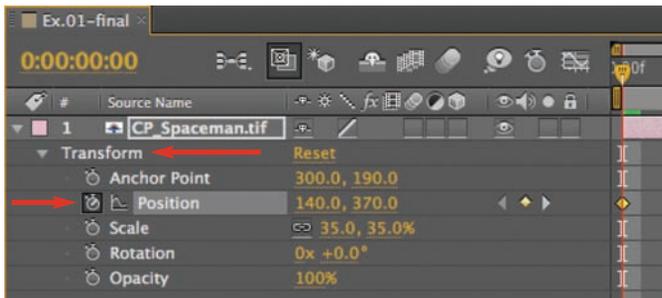


3

Basic Animation

Animating a layer's transformations along with mastering motion paths.

One of the most important skill sets in motion graphics is learning how to animate *transformations*: Anchor Point, Position, Scale, Rotation, and Opacity. Fortunately, many rules and techniques for creating transform keyframes can be applied to virtually all the other parameters throughout After Effects. And once you learn how to manipulate the handles of a 2D Bezier motion path, you can employ these same skills when using the Pen tool to create vector shapes for masks (Chapter 10) and shape layers (Chapter 32).



Twirl down the layer, then twirl down the Transform section to reveal the transformation properties. In this example, Position is animating (its stopwatch is on); the other properties are at a constant value.

Example Project

Explore the 03-Example Project.aep file as you read this chapter; references to [Ex.##] refer to specific compositions within the project file.

In this chapter, we'll concentrate on the basics, including tips for avoiding many common mistakes. You might be surprised to see how much can be done with just one or two animated properties and just two keyframes per property. You'll notice this if you spend some time studying motion graphics on television: A title moves left to right (two Position keyframes). A title fades in (two Opacity keyframes). A title grows

larger (two Scale keyframes). We bet you won't find many titles buzzing around the frame doing figure eights (you know who you are...).

So as not to add to your anxiety, this chapter concentrates on moving layers in 2D space (the X and Y axes), leaving the Z axis to Chapter 13, *3D Space*. After mastering motion in 2D, just one more itsy-bitsy axis shouldn't be too daunting...

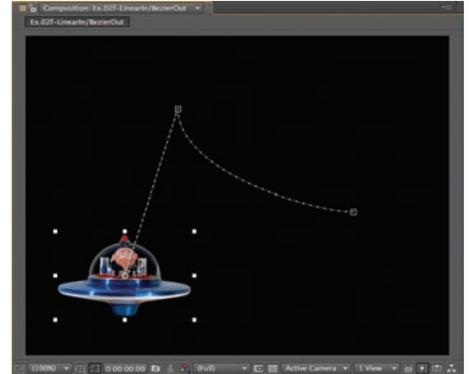
In the next chapter, we cover controlling speed (how layers change over time) including how to use the powerful Graph Editor. Don't feel overwhelmed when you start delving into the nitty-gritty of motion paths and velocity curves; more than likely many layers can be animated very simply. However, you will appreciate being able to make a layer move exactly the way you want it to when the project calls for more complex moves and for subtle timing changes.

In Chapter 5, you'll increase your animation skills with tips and techniques for manipulating keyframes and motion paths, as well as explore some of the very useful Keyframe Assistants that ship with After Effects.

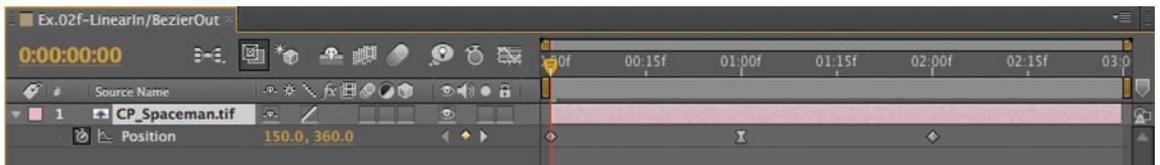
Position in Time and Space

Before we delve into creating Position keyframes, it's worth pointing out that Position keyframes exist in both space and time. When you animate Position you create a motion path in the Comp panel. After Effects calls this *spatial* interpolation, or how the layer interpolates between keyframes in *space*. This motion path can be manipulated using Bezier handles; these create different “flavors” of keyframes which we will explore in depth in this chapter.

The overall speed of the layer as it travels along this path is set by two factors: how many pixels the layer travels between keyframes in the Comp panel, and how many frames apart these keyframes are in the Timeline panel. How the layer interpolates between keyframes over *time* is referred to as *temporal* interpolation. To gain more subtle control over its velocity, you can also manipulate a layer's speed graph in the Graph Editor (covered in the next chapter).



The motion path in the Comp panel determines the direction the layer travels. Spaceman object courtesy Classic PIO/Nostalgic Memorabilia.

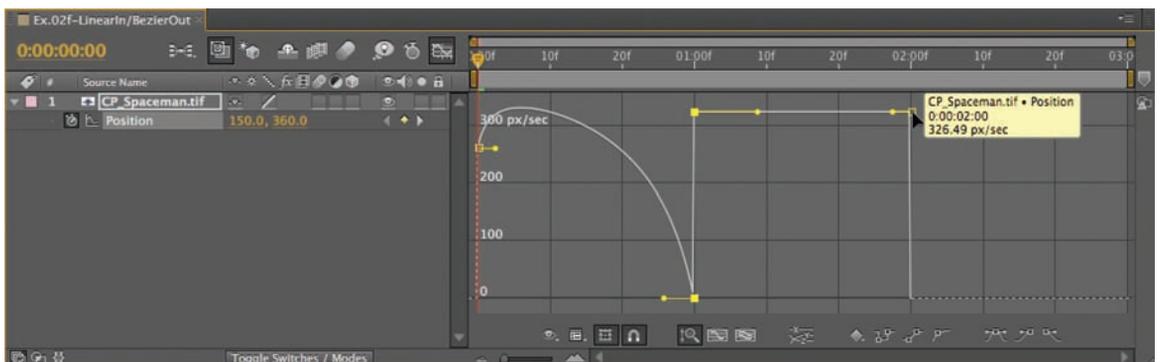


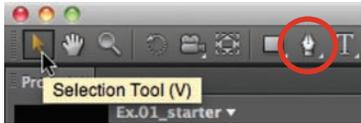
Obviously, we're talking about two different concepts here – *space* and *time*. By default, the keyframe flavor you choose for your motion path is independent of the keyframe types available when manipulating the speed in the Graph Editor. And once you are introduced to Roving Keyframes (Chapter 4), you'll see that space and time can even be disconnected from each other for the ultimate in independence!

Besides Position, other properties with values on the X and Y axes are also considered to have a spatial component – such as Anchor Point and Effect Point for 2D and 3D layers, as well as Cameras and Lights in 3D (which add a Z axis, of course). In contrast, properties such as Scale, Rotation, and Opacity do not have a spatial component.

The overall speed of the layer is set by how far the keyframes have to travel in the Comp panel plus the spacing of the keyframes in the Timeline panel (above).

You can then further tweak how the layer travels in time by editing the speed graph in the Graph Editor (below), which is covered in the next chapter. The keyframe interpolation methods used in both time and space are independent of each other.





Step 1: You will create your motion path with the Selection tool (shortcut: V). You will use the Pen tool (circled) later when editing the path.

TIP

Stopwatch Shortcut

Option+Shift+P on Mac (Alt+Shift+P on Windows) is the shortcut to turn on the stopwatch for Position and set the first keyframe. This shortcut will also reveal the Position property in the Timeline panel if it is currently twirled up.

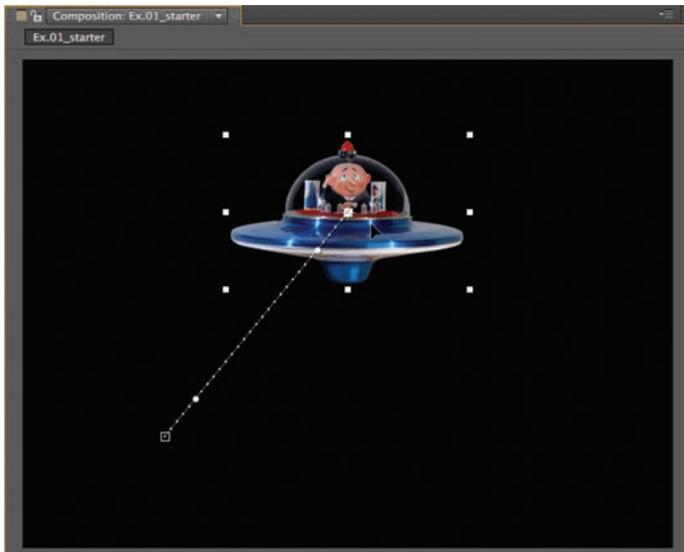
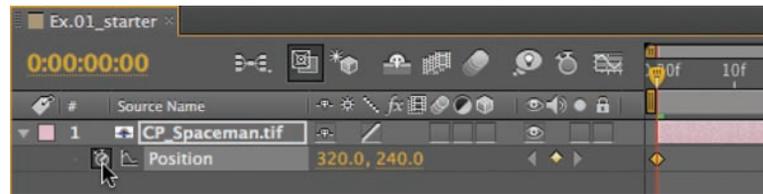
Step 2: At 00:00, click the stopwatch to turn it on and set the first Position keyframe.

Animating Position

Open the After Effects file **03-Example Project.aep** from the Chapter Projects folder on your DVD. To get started, create three Position keyframes so you'll have a motion path to play with:

Step 1: Open our first example composition, [Ex.01_starter]. We created it at 640×480 pixels, 29.97 frames per second (fps), with a duration of 05:00. We used **CP_Spaceman.tif** from this project's **Sources > Objects** folder, scaled to 40%. For this exercise, you'll be using the Selection tool (shortcut: V), so make sure this is selected.

Step 2: To animate Position, you first need to turn on its animation stopwatch. Rather than twirl all the properties down to find Position, select the **CP_Spaceman** layer and press P to solo the Position property in the Timeline panel. The current value for Position is displayed as a value on the X (left/right, or horizontal) and Y (up/down, or vertical) axes in the Comp panel, computed from the top left-hand corner (which has a value of 0,0). To be precise: The Position value represents the position of the layer's Anchor Point (which defaults to the center of the layer) in relation to the composition.



Step 3: Dragging the layer to a new location creates the second keyframe automatically and draws a motion path between both locations.

- Turn on the stopwatch to the left of the word Position to set the first keyframe at 00:00. In the comp panel, click anywhere inside the layer (avoiding the layer's corners) and drag the spaceman to the bottom left-hand corner; this updates the keyframe's XY value. If the Window > Info panel is open, you'll also see the Position value update in real time as you move a layer.

Step 3: Move the current time indicator to 01:00, click anywhere inside the layer, and drag the spaceman to the top of the Comp panel. The second keyframe is created automatically, along with a motion path made up of dots. Each dot indicates the position of the layer on each frame from 00:00 to 01:00.

Step 4: Move in time to 02:00 and drag the layer to the bottom right-hand corner to create the third keyframe. Notice that the motion path is now rounded at the second keyframe. (The Timeline panel has three diamond-shaped keyframe icons, which we won't worry about for now.) If you got lost, our result is shown in comp [Ex.01-final].

Step 5: Press Home to return to time 00:00 and preview the animation by tapping the spacebar; this Standard preview displays the motion path as it plays, unlike RAM Preview. (We explored previewing options in depth at the end of Chapter 2.)

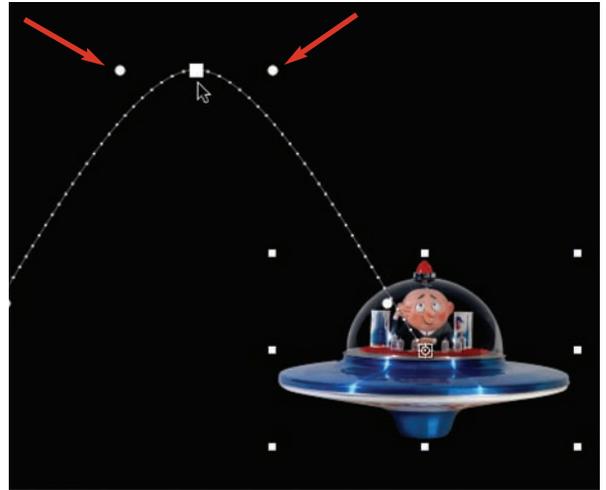
Editing the Motion Path

An important concept is that most editing happens *at the current time*. The position of the current time indicator in the Timeline panel indicates the active frame. If a property is set to animate (its stopwatch is on), changing the value of this property at this point in time either (a) edits a keyframe if one exists on this frame or (b) creates a new keyframe.

The exception to this rule is the motion path: You can select and move keyframe boxes in the Comp panel *without first having to move to that point in time*. Go ahead and practice moving the keyframes around (in Chapter 5, we'll cover moving and scaling the entire motion path).

In the Comp panel, with the Selection tool active, select the keyframes individually by clicking on their keyframe box and notice their associated handles that look not unlike the dots for the motion path. The first keyframe has just one handle, while the middle keyframe, when it's selected, shows a handle on each side. (For now, resist the urge to touch these default handles, or you'll convert them to another keyframe type.) The fact that the handles are drawn simply as "dots," with no connecting lines, indicates that these are all *Auto Bezier* keyframes, the default keyframe in the Comp panel. Because the middle keyframe has both incoming and outgoing characteristics, we'll concentrate on its behavior in the next section.

After Effects identifies its keyframe interpolation types by important-sounding names such as Linear, Auto Bezier, Continuous Bezier, and Bezier. After all, without these names, we would have to refer to Bezier as the "keyframe with handles sticking out in different directions" (or KWHSOIDD for short). Don't get too hung up on the keyframe names – it's more important to know what the Bezier handles are doing and how to edit them. Creating motion paths is easy; making them do exactly what you want them to do takes a little practice! We've provided examples of each keyframe type in the [Ex.02-spatial keyframes] folder of comps, so let's take a tour...



Step 4: The Auto Bezier keyframe is the default spatial keyframe: Select the middle keyframe and you'll see two "dots" on each side of the keyframe box. These dots form an imaginary line. Note that we've increased the size of the keyframe icons in the Comp panel (Preferences > General > Path Point Size) – a new feature in CS5.

FACTOID

Motion Path Color

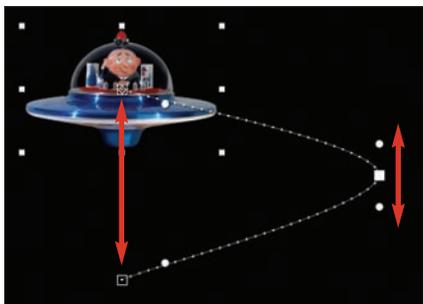
The color of the motion path is derived from the layer's label color. If you are having trouble seeing the path, try changing the label color (Chapter 6).

TIP

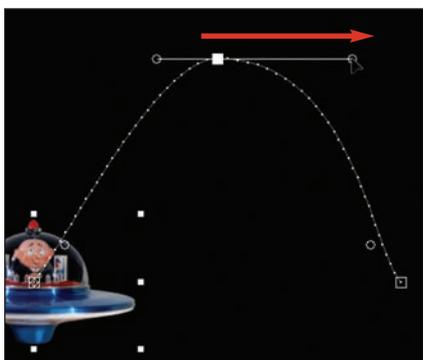


Live Update

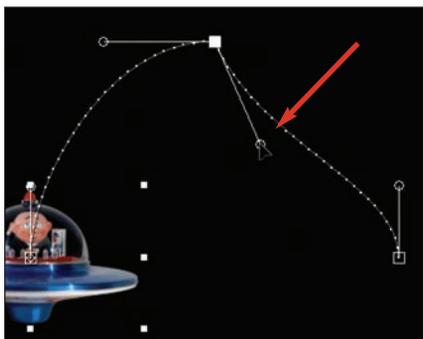
When you scrub the current time indicator in the timeline, the Comp panel should update on the fly. If it is not updating until you release the mouse, check that the Live Update button wasn't inadvertently toggled off.



In [Ex.02b], the orientation of the Auto Bezier handles for the middle keyframe appear vertical and parallel to the imaginary line created by the first and last keyframe.



Dragging one of the Auto Bezier dots converts the keyframe to Continuous Bezier, which maintains a straight line through the keyframe.



To gain independent control over the incoming and outgoing handles, hold down the G key and drag a Continuous Bezier handle. This technique is a toggle.

Auto Bezier Keyframe: The default keyframe type in the Comp panel is Auto Bezier. Its role is to create a smooth angle into and out of a keyframe, with no hard angles or sudden changes in direction. In [Ex.02a], select the middle keyframe and imagine a line connecting the two dots on each side of the keyframe. Now imagine another line connecting the first and third keyframes. Unless your imagination is playing tricks on you, these two lines should be parallel to each other.

To see what's automatic about Auto Bezier, move the three keyframes around in the Comp panel by selecting their keyframe boxes and dragging them to new positions (again, avoid dragging the keyframe handles themselves). Notice that no matter where you drag the keyframes, the two imaginary lines remain parallel. One result is shown in comp [Ex.02b].

Continuous Bezier Keyframe: More often than not, you'll end up manually editing the default Auto Bezier handles so you can better control the curves of the motion path. You do this by dragging one of the default handle dots, which turns the imaginary line connecting the dots into real direction handles (see [Ex.02c]).

This keyframe type is called Continuous Bezier. You'll notice that as you edit a handle on one side, the opposite handle moves also (similar to a see-saw action). The two direction handles are lengthened or shortened independently of each other, but the handles maintain a continuous straight line through the keyframe.

Note: If you're having trouble finding the default Auto Bezier handle dots amid the motion path dots, press *and hold down* the G key (to temporarily toggle to the Pen tool), click on the keyframe in the Comp panel, and drag out new handles. When you release the G key, the Selection tool should be active again. (If you actually changed to the Pen tool, press V to return to the Selection tool.)

Bezier Keyframe: For the ultimate control, you can "break" the incoming and outgoing handles so they operate independently – this is the Bezier keyframe type. You can then create any combination of straight lines and smooth curves, as we did in [Ex.02d].

To break the handles, press *and hold down* the G key (to temporarily toggle to the Pen tool) and move the cursor over a handle – the cursor will toggle to the Convert Vertex tool (an upside down V). Click and drag a handle to break it. When you release the G key, the Selection tool should be active again.

To revert back to Continuous Bezier, just repeat the procedure: Hold down the G key, then click and drag on a handle; the opposing handle will jump to form a continuous line again. You can also press G and drag new handles out of the keyframe box.

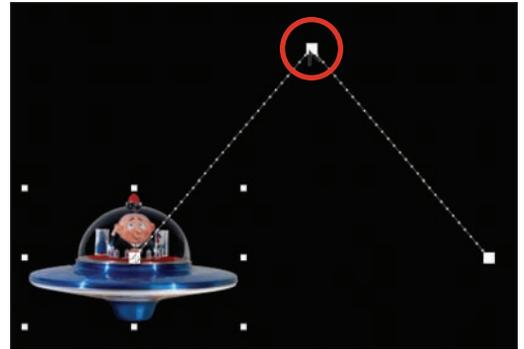
Note that if you press G and release, it will permanently toggle to the Pen tool. We recommend you stick with the Selection tool for basic editing (see *Using the Pen Tool* on the next page).

Linear Keyframe: Up to now we've dealt with curves and handles, but there are many occasions when you need absolute straight lines and hard angles in your motion path. You can do this by "retracting" the handles into the center of the keyframe:

Press *and hold down* the G key and move your cursor over the keyframe box (the cursor will change to the Convert Vertex tool). Click directly on the keyframe box. The handles will disappear, and the result is a Linear keyframe type with a corner point. To pop out the handles again, just repeat this technique and the Auto Bezier dots will reappear. Note that retracting handles in this manner works across multiple keyframes: Just preselect them first and then edit one of them.

If you hold down the G key and move your cursor over the motion path itself, the cursor will change to the Add Vertex tool. Click to add a new keyframe on the frame represented by that "dot." Release the G key to revert back to the Selection tool, then move and edit the new keyframe as needed.

To change a Linear keyframe directly to Continuous Bezier, press and hold down G to switch to the Pen tool, then click and drag out from the keyframe box.



To convert all keyframes to Linear in one go, click on the word Position in the Timeline panel to select all Position keyframes, then hold down the G key and click directly on one of the keyframe boxes.

TIP

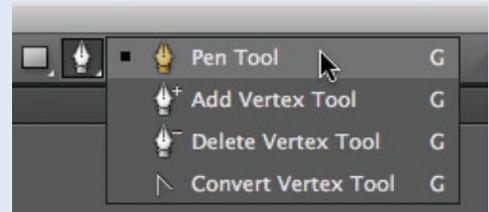
Temporary Tools

You can temporarily toggle to some tools by pressing and holding down the respective shortcut key. This trick works for the Pen (G), Zoom (Z), Rotate (W), and Hand (H) tools.

Using the Pen Tool

We prefer to edit motion paths with the Selection tool, using the Pen tool only to break and retract handles. We use the Pen tool more when creating masks (Chapter 10) and shape paths (Chapter 32). However, feel free to use the Pen tool if you find it more intuitive:

- When the Pen tool is active, dragging a handle will break the handles and convert the keyframe to Bezier. Press Command (Control) to temporarily switch to the Selection tool to move a keyframe box or handle.
- To add a keyframe anywhere along the motion path, select the Pen tool (or Add Vertex tool) and move over the motion path. Click on a motion path dot to create a new keyframe on the frame represented by that dot (see figure to the right).
- When you move over an existing keyframe in the Comp panel, the Pen cursor changes to the Convert Vertex tool, and clicking the keyframe box will toggle it between Linear and Auto Bezier.



Add, delete, and edit keyframes along a motion path directly with the Pen tool; press G to cycle through the various tools (above). Be sure to click directly on the motion path, otherwise you may start drawing either a mask path or a Shape layer! (Undo if so.)



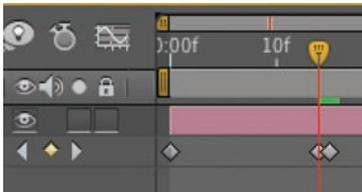


The state of the Keyframe Navigator indicates whether the current time indicator is positioned exactly on a keyframe (left) or between keyframes (right). The left and right arrows are a handy way to navigate among keyframes.

TIP

Skip along the Path

If a property has a motion path, you can double-click a keyframe box in the Comp panel with the Selection tool to jump to that point in time.



A common beginner mistake is to navigate to keyframes by dragging the current time indicator. If you miss by a frame, then edit the layer, you'll have two keyframes one frame apart – and a likely glitch in your animation.

TIP

Sticky Shift

Pressing the Shift key while dragging the current time indicator makes it stick to keyframes, in and out points, and so on.

Keyframe Navigation

Once you've created a few Position keyframes, you'll have noticed that the Keyframe Navigator area in the Timeline panel became active. The navigator consists of a left and right arrow and a diamond-shaped checkbox in the center. When the checkbox is selected (checked), this indicates that the current time indicator is positioned exactly at a keyframe. When the checkbox is empty, it means that you're parked between keyframes.

The keyframe navigator defaults to being grouped with the A/V Features column (Video, Audio, Solo, and Lock) on the left side of the Timeline panel. We prefer to move this column to the far right, beside the timeline area. (Do this by dragging the column header to the right, as covered in Chapter 2.) After Effects will remember this preference for all future comps.

If you prefer to leave the A/V Features column on the left side, we suggest you open the keyframe navigator in its own column: right-click on any column head, and select Columns > Keys from the popup menu. Then move the Keys column to the far right, by the timeline area.

To edit a keyframe value, it's usually necessary to move the current time indicator to that point in time; you can do this either by using the navigator or by double-clicking the keyframe box on the motion path. The natural instinct for beginners is to drag the current time indicator to a keyframe to make it the active frame. The problem with this method is that it's all too easy to drag the time indicator to a frame close to the keyframe, but not *exactly* on top of it. When you move the layer, instead of editing the intended Position keyframe, you create a *new* keyframe just one frame to the left or right. The two keyframes tend to overlap when the timeline is zoomed out; so if you see a glitch in the animation, zoom into the timeline to see if there are two keyframes where there should be one, then delete the unwanted keyframe. You can avoid this problem entirely if you navigate to keyframes using the navigator arrows or shortcuts (see below). If you do prefer to drag the current time indicator, add the Shift key and it will “stick” to keyframes, in and out points, markers, and so on.

Another method for moving the current time indicator to specific keyframes are the following shortcuts (though they become less useful in a complex composition with many visible keyframes):

- Go to previous visible keyframe (or layer marker) J
- Go to next visible keyframe (or layer marker) K

If keyframes are already applied but the layer is currently twirled up, there are a couple of handy shortcuts you'll want to remember. In both cases, select the layer(s) first:

- Show all animating values U
- Show all changed values UU (two Us, in quick succession)

Editing Keyframes Numerically

Up to now we've created Position keyframes interactively by moving the layer around in the Comp panel to set new keyframes or to edit existing ones. Throughout After Effects, however, you also have the choice to scrub parameter values in the Timeline panel, or enter precise values for a keyframe directly.

When you're scrubbing values, press the Shift key to scrub in large increments, or press Command (Control) to scrub in small increments. You can also select multiple keyframes at different points in time (or even across layers) and edit all values simultaneously: Scrub one value, and all the selected values will be edited relative to the value you scrub.

To enter a precise value, click on the text, enter the new value, and press Return to accept it. Again, you can enter values for multiple selected layers. Press Tab to cycle through the various visible parameter entry boxes.

Position values are always displayed as pixel values, and defined by the top left-hand corner of the comp. However, you can enter a Position value using different Units: Right-click on the current value in the Timeline panel, and select Edit Value from the popup. Select from a number of options in the Units popup; the most useful are Pixels and % of Composition. For instance, if you want to center a layer in the comp, set the Units menu to % of Composition, and the X and Y values to 50,50.

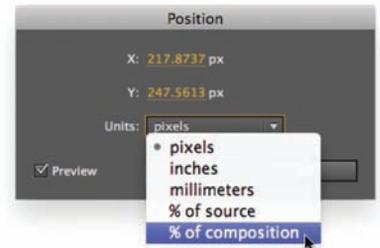
To open the Position dialog for a keyframe (without first moving to that point in time), double-click the keyframe icon in the Timeline. If you just want a readout of a keyframe's Position value, right-click on its keyframe box in the Comp panel or its keyframe icon in the Timeline; the first item on the popup menu is the keyframe's numerical value.

Other properties have similar dialog boxes, and the options are context-sensitive: For instance, editing the Anchor Point only gives you the option to set its value to % of Source (not % of Composition), while Rotation and Opacity offer no new options.

Watch out for this gotcha: The numerical value shown in the Timeline panel is the value *at the current time*. A common mistake is to select a keyframe at a different point in time, then either scrub the Position value or type a new value. This does not edit the keyframe you selected – it edits the value at the current time, creating a new keyframe if there wasn't one there already. If you want to edit a specific keyframe, either double-click the keyframe icon to open the Position dialog box, or simply navigate to the keyframe you want to edit so that it now lies at the current time.

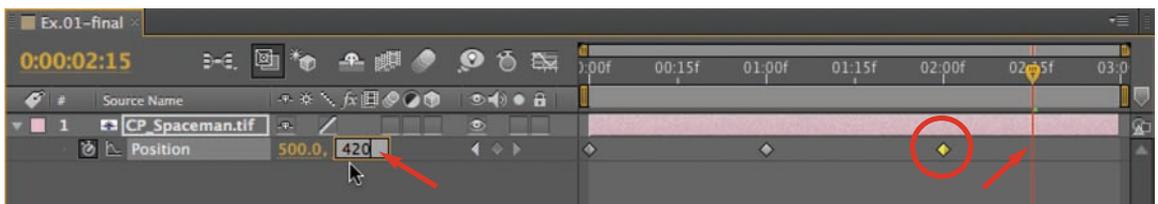


Anywhere you see a value that's underlined, you can either scrub the values or click to enter a precise value. Press Shift to scrub in larger increments; press Command (Control) to scrub in finer increments.



To bring up a dialog to edit numerically, right-click on a value to get the Edit Value option or double-click an existing keyframe. The Position dialog allows you to enter values using various criteria. Note that the subpixel numbers to the right of the decimal point are used when the layer is set to Best Quality (covered in the sidebar at the end of this chapter).

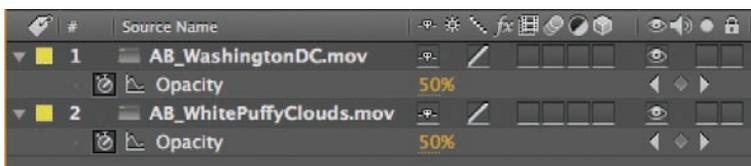
Gotcha! Selecting a keyframe elsewhere on the Timeline, then scrubbing or editing the Position value, does not edit the selected keyframe – it either edits the keyframe at the current time, or adds a new one if none currently exists.



Opacity Logic

When you stack two layers on top of each other, each with opacity at 50%, you might expect the result would be 100% opaque. But opacity *multiplies* rather than adds. The only way to go fully opaque is to have a layer somewhere in the stack that is at 100% opacity. This fact about opacity can cause problems, such as when two antialiased layers have edges that are supposed to meet seamlessly, or when one layer is fading out while another is fading up on top. Fortunately, After Effects has cures for these two particular cases – the Alpha Add blending mode (Chapter 12) and the Blend effect (Bonus Chapter 23B), respectively.

[Ex.04a]: During a “cross” dissolve, both layers are partially transparent, in this case revealing the checkerboard transparency grid behind. This is not always desirable. Footage from Artbeats/White Puffy Clouds and Washington DC.



T is for Opacity

Actually, T is for Transparency (the O key was being used already). After Effects uses the concept of *opacity*, rather than *transparency*, so setting the Opacity property to 0% makes a layer 100% transparent.

To practice editing Opacity, close all comps and open [Ex.03], select the layer, and type T to reveal this property in the Timeline panel. The easiest way to edit it is to scrub its value in the Timeline panel, watching the result in the Comp panel. You can also edit Opacity by clicking on its value and entering a new number.

New keyboard shortcuts were added in CS4 to alter the Opacity of a selected layer. Hold Control+Option (Control+Alt) and use the + and – keys on the numeric keypad to increase or decrease Opacity in 1% increments. Add the Shift key to jump by 10% increments. (By the way, that’s not a typo; the Mac keyboard shortcut really is Control+Option, not Command+Option.)

When you edit Opacity, the layer’s alpha channel is being changed, making the layer more or less transparent. In [Ex.03], press Option (Alt) and click on the Show Channel button at the bottom of the Comp panel to view the Comp’s alpha, and observe the results as you edit Opacity.

You’ve probably guessed already that turning on the stopwatch for Opacity and setting two keyframes with values of 0% to 100% will fade up a layer. Try it now, and note that the reverse will fade off a layer.

Crossed-up Dissolves

If you crossfade by fading one layer down while the other fades up, as in [Ex.04a], you may notice a dip in the middle where both layers are at 50% opacity. If the background is black, the crossfade will result in a dip in brightness as some of the black background becomes visible. In our example, the checkerboard grid is turned on, so it’s partially visible.

If both layers are the same size, you need only fade up the top layer from 0 to 100%, as in [Ex.04b]. Once the top layer is fully opaque, trim out the bottom layer (even though the bottom layer is obscured, you may waste time retrieving frames from disk).

This does not always work; problems occur when the layers are not the same size, or have their own alpha channels and transparencies. Also, the layer behind might still be partially visible and pop off, as in [Ex.04c]. In this case, go ahead and crossfade the two layers.

Fading Layers as a Group

When you fade down multiple layers individually, you will end up with a “staggered” fade-out, as in [Ex.05a]. The solution is to fade out the layers as a group *after* they’ve been composited together. There are two ways to do this:

- [Ex.05b]: Add Layer > New > Adjustment Layer and apply Effect > Distort > Transform. Then set keyframes for the Opacity parameter in the Transform effect. This works because the Adjustment Layer gets a copy of the composite of all layers below, and the effect fades it out. (Adjustment Layers are covered in Chapter 22.)
- [Ex.06]: Composite the layers in one comp (a *precomp*), as we did in [Ex.06a]. Then nest this comp into a second comp, [Ex.06b]. Animating Opacity in the second comp will apply to the group of layers *after* they’ve been composited together. Nesting is covered in Chapter 18; you can also use Precomposing (Chapter 19) to move a group of layers to a precomp.

S is for Scale

Next you’ll learn how to manipulate the Scale property of a layer in a variety of ways, and pick up a few shortcuts and tips while you’re at it. In this chapter’s project, close any open comps and open [Ex.07]. Select the **AB_WashingtonDC.mov** layer in the Timeline panel, and type S – this is the shortcut to twirling down just the Scale property for a selected layer. You will see two values: the first one is X Scale, representing the layer’s width; the second one is Y Scale, representing its height. There are a variety of ways to edit Scale:

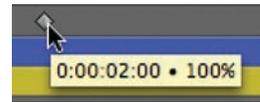
- The simplest way to edit Scale is to scrub its value. This works similarly to scrubbing the Position value (discussed earlier in this chapter): scrub to the left or right and the size of the layer will be updated in the Comp panel. If you scrub the value below 0%, the image will flip and start growing again because you are now entering negative Scale values. If you find the values change too fast as you scrub, press the Command (Control) key to scrub in finer increments. Conversely, holding Shift while you’re scrubbing will update Scale in increments of 10%.
- You can also edit Scale numerically by clicking on one of the values, entering a new number, and pressing Return.
- If you want to change the X and Y Scale values independently from each other, click on the chain link icon to the left of their values to turn off the aspect ratio lock switch. Clicking again in the empty box where the chain link used to be will turn the aspect lock back on; now changing one of the Scale values will update the other and automatically maintain the same aspect ratio.



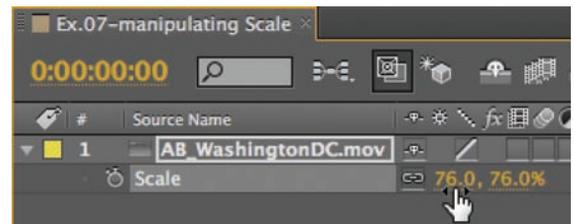
[Ex.05b]: One method for fading out multiple layers as a group is to apply the Transform effect to an Adjustment Layer and animate the effect’s Opacity value.

TIP

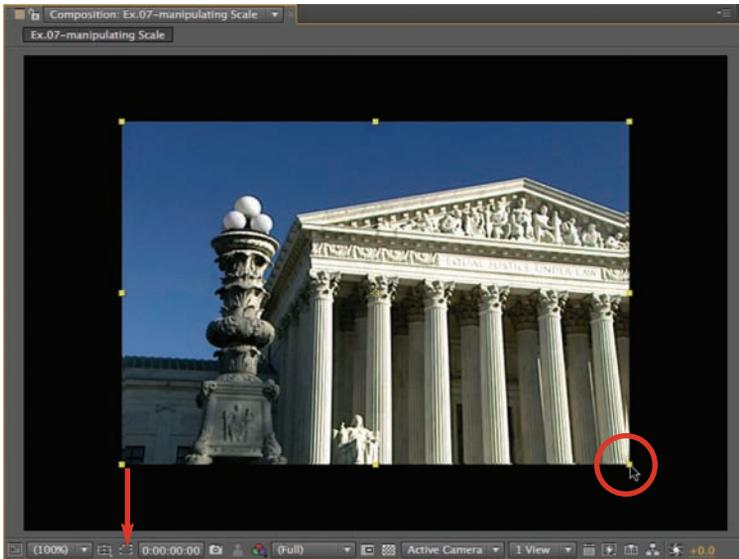
Vital Statistics



Hover your cursor over a keyframe in the Timeline panel to display a tooltip containing its time and value. This tooltip does not update if you drag a keyframe in time; keep an eye on the Window > Info panel to verify its new timing.



To edit Scale in the Timeline, select the layer, type S to expose the Scale property, and scrub its values. The chain link icon indicates that the X and Y Scale values are locked together; the aspect ratio of the layer will be maintained as you change either value.



You can scale a layer directly in the Comp panel by dragging its handles; add the Shift key after you start dragging to maintain the aspect ratio. If the layer displays a colored outline rather than handles, it has a mask applied; if so, turn off the Toggle Mask and Shape Path Visibility button at the bottom of the Comp panel (see arrow).

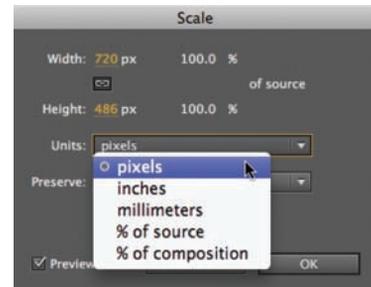
TIP

Stretch to Fit

Command+Option+F (Control+Alt+F) will force a layer to scale, rotate and position itself to fit the size of the comp exactly. Even more such options can be found under the Layer > Transform menu.

- You can also edit Scale interactively by dragging the handles that appear around a layer's outline in the Comp panel. The trick is to add the Shift key *after* you start dragging to maintain the aspect ratio of the layer as you scale. Note this changes X and Y Scale independently, but does *not* disable the aspect ratio lock switch.

- For even more control, right-click on one of the values and select Edit Value to open the Scale dialog box. Here, you also have the option to change the units you use for Scale to % of Composition or Pixels, as well as the less useful inches or millimeters. There is also a popup menu in this dialog to preserve the aspect ratio of the layer as you edit; this mimics the behavior of the chain link icon in the Timeline panel. When the layer has been animated, you can also double-click a Scale keyframe to open this dialog.



- Added in CS4: You can scale in 1% increments holding down Option on Mac (Control – not Alt – on Windows) and using the + and – keys on the numeric keypad (not the regular keyboard). To practice this, make sure the layer is selected, then press Option+ (Control+) to increase Scale by 1% and Option– (Control–) to decrease Scale by 1%. Add the Shift key while you're doing this to change Scale in 10% increments.

Note that no matter which method you use for changing scale, the origin for all scaling (as well as rotation) is the layer's Anchor Point (the icon in the center of the layer that looks like a crosshair). Changing the Anchor Point is covered later in chapter.

To see this in action, turn off the aspect lock, set the Scale values to some easy-to-remember relationship such as X = 100% and Y = 50%, and turn the aspect lock back on. If you then scrub or change the X Scale value to 60%, the X Scale will automatically change to 30%, keeping the same 2:1 aspect ratio.

Here's a handy shortcut for resetting the X and Y Scale to have the same values: If the chain link icon is on, first turn it off. Then press Option (Alt) as you turn back on the chain link; the Y value will snap to the X value. The aspect ratio will be locked so they continue to stay in sync.

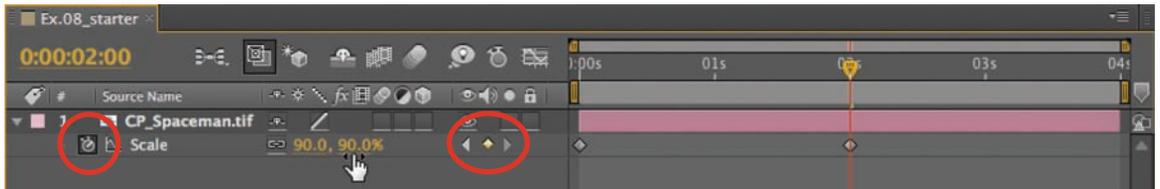
Animating Scale

Now that we know several different ways to manipulate Scale, it's time to animate it. You can practice this in [Ex.08_starter]:

Step 1: Select the **CP_Spaceman.tif** layer, and type **S** to reveal the Scale property in the Timeline panel.

Step 2: Make sure the current time indicator is at the beginning of the comp (press Home if it's not), and enable the stopwatch for Scale. This enables animation and sets the first Scale keyframe at the current time using the current size as its value.

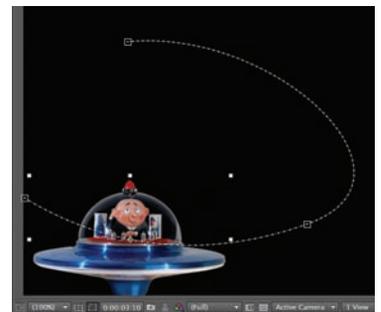
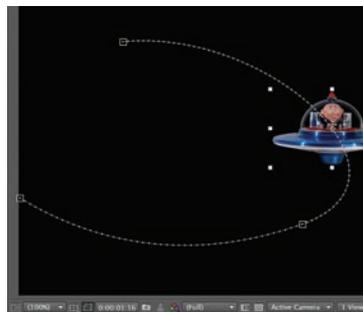
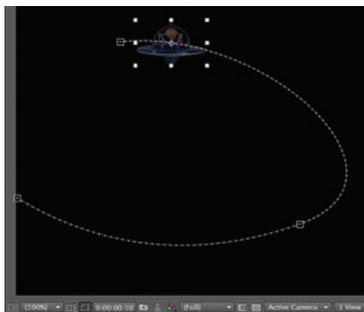
Step 3: Still at time 00:00, change the scale of the layer (bearing in mind that values over 100% will blow up pixels and decrease quality).



Step 4: Move the time indicator later in time and rescale the spaceman to a size different from the first keyframe. Notice that a new keyframe is automatically created in the Timeline panel. Whenever Scale's stopwatch is on, changing the Scale results in a keyframe being created at that point in time, or updated if there was already a keyframe at that point in time, just as with Position keyframes.

As you scrub the time indicator along the timeline, notice that the spaceman changes size between keyframes, as After Effects automatically interpolates the Scale values.

Once you get the hang of animating Scale, try also animating Position and Opacity for the layer if you need the practice. With Scale revealed already in the Timeline panel, select the layer and press Shift+P to also reveal Position, and Shift+T to add Opacity. Remember that the three properties are independent of each other; you don't need to create the same number of keyframes for each property or have them appear at the same points in time. RAM Preview your animation at any time. Our example of all three properties animating is in [Ex.08-final].



TIP

Resetting Scale

To return the Scale value of a selected layer back to 100%, double-click the selection arrow in the Tools panel.

Steps 1–4: To animate Scale, enable the stopwatch to set the first keyframe, and create at least one more keyframe at a later point in time with a different Scale value. Remember that you can use the keyframe navigator to jump between Scale keyframes, as well as set new keyframes and delete existing ones.

Try animating Position, Scale and Opacity, as we did in [Ex.08-final]. Try to avoid scaling a layer above 100%. This forces After Effects to create new pixels without enough information from the source image, resulting in a softer image.



Select a layer and press R to reveal Rotation in the Timeline panel. As you scrub the rightmost parameter – degrees – past 359°, the revolutions value to the left will increase.



You can rotate 2D layers interactively in the Comp panel using the Rotation tool (shortcut: W). If the Selection tool is active, remember that you can temporarily switch to the Rotation tool by pressing and holding down W; the cursor in the Comp panel will change to the rotate cursor. Rotate the layer and release the W key to return to the Selection tool.

R is for Rotation

The Rotation property has its own set of keyboard shortcuts and alternate methods of manipulation that are worth learning. Close any open comps and open [Ex.09]. Select the `CD_bikewheel` layer, and type R on the keyboard – this is the shortcut for revealing just the Rotation property. The value shown is in Revolutions + Degrees, with positive numbers rotating clockwise from 0°. As with Scale, there are a variety of ways to edit Rotation:

- The easiest way to edit Rotation is to scrub its value in the Timeline panel. With the Rotation property revealed, scrub the rightmost value (degrees) to the right or left, watching the wheel rotate in the Comp panel. As you drag past 359°, you will notice that the number of whole revolutions change as the degrees start over again from 0. Holding Command (Control) as you scrub gives you finer control; holding Shift jumps degrees by multiples of 10.

- You can edit Rotation numerically by clicking on its value in the Timeline panel to highlight it, typing in a new value, and pressing Return. The Tab key jumps between the revolutions and degrees values. If you enter a value of 360 or larger, After Effects will automatically convert it to the correct number of full revolutions plus the remaining number of degrees.

- To offset the current Rotation value by 1° increments, make sure the layer is selected, then press the + or – key on the numeric keypad (not the regular keyboard). If you add the Shift key while you're doing this, Rotation will change in 10° increments.

- You can interactively rotate a layer in the Comp panel with the Rotation tool (shortcut: W for Wotate – seriously, that's what they

Rotation Rules

After you've rotated a layer a few times in a graphics program such as Adobe Illustrator or Photoshop, it's often difficult to reset the orientation back to the starting position (before it was ever rotated). This is because once rotation is processed, the image reassumes a rotation value of 0.

When you rotate a layer in After Effects, however, the value displayed is always in relation to the original starting value of 0°, and you can always return to this original rotation value at any time. It's also worth pointing out that the Rotation value of a single keyframe *does not indicate how the layer will animate*. For instance, a keyframe value of 90°

does not necessarily mean the layer has just rotated clockwise 90°. That would be true only if the *previous* keyframe had a value of 0°.

In [Ex.11_starter], both wheels rotate from 0° to 180° clockwise over two seconds. If you now wish the wheel to animate counterclockwise by 180°, the third keyframe should be set to 0° (not minus 180° as you might think).

So gauging whether a layer is rotating clockwise or counterclockwise can only be accomplished by checking the values of keyframes before and after the current keyframe, or by consulting the Value Graph in the Graph Editor (Chapter 4).

told us). Add the Shift key after you start dragging to constrain Rotation to 45° increments. If you make a mess, double-click the Rotation tool to revert to 0°.

Animating Rotation

If you'd like to practice animating rotation, follow these steps using [Ex.10_starter]:

Step 1: Select the `CD_bikewheel` layer and press R if Rotation is not already revealed in the Timeline panel.

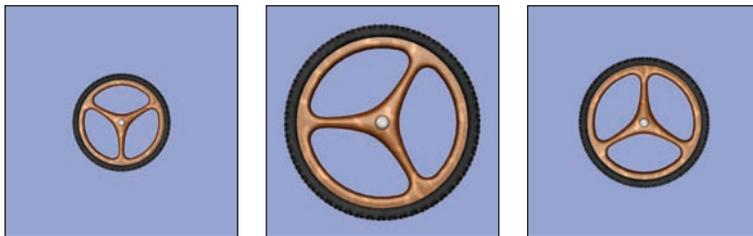
Step 2: Make sure the current time indicator is at 00:00 and click on the stopwatch icon to the left of the word Rotation. This enables animation and sets the first Rotation keyframe at the current time. We'll use the current rotation amount – 0° – for this keyframe.

Step 3: Move the current time indicator to a different point in time and scrub the rotation value in the Timeline panel to create a new keyframe.

Step 4: Move to another point later in time, press *and hold down* the W key to temporarily switch to the Rotation tool, and rotate the wheel interactively in the Comp panel to create the third keyframe. (If you accidentally changed tools, press V to revert to the Selection tool.)

Press 0 to RAM Preview the comp to see the effects of your animation. Again, double-clicking on a keyframe is another way to edit a keyframe numerically by opening that property's dialog box.

Our version is [Ex.10-final], where we've also animated Scale. RAM Preview; did you notice the animation seamlessly loops? This is because we set the same values for Scale and Rotation at the beginning and end, then placed the last two keyframes one frame after the end of the comp (at 04:00) so that this value wouldn't be repeated when the animation loops. To get to this "extra" frame, press End to jump to the last frame of the comp (03:29), then press Page Down to advance one frame. The Comp panel will be grayed out, but you can still edit the keyframes!



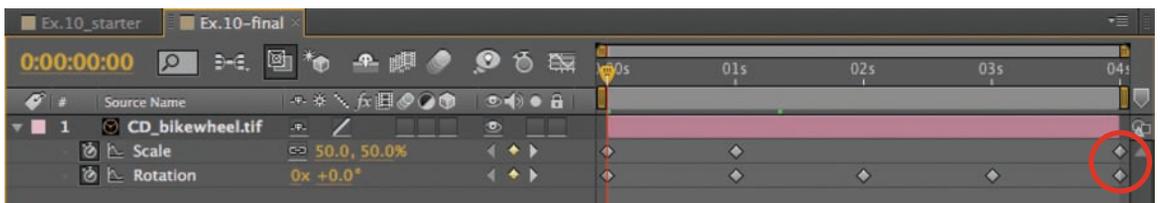
If rotated layers look a bit "sliced" or aliased, check that the Comp panel's Magnification is set to 100%, the layer's Quality switch is set to Best Quality (the default), and the comp's Pixel Aspect Ratio Correction switch is off.

TIP

Auto Rotation

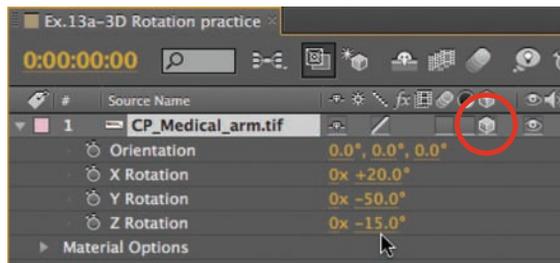
Auto-orientation (Chapter 5) can automatically orient a layer along its motion path, with no rotation keyframes necessary!

In [Ex.10-final], the wheel both rotates and scales (left). The animation creates a seamless loop thanks to the first and last keyframes being identical, and the last two keyframes being placed one frame after the last frame (below).

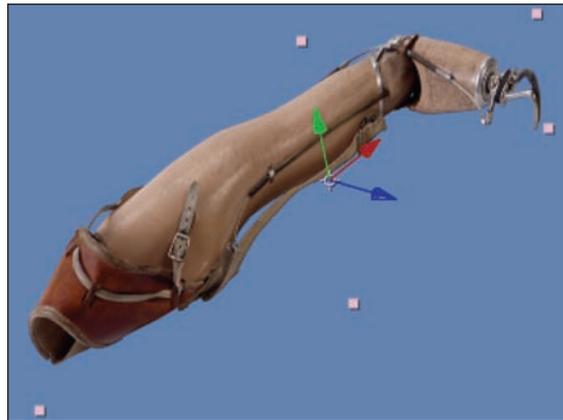


GOTCHA**3D Terminated**

Turning off the 3D Layer switch wipes out the Orientation plus the X and Y Rotation values, keeping just Z Rotation.



When the 3D Layer switch is enabled (circled in red), you get three Rotation properties plus Orientation (above). The three colored Rotation arrows in the Comp panel (right) show you what axis you are rotating around. Image courtesy Classic PIO/Classic Medical Equipment.

**An Orientation in 3D Rotation**

When 3D space was added in After Effects, the Rotation property went from having one parameter to having four: Orientation, plus individual X, Y, and Z Rotation. Let's explore how this works.

Open [Ex.12a] and make sure the regular 2D Rotation property is exposed for the **CP_MedicalArm.tif** layer. Scrub its value; watch it rotate clockwise and counterclockwise in the Comp panel. Rotation, like Scale, occurs around the layer's anchor point (covered in the next section). Leave Rotation at some value other than 0°, then turn on the layer's 3D Layer switch (the cube icon at the right side of the Switches column).

You will now see the four parameters mentioned above: Orientation, X Rotation, Y Rotation, and Z Rotation. Notice that the value you left Rotation at before enabling the 3D Layer switch was copied into Z Rotation. 2D Rotation revolves an object like a pinwheel around the axis pointing out of the layer straight toward you – the Z axis (the blue colored arrow).

TIP**Solo Selected**

To reduce the number of properties revealed in the Timeline, select just the ones you wish to see and press **SS** to solo them. This is especially useful when you wish to solo parameters that don't have their own shortcuts, such as effect parameters.

- Scrub the Z Rotation value to confirm that it rotates not unlike a 2D layer. The axis it's rotating around (the blue arrow) is hard to see because it's pointing straight toward you. Double-click the Rotation tool to set the Z Rotation back to 0° when you're done.
- Scrub the X Rotation – the layer will tumble around the X axis (red arrow). Undo or set the value back to 0°.
- Scrub the Y Rotation – the layer swivels around the Y axis (green arrow).
- Now rotate the layer using all three Rotation values – X, Y, and Z – and see how any orientation in 3D space is possible.

These three rotational parameters are sometimes referred to as the layer's *Euler* rotation. They are the values you will be keyframing most often when you want to animate a layer's rotation. They each have their own line in the Timeline panel, meaning they each have their own keyframes (and their own graphs in the Graph Editor). This independence

allows you to do things like spin a layer like a top 20 times around its Y axis, while you slowly wobble it back and forth along its Z axis.

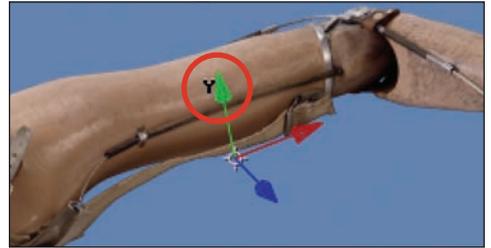
Double-click the Rotation tool to set all three Rotation parameters back to 0°, and turn your attention to the Orientation property. Notice that it has X, Y, and Z values; as you scrub them, they initially seem to act just like the individual Euler Rotation parameters. But notice the lack of a “number of rotations” value: Orientation is mainly used for posing, rather than animating, a layer. This will become evident when you keyframe these different parameters:

In [Ex.12b], two different animations are taking place. (If the keyframes aren't visible, select both layers and press U.) The upper arrow has its X, Y, and Z Rotations animated from 0° to 300° and back. The lower arrow's Orientation property is animated using the same values. If you scrub the current time indicator or RAM Preview the comp, you will notice that the Orientation animation moves only a little, while the Rotation arrow layer gyrates wildly. This is because Orientation uses what is called *Quaternion* interpolation, where it takes the shortest path between keyframes – instead of spinning the exact number of degrees you requested. So in our example, layer 1 rotates 300 degrees between the first and second keyframes, while layer 2 takes the shortest route and rotates negative 60° to arrive at the exact same “pose”!

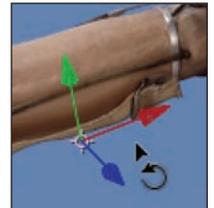
You'll learn more about working in 3D space in Chapter 13. In the meantime, remember that you can enable the 3D Layer switch any time you need to do a quick swivel and tilt – you don't need to add cameras and lights and create a whole 3D world!



When the Rotation tool is selected, a popup menu appears on the right side in the Tools panel. Here you can toggle the tool's behavior between editing Orientation or Rotation values for a 3D layer.



You can rotate the X, Y and Z axes of a 3D layer interactively in the Comp panel (above); place the cursor over the axis you wish to rotate around until the cursor changes to this axis, then click and drag.

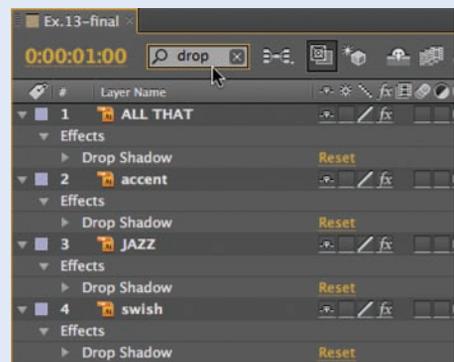


Move away from the arrows to rotate freely (inset). That said, be very careful using the Rotate tool to alter Y Rotation or Orientation: There is a nasty anomaly that if you go beyond $\pm 90^\circ$, the X and Z values flip by 180° (try it!). That's why we prefer scrubbing the values directly in the Timeline panel.

QuickSearch

QuickSearch fields appear in the Project and Timeline panels. These make it much easier to find specific sources or parameters, as well as comments in these panels. To try this out in the Timeline, open [Ex.13-final]; select layers 1–4 and Command (Control) click on the twirly arrow to the left of layer 1. Quite a daunting list of parameters! To search the selected layers for a particular parameter – say, Color – type “color” into the QuickSearch field. Try other parameter names, such as “position” or “drop”.

To clear the QuickSearch field, click the X that appears on the right side when a search is active; all layers will twirl up. To search all layers, deselect all layers first (shortcut: F2).



Using QuickSearch allows you to reveal just the parameters you're looking for.

TIP

I Remember U

Pressing U for a selected layer, or layers, twirls down all properties that have their stopwatches set, while UU (two Us in quick succession) also twirls down properties that have changed from their default settings.

Enable Auto-keyframe mode. Now any changes you make to a layer, either interactively in the Comp panel or by scrubbing values in the Timeline, will create a keyframe automatically.



Once Auto-keyframe mode is enabled, moving the **All That** layer to the pasteboard on the right side will turn on the stopwatch for Position and create the first keyframe. Moving the layer back to its original position will create the motion path (above) and the second keyframe (right).

Auto-keyframe Mode

Now that you've had some experience with animating Position, Scale, Rotation, and Opacity, you've seen how important it is to turn on the animation stopwatch for the correct property if you want your actions to be recorded. New users often forget this step and change property values interactively in the Comp panel – only to realize later that After Effects didn't capture any of their changes! Auto-keyframe mode – a new feature in CS5 – aims to solve that problem.

When Auto-keyframe mode is on, modifying a property automatically turns on that property's keyframe animation stopwatch and adds a keyframe at the current time. Try this approach in our next example:

- Open [Ex.13_starter], where we've already placed four layers that make up the title "All That Jazz" along with a background layer (which is locked). Note that the 3D layer switch is enabled for the four title layers so you can rotate them in 3D (as you practiced on the previous page).



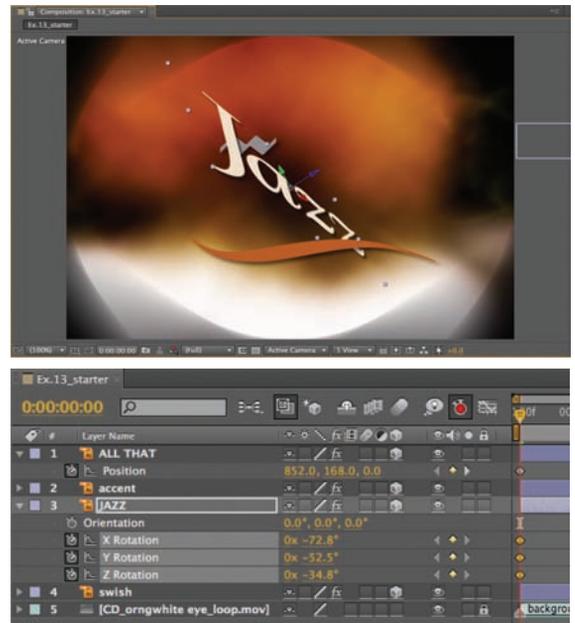
- Enable Auto-keyframe mode by clicking the large stopwatch icon along the top of the Timeline panel. Its center turns red. Note that Auto-keyframe mode is now on *for all comps in this project*, not just this one.
- At 00:00, select layer 1, **All That**, and drag the X axis arrow (the red one) to move the layer to the right so it resides completely on the pasteboard. (Selecting the X axis means that it won't move up or down accidentally; with a 2D layer you could add the Shift key after you start moving to restrain horizontally.)
- Press U; the stopwatch for Position is on and the first keyframe has been created. Move to 01:00, and scrub the X value in the Timeline to return the layer to its original position. This creates the second keyframe.



- Return to 00:00, and select layer 3, **Jazz**. Select the Rotation tool and check that the Set popup in the Tools panel is set to Rotation (not Orientation). In the Comp panel, rotate the layer around its X, Y, and Z axes. Press R to reveal Rotation in the Timeline; the X, Y, and Z Rotation properties are all set to animate (see figures to the right).
- Press V to return to the Selection tool, move later in time, and set all three values back to 0° – this will create a second set of keyframes.

After Auto-keyframe mode is enabled, editing any parameter will add a keyframe for it. However, the act of enabling Auto-keyframe does not create any keyframes at that moment. If you want to create a first keyframe that contains a parameter's current value, it is safer to manually toggle on the stopwatch for that property.

Auto-keyframe mode is set project-wide, not per comp – so remember to turn it off when you're done!



Flip & Flop

Negative scale values are normally used to flip a layer horizontally or vertically (although you can also use 3D Rotation to flip a layer horizontally or vertically). Open **[Ex.90-Flip & Flop]** and make sure its Scale property is exposed in the Timeline panel (select the layer **AB_IndustryScenes.mov** and press S if not).

- Click on the chain link icon to turn off the aspect ratio lock, then click on the X Scale value and type “-100” and press Enter. The movie in the Comp panel will flip horizontally and the smoke will now flow out of the smokestack from right to left instead. Turn the aspect lock back on and scrub either value to rescale the flipped image. The shortcut for this technique is to select Layer > Transform > Flip Horizontal.
- To flip a layer vertically, enter a negative value for the Y value, or select Layer > Transform > Flip Vertical.

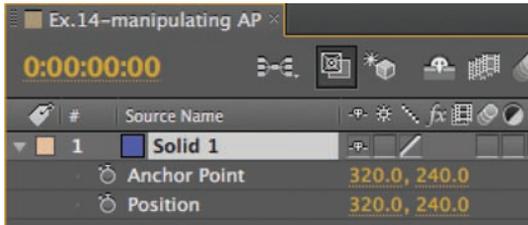
The Layer > Transform menu commands do not affect existing keyframes. Note that After Effects also has Flip, Flop, and Flip + Flop Animation Presets. These work by adding a Transform effect to the layer, leaving its Scale value – and any existing Scale keyframes – untouched. Animation Presets are covered in Chapter 25.



An image can be flipped horizontally or vertically by entering negative scale values for one or both dimensions. Shortcuts were added to the Layer > Transform submenu in CS4 to perform the same tricks. Footage from Artbeats/Industry Scenes.

A is for Anchor Point

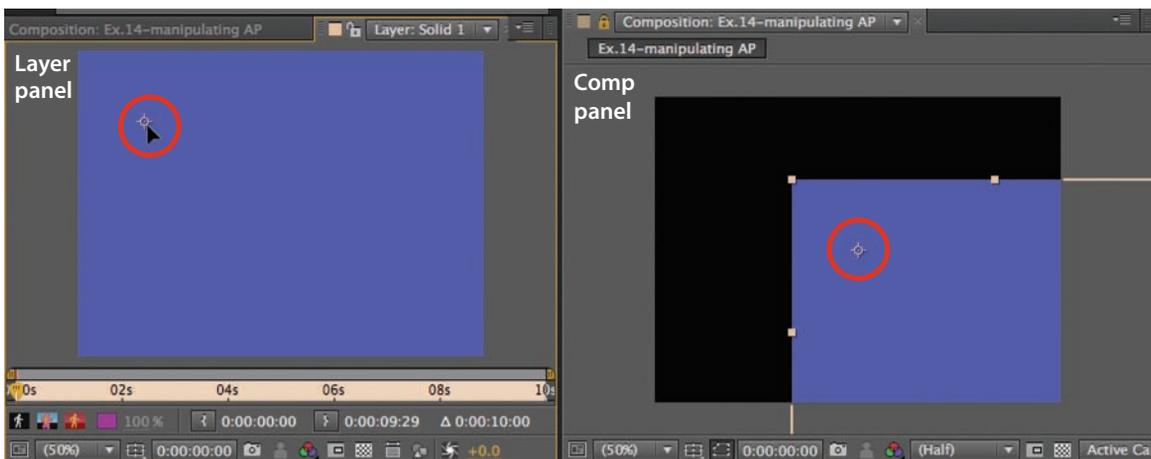
Central – quite literally – to changing the position, scale, and rotation of an image is its *anchor point*. This is the pivot around which these activities take place. Judicious placement and animation of the anchor point will result in more predictable movements. Once you have a good grasp on the anchor point, we will show you how to use it to simulate 2D motion control moves.



The anchor point is the pivot around which layers scale and rotate; it defaults to the center of the layer. It's important to note that anchor point X and Y values are relative to the layer, while Position's X and Y values refer to the anchor point's position in the Comp panel.

Both Anchor Point and Position appear to have the same values on the X and Y axes, so how do these numbers differ? Move the layer in the Comp panel and notice that only the value of Position has changed. *The value of Position is the position of the layer's anchor point relative to the comp* (in other words, the Position's X and Y axes are in *comp space*). Undo until the layer returns to the center of the comp.

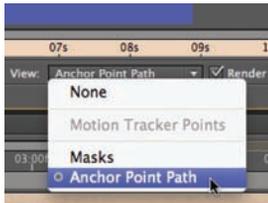
Because the Layer panel docks with the Comp panel, we suggest you split the Comp viewer for this exercise so you can view both panels side by side: With the Comp panel active, press Command+Option+Shift+N (Control+Alt+Shift+N) to get two viewers. The new viewer on the right side will be locked. Double-click the layer to open the Layer panel (introduced in Chapter 2) in the left viewer (see figure below). In the Layer panel, the anchor point should be visible in the center of the layer.



As you move the anchor point in the Layer panel (left viewer), its value updates in the Timeline, and the layer is offset in the Comp panel (right viewer) in the opposite direction. Notice the position of the anchor point in the Comp panel does not change.

In the Layer panel, grab the anchor point with the mouse and move it around. As you do so, watch the Comp and Timeline panels. You will notice that the anchor point stays in the same place in the Comp panel, but the edges of the layer move to match the distance between the anchor point and the layer edges in the Layer panel. Also note that only the value of the anchor point parameter changes in the Timeline panel. *The anchor point value is the position of the anchor point relative to the layer* (in other words, the anchor point's X and Y axes are in *layer space*).

When you move the anchor point in the Layer panel, the image will appear to move in the opposite direction in the Comp panel. Obviously, this is not very intuitive! But the Position property has no sense of the layer's boundaries; it only keeps track of where the anchor point is in the comp. Considering that the anchor point's location in the Comp panel has not changed, but the position of the anchor point relative to the layer has, it makes sense that the layer is "offset" in the Comp panel. Fortunately, it's easy to reposition the layer in the comp so that your layout appears unchanged. (Chapter 5 covers moving a motion path.)



When working with anchor points, set the Layer panel's View popup to Anchor Point Path. Although you can drag the anchor point in the Masks view (the default), the Anchor Point Path view also allows you to nudge it using the cursor keys, and to see its motion path (if it is animating).

Remember that when you move the anchor point, then scale and rotate the layer, the image will anchor itself around this new position. With some images it'll be obvious that scale and rotation should happen around a certain point – the center of a wheel or gear, for instance. Because of the offset behavior mentioned above, it's best to decide on the location of the anchor point as soon as you drag the layer into the comp – *before* the layer's Position property has been animated over time.

Moving Anchor and Position Together

As you've discovered, in order to change the center of rotation and scale without changing your layout, you have to move the anchor point and then reposition the layer in the Comp panel. But can't we do this in one step? This is where the Pan Behind tool comes in handy: It can edit these two properties at the same time.

To use the Pan Behind tool (shortcut: Y), click directly on the anchor point in the Comp or Layer panel; as you move the anchor point, the layer maintains the same visual position in the comp. It achieves this feat *by changing the value for both Anchor Point and Position at the same time*. Try it in [Ex.14] while watching how these parameters update in the Timeline panel. *Beware:* This is of little use if Position is already animating – unless you want to make a mess of your motion path! But, if you set the anchor point in the Comp panel before creating Position keyframes, it sure beats fussing about in the Layer panel.

TIP



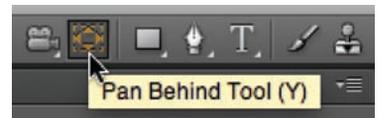
Anchor Point Reset

To set the anchor point back to the center of a layer, right-click on its value in the Timeline panel and select Edit Value. In the Anchor Point dialog, set the Units popup to % of Source, then set both the X and Y values to 50.

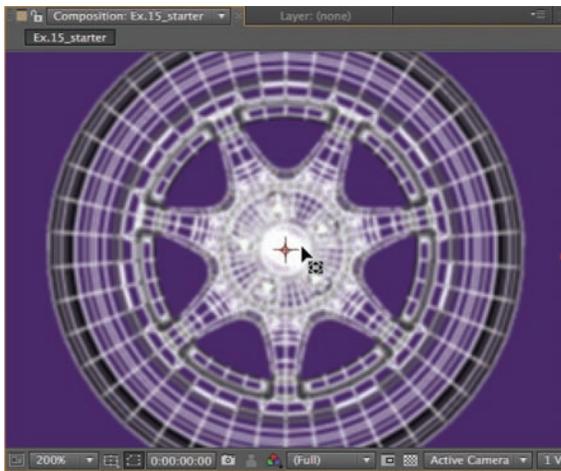
GOTCHA

Pan Behind What?!

Don't mistake the Pan Behind tool for an innocent "move" tool. Its real purpose is to pan an image behind a window created by a mask (see Chapter 10), while keeping the mask's position stationary in a comp.



To temporarily switch to the Pan Behind tool, press and hold down the Y key, edit the anchor point, then release the mouse to return to the previous tool.

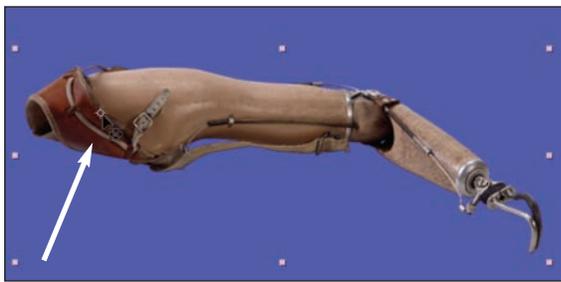


In [Ex.15_starter], you'll need to re-center the anchor point to remove the wobble when the wheel rotates. In the Comp panel, with the Pan Behind tool selected, press Option (Alt) and drag the anchor point to center the wheel.

TIP

3D Anchor Point

When the 3D Layer switch is enabled, the anchor point can be offset in Z space as well, allowing 3D orbits. We'll discuss this further in Chapter 13.



To animate the arm rising and falling using simple rotation, its anchor point should be placed at the shoulder joint (where the arrow is pointing).

It is also possible to edit just the anchor point value in the Comp panel without affecting the value for Anchor Point: Select the Pan Behind tool, then hold the Option (Alt) key while you're dragging the anchor point in the Comp panel. This has the same effect as dragging the anchor point in the Layer panel with the Selection tool. To practice this alternate method:

- Close the second (rightmost) comp viewer and open comp [Ex.15_starter] which consists of a simple 3D wireframe of a tire and wheel. The Title/Action Safe grid should be enabled. You can see that the anchor point is centered in the comp, but if you press 0 to RAM Preview the animation, you'll see how the tire wobbles as it rotates. This is because the tire is not centered in relation to the source layer.

- To fix this, press Z to select the Zoom tool, then click to zoom into the Comp panel so you can see more detail.
- Press Y to select the Pan Behind tool, then press Option (Alt) and drag the anchor point up and to the right. Notice how the anchor point stays in the same place and the wheel "slides" around behind it. Release the mouse when the wheel is centered in the comp. Because only the Anchor Point value changed, not the value for Position, the wheel continues to rotate around the center of the comp. Preview the animation again and tweak until the wobble is cured, as in [Ex.15-final].

Of course, you could have used the original technique and arrived at the same result: Double-click the layer to open the Layer panel and use the Selection tool to reposition the anchor point to the wheel's center. But it's nice to have options.

Anchor Point Examples

The project file includes several examples of the benefits of manipulating the layer's anchor point:

- Open comp [Ex.16_starter] and RAM Preview: An attempt is made to rotate an artificial arm, but the anchor point is centered in the original footage item. The arm pivots about this center, rather than moving from the imaginary shoulder joint, as we would expect it to. To fix this, use the Pan Behind tool (Y) in the Comp panel to reposition the anchor point at the left end where you imagine the joint should be and preview again. Return to the Selection tool (V) when you're done. Our version is in [Ex.16-final].

Remember that you can also position the anchor point outside of the layer's boundary. Then, when you animate Rotation, the layer will rotate in an arc. See [Ex.17] for an example.

- To demonstrate how the anchor point works when scaling a layer, open comp [Ex.18a] and RAM Preview. We created a series of transitions in which a layer stretches from one corner or side to the other. For instance, if we set the anchor point on the left side of a layer, and animate Scale from 0% width to 100% width, the layer stretches horizontally from the left side.

- [Ex.18b] takes this idea further, coordinating keyframes so one layer appears to “push” another off as they scale. Notice that Hold keyframes (discussed in the next chapter) are used for Anchor Point and Position so that a layer can push in from the left side, then be pushed out to the right side later, or even return to scaling from the center.



[Ex.18b]: Coordinating Anchor Point, Position, and Scale keyframes allows one layer to “push” off another layer. Images courtesy Getty Images.

Orbiting Objects

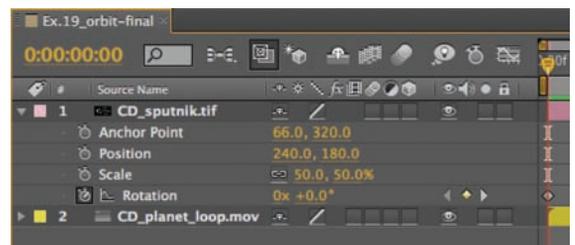
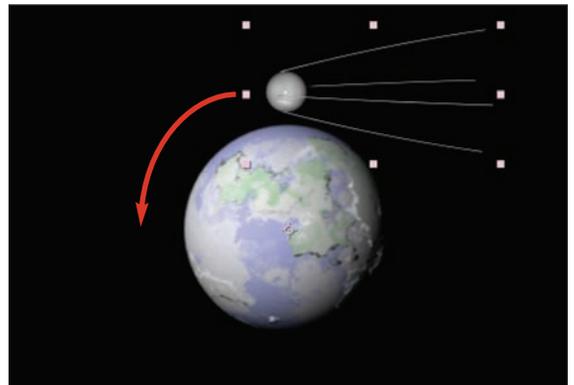
One of the simplest and most useful things you can do by offsetting an anchor point is to have one object rotate around another, as demonstrated in comp [Ex.19_orbit-final]. RAM Preview, then select the top layer and press U to twirl down its keyframes; only Rotation is animating. Let’s re-create this effect from scratch:

Step 1: Open comp [Ex.19_orbit_starter]. Drag the `CD_sputnik.tif` (found in the Project panel’s Sources > Objects folder) to the left side of the Timeline panel so it defaults to being centered in the Comp panel. Do the same for the `CD_planet_loop.mov` (found in Sources > Movies). It’s important that both layers share the same Position value.

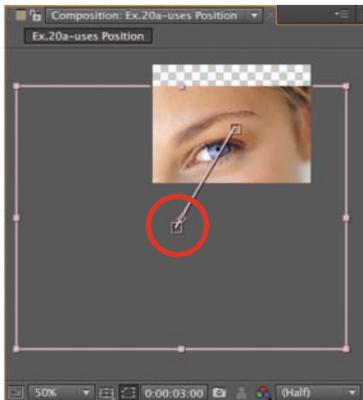
Step 2: Make sure the sputnik layer is on top of the planet layer in the layer stack. Since it is large in relation to the planet, select the sputnik layer, press S to reveal Scale, and scale it to around 50%.

Step 3: With the `CD_sputnik.tif` layer still selected, press A to reveal its Anchor Point and scrub its X value until the anchor point is centered horizontally in the sphere (about X = 66), then scrub its Y value until the sputnik is positioned above the planet (about X = 320).

Step 4: At time 00:00, press R to reveal Rotation and turn on its stopwatch to set the first keyframe at 0°. For the second keyframe, press End to jump to the end of the comp (05:29), then press Page Down to advance to 06:00, one frame after the end (the Comp panel will be gray). Click on the value for Rotation, enter a value of -1 Revolutions + 0 Degrees, and press Return. Press 0 to RAM Preview your animation. The sputnik appears to revolve counterclockwise around the planet, using its new anchor point, which just so happens to be the center of the planet. It seamlessly loops because the value of the keyframe one frame after the end is a whole revolution from the starting keyframe.



[Ex.19]: To make one object orbit another in a perfect circle, it’s easier to offset the layer’s anchor point and animate its rotation than it is to create a circular motion path with Position keyframes.

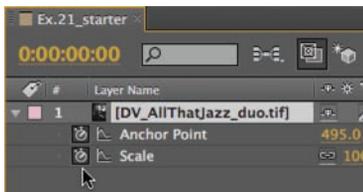


[Ex.20a]: Because scaling occurs around the anchor point (circled above), if you animate Position and Scale on an image that is much larger than the comp, the image may appear to drift off toward the pasteboard. Model courtesy Digital Vision/Beauty.

TIP

More Than Stills

This technique is not limited to still images – you can use moving sources or a nested comp (see *Size Doesn't Matter* in Chapter 18). Remember that the source should be larger than the output size so you don't need to scale above 100%.



Step 2: Turn on the stopwatches for both Anchor Point and Scale.

Motion Control Moves

The ultimate use for the anchor point is creating 2D motion control moves, popular for panning around photographs. Perhaps the most well-known example of this is the documentary *The Civil War: A Film by Ken Burns*. Traditionally, motion control involved placing photographs on a stand, then having a camera zoom and pan around them.

This technique is easy to replicate – with greater control and higher quality – inside After Effects. It's important to start with an image that's much larger than the comp size so you can avoid scaling past 100% at your tightest zoom, which would result in a softer, lower-quality image.

You could animate Position keyframes, but problems will creep in as soon as you try to simulate a zoom by animating Scale as well: Because layers scale around their anchor point, your image will slide around the frame. An example of what can go wrong when you animate Position and Scale is shown in [Ex.20a] – RAM Preview to see how the layer drifts. Select the `DV_Beauty_eye.jpg` layer and press the comma key to reduce the magnification; notice that the anchor point starts on the pasteboard, so scaling occurs around this point, not the center of the Comp panel. Sometimes this problem is barely noticeable, but the larger the image is compared with the comp size or the more off-center the detail you want to zoom in on, the more exaggerated the problem becomes.

How do you keep the anchor point centered? Easy: Center the Position of the layer in the Comp and animate the Anchor Point property instead. The anchor point now becomes the “crosshairs” your virtual camera is aimed at as you pan around an image. Comp [Ex.20b] shows the same move and zoom, but with animating the anchor point instead; now the focal point of the image no longer wanders away.

Smooth Operator

If you would like to practice this, re-create a similar motion control move from scratch. Use our image or one of your own:

Step 1: Open [Ex.21_starter]. Open the **Sources > Stills** folder in the Project panel, select `DV_AllThatJazz_duo.tif`, and press Command+/ (Control+ /) to add it to your comp – this places its Position (and therefore its Anchor Point) at the center of the comp. Don't reposition it!

Step 2: Press A, then Shift+S, to twirl down Anchor Point and Scale in the Timeline panel. At 00:00, turn on the stopwatch for both properties.

Step 3: Select the Comp panel and press Command+Option+Shift+N (Control+Alt+Shift+N) to get two viewers so you can see the Layer and Comp panels side by side. Select the left viewer, then double-click the layer to open the Layer panel. You will be working mainly in the Layer panel, so adjust the magnification to allow you to see the entire image.

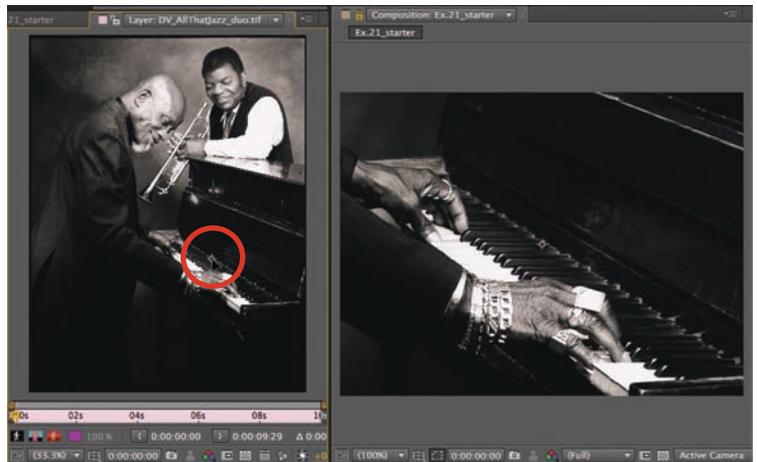
Step 4: Our photo consists of two musicians: a pianist and a trumpet player. Our camera move will travel from a close-up on the pianist's hands to a shot that includes both of their faces.

Select Anchor Point Path from the Layer panel's View menu. Now drag the anchor point in the Layer panel and notice that the location of the anchor will be what's centered in the Comp panel (provided the position of the layer is still in the exact center of the comp). Position the Anchor Point so that you nicely frame the pianist's hands.

Step 5: Move the current time indicator later in the comp – say, around 08:00. In the Layer panel, drag the Anchor Point to the faces area so you have a nice initial framing in the Comp panel. Reduce the Scale value to zoom back a bit, and notice that because the Anchor Point is centered in the Comp panel, the image does not slide off toward the pasteboard. In fact, animating Scale results in behavior not unlike zooming in and out with a real camera! Make sure you don't accidentally pan or scale the image so far that part of the comp's background is revealed.

Step 6: RAM Preview. Not a bad start; here are a few improvements:

- The anchor point's motion path in the Layer panel can be edited just like Position; try pulling Bezier handles to introduce a gentle curve.
- To smooth out the speed changes, select all the keyframes and press F9 to apply the Easy Ease keyframe assistant (discussed in Chapter 4).
- It can look more realistic if the rate of change is not exactly the same for both the Anchor Point and Scale properties – real camera operators aren't that smooth! In [Ex.21-JazzGuys_final], we moved the first anchor point keyframe to 01:00 to linger longer on the hands. You can also adjust their speed graphs in the Graph Editor (Chapter 4) to add variety.
- Add a very slight “wiggle” to the anchor point and scale animations to reduce the ultra-smooth move and better simulate a traditional motion control rig. This is best done with the wiggle expression (Chapter 37).
- If you find the move starts to “strobe” during the faster sections, consider using Motion Blur (Chapter 8).



Step 4: Move the anchor point in the Layer panel (left viewer) so the hands on the piano are nicely framed in the Comp panel (right viewer). Image courtesy Digital Vision/All That Jazz.



Step 5: Our second keyframe set zooms back and pans up to their faces

TIP

The Kid Stays in the Picture

An update on this technique is to cut objects of interest out of their backgrounds and to perform moves in 3D space. We cover this technique in a column we originally wrote for Artbeats, which is included on the DVD in the **Goodies** folder.

Transform Keyboard Shortcuts

Here is a handy set of shortcuts to remember when you're working with the transform properties. (Shortcuts in parentheses are the Windows equivalents.)

Reveal property in Timeline panel:

Anchor Point	A	Rotation	R
Position	P	Opacity	T
Scale	S	To add/subtract	Shift + property reveal key

Turn on property stopwatch	Option+Shift (Alt+Shift) + respective reveal key (above)
If stopwatch on, add/delete keyframe	Option+Shift (Alt+Shift) + respective reveal key (above)
Show all animating properties	U
Reveal modified properties	UU
Solo selected properties	SS
Hide property or category	Option+Shift (Alt+Shift) + click property or category name
Select all keyframes for property	Click property name
Set value in dialog box	Command+Shift (Control+Shift) + P, S, or R
Constrain Scale to aspect ratio	Drag layer handle to start scaling, then add Shift
Constrain Rotation to 45° increments	Rotate with tool, then add Shift
Reset Scale to 100%	Double-click Selection tool
Reset Rotation to 0°	Double-click Rotation tool
Nudge Scale + 1% and -1%	Option+ (Control+) and Option- (Control-) (plus and minus keys) on the numeric keypad (add Shift to scale plus/minus 10%)
Nudge Rotation + 1° and -1°	+ (plus) and - (minus) keys on the numeric keypad (add Shift to rotate plus/minus 10°)
Increase/decrease Opacity + and -1%	Control+Option (Control+Alt) + (plus) and - (minus) keys on the numeric keypad (add Shift to rotate plus/minus 10°)
Stretch layer to fit Comp size	Command+Option+F (Control+Alt+F)
Stretch layer to fit vertically only	Command+Option+Shift+G (Control+Alt+Shift+G)
Stretch layer to fit horizontally only	Command+Option+Shift+H (Control+Alt+Shift+H)
Auto-Orient dialog (see Chapter 5)	Command+Option+O (Control+Alt+O)

Keyframe Tips and Gotchas

The concept of *key frames* comes from traditional animation: The master animator would draw the important frames of a scene, while others filled in the frames in-between. In the digital world, you determine the keyframes, and the computer calculates the frames in-between by interpolating intermediate values.

If you are new to animating with keyframes, below are some general tips as well as some common gotchas to help you avoid frustration:

- Be sure to turn on the stopwatch for the specific property you wish to animate (a layer's movement would be Position, to animate its size would be Scale, and so on).
- There is no animation unless you create at least two keyframes with different values at different points in time.
- Turn off Auto-keyframe mode as soon as you are done with it, or you will find extra keyframes all over the place. You've been warned...
- Turning off the stopwatch deletes all the keyframes for that property.
- Don't enable the stopwatch for every property on the first frame of a layer. If you do, you'll be forced to return to the first keyframe at the beginning of the layer to make a global change; you might also create unwanted animation by accidentally adding keyframes later in time.
- When you want a property to animate, the first keyframe does *not* need to occur at the beginning of the layer. For instance, if you want a title to fade out at the end, place two Opacity keyframes (100% and 0%) at the end of the layer. The layer will start out using the value of the first keyframe (100%) until it passes the first keyframe, at which point it will start to interpolate down to 0%. There's no need for a keyframe of 100% at the start of the layer.
- When properties are set to animate, there's no equal-opportunity rule that says they must all have the same number of keyframes all synced to the same points in time! Create keyframes only where needed for each property: The fewer keyframes you have to manage, the easier the animation will be to edit.
- On the other hand, when multiple properties are animating together, it's usually best to apply the same amount of ease in and out to keyframes that do align in time. (Examples of this are in the next chapter.)

Remember: Creating motion graphics begins with *motion*, and manipulating transformation keyframes is a large part of the job. Another very important skill is controlling how layers animate over time, and that is the subject of Chapter 4. We'll cover more animation tips plus some fun and useful keyframe assistants in Chapter 5.

Before you move on, we encourage you to experiment and have fun until you feel comfortable with the basic animation techniques covered so far in this chapter. Create a new comp and design your own animation. Go ahead – it's only software; you can't break anything!

To Keyframe, or Not to Keyframe

Not all animation in After Effects results from creating keyframes:

- Some effects (such as Distort > Wave) self-animate – they create an animation at their default settings.
- Expressions (Chapter 37) can make a property wiggle or loop as well as create more complex animations, all based on JavaScript.
- Behaviors (Chapter 25) use a combination of effects and expressions to automatically animate a layer without using keyframes. For example, the Drift Over Time behavior moves a layer in a certain direction at a certain speed.
- Further examples include the Wiggly Selector for a Text Animator (Chapter 21) and the Wiggle Paths option for Shapes (Chapter 32).

CONNECT

- Layer panel, RAM Previewing: Chapter 2.
- Graph Editor, hold keyframes: Chapter 4.
- Moving and scaling motion paths, auto-orient rotation, keyframe assistants: Chapter 5.
- Managing layers: Chapter 6.
- Trimming layers: Chapter 7.
- Motion blur: Chapter 8.
- Anchor point in 3D: Chapter 13.
- 3D space: Chapters 13–16.
- Parenting: Chapter 17.
- Nesting compositions: Chapter 18.
- Animating effects: Chapter 22.

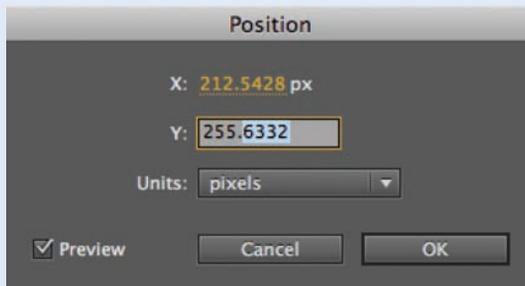
In Search of the Perfect Pixel

As a motion graphics designer, delivering a high-quality render to your client is of the utmost concern. If you are new to After Effects, however, you may have concerns about why pixels appear less than perfect. Note that many of the solutions involve techniques “not yet in evidence,” so feel free to review this checklist when the need arises. We hope it will help you determine if the artifacts you are seeing are temporary, trivial, or really need fixing:

- The image in the Comp panel looks “crunchy.” Solution: Check if Magnification is set to less than 100%. This is a temporary display issue and nothing to worry about! See *Navigating in Space*, Chapter 2.
- The Comp panel is at 100%, but images appear “blocky.” Solution: Check that the comp’s Resolution is set to Auto or Full. See *Resolution*, Chapter 2.
- Magnification is set to 100%, Resolution is at Auto or Full, but images are still “crunchy.” Solution: Check if the Pixel Aspect Ratio Correction switch is toggled on at the bottom of the Comp/Layer/Footage panel. See *Working Square*, Chapter 41.
- Layers are not moving smoothly, or they look aliased when rotated or scaled. Solution: Check that the layer’s Quality switch is set to Best, which makes layers move smoothly and antialiases them when they are transformed or distorted. See *Subpixel Positioning* (next page), and *Quality*, Chapter 2.
- The layer is set to Best Quality, but you’ve applied a blur or distortion effect and it doesn’t render smoothly. Solution: Check if the effect offers different levels of antialiasing in the Effect Controls panel, and if so, set the Antialiasing popup to High.
- Imported still images look a little softer in After Effects than they do in Photoshop or Illustrator. Solution: Create artwork in other programs where the width and height are an even number of pixels. See *Resampling in Action* (next page).
- Images in the Comp panel look “fat,” and circular objects look like eggs. Solution: D1/DV pixels are not square, so this could be correct behavior if you have placed a square pixel image into a D1/DV NTSC or PAL comp. Non-square pixels are discussed in Chapter 41, *Video Issues*, along with correct frame rates and frame sizes for video output as well as working with anamorphic widescreen sources.
- There are horizontal lines running through a movie in the Comp panel. Solution: The movie is interlaced, and you need to separate the fields in the Interpret Footage dialog. See *Fields and Pulldown*, Chapter 38, and *Fields and Interlaced Frames*, Chapter 41.
- Movies in the Comp panel are alternating between sharp and soft. Solution: The source movie’s frame rate may not be in sync with the Comp’s frame rate. Select the source in the Project panel and open File > Interpret Footage > Main. Then conform the source’s frame rate to the correct rate – 29.97 frames per second (fps) for NTSC video, 25 fps for PAL, and so on. (Even if it says the movie is 29.97 already, conform it anyway...) See *Frame Rate*, Chapter 38.
- You play back a rendered movie on a television monitor, and some parts are “flickering” slightly. Solution: You may need to selectively blur these high-contrast areas. See *Field Flicker*, Chapter 41.
- You play back a field-rendered movie on a video monitor, and the flicker is really, *really* bad. Solution: The field order of the movie may not match the hardware chain and the fields therefore may be reversed. See the Field Render options in Chapter 42, *Render Queue*.
- You render a movie with an alpha channel, and when you composite it in your editing program, it has a black “fringe.” Solution: Render with a straight alpha channel, not the default premultiplied alpha. This is discussed in the *Color* section of *Output Module Settings*, Chapter 42.
- You render with an alpha channel and the movie looks really ugly when viewed in QuickTime Player. Solution: Congratulations, you successfully rendered a straight alpha channel, but QuickTime Player is showing you only the RGB Channel with the extra “bleed.” Import this movie into your editing program – and relax!

Subpixel Positioning

When a layer is set to Best Quality (the default), it will use *subpixel positioning*; this allows a layer to be positioned using less than one pixel for smoother motion. How much less? After Effects resolves to 16 bits of subpixel resolution, so each pixel is divided into 65,536 parts width *and* height. With that kind of resolution, there are more than 4 billion subpixels. Technically speaking, that's known as "a lot."



When Position is interpolating between keyframes, check out the current value – the subpixel numbers to the right of the decimal point are used when the layer is set to Best Quality (the default).

To see the numerical results of this precision, park the current time indicator between two interpolating Position keyframes, select the layer and press Command+Shift+P (Control+Shift+P) to open the Position dialog. The dialog will show values for the X and Y axes for 2D layers: Numbers to the left of the decimal point are the integer values used by Draft Quality, while the fractional numbers indicate the subpixels used by Best Quality.

When a layer is set to Draft Quality, movement is calculated using whole pixels only. While this lets you set up keyframes and preview them more quickly, you might find the results a little bumpy.

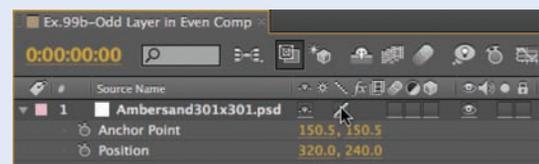
In addition to smoother motion, Best Quality also ensures that effects and transformations are rendered with full antialiasing. Draft Quality renders without antialiasing (this is particularly noticeable with vector artwork such as Text layers, Solid layers, or Illustrator sources).

Resampling in Action

A benefit of Best Quality and subpixel positioning is that layers are antialiased (or resampled) when they are transformed. While good antialiasing is desirable (especially with distortion effects), the softness that resampling adds can be unwanted when you're just placing, say, a non-moving image or title created in Illustrator or Photoshop in your comp at 100%.

To avoid this unwanted resampling, we need to understand why and when it kicks in. As it happens, After Effects resamples a layer whenever it uses subpixel positioning, and that means *whenever the difference between the Anchor Point value and Position value is not a whole number*. Check out the following example comps in this chapter's project:

- **[Ex.99a]:** Your layer is *even* sized, 300 pixels wide by 300 high, which places the Anchor Point in the center at 150,150. You place this image in an even-sized 640×480 pixel comp and Position it in the center (320,240). The difference between 150,150 and 320,240 is a whole number, so the layer does *not* get resampled. Toggle the layer between Draft and Best Quality, and you'll see that there is no change.
- **[Ex.99b]:** Toggle the layer between Draft and Best, and see the image shift and soften slightly. This is because this layer is *odd* sized, 301 pixels wide by 301 high, which places the Anchor Point at



150.5,150.5. When it's positioned in the middle of this even-sized 640×480 pixel comp, the difference between 150.5,150.5 and 320,240 is not a whole number, so the layer will be resampled.

As you can see, you can avoid resampling for non-moving images by creating sources with even sizes in Photoshop or Illustrator. If all else fails, you can always avoid unnecessary resampling by changing the Position of the layer by a half pixel up or down, left or right, until the image pops into sharpness.