SpaceBox 4096 – for Unity3D

IMPORTANT NOTE:
Default Max Size has been set to 1024 x 1024 to improve speed when importing the asset. To increase resolution to 2048 or 4096, select the textures in SpaceBox HD/Textures project folders and change MaxSize to 2048 or 4096 then click Apply (hint: you can select multiple textures using shift/control key.)

SpaceBoxes, or space-themed skyboxes, are used in games and 3D scenes to create the illusion of being inside an enormously large space environment. This illusion is achieved by texture-mapping the insides of a cube with seamless space textures. The cube is repositioned along with movements of the observing camera so the view always remains static.

Using a box instead of a traditional spherical mapped skydome or sphere eliminates polar distortion commonly associated with these techniques. SpaceBox4096 spaceboxes compensate for cubical distortion making the environment totally seamless and virtually free of distortion.

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SpaceBox Formats

Spaceboxes are provided in two different formats, SpaceBox HD (High Definition) and SpaceBox ST (Single Texture).

SpaceBox HD (High Definition)

Advantages: Superior Image Quality
Disadvantages: VRAM use and increased size of distribution

SpaceBox HD are provided as 6 individual 4096 x 4096 textures designed to be mapped onto a traditional Unity3D Skybox. This is the highest quality version although 6 draw calls are required to render the scene, a lot of VRAM is consumed, and game distribution size increases when using High Definition spaceboxes. You can optionally reduce the resolution of the textures to 2048 or 1024 if you find quality is sufficient for improved performance, reduced VRAM use, and reduced size of game distributable.

SpaceBox ST (Single Texture)

Advantages: Superior Performance and reduced VRAM use and distribution size
Disadvantages: Reduced quality

SpaceBox ST (Single Texture) is provided as a single 4096 x 4096 textures where all six cube sides are arranged. This requires a custom script, SpaceBoxST.cs, which you attach to a camera. The script procedurally creates a cube with UV-mapping to render the spacebox sides from a single texture. This requires only 1 draw call to improve performance and reduce VRAM use and size of game distributable.

How to use SpaceBox HD

SpaceBox HD are used as normal skyboxes in Unity. The Unity manual describes the skybox component in the online manual: http://docs.unity3d.com/Manual/class-Skybox.html

Step-by-step

1. Select the Main Camera (or your camera of choice) in the Hierarchy
2. Go to menu Component | Rendering | Skybox
3. Drag a material from the SpaceBox HD/Materials folder onto the Custom Skybox property of the Skybox Component in the Inspector

Your spacebox is now active and will be rendered by your main camera when you press play.

Quality Settings

You can change the quality settings of SpaceBox HD textures to find a balance between image quality, performance, memory consumption, and size of game distributable.

By default, the SpaceBox HD textures are set to the maximum resolution of 4096 x 4096.

Important settings for SpaceBox HD textures:

Wrap Mode

- Must be set to "**Clamp**" for all textures, otherwise seams of the skybox will be visible.

Max Size

- **4096** (default) provides the best possible quality but also requires a lot of VRAM use (48 MB when compressed as DXT1 textures)
- **2048** provides a good compromise between image quality and memory usage (12 MB used when compressed as DXT1 textures)
- **1024** favours low memory usage (3 MB when compressed as DXT1 textures) but quality is greatly reduced.

Format

- **Compressed** (default) reduces the size of the textures to 17.5% of their original size.
- **RGB24** provides the best possible image quality but increases VRAM use and distributable size nearly 6 times (288 MB for 4096, 72 MB for 2048, and 12 MB for 1024) per spacebox

How to use SpaceBox ST

SpaceBox ST requires a custom script in Unity which has also been made available as a component.

Step-by-step

1. Select the Main Camera (or your camera of choice) in the Hierarchy
2. Go to menu Component | Rendering | SpaceBox ST
3. Drag a material from the SpaceBox ST/Materials folder onto the

NOTE: SpaceBox ST is only visible in Play mode and not in editor. A hidden procedurally generated inverted cube is automatically created when Play is pressed which is attached to the camera.

Quality Settings

SpaceBox ST combines all sides of the spacebox onto a single texture. The default Max Resolution of the texture is set to 4096 x 4096 which equals a resolution of 1360 x 2032 for each individual side of the spacebox when padding is excluded. SpaceBox ST has higher quality compared to SpaceBox HD configured with a texture size of 1024, but lower quality compared to a SpaceBox HD configured with a texture size of 2048.

Reducing the size of a SpaceBox ST from 4096 x 4096 to anything lower may not be desirable from an image quality perspective. Some mobile devices will not support texture resolutions of 4096 x 4096 so it may be more suitable to use a SpaceBox HD with either 1024 or 2048 texture resolutions to achieve a desirable level of quality even if the number of draw calls are increased.

Important settings for SpaceBox ST textures:

Wrap Mode

- Can be set to either Wrap or Clamp. The SpaceBox ST textures include 8 pixels of wrapped padding around all cube edges to ensure there is no tearing between the edges.

Max Size

- **4096** (default) Uses 8 MB of VRAM when compressed as DXT1 a texture.
- **2048** Uses 2.0 MB of VRAM when compressed as DXT1 a texture but image quality will be low.
- **1024** uses only 0.5 MB of VRAM when compressed as DXT1 texture but image quality is very poor at such a low resolution.

Format

- **Compressed** (default) reduces the size of the textures to 17.5% of their original size.
- **RGB24** provides the best possible image quality but increases VRAM use and distributable size nearly 6 times (48 MB for 4096, 12 MB for 2048, and 3 MB for 1024) per spacebox

Mesh and UV Mapping

The procedurally generated SpaceBox ST mesh with UV mapping is created at runtime by the SpaceBoxST.cs script when attached to a camera. The texture atlas contains all 6 sides of the cube as laid out as illustrated in Figure 1.

The texture edges in the atlas have 8 pixels of wrapped padding to ensure there is no tearing between sides of the cube.

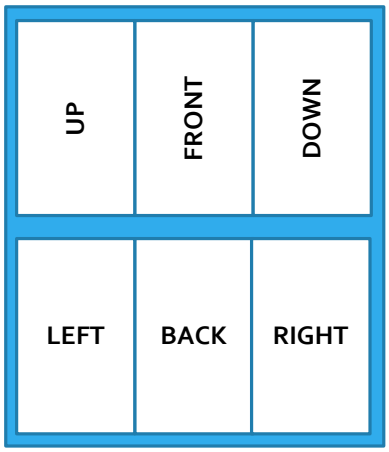


Figure 1 - Texture and UV Layout

Mip Maps and Image Quality

You can enable "Generate Mip Maps" option which is available when Texture Type is set to Advanced.

- **Advantages:**
  - Fidelity of textures are greatly improved with individual stars becoming much sharper
  - Reduced VRAM usage by 25%
- **Disadvantages:**
  - Without Mip Maps flickering may be introduced, especially for spaceboxes with a lot of individual stars when the camera pans smoothly.

Demo Scenes

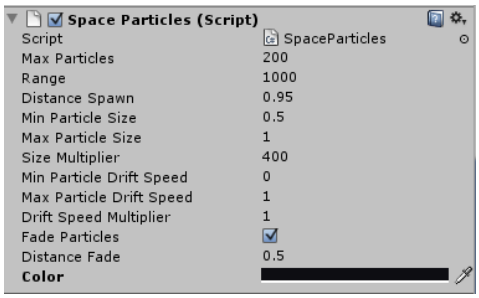
The Unity version of SpaceBox 4096 includes demo scenes for all SpaceBox HD and SpaceBox ST materials:

- Demo/Scenes/High Definition (HD)
- Demo/Scenes/Single Texture (ST)

Hint: Use mouse too look around and use arrow keys to see the particle effects in action.

Particle Effects

To enhance the look and feel of travelling through a spacebox, the Unity version includes two particle effects, SpaceFog and SpaceParticles.



The particle effects prefabs are located in the Demo/Space Effects/Prefab Folder. Attach the prefab to your camera and configure parameters for the SpaceParticles script such as color, fading, range, max particles etc.

The particles remain positioned around your camera and as the camera moves the fog and particles will re-spawn at a distance as particles become out of range to create the illusion of endless amount of particles.