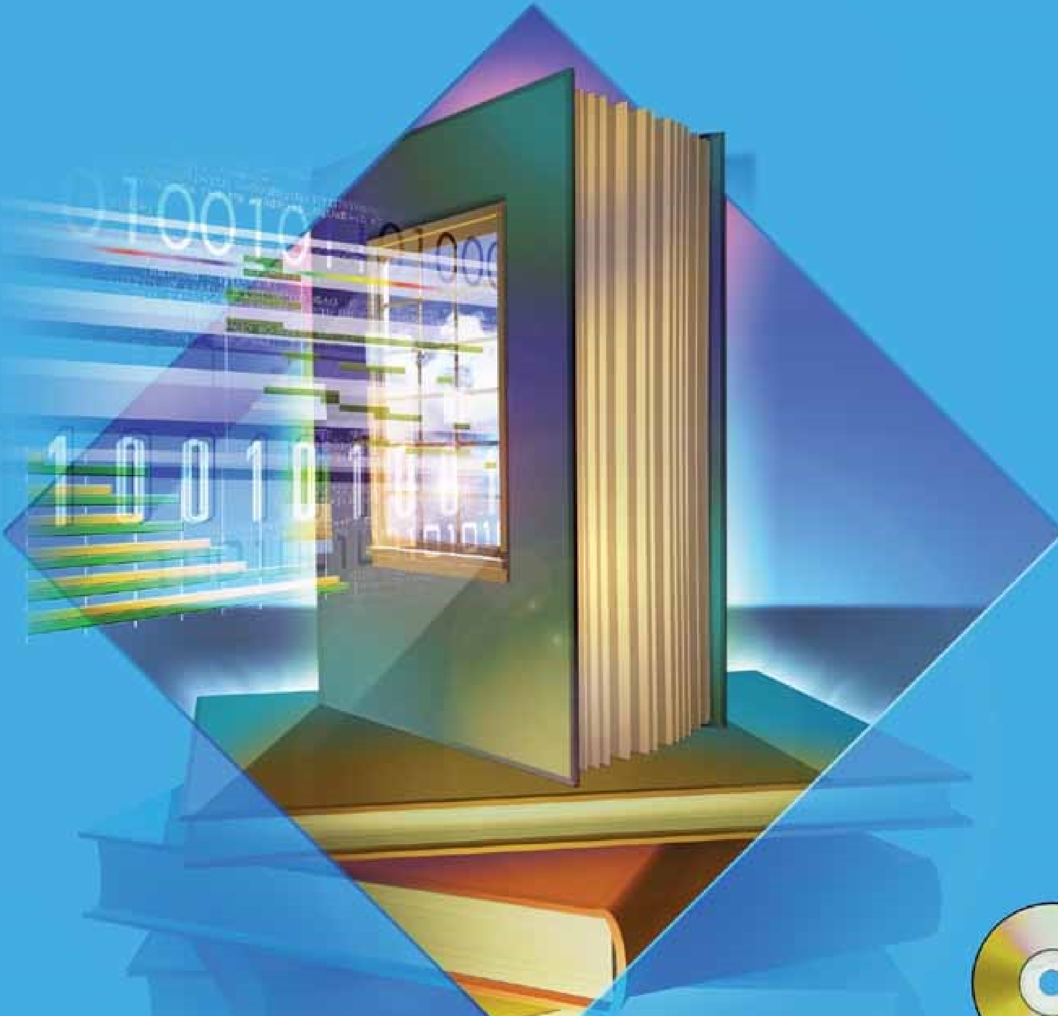
Mark Whitehorn and Bill Marklyn

ACCESSIBLE ACCESS 2003



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Accessible Access 2003

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This book is dedicated to

Pamela Mary Barham

(né Moulton),

who always meant to write a book,

but spent too much time on other people

ever to get around to it.

Acknowledgements

Top of the list has to be Mary Whitehorn, who contributed so much that by rights she should have been listed as another author, but she declined on the grounds of modesty (now that **is** rare in a writer).

Also up there are those ever-cheerful people at Springer Verlag – Beverley Ford, Rebecca Mowat and Sally Tickner who all worked hard behind the scenes and provided the drive and enthusiasm.

And finally, grateful thanks are due to the Three Crowns at Ullingswick. This tranquil establishment (with superb food) was where we planned the early stages of the project. Of course, as work progressed, further restorative visits were unavoidable....

Contents

Preface to the second edition?

Our first book on Access was entitled *Accessible Access 2000*. Given that this one is all about Access 2003, we clearly had to change the title. As soon as you change the title of a book, you get a new ISBN and technically it's a new book. However, since the original book seemed to be popular with its readers, we didn't want to change a formula that worked. So in truth this is essentially a second edition of that original book, updated for Access 2003.

Both of us seriously dislike technical books that are simply re-badged for newer versions of the software without being properly re-written where appropriate. With that in mind we have reread every word. We have checked every single example to make sure that they all still work and are all still relevant to Access 2003. We have retaken every screen shot in Access 2003 to make sure that they all match what you should see when using the product.

We have also added entirely new material on pivot tables/charts, Data Access Pages, object dependencies and file formats. Despite these additions, we hope we have managed to stick to the original ethos of the book, which was to concentrate on the core parts of Access, rather than drilling into too much detail.

Part I

Introduction

Chapter 1

Introduction

This is where we try to convince you to buy this book, tell you what it tries to do, define a few terms and generally set the scene – all of which makes this more like an introduction than a first chapter, but no-one reads introductions so we called it a chapter. If you have already bought the book and know what it does, feel free to skip to Chapter 2 where the action starts.

Why should you buy this book?

There are many Access books on the market, why should I buy this one? Does it have more information than any other book?

Errr, no, it actually has less than the big reference books you'll also find on the shelf.

So, is it very cheap?

Well, it isn't as expensive as some but, no, it isn't particularly cheap either.

To be brutally frank, you're not doing a great job of selling this to me.

Right, time for the hard sell.

Bill worked for Microsoft as the Development Manager for the first three versions of Access. I (Mark) work as a database consultant, teach database theory and practice at two Universities and have written the UK *Personal Computer World*'s database column for more than ten years.

We met (at a database conference, not unreasonably, given our interests) in the summer before Access 1.0 was launched and found that we shared similar views on how databases should be designed and built. Since then we have written a book together about the relational model that underlies Access and all other relational database systems (see below for the inevitable plug). But why write a book about Access itself when there are already so many around?

Well, since Bill was in charge of the product's development, it was fair to assume that we had the technical side reasonably well covered. I have been teaching people (students and IT professionals) to use Access since version 1.0 appeared and found that teaching Access was very different from teaching a package like Word.

When you teach people how to use Word, you find that you can spend most of your time concentrating on how to use the features that Word offers. You don't need to tell them what a letter is, or a paragraph, or italic font; they already know all that.

Access is a tool that lets you create databases and, in my experience, most people, including the IT professionals, who come on an Access course have never built a database before. (The people who have experience with building databases often simply pick up Access and start work with it, so I rarely see them.)

The people who do come on courses tend to know that databases are used to store data but the detail beyond that is usually hazy. So I found that I needed to teach them about the features that Access offers and at the same time teach them how use that knowledge to create a database. To give a concrete example, I would show them how to build a table and also tell them what a table did within a database. And when I taught them how to build a form I also told them how the form would be used in a database and how forms could interact with tables.

So when Bill and I planned this Access book, we had two very specific aims. We wanted it to tell you:

- how to get started with Access as rapidly as possible.
- how to use a particular set of features effectively and also why those features are important.

Ah, but which features to show you? We were also aware that Access is, to coin a phrase, a very feature-rich product. This is vital because building and managing databases can become a complex operation. But at the start it doesn't **have** to be. We have also endeavored to focus on the parts that are fundamental. After all, you are going to have to learn not just how to drive Access but also what all of the components are for. You don't want to be sidetracked right at the start into learning features that you may not need for years; indeed, that you may never need.

So one really strange end result of our design for the book is that we hope that you'll buy it, not for all of the Access detail that we have put in, but for all the bits we have left out. Considering that Bill was instrumental in designing Access, we really could have stuffed this book with a mass of information.

Instead we tried very hard to use my experience of teaching Access to describe just the core of Access – enough information to get you up and running but with no extraneous detail.

But once you have finished this book and you want to go on, for example, to become a professional Access developer, how do you find all of those extra bits that we don't tell you? You buy one of those great 1000+ page reference books that are available; there are some very good ones out there. So why not simply buy one of those now and save the cost of this one? Because this one will give you the framework that you need in order to use the information that those books contain.

So what do we cover?

We start by introducing the basic components of a database – tables, forms, queries and reports. We show you how to create simple examples of each using the Access wizards where appropriate. Then we cover each of them again, only this time we show you how to hand-build them so that you can achieve more than you can using just the wizards.

By that stage you should be comfortable with creating a simple database which stores its data in a single table. However, 'real-world' databases typically use multiple tables. So we show you why you need multiple tables and then run through those four components one more time, showing you how they can be used to create really effective multi-table databases.

What don't we cover?

In this book we have tried, as we said, to act as intelligent filters. A computer manual gives you every bit of information that you could possibly ever need; we are trying to give you only the most commonly used information. As a good example, Access provides so-called Input Masks that you can use to control what information can be placed in a database. Input masks can be composed of three different parts. However, the last two are optional and are rarely used in practice, so when we tell you about input masks we only cover the first part in any detail. This isn't because we don't know about the last two or because they are never used. It is simply that you can get 95% of the functionality of an input mask simply by understanding the first element. We think that the trade off is a good one, and that you can become productive much more rapidly. Another example is that Access offers a facility called globally unique identifiers. These are useful when you build databases in which some users will want to work on data when they are disconnected from a shared database – for example, traveling sales people. It is a really useful feature, but not one you are likely to build into your first couple of databases. So we tell you about it but don't go into the details.

We also don't cover the more advanced features like programming Access or using it to generate databases outside an intranet. We also don't cover, more than is absolutely necessary, the theory that underlies database design and operation. This is a practical book about how you use Access. However, and here is that blatant plug, if you find that you want to know more about the underlying theory and database design in general, take a look at *Inside Relational Databases*, by Whitehorn and Marklyn, published by Springer.

In addition, as mentioned above, I've been writing a database column in *Personal Computer World* for well over ten years. I've rewritten material from that into a database problems/solutions cookbook. Details are on the website: `www.MarkWhitehorn.com`.

How do we work?

As with our other books, I tend to write most of the actual words while Bill provides a wealth of information and enthusiasm, proof reading and generally tends to keep me on track. Since only one of us is in charge of the keyboard at any one time it often feels more natural to write in the first person – 'I prefer this', 'I recommend that' and so on. Since both of us see the text, you can assume that we both agree in general with the sentiments expressed, although paradoxically it may not always exactly be true. Consider the statement 'I get paid for developing Access applications and use wizards whenever I think that using one will save me time.' I (Mark) do indeed get paid for developing Access applications, Bill doesn't – he got paid for developing Access itself – but we both agree that wizards are a good place to start. At other times, we'll use 'we' when it happens to run off the keyboard more naturally, for example, 'we have included on the CD-ROM a file called...'.

Who are you?

You are a reasonably competent Windows and Office user who has no experience with Access. You want to be able to create and use a stand-alone database to store and track information.

Making these assumptions means we don't waste time (and words) going into endless detail about common Office operations like opening and saving files. Nor do we cover components that are common to both Office and Access, like, for instance, Graph.

So if you've already used Access (or another database system) to create multi-table databases that work effectively then, much as we'd like you to buy this book, we'd encourage you to buy one of the more detailed books.

What do you have?

We also presume you have Access installed on your computer. These days, the installation process is just another Windows task and we won't be walking you through it. We also assume that you have installed all of Access; if not, we recommend that you go back and install the missing bits. The only reason we say this is so that we don't have to keep on checking that you have installed the bits necessary for the different operations we show you.

Definitions

We don't want to load you down with lots of techno-babble but it is useful if we define a couple of terms before we start.

Database

A database is simply a collection of data. Nowadays the term tends to be used about computerized systems but the old cards which were used to classify and locate books in a library are a good example of a non-computerized database.

Relational DataBase Management System (RDBMS)

A database is a collection of data – perhaps a list of your customers, their addresses, fax numbers and so on. In order to keep the data in your database under control, you need software known as a DBMS. The DBMS is to a database what a word processor is to a letter. The former is the controlling software, the latter the data that it manipulates. Access is a DBMS. In fact, it is also a Relational DBMS, hence the acronym. The word Relational simply refers to the way in which the data in the database is organized and since almost all modern DBMSs are relational the R is almost superfluous but is still commonly used.

Database application

So, you can use Access (an RDBMS) to create one or more databases. You will also hear people talking about using Access to create 'database applications'. The distinction between a database and a database application is a relatively fine one. Technically a database is simply a collection of information. As soon as you start using Access (or any other RDBMS) to create a user interface that allows people to interact with the data, then you are creating a database application. In practice, the database and the database application tend to be created together in Access so the difference is not very apparent. However, it is more so with other RDBMSs, such as Oracle.

User

In recent times this unassuming word has, in certain circles, gained a pejorative flavor. It's a word we use throughout this book and always for its dictionary-defined meaning. There are times when we have to differentiate between you, the person using Access to create a database application, and those people who will make use of your completed application. 'User' is the obvious and appropriate word, and it is never used to imply any negative connotations.

Sample files

The CD supplied with this book has a folder called `AccSamp`. Within that folder is a set of files that are the example files that we generate and use in the book. We suggest that you copy the entire folder to a convenient location on your hard disk.

On our first book we provided a CD-ROM which had a batch file to move the files. This was, we discovered, a big mistake. Some people really don't like having files automatically placed on their disks, they like to choose where the files go. This time we are playing safe and letting you do it, so move the entire folder to the location of your choice. Since the files are stored on a CD-ROM they will be read only, even when they are moved. So select all of the files in the folder on your hard disk (highlight one of the files and press Ctrl-A), right click on them, select 'Properties' and deselect the 'Read Only' option.

All the MDB file names start with `chap` and the chapter number. For many of the chapters, you'll find files called `chapXstart.mdb` and `chapXend.mdb`: these are the files with which you should start work if you're following the examples and the file you should end up with once the example is complete. Sometimes there are intermediate files within a chapter; for instance, in Chapter 12 there are four files:

```
chap12start.mdb
chap12reports.mdb
chap12start2.mdb
chap12end.mdb
```

Occasionally there is no `chapXstart` file in a chapter where you start work from scratch and work towards a completed example.

What's in a name?

When it first appeared, Access was revolutionary in many ways – one was that it allowed you to use long names for objects like tables, forms etc. It also allowed you to include spaces in the names. This is great because it enables you to give tables meaningful names like 'Orders received'. It was also a major step forward compared to the PC-based DBMSs of the day such as dBASE which only allowed eight characters and no spaces. However, as Access applications were developed, an unexpected problem occurred. Many such applications became so successful that they were upgraded to client–server systems. (These are larger, more complex database applications where the data is held centrally and many people can use it at the same time. A typical example of client–server database software is a Microsoft product called SQL Server, another is IBM's DB2.) Sadly most of these client–server systems didn't, and some still don't, support long complex names like this. The result was that considerable work was often necessary to upsize these Access applications.

The situation is now considerably better for two reasons.

- For a while, Access has allowed you to create applications that are, right from the start, SQL Server compatible – so that if you ever do want to upsize the application to SQL Server the process is trivial. This is done using 'Projects' which are discussed briefly in Chapter 22.
- Version 7.0 (and above) of SQL Server does support long names and even spaces in those names (though other client–server systems and earlier versions of SQL Server do not.)

However, suppose you develop an Access application in the normal way (that is, you do not use a project file) and then you later discover that you want to move it to a client–server system. It may also turn out that you don't want to use SQL Server as the client–server system, in which case any long names and/or those with spaces are going to be a pain. So, our general advice is to keep names shorter rather than longer and not to use spaces. On the other hand, if you are developing a simple addressing database that you know will never be upsized, feel free to use any combination of characters and spaces that Access permits.

For clarity's sake we have chosen to ignore our own advice in this book and have used rather long names. This book is primarily a teaching aid and we felt that the gain in making things easier to follow was worthwhile.

Disclaimer

We've made every effort to ensure that the material in this book is accurate but we cannot guarantee that it works perfectly or that we haven't made mistakes (we are only human). If you find a problem with the book we'd love to know, so please tell us at `www.MarkWhitehorn.com`. You can also check out that site to see if we have posted any fixes for the material herein.

As a general rule, always work with a copy of your data when you're experimenting, developing or just simply playing. It's the simplest way to avoid problems and furthermore, knowing that you can't do any damage gives you greater confidence to experiment and learn by both your successes and your mistakes.

Lastly we'd like to say that the data in our examples is fictional and any similarity to any people in the real world is entirely coincidental... apart from some of our friends whose names do occasionally occur. But we don't expect them to sue us.

The 'd' word

Data: singular or plural? We know, correctly speaking, that datum is singular and data is plural. We also know that it sounds funny when used that way so we've gone with common usage and, with apologies to purists, merrily write 'data is' throughout.

Conventions and layout

This is a practical book so we continually tell you to type material into Access. Sometimes it seems clearer to use single inverted commas to outline exactly what we mean – for example, on page 50:

> Thus 'car???' will find Carmel...

At other times we have left them out because they seem superfluous. As a general rule Access doesn't expect single inverted commas around the information that you type in.

Most people don't read books from cover to cover; so we have occasionally repeated important points in different sections. To avoid too much repetition we have also sometimes cross-referenced between chapters. Either technique is irritating if carried out to excess, so we have tried to strike a reasonable balance.

Part II

Getting started

Chapter 2

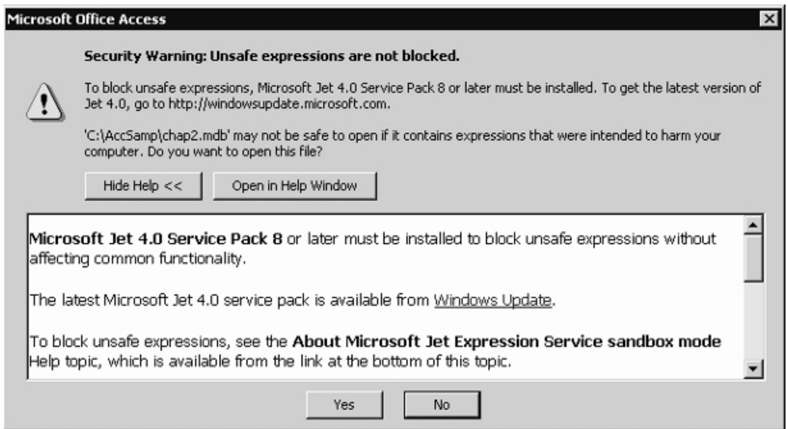
The Database wizard – or not

Access, like other Microsoft products, uses wizards to simplify and speed up commonly performed tasks. Wizards are an excellent way to learn how to complete a new task but they're not only there to help novices. Professional developers will often use wizards when appropriate, because they are the fastest way to achieve a basic end result. So, for example, I typically use the Form wizard to create a form because it does most of the ground work for me and then I modify it and make the changes I want using the Design view. On the other hand, I usually build queries from scratch without the query wizard because queries are so easy to build. The bottom line is that you shouldn't feel the need to apologize for using a wizard if someone catches you doing it. I get paid for developing Access applications and use wizards whenever I think that doing so will save me time.

Access provides a set of Database wizards which can be used to generate complete, working database applications. Since you are, presumably, reading this book because you want to be able to create complete, working database applications, it seems totally perverse not to start by showing you those wizards – but that's what we are going to do. We think these wizards are great and heartily recommend that you have a look at them and see what they can do. The only problem with using them lies, not in the wizards themselves, but in the diversity of databases. No matter how many questions a wizard asks you, it cannot really be expected to generate exactly the database you need. Just like the wizards for other tasks in Access, the best it can usually do is to generate a sort of 'first approximation' to what you want. That's fine, but it means that ultimately you are still going to need to know how to use the rest of Access in order to fine tune it. So we'll leave you to play with these wizards at your leisure and get started straight away with the 'rest' of Access.

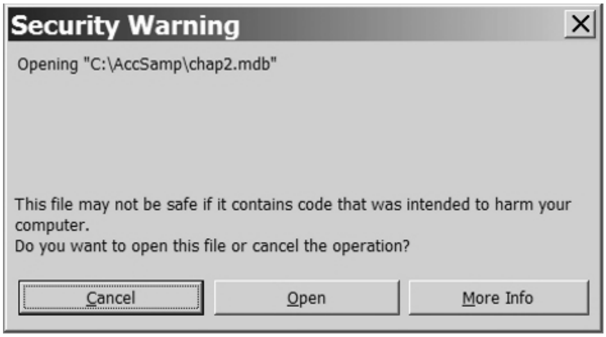
First steps

In the next chapter we'll get you to start building a database but in order to familiarize yourself with the components in Access we recommend that you start with one that already exists. We have included one on the CD-ROM called `chap2.mdb`. This is a database of names and addresses, a computerized address book if you like, which seems a reasonable place to start. The file is located in the `AccSamp` folder (see Chapter 1). Locate that file and double click on it. At this point you may get a message like this one:



To the best of our knowledge and belief, there are no 'unsafe expressions' in any of the files we supply on the CD-ROM, so you can probably click on 'Yes' to continue loading the file. Nevertheless it is a good idea to apply the service pack described by following the instructions in the dialog box.

However, even after you have applied it, you will still get a message like this one when you try to open files:

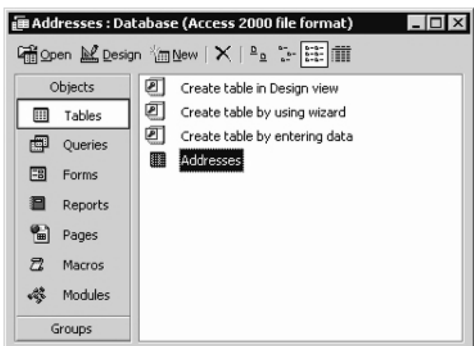


To the best of our knowledge and belief, there is no code intended to harm your computer in any of the files we supply on the CD-ROM. Microsoft is currently taking an extremely conservative approach and will warn you about this every time you open a file, even one that you have created on your machine.

Click Open if you want to go ahead and open the file.

The database window

This is what you should see: it's the database window for the `Addresses` database. It shows you all the various components of the database and lets you reach them.



The window has two gray title buttons on the left-hand side labeled Objects and Groups. In the screen shot above the Objects button has been clicked so that it shows seven tabs down the left hand side – Tables, Queries etc. Each of these relates to a type of object in Access.

The computing world seems to have adopted the word 'object' as its own; the word sounds so wonderfully decisive and exact. In some areas of computing, particularly programming, the word does have a precise meaning. However, we are using it to mean 'thing', but we dare not use that word for fear of sounding too lax and unprofessional.

The first four object types (reading from top to bottom) are the four main components of a database:

- Tables
- Queries
- Forms
- Reports

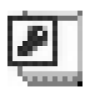
In the screen shot above, the Tables tab is active.

For most of this book we'll concentrate on these four but, just for completeness, we do explain the other three in the last two chapters.

We'll illustrate each of the top four components using the address book database, starting with tables.

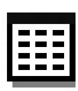
Tables – the fundamental building blocks

Click the first tab, Tables, if it isn't already active. At the top of the contents pane there are three options with an Access key symbol.



These identify various actions that you can perform from here, all concerned with creating new tables. We'll ignore these for the moment.

Below this is a symbol that indicates a table.



There's one of these, called `Addresses`.

Highlight the `Addresses` table and click Open, or double click on the table name. This is what you'll see.


Addresses : Table

AddressID	First Name	Last Name	Spouse Name	Address	City	State/Province	Postal Code	Country	Home Phone
1	Nancy	Davolio	Paul	507 - 20th Ave. E.	Seattle	WA	98122	USA	(504) 555-9857
2	Andrew	Fuller	Anne	908 W. Capital Way	Tacoma	WA	98401	USA	(504) 555-9482
3	Janet	Leverling	Robert	722 Moss Bay Blvd.	Kirkland	WA	98033	USA	(504) 555-3412
4	Margaret	Peacock	Michael	4110 Old Redmond Rd.	Redmond	WA	98052	USA	(504) 555-8122
5	Steven	Buchanan		14 Garrett Hill	London		SW1 8JR	UK	(71) 555-4848
6	Graham	Bell	Marion	1954 North Drive	Denver	CO	80206	USA	
7	Milly	Miles		1976 Sunshine Blvd	Philadelphia	PA	19102	USA	
8	Gordon	Pennock	Sophie	1212 Seasons Drive	Birmingham	AL	35284	USA	
9	Jo	Jackman	Annie	12 Lancaster Drive	London		EC1 5TU	UK	
10	Kim	Clarke		34A South Parade	London		SW1 9RT	UK	
11	Francis	Freeman	Laura	8 Ely Road	London		E1 8DF	UK	
12	Jennifer	Powell	Simon	23 Elm Road	London		SE7 9SK	UK	
(AutoNumber)									

Record: 12 of 12

The data in the `Addresses` table is set out in a grid, a method of displaying information clearly that's commonly used for sports scores, exchange rates, whatever. This view of a table is referred to as the Datasheet view.

Databases are all about storing data and tables are the basic containers that all databases use for holding data. The data in a table can be presented to us in a variety of ways but when you look directly at the data in a table it is typically presented like this, as a grid of intersecting rows and columns. All areas of expertise have their own terminology and databases are no exception, so you will find in practice that rows of data are also referred to as 'records'. Both terms are commonly used; people will say 'How many rows are there in that table?' and also 'How many records are there...'. In the same way columns of data are also called 'fields'.

Records and fields

Record and field are important database terms.

A record, in the context of an address database, is all the information you've gathered about where one person lives. A record comprises all the data about one entry in a table. If you had a sales database, each record would be likely to contain information about a single sales transaction.

A field equates to each piece of information you store in your database: last names, first names, phone numbers and so on. Each of these distinct types of information is stored in a separate field.

There'll be more on fields and records in Chapter 3.

You can navigate through the data shown here in several ways. Firstly you can move the cursor around the data in the table either with the mouse or with the cursor keys. (You can also use the navigation tools at the bottom of the window but we'll illustrate these in just a moment).

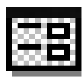
❛ *The title bar that heads every Access window and dialog box can be a useful clue to what you're seeing. The bar in the previous screen shot says 'Addresses: Table', identifying the object type (Table) and giving its name (Addresses).* ❜

In practice, people mostly view the data in a database with a form (see below) but occasionally looking at the table as we have done here helps give an overview of the data.

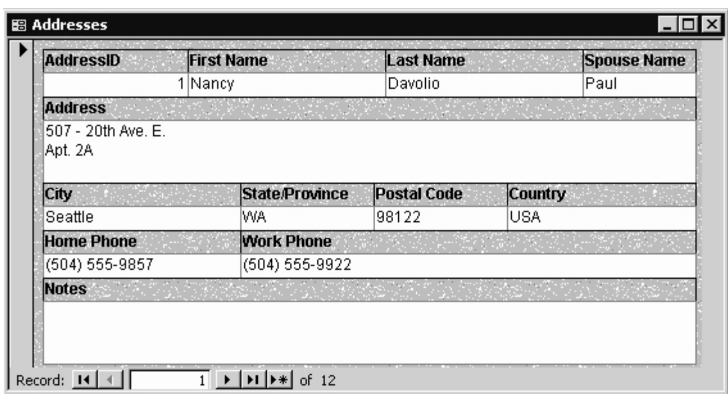
Click the Close button to return to the database window.

Forms – and their function

Click on the Forms tab (we've skipped the Queries tab but we'll be back) where there is one form called Addresses. This is the icon that identifies a form:



Double click on Addresses and you'll see this.



This is a form: it looks similar to the many paper forms that cross our paths. Forms are the main way in which users of the database interact with the data.

They usually present the data in a more user-friendly fashion than the table view. Forms can also be attractive to look at, a factor which is surprisingly non-trivial. Users are almost invariably happier to interact with a database through well-designed forms that look good and have their components set out neatly and clearly. Good form design can make users more efficient and give greater satisfaction. If that doesn't convince you that form design is important – remember that happy users are more likely to generate repeat business for database designers...

You can build many forms for a single database, indeed you can build many forms for any given table within a database. Why would you want to do that? Well, for a start, any given form doesn't have to show all the fields in a database. If you wanted to scan a table to find a contact's fax number, you could use a form which showed just the people's names and fax numbers. This would allow you to concentrate on the job without the distraction of the other fields. Another reason might be that in a business application, personnel staff could use a form showing all of an employee's data except medical records and the medical officer's form would show just the medical records. Other employees could use a form showing limited information, like phone number at work and email address. It is also possible to restrict access to these forms so that only the medical officer can see the form that shows the medical data.

Furthermore, a form can be based upon a query: the query will sort out a subset of the information stored in the database and a form based upon that query will provide user-friendly access to that information. The user of the form is thus saved from having to expend energy looking through irrelevant data.

So forms can be tailored to the needs of those using them, both in terms of content and of style. There can be data entry forms, forms for editing data and for simply displaying it. In some companies, telesales staff might appreciate a jazzier style than the executive officers. *Not that we wish to imply, for even a second, that EOs are boring (after all, they are also concerned with the repeat business process...)*

You can move around the records using the controls which appear at the bottom of all Access database forms. The small buttons show VCR-type control symbols.

- The single arrowheads move you one record at a time backwards and forwards through the database.
- The arrowheads with a vertical bar alongside take you to the first or last record in the database.
- The arrowhead with an asterisk alongside takes you to a new blank record where you can enter a new set of details.

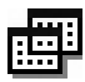
- The box sandwiched between these controls shows you the number of the current record.
- Just to the right of these controls is the total number of records in the database.

Try moving through records one by one using these controls (it won't take you long as there are only twelve records in the sample data) and then jump back to the beginning. You can also move around the form's fields with the arrow keys on your keyboard. The Tab key works too: it steps through the fields and, on reaching the last field in a record, it moves to the first field of the next record.

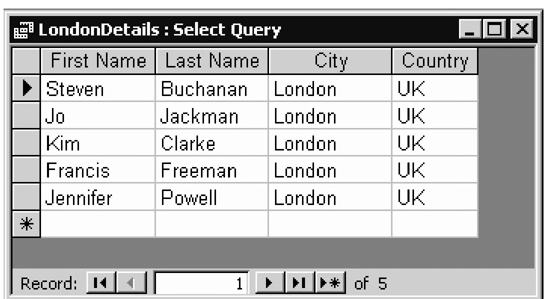
Queries – questions, questions, questions...

A query is, as the name suggests, a question that you ask of your database. When you 'run' the query, Access searches for the data you have requested and presents it to you in a table. We have built a query called `LondonDetails` that looks for records in the table that relate to people who live in London. The query has also been designed only to supply the data from four of the 12 fields in the table.

Click the Close button to leave the form and click the Queries tab back in the database window and double click on LondonDetails. Queries are identified by an icon looking like this:



The answer appears in what is, with perfect logic, called an answer table.



LondonDetails : Select Query

First Name	Last Name	City	Country
Steven	Buchanan	London	UK
Jo	Jackman	London	UK
Kim	Clarke	London	UK
Francis	Freeman	London	UK
Jennifer	Powell	London	UK

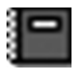
Record: 1 of 5

Think of a query as being a stored question. The very act of double clicking it sets the question in motion and what you see is the result, or the answer, that the query has found. The reason we suggest that you always think of queries in this way (as a question rather than as a fixed answer) is simple. If you change the data in the table and then re-run the query, you will get a different answer table (assuming that you have, in this case, added a person who lives in London).

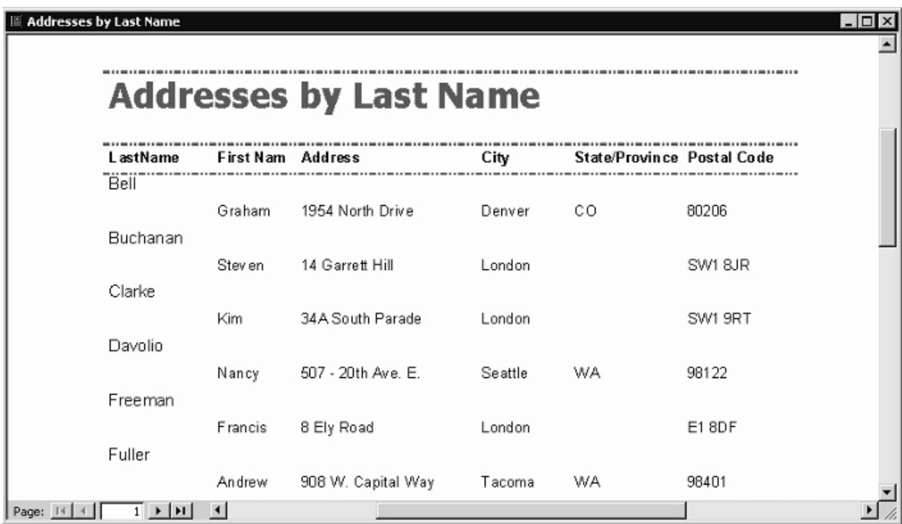
Queries are amazingly, mind-bogglingly useful. They take the raw data in a database and turn it into hard information. They're not only for locating information in the database but also for discovering trends in the data. A query can find all the sales of yellow telephones made over the last six months. Indeed, if it was more helpful for you, the query could be constructed to show you the sales per month for the last six months so that you could see if sales are booming or fading.

Reports – printed output from a database

Click on the Reports tab to see what reports the `Addresses` database contains. Double click on the report called AddressesByLastName. It has an icon like this:



and the report looks like this:



This is a simple report (in which only the top, showing the first six records, is visible in the screen shot above) that lists all contacts in the database, stacked in alphabetical order by last name. Alphabetical lists of club members, employees, customers or items for sale are used in almost every home and business.

A report is a collection of information, often summarized information, that's ready to be printed out. There are many occasions when printed output is necessary; for example, presenting a membership list to the club secretary, or the month's sales figures to a committee, for instance.

Reports can include all or part of each record in the database, but they really come into their own when used with queries. A report, just like a form, can be based upon a query: the query sorts out the subset of data and the report presents it. A well-designed report is easy to read, contains no superfluous material and provides a take-home message that is abundantly clear. A badly designed one, of course, does none of the above, which is why good design is important. Reports can also contain totals, subtotals and other values generated from the data such as means, averages and percentages. Finally, reports can also be used to 'group' information. For example, suppose you want to print out a membership list from a club. You might want this grouped by region – all of the members from Arlington, followed by all those from Burlington and so on. Of course, you want the members' names arranged alphabetically within each group, you want a sub-total after each group showing the number of members in that region and a grand total at the end. Fine, no problem; a report will do all this for you.

A brief summary of the big four

Component	Function
Table	Stores the data
Form	Provides useful views of the data
Query	Sorts out the pieces of data you want at any one time
Report	Presents data for general consumption as printed output

An understanding of these four components underpins the flexibility of Access, and in the next chapter we'll look at each in more detail.

The remaining three tabs – Pages, Macros and Modules – we'll leave, as we've said, till Chapter 21 where we cover pages and Chapter 22 where macros and modules are introduced. However, that coverage is brief because they aren't required in the early stages of learning about Access.

Chapter 3

Tables – for storing your data

In Chapter 2, as a brief introduction to the four major components of Access – Tables, Queries, Forms and Reports – we looked at a ready-made database containing some data. In this and the subsequent three chapters we'll cover these four components (one per chapter) using the various wizards to construct an example, with Chapter 7 as a brief refresher of the content covered thus far.

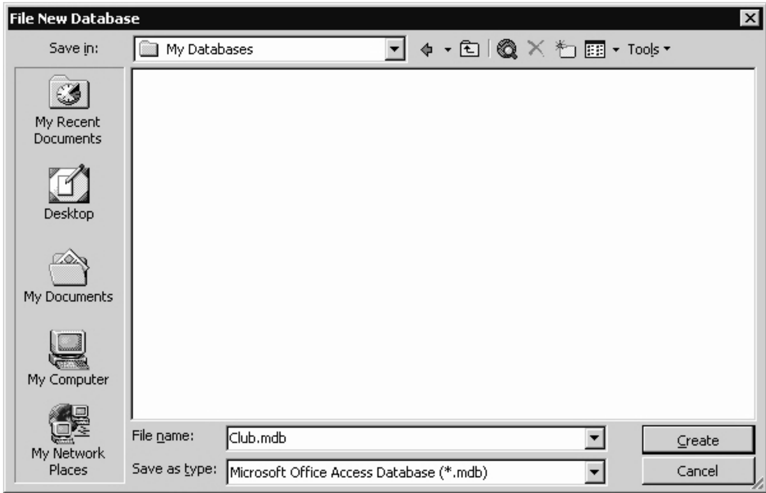
Tables are the most basic building blocks in a database; they are the containers for the data. Tables underlie all the other components and all the functionality that Access offers; the tables hold the data and the other three components (forms, queries and reports) are tools for accessing, extracting and presenting the data held in the containers.

There are two easy ways to create a table in Access 2003: one is to use the Table wizard and the other to simply start typing in your data. Here we will use the wizard because, as we've said, they are a very easy way of getting started.

Our example table will store a list of the members of a club and will, in fact, be very similar to the table in the `Addresses` database that you've already seen.

Using the Table wizard

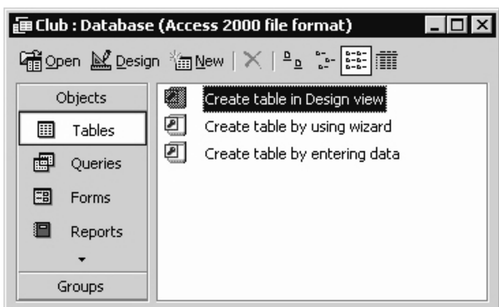
Close all the open windows within Access using their Close buttons and click on File on the left of the menu bar and on New. The New File task pane opens up offering five ways of creating a new database. We'll take the first option, 'Blank database...', so click it and the File New Database dialog opens. The gray panel at the top of the dialog reads 'Save in:' so navigate in the usual way to the folder in which you want to store your sample databases and then look at the bottom of the dialog, where Access is suggesting a file name. Type in something memorable, reflecting the content of your database: my file is called `Club`. The default file type is Microsoft Access Databases (*.mdb) which is perfect.



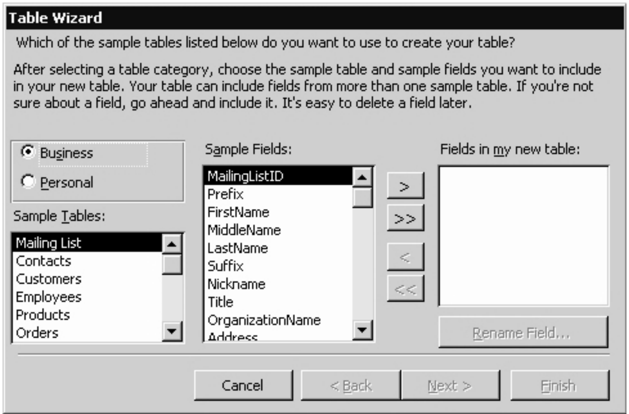
Click the Create button to proceed.

Building a table with the Table wizard

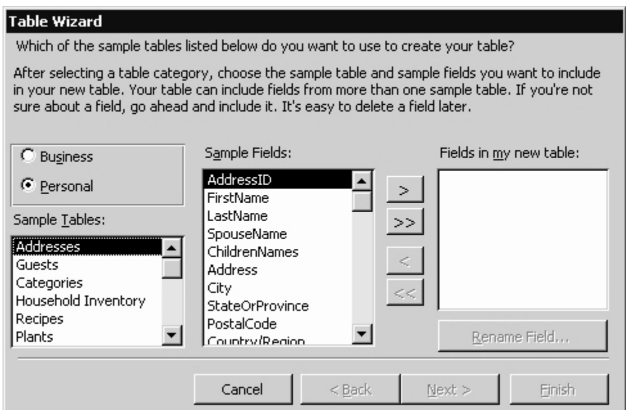
The database window opens, giving an overview of the contents of the database: this view should already be reasonably familiar and will become more so as your learn your way around Access.



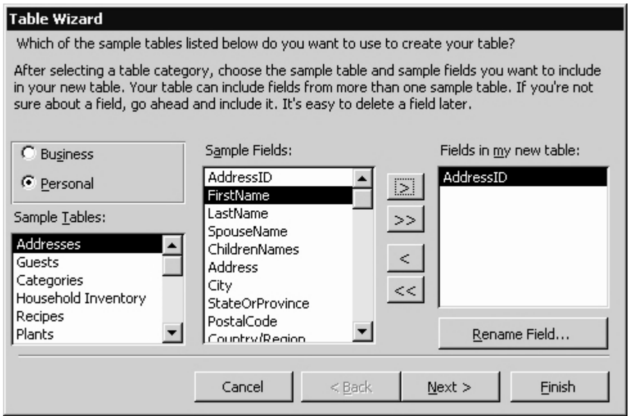
In the Objects list, the Tables tab is selected. In the contents pane to the right is a list of possible actions. We'll try the middle option first: double click on 'Create table by using wizard'. This is the first page of the wizard.



Here you define the fields in your table. First look at the panel to the left with option buttons labeled Business and Personal. Clicking on each reveals a list of ready-made Sample Tables from which to choose. Highlighting one of these Sample Tables shows a further list of the Sample Fields within the selected table. We are aiming to build a table to store details of the members of a gardening club (well, why not?) and the `Addresses` table from the Personal list seems suitable.



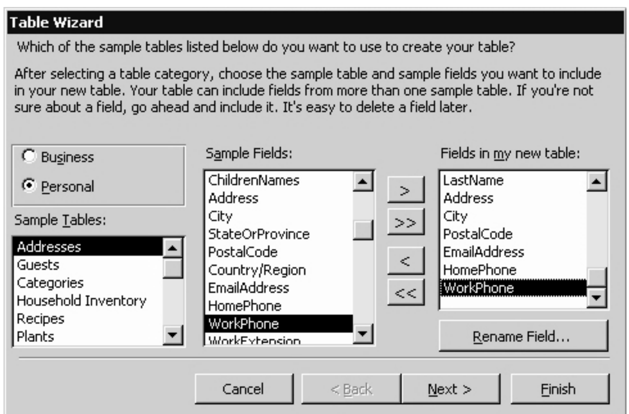
You aren't obliged to use all the fields in the list. You choose the ones you want with the selection buttons that lie between the sample fields list and the right hand list labeled 'Fields in my new table'. Highlight the `AddressID` field, for instance, and click the top button. This transfers the selected field to your new list.



Repeat this to build up a list of all the fields you want.

Selection buttons like these occur in various dialogs. The arrowheads on the buttons indicate the direction of transfer, letting you add or remove selections from the list you're compiling. The double arrowhead buttons add or remove the whole list.

I've chosen a mere nine fields – `AddressID`, `FirstName`, `LastName`, `Address`, `City`, `PostalCode`, `EmailAddress`, `HomePhone` and `WorkPhone`. I'm using the UK localized version of Access; yours may show slightly different names here so just choose whichever seem appropriate.



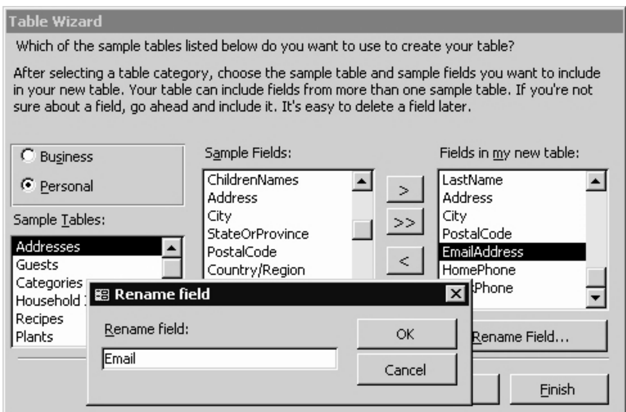
Addresses are typically split up into multiple fields, as in this case where three are used to store the information instead of storing it in a single field. Benefits accrue when you need to locate records because it will be easy to look for all those in Boston or those with 8 in the postal code.

If you decide you want more than one field for the address, you can add the `Address` field from the sample list more than once. It will be called `Address1` the second time you add it, and so on.

You can edit a field name by highlighting an existing name in the 'Fields in my new table' column, clicking the Rename Field... button, typing in the new name and choosing OK.

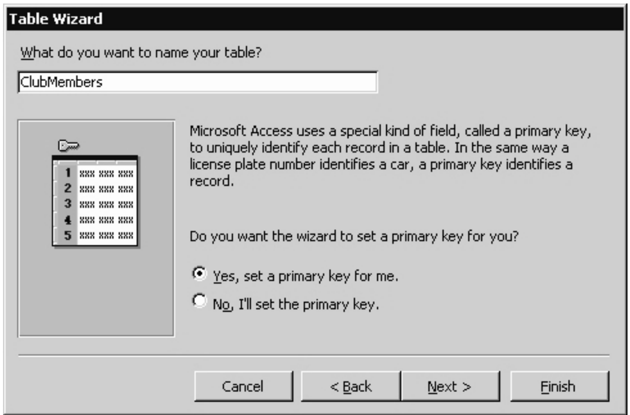
It's good practice to choose names for your fields which reflect the content accurately. Localizing is also useful – 'post code' is fine in the UK whereas 'postal code' or 'zip code' is probably better in the US.

Brevity is also often an advantage; for example, you might want to change the long-winded `EmailAddress` to `Email`.



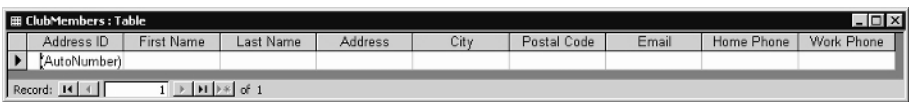
Now click the Next button.

Here you give the table a name; `ClubMembers` seems appropriate. This dialog also introduces primary key fields. At this point, let the wizard do the work, clicking the 'Yes, set a primary key for me' button.



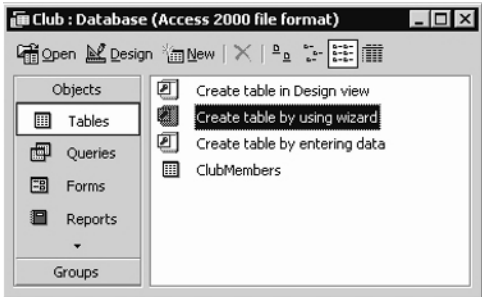
Primary keys are very important in a relational database; every table should have a primary key because they are the main way of ensuring the data entered into a table is correct and that all your future questions can be answered quickly and accurately. As to how they achieve this impressive ideal – we'll look at that in Chapter 15.

Click Next. The wizard wants to know your next move; unfortunately there's no option for 'Just end the wizard because I haven't decided what to do next', so click on the middle option 'Enter data directly into the table'. This will enable you to see the finished table. Click on Finish and you should see a table looking like this:



Incidentally, you'll notice that the names of the fields that show up here are subtly different from the names that you chose when you ran the wizard. For example, here you see a field called `Postal Code` *which has a space and yet you chose one called* `PostalCode` *without a space. This is because fields can have not only a name, but also a caption which is used as the label for the field. The wizard you have just used automatically supplied a caption with a space in it. If it hadn't, then the name of the field* `PostalCode` *would appear. We talk about this in more detail in Chapter 8.*

Close the wizard-created table by clicking the Close button. Back in the database window you'll see the new `ClubMembers` table in the list.



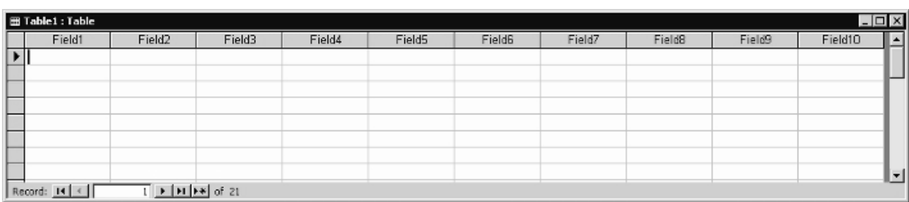
Tables can and should be different for different kinds of data

All the data in a table should refer to objects (things) that are similar: a table cataloging your Greek urn collection, for example, should contain Greek urn information only. So, suppose that you collect both Greek urns and books and you decide to catalog both collections in a database. If you try to store information about urns and books in the same table it will be a mess. Why? Well, you may want a field called 'Publisher' in the books table – Greek urns do not have publishers. So, don't build one table to store information about two kinds of your possessions, use two tables – one for each type (or Class) of object.

Building a table by entering data

To illustrate the other quick method of building tables, let's construct a table for that mythical *(or possibly mythological)* Greek urn collection.

In the database window, double click the 'Create table by entering data' option. A blank grid appears.



Each column has a heading, starting with `Field1` and ending with `Field10`. (More fields can be added if required.) The column headings you choose will, when the table is finished, be the names of the fields that comprise the table.

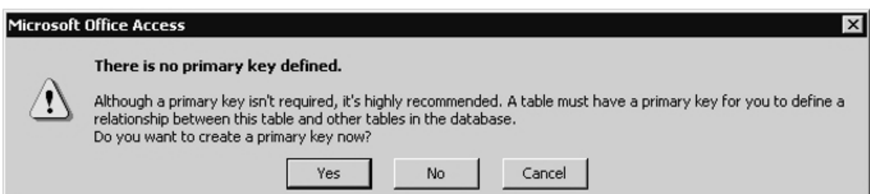
The columns could contain information on when and where the urn was bought, its style, color and type of decoration, its dimensions, its age and a field for any additional notes. Add a name to the first column by double clicking in the gray cell that currently says `Field1`. This designation will be highlighted and you can type in your own entry. Do this for a few fields and then enter some data in the white cells below.

You can, in fact, type in the data and add the headings later, but this might lead to confusion if, without headings to guide you, height data was entered accidentally into the column for width data and vice versa. Suddenly your tall elegant urns are all short and squat which will earn you a poor reputation...

If you need to delete a column, click with the right mouse button in the title cell and choose Delete Column. (You don't need to delete any spare fields you don't use because only the columns that contain data will be saved as part of the table definition).

To add further columns, right click in the same way to highlight the column to the right of the position for the new column and select Insert Column. (If you add a column after you've renamed the first column, the new one appears as `Field1`.)

When you click the Close button on your new table, Access will ask if you want to save changes so answer Yes and type in a name. Access reports that no primary key field has been chosen for the table so click the Yes button to let Access add a suitable field.



This is how the Datasheet view of the `Urns` table should look with a few more records added. The first field, labeled `ID`, is the one Access added to act as the primary key field.

Urns : Table

ID	Height	MaxWidth	BaseColor	DesignColor	DesignType
1	28	18	Orange	Black	Key border and figures
2	20	14	Ochre	Black	Key border
3	15	14	Ochre	Dark crimson	Fruit & flowers
4	15	14	Ochre	Dark crimson	Vegetables & flowers
5	17	9	Terracotta	Black	Key border
6	14	9	Chestnut	Black	Figures
7	12	12	Ochre	Black	Key border & figures
8	14	10	Terracotta	Black	Flowers
(AutoNumber)					

Record: 9 of 9

Adding records

When you start typing data into a table, a pencil icon appears in the gray square to the far left of the row. This indicates that the record has been altered but not yet saved, or ‘posted’, in database terminology. Moving down to the next row automatically posts an entry, as does clicking on the pencil icon.

What do we mean by ‘posting’ the entry? Well, when you use a word processor to create a letter, you save the letter at intervals as you work, or you set the word processor to do it for you, or you live dangerously and only save the finished letter. Access sometimes works in the same way. For example, when you create and edit a form, it exists only in the memory of the machine until you actively save that form. If the machine crashes, the form will be lost. The same is true for reports and queries and even when you are creating a table. However, once a table has been created and you start entering data, Access treats the data in a table very differently. Every record that you create and/or edit is treated as a valuable entity. As soon as you move to another record, the one upon which you have been working is saved to disk. The good news is that the data in your database is much more likely to survive if your machine has a problem. The bad news is that you cannot undo multiple edits to multiple records. Some undo ability is allowed via the interface, and the general rules are as follows:

- If you are adding a new record, or editing an existing one and you haven’t moved off that record, you can move the cursor along that record and alter or add to each field. You can also click the Undo button to undo changes.

- Once you've posted the record, you still have a small window of opportunity within which to undo the changes by going to the Edit menu and clicking Undo. When not available to you, the option is grayed out and reads 'Can't Undo'.

But that's it. You can, of course, locate any record and edit it manually to remove changes made earlier, but you can't do it using the Undo method. Although these general rules apply most of the time, in certain Access applications you may not be able to undo any changes.

So the bottom line is to be careful out there when you're dealing with important data. It is well worth playing around with a table of test data to get a feel for what you can and can't do before working with real data.

Field names

If you skipped Chapter 1, we strongly recommend that, at this point, you read the section called 'What's in a name?' The advice given there can safely be ignored for this first table but is worth following for real databases that you build in the future.

Records and fields revisited

A record comprises all the data you collect for one person, urn or whatever. In the address book example, everything entered in the database about Person X comprises their record – which is a single row in the table.

Records are made up of fields and the fields reflect the individual pieces of information being collected. The address table has fields for first name, last name, phone number and so on – each field is a column in the table.


ClubMembers : Table

Address ID	First Name	Last Name	Address	City	Postal Code	Email	Home Phone	Work Phone
1	Simon	Jackson	1234 Lime Tree Drive	Carmel	94652	sj@email	000-222-2222	
2	Maria	Carlson	34 Minton Road	London	SW4 2HJ		0100 222 2222	0100 333 3333
3	Paula	Andrews	17 George Street	London	W4 3JK	paula@email	0100 444 4444	
4	David	Hassall	143 Western Way	Tacoma	98467	dh@email	000-999-8888	
5	Gordon	Grant	128 Lothian Road	Edinburgh	EH1 1RD	gordong@email		
6	Felicia	Sharmain	2453 Rose Bvd	San Francisco	94117	fee@email	000-222-3333	

Record: 16 of 16

❛ *As we have said, the terms 'row' and 'record' are often used more or less interchangeably, as are 'field' and 'column'. If you want some guidance, as a general rule, if I was talking about the table structure itself, I would tend to talk about rows and columns ('This table has five columns and 20 rows.') If I was talking about the data I would tend to use field and record ('The* `LastName` *field in John's record contains the value "Parker".') But this is not a hard and fast rule – only a pedant would differentiate too forcefully.* ❜

If you've worked through the chapter thus far you should have a database like the one in the file called `chap3.mdb`. The screen shot above shows the `ClubMembers` table from the `Club` database just as described above. The only difference is that we have added some data.

Chapter 4

Queries – finding data

Why you need to use queries

Creating and maintaining databases is fun (or at least I find it so) but ultimately we don't do all this work for the fun of it, we do it because sometime, somewhere, we are going to want to get data back out of the database. Typically we use queries to do this for us.

What is a query?

Queries can be simple: 'How many contacts do I have in Fontana or Frankfurt?', for instance, or more complex: 'Do I know anyone with a birthday in May who drives a Dodge Viper and lives in Oregon?' Given a business application, even more complex queries can be imagined: 'What are last year's sales figures, month by month, for each sales representative working in Europe but ignoring sales of the new product SuperClean?'

Queries can be saved for future use. You can build queries for questions that are asked regularly about the data. For example, you could construct a query which lists the current membership of a club or another which works out the turnover for the current month. When a need arises for up-to-date information, simply run the saved query and it will produce the current answer.

The answer to a query appears in a table or, more specifically, in an answer table. This has the look and feel of a table, but it does not, in fact, have any lasting existence and you won't find it listed in the Tables tab of the current database window. An answer table is a 'virtual' table; as soon as you close the query, the answer table ceases to exist. In case this sounds like a problem, it isn't. Typically you don't want an answer table to be permanent (and if you ever do, as explained later, Access provides an easy way for you to achieve this) and the default therefore is for transitory answer tables.

Using the Query wizard

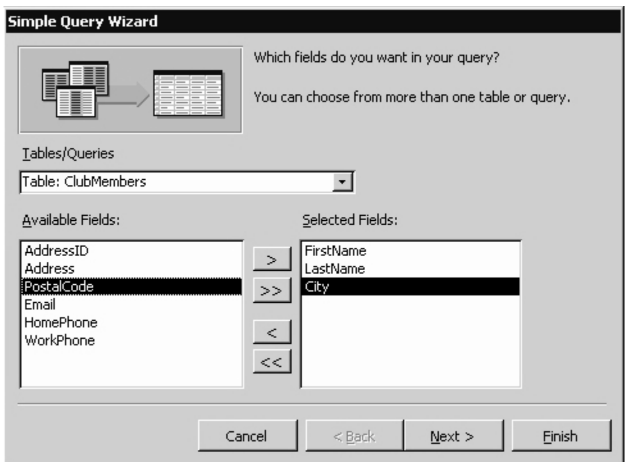
The query wizard provides a great way to learn about queries, so we'll start with that.

Building a query

Load the `Club` database (`chap4start.mdb`) from the `AccSamp` folder: this is the same database as the one constructed by the end of Chapter 3 except that it has data in it. In the database window, click on the Queries tab. There are two options for creating queries: choose the wizard method with a double click. (You can see a greater selection of query wizards by clicking the New button from the database window menu. If you elect to do it this way, choose the Simple Query Wizard for now).

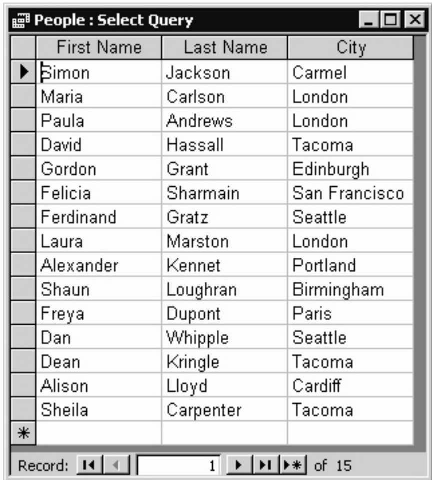
Here you select the table and fields to use in the query using essentially the same methods as in the Table wizard. Select the `ClubMembers` table from the pop down list of Tables/Queries (unless it's already selected) and then inspect the list of Available Fields below.

For this example I'll include, say, the `FirstName`, `LastName` and `City` fields.



Now click the Next button, give your query a name (I've used `People`) and click Finish to accept the default 'Open the query to view information'.

As a general rule it is worth picking memorable and informative names for the objects that you create in Access. I realize that 'People' doesn't follow this rule but the query is so simple that a choosing a meaningful name represents something of a challenge!



First Name	Last Name	City
Simon	Jackson	Carmel
Maria	Carlson	London
Paula	Andrews	London
David	Hassall	Tacoma
Gordon	Grant	Edinburgh
Felicia	Sharmain	San Francisco
Ferdinand	Gratz	Seattle
Laura	Marston	London
Alexander	Kennet	Portland
Shaun	Loughran	Birmingham
Freya	Dupont	Paris
Dan	Whipple	Seattle
Dean	Kringle	Tacoma
Alison	Lloyd	Cardiff
Sheila	Carpenter	Tacoma

Here's the result of your query. The title bar reads People: Select Query. Your query has 'selected' a set of records corresponding to the responses you gave the wizard. In this case, the set selected comprises data from three of the fields and all of the records in the table.

This wizard, like its name suggests, builds only simple queries. You can choose a subset of fields but you cannot specify a subset of records. This is a limitation because the majority of questions asked of a database demand a subset of both fields and records: the names of my contacts based in London and Long Beach, the prices of the silk shirts or all the addresses from the July invoices.

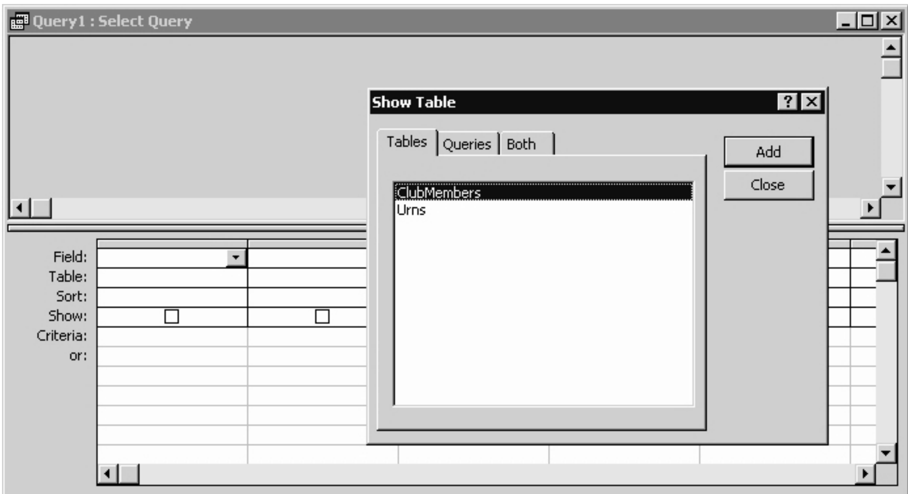
The other query building wizards – 'Crosstab', 'Find Duplicates' and 'Find Unmatched' – all tend to be relatively specialized. In practice, the easiest way to create a simple query that subsets both the records and fields is to use the Query Design tool. However, the good news, as I implied in Chapter 2, the query design tool is so easy to use that I rarely use the query wizards. With that in mind we'll move on rapidly.

The Query Design tool

With the Query Design tool you can build anything from the simplest to all but the most complex queries.

Creating a simple query

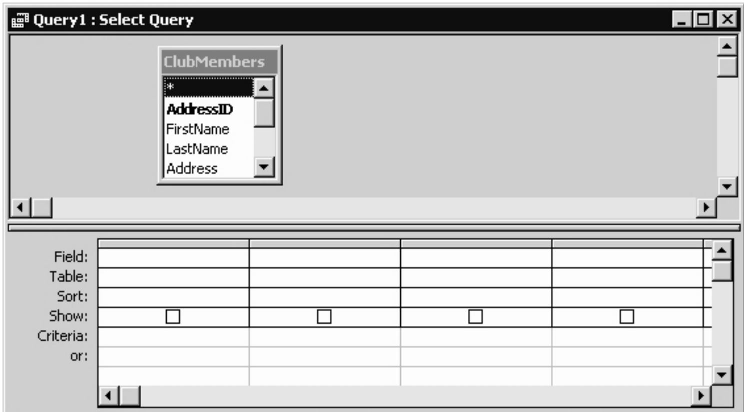
Close the `People` answer table and back in the database window, double click 'Create query in Design view'.



This pops up the Show Table dialog with a window behind it. The active dialog has three tabs: our query will be based on the `ClubMembers` table again so from the Tables tab, double click it. A representation of the chosen table now appears in the background window.

That's all we need but if you look in the Queries tab, you'll see your People query. *(If you are now beginning to wonder whether this means that you can perform the recursive-sounding process of basing queries on other queries, you're right. We have a look at that in Chapter 9).* And if you look in the Both tab – well, you guess.

Your actions so far have determined the table upon which the query is to be built and placed it in the Query Design window. When you click Close in the Show Table dialog, you see this:



(If a Query Properties sheet is also visible, it's worth closing it for the moment to keep things simple.)

There are two main elements to the Query Design window:

The top section is the Table/Query pane and shows the table or query on which the new query is based.

Beneath that is the Query Design pane, a grid where you define the query. Each column of the grid can contain one field and information which narrows the search for data within that field.

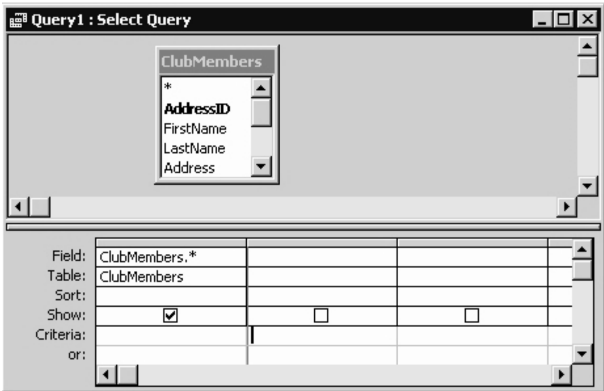
Finding the right fields

The first step in building any query is to select fields to appear in the query answer.

In the table in the upper pane, the top row contains just an asterisk (*); this is formally known as the 'all fields reference tag'. This is Access-speak for 'include all fields in the query'. Double click on it and the field name `ClubMembers.*` appears in the Field row of the grid.

To identify a field unequivocally in Access, it's written as `TableName.FieldName`. The entry in the field row of the query grid is `ClubMembers.*`, meaning all fields in the `ClubMembers` table.

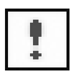
The table name in shown the Table row and the check box in the Show row is checked.



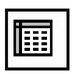
If this check box is checked, the field will be visible in the completed query.

*The last statement may sound odd and could reasonably provoke the question 'Why would I ever select a field that I **don't** want to see in the answer?' Well, for example, suppose you want to find every member in Seattle. You will need the* `City` *field to be included in the query in order to select those members. But it is pointless to make the* `City` *field visible in the answer table because every record will contain the same value – Seattle. 'Ah, but', you argue 'I **want** it to be visible in order to check that my query is working properly.' OK, that's fine, the choice is yours and I often do the same, particularly when I first create a query. But once you are happy that the query is working properly, you may well find it useful, particularly when working with big sets of data, to have the option of removing the field.*

The query looks like an exercise in minimalism but run it anyway by either clicking on the Run button:



or on the View button



which flips you between the Design view (where you define the query) and the Datasheet view (where you can see the results).

❛ *For now these two buttons appear to do exactly the same job i.e. let you see the answer table. They do have subtly different functions and all will be revealed in Chapter 9.* ❜

Despite the minimalist query, all the fields in the table have been selected and the data from each is displayed.

Query1 : Select Query

Address ID	First Name	Last Name	Address	City	Postal Code	Email	Home Phone	Work Phone
1	Simon	Jackson	1234 Lime Tree Drive	Carmel	94652	sj@email	000-222-2222	
2	Maria	Carlson	34 Minton Road	London	SW4 2HJ		0100 222 2222	0100 333 3333
3	Paula	Andrews	17 George Street	London	W4 3JK	paula@email	0100 444 4444	
4	David	Hassall	143 Western Way	Tacoma	98467	dh@email	000-999-8888	
5	Gordon	Grant	128 Lothian Road	Edinburgh	EH1 1RD	gordong@email		
6	Felicia	Sharmain	2453 Rose Bvd	San Francisco	94117	fee@email	000-222-3333	
7	Ferdinand	Gratz	1003 Shore Road	Seattle	98128		000-333-4444	000-333-4444
8	Laura	Marston	17a Walton Road	London	E11 5HN		0100 555 5555	
9	Alexander	Kennet	123 Ridgeway Road	Portland	97219	alexk@email		
10	Shaun	Loughran	12 South Parade	Birmingham	B5 3GH		0100 777 8888	
11	Freya	Dupont	12 Rue de Soleil	Paris	75627	freya_dupont@		
12	Dan	Whipple	2073 Hill Street	Seattle	98345	daniel@email	000-444-5555	
13	Dean	Kringle	1863 Bridge Bvd	Tacoma	98451	kringle2@email	000-777-8888	
14	Alison	Lloyd	178 Bridge Street	Cardiff	CF4 5WL	a_lloyd@email		
15	Sheila	Carpenter	144 Sunset Road	Tacoma	98463		000-444-5555	000-444-6666
(AutoNumber)								

Record: 1 of 15

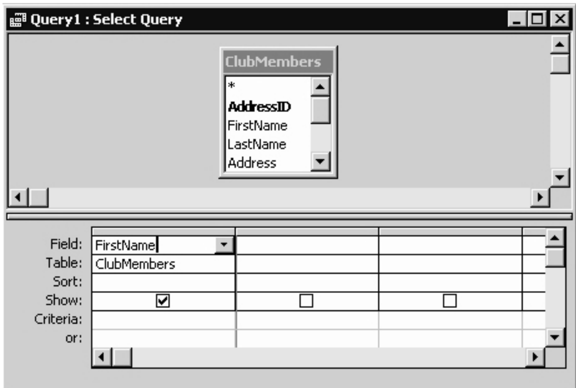
Making use of an asterisk in a query is a very quick way of building a query that shows all of the fields in the table. Using the Query Design tool you could get the same result by picking each field manually but the asterisk method brings other advantages apart from speed. If you save such a query, the results will always include all fields, even if you've deleted fields from the table or added new ones since you last ran the query.

Close the answer table by clicking the Close button. Access asks if you want to save the new query (provisionally entitled `Query1`). We might as well save it as the informatively named `AllInfo`.

Now let's create a query from a limited set of fields.

Start as before, selecting the `ClubMembers` table for use in the query grid.

To include a subset of fields in a query, add them one at a time. Double click on the `FirstName` field from the `ClubMembers` table in the upper pane. This puts the field name into the Field row of the grid, the table name into Table row, and a check into the Show row.



Repeat to select all required fields: as well as `FirstName` I'm using `LastName` and `City`.

Run the query.

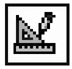

Query1 : Select Query

First Name	Last Name	City
Simon	Jackson	Carmel
Maria	Carlson	London
Paula	Andrews	London
David	Hassall	Tacoma
Gordon	Grant	Edinburgh
Felicia	Sharmain	San Francisco
Ferdinand	Gratz	Seattle
Laura	Marston	London
Alexander	Kennet	Portland
Shaun	Loughran	Birmingham
Freya	Dupont	Paris
Dan	Whipple	Seattle
Dean	Kringle	Tacoma
Alison	Lloyd	Cardiff
Sheila	Carpenter	Tacoma

Record: 1 of 15

Now a subset of fields is displayed for all records.

Incidentally, I'd love to tell you that I was good enough to always build exactly the query I want first time, but it isn't true for me and I suspect it isn't for most database designers. Designing a query is often an iterative process. You do some of the design work, run the query and see what you get, alter the design a bit, run it again and so on until it is perfect. So, for example, in this case, perhaps you want to see phone numbers as well. To swop back into the Design view, click the View button, which now looks like this:

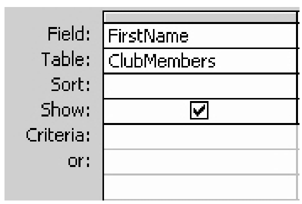


Back in design mode, you can modify the query by adding or removing further fields.

Now you can create queries using all fields or just some of them, what about controlling which of the records will appear in the answer table?

Finding the right records

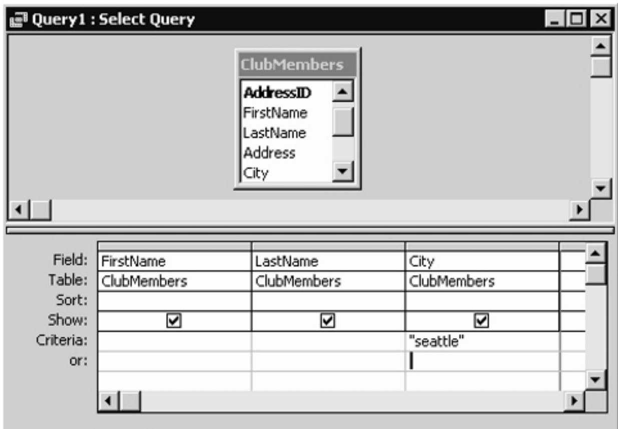
We'll continue to work with the current query so return to the Design view. A glance at the Query Design grid shows that there is a row labeled Criteria (and one labeled, mysteriously, 'or') and this is where you determine the records to be displayed.



The entry you make in the Criteria row is the information that Access will try to find in that field, so on the Criteria row in the `City` column, type:

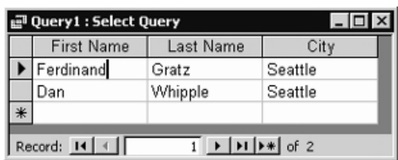
seattle

This says, in English, 'select the record only if the entry in the city field says Seattle'.



When you type 'seattle' as a criterion and then move the cursor (say by pressing the tab key), Access automatically wraps the word in quotes so you don't have to bother – another time-saving device brought to you by the creators of Access. The match also happens to be case-insensitive so it will find 'seattle', 'Seattle', 'seAttlE' etc.

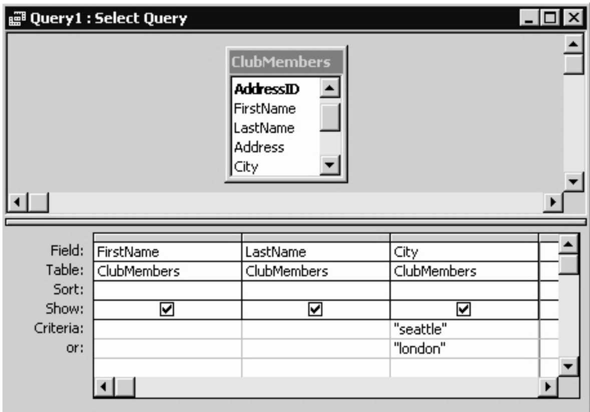
Run the query and see if your result looks like this:



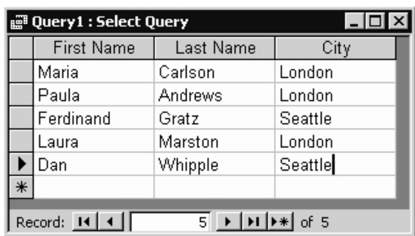
There should be two people living in Seattle, Ferdinand Gratz and Dan Whipple, and that's your first answer comprising a subset of records.

Return to the Design view. On the 'or' row in the City column, type:

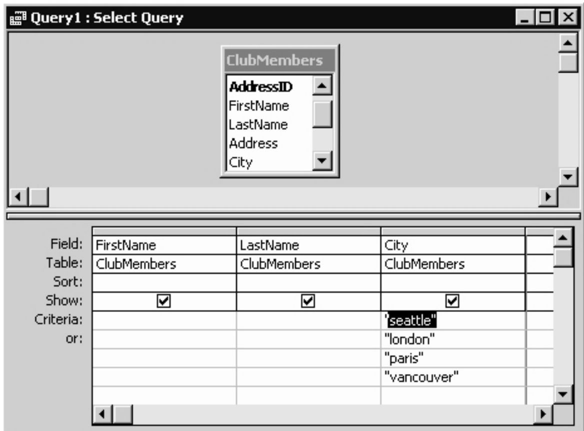
london



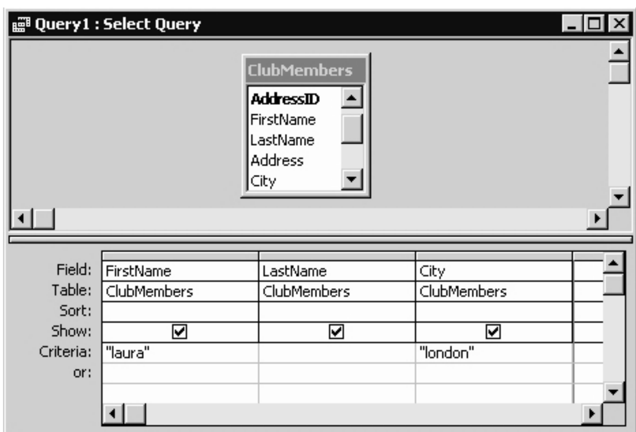
Run the query; you should see this:



It shouldn't be a surprise that the Seattle residents' records have been joined by those of the Londoners. The English rendition of the criteria is now 'select the record if the entry in the city field says either Seattle or London'. Further criteria can be added in subsequent rows.



You're not limited to setting criteria for a single field, however. If you want the records for anyone living in London whose name is Laura, the criteria in the `City` column would read 'london' and in the `FirstName` column, 'laura'. Criteria in different columns are taken to be joined with an 'and': in English the query says 'show me the records where the city field contains 'london' and where the first name field contains 'laura'.



The results of expressions containing 'and' and 'or' can sometimes cause confusion. If you use 'or' you will, as a general rule, get a larger answer set than if you use 'and'. At first glance, this may seem odd. What the 'or' is saying is "Accept a record for display in the answer table if it contain either x ***or*** *y", so you get all the records which contain x and all those that contain y. 'and' says "Accept only those records that contain both x* ***and*** *y" so you only get the records that meet both criteria.*

Operators

'and' and 'or' are both operators. These are used in queries and also in other parts of Access. Now seems like a good time to cover them and while we are at it we'll look at wildcards.

Operators are used to modify the way in which (in this case) the criteria work. So far we have come across two operators – 'and' and 'or'. However, there are others that you can use. Remember when you typed in the word 'seattle' as a criterion, it worked fine because the `City` field contains text information and we wanted an exact match to the word. Suppose that you were using the `Urns` table and wanted to find all of the urns shorter than 20 units tall. This information is in a numeric field so you are clearly going to use '20' as the criterion. However, if you simply use '20', the answer table will simply list those urns that are exactly 20 units high. Using '<20' will do the job perfectly because '<' is an operator that means 'Less than'. The table below lists the common operators.

Commonly used operators	
Symbol	*Meaning*
*	Multiply
+	Add
-	Subtract
/	Divide
=	Equal
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
<>	Not equal to
Is null	Doesn't contain data
Is not null	Does contain data
Like	Similar to

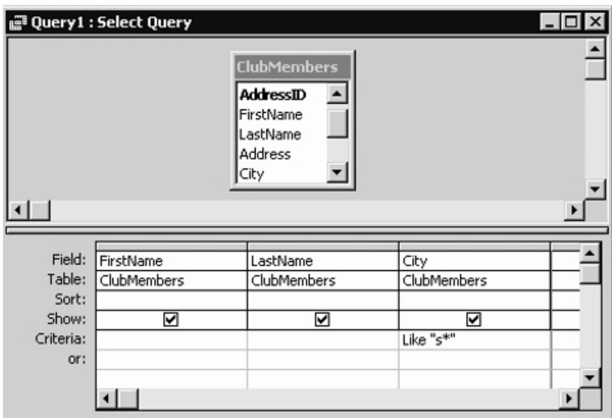
Null values are discussed in Chapter 8 but in essence a field that doesn't contain any data is said to be null, or to contain a null value.

As a general rule the '=' symbol is assumed if you don't supply one; hence when you typed 'seattle', this was taken to mean '=seattle'.

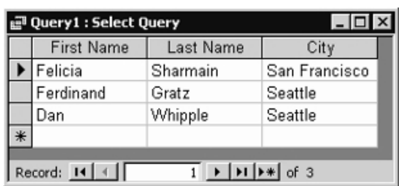
Wildcards

So far, so good. But suppose that you want to find customers in Seattle but you can't remember how to spell the name of that city. Access will allow you to use what the computing world calls wildcards – '*'and '?'.

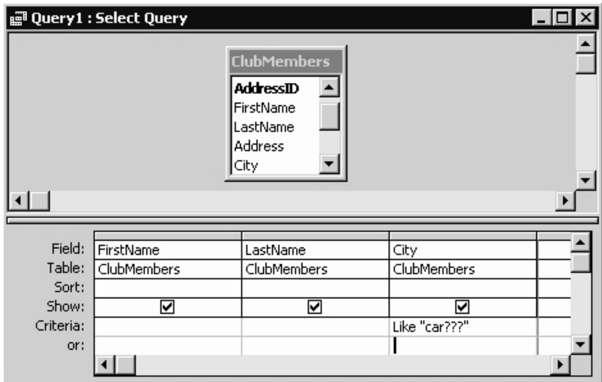
'*' means substitute any number of characters here. So, assuming that you know that Seattle starts with an 'S', you could type in 'S*'. Access will turn this into 'Like "s*"'

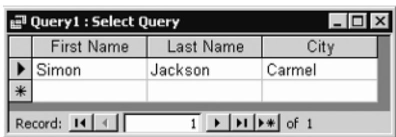


When the query runs, you find the correct records, you discover how Seattle is spelt and, as an added bonus, you also find the records for San Francisco.



The '?' wildcard is much more specific (and therefore used less frequently) and substitutes for a single character. Thus 'car???' will find Carmel but not Cardiff (both of which exist as cities in the `ClubMembers` table) because Cardiff has seven letters, not six.





Access will again add inverted commas to turn the criterion you type as car??? into:

Like "car???"

This simply means 'Find the records which are like this'. Of course, you can type the expression in full, but why not let Access do the hard work?

We've been experimenting with this query so once you've finished exploring the delights of wildcards and such, there's no need to save it though you can do so if you wish.

Finding both fields and records

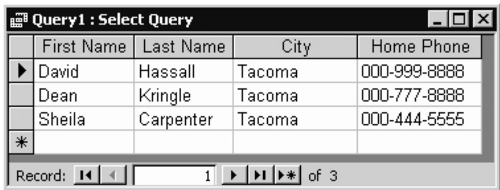
The foregoing methods can be used to produce an answer which is both a subset of fields and a subset of records. This, in fact, is what most queries are and it's also what gives queries their flexibility.

To illustrate this, we'll build a query which looks for all residents of Tacoma and shows their names and phone numbers.

Start with a new query constructed from the Design view and based on the `ClubMembers` table. Add four fields: first and last name, city and home phone number. Type the criterion:

tacoma

into the `City` column and run the query. This is the answer:

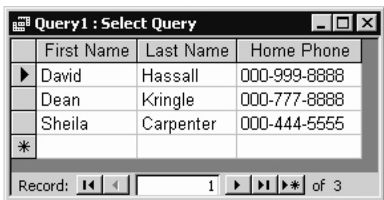


Query1 : Select Query

First Name	Last Name	City	Home Phone
David	Hassall	Tacoma	000-999-8888
Dean	Kringle	Tacoma	000-777-8888
Sheila	Carpenter	Tacoma	000-444-5555

Record: 1 of 3

Do you really need to see Tacoma listed three times in the answer? You already know you're looking for Tacoma residents; you might even have named the query `Tacoma`. Flip to the Design view. Click in the Show box in the `City` column to remove the check and run the query again.



Query1 : Select Query

First Name	Last Name	Home Phone
David	Hassall	000-999-8888
Dean	Kringle	000-777-8888
Sheila	Carpenter	000-444-5555

Record: 1 of 3

This is a good example of why it's useful to be able to include a field in a query without displaying its contents as part of the answer table.

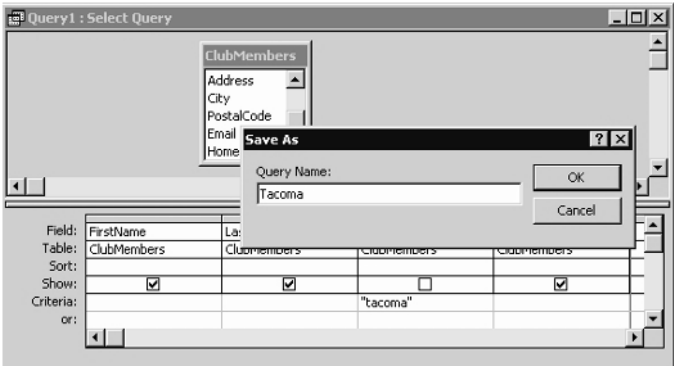
Multiple queries per table

A query can be saved for future use and many different queries can be associated with a single table. This brings efficiency gains and saves time; particularly useful queries and ones which are likely to be run often (monthly sales, for instance) can be used time and time again.

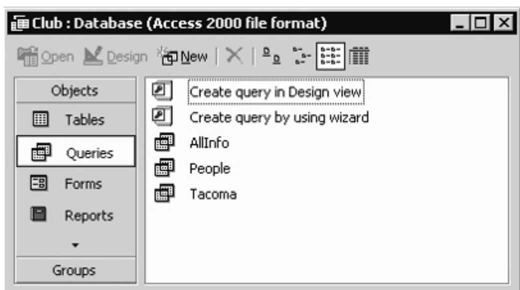
Saving queries

When a query is working correctly and you are likely to use it again, save it.

With your query on the screen (either in Design or View mode), click File, Save from the menu, or the Save button, or press Ctrl+S on the keyboard. In the resulting Save As dialog, enter a name for your query (mine is `Tacoma`)



and click OK. Return to the database window and the new query should be listed under the Queries tab.



When you want to run the new query, activate the Query tab of the database window and double click on the query. It will run and generate an up-to-date answer from the data in your database.

Saving data with a make-table query

Not only can you save the query, you can save the result it generates too. Mostly it's enough to save a query for future use so that you generate an up-to-date answer each time you run it. Occasionally, however, it is useful to have a snapshot of the answer returned at a particular time.

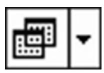
To turn the answer table produced by a query into a new table in the database, you use a Make-table query.

With the `Tacoma` query open in Design view, look at the title bar which says Tacoma: Select Query. 'Select' simply describes the action of the query: it selects the records as per your query definition.

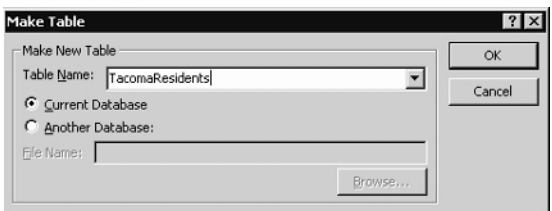
❛ *Queries have a terminology all of their own and much of it comes from a language specifically designed for building complex queries. The language is SQL, Structured Query Language, and 'select' is one of its commands. You're unlikely to need to know anything more about SQL as Access' querying is sufficiently powerful to make it unnecessary except for highly specialized querying.*

SQL, by the way, is pronounced variously as 'Ess-que-ell' and 'Sequel'; the former predominates in Britain and the latter in the US. ❜

For the current task we need a different type of query. Still in the Design view, find the Query Type icon in the top menu



and click on the arrowhead in the bar to its right. Click on Make-Table Query... from the pop down list. (If this option isn't listed, click or just hover over the double arrowhead button to extend the list). In the Make Table dialog box, type a name for the new table such as `TacomaResidents` and ensure the Current Database option button is selected.



Click OK. As can be seen from the title bar, the `Tacoma` query is now a Make-Table query and it will generate a table called TacomaResidents. When you close it, Access asks if you want to save it in its new guise. Answer Yes and in the database window, its icon changes to reflect its new type.

Now try running it. Access will check two things with you: firstly, that you're aware of the query's type: click Yes to continue. Secondly, Access asks if it's OK to proceed with pasting data into a new table.

Access is ensuring that you remember that each time a Make-Table query is run, the data in the table will be over-written with the most recent results from the query.

Answer Yes again. Look in the Tables tab of the database window and there's the new table which you can open and inspect just like any other table.

A table created with the Make-Table query does not inherit the primary key nor all of the field properties from the original table. There's more on both these topics in Chapter 8.

If you run the query a second time, Access will check three things. Firstly, as before, that you know it's a Make Table query, secondly, that the existing `TacomaResidents` table will be deleted, and thirdly that data will be pasted into a new table. One more point seems worth making here. As described above, Access overwrites the `TacomaResidents` table each time. If you want to preserve any particular copy of the table, simply rename it. You can do this by right clicking on the name of the table, selecting Rename and adding, say, a 1.

When you rerun the query it will generate a new table with the name `TacomaResidents` leaving `TacomaResidents1` intact.

Summary

With queries you can pull selected information out of a database and in this chapter we've introduced that most straightforward and most useful type of query, the Select query that allows you to select exactly the information you require. Make-Table queries are rather less commonly used but can be very useful on occasions.

The database constructed so far is contained in the file `chap4end.mdb`.

Chapter 5

Forms – viewing and entering data

You are well aware that you can see data in tables so you may be wondering why forms are needed at all because they show data too. What, then, is the difference?

A table is a table is a table. It stores data and that's its primary function. Forms can be thought of as gateways into the table: you can enter data into a table via a form, use a form to view data, edit it and manipulate it. True, you can do all these things by interacting directly with the table but there is no easy way of modifying what a user sees of a table: it's all or nothing. With a form, you can restrict the visible fields so that the form acts like a filter on the data in the table. In addition, a whole range of different forms can be associated with one table. As we said in Chapter 2, Access allows you to restrict who can use which form (and stop people getting to the underlying table) so that nobody has to wade through irrelevant data and no-one can get to information that they shouldn't see.

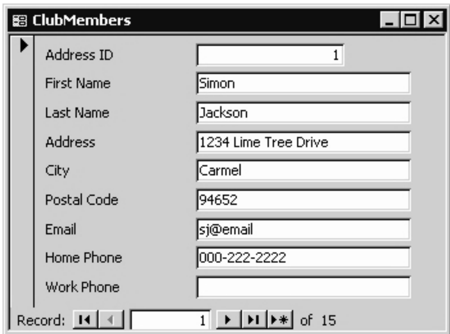
Forms are also generally more helpful to the user than tables. You can label fields with terms that mean something to the user of the form, rather than hoping they'll understand the terminology chosen by the designer of the table. You can also put messages to the user on the screen and provide ways of making data entry less tedious and hence less likely to contain errors.

So tables are the core of a database and hold the data, but users of the database will typically interact with that data via one or more forms.

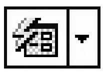
Really rapid form creation

Access has a one-click mechanism for creating forms: this speed freak is the AutoForm and we'll use it to create a form for entering new addresses into the `Club` database.

If you're following the examples, start with the database in `chap5start.mdb`. In the Tables tab of the database window, ensure that the `ClubMembers` table is highlighted. Click Insert on the main menu and choose AutoForm – and there's a whole new form that includes all fields.

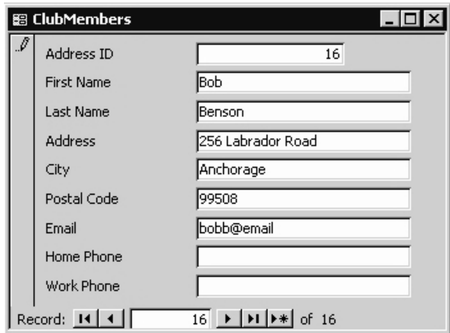


You can also create an AutoForm by highlighting the table upon which you wish it based and clicking the down arrow alongside the New Object button



and selecting AutoForm. If hover help says New Object: AutoForm as your mouse hovers over the button, you can just click the button itself. Hover help shows the last use that was made of the New Object button, which is what it will do when clicked.

You can save an AutoForm in the usual way: I've called it `AllFields`. To add a new record using the new form, click on the New Record button on the toolbar or on the form and you're ready to enter new data.

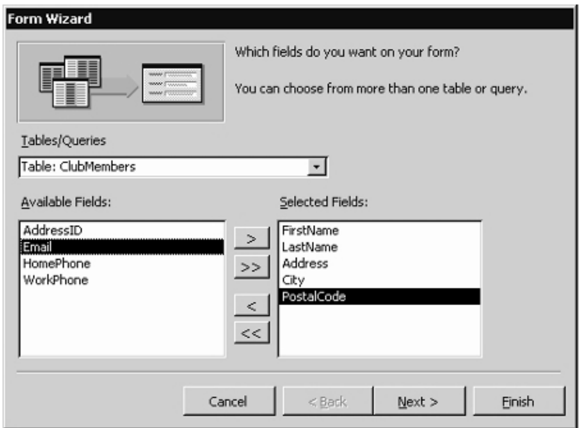


As discussed, this form contains all of the fields in the table; such forms are often used for data entry when a complete record is required. But suppose that you want to create a more specialized form which shows only some of the fields? For this you can use the Form wizard.

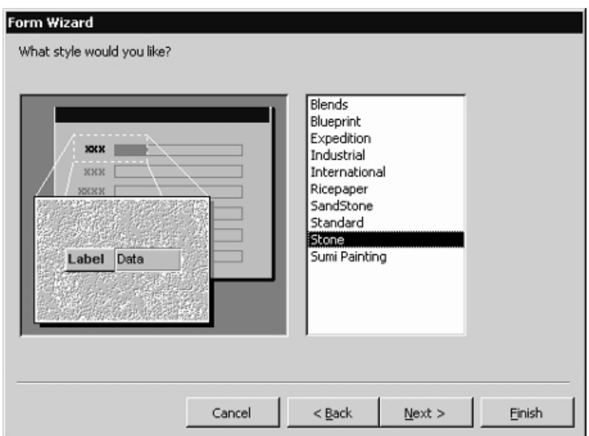
Using the Form wizard

In the database window, click the Forms tab and double click 'Create form by using wizard'. In the first step of the Form wizard, select the table with which to work: we'll stick with `ClubMembers` and build a form to view names and postal addresses.

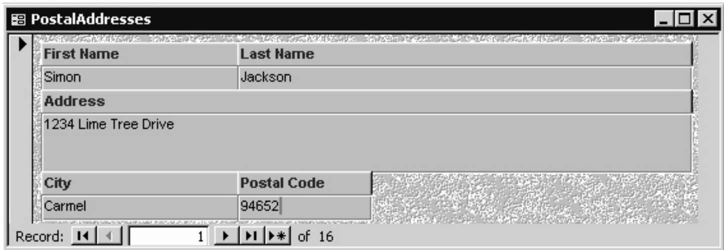
Move the appropriate fields from the Available Fields panel to the Selected Fields panel with the arrow keys



and click Next. Four layout types are offered for your form; a sample is displayed as you click on each of the four options. I've chosen the Justified layout and, in the next page, the style called Stone.



Click Next. Give the form a title (I've used `PostalAddresses`) and check that the option button for 'Open the form to view or enter information' is selected. Click Finish and you have a form for viewing name and address information from the club membership database.



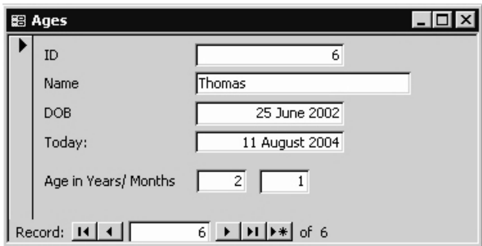
Creating different types of form

The Form wizard can be used to produce a good usable form and Access allows you to customize this form in an almost infinite series of ways. This is done with the form designer, a tool that we examine in detail in Chapters 10 and 11. That's where we show you how to do all the fun things like inserting pictures, changing colors and so on. With great restraint we have resisted the temptation to go straight to the colorful bit and in this chapter we have concentrated on introducing the less visually stimulating but potentially more useful topic of calculated values.

Calculated values

Suppose that you want to store information about people. If that information includes, say, pension information, you will need to know how old each person is. So should you store their age in the table? The obvious (and correct) answer is 'no' because that information would have to be updated every time each person had a birthday. However, suppose that you store each person's date of birth in the table and use a form to look at the data. As each record is displayed in the form, the current age of the person can be calculated by Access and displayed.

We won't actually demonstrate how to create this one because, despite being a great example to which most people can relate, it happens to be rather tortuous to do in practice. This has nothing to do with Access and everything to do with the tortuously complex *calendar system that we use. However, we also understand that using it as an example and not providing a solution is likely to be frustrating if an age calculation just happens to be exactly what you need for your database. So we have included an example, solved using the Access programming language, in the file called* `Chap5ages.mdb`. *Feel free to look at it if the subject interests you.*

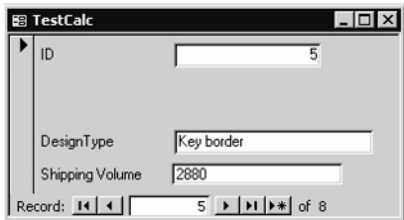


We'll demonstrate calculated values with another example, where we can concentrate on the method rather than the intricacies of date manipulation. Suppose you store information about urns. Amongst the information stored in the database is the height and the width of each urn. Suppose also that you frequently move the urns around and so you need to know the smallest packing case that will accommodate each urn. Your carrier isn't interested in the shape, just the external volume of each case, in order to calculate the shipping charges. Should you also store that information in the table of information about urns? The answer is again 'no' because that information is already inherently stored in the table. To calculate the external volume of the case required (assuming that the case walls and packaging are 1.5 units thick on each side) all you have to do is to multiply (height + 3) * (width + 3) * (width + 3).

We call data that is inherent in other data 'derivable' or 'redundant' data for the simple reason that it can be derived from the existing data and therefore storing it is redundant. As a pretty hard and fast rule, you shouldn't store derivable data in a table. Instead you get the computer to calculate it for you whenever you need it. This can be done using a form (as we'll demonstrate here) or using a query (as demonstrated later in Chapter 9). Since the users of your database will only view the data using a form, as far as they are concerned, the age of the person or the shipping volume of the urn is always visible. Indeed, they may believe that the information is stored in the database – that's fine; as long as the database is useful to them, it doesn't matter how the information is stored.

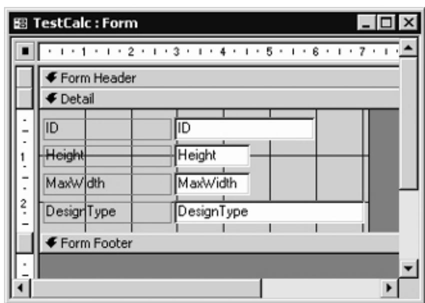
Forms performing calculations

Putting a calculation on a form means using the Design view but we'll start by building a simple form with the Form wizard. Based on the `Urns` table, the form uses the fields `ID`, `Height`, `MaxWidth` and `DesignType`. I've called it `TestCalc` and the finished form looks like this:



Flip into Design view by pressing the design button:

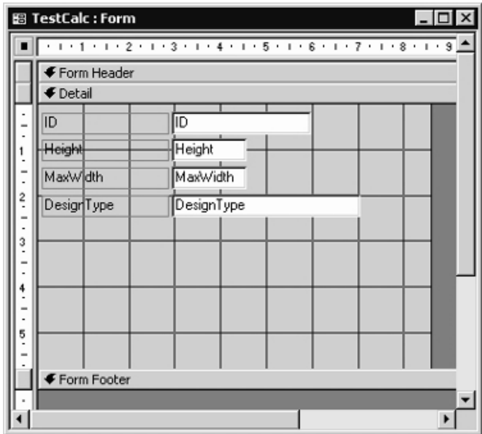
The form now looks like this:



Design view gives you the tools you need for controlling how a form looks and behaves. You can move the fields around, remove them and add different ones, change the sizes, colors, fonts, patterns, borders, add messages to the user and all sorts of other stuff that's covered in detail in Chapters 10 and 11. You can also, of course, add calculations, and we'll do that now.

We'll add a calculated field to this form that will add the value 3 to each dimension and then multiply the figures together to calculate the shipping volume.

First, give yourself some more room on the form by placing the cursor on the bottom right corner of the gridded area, called the Detail section, which denotes the shape of the finished form. When the cursor shows as a four-headed arrow, drag the area out a bit.

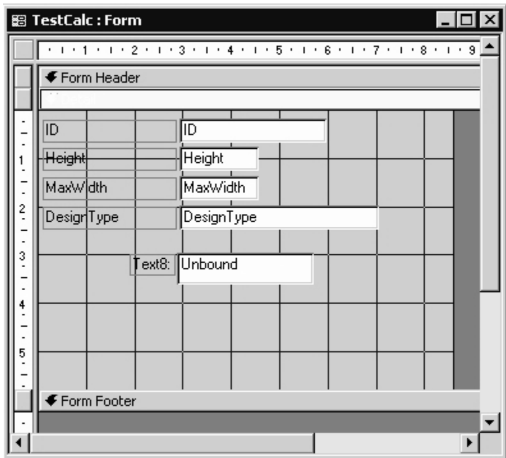


Calculations are almost always placed in text boxes on a form; check out the Toolbox.

(If you can't find the toolbox, select View, Toolbox from the main menu.)

Within the Toolbox locate the Text Box tool.

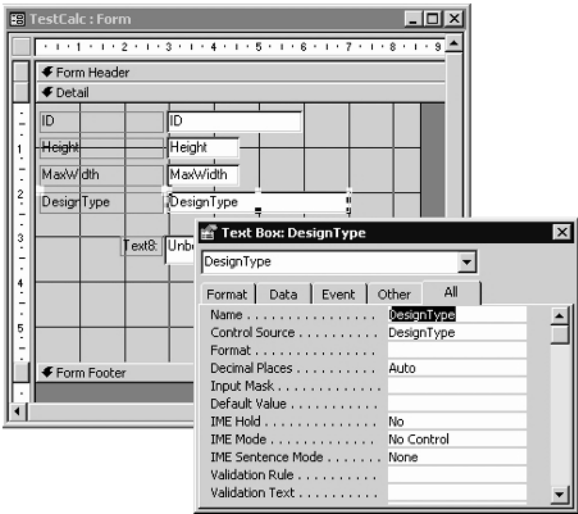
Click it and move the cursor onto the form. Click and drag to outline a text box: make your first click some way in from the left hand edge of the form so there's room for both the text box and for the accompanying label that's placed to its left. Play with the various handles to move it around and resize it: to move the label (which will say 'Text8:' or some such number) or the text box independently, put the cursor on the top left corner whereupon it changes into a hand-with-pointing-finger. (A cursor showing a spread hand moves the two together).



Objects and properties

Everything on a form is an object and every object has a set of properties. (In this case we are using the term 'object' in a slightly more formal sense than in Chapter 2). Objects are things like fields, labels, the detail, header and footer sections and the form itself. Properties are things like the size, color, font, caption and so on. Different objects have different selections of properties, just like objects in real life. For instance, a notebook would have a 'number of pages' property which has no meaning for, say, a fish.

To see the properties of any object, place the cursor on it, click the right mouse button and select Properties, last on the list. A window like this will pop out, showing the object's property sheet.



You can also see an object's property sheet by selecting it and clicking the Properties button,

or you can double click on the object itself, or you can select an object and press F4 on your keyboard. Once a property sheet is displayed, you can click on other objects and the sheet will change to show the properties of the selected object. You must actively choose to close the property sheet using its Close button or the Properties button in the top menu.

To see the properties of the form, rather than those of the individual objects that make up the form, click on the Form Selector. This is the gray square in the top left hand corner of the form in Design view.

When you click it, a small black square appears inside the gray square and the properties for the whole form are now listed. Clicking on any other object returns the form selector to plain gray and changes the property sheet to show the properties of the object you have now selected.

For any given object there is a number of tabs in the Properties dialog – typically five: Format, Data, Event, Other and All (which combines information from the previous four).

Inspect the Data properties of the new text box. The first property on the Data tab is Control Source: this tells the text box where to get the information to display on the form. Put the cursor in the Control Source cell and two buttons appear to the right. The left one pops down a list of the fields in the table that underlies the form. We don't want data from a single field but the data from two (`Height` and `MaxWidth`) manipulated such that we add three to each to allow for the packaging. We then want to multiply the height by the width, and then by the width again to calculate the volume.

In pseudo English the equation would read something like:

(height + 3) * (width + 3) * (width + 3).

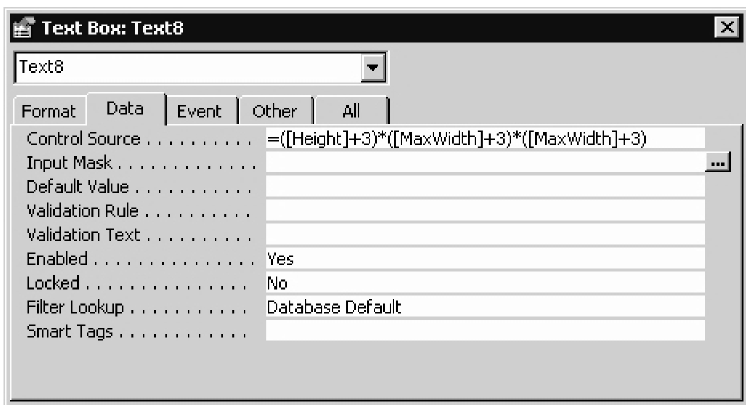
In practice, we need to use the names of the fields that hold the data so the equation reads as:

([`Height`]+3)*([`MaxWidth`]+3)*([`MaxWidth`]+3)

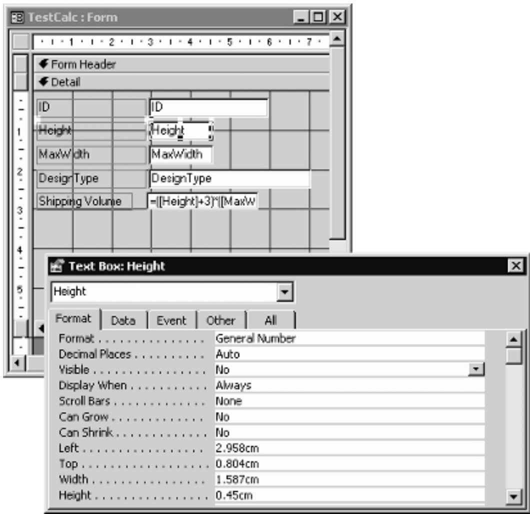
All we have to do is to add an equals sign to the front and we get:

=([`Height`]+3)*([`MaxWidth`]+3)*([`MaxWidth`]+3)

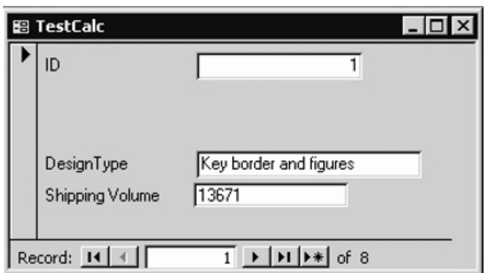
which is what you need to type in as the control source:



While we are here in Design mode, you could also change the Caption of the new label to something more sensible. You could also decide to hide the height and width fields so just the volume is shown on the form: in the Format properties of the `Height` text box, change the Visible property from Yes to No (click the arrow and choose).



Do the same for `MaxWidth` and inspect the form again.



A quick check of the arithmetic tells you it's working properly.

Querying from a form

We've shown you how to use queries to find specific records. However, if your query requirements are very simple, it's also possible to do it from a form.

Open the `AllFields` form and, if you want to see just the records for people in London, find a record with London in the `City` field, place the cursor in that field and click the Filter By Selection button in the menu bar:

At the bottom of the form you'll see that you now have a smaller set of records, filtered out from the full set if the `City` field contains London. To return to the full set of records, click the Remove Filter button:

You can only filter on a single field at a time but it's a handy shortcut for reducing the number of records you see.

Multiple forms per table

As mentioned briefly above, many forms can be associated with one table. Creating a range of forms could simplify the performance of various tasks, making data entry more enjoyable, maintenance of existing data less confusing and so on. It also lets you give users exactly the tool they need for a particular job.

Summary

Building forms is quick and easy using the Form wizard and AutoForm while for more adventurous forms, the Form Design tool provides the needful. As we've said, there'll be a lot more about the Form Design tool in Chapters 10 and 11 as this chapter contains only a brief introduction. Using the wizard and the Design view in conjunction speeds up development time as you can start with a wizard-generated form that's almost perfect and then fine tune it with the tools in the Design view.

Chapter 6

Reports – printing your data

Demands for data in printed form are still much in evidence. "Can you just run me off a copy of the latest stock levels/employee details/baseball scores?" So much for the paperless office.

Reports are Access's way of preparing data for printing, with headings, page numbers and the information arranged in helpful groups. Looking at the Report wizard will provide a good overview.

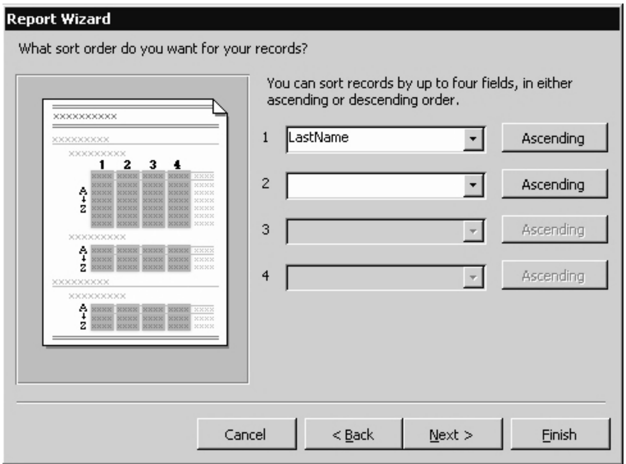
Creating a report using the Report wizard

Start with the `chap6start.mdb` file. Under the Reports tab in the `Club` database window, double click on 'Create report by using wizard'. The goal in this example is to print out a list of each member's contact details including phone numbers.

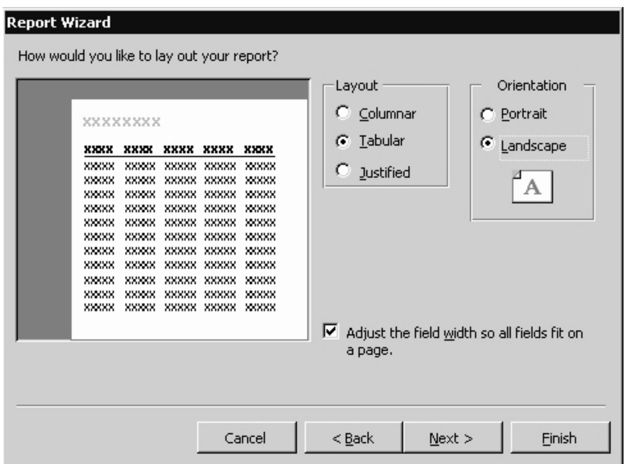
In the first screen, select the table on which to base the report (good old `ClubMembers`) and then choose the fields you want in the report. I've chosen all fields except the `ID` field.

Click the Next button. The wizard asks if you want any 'grouping levels': we'll ignore this for now (but we'll do it in Chapter 12) so click the Next button.

Here you can specify the sort order for the records. Mostly we find a person's phone number by looking up the last name, so select `LastName` from the pop down list in the top sort slot. Either stick with the default A–Z order or swop to Z–A order if you're feeling perverse (or perpetually hard-done-by as you would be if your last name was Whitehorn...).



Click Next. In this dialog, the wizard offers six layouts for the report (a sample is shown when you make a selection), two paper orientations and a very handy check box for juggling things so that all the chosen fields fit on one page. My settings are Tabular layout and Landscape orientation.

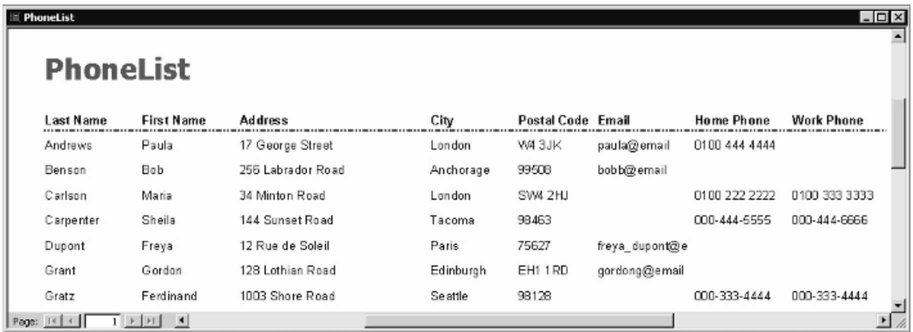


The 'Adjust the field width so all fields fit on a page' check box could also be referred to as a 'print to fit' check box – it prints the output so it fits onto the page neatly.

This option is certainly useful but it doesn't possess supernatural powers. If you have lots of fields in your portrait-orientated report all packed with long text entries, it can't possibly fit it onto a single page. Access will do its best but field names and contents are likely to appear truncated when you print out the report.

Choose a layout and orientation and click Next, then choose a style and click Next. Name the report (mine is `PhoneList`) and click Finish with the 'Preview the report' option selected (the default).

This is part of the resulting report.


PhoneList

PhoneList

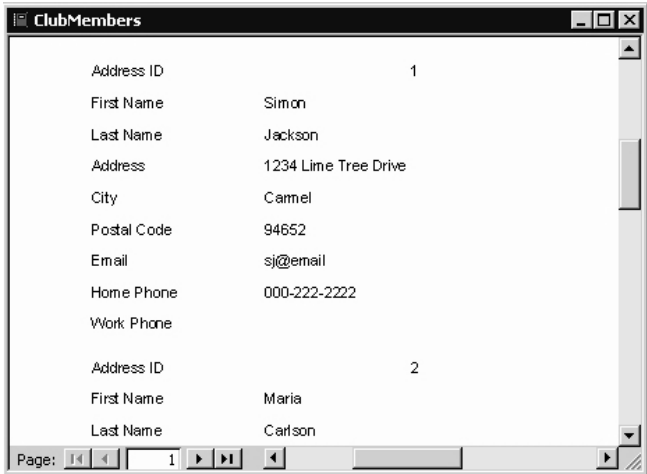
Last Name	First Name	Address	City	Postal Code	Email	Home Phone	Work Phone
Andrews	Paula	17 George Street	London	W4 3JK	paula@email	0100 444 4444	
Benson	Bob	256 Labrador Road	Anchorage	99508	bobb@email		
Carlson	Maria	34 Minton Road	London	SW4 2HJ		0100 222 2222	0100 333 3333
Carpenter	Sheila	144 Sunset Road	Tacoma	98463		000-444-5555	000-444-6666
Dupont	Freya	12 Rue de Soleil	Paris	75627	freya_dupont@e		
Grant	Gordon	128 Lothian Road	Edinburgh	EH1 1RD	gordong@email		
Gratz	Ferdinand	1003 Shore Road	Seattle	98128		000-333-4444	000-333-4444

Page: 1

Creating other wizard-generated reports

Having already met AutoForms in Chapter 5, you might have noticed AutoReport listed under the New Object button or the Insert menu option. This will let you generate reports even more rapidly than by using the Report wizard. You have little control over what's produced and sometimes the results are less than optimal but for all the time it takes to try, it's often worth generating one to see if it will do the job.

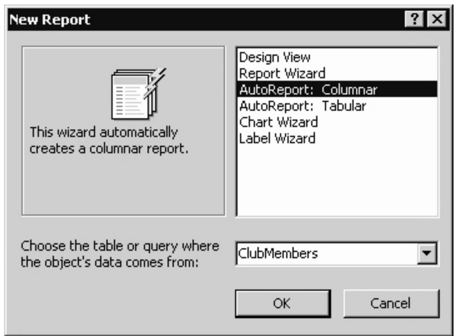
Highlight the `ClubMembers` table in the Tables tab, click the arrow alongside the New Object button, select AutoReport and that's it.



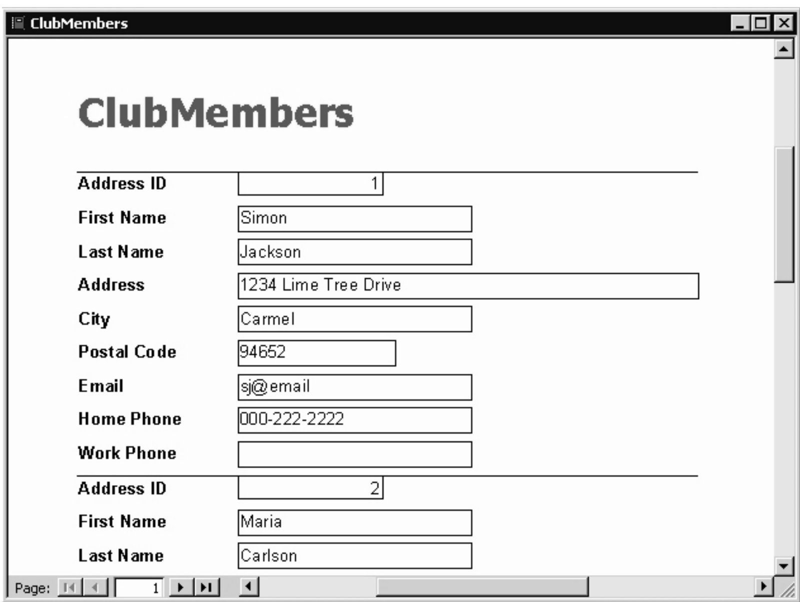
Hmm, not so great, this one. It's simply a list of entries in which it would be hard to locate a specific phone number or even person as the records are listed in the order they were entered. Close the report and don't bother to save it. Some you win, some you lose.

Other types of AutoReport are available from the New button in the database window. With the Reports tab selected, click this button:

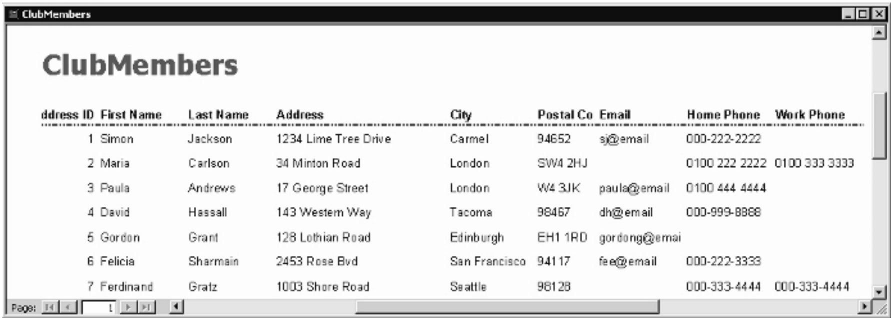
and you're offered AutoReport: Columnar and AutoReport: Tabular. Choose the former and then pick the `ClubMembers` table from the pop down list below.



Click OK and the new report is displayed as shown below.



This columnar report has the same problems as the first AutoReport we generated. Throw it away and try the AutoReport: Tabular option which is sometimes more satisfactory, as it is here,



ClubMembers

ddress ID	First Name	Last Name	Address	City	Postal Co	Email	Home Phone	Work Phone
1	Simon	Jackson	1234 Lime Tree Drive	Carmel	94652	sj@email	000-222-2222	
2	Maria	Carlson	34 Minton Road	London	SW4 2HJ		0100 222 2222	0100 333 3333
3	Paula	Andrews	17 George Street	London	W4 3JK	paula@email	0100 444 4444	
4	David	Hassall	143 Western Way	Tacoma	98467	dh@email	000-999-8888	
5	Gordon	Grant	128 Lothian Road	Edinburgh	EH1 1RD	gordong@emai		
6	Felicia	Sharmain	2453 Rose Bvd	San Francisco	94117	fee@email	000-222-3333	
7	Ferdinand	Gratz	1003 Shore Road	Seattle	98128		000-333-4444	000-333-4444

but I still won't save it as once more the records are in entry order rather than alphabetical by surname: the `PhoneList` report does a much better job.

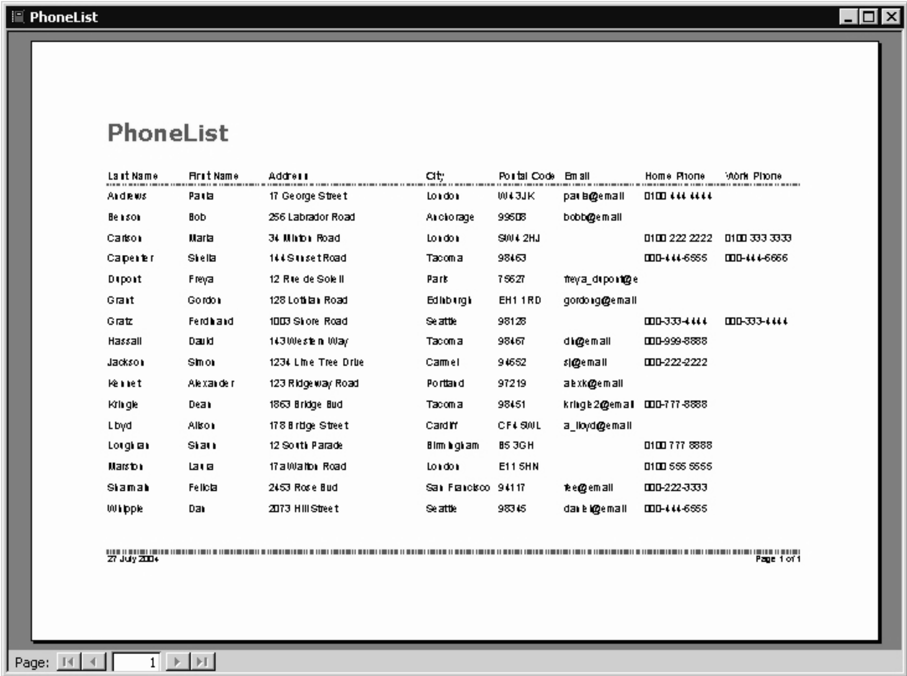
Printing a report

OK, you've created a report, now let's get it committed to paper. We're presuming you have a printer set up from Windows and ready to go.

❝ *Troubleshooting printer problems is outside the remit of this book but if you experience difficulties, start by checking your printer setup under Windows.* ❞

First let's have a sneak preview of what we hope will roll out of the printer. In the Reports tab, highlight the `PhoneList` report and click either the Preview button in the database window or the Print Preview button on the toolbar.

Your report is displayed just as it will look on paper. (Click the One Page button to see the whole page).



PhoneList

Last Name	First Name	Address	City	Postal Code	Email	Home Phone	Work Phone
Andrews	Paula	17 George Street	London	W4 3JK	paula@email	0100 444 4444	
Benson	Bob	256 Labrador Road	Anchorage	99508	bobb@email		
Carlson	Maria	34 Milton Road	London	SW4 2HJ		0100 222 2222	0100 333 3333
Carpenter	Sheila	144 Sunset Road	Tacoma	98463		000-444-6555	000-444-6666
Dupont	Freya	12 Rue de Soleil	Paris	75627	freya_dupont@e		
Grant	Gordon	128 Lothian Road	Edinburgh	EH1 1RD	gordong@email		
Gratz	Ferdinand	1003 Shore Road	Seattle	98128		000-333-4444	000-333-4444
Hassall	David	143 Western Way	Tacoma	98467	dh@email	000-999-8888	
Jackson	Simon	1234 Lime Tree Drive	Carmel	94652	sj@email	000-222-2222	
Kennet	Alexander	123 Ridgeway Road	Portland	97219	alexk@email		
Kringle	Dean	1863 Bridge Blvd	Tacoma	98451	kringle2@email	000-777-8888	
Lloyd	Alison	178 Bridge Street	Cardiff	CF4 5WL	a_lloyd@email		
Longman	Shaun	12 South Parade	Birmingham	B5 3GH		0100 777 8888	
Marston	Laura	17a Walton Road	London	E11 5HN		0100 555 5555	
Shamah	Felicia	2453 Rose Blvd	San Francisco	94117	fee@email	000-222-3333	
Whipple	Dan	2073 Hill Street	Seattle	98345	daniel@email	000-444-6555	

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It looks promising so click the Print button on the toolbar. Your report should print out looking just like the preview with a title at the top and the data arranged under field headings, with today's date and a page number at the bottom.

Summary

You can now print out reports from your database – membership lists, monthly sales reports and personal phone directories are just a few clicks away.

Chapter 7

The story so far

You can create and manage a simple database

With the tools and techniques covered in the preceding chapters you can create and manage a simple database for such applications as club membership, inventories and address/contact lists. You can do everything from building the database to the point when you can present neat printed reports of the information collected.

You've met the four important building blocks

Tables – for storing data
Queries – for locating specific information
Forms – for interacting with the data (viewing, adding or editing records)
Reports – for presenting printed information

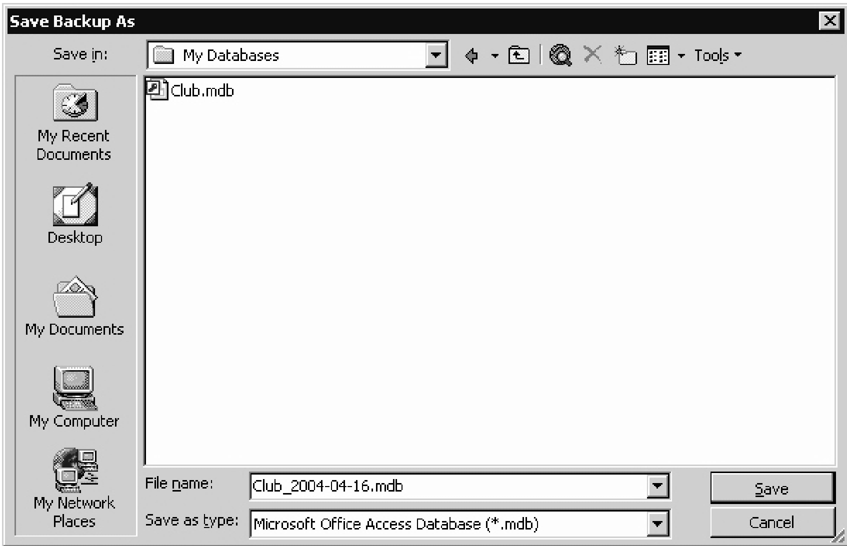
These four will appear again as we continue our progress through Access and each time they surface you'll learn a little more about them. While it's true that things get more complex from here on in, Access' famed ease of use rarely falters.

Keep your work safe by backing up

Backing up is all about keeping your work safe whether you're working through the examples in order to learn about Access or whether you're developing your own database. It's quick and easy to do and can save an awful lot of grief should anything go wrong.

A backup is simply a copy of your work to date. Whenever you build an Access database, a file is created with the extension .MDB in which all your tables, queries, forms and reports are held. This means there is just one file to back up, which makes life easier.

Access has made life even easier by providing a backup facility. With the database window open but with all tables, queries, forms and reports closed, click Tools in the main menu and select Database Utilities and then Back up Database.... A window opens so that you can specify where to place the backup file. The backup file name will have the date in YYYY-MM-DD format appended so it's easy to see when it was made.



If you make more than one backup on a particular date, a number will also be appended. The name of the second backup will look something like this: `MyDatabase_2004-04-16_(1).mdb`. (Another unhelpful instance of counting from zero – it just goes to show that while computers may know about digits, they certainly don't count on their fingers.)

The backing up process will close the database and then re-open it, and you're ready to continue.

Keeping a safe copy on your computer is an excellent plan, but ideally, you should also keep backup copies on a CD-ROM or floppy disk, tucked away somewhere safe.

Backups can also be made manually by copying and pasting the .MDB file with the file handling facilities of My Documents or My Computer.

Revisit the big four

In the next five chapters we'll take a longer, harder look at each of the components in turn, explaining capabilities and demonstrating their use. This will let you hone your simple database to the peak of perfection where only fine upstanding data is permitted to enter its hallowed table, where stylish forms beckon the user, where queries surprise and reports satisfy. Enough of this hyperbole; here comes Chapter 8.

Part III

Creating hand-crafted databases

Chapter 8

Exploring tables in more depth

What more could you possibly need to know?

So far we've looked at the quick and easy routes to creating tables provided by Access wizards. They offer a degree of flexibility which will cover the needs of most simple databases and if you never feel the need to delve any further, that's fine. However, databases frequently develop over time. Once the basics are in place and a table is used in earnest, all sorts of other possibilities and ideas pop up and these go beyond what's possible at the level described thus far.

When a wizard isn't enough

There are things that the wizard can't do but Access is full of extra functionality to achieve practically everything you can imagine. For instance, it's perfectly possible to ensure that only 'Mr' and 'Ms' are permitted as entries in a `Title` field (though whatever titles you choose these days, someone somewhere will be offended). It's not difficult to set this up but you can't do it with a wizard.

Modifying a wizard's work

Even when your needs outstrip those met by wizards, they are still very useful. You can use the Table wizard to build the basic data storage table and then you can add further refinements to that table using the other tools Access provides (as we did with the `TestCalc` form in Chapter 5). However, in order to make meaningful changes to the structure of a table you need some background information.

Primary keys

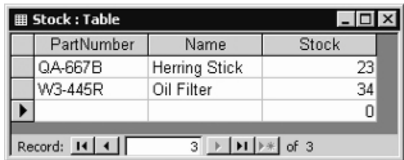
You have already found that Access is almost obsessed with primary keys; every time you use the Table wizard Access tries to make sure that you add one. A primary key is a field (or fields) that contains a unique value for each record. For example, you might have a table of employees within a company. Each person will have a national insurance number (UK), social security number (US) or equivalent, that is unique to that person. So if you decide to include a field in the table which holds that number, then that field is perfect as a primary key. Unlike people, most items aren't issued with a government-defined number (thankfully). However, items used within a company are often numbered for convenience by that company – think about order numbers, part numbers etc. Again, these are often chosen to be the primary key value in a table. Even if you create a table of information about your friends and relations, it's a good idea to give the table a primary key. This doesn't mean that you have to find out your cousin's social security number, you can simply set up a field called, perhaps, `ID` and put a 1 in that field for the first record, a 2 for the second and so on.

This tells us what a primary key does – the value in the primary key field uniquely identifies every record in the table. But it doesn't tell us **why** each table needs a primary key. The answer is that primary keys are essential when we start to use multiple tables together in a single database. We'll start to do that in Part IV whereupon primary keys will begin to make more sense. However, we will still be making sure as we work that every table has a primary key. The field chosen by the Table wizard during the building of a table, or when you save a manually-built table, will be fine.

Incidentally, I said above that 'a primary key is a field (or fields)' and this is perfectly true – a primary key can be made up of two or more fields, although it is often composed of just one. We'll touch on this again in Chapter 15 in the section called Many-To-Many relationships.

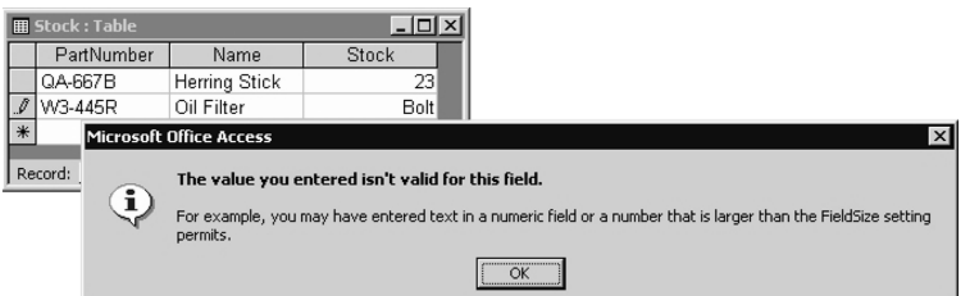
Data types

Tables store data and data comes in many different flavors. Access lets you determine the type of data that will be stored in each field and it is a good idea to try to match the data type to the type of data (if you see what I mean!) that you intend to store in that field. As a simple example, suppose that you create a table of the stock held in a warehouse. The table might be called 'Stock' and have three fields – `PartNumber`, `Name` and `Stock`:



If we ignore `PartNumber` for the moment, it is clear that `Name` is supposed to contain text-type information and `Stock` (the number of items in stock) is destined to contain numbers. Therefore, the data type for `Name` is text and the data type for `Stock` is number. Simple. In fact, telling Access what data types to use brings several benefits.

For a start, Access can prevent you from putting the wrong data into a field:



In addition, choosing the right data type can save storage space, making your database leaner and faster as we'll explain at the end of the chapter.

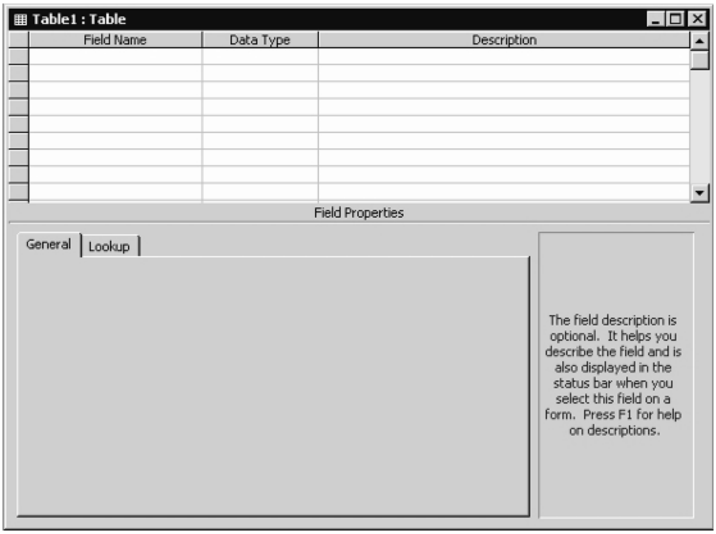
So data types are worth knowing about and we'll look at each of the data types and the sort of data you'd store in each. The table below lists all the possible types.

Data type	Field size property
Text	
Number	Byte
	Integer
	Long Integer
	Single
	Double
	Replication ID
	Decimal
Date/Time	
Currency	
AutoNumber	Long Integer
Yes/No	
Lookup wizard	
Hyperlink	
OLE Object	
Memo	

The number data type is subdivided into seven field sizes for dealing with different numerical ranges (see below). Some are very much more commonly used than others. It's useful to have a feel for everything that Access **can** handle but you'll probably find that you mainly use long integer and single in practice, so you probably don't need to spend too long studying the other types that are on offer.

To demonstrate data types, we'll create a table called `DataTypes` in a new database of the same name. From the Tables tab in the database window, double click 'Create table in Design view'.

You're now in an entirely blank table design area where you can define the fields.



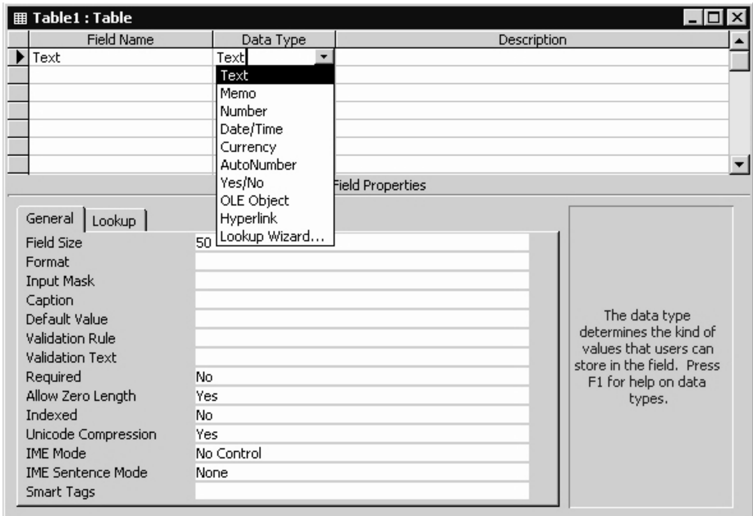
The top panel of the dialog is divided into rows and columns. Field names, data types and descriptions are entered here. Beneath this lies the Field Property panel where the properties of each field are defined. The box to the right displays handy tips, determined by the position of the cursor.

Selecting data types

In the Field Name column, type a name for the field: we'll use Text.

❛ *Clearly using the name of the data type isn't normally to be recommended, you'd use a name like* `FirstName` *or* `CompanyName`*, but we've designed this table just to demonstrate the different data types.* ❜

Press the right arrow key, or Enter, or click in the adjacent cell in the Data Type column. The default data type is Text, which happens to be fine. However, just to show you how it works, click the arrow button at the right of the cell,



and a list of all available data types pops down. If you wanted something other than text for this field, you'd select it here.

Add a few words about the field in the Description column if you wish; this isn't obligatory but can be helpful if field names are vague. Hint: don't use vague field names!

Data type: Text

A field of the text data type is used for storing text: no surprises there. Names, addresses, descriptions of products, colors and countries would sit happily in the text category. Numbers as well as characters can be entered in text fields as in an address like 1054 Penguin Boulevard. The numbers in an address are like a label; they're never used mathematically. (When did you last calculate the average house number of your friends?) Indeed, the different ways in which numbers are used is generally worth bearing in mind. Phone numbers are numerical, but as you never multiply one by another, they are more properly stored in a text field. This prevents other problems too. Any leading zeros (which every number has if the full international rendition is used) are truncated by numerical formats. Also, it's common to use spaces, dashes and even brackets in phone numbers and these are disallowed in any of the numerical field types. So, always store telephone numbers in a text field unless you have a very good reason to do otherwise.

Serial numbers and other codes used for identification are always stored as text if they contain any text characters. Only if they are entirely numerical (without any leading zeros!) is it reasonable to store them in a field of type Number.

The table below shows examples of text data.

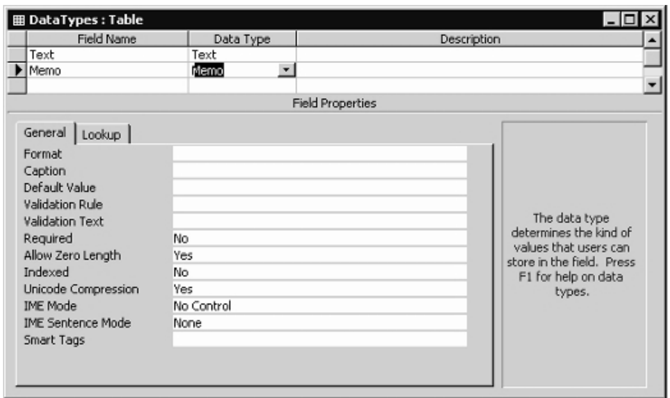
Field name	Data type	Example entry
Surname	Text	Campbell
Address	Text	124 East Street
State	Text	CA
Serial Number	Text	TFH1567-8/R
Phone Number	Text	(000) 444-444
Fax Number	Text	001 000 888 999
License Number	Text	XGN 845 G
Stock Code	Text	0000345

So, in the `Stock` table mentioned above, it should now be clear that the `PartNumber` field, despite having ‘Number’ in the field name, should actually be of data type text.

❛ *The text data type can also be called an alphanumeric data type. This is perhaps a better term as it makes it clear that as well as holding letters of the alphabet, numbers can be stored too.* ❜

Data type: Memo

This is a useful data type for fields with a large but variable amount of alphanumeric text, such as additional notes or background information. Up to 64,000 characters can be stored (that's about 24 pages of an average paperback novel) but happily the space taken up is determined by the length of the entry so none is wasted by storing shorter entries or by not having an entry for some, or even most, records. If you were creating a table of data about restaurants, you would store the establishment's name in a text field but notes about the ambiance in a memo field. The entries in memo fields can be searched but cannot be indexed (see below). Add a memo field called `Memo` to the table.



Data type: Number

When you select the data type Number, the Field Property panel allows you to select one of seven separate Field Sizes which are outlined briefly in the table below.

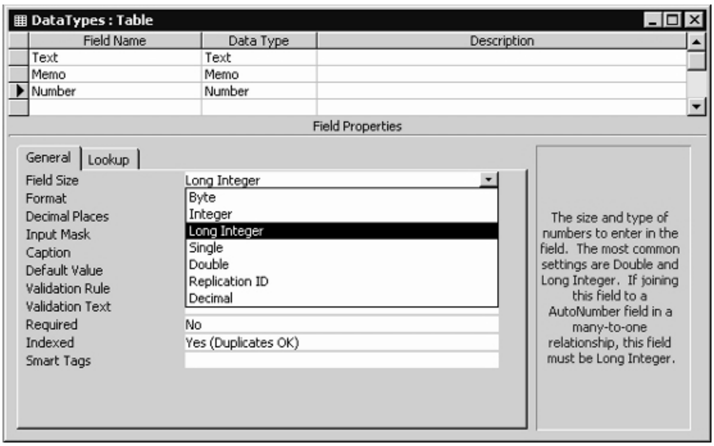
Field size	Range	Decimal places	Storage space/record
Byte	0–255	0	1 byte
Integer	–32,768 to 32,767	0	2 bytes
Long Integer	–2,147,483,648 to 2,147,483,647	0	4 bytes
Single	-3.4×10^{38} to 3.4×10^{38}	7	4 bytes
Double	-1.797×10^{308} to 1.797×10^{308}	15	8 bytes
Decimal	$-10^{28} - 1$ to $10^{28} - 1$	28	12 bytes
Replication ID	globally unique identifiers (see below)	NA	16 bytes

❛ *When is a data type not a data type? Sticking strictly to Access' terminology, Number is a data type and its subdivisions (byte, integer et al.) are field sizes. In common parlance, however, byte, integer and so on are referred to as data types so we'll stick with that.* ❜

These seven data types have different properties, notably different storage requirements. At the end of this chapter is a discussion of storage requirements vs. speed.

Selecting the field size

Type in the field name 'Number'. The data type defaults to text so click the button in the Data Type column and select Number. In the Field Properties panel, the General tab is current and the first item in its list is Field Size. The default is Long Integer. Click to place the cursor in the field size cell and click on the button that appears. A list of seven choices pops down. Make your selection here.



❛ *We are about to enumerate all of the numerical data types for the sake of completeness. If you aren't mathematically inclined this may begin to get tedious. If it does, use the following simple rule: most whole numbers can be stored happily in the default type which is Long Integer. If your number is going to include decimal values (like 1.23) then choose Single. If that sounds fine for the moment, feel free to skip to the section headed **Data type: Date/Time**.* ❜

Data type: Number – Byte

The Byte data type can store numbers between 0 and 255. Many pieces of data fall within the bounds of the byte field: it's perfect for household inventory fields, for instance. Even the cleanest family is unlikely to hit the 255 limit for washing machines and such devices rarely occur in thirds or halves. Byte cannot store negative numbers... but that is OK for washing machines as well.

Data type: Number – Integer

Useful for numbers that can be negative and that also have a range greater than 255 but less than 32,000 odd. Great for the number of pupils in a school or employees in a small to medium sized enterprise.

Data type: Number – Long Integer

Long integer is the default data type. Even larger numbers can be stored in the long integer data type (minus two to plus two million and then some) and many applications will never approach the upper or lower limit. Useful for order numbers for a company of reasonable size. You still can't store decimal places in this field type so a number like 3.14159 is right out.

Data type: Number – Single

These numbers are getting ever more vast but, perhaps more importantly, you can finally store decimal values so you can enter a number like 3.14159. Up to seven decimal places are permitted.

Data type: Number – Double

Even more mind-stretchingly huge numbers can be stored in the double field type. Given that there are about 10^{73} particles in the observable universe (last time I looked) the limit of 1.797×10^{308} is probably adequate for most purposes. This data type can also store even more decimal places. Wow.

Data type: Number – Decimal

This one's for huge numbers where high levels of precision are required. Numbers can be quoted to 28 decimal places, which should be enough for most mortals.

Data type: Number – Replication ID

The replication ID field stores globally unique identifiers (or GUIDs for short. This can be pronounced as 'goo-id' or possibly even like 'good' with a strong

Scottish accent. Your choice.) GUIDs are used to identify the components of a database for use in the process of replication.

❛ *In a nutshell, replication helps to allow users who are disconnected from a shared database to work with data from that database. The bottom line is that if you are new to Access you probably don't want to worry about this data type yet.* ❜

So there are lots of different numerical data types. Choose whichever one takes your fancy for the table you are creating.

Data type: Date/Time

If you want to store a date, you might argue that you simply need to use a text field because in there you can type 'January 1 2001'. True, you can. The problem with doing this is that Access will store it for you as text and won't be able to perform so-called 'Date Arithmetic' on that date. For example, it won't be able to work out that there are 36 days between the 1st of January and the 7th of February in the same year, or that if Helen's date of birth is the 12th of September 1963, on the 22nd of October 2003 she was 40. We manipulate dates all the time and we often want Access to do the same for us. However, in order for Access to do this, we have to use a Date/Time field.

❛ *When a date is entered into a Date/Time field, it is actually stored behind the scenes as a number and Access uses that number to work out the answers we want. For example, the date 16th August 2003 is stored as 37849. The same is true for time: you can't just type 15:24 in a text field and hope that Access knows it's temporal information meaning "getting on for half past three and time for a cup of tea". Instead you type, say, '16 August 2003 15:24' into a Date/Time field and Access will store it as 37849.6416666667* ❜

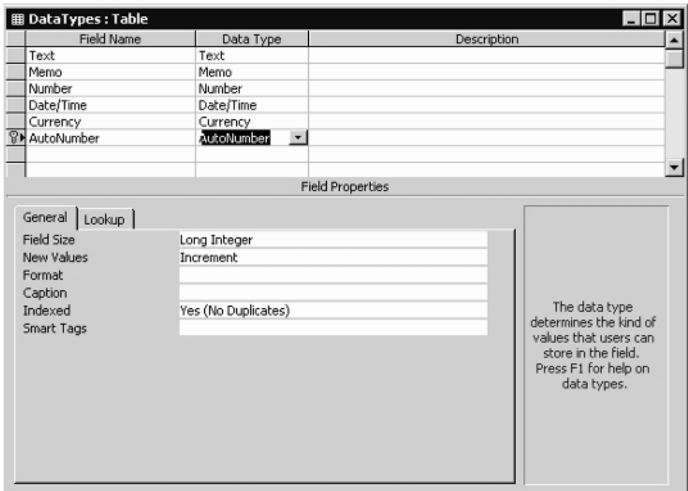
Add a field called Date/Time to the table. (In fact, add one of the appropriate name for the rest of the data types once you've read the descriptions below.) Date and time data can be displayed in different ways: these are discussed in the section called 'Investigating the main properties of fields' later in this chapter.

Data type: Currency

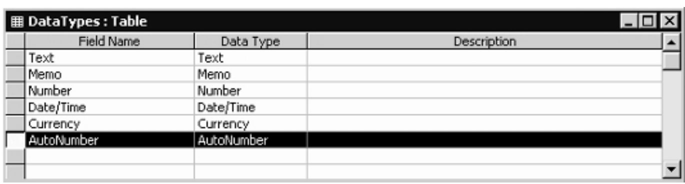
This is just what it seems, a field for storing values which equate to currency values. Up to four decimal places are permitted, with up to 15 digits before the decimal point.

Data type: AutoNumber

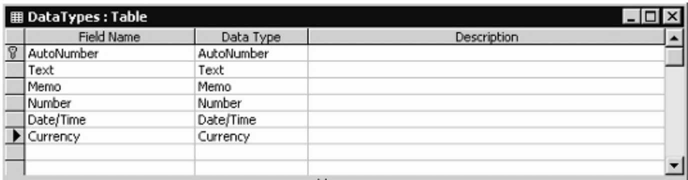
This data type generates a series of numbers, automatically incremented by one. The most common usage is as an `ID` field for use as a primary key. So, after you have added an AutoNumber field called `AutoNumber` to your table, with the cursor still on that field, click on the Primary Key button (the one with the key symbol). The field should acquire a key symbol at the left hand side of the table.



It is conventional (but not essential) to put the primary key field(s) at the top of the table. You can move fields around as follows. Click on the key symbol to the left of the AutoNumber field and the entire row should highlight.



Release the mouse button, and then click in the same place, but hold the mouse button down. Now slide the row upwards to the top of the table and then release the mouse button.



As I said, you don't have to follow this convention but it does make life easier (you always know where to find the primary key) so why flout accepted wisdom?

When you tell the Table wizard that you want it to provide a primary key, it adds an `ID` field of the AutoNumber data type to the table. Every time you add a record, Access assigns it the next number in sequence and writes it into the `AutoNumber` field.

The AutoNumber data type is, in fact, simply a specialized form of Long Integer field so the values stored in an AutoNumber field are actually just long integers. You may feel that you don't really need to know this, but this factoid becomes important when we start using multiple tables.

Data type: Yes/No

There are many pieces of information that are either one thing or the other, without shades in between (for database purposes, anyway – human beings are past masters of 'yes, but...' exceptions.) Do you have a current driving license? Have you ever been in Canada? The Yes/No data type stores the response neatly in a mere 1 bit. (In other words, the information is stored very efficiently, which means that less disk space is wasted.) Once again, like dates, you could use a text field and store 'Yes' or 'No' but it is better to use a Yes/No data type because then people won't enter 'Yup', 'Naah' or any other unhelpful variant. A Yes/No field will, by default, accept simply a check (referred to as a tick if you live east of the Atlantic) for yes and a lack of a check for no so people can input the information using a mouse.

Data type: OLE Object

OLE stands for Object Linking and Embedding – this data type allows you to link to, or embed, an object from outside Access into a table. Such an object might be an Excel spreadsheet, a Word document or an image. So if you had a spreadsheet holding details of employees' expenses, you could access it from within Access using a field of the OLE Object data type.

Data type: Hyperlink

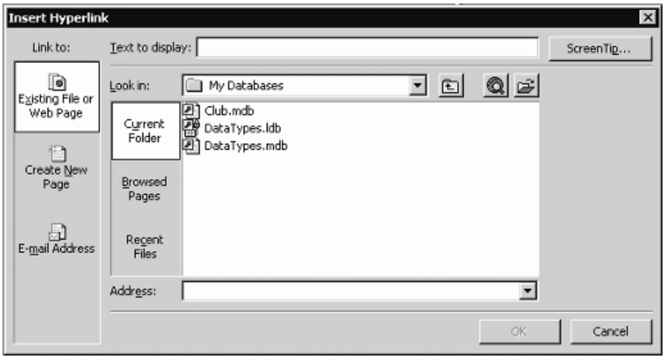
This data type is potentially very useful for the web aware (and who isn't aware of the web nowadays?). A hyperlink field can contain a URL so your table could contain the location of, say, a person's home page. Any entries in this field are formatted to appear blue and underlined, the classic look for URLs. Hyperlink fields can also contain UNC paths to point to a specific file either on your PC or on a server.

❛ *A URL is a Uniform Resource Locator and is used to point to a specific place.* `http://www.msn.com` *is a typical URL. A UNC path is Universal Naming Convention path which acts in a similar way but points to a shared folder and file on a PC or file server, like this:* `\\machine\folder\filename.mdb`. ❜

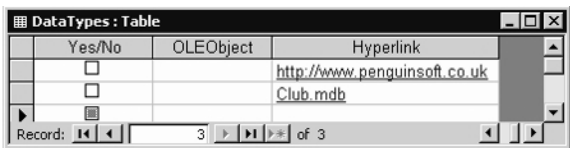
If you provide your users with a hyperlink data type, the implication is that they may want to enter hyperlinks into the database. As most people are aware, hyperlinks themselves can be rather complex, for example:

```
http://office.microsoft.com/assistance/
  preview.aspx?AssetID=HA010916581033&CTT=98
```

Few people will want to type such a long string of characters into the field. Happily, they don't have to. Let's assume you have created a table with a hyperlink field and you are now entering some data. You right click on the hypertext field and select Hyperlink, Edit Hyperlink. The Edit Hyperlink window opens. From here you can browse to the required file and/or, assuming that your machine has a connection to the Internet, even to the required web page.



Clicking OK puts the UNC path or URL into the table: the next screen shot shows one of each.

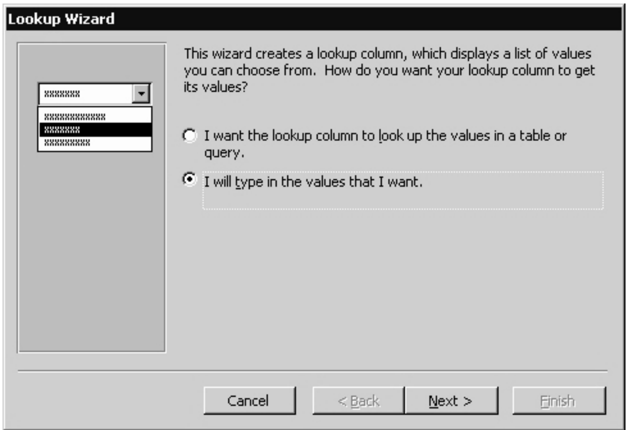


The full UNC path is not shown in the field, only the file name. If you want to see where the file originates, right click in the field, move the cursor down to select Hyperlink and then click Edit Hyperlink.... This opens the editing window shown above and lets you see where the link is pointing.

Data type: Lookup wizard

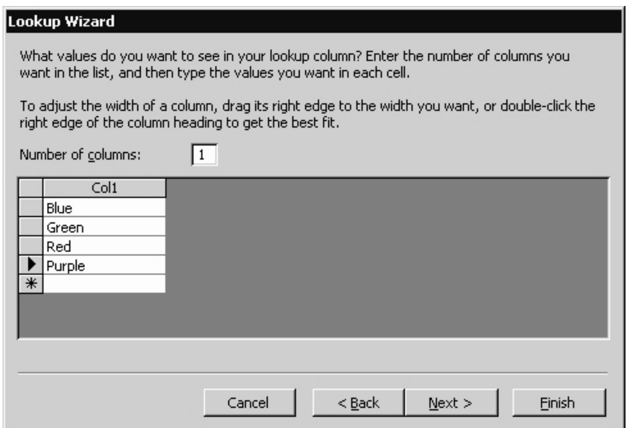
The Lookup wizard isn't really a data type but it appears in the list of data types so we've included it here. This is a very useful device for keeping data within bounds. The Lookup wizard gives you control over the entries that are allowed in that field. If you only want the responses Blue, Green, Red or Purple in a field, use the Lookup wizard type. You can either determine the permitted entries when you're building the field with the wizard or you can set the field to refer automatically to data from another table.

Type in a field name and select the Lookup wizard. The wizard runs and asks where the permissible values will come from.

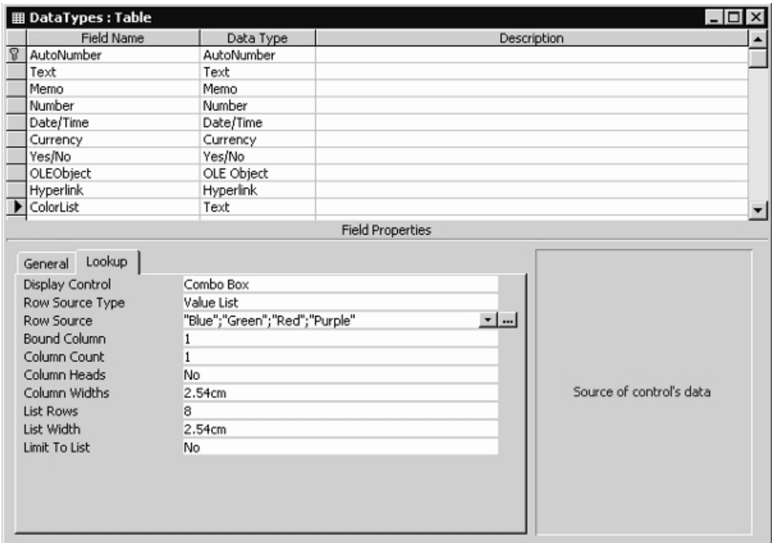


You can also run the Lookup wizard from Design view by clicking on Insert in the main menu and choosing Lookup Field...

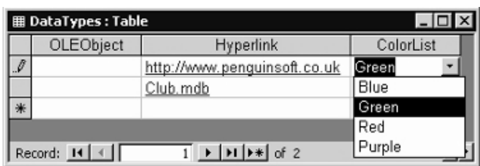
We'll try typing in the values so choose this and click Next. The wizard suggests a default of one column. In the single column table start typing the allowable entries; as soon as you start typing an entry, a new row appears in the table. Build up a 'table' looking like this.



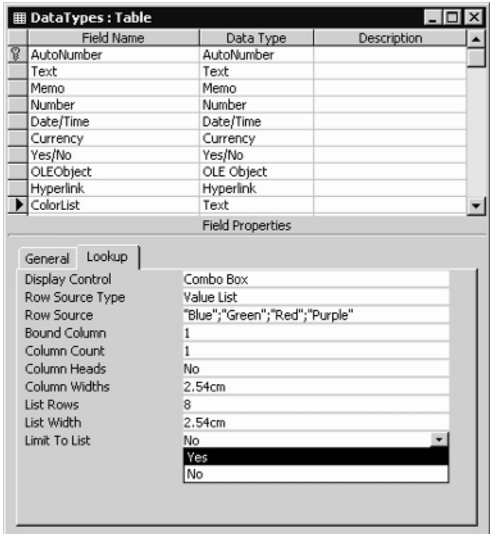
Click Next, type a name for the lookup column (for this example it's `ColorList`) and click Finish. The data type has reverted to text (but see below) and the Field Name has changed to reflect the name you gave the lookup column. Check out the properties in the Lookup tab and in the Row Source cell you'll see the valid entries.



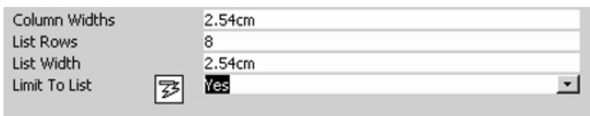
Click to save the table and swop to the Datasheet view. When the cursor is placed in the `ColorList` field, a button appears giving access to the list of permitted entries.



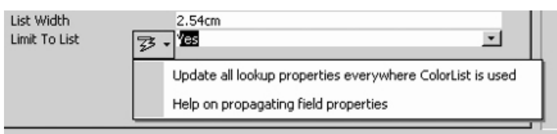
If you try to type in anything other than these precise entries, you'll find you can, which seems to negate the whole idea. Swop to Design view and check out the last property on the Lookup tab. It says 'Limit to list'. Aah. Click to see the options and select Yes.



When you make this change, you may notice that a bolt of lightening icon appears alongside the property.



This is the Property Update Options icon and clicking it reveals two options: one is to 'Update all lookup properties everywhere ColorList is used' and the other is Help.



As the option suggests, it offers a way of automatically reflecting the change we've made in every instance where the ColorList lookup is used. It's of limited use at our present early stage of learning about Access, but this feature will come into its own in Chapter 11. Don't select either option for now.

Back in table view, try entering Mauve. Access beeps when you try to leave the field and the message window tells you to pick one from the list.

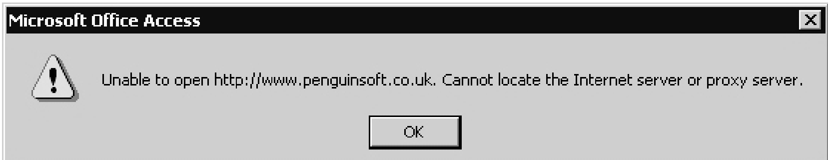
Your lookup list is now functioning and will not permit entries other than those you specified.

In our example, we accepted the default data type which was text but you don't have to do this. You might, for example, provide the values 1, 2 and 3 and then set the data type to numeric: it's up to you. However, if you do something logically questionable, like setting up a list of colors and then set the data type to be numeric, Access will, quite reasonably, object when you try to enter data.

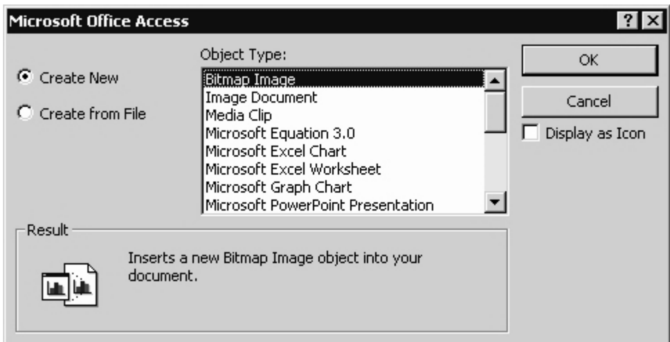
Lookup fields can certainly be useful when used in the way described above. However, we have reservations about using them to create automatic references to data from another table. The reasons for this are explained in Chapter 20: this is because the explanation will make more sense once we've done a little work with databases that comprise more than one table.

Summary so far

We have had a look at the different data types that are available in Access, and a sample table, `DataTypes`, containing examples of each is available in the file called `chap8datatypes.mdb`. You can create a form for this table using AutoForm and then play around entering data into the different fields. Most of the results that you get will be self-explanatory as soon as you see the end result. However, a couple of points may be worth noting. One is that you can enter text into the hyperlink field and if you double click on the entry, Windows will try to connect you to that URL. What happens next depends on whether you have a current internet connection and also how your computer is set up. A browser may open up showing the web page or, if you don't have a current internet connection your computer may try to establish a contact to the internet. Or you may get an error message, such as:



Another point is that if you want to insert an object into the OLE field, right click in the field, select Insert Object and then use the dialog box to choose the options you want.



It is worth spending some time playing with this until you are happy that you have a feel for the sort of data that is best suited to the different data types that Access offers.

Controlling data entry

OK, so you now know how to construct a table that can hold the correct **type** of data. The next stage is to learn how you can modify the table so that, as far as is feasible, only **correct** data ends up in that table. To be of real value, your data must be as accurate as possible. Unfortunately, most data is entered by people and people don't always function with 100% accuracy. Access recognizes that we're only human and provides several ways of improving the accuracy of data that gets into a database.

One way, which we have already covered, is to use the lookup wizard. Users no longer stare at a field labeled 'Grade' wondering whether they should enter 'A++', 'Yes' or 'NA'; they're able to pick an answer from the range supplied.

Controlled data entry also helps keep humorists in check. No longer will a field labeled 'Sex' hold such side-splitting entries as 'Yes please'. Not that I have anything against humor, indeed if I had to lose one or the other then databases would have to go. With any luck though, we should be able to keep both.

Another way in which Access can help is to look for an expected pattern in the incoming data, which brings us to input masks.

Input masks – the background

An input mask lets you control data entry into a field to a remarkable degree. Using such a mask you can ensure that, for example, serial numbers are always entered in the format 456-78 (23) and that data always conforms to a required pattern, such as two characters followed by a dash and then three numbers. This is particularly useful for numbers that are forced upon us by bureaucracy: social security numbers, license numbers, permit numbers and so on. They are also invaluable within companies where you may know that, for instance, part numbers always conform to the format AA-111.

The mask itself

The input mask is built up from various characters and symbols which acquire a special meaning in the context of masks. These are shown below.

Character/ symbol	Description of action
0	digit (0–9, entry compulsory)
9	digit or space (entry optional)
#	digit or space (optional; blank positions appear as spaces)
L	letter (A–Z, compulsory)
?	letter (A–Z, optional)
A	letter or digit (compulsory)
a	letter or digit (optional)
&	any character or a space (compulsory)
C	any character or a space (optional)
. , : ; - /	Decimal point, thousands, date and time separators
<	all subsequent characters will appear in lowercase
>	all subsequent characters will appear in uppercase
!	causes the input mask to display from right to left, reversing the default. Can be positioned anywhere in the mask
\	the subsequent character is displayed literally. Displays any of the characters listed in this table as literal characters (i.e. \& appears as &)

If you wanted a serial number field to contain entries in the format three uppercase characters, dash, five numbers (ABC-12345), the mask would look like this:

    >LLL\-00000

If serial numbers like AB-123 and A-1 were also valid (i.e. with variable numbers of letters and digits, though at least one of each) the mask would look like this:

    >L??\-09999

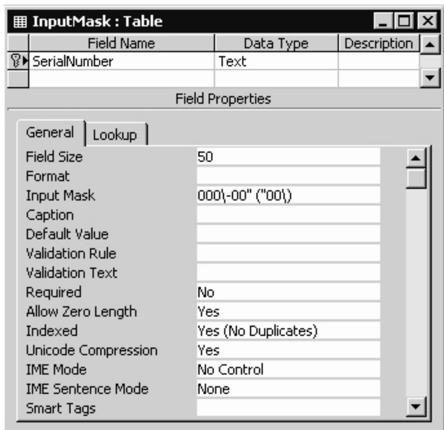
Creating an input mask

Create a new table, add a text field called `SerialNumber` and, in the General properties tab, you should find a property called Input Mask. Type in the following:

000\-00" ("00\)

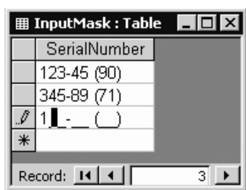
Anything inside double quotes is also displayed literally.

There is no immediate reason why this cannot be a primary key field, so, in your best *Star Trek* manner, make it so.



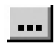
You should then find that you can only enter numbers in the form:

123-12 (12)



If you experiment and make changes to the input mask, once again the Property Update Options icon appears. If it bugs you, turn it off for the time being by clicking Tools, Options and on the Tables/Queries tab, de-select 'Show Property Update Options buttons' using the check box.

Input masks are easy to create and efficient in use. If required, you can invoke a wizard to create some for you, just by pressing the ellipsis button (the one with three dots)



that appears in the last but one screen shot. However, it is essentially just as easy to create your own.

In fact, input masks can be made more complex than this. We've shown a mask with just one element: in fact they can have three elements, the other two allowing a degree of fine control that's not used all that commonly. They're covered in a section called 'More on input masks' towards the end of the chapter but it certainly isn't required reading at this stage. The following digression, we think, probably is.

Herein a brief digression on postal code and phone number problems

Storing certain kinds of data in databases is challenging. (We don't have problems, we have challenges). Both postal codes and telephone numbers fall into the 'challenging data' category which is a shame because we often want to store precisely those pieces of information about people.

For a start, in countries like the UK, post codes (the UK specific form of a postal code) and telephone numbers don't conform to a standard format. For example, DD1 4HN, SW1A 4WW and M1 3GU are all acceptable post codes in the UK but have different formats. The first is 2 characters, 1 number, space, 1 number, 2 characters, the second is 2 characters, 1 number, 1 character, space, 1 number, 2 characters and the last one is 1 character, 1 number, space, 1 number, 2 characters.

❛ *Incidentally, UK users should be wary of the Postal Code mask offered by the Input Mask wizard when you click the ellipsis button in the Input Mask field. There are many postcodes that it will not accept. For example, not one of the three shown above can be entered into the field with this mask in place. Oh, and many UK phone numbers won't fit into the Phone Number mask either...* ❜

Even if you live in the US where formats are more controlled, the problem is only dormant. We are now part of a global economy, so some/many of your contacts may be in countries other than your own. Different countries have different systems (of varying degrees of complexity) and this lack of uniformity makes it very difficult to write an input mask that works in all eventualities for postal codes and local variations on phone number formats: it's likely to be impossible if you deal with data from many countries.

However, this brief diatribe does not mean that input masks are worthless: there are many occasions when data does conform to a strict standard. Within a company, for instance, employee numbers or part numbers often fall into this category and their entry can readily be controlled with masks.

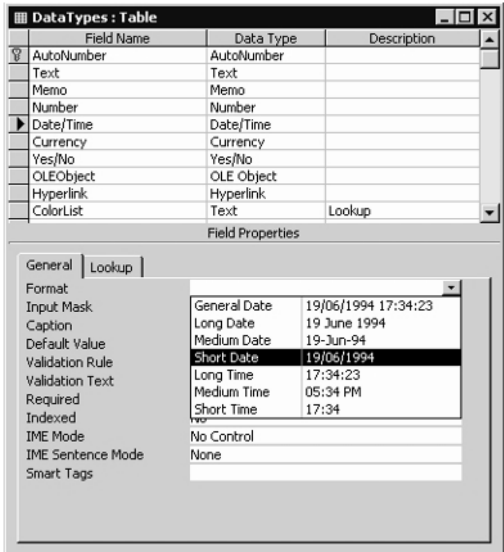
Investigating the main properties of fields

Objects have properties and the fields in an Access table are no exception. The properties of each field in a table can be set from the Design view, more specifically in the Field Properties panel which we introduced towards the beginning of this chapter.

The list of properties varies with the data type of the field; number fields have a Field Size property, as already discussed. Other data types lack this property but are imbued with others. We'll have a look at the main properties – these are the ones that you're most likely to need to understand when getting to grips with table design.

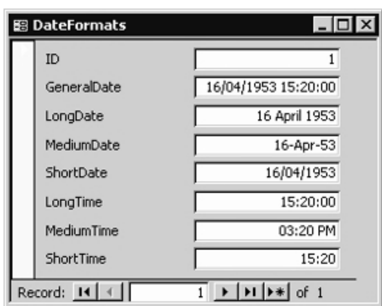
Format

Every data type except OLE Object has a format property with predefined formats for the date/time data type.



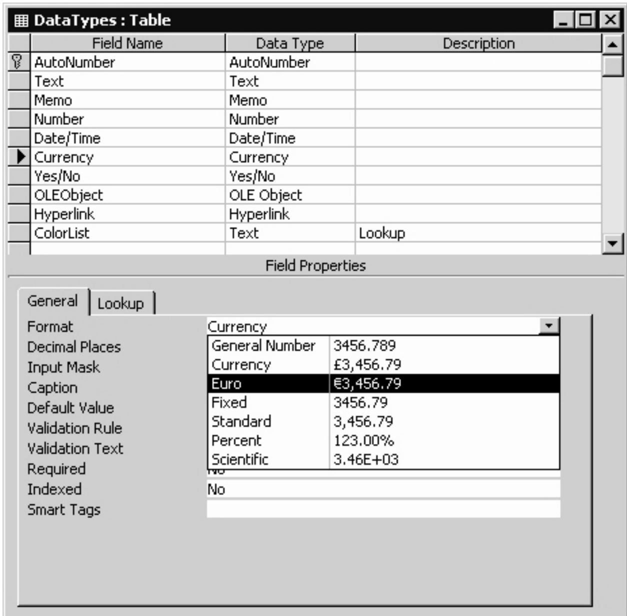
❛ *The Short Date format assumes dates between 1/1/00 and 31/12/29 are in the years 2000 to 2029. Dates between 1/1/30 and 31/12/99 are assumed to be twentieth century dates, i.e. the years 1930 to 1999.* ❜

To demonstrate the various date/time formats we have created a table where they are set differently.



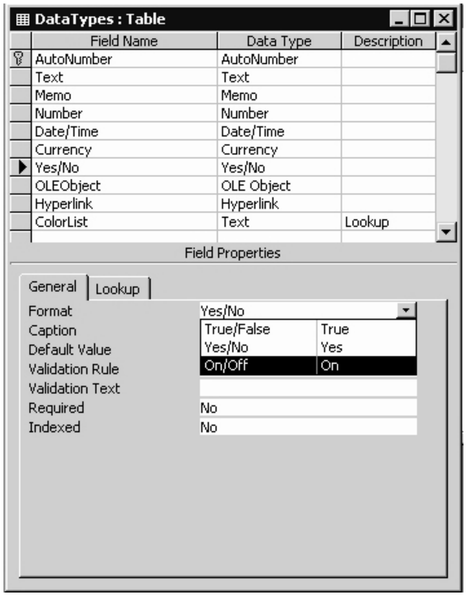
“*We happen to be doing this in the UK where the Windows default is set to dd/mm/yyyy rather than mm/dd/yyyy. So 12/01/1967 would be the 12th January 1967 rather than 1st December 1967.*”

Predefined formats are also available for the currency data type.



All currency fields also have a Decimal Places property which can be set to the desired accuracy.

The Yes/No data type also has three formats:



If it's more appropriate to the data being entered, the field can be set to True/False or On/Off format. True, Yes and On are equivalent responses and False, No and Off are also equivalents.

❛ *When storing Yes/No data, Access uses –1 to mean Yes and 0 to equal No. This sounds positively perverse to the non-mathematical though, in fact, there is a deeply theoretical and (reasonably) reasonable reason for this choice. For an easy life let's just accept the weirdness hit.* ❜

So, what is the point we are trying to make? There is an important distinction between the data type and the format. The data type controls the data that can be entered into a field, the format property controls the way in which the data appears to the user. In a sense the former provides an absolute control over the value stored, the latter simply controls how the value is perceived. The two can be used in a variety of ways. For example, you may well want to store some values to a high degree of accuracy, but display them with only integer accuracy. This can be achieved by mixing and matching the data type and the format.

Caption

All field types have a caption property. If you enter a caption, as we said earlier, it will be used as the field label in any form based upon the table, even AutoForms, and as the column header in the Datasheet view of the table. If you don't use captions your fields are still labeled because the field name will be used instead.

Captions can be up to 2,048 characters long, which is probably more than sufficient.

Default Value

This property can be held by all fields except AutoNumber and OLE Object.

The Default Value property specifies a text string or a number that will appear automatically in a field when a new record is created. For example, if most of your customers are based in Switzerland you might have a `Country` text field with the default value set to 'Switzerland'.

When you need an entry for another country, you simply start typing. The default entry is highlighted when your cursor arrives in the field and is deleted as soon as you type.

The maximum length for a default value is 255 characters. A default value can also be an expression; these are covered below.

Validation Rule

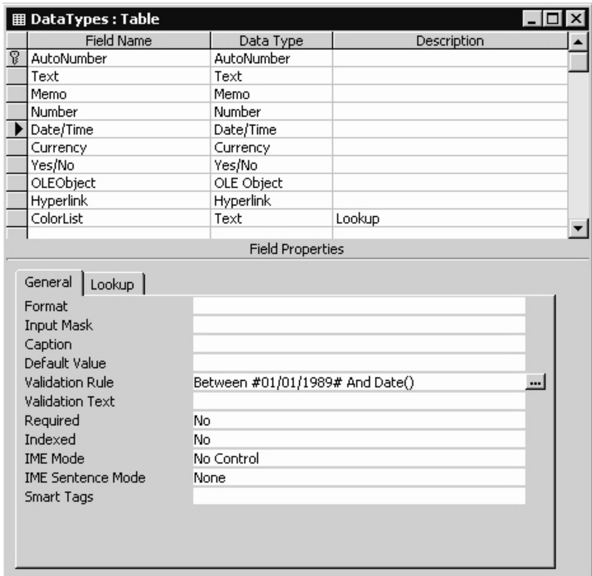
Like Default Value, this property can be ascribed to all fields except AutoNumber and OLE Object. Access undertakes some data validation automatically, precluding text from being entered into any of the number fields, for instance. If you want a further level of validation, you can set a rule by which any entry must abide.

For example, imagine you run a Botanic Garden, need to store the date on which a plant variety was acquired and want to ensure that it always falls between the date you started your collection and today's date. We can demonstrate this using the Date/Time field in the `DataTypes` table.

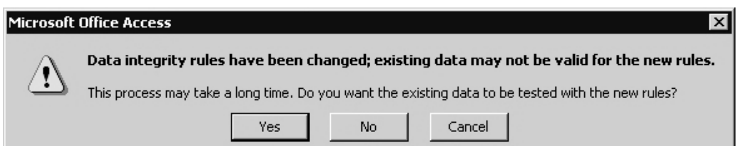
Open the table in Design mode, click in the Validation Rule row and enter the expression:

Between #01/01/89# And Date()

Hints: 'Between' is a comparison operator. 'Date' is a built-in date/time function that supplies the current date.

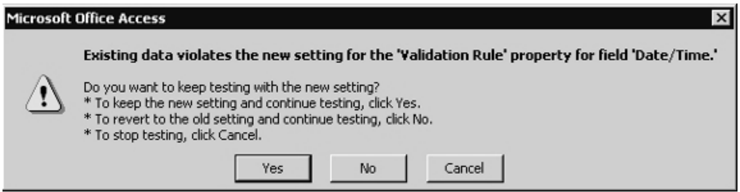


If you've just added a couple of records for experimentation purposes as we go along you may see the following message when you save the table:



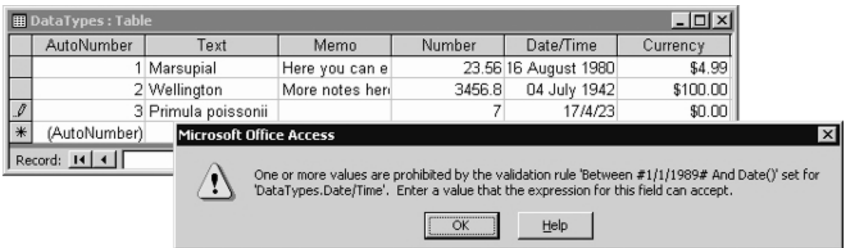
As our data is only experimental, click No.

“ *If you had real data in the table, clicking Yes would start Access testing to see if the dates complied with the new validation rule. If they didn't, you'll see another message:*



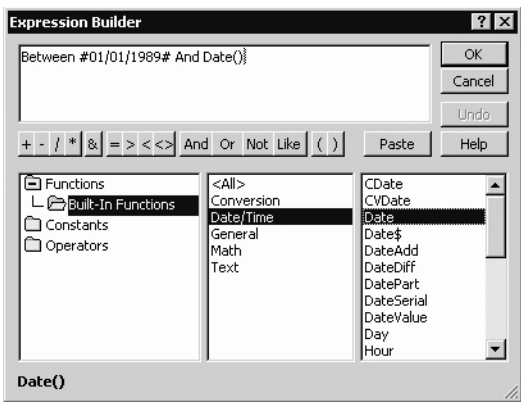
from which you'd select a course of action. ”

With the validation rule in place, if you try to enter a date that is outside these limits, Access refuses to accept it.

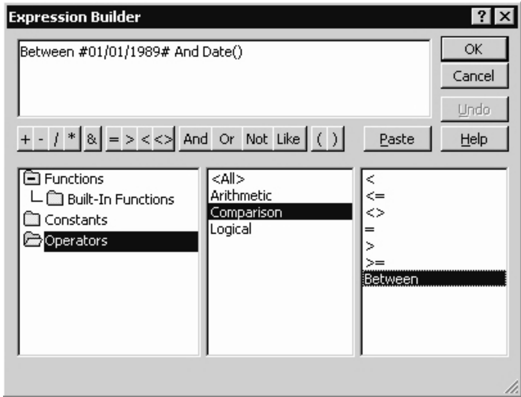


Incidentally, Access provides an Expression Builder to help you to compose expressions like this. You can get it by clicking on the Build button – that's the one with the ellipsis that appears when your cursor is in place to enter a Validation Rule.

The Expression Builder appears and lets you hunt through the functions



and operators



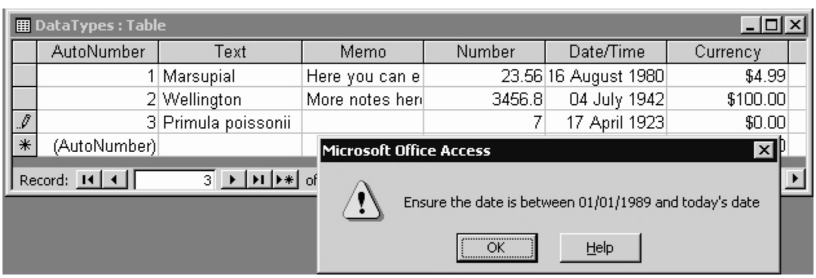
and build the expression you want by pasting in your choices instead of typing everything. This builder can be particularly useful when you are starting to use Access and aren't familiar with all the functions and operators that are available.

Validation Text

The Validation Text property goes hand in hand with the Validation Rule property. You can define the message seen by users if an attempt is made to enter data which does not conform to the validation rule. 'Try again, dummy' probably won't win any prizes for diplomacy; 'Ensure the date is between 01/01/89 and today's date' is more tactful. You have 255 characters in which to express yourself.

If you set a validation rule but no validation text, Access displays a standard error message when the rule is violated (see above).

Type the error message you want into the validation text slot. The error message appears with a warning triangle if invalid data is entered.



Required

The property Required can be set to either Yes or No. If an entry into a field is obligatory, set this property to Yes. If you must know whether a person was born in Italy to make any sense of the rest of the data collected, ensure the Required property is set to Yes.

Indexing

This property lets you define what is called an 'Index' on a field. Indexes (more correctly, the plural of index is 'indices', but most people say indexes) are wonderful. Suppose you have a table that stores a list of the employees in your company. You regularly search through this looking for particular people, locating them using their last name. If you put an index on a `LastName` field, your searches will run much faster, often by one or more orders of magnitude.

The three options are shown below; the default is No index.

Setting	Description
No index	
Yes (Duplicates OK)	The index permits duplicates
Yes (No Duplicates)	The index doesn't permit duplicates

For use with a `LastName` field the 'Yes (Duplicates OK)' would be the one to choose as it's quite possible you'd have employees with identical last names.

Primary keys are, by default, indexed automatically in Access with the 'Yes (No Duplicates)' option. Access also lets you have as many other indexes as you want so you may be tempted to index every field immediately. However, each index you create takes up some disk space and, with a large table, too many indexes can slow down data entry. So use them sparingly but on the other hand don't be afraid to use them because the speed gains are tremendous.

❛ *You will notice that we are saying, in effect, that there is no hard and fast rule here. You will have to use your judgment and/or you will have to experiment to find the best balance of indexes for a particular database. As you start to build more complex databases, these judgment calls (about indexes and other components) become more important. This is why, for me at least, designing databases is such a delight; it becomes both a science and an art. There is real satisfaction in creating a fast, elegant database.* ❜

Having said that, there is one place where an index is almost always worth applying and that is a foreign key field. You haven't met these yet, but they are covered in Chapter 15.

Summary of field properties

Field properties allow you to modify the way in which your table behaves. We haven't covered all of the possible options, but we have covered those properties that you're likely to need for the first databases you build. As you gain experience it's worth having a look at the rest of the properties to find out what they do.

Choosing the right data type means leaner, faster databases... up to a point

We said earlier that choosing the correct data type could make your database leaner and faster. To a large extent this has to do with size. If you want to store, say, the number of children that people have, you could choose the Byte data type (which would be the most appropriate). Choosing Decimal is a mistake because a user of your database might enter 3.187. Accepting Long Integer (the default) would be OK, except that it takes 4 bytes of storage space per record. I don't know anyone with two million children (nor with minus two million) and the 255 allowed by Byte are probably enough. So, Byte is fine, but what does it matter if you choose Long Integer? The answer is – it depends: it is a matter of judgment.

Look at it this way. Choosing Long Integer wastes 3 bytes per record. If you expect your table to have, say, 1,000,000 records, then your table will be 3,000,000 bytes = 3 Megabytes larger than if you had chosen Byte. Those extra 3 Mbytes matter, both in terms of storage and database speed. But if your table is only likely to have 50 records, then the wastage is trivial and not worth worrying about.

In the bad old days when computers struggled for disk space and power, we advocated choosing data types with great care. Given the power and capacity of modern machines, we think it is foolish to worry unless your databases are likely to become huge. In other words, be aware of the issue but don't become obsessed.

Summary

In this chapter, we've introduced data types and properties, two major methods of ensuring that the data in your tables is accurate. Using the most suitable data types for your data means that it can be handled quickly and accurately by Access. The properties of the fields in a table let you control entries as they're typed in and how they look once they are in.

Playing with the various data types and properties with a dummy database is an excellent way to get a feel for what they all do.

Not required on voyage

The information in the remainder of this chapter isn't required reading for your first database. However, it expands some of the topics covered in this chapter. For your first run through the book we actively advise that you don't read it but it may be useful for reference purposes later.

More on input masks

We said that input masks have three elements and that the first is the most useful and is covered above. As for the other two...

Displaying separation characters

The second element of the input mask determines whether the literal separation characters, for example (and - in our (123) 123-1234 example above, are stored in the field. These characters are often used to make the information more readable but it's not always necessary to store them.

There are two options for this:

- a 0 stores separation characters with the values
- a 1 (or a blank, i.e. not specifying this element of the mask) stores values without separators

As we said, this element of the input mask is placed after a semi colon. So, for example, if we use this mask:

```
000\-00" ("00\);0
```

numbers will be stored like this

123-45 (67)

in the table, but with a mask like this:

000\-00" ("00\);1

numbers will be stored like so:

1234567

Unfortunately, Access' super-helpful interface shows entries made with both these input masks as looking identical when data is viewed in the table. The brackets, space and dash appear for numbers entered using both masks.

However, this feature is still useful when you export data as, for example, comma separated values (.CSV) or plain text (.TXT) format.

Displaying blanks

The third element determines the character that's displayed in the input mask to indicate where the entry should be typed: this character is known as a place-holder. You can use any character, for instance, * displays a star character. If you omit the third element, the default character is the underscore (_).

These are examples of complete input masks:

(000) 000-0000;0
(000) AAA-AAAA;0;*
#999;1;-
>L????L?000L0;1;" "
>L0L 0L0

And now more about the properties of a field...

Nulls

We are about to look at the Allow Zero Length property but before we do, we need to cover the topic of nulls, primarily because a zero length string is mainly defined in terms of 'not being a null' and if you haven't met nulls yet, this definition will be totally unhelpful.

OK, so what is a null? Well, consider this statement as (allegedly) heard on a radio station. 'Well, it's good news for all you hay fever sufferers – the pollen count today is zero... because all the pollen counters are on strike.'

The joke has an added piquancy for database fanatics because it hinges on the confusion between a value and a null value. A well-designed database recognizes the fact that some data may be unavailable to the database and that uncollected data is **not** the same as zero. You would never really enter a zero if the pollen counters were on strike, so the field for today's pollen count would, instead, contain a null.

Imagine now that you are entering data into a table (either directly, or via a form, it doesn't matter). The table has four fields and none of them has a default value. You move to a new record, put the cursor into one of the fields and enter a value. Then you save the record and close the table. You haven't explicitly put anything into the other three fields, so they have nothing in them. More correctly, the three fields contain null values.

So, back to the question, what is a null? A null is an absence of data. It is not a blank, it is not a zero, it is an absence of data.

Does this distinction matter to anyone other than hay fever sufferers? Yes. Suppose that you have a class of thirty pupils. You have entered the name of each into an Access table which therefore has 30 records. You have marked 20 of their essays and placed those marks in the table, again in a field without a default value. So far so good. Now you ask Access for the average mark gained (this can be done with a query). Access adds up the marks so far and then divides that total by... what? 20 or 30? The answer is that Access knows that a null is not the same as a zero, it sees only 20 entries for the essay mark (despite the fact that there are 30 records) so it divides by 20. If you had set the default mark to be 0 then there would be thirty entries, ten of them would be zeros. Access would have divided by 30 and you would get the wrong answer.

Allow Zero Length

This property applies only to Text, Memo, Hyperlink and Lookup fields and sounds simple but it is worth looking at in detail – which means we have to backtrack a little.

So first, what is a 'zero length string'? It's a field into which double quotation marks **without** a space between them have been entered. Oh, so it's a null. No, it is similar to, but not quite the same as, a null.

You could be forgiven for thinking that we are beginning to get very pedantic about all this, so consider a table that is used to collect names. We have four fields:

```
FirstName
SecondName
ThirdName
LastName
```

You start entering names. The first person has three forenames: he's Anthony Aloysius St. John Hancock. No problem, all four fields have entries.

The next person is John Smith. You don't know if he has a second and/or a third name, so you enter the first and last. The result is that `SecondName` and `ThirdName` contain nulls. This is still fine.

Finally, Sally Jones appears. You happen to know her well and you know for a fact that she has no other names. So you leave the middle two fields blank. But wait, those fields now contain null values, exactly as they do for John Smith. But we **know** that Sally doesn't have middle names, which is not at all the same thing as being unsure. If you use a null it implies that you don't know. So, finally, we find out what a zero length string is for. You can use it for Sally's `SecondName` and `ThirdName` fields to mean 'We know about this value and it doesn't exist.'

The permutations of settings for Allow Zero Length and Required let you distinguish between null and zero length entries to prevent problems when fields are matched. A field that looks blank could also contain one or more space characters and these too, can be controlled, either allowing such entries in the field or not. The table below gives the permutations.

Required	Allow Zero Length	Action at data entry	Value stored
No	No	Enter pressed	Null
		Spacebar pressed	Null
		Zero length string entered	Not allowed
No	Yes	Enter pressed	Null
		Spacebar pressed	Null
		Zero length string entered	Zero length string
Yes	No	Enter pressed	Not allowed
		Spacebar pressed	Not allowed
		Zero length string entered	Not allowed
Yes	Yes	Enter pressed	Not allowed
		Spacebar pressed	Zero length string
		Zero length string entered	Zero length string

In order to let you play with these we have set up a table called `Nulls` which has four fields – one with each of these permutations – in the `chap8nulls.mdb` file.

Chapter 9

Tapping the power of Access queries

Queries are much more powerful than they first appear

Queries can show you exactly the aspect of your data that interests you, without a clutter of data that's irrelevant to the task in hand. Queries are also great for times when you're sure that certain information can be teased out of the database; it's so quick to build and modify queries that you can do it iteratively, narrowing your criteria until you reach the goal. It's also often possible to start from a wizard-generated query and speed up the process further.

So far we've talked about basing forms and reports on an underlying table of data, but one of Access' most powerful assets is its ability to base forms and reports on the answer table generated by a query. There's more on this topic later in the chapter.

Records extracted with a query can be sorted into a specified order, and as people prefer to deal with sorted information, this makes the assimilation of results easier. Listing customers alphabetically by last name, for example, lets you check individual records quickly. Queries can also perform mathematical calculations and return the results. The values in a field can be summed, the number of values counted, averages calculated and so on. Bearing in mind that, as we've just said, forms can be based on queries, a world of possibilities opens up. You might, for instance, build a query that extracted all of the orders from Boston that your company has processed, calculated the total value of each order and then sorted them by that value. You could then base a form on that query called, say, `BigBostonOrders`. The people who use your database don't have to know how you have done this, all they need to know is that when they open the form they see the relevant data, neatly summed and sorted.

Sometimes a query will uncover some hitherto unknown aspect of your data; maybe you sell more red cars in the south of your territory and mainly blue ones in the north. Not only do queries let you extract more information from your raw data, they let you make more of the information you extract.

Once a database has been established and is in use, it will need to be maintained and this is another area where queries are invaluable. The so-called 'action' queries (see below) are used to automate housekeeping tasks which would be seriously tedious to perform manually.

So, if it sounds as if we are fans of queries, indeed, we are. A database doesn't begin to repay the effort required to create and maintain it until you start to extract information from it and queries are the main tools for that extraction.

The main types of query

So far, when looking at queries we've concentrated on Select queries which can extract subsets of the fields and the records. However, Select queries are not the only type we can run. In fact, there are six categories of query, ranging from the straightforward to the advanced. All are designed to let you find exactly what you want in your database and some have their own wizards. Very briefly (just to give you an overview) they are:

Type of query	Usage
Select	Selects fields/records from a table according to the criteria specified
Parameter	Displays dialog boxes which prompt the user to supply a criterion on which to query (parameter value criterion)
Range	Selects fields/records which contain a range of values
Group By and Crosstab	Displays summarized values (sums, counts, averages) in a grid form, looking much like a spreadsheet, taking its rows and columns from chosen fields.
Action	Performs actions to change the records in a table (Delete, Update and Append queries) and to create new tables (the Make-Table query)
SQL	Queries can be written in SQL (Structured Query Language): complex SQL queries cannot be created in Design view.

Now we'll look at the first five in more detail. To cover the sixth, SQL querying, would mean introducing a whole language devoted to querying databases and to do this is beyond the scope of the book. The other types of query will provide more than enough functionality for learning what you can do with your databases.

Creating a Select query

You've already created select queries – these are what we built in Chapter 4 with the wizard and from the Design view.

Select queries are the simplest and most common type of query; they're also highly useful, letting you concentrate on a reduced set of the information in a database.

To re-cap briefly, the main steps are:

- Choose the table you wish to query.
- Choose the fields you want to use in the query.
- Add criteria to choose the records you wish to find.
- Run the query.

Creating a Parameter query

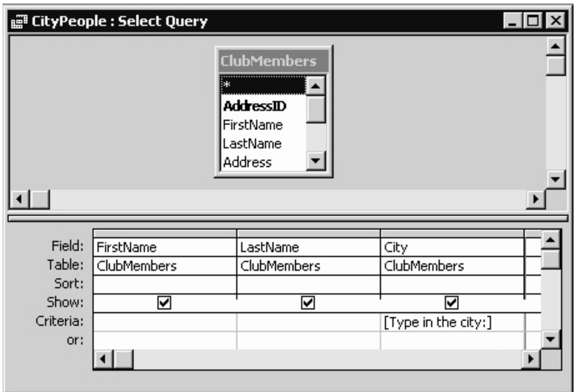
A parameter query is amazingly useful, particularly when you know that you are going to have to query the same table many times but that you are going to be looking for slightly different sets of information each time. Suppose you have a table of customer records. You find that you frequently want to run a query that shows all of the records of the customers from a given city but that the city changes each time you run the query. One time you need to see all of the customers from Paris, then you need to see everyone in London, next time for Boston and so on. Using a parameter query gives you a quick way of checking out records of different cities without having to edit the query in the Design window every time. When a parameter query runs a dialog box appears, you type in the appropriate city and the query is automatically set to search for records that match. This is invaluable when you are building a database for other people to use, particularly if they may not know how to build queries.

Parameter queries can prompt for more than one piece of information; if you commonly retrieve sales made within a period of time, you can design prompts to ask for the start and finish dates. With these entered, all records that lie between the two dates are retrieved by the query.

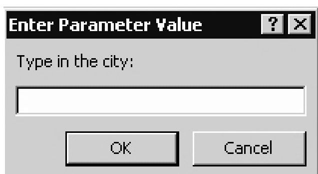
❝ *Incidentally, we said in Chapter 2 that reports and forms can be based on queries and that includes parameter queries. Reports that are required regularly (perhaps a monthly sales report) are well suited to being based on parameter queries. When such a report is run, it asks, by means of a dialog box, for the period the report is to cover. Enter the month and the report will automatically take the values from records from that period.* ❞

Returning to the Club database, we'll build a parameter query to select records for a city that you will specify in a dialog box once the query is running. Open the chap9start.mdb file and build a select query with the wizard.

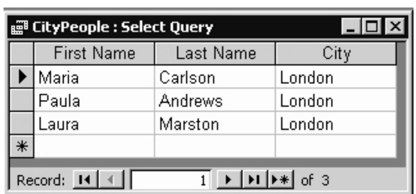
Include the FirstName, LastName and City fields from the ClubMembers table in the query and call it CityPeople. When the wizard displays the answer table, swop to Design view. Prepare to add a criterion to the City field but instead of the usual 'London', you type the text that you want the parameter query dialog to display. This text must be wrapped in square brackets. '[Type in the city:]' is the text used here.



Run the query to see the completed dialog box.



Type in a city ('london', for instance) and click OK.



The answer table has located all records from your chosen city unless, of course, there are none.

❛ *In Chapter 4 we said that you can use wildcards to look for records when you aren't exactly sure what you're searching for. In a normal select query, if you type in car* as the criterion, Access converts this to:*

Like "car"*

If you want to use a wildcard in a parameter query, simply create a parameter query that uses the LIKE operator and the wildcard symbol (*). For example:

Like [Enter the first letter to search by:] & ""*

will look for words that begin with a specified letter, while:

Like "" & [Enter any letter to search by:] & "*"*

will look for words that contain the specified letter. You can also type in the first two or three letters: 'se' finds Seattle whereas 's' finds Seattle and San Francisco. ❜

Creating a Range query

A range query locates records that fall within a specified range. A range can be date or time-based (between April 16 and August 19, or between 09:00 and 18:00) or value-based (between 30 and 100).

Again, you can start with a wizard-built select query and then modify it from the Design view to add a range criterion.

Range criteria use the Between...And operator. The syntax is just like English: we'd say "Show me the records from between April 16 and August 19" and that's just how this operator works.

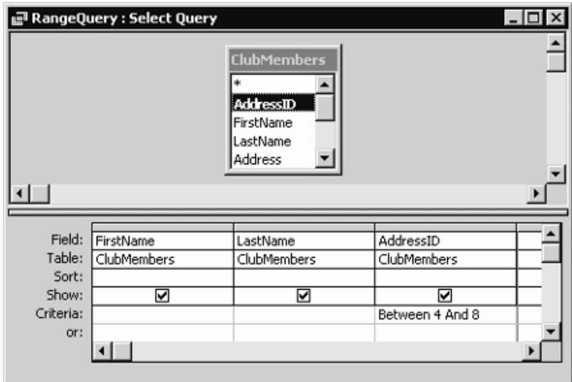
Examples of valid range criteria include:

Between 100 And 150
Between #01/01/60# And #31/12/62#
Between #08:30:00# And #12:20:00#

Records that meet the values that specify the starts and ends of ranges are included in the answer set. You can also use mathematical operators to the same effect, for instance, >=100 and <=150.

You can type in dates and times without the surrounding hashes and Access will add them automatically.

A typical range query might look like this



for finding records with address ID numbers between 4 and 8 inclusive.

Finally, we can combine Parameter and Range queries by using criteria like:

Between [Type the start ID:] And [Type the end ID:]

Typing 3 and 10 into the parameter query dialogs will find addresses with IDs 3 through 10 inclusive.

Creating Action queries

Action queries, as their name suggests, do things. They effect actual changes to the records in a table, either by deleting them, updating or adding new records (appending, in database-speak). A single query of any of these types can affect multiple records. Action queries are very powerful and are mainly used for database maintenance tasks.

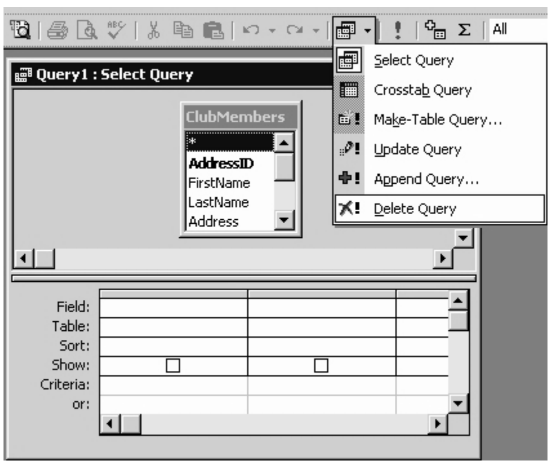
- A delete query will delete from a table all records that match certain criteria. Delete queries always delete entire records, not just certain fields within records.
- An update query will locate records that match a criterion and then alter each record to contain the updated information.
- An append query is used to incorporate records from one table into another. Records from tables that contain different fields can be brought together with an append query.
- The fourth type of action query is the Make-Table query; we looked at this in Chapter 4. When the answer table produced by a query would be useful as a table in its own right, the Make-Table query does just that.

❛ *Action queries can accurately be called 'powerful' but remember that 'powerful' is also a euphemism for 'extremely, mind-bogglingly, dangerous'. A single delete query could, for example, remove all 200,000 customers from your table. Or one quick update query could turn the date of every order in the database to 1/1/2000: neither of these changes is likely to be helpful. We have no intention of trying to inhibit you from using these queries because when used carefully, they are almost magically effective. So please 'do do this at home' but equally importantly, please do any testing and development work using a copy of the database rather than the real thing. Then if something does go wrong, you can recover painlessly. That is exactly what I do because no query designer gets everything right first time every time.* ❜

Creating a Delete query

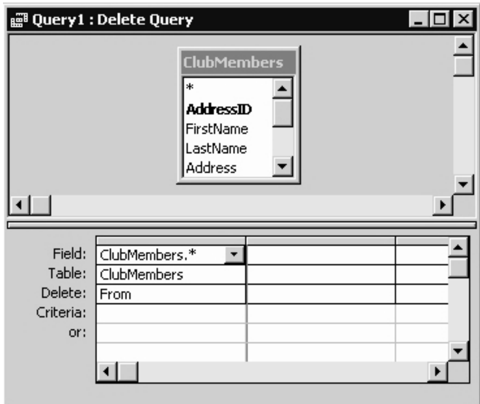
You'd create a delete query if, for instance, the French club members started a break-away movement and formed their own independent club. A delete query could remove from the table all records for members based in France. Whether there was but one member in the table or 999 of them, the delete query would rout them all out and delete them.

This example will delete all the Seattle-based members from the `Club` database (nothing personal, Seattleites; it's just an example). Go to the Query tab in the database window and start the process of building a new query from Design view, based on the `ClubMembers` table. Click the arrow next to the Query Type icon and select Delete Query from the list (you may need to click the down arrow button at the bottom of the list to reveal the Delete Query option).



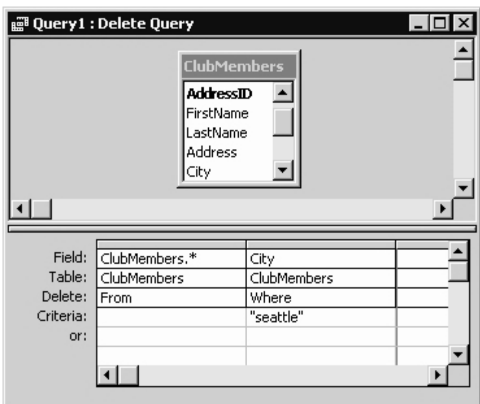
The title bar for the Design window now indicates that you're working on a delete query and the Query Design grid has acquired a row labeled Delete.

Double click the asterisk from the `ClubMembers` field list: this step isn't compulsory but it will give you, in a few moments, a more comprehensive view of the records you're planning to delete. The Delete line now says 'From'.



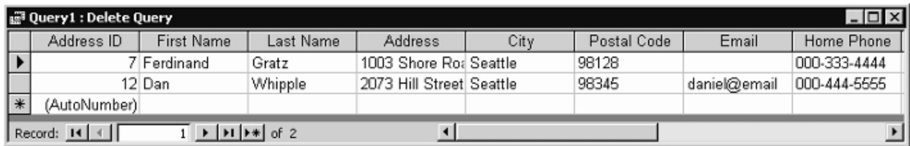
You have chosen the table from which you want records deleted, so now you set the criterion for the records to be deleted. Drag the City field from the list into the field row of the second column in the grid. The word 'Where' appears in the Delete row and in the Criteria row below that, specify the records to be deleted. We're going to remove the details of people in Seattle, so type:

seattle



❛ *We said in Chapter 4 that when you're building queries, there is a difference between the Run button and the Datasheet view button. Here we'll see this difference in action.* ❜

Don't, at this point, click the Run button. Flip to the Datasheet view instead (using the first button in from the left on the toolbar) as this will show you the records that this query will delete *if* it is run. Showing all fields makes it easier to see what the query proposes to do to your data.


Query1 : Delete Query

	Address ID	First Name	Last Name	Address	City	Postal Code	Email	Home Phone
▶	7	Ferdinand	Gratz	1003 Shore Ro	Seattle	98128		000-333-4444
	12	Dan	Whipple	2073 Hill Street	Seattle	98345	daniel@email	000-444-5555
*	(AutoNumber)							

Record: 1 of 2

Click to return to Design view. This is the point at which, if you didn't see the records you expected, you'd edit the query accordingly, returning to the preview to check all is well.

When the records you want to delete are shown in the Datasheet view, return to the Design view one last time and actually run the query with a click on the Run button. A message window tells you that any rows deleted cannot be restored with the Undo button. Click Yes to continue. Look at the `ClubMembers` table: all the Seattle residents' records have, indeed, disappeared.

If you save this query as, say, `DeleteSeattleRecords`, add a Seattleite record to the table and then double click the query name, the query will warn you that it is about to delete records before running.

In the database window, delete queries are identified by this icon with a red cross to warn that data may be lost if you run the query:

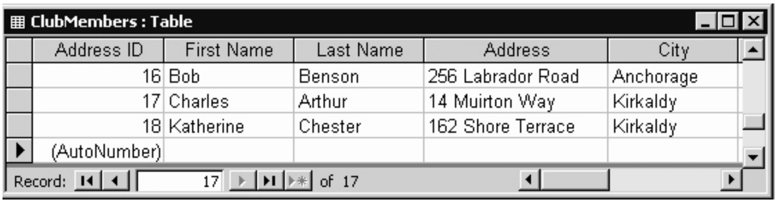
You can set criteria in more than one field, perhaps to identify those with email addresses who live in London (We're not sure why you'd want to persecute these individuals either, but the option's there).

The `chap9deletequery.mdb` contains the `DeleteSeattleRecords` query but it hasn't been run: you can do this and check the result. To return to a full set of member records, load up the `chap9start2.mdb`.

Creating an Update query

You would use an update query if you wanted to increase the sale price of your goods by 5%. The increase could either be applied to all items sold or just to those with a stock code beginning YSK. Similarly, if a supplier introduced a new coding structure which replaced YSK codes with JFX codes, you could bring your records into line with an update query.

So, as a demonstration, we'll assume that you've just discovered, much to your embarrassment, that you've spelled Kirkcaldy incorrectly in the addresses of all your friends living there. I've added two of these to the table, like this:

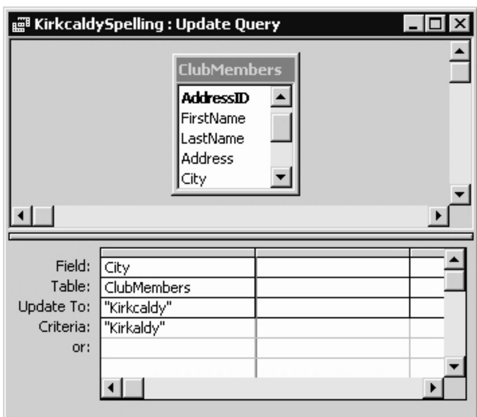


For one or two records, you could easily make the change manually, but with dozens or hundreds of records to update, you'd use an update query.

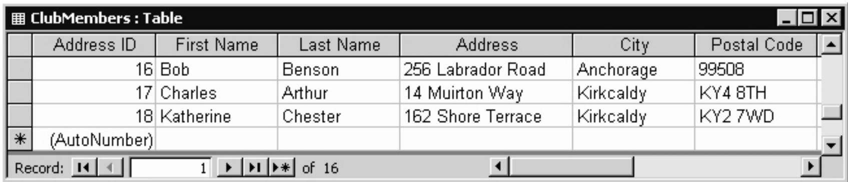
Start building a new query from the Design view, adding the `ClubMembers` table to the Table/Query pane. Click the Query Type icon and select Update Query from the list. The title bar for the Query Design window shows you're designing an update query and the design grid now contains an 'Update to' row. Add the `City` field to the Field row and in the Criteria row type in the misspelling you want to locate, namely the records saying Kirkaldy in the `City` column.

In the Update To row in the same column, type in:

Kirkcaldy



This will update the existing spelling with this new correct spelling, as you'll see when you run the query. (You can check the records that will be updated by looking at the Datasheet view as before.) Exactly what you type in the Update To row will be written into the fields, so use capitals as required. A message window checks that it's OK to go ahead; click Yes if it is and the update query will run.


ClubMembers : Table

Address ID	First Name	Last Name	Address	City	Postal Code
16	Bob	Benson	256 Labrador Road	Anchorage	99508
17	Charles	Arthur	14 Muirton Way	Kirkcaldy	KY4 8TH
18	Katherine	Chester	162 Shore Terrace	Kirkcaldy	KY2 7WD
(AutoNumber)					

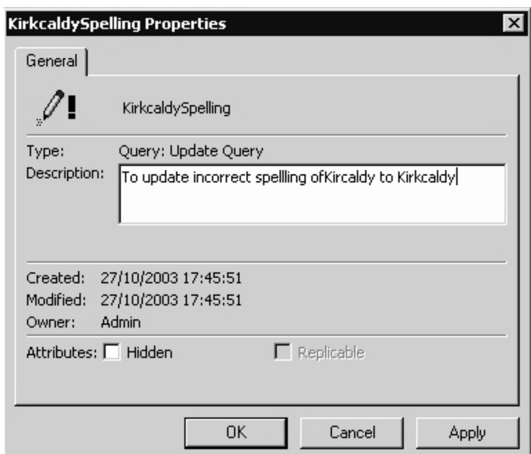
Record: 1 of 16

There, your street-cred is restored.

❛ *(Kirkcaldy is a charming town is Scotland, just north of Edinburgh, and is pronounced Kir-cod-ee rather than Kirk-aldy. I agree that you don't* ***need*** *to know this in order to run the query, but I thought the information might break up the heavy database stuff a bit. Kirkcaldy has a great Italian restaurant called La Gondola.)* ❜

Update queries can involve more than one field. For instance, you can locate the records for goods from Supplier X and increase the sum in the corresponding `Price` fields by 5%.

When you save a query, it appears in the list of queries (accessed by the Query tab) alongside an icon identifying the query type. If you can't identify a query type from the icon, highlight it and click the Properties button.



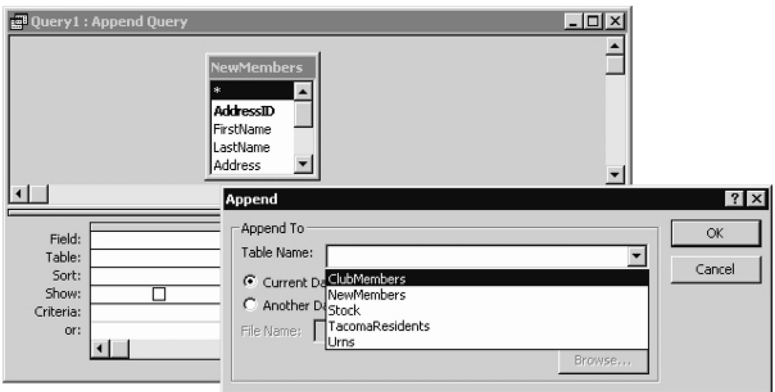
The `chap9updatequery.mdb` contains the `KirkcaldySpelling` query but it hasn't yet been run.

Creating an Append query

Append queries will add records from one table to another. For example, you decide to stock a new range of products and the manufacturer supplies an Access table detailing them. With an append query, you could add these records into your own `ItemsStocked` table automatically. This one's a real time-saver: imagine how much longer it would take to type in these new records and how many more errors would be likely to result if you did it manually.

This simple example of an append query will add records for three new members to the `ClubMembers` table in the `Club` database. The new records are held in a table called `NewMembers`: this table is included in the `chap9start3.mdb`.

Start with a new query in the Design view, adding the `NewMembers` table (the source of the new records) to the Table/Query pane. Click the Query Type icon and select Append Query from the list. A dialog asks for the name of the table to which you wish to append records (i.e. the destination of the new records); select `ClubMembers` from the pop down list and check the option button to indicate that it's in the current database. (You can also append to tables held elsewhere; just type in the file name and the path as necessary).



Click OK. At this point you determine which fields in the `NewMembers` table should be appended to the `ClubMembers` table. You should be aware that:

- if the source and destination tables both have `AutoNumber` fields you shouldn't add this field to the query. Access will automatically insert AutoNumber values into the destination table, giving records values leading on from the largest entry therein.

- if the field names in the source differ from those in the destination table, enter the field name used in the destination table into the query grid on the Append To row. In this case the asterisk cannot be used; each field must be entered individually into the grid.

I've selected everything but the AutoNumber `AddressID` field. Click into Datasheet view button to see the records that will be appended; return to Design view and run the append query. A message says this action will not be undo-able; click Yes to go ahead. Check out the `ClubMembers` table which now contains the new records.

ClubMembers : Table

Address ID	First Name	Last Name	Address	City	Postal Code	Email
16	Bob	Benson	256 Labrador Road	Anchorage	99508	bobb@email
17	Charles	Arthur	14 Muirton Way	Kirkcaldy	KY4 8TH	c_arthur@email
18	Katherine	Chester	162 Shore Terrace	Kirkcaldy	KY2 7WD	
19	Claude	Dupont	124 Avenue Clemence	Bordeaux	16459	claudedupont@email
20	Sonny	Fischer	1345 Lakeside Drive	Boston	02154	sfischer@email
21	Angela	Cartman	45b Chiltern Road	Oxford	OX2 4HG	
(AutoNumber)						

Record: 1 of 19

The query is saved as `AddNewMembers` and is present in the `chap9appendquery.mdb` file but it hasn't yet been run.

Creating a Group By query

In the table at the start of this chapter we listed Group By and Crosstab together because they do much the same sort of job. However, here we'll deal with them one at a time because they do differ in detail (and power).

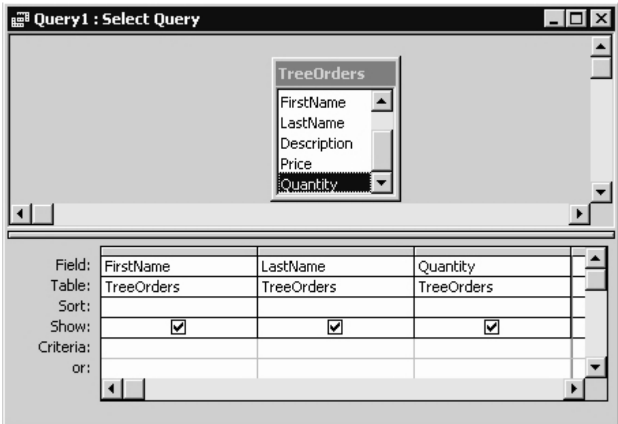
Take a look at the `TreeOrders` table, shown below, from the `Tree` database in the `chap9start4.mdb` file.

TreeOrders : Table

SalesID	FirstName	LastName	Description	Price	Quantity
1	George	Thomas	Silver birch	$19.50	1
2	George	Thomas	Hornbeam	$17.00	2
3	Anna	Morgan	Hornbeam	$17.00	2
4	George	Thomas	Willow	$15.00	1
5	Jo	Green	Beech	$15.00	1
6	Jo	Green	Beech	$15.00	1
7	John	Parker	Ash	$15.00	1
8	Heather	Bell	Willow	$15.00	1
9	Anna	Morgan	Oak	$25.00	1
10	Heather	Bell	Oak	$25.00	1
11	John	Parker	Oak	$25.00	2

Record: 1 of 25

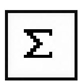
Create a new select query based on the `TreeOrders` table and showing three fields, `FirstName`, `LastName` and `Quantity`.



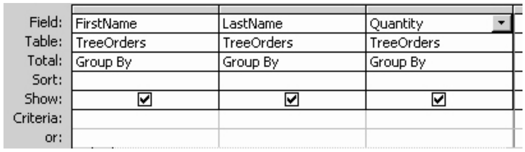
When you run it, you'll see, as expected, 25 records of which the first few are shown here:

FirstName	LastName	Quantity
George	Thomas	1
George	Thomas	2
Anna	Morgan	2
George	Thomas	1
Jo	Green	1
Jo	Green	1
John	Parker	1

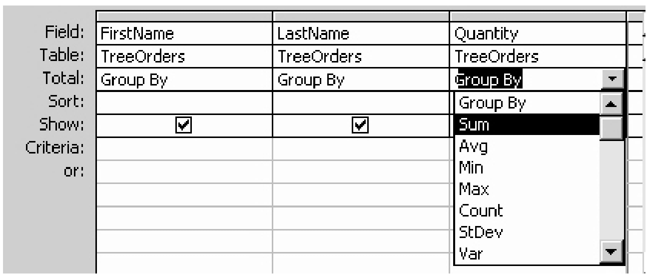
Now, suppose that you want to see the total quantity for each person. In other words, you want to see each name only once in the answer table with the total beside it. Flip back to Design mode, locate the 'Totals' button in the toolbar



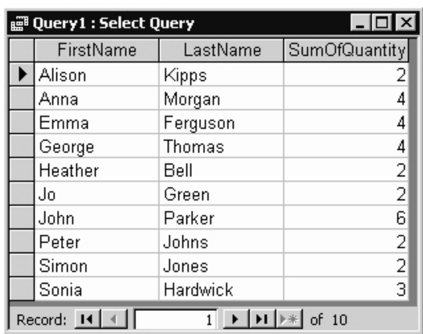
and press it. An extra row, labeled Total, appears in the lower part of the design window.



By default each field in this Total row reads 'Group By' but we want to change this, so click in this row under the Quantity field, then click the down arrow that appears.



From the list select Sum and run the query.



Magic. Save it: ours is called `GroupByQuantity`. So how is it working?

The Group By instruction under a field says "find all of the records that have the same value in this field and put them together in the answer table." The Sum instruction says "add up the values found in this field for all of the records that have been put together by the Group By instruction."

Ah, but you noticed that there were options other than Sum in there. Try selecting, say, Avg and re-running the query. You're way ahead of me; you guessed it would give the average. Have a play with the others while you're here.

Now try to answer this one before you try it. If you edit the original table so that Jo Green becomes John Green, what happens if we sum the quantities? After all, we already have a John Parker, so will the query show us the orders for these two individuals together?

The answer is...

FirstName	LastName	SumOfQuantity
Alison	Kipps	2
Anna	Morgan	4
Emma	Ferguson	4
George	Thomas	4
Heather	Bell	2
John	Green	2
John	Parker	6
Peter	Johns	2
Simon	Jones	2
Sonia	Hardwick	3

No, because we are grouping by two name fields, and both have to be the same before the records are put together. However, what would happen if we removed the `LastName` field from the query? Would the query then put all the 'John' records together? This is a more interesting question. After all, we know the records refer to different people, and, in a sense, Access 'knows' this as well because it has the data in the base table.

The answer is...

FirstName	SumOfQuantity
Alison	2
Anna	4
Emma	4
George	4
Heather	2
John	8
Peter	2
Simon	2
Sonia	3

that the John records **are** put together, which is an important point. A Group By query will group records on the basis of the fields that you choose for the query, not on the basis of the original records. In fact, once you think about it, this has to be the case. Each record in the original table has a different primary key value so if the value in every field in the base table was considered, no records could ever be grouped together.

Grouping is easy to demonstrate, but don't let that fool you: it's a very powerful tool. When you start to query databases in anger, it will be one of your best friends.

Creating a Crosstab query

A crosstab query is essentially a Group By query but with even more power. It is often the answer when you're juggling different ways of looking at a block of data, it adds an extra dimension to a Group By query and gives an answer table that is reminiscent of spreadsheet output. It lets you present data in two categories rather than one but with the same sum, average or whatever calculated for each intersection. This description, while accurate, probably doesn't mean too much and the easiest way to see what a crosstab does is to show you one.

WhoBoughtWhat : Crosstab Query

LastName	Total Of Quantity	Ash	Beech	Hornbeam	Oak	Silver birch	Willow
Bell	2				1		1
Ferguson	4			3			1
Green	2		2				
Hardwick	3		2		1		
Johns	2		1	1			
Jones	2				1		1
Kipps	2			1		1	
Morgan	4			2	1	1	
Parker	6	2			3	1	
Thomas	4			2		1	1

Record: 1 of 10

So that's an example of what a crosstab query can be induced to do; all you need to know is how to make it work. Just before we start, note that there are essentially three 'elements' in this crosstab. Down the left hand side are the last names of the people (taken from the `LastName` field in the original table) and these are acting as headings for the rows that we can see in the crosstab. Along the top are the names of the trees (from the `Description` field) which are acting as the headings of the columns. Finally, at the intersection of the rows and columns, there are the numbers of trees bought (`Quantity` field). In this crosstab, these numbers have been added (or summed) where appropriate. For example, John Parker has bought one oak and then another two and the crosstab shows the correct total of three at the intersection of Parker and Oak. In addition, he has bought two Ash trees and a Silver Birch, so his total for all trees is six.

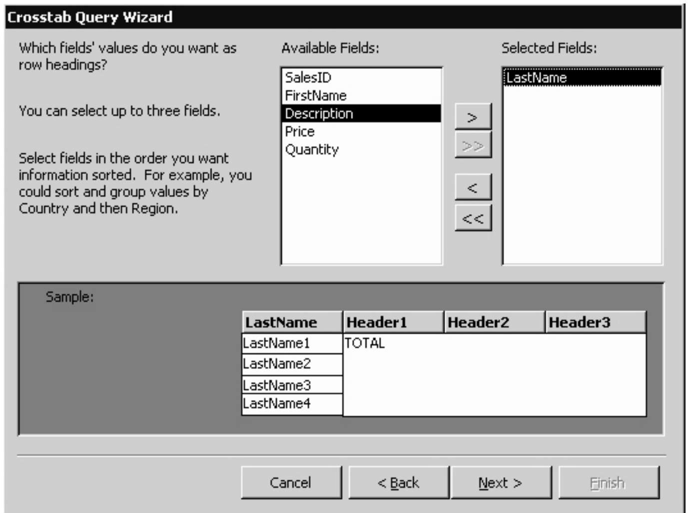
Cross tabs can be created with a wizard, so the wizard is going to want to know:

1. which table you want to query;
2. which field to use for the row headings;
3. which field for the column headings;
4. which field for the intersections;
5. what mathematical operation (in this case, summing) to apply to the numbers at the intersections.

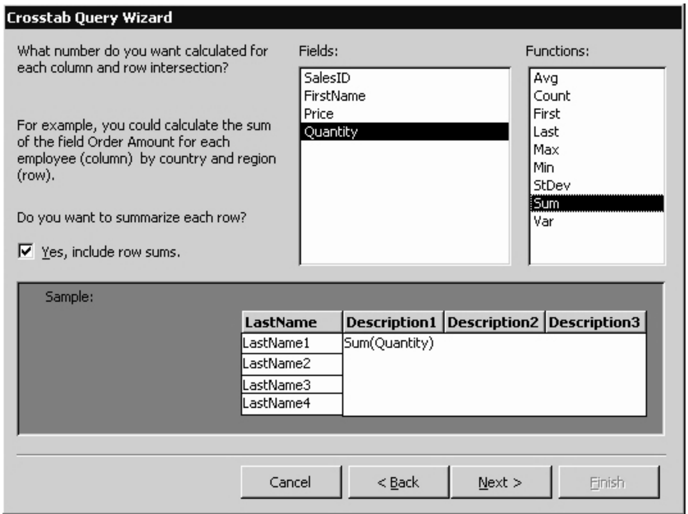
Right, armed with that foreknowledge, we'll build this query, starting with the Crosstab wizard.

In the Queries tab, click the New button from the top of the database window, select Crosstab Query Wizard and click OK. Select the `TreeOrders` table and click Next.

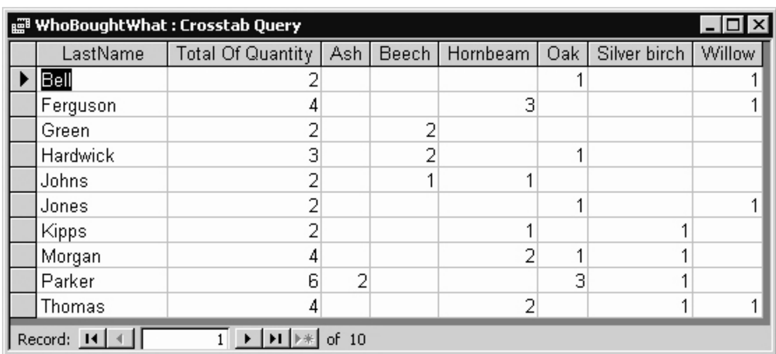
In this dialog you choose the row headings. Select the `LastName` field and it's illustrated in the sample display so you can check the orientation, as shown below.



Click Next. Now select the field for the column headings – `Description`. Again your choice is illustrated by the sample. Click Next. This is where you determine the number you want to be calculated at the intersections, so select the `Quantity` field. Then select the Sum function. There is a check box for whether to include row sums: check it to include a total number of items purchased in the crosstab.



Click Next one more time, give your query a name (ours is `WhoBoughtWhat`), check that the option button for 'View the query' is selected and click Finish.



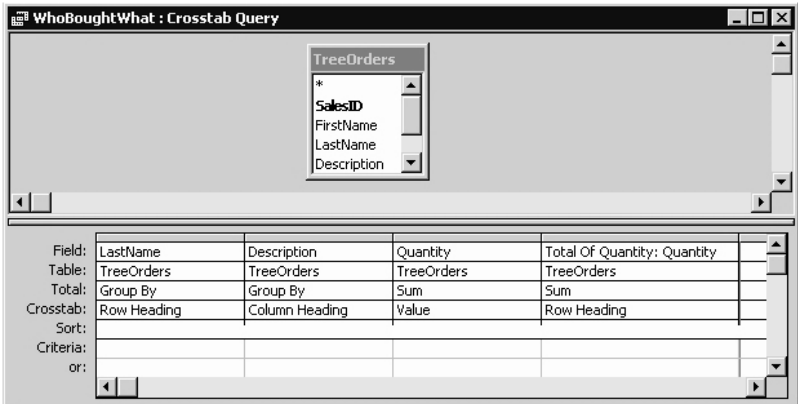
WhoBoughtWhat : Crosstab Query

LastName	Total Of Quantity	Ash	Beech	Hornbeam	Oak	Silver birch	Willow
Bell	2				1		1
Ferguson	4			3			1
Green	2		2				
Hardwick	3		2		1		
Johns	2		1	1			
Jones	2				1		1
Kipps	2			1		1	
Morgan	4			2	1	1	
Parker	6	2			3	1	
Thomas	4			2		1	1

Record: 1 of 10

Easy!

It's worth having a look at the Design view of this crosstab query,



to get a feel for how it has been constructed. Once you get used to creating crosstabs, you can, of course, start tweaking in Design view to customize the query further. But for now, have a play and create some more crosstabs from this data.

The Crosstab wizard offers a range of functions apart from SUM, used above, and these are shown below.

Function	Description
AVG	Average of the values in a field
COUNT	Number of values in a field, not counting blank values
FIRST	Field value from the first record in the result set in a query
LAST	Field value from the last record in the result set in a query
MAX	Highest value in a field
MIN	Lowest value in a field
STDEV	Standard deviation of the values in a field
SUM	Totals the values in a field
VAR	Variance of the values in a field

We have taken some care to stress that a crosstab has three main elements because, unless you bear that in mind, sometimes you may get an answer that seems counter-intuitive. For example, John Parker has bought three oaks, all at $25 each. Suppose that when he bought two together we were generous and dropped the price to $20.

TreeOrders : Table

SalesID	FirstName	LastName	Description	Price	Quantity
25	John	Parker	Oak	$25.00	1
11	John	Parker	Oak	$20.00	2
19	John	Parker	Ash	$15.00	1
7	John	Parker	Ash	$15.00	1
12	John	Parker	Silver birch	$19.50	1
1	George	Thomas	Silver birch	$19.50	1
4	George	Thomas	Willow	$15.00	1

Record: 19 of 25

The average price he has paid for oaks is now (20+20+25)/3 which is 65/3 which is $21.67. If you make the required change to the `TreeOrders` table and then create a crosstab query to show the average price, will it show $21.67 for Parker's oaks? At first thought this seems the obvious answer, but not if you think about the elements we give the cross tab in order to do the calculation. We tell it to look at the `LastName`, `Description` and `Price` fields. We haven't told it to look at the Quantity field at all, so it doesn't 'know' that John Parker bought two oaks at $20, it simply knows that there are two records for Parker buying oaks in the `TreeOrders` table – one gives the price as $25 and the other $20. The crosstab uses this data to calculate the averages, so in the answer it cites the average for oaks as $22.50.

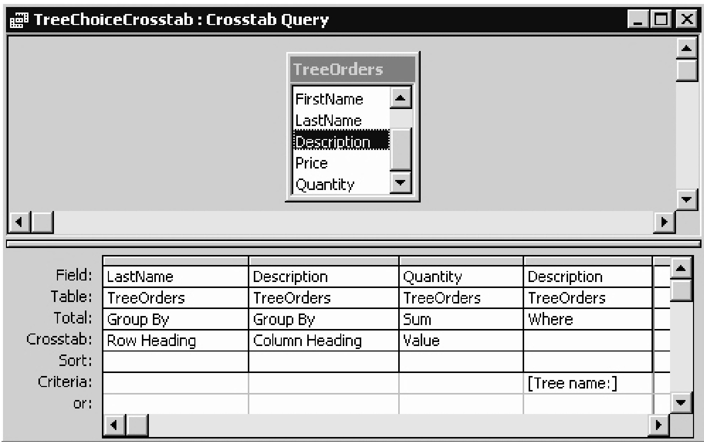
AveragePriceCrosstab : Crosstab Query

LastName	Total Of Price	Ash	Beech	Hornbeam	Oak
Parker	$18.90	$15.00			$22.50
Thomas	$17.17			$17.00	

Record: 1 of 10

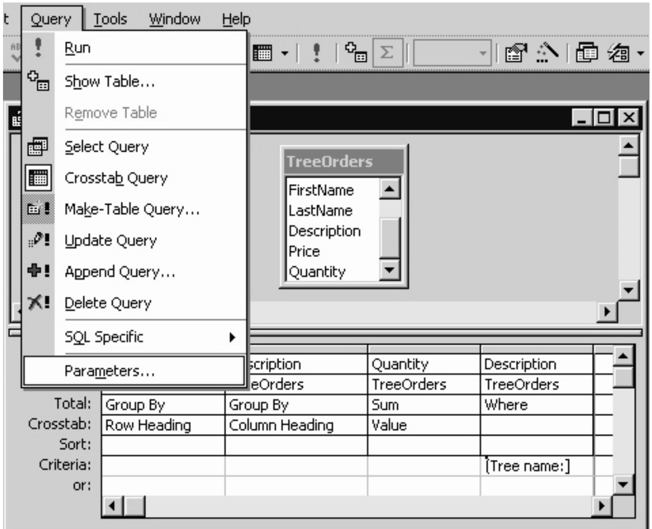
It is giving the right answer, based on the information we asked it to use. We aren't trying to make this out to be a big problem, it is just something that needs to be borne in mind. (This query is called `AveragePriceCrosstab`).

Another point worth knowing is that you can create crosstab queries that use parameters. Here is one, called `TreeChoiceCrosstab`, all set to go.

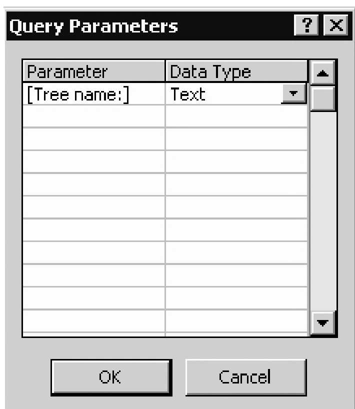


The only problem is that it won't run and instead generates an error message.

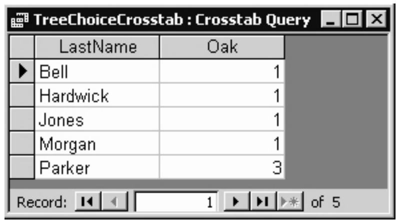
This is because, when you create a crosstab query that uses parameters, you have to tell Access the 'type' of data that is going to be used in the parameter. This is easy, all you have to do in Design view is to pop down the Query menu and select Parameters...



Then type in the same information as you typed into the Criteria line of the query and set the data type to text as shown here:



After that, the query should run like a normal parameter query.



Using a query to perform calculations

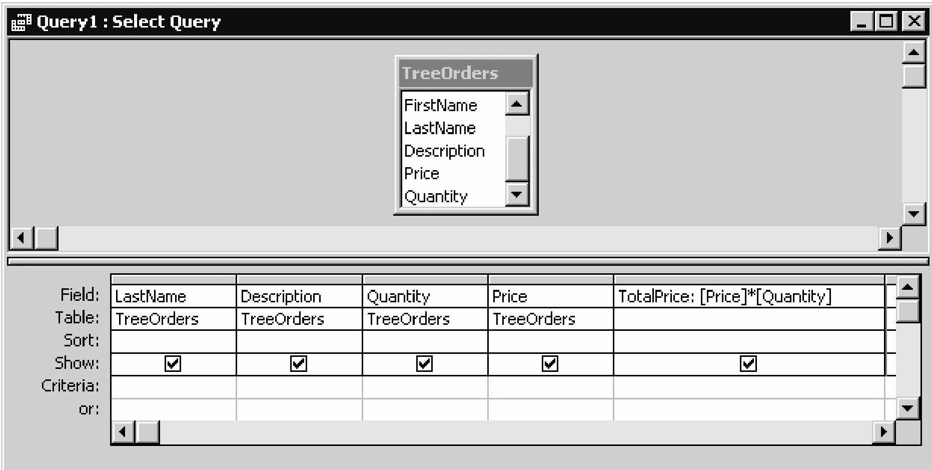
Databases exist to enable the extraction of information from the data stored: that's the primary reason for building a database. Information like totals, averages and so on are really useful pieces of information but you don't usually store them in the database. The reason is simple. Take our table of tree sales. John Parker buys two oaks at $25 each, so I enter that information and the total, $50. When he comes to collect them I realize he is an old friend and change the price to $20 each. I amend the price per oak, but forget to amend the total. Six months later, I look at the record and see the anomaly but haven't a hope of remembering which value is incorrect – the price per oak, the number bought or the total. So, as a general rule we don't store totals, averages or any other data in a database that can be calculated (or derived) from the data that is already there. Instead we calculate it afresh whenever we need it and, as you've probably guessed, this can be done with queries.

We'll build the query which generates an answer table that totals the cost for each order.

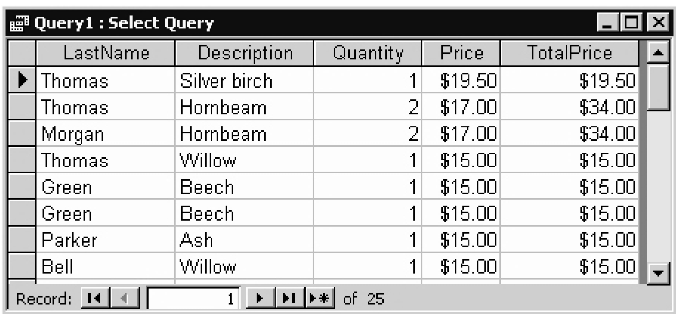
The first step is to build a select query based on the `TreeOrders` table and using the four fields `LastName`, `Description`, `Quantity` and `Price`: use whichever method you prefer to get to this point. You want to add a new field for the total price that's to be calculated from the Price and Quantity fields. In Design view, in the Field row of a blank column type

```
TotalPrice: [Price]*[Quantity]
```

This says, in effect, 'create a field called `TotalPrice` and place in it values calculated by multiplying the value in the `Price` field by the value in the `Quantity` field'.



Click to Datasheet view to see the result.

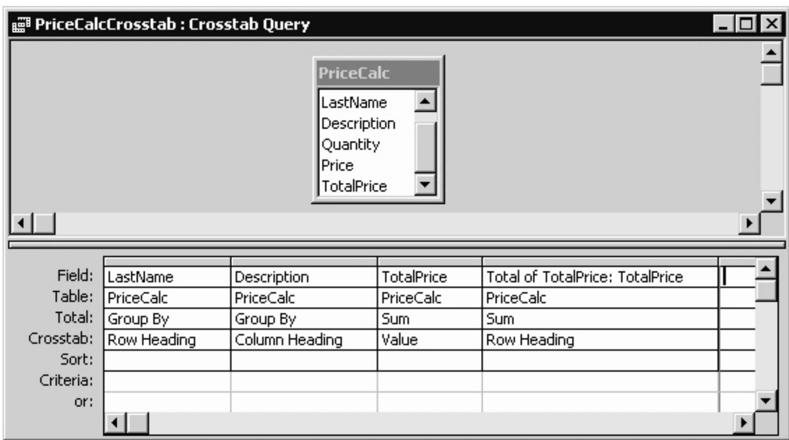

Query1 : Select Query

LastName	Description	Quantity	Price	TotalPrice
Thomas	Silver birch	1	$19.50	$19.50
Thomas	Hornbeam	2	$17.00	$34.00
Morgan	Hornbeam	2	$17.00	$34.00
Thomas	Willow	1	$15.00	$15.00
Green	Beech	1	$15.00	$15.00
Green	Beech	1	$15.00	$15.00
Parker	Ash	1	$15.00	$15.00
Bell	Willow	1	$15.00	$15.00

Record: 1 of 25

I've saved this query as `PriceCalc`. Now if you edit the order for Parker to change the price per oak back to $25, you'll find that as soon as you move off the cell you've edited, the total price automatically updates to the correct value before your very eyes.

You can now build a Crosstab query based on this query which will show, instead of the numbers of trees that have been purchased, the amount spent by each customer on each type of tree. Here it is in Design view



and in Datasheet view: it's called `PriceCalcCrosstab`.

PriceCalcCrosstab : Crosstab Query

LastName	Total of TotalPrice	Ash	Beech	Hornbeam	Oak	Silver birch	Willow
Bell	$40.00				$25.00		$15.00
Ferguson	$66.00			$51.00			$15.00
Green	$30.00		$30.00				
Hardwick	$55.00		$30.00		$25.00		
Johns	$32.00		$15.00	$17.00			
Jones	$40.00				$25.00		$15.00
Kipps	$36.50			$17.00		$19.50	
Morgan	$78.50			$34.00	$25.00	$19.50	
Parker	$124.50	$30.00			$75.00	$19.50	
Thomas	$68.50			$34.00		$19.50	$15.00

Record: 1 of 10

The `Tree` database with all these crosstab queries is in the `chap9crosstab.mdb` file.

Can you edit the data in an answer table?

You'll be familiar by now with the idea that data is stored in a table and also that queries produce tables. Tables for storing the raw data in a database are known as base tables while the ones generated by queries are called answer tables.

Answer tables and base tables share many attributes (see the section on closure later in this chapter); one of the few ways in which they can differ is whether you can edit the data they contain. Clearly you can edit the data in a base table but what about the data in an answer table? The answer is normally 'Yes' but you need to be aware that sometimes the answer is 'No'.

Imagine a select query that pulls out all the records for people living in Washington state and presents them in an answer table. You want to edit the address of a friend who has moved house; can you do that in the answer table? Yes, you can and the changes that you make in the answer table will appear in the base table upon which it is based.

Now consider the `PriceCalc` query described above that has a calculated field called `TotalPrice`. The values in this field are generated from the values in `Price` and `Quantity` fields. Can you edit the total price values in this answer table? No, you can't (give it a try). The query has calculated the total price values from the values in two fields in the base table. If you alter the total price value for a record in the answer table, that alteration ought to be reflected in the base table. In which field should Access place your alteration in the base table, the unit price or the quantity purchased? Access can't tell which alternative is the sensible one so in this case it will refuse to let you edit the answer table.

As a rule of thumb for establishing whether a field is editable or non-editable, consider what it is showing you. If it's simply a view of what's contained in the base table, you'll be able to make changes that will be incorporated into the underlying table. If some manipulation has been carried out on the fields you see in the answer table (the calculation of a sum, average or total, or the concatenation of text fields, for example) then you will not able to edit those fields. Please note, however, that this is only a rule of thumb. Sometimes answer tables are rendered un-editable for more complex reasons that fall outside the remit of this book. This shouldn't worry you too much because you can always simply try it. Build the query and try to edit the answer table. If Access allows you to perform the edit, then it considers the edit to be safe and you can go ahead.

Refining queries to home in more precisely upon records

Queries can be fine-tuned to help you find exactly the records for which you're searching; here are some of the more useful ways of performing this trick. We'll use the `ClubMembers` database again so if you wish to follow our steps, load up the `chap9start5.mdb` file.

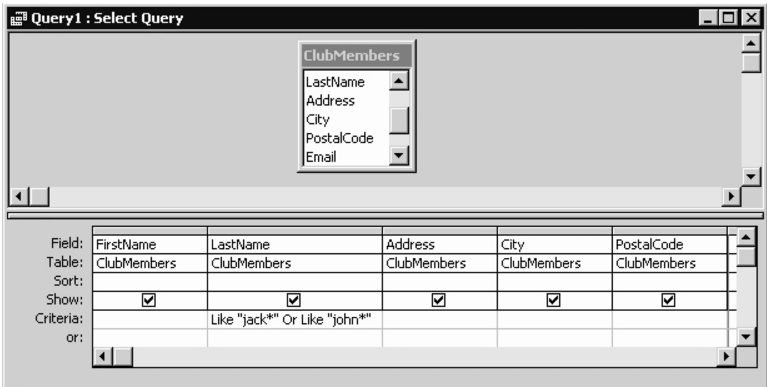
For example, operators can be used in queries to help you home in on the records you want. Because these queries are often created in response to a sudden one-off question, they are rarely saved. (Such queries can be described as 'built on the fly').

OR and AND

Two of the most commonly used operators are OR and AND: we met these in Chapter 4. Remember that using OR tends to increase the number of records in the answer table and that AND tends to decrease them.

LIKE

This works in a similar was to its English language equivalent: it's like saying "Find me the address for that guy Jackson... or Johnson... whatever". Such a query would look something like this:



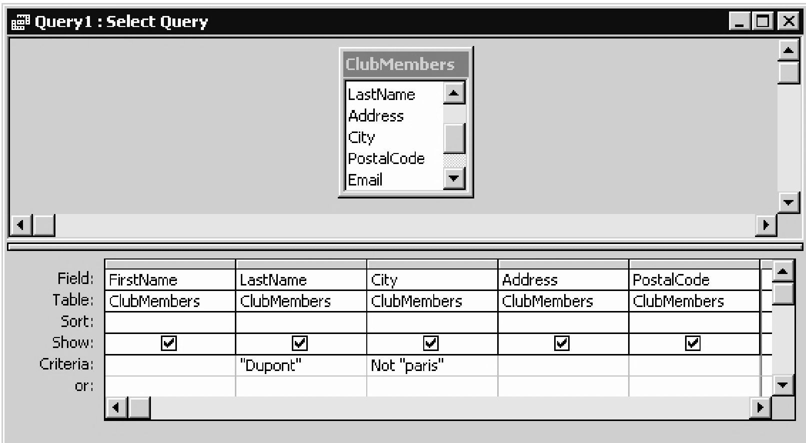
(You can simply type 'jack* or john*' and Access adds the inverted commas and both Likes).

The asterisks in this query are wildcards (see below); used in conjunction with these, LIKE is a very useful and powerful operator.

NOT

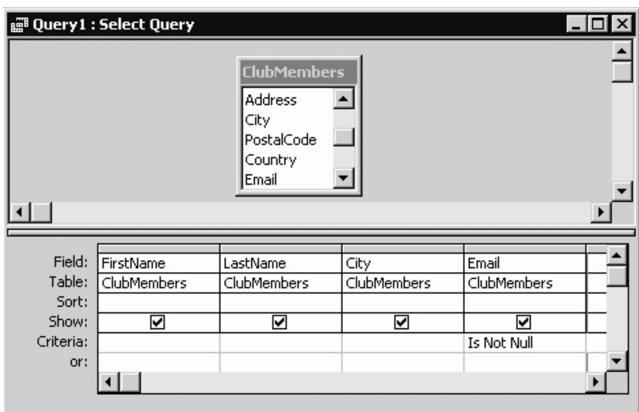
Another useful one, NOT. (No, it is, really it is). It can be thought of as the opposite of LIKE and lets you chop away the records you don't want on the occasions where that's easier than specifying the ones you do.

For instance, if you know that there are several people with the last name 'Dupont' in the database, and you know that you **don't** want the one who lives in Paris, you could use the following query:



to further narrow the search.

NOT is also very useful when combined with Null, that absence of data discussed in the previous chapter. If you wanted to find all the members with email addresses, you'd write a query like this, using Is Not Null as the criterion for the Email field.



This says 'Show me this field in the answer table so long as it has content, that is, if it's not null' and the result, saved as `EmailList`, is:

EmailList : Select Query

First Name	Last Name	City	Email
Simon	Jackson	Carmel	sj@email
Paula	Andrews	London	paula@email
David	Hassall	Tacoma	dh@email
Gordon	Grant	Edinburgh	gordong@email
Felicia	Sharmain	San Francisco	fee@email
Alexander	Kennet	Portland	alexk@email
Freya	Dupont	Paris	freya_dupont@email
Dan	Whipple	Seattle	daniel@email
Dean	Kringle	Tacoma	kringle2@email
Alison	Lloyd	Cardiff	a_lloyd@email
Bob	Benson	Anchorage	bobb@email
Charles	Arthur	Kirkcaldy	c_arthur@email
Claude	Dupont	Bordeaux	claudedupont@email
Sonny	Fischer	Boston	sfischer@email

Record: 1 of 14

BETWEEN...AND

We introduced this operator when we built a range query earlier in this chapter; it too works as it does in English syntax. Below is a typical example for finding a record in a specific range of dates:

Between #01/01/58# And #31/12/60#

Wildcards

A wildcard is a character that is used in place of an unknown character or characters. There are six, listed in the table below, of which * is by far the most commonly used.

Character	Action	Example
*	Matches any number of characters; can be first or last character in the search string	*pe** finds penguin & pencil; **pe* finds hope & calliope
?	Matches any single alphabetic character	*?oad* finds road, toad & load
[ ]	Matches any one of the characters within brackets	*[rt]oad* finds road & toad but not load
!	Matches any character not in the brackets	*[!rt]oad* finds load & goad but not road & toad
-	Matches any one of a range of characters; the range must be specified in ascending order (A to Z)	*x[f-h]y* finds xfy, xgy & xhy
#	Matches any single numeric character	*4#5* finds 435, 405 & 465

The criteria

Like 'Jack*' Or Like 'John*'

used above say 'show me all the records where the value in the `LastName` field starts with the letters Jack or John with any and all combinations of letters after those'. Jackson and Johnsson are found, as would Jack, john, Jack789 and Johnstonely-Burlinghame if they had been in the table.

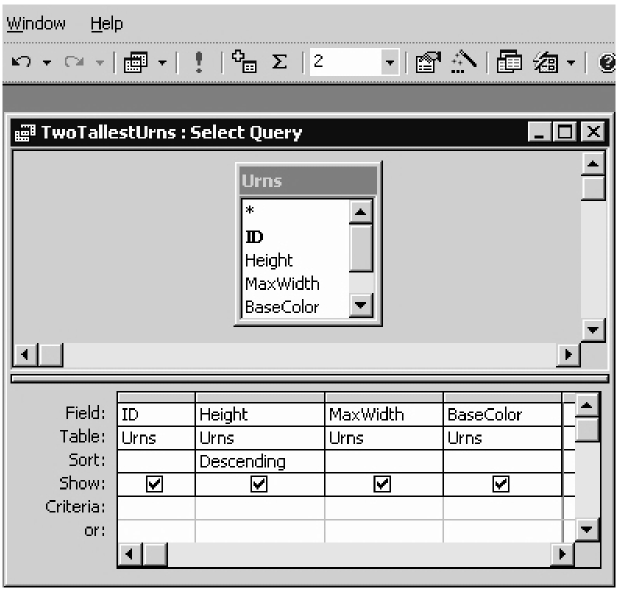
Display only the highest or lowest values in the query's results

It's also possible to restrict the scope of Select queries and of some Action queries with a query limiter called TopValues. As the name suggests this lets you find, for example, the top five selling products. Of course, 'Top' can refer to the lowest values in a list, so you can also find the eight worst performing sales people in your sales force...

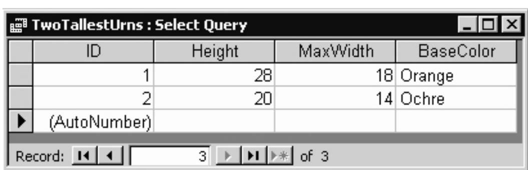
The TopValues box

is accessible from the main menu when you have a query open in Design view. Entries can either be numbers (10, for instance, will give you the top ten records) or percentages (10% gives the top ten percent of records in the answer table).

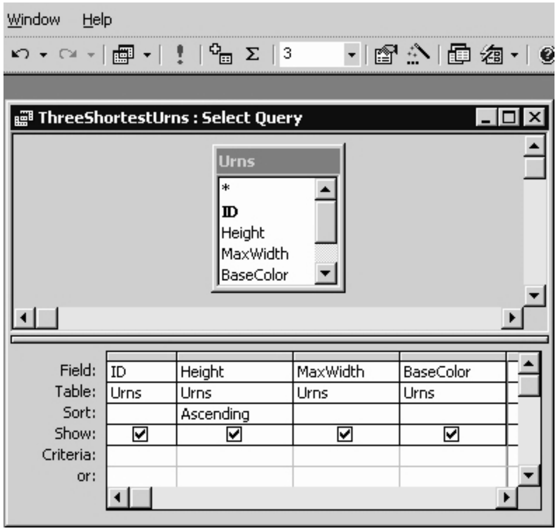
For example, if you want to find the two tallest urns in your collection, the following will do it.



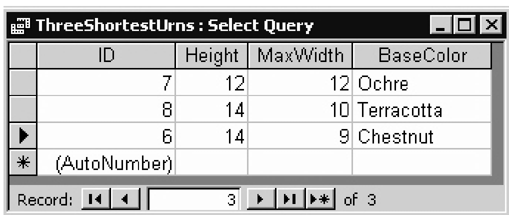
The field we want to use for the selection (`Height`) has been sorted into Descending order; in addition we have set the TopValues box to two. The answer table shows the result we want:



If we wanted the three smallest, we'd simply alter the query to this:



and the answer would be:


ThreeShortestUrns : Select Query

ID	Height	MaxWidth	BaseColor
7	12	12	Ochre
8	14	10	Terracotta
6	14	9	Chestnut
(AutoNumber)			

Record: 3 of 3

To make this a percentage rather than a number, simply follow the number in the TopValue box with a percent sign (%).

Closure – and making further use of queries

❛ *Closure is a term used in databases to describe the fact that answer tables not only look like but also behave like the underlying base tables. This is more important than it first appears...* ❜

Queries show you the data you want to see in an answer table. As you will have noticed by now, the answer tables that Access displays look very much like the base tables that hold the underlying data; both have rows and columns, both are editable (though see the exceptions discussed above in the section called 'Can you edit the data in an answer table?'). The fact that answer tables are constructed to look just like base tables is not accidental; it gives us much more flexibility in the ways in which we can manipulate the data in the database.

You know by now that you can build one or more forms on a base table in the same way that you can build one or more queries on a base table. Closure means that you can do exactly the same with answer tables that come from queries. That is to say, you can build forms that take their data from an answer table and you can build queries that take their data from an answer table.

Suppose that you have a massive customer table which holds all your customers from around the world. You create a query called `USACustomers` which extracts only the customers who live in the US. You can then build a form on that query called, perhaps, `American`. When you open up that form, the query will run automatically for you and in the form you will see only the US-based customers.

❛ *We should, in fact, say 'build a form on the answer table generated by that query' but common usage and a dislike of verbosity lead us to prefer the looser phrasing.* ❜

And/or you can build a query based upon `USACustomers` that shows the people who live in Seattle. You can go on and on. You could, for example, then build a form called, say, `SeattleCustomers` on **that** query. When you open that form, the first query runs, extracts the US customers and passes the answer table to the second query. That query extracts the Seattle customers and these are the ones you see in the form.

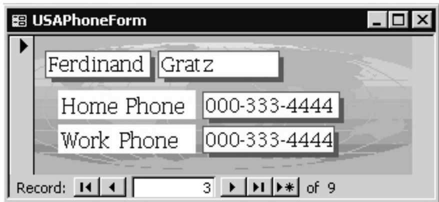
❛ *Warning: gratuitous plug approaching.*

This is all you need to know about closure in order to make use of it. If you end up interested in the background to closure and other aspects of the relational database model that Access uses, try Inside Relational Databases, mentioned in the introduction. It will also provide a beginners' guide to using SQL. ❜

We'll have a look at a couple of examples of where closure can be useful.

Using a query as the basis for a form

You spend a lot of time on the phone to club members and you're always looking up numbers. You create queries to divide members into those in the USA and those in Europe, showing the records in alphabetical order, but it's still a table to be looked through to find the right number. Base a form on this query and you can have a neat clean view of one record at a time and cycling through to the record you want is quick and easy. An example of such a form is shown below.



Start by building a select query to find all those resident in the USA: a field called `Country` has sidled into the `ClubMembers` table to make this possible. The query is called `USAPeople`. From the Forms tab, start the Form wizard. Select the query from the Tables/Queries list, add all its fields except `Country`, pick a layout (Columnar), a style (Stone) and a title (`USAPeoplePhoneNumbers`).

To sort the records alphabetically by last name, place the cursor on the last name field, click the Sort Ascending button on the button bar and save the form. Now it will always open with records sorted by last name.

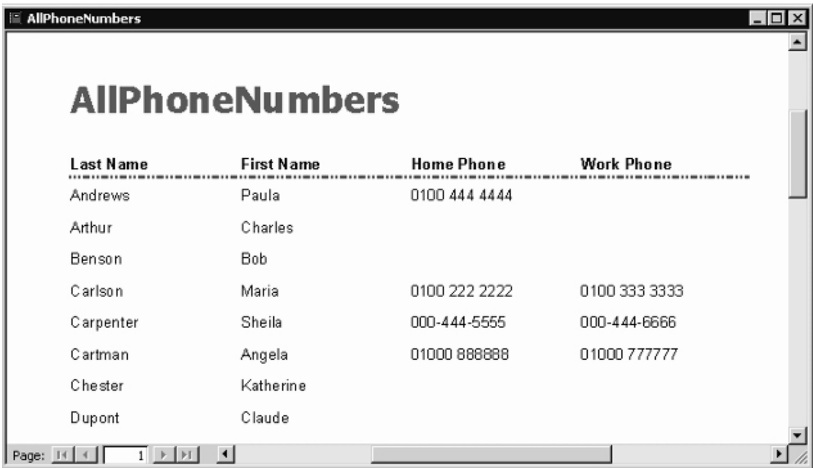
There it is, a friendly front-end to your list of contacts. This doesn't look quite like the one above it; the layout and style are different and it lacks the customized image but it's perfectly usable and was created in a flash. (Changing the look of your forms is covered in Chapter 10).

As you work with your database, you'll find many more places where a form based on a query makes a whole lot of sense.

Using a query as the basis for a report

A report can be based on a query in the same way as a form can, and just as easily. You're going abroad and suspect that while you're away you'll need to make a few phone calls to keep things moving. It's the work of a moment to print out a list of contact details to slip into your suitcase.

Build a query to show all phone numbers. In the Reports tab, start the Report wizard, select the underlying query (`AllPhoneNumbers`) and all its fields. Don't group the records, sort them by last name, use the Tabular layout, Portrait orientation, pick a style (Casual) and a name for the report (`AllPhoneNumbers`). Click Finish



and there it is. Send it to the printer and you're heading for the airport in seconds flat.

The forms and report described above are in the file `chap9end.mdb`.

Using a query as the basis for another query

This sounds like weird recursive stuff. It is a bit, but it's also very useful. Imagine you have a query that identifies all the members in Europe. It's a useful query and you use it frequently. In time, the number of contacts grows to a point at which it is no longer efficient to flip through the records to find the information you want. The quickest way to find everyone you know in Paris who uses email is to build another query.

Rather than start again from the whole tableful of contacts, you can base the new query on the answer table generated by the original query that finds European members. With a simple membership database this time saving may not be significant but with a vast table of thousands of orders, for instance, it could be a different story.

A query based on a query can be built manually or with the wizard. When you start the wizard, pop down the list of Tables/Queries and choose the query to base the new query upon. The manual method is just as simple. Click the Queries tab in the Show Table dialog and pick the one you want. The query can then be constructed just as if you were basing it on a table.

When you've completed the new query you simply run it: you don't have to run the query on which it is based. Access takes care of that; all you see is an answer table with the data requested.

Summary

Time and effort go into collecting data and filling a database with it. Queries are how you make your database work for you; they're the payoff once all the hard work has been done. Having put the data in, queries are how you get information out.

As we progress through the delights of querying, some of the examples may sound a little trivial. Indeed they are, but they're there to demonstrate the basic task that each type of query performs. Once you understand the principle of each, as your database grows you'll meet more and more occasions when they can be pressed into service.

Combined with forms and reports, queries become even more powerful and flexible. Experimentation is the key: time spent playing with queries and their adjuncts is rarely wasted.

Chapter 10

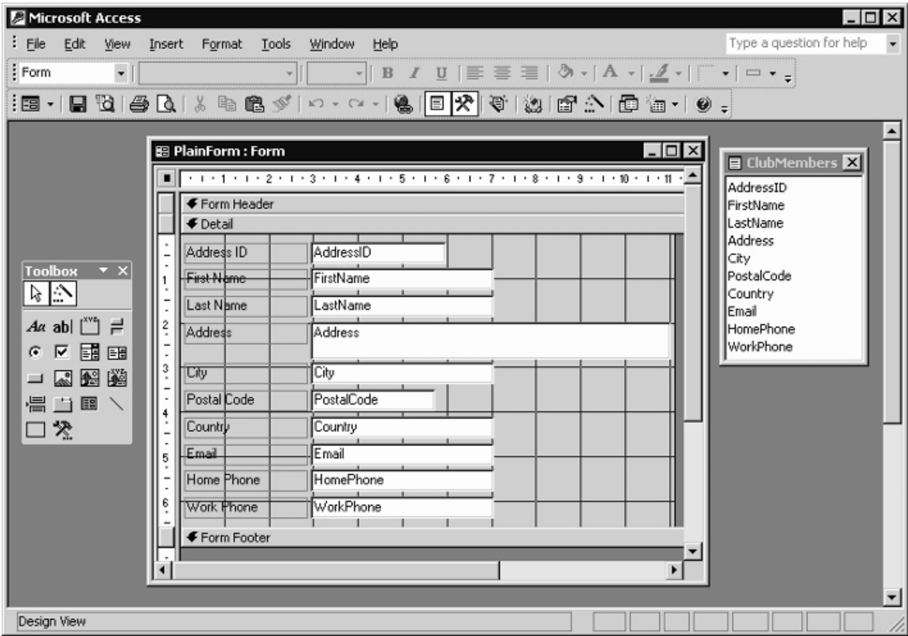
Forms again – design

In Chapter 5 we looked at generating basic forms and then at how forms can be used to calculate values for you. In this chapter we're going to concentrate on using the form designer to customize forms further and then look at a few other ways of building forms.

Designing your form

Forms are the face your Access database presents to the world. Even if you are the sole user of the database they are useful. However, when you start to build databases that other people use, people who may be less computer literate than you, they become invaluable. An uncluttered form in cool colors that shows the fields you need is more conducive to accurate data entry than one looking like a dog's dinner.

You're given control over a form's appearance in Design view, as we've already seen in Chapter 5. Start from the `chap10start.mdb` and use the wizard to create a form showing all fields in the `ClubMembers` table. Use the default columnar layout and standard style, calling it `PlainForm`. Flip into the Design view (or, on the last page of the wizard, select the 'Modify the form's design' option).



It's an oddity that if you select 'Modify the form's design' option, when the form opens in Design view, it has the default name of `Form1` in its title bar, rather than the name you specified to the wizard. When you close the form, however, it's saved by your chosen name, so Access does know what's going on really….

This is your design environment. The toolbox is shown in this screen shot; if it isn't visible on your screen, click on the toolbox icon in the Form Design toolbar.

The Field List is open too, showing the fields in the table on which the form is based; if it isn't open, click the Field List button.

The form has two gray bands at the top labeled Form Header and Detail, and one at the bottom called Form Footer. (If you can't see the Form Footer band, drag to make the window bigger until you can). The footer and header sections are not in use at present. Below the Detail band is an area covered by a grid, known as the Detail section.

Moving fields

Make some room on the form by placing the cursor on the bottom right corner of the Detail section and when the cursor turns into a four-headed arrow, drag the corner in a south-easterly direction.

Each field in the Detail section is represented by two parts. To the left is a Label that identifies the contents of the field. The label is transparent and its text appears on top of the form's background (flip to Form view to check this). To the right is a Text box where the data from the field is displayed. This defaults to a sunken white box in Form view.

Click anywhere in a text box and handles will appear around the text box and also on the associated label. Mostly you'll want to move these two together, so aim the cursor at an edge of the text box until it shows as an open hand. Now click and drag to move text box and label together to a new position.

To move a text box independently, put the cursor on its top left corner whereupon it shows as a pointing hand. Click and drag to move it without the label coming too. This technique works for moving labels on their own too.

You can also select a batch of fields and labels in order to move (or otherwise manipulate) them all at once. Click somewhere on the gridded area and drag a rubber band outline to encompass or to pass through all the objects you want to select. When you release the button, handles appear on all the objects and they can be moved just as you move any single object.

Deleting fields

To delete a text box and label, click on the text box and press the Delete key. To remove a label and leave the text box, click on the label and press Delete.

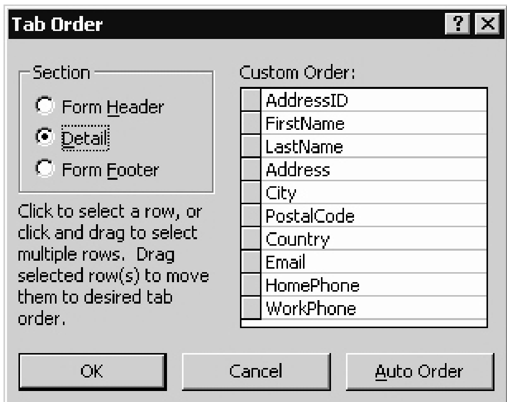
Inserting fields

If you don't have the Field List on screen, click the Field List button in the main button bar or click View, Field List. You can drag this list of fields to anywhere on screen (as you can the Toolbox). To insert a field, click and drag a field name from the list onto the form.

Changing the tab order of fields

When in Form view, pressing the Tab key moves you from field to field in a certain order. This sequence is known as a form's 'tab order'. In the `PlainForm` form, this is the order in which the fields appear in the underlying table. Usually the default tab order is fine but if you move fields around the form, that default may no longer seem so logical.

To inspect the tab order, flip into Design view, click View from the main menu and Tab Order... (If it isn't shown as an option, expand the list).



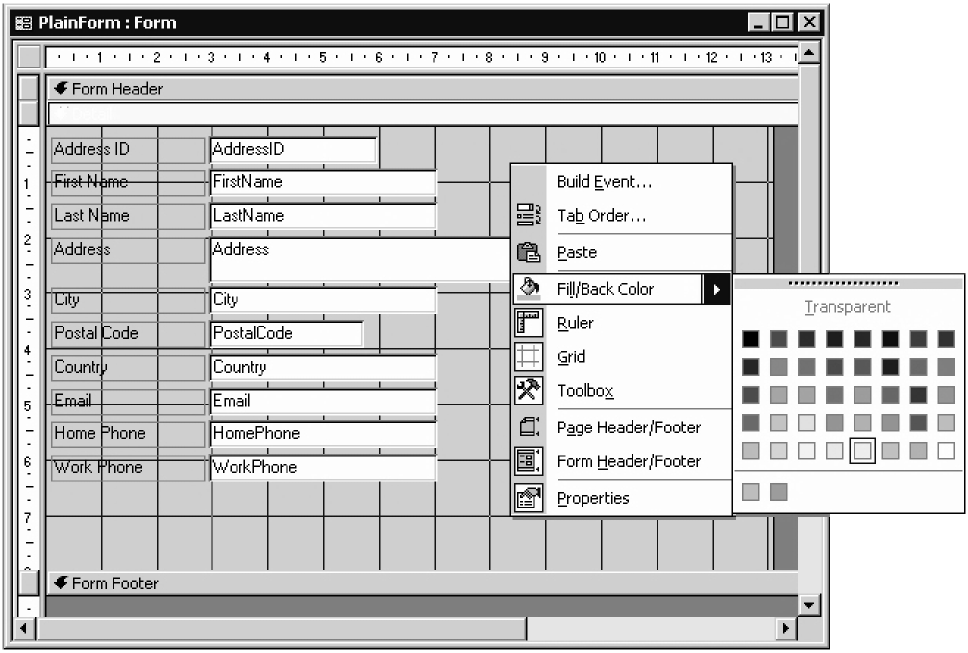
As the dialog explains, you can select each field name and drag it up or down the list to create the order you want. Click on the grey square to the left of each field name to select and move it by dragging. The Auto Order button is useful for reinstating the default tab order. Click OK when the order is to your liking.

You can also right click anywhere on the form and select the Tab Order option from the pop out menu.

Formatting your form with colors and fonts

Using color isn't necessary or obligatory, but it often improves the look of a form and gives you and any other users a more attractive workplace.

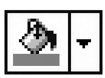
To change the background color, right click on the Detail section of the form, select the Fill/Back Color option and chose the color you want from the pop out palette.



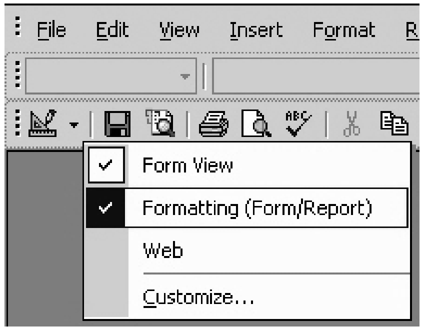
Sometimes it is easier to see the effect of these changes in Form view rather than in Design view. You can also view the properties and even change some of them from Form view. To demonstrate this, change to Form view.

Inspect the property sheet: if it was visible when you left Design view, it will remain visible in Form view. If you need to open it, just click the Properties button in the main toolbar.

We'll carry on playing with color, so look for the Fill/Back Color button in the main toolbar.



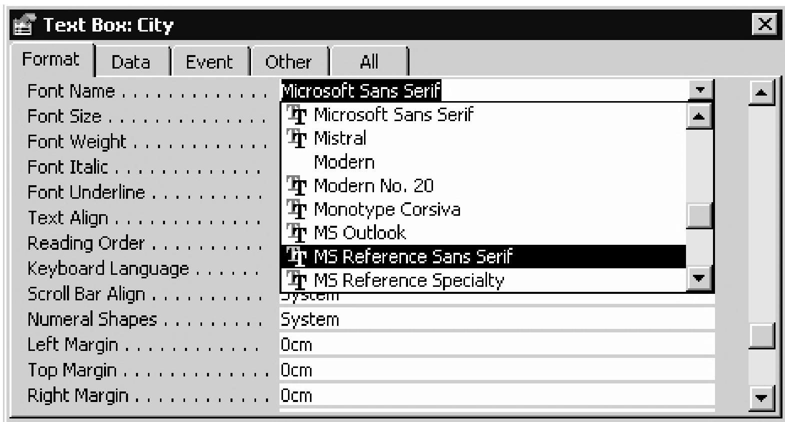
If you can't see the button, you may need to turn on the Formatting (Form/Report) toolbar – do this by right clicking on the existing toolbar and selecting it.



Still in Form view, clicking on the Detail section of the form will toggle the properties shown between those for the entire form and those for the Detail section of the form. When you're looking at form properties, the Fill/Back Color button is grayed out, so with the Detail properties visible, click the arrowhead alongside the Fill/Back Color button and pick a color. As soon as you do, the new background color appears on the form. The color you've chosen has now been loaded into the paint tin shown on the main part of the Fill/Back Color button (a little bar of the color appears under the tin) so, should you want this color again, you can simply click the main button.

Sadly we can't have color pictures in this book to illustrate the excesses that can be wrought by changing this background color and the color properties of all the other objects. (You can set the Back Color, Fore Color and Border Color for each text box alone....)

Fonts are changed equally easily. With a text box selected, inspect the Font Name and Font Size properties on the Format tab. Both have pop down lists to let you change fonts and sizes. As you can see, Access allows you to make these formatting changes in a host of different ways – from both the Design and Form views, and from the toolbars or from the property box itself.



However, some design work can only be done in the Design view so it is best to work there for the rest of the chapter.

Changing field lengths and widths

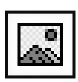
You may decide that you need labels and text boxes to be bigger. This is often the case if you change fonts and/or font sizes, as described above. Changing the font size of the `FirstName` text box to 18 and flipping to Form view, the entry in the field is now so large that it's illegible on the form.

First clear some space by rubber-banding around all fields and labels below the `FirstName` text box and moving them downwards. Now, to make a text box bigger, go to Design view, select it with a click and then place the cursor on one of its sides. When the cursor shows a double headed arrow, you can drag to enlarge the box. Placing the cursor on a top right, lower right or lower left corner to show a slanting double headed arrow lets you drag to change the width and height simultaneously. Labels can be resized in the same way.

Adding graphics to your form

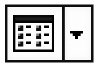
You can add graphics to your forms for fun or to give them a professional appearance. If you have a company logo stored electronically, you can put it on forms for a co-ordinated look. There is a ton of clip art around these days to cover the fun angle.

From the Toolbox, click on the Image tool.



Click on your form and drag an outline to be filled by the graphic. When you release the mouse button, a window opens to let you navigate to your chosen image.

❛ *If you just want something for experimentation, given a standard Office installation, you could try navigating to* `Program Files\Microsoft Office\Clipart` *and looking around. Clicking the Views button:*

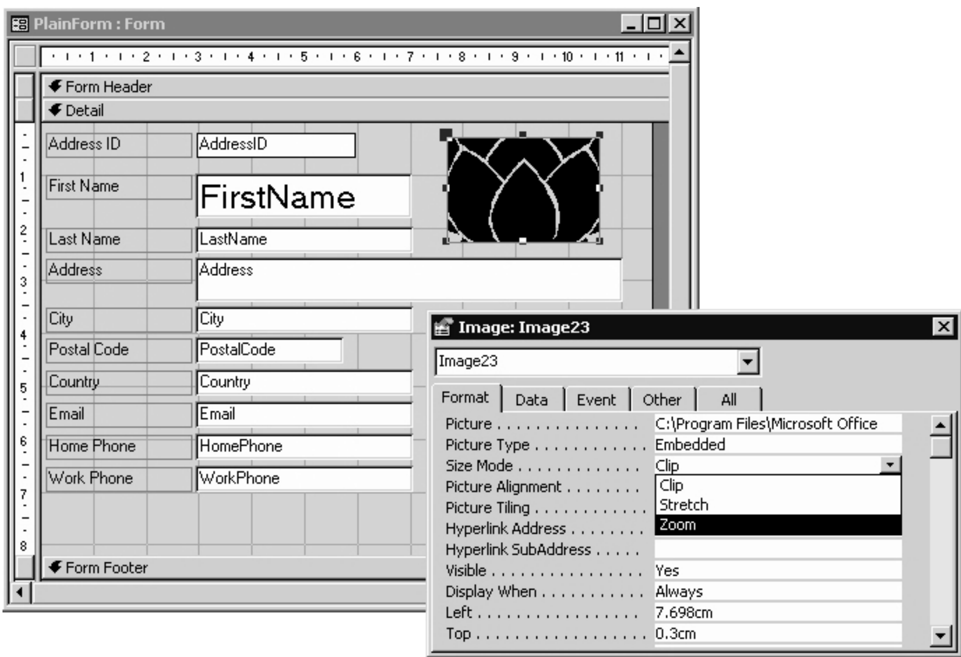


and selecting Thumbnails lets you see each clip. It might take a moment or two to generate the thumbnails as there may be many clips in a folder. ❜

Once you've selected a suitable clip, click OK.

Sometimes, depending on the provenance of the graphics file, the box outlined will only show a small section of an image that's much too large to fit and sometimes it will look completely blank, both in Design and Form view.

Look at the properties for the Image and set the Size Mode (found under Format) to Zoom.



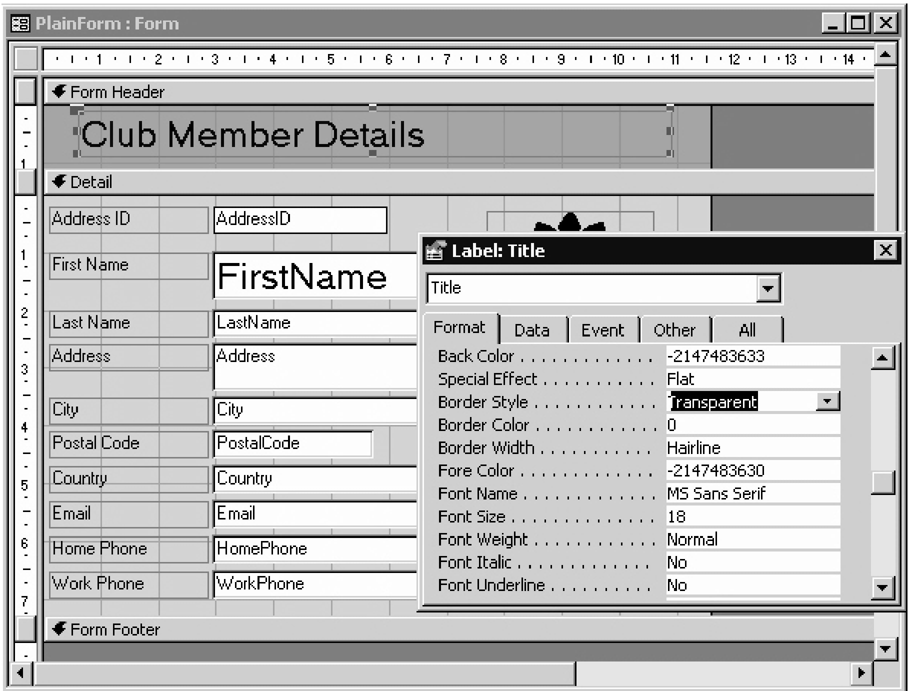
The image should now appear in the Image box and be scaled to fit inside its outline.

If you resize the image box on the form, the image itself will continue to zoom to fill the space you've given it. Borders can be put around an illustration: check out the Border Style, Color and Width properties.

We've saved this enhanced version of the original `PlainForm` form under the name `NotSoPlainForm`.

Headers and footers

To include a header on your form, put the cursor on the top of the Detail band so that it shows as a horizontal bar with a two-headed arrow through it. Now click and drag downwards and a new gridded area appears under the Form Header band. Here you can add a label with a title for the form, a graphic or whatever you want at the top of the form.



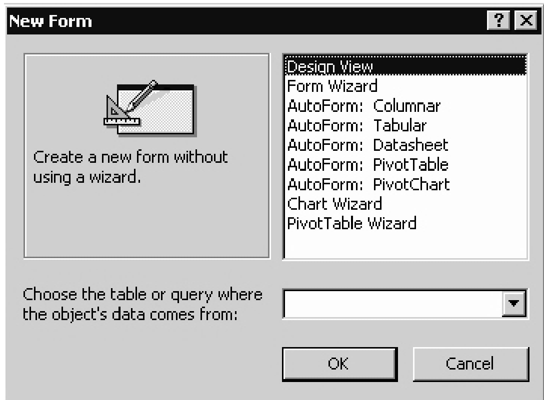
In Form view, any objects in the header will remain on screen, even if your form becomes so long that you have to scroll down to see it all.

The Form Footer works in just the same way (drag the lower edge of its band to pull out a working area) and anything placed here will be visible as you inspect records.

❛ *Strangely, if you click on the Header, Footer or Detail bars themselves in order to inspect their properties, the bar turns white and you can no longer read its name. The name is shown at the top of the property sheet, however, but it's an odd 'feature' that's crept in.* ❜

Other ways of creating forms

If you opt to create a new form, Access offers a range of choices.



We've already used the Form wizard (Chapter 5) and have just taken a look at Design view. The next five options in the list are five types of AutoForm:

- AutoForm: Columnar
- AutoForm: Tabular
- AutoForm: Datasheet
- AutoForm: PivotTable
- AutoForm: PivotChart

The first three AutoForms are so easy to use that we suggest that you simply run through each to see what it produces. The two remaining AutoForms both offer great ways of looking at your data and we'll cover them below in some detail.

The last items in the list are two further form-building wizards – the PivotTable Wizard and the Chart Wizard – and both are explored below too.

PivotTables

A Pivot table is a method of displaying data that may be familiar to users of Excel because that's where they appeared first. They are very clever, letting you look at the data in a database from different angles, all controlled by mousework, and all from within a single form. This description doesn't make them sound exactly stimulating, so a few illustrations might help win you over.

In order to get the best from a Pivot table, you need to feed it with data that is structured in a particular way. Nothing too weird and to give you the idea, here is a sample of the data we are going to use to illustrate Pivot tables:

ID	City	Person	Item	Price	Number
1	London	Ross	Biscuits	$2.00	45
2	London	Sophie	Cigars	$50.00	5
3	London	Sophie	Beef jerky	$12.00	3
4	Seattle	Ross	Biscuits	$5.00	12
5	Half Moon Bay	Katie	Toys	$35.00	3
6	London	Julia	Concert tickets	$150.00	4
7	Seattle	Steve	Herring	$50.00	2
8	Paris	Andrea	Toys	$23.00	4

We have columns that contain the data we want to analyze (`Price` and `Number`) and columns that contain information about the way in which we want to analyze the data (we want to analyze by `City`, `Person` and `Item`).

In a well-designed database, you probably wouldn't find a table that looked exactly like this but that's no problem. You would simply build a query that produced the data in this kind of format and base the Pivot table on that query. Just to make life simple, we have provided a table that is exactly like this. It is a table called Pivot which is itself in the `chap10start.mdb` file.

Given the data from the table above, you might want to see which items were bought in which city:

Pivot

Person: All

City

Item	Boston	Half Moon Bay	London	Paris	Seattle	Grand Total
	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number
Beef jerky		6	3	4		13
Biscuits			45		13	58
Caviar				1		1
Cigars			5	5		10
Concert tickets			8			8
Herring	1				2	3
Music	3					3
Toys	5	3		4		12
Grand Total	9	9	61	14	15	108

to see where different people made purchases:

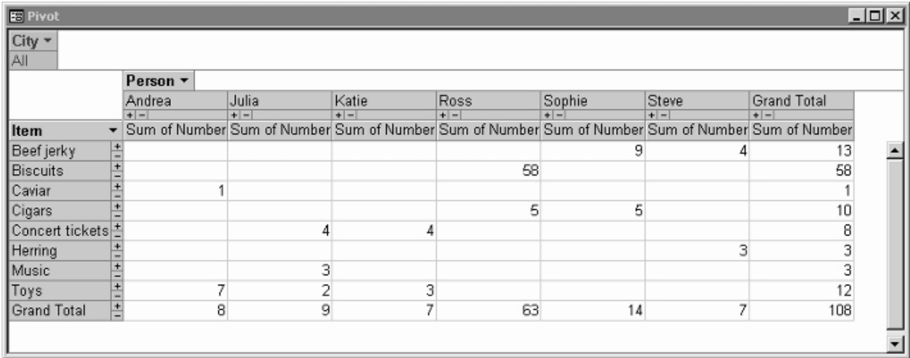
Pivot

Item: All

City

Person	Boston	Half Moon Bay	London	Paris	Seattle	Grand Total
	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number
Andrea	3			5		8
Julia	5		4			9
Katie		3	4			7
Ross			45	5	13	63
Sophie		6	8			14
Steve	1			4	2	7
Grand Total	9	9	61	14	15	108

or what each person bought:

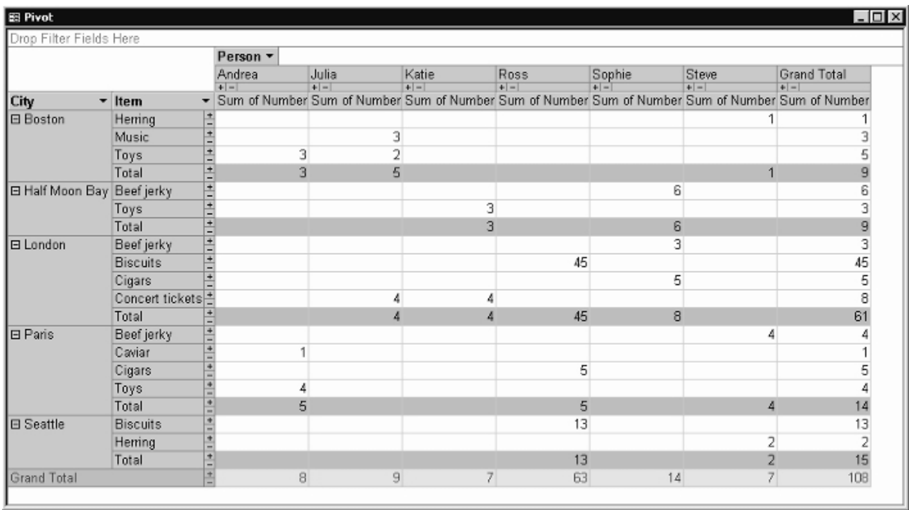


Pivot

City: All

Item	Andrea	Julia	Katie	Ross	Sophie	Steve	Grand Total
	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number
Beef jerky					9	4	13
Biscuits				58			58
Caviar	1						1
Cigars				5	5		10
Concert tickets		4	4				8
Herring						3	3
Music		3					3
Toys	7	2	3				12
Grand Total	8	9	7	63	14	7	108

or even what each person bought where:



Pivot

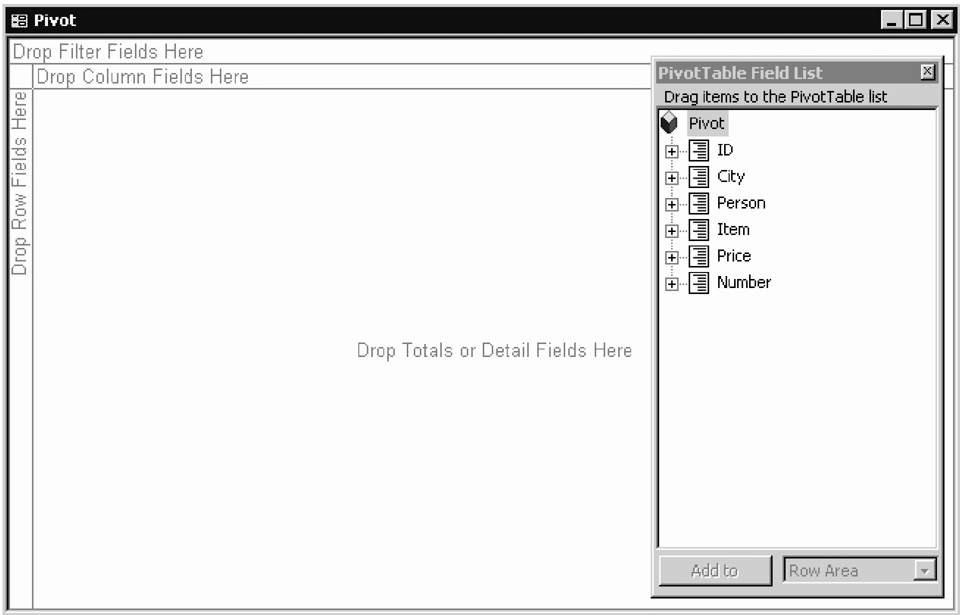
Drop Filter Fields Here

City	Item	Andrea	Julia	Katie	Ross	Sophie	Steve	Grand Total
		Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number	Sum of Number
Boston	Herring						1	1
	Music		3					3
	Toys	3	2					5
	Total	3	5				1	9
Half Moon Bay	Beef jerky					6		6
	Toys			3				3
	Total			3		6		9
London	Beef jerky					3		3
	Biscuits				45			45
	Cigars					5		5
	Concert tickets		4	4				8
	Total		4	4	45	8		61
Paris	Beef jerky						4	4
	Caviar	1						1
	Cigars				5			5
	Toys	4						4
	Total	5			5		4	14
Seattle	Biscuits				13			13
	Herring						2	2
	Total				13		2	15
Grand Total		8	9	7	63	14	7	108

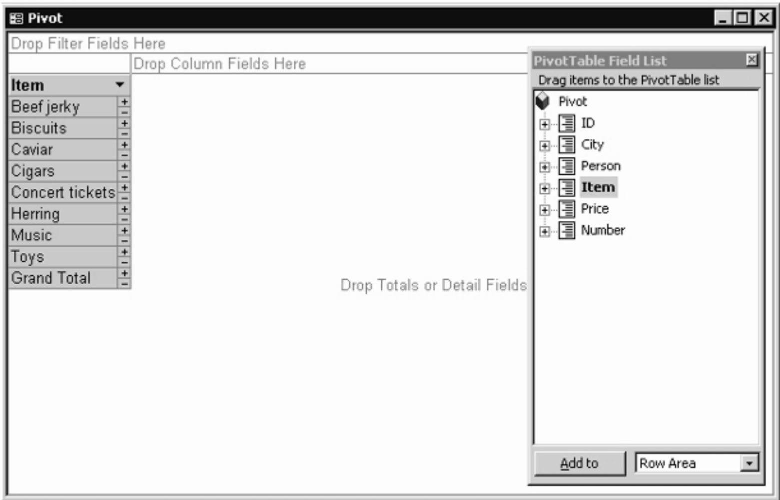
You can see all these aspects of the data from within a single PivotTable view (which is what Access calls a form displaying data this way). That's an awful lot of functionality to cram into a single form but it's gratifyingly easy to put together the elements you want, whether you choose to use the AutoForm: PivotTable or the PivotTable Wizard.

AutoForm: PivotTable

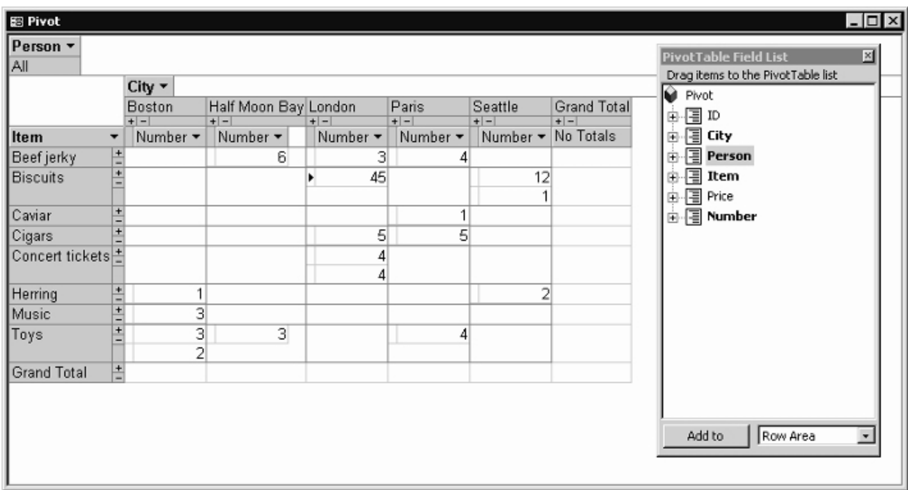
From the Forms tab in the database window, click the New button, select AutoForm:PivotTable and the table called Pivot. You'll see a blank canvas with gray instructions upon it and a PivotTable Field List, like this:



Drag the field called `Item` from the field list and drop it into the narrow vertical band on the left side, labeled 'Drop Row Fields Here'. The band will be outlined in blue when your cursor is placed correctly. Release the mouse button and the items are shown on the form.

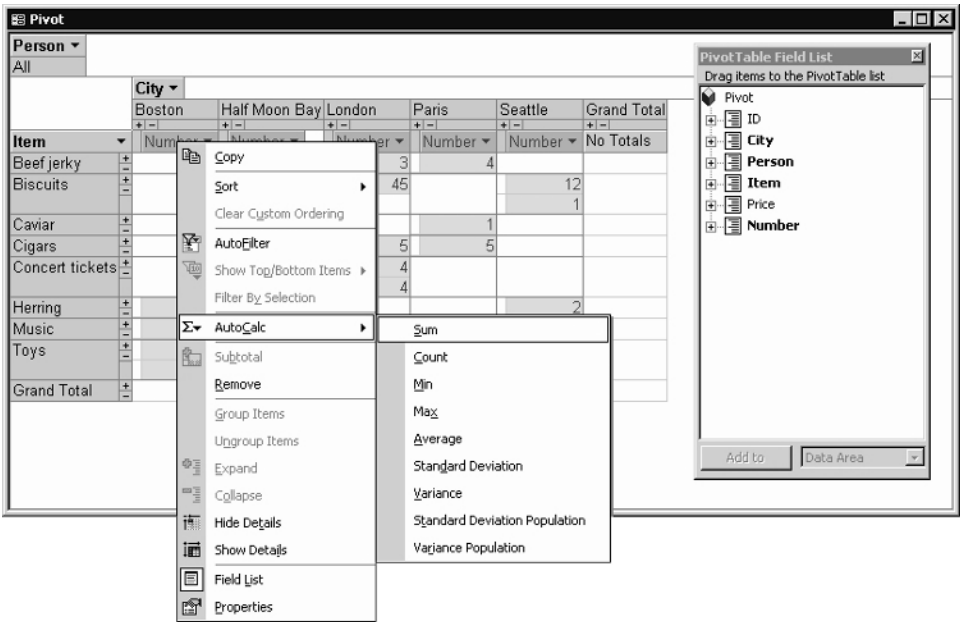


Now drag the `City` field to where it says 'Drop Column Fields Here' and drag the `Number` field into the centre of the form. Finally, drag the `Person` field to the top of the form, where it says 'Drop Filter Fields Here'. Move the field list if it overlaps the form, or close it, and your form should look like this:

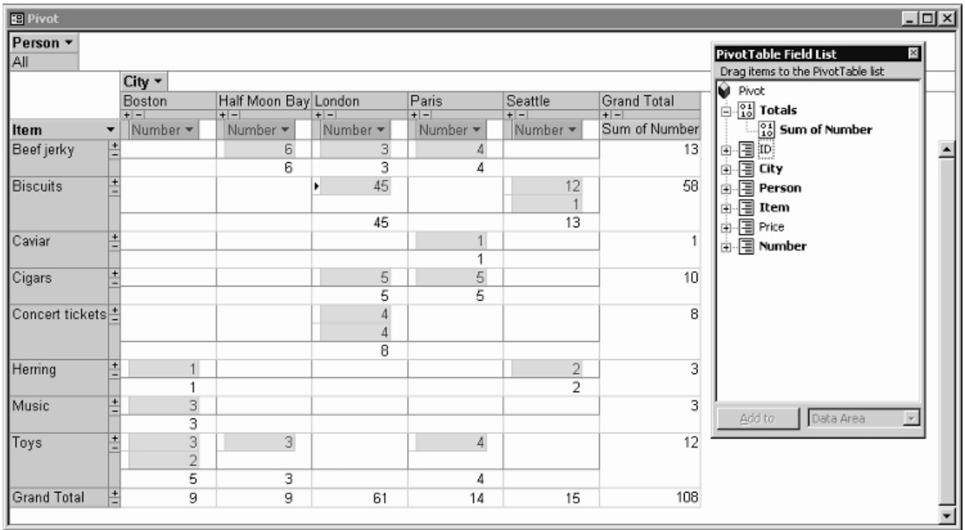


It's been really easy to reach this point and you can already see, for instance, that there were two purchases of four concert tickets in London and that caviar was only purchased in Paris – but let's add some totals before we go any further.

Right click in any of the header cells that say `Number` and select AutoCalc. A range of possible calculations is presented: we want to see the totals of items purchased, so choose Sum.

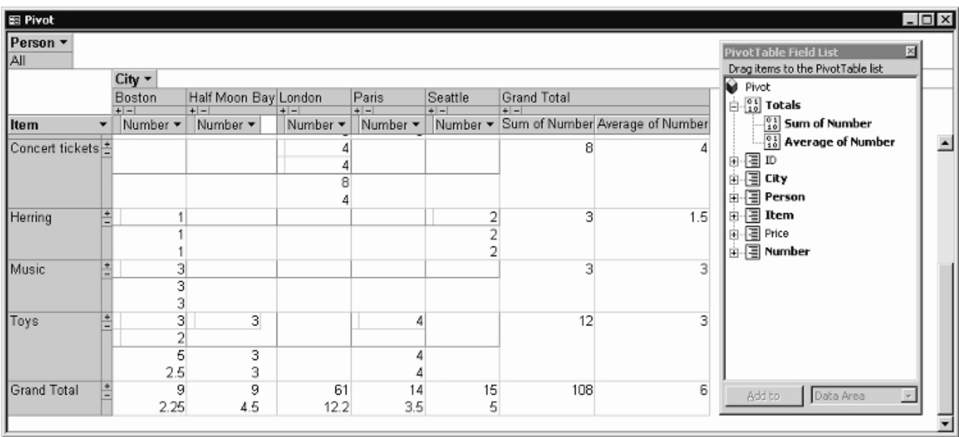


The table now shows totals of items bought in each city, for all items bought in each city, and the total of each type of item.

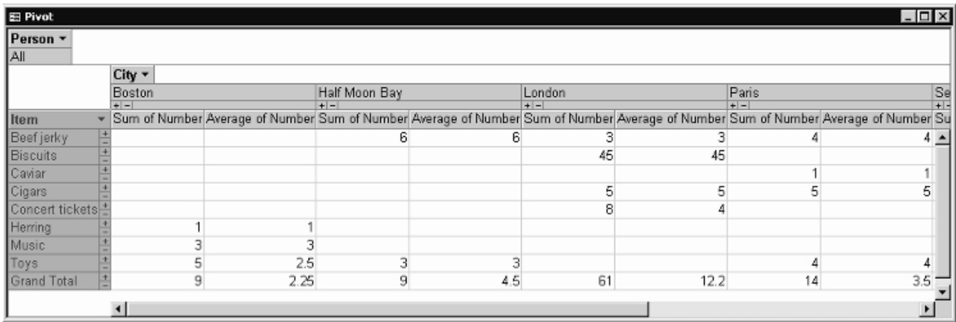


The PivotTable helpfully adds gray shading to the cells containing the base data, and in the PivotTable Field List you'll see an entry at the top, called `Totals`. Below it is the Sum of Number calculation you've just specified.

You could click again on a Number heading and add another calculation, this time for the Average sales figures. The Field List reflects the new calculation.

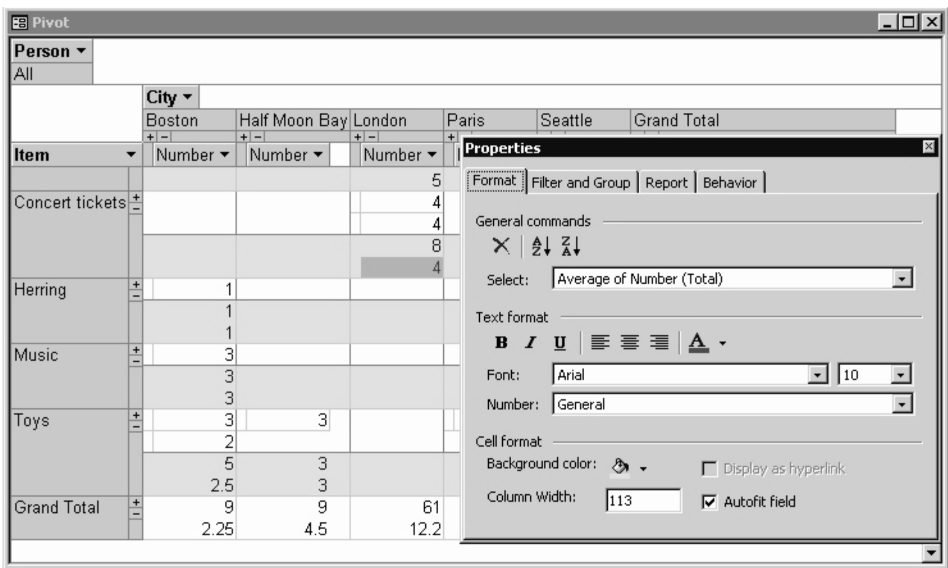


Now the grid is even more complex but there are several ways of reducing the clutter. You can click the tiny button showing a minus sign alongside each item to hide the details, so you can see just the sum and the average. Or you can right click in the `Item` column header and select Hide Detail, which changes the layout to look like this:

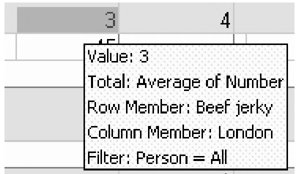


Playing around with the Show and Hide Details options (using the little buttons or from the right click menu) gives you a feel for how you can change the appearance of the data. Now return to showing details.

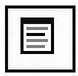
A useful trick for adding clarity to the display is to add color. Right click on one of the cells in the main body of the grid that contains an average or sum. Choose Properties and in the Format tab, select a Background color.



Another useful tip is to hover the cursor over a cell for a moment, until a label pops out identifying the cell contents:



You can also close the Field List until you need it again: when you do, click the Field List button in the menu bar:



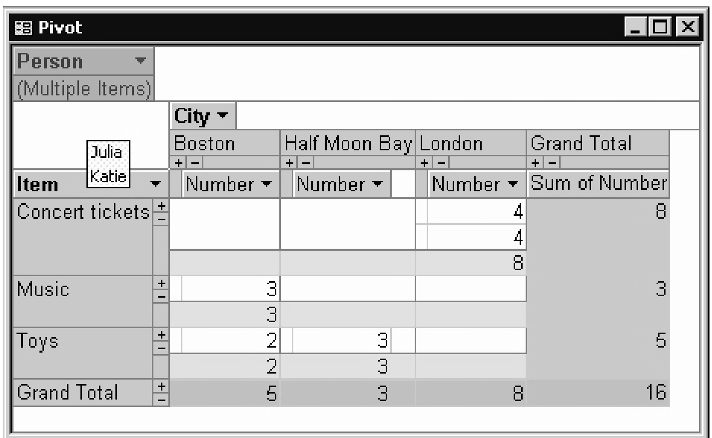
As you'll appreciate, there is a lot of flexibility at your disposal in a PivotTable, and we've barely scratched the surface. We'll look briefly at a couple more of its features and then leave you to experiment in your own time.

We'll start by reducing the complexity a little: open the Field List, right click on the Average calculation and delete it.

Remember dropping the `Person` field at the top of the form into an area labeled 'Drop Filter Fields Here'? Beneath the `Person` label in the top left corner it says All. This means that the PivotTable is displaying data for all people so no filtering of data is taking place.

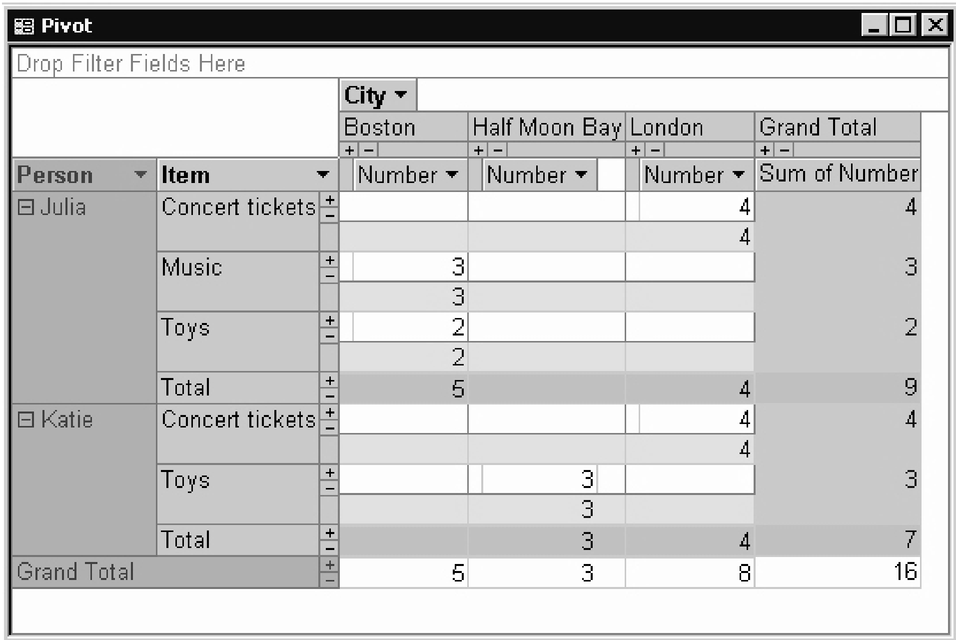
Click on the down arrowhead alongside the `Person` label and you'll see a list of all people. Here you can filter for those persons for whom you wish to see data simply by deselecting or selecting their names. If we wanted to filter on just Katie and Julia's purchases, we'd deselect the other four, like this:

Click OK and the PivotTable will reduce in size dramatically:

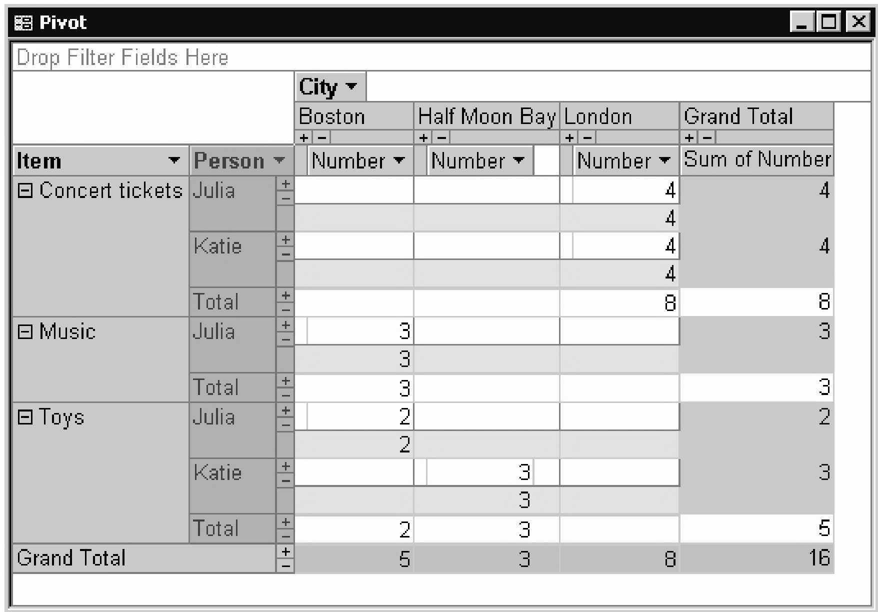


Hovering the cursor over the words (Multiple Items) beneath the `Person` label shows you the names of those whose data you are inspecting.

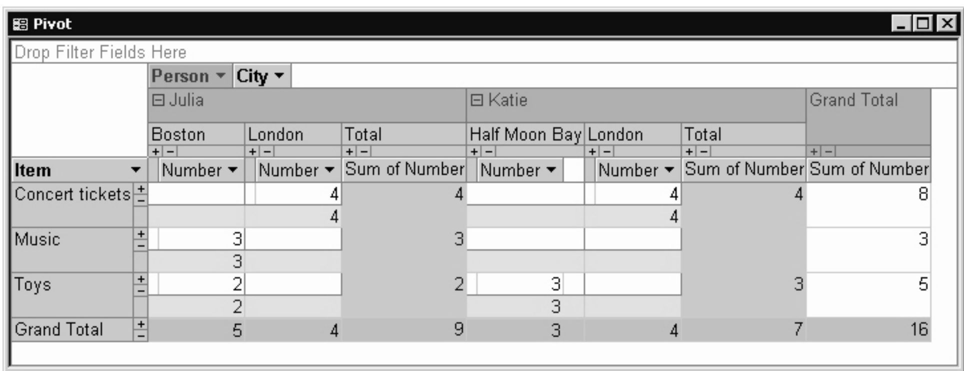
You can also incorporate the `Person` data into the PivotTable as an additional row or column. Click and drag the `Person` label from the top left corner onto the main form, pulling it down to the left of the Item column (a blue bar will show you where it will land). Release the mouse button and the display changes to this:



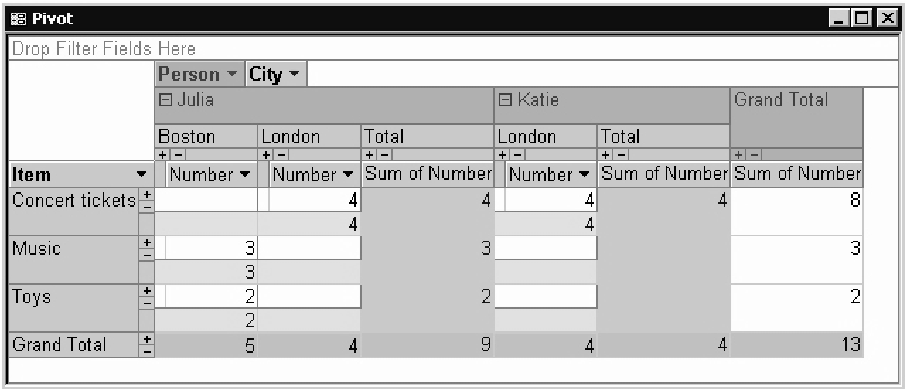
If you don't want to see the data displayed like that, click and drag the `Person` label to the other side of the Item column for a display like this:



Or make `Person` a column rather than a row, like this:



You can also filter on data in columns and rows: click on the down arrowhead next to `City`, for instance, and filter on Boston and London.



The sky's the limit with PivotTables. This one's saved as `Purchase PivotTable`.

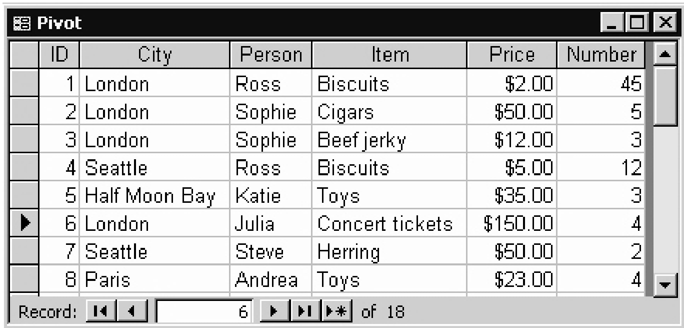
Note that if you make changes to the data in the underlying table, you have to re-open the PivotTable form in order to see those changes. In the database window, the icon for a PivotTable form is no different from that for other types of form: this is a shame as it would be helpful to have these flexible and useful forms differentiated in some way.

❛ *PivotTables are so wonderful that we've gone on rather a lot about them. As we've said, they really come into their own with a multi-table database.* ❜

Views

Towards the start of this PivotTable section we said that Microsoft used the term 'PivotTable view'. Open PurchasePivotTable, if you've closed it, and click on the down arrowhead alongside the View button (the button used to toggle to Design and other views) and select Form view.

Amazingly, your snazzy reactive PivotTable can also look like an ordinary form from which you can move through records one at a time. It's not perfect (the label for the `Number` field is too small) but nothing a little tweak in Design view wouldn't fix. Now choose the Datasheet view:

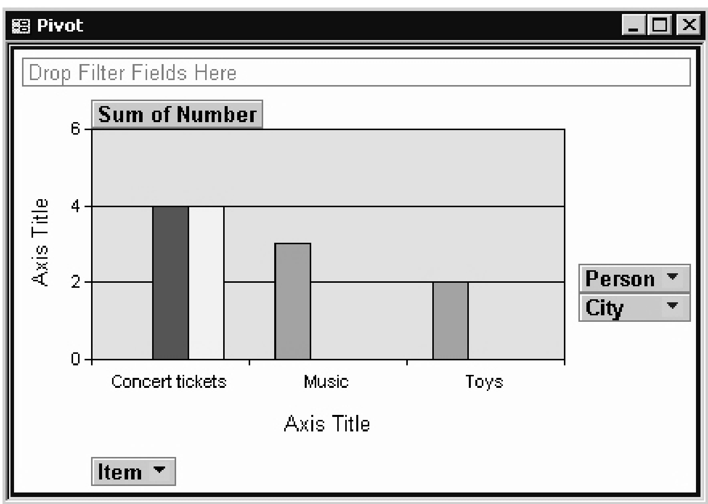


Pivot

ID	City	Person	Item	Price	Number
1	London	Ross	Biscuits	$2.00	45
2	London	Sophie	Cigars	$50.00	5
3	London	Sophie	Beef jerky	$12.00	3
4	Seattle	Ross	Biscuits	$5.00	12
5	Half Moon Bay	Katie	Toys	$35.00	3
6	London	Julia	Concert tickets	$150.00	4
7	Seattle	Steve	Herring	$50.00	2
8	Paris	Andrea	Toys	$23.00	4

Record: 6 of 18

and there's all the data on display. Select the PivotChart view and, lo and behold,



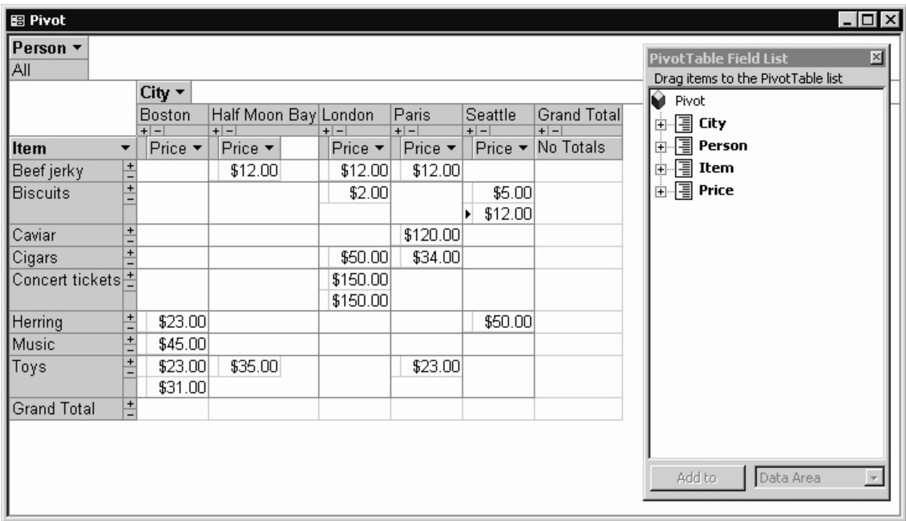
there's a chart representation of the latest PivotTable view.

This is an excellent indication of how Access handles the display of data. The important element is the underlying data: forms, PivotTables and the rest are simply different ways of showing it to you.

The PivotTable wizard

Returning to the Forms tab of the database window, clicking New and selecting PivotTable Wizard give you another route to building the type of form we've just discovered by selecting AutoForm: PivotTable.

Try it using the same table of data (`Pivot`) and you'll see a screenful of explanation and, when you click Next, you can choose the fields for pivoting: this time we'll use `City`, `Person`, `Item` and, for a change, `Price`. Click the Finish button and you see the familiar interface where you drag the fields into positions for rows, columns, data and filter fields, just as before.

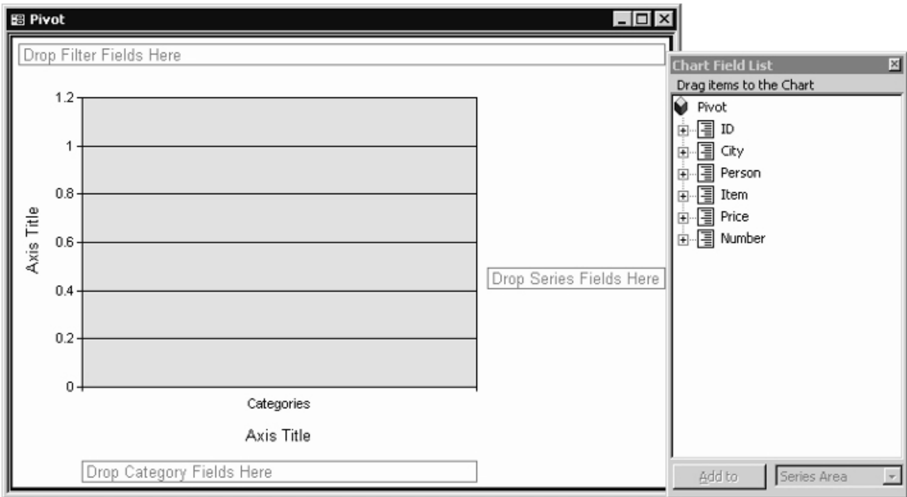


You're now ready to add totals, colors, introduce filters and flip fields into position as described in the AutoForm: PivotTable section above.

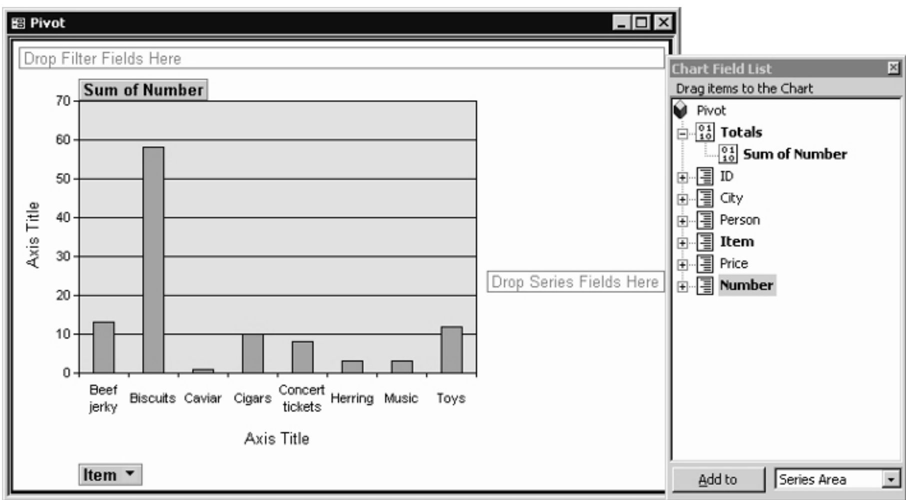
AutoForm: PivotChart

Having been introduced to a PivotTable in all its glory, you'll doubtless have a good idea of what a PivotChart can do, so let's take a look.

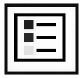
From the Forms tab in the database window, click New, select AutoForm: PivotChart and the table called Pivot. A blank chart outline appears with the now-familiar labels for positioning fields and the Field List itself.



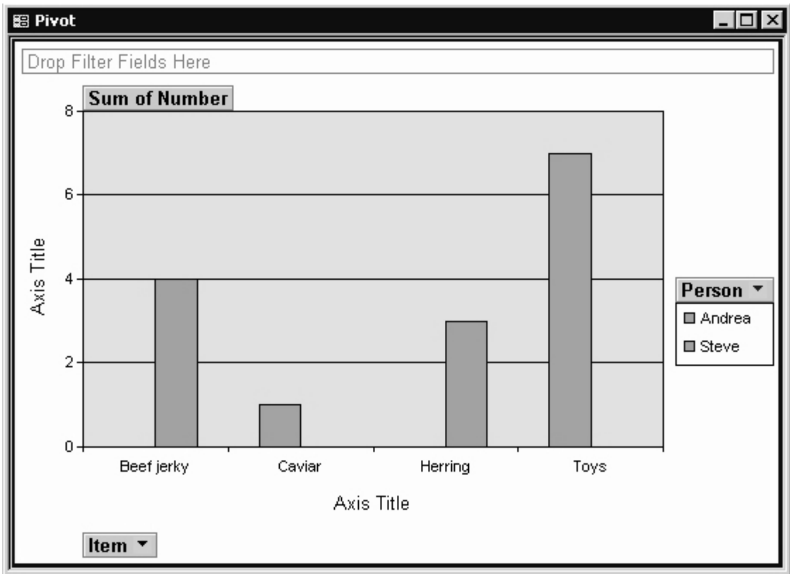
Drag the `Item` field to the bottom ('Drop Category Fields Here'). Now drag Number to the top of the chart ('Drop Data Fields Here'): this automatically creates a Sum of Number calculation and already we have a chart with items along the X axis and totals shown on the Y axis.



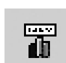
Drag the Person field to the 'Drop Series Fields Here' position and then click the Person label that appears on the chart to filter on Andrea and Steve. Now click the Show Legend button on the button bar:



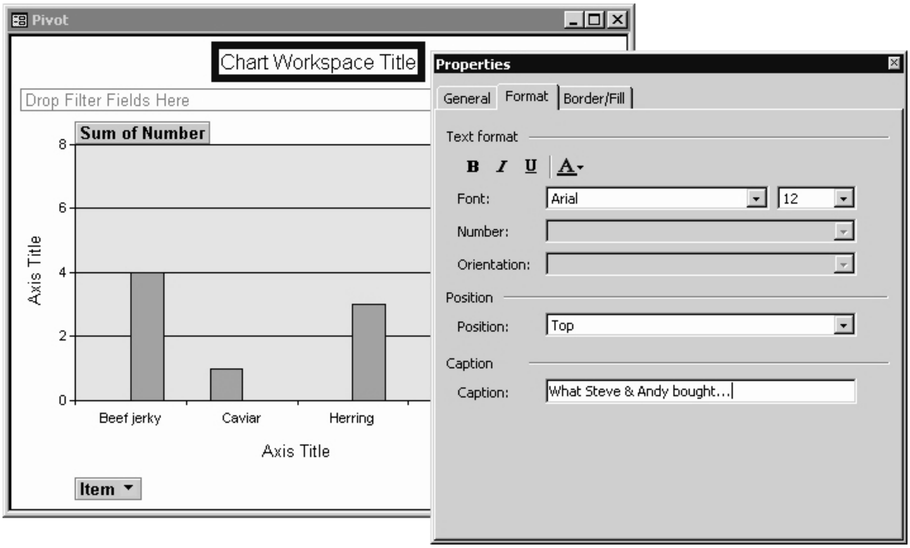
and here's a useful chart showing what Steve and Andrea bought and in what quantities.



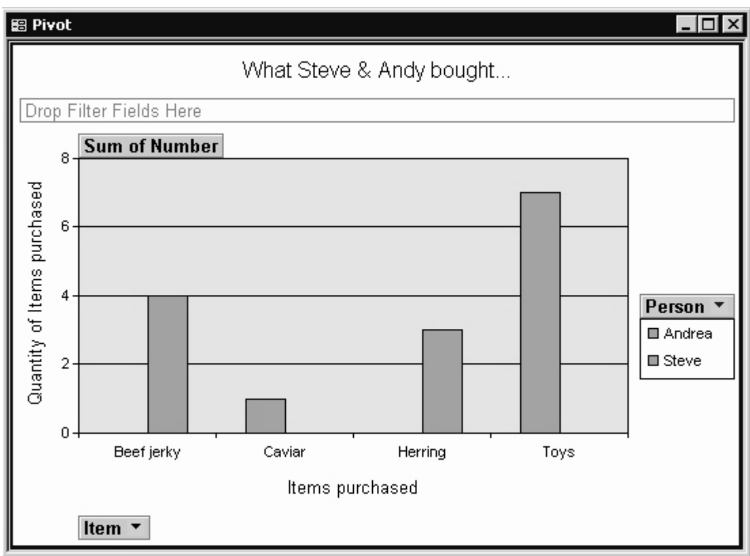
We can add a title and label the axes: for the title, place the cursor anywhere in the white space surrounding the chart (hovering will produce the Chartspace label), right click and choose Properties. On the General tab, click the Add Title icon.



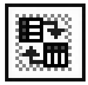
A box saying ‘Chart Workspace Title’ appears on the form: click on it and go to the Format tab in the Properties sheet. Edit the caption to whatever you want.



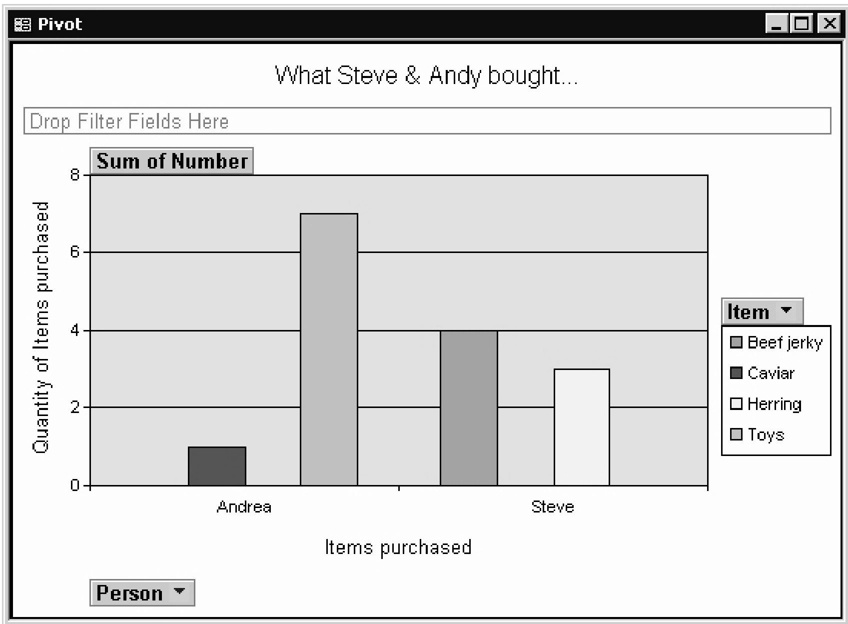
Edit the axis labels in the same way, by clicking on them and editing their captions in the Format tab.



There's a handy button on the button bar looking like this:

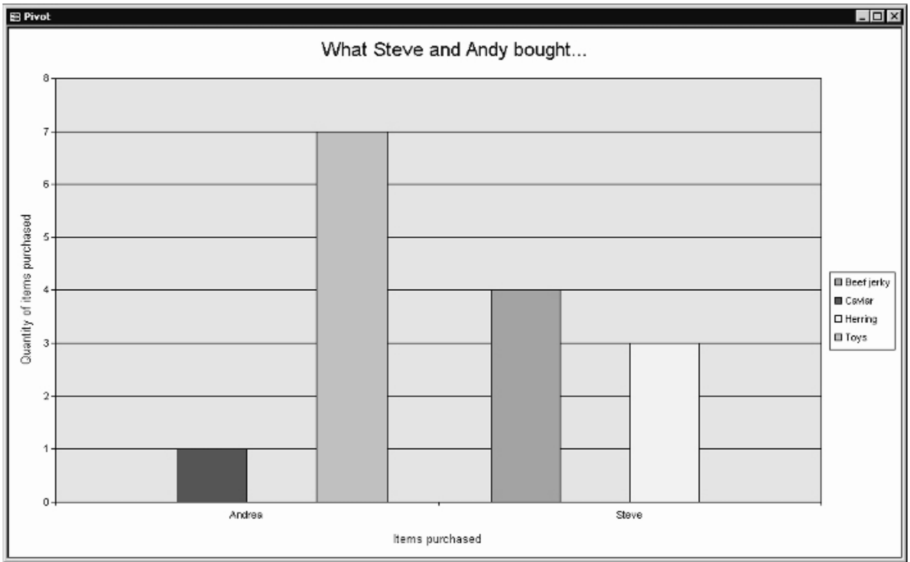


It's labeled By Row/By Column and clicking it swops the rows and columns over so that you see this display:



This is very handy, but it is worth noting that the axis labels don't swop around at the same time. This may, or may not, matter too much. It depends upon how vague your labels are...

You'll have guessed that you can drag another field to the 'Drop Filter Fields Here' position and define filters as you can with PivotTables. However, if you don't want to do this, you can inspect the properties of the Chartspace and in the Show/Hide tab, deselect the Field buttons/drop zones option. Now these will vanish from your PivotChart view, making it look much more professional.



This PivotChart is saved as `PurchasePivotChart`. You can, of course, play with chart types, colors, fonts, backgrounds and many other properties: experimentation is your best approach here.

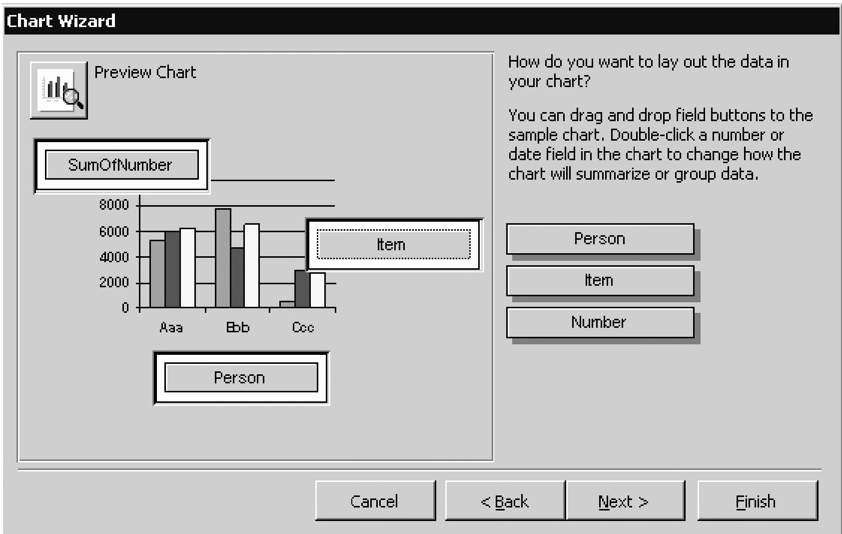
❛ *We experimented with changing the colors for each of the bars in the chart and, whatever we did, we couldn't persuade Access to reflect those new colors in the legend. Perhaps you can in your version....* ❜

The Chart wizard

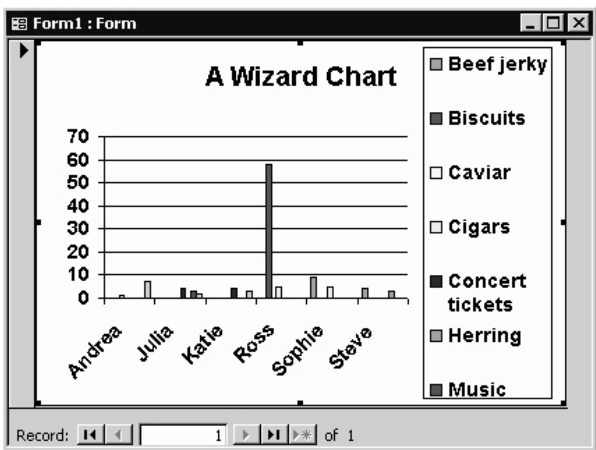
❛ *The Chart wizard will place a Microsoft Graph chart onto a form. To use this wizard, you must have Microsoft Graph installed, which you will do if you performed a standard Microsoft Office installation.* ❜

From the Forms tab in the database window, click New, select Chart Wizard and the table called `Pivot`.

In the first step, select the `Person`, `Item` and `Number` fields and click Next. Then accept the default, a column chart, by clicking Next in the second step. Now the wizard shows you its default choice of what the chart will show: people along the X axis, quantity up the Y axis and with items as the series.

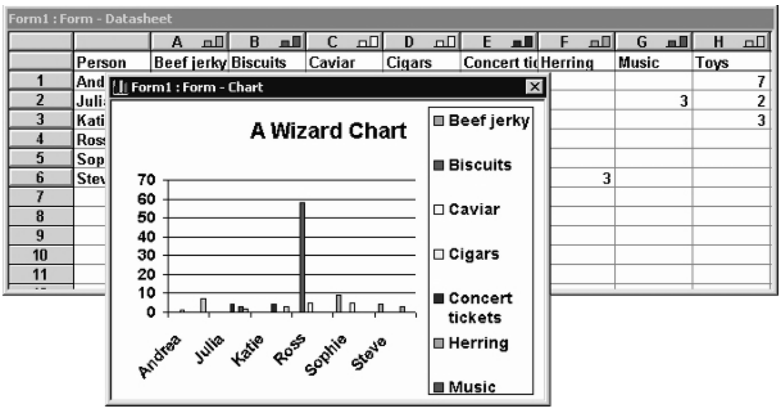


This is fine for our demonstration so click Next, give it a title and click Finish.

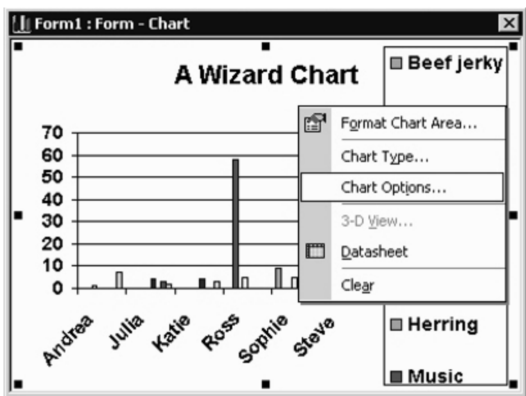


Oh. Compared to the PivotChart, it looks rather boring and rather poorly set out. If, however, you're a seasoned Office user, this chart should look familiar because it is simply a Microsoft Graph chart. The good news is that Access uses this standard Office component, so if you are used to embedding graphs into, say, Word then you should find that from within Access it works in much the same way.

Since this book is about Access, rather than Office, we don't intend to spend much time on a standard Office component but at the risk of boring those who are familiar with Graph, it is worth making just a couple of points. If you right click on the chart you can get to see the properties as usual. However, from the right-click menu you can also select Chart Object, Open.



This will open up Microsoft Graph and if you right click on the chart now, you can select Chart Options



and start to tweak it.

Summary

Changing the appearance of your forms and jazzing them up with colors, fonts and graphics is enormous fun.

It's also good practice for manipulating objects and setting properties, so we really recommend that you spend some time experimenting at this point. But beware: don't go too mad with your works of art. Excessive jazziness often looks untidy and unprofessional, an impression you're unlikely to want to give, especially for forms to be used by others. Restraint is the key.

The same is true for PivotTables and PivotCharts: they're tempting to use because they give such flexibility in the way data is presented. Think about the data and what the user of the form will hope to see in that data: try to use the Pivots only when they will add clarity and value.

The file `chap10end.mdb` contains the forms created in this chapter.

Chapter 11

Forms again – controlling data entry

Data validation

Time devoted to ensuring that only sensible data gets into your database is almost always time well spent. The motivation for collecting data and storing it in a database is that you want to extract it later, to find specific information, to see if any trends develop, to find any unexpected overlaps or omissions. The information you hope to take out can only ever be as accurate as the data that's entered so data validation at the point of entry for new records is crucial.

This topic has already been mentioned in Chapter 8 and various methods of controlling data entry were covered. However, these were all implemented from the Design view of the table destined to contain the data. Further data validation methods are available in Access' armory and can be put onto a form in Design view.

A tiny bit of theory

This book is aimed at getting you up and running with Access as quickly as possible. You may, however, be wondering why Access provides two very different places where data entry can be controlled – the table and the form. Well, flexibility is the trite answer, but it's an unhelpful one unless you know why such flexibility is useful. Think of it this way. You can have many different forms and queries based on a table. If you put a control on how data is entered into a table, then that control will automatically be applied to every form and query that uses that table. No new form or query will be allowed to subvert the rule. However, if you place the control on a form then that control applies only to data entered using that form. In other words, controls placed on tables are more all-encompassing, more powerful. There are times when that power is very useful (when a control needs to be rigorously applied to the data), and times when it is unhelpful (when the control needs to be applied sparingly). The choice is yours, which is where the flexibility comes in.

Form controls introduced

Form controls are objects that sit on forms to display records, perform actions or make it easier for people to use the form. There are different types of control, as discussed below, but they can all help you determine what can and can't go into the database by their actions or by pointing the way. Some controls are passive – labels, for instance, just sit there providing helpful information to the user of the form. Some are active, for example, only letting predetermined entries into a field (as does the Lookup Wizard data type mentioned in Chapter 8).

The best way to see how they work is to build some, so that's what we'll do – build a form that contains all of the elements described in the chapter. Clearly this is going to lead to a cluttered, complex form – exactly the sort that we would normally recommend you try to avoid creating. However, we hope that you will forgive the excesses and appreciate that this is just an example of what you **can** do, not of what you **should** do.

Bound, unbound and calculated controls

Controls come in three flavors, bound, unbound and calculated. A bound control is tied (or bound, hence the name) to a field in an underlying table or query and this underlying field is the data source for the control. A bound control is used to display existing data from a field in the underlying table for inspection, editing and for entering new data.

An unbound control doesn't have a data source. Unbound controls are used to display messages, lines, rectangles and pictures that help users navigate and use the form.

A calculated control has an expression as its source of data. The expression can manipulate data from a field or fields in the underlying table or from another control on the form. Calculated controls are useful for showing information that's helpful for users of the form but not sensible to store in the table because it can be derived easily.

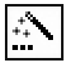
❛ *As we did when discussing queries, we are keen to convince you that storing derivable data in a table is usually a bad idea. Just as queries can be used to calculate derivable data when you need it, so can forms.* ❜

Overview of controlling form controls

Adding a form control

To place a control onto a form, you must be in Design view with the Toolbox open.

When you're starting to work with controls, it's helpful to activate the Control wizards by clicking the button at the top of the Toolbox. This will activate a wizard for some of the more complex controls when you place them on the form.



Select the control from the Toolbox by clicking on it. Move the cursor over to the form. If you just click on the form a control of default size will appear. Or you can click and drag to outline the shape and size of the control you want; as this can be altered later, pinpoint accuracy isn't needed at this stage. On releasing the mouse button, the control appears in place on the form, or a wizard runs to help you to build it. Once it's complete, flip to Form view to see the result.

Deleting a form control

In Design view, click on a control so that its handles appear and press the Delete key. Elements of some controls can be deleted separately: the label alongside an option button or check box can be removed, leaving the button itself, by clicking on the label and pressing Delete.

Moving a form control

Click anywhere on a control so that its handles appear. Aim the cursor at one edge until it shows as an open hand then click and drag to move it. Elements of controls can be moved independently by aiming the cursor at the top left corner of the element to be moved. When the cursor looks like a pointing hand, click and drag the element to its new position.

Sizing a form control

To change the size of a control, select it by clicking and place the cursor on one of its sides. When the cursor shows a double headed arrow, drag to enlarge or reduce the control's size. Placing the cursor on a corner so it shows a slanting double headed arrow lets you drag to change the width and height simultaneously.

Formatting controls

Most controls have formatting properties; these are listed on the Format tab of the Property sheet. You can change the Back Color of an option group, give an option button a sunken Special Effect and so on by clicking to select the object in question and editing its properties in the Property sheet.

Selecting multiple controls for editing/formatting

There are two ways to select multiple controls for batch editing or formatting.

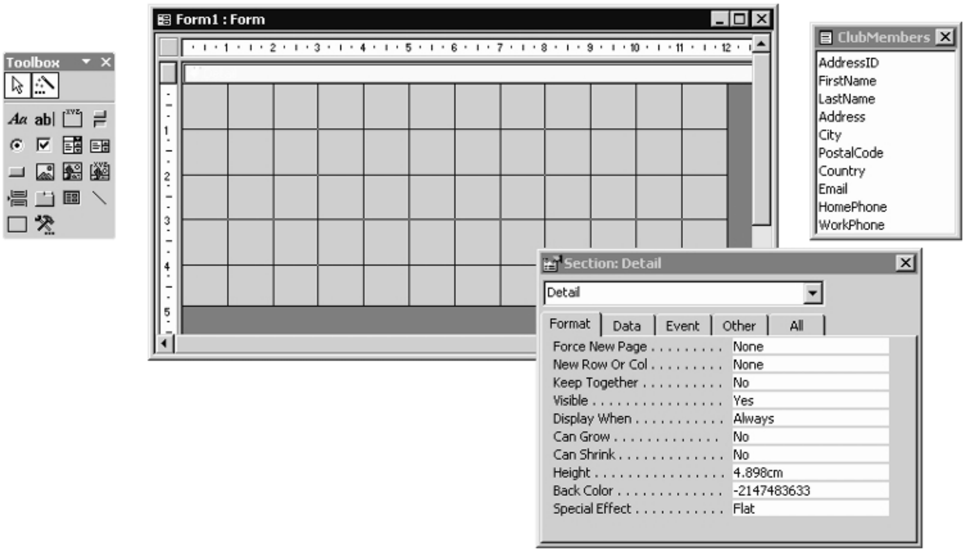
Click on one object then, with the Shift key pressed, click on the other objects you wish to select. When they all have handles, proceed with the changes.

Alternatively you can start from anywhere on the Detail section background and click and drag to pull out a rectangle to encompass (or at least pass through) any object you wish to select. When they all have handles, changes can be implemented.

Controls in use

OK, that was the overview and now we're going to start with a blank form and add a number of controls, but bear in mind that when you use these controls for real, there is absolutely nothing to stop you adding them to a form which has been generated with a wizard. Open up the `chap11start.mdb` file, select the Forms tab and click on the New button. In the dialog that appears, click on Design View, select the `ClubMembers` table and click OK.

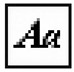
A new form appears, a blank canvas upon which you can work your magic. Make sure that the toolbox, Property sheet and field list are all open. Click on the Format tab of the Property sheet.



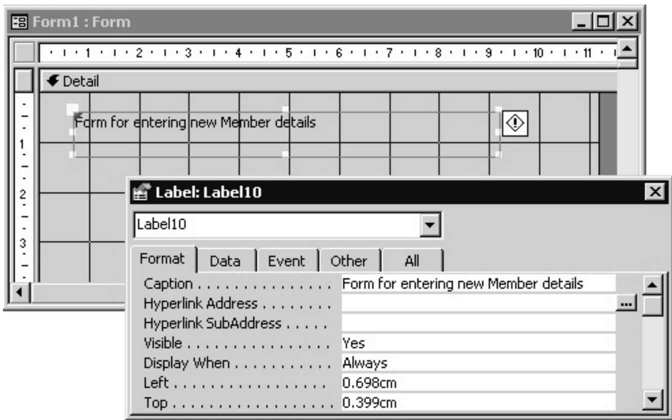
Access can perform automatic error checking while you're building a form if you wish. This will be easier to demonstrate once we have a control on a form, so we'll revisit this topic in a moment.

Types of form control

Label



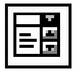
Put a label on the top of the blank form, type in some text and press the Enter key.



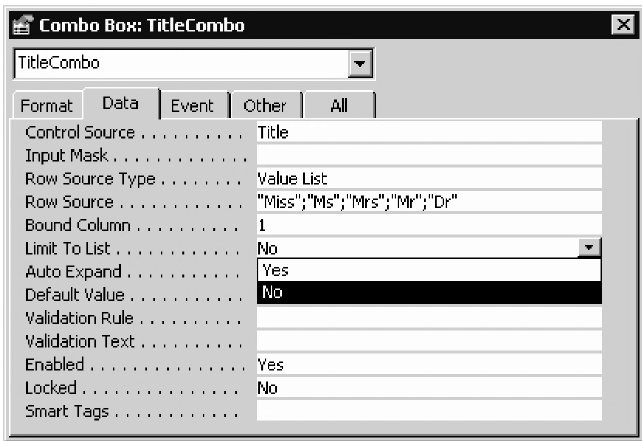
The Caption property of the Label shows as the text you have just typed in. We aren't going to keep on telling you to look at the properties of the controls you create because that will get boring, but we do recommend that you keep referring to them throughout this exercise because it will give you a feel for the parameters you can set for each control. As an example, have a look at the property called 'Display When' for the Label. Its possible states are Always, Print Only and Screen Only. These are ideal for messages to users that you don't want to appear on printed output, or vice versa. You can also use the Property sheet to set the font size, color etc, and/or you can do this using the tools in the formatting toolbar at the top of the screen. (If you can't see this toolbar, right click on the menu bar and select it from the list).

Labels can say anything you want them to. So, for example, you might find that users were continually trying to enter dates in DD/MM/YYYY format, when your database was expecting MM/DD/YYYY. You could add a label next to the date text box saying: 'Please enter dates with the month first, then the day and finally all four digits of the year – for example, 05/23/2004.'

Combo Box

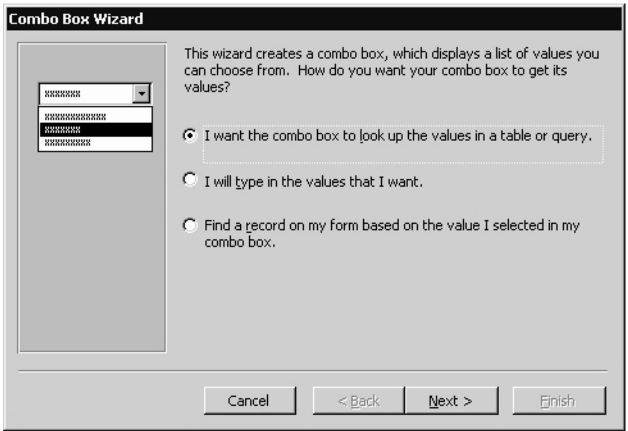


Combo boxes are great for entering data into fields where only a limited range of values is likely. For example, entries in the `Title` column of the `ClubMembers` table are likely be mainly Ms, Miss, Mrs and Mr entries with a scattering of Dr, Prof and Rev entries and maybe some in different languages, like Mme or Herr. Users of your form can be presented with a list of the commonest titles for ease of selection and still have the option of typing in rarer ones. Or alternatively, you can force the user to use only the options that appear in the combo box. It's up to you, and once the combo box is complete, you can swap it between these two behaviors by changing the 'Limit to List' property.

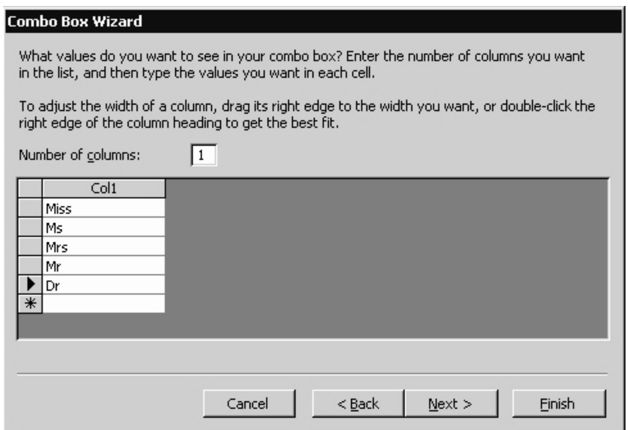


❛ *During the course of this chapter, you'll notice that fields appear in the ClubMembers table without so much as a by-your-leave, like the Title field referred to above. Don't worry about this, it's simply so that we have data to hand for illustrating various types of control.* ❜

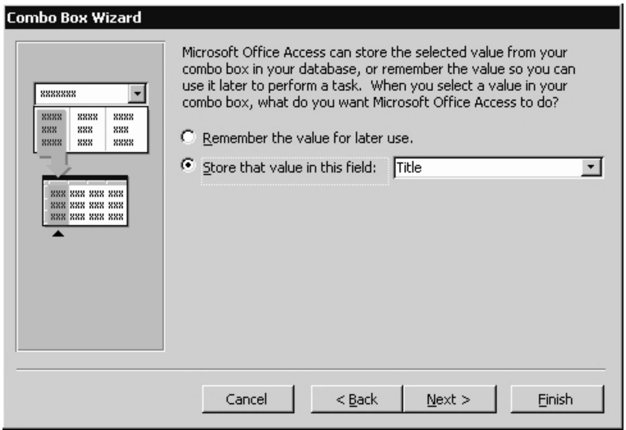
To create a `Title` combo box, place a control on the form and the Combo Box wizard opens.



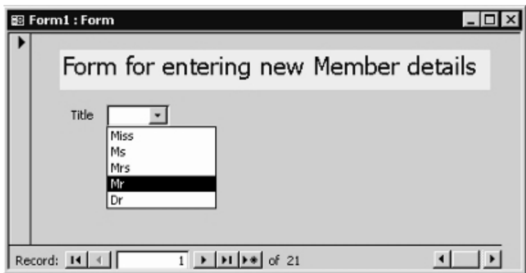
Click the middle button to type your own values and in the next step, leave the number of columns as one and start entering a title into the first cell. Fill in the entries you want (Access posts the last one even if you don't click in the gray cell to remove the editing pencil)



and click Next. Now click the 'Store that value...' option and select the Title field.



Finally, label the combo box and the process is complete. This is how the control will appear to users: a click on the arrowhead displays the list ready for a selection to be made.

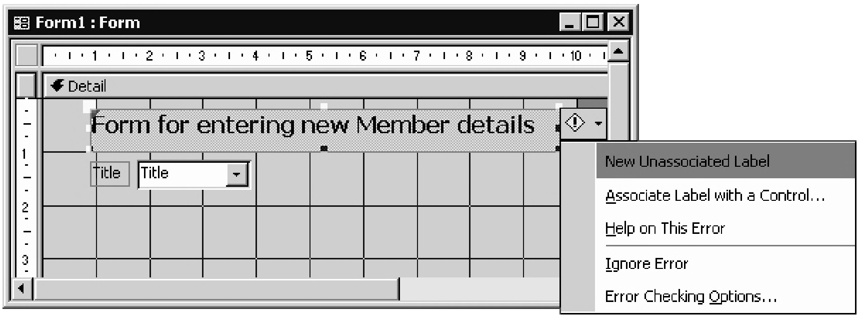


Although highly useful in this instance, combo boxes really come into their own when used in a database with more than one table so we'll revisit this useful control in a later chapter (Chapter 18).

Automatic error checking

If this checking is turned on (which is the default) you'll notice, once you've put a combo box or other control on your form, that the very top left corner of the label has turned green. Make a single click on the label and the tip of the green corner turns pink and a warning button appears alongside it: this is the Error

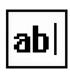
Checking Options button. Move the cursor over the button and pop down its list:



It's telling you that your label is not associated with a control on your form. This is perfectly true but also perfectly reasonable in this case, where the label is simply announcing the purpose of the whole form. Selecting 'Help on This Error' tells you more and selecting 'Ignore this Error' means that Access will no longer flag this option as harboring a possible error, turning off the green marker and the button. Having to choose this option is mildly irritating because no error has been made: we know exactly what we're doing.... In this case. However, there may be times when the Error Checking Options button tells you something you didn't know. When you're developing forms it's quite possible to lose track of what you're doing (the phone rings, the dog barks, someone shouts "Coffee?") Then you may find it useful for Access to report an error like 'This control has an invalid control source' and to tell you it's because there is no such field in the field list.

You can, however, turn error checking off completely from the Tools menu. Click Options... and the Error Checking tab, deselecting the Enable error checking box.

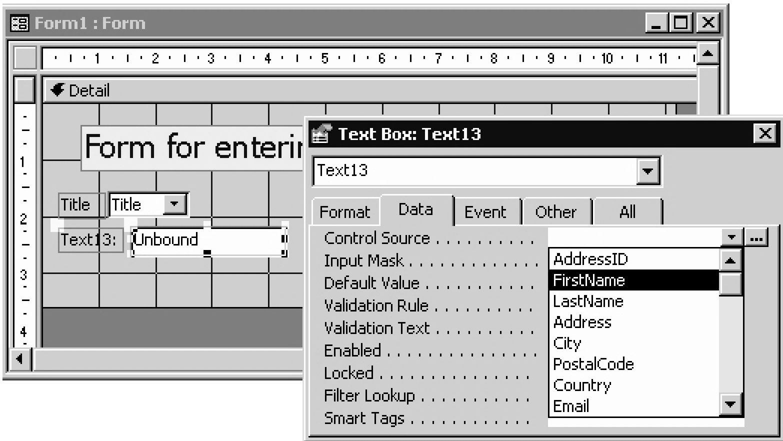
Text Box



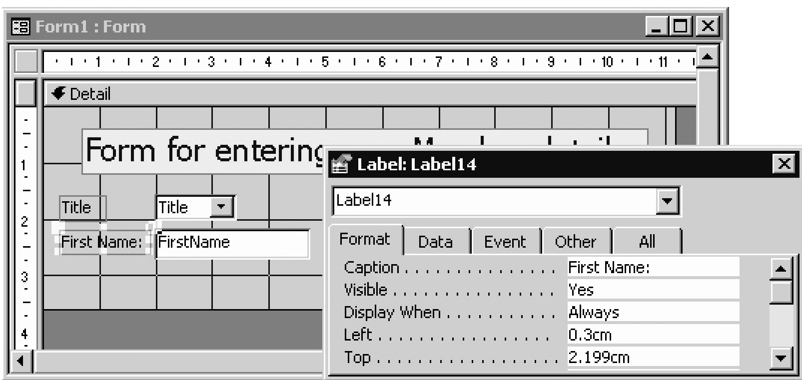
Text boxes are most frequently used to show the contents of a field in the underlying table. Put a text box onto the form, making sure that you position it over to the right to accommodate the label to the left.

A newly-created text box is unbound; the Control Source property (under the Data tab) is blank and the field itself reads 'Unbound'. Click to pop down the

Control Source list and pick a field to associate with the text box: we're using `FirstName`.



You now have a bound text box. You can also alter the text of the label to something more helpful.



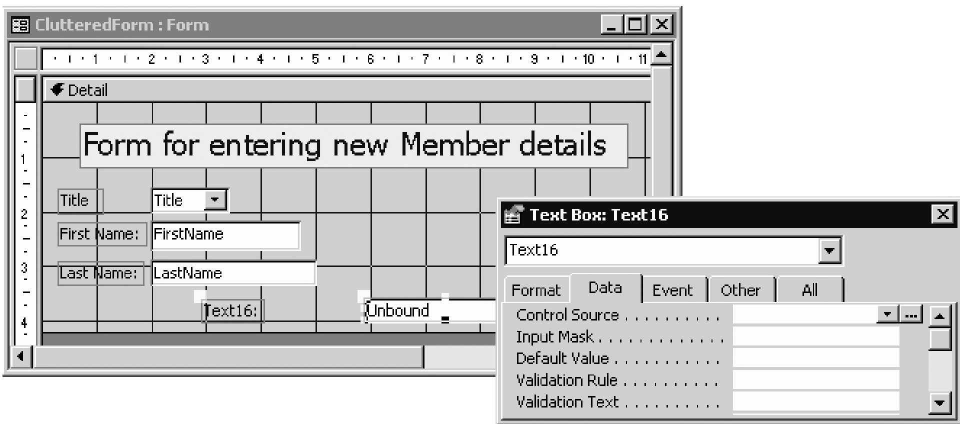
Take a look at the field list.

This offers a quick way of adding text boxes to a form. Click and drag a field from this list to place it and its label on the form. Text boxes adding in this way are automatically bound to the field in the underlying table. They also automatically gain a caption: if you entered one in the Caption property when you designed the table, it will be used. If you didn't the field name will be used instead. Add a text box for data from the LastName field using this method.

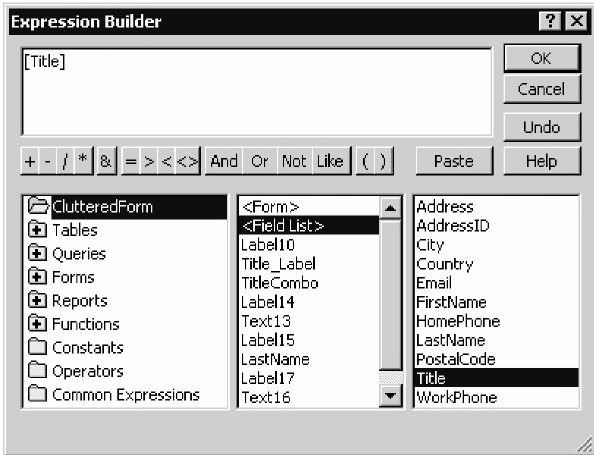
'Text box' is a slightly misleading term since it implies that only text can be displayed; in fact, text boxes can display numerical information and can also be used to perform calculations. Just to show how it is done, we'll create a text box that performs a 'calculation' on some text.

Now might be a good time to save your new form. Thus far, Access has referred to it by the default name of Form1 so click the Save button and type a name when prompted. Our example is called ClutteredForm because by the end of the chapter that's how it will look.

Then add another text box and instead of binding it directly to a field, click on the ellipse button which appears at the end of the Control Source property.



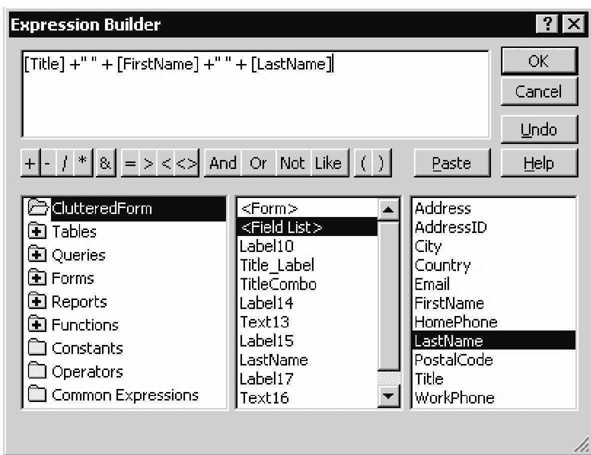
This opens the Expression builder. In the left pane select ClutteredForm, in the middle pane choose Field List and double click on Title in the right hand pane.



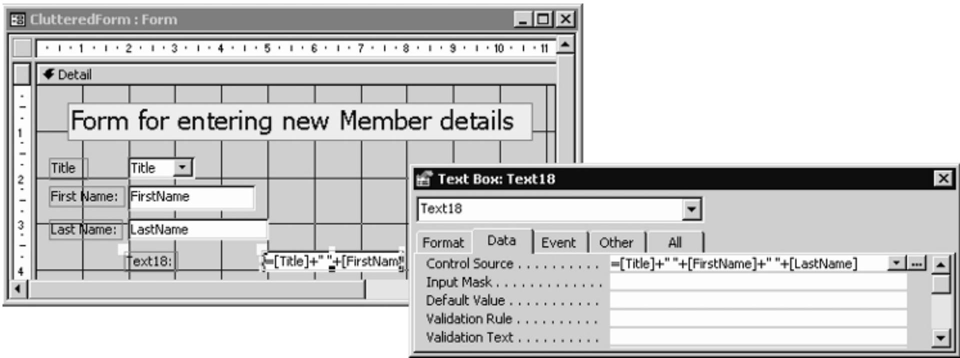
The formula we are going to build is:

```
[Title]+" "+[FirstName]+" "+[LastName]
```

which is easiest to build using a mixture of the keyboard and options selected from the expression builder.



When it's complete, click on the OK button and this formula appears as the control source (plus a leading equals sign that Access has added).



Change the label for the text box to something like Full Name and then inspect it from Form view. It should simply add (or concatenate) the three text fields into one.

Toggle Button, Option Button and Check Box

These three work in much the same way: the main difference between them is their appearance on the form so we'll describe how to create and use a Check box and leave you to experiment with the others.

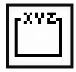
A check box button can be bound to a Yes/No field. We're about to bind a check box to a Yes/No field called `DrivingLicence`. Once it is in place on the form, clicking on the check box (or on its label) toggles it between two states – checked and unchecked. A check mark indicates Yes and unchecked No. When existing records are inspected, the toggle button reflects the entry in the field, appearing to have been selected if a license is held and vice versa.

So, put a check box control on the form, set the Control source to be the field DrivingLicence and amend the label accordingly.

Just for fun, we've added a toggle button and an option button and bound all three to the same `DrivingLicence` field. An option button doesn't automatically come with a label so you can choose whether to add one or to enlarge the button sufficiently to take a suitable caption as we've done here.

We would never suggest, even for a moment, that binding more than one of these controls to the same field was sensible for a real form, but it does allow you to play with all three.

Option Group



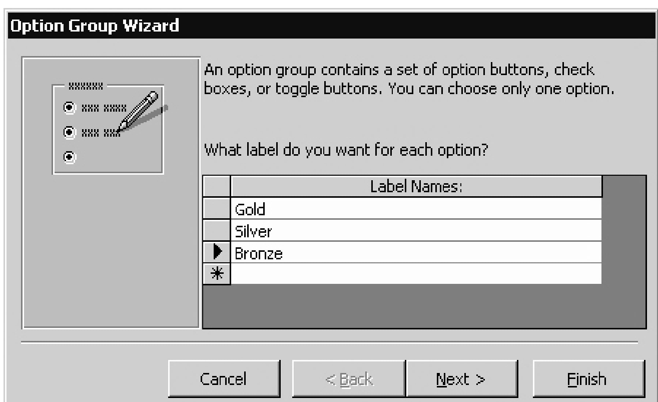
OK, this is where we start to work with the more complex controls that let you create really powerful forms. Suppose you want to collect information which is more complex than Yes/No – perhaps you offer different types of club membership – Gold, Silver and Bronze. You could simply provide a text box on the form but this solution gives people entering the data little information about the available options. It is much better to provide a control to guide them and which, at the same time, only allows them to select a viable option.

An option group is a control that contains other controls of the toggle button, option button or check box type. Its purpose is to allow users to make a single selection from a group of two or more items with each item labeled.

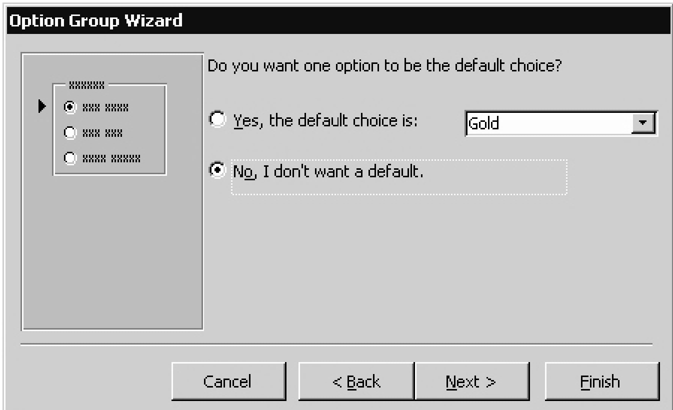
Each option in the group is given by default an arbitrary value (though you can change these) and when an option is selected by the user of the form, the option's value is stored in a field in the underlying table.

In fact, the value doesn't have to be stored in the table, it can be stored by Access for later use. However, this 'later use' bit is only likely to be useful when you're using Access' built-in programming language so it can safely be ignored for now.

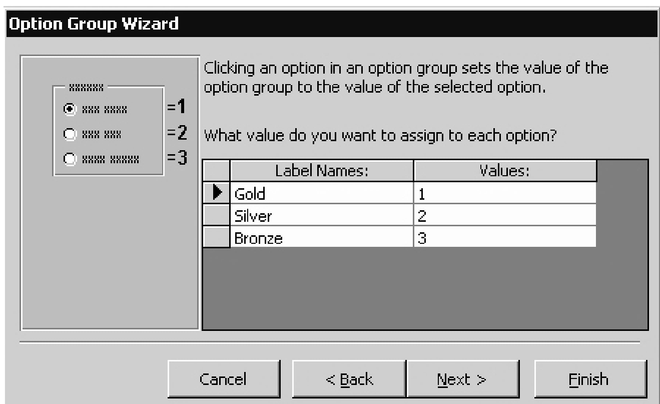
I've added a field to the `ClubMembers` table to contain the type of membership. An option group to select the membership type can be placed on any form based on that table. Open `ClutteredForm` in Design mode, click the Option Group button and drag an outline onto the form. This runs the Option Group Wizard. In the first step you label the options.



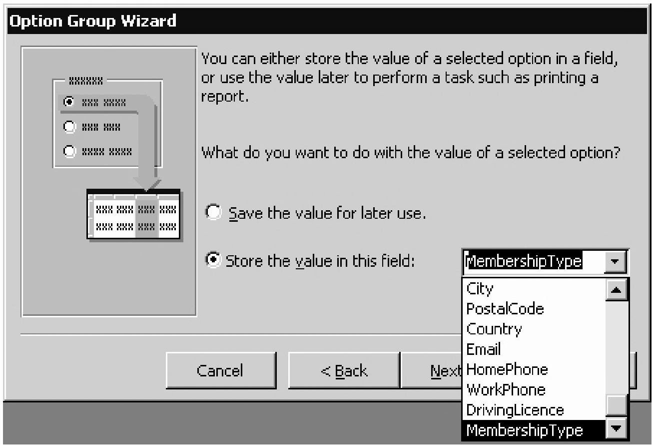
Click Next and in the second step you decide whether to set one of them as the default; this is usually the option that's chosen most frequently.



The next step shows the values that are assigned to each option: alter them if you wish but in this case, the values look entirely reasonable – 1 will represent Gold, 2 Silver and 3 Bronze.



Next you determine what happens to the choice made by the user. As discussed above, the value is normally stored in a field which can be chosen from a pop down list. Here I've selected the `MembershipType` field.

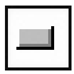


Choose the type of control in the next step and the style of display

and in the final step, give the option group a caption before clicking Finish.

The completed option group looks like this in Form view:

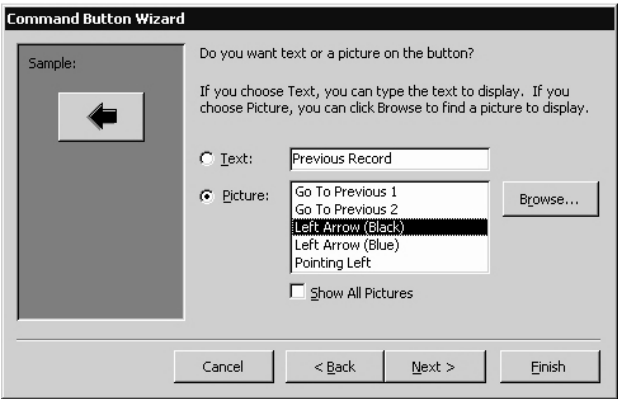
Command Button



A command button lets you give users the option of issuing a command to Access. Actions such as saving a record, printing a form or moving to the previous record can be performed by clicking a command button. Placing buttons for common tasks on your forms can make those forms much easier to use, so let's experiment.

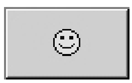
Place a command button onto `ClutteredForm`: this activates the Command Button wizard. In its first step you determine what the button will do. There are six categories of action, each with between four and eight actions. Here I've selected the Goto Previous Record from the Record Navigation category.

In the second step you can decide whether to display text or an icon on the button.



‘ *Checking Show All Pictures gives a much larger range of icons, including:*

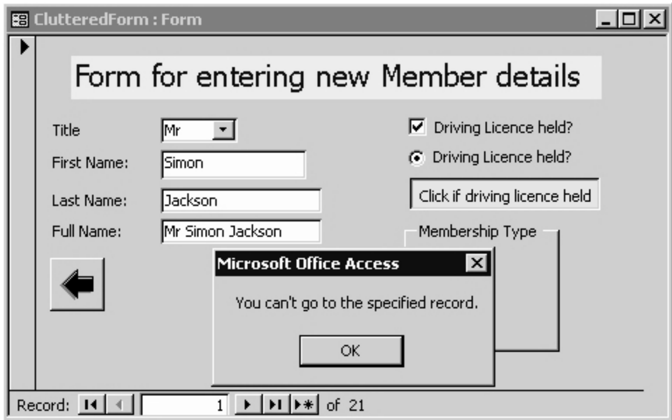
and



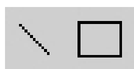
’

Finally, give a name to the command button like `GoBackOneRecord`. This name isn't shown on the form but is shown under the Other tab in the Property sheet.

Try out the button in Form view: it works just as you'd expect, even coming up with an error message 'You can't go to the specified record' if you click it when inspecting the first record.

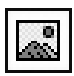


Line and Rectangle



These controls let you place lines and rectangles on your forms. Though simple, these can be used to group fields and controls and generally lead the eye of the user. Try changing a line's Border Style, Color and Width properties to add emphasis.

Image



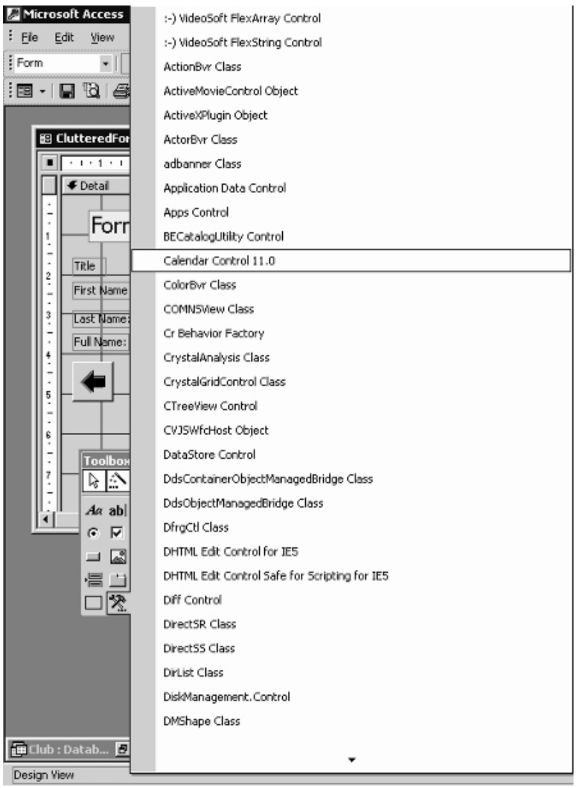
With this sort of control, images can be put onto forms. Images can be anything from output from a painting package to off-the-shelf clip art. Placing an image control onto a form was covered in Chapter 10.

More Controls

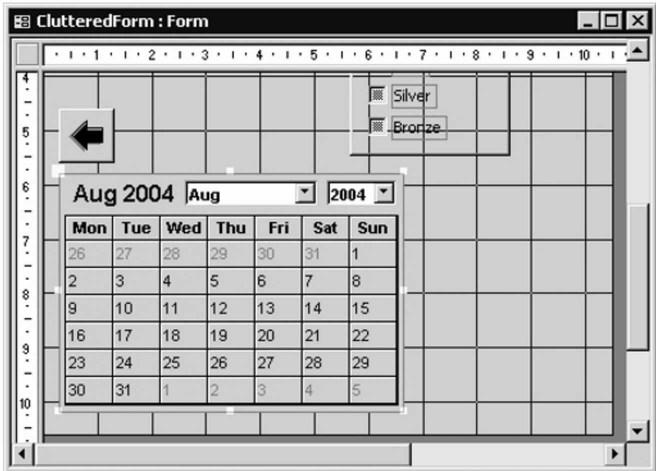
Wow! Clicking this icon produces a vast list of weird and wonderful controls, some available and some not. The extent of this list is an indication of how important Access controls have become since the product first appeared. While some of these extras come from Microsoft itself, many more come from third party suppliers, all of whom think it worthwhile to create specialist controls for Access users. Furthermore, this list is far from exhaustive: even more controls can be bought and/or downloaded from the internet.

We can't possibly cover all these controls here so we'll select one to look at in some detail and leave further investigation to you. We've chosen Calendar Control 11.0 because the handling of dates can be a pain in the neck and this control does a great job of keep things in order.

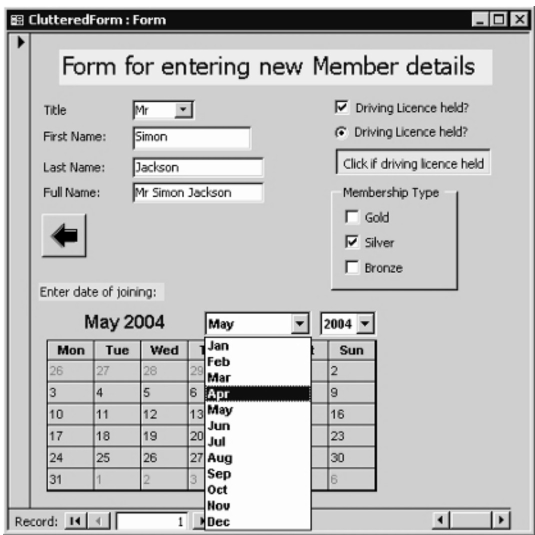
Click the More Controls icon and select Calendar Control.



Drag to outline a large area on the form: about 5 × 7 cm (2 × 3 inches) is not unreasonable. When you release the mouse, a calendar appears, looking like this:



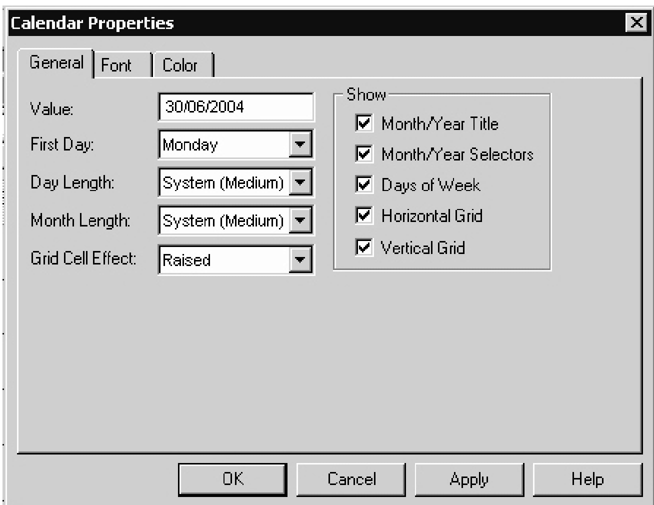
This gives users a familiar way in which to enter dates: the month and year can be selected from lists if the date isn't in the current month and then the day selected by clicking on the appropriate cell in the calendar. Here it is in use with a label added to the form so users can enter a member's joining date.



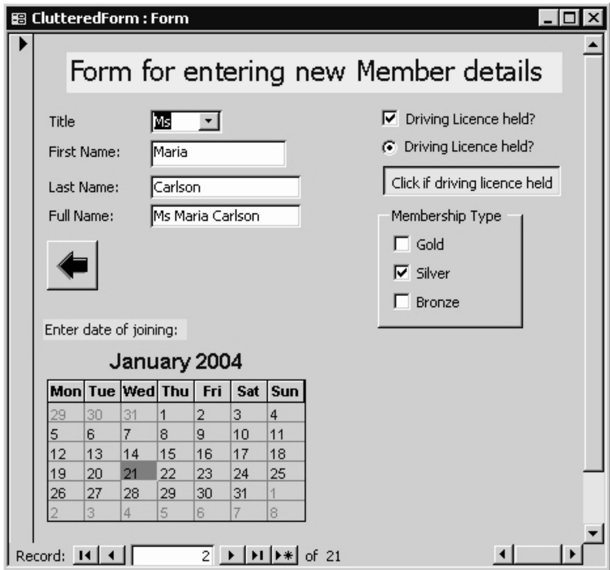
The control source for the calendar control has been set to a field in the `ClubMembers` table called `JoinDate` and this is where dates entered by users will be stored. If you set the Default Value for this field to be Date() – go to the Design view of the table to do this – the calendar control will default to the current date. Close the form and reopen it to see this in action.

As you can see, with its default settings the calendar control takes up a large area of 'form real estate'. This can be reduced considerably by tweaking its properties without reducing its ease of use.

This control has two sets of properties. It has the usual tabbed property sheet but it also, if you double click on it (or try Edit, Calendar Object, Properties from the main menu), has a different set of properties, looking like this:



By customizing what the calendar shows (unchecking the Month/Year selectors, choosing the English (Medium) Day Length display format, a flat Grid Cell Effect and so on) you can reduce the space required.

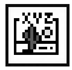


The choices you make depend on how your database is used. For instance, if new member records are added to the database shortly after their joining date, month and year selectors are largely unnecessary but if new records are only added every quarter, then a pop down list for moving between months becomes desirable. If you had a book database and were entering the publishing dates of tomes from Caxton onwards, then a pop down year selector would be vital too.

Further controls

The controls covered above should give you a reasonable collection for experimentation and you may find you never need anything further in the control line. You may, however, wish to skim through the rest of this chapter so you have an overview of what else is possible with Access controls but leaping to the next chapter is perfectly OK too.

Bound Object Frame



A bound object frame control displays a picture, a chart, a document or any object that can be stored in an OLE Object field. This control is bound to a field in an underlying table and that field must be of the OLE Object type. So, for example, you might use an OLE Object type in a contacts table to hold a picture of the person concerned. You could use a bound object frame control on a form to view the picture.

On the other hand, if the OLE object was an Excel worksheet, for instance, you could double click the control to open up Excel so the worksheet can be inspected. In other words, this control type permits the object to be edited (or even created) from within the form. This isn't always sensible but you can choose whether to link allowing edits or not when you enter records into the OLE Object field.

Open the `ClubMembers` table and you'll find a field called Photo of the type OLE Object. We provide four sample image files in the `AccSamp` folder which were culled from Microsoft Office's store of clip art (`simon.bmp`, `maria.bmp`, `paula.bmp` and `david.bmp`). These should have been moved to your hard disk along with the sample Access files. The images can be used as portraits of the first four members in the table. To enter an object into the field, find the record relating to Simon Jackson, right mouse click on the OLE Object field and select Insert Object. Select the Create from File option and browse to the `simon.bmp` file, click the Link check box but not the Display as Icon check box.

Add the other three mug shots in the same way.

OK, so Simon's image is now in the table and we want to see it in the form. You can achieve this automatically simply by getting Access to auto-generate a new form (try it to see) but we also want to show you how to do it manually. So, create in Design view a new form based on the `ClubMembers` table, drag a bound object frame control into place, delete the label (users are unlikely to need to be told that they're seeing members photos) and specify the control source of the frame itself as the OLE Object field called `Photo`. Save the form as `FurtherControls`.

If you also set the Size Mode (on the Format tab) to Stretch, each photo neatly fills the available space; although there may be some distortion if you have made the dimensions of the control very different from those of the original image. Check it out in Form view. If you double click on the image, you will find that you can give Paula a false moustache and/or red nose. If you feel that such power might be 'abused' by users of a real form that uses real photos (you know your users better than we do) you can disable editing with the Enabled setting on the Data tab: set it to No.

❛ *David Hassall appears to be something of a joker anyway, or perhaps he's a New Zealander.* ❜

Finally, I've copied the concatenated full name field from `ClutteredForm`, pasted it in under the bound frame and this is the result.

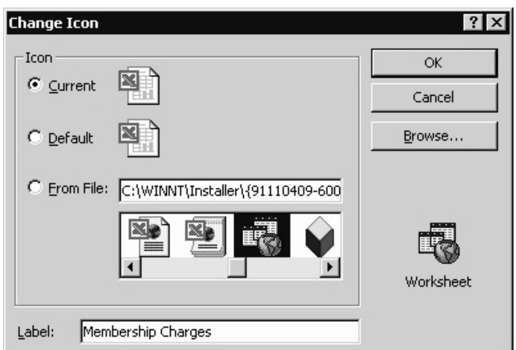
Unbound Object Frame

As described above, a bound object frame points to an object that is stored in the table so Paula's picture appears on the form only when you are looking at her record. What if you want the same object (say a chart from an Excel worksheet) to appear on the form irrespective of which record is being displayed? OK, given the heading of this section, there are no prizes for guessing: you use an unbound object frame control. An unbound object frame control displays a picture or a chart that is not stored in the underlying table and hence is not associated with any particular record. As with a bound object, it's possible to edit the file displayed with this type of control; if it's displaying an `.XLS` file created with Excel, double clicking upon the image opens up Excel.

With this type of control, users could, for example, have access to a worksheet showing the current membership costs by double clicking an Excel icon on a form. As with the images, the values in this worksheet do not have to be available for editing. Here we'll illustrate placing such a control on a form to give read-only access to membership rates.

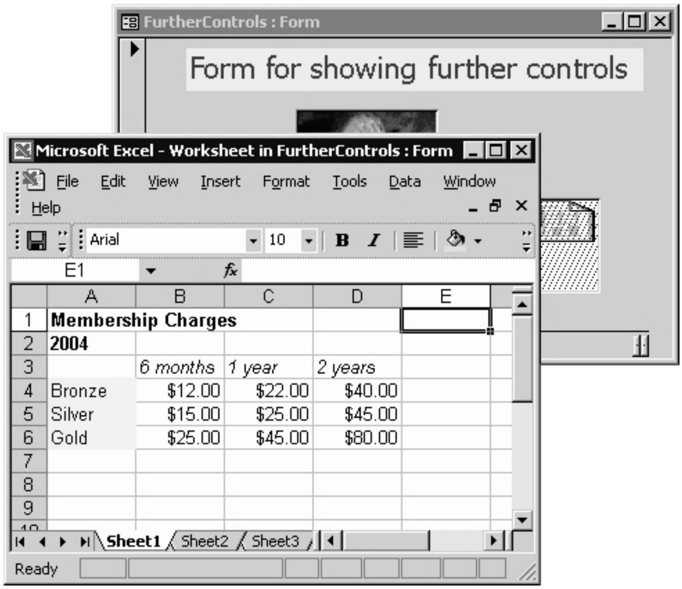
Drag an unbound object control into place, select Create from File, browse to the file (`charges.xls` is in the AccSamp folder) and select the Display as Icon option but not the Link option.

To change the icon or the label beneath, click the Change Icon button.



In the Properties sheet, set Enabled on the Data tab to Yes. This makes the control active in form view so that a double click on the icon launches Excel. The Locked property should be left set to Yes so that users can now inspect the worksheet by double clicking the icon on the form but will not be able to alter the data on the sheet.

Double clicking the worksheet icon opens Excel and displays the membership charges worksheet. (When Excel is open, the control is greyed out on the form).



You'll find that you can, in fact, make changes to the worksheet but when you close it, Access presents a message saying that changes won't be saved when the form is closed. However, the change persists when you open the worksheet from another record but, when you close the form and re-open it, the change will indeed not have been saved.

When I follow these steps to the point where I've launched Excel for the first time and the worksheet is on screen, a 'software anomaly' occurs when I close it. Excel remains visible and the title bar for Access and for the FurtherControls form start flashing. Clicking anywhere within Access closes Excel with a message telling you that any changes will not be saved, even if you haven't altered the worksheet in any way.

This seems only to occur the first time the unbound control is used: thereafter Excel can be closed to return smoothly to Access. No harm is done but it's a little messy. I suspect something isn't quite right here: maybe a point release or patch will clear up the *confusion so you may not even see this effect. I only mention it in case it confuses you, as it did me on first sight.*

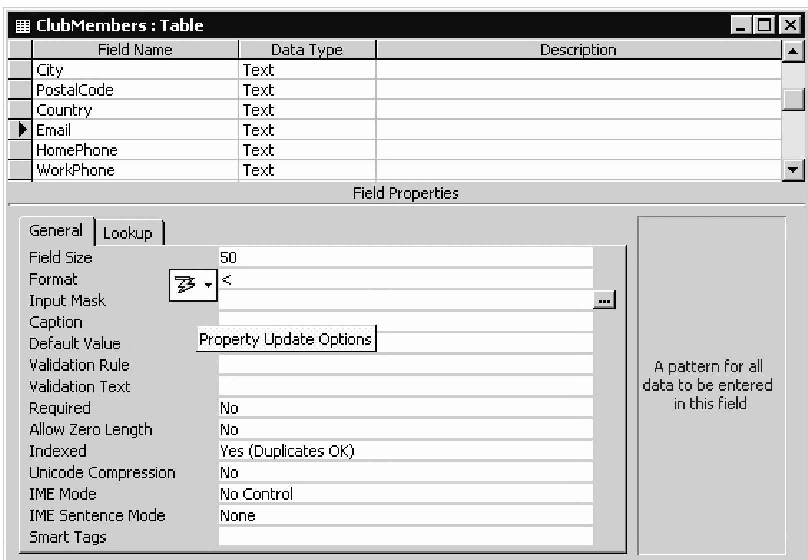
The work completed thus far in this chapter is in `chap11controls.mdb`.

Updating properties

Here we'll look again at the Property Update Options buttons mentioned in Chapter 8 and show how useful they can be. Add a simple text field to the `FurtherControls` form to show a member's email address.

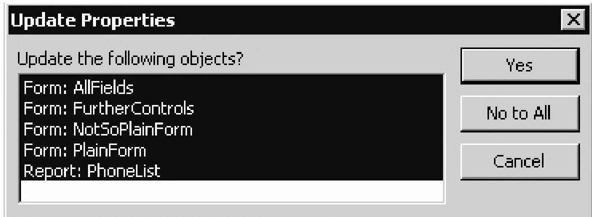
Moving through the records, you notice that some email addresses contain upper case letters. (Have a look at a Paula's). Save the form and go to the `ClubMembers` table in Design mode. On the General tab for the `Email` field, you'll see a property called Format. You can turn all the characters in a string to lower case simply by adding a < symbol to this property. (To turn strings to upper case, type in >).

As soon as you move off the Row Source row, the Property Update Options buttons appears with its little bolt of lightning.

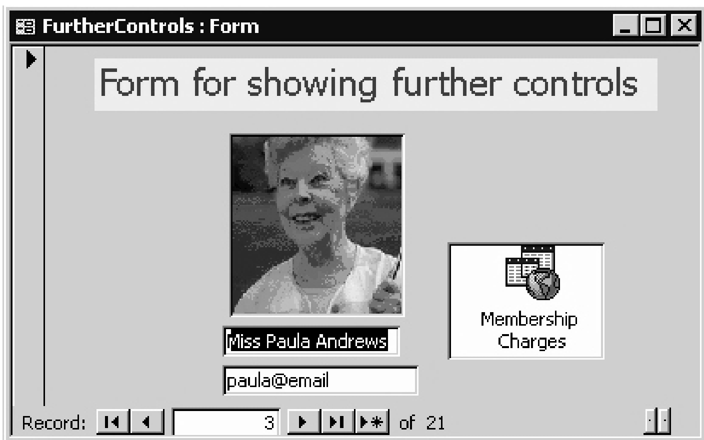


If you don't see it, click Tools, Options, select the Tables/Queries tab and check the box labeled 'Show Property Update Options buttons'.

Click (or right click) it and select the 'Update Format wherever Email is used' option. An Update Properties dialog appears, asking if the four forms (including `FurtherControls`) and the report that use the fields should be so updated.



Answer in the affirmative, save and close the table and return to the form. Now inspect Paula's email address from FurtherControls and you'll see it all in lower case. (Put your cursor on the email text box to see the address with its original formatting).



Property Update can be a great time and effort saver. It would have been rather tiresome to have had to track down every form and report where the Email field is used and change them all.

The `chap11end.mdb` file contains this last tweak as well as other progress from this chapter.

Summary

Despite all that this chapter has covered, it still isn't a full list of controls; we'll cover some more in Chapter 18. As we said earlier, controls are a very important part of Access!

In this chapter we've looked at putting sophisticated controls onto your forms. Choosing the right one for the job should be looked at both from the point of view of the data it lets into the table and from that of the user. The ease with which controls can be added, experimented with and removed lets you try several different approaches before deciding upon the one that's most suitable.

Chapter 12

Reports again – customizing printed output

Report types

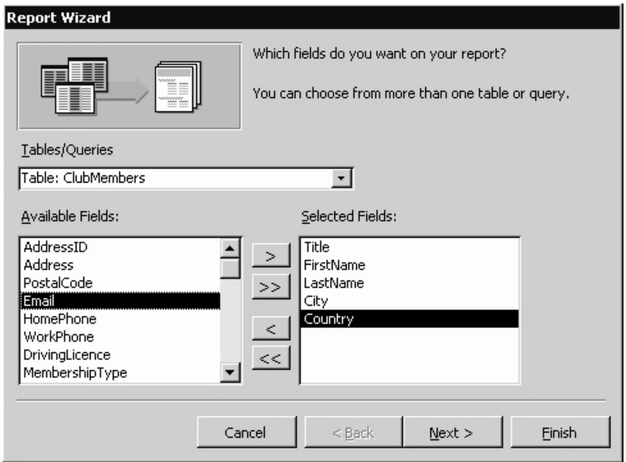
Reports come in all shapes and sizes as we've already seen from a first play with the Report wizard in Chapter 6 and from the three types of AutoReport (the vanilla one from the New Object button and the Tabular and Columnar ones from the New button on the database window).

It's worth taking another look at the Report wizard as it provides much flexibility in report construction; furthermore, a wizard-generated report is often the best starting point for creating highly customized reports. A report is all about setting out information on the page and this is where the wizard really scores as it can produce a consistent layout very quickly. If it isn't exactly what you want, it's much easier to go to work on this approximation than to start from scratch. I almost invariably tinker with the wizard-generated report to fine tune it to my exact requirements.

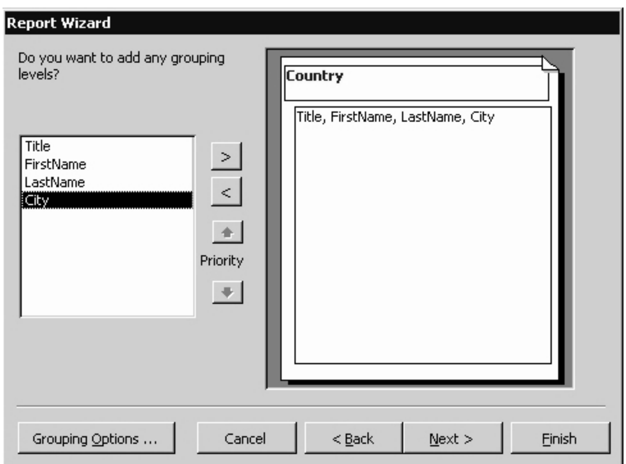
Once again, it may not be immediately apparent what the wizard is going to do with some of the information it asks of you on the first run through. However, the reasons should become clear when you see the end result.

The Report wizard again

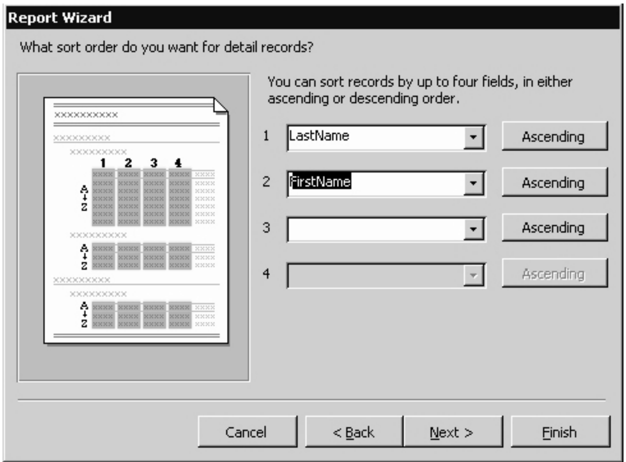
Open the `chap12start.mdb` file and go to the Reports tab. Click the New button to open the New Report window, choose a table (`ClubMembers`) and launch the Report wizard. Select some fields, as shown in the screenshot below:



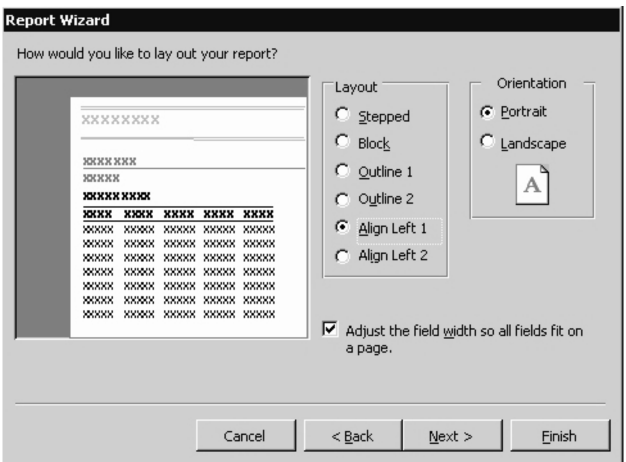
and click the Next button. Your choice in the second step determines the options the wizard will offer in a later step. If we set a grouping level here (something we didn't do in Chapter 6) you'll be able to choose from the six layout options shown in step four. So chose to group records by Country.



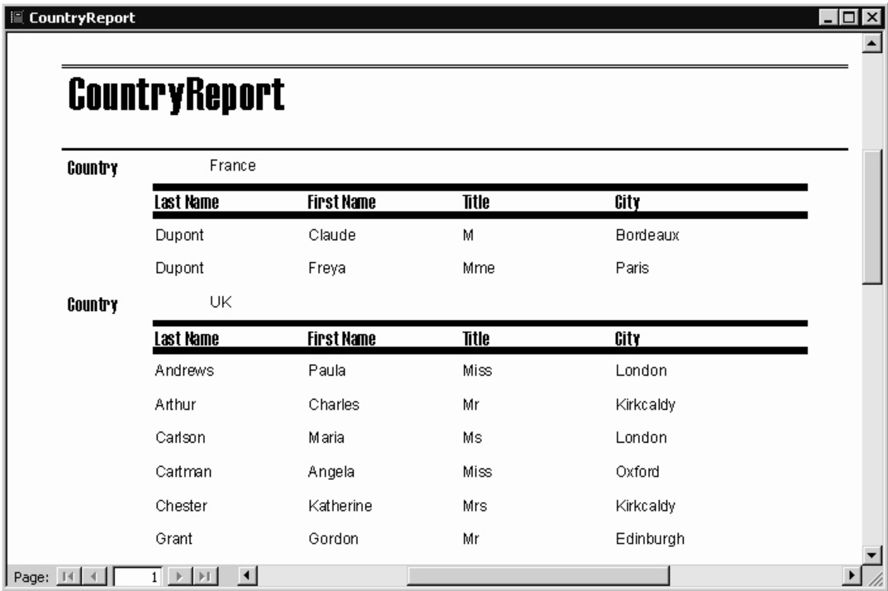
In the third step, elect to sort within the group by `LastName` and then by `FirstName`.



In the fourth step you can choose the layout of the report.

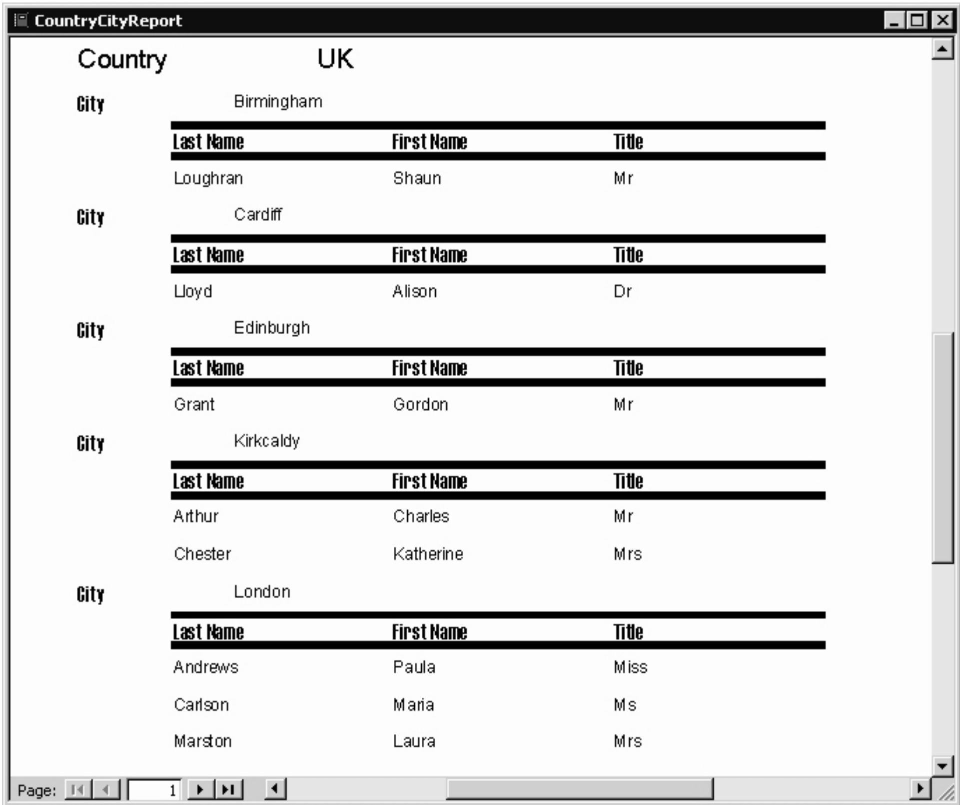


We looked at columnar and tabular AutoReports in Chapter 6 and if you thought such layouts were useful but that you could do with a bit more control over the fields, the sort order and so on, this will be a welcome sight. Pick one, say, Left Align 1, complete the wizard (our choices were Compact style and `CountryReport` as a title) and you should see something like this:



At this point the meaning of the groupings should become apparent. The report has found all of the records for club members in France and grouped them together. Within that group it has sorted them by last name, and members with the same last name are arranged alphabetically by first name.

Try running the wizard again but this time group the report by `Country` and `City`. This time there will be two levels of grouping in the report.



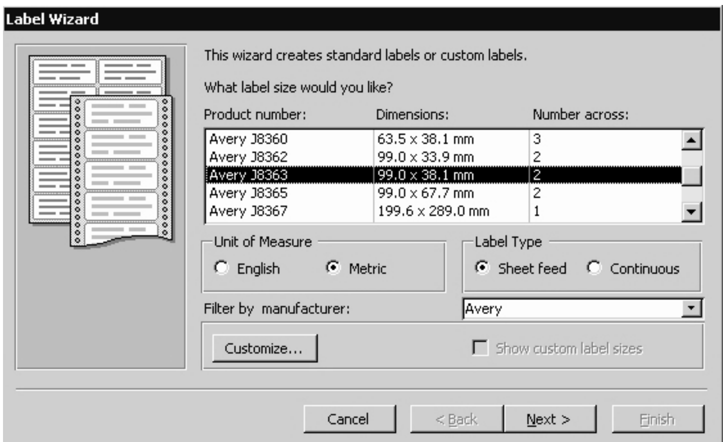
Now that you have an idea of what the wizard can do, run it again and try out the different layouts in step four to see what effects they produce.

The Label wizard

English is a wonderful language; it has words of astonishing subtlety. For example, I send out useful mail shots to my customers but I receive junk mail. It reminds me of the (probably apocryphal) sign seen in a store:

> We buy junk,
> we sell antiques.

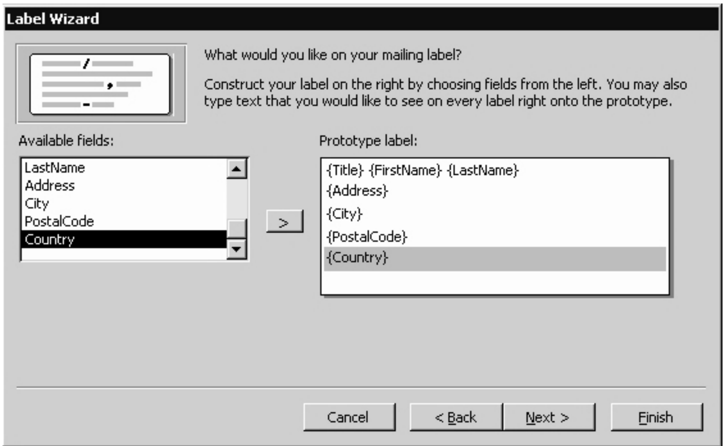
Whatever your views on mail shots (and, indeed, the long-term viability of snailmail), the ability to generate printed labels is still a major asset. Access handles the printing of labels as a specialized type of report – a label report – and it can be based either on a table or on a query. We'll illustrate the latter option, so build a query to pull out the names and addresses of all the members in Europe. (Hint: use the NOT operator, introduced in Chapter 9, to exclude all the records with USA in the `Country` field). Call the query `EuropeMembers`. From the Reports tab, click New, select the new query and launch the Label wizard. The first screen lets you choose your label size from dozens of sizes from several manufacturers.



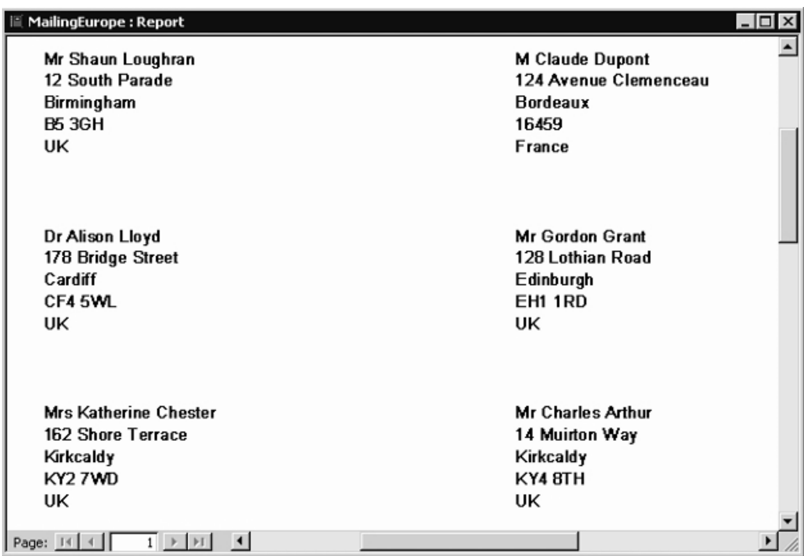
(In the unlikely event that none of these are suitable, you can click the Customize... button to define a new label).

The next step lets you choose the font that will be printed on the label, its size, color and weight and whether it should be italicized or underlined.

In the third step you build a template for the printed labels, choosing the fields you want in the order you want them. Several fields can be placed on one line, which is very useful for concatenating first and last names. Double click on the `Title` field in the Available fields list to move it into the Prototype label, type a space and double click to add the `FirstName` field, do the same and add the `LastName` field. Any characters you want to appear on every label can be added to the prototype too.



In the next step, labels can be sorted to print in a particular order, by city or by last name, or by city and then by last name. In the final step, name the new report as `MailingEurope` and click Finish to see a preview of the sheet of labels.



The Label wizard is a great time-saver (the longest part of the job is often finding a ruler so you can measure and identify the labels you are using) and once you've built a label report, you can use it time and time again.

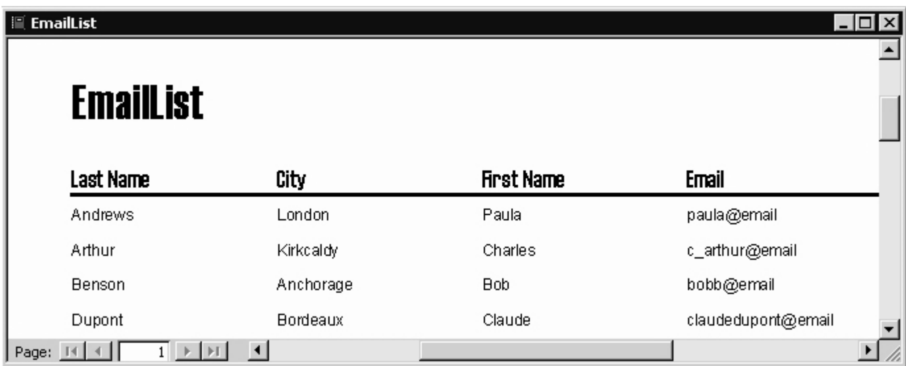
The Chart wizard

Also in the New Report window is a Chart Wizard option: we covered the use of the chart wizard in Chapter 10. Essentially it works in just the same way as it does when used in forms: charts, like labels, can be handled as reports.

Building a customized report

The time to investigate the tools offered in Design view is when a wizard-generated report doesn't look exactly right. You can, of course, design a report from scratch on a blank design screen but it is far more common to let the wizard do the grunt work and tweak the results.

Find or generate a report: here's mine, `EmailList`, in the Print Preview view.

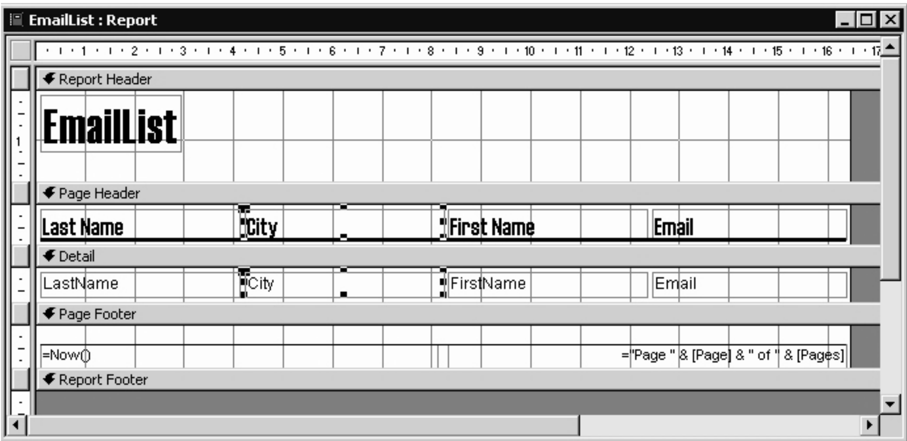


Now click the View button to see the Design view which should look familiar from the previous chapters on form design.

The design area itself looks somewhat different having rather more gray bands across it, labeled Detail, Page Header and Footer and Report Header and Footer. As you'd expect from exposure to forms in Design view, any objects in the Report Header are printed only once at the top of the first page and any Report Footer objects occur only at the very end of the report. Objects in the

Page Header and Footer are printed at the top and bottom of each page. Objects in the Detail section are printed once for each record that is included in the report.

Text boxes and labels can be moved or removed in exactly the same way as they can on a form. Here you might decide that it's silly to have the city sandwiched between last and first names, so simply drag the labels and text boxes to new positions. Labels and text boxes in this report aren't linked in the same way as they are on forms so click on one and Shift-Click on the other to select a pair simultaneously, or by dragging a rubber band around/through them. Labels and text boxes can be moved together like this despite being in different sections of the report.



Flip between Design and Print Preview views as you work to see how things look.

The text in a label, such as the one in the header, can be edited by clicking twice to get a text-editing I-beam. These clicks should not be as close together as they are in a double click: double clicking highlights the whole entry which is fine if you want to, say, delete rather than edit it.

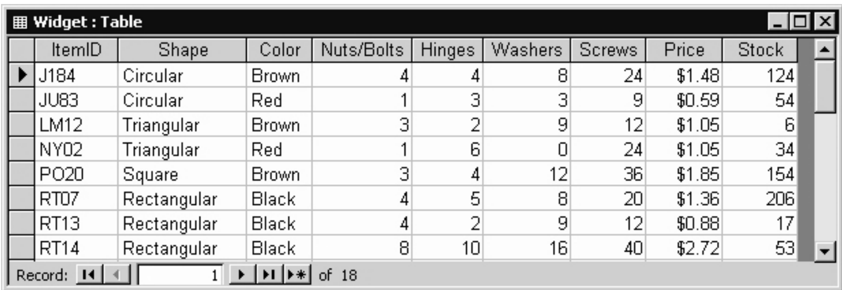
The reports illustrated above appear in the `chap12reports.mdb` file.

What else can you do on a report?

Sometimes you don't just want to print out the data from a table, you want to present it for a specific use. Access reports let you summarize data, calculate values and present fields in logical groups.

As a rule of thumb, most reports of any complexity are based upon a query. Queries are designed to make it easy to pull out specific information but are not ideal for generating totals, subtotals, averages and so on or for grouping operations. The best approach, therefore, is to design a query to locate all the records you need and add subtotals and totals during the report design stage.

To illustrate the further abilities of reports, I'll use the file `chap12start2.mdb` which is a tableful of specifications for widgets giving their shape, color, components and so on.



Widget : Table

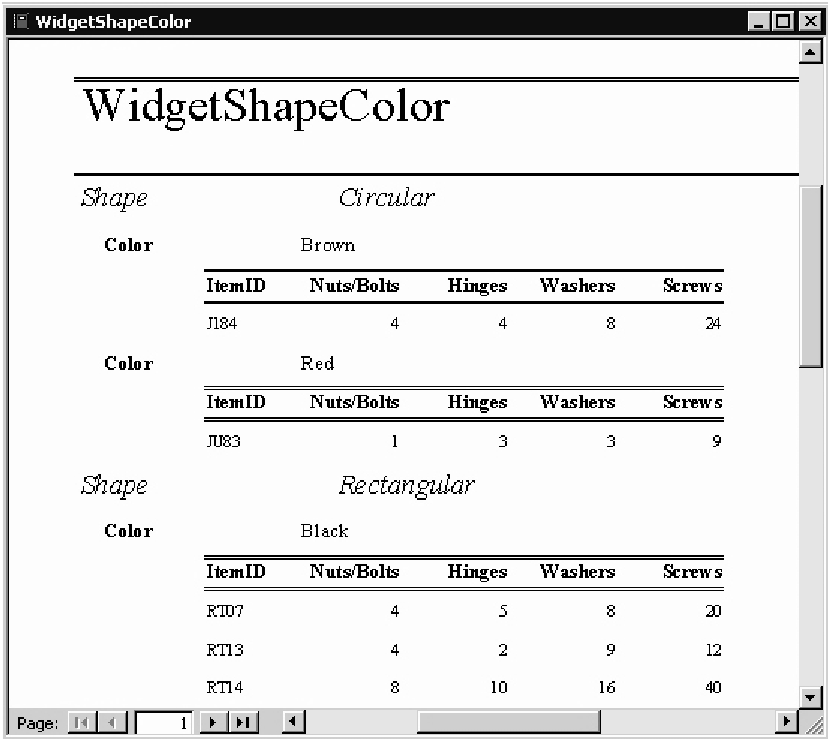
ItemID	Shape	Color	Nuts/Bolts	Hinges	Washers	Screws	Price	Stock
J184	Circular	Brown	4	4	8	24	$1.48	124
JU83	Circular	Red	1	3	3	9	$0.59	54
LM12	Triangular	Brown	3	2	9	12	$1.05	6
NY02	Triangular	Red	1	6	0	24	$1.05	34
PO20	Square	Brown	3	4	12	36	$1.85	154
RT07	Rectangular	Black	4	5	8	20	$1.36	206
RT13	Rectangular	Black	4	2	9	12	$0.88	17
RT14	Rectangular	Black	8	10	16	40	$2.72	53

Record: 1 of 18

While this won't bear scrutiny as a fine upstanding example of table crafting, it'll be fine for demonstration purposes.

Grouping data

As described above, the wizard lets you specify various levels of grouping. Using your skill and judgment, create a report that groups the widgets by shape and by color. My report, called `WidgetShapeColor`, is shown below.


WidgetShapeColor

WidgetShapeColor

Shape *Circular*

Color Brown

ItemID	Nuts/Bolts	Hinges	Washers	Screws
J184	4	4	8	24

Color Red

ItemID	Nuts/Bolts	Hinges	Washers	Screws
JU83	1	3	3	9

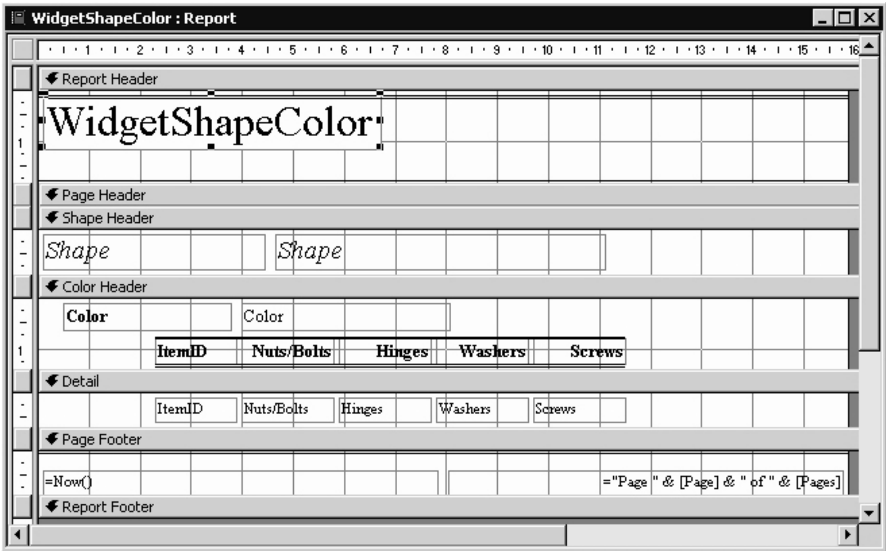
Shape *Rectangular*

Color Black

ItemID	Nuts/Bolts	Hinges	Washers	Screws
RT07	4	5	8	20
RT13	4	2	9	12
RT14	8	10	16	40

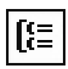
Page: 1

It has two levels of grouping, is sorted on ItemID and uses the Outline 1 layout. Looking at the Design view of this report

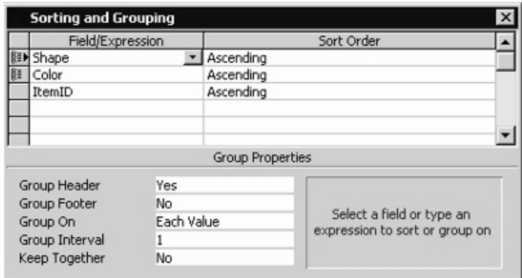


you can see the levels of grouping represented by the extra headers. There are the usual report and page headers but there's also a Shape Header and a Color Header. The labels and fields on the shape header appear every time a new shape is displayed in the report and those on the color header for each color within a group of shapes.

New groupings can be added to a wizard-generated report from the Design view by clicking on the Sorting and Grouping button in the main menu bar.



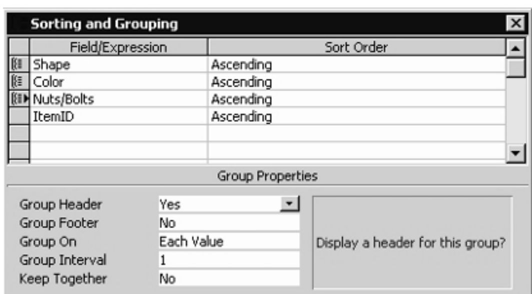
The present settings are displayed,



those which were chosen using the wizard. The Field/Expression column shows the fields on which records are sorted and/or grouped. The symbol to the left of the `Shape` and `Color` field names indicates that records are grouped by these fields. The lack of such a symbol alongside the `ItemID` field tells us that the field is only sorted, not grouped. The sort order is shown in the second column.

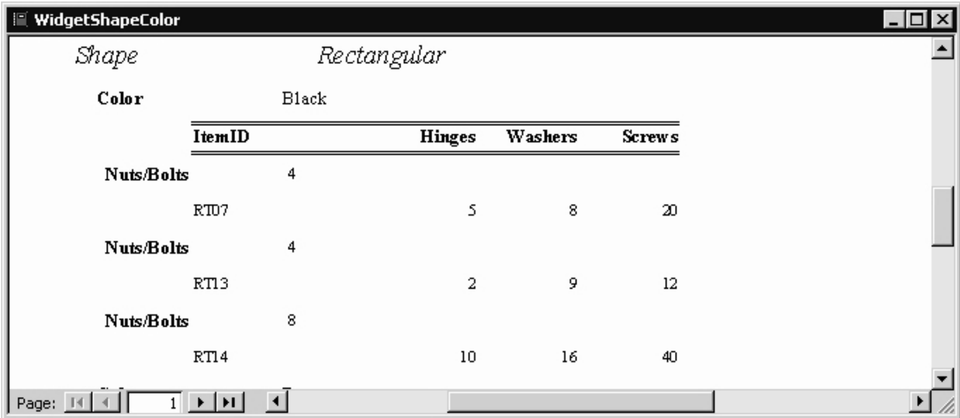
You can add another level of grouping here. To group widgets by the number of nuts and bolts in the component, add the Nuts/Bolts field to the Field/Expression column: do this by dragging the field in from the Field List. (Alternatively, double click in an empty Field/Expression cell and the first field from the Field List will appear. Further double clicks cycle through the remaining fields so you can choose the one you want). The Sort Order will default to Ascending and in the Group Properties panel, set the Group Header property to Yes. The grouping symbol appears alongside the Nuts/Bolts entry.

Lastly, drag the Nuts/Bolts grouped field up until it's below the other two grouped fields. This ensures that records are grouped first and then sorted.

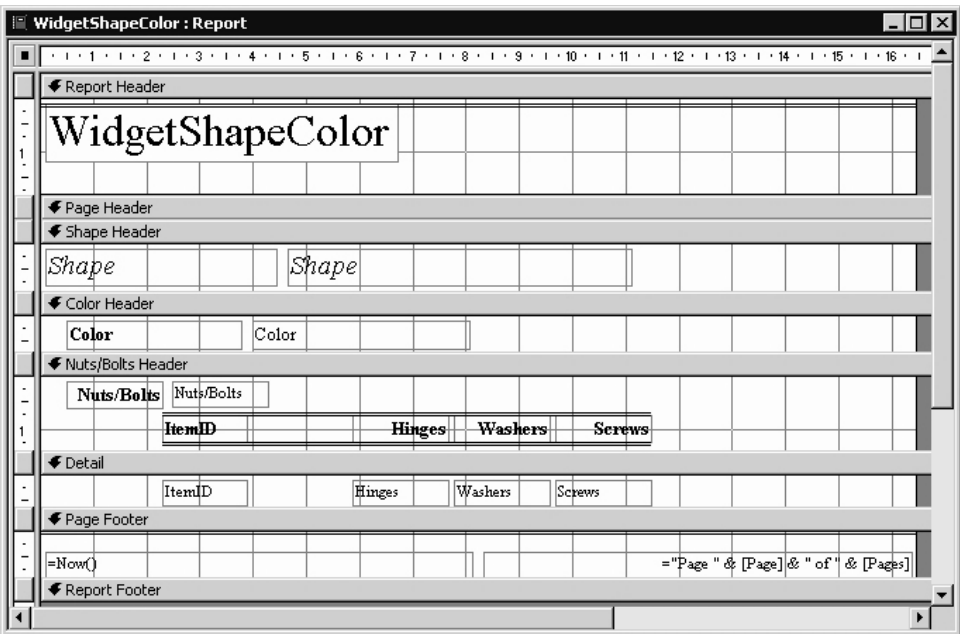


Close the dialog and the new Nuts/Bolts Header section is now in place. Into this section I want to place the Nuts/Bolts label and the associated text field. Drag the Nuts/Bolts label down from the Color Header section and the Nuts/Bolts field up from the Detail section.

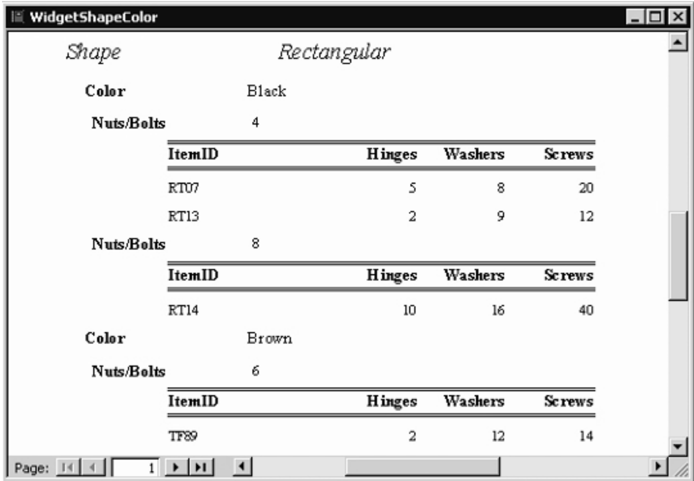
This is part of the result.



Hmmm. Not ideal, is it? I think the ItemID, Hinges, Washers and Screws labels need to move down from the Color Header into the Nuts/Bolts Header section, like this:



Thus, when seen in Design view, the report looks like this.



That's better.

By adding grouping levels, data can be displayed in a report that gives prominence to the information you wish to convey.

Summarizing data

This is where reports begin to add value to a report that's based on a simple table or query. In the following example, we'll add subtotals for the number of widgets in each grouping for shape, color and nuts/bolts category and also a figure at the end of the report of the total value of all stock held.

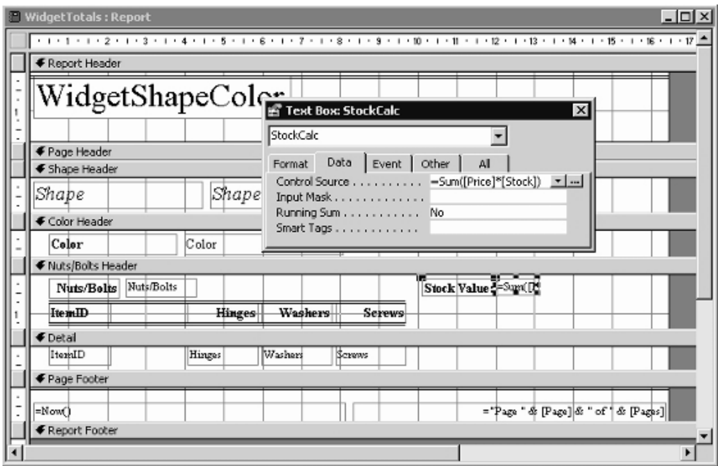
To add the subtotal and total fields you build a field expression, that is to say an expression or formula that uses values from existing fields to calculate new data. As you've heard me say (or read me write) redundant data should not be stored in tables and therefore the Widget table doesn't store the value of stock held. However, from the values in the Price and Stock fields, the value of stocks held is easily calculated with a field expression.

Using field expressions

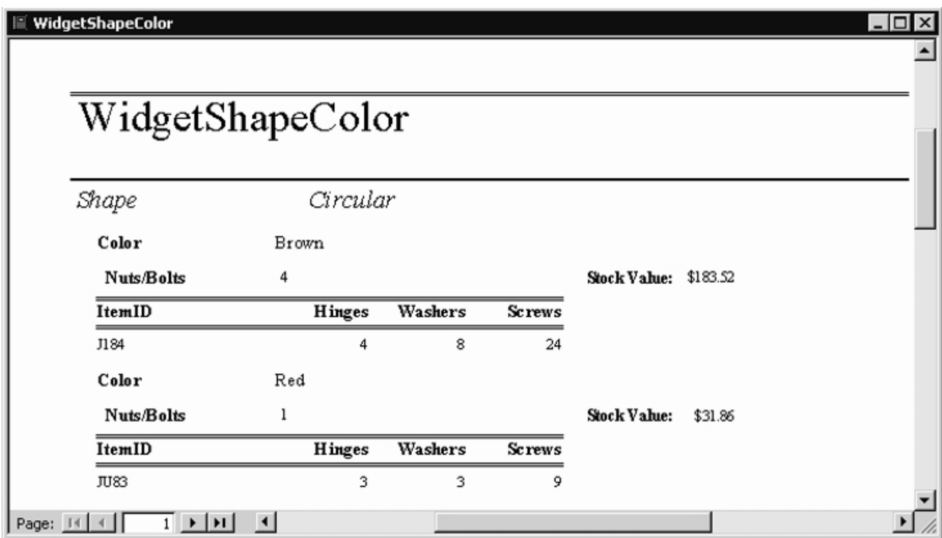
Make a copy of the `WidgetShapeColor` report, call it `WidgetTotals`. Place a new text box in the nuts/bolts header section. Give its label a memorable Name and set its Caption to read Stock Value. Call the text field itself something suitable, like `StockCalc`, and change its Format to Currency to match the data type of the Price field in the Widget table. For the Control Source property, you can either type an expression straight into the cell or you can call up the Expression Builder. Create an expression that reads:

=Sum([Price]*[Stock])

which will multiply the value in the `Price` field by the value in the `Stock` field. Here it is as the Control Source property:

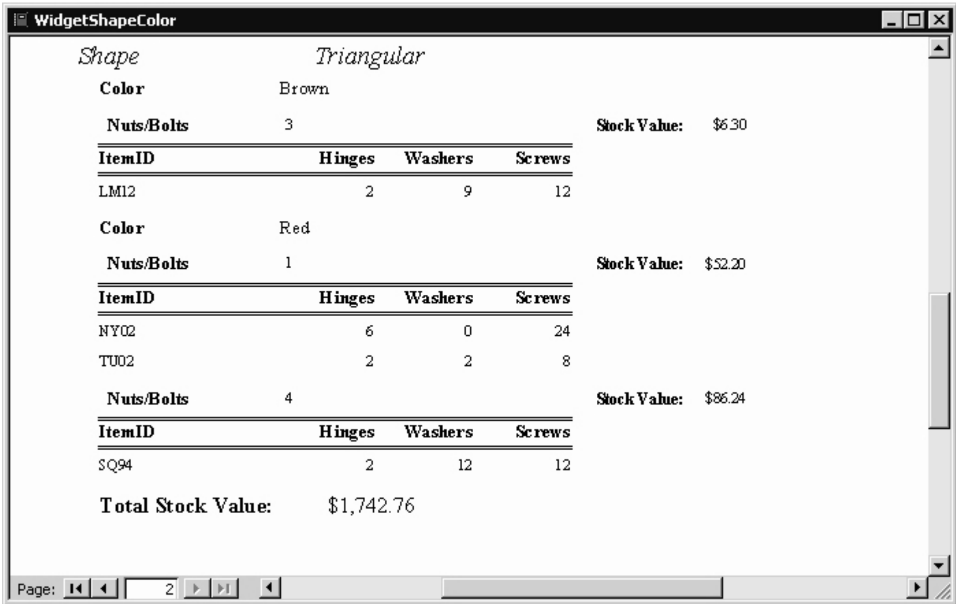


Flip to Report view and there's the calculated subtotal.



Back in Design view, copy the label and text field you've just created to the report footer, changing the label to read Total Stock Value. In Report view, you'll see that the total stock value has been calculated.

This is the last page of the report showing the two calculated fields generating two subtotals and the total stock value.



From this you can see that it is the position of a calculated field that determines how the calculation is performed: when placed in the nuts/bolts header section, it calculates the stock value of all the widgets that fall into each nuts/bolts category. When placed in the report footer, it calculates the stock value of all widgets in the report. If you were to place the same field expression in the color header section, it would calculate the stock value for all the widgets in each color category.

Both the reports based on the `Widget` table appear in the `chap12end.mdb` file.

Calculated fields can be very much more complex than this simple example. Access has a huge range of built-in functions for such tasks as handling dates (calculating the number of days between two dates, for instance), for manipulating text and for calculating averages, standard deviations and the like. Very often, however, it's simple information like subtotals within categories and grand totals that make the difference between a clear and informative report and an impenetrable mass of data.

Formatting your report

The method of formatting the various elements of a report is exactly the same as that described for making formatting changes to a form, covered in Chapter 10.

Inspect the Properties sheet for the object to be formatted, locate the element you wish to change and edit its property accordingly. Constraint should be applied when designing reports too. The information you are trying to convey can become lost in too many fancy effects and irrelevant graphics so be abstemious with these additions.

Summary

An Access report is an immensely flexible method of preparing data for printing, adding value to the raw data by offering many ways of presenting it and illustrating it with charts. The same data can tell different stories depending on how a report is structured, so matching the report to the intended audience or to the point you are hoping to carry is worthwhile. This is often the hardest aspect of creating reports.

Chapter 13

Where are we now?

Single tables for simple databases

So far we have looked at databases where a single table holds all of the data in which we are interested at any one time. Queries, forms and reports have all been based either on that table or on queries that pull data from the one table. Using these components we have looked in detail at how Access makes it easy to extract, display and print out the data from a single table database.

The value of single table databases

A database that's straightforward and stores all its data in a single table can be the basis of a highly valuable application. There are many worthwhile types of single table databases, from address lists and birthday card lists to inventories, small catalogs and many more. (If you are patiently waiting for the 'But', it's coming at the start of the next paragraph). If a single table solution is right for the task, despite its simplicity, then use just a single table. When I was a young database designer I built a database to collect medical information about patients. I almost bent over backwards to make it a multi-table application because I knew that this was what 'professional' database designers did. Luckily, common sense eventually prevailed and I built it with one table because that was all it needed.

Increasing complexity – most data isn't that simple

But, even though some applications do only need one table, life often isn't that simple. Databases almost invariably model some activity that's taking place in the real world with all its exceptions, variations and repetitions. Even the smallest of businesses run from the spare room or garage has customers, orders, price lists and suppliers of raw materials or components. A database to model something like that turns out to be much more efficient if each of the different object types (customers, suppliers etc.) is put into a separate table; i.e. all of the customers in one table, all of the suppliers in another and so on.

The whys and wherefores that make this so are covered in Part IV. Hopefully, in Parts I to III we have given you a firm grounding in how to use the basic components of Access – tables, queries, forms and reports. If you've worked through that, you are now in an excellent position to understand both why we need to use multiple tables and how to use them effectively.

So let's get started.

Part IV

More complex databases

Chapter 14

Multiple table databases

More is better!

The natural progression from a single table database is to a multiple table database. At its most basic, this means that instead of one base table containing all the data, the data is split between a number of base tables. How many tables you need depends on what you are doing: a database for a small business might have three or four tables, Northwind, the sample database that Microsoft supplies with Access, contains eight and a big financial application may well have hundreds.

Using multiple tables to store your data

Using multiple tables to store your data has several advantages. These are best illustrated not by us telling you to do it, but by showing you the problems that arise when a single table is used to hold data that's more complex than it has been in our previous examples. The idea behind this approach is simple – motivation.

Using multiple tables is obviously more complex than using a single one and you are going to have to put effort into finding out how the multiple tables can be induced to work together. However, if we can convince you that the gain far outweighs the initial pain (and it does) then we hope that you'll embrace the idea of multiple tables with open arms.

So here's a brief motivational diversion.

Imagine a microbrewery selling several different beers by the bottle. The database needs to store each order and the fields required might be these:

OrderID	OrderDate	Item	Quantity	Price	and several more for the customer's name and address

You may also want to store the name of the staff member who made the sale. And since there is only one table in the database, you'll have to include any other information that you want to store about that person (such as date of birth, date of employment and home address) in the same table. So we need to add these fields:

EmployeeID	LastName	FirstName	DateOfBirth	DateOfEmployment	and more for the employee's address

Each record in the resulting table might look like this, though we're not showing all the fields as there's not enough room on the page.

OrderID	Customer	Item	Quantity	Price	EmpID	LastName	FirstName	DOB
1	Carr	Druid's Dream	6	$4.65	7	Johnston	Hannah	03/05/72
2	Jones	Adder Ale	1	$5.50	8	Murray	Bert	12/10/58
3	Smith	Adder Ale	2	$5.50	7	Johnston	Hannah	03/05/72
4	Jones	Lambswool	1	$5.50	2	Trudeau	Simone	23/08/68
5	Carr	Adder Ale	2	$5.50	2	Trudeau	Simone	23/08/68
6	Thomas	Druid's Dream	12	$4.65	7	Johnston	Hannah	03/05/72
7	Forbes	Druid's Dream	6	$4.65	8	Murray	Bert	12/10/58
8	Smith	Adder Ale	4	$5.50	8	Murray	Bert	12/10/58

Problem 1: redundant data
In the table above, there are many occasions where the same information appears in many records; the addresses of the sales people, for example. This repeated data is also known as 'redundant data'.

So what's wrong with a bit of redundant data? Well, as the table grows (with increasing orders) the burden of redundant data can become huge. It takes up space, it makes the table large and unwieldy and has the effect of making queries run slowly. And you will get very bored entering the same data over and over and over again.

Problem 2: typographical errors
Human beings are only human and entering data can be a rather boring task, especially if each order is often largely a repeat of the previous one. The opportunities for error are many: before long, records will appear in which Hannah's name is spelled Hanna, where Bert was born in 1928 and Druid's Dram is offered for sale (an appropriate enough name but incorrect nevertheless).

These errors start to do serious damage when queries are used to extract information. Hannah is unlikely to be pleased if she's paid on commission and isn't credited with sales accredited to Hanna. Someone might decide to retire the octogenarian on the staff and the business plan might be put in jeopardy because sales of Druid's Dream aren't going as well as usual.

Problem 3: updating records
Simone gets married and decides that she will change her last name to that of her husband. It's a lot of work to find all the records of her sales and edit each one.

Problem 4: modifying records
If the record for order number four is deleted, all reference to the Lambswool brew is lost because its name and price are stored nowhere else in the table. Furthermore, a new brew called Hector's Nectar comes on line. There's nowhere for its name and price to be stored, so you must wait until an order is taken before it can be entered and if you wanted to generate a price list of all brews to include the new variety, you couldn't.

These are some of the problems that arise in single table databases when the complexity of the data increases. In fact, there are more, and poor beleaguered students on database courses get a much longer list. The good news is that all are addressed by designing a multi-table database. True, you can probably think of alternative individual cures – the last name change could be implemented with an update query, for instance, and an incomplete dummy record could inhabit the table until the first order for the new brew is taken. However, experience has shown that a multi-table solution is the most comprehensive treatment for all these woes.

OK, enough motivation, how do we do it?

Deciding what data goes into which table

As was said in the last chapter, a database frequently models an activity that's taking place in the real world. In these activities, objects can usually be identified readily. These aren't objects in any special mathematical sense, just elements that can be combined to define the activity.

In the microbrewery example above, a customer is an object, as are a member of staff, a brew and an order. It is also clear that objects fall into groups that are likely to have similar information stored about them. For example, a customer is one object, another customer is a different object, and an order is a third object. However, the type of information that we want to store about the customers differs from the information that we want to store about the order. We can group similar objects into object types and it is a good rule of thumb that the information about each object type should be stored in a separate table. So here we might have four tables called `Customer`, `Staff`, `Product` and `Order`.

To illustrate the mechanics of dividing a single table of data into multiple tables of data, we'll start from a slightly simpler version of the microbrewery table shown above. The table, called `BrewSales`, is in the `chap14start.mdb` file and looks like this:

OrderID	Customer	Item	Quantity	Price
1	Carr	Druid's Dream	6	$4.65
2	Jones	Adder Ale	1	$5.50
3	Smith	Adder Ale	2	$5.50
4	Jones	Lambswool	1	$5.50
5	Carr	Adder Ale	2	$5.50
6	Thomas	Druid's Dream	12	$4.65
7	Forbes	Druid's Dream	6	$4.65
8	Smith	Adder Ale	4	$5.50

❛ *This is, as you'll have noticed, a very small table because we've removed most of the detail and the reference to employees. It is, however, large enough to illustrate the concepts behind dividing data between tables.* ❜

First we decide to split out the customer information and put it in a `Customer` table, adding an ID field of the AutoNumber type to ensure that each entry is unique.

CUSTOMER

CustomerID	Customer
1	Carr
2	Jones
3	Smith
4	Thomas
5	Forbes

In a real example, you're likely to have additional fields for address, contact details and so on.

Then we decide to split out all the product information and put it into a `Product` table, again adding an AutoNumber ID field.

PRODUCT

ProductID	Item	Price
1	Adder Ale	$5.50
2	Druid's Dream	$4.65
3	Lambswool	$5.50

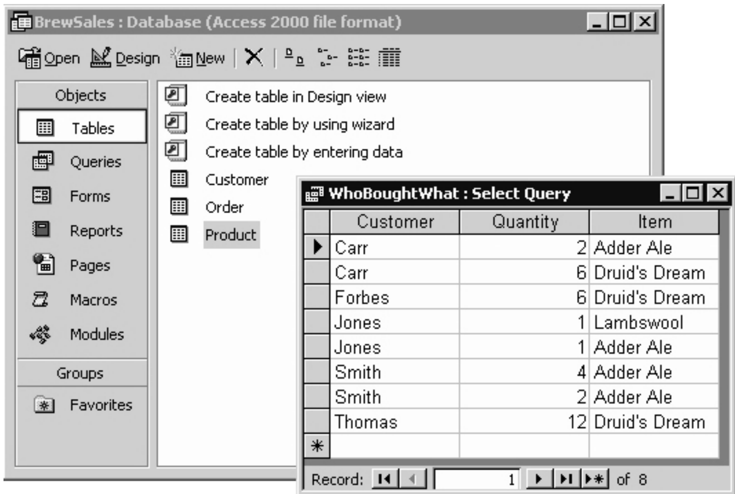
This leaves us with a mere two fields, `OrderID` and `Quantity`, for the `Order` table. On their own, these two don't tell us what was bought or who bought it, so two fields must be added to access that information in the newly formed Customer and Product tables. These are `CustomerID` and `ProductID`.

ORDER

OrderID	Quantity	CustomerID	ProductID
1	6	1	2
2	1	2	1
3	2	3	1
4	1	2	3
5	2	1	1
6	12	4	2
7	6	5	2
8	4	3	1

The first record in this table tells us that customer 1 bought six of product 2; looking back at the Customer and Product tables reveals that customer 1 is Carr and that product 2 is Druid's Dream.

OK, so now customer and product details are only stored once each, which is good, but we're left to deal with an unfriendly number-filled `Order` table, which is bad. Fear not, when the completed database is in use you'll rarely, if ever, see the table looking like this. Using queries and forms, Access can present the data in a helpful format so you can see at a glance



that customer Jones has bought Lambswool and Adder Ale and that Thomas has only tried Druid's Dream. The `WhoBoughtWhat` query above shows who bought which products, a typical example of the appearance your data would have in use.

In the `chap14manualsplit.mdb`, you'll find the data from the original `BrewSales` table split into three tables (`Customer`, `Product` and `Order`) as described above and the `WhoBoughtWhat` query.

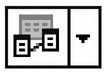
The subsequent chapters will look at designing a multi-table database from scratch, but what can you do if you realize that the data in your current table would benefit from being split into several tables? Do you really have to begin all over again? Happily not. Access comes with a Table Analyzer wizard that automates the process of splitting a single table into as many tables as it deems necessary. It makes a reasonably good stab at the job too. It's a worthwhile route to try (with a backup of your database, of course) as it doesn't take long and you can make tweaks when following the wizard's steps, as shown below. If you don't like the result, you can always go for a manual redesign.

Start by opening the `chap14start2.mdb` file, containing the familiar `BrewSales` table.

Build a quick AutoForm based on the `BrewSales` table and call it `BrewSalesForm` – this will be used later but, once built, can be forgotten for the moment.

Using the Table Analyzer wizard

To run the Table Analyzer wizard, find the Analyze button in the main button bar. It will probably be showing this icon.

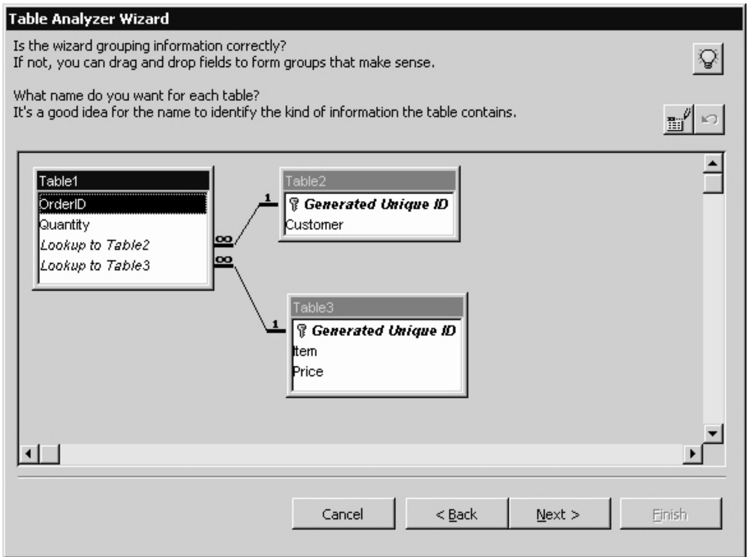


If it is, click it, but if it isn't, click the slim button with an arrowhead to its right and pick Analyze Table.

The first two steps describe, as in the paragraphs above, the potential problems with single table solutions and the potential benefits of using multiple tables. You don't have to do anything except read, looking at the examples if you wish, and click Next to proceed. In the third step, select the table you require analyzed.

Also on the third screen you can decide whether you want to see the introductory screens next time you run the Analyzer.

Here we're using `BrewSales` so highlight it and click Next. Now you decide whether to give the wizard its head or whether to divide the table yourself. The wizard's decision is not final, so let's see what it produces by accepting the default 'Yes, let the wizard decide'. Click Next.



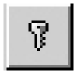
The wizard has divided the table into three. Table 2 contains the customer records and Table 3 contains the product details. Both tables have acquired a Generated Unique ID field. Table 1 retains the order details and has gained some new Lookup fields: these are what will enable Access to locate all the elements of a single order now that the fields are located in different tables.

❛ *It's worth noting that you need a certain amount of data to enable to wizard to function properly. If the* `BrewSales` *table is shrunk to just the first seven records, the wizard decides that it doesn't have enough sample data upon which to work.* ❜

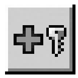
It is apparent that the wizard agrees with our theoretical identification of objects performed above and our answer to the question at the top of the page ('Is the wizard grouping information correctly?') is therefore yes, so we'll proceed to the second question. With the focus on Table1, click the rename button

to the right of the question, type `Order` in the box and click OK. Repeat this for the other two tables, choosing names to reflect the table contents, like `Customer` and `Product`.

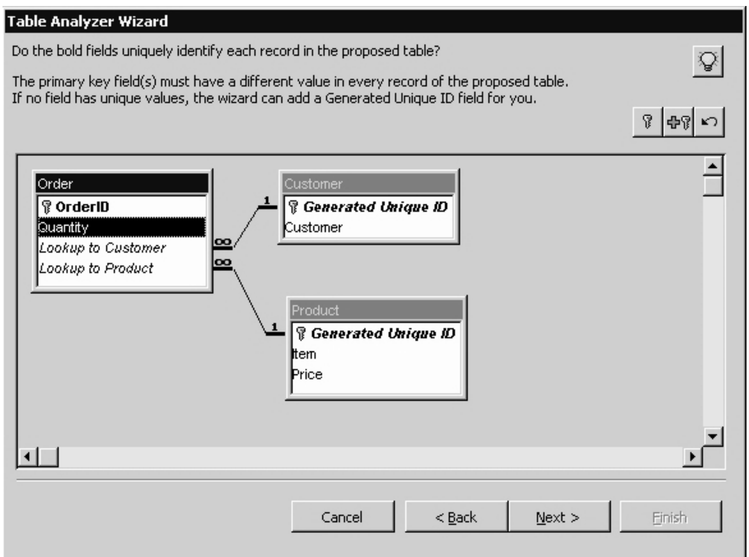
Click Next to continue: this step asks you to confirm the wizard's identification of primary key fields. These are the Generated Unique ID fields it added to the `Customer` and `Product` tables. The `Order` table doesn't have a primary key, however, so highlight the `OrderID` field and click this button.



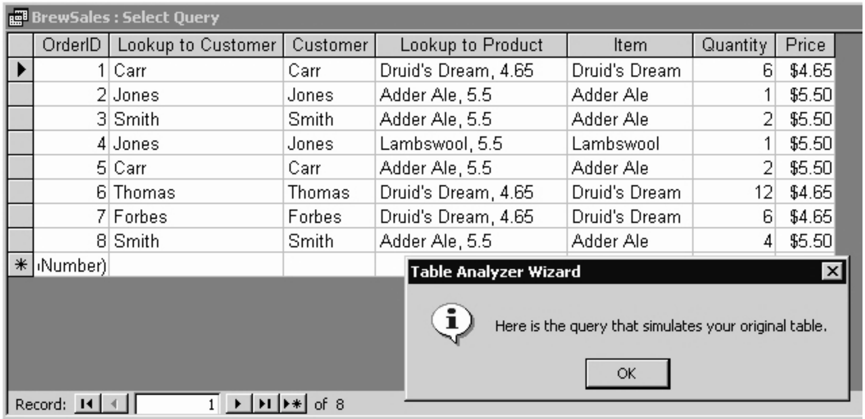
If there wasn't an obvious candidate for a primary key field, one can be generated by clicking this button.



The three tables now all have meaningful names and primary keys.



Click Next. The default in the last page is for the wizard to create a query to display your records just as they were in the original single table: this is a useful starting point so select the 'Yes, create the query' option. If the check box at the bottom of this step remains selected, Help will open automatically when the query is displayed. For simplicity's sake, I've unchecked it. Click Finish


BrewSales : Select Query

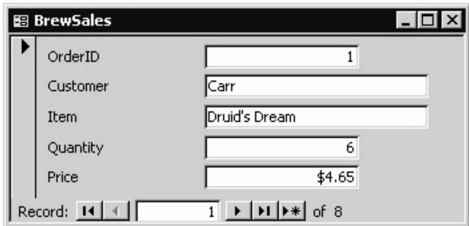
OrderID	Lookup to Customer	Customer	Lookup to Product	Item	Quantity	Price
1	Carr	Carr	Druid's Dream, 4.65	Druid's Dream	6	$4.65
2	Jones	Jones	Adder Ale, 5.5	Adder Ale	1	$5.50
3	Smith	Smith	Adder Ale, 5.5	Adder Ale	2	$5.50
4	Jones	Jones	Lambswool, 5.5	Lambswool	1	$5.50
5	Carr	Carr	Adder Ale, 5.5	Adder Ale	2	$5.50
6	Thomas	Thomas	Druid's Dream, 4.65	Druid's Dream	12	$4.65
7	Forbes	Forbes	Druid's Dream, 4.65	Druid's Dream	6	$4.65
8	Smith	Smith	Adder Ale, 5.5	Adder Ale	4	$5.50
ıNumber)						

and this is the resulting answer table, called `BrewSales`, with a last helpful note from the Analyzer to explain that it's showing you a query that simulates the original single table.

Well, it doesn't look *quite* like the original; indeed there's a lot more going on in here. You can see that Access is able to pull together records from different tables to build a full record showing all that the original table held, with some extra Lookup fields. It may not be instantly apparent what good these fields are doing: they just seem to be repeating data shown in other fields.

Take a quick look at what's in the Tables tab – this isn't avoiding the issue, it's a digression that will, hopefully, make things clearer in a moment.

The three new tables are there (`Order`, `Product` and `Customer`) plus the original table upon which the Analyzer was run, renamed as `BrewSales_OLD`. Now look at the Forms tab: there's the `BrewSalesForm` which was based on the original `BrewSales` table. Now that there's no table called `BrewSales` (because it's been renamed), can we expect the form to work properly? Try it and see.

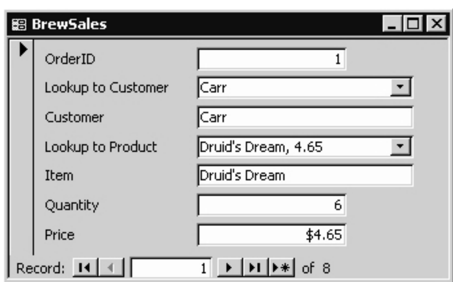


Wonder of wonders, there it is looking perfect. How does Access work this magic?

When you created that form it was based on the table called `BrewSales`, so when you open the form, it looks for a table called `BrewSales` and pulls the data from there. Or, to be slightly more accurate, it doesn't look for a table called `BrewSales`, it looks for a table or query called `BrewSales`. Then the Analyzer renamed the table and created a query with the original name: Analyzer's last on-screen message announced this fact, and it's there under the Queries tab. So now when you fire up the form, it finds a query with the expected name and is quite happy to pull data from that.

One consequence of the fact that a form can pull data from a table and/or a query is that, just as Access won't let you create two tables with the same name, you can't have a table and a query with identical names.

You can create a new AutoForm based on this query which should look like this one, called `BrewSalesForm2`.



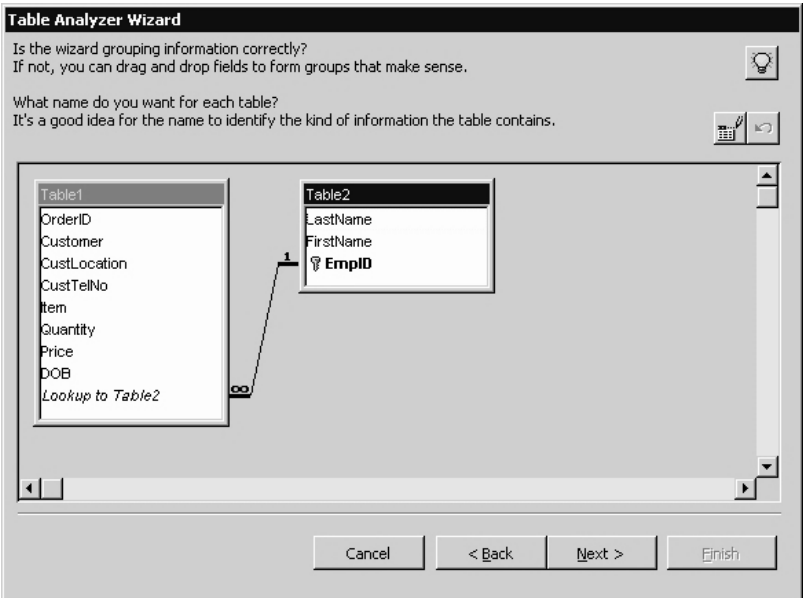
If you click on the arrowhead in the Lookup to Customer and Lookup to Product fields, you'll see ready-made combo boxes from which you can make selections. These are ideal on a form for entering new records. A quick flip into Design view to delete the `Customer`, `Item` and `Price` fields that show details that are duplicated by the lookup fields, followed by a little tweaking, leaves you with a lean, mean data-entry form.

The file `chap14wizardsplit.mdb` contains the tables, query and forms described above.

To illustrate the next two points, open the `chap14start3.mdb` file, which contains tables called `MoreComplex` and `BrewSalesTypo`.

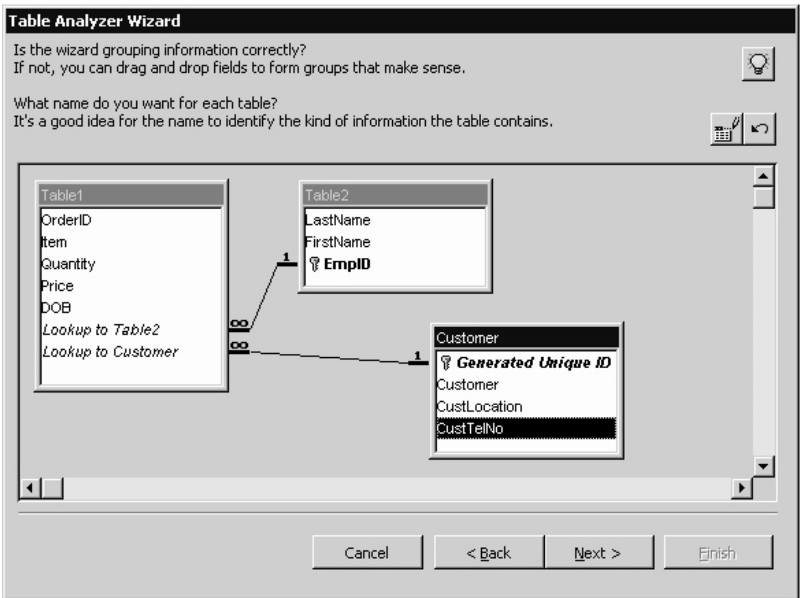
What if...

What if you don't like the division of data that the wizard proposes? In the example shown below, in which the Analyzer wizard has been let loose on the table called `MoreComplex`,



the suggested configuration would still lead to multiple instances of customer details in Table 1.

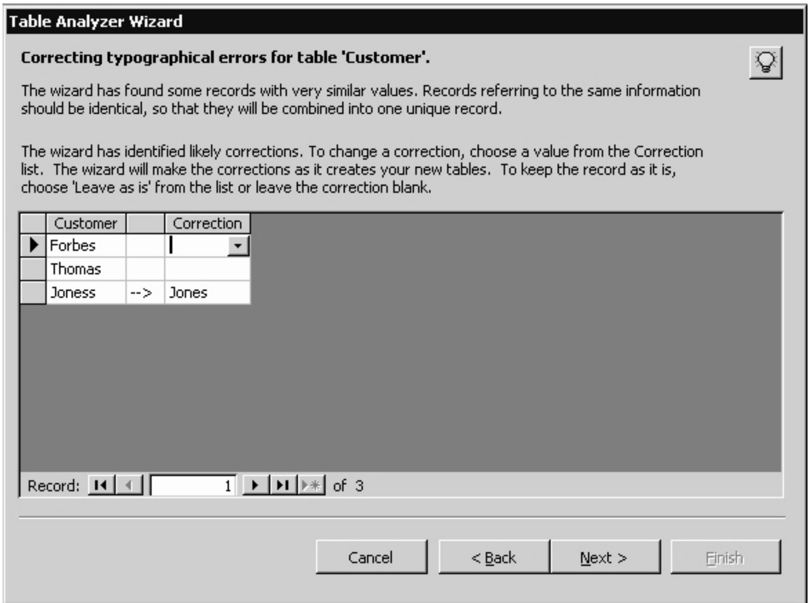
To subdivide Table 1 by relocating the customer records in a third table, click on the `Customer` field and drag it to some free space: the cursor shows as a tiny table. Release the mouse button and Table 3 appears containing the `Customer` field and a Generated Unique ID field. This new field will ensure that each customer has a unique ID number for accurate identification. Rename Table 3 in the dialog box that pops up. Now the `CustLocation` field can be dragged across into the new table.



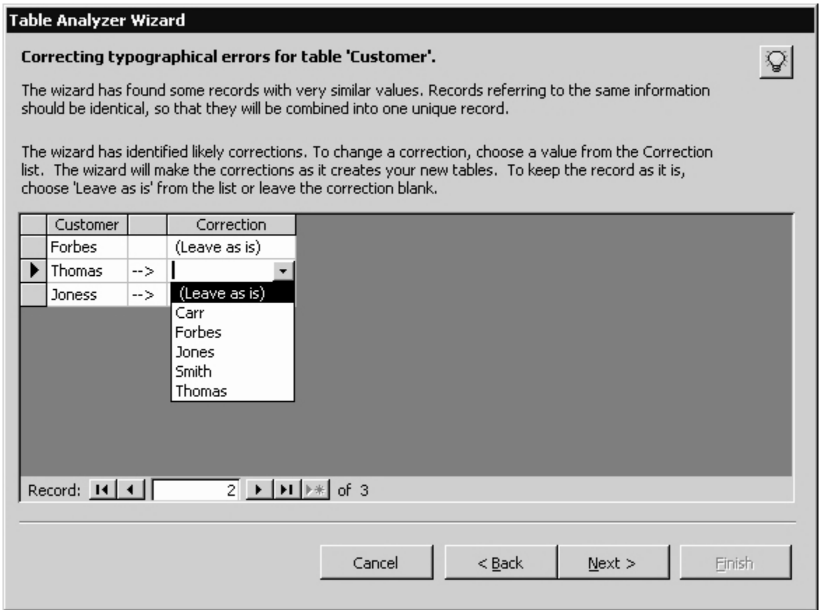
Once you're happy with your alterations (in this example, you might also consider a fourth table for product details) rename the other tables as necessary and continue as outlined above.

And what if?

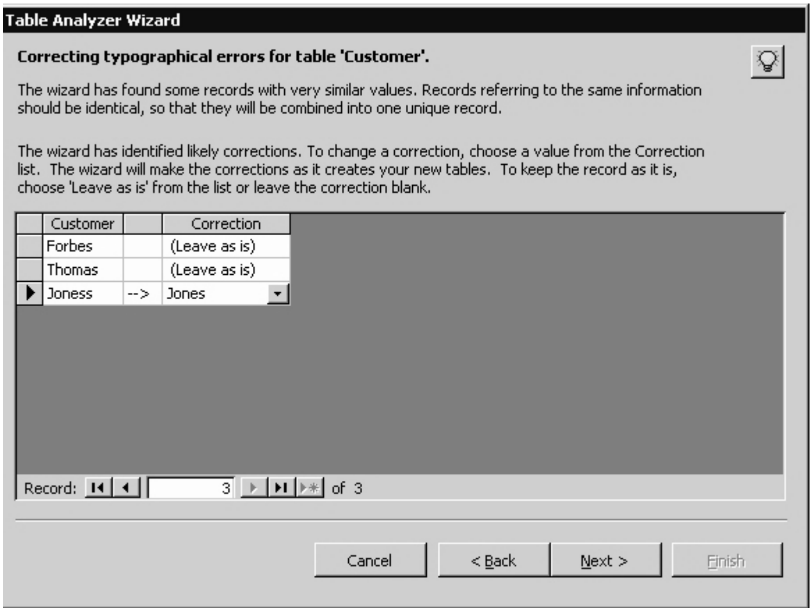
What if the Analyzer wizard pops an extra step, not covered above, that looks like this? Run the wizard against the `BrewSalesTypo` table, proceed as before and you'll see this step:



Here the wizard attempts to identify records with entries so similar that they might be typos and it also tries to identify sensible corrections. In the `Customer` column in this example there are three names. The first two are correct (Forbes and Thomas) so pop down the list and select (Leave as is) in the `Correction` column for them both.



The third entry, Joness, has been correctly identified as a mis-spelling of Jones, with the correct spelling shown in the `Correction` column.



If the `Correction` column didn't contain the correct spelling, you'd click to pop down the list of possible corrections and select one, or tell the wizard to leave it as it is.

If the wizard doesn't spot any such typos, you won't see this step.

As the `MoreComplex` and `BrewSalesTypo` tables are just examples of tweaking the Analyzer's division of your data, we don't, for once, have a `chap14end.mdb`.

The manual solution

If the Table Analyzer wizard doesn't appeal, you can always split a table manually.

It's not at all necessary for you to do this as a practical exercise as Chapter 16 contains a full description of how to build a complete multi-table database. It's just given in case you were wondering how it could be achieved.

First, take a backup of the database. Then make a copy of the single table, taking both the structure and the data, and rename it as one of the new tables, say, `Customer`. Then delete the fields that do not contain customer information, ensure there's a primary key and save the table. Make another copy of the single table, name it `Product`, organize its fields and primary key and save it. Finally, make a third copy of the original table and create the `Item` table. Now you can add `Old` to the name of the original table until you're sure everything is working well, whereupon you can delete it.

Bringing the data together again is described in the next chapter.

Summary

The bigger the database, the more important it is to design it from the outset with a multi-table structure. Databases have a habit of growing and becoming more complex. Often what happens is that users find a database application easy to use and want it to do more and to store details of other aspects of the business. As the complexity increases, it becomes more likely that you'll encounter the four problems outlined at the start of this chapter. The time and effort spent in redesigning the contents of a single table into a series of tables will almost invariably be less than that taken to work around the problems.

If the Table Analyzer doesn't produce the results you hope for, designing from scratch is the next step. Creating a database from the ground up also gives you a much greater insight into the way a multi-table database works.

Once you've identified the various objects about which data is stored and constructed tables to contain those objects, the next stage is to determine how the tables should act together to form the whole database. No prize is offered for guessing that this happens in Chapter 15.

Chapter 15

Tables – making multiple tables work together

In Chapter 14 we tried to convince you that it was a good idea to split data up into separate tables in the database. However, in order for a database that's constructed from multiple tables to work effectively, there has to be some means of linking the data from the different tables so that, although it is located in different tables, it can work together. In Access, and indeed in RDBMSs in general, the associations between tables are called 'joins'.

The data in the tables needs to be regulated somewhat more carefully in a multi-table database and Access uses primary keys to do this. Primary keys ensure that each record can be identified uniquely and this property is important in defining the joins that are made between tables.

The primary keys and joins work together to enable Access to identify the records from different tables that comprise a complete set of data.

OK, that was a brief outline of how a multi-table Access database is put together, but it doesn't tell you how all of this works. So here comes the detail.

Primary keys

Primary keys are, as we've said, a way of ensuring that each of the records stored in a database can be identified uniquely. Even if Mr Smith does order five red roses twice on the 14th of February (let's not ask why), the database should record two different events and ensure that we don't confuse them. Even if all of the other fields in the `Order` table carry the same value, the primary key value (in this case found in the `OrderNo` field) enables us to differentiate between the two events.

OrderNo	Name	Date	Type	Number
32	Smith	14th Feb	Red Roses	5
33	Jones	14th Feb	White Roses	6
34	Simons	14th Feb	Red Roses	6
35	Smith	14th Feb	Red Roses	5

This table is relatively simple but primary keys assume even more importance in a multi-table database.

Deciding on a primary key field

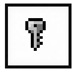
Every table should have a primary key. Access can automatically add a field if you use the wizard to create a table, the additional field being of AutoNumber type. As we have covered earlier, the values in AutoNumber fields are automatically filled in for you with the values 1, 2, 3 and so on. This, of course, ensures a unique value in each record. In Design view, you define the primary key field yourself. So which field should you pick?

Primary keys ensure uniqueness so your choice should be a field that is unlikely to contain duplicate entries. You'll often find that something is already used to identify objects uniquely, for instance, a National Insurance or Social Security number. This makes an ideal primary key field in a personnel table. Products are identified by a code or serial number, cars have unique license plates (or are supposed to) and so on.

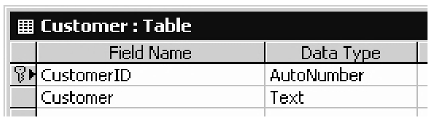
If there isn't an obvious candidate, you can add an AutoNumber field to generate a unique ID number for each record.

Adding a primary key

When you've decided on all the fields in a table and have identified the field to contain the primary key, the actual act of declaring the primary key field is extremely simple. Click on the field name and then on the Primary Key button.



A tiny key symbol appears to the left of the field name, signifying that this is now a primary key field.



It is common practice for the primary key field to be the first field in a table. This is by no means obligatory, but our feeling is that it is a convention worth following. To insert a field at the top of the list, click on the current top field, on Insert from the main menu, select Rows and a new row is inserted.

You can remove the primary key field designation equally easily, by selecting the field and clicking the Primary Key button again. Decisions about primary keys are best made at the design stage before any data is entered into the table. You can change things later but it's not quite as easy.

Joins – and foreign keys

A join is created between two tables starting with a primary key field in one of the tables. The field in the second table at the 'other end' of the join is called a foreign key field. Which bring us to an interesting point. As the database designer you explicitly tell Access which fields are the primary key fields. But foreign keys only come into existence when joins are created between tables. In a sense, the act of creating a join is the one that tells Access which field is the foreign key. I don't want all of this to sound too existentialist, I only mention it because otherwise you may think you have missed a stage somewhere when we run through this in practice.

In a single table database (where it's still highly sensible to have a primary key field to ensure the uniqueness of records) there will be no foreign key fields. But that changes as soon as you start to use multiple tables.

Identifying a foreign key field

To illustrate this, we'll return to the three tables that were identified from the original single microbrewery table. They look like this (with rather minimal data, just to save paper):

PRODUCT

ProductID	Item	Price
1	Adder Ale	5.50
2	Druid's Dream	4.65
3	Lambswool	5.50

CUSTOMER

CustomerID	Customer
1	Carr
2	Jones
3	Smith

ORDER

OrderID	CustomerID	ProductID	Quantity
1	1	2	6
2	2	1	1
3	3	1	2

The key symbol shown above identifies the primary key fields. These are just shown in this book, they don't appear like this in Access.

The `Order` table tells you that customer 1 bought product 2. It is intuitively obvious (he typed hopefully) that, using the other two tables, we can see that customer 1 is Carr and that product 2 is Druid's Dream.

So the `CustomerID` field in the `Customer` table should be joined to the field of the same name in the `Order` table and the `ProductID` field in the `Product` table should be joined to the `ProductID` field in the `Order` table.

The `CustomerID` field in the `Customer` table is a primary key field but in the `Order` table it is going to be the foreign key field. And once you've made the join, the `CustomerID` field in the `Order` tables becomes a foreign key. The same is true for the `ProductID` field in the `Order` table: you have now identified the two fields that will be used as foreign key fields.

Armed with this knowledge, you're in a position to make the joins.

Joining tables

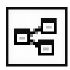
Joins must be made between fields of the same data type. A text string in one table and a currency value in another doesn't sound like a match made in heaven: Access certainly doesn't think so because it won't allow you to form a join between two fields unless they are of the same data type.

The only exception to this rule is when (as often happens) you use an AutoNumber field as a primary key. In this case, the other end of the join (the foreign key field) must be of the Number: Long Integer type. This, too, makes sense on further inspection. When you use the AutoNumber type, you hand over to Access the generation of a unique number for each record so it automatically puts a number into the field. However, the numbers that Access inserts are, in reality, simply long integer numbers so that's the data type to use for the foreign key.

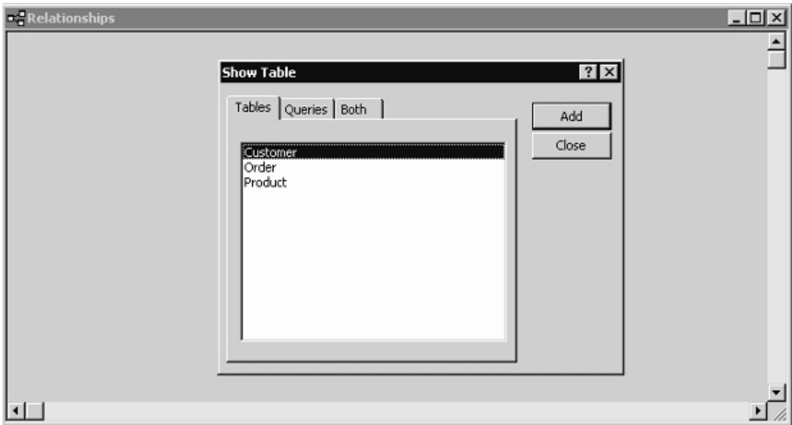
Making joins between tables

To illustrate the joining process we'll use the microbrewery `Order`, `Product` and `Customer` tables that have become familiar, contained in the file `chap15start.mdb`. This is still a very simple database with limitations for use in the real world, the most restrictive of which is that a customer may only order a single product per order, but it will suffice for demonstration purposes.

Click on the Relationships button in the main button bar:



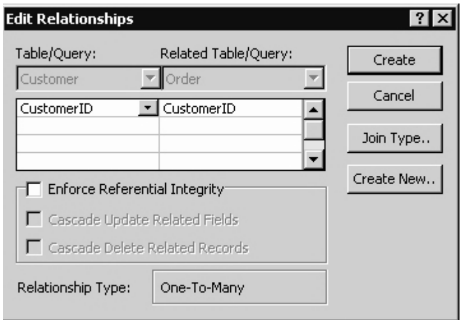
This opens the relationship window, a blank gray window, on top of which is the Show Table window.



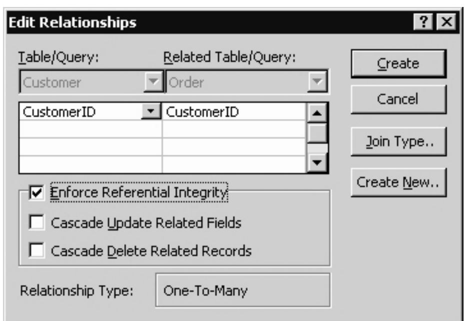
If you don't see the Show Table window, click the Show Table button.

From the Tables tab, double click on each of the tables in the relationship to place them in the relationship window (or highlight them and click Add). We're using `Customer`, `Order` and `Product`. Now close the Show Table window.

The three tables are now in place and you're ready to make the first join. As discussed above, the `CustomerID` field in the `Customer` table is to be joined to the `CustomerID` field in the `Order` table. Click on the `CustomerID` field in the `Customer` table and (holding the mouse button down) drag it across to the `Order` table: when the cursor reaches the `Order` table, it shows as a tiny field. Release the mouse button when the cursor is over the `CustomerID` field. A dialog box pops out, entitled Edit Relationships.



Reading down from the top of the box, Access identifies the fields and tables with which you're working. Then comes a check box labeled Enforce Referential Integrity with two further check boxes grayed out. This sounds rather like a draconian edict issued by Big Brother but is, in fact, Access asking whether it should work behind the scenes to ensure that duff data doesn't sneak into your database. It's a Good Thing and you should check the box.



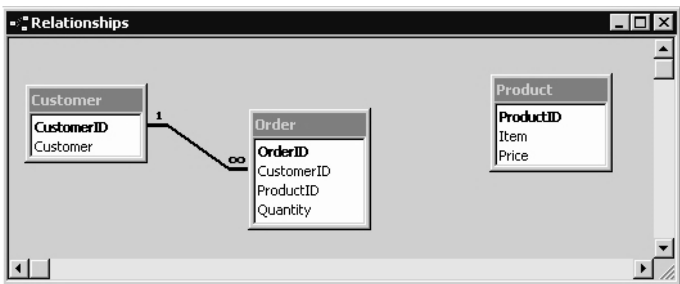
More questions arise as the grayed out boxes spring to life. Are Cascade Update Related Fields and Cascade Delete Related Records also Good Things? Yes, they can be amazingly useful, depending upon circumstances. However, when you're learning and experimenting it's probably best to leave these two unchecked for the moment. As your confidence in using Access and controlling your data grows, you can return and enable either one or both of them. But of course, by writing that we have undoubtedly made you almost insanely keen to know what they do. So...

❛ *Cascade Update and Cascade Delete*

These settings allow Access to automate the housekeeping tasks of updating or deleting records that, in a multi-table database, are spread between many tables. For example, suppose you set Cascade Delete on the join between a `Customer` *table and an* `Order` *table. If you then ever delete a customer's record from the* `Customer` *table, Access would automatically delete the records of every purchase that customer ever made. Generally speaking, this move won't please your accountant, so Cascade Delete is inappropriate in this case. On the other hand, there are cases where Cascade Delete is appropriate – in a database that's storing provisional orders, for example.*

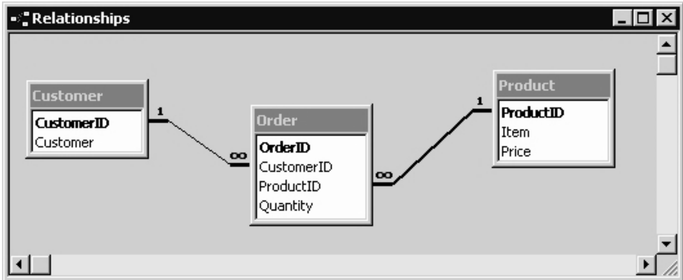
Cascade Update enables you to change the primary key value for a customer even when that customer has placed orders. Both of these options are reasonably powerful and need to be treated with respect since they can wreak havoc when used incautiously. The flip side of that is that they are really useful when used properly so regard them as friends. ❜

At the bottom of the dialog it says Relationship Type: One-To-Many. Types of relationship, of which one-to-many is one, are covered below. For the time being, just accept the default and click the Create button.



In the relationships window you should see a line running between the two fields to indicate the join is in place. There's a tiny one alongside the `Customer` table end of the line and a tiny infinity symbol (a figure of eight on its side) at the `Order` end. These indicate the one (1) and many (∞) ends of the join. This is reasonable since one customer can, and hopefully will, place many orders.

Repeat this process to place a join between the ProductID field in the Product table and the ProductID field in the Order table. Set the referential integrity as before and the relationships window should show these joins.

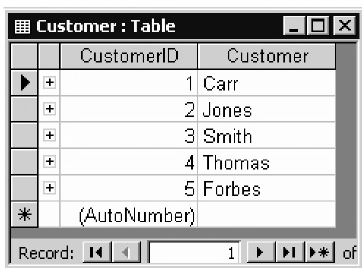


At this point, if you haven't already, it might be worthwhile dragging the tables around until they sit with the Order table in the middle and the joins shown without the complication of crossing lines. When you're working with several tables it's very helpful to be able to spread them out in a pattern that displays the joins clearly. The layout can be saved when you close the Relationships window.

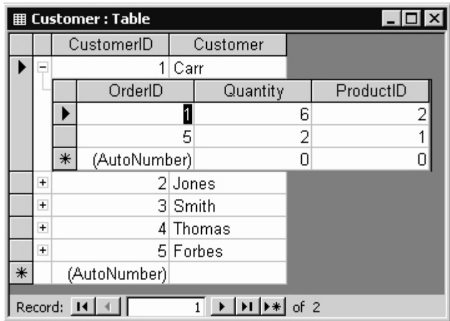
That's it. It has taken us some time to describe this all, but in practice the process is very easy to use and only takes a few seconds to set up.

How joins affect tables and forms

We'll now take a brief look at the three tables to see what effect introducing joins has had. The Order table looks just as it always did but the Customer and Product tables have acquired an extra expand button to the left of each record. The Customer table looks like this:

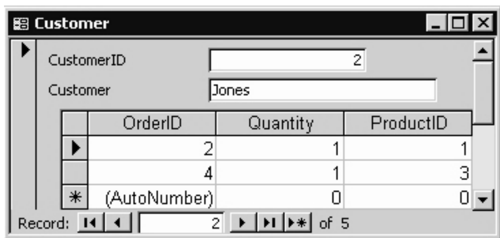


When you click the expand button by the first record, a subtable pops out showing the associated records from the Order table.



Access has automatically given tables at the 'one' end of a join expand buttons to let you see records in the table at the 'many' end of the join.

If you build an AutoForm on the `Customer` table, this too will automatically include a subform to view the data in the `Order` table.



Indexing

We said in Chapter 8 that fields can be indexed and that foreign key fields were almost always worth indexing. We say it again here, even more forcefully: it is a very good idea to index all foreign key fields in your database. The reason is that when you run a query that uses data from more than one table, Access will have to search through the data in one or more of the foreign key fields. If those fields are indexed, the answer to the query will appear more rapidly. If you have large tables of data, this can make a difference of an order of magnitude or more.

Join types

As a break from the practical work, we'll use the rest of this chapter to describe the different types of join that you can set up. If you are really keen to keep on working, you may want to skip this for now and come back to it later. On the other hand, we put it here because it seemed the most logical place for it, so if you can bear it...

One-To-Many relationships

This is by far the most common of the three types of relationship between tables (the other two are One-To-One and Many-To-Many).

❛ *One-To-Many and its friends are also known as joins; in fact both terms are reasonably commonly used.* ❜

A one-to-many relationship indicates that one record from one table may be joined to one or more records in the second table. In our example, you'd hope that your customers would place many orders and buy from you again and again. Each purchase means a record in the `Order` table that's joined to a single customer record in the `Customer` table. It's the same with orders for products: each brew is likely to be ordered many times. The relationship between the `Product` table and the `Order` table is also a one-to-many join.

❛ *Given the business we're discussing, perhaps we should call it a one-too-many join...* ❜

One-To-One relationships

These are rare but can be useful. This type of join ensures that a single record in one table is always and only joined to a single record in the second table.

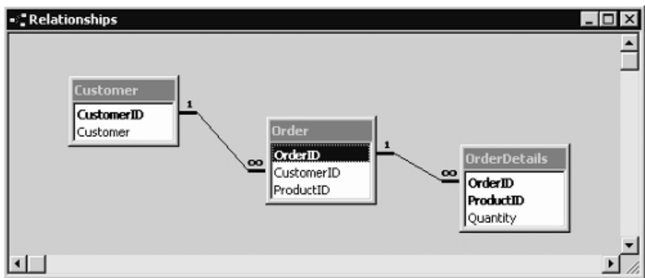
An example of its use would be if you had a table of contact details and that one or two of those contacts went abroad for extended periods. You decide not to store these temporary foreign addresses in the contacts table because most people in the table don't have a foreign address, so you put them in a separate table. With a one-to-one join between this table and the contacts table, each foreign address would be associated only and always with one contact.

Many-To-Many relationships

Describing joins as many-to-many is almost a misnomer as they are constructed with two one-to-many joins used in a specific way. A many-to-many join means that many records from one table can be joined to many records in the second table by making use of a third table as an intermediary.

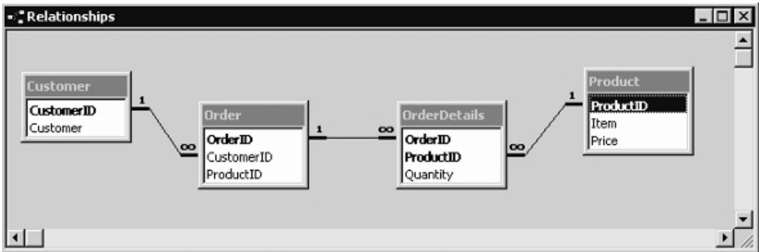
In our example, a customer can buy many different products and each product can be bought by many different customers. A many-to-many join between the `Customer` and `Product` table can therefore be envisaged with the `Order` table acting as the intermediate table. In the practical session above, we made two one-to-many joins (one between `Order` and `Customer` and one between `Order` and `Product`). This, in effect, defines a many-to-many join between the `Customer` and `Product` tables, using `Order` as the intermediate table.

Not all pairs of one-to-many joins form a many-to-many join, however. (It couldn't be that simple, could it?) The two one-to-many joins must have their 'many' ends in the same table, as does the relationship you've just built. Two one-to-many joins like this



do not constitute a many-to-many join. They're just two one-to-many joins between `Customer` and `Order` (one customer can place many orders) and `OrderDetails` and `Order` (one order can be for many items).

‘ *The additional table would mean that a customer could order more than one product at a time. The* `Product` *table is still required and would be joined to* `OrderDetails` *like this. This does produce a many-to-many join which is between the* `Order` *and* `Product` *tables.*



’

In the `chap15twofieldPK.mdb` file you'll find four tables related in this way.

Two field primary keys

Incidentally, the `OrderDetails` table is an example of one in which it is useful to use a primary key composed of two fields – in this case `OrderID` and `ProductID`. This is because, in any one order, we would only expect any one product to appear once. True, the person placing the order may want six of that product, but that is recorded in the `Quantity` field.

To add a two field primary key to a table in Design mode you must highlight both the fields before clicking the Primary Key button. A slight peculiarity in the interface means that you cannot see the little key symbols for confirmation that all is well until you move the focus off the two fields.

Editing joins

If your cursor slips and you inadvertently join the wrong fields or if you forget to set referential integrity (in which case the 1 and ∞ symbols would not be shown alongside the join line) it's easy to edit the join.

Double click on a join line to bring up the Edit Relationship dialog to change the fields or the referential integrity settings.

Deleting joins

Click on the join you want to delete (it becomes fatter when you've selected it) and press the Delete key. Access checks that you're sure; when you answer Yes, the join is removed.

Completing the manual solution

‘ *As we said before, this is an optional exercise.* ’

In order to put the joins described above in place in a hand-built version of the microbrewery database, described towards the end of the last chapter, you'll need to add two fields to the `Order` table, called `CustomerID` and `ProductID`. As these will be the foreign key ends of the joins, they should both be of the Number: Long Integer type. Now you can put the joins in place and create a multi-table database from a single table database.

Summary

In Chapter 14 we discussed the reasons why a multi-table database can be a better tool than a single table database and illustrated how a table can be subdivided. In this chapter you've learned how to join the new tables so that they can be used together by Access to provide the same level of functionality as the old single table. The joins are in place for inspection in the microbrewery database in the `chap15end.mdb` file.

Next we'll construct a complete example to bring together these elements into a working database.

Chapter 16

Tables – a complete multi-table database

Data – divide and conquer

When you begin work on any new database project, it is best to start with pencil, paper and a cup of coffee well away from the computer. This isn't simply to keep the coffee out of the keyboard, the real reason is because the process is one that requires thought in a peaceful environment. In the light of what you wish to extract from the finished database, consider what you need to store in it. In fact, that last sentence contains an important point which is often overlooked. When people start to design a database, they often ask the question "What data do I want to store?" A much better question to ask is "What information do I ultimately want to extract from the database?" Once you have answered that one, you will be in a much better position to decide what information you should store. It is also useful, as discussed in Chapter 14, to identify the various objects that will form the basis of the tables and then to think about how the objects are related.

In our next example, the data to be divided and conquered is for a catalog of books. Four objects have been identified – the books themselves, their category (fiction, humor, poetry etc.) the authors and the publishing houses. Starting from scratch we'll create a complete set of tables and joins in this chapter and the following chapters will build on this database. Using the other three elements of a database – queries, forms and reports – will be covered with reference to multiple tables.

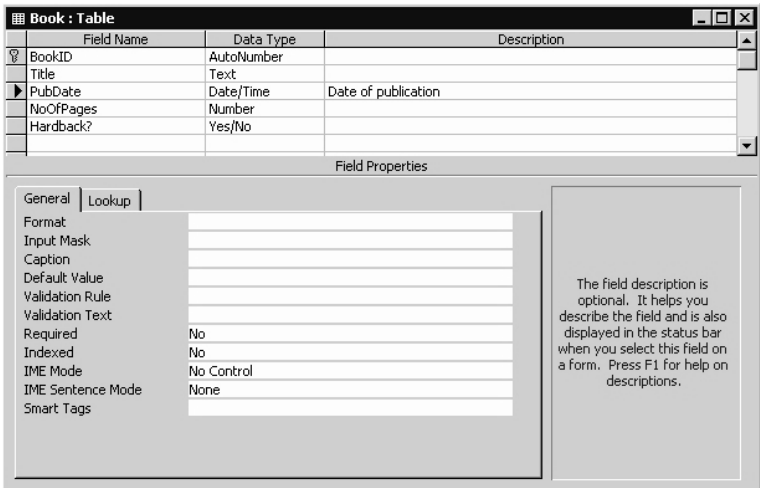
Although our example database will again be compact, one of the joys of a multi-table database is that it is very flexible. If you start selling books, you can add a customer table and an order table, and to track which sales assistants are selling which books, all you need add is a table of staff.

This example, however, will restrict itself to just four tables.

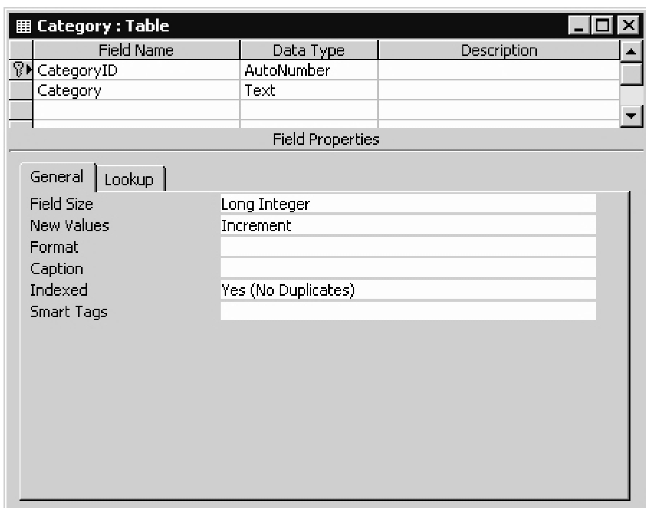
Building the tables

The definitions of each table are shown in the next four screen shots; they all have an ID field of the AutoNumber type. If you need a quick refresher on building tables in Design view, look back at Chapter 8.

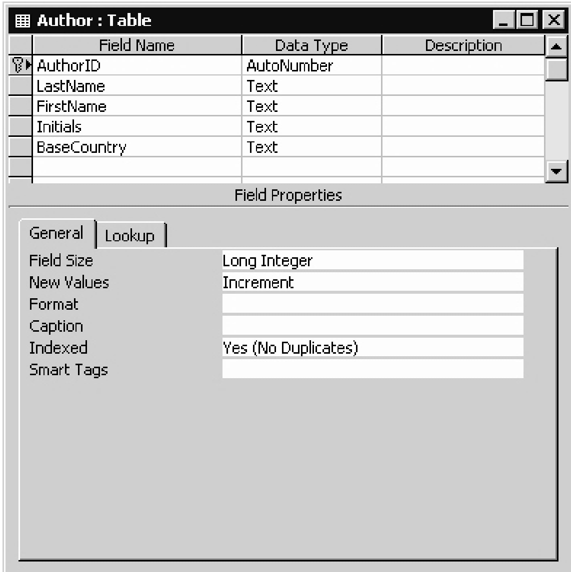
First, here's the `Book` table.



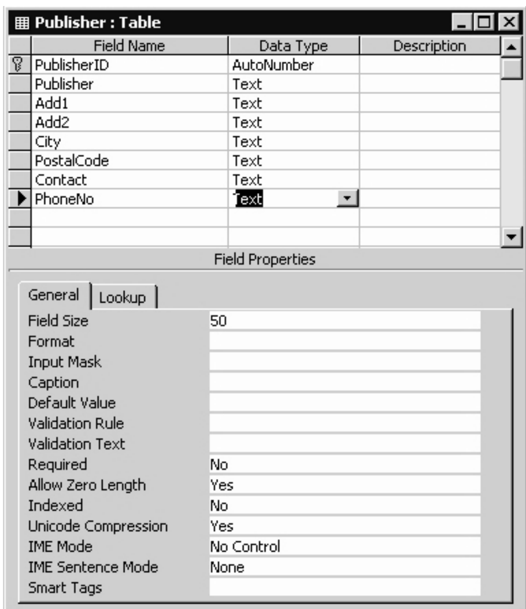
This is the `Category` table,



the `Author` table



and the `Publisher` table.



Adding primary keys

You'll probably be able to see where we're going with primary keys. In each table, the AutoNumber ID field has been designated the primary key field. These are:

`BookID` in the `Book` table
`CategoryID` in the `Category` table
`AuthorID` in the `Author` table
`PublisherID` in the `Publisher` table

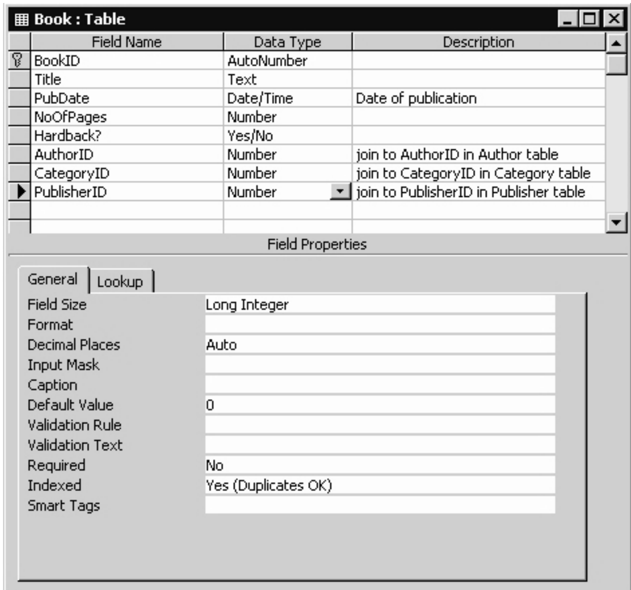
In reality you might choose to use a book's ISBN (International Standard Book Number) as its primary key, these being unique identifiers for almost all published material. They aren't quite universal but for a mainstream book catalog they'd do the job.

In Design view, highlight the field and click the Primary Key button to add these primary keys.

Identifying foreign keys

In order to collate the record for a single book from the entries in all four tables, the `Book` table needs fields to act as foreign keys to the ID fields in the `Author`, `Publisher` and `Category` tables.

To the Book table definition in the Design view, add three fields of the Number: Long Integer type. It is common practice for these fields to bear the same name as their AutoNumber counterparts. This is not obligatory but using the same name does give a good indication of what the join is doing (for instance, matching AuthorID records in one table with AuthorID records in another).



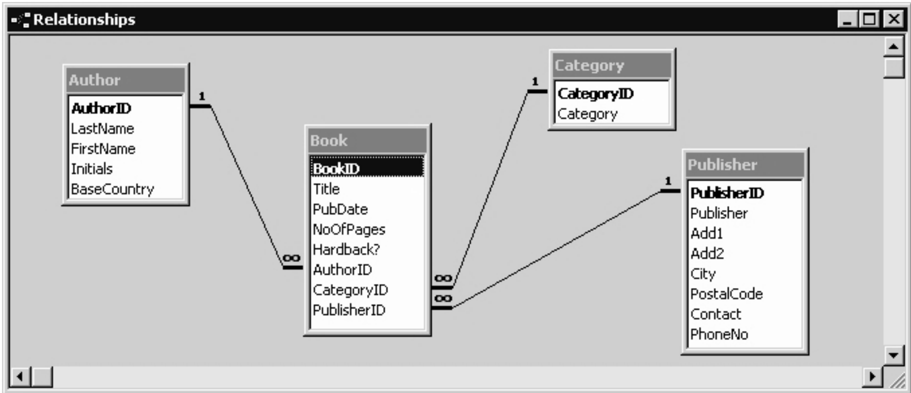
Joining the tables

Open the relationships window by clicking the Relationships button and then put the four tables in place.

Click on the AuthorID field in the Author table and drag it across to the AuthorID field in the Book table and drop it. Ensure that the correct fields and tables are identified in the Edit Relationship dialog, check the referential integrity box and click Create.

Repeat these steps to make the joins between the CategoryID fields in Book and Category and between the PublisherID fields in Book and Publisher.

The relationship window should look like this.



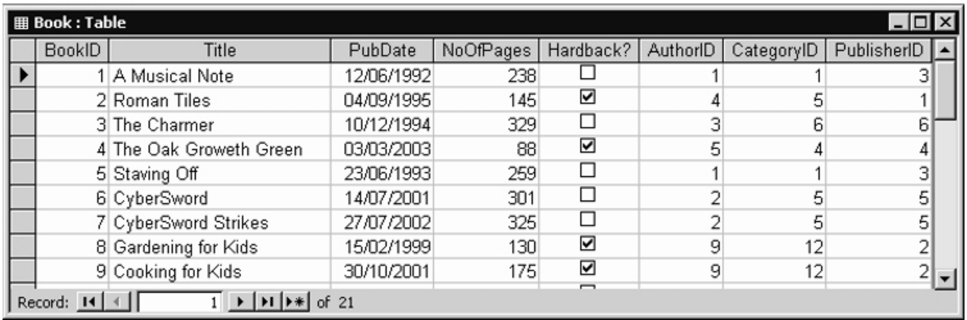
Objects

You may be wondering (worrying) about why we chose category as an 'object' worthy of a separate table. It is true that in this simple example we could have replaced the `Category` table with a lookup field in the `Books` table, giving access to a list of the relevant categories. In a real database there might be other properties associated with the different categories – color, size, packaging etc. We have included it here as a separate table simply to illustrate that objects, in terms of tables at least, aren't always physical objects.

Lookup fields – handle with care (if at all)

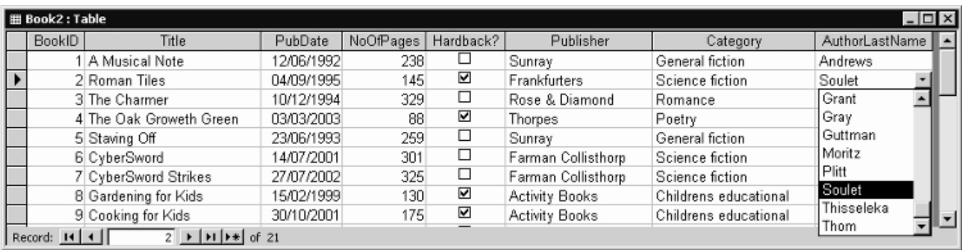
We introduced lookup fields in Chapter 8 and mentioned our reservations about using them to create automatic references to data in other tables. On the face of it, this may seem like a grumpy reaction to a relatively newly-arrived feature in Access, but read on...

When we look at the `Book` table, it does appear rather unfriendly.



BookID	Title	PubDate	NoOfPages	Hardback?	AuthorID	CategoryID	PublisherID
1	A Musical Note	12/06/1992	238	☐	1	1	3
2	Roman Tiles	04/09/1995	145	☑	4	5	1
3	The Charmer	10/12/1994	329	☐	3	6	6
4	The Oak Groweth Green	03/03/2003	88	☑	5	4	4
5	Staving Off	23/06/1993	259	☐	1	1	3
6	CyberSword	14/07/2001	301	☐	2	5	5
7	CyberSword Strikes	27/07/2002	325	☐	2	5	5
8	Gardening for Kids	15/02/1999	130	☑	9	12	2
9	Cooking for Kids	30/10/2001	175	☑	9	12	2

Look at the last three columns: why must we see those nasty numerical values from foreign key fields held in another table? Why not just use a nice cuddly lookup field that can show us the actual data from that other table, not just a numerical pointer? Using lookup fields, our table, now called `Book2`, could look like this:

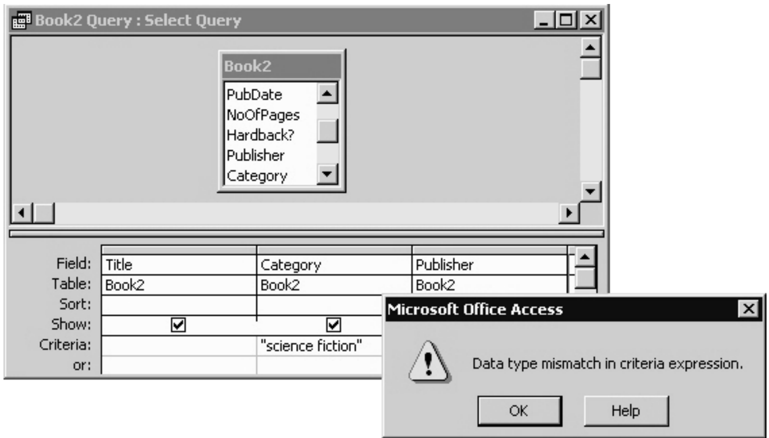


BookID	Title	PubDate	NoOfPages	Hardback?	Publisher	Category	AuthorLastName
1	A Musical Note	12/06/1992	238	☐	Sunray	General fiction	Andrews
2	Roman Tiles	04/09/1995	145	☑	Frankfurters	Science fiction	Soulet
3	The Charmer	10/12/1994	329	☐	Rose & Diamond	Romance	
4	The Oak Groweth Green	03/03/2003	88	☑	Thorpes	Poetry	
5	Staving Off	23/06/1993	259	☐	Sunray	General fiction	
6	CyberSword	14/07/2001	301	☐	Farman Collisthorp	Science fiction	
7	CyberSword Strikes	27/07/2002	325	☐	Farman Collisthorp	Science fiction	
8	Gardening for Kids	15/02/1999	130	☑	Activity Books	Childrens educational	
9	Cooking for Kids	30/10/2001	175	☑	Activity Books	Childrens educational	

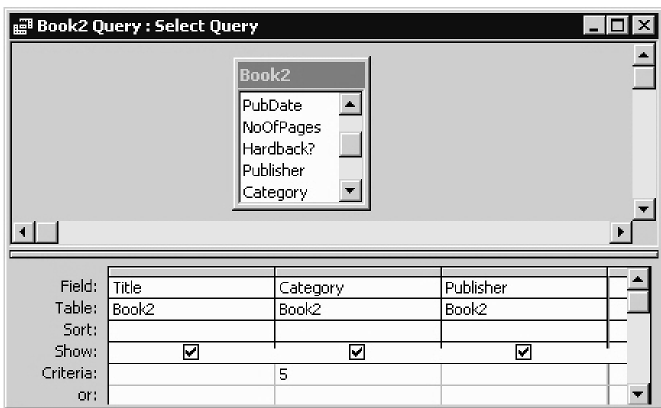
Not only are there proper names in the last three columns, but we also get those handy pop down lists of name from the other tables. Looks good, doesn't it?

You can tell we're not convinced, can't you? And this is why.

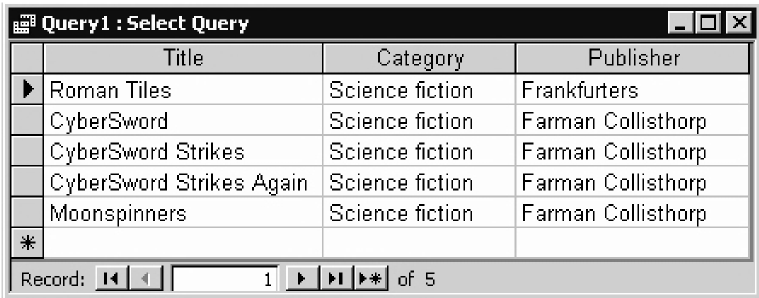
Imagine you want to see all the science fiction titles in the database so you build a query like this, which says 'show me all the records where it says "science fiction" in the Category column'. Fine, easy.



Except that it doesn't run. (`Chap16lookups.mdb` contains the reviled `Book2` table). Access reports a 'Data type mismatch in criteria expression'. What Access wants here is not the friendly text string 'science fiction' but the unfriendly numerical value that, in the Category table, identifies the science fiction category. It happens to be 5, so if you re-write the query like this:



it works.

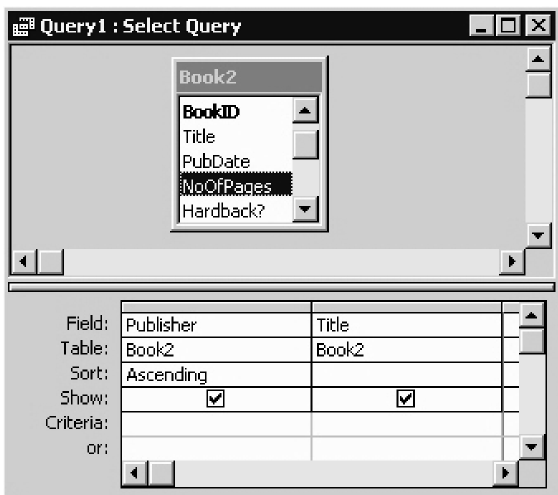

Query1 : Select Query

Title	Category	Publisher
Roman Tiles	Science fiction	Frankfurters
CyberSword	Science fiction	Farman Collisthorp
CyberSword Strikes	Science fiction	Farman Collisthorp
CyberSword Strikes Again	Science fiction	Farman Collisthorp
Moonspinners	Science fiction	Farman Collisthorp

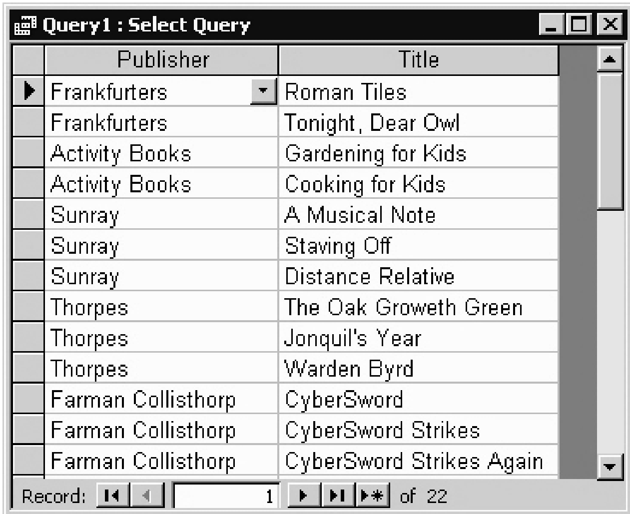
Record: 1 of 5

Those apparently friendly lookup fields aren't quite as obliging as they seem. We can see why if we look at the `Book2` table in Design view. The data type for lookup fields is Number (Long Integer) and that's why any query that uses this field will only recognise numbers and will choke on text strings.

There are other odd effects, such as that illustrated by this simple query to list all titles and publishers, with the publishers in ascending order.



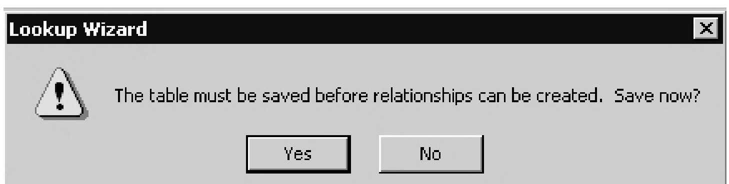
In the answer table, however, the publishers appear to be listed in random order:



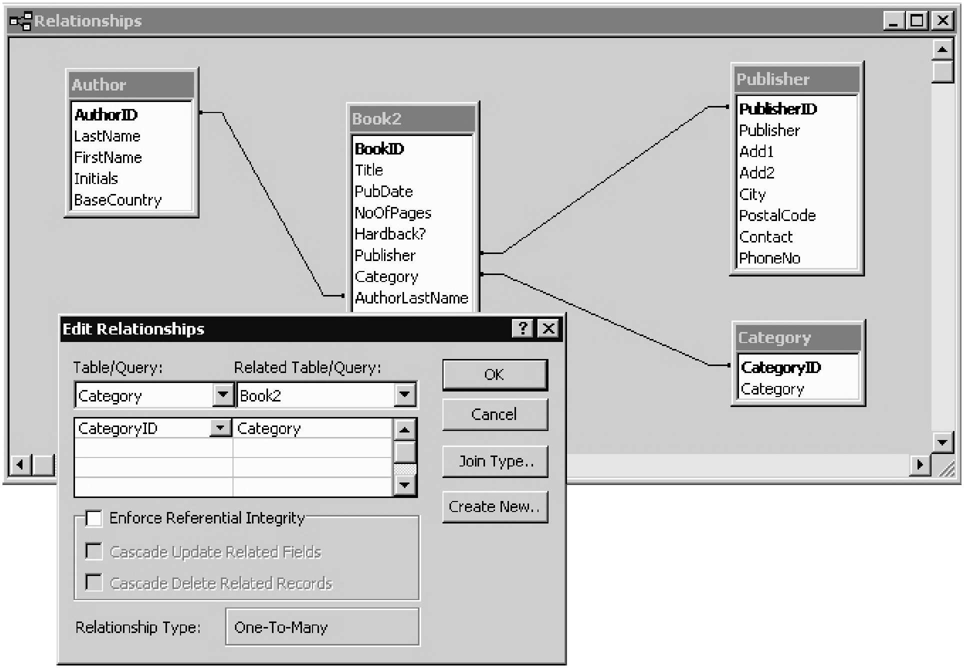
Publisher	Title
Frankfurters	Roman Tiles
Frankfurters	Tonight, Dear Owl
Activity Books	Gardening for Kids
Activity Books	Cooking for Kids
Sunray	A Musical Note
Sunray	Staving Off
Sunray	Distance Relative
Thorpes	The Oak Groweth Green
Thorpes	Jonquil's Year
Thorpes	Warden Byrd
Farman Collisthorp	CyberSword
Farman Collisthorp	CyberSword Strikes
Farman Collisthorp	CyberSword Strikes Again

Once again, it's because of the numerical data that underlies the lookup table. Inspecting the `Publisher` table shows that Frankfurters' ID is 1, Activity Book's is 2 and so on, and this is the order into which the lookup field entries have been sorted.

Furthermore, when we add lookup fields to our new book table, the wizard shows us the following message:



The lookup wizard is creating the joins between tables. Looking at those joins with the Relationships window, we see that no referential integrity settings have been put in place.



Referential integrity is, you'll recall, Access' behind-the-scenes way of keeping your data tidy and free from errors. You can, of course, edit the joins to add referential integrity but it's a step that might be forgotten.

These are, in our opinion, good reasons why we should stick to the 'classical' primary key to foreign key joins between our tables and not be lured away by the pretty face of lookup tables. Forms are equally good at hiding numerical complexity and they're considerably more flexible and have the potential to be even prettier. It's easier to write queries that work and they're more likely to return the answers you expect. Lastly, your data is safer from errors.

Summary

The basic structure of the book database is now complete; the tables have been built and the joins are in place between them. All it lacks is some data. Being the amiable types we are, you'll find a file called `chap16end.mdb` containing a database of an identical structure to the one described in this chapter and, what's more, it contains data. When you look at the table view of this data, you'll see that expand buttons appear alongside records in the `Category`, `Publisher` and `Author` tables, placed there automatically by Access.

Chapter 17

Queries – finding data from multiple tables

Check out the data

Take a few moments to look over the four tables in the `Book` database with data (`chap17start.mdb`). Check out the Datasheet view of the `Author` table: everything looks as you'd expect, including those useful expand buttons in the first column. Click on one and, again as you'd expect, a subtable pops out showing the related record or records from the `Book` table (to which the `Author` table is joined). This is the first proof that the joins in the new database are working: Access is using them to show you related records.

Having built a complete set of tables and allocated the data between them, you now have various tables each of which holds only one aspect of the whole catalog. For a human being interacting with the database, this could perhaps be seen as less than ideal so a method is required to collate the data into a complete record. This, as the chapter title implies, is done with queries.

Bringing it all back together

A query can be based on one table or on many and building multi-table queries differs not very much from building single table queries. We'll build one now for showing complete records from the book catalog.

Multiple table queries

From the Queries tab in the database window, double click to build a new query in Design view. From the Show Table dialog, select all four tables (click on the first in the list, which should be highlighted and drag downwards to select them all, and then click Add). In the Table/Query pane you'll see the tables are displayed with their joins represented as lines, just as they are in the Relationship window. You can, if you wish, drag the tables into positions where the joins can be seen clearly.

Turning to the Query Design pane, the quickest way to see all the fields is to double click on the asterisk line in each table, a short cut to adding all the fields in the table to the query. The result, however, isn't ideal.

Query1 : Select Query

Book.CategoryID	Book.PublisherID	Category.CategoryID	Category	Publisher.PublisherID	Publisher	Add1	Add2
1	3	1	General fiction	3	Sunray	Sunrise House	1934 Maple Boulevard
5	1	5	Science fiction	1	Frankfurters	Frankfurter House	Wurstweg 12
6	6	6	Romance	6	Rose & Diamond	Cupid's Bower	Love Lane
4	4	4	Poetry	4	Thorpes	The Old Rectory	Great Lapford
1	3	1	General fiction	3	Sunray	Sunrise House	1934 Maple Boulevard
5	5	5	Science fiction	5	Farman Collisthorp	Suite 2387	134 Beach Drive
5	5	5	Science fiction	5	Farman Collisthorp	Suite 2387	134 Beach Drive

Record: 1 of 21

This shows part of the very wide answer table which contains several columns of extraneous information such as the ones shown above labeled `Book.CategoryID` and `Category.CategoryID`. These are displaying the ID fields from the `Book` and `Category` tables which isn't particularly helpful, especially as further along the answer table is a column labeled `Category` containing the type of book in plain English. The same happens with publisher and author ID data.

❛ *When Access needs to differentiate between fields of the same name from different tables, it displays the field name preceded by the table name, the two names being separated with a dot. The answer table above has fields labeled* `Book.CategoryID`, `Book.AuthorID` *and* `Category.CategoryID`, *amongst others.* ❜

To build a more concise and user friendly answer table takes a little longer but is well worth the effort. Close this query without saving it and start again in Design mode, adding all four tables as before. This time select fields from each table, leaving out every field that ends with 'ID'.

Query1 : Select Query

Title	PubDate	NoOfPages	Hardback?	Category	FirstName	LastName	Initials	BaseCountry	Publisher
A Musical Note	12/06/1992	238	☐	General fiction	Alan	Andrews	A	UK	Sunray
Roman Tiles	04/09/1995	145	☑	Science fiction	Yves	Soulet	J-C	France	Frankfurters
The Charmer	10/12/1994	329	☐	Romance	Sandra	Grant	P	USA	Rose & Diamond
The Oak Groweth Green	03/03/2003	88	☑	Poetry	Sunny	Thom		USA	Thorpes
Staving Off	23/06/1993	259	☐	General fiction	Alan	Andrews	A	UK	Sunray
CyberSword	14/07/2001	301	☐	Science fiction	Sam	Bradford		UK	Farman Collisthorp
CyberSword Strikes	27/07/2002	325	☐	Science fiction	Sam	Bradford		UK	Farman Collisthorp
Gardening for Kids	15/02/1999	130	☑	Childrens educational	Frances	Francis		UK	Activity Books
Cooking for Kids	30/10/2001	175	☑	Childrens educational	Frances	Francis		UK	Activity Books
Spook City	13/11/1997	342	☐	Horror	Hugh	Gordon	K	UK	SkullShocks

Record: 1 of 21

The resulting answer table is still rather wide but its contents are a lot easier to understand. You can see complete records without any of the ID numbers that are primarily for use by Access rather than by users.

This query can also be created using the wizard: the choice of tools is up to you. I've saved this query, calling it `Everything`.

The rest of this chapter goes into more detail about querying multiple tables, different types of join, basing queries on other queries and so on. However, we have already covered the most important lesson that you can learn about querying multiple tables – which is that it is amazingly easy to do. And not only that, the result is also amazing. In earlier chapters we have shown you how to split the data up so that it is placed neatly in the separate tables. This query pulls it together again with Access doing most of the work for you. It is automatically matching all of the data in the primary and foreign keys; you don't need to tell it to do so explicitly once the joins are in place. With a trivial amount of work you can pull the data that you need from the tables and see it is a way that is intuitively easy to understand.

As long as that message is clear, you have already understood most of what this chapter has to offer. We think the rest of the chapter is worth reading (it wouldn't be here if we didn't) but it is icing on the cake. However, icing is well worth having so let's look at that now.

The effect of joins on queries

The data that the query places in the answer table is selected on the basis of the joins present between the base tables (`Book`, `Author` etc.). Now when you create a join between two tables in the Relationship window, unless you specify otherwise, that join is what is called an Inner join. When we showed you the Relationship window (Chapter 15) we didn't show you how to create any other type of join apart from Inner because, as a good general rule, you don't often use any other type. Why? Because if you create an Inner join from the Relationship window, you can always modify it at query time if need be. Of course, now that we've said that, you want to know about the possible variants. Fine, no problem.

Inner join

The queries we've demonstrated in the book thus far look for matching data in the fields at either end of the join and, when a match is found, the record is popped into the answer table. So, if the value in the primary key matches the one on the foreign key, the data from the two records appears in the answer table. Conversely, if there's no matching data, there will be no record in the answer table.

This 'normal' type of join is properly called an inner join and is the default join type, always combining two or more tables on the basis of identical values within joined fields. It works well and is extremely useful but there may be occasions when you want something different.

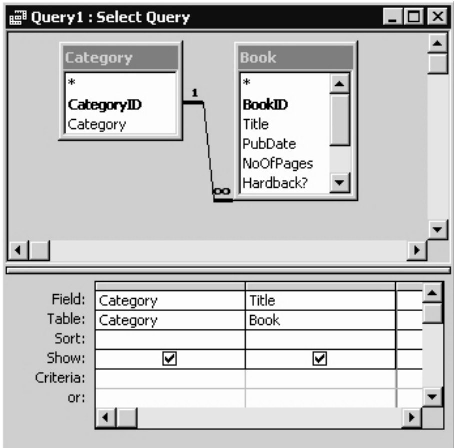
Into the `Category` table you have entered all the likely classifications of book in the catalog. Suppose that, having also entered some book records, you want to see if there are any categories that are not represented by the current collection of books. If we use an inner join in the query, unallocated categories won't show up in the answer table from a query because, despite having a `CategoryID` number in the `Category` table, they have no matching records in the `CategoryID` field in the `Book` table. To produce the answer table you want, what you need is an outer join.

Outer join

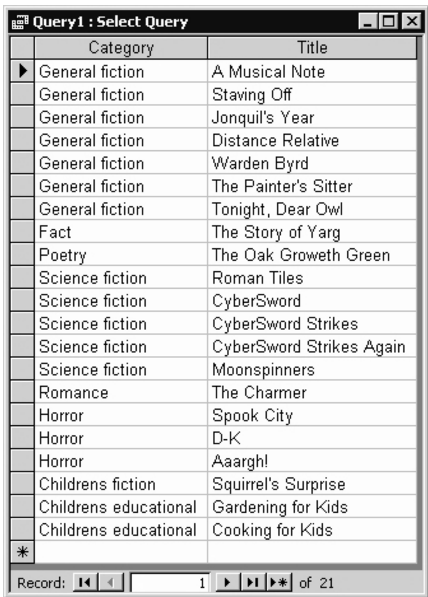
If you use an outer join between the tables, the answer table generated by a query will let you see **all** the records in the table on one side of the join, even if there is no match in the other table.

In fact, to be pedantic, there are two types of outer join, depending on which records you wish to see in their entirety. The proper names for these flavors of outer join are 'left outer join' and 'right outer join' (although people often leave out the 'outer' part of the description and talk about left and right joins). The terms 'left' and 'right' come from the syntax used in the SQL querying language. The good news is that these translate very well into the Access query builder which makes left and right joins delightfully simple to use. However, this is probably getting far too theoretical and a demonstration should make it all clearer.

Create a new query in Design view and add the tables `Category` and `Book`. Select the fields `Category.Category` and `Book.Title`.



This is using the default join type, inner (which it is taking from the relationship window), so when we run it we see all of the books, each with its category.

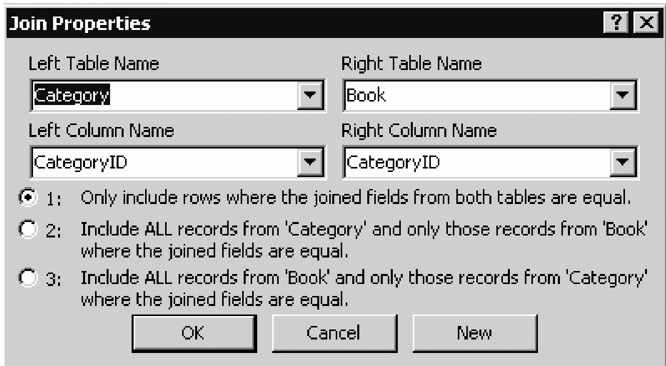


Query1 : Select Query

Category	Title
General fiction	A Musical Note
General fiction	Staving Off
General fiction	Jonquil's Year
General fiction	Distance Relative
General fiction	Warden Byrd
General fiction	The Painter's Sitter
General fiction	Tonight, Dear Owl
Fact	The Story of Yarg
Poetry	The Oak Groweth Green
Science fiction	Roman Tiles
Science fiction	CyberSword
Science fiction	CyberSword Strikes
Science fiction	CyberSword Strikes Again
Science fiction	Moonspinners
Romance	The Charmer
Horror	Spook City
Horror	D-K
Horror	Aaargh!
Childrens fiction	Squirrel's Surprise
Childrens educational	Gardening for Kids
Childrens educational	Cooking for Kids

Record: 1 of 21

But we want to see which categories aren't used. So go back to the query definition and double click on the line that joins the two tables. This dialog should open up.



This shows the Join Properties of which there are three, all described in the dialog box in plain English.

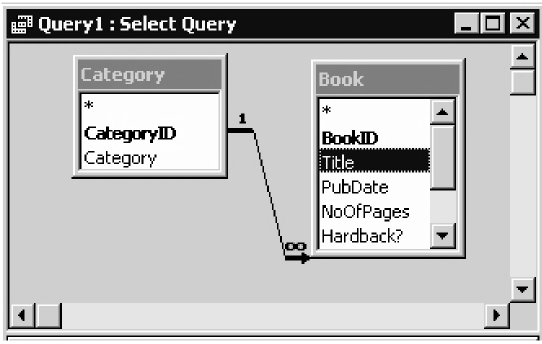
1. The first is the default, the workhorse inner join. Hopefully, you will recognize it from the description given above.
2. The second type explains that it will give all the records from the `Category` table plus the matching ones from the `Book` table.
3. The third type is the reverse: all records from the `Book` table plus the matching ones from the `Category` table.

To get the result described above (all the categories regardless of whether or not the catalog contains books in each category) we want to use the type 2 join.

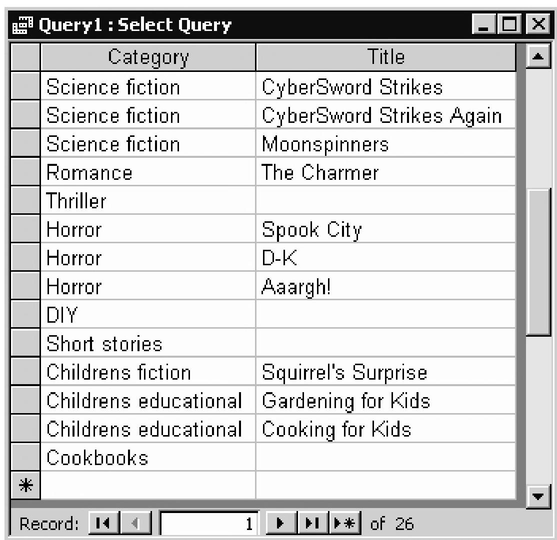
A type 3 join, in this instance, would give the same answer as a type 1 join because every record in the Book table has been allocated a category though, of course, it depends on your data and won't always be the case.

So, select the second option and click OK.

In the query window, the line depicting the join has changed subtly to include an arrowhead at the `Book` end of the join.



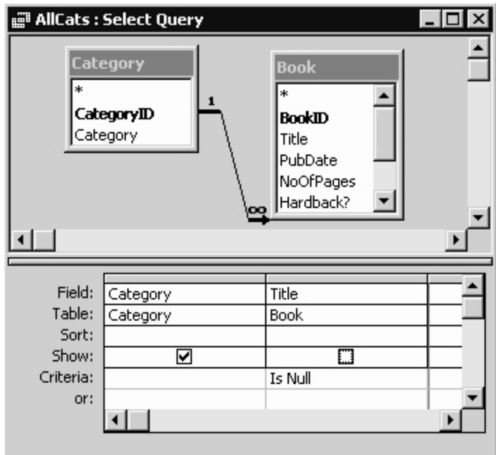
Run the query and...



Category	Title
Science fiction	CyberSword Strikes
Science fiction	CyberSword Strikes Again
Science fiction	Moonspinners
Romance	The Charmer
Thriller	
Horror	Spook City
Horror	D-K
Horror	Aaargh!
DIY	
Short stories	
Childrens fiction	Squirrel's Surprise
Childrens educational	Gardening for Kids
Childrens educational	Cooking for Kids
Cookbooks	
*	

there are all the category records, most of them with associated book titles but some of them without. Just from this portion of the answer table we can see that there are no cookbooks, short stories or books in the DIY category. This query is saved as `AllCats`.

Now we have demonstrated the left outer join and that is, theoretically, the end of the demo but we can't bear to leave it at that because you're probably wondering 'But how do I get a list which shows just the categories that aren't used?' This has nothing to do with left outer joins but it's a good question and we can answer it using information you already have about queries. All we need to do is to add a condition to the query which says 'Show me this same list, but only include the records where the entry for the field `Book.Title` is null (that is, where there isn't a book title).' This is easily achieved by adding an 'is null' operator under `Book.Title` and deselecting the Show check box:



which produces:

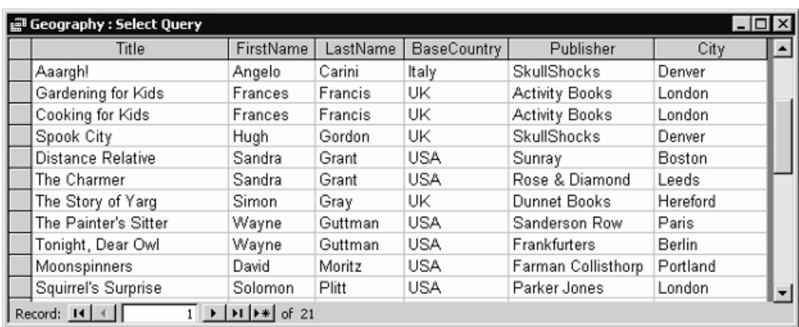
As we said above, the right outer join (showing all books) is, in this instance, the same as an inner join because all books have categories. However, as you start to build more complex databases the distinction between left and right outer joins can become useful. The important take-home message from this exercise is that Access normally returns all records where the values in the primary and foreign key match. On those occasions when you want to see values that don't have a match in the other key, you can use an outer join. This query is saved as `UnusedCats` (which sounds rather sad to an animal lover, but never mind).

There may come a time during your experimentation with joins and queries when you produce an answer table with many more records than you expect. The reason, almost certainly, is that the query has produced a Cartesian product. This grand name means that there were no joins between the tables in your query definition and when asked to perform a query based on unjoined tables, Access tries to help by working out all the possible permutations. Six records in one table and 16 in a second gives 96 records (6 × 16 = 96), most of them nonsense. This can become more serious with large tables. Given 10,000 records in each, the answer table will have 100,000,000 records.... The only thing to do is to go back to the Relationship window, install some joins and rewrite the query.

Basing a query on a query

As mentioned in Chapter 9, queries can be based on other queries. This is often an efficient approach, especially with multi-table queries which take a little longer to set up than those based on single tables.

I already have the `Everything` query to hand so when I want to find out in which countries authors are based and also in which country the publishers of their books are located, I can base a new query on `Everything`. Below is shown the new query, called `Geography`, which is based on that `Everything` query and with the records sorted by author last name:


Geography : Select Query

Title	FirstName	LastName	BaseCountry	Publisher	City
Aaargh!	Angelo	Carini	Italy	SkullShocks	Denver
Gardening for Kids	Frances	Francis	UK	Activity Books	London
Cooking for Kids	Frances	Francis	UK	Activity Books	London
Spook City	Hugh	Gordon	UK	SkullShocks	Denver
Distance Relative	Sandra	Grant	USA	Sunray	Boston
The Charmer	Sandra	Grant	USA	Rose & Diamond	Leeds
The Story of Yarg	Simon	Gray	UK	Dunnet Books	Hereford
The Painter's Sitter	Wayne	Guttman	USA	Sanderson Row	Paris
Tonight, Dear Owl	Wayne	Guttman	USA	Frankfurters	Berlin
Moonspinners	David	Moritz	USA	Farman Collisthorp	Portland
Squirrel's Surprise	Solomon	Plitt	USA	Parker Jones	London

Record: 1 of 21

It's a quick and easy way to generate the answer, so when you need a new query, consider whether you have an existing one that can be pressed into service like this.

Summary

Queries in multi-table databases are even more flexible than they are in single table databases because you can 'mix and match' data from the various tables to reach precisely the information you want. All the different types of queries covered in Chapter 9 (range, update, crosstab and so on) are, of course, still available to you.

A query can either take all the records that have matching records in the tables to which they are joined or, using outer joins, you can insist that all records from a specific table are included in the answer table. Queries can be based on one table, all tables or a subset of tables and, by recycling an existing query as the basis for another, you can work even more efficiently.

The queries described above are to be found in the `chap17end.mdb` file.

Chapter 18

Forms – your interface to multiple tables

Forms and functions

So far you've only seen data from the `Book` multi-table database from the viewpoint of query-generated answer tables. This is fine for development work by people with an intimate understanding of the data but isn't half so fine for anyone expected to use the database simply as a tool. Users need to enter new records, browse and update existing records and be able to do this while looking at a pretty face.

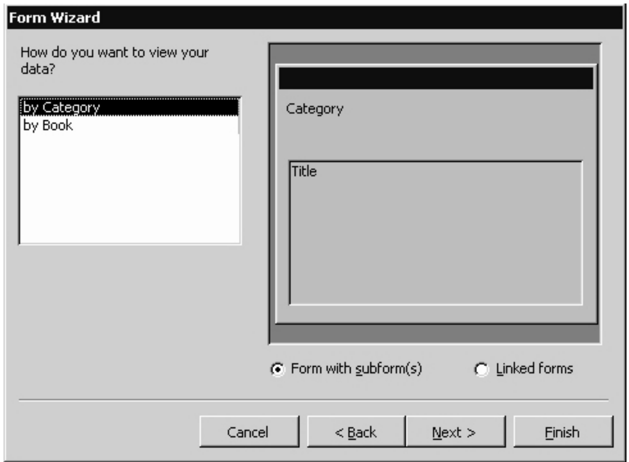
Forms provide the pretty face and hide the excessively databaseish appearance of tables of raw data from the squeamish. Forms also have several neat ways of presenting data that can make life easy for users; chief among these is the subform.

Subforms

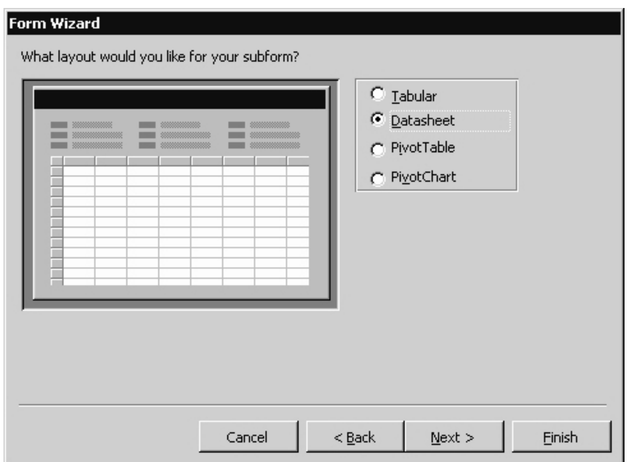
Consider the outer join query we built at the end of the last chapter. It shows each category of books together with the books in each category. A form with a subform is an ideal mechanism for displaying this information because it lets you see the category record as well as the related book records. Furthermore, the book records are presented in a way that makes it easy to browse through them. We could expend hundreds of words explaining what a subform is, but it's easier to show you.

Creating a form with a subform

Let's do this first with the Form wizard, working with the `chap18start.mdb` file. Launch the wizard and in the first step, select the `Category` table and, from that, choose the `Category` field. Switch to the `Book` table and choose the `Title` field and then click the Next button. The second step looks like this:



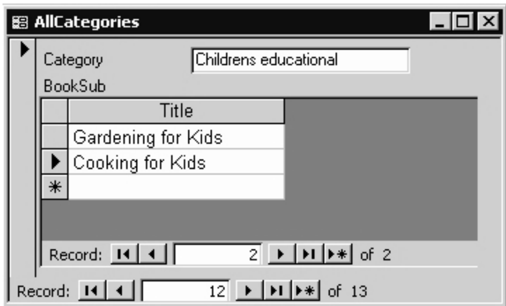
The wizard has determined that a subform is likely to offer the best view of the fields you've chosen and is asking whether you wish to view them by category or by book. The default has the 'by Category' option selected and in the preview panel to the right, you can see that the category will be shown at the top of the form with the book titles listed in a subform. If you move the highlight to 'by Book', you'll see that the wizard thinks a single form would display the records in their best light. However, we're here to inspect subforms so return to the 'by Category' selection and click Next.



Pick a layout for the book record subform from the options shown: the preview shows that each of the options retains the category records in the same position at the top of the main form, above the book record subform. I'll go with Datasheet and click Next.

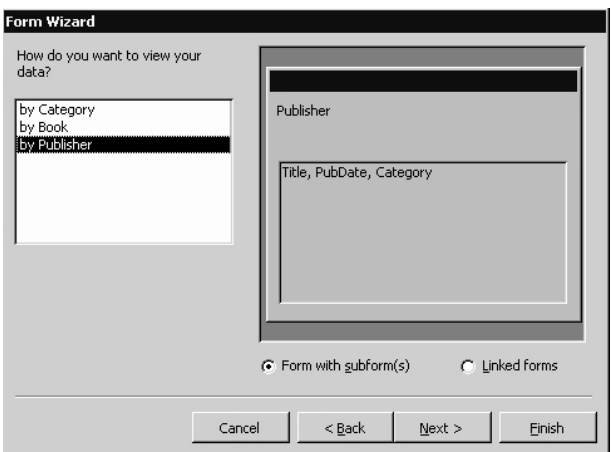
Pick a style, in the final step give names to the form and subform (these are `AllCategories` and `BookSub`) and click Finish.

This is the resulting form.

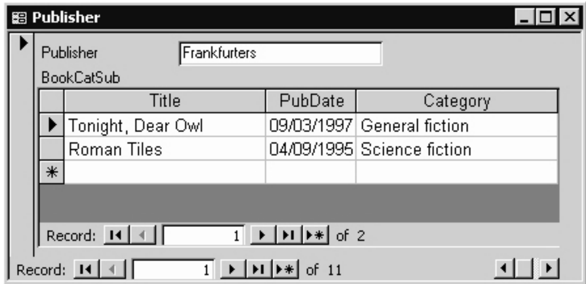


The category is shown at the top of the form and controls for moving through the category records are at the bottom of the form. In the subform, book records are shown, again with controls below.

You can base a form-with-a-subform like this on more than two tables, for instance, a subform can display records from both the `Book` and the `Category` tables with the form showing records from the `Publisher` table. The step defining the subform looks like this:



and the resulting form/subform like this:



This form is called `Publisher` and the subform, `BookCatSub`.

❛ *Choosing memorable names for forms and subforms is quite important because after only a short period of experimentation, you can find the Forms tab bursting with forms. Remembering the relationships they have to each other can be tricky without hints from their names.* ❜

You can move the order of fields in the subform by clicking on the header when the cursor shows as a broad down arrow to select the whole column in the subform. Now you can click and drag the selected column to a new location. The layout will be saved whenever you close the `Publisher` form, an action which also closes the `BookCatSub` subform.

Note that when you use the form, you can edit all of the fields, including those in the subform. You can even add a `Category` but you can't add a book: a little thought tells you why.

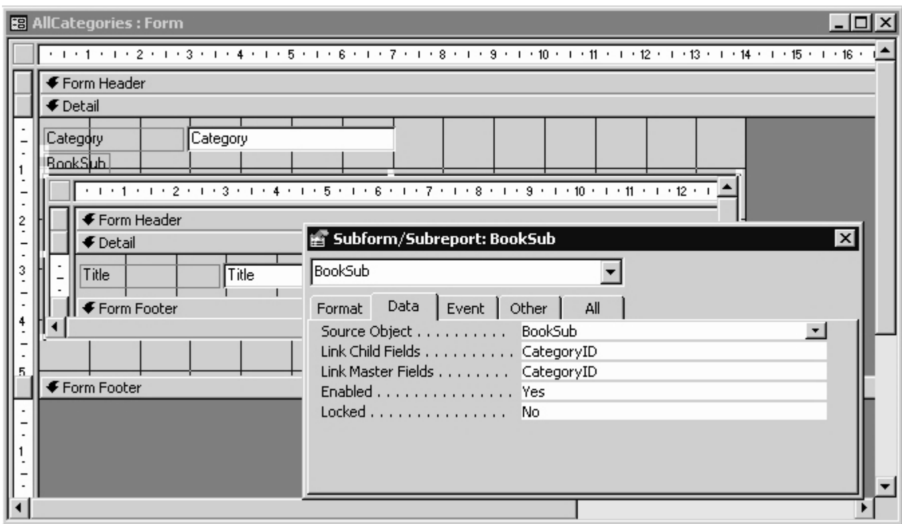
❛ *I hate books that say that, it always implies to me that the authors don't understand it either. So, the reason is that the subform isn't showing all of the information necessary to ensure that all of the records are complete. If Access let you add a book you would end up with a strange incomplete record. And, in practice, deciding which records can be updated/added is more taxing than it first appears for any RDBMS (Access included) so they tend to err on the side of caution.* ❜

That's really clever, but what happened?

This wizard is very powerful (clearly a member of some inner circle of magicians) by which we mean that it makes a complex process really easy. To use the wizard you don't have to know how it works. On the other hand, you may be curious to know how a form and its subform work together. So that's what we are going to explain in this section but feel free to skip it for now (or for ever) if you aren't interested in the underlying mechanism.

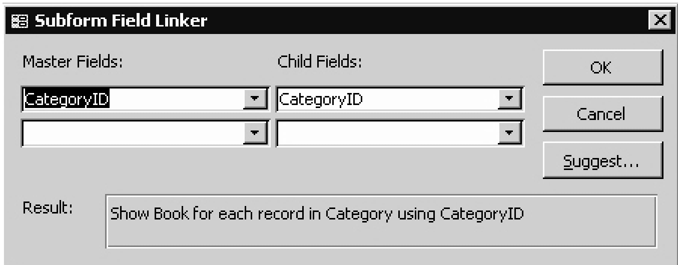
If we take the first example, the wizard created two forms – `AllCategories` and `BookSub`. If you open the form `BookSub` on its own, you'll find that it's a fairly basic form that displays the `Title` field from the `Book` table as a datasheet. Note that it shows all of the books, not those associated with any particular category. So, when this form is used as a subform in the form called `AllCategories`, something in `AllCategories` must be doing the clever work.

So, open up the form `AllCategories` in Design mode and open up the properties window. Now click once on the subform so that it is highlighted with handles around the edge and so that the properties window reads Subform/Subreport: BookSub. (Aim to click at the very top edge of the subform, above the ruler, when the cursor is showing as a white arrow.)



The Data tab of the property sheet shows how the two forms are linked. The `CategoryID` field in the `Book` table (the Link Child Fields property) is being used to select the records in the book table that match the `CategoryID` field in the `Category` table (the Link Master Fields property).

Clicking on the Build button that appears when the cursor is on Link Child Fields opens the Subform Field Linker which states the result of the current settings:



You can look at the Link Master Fields settings in the same way.

Since neither the property sheet nor the Subform Field Linker shows the table names associated with the `CategoryID` fields, you might wonder how I know which is the master and which the child. The answer is that link child fields always come from the subform.

OK, that's the end of the mechanics.

Another form based on multiple tables

Subforms aren't the only way of viewing data from multiple tables on one form. Another method that's very commonly used is to base a form on a query. The query pulls together records from multiple tables (from two or up to as many as there are in the database) and a form is then based upon that query.

If you base a form on the `AllCats` query, you can navigate through all the records and see the title of each book and its category.

When you're designing a form, the use to which it is to be put should be the deciding factor. The subform gives more of an overview while the simple form shown above lets the user concentrate on one record at a time.

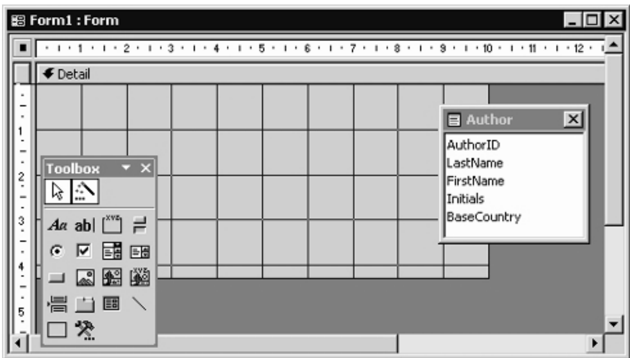
More form controls

Now's the time, as promised at the end of Chapter 11, to introduce the remaining form controls. Returning to the subform theme, we'll look at creating these from the Design view rather than from the Form wizard.

Subform/Subreport control

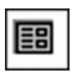
This example is to show the author on the main form and details of the books the author has written and their categories on the subform.

From the Form tab in the database window, click New, select Design View and the Author table.



You should see a field list on the screen (as above) showing the fields in the Author table; if you don't, click the Field List button on the main button bar. Click on the LastName field and drag it onto the Detail section.

After checking that the Control Wizards button at the top of the Toolbox is selected, click on the Subform/Subreport button



in the Toolbox and drag to outline a rectangle on the Detail section. When you release the mouse button, the SubForm wizard starts up and asks whether the data for the subform is to come from existing tables and queries, or from an existing form (a list of which is shown). The book records I want to see are in the Book and Category tables, so click the top option button and click Next. Select the Book table and move the Title field into the Selected Fields list. Now select the Category table and move the Category field across.

Click the Next button. Here you determine how the records in the main form are linked to those in the subform; the default 'Choose from a list' option displays two possible links.

For this example, the first choice sounds fine, selecting the records from the `Book` table on the basis of the `AuthorID` field.

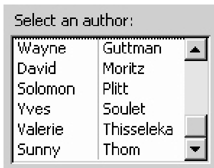
If the wizard's suggestions don't suit, click the 'Define my own' option and set the fields for the form and subform as appropriate. You may have to go back a step to add the fields you need for linking purposes if these don't already figure as fields to be displayed in the subform.

Click Next and name the subform in the final step (`TitleCategory`), clicking Finish thereafter. This is the Form view of the new form, called `WhoWroteWhat`, with its subform after a little judicious rearranging:

With the browsing controls at the bottom of the form you can move between author records and as you do so, the relevant book and category records are shown in the subform. Further browse controls let you move through these records too.

List Box control

List boxes are especially useful on forms used for entering new data where they can eliminate misspelled words and inappropriate entries. The list box shows the user a list of all the possible entries for a field; picking one will fill in the field accurately. This is an example of how a list box on a form can look:

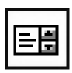


In many cases, the list that appears in the list box will be taken from an existing table though it is possible to type in a list of entries when you create the list box using the wizard.

The example below builds a form called `AddNewBook` for entering new book records. It will use three list boxes for entering the category, author and publisher for each new book. In each case, we want to ensure that details of the author and publisher are already stored in the database and that the book falls into an existing category.

From the Form tab in the database window, click New, select Design View and the `Book` table. From the Field List add the `BookID`, `Title`, `PubDate`, `NoOfPages` and `Hardback?` fields to the Detail section of the new form.

Now click on the List Box control in the Toolbox

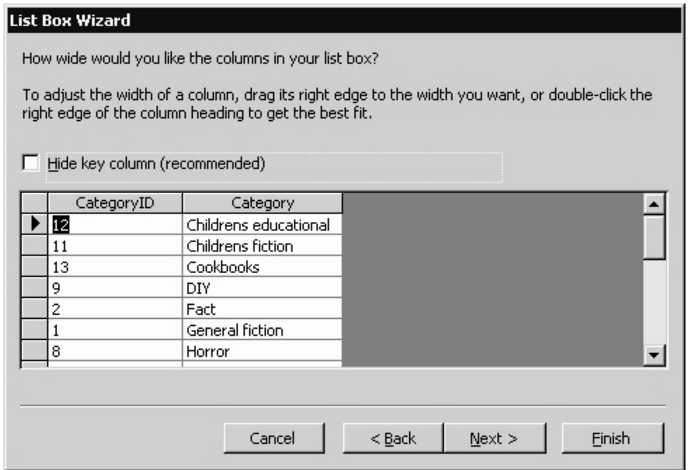


and drag an outline for it on the form. The first step of the List Box wizard offers three options for the location of the values to appear in the list. The top option finds them in an existing table or query and is the default; it's also the one we want.

Click Next to choose the table or query containing values for the list; this list box will let users select a book's category so here it's the `Category` table. Click Next and add the `Category` field to the Selected Fields list and click Next.

Now add a sort order – it would be helpful to have categories displayed in ascending alphabetical order – and click Next.

The next step lets you set column widths: make the column width 'best fit' by double clicking on the right edge of the column. There is also an intriguing check box which, of course, it's impossible not to uncheck:

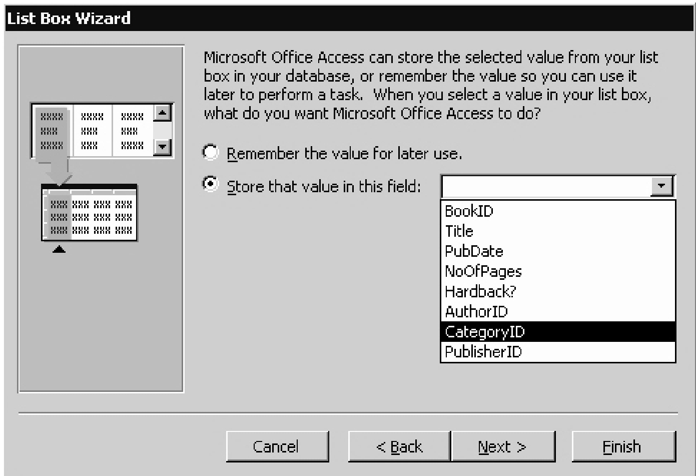


Unchecking it shows the `CategoryID` field which has, in fact, been added by the wizard. You can see this if you go Back two steps to where you selected just the `Category` field: it's been joined by `CategoryID`.

Adding this field is a sensible action by the wizard because it is the `CategoryID` field that is the basis for the link between the `Book` and `Category` tables.

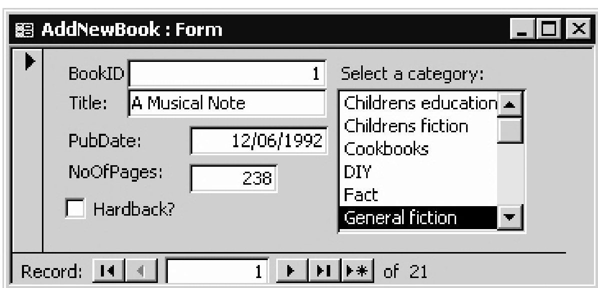
Click Next to return two steps and click to reselect the option to hide the key column because, in the finished list box, you'll want users to see the categories in plain English, unencumbered by the ID number that exists primarily so that Access can ensure data integrity.

Click Next. When a user chooses a category when entering a new record, this information needs to be transferred into the right field in the `Book` table for storage. Of the two options offered, the second one fits the bill. Select the `CategoryID` field from the pop down list of fields (list boxes get everywhere!) from the `Book` table



and click Next. Lastly, type in a label for the list box (something like 'Select a category:' would be helpful to users) and click Finish.

This is the Form view of the new list box. If there are more values than will fit in the space allocated to the list box in the Design view, slider bars are provided automatically so you can scroll through the values.



Flip to Design view to resize the rectangle the list box inhabits and to move and resize the label if necessary.

That's really clever, but what happened?

Once again, you don't have to read this section, but you can if you want to know how the list box works.

In Design view, let's look at some of the properties the wizard has set during the creation of this list box. I've given it a Name property of `CategoryList`. The Row Source Type indicates that the values for the list are taken from a table or query and the Row Source identifies the fields used and how they're ordered.

What it shows you is:

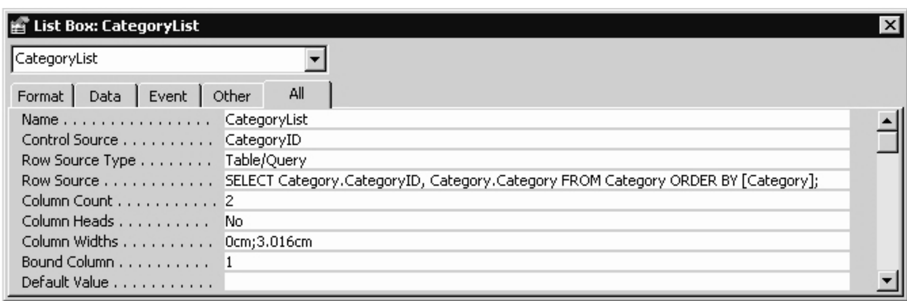
```
SELECT [Category].[CategoryID], [Category].[Category]
FROM [Category] ORDER BY [Category];
```

This is simply a query expressed in formal database terminology and the query finds the `CategoryID` and `Category` fields from the `Category` table, and orders them by the `Category` entries.

The Column Count is two (the wizard added the `CategoryID` field after you'd selected the `Category` field) but the Column Widths property shows that the first column (`CategoryID`) has no width and is therefore hidden.

Column Heads is set to No: the column of categories doesn't need a header as it already has an explanatory label.

The Bound Column is shown to be column 1 (the first column), meaning that the `CategoryID` column in the list box definition is bound to the field specified in the Control Source property. In this case it's the `CategoryID` field in the `Book` table (you can tell it's from the Book table by popping down the list of fields in the Control Source field). When a category is selected from the list box, its category ID number is stored in the `CategoryID` field in the `Book` table (i.e. in the Control Source).



More list boxes

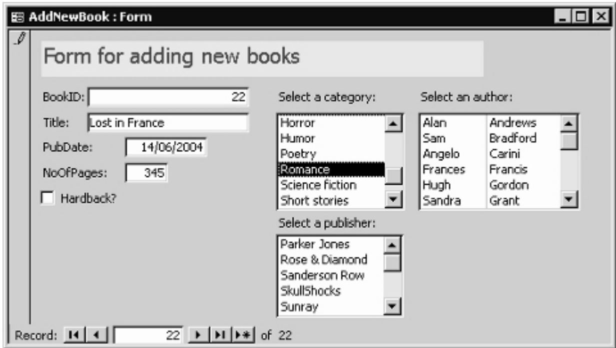
Now build another two list boxes to list the authors and the publishers. For the author list, choose the first and last name fields, and store the value in the `AuthorID` field in the `Book` table. For the publisher list, the value should be stored in the `PublisherID` field in the `Book` table. Click the Save button and give the new form a name like `AddNewBook`.

Your form should now look like this:

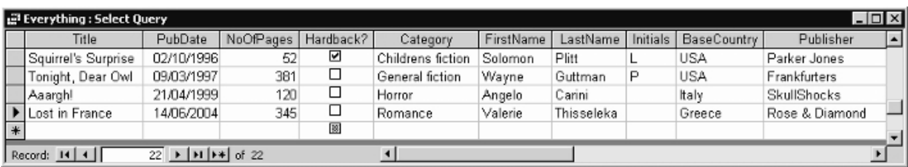
I've added a label to tell users what they can do from the form and now it's ready for testing.

❝ *It's not possible to test the form by adding a new record with just the category list box in place because of the joins that exist between the tables. Access would quite rightly object that there was no author and no publisher specified for the new book record and would not allow you to store an incomplete record.* ❞

Click the new record button and start by typing in a title for the new book (it gets an ID number automatically), a publication date, a number of pages and check the box if it's a hardback. Select a category by highlighting the one you want from the category list,



and an author and publisher from the remaining lists. Click in the narrow vertical pane to the left of the form and the tiny pencil graphic changes to an arrowhead to indicate that the new record has been successfully saved. Close the form and open the `Everything` query.

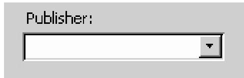


As you can see, the new book is in place with the category, author and publisher details in full, put in place by simple selections from list boxes.

Here's one final tip for users of list boxes: to reach an entry quickly, type its first letter. Click anywhere in the category list, type an 's' and the highlight zaps to 'Science fiction'; press 's' again to work through multiple entries beginning with that letter.

Combo Box control

A combo box is very like a list box but it has different strengths. It too presents a list from which values can be chosen but the list is not shown on the form until you ask to see it. A combo box looks like this



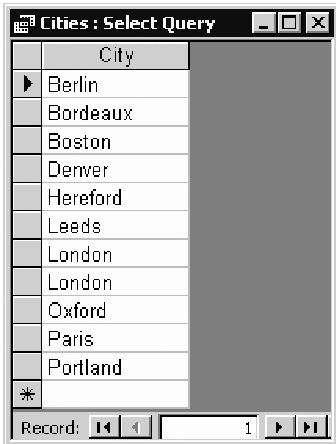
and when you click the button, the list appears.

One advantage of combo boxes is that they take up less room on a form, so if a form already has many controls on it, consider a combo box instead of a list box. Combo and list boxes behave in the same way, letting users select a value from a predefined list usually taken from a table or query, and storing it in the appropriate field. Combo boxes, however, will also allow values that do not appear in the list to be typed in.

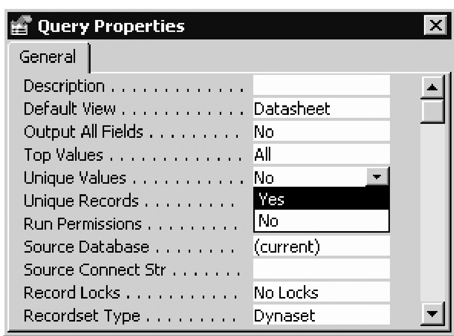
❛ *The 'combo' in this control's name comes from its behavior which combines that of a list box (from which you can only select predefined values) and a text box (into which you can type new values).* ❜

We'll build a combo box on a form called `AddNewPub` that lets users add new publisher details to the `Publisher` table and with it users can either pick a city from the list or type in a new location.

The combo box will be based on a query rather than on a table so the first step is to build a query that simply pulls out all the records from the `City` field in the `Publisher` table. We can, at the same time, get the query to sort them in alphabetical order. This isn't essential, but people generally like sorted lists of information, so we might as well make life easy for them. The answer table looks like this:

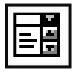


which isn't ideal because London figures twice and the list we want for the combo box shouldn't contain duplicates. (Such a list *can* contain duplicates but for efficient use values should appear once only). In Design view of the query, click anywhere on the top pane background and click the Properties button from the main button bar. In the list of Query Properties is a property called Unique Values, presently set to No. Set this to Yes

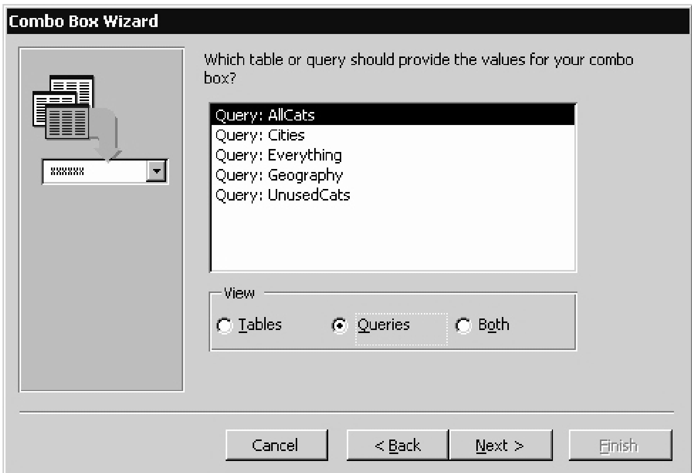


and take another look at the Datasheet view. London no longer appears twice in the list. Close this query, saving it as `Cities`.

In the Forms tab of the database window, click the New button, select Design View and the `Publisher` table. Add all the fields from the field list except the `City` field. Click the Combo Box button in the Toolbox

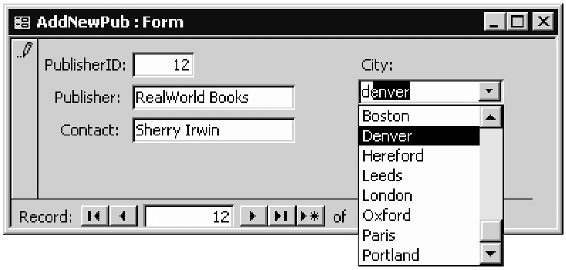


and drag an outline onto the form. In the first step of the Combo Box wizard, choose the first option, that of looking up values for the list in a query or table. Click Next and click the Queries option in the View panel to see your saved queries.



Double click the `Cities` query (or highlight it and click Next). In the next three steps, select the one and only field, sort the cities in ascending order and alter the column width to suit. Then specify the `City` field as the field in which to store the chosen value and lastly choose a label for the combo box.

Below is the Form view of the new control when entering a new publisher. A click pops down the list or you can start typing a new entry in the text box. If you start typing a value that already appears in the list, that value is popped automatically into the text box. Typing a ‘d’ pops Denver into the box and highlights Denver in the list, ready for a click to accept it.

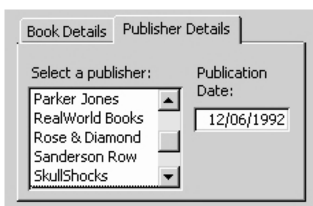


To add a city, just start typing. If you were adding Detroit, the highlight would stay on Denver while you typed ‘D’ and ‘e’ but as soon as you type ‘t’, the text box clears, leaving you to type ‘roit’ to add the new city. The next time you open the `AddNewPub` form to add a new publisher, the query runs and generates a list that includes the new value for Detroit.

❛ *Note how carefully we phrased that. If, after adding Detroit and without closing the form, you enter another new publisher and pop down the list, Detroit won't appear. This is because the query to find all of the cities runs when the form is opened, not every time you use the combo box. This is not a bug, it's a feature. No, really, it is a feature! Most of the time people don't add new items when using a combo box and if the query ran every time the combo box was used, it would be slower. In fact, using the advanced features of Access (the programming bit) it is possible to re-run the query when an item is added but that falls outside the remit of this book. However, this is a good illustration of why Access has a programming language.* ❜

Tab control

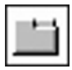
Tab controls are useful for organizing forms by grouping related controls. A tab control looks like this:



To move between tabs you just click on the one you want, just as you do when inspecting the various types of property in the property sheet. Tab controls are invaluable on forms that need to hold large amounts of data. Indeed, it is quite common to make the entire form a huge tab control so that all of the data that the user sees is inside one tab or another. On the sort of form we are using here, a tab control is probably excessive but it demonstrates the principle.

We'll build a tab control into a variation of the `AddNewBook` form: start by making a copy of this form and calling it `AddNewBookTab` by highlighting the form in the database window, clicking the Copy and Paste buttons and typing in the new name. Now open the new form in Design mode.

Click on the Tab Control button in the Toolbox

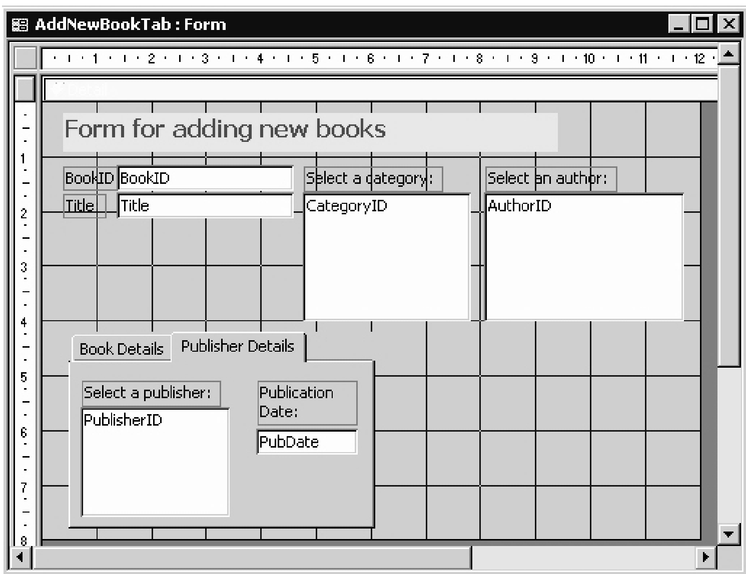


and drag an outline onto the form. A tab control with two pages is now in place. First we'll change the page labels. At present each shows an arbitrary page number, the value of which will depend on how much experimentation you've done in your database. Inspect the properties (click on the tab itself rather than on the body of the tabbed page) and you'll see that the page numbers appear as the Name property by which Access identifies the page object internally: it's advisable to change this to something by which you can identify it yourself. Now add a Caption property to appear on the tab; type what you want and, so long as your tab control is wide enough, the tab will expand automatically to fit. My first tab is for BookDetails and this will work as a Name and, with a space, as a Caption.

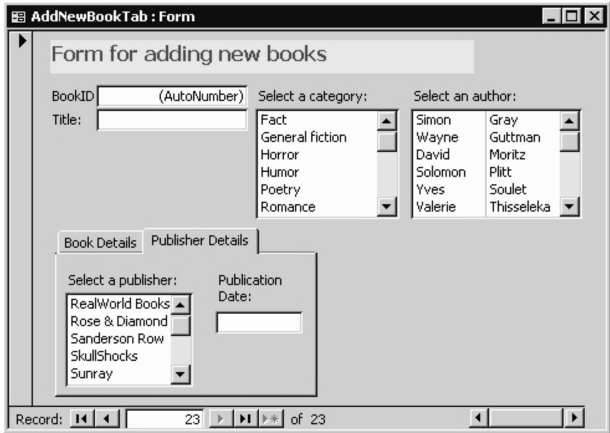
Controls can be placed directly on each page of a tab control in the same way as they can onto a form and existing controls can also be cut and pasted from the form onto a tabbed page.

❛ *Don't try to drag and drop existing controls from the form onto a tab control page. If you try it you'll find that when you let go of them, they apparently disappear because they have dropped, not onto the tabbed control page, but onto the form underneath. It is easier to use cut and paste as described here.* ❜

Select the `NoOfPages` and `Hardback?` fields by rubber banding, cut the selection, click the tab itself rather than the body of the page (the property sheet should be headed Page: BookDetails) and paste. Shuffle the fields around into the required positions. Rename the second tab as PublisherDetails, add a caption and move the PubDate and the Publisher list box controls onto it.



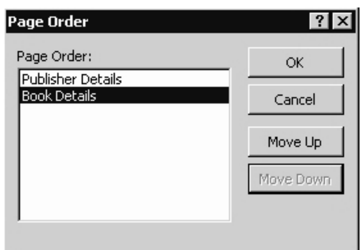
Flip into Form view and inspect the new control.



Back in Design view, you can add further pages by clicking with the right mouse button on the tab control. From the list that pops out, select Insert Page and that's what happens.

❛ *If the tab control isn't wide enough to display all its pages, a navigation control is added automatically.* ❜

From this menu you can also delete a page (make sure the focus is on the correct page before you do this as there's no dialog to confirm the deletion) and change the order of the pages across the tab control. Select the Page Order option,



highlight the page to be moved and click the Move Up or Move Down buttons accordingly.

With the Tab Order option on this menu you can change the tab order within the current page of a tab control. To change the tab order of the tab control itself, right click anywhere on the form and select Tab Order.

Giving the tab control and its pages meaningful entries for the Name property pays dividends here: identifying Page18, Page19 and TabCtl4 can take some brain-racking.

Summary

With a grasp of the extensive armory of controls for Access forms, you can design and build forms for any purpose. Forms give users a helpful interface for entering data and for displaying it, either all records or a subset determined by an underlying query.

Try to think about a form from the users' point of view; keep things simple but don't hesitate to add helpful labels and captions. Use lines and rectangles to draw the eye towards groups of controls. Use the most appropriate control: a check box for a filling in a Yes/No field is quicker than selecting from a list. Use tab controls to give a logical flow to progress through the data entry process. Use list and combo boxes to control data entry and improve the integrity of your data.

The examples covered in this chapter all appear in `chap18end.mdb`.

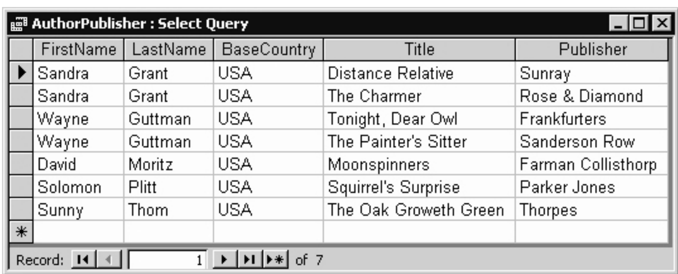
Chapter 19

Reports – printing data from multiple tables

Basing reports on queries

Queries and reports are very much joint partners in the production of summarized information from your database. Each has an area of data handling where it performs best and together they give a high degree of control over report production. Queries are good at locating data that meets certain criteria. Reports are good at sorting and summarizing data, and at adding totals, subtotals, percentages, averages and so on.

For instance, a query can easily show authors based in the US, the books they've written and for which publishing houses, and while these can be sorted on the author's last name, it takes more than a glance to see which authors have had books published by more than one publisher.

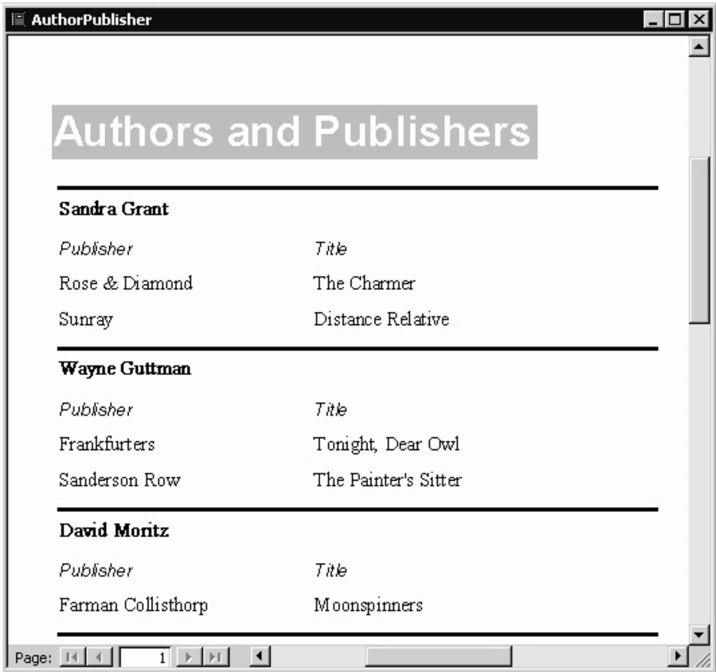


AuthorPublisher : Select Query

FirstName	LastName	BaseCountry	Title	Publisher
Sandra	Grant	USA	Distance Relative	Sunray
Sandra	Grant	USA	The Charmer	Rose & Diamond
Wayne	Guttman	USA	Tonight, Dear Owl	Frankfurters
Wayne	Guttman	USA	The Painter's Sitter	Sanderson Row
David	Moritz	USA	Moonspinners	Farman Collisthorp
Solomon	Plitt	USA	Squirrel's Surprise	Parker Jones
Sunny	Thom	USA	The Oak Groweth Green	Thorpes

Record: 1 of 7

A report based on this query (both query and report are called `AuthorPublisher` and are in the `chap19start.mdb` file) could display the data looking like this:



The records are still sorted by the authors' last name and by the publisher, but each author appears only once and the publishers are listed thereafter. Now it's much easier to see that Grant and Guttman have both published books with different publishers.

True, we've covered most of this information in Chapter 12 and there isn't much more to say here, so why this separate chapter? Well, one reason is symmetry – all of the other main components get their own chapter in the multi-table section. There is a danger that the reports will sulk if they don't get their own chapter. But fractionally more seriously we wanted to make the point that once you start working with multi-table databases, queries become even more important when you create a report. Almost all reports in multi-table databases are based on queries which gather the relevant data together from the separate tables.

That's the main take-home message. However, just to stop this chapter looking ridiculously short, we'll show you one more feature of reports that we like.

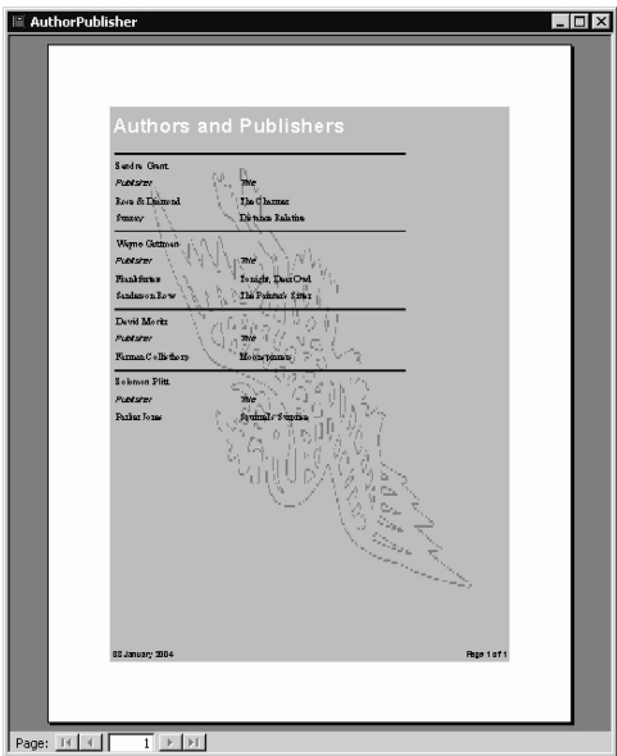
Adding a watermark

To add a bit of a dash, you can simulate a watermark on your reports very easily. In Design view, inspect the Form properties and set the Picture property to the graphics file of your choice. The Build button lets you browse the various folders where clip art or your personal artwork is stored.

Set the Picture Type property to either linked or embedded. An embedded picture is stored in the database file; this is a good choice if the graphics file is on your personal hard disk and may not be accessible to anyone else using your database. So long as the graphics file is on your hard disk, you can use the linked setting.

You can experiment with the Picture Size Mode, Picture Alignment and Picture Tiling properties to get the effect you want. (Tiling only works with Clip and Zoom Picture Size Mode settings).

The watermark looks best if a pale colored design is used: it interferes less with the information displayed in the report.



This stylish bird design is incorporated into the report called `AuthorPublisherWatermark` – another snappy name from your intrepid writers – and is in the `chap19end.mdb` file.

Summary

Having now completed a third pass through the four main elements of a database, you should have a clear picture of how Access can help you control the data that's stored in the database and also help you extract it in ways you find helpful. In the next chapter, we'll look at the database as a complete application.

Chapter 20

Producing a user interface for your database

Not just a pretty face

Your database needs to present an attractive, unified user interface (UI) to the world. This interface can ensure that users are able to perform the actions they want with the minimum of effort. A good UI has an uncluttered layout with informative labels and instructions to keep users on the right track. The paths through the application should also be plainly sign-posted, with options for retracing steps if a wrong choice is made and for exiting the application tidily.

All the tools you need to build a user interface to your database application are to hand in Access. In the main, you'll use the form controls introduced in Chapters 11 and 18 to create a series of forms that guide users through the necessary processes.

Design considerations

An entire book could be written about database UI design. However, the following pointers may help.

The main message is to keep it simple, avoiding too much color, too many different fonts, too many graphics and generally just too much on a single form. All these elements can, of course, be used most successfully in moderation. If, for instance, tasks divide straightforwardly between adding records and searching existing records, then using a different colored background to the forms dealing with the two types of task gives users an instant visual clue to where they are in the application. This also tells us that consistency of design is also important. If you have a button for performing a common task (closing the application and/or closing Access, for instance) that you use on more than one form, put the button in the same place on each form.

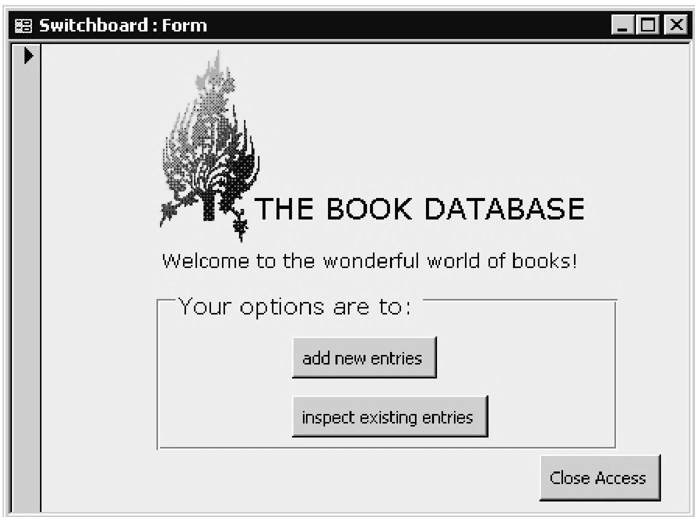
❛ *When you have several forms that are largely similar, build one and make copies, editing the copies as necessary for their different roles. This cuts down the workload and also ensures a degree of consistency.* ❜

Consider the wording on your forms carefully. Will your users understand the terse instruction 'add record' or would 'add a book entry' be clearer?

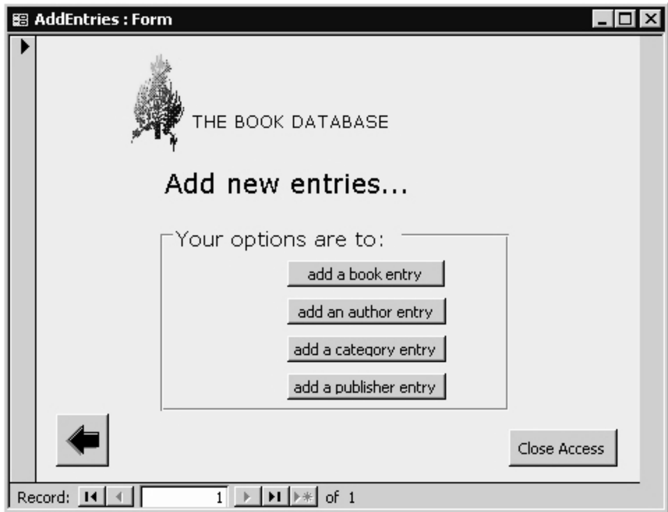
The most common approach to designing a UI is to adopt a branching structure, starting with a main form from which a choice is made depending on the task in hand. Such a form is known as a switchboard.

Switchboards

A switchboard for the book database might lead on to forms for adding new records or searching for particular information.



Clicking on the upper button could lead to an option group which lets the user choose what sort of an entry to add.



The switchboard form is often set to open automatically as soon as the database application is launched (which can be from a shortcut on the Windows desktop), leaving the user in no doubt about how to get started.

Form control without programming

Controlling the paths users can take through the forms that comprise a UI can, of course, be achieved by writing sections of Visual Basic code and attaching them to controls on the forms. With the more complex database applications this is usually how it is done. Happily you can get started without programming by using a combination of two simple ideas: one is that a command button can close the current form or open a new form and the second is that you have complete control over the size of each form.

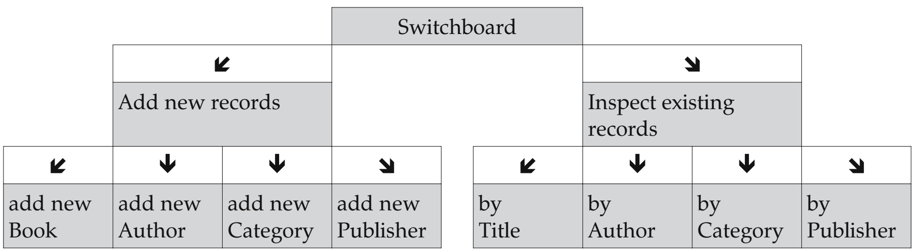
On the switchboard the user has a choice of command buttons. If, for instance, the 'add new entries' button is clicked, a form opens from which new records can be added. Its size and position are carefully set so that it completely covers the switchboard form which remains open underneath (but cleverly concealed from sight). When the user clicks the command button to return to the switchboard, the current record-adding form closes and the switchboard form becomes visible again.

Thus, given buttons to open and close forms and with the judicious use of sizing, a seamless interface can be constructed. It does, of course, have its limitations. This method will work best with simple interfaces without branches at many different levels but it has the benefits of being quick and easy to build.

Designing a user interface

The first tools you'll need are good old fashioned pencil and paper. Think about what the users will want to do and how best to guide them. Circles, arrows and scribbled notes are a good way of organizing your thoughts and determining the likely paths through the application and thereby deciding upon how the interface will reflect this.

We've decided that our UI needs a switchboard and from the switchboard users need access to two task areas – each of which has a form, one for adding new records and one for searching existing records. Below these two forms are further forms for undertaking specific operations. For ease of reference, we'll describe the switchboard form as being Level 1, the adding and inspecting forms as Level 2 and the forms where entries are made or browsed as Level 3.



This diagrammatic representation shows the structure of the complete UI.

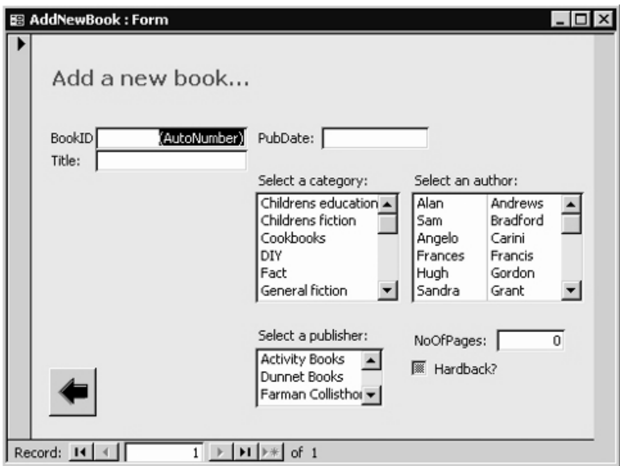
Once you start setting fingers to keyboard, it's best to work backwards, first building the Level 3 forms, then the Level 2 and finally the switchboard. Why this is so should become apparent as we work through the example.

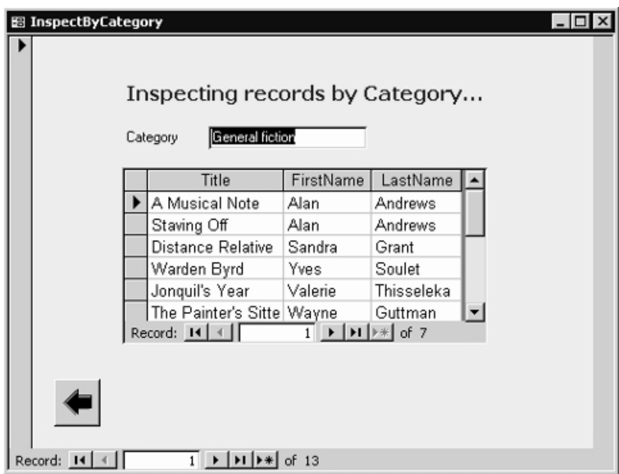
Building an interface

We'll now take a gallop through the process of building this simple UI based on the `Books` database. Many of the steps you'll have seen before so we'll skim over much of the detail. In addition, we have part-built some of the forms for you so that you can concentrate on the parts that are novel: start from the `chap20start.mdb` file. We've also weeded out the forms that won't be needed in for the UI in order to reduce the clutter.

Level 3

Starting with Level 3 of the hierarchy in the UI diagram above, we've chosen a form that we've already created in an earlier chapter: `AddNewBook` from Chapter 18 is for adding a new book record to the database. We've provided another form called `InspectByCategory` with its subform, `BookAuthorSub`, which allows users to look for books by specific category. The forms now look like this:





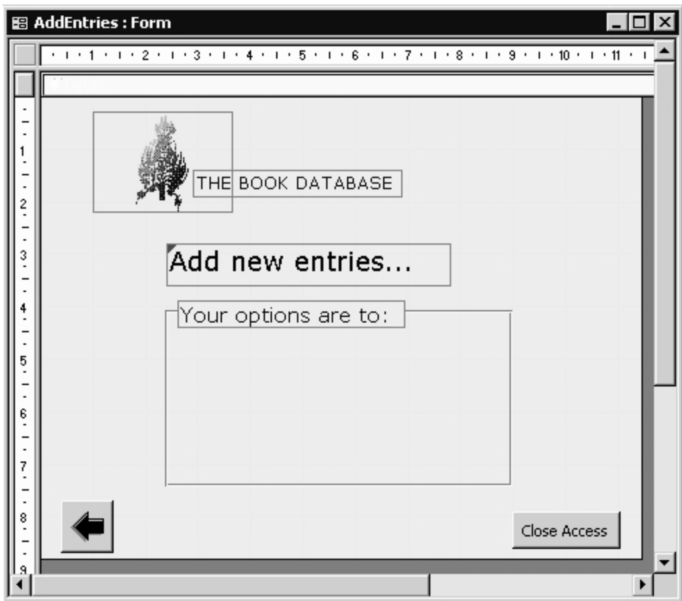
You could also either create new forms or identify other ones you may have already built during earlier sessions.

Both the forms shown above have a 'Back' button built with the Command Button wizard which, when clicked, closes the current form.

In the hierarchy described, there are six further forms at this level but these two should be enough to give you the idea.

Level 2

Below is the Design view of the part-built `AddEntries` form reached when the user chooses, at the switchboard, to add a new record.



A small title banner with a graphic has been added and a larger label indicating the form's purpose. There are two command buttons, both built with the wizard. The Close Access button makes use of the Quit Application action from the Application category to do just what it says, and the Back button closes the current form. Lastly, there's an option group with a label.

Option groups, you'll recall, usually contain check boxes, option or toggle buttons, not command buttons. However, turning off the Control wizards in the Toolbox and putting an option group on the form is a very quick way of placing a box and label on your form which you're then free to fill with command buttons. You can, of course, build exactly the same look with the Rectangle tool and a Label, altering the format settings to get the same etched appearance etc.

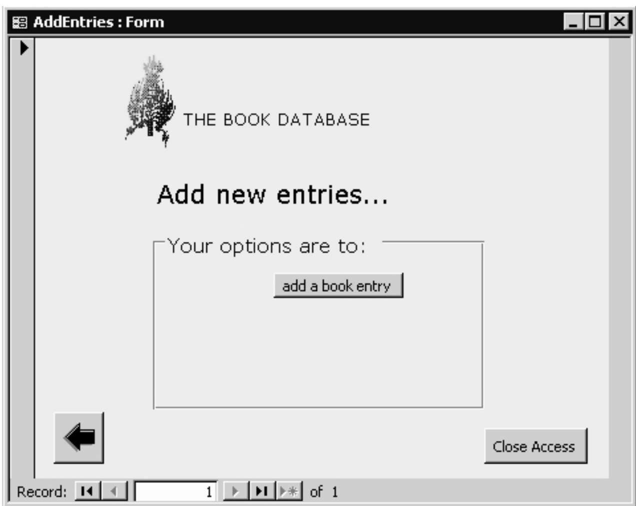
What we need to add now are the buttons to open the Level 3 forms.

We have already covered the construction of command buttons, so add one, choosing the following options:

- Category – Form Operation
- Action – Open Form
- Form – `AddNewBook`
- Open the form and show all records
- Text – add a book entry
- Meaningful name – AddBook

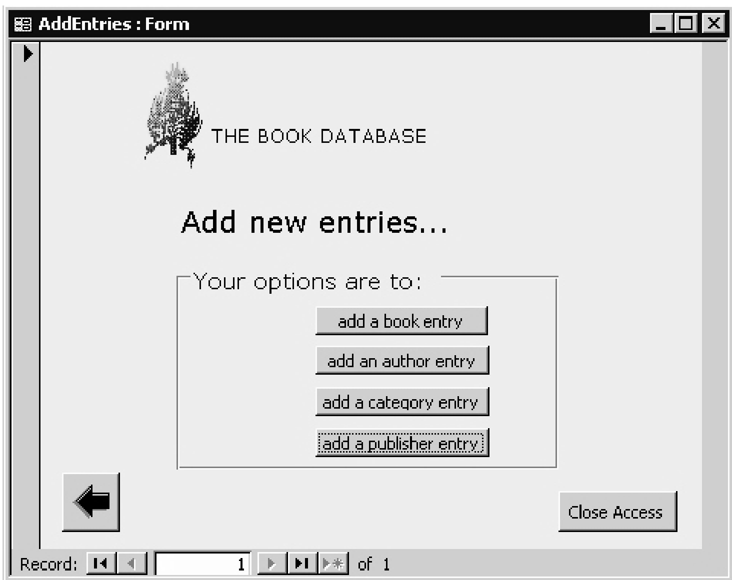
The wizard only lets you choose from existing forms which is why working from the bottom up is such a good idea.

Great. The form should now look like this:



Save it and try it out. It works fine except when the `AddNewBook` form opens up it's showing all of the records, so the user will have to move to a new record before they can add one. Since this form now has one purpose in life (allowing users to add new books) we should be able to customize it for this purpose. Move to Design mode for this form, call up the properties for the entire form (click on the square at the top left of the form) and set the Data Entry property to Yes. This tells the form that it is to be used for data entry, so it won't bother showing any existing records.

Now the buttons and forms should work fine together. You can repeat the whole exercise for the `AddNewAuthor` form – that's in the file though we haven't included data entry forms for categories, though there is an `AddNewPub` form created earlier that could be used as a starting point. By now you'll know how to build or adapt as necessary in order to complete the application. The finished `AddEntries` form is shown below:



The `InspectEntries` form is largely similar with options for getting to the various browsing pages. Clearly you shouldn't set the Data Entry property of the `InspectByCategory` form to Yes. However, since this form is supposed to be used for viewing information only, you might want to set its Allow Edits, Allow Deletions and Allow Additions properties to No.

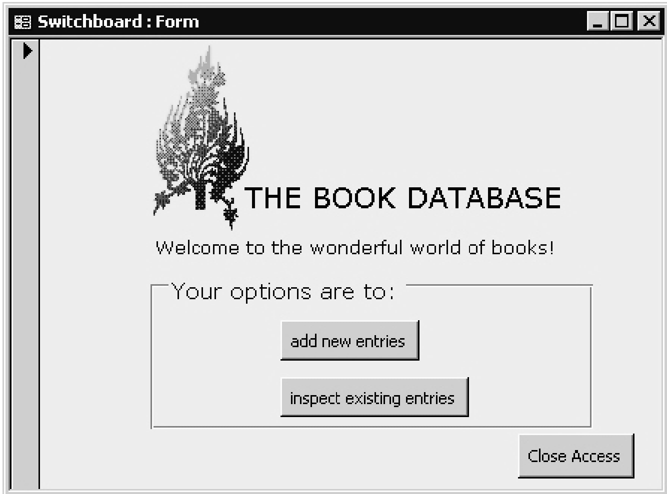
Level 1

Now let's tackle the switchboard, which is just a specialized type of form so start work in Design mode on the form called `Switchboard`. It has graphics, labels and a Close button so it's up to you to add the two command buttons to give access to the two Level 2 forms.

Click the Command Button tool and drag a rectangle out onto the form. In the wizard's steps, make the following selections:

- Category – Form Operation
- Action – Open Form
- Form – `AddEntries`
- Text – add new entries
- Meaningful name – AddNewEntries

Repeat these steps to create a second command button that opens the `InspectEntries` form.



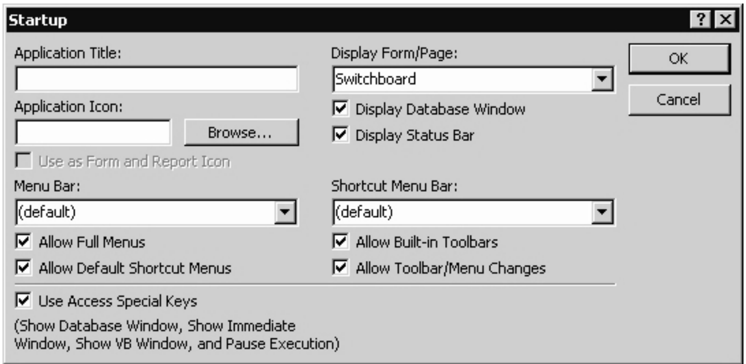
I've also set two Format properties for the form: Scroll Bars is set to Neither and Navigation Buttons to No.

A seamless whole

Now you have to juggle with the form sizes so that the secondary forms, when open, completely cover the switchboard. The form property Auto Center (on the Format tab) is useful here as it ensures that a form always opens in the center of the screen. Set this property to Yes for all the forms in the UI. Then work your way through the various paths, dragging the forms to a size where they cover the underlying form: basically, the forms get larger as you work down the hierarchy.

You may find that you apparently resize a form and save it, but when you re-open it, lo and behold, it stubbornly returns to its original size. The trick is to open the form in design mode, and make sure that you resize the form itself (rather than alter the size of the window in which it appears).

If you want the switchboard to open automatically as soon as the book database is started, click Tools, Startup in the main menu bar. In the Startup window enter the name of the switchboard form (here it is Switchboard) under the Display Form/Page heading.



If you don't want to give users access to the database window, uncheck the Display Database Window option.

Further tweaks possible here are to type in the Application Title which will then appear on the top title bar that normally reads 'Microsoft Access'. You can also pick an icon for the application to appear instead of the Access key symbol in the title bar, the task bar and when Alt-Tab is used.

A far from perfect UI

This user interface is a long way from perfect. All sorts of considerations haven't been explored:

- should you give users a button to click to save a record or can you rely on them being sufficiently Access aware to know that if they close a form the record will automatically be saved? Do they even need to worry about this?
- should you let users close Access or just close the database application?
- should users be forced to track back to the switchboard in order to exit?
- what about editing existing records?

The last point is an important one. At present there is no way for users to correct an entry that's incorrect. You may decide this doesn't matter, or maybe you don't want users editing records anyway. Or maybe you'll add a record editing option to the switchboard and another thread to the hierarchy.

Even when designing and building a simple UI there are many solutions, and it can be a time-consuming process. Guinea pigs are useful for testing the interface: what you think is obvious might only be so because of your high degree of familiarity with the system. Tactful, truthful and objective guinea pigs are ideal: failing those, grit your teeth and don't take criticism too personally!

Summary

Using these wizard-built buttons and the technique of opening and closing forms of carefully chosen dimensions, it's possible to put together an attractive and useable front-end to your database, tailored to the needs of your users. The user interface described above, so far as it goes and with all its imperfections, is in the `chap20end.mdb` file.

Chapter 21

Data Access Pages

The story so far

We've been working with objects in the first four tabs in the database window: Tables, Queries, Forms and Reports. This is because our main aim is to get you to the stage where you can design and build databases, both in single table and multi-table formats. We also hope that you have gained sufficient confidence to continue to experiment and learn about databases, because there is a great deal more to Access than the parts we've covered. This chapter and the next, therefore, are designed to give you just a taste of Access' extras. In this chapter we'll look at Data Access Pages – the webby bits – and cover a handful of other topics in the next.

Data Access Pages – do you even need them?

Access started life in the era of the stand-alone PC. In those days it was assumed that a PC database application would be developed on a single machine and would be used by one person at a time. That is the simplest type of database to build and so that's the kind of database we've been teaching you about. However, over the years the networking of PCs has become ever more common, we've seen the development of the internet and the web that we all know and love. We have also seen the development of miniature internets (called intranets) within companies. Increasingly, there is a requirement for databases that can be used by multiple people at the same time.

Access has several mechanisms for allowing a database to be used by several simultaneous users: one is to give shared access to a database over a network, and an overview of this is given in the next chapter in a section called 'Application Development'.

A second mechanism is to use data access pages. A data access page is a type of web page specifically designed to let you use an Access database through the medium of a web browser. This might lead you to think "Oh, so this means that I can build a data access page and really easily make data available from my Access database across the web!" No, no, don't even think about going there! Why not? Because it's tough to build a safe and secure interface between any database and the big bad internet. The internet is a hostile environment where hackers and viruses abound. Allowing a database to interact safely with the internet is way beyond the scope of this book: it opens up a whole raft of technologies, protocols and security issues that we don't cover.

Even within the relative safety of an intranet (protected from the outside world, as it should be, by a firewall), there are still security implications. Data access pages are designed to let other people see the data in your database. Once access to your data is extended in any way like this, it is highly likely that two conflicting goals will need to be balanced. On the one hand, people must be given access to the data; on the other you may well need to protect the data from unauthorized viewing and/or tampering.

As we'll explain later, data access pages aren't stored in the usual Access .MDB file but as HTML files in one of several locations. This can be in the file system on your own PC, in a folder shared over a network or on an HTTP server (also known as a web server).

“ *HTML – HyperText Markup Language – the language used to create web pages. HTML is often stored in files with the extension .HTM.*

HTTP – HyperText Transport Protocol – defines the way in which web pages are transmitted. ”

This means that Access itself cannot control the security of data access page files. Microsoft recommends that you put in place security measures for the .HTM files and their associated folders using the system security of the computer on which they are stored. That should ensure that access to the pages is controlled.

In addition, to help protect the data that the page displays, you can also make use of the security features of Access itself or configure Microsoft Internet Explorer security settings to prevent unauthorized access.

Potential problems don't end here, unfortunately. Some page controls raise security issues: Hyperlink, Image Hyperlink and Bound Span controls should all be used with caution because they can offer a way for the malefactor to introduce destructive or detrimental HTML into the controls. There are methods for dealing with such loopholes but it's all moving a long way from the intended scope of this beginners' book about building databases with Access.

We realize that we must sound as if we are trying to put you off using data access pages, and we most certainly are not. However, it would seem irresponsible not to alert you to the fact that as soon as you start to share data, you move into security issues that fall outside the compass of this book.

Stopping here makes good sense... but it's also boring

The bottom line is that, for now, we'd only recommend you build data access pages for use within a highly controlled environment – like a totally stand-alone PC that doesn't connect to the internet.

So, if there is no immediate commercial advantage for you in learning about data access pages, why bother? Well, these things are fun to play with. You can build an up-to-the-minute browser-style interface to your personal database on your own computer without servers or security settings. It's very cool.

Once you are familiar with data access pages, and the security issues, then is the time to consider broadening the use of your new interface to a couple of networked PCs on a home or, perhaps, small office intranet with trusted users. However, we still very strongly recommend that you start on a stand-alone computer that isn't connected to the internet. Let's be careful out there.

What's a Data Access Page?

A Data Access Page, hereinafter called a page for short, is a type of web page used to view data that's stored in an Access or SQL Server database. Since this is a book about Access, we'll concentrate on the Access side. These pages are built to be viewed using Internet Explorer (Microsoft's web browser), and are stored as HTML files with the extension .HTM .

You'll need to install Internet Explorer 5.01 Service Pack 2 or later in order to work with Data Access Pages. The 'Access' in the name, incidentally, is the nothing to do with Access the DBMS but is a description of what the pages do, which is to give access to data.

Pages can be thought of as acting rather like forms for the web. You can use a page to view data or to enter it, and just as you can base a form on a query, you can also base a page on a query. The page below is an example of the kind of page that can easily be produced.

AutoPage

The best way to see what pages are all about is to build one and take a look at it, so AutoPage seems like a good place to start, as does the `chap21start.mdb`.

❛ *With previous chapters, you've been able to load up the `chap*.mdb` file, work through the chapter content and save the file with whatever file name you choose. This approach is not possible once you start developing pages. Access maintains the links between the .MDB file, .HTM files and any other associated files, and this means that if you create .HTM and other files from an .MDB file called `chap21start` that .MDB name is encoded as part of the links that make everything work. If you want to rename the .MDB, do it before you start creating pages. It further simplifies things if you keep all the files in one folder, so create a new one called `WebTest` and copy `chap21start.mdb` into it (renaming it if you wish) before starting work.* ❜

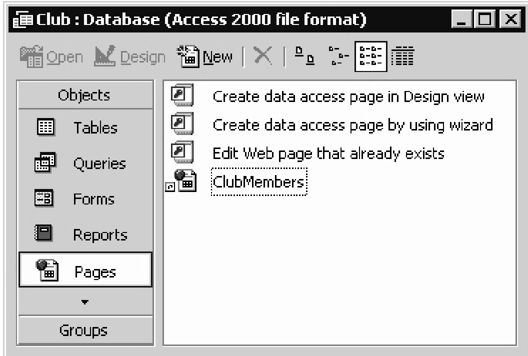
AutoPage is the speed demon of page building. Like AutoForm, it takes only a few clicks to come up with a result, so start by selecting Pages in the database window. Now click the New button, select AutoPage:Columnar and then pick a table or query to base the page upon. We'll use the `ClubMembers` table here.

Click OK, and after a few moments and a few windows appearing and disappearing, your almost-instant page appears.

All but one of the fields are represented on this page, the only exclusion is the `Photo` field because this type of field is not supported.

Close the page and you're asked if you want to save it. Reply yes, and the `WebTest` folder is suggested, and the name suggested for the page itself is that of the underlying table. Both are reasonable suggestions so accept them by clicking Save. (At this point Access might ask if you want to make this folder the default location for data access pages: answering yes ensures they'll all be kept together). When you return to the database window, you'll see an item under Pages.

Depending upon the security settings on your version of Windows, you may see a variety of extra dialog boxes as you work with pages.



When you look in the folder, you'll find a file called `ClubMembers.HTM` and also a folder called `ClubMembers_files`. This folder contains various files required by Access and they're placed here automatically: the little .GIF files contain the graphical elements that describe the look of the page.

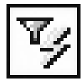
"OK", you might be thinking, "so if the page is an HTML document in my database folder, what's the page shown under Pages in the database window?" It's actually a shortcut that points to the HTML file in the database folder: that file contains the actual HTML code that encapsulates your page.

Management of files becomes rather more of an issue once you start developing Data Access Pages. Pages are always stored outside the Access .MDB file and some care must be taken that they are kept together and with their ancillary folders. What's more, you must remember them when you're backing up your database, because Access' automatic backing up facility only backs up the .MDB file.

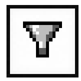
The record navigation toolbar

Re-open the `ClubMembers` page and it's displayed in Page view. The record navigation toolbar at the bottom of the page lets you move through the records as usual, and tells you that there are 23 in total. There are also buttons for tasks such as New (add new record), Save, Delete, Undo, Sort Ascending and Descending, Filter buttons and Help.

Most of these you'll know about but a quick recap of the Filter by Selection button



and the Filter Toggle button might be in order.

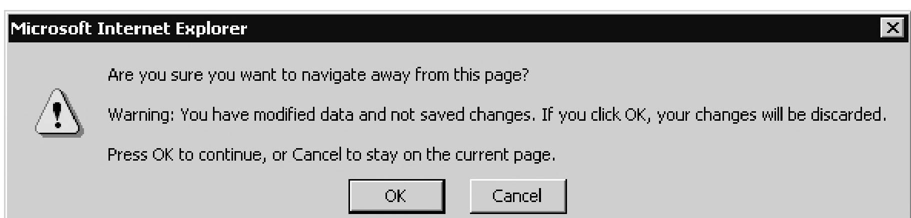


Put the cursor in the `Country` field for any record where it says USA. Now click the Filter by Selection button and the page will now show a subset of records (the toolbar indicates that there are twelve such records) where the country is USA. To remove the filter, click the Filter Toggle button. Until you change the data on which you want to filter, the toggle button will flip between showing all records and just those identified by your filter.

To sort the records into last name order, put the cursor on that field in any record and click the Sort Ascending button. (Unlike a form, any sort order applied from a page like this will not be perpetuated when the page is reopened, even if you save it).

From this page you can add data to an incomplete record (to save your change, click the Save button), change existing data and also add a new record (click the New button with its rather indistinct star).

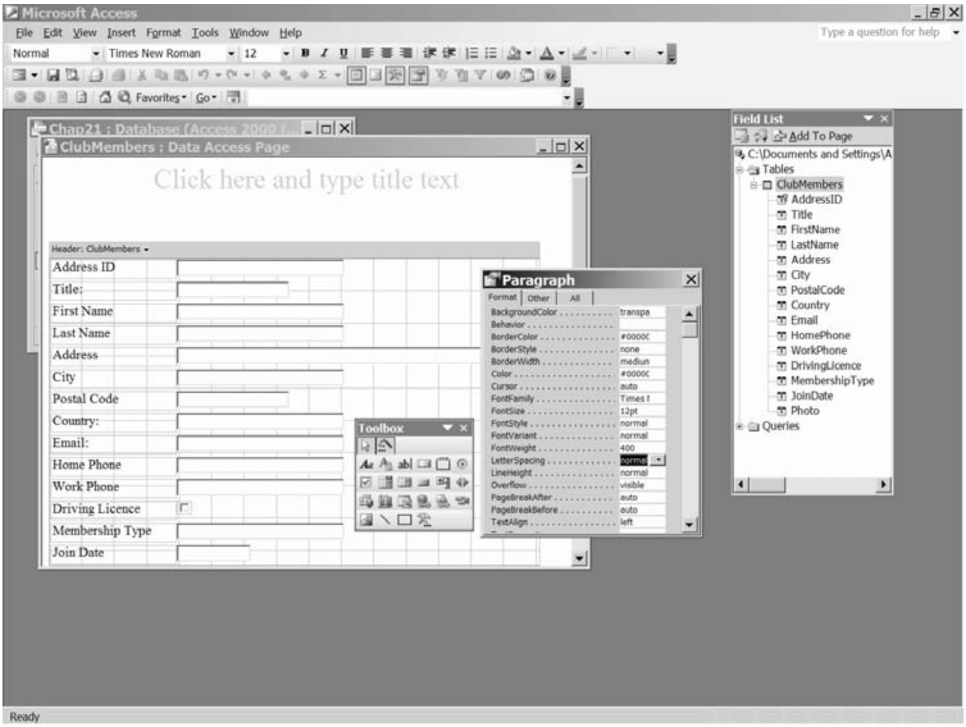
If you edit a record and then close the page without saving the record, you'll see this message:



This means your changes won't be reflected in the table until you click Cancel and save the changes explicitly. Then you can close the page as normal.

Enhancing an AutoPage

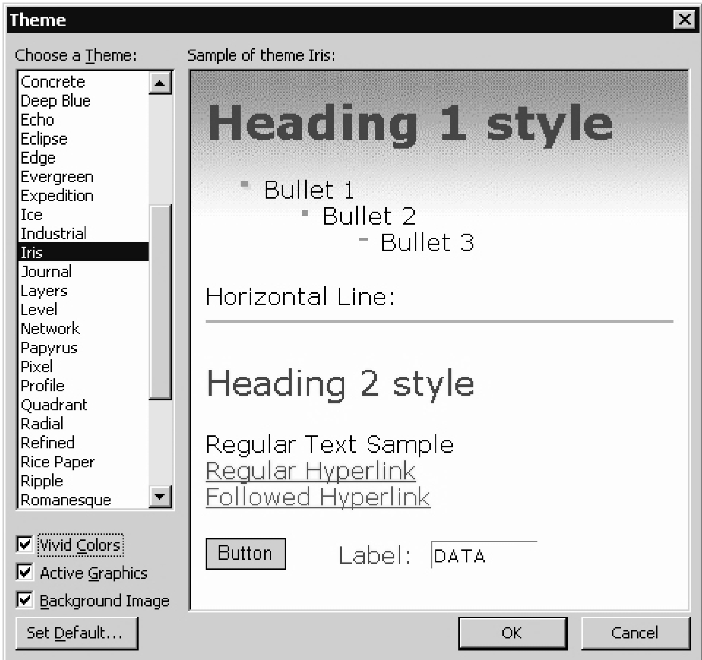
As we've already noticed with automatic generations, the results are OK but they're certainly not great. They do, however, provide an excellent basis on which to build, so switch into Design mode.



This is a somewhat different design environment from the usual one: apart from the Toolbox and the property sheet, there's an all-singing all-dancing Field List. It can show all the fields in every table in the database, and also the fields used in each of the queries. There's a Web toolbar at the top of the screen too, with buttons for Refresh and Start Page (what used to be known as the home page, hence the little house icon). If you don't see this bar, right click anywhere on the background to the toolbars and select Web.

Let's start by adding a heading as there's a helpful label indicating how to do this: click where indicated near the top of the page and type whatever you wish as a title for the form.

One of the easiest and most dramatic things you can do to a form is to add a theme. Click Format on the main menu bar and select Theme.



Here you can inspect the possible themes, experiment with Vivid Colors, and finally make a selection. Save the page, flip into Page view and –

suddenly it looks more like a web page. Pop down the list alongside the View button and select Web Page Preview. This opens Internet Explorer and displays the page just at it will be seen on the web. It looks even better.

❛ *After adding a theme, on rare occasions when I saved a page the theme was apparently forgotten and the page reverted to a plain monochrome appearance. To fix this I simply re-applied the theme as described above and all was well. It's possible you won't see this behavior but happily, if you do, it doesn't appear to cause lasting damage to the page.* ❜

Create another AutoPage based on the `EuropeMembers` query, giving it a title and theme as before. We'll use it in a moment.

Page Design view

Back in Design view, it's worth spending some time investigating the various components. Much of it will be familiar from your work with forms and reports: the page is divided into various sections and each section has properties, as do the elements within sections, as does the page itself.

The window that contains the page is the Data Access Page window: to inspect the Page properties, display the property sheet if it isn't already visible. Click on the title bar at the top of the window, or right click anywhere on the page and select Page Properties.

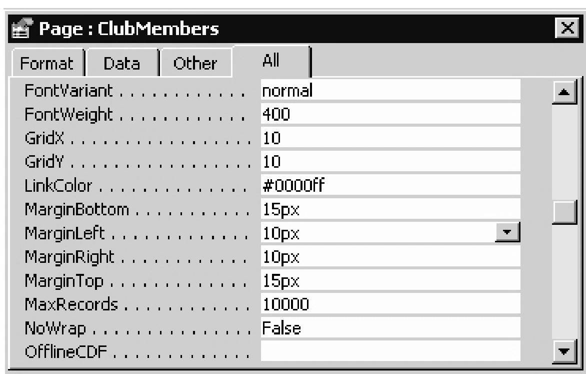
Part way down the page is a gray bar labeled 'Header:'. It indicates the top of the data processing area: in this section you will find all the fields that are bound to fields in the underlying table or query. Inspect its properties by clicking anywhere on its background.

Below this comes a bar labeled Navigation, containing the record navigation toolbar.

In the data processing section you can format the labels and text boxes much as usual, resizing them and changing their appearance. Moving fields and their labels is also easy. Click and drag a field and its label moves too; click and drag a label and it moves independently of its field. The best technique is to position the field exactly where you want it, resize it if necessary and then move the label into position and resize it.

Very usefully, the Undo button lets you undo your work.

Resizing elements of a web page from the property sheets is somewhat different too. Because the page can potentially be opened by browser software on another machine, you have no control at all over the size of the window in which the browser opens. Many measurements are expressed as pixels. The screen shot below shows the page margins in pixels:



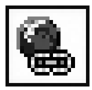
Increasing the MarginTop moves the whole content of the page downwards. Similarly, increasing the Left property of the Header (on the Format tab) moves the data processing section over to the right.

The Toolbox has a different range of controls, some of which are new. Two that are of great interest are the Hyperlink and Image Hyperlink controls.

Hyperlink control

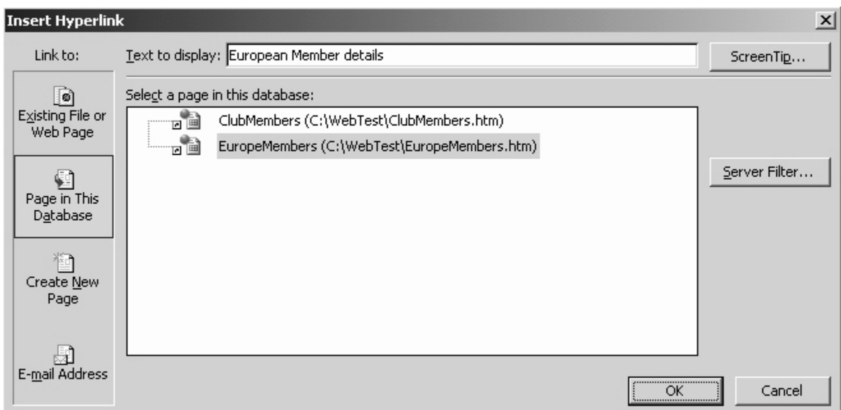
You can use a hyperlink control to put a control on your page which will, when clicked, open another document or another page, or send an email.

Given a way of opening one page from another, you can build a basic web interface. Check that the Wizards are turned on in the Toolbox, click on the Hyperlink control



and drag out a rectangle on the page. The Insert Hyperlink dialog opens.

Select Page in this Database from the big buttons on the left, highlight the page (we only have one other to work with, called `EuropeMembers`) and in the Text to display box at the top, type what you want to read as the hyperlink control. You can also add a hovering tip if you click the ScreenTip button.



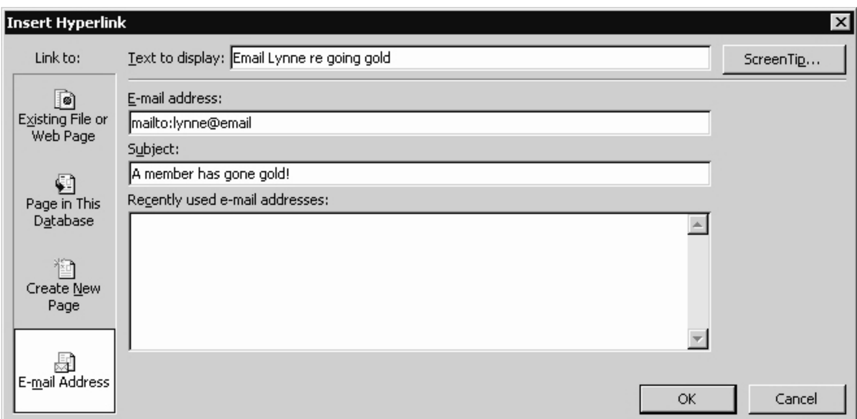
Click OK and the hyperlink appears. Once the size of the control is altered to better fit the text and with color added, the control looks like this in Page view.

To see it in action, go to Web Page Preview and click on it. The European members page is displayed. To return to the `ClubMembers` page, you just click Back.

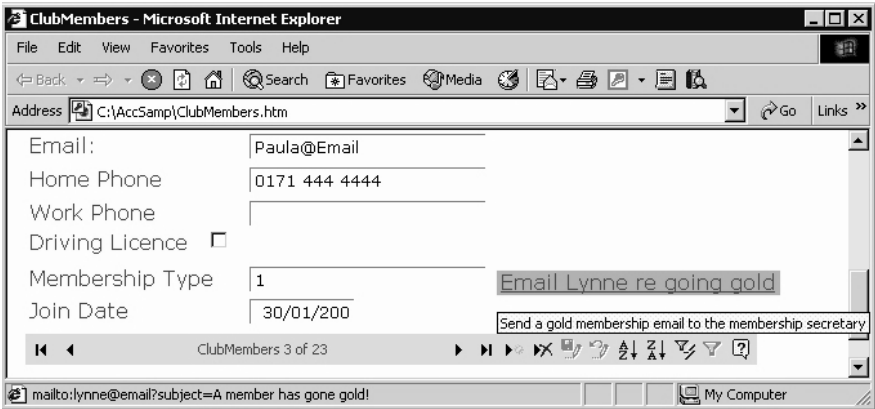
We'll whiz quickly through another use for a Hyperlink control before moving on. Suppose you want to send an email to the membership secretary every time a member takes out or upgrades to gold membership.

❛ *An email application such as Microsoft Outlook must be installed for this to work.* ❜

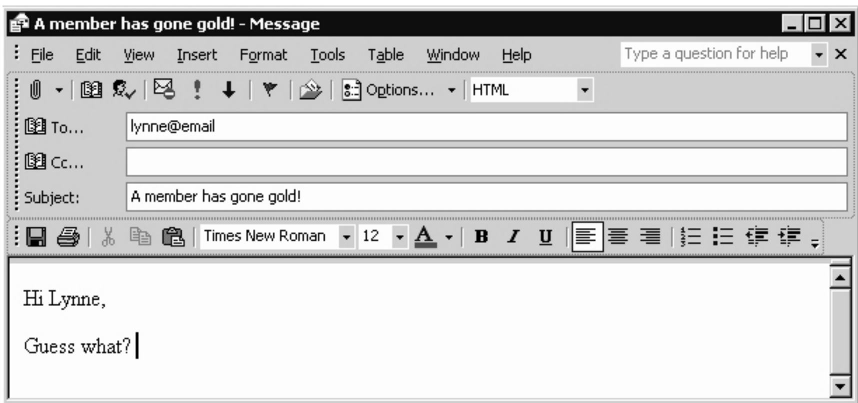
Return to the Design view of the page and put another Hyperlink control onto it. This time, click the E-mail Address button, type the text for display, the email address and the subject, add a ScreenTip if you wish



and click OK. This is the (slightly tweaked) result in Web Page Preview with the screen tip visible.



This is what you see when you click the hyperlink.



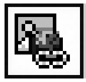
Outlook opens with an email at the ready, addressed and with a subject in place. Just type and send...

Here we've hard-wired the membership secretary's name into the interface because it's so easy to change it. On the Other tab in the property sheet for the hyperlink is a property called Inner Text. This is where the string that appears in the interface is held, and editing this is all it takes to change the text.

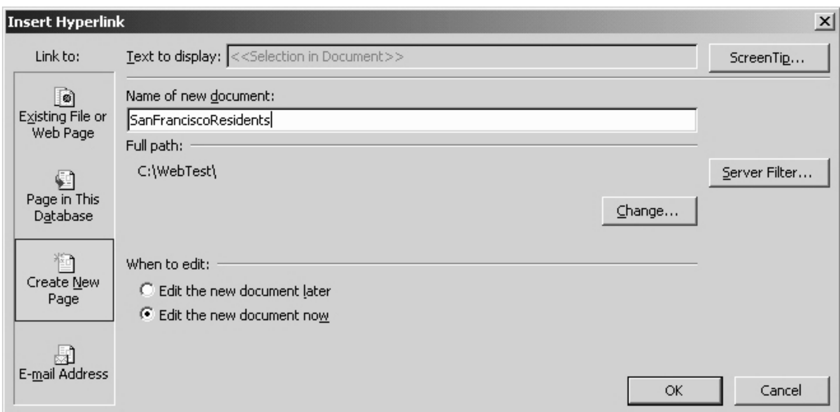
Image Hyperlink control

Instead of having hyperlinks on your page that are activated by clicking on text, you can also have ones that work when you click on an image.

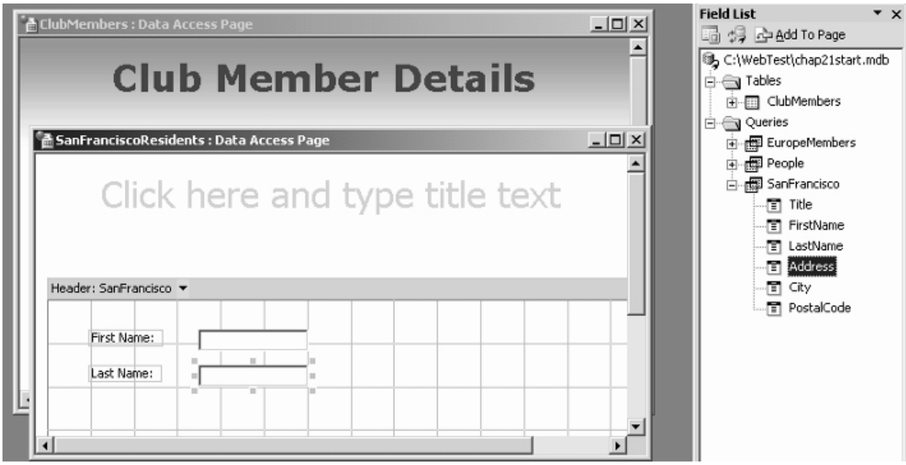
Click the Image Hyperlink control,



drag out a control on the page, navigate to an image of your choosing and select it. The Insert Hyperlink dialog opens to let you determine what you're linking to the image. There is a query in the database called `SanFrancisco`, which identifies members in that city. We'll use this as the source of the data for the page. We don't have a page to display San Franciscan residents yet, but rather than having to go back and build this before starting again, you can click the Create New Page button. Here you can type a name for the new page.

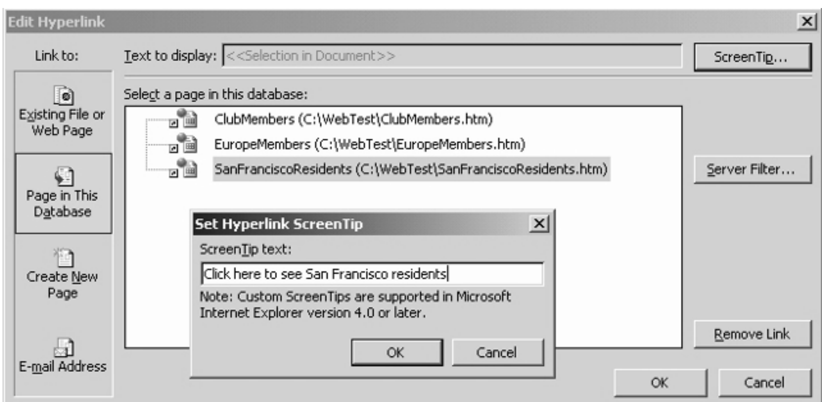


Clicking OK opens up a blank page in Design view. Drag the fields from the Field List: expand the list of Queries and then expand the `SanFrancisco` query to see them.



Add whatever tweaks, themes and titles you wish before saving the page. You could even decorate the page with the same image used for your image hyperlink (with the Image control).

Save and close the page, and still in Design view, right click on the hyperlink image and select Edit Hyperlink. Now click the Page in this Database button and your newly-constructed page appears in the list of pages. Select it, add a ScreenTip (these are useful with images because they give extra information)



and click OK. Save the page and check it out in Web Page Preview. This is the `ClubMembers` page:

Clicking the bridge image opens the `SanFranciscoResidents` page:

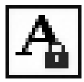
Neat, that.

Bound Span control

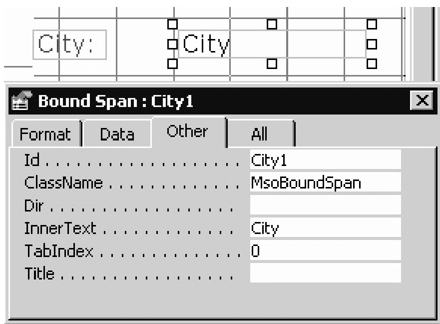
This control provides another means of making text and memo fields from your database visible on screen. The main benefit that might lead you to use bound span controls is to improve the loading speed of your pages. For users of Internet Explorer 5.01 with Service Pack 2 or later, bound span controls will load faster than other controls and thus improve the performance of the page.

The data displayed in bound span controls cannot be edited so for data browsing/inspection forms this is an additional benefit. Furthermore, the control can be bound to a text or memo field that contains HTML code so you can also control the way the data is displayed in this way.

To create a bound span that just simply displays a field, click the Bound Span control.



Now click the `City` field in the Field List, keeping the mouse button depressed, and drag it onto the page. Release the button when the pointer is where you want the top left corner of the control to be. It looks just like a text box and label but its property sheet tells you, on the Other tab, that it's a Bound Span. (It's called City1 because we already have a City text box control).



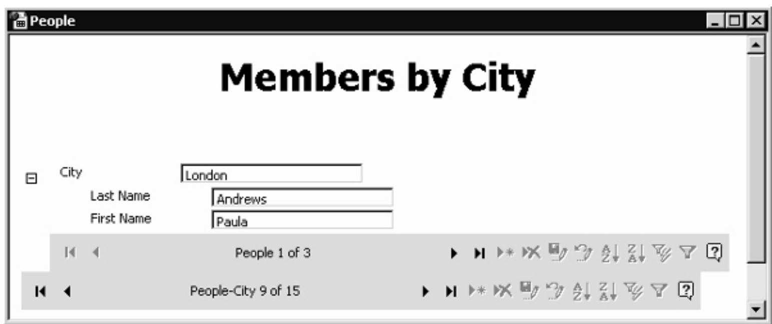
Flip into Page view and you won't be able to edit the contents of that field, and neither can you in Web Page Preview.

The Page Wizard

All of the pages we've built so far have just one level of grouping: records are displayed without any levels of sorting. Rather more sophisticated pages can be built with the Page wizard.

Launch the wizard and select a table or query: we're using the `People` query. Include all its fields and in the second step, add a grouping level of City. Sort records by Last Name, name the page and Finish. This is the resulting page in Page view, a title having been added.

You can navigate though the fifteen cities with the navigation bar and, when you find one of interest, click on the expand button alongside the City label.



Another level opens up, showing the first person in the alphabetically-sorted list. A second navigation bar appears, for moving through the people associated with the chosen city (there are three for London).

Using the People-City navigation bar to move to a different city collapses the people group until you're ready to expand it again.

Controlling access

Imagine that you've constructed the ClubMembers page so that intranet users can inspect the membership database. Letting them look is all well and good, but you probably don't want them editing, adding or deleting records.

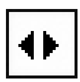
Open the page in Design view. You can inspect the properties of a group, rather than of the section that contains them, by right clicking anywhere in the section and selecting Group Level Properties. The property sheet has only one tab, All, and the first three properties in the list are very interesting. AllowAdditions, AllowDeletions and AllowEdits are presently all set to True but they can all be set to False, thus preventing web users from altering the data in your database. Flip back to Page view and you'll see that the New, Save and Delete buttons are all grayed out, and you should find that the cursor won't appear in any of the fields.

However, on some machines we found that in Page view neither the hyperlink to European member details nor the image hyperlink to San Franciscans works, though the email-sending hyperlink does. On other machines it was fine. Go to the Web Page Preview, however, and these three all work perfectly, while restricting the editing abilities as described above.

A few more controls

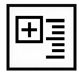
Here are three more controls: two are highly useful and time-saving and one is for fun.

The Record Navigation control



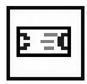
puts a ready-made navigation bar onto a page: put it in position in a data processing section and magically it just works, displaying the correct numbers of records and ready to roll.

The Expand control



adds an expand/collapse button. Place it where you have a group level that can be expanded, otherwise you'll see an error message when you click it, saying in effect that there's nothing to expand or collapse.

The fun control is the Scrolling Text control.



Drag one out on a page and find its ControlSource property on the Data tab. Pop down the list and choose City. In Page view, you'll see the city from the current record scrolling past.

Alternatively you can put a scrolling text control on the page and edit the InnerText property from the Other tab. Type in some text to scroll: you can also, of course, play with the control's fonts and colors. Now across every record you inspect a message is scrolled distractingly across the control – albeit not in the screen shot.

You can also set the Direction property (Other tab) so the text moves from left to right, or up or down, and experiment with the Behavior property or with Loop for the number of times the text scrolls past. There's a great deal of potential for being irritating. Such distracting controls should be used with caution, though they can be fun if not used to excess.

Summary

Work completed in this chapter is in the `chap21end.mdb` file. This file and all the associated folders and .HTML files are in the `WebTest` folder in `AccSamp`: as we've said, it makes file management easier if you keep all the elements that make your pages work in one place.

In this chapter we work with Access, external files, a browser and email software, all of which can exist on a machine in slightly different versions and be set up in slightly different ways. We spotted such differences (documented in the chapter) between two machines which we thought were set up identically. While we can't guarantee it will work, we supply the `chap21end.mdb` and its associated files in the hope that it will do so in most cases.

To cover the full implications of publishing Data Access Pages on the web, even on an intranet, is beyond the scope of this introductory book, not least because approaches to addressing security issues partly depend upon the software you are running and partly on the configuration of your network and hardware. All problems are addressable, however, given further work.

The foregoing should not detract from the great job Access does of providing the environment and tools for building data access pages. What we cover in this chapter and elsewhere should be enough for you to experiment with pages and to publish them across a home or small office network to a few trusted colleagues.

Chapter 22

You mean there's even more?

This chapter is designed to give you just a taste of the extra bits that we haven't yet covered. We'll start with the two remaining tabs from the database window that we have stalwartly managed to avoid so far.

Modules and macros

Access provides a host of ways to let you create databases without the need to become a programmer. However, if you really take to Access and start to develop more complex applications, there will doubtless come a point when you want the database to work in a particular way and there simply isn't a wizard available to help you to automate the process.

Microsoft provides a fully-blown programming language called Visual Basic (VB) as part of Access which can be used to make the product do anything – dust the house, make tea, anything (OK, anything within reason). This is essentially the same language that's found in all of the Microsoft Office applications.

A module is simply a collection of pieces of code written in Visual Basic. These code snippets can either be associated with a certain Access report or form, or used throughout an Access application.

Access also allows you to create macros that can be used to automate processes within Access. Macros have a great deal of appeal because they give you some of the power of programming without actually having to program. A macro is built up from predefined actions, each of which performs a particular operation. Building a macro is, in fact, a very similar process to that of constructing a command button with the wizard, as covered in Chapter 11. The main difference is that you can choose from a larger number of actions to perform and that you are no longer limited to a single action per command button.

Macros are commonly used to automate actions that are repeated frequently, like running a report, printing it and closing it afterwards. A macro is often tied to a button which, when clicked, causes the macro to perform its actions.

So if macros are so wonderful, why bother with VB? Well, macros are easier to learn than VB but not as versatile; some of the more complex operations that programmers perform with Access are impossible to perform from a macro. If you are really keen to take database development further, my advice is to take the plunge and learn Visual Basic.

Application development

Suppose that you build a database in Access for your department or company. It starts life as a simple application that you and perhaps one other person use. It sits on one machine so you take turns using the database. You both help to develop it, you both know it like the back of your hand, you can both use it effectively.

The database is so useful that it rapidly becomes important, not to say crucial, to the running of the organization. This is good, but you are likely to hit several distinct issues at about this time.

- What happens when untrained people start to use it?
- How do you let different people have different access to the database (perhaps some of them should only have the ability to read, but not alter, the data)?
- How do you allow between five and ten people to use the database at the same time from different machines?
- Does it matter if the number of people goes up to, say, fifty?

What happens when untrained people start to use it?

They uncover all of the holes that you didn't know were there. **You** know how to use the database because you helped to design and build it. You instinctively know that you have to add an author to the author table before trying to add a book to the book table. It's obvious – but not to someone who has never used a database. So the users will need to be trained and the database may need some further development work.

How do you let different people have different access to the database?

By making use of Access' security features, designed for just this purpose.

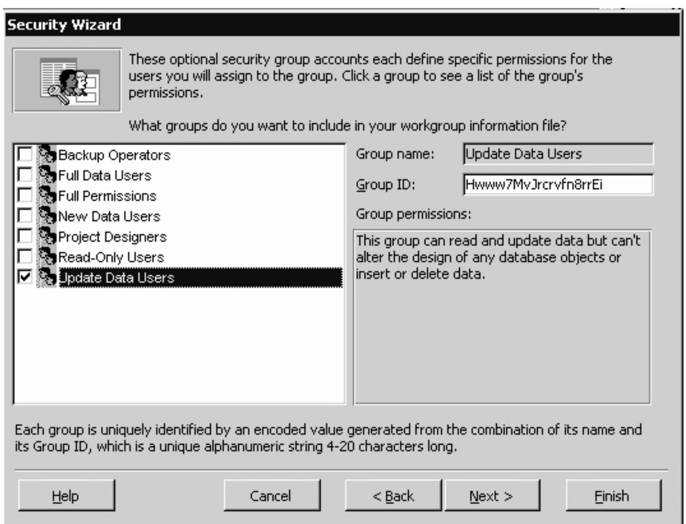
Security is a broad subject with far-reaching consequences and in this book we only scratch at the surface. If your databases need sophisticated protection, it's likely that it can be set up just as you wish.

The simplest form of security is to assign a password to the database application: users must type in the password in order to access the database. This offers no protection to the database components: your table designs, queries and so on can still be altered by any user but only, of course, if that user has the password. For a home or small business database there are instances where this type of protection will be adequate.

An alternative is to opt for user-level security which can be used to limit the access users have to the components you have created. User-level security is extremely flexible, letting you determine exactly who can do what. You can set it up so that users cannot change the design of tables, that they have read-only access to queries (so they can see what they do but not alter them) and even so that they can't access certain tables of sensitive data (salaries information, for example) at all.

Anyone who uses the database is a user and has a name and a password. Each user is allocated to one or more groups and is said to be a member of a group or groups. Each group is given permissions that enable the users in the group to perform certain tasks. Access provides predefined groups including Read-Only Users, whose members can read all data but cannot alter it nor the design of any database object, and Full Data Users, who can edit the data but not alter the design of any database object.

In addition, there is a User-Level Security Wizard, accessed from the main menu under Tools, Security. This advanced wizard with many steps takes a lot of the sting out of a job that can be somewhat challenging.



This is a typical page from the wizard. Here you determine which of the predefined groups you wish to use for the database. The groups have descriptive names indicating the sort of tasks users can perform and text to the right describes this in more detail.

When you set up a security system with this wizard, it produces a report outlining the security that has been put in place. Print this out and keep it safe as it contains information you'll need if you ever need to recreate this particular setup.

How do you allow between five and ten people to use the database at the same time from different machines?

Let's assume that all of the machines are networked and can all 'see' a common disk somewhere on the network. Let's further assume that all of the machines have a copy of Access 2003. If you put the Access .MDB file on the common shared disk then, if all is well, all of the users should be able to use the database at the same time. Note that tiny phrase slipped in there 'if all is well'. Sharing databases is much easier than it used to be but it still often requires a reasonable understanding of both networks and databases. However, the good news is that, possibly with a bit of initial tweaking, Access is capable of allowing multi-user access to data.

Does it matter if the number of people goes up to, say, fifty?

Yes. The Access .MDB format allows multiple copies of Access to use the same database simultaneously. The mechanism that it uses to allow this is sub-optimal when the number of users increases above about ten (the actual number depends upon what those users are doing). "Ah ha", you think, "sub-optimal. That's code for badly designed." Not really. Access was designed to be optimal when run as a stand-alone database engine and it was a sensible decision because that's the way it is normally used.

So, what do you do if you want lots of people to use the database? You upsize your Access application to some database engine that is designed for large numbers of simultaneous users. Such an engine might be Microsoft's SQL Server, or it could be IBM's DB2 or Oracle's Oracle. These database engines sit not on the PC, but on the server with the data. They can handle not just fifty simultaneous users, not just 500, not just 5,000... you get the picture. How you upsize the application is another book but all of these companies now offer wizards or the equivalent to help you upsize.

Which brings us neatly to project files.

Projects

Before describing an Access project, here's a little background to help give a context to the description.

At the core of Access lies what's known as a database engine. Called the Jet engine, it is software that keeps such things as referential integrity, validation at the table level and joins between tables under control and it also performs whatever searches and queries are required by the users.

When you create an Access application within its .MDB file, your creation is optimized for use by the Jet engine. (Incidentally, isn't it a great name? It sounds like something from a Flash Gordon story, or at least from the archives of the Jet Propulsion Laboratory).

Microsoft's other RDBMS product, SQL Server, also has a database engine, but that is a very different beast, heavily optimized for multiple users.

Microsoft had the clever idea of coming up with a third engine called the SQL Server 2000 Desktop Engine. This one is exactly the same as the SQL Server engine except that it will run on stand-alone PCs and is sub-optimal for more than about ten users. "Ah ha", you think again, "sub-optimal. That's code for badly designed." No, it was a decision taken by Microsoft in cold blood to actively and deliberately restrict this engine so that it doesn't work well with more than a few users. Why? Well, if you want to run with hundreds of users, Microsoft wants to sell you SQL Server. However, Microsoft also wants to give you a path to upsize easily from Access to SQL Server and therefore provides the SQL Server Desktop Engine.

When you elect to create an Access project, Access stops using the Jet engine and switches to the Desktop Engine or SQL Server. You continue to use Access and it will apparently work in much the same way as before. You can use it to create tables, queries, forms and so on. In terms of differences, when you start work you'll notice a new button on the database window for Database Diagrams and that when you create a new table, Access offers you a different set of data types. However, all of the work you do can later be updated to SQL Server really easily because the Desktop Engine has a high degree of compatibility with SQL Server.

Project files have an .ADP extension instead of the usual .MDB extension. Unlike an .MDB file, a Project file contains no tables of data, just forms, reports, macros, modules and data access pages. The tables of data are looked after by the Desktop Engine but when viewed from Access running on a client machine, the tables are visible components just as they are in stand-alone Access applications.

Object dependencies

Access 2003 offers a means of inspecting the object dependencies in your database at any time. This is a great help for general maintenance and housekeeping, especially after a bout of development work.

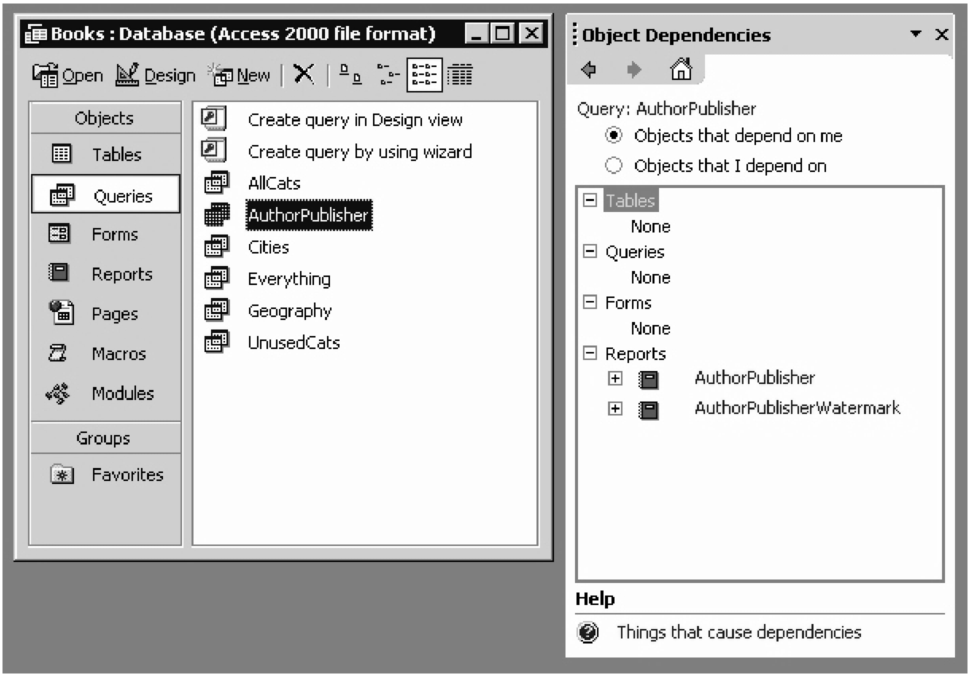
Imagine you've generated lots of queries and there are several that you think aren't being used but you're not entirely sure. To work out manually whether any forms or reports are based upon a query can be a slow process, but happily there's an alternative way.

Looking at Queries from the database window with all objects closed, highlight a query and select View, Object Dependencies (or right click the query and select Object Dependencies, or press Alt-V, N).

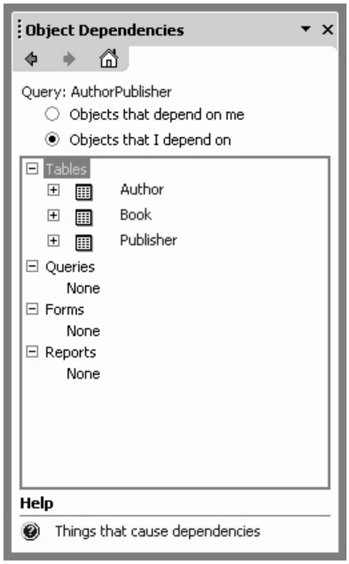
You may see this message when you ask to see Object Dependencies:

Answer Yes and the feature will be enabled by turning on the 'Track name AutoCorrect info' setting. You can do this manually via Tools, Options and the General tab.

Dependencies are displayed in a panel: here we are looking at the `AuthorPublisher` query from the `Books` database:



The radio button at the top lets you choose between the objects depending on the query and those that the query itself is dependent upon. Two reports depend on the `AuthorPublisher` query, and



the query itself depends on three tables for its data.

The dependencies of tables, queries, forms and reports can be inspected, though not those of macros, modules or data access pages.

File formats

The Access 2000 file format is used as the default file format in Access 2003, as you may have noticed from the database window's title bar as we've worked through the book.

Databases in the Access 2000 format can be opened in Access 2003 and will behave perfectly. You can develop the database further, making use of features new to Access 2003. Should you wish to open the file from Access 2000, any elements that rely on those new features will be ignored, but the database will still run. Should you wish to open the file in Access 2002, most of these new features will remain in working order.

Access gives you this flexibility because it is quite common for users on a network to have different versions of Access installed and yet need to use the same Access database.

Access 2003 also offers the Access 2002 – 2003 file format. A database in this format can only be opened in Access 2002 or later. If you decide you want to create a database in this format, click Tools, Options and select the Advanced tab. Pop down the list of Default File Formats and pick Access 2002 – 2003.

Regardless of whether you choose the Access 2000 or the Access 2002 – 2003 file format, your database file will be saved with the .MDB file extension.

Summary

There are other really interesting bits of Access but the areas in this chapter are those we would examine if we had read this book and wanted to know what to investigate next. We hope you enjoy using Access as much as we enjoy our continuing involvement with it.

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