



## CD Constraints v1.5 For Cinema 4D 9.6+

CD Constraints is a set of constraint expression tags. These constraint expressions use the Attributes Manager interface, which makes them easy to set up and use. Each expression tag also has a setup command which will set up the constraint for you. CD Constraints is a perfect companion for CD IK Tools.

The components of CD Constraints plugin suite are:

### Command Tools:

- CD Add Aim Constraint
- CD Add Clamp Constraint
- CD Add Distance Constraint
- CD Add Lock Constraint
- CD Add Mirror Constraint
- CD Add Nail Constraint
- CD Add Parent Constraint
- CD Add Points Constraint
- CD Add Position Constraint
- CD Add PSR Constraint
- CD Add Rotation Constraint
- CD Add Scale Constraint
- CD Add Space Switch Constraint
- CD Add Spline Constraint
- CD Add Spring Constraint
- CD Add Surface Constraint
- CD Add Tag Along Constraint
- CD Auto Redraw

### Expressions:

- CD Aim Constraint
- CD Clamp Constraint
- CD Distance Constraint
- CD Lock Constraint
- CD Mirror Constraint
- CD Nail Constraint
- CD Parent Constraint
- CD Points Constraint
- CD Position Constraint
- CD PSR Constraint
- CD Rotation Constraint
- CD Scale Constraint
- CD Space Switch Constraint
- CD Spline Constraint
- CD Spring Constraint
- CD Surface Constraint
- CD Tag Along Constraint

### Selecting Objects in Order

CD Constraints keeps track of the order in which objects are selected when selecting more than one object. This works best when shift selecting the objects one at a time in the viewport. If you drag a selection around a group of objects so that several objects are selected at once, then the order will be determined by the order in which the objects appear in the Object Manager. Remember that in R10 and above, when selecting multiple objects in order in the Object Manager, you must control select the objects.

## Command Tools

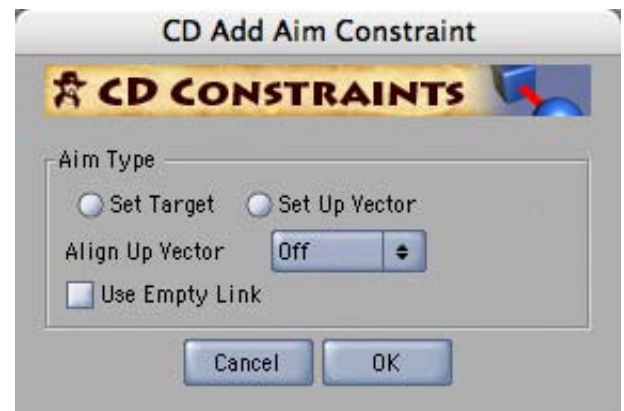
The command tools are simple tools that make setting up the constraints on the selected

objects easier. Most of the commands require you to select the objects in order, as described above in the **Selecting Objects in Order** section. If the object receiving the constraint tag already has an existing constraint tag on it that is of the same type you are setting up and is of a type that can have multiple targets, then the command will simply add new target links to the existing tag and set the selected objects up in the new target links. In most cases, if you only have one object selected that does not have an existing constraint tag on it that is of the same type you are setting up, then the command will simply add the tag to the selected object and you must then manually set up the constraint's parameters. Some of the commands also have options dialogs which you can access by holding the control key down when clicking on the command. The options dialogs allow you to set the command's default setup parameters. These defaults are stored in the plugins preferences, so that the next time you call the command without opening the options dialog, the command will set up the constraint according to the default parameters that were set the last time the options dialog was accessed.



### CD Add Aim Constraint

This command sets up a **CD Aim Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the object that will be the aim target, then shift select the object that will be the up vector object and then click on the command. If you only have two objects selected, you will get a dialog box where you can choose whether you're setting up an aim target or an up vector.



### Options Dialog

In the options dialog, *Set Target* determines that you're setting up an aim target, and *Set Up Vector* determines that you're setting up an up vector. The *Align Up Vector* option is only available when *Set Up Vector* is chosen and will enable the *Align Up Vector* in the CD Aim Constraint for the target group you are setting up. The choices in the dialog for *Align Up Vector* are *Off*, *+X Axis* and *+Y Axis*. Enabling *Use Empty Link* will place the aim target or up vector objects in the first available link, otherwise the command will create a new target set for the objects. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.

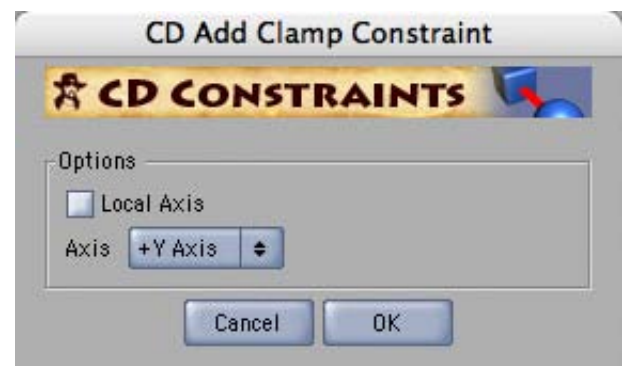


### CD Add Clamp Constraint

This command sets up a **CD Clamp Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the objects that will be the clamp targets, then click on the command.

### Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. *Local Axis* in the options dialog will enable the CD Clamp Constraint's *Local Axis* option for the targets you are



setting up. *Axis* in the options dialog will set the CD Clamp Constraint's *Axis* option for the targets you are setting up. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.

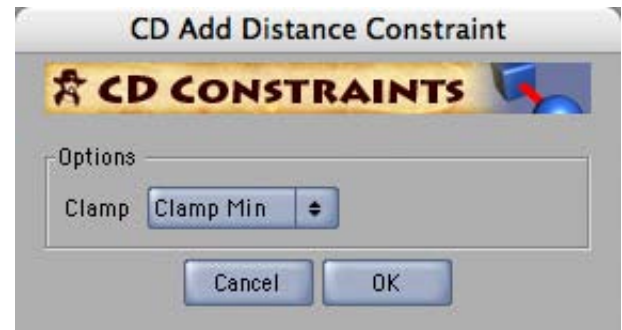


### + CD Add Distance Constraint

This command sets up a **CD Distance Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the objects that will be the distance targets, then click on the command.

#### Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. The *Clamp* option in the dialog will set the *Clamp* option in the CD Distance Constraint. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.

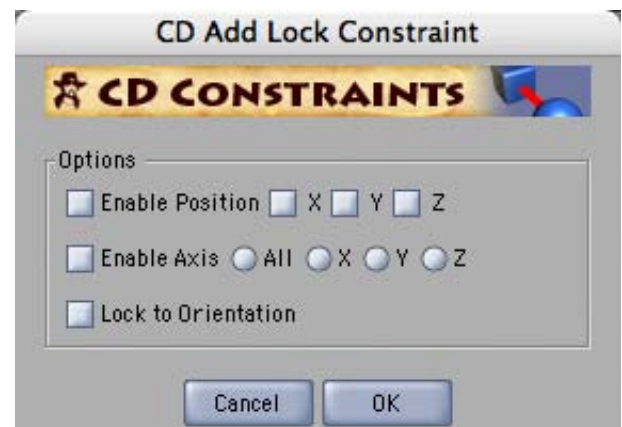


### + CD Add Lock Constraint

This command sets up a **CD Lock Constraint** on the selected objects. To use the command you select the objects which you wish to receive a tag and then click on the command.

#### Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. *Enable Position* will allow you to set the position locks on the CD Lock Constraint. You can choose to lock X, Y and Z positions. *Enable Axis* will allow you to set the axis locks on the CD Lock Constraint. You can choose between *All*, X, Y or Z. *Lock To Orientation* sets the CD Lock Constraint's *Lock To Orientation* parameter. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.



### + CD Add Mirror Constraint

This command sets up a **CD Mirror Constraint** on the first selected object. To use the command you select the object which will receive a tag, then shift select the object that will be the mirror target and then click on the command. This setup command does not have an options dialog. It will simply compare which quadrant each object is within, and calculate the closest mirror plane between the two objects.



### + CD Add Nail Constraint

This command sets up a **CD Nail Constraint** on the first selected object. To use the command you select the object which will receive a tag, then shift select the object that will be the target. ***The target object must have surface geometry.*** Once you selected the desired objects, click on the command. This command does not have an options dialog.



### + CD Add Parent Constraint

This command sets up a **CD Parent Constraint** on the first selected object. To use the command you select the object which will receive a tag, then shift select the object that will be the parent target and then click on the command. This command does not have an options dialog.



### + CD Add Points Constraint

This command sets up a **CD Points Constraint** on the first selected object. ***This command only works if the first selected object is a point or polygon object.*** To use the command you select the object which will receive a tag, then switch to Points mode and select a point of the object, then shift select the target object and click on the command. You can also select multiple points and objects. When selecting multiple points and objects, the order of the objects will determine which point is assigned to which object. The point order will always be the order in which the points are within the object's points array, as determined by the Structure Manager. If you only select one object (the object receiving the tag) and then select some points in Points mode, the command will create a Null target object for each selected points. If no points are selected then the command will only add a CD Points Constraint to the object and you must then set up the constraint manually. This command does not have an options dialog.

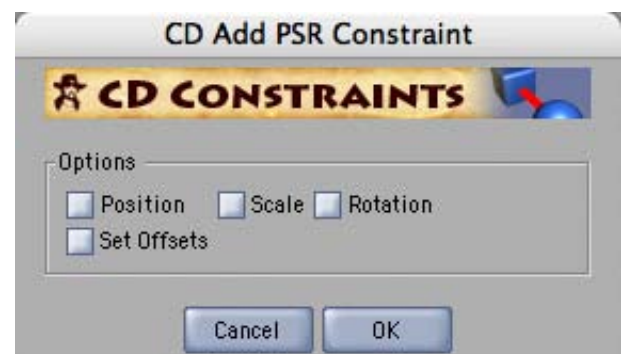


### + CD Add PSR Constraint

This command sets up a **CD PSR Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the objects that will be the psr targets, then click on the command.

## Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. Enabling *Position*, *Scale* and *Rotation* will enable the corresponding *Position*, *Scale* and *Rotation* options in the CD PSR Constraint. Enabling *Set Offsets* will automatically calculate the current PSR offset of the object from the constrained PSR and plug those values into the CD PSR Constraint's corresponding *Offset* parameters according to which of the *Position*, *Scale* and *Rotation* options are set in the dialog. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.





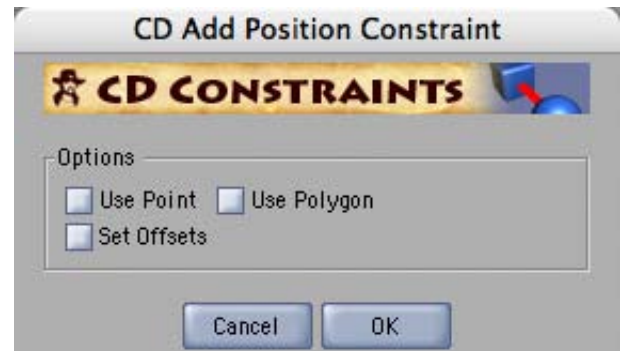


### CD Add Position Constraint

This command sets up a **CD Position Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the objects that will be the position targets, then click on the command.

#### Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. *Use Point* will enable the CD Position Constraint's *Use Point* option for the target you are setting up. This will only be available if the target object is a point object. If you also select a point on the target object, the command will designate that point's index in the CD Position Constraint for the target you are setting up. *Use Polygon* will enable the CD Position Constraint's *Use Polygon* option for the target you are setting up. This will only be available if the target object is a polygon object. If you also select a polygon on the target object, the command will designate that polygon's index in the CD Position Constraint for the target you are setting up. *Set Offsets* will automatically calculate the current position offset of the object from the constrained position and plug those values into the CD Position Constraint's *Constraint Offset* parameters. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.

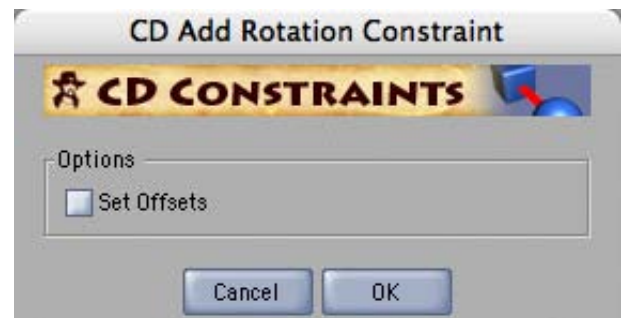


### CD Add Rotation Constraint

This command sets up a **CD Rotation Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the objects that will be the rotation targets, then click on the command.

#### Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. *Set Offsets* will automatically calculate the current rotational offset of the object from the constrained rotation and plug those values into the CD Rotation Constraint's *Constraint Offset* parameters. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.

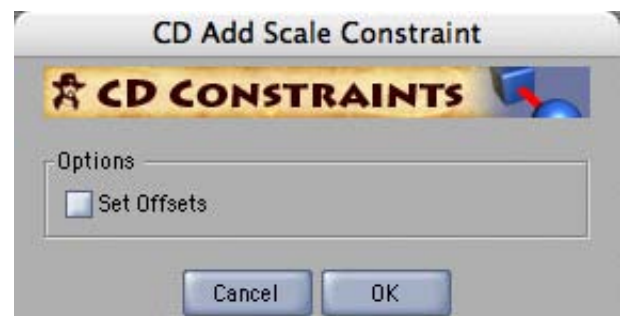


### CD Add Scale Constraint

This command sets up a **CD Scale Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the objects that will be the scale targets, then click on the command.

#### Options Dialog

If you hold down the control key when you click on



the command you will get an options dialog. *Set Offsets* will automatically calculate the current scale offset of the object from the constrained scale and plug those values into the CD Scale Constraint's *Constraint Offset* parameters. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.



#### CD Add Spline Constraint

This command sets up a **CD Spline Constraint** on the first selected object. To use the command you select the object which will receive a tag, then shift select a spline object you wish to be the target object, then you can optionally shift select a rail spline object or an up vector object. After you selected the desired objects, click on the command to set up the constraint. This command does not have an options dialog.



#### CD Add Spring Constraint

This command sets up a **CD Spring Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the object that will be the anchor target, then you can optionally shift select an object to be the attachment object. After you have selected the desired objects, click on the command to set up the constraint.

#### Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. *Linear* will enable the CD Spring Constraint's *Position Spring* parameter. *Rotational* will enable the CD Spring Constraint's *Rotation Spring* parameter. *Set Offsets* will automatically calculate the object's offset to the anchor, and plug those values into the CD Spring Constraint's offsets. Enabling *Gravity* will set the CD Spring Constraint's *Gravity* parameter to the default value of 9.8. *Mass* will set the CD Spring Constraint's *Mass* parameter. Once you have your options selected click on *OK* to setup up the constraint or *Cancel* to abort.



#### CD Add Surface Constraint

This command sets up a **CD Surface Constraint** on the first selected object. To use the command you select the object which will receive a tag, then shift select the object that will be the target. **The target object must have surface geometry.** Once you have selected the desired objects, click on the command. This command does not have an options dialog.



#### CD Add Space Switch Constraint

This command sets up a **CD Space Switch Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select

the objects that will be the targets, then click on the command.



### CD Add Tag Along Constraint

This command sets up a **CD Tag Along Constraint** on the first selected object. To use the command you first select the object which will receive the tag, then shift select the object that will be the target, then click on the command.

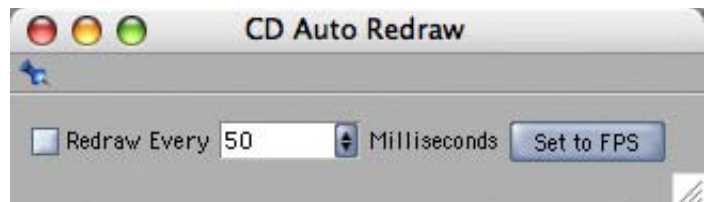
#### Options Dialog

If you hold down the control key when you click on the command you will get an options dialog. *Speed*, *Length* and *Height* will set the values of the corresponding parameters in the CD Tag Along Constraint. Once you have your options selected click on **OK** to setup up the constraint or **Cancel** to abort.



### CD Auto Redraw

This command is similar to Cinema 4D's Auto Redraw found in the Mocca Module. It will refresh the view at intervals according to the value set in the *Milliseconds* parameter. *Redraw* turns the auto redrawing on and off. The *Set to FPS* button will set the *Milliseconds* parameter value to the document's current FPS, as set in the document's Project Settings.



## Expressions

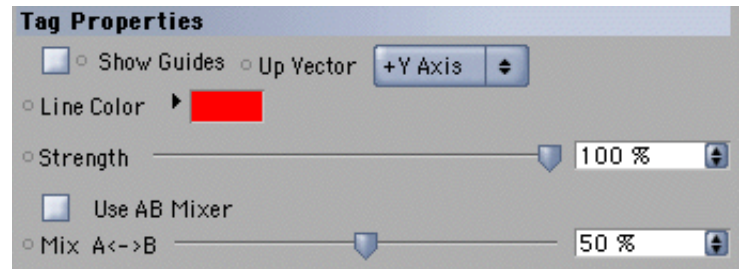


### CD Aim Constraint

This expression is a targeting expression with a *Target* object link and an *Up Vector* object link for each target group. The expression will function if either or both links hold an object. By leaving the *Target* link empty, the expression essentially becomes an *Up Vector* expression. The Z axis of the object that this expression affects will point to the object assigned to the *Target* link. This is an absolute direction in that the Z axis of the object will point absolutely to the target object, or the blended position of multiple target objects. The object assigned to the *Up Vector* link can be used to control either of the object's other two axes (X and Y axes). This is only a general direction in that the up vector axis only points in the general direction of the up vector object, or the blended position of multiple up vector objects.

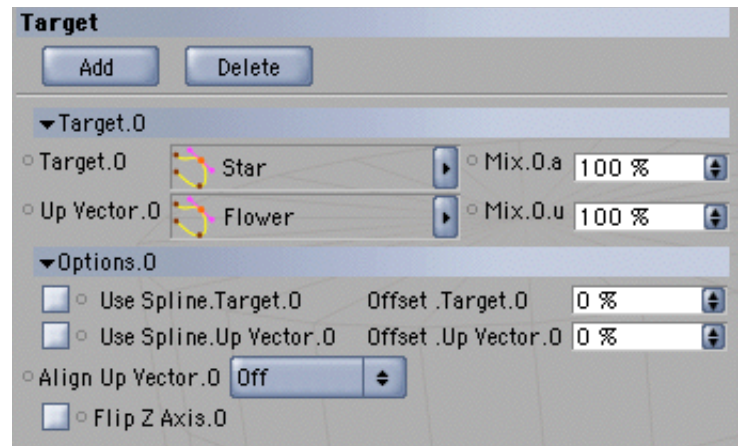
## Tag Properties Tab

*Show Lines* will display lines between the Target object, the Up Vector object and the object to which the tag is assigned. *Up Vector* is a pop-up menu allowing you to choose which axis to use for the up vector (+X, +Y, -X or -Y). *Line Color* will allow you to set the color of the lines drawn. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into position. If there are two or more target groups, then the *Use AB Mixer* option will become available. The *Mix A<->B* slider will blend between the target groups, dividing up the slider equally according to how many target groups there are.



## Target Tab

The *Add* button will add a target group to the bottom of the list. The *Delete* Button will delete the target group at the bottom of the list. The *Target* link holds the target object and the *Up Vector* link holds the up vector object. Each link has its own *Mix* parameter which can be set between 0% and 100%. If the object in the *Target* link is a spline object, then the *Use Spline.Target* option becomes available. Enabling this option will allow the object to target a position along the spline object in the *Target* link. *Offset.Target* sets the position along the spline between 0% and 100%. If the object in the *Up Vector* link is a spline object, then the *Use Spline.Target* option becomes available. Enabling this option will allow the object to target a position along the spline object in the *Up Vector* link. *Offset.Up Vector* sets the position along the spline between 0% and 100%. *Align Up Vector* allows you to align the object's up vector axis to an axis of the object in the *Up Vector* link. The choices are: Off, +X, +Y, +Z, -X, -Y and -Z. Enabling the *Flip Z Axis* option will set the object to point its -Z axis to the object in the *Target* link.

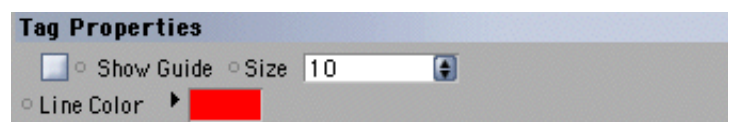


## CD Clamp Constraint

This expression is a clamping expression that prevents one object from going past another object, according to which clamp axis has been set for the target object. It can also use a polygonal object's surface to determine the clamping position.

## Tag Properties Tab

*Show Guide* turns on the drawing of a rectangle on the clamp object and a line between the clamp object and the object to be clamped. *Size*



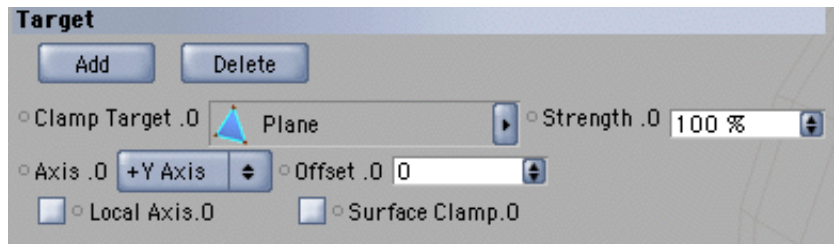


sets the size of the rectangle guide. *Line Color* will allow you to set the color of the lines drawn.

## Target Tab

The *Add* button adds another clamp target to the bottom of the list. The *Delete* button deletes the target at the bottom of the list. The *Clamp Target* link holds the clamping object. *Strength* sets the strength of the clamp. When the strength is set to a low value the object will actual-

ly go past the clamp position and then ease back to the clamp position, giving the clamp a softer effect. *Axis* is a popup menu that allows you to choose which axis is affected by the clamp. *Offset* allows you to set a distance away from the object at which the clamp takes effect. Local Axis will set the clamping axis to the targets orientation, other wise the clamping axis is according to the world's orientation. If the object in the *Target* link is a polygon object, the *Surface Clamp* option becomes available. This option allows you to clamp to the surface of the target object.

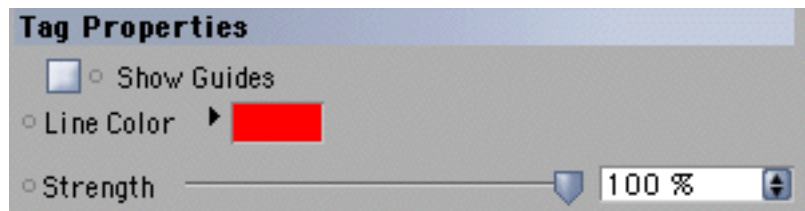


## CD Distance Constraint

This expression sets a distance between two objects and constrains one object to the other by this distance. The tag can be set to constrain one object to a maximum distance away from the other, to constrain one object to a minimum distance close to the other object, or to constrain both maximum and minimum so that the one object always stays the same distance away from the other.

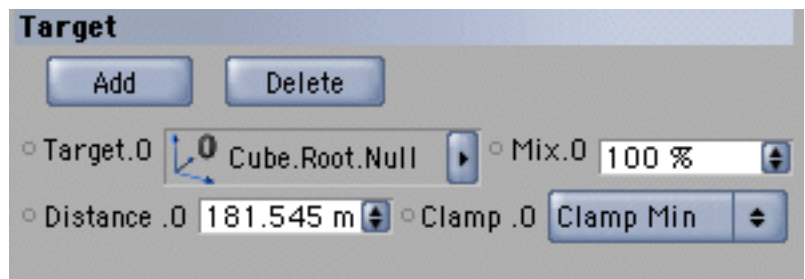
## Tag Properties Tab

*Show Lines* will display lines between the Target object and the object to which the tag is assigned. *Line Color* will allow you to set the color of the lines drawn. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into position.



## Target Tab

The *Add* button adds another distance target to the bottom of the list. The *Delete* button deletes a target from the bottom of the list. The *Target* object link holds the target object. Each link has its own *Mix* parameter which can be set between 0% and 100%. The *Distance* parameter is initially set automatically when you drop an object into the



*Target* link, or when you use the CD Add Distance Constraint command to setup the constraint. You can then alter the distance by using the up and down arrows. The *Clamp* parameter determines the

type of distance constraint for the target. The choices are *Clamp Min*, *Clamp Max* or *Clamp Both*.

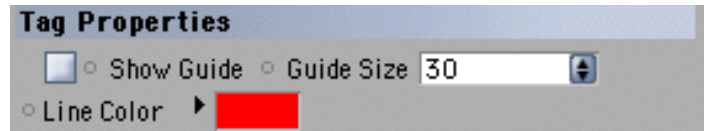


## CD Lock Constraint

This expression can lock an object's movement by locking its position to the X, Y and Z axis, and it can lock an object's orientation by locking its rotation to either the X, Y or Z axis. This lock can be in Global or Local coordinate space.

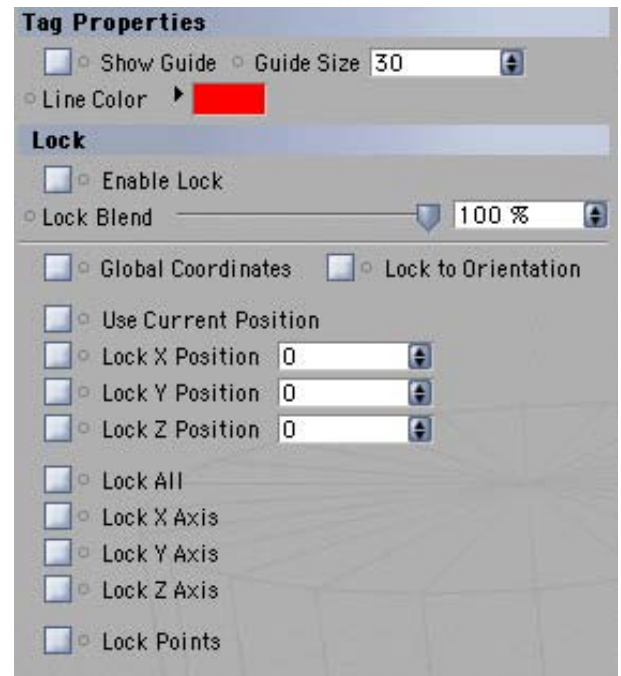
### Tag Properties Tab

*Show Guide* turns on the drawing of a small red, green and blue axis showing the lock reference position and orientation. It will also draw a line from the object to the lock reference axis. *Size* sets the size of the lock reference axis guide. *Line Color* will allow you to set the color of the line that is drawn from the object to the lock reference axis.



### Lock Tab

*Enable Lock* turns the lock on and off. When the lock is enabled you can use the Lock Blend slider to blend between an unconstrained state and a constrained state. When *Global Coordinates* is enabled, the lock will be in global coordinate space, otherwise the lock is in local coordinate space. *Use Current Position* will lock the object in its current state when switching from an unconstrained state to a constrained state. *Lock X Position*, *Lock Y Position* and *Lock Z Position* allow you to lock each axis individually. When an axis is locked, its position parameter edit field becomes available, where you can input a position value along that axis. When *Lock All* is enabled, all of the axes are locked so that the object cannot rotate, and the individual axes locks are disabled. The *Lock X Axis*, *Lock Y Axis* and the *Lock Z Axis* allow you to lock the rotation of the object around one of the individual axes. When one of these axis parameters are enabled the other two become disabled. Enabling *Lock Points* will lock the points of editable point objects, polygon objects, spline objects, etc.

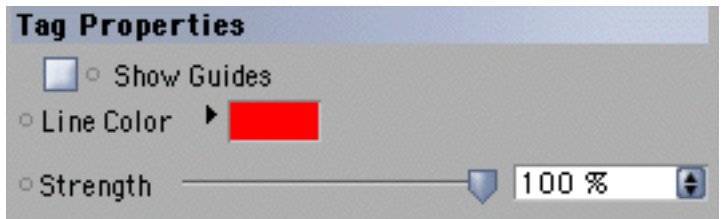


## CD Mirror Constraint

This expression constrains one object to another object's mirrored position, scale and rotation according to which axis you set as the mirror plane axis.

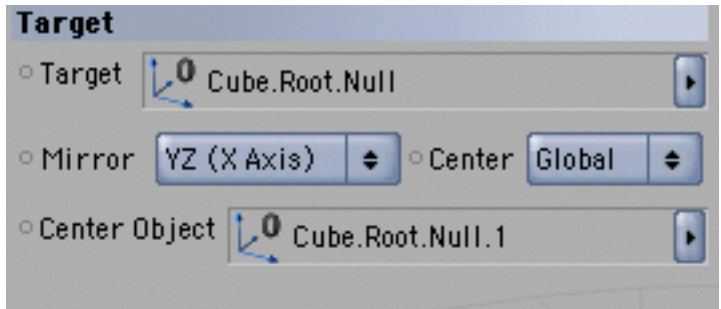
## Tag Properties Tab

*Show Guides* will display a line between the Target object and the object to which the tag is assigned. *Line Color* will allow you to set the color of the line drawn. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into position.



## Target Tab

The *Target* link holds the mirror target object. *Mirror* sets the mirror plane axis. The choices are YZ(X Axis), XZ(Y Axis) and XY(Z Axis). The *Center* parameter allows you to choose whether the center will be in *Global* coordinate space, *Local* coordinate space, or in the coordinate space of an external *Object*. When you choose *Object* for the *Center* parameter, the *Center Object* link becomes available where you can drop the object on which you wish the mirror to be centered.

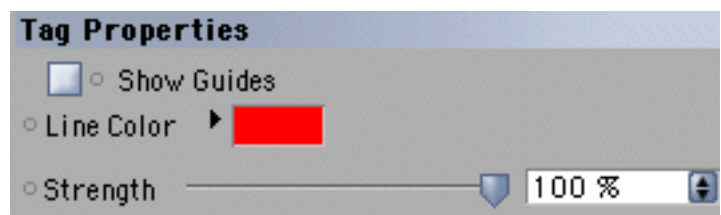


## CD Nail Constraint

This expression constrains an object to a locked position on the surface or near the surface of another object. The constrained position of the object is determined by the object's current position and orientation at the time the constraint was set.

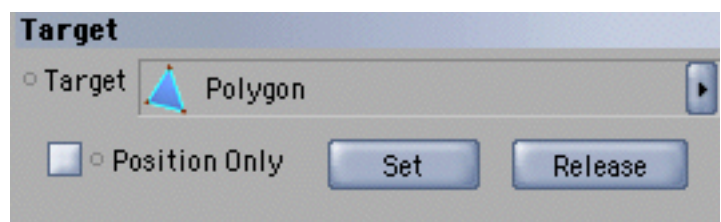
## Tag Properties Tab

*Show Guides* will display a line between the nail position and the object to which the tag is assigned. *Line Color* will allow you to set the color of the line drawn. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into position.



## Tag Properties Tab

The *Target* link holds the target object. **The target object must have surface geometry.** Enabling the *Position Only* parameter will constrain the object's position only, otherwise the object's orientation will also be constrained, and the object will reorient itself as the surface normals change direction. The Set button will set





the object's constrained position and orientation. The Release button will release the previously set constrained position and orientation.

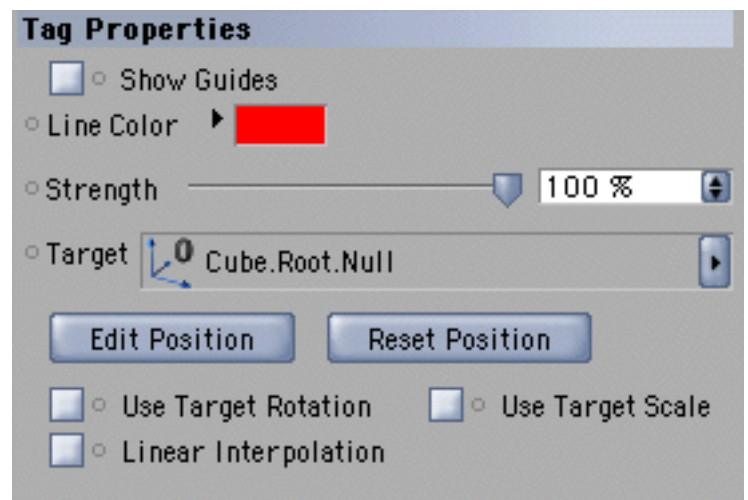


## CD Parent Constraint

This expression creates a parent/child relationship between two objects without them needing to be in the same hierarchy. The position of the child to the parent is automatically calculated when an object is dropped into the link, or when the CD Add Parent Constraint setup command is used. If the object in the link is changed, a new parent/child relationship is set and the new position of the child to the new parent is automatically calculated.

### Tag Properties Tab

*Show Lines* will display a line between the Target object and the object to which the tag is assigned. *Line Color* will allow you to set the color of the line drawn. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into position. The *Target* link holds the target parent object. The *Edit Position* button allows you move the position of the child and the *Reset Position* button sets the new position of the child to the parent after using the *Edit Position* button. When *Use Target Rotation* is enabled, the child object will rotate with the target parent object, otherwise it will stay at it's original orientation. When *Use Target Scale* is enabled, the child object will scale with the parent, otherwise only the position of the child is scaled. When *Linear Interpolation* is enabled, the position that is interpolated when the *Strength* parameter is set to a low value is interpolated linearly, otherwise the position is interpolated radially. This only affects the interpolated position when the parent object is rotated.



## CD Points Constraint

This expression can constrain the position of the points of a point or polygon object to external target objects. The points can also be blended between more than one target.

### Tag Properties Tab

*Show Lines* will display lines between the Target objects and the points of the object to which the tag is assigned. *Line Color* will allow you to set the color of the lines drawn. *Strength* sets the strength of the constraint. When the strength is

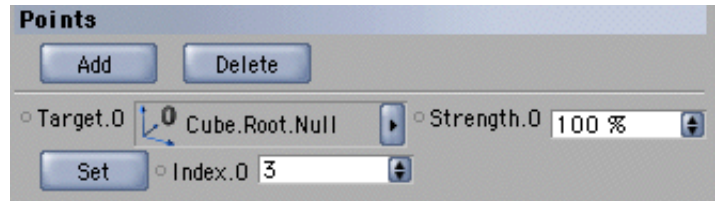




set to a low value, the object's points will ease into position.

## Points Tab

The *Add* button will add another target to the bottom of the list. The *Delete* button will delete a target from the bottom of the list. The *Target* link holds a target object to which a point will be constrained. Each target has its own *Strength* parameter which can be set between 0% and 100%. The *Set* button will set a selected point to the target object in the Target link, and update the *Index* parameter with the selected point's index in the points array, as shown in the Structure Manager. The *Index* parameter determines which point in the points array will be constrained to the target object.

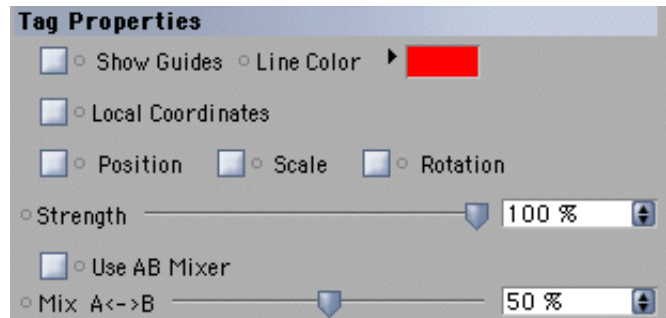


## CD PSR Constraint

This expression can constrain the position, scale and rotation of an object to the position, scale and rotation of another object or blend between the position, scale and rotation of several objects.

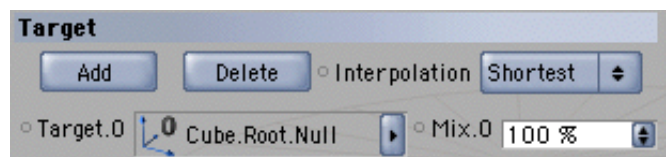
## Tag Properties Tab

*Show Guides* will display lines between the Target objects and the object to which the tag is assigned. *Line Color* will allow you to set the color of the lines drawn. *Local Coordinates* will transfer the constrained position to the local coordinate space of the constrained object. *Position* enables the position constraint, *Scale* enables the scale constraint and *Rotation* enables the rotation constraint. A corresponding tab with parameters will appear when each one of these constraints are enabled. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into the PSR. If there are two or more targets, then the *Use AB Mixer* option will become available. The *Mix A<->B* slider will blend between the targets, dividing up the slider equally according to how many targets there are.



## Target Tab

The *Add* button adds another target to the bottom of the list. The *Delete* button deletes a target from the bottom of the list. *Interpolation* allows you to choose which rotation interpolation you want to use. The choices are *Shortest* and *Average*, with *Shortest* being the most stable. The *Target* link holds the target object. Each link has its own *Mix* parameter which can be set between 0% and 100%.



## Position Parameters

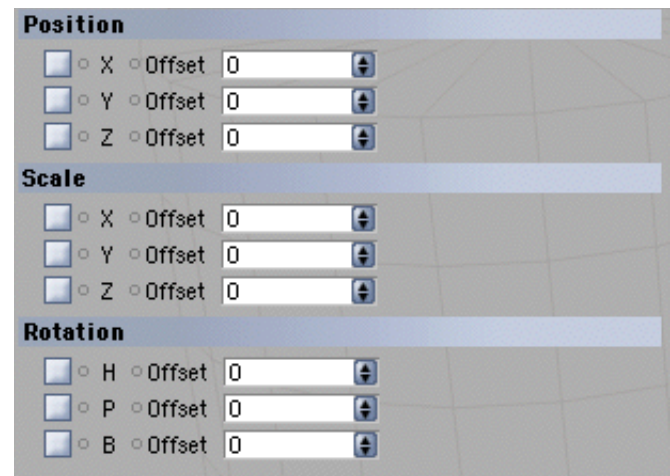
The *X*, *Y* and *Z* switches enable the position constraint for each axis. The three *Offset* parameters allow you to set a position offset for each axis.

## Scale Parameters

The *X*, *Y* and *Z* switches enable the scale constraint for each axis. The three *Offset* parameters allow you to set a scale offset for each axis.

## Rotation Parameters

The *H*, *P* and *B* switches enable the rotation constraint for each axis. The three *Offset* parameters allow you to set a rotational offset for each axis.

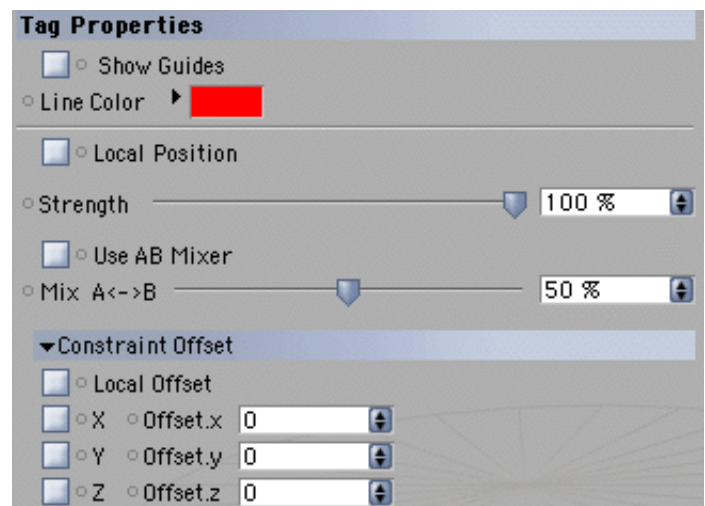


## CD Position Constraint

This expression will constrain the position of an object to the position of another object, or blend between the positions of several objects.

## Tag Properties Tab

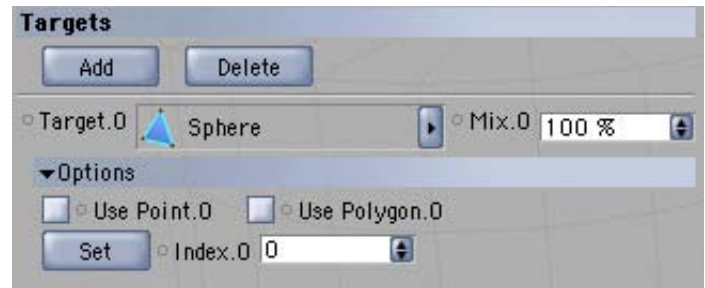
*Show Guides* will display lines between the Target objects and the object to which the tag is assigned. *Line Color* will allow you to set the color of the lines drawn. *Local Position* will transfer the constrained position to the local coordinate space of the constrained object. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into the position. If there are two or more targets, then the *Use AB Mixer* option will become available. The *Mix A<->B* slider will blend between the targets, dividing up the slider equally according to how many targets there are. *Local Offset* is only available when there is only one target and will calculate the position offset local to the target's axes orientation. The *X*, *Y* and *Z* switches enable the position constraint for each axis. The three *Offset* parameters allow you to set a position offset for each axis.



## Target Tab

The *Add* button adds another target to the bottom of the list. The *Delete* button deletes a target from the bottom of the list. The *Target* object link holds the target object. Each link has its own *Mix* parameter which can be set between 0% and 100%. If the target object is a point object the *Use Point* option becomes available. This allows you to constrain the object's position to a point of the target object. If the object is a polygon object, then the *Use Polygon* also becomes available. This allows you to constrain

the position of the object to the center of a polygon. The *Set* button will set the *Index* parameter to a selected component of the object. The *Index* value is the component's index in the internal array object. If the *Use Point* option is enabled, then the *Index* value will be from the objects internal points array, and if the *Use Polygon* object is enabled, then the *Index* value will be from the object's internal polygons array.

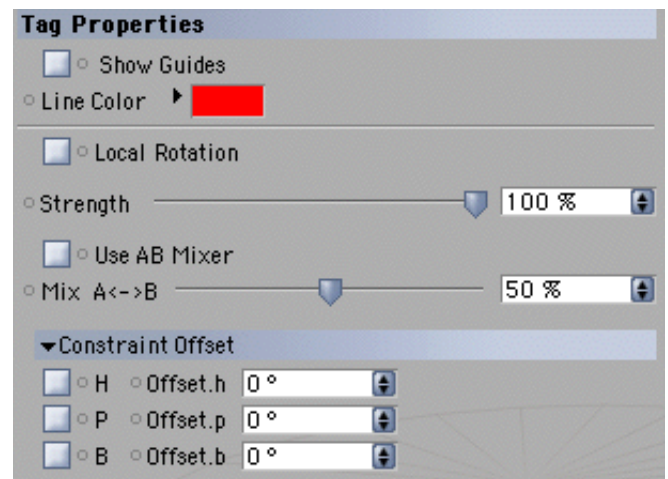


## CD Rotation Constraint

This expression will constrain the rotation of an object to the rotation of another object or blend between the rotations of several objects.

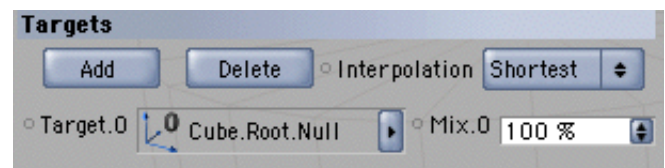
### Tag Properties Tab

*Show Guides* will display lines between the Target objects and the object to which the tag is assigned. *Line Color* will allow you to set the color of the lines drawn. *Local Rotation* will transfer the constrained rotation to the local coordinate space of the constrained object. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into the rotation. If there are two or more targets, then the *Use AB Mixer* option will become available. The *Mix A<->B* slider will blend between the targets, dividing up the slider equally according to how many targets there are. The *H*, *P* and *B* switches enable the rotation constraint for each axis. The three *Offset* parameters allow you to set a rotational offset for each axis.



### Target Tab

The *Add* button adds another target to the bottom of the list. The *Delete* button deletes a target from the bottom of the list. *Interpolation* allows you to choose which rotation interpolation you want to use. The choices are *Shortest* and *Average*, with *Shortest* being the most stable. The *Target* link holds the target object. Each link has its own *Mix* parameter which can be set between 0% and 100%.



## CD Scale Constraint

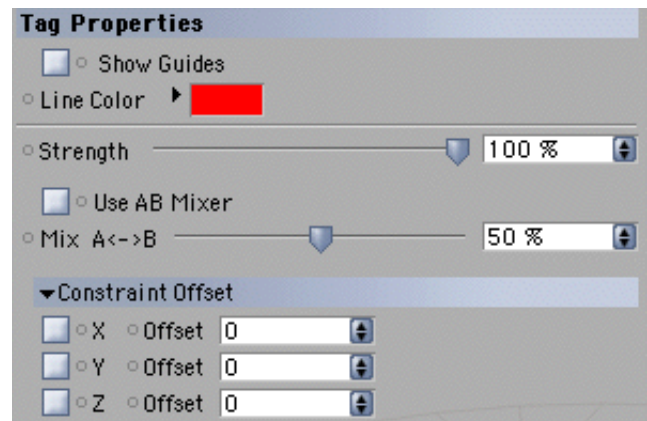
This expression will constrain the scale of an object to the scale of another object or blend between



the scales of several objects.

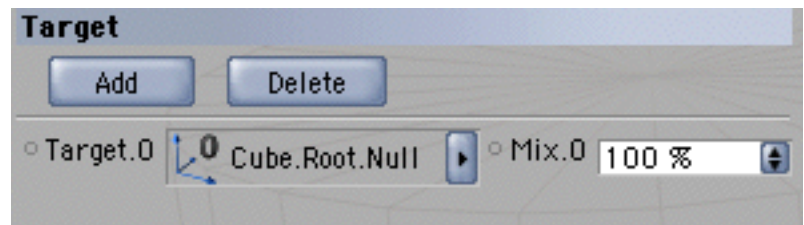
## Tag Properties Tab

*Show Guides* will display lines between the Target objects and the object to which the tag is assigned. *Line Color* will allow you to set the color of the lines drawn. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into the scale. If there are two or more targets, then the *Use AB Mixer* option will become available. The *Mix A<->B* slider will blend between the targets, dividing up the slider equally according to how many targets there are. The X, Y and Z switches enable the scale constraint for each axis. The three *Offset* parameters allow you to set a scale offset for each axis.



## Target Tab

The *Add* button adds another target to the bottom of the list. The *Delete* button deletes a target from the bottom of the list. The *Target* link holds the target object. Each link has its own *Mix* parameter which can be set between 0% and 100%.

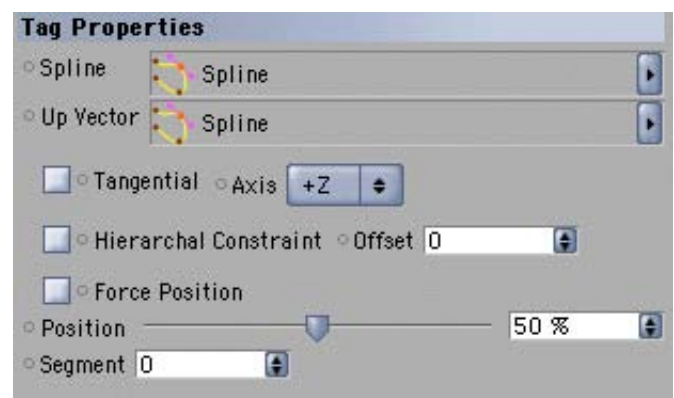


## CD Spline Constraint

This expression will constrain the position of an object to a spline object, so that the object can only be moved along the spline. If the object has a hierarchy of child objects they can also be constrained to the spline with an offset distance from each other.

## Tag Properties Tab

The *Spline* link holds the spline target object. The *Up Vector* link holds the up vector object. If a spline object is placed in the up vector link, then it functions like a rail spline, otherwise it functions as a single position up vector. *Tangential* will align the object to the tangents according to the current position of the object along the spline. *Axis* determines which axis of the object will be aligned to the tangents. The choices are +X, -X, +Y, -Y, +Z or -Z. Enabling *Hierarchal Constraint* will constrain the object's children if they are in a hierarchal chain. *Offset* determines the distance between the child objects along the spline. Enabling the *Force Position* parameter





forces the object to be constrained to a position on the spline as determined by the *Position* parameter. *Segment* determines to which segment of the spline the object is constrained.



## CD Spring Constraint

This expression will constrain an object to another object with a spring physics simulation. You can also constrain an object between two objects with a spring attached to both other objects. This is perfect for setting up a small simple dynamic rig without needing to use a full fledged dynamics simulation, which can sometimes be computationally expensive. The CD Spring Constraint can be set up as a positional spring, a rotational spring or both at the same time. The spring simulation includes settings for spring stiffness, drag, mass (of the constrained object) and gravity. You can also set up simple planer collisions if the CD Spring Constraint is used in conjunction with a CD Clamp Constraint.

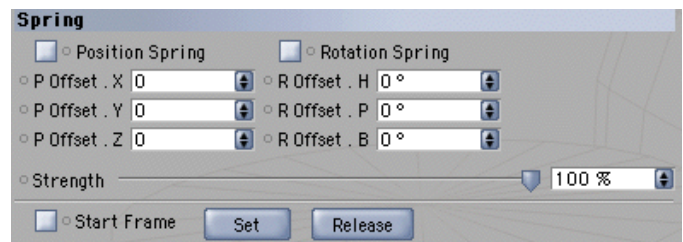
### Tag Properties Tab

*Show Spring* will draw a 2 dimensional spring between the constrained object and the *Anchor* object. If there is an *Attachment* object, then a spring will also be drawn between the constrained object and the attachment object. *Show Gravity* will draw an arrow from the constrained object pointing in the direction of the gravity force. The arrow's size is dependent on the strength of the gravity. The *Anchor* link holds the anchor object. The *Attachment* link hold the attachment object. This is used for constraining the object between two other objects with a spring attached to both other objects.



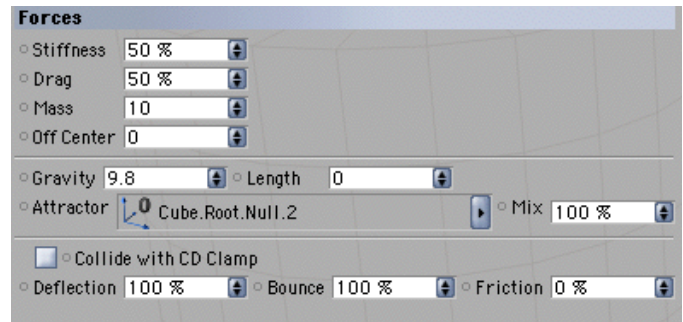
### Spring Tab

*Position Spring* enables the position spring and *Rotation Spring* enables the rotational spring. Each type of spring has *Offset* parameters that function in the same way as the offsets in the CD PSR Constraint as described above. The *Strength* slider is a blend slider for the spring simulation, with 100% being the full spring simulation and 0% being a position/rotation constraint. *Start Frame* allows you to store the start frame state of the object for the simulation during animation. The *Set* button stores the current state of the object at the current frame in the timeline. The *Release* button removes the previously stored start frame state and simultaneously disables the *Start Frame* option. To set a start frame state, you first enable the *Start Frame* option. This temporarily disables the spring simulation constraint so you can manually position the object to the desired start frame state. Once you have the object positioned, click on the *Set* button to store the start frame state of the object.



## Forces Tab

In this tab you set the various forces that determine how the spring simulation behaves. *Stiffness* sets the spring stiffness between 0% and 100%. This parameter determines the strength the spring's pull on the object. *Drag* sets the spring drag between 0% and 100%. This parameter determines the resistance against the spring's pull on the object. *Mass* sets the mass (or weight) of the object between 1 and 100. The mass of an object affects the intensity of the other forces on that object. The *Off Center* parameter allows you to move the spring's attachment point on the object. A setting of 0 sets the spring's attachment to the center of the object (or the center of its mass). When you move this attachment point off center and have the Rotation Spring enabled, it causes the object to tilt in the direction it's being pulled. *Gravity* sets the amount of gravity force on the object. A gravity of 9.8 is normal earth gravity. *Length* sets the length of the spring which is the length between the object and the anchor when the effect all forces have settled down. The *Attractor* link holds an optional gravity attractor object. This allows you to use an object to determine the direction of the gravity. With *Collide with CD Clamp* enabled, you can use a CD Clamp Constraint in conjunction with the CD Spring Constraint to set up simple planer collisions. This option is only available if there is a CD Clamp Constraint also on the object. *Deflection* sets the "hardness" of the collision surface between 0% and 100%. Use a high value for a harder surface and a low value for a softer surface. *Bounce* sets the rebound force between 0% and 100%. This determines how high the object will rebound off the surface after the collision. This of course is affected by the amount of force the object has when it collides with the surface. *Friction* sets the collision plane's surface friction between 0% and 100%. This only affects the object while it is in contact with the collision plane's surface.

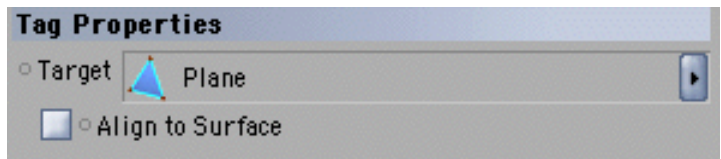


## CD Surface Constraint

This expression constrains an object to the surface of another object, so that the object can only move along the surface of the target object.

## Tag Properties Tab

The *Target* link holds the target object. **The target object must have surface geometry.** Enabling the *Align to Surface* parameter will align the object's Y axis to the target's surface normal at the object's current position on the surface.



## CD Tag Along Constraint

This expression constrains an object to a target object, so that when the target object exceeds a certain

distance from the object, the object will "hop" towards the target object.

## Tag Properties Tab

*Show Lines* will display lines between the Target object and the object to which the tag is assigned. *Line Color* will allow you to set the color of the line drawn. *Strength* sets the strength of the constraint. When the strength is set to a low value, the object will ease into position.



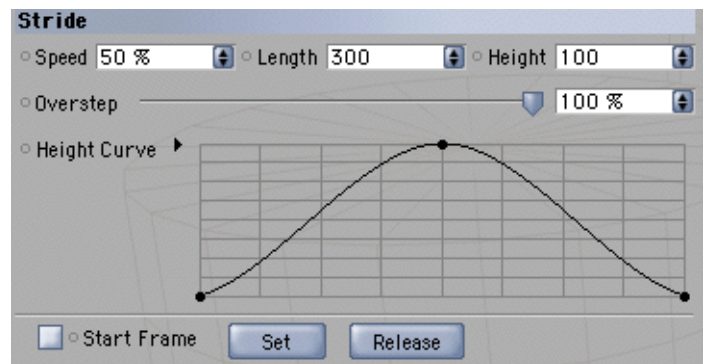
## Target Tab

The *Target* link holds the target object. The Reset Position button will reset the object to the current position of the target object.



## Stride Tab

In this tab you set the parameters that will determine how the object hops toward the target object. *Speed* determines how fast the object will hop to the target position and can be set between 0% and 100%. At a setting of 0% the object will not hop at all and a setting of 100% the object will hop to the target position almost instantaneously. *Length* determines the maximum distance the target object can be from the object before the object begins to hop towards the target. *Height* determines how high the object will hop. This parameter works in conjunction with the *Height Curve*, which allows you to shape the path of the hop. Setting the *Overstep* parameter higher than 0% allows the object to hop past the target object. A setting of 100% makes the object hop past the object at the distance of the *Length* parameter. *Start Frame* allows you to store the start frame position of the object during animation. The *Set* button stores the current position of the object at the current frame in the timeline. The *Release* button removes the previously stored start frame position and simultaneously disables the *Start Frame* option. To set a start frame position, you first enable the *Start Frame* option. This temporarily disables the constraint so you can manually position the object to the desired start frame position. Once you have the object positioned, click on the *Set* button to store the start frame position of the object.

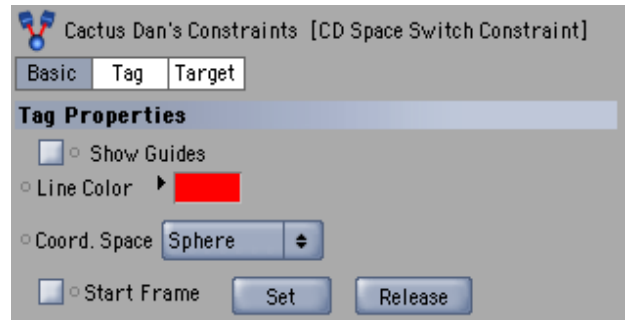


## CD Space Switch Constraint

This expression constrains an object to the coordinate space of one of several other target objects. It can be used to create space switching or dynamic parenting rigs. The object can only be constrained to one of the target objects at a time, so when one of the target objects is active the other target objects have no affect on the constrained object.

## Tag Properties Tab

*Show Guides* will display lines between the active Target object and the object to which the tag is assigned. *Line Color* will allow you to set the color of the lines drawn. *Coord. Space* is a popup menu that allowsy you switch between the coordinate spaces of the target objects. *Start Frame* allows you to store the start frame position of the object during animation. The *Set* button stores the current position of the object at the current frame in the timeline. The *Release* button removes the previously stored start frame position and simultaneously disables the *Start Frame* option. To set a start frame position, you first enable the *Start Frame* option and then click on the *Set* button to store the start frame position of the object.



## Target Tab

The *Add* button adds another target to the bottom of the list. The *Delete* button deletes a target from the bottom of the list. The *Target* object links hold the target objects. Each link has its own *Mix* parameter which can be set between 0% and 100%. The Mix parameter determines the strength each target object's coordinate space has on the object that has the CD Space Switch Constraint on it.

