

Table of Contents

About the Author	1
Introduction	2
Acknowledgments and Thanks	3
Part I - Getting Started	5
Chapter 1 - Setup and Parts of the Environment.....	7
dQuery – the Startup Program	7
Some Basic Setup	7
The dBASE Desktop	12
The Title Bar	13
The Menu Bar	13
The Tool Bar	13
The Navigator Window	13
The Command Window	14
The Status Bar	15
Important Tools in dBASE PLUS	15
Speed Menus	15
Getting Help	15
Using the Knowledgebase	17
Windows Vista	17
Part II - Data	19
Chapter 2 - Table Types	21
Should I Change the Table Level?	21
Terminology	22
The dBF Field Types	22
Field Properties	23
Null Values	24
Field Names	25
Table Language Drivers	26
Indexes	27
Using BLOB Fields	28
DBF Table Limits	29
Table Design Guidelines	29
Identify the Type of Information You Need to Store	29
Break the Information Down	29
Determine The Relationships Among the Tables	29
Making it Possible to “Upsize” to Other Platforms	32
Designing Your Tables and Application Appropriately	32

Chapter 3 - SQL - A Different Language	35
What is SQL, and Why Is It Important?	35
Calculated Fields	40
SQL Joins	40
The WHERE Clause	41
Read Only Queries	41
Other Useful Local SQL Commands	42
Creating a table	42
Add/Remove Fields	42
Deleting a Table	42
Renaming A Table	43
Creating an Index Tag	43
Deleting an Index Tag	43
Adding Data to a Table	43
Update a Set of Data	43
 Chapter 4 - Connecting to SQL and Local Databases	 45
What Is SQL Data, versus dBASE or “Local” Tables?	45
Database Aliases	45
Making the Connection	46
Start the Data Engine	46
Create the Database Alias	47
Start dBASE	48
Other Data Engines	49
ODBC Drivers	49
In General	50
Creating a Database Alias for Local Tables	50
 Part III - Object Oriented Code and dBASE	 53
Chapter 5 - Introduction to Objects and dBASE PLUS	55
OOP Concepts and Terminology	55
Working with Simple Objects	57
Creating a form object	57
Creating Objects On A Form	59
Dot Notation	60
Containership	60
Understanding the Object Inspector	61
Understanding Events	62
Windows is Event-Driven	62
What is Event-Driven Programming?	63
dBASE Events	63
Using the dBASE Form To See How This Works	63
Event Handlers	64

Assigning Event Handlers	64
Working With Methods	65
Codeblocks	65
Expression Codeblocks	66
Statement Codeblocks	67
Using Codeblocks as Event Handlers	67
Using Custom Properties and Methods	67
The Object is Built From the Class	67
Parts of a Class	67
The Class Declaration Statement	68
The Class Constructor Code	68
Class Declaration of Methods	69
The ENDCLASS Statement	71
The className and baseClassName Properties	73
Working with Object Reference Variables	74
The dBASE Object Class	74
Types of Classes	75
Stock Classes	75
User-created Custom Classes	75
Building Custom Classes from Scratch	76
General Syntax for Custom Classes	77
Declaring Class Parameters	79
Using Class Hierarchies	80
Using the Scope Resolution Operator	82
Overriding Methods and Events	84
Object Containership	84
The Keyword This	85
The Keyword Form	85
The Keyword CLASS	85
Using Objects as Parameters	88
Making Objects Go Away	88
Multiple References to the Same Object	89
Multiple Instances of the Same Class	90
Protecting Members of a Class	91
Knowing What the Members of a Class Are	93
Chapter 6 - Working with the Data Object Model (OODML)	95
An Overview	95
Creating and Coding Query Objects	96
How Do I Use a Query?	96
Query Objects and SQL Server Databases	99
Rowset and Field Objects – The Heart of the Data Object Structure	99
Some Basic Information about Rowsets	99
Rowset Events and Event Handlers	100

Navigation In A Rowset	104
Programmatically Stepping Through a Rowset	105
Editing Data In a Rowset	106
Deleting Rows	107
Fields Array and Field Objects	108
Field Class	108
Looping Through All Fields In A Table	109
Other Field Object Events, Methods, etc.	110
OLE, Binary and Memo Fields	110
Creating and Coding Database Objects	110
The Default Database	111
Creating a Database Object Reference	111
Table Maintenance	111
Transaction Processing	112
Using the Index Object(s)	112
More on Expressions	113
Creating and Coding Session Objects	114
The Default Session	115
Creating and Coding Stored Procedure Objects	116
The TableDef Object	116
List Field Information	117
List Index Information	118
The UpdateSet Object	118
Part IV - Data Objects and The Language	119
Chapter 7 - OODML, SQL, and XDMML	121
How To Do Things You May Have Done Before	121
Finding Data	121
Performing Lookups in Other Tables	135
Shortening References	136
Relating Tables	137
Setting a Relationship Between Parent and Child Tables	137
Set Skip	138
Referential Integrity – Adding A Parent to Parent/Child	143
Referential Integrity – Cascading Deletes	144
Child Table Sorted Differently?	145
Calculated Fields	146
Morphing Data	146
More on Data Object Events	149
Query Object - canOpen()	150
Rowset Object – onAppend()	150
Rowset Object – canSave()	151
UpdateSet	152

Copying a Table or Rowset	152
Using Copy() with Calculated Fields	154
Appending Rows From Another Table	155
Updating Rows From Another Rowset	157
Updating Rows and Adding NEW Rows	158
Deleting Rows	159
Chapter 8 - Creating and Working With Data Modules	161
What is a Data Module, and Why Should You Care?	161
Starting dQuery	161
Using dQuery to Create and Modify Data Modules	163
Opening an Existing Data Module	166
Examining the Source Code	166
Filtering Data With Conditional Statements	168
Adding Calculated Fields	170
A More Complex Calculated Field?	171
Using Multiple-Table Queries	171
Understanding Relationships Among Different Tables	173
Using Multiple Database Queries	174
Chapter 9 - Working in a Shared Environment	175
Programming for a Shared Environment	175
Opening a Table for Exclusive Use	176
Opening a Table for Read-Only (RO) Access	177
Locking Data	178
Implicit Locks	178
Explicit Locks	179
Using the Session Object to Modify Lock Behavior	180
Locking the Rowset	181
The _DBASELOCK Field	181
Maximum Locks	183
Using Session Objects	183
Adding a Session Object In the Form Designer	184
Adding a Session Object to a Data Module	184
The Session Object and Encrypted Tables	185
Locking Related Tables	185
Processing Transactions	186
Drawbacks to Using Transactions	186
CacheUpdates	187
Working with Non-dBASE Tables	187
Transaction Processing	187

Chapter 10 - Security	189
The PROTECT Command	189
SET ENCRYPTION	194
LOGOUT	194
Security and Paradox Tables	194
Security and SQL Server Tables	195
The Session Object	195
The Database Object	196
Application Security	196
Part V - Designing the User Interface	197
Chapter 11 - Working With the Designers	199
A Warning	199
The Form Designer	200
Form Designer Properties	202
The Menu Designer	202
The Report/Label Designer	203
The Table Designer	205
The SQL Designer	205
The Data Module Designer	205
Designer Common Tools	206
The Inspector	206
The Component Palette	209
The Field Palette	211
The Format Toolbar	212
Chapter 12 - Creating Forms	215
What is a Form?	215
Design Concepts	215
Types of Forms	216
Creating a Form	217
Form Metrics	218
Add a Text Control	219
Saving The Form	220
Modifying Properties of the Text Control	220
Add a Pushbutton	221
Run the Form	222
Add An Event Handler	223
Modifying .wfm files	223
Two-way Tools	225
OODML and Forms	227
Put Some Fields On The Form	228

Interacting With the Data	230
Putting Buttons On the Form	231
Form Cosmetics	247
Multi-Page Forms	248
Changing Pages Using a TabBox Control	248
Changing Pages Using PushButtons	251
Potential Problems	253
Running Forms	253
Communicating Between Forms	254
Passing Data to and Returning Data from A Dialog Form	254
It Is Important That You Understand	259
What Can This Be Used For?	259
Naming Your Controls	260
Tab Order Of Controls	260
Some Notes on Tab Order	263
Chapter 13 - Stock Form Controls	265
Windows XP Themes and Other Changes	265
Common Properties, Events and Methods	269
A Brief Overview of the Stock User-Interface Controls	269
Text	269
TextLabel	271
Entryfield	271
Spinbox	274
Checkbox	276
Radiobutton	277
Container	280
Notebook	281
Editor	282
Combobox	284
Listbox	287
Grid	288
Getting Started With A Grid	289
Tabbox	292
Pushbutton	294
Windows XP/Vista, Themes, and Pushbuttons	294
Line	296
Rectangle	296
Image	297
Shape	297
TreeView and TreeItem	298
Progress	303

ActiveX	306
ReportViewer	311
SubForm	314

Chapter 14 - Working With The Grid 319

Getting Started	319
The Columns Array	320
The Column's editorType Property	324
Editable or Not?	327
Editable Grids	327
Non-Editable Grids	328
Display Issues	329
Fonts	329
Colors	329
Other Grid Appearance Properties	331
Changing the Appearance of Individual Columns	331
Enhancing the Grid's Abilities	332
Multiselect Grids	332
Changing Rowset Sort Order	336
Conditional Colors of Cells and Rows	340
The Grid's rowSelect and multiSelect Properties and Colored Cells	342
Coloring a Whole Row	344
Saving and Restoring Column Positions	346
Multi-User?	350
Saving/Restoring More Properties Than Shown Here	351
Using Multi Table Rowsets	351
Building A Grid On The Fly	351
Restating Datalinks	354

Chapter 15 - Common Properties and Event Handlers of Form

Controls	355
Common Properties	355
Formatting Data – Picture and Function	355
The enabled Property and the when() Event	356
Common Events	357
Event Sequences	357
The key() Event	360
The onKey() Event	361
The onChange() Event	361
Using the onLostFocus() Event to Force Navigation and/or Validation	362
The onMouseOver() and onMouseOut() Events	362
Data Validation	363
Table Designer/Field Level Validation	363



Control-Level Validation	364
Form-Level Validation	366
Record-Level Validation	366
Drag and Drop	368
What Else Can Be Done?	372

Chapter 16 - Custom Forms and Custom Form Classes 373

Source Code Aliases vs. Database Aliases, and Why They're Important	373
How To Create A Source Code Alias	374
Using Custom Forms	376
Why Work With Custom Form Classes?	376
Changing Built-in Default Property Values	376
Creating New (Custom) Properties for Custom Form Classes	377
Assigning Default Actions to Event Handlers	377
Creating Methods for a Custom Class	377
Define Default Controls for a Form	377
The Complete Custom Form Class	377
Clearing Out The Custom Form Class	380
A Data Custom Form	381
Placing Custom Forms in Source Alias Folder	384
Using The "Data" Custom Form	386
Creating Classes for Control Objects	389
Why Create Your Own Custom Classes?	390
Methods of Creating and Modifying Custom Classes	390
Creating a Custom TextLabel Class	391
Creating a Custom Entryfield Class	394
Creating a Custom Spinbox Class	394
Creating a Custom Editor Class	394
Creating a Custom Image Class	395
Cleanup of the Custom Class Code	395
Putting These Custom Classes to Work	397
Creating a Custom Pushbutton Class	401
Putting the Custom Pushbutton Classes to Work	407
Modifying the Base Pushbutton Class	408
Using Your Custom Classes For New Forms	410

Chapter 17 - Using the Custom Classes that Ship with dBASE 413

Custom Pushbuttons	413
Custom Controls on the Form Controls Tab	415
Seeker	415
Splitter	417
Animate	421
Calendar	422
Form Viewer	424

Chapter 18 - Creating Menus, Popup Menus, Speedbars and Toolbars	427
Creating Menu	427
Edit Menu Options	429
Attaching the Menu to a Form	430
Creating an Application Menu	431
Adding A Separator	433
Attaching a Menu to the Application Framewindow	434
Form and Rowset References	434
Creating Popup (Right-Click) Menus	438
The onInitMenu Event	440
Attaching a Popup Menu to a Form	441
Creating SpeedBars	441
Creating Toolbars	445
How Do You Design a ToolBar?	445
More Source Code Alias Stuff	446
Putting Toolbuttons in the Toolbar	446
Making The Toolbar More Useful	448
Testing Our Toolbar	451
Adding Functionality To the ToolBar	453
Things to Note	458
Toolbars and SDI Forms	461
Floating Palettes versus Attached to Form	462
 Chapter 19 - Reporting and Printing	 463
Report Objects	463
How a Report is Rendered	464
The Report Designer	465
Metrics	466
Creating A Simple Report	466
A Quick Look At The Design Surface	467
Report Headings	467
Adding A Page Number	468
Add a Table	469
Place Fields On The Report	470
Multi-Table Reports	474
Start the Report	474
Add the Tables	475
The detailBand	475
The Group Object	476
Change the Controlling Rowset	477
Summary (Aggregate) Calculations	477
Group Report Hints	479
Labels	481
Custom Label Sizes?	484

Printing Reports	485
Print from the Preview Window	485
Print Using Code	485
Create A Preview Form Using a ReportViewer Object	486
General Report Designer Hints	487
Field Labels	487
Alignment Tools	488
Lines	488
Large Tables	488
Navigating In Report Designer	488
Null Fields	489
Displaying Numeric Values	489
Part VI - Programming	491
Chapter 20 - Programming in dBASE PLUS	493
Using the Source Code Editor	493
Setting the Source Code Editor's Default Properties	494
Using the Source Editor To Modify Your Forms, Reports, Labels and other Source Code	495
Getting Started	495
Documenting Your Code	496
Indenting Your Code	498
Creating the Program File	499
Testing Programs	500
Working with the Command Window	500
Entering and Executing Commands	501
Pasting Syntax from Help or Other Files	501
Functions and Procedures	502
Working with Memory Variables	504
Codeblocks	505
Function Pointers	506
The Scope Commands	506
Assignment Operators	513
Math	514
Some Basic Commands	515
Controlling Program Flow	517
Working with Data Types	528
Performing Financial Calculations	528
Computing Engineering and Scientific Formulas	529
Working with Date Data	531
Working with Time Data	534
DateTime() And Related Functionality	535
Working with Logical Data	536
Working with Character Data	536
Converting Data Types	537
Using Preprocessor Directives	538

Using Source Aliases to Manage Your Code	539
The SET PROCEDURE Command	539
Debugging Your Programs	541
Testing Methods, Fixing Program Errors	542
Compiling the Code	542
Visual Review	542
Running Portions of the Application	542
Observing Others Running the Application	542
Using Code to Trap Errors	543
Shortcuts	546
Built-In Functions and Other Commands	546
Chapter 21 - dBASE's Non-Visual Objects	547
Using Arrays	547
How Do I Define An Array?	549
Now You Have Defined The Array, How Do You Put Data In It?	549
Deleting Data in An Array	551
Referencing/Displaying Data In An Array	553
Sorting The Contents of An Array	556
A Couple of dBL Functions That Are Very Useful When Working With Arrays	557
Making an Array Larger	558
The insert() Method	559
Adding Default Values Into An Array – fill()	561
Directory Listings – dir() and dirExt()	562
Storing the Records (or Certain Fields) in a Table Into an Array	563
Copying An Array	565
Searching An Array	565
The element() Method	566
The subscript() Method	567
Using Arrays With dBASE User Interface Objects	567
Array Size Limits	569
Literal Arrays	570
Associative Arrays	570
The Timer Class	572
The File Class	574
To Copy a File	575
Rename a File	575
Deleting a File	575
See If a File Exists	576
To Check Attributes of a File	576
Opening or Creating a File	576
Looping Through a File	577
Reading From A File	578
Writing To A File	578
The Math Class	582

The Date Class	582
Date Math	583
International Issues	584
The String Class	585
Methods That Operate on The String	586
Methods That Wrap the String in HTML Tags	591
Using the String Object's Methods	591
Stacking Methods	592
Strings and Nulls	592
Part VII - Working With the Outside World	595
Chapter 22 - OLE and WSH	597
Object Linking and Embedding (OLE)	597
OLE2 Automation Support	597
Communicating with Excel	599
Some Fun – The Sound API in Windows	601
Working with OLE Data and Fields	603
Windows Script Host (WSH)	607
Chapter 23 - The Windows API and DLLs	611
Overview	611
The Right Documentation	611
Header Files	612
The EXTERN Statement	612
Typical EXTERN Statement	613
Calling Convention	613
Mapping Data Types	614
Data Type Mapping	615
Taking Advantage of Module Aliases	616
Aliasing Function Names	617
Working with Win32 Character-Based Functions	619
Dealing with Character Data	619
Data Structures 101	621
Using a Simple Data Structure	621
Retrieving Data from a Structure	622
Making Structures Easy with OOP	624
More About Structures	628
When to EXTERN	629
Placing Data in Structures	630
Part VIII - Putting An Application Together	633
Chapter 24 - Some Application Design Concepts	635
The Application Framework	635
_app Properties	636

_app.Methods	638
The Application Framework	639
The Application Framework's Properties and Methods	641
Creating an Application Object	642
SDI vs. MDI Style Applications	650
Menus, Toolbars, Popup Menus – Should You Use Them?	651
Passing Parameters to An Application	651
Chapter 25 - Using the Project Explorer	653
Starting a New Project	653
Project	654
File Details	655
Log	655
DEO	655
Inno	655
Adding Files to The Project	655
Creating a “Basic” (Non-DEO) Application	655
Getting Started	656
Add Files	657
Start Program	659
Finishing Touches	660
Now What?	661
Compiling and Building the Application	661
Running the Executable in the Same Folder as the Source	662
Creating a DEO Application	662
DEO Folders	663
Selecting the DEO Folder For Each File	665
The Application's INI File	666
Compile and Build The Application	667
DEO and NON-DEO?	668
.INI Files	668
Encrypted Tables	670
Start Your Application Without the Data Engine	670
ActiveX and DLL Controls	670
Manually Handling These In Your Own Code	670
Network Deployment	672
Other Ways to Build Your Executable	673
Running a dBASE PLUS Executable	674
Using an Alternate INI File	674
Chapter 26 - The .INI File	677
What Exactly Is a .INI File?	677
How Do I Find Things in My .INI File?	678

Examining PLUS.INI	678
Custom BDE .CFG File	692
Encrypted Tables	692
Items You Can Add	692
No Data Engine	692
Reading/Modifying a .INI File In An Application	693
Chapter 27 - Preparing An Application For Deployment	695
Using Inno Setup Manually	695
Some Basic Information	696
Inno Constants	696
Using Other Languages	697
Creating an Install	697
The Types and Components Sections	699
The INI Section	703
The Code Section	704
Borland Database Engine Issues	707
Handling the Registry Settings	707
Database Aliases	708
SQL Links Drivers	708
Creating a CD Image	708
Using Inno Setup Through the Project Explorer	709
Contacting the Author of Inno Setup	709
Manual Deployment – What Files Are Needed?	710
Application Files (DEO vs. non-DEO)	710
Installing the dBASE PLUS Runtime With Your Application	710
BDE Files	712
Windows Vista Issues	712
Other Issues	712
Part IX - The Internet	713
Chapter 28 - dBASE PLUS On The Web	715
What Is a Web Application?	715
Static Web Pages vs. Interactive dBL Applications	716
Automatically Generated Web Applications	716
Using the Web Wizards	716
The Data Entry Web Wizard	717
The Query and Response Web Wizard	723
The Publish Web Wizard	723
Using dQuery's One-Click Web Application	723
Testing Using Apache	724
The Configuration File	724
Start Apache	726

Writing Your Own Web Applications 726

The Appendices 729

Appendix 1 - Resources Available 731

Other dBASE Books 735

Appendix 2 - A Brief History of dBASE 737

Appendix 3 - Colors, Images and Graphics in dBASE Applications 743

Colors 743

 16-Bit/DOS Color Names 743

 JavaScript "Safe Palette" Color Names 743

 Hexadecimal BGR Colors 743

 Windows Named Colors 744

 User Defined Color Name 744

Working With DLL Files 744

 Other Ways to Store Images 747

Graphics Issues for Icons and Buttons (Pushbuttons and Toolbuttons) 747

 Icons 747

 Images for Pushbuttons 748

 Images for Toolbuttons 749

An Undocumented Feature 750

Appendix 4 - Borland Database Engine and Table Specifications 751

 Differences Between dBASE (DBF) Table Levels 755

Appendix 5 - Undocumented Features 761

Appendix 6 - ANSI Chart 769

Appendix 7 - Windows Application Interface Design and Standards 773

Appendix 8 - Glossary 779

Index 785