General Concepts

The Iray Uber Shader is comprised of three separate shaders in one. This is done by providing three mixing modes which determine what properties show. Each has properties specific to that mode. This document breaks down the properties for all three modes. To see the properties specific to a particular Base Mixing mode, please refer to each individually.

General

These two properties are common across most shaders shipped with DAZ Studio.

- **Tags** - Tags are added in the text box as a comma delimited list, and are used for filtering and selection. The tags are saved with the shader, and all DAZ 3D default shaders include tags. It is recommended that shaders submitted for sale include tags as well.
- **Material ID** - Use this to set a color to flag or group particular materials. Material ID is used by Iray in Render Settings > Advanced > (check) Canvases > (click +) Type > Material ID Canvas.

Base

Mixing

- **Base Mixing** - Iray has the ability to use 3 separate types of shader mixing.
  - PBR Metallicity/Roughness
  - PBR Specular/Glossiness
  - Weighted

Diffuse

Reflection

- **Metallicity** - This is a main property of the PBR Metallicity/Roughness shader. The default 0 value (off) sets the shader up as a dielectric (or non-metal) surface. Setting the value to 1 (on) gives the surface the properties of metal. When turned on, the metal properties will over-ride all other shader properties with the exception of Refraction Weight.

Using correct metal sRGB values is an important aspect of getting realistic metals when using this setting. The Metallicity property will also accept an image map to drive its strength. This map should be mostly black and white, with a small amount of gray allowed where these 2 colors meet.

While this value is normally on or off, the value can be set anywhere between but may give less realistic results. Oxidized metals will have lower values, and ideally should be driven by a strength map in the channel. (i.e., Rust, dirt, etc...)
- **Base Color** - This is the primary color of the surface base. The property is used in both metal and dielectric surfaces and can accept a colored image map. When converting from 3Delight, this is where the **Diffuse** map is plugged in to the shader.

  Base color for non-metal surfaces should range between 50-240 sRGB or .028-.9 linear RGB. Metal surface ranges should be between 180-255 sRGB or .46-1.0 linear RGB.

- **Diffuse Roughness** - This property is based on the Oren-Nayar model of diffusing reflection off rough surfaces. If used, it will give the surface a more clay-like and darker surface such as sandstone, concrete and clay.

**Translucency**

- **Translucency Weight** - Translucency Weight allows a highly diffusive transmission of light into the surface. This is good for things like skin, wax and paper.

  Any setting other than 0.0 allows light to pass through, or be transmitted into the surface. This is normally set at about .5, but can range from .1 to .9.

- **Base Color Effect** - Setting the Translucency Weight to anything other than 0 opens the Base Color Effect options.
  - **Scatter Only** - Diffuse is layered over Transmission and absorbs the remainder of any unused reflectance value.
  - **Scatter & Transmit** - This works like Scatter Only, except with reflection, and based according to the Base Color's RGB; however, the remainder is sent to the Transmission layer instead of absorbed.

- **Translucency Color** - This setting is used for tinting the color of the transmission. It can be mapped to mask out veins, hair, and so forth.

  This property only shows when **Translucency Weight** is active.

- **SSS Reflectance Tint** - The color in this property is multiplied by the base color and can be used to correct for SSS color. For example, if the base skin map shows too much red after setting up SSS, use this tint to remove color from the red channel and correct the skin tone.

  A value of 0.54 in the red channel and 1.0 in the blue and green channels is a good starting point for Caucasian skin. As the skin tone darkens, the red channel number will raise (to remove less red). For pale skin, use a lower the number in the red channel as to not pull too much red from the skin tone.

  This property only shows when **Base Color Effect > Scatter & Transmit** is selected.

**Glossy**

**Reflection**

- **Glossy Layered Weight** - This controls the glossy properties for the base layer of the shader. The setting can range anywhere from 0.0 to 1.0, but unless it is for legacy conversion, it usually left alone. When converting legacy materials, specular maps are inserted here.
**Shared Glossy Inputs** - This property opens more inputs to glossy effects. In order for this to have an effect, *Backscattering* or Refraction Weight must be *On* (have a value other than 0).
- **On** - Universal
- **Off** - Opens up more values when Backscattering or Refraction Weight are in use.

**Glossy Color** - The property sets the color of the glossy highlight of the base layer. Glossy color is not generally changed in most situations, and the color should generally be left at white for more realistic effects. An exception to this rule would be when tinting Thin Walled glass, though this is better done using Shared Glossy Inputs and Refraction Weight.

**Glossy Color Effect** - The property has two options that work the same as the *Base Color Effect* options, but with Glossy over Diffuse.
- **Scatter Only** - See *Scatter Only*
- **Scatter & Transmit** - See *Scatter & Transmit*

**Glossy Reflectivity** - The default setting is 0.50 and should generally be left here in most cases. This property roughly correlates to IOR and the settings of that property. The value is roughly the same as the IOR setting of 1.5, which is a good plastic base.

This property only exists in the **PBR Metallicity/Roughness** and **Weighted** modes of the shader.

**Glossy Specular** - This sets the specular amount for the glossy and ranges in value from 0.0 to 0.08 for dielectrics and .56 to 1.0 for metals.

This property shows in the **PBR Specular/Glossiness** mode of the shader.

**Glossiness** - This property is the inverse of Glossy Roughness. In this case, the higher the number the more sharp the highlight becomes.

This property shows in the **PBR Specular/Glossiness** mode of the shader.

**Glossy Roughness** - The property controls the roughness of the surface. The higher the value, the less shine the surface will have. It can also be mapped with an image map to drive its strength.

This setting is essentially one of the only glossy channels that matters when using Metallicity. When set to any value other than 0, this opens up two more properties - Glossy Anisotropy and Glossy Anisotropy Rotations.

This property exists in the **PBR Metallicity/Roughness** and **Weighted** modes of the shader.

**Glossy Anisotropy** - This setting controls glossy's bi-directional scattering distribution functions (BSDF) reflection and transmission on a rough surface such as brushed or sanded metal. This is a ranged value from 0.0 to 1.0. The higher value spreads or stretches the anisotropic effect further across the object's surface. The lower the value, the more condensed the anisotropic effect becomes.

In the PBR Metallicity/Roughness mode, this requires some roughness value, and is only available if the Glossy Roughness has a value of more than 0. In PBR Specular/Glossiness and Weighted modes, the Glossiness value must be less than 1.0 to open this setting.
Backscattering

- **Backscattering Weight** - This is generally used to create a sheen on certain surfaces such as silk or velvet. It is a ranged value between 0.0 to 1.0.

  Setting backscattering to any value more than 0 opens up **Backscattering Roughness**.

- **Backscattering Roughness** - This property controls the amount of backscattering sheen on the surface. Higher numbers will give more sheen to the surface.

  Setting Backscattering Roughness to anything more than 0 opens up **Backscattering Anisotropy**.

  This property only exists in the **PBR Metallicity/Roughness** and **Weighted** modes of the shader.

- **Backscattering Glossiness** - This property sets the sharpness of the backscattering highlight. Higher numbers will give a sharper highlight on the surface.

  Setting Backscattering Glossiness to anything less than 1 opens up **Backscattering Anisotropy**.

  This property shows in the **PBR Specular/Glossiness** mode of the shader.

- **Backscattering Anisotropy** - See **Glossy Anisotropy**.

- **Backscattering Color** - This sets the color tint of the Backscattering effect and usually used in conjunction with **Top Coat**.

  The setting is only available if **Shared Glossy Inputs** is set to **Off**.

Refraction

- **Refraction Index** - This is used anytime the intention is to send light into the surface instead of having it all reflect back. There are several Index of Refraction (IOR) tables online that give the refraction values for different surfaces ranging from air to liquids and to gemstones. This setting can affect either or both Refraction and Transmission.

  The property is also affected by the **Thin Walled** On/Off setting. (bubble vs marble for example.)

- **Refraction Weight** - This sets the amount of weight this property gets. The value ranges between 0.0 to 1.0.

  In PBR modes, refraction wins over other settings, but in Weighted mode it is mixed with diffuse since it is part of the glossy settings.

  Setting this to more than 0 will open the Abbe setting.

- **Refraction Color** - This color is generally used for tinting thin walled glass.

  Setting this property to a value more than 0 will make the **Abbe** setting available. If Abbe is on, Refraction Roughness values are ignored.

- **Refraction Roughness** - Setting this one on a surface causes it to look more and more cloudy as less light passes through the roughened surface. The value ranges from 0.0 to 1.0.
This is only available if Shared Glossy Input is Off.

- **Refraction Glossiness** - This property controls the glossy effect of the refraction. This is similar to comparing clear glass to a frosted glass.

  Setting Refraction Glossiness to anything less than 1 opens up Glossy Anisotropy Rotations.

  This property shows in the PBR Specular/Glossiness mode of the shader.

- **Abbe** - Abbe is a constant chromatic dispersion. Lower numbers (but greater than 0) give more dispersion on the surface, and the higher the value, the less dispersion. This works on surfaces with volume, not on Thin Walled surfaces.

### Anisotropy

- **Glossy Anisotropy Rotations** - This controls the rotation of the anisotropic effects. Its values range from 0.0 to 1.0 with the value of 1.0 equating a full rotation of 360°

### Thin Film

- **Base Thin Film** - Thin Film is included for each of the three layers that make up the surface. Its thickness is measured in nanometers, so is very thin. The value is usually in the 3-digit range. The effects of the Thin Film are controlled by its thickness and its IOR settings. The IOR setting for Thin Film controls the color, but this is also based on the thickness of the film.

- **Base Thin Film IOR** - See Refraction Index.

### Bump

- **Base Bump** - The Base bump is set using a typical bump map. It works the same way as bump in 3Delight, but is dependent on the image map as there is no min/max value. When converting materials from 3Delight to Iray, the bump will need a higher value in Iray than the original material used. For this reason, the value slider has a range of 0 to 50.

  The bump is fairly sensitive to both the pixel density of the mesh and the resolution of the image map. A typical example is the Genesis 2 Figure. The face is more dense than the head in number of pixels. If the head and face are set to the same bump strength, the figure will have seam lines where these two maps meet.

- **Normal Map** - Uses a typical normal map common to all 3D applications. There is a slider to adjust the normal map's strength.

### Metallic Flakes

### Flakes

- **Metallic Flakes Weight** - This adds a metallic flakes layer to the surface, which is considered the second layer of the shader. The setting affects both metallic and dielectric surfaces.
When the value is set to more than 0, it opens the other properties for setting up metallic flakes.

- **Metallic Flakes Color** - This sets the base color of the flakes.

- **Metallic Flakes Color Effect** - Offers the choice between Scatter Only and Scatter & Transmit. This works between the Flake and Base layers.
  - Scatter Only - This works the same as Scatter Only, but affects the Metallic Flakes layer of the shader.
  - Scatter & Transmit - This works the same as Scatter & Transmit, but affects the Metallic Flakes layer of the shader.

- **Metallic Flakes Roughness** - This property works the same as Glossy Roughness, but affects the Metallic Flakes layer of the shader.

  This property only exists in the PBR Metallicity/Roughness and Weighted modes of the shader.

- **Metallic Flakes Glossiness** - This property works the same as Glossiness, but affects the Metallic Flakes layer of the shader.

  This property shows in the PBR Specular/Glossiness mode of the shader.

- **Metallic Flakes Size** - This sets the size of the flakes, from a small speck to large prominent flakes.

- **Metallic Flakes Strength** - This sets how strong the flake effect is, or how much they show up.

- **Metallic Flakes Density** - This sets how dense the number of flakes are on the surface. Higher numbers will equal closer placed and more flakes, while lower numbers mean the flakes will be fewer and more dispersed.

**Thin Film**

- **Metallic Flakes Thin Film** - This works the same as Base Thin Film, but affects the Metallic Flakes layer of the shader.

- **Metallic Flakes Thin Film IOR** - This works the same as Refraction Index, but affects the Metallic Flakes layer of the shader.

**Top Coat**

**General**

- **Top Coat Weight** - When this property is set to more than 0, it adds the top most layer to the shader. Use examples would car paint or varnish. Its value can be range from 0.0 to 1.0.

  When set to more than 0, it opens several other properties.

- **Top Coat Color** - This color is the tint of the Top Coat layer. The color should almost always be set to white.
• **Top Coat Color Effect** - Use is only necessary if the top coat is any color other than *white*. This works between the Top Coat and the layers below it.
  - **Scatter Only** - See Scatter Only
  - **Scatter & Transmit** - See Scatter & Transmit

• **Top Coat Roughness** - This property works the same as **Glossy Roughness**, but affects the Top Coat layer of the shader.

  This property shows in the **PBR Metallicity/Roughness** and **Weighted** of the shader.

• **Top Coat Glossiness** - This property works the same as **Glossiness**, but affects the Top Coat layer of the shader.

  This property shows in the **PBR Specular/Glossiness** mode of the shader.

• **Top Coat Layering Mode** - Top Coat offers four modes.
  - **Reflectivity** - Enables the Top Coat to work as a reflective surface.
  - **Weighted** - Top Coat Weight is used to compute what light is reflected back from the surface and how much passes through to the next layer.
  - **Fresnel** - Uses IOR to control the reflection and transmission of this layer. One example would be to the value to 1.3 to get a thin water layer over the top of the surface. Depending on the other settings this could look like an oil slick on water.
  - **Custom Curve** - This is based off of **Schlick's** approximation formula. There are several documents online which explain the formula and the settings.

• **Top Coat IOR** - This works the same as **Refraction Index**, but affects the Top Coat layer of the shader.

  This only shows if **Fresnel** is selected.

• **Reflectivity** - Sets the amount of lights reflectivity on the Top Coat. The value ranges from 0.0 to 1.0.

• **Top Coat Curve 0** - This property uses settings similar to **glossy Specular** For settings see **Glossy Reflectivity**.

• **Top Coat Curve 90** - This is generally set to 1.

• **Top Coat Curve Exponent** - This is generally set to 5.

**Anisotropy**

• **Top Coat Anisotropy** - This works the same as **Glossy Anisotropy**, but affects the Top Coat layer of the shader.

• **Top Coat Rotations** - This works the same as **Glossy Anisotropy Rotations**, but affects the Top Coat layer of the shader.

**Thin Film**

• **Top Coat Thin Film** - This works the same as **Base Thin Film**, but affects the Top Coat layer of the shader.
• **Top Coat Thin Film IOR** - This works the same as **Base Thin Film IOR**, but affects the Top Coat layer of the shader.

**Bump**

• **Top Coat Bump Mode** - The Top Coat has its own Bump channel, independent of the **Base Bump** map. It has two options for the bump image.
  - **Height Map** - Uses a height map for its bump calculations.
  - **Normal Map** - Uses a normal map for its bump calculations.

• **Top Coat Bump** - This setting holds any image map used for the bump strength of the Top Coat.

**Volume**

**General**

• **Thin Walled** - This property sets the volumetric effects of the surface. Compare a bubble (**on**) to a marble (**off**) for example.
  - **On** - When the property is on, the surface takes on the characteristics of a thin walled surface.
  - **Off** - When this property is off, the surface takes on the characteristics of a thicker or solid surface item. Thin Walled must be off to get volumetric effects such as Sub Surface Scattering.

**Transmission**

• **Transmitted Measurement Distance** - This is the distance light must pass through an object before getting the transmitted color.

• **Transmitted Color** - This property sets the color of the transmission.

**Scattering**

• **Scattering Measurement Distance** - This is the distance light must pass through an object before getting the SSS Amount.

• **SSS Amount** - This property sets how much scattering is occurring.

• **SSS Direction** - This property is used to determine whether the surface scatters toward or backwards from the light. 0 is Isometric, or almost no scattering - like water. Negative numbers (-) backscatter to the direction of the light source. Positive numbers (+) forward scatter away from the direction of the light.
Emission

- **Emission Color** - This property allows the surface to emit light. When this is active, the surface will act like a light and illuminate what is around it in the scene. Turn it on by setting the color to any other color except pure black (0,0,0).

For emission only, everything else must be turned off. In the PBR Modes turn off: *Metallic*, *Diffuse (0,0,0)*, *Glossy Layered Weight (0)*, and *Reflection (0)*. In Weighted Mode turn off: *Glossy (0)*, *Diffuse (0,0,0)*, and *Reflection (0)*.

Once Emission is active, several other properties will become available.

- **Emission Temperature (K)** - This is the temperature of the emitted light. It uses Kelvin temperature, which ranges from warm to cool and simulates different lighting conditions such as sunny, cloudy, indoor, etc... There are several tables online that list light temperatures.

- **Two Sided**
  - On - Emits from both sides, if *Thin Walled* is on.
  - Off - Emits from the front side only.

- **Emission Profile** - There are sources online for emission profiles which can be used to simulate exact lighting conditions.

- **Luminance** - This is the intensity of the light as specified by the Luminance Units.

- **Luminance Units** - This is a list of units of measurement for the emission illumination. Several choices are available. Use whichever you are most comfortable with.
  - cd/m^2 - candela per square meter
  - kcd/m^2 - kilocandela per square meter
  - cd/ft^2 - candela per square foot
  - cd/cm^2 - candela per square centimeter
  - lm - lumen, measures the total amount of light emitted over the whole surface.
  - W - watts, measures the total amount of light emitted over the whole surface
  - **Lumen Efficiency** - How many Lumens/watt. Fifteen (15) is a good setting for average tungsten.

Geometry

Cutout

- **Cutout Opacity** - This property uses a mainly black and white image map to cut or hide polys of the surface. This is not to be confused with the legacy habit of using an opacity map to make something translucent. To do that, please see the sections on: *Translucency Weight* and *Refraction Weight*.

Displacement

- **Displacement Strength** - Uses a displacement image map to set the strength of the displacement.
Tiling

- **Horizontal Tiles** - Multiplies the value set, times the UV, to show the image multiple times horizontally across the surface.

- **Horizontal Offset** - The value that the image is offset or staggered horizontally from those it is next to.

- **Vertical Tiles** - Multiplies the value set, times the UV, to show the image multiple times vertically across the surface.

- **Vertical Offset** - The value that the image is offset or staggered vertically from those it is next to.

UV Maps

- **UV Set** - This property allows the user to choose the appropriate UV set for the object when UV swapping is in use.

Smoothing

- **Smooth** - This property determines whether or not normals are smoothed across polys. This does not have an effect on SubD meshes.
  - **On** - Normals are smoothed resulting in a less faceted look.
  - **Off** - Normals are not smoothed, resulting in a more faceted mesh.

- **Angle** - This is the cutoff value for when two polygons are split.

- **Round Corner Radius** - This is a shading setting that alters the normals near an edge to give sharp edges a more rounded corner. It does not move the actual mesh.

- **Round Corners Across Materials** - The On/Off properties are dependent on Round Corner Radius being set, otherwise they have no affect.
  - **On** - When this is on, the property settings for Rounded Corner Radius will cross over material boundaries.
  - **Off** - When this is off, the property settings for Rounded Corner Radius will not cross material boundaries.