
KEYLIGHT
BY THE FOUNDRY

Keylight User Guide

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INTRODUCTION

Welcome to this User Guide for Keylight on Discreet.

Keylight has been refined over a number of years to make keying quicker and easier while providing a depth to the tools that will tackle even the most challenging shots. Keylight was first developed by The Computer Film Company to help with difficult keys on feature films. Over the years, Keylight has been refined in production on hundreds of films. This pioneering work on digital compositing was honoured with a Technical Academy Award® in 1996.

About this User Guide

This User Guide will tell you how to install and use the Keylight spark. Licensing Keylight is covered in the separate Foundry FLEXlm Tools User Guide. Throughout this user guide we assume you are familiar with Autodesk Media & Entertainment Solutions and the machine it is running on.

Use the Quick Key chapter to see how a simple key is pulled using Keylight. The Basic Keying Chapter goes over the most common parameters you'll need to pull a variety of keys. The Advanced Keying Chapter explains how to tackle more difficult keys.

What's New?

For information on system requirements, new features, improvements, fixed bugs and known bugs & workarounds, see "Appendix A" on page 57.

Example Images

Example images are provided for use with Keylight. You can download these images from our web site http://www.thefoundry.co.uk and try Keylight out on them.

Notation

All the directory and file names in this document are the 32 bit versions. For the 64 bit equivalent, simply substitute 64 for 32 in any of the relevant names. The phrase "Discreet Flame" is used to denote any of the compatible Autodesk Media & Entertainment Solutions, Discreet® Flame®, Discreet® Flint®, Discreet® Fire®, Discreet® Inferno®, and Discreet® Smoke®.

When we refer to blue screens throughout the text we mean, of course, blue or green screens.

Installing Keylight on Discreet Irix

Downloads are available from http://www.thefoundry.co.uk.

1. Log in as root.
2. Download the Keylight software. You should get a file called

```
Keylight2.2v2_Spark4.0-irix-mips-release-32.tardist
```

3. Install the default software using the inst command (or, if you prefer, use the Software Manager)

```
inst -f Keylight2.2v2_Spark4.0-irix-mips-release-32.
     tardist
Inst> list
Inst> install *
Inst> go
Inst> quit
```

4. The plug-ins are installed to /usr/discreet/sparks Keylight2.2v2.
5. Proceed to licensing Keylight.

Installing Keylight on Discreet Linux

Downloads are available from http://www.thefoundry.co.uk.

1. Log in as root.
2. Download the Keylight software. You should get a file called

```
Keylight2.2v2_Spark4.0-linux-x86-release-32.run
```

3. Install the software with the command

```
./Keylight2.2v2_Spark4.0-linux-x86-release-32.run
```

4. The plug-ins are installed to /usr/discreet/sparks/Keylight2.2v2.
5. Proceed to licensing Keylight.

Installing Keylight on Burn

Downloads are available from http://www.thefoundry.co.uk. On each Linux machine running Burn:

1. Log in as root.
2. Download the Keylight software. You should get a file called

```
Keylight2.2v2_Spark4.0-linux-x86-release-32-Burn.run
```

3. Install the software using the command

```
./Keylight2.2v2_Spark4.0-linux-x86-release-32-
    Burn.run
```

4. The plug-ins are installed to /usr/discreet/sparks/Keylight2.2v2.
5. Repeat this for each Burn station.

No license is required for Keylight on Burn. All Burn versions of the software are provided free of licensing so you may install and use this software on as many Burn nodes as you have available to you.

Note *The Keylight 2.2 for Discreet sparks must have EXACTLY the same directory path (`/usr/discreet/sparks/Keylight2.2v2`) as*

the Keylight 2.2 for Discreet sparks on Discreet Flame. If they are different, remote rendering of these sparks on Discreet will fail.

Licensing Keylight

Keylight uses FLEXlm encryption in the license keys. The license key is a sequence of numbers and letters, stored in a plain text file, that unlocks Keylight.

You will need the System ID (lmhostid) of your machine to get a license. The System ID is a unique number for your machine. To display this number, download the Foundry System ID utility from http://www.thefoundry.co.uk/licensing.

Without a valid software license key, the Keylight plug-in will render a watermark (coloured dots) across the rendered image along with a diagnostic text to help you identify the problem with the license.

Note that on Burn, no license is required.

For more information on licensing Keylight, setting up a floating license server, adding new license keys, and managing license usage across a network, you should read the Foundry FLEXlm Tools User Guide. You can download this user guide from our web site, http://www.thefoundry.co.uk/licensing.

Removing Keylight from Irix

If you wish to completely remove Keylight 32 bit sparks from your system, use the following command as root:

```
versions remove Keylight2.2v2_Spark4.0-irix-mips-
     release-32
```

Or, to remove the 64 bit sparks:

```
versions remove Keylight2.2v2_Spark4.0-irix-mips-
     release-64
```

Documentation

This User Guide is installed alongside the sparks in a directory called docs.

Other Foundry Products

The Foundry is a leading developer of plug-in visual effects for film and video post production. Its products include Nuke, Furnace, Tinder, Tinderbox, and Keylight and run on a variety of compositing platforms. For the full list of products and supported platforms, see our web site at http://www.thefoundry.co.uk.

Nuke is an Academy Award® winning compositor. It has been used to create extraordinary images on scores of feature films including *The Dark Knight*, *The Golden Compass*, *Iron Man*, *Transformers*, *King Kong*, and *Pirates of the Caribbean: At World's End.*

Furnace is a collection of film tools. Many of the algorithms utilise motion estimation technology to speed up common compositing tasks. Plug-ins include wire removal, rig removal, steadiness, deflicker, degrain and regrain, retiming, and texture tools.

Tinder and Tinderbox are collections of image processing effects including blurs, distortion effects, background generators, colour tools, wipes, matte tools, painterly effects, lens flares, and much more.

Ocula is a collection of tools that solve common problems with stereoscopic imagery, improve productivity in post

production, and ultimately help to deliver a more rewarding 3D-stereo viewing experience.

Visit The Foundry's web site at http://www.thefoundry.co.uk for further details.

About CFC and Framestore

The Computer Film Company (CFC) pioneered the field of digital film compositing and today operates a state of the art film effects facility in London under the name Framestore. The company has always invested in research, and maintains the kind of edge that has twice been honoured with Technical Achievement Awards from the Academy of Motion Picture Arts and Sciences.

Visit Framestore's web site at http://www.framestore.com for further details.

GETTING STARTED

Quick Key

Consider this shot from The Saint, pictures courtesy of CFC and Paramount British Pictures Ltd. Figure 1 is the blue

Figure 1. Blue Screen.

screen foreground that should be composited over the background shown in Figure 2.

Figure 2. Background.

Step by Step

1. Load Keylight from /usr/discreet/sparks/Keylight2.2v2 and select the blue screen followed by the background. You need to supply images for the inside and outside mattes. Since we don't have any, just click on the background image for the third and fourth inputs.

2. Pick the Screen Colour. Select the Pick Screen Colour

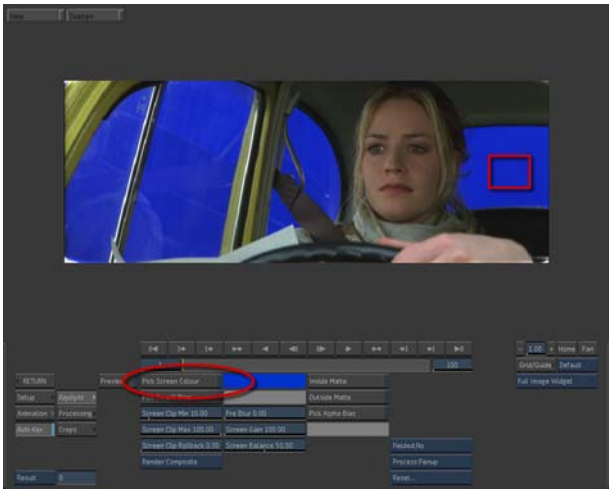

Figure 3. Picking the blue screen using Color Picker.

button and click and drag a rectangle over the blue screen. The average colour of the pixels selected is used for the screen colour. The Screen Clip Min is also set based on the colour variation of the screen (up to a maximum of 4%) and the foreground is automatically despilled. You can repeatably pick the screen colour until you get a result you're happy with.

3. That's it. The final composite is shown in Figure 4.

Figure 4. Final composite.

If you want to have a go of this shot, you can! The images can be downloaded from our web site and this quick key is also covered in the Tutorial Chapter. See "Tutorial 1: Simple Key" on page 41.

Just picking the screen colour may be enough for a lot of keys, but there are many more tools within Keylight that can be used to tackle more complicated shots. These are described in later chapters.

BASIC KEYING

The following section describes the parameters you need to do basic keying. This will give you enough to tackle most simple keys. A discussion of advanced parameters to fine tune keys and tackle complex keys can be found in the next chapter.

Screen Colour

The Screen Colour is probably the most important parameter and you should always pick the screen colour before doing anything else. It should be set to the colour of the green or blue curtain behind the foreground object. Enable the Pick Screen toggle and pick the screen colour directly from the image by dragging an area.

Picking the screen colour creates the screen matte used to composite the foreground over the background, sets the clip min value (up to a maximum of 4) and despills the foreground image.

Screen Matte

Setting the screen colour will pull a key or in other words, create a matte. This is shown by selecting Render - Screen Matte. Setting the screen colour will also despill the foreground although you can use the Despill Bias to remove more spill. In some cases just picking the screen colour is enough to get a decent key. For more information on Screen Colour see page 22. Figure 5 shows a well lit blue screen

behind an actor. You should note that repeatedly picking

Figure 5. Blue Screen.

colours does not add to previous selections and key more of the image with each click. To key more of the image, in other words to improve the background you should use the Screen Clip Min parameter. See "Keying More" on page 17.

Viewing the Key

After picking the screen colour you have created a matte (the screen matte) and despilled the foreground. The result can be displayed in a number of different ways using the Render option menu. You can output the final composite of the foreground over the background, or you can output processed screen mattes that can be used as matte inputs for other Keylight nodes.

The Status view is useful in fine tuning the key rather than as an output image in its own right. The Status is one of the options in the render menu and shows an exaggerated view of the key so that you can make a more informed decision

when tuning the key. Figure 7 shows the Status display after

Figure 6. Green Screen.

Figure 7. Status.

the screen colour has been picked from the image shown in Figure 6. Three colours are displayed. Black pixels show areas that will be pure background in the final composite. White pixels show areas that will be pure foreground. Mid-grey pixels will be a blend of foreground and background pixels in the final composite. You need grey pixels around the edge of the foreground to get a good key at the foreground edge.

Pixels that are a blend between the foreground and background are shown in just one shade of grey. This is done to highlight potential problems with the key. These grey pixels may represent a foreground/background blend of 50/50 or 99/1. No distinction is made as to this ratio.

You may occasionally see other colours in the Status View and these are covered on page 20 in the Advanced Keying Chapter.

Keying More

To improve the key by firming up the foreground so the background doesn't show through you should adjust the

Screen Clip Max parameter. To key more of the foreground so that the background is clearer you should use the Screen Clip Min parameter. Look at the screen matte and the composite while you're doing this. Don't overdo either of these or the edges between foreground and background will become hard.

ADVANCED KEYING

The following section describes the parameters you need to fine tune keys and get the most out of Keylight. Basic parameters covered in the previous chapter may also be covered here in more detail.

Render

The render parameter allows Keylight to render the final composite of the foreground over the background, or the premultiplied/unpremultiplied foregrounds for compositing further down the tree. Two options, screen and status, are for viewing the key rather than as an output. The options are:

- **Composite** – this renders the foreground composited over the background using all mattes, spill and colour corrections.
- **Premultiplied** – this creates a premultiplied RGBA foreground.
- **Unpremultiplied** – this creates an unpremultiplied RGBA foreground.
- **Screen Matte** – this is the matte created from picking the screen colour and includes any screen processing on it. It does not include any inside or outside mattes.
- **Combined Matte** – this is the screen matte plus inside and outside mattes.
- **Status** – this renders an exaggerated view of the key so that minor problems are shown clearly.

Status is one of the options in the render menu and shows an exaggerated view of the key so that you can make a more

informed decision when fine tuning the composite. Figure 9

Figure 8. Green Screen.

Figure 9. Status.

shows the Status after the screen colour has been picked from the image shown in Figure 8 on page 20. Three colours are displayed. Black pixels represent pure background in the final composite. White pixels are pure foreground and grey pixels are a blend of the foreground and background pixels. The grey is just one colour to highlight any areas that are not pure foreground or background. Grey pixels do not mean the key is poor – the final composite may be fine.

You may occasionally see other colours in the Status View.

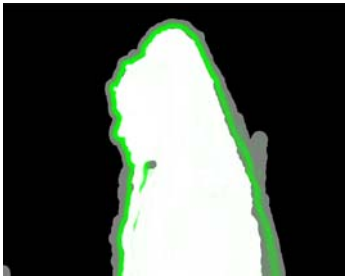

Figure 10. Status showing processing of the alpha channel.

Figure 11. Composite showing Screen Replace Colour.

Figure 10 shows black, white, grey and green pixels. The green pixels are a warning. They show you the parts of the

alpha that have changed through processing the alpha channel (clipped, softened or eroded). These areas have had the correct amount of spill removed, but the alpha has subsequently changed and the composite may no longer look right. This can be corrected using the Replace Colour to put back colour in these areas. Figure 11 on page 20 is an extreme example to illustrate the point. The Replace Colour has been set to pure red and you can see that this mirrors the green pixels in the Status View.

Similarly you may see blue pixels in the Status. These

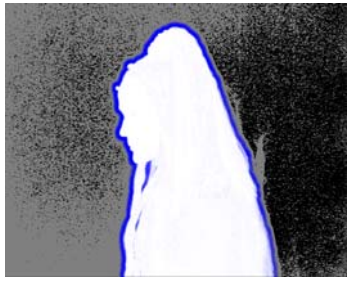

Figure 12. Status showing how the inside matte will affect the foreground.

Figure 13. Composite showing the inside replace colour.

represent processed pixels in the inside matte that affect the despill of the foreground. The inside replace colour will be used to modify these pixels. Another extreme example is shown in Figure 13. The Inside Replace Colour is set to pure yellow and the Inside Replace Method is Hard Colour.

You may also see dark red pixels which indicate areas where an outside matte has been used to reduce the transparency of the image.

Screen Colour

The screen colour represents the colour of the pure blue (or green) screen. The first thing you should do when pulling a key is pick the Screen Colour. This single colour has a primary component, blue or green, and that has a saturation. Once the screen colour has been picked, Keylight analyses all the pixels in the image and compares the saturation of each pixel with the saturation of the screen colour. Keylight uses this comparison to do two things.

1. Calculate a semi-transparency of that pixel as an alpha value.
2. Remove the screen colour from the pixel, leaving a foreground colour, a process known as "despilling".

Tip It's worth sampling a selection of screen (blue or green) colours and viewing the result. Picking different colours will give different results.

Background Pixel

If the saturation of the pixel in the image is as strong, or

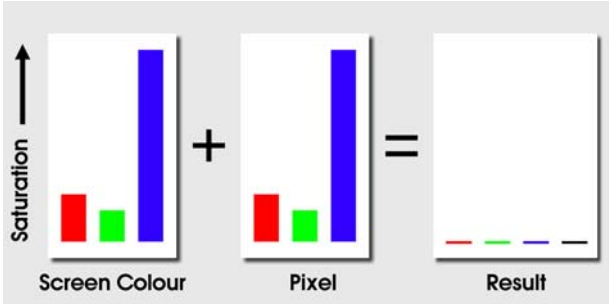

Figure 14. Blue screen pixel set alpha to zero.

greater than the screen colour, then it'll be a pixel from the blue screen background, and that pixel will be set to

completely transparent and black. See Figure 14.

Edge Pixel

If the saturation of the pixel is less than the screen colour, then it'll be the edge of the foreground object, and we subtract some of the screen colour from the pixel (de spilling) and set the image to semi-opaque. See Figure 15.

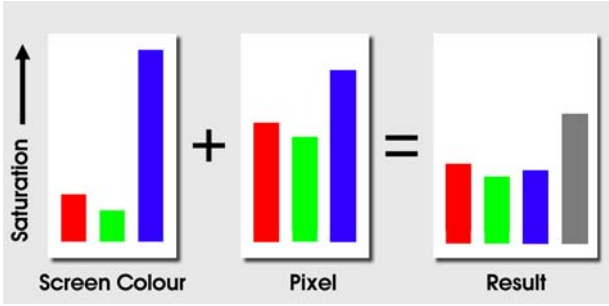

Figure 15. Edge pixel gives partial alpha.

Foreground Pixel

If the primary component in the pixel is not the same as the primary component of the screen colour we have a

foreground pixel, and the alpha is set to completely opaque.

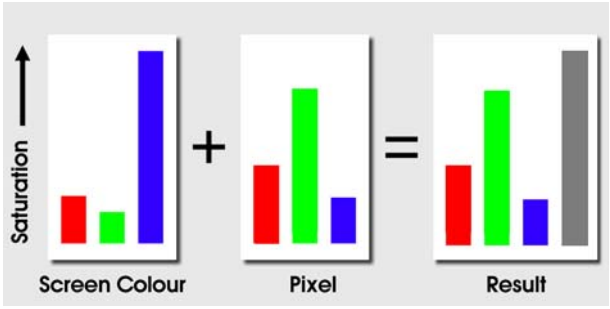

Figure 16. Foreground pixel gives full alpha.

The pixel colour is not modified. See Figure 16.

Note *You should note that the Screen Colour is a single colour. You are not picking lots of colours that are keyed out.*

Biasing

What are these Bias Colours of which you speak? Biasing in Keylight was originally developed for a shot in the motion picture "Executive Decision". The foreground consisted of reddish browns, but a combination of factors led to the 'green screen' being lit so that its primary component was

actually slightly red.

Figure 17. 'Red Screen' Shot from Executive Decision (the red is actually the major component in the background, only just).

So what happens when we pick the screen colour? Well because the screen was 'red', as is the foreground, our pilot ends up being keyed out as shown in Figure 18.

Figure 18. Result of a normal key, setting Screen Colour to the 'red screen'.

Not a great result, I'm sure you'll agree, and much pressure was applied to the lowly programmers to get around the problem.

A work around to this is to manually colour correct the image so that the background is properly green, pull the key from this corrected image, then 'un-correct' the result of that so that the foreground colours match the original. A corrected image would look something like the one shown in Figure 19. The green screen is now strongly green and distinct from the foreground colours. Notice also the red cast on the pilots mask has been removed and turned into a neutral grey.

Figure 19. Colour corrected image that would give a better key.

This is effectively how the Keylight developers got around the problem. They introduced the concept of a 'bias' colour, which is a colour cast that is removed from the source image and screen colour, then a key is pulled from this modified image, then the colour cast is put back. In essence this automates the 'work around' described above, however it is done in a way that does not slow Keylight down at all. For our Executive Decision shot, an appropriate colour is the red cast on the pilot's mask in the source footage. Setting our bias to this now gives us the far better result as shown in

Figure 20.

Figure 20. Final Key, with the Bias Colour Set to the Value of the Pilot's Mask

The Bias Colours in everyday use

It also turns out that the bias colour is actually useful for situations without strong casts, typically where there is some colour spill around the edge of keys. By setting the biases to the main colour that occurs near the edge of the foreground (typically flesh tones or hair tones), you allow Keylight to better discriminate between foreground and background.

Picking a Bias Colour

To pick a bias colour, select the 'Pick Alpha Bias' or 'Pick Despill Bias' toggle and drag a box over the image, the average colour under the box will be used for the bias you have chosen. Note that the 'despill bias' is not enabled by default

Why are there two Bias Colours?

Remember that Keylight does two things, calculates a transparency and removes the screen colour from the

foreground. By default one bias colour, the 'Alpha Bias', is used for both operations. This works fine in most situations, for example, the Executive Decision shot above.

However, sometimes you can pick a bias that gives a great alpha, but performs a poor despill, and another bias that gives a great despill, but a poor alpha. Consider the blue screen from the TV series Merlin, courtesy of CFC Framestore shown below in Figure 21.

We pick the strong blue of the background without choosing an alpha bias, and end up with the lovely alpha shown in Figure 22, but the despill resulting from this key is poor as shown in Figure 23 on page 29.

Figure 21. Merlin blue screen.

Figure 22. Nice Alpha.

We can pick a different shared bias to get a better despill, but this destroys our nice alpha. The way around this is to turn on the 'Enable Despill Bias', which gives you a separate bias factor to use solely for despill calculations. If you pick the 'Despill Bias' to be something from Miranda Richardson's hair or skin tone, you will keep the nice alpha, and get a

good despill as well (Figure 24).

Figure 23. Poor despill.

Figure 24. Final Key, Using Separate Despill and Alpha Biases.

Clip Min and Max

Clip levels are used to adjust the alpha values calculated by Keylight. Any alpha value at or below Screen Clip Min will be set to zero and any alpha value at or above Screen Clip Max will be set to 100. Figure 25 on page 30 shows the original alpha of an image and Figure 26 on page 30 shows the result of clipping it. Notice how the grey areas in the black background have been reduced and that the grey edges have hardened up considerably. When compositing, the Screen Clip Min control can be used to improve the background image if parts of the foreground are showing through. The Screen Clip Max control on the other hand can be used to firm up the centre of the matte, making it less transparent to

the background.

Figure 25. Screen Clip Min = 0

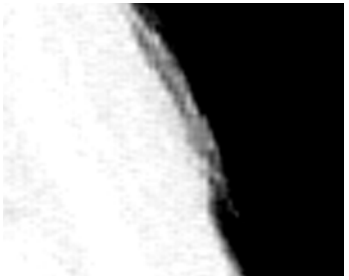

Figure 26. Screen Clip Min = 0.5

Note *You need to be really careful if you choose to use Screen Clip Min and Screen Clip Max that you don't destroy the edges on your foreground. It is possible to use Clip Rollback to compensate for this.*

Screen Gain

The screen gain controls how much of the screen colour is removed to make the screen matte. Increasing this value will

Figure 27. Status after picking the Screen Colour.

Figure 28. Status showing the increase in Screen Gain.

key more. Figure 27 shows the Status after picking the screen colour. You can clearly see that parts of the background are grey where they should be black. When composited you may see faint pixels from the foreground

where you should be seeing pure background. Increasing the screen gain will fix this, as shown in Figure 28, but increasing it too much will destroy your good work. Like many keying parameters it's a balance - not too much, not too little. Increasing the screen gain too much will lead to the background showing through the foreground and edge detail will be destroyed. Figure 30 on page 31 shows this

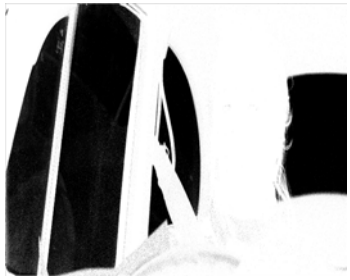

Figure 29. Screen Gain = 105 giving a good screen matte.

Figure 30. Screen Gain = 150 giving background show through and over eroded edges.

quite well. Note the steering wheel is black when it should be white. If you look at the composite you will see the background showing through here. Also, some of the fine hair detail on the actor, visible in Figure 29, has been eroded in Figure 30.

Screen Balance

Saturation is measured by comparing the intensity of the primary component against a weighted average of the two other components. This is where the **Screen Balance** control comes in. A balance of 100 means that the saturation will be measured against the smallest of the other two components in the screen colour.

A balance of 0 means that the saturation will be measured

against the larger of the other two components. A balance of 50 will measure the saturation from the average of the other two components.

The appropriate balance point for each image sequence you key will be different depending on the colours in that image. Generally speaking, blue screens tend to work best with a balance of around 95 and green screens with a balance of around 50. The screen balance value is set automatically on picking the screen colour but this can be adjusted. If the key is not working too well with these settings, try setting the balance to about 5, 50 and 95 and see what works best.

Pre Blur

Some shots can be improved by softening the foreground image that is used to generate the key. The original image is then used in the composite and colour corrections. The Pre Blur parameter is used to do this. DV footage or grainy shots may benefit from subtle use of this control.

Gains

Keylight creates the screen matte after the screen colour has been picked. You can make fine adjustments to this matte using the gain controls. Increasing the gain controls makes the screen matte more transparent by increasing the amount of screen colour showing through the matte. This tends to tint the edges the opposite of the screen colour (for blue screens, edges become yellow). Decreasing the gain makes the main matte more opaque by reducing the amount of screen colour showing through the matte.

The matte can be adjusted independently in the shadows, midtones and highlights giving more control than the clipping

levels.

The level of the midtones can be adjusted too. For example, if you are working on a dark shot you may want to set the midtone level to a dark grey to make the gain controls differentiate between tones that would otherwise all be considered shadows.

Screen Processing

Once you have picked the screen colour and got the screen matte, you may wish to process this matte using the parameters in the screen processing edit group. The matte can be adjusted using clipping levels, it can be eroded or grown, despotted and softened.

For example, you could soften and erode the matte to produce a hold matte that could be connected to the inside input of another Keylight node further down the tree in batch. This holdout matte could stop print through (foreground transparency).

Clip Rollback

Pulling a screen matte (Figure 31) will typically produce lots of transparency (grey) in the matte at the edges. This is good since this is what you need to key hair well. You may also get transparency in the foreground as shown in Figure 32. This is bad as your subject will appear slightly see-through, and

this should be corrected. You can do this by connecting a

Figure 31. Screen matte highlighting the close up view as shown in Figure 32.

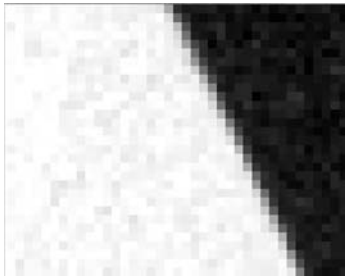

Figure 32. Close up screen matte showing unwanted (grey) transparency in the (white) foreground.

matte into the third (inside) input, or you can use the Screen Clip Max parameter to turn these grey pixels white. This cleans up the foreground (Figure 33) but it will also destroy the edge detail you want to keep. This is where Screen Clip Rollback comes in. This is used to put back the edges to restore the detail that was lost. A rather exaggerated clip rollback is shown in Figure 34 to illustrate the point.

Figure 33. Screen Clip Max has been used to remove the unwanted grey pixels in the white matte.

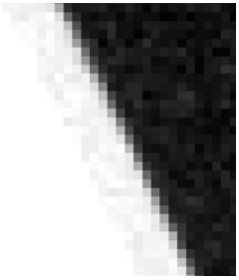

Figure 34. Screen Clip Rollback has been used to reduce the unwanted erosion of the edge.

Grow & Shrink

This control should not normally be used as eroding the edges can produce a very poor key. However, the Grow/Shrink parameter allows you to grow (if greater than zero) or shrink (if less than zero) the Screen Matte. These controls are sub-pixel accurate.

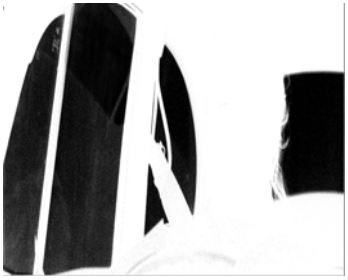

Figure 35. Screen Matte.

Figure 36. Eroded Matte.

Of course, you can use the clip and erode parameters to create a holdout matte for use in another Keylight node downstream. See "Tutorial 5: Inside Mattes" on page 54.

Despot

This controls how much to simplify the matte. It coagulates similar regions so that, for example, black specks in the white matte can be absorbed by the surrounding white areas. Increasing the Despot Black will remove isolated spots of black in the white matte. Increasing Despot White will

remove isolated spots of white in the background up to that size.

Figure 37. Eroded matte.

Figure 38. Despot.

Mattes

There are 4 mattes in Keylight.

1. Screen Matte
2. Inside Matte
3. Outside Matte
4. Combined Matte

The screen matte is generated by the Keylight algorithm after the screen colour has been picked. It can be processed (clipped, eroded, etc.) by the screen processing tools.

The inside matte is the holdout matte. It is used to confirm areas that are definitely foreground. If your subject has blue eyes and is being shot in front of a blue screen, this matte can be used to key back the eyes. This matte is taken from the 3rd input to Keylight.

The outside matte is the garbage matte and is used to remove unwanted objects (lighting rigs, etc.) from the foreground. The matte is taken from the 4th input to

Keylight.

The matte used to blend the foreground and background in the final composite is the combined matte. This matte is the combination of the screen matte, inside and outside mattes.

Inside & Outside Mattes

If you can't adequately improve the screen matte using the clip levels, you should use the inside and outside matte inputs. The inside matte makes the foreground less transparent and the outside matte is used to clean up the background that might have bits of the foreground showing through. It is sometimes referred to as the hold out matte.

The outside matte (garbage matte) is often used to clean up screens that are not a constant colour or have lighting rigs in shot (Figure 39) by forcing the matte black. The inside

Figure 39. Green screen with lighting rig visible.

matte can be used to keep elements in the foreground that you don't want to lose (an actor's blue eyes in front of a blue screen). These mattes should normally be softened externally to blend into the screen matte.

Figure 40 on page 38 shows a spline drawn around the lighting rig on the left side of the screen. Figure 41 shows the matte. Connect the matte to the fourth (outside) input of Keylight. The outside matte forces that part of the image to

Figure 40. Spline drawn round the lighting rig.

Figure 41. Corresponding matte.

be in the background thus keying out the rig.

Colour Replacement

Remember that Keylight does two things – it removes the screen colour to despill the image and generates an alpha (Screen Matte) to composite the foreground over the background layer.

If you then process the Screen Matte, for example, by eroding the alpha or changing the clip levels, Keylight's automatic amount of despill will be wrong in those pixels whose transparency you have changed. The **Replace Method** instructs Keylight how to deal with such pixels. The Status will display which pixels use a replace method. Those pixels who use a replace method because the alpha processing tools modified the transparency will be green, whilst those pixels whose transparency was modified by the inside matte will be blue. See the Status View on page 20.

There are four options to the replace method, these are:

1. **None** – the despilled image is left untouched if the alpha is modified.
2. **Source** – the image will have a corresponding amount of the original pixel (screen colour and all) reintroduced/ removed if the alpha is changed.
3. **Hard Colour** – the despilled image has a corresponding amount of the replace colour added for any increase in alpha.
4. **Soft Colour** – the despilled image has a corresponding amount of the replace colour added for any increase in alpha, however, it attempts to modulate the luminance of the resulting pixel so that it matches the original pixel. This will give a more subtle result than the Hard Colour option.

TUTORIAL

Introduction

We have included several tutorials with example images that you can use to practice Keylight.

- Tutorial 1: Simple Key
- Tutorial 2: Fine Tuning a Key
- Tutorial 3: Extreme Blue Spill
- Tutorial 4: A Red Green Screen
- Tutorial 5: Inside Mattes

Example Images

The tutorial images referred to in this chapter can be downloaded from our web site http://www.thefoundry.co.uk.

Tutorial 1: Simple Key

Using the blue screen clip from The Saint, you will composite the actor over the background. You will learn how to:

- Apply Keylight to a layer.
- Pick the Screen Colour.
- View the Final Result.

The clips you will need for this task are called SaintFG.tif and SaintBG.tif, pictures courtesy of CFC and Paramount British Pictures Ltd. for the film The Saint. You should import them

into Discreet.

Figure 42. Blue Screen - SaintFG.tif

Figure 42 is the blue screen foreground that should be

Figure 43. Background - SaintBG.tif

composited over the background shown in Figure 43.

Step by Step

1. Load Keylight from /usr/discreet/sparks/Keylight2.2v2 and select the blue screen followed by the background. You need to supply images for the inside and outside mattes. Since we don't have any just click on the background image for the third and fourth inputs.

2. Select the Pick Screen Colour button and click and drag a

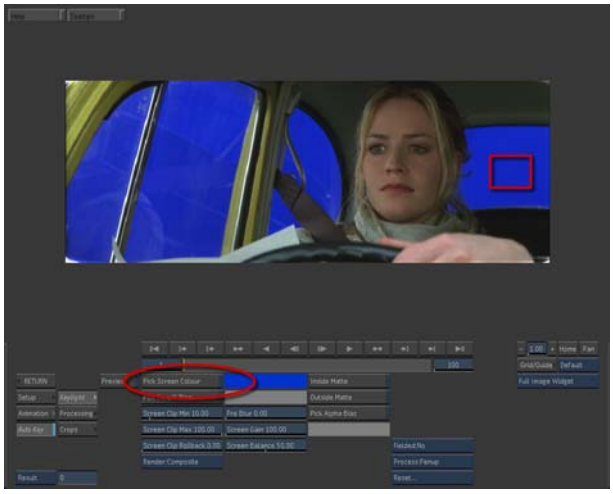

Figure 44. Picking the blue screen using Color Picker.

rectangle over the blue screen as shown in Figure 44. You can repeat this process, while looking at the Composite until you are happy with the result.

3. There is a tiny amount of blue spill still visible that could be removed. Simply select the Pick Alpha Bias and pick skin tones from the image.

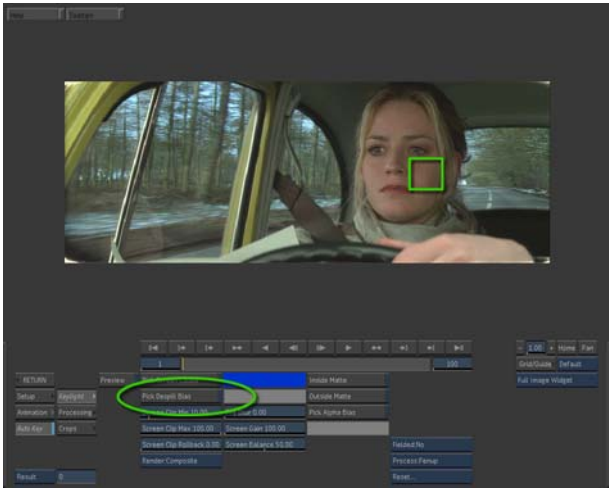

Figure 45. Pick the Despill Bias.

4. That's it. The final composite is shown in Figure 46.

Figure 46. Final composite.

There are a couple of extra steps that can be taken to fine tune this key and these are discussed in the next chapter "Tutorial 2: Fine Tuning a Key" on page 45.

Tutorial 2: Fine Tuning a Key

Using the images from the film The Saint, you will learn how to fine tune the key pulled in Tutorial 1. You will learn how to:

- Use Status to highlight any problems.
- Use the Screen Clip Min to improve the background.
- Use the Despill Bias to remove more blue spill.

Step by Step

1. Import SaintFG.tif and SaintBG.tif. Click on the blue screen foreground for the first input of Keylight and the road background for the second, third and fourth inputs. Select the Pick Screen Colour and click and drag an area on the blue screen.

Note *These steps were covered in greater detail in the previous tutorial.*

2. Before we do anything else we need to look at the quality of the key so far. On first inspection, the composite looks pretty good, but it's hard to judge. You should also look at the screen matte to see how good the matte is in the foreground and background areas. To see any potential problems more clearly, switch the render to Status as shown in Figure 47. Here we can see that the windscreens

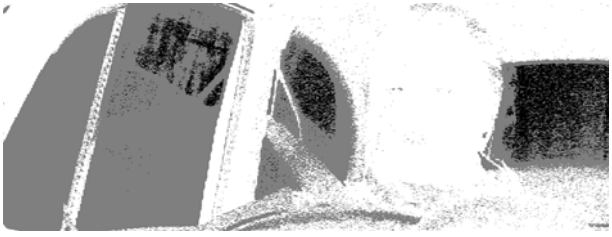

Figure 47. Status showing grey pixels in the background.

are a mixture of black and grey pixels. The black pixels tell us that pure background will be seen here in the final composite. The grey pixels tell us that there will be a mix of foreground and background pixels. Now remember that

the status view is an exaggerated version of the key to help us quickly see where there may be problems. You should always look at the screen matte and the composite. But for now, let's try and clean up the background showing through the windows, while leaving some reflections in the side window. In other words we need mostly black pixels with a few grey ones.

3. Figure 48 on page 46 shows the Status view that we're aiming for. The background has been cleaned up and we still have some reflections in the side window. To get this you should increase the Screen Gain to 110.

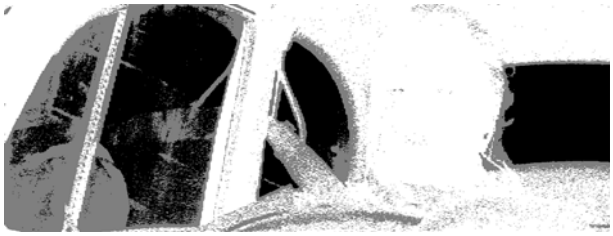

Figure 48. Improved screen matte with Screen Gain.

4. There is a small amount of print through in the foreground under the seat belt. You can see this as the grey pixels in Figure 48. This can be removed with a hold matte. Use Keylight to pull a screen matte then soften

and erode the edges and feed it back into another Keylight node. The batch tree is shown in Figure 49.

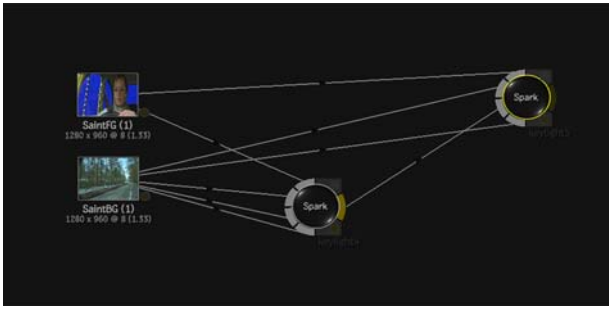

Figure 49. Keylight (unhighlighted) used to generate a hold matte for another downstream Keylight node.

5. Finally, if you look closely at the composite you will see a tiny amount of blue spill on the woman's hand and in her hair. This was from reflected light from the blue screen. Select Pick Alpha Bias and pick some skin tones to remove it.

Figure 50. Final Composite.

Tutorial 3: Extreme Blue Spill

This is a really interesting clip from the film Merlin. The results with Keylight are certainly not perfect, indeed it is unlikely that you will ever end up with a truly realistic looking shot. However, there are some interesting things to observe. You will learn how to:

- Reduce the blue spill using Despill Bias.

Step by Step

1. Import the MerlinBlueFG.tif (Figure 51) and MerlinBlueBG.tif clips and apply Keylight.

Figure 51. A tricky blue screen.

2. Pick the purest blue you can see for the Screen Colour.

Figure 52. Serious blue spill.

3. Switch on Enable Despill Bias, select Pick Despill Bias and pick skin tones from the face and neck. View the composite as shown in Figure 53.

Figure 53. Result.

Tutorial 4: A Red Green Screen

Using the images from the film Executive Decision, you will learn how to pull a key from a poor green screen using the Alpha Bias control. You will learn how to:

- Pick the Screen Colour.
- Pick Alpha Bias.
- Produce a final composite.

Step by Step

1. Import ExecFG.tif (Figure 54) and ExecBG.tif. Apply Keylight. The foreground image is actually a green screen

Figure 54. Poor Green Screen.

shot, although it doesn't look it. If you analyse the pixels it's slightly more red than green. To key this we'll have to fool Keylight.

2. Pick the Screen Colour. You should go for the slightly darker green patch to the left of the pilot. Although feel free to experiment picking different parts of the green

screen. The initial selection gives the composite shown in Figure 55.

Figure 55. Default key.

3. To fix this select the Alpha Bias and pick colours from the mask. The result is shown in Figure 56.

Figure 56. Alpha Bias.

4. If you look closely, the background and foreground needs cleaning up. Figure 57 shows the Status View. We will use

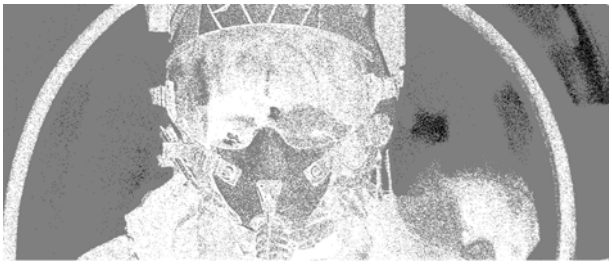

Figure 57. Status View.

the screen matte processing tools to make the cockpit windows black and the pilot white.

5. Increase Screen Clip Min to 20 to remove some of the foreground showing through the background. Decrease Screen Clip Max to 70 to improve the opacity of the foreground. Increase softness to 1, Despot Black to 2 and Despot White to 2.

Figure 58. Composite.

6. Use the Screen Replace Method to pull some of the original source image through the composite. This

improves the apparent graininess in the foreground. Figure 59 shows the differences.

Figure 59. Close up view. The left image has Replace Method set to Source. The right image has Replace Method set to None.

Tutorial 5: Inside Mattes

Using the green screen Merlin images you will learn how to:

- Process the Screen Matte.
- Pull a holdout matte.
- Use Keylight in Batch
- Remove lighting rigs from the foreground.

Step by Step

1. Import the two files as shown in Figure 60 and Figure 61.

Figure 60. Foreground.

Figure 61. Background.

2. In Batch set up the tree as shown in Figure 62. The

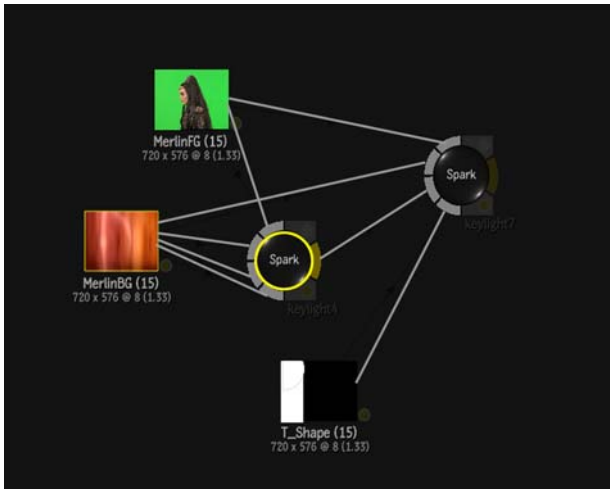

Figure 62. Batch tree.

Keylight spark highlighted in yellow renders a holdout matte (inside matte) that is used as the third input to the second Keylight node.

3. Edit the first Keylight node. Pick the screen colour and render the screen matte. Set the Screen Clip Min to 20,

Screen Clip Max to 80, Softness to 5, Grow/Shrink to -10 to get the holdout matte shown in Figure 64.

Figure 63. Foreground.

Figure 64. Holdout Matte.

4. Edit the second Keylight node. Pick the Screen Colour and Alpha Bias. Increase the Screen Clip Min slightly to clean

Figure 65. Status.

Figure 66. With Inside Matte.

up the background. The Status view is shown in Figure 65 which shows the background showing through the foreground. To fix this we just switch on the Inside Matte (which has come from the other Keylight node) to get the result shown in Figure 66.

5. You can clip off the foreground lighting rig using either the Crop controls (third edit group) or by using an outside matte as shown in the batch tree in Figure 62.

APPENDIX A

Release Notes

This appendix describes the requirements, new features, improvements over previous versions, fixed bugs and known bugs and workarounds in Keylight.

Keylight 2.2v2

This is a maintenance release of Keylight that fixes one bug.

Requirements

Flame, Flint, Fire, Inferno, Smoke, or Burn.

Flame 8.5 on Irix32, Flame 9.5 on Irix64, Flint 9.0/9.5/2007/2008/2009 on Linux32, Flame 9.5/2007/2008/2009 on Linux64, and Burn 2.0/2007 have been tested.

Foundry FLEXlm Tools (FFT) 5.0v1 or later for floating license support.

Release Date

December 2008.

New Features

There are no new features.

Improvements

There are no improvements in this release.

Fixed Bugs

BUG ID 6830 - Using the 'Screen Softness' parameter made the foreground image disappear. This has been fixed.

Known Bugs and Workarounds

There are no known bugs.

Keylight 2.2v1

This is a maintenance release of Keylight that removes licensing from the Burn version of the software.

Requirements

Flame, Flint, Fire, Inferno, Smoke, or Burn.

Flame 8.5 on Irix32, Flame 9.5 on Irix64, Flint 9.0/9.5/2007/2008/2009 on Linux32, Flame 9.5/2007/2008/2009 on Linux64, and Burn 2.0/2007 have been tested.

Foundry FLEXlm Tools (FFT) 5.0v1 or later for floating license support.

Release Date

December 2008.

New Features

There are no new features.

Improvements

Licensing has been removed from the Burn version of the software. The Burn version of the software is now provided free to the end user.

Fixed Bugs

There are no fixed bugs.

Known Bugs and Workarounds

There are no known bugs.

Keylight 2.1v1

This is a minor upgrade to Keylight 2.0v1 to enable it to use

FLEXlm licensing.

Requirements Flame, Flint, Fire, Inferno, Smoke, or Burn.

Flame 8.5 on Irix32, Flame 9.5 on Irix64, Flint 9.0/9.5/2007/2008/2009 on Linux32, Flame 9.5/2007/2008/2009 on Linux64, and Burn 2.0/2007 have been tested.

Foundry FLEXlm Tools (FFT) 5.0v1 or later for floating license support.

Release Date December 2008.

New Features
There are no new features.

Improvements
Keylight now uses FLEXlm licensing.

Fixed Bugs
There are no fixed bugs.

Known Bugs and Workarounds
There are no known bugs.

Keylight 2.0v1

This is a major new release of Keylight to incorporate improvements made to the algorithm over the years and support linux, burn and 64 bit applications.

Requirements Flame, Flint, Fire, Inferno, Smoke and Burn.

Discreet Flame 8.5, 9.5 on Irix, Discreet Flint 9.0 on Linux 32

have been qualified although earlier and later versions are also likely to work.

FLM 3.1 licensing used.

Release Date

November 2005.

New Features

1. The matte input has been replaced with an Inside Matte and Outside Matte.
2. The FG Bias has been decoupled into a Despill Bias and Alpha Bias. The Despill Bias can now despill without affecting the alpha.
3. The html documentation has been replaced with this comprehensive pdf user guide.
4. The built-in holdout matte has been removed and replaced with an inside matte input to make a more streamlined plug-in for use in Batch.
5. A preblur parameter has been added to help with keying DV footage or excessively noisy images.
6. Support for field rendering has been added.
7. New display tools are included to allow for the selection of parameter values based on rendered images.

Improvements

1. The screen matte processing tools have been improved with rollback and despot controls.
2. Tooltips are now included.

Changes

1. The colour correction controls have been removed.
2. The built-in holdout matte has been removed.

3. The video/log/linear control has been removed.
4. The product identifier in the license key has changed from CFT to Keylight.

Fixed Bugs
There are no fixed bugs.

Known Bugs and Workarounds
There are no known bugs.

CFT 1.1v2

Release Date
Feb 2000

New Features
There are no new features.

Improvements
There are no improvements over previous versions.

Fixed Bugs
If Keylight was reloaded from a saved setup file the pixels defining the Hold Matte would be incorrect. This has been fixed in version 1.1v2

Known Bugs and Workarounds
There are no known bugs.

CFT 1.1v1

New Features
1. Status - A new output mode has been added to enable users to better see the areas of the image that will become foreground or background. Black pixels represent pure background in the composite, blue pixels represent

pure foreground, green pixels represent the blend of foreground and background pixels (pure green is mostly foreground with some background, 50% green is mostly background with some foreground), red pixels are pure background with foreground reflections added on top.

2. A toggle switch (Suppress Reflections) will remove the foreground reflections that are added back on to the background. There are some situations where relections are not important and foreground grain is being added to the background. This can be removed with the Suppress Reflections toggle.

Improvements
There are no improvements to existing features.

Fixed Bugs
There are no fixed bugs.

Known Bugs and Workarounds
There are no known bugs.

CFT 1.0v1

Release Date
Nov 1998

New Features

A radically different compositing tool that accurately models the interaction of the blue or green screen light with the foreground elements and replaces it with light from the new background. With this approach, blue/green spill removal becomes and intrinsic part of the process, providing a much more natural look with less tedious trial and error. Keylight is simple and quick to use, and is particularly powerful in dealing with reflections, semi-transparent areas and hair.

Improvements

This section will describe improvements to existing features in later versions.

Fixed Bugs

This section will describe fixed bugs in later versions.

Known Bugs and Workarounds

There are no known bugs.

APPENDIX B

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