

# Microsoft Visual Basic 2005: Developing Applications

## Table of Contents

INTRODUCTION .....	INTRO-1
Prerequisites .....	INTRO-2
Installing the Practice Files .....	INTRO-3
Software Requirements .....	INTRO-3
Sample Database .....	INTRO-3
Security .....	INTRO-4
Installation .....	INTRO-4
About the Authors .....	INTRO-5
INTRODUCTION TO WINDOWS FORMS .....	1-1
.NET Does Windows .....	1-2
Adding Controls to a Form .....	1-6
Investigating Snap Lines .....	1-7
Adjusting Control Sizes and Positions .....	1-8
Controlling Tab Order .....	1-10
A Peek behind the Scenes .....	1-12
Viewing the Code .....	1-12
Adding Event Handling Code .....	1-19
Adding a Menu to the Form .....	1-21
Adding Non-Graphical Components .....	1-27
The ToolTip Component .....	1-27
The Timer Component .....	1-29
LAB 1: INTRODUCTION TO WINDOWS FORMS .....	1-35
Lab 1 Overview .....	1-36
Create a Windows Application .....	1-37
Anchor the Controls .....	1-41
Add Event-Handling Code .....	1-43
TAKING ADVANTAGE OF THE FORM EVENT MODEL .....	2-1
How Visual Basic Handles Events .....	2-2
Working with Events .....	2-2
Working with Forms .....	2-7
Peeking under the Event “Covers” .....	2-14
Exploring Form and Control Events .....	2-29

Form Events.....	2-29
Keyboard Events.....	2-32
Mouse Events .....	2-39
Control Events .....	2-42
Validating User Input.....	2-43
<b>LAB 2: TAKING ADVANTAGE OF THE FORM EVENT MODEL.....</b>	<b>2-53</b>
Lab 2 Overview.....	2-54
Creating an Event Handler Using Visual Studio .....	2-55
Creating a Dynamic Event Handler .....	2-57
<b>COMMON WINDOWS FORMS CONTROLS.....</b>	<b>3-1</b>
Windows Forms Controls.....	3-2
Label Control.....	3-3
TextBox Control .....	3-8
Button Control .....	3-15
CheckBox Control .....	3-20
RadioButton Control.....	3-22
ComboBox Control.....	3-26
ListBox Control.....	3-30
CheckedListBox Control .....	3-31
LinkLabel Control .....	3-34
NumericUpDown Control .....	3-35
PictureBox Control .....	3-37
ProgressBar Control .....	3-40
<b>LAB 3: COMMON WINDOWS FORMS CONTROLS.....</b>	<b>3-47</b>
Lab 3 Overview.....	3-48
Create a Simple Data Entry Form.....	3-49
Modify the Data Entry Form.....	3-54
Add Validation to the Data Entry Form .....	3-58
<b>EXCEPTION HANDLING .....</b>	<b>4-1</b>
Perspectives on Exception Handling .....	4-2
Exception Handling in .NET .....	4-2
The Demonstration Code.....	4-4
Getting Started with Exception Handling .....	4-5
No Error Handling .....	4-5
Adding a Simple Try/Catch Block .....	4-8
Unhandled Exceptions.....	4-9
Using an Exception Object.....	4-10

Catching Specific Exceptions .....	4-14
Taking Advantage of the Exception Hierarchy .....	4-16
Raising Errors .....	4-19
Using the Throw Keyword .....	4-19
Exception-Handling Options .....	4-20
Passing Error Information .....	4-21
Running Code Unconditionally .....	4-24
The Finally Block.....	4-24
Cleaning Up: The <i>Using</i> Statement .....	4-25
Handling Unhandled Exceptions.....	4-27
Creating Exception Classes.....	4-30
LAB 4: EXCEPTION HANDLING .....	4-37
Lab 4 Overview.....	4-38
Add Simple Exception Handling .....	4-40
Handle Individual Exceptions.....	4-42
Add Code Running Unconditionally .....	4-44
WORKING WITH STRINGS AND DATES .....	5-1
Basic .NET Data Types .....	5-2
Working with Text: The String Class.....	5-3
Investigating the String Class .....	5-3
Creating Strings .....	5-4
String Properties .....	5-4
Shared String Methods .....	5-6
Instance String Methods .....	5-10
Manipulating Text with the StringBuilder Class.....	5-13
Working with Dates and Times .....	5-17
DateTime Constructors .....	5-17
Shared Members .....	5-19
Simple Properties.....	5-20
Conversion Methods .....	5-21
Calculation Methods .....	5-22
Shared Methods.....	5-23
Using the DateTime Type .....	5-24
Handling Elapsed Times with the TimeSpan Type .....	5-29
Measuring Elapsed Time .....	5-34
LAB 5: WORKING WITH STRINGS AND DATES .....	5-41
Lab 5 Overview.....	5-42

Work with Strings.....	5-43
Work with the StringBuilder Class .....	5-47
Use Stopwatch and TimeSpan to Measure Elapsed Time .....	5-50
ACCESSING DATA.....	6-1
Overview of ADO.NET .....	6-2
ADO.NET Classes .....	6-2
The ADO.NET Architecture.....	6-3
Creating ADO.NET Data Objects.....	6-4
Connecting to Data .....	6-9
Setting Up Connection Information .....	6-9
Creating Connection Strings in the Configuration File .....	6-12
Using the Connection Object .....	6-14
Executing Commands.....	6-17
Working with Data Readers .....	6-17
Using the SqlDataReader .....	6-18
Working with Data.....	6-22
Working with Data Using a Data Adapter .....	6-22
Managing Data with the DataSet Object.....	6-22
Filling a DataTable within a DataSet.....	6-24
Filling a DataTable from SQL Server .....	6-27
Choosing an ADO.NET Provider .....	6-31
The SQL Server .NET Data Provider.....	6-31
The OLE DB .NET Data Provider .....	6-31
The ODBC Data Provider .....	6-32
Writing Code for Multiple Providers .....	6-32
LAB 6: ACCESSING DATA .....	6-43
Lab 6 Overview.....	6-44
Create a Connection String in the Configuration File .....	6-45
Use the DataReader to Fill a ListBox with Categories.....	6-47
Use a DataSet to Fill a DataGridView with Products .....	6-50
DATA BINDING TECHNIQUES .....	7-1
Data Binding Basics.....	7-2
Creating a Data Source .....	7-3
The Data Sources Window .....	7-7
Creating Data-Bound Forms.....	7-9
Data Binding Components and Controls .....	7-13

The DataSet.....	7-13
The TableAdapter .....	7-15
The BindingSource Component.....	7-17
The BindingNavigator Control.....	7-19
Displaying Data from Related Tables .....	7-21
Displaying Data from Lookup Tables.....	7-25
Adding Search Capabilities to a Form .....	7-28
Filtering by Values from a Lookup Table .....	7-35
Data Validation .....	7-40
Determining Whether the User Made Changes .....	7-40
Validating Data at the Form Level.....	7-43
Validating Data at the Data Level .....	7-45
Working with Local Data .....	7-50
<b>LAB 7: DATA BINDING TECHNIQUES.....</b>	<b>7-57</b>
Lab 7 Overview.....	7-58
Create a Simple Data-Bound Form .....	7-59
Search and Filter Based on Criteria.....	7-69
Validate Data .....	7-77
<b>USING THE DATA CONTROLS .....</b>	<b>8-1</b>
Data Controls.....	8-2
The BindingNavigator Control.....	8-3
BindingNavigator ToolStripItems .....	8-3
Built-In and Custom Functionality .....	8-5
Adding a BindingNavigator Control to a Form .....	8-6
The BindingSource Component.....	8-8
Data Navigation .....	8-8
Data Manipulation .....	8-10
Sorting and Filtering.....	8-11
Working with the Underlying Data.....	8-12
Working with Related Data .....	8-16
The DataGridView Control.....	8-20
Customizing How Data is Displayed.....	8-20
Formatting Cells at Runtime .....	8-25
Displaying Calculated Values .....	8-27
Displaying Images.....	8-29
Adding Controls to a DataGridView .....	8-32
The ReportViewer Control .....	8-35

Creating and Viewing Reports .....	8-35
Local and Remote Report Processing .....	8-40
LAB 8: USING THE DATA CONTROLS.....	8-45
Lab 8 Overview .....	8-46
Navigation and Data Manipulation with the BindingSource Component .....	8-47
Formatting the DataGridView Control.....	8-53
Displaying Reports with the ReportViewer Control.....	8-61
HANDLING INPUT/OUTPUT TASKS.....	9-1
Introducing the System.IO Namespace .....	9-2
Selecting Files .....	9-4
Browsing for Folders.....	9-13
Handling Path Information .....	9-17
Working with Directories and Files .....	9-21
Retrieving Information about Drives.....	9-23
Investigating the Objects.....	9-25
Calling Methods of the Directory Class.....	9-28
Filling the TreeView .....	9-30
Displaying Drive, File, and Directory Information.....	9-34
Using Stream-Based Objects to Read and Write File Contents .....	9-39
Reading and Writing Text Files.....	9-40
Investigating the Code .....	9-41
Alternate Solutions.....	9-45
Writing to Files Using the StreamWriter .....	9-45
LAB 9: HANDLING INPUT/OUTPUT TASKS.....	9-51
Lab 9 Overview .....	9-52
Browse for Files .....	9-53
Display Selected File Information .....	9-55
Load File Contents.....	9-57
PROJECT SETTINGS IN VISUAL STUDIO 2005.....	10-1
The Project Designer .....	10-2
Application Properties.....	10-3
Assembly Name.....	10-3
Root Namespace .....	10-4
Icon .....	10-4
Startup Form .....	10-4

Assembly Information .....	10-5
Application Framework Properties .....	10-7
Application Events .....	10-8
Compilation Properties .....	10-11
Conditional Compilation .....	10-12
Option Explicit and Option Strict .....	10-14
Compiler Errors and Warnings.....	10-14
Build Events .....	10-16
Debugging Properties .....	10-17
Start Action .....	10-17
Start Options .....	10-18
Enable Debuggers .....	10-18
Project References .....	10-20
Adding Project References .....	10-21
Unused References .....	10-25
Imported Namespaces.....	10-26
Project Resources .....	10-28
Project Settings.....	10-32
LAB 10: PROJECT SETTINGS IN VISUAL STUDIO 2005 .....	10-39
Lab 10 Overview .....	10-40
Application Behavior and Appearance.....	10-41
Building the Project.....	10-45
Project Resources and Settings .....	10-50
WORKING WITH THE MY NAMESPACE.....	11-1
The My Namespace.....	11-2
My.Application .....	11-3
My.Application.Info.....	11-6
My.Application.Log.....	11-8
My.Computer .....	11-11
My.Computer.Screen .....	11-11
My.Computer.Audio .....	11-12
My.Computer.Clipboard .....	11-14
My.Computer.Clock .....	11-15
My.Computer.FileSystem.....	11-16
My.Computer.Info .....	11-19
My.Computer.Keyboard .....	11-20
My.Computer.Network .....	11-21

My.Computer.Registry .....	11-22
My.User .....	11-24
My.Forms.....	11-25
My.Resources.....	11-26
My.Settings.....	11-28
My.WebServices.....	11-30
LAB 11: WORKING WITH THE MY NAMESPACE.....	11-37
Lab 11 Overview.....	11-38
Working with the File System .....	11-39
Using the My.Application Object.....	11-47
Using the My.User and My.Computer Objects .....	11-50
DEBUGGING YOUR APPLICATIONS.....	12-1
Debugging Applications.....	12-2
Setting Breakpoints and Stepping through Code.....	12-3
Setting a Breakpoint.....	12-3
Continuing Program Execution .....	12-5
Setting Conditional Breakpoints.....	12-5
Specifying a Breakpoint Hit Count .....	12-7
Setting a Breakpoint on a Function.....	12-7
Breakpoints Window .....	12-9
Breaking on Exceptions .....	12-9
Debugging Code in Assemblies.....	12-12
Stepping into Code in an Assembly .....	12-12
Stepping into Code Written in another Language.....	12-14
Evaluating Variables and Objects.....	12-15
DataTips and Visualizers .....	12-15
Using the Watch Window and QuickWatch Dialog Box .....	12-18
Using the Locals Window.....	12-20
Using the Autos Window.....	12-22
Using the Immediate Window .....	12-22
Edit and Continue .....	12-24
Tracing Applications .....	12-28
Trace Sources.....	12-28
Trace Switches .....	12-32
Trace Listeners .....	12-33
Trace Filtering .....	12-36
Using Configuration Files to Control Tracing .....	12-38



LAB 12: DEBUGGING YOUR APPLICATIONS .....	12-45
Lab 12 Overview .....	12-46
Setting Breakpoints and Stepping Through Code .....	12-47
Evaluating Expressions and Using Edit and Continue.....	12-52
Tracing Applications .....	12-60
CONTAINER CONTROLS .....	13-1
Introducing Container Controls .....	13-2
Working with Container Controls .....	13-3
Creating the Switchboard Form .....	13-3
Grouping Controls with the GroupBox Control .....	13-7
GroupBox Control Members .....	13-7
BackgroundImage and BackColor Properties .....	13-11
Visible, Enabled, and Font Properties.....	13-11
Introducing the Panel Control .....	13-13
BorderStyle Property.....	13-13
Scrolling Features .....	13-14
Displaying Multiple Panels with the SplitContainer Control .....	13-16
Orientation Property .....	13-17
IsSplitterFixed Property.....	13-18
SplitterWidth Property .....	13-18
SplitterDistance Property .....	13-18
FixedPanel Property .....	13-18
Panel1MinSize and Panel2MinSize Properties.....	13-19
Panel1Collapsed and Panel2Collapsed Properties .....	13-20
SplitContainer Control Events.....	13-20
Laying out Panels with the TabControl Control .....	13-23
Working with Tab Pages .....	13-25
Alignment Property .....	13-26
Appearance Property .....	13-26
MultiLine Property .....	13-27
SizeMode Property .....	13-28
ShowToolTips Property.....	13-30
Informational Properties.....	13-31
Adding Tab Pages .....	13-32
TabControl Events .....	13-32
Simple Layout Using the FlowLayoutPanel Control.....	13-34
Working with the FlowLayoutPanel Control .....	13-37
FlowLayoutPanel Control Properties .....	13-41

Advanced Layout Using the TableLayoutPanel Control .....	13-45
Getting Started with the TableLayoutPanel Control .....	13-45
Setting Row and Column Styles .....	13-47
Positioning New Controls .....	13-50
Adding Controls Programmatically .....	13-50
Working with Other Properties .....	13-52
Laying out the Columns or Rows .....	13-53
TableLayoutPanel Control Extender Properties .....	13-56
TableLayoutPanel Control Methods .....	13-60
LAB 13: CONTAINER CONTROLS .....	13-67
Lab 13 Overview .....	13-68
Lay Out a Panel Control .....	13-69
Use the SplitContainer Control .....	13-72
Work with the TableLayoutPanel Control .....	13-74
MENUS AND TOOLBARS .....	14-1
Introducing the 'Strips .....	14-2
Adding Menu Images .....	14-6
Using Visual Studio's Automatic Menus .....	14-8
The ToolStrip Control .....	14-9
The StatusStrip Control .....	14-12
The ContextMenuStrip Control .....	14-16
The ToolStripContainer Control .....	14-17
Working with a ToolStripItem .....	14-20
ToolStripItem Display Styles .....	14-22
Making and Saving Runtime Customizations .....	14-23
ToolStrip Layout Issues and Overflow .....	14-28
Working with the 'Strips .....	14-32
RichTextBox Demo .....	14-32
WebBrowser Demo .....	14-36
LAB 14: MENUS AND TOOLBARS .....	14-45
Lab 14 Overview .....	14-46
Add the MenuStrip .....	14-47
Add the ToolStrip .....	14-49
Add the StatusStrip .....	14-51
CREATING MDI APPLICATIONS .....	15-1
MDI Applications .....	15-2
Child Windows .....	15-3

Creating an MDI Application .....	15-3
MDI Parent and Child Forms .....	15-4
MDI Parent Form .....	15-4
MDI Child Forms .....	15-5
Managing Open Windows.....	15-8
Automatically Creating a Window List.....	15-8
Manually Creating a Window List.....	15-9
Arranging Open Windows .....	15-10
Managing Menus .....	15-14
Merging Menus .....	15-14
Design Considerations.....	15-19
Working with Open Forms .....	15-22
Handling the mdiChildActivate Event.....	15-22
Handling Edit and Format Menu Items .....	15-23
Passing Data between Open Forms .....	15-26
Handling Form Closing .....	15-28
LAB 15: CREATING MDI APPLICATIONS .....	15-35
Lab 15 Overview .....	15-36
Create the Parent and Child Forms .....	15-37
Manage Menus and Open Windows.....	15-39
Work with Open Forms .....	15-47
COMPLEX WINDOWS FORMS CONTROLS.....	16-1
Introducing Complex Controls .....	16-2
NotifyIcon Control .....	16-3
Investigating the Sample Form .....	16-5
WebBrowser Control.....	16-10
Investigating the Sample Form .....	16-12
Investigating WebBrowser Navigation .....	16-13
Displaying Dialog Boxes .....	16-15
Reacting to Environment Changes .....	16-16
In Summary.....	16-21
MaskedTextBox Control .....	16-22
Operation of the MaskedTextBox Control.....	16-23
Reacting to the MaskInputRejected Event.....	16-28
Status Properties .....	16-29
In Summary.....	16-30
RichTextBox Control.....	16-31

Handling State .....	16-32
Undo and Redo.....	16-36
Working with the Clipboard.....	16-39
Working with Fonts and Styles.....	16-40
Formatting Text.....	16-44
Working with Zoom, Links, and More.....	16-48
TreeView and ListView Controls.....	16-50
TreeView Control .....	16-52
ListView Control.....	16-61
Setting Up the Images .....	16-64
Filling the List of Files .....	16-66
Working with ListView Items .....	16-68
Showing Items in Groups.....	16-70
Sorting the Columns .....	16-74
MonthCalendar and DateTimePicker Controls .....	16-81
The MonthCalendar Control.....	16-82
The DateTimePicker Control.....	16-88
In Summary.....	16-92
LAB 16: COMPLEX WINDOWS FORMS CONTROLS .....	16-97
Lab 16 Overview.....	16-98
Set Up the NotifyIcon Control .....	16-99
Add the DateTimePicker Control .....	16-102
Add a Web Browser.....	16-105
CREATING CUSTOM CONTROLS .....	17-1
Control Creation in Windows Forms .....	17-2
Inheriting from an Existing Control.....	17-3
Required Steps .....	17-3
Creating a TextBox with Required Input .....	17-4
Adding the Finishing Touches.....	17-9
Inheriting Controls, In Review .....	17-13
Drawing Your Own Custom Controls.....	17-14
Inheriting from the Control Base Class .....	17-14
Control Properties .....	17-16
Drawing the Control .....	17-17
Default Values and Serializing Properties.....	17-20
Raising Events .....	17-24
Hiding Properties .....	17-25
Adding Ease-of-Use Features.....	17-26

Drawing Your Own Controls, In Review.....	17-27
Creating Composite Controls.....	17-28
Required Steps .....	17-28
The Sample Control .....	17-29
Designer Support for Properties .....	17-31
Handling Events.....	17-32
Setting the Default Control Text.....	17-32
Serializing the Text Property.....	17-33
Data Binding .....	17-35
Inheriting from UserControl, In Review .....	17-36
LAB 17: CREATING CUSTOM CONTROLS.....	17-41
Lab 17 Overview.....	17-42
Create the DigitalClock Control .....	17-43
Add Finishing Touches .....	17-48
WORKING WITH TOOLBOX COMPONENTS.....	18-1
Introducing Components.....	18-3
Adding Components to Your Forms.....	18-5
Timer Component.....	18-8
Using the Timer Component.....	18-8
BackgroundWorker Component .....	18-12
Understanding the Code .....	18-13
Introducing Multi-Threading with the BackgroundWorker Component .....	18-17
FileSystemWatcher Component.....	18-23
Working with the FileSystemWatcher Component.....	18-24
PerformanceCounter Component.....	18-28
Retrieving Values Using the PerformanceCounter Component .....	18-30
Creating Performance Counters .....	18-33
Process Component .....	18-37
Using the Process Component .....	18-37
Process Component Methods.....	18-41
Start a Process and React When it's Completed.....	18-43
Working with Processes.....	18-44
ServiceController Component.....	18-47
Using the ServiceController Component.....	18-47
Interacting with Windows Services .....	18-50
Working with Services.....	18-51

EventLog Component .....	18-58
Event Log Concepts .....	18-58
Using the EventLog Component .....	18-60
Investigating the Sample Form .....	18-62
Working with the Server Explorer .....	18-69
LAB 18: WORKING WITH TOOLBOX COMPONENTS .....	18-77
Lab 18 Overview .....	18-78
Monitor File Changes Using the FileSystemWatcher Component.....	18-79
Keep Track of File Changes Using the EventLog Component .....	18-82
Run an Application Using the Process Component.....	18-85
INTEROPERABILITY .....	19-1
Interoperability .....	19-2
COM and .NET .....	19-3
Understanding COM Components.....	19-3
Managed and Unmanaged Code.....	19-4
Calling COM Objects from .NET .....	19-6
Calling a COM DLL from .NET.....	19-6
Interop Assemblies .....	19-11
Exporting Data to Excel .....	19-12
Calling .NET Assemblies from COM.....	19-17
Creating COM DLLs in Visual Studio.....	19-17
Creating Wrappers for .NET Framework Classes.....	19-22
Using Platform Invoke.....	19-26
Using the Windows API .....	19-26
Platform Invoke Caveats.....	19-29
Web Services.....	19-30
Web Service Requirements and Technologies.....	19-30
Creating a Web Service .....	19-32
Adding a Project Reference to a Web Service.....	19-36
Calling a Web Service.....	19-37
LAB 19: INTEROPERABILITY .....	19-43
Lab 19 Overview .....	19-44
Call a COM DLL from .NET .....	19-45
Call a COM Object from .NET .....	19-49
Call a .NET Assembly from COM .....	19-53
DEPLOYING APPLICATIONS USING CLICKONCE .....	20-1

ClickOnce Deployment .....	20-2
Publishing an Application.....	20-3
Publishing an Application with the Publish Wizard .....	20-3
Publish, Install, and Update Locations.....	20-8
Setting Publish Options .....	20-10
Prerequisites .....	20-12
Additional Files.....	20-13
Updating a Deployed Application.....	20-15
Rolling Back an Update .....	20-16
Setting Update Options.....	20-17
What Happens when You Publish an Application?.....	20-20
Examining Publish.htm and Setup.exe .....	20-21
The Deployment Manifest .....	20-21
The Application Manifest.....	20-24
Application Files.....	20-26
The ClickOnce Cache .....	20-27
What Happens when You Publish an Update to an Application? .....	20-28
ClickOnce and Security .....	20-30
Setting Permissions .....	20-31
Debugging a Partial Trust Application.....	20-33
Changes to the Manifest Files .....	20-34
Using the Deployment API to Manage Updates .....	20-35
LAB 20: DEPLOYING APPLICATIONS USING CLICKONCE .....	20-41
Lab 20 Overview .....	20-42
Publish an Application .....	20-43
Update an Application.....	20-45
Debug with Reduced Permissions.....	20-50
INDEX.....	INDEX-1

