# COMPOSITING

### FRAMEFORGE<sup>®</sup> STORYBOARD STUDIO

#### SUPPLEMENTAL MANUAL

#### Introducing Live Backgrounds (Background Image Plates)

FrameForge Version 4 Introduces *Live Backgrounds* which is a special compositing feature that lets you take an image of a location or set and make it fill the background of your frame, allowing your actors to effectively move around in the 3D space of the picture, as shown in the image below.



Live Backgrounds (Image Plates) are a lot more powerful than simple backdrops displayed on a wall behind your actors. That kind of static backdrop can be great for creating the illusion of a vast, sweeping background (as in the image of the cowboys to the right), but a backdrop like that only works because the cowboys are not really a part of the environment the backdrop represents.



Using a static 2D image as a backdrop can be effective in some situations



If you want them to go into the canyons behind them, and you were using a static background, you'd have to fake it by scaling them and elevating them to create forced perspective, which defeats all the

benefits of FrameForge's optically accurate cameras. Use live backgrounds, however, and they can ride in or out of the sunset just like they were on any other set.

Live Backgrounds do this magic by "mapping" the 3D space of the FrameForge Floor to exactly match the "floor" surface of the original location through its unique, visual **Calibration Function**.

You can see what's going on "under the hood" in



the image below. It looks like the actors are walking on the cobbled road in the image, because the floor they are *really* walking on exactly matches the road's plane in the image itself, but the image is begin composited on top of it.





Understanding the basic concepts behind how FrameForge performs this magic will help you a lot in calibrating any images you want to use. So let's take a moment to delve in a bit deeper because it will help you a lot going forwards.

Imagine that you are a photographer taking a picture of some railroad tracks. As you look through your lens, the railroad tracks vanish into the distance.



Accurate Perspective requires we follow its Rules

Depending how high you and the camera are, and how much you're tilting the camera up or down, you will get a different perspective. For example, with a short focal length, the tracks recede quickly, tilt it down and the vanishing point of the tracks gets higher in the frame, and so on.

However, no matter how you move your camera, the underlying space of the area that the photo is capturing doesn't change, only your perspective of it does.

Now imagine a FrameForge camera. You put it at the same height as the camera that took the original photo, and you match the original camera's tilt and angle of view as well.







Degree of Tilt of optical center of camera lens

Now, because FrameForge's cameras exactly mimic 3D space, and we've set

our camera to match the one that was used to snap the image, then the virtual 3D space and the original 3D space are effectively the same.

And that means that if you add an actor or object to your FrameForge's set, it will be at the same place in the frame and displayed at the same height through your FrameForge camera as it

would have been through the original camera used to snap the shot, had that actor or object existed at the location where the photo was originally taken.



Similarly, if you move your actor towards or away from the camera, they'll increase and decrease in size at the same rate at the objects in the background image, effectively putting them directly into the picture!

Okay, now that you understand the underlying concepts, here's how you actually use them.

#### Setting Up Live Backgrounds (Background Image Plates)

First, make sure that the camera you want to use the background with is the live camera.

Next, go to the **Cameras** drop down menu, select **Background Image Plate** and then click **Add Background Image**.

It will display a standard image selection dialog and you should select the image you want to use as a background. You should note that there is a sub-folder in the **backgrounds folder** named <u>from</u> <u>Pixabay.com</u> which is an amazing source of free images. We've shipped a small selection of images we've gotten from them, but

Sets Objects Relationships Tools Poses Help Set Optical Parameters Override Selected Camera's Parameters Select Ground Glass Render Depth of Field Ctrl+Alt+D Force Redraw of Main View Ctrl+R Normal Renderer Normal with Outlines Cartoon Rendering User Rendering Style Percolate Render Style.. Background Image Plate

Deploying an Image Plate from the Camera menu

you should really check them out if you're looking for high quality, free backgrounds.

Once you have selected your image you'll either need to *calibrate* it or use existing calibration data, if any. If there is existing calibration data (and there is for most if not all of the background images we've supplied) you'll see a pop-up asking you if you want to use the existing calibration data or not.

If you choose to use existing calibration data then you're done, otherwise you'll need to calibrate the image yourself.

#### **Image Calibration**

As mentioned before, the process of Image Calibration sets up your FrameForge camera to match the properties of the camera when it was used to take the picture. So the first thing it will ask you is if you know the camera settings.

Do you know what focal length and camera settings were used to take this background photo?

Yes, I know the Camera Settings

No, I don't (or am not sure)



If you DO know the camera settings you should select YES and you'll be able to enter them directly in the following dialog. If you don't know them, simply enter No and it will instead take you to its visual calibration function.

**NOTE:** If you want to enter the camera settings directly, you need to know the following three things:

## The Focal Length of the lens when Image was taken

Since a given focal length can produce wildly different angles of view depending on the film or

sensor size, all focal lengths used by the Calibration function are those used by a standard 35mm still camera.

Many cameras record this information within a jpg's meta-data, and if it exists, the Calibration function will read it automatically.

#### The Height of the Camera when the Image was taken

This should be self-explanatory to almost everyone, but for clarity this can be defined as the distance from the ground plane to the optical center of the lens.

If you know the height of the photographer, you can generally calculate it by subtracting about four

inches (10 cm) from their height plus their height above the ground plane of the image.

#### The Degree of Tilt in reference to the Ground Plane Camera was angled at when Image was taken

Again, this should be self-explanatory but just to be clear, this is the degree of tilt relative to the ground plane that the camera's optical center of lens is directed towards.







Height of optical center of camera lens



Degree of Tilt of optical center of camera lens

#### **Visual Image Calibration**

If you do not know the camera settings, have no fear, there is an extremely simple, visual way to calculate them, and you'll do so in the following dialog, though of course the large image shown will be the one you selected.



The Image Calibration Application

There are step-by-step instructions how to use this dialog in the upper left-hand corner but the concept is very simple. You have four categories of objects: **Actors, Plants/Trees**, **Cars** and **Buildings** and if you click any of them, it will switch to another object in that category with a different height.



For example, the actors category initially starts with a 6' / 1.83m man, click him and it switches to a

new actor, this time a 5' / 1.52m young woman. Click her and it then switches to a 3.5' / 1.07 girl.

You care about this because you are going to use these objects to define the scale of the picture, and depending on the scene that the image represents, different ones will make better reference objects.



So, choose the object that most appropriate from the available choices and drag it onto the image's foreground. Position and scale the reference object so that it looks as natural as possible given the chosen Image Plate.



Scaling and positioning reference objects with the Image Calibration Application

Repeat the process with an image in the background. Generally speaking the more separation you can give them, the better, but sometimes the reference objects in the image don't lend themselves well to that, such as in the field with trees to the left.

**NOTE**: FrameForge is going to calculate the camera settings from your reference objects based on the assumption that *bottoms of both objects* are on the same plane—in this case is the field—so it's very important to ensure that you don't have either object's base positioned on anything higher than the ground plane. See the image on the next page more details.







For example, take a look at the scaling of the man and girl reference objects in the image to the right.

The man on the left of the frame is our foreground calibration object and he looks fairly natural at that scale in the image. On the other hand, the girl in the background doesn't look quite right.

Your instinctive sense of *perspective* tells you that the little girl is some distance from the camera, but she looks too big to be that far away.

While the man looks like he's scaled correctly relative to the door, he is at the top of the stairs which is *significantly higher* than the ground itself, issue is a hard-and-fast rule, a lot of this process admittedly does come down to you making the decision as to how natural the reference objects look at a certain scale when placed on the image background.

Follow your intuition... your eyes and your brain knows what looks natural instinctively.



An Example of Correct & Incorrect Scaling of Reference Objects



Perspective done correctly conveys distances accurately

**NOTE:** If you know some of the original camera data such as its focal length—but not all of it, look at the bottom of the dialog, and uncheck the appropriate box and directly enter the values that you know.





Once your two objects are set up and look like they're to scale, click the CALCULATE CAMERA SETTINGS button found in the lower right hand corner of the screen.

The Calibrator will do a little magic and you'll see 3D versions of the objects you chose on a set with your new background composited in. Try clicking on them and dragging them around to see if their position still seems consistent with the background.

*This is very important* as something that may look fine in its initial position may look very wrong when the objects are moved. For Example:



Fortunately, FrameForge has an easy visual way to deal with this.



On the lower left of the screen, you'll see the following step which tells you to do what we just did. If everything DID look good, and it often will, simply click the first button, **Yes, everything looks good...** and it will return you to FrameForge with your background image now composited in.

If doesn't work well when things are moved but it looked good initially, then click the second button, **It Needs Some Minor Adjustments.** 

When you do that, you'll see a floor grid overlaid on top of the image with an arrow cross-bar at the top middle, as shown in the image on the next page.





Clearly the angle of the floor is too steep, so click and drag on the appropriate cross-bar of the floor grid until the top edge of the grid is on the horizon, like so:



As you can see, suddenly the actors look like they're back into correct perspective.



If you're happy with the result, then click the button **Yes, everything looks good...** or **Accept Settings** and you'll be taken back to FrameForge with the background composited in and the camera matching the calibrated settings.

If it still doesn't look quite right, you can either try manually adjusting the camera parameters with the controls at the bottom of the dialog or return to the initial calibration screen to try again with the 2D clip-art objects and repeat as needed.

#### Working with a Live (Composited) Background

Once you've selected a live background and returned to your set, you *may* find that the background image is cropped either at the top and bottom or left and right. This will happen when the aspect ratio of your FrameForge Camera is different from the aspect ratio of your background image.



The Image Plate as seen through the camera does not show the entire image. What went wrong?

For example, the background image we've been using in this example has a 1.33:1 aspect ratio while this sample FrameForge Frame has 1:1.85 ratio. In order to ensure it fully fills the frame, the program has to crop the top and bottom as shown in the control room above.

Note that you aren't locked into that specific crop, however, as you can pan and tilt to reframe it as desired, using FrameForge's unique **Synch Mode** which automatically keeps the background image in synch relative to



any foreground objects when you are panning, tilting and zooming.



However, you've probably noticed that many of the camera controls are disabled. In fact, when you are in Synch Mode you cannot dolly, roll or crane the camera. The reason behind this is very simple: dollying and craning create significant parallax changes which cannot be mimicked within the background because it is a simple 2D image. And while panning and tilting do cause some parallax changes they are very limited and completely invisible to the viewer in normal usage.

REMEMBER: the key to the live background is having the FrameForge camera in the same place in 3D space and with the same settings as the original camera, and if you dollied or craned, you would completely break that connection. In any case, when you have a live background (or any green screen composited background) you'll see some additional controls on the camera controls palette:

**Synch**, which we've just discussed, **FG**, **BG** and of course  $\bigotimes$ , the international symbol for **NO**.

Click **FG** and the camera controls will *only* control the camera that's shooting your scene while leaving the background image alone. **BG** will do the reverse, only adjusting the background while leaving the foreground camera as-is. And finally,  $\bigotimes$  will pause the compositing altogether, showing you the true underlying floor, which can be very useful in figuring out where to set props or an actor's marks on an actual green screen set.

And that's it! You can now shoot, tween, print and export shots using the image plate within the confines of the camera controls limits and all Actors and Objects you place in the scene will automatically visually change their size and position in a photo-accurate manner based on their depth in the scene just like they do in any other FrameForge set.



He shoots and ...

...he scores!



#### **Physical Green Screens (Pro and Stereo Editions ONLY)**

Now, in addition to the **Live Background (Image Plates**), the Pro and Stereo Editions also offer several types of Green Screen Compositing.

The two main types are:

**Compositing with a true 3D Set** – in this case the source of the compositing image is built as a standard FrameForge set and you simply point one camera at it, then take another camera, point it at the Green Screen and the source camera's image will appear as its background.

This is generally the technique you want for virtual set extensions. If you look at the two monitors at the top of the Control Room, you'll see that the one on the left (red camera) is shooting a virtual set extension in a hanger, while the one on the right (blue camera) is shooting our guy against a green screen.





The live view is a simulated image of both the underlying green screen shoot and the composited-in background. It's not something you'd ever see in FrameForge, we just did it to help you try and get a better visual idea as to what is going on.

**Compositing with an Image on a Physical Background** – this is very similar to the **Live Background** / **Image Plate Compositing** we discussed in the previous section, but rather than having the background image fill the background similar to the way the sky does, this technique utilizes two cameras with the background source shooting against a physical wall with the background image.

One benefit of this is that you can then add objects between this background image and the camera, effectively combining the two techniques. In addition, because the background image is on a physical wall, moving the camera shooting it can introduce desired parallax effects that are not possible with a Live Background. For example, in the image below we've craned upwards and the background image shows as much of distortion as is possible given that it is a fixed 2D image because the camera shooting it is both high and tilted down.



A behind-the-scenes look shows us how that shot was done shows us that a very tall camera was shooting down on the background image which is itself displayed on a wall, another camera at an equal height shoots our guy against the green screen. By doing this, you are doing a poor man's version of re-shooting the original background from another height.





Furthermore, in addition to deciding the type of source of the compositing image (e.g. Virtual Set **Extension** versus **Image on Physical Background**), you have two additional options:

You can either use a **Green Screen of a Fixed Size** or what we call an **Edgeless Green Screen**. The first one is exactly what it sounds like, a Green Screen that has specific dimensions and which exists as an object on our set, like in the image above.

This approach is useful for when you're trying to determine what size Green Screen you'll really need and to ensure that all your shots will fit on it. The Edgeless Green Screen, on the other hand, is kind of like a cross between the Image Plate (in that it has no edges and the background will fil it completely) and the Green Screen of Fixed Size (in that it still is a physical object on the set and your actor will collide into it if you move them too far back).

#### **Using a Physical Green Screen in Practice**

Before you add a physical Green Screen to your set, you need to figure out whether you want to use a camera shooting a virtual set as a source for the Green Screen compositing, or whether you're going to use an image as a source.



#### **Shooting Using a Virtual Set or Set Extension**

For this type of setup, there are a few important steps you need to do prior to adding your green screen.

- 1) Build or open the set that is going to be composited in as your green screen background.
- 2) Setup a camera shooting it.
- 3) While in the Blueprint View, move this set and its camera off to one side so that when you add the Green Screen and its camera, it won't accidentally pick up the objects on the virtual set.

For example, say we are building a virtual set extension of an airplane and airport, and on our green screen set we will have a set of stairs with our actor at the top, like so.



So that the resulting composited image will be:





To set this up, we first build the airport set with its camera, and then shift it over to one side or the other so that it's out of our way and our camera that's shooting the Green Screen won't accidentally directly pick up any of it.

Next, we need to place another camera on the set, the one that will be shooting against our green screen and then add our Green Screen in front of it. Doing so is as simple as going to the **Camera Equipment** category under **Props** in the **Object Library** then dragging in the **Green Screen for Live Compositing Object** just like we would any other object.

Once it is placed on the set, it will automatically display a **Setup Green Screen Compositing** dialog like the one below.





Since my **blue camera** in this example is the one that will be shooting the airplane (in other words, the source of the image that's going to be composited in as the background on our green screen) I need to drag that camera from the list of available cameras to the box in the upper right labeled **Source of Green Screen Image** ("Drag the Source Camera Here....").





My **Red Camera,** on the other hand, is the one that is going to be shooting against the Green Screen so I need to drag it to the lower right-hand box labeled **Foreground Camera** ("Drop the Camera that is going to be shooting against the Green Screen")

**NOTE:** Once you've selected both cameras, the option **Image "Plate" as Background** will become disabled because we've got two cameras and that option is just another way to access the **Live Backgrounds** which only require a single camera.

You next need to choose whether you want to have a **Physical Green Screen** or an "**Edgeless**" **Green Screen Option.** If you choose the Physical Green Screen option, you will see size options like those in the image below allowing you to directly enter the Green Screen dimensions.





Regardless, once you have everything set up, simply press the **Associate Camera(s) with Green Screen Button** to finalize it.

