limber

User Guide
v.1.5.0

Installation

Unpack the archive you have downloaded and copy/paste the file "Limber.jsxbin" to your “ScriptUI Panels” folder, located here:

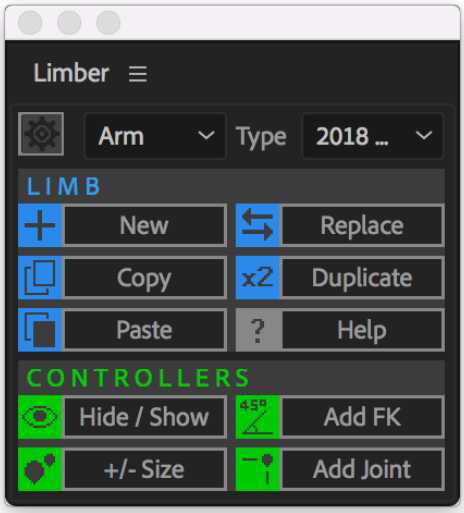
Windows: Program Files\Adobe\Adobe After Effects <version>\- Support Files\Scripts
Mac OS: Applications/Adobe After Effects <version>/Scripts

If the ScriptUI Panels folder does not exist, create a folder and name it “ScriptUI Panels”.

2. Go to the General tab of After Effects’ Preferences pane and make sure that ‘Allow Scripts to access the network’ is checked ON

Once installation is finished run the script in After Effects by clicking Window > Limber

How Limber Works

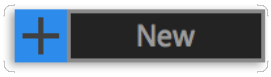


Limber uses shape layers to make limbs for character animation. It can be faster and more powerful to use than other scripts because of it’s unique features and range of customizing options. Limber can generate two types of limb: *tapered* and *bones*. Tapered limbs are based on three circles connected with a continuous outline around them. Bones are made of a single path; they’re designed to be really fast to preview and render. Bones require After Effects CC2018 or newer.

Limber generates three layers for each new limb, which we call a *set* of layers: The *limb layer* itself, and two *controllers* that correspond to the position of the *start* (shoulder or hip) of the limb, and the *end* (wrist or ankle). The controllers are guide layers so that they don't appear in your final render. Usually, you’d parent the *start controller* to your character's body layer, and keyframe the *end controller's* Position property to animate.

There is a ‘Limber’ effect on the end controller that gives you several properties to determine the appearance and behavior of the limb. If you make a new limb and adjust these properties, you’re using what we call a *basic limb*. For users who are comfortable modifying shape layers, the limb layer itself can be altered or added to, and we call these *custom limbs,* because they are not permanently stored by the script. Limber can copy and paste these custom limbs, but you need to keep a version of them in a comp somewhere if you want to be able to re-use them in the future. The *Limb Library* After Effects project file included in the Limber download contains a selection of custom

limbs that we've designed for you, some of which add functionality the basic limbs don't have, such as muscle bulges on the tapered limbs or bendy joints on bones.

New Limbs 

Firstly, select either *Arm*, *Leg* or another preset from the lefthand dropdown menu. Then select the *Type* in the other dropdown to choose between types of limb:

2017 and earlier - the tapered limb for use in versions of After Effects prior to CC2018
2018 and later - the tapered limb for use in After Effects CC2018 and later.
Bone - bones only work in CC2018 and later.

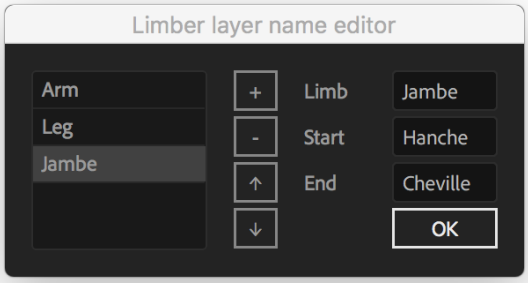
Then click *New* and you'll get a popup asking you to name the limb. This is so you can differentiate between several limbs within a character, such as left and right, as well as between different characters if there are several in your comp. The layer names can always be altered later if you change your mind but it's a bit quicker at this stage.

Limber will make a new set of layers and give each one an appropriate name. For example, if you selected 'Leg' and specified 'redguy-R' you'll get 'redguy-R-Ankle, 'redguy-R-Hip' and 'redguy-R-Leg'.

If you change a Limber layer's name, the expressions automatically update, taking advantage of AE's native expression layer-tracking, and they'll still refer to the same layers. Unfortunately, this means you cannot use third-party layer naming utilities to update your Limber layer names.

Layer name presets

To change the suffixes that Limber applies to your layer names, click on the gear icon button next to the first dropdown. Select a preset and you can remove it using the - button, add a new one with the + button, change the display order by clicking the up or down buttons, or edit a preset in the textfields on the right. Presets are saved locally when you hit OK.



Limb properties

To change the look and behavior of a basic limb, select the end controller and twirl down the Limber effect's property groups:

Shape

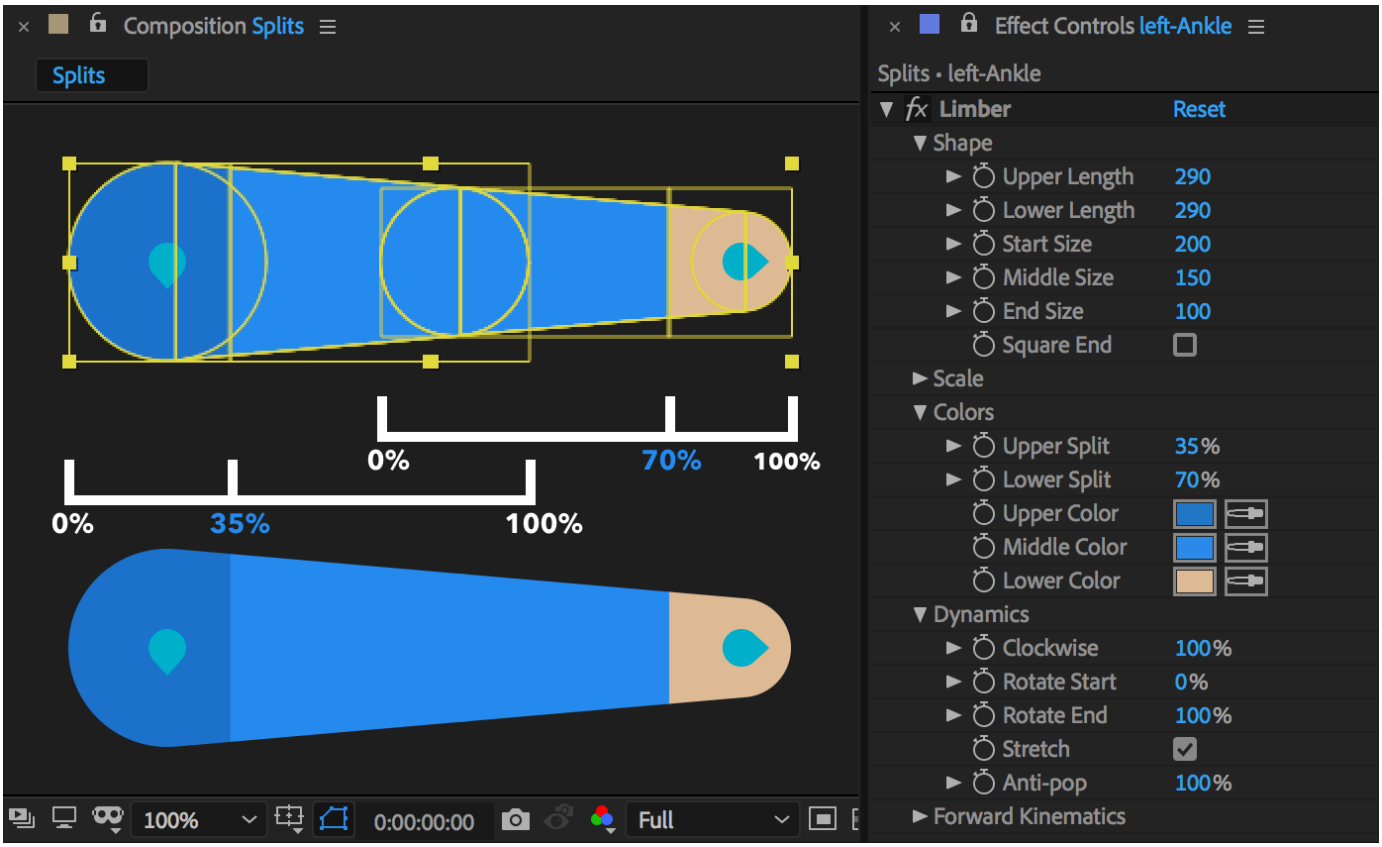
The lengths of the limb determine how long it is, in pixels. From the center point of the hip to the center point of the knee is *Upper Length* and similarly, from the knee to the ankle is the *Lower Length*. The *Start Size*, *Middle Size* and *End Size* determine the diameter of the three circles, in pixels. The *Square End* property makes the end circle invisible, so you have the appearance of a boxy, square end to the limb.

Scale

The *Size Scale* property will scale all the three circle sizes at once. If you have *Link Length to Size Scale* checked, the length of the limb will scale up proportionally, too. This enables you to scale a limb along with the rest of a character - see the 'Scaling' section below.

Colors

The *Upper Split* and *Lower Split* properties determine where the upper and lower parts of the limb are split, by a straight line, into different colors. The upper part uses the *Upper Color* and *Middle Color*, while the lower part uses the *Middle Color* and the *Lower Color*. The splits are a percentage of the length of each part, calculated from the most distant edges of the two circles rather than their centers.



Bones don't respond to Size options because they are stroke based and so cannot taper. They also don't respond to Square End or Color choices because doing so slows them down a bit (check out the *Colored Bone* in the Limb Library if you want that). We wanted to keep Bones as fast and simple as possible. If you want to style a Bone, you can change the Stroke Color and Width on the limb layer to whatever you like, inside the limb layer.

Dynamics

The Clockwise property will determine whether the joint bends out to the left or to the right. Usually you'd set this to either 100% or -100% and then leave it, but it can be keyframed between these values for certain inbetweens. At 0% the limb will always appear perfectly straight regardless of where the controllers are, as if the

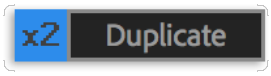
joint was pointing directly towards or away from the viewer rather than out to one side. When you copy and paste styles from one limb to another, the Clockwise property values are not pasted (because you often want to paste a left-facing limb's style onto a right-facing one.)

The *Rotate Start* and *Rotate End* properties will enable the respective controllers to automatically rotate along with the limb, when they're at 100%. At 0% the controllers will not rotate as they move around. You can keyframe between auto-rotation and non-rotation to make transitions between poses or cycles of animation easier.

The *Stretch* property enables your limb to stretch beyond it's nominal length. If unchecked, the limb will not extend to an end controller that is further away from a position where the limb is dead straight. If you have a foot layer parented to the end controller, and you want limited-length legs, you can use an FK controller to get a non-stretchy foot to 'stick' to the leg. See the Forward Kinematics section below.

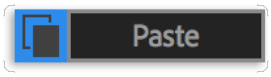
Anti-pop helps prevent the visual pops or jerking that can occur in IK animation, such as when limbs become straight too suddenly. It works by making the limb shorter around 90°, and the normal length when dead straight (and fully folded up). Values above 50% tend to work best with Anti-pop.

Duplicating an existing Limb



To duplicate a limb, select one of it's layers and click the *Duplicate* button. This will bring up a popup window that prompts you to change the first part of the layer name, the idea being that if you had named the first limb set 'Right' you could now name the duplicate limb 'Left'. Custom limbs can be duplicated just like basic limbs, and the limb layer will be an exact copy of the one being duplicated.

Copying and Pasting Limbs

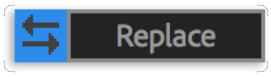


Select a Limber layer, click *Copy*, then select a layer from a different limb set and click *Paste*. The pasting process actually deletes the limb layer of the destination set and replaces it with a full blown copy of the copied limb layer, updating the expressions so as to link it to the destination limb's controllers. The Limber effect properties (Lengths, Sizes, Colors etc) on the end controller are also pasted (except *Clockwise* and those in the FK Group). If you hold Alt whilst clicking Paste, the limb layer is pasted *without* changing those properties. This is often what you want when copying and pasting custom limb layers, if you've already set the basic size and color of your destination limb.

When pasting, certain layer properties such as markers, masks, opacity, switches and effects on the destination limb layer, may be lost, replaced or reset. Keyframed properties are copied using the value at the current time. If your destination limb has keyframes on Limber properties affected by the Paste operation, the script makes a new keyframe for them at the current time.

About Limb sets

Many of the operations in Limber require you to select one or more Limber layers. Most of the time, it doesn't matter which of the three layers in a set you have selected. If I want to duplicate a limb, I can select the limb layer or either of the controllers and hit the Duplicate button. If you've selected more than one from the same set, the script only performs the operation once. Likewise, you can select layers from more than one limb set, and the operation will run sequentially. I could select all the layers in my comp, click the Duplicate button, and the script would make duplicates of every limb.

Replacing a Limb Type 

You can *replace* (previously called *swapping*) limb layers with fresh copies of basic limbs, whilst retaining all the properties in the Limber effect. Typically, this might be between a basic Tapered limb and a Bone, and then back to a basic limb, to temporarily take advantage of the speed boost of the bone. Select one or more limb layers, choose the type you want to replace them with in the Type dropdown in the UI, and click *Replace*. The limb layer is then replaced by a fresh copy of the selected type, but the controllers, including properties you've altered in the Limber effect, are untouched. Those sizes and colors and so on all reappear when you swap back to a tapered type. But any changes you have made to the limb layer itself (meaning that limb is now a custom limb) are ***not*** remembered during the Replace operation. It replaces the limb layer with a new, basic one each time you use it.

If you want to temporarily switch from a **custom limb** to, say, a Bone; you would need to first save your custom limb somewhere else (e.g in another comp) so that you could use Limber's Copy and Paste functions to paste that custom limb back. You can select all the layers in a limb set, and use After Effects' standard Copy and Paste commands to copy a custom limb to another comp.

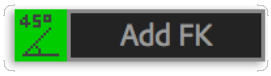
Forward Kinematics

Forward Kinematics, or FK, allow you to animate by specifying rotation values for the upper and lower part of the limb, instead of positioning the end controller and letting the computer figure them out (that's what IK is!). FK is useful in a number of different circumstances, for example:

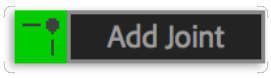
- Swinging or dangling legs where you want the knee to stay still but move the ankle
- Animating between a clockwise and anti-clockwise pose with very smooth arcs
- Leg movements that flow outwards from the hip such as kicking or swimming
- 'Breaking the joint' to let elbows bend backwards slightly

Limber's FK controls are unique amongst After Effects IK solutions but fairly intuitive. The *FK* property is a percentage slider that goes from 0 (full IK) to 100 (full FK). You should animate on full IK or full FK, and keyframe the FK property between it's minimum and maximum values when you need to change. This is sometimes called IK-FK blending. When animating on IK, you keyframe the Position property of

the end controller (or perhaps a layer that it is parented to). When animating on FK, you keyframe the *Upper FK Rotation* and *Lower FK Rotation* values.

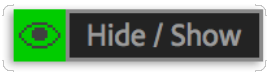
FK Controllers 

If you have a hand or foot layer parented to the end controller, that layer won't follow the end of the limb when you dial up FK. The solution is to click *Add FK* to generate a new FK controller, and parent your hand or foot to this layer instead. If you make sure the FK is set to zero before you click *Add FK*, Limber automatically does the re-parenting for you.

Joint Controllers 

Joint controllers follow the position of the limb joint, should you need something to parent knee or elbow artwork to. The Joint controller has it's own *Limber Joint* effect on it which allows it to auto-rotate or not, like the other controllers.

FK controllers and Joint controllers are never keyframed or positioned by the user. They are only there for when you need a layer to parent things to. If you want to remove an FK or Joint controller, you can't just delete the layer, you'll need to Alt-click on the appropriate button and the script will remove it without breaking expressions. If your FK was set to zero, it'll re-parent any hand or feet layers back to the End controller.

Hiding and showing Controllers 

You can hide controllers by clicking *Hide/Show*. If you have one or more Limber layers selected, this will hide all the controllers from those limb sets. If you have no Limber layers selected, it will hide all the Limber controllers in your comp. Alt-clicking the Hide/Show button will show controllers again in the same manner.

Hiding and showing controllers turns their opacity to 0 or 100 rather than affecting the visibility switch for the layers. This way, you can still see and edit the motion path when you select a controller, even if it's hidden. You can use the visibility switches for a second level of control over hiding if you want, for example, to manually switch off the visibility of just your start controllers, since they are often not keyframed at all.

If you Shift-click the Hide/Show button, the script will turn off the dynamic color changes for all the controllers in the set. Shift-clicking again will turn them back on.

Changing Controller size 

You can make controllers larger or smaller by clicking (or alt-clicking) the *+/- Size* button. This will re-size all the controllers from the limb set. The size of child layers are unaffected since it works on internal shape groups instead of layer scale.

Tips and techniques

Controller Rotation

The auto-rotation of start and end controllers takes effect through an expression on their rotation properties, but this expression allows for the user to further modify the value, rather than totally overriding any keyframes. You *can* animate the rotation of your foot like this, but since the values are always modified by the expression, it might be a confusing way to work. A better approach is to animate the Rotation value of the foot layer instead, and just set the end controller's rotation once, to put the pose of the foot where you want it to be at a 'zero' or neutral rotation. This way you can easily get the foot back to this flat position by setting it's rotation to zero, and your values will make more sense of how the foot is rotated relative to the leg. Another easily missed pitfall with controller rotation values is that they can be affected by the process of parenting and un-parenting. If you parent a controller to a layer, rotate the parent layer, then un-parent the controller, the controller's underlying rotation property value will have changed, and may need to be corrected (to zero) in order to behave as expected again.

Limber follows AE's standard rotation paradigm where 0° is north, so limbs pointing downwards have 180° rotation values, not 0° as in some other tools. This means that hand and feet layers you design may be seen to have their rotation values jump when they are parented to a Limber controller. To a Limber limb they are effectively upside-down when they are visually the 'right' way up. This is necessary for the FK functionality, and just means your hands and feet layers will often show 180° or -180°

A final reason to not keyframe the controller rotation is that you cannot apply your own expressions to those keyframes, e.g. to loop them.

Troubleshooting blending

If your FK blending seems to go the wrong way, it's worth checking the Rotation values of your IK Controllers: they may be 360° higher or lower than you expect.

If you are blending FK whilst the Upper limb goes *around North* (e.g. crosses over 0° or 'straight upwards'), an undesirable jump can occur in the position of the FK Controller. Similarly, if you animate Rotate Start / Rotate End values between 0 and 100% whilst the upper limb passes across north, their rotation will flip suddenly. This is a limitation of our math. The only real solution is to complete the blend before (or start it after) the point where the upper limb goes around the north axis.

Generally, try not to blend other properties whilst blending FK. If you blend between Clockwise and Anti-clockwise whilst FK is neither 0 nor 100, it can produce odd jumps or flips during the animation.

Limbs on full FK are always the length given in the Length properties. They are not affected by Stretch, Anti-pop or Clockwise properties. But those properties

can affect the apparent length of the limb when on IK. So when blending between a pose where the limb is being significantly shortened by Anti-pop or Clockwise (or lengthened by Stretch), and an FK pose, it can look like the limb is changing length. To prevent this, either reduce the effects of the length-altering property before the blend takes place, or blend at a different point in time.

Scaling

Limber limbs are formed on a shape layer which has expressions to stop that layer from being transformed, because it would alter the 'world space' of the layer and throw everything off, so you cannot alter the Scale of a limb layer to make it bigger. But if you want to scale a character as a whole, you can do so using the Size Scale property and a 'master controller' for you character.

Whilst you should parent the start controllers, and perhaps end controllers, to other layers that are a part of your rig, you should never parent the limb layers. If you do, you'll find that they don't behave like parented layers anyway, because they have expressions on them to reverse the effects of parenting. If you are careful to not parent or transform the layer, you can even delete these expressions.

A master controller would be a layer that every layer in your rig is ultimately parented to in one way or another. This layer's Scale transform property should match the Limber effect's *Size Scale* property when your character is at it's 'normal' size (the simplest thing is to have them both at 100%). Make a new expression on the Size Scale property, and pickwhip it's value to the X or the Y Scale value of your master controller. Make sure 'Link Length to Size Scale' is checked on. You can then alter the scale of the master controller, and the Limber limbs will scale up with the rest of your character.

Orphan Limb Layers

When you duplicate a Limb layer using AE's standard Edit>Duplicate command, the new copy is effectively *orphaned* from the limb layer set. It's expressions still refer to the same controllers, but the Limber script code itself will no longer know about this orphaned layer. When you use Limber's Copy button, Limber judges which limb layer you want to copy. If you have a limb layer selected, *that* is the layer that will copy, *even if it's an orphaned layer*. But, if you have any other layer selected, e.g. a controller, it will copy the style of the original, non-orphaned limb layer. In addition, you cannot Replace or Duplicate these orphaned layers. Trying to do so will result in the non-orphaned layer being swapped or duplicated instead.

Similarly, when you paste a limb, it will only paste to an orphaned limb layer if you have that layer selected. If you have a controller selected, it will paste to the non-orphaned limb layer.

How to use the Limb Library

The custom limbs in the limb library are organized in separate comps and have notes and tips that explain what they do. In After Effects, go to *File* > *Import* > *File*

and import the Limb Library AEP into your project as a folder. You can then browse the custom limbs, and copy and paste them into your characters for use. Remember you can Alt-paste to preserve Length, Size, Color and other options in the Limber effect. If you come up with a new custom limb or style you particularly like, you can save it in a new comp in the limb library for future use. If you want to design your own custom limbs, you may want to start with one of these existing comps instead of a basic limb.

Customizing Limbs

Limb customization is a powerful tool to an experienced AE user. This section covers how Limber's expressions and shapes work under the hood, to act as a reference for anyone making more advanced custom limbs. This is a more in-depth section that requires knowledge of expressions, property-linking, and how shape layer objects 'nest' inside one another.

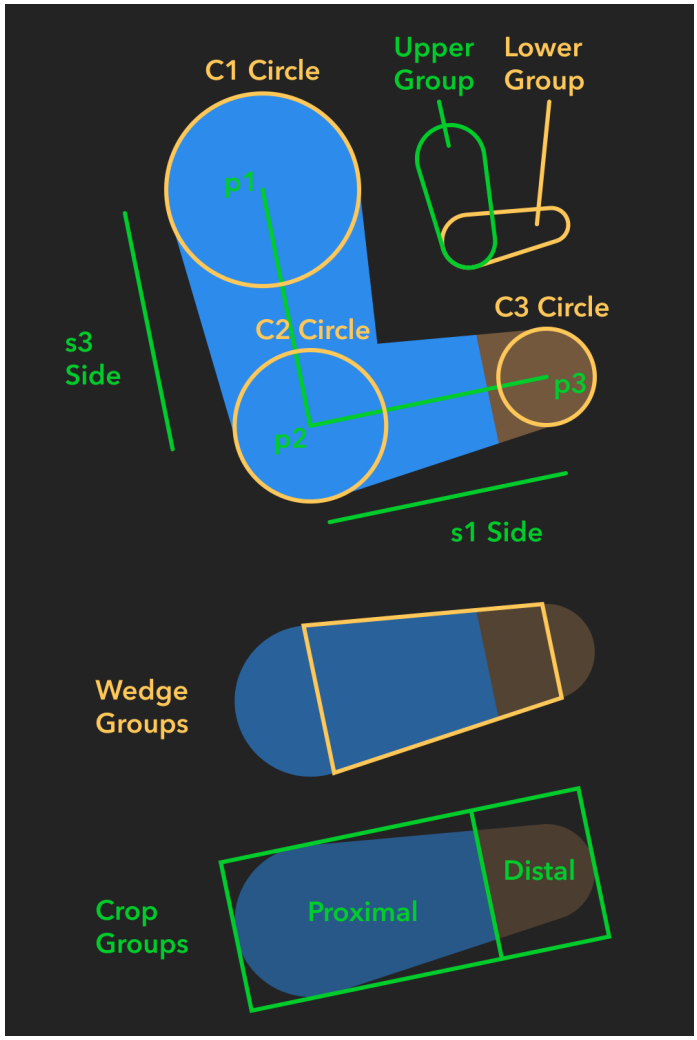
The Admin Group expressions

Inside a limb's end controller is the *Admin* shape group. The Admin group is where values are 'stored' in expressions that are referenced in turn by expressions in the other limb layers. This saves processing the same long calculation many times. You shouldn't modify any of these Admin expressions, but you may need to grasp what they represent, if you want to link expressions of your own to them.

Each limb's geometric 'skeleton' is based on two sides of a triangle. These naming conventions are used:

p1 - The position of the start controller
p2 - The position of the joint or knee
p3 - The position of the end controller
s1 - The length of Side 1, between p2 and p3, the lower limb
s3 - The length of Side 3, between p1 and p2, the upper limb
A1 - The angle of the upper limb (s3) (relative to 0 degrees / north)
A2 - The angle of the lower limb (s1) (relative to 0 degrees / north)
C1 - The circle at the start point (p1)
C2 - The circle at the middle point (p2)
C3 - The circle at the end point (p3)

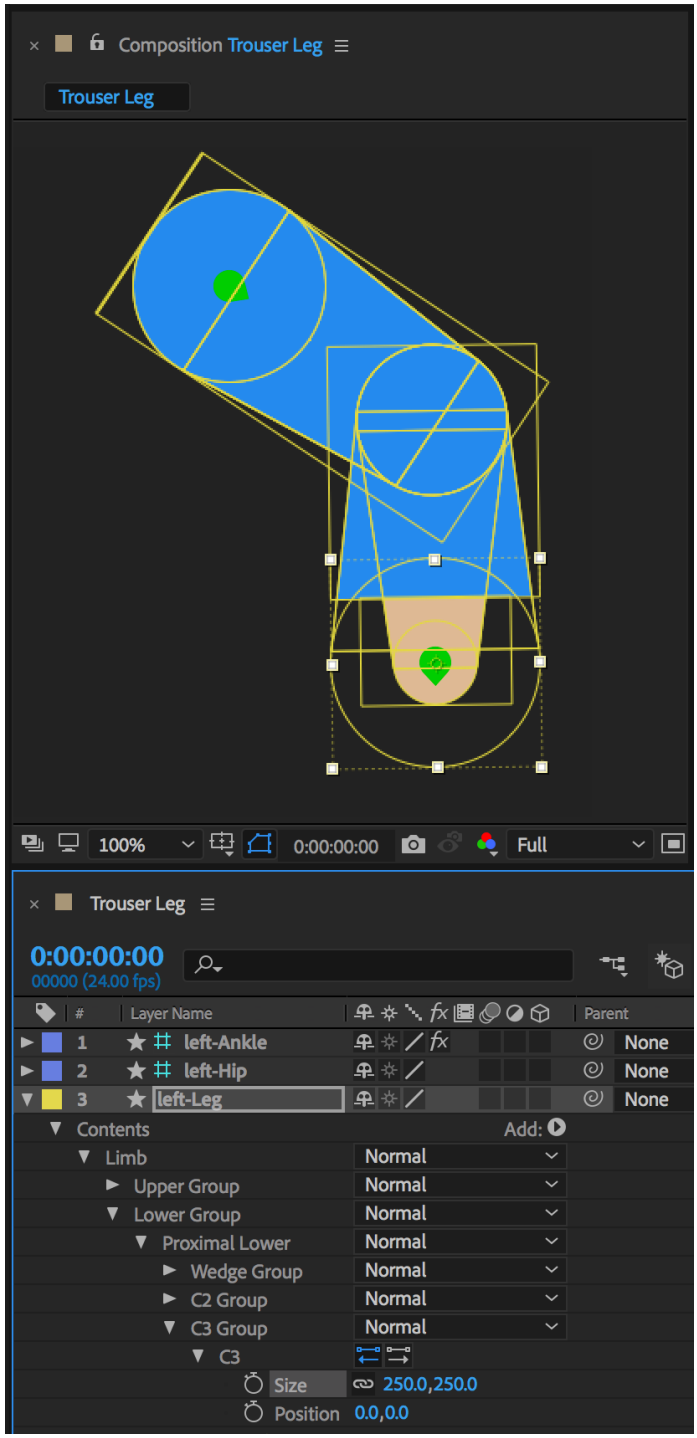
So p1 in the Admin Group, for example, takes it's Position value from the position of the start controller. Then, inside the Limb layer, the entire *Upper Group* then takes it's position from the p1 expression



(and it's Rotation from A1). Any shapes nested inside the Upper Group will be positioned and rotated along with it.

The basic tapered Limb layer is comprised of four main sub-groups: a *Proximal Upper* and *Distal Upper* contained in the *Upper Group*, and a *Proximal Lower* and *Distal Lower* contained in the *Lower Group*. The *upper* refers to the bicep or thigh half of the limb (s3), whilst the *lower* refers to the forearm or calf (s1). The names *proximal* and *distal* refer to proximity or distance to and from the body, so the distal groups are the lower ones of the pair.

Inside any of these four sub-groups, the same kind of structure can be found: A *Wedge Group*, two *Circle Groups* called something like *C1 Group,* a Merge Paths, a *Crop Group*, a second Merge Paths, and lastly a Fill. Within each Upper or Lower Group, the Proximal and Distal sub-groups are identical except for how they are cropped by the Color Split controls (the Crop Group), and what Fill they have.



Typical wide sleeve limb - C3 Circle has had it's expression deleted and been manually made larger.

The Wedge Groups are a little different between the 2017 and the 2018 basic limbs. Before CC2018, there was no way of drawing a path with expressions, so to make the wedge shape we have to use three rectangles that are all positioned, rotated and intersected. In CC2018 and above, we just use an expression to draw the wedge shape. Wedge Groups reference the sizes of the circles in their respective sub-groups, rather than directly referencing the sizes specified in the Admin Group. So that you can disable the expression on one of the circle's Size properties, and it's Wedge Group will react to that change. In this way we can make wide sleeves and cuffs, etc.

You cannot delete the circles or their groups without breaking expressions in the Wedge and Crop Groups. But you can delete the Wedge or Crop Groups if you want to. You can also delete a sub-group or the entire Upper or Lower Group. The Lower Group is not dependent on the Upper Group for it's Position or Rotation.