IDE

This chapter describes Visual Studio's integrated development environment (IDE). It explains the most important windows, menus, and toolbars that make up the environment, and shows how to customize them to suit your personal preferences. It also explains some of the tools that provide help while you are writing Visual Basic applications.

Even if you are an experienced Visual Basic programmer, you should at least skim this material. The IDE is *extremely* complex and provides hundreds (if not thousands) of commands, menus, toolbars, windows, context menus, and other tools for editing, running, and debugging Visual Basic projects. Even if you have used the IDE for a long time, there are sure to be some features that you have overlooked. This chapter describes some of the most important of those features, and you may discover something useful that you've never noticed before.

Even after you've read this chapter, you should periodically spend some time wandering through the IDE to see what you've missed. Every month or so, spend a few minutes exploring the menus and right-clicking on things to see what their context menus contain. As you become a more proficient Visual Basic programmer, you will find uses for tools that you may have previously dismissed or failed to understand.

It is important to remember that the Visual Studio IDE is extremely customizable. You can move, hide, or modify the menus, toolbars, and windows; create your own toolbars; dock, undock, or rearrange the toolbars and windows; and change the behavior of the built-in text editors (change their indentation, colors for different kinds of text, and so forth).

These capabilities let you display the features you need the most and hide those that are unnecessary for a particular situation. If you need to use the Properties window, you can display it. If you want to make room for a very wide form, you can make it short and wide, and move it to the bottom of the screen. If you have a collection of favorite tools and possibly some you have written yourself, you can put them all in one convenient toolbar. Or you can have several toolbars for working with code, forms in general, and database forms in particular.

This chapter describes the basic Visual Studio development environment as it is initially installed. Because Visual Studio is so flexible, your development environment may not look like the one described here. After you've moved things around a bit to suit your personal preferences, your menus and toolbars may not contain the same commands described here, and other windows may be in different locations or missing entirely.

To avoid confusion, you should probably not customize the IDE's basic menus and toolbars too much. Removing the help commands from the Help menu and adding them to the Edit menu will only cause confusion later. It's less confusing to leave the menus more or less alone. Hide any toolbars you don't want and create new customized toolbars to suit your needs. Then you can find the original standard toolbars if you decide you need them later. The section "Customize" later in this chapter has more to say about rearranging the IDE's components.

This chapter describes the Visual Studio IDE. Before you can understand how to use the IDE to manage Visual Basic projects and solutions, however, you should know what projects and solutions are.

Projects and Solutions

A *project* is a group of files that produces some specific output. This output may be a compiled executable program, a dynamic-link library (DLL) of classes for use by other projects, or a custom control for use on other Windows forms.

A *solution* is a group of one or more projects that should be managed together. For example, suppose that you are building a server application that provides access to your order database. You are also building a client program that each of your sales representatives will use to query the server application. Because these two projects are closely related, it might make sense to manage them in a single solution. When you open the solution, you get instant access to all the files in both projects.

Both projects and solutions can include associated files that are useful for building the application but that do not become part of a final compiled product. For example, a project might include the application's proposal and architecture documents. These are not included in the compiled code, but it is useful to associate them with the project.

When you open the project, Visual Studio lists those documents along with the program files. If you double-click one of these documents, Visual Studio opens the file using an appropriate application. For example, if you double-click a file with a .doc extension, Visual Studio normally opens it with Microsoft Word.

To associate one of these files with a project or solution, right-click the project in the Solution Explorer (more on the Solution Explorer shortly). Select the Add command's Add New Item entry, and use the resulting dialog to select the file you want to add.

Often a Visual Basic solution contains a single project. If you just want to build a small executable program, you probably don't need to include other programming projects in the solution.

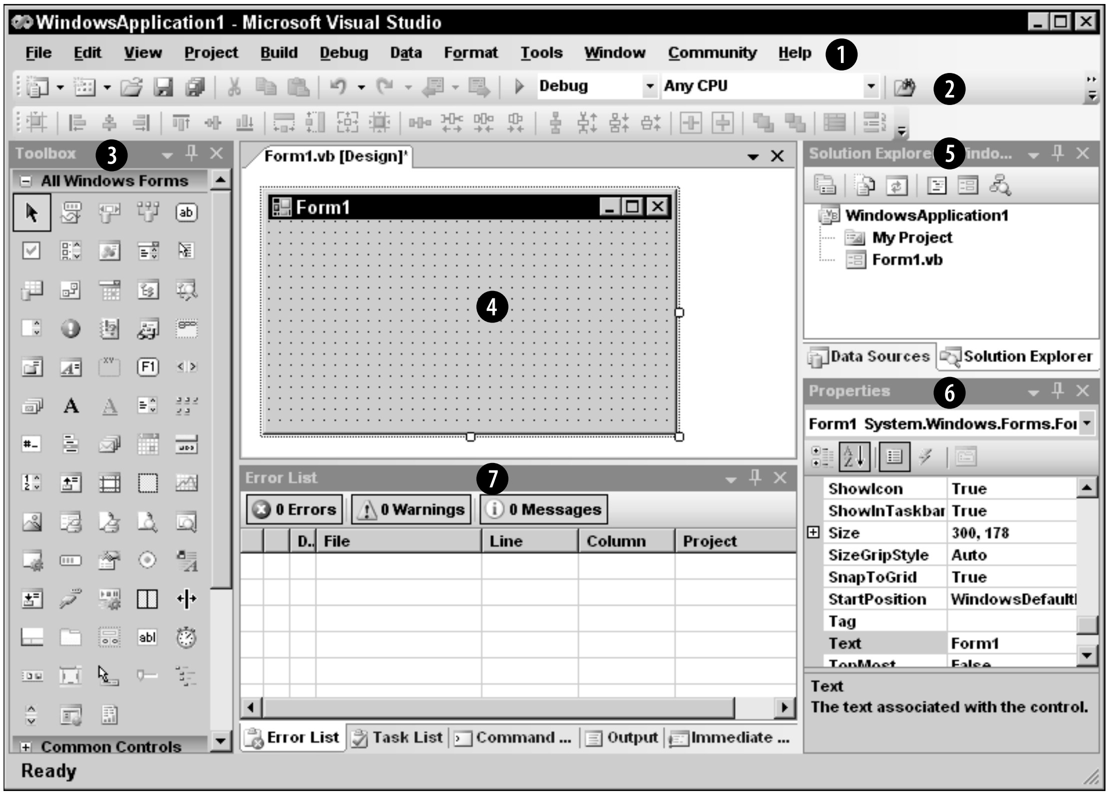
Another common scenario is to place Visual Basic code in one project and to place documentation (such as project specifications and progress reports) in another project within the same solution. This keeps the documentation handy whenever you are working on the application but keeps it separate enough that it doesn't clutter the Visual Studio windows when you want to work with the code.

While you can add any file to a project or solution, it's not a good idea to load dozens of unrelated files. While you may sometimes want to refer to an unrelated file while working on a project, the extra clutter brings additional chances for confusion. It will be less confusing to shrink the Visual Basic IDE to an icon and open the file using an external editor such as Word or WordPad. If you won't use a file very often with the project, don't add it to the project.

IDE Overview

Figure 1-1 shows the IDE immediately after starting a new project. The IDE is extremely configurable, so it may not look much like Figure 1-1 after you have rearranged things to your own liking.

If you don't have a reason to modify the IDE's basic arrangement, you should probably leave it alone. Then when you read a magazine article that tells you to use the Project menu's Add Reference command, the command will be where it should be. Using the standard IDE layout also reduces confusion when you need to consult with another developer. It's a lot easier to share tips about using the Format menu if you haven't removed that menu from the IDE.



Form1 System.Windows.Forms.Fo

ShowIcon	True
ShowInTaskbar	True
⊞ Size	300, 178
SizeGripStyle	Auto
SnapToGrid	True
StartPosition	WindowsDefaultL
Tag	
Text	Form1
TopMost	False

Text
The text associated with the control.

Figure 1-1: Initially the IDE looks more or less like this.

The key pieces of the IDE are labeled with numbers in Figure 1-1. The following list briefly describes each of these pieces.

- *(1) Menus* — The menus contain standard Visual Studio commands. These generally manipulate the current solution and the modules it contains, although you can customize the menus as needed. Visual Studio changes the menus, and their contents depending on the object you currently have selected. In Figure 1-1, a Form Designer (marked with the number 4) is open so the IDE is displaying the menus for editing forms.
- *(2) Toolbars* — Toolbars contain tools that you can use to perform frequently needed actions. The same commands may be available in menus, but they are easier and faster to use in toolbars. The IDE defines several standard toolbars such as Formatting, Debug, and Image Editor. You can also build your own custom toolbars to hold your favorite tools. Visual Studio changes the toolbars displayed to match the object you currently have selected.
- *(3) Toolbox* — The Toolbox contains tools appropriate for the item that you currently have selected and for the project type that you are working on. In Figure 1-1, a Form Designer is selected in a Windows Forms application so the Toolbox contains tools appropriate for a Form Designer. These include Windows Forms controls and components, plus tools in the other Toolbox tabs: Crystal Reports, Data, and Components (plus the General tab is scrolled off the bottom of the Toolbox). You can add other customized tabs to the Toolbox to hold your favorite controls and components. Other project types may display other tools. For example, a Web project would display Web controls and components instead of Windows Forms components.
- *(4) Form Designer* — A Form Designer lets you modify the graphical design of a form. Select a control tool from the Toolbox, and click and drag to place an instance of the control on the form. Use the Properties window (marked with the number 6) to change the new control's properties. In Figure 1-1, no control is selected, so the Properties window shows the form's properties.
- *(5) Solution Explorer* — The Solution Explorer lets you manage the files associated with the current solution. For example, in Figure 1-1, you could select Form1.vb in the Project Explorer and then click the View Code button (the icon third from the right at the top of the Solution Explorer) to open the form's code editor. You can also right-click an object in the Solution Explorer to get a list of appropriate commands for that object.
- *(6) Properties* — The Properties window lets you change an object's properties at design time. When you select an object in a form designer or in the Solution Explorer, the Properties window displays that object's properties. To change a property's value, simply click the property and enter the new value.
- *(7) Error List* — The Error List window shows errors and warnings in the current project. For example, if a variable is used and not declared, this list will say so.

If you look at the bottom of Figure 1-1, you'll notice that the Toolbox and Error List windows each have a series of tabs. The Toolbox's other tab displays the Document Outline window, which displays an outline view of a project showing its forms and components.

The Error List window's Output tab shows output printed by the application. Usually an application interacts with the user through its forms and dialogs, but it can display information here to help you debug the code. The Output window also shows informational messages generated by the IDE. For example, when you compile an application, the IDE sends messages here to tell you what it is doing and whether it succeeded.

The following sections describe the major pieces of the IDE in more detail.

Menus

The IDE's menus contain standard Visual Studio commands. These are generally commands that manipulate the project and the modules it contains. Some of the concepts are similar to those used by any Windows application (File\New, File\Save, Help\Contents), but many of the details are specific to Visual Studio programming, so the following sections describe them in a bit more detail.

The menus are customizable, so you can add, remove, and rearrange the menus and the items they contain. This can be quite confusing, however, if you later need to find a command that you have removed from its normal place in the menus. Some developers place extra commands in standard menus, particularly the Tools menu, but it is generally risky to remove standard menu items. Usually it is safest to leave the standard menus alone and make custom toolbars to hold customizations. For more information on this, see the section "Customize" later in this chapter.

Many of the menus' most useful commands are also available in other ways. Many provide shortcut key combinations that make using them quick and easy. For example, Ctrl-N opens the New Project dialog just as if you had selected the File\New Project menu command. If you find yourself using the same command very frequently, look in the menu and learn its keyboard shortcut to save time later.

Many menu commands are also available in standard toolbars. For example, the Debug toolbar contains many of the same commands that are in the Debug menu. If you use a set of menu commands frequently, you may want to display the corresponding toolbar to make using the commands easier.

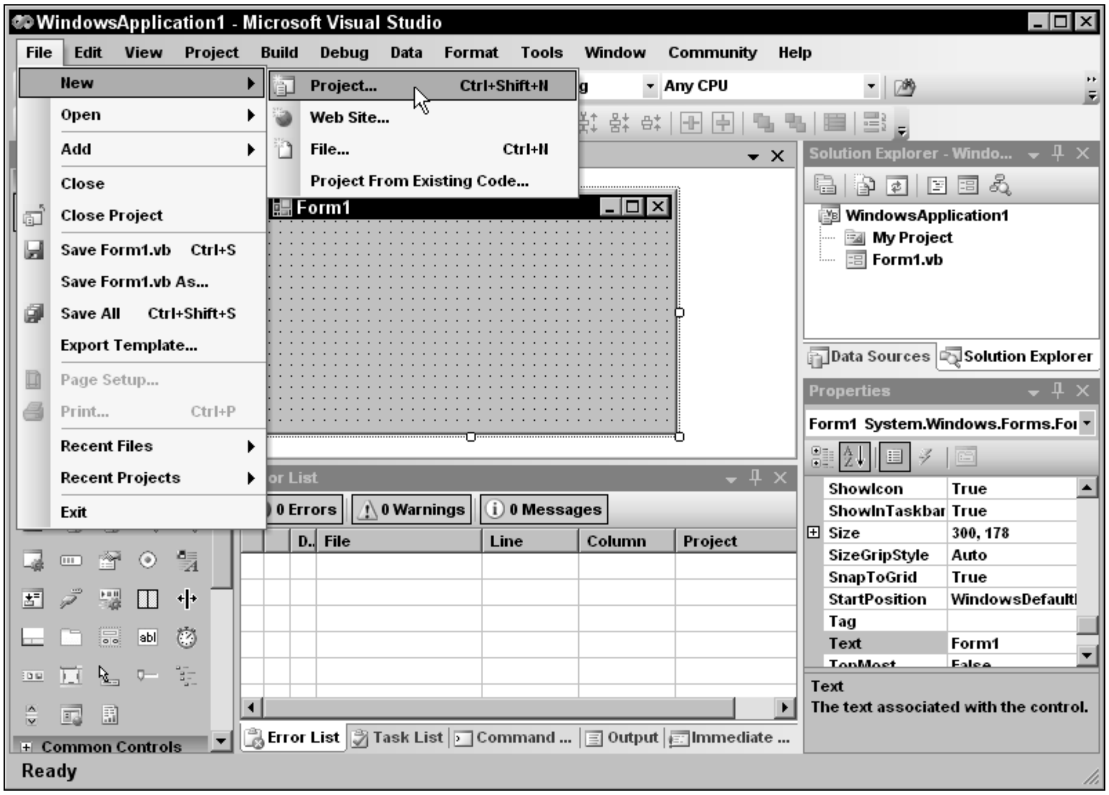
Visual Studio also provides many commands through context menus. For example, if you right-click on a project in the Solution Explorer, the context menu includes an Add Reference command that displays the Add Reference dialog just as if you had invoked Project\Add Reference. Often it is easier to find a command by right-clicking an object related to whatever you want to do than it is to wander through the menus.

The following sections describe the general layout of the standard menus. You might want to open the menus in Visual Studio as you read these sections, so you can follow along.

Note that Visual Studio displays different menus and different commands in menus depending on what editor is active. For example, when you have a form open in the form editor, Visual Studio displays a Format menu that you can use to arrange controls on the form. When you have a code editor open, the Format menu is hidden because it doesn't apply to code.

File

The File menu, shown in Figure 1-2, contains commands that deal with creating, opening, saving, and closing projects and project files.



ShowIcon	True
ShowInTaskbar	True
Size	300, 178
SizeGripStyle	Auto
SnapToGrid	True
StartPosition	WindowsDefaultL
Tag	
Text	Form1
TopMost	False

Text
The text associated with the control.

Figure 1-2: The File menu holds commands that deal with the solution and its files.

Following is a description of the commands contained in the File menu and its submenus:

❑ *New* — The New submenu shown in Figure 1-2 contains commands that let you create a new Visual Basic project, Web site project (generally ASP.NET or a Web Service), or file (text file, bitmap, Visual Basic class, icon, and many others). The Project From Existing Code command creates a new project and puts all of the files in a directory in it, optionally including subdirectories.

❑ *New\File* — The New submenu's File command displays the dialog shown in Figure 1-3. The IDE uses integrated editors to let you edit the new file. For example, the simple bitmap editor lets you set a bitmap's size, change its number of colors, and draw on it. When you close the file, Visual Studio asks if you want to save the file and lets you decide where to put it. Note that this doesn't automatically add the file to your current project. You can save the file and use the Project\Add Existing Item command if you want to do so.

❑ *Open* — The Open submenu contains commands that let you open a project or solution, Web site, or file. The Convert command displays the Convert dialog shown in Figure 1-4. From this dialog, you can launch the Visual Basic 2005 Upgrade Wizard, which can help you convert Visual Basic 6 programs to Visual Basic 2005.

❑ *Close* — This command closes the current editor. In Figure 1-2, `Form1` is open in the form designer editor. This command would close this editor.

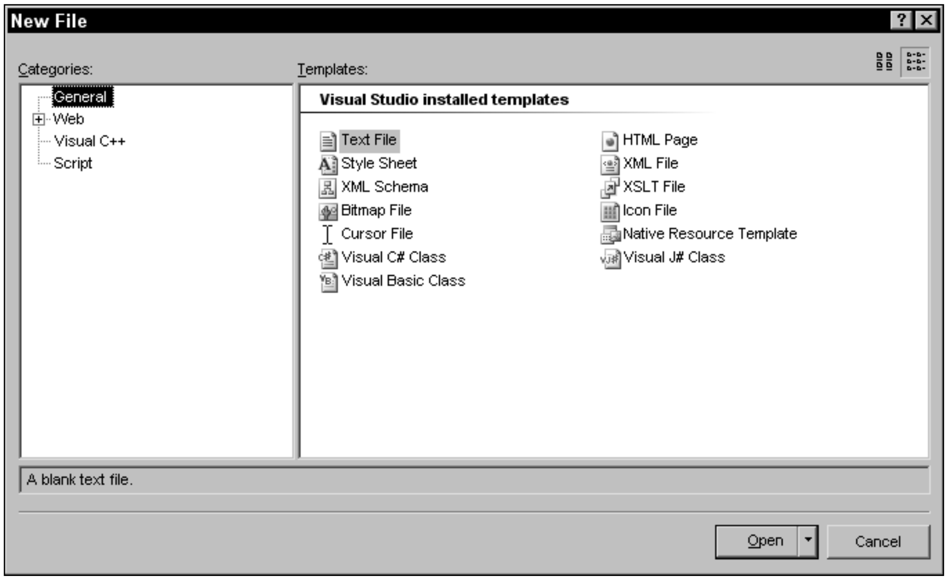


Figure 1-3: The File\New\File command displays this dialog to let you select the new file's type.

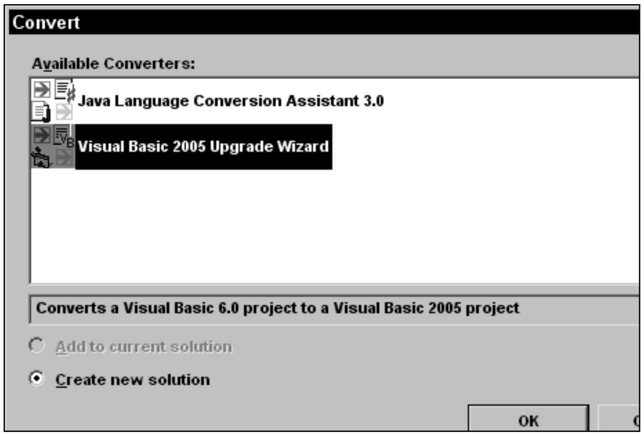
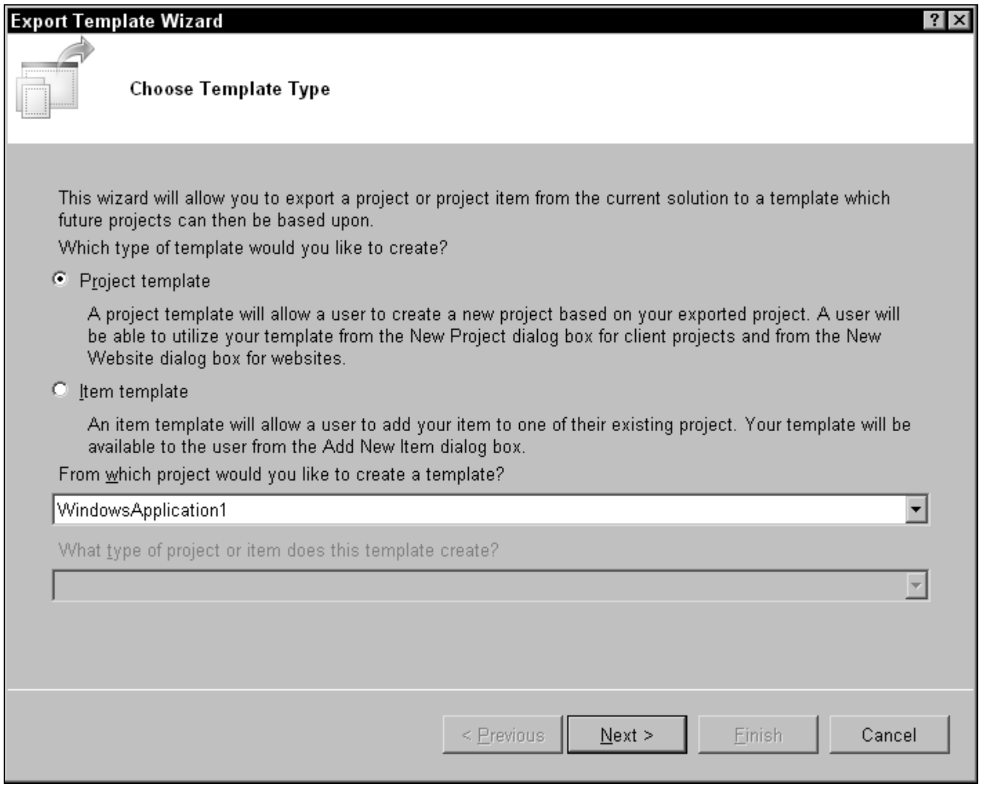

Convert
Available Converters:
Java Language Conversion Assistant 3.0
Visual Basic 2005 Upgrade Wizard
Converts a Visual Basic 6.0 project to a Visual Basic 2005 project
Add to current solution
Create new solution
OK

Figure 1-4: The File\Open\Convert command displays this dialog
to help you convert Visual Basic 6 applications to Visual Basic 2005.

- *Close Project* — This command closes the entire project and all of the files it contains. If you have a solution open, this command is labeled Close Solution.
- *Save Form1.vb* — This command saves the currently open file, in this example, Form1.vb.
- *Save Form1.vb As* — This command lets you save the currently open file in a new file.
- *Save All* — This command saves all modified files.
- *Export Template* — This command displays the dialog shown in Figure 1-5. The Export Template Wizard lets you create project or item templates that you can use later.



This wizard will allow you to export a project or project item from the current solution to a template which future projects can then be based upon.

Which type of template would you like to create?

[✓ Project template]

A project template will allow a user to create a new project based on your exported project. A user will be able to utilize your template from the New Project dialog box for client projects and from the New Website dialog box for websites.

Item template

An item template will allow a user to add your item to one of their existing project. Your template will be available to the user from the Add New Item dialog box.

From which project would you like to create a template?

WindowsApplication1

What type of project or item does this template create?

Figure 1-5: The File\Export Template command displays this dialog to help you create project or items templates that you can easily use in other projects.

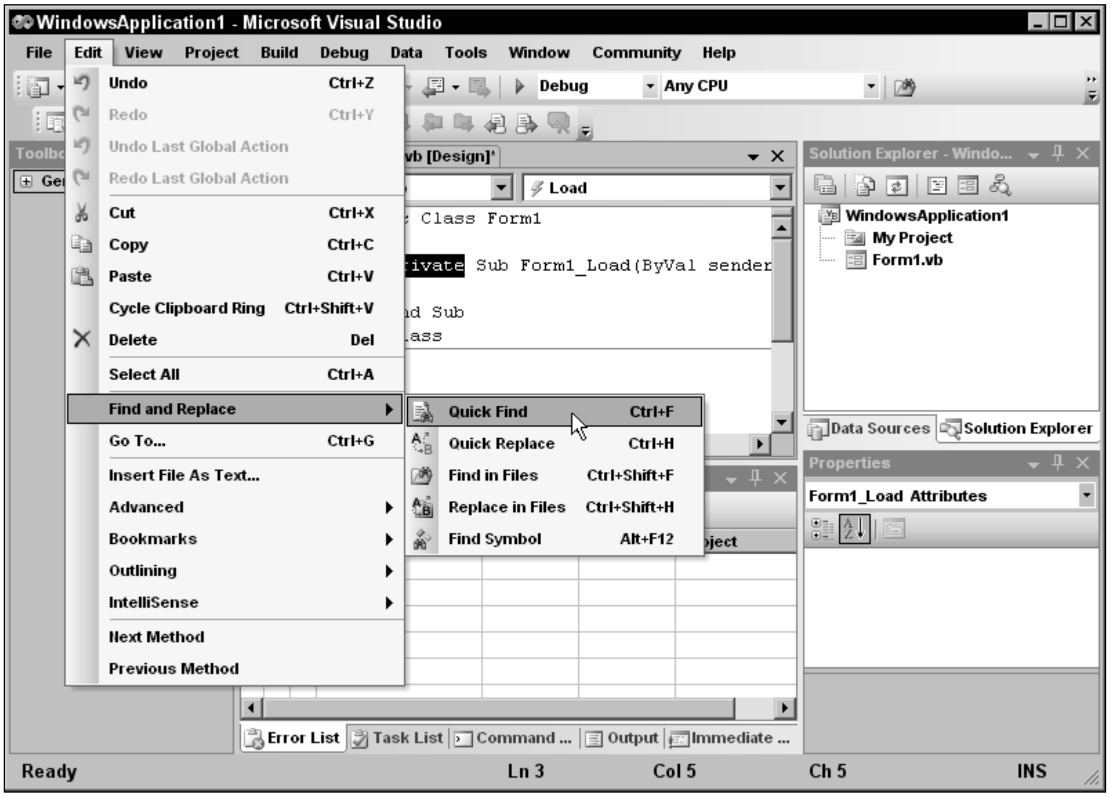
- *Page Setup and Print* — The Page Setup and Print commands let you configure printer settings and print the current document. These commands are enabled only when it makes sense to print the current file. For example, if you are viewing a source code file or a configuration file (which is XML text), you can use these commands. If you are viewing bitmap or a form in design mode, these commands are disabled.
- *Recent Files and Recent Projects* — The Recent Files and Recent Projects submenus let you quickly reopen files, projects, and solutions that you have opened recently.

Edit

The Edit menu, shown in Figure 1-6, contains commands that deal with manipulating text and other objects. These include standard commands such as the Undo, Redo, Copy, Cut, and Paste commands that you've seen in other Windows applications.

Following is a description of other commands associated with the Edit menu:

- *Cycle Clipboard Ring* — The clipboard ring contains the last several items that you copied into the clipboard. This command copies the previous clipboard ring item to the current location. By using this command repeatedly, you can cycle through the items until you find the one you want.



```
: Class Form1

ivate Sub Form1_Load(ByVal sender

d Sub
ass
```

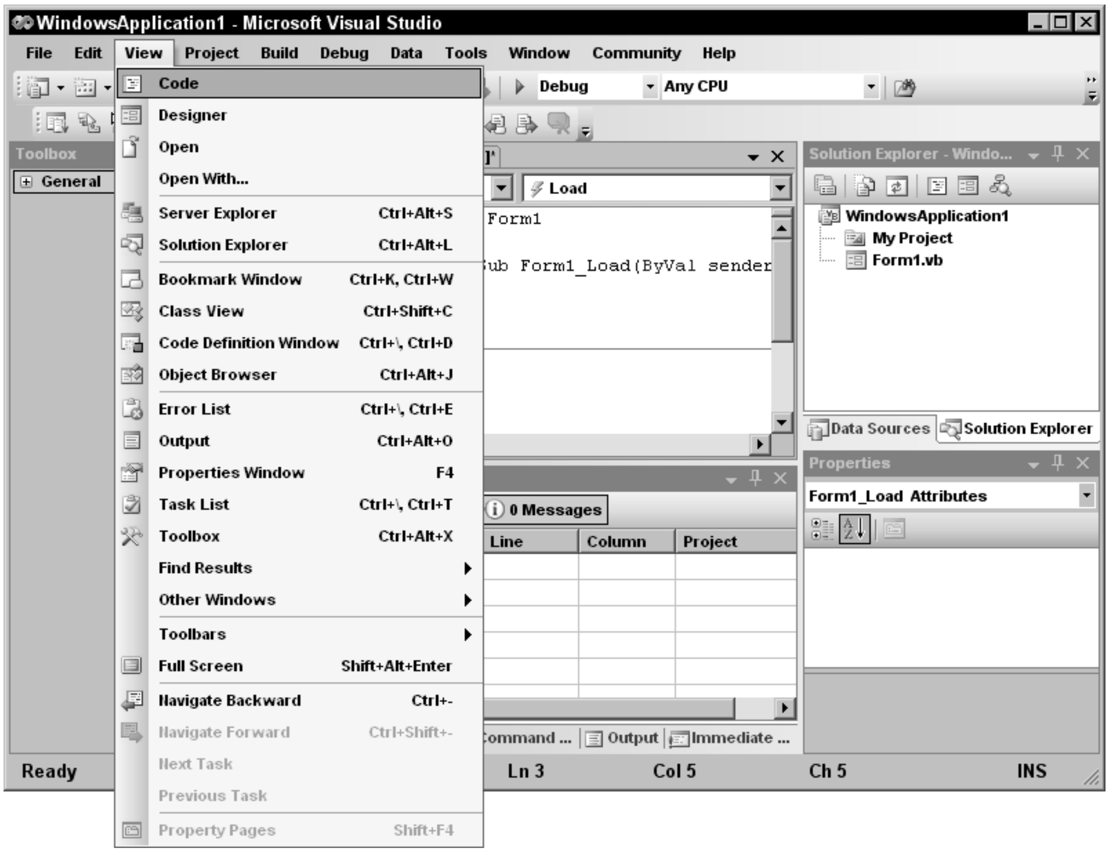
Figure 1-6: The Edit menu holds commands that deal with manipulating text and other objects.

- ❑ *Find and Replace\Quick Find* — This command displays a find dialog where you can search the project for specific text. A drop-down lets you indicate whether the search should include only the current document, all open documents, the current project, or the entire solution. Options let you determine such things as whether the text must match case or whole words.
- ❑ *Find and Replace\Quick Replace* — This command displays the same dialog as the Quick except with some extra controls. It includes a text box where you can specify replacement text, and buttons that let you replace the currently found text or all occurrences of the text.
- ❑ *Find and Replace\Find in Files* — This command is similar to Quick Find except that it displays its results as a list in a new window. Double-click on an entry in the list to view the occurrence in its file.
- ❑ *Find and Replace\Replace in Files* — This command is similar to *Quick Replace* except that it displays its results as a list in a new window.
- ❑ *Go To* — This command lets you jump to a particular line number in the current file.
- ❑ *Advanced* — The Advanced submenu contains commands for performing more complex document formatting such as converting text to upper- or lowercase, controlling word wrap, and commenting, and uncommenting code.

- *Bookmarks* — The Bookmarks submenu lets you add, remove, and clear bookmarks, and move to the next or previous bookmark.
- *Outlining* — The Outlining submenu lets you expand or collapse sections of code, and turn outlining on and off.
- *IntelliSense* — The IntelliSense gives access to IntelliSense features. For example, its List Members command makes IntelliSense display the current object's properties, methods, and events.

View

The View menu, shown in Figure 1-7, contains commands that let you hide or display different windows and toolbars in the Visual Studio IDE.



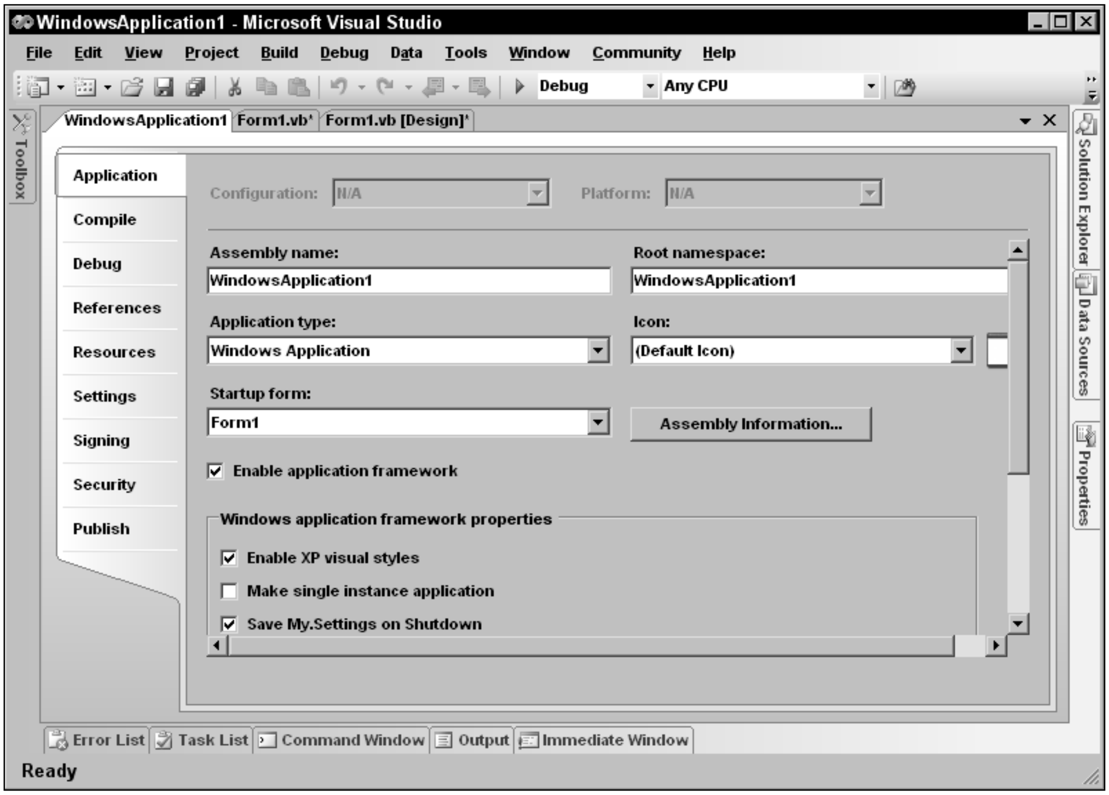
```
Form1

ub Form1_Load(ByVal sender
```

Figure 1-7: The View menu lets you show and hide IDE windows and toolbars.

Following is a description of commands associated with the View menu:

- *Code* — The Code command opens the selected file in a code editor window. For example, to edit a form's code, you can click on the form in the Solution Explorer and then select View\Code.
- *Designer* — The Designer command opens the selected file in a graphical editor if one is defined for that type of file. For example, if the file is a form, Visual Studio opens it in a graphical form editor. If the file is a class module or a code module, the View menu hides this command because Visual Studio doesn't have a graphical editor for those file types.
- *Open* — Opens the selected item with its default editor.
- *Open With* — Opens the selected item with an editor of your choosing. For example, you could open a form's code with a text editor.
- *Standard windows* — The next several commands shown in Figure 1-7 display the standard IDE windows Solution Explorer, Class View, Resource View, Server Explorer, Properties Window, Bookmark Window, Object Browser, Toolbox, Start Page, and Property Manager. These commands are handy if you have hidden one of the windows and want to get it back. The most useful of these windows are described later in this chapter.
- *Web Browser* — The Web Browser submenu lets you display and manage a Web Browser within the IDE. When the Web Browser is visible, the IDE displays a Web toolbar that lets you enter a URL, jump to one of your favorite links, or add the current page to your Web favorites. The Web Browser is particular useful for debugging Web applications because it lets you see what Web pages will look like before you publish them.
- *Other Windows* — The Other Windows submenu lists other standard menus that are not listed in the View menu itself. These include the Macro Explorer, Document Outline, Task List, Error List, Command Window, Output, Code Definition Window, and Object Test Bench. It also includes find results windows that list the results of searches you make using the Edit\Find and Replace commands.
- *Tab Order* — If a form contains controls, the Tab Order command displays the tab order on top of each control. You can click on the controls in the order you want them to have to set their tab order's quickly and easily.
- *Toolbars* — The Toolbars submenu lets you toggle the currently defined toolbars to hide or display them. This submenu lists the standard toolbars in addition to any custom toolbars you have created.
- *Full Screen* — The Full Screen command hides all toolbars and windows except for any editor windows that you currently have open. It also hides the Windows taskbar so that the IDE occupies as much space as possible. This gives you the most space possible for working with the files you have open. The command adds a small box to the title bar containing a Full Screen button that you can click to end full-screen mode.
- *Navigate Backward, Navigate Forward* — These commands let you move back and forth through the last several locations you visited.
- *Next Task, Previous Task* — These commands move through the items in the Task List.
- *Property Pages* — This command displays the current item's property pages. For example, if you select an application in Solution Explorer, this command displays the application's property pages similar to those shown in Figure 1-8.



Configuration: N/A
Platform: N/A
Assembly name: WindowsApplication1
Root namespace: WindowsApplication1
Application type: Windows Application
Icon: (Default Icon)
Startup form: Form1
☑ Enable application framework
Windows application framework properties
☑ Enable XP visual styles
☐ Make single instance application
☑ Save My.Settings on Shutdown

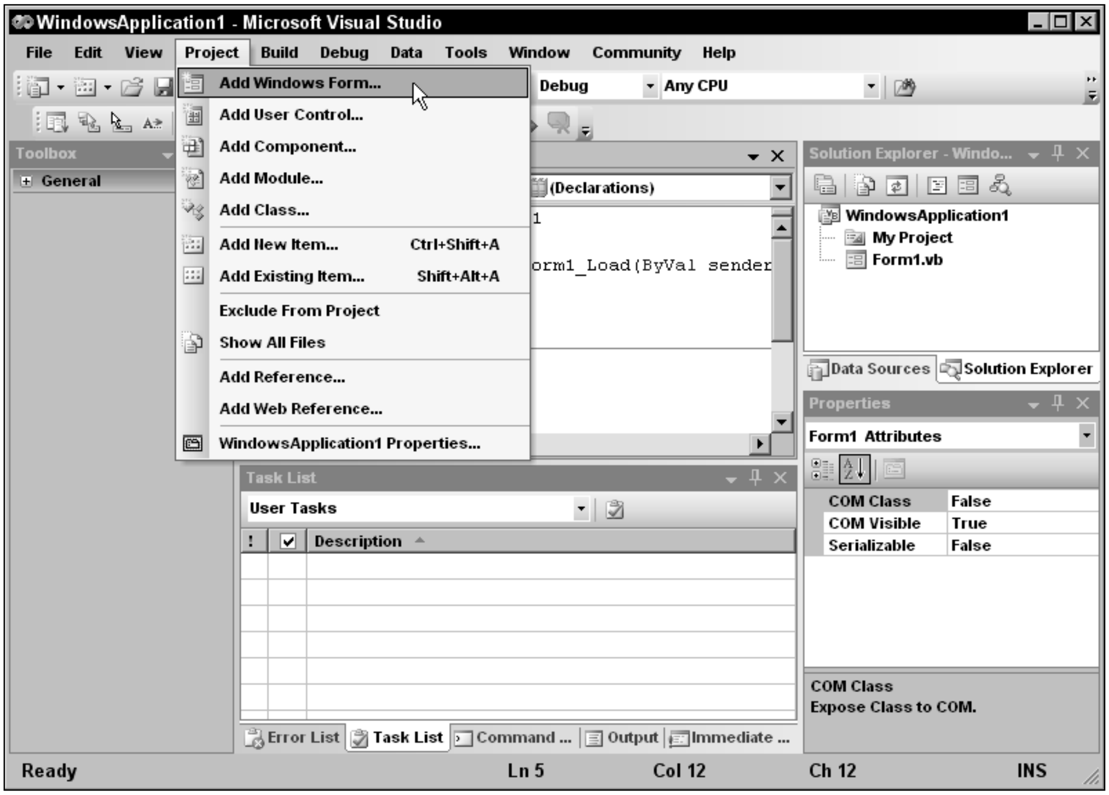
Figure 1-8: The View menu's Property Pages command displays an application's property pages.

Project

The Project menu shown in Figure 1-9 contains commands that let you add and remove items to and from the project. Which commands are available depends on the currently selected item.

Following is a description of commands associated with the Project menu:

- *New items* — The first several commands let you add new items to the project. These commands are fairly self-explanatory. For example, the Add Class command adds a new class module to the project. Later chapters explain how to use each of these file types.
- *Add New Item* — The Add New Item command displays the dialog shown in Figure 1-10. The dialog lets you select from a wide assortment of items such as text files, bitmap files, and class modules.
- *Add Existing Item* — The Add Existing Item command lets you browse for a file and add it to the project.
- *Exclude From Project* — This command removes the selected item from the project. Note that this does not delete the item's file; it just removes it from the project.

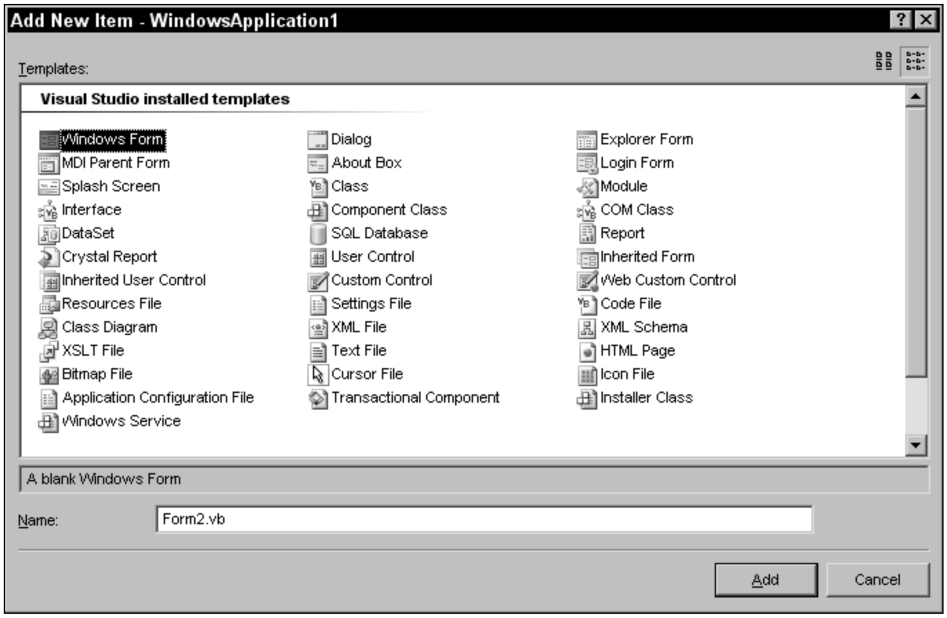


```
1
orm1_Load(ByVal sender
```

COM Class	False
COM Visible	True
Serializable	False

COM Class
Expose Class to COM.

Figure 1-9: The Project menu lets you add files and references to the currently selected project.

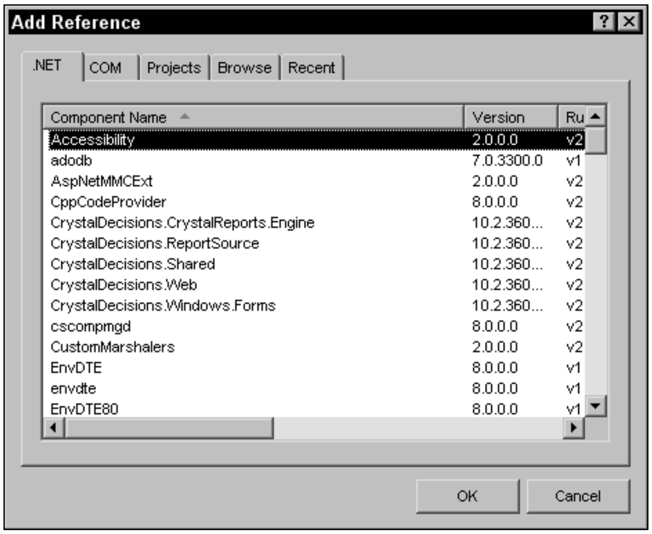


A blank Windows Form

Name: Form2.vb

Figure 1-10: The Project menu's Add New Item command lets you add a wide variety of items to the project.

- *Show All Files* — The Show All Files command makes Solution Explorer list files that are normally hidden. These include resource files corresponding to forms, hidden partial classes such as designer-generated form code, resource files, and files in the `obj` and `bin` directories that are automatically created by Visual Studio when it compiles your program. Normally, you don't need to work with these files, so they are hidden. Select this command to show them. Select the command again to hide them.
- *Add Reference* — The Add Reference command displays the dialog shown in Figure 1-11. Select the category of the external object, class, or library that you want to find. For a .NET component, select the .NET tab. For a Component Object Model (COM) component such as an ActiveX library or control built using Visual Basic 6, select the COM tab. Select the Projects tab to add a reference to another Visual Studio project. Click the Browse tab to manually locate the file you want to reference.



Component Name	Version	Ru
Accessibility	2.0.0.0	v2
adodb	7.0.3300.0	v1
AspNetMMCExt	2.0.0.0	v2
CppCodeProvider	8.0.0.0	v2
CrystalDecisions.CrystalReports.Engine	10.2.360...	v2
CrystalDecisions.ReportSource	10.2.360...	v2
CrystalDecisions.Shared	10.2.360...	v2
CrystalDecisions.Web	10.2.360...	v2
CrystalDecisions.Windows.Forms	10.2.360...	v2
cscompmgd	8.0.0.0	v2
CustomMarshalers	2.0.0.0	v2
EnvDTE	8.0.0.0	v1
envdte	8.0.0.0	v1
EnvDTE80	8.0.0.0	v1

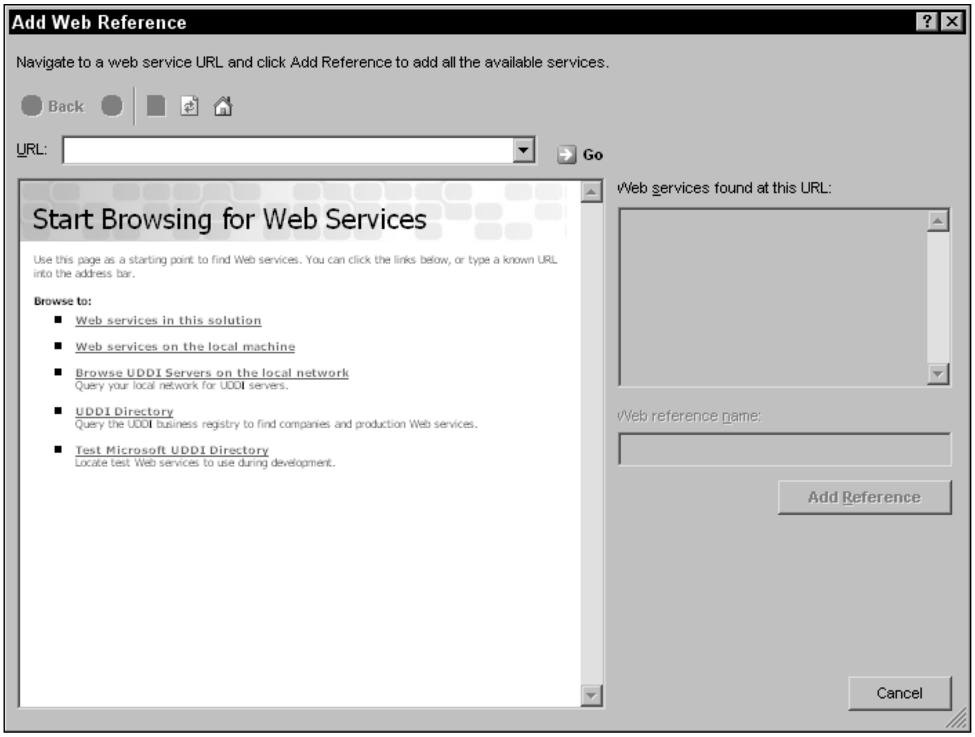
Figure 1-11: Use the Add Reference dialog to add references to external libraries.

Scroll through the list of references until you find the one you want and select it. You can use Shift-Click and Ctrl-Click to select more than one library at the same time. When you have made your selections, click OK to add the references to the project. After you have added a reference to the project, your code can refer to the reference's public objects. For example, if the file

`MyMathLibrary.dll` defines a class named `MathTools` and that class defines a public function `Fibonacci`, a project with a reference to this DLL could use the following code.

```
Dim math_tools As New MyMathLibrary.MathTools
MsgBox("Fib(5) = " & math_tools.Fibonacci(5))
```

- *Add Web Reference* — The Add Web Reference command displays the dialog shown in Figure 1-12. You can use this dialog to find Web Services and add references to them so your project can invoke them across the Internet.
- *WindowsApplication1 Properties* — This command displays the application's property pages shown in Figure 1-13.



Navigate to a web service URL and click Add Reference to add all the available services.

Start Browsing for Web Services

Use this page as a starting point to find Web services. You can click the links below, or type a known URL into the address bar.

Browse to:

- Web services in this solution
- Web services on the local machine
- Browse UDDI Servers on the local network
  Query your local network for UDDI servers.
- UDDI Directory
  Query the UDDI business registry to find companies and production Web services.
- Test Microsoft UDDI Directory
  Locate test Web services to use during development.

Figure 1-12: Use the Add Web Reference dialog to add references to Web Services.

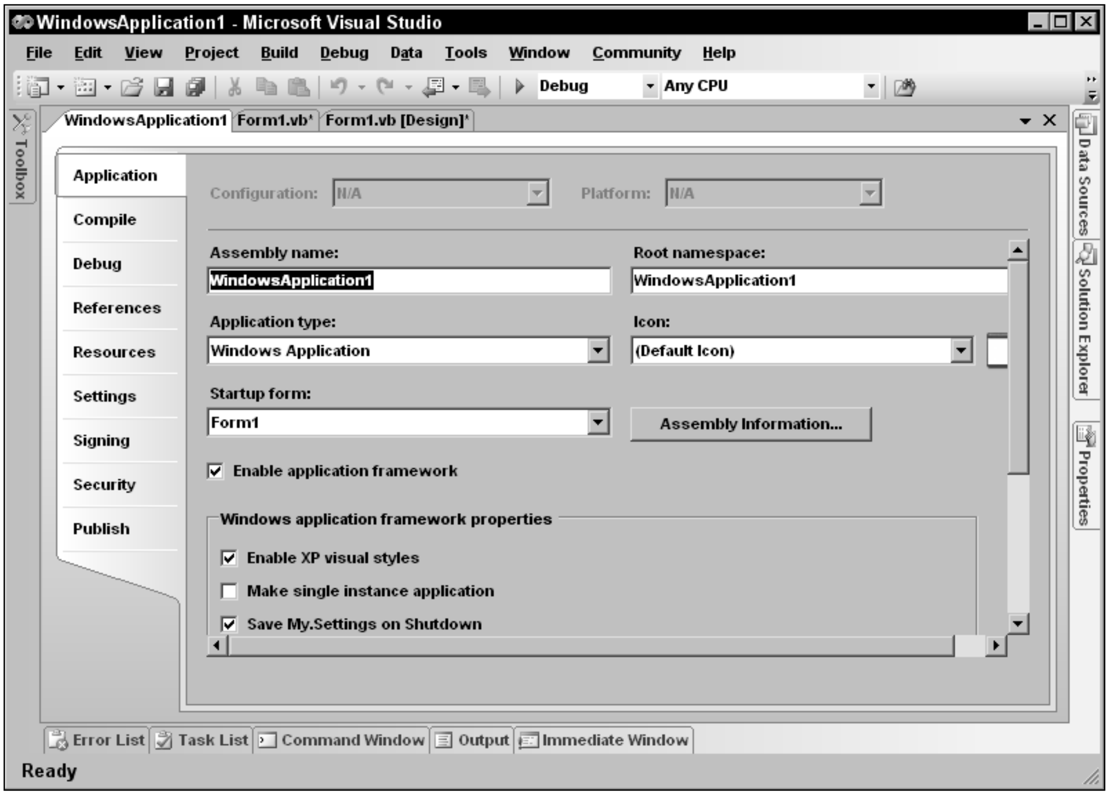
In Figure 1-13, the Toolbox, Solution Explorer, Properties window, Errors List, and other secondary windows have been hidden to make more room for the large Properties page. You can see these other windows' icons lurking along the left, right, and bottom edges of the figure.

Click the tabs on the left to view and modify different types of application settings. You can leave many of the property values alone and many are set in other ways. For example, by default, the Assembly name and Root namespace values shown in Figure 1-13 are set to the name of the project when you first create it.

There are three properties on the Compile tab shown in Figure 1-14 that deserve special mention.

First, Option Explicit determines whether Visual Basic requires you to declare all variables before using them. Leaving this option turned off can sometimes lead to subtle bugs. For example, the following code is intended to print a list of even numbers between 0 and 10. Unfortunately, a typographical error makes the `Debug.WriteLine` statement print the value of the variable `j` not `i`. Because `j` is never initialized, the code prints out a bunch of blank values. If you set Option Strict to On, the compiler complains that the variable `j` is not declared and the problem is easy to fix.

```
For i = 1 To 10
    If i Mod 2 = 0 Then Debug.WriteLine(j)
Next i
```


WindowsApplication1 - Microsoft Visual Studio
File Edit View Project Build Debug Data Tools Window Community Help
Debug
Any CPU
WindowsApplication1 Form1.vb* Form1.vb [Design]*
Toolbox
Data Sources
Solution Explorer
Properties
Application
Compile
Debug
References
Resources
Settings
Signing
Security
Publish
Assembly Information...
Error List Task List Command Window Output Immediate Window
Ready

Configuration: N/A Platform: N/A

Assembly name: WindowsApplication1

Root namespace: WindowsApplication1

Application type: Windows Application

Icon: (Default Icon)

Startup form: Form1

☑ Enable application framework

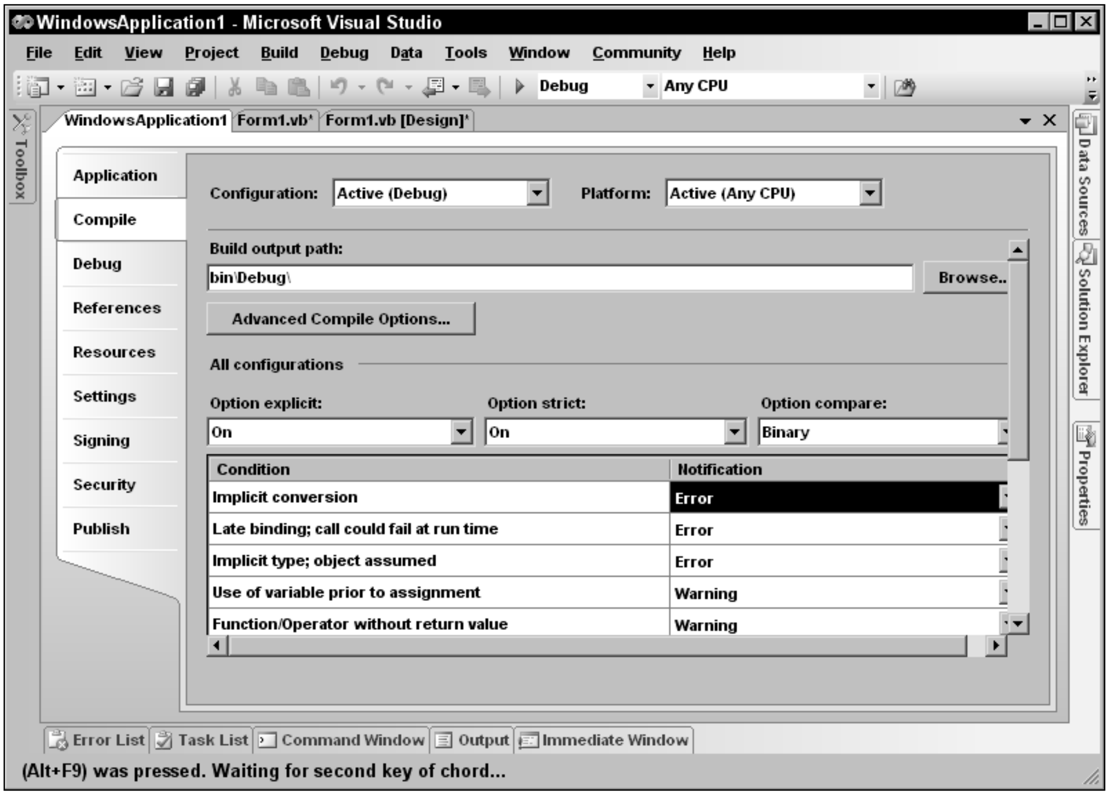
Windows application framework properties

☑ Enable XP visual styles

☐ Make single instance application

☑ Save My.Settings on Shutdown

Figure 1-13: Property pages let you set a project's properties.



WindowsApplication1 - Microsoft Visual Studio

Configuration: Active (Debug)   Platform: Active (Any CPU)

Build output path: bin\Debug\

All configurations

Option explicit: On   Option strict: On   Option compare: Binary

Condition	Notification
Implicit conversion	Error
Late binding; call could fail at run time	Error
Implicit type; object assumed	Error
Use of variable prior to assignment	Warning
Function/Operator without return value	Warning

(Alt+F9) was pressed. Waiting for second key of chord...

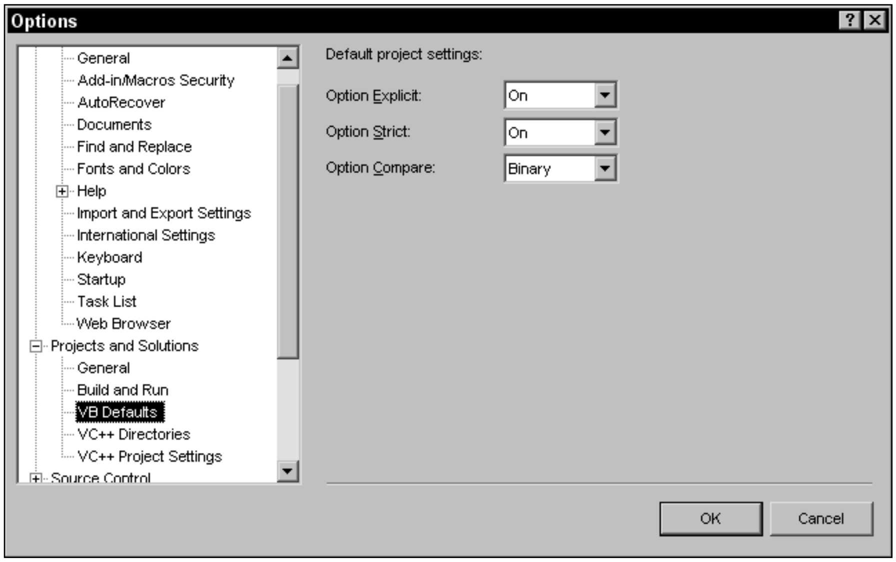
Figure 1-14: The Compile tab contains important properties for controlling code generation.

The second compiler option is Option Strict. When this option is turned off, Visual Studio allows your code to implicitly convert from one data type to another, even if the types are not always compatible. For example, Visual Basic will allow the following code to try to copy the string `s` into the integer `i`. If the value in the string happens to be a number, as in the first case, this works. If the string is not a number, as in the second case, this fails at run time.

```
Dim i As Integer
Dim s As String
s = "10"
i = s        ' This works.
s = "Hello"
i = s        ' This Fails.
```

If you set Option Strict to On, the IDE warns you that the two data types are incompatible, so you can easily resolve the problem while you are writing the code. You can still use conversion functions such as `CInt`, `Int`, and `Integer.Parse` to convert a string into an Integer, but you must take explicit action to do so. This makes you think about the code and reduces the chances that the conversion is just an accident. This also helps you use the correct data types and avoid unnecessary conversions that may make your program slower.

To avoid confusion and long debugging sessions, you should always set Option Explicit On and Option Strict On. You can turn them on for a project using the project page. To make them on by default for new projects, open the Tools menu and select Options. Open the Projects and Solutions folder, select the VB Defaults page, and turn the options on, as shown in Figure 1-15.



Default project settings:

Option Explicit: On

Option Strict: On

Option Compare: Binary

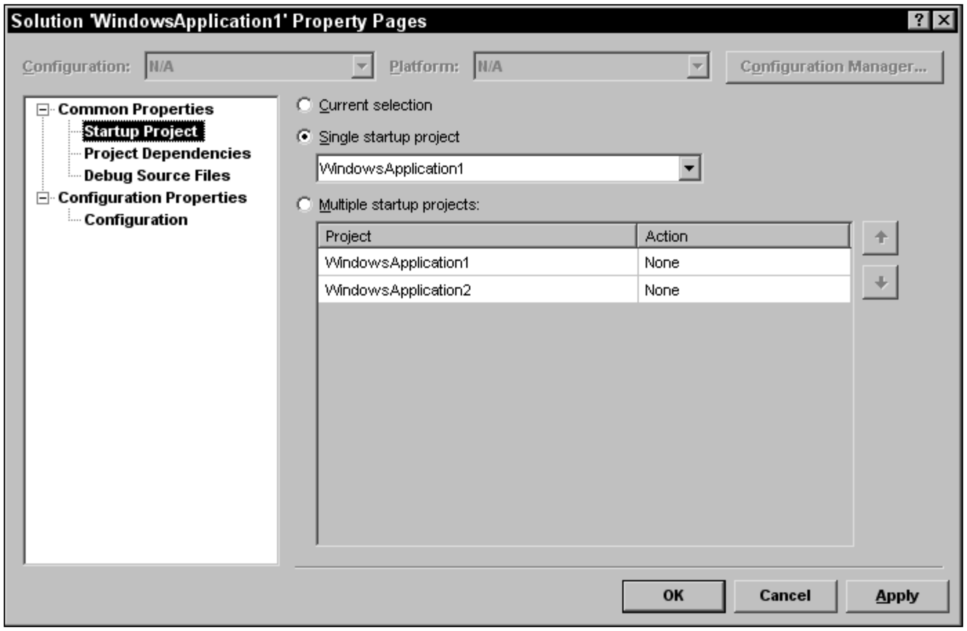
Figure 1-15: The Projects and Solutions folder's VB Defaults page lets you set default values for Option Explicit and Option Strict.

The final compiler directive, Option Compare, can take the values `Binary` or `Text`. If you set Option Compare to `Binary`, Visual Basic compares strings using their binary representations. If you set Option Compare to `Text`, Visual Basic compares strings using a case-insensitive method that depends on your computer's localization settings. Option Compare Binary is faster, but may not always produce the result you want.

If you select a solution and then invoke the Project menu's Properties command, Visual Studio displays the Solution Properties Pages dialog shown in Figure 1-16. Select an item on the left to view, and modify the corresponding values on the right.

Build

The Build menu, shown in Figure 1-17, contains commands that let you compile projects within a solution.



Solution 'WindowsApplication1' Property Pages

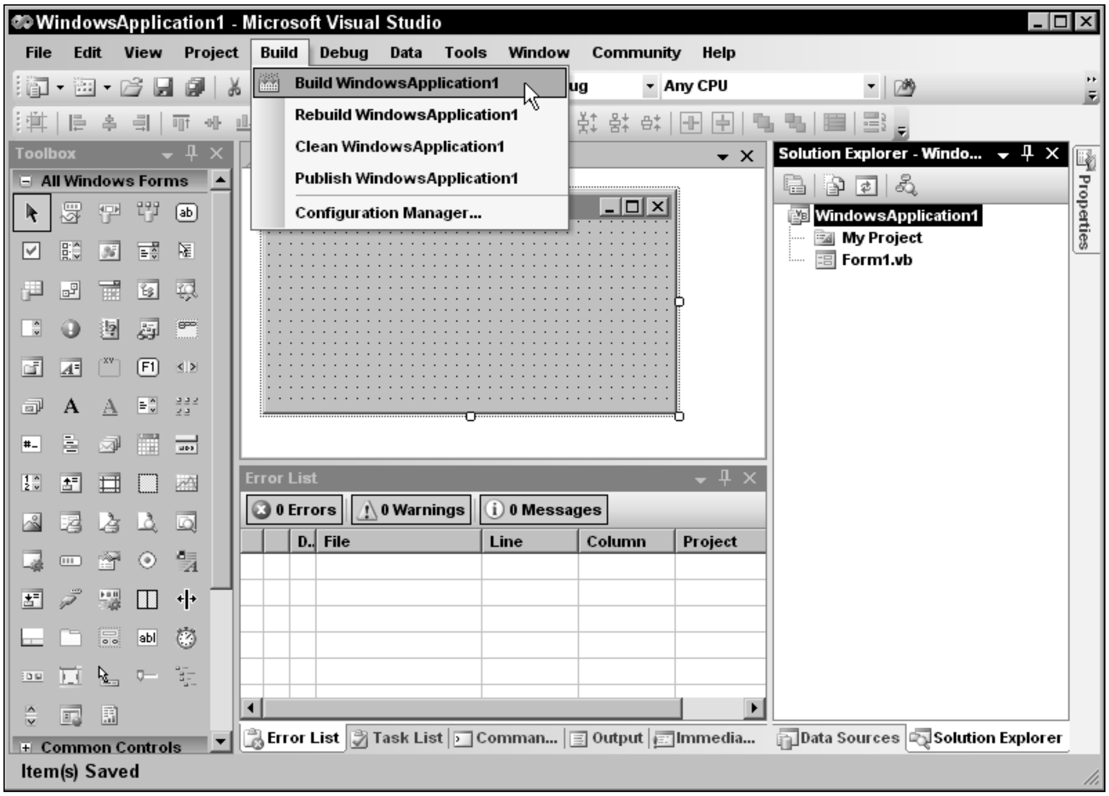
Configuration: N/A Platform: N/A

- Common Properties
  - Startup Project
  - Project Dependencies
  - Debug Source Files
- Configuration Properties
  - Configuration

( ) Current selection
(●) Single startup project
WindowsApplication1
( ) Multiple startup projects:

Project	Action
WindowsApplication1	None
WindowsApplication2	None

Figure 1-16. The Solution Properties Pages dialog lets you set solution properties.



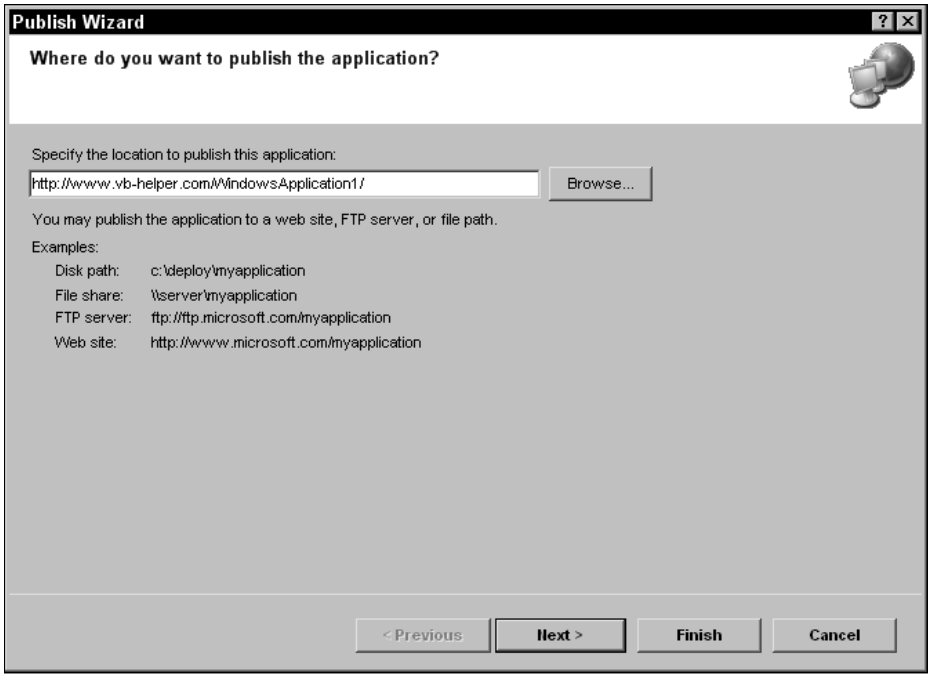
WindowsApplication1 - Microsoft Visual Studio

Item(s) Saved

Figure 1-17: The Build menu lets you compile projects.

Following is a description of commands associated with the Build menu:

- *Build WindowsApplication1* — This command compiles the currently selected project, in this case the project WindowsApplication1. Visual Studio examines the project's files to see if any have changed since the last time it compiled the project. If any of the files have changed, Visual Studio recompiles those files to update the result.
- *Rebuild WindowsApplication1* — This command recompiles the currently selected project from scratch. The *Build WindowsApplication1* command compiles only the files that you have modified since they were last built. This command rebuilds every file.
- *Clean WindowsApplication1* — This command removes temporary and intermediate files that were created while building the application, leaving only the source files and the final result .exe and .dll files.
- *Publish WindowsApplication1* — This command displays the Publish Wizard shown in Figure 1-18. It can walk you through the process of making your application available for distribution on a local file, file share, FTP site, or Web site.


Publish Wizard

Where do you want to publish the application?

Specify the location to publish this application:

http://www.vb-helper.com/WindowsApplication1/

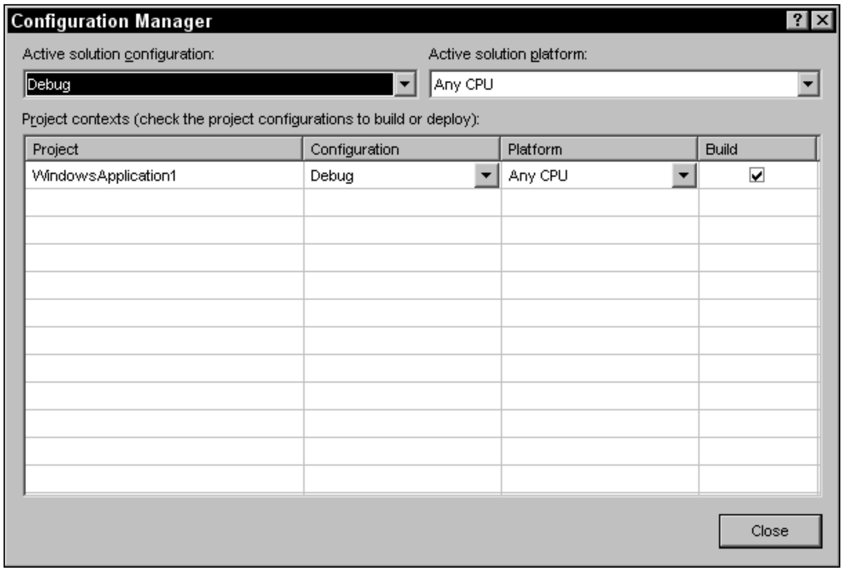
You may publish the application to a web site, FTP server, or file path.

Examples:

Disk path:	c:\deploy\myapplication
File share:	\\server\myapplication
FTP server:	ftp://ftp.microsoft.com/myapplication
Web site:	http://www.microsoft.com/myapplication

Figure 1-18: The Publish Wizard helps you deploy an application.

- *Configuration Manager* — The Configuration Manager command displays the dialog shown in Figure 1-19. You can use this dialog to indicate the type of build you want to use for each project (debug or release), and the platforms you want to target (for example Itanium, x64, or x86). You can also use the Build check boxes shown in the figure to determine which projects get built. You can use this feature to skip compilation of some projects within the solution. If you find that some parts of a solution are not compiling, check the Configuration Manager.


Configuration Manager
Active solution configuration:
Debug
Active solution platform:
Any CPU
Project contexts (check the project configurations to build or deploy):
Close

Project	Configuration	Platform	Build
WindowsApplication1	Debug	Any CPU	✓

Figure 1-19: The Configuration Manager lets you manage project builds.

Release configurations use more optimizations than Debug configurations, so they provide smaller, faster executable programs. They do not include support for debugging, however, so you cannot debug a program compiled for release.

In the "Active solution configuration" drop-down, select the <New...> entry to create a new configuration. When you select this entry, Visual Studio displays the New Solution Configuration dialog shown in Figure 1-20. Enter the name you want to give the configuration, select the existing configuration from which it should copy default values, and click OK.

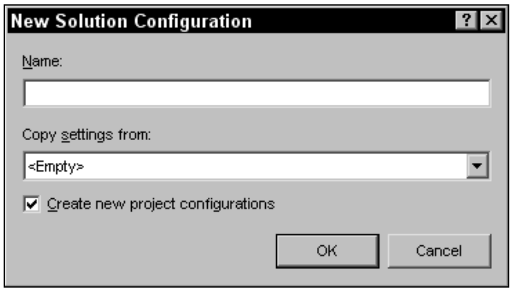

New Solution Configuration
Name:
Copy settings from:
<Empty>
☑ Create new project configurations
OK
Cancel

Figure 1-20: The New Solution Configuration dialog lets you create new configurations.

The "Active solution configuration" drop-down also contains an item labeled <Edit...>. If you select this entry, Visual Studio displays a dialog where you can rename or remove configurations.

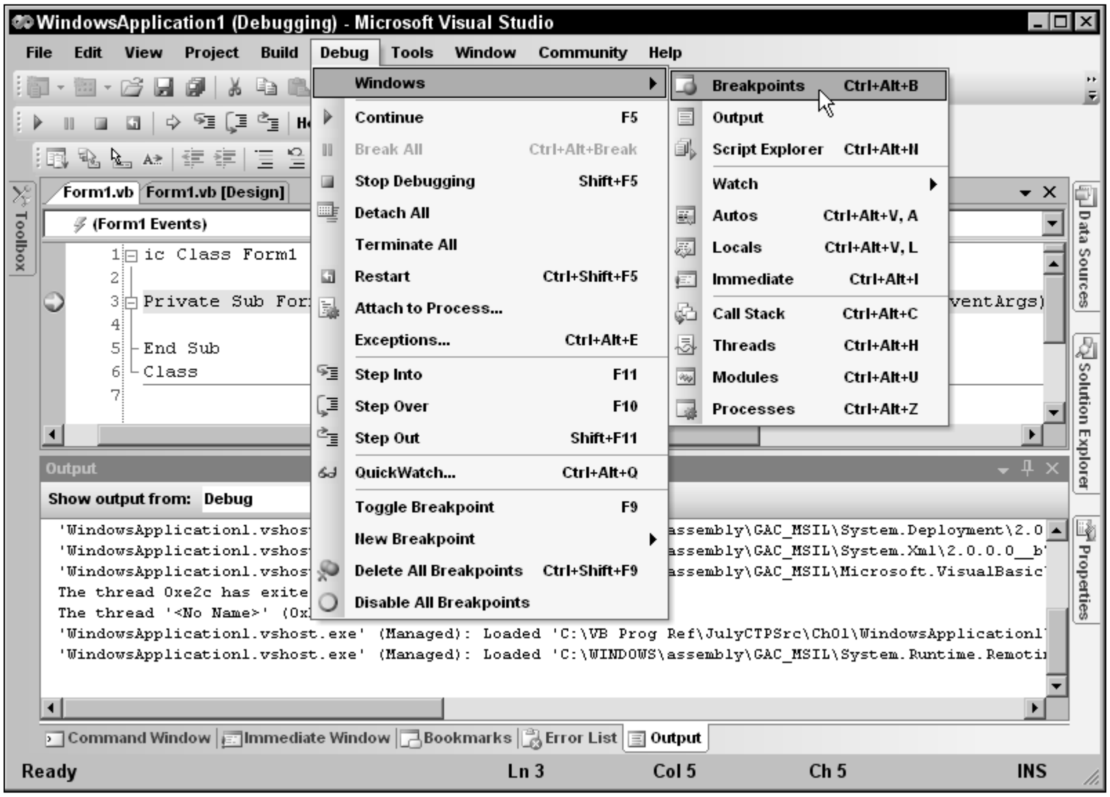
Use the drop-downs and check boxes in the grid to select features for the solution's projects. For example, if the solution contains several projects, you could flag some to compile using the Debug configuration and others to compile using the Release configuration. If you then rebuilt the solution, you would be able to debug some of the projects but not all of them. This approach may be useful if you want to give some of the projects to customers in their release versions while you keep working on others.

If you uncheck a project's Build box, that project is excluded from any builds. If you build the solution, it is not compiled. Visual Studio writes its results into the Output window and counts the skipped project in its final summary line. The following line shows an example where one project was compiled and one skipped.

```
========== Build: 1 succeeded or up-to-date, 0 failed, 1 skipped ==========
```

Debug

The Debug menu, shown in Figure 1-21, contains commands that help you debug a program. These commands help you run the program in the debugger, move through the code, set and clear breakpoints, and generally follow the code's execution to see what it's doing and hopefully what it's doing wrong.



```
ic Class Form1

    Private Sub For                                          ventArgs)

    End Sub
Class
```

```
'WindowsApplication1.vshos   assembly\GAC_MSIL\System.Deployment\2.0
'WindowsApplication1.vshos   assembly\GAC_MSIL\System.Xml\2.0.0.0__b
'WindowsApplication1.vshos   assembly\GAC_MSIL\Microsoft.VisualBasic
The thread 0xe2c has exite
The thread '<No Name>' (0x
'WindowsApplication1.vshost.exe' (Managed): Loaded 'C:\VB Prog Ref\JulyCTPSrc\Ch01\WindowsApplication1
'WindowsApplication1.vshost.exe' (Managed): Loaded 'C:\WINDOWS\assembly\GAC_MSIL\System.Runtime.Remoti
```

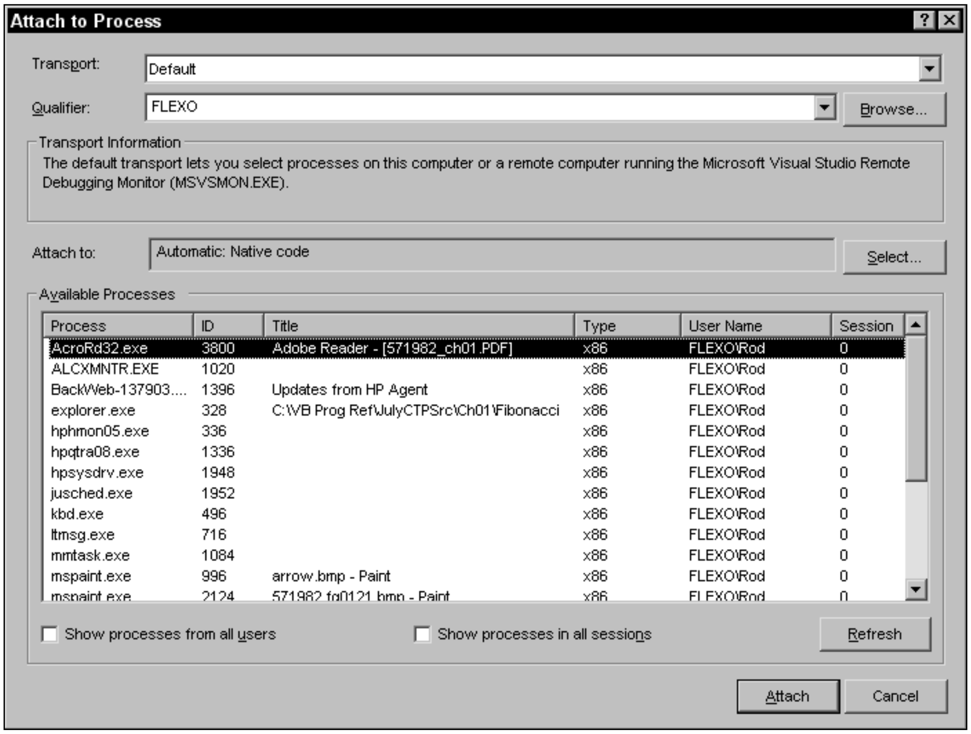
Figure 1-21: The Debug menu contains commands for debugging an application.

Effectively using these debugging techniques can make finding problems in the code much easier, so you should spend some time learning how to use these tools. They can mean the difference between finding a tricky error in minute, hours, or days.

The commands visible in the Debug window change, depending on several conditions such as the type of file you have open, whether the program is running, the line of code that contains the cursor, and whether that line contains a breakpoint. This section discusses the menu items shown in Figure 1-21. You will see other menus items under different circumstances.

The following list briefly describes the Debug menu's commands.

- *Windows* — This submenu's commands display other debugging-related windows. This submenu is described in more detail in the following section, "The Debug\Windows Submenu."
- *Continue* — This command resumes program execution. The program runs until it finishes, it reaches another breakpoint, or you stop it.
- *Break All* — This command stops execution of all programs running within the debugger. This may include more than one program if you are debugging more than one application at the same time. This can be useful, for example, if two programs work closely together.
- *Stop Debugging* — This command halts the program's execution and ends its debugging session. The program stops immediately, so it does not get a chance to execute any cleanup code.
- *Detach All* — This command detaches the debugger from any processes to which it is attached. Note that this does not stop those processes.
- *Terminate All* — This command terminates any processes to which the debugger is attached.
- *Restart*— This command stops the currently running process and restarts the startup project.
- *Attach to Process* — This command displays the dialog shown in Figure 1-22 to let you attach the debugger to a running process. Select the process to which you want to attach and click Attach.
- *Exceptions* — This command displays the dialog shown in Figure 1-23. If you check a Thrown box, the debugger stops whenever the selected type of error occurs. If you check a User-unhandled box, the debugger stops when the selected type of error occurs and the program does not catch it with error handling code. For example, suppose that your code calls a subroutine that causes a divide-by-zero exception. Use the dialog to select Common Language Runtime Exceptions/System/System.DivideByZeroException (use the Find button to find it quickly). If you check the Thrown box, the debugger stops in the subroutine when the divide-by-zero exception occurs even if the code is contained in an error handler. If you check the User-unhandled box, the debugger stops only if no error handler is active when the error occurs.



Attach to Process

Transport: Default

Qualifier: FLEXO

Transport Information
The default transport lets you select processes on this computer or a remote computer running the Microsoft Visual Studio Remote Debugging Monitor (MSVSMON.EXE).

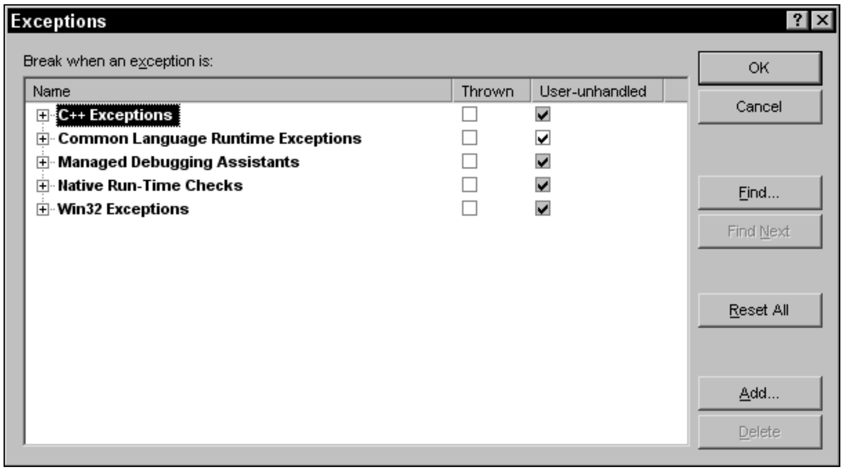
Attach to: Automatic: Native code

Available Processes

Process	ID	Title	Type	User Name	Session
AcroRd32.exe	3800	Adobe Reader - [571982_ch01.PDF]	x86	FLEXO\Rod	0
ALCXMNTR.EXE	1020		x86	FLEXO\Rod	0
BackWeb-137903....	1396	Updates from HP Agent	x86	FLEXO\Rod	0
explorer.exe	328	C:\VB Prog Ref\JulyCTPSrc\Ch01\Fibonacci	x86	FLEXO\Rod	0
hphmon05.exe	336		x86	FLEXO\Rod	0
hpqtra08.exe	1336		x86	FLEXO\Rod	0
hpsysdrv.exe	1948		x86	FLEXO\Rod	0
jusched.exe	1952		x86	FLEXO\Rod	0
kbd.exe	496		x86	FLEXO\Rod	0
ltmsg.exe	716		x86	FLEXO\Rod	0
mmtask.exe	1084		x86	FLEXO\Rod	0
mspaint.exe	996	arrow.bmp - Paint	x86	FLEXO\Rod	0
mspaint.exe	2124	571982 fg0121.bmp - Paint	x86	FLEXO\Rod	0

☐ Show processes from all users ☐ Show processes in all sessions

Figure 1-22: The Attach to Process dialog lets you attach the debugger to running processes.



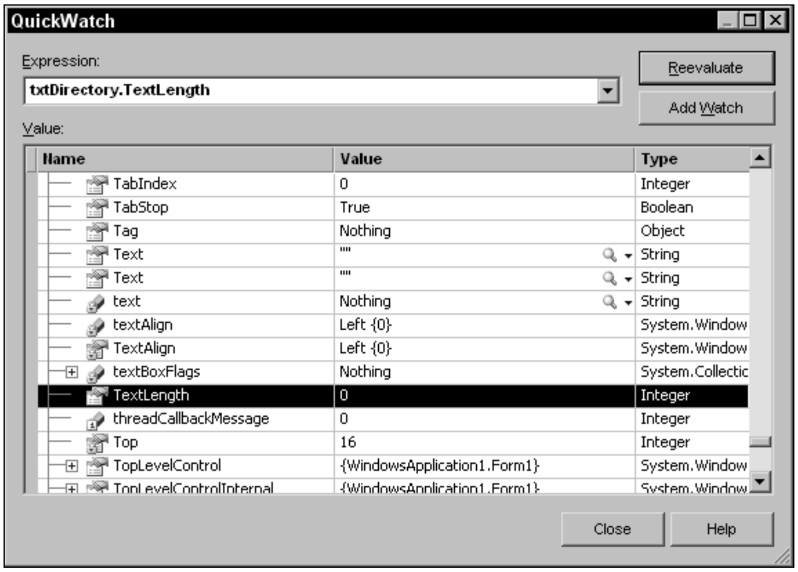
Exceptions

Break when an exception is:

Name	Thrown	User-unhandled
C++ Exceptions	☐	✓
Common Language Runtime Exceptions	☐	✓
Managed Debugging Assistants	☐	✓
Native Run-Time Checks	☐	✓
Win32 Exceptions	☐	✓

Figure 1-23: The Exceptions dialog lets you determine how Visual Basic handles uncaught exceptions.

- *Step Into* — This command makes the debugger execute the current line of code. If that code invokes a function, subroutine, or some other procedure, the point of execution moves into that procedure. It is not always obvious whether a line of code invokes a procedure. For example, a line of code that sets an object's property may be simply setting a value or invoking a property procedure.
- *Step Over* — This command makes the debugger execute the current line of code. If that code invokes a function, subroutine, or some other procedure, the debugger calls that routine but does not step into it, so you don't need to step through its code. However, if a breakpoint is set inside that routine, execution will stop at the breakpoint.
- *Step Out* — This command makes the debugger run until it leaves the routine it is currently executing. Execution pauses when the program reaches the line of code that called this routine.
- *QuickWatch* — This command displays a dialog that gives information about the selected code object. Figure 1-24 shows the dialog displaying information about a `TextBox` control named `txtDirectory`. If you look closely, you can see some of the control's properties including `TabIndex`, `TabStop`, `Tag`, and `Text`.



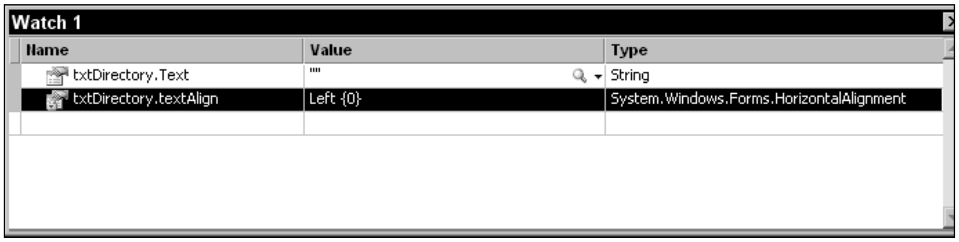
Expression: txtDirectory.TextLength

Value:

Name	Value	Type
TabIndex	0	Integer
TabStop	True	Boolean
Tag	Nothing	Object
Text	""	String
Text	""	String
text	Nothing	String
textAlign	Left {0}	System.Window
TextAlign	Left {0}	System.Window
textBoxFlags	Nothing	System.Collectic
TextLength	0	Integer
threadCallbackMessage	0	Integer
Top	16	Integer
TopLevelControl	{WindowsApplication1.Form1}	System.Window
TopLevelControlInternal	{WindowsApplication1.Form1}	System.Window

Figure 1-24: The QuickWatch dialog lets you examine an object's properties and optionally set a new watch on it.

If you double-click on a property's value, you can change it within the dialog. If you click the Add Watch button, the debugger adds the expression to the Watch window shown in Figure 1-25. You can also highlight a variable's name in the code and drag and drop it into a Watch window to create a watch very quickly. Right-click a watch in this window and select Delete Watch to remove it.



Name	Value	Type
txtDirectory.Text	""	String
txtDirectory.textAlign	Left {0}	System.Windows.Forms.HorizontalAlignment

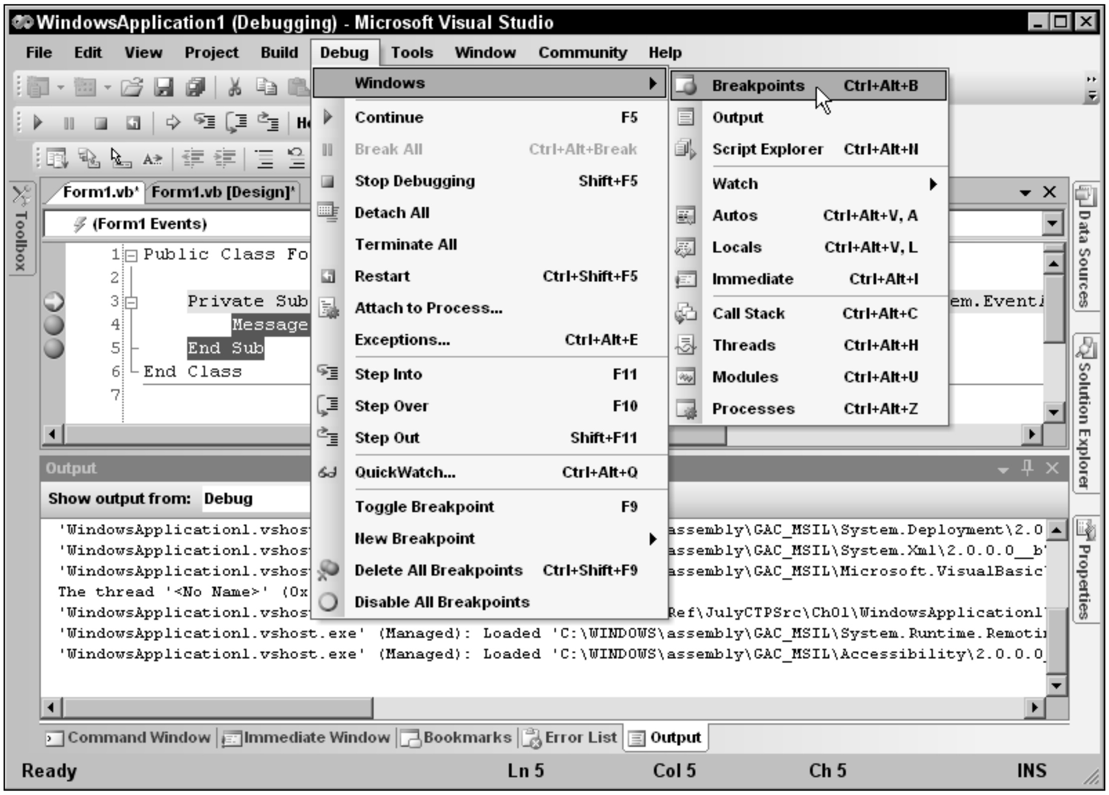
Figure 1-25: The Watch window lets you easily track expression values.

- ❑ *Toggle Breakpoint* — This command toggles whether the current code line contains a breakpoint. When execution reaches a line with an active breakpoint, execution pauses so you can examine the code and program variables. You can also toggle a line's breakpoint by clicking on the margin to the left of the line in the code editor. In Figure 1-21, line number 4 displays a circle containing an arrow on the left, indicating that it has a breakpoint (the circle) and that it is the current line of execution (the arrow). The following line also contains a breakpoint, and line 7 contains a disabled breakpoint, indicated by a hollow circle in the left margin.
- ❑ *New Breakpoint* — This submenu contains the Break At Function command. This command displays a dialog that lets you specify a function where the program should break.
- ❑ *Delete All Breakpoints* — This command removes all breakpoints from the entire solution.
- ❑ *Enable All Breakpoints* — This command reenables any disabled breakpoints. The Enable All Breakpoints command is available if any breakpoints are currently disabled. Note that you can right-click a line of code that contains a disabled breakpoint and select Enable Breakpoint to enable only that breakpoint.
- ❑ *Disable All Breakpoints* — This command temporarily disables all the solution's breakpoints. The breakpoints are still defined but they don't interrupt the program's execution. The Disable All Breakpoints command is available if any breakpoints are currently enabled. Note that you can right-click a line of code that contains a breakpoint and select Disable Breakpoint to disable only that breakpoint.

The Debug\Windows Submenu

The Debug menu's Windows submenu, shown in Figure 1-26, contains commands that display debugging-related windows. The following list briefly describes these commands. The two sections that follow describe some of the more complicated windows in greater detail.

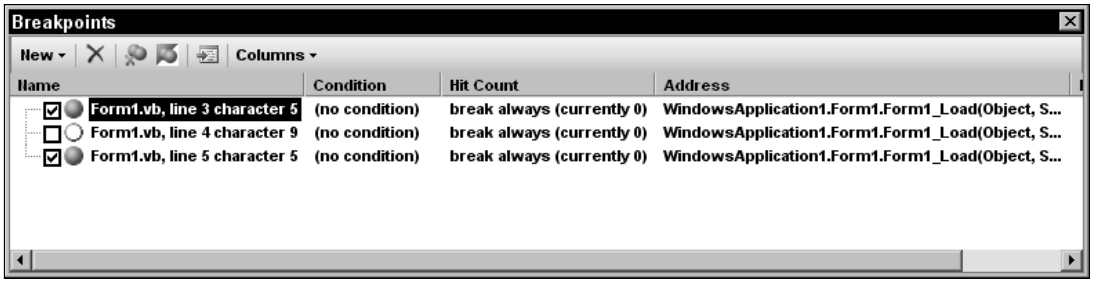
- ❑ *Breakpoints* — This command displays the Breakpoints window shown in Figure 1-27. This dialog shows the breakpoints, their locations, and their conditions. Check or uncheck the boxes on the left to enable or disable breakpoints. Right-click a breakpoint to edit its location, condition, hit count, and action. Use the dialog's toolbar to create a new function breakpoint, delete a breakpoint, delete all breakpoints, enable or disable all breakpoints, go to a breakpoint's source code, and change the columns displayed by the dialog. Right-click on a breakpoint to change its condition (a condition that determines whether the breakpoint is activated), hit count (a count that determines whether the breakpoint is activated), and "When Hit" (action to take when activated). See the section "The Breakpoints Window" later in this chapter for more detail.



```
1  Public Class Fo
2
3      Private Sub                                    em.EventA
4          Message
5      End Sub
6  End Class
7
```

```
'WindowsApplication1.vshos                                      assembly\GAC_MSIL\System.Deployment\2.0
'WindowsApplication1.vshos                                      assembly\GAC_MSIL\System.Xml\2.0.0.0__b
'WindowsApplication1.vshos                                      assembly\GAC_MSIL\Microsoft.VisualBasic
The thread '<No Name>' (0x
'WindowsApplication1.vshos                                      Ref\JulyCTPSrc\Ch01\WindowsApplication1
'WindowsApplication1.vshost.exe' (Managed): Loaded 'C:\WINDOWS\assembly\GAC_MSIL\System.Runtime.Remoti
'WindowsApplication1.vshost.exe' (Managed): Loaded 'C:\WINDOWS\assembly\GAC_MSIL\Accessibility\2.0.0.0
```

Figure 1-26: The Debug menu's Windows submenu contains commands that display debugging-related windows.



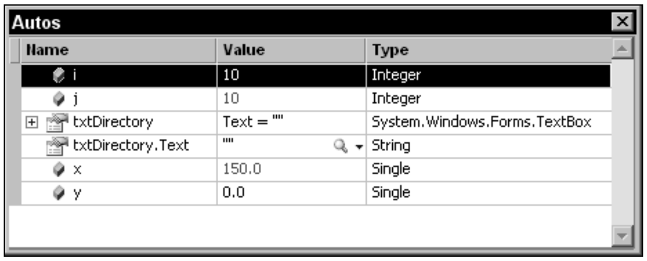
Name	Condition	Hit Count	Address
☑ ● Form1.vb, line 3 character 5	(no condition)	break always (currently 0)	WindowsApplication1.Form1.Form1_Load(Object, S...
☐ ○ Form1.vb, line 4 character 9	(no condition)	break always (currently 0)	WindowsApplication1.Form1.Form1_Load(Object, S...
☑ ● Form1.vb, line 5 character 5	(no condition)	break always (currently 0)	WindowsApplication1.Form1.Form1_Load(Object, S...

Figure 1-27: The Breakpoints window helps you manage breakpoints.

- *Output* — This command displays the Output window. This window displays compilation results and output produced by Debug and Trace statements.
- *Script Explorer* — This command displays the Script Explorer, which can help you debug script code written in VBScript or JScript.
- *Watch* — The Watch submenu contains the commands Watch 1, Watch 2, Watch 3, and Watch 4. These commands display four different watch windows. When you create a watch using the

Debug menu's QuickWatch command described earlier, the new watch is placed in the Watch 1 window (shown in Figure 1-25). You can click and drag watches from one watch window to another to make a copy of the watch in the second window. You can also click on the Name column in the empty line at the bottom of a watch window and enter an expression to watch. One useful IDE trick is to drag watch windows 2, 3, and 4 onto Watch 1 so that they all become tabs on the same window. Then you can easily use the tabs to group and examine four sets of watches.

❑ *Autos* — This command displays the Autos window shown in Figure 1-28. This window displays the values of local and global variables used in the current line of code and in the three lines before and after it.

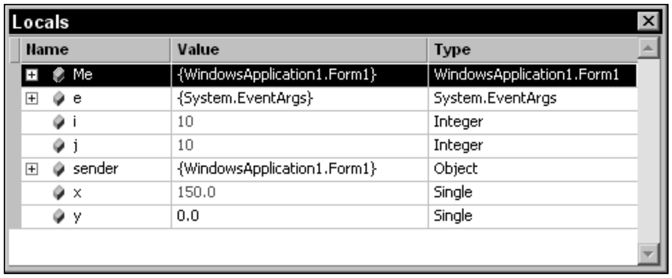


Autos

Name	Value	Type
i	10	Integer
j	10	Integer
⊞ txtDirectory	Text = ""	System.Windows.Forms.TextBox
txtDirectory.Text	""	String
x	150.0	Single
y	0.0	Single

Figure 1-28: The Autos window displays the variables used in the current code statement and the three statements before and the three after.

❑ *Locals* — This command displays the Locals window shown in Figure 1-29. The Locals window displays the values of variables defined in the local context. To change a value, click on it and enter the new value. Click the plus and minus signs to the left of a value to expand or collapse it. For example, the `Me` entry shown in Figure 1-29 is an object with lots of properties that have their own values. Click the plus sign to expand the object's entry and view its properties. Those properties may also be objects, so you may be able to expand them further.



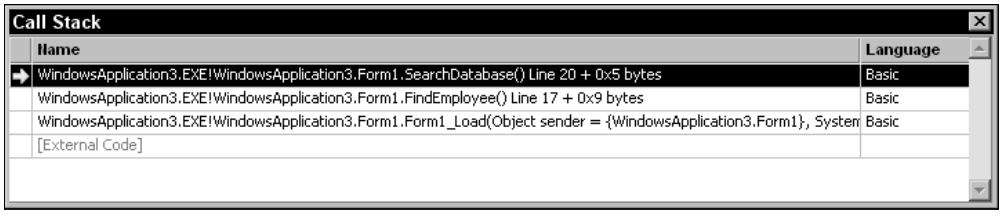
Locals

Name	Value	Type
⊞ Me	{WindowsApplication1.Form1}	WindowsApplication1.Form1
⊞ e	{System.EventArgs}	System.EventArgs
i	10	Integer
j	10	Integer
⊞ sender	{WindowsApplication1.Form1}	Object
x	150.0	Single
y	0.0	Single

Figure 1-29: The Locals window displays the values of variables defined in the local context.

❑ *Immediate* — This command displays the Immediate window, where you can type and execute ad hoc Visual Basic statements. The section "The Command and Immediate Windows" later in this chapter describes this window in a bit more detail.

❑ *Call Stack* — This command displays the Call Stack window shown in Figure 1-30. This window lists the routines that have called other routines to reach the program's current point of execution. In this example, the program is at the line 20 in function `SearchDatabase`. That function was called by function `FindEmployee` at line 17, and that function was called by the `Form_Load` event handler. Double-click on a line to jump to the corresponding code in the program's call stack. This technique lets you move up the call stack to examine the code that called the routines that are running. This can be a very effective technique when you need to find out what code is calling a particular routine.

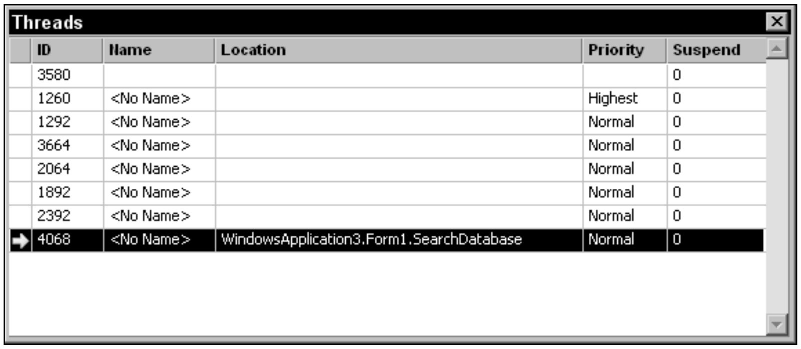


Call Stack

	Name	Language
➡	WindowsApplication3.EXE!WindowsApplication3.Form1.SearchDatabase() Line 20 + 0x5 bytes	Basic
	WindowsApplication3.EXE!WindowsApplication3.Form1.FindEmployee() Line 17 + 0x9 bytes	Basic
	WindowsApplication3.EXE!WindowsApplication3.Form1.Form1_Load(Object sender = {WindowsApplication3.Form1}, Systen	Basic
	[External Code]	

Figure 1-30: The Call Stack window shows which routines have called which to get to the program's current point of execution.

- ❑ *Threads* — This command displays the Threads window shown in Figure 1-31. A *thread* is a separate execution path that is running. A multithreaded application can have several threads running to perform more than one task at the same time. The Threads window lets you control the threads' priority and suspended status. The last line has the location `WindowsApplication1.Form1.SearchDatabase`, indicating that this thread is executing the `SearchDatabase` routine in the Form1 module in program `WindowsApplication1`. The arrow on the left indicates that this is the currently active thread.



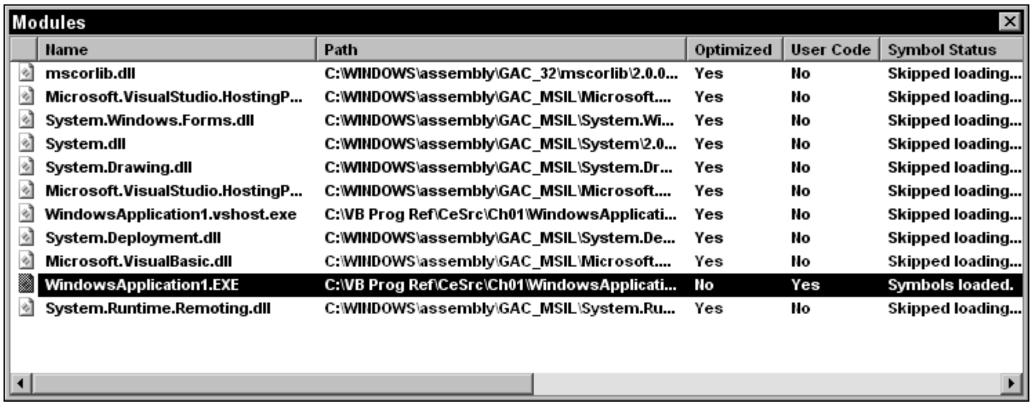
Threads

	ID	Name	Location	Priority	Suspend
	3580				0
	1260	<No Name>		Highest	0
	1292	<No Name>		Normal	0
	3664	<No Name>		Normal	0
	2064	<No Name>		Normal	0
	1892	<No Name>		Normal	0
	2392	<No Name>		Normal	0
➡	4068	<No Name>	WindowsApplication3.Form1.SearchDatabase	Normal	0

Figure 1-31: The Threads window displays information about the program's threads of execution.

Right-click a thread and select Freeze to suspend it. Select Thaw to make it resume execution. Double-click a thread or right-click it and select Switch To Thread to activate that thread.

- ❑ *Modules* — This command displays the Modules window shown in Figure 1-32. This window displays information about the DLL and EXE files used by the program. It shows each module's file name and path. It indicates whether the module is optimized, whether it is your code (versus an installed library), and whether debugging symbols are loaded. Scrolled off the right edge of Figure 1-32, the window shows each module's load order (lower-numbered modules are loaded first), the module's version, timestamp, and the process using the module. Click on a column to sort the modules by that column.



Modules

Name	Path	Optimized	User Code	Symbol Status
mscorlib.dll	C:\WINDOWS\assembly\GAC_32\mscorlib\2.0.0...	Yes	No	Skipped loading...
Microsoft.VisualStudio.HostingP...	C:\WINDOWS\assembly\GAC_MSIL\Microsoft....	Yes	No	Skipped loading...
System.Windows.Forms.dll	C:\WINDOWS\assembly\GAC_MSIL\System.Wi...	Yes	No	Skipped loading...
System.dll	C:\WINDOWS\assembly\GAC_MSIL\System\2.0...	Yes	No	Skipped loading...
System.Drawing.dll	C:\WINDOWS\assembly\GAC_MSIL\System.Dr...	Yes	No	Skipped loading...
Microsoft.VisualStudio.HostingP...	C:\WINDOWS\assembly\GAC_MSIL\Microsoft....	Yes	No	Skipped loading...
WindowsApplication1.vshost.exe	C:\VB Prog Ref\CeSrc\Ch01\WindowsApplicati...	Yes	No	Skipped loading...
System.Deployment.dll	C:\WINDOWS\assembly\GAC_MSIL\System.De...	Yes	No	Skipped loading...
Microsoft.VisualBasic.dll	C:\WINDOWS\assembly\GAC_MSIL\Microsoft....	Yes	No	Skipped loading...
WindowsApplication1.EXE	C:\VB Prog Ref\CeSrc\Ch01\WindowsApplicati...	No	Yes	Symbols loaded.
System.Runtime.Remoting.dll	C:\WINDOWS\assembly\GAC_MSIL\System.Ru...	Yes	No	Skipped loading...

Figure 1-32: The Modules window displays information about the modules used by the program.

- *Processes* — This window lists processes that are attached to the Visual Studio session. This includes any programs launched by Visual Studio and processes that you attached to using the Debug menu's Attach to Process command.

The Breakpoints Window

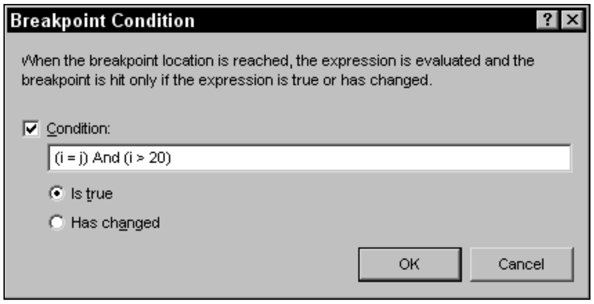
A *breakpoint* is a line of code that you have flagged to stop execution. When the program reaches that line, execution stops and Visual Studio displays the code in a code editor window. This lets you examine or set variables, see which routine called the one containing the code, and otherwise try to figure out what the code is doing.

The Breakpoints window lists all the breakpoints you have defined for the program. This is useful for a couple of reasons. First, if you define a lot of breakpoints, it can be hard to find them all later. While other commands let you disable, enable, or remove all of the breakpoints at once, there are times when you may need to find a particular breakpoint.

A common debugging strategy is to comment out broken code, add new code, and set a breakpoint near the modification so that you can see how the new code works. When you have finished testing the code, you probably want to remove either the old or new code, so you don't want to blindly remove all of the program's breakpoints. The Breakpoints window lists all of the breakpoints and, if you double-click a breakpoint in the list, you can easily jump to the code that holds it.

The Breakpoints window also lets you modify the breakpoints you have defined. Check or uncheck the boxes on the left to enable or disable breakpoints. Use the dialog's toolbar to enable or disable all breakpoints, clear all breakpoints, or jump to a breakpoint's source code.

Right-click a breakpoint and select Condition to display the dialog shown in Figure 1-33. By default, a breakpoint stops execution whenever it is reached. You can use this dialog to add an additional condition that determines whether the breakpoint activates when reached. In this example, the breakpoint stops execution only if the expression `(i = j) And (i > 20)` is `True` when the code reaches the breakpoint. Note that specifying a breakpoint condition can slow execution considerably.



Breakpoint Condition

When the breakpoint location is reached, the expression is evaluated and the breakpoint is hit only if the expression is true or has changed.

[✓] Condition:

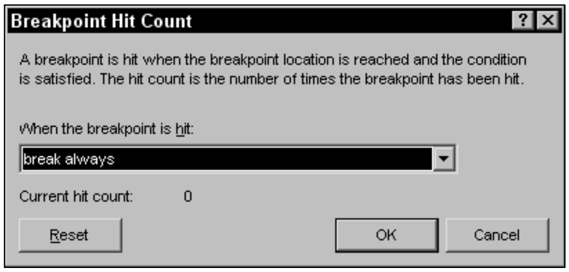
(i = j) And (i > 20)

[✓ Is true]

Has changed

Figure 1-33: The Breakpoint Condition dialog lets you specify a condition that determines whether Visual Studio stops at the breakpoint.

Right-click a breakpoint and select Hit Count to display the Breakpoint Hit Count dialog shown in Figure 1-34. Each time the code reaches a breakpoint, it increments the breakpoint's hit count. You can use this dialog to make the breakpoint's activation depend on the hit count's value.



Breakpoint Hit Count

A breakpoint is hit when the breakpoint location is reached and the condition is satisfied. The hit count is the number of times the breakpoint has been hit.

When the breakpoint is hit:

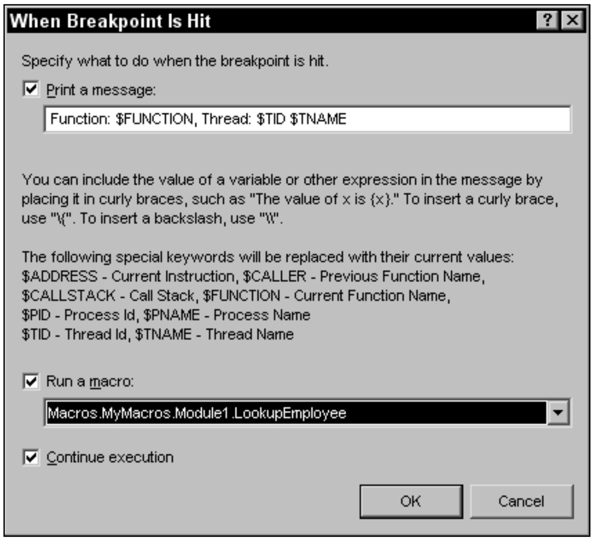
break always

Current hit count: 0

Figure 1-34: The Breakpoint Hit Count dialog lets you make a breakpoint's activation depend on the number of times the code has reached it.

From the drop-down list you can select the options "break always," "break when the hit count is equal to," "break when the hit count is a multiple of," or "break when the hit count is greater than or equal to." If you select any but the first option, you can enter a value in the text box and the program will pause execution when the breakpoint has been reached the appropriate number of times. For example, if you select the option "break when the hit count is a multiple of" and enter "2" into the text box, then execution will pause every other time it reaches the breakpoint.

Right-click a breakpoint and select When Hit to display the When Breakpoint Is Hit dialog shown in Figure 1-35. This dialog lets you specify the actions that Visual Basic takes when the breakpoint is activated. Check the "Print a message" box to make the program display a message in the Output window. Check the "Run a macro" box to make the program execute a VBA macro. Check the "Continue execution" box to make the program continue running without stopping.



When Breakpoint Is Hit

Specify what to do when the breakpoint is hit.

☑ Print a message:

Function: $FUNCTION, Thread: $TID $TNAME

You can include the value of a variable or other expression in the message by placing it in curly braces, such as "The value of x is {x}." To insert a curly brace, use "\{". To insert a backslash, use "\\".

The following special keywords will be replaced with their current values:
$ADDRESS - Current Instruction, $CALLER - Previous Function Name,
$CALLSTACK - Call Stack, $FUNCTION - Current Function Name,
$PID - Process Id, $PNAME - Process Name
$TID - Thread Id, $TNAME - Thread Name

☑ Run a macro:

Macros.MyMacros.Module1.LookupEmployee

☑ Continue execution

Figure 1-35: The When Breakpoint Is Hit Condition dialog lets you determine what actions Visual Basic takes when the breakpoint is activated.

The Command and Immediate Windows

The Command and Immediate windows both allow you to execute commands while the program is stopped in the debugger. One of the more useful commands in each of these windows is the `Debug.Print` statement. For example, the command `Debug.Print x` displays the value of the variable `x`.

You can use a question mark as an abbreviation for `Debug.Print`. The following text shows how the command might appear in the Command window. Here the > symbol is the command prompt provided by the window and `123` is the result: the value of variable `x`. In the Immediate window, the statement would not include the ">" character.

```
>? x
123
```

The command `>immed` tells the Command window to open the Immediate window. Conversely, the command `>cmd` tells the Immediate window to open the Command window.

While there is some overlap between these two windows, they serve two mostly different purposes. The Command window can issue commands to the Visual Studio IDE. Typically, these are commands that appear in menus or toolbars, or that could appear in menus and toolbars. For example, the following command uses the Debug menu's QuickWatch command to open a QuickWatch window for the variable `first_name`.

```
>Debug.QuickWatch first_name
```

One particularly useful command is `Tools.Alias`. This command lists command aliases defined by the IDE. For example, it indicates that `?` is the alias for `Debug.Print` and that `??` is the alias for `Debug.QuickWatch`.

The Command window includes some IntelliSense support. If you type the name of a menu, for example Debug or Tools, IntelliSense will display the commands available within that menu.

While the Command window issues commands to the IDE, the Immediate window executes Visual Basic statements. For example, suppose that you have written a subroutine named `CheckPrinter`. Then the following statement in the Immediate window executes that subroutine.

```
CheckPrinter
```

Executing subroutines in the Immediate window lets you quickly and easily test routines without writing user interface code to handle all possible situations. You can call a subroutine or function, passing it different parameters to see what happens. If you set breakpoints within the routine, the debugger will pause there.

Similarly, you can also set the values of global variables and then call routines that use them. The following Immediate window commands set the value of the `m_PrinterName` variable and then calls the `CheckPrinter` subroutine.

```
m_PrinterName = "LP_REMOTE"
CheckPrinter
```

You can execute much more complex statements in the Command and Immediate windows. For example, suppose that your program uses the following statement to open a file for reading.

```
Dim fs As FileStream = File.OpenRead( _
    "C:\Program Files\Customer Orders\Summary" & _
    datetime.Now().ToString("yymmdd") & ".dat")
```

Suppose that the program is failing because some other part of the program is deleting the file. You can type the following code (all on one line) into the Immediate window to see if the file exists. As you step through different pieces of the code, you can use this statement again to see if the file has been deleted.

```
?System.IO.File.Exists("C:\Program Files\Customer Orders\Summary" & _
DateTime.Now().ToString("yymmdd") & ".dat")
```

The window evaluates the complicated string expression to produce a file name. It then uses the `System.IO.File.Exists` command to determine whether the file exists and displays `True` or `False` accordingly.

Data

The Data menu, shown in Figure 1-36, contains commands that deal with data and data sources. Some of the commands in this menu are only visible and enabled if you are designing a form and that form contains the proper data objects.

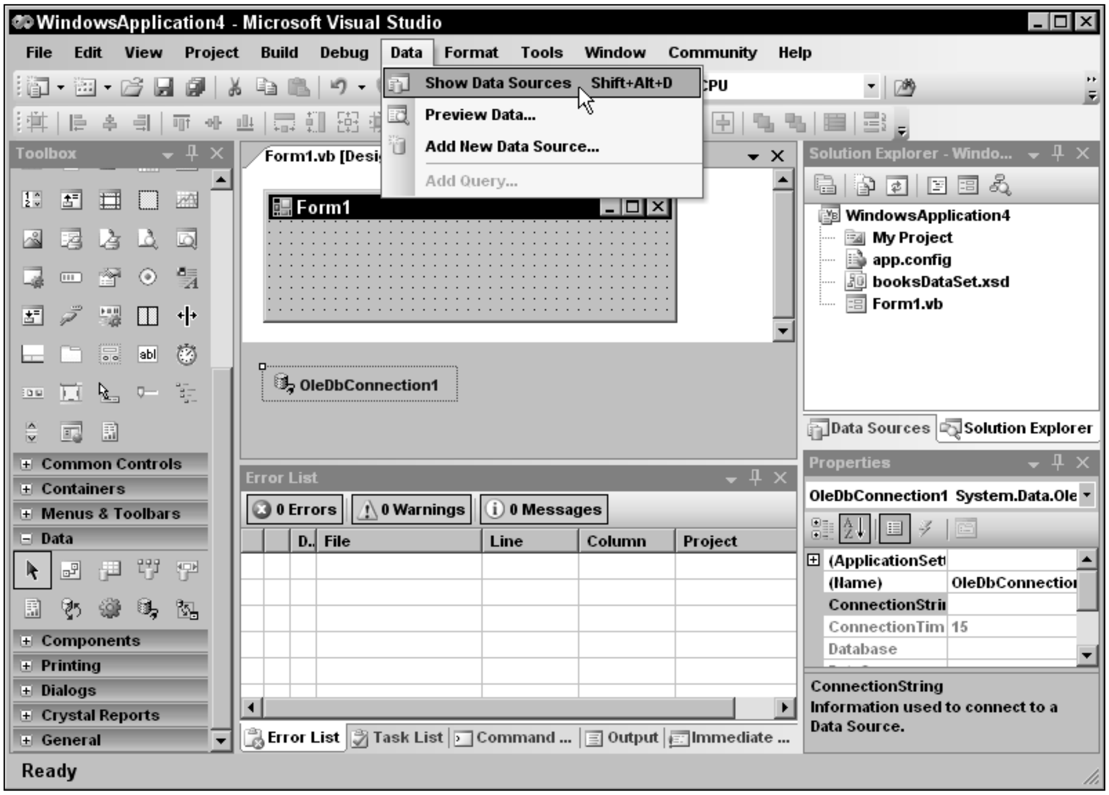


Figure 1-36: The Data menu holds commands that deal with datasets.

The following list describes commands shown in Figure 1-36:

- *Show Data Sources* — This command displays the Data Sources window, where you can work with the program's data sources. For example, you can drag and drop tables and fields from this window onto a form to create controls bound to the data.
- *Preview Data* — This command displays a dialog that lets you load data into a `DataSet` and view it at design time.
- *Add New Data Source* — This command displays the Data Source Configuration Wizard, which walks you through the process of adding a data source to the project.
- *Add Query* — This command is available when you are designing a form and have selected a data bound control such as a `DataGridView` or bound `TextBox`. This command opens a dialog where you can specify a query to add to the form. This places a `ToolStrip` on the form containing `TooStripButton` that populates the bound control by executing the query.

Format

The Format menu, shown in Figure 1-37, contains commands that arrange controls on a form. The following list describes the Format menu's submenus:

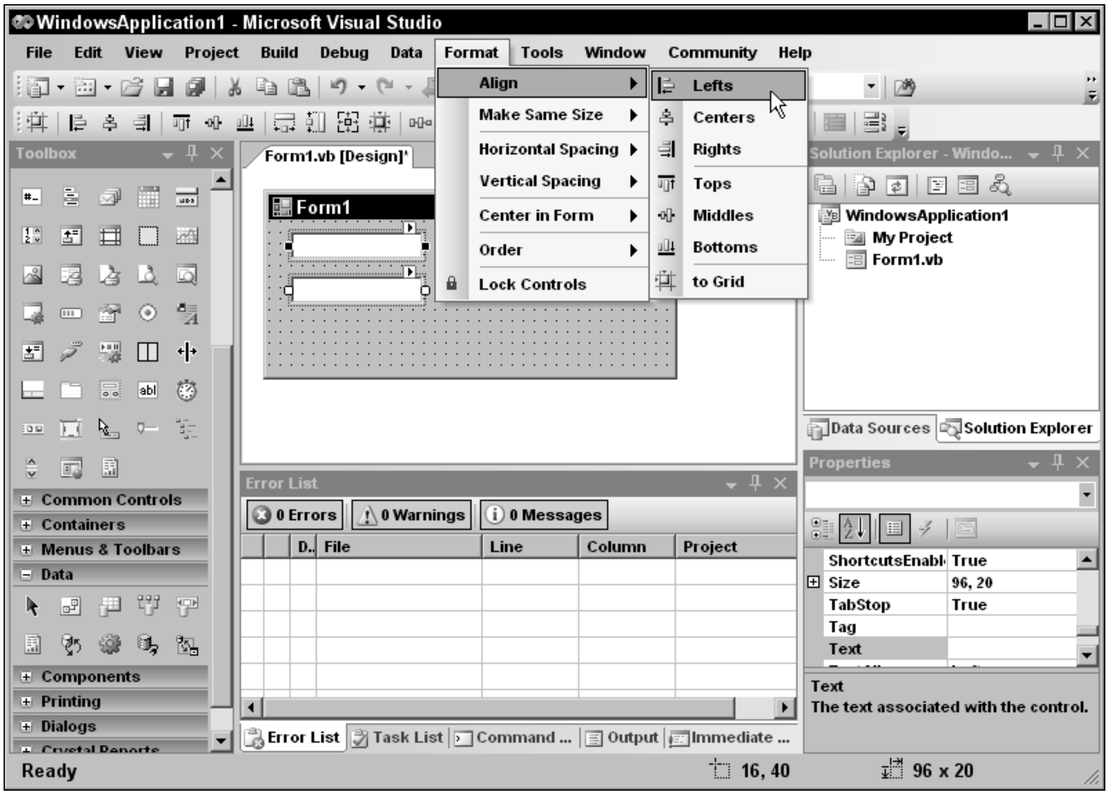


Figure 1-37: The Format menu contains commands for formatting and arranging controls on a form.

- ❑ *Align* — This submenu contains commands that align the controls you have selected in various ways. It contains the commands Lefts, Centers, Rights, Tops, Middles, Bottoms, and “to Grid.” For example, the Lefts command aligns the controls so their left edges line up nicely. The “to Grid” command snaps the controls to the nearest grid position. This is useful if you have moved some controls off of the alignment grid, possibly by using one of the other Align commands or by changing a control’s Location property in the Properties window.
- ❑ *Make Same Size* — This submenu contains commands that change the size of the controls you have selected. It contains the commands Width, Height, Both, and “Size to Grid.” The “Size to Grid” command adjusts the selected controls’ widths so that they are a multiple of the alignment grid size. The other commands give the selected controls the same width, height, or both.
- ❑ *Horizontal Spacing* — This submenu contains commands that change the spacing between the controls you have selected. It contains the commands Make Equal, Increase, Decrease, and Remove. For example, if you have selected three controls, the Make Equal command makes the spacing between the first two the same as the spacing between the second two. This can be handy for making columns that line up nicely.
- ❑ *Vertical Spacing* — This submenu contains the same commands as the Horizontal Spacing submenu except it adjusts the controls’ vertical spacing rather than their horizontal spacing.

- *Center in Form* — This submenu contains commands that center the selected controls on the form. It contains the commands Horizontally and Vertically. Note that the selected controls are centered as a group; they are not centered individually on top of each other.
- *Order* — This submenu contains the commands Bring to Front and Send to Back, which move the selected controls to the top or bottom of the stacking order.
- *Lock Controls* — This command locks all of the controls on the form so that they cannot be moved or resized by clicking and dragging. You can still move and resize the controls by changing their Location and Size properties in the Properties window. Invoking this command again unlocks the controls. Locking the controls can be useful if you have spent a long time positioning them precisely. After they are locked, you can work on the controls without fear of accidentally messing up your careful design.

Tools

The Tools menu, shown in Figure 1-38, contains miscellaneous tools that do not fit particularly well in the other menus. It also contains a few duplicates of commands in other menus and commands that modify the IDE itself.

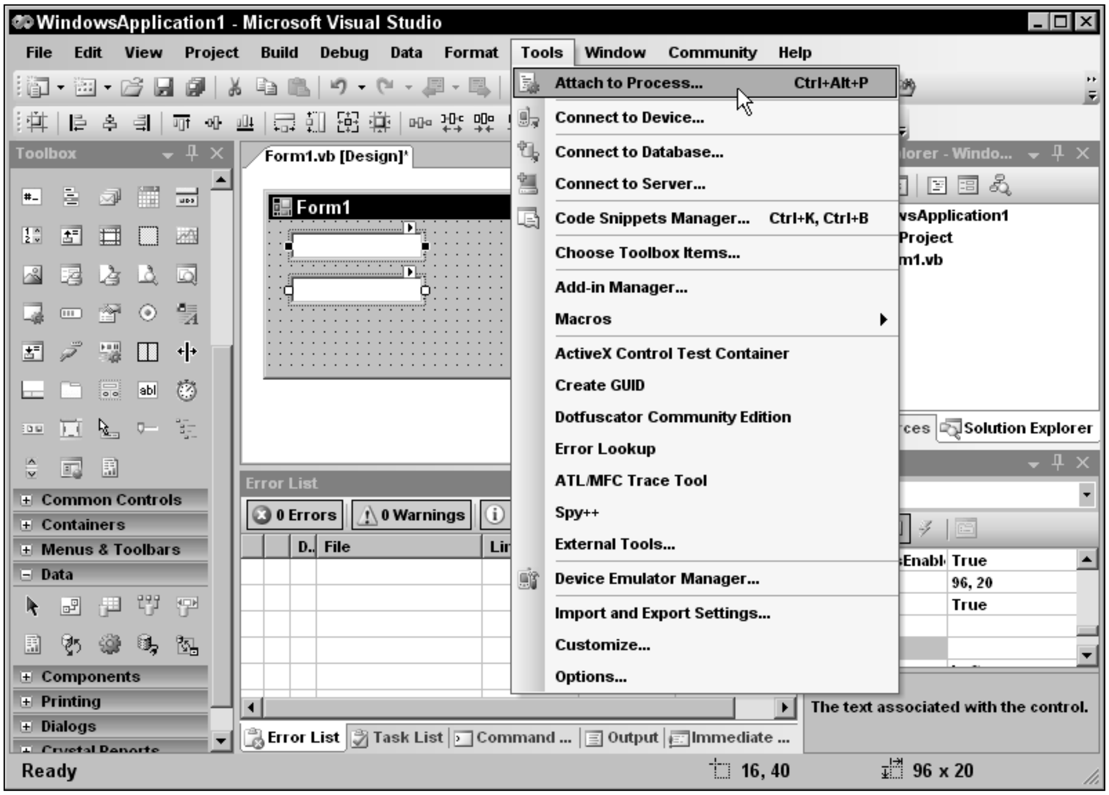
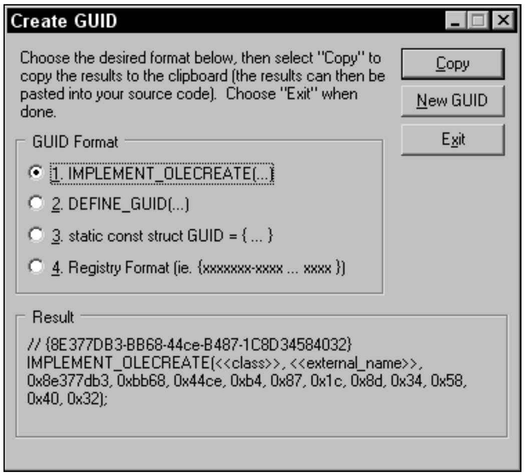

WindowsApplication1 - Microsoft Visual Studio
File Edit View Project Build Debug Data Format Tools Window Community Help
Attach to Process... Ctrl+Alt+P
Connect to Device...
Connect to Database...
Connect to Server...
Code Snippets Manager... Ctrl+K, Ctrl+B
Choose Toolbox Items...
Add-in Manager...
Macros
ActiveX Control Test Container
Create GUID
Dotfuscator Community Edition
Error Lookup
ATL/MFC Trace Tool
Spy++
External Tools...
Device Emulator Manager...
Import and Export Settings...
Customize...
Options...
Toolbox
Common Controls
Containers
Menus & Toolbars
Data
Components
Printing
Dialogs
Form1.vb [Design]*
Form1
Error List
0 Errors
0 Warnings
Solution Explorer
The text associated with the control.
Error List Task List Command ... Output Immediate ...
Ready
16, 40
96 x 20

Figure 1-38: The Tools menu contains miscellaneous commands and commands that modify the IDE.

The following list describes the Tools menu's most useful commands:

- *Attach to Process* — This command displays the dialog shown in Figure 1-22 to let you attach the debugger to a running process. Select the process to which you want to attach and click Attach.
- *Connect to Device* — This command lets you connect to a physical device or emulator such as Pocket PC or Smartphone devices or emulators. You can use the devices and emulators to test software you are writing for devices other than the Windows platform where you are building the application.
- *Connect to Database* — This command displays the Connection Properties dialog, where you can define a database connection. The connection is added to the Server Explorer window. You can later use the connection to define data adapters and other objects that use a database connection.
- *Code Snippets Manager* — This command displays the Code Snippets Manager, which you can use to add and remove code snippets.
- *Choose Toolbox Items* — This command displays a dialog that lets you select the tools displayed in the Toolbox. For instance, by default the `OleDbDataAdapater` and `OleDbConnection` components are not included in the Toolbox. You can use this command to add them if you will use them frequently.
- *Add-in Manager* — This command displays the Add-in Manager, which lists the add-in projects registered on the computer. You can use the Add-in Manager to enable or disable these add-ins.
- *Macros* — The Macros submenu contains commands that help you create, edit, and execute macros. See the section "Macros," later in this chapter, for details.
- *ActiveX Control Test Container* — This command displays the ActiveX Control Test Container, which lets you test and debug ActiveX controls. You can use it to change the control's properties, call its methods, and raise its events.
- *Create GUID* — This command displays the Create GUID dialog shown in Figure 1-39 to let you create a new globally unique identifier (GUID, pronounced to rhyme with "squid"). Select the GUID format that you need and click New GUID to generate a new GUID. Click Copy to copy the result to the clipboard.
- *Dotfuscater Community Edition* — This command launches the displays the Dotfuscater Community Edition, a tool that you can use to make the intermediate language (IL) code generated by Visual Basic more obscure and harder to reverse engineer.
- *Error Lookup* — This command displays a small dialog where you can enter an error code and see a description of the error.
- *ATL/MFC Trace Tool* — If you are building Active Template Library (ATL) or Microsoft Foundation Classes (MFC) projects, this command displays a tool that lets you view debug trace messages.
- *Spy++* — This command launches the Spy++ tool, which lets you view the messages sent to the application.
- *External Tools* — This command displays a dialog that lets you add and remove commands from the Tools menu. For example, you could add a command to launch WordPad, MS Paint, WinZip, and other handy utilities from the Tools menu.
- *Device Emulation Manager* — This command displays the Device Emulation Manager, which lets you connect, reset, shut down, and otherwise manipulate device emulators.



Choose the desired format below, then select "Copy" to copy the results to the clipboard (the results can then be pasted into your source code). Choose "Exit" when done.

GUID Format

- [✓ 1. IMPLEMENT_OLECREATE(...)]
- 2. DEFINE_GUID(...)
- 3. static const struct GUID = { ... }
- 4. Registry Format (ie. {xxxxxxx-xxxx ... xxxx })

Result

```
// {8E377DB3-BB68-44ce-B487-1C8D34584032}
IMPLEMENT_OLECREATE(<<class>>, <<external_name>>,
0x8e377db3, 0xbb68, 0x44ce, 0xb4, 0x87, 0x1c, 0x8d, 0x34, 0x58,
0x40, 0x32);
```

Figure 1-39: The Create GUID dialog generates GUIDs.

- ❑ *Import/Export Settings* — This command displays a dialog that you can use to save, restore, or reset your Visual Studio IDE settings.
- ❑ *Customize* — This command allows you to customize the Visual Studio IDE. See the “Customize” section later in this chapter for details.
- ❑ *Options* — This command allows you to specify options for the Visual Studio IDE. See the “Options” section later in this chapter for details.

Macros

The Macros submenu, shown in Figure 1-40, provides commands that help you create, edit, and execute macros that automate repetitive Visual Studio programming chores. If you must perform a series of actions many times, you can record a macro that performs them. Then you can call the macro repeatedly to perform the actions rather than executing them manually.

After you have recorded a macro, you can edit the macro’s code and make changes. For example, if you want to run the code a certain number of times, you can include it in a For loop. Often, a quick inspection of the code lets you figure out how to modify the code to perform actions similar to (but not exactly the same as) the actions you originally recorded.

Most of the commands in the macros submenu are self-explanatory. Use the Record TemporaryMacro command to record a macro for quick temporary use. When you select this command, a small window pops up that contains buttons you can click to suspend, finish, or cancel recording. Visual Studio saves the commands you execute in a macro named “TemporaryMacro.”

Select Run TemporaryMacro to run this macro. If you record a new TemporaryMacro, it overwrites the existing one without warning you. Select the Save TemporaryMacro command to rename the macro so you can record a new TemporaryMacro without destroying this one.

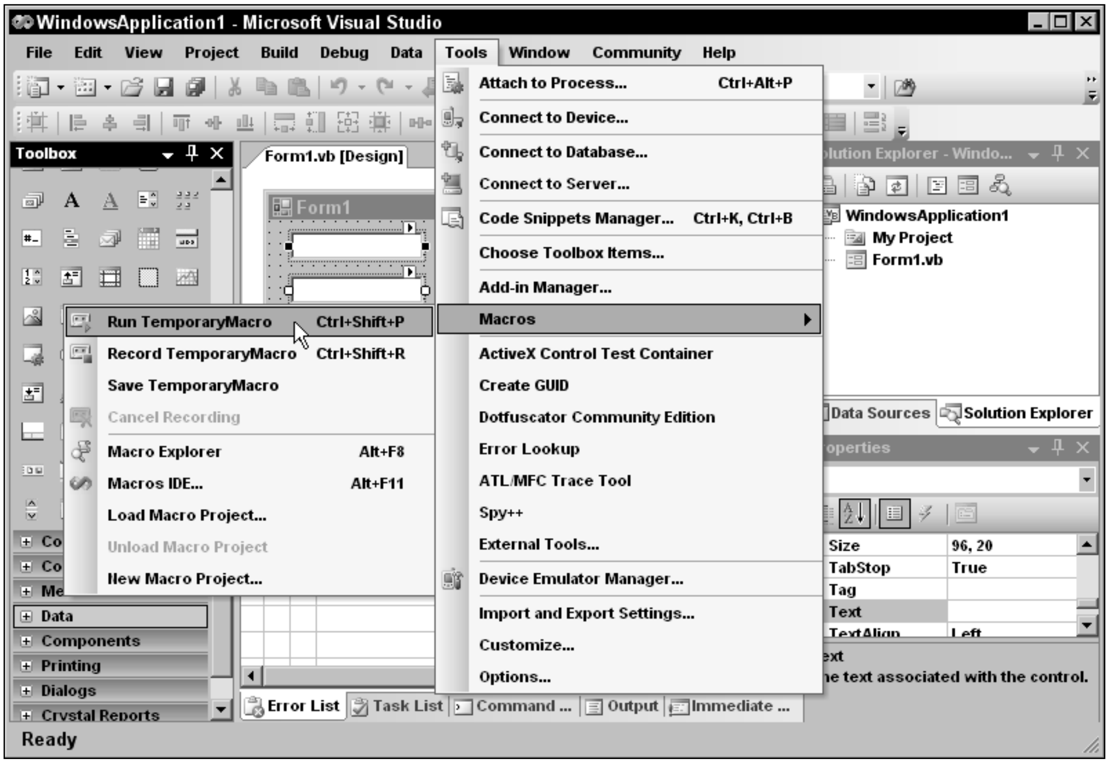


Figure 1-40: The Macros submenu contains commands for recording and executing macros.

Select the Macro Explorer command to display the window shown in Figure 1-41. If you right-click on a macro, the resulting pop-up menu lets you run, edit, rename, or delete the macro. Notice the Macro Explorer’s predefined Samples section, which contains example macros that you can use or modify for your own use.

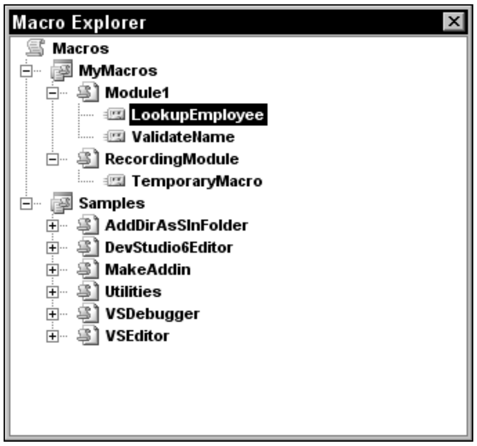


Figure 1-41: The Macro Explorer lets you edit, run, and delete macros.

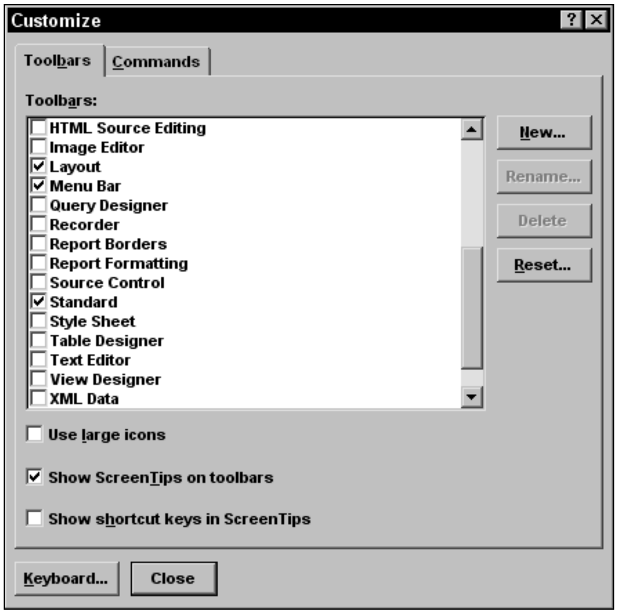
Sometimes when you perform a series of programming tasks many times, there are better ways to approach the problem than writing a macro. For example, you may be able to make your program repeat the steps inside a loop. Or you may be able to extract the common code into a subroutine and then call it repeatedly rather than repeating the code many times. In these cases, your application doesn't need to contain a long sequence of repetitive code that may be hard to debug and maintain.

Macros are generally most useful when you must write similar pieces of code that cannot be easily extracted into a routine that can be shared by different parts of the application. For example, suppose that you need to write event handlers for several dozen `TextBox` controls. You could record a macro while you write one of them. Then you could edit the macro to make it generate the others in a loop using different control names for each event handler. You could place the bulk of the event-handling code in a separate subroutine that each event handler would call. That would avoid the need for extensive duplicated code. (In fact, you could even use the `AddHandler` statement to make all the controls use the same event handler. Then you wouldn't even need to write all of the separate event handlers.)

Macros are also useful for manipulating the IDE and performing IDE-related tasks. For example, you can write macros to show and hide your favorite toolbars, or to change whether the current file is opened read-only.

Customize

The Tools menu's Customize command displays the dialog shown in Figure 1-42. On the Toolbars tab, check the boxes next to the toolbars that you want to be visible. Click New to create a new toolbar where you can add your favorite tools. You can leave the toolbar floating or drag it to the edge of the IDE and dock it. If you drag it to the top, it joins the other toolbars.

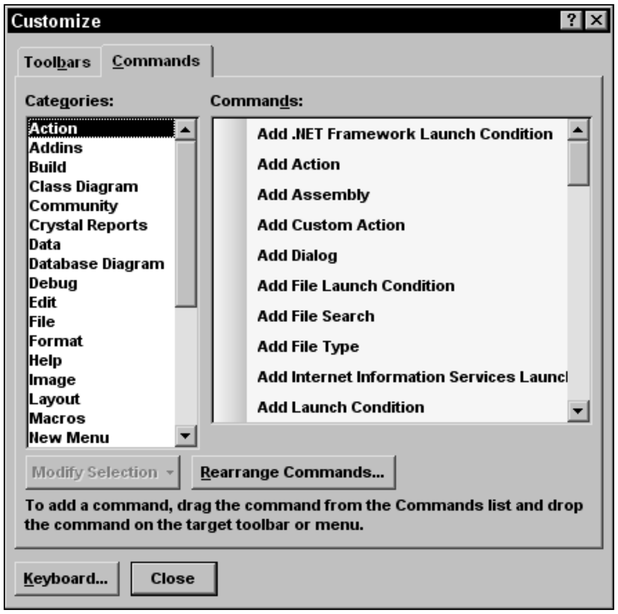


- [ ] HTML Source Editing
- [ ] Image Editor
- [✓] Layout
- [✓] Menu Bar
- [ ] Query Designer
- [ ] Recorder
- [ ] Report Borders
- [ ] Report Formatting
- [ ] Source Control
- [✓] Standard
- [ ] Style Sheet
- [ ] Table Designer
- [ ] Text Editor
- [ ] View Designer
- [ ] XML Data

- [ ] Use large icons
- [✓] Show ScreenTips on toolbars
- [ ] Show shortcut keys in ScreenTips

Figure 1-42: The Customize dialog's Toolbar tab lets you determine which toolbars are visible.

Click the Commands tab to see a list of categories as shown in Figure 1-43. Select a category on the left. Then click and drag a command from the list on the right. If you drop the command on a toolbar, the command is added to the toolbar. Hover over a menu to open the menu so that you can drop the command in it.



To add a command, drag the command from the Commands list and drop the command on the target toolbar or menu.

Figure 1-43: The Customize dialog's Commands tab lets you add commands to toolbars and menus.

To create a new menu, select the New Menu item in the list on the left. Then drag and drop the New Menu entry from the right list onto the IDE's menu area.

To make a command that executes a macro you have created, select the Macros category in the list on the left. Find the macro you want to use in the list on the right, and drag it onto a toolbar or menu.

To remove a command from a toolbar or menu, right-click it and select Delete. Alternatively, you can click and drag the command somewhere that it cannot be placed. For example, you can drop it on the Customize dialog or most places in the IDE other than on a menu or toolbar (code editors, the Properties window, the Toolbox). The mouse cursor changes to a box with an "X" beside it when the mouse is over one of these areas.

Modifying the IDE's standard menus and toolbars can cause confusion later. You may later discover that you need a command that you have removed from a menu, and it may take you quite a while to find it again. A better approach to modifying standard commands is to create a new custom toolbar or menu. Add the commands you want to use to the new toolbar and then hide the standard toolbar that you are replacing. Later you can restore the hidden standard toolbar if necessary.

If you right-click a command in a menu or toolbar while the Customize dialog is open, Visual Studio displays the pop-up menu shown in Figure 1-44. Click the Name text box and enter a new name to change the text displayed in the menu or toolbar.

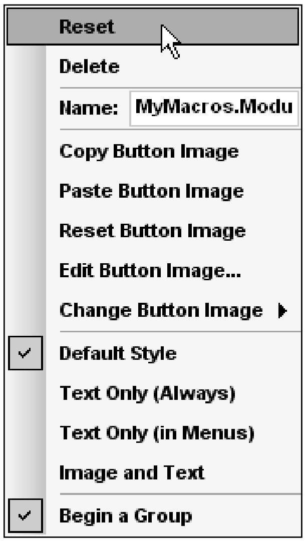


Figure 1-44: Right-click menu and toolbar commands to change their appearances.

Use the Copy Button Image command to copy the button's image to the clipboard. Use Paste Button Image to paste a copied image onto a button. Usually you will use these two commands to copy the image from an existing button to one you are adding. However, the Paste Button Image command will paste any graphical image from the clipboard. For example, you can open a bitmap using Microsoft Paint, press Ctrl-A to select the whole image, and press Ctrl-C to copy it to the clipboard. Then you can use the Paste Button Image command to paste the image into a button. Note that the buttons are 16 by 16 pixels. If the image you copy is larger, Visual Studio shrinks it to fit.

Select the Reset Button Image command to restore the button to its default image. For a command tied to a macro, this erases the image.

Select the Edit button image command to display the simple button editor shown in Figure 1-45. If you click on a pixel that is not the selected foreground color (black in Figure 1-45), the editor changes the pixel to the foreground color. If you hold the mouse down and drag it, the editor gives the pixels you cross that color, too. If you click on a pixel that is already the foreground color, the editor erases the pixel and any others that you drag over.

If you click the Change Button Image command, a menu containing several dozen standard images pops out. Click one to assign that image to the button. A useful technique is to start with one of these images and then edit it to customize it for your command.

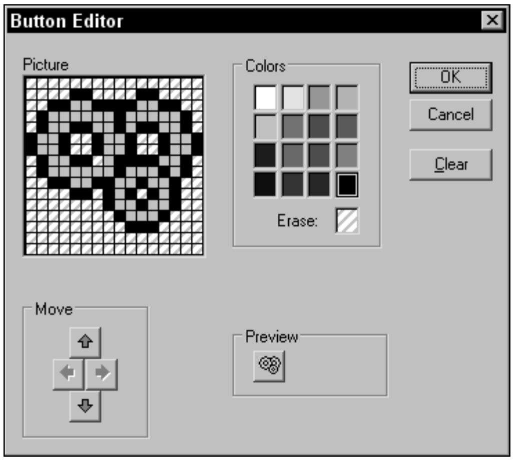


Figure 1-45: You can use Visual Studio's simple button editor to change a command's button.

The pop-up menu's Default Style command makes the command use a style that depends on whether it is in a menu or toolbar. In a menu, the command displays a button and text. In a toolbar, the command displays only a button. Ironically, a new button's default style is not Default Style. When you create a new toolbar or menu command, the button initially displays only text. You need to use the Default Style command to make the button use this style.

Text Only (Always) makes the command display only text. Text Only (in Menus) makes a command in a toolbar display a button and a command in a menu display text.

Image and Text makes the command display both an icon and text whether it is in a toolbar or a menu.

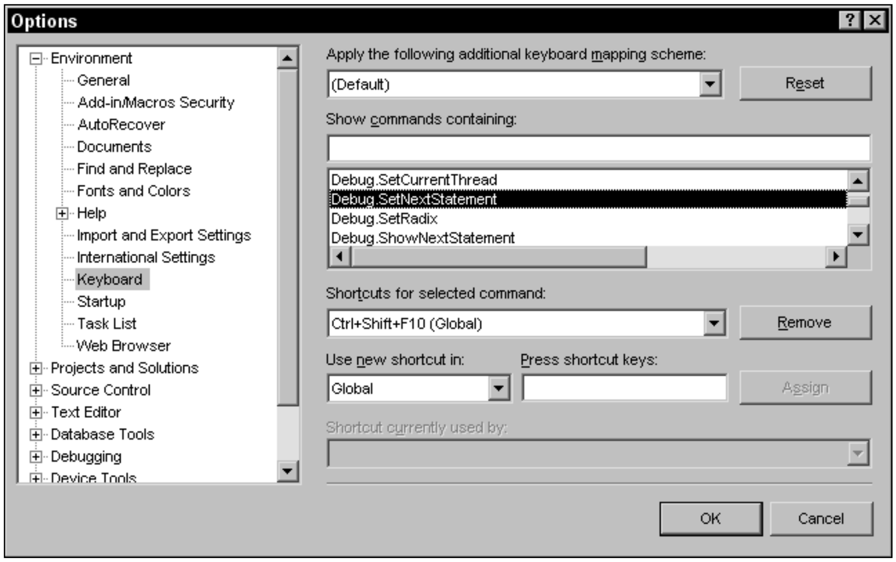
Finally, the Begin a Group command makes the IDE insert a group separator before the button.

The Customize dialog's Rearrange Commands button displays a dialog that lets you rearrange the commands in an existing menu or toolbar, and change the appearance of those commands. It's usually easier to just click and drag the commands on its menu or toolbar, however.

The Customize dialog's Keyboard button displays the dialog shown in Figure 1-46. You can use this display to view and edit keyboard shortcuts.

Enter words in the "Show commands containing" text box to filter the commands. When you click on a command, the dialog displays any keyboard shortcuts associated with it.

To make a new shortcut, click on the "Press shortcut key(s)" text box and press the keys that you want to use as a shortcut. The "Shortcut currently used by" drop-down lists any commands that already use the shortcut you entered. To make the assignment, click the Assign button.



Apply the following additional keyboard mapping scheme: (Default)

Show commands containing:

Debug.SetCurrentThread
Debug.SetNextStatement
Debug.SetRadix
Debug.ShowNextStatement

Shortcuts for selected command: Ctrl+Shift+F10 (Global)

Use new shortcut in: Global

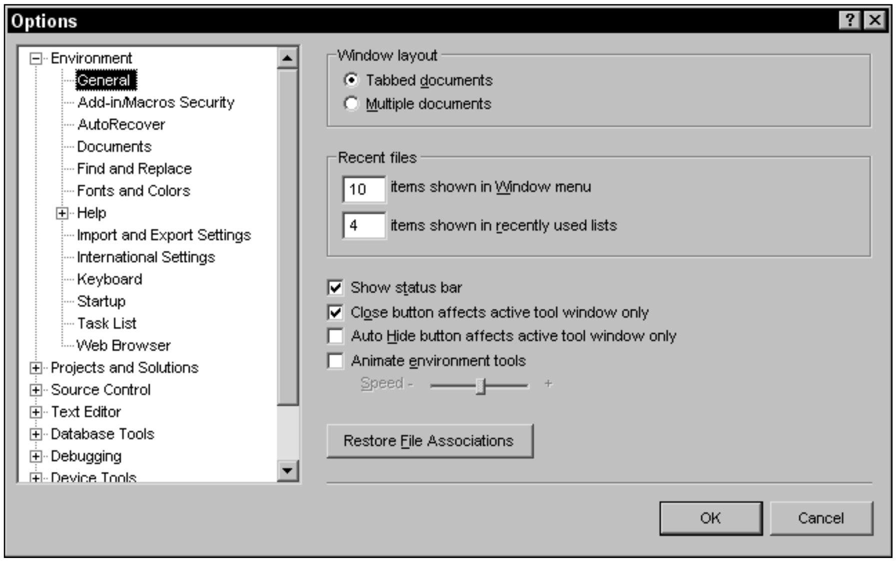
Press shortcut keys:

Shortcut currently used by:

Figure 1-46: The Options dialog's Keyboard section lets you view and modify keyboard shortcuts.

Options

The Tools menu's Options command displays the dialog shown in Figure 1-47. This dialog contains a huge number of pages of options that configure the Visual Studio IDE. The Customize dialog's Keyboard button described in the previous section uses the same dialog with the Keyboard item selected in the list on the left.



Window layout
- [✓ Tabbed documents]
- Multiple documents

Recent files
- 10 items shown in Window menu
- 4 items shown in recently used lists

- [✓] Show status bar
- [✓] Close button affects active tool window only
- Auto Hide button affects active tool window only
- Animate environment tools

Speed - +

Figure 1-47: The Options dialog lets you specify IDE options.

The following list describes the Options dialog's most important categories.

- *Environment* — Contains general IDE settings such as whether the IDE uses an Multiple Document Interface (MDI) or Single Document Interface (SDI) interface, the number of items listed in the MRU lists, and how often the IDE saves AutoRecover information. The Fonts and Colors subsection lets you determine the colors used by the editors for different types of text. For example, comments are shown in green by default, but you can change this color.
- *Projects and Solutions* — Contains the default settings for Option Explicit, Option Strict, and Option Compare.
- *Source Control* — Contains entries that deal with the source code control system (for example, Source Safe).
- *Text Editor* — Contains entries that specify the text editors' features. For example, you can use these pages to determine whether delimiters are highlighted, the editor provides drag-and-drop editing, scroll bars are visible, long lines are automatically wrapped, line numbers are displayed, and the editor provides smart indentation. The Basic\VB Specific subsection lets you specify options such as whether the editor uses outlining, whether it displays procedure separators, and suggested corrections for errors.
- *Database Tools* — Contains database parameters such as default lengths for fields of various types.
- *Debugging* — Contains debugging settings such as whether the debugger displays messages as modules are loaded and unloaded, whether it should make you confirm when deleting all breakpoints, and whether it should allow Edit-and-Continue.
- *Device Tools* — Contains options for development on devices such as Smartphones, Pocket PCs, or Windows CE.
- *HTML Designer* — Contains options for configuring HTML Designer. These options determine such settings as whether the designer starts in source or design view, and whether it displays Smart Tags for controls in design view.
- *Windows Form Designer* — Contains settings that control the Form Designer. For example, this section lets you determine whether the designer uses a snap-to grid or snap lines.

Window

The Window menu contains commands that control Visual Studio's windows. Which commands are enabled depends on the type of window that has the focus. Figure 1-48 shows this menu when the Toolbox has the focus.

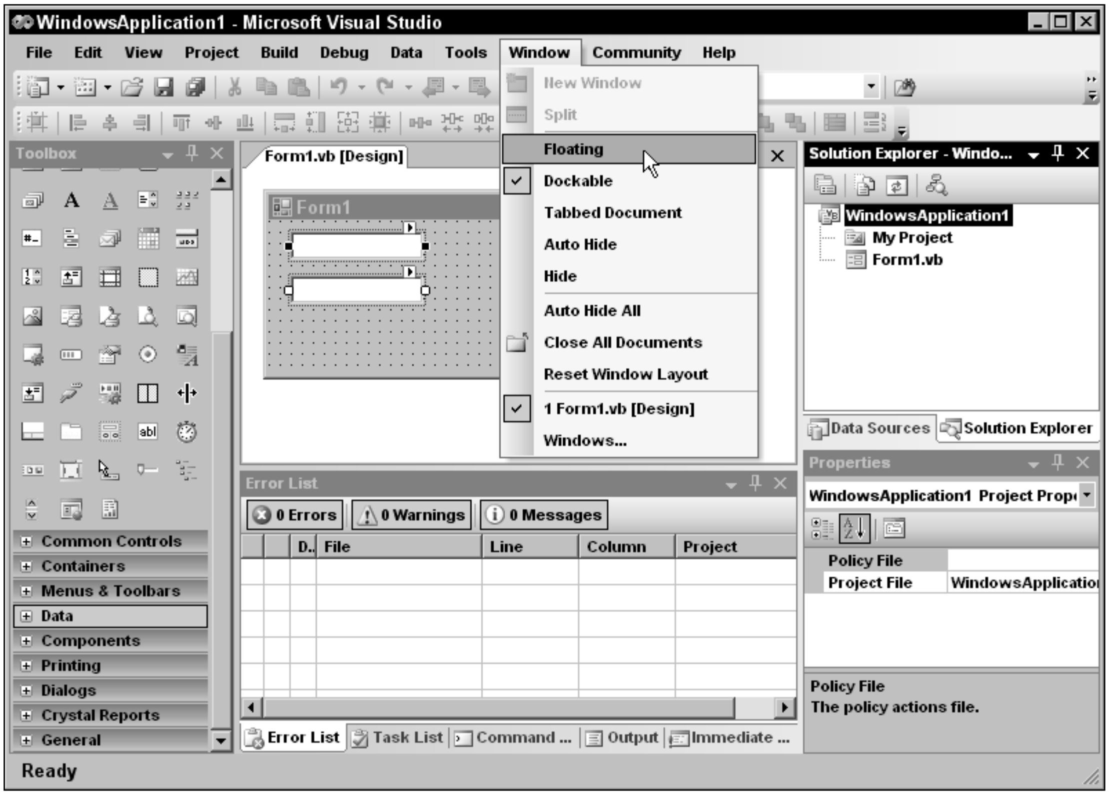


Figure 1-48: The Window menu displays commands that control Visual Studio's windows.

The following list briefly describes these commands.

- *New Window* — Creates a new window displaying the contents of the current code window.
- *Split* — Splits a code window into two panes that can display different parts of the code at the same time. This command changes to Remove Split when you use it.
- *Dockable, Floating, Tabbed Document* — Secondary windows such as the Toolbox, Solution Explorer, and Properties windows can be displayed as dockable, as floating, or as tabbed documents. A dockable window can be attached to the edges of the IDE or docked with other secondary windows. A floating window stays in its own independent window even if you drag it to a position where it would normally dock. A tabbed document window is displayed in the main editing area in the center of the IDE with the forms, classes, and other project files.
- *Auto Hide* — Puts a secondary window in Auto Hide mode. The window disappears, and its title is displayed at the IDE's nearest edge. When you click on the title or hover over it, the window reappears so that you can use it. If you click on another window, this window hides itself again automatically.
- *Hide* — Removes the window.
- *Auto Hide All* — Makes all secondary windows enter Auto Hide mode.

- *New Horizontal Tab Group* — Splits the main document window horizontally so that you can view two different documents at the same time.
- *New Vertical Tab Group* — Splits the main document window vertically so that you can view two different documents at the same time.
- *Close All Documents* — Closes all documents.
- *Reset Window Layout* — Resets the window layout to a default configuration.
- *Form1.vb* — The bottom part of the Window menu lists the open documents. In Figure 1-48, it lists Form1.vb in the code editor and Form1.vb [Design] in the Form Designer (Design mode). The code editor entry is checked because it is the currently active document.
- *Windows* — If you have too many open documents to display in the Window menu, select this command to see a list of windows in a dialog. This dialog lets you switch to another document, close one or more documents, or save documents. By using Ctrl-Click and Shift-Click you can select more than one document and quickly close them.

Community

The Community menu shown in Figure 1-49 contains commands that can help you connect with the Visual Basic programming community. These commands lead to various Microsoft Web pages where you can ask questions, send feedback, search for examples, find snippets, and so forth.

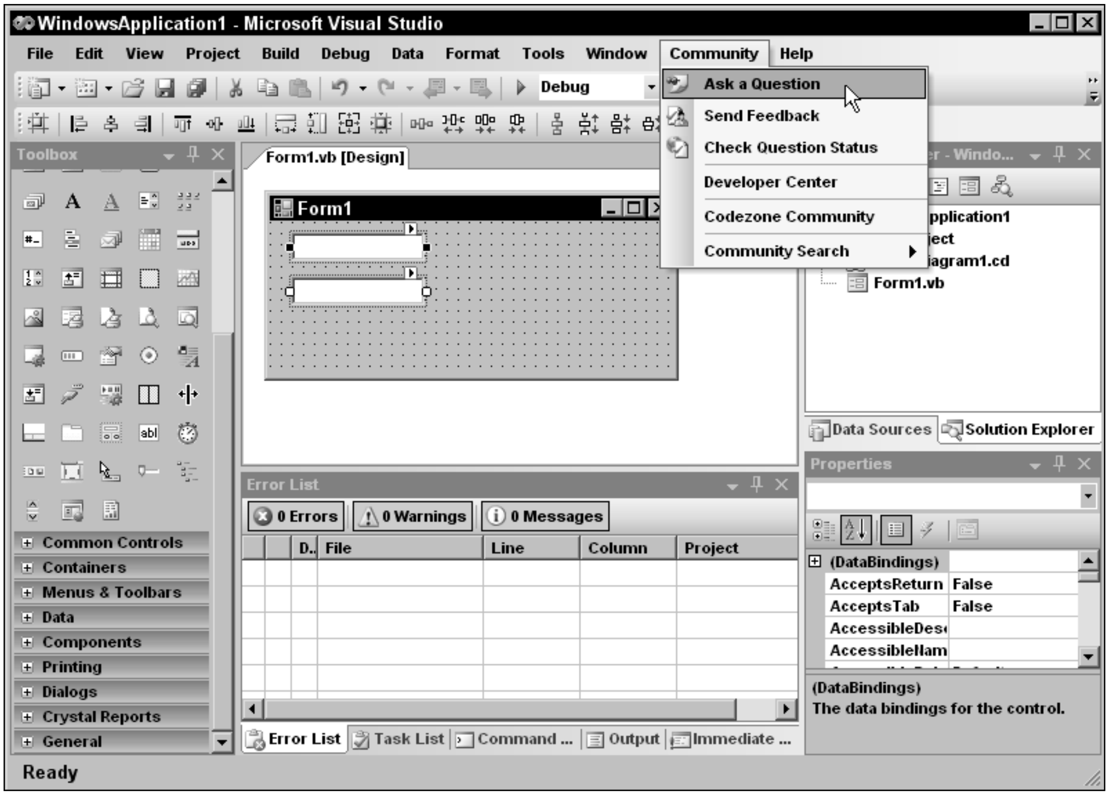


Figure 1-49: The Community menu contains commands that give access to Microsoft's Visual Basic developer community.

For other Visual Basic community resources, see the "community support" topic in the MSDN help or visit the Web page http://msdn.microsoft.com/library/en-us/vsintro7/html/vxoriAdditionalResourcesForVisualStudioDevelopers.asp. Also see the Visual Studio 2005 Home Page at http://msdn.microsoft.com/vs2005/default.aspx. Microsoft may move these pages but you should be able to find them if you search Microsoft's Web site for "Additional Resources for Visual Studio Developers" and "Visual Studio 2005."

Help

The Help menu shown in Figure 1-50 displays the usual assortment of help commands. You should be familiar with most of these from previous experience.

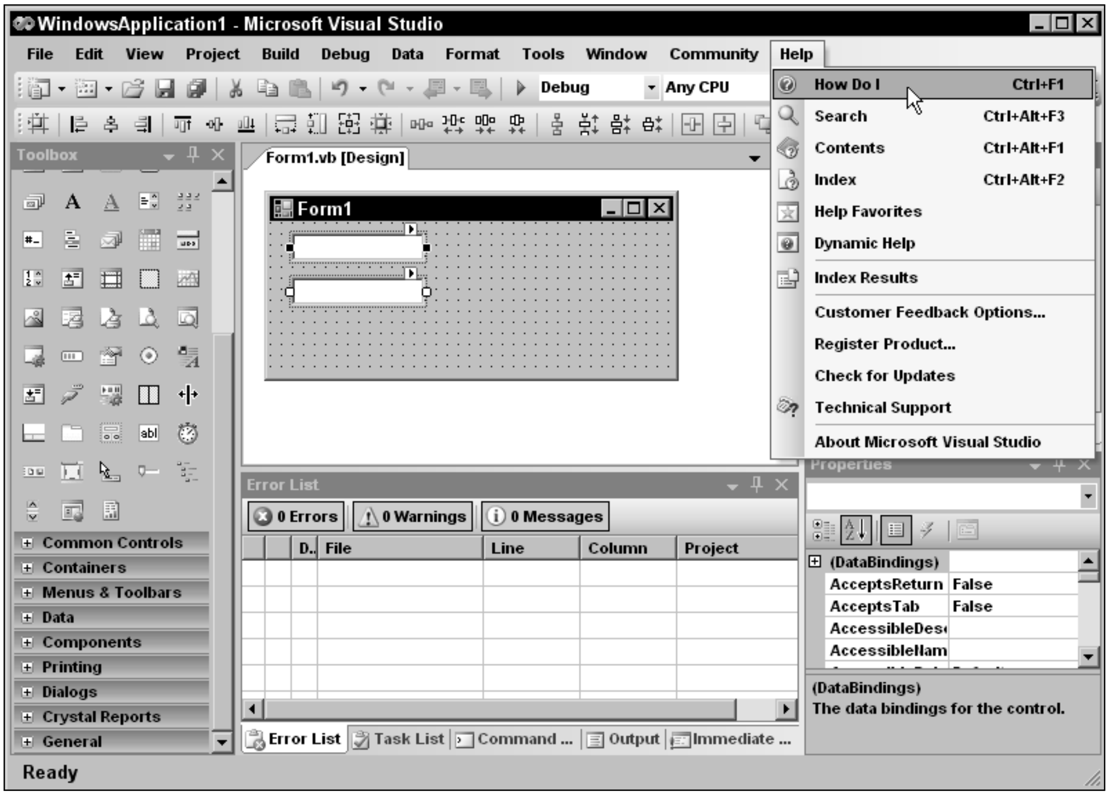


Figure 1-50: The Help menu contains commands that give you help.

One new item in the Help menu is the How Do I command. This command opens the help system and displays a page full of links to common programming topics. These topics lead to a hierarchical series of categorized tutorials on various programming topics. For example, the Visual Basic > Language > Basics > Data Types > Data Type Summary topic describes the Visual Basic data types, their storage requirements, and their ranges of allowed values.

Toolbars

Visual Studio's toolbars are easy to rearrange. Grab the four gray dots on a toolbar's left or upper edge and drag the toolbar to its new position. If you drag a toolbar to one of Visual Studio's edges, it will dock there either horizontally (on the IDE's top or bottom edge) or vertically (on the IDE's left or right edge). If you drop a toolbar away from the IDE's edges, it becomes a floating window not docked to the IDE.

You can use the menu commands described earlier in this chapter to determine which toolbars are visible, to determine what they contain, and to make custom toolbars of your own.

Many menu commands are also available in standard toolbars. For example, the Debug toolbar contains many of the same commands that are in the Debug menu. If you use a set of menu commands frequently, you may want to display the corresponding toolbar to make using the commands easier.

Secondary Windows

You can rearrange secondary windows such as the Toolbox and Solution Explorer almost as easily as you can rearrange toolbars. Click and drag the window's title area to move it. As the window moves, the IDE displays little blue icons to help you dock the window, as shown in Figure 1-51. This figure probably looks somewhat confusing, but it's fairly easy to use.

The IDE displays four docking icons near the edges of the IDE. You can see these icons near the edges of Figure 1-51. If you drop the window on one of these icons, the window docks to the corresponding edge of the IDE.

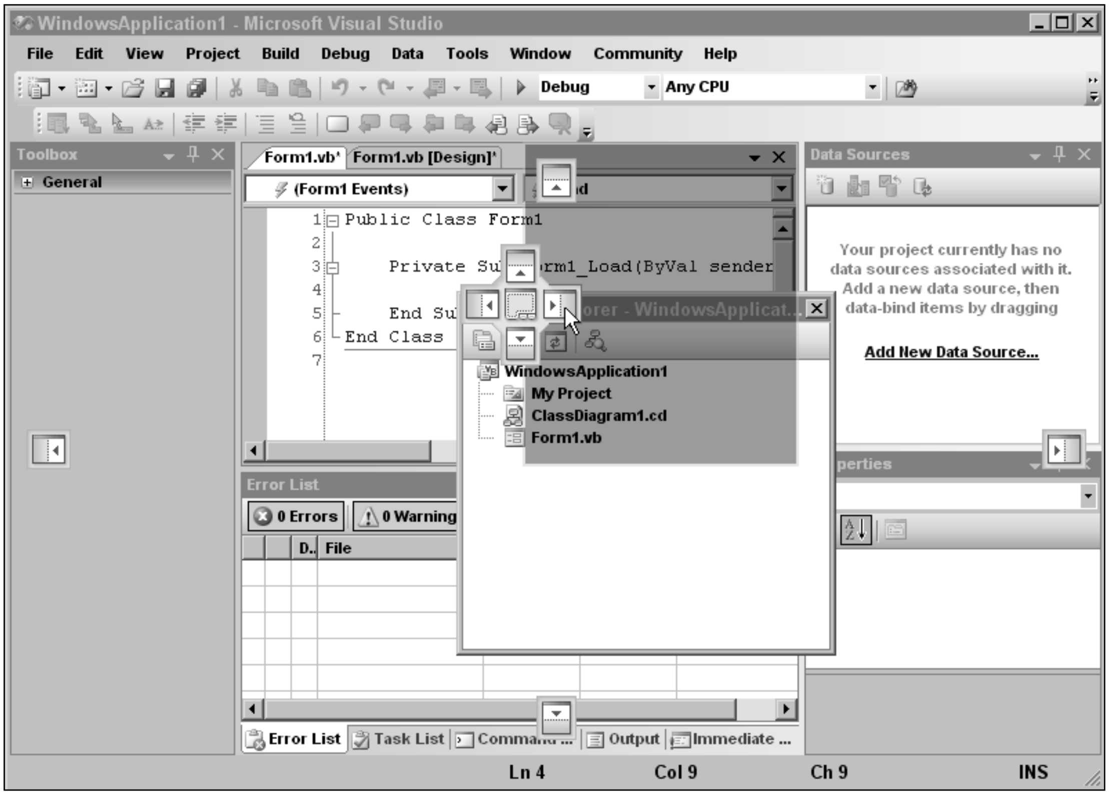
When you drag the window over another window, the IDE displays docking icons for the other window. In Figure 1-51, these are the five icons near the mouse in the middle of the screen. The four icons on the sides dock the window to the corresponding edge of the other window.

The center icon places the dropped window in a tab within the other window. If you look closely at Figure 1-51, you can see a little image of a document with two tabs on the bottom in this icon.

When you drag the mouse over one of the docking icons, the IDE displays a dark gray rectangle to give you an idea of where the window will land if you drop it. In Figure 1-51, the mouse is over the main document window's right docking icon, so the grayed rectangle shows the dropped window taking up the right half of the main document window.

If you drop a window somewhere other than on a docking icon, the window becomes free-floating.

Once you drop a window on the main document area, it becomes a tabbed document, and you cannot later pull it out. To free the window, select it and use the Window menu's Dockable or Floating command.


WindowsApplication1 - Microsoft Visual Studio
File Edit View Project Build Debug Data Tools Window Community Help
Debug
Any CPU
Toolbox
General
Form1.vb* Form1.vb [Design]*
(Form1 Events)
Data Sources
Add New Data Source...
WindowsApplication1
My Project
ClassDiagram1.cd
Form1.vb
Error List
0 Errors
0 Warning
D.. File
Error List Task List Comma... Output Immediate ...
Ln 4 Col 9 Ch 9 INS

```
Public Class Form1

    Private Su   rm1_Load(ByVal sender

    End Su
End Class
```

Your project currently has no data sources associated with it. Add a new data source, then data-bind items by dragging

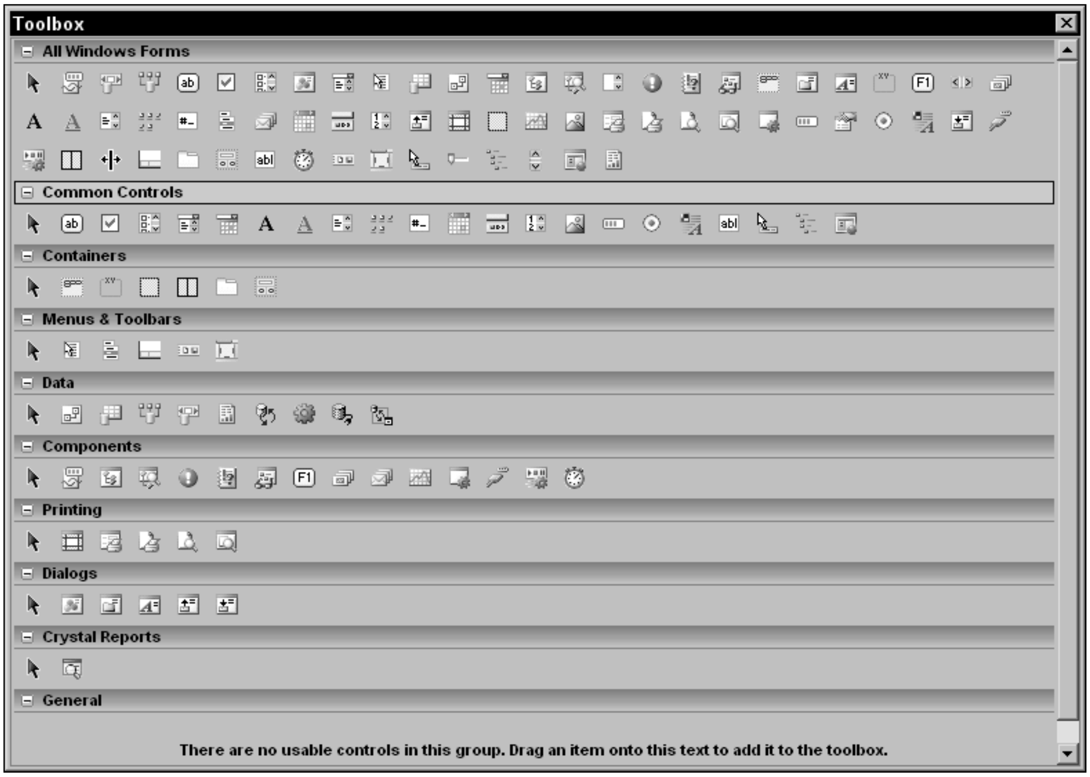
Figure 1-51: Use the IDE's docking icons to help you dock windows.

Sometimes the IDE is so cluttered with windows that it's hard to figure out exactly where the window will be dropped. It's usually fairly easy to just move the mouse around a bit and watch the grayed rectangle to see what's happening.

The windows in the Microsoft Document Explorer used by the MSDN Library and other external help files provides the same arranging and docking tools for managing its subwindows such as Index, Contents, Help Favorites, Index Results, and Search Results.

Toolbox

The Toolbox window displays a series of sections containing tools for the currently active document. These tools are grouped into sections called *tabs*, although they don't look much like the tabs on most documents. In Figure 1-52, the Toolbox displays tools for the form designer grouped into the All Windows Forms, Common Controls, Containers, Menus & Toolbars, Data, Components, Printing, Dialogs, and General tabs. In this figure, the Toolbox was enlarged greatly to show most of its contents. Most developers keep this window much smaller and docked on the left edge of the IDE.



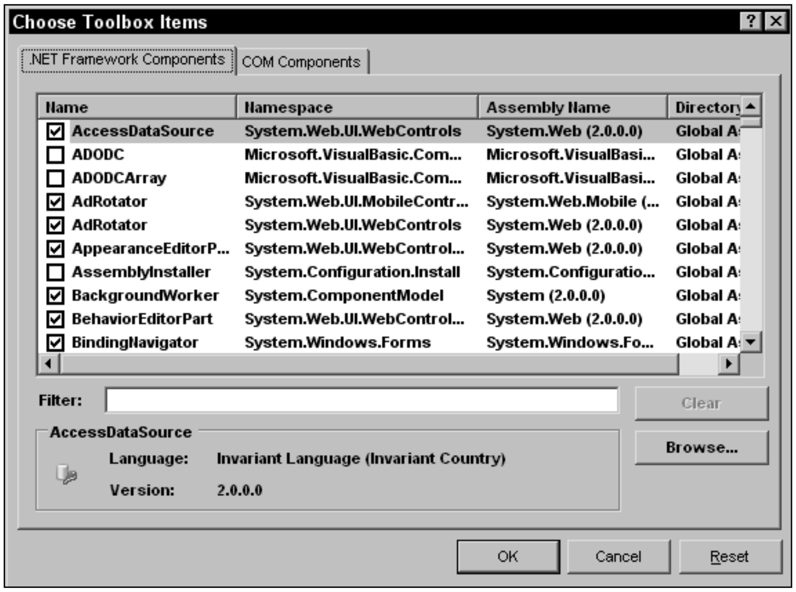
There are no usable controls in this group. Drag an item onto this text to add it to the toolbox.

Figure 1-52: The Toolbox window can display tools by name or icon.

You can customize the Toolbox by right-clicking on it and selecting one of the commands in the context menu. The following list briefly describes these commands.

- *List View* — Toggles the current tab to display tools either as a list of names or a series of icons.
- *Show All* — Shows or hides less commonly used tool tabs such as XML Schema, Dialog Editor, DataSet, Login, WebParts, Report Items, Device Controls, and many others.
- *Choose Items* — displays the dialog shown in Figure 1-53. Use the .NET Framework Components tab to select .NET tools, and use the COM Components tab to select COM tools. Click the Browse button to locate tools that are not in either list.
- *Sort Items Alphabetically* — Sorts the items within a Toolbox tab alphabetically.
- *Reset Toolbox* — Restores the Toolbox to a default configuration. This removes any items you may have added by using the Choose Items command.
- *Add Tab* — Creates a new tab where you can place your favorite tools. You can drag tools from one tab to another. Hold down the Ctrl key while dragging to add a copy of the tool to the new tab without removing it from the old tab.

- *Delete Tab* — Deletes a tab.
- *Rename Tab* — Lets you rename a tab.
- *Move Up, Move Down* — Moves a tab up or down in the Toolbox. You can also click and drag the tabs to new positions.



	Name	Namespace	Assembly Name	Directory
☑	AccessDataSource	System.Web.UI.WebControls	System.Web (2.0.0.0)	Global A:
☐	ADODC	Microsoft.VisualBasic.Com...	Microsoft.VisualBasi...	Global A:
☐	ADODCArray	Microsoft.VisualBasic.Com...	Microsoft.VisualBasi...	Global A:
☑	AdRotator	System.Web.UI.MobileContr...	System.Web.Mobile (...	Global A:
☑	AdRotator	System.Web.UI.WebControls	System.Web (2.0.0.0)	Global A:
☑	AppearanceEditorP...	System.Web.UI.WebControl...	System.Web (2.0.0.0)	Global A:
☐	AssemblyInstaller	System.Configuration.Install	System.Configuratio...	Global A:
☑	BackgroundWorker	System.ComponentModel	System (2.0.0.0)	Global A:
☑	BehaviorEditorPart	System.Web.UI.WebControl...	System.Web (2.0.0.0)	Global A:
☑	BindingNavigator	System.Windows.Forms	System.Windows.Fo...	Global A:

Filter:

AccessDataSource

Language: Invariant Language (Invariant Country)

Version: 2.0.0.0

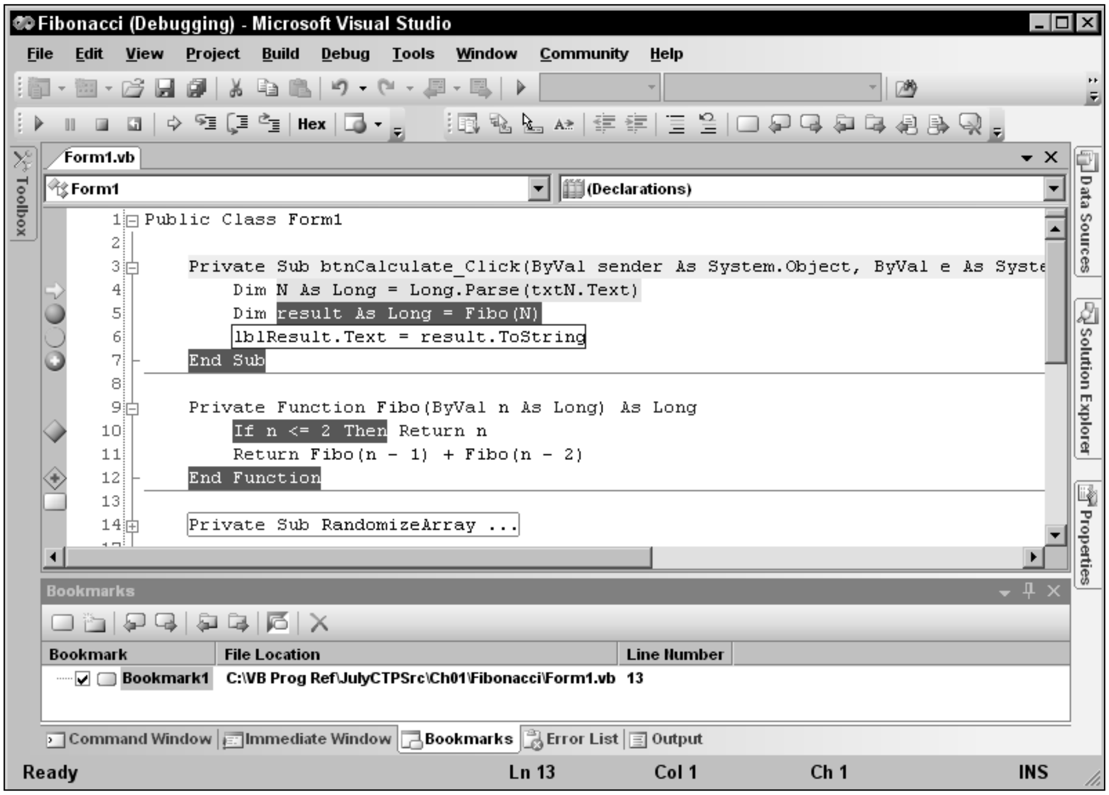
Figure 1-53: Use the Choose Toolbox Items dialog to select the tools in the Toolbox.

The Visual Basic Code Editor

Visual Studio includes editors for many different kinds of documents, including several different kinds of code. For example, it has Hypertext Markup Language (HTML), Extensible Markup Language (XML), and Visual Basic editors. These editors share some common features, such as displaying comments and keywords in different colors.

As a Visual Basic developer, you will use the Visual Basic code editor frequently, so you should spend a few minutes learning about its specialized features.

Figure 1-54 shows the code editor displaying some Visual Basic code at run time. To make referring to the code lines easier, this figure displays line numbers. To display line numbers, invoke the Tools menu's Options command, navigate to the Text Editor\Basic\General page, and check the Line Numbers box.



```
 1 Public Class Form1
 2
 3     Private Sub btnCalculate_Click(ByVal sender As System.Object, ByVal e As Syste
 4         Dim N As Long = Long.Parse(txtN.Text)
 5         Dim result As Long = Fibo(N)
 6         lblResult.Text = result.ToString
 7     End Sub
 8
 9     Private Function Fibo(ByVal n As Long) As Long
10         If n <= 2 Then Return n
11         Return Fibo(n - 1) + Fibo(n - 2)
12     End Function
13
14     Private Sub RandomizeArray ...
```

Bookmark	File Location	Line Number
✓ Bookmark1	C:\VB Prog Ref\JulyCTPSrc\Ch01\Fibonacci\Form1.vb	13

Figure 1-54: The Visual Basic code editor provides many features, including line numbers and icons that indicate breakpoints and bookmarks.

Margin Icons

The gray margin to the left of the line numbers contains icons giving information about the corresponding lines of code. The following table describes the icons on lines 4 through 11.

Line	Icon	Meaning
4	Yellow arrow	Indicates that execution is paused at this line
5	Red circle	Indicates a breakpoint
6	Hollow red circle	Indicates a disabled breakpoint
7	Red circle with plus sign	Indicates a breakpoint with a condition or hit count test
10	Red diamond	Indicates a breakpoint that executes an action when reached
11	Blue and white rectangle	Indicates a bookmark

These icons can combine to indicate more than one condition. For example, line 12 shows a blue and white rectangle to indicate a bookmark, a hollow red diamond to indicate a disabled breakpoint that performs an action, and a plus sign to indicate that the breakpoint has a condition or hit count test.

Note that the editor marks some of these lines in other ways than just an icon. It highlights the currently executing line with a yellow background. It marks lines that hold enabled breakpoints with white text on a red background.

To add or remove a simple breakpoint, click in the gray margin.

To make a more complex breakpoint, click in the margin to create a simple breakpoint. Then right-click the breakpoint icon and select one of the context menu's commands. The following list describes these commands.

- *Delete Breakpoint* — Removes the breakpoint.
- *Disable Breakpoint* — Disables the breakpoint. When the breakpoint is disabled, this command changes to Enable Breakpoint.
- *Location* — Lets you change the breakpoint's line number. Usually it is easier to click in the margin to remove the old breakpoint and then create a new one.
- *Condition* — Lets you place a condition on the breakpoint. For example, you can make the breakpoint stop execution only when the variable `num_employees` has a value greater than 100.
- *Hit Count* — Lets you set a hit count condition on the breakpoint. For example, you can make the breakpoint stop execution when it has been reached a certain number of times.
- *When Hit* — Lets you specify the action that the breakpoint performs when it triggers. For example, it might display a message in the Output window or run a macro.

To add or remove a bookmark, place the cursor on a line and then click the Toggle Bookmark tool. You can find this tool, which looks like the blue and white bookmark icon, in the Text Editor toolbar (under the mouse in Figure 1-54) and at the top of the Bookmarks window. Other bookmark tools let you move to the next or previous bookmark, the next or previous bookmark in the current folder, or the next or previous bookmark in the current document. The final bookmark command clears all bookmarks.

Outlining

By default, the code editor displays an outline view of code. If you look at the first line in Figure 1-54, you'll see a box with a minus sign in it just to the right of the line number. That box represents the outlining for the Form1 class. If you click this box, the editor collapses the class's definition and displays it as a box containing a plus sign. If you then click the new box, the editor expands the class's definition again.

The gray line leading down from the box leads to other code items that are outlined, and that you can expand or collapse to give you the least cluttered view of the code you want to examine. Near the bottom of Figure 1-54, you can see that the `RandomizeArray` subroutine has been collapsed. The ellipsis and rectangle around the routine name provided an extra indication that this code is hidden.

The editor automatically creates outlining entries for namespaces, classes and their methods, and modules and their methods. You can also use the `Region` statement to group a section of code for outlining. For example, you can place several related subroutines in a region so you can collapse and expand the routines as a group.

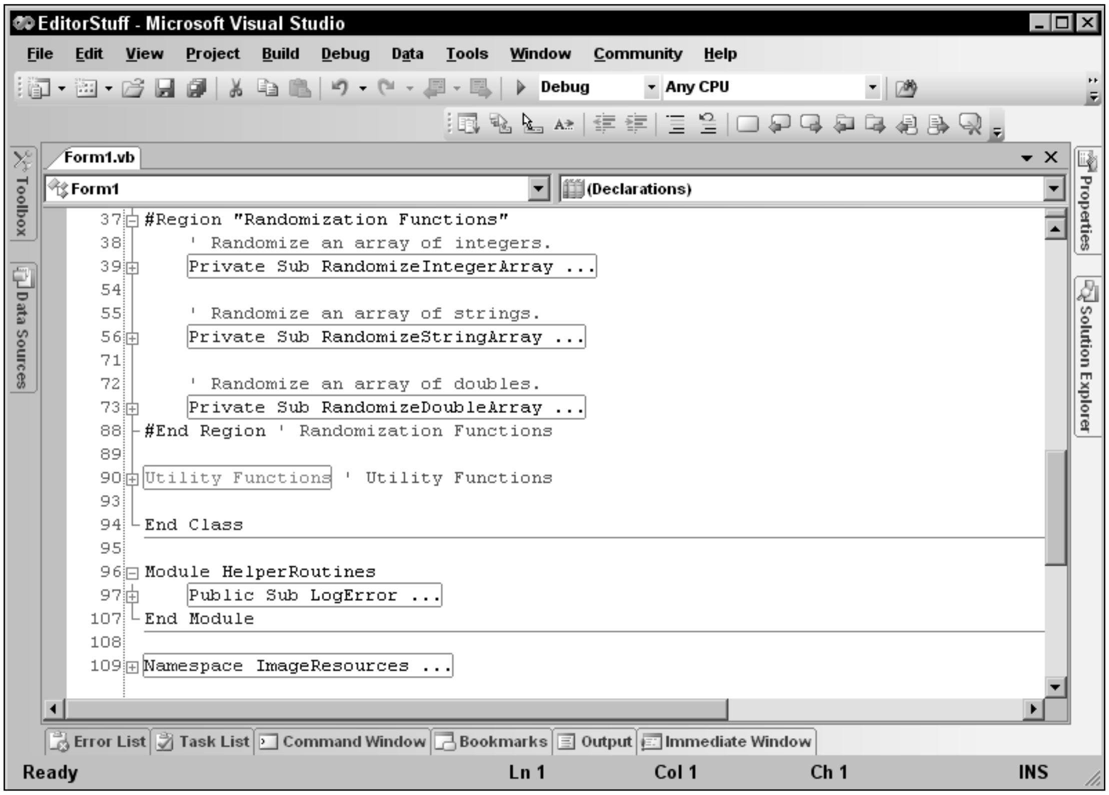
Figure 1-55 shows more examples of outlining. Line 37 begins a region named `Randomization Functions` that contains three collapsed subroutines. Notice that the corresponding `End Region` statement includes a comment giving the region's name. This is not required but it makes the code easier to understand when you are looking at the end of a region.

Line 90 contains a collapsed region named `Utility Functions`.

Line 96 starts a module named `HelperRoutines` that contains one collapsed subroutine.

Finally, Line 109 holds the collapsed `ImageResources` namespace.

Notice that the line numbers skip values for any collapsed lines. For example, the `RandomizeIntegerArray` subroutine is collapsed on line 39. This subroutine contains 15 lines (including the `Sub` statement), so the next visible line is labeled 54.



```
 37 #Region "Randomization Functions"
 38     ' Randomize an array of integers.
 39     Private Sub RandomizeIntegerArray ...
 54
 55     ' Randomize an array of strings.
 56     Private Sub RandomizeStringArray ...
 71
 72     ' Randomize an array of doubles.
 73     Private Sub RandomizeDoubleArray ...
 88 #End Region ' Randomization Functions
 89
 90 Utility Functions ' Utility Functions
 93
 94 End Class
 95
 96 Module HelperRoutines
 97     Public Sub LogError ...
107 End Module
108
109 Namespace ImageResources ...
```

Figure 1-55: The code editor outlines namespaces, classes and their methods, modules and their methods, and regions.

Also notice that comments before a subroutine are not collapsed with the subroutine. You can make reading collapsed code easier by placing a short descriptive comment before each routine.

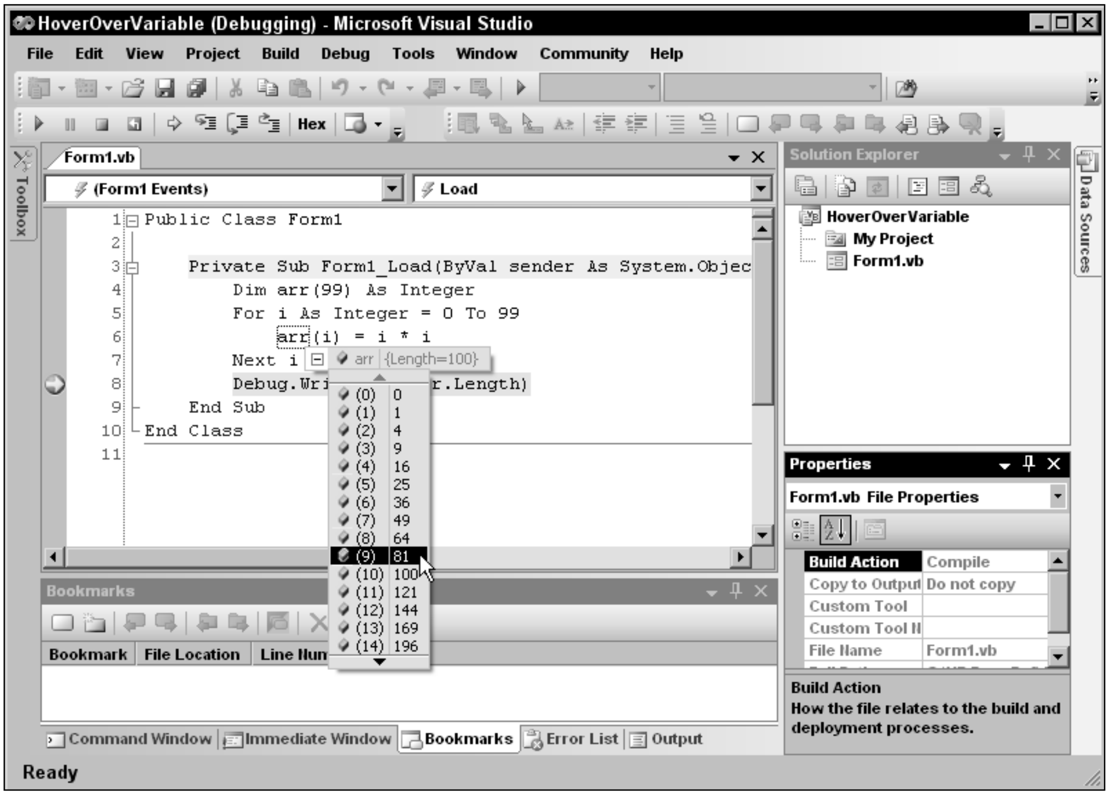
Tooltips

If you hover the mouse over a variable at design time, the editor displays a tooltip describing the variable. For example, if you hover over an integer variable named `num_actions`, the tooltip would display "Dim num_actions As Integer."

If you hover over a subroutine or function call, the tooltip displays information about that method. For example, if you hover over the `RandomizeArray` subroutine (which takes an array of integers as a parameter), the tooltip says, "Private Sub RandomizeArray(arr() As Integer)."

At run time, if you hover over a variable, the tooltip displays the variable's value. If the variable is complex (such as an array or structure), the tooltip displays the variable's name and a plus sign. If you click or hover over the plus sign, the tooltip expands to show the variable's members.

In Figure 1-56, the mouse hovered over variable `arr`. The editor displayed a plus sign and the text `arr {Length = 100}`. When the mouse hovered over the plus sign, the editor displayed the values shown in the figure. Moving the mouse over the up and down arrows at the top and bottom of the list makes the values scroll.


HoverOverVariable (Debugging) - Microsoft Visual Studio
File Edit View Project Build Debug Tools Window Community Help
Hex
Toolbox
Form1.vb
(Form1 Events)
Load
Solution Explorer
HoverOverVariable
My Project
Form1.vb
Data Sources
Bookmarks
Bookmark File Location Line Num
Command Window Immediate Window Bookmarks Error List Output
Ready

```
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Objec
        Dim arr(99) As Integer
        For i As Integer = 0 To 99
            arr(i) = i * i
        Next i
        Debug.Wri          r.Length)
    End Sub
End Class
```

```
arr {Length=100}
(0)  0
(1)  1
(2)  4
(3)  9
(4)  16
(5)  25
(6)  36
(7)  49
(8)  64
(9)  81
(10) 100
(11) 121
(12) 144
(13) 169
(14) 196
```

Properties

Form1.vb File Properties

Build Action	Compile
Copy to Output	Do not copy
Custom Tool	
Custom Tool N	
File Name	Form1.vb

Build Action
How the file relates to the build and deployment processes.

Figure 1-56: You can hover the mouse over a variable at run time to see its value.

If a variable has properties that are references to other objects, you can hover over their plus signs to expand those objects. You can continue following the plus signs to drill into the variable's object hierarchy as deeply as you like.

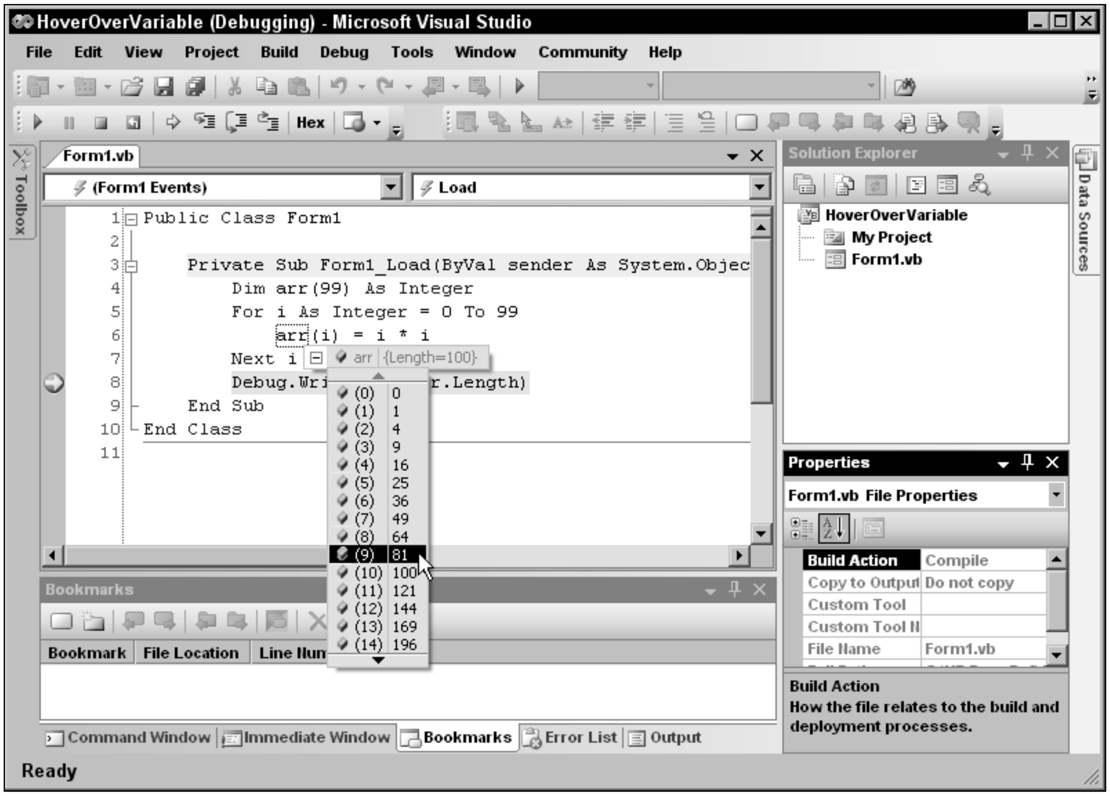
IntelliSense

If you start typing a line of code, the editor tries to anticipate what you will type. For example, if you type "Me." then the editor knows that you are about to use one of the current object's properties or methods.

IntelliSense displays a list of the properties and methods that you might be trying to select. As you type more of the property or method, IntelliSense scrolls to show the choices that match what you have typed.

In Figure 1-57, the code includes the text `me.Set`, so IntelliSense is displaying the current object's methods that begin with the string `Set`.

While the IntelliSense window is visible, you can use the up and down arrows to scroll through the list. While IntelliSense is displaying the item that you want to use, you can press the Tab key to accept that item. Press the Escape key to close the IntelliSense window and type the rest manually.



HoverOverVariable (Debugging) - Microsoft Visual Studio
File Edit View Project Build Debug Tools Window Community Help
Hex
Toolbox
Form1.vb
(Form1 Events)
Load
Solution Explorer
HoverOverVariable
My Project
Form1.vb
Data Sources
Properties
Form1.vb File Properties
Bookmarks
Bookmark File Location Line Num
Command Window Immediate Window Bookmarks Error List Output
Ready

```
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Objec
        Dim arr(99) As Integer
        For i As Integer = 0 To 99
            arr(i) = i * i
        Next i
        Debug.Wri           r.Length)
    End Sub
End Class
```

```
arr {Length=100}
(0)  0
(1)  1
(2)  4
(3)  9
(4)  16
(5)  25
(6)  36
(7)  49
(8)  64
(9)  81
(10) 100
(11) 121
(12) 144
(13) 169
(14) 196
```

Build Action	Compile
Copy to Output	Do not copy
Custom Tool	
Custom Tool N	
File Name	Form1.vb

Build Action
How the file relates to the build and deployment processes.

Figure 1-57: IntelliSense displays a list of properties and methods that you might be trying to type.

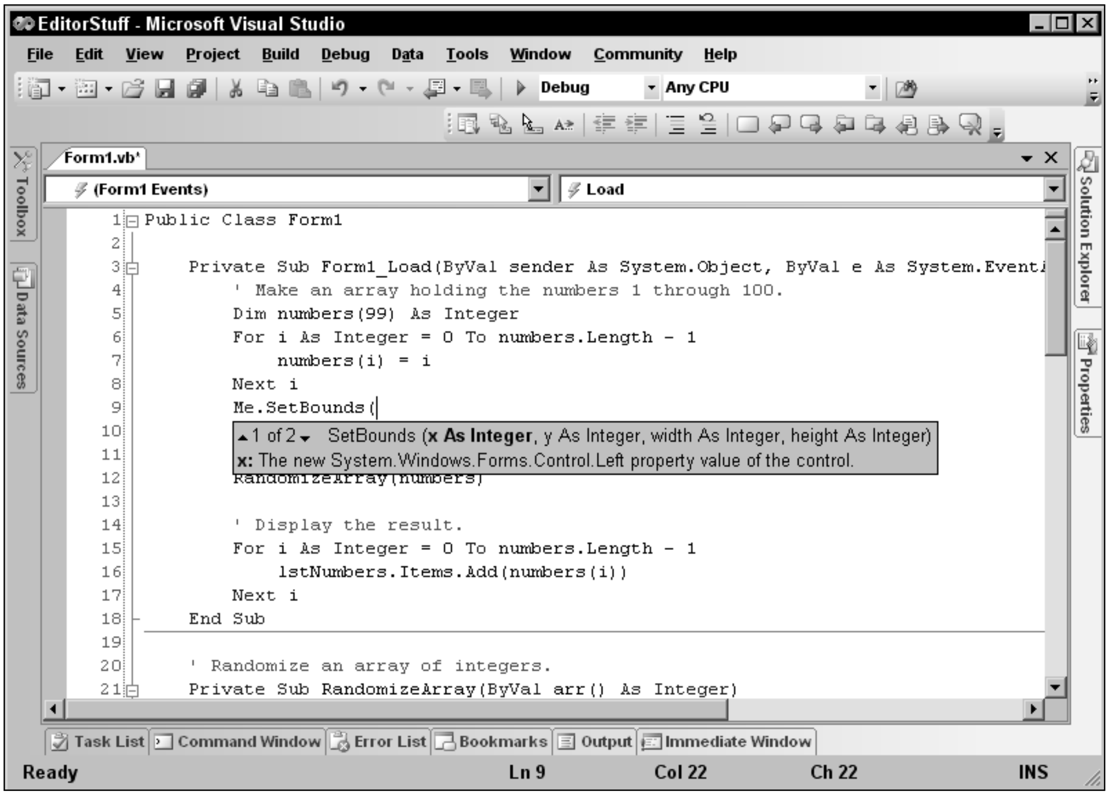
After you finish typing a method and its opening parenthesis, IntelliSense displays information about the method's parameters. Figure 1-58 shows parameter information for a form object's `SetBounds` method. This method takes four parameters: `x`, `y`, `width`, and `height`.

IntelliSense shows a brief description of the current parameter `x`. As you enter parameter values, IntelliSense moves on to describe the other parameters.

IntelliSense also indicates whether there are overloaded versions of the method. In Figure 1-58, IntelliSense is describing the first version of two available versions. You can use the up and down arrows on the left to move through the list of overloaded versions.

Code Coloring and Highlighting

The code editor displays different types of code items in different colors. You can change the colors used for different items by selecting the Tools menu's Options command, and opening the Environment\Fonts and Colors option page. To avoid confusion, however, you should probably leave the colors alone unless you have a good reason to change them.



```
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.EventA
        ' Make an array holding the numbers 1 through 100.
        Dim numbers(99) As Integer
        For i As Integer = 0 To numbers.Length - 1
            numbers(i) = i
        Next i
        Me.SetBounds(


        RandomizeArray(numbers)

        ' Display the result.
        For i As Integer = 0 To numbers.Length - 1
            lstNumbers.Items.Add(numbers(i))
        Next i
    End Sub

    ' Randomize an array of integers.
    Private Sub RandomizeArray(ByVal arr() As Integer)
```

▲1 of 2▼ SetBounds (**x As Integer**, y As Integer, width As Integer, height As Integer)
x: The new System.Windows.Forms.Control.Left property value of the control.

Figure 1-58: IntelliSense displays information about a method's parameters.

The following table describes some of the default colors that the code editor uses to highlight different code elements.

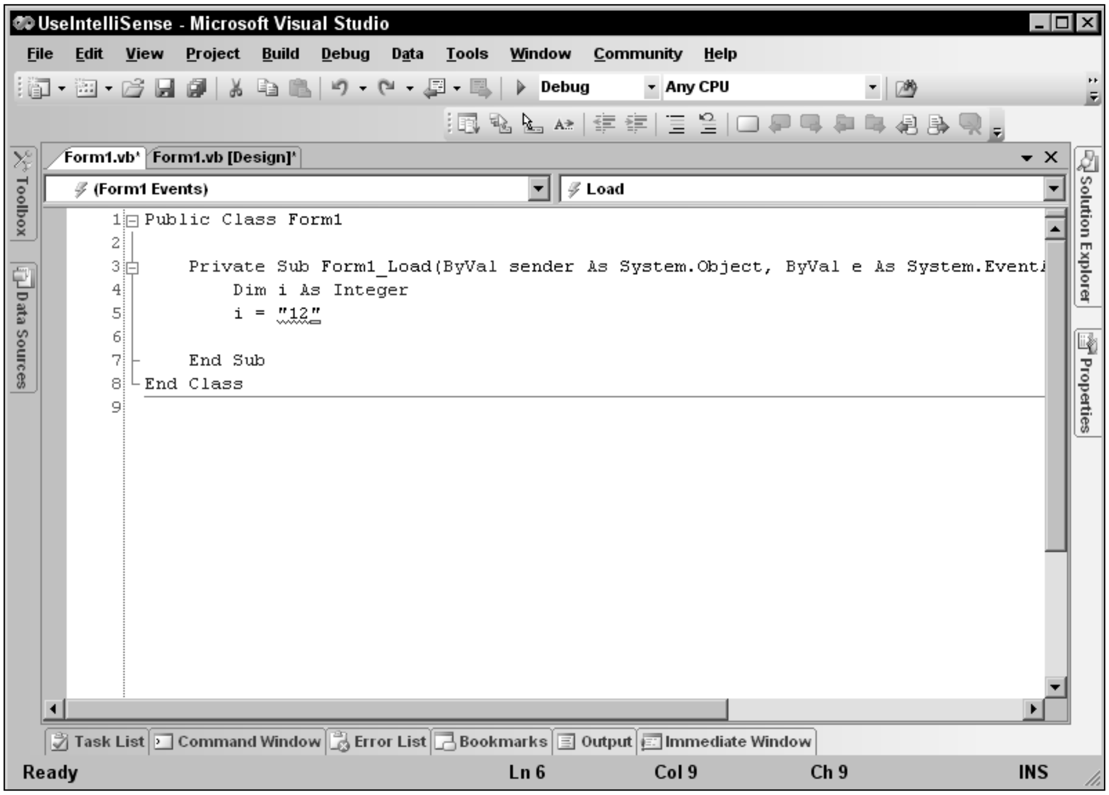
Item	Highlighting
Comment	Green text
Compiler error	Underlined with a wavy blue underline
Other error	Underlined with a wavy green underline
Keyword	Blue text
Preprocessor keyword	Blue text
Read-only region	Light gray background
Stale code	Purple text
User types	Navy text
User types, delegates	Navy text
User types, enums	Teal text
User types, interfaces	Navy text
User types, value types	Teal text
Warning	Underlined with a wavy purple underline

A few other items that may be worth changing have white backgrounds and black text by default. These include identifiers (variable names, types, object properties and methods, namespace names, and so forth), numbers, and strings.

When the code editor finds an error in your code, it highlights the error with a wavy underline. If you hover over the underline, the editor displays a tooltip describing the error. If Visual Studio can guess what you are trying to do, it adds a small flat rectangle to the end of the wavy error line to indicate that it may have useful suggestions.

The assignment statement `i = "12"` shown in Figure 1-59 has an error because it tried to assign a string value to an integer variable and that violates the Option Strict On setting. The editor displays the wavy error underline and a suggestion indicator because it knows a way to fix this error.

If you hover over the suggestion indicator, the editor displays a tooltip describing the problem and an error icon. If you click the icon, Visual Studio displays a dialog describing the error and listing the actions that you may want to take. Figure 1-60 shows the suggestion dialog for the error in Figure 1-59. If you click the text over the revised sample code, or if you double-click the sample code, the editor makes the change.



```
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.Event
        Dim i As Integer
        i = "12"

    End Sub
End Class
```

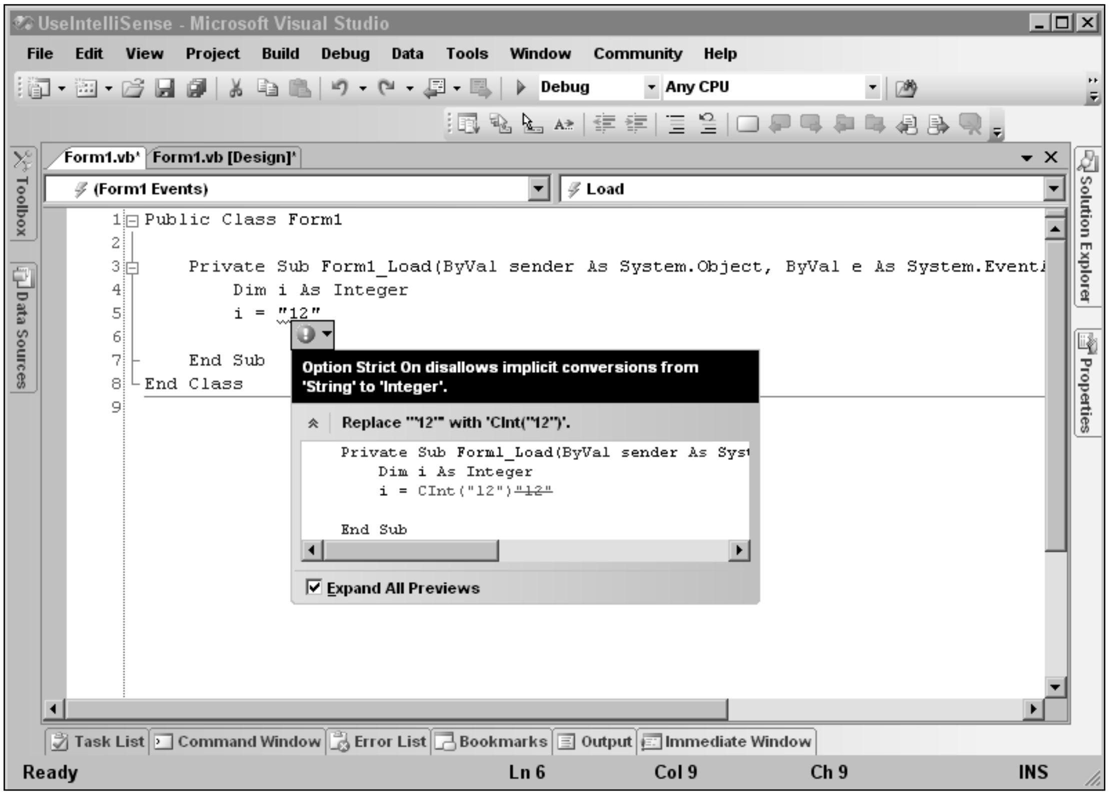
Figure 1-59: If the code editor can figure out what's wrong, it displays a suggestion indicator.

Code Snippets

A code snippet is a piece of code that you might find useful in many applications. It is stored in a snippet library so that you can quickly insert it into a new application.

Visual Studio comes with hundreds of snippets for performing standard tasks. Before you start working on a complicated piece of code, you should take a look at the snippets that are already available to you. In fact, it would be worth your time to use the Snippet Manager available from the Tools menu to take a good look at the available snippets right now before you start a new project. There's little point in you reinventing methods for calculating statistical values if someone has already done it and given you the code.

Snippets are stored in simple text files with XML tags, so it is easy to share snippets with other developers. Go to this book's Web page, `www.vb-helper.com/vbprogref.htm`, to contribute snippets and to download snippets contributed by others.



```
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.Eventi
        Dim i As Integer
        i = "12"

    End Sub
End Class
```

Option Strict On disallows implicit conversions from 'String' to 'Integer'.

Replace '"12"' with 'CInt("12")'.

```
Private Sub Form1_Load(ByVal sender As Syst
    Dim i As Integer
    i = CInt("12")~~"12"~~

End Sub
```

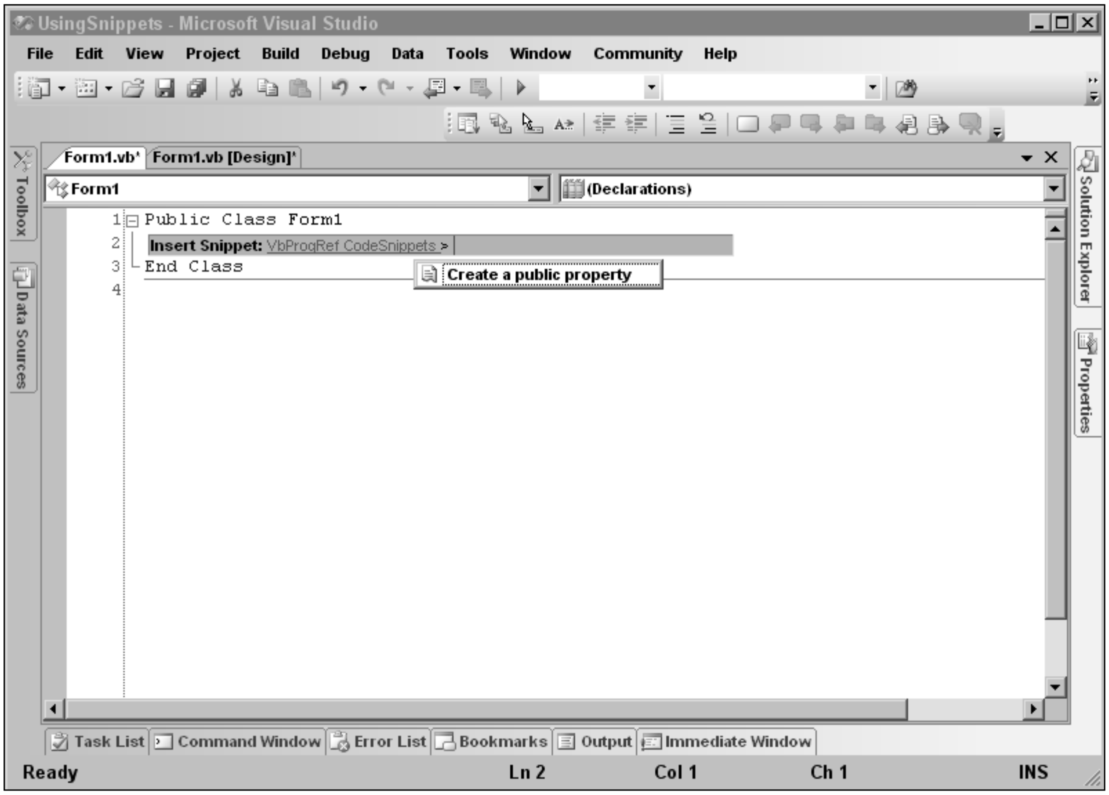
☑ Expand All Previews

Figure 1-60: The error suggestion dialog proposes likely solutions to an error.

The following sections explain how to use snippets in your applications and how to create new snippets.

Using Snippets

To insert a snippet, right-click where you want to insert the code and select Insert Snippet to make the editor display a list of snippet categories. Double-click a category to find the kinds of snippets that you want. If you select a snippet, a tooltip pops up to describe it. Figure 1-61 shows the editor preparing to insert the snippet named “Create a public property” from the “VbProgRef CodeSnippets” category.

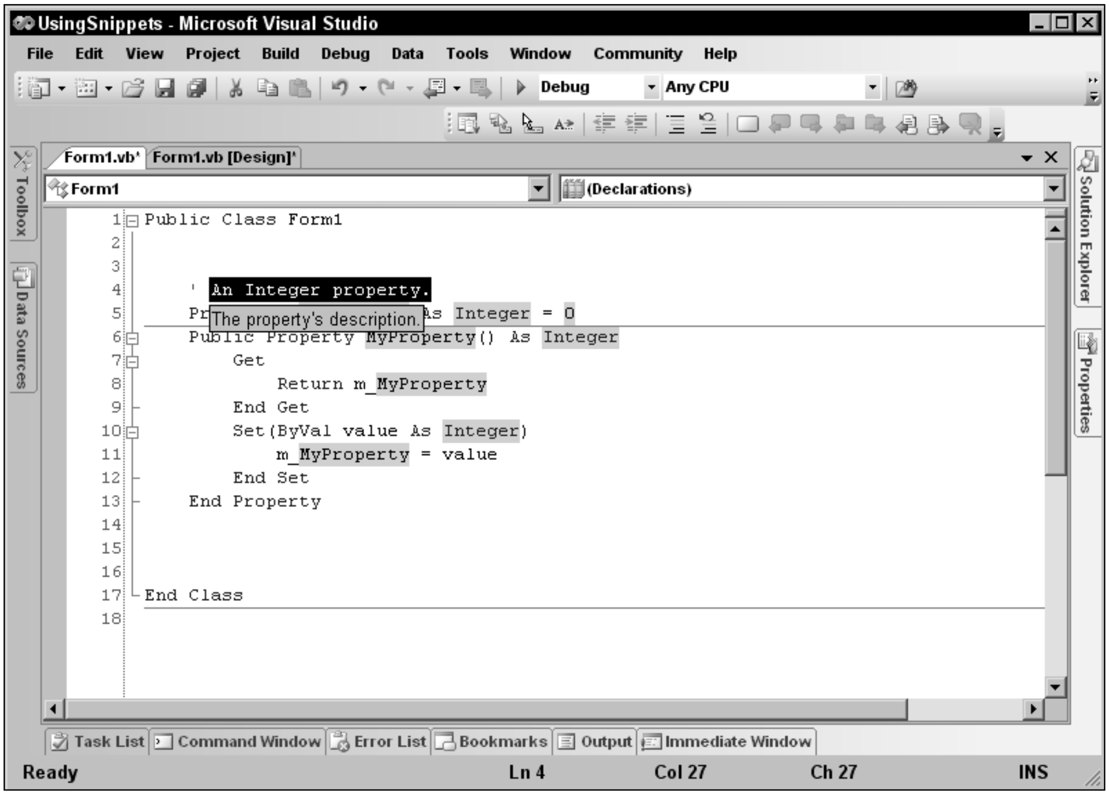


```
Public Class Form1
    Insert Snippet: VbProgRef CodeSnippets >
End Class
```

Figure 1-61: When you select a code snippet, a pop-up describes it.

Double-click on the snippet to insert it into your code. The snippet may include values that you should replace in your code. These replacement values are highlighted with a light green background, and the first value is initially selected. If you hover the mouse over one of these values, a tooltip appears to describe the value. You can use the Tab key to jump between replacement values.

Figure 1-62 shows the inserted code for this example. The text `An Integer Property` is highlighted and selected. Other selected text includes `Integer`, `0`, and `MyProperty`. The mouse is hovering over the value `An Integer Property`, so the tooltip explains that value's purpose.



```
Public Class Form1


    ' An Integer property.
    Pr The property's description. As Integer = 0
    Public Property MyProperty() As Integer
        Get
            Return m_MyProperty
        End Get
        Set(ByVal value As Integer)
            m_MyProperty = value
        End Set
    End Property



End Class
```

Figure 1-62: Values that you should replace in a snippet are highlighted.

Creating Snippets

To create a new snippet, you need to build an XML file containing the property tags to define the snippet and any replacements that the user should make. The following code shows the "Create a public property" snippet used in the previous section. The outer `CodeSnippets` and `CodeSnippet` tags are standard and you should not change them.

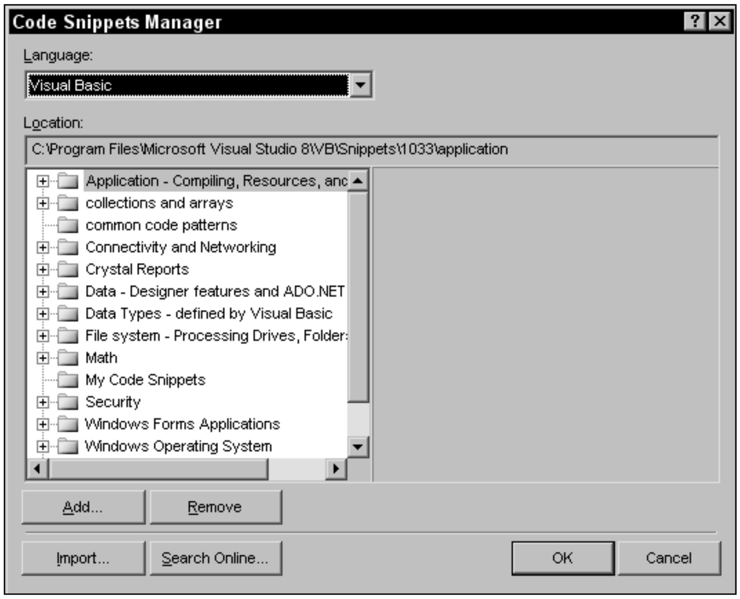
Use the `Title` tag in the `Header` section to describe the snippet.

Inside the `Snippet` tag, build a `Declarations` section describing any literal text that the user should replace. This example defines `DataType`, `Description`, `DefaultValue`, and `PropertyName` symbols. Each literal definition includes an `ID`, and can include a `ToolTip` and `Description`.

After the declarations, the `Code` tag contains the snippets source code. The syntax `<![CDATA[...]]>` tells XML processors to include any characters including carriage returns between the `<![CDATA[` and the `]]>` in the enclosing tag.

```
<CodeSnippets xmlns="http://schemas.microsoft.com/VisualStudio/2005/CodeSnippet">
    <CodeSnippet Format="1.0.0">
        <Header>
            <Title>Create a public property</Title>
        </Header>
        <Snippet>
            <Declarations>
                <Literal>
                    <ID>DataType</ID>
                    <ToolTip>The property's data type.</ToolTip>
                    <Default>Integer</Default>
                </Literal>
                <Literal>
                    <ID>Description</ID>
                    <ToolTip>The property's description.</ToolTip>
                    <Default>An Integer property.</Default>
                </Literal>
                <Literal>
                    <ID>DefaultValue</ID>
                    <ToolTip>The property's default value.</ToolTip>
                    <Default>0</Default>
                </Literal>
                <Literal>
                    <ID>PropertyName</ID>
                    <ToolTip>The property's name.</ToolTip>
                    <Default>MyProperty</Default>
                </Literal>
            </Declarations>
            <Code Language="VB">
                <![CDATA[
    ' $Description$
    Private m_$PropertyName$ As $DataType$ = $DefaultValue$
    Public Property $PropertyName$() As $DataType$
        Get
            Return m_$PropertyName$
        End Get
        Set(ByVal value As $DataType$)
            m_$PropertyName$ = value
        End Set
    End Property
]]>
            </Code>
        </Snippet>
    </CodeSnippet>
</CodeSnippets>
```

Save the snippet's XML definition in a snippet directory. To add the directory to the list of usable snippet locations, select the Tool menu's Code Snippets Manager command to display the tool shown in Figure 1-63. Click the Add button, browse to the new snippet directory, and click OK. Now the directory and the snippets that it contains will be available in the Insert Snippet pop-ups.


Code Snippets Manager
Application - Compiling, Resources, anc
collections and arrays
common code patterns
Connectivity and Networking
Crystal Reports
Data - Designer features and ADO.NET
Data Types - defined by Visual Basic
File system - Processing Drives, Folder:
Math
My Code Snippets
Security
Windows Forms Applications
Windows Operating System
Add...
Remove
Import...
Search Online...
OK
Cancel

Language: Visual Basic

Location: C:\Program Files\Microsoft Visual Studio 8\VB\Snippets\1033\application

Figure 1-63: The Code Snippets Manager lets you add and remove snippet directories.

The Code Editor at Run Time

The code editor behaves slightly differently at run time and design time. Many of its design time features still work. Breakpoints, bookmarks, IntelliSense, and snippets still work.

At run time, the editor adds new tools for controlling the program's execution. Right-click on a value and select Add Watch or QuickWatch to examine and monitor the value. Use the Stop Into, Step Over, and Step Out commands on the Debug menu or toolbar to make the program walk through the code.

Right-click on a statement and select Show Next Statement to move the cursor to the next statement that the program will execute. Select Run To Cursor to make the program continue running until it reaches the cursor's current line.

Right-click and select Set Next Statement to make the program jump to a new location. You can also drag the yellow arrow indicating the next statement to a new location in the left margin. There are some restrictions on where you can move the execution position. For example, you cannot jump out of one routine and into another.

You can discover other run-time features by exploring the editor at run time. Right-click on different parts of the editor to see which commands are available in that mode.

Summary

The Visual Studio integrated development environment provides many tools for writing and debugging applications. It provides code snippets that make saving and reusing code easy. It lets you add, remove, and disable complex breakpoints that check conditions and hit counts, and that can perform customized actions. You can use regions and bookmarks to organize and find pieces of code, and you can step through the code line by line at execution time.

The IDE is extremely flexible. You can show, hide, and rearrange windows; add and remove items from menus and toolbars; and write macros to automate simple chores. Context menus attached to all sorts of objects provide help, tools, and other features that make sense for their particular objects and under different situations.

This chapter describes some of the most useful parts of the IDE, but listing every last nook and cranny would be tedious and not terribly useful. Rather than reading about the IDE further, you would be better off experimenting with it. Spend a few hours really examining all of the menus. Create a snippet with some replacement values and then insert it into your code. Step through a small program and try the Immediate and Command windows.

While you do all this, and while you're developing real applications, right-click on things to see what sort of context menus they provide. The IDE is packed with so many tools that it is sometimes hard to find the one you want. Because context menus are tied closely to the objects that you click to display them, they often provide more appropriate and focused commands than the toolbars or menus.

After you have used the IDE for a while and are comfortable with it, customize it to match your preferences. Build custom toolbars and menus to make using your favorite tools easier. When you have the tools that you use most at your fingertips, you will see just how productive Visual Studio can be.

Once you have become familiar with the IDE, you can start building applications. One way to begin is to design the application's user interface: the forms, labels, text boxes, and other controls that the user sees and manipulates to control the application. Chapter 2, "Controls in General," describes controls in general terms. It explains what controls are, how you can add them to a form, and how you can control and interact with them at design time and run time.