

White Paper
Dynamic Blocks in Autodesk® AutoCAD 2006
Part 1 of 3: Dynamic Block Overview and Quick-Start Tutorial

In AutoCAD 2006 software, you can now create blocks that are intelligent and flexible. This exciting new feature, called *dynamic blocks*, enables you to modify blocks within specific constraints. A block library might have dozens of windows (if architectural) or bolts (if mechanical). With dynamic blocks, you can create one block that takes the place of all these related blocks and ensure that modifications match the dimensions of their real-world objects. As a result, the process of finding the right block is much more efficient. Inserting and editing the block is practically error-free.

Furthermore, you can individually modify components of blocks. For example, within a desk set, you could move the chair, change the type of telephone, change the desk size, and specify the size of the computer's monitor. You can therefore work with one block that contains multiple, editable components in place of several blocks. Facilities management was never so easy!

This first of three articles explains the basic concepts of dynamic blocks and ends with a quick-start tutorial. Part 2 provides detailed documentation of the feature. Part 3 introduces some of the advanced uses for dynamic blocks.

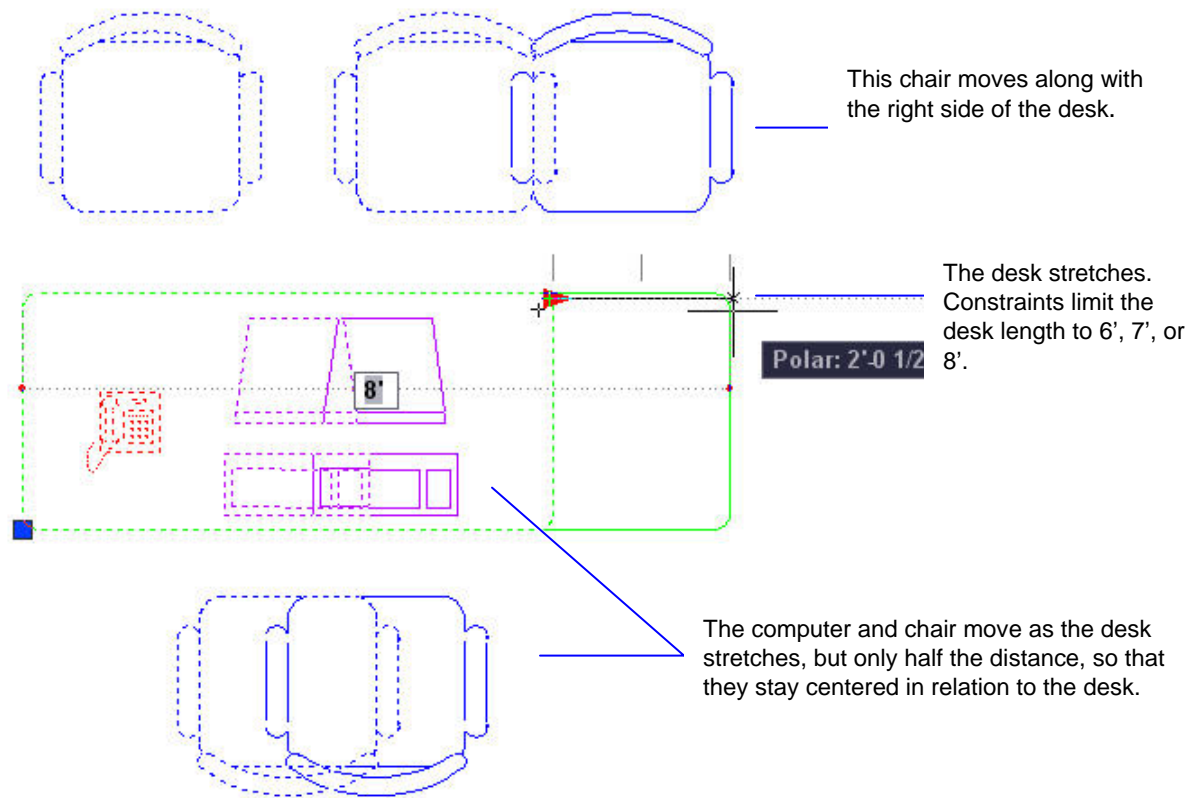
How you can use dynamic blocks

Once you create a dynamic block and specify its features and constraints, you modify the block after you insert it, using special grips. As you click or drag the grips, the block adjusts according to its allowable flexibility. In other cases, you can choose options from a drop-down list to specify how to modify the block.

Here are some possible scenarios for using dynamic blocks:

- A door that you can stretch to increase its width, without increasing the thickness of the door.
- A bolt that you can lengthen without increasing its thickness
- A bed that you can change from twin to queen to king, adjusting the number of pillows appropriately
- A picket fence that enables you to specify various post heights and then automatically arrays those posts as you stretch it
- A rectangular metal plate with a centered hole that stays centered as you stretch the plate.
- A piece of equipment (such as a phone or a computer monitor) that can take one of several forms that you choose from a drop-down list

You can make any existing block dynamic by adding dynamic features to it. The office set in the figure includes a desk, three chairs, a computer, and a phone. This block is constructed so that you can stretch the 6-foot desk to 7 feet or 8 feet. As you drag, the chair behind the desk and the computer both move, always remaining centered between the two sides of the desk. The right chair in front of the desk moves to remain aligned with the right side of the desk. Without dynamic blocks, you would have to manually adjust all the separate components individually when you stretched the desk.




Editing a dynamic block in a drawing.

You can add as much complexity as you want to a multi-component block such as this. For example, you might want the ability to change the type of phone, the type of monitor (CRT or LCD), the size of the monitor, the type of computer (desktop or laptop), and so on.

How to create a dynamic block

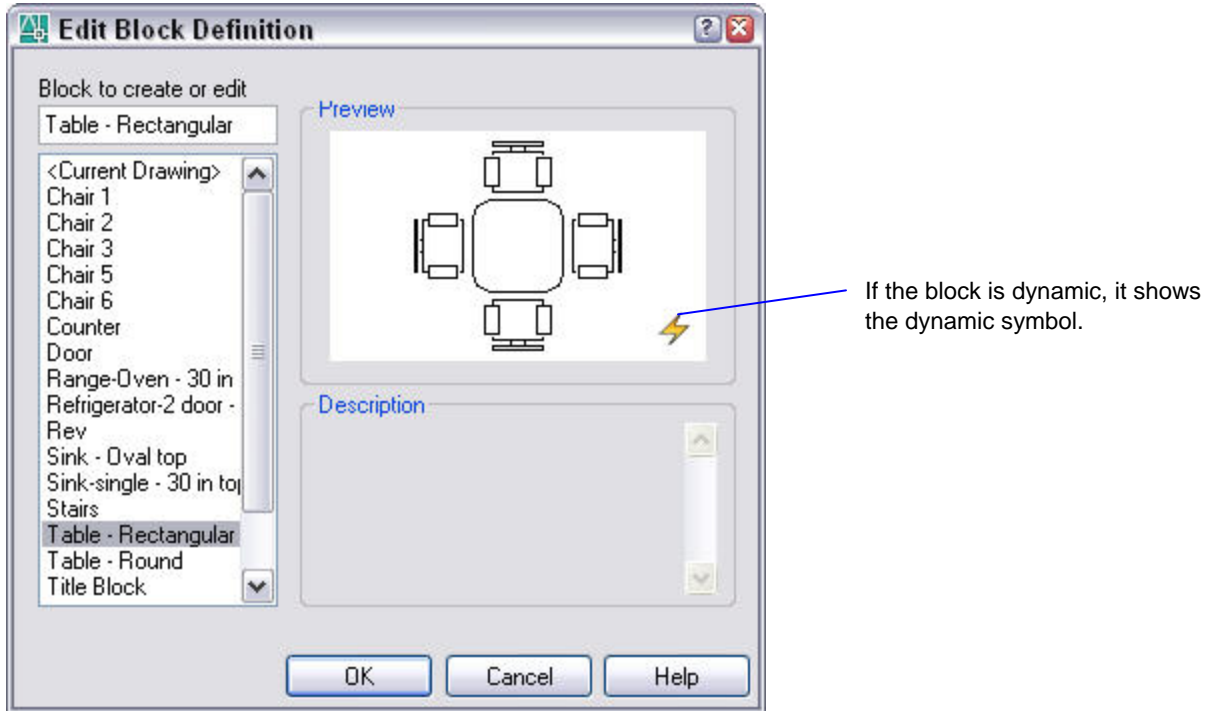
You create (author) a dynamic block in the new Block Editor. You can start from an existing block or individual objects. When you open a block in the Block Editor, you can select and edit the individual objects that make up the block; therefore, you don't have to explode it first. You save your changes in the Block Editor and then you can insert your new dynamic block and test it out!

To start authoring a dynamic block based on existing blocks, open the drawing that contains the block. Then open the Block Editor using one of the following methods:

-  Click Block Editor on the Standard toolbar
- Enter **bedit** on the command line or in the dynamic input tooltip
- Choose Tools > Block Editor from the drop-down menu

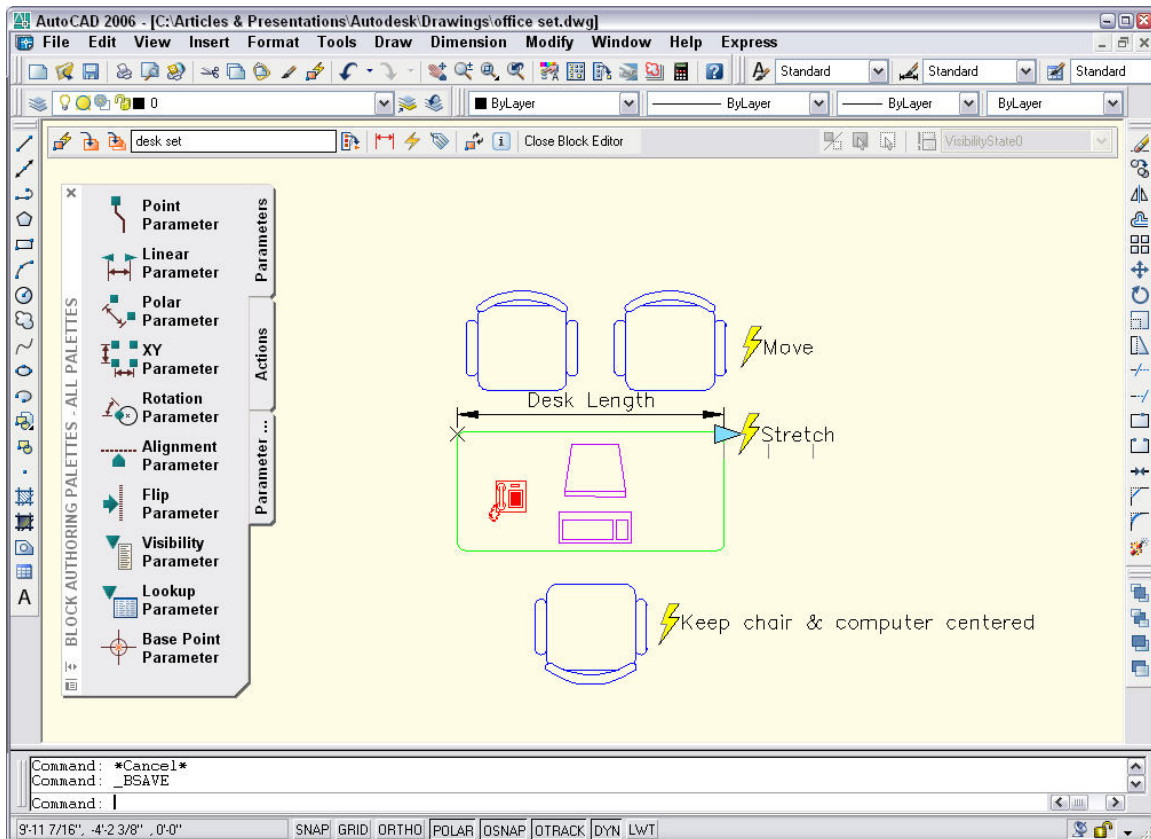
The Edit Block Definition dialog box appears. Here you can choose any block in the drawing. If you want to turn all of the objects into a dynamic block, choose <current drawing> to work with the entire drawing. You'll then be able to insert the entire drawing as a dynamic block.

Note: If you want to use the Design Center to insert the dynamic block (which you would do for a block library drawing with more than one dynamic block) choose the block you want to edit.



The Edit Block Definition dialog box.

Click OK, and you're now in the Block Editor. The Block Editor is a special window for editing dynamic blocks. The Block Editor has its own toolbar that provides commands for working with dynamic blocks. At the same time, the Block Authoring Palettes window opens. The palette has three tabs that you use for turning ordinary blocks or objects into dynamic blocks.



A dynamic block in the Block Editor

Adding parameters and actions

Compared to a regular block, a dynamic block generally has two additional items — a parameter and an action. Of course, you can add more than one of each. A *parameter* defines the features of the geometry of the objects that you want to change. An *action* defines the modification that acts on the parameter. Each action is attached to a parameter.

One exception is the alignment parameter, which doesn't require an action. An alignment parameter in a dynamic block enables you to quickly align the block with other objects in the drawing — either tangentially or perpendicularly. Many blocks can benefit from an alignment parameter in addition to the other dynamic features they contain.

The simplest example is a dynamic block that allows you to independently move an object in a block, based on a specified point on the object. You use the point parameter to specify the point, and then attach a move action to that parameter. When you insert and select this dynamic block, you find a grip on the point you specified and can move the object from that point.

You choose a parameter based on the geometry you want to control and the position, distance, and/or angle that you want to specify. Then you choose an action that modifies

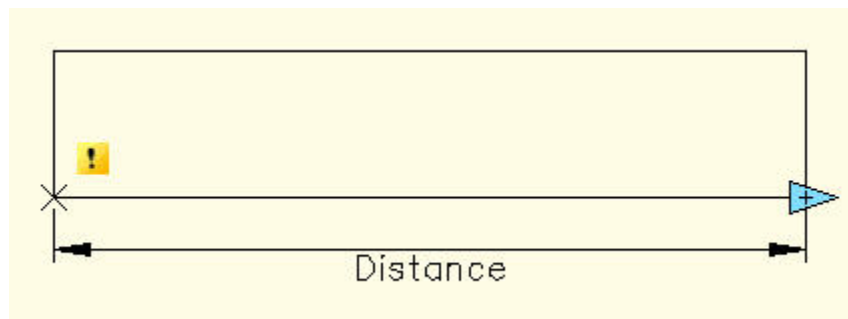
that parameter. Actions are like editing commands — they move, stretch, rotate, scale, array, and mirror (flip) objects.

To choose a parameter, you click one of the parameters on the Parameters tab of the Block Authoring palette. Then you respond to the prompts for that parameter. The prompts vary with the parameter, but you generally specify the following:

- **Start point:** The first point of the distance. (A point parameter has only one point.)
- **Endpoint:** The end point of the distance, which may also define an angle.
- **Label location:** A place for the parameter's label. The label location is just for your convenience.

You may want only one parameter point and grip, perhaps at the right side of the distance parameter. You can right-click the parameter, and choose the number of grips you want from the Grip Display item on the shortcut menu. The example shows one grip only. If you wanted to add two stretch actions, one to stretch from the left point and another to stretch from the right point, you would use two grips.

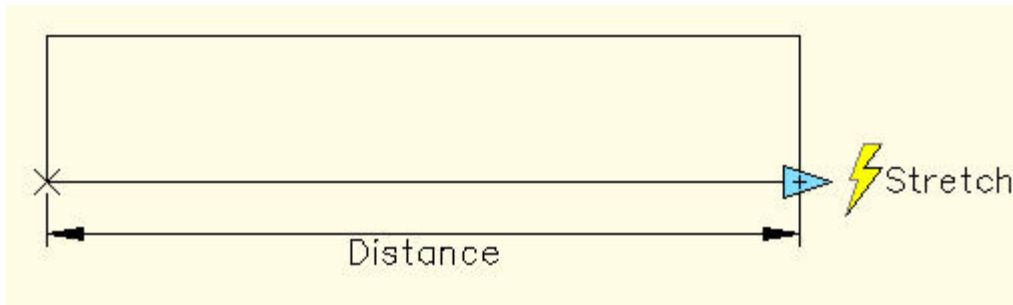
When you finish your parameter, you see an exclamation point to remind you that you still need to add an action.



A linear parameter without an associated action

To assign an action, click the Actions tab and choose one of the actions. Some restrictions apply; for example, you can only assign a rotate action to a rotation parameter. The first prompt always asks you to select a parameter. The next prompt usually asks you to specify which parameter point you want to associate with the action. For example, if you want to stretch an object with a linear parameter, do you want to stretch from the left point or the right point?

The next prompts depend on the action, but you generally need to select the objects you want to include in the selection set for the action. If you want the parameter to move as the object moves, you include the parameter in the selection set. Finally, you place the action's label. The label has no effect on the dynamic block and is just for your convenience when you edit the block. When you're done, the exclamation point should disappear and you know that you've successfully assigned the action to the parameter.



A block with a stretch action attached to its linear parameter

Constraining values for block components

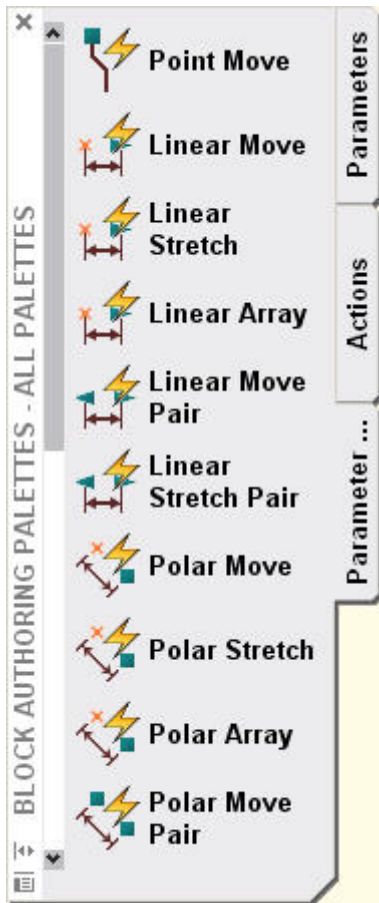
If you're creating a block for a desk, you probably need to restrict the desk size to the sizes available from your supplier. A great feature of dynamic blocks is the ability to specify either a list of values or possible increments with minimum and maximum values. This feature is called *value sets* and it helps avoid time-consuming mistakes! Value sets provide you with the perfect balance of flexibility and control.

Let's say that you only buy desks that are 4 feet, 5 feet, or 6 feet 6 inches long. In this case, you can use a *list* value set and simply supply these three values. Then you can only stretch the desk to one of those three values. On the other hand, you may have a part whose length is in increments of 1 inch, but never less than 3 inches or more than 20 inches. In that case, you can use an *increment* value set to specify those values and constrain the length of the part accordingly.

You specify a value set when you create a parameter. You can choose the Value set option when you choose a parameter and provide the details on the command line or in the dynamic input tooltip. You can also select an existing parameter and create the value set in the Properties palette.

Using parameter sets

AutoCAD 2006 software comes with a number of pairs of parameters and actions that you can use, almost straight out of the box. These sets are a great way to get started with dynamic blocks. Click the Parameter Sets tab on the Block Authoring Palettes.




The Parameter Sets tab of the Block Authoring Palettes window

The parameter sets combine the most commonly used pairs of parameters and actions, such as a point parameter with a move action and a linear parameter with a stretch action. You still have to choose the geometrical points for the parameter and place its label.

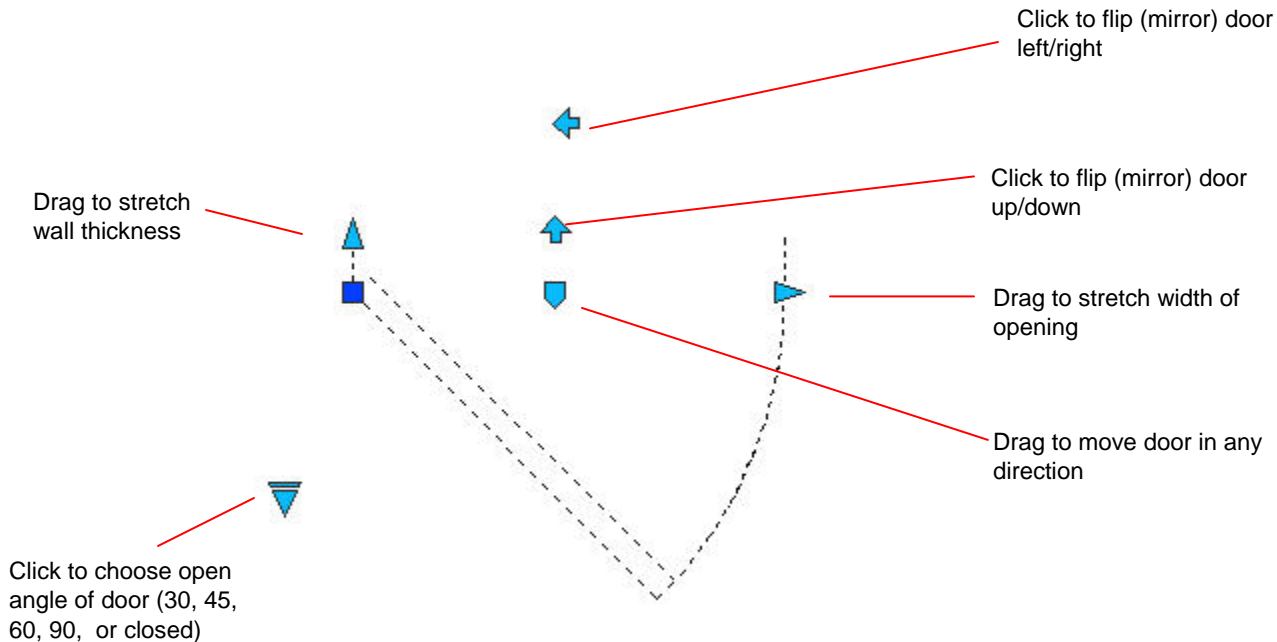
The only missing information is the selection set for the action. For this reason, when you place a parameter set, you see one or more exclamation points to alert you that you need to select objects. Double-click the action and then select the objects. That's all there is to it.

Inserting and editing dynamic blocks

When you finish creating your dynamic block, you save it by choosing Save Block Definition  on the Block Editor toolbar. Then click the Close Button Editor button.

Open a new drawing or any drawing in which you want to insert the dynamic block. If you saved your block as one of a number of blocks in a drawing that functions as a block library, insert the block from the DesignCenter. If you edited the entire drawing (choosing <current drawing> when you opened the block editor), choose Insert > Block from the menu and insert the drawing.


Now select the block and you see one or more dynamic block grips. You usually click or drag a grip. For example, if you added a stretch or move action, the block stretches or moves as you drag a grip. If you added a flip action, you just click the grip to flip the block.



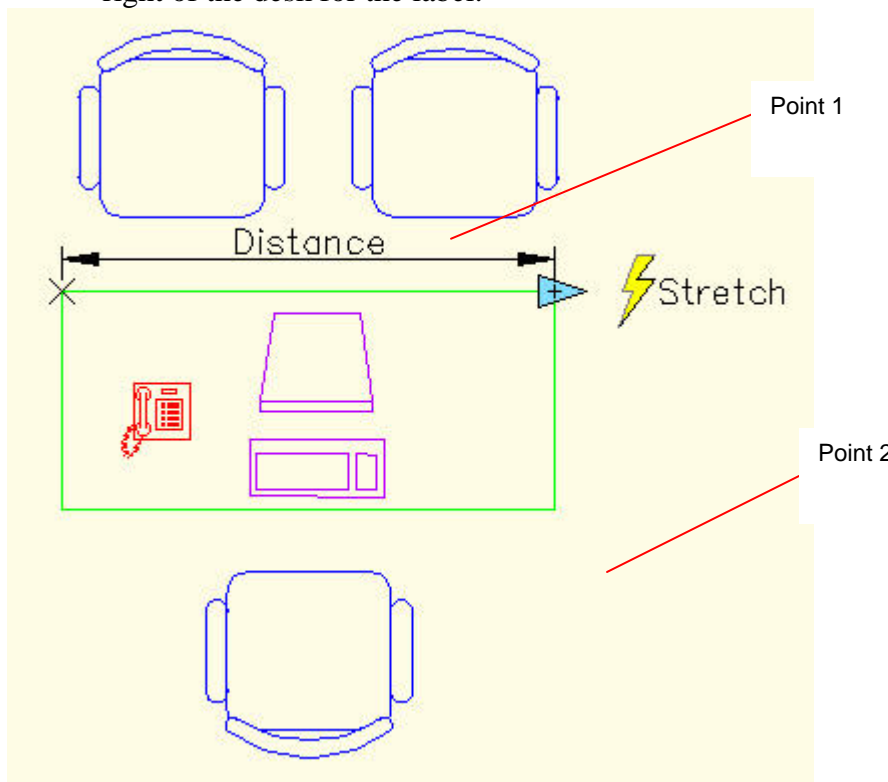
You click or drag a dynamic block grip to edit the block

Quick-start tutorial


Although this White Paper is not meant to be a tutorial, a short, simple tutorial is included here to get you started. After you have created your first dynamic block, you'll see that the process is not as difficult as it might seem when you first read about the many options. This tutorial adds a linear parameter and a stretch action to a desk.

1. Open *office set.dwg*. If you would like to keep the original drawing without changing it (perhaps so you can do the tutorial again), choose File > Save As and save it under a different name. Remember where you saved it.
2.  Choose Block Editor from the Standard toolbar.
3. In the Block Edit Definition dialog box, choose the *deskset* block. Click OK. The Block Editor opens and the Block Authoring Palettes window appears.
4. Click the Parameters tab of the palette and choose Linear Parameter.
5. At the *Specify start point or [Name/Label/Chain/Description/Base/Palette/Value set]:* prompt, pick the upper-left corner of the desk.
6. At the *Specify endpoint:* prompt, pick the upper-right corner of the desk.
7. At the *Specify label location:* prompt, pick a location above the desk for the label.
8. Select the parameter. Right-click and choose Grip Display > 1 from the shortcut menu. The left grip disappears.

9. Click the Actions tab of the palette and choose Stretch Action.
10. At the *Specify parameter:* prompt, pick the Linear parameter that you just inserted.
11. At the *Specify parameter point to associate with action or enter [Start point/Second point] <Start>:* prompt, move the cursor over the right grip. When you see the red marker there, click.
12. Turn OSNAP off if it's on.
13. At the *Specify first corner of stretch frame or [CPolygon]:* prompt, click at Point 1 in the figure.
14. At the *Specify opposite corner:* prompt, click at Point 2 in the figure.
15. At the *Specify objects to stretch Select objects:* prompt, click near (but not exactly on) Point 2.
16. At the *Specify opposite corner:* prompt, click near (but not exactly on) Point 1.
17. At the *Select objects:* prompt, press Enter to end selection.
18. At the *Specify action location or [Multiplier/Offset]:* prompt, pick a point to the right of the desk for the label.



Creating a stretch action for a desk

19.  Click Save Block Definition on the Block Editor toolbar. Then click Close Block Editor.
20. Save and close the drawing.
21. Open a new drawing using any template.
22. Press Ctrl+2 to open the DesignCenter.
23. In the DesignCenter's Folder List, navigate to the drawing where you saved the dynamic block. Double-click the drawing and choose the Blocks item.

24. In the content pane of the DesignCenter, double-click the *deskset* block. In the Insert dialog box that opens, click OK. Close the DesignCenter.
25. Click anywhere in your drawing to insert the *deskset* block. Choose Zoom Extents from the Zoom flyout of the Standard toolbar to display the entire block.
26. Select the block. The stretch action grip is a right-facing arrow. Drag the arrow to stretch the desk. Click when the desk is the desired length.

As you can see, adding dynamic features to a block greatly increases the flexibility and usefulness of the block. Take some time to think about how you could use this feature for your blocks and then start creating some dynamic blocks!