Passes

Reference

Panel:
Properties ▸ View Layer ▸ Passes

A *Pass* is a type of intermediate rendering information that's extracted as a separate image. Examples include the diffuse colors of the objects in the scen the light distribution, the depth map, and the normal map.

These images can be accessed using the Render Layers Node in the Compositor and combined in a custom way that replaces the standard one.

Data

Cycles

Include

Combined
The render output before any compositing is applied.

Z
Distance to the nearest visible surface. Can be used with the Defocus Node for a fake Depth of Field effect.

> Note
>
> This pass produces noisy results if the render itself uses Depth of Field or motion blur. Use the Mist pass for a cleaner image.

Mist
Distance to the nearest visible surface, mapped to the 0.0 - 1.0 range. When enabled, settings become available in the World tab.

This pass can be used to fade out objects that are farther away. An alternative is using the *Volume* slot of the World Output shading node.

Position
Positions in world space.

Normal
Surface normals in world space.

Vector
Motion vectors for the Vector Blur Node. The four components consist of 2D vectors giving the screen-space motion based on the next ar previous frames.

This pass is disabled when Motion Blur is enabled in the render settings.

UV
The UV coordinates within each object's active UV map, represented through the red and green channels of the image. (The blue channel stores a constant value of 1 and does not hold any information.) Can be used with the Map UV Node.

Denoising Data
Includes *Denoising Albedo*, *Denoising Normal*, and the combined image before denoising. Can be used with the Denoise Node as a replacement for automatic denoising.

Indexes

Object Index
A map where each pixel stores the user-defined ID of the object at that pixel. This map can be converted into a mask for a particular objec using the ID Mask Node.

Material Index

Material Index

A map where each pixel stores the user-defined ID of the material at that pixel. This map can be converted into a mask for a particular material using the ID Mask Node.

Note

The Z, Position, Object Index, and Material Index passes are not anti-aliased.

Debug

Sample Count

Number of samples calculated for each pixel, divided by the maximum number of samples. Used to analyze adaptive sampling.

Alpha Threshold

The Z, Position, Normal, Vector, UV, and Index passes are only affected by surfaces with an opacity equal to or higher than this threshold. With value 0.0, the first surface hit will always write to these passes regardless of opacity. With higher values, surfaces that are mostly transparent will b skipped until an opaque surface is encountered.

EEVEE

Include

Combined

The render output before any compositing is applied.

Z

Distance to the nearest visible surface. Can be used with the Defocus Node for a fake Depth of Field effect.

Mist

Distance to the nearest visible surface, mapped to the 0.0 - 1.0 range. When enabled, settings are in the World tab.

This pass can be used to fade out objects that are farther away. An alternative is using the *Volume* slot of the World Output shading node.

Normal

Surface normal in world space.

Position

Position in world space.

Vector

Motion vectors for the Vector Blur Node. The four components consist of 2D vectors giving the screen-space motion based on the next ar previous frames.

This pass is disabled when Motion Blur is enabled in the render settings.

Light

Cycles

Diffuse

Direct

The intensity and color of light that hit a surface with a Diffuse or Subsurface Scattering BSDF and did not yet bounce off/pass through any other surface (ignoring Transparent ones). The color of the surface itself is not included.

Indirect

The intensity and color of light that hit a surface with a Diffuse or Subsurface Scattering BSDF and already bounced off/passed through another surface before (ignoring Transparent ones). The color of the surface itself is not included.

Color

The colors of Diffuse and Subsurface Scattering BSDFs, modified by any Mix and Add Shader nodes. The intensity and color of light are r included.

Glossy

Direct, Indirect, Color

Same as above, but for glossy BSDFs.

Transmission

Direct, Indirect, Color

Same as above, but for transmissive BSDFs.

The *Transparent* BSDF is not included; see Light Paths for details. To create a transparent surface that does get included in this pass, use Glass BSDF with the IOR set to 1.

Volume

Direct, Indirect

Same as above, but for volumetric BSDFs.

Other

Emission

Emission from directly visible surfaces.

Environment

Emission from the directly visible World Environment. When the Film is set to Transparent (meaning the world is excluded from the final render), this pass can be used to get the environment color and composite it back in.

Ambient Occlusion

Ambient occlusion from directly visible surfaces. This is a grayscale pass with values that go from 0 (fully occluded) to 1 (fully exposed), making it suitable for multiplying with a color image in the Compositor (see Mix Node).

As an alternative to this pass, it's also possible to use the Ambient Occlusion Node in materials.

Shadow Catcher

Shadows collected by objects with the Shadow Catcher option enabled. Can be multiplied with existing footage to (for example) have a rendered object cast a shadow on recorded ground.

EEVEE

Diffuse

Light

The intensity and color of light that hit a surface with a Diffuse or Subsurface Scattering BSDF. The color of the surface itself is not includec

Color

The colors of Diffuse and Subsurface Scattering BSDFs, modified by any Mix and Add Shader nodes. The intensity and color of light are r included.

Specular

Light, Color

Same as above, but for specular BSDFs.

Volume

Light

Contains Volume objects, as well as any volumes generated by the volume shader nodes (Principled Volume, Volume Absorption, and Volume Scatter), whether they're used in a material or in the World background.

Other

Emission

Emission from directly visible surfaces.

Environment

Emission from the directly visible World Environment. When the Film is set to Transparent (meaning the world is excluded from the final render), this pass can be used to get the environment color and composite it back in.

Shadow

A pass that's black for areas that don't receive direct light and white for ones that do. Mostly useful for compositing objects with shadow i existing footage.

Ambient Occlusion

Ambient occlusion from directly visible surfaces. This is a grayscale pass with values that go from 0 (fully occluded) to 1 (fully exposed), making it suitable for multiplying with a color image in the Compositor (see Mix Node).

As an alternative to this pass, it's also possible to use the Ambient Occlusion Node in materials.

Transparent

Contains Blended surfaces, so they can be adjusted in the Compositor and later mixed with opaque passes.

This pass only supports grayscale opacity. Colored opacity will show differently than in the Combined pass.

Occlusions Distance

Maximum distance for objects to contribute to the Ambient Occlusion pass.

Cryptomatte

Cryptomatte is an image standard to efficiently create masks for specific objects or materials. Its purpose is the same as the *Object Index* and *Material Index* passes, but it has several advantages: it's easier to set up, can be used with other compositing software than Blender, and supports multiple object per pixel. Specifically, it works with transparency, as well as motion blur and depth of field when using Cycles.

Object

Render cryptomatte passes for isolating objects.

Material

Render cryptomatte passes for isolating materials.

Asset

Render cryptomatte passes for isolating groups of objects with the same parent. This option is not related to Blender's asset feature.

Levels

The maximum number of objects to be distinguished per pixel. The Render Layers node will output half this many Cryptomatte images, named (fo example) *CryptoObject00*, *CryptoObject01* and so on – the reason being that one Cryptomatte image can reference two objects per pixel.

The first image references, for each pixel, the two objects that contribute the most to that pixel's color. The next image references the next two objects, and so on.

See also

Cryptomatte Node

Shader AOV

Shader AOVs (Arbitrary Output Variables) are custom render passes that can hold additional information for use in compositing. Create a pass in the *Shader AOV* panel, write to it from a material using the AOV Output Node, and finally read from it in the Compositor using the socket on the Render Layers node.

Name

The name of the render pass. Used in both the AOV Output node and the Render Layers node. The name can be anything as long as it doesn't conflict with other (enabled) passes.

Data Type

The type of data that the render pass stores per pixel. Use *Color* to store a color, normal, or other type of vector. Use *Value* to store a single number.

Light Groups

Cycles only

A Light Group provides a limited *Combined* render pass where the scene is only illuminated by certain lights. Multiple such passes can then be combined in compositing to construct a full render with all the lights. The most straightforward way is to simply *Add* them together using the Mix Node, but by making more complex combinations, it's possible to change the color and intensity of individual lights without having to re-render.

To assign a Light object to a new or existing Light Group, use the panel Object ‣ Shading ‣ Light Group (details).

To assign the World background to a Light Group, use the panel World ‣ Settings ‣ Light Group (details).

Name

The name of the light group.

Light Group Sync

These operators are available from the  button to the right of the Light Group list.

Add Used Lightgroups

Create Light Groups for any lights that reference a non-existing one.

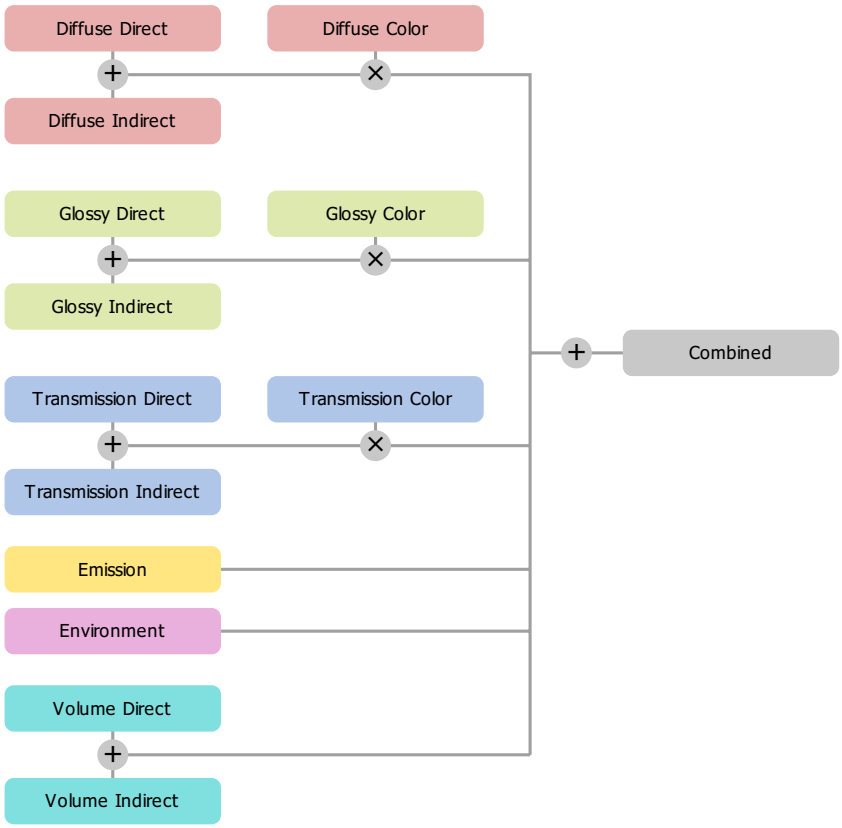
Remove Unused Lightgroups

Delete any Light Groups that are not referenced by any lights.

Combining

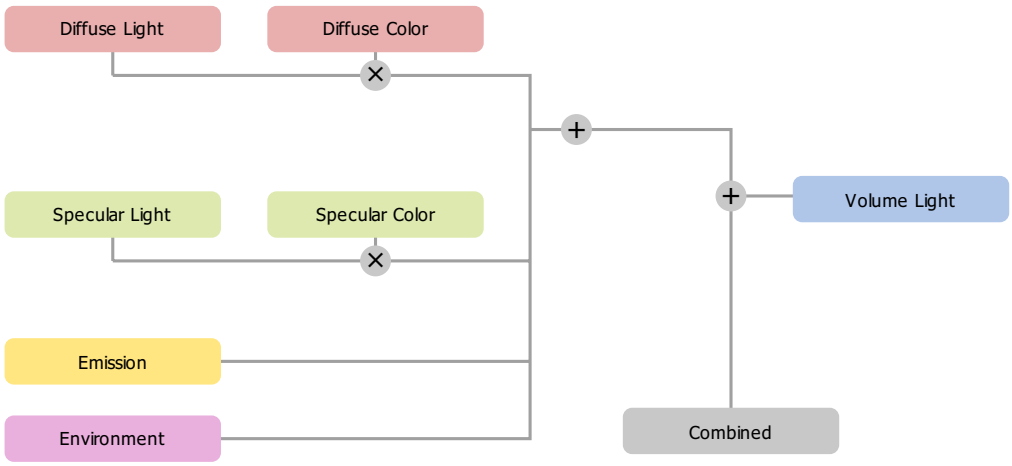
Cycles

The different render passes can be combined to produce the final image as follows:



EEVEE

The passes can be combined to produce the final image as follows:



EEVEE Limitations

- Depth of Field and Motion Blur are not rendered in passes other than *Combined*. They can be emulated in the Compositor using the Defocus Node and the Vector Blur Node.
- Transparent materials that have their Render Method set to *Blended* are not rendered in passes other than *Combined* and *Transparent*. Use the *Dithered* method instead.
- The Shader To RGB Node only works correctly in the *Combined* pass as EEVEE excludes parts of the BSDF equation.
- There is a maximum of 16 *Color* and 16 *Value* AOVs (custom render passes).

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