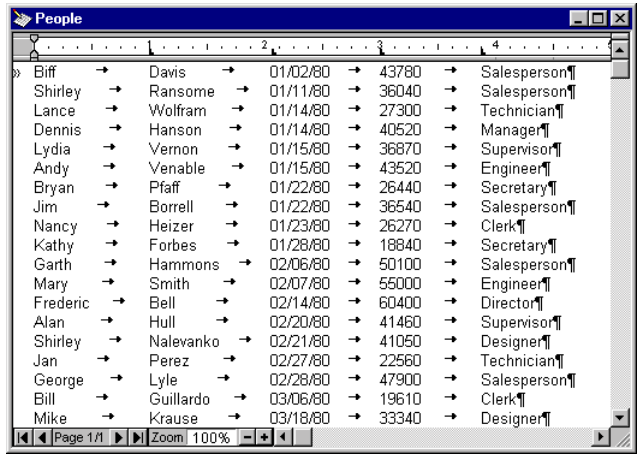
## Field, Record, and File Delimiters

End-of-field delimiters are placed between fields in a record and the end-of-record delimiter is placed after each record. End-of-file delimiters are placed at the end of the import or export file. They may be necessary when exchanging files with certain applications. Delimiters are used only with the Text and Fixed Length Text formats. The Fixed Length Text format does not use Field delimiters and, generally, neither text format uses an explicit File delimiter.

The following figure shows a text file as displayed in a word processor. The file is in Text format. This word processor displays the Tab character as an arrow ➔ and the Carriage return as a paragraph symbol ¶.

1. This option allows you to pre-enter values in the Delimiters Page of the Import or Export editor. You can also modify them directly on this page.

This is a Text format file:



People

| | | | | |
|---|---|---|---|---|
| Biff | Davis | 01/02/80 | 43780 | Salesperson¶ |
| Shirley | Ransome | 01/11/80 | 36040 | Salesperson¶ |
| Lance | Wolfram | 01/14/80 | 27300 | Technician¶ |
| Dennis | Hanson | 01/14/80 | 40520 | Manager¶ |
| Lydia | Vernon | 01/15/80 | 36870 | Supervisor¶ |
| Andy | Venable | 01/15/80 | 43520 | Engineer¶ |
| Bryan | Pfaff | 01/22/80 | 26440 | Secretary¶ |
| Jim | Borrell | 01/22/80 | 36540 | Salesperson¶ |
| Nancy | Heizer | 01/23/80 | 26270 | Clerk¶ |
| Kathy | Forbes | 01/28/80 | 18840 | Secretary¶ |
| Garth | Hammons | 02/06/80 | 50100 | Salesperson¶ |
| Mary | Smith | 02/07/80 | 55000 | Engineer¶ |
| Frederic | Bell | 02/14/80 | 60400 | Director¶ |
| Alan | Hull | 02/20/80 | 41460 | Supervisor¶ |
| Shirley | Nalevanko | 02/21/80 | 41050 | Designer¶ |
| Jan | Perez | 02/27/80 | 22560 | Technician¶ |
| George | Lyle | 02/28/80 | 47900 | Salesperson¶ |
| Bill | Guillardo | 03/06/80 | 19610 | Clerk¶ |
| Mike | Krause | 03/18/80 | 33340 | Designer¶ |

Page 1/1 Zoom 100%

When importing data using the Text format, 4th Dimension uses the delimiters embedded in the file to determine where fields and records end. When exporting data, 4th Dimension automatically places these delimiters in the file for you.

Be certain that fields do not contain embedded characters that are also used as field or record delimiters. For example, if the Carriage return is used as the record delimiter, no field should contain a Carriage return. When importing data, 4th Dimension will interpret any Carriage return as a record delimiter. Thus, a Carriage return inside a field will be erroneously interpreted as the end of that record. An improperly placed Carriage return will disrupt the importing process.

When you export data that includes a Text field, a Carriage return might be embedded within the Text field. If this is a possibility, choose another record delimiter or remove the embedded Carriage returns prior to exporting the data.

# Importing Data from Files

You can import data from files in XML, 4th Dimension, SYLK, DIFF, DBF, Text, or Fixed Length Text formats. If you are importing data that has been exported from another application, see that application's documentation for information about exporting the data in one of these formats. If the other application uses a different format for exporting data, you may need to modify the file in advance using a text editor or word processor.

If you are importing data from another application running on the same platform as your database, first export the data using the other application.

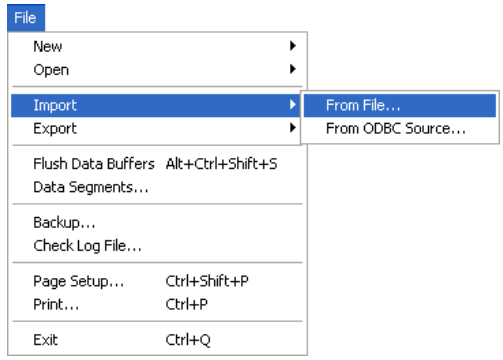
Note the order in which the fields were exported, the format the application uses to save the data, and, if the Text format was used, the delimiters used by the application. When importing the data, you must match these settings.

You do not need to build your entire table structure before you import data. You can create the required tables directly from the Import dialog box.

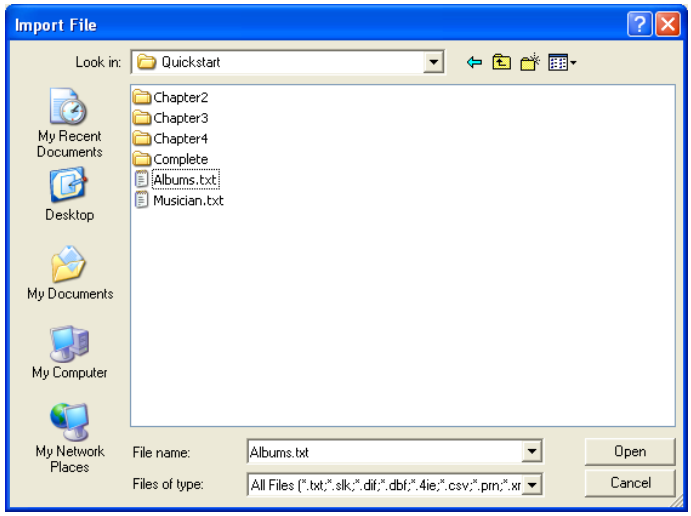
You have the option of selecting the fields for which data will be imported in the Import dialog box or specifying an input form that contains the fields for which data will be imported.

► To import data:

1 **Choose Import > From File... from the File menu of 4th Dimension.**



4th Dimension displays an open-file dialog box.

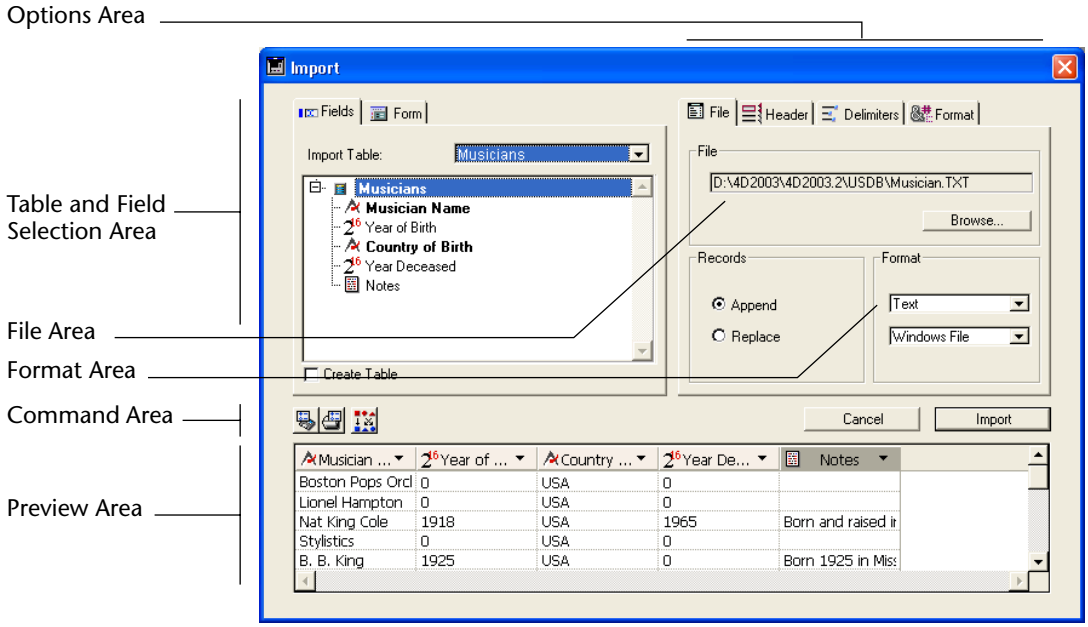



2 **Select the type of file to be imported: XML, Text, DIFF, DBF, SYLK, or 4IE (optional).**

For more information about file types, please refer to the "File Formats" section on page 362.

3 **Select the file to import and click Open.**

The Import Editor appears:



The **File** area shows the pathname of the file to be imported. If you want to import another file, click the **Browse** button to choose the file.

4 **In the Format area, select the type of the import file and its format (Macintosh or Windows).**

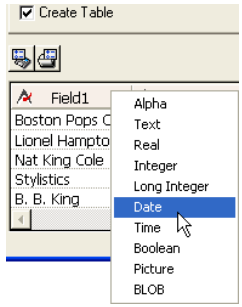
For more information on these choices, please refer to the "File Formats" section on page 362 and the "Macintosh and Windows Files" section on page 363.

5 **In the Table and Field Selection Area, choose the table and the fields into which you want to import the data.**

You can choose one of the following options:

- **Import data into an existing table and fields**: Select a table from the Import Table drop-down list (by default the first table is selected). The hierarchical list allows you to view and select the fields into which you want to import data.
- **Create a new table for the data import**: Check the **Create Table** check box. 4th Dimension will then create a new table into which it will import the data. 4th Dimension determines the number of fields and the type of each field according to the data being imported.

  If you want to change the name of the new table or a field, double-click on it in the Table and Field Selection area so that it becomes editable[1]. You can also change the data type for the new fields by clicking on the field's title bar in the Preview Area.
  A pop-up menu displays the different types available.




1. If the Text file contains a row of field names, you can instruct 4th Dimension to use those names. For more information, please refer to the "Header Page" section on page 371.

The table is created only during the import. If you cancel the import or deselect the option, the database structure remains unmodified.

*Note* With the Password Access System, you can deactivate the **Create Table** option to prevent users from creating a new table in the database from the Import Data dialog box. To do so, use the Preferences dialog box to create an access group that has access to the Design environment (of course, the 4th Dimension password access system must first be activated). Users not included in this access group are not allowed to select the **Create Table** option in the Import dialog box. For more information, please refer to the *4th Dimension Design Reference* manual.

- **Import data using a form**: This option is discussed in detail in the "Importing Data Using a Form" section on page 370.

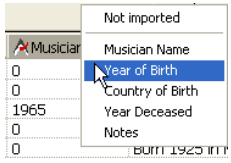
The Preview Area displays the contents of the import file as columns of data. If you import data using a form, all the fields of the form are displayed. You can resize each column by selecting and dragging the boundaries of the title bar with the mouse.

6 **If necessary, in the Preview Area, use the pop-up menus in the header area to select the fields into which each column in the import file will be imported.**

*Note* This feature is not available if you checked the **Create Table** option or import data using a form.

Resizing a column affects the number of characters allocated to the column if you are using the Fixed Length Text format. Otherwise, it only affects your view of the columns.

The title bar for each column indicates the name of the field into which the column will be imported and its data type. If necessary, use the pop-up menu to select a different field:



You can also select the **Not imported** option. In this case, the column of data is not imported.

Value to Field button

- **Value to Field** This button allows you to "intelligently" assign columns from the import file to the fields in the table according to their type and not according to the order in which they appear. The data type of each column is estimated and it is assigned to a compatible field. The interpretation is done in the following manner:

| Estimated Field Type | 4D Type |
|---|---|
| All numbers | Real (Number) |
| True/False | Boolean |
| Date in one of 4D formats | Date |
| Time | Time |
| Other | Alpha |

If no compatible field is found, the column is not imported. If you want to import the column, you must assign a field to it manually in the Preview Area using the column's pop-up menu in the header area.

*Note* This option is not available if you use a form for the import or if you check the **Create Table** box.

- **Number of characters for the Fixed Length Text file format**: When importing a Fixed Length Text file, the Preview Area displays the number of characters for each column below the field's data type icon. The number of characters assigned to each column is based on the first row of data. You can change the distribution of characters among the columns by dragging the column dividers in the header area or entering values in the field length areas, but you can't add characters to the row.

7 **In the Records area, indicate if the imported records should replace the current selection (the Replace option), or if they are to be added to the existing data (the Append option).**

8 **Choose any other import options using the Header, Delimiters, Fill, XML and/or Format pages (optional).**

These options are discussed in the "Import Options" section on page 371.

9 **If you want to save your settings, click the Save Settings button.**

This option is discussed in the "Saving and Loading Import and Export Settings" section on page 390.

10 **Click the Import button to begin importing the text file.**

4th Dimension displays a progress indicator as it imports the data into your database.

## Importing Data Using a Form

If you want to import a text file into a form, click the **Form** tab located at the top of the Table and Field Selection Area. The advantage of using a form is that the form and object methods associated with it are executed as each record is imported. This allows you to process data while importing data from the User environment (i.e., without writing a custom import routine).

The list of forms in the selected table is displayed, so that you can choose a form for the import. The data will be imported into the fields on the form using the entry order of the form.

You can use forms that contain enterable variables and fields, but not buttons. The form method and the methods associated with variables and fields will be executed when each record is imported. Note, however, that the effects of these methods are not shown in the Preview area.

If you use a form for the import, please keep the following considerations in mind:

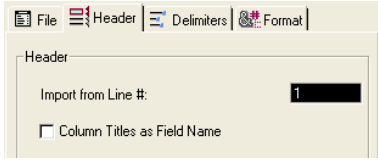
- The entry order of the form determines the order in which the columns of data are imported. You should make sure that the entry order of the form matches the order of the columns in the text file.
- If there are fewer fields and variables on the form than columns in the text file, the extra columns will be ignored.
- A form used for import should not contain buttons. Also, subform objects are ignored.

## Import Options

4th Dimension offers you various import options that are accessible through tabs in the Options area. The number of tabs (between 1 and 5) as well as their contents vary and depend on the type of file used and the options selected.

### Header Page

This page is available only for imports from Text and Fixed Length Text files. Two options are available:

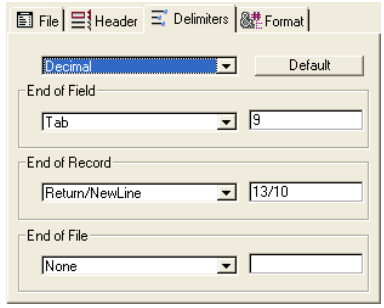



- **Import from line #**: This option allows you to specify the first line in the text file that will be imported. Use this feature to tell 4th Dimension to skip over header information — such as titles or field names — in the import file. It is particularly useful when the import file starts with unformatted lines (title, date, etc.) because the import columns are calculated according to the format of the first line.
- **Column Titles as Field Name**: This option tells 4th Dimension to use the column titles as field names if you have selected the **Create Table** option.

Use these two options together, if needed. For example, if the import file starts with a title, followed by field names, followed by the first row of data, set the **Import from Line #** parameter to 2 and then check the **Column Titles as Field Names** check box.

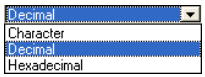
### Delimiters Page

This page allows you to specify the field, record, and file delimiters used in Text and Fixed Length Text files.



Delimiters are discussed in detail in the "Field, Record, and File Delimiters" section on page 363. To change the default delimiters, use the drop-down lists to the left of each area. These menus contain the values most frequently used for each delimiter.

You can also enter a delimiter into the entry areas on the right.

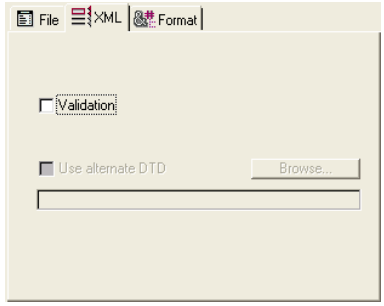



The drop-down list at the top of the page allows you to view the delimiters in different formats: **Character**, **Decimal** (default format), and **Hexadecimal**. Please note that, if you use unprintable characters as delimiters (such as Tab, Linefeed, and Return), the Character option will not show anything.

*Note* The delimiters are reset to their default values if you click the **Default** button or if the type of the document is modified on the **File** page.

## XML Page

This page is available for XML files only. It allows you to configure the parsing mode of the imported XML contents.




At the time of data import, 4th Dimension interprets the contents of the XML document in order to extract the information. By default, this operation is carried out without any specific validation. The XML document is assumed to be "well-formed," meaning that its structure is correct and its interpretation is unambiguous.

You can, however, request "validation" of the document at the time of import: to do this, check the **Validation** option. In this case, 4th Dimension parses the contents of the document based on its DTD (Document Type Definition) and checks that it corresponds to this definition. Import is only carried out if the document is validated.

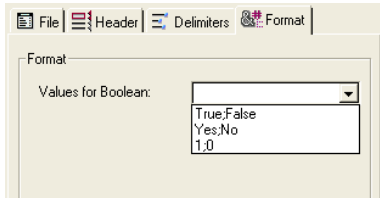
*Note* For more information on the DTD, refer to the "XML Page" paragraph on page 380.

If the DTD of the imported document is not included in the document itself, but is in a separate file, or if you want to use another DTD to validate the document, check the **Use alternate DTD** option and indicate the file containing the DTD using the **Browse** button.

Once the import is completed, the dialog box is closed and the table into which the data were imported becomes the current table.

**Format Page**

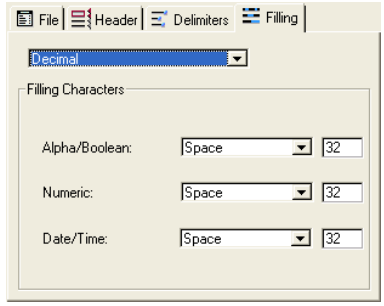
This page is available for Text, Fixed Length Text and XML files. It allows you to set the formats for imported Boolean fields.




The syntax to use is True_Value;False_Value. For example, if you import a column into a Boolean field whose values are “Black” (for true) and “White” (for false), you can enter Black;White.
The combo-box displays the most commonly used Boolean formats. You can enter any format that is not in the combo-box.

**Filling Page**

This page appears only for Fixed Length Text files. It allows you to define the fill characters to use for each data type. The default fill character is the space:




For more information about the Fixed Length Text file format, please refer to the “File Formats” section on page 362.

Different fill characters can be used for three data types: **Alpha/Boolean** (Boolean fields are imported as alphas), **Numeric** (Integer, Longint, and Real) and **Date/Time**.

Normally, the space is used to pad fixed format fields. The drop-down lists contain other choices. The entry areas to the right display the selected fill character. If you wish to use other characters, enter them directly in the entry areas.

The menu at the top of the page allows you to view the fill characters in different formats: **Character**, **Decimal** (default format), and **Hexadecimal**. An unprintable fill character will not appear if you use the Character format.

# Exporting Data to Files

When you export data, you create a 4th Dimension, XML, SYLK, DIFF, DBF, Text, or Fixed Length Text file that can be opened by or imported by other applications. If you are exporting data for use with another application, see that application's documentation for information about importing data. Choose a file format and delimiters compatible with the other application.

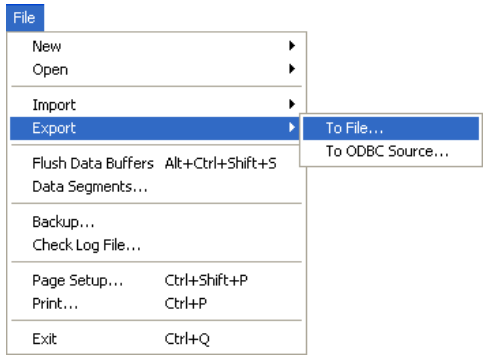
In some cases, you need to use one or more export options to structure the export file correctly for the target application. For example, some programs accept the Text file format but require that the first record consist of the field names. You can add this record using a Header option that is available in the Options Area. See the "Header Page" section on page 379 for more information.

4th Dimension exports the records in the current sort order. You can choose to export all the records of a table or the current selection only.

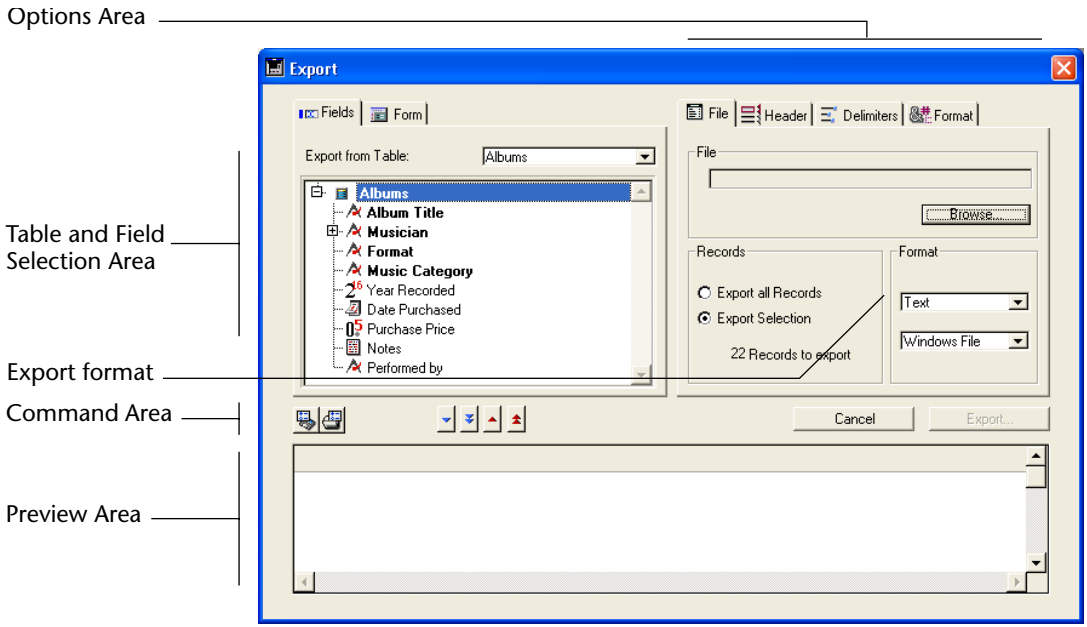
You have the option of selecting the fields to be exported in the Export Data dialog box or specifying a form. If you use a form, the fields on the form will be exported.

► To export data:

1 **Choose Export > To File... from the File menu of 4th Dimension.**




The Export Data dialog box appears.




2 **Choose the export format from the Format drop-down list— Text, Fixed Length Text, DIFF, DBF, SYLK, XML, or 4IE.**

For more information, please refer to the "File Formats" section on page 362.

3 **Choose the file type — Macintosh or Windows.**

This option sets the record delimiters and ASCII map that will be used in the export file. For more information, see the "Macintosh and Windows Files" section on page 363.

4 **Click the Browse button, enter a name and a location for the export file and click Save (optional).**

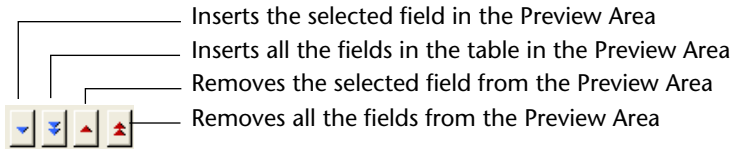
The Export Data dialog box reappears, with the export file's pathname shown in the File area. *This step does not start the export.*

*Note* If you skip these steps, you can also specify the name and location of the export file when you click the **Export** button.

5 **In the Table and Field Selection Area, select the table and the fields that you want to export.**

You can choose either of the following options:

- **Select the fields to export in the Export Data dialog box**
  If you use this option, choose a table from the Export From Table drop-down list to populate the Fields list with the eligible fields for the export. You then choose fields using the two blue buttons just above the Preview area. You can remove fields from the Preview area using the red buttons:




- **Export the data using a form**
  This option exports the fields on the form. This option is discussed in detail in the "Exporting Data Using a Form" section on page 378.

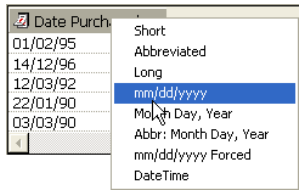
6 **In the Preview Area, modify the fields from which the data will be exported (optional).**

*Note* This feature is not available if you export data using a form.

Several modifications can be made using the Preview Area:

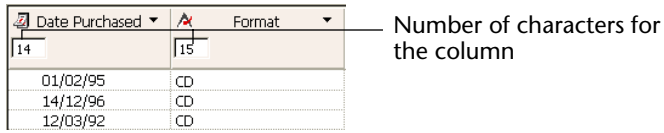
- **Choosing other fields**: The Preview area displays the contents of the export file as columns of data. The Header area for each column is a pop-up menu that you can use to change the field assigned to that column.

- **Specifying the export format**: The icon to the left of the field name indicates its data type. You can right-click to display a contextual menu of formats that are appropriate for the column's data type. If desired, choose a format from the contextual menu.




If you do not assign a format, the Default Format is used. A format can also be selected on the Format options page. For more information, see the "Format Page" section on page 383.

- **Changing the lengths of Fixed Length Text fields**: If you choose the Fixed Length text format, the Preview Area indicates the number of characters for each column. You can resize each column by dragging the column divider in the title bar with the mouse. If you are using the Fixed Length Text format, this changes the number of characters allocated to the column in the export file. You can set the exact number of characters by entering a value in the entry area below the field's data type icon. The default number of characters is as follows: Text fields have a length of 80 characters, Alpha fields have the maximum length assigned in the Design environment, and numeric fields have a length of 10 characters.

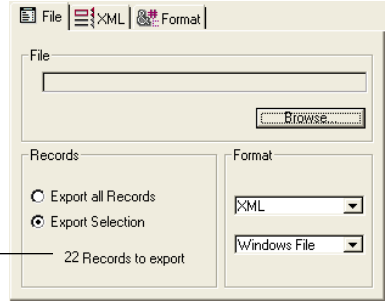



The fill characters are added at the end of alphanumeric fields and at the beginning of numeric fields.

- **Removing fields from the export file**: You can remove a column from the export file and the Preview Area. To do so, click the column's header and click the **Delete** button in the button panel . To delete all the fields, click the **Delete All** button in the button panel .

7 **In the Records area, indicate if you want to export all the records of the selected table (the Export all Records option), or only the current selection (the Export Selection option).**

In both cases, the number of records to be exported is displayed in this area.




Number of records to be exported

8 **Specify any other export options using the Header, Delimiters, Format, XML, and Filling pages (optional).**

These options are discussed in the "Export Options" section on page 379.

9 **If you want to save your settings, click the Save Settings button.**

This feature is discussed in the "Saving and Loading Import and Export Settings" section on page 390.

10 **Click Export to begin exporting to the disk file.**

If you have not specified the pathname for the export file (as described in step 4 on page 376), a standard save file dialog appears.

4th Dimension displays a progress indicator while the data is being exported.

## Exporting Data Using a Form

If you want to use a form for the export, click on the **Form** tab, located at the top of the Export dialog box. You can then choose a form from the list of forms for the selected table.

The main advantage of using a form is that the form method and the object methods associated with fields and variables are executed when each record is exported. This allows you to process the data during the export. Fields and variables will be exported in the order specified by the entry order of the form. Note, however, that the effects of these methods are not shown in the Preview Area.

Do not place buttons on the form. Subform objects are ignored.

*4D Server* It is not possible to export data using a form that includes methods in a stored procedure on the server. In fact, since form events are not managed by the server, the associated methods will not be called.

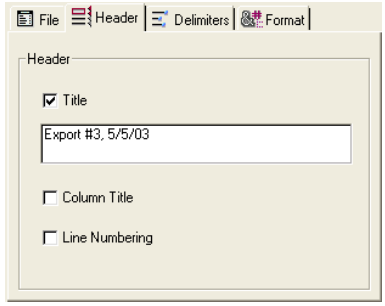
## Export Options

4th Dimension offers you various export options that are accessible using tabs in the Options area. The number of tabs as well as their contents depends on the type of export file and the selected options.

This section describes all the Export options pages; some may only be available for certain export file types.

### Header Page

This page is only available for Text and Fixed Length Text exports.




It allows you to add a title, row of field names, and/or a record number to the export file:

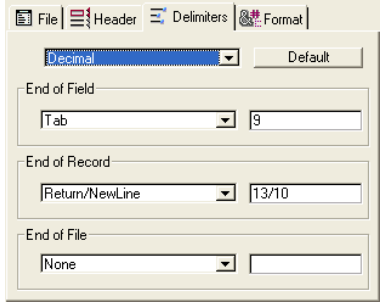
- **Title**: This option allows you to enter a title for the export document. Enter the title in the area below the check box.
- **Column Titles**: This option exports the field names as the first 'record' in the export file.
- **Line numbering**: This option numbers each line, which is each exported record. The numbering starts at 1 and increments by 1.

If **Title** is selected, it is the first row in the export file even if Column Titles is also selected. If **Column Titles** is selected, the field names follow the title (if also present) and precede the first row of data; for Text files, the field names are separated by the field delimiter.

If **Line Numbering** is selected, the line number precedes the first field in each row, i.e., the first field as specified in the Preview Area becomes the second field, and so on.

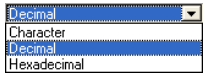
## Delimiters Page

This page allows you to specify the delimiters used in Text and Fixed Length Text files. It is not relevant for other types of export files.




Delimiters are discussed in detail in the "Field, Record, and File Delimiters" section on page 363. To modify the delimiters, you can use the drop-down menus to the left of each area. These menus contain the values most frequently used for each type of delimiter.

You can also enter a delimiter directly in the area on the right.

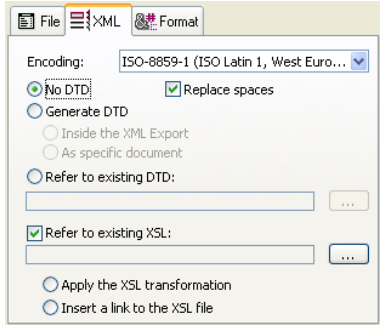



The menu at the top of the page allows you to modify or view the delimiters in different formats: **Character**, **Decimal** (default format), and **Hexadecimal**. Please note that if you use an unprintable character as a delimiter (such as a tab, linefeed, or return), the Character option will not show anything. The Decimal and Hexadecimal formats can display any character's ASCII code.

*Note* The delimiters are reinitialized to their default value if you click the **Default** button or if the type of the document is modified on the **File** page.

## XML Page

This page of parameters is only available for XML exports. It enables the configuration of the exported XML file contents:



- **Encoding**
  This pop-up menu is used to select the encoding (i.e. the set of characters) to be used for the XML document. The choice of encoding depends on the contents of the data to be exported and the application that will be using them. By default, ISO-8859-1 (ISO Latin 1, West European) coding is selected.

- **DTD options**
  When exporting in XML format, 4th Dimension allows you the choice of whether or not to generate a DTD (Document Type Declaration). A DTD records the set of specific rules and properties that the XML must follow. These rules define, more particularly, the name and contents of each tag, as well as its context.

  This formalization of elements enables you to check an XML document to make sure it is "valid" and is particularly useful in the case of recurrent tags in an XML document. Note that a DTD is not mandatory.

  To define the handling of the DTD, you must select one of the three following options:

  - **No DTD** (default option): When this option is selected, a DTD is not generated during export.
  - **Generate DTD**: generates a DTD during export. When this option is checked, the following subset of radio buttons enables you to specify the location of the DTD to be generated:
    - ***Inside the XML Export***: A DTD will be included in the XML file itself (internal DTD). The generated XML file is thus independent.
    - ***As specific document***: A DTD will be generated in a separate file (external DTD). An external DTD can be shared between several users and thus enables the harmonization of XML document structures generated from different sources.

*Note* 4th Dimension allows a table and a field to have the same name. However, the XML language prohibits the use of different elements having the same name. Consequently, when the "Generate DTD" option is used, the exported 4D data must not include a table and field having the same name; otherwise, the XML file generated is invalid and cannot be opened by an XML parser.

  - **Refer to existing DTD**: Using the associated **Browse** button, this option allows you to designate an existing external DTD file.

4th Dimension will include a reference to this DTD in the exported file.

- **Replacing spaces**
  The **Replace spaces** option causes “space” characters to be replaced by underlines (“_”) in value name fields of the XML file generated. This option is checked by default since spaces are not allowed in XML value name fields.

  However, it is possible to uncheck the option when necessary for specific purposes. In this case, of course, the generated file will not be in conformity with the general syntax rules defined by the W3C for XML.

- **Refer to existing XSL**
  XSL (eXtensible Stylesheet Language) enables visual representation of the elements defined in an XML document. This language is used to schematically define the style sheets that can be used to process and display the contents of an XSL document. Using the **Browse** button, the **Refer to existing XSL** option allows you to associate an XSL file for the exported data.

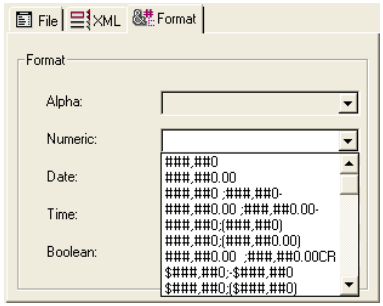
*Note* For more information about the support of XSL, refer to the *4th Dimension Language Reference* manual.

When an XSL file has been selected, you must set up how it will be used with exported data using two options:

- **Apply the XSL transformation**: When this option is checked, 4th Dimension performs the transformation of XSL data directly on the set XSL document at the moment of export.
- **Insert a link to the XSL file**: When this option is checked, 4th Dimension only inserts the reference to the designated XSL in the exported document (the transformation is not carried out). The exported XML file will therefore contain references to this XSL file.

**Format Page**

This page allows you to set the export formats for Alpha, Numeric, Date, Time, and Boolean fields. This option is available for Text and Fixed Length Text exports. By default, 4th Dimension's standard formats are used.




► To assign an export format:

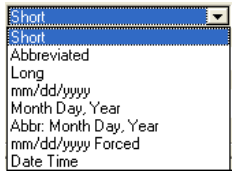
1 **Select a column in the Preview Area.**

The combo-box corresponding to its data type becomes enabled.

2 **Choose a format from the combo box or (for Alpha, Numeric, or Boolean data types) enter a custom format.**

*Note* You can also set a column's export format using the contextual menu in the column's header area (see the "Exporting Data to Files" section on page 374).

■ **About DateTime Format**



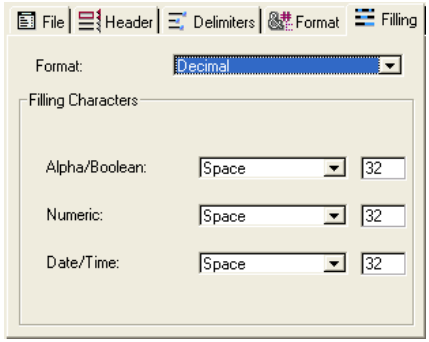

The **DateTime** display format is available for exporting date or time data. This format corresponds to the XML date and time representation standard (ISO8601 format). For example, in this format the date/time May 31, 2003 at 1:20 p.m. is noted 2003-05-31T13:20:00.

4th Dimension does not allow both a date and time to be stored in a single field. However, you can export data in this format so that the dates or times are recorded in conformity with the XML standard. If you export dates, the exported values will be of the style: 2003-05-31T00:00:00; whereas if you export times, they will be of the style: 0000-00-00T13:20:55.

*Note* You can import XML data recorded in this format. They can be stored either in a date or time field, depending on the information that you want to keep.

## Filling Page

This page is only relevant for Fixed Length Text exports. It allows you to define the fill character to use for each data type. You can specify a different fill character for Alpha/Boolean (Boolean fields are exported as Alpha fields), Numeric (Integer, Longint, and Real), and Date/Time values.




For a description of the Fixed Length Text file format, please refer to the "File Formats" section on page 362.

Most often, the Space character is used. The drop-down lists contain other possible values. The entry areas to the right display the characters selected. If you wish to use other characters, enter them directly in these areas.

The drop-down list at the top of the page allows you to view the fill characters in different formats: **Character**, **Decimal** (default format), and **Hexadecimal**. Please note that an unprintable character will be invisible if you select the **Character** format. The Decimal and Hexadecimal formats can display any character's ASCII code.

# Importing and Exporting Data via an ODBC Data Source

4th Dimension lets you import and export data from or to an ODBC data source.

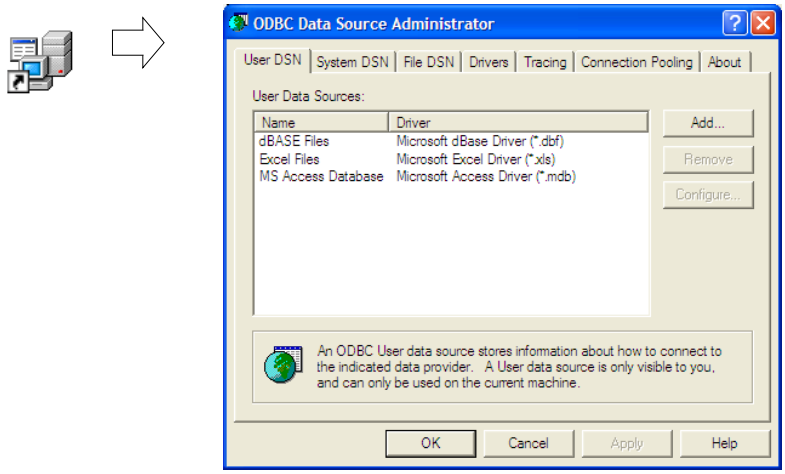
## What is an ODBC Source?

The ODBC protocol (Open DataBase Connectivity) is an interface allowing different applications to communicate between each other using SQL language. An ODBC data source is a permanently open "window" to a document belonging to an application, even when this application is not open. Many applications (databases, spreadsheets, data managers, etc.) allow publishing data as an ODBC source using a specific ODBC driver.

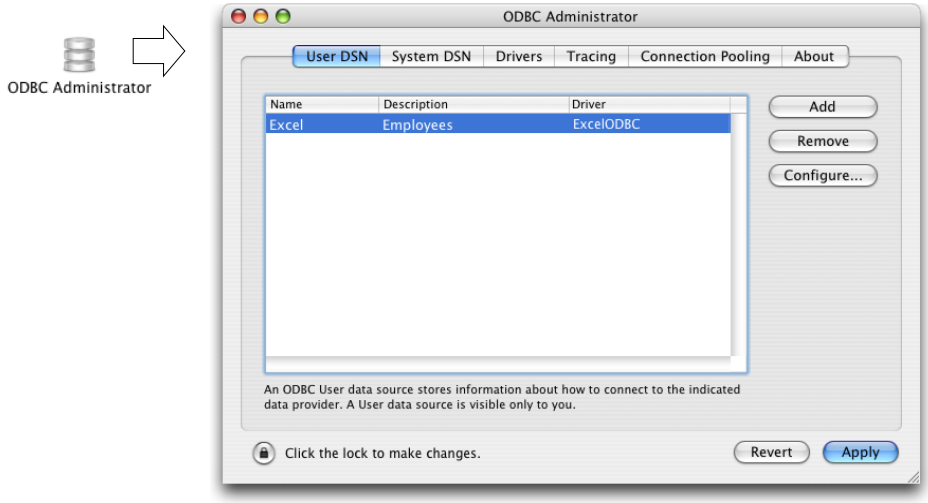
Any application supporting the ODBC protocol can read or write data in an ODBC source. The 4th Dimension import function allows getting data from an ODBC source while the export function allows inserting data into the ODBC source.

## Defining an ODBC Source

- Under Windows, the definition of an ODBC source is carried out using the **Administrative Tools** then **Data Sources (ODBC)** configuration panel:



- Under Mac OS X, the definition of an ODBC source is carried out using the **ODBC Administrator** program located in the **Utilities** folder:



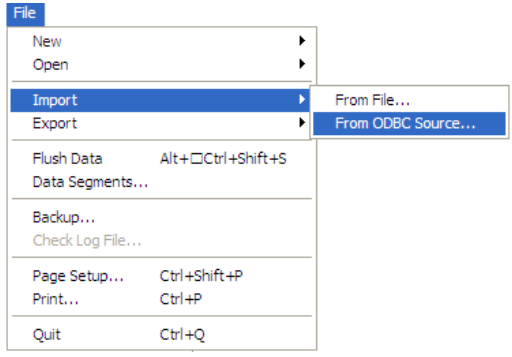

*Note* For more information on these dialog boxes, please refer to the operating system documentation.

## Importing Data from an ODBC Source

The concept of importing data from an ODBC source is the same as when importing other types of data, with the exception that an intermediary dialog box allowing you to select an ODBC source is used.

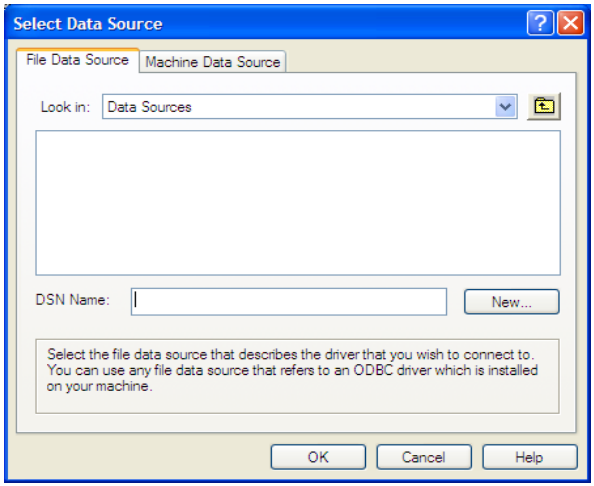
► To import data from an ODBC source:

1 **Choose the Import > From ODBC Source... command in the 4th Dimension File menu:**

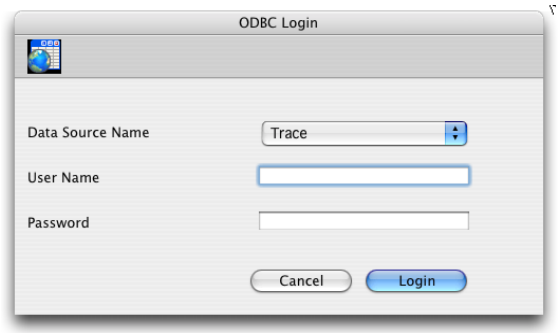


The select ODBC data source dialog box appears:

Windows

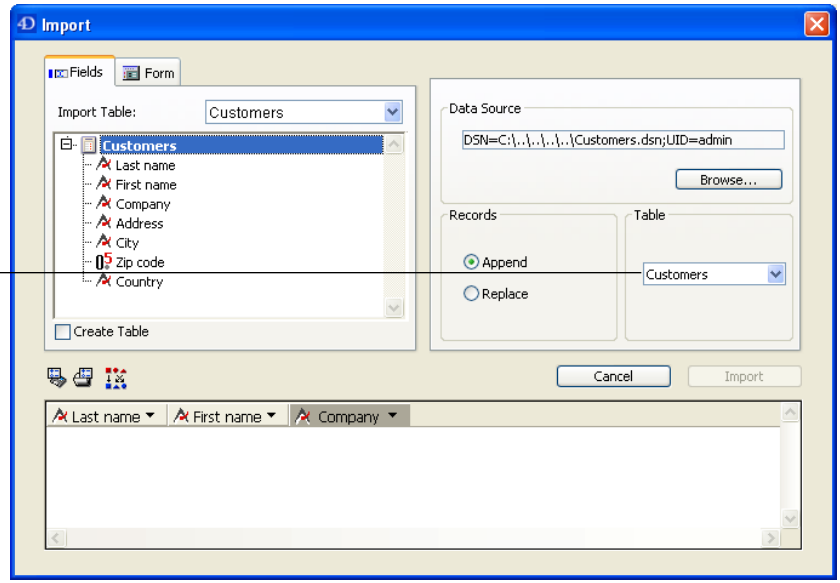



Mac OS




2 **Select the data source to use and click OK (Windows) or Login (Mac OS).**

The standard 4th Dimension import data dialog box appears:




Selection of SQL table

3 **On the right side of the dialog box, set (using the table selection menu) the SQL table from which you wish to import data.**

4 **Select the table and 4D fields into which the data must be imported or check the "Create a table" option (this option is not available for compiled databases).**

Like all other kinds of imports, the preview area displays matches between imported data and fields. You can also click the **Form** tab and import data using a form. For more information about these functions, refer to steps 5 and 6 in the "Importing Data from Files" paragraph on page 365, as well as the "Importing Data Using a Form" paragraph on page 370.

5 **Choose import options on the right side of the dialog box:**

- **Data Source**: This area describes the data source to which the database is connected. You can display the select data source dialog box again by clicking **Browse...**.
- **Records**: You can add or replace the records of the import table with data coming from the source.

6 **Click Import to import the data.**

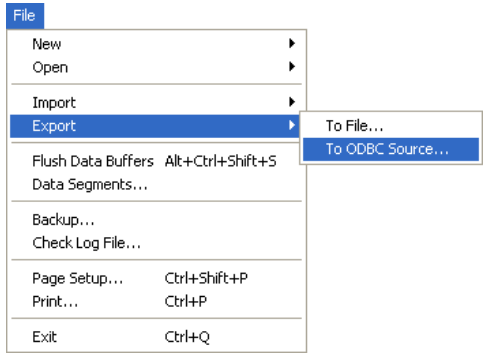
Once the data is imported, the connection between 4th Dimension and the data source is automatically closed.

## Exporting Data to an ODBC Source

The concept of exporting data to an ODBC source is the same as when exporting other types of data, with the exception that an intermediary dialog box allowing you to select an ODBC source is used. Also, exported data is not stored in a disk file but directly in the published ODBC data source.

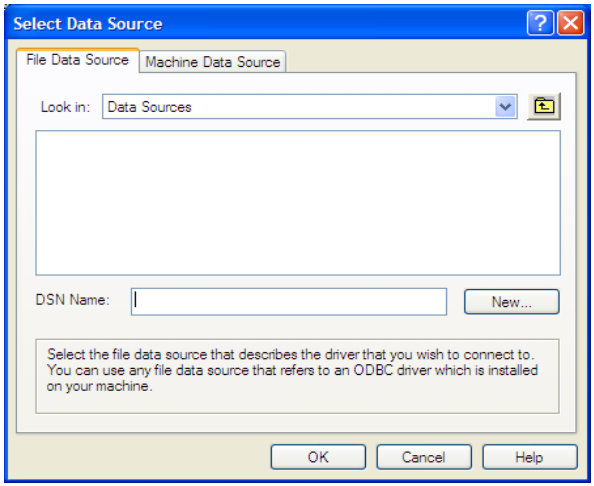
► To export data toward an ODBC source:

1 **Choose the Export > To ODBC Source command in the 4th Dimension File menu:**



The select ODBC data source dialog box appears:

Windows




Mac OS

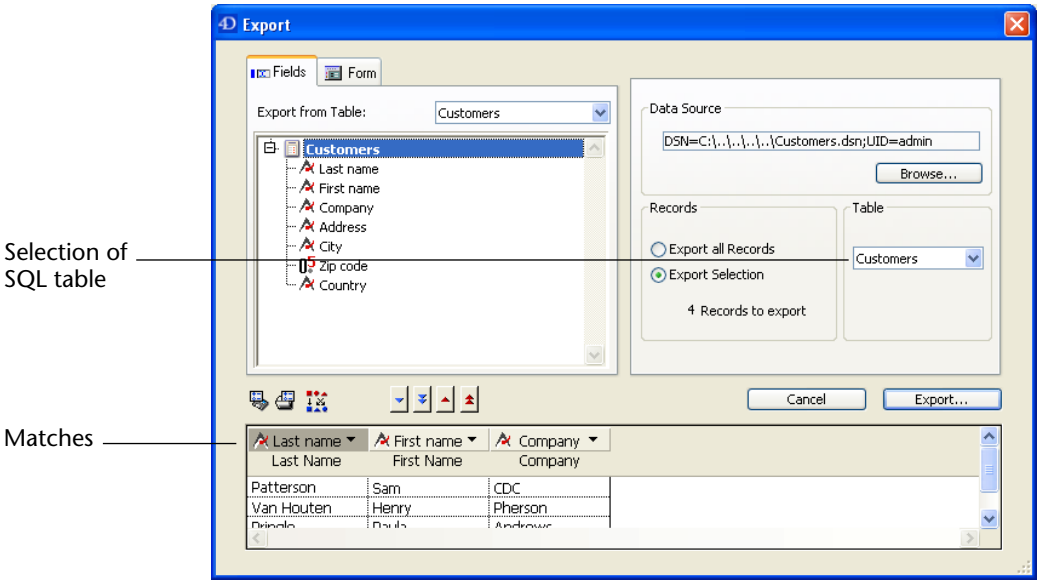
2 **Select the data source to use and click OK (Windows) or Login (Mac OS).**

The standard 4th Dimension export data dialog box appears.

3 **On the right side of the dialog box, set (using the table selection menu) the SQL table into which you wish to export data.**

4 **Select the table and 4D fields from which the data must be exported.**

Like all other kinds of exports, the preview area displays matches between exported data and fields. You can modify these matches.



You can also click the **Form** tab and export data using a form. For more information about these functions, refer to steps 4 and 5 in the "Exporting Data to Files" paragraph on page 374, as well as the "Exporting Data Using a Form" paragraph on page 378.

5 **Choose export options on the right side of the dialog box:**
   - **Data Source**: This area describes the data source to which the database is connected. You can display the select data source dialog box again by clicking **Browse...**
   - **Records**: You can only export the current selection or all records of the table.

6 **Click Export... to export data toward the ODBC source.**

Once the data is exported, the connection between 4th Dimension and the data source is automatically closed.

# Saving and Loading Import and Export Settings

The import and export dialog boxes allow you to save and load your settings to and from disk. A settings file stores all the settings specified in the Import or Export editor:

- Name and access path of file or ODBC source,
- Tables and fields selected and the name of the form, the export uses a form,
- Import and export options (file type, delimiters, etc.).

You can carry out this operation using the import-export dialog boxes of files and ODBC sources. However, projects saved in the ODBC import-export dialog box are not compatible with the standard import-export dialog box and vice versa.

- To save or load the import or export settings, click the corresponding button in the Command area:

Save Settings— —Load Settings

Import and export settings files have the extension ".4SI" on Windows (they are of "4DSI" type on Mac OS).This feature allows you to automate the import or export process. Using a settings file is particularly useful in conjunction with the IMPORT DATA and EXPORT DATA commands. For more information, please refer to the *4th Dimension Language Referen*ce manual.

*Note* An import/export settings file does not store filters because they are also related to the serial communication. If necessary, you will need to load an import or export filter before the operation.

# 15 Web Server

4th Dimension, as well as 4D Server and 4D Client have the ability to publish databases on the World Wide Web. When a database is published on the Web, a user can access it using a Web browser such as Netscape or Microsoft Internet Explorer. A Web user can perform all the standard data management tasks, such as viewing, adding, modifying, and deleting records. You can design a Web site using 4th Dimension by creating forms that function as Web "pages" and using the 4th Dimension engine as the Web server.

A 4D database can be published "as-is", so that Web browsers connect in the same manner as the 4D Client in Custom Menus environment. The 4th Dimension Web server automatically manages the conversion of forms into HTML (HyperText Markup Language) format — the data format used by Web browsers — and data integrity.

You can also define custom methods and static or semi-dynamic HTML pages and manage all the data sent and received by the Web server by programming.

Regardless of the Web server operating mode, you can continue to use your database in User or Custom Menus mode, for example entering or sorting records, even though the database is published. You can decide at any time to start or stop Web publication of your database.

When 4th Dimension publishes a database on the Web "as-is", it transparently translates the database's forms and design components into HTML pages. A Web user accesses the database through HTML versions of your custom menus and forms. You can also use 4th Dimension to publish static HTML pages, prepared, for example, using a WYSIWYG HTML generator. You can also encapsulate HTML on a 4th Dimension form. Within the encapsulated HTML, you can then implement JavaScript code that performs actions and data control on the user's Web browser, without requiring a request to be sent back to 4th Dimension.

When they become 4D clients, Web browsers are treated as "normal" database clients. For example, if a Web user modifies a record, 4th Dimension automatically locks the record, preventing any other concurrent user (4th Dimension/4D Client or Web browser) from modifying it. After the user validates or cancels the data entry, 4th Dimension automatically unlocks the record.

For a complete description of the process of setting up and managing a database as a Web site, see the "Web Server" section in the *4th Dimension Language Reference* manual.

The following subjects will be addressed in this chapter:

- Conditions for publishing the database as a Web server
- Publishing and stopping publication of a database from the User environment
- Testing the Web server.

# Database Publishing Conditions

In order for a database to be published as a Web server, the following conditions must be met:

- You must have a "Web Server" expansion license. For more information on this, please contact 4D or refer to the *4th Dimension Installation Manual*. If you do not have such a license, the Web server will function as a demo for one hour.
- Your computer must be connected to a network (Internet or Intranet) and the TCP/IP protocol must be installed on your operating system.
- Under Mac OS X, you must have set up the access to the TCP port for Web server publishing. For more information, refer to the "Web server configuration and connection management" section in the *4th Dimension Language Reference* manual.

# Starting and Stopping the Web Server

The 4D Web server is not completely automatic; it must be started and stopped by a database administrator. This can be carried out from 4th Dimension, 4D Client or 4D Server.

*Note* The Web server can also be started and stopped by programming (using the START WEB SERVER and STOP WEB SERVER commands). For more information, please refer to the *4th Dimension Language Reference* manual.

## Starting the Web Server

► To start the Web server:

1 **Check that the publishing conditions are met.**

These conditions are described in the "Database Publishing Conditions" paragraph on page 392.

2 **Choose Start Web Server from the Run menu (4th Dimension and 4D Client).**
**OR**
**Choose Start Web Server from the Web menu (4D Server).**

The command is dimmed when the Web Server is already running. If the network is not available, a warning dialog box will inform you of the fact.

The "Web Server" process, intended to manage Internet and/or Intranet access to the database, is then opened and the database is accessible to browsers.

When a database is published on the Web, the access rights defined for the User and/or Custom Menus environments are preserved in their entirety.
In the case of simultaneous and multiple accesses to the database (for example, when several different browsers connect to it), 4th Dimension automatically ensures the control of data integrity and the locking of records if necessary. In this case, the control of data integrity is identical to that carried out during 4D Client connections.

While your database is published on the Web, you can continue to work in the User environment, or continue to develop the database using the Design environment.

## Stopping the Web Server

► To stop the Web server:

1 **Choose Stop Web Server from the Run menu (4th Dimension and 4D Client).**
**OR**
**Choose Stop Web Server from the Web menu (4D Server).**

The command is dimmed when the Web Server is not currently running.

Choosing this command immediately stops the database publication on the Web.

*4D Server* Of course, this menu command does not stop database publication for 4D Client machines.

## Automatic Publication

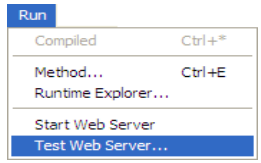
All databases created using 4th Dimension or 4D Server can be published as a Web server by default once it has been executed.

You can configure these settings in the Design environment, in the Preferences dialog box, **Web/Configuration** page: select **Publish Database at Startup**. For more information on this dialog box, please refer to the *4th Dimension Design Reference* manual.

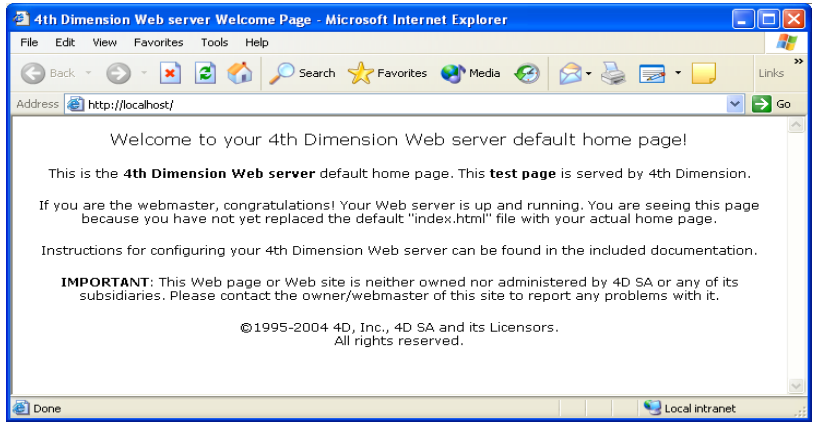
# Testing the Web Server

You can check the operation of the 4th Dimension or 4D Client Web server at any time from the machine containing the 4D application.

To do so, you just need to select the **Test Web Server...** command in the **Run** menu of 4th Dimension or 4D Client — when the Web server is launched:



When you select this command, the home page of the Web site published by the 4D application is displayed in a window of your default web browser:




This command allows verifying that the Web server, home page display, etc. are working correctly.

The page is called using the URL Localhost, which is the standard shortcut designating the IP address of the machine on which the Web browser is executed. The command takes into account the TCP publication port number specified in the application Preferences.

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