C++ BUILDER

Chapter 1

Introduction

This *Quick Start* provides an overview of the C++Builder development environment to get you started using the product right away. It also tells you where to look for details about the tools and features available in C++Builder.

What is C++Builder?

C++Builder is an object-oriented, visual programming environment for rapid application development (RAD). Using C++Builder, you can create highly efficient 32-bit Windows applications with a minimum of manual coding. C++Builder provides all the tools you need to develop, test, debug, and deploy applications, including a large library of reusable components, a suite of design tools, application and form templates, and programming wizards. These tools simplify prototyping and shorten development time.

Where to find information

Information on C++Builder is available in a variety of forms:

- Online Help
- Printed documentation
- Inprise developer support services
- Inprise and borland.com Web sites

For information about new features in this release, refer to What's New in the online Help and to the borland.com Web site.

Online Help

The online Help system provides detailed information about user-interface features, language implementation, programming tasks, and the components in the Visual Component Library (VCL). It includes the core Help files listed in Table 1.1

Table 1.1 Online Help files

Help file	Contents	Audience
What's New (BCB5new.hlp)	Introduces new features and enhancements to C++Builder for the current release and includes links to detailed information. Includes details on upgrading from a previous release.	Developers who upgraded to this release
Using C++Builder (Bcb5.hlp)	Introduces the development environment and explains how to work with forms, projects, and packages. Discusses basic concepts of component-based object-oriented programming. Includes two step-by-step tutorials to help you learn C++Builder.	New C++Builder developers, people with questions about the IDE
Visual Component Library Reference (Bcb5vcl.hlp)	Presents a detailed reference on VCL classes, global routines, types, and variables. Entries show the unit where each class is declared; its position in the hierarchy; a list of available properties, methods, and events; and code examples.	All C++Builder developers
Standard C++ Library Reference (Bcb5scl.hlp)	Presents a detailed reference on the Standard C++ Library.	All C++Builder developers
C Runtime Library Reference (Bcbrtl.hlp)	Presents a detailed reference on the C Runtime Library.	All C++Builder developers
Programming with C++Builder (Bcb5prog.hlp)	Provides details about using the VCL components and illustrates common programming tasks such as handling	All C++Builder developers

	exceptions, creating toolbars and drag-and-drop controls, and using graphics.	
Developing Database Applications (Bcb5dbd.hlp)	Explains design of single- and multi-tiered database applications, including database architecture, datasets, fields, tables, queries, and decision support.	Database developers
Developing Distributed Applications (Bcb5dap.hlp)	Explains how to create distributed applications. Includes information on CORBA, DCOM, MTS, HTTP, and sockets.	Developers writing client/server applications
Creating Custom Components (Bcb5cw.hlp)	Provides information on writing custom C++Builder components. Explains how to design, build, test, and install a component.	Developers writing C++Builder components
Developing COM-based Applications (Bcb5com.hlp)	Explains how to build distributed applications using COM. Topics include COM objects, MTS components, Automation servers and controllers, ActiveX controls, and type libraries. Explains how to modify generated type libraries using C++Builder's Type Library Editor.	Developers writing client/server applications
C++Builder Language Guide (Bcb5lang.hlp)	Describes the C++ programming language including lexical elements, language structure, preprocessing directives, keywords, and C++ topics such as namespaces, polymorphism, and scope.	All C++Builder developers
Command-line tools	Provides information about using many tools that are included with C++Builder	Developers who want to use

(Bcb5tool.hlp)	such as the C++ compiler, the incremental linker, the resource linker, MAKE, GREP, and several conversion tools.	additional tools from the command line
Object Pascal Reference (Del5op.hlp)	Provides a formal definition of the Object Pascal language and includes topics on file I/O, string manipulation, program control, data types, and language extensions.	Developers who need Object Pascal language details
Borland OpenHelp (OpenHelp.hlp)	Explains how to configure the C++Builder Help system. The OpenHelp utility lets you add or remove any Windows Help (.HLP) file.	Developers wanting to customize the C++Builder Help system

You will also find Help on additional products that are supplied with some versions of C++Builder, such as:

- Integrated Translation Environment (ITE) Help
- InterBase Express Reference Help
- Borland Database Engine (BDE) Help
- BDE Administrator Help
- Database Explorer Help
- Local SQL, SQL Builder, and SQL Monitor Help
- TeamSource Help
- CodeGuard Help
- TurboAssembler Help
- Package Collection Editor Help
- Help Author's Guide (Help Workshop)
- QuickReport Help
- TeeChart Help
- InterBase and InterBase Express Help
- CORBA Component Library Reference Help
- Help for miscellaneous components (FastNet Time, DayTime, Echo, Finger, HTTP, NNTP, POP3, Powersock, SMTP, UDP, URL Encode/Decode, UUprocessor, Stream and Msg components)

All Help files are located in the Help directory under the main C++Builder directory.

Developer support services

Inprise also offers a variety of support options to meet the needs of its diverse developer community. To find out about support offerings, refer to http://www.borland.com/devsupport/.
From the Web site, you can access many newsgroups where C++Builder developers exchange information, tips, and techniques. The site also includes a list of books about C++Builder.

Typographic conventions

This manual uses the typefaces described below to indicate special text.

Table 1.2 Typographic conventions

Typeface	Meaning
Monospace type	Monospaced type represents text as it appears on screen or in code. It also represents anything you must type.
Boldface	Boldfaced words in text or code listings represent reserved words or compiler options.
Italics	Italicized words in text represent C++Builder identifiers, such as variable or type names. Italics are also used to emphasize certain words, such as new terms.
Keycaps	This typeface indicates a key on your keyboard. For example, "Press Esc to exit a menu."

Chapter 2

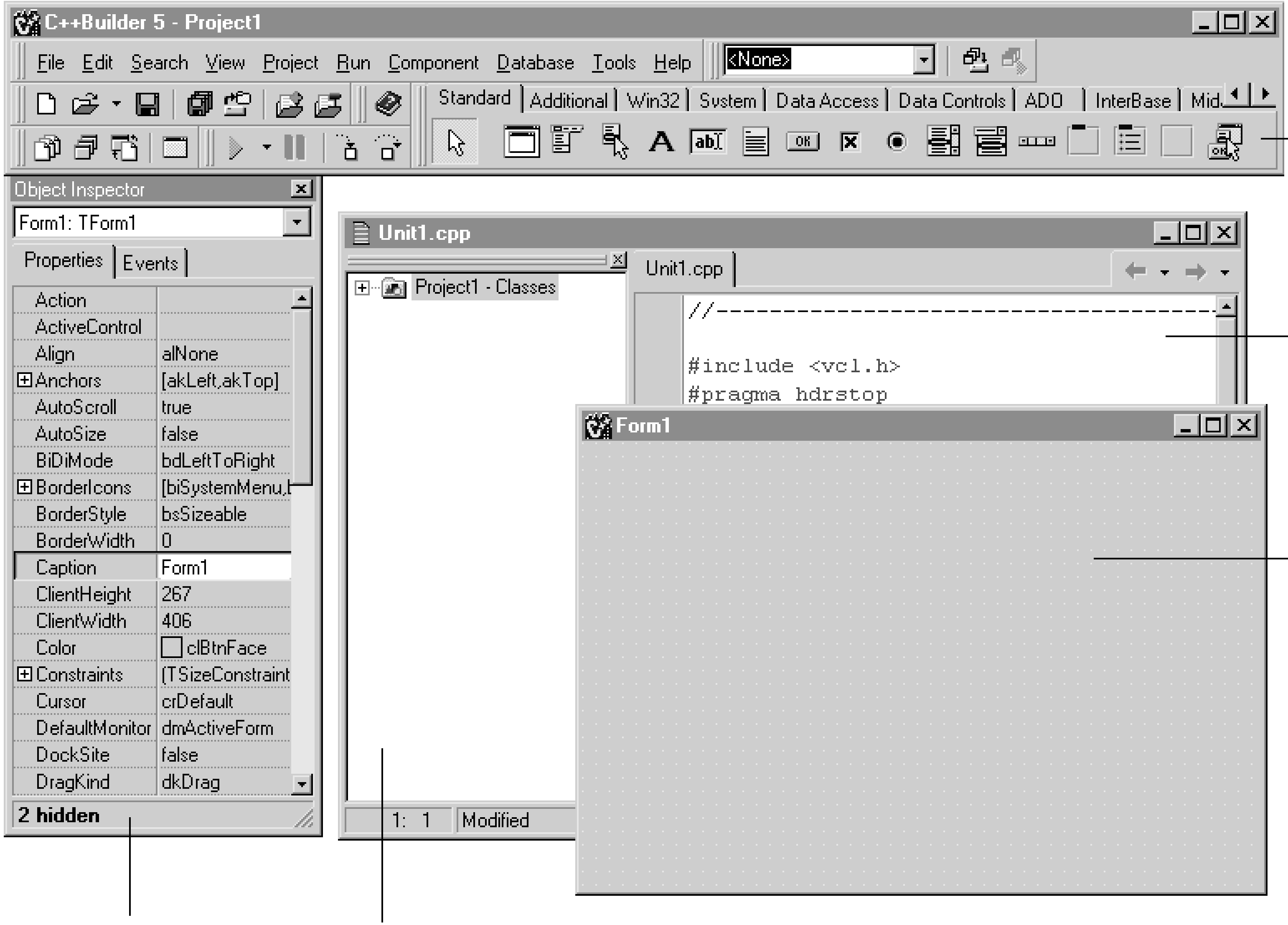
A tour of the environment

Starting C++Builder

You can start C++Builder in several ways:

- Double-click the C++Builder icon (if you've created a shortcut).
- Choose Programs|Borland C++Builder from the Windows Start menu.
- Choose Run from the Windows Start menu, then enter Bcb.
- Double-click Bcb.exe in the CBuilder\Bin directory.

Right away, you'll see some of the major tools in C++Builder's integrated development environment (IDE).



Action	
ActiveControl	
Align	alNone
⊞Anchors	[akLeft,akTop]
AutoScroll	true
AutoSize	false
BiDiMode	bdLeftToRight
⊞BorderIcons	[biSystemMenu,b
BorderStyle	bsSizeable
BorderWidth	0
Caption	Form1
ClientHeight	267
ClientWidth	406
Color	□ clBtnFace
⊞Constraints	(TSizeConstraint
Cursor	crDefault
DefaultMonitor	dmActiveForm
DockSite	false
DragKind	dkDrag

```
//-----------------------------------------------

#include <vcl.h>
#pragma hdrstop
```

Palette of ready-made components to use in your applications.

Code editor for viewing and editing code.

The Form Designer contains a blank form on which to start designing the UI for your application. An application can include many forms.

The Object Inspector is used to change objects' properties and select event handlers.

The ClassExplorer shows you the classes, variables, and routines in your unit and lets you navigate quickly.

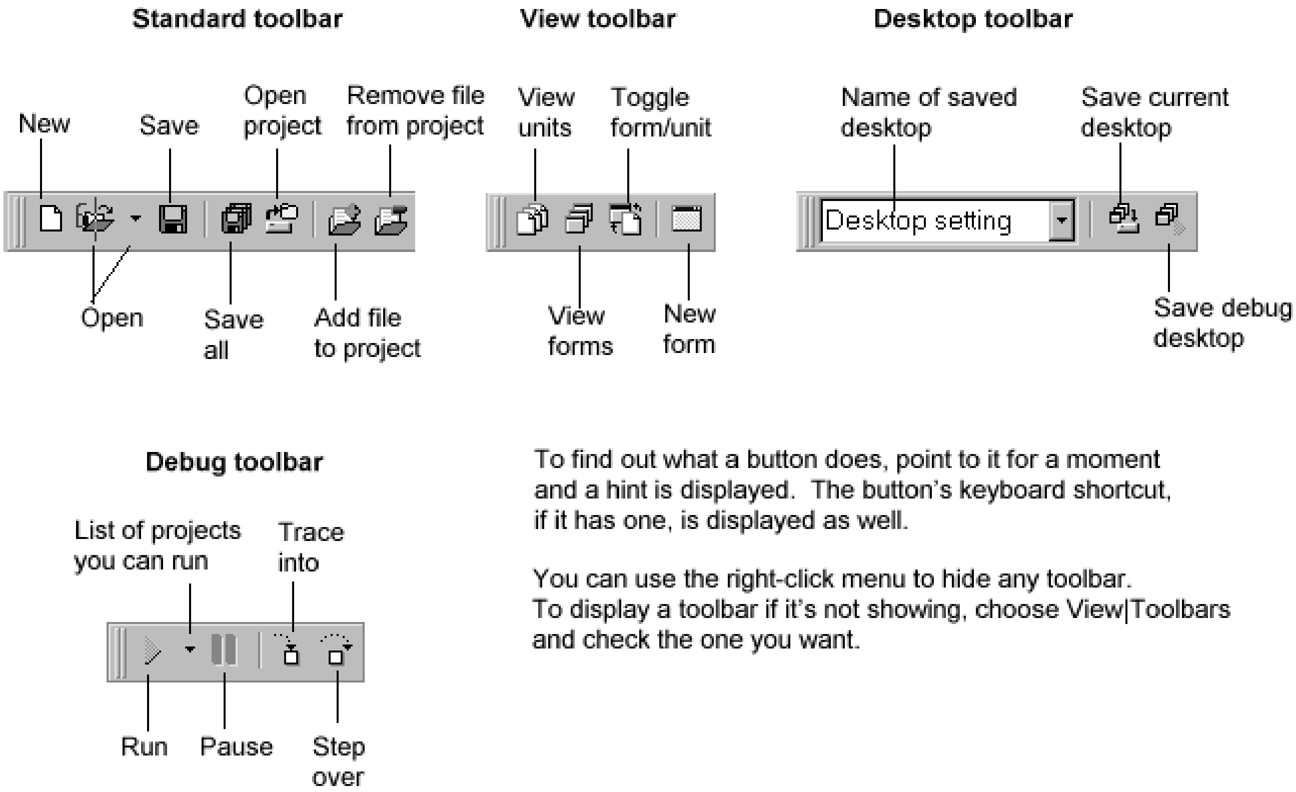
C++Builder's development model is based on *two-way* tools. This means that you can move back and forth between visual design tools and text-based editing. For example, after using the Form Designer to arrange buttons and other elements in a graphical interface, you can immediately view the form (.DFM) file that contains the textual description of your form. You can also manually edit any code generated by C++Builder without losing access to the visual programming environment.

From the IDE, all your programming tools are within easy reach. You can manage projects, design graphical interfaces, write code, search databases, compile, test, debug, and browse through class libraries without leaving the IDE.

To learn about organizing and configuring the IDE, see Chapter 5, "Customizing the environment".

Using toolbars, menus, and keyboard shortcuts

C++Builder's toolbars, located in the main window, provide quick access to frequently used operations and commands. All toolbar operations are duplicated in the drop-down menus.



To find out what a button does, point to it for a moment and a hint is displayed. The button's keyboard shortcut, if it has one, is displayed as well.

You can use the right-click menu to hide any toolbar. To display a toolbar if it's not showing, choose View|Toolbars and check the one you want.

Many operations have keyboard shortcuts as well as toolbar buttons. When a keyboard shortcut is available, it is always shown next to the command on the drop-down menu.

You can right-click on many tools and icons to display a menu of commands appropriate to the object you are working with. These are called *context menus*.

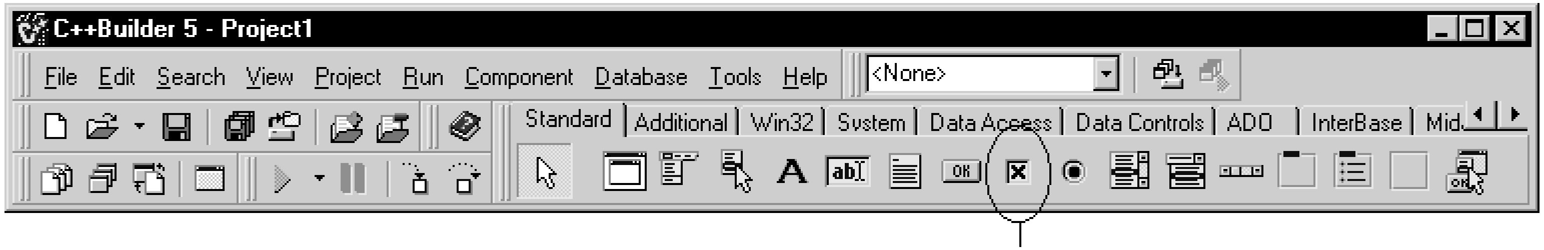
The toolbar is also customizable. You can add commands you want to it or move the parts of the toolbar to different locations. For more information, see "Arranging menus and toolbars".

You can name and save desktop arrangements using the Desktop toolbar.

Placing components on a form

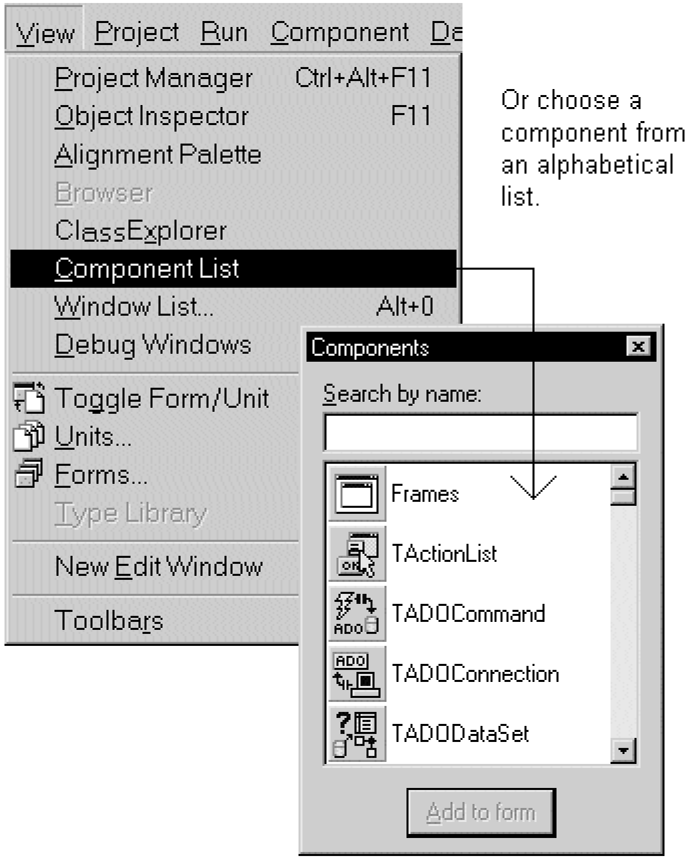
To build an application interface, you place components on a form, set their properties, and code their event handlers.

Many components are provided on the Component palette, grouped by function.

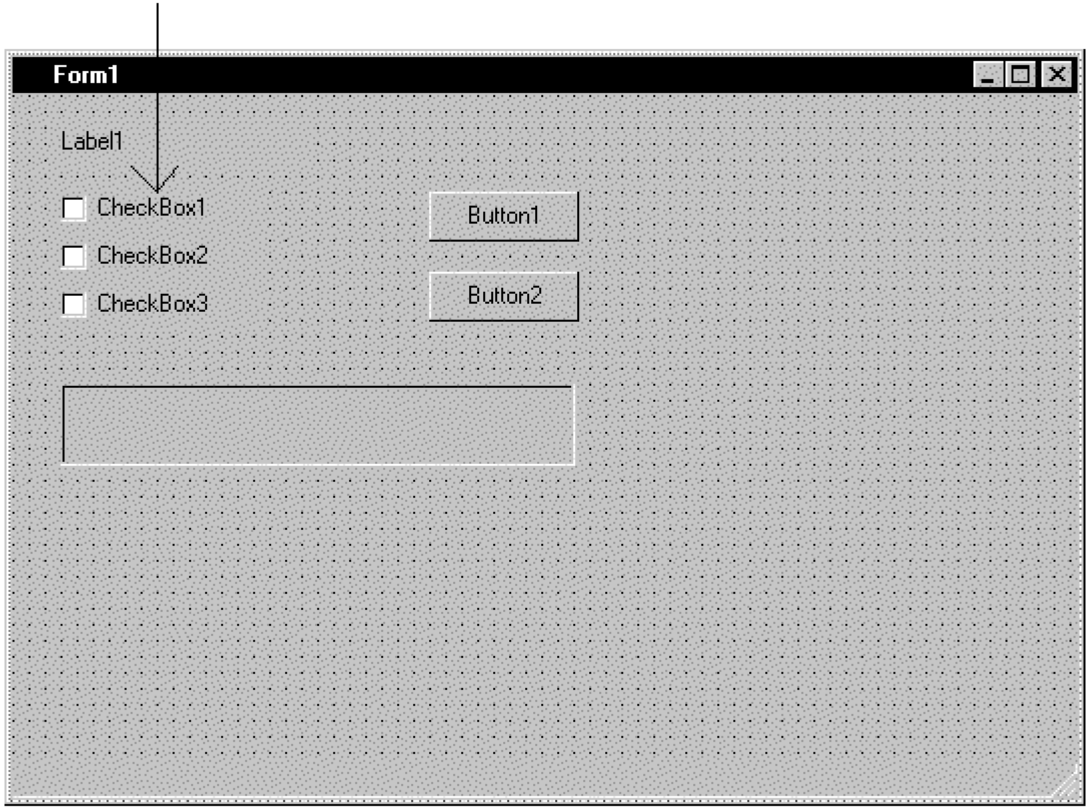


Click a component on the Component palette.

Then click where you want to place it on the form.

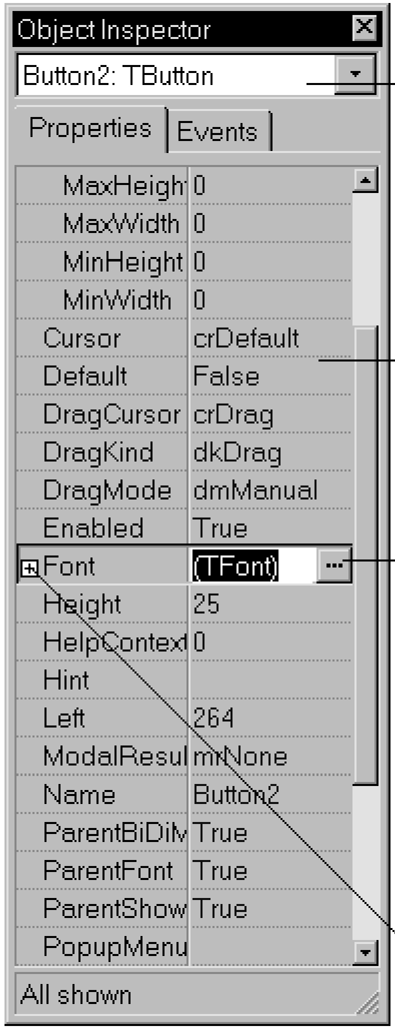


Or choose a component from an alphabetical list.



Changing component appearance and behavior

You can change the way a component appears and behaves in your application by using the Object Inspector. When a component is selected on a form, its properties and events are displayed in the Object Inspector.



Object Inspector

Button2: TButton

Properties | Events

MaxHeigh	0
MaxWidth	0
MinHeight	0
MinWidth	0
Cursor	crDefault
Default	False
DragCursor	crDrag
DragKind	dkDrag
DragMode	dmManual
Enabled	True
⊞Font	(TFont) ...
Height	25
HelpContex	0
Hint	
Left	264
ModalResul	mrNone
Name	Button2
ParentBiDiM	True
ParentFont	True
ParentShow	True
PopupMenu	

All shown

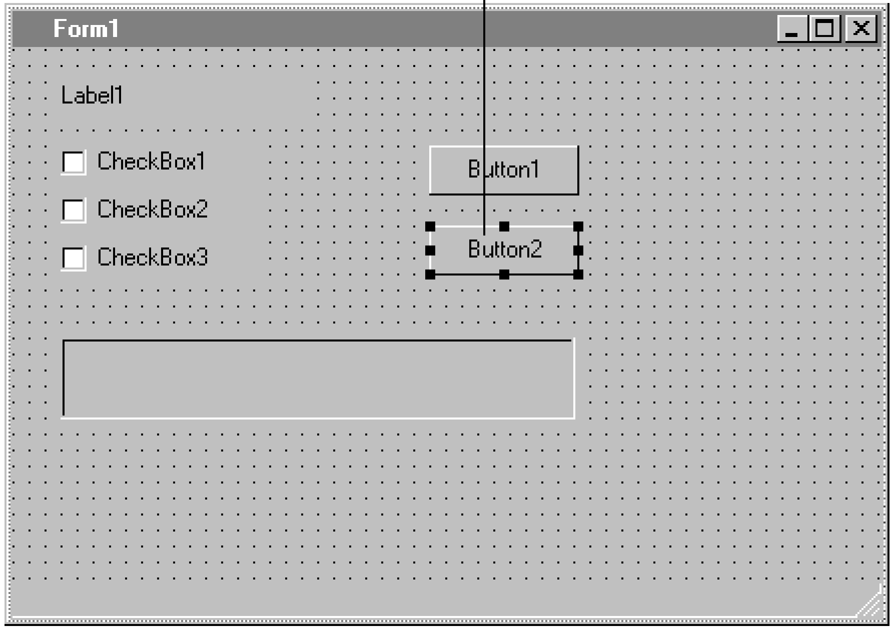
Or use this drop-down list to select an object. Here, Button2 is selected, and its properties are displayed.

Select a property and change its value in the right column.

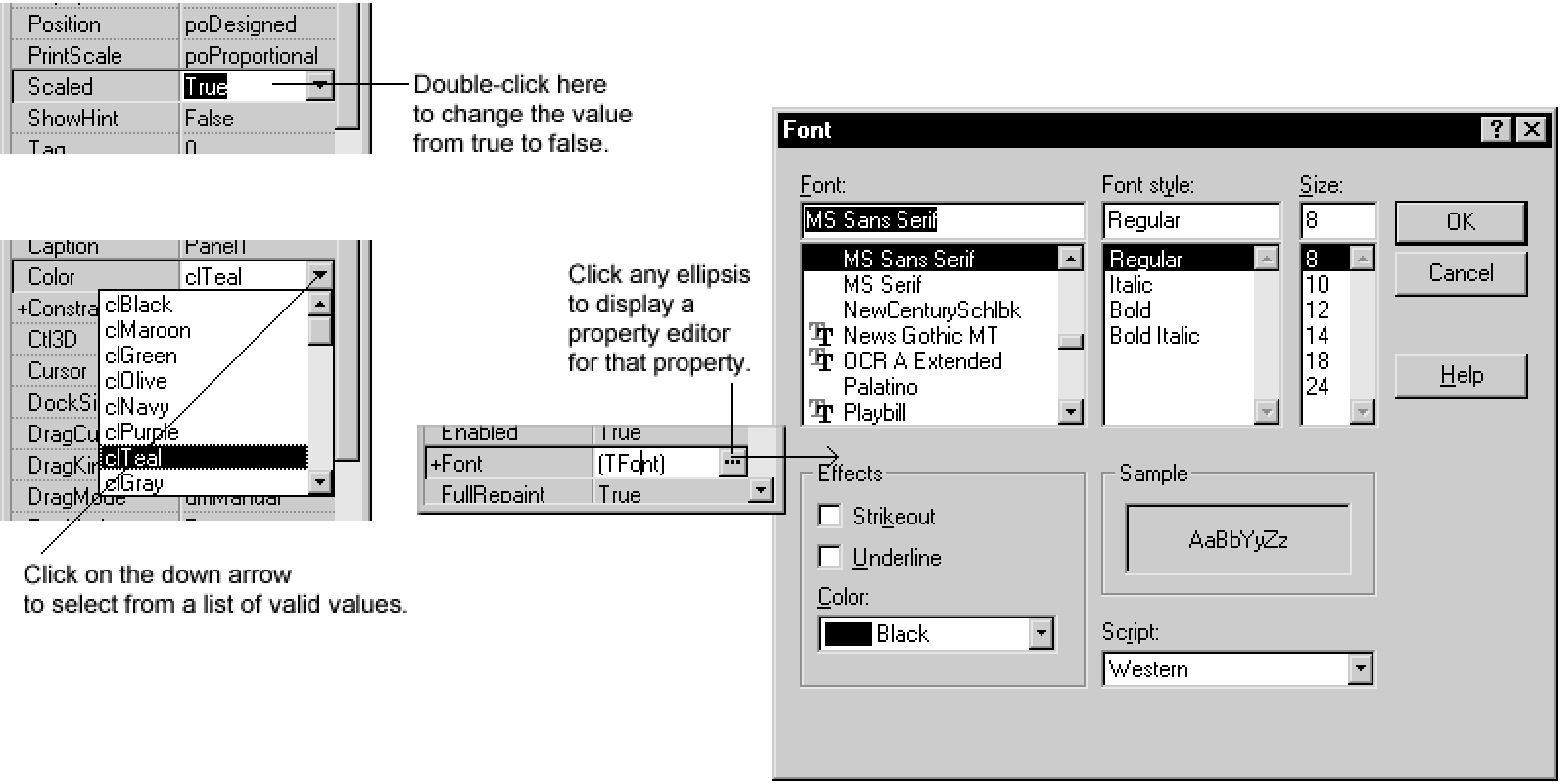
Click an ellipsis to open a dialog where you can change the properties of a helper object.

You can also double-click a plus sign to open a detail list.

You can select an object on the form by clicking on it.



Many properties have simple values--such as names of colors, *true* or *false*, and integers. For Boolean properties, you can double-click the word to toggle between *true* and *false*. Some properties have associated property editors to set more complex values. When you click on such a property value, you'll see an ellipsis.



Position	poDesigned
PrintScale	poProportional
Scaled	True
ShowHint	False
Tag	0

Double-click here to change the value from true to false.

Caption	Panel1
Color	clTeal

Click on the down arrow to select from a list of valid values.

Click any ellipsis to display a property editor for that property.

Enabled	True
+Font	(TFont)
FullRepaint	True

Font

Font: MS Sans Serif

Font style: Regular

Size: 8

Effects

☐ Strikeout

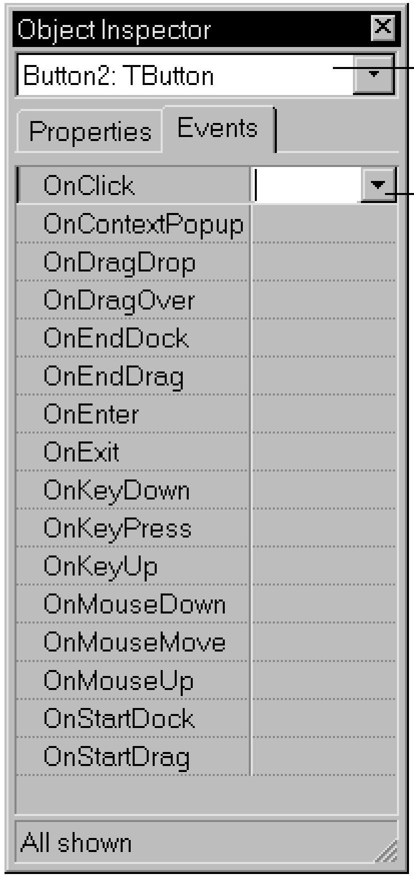
☐ Underline

Color: Black

Sample

Script: Western

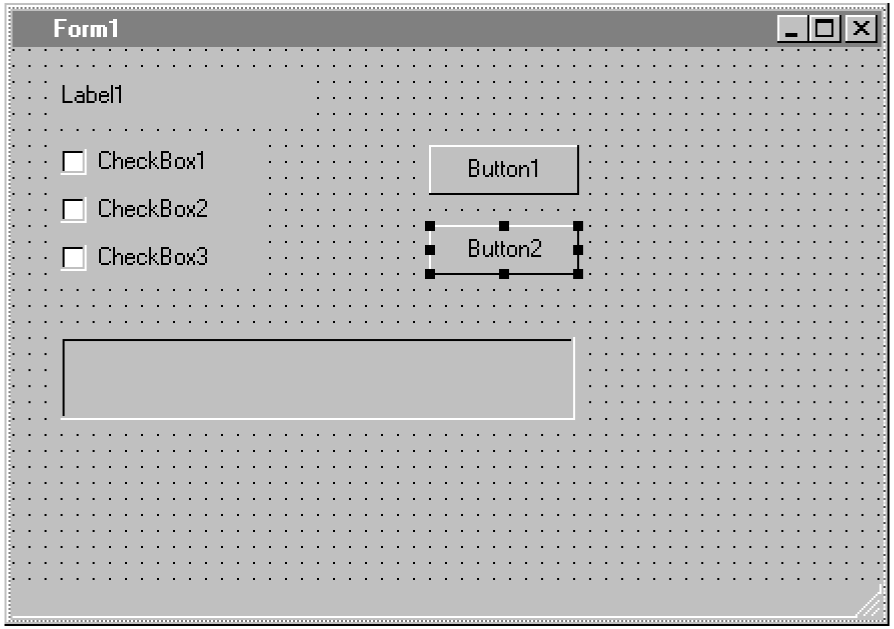
Working with events



Click the Events tab in the Object Inspector to see the events that each component can handle. Here, Button2 is selected and its type is displayed: *TButton*.

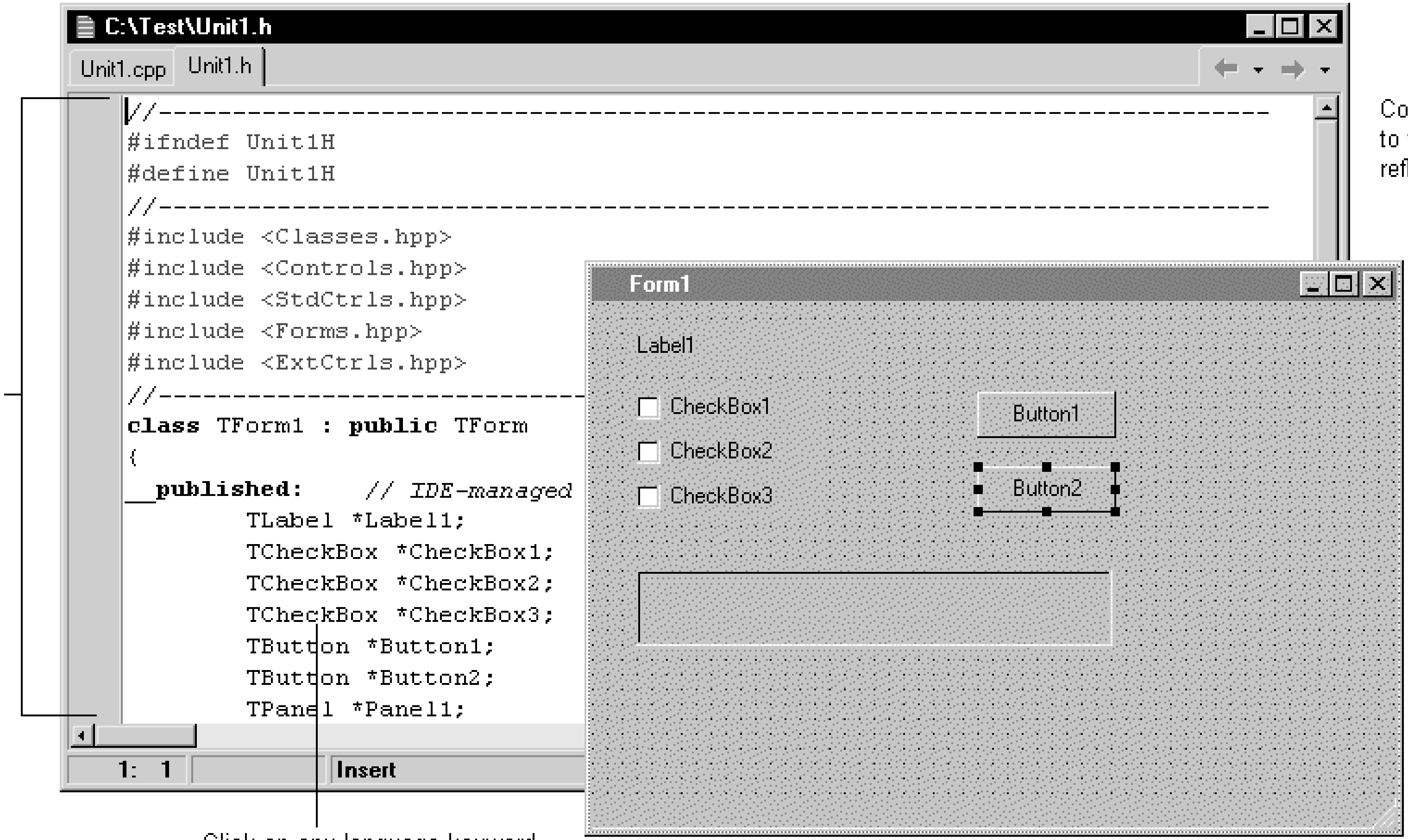
Select an existing event handler from the drop-down list.

Or double-click in the value column, and DelphiC++Builder generates skeleton code for a new event handler.



Viewing and editing code

As you design the user interface for your application, C++Builder generates the underlying code. When you select and modify the properties of forms and components, your changes are automatically reflected in the source files.
You can also add code to your source files directly using the built-in Code editor. The Code editor is a full-featured ASCII editor. Choose Tools|Editor Options to customize your editing environment. You can set options such as tabbing, key mapping, color, and automatic features.



```
//-------------------------------------------------------------------------
#ifndef Unit1H
#define Unit1H
//-------------------------------------------------------------------------
#include <Classes.hpp>
#include <Controls.hpp>
#include <StdCtrls.hpp>
#include <Forms.hpp>
#include <ExtCtrls.hpp>
//------------------------------
class TForm1 : public TForm
{
__published:    // IDE-managed
        TLabel *Label1;
        TCheckBox *CheckBox1;
        TCheckBox *CheckBox2;
        TCheckBox *CheckBox3;
        TButton *Button1;
        TButton *Button2;
        TPanel *Panel1;
```

Generated code.

Components added to the form are reflected in the code.

Click on any language keyword or VCL element, and press F1 to get Help.

Viewing form files

Forms are a very visible part of most C++Builder projects--they are where you design the user interface of an application. Normally, you design forms using C++Builder's visual tools, and C++Builder stores the forms in form files. Form files (extension .DFM) describe each component in your form, including the values of all persistent properties.

To view a form (.DFM) file in the editor, right-click on the form and select View as Text. Form files can be edited. To return to the pictorial view of your form, right-click and choose View as Form.

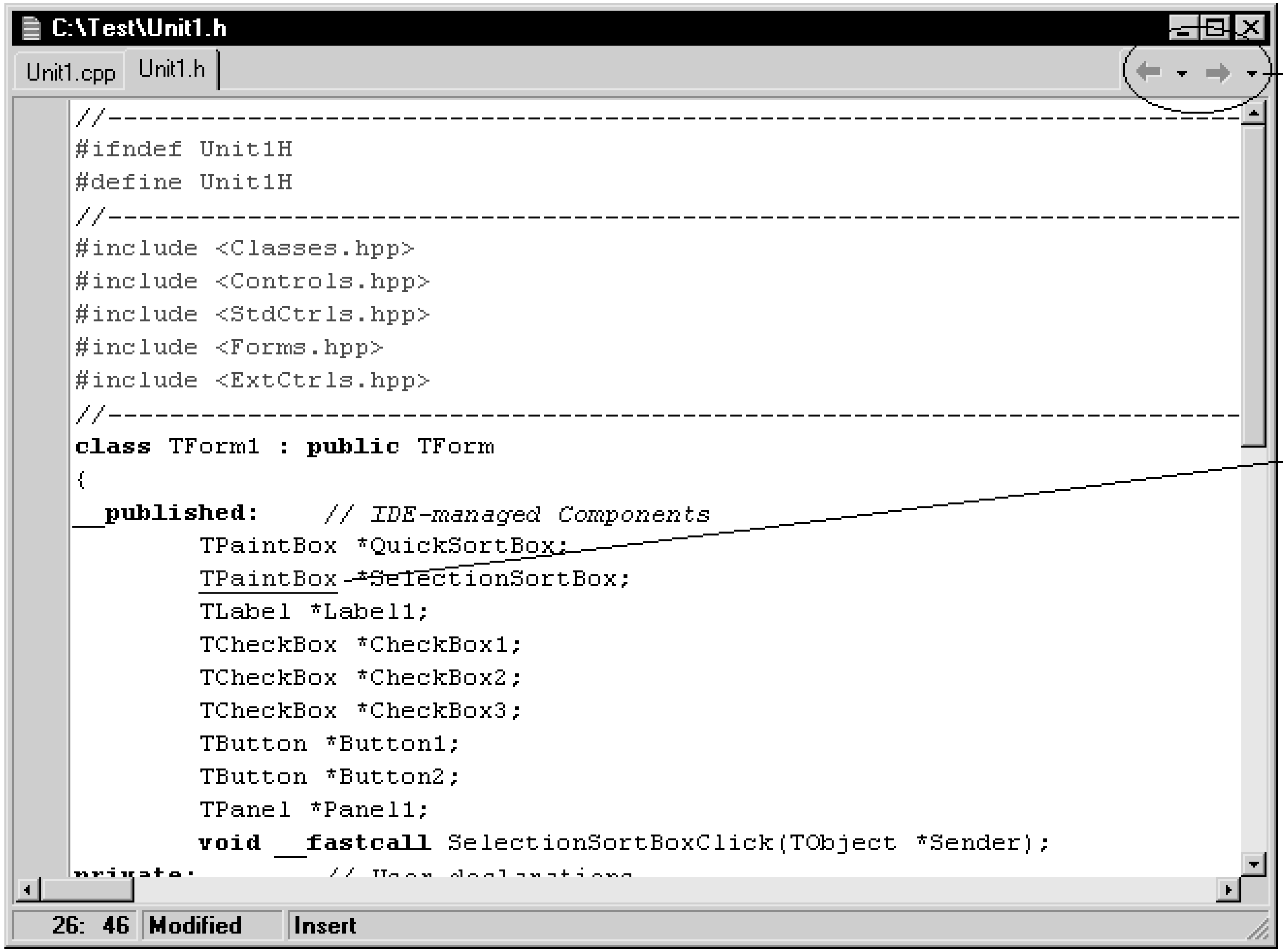
You can save form files in either text (the default) or binary format. The Environment Options dialog lets you indicate which format to use for newly created forms.

For more information...

Search for "form files" in the Help index.

Browsing with the editor

The Code editor has Forward and Back buttons like the ones you've seen on Web browsers. You can use them to navigate through source code. Click the left arrow to return to the last place you were working in your code. Then click the right arrow to move forward again.



```
//---------------------------------------------------------------------------
#ifndef Unit1H
#define Unit1H
//---------------------------------------------------------------------------
#include <Classes.hpp>
#include <Controls.hpp>
#include <StdCtrls.hpp>
#include <Forms.hpp>
#include <ExtCtrls.hpp>
//---------------------------------------------------------------------------
class TForm1 : public TForm
{
__published:    // IDE-managed Components
        TPaintBox *QuickSortBox;
        TPaintBox *SelectionSortBox;
        TLabel *Label1;
        TCheckBox *CheckBox1;
        TCheckBox *CheckBox2;
        TCheckBox *CheckBox3;
        TButton *Button1;
        TButton *Button2;
        TPanel *Panel1;
        void __fastcall SelectionSortBoxClick(TObject *Sender);
private:        // User declarations
```

Use the editor
like a Web browser.

Press Ctrl and point
to any identifier.
The cursor turns into
a hand, and the
identifier turns blue
and is underlined.

Click to jump to the
definition of the identifier.

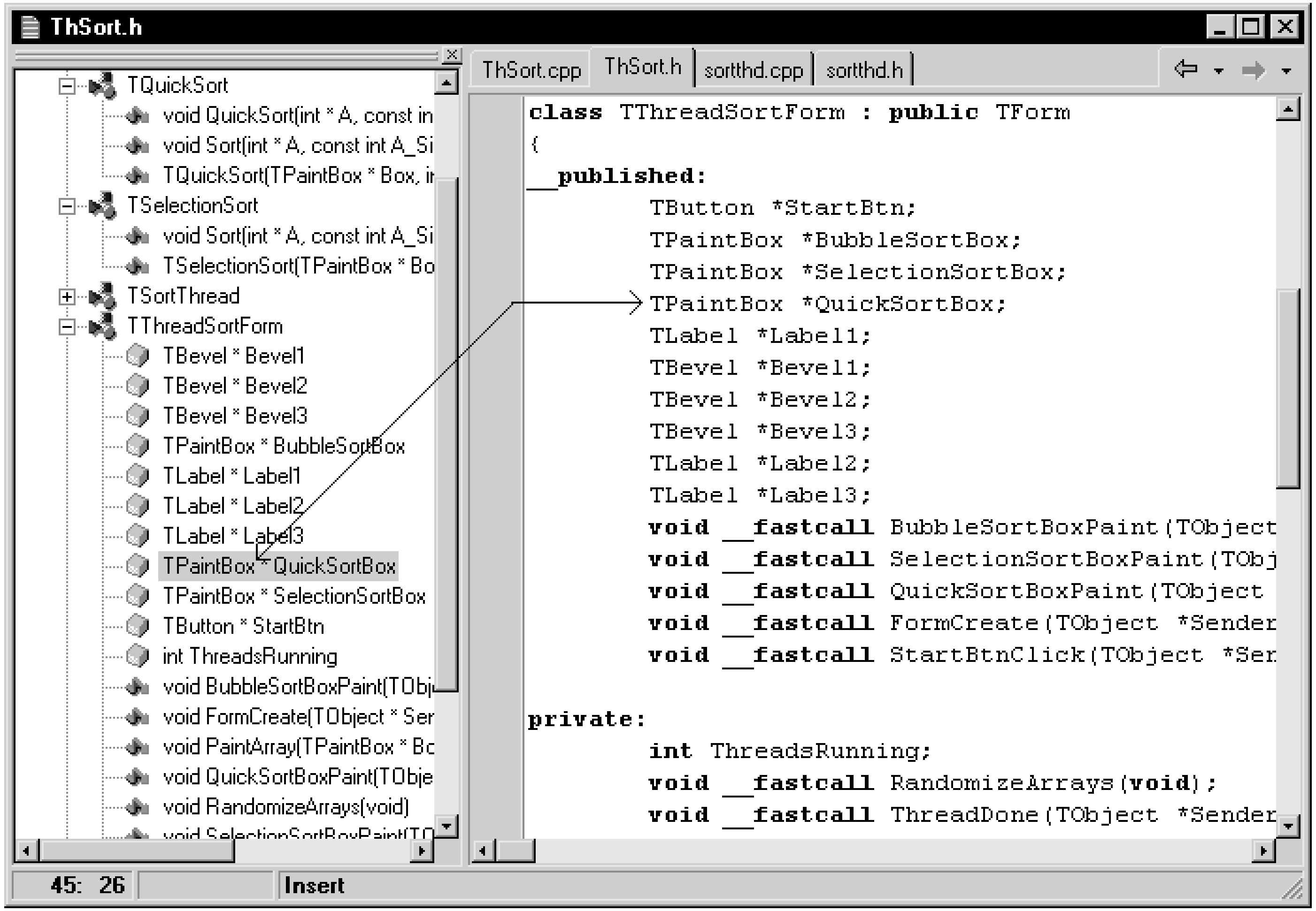
After navigating, click the
Back arrow to return to
your previous location.

For more information...

Search for "Code editor" in the Help index.

Exploring code

When a source file is open in the Code editor, you can use the ClassExplorer to see a structured table of contents for the code. The ClassExplorer contains a tree diagram showing the types, classes, properties, methods, global variables, and routines defined in your unit.

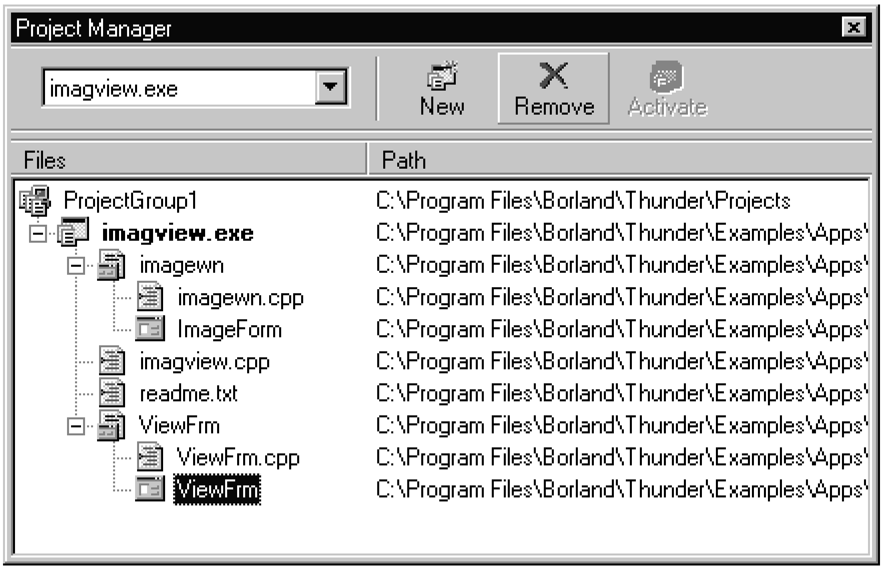


```
TQuickSort
    void QuickSort(int * A, const in
    void Sort(int * A, const int A_Si
    TQuickSort(TPaintBox * Box, ir
TSelectionSort
    void Sort(int * A, const int A_Si
    TSelectionSort(TPaintBox * Bo
TSortThread
TThreadSortForm
    TBevel * Bevel1
    TBevel * Bevel2
    TBevel * Bevel3
    TPaintBox * BubbleSortBox
    TLabel * Label1
    TLabel * Label2
    TLabel * Label3
    TPaintBox * QuickSortBox
    TPaintBox * SelectionSortBox
    TButton * StartBtn
    int ThreadsRunning
    void BubbleSortBoxPaint(TObj
    void FormCreate(TObject * Ser
    void PaintArray(TPaintBox * Bc
    void QuickSortBoxPaint(TObje
    void RandomizeArrays(void)
    void SelectionSortBoxPaint(TO
```

```
class TThreadSortForm : public TForm
{
__published:
        TButton *StartBtn;
        TPaintBox *BubbleSortBox;
        TPaintBox *SelectionSortBox;
        TPaintBox *QuickSortBox;
        TLabel *Label1;
        TBevel *Bevel1;
        TBevel *Bevel2;
        TBevel *Bevel3;
        TLabel *Label2;
        TLabel *Label3;
        void __fastcall BubbleSortBoxPaint(TObject
        void __fastcall SelectionSortBoxPaint(TObj
        void __fastcall QuickSortBoxPaint(TObject
        void __fastcall FormCreate(TObject *Sender
        void __fastcall StartBtnClick(TObject *Ser

private:
        int ThreadsRunning;
        void __fastcall RandomizeArrays(void);
        void __fastcall ThreadDone(TObject *Sender
```

Managing projects

Use the Project Manager to organize the form and unit files that make up an application. To display the Project Manager, choose View|Project Manager.



Files	Path
ProjectGroup1	C:\Program Files\Borland\Thunder\Projects
imagview.exe	C:\Program Files\Borland\Thunder\Examples\Apps\
imagewn	C:\Program Files\Borland\Thunder\Examples\Apps\
imagewn.cpp	C:\Program Files\Borland\Thunder\Examples\Apps\
ImageForm	C:\Program Files\Borland\Thunder\Examples\Apps\
imagview.cpp	C:\Program Files\Borland\Thunder\Examples\Apps\
readme.txt	C:\Program Files\Borland\Thunder\Examples\Apps\
ViewFrm	C:\Program Files\Borland\Thunder\Examples\Apps\
ViewFrm.cpp	C:\Program Files\Borland\Thunder\Examples\Apps\
ViewFrm	C:\Program Files\Borland\Thunder\Examples\Apps\

The Project Manager shows you the form, unit, resource, object, library, and other files contained in a project. You can use the Project Manager to add and remove files, and you can open any file by double-clicking it.

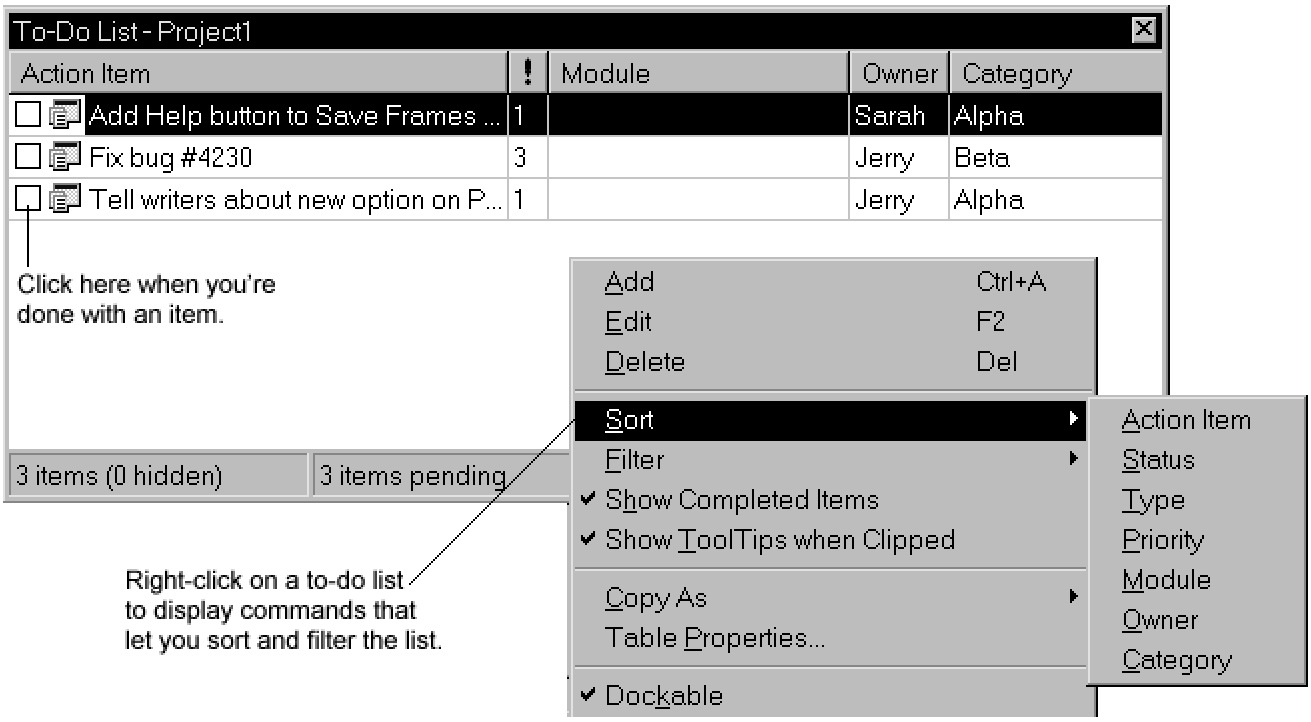
You can combine related projects into a single *project group*. For example, you might use project groups to organize a multi-tiered application or to keep DLLs with executables that use them.

For more information...

Search for "Project Manager" in the Help index.

Creating to-do lists

To-do lists record items that need to be completed for a project. You can add project-wide items to a list by adding them directly to the list, or you can add specific items directly in the source code. Choose View|To-Do list to add or view information associated with a project.



To-Do List - Project1

Action Item	!	Module	Owner	Category
□ Add Help button to Save Frames ...	1		Sarah	Alpha
□ Fix bug #4230	3		Jerry	Beta
□ Tell writers about new option on P...	1		Jerry	Alpha

3 items (0 hidden) | 3 items pending

Click here when you're done with an item.

Right-click on a to-do list to display commands that let you sort and filter the list.

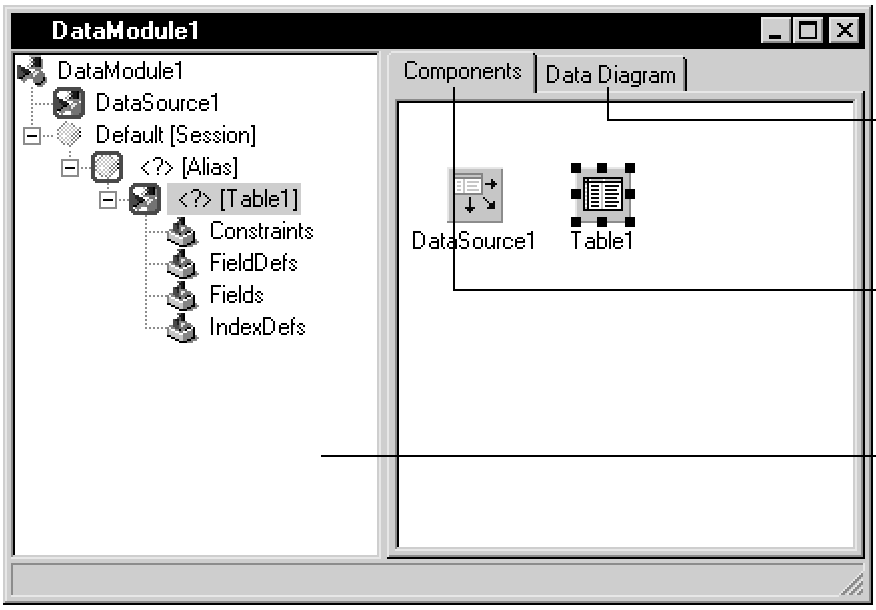
For more information...

Search for "To-Do Lists" in the Help index.

Designing data modules

A data module is a special form that contains nonvisual components. All the components in a data module *could* be placed on ordinary forms alongside visual controls. But if you plan on reusing groups of database and system objects, or if you want to isolate the parts of your application that handle database connectivity and business rules, data modules provide a convenient organizational tool.

The Data Module Designer makes it easy to create data modules. To create a data module, choose File|New and double-click on Data Module.



This tab shows a graphic representation of relationships among components, such as master-detail and lookup fields.

The Components tab (displayed here) shows components as they would appear on a form.

This pane shows a hierarchical tree view of the components in the module.

C++Builder opens an empty data module in the Data Module Designer, displays the unit file for the new module in the Code editor, and adds the module to the current project. When you reopen an existing data module, C++Builder displays its components in the Data Module Designer.

For more information...

Search for "Data Module Designer" or "data module" in the Help index.

Setting project and environment options

The Project Options dialog, accessed by choosing Project|Options, controls compiler and linker switches, some search paths and output directories, project version information, and other settings that are maintained separately for each application. When you make changes in the Project Options dialog, your changes affect only the current project; but if the Default check box is selected, your selections are also saved as the default settings for new projects. (See "Setting default project options".)

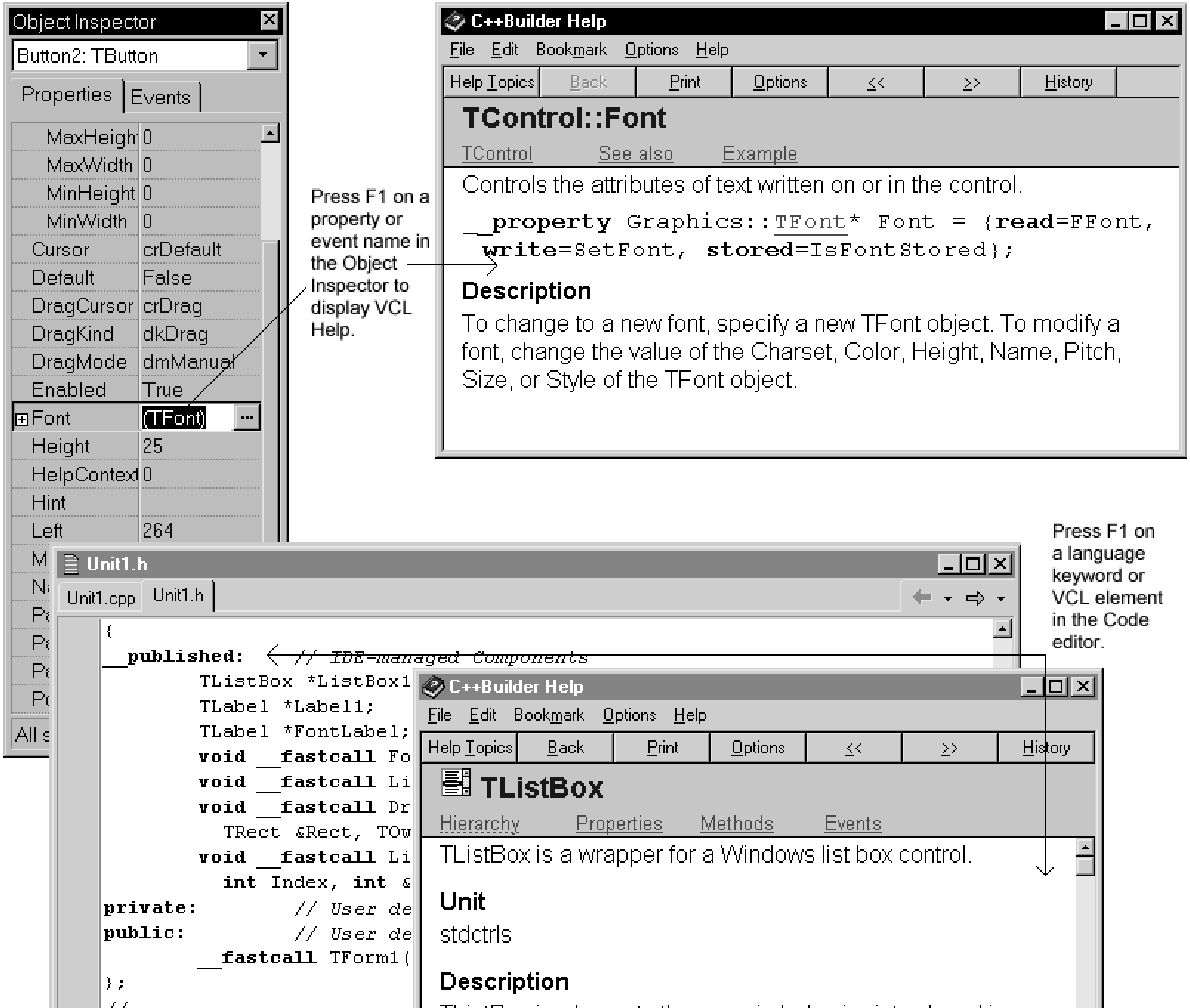
The Environment Options dialog, accessed by choosing Tools|Environment Options, controls global IDE settings for all projects. These include many settings that affect the appearance and behavior of the IDE, as well as some search paths and output directories. You'll find more information about some of these options in "Setting tool preferences".

For more information...

For details about the options on any page of the Project Options or Environment Options dialogs, click the Help button on that page. Or search for "Project Options dialog box" or "Environment Options dialog box" in the Help index.

Getting help

The online Help system provides extensive documentation on the VCL and other parts of C++Builder. Here are some of the ways you can display Help:


Object Inspector
Button2: TButton
Properties
Events
All s

MaxHeigh	0
MaxWidth	0
MinHeight	0
MinWidth	0
Cursor	crDefault
Default	False
DragCursor	crDrag
DragKind	dkDrag
DragMode	dmManual
Enabled	True
⊞Font	(TFont)
Height	25
HelpContext	0
Hint	
Left	264

Press F1 on a property or event name in the Object Inspector to display VCL Help.

C++Builder Help
File Edit Bookmark Options Help
Help Topics Back Print Options << >> History

TControl::Font

TControl See also Example

Controls the attributes of text written on or in the control.

```
__property Graphics::TFont* Font = {read=FFont,
 write=SetFont, stored=IsFontStored};
```

Description

To change to a new font, specify a new TFont object. To modify a font, change the value of the Charset, Color, Height, Name, Pitch, Size, or Style of the TFont object.

Press F1 on a language keyword or VCL element in the Code editor.

```
{
__published:    // IDE-managed Components
        TListBox *ListBox1
        TLabel *Label1;
        TLabel *FontLabel;
        void __fastcall Fo
        void __fastcall Li
        void __fastcall Dr
          TRect &Rect, TOw
        void __fastcall Li
          int Index, int &
private:        // User de
public:         // User de
        __fastcall TForm1(
};
//
```

C++Builder Help
File Edit Bookmark Options Help
Help Topics Back Print Options << >> History

TListBox

Hierarchy Properties Methods Events

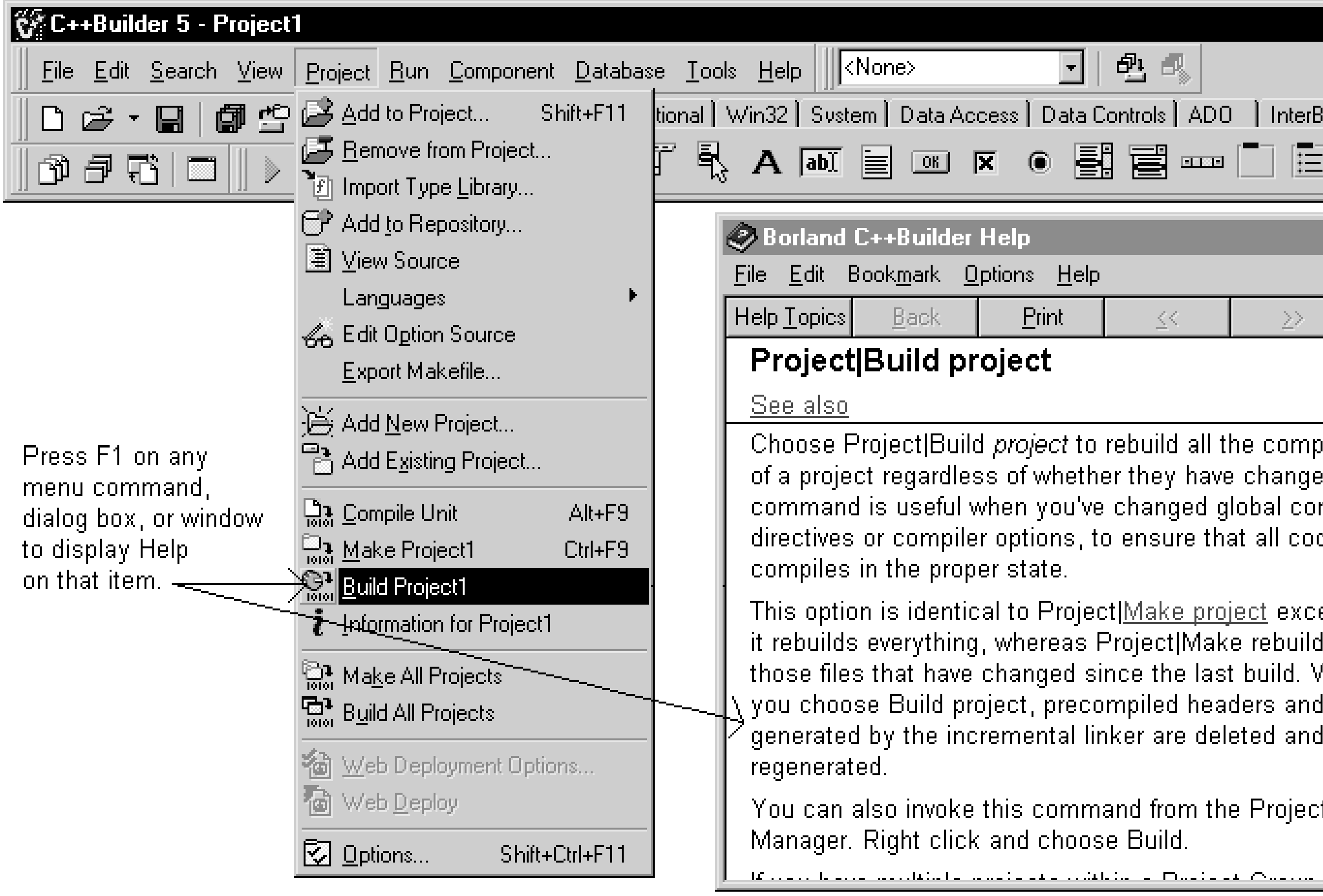
TListBox is a wrapper for a Windows list box control.

Unit

stdctrls

Description

You can get Help on any part of the development environment, including menu items, dialog boxes, windows, toolbars, and components.



Choose Project|Build *project* to rebuild all the comp of a project regardless of whether they have change command is useful when you've changed global cor directives or compiler options, to ensure that all coc compiles in the proper state.

This option is identical to Project|Make project exce it rebuilds everything, whereas Project|Make rebuild those files that have changed since the last build. V you choose Build project, precompiled headers and generated by the incremental linker are deleted and regenerated.

You can also invoke this command from the Projec Manager. Right click and choose Build.

Press F1 on any menu command, dialog box, or window to display Help on that item.

Pressing the Help button in any dialog box also displays context-sensitive online documentation.

Error messages from the compiler and linker appear in a special window below the Code editor. To get Help with compilation errors, select a message from the list and press F1.

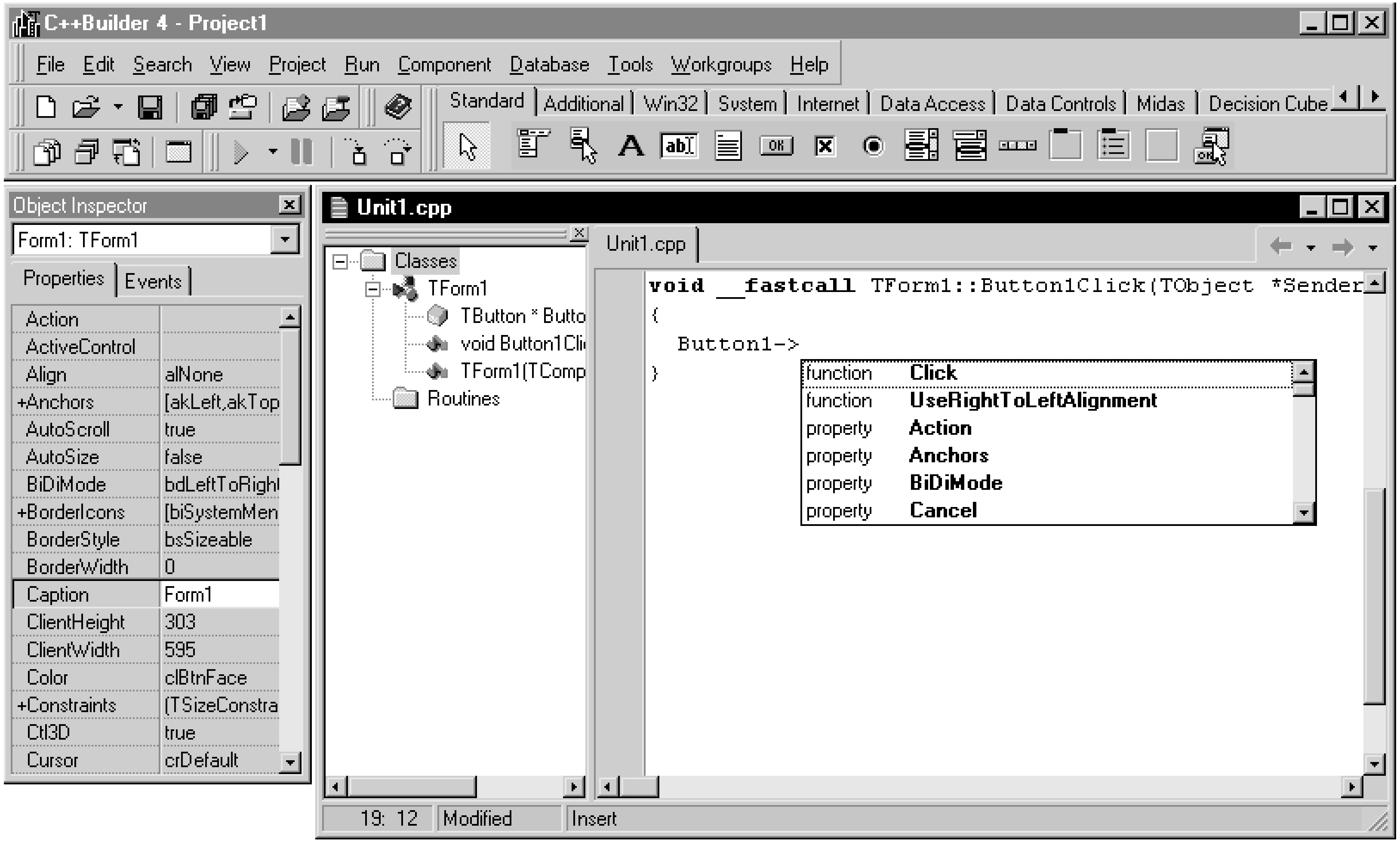
Help with coding

C++Builder provides various aids to help you write code. The Code Insight tools display context-sensitive pop-up windows in the Code editor.

Table 2.1 Code Insight tools

Tool	How it works
Code Completion	Type the name of a variable that represents a pointer to an object followed by an arrow (->) or that represents a non-VCL object followed by a dot. Type the beginning of an assignment statement and press Ctrl+space to display a list of valid values for the variable. Type a procedure, function, or method name to bring up a list of arguments.
Code Parameters	Type a method name and an open parenthesis to display the syntax for the method's arguments.
Code Templates	Press Ctrl+J to see a list of common programming statements that you can insert into your code. You can create your own templates in addition to the ones supplied with C++Builder.
Tooltip Expression Evaluation	While your program has paused during debugging, point to any variable to display its current value.
Tooltip Symbol Insight	While editing code, point to any identifier to display its declaration.

To configure these tools, choose Tools|Editor Options and click the Code Insight tab.


C++Builder 4 - Project1
File Edit Search View Project Run Component Database Tools Workgroups Help
Standard Additional Win32 System Internet Data Access Data Controls Midas Decision Cube
Object Inspector
Form1: TForm1
Properties Events
Unit1.cpp
Classes
TForm1
TButton * Butto
void Button1Cli
TForm1(TComp
Routines
Unit1.cpp

Action	
ActiveControl	
Align	alNone
+Anchors	[akLeft,akTop
AutoScroll	true
AutoSize	false
BiDiMode	bdLeftToRight
+BorderIcons	[biSystemMen
BorderStyle	bsSizeable
BorderWidth	0
Caption	Form1
ClientHeight	303
ClientWidth	595
Color	clBtnFace
+Constraints	(TSizeConstra
Ctl3D	true
Cursor	crDefault

```
void __fastcall TForm1::Button1Click(TObject *Sender
{
  Button1->
}
```

function	**Click**
function	**UseRightToLeftAlignment**
property	**Action**
property	**Anchors**
property	**BiDiMode**
property	**Cancel**

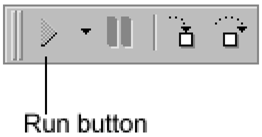
19: 12 Modified Insert

When you type Button1-> C++Builder displays a list of properties, methods, and events for the class.

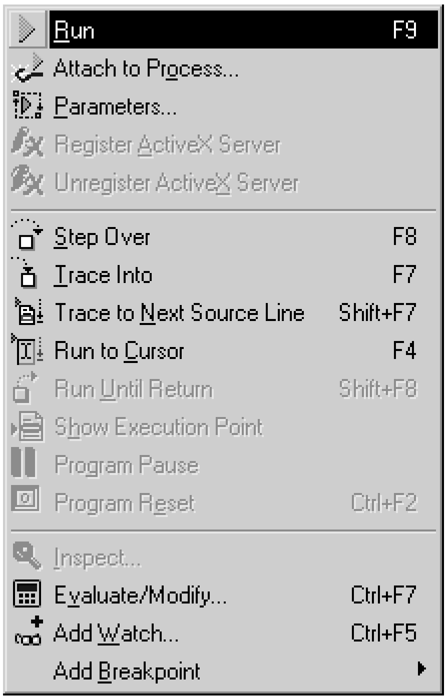
Select an item on the list and press *Enter* to add it to your code.

Debugging applications

The IDE includes an integrated debugger that helps you locate and fix errors in your code. The debugger lets you control program execution, watch variables, and modify data values while your application is running. You can step through your code line by line, examining the state of the program at each breakpoint.



Run button

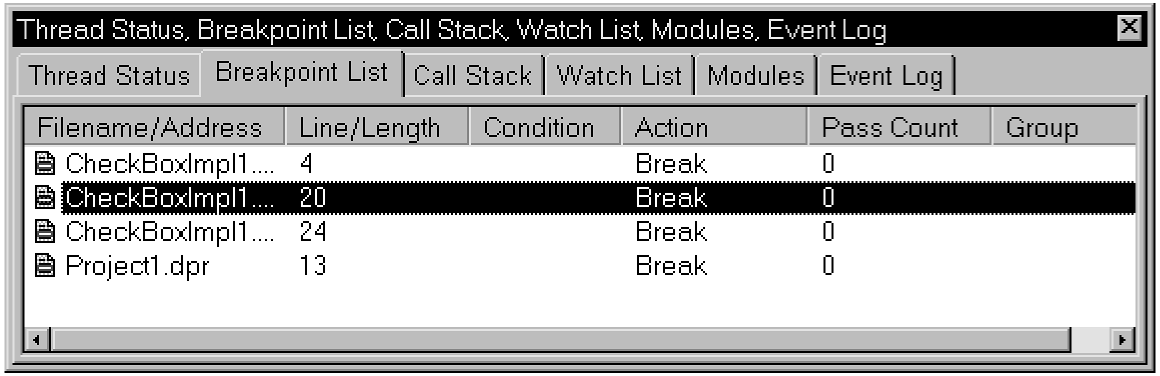


Choose any of the debugging commands from the Run menu. Some commands are also available on the toolbar.

To use the debugger, you must compile your program with debug information. Choose Project|Options, select the Compiler page, and check Debug Information. Then you can begin a debugging session by running the program from the IDE. To set debugger options, choose Tools|Debugger Options.

Many debugging windows are available, including Breakpoints, Call Stack, Watches, Local Variables, Threads, Modules, CPU, and Event Log. Display them by choosing View|Debug Windows. To learn how to combine debugging windows for more convenient use, see "Docking tool windows".

You can attach or overlay several debugging windows for easier use.


Thread Status, Breakpoint List, Call Stack, Watch List, Modules, Event Log
Thread Status
Breakpoint List
Call Stack
Watch List
Modules
Event Log

Filename/Address	Line/Length	Condition	Action	Pass Count	Group
CheckBoxImpl1....	4		Break	0	
CheckBoxImpl1....	20		Break	0	
CheckBoxImpl1....	24		Break	0	
Project1.dpr	13		Break	0	

Once you set up your desktop as you like it for debugging, you can save the settings as the debugging or runtime desktop. This desktop layout will be used whenever you are debugging any application. For details, see "Customizing desktop settings".

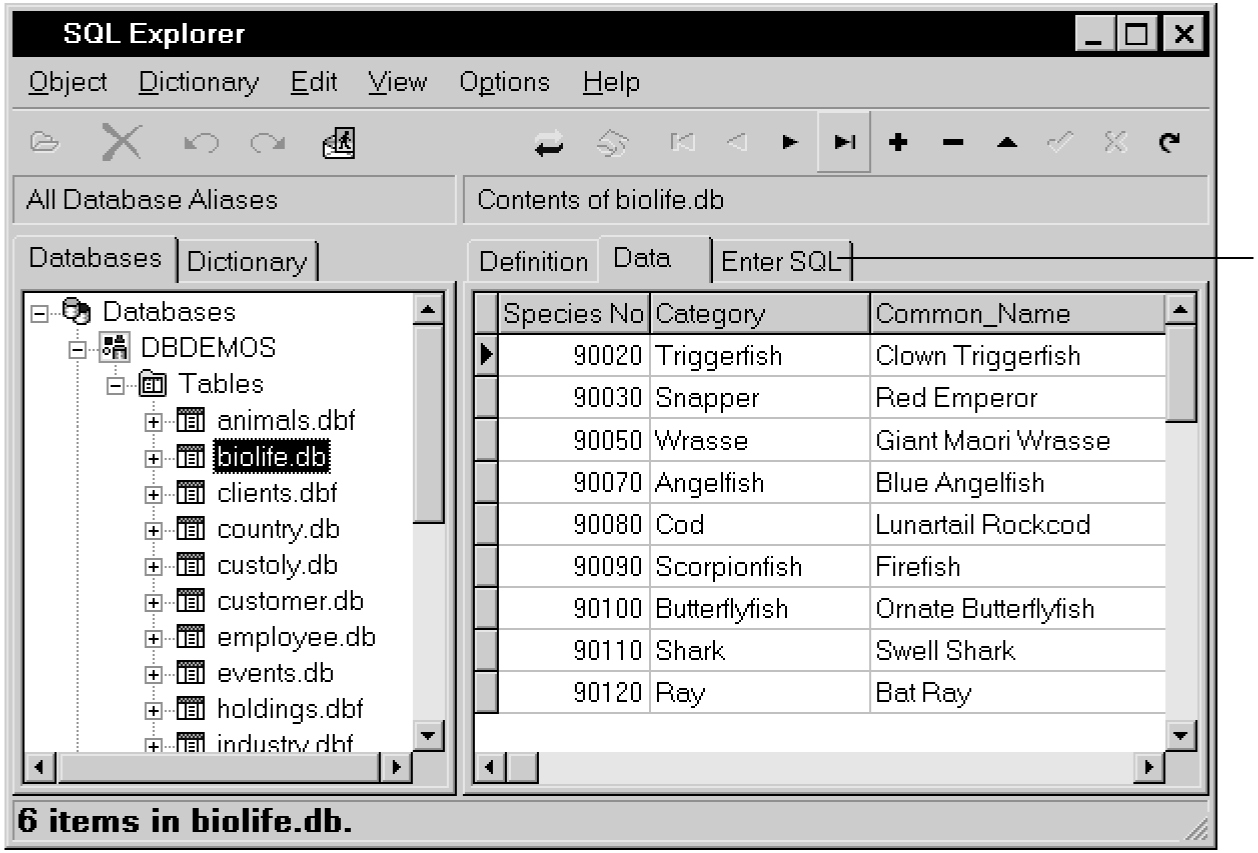
Some versions of C++Builder support multiprocess and remote debugging of distributed applications from either the client or the server. To turn on remote debugging, choose Run|Parameters, click the Remote tab, and check "Debug Project on remote machine".

For more information...

See "Using C++Builder" in the Help contents or search for "debugging" in the Help index.

Exploring databases

The SQL Explorer (or Database Explorer in some editions of C++Builder) lets you work directly with a remote database server during application development. For example, you can create, delete, or restructure tables, and you can import constraints while you are developing a database application.



Species No	Category	Common_Name
90020	Triggerfish	Clown Triggerfish
90030	Snapper	Red Emperor
90050	Wrasse	Giant Maori Wrasse
90070	Angelfish	Blue Angelfish
90080	Cod	Lunartail Rockcod
90090	Scorpionfish	Firefish
90100	Butterflyfish	Ornate Butterflyfish
90110	Shark	Swell Shark
90120	Ray	Bat Ray

6 items in biolife.db.

Choose Database|Explore to display the Explorer. You can see and change the data in a table.

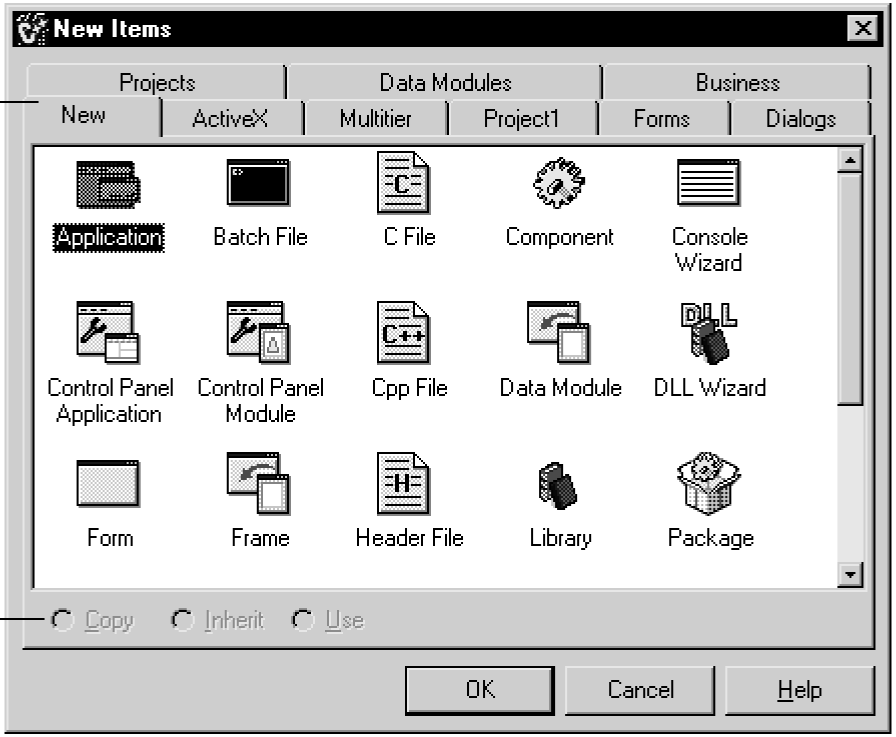
And you can query a database directly.

For more information...

Choose Database|Explore to open the Explorer; then press `F1`. Or search for "Database Explorer" in the main Help index.

Templates and the Object Repository

The Object Repository contains forms, dialog boxes, data modules, wizards, DLLs, sample applications, and other items that can simplify development. Choose File|New to display the New Items dialog when you begin a project. Check the Repository to see if it contains an object that resembles one you want to create.

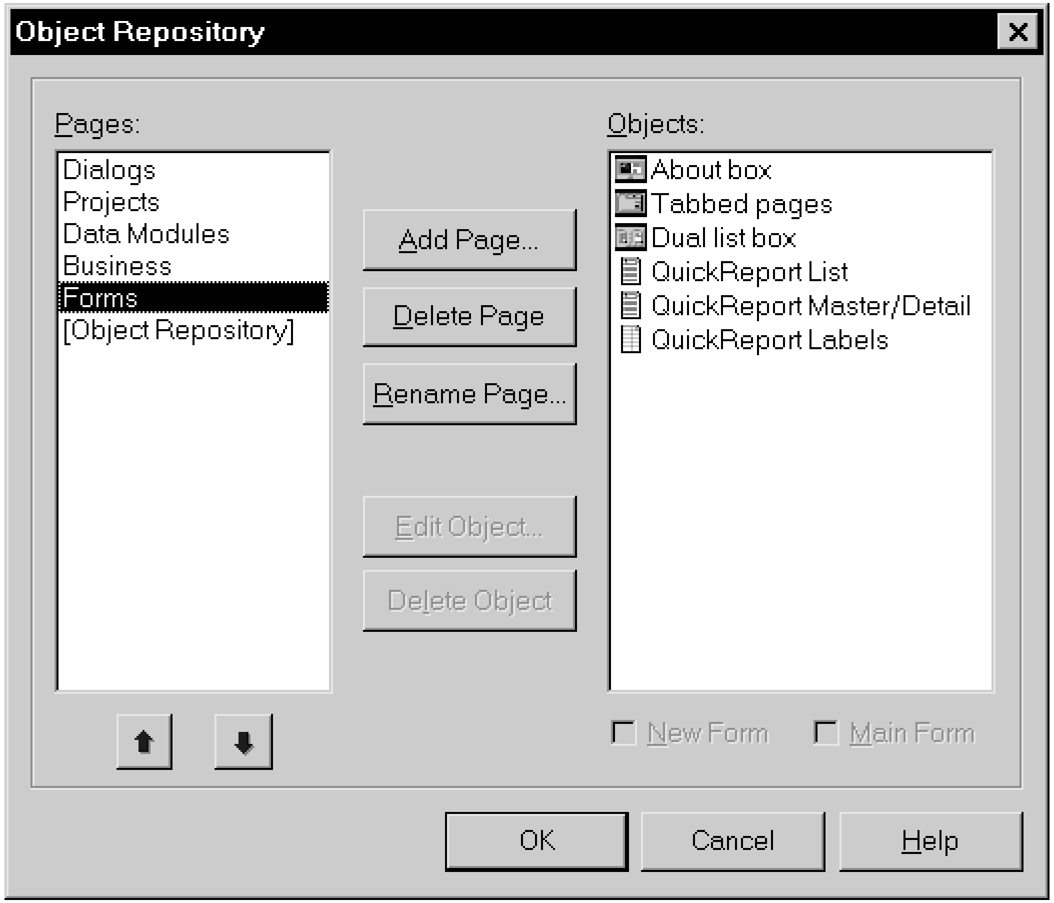


The Object Repository contains many tabbed pages, which include objects like forms, frames, units, and batch files, and wizards to create specialized items.

You can copy, inherit, or reference an existing object.

You can add your own objects to the Repository to facilitate reusing them and sharing them with other developers. Reusing objects lets you build families of applications with common user interfaces and functionality; building on an existing foundation also reduces development time and improves quality. The Object Repository provides a central location for tools that members of a development team can access over a network.

To add objects to the Repository, right-click in the New Items dialog and choose Properties, or choose Tools|Repository from the main menu.



For more information...

See "Using C++Builder" in the Help contents or search for "Object Repository" in the Help index. Also choose File|New and browse in the Object Repository to see the types of templates and wizards you can use as starting points for your applications. The objects available to you will depend on the version of C++Builder you purchased.

Chapter 3

Creating a text editor--a tutorial

This tutorial takes you through the creation of a text editor complete with menus, a toolbar, and a status bar. It includes a simple help file accessible from the application.

Note: This tutorial is for all versions of C++Builder.

Starting a new application

Before beginning a new application, create a folder to hold the source files:

1. Create a folder called TextEditor in the Projects directory off the main C++Builder directory.
2. Create a new project.

   Each application is represented by a *project*. When you start C++Builder, it creates a blank project by default. If another project is already open, choose File|New Application to create a new project.

   When you open a new project, C++Builder automatically creates the following files:

   - *Project1.cpp*: a source-code file associated with the project.
   - *Unit1.cpp*: a source-code file associated with the main project form. This is called a *unit file*.
   - *Unit1.h*: a header file associated with the main project form. This is called a *unit header file*.
   - *Unit1.dfm*: a resource file that stores information about the main project form. This is called a *form file*.

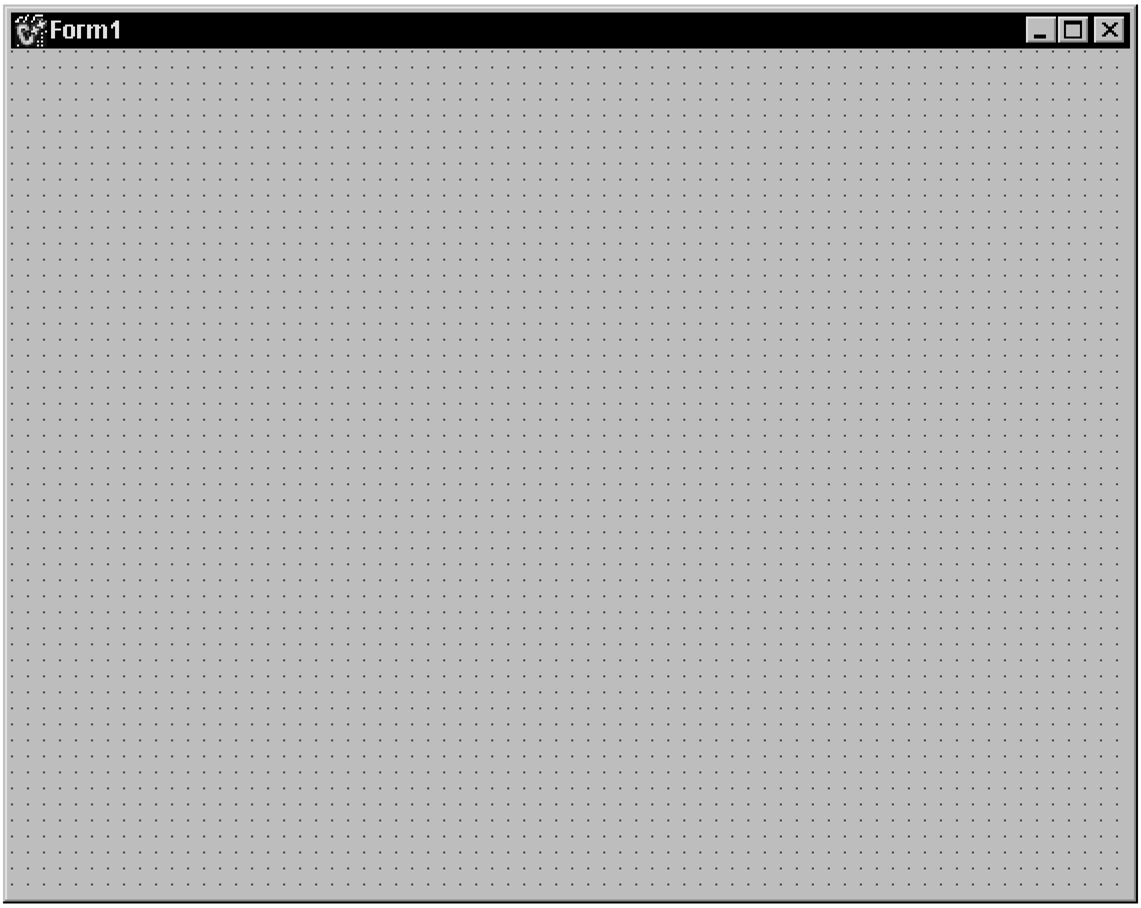
Each form has its own unit (*Unit1.cpp*), header (*Unit1.h*), and form (*Unit1.dfm*) files. If you create a second form, a second unit (*Unit2.cpp*), header (*Unit2.h*), and form (*Unit2.dfm*) file are automatically created.

3. Choose File|Save All to save your files to disk. When the Save dialog appears:
    - Navigate to your TextEditor folder.
    - Save Unit1 using the default name Unit1.cpp.
    - Save the project using the name TextEditor.bpr. (The executable will be named the same as the project name with an exe extension.)

Later, you can resave your work by choosing File|Save All.

When you save your project, C++Builder creates additional files in your project directory. These files include TextEditor.bpr, which is the project options or makefile, and TextEditor.res, which is the Windows resource file. You don't need to worry about these files but don't delete them.

When you open a new project, C++Builder displays the project's main form, named *Form1* by default. You'll create the user interface and other parts of your application by placing components on this form.

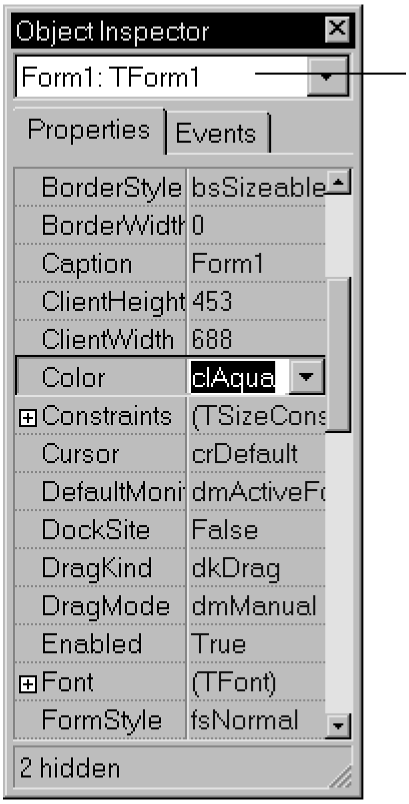


The default form ha
and Minimize butto
button, and a Contr

If you run the form
pressing F9, you'll
these buttons all w

To return to design
click the X to close

Next to the form, you'll see the Object Inspector, which you can use to set property values for the form and components you place on it.



BorderStyle	bsSizeable
BorderWidth	0
Caption	Form1
ClientHeight	453
ClientWidth	688
Color	clAqua
⊞Constraints	(TSizeCons
Cursor	crDefault
DefaultMoni	dmActiveF
DockSite	False
DragKind	dkDrag
DragMode	dmManual
Enabled	True
⊞Font	(TFont)
FormStyle	fsNormal

2 hidden

The drop-down list at the top of the Object Inspector shows the currently selected object. In this case, the object is Form1 and its type is TForm1.

When an object is selected, the Object Inspector shows its properties.

Setting property values

When you use the Object Inspector to set properties, C++Builder maintains your source code for you. The values you set in the Object Inspector are called *design-time* settings.

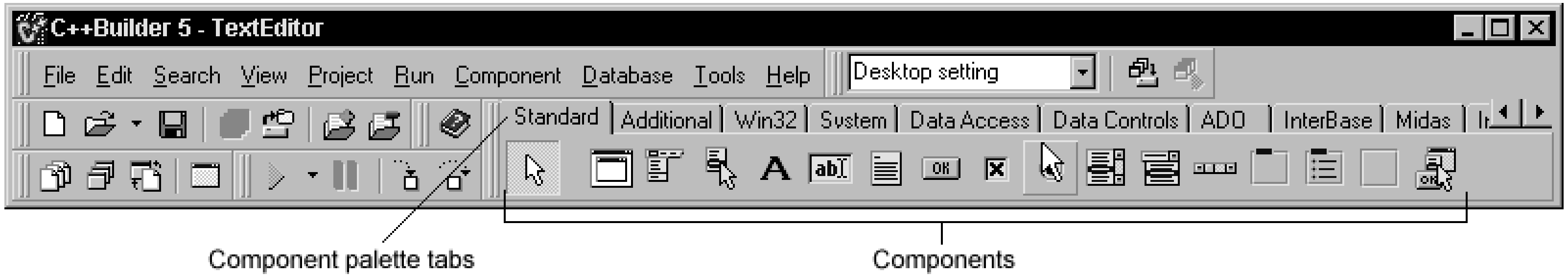
You can change the caption of *Form1* right away:

- Find the form's *Caption* property in the Object Inspector and type "Text Editor Tutorial" replacing the default caption "Form1." Notice that the caption in the heading of the form changes as you type.

Adding objects to the form

Before you start adding objects to the form, you need to think about the best way to create the user interface (UI) for your application. The UI is what allows the user of your application to interact with it and should be designed for ease of use. The text editor application requires an editing area, a status bar for displaying information such as the name of the file being edited, menus, and perhaps a toolbar with icons for easy access to commands. The beauty of designing the interface using C++Builder is that you can experiment with different components and see the results right away. This way, you can quickly prototype an application interface. C++Builder includes many objects that represent parts of an application. For example, there are objects (also called *components*) that make it easy to program menus, toolbars, dialog boxes, and hundreds of other visual (and nonvisual) program elements.

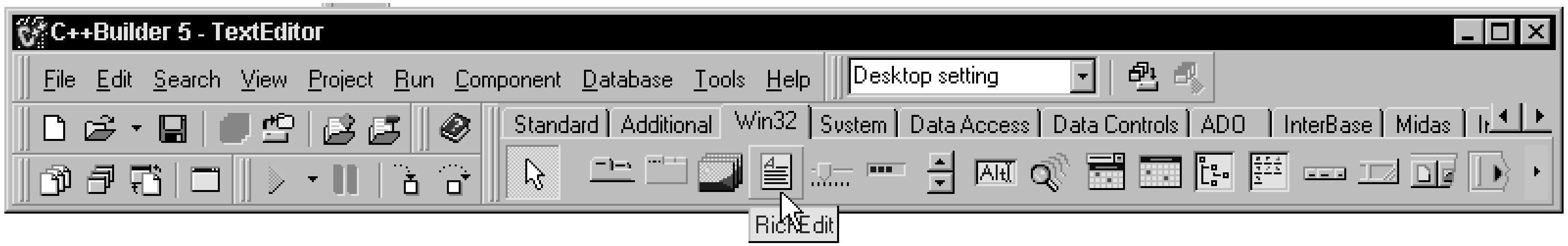
The Component palette represents VCL components using icons grouped onto tabbed pages. Add a component to a form by selecting the component on the palette, then clicking on the form where you want to place it. You can also double-click a component to place it in the middle of the form. To get help on the components, select the component (either in the Component palette or on the form) and press F1.


C++Builder 5 - TextEditor
File Edit Search View Project Run Component Database Tools Help
Desktop setting
Standard Additional Win32 System Data Access Data Controls ADO InterBase Midas In
Component palette tabs
Components

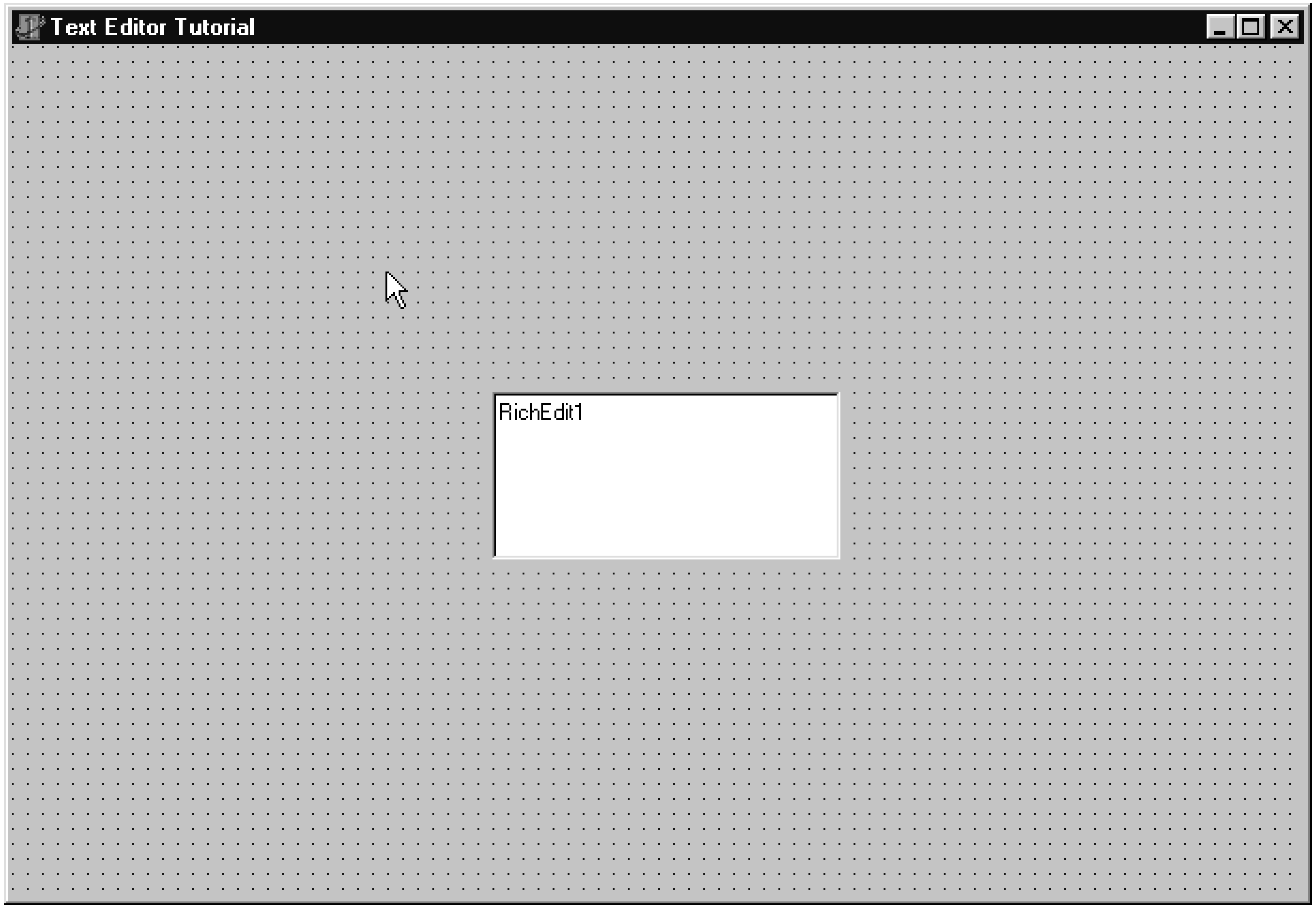
To start designing the text editor, add a *RichEdit and a StatusBar component* to the form:

1. To create a text area, drop a *RichEdit* component onto the form.

   Click the Win32 page on the Component palette. To find the *RichEdit* component, point to an icon on the palette for a moment; C++Builder displays a Help hint showing the name of the component.



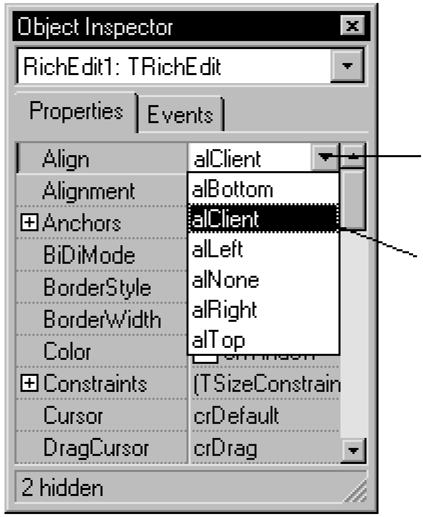
When you find the *RichEdit* component, double-click it to place it on the form.


Text Editor Tutorial
RichEdit1

Each C++Builder component is a *class*; placing a component on a form creates an *instance* of that class. Once the component is on the form, C++Builder generates the code necessary to construct an instance object when your application is running.

2. Set the *Align* property of *RichEdit1* to *alClient*.

   To do this, click on *RichEdit1* to select it on the form, then choose the *Align* property in the Object Inspector. Select *alClient* from the drop-down list.



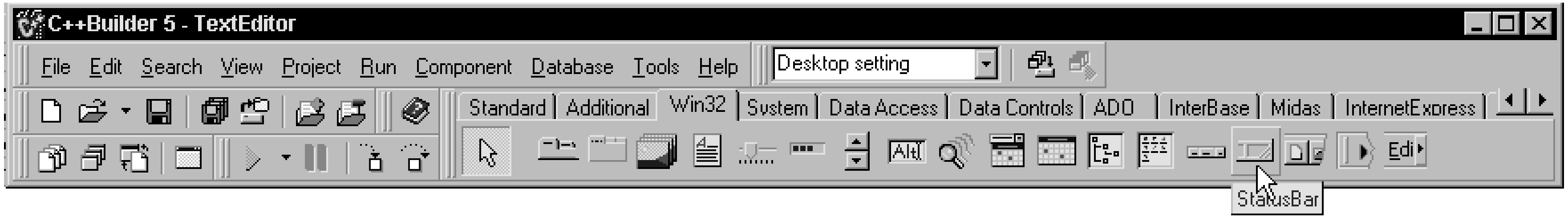
Select the RichEdit1 component on the form.

Look for Align in the Object Inspector. Click the down arrow to display the property drop-down list.

Select *alClient*.

The *RichEdit* component now fills the form so you have a large text editing area. By choosing the *alClient* value for the Align property, the size of the *RichEdit* control will vary to fill whatever size window is displayed even if the form is resized.

3. Double-click the *StatusBar* component on the Win32 page of the Component palette. This adds a status bar to the bottom of the form.

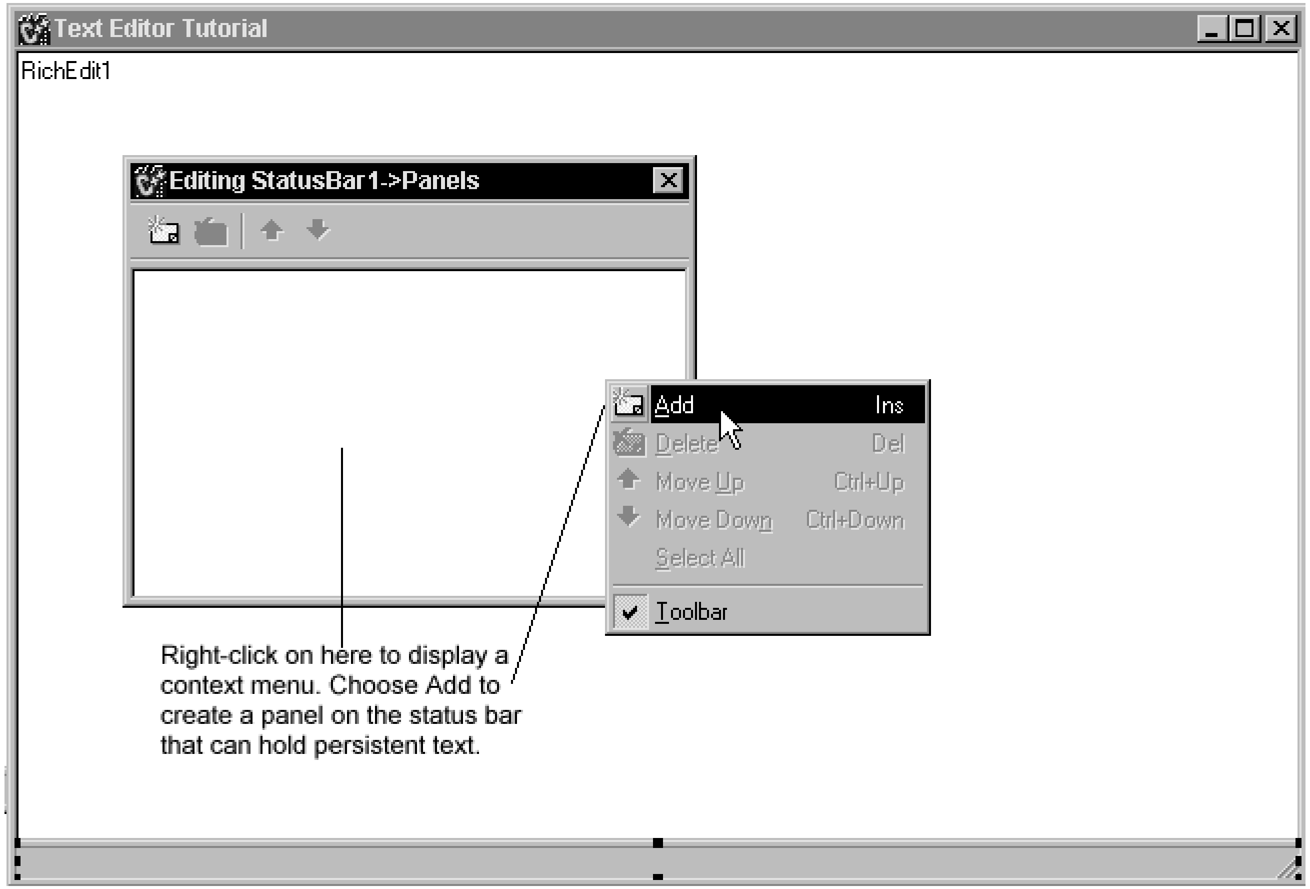


Next we want to create a place to display the name of the file being edited. You can do this in two ways. The easiest way is to set the *SimplePanel* property of the *StatusBar1* object to true and assign any text that you want to display to the *SimpleText* property. This provides only one panel in the status bar. You can assign its value as follows:

```
StatusBar1->SimpleText = "untitled.txt";
```

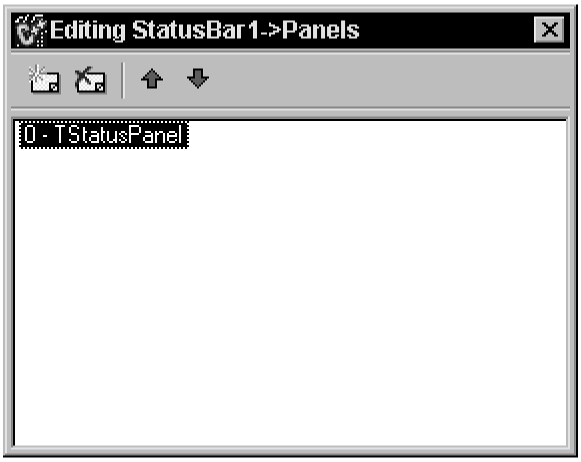
However, many times you will want to include more than one panel in the status bar so you can include more than one piece of information. You can specify more than one panel by using the *Panels* property of the *TStatusBar* component as explained in the next few steps.

4. Double-click the status bar to display the Editing StatusBar1->Panels dialog box.



Right-click on here to display a context menu. Choose Add to create a panel on the status bar that can hold persistent text.

5. Right-click on the dialog box and choose Add to add the panel to the status bar.



This shows the panel you created. It has an index number of 0.

The Panels property is a zero-based array that allows you to access each Panel that you create based on its unique index value (by default, it is 0 for this panel). Use the default property values for the panel. Click the **X** in the upper right corner to close the dialog box. Now the main editing area of the user interface for the text editor is set up.

Adding support for a menu and a toolbar

For the application to do anything, it needs a menu, commands, and, for convenience, a toolbar. Because some of the same commands will appear on the menu and the toolbar, you can centralize the code by creating an *action list*. Action lists help to centralize the code for the commands.
Following are the kinds of actions our sample text editor application needs:

Table 3.1 Planning Text Editor commands

Command	Menu	On Toolbar?	Description
New	File	Yes	Creates a new file.
Open	File	Yes	Opens an existing file for editing.
Save	File	Yes	Stores the current file to disk.
Save As	File	No	Stores a file using a new name (also lets you store a new file using a specified name).

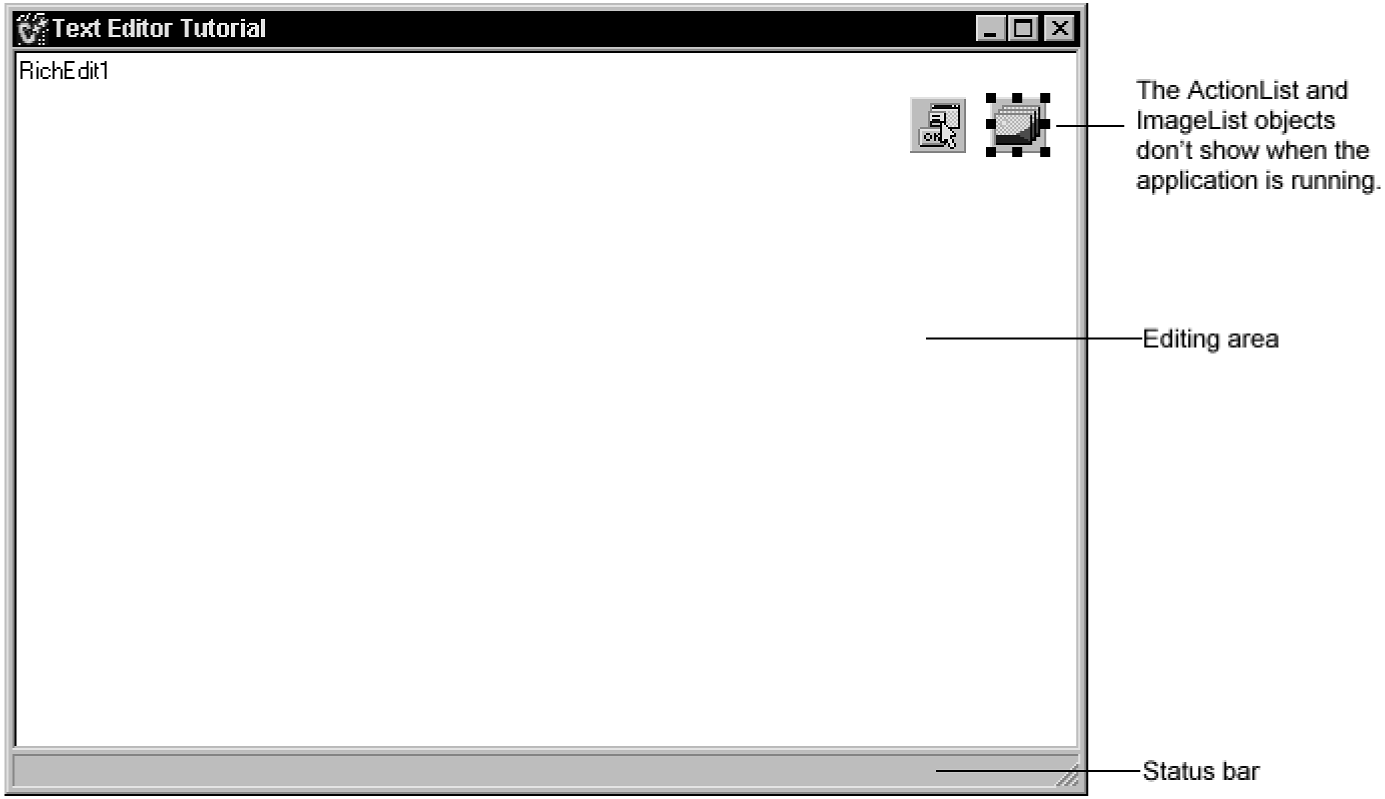
Exit	File	Yes	Quits the editor program.
Cut	Edit	Yes	Deletes text and stores it in the clipboard.
Copy	Edit	Yes	Copies text and stores it in the clipboard.
Paste	Edit	Yes	Inserts text from the clipboard.
Contents	Help	Yes	Displays the Help contents screen from which you can access Help topics.
Index	Help	No	Displays the Help index screen.
About	Help	No	Displays information about the application in a box.

You can also centralize images to use for your toolbar and menus in an *ImageList*.

To add an *ActionList* and an *ImageList* to your form:

1. From the Standard page of the Component palette, drop an *ActionList* component onto the form. The *ActionList* component is nonvisual, so it doesn't matter where you put it on the form. It won't appear at runtime.
2. From the Win32 page, choose the *ImageList* component and drop it onto your form. It's also nonvisual so you can put it anywhere.

   Your form should now resemble the following figure.


Text Editor Tutorial
RichEdit1
The ActionList and ImageList objects don't show when the application is running.
Editing area
Status bar

Adding actions to the action list

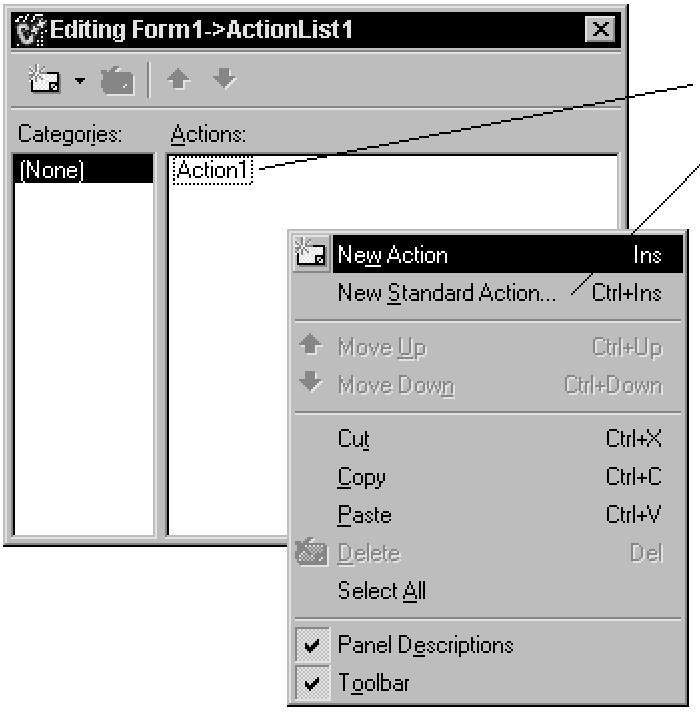
Next we'll add the actions to the action list.

Tip: By convention, we'll name actions that are connected to menu items the name of the top-level menu and the item name. For example, the FileExit action refers to the Exit command on the File menu.

1. Double-click the ActionList icon.

   The Editing Form1->ActionList1 dialog box is displayed. This is also called the Action List editor.

2. Right-click on the Action List editor and choose New Action.



Right-click on the Action List editor and choose New Action to create an action for the action list.

3. In the Object Inspector, set the following properties for the action:
   - After *Caption*, type &New. Note that typing an ampersand before one of the letters makes that letter a shortcut to accessing the command.
   - After *Category*, type File. This organizes the File commands in one place.
   - After *Hint*, type Create file (this will be the Help hint).
   - After *ImageIndex*, type 0 (this will associate image number 0 in your ImageList with this action).
   - After *Name*, type FileNew (for the File|New command).
4. Right-click on the Action List editor and choose New Action.
5. In the Object Inspector, set the following properties:
   - After *Caption*, type &Open.
   - Make sure the *Category* says File.
   - After *Hint*, type Open file.
   - After *ImageIndex*, type 1.
   - After *Name*, type FileOpen (for the File|Open command).
6. Right-click on the Action List editor and choose New Action.
7. In the Object Inspector, set the following properties:
   - After *Caption*, type &Save.
   - Make sure the *Category* says File.
   - After *Hint*, type Save file.
   - After *ImageIndex*, type 2.
   - After *Name*, type FileSave (for the File|Save command).
8. Right-click on the Action List editor and choose New Action.
9. In the Object Inspector, set the following properties:
   - After *Caption*, type Save &As.
   - Make sure the *Category* says File.

- After *Hint*, type Save file as.
- No *ImageIndex* is needed. Leave the default value.
- After *Name*, type FileSaveAs (for the File|Save As command).

10. Right-click on the Action List editor and choose New Action.
11. In the Object Inspector, set the following properties:
    - After *Caption*, type E&xit.
    - Make sure the *Category* says File.
    - After *Hint*, type Exit application.
    - After *ImageIndex*, type 3.
    - After *Name*, type FileExit (for the File|Exit command).
12. Right-click on the Action List editor and choose New Action to create a customized Help|Contents command.
13. In the Object Inspector, set the following properties:
    - After *Caption*, type &Contents.
    - After *Category*, type Help.
    - After *Hint*, type Display Help.
    - After *ImageIndex*, type 7.
    - After *Name*, type HelpContents (for the Help|Contents command).
14. Right-click on the Action List editor and choose New Action.
15. In the Object Inspector, set the following properties:
    - After *Caption*, type &Index.
    - Make sure the *Category* says Help.
    - After *Name*, type HelpIndex (for the Help|Index command).
16. Right-click on the Action List editor and choose New Action.
17. In the Object Inspector, set the following properties:
    - After *Caption*, type &About.
    - Make sure the *Category* says Help.
    - After *Name*, type HelpAbout (for the Help|About command).

Keep the Action List editor on the screen.

Note: When you were adding actions to the action list, you might have noticed a standard Help|Contents command is provided. We added a custom Help|Contents command that will display the Help Contents tab at all times. The standard Help|Contents command brings up the last tabbed page that was displayed, either the Contents or the Index.

Adding standard actions to the action list

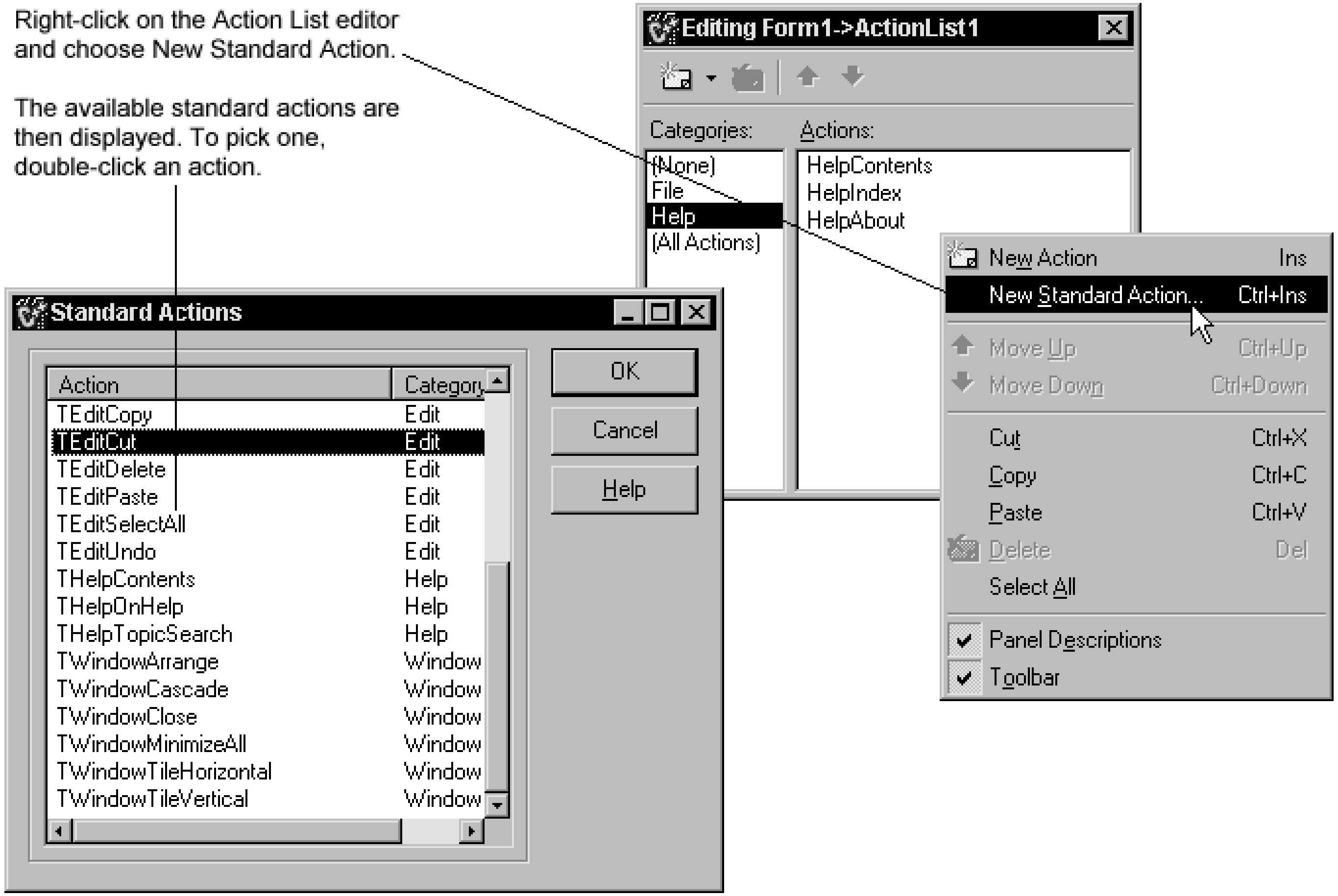
C++Builder provides several standard actions that are often used when developing applications. Next we'll add the standard actions (cut, copy, and paste) to the action list.

Note: The Action List editor should still be displayed. If it's not, double-click the ActionList icon on the form.

To add standard actions to the action list:

1. Right-click on the Action List editor and choose New Standard Action.

   The Standard Actions dialog is displayed.



Right-click on the Action List editor and choose New Standard Action.

The available standard actions are then displayed. To pick one, double-click an action.

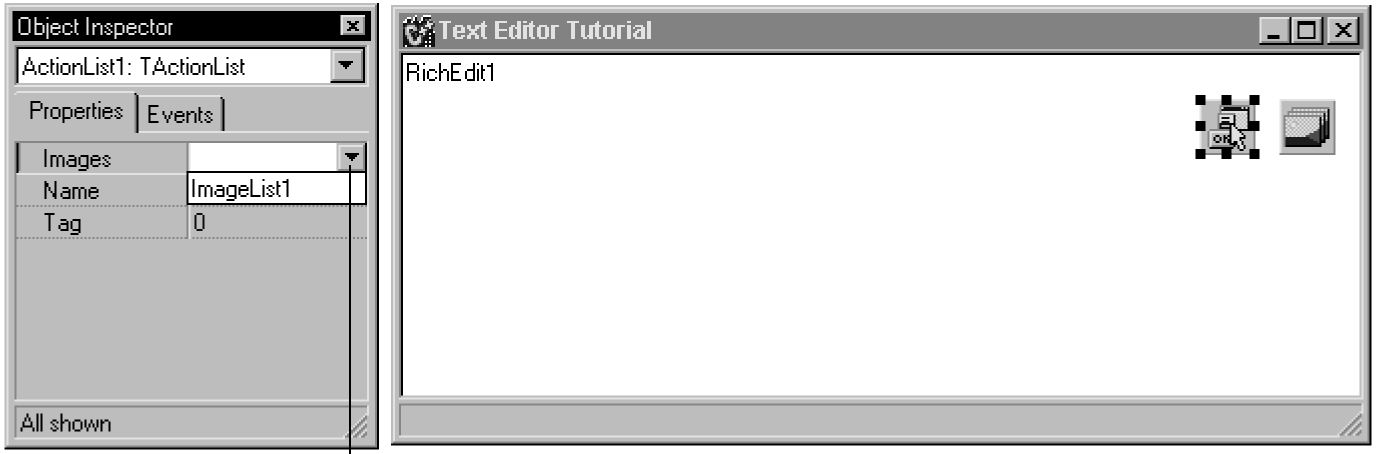
Action	Category
TEditCopy	Edit
TEditCut	Edit
TEditDelete	Edit
TEditPaste	Edit
TEditSelectAll	Edit
TEditUndo	Edit
THelpContents	Help
THelpOnHelp	Help
THelpTopicSearch	Help
TWindowArrange	Window
TWindowCascade	Window
TWindowClose	Window
TWindowMinimizeAll	Window
TWindowTileHorizontal	Window
TWindowTileVertical	Window

2. Double-click TEditCut. The action is created along with a new category called Edit. EditCut1 should be selected.
3. In the Object Inspector, set the following property for EditCut1:
   - After *ImageIndex*, type 4.

The other properties are set automatically.

4. Right-click on the Action List editor and choose New Standard Action.
5. Double-click TEditCopy.
6. In the Object Inspector, set the following properties:
   - After *ImageIndex*, type 5.
7. Right-click on the Action List editor and choose New Standard Action.
8. Double-click TEditPaste.

9. In the Object Inspector, set the following properties:
   - After *ImageIndex*, type 6.
10. Now you've got all the actions that you'll need for the menus and toolbar. If you click on the category All Actions, you can see all the actions in the list:
11. Click on the **X** to close the Action List editor.
12. With the Action List still selected on the form, set its *Images* property to ImageList1.



Click on the Images property, then on the down arrow next to Images. ImageList1 is listed for you. Select it. This associates the images that we'll add to the image list with the actions in the action list.

Adding images to the image list

Previously, you added an ImageList object to your form. In this section, you'll add images to that list for use on the toolbar and on menus. Following are the images to use for each command:

Command	Icon image name	ImageIndex property
File|Open	Fileopen.bmp	0
File|New	Filenew.bmp	1
File|Save	Filesave.bmp	2
File|Exit	Doorshut.bmp	3
Edit|Cut	Cut.bmp	4
Edit|Copy	Copy.bmp	5
Edit|Paste	Paste.bmp	6
Help|Contents	Help.bmp	7

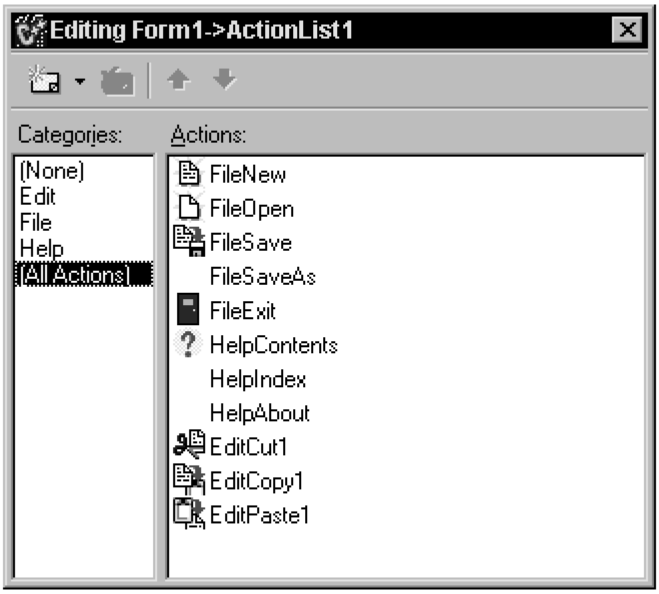
To add the images to the image li

1. Double-click on the ImageList object on the form to display the Image List editor.
2. Click on the Add button and navigate to the Buttons directory provided with the product. The default location is C:\Program Files\Common Files\Borland Shared\Images\Buttons.
3. Select fileopen.bmp.
4. When a message asks if you want to separate the bitmap into two separate ones, click Yes each time. Each of the icons includes an active and a grayed out version of the image. You'll see both images. Delete the grayed out (second) image.
    - Click Add and select filenew.bmp. Delete the grayed out image.
    - Click Add and select filesave.bmp. Delete the grayed out image.
    - Click Add and select doorshut.bmp. Delete the grayed out image.
    - Click Add and select cut.bmp. Delete the grayed out image.
    - Click Add and select copy.bmp. Delete the grayed out image.
    - Click Add and select paste.bmp. Delete the grayed out image.
    - Click Add and select help.bmp. Delete the grayed out image.
5. Click OK to close the Image List editor.

    You've added 8 images to the image list and they're numbered 0-7 consistent with the ImageIndex numbers on each of the actions.

    Note: If you get them out of order, you can drag and drop them into their correct positions in the image list editor.

6. To see the associated icons on the action list, double-click the ActionList object then select the All Actions category.



Editing Form1->ActionList1

Categories:
(None)
Edit
File
Help
[All Actions]

Actions:
FileNew
FileOpen
FileSave
FileSaveAs
FileExit
HelpContents
HelpIndex
HelpAbout
EditCut1
EditCopy1
EditPaste1

When you display the Action List editor now, you'll see the icons associated with the actions.

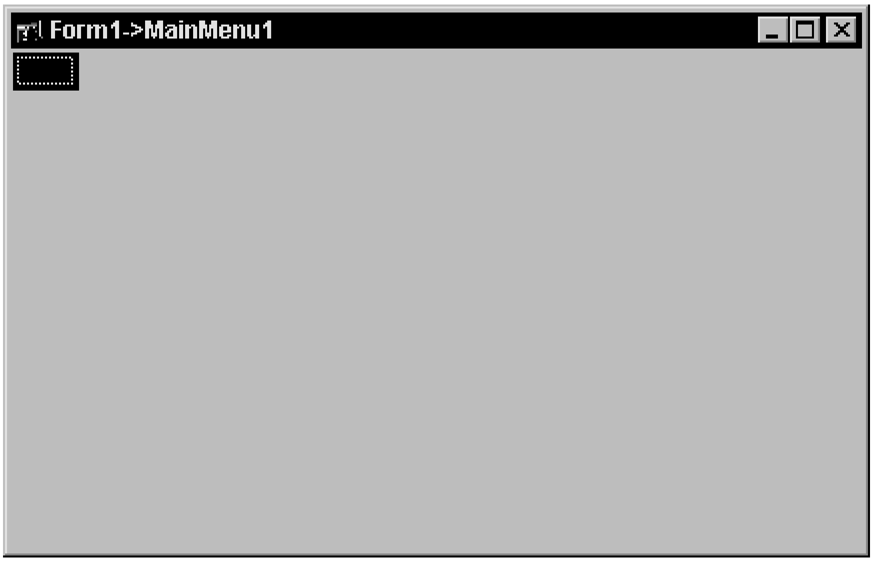
We didn't select icons for three of the commands because they will not be on the toolbar.

When you're done close the Action List editor. Now you're ready to add the menu and toolbar.

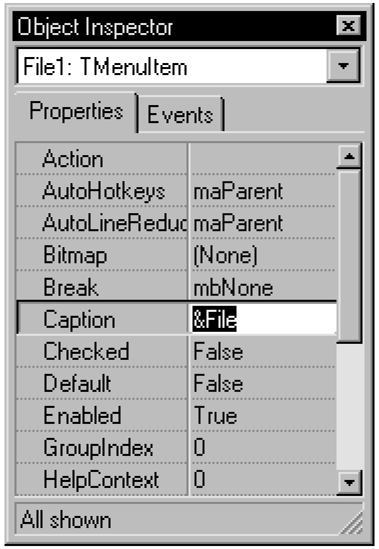
Adding a menu

In this section, you'll add a main menu bar with three drop-down menus--File, Edit, and Help--and you'll add menu items to each one using the actions in the action list.

1. From the Standard page of the Component palette, drop a *MainMenu* component onto the form. It doesn't matter where you place it.
2. Set the main menu's *Images* property to *ImageList1*. This will allow you to add the images to the menu items.
3. Double-click the menu component to display the Menu Designer.



4. In the Object Inspector, type &File to set the *Caption* property of the first top-level menu item and press Enter.



Object Inspector

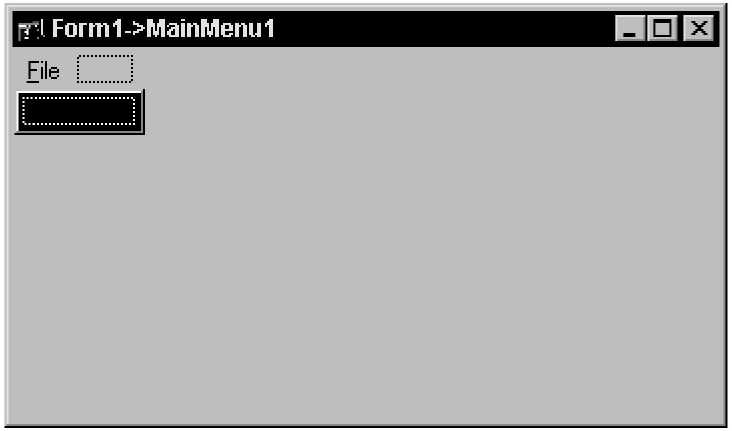
File1: TMenuItem

Properties | Events

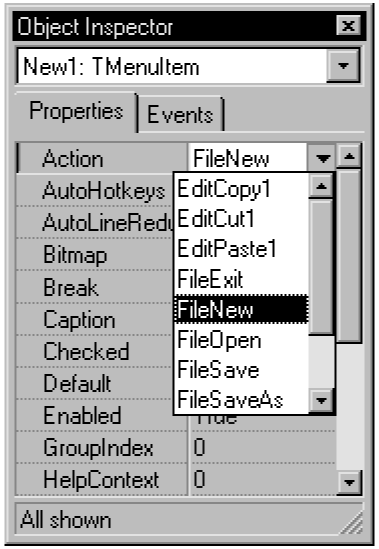
Action	
AutoHotkeys	maParent
AutoLineReduc	maParent
Bitmap	(None)
Break	mbNone
Caption	&File
Checked	False
Default	False
Enabled	True
GroupIndex	0
HelpContext	0

All shown

When you type `&File` and focus on the Menu Designer, the top-level File command appears ready for you to add the first menu item.



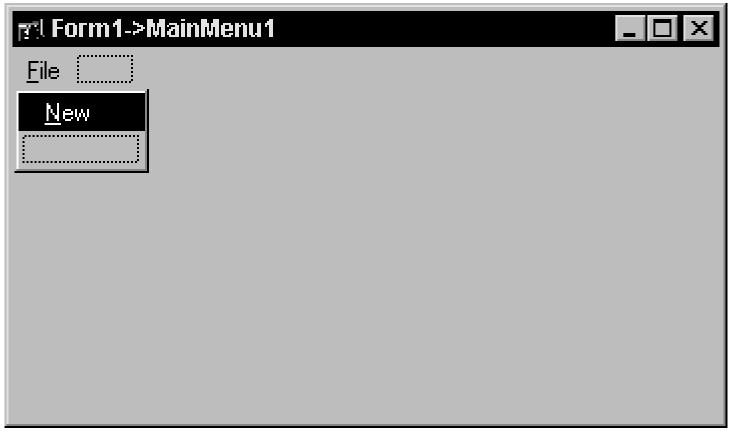
5. In the Menu Designer, select the File item you just created. You'll notice an empty item under it: select the empty item. In the Object Inspector, choose the Action property. The Actions from the action list are all listed there. Select FileNew.



New1: TMenuItem

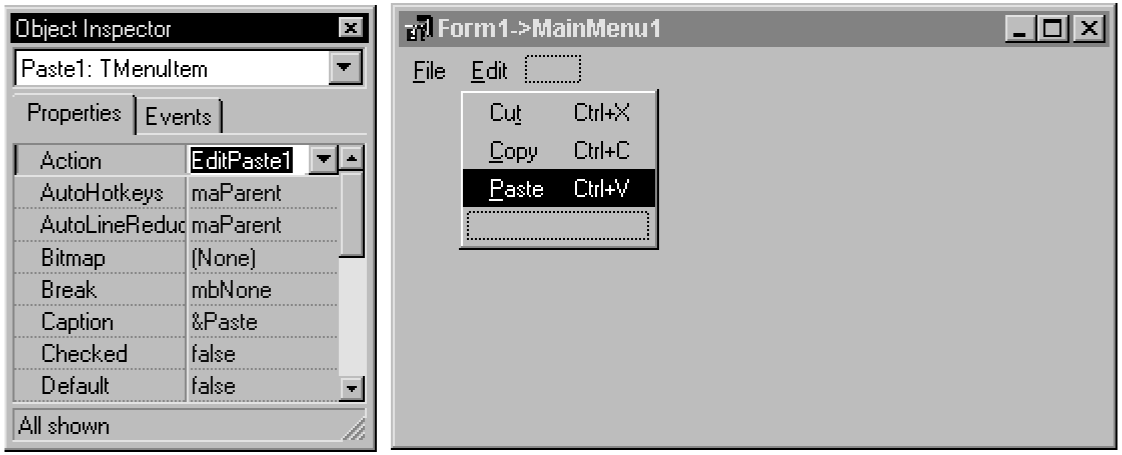
Action	FileNew
AutoHotkeys	
AutoLineRedu	
Bitmap	
Break	
Caption	
Checked	
Default	
Enabled	True
GroupIndex	0
HelpContext	0

When you select FileNew from the Action property list, the New command appears with the correct Caption and ImageIndex.



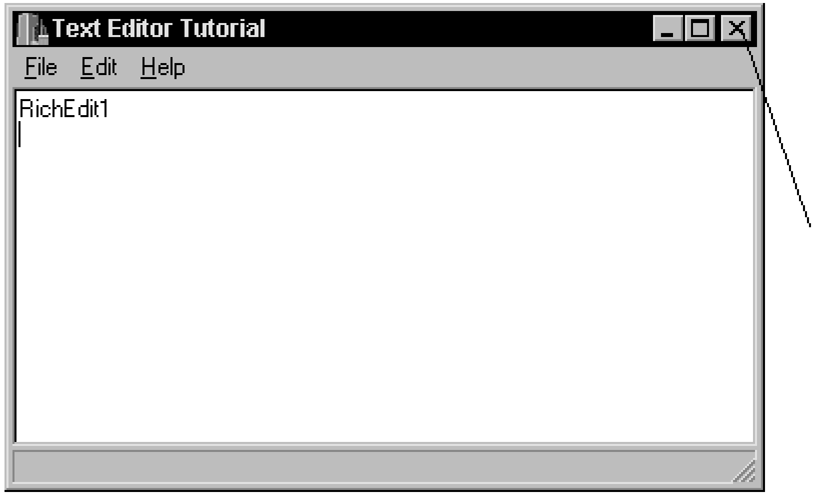
- Focus on the item under New and choose FileOpen from its Action property.
- Focus on the item under Open and choose FileSave from its Action property.
- Focus on the item under Save and choose FileSaveAs from its Action property.
- Focus on the item under Save As and type a hyphen as the Caption of the next item under the File menu and press Enter to create a separator bar on the menu.
- Focus on the item under the separator bar and choose FileExit from its Action property.

6. Next create the Edit menu:
   - Point to the item to the right of the File command and set its Caption property to &Edit and press Enter.
   - Focus is now on the item under Edit; choose EditCut1 from its Action property.
   - Select the item under Cut and choose EditCopy1 from its Action property.
   - Select the item under Copy and choose EditPaste1 from its Action property.



Action	EditPaste1
AutoHotkeys	maParent
AutoLineReduc	maParent
Bitmap	(None)
Break	mbNone
Caption	&Paste
Checked	false
Default	false

7. Next create the Help menu:
    - Point to the item to the right of the Edit command and type &Help as its caption.
    - Focus on the Menu Designer to select the item under Help and choose HelpContents from its Action property.
    - Select the item under Contents and choose HelpIndex from its Action property.
    - Select the item under Index and type a hyphen its Caption and press Enter to create a separator bar on the Help menu.
    - Select the item under the separator bar and choose HelpAbout from its Action property.
8. Click on the **X** to close the Menu Designer.
9. Choose File|Save to save your project.
10. Press F9 to compile and run the project. (You can also run the project by clicking the Run button on the Debug toolbar, or by choosing Run from the Run menu.)



When you press F9 to run your project, the application interface is displayed. The menus, text area, and status bar all appear on the form.

To return to design mode, click the X to close the form.

When you run your project, C++Builder opens the program in a window like the one you designed on the form. The program is a full-fledged Windows application, complete with Minimize, Maximize, and Close buttons and a Control menu. The menus all work although most of the commands are grayed out. The images are displayed next to menu items with which we associated icons.

Though your program already has a great deal of functionality, there's still more to do to activate the commands. And we want to add a toolbar to provide easy access to the commands.

11. Click the **X** in the upper right corner to close the application and return to the design-time view of the form.

Clearing the text area (optional)

When you ran your program, the name of the *RichEdit* control appeared in the text area. You can remove that text using the Strings editor. This is optional because in a later step, the text will be removed when initializing the main form.

To clear the text area:

1. On the main form, click on the *RichEdit* component.
2. In the Object Inspector, double-click on the value (TStrings) next to the Lines property to display the String List editor.
3. Select the text you want to remove in the String List editor, press the Delete key, and click OK.
4. Save your changes and trying running the program again.

   The text editing area is now cleared when the main form is displayed.

Adding a toolbar

Since we've set up actions in an action list, we can add some of the same actions that were used on the menus onto a toolbar.

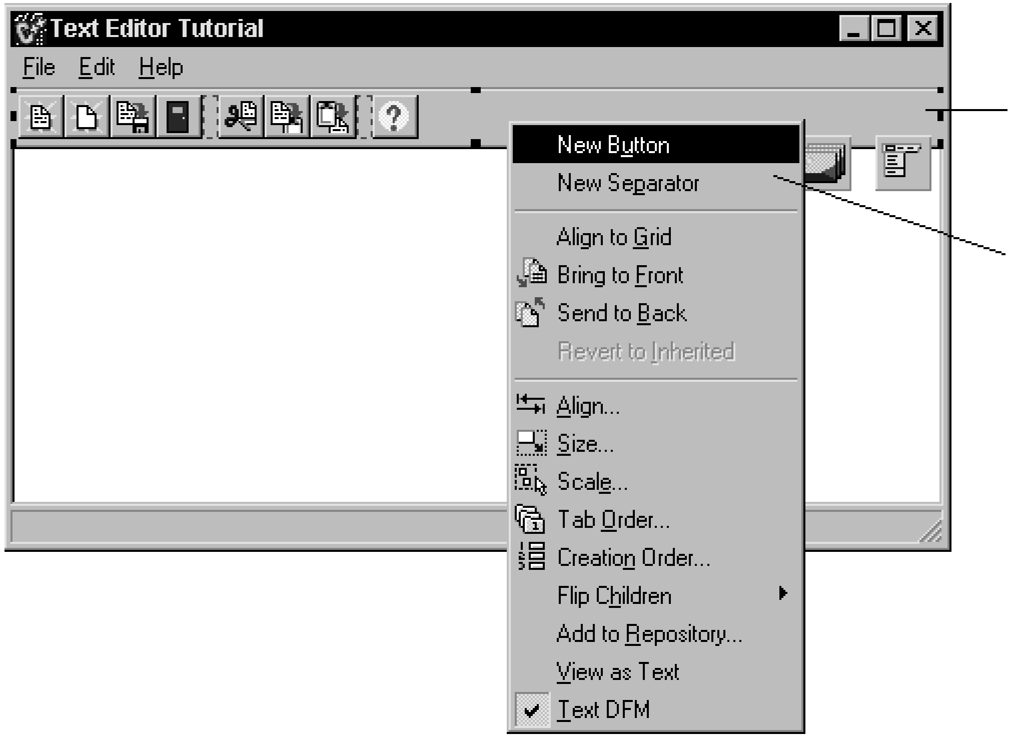
1. On the Win32 page of the Component palette , double-click the *ToolBar* to add it to the form.

   A blank toolbar is added under the main menu. With the toolbar still selected, change the following properties in the Object Inspector:

   - Set the toolbar's *Indent* property to 4. (This indents the icons 4 pixels from the left of the toolbar.)
   - Set its *Images* property to *ImageList1*.
   - Set *ShowHint* to *true*. (**Tip:** Double-click on *false* to change it to *true*.)

2. Add buttons and separators to the toolbar:
   - With the toolbar selected, right-click and choose New Button four times.
   - Right-click and choose New Separator.
   - Right-click and choose New Button three more times.
   - Right-click and choose New Separator.
   - Right-click and choose New Button once again.

Note: Don't worry if the icons aren't correct yet. The correct icons will be selected when you assign actions to the buttons.



The toolbar object is added under the menus by default.

To add buttons or separators, select the toolbar, right-click, and choose New Button or New Separator. Then assign actions from the action list.

3. Assign actions from the action list to the first set of buttons.
    - Select the first button and set its *Action* to *FileExit*.
    - Select the second button and set its *Action* to *FileNew*.
    - Select the third button and set its *Action* to *FileOpen*.
    - Select the fourth button and set its *Action* to *FileSave*.
4. Assign actions to the second set of buttons.
    - Select the first button and set its *Action* to *EditCut1*.
    - Select the second button and set its *Action* to *EditCopy1*.
    - Select the third button and set its *Action* to *EditPaste1*.
5. Assign an action to the last button.
    - Select the last button and set its *Action* to *HelpContents*.
6. Press F9 to compile and run the project.

    Your text editor already has lots of functionality. You can type in the text area. Check out the toolbar. If you select text in the text area, the Cut, Copy, and Paste buttons work.

7. Click the **X** in the upper right corner to close the application and return to the design-time view.

Writing event handlers

Up to this point, you've developed your application without writing a single line of code. By using the Object Inspector to set property values at design time, you've taken full advantage of C++Builder's RAD environment. In this section, you'll write functions called *event handlers* that respond to user input while the application is running. You'll connect the event handlers to the items on the menus and toolbar, so that when an item is selected your application executes the code in the handler.

Because all the menu items and toolbar actions are consolidated in the action list, you can create the event handlers from there.

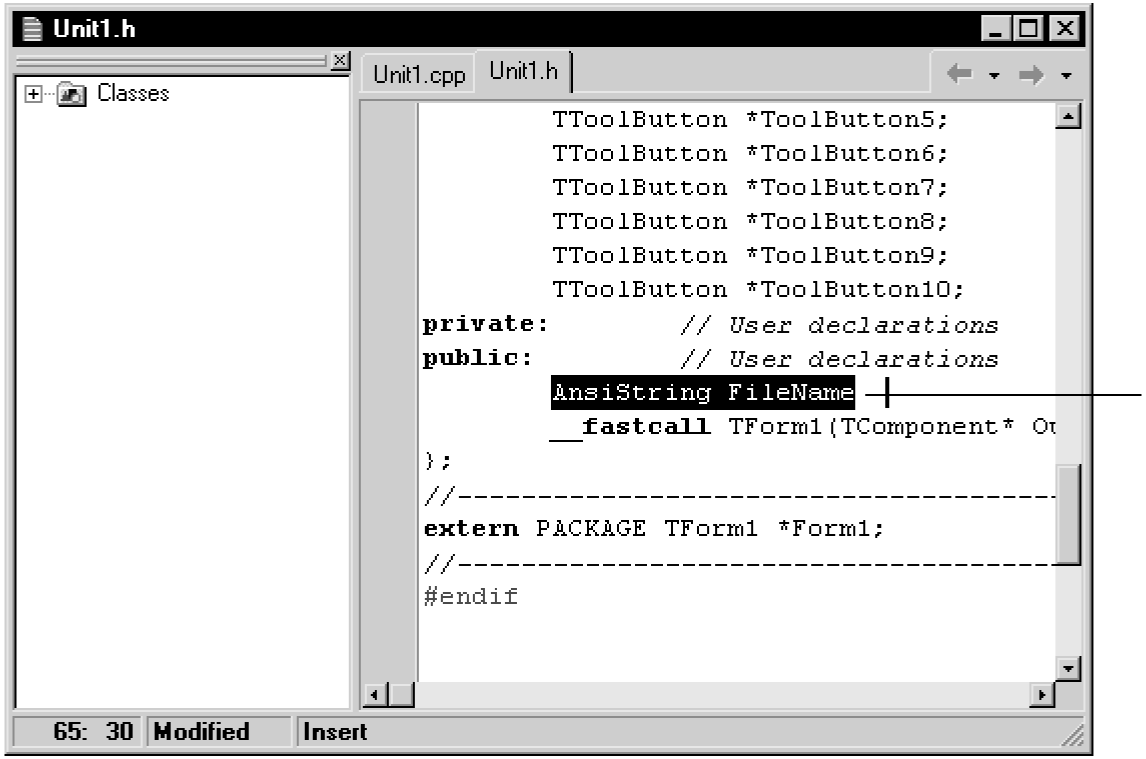
For more information about events and event handlers, see "Developing the application user interface" in the *Developer's Guide* or online Help.

Creating an event handler for the New command

To create an event handler for the New command:

1. Choose View|Units and select Unit1 to display the code associated with Form1.
2. You need to declare a FileName that will be used in the event handler. Add a custom property for the file name to make it globally accessible. Open the Unit1.h file by right-clicking in the Unit1.cpp file in the code editor and choosing Open Source/Header File. In the header file, locate the public declarations section for the class TForm1 and on the line after public: // User declarations, type:
3. AnsiString FileName;
4.

Your screen should look like this:



```
        TToolButton *ToolButton5;
        TToolButton *ToolButton6;
        TToolButton *ToolButton7;
        TToolButton *ToolButton8;
        TToolButton *ToolButton9;
        TToolButton *ToolButton10;
private:        // User declarations
public:         // User declarations
        AnsiString FileName
        __fastcall TForm1(TComponent* Ow
};
//---------------------------------------
extern PACKAGE TForm1 *Form1;
//---------------------------------------
#endif
```

This line defines FileName as a string which is globally accessible from other methods.

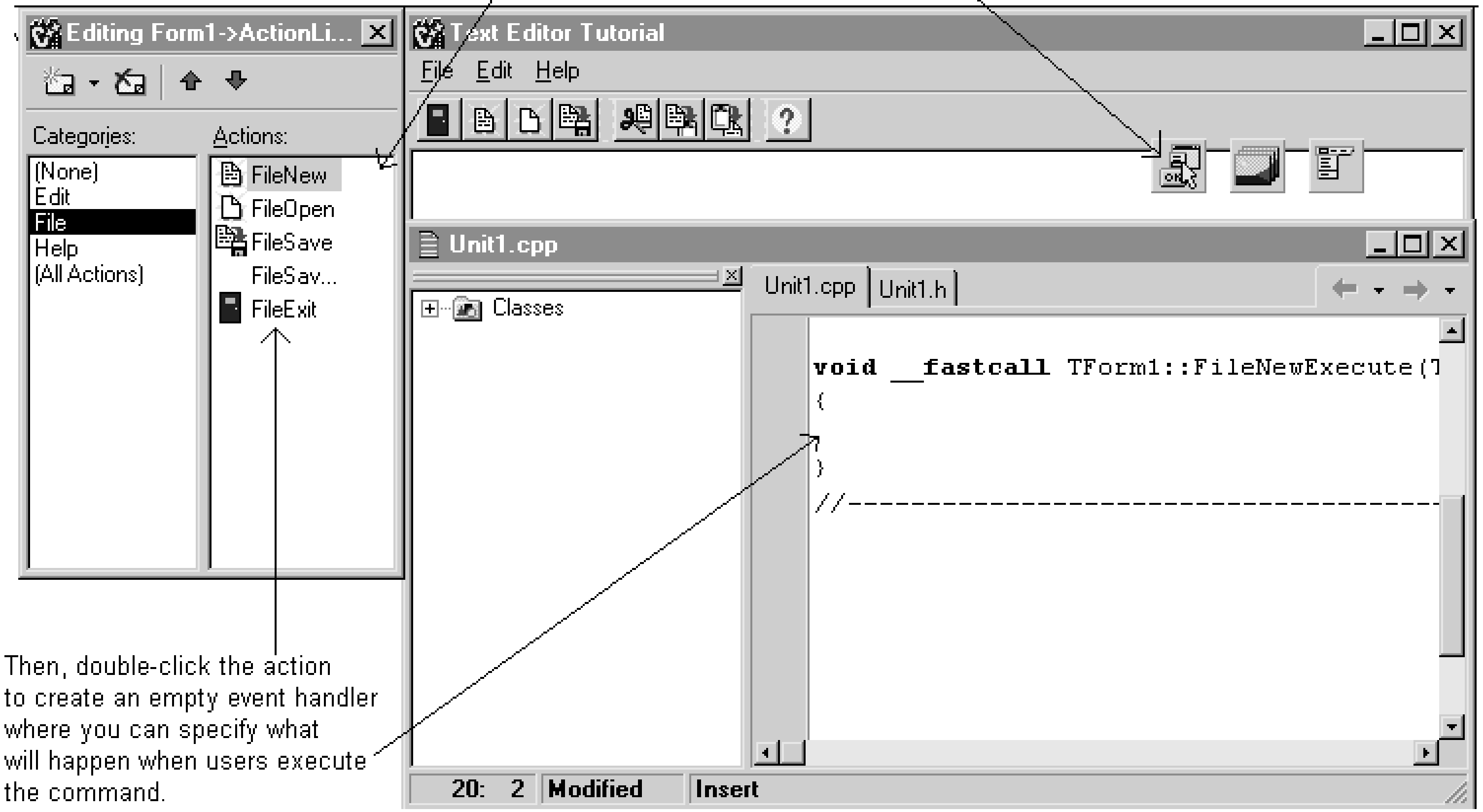
5. Press F12 to go back to the main form.

Tip: F12 is a toggle which takes you back and forth from a form to the associated code.

6. Double-click the ActionList icon on the form to display the Action List editor.
7. In the Action List editor, select the File category and then double-click the FileNew action.

The Code editor opens with the cursor inside the event handler.

First, double-click the Action List object to display the Action List editor.



```
void __fastcall TForm1::FileNewExecute(T
{

}
//-------------------------------------
```

Then, double-click the action to create an empty event handler where you can specify what will happen when users execute the command.

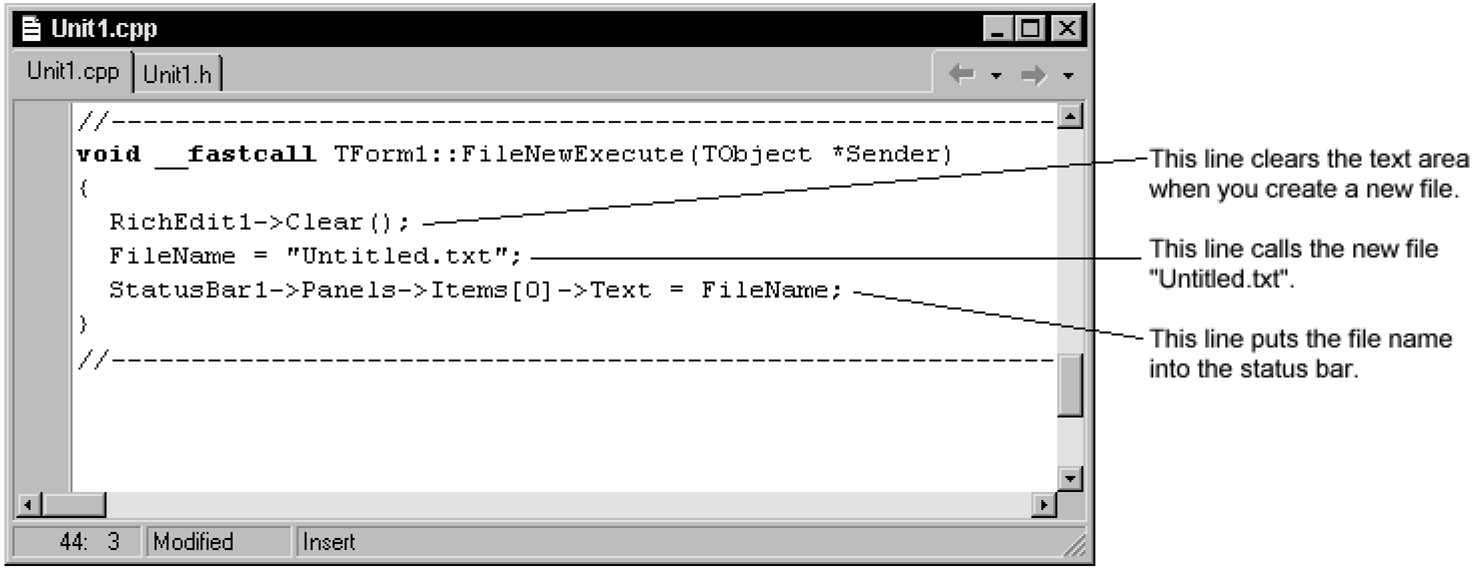
8. Right where the cursor is positioned in the text editor (between { and }), type the following lines:

9. RichEdit1->Clear();

10.

```
FileName = "Untitled.txt";

StatusBar1->Panels->Items[0]->Text = FileName;

```

Your event handler should look like this when you're done:



```
//--------------------------------------------------------------------
void __fastcall TForm1::FileNewExecute(TObject *Sender)
{
  RichEdit1->Clear();
  FileName = "Untitled.txt";
  StatusBar1->Panels->Items[0]->Text = FileName;
}
//--------------------------------------------------------------------
```

This line clears the text area when you create a new file.

This line calls the new file "Untitled.txt".

This line puts the file name into the status bar.

Save your work and that's it for the File|New command.

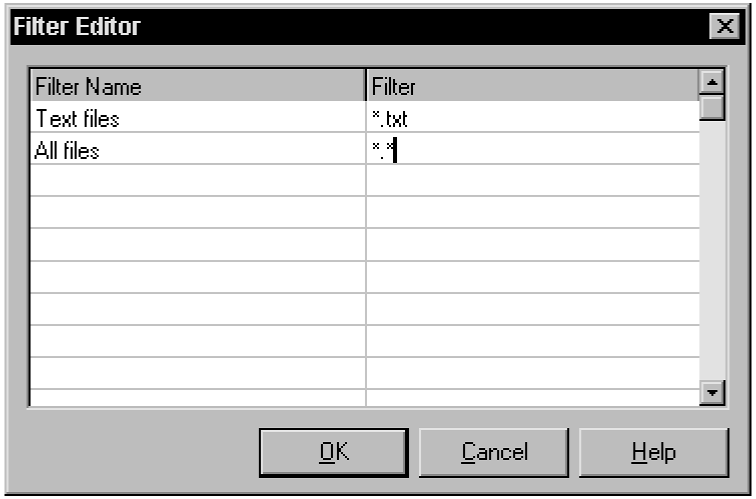
Tip: You can resize the code portion of the window to reduce horizontal scrolling.

Creating an event handler for the Open command

When you open a file, a File Open dialog is automatically displayed. To attach it to the Open command, drop a *TOpenDialog* object on the main editor form. Then you can write the event handler for the command.

To create an Open dialog and an event handler for the Open command:

1. Locate the main form (select View|Forms and choose Form1 to quickly find it).
2. From the Dialogs page of the Component palette, drop an *OpenDialog* component onto the form. (You may need to scroll to find the Dialogs page.) This is a nonvisual component, so it doesn't matter where you place it. C++Builder names it *OpenDialog1* by default. (When *OpenDialog1*'s *Execute* method is called, it invokes a standard Windows dialog for opening files.)
3. In the Object Inspector, set the following properties of *OpenDialog1*:
   - Set *DefaultExt* to txt.
   - Double-click the text area next to *Filter* to display the Filter editor. Specify filters for file types: Type "Text files" as the Filter Name and *.txt as the filter and "All files" as a second Filter Name and *.* as its filter). Then click OK.



Filter Name	Filter
Text files	*.txt
All files	*.*

- Set *Title* to Open File.

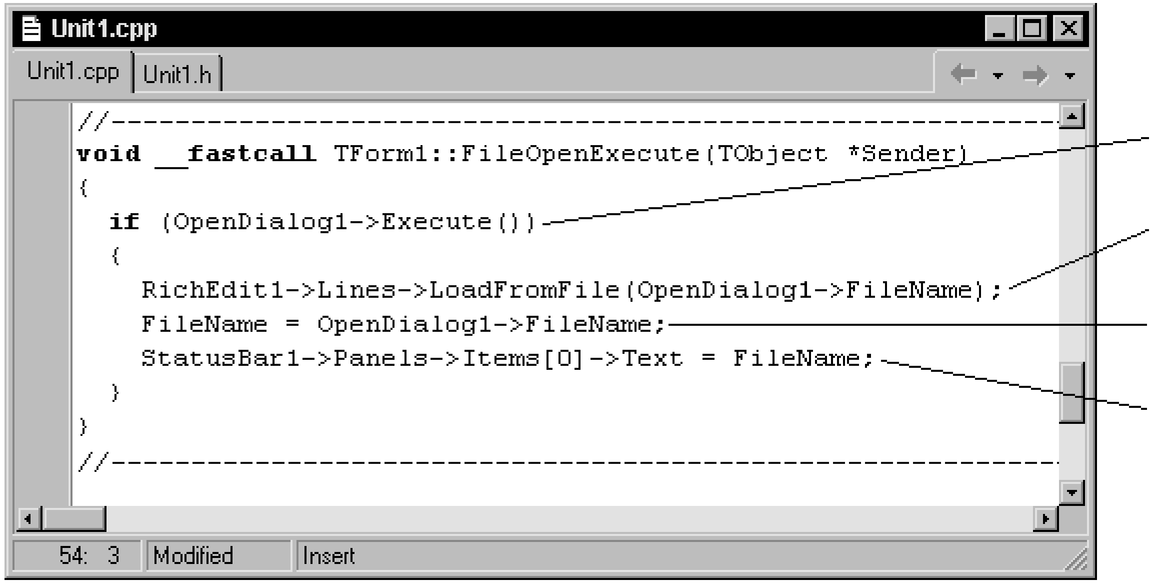
4. The Action List editor should still be displayed. If it's not, double-click the ActionList icon on the form.
5. In the Action List editor, double-click the FileOpen action.

   The Code editor opens with the cursor inside the event handler.

6. Right where the cursor is positioned in the text editor (between { and }), type the following lines:
7. **if** (OpenDialog1->Execute())
8.
9. {
10.
11. RichEdit1->Lines->LoadFromFile(OpenDialog1->FileName);
12.
13. FileName = OpenDialog1->FileName;

```

   StatusBar1->Panels->Items[0]->Text = FileName;

 }

```

Your FileOpen event handler should look like this when you're done:



```
//-----------------------------------------------------------------
void __fastcall TForm1::FileOpenExecute(TObject *Sender)
{
  if (OpenDialog1->Execute())
  {
    RichEdit1->Lines->LoadFromFile(OpenDialog1->FileName);
    FileName = OpenDialog1->FileName;
    StatusBar1->Panels->Items[0]->Text = FileName;
  }
}
//-----------------------------------------------------------------
```

This line defines what happens when the Open command is executed.

This line inserts the text from the specified file.

This line sets the filename to the one in the Open dialog.

This line puts the file name into the status bar.

That's it for the File|Open command and the Open dialog.

Creating an event handler for the Save command

To create an event handler for the Save command:

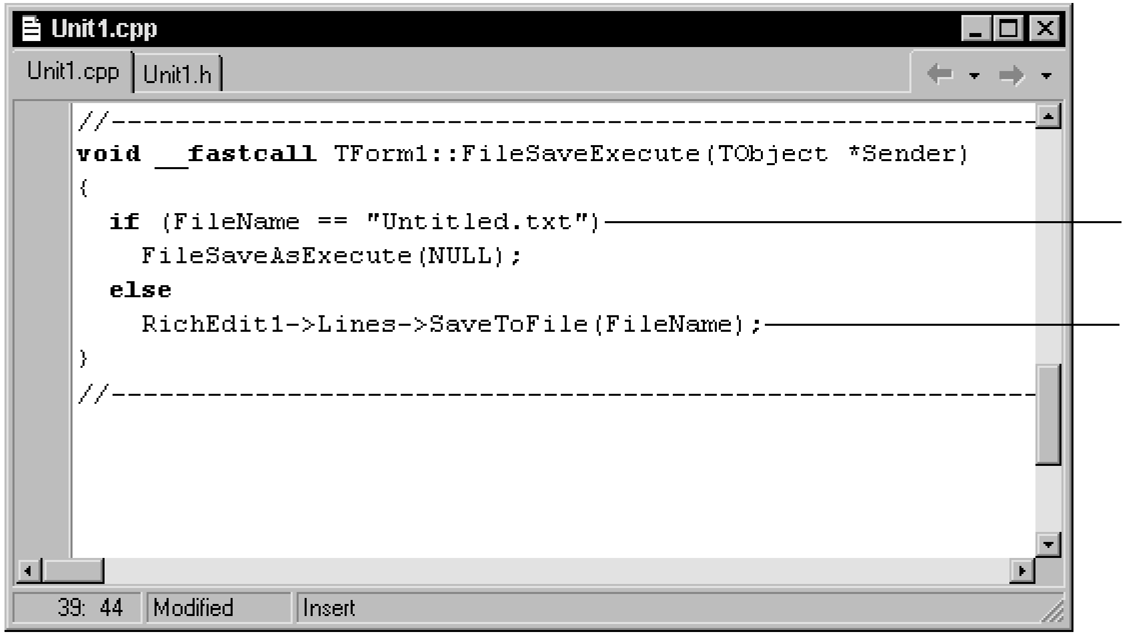
1. The Action List editor should still be displayed. If it's not, double-click the ActionList icon on the form.
2. On the Action List editor, double-click the FileSave action.

   The Code editor opens with the cursor inside the event handler.

3. Right where the cursor is positioned in the text editor (between { and }), type the following lines:
4. **if** (FileName == "Untitled.txt")
5.
6. FileSaveAsExecute(NULL);
7.
8. **else**
9.
10. RichEdit1->Lines->SaveToFile(FileName);
11.

    This code tells the editor to display the SaveAs dialog if the file isn't named yet so the user can assign a name to it. Otherwise, save the file using its name. The SaveAs dialog is defined in the event handler for the Save As command(see list item 4, in the section "Creating an event handler for the Save As command"). FileSaveAsExecute is the automatically generated name for the Save As command.

    Your event handler should look like this when you're done:



```
//---------------------------------------------------------------------------
void __fastcall TForm1::FileSaveExecute(TObject *Sender)
{
  if (FileName == "Untitled.txt")
    FileSaveAsExecute(NULL);
  else
    RichEdit1->Lines->SaveToFile(FileName);
}
//---------------------------------------------------------------------------
```

If the file is untitled, display the File Save As dialog.

Otherwise, save to the named file.

That's it for the File|Save command.

Creating an event handler for the Save As command

To create an event handler for the Save As command:

1. From the Dialogs page of the Component palette, drop a *SaveDialog* component onto the form. This is a nonvisual component, so it doesn't matter where you place it. C++Builder names it *SaveDialog1* by default. (When *SaveDialog*'s *Execute* method is called, it invokes a standard Windows dialog for saving files.)
2. In the Object Inspector, set the following properties of *SaveDialog1*:

- Set *DefaultExt* to txt.
- Double-click the text area next to *Filter* to display the Filter Editor. In the editor, specify filters for file types as in the Open dialog (set Text files to *.txt and All files to *.*) then click OK.
- Set *Title* to Save As.

Note: The Action List editor should still be displayed. If it's not, double-click the ActionList icon on the form.

3. In the Action List editor, double-click the FileSaveAs action.

The Code editor opens with the cursor inside the event handler.

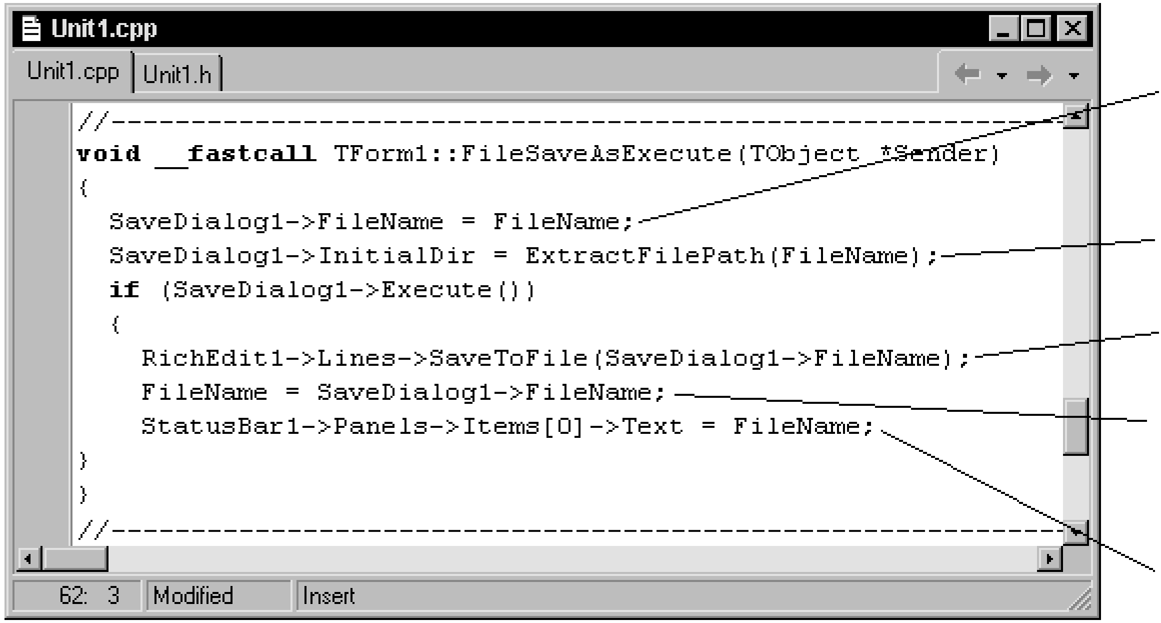
4. Right where the cursor is positioned in the text editor, type the following lines:

```
SaveDialog1->FileName = FileName;

SaveDialog1->InitialDir = ExtractFilePath(FileName);

if (SaveDialog1->Execute())

{

  RichEdit1->Lines->SaveToFile(SaveDialog1->FileName);

  FileName = SaveDialog1->FileName;

  StatusBar1->Panels->Items[0]->Text = FileName;

```

19. }

20.

Your FileSaveAs event handler should look like this when you're done:



```
//---------------------------------------------------------------
void __fastcall TForm1::FileSaveAsExecute(TObject *Sender)
{
  SaveDialog1->FileName = FileName;
  SaveDialog1->InitialDir = ExtractFilePath(FileName);
  if (SaveDialog1->Execute())
  {
    RichEdit1->Lines->SaveToFile(SaveDialog1->FileName);
    FileName = SaveDialog1->FileName;
    StatusBar1->Panels->Items[0]->Text = FileName;
}
}
//---------------------------------------------------------------
```

This sets the SaveAs dialog's FileName property to the main form's FileName property value.

The default directory is set to the last one accessed.

This line saves the text to the specified file.

This sets the main form's FileName to the name specified in the SaveAs dialog.

This puts the file name in the text panel of the status bar.

That's it for the File|SaveAs command.

Creating an event handler for the Exit command

To create an event handler for the Exit command:

1. The Action List editor should still be displayed. If it's not, double-click the ActionList icon on the form.
2. On the Action List editor, double-click the FileExit action.

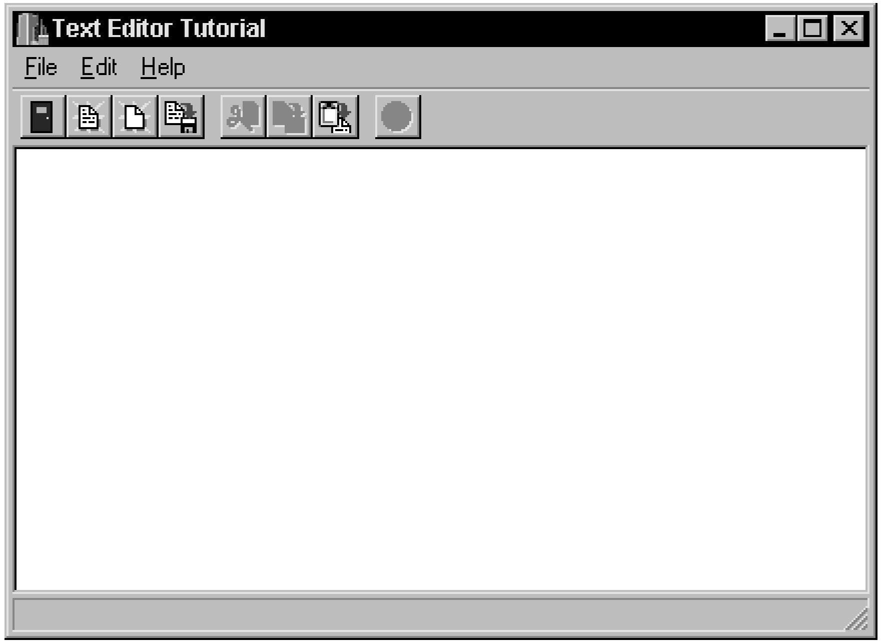
   The Code editor opens with the cursor inside the event handler.

3. Right where the cursor is positioned in the text editor, type the following line:
4. Close();
5.

   This calls the close method of the main form. That's all you need to do for the File|Exit command.

6. Choose File|Save All to save your project.

To see what it looks like so far, run the application by pressing F9 or by clicking on the green Run button ▶ on the toolbar.



The running application looks a lot like the main form in design mode. Notice that the nonvisual objects aren't there.

You can close the application in three ways:

Click the X.

Choose File|Exit.

Click the Exit application button on the toolbar.

Most of the buttons and toolbar buttons work but we're not finished yet.

To return to design mode, close the Text Editor application by choosing File|Exit, by clicking the Exit application button on the toolbar of your application, or by clicking the **X** in the upper right corner.

If you receive any error messages, click on them to locate the error. Make sure you've followed the steps as described in the tutorial.

Creating a Help file

It's a good idea to create a Help file that explains how to use your application. C++Builder provides Microsoft Help Workshop in the Help\Tools directory which includes information on designing and compiling a Windows Help file. In the sample editor application, users can choose Help|Contents or Help|Index to access a Help file with either the contents or index displayed.

Earlier, we created HelpContents and HelpIndex actions in the action list for displaying the Contents tab or Index tab of a compiled Help file. We need to assign constant values to the Help parameters and create event handlers that display what we want.

To use the Help commands, you'll have to create and compile a Windows Help file. Creating Help files is beyond the scope of this tutorial. A sample rtf file (TextEditor.rtf), Help file (TextEditor.hlp) and contents file (TextEditor.cnt) are downloadable from the http://www.borland.com/techpubs/bcppbuilder/ Web site. Or, to test the Help, you can use any HLP or CNT file (such as one of the C++Builder Help files and its associated CNT file) in your project. You will have to rename them for the application to find them.

Creating an event handler for the Help Contents command

To create an event handler for the Help Contents command:

1. The Action List editor should still be displayed. If it's not, double-click the ActionList icon on the form.
2. On the Action List editor, select the Help category, then double-click the HelpContents action.

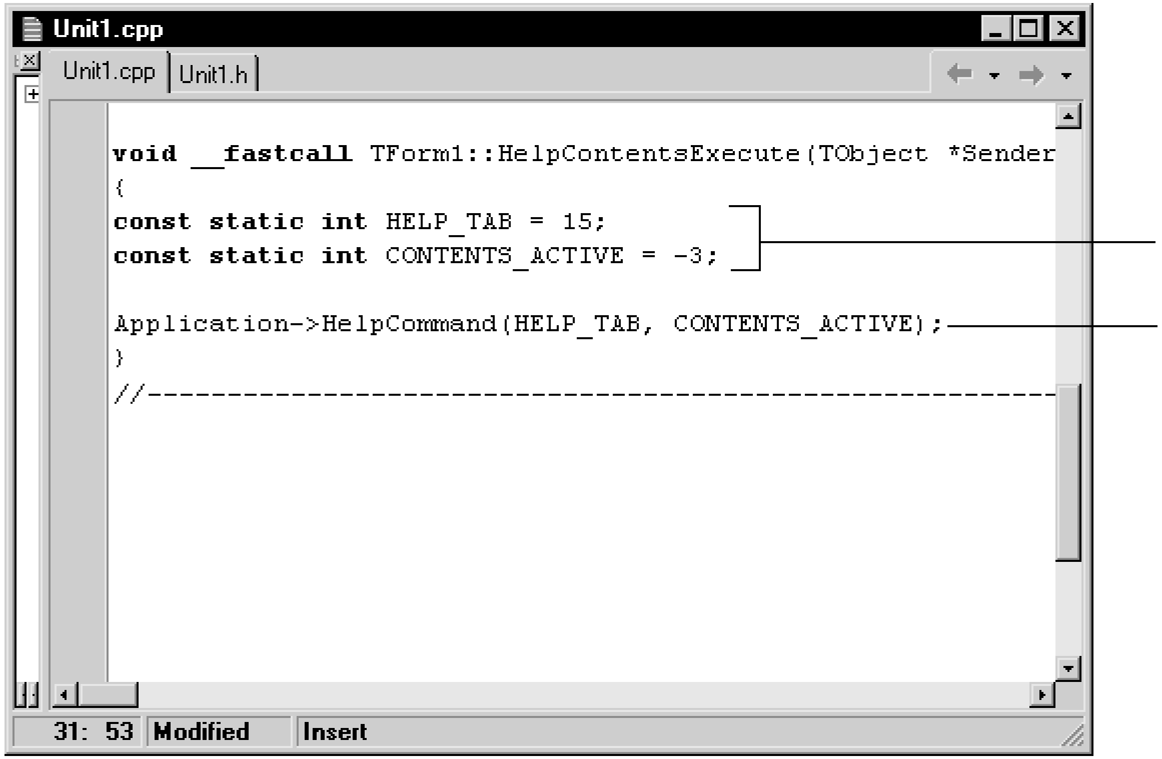
   The Code editor opens with the cursor inside the event handler.

3. Right after where the cursor is positioned in the text editor, type the following lines:
4. **const static int** HELP_TAB = 15;
5.
6. **const static int** CONTENTS_ACTIVE = -3;

```



Application->HelpCommand(HELP_TAB, CONTENTS_ACTIVE);

```

This code assigns constant values to the HelpCommand parameters. Setting HELP_TAB to 15 displays the Help dialog and setting CONTENTS_ACTIVE to -3 displays the Contents tab.

Your event handler should look like this when you're done:



```
void __fastcall TForm1::HelpContentsExecute(TObject *Sender
{
const static int HELP_TAB = 15;
const static int CONTENTS_ACTIVE = -3;

Application->HelpCommand(HELP_TAB, CONTENTS_ACTIVE);
}
//---------------------------------------------------------
```

These lines define the command and data parameters of the HelpCommand method of TApplication.

This says to display the Help dialog with the contents tab displayed.

Tip: To get Help on the HelpCommand method, put the cursor next to HelpCommand in the editor and press `F1`.

That's it for the Help|Contents command.

Creating an event handler for the Help Index command

To create an event handler for the Help Index command:

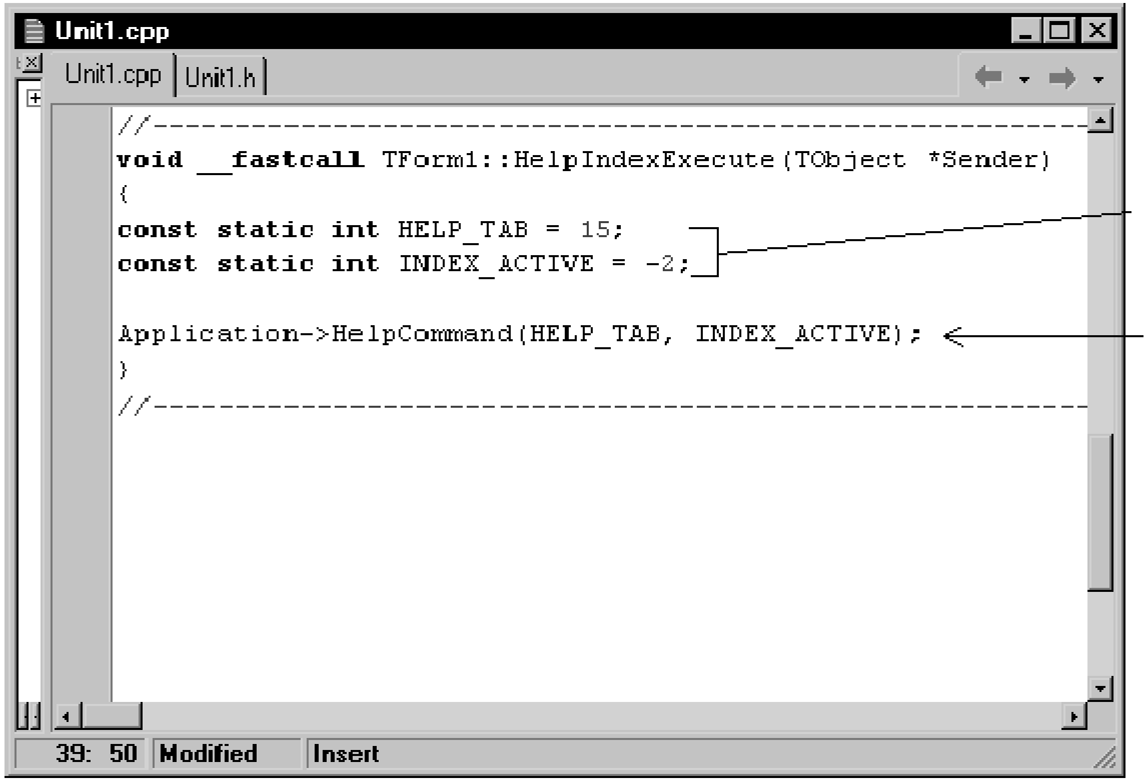
1. The Action List editor should still be displayed. If it's not, double-click the ActionList icon on the form.
2. On the Action List editor, select the Help category and then double-click the HelpIndex action.

   The Code editor opens with the cursor inside the event handler.

3. Right after where the cursor is positioned in the text editor, type the following lines:
4. **const static int** HELP_TAB = 15;
5.
6. **const static int** INDEX_ACTIVE = -2;
7.
8.
9.
10. Application->HelpCommand(HELP_TAB, INDEX_ACTIVE);
11.

   This code assigns constant values to the HelpCommand parameters. Setting HELP_TAB to 15 again displays the Help dialog and setting INDEX_ACTIVE to -2 displays the Index tab.

   Your event handler should look like this when you're done:



```
//---------------------------------------------------------------
void __fastcall TForm1::HelpIndexExecute(TObject *Sender)
{
const static int HELP_TAB = 15;
const static int INDEX_ACTIVE = -2;

Application->HelpCommand(HELP_TAB, INDEX_ACTIVE);
}
//---------------------------------------------------------------
```

These lines define the command and data parameters of the HelpCommand method of TApplication.

This says to display the Help dialog with the index tab displayed.

That's it for the Help|Index command.

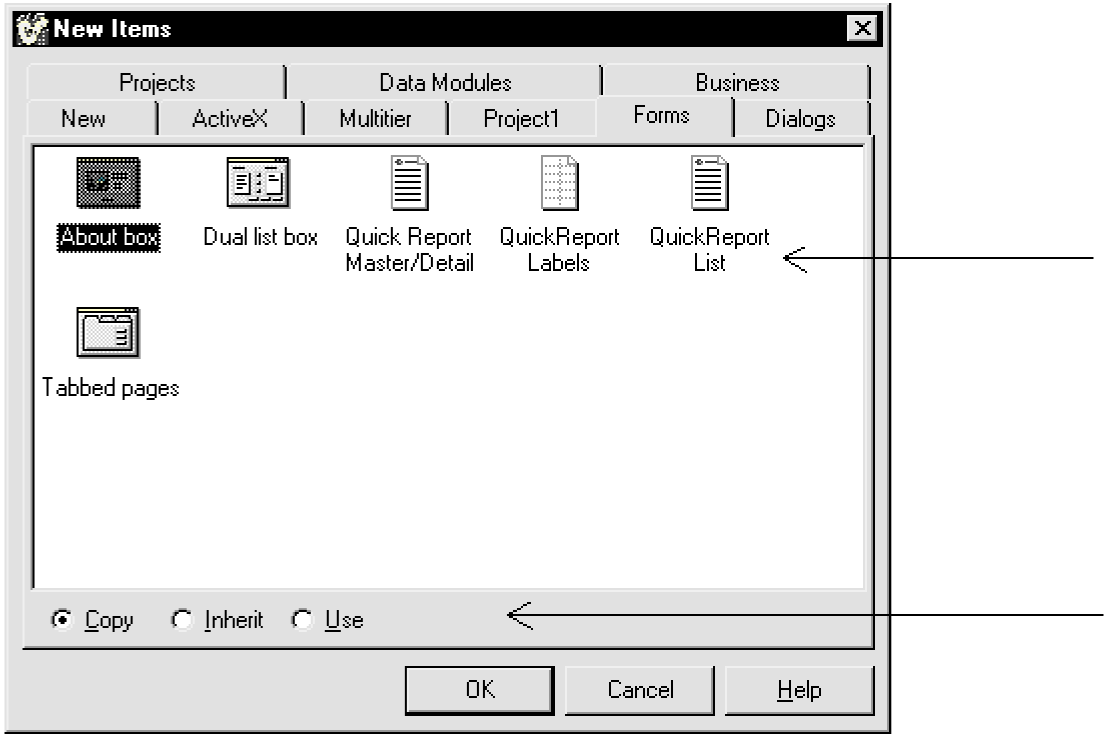
Creating an About box

Many applications include an About box which displays information on the product such as the name, version, logos, and may include other legal information including copyright information.

We've already set up a Help About command on the action list.

To create an About box:

1. Choose File|New to display the New Items dialog box and select the Forms tab.



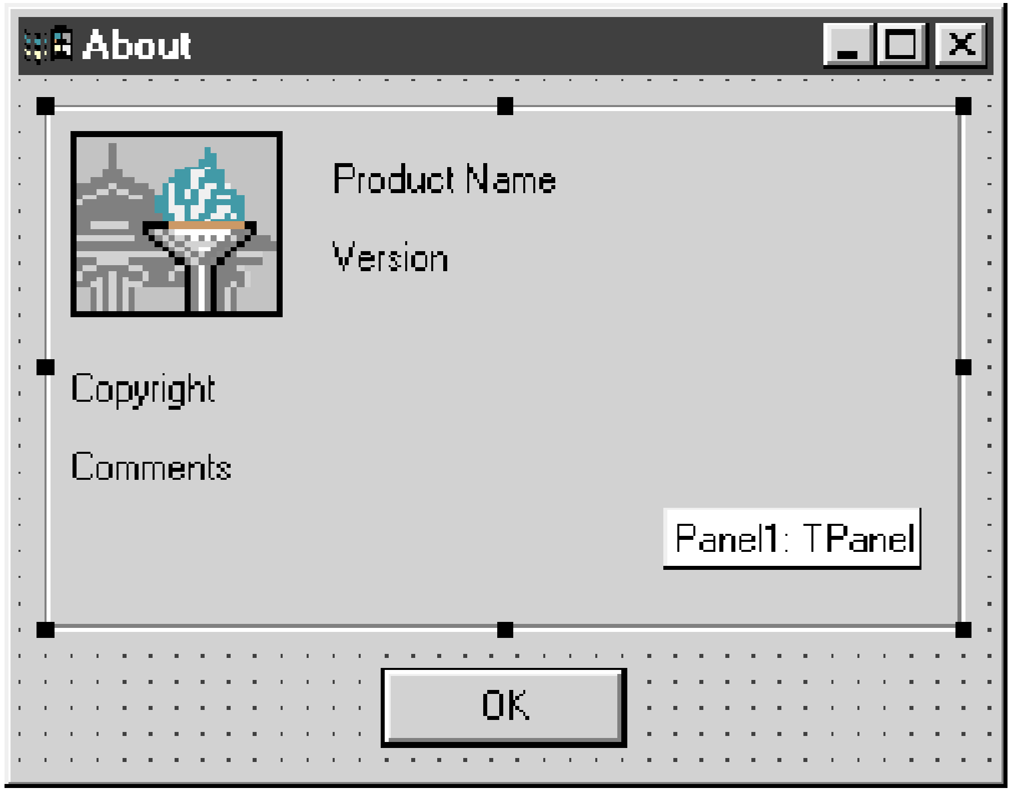
The New Items dialog box is also called the Object Repository.

When you're creating an item based on one from the Object Repository, you can copy, inherit, or use the item:

Copy (the default) creates a copy of the item in your project. Inherit means changes to the object in the repository are inherited by the one in your project. Use means changes to the object in your project are inherited by the object in the repository.

2. On the Forms tab, choose About Box.

   A new form is created that simplifies creation of an About box.



A standard About box is created when you choose File|New and click About Box on the Forms tab. You can modify it as you like to describe your application.

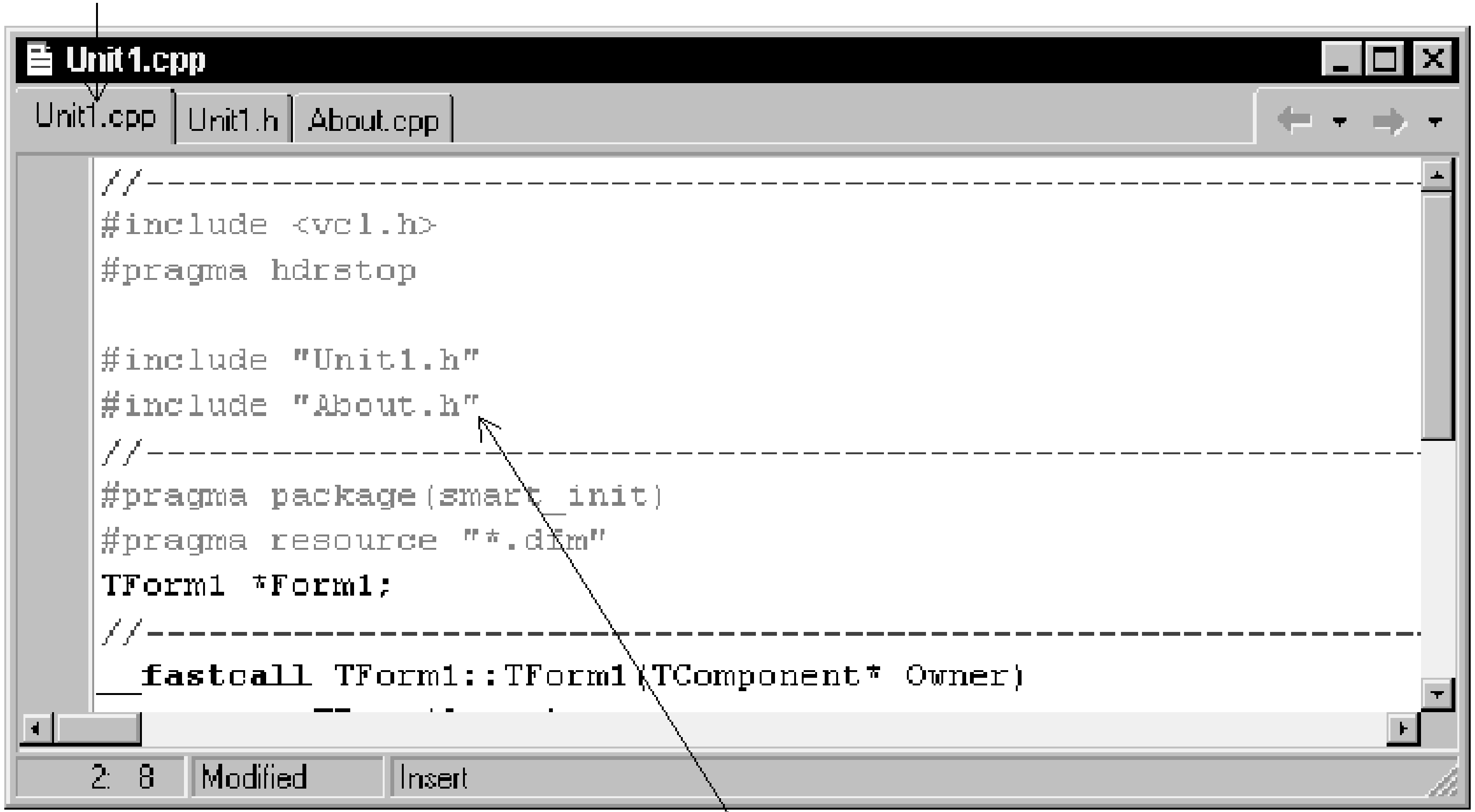
3. Select the following *TLabel* items in the About box and change them in the Object Inspector:
   - Change Product Name to Text Editor.
   - Make it Version 1.0.
   - Enter the year next to Copyright.
4. Select the form itself and change its *Caption* in the Object Inspector to About Text Editor.

Tip: The easiest way to select the form is to click on the grid portion.

5. Save the About box form by choosing File|Save As and saving it as About.cpp.
6. In the C++Builder editor, you should have three files displayed: Unit1.cpp, Unit1.h, and About.cpp. Click on the Unit1.cpp tab.
7. Add an include statement for the About unit to Unit1. Choose File|Include Unit Hdr and then select About and click OK.

Notice that #include About.h has been added to the top of the .cpp file.

Click on the tab to display a file associated with a unit. If you open other files while working on a project, additional tabs appear on the editor.



```
//---------------------------------------------------------------------------
#include <vcl.h>
#pragma hdrstop

#include "Unit1.h"
#include "About.h"
//---------------------------------------------------------------------------
#pragma package(smart_init)
#pragma resource "*.dfm"
TForm1 *Form1;
//---------------------------------------------------------------------------
__fastcall TForm1::TForm1(TComponent* Owner)
```

When you create a new form for your application, you need to add it to the main form. Choose File|Include Unit Hdr and select the header to add.

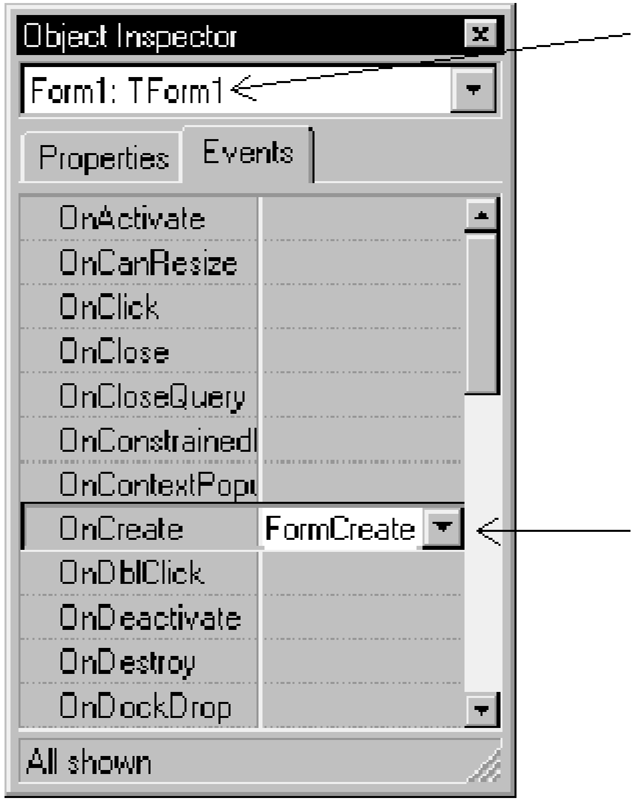
8. On the action list, double-click the HelpAbout action to create an event handler.
9. Right where the cursor is positioned in the text editor, type the following line:
10. AboutBox->ShowModal();
11.

This code opens the About box when the user clicks Help|About. ShowModal opens the form in a modal state. That means the user can't do anything until the form is closed.

Completing your application

The application is almost complete. However, we still have to specify some items on the main form. To complete the application:

1. Locate the main form (press F12 to quickly find it).
2. Check that focus is on the form itself, not any of its components. The top list box on the Object Inspector should say Form1: TForm1. (If it doesn't, select Form1 from the drop down list.)



Check here to make sure focus is on the main form. If it's not, select Form1 from the drop down list.

Double-click here to create an event handler for the form's OnCreate event.

3. In the Events tab, double-click OnCreate to create an event handler that describes what happens when the form is created (that is, when you open the application).
4. Right where the cursor is positioned in the text editor, type the following lines:
5. Application->HelpFile = ExtractFilePath(Application->ExeName) + "TextEditor.hlp";
6. FileName = "Untitled.txt";
7. StatusBar1->Panels->Items[0]->Text = FileName;

8. RichEdit1->Clear();

   This code initializes the application by associating a Help file, setting the value of FileName to untitled.txt, putting the filename into the status bar, and clearing out the text editing area.

9. Put the .HLP file and the CNT file into the project application directory (called projects\TextEditor).

   Note: If you decided not to investigate how to create a Help file or use the sample one provided on the web, the application still works but you'll receive an error message when you choose either of the Help commands or click Help on the toolbar.

10. Press F9 to run the application.

You can test the Text Editor now to make sure it works. If errors occur, click on the error message and you'll go right to the place in the code where the error occurred.
Congratulations! You're done.

Chapter 4

Programming with C++Builder

The following sections provide an overview of software development with C++Builder and describe features that are not covered earlier in this *Quick Start*.

Development tools and features

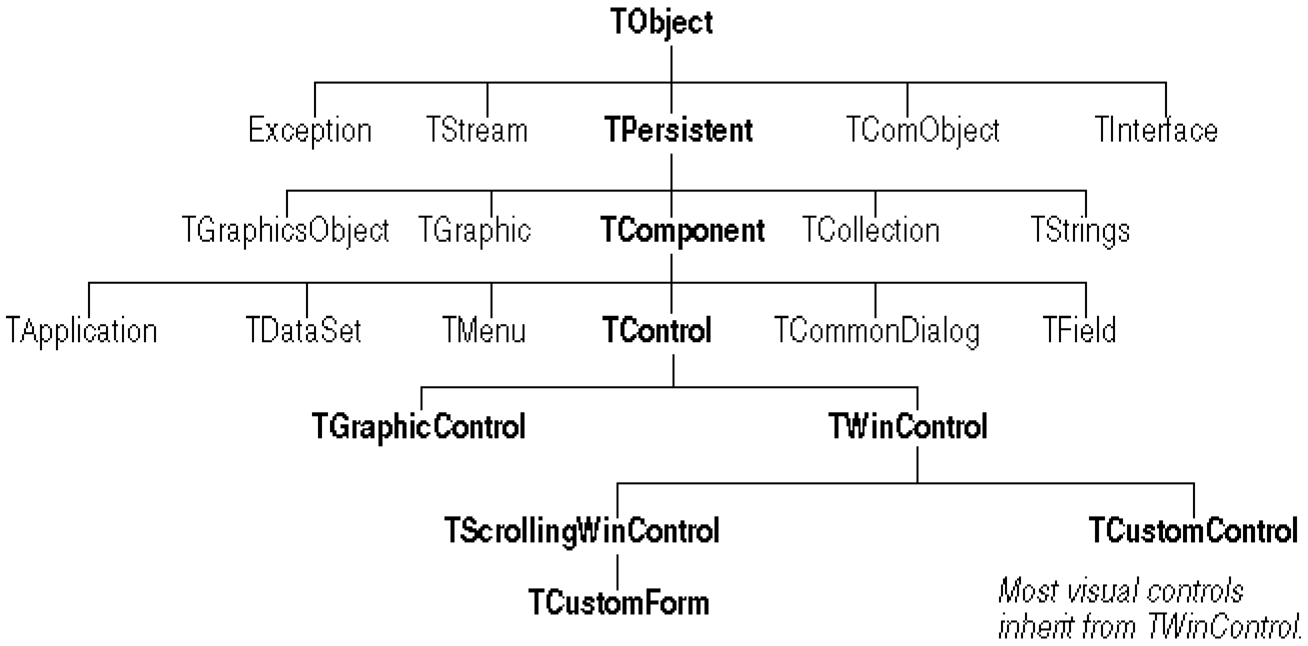
The integrated development environment (IDE) includes the Form Designer, Object Inspector, Component palette, Project Manager, ClassExplorer, Code editor, Data Module Designer, software localization tools, debugger, and many other tools. The particular features and components available to you will depend on which version of C++Builder you've purchased.

All versions of C++Builder support general-purpose 32-bit Windows programming, multithreading, COM (Component Object Model) and Automation controllers, and multiprocess debugging. Some versions add support for server applications such as COM servers and Web applications, database development with report and chart generation for a variety of DBMS back ends, support for SQL database servers (such as Oracle 8 and InterBase), Microsoft Transaction Server (MTS), multi-tiered database applications, CORBA, and decision-support systems. For up-to-date product information, refer to www.borland.com or contact your Inprise distributor.

Using the VCL

C++Builder comes with components that are part of a class hierarchy called the Visual Component Library (VCL). The VCL includes objects that are visible at runtime--such as edit controls, buttons, and other user-interface elements--as well as nonvisual controls like datasets and timers.

The diagram below shows some of the principal classes that make up the VCL.



Objects descended from *TComponent* have properties and methods that allow them to be installed on the Component palette and added to C++Builder forms. Because VCL components are hooked into the IDE, you can use tools like the Form Designer to develop applications quickly.

Components are highly encapsulated. For example, buttons are preprogrammed to respond to mouse clicks by firing *OnClick* events. If you use a VCL button control, you don't have to write code to handle Windows messages when the button is clicked; you are responsible only for the application logic that executes in response to the event.

Most versions of C++Builder come with complete source code for the VCL.

For more information...

See "Visual Component Library Reference" and "Creating Custom Components" in the online Help.

Exception handling

C++Builder's error-handling is based on *exceptions*, which are special objects generated in response to unanticipated input or faulty program execution. Exceptions can be thrown at both design time and runtime, and the VCL contains many exception classes that are associated with specific error conditions. In your applications, you'll want to write *exception handlers* to deal gracefully with runtime errors. Exceptions can also be a valuable debugging tool, since the class of an exception often provides a clue about what caused it to be thrown.

For more information...

See the entries for "Exception" and its specialized descendant classes in the online VCL reference. Look up "exception handling" in the Help index.

Database connectivity and utilities

C++Builder and the VCL offer a variety of connectivity tools to simplify the development of database applications. The Borland Database Engine (BDE) is a collection of drivers that support many popular database formats, including dBASE, Paradox, FoxPro, Access, and any ODBC data source. SQL Links drivers, available with some versions of C++Builder, support servers such as Oracle, Sybase, Informix, DB2, SQL Server, and InterBase.

C++Builder includes components that you can use to access data through InterBase Express (IBX). IBX applications provide access to advanced InterBase features and offer the highest performance component interface for InterBase 5.5 and later.

IBX is based on the custom data access C++Builder component architecture, and is integrated with the Data Module Designer. IBX is compatible with C++Builder's library of data-aware components, and does not require the BDE.

You can create database tables at design time in the Form Designer. First, create field definitions using the Object Inspector, then right-click on the table component and choose Create Table.

Some versions of C++Builder include components to connect to databases using ActiveX Data Objects (ADO). ADO is Microsoft's high-level interface to any data source, including relational and non-relational databases, email and file systems, text and graphics, and custom business objects.

For more information...

See "Developing Database Applications" in the *Developer's Guide* or online Help.

BDE Administrator

Use the BDE Administrator (BDEAdmin.exe) to configure BDE drivers and set up the aliases used by data-aware VCL controls to connect to databases.

For more information...

Start the BDE Administrator from the C++Builder program group under the Windows Start menu. Then choose Help|Contents.

SQL Explorer (Database Explorer)

The SQL Explorer (DBExplor.exe) lets you browse and edit databases. You can use it to create database aliases, view schema information, execute SQL queries, and maintain data dictionaries and attribute sets.

For more information...

From the C++Builder main menu, choose Database|Explore to open the Explorer; then press F1. Or search for "Database Explorer" in the main Help index.

Database Desktop

The Database Desktop (DBD32.exe) lets you create, view, and edit Paradox and dBase database tables in a variety of formats.

For more information...

Start the Database Desktop from the C++Builder program group under the Windows Start menu. Then press F1.

Data Dictionary

The Data Dictionary provides a customizable storage area, independent of your applications, where you can create extended field attribute sets that describe the content and appearance of data. The Data Dictionary can reside on a remote server for additional sharing of information.

For more information...

Search for "Data Dictionary" in the Help index.

Types of development projects

You can use C++Builder to write Windows GUI applications, console applications, service applications, dynamic-link libraries (DLLs), packages (a special type of DLL used by C++Builder), and other programs.

Applications and servers

C++Builder has features that make it easy to write distributed applications, including client/server, multi-tiered, and Web-based systems. In addition to support for standards like COM and a suite of Internet components, some versions of C++Builder provide extensive tools for CORBA development.

For more information...

See "Building applications, components, and libraries" and "Developing distributed applications" in the *Developer's Guide* or online Help.

DLLs

Dynamic-link libraries (DLLs) are compiled modules containing routines that can be called by applications and by other DLLs. Since a DLL contains sharable code or resources, it is typically used by more than one application.

For more information...

Search for "DLLs" in the Help index.

Custom components and packages

A *package* is a special dynamic-link library used by C++Builder applications, the IDE, or both. While packages can be used in a variety of ways, their most common purpose is the encapsulation of C++Builder components. In fact, all components installed in the IDE must be compiled as packages.

The components that come with C++Builder are preinstalled in the IDE and offer a range of functionality that should be sufficient for most of your development needs. You could program with C++Builder for years without installing a new component, but you may sometimes want to solve special problems or encapsulate particular kinds of behavior that require custom components.

Custom components supplement the VCL while promoting code reuse and consistency across applications. Many C++Builder components are available through third-party developers, and C++Builder provides a New Component wizard that makes it easy to create and install components on your own.

For more information...

See "Creating Custom Components" in the *Developer's Guide* or online Help. Search for "packages" in the Help index.

Frames

A frame (*TFrame*), like a form, is a container for other components. In some ways, a frame is more like a customized component than a form. Frames can be saved on the Component palette for easy reuse, and they can be nested within forms, other frames, or other container objects. After a frame is created and saved, it continues to function as a unit and to inherit changes from the components (including other frames) it contains. When a frame is embedded in another frame or form, it continues to inherit changes made to the frame from which it derives.

For more information...

Search for "frames" and "TFrame" in the Help index.

COM and ActiveX

C++Builder supports Microsoft's COM standard and provides wizards for creation of ActiveX controls. Sample ActiveX controls are installed on the ActiveX page of the Component palette. Numerous COM server components are provided on the Servers tab of the Component palette. You can use these components as if they were VCL components. For example, you can place one of the Microsoft Word components onto a form to bring up an instance of Microsoft Word within an application interface.

For more information...

Search for "COM" and "ActiveX" in the Help index.

Type libraries

Type libraries are files that include information about data types, interfaces, member functions, and object classes exposed by an ActiveX control or server. By including a type library with your COM application or ActiveX library, you make information about these entities available to other applications and programming tools. C++Builder provides a Type Library editor for creating and maintaining type libraries.

For more information...

Search for "type libraries" in the Help index.

Deploying applications

When you deploy an application, be sure to supply all the required files--including executables, DLLs, packages, and BDE drivers--to your users. To make this process easier, C++Builder includes a special version of InstallShield Express, a popular tool for developing installation utilities.

For more information...

Search for "deploying applications" in the Help index.

Internationalizing applications

C++Builder offers many features for internationalizing and localizing applications. Support for input method editors (IMEs) and extended character sets is provided throughout the VCL, and tools like the Resource DLL wizard make it easy to prepare a project for localization. To get the maximum benefit from these features, you need to start thinking about internationalization requirements as early as possible in the development process.

The Integrated Translation Environment (ITE), available in some versions of C++Builder, is a suite of tools for software localization and simultaneous development for different locales. It is integrated with the IDE to let you manage multiple localized versions of an application as part of a single project.

The ITE includes three tools:

- Translation Manager, a grid for viewing and editing translated resources
- Translation Repository, a sharable database for translations
- Resource DLL wizard, a DLL wizard that generates and manage resource DLLs