AutoCAD®

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Dynamic Blocks in AutoCAD 2006

Part 2 of 3: Inventory of Block Editor, Commands, Parameters, Actions, and Parameter Sets

By Ellen Finkelstein, EllenFinkelstein.com
Author of AutoCAD 2006 and AutoCAD LT 2006 Bible

This second of three white papers on Dynamic Blocks in AutoCAD® 2006 documents the software's parameters, actions, and parameter sets so that you can discover how they might best apply to your situation. The white paper includes the following:

- A brief overview of the capabilities of Dynamic Blocks

- An explanation of the Block Editor, where you create Dynamic Blocks

- Tables of parameters, actions, and parameter sets, including an explanation of which parameters and actions you can pair

For those new to Dynamic Blocks, Part 1 presents an overview of Dynamic Blocks and a quick-start tutorial.

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Capabilities of Dynamic Blocks

It's hard to list all the capabilities of Dynamic Blocks because you can combine features to make new ones. But a basic list can help you decide how you could benefit from using Dynamic Blocks. When you start to create Dynamic Blocks, you can also use this list to determine which features to add to each block. Each of these actions can apply independently to any component within the block. A Dynamic Block can do the following:

- Move based on a point, linear distance, polar distance (both a distance and an angle), or XY distance (distances along X and Y axes)

- Scale based on a linear distance, polar distance, or XY distance

- Stretch based on a point, linear distance, polar distance, or XY distance

- Rotate

- Stretch and rotate (polar stretch)

- Align (the entire block) to existing objects

- Flip along an axis (like the Mirror command)

- Array based on a linear distance, polar distance, or XY distance

- Take a value from a lookup table

- Become visible or invisible

Important additional features are the ability to connect changes, so that changing one component automatically changes another one; set a multiplier so that one object moves or stretches a percentage factor of another object; and specify which grips can be used as insertion base points.

As you can see, Dynamic Blocks offer many capabilities, enabling you to create blocks that are intelligent and flexible, yet easy to control. Instead of separately changing numerous components of a block, you can maintain the integrity of the block while modifying it within specific constraints.

Review of the Block Editor

You create Dynamic Blocks in the Block Editor. To start the Block Editor, choose Block Editor on the Standard toolbar, or type **bedit** on the command line. You then see the Edit Block Definition dialog box, where you choose to edit either a block or the entire current drawing. Then click OK to open the Block Editor.
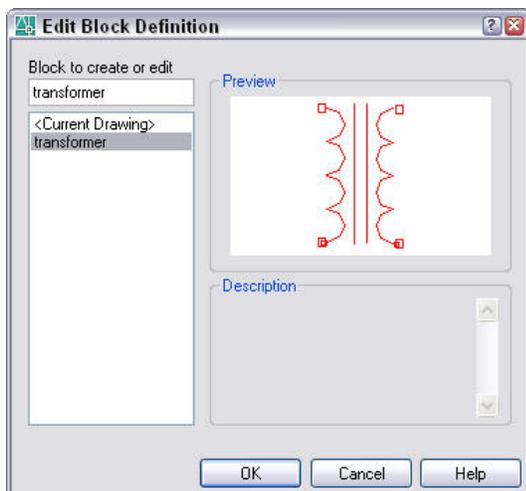

Figure 1: The Edit Block Definition dialog box.

The Block Editor is a window and mode separate from the drawing area. You can execute most commands from within the Block Editor, but not all. However, you can perform all drawing and editing tasks there. The Block Editor displays all menus and toolbars.
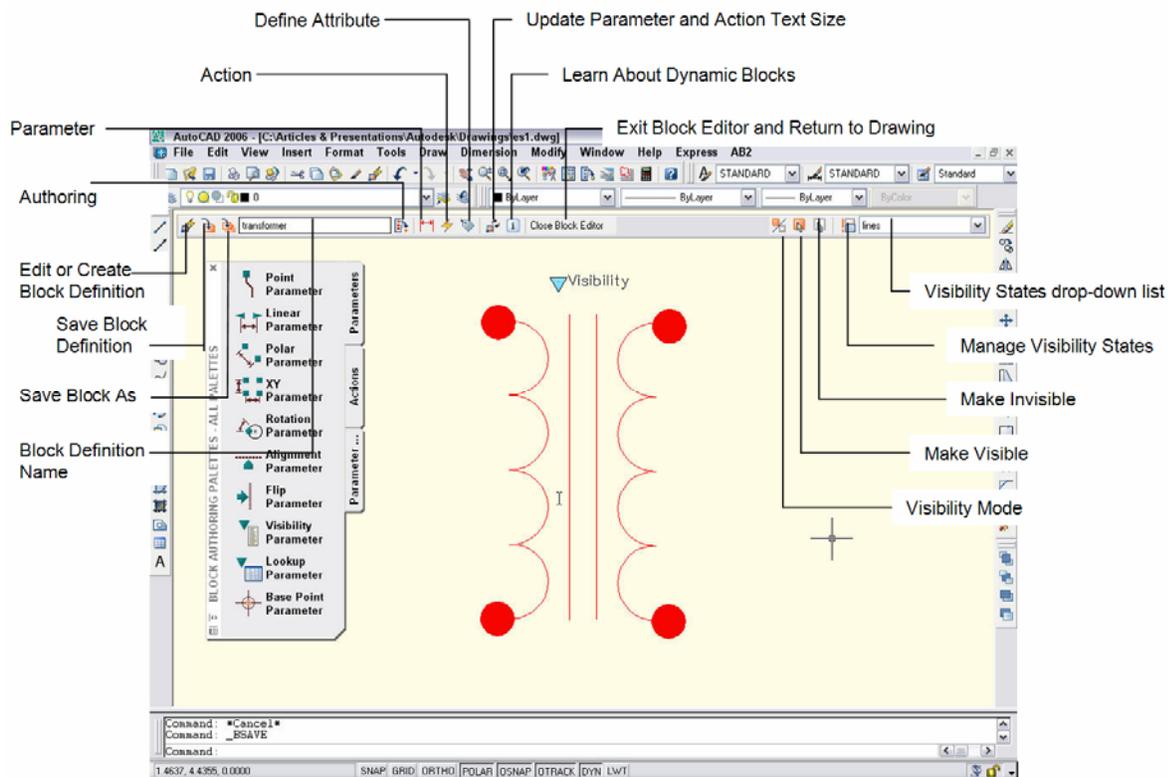

Figure 2: Block Editor with the transformer block open for editing.

Note: The colored background of the Block Editor indicates that you're not in the regular drawing area.

Before using the Block Editor, you may find it helpful to familiarize yourself with its toolbar buttons:

- **Edit or Create Block Definition:** Opens the Edit Block Definition dialog box, where you can choose another existing block to edit or enter a name to create a new block in the Block Editor. Use this button to edit several Dynamic Blocks (existing or new) without exiting the Block Editor.
- **Save Block Definition:** Saves the current block.
- **Save Block As:** Opens the Save Block As dialog box, where you can save the current block under a new name. Use this procedure to define a new Dynamic Block based on an existing one.
- **Block Definition Name:** Lists the block you are currently editing.
- **Authoring Palettes:** Toggles the display of the Block Authoring Palettes window. Use this window to place parameters, actions, and parameter sets.
- **Parameter:** Starts the BPARAMETER command, which enables you to use the command line (or dynamic input tooltip) to place a parameter. The options are the same as when you use the Block Authoring Palettes window.
- **Action:** Starts the BACTION command, which enables you to use the command line (or dynamic input tooltip) to place an action. The options are the same as when you use the Block Authoring Palettes window.

- **Define Attribute:** Opens the Attribute Definition dialog box, where you define attributes for the block.

- **Update Parameter and Action Text Size:** Sometimes, the parameter and action text becomes unusually large. When this happens, just click this button, and the text resizes to normal.

- **Learn About Dynamic Blocks:** Opens the New Features Workshop, where you can view a tutorial on Dynamic Blocks.

- **Exit Block Editor and Return to Drawing:** Closes the Block Editor.

- **Visibility Mode:** Toggles the BVMODE system variable, which determines how invisible objects display in the Block Editor. The default value (0) does not display invisible objects for the current visibility state. If you change the value to 1 (by clicking the Visibility Mode button), invisible objects are dimmed but still visible.

- **Make Visible:** Makes selected objects visible for the current visibility state.

- **Make Invisible:** Makes selected objects invisible for the current visibility state.

- **Manage Visibility States:** Opens the Visibility States dialog box, where you name visibility states.

- **Visibility States drop-down list:** Displays the current visibility state. Choose a visibility state from this list to change the current visibility state.

Note: Visibility states are discussed in more detail in Part 3 of this series of white papers on Dynamic Blocks.

When you open the Block Editor, the Block Authoring Palettes window automatically opens. This window has three tabs:

- Parameters

- Actions

- Parameter Sets

The contents of these tabs are discussed in the rest of this white paper.

Using Parameters

The first step in creating a Dynamic Block is to add a parameter. You can find all the parameters on the Parameters tab of the Block Authoring Palettes window. A parameter defines the geometry of the block to which you add a parameter. In each case, you need to specify geometric points on the block. Usually, you add an action to the parameter to define how the geometry will change when you edit the Dynamic Block in a drawing.
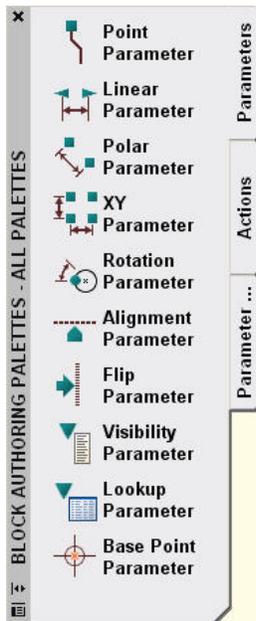

Figure 3: The Parameters tab of the Block Authoring Palettes window.

Parameters and actions pair together in logical ways. For example, you can stretch geometry along a distance (a linear parameter), but you can't rotate geometry along a distance. Therefore, each parameter takes only certain actions. The following table explains each parameter and which actions they can take.

Parameter	Applicable Actions	Description
Point	Move, Stretch	Defines a point (XY coordinate) on the geometry. Move or stretch from that point.
Linear	Move, Scale, Stretch, Array	Defines a linear distance. Specify a start point and an endpoint. Move, scale, stretch, or array along the line between the two points.
Polar	Move, Scale, Stretch, Polar Stretch, Array	Defines a linear distance and displays an angle. Specify a start point and an endpoint. Move, scale, stretch, polar stretch (stretch at an angle), or array along the line between two points and at a specified angle.
XY	Move, Scale, Stretch, Array	Defines X and Y distances. Specify a start point and an endpoint at an angle, and the parameter separately labels the X and Y distances. Move, scale, stretch, or array at specified X and Y distance.
Rotation	Rotate	Defines a base point, radius, and default rotation angle. Rotate around the base point.
Alignment	None	Defines a tangent or perpendicular alignment point. Specify the type (tangent or perpendicular) and the direction. No action is required. An alignment parameter aligns the entire block with other objects, enabling you to "snap" the block into place at the appropriate alignment.

Parameter	Applicable Actions	Description
Flip	Flip	Defines a *reflection line.* Specify the base point and endpoint of the line. Flipping is like mirroring.
Visibility	None	Controls the visibility of components in the block. No action is required, but you need to define the visibility states and which components are visible or invisible in each state.
Lookup	Lookup	Defines preset values that you specify. You then create labels for each value. When you edit the block in a drawing, choose one of the labels from the list to modify the block according to the values.
Base Point	None	Defines a base point for the Dynamic Block. Use this parameter when you want a base point to maintain its relationship to the block as other parts of the block are modified. For example, use a base point parameter if you want the base point of the block to always remain at the lower-left corner of a rectangle, even if that corner is stretched to a new position.

Note: Visibility states, lookup parameters, and many specific uses for these parameters are discussed more in detail in Part 3 of this set of white papers on Dynamic Blocks.

For example, you can attach an array action to an XY parameter. In Figure 4, the row and column distances are defined to be one unit larger than the stepping-stone, so that there are spaces between the stones when they are arrayed. If you know the X and Y distances that need to be covered with stepping-stones, you can easily array the stones to cover the area.
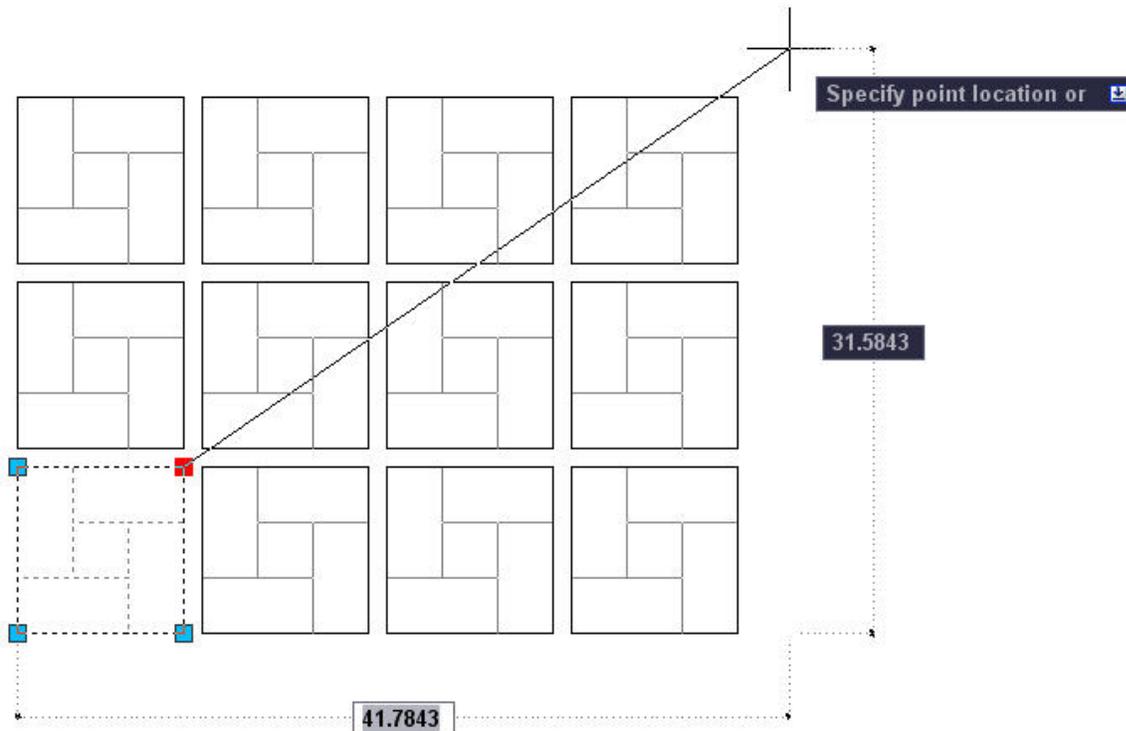

Figure 4: Arraying stepping-stones. The block contains one stepping-stone with an XY parameter and an array action.

Using Actions

All actions are attached to a parameter. First, you add a parameter to a block, and then you add an action to the parameter.
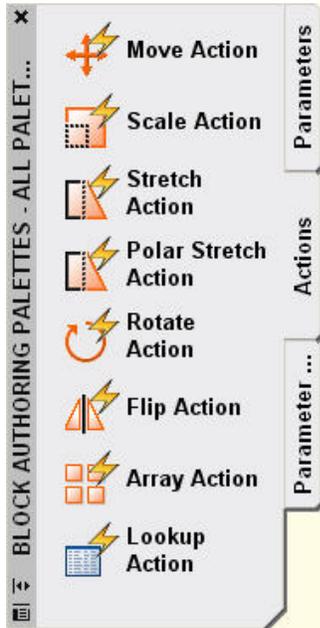

Figure 5: The Actions tab of the Block Authoring Palettes window.

Actions are similar to the commands on the Modify toolbar. They define the way objects within the dynamic block change when you edit the block in a drawing. Actions need to match up with an appropriate parameter. The following table explains each action and its appropriate parameters.

Action	Appropriate Parameters	Description
Move	Point, Linear, Polar, XY	Moves objects from a point, along a line, along a line with a displayed angle, or by specified X and Y units.
Scale	Linear, Polar, XY	Scales objects by specifying a length, a length and an angle, or X and Y distances.
Stretch	Point, Linear, Polar, XY	Stretches objects based on a point, a length, a length and angle, or X and Y distances.
Polar Stretch	Polar	Stretches objects and enables you to rotate them as well. You can rotate some objects while leaving others unchanged.
Rotate	Rotation	Rotates objects around a base point as you drag a second point (the endpoint of the parameter's radius).
Flip	Flip	Flips (mirrors) objects along a reflection line.
Array	Linear, Polar, XY	Arrays objects by specifying a length, a length and an angle, or X and Y distances.
Lookup	Lookup	Sets values according to a table that you specify (using the Reverse Lookup feature). When editing, you choose one of the values from a drop-down list.

The door shown in Figure 6 has many capabilities, including two flip parameters and corresponding flip actions. (You can stretch it, set the opening angle, and change the wall thickness.)
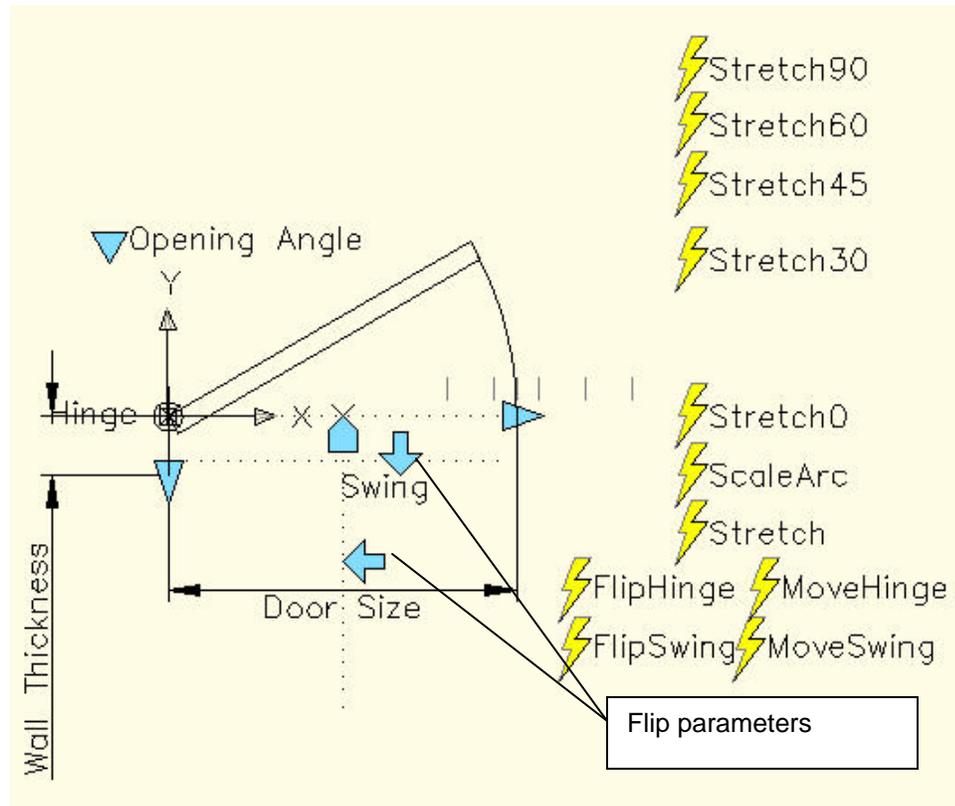

Figure 6: This door can flip both horizontally and vertically.

By flipping horizontally (across the vertical reflection line), you can insert a door that opens from the left or from the right. By flipping vertically (across the horizontal reflection line), you can insert a door that opens inward or outward.
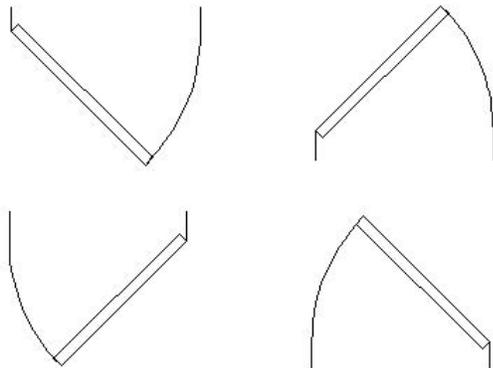

Figure 7: The two flip parameters and actions offer four permutations for the direction of the door's opening.

Using Parameter Sets

The final tab on the Block Authoring Palettes window contains parameter sets. Parameter sets are preset pairings of parameters and actions. Parameter sets are useful when you are learning about Dynamic Blocks but also offer a way to reduce their development time.

The Parameter Sets tab is so long that it doesn't fit on the screen; you need to scroll down to see all the sets.

To see what the set contains, place the cursor over any parameter set to see a tooltip explaining the set's functioning.

When you place a parameter set, you still need to respond to the parameter prompts by specifying one or more points and placing the label. An exclamation point appears next to the action to indicate that you still need to select objects for the action. Double-click the action to display prompts for selecting objects.
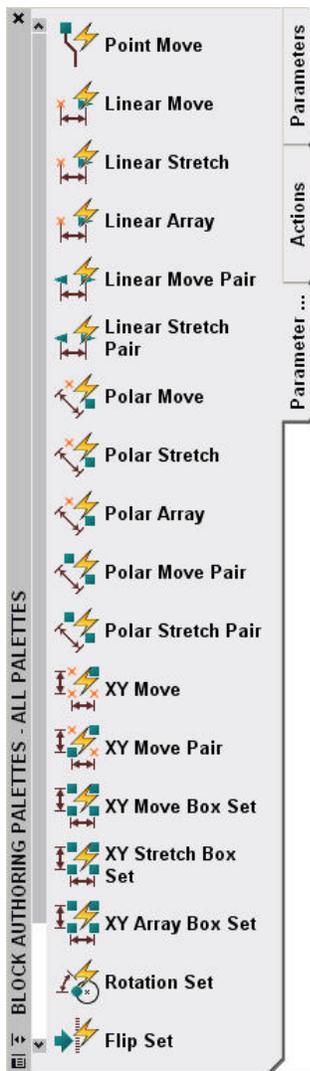

Figure 8: The Parameter Sets tab of the Block Authoring Palettes window.

The following table describes the parameter sets:

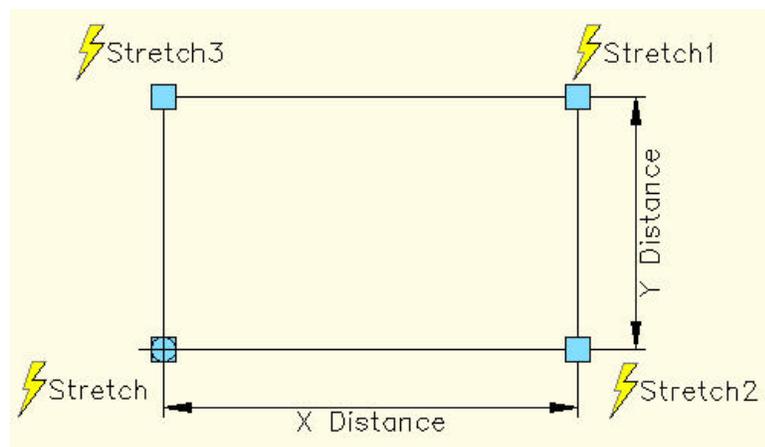| Name	Description
Point Move	A point parameter with a move action
Linear Move	A linear parameter with one grip and a move action at the endpoint
Linear Stretch	A linear parameter with one grip and a stretch action at the endpoint
Linear Array	A linear parameter with one grip and an array action at the endpoint
Linear Move Pair	A linear parameter with two grips and a move action at both the start point and endpoint
Linear Stretch Pair	A linear parameter with two grips and a stretch action at both the start point and endpoint
Polar Move	A polar parameter with one grip and a move action at the endpoint
Polar Stretch	A polar parameter with one grip and a stretch action at the endpoint
Polar Array	A polar parameter with one grip and an array action at the endpoint
Polar Move Pair	A polar parameter with two grips and move actions at both the start point and endpoint
Polar Stretch Pair	A polar parameter with two grips and stretch actions at both the start point and endpoint
XY Move	An XY parameter with one grip and a move action at the endpoint
XY Move Pair	An XY parameter with two grips and move actions at both the start point and endpoint
XY Move Box Set	An XY parameter with four grips and move actions at all four coordinates defined by the start point and endpoint
XY Stretch Box Set	An XY parameter with four grips and stretch actions at all four coordinates defined by the start point and endpoint. Use this parameter set to create a rectangular block that you can stretch from any corner, without changing the shape of the block.
XY Array Box Set	An XY parameter with four grips and array actions at all four coordinates defined by the start point and endpoint
Rotation Set	A rotation parameter and rotation action
Flip Set	A flip parameter and flip action
Visibility Set	A visibility parameter
Lookup Set	A lookup parameter and lookup action

Figure 9: A rectangular block with an XY Stretch Box parameter set, as shown in the Block Editor.
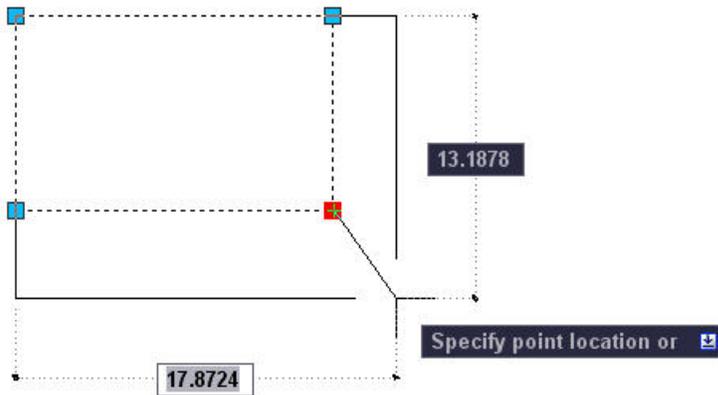
Figure 10: Stretching the rectangular block. You can stretch it from any corner.

Easier Done Than Explained

Although Dynamic Blocks have some complexities, many of the most commonly used parameters and actions are easy to create and use. The lists in this white paper may seem long, but after you've created a simple Dynamic Block or two, you'll find a great deal of commonality among the various parameters and actions. The best advice is to start simple, and soon you'll have some very useful Dynamic Blocks.