

# PrayMitive

## RAY MARCHING

### Ae Plugin

## PrayMitive User Manual

Welcome to PrayMitive! An innovative After Effects plugin that harnesses the power of RayMarching to render stunning SDF (Signed Distance Function) primitives. Bind these primitives to a 3D Null object and transform them as you please.

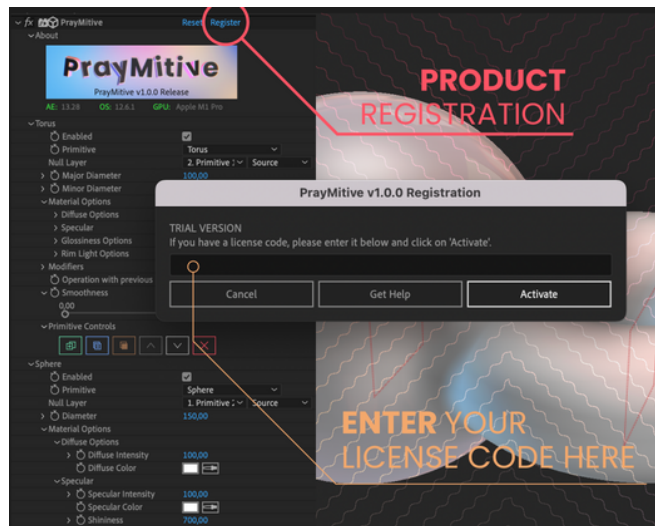
### Installation Guide for PrayMitive Plugin:

The easiest way to install and license PrayMitive is by using the [aescripts + aeplugins manager](#). To install a trial, you can select 'Add Trial' from the 'Account' menu.

However, if you prefer to manually install the plugin, here's how you can do it:

1. Move the folder containing the plugin file to the directory `/Applications/Adobe After Effects 2023/Plug-ins/`
2. The plugin will be available in the *Effects & Presets* panel or the *Effects* menu under the category *TIM Building/PrayMitive*
3. To use the plugin, simply add this effect to a Solid Layer in your composition

### Product Registration



Noticing crisscross wavy lines on your primitives? This indicates your product isn't registered.

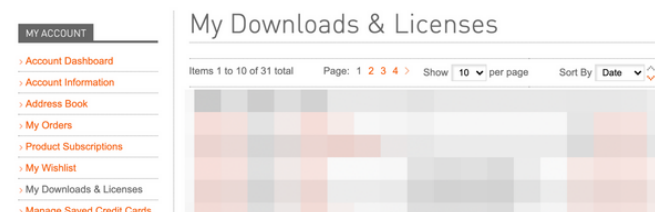
#### How to Register:

1. For easy registration, utilize the [aescripts manager app](#).
2. Alternatively, in the Effects Control Window, click 'Register' and input your serial.

#### Clearing Cache for Smooth Functionality:

Clearing the cache in After Effects can solve a multitude of issues, not just related to our plugin. Regularly purging the cache ensures optimal performance and can help in troubleshooting.

- Go to *Edit > Purge > All Memory & Disk Cache*. A prompt will ask if you're sure you want to delete the cache files. Confirm by selecting 'OK'.
- Restart After Effects and, if using, Adobe Media Encoder.



#### Finding Your Serial Key:

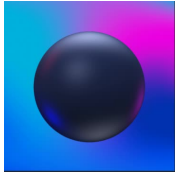
If you purchased through aescripts, locate your serial key in your account dashboard under 'My Downloads and Licenses'. Please note: the key is not sent via email.

### Further Registration Queries

For a detailed guide on registration questions, please visit [aescripts' License Code FAQ](#).

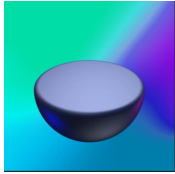
# Primitives & Their Parameters

## Sphere



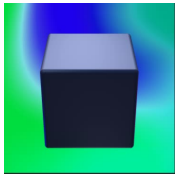
**Diameter:** Controls the size of the sphere.

## Hemisphere



**Diameter:** Controls the size of the hemisphere.  
**Fill Percent:** Allows you to fill the hemisphere to a specific percentage.  
**Fillet:** Controls the smoothing of the edges.  
**Position & Rotation:** Control the position and rotation in 3D space.

## Box



**Size (X, Y, Z):** Controls the size along each axis.  
**Fillet:** Controls the smoothing of the edges.

## Torus



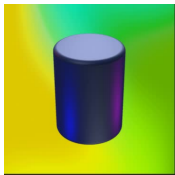
**Major Diameter:** Controls the overall diameter of the torus.  
**Minor Diameter:** Controls the diameter of the tube.

## Capsule



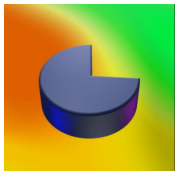
**Diameter:** Controls the width of the capsule.  
**Height:** Controls the height of the capsule.

## Cylinder



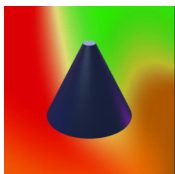
**Diameter:** Controls the width of the cylinder.  
**Height:** Controls the height of the cylinder.  
**Fillet:** Controls the smoothing of the edges.

## Pie Cylinder



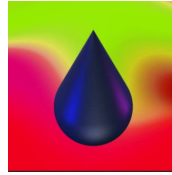
A cylinder shaped like a pie, ideal for creating 3D pie charts.  
**Percent:** Determines the fill percentage of the pie.  
**Diameter & Height:** Controls the size of the cylinder.  
**Fillet:** Controls the smoothing of the edges.  
**Position & Rotation:** Control the position and rotation in 3D space.

## Cone



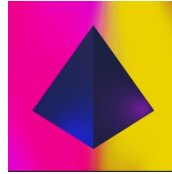
**Top Diameter:** If zero, a standard cone; if more, it looks like the top of the cone has been cut off.  
**Bottom Diameter, Height:** Controls the size of the cone.

## Round Cone



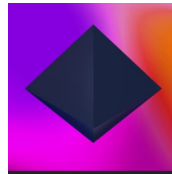
**Top Diameter, Bottom Diameter, Height:** Controls the shape (from droplet to capsule-like).

## Pyramid



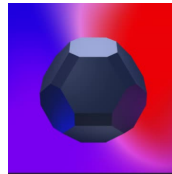
**Size:** Controls the size of the pyramid.

## Octahedron



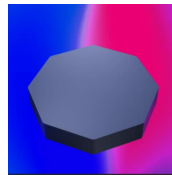
**Size:** Controls the size of the octahedron.

## Polyhedron



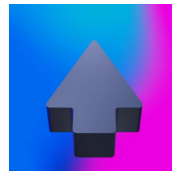
A complex figure that resembles an Octahedron and can be transformed through various parameters.  
**UVW:** Modifies the chamfer (cut) of each corner.  
**Spherize:** Transforms the polyhedron into a sphere.  
**Type:** Select from 3 (pyramid) to 5 faces (diamond-like).  
**Position & Rotation:** Control the position and rotation in 3D space.

## Polygon



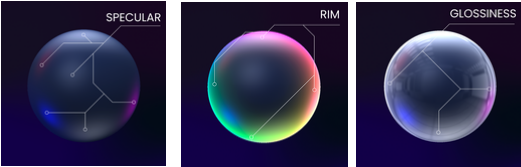
A polygon on a 2D plane extruded into 3D space.  
**Sides:** Select between 3 and 16 sides.  
**Diameter & Height:** Controls the size of the polygon.  
**Fillet:** Affects the smoothing in the 2D plane.

## Cursor



A 3D cursor shape created for promotional use but can be utilized for various purposes.  
**Root Width & Height:** Control the size of the box part of the cursor.  
**Triangle Width:** Controls the width of the triangular part.  
**Height & Size:** Control the overall size of the cursor.  
**Fillet:** Affects the smoothing only in the 2D plane.

# Material Options



Material Options	
Diffuse Options	
Diffuse	100,00
Diffuse Color	<div></div>
Specular	
Specular	100,00
Specular Color	<div></div>
Shininess	100,00
Glossiness Options	
Glossiness	0,00
Fresnel Edge Bias	150,00
Fresnel Central Bias	0,00
Rim Light Options	
Rim	0,00
Colorized Normal Mix	100,00
Rim Color	<div></div>
Fresnel Edge Bias	150,00
Fresnel Central Bias	0,00

Material adjustments in PrayMitive allow you to fine-tune the appearance of each primitive, manipulating properties like color, specular highlights, reflections, and unique effects like rim lighting. Below are the details of each available adjustment:

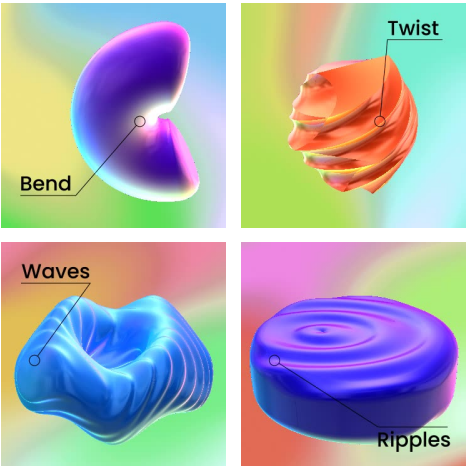
- 1. **Diffuse:**
  - **Diffuse** (0-100): Controls the overall strength of the chosen color.
  - **Color:** Lets you select the color of the primitive.
- 2. **Specular:**
  - **Strength** (0-200): Regulates the intensity of the highlight, allowing an overdrive effect up to 200.
  - **Color:** Choose the color of the specular highlights on the surface.
  - **Shininess:** Adjusts the size of the specular highlight on the surface.
- 3. **Glossiness:**
  - **Glossiness** (0-200): Controls the intensity of reflections on the surface.
  - **Fresnel Edge Bias** (0-500): Adjusts the way reflections appear based on the viewing angle. A value of 0 produces uniform reflections, while 500 causes reflections to appear mainly at perpendicular angles to the camera's view. It follows the algorithm:  $\text{saturate}(\text{pow}(1.0 - \text{abs}(\text{dot}(-\text{rd}, \text{n})), \text{size}))$ .
  - **Fresnel Central Bias** (0-100): Compensates for the Fresnel effect, influencing how much reflection is seen from different angles. A value of 100 makes the reflection complete across the surface.
- 4. **Rim Light Options:**
  - **Rim Strength** (0-200): Regulates the intensity of the rim lighting.
  - **Rim Color:** Chooses the color of the rim lighting effect.
  - **Colorized Normal Mix:** Creates a rim lighting effect based on the surface normals, allowing a colorful representation depending on the normal direction (e.g., upward-facing normals in pink, downward in green).
  - **Fresnel Edge Bias & Fresnel Central Bias:** Similar to the reflection settings, these control how the rim effect appears based on the viewing angle.

# Modifiers

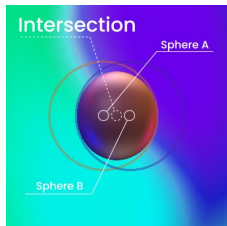
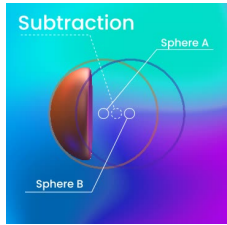
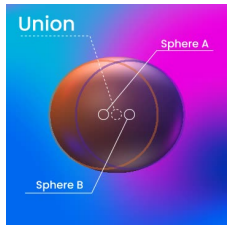
Modifiers	
Bend	
Enabled	<input checked="" type="checkbox"/>
Strength	0,00
Rotation	
Rotation X	0x+0,0°
Rotation Y	0x+0,0°
Rotation Z	0x+0,0°
Twist	
Enabled	<input checked="" type="checkbox"/>
Strength	0,00
Rotation	
Waves	
Enabled	<input checked="" type="checkbox"/>
Cosine	
Amplitude	0,00
Frequency	2,00
Offset	0x+0,0°
Rotation	
Sine	
Amplitude	0,00
Frequency	2,00
Offset	0x+0,0°
Rotation	
Ripples	
Enabled	<input checked="" type="checkbox"/>
Amplitude	0,00
Frequency	2,00
Offset	0x+0,0°
Rotation	

Modifiers are powerful tools in PrayMitive that allow users to deform and transform primitives in intricate ways. Each modifier comes with its unique set of parameters and can be applied based on Euler controls for the X, Y, and Z axes. Below are the available modifiers and their individual details:

- 1. **Bend:**
  - **Description:** The Bend modifier lets you curve or arch your primitive, adding an organic feel to the object.
  - **Strength Parameter:** Determines the intensity of the bend. Care is advised as higher values can cause visual artifacts.
  - **Tips:** If you encounter any artifacting, consider adjusting the "RayMarch Scale" setting for a cleaner render.
- 2. **Twist:**
  - **Description:** Use the Twist modifier to spin or rotate a section of your primitive, resulting in a twisted appearance.
  - **Strength Parameter:** Governs the magnitude of the twist applied to the primitive. As with Bend, very high values can produce artifacts.
  - **Recommendations:** Should artifacts appear, modifying the "RayMarch Scale" may help in achieving a better result.
- 3. **Wave:**
  - **Description:** The Wave modifier induces a wavy deformation onto your primitive, making it look as though it's oscillating or undulating.
  - **Amplitude:** Defines the height of the wave.
  - **Frequency:** Adjusts the number of wave cycles over a certain distance.
  - **Offset:** Allows you to move or shift the wave pattern.
- 4. **Ripples:**
  - **Description:** Mimicking the effect of a pebble dropped in water, the Ripples modifier introduces concentric waves radiating outward.
  - **Amplitude:** Determines the height or prominence of the ripples.
  - **Frequency:** Adjusts the spacing or distance between individual ripple waves.
  - **Offset:** Lets you change the starting point of the ripples, effectively controlling their phase.



# Combining Primitives



In PrayMitive, the true innovation comes alive when combining different primitives. With the RayMarching algorithm, the user can execute complex blending operations, fusing or subtracting primitives in real-time with unprecedented smoothness. This allows the creation of complex and artistic shapes through smooth blending transitions. Below are the available methods to combine primitives:

## Operations

1. **Union (Smooth Fusion)**: This operation merges two or more primitives, forming a unified shape. It can be used to create organic connections and intricate forms.
2. **Subtraction (Smooth Cutting)**: Subtraction delicately removes one primitive from another, with the RayMarching algorithm ensuring a smooth and organic-looking cut.
3. **Intersect (Smooth Intersection)**: The Intersect operation reveals the common volume between two or more primitives, blending the intersecting areas smoothly.

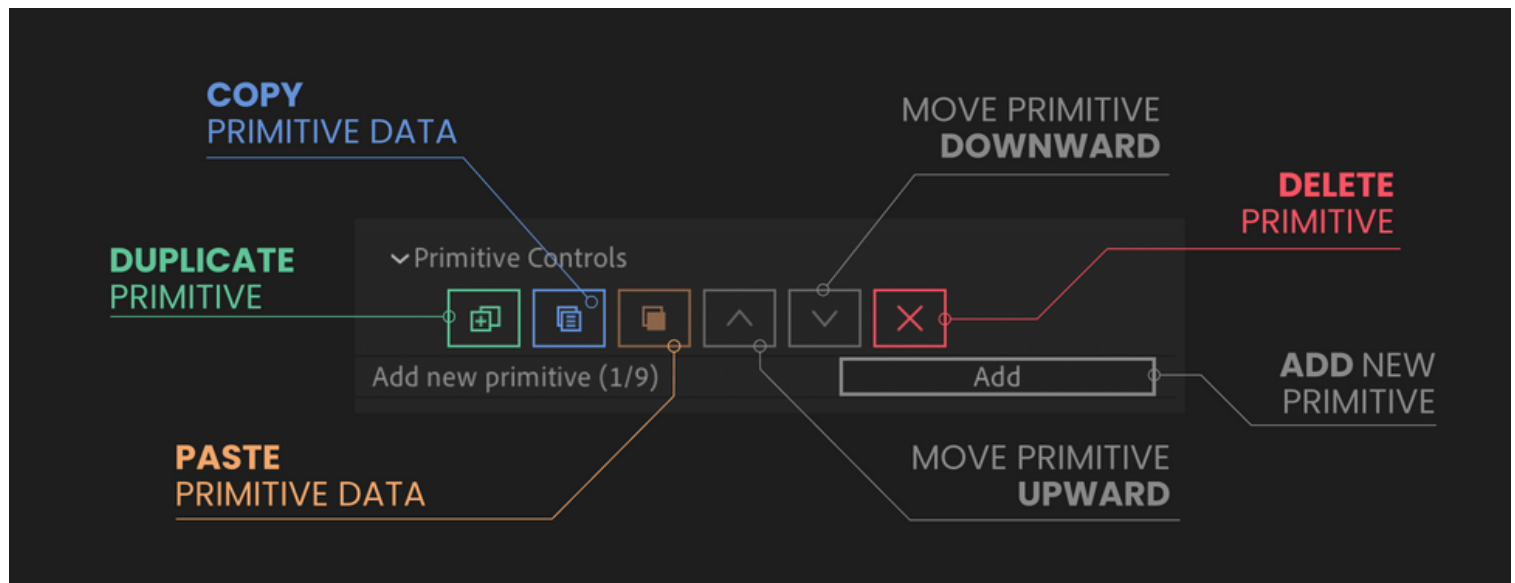
## Smoothness Control

One of the key features of PrayMitive's combining methods is the ability to control the smoothness of the operations. This control is available for all the above operations and allows the user to adjust the blending transitions. The smoothness control enables anything from subtle blends to sharp edges, allowing for highly customized and artistic results.

The power of RayMarching in PrayMitive ensures these "metaball-like" transitions between primitives, providing a level of control and organic fusion that is rare in traditional 3D modeling. The smooth combining capabilities offer a potent toolset for creating unique, intricate, and aesthetically pleasing models efficiently and creatively on the GPU.

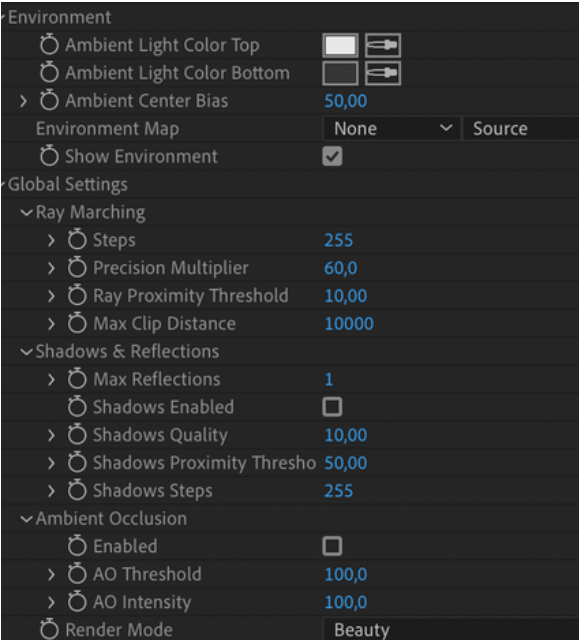
# Primitive Controls Overview

In the PrayMitive plugin, each primitive is accompanied by a dedicated control panel to streamline your workflow. This panel provides easy access to several core functions, ensuring you can swiftly manipulate primitives without navigating through complex menus. Let's dive into each control:



1. **Duplicate Primitive**: This button instantly creates a new identical primitive, inheriting all properties and settings from the source primitive. It's particularly useful when you need multiple similar shapes without manually redefining attributes.
2. **Copy Primitive Data**: Clicking on this button copies all the data and attributes associated with the selected primitive to the clipboard. It's a handy feature for those times when you wish to apply the same attributes to another primitive or when you need to transfer settings between projects.
3. **Paste Primitive Data**: After copying data from a primitive, this button will apply those attributes to the currently selected primitive. It works in tandem with the Copy Primitive Data button, essentially granting you a copy-paste mechanism for primitives.
4. **Move Primitive Upward**: By pressing this button, the current primitive is moved up in the list, essentially swapping places with the one above it. This provides an easy way to reorder and prioritize your list of primitives without dragging and dropping.
5. **Move Primitive Downward**: Opposite of the above, this button moves the selected primitive down the list, swapping its place with the one below. Useful for when you need to adjust the layering or priority of your primitives.
6. **Delete Primitive**: This button removes current primitive from the list and the composition entirely. Use with caution, as once a primitive is deleted, it cannot be undone unless you've saved prior states or versions of your project. It's recommended to ensure that you truly want to remove a primitive before using this option.





# Environment Settings

This section offers settings to fine-tune the environmental lighting and reflection cues in PrayMitive. Create visually appealing ambient lighting conditions and utilize equirectangular maps for both environmental backdrops and material reflections.

- Ambient Light Color Top:** This option lets you set the color of the ambient light that emanates from the top side of your scene.
- Ambient Light Color Bottom:** Adjust the color of the ambient light originating from the bottom side of your scene.
- Ambient Center Bias:** This control allows for the dynamic adjustment of the midpoint between the top and bottom ambient light sources. By sliding the control, you can shift the ambient light's center point, either raising or lowering it within your scene.
- Environment Map:** Integrate an equirectangular layer to serve as a reflective environment map. This map provides reflections (Glossiness) in the material settings of your primitives. Additionally, when "Show Environment" is enabled, this map can also serve as a scene backdrop, enhancing the overall environmental aesthetic.
- Show Environment:** This toggle allows you to display or hide the environment map in the background. It's purely a visual aid and doesn't affect the performance.

## General Settings

### Ray Marching:

- Steps:** This parameter defines the number of iterations the ray marches before reaching a conclusion about what's in its path. A higher value will provide more accurate results but may be computationally more intensive.
- Precision Multiplier:** This value is multiplied with the final ray marching calculation to combat visual artifacts, especially when rays intersect or overlap with each other. A careful balance is needed as excessive values might cause performance issues or unwanted visual discrepancies.
- Ray Proximity Threshold:** This represents the closest calculation point for ray marching. In essence, it defines how close a ray can get to an object before it's considered a hit. Lower values can increase precision but can also lead to performance costs.
- Max Clip Distance:** This is the furthest point at which the ray marching calculation is considered. Anything beyond this distance won't be rendered, effectively serving as a rendering horizon.

### Shadows & Reflections:

- Max Reflections:** Determines the number of times objects can reflect off one another. When set to 0, no reflections will be rendered.
- Shadows Enabled:** Toggle this to enable or disable shadow rendering.
- Shadows Proximity Threshold:** Much like the Ray Proximity Threshold, this defines the nearest calculation point for shadows, dictating the precision of shadow calculations.
- Shadows Steps:** Specifies the number of iterations or "steps" the ray takes to compute shadows. Fewer steps can expedite rendering at the cost of shadow precision. Conversely, more steps result in more detailed shadows but might be computationally expensive.

### Ambient Occlusion:

- Enabled:** Switch to turn on or off the Ambient Occlusion.
- AO Threshold:** This parameter sets the limit at which ambient occlusion begins to have an effect. It can help fine-tune the areas where AO appears, especially in corners or crevices.
- AO Intensity:** Regulate the strength or darkness of the ambient occlusion effect. Higher values intensify the shading effect, making creases and corners appear deeper or more shadowed.

### Render Modes:

- Beauty:** The primary rendering mode that provides the final visual output.
- Normal Map:** Displays the direction each point on an object's surface is facing. Used in combination with Displacement Maps, this mode can be employed to simulate effects like refraction.
- Depth:** Renders a grayscale depth map where the nearest point is black, and the farthest point is white. The range of depth is controlled by the Max Clip Distance. This mode is especially useful for post-processing effects such as Depth of Field (DOF) and fog.

## Camera & Light Integration

### Camera:

- PrayMitive instantly detects and syncs with the active composition camera.
- The plugin respects the camera's zoom level, influencing the Field of View (FOV).
- The scene can be viewed using different camera perspectives including Custom view, Left, Right, Top, etc.

### Lighting:

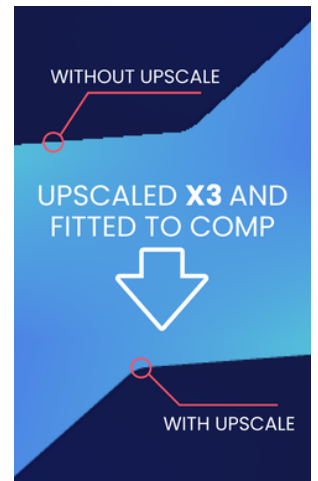
- PrayMitive identifies and responds to all lights in your composition, considering position, color, intensity, and type.
- The interaction between light and primitives also depends on the chosen material settings.

# Tips & Tricks

## Simulating Anti-aliasing:

To achieve an anti-aliasing effect, you can enlarge the *Solid* containing PrayMitive:

- Hold **Ctrl [CMD]+Shift+Y** to open '*Solid Settings*' or navigate through **Layer → Solid Settings**.
- With the '*Lock Aspect Ratio*' enabled, enter **\* 2**, **\* 2.5**, etc., adjacent to the width or height fields. Essentially, you're multiplying the composition's size by this number.
- Adjust the Scale to match the composition using '*Fit to Comp*'. This can be achieved via the shortcut **Ctrl [CMD]+Alt+F** or through **Layer → Transform → Fit To Comp**.



## Addressing Ray Marching Artifacts:



- If you observe artifacts with certain modifiers, it often happens because the depth of the object is so fine that the ray passes through it, a limitation of the technology.
  - One remedy is to reduce the 'Precision Multiplier' parameter. It multiplies the transparency of the final image generated through Ray Marching. However, this method comes with its own set of limitations:
    - At near-zero values, you might notice the boundaries of the generated space.
    - At slightly higher, but still low values, the alpha might exhibit "stepping" or "jagged edge" artifacts.

