

Figures, Tables, and Listings

Preface

About This Book xxiii

Figure P-1 Roadmap to the QuickDraw GX suite of books xxiv

Chapter 1

Introduction to QuickDraw GX Graphics 1-1

Figure 1-1 Shape object structure 1-5
Table 1-1 Where to find information on shape-type conversion 1-6
Figure 1-2 The geometric shape types and examples of geometric shape geometries 1-8
Figure 1-3 A polygon shape with a single polygon contour containing three geometric points 1-10
Figure 1-4 Framed shapes versus solid shapes 1-11
Figure 1-5 Two condensed views of a polygon shape 1-12
Figure 1-6 The geometric style properties and some examples of their effects 1-13
Figure 1-7 An example of reducing a shape 1-14
Figure 1-8 An example of simplifying a shape 1-14
Figure 1-9 Some examples of the geometric information available about a shape 1-15
Figure 1-10 Some examples of the geometric arithmetic you can perform with shapes 1-16
Figure 1-11 Sample bitmap shapes 1-17
Figure 1-12 A bitmap shape 1-18
Figure 1-13 Elements of a bitmap geometry 1-19
Figure 1-14 Sample picture shapes 1-20
Figure 1-15 A picture hierarchy 1-21

Chapter 2

Geometric Shapes 2-1

Figure 2-1 A shape object 2-6
Figure 2-2 The geometric shape types and examples of geometric shape geometries 2-8
Figure 2-3 A polygon shape with a single contour containing three geometric points 2-10
Figure 2-4 Framed shapes versus solid shapes 2-12
Figure 2-5 The various shape fills and examples of their effects 2-13
Figure 2-6 The even-odd rule and winding-number rule algorithms 2-14
Figure 2-7 The inverse even-odd shape fill 2-15
Figure 2-8 Two lines 2-17
Figure 2-9 A quadratic Bézier curve 2-18
Figure 2-10 Finding the midpoint of a curve 2-19
Figure 2-11 Dividing a curve into two smaller curves 2-20
Figure 2-12 A rectangle geometry shown framed and filled 2-21
Figure 2-13 A polygon shape with two polygon contours 2-23

Figure 2-14	A polygon drawn with the even-odd and winding shape fills	2-24
Figure 2-15	A path with two consecutive off-curve points	2-25
Figure 2-16	A path shape filled with the even-odd and winding shape fills	2-26
Listing 2-1	Drawing a point without creating a point shape	2-30
Figure 2-17	A point	2-30
Listing 2-2	Creating a point shape with the <code>GXNewPoint</code> function	2-31
Listing 2-3	Creating a point shape with the <code>GXNewShapeVector</code> function	2-32
Listing 2-4	Creating a point shape with the <code>GXNewShape</code> and <code>GXSetPoint</code> functions	2-33
Listing 2-5	Using the <code>GXSetPoint</code> function to replace a point shape's geometry	2-34
Figure 2-18	Two different point geometries	2-35
Listing 2-6	Drawing a line without creating a line shape	2-37
Figure 2-19	A line	2-37
Listing 2-7	Creating a line shape with the <code>GXNewLine</code> function	2-38
Listing 2-8	Drawing two parallel lines	2-39
Figure 2-20	Parallel lines	2-39
Figure 2-21	Nearly parallel lines	2-40
Listing 2-9	Creating a curve shape	2-41
Figure 2-22	A curve	2-42
Listing 2-10	Creating a rectangle shape	2-43
Figure 2-23	A rectangle	2-44
Listing 2-11	Creating a framed rectangle	2-44
Figure 2-24	A framed rectangle	2-45
Listing 2-12	Drawing a triangular polygon	2-46
Figure 2-25	A polygon	2-47
Figure 2-26	A triangular polygon with inverse shape fill	2-47
Listing 2-13	Creating a polygon with two contours	2-49
Figure 2-27	A filled polygon with two separate contours	2-50
Listing 2-14	Creating a polygon with a crossed contour	2-50
Figure 2-28	A framed polygon with a crossed contour	2-51
Figure 2-29	A solid polygon with a crossed contour	2-51
Listing 2-15	Creating a polygon with an overlapping contour	2-52
Figure 2-30	A polygon with an overlapping contour and closed-frame shape fill	2-53
Figure 2-31	A polygon with an overlapping contour and even-odd shape fill	2-53
Figure 2-32	A polygon with an overlapping contour and winding shape fill	2-54
Listing 2-16	Drawing a path shape	2-57
Figure 2-33	A path	2-58
Listing 2-17	Creating a path using only off-curve control points	2-59
Figure 2-34	A round path shape	2-60
Listing 2-18	Creating a path with concentric contours	2-61
Figure 2-35	A path shape with two concentric clockwise contours and closed-frame shape fill	2-62
Figure 2-36	A path shape with two concentric clockwise contours and even-odd shape fill	2-63

Figure 2-37	A path shape with two concentric clockwise contours and winding shape fill	2-63
Figure 2-38	A path shape with an internal counterclockwise contour and closed-frame shape fill	2-64
Figure 2-39	A path shape with even-odd or winding shape fill	2-65
Listing 2-19	Creating a figure-eight path shape	2-67
Figure 2-40	A figure-eight path shape	2-67
Figure 2-41	A path shape before and after conversion to a rectangle shape	2-68
Figure 2-42	A path shape before and after conversion to a line shape	2-69
Figure 2-43	A path shape before and after conversion to a point shape	2-70
Listing 2-20	Converting a line to a curve	2-71
Figure 2-44	A line shape before and after conversion to a curve shape	2-72
Listing 2-21	Converting a rectangle to a curve	2-72
Figure 2-45	A rectangle shape before and after conversion to a curve shape	2-73
Listing 2-22	Converting a polygon shape to a curve shape	2-73
Figure 2-46	A polygon shape before and after conversion to a curve shape	2-74
Listing 2-23	Converting a rectangle shape to a polygon shape	2-75
Figure 2-47	A rectangle shape before and after conversion to a polygon shape	2-75
Listing 2-24	Converting a path shape to a polygon shape	2-76
Figure 2-48	A path shape before and after conversion to a polygon shape	2-77
Listing 2-25	Converting a polygon shape to a path shape	2-78
Figure 2-49	Polygon shape with two contours before and after conversion to a path shape	2-79
Listing 2-26	Replacing geometric points	2-80
Figure 2-50	A path shape with a flat top	2-81
Figure 2-51	A path shape with geometric points replaced	2-81
Listing 2-27	Creating a polygon shape with two contours	2-82
Figure 2-52	A polygon shape with two contours	2-83
Listing 2-28	Extracting part of a polygon shape	2-84
Figure 2-53	A polygon shape extracted from a larger polygon shape	2-85
Listing 2-29	Replacing geometric points of a polygon shape	2-86
Figure 2-54	A polygon with two geometric points replaced by a single geometric point	2-87
Figure 2-55	A polygon shape with one contour	2-87
Listing 2-30	Inserting a geometric point in a polygon shape	2-88
Figure 2-56	A polygon shape edited with the <code>gxBreakNeitherEdit</code> flag set	2-89
Figure 2-57	A polygon shape edited with the <code>gxBreakLeftEdit</code> flag set	2-89
Figure 2-58	A polygon shape edited with the <code>gxBreakRightEdit</code> flag set	2-90
Listing 2-31	Creating a path shape with two curved contours	2-91
Figure 2-59	A path shape with two curved contours	2-92
Figure 2-60	A path shape edited with <code>GXSetPathParts</code>	2-93

Listing 2-32	Creating a path shape with one contour	2-94
Figure 2-61	A path shape with a flat top	2-95
Figure 2-62	A path shape edited to have a pointy top	2-96
Figure 2-63	A path shape edited to have a round top	2-97
Listing 2-33	Creating a diagonal line	2-98
Figure 2-64	A diagonal line	2-99
Figure 2-65	An edited line	2-99
Table 2-1	Shape-related functions that exhibit special behavior with geometric shapes	2-101

Chapter 3

Geometric Styles 3-1

Figure 3-1	Style object with geometric properties highlighted	3-6
Figure 3-2	Shared style objects	3-7
Figure 3-3	Effects of the <code>GXPrimitiveShape</code> function on a line shape	3-9
Figure 3-4	Effects of the <code>GXPrimitiveShape</code> function on a rectangle shape	3-10
Figure 3-5	The QuickDraw GX geometric pen	3-15
Figure 3-6	Differing pen widths	3-16
Figure 3-7	Pixels included in a hairline	3-16
Figure 3-8	A geometry with no hairline	3-17
Figure 3-9	Pen placement	3-18
Figure 3-10	Effect of the auto-inset style attribute	3-19
Figure 3-11	Effect of the auto-inset and inside-frame style attributes for a crossed contour	3-19
Figure 3-12	Eliminating crossed contours	3-20
Figure 3-13	Constraining shapes to grids	3-21
Figure 3-14	Caps, joins, dashes, and patterns	3-22
Figure 3-15	A shape with caps	3-23
Figure 3-16	A shape with level caps	3-24
Figure 3-17	Standard cap shapes	3-24
Figure 3-18	A shape with joins	3-25
Figure 3-19	A shape with level joins	3-26
Figure 3-20	Standard joins	3-26
Figure 3-21	Sharp join with miter	3-27
Figure 3-22	A dashed shape	3-27
Figure 3-23	Scaling a dash shape	3-28
Figure 3-24	Effect of the clip dash attribute	3-29
Figure 3-25	Effects of breaking a dash	3-30
Figure 3-26	Effects of bending a dash	3-30
Figure 3-27	A shape with a pattern	3-31
Figure 3-28	Pattern placed on a nonrectilinear grid	3-32
Figure 3-29	Effects of the port-align pattern attribute	3-32
Figure 3-30	Effects of the port-map pattern attribute	3-33
Figure 3-31	A shape with a cap, join, and pattern	3-34
Figure 3-32	A shape with a dash and a pattern	3-34
Figure 3-33	A shape with a clipped dash and a cap and join	3-35
Listing 3-1	Adding style information by directly manipulating a style object	3-37
Figure 3-34	Rectangle with thick pen	3-38

Listing 3-2	Manipulating style information indirectly	3-39
Listing 3-3	Constraining a shape to a half-inch grid	3-40
Figure 3-35	Scaled, but not constrained, V shape	3-41
Figure 3-36	Constrained V shape	3-42
Listing 3-4	Creating a shape with fractional geometric point positions	3-43
Figure 3-37	Rotated star not constrained to device grid (magnified 200 percent)	3-44
Figure 3-38	Rotated star constrained to device grid (magnified 200 percent)	3-45
Listing 3-5	Converting a circle to a polygon	3-46
Figure 3-39	Polygon approximation of a circle with curve error of 1	3-46
Figure 3-40	Polygon approximation of a circle with curve error of 5	3-47
Figure 3-41	Polygon approximation of a circle with curve error of 10	3-47
Figure 3-42	Polygon resulting from a curve error of 0	3-48
Listing 3-6	Creating a complicated contour	3-49
Figure 3-43	Wavy line	3-50
Figure 3-44	Wavy line somewhat smoothed by curve error of 10	3-50
Figure 3-45	Wavy line smoothed by curve error of 15	3-50
Figure 3-46	Wavy line completely straightened by curve error of 20	3-50
Listing 3-7	Defining a figure eight	3-51
Figure 3-47	A hairline figure eight	3-52
Figure 3-48	A thick figure eight	3-52
Figure 3-49	A figure eight with pen inset	3-53
Figure 3-50	A figure eight with pen outset	3-54
Figure 3-51	A reversed figure eight with pen outset	3-55
Listing 3-8	Removing unwanted contour crossings	3-55
Figure 3-52	Uncrossed figure eight with pen outset	3-56
Listing 3-9	Creating an arrow	3-57
Figure 3-53	An arrow	3-59
Listing 3-10	Adding round caps and square caps to a curve	3-60
Figure 3-54	Round and square caps	3-61
Listing 3-11	Adding joins to a shape	3-61
Figure 3-55	A square with diamond-shaped joins	3-63
Figure 3-56	A square with level joins	3-63
Listing 3-12	Adding a sharp join to an angle shape	3-64
Figure 3-57	An angle with a sharp join	3-65
Figure 3-58	An angle with a truncated sharp join	3-65
Listing 3-13	Creating a curve shape dashed with diamonds	3-66
Figure 3-59	A dashed curve	3-68
Figure 3-60	A curve with scaled dashes	3-68
Figure 3-61	A curve with clipped dashes	3-69
Figure 3-62	A curve with phased dashes	3-69
Listing 3-14	Creating a dashed circle	3-70
Figure 3-63	Circle dashed with diamonds	3-71
Figure 3-64	Circle with automatically advanced dashes	3-72
Figure 3-65	Circle with diamond dashes inset	3-73

Figure 3-66	Circle with diamond dashes moved toward the center	3-74
Figure 3-67	Dash shape with two contours	3-75
Listing 3-15	Creating a dash with multiple contours	3-75
Figure 3-68	Circle dashed with double diamonds	3-76
Figure 3-69	Circle with dashes broken	3-77
Figure 3-70	Circle with hairline dashes	3-78
Figure 3-71	Circle with bent hairline dashes	3-79
Listing 3-16	Wrapping text	3-80
Figure 3-72	Wrapped text	3-81
Listing 3-17	Creating a circle with 12 dashes	3-82
Figure 3-73	Dash positions for a clock	3-83
Listing 3-18	Creating a clock shape	3-83
Figure 3-74	A clock shape	3-85
Listing 3-19	Patterning a shape	3-86
Figure 3-75	A rectangle with a pattern	3-87
Figure 3-76	A framed rectangle with a pattern	3-88
Listing 3-20	Changing a pattern throughout a patterned shape	3-89
Figure 3-77	Shape with changing pattern	3-91
Listing 3-21	Combining a cap, join, and pattern	3-92
Figure 3-78	Angle shape with cap, join, and pattern	3-93
Figure 3-79	Angle shape with dash and pattern; caps and join ignored	3-94
Figure 3-80	Shape with cap, join, dash, and the clip dash attribute set	3-95

Chapter 4

Geometric Operations 4-1

Figure 4-1	Line contours	4-5
Figure 4-2	A path shape with two contours	4-6
Figure 4-3	A path whose contour direction is not immediately obvious	4-7
Figure 4-4	A path whose inner contour has the same contour direction as its outer contour	4-8
Figure 4-5	A path shape whose inner and outer contours have different contour directions	4-8
Figure 4-6	Effects of reducing and simplifying shape geometries	4-10
Figure 4-7	How simplifying a shape can produce more predictable results when drawing	4-11
Figure 4-8	Simple example of the <code>GXPrimitiveShape</code> function	4-13
Figure 4-9	More involved example of the <code>GXPrimitiveShape</code> function	4-15
Figure 4-10	Geometric information available about a path shape	4-17
Figure 4-11	A path shape resized by changing its bounding rectangle	4-18
Figure 4-12	Testing whether one shape touches another	4-19
Figure 4-13	Testing whether one shape contains another	4-20
Figure 4-14	Geometric arithmetic with two solid shapes	4-21
Figure 4-15	Geometric arithmetic with a framed shape and a solid shape	4-22
Figure 4-16	Geometric inversion	4-22
Listing 4-1	Creating a polygon shape with two contours having opposite contour directions	4-24

Figure 4-17	A polygon shape whose two contours have opposite contour directions	4-25
Figure 4-18	A polygon shape with the direction of both contours reversed	4-26
Figure 4-19	A polygon shape with the direction of the inner contour reversed	4-27
Listing 4-2	Creating a path shape with a single contour	4-28
Figure 4-20	A path shape with a single contour	4-29
Figure 4-21	A path shape broken into two contours	4-29
Listing 4-3	Creating a polygon with redundant geometric points	4-31
Figure 4-22	A polygon shape with unnecessary geometric points	4-31
Figure 4-23	A polygon shape with the unnecessary geometric points removed	4-32
Listing 4-4	Creating a polygon shape with a crossed contour	4-33
Figure 4-24	A polygon shape with a crossed contour	4-34
Figure 4-25	A polygon shape with no crossed contours	4-34
Listing 4-5	Creating a path shape with two clockwise contours	4-35
Figure 4-26	A path shape with two concentric clockwise contours and even-odd shape fill	4-36
Figure 4-27	A path shape with two concentric contours with opposite contour direction	4-36
Figure 4-28	A path shape with two concentric clockwise contours and winding shape fill	4-37
Figure 4-29	A path shape simplified to a single clockwise contour	4-37
Listing 4-6	Creating an hourglass polygon shape with a thick pen width	4-38
Figure 4-30	A hourglass-shaped polygon with a thick border	4-39
Figure 4-31	A polygon shape with style information incorporated into its geometry	4-39
Figure 4-32	The primitive form of the polygon shape after simplification	4-40
Listing 4-7	Creating a path shape with two contours having opposite contour directions	4-41
Figure 4-33	A path with an outer clockwise contour and an inner counterclockwise contour	4-42
Figure 4-34	Finding a specified point on a path contour	4-43
Figure 4-35	Finding the bounding rectangle and the center point of a path	4-44
Figure 4-36	Finding the center point of two contours	4-44
Figure 4-37	Finding the area of a path, two contours with same contour direction	4-45
Figure 4-38	Finding the area of a path, two contours with opposite contour direction	4-46
Figure 4-39	Finding the area of a simplified path	4-46
Listing 4-8	Creating a circular path	4-47
Figure 4-40	A circular path	4-48
Figure 4-41	A circular path after bounding rectangle changed	4-48
Figure 4-42	A path shape with a transform mapping	4-49
Listing 4-9	Creating a tight curve shape	4-50
Figure 4-43	A tight curve	4-51
Figure 4-44	An inset curve shape	4-51

Figure 4-45	An outset curve	4-52
Listing 4-10	Creating a rectangle and a circular path shape	4-53
Figure 4-46	A rectangle containing a circular path	4-54
Figure 4-47	A rectangle that touches a circular path shape	4-55
Figure 4-48	A rectangle and a circular path touching at a single point	4-56
Figure 4-49	A large circular path shape touching a smaller circular path shape	4-57
Listing 4-11	Creating a path shape with two contours and a smaller concentric rectangle shape	4-58
Figure 4-50	A path shape with two contours and a smaller concentric rectangle shape	4-59
Listing 4-12	Creating a diamond-shaped polygon and a circular path that intersect	4-60
Figure 4-51	A diamond-shaped polygon geometry and a circular path geometry	4-61
Figure 4-52	The intersection of a diamond-shaped polygon and a circular path	4-61
Figure 4-53	The union of a diamond-shaped polygon and a circular path	4-62
Figure 4-54	The union of a framed diamond-shaped polygon and a circular path	4-63
Figure 4-55	The result of subtracting a circular path from a diamond-shaped polygon	4-63
Figure 4-56	The result of subtracting a diamond-shaped polygon from a circular path	4-64
Figure 4-57	The result of the exclusive-OR operation on a polygon and a path	4-65
Figure 4-58	An inverted diamond	4-66

Chapter 5

Bitmap Shapes 5-1

Figure 5-1	A bitmap shape	5-4
Figure 5-2	A black-and-white bitmap geometry	5-6
Figure 5-3	A grayscale bitmap geometry	5-7
Figure 5-4	The effect of transfer modes on bitmap shapes	5-9
Figure 5-5	The effect of mappings on bitmap shapes	5-10
Figure 5-6	The effect of the <code>gxMapTransformShape</code> shape attribute on bitmap mappings	5-11
Figure 5-7	Bitmaps and view devices	5-13
Listing 5-1	Creating a black-and-white bitmap	5-15
Figure 5-8	A black-and-white bitmap—32 bits wide	5-17
Figure 5-9	An example of unaligned bytes per row	5-19
Listing 5-2	A bit image with an even number of bytes per row	5-20
Figure 5-10	An envelope with a shadow	5-20
Figure 5-11	A bitmap with a grayscale color set (four shades)	5-22
Figure 5-12	A bitmap with a grayscale color set (sixteen shades)	5-23
Listing 5-3	Defining a color set	5-23
Figure 5-13	A bitmap with an eight-color color set	5-24
Listing 5-4	Creating a color ramp	5-26
Figure 5-14	A color ramp from red to green	5-28
Listing 5-5	Creating a color ramp using the ramp library	5-28

Listing 5-6	Creating a color ramp using both the ramp and color libraries 5-29
Figure 5-15	Dithered bitmaps 5-31
Listing 5-7	Halftoning a bitmap 5-31
Figure 5-16	Halftoned bitmaps 5-32
Listing 5-8	Applying a transfer mode to a bitmap 5-33
Figure 5-17	A blended color ramp 5-34
Listing 5-9	Converting a path to a bitmap 5-35
Figure 5-18	A bitmap representation of a path shape 5-36
Figure 5-19	A bitmap and its bounding rectangle 5-36
Figure 5-20	A bitmap drawn over a background 5-37
Figure 5-21	A bitmap with a transfer mode drawn over a background 5-38
Figure 5-22	A path shape converted to a bitmap shape 5-39
Figure 5-23	A path shape converted to a bitmap shape and then skewed 5-39
Figure 5-24	A color ramp bitmap 5-40
Figure 5-25	A bitmap after multiple transformations 5-40
Listing 5-10	Scaling text 5-41
Figure 5-26	Scaled text 5-41
Listing 5-11	Scaling a bitmap 5-42
Figure 5-27	Scaled text and a scaled bitmap 5-42
Figure 5-28	A clipped bitmap 5-43
Listing 5-12	Creating a black-and-white bitmap 5-46
Listing 5-13	Creating an offscreen bitmap 5-49
Figure 5-29	Multiple shapes drawn to a bitmap 5-51
Listing 5-14	Creating an offscreen bitmap using the offscreen library 5-51
Figure 5-30	An extracted bitmap 5-53
Figure 5-31	An edited bitmap 5-54
Table 5-1	Shape-editing functions that post errors or warnings when applied to bitmaps 5-55
Table 5-2	Geometric operations that post errors or warnings when applied to bitmaps 5-56
Table 5-3	Shape-related functions that exhibit special behavior when applied to bitmaps 5-57
Table 5-4	Geometric operations that exhibit special behavior when applied to bitmaps 5-58
Table 5-5	Transform-related functions that exhibit special behavior when applied to bitmaps 5-60
Table 5-6	View-related functions that can be applied to bitmaps 5-61

Chapter 6

Picture Shapes 6-1

Figure 6-1	A picture shape 6-4
Figure 6-2	A picture item 6-5
Figure 6-3	A picture geometry with two items 6-6
Figure 6-4	Condensed view of picture with two items 6-7
Figure 6-5	A picture shape with overrides 6-9
Figure 6-6	A picture containing multiple references to the same shape 6-10

Figure 6-7	A condensed view of a picture with multiple references	6-11
Figure 6-8	Multiple references with overriding transforms	6-12
Figure 6-9	Multiple references with overriding styles, inks, and transforms	6-14
Figure 6-10	An empty picture shape and a polygon shape	6-15
Figure 6-11	Adding a polygon shape to a picture shape	6-16
Figure 6-12	Adding a shape to a picture twice	6-17
Figure 6-13	A condensed view of a picture hierarchy	6-18
Figure 6-14	A path shape and its transform	6-19
Figure 6-15	A picture with an overriding transform	6-20
Figure 6-16	Simple transform concatenation	6-21
Figure 6-17	Intricate transform concatenation	6-23
Figure 6-18	A picture shape and hit-test points	6-25
Listing 6-1	Creating a simple picture of a house	6-28
Figure 6-19	A picture of a house with a roof and a door	6-29
Listing 6-2	Disposing of shapes contained in a picture before disposing of the picture	6-30
Listing 6-3	Extracting and editing items from a picture	6-31
Figure 6-20	A picture of a house with a relocated door	6-32
Listing 6-4	Defining new shapes for the house picture	6-33
Listing 6-5	Adding new shapes to the house picture	6-34
Figure 6-21	A house with a lawn, walkway, and chimney	6-35
Listing 6-6	Removing an item from a picture	6-36
Figure 6-22	A house with chimney removed	6-36
Listing 6-7	Replacing one shape with another	6-37
Figure 6-23	A house with the chimney replaced	6-37
Listing 6-8	Creating style, ink, and transform objects	6-38
Listing 6-9	Creating a picture whose items have overriding styles, inks, and transforms	6-39
Listing 6-10	Disposing of overriding style, ink, and transform objects before drawing	6-40
Figure 6-24	A house picture with an overriding style, ink, and transform	6-40
Listing 6-11	Adding four items that reference the same shape to a house picture	6-41
Listing 6-12	Disposing of the white rectangle and the three transform objects before drawing	6-42
Figure 6-25	A house with four windows	6-42
Listing 6-13	Adding unique items to a picture	6-43
Figure 6-26	A house with four windows and four unique overriding transforms	6-44
Listing 6-14	Creating a picture hierarchy	6-45
Figure 6-27	A house rotated by 90 degrees two times	6-45
Listing 6-15	Creating a picture hierarchy	6-46
Figure 6-28	Grounds picture	6-47
Figure 6-29	House picture	6-47
Figure 6-30	Picture containing grounds picture and house picture	6-48
Listing 6-16	Hit-testing a picture shape	6-49
Figure 6-31	Hit-testing the picture of house and grounds	6-49
Figure 6-32	Hit-testing the picture at depth 2 and level 1	6-50

Table 6-1	Hit-testing a picture at different depths and levels	6-51
Table 6-2	Geometric operations that post errors or warnings when applied to pictures	6-53
Table 6-3	Shape-related functions that exhibit special behavior when applied to pictures	6-54
Table 6-4	Geometric operations that exhibit special behavior when applied to pictures	6-55

