



## WHAT IS "RETRO SHADERS PRO FOR URP"?

*Retro Shaders Pro for URP* is a collection of shader effects which emulate the look and feel of retro games. This style is commonly referred to as the "PSX style" due to its similarity to the look and feel of the PS1. As of version 1.2, this pack also includes N64-style shaders.

## SUPPORT

Sometimes things break! If you've encountered an error and this README doesn't have the answers (or if you have feature requests), then pop me an email at [danielilett+retroshaders@gmail.com](mailto:danielilett+retroshaders@gmail.com) and I'll try to sort you out. Please:

- **Clearly** describe the problem you are having and what steps I can take to reproduce the error.
- Include the **Unity version you are using**.
- Also include the **package version** you are using (you can find this in the Package Manager).
- Include the **render path** (i.e. Forward, Forward+, Deferred) – this option is on your URP settings asset.
- **Attach images or short videos** where necessary to describe your problem.

Following these steps will help me fix your issue as quickly as possible!

## SETUP

**Folder Structure:** Upon installing the pack, all the assets will be contained in the “Retro Shaders Pro” folder. All demo scenes are included under “Retro Shaders Pro/Demo”, containing examples of meshes and textures configured to work with the Retro shaders.

Most of the shaders are included inside “Retro Shaders Pro/Shaders”, including the terrain, decals, and skybox shaders. The post processing assets are included in the “Retro Shaders Pro/Scripts” and “Retro Shaders Pro/Resources” folders.

**Auto-Installer:** An auto-installer tool is included with this pack which will help you install extra Shader Graph versions of some shaders for you to modify. The window should open upon installing the pack, but you can open this installer at any time via *Tools -> Retro Shaders Pro -> Open Installer Window*.

**Warning:** When the “Retro Base Lit” graph is imported into your project, you may see compiler errors related to being unable to import the graph. Please go into *Preferences -> Shader Graph* (before Unity 6) or *Project Settings -> Shader Graph* (Unity 6 and after) to increase the shader variant limit – this might need to be at least 512. This is due to the usage of shader keywords for the graph’s lighting capabilities.

## MESHES

The Retro Lit, Retro Unlit, and Retro Vertex Lit shaders, as well as the Bilinear3 versions of those shaders, are intended to be used with regular meshes in your scene. To use these shaders, create a regular Material and select one of these Retro shaders from the drop-down menu, then attach the material to your object.

This pack also features the Retro Base Lit and Retro Base Unlit shaders, which are built in Shader Graph and are intended to provide a more approachable basis for you to create your own effects which use similar functionality as the Retro Lit and Retro Unlit shaders.

You may also use the CRT (Mesh) shader to apply the CRT-style effect to any regular mesh in your scene.

## TERRAIN

The Retro Terrain Lit shader may be used for your Unity terrains. To use this shader, create a Material and select the “Retro Shaders Pro/Terrain/Lit” shader from the menu. Then, select your terrain and assign this material in the Terrain Settings tab on the Terrain component (the option is inside the Basic Terrain foldout). Then, you can paint textures onto your terrain as usual.

## SKYBOX

*Retro Shaders Pro* contains two Skybox shaders.

The *Cubemap* version is similar to the Retro Unlit shader, except it takes a Base Cubemap as input. This type of skybox can be attached to a scene via the Lighting tab -> Environment tab -> Skybox Material slot.

The *Procedural* version generates a sky gradient and a cloud pattern which can be dynamically adjusted. This type of skybox does not function correctly with the Skybox Material slot, so it should be attached to a large sphere mesh in your scene. An example of this setup is included in the demo scene.

## DECALS

The Retro Decals shader can be used in conjunction with the URP Decal Projector. This shader supports some of the features of the Retro Lit shader (namely, resolution and color depth limiting), but sadly, it doesn't seem possible to support affine texture mapping or vertex snapping currently.

## POST PROCESSING

This shader pack uses **Universal Render Pipeline's ScriptableRenderFeature** functionality for the custom CRT post processing effect. The [Unity documentation](#) will outline the basics of URP if you're not familiar with how to create custom renderers.

Please follow these steps to enable an effect in your scene:

- Find your **URP Renderer Asset** and add the effect(s) you wish to use in the **Renderer Features** section at the bottom.
  - This is most commonly found in the Assets/Settings folder if you created a new project using the URP template from the Unity Hub.
  - This asset will be named something like "UniversalRP-HighQuality" (Unity versions 2022.3 and prior) or "PC\_RPAsset" (Unity 6) by default.
  - *Retro Shaders Pro* also includes a ready-made asset named "Retro\_Renderer" in its root folder, which has the CRT effect pre-added.
- Create a volume profile asset via **Create -> Volume Profile** and add the CRT effect (and any other effects you want to use) to the profile.
- Add a volume to your scene via *GameObject -> Volume* and attach the volume profile.
- Tweak the settings on your volume profile as desired. The CRT effect may require textures to achieve the visuals you desire.

The latest version of this asset was created using Unity 2022.3.0f1 and URP 14.0.7.

## USING UNITY 6 [IMPORTANT]

Post processing effects in Unity 6 will eventually require support for **Render Graph**. Non-RG workflows will be deprecated in the future. *Retro Shaders Pro* supports both workflows, which have been tested in Unity 6.0.0.

You can disable Render Graph via *Project Settings -> Graphics -> Pipeline Specific Settings -> URP*. You will find a checkbox to disable Render Graph near the bottom of the window. However, this shouldn't be necessary unless your project uses external effects which rely on the non-Render Graph workflow.

## ADDITIONAL WARNINGS

These shaders are designed for **linear color space**, so you may encounter issues in gamma space. To swap between color spaces, go to *Project Settings->Player->Other Settings* and find the **Color Space** dropdown option.

The shaders in *Retro Shaders Pro* support the Forward, Forward+, and Deferred rendering paths.

## ASSETS INCLUDED

The following assets are included in the asset pack:

### RETRO LIT

A PSX-style shader that can be attached to any mesh to instantly give it a classic PS1 aesthetic. The Lit variant applies diffuse lighting from a single directional light source.

This shader uses affine texture mapping for sampling textures (as this was a limitation of the original PS1 hardware), so objects may appear warped when viewing them at extreme angles, or when viewing large triangles.

#### Surface Options

- **Surface Type** – Toggle between *Opaque* and *Transparent* rendering.
- **Render Face** – Choose whether to render *Front*, *Back*, or *Both* faces.
- **Alpha Clip** – Toggle whether the shader should apply the *Alpha Clip Threshold*.
- **Alpha Clip Threshold** – Pixels with final alpha values below this threshold will be culled (if *Alpha Clip* is enabled).

#### Retro Properties

- **Base Color** – The albedo color of the object.
- **Base Texture** – An albedo texture to apply more color detail than *Base Color* alone.
- **Resolution Limit** – Sets an upper bound on the resolution of *Base Texture* (will be rounded down to the next power of two)
- **Snaps Per Meter** – The vertices of the mesh will snap to this number of snap points per meter along each axis (in view space, i.e., relative to the camera).
- **Color Depth** – Each color channel is constrained to this many possible values. Low values may darken your image because a floor function is applied.
- **Color Depth Offset** – Applies a slight offset to the colors to avoid the darkening issue.
- **Ambient Light Override** – Toggle to choose Unity ambient light or the Strength property:
- **Ambient Light Strength** – Sets a lower bound for how dark the shadowed areas of a mesh may appear.
- **Affine Texture Mapping** – Toggle between affine and perspective-correct mapping.
- **Point Filtering** – Toggle between pixelated point filtering and linear filtering.
- **Enable Dithering** – Toggle the dithering effect, which ‘blends’ between color values according to a Bayer matrix pattern when the Color Depth is reduced.

## RETRO VERTEX LIT

A PSX-style shader like the Retro Lit shader, except lighting is applied in the vertex stage rather than the fragment stage. This is faster but results in lower graphical fidelity on low-poly objects. This kind of lighting was popular in PS1 games!

## RETRO UNLIT

A PSX-style shader which has all the features of the Retro Lit shader, except the ability to receive lighting and shadows. All Retro Unlit objects have 100% white ambient lighting applied at all times.

## RETRO BILINEAR3 LIT

A lit N64-style shader which uses the limited 3-textel bilinear filter present in the N64 hardware (rather than the standard 4-textel filter used in modern hardware).

This shader has all the same options as Retro Lit, except the **Point Filtering** option.

## RETRO BILINEAR3 UNLIT

An unlit N64-style shader which uses the limited 3-textel bilinear filter present in the N64 hardware (rather than the standard 4-textel filter used in modern hardware).

This shader has all the same options as Retro Unlit, except the **Point Filtering** option.

## RETRO BILINEAR3 VERTEX LIT

A vertex-lit N64-style shader which uses the limited 3-textel bilinear filter present in the N64 hardware (rather than the standard 4-textel filter used in modern hardware).

This shader has all the same options as Retro Vertex Lit, except the **Point Filtering** option.

## RETRO TERRAIN LIT

This shader applies the PSX-style effect to Unity's built-in terrains. See above for full property descriptions.

- **Resolution Limit**
- **Snap Per Unit**
- **Color Depth**
- **Color Depth Offset**
- **Enable Dithering**

## RETRO SKYBOX [CUBEMAP]

This skybox shader reads from a cubemap texture and applies it to the scene.

- **Base Color**
- **Base Cubemap** – Instead of a regular texture, the skybox samples a cubemap texture for its albedo.
- **Rotation** – Adjust the orientation of the skybox around the y-axis.
- **Resolution Limit**

- **Color Depth**
- **Color Depth Offset**
- **Point Filtering**

## RETRO SKYBOX [PROCEDURAL]

This skybox shader generates noise clouds which scroll above the scene, alongside a color gradient.

- **Ground Color** – Skybox color close to the horizon.
- **Sky Color** – Skybox color at the very top of the sky.
- **Color Mix Power** – Lets you configure which of **Ground Color** or **Sky Color** are more strongly mixed in the sky gradient.
- **Cloud Height Threshold** – Controls how far the clouds extend. The first value determines a cutoff point for 0% opacity, and the second value determines at what point the clouds use 100% opacity.
- **Cloud Sizes** – Values used for the noise generator while creating the cloud shapes.
- **Cloud Visibility Threshold** – Controls the amount of cloud that appears. The first value thresholds the generated noise values. The second value controls where the clouds reach 100% opacity.
- **Cloud Color** – Tint applied to the clouds.
- **Cloud Velocity** – How fast the clouds scroll across the sky.
- **Resolution Limit** – Pixelates the noise texture.

## RETRO DECALS

This decal shader should be attached to the URP Decal Projector to seamlessly project textures onto other objects in the scene. The other shaders in this pack support decal rendering. See above for full property descriptions.

- **Base Color**
- **Base Texture**
- **Normal Map** – An additional texture which can be used to modify the lighting applied to this decal.
- **Normal Blend** – Controls how strongly the decal normals are blended with the existing object normals.
- **Resolution Limit**
- **Color Depth**
- **Color Depth Offset**
- **Enable Dithering**

## CRT

The CRT post processing effect covers the entire screen to make it appear like an old-school CRT TV, complete with distortion effects and RGB subpixels.

### BASIC SETTINGS

- **Show In Scene View** – Tick to apply the CRT effect while in Scene View.

- **Enabled** – Tick to apply the CRT effect.
- **Render Pass Event** – Choose whether to run the CRT effect before or after URP's internal post processing loop (which includes effects like Bloom).

## RESOLUTION & FIDELITY

- **Pixel Size** – An integer value representing how pixelated the image becomes.
- **Scale in Screen Space** – Choose whether to scale the size of other parameters relative to a reference resolution. Enable this when you want pixelation/RGB properties to appear the “same size” on different resolution screens.
- **Reference Resolution (Vertical)** – Set this to the vertical screen resolution you are designing the game around. When Scale Parameters is enabled, each parameter remains unchanged when the screen is at this resolution.
- **Force Point Filtering** – Use nearest-neighbor filtering when upscaling the pixelated image back to full screen size. Disable to use bilinear filtering instead.
- **True Interlacing** – If enabled, the effect will only render every other row of pixels this frame, and then it will render the remaining half of the rows the next frame, and so on.

## BARREL DISTORTION

- **Distortion Strength** – Controls how strongly the edges of the screen warp inwards to form the shape of a CRT glass screen.
- **Background Color** – Color of the areas outside the distorted CRT screen shape.

## RGB SUBPIXELS & SCANLINES

- **RGB Subpixel Texture** – Texture to use for the RGB subpixel effect. All pixels on the screen are multiplied by this texture such that the red, green, and blue screen colors appear separate to each other.
  - An example of a texture to use for this is contained in “Retro Shaders Pro/Resources/Textures/RGBTexture.png”.
- **RGB Subpixel Strength** – How strongly the RGB subpixel effect is applied.
- **Scanline Texture** – Texture to use for the scanline effect. All pixels on the screen are multiplied by this texture such that scanlines appear scrolling over the image.
  - An example of a texture to use for this is contained in “Retro Shaders Pro/Resources/Textures/ScanlineTexture.png”.
- **Scanline Strength** – How strongly the scanline effect is applied.
- **Scanline/RGB Size** – Larger values make the scanlines (and RGB subpixels) appear larger on-screen.
- **Scanline Scroll Speed** – How quickly the scanline texture scrolls over the screen.

## VHS ARTIFACTS

- **Random Wear** – Adds small, noisy UV distortions horizontally to simulate the fuzzy look common with old VHS tapes.
- **Aberration Strength** – How strongly chromatic aberration (color channel separation) is applied at the screen edges.

- **Tracking Texture** – A control texture for tracking artifacts.
  - This should be an x-by-1 image.
  - The red channel controls the strength of the tracking UV offsets.
  - The green channel controls the presence of tracking lines overlaid onto the screen.
  - An example of a texture to use for this is contained in “Retro Shaders Pro/Resources/Textures/TrackingRamp.png”.
- **Tracking Size** – How ‘zoomed in’ the tracking ramp is when scrolling over the screen.
- **Tracking Strength** – How strongly the tracking ramp red channel offsets the UVs of the screen horizontally.
- **Tracking Speed** – How quickly the tracking ramp scrolls across the screen. Use negative values to scroll upwards.
- **Tracking Jitter** – A random offset applied to the scrolling to make it appear jittery.
- **Tracking Color Damage** – Cycle the chrominance of the image slightly to look like the tape is damaged. The screen is converted to YIQ color space, and the offset is applied to the I and Q channels.
- **Tracking Lines Threshold** – A threshold for tracking lines to appear on screen. Higher values mean fewer lines.
- **Tracking Lines Color** – The color of the tracking lines, where the alpha channel acts as a global multiplier on the tracking line strength.

## COLOR ADJUSTMENTS

- **Brightness** – Global multiplier for the image colors before some effects are applied. A value of 1 preserves the image as-is.
- **Contrast** – Forces differences in colors to become more obvious. A value of 1 preserves the image as-is.

## CRT [MESH]

A version of the CRT effect which can be applied to a regular mesh in your scene. This effect supports most of the parameters of the post-process version, besides the variables relating to screen resolution.

## FRAMERATE LIMITER [SCRIPT]

Contained in “Retro Shaders Pro/Scripts”, you will find a Framerate Limiter script, which lets you set an FPS upper bound which Unity will aim for. You may find this useful for imitating a poor refresh rate with your game.

## DEMO SCENES

The pack contains three demo scenes:

- The OutdoorDemo scene contains a terrain-based forest area, showing off the base capabilities of the shaders under a single directional light.
- The CityDemo scene contains a small contained city block, showcasing the additional light support of the shaders. This scene works best when under the Forward+ or Deferred



rendering paths because Forward has a cap on the number of realtime additional lights it can process.

- The Bilinear3Demo scene contains just a couple of crates with N64 bilinear shaders attached.

## RETRO BASE LIT (SHADER GRAPH)

A copy of the Retro Lit shader, created with Shader Graph. The purpose of this graph is to provide a basis for you to create your own effects with the basic features of the Retro shaders, without needing to understand what all the shader code is doing.

I recommend copying this graph and then modifying the copied version to create your own custom effect.

**Warning:** this graph uses a lot of shader keywords, and as such, you may need to increase the shader variant limit found in **Project Settings -> Shader Graph**. The graph might also be slow when adding/removing/modifying nodes and the generated shader will be large. I have attempted to restrict the number of keywords by removing the ambient light and point filtering toggles.

Copying and modifying one of the source code files, such as Retro Lit, will usually (almost always) result in better performance.

## RETRO BASE UNLIT (SHADER GRAPH)

A copy of the Retro Unlit shader, created with Shader Graph. This graph is also intended to provide a base to create your own custom effects using the Retro features.

This graph does not use the same shader keywords as the Retro Base Lit shader, and as such, does not suffer from the same variant explosion and sluggish Editor issues.

## SPECIAL THANKS

Many thanks to:

- [ambientCG](#) for many of the CC0 licensed textures used in the demo
- [OpenGameArt](#) for some CC0 licensed textures used in the demo
- [Timothy Ahene on Sketchfab](#) for the CRT model used in the promotional art
- [Sergej Majboroda on Polyhaven](#) for the sky HDRI used in the promotional art