

# tutorial\*

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# intro

## Introduction

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Welcome to the tutorial for **flame**® and **inferno**®, the powerful tools for digital compositing, editing, keying, colour correcting, and 2D and 3D image processing from Discreet.

### About the Tutorial

This tutorial explains all the basic concepts of the **flame** and **inferno** software and provides you with the fundamental skills you need to use the software in a fast-paced production environment.

The lessons were written for use with **flame** version 7.0 or **inferno** version 4.0 or later. Each lesson explains the basics of a particular module of the software, and includes one or more exercises to guide you through the important features of the software. Source and result clips for each exercise are provided on the CDs included in your software kit.

Each lesson builds on concepts presented in earlier lessons. New users should complete the lessons in sequence. If you are already familiar with **flame** or **inferno**, you can select the lessons of particular interest to you.

The CDs containing the source and result clips are provided in either NTSC or PAL format. Some parameter values that you enter during the exercises differ between the two resolutions. These differences are clearly marked in the instructions.

## What's New

If you have already used this tutorial with a previous version of **flame** or **inferno**, here's what's new:

- Lesson 13, “Modular Keying: Basic Techniques” (new for **flame** users)
- Lesson 14, “Modular Keying: The Tracer” (new for **flame** users)
- Lesson 15, “The Colour Warper”
- Lesson 16, “3D Tracking” (**inferno** only)
- Lesson 17, “Motion Estimation” (**inferno** only)

## Before You Begin

Before you get started on the lessons:

- A CD-ROM drive must be installed and mounted on your system in order to access the clips, setup files, and interactive tutorial on the CDs. See “Mount the CD-ROM Drive” on page 13 for instructions.
- Run the interactive tutorial provided on Tutorial CD 1, “interactive tutorial & documentation.” The interactive tutorial is designed to provide an overview of the main features of the software. See “Run the Interactive Tutorial” on page 15 for instructions.
- Make sure the software is correctly installed. See the **flame** or **inferno** *Installation Guide* for instructions.

## Conventions

A number of style conventions are used throughout these lessons. These conventions and examples of their use are shown below.

### Convention:

Text that you enter into a UNIX shell appears in Courier bold.

Directory and file pathnames appear in italics.

Variables in pathnames appear enclosed in angle brackets.

Hot keys appear in Myriad bold.

### Example:

**killall mediad**

*/usr/discreet/demo*

<user name>

Select Move or press **M**

**Note:** Once specified in a lesson, hot keys are indicated in parentheses, for example:

1. Select Move (**M**).

## Getting More Help

For a comprehensive reference to all of the software features, see the *flame* or *inferno User's Guide*. If you are not able to find the answers to your questions in either this guide or the user's guide, contact Discreet Logic Customer Support at one of the numbers below. You can also send queries by e-mail.

North America:	(800) 92LOGIC
Overseas:	(514) 954-7199
Fax:	(514) 954-7254
E-mail:	<a href="mailto:discreet.support@autodesk.com">discreet.support@autodesk.com</a>



# 1 Essentials

This lesson covers the basic procedures and concepts needed to use **flame** or **inferno**. Even if you have used the software before, you should read this lesson to become familiar with the terminology used in this tutorial guide.

In this lesson:

- Start the software
- Create a new project, partition, and user
- Take a tour of the desktop
- Learn how to identify, select, copy, move, name, and delete clips
- Create a colour noise clip and a single black frame using the Coloured Frame command
- View a clip using the reel control buttons and Player
- Learn how to use the image window controls, timeline, and widescreen viewing controls

Time to complete this lesson: 45-60 minutes

## Exercise 1: Learning the Basics

In this exercise, start the software, create a new project and user, then go on a tour of the desktop. Next, create a 30-frame clip of colour noise, name the clip, and learn how to move, copy, and delete clips on the desktop.

### Log In

When you turn on the computer monitor, the login screen appears.

1. If your system is set to display login icons, double-click the **flame** or **inferno** icon.

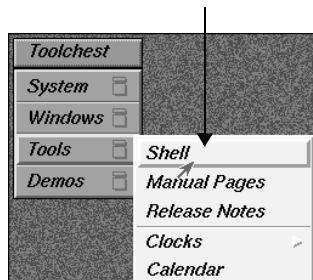
If your system is not set to display icons, you must type the account name in the Login name field and press **ENTER**. The account name is usually the software name followed by the version number. For example, the account name for **flame** 7.0 is **flame7\_00CT**.

2. If the account has a password, type the password and press **ENTER**. If you do not know the password, contact your system administrator.

After a few moments, a UNIX shell appears on the monitor screen.



Do not worry if the UNIX shell does not appear. This just means that your system has been configured differently. You can open a shell yourself by selecting Shell from the Tools menu in the Toolchest.



You will use this shell to run the interactive tutorial and to start **flame** or **inferno**. First, follow the instructions in the next step to mount the CD-ROM drive.



## Mount the CD-ROM Drive

In order to access the source clips, setup files, and interactive tutorial provided on CD in your software kit, a CD-ROM drive must be installed and mounted on your system. For instructions on mounting a drive across the network, consult your system administrator.

1. Login as the super-user:

a) Open a new UNIX shell by selecting Shell from the Tools menu in the Toolchest.

b) Type

**su**

and press **ENTER**.

c) Type the root password and press **ENTER**.

**Note:** Logging in as super-user gives you special privileges for changing the UNIX environment. You may have to consult your system administrator to gain access, or have your system administrator mount the CD-ROM drive for you.

2. Place CD 1, “interactive tutorial & documentation” in the drive.

3. Check whether the drive is mounted. In a UNIX shell, type

**df**

and press **ENTER**.

If the drive is mounted, a line appears that ends with **/CDROM**. If there is no line that ends with **/CDROM**, the drive is not mounted. Continue with step 4.

4. Type

**mediad -k**

and press **ENTER**. This ensures no devices are running in the background.

5. Type

**mediad**

and press **ENTER**.

6. Verify that the CD-ROM drive is recognized by the system. Type

**df**

and press **ENTER**. A line ending with **/CDROM** appears. You are ready to run the interactive tutorial.

7. Close the shell in which you logged in as super-user by double-clicking the close button in the top-left corner of the shell.
8. Mediad interferes with the correct functioning of VTRs used with the software. Once you have finished:
  - running the interactive tutorial in Lesson 1
  - copying the setup files to your system disk in Lesson 2
  - loading the clips from the CD-ROM archive to your framestore in Lesson 3

Unmount the CD-ROM drive and turn off mediad. To do this, log in as super-user in a UNIX shell and type the following commands:

```
eject /CDROM
```

```
mediad -k
```

## Alternate Procedure for Mounting the CD-ROM Drive

If you are not able to mount the CD-ROM drive using the mediad command, try the following procedure.

1. Get the device and controller numbers of the CD-ROM drive using the hinv (hardware inventory) command. Type

```
hinv | grep CDROM
```

and press **ENTER**. The hardware inventory for the CD-ROM drive appears. For example:

```
CDROM: unit 3 on SCSI controller 0
```

In this example, the device number is 3 and the controller number is 0.

2. Mount the CD-ROM drive. Type

```
mount -o ro /dev/dsk/dks<controller#>d<device#>s7 /CDROM
```

using the controller and device numbers of the CD-ROM drive and press **ENTER**. For example:

```
mount -o ro /dev/dsk/dks0d3s7 /CDROM
```

## Run the Interactive Tutorial

The interactive tutorial included in your software kit is designed to provide an overview of some of the main features of the **flame** and **inferno** software, including automated rotoscoping, colour correction, compositing, keying, tracking, working with 3D models and textures, and particle generation.

If you have not already run the interactive tutorial, do so now. We strongly recommend copying the interactive tutorial to the system disk for faster playback and interaction. If you want to run it from the CD, wait at least 10 seconds before playing each movie to allow the movie to load.

### Copying the Interactive Tutorial to Your System Disk

For optimum playback of the interactive tutorial, first copy it from CD 1 to your system disk (the interactive tutorial requires about 115 MB). If you need help copying the files across the network, consult your system administrator.

1. Place CD 1, “interactive tutorial & documentation” in the CD-ROM drive of your SGI machine.

2. Log in to the **flame** or **inferno** account.

3. In a UNIX shell, type

```
cp -r /CDROM/interactive_tutorial /usr/discreet
```

and press **ENTER**. This creates a directory called *interactive\_tutorial* within */usr/discreet* and copies the interactive tutorial.

4. Go to the *interactive\_tutorial* directory. Type

```
cd /usr/discreet/interactive_tutorial
```

and press **ENTER**.

5. Start the interactive tutorial by typing one of the commands listed in the following table.

If your machine is an:	Type:
O2	<b>./tutorial -v 0x3a</b>
Octane SE	<b>./tutorial -v 0x2a</b>
Octane MXE	<b>./tutorial -v 0x3a</b>
ONYX IR	<b>./tutorial -v 0x5a</b>
ONYX IR2	<b>./tutorial -v 0x5a</b>

6. Complete the interactive tutorial at your own pace. It takes about 45 to 60 minutes to run the entire tutorial.

**Note:** If during the interactive tutorial you are not automatically advanced to the next step and there is no Continue button, simply use the navigation tools (</>) to advance.

7. Eject the CD:

a) Return to the **flame** or **inferno** home directory. Type

**cd**

and press **ENTER**.

b) Type

**eject /CDROM**

and press **ENTER**.

8. Continue with the step “Start the Software” on page 18.

## Running the Interactive Tutorial from the CD

1. Place CD 1, “interactive tutorial & documentation” in the CD-ROM drive of your SGI machine.
2. Go to the *interactive\_tutorial* directory. Position the cursor over the UNIX shell, type  
**cd /CDROM/interactive\_tutorial**  
and press **ENTER**.
3. Start the interactive tutorial using the appropriate command from the preceding table.
4. Complete the interactive tutorial at your own pace. It takes about 45 to 60 minutes to run the entire tutorial.

## Documentation Available Online

The user guide and tutorial manual for each product are available in PDF format for online viewing and printing. You can access the PDF files from any of the following locations.

### On Tutorial CD 1, “interactive tutorial & documentation”

You can view and print the PDF files on CD 1 using Adobe Acrobat Reader™ on a PC, an SGI machine, or a Macintosh. To access the PDF files from an SGI machine:

1. Place CD 1, “interactive tutorial & documentation” in the CD-ROM drive of your SGI machine.
2. Go to the *documentation* directory for your software product. For example, to view the documentation for **flame**, position the cursor over the UNIX shell, type  

```
cd /CDROM/documentation/flame
```

and press **ENTER**.
3. View the list of available documentation for the product. Type  

```
ls
```

and press **ENTER**.
4. To view one of the documentation PDF files using Adobe Acrobat Reader, type  

```
acroread <filename>
```

and press **ENTER**. For example, to view the **flame** and **inferno** tutorial manual PDF file, type  

```
acroread flame70_inferno40_tutorial.pdf
```

### On your hard drive

The documentation PDF files are installed on the hard drive of your SGI machine when you install the product software. To access the PDF files installed on your hard drive:

1. Go to the product documentation directory. Type  

```
cd /usr/discreet/<product name>/documentation
```
2. Perform steps 3 and 4 above to view the list of available documentation and to open one of the PDF files using Adobe Acrobat Reader.

### On [www.discreet.com](http://www.discreet.com)

You can also find the PDF files on the Discreet web site, [www.discreet.com](http://www.discreet.com). Go to the Support page, open the Documentation Library, and download any of the available files.

## Start the Software

When working in UNIX, use the mouse to move the cursor. Once **flame** or **inferno** is running, use the pen and tablet to move the cursor.

1. Make sure you are logged in to the **flame** or **inferno** account.
2. Position the cursor over the UNIX shell.
3. Type **flame** (to start **flame**) or **inferno** (to start **inferno**) in lowercase letters and press **ENTER**.

**Hint:** If you are using Discreet Audio, you should type **flames** or **infernors** to start the software.

After a few moments, the startup screen appears.



When the software initialization is complete, the cursor changes to a yellow cross. You use the yellow cross cursor to click menu buttons, select options, and enter values in numeric fields.



## Create a New Project

With project management in **flame** and **inferno**, you can organize your clips and setups according to job, client, image resolution, or any other category of your choosing. When starting the software, you can either select an existing project or create a new one. In this step, create a new project for the clips and setups you will generate in these lessons.

1. A raised dark blue box is an option box. Pressing an option box with the cursor reveals a list of options. For example, press the Project box to view the list of existing projects:
  - a) Position the cursor over the Project box by moving the pen over the tablet. Do not slide the pen but hold it slightly above the surface of the tablet. If you slide the pen you may accidentally enable a button other than the one you want.



- b) Press the Project box by pressing and holding the pen against the tablet.

A list of existing project names appears. If this is the first time the system is being used, the only names that appear in the list are *default* and *<new>*.

- c) Drag the cursor over *<new>*, then release the cursor by lifting the pen.

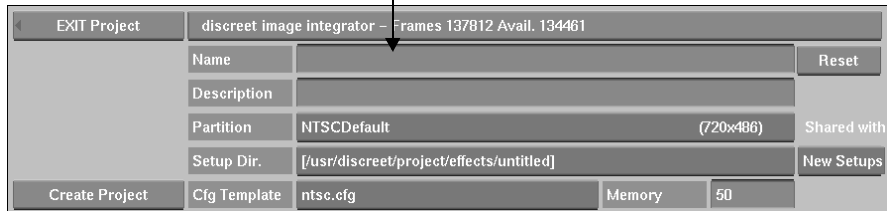


The Create Project menu appears.

**Hint:** You can adjust the sensitivity of the tablet using the Pointer Preferences menu, accessible from the System menu. For more information, see the chapter “System Utilities and Preferences” in the **flame** or **inferno** *User’s Guide*.

2. Recessed, lighter blue boxes are fields used to enter text or numeric values. Enter a name for the new project:

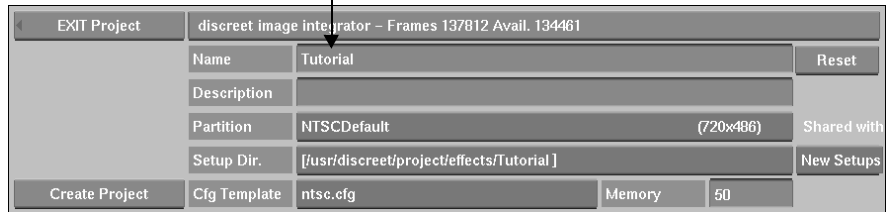
a) Click the Name field by positioning the cursor over the field and tapping the pen against the tablet.



EXIT Project	discreet image integrator – Frames 137812 Avail. 134461			
	Name		Reset	
	Description			
	Partition	NTSCDefault	(720x486)	Shared with
	Setup Dir.	[/usr/discreet/project/effects/untitled]		New Setups
Create Project	Cfg Template	ntsc.cfg	Memory	50

b) Type the name “Tutorial” and then press **ENTER**.

You are returned to the Create Project menu and the project name appears in the Name field.



EXIT Project	discreet image integrator – Frames 137812 Avail. 134461			
	Name	Tutorial	Reset	
	Description			
	Partition	NTSCDefault	(720x486)	Shared with
	Setup Dir.	[/usr/discreet/project/effects/Tutorial ]		New Setups
Create Project	Cfg Template	ntsc.cfg	Memory	50

Notice the Setup Dir. (setup directory) box is updated to show the pathname of the project directory, */usr/discreet/project/effects/Tutorial*.



Setup Dir.	/usr/discreet/project/effects/Tutorial
------------	--

Each project created in **flame** or **inferno** uses a different directory on the system disk for storing setups and other files. Within the project directory, there is a separate subdirectory for each module. The pathname—a series of directory names separated by slashes (/)—indicates where the setup files are stored. For example, all Keyer setups saved while working in the *Tutorial* project are saved by default in the */usr/discreet/project/effects/Tutorial/key* directory.

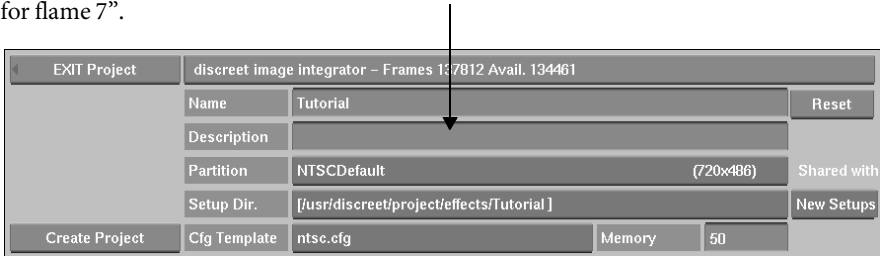
You will learn more about setup files and the project directory in later lessons as you create and save setups.

**Hint:** A directory pathname is suggested by the software. However, you can share setups between projects by selecting an existing pathname from the Setup Dir. box. You can also select <new> and select another pathname using the file browser. For information about



how you can save space on your system disk when creating many new projects, see the chapter “Project Management” in the *flame* or *inferno* User’s Guide.

- 3. (Optional) Click the Description field and enter a project description, such as “tutorial for flame 7”.



The screenshot shows a dialog box titled "EXIT Project" with a subtitle "discreet image integrator - Frames 137812 Avail. 134461". It contains several input fields: "Name" (Tutorial), "Description" (empty), "Partition" (NTSCDefault, 720x486), "Setup Dir." ([usr/discreet/project/effects/Tutorial]), "Cfg Template" (ntsc.cfg), and "Memory" (50). There are "Reset" and "New Setups" buttons. An arrow points to the "Description" field.

EXIT Project	discreet image integrator - Frames 137812 Avail. 134461			
Name	Tutorial			Reset
Description				
Partition	NTSCDefault (720x486)			Shared with
Setup Dir.	[usr/discreet/project/effects/Tutorial]			New Setups
Create Project	Cfg Template	ntsc.cfg	Memory	50

## Create a New Partition

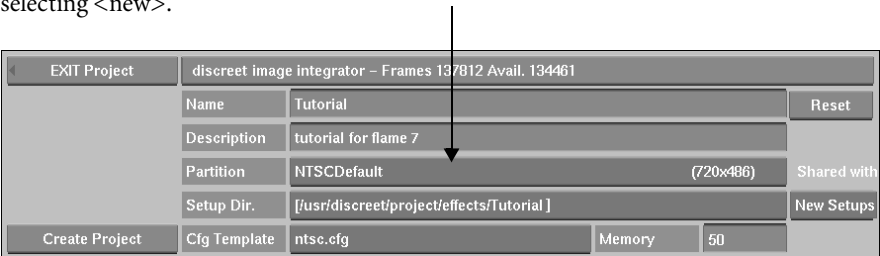
In *flame* and *inferno*, clips are stored on an external disk array called the framestore. Although it is located on an external device, the framestore is directly accessed by the software when editing and processing clips.

The framestore can be divided into multiple partitions. Each partition is a separate area of the framestore configured to store clips of a specific resolution, such as NTSC or PAL.

If this is the first time you are running *flame* or *inferno*, you must create a new partition for this project. When setting up a new project in the future, you can either create another new partition to keep your clips separate from those of other projects, or share partitions between projects by selecting an existing partition from the Partition box.

In this step, create a new partition to store the clips for the *Tutorial* project.

- 1. Open the Framestore Setup menu to create a new partition by pressing the Partition box and selecting <new>.



The screenshot shows the same dialog box as above, but the "Description" field now contains the text "tutorial for flame 7". An arrow points to the "Description" field.

EXIT Project	discreet image integrator - Frames 137812 Avail. 134461			
Name	Tutorial			Reset
Description	tutorial for flame 7			
Partition	NTSCDefault (720x486)			Shared with
Setup Dir.	[usr/discreet/project/effects/Tutorial]			New Setups
Create Project	Cfg Template	ntsc.cfg	Memory	50

The Framestore Setup menu appears. The partitions on your framestore are listed in the top area of the screen. For example, the framestore on this system already has an *NTSC Default* partition.

stonefs		Total 26030.00 MB				
		Free 25341.00 MB				
Frames						
No.	Partition Name	Capacity	Used	Audio Segs.	Total MB	%
0	NTSCDefault	31100	0	0	12.00	0.05

**Hint:** You can share partitions between projects by selecting an existing partition from the Partition Box.

- Set up a new partition called “Tutorial”:

a) Select Add.

b) Click the Name field, press **ESC** to clear the default name, type “Tutorial”, and press **ENTER**.

- c) Select either NTSC or PAL.

- d) Select Proxies Not Stored. See “Storing Proxies” below.

When you select either NTSC or PAL, the correct parameters for the selected resolution are entered automatically in the appropriate fields. You must use either an NTSC or a PAL partition to load the clips from the CD archive.

## Storing Proxies

A proxy is a scaled-down version of a frame which is stored on the framestore. Proxies are used to speed up the interaction of the desktop as well as allow real-time playback when it is not possible to do so with the full frames. If you do not need to store proxies, for instance, if you are working in video resolution, select Proxies Not Stored.

The Proxy Size control is used to specify the size of the image proxies that will reside in the partition. For information on determining the best proxy size, see the chapter “Framestore Setup” in the *flame* or *inferno* user’s guide.

3. Click Apply to create the partition. (Don't worry— you cannot delete or destroy any information or clips by adding a new partition.)

The *Tutorial* partition is activated and appears in the partition list. This is the partition in which you will save all clips created in these lessons.

stonefs				Total 34724.00 MB		
				Free 30344.00 MB		
Frames						
No.	Partition Name	Capacity	Used	Audio Segs.	Total MB	%
0	NTSCDefault	31100	0	0	12.00	0.05
1	<i>Tutorial</i>	31100	0	0	1.00	0.00

**Note:** If the *Tutorial* partition does not appear in the list, there is not enough space remaining on the framestore to create a new partition. You can either delete some of the clips from the existing clip libraries and try again, or use an existing partition for the *Tutorial* project.

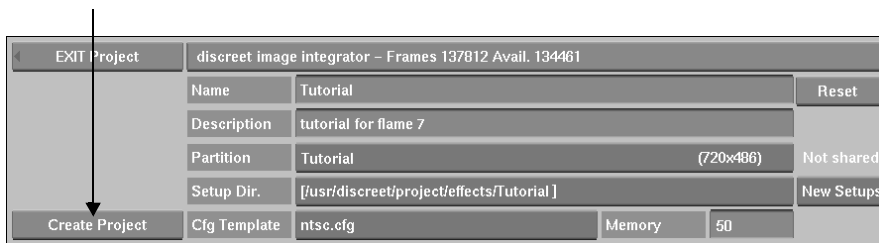
4. Click EXIT Framestore Setup to return to the Create Project menu.

## The Partition List

The partitions in the framestore are listed above the Framestore Setup menu. The list contains the following fields.

Field Name	Description
No.	The partition number. The number of any given partition may change as you add and delete partitions. For this reason, a partition is always identified by its name rather than its number.
Partition Name	The name of the partition.
Capacity	The total capacity of the partition in frames.
Used	The total number of frames used in the partition.
Audio Segs.	The amount of space taken up by audio data, in video frames of the partition resolution.
Total MB	The amount of disk space used by the frames currently stored in this partition.
%	The percentage of framestore space used by the frames currently stored in this partition.

5. The Project setup is now complete. Click Create Project.



EXIT Project	discreet image integrator - Frames 137812 Avail. 134461			
Name	Tutorial			Reset
Description	tutorial for flame 7			
Partition	Tutorial (720x486)			Not shared
Setup Dir.	[/usr/discreet/project/effects/Tutorial]			New Setups
Create Project	Cfg Template	ntsc.cfg	Memory	50

It takes a few moments for the project to be created. When the process is complete, you are returned to the Project Management menu.

## Create a New User

Menu preferences and keyboard commands, or hot keys, are saved by user name. Projects and users are created separately, so you can carry your user preferences over different projects, and any user can start a given project.

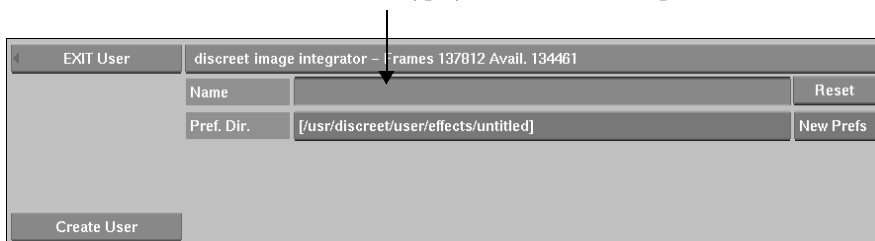
Define a user name that you can use for the *Tutorial* project as well as any other projects you are working on.

1. Press the User box and select <new>.



Project	Tutorial	(Tutorial : 720x486)	Edit
User	default		Edit

2. Enter a user name: click the Name field, type your name and then press **ENTER**.



EXIT User	discreet image integrator - Frames 137812 Avail. 134461	
Name		Reset
Pref. Dir.	[/usr/discreet/user/effects/untitled]	
		New Prefs
Create User		

3. Click Create User.

It takes a few moments to create the user. When the process is complete, you are returned to the Project Management menu.

4. Click Start or press **ENTER** to continue the software initialization using the *Tutorial* project and your user name.

When the software initialization is complete, a yellow cross cursor appears.







## Sharing User Preferences

The Pref. Dir. (Preferences Directory) box shows the directory on the computer's system disk where menu preferences and hot key definitions created by this user are saved by default. A separate directory is created for each user.

A directory pathname is suggested by the software. However, you can share preferences and hot keys with other users by selecting an existing pathname from the Pref. Dir. box. You can also select <new> and select another pathname using the file browser.

## Tour the Desktop

The commands and modules of the software are grouped under six menus accessed from the Main menu in the bottom-left corner of the screen. You use these commands and modules to execute processing sequences and to apply effects to clips.

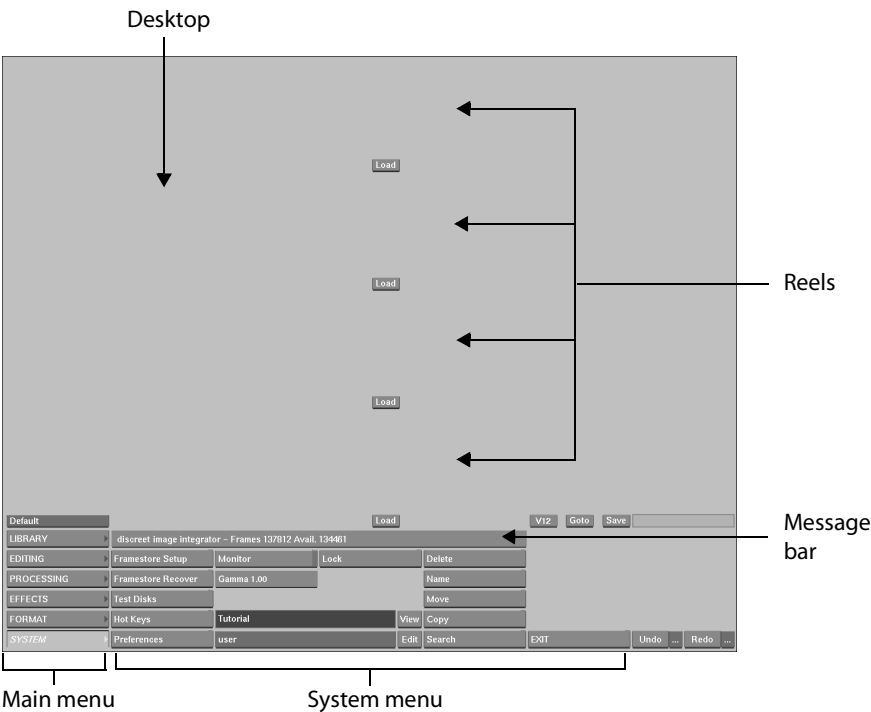
Click:	To:
	Open the Library menu. The Library menu provides management and archiving functions for clips and image files. You can use the network library to access clip libraries in other partitions. You can also transfer clips to and from an external recording device or the file system.
	Open the Editing menu. The Editing menu provides commands for editing and assembling clips. You can cut, splice, reverse, and copy clips. You can also perform mixes, dissolves, crossfades, change the timing of a clip, and access the EDL menu for importing EDLs.
	Open the Processing menu. The Processing menu provides image processing commands that are applied across all frames in a clip. You can also change the colours of a clip and perform colour corrections.
	Open the Effects menu. The Effects menu contains modules for compositing and adding special effects to clips.
	Open the Format menu. The Format menu contains video and film setup commands. There are commands for changing the field dominance and for interlacing, deinterlacing, and merging the fields in a clip.
	Open the System menu. The System menu contains setup and utility commands. The EXIT command, used to end the current work session, is also found in the System menu.

1. Open the System menu:

- a) Move the pen over the tablet to position the cursor over the System button.
- b) Click the System button by quickly tapping the pen on the tablet.



The desktop and the menu panel appear, and the System menu appears in the menu panel.



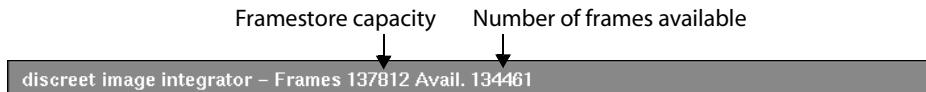
## The Desktop

The top part of the screen is the desktop, which is divided into a number of reels. You view, edit, and process clips on the reels. When you start **flame** or **inferno** for the first time, the reels are empty. In Lessons 2 and 3, you learn how to display clips on the reels by loading clips from a clip library or an external source.

**Hint:** You can change the number of reels using the Reels field in the Desktop Preferences menu, accessible from the System menu. Choose between four and eight reels.

## The Message Bar

Clips that you load and process in **flame** or **inferno** are stored in the framestore (learn more about the framestore in Lesson 2, “Working at Different Resolutions”). The framestore capacity and the number of frames available appear in the message bar. As you work, error messages and other processing information also appear in the message bar.



## Buttons, Fields, and Option Boxes

As you have already seen by using the Project Management menu, the menus contain three general types of controls: buttons, option boxes, and text or numeric fields.

- A menu button is an embossed grey box containing text. Click a menu button to initiate an action or to display a submenu. The button is highlighted when enabled.
- An option box is used to select a processing mode or display option from a pop-up menu.
- A field is used to enter a numeric value or text. Black fields convey information that generally cannot be altered.



## Name the Desktop

You can name and save the desktop, which allows you to have separate desktops for each project. Saving the desktop saves all of the reels with their clips. Learn how to save the desktop when you learn about the clip library in Lesson 3, “Clip Management”.

1. Click the Desktop Name field to open the on-screen keyboard.



2. Type a name, for example, “Lessons\_Desktop”. Use the workstation keyboard or click the keys on the on-screen keyboard.
3. Press **ENTER**.

You are returned to the Main menu. The name *Lessons\_Desktop* appears in the Desktop Name field.



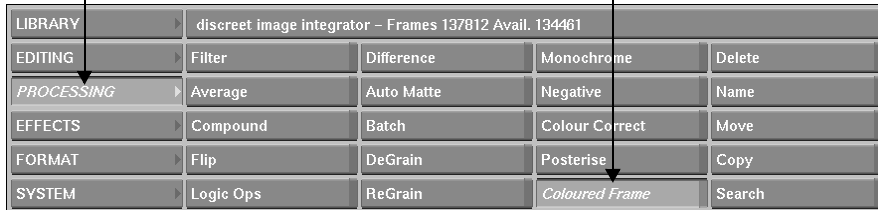
## Select the Coloured Frame Command

Use Coloured Frame in the Processing menu to create a colour noise clip. You can also use this command to create colour frames and clips of colour bars.

### 1. Select Coloured Frame:

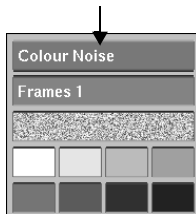
a) Click Processing to open the Processing menu.

b) Click Coloured Frame.



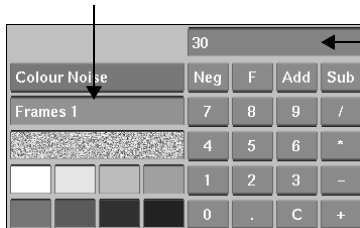
The Coloured Frame menu appears. The cursor changes to a white arrow, meaning that you must select a destination reel (see “The Arrow Cursor” on page 31). First, set the options for the command.

### 2. Press the Frame Mode box and select Colour Noise.



### 3. Create a clip that is 30 frames long:

a) Click the Frames field.



b) The numeric keypad appears. Use the keypad to enter the number 30, just like you would on a calculator. When you click a number, it appears in the keypad field. If you make a mistake, click C to clear the keypad field.

c) Click the keypad field to update the value in the Frames field.

**Hint:** You can also use the numeric keypad on the workstation keyboard to enter numbers.

## Select a Destination Reel

Use the white arrow cursor to select a destination reel. The destination reel is the reel where you want to place the clip generated by the selected command or module. You can select any reel as the destination reel, and a different destination reel for every command.

There are two ways of selecting a destination reel:

- Click anywhere on the reel, even on top of another clip. This places the generated clip after all other clips on the reel.
- Click the top-left corner of the last frame of a clip on the reel. This places the generated clip immediately after the clip on the reel.

### The Arrow Cursor

When you click one of the module buttons, the cursor changes from a yellow cross to an arrow.

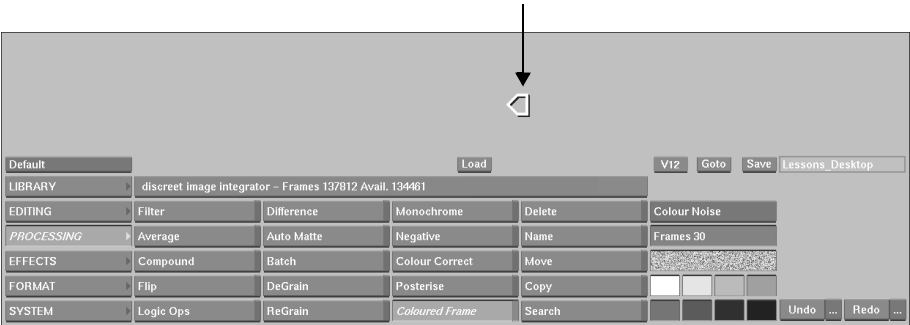
Use the arrow cursor to select the frames and clips that you want to edit or process. For some modules, you must select more than one clip. For example, if you select Action in the Effects menu, you must select three different clips to open the module: a front clip, a back clip, and a matte clip.

As you select each clip, the colour of the arrow cursor changes. Each module has its own clip requirements, but the colour coding of the arrow cursors remains the same for all modules. The most common colour codes for the arrow cursors are listed below.



Colour	Function
Red	Select the first source clip, or front clip. If the operation requires a second source clip, the arrow turns green. Otherwise it turns white.
Green	Select the second source clip, or back clip. If the operation requires a matte clip, the arrow turns blue. Otherwise it turns white.
Blue	Select the matte clip. The arrow turns white.
White	Select a destination reel for the generated clip.

Select a destination reel for the colour noise clip by clicking one of the reels on the desktop.



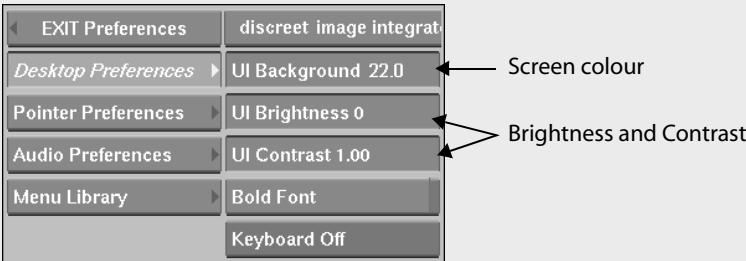
A 30-frame colour noise clip appears on the destination reel. Notice that the frames in the clip are outlined in red. This helps you to identify the last clip generated on the reels.

Also notice that a number of new buttons appear below the clip. Learn how to use these reel control buttons in “Exercise 2: Viewing Clips” on page 41.

## Adjusting the Screen Colour

You can adjust the colour of the screen using the UI Background field in the Desktop Preferences menu. Click the Preferences button in the System menu, then Desktop Preferences to open the menu.

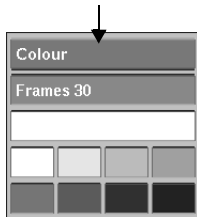
The background colour can range from 0 (black) to 100 (white). The default value is 22. At values of 40 or more, also adjust the brightness and contrast of the UI. Because these are user preferences, the values you set are saved under your user name, and are restored when you open any project using the same user name.



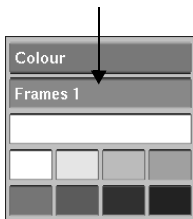
## Create a Coloured Frame

Use Coloured Frame to create a single black frame.

1. Click Coloured Frame in the Processing menu.
2. Press the Frame Mode box and select Colour.

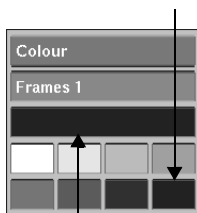


3. Create a single frame. Instead of using the keypad, press the Frames field and drag to the left until the value is 1.



Dragging left decreases the value in the field. Dragging right increases it. The more pressure you apply with the pen, the more quickly the value changes.

4. Change the colour for the clip to black by clicking the black colour pot.



Black appears in the current colour field.

5. Select a destination reel by clicking any reel on the desktop.

A black frame appears on the destination reel.

## Name a Clip

When generated, the colour noise clip was assigned the default name `COL_NOISE`. Use the Name command to change the name of the clip.

1. First, make sure the system is set to display the clip name and the length of the clip:

a) Click System to open the System menu.

LIBRARY	discreet image integrator – Frames 137812 Avail. 134461			
EDITING	Framestore Setup	Monitor	Lock	Delete
PROCESSING	Framestore Recover	Gamma 1.00		Name
EFFECTS	Test Disks			Move
FORMAT	Hot Keys	Tutorial	View	Copy
SYSTEM	Preferences	user	Edit	Search

b) Click Preferences to open the Preferences menu.

**Note:** Your menus may look slightly different from those shown here, depending on which options were last selected.

2. Select the clip identification options:

a) Click Desktop Preferences to open the Desktop Preferences menu.

b) Select No Frame Display.

EXIT Preferences	discreet image integrator – Frames 137812 Avail. 134461			
Desktop Preferences	UI Background 22.0	Soft Edits	Proxy Transp 50	AutoSave 150 Seconds
Pointer Preferences	UI Brightness 0	Soft Cuts	No Frame Display	Display Interlaced
Audio Preferences	UI Contrast 1.00	Audio Follows Video	Names & Duration	Proxy Aspect On
Menu Library	Bold Font	Gestural Editing	Frame Display	4 Reels
	Keyboard Off	Scale Setups		Right ----> Left

c) Select Names and Duration.

The number of frames and default name appear in the bottom-left corner of each frame of the colour noise clip.

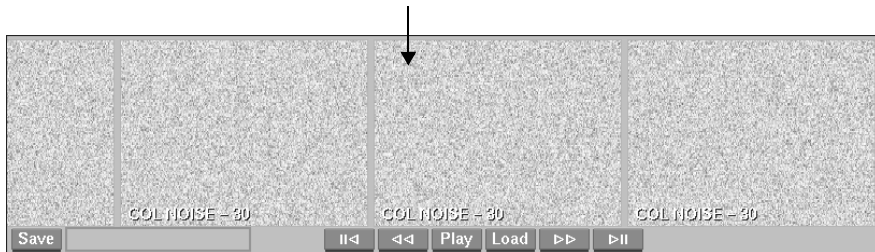
COLNOISE - 30				
Save		II<	<<	Play Load >> II

3. Click EXIT Preferences to return to the System menu.
4. Click Name.

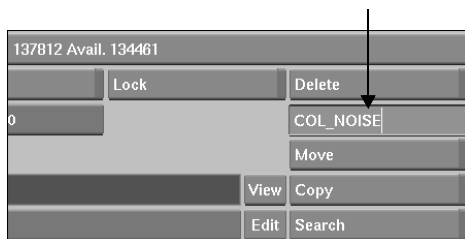


The cursor changes to a red arrow, indicating that you must select the source clip.

5. Select the colour noise clip by clicking the top-left corner of any frame of the clip.



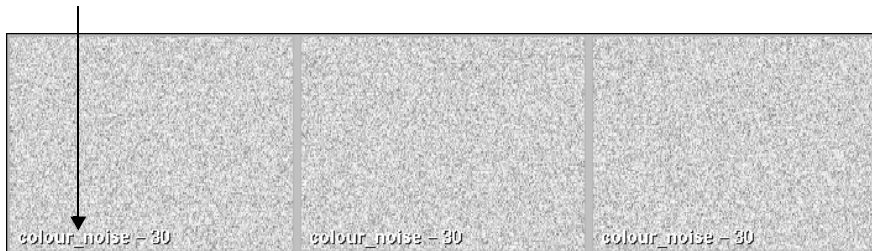
The current name, COL\_NOISE, appears in the Name field.



6. Press **ESC** to clear the current name.

7. Type “colour\_noise” and then press **ENTER**.

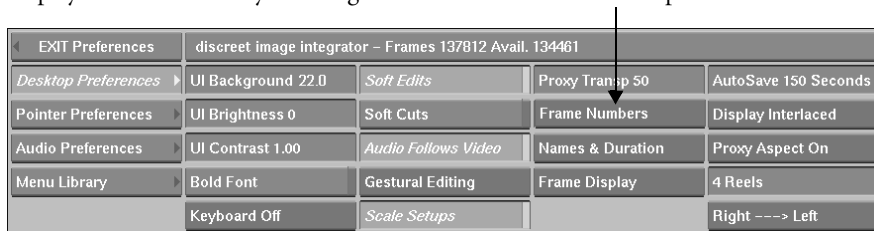
The name *colour\_noise* appears in the bottom-left corner of each frame of the clip.



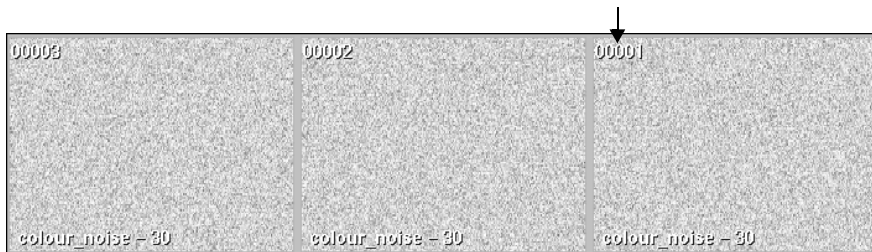
## Display Frame Numbers and Timecodes

Change the clip identification display mode.

1. Click Preferences in the System menu, then click Desktop Preferences.
2. Display frame numbers by selecting Frame Numbers in the Desktop Preferences menu.



The frame numbers appear in the top-left corner of the frames, starting at 00001.

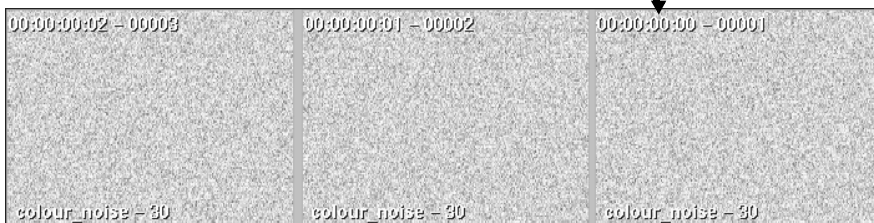




### 3. Display timecodes by selecting Source TimeCode.

EXIT Preferences	discreet image integrator – Frames 137812 Avail. 134461			
Desktop Preferences ▶	UI Background 22.0	Soft Edits	Proxy Transp 50	AutoSave 150 Seconds
Pointer Preferences ▶	UI Brightness 0	Soft Cuts	Source TimeCode	Display Interlaced
Audio Preferences ▶	UI Contrast 1.00	Audio Follows Video	Names & Duration	Proxy Aspect On
Menu Library ▶	Bold Font	Gestural Editing	Frame Display	4 Reels
	Keyboard Off	Scale Setups		Right ----> Left

The source timecode appears next to the frame numbers in the clips, starting at 00:00:00:00.



### 4. Change the playback direction by selecting Left ---> Right.

EXIT Preferences	discreet image integrator – Frames 137812 Avail. 134461			
Desktop Preferences ▶	UI Background 22.0	Soft Edits	Proxy Transp 50	AutoSave 150 Seconds
Pointer Preferences ▶	UI Brightness 0	Soft Cuts	Source TimeCode	Display NonInterlaced
Audio Preferences ▶	UI Contrast 1.00	Audio Follows Video	Names & Duration	Proxy Aspect On
Menu Library ▶	Bold Font	Gestural Editing	Frame Display	4 Reels
	Keyboard Off	Scale Setups		Left ----> Right

The clip is inverted.

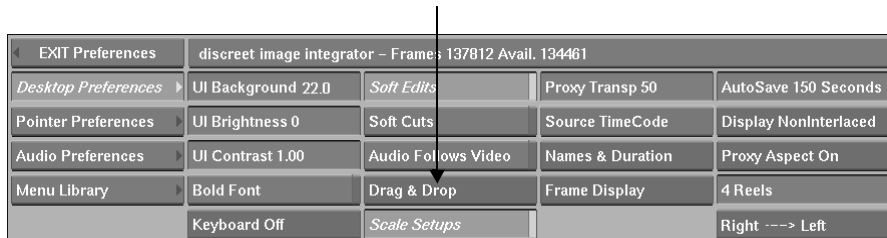
**Hint:** You can set the playback direction according to your personal preference. You can also select either Top ----> Bottom or Bottom ----> Top to arrange the clips on the desktop vertically.

### 5. The remainder of Lesson 1 and all subsequent lessons have been designed with Right ----> Left as the selected playback direction. Select this option to reset the playback direction.

## Use Drag and Drop on the Desktop

You can copy, move, and delete clips on the desktop using either drag and drop actions or the dedicated menu buttons. In this step, use drag and drop to copy, move, and delete the colour noise clip.

1. Select Drag & Drop in the Desktop Preferences menu.



2. Click EXIT Preferences to return to the System menu.

3. Make a copy of the *colour\_noise* clip:

a) Press and hold **SPACEBAR** on the keyboard.

b) Grab the clip by pressing anywhere on the clip and dragging.



c) Drag the copy to another reel and drop it by releasing the cursor and space bar.

**Hint:** You can change the clip transparency using Proxy Transp in the Desktop Preferences menu.

4. Name the copied clip “copy”. For instructions, see “Name a Clip” on page 34.

5. Move the *copy* clip to another reel:

a) Grab the clip by pressing any frame of the clip.

b) Drag the clip to another reel and release the cursor.

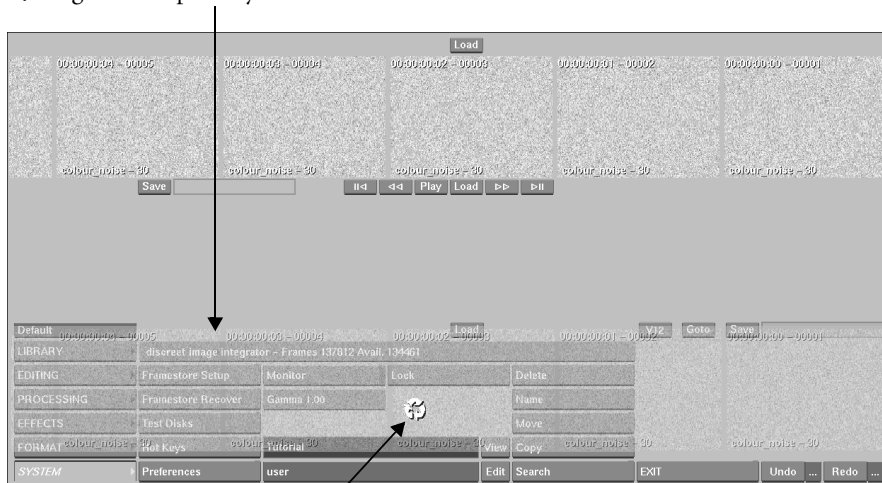



6. As you work through these lessons, clips will accumulate on the reels. To avoid clutter and free up space on the framestore, delete the clips you no longer need.

Delete the *copy* clip:

a) Grab the clip by pressing anywhere on the clip.

b) Drag the transparency towards the bottom of the screen.



c) When the recycle cursor  appears, release the cursor to delete the clip.

**Hint:** You can also use the Delete button in the menu panel to delete individual clips, all clips on a single reel, or all clips on the desktop.

7. Undo the last operation by clicking Undo.



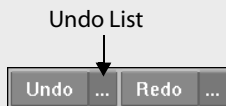
The *copy* clip reappears on the desktop.

8. Click Redo to redo the last operation.

The *copy* clip is deleted.

## Using Multiple Undo Levels

**flame** and **inferno** include multiple levels of Undo. To undo the last action, click Undo. To undo multiple actions, click the Undo List and select an action. All actions up to and including the one selected are undone.



Use the Redo List in the same way to redo actions.

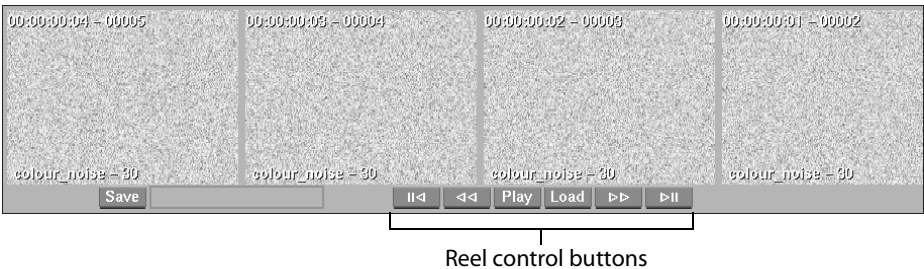
You can set the number of levels of Undo using the Undo Levels field in the Desktop Preferences menu (accessed through the System Preferences menu).

# Exercise 2: Viewing Clips

In this exercise, learn how to view clips using the reel control buttons, Player controls, image window controls, and timeline.







## Use the Reel Control Buttons

When the colour noise clip was generated on the reel, the reel control buttons appeared. Use the reel control buttons to scroll the clips on the reels or to access the Player to play a clip at full resolution.



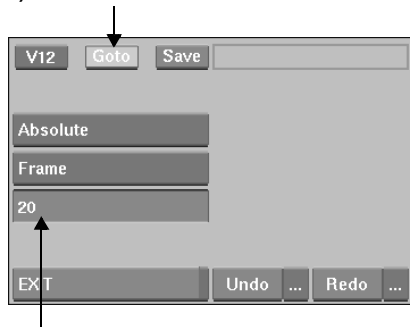
1. Practice using the reel control buttons to scroll through the *colour\_noise* clip.

**Note:** The following table applies to reel control with playback direction set to Right ---> Left. See Instruction 4 on page 37.

Click:	To:
	Advance to the next clip on the reel.
	Scroll the clip forwards.
	Open the Player. See “Play the Clip” on page 44.
	Load a new clip onto the reel. See Lesson 3, “Clip Management”.
	Scroll the clip in reverse.
	Go to the previous clip on the reel.

2. Try using the Goto button to go to a specific frame of a selected clip:

- a) Click the Goto button.



- b) Enter the frame number.

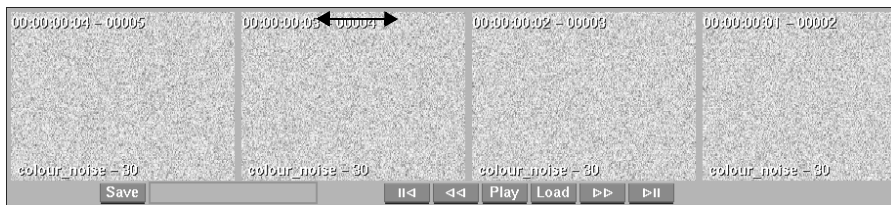
- c) Select the clip.


To specify a timecode instead of a frame number, select Source Timecode.

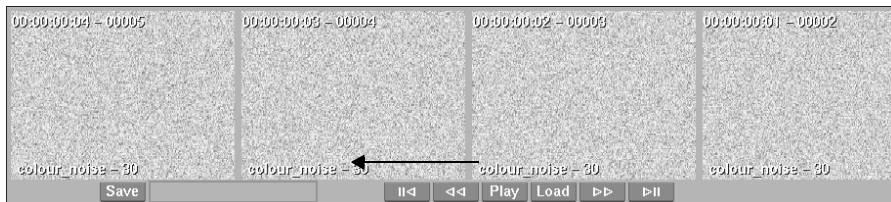
**Hint:** Click in the grey area of the menu panel to deactivate Goto mode.


3. In addition to using the reel control buttons, you can use any of the following methods to scroll through a clip:

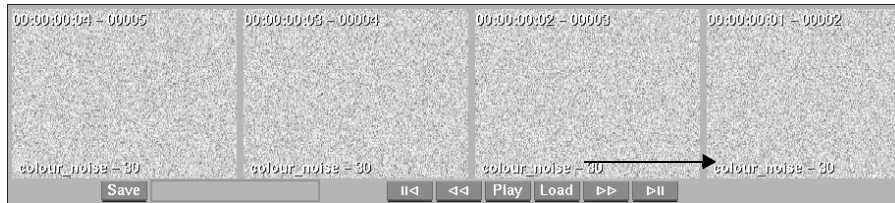
- a) Drag the cursor in either direction along the top of any frame on the reel. The entire clip is played within the selected frame.



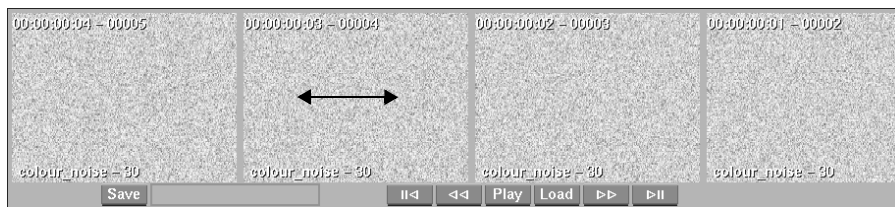
- b) Press and hold the cursor on the hotspot above the  reel control button to play forwards through the clips on the reel. Dragging the cursor to the left makes the clips play faster.



c) Press and hold the cursor on the hotspot above the  reel control button to play the clips in reverse. Dragging the cursor to the right makes the clips play faster.



d) Press in the centre of a frame and drag in either direction to scroll the clip.



## Collapse the Clip

You can view more clips on the desktop by collapsing the clips.

1. Collapse the *colour\_noise* clip by positioning the cursor over any frame of the clip and pressing **C**.

Only the current frame is visible in the collapsed clip, and the clip has a stacked appearance. Scroll through a collapsed clip by pressing on the top of the frame and dragging in either direction.



2. Expand the clip by placing the cursor over the clip and pressing **C** again.

**Hint:** To collapse or expand all clips on a reel, place the cursor over the grey space between any two clips and press **C**. Do the same for all clips on the desktop by placing the cursor over the menu panel and pressing **C**.

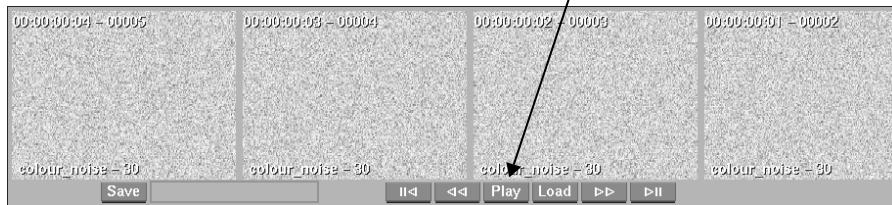
## Play the Clip

To preview the results of an edited or processed clip, use the Player to play the clip in a larger window at full resolution.

1. Load the *colour\_noise* clip into the Player:

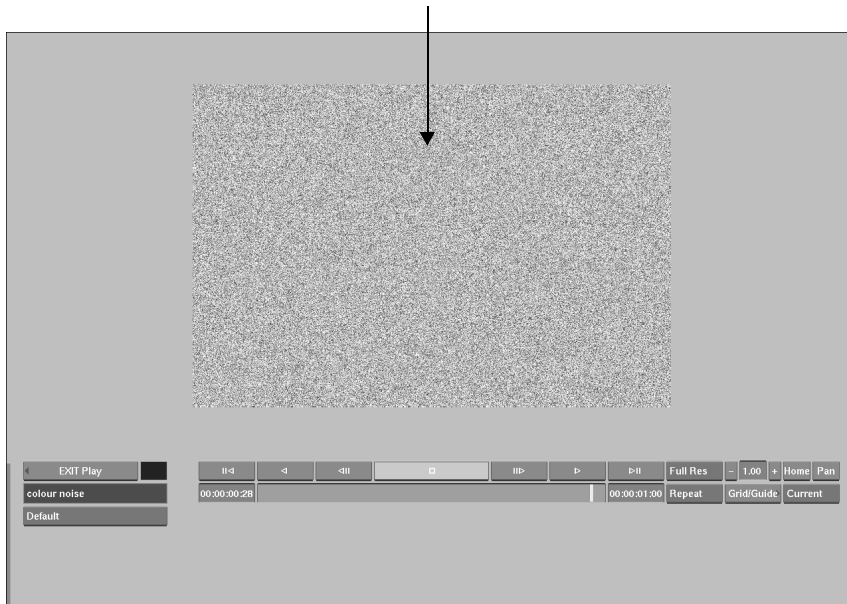
a) Position the clip above the reel control buttons.

b) Click Play.



**Hint:** You can also load a clip into the Player by positioning the cursor over any frame of the clip and pressing **Esc**.

The colour noise clip appears in the image window.





**Hint:** If you selected Proxies Not Stored when creating the partition for your project (for example, when working at video resolution) the image is displayed at full resolution. If you select Proxies Stored (for example, when working at film resolution, the image appears as an image proxy, or low resolution, by default. You can view the clip at full resolution by selecting Full Res.



## 2. Play the clip:

a) Select Repeat to play the clip continuously.



b) Click to play the clip.

**Hint:** You can also play the clip by pressing in the image window. Dragging right or left changes the playback rate, and also switches between forward and reverse playback.

## 3. Click to stop the clip while it is playing.

## Ratio On/Off

Use the Ratio On/Off box in the Grid/Guide menu to select the frame aspect ratio used for image display.



Select Ratio Off to display the image using square pixels. This option enhances performance by eliminating the need to map pixels with a non-square aspect ratio onto the square pixels of the SGI monitor.

Select Ratio On to display the image using the frame aspect ratio specified in the project partition.

To properly view video aspect ratio, it is recommended you select Ratio Off and view the result on a broadcast monitor.

## Use the Image Window Controls and the Timeline

Practice using the image window controls and the timeline to play the clip.

### 1. Examine the timeline:

**a)** The play bar in the timeline indicates the relative position of the current frame in the clip. Play the clip by clicking in the timeline where you want play to start, then dragging left or right.










**b)** The Frame Number field shows the timecode or frame number of the current frame in the image window. To go to a different frame, click this field and enter the new frame number.

**c)** The Total Frames field shows the duration of the clip in timecode or frames.

You can toggle between frame number, source timecode, and record timecode by clicking the Total Frames field.







- Hot keys, or keyboard shortcuts, are also available for playing the clip. Practice using the image window controls and hot keys. Notice how the Frame Number field and position of the play bar are updated as you use the controls.

Click:	Or press:	To:
	<b>CTRL+LEFT ARROW</b>	Go to the first frame.
	<b>CTRL+ENTER</b>	Play backwards.
	<b>LEFT ARROW</b>	Go to the previous frame.
	<b>SPACEBAR</b>	Stop playing.
	<b>RIGHT ARROW</b>	Go to the next frame.
	<b>ENTER</b>	Play forwards.
	<b>CTRL+RIGHT ARROW</b>	Go to the last frame.

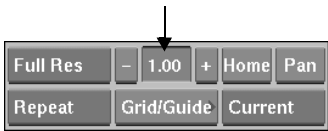
- You can view a list of hot keys using the Hot Key Editor. In any menu, press **F8** to open the Hot Key Editor. The list on the left shows the defined hot keys for that menu. Press **F8** a second time to close the editor. Learn how to create your own hot keys using the Hot Key Editor in “Define a Hot Key” on page 114.

## Zoom and Pan the Image

1. Practice zooming in, zooming out, and panning the image.

Click:	Or press:	To:
	<b>CTRL+UP ARROW</b>	Zoom in on the image.
	<b>CTRL+DOWN ARROW</b>	Zoom out from the image.
	<b>HOME</b>	Toggle between the original size image window and the last pan or zoom position.
	<b>SPACEBAR</b> and press the image	Pan the image. Press and drag the hand cursor in the image window.

2. Enter a value to zoom in or out.



3. To centre the image on the screen, quickly move the cursor across the swipe bar at the left or right edge of the menu panel.

**Hint:** To disable the full-screen swipe:

a) Select Setup to view the Setup menu.



b) Click the Swipe Enabled/Disabled box in the Setup menu.

4. Click EXIT Play or press **ESC** to return to the reels.

## End the Work Session

You must exit **flame** or **inferno** before beginning Lesson 2. End the work session at any time using the EXIT command in the System menu.

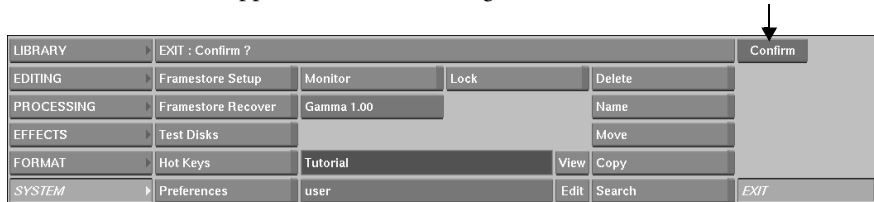
1. Select EXIT:

a) Click System.

b) Click Exit.



2. A red Confirm button appears next to the message bar. Click Confirm to exit.



**Hint:** To cancel, click the grey area of the menu panel.

## Recovering From a System Failure

Occasionally, the system may cease to respond—the cursor seems to “freeze” on the screen due to a system error. If this happens, end the work session from a UNIX shell.

1. Return to the UNIX desktop by pressing **F5**. The UNIX shell used to start the software appears on top of the **flame** or **inferno** desktop.

**Note:** To return to the **flame** or **inferno** desktop, move the cursor over the desktop and press **F6**.

2. Place the cursor over the UNIX shell, type **kf** (for **flame**) or **ki** (for **inferno**) and press **ENTER**.

kf stands for “kill flame,” and ki stands for “kill inferno.” Both are defined in your .cshrc file.

For more information on recovering from a system failure, see the chapter “The System and Preference Menus” in the **flame** or **inferno** *User’s Guide*.

## Things to Remember

- When you start **flame** or **inferno**, use the Project Management menu to create a new project and user, or to select an existing project and user.
- The software consists of various modules and commands grouped under six menus that are accessed from the Main menu.
- A clip generated by a module is placed on the destination reel. The destination reel can be any reel on the desktop.
- Use the different colour arrow cursors to select the clips and destination reel for the generated clip.
- To select a clip on the desktop, click the top-left corner of any frame of the clip.
- Use the lighter blue fields to enter text or numeric values. Click the field to enter the new value.
- You can also change a numeric value by pressing the field and dragging left to decrease the value, or right to increase it.
- Use the darker blue option boxes to select the processing mode for the command. Press the box and select one of the pop-up menu options.
- Use the reel control buttons to view the clips on the desktop.
- Play a clip at full resolution in the Player.
- Use the playback controls and the timeline to play the clip in the image window.
- Use the Coloured Frame command to generate a colour noise clip, a clip of a solid colour, or colour bars.
- Use the Name command to name a clip.
- You can use drag and drop actions to move, copy, and delete clips (make sure the Drag & Drop option is selected in the System Desktop Preferences menu). There are also dedicated menu buttons to perform these actions.

# Working at Different Resolutions



In **flame** and **inferno**, you can create multiple partitions in which to store clips at different resolutions on your framestore. For example, you can store NTSC, PAL, and film resolution clips on the same framestore. You can easily switch from one partition to another, as well as load clips from one partition for use in another.

In this lesson:

- Learn more about partitions and the framestore
- Create a new project configured to use a new film partition
- Access the clips in the film partition from your NTSC or PAL partition
- Copy the setup files from CD to your project directory
- Use the file browser to access the UNIX file system from within **flame** or **inferno**
- Import a clip from the UNIX file system

Time to complete this lesson: 30 minutes

## About the Framestore

As you learned in Lesson 1, the disk array, or framestore, is an integral part of the **flame** and **inferno** environment. All of the clips loaded from VTRs, tapes, and other external devices, as well as the clips you are currently working on in the software, are stored in the framestore.

Although the framestore is located on an external device, it is directly accessed by **flame** or **inferno** when editing, processing, and applying special effects to clips.

During the software installation, the framestore is configured to use one or more volumes. A volume is simply a section of the disk array. Because most systems use one volume only, this level of division is usually transparent to the user.

As you are using **flame** or **inferno**, you can divide the framestore volume into a number of partitions of the same or different resolutions. For example, you created an NTSC or PAL resolution partition called *Tutorial* in Lesson 1. In this lesson, you will create a second partition for storing film resolution images.

**Note:** The Discreet Filesystem is the component of the software responsible for the creation and management of the partitions. In order to complete this lesson, the Discreet Filesystem software must be installed on your computer. For information, see the **flame** or **inferno** *Installation Guide*.

In **flame** and **inferno**, you can organize clips within clip libraries. A clip library in a framestore partition is like a folder in a directory on a PC. For example, all clips stored in clip libraries in an NTSC partition are at NTSC resolution. The number of clips that can be saved is limited only by the size of the framestore. Removing clips from a clip library in one partition frees up space that can be used by another.

## Accessing Clip Libraries in Other Partitions

Using the network library, you can load clips from or save clips to clip libraries in other partitions on your framestore. The resolution of the clips is converted automatically during the transfer.

If **wire**® is installed on your system, you can also access clip libraries in the framestores of other **effect**, **flint**®, **flame**®, or **inferno**® systems through the network library. A special licence is required to run **wire**.



## Exercise: Creating a New Partition

In this exercise, create a new project and configure it to use a film resolution partition, then load a sequence of image files into the film partition. Next, load the clip from the film partition into your NTSC or PAL partition.

**Note:** To complete this exercise, the Discreet Filesystem software must be installed on your computer. For information, see the *flame* or *inferno* *Installation Guide*.

### Copy the Setup Files to Your System Disk

In *flame* and *inferno*, a setup file is a text file containing data and menu settings for a specific module. For example, a Keyer setup file contains the menu settings used to key a specific clip.

As you learned in Lesson 1, each project uses a different directory for storing setup files. This directory is defined in the Setup Dir. field of the Create Project menu when the project is created.

The image files for this lesson and the setup files for the other exercises in this tutorial are provided on CD 2, “setups & images.” Before continuing, copy the setup files to the *Tutorial* project directory on your system disk. You will learn how to save your own setups in the project directory as you complete the tutorial lessons.

**Hint:** Whereas clips are stored in the framestore, setup files, 3D models, EDLs, and images files are saved on the system disk. These files cannot be recovered if they are deleted from the system disk. Remember to back them up regularly.

1. If you are currently running *flame* or *inferno*, exit the software: click System to open the System menu, click EXIT, and Confirm.
2. Open a new UNIX shell and log in as super-user.
3. To access the files on CD, a CD-ROM drive must be installed and mounted on your system. For information, see “Mount the CD-ROM Drive” on page 13.
4. Place the CD 2, “setups & images” in the drive.

If another CD is already in the drive, eject it by typing **eject /CDROM**. For more information on ejecting a CD, see “Changing CDs” on page 74.

5. In the UNIX shell, go to the *Tutorial* project directory. Type  
`cd /usr/discreet/project/effects/Tutorial`  
 and press **ENTER**.

6. Copy the setup files from the CD to the *Tutorial* project directory. Type

```
cp -r /CDROM/setups setups
```

and press **ENTER**.

7. Verify that the setup files have been copied. Type

```
ls setups
```

and press **ENTER**. The lesson directories are listed. Not all lessons use setup files. See the table on page 73 for a lesson-by-lesson listing.

8. You may want to leave the CD in the drive until you have completed Lesson 3, “Clip Management”, in which you copy the clips for the lessons from the CD to your framestore. Otherwise, you can eject the CD from the drive by typing

```
eject /CDROM
```

9. Close the UNIX shell by double-clicking the top-left corner of the shell.

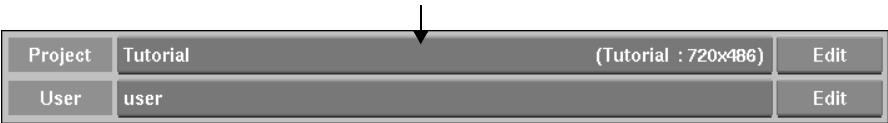
You are now ready to continue the exercise.

**Hint:** Further information about IRIX commands can be found in the on-line operating system documentation. In a UNIX shell, type **man** followed by the name of the command. For example, for information on copying files, type **man cp**.

## Create a Film Partition

As you learned in Lesson 1, you can create a new partition when you set up a new project. In this step, use Project Management to create a new film partition.

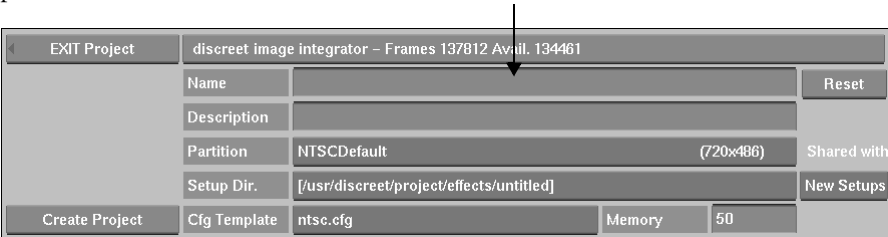
1. Create a new project for the film partition:
  - a) Open a shell in the **flame** or **inferno** account and type **f1ame** (to start **flame**) or **iinferno** (to start **inferno**).
  - b) When the Project Management menu appears, select <new> from the Project box.



The screenshot shows a Project Management menu with two rows. The first row is labeled 'Project' and contains the text 'Tutorial' followed by '(Tutorial : 720x486)' and an 'Edit' button. The second row is labeled 'User' and contains the text 'user' and an 'Edit' button. An arrow points to the 'Project' box.

Project	Tutorial (Tutorial : 720x486)	Edit
User	user	Edit

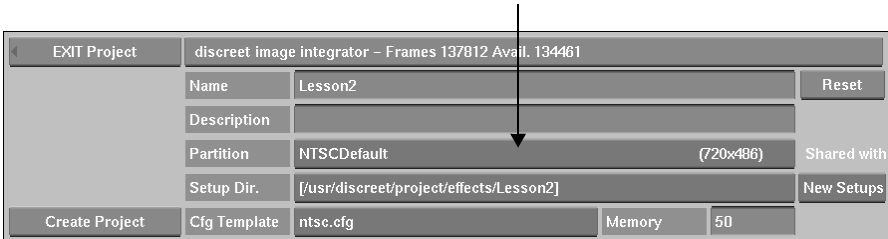
- c) In the Create Project menu, click the Name field and type a name such as “Lesson2” and press **ENTER**.



The screenshot shows the Create Project menu. It has a title bar 'EXIT Project' and 'discreet image integrator - Frames 137812 Avail. 134461'. Below the title bar are fields for 'Name', 'Description', 'Partition', and 'Setup Dir.'. The 'Name' field is highlighted with an arrow. To the right of the 'Name' field is a 'Reset' button. Below the 'Partition' field is a 'Shared with' button. Below the 'Setup Dir.' field is a 'New Setups' button. At the bottom, there is a 'Create Project' button, a 'Cfg Template' field with 'ntsc.cfg', a 'Memory' field with '50', and a '50' button.

EXIT Project	discreet image integrator - Frames 137812 Avail. 134461			
	Name			Reset
	Description			
	Partition	NTSCDefault (720x486)		Shared with
	Setup Dir.	[/usr/discreet/project/effects/untitled]		New Setups
Create Project	Cfg Template	ntsc.cfg	Memory	50

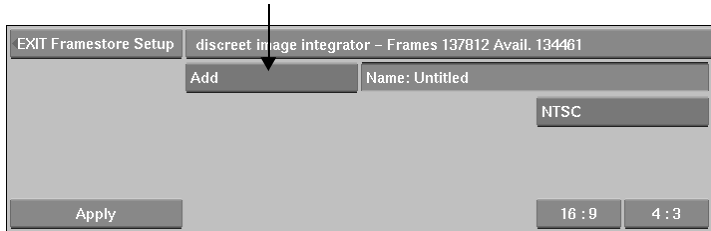
2. Press the Partition box and select <new> to open the Framestore Setup menu.



The screenshot shows the Create Project menu with the 'Partition' field highlighted by an arrow. The 'Name' field now contains 'Lesson2'. The 'Setup Dir.' field now contains '[/usr/discreet/project/effects/Lesson2]'. The 'Reset' button is still present.

EXIT Project	discreet image integrator - Frames 137812 Avail. 134461			
	Name	Lesson2		Reset
	Description			
	Partition	NTSCDefault (720x486)		Shared with
	Setup Dir.	[/usr/discreet/project/effects/Lesson2]		New Setups
Create Project	Cfg Template	ntsc.cfg	Memory	50

3. Select Add to add a new partition.

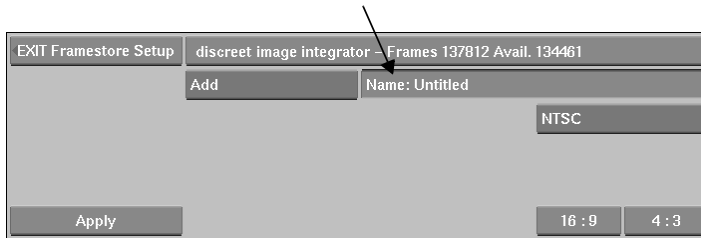


The screenshot shows the Framestore Setup menu. It has a title bar 'EXIT Framestore Setup' and 'discreet image integrator - Frames 137812 Avail. 134461'. Below the title bar is an 'Add' button, which is highlighted by an arrow. To the right of the 'Add' button is a 'Name: Untitled' field. Below the 'Name: Untitled' field is a 'NTSC' button. At the bottom, there is an 'Apply' button, a '16 : 9' button, and a '4 : 3' button.

EXIT Framestore Setup	discreet image integrator - Frames 137812 Avail. 134461	
	Add	Name: Untitled
		NTSC
Apply	16 : 9	4 : 3

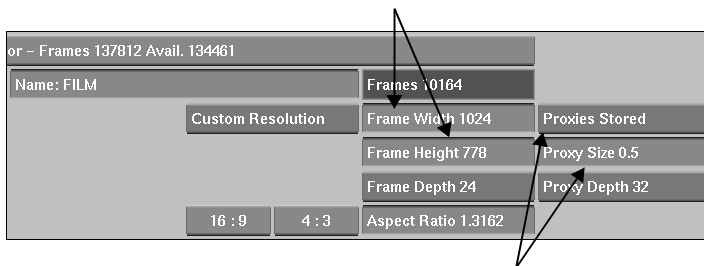
## 4. Name the partition:

a) Click the Name field.

b) Press **ESC** to clear the default name.c) Type “FILM” and press **ENTER**.

## 5. Configure the partition for film resolution images:

a) Set Frame Width to 1024 and Frame Height to 778.

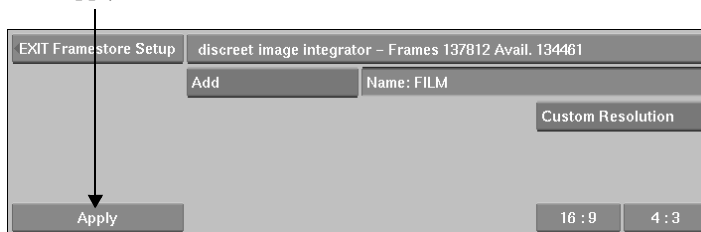


b) Select Proxies Stored and set Proxy Size to 0.5.

c) Set the Aspect Ratio to 1.3162 to maintain the correct proportions of the image for display purposes.

**Hint:** Proxies Stored uses image proxies to improve desktop interaction and playback speed. For more information, see the chapter “Framestore Setup” in the *flame* or *inferno* User’s Guide.

## 6. Click Apply.



The new partition appears in the partition list.

stonefs			Total 34724.00 MB				
			Free 30284.00 MB				
			Frames				
No.	Partition Name	Capacity	Used	Audio Segs.	Total MB	%	
0	NTSCDefault	31100	0	0	12.00	0.05	
1	Tutorial	31100	0	0	1.00	0.00	
2	FILM	31100	0	0	1.00	0.00	

**Note:** If the new partition does not appear in the partition list, there is not enough space remaining on the framestore to create a 1K partition. Delete some of the clips in the default partition and repeat instructions 2 through 6.

- Click EXIT Framestore Setup to return to the Create Project menu.
- Each project has its own configuration file which defines various software environment settings. The project configuration file is created automatically based on the template file specified in the Cfg Template box.

To use a template for the film resolution partition, select *film.cfg* from the Cfg Template box.

EXIT Project		discreet image integrator - Frames 137812 Avail. 134461		
Name	Lesson2		Reset	
Description				
Partition	FILM (1024x778)		Not shared	
Setup Dir.	[usr/discreeet/project/effects/Lesson2]		New Setups	
Create Project	Cfg Template	film.cfg	Memory	5

**Hint:** At NTSC or PAL resolution, the project configuration file template is selected automatically by the software. For information about using a customized template for custom resolution partitions, see the chapter "Project Management" in the *flame* or *inferno User's Guide*. For information about the configuration file, see the *flame* or *inferno Installation Guide*.

- Click Create Project to create the new project and partition.

You are returned to the Project Management menu.

10. In the User box, select the user name you created in Lesson 1.

Project	Lesson2 (FILM : 1024x778)	Edit
User	user	Edit

11. Click Start or press **ENTER** to continue the software initialization using the *Lesson2* project and your user name.

## Import a Clip into the Partition

When you create a new partition, a default clip library is automatically created for it. Use Import Image to import a film-resolution clip from the UNIX file system into the *Default* clip library of the *FILM* partition. Import Image and Export Image are useful for transferring clips between **flame** or **inferno** and other software applications.

1. Open Import Image:

a) Click Library to open the Library menu.

b) Click Import Image.

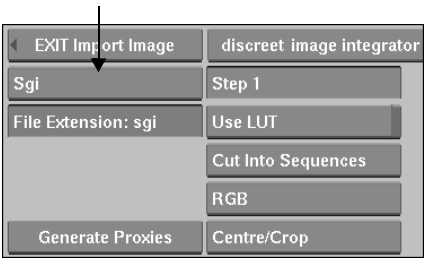
<b>LIBRARY</b>	discreet image integrator – Frames 137812 Avail. 134461			
EDITING	Load	<b>Import Image</b>	Input Clip	Delete
PROCESSING	Save	Export Image	Output Clip	Name
EFFECTS	Archive	Import OMF	DDR Library	Move
FORMAT	Network	Export OMF	Tape Library	Copy
SYSTEM		HDCAM Codec		Search

c) Select a destination reel for the clip you are importing.

The Import Image menu and the file browser appear.

2. In **flame** and **inferno**, you can import and export any of the following standard image file formats: Wavefront, Tiff, Tdi/Maya, Targa, Softimage, Sgi, Pixar, Pict, Jpeg, Dpx (Spirit), Cineon, and Alias. The files imported in this step use Sgi format.

Select Sgi format.



Only the files that use the current file extension (.sgi) are listed in the file browser.

**Hint:** To import files that use a non-standard file extension, click the File Extension field, type the required file extension, and press **ENTER**. If you do not specify a file extension, all files in the current directory are listed.

3. The appearance of the file browser depends on whether you are in Titles mode or Proxies mode.
  - In Titles mode, files and directories are shown as titles (text).
  - In Proxies mode, proxies for files and directories are shown instead of titles.

Select Titles mode.



The pathname at the top of the file browser is the default directory pathname for Import Image within the *Lesson2* project. You can go to a different directory in the file system by changing this pathname.



**Hint:** You can quickly return to the default directory by clicking the R (Return) button next to the project name.

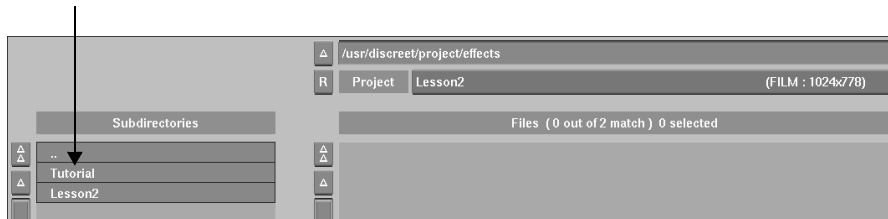
4. The images provided for this lesson were copied to the `/usr/discreet/project/effects/Tutorial/setups/lesson_02` directory. Use the file browser to go to this directory:

a) Click the up arrow to back up one level in the directory path. The last directory name is removed from the pathname.



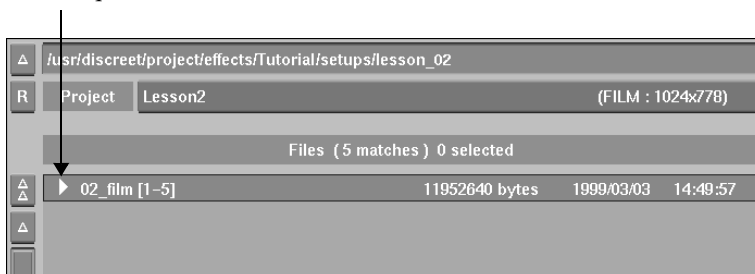
b) Click the up arrow again to reach the `/usr/discreet/project/effects` directory.

c) Go to the *Tutorial* project directory by selecting “Tutorial” in the Subdirectories list.



d) In the Subdirectories list, select “setups”, then select “lesson\_02”.

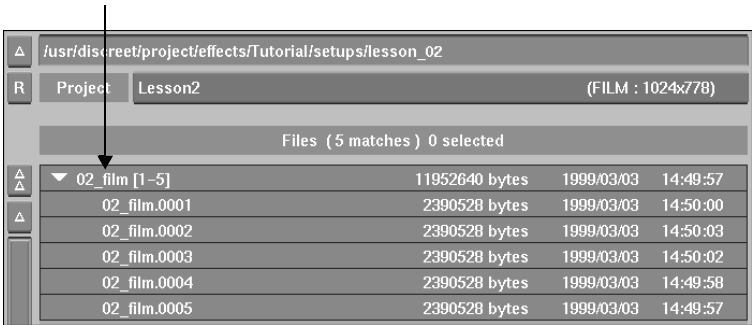
5. The image sequence appears as a single entry. Click the expand arrow to view the five images in the sequence.





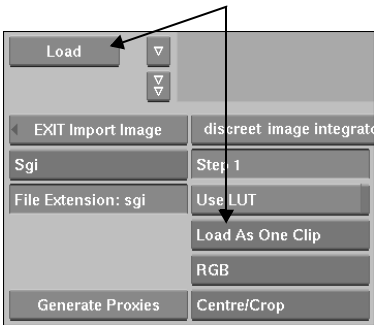
6. Import the image files:

a) Click the *02\_film* sequence entry to select all files in the sequence.

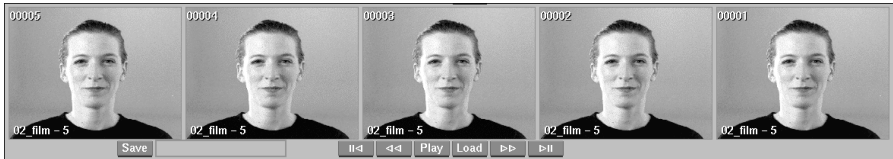


**Hint:** To select one image, click the image entry. To select a region, click the first entry, then **SHIFT**-click the last entry; to add an entry to a selection, **CTRL**-click the entry.

b) Select Load as One Clip to load all the selected image files as one clip, then click Load.



The imported clip appears on the desktop.



**Hint:** Use the Import Queue to import image files as a batch. The Import Queue imports the images in the background while you perform other tasks. For more information, see the chapter "Image Import and Export" in the *flame* or *inferno User's Guide*.

7. Save the clip in the *Default* clip library of the *FILM* partition:

a) Click Library.

b) Click Save.

c) Select Clip.



d) Select the *02\_film* clip by clicking the top-left corner of any frame.

e) When the keyboard appears, press **ENTER** to accept the existing name.

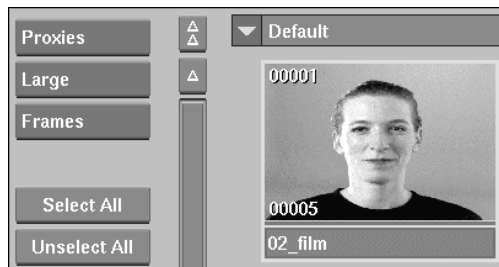
8. Verify that the clip has been saved:

a) Click Load to open the *Default* clip library.



b) Select a destination reel.

The *02\_film* clip appears in the clip library. Learn more about clip libraries in Lesson 3, “Clip Management”.



9. Click EXIT Load to return to the reels.

10. Now that you have saved the clip, it is stored in the *FILM* partition of the framestore and can be accessed from your *Tutorial* project. You must exit **flame** or **inferno** in order to select a different project or partition. Click EXIT in the System menu and Confirm to exit the software.

## Access the FILM Partition from Your NTSC or PAL Partition

You can use the network library to access clip libraries in other partitions on your framestore. In this step, access the *Default* clip library of the *FILM* partition from your *Tutorial* (NTSC or PAL) partition.

**Hint:** You can also access framestores on other systems on the network. To do this, **wire** must be installed and configured, and a special licence file is required. For information, see the **flame** or **inferno** *Installation Guide*.

1. Start **flame** or **inferno**:

- a) In the UNIX shell, type **flame** (to start **flame**) or **inferno** (to start **inferno**).
- b) When the Project Management menu appears, select the *Tutorial* project created in Lesson 1, then select your user name.

Project	Tutorial	(Tutorial : 720x486)	Edit
User	user		Edit

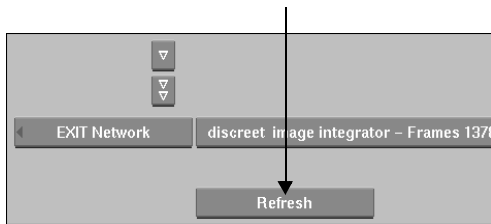
- c) Click Start or press **ENTER**.

2. In the Library menu, click Network.

<b>LIBRARY</b>	discreet image integrator – Frames 137812 Avail. 134461			
EDITING	Load	Import Image	Input Clip	Delete
PROCESSING	Save	Export Image	Output Clip	Name
EFFECTS	Archive	Import OMF	DDR Library	Move
FORMAT	Network	Export OMF	Tape Library	Copy
SYSTEM		HDCAM Codec		Search

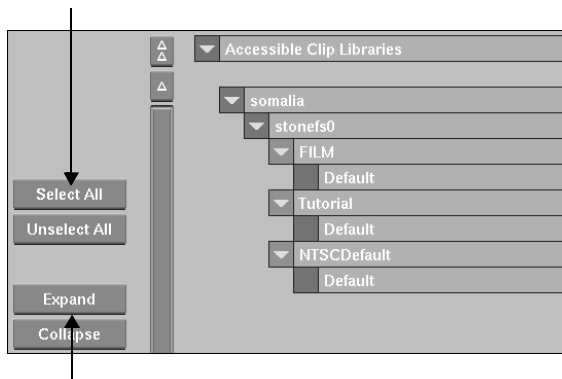
The network library appears.

3. Click Refresh to initialize the network library.



4. View all accessible clip libraries:

- a) Click Select All.

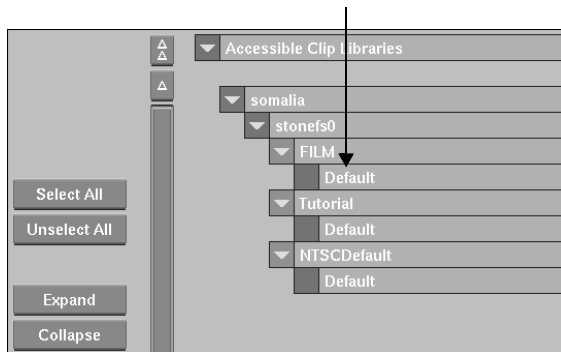


- b) Click Expand.

The network library uses a hierarchical structure. Entries are colour-coded by the box at the left of each entry.

- Blue entries are host machines.
- Red entries are framestore volumes.
- Green entries are partitions.
- Dark grey entries are clip libraries.

5. All entries that are selected (highlighted) can be accessed from your partition. Make sure the *Default* clip library in the *FILM* partition is selected.



6. Click EXIT Network to return to the reels.

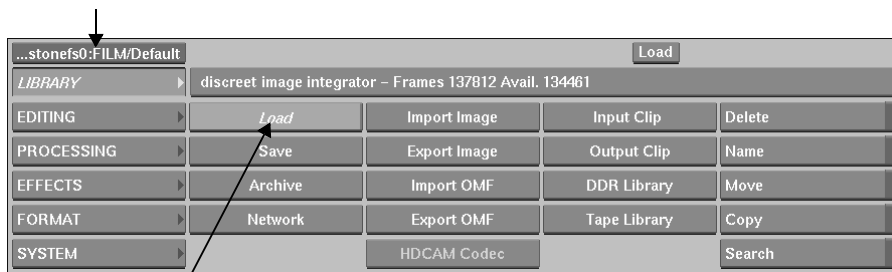
The *Default* clip library of the *FILM* partition can now be accessed from the *Tutorial* project.

## Load the Film Clip onto the Desktop

Load the *02\_film* clip onto the desktop.

1. Open the *Default* clip library of the *FILM* partition:

- a) Select *FILM/Default* in the Clip Library box. The clip library name includes the machine hostname and the volume name.

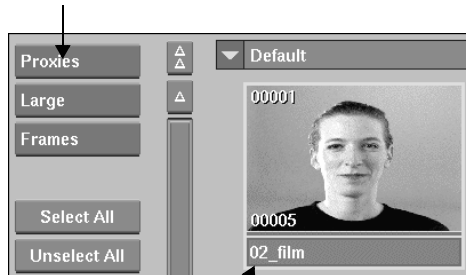


- b) Click Load.

- c) Select a destination reel.

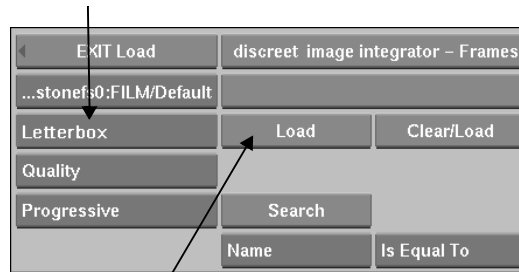
2. Load the *02\_film* clip:

a) Select Proxies to view the image.



b) Select the *02\_film* clip.

c) Select Letterbox to resize the image. See “Image Resizing Options” on page 67.



d) Click Load.

The clip is converted to NTSC or PAL resolution and appears on the destination reel. You can work on the clip in NTSC or PAL and save it in your clip library, or save the modified clip in the *FILM* partition.

# Things to Remember

- A partition stores clips of a specific resolution.
- The framestore may contain partitions of different resolutions.
- Use the Framestore Setup menu to create a new partition when creating a new project.
- Use the network library to access a clip library in another partition on your framestore, or on another framestore on the network.
- When importing clips from a partition of a different resolution, use the Letterbox option to preserve the entire image.
- Setup files are stored in subdirectories of the project directory.
- Use the file browser to access the UNIX file system from **flame** or **inferno**. In the file browser, the directories and files can be displayed as titles or proxies.
- Import Image and Export Image use standard image file formats to transfer images between **flame** or **inferno** and the UNIX file system.

## Image Resizing Options

Several options are available for resizing images loaded from clip libraries of different resolutions.

Use:	To:
Center/Crop	Centre and crop the image if it is larger than the frame size. A black border is added if the image is smaller than the frame size.
Letterbox	Scale the longest edge of the image to fit into the frame and fill the rest of the frame with black. All of the image is preserved.
Crop Edges	Scale the shortest edge of the image to fit into the frame and crop the longest edge. Some of the image is lost.
Fill	Scale the X and Y dimensions non-proportionally to make the image fit in the current frame size. The aspect ratio may be affected.





# 3

## Clip Management

---

Whether you are working on one project or on several projects at once, you will want to organize and save your clips for convenient access. You can create a clip library for each project you are working on. Within each clip library, you can organize your clips on different desktops and reels. You can then archive your clip libraries to a VTR or tape drive.

In this lesson:

- Load clips from the archives on CD to the desktop
- Create a clip library for the clips used in these lessons
- Save clips and reels in a clip library
- Archive clips to tape

Time to complete this lesson: 60 minutes

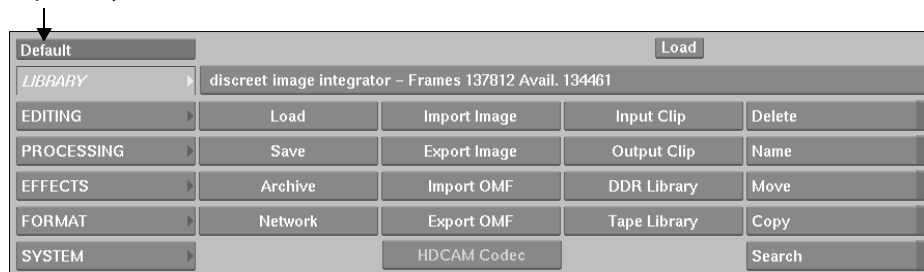
## About Clip Libraries

So far, you have worked with clips on the desktop. As you continue to process clips or load them from an external source, you will want to move the clips off the desktop and organize them for convenient access. In **flame** and **inferno**, clips are stored in clip libraries.

As you learned in Lesson 2, a default clip library is created for each new partition. You can create additional clip libraries in each partition. For example, you create two clip libraries in Exercise 1 of this lesson—one for the source and result clips on the CDs, and another for the clips you generate while performing the lessons. Within each clip library, you can organize clips on different desktops and reels.

The clip library that you are currently using is shown in the Clip Library box. All available clip libraries appear in the Clip Library box pop-up menu.

Clip Library box



## About Archiving

When you save clips in the clip library, the clips are saved in the framestore. You should back up—or archive—your clips on a regular basis or when the framestore becomes full. You can archive all of the material in the framestore, or just selected clips. To access clips in the archive, you can load selected clips or the entire archive. The devices that can be used for archiving are listed in the following table.

Device type	Description
File	A file in the UNIX file system on your system disk or in a remote file system. In Exercise 1 of this lesson, you load clips from a read-only file archive on CD.
Tape	Can be a DAT, Exabyte, or DLT device. In Exercise 2 of this lesson, you archive clips to a tape device.
DST	DST device.
VTR	Can be a D1, Betacam, or Digital Betacam.

Device type	Description
Dataview	Viewgraphics Dataview Serial Digital Adaptor for D1 or D5 VTRs ( <b>inferno</b> only).
HD-D5 VTR	Such as the Panasonic AJ-D580B/HDP500 and the Panasonic AJ-HD2700 ( <b>inferno</b> only).
Phillips D6 VooDoo	An uncompressed HDTV VTR that can store up to an hour of uncompressed HDTV material on a large cartridge ( <b>inferno</b> only).

## Exercise 1: Loading the Source Clips

The source and result clips for the exercises are provided in file archives on the CDs included in your software kit. At the beginning of each exercise, you must load the appropriate source and result clips from the archives. In this exercise, learn how to access the archives by loading the clips for Lesson 4 and Lesson 5.

Depending on which software kit you received, the clips on the CDs are at either NTSC or PAL resolution. You must be working in either NTSC or PAL to load the clips. If you are not, follow the instructions in “Create a New Project” on page 19 and “Create a New Partition” on page 21 to create an NTSC or PAL partition.

## Enable the File Clip Management Device Type

To access the clip archives on the CD, you must enable the ClipMgtDevice line for the file device type in the initialization configuration file. This file contains a list of device parameters required to run **flame** or **inferno**.

1. Open the initialization configuration file for editing:

- a) Press **F5** to lower the **flame** or **inferno** desktop and view the UNIX shell in which you started the software.
- b) In the shell, scroll up to locate a list of configuration and device specifications. At the top of the list is a CONFIG entry specifying the pathname of the initialization configuration file.

```

xvish
Manufacturer is Discreet Logic Inc., 10 Duke Street, Montreal, Quebec,
Canada H3C 2L7.
CONFIG      : /usr/discreet/flame_7.00CT/cfg/init.cfg
VIDEO       : OCTANEVIDEO in format SERIAL1, out format SERIAL1
SYNC        : HOUSE, GREEN
DATE        : Tuesday June 20 2000 00:20 EDT
MENU        : /usr/discreet/flame_7.00CTbeta6/menu/default.menu
AUDIO       : Default directory: ~/audio
AUDIO       : Import-Export directory: ~/audio
AUDIOSTORE  : Using direct scsi connection: /dev/scsi/sc2d110
Using stonefs 1.05 Release; ProductSwM_082
PROJECT     : Tutorials
USER        : user
CONFIG      : /usr/discreet/project/effects/Tutorials/cfg/Tutorials.cfg
STANDARD    : NTSC
HIRES RATE  : 30HZF
MEMORY      : 50 Auxiliary Buffers
PROCESSORS  : 2 available
MEMORY      : Using 50 Auxiliary, 92 Total Memory Buffers
MEMORY      : Allocated 0x7ba4000 bytes at address 0x66000000 using mmap()

EDL module: Portions Copyright © 1991-1998 ALBA Editorial, Inc., All Rights Reserved.

```

- c) Use the jot editor to open the file. For example, using the pathname specified in the UNIX shell above, you would type

```
jot /usr/discreet/flame_7.00CT/cfg/init.cfg
```

and press **ENTER**.

**Note:** Make sure you type the pathname for the initialization configuration file shown on the *first* CONFIG line. The second CONFIG line shows the pathname for the project configuration file. Your initialization configuration file may use a name other than *init.cfg*. For example, if there are several Discreet products installed on your system, it may use the name of the product (for example, *flame.cfg*).

2. Enable the file device type line in the file:

- a) In the jot editing window, scroll down the file until you reach the heading "CLIPMGTDDEVICE KEYWORD."
- b) Under this heading, look for the file device type line which reads "#ClipMgtDevice File, usr/tmp/archive."
- c) Remove the "#" symbol to enable the file device type line.

**Note:** If you do not see a "#" symbol at the beginning of the line, the file clip management device type is already enabled. Go to "Load the CD" on page 73.

3. Save the file:
  - a) Select “Save” from the File menu.
  - b) Close the file by double-clicking the top left corner of the jot editing window.
4. You must restart **flame** or **inferno** to recognize the change to the file:
  - a) Move the cursor off the UNIX shell, then press **F6** to raise the **flame** or **inferno** desktop.
  - b) Open the System menu, click EXIT, and Confirm.
  - c) In the UNIX shell, type **f1ame** (to start **flame**) or **infern0** (to start **inferno**).

## Load the CD

The clips for lessons 4 and 5 are found on CD 2, “setups & images.”

1. Place CD 2, “setups & images” in the drive.
2. Make sure the CD-ROM drive is mounted:
  - a) Press **F5** to lower the **flame** or **inferno** desktop and view the UNIX shell and Toolchest.
  - b) Follow the instructions in “Mount the CD-ROM Drive” on page 13.
  - c) Move the cursor off the UNIX shell, then press **F6** to raise the **flame** or **inferno** desktop.

When loading the clips in later lessons, use the table below to determine which CD to use. Lessons for which there is “No archive” do not use source clips.

Lesson	CD# for File Archive	Setup file
1: Essentials	No archive	No
2: Working at Different Resolutions	No archive	Yes
3: Clip Management	2	No
4: Retouching a Clip	2	Yes
5: Precision Keying	2	Yes
6: Animating Composites	2	Yes
7: 3D Objects and Texture Mapping	2	Yes
8: One and Two-Point Tracking	3	Yes

Lesson	CD# for File Archive	Setup file
9: Generating Particles	3	Yes
10: Morphing	3	Yes
11: Colour Correction	3	Yes
12: Batch Processing	3	Yes
13: Modular Keying: Basic Techniques	3	Yes
14: Modular Keying: The Tracer	4	Yes
15: The Colour Warper	4	Yes
16: 3D Tracking	4	Yes
17: Motion Estimation	4	Yes

### Changing CDs

You will be unable to eject the CD unless you navigate out of the */CDROM* directory. To do this while running **flame** or **inferno**:

1. In the Library menu, click Archive to open the Archive menu.
2. Go to the file browser and click the up arrow to navigate back to the root (/) directory.
3. Minimize **flame** or **inferno** by pressing **ALT+F9**.
4. Open a new UNIX shell.
5. Type  
`eject /CDROM`  
and press **ENTER**.
6. Click the **flame** or **inferno** icon to return to the software.

You might have to re-mount the CD-ROM drive to access the next CD. See “Mount the CD-ROM Drive” on page 13 for instructions.

## Create a Clip Library

Create a new clip library to keep the clips loaded from the CD archives separate from other projects.

1. Create the *Tutorial* clip library:
  - a) Click Library to open the Library menu.
  - b) Press the Clip Library box and select <new>.



- c) Type "Tutorial" as the name of the new clip library and press **ENTER**.

The new clip library is now the current clip library.



## Load the Reel for Lesson 4

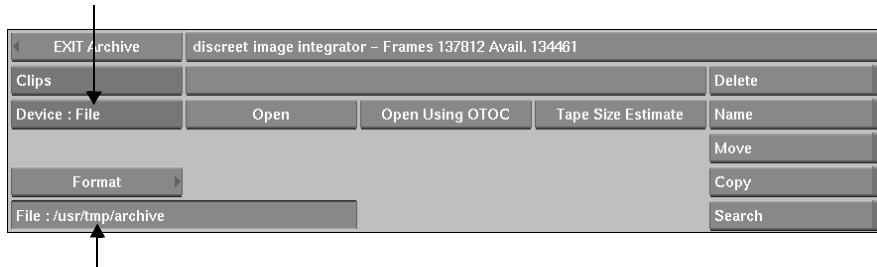
Open the file archive and load the reel for Lesson 4.

1. Click Archive to open the Archive menu.



## 2. Select the archive for Lesson 4:

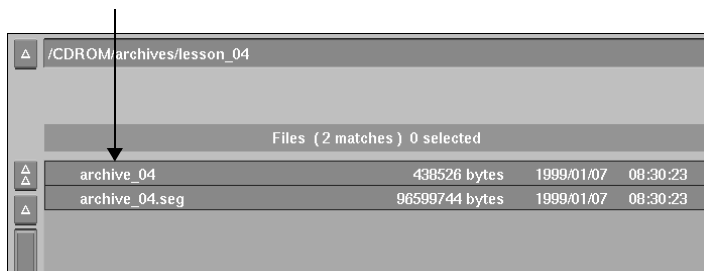
### a) Select File as the archive device.



### b) Click the File field to view the file browser.

### c) Change the directory to `/CDROM/archives/lesson_04`. For instructions on using the file browser, see instructions 3 and 4 beginning on page 59.

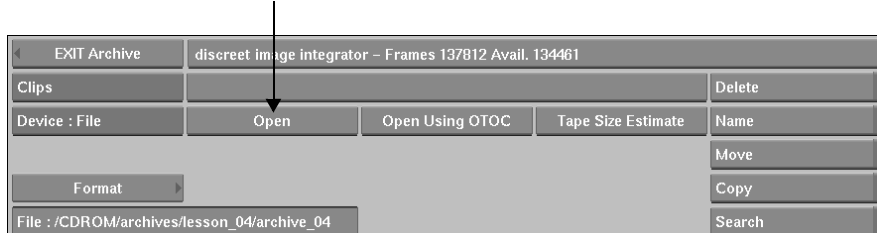
### d) Select *archive\_04*.



You are returned to the Archive menu.

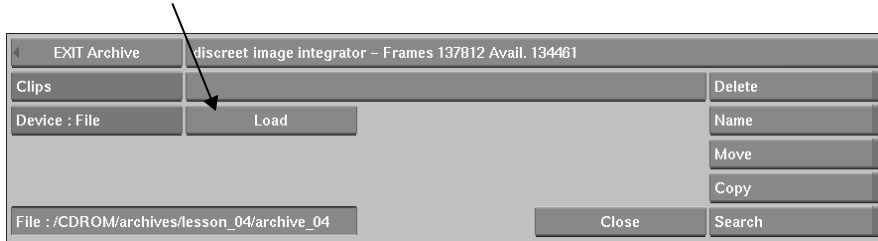
## 3. Open the archive:

### a) Click Open. The archive is read and the Load button appears.





b) Click Load.

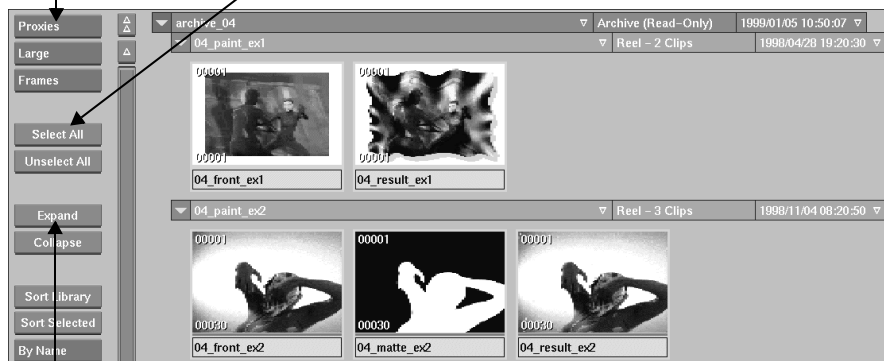


c) Select a destination reel.

#### 4. Select the reels for Lesson 4:

a) Select Proxies to view image proxies.

b) Click Select All to select the entire contents of the archive.



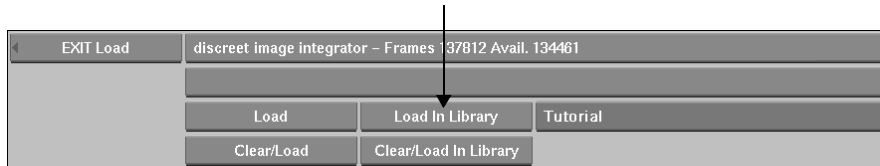
c) Click Expand to view the contents of the selected entries.

**Hint:** You can also expand all entries by pressing **CTRL** and clicking **Expand**.

The selection boxes of the two reels in the archive are green, indicating that they are selected.



5. Click Load in Library to load the *04\_paint\_ex1* and *04\_paint\_ex2* reels into the *Tutorial* clip library.



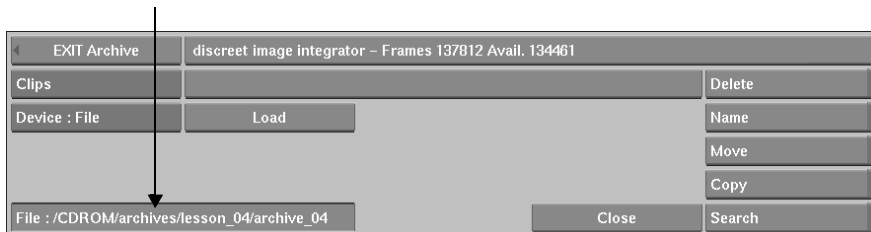
You are returned to the Archive menu. Notice that the number of frames available shown in the message bar has changed to reflect the number of frames loaded from the archive.

**Hint:** You can load clips from an archive directly to the reels by clicking Load.

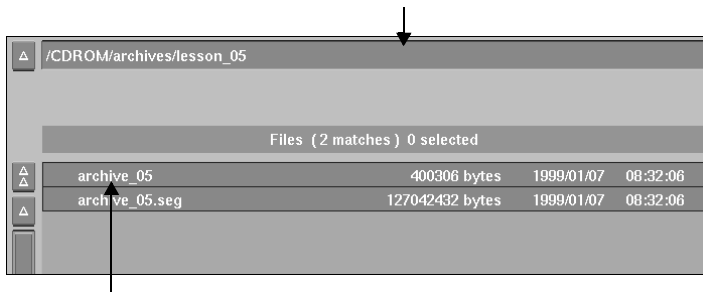
## Load the Reel for Lesson 5

Change the archive directory and load the reel for Lesson 5.

1. Select the archive for Lesson 5:
  - a) Click the File field to view the file browser.



- b) Change the directory to */CDROM/archives/lesson\_05*.

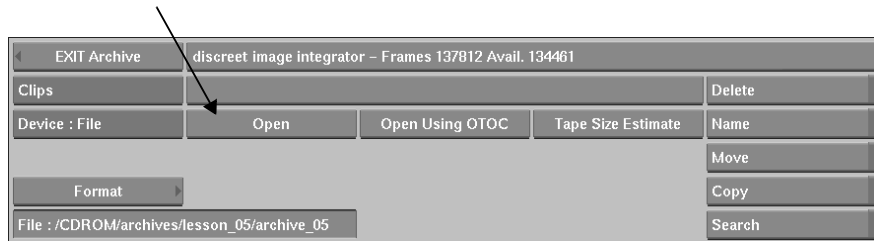


- c) Select *archive\_05*.

You are returned to the Archive menu.

2. Open the archive:

a) Click Open.

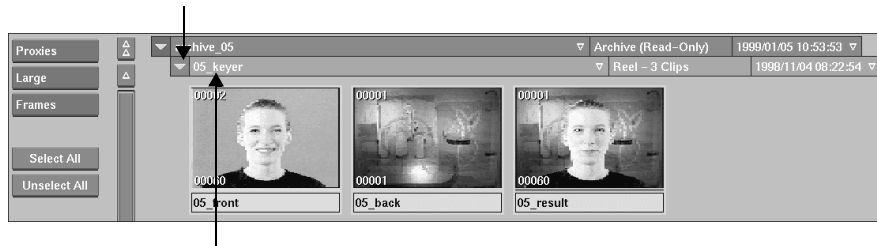


b) Click Load.

c) Select a destination reel.

3. Select the reel for Lesson 5:

a) Click the expand arrow on the 05\_keyer reel to view the clips.



b) Click the 05\_keyer reel to select the reel.

4. Click Load in Library to load the 05\_keyer reel into the *Tutorial* clip library.

You are returned to the Archive menu.

5. Click EXIT Archive and then Confirm to return to the reels.

## Load the Clips to the Reels

Load the *04\_paint\_ex1* reel and the *05\_keyer* reel to the desktop. Use this procedure in each of the remaining lessons to load the required reel for the exercise.

1. Open the *Tutorial* clip library:

- a) Make sure the *Tutorial* clip library is selected.



- b) Click Load in the Library menu.

- c) Select a destination reel.

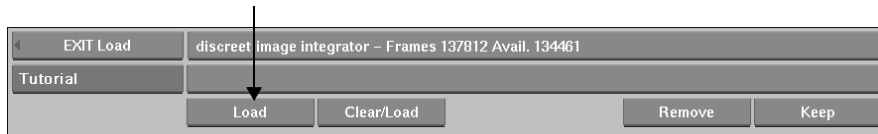
The *Tutorial* clip library appears. It contains the three reels that you loaded from the archive on CD 2, “setups & images.”

2. Select the *04\_paint\_ex1* reel.



Notice that the expand arrow for the clip library entry turns yellow, indicating that only some of the entries in the clip library are selected.

3. Click Load to load the selected reel to the desktop.

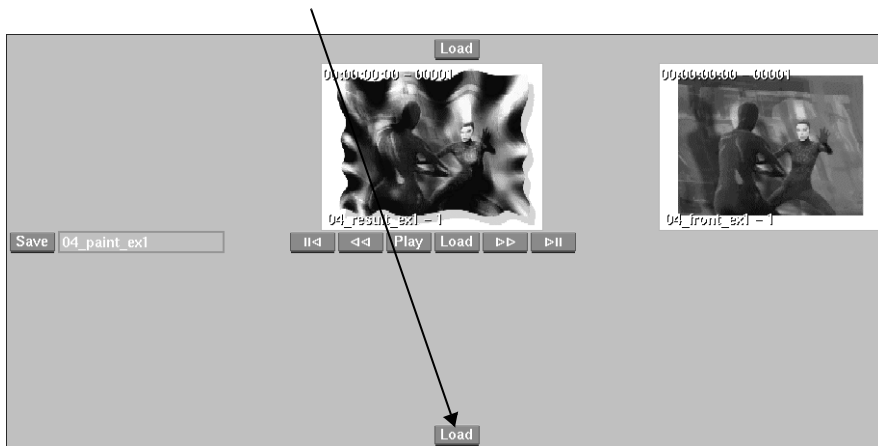


The reel appears on the desktop and is named *04\_paint\_ex1*.



4. Instead of using Load in the Library menu, use the Load Clip shortcut to load the *05\_keyer* reel:

- a) Click Load on an empty reel to open the clip library.



- b) Select the *05\_keyer* reel.

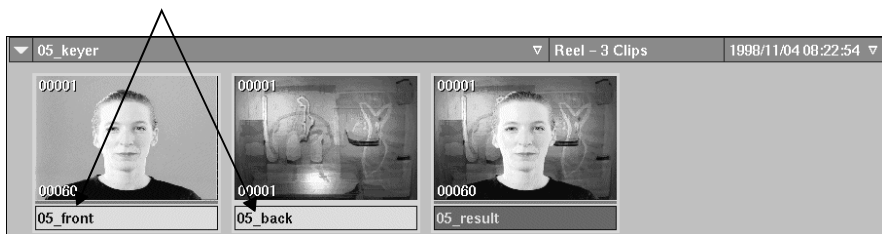


c) Click Load.

The reel appears on the desktop and is named *05\_keyer*.



**Hint:** You can also load individual clips from the clip library. The clips can be on the same reel or on different reels. Click the selection box on the clip entries you want to load and click Load.



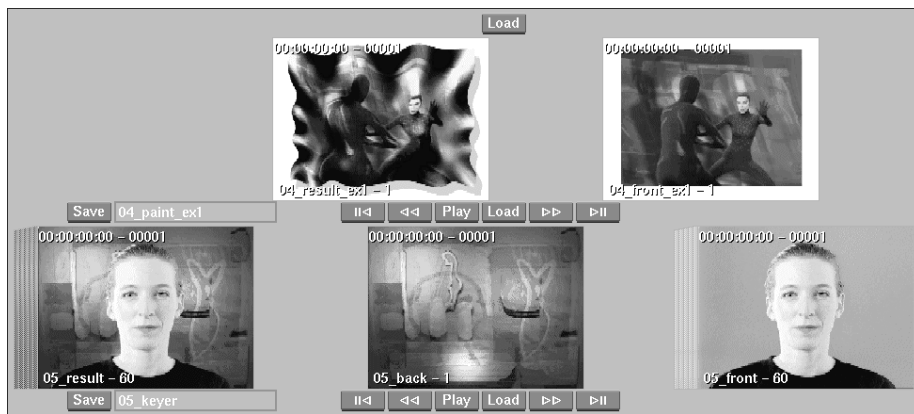
Next, learn how to manage clips in the library.

## Exercise 2: Managing a Clip Library

Within a project, you can create any number of clip libraries to manage your separate clips. In this exercise, create your own clip library and save a clip, reel, and an entire desktop.

### Load the Reels

The *04\_paint\_ex1* and *05\_keyer* reels should already be on the desktop. If they are not, load them now. For instructions, see “Exercise 1: Loading the Source Clips” on page 71. Your desktop should look like this.



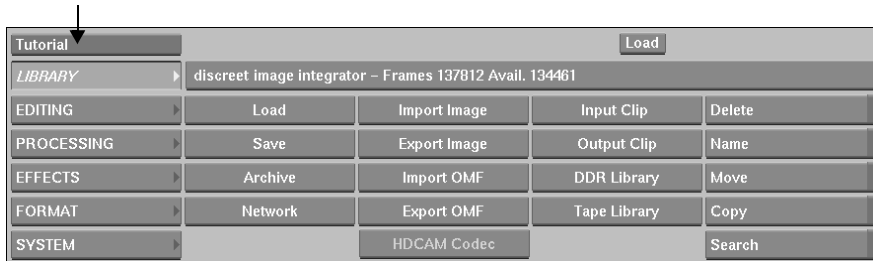
**Note:** This exercise assumes that these are the only clips on the desktop. If there are others, your clip library will differ from the one shown in this exercise.

## Create a Clip Library

Create a clip library and save a clip, reel, and desktop. Use this clip library to save your result clips in later lessons.

### 1. Create a clip library:

- a) Press the Clip Library box and select <new>.



- b) If necessary, press **ESC** to clear the current name.

- c) Type your name as the name for the new clip library and then press **ENTER**.

In this exercise, the new clip library is named *operator1*.

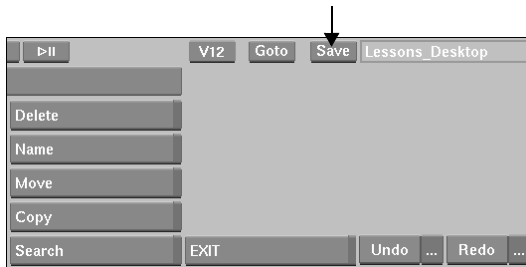
### 2. To save a desktop to the clip library, you can use either the Save command in the Library menu, or the Save button next to the desktop name. Save your desktop:

- a) Make sure the new clip library is selected.





b) Click Save next to the Desktop Name field.



c) The current desktop name (*Lessons\_Desktop*, or whatever name you gave the desktop in Lesson 1) appears in the keyboard window. Press **ENTER** to save the desktop under the same name, or enter a new name now.

The message “Desktop Lessons\_Desktop successfully saved” appears in the message bar.

**Note:** Although clips on the desktop are also saved in the framestore, you should save any work you value to a clip library. If a system failure occurs, the desktop could become corrupted, resulting in the loss of all clips found there.

3. To save a reel to the clip library, you can use either the Save command in the Library menu or the Save Reel button below the reel itself. Save the *05\_keyer* reel using the Save Reel button:

a) Click Save under the *05\_keyer* reel.



b) The reel name appears in the keyboard window. Press **ENTER** to save the reel using the same name.

The message “Reel 05\_keyer successfully saved” appears in the message bar.

#### 4. Save a clip to the new clip library:



#### c) Select the 04\_front\_ex1 clip by clicking the top-left corner of the clip.



#### d) The clip name appears in the keyboard window. Press **ENTER** to save the clip using the same name.

The message "Clip 04\_front\_ex1 successfully saved" appears in the message bar.

## Using Hot Keys to Name and Save Clips, Reels, and the Desktop

You can use the **N** and **S** hot keys to quickly name and save clips, reels, and the desktop.

### Clips

To name a clip, place the cursor over the clip and press **N**. The on-screen keyboard appears. Type a name and press **ENTER**.

To save a clip, place the cursor over the clip and press **S**. If the clip has a name, it is saved to the current clip library. If it has no name, the on-screen keyboard appears. Type a name and press **ENTER**. The clip is saved.

### Reels

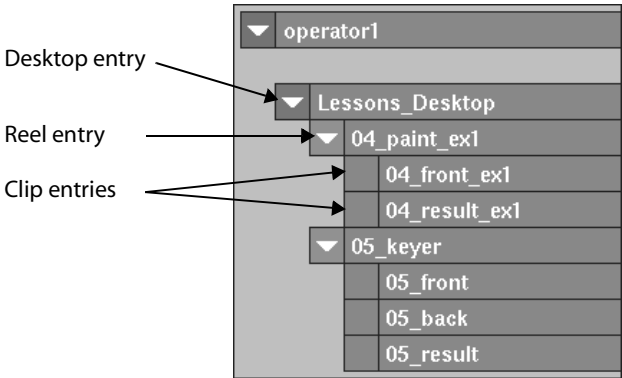
As for clips, but place the cursor in the grey area on the reel between clips and press **N** or **S**.

### The Desktop

As for clips, but place the cursor over the menu panel and press **N** or **S**.



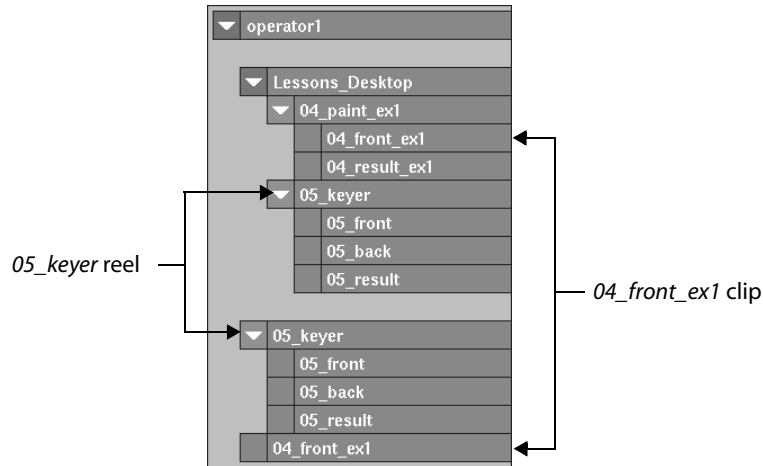
The hierarchical relationship between the desktop, reels, and clips is represented using indentation: the desktop entry is at the top of the clip library, the reels are indented beneath the desktop entry, and the clips are further indented beneath each reel entry.



Each type of entry in the clip library uses a different colour.

The colour:	Is used for:
Grey	Clips
Green	Reels
Blue	Desktops
Dark grey	Clip libraries

Because you saved the *05\_keyer* reel and the *04\_front\_ex1* clip as part of the desktop and then again separately, they appear twice in the clip library—once in the desktop entry and once as separate entries.



Although these entries appear twice in the clip library, only one version of each entry is saved in the framestore. In other words, the *04\_front\_ex1* clip is listed twice in the clip library, but both entries point to the same 30 frames in the framestore. This provides extra flexibility for organizing clips. For example, if you use the same source clips for two different projects, you can save the clips in two different clip libraries without taking up extra space in the framestore.

When you delete one of several copies, its pointer to the clip is deleted, but the clip itself remains on the framestore. Only when you delete all copies in all clip libraries is the clip removed from the framestore.

Also, if you change the name of one of the copies of a clip, whether it is on the desktop or in a clip library, the clip name is changed in all locations.

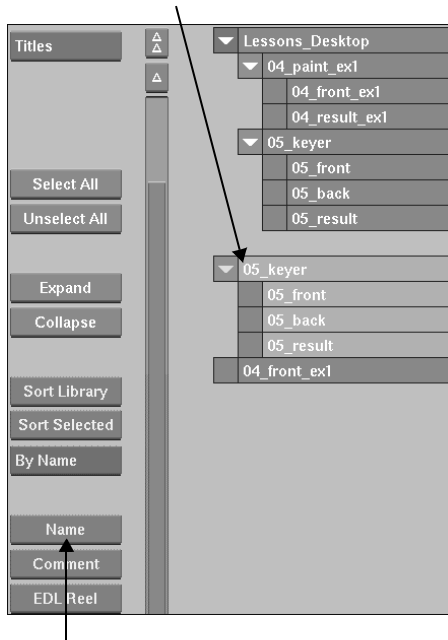
## Rename an Entry

You can change the name of any clip library entry.

**Hint:** For your convenience, use a standard convention when naming clips. For example, always use lower case letters.

1. Change the name of the *05\_keyer* reel entry:

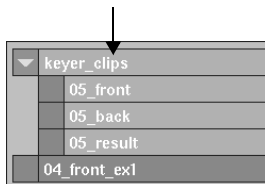
- a) Select the *05\_keyer* reel.



- b) Click Name or press **N**. The keyboard appears.

- c) Press **ESC** to clear the old name. Type “keyer\_clips” and press **ENTER**.

The name is changed to *keyer\_clips*.



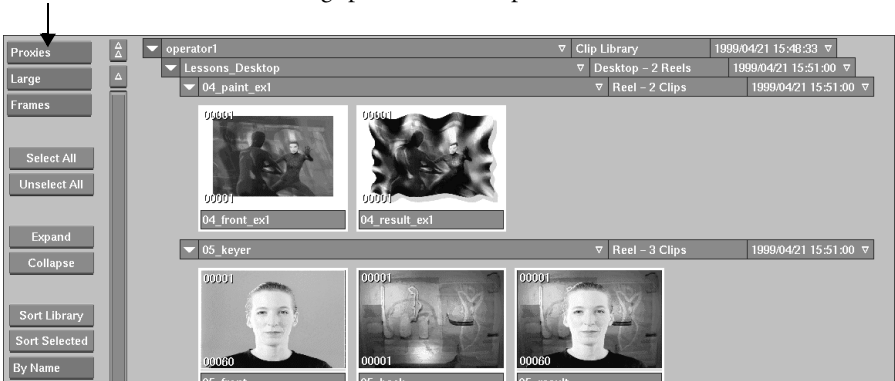
2. Click the *keyer\_clips* entry to deselect it.

**Hint:** You can also use **N** to name a clip in the clip library. Simply place the cursor over the clip and press **N**, then enter the new name.

# Reorganize the Clip Library

There are several display modes and sorting options available for organizing the clip library. You can also drag clips and reels to new locations within the clip library.

1. Select Proxies mode to view image proxies of the clips.

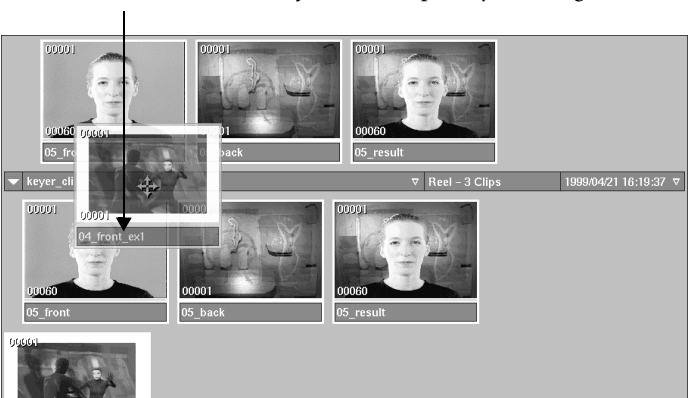


**Hint:** You can view large, medium, or small proxies. Small proxies are useful if there are many clips in the library.



2. Move the *04\_front\_ex1* clip:

- a) Click the title bar of the *04\_front\_ex1* clip entry and drag it over the *keyer\_clips* reel entry.

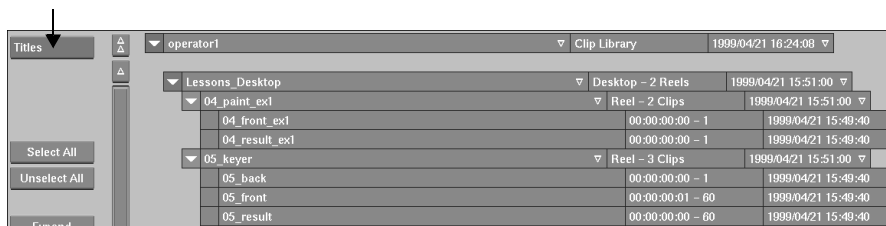


### 3 Clip Management

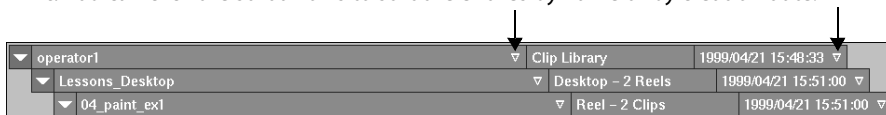
The *04\_front\_ex1* clip becomes part of the *keyer\_clips* reel.



### 3. Select Titles mode.



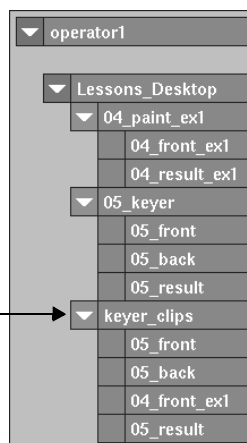
**Hint:** You can click the sort arrows to sort the entries by name or by creation date.



### 4. Move the *keyer\_clips* reel in Titles mode:

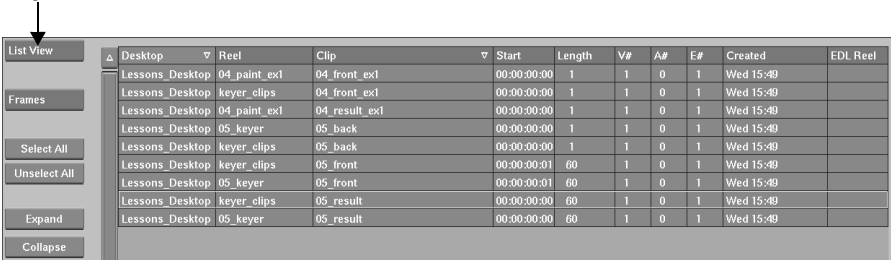
a) Drag the *keyer\_clips* reel entry over the *Lessons\_Desktop* entry.

The *keyer\_clips* reel becomes part of *Lessons\_Desktop*.





5. Select List View to display additional clip information, including start timecode and clip length.



Desktop	Reel	Clip	Start	Length	V#	A#	E#	Created	EDL Reel
Lessons_Desktop	04_paint_extl	04_front_extl	00:00:00:00	1	1	0	1	Wed 15:49	
Lessons_Desktop	keyer_clips	04_front_extl	00:00:00:00	1	1	0	1	Wed 15:49	
Lessons_Desktop	04_paint_extl	04_result_extl	00:00:00:00	1	1	0	1	Wed 15:49	
Lessons_Desktop	05_keyer	05_back	00:00:00:00	1	1	0	1	Wed 15:49	
Lessons_Desktop	keyer_clips	05_back	00:00:00:00	1	1	0	1	Wed 15:49	
Lessons_Desktop	keyer_clips	05_front	00:00:00:01	60	1	0	1	Wed 15:49	
Lessons_Desktop	05_keyer	05_front	00:00:00:01	60	1	0	1	Wed 15:49	
Lessons_Desktop	keyer_clips	05_result	00:00:00:00	60	1	0	1	Wed 15:49	
Lessons_Desktop	05_keyer	05_result	00:00:00:00	60	1	0	1	Wed 15:49	

You can perform a primary sort on any of the fields in either ascending or descending order, with a secondary sort on the clip name. For example, clicking the Clip name heading followed by the Start heading sorts the clips by start timecode with a secondary sort on clip name.

For more information about clip library display modes or sorting options, see the chapter “Clip Libraries” in the *flame* or *inferno* User’s Guide.

## Search the Clip Library for a Clip

You can search the clip library for clips by name, timecode, duration, and other indicators.

1. To search for a clip by name, select Name.



EXIT Load    discreet image integrator – Frames 137812 Avail. 134461

operator1

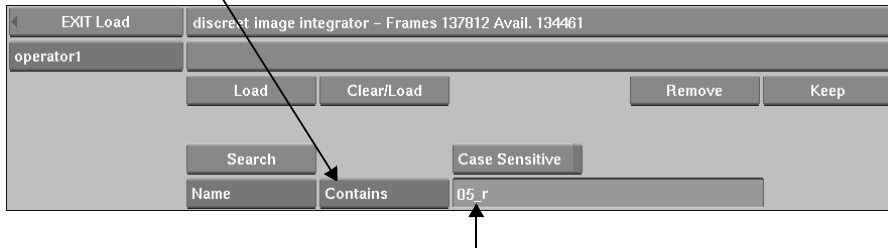
Load    Clear/Load    Remove    Keep

Search    Case Sensitive

Name    Is Equal To

2. When searching for a clip by name, you can enter the entire name or any part of the name. Enter a character string:

a) Select Contains.



The screenshot shows a software interface for clip management. At the top, there's a header bar with 'EXIT Load' and 'discreet image integrator - Frames 137812 Avail. 134461'. Below this is a section labeled 'operator1'. In the center, there are four buttons: 'Load', 'Clear/Load', 'Remove', and 'Keep'. Below these buttons is a 'Search' button and a 'Case Sensitive' checkbox. At the bottom, there are two tabs: 'Name' and 'Contains'. The 'Contains' tab is selected, and a text input field next to it contains the string '05\_r'. An arrow points from the 'Contains' tab to the text input field, and another arrow points from the 'Search' button to the 'Contains' tab.

b) Click the text field, type “05\_r” and press **ENTER**.

3. Click Search.

Clips matching the specifications are highlighted in the clip library.

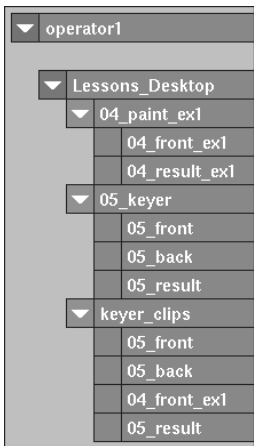
**Hint:** Accessing the Search menu from the desktop allows you to search either the current desktop or the current clip library. You can also search for an individual frame according to its ID or its pixel content. For more information, see the chapter “Fundamentals” in the *flame* or *inferno User's Guide*.

# Remove Entries from the Clip Library

You can remove unwanted clips from the clip library using any of the following methods:

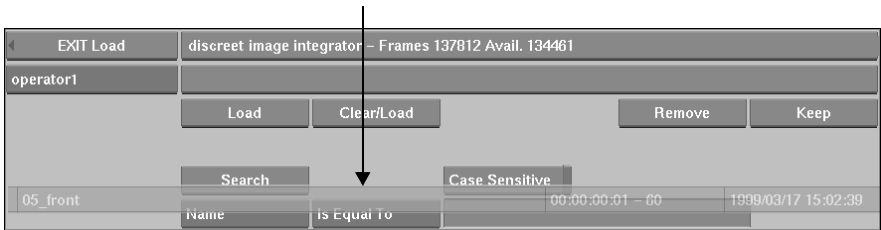
- Use drag and drop actions to remove one entry at a time.
- Use the Remove command to delete several selected entries at the same time.
- Use the Keep command to keep several selected entries, removing all unselected entries.

1. Use drag and drop actions to remove the *05\_front* clip from the *keyer\_clips* reel:



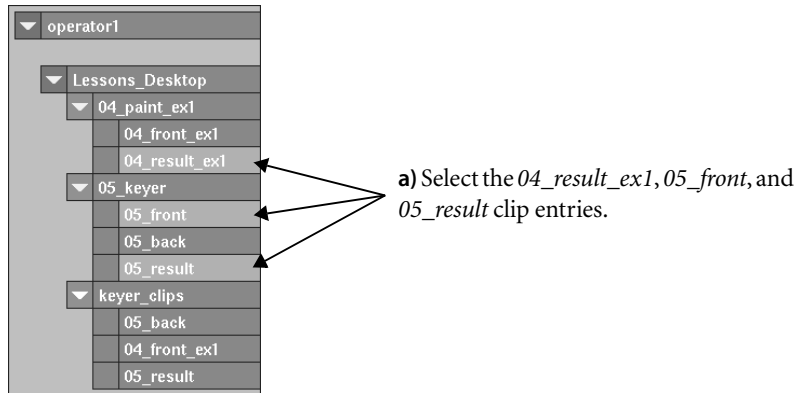
a) Drag the *05\_front* clip towards the bottom of the screen.

b) When the entry is at the bottom of the screen, a recycle cursor appears. Release the cursor.



c) Click Confirm to delete the entry.

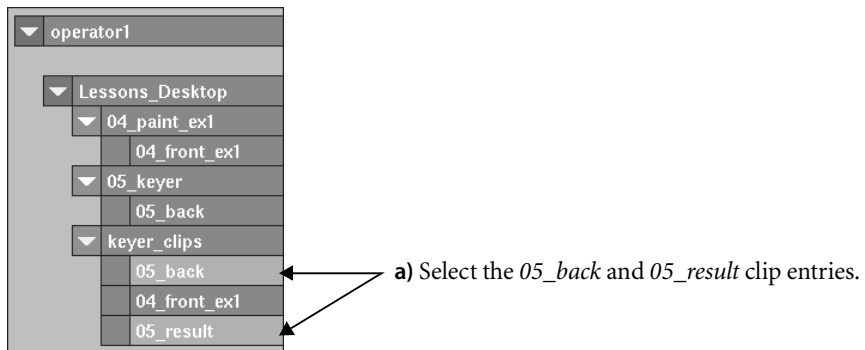
2. Use the Remove command to delete selected entries:



- b) Click Remove and then Confirm to delete the selected entries.



3. If you want to delete more entries than you want to keep, select the entries you want to keep and use the Keep command to delete the non-selected entries:



- b) Click Keep and then Confirm to delete the non-selected entries.



The clip library should now look like this.

▼ operator1 ▼	Clip Library	1999/03/17 15:51:43 ▼
05_back	00:00:00:00 – 1	1999/03/17 15:02:39
05_result	00:00:00:00 – 60	1999/03/17 15:02:39

4. Delete the remaining clip entries from the clip library.

Do not delete the clip library entry. Use this clip library to save your result clips in later lessons.

5. Click EXIT Load to return to the reels.

Now you know how to manage your clips in clip libraries. In the next exercise, learn how to back up your clips to a tape device.

## Exercise 3: Archiving to Tape

In this exercise, archive clips and reels from the *Tutorial* clip library to a tape device, such as DAT, Exabyte, or DLT. Before you begin:

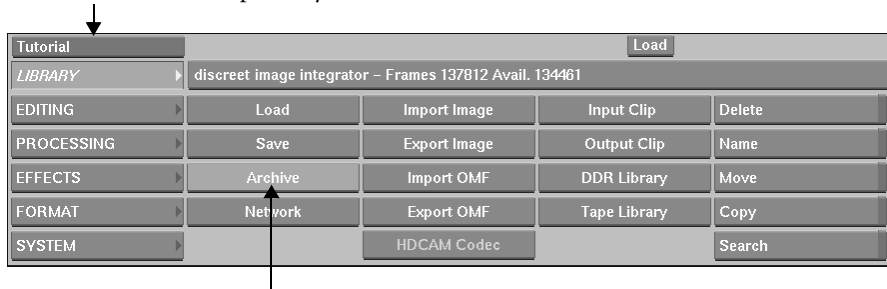
- The tape device must be mounted on your system.
- The tape device must be declared on a ClipMgtDevice line of the initialization configuration file as described in “Enable the File Clip Management Device Type” on page 71. For more information, read the comments in the configuration file itself or see the *flame* or *inferno* *Installation Guide*.
- You must have already completed Exercises 1 and 2 of this lesson.

**Note:** Archiving is not a background process. You must wait for archiving to finish before you can continue to work in *flame* or *inferno*.

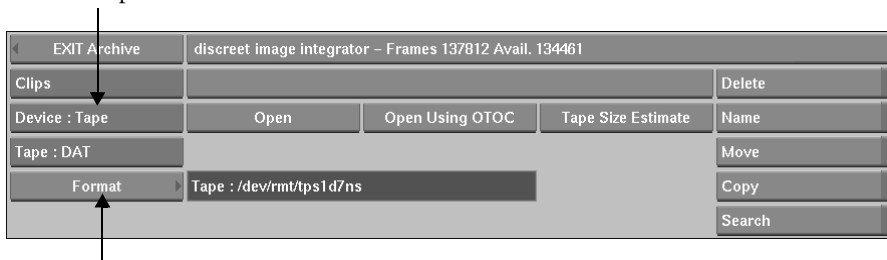
## Format the Tape

You must format the tape the first time it is used for archiving.

1. Insert the tape in the drive.
2. Open the Archive menu:
  - a) Select the *Tutorial* clip library.



- b) Click Archive in the Library menu.
3. Specify the tape device as the location of the archive:
  - a) Select Tape as the archive device.



- b) Click Format to open the Format menu.

If you do not see the Tape option or tape device pathname, make sure the tape drive is mounted correctly on your system. Ask your system administrator for more information.

#### 4. Format the tape:

- a) Click the Name field, type a name for the archive, such as “paint\_keyer\_archive”, and press **ENTER**.      b) Select the capacity of the tape.

The screenshot shows the 'EXIT Format' menu. At the top, it displays 'discreet image integrator - Frames: 137812 Avail. 134461'. Below this, there are several fields and buttons. An arrow points to the 'Name' field, which contains 'paint\_keyer\_archive'. Another arrow points to the 'Capacity' field, which shows '1.3 GB (DDS DAT 60m)'. A third arrow points to the 'Comment' field, which contains 'paint and keyer lessons'. Below the comment field, there is a 'Tape' field showing '/dev/rmt/tps1d7ns' and a 'Block Size' field showing '65536'. A 'Default' button is located below the block size field. An arrow points to this 'Default' button. The 'Format' button is located to the left of the 'Name' field.

- c) Click the Default button to use the default block size for the tape.      d) Enter a comment (optional).
- e) Click Format and Confirm.

When the tape is formatted, you are returned to the Archive menu.

## Archive Your Clips

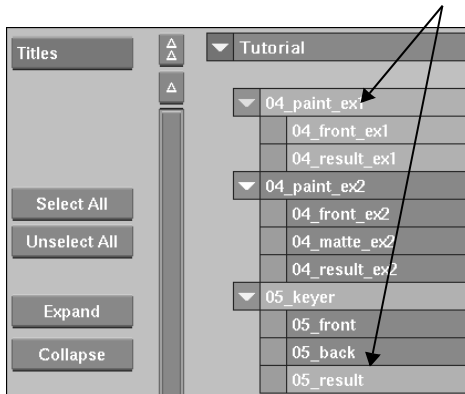
Once the archive is formatted, archive clips and reels from the *Tutorial* clip library to the tape.

#### 1. Open the archive by clicking Save From Library.

The screenshot shows the 'EXIT Archive' menu. At the top, it displays 'discreet image integrator - Frames: 137812 Avail. 134461'. Below this, there is a 'Clips' section with a 'Delete' button. A 'Device : Tape' section contains 'Load', 'Save', 'Save From Library', and 'Normal' buttons. An arrow points to the 'Save From Library' button. Below these buttons, there is a 'Tape' field showing '/dev/rmt/tps1d7ns'. On the right side, there is a vertical list of buttons: 'Name', 'Move', 'Copy', 'Close', and 'Search'.

## 2. Select the entries to be archived:

a) Select Titles mode.

b) Select the *04\_paint\_ex1* reel and the *05\_result* clip.

c) Select Normal (see Hint).

d) Click Save.

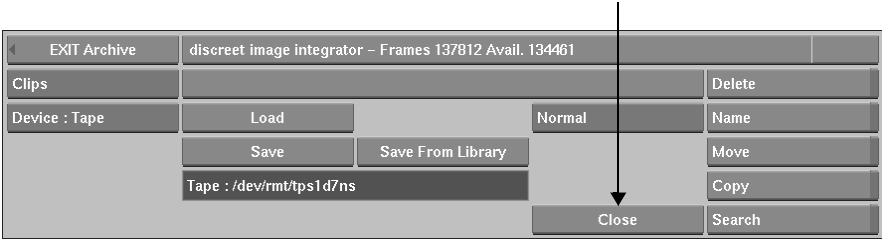


It takes approximately three minutes to archive the selected material, depending on the device used. The status is shown in the message bar.

**Hint:** With the Normal option, source clips remain in play order on the archive tape. With the Compact option, duplicate frames are not archived, so less space is used on the archive tape. For more information, see the chapter "Archiving" in the *flame* or *inferno* User's Guide.



3. When archiving is complete, the Load and Save options appear. Click Close to close the archive.



The archive is updated and you are returned to the Archive menu. You can save more clips to the archive at any time. Do not format the tape before saving additional clips to the archive.

## Load a Clip From the Archive

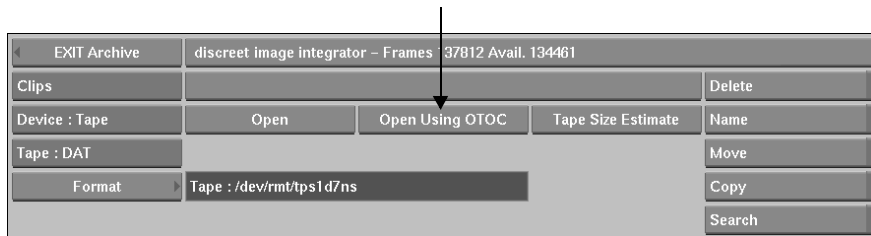
When you create an archive, an online table of contents (OTOC) for the archive is automatically created in a directory on your computer's system disk. You can use the OTOC to recover the material in an archive if the table of contents on the tape is corrupted. For more information, see the chapter "Archiving" in the *flame* or *inferno* User's Guide.

It is also faster to open an archive using the OTOC. However, with OTOC you can only load material from the archive; you cannot save additional clips to the archive. Also, the OTOC does not contain proxy information, so you cannot view the proxies for the clips in the archive.

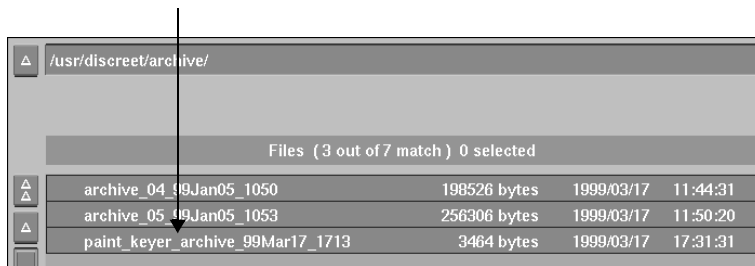
Define the directory where the online tables of contents are stored using the ArchiveLibrary keyword in the initialization configuration file. By default, the tables of contents are stored in the `/usr/discreet/archive` directory. If you do not define a directory for the online tables of contents, a reminder appears when you start *flame* or *inferno*.

1. Open the archive using the online table of contents:

a) Click Open Using OTOC. The file browser appears.

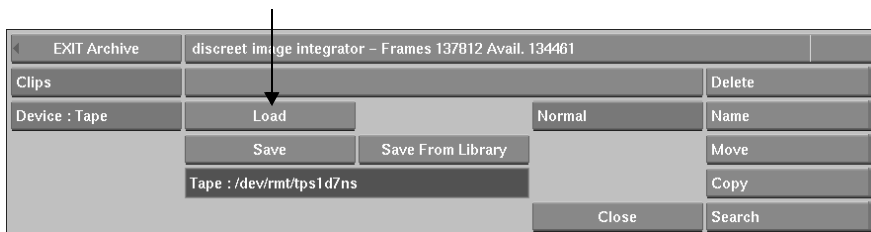


b) Select the table of contents file for the archive you just created and Confirm.



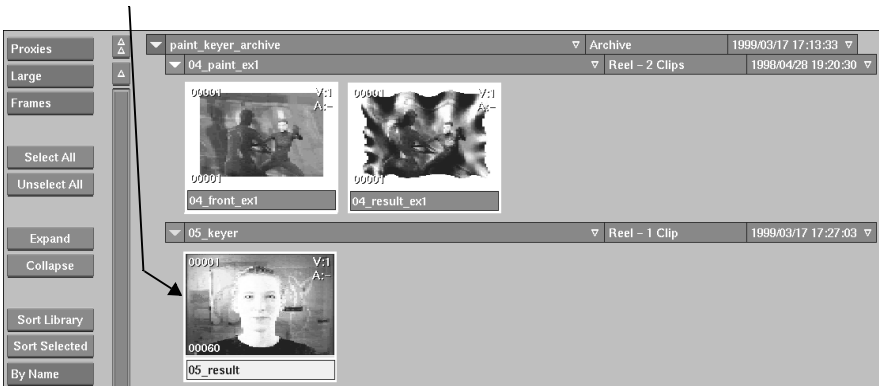
**Hint:** When you create an archive, write the archive name and date on the tape label. This will help you to select the correct table of contents file when you open the archive.

2. Click Load and select a destination reel.



3. Select and load a clip:

a) Select *05\_result*.



b) Click Load to load the clip to the reels.



The *05\_result* clip appears on the destination reel.

- 4. Click Close to close the archive.
- 5. Click EXIT Archive to return to the Library menu.

## Things to Remember

- Clip libraries are used to store and manage clips.
- The clip library that you are currently saving to and loading from is shown in the Clip Library box on the desktop.
- You can change the name of any entry in the clip library by selecting the entry and clicking the Name button.
- If you change the name of the clip in either the clip library or on the desktop, the name is changed in both locations.
- You can organize clips and reels in the clip library using drag and drop actions.
- You can search for clips or individual frames in the current desktop or clip library using the Search menu.
- Back up the clips on the framestore by archiving to an Exabyte, DAT, DLT, a DST tape drive, or a D1, Betacam, or Digital Betacam VTR, or Dataview.
- You must declare file and tape devices used for archiving in the initialization configuration file by enabling their ClipMgtDevice lines.
- Use the online table of contents to open an archive or to recover the archive if the table of contents on the tape is corrupted.

# 4 Retouching a Clip

**flame** and **inferno** include a feature-rich Paint module for creating original clips and retouching existing ones. User-definable brushes and a variety of paint media allow you to achieve a myriad of novel effects. You can also use animated graphics to build rotoscoped sequences and shape animations.

In this lesson:

- Combine paint colours, special effects, and brush attributes to define different brushes
- Use filters and special effects media, such as Warp and Shade, to enhance an image
- Select colours using the colour picker and the colour palette
- Retouch an image using the Reveal brush
- Design a brush shape using the Brush Editor
- Apply random animated paint strokes to the clip using AutoPaint

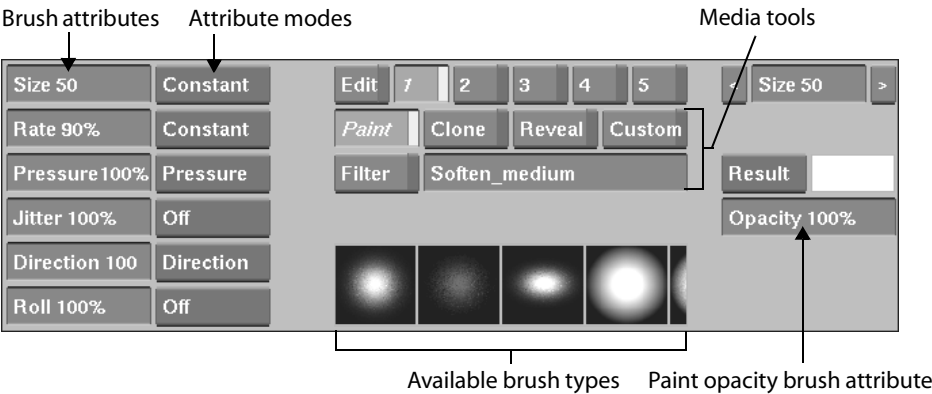
Time to complete this lesson: 60-90 minutes

# About Paint

In Paint, the cursor becomes a brush used to paint colours and effects on the image, or canvas. There are many pre-defined brush types to choose from. You can also create custom brush types.

There are many ways to change the behaviour of a brush. In general, you can specify:

- the media tool (such as Paint, Clone, or Reveal)
- the brush type (such as air brush, soft-edged brush, or hard-edged brush)
- the brush attributes (including size and opacity)
- the brush attribute modes (special ways of modifying brush attributes)



## Brush Attributes

Use the brush attributes to specify how you want the paint to be applied: opacity, size of stroke, application rate, brush pressure, and so on. The value determines how much the attribute affects the brush.

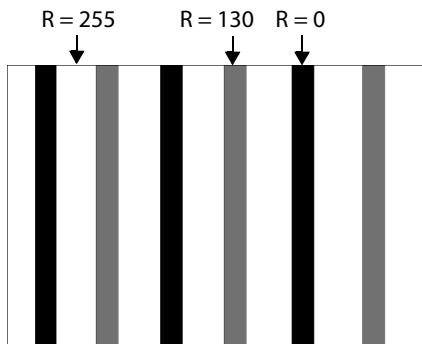
Use:	To:
	Adjust the opacity of the paint.
	Adjust the size of the brush.
	Adjust the application rate for the brush. A high value produces a continuous stroke, while a low value produces gaps in the stroke.

Use:	To:
<b>Pressure 100 %</b>	Adjust the paint transparency (when used with the Pressure attribute mode).
<b>Jitter 100 %</b>	Disperse the paint on the canvas. The higher the value, the greater the effect.
<b>Direction 100 %</b>	Make the paint follow the trajectory of the brush (when used with the Direction attribute mode).
<b>Roll 100 %</b>	Create a calligraphy effect (when used with the Direction attribute mode). Roll works best with a non-symmetrical brush type.

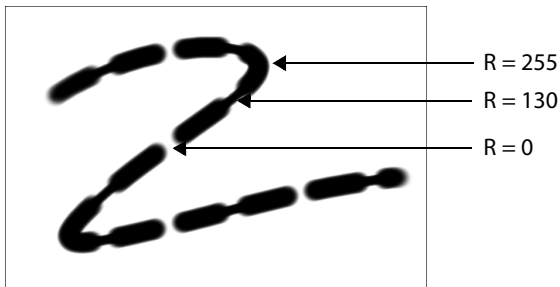
## Brush Attribute Modes

The behaviour of the brush also depends on the attribute mode. The attribute mode specifies a particular reference source that controls the way the brush attribute value changes.

For example, you can vary the size of the brush according to the value of the red channel in the back clip. In the illustration below, the front clip is a white frame and the back clip is a frame of colour bars with red channel (R) values of 0, 130, and 255. The Size attribute mode is set to Back.



As you paint, the brush size changes in relation to the red channel value of the back clip. The brush size is largest where  $R = 255$ , intermediate where  $R = 130$ , and zero where  $R = 0$ .



Select:	To:
<b>Result</b>	Use the red channel of the result clip as the reference. The result clip is the front clip plus the paint effects you have applied to it.
<b>Saved</b>	Use the red channel of the last saved frame as the reference. Learn more about the Saved option later in this lesson.
<b>Back</b>	Use the red channel of the back clip as the reference, if you have loaded a back clip from the reels. You cannot paint on the back clip itself.
<b>Front</b>	Use the red channel of the front clip as the reference. The front clip is the clip you apply paint to.
<b>Direction</b>	Use the direction of the brush as the reference.
<b>Pressure</b>	Use the pressure exerted on the pen as the reference. This option can be used only if you are using a tablet and pen instead of a mouse.
<b>Constant</b>	Produce no variation. The brush attribute is determined only by the attribute value.
<b>Off</b>	Disable the brush attribute. In most cases, Off mode has the same effect as setting the brush attribute value to 0% in Constant mode.



## Media and Filters

Use the paint media to add special effects to the image. In this lesson, you use the Paint, Reveal, Shade, and Warp media, as well as filters.

Use:	To:
<b>Paint</b>	Paint using the selected colour.
<b>Clone</b>	Copy part of the image.
<b>Reveal</b>	Paint using a reference image (the front, back, or result clip) instead of a colour.
<b>Filter</b>	Paint using a filter instead of a colour.
<b>Custom</b>	View the custom brush options, listed in the remainder of this table.
<b>Wash</b>	Replace the hue of the image with the hue of the paint colour.
<b>Shade</b>	Darken or lighten the image, depending on the luminance of the current colour.
<b>Smear</b>	Smudge the image (like smearing wet paint).
<b>Drag</b>	Drag a part of the image, leaving a trail of smeared paint.
<b>Warp</b>	Stretch and distort the image.
<b>Impressionist</b>	Give the image an “impressionist” effect by painting on colours from a reference clip.
<b>Recursive Clone</b>	Make multiple copies of part of the image.
<b>Stamp</b>	Capture a sample of the image to use as the brush.
<b>Blur</b>	Blur the image.

## Mattes in Paint

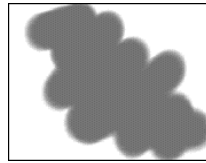
In Paint, the matte clip is a black and white clip that protects the clip while you paint. The white areas of the matte protect the result clip, and the black areas let the brush strokes through.



Front clip



Matte clip



Paint strokes



Result clip

You can use the matte to protect areas of the image while painting or creating animated shapes or cutouts. For example, in Exercise 2 of this lesson, you use a matte to paint the background of a clip without affecting the dancer in the foreground.

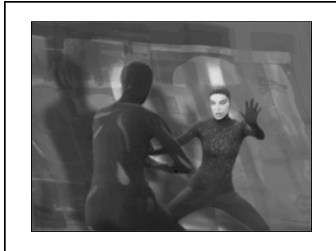
You can also paint directly on the matte clip to create your own matte or to retouch an existing one. For information, see the chapter “Paint: Using Mattes” in the *flame* or *inferno* *User’s Guide*. Learn how to create mattes using the Keyer in Lesson 5, “Precision Keying”, and using the Modular Keyer in Lesson 13, “Modular Keying: Basic Techniques”.

## Exercise 1: Painting a Cloth Effect

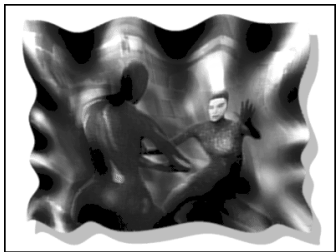
In this exercise, use a combination of brush types, media, and filters to make an image look like it is painted on a piece of cloth.

Load the *04\_paint\_ex1* reel onto the desktop. If you have not yet copied it from CD 2, “setups & images,” copy it now. For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*04\_front\_ex1*: The image before retouching



*04\_result\_ex1*: The image after retouching

## Open Paint

Load the source clip and reset Paint.

### 1. Select Paint:

a) Click Effects.    b) Click Paint.

c) Select Front input mode.

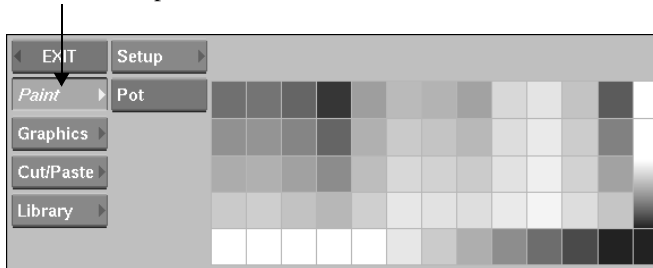


### 2. Select the *04\_front\_ex1* clip.

3. Select any reel on the desktop as the destination reel.

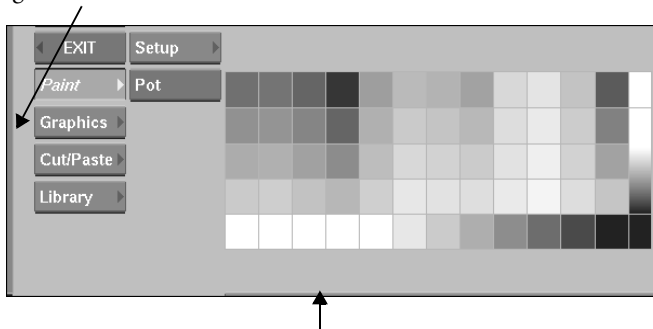
Paint opens and the *04\_front\_ex1* clip appears in the image window.

4. Click Paint to open the Paint menu.



5. You can change the view of the Paint menu using the swipe bars:

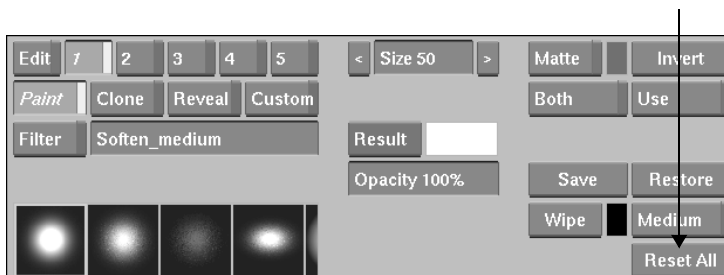
a) Use the cursor to swipe the bar on the left or right side of the Paint menu. The screen changes to Large Canvas mode. To re-display the menu panel, touch one of the swipe bars again.



b) Swipe the bar below the colour palette or press the ~ key to hide or show the palette.

6. When you open any module in **flame** or **inferno**, do a “reset all” to reset the menu settings, animations, or other data left from the last session.

To reset the Paint preferences and setups to their default values, click Reset All and Confirm.



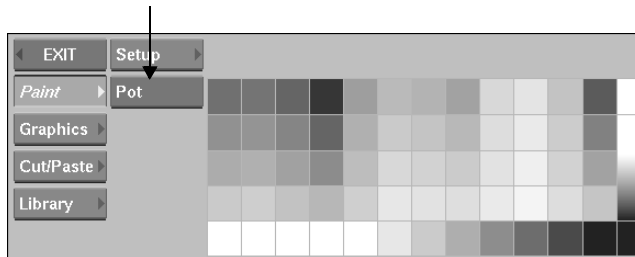
## Change the Wipe Colour

Later in the exercise you use the Warp medium to distort the image. Warping the edges of an image reveals a colour “underneath” the edges. This is the wipe colour. Change the wipe colour to white.

1. First, set the current colour to white:

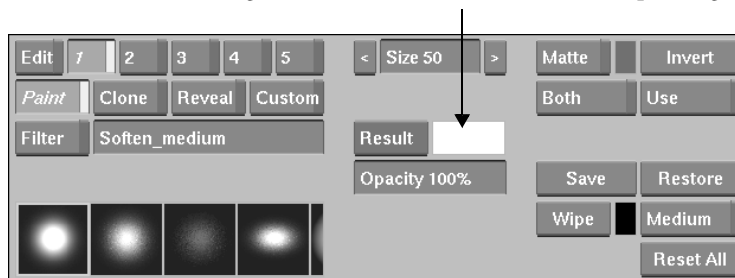
a) Swipe the bar at the bottom of the menu or press ~ to show the colour palette.

b) Select Pot to view the colour pots.

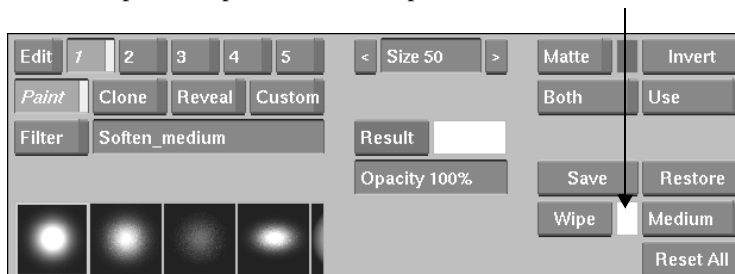


c) Click white in the colour palette. Do not hold the cursor too long on the white colour pot, or else the current colour will be saved to the pot.

The current colour changes to white. This is the colour used for painting.



2. Click the wipe colour pot to make the wipe colour the same as the current colour.



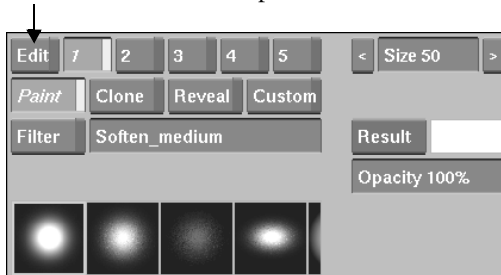
3. Hide the colour palette by pressing ~.

## Define a Hot Key

In the next step, you define several brush setups. For each brush setup, you must enable Edit in the Paint menu, define the setup, then disable Edit to save the changes. Define a hot key that you can use to enable and disable Edit.

1. Press **F8** to open the Hot Key Editor.
2. Define **E** to be the hot key for the Edit button:

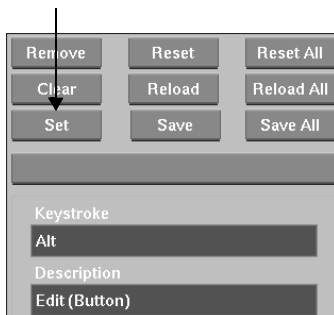
- a) Click Edit in the menu panel.



- b) Click the E key in the on-screen keyboard.



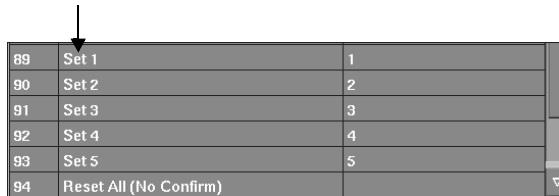
- c) Click Set. The new hot key appears in the hot key list.



- d) Click Save and Confirm to save the new hot key list under your user name.

3. When selecting a brush setup, you can either click the numbered brush setup button in the Paint menu or use the predefined hot key. Press **1** on the keyboard to select brush setup 1, **2** for brush setup 2, and so on.

Look for Set 1, Set 2, and so on in the hot key list. If the brush setups are not defined, define them now.



89	Set 1	1
90	Set 2	2
91	Set 3	3
92	Set 4	4
93	Set 5	5
94	Reset All (No Confirm)	

4. Press **F8** to close the Hot Key Editor.

## Define Five Brush Setups

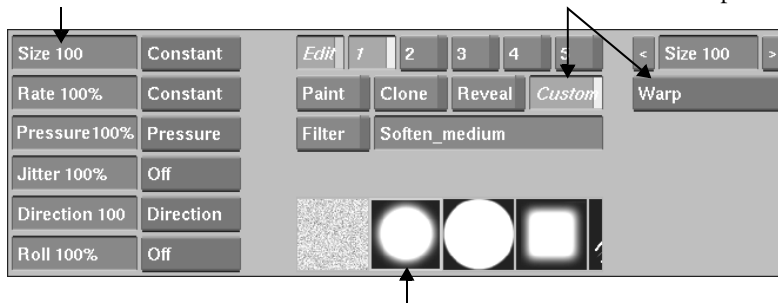
Choose brush characteristics to define the brush setups for painting the cloth effect. You can either click Edit and numbered brush setup buttons or use the defined hot keys.

1. Define brush setup 1 as a warping brush:

a) Enable Edit and 1 (or press **E** and **1**) to edit the first brush setup.

b) Set the brush size to 100.

c) Click Custom and select the Warp medium.

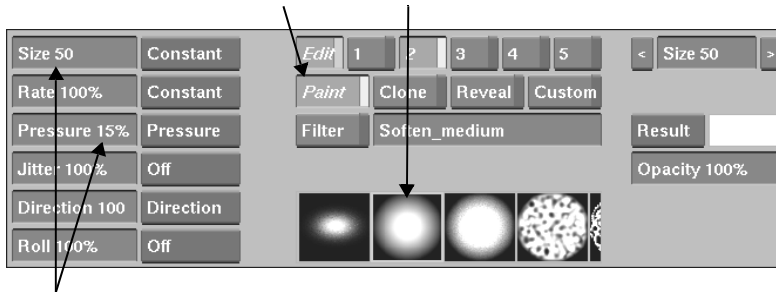


d) Select a brush with a soft edge. To scroll through the brushes, drag left or right over the brush icons.

e) Disable Edit (**E**) to save brush setup 1.

2. Define brush setup 2 as a light air brush:

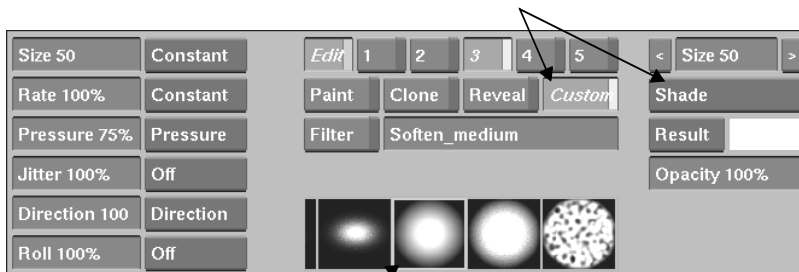
- a) Enable Edit and 2 (or press **E** and **2**).
- b) Click Paint to use a solid colour.
- c) Select an air brush.



- d) Set the brush size to 50 and the pressure to 15%.
- e) Disable Edit (**E**) to save brush setup 2.

3. Define brush setup 3 as a shade brush for painting highlights:

- a) Enable Edit and 3 (or press **E** and **3**).
- b) Click Custom and select the Shade medium.

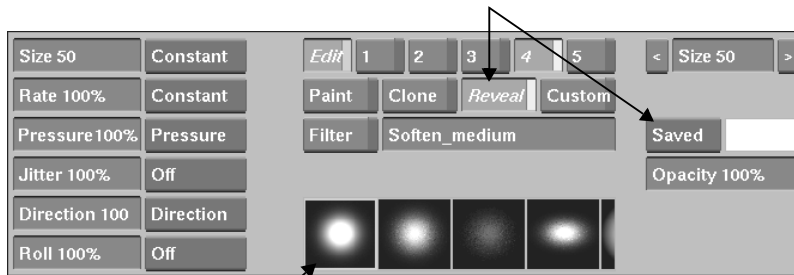


- c) Select an air brush.
- d) Set the brush size to 50 and the pressure to 75%.
- e) Disable Edit (**E**) to save brush setup 3.



4. Define brush setup 4 as a brush that reveals the saved image. Use this brush to retouch the canvas as you create the cloth effect (see “Use Reveal to Retouch Mistakes” on page 119 for details):

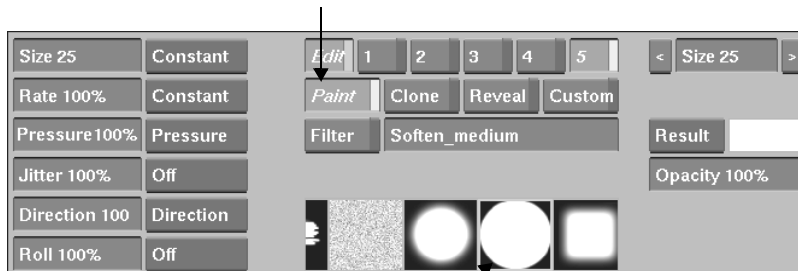
- a) Enable Edit and 4 (or press **E** and **4**).
- b) Select the Reveal medium and Saved as the reference.



- c) Select an air brush.
- d) Set the brush size to 50.
- e) Disable Edit (**E**) to save brush setup 4.

5. Define brush setup 5 as a small, hard-edged brush for drawing a shadow:

- a) Enable Edit and 5 (or press **E** and **5**).
- b) Click Paint to use a solid colour.

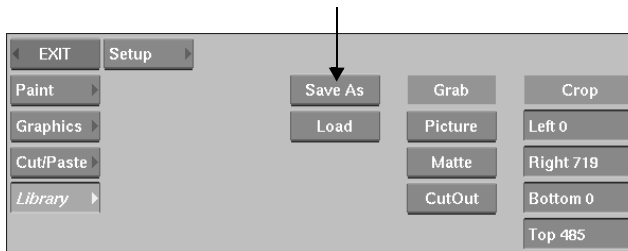


- c) Select a hard-edged brush.
- d) Set the brush size to 25.
- e) Disable Edit (**E**) to save brush setup 5.

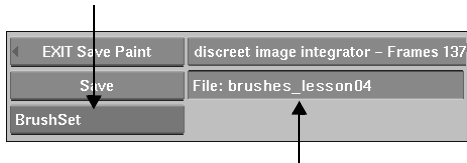
## 6. Save the brush set:

a) Click Library to open the Paint library menu.

b) Click Save As to open the file browser.



c) Select BrushSet.

d) Click the File field, type a name for the brush set such as "brushes\_lesson04", and press **ENTER**.

All five brush setups are saved in the brush set in your user preference directory, which has the pathname `/usr/dscreet/user/effects/<user name>/paint/set`. You can define and store many brush sets, each consisting of five brush setups.

**Hint:** If you need help, the brush setups for this exercise are provided in the file `/usr/dscreet/project/effects/Tutorial/setups/lesson_04/brushes_lesson04`. Click Load, select BrushSet, and then select the brush set file from the browser.

## 7. Click Paint to return to the Paint menu.

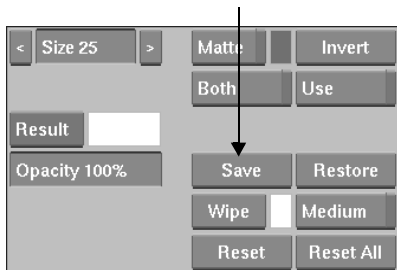


## Use Reveal to Retouch Mistakes

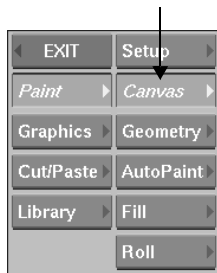
Next, learn how to retouch the image using the Save and Reveal features.

- Clicking the Save button saves the result image (the image on the canvas). Each time you click Save, the saved image is updated. Save your image frequently as you are working. If you make a mistake, you can restore the last saved image and continue working on the image without starting from scratch.
- Use the Reveal medium to paint portions of the front, back, saved, or result image onto the canvas. Here, use the Reveal medium to restore portions of the last saved image.

1. Click Save to save the result image.



2. Click Canvas. This button must be enabled to apply brush strokes to the image.



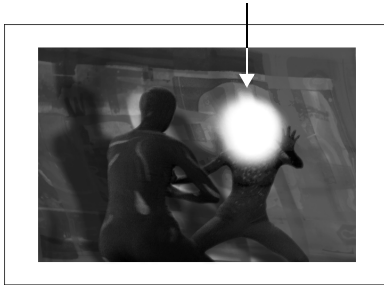
3. Select a colour from the colour palette:

- a) Press ~ to display the colour palette.
- b) Click any colour in the palette.

The selected colour appears in the current colour field.

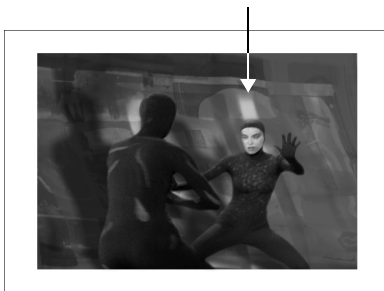
**Hint:** A scratch pad is also available for mixing colours or just to see how your stroke will look. Select Palette or Pot next to the colour palette to toggle between the scratch pad and the colour pots.

4. Enable brush setup 2 by pressing **2**, then paint over the dancer's face.



**Hint:** If you are using a mouse, always use the right mouse button to obtain the correct brush pressure. For full control over brush pressure and paint opacity, use a tablet and pen.

5. Enable brush setup 4 by pressing **4**, then paint over the coloured area to restore the dancer's face.



Brush setup 4 uses the Reveal medium with the saved image as a reference. The saved image is painted on the canvas. Use this technique to retouch mistakes while painting.

**Hint:** To restore the entire saved image to the canvas, click Restore.

## Creating Custom Colour Palettes

You can create custom colour palettes for different projects. Use the colour picker to pick a colour to be saved (see "Using the Colour Picker" on page 123), then press and hold on a colour pot in the palette until the colour is copied from the current colour field. Save the custom palette using Save As in the Paint Library menu.

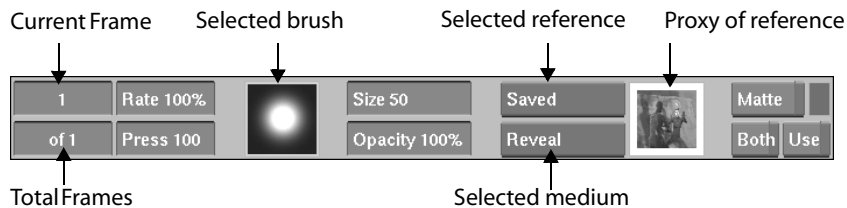
Remember, click a colour pot to select the colour for painting, but press and hold the colour pot to save the colour from the current colour field to the colour palette.

## Use the Large Canvas

You may find it easier to paint in Large Canvas mode, especially for detailed work. This mode is only available in the Paint menu with the Canvas button enabled. The remainder of this exercise is performed in Large Canvas mode.

1. Swipe the bar on the right or left side of the screen or press **ESC** to go to Large Canvas mode.

Although the menu is reduced in size, many Paint options are available. Note that the brush setup buttons are not available; use the hot keys to select the brush setups in this mode.



2. Zoom in or out by pressing **UP ARROW** or **DOWN ARROW**. To pan, press **SPACEBAR** while dragging the image.

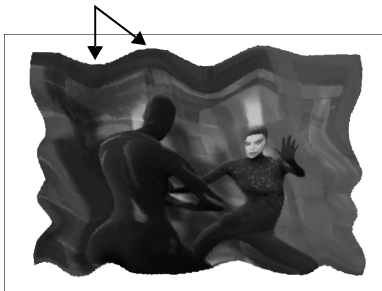
## Paint Folds and Highlights

Use the brush setups to make the image look like it is painted on cloth.

1. Create the cloth's folds:

a) Press **1** to enable brush setup 1 (the Warp effect).

b) Use the brush to stretch the white border into the image, and to stretch the image over the white border.



c) To make some of the smaller folds, reduce the brush size by pressing **S** while dragging left over the image. Dragging to the right makes the brush larger.

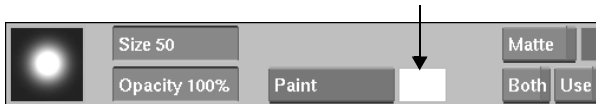
d) Stretch some areas within the image to enhance the look of the folds.

**Hint:** When the cursor is positioned over the canvas in the Paint menu, it appears as a green cross within a circle, no matter which brush type is selected. The size of the circle represents the size of the brush. Toggle the cross on and off by pressing **H**.

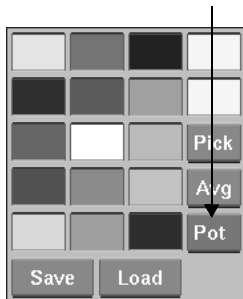
2. Change the brush colour to black:

a) Enable brush setup 2 by pressing **2**.

b) Click the current colour field to view the colour picker.



c) Click the colour picker mode box until the colour pots appear.

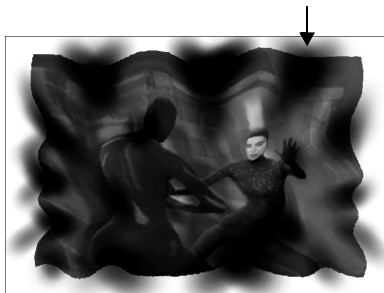


d) Click the black colour pot.

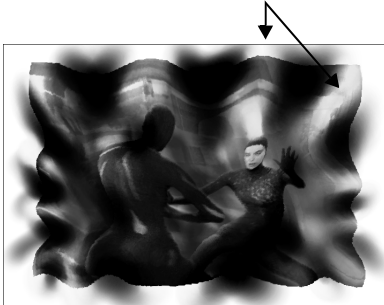
e) Click the current colour field again to make the selected colour the current colour.

**Hint:** If you don't see a black colour pot, click Load in the colour picker and select the *ColourPickerDefault* file from your user preference directory, */usr/discreet/user/effects/<user name>/colourpicker*. For more information, see "Using the Colour Picker" on page 123.

3. Paint between the folds to add shadows and give the cloth a 3D look. To increase shading control, reduce the paint opacity or resize the brush.

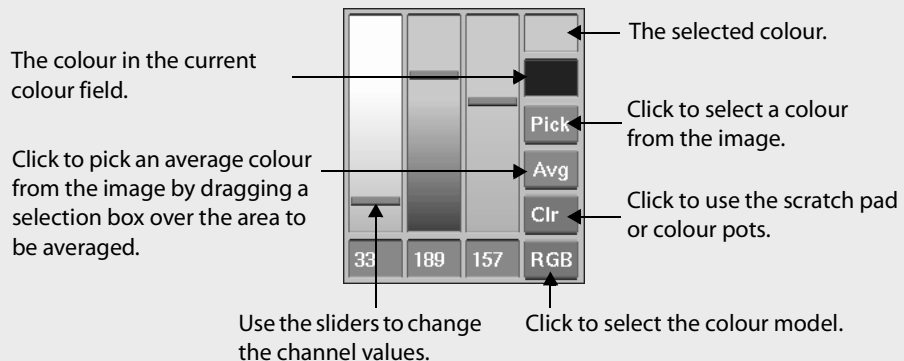


4. Paint highlights on the top of each fold:
  - a) Enable brush setup 3 by pressing **3**.
  - b) Click the current colour field and use the colour picker to change the brush colour to white.
  - c) Paint highlights on the folds.



## Using the Colour Picker

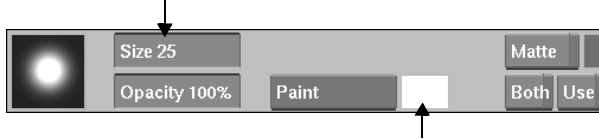
Use the colour picker to select a colour from the image or to set the channel values for a new colour. To display the colour picker, click the current colour field. Click the current colour field a second time to transfer the selected colour to the current colour field.



5. Enhance the highlights where the folds are the brightest:

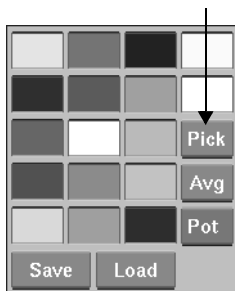
a) Enable brush setup 2 by pressing **2**.

b) Change the brush size to 25.



c) Click the current colour field to view the colour picker.

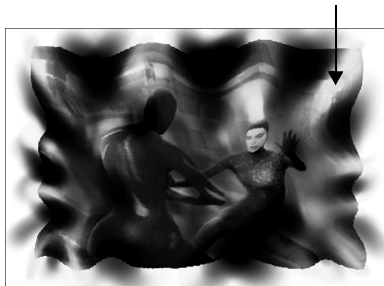
d) Click Pick and use the eyedropper cursor to select the brightest yellow from the image.



**Hint:** You can also pick a colour from the image by pressing **CTRL** as you click the colour.

e) Click the current colour field to make the selected colour the current colour.

f) Paint yellow highlights where the folds are the brightest.



**Note:** Changing the brush size in instruction 5b does not change the brush setup. You can temporarily change any brush characteristic (type, opacity, and so on) by not enabling Edit before making the change. The next time you select the setup, you will see the original characteristics.



## Apply a Filter

Apply the Fabric filter to give the cloth a fabric texture.

### 1. Select the Fabric filter:

a) Select Filter.

b) Click the option box to view the list of predefined filters.



c) Select Fabric from the list of available filters.

You are returned to the Paint menu.

### 2. The Wipe command applies a solid colour, a medium, or a filter to the entire image. Wipe the image using the Fabric filter to give the cloth a fabric texture:

a) Enable Medium to wipe with the selected filter.

b) Click Wipe.



The Fabric filter is applied to the image.



**Hint:** You must always enable Medium to wipe with a medium (such as Shade) or a filter. To wipe with the colour in the wipe colour pot (next to the Wipe button), disable Medium before clicking Wipe.

### 3. Disable Medium.

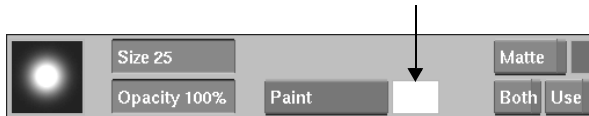
## Paint a Shadow

To add a sense of depth to the image, give the cloth a shadow.

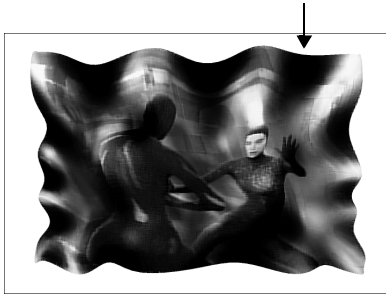
### 1. Remove the paint from the white background:

a) Enable brush setup 5 by pressing **5**.

b) Click the current colour field and use the colour picker to change the brush colour to white.



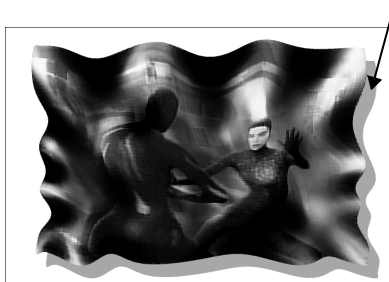
c) Paint over the strokes on the white border. Remember, you can press **S** and drag to resize the brush.



### 2. Paint a shadow for the cloth:

a) Click the current colour field and use the colour picker to change the brush colour to grey.

b) Paint a shadow for the cloth. Zoom in and pan as needed. To make the corners of the shadow sharp, paint them using a very small brush size, such as 5.



## Check Your Results

Compare your result to the *04\_result\_ex1* clip.

1. Swipe the bar at the edge of the screen or press **ESC** to disable Large Canvas mode.
2. Click EXIT. You are returned to the reels and the result clip is written to the destination reel.
3. Use the Player to view your result clip. Compare your result to the *04\_result\_ex1* clip.
4. Save your result clip in your clip library.
5. Delete the result clip and exercise reel from the desktop.

## Exercise 2: Painting a Stardust Effect

In this exercise, use AutoPaint in Random mode and a custom brush shape to apply a stardust effect to the background of a clip.

Load the *04\_paint\_ex2* reel onto the desktop. If you have not yet copied it from CD 2, “setups & images,” copy it now. For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*04\_front\_ex2*: This is the front clip. You paint the background of this clip to add a stardust effect.



*04\_matte\_ex2*: This is the matte clip. The matte is provided to protect the dancer while painting the background of the clip.



*04\_result\_ex2*: This clip shows the expected result. To preview the effect, play the *04\_result\_ex2* clip using the Player.

# Open Paint

Create a noise clip and load the source clips into Paint.

1. Using Coloured Frame in the Processing menu, create a 30-frame noise clip to use as a reference clip in Paint. For instructions, see “Select the Coloured Frame Command” on page 30.
2. Click Paint in the Effects menu and select Front Back Matte input mode.



3. Select *04\_front\_ex2* as the front clip, the 30-frame noise clip as the back clip, and *04\_matte\_ex2* as the matte clip.
4. Select a destination reel.  
Paint opens and the *04\_front\_ex2* clip appears in the image window.
5. Click Reset All and Confirm to reset all Paint preferences and setups to their default values.

# Wipe the Canvas with Black

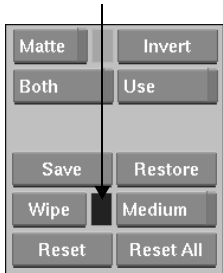
To create a starburst brush, draw a starburst pattern on a black background. First, wipe the canvas with black. You reveal the front clip again in a later step.

1. Click Canvas. This button must be enabled to apply paint to the canvas.

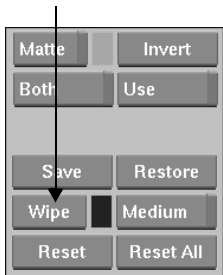


2. Change the wipe colour to black:

- a) If necessary, press ~ to view the colour palette.
- b) Click black in the colour palette to change the current colour to black.
- c) Click the wipe colour pot.



3. Click Wipe. The canvas becomes black.



## Draw a Starburst Pattern

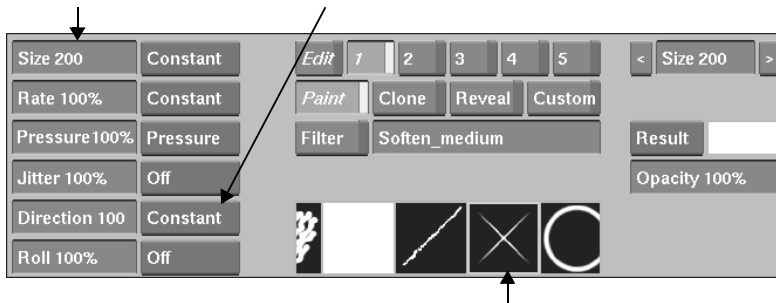
Use the star brush to draw a starburst pattern on the black background.

1. Set the brush colour by changing the current colour to white.
2. Press ~ to hide the colour palette.

**3. Start drawing the starburst pattern on the canvas:**

**a) Set the brush size to 200.**

**b) Set Direction to Constant mode.**



**c) Select the star brush. To scroll through the brushes, drag left or right over the brush icons.**

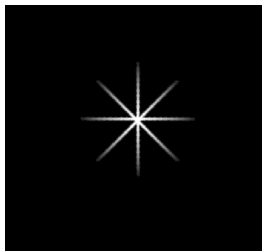
**d) Click once on the canvas to get one impression of the star brush.**

**4. In Constant mode, changing the Direction value causes the brush stroke to rotate. Change the brush direction to build the starburst pattern:**

**a) Set Direction to 85%.**



**b) Click the centre of the star on the canvas. The image should look like this.**

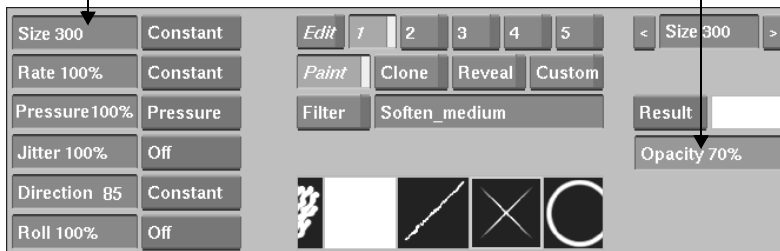


**c) Continue to build the starburst pattern by changing Direction by increments of 5% or 10% and adding strokes to the canvas.**

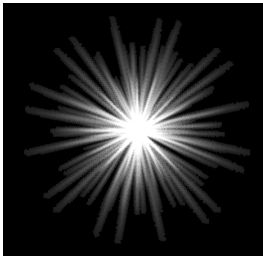
5. Change the brush size and paint opacity to complete the starburst pattern:

a) Set Size to 300.

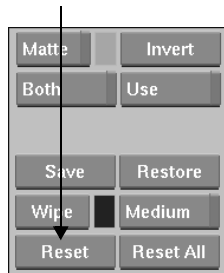
b) Set Opacity to 70%.



- c) Changing the Direction value each time, add more strokes at the new paint opacity until the image looks like this.



6. When you are satisfied with the starburst pattern, click Reset and Confirm to reset the brush attributes.





## Create a Custom Brush

You can use the Brush Editor to design a brush type by:

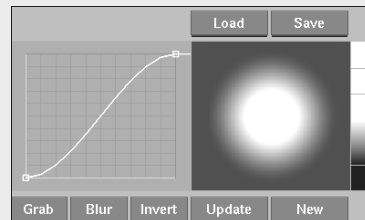
- Modifying one of the existing brushes
- Drawing a brush shape from scratch
- Grabbing a part of the image

In this step, use the Brush Editor to grab the starburst pattern that you have drawn on the canvas. For additional information on customizing brushes, see “The Brush Editor” below.

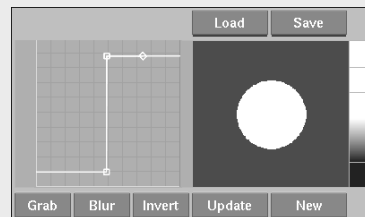
### The Brush Editor

Use the graph in the Brush Editor to modify the size and edge softness of a brush. For example:

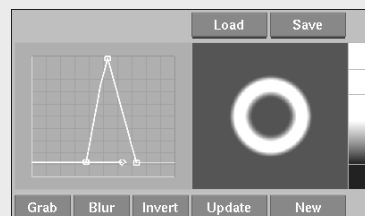
Create an airbrush by using an S-shaped curve. To adjust the curve, click on a point to display its handle, then move the handle.



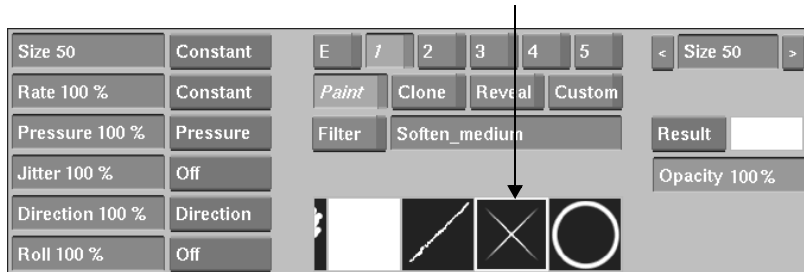
Give a brush a hard edge by making the curve vertical. Drag the two points inwards to make the line between them vertical.



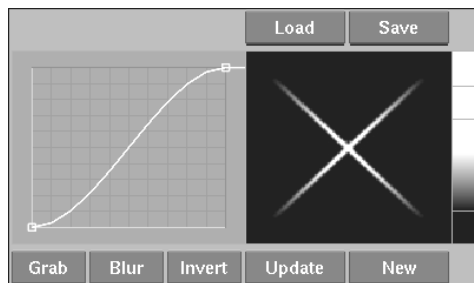
Create a ring brush by adding a third point to the curve. To add a point, press **A** to select Add mode, and then click on the curve. Next, press **M** to select Move mode and move the points to form a triangular shape.



1. Open the Brush Editor by clicking the selected brush icon.

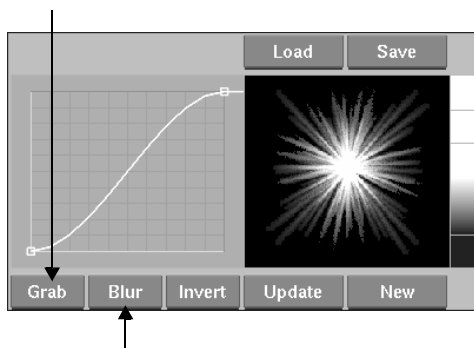


The Brush Editor appears.



2. Save the starburst pattern as the custom brush:

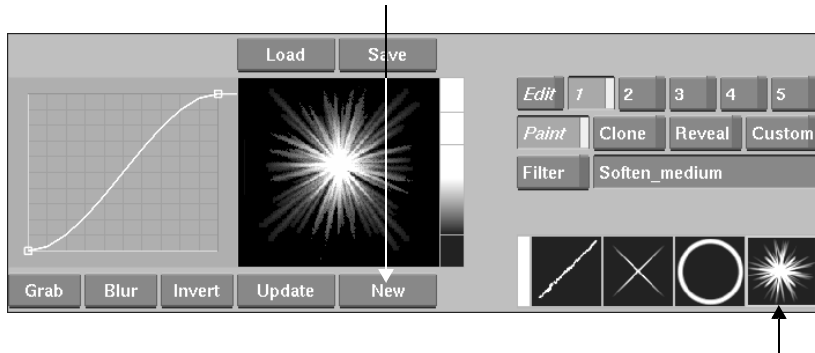
a) Click Grab and drag a selection box around the pattern on the canvas. The pattern appears in the Brush Editor.



b) Click Blur to slightly blur the brush image.

### 3. Make an icon for the new brush:

- a) Click New to create the icon for the new brush.



- b) Scroll to the last entry in the Brushes window. You should see the new brush icon.

- c) Click Save above the Brush Editor to open the file browser.

- d) Click the File field, type “starburst” to name the brush, and then press **ENTER**.

- e) Click the new brush icon to close the Brush Editor.

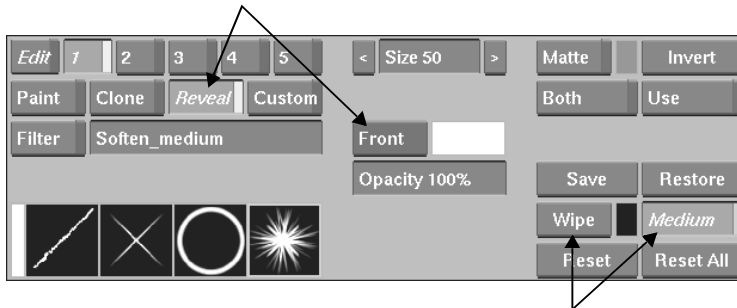
The brush is saved in your user preferences directory, */usr/discreet/user/effects/<user name>/paint/brush*, and will be available the next time you start **flame** or **inferno**.

**Hint:** You can also compare your starburst brush to the one provided for the lesson. To do this, open the Brush Editor, click New to create a new brush icon, then click Load to open the file browser. Go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_04* and select the file *starburst*.

## Reveal the Front Clip

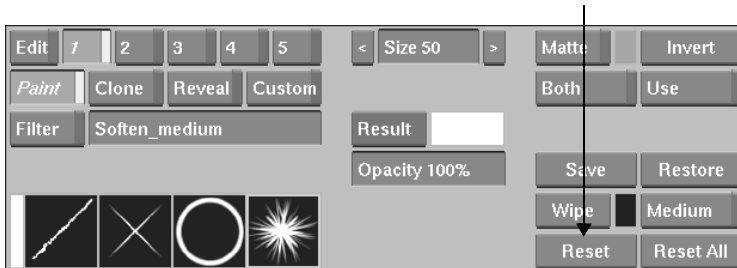
Now that you have grabbed and saved the starburst brush, get ready to paint the effect by revealing the front clip in the first frame.

1. Wipe the current frame to reveal the front clip:
  - a) Click Reveal and select Front as the reference source.



- b) Enable Medium to wipe using Reveal and click Wipe.

2. After wiping the frame, click Reset and Confirm to reset the options you changed.



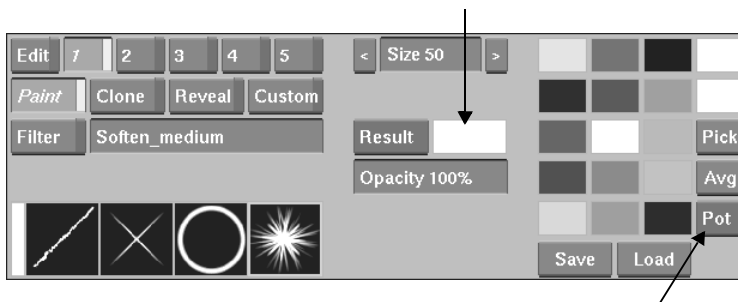
## Add the Stardust Effect

AutoPaint applies paint to each frame of the clip automatically. Random AutoPaint mode applies random paint strokes using the current colour and the selected brush attributes. A filter or one of the effects media, such as Shade, Wash, Impressionist, or Reveal, can also be applied. The number of brush strokes per frame, the brush attributes, and the paint colour can be animated.

In this step, use AutoPaint in Random mode with the starburst brush to add the stardust effect to the clip. Animate the number of strokes per frame as well as the brush size.

### 1. Select the colour for the effect:

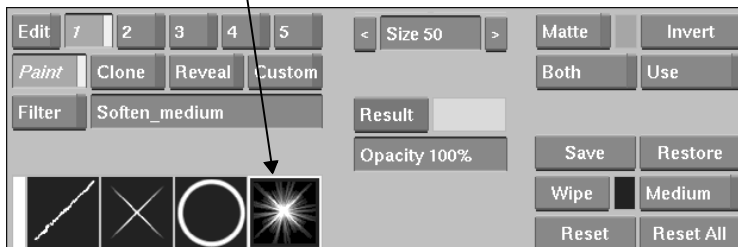
- a) Click the current colour field to view the colour picker.



- b) Click the colour picker mode box until the colour pots appear.
- c) Click the light grey colour pot.
- d) Click the current colour field again to make grey the current colour.

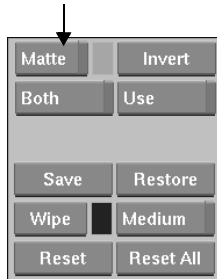
**Hint:** If you do not see light grey in the palette, click Load and select the *ColourPickerDefault* file from the */usr/discreet/user/effects/<user name>/colourpicker* directory.

### 2. Select the starburst brush.



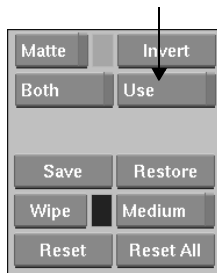
3. Enable the matte so the AutoPaint effect is applied only to the background of the clip:

a) Click Matte to view the dancer matte you loaded from the reels when you opened Paint.



The matte appears and is the colour shown in the matte colour pot. This is the area that will be protected as you paint.

b) Click Use to enable the matte.

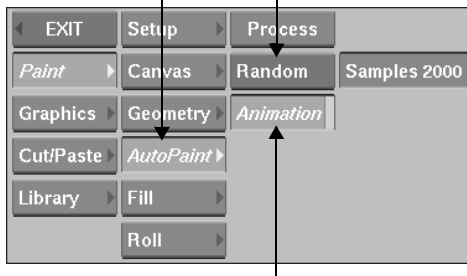


The Matte button is disabled. Although the matte is not shown, it is used to protect the image while you paint.

**Hint:** To paint on the matte, enable the Matte button.

4. Select Random AutoPaint mode:

a) Click AutoPaint.      b) Select Random.



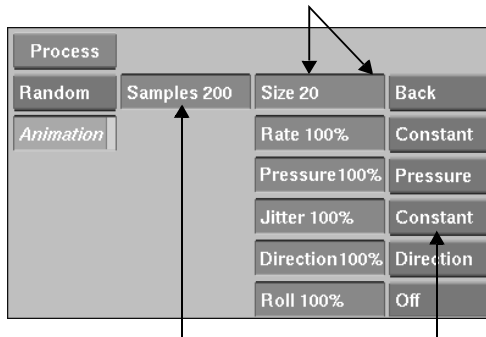
c) Click Animation to create keyframes for the selected channels.

5. Press **CTRL+LEFT ARROW** to go to frame 1.

**Hint:** Changing a channel value sets a keyframe. Make sure you are at the correct frame before changing a value, or the result may not be what you expect.

6. Set the brush size and number of strokes (or samples) per frame at frame 1. By selecting the back clip (the colour noise clip) as the reference for the brush size, the size of the strokes will vary according to the red channel value of the noise clip. See “Brush Attribute Modes” on page 107 for more information.

- a) Set Size to 20 and select Back (the noise clip) as the reference.



- b) Set Samples to 200.

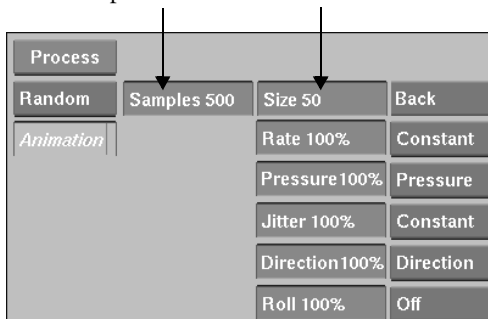
- c) Select Constant for the Jitter attribute.

7. Press **CTRL+RIGHT ARROW** to go to frame 30.

8. Set the brush size and number of strokes per frame at frame 30:

- a) Set Samples to 500.

- b) Set Size to 50.

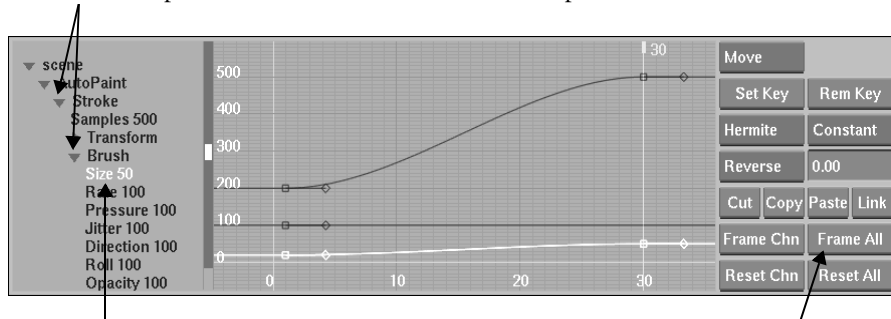


## View the Paint Animation Curves

When you set brush characteristic values at different frames, animation curves are created. Open the Channel Editor to view the animation curves for the brush size and number of strokes.

1. To view the Channel Editor, swipe the bar at the bottom of the screen or press ~.
2. Display the brush size curve:

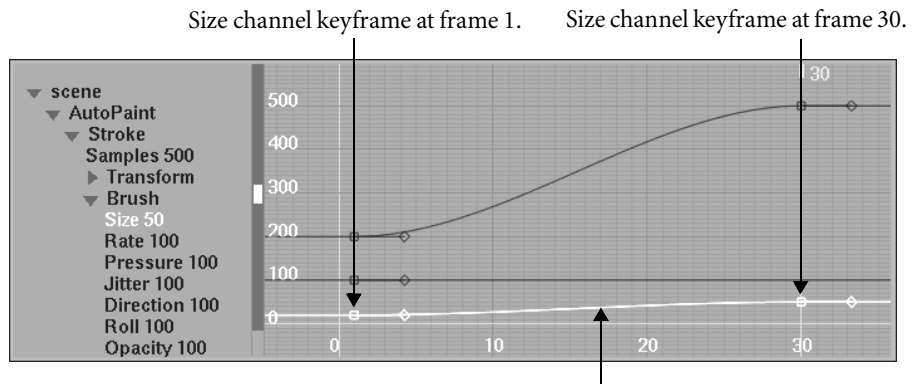
a) Click ► to open the Stroke folder, then click ► to open the Brush folder.



b) Click Size to select the size channel.

c) Click Frame All to centre both the Samples and the Size curves in the Channel Editor.

3. Notice the position of the key frames.



The size of the brush is interpolated between keyframes to create the animation curve.

Learn more about the Channel Editor in Lesson 6, “Animating Composites”.



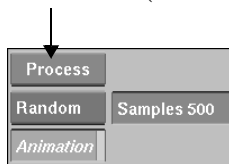
4. When you are finished viewing the curves, swipe the bar at the bottom of the screen or press ~ to return to the AutoPaint menu.

**Hint:** You may want to try this exercise again using different values for brush size and number of strokes. Before creating new keyframes, click Reset All in the Channel Editor to reset the animation curves.

## Check Your Results

Process the clip, then exit Paint and compare your result to the *04\_result\_ex2* clip.

1. Go to frame 1 (CTRL+LEFT ARROW) and click Process.



Random strokes are painted in each frame of the clip.

**Hint:** To apply the AutoPaint effect to the current frame only, click on the image.

2. Click EXIT to return to the reels.  
The result clip is written to the destination reel.
3. Use the Player to view your result clip. Compare your result to the *04\_result\_ex2* clip.
4. Save your result clip in your clip library.
5. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- In Paint, the result clip is a copy of the front clip to which brush strokes are applied. The result is written to the destination reel when you exit Paint.
- Use the Save buffer in conjunction with a Reveal brush to retouch the image.
- Define a brush setup to store the type of brush, the brush attributes, the medium, and the filter used when painting.
- The brush attributes determine how paint is applied: the paint opacity, the size of the stroke, brush pressure, and so on. The percentage value determines how much the attribute affects the behaviour of the brush: the higher the percentage, the greater the effect. The attribute mode determines how the brush attribute varies in relation to a reference source.
- Click the current colour field to view the colour picker. Use the colour picker to select the paint colours.
- Pick a colour from the image by pressing **CTRL** and clicking the colour.
- Create different colour palettes and save them in the Paint library menu. To save the current colour in the colour palette, press and hold on a colour pot. To select a colour from the colour palette, click one of the colour pots.
- Press **~** to hide or view the colour palette.
- Use Wipe to wipe the canvas with the wipe colour. To wipe with a filter, a Reveal brush, or other medium, enable the Medium button before clicking Wipe.
- To paint in Large Canvas mode, swipe the bar at the right side of the screen or press **ESC**. Zoom in by pressing **UP ARROW**.
- Use AutoPaint in Random mode to apply random strokes to each frame of the clip. The paint is applied using the current colour or medium and the selected brush attributes. The number of brush strokes per frame, the brush attributes, and the paint colour can be animated.
- Use the Brush Editor to create a custom brush shape. To open the Brush Editor, click the selected brush icon in the Brushes window.

# 5 Precision Keying

Use the Keyer to generate precise composites and mattes. A variety of colour extraction tools are available for pulling keys from green screen and blue screen clips, as well as from clips with shadows, reflections, transparencies, or non-uniform colour backgrounds.

To help you obtain the most precise matte possible, the Keyer provides tools for variable edge treatment and softness, colour spill removal, and adding spline-based animatable garbage masks.

In this lesson:

- Create a matte and a composite using the Keyer
- Soften the edges of the matte
- Use a garbage mask to key out problem areas
- Remove colour spill from the composite

## **Need Help?**

If you need help creating the key, load the setup file provided for this lesson. Click the Load button in the Keyer menu to open the file browser and go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_05*. Load the setup file *05\_keyer*.

Time to complete this lesson: 30 minutes

## About Composites and Mattes

A composite is created by combining elements from a front clip and a back clip using a matte clip. A matte clip is a black and white clip; the white area, which resembles a cut-out shape, determines the area of the front clip used in the composite. The matte clip may also contain shades of grey, producing a blend of the front and back clips in the composite. In the Keyer, the matte is often called the key.

If you do not have a matte for the composite, you can create one. In this lesson, use the Keyer to generate a matte from a blue screen clip. Learn additional techniques for generating mattes from more difficult to key material in Lesson 13, “Modular Keying: Basic Techniques”.

## The Keying Process

The Keyer uses a key-in clip to generate the matte clip. Usually, the same clip is used as both the front clip and the key-in clip. The Keyer extracts, or keys out, colours within a defined range from the key-in clip to produce the black areas of the matte. These black areas mask out the background of the front clip, and the back clip becomes the new background in the composite. Colours not keyed out produce the white areas of the matte which correspond to the areas of the front clip used in the composite.

You can use the Keyer’s key-in filter to remove grain or artifacts from the key-in clip before performing the key. This produces a cleaner key by making the colour in the area to be keyed out more consistent. However, it also blurs the edges of the key, and should be used in moderation.

## Using a Blue Screen or Green Screen

The best keys are obtained when the front and key-in clips consist of a subject shot in front of an evenly lit, pure colour background, such as a blue screen or a green screen. All pixels with the same colour values as the background are keyed out; all other pixels are preserved.

Since blue and flesh tone are close to complementary colours, a blue screen is the usual choice when the object to key is a talent.

It may be preferable to use a green screen if the object to key contains any but the most pastel of blues. Also, since the background colour usually spills on to the object, green spill on flesh tones is less noticeable than blue spill. The Keyer contains colour suppression tools for neutralizing colour spill.

## Selecting a Keying Technique

The Keyer includes a number of colour models for extracting a matte from the key-in clip. The colour model you choose depends on the key-in clip and on your personal preference. If you cannot successfully build a key using one model, try another.

<b>Use:</b>	<b>To:</b>
RGB	Define a range of colours to be keyed out using the red, green, and blue channels of the image.
YUV	Define a range of colours to be keyed out using the luminance and chrominance signals of YUV component video.
HLS	Define a range of colours to be keyed out using the hue, luminance, and saturation channels of the image.
CHAN	Extract factory preset blue or green. You can also select a custom colour, which is useful if the front clip includes transparencies, shadows, or reflections.
RGB-CMYL	Define a range of colours to be keyed out using the red, green, blue, cyan, magenta, yellow, and luminance channels of the image. This colour model offers sub-pixel resolution.
LUM	Build a key according to the clip's luminance and chrominance values. This colour model is most often used for clips with high contrast or filmed against a black background.

## Exercise: Pulling a Key

In this exercise, pull a key from a blue screen clip using the HLS colour model and remove the colour spill in the composite.

Load the *05\_keyer* reel onto the desktop. If you have not yet copied it from CD 2, “setups & images,” copy it now. For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*05\_front*: This is the blue screen clip to be keyed.



*05\_back*: This is the background for the composite.



*05\_result*: This is the final composite.

To preview the final composite, play the *05\_result* clip using the Player.

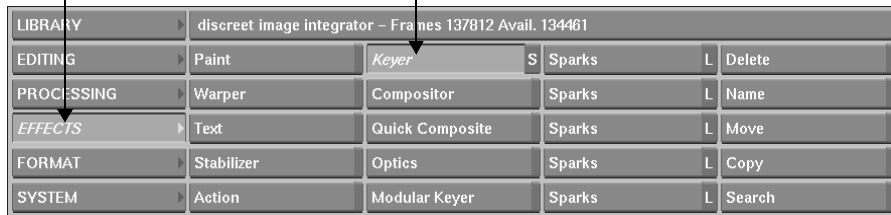
## Open the Keyer

Load the source clips and reset the Keyer.

1. Select the Keyer:

a) Click Effects.

b) Click Keyer.



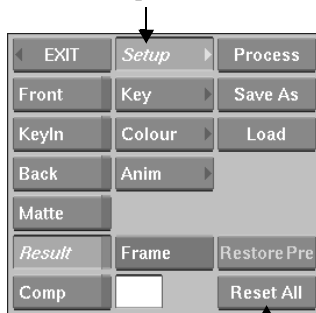
2. Select *05\_front* as the front clip, *05\_back* as the back clip, and *05\_front* again as the key-in clip.

3. Select any reel as the destination reel.

The Keyer opens.

4. Go to the Setup menu and reset all options to their default values:

a) Click Setup.



b) Click Reset All and Confirm.

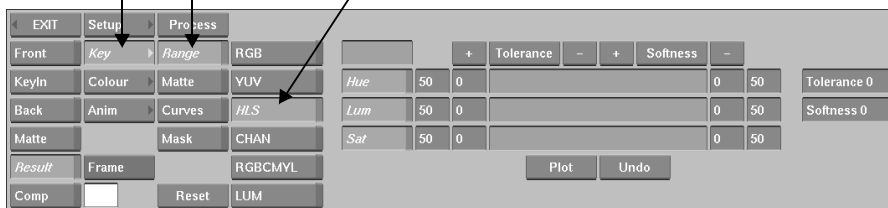
**Note:** If you swipe the bar on the left or right side of the Keyer menu, the Channel Editor appears. To re-display the image window, swipe the bar again.

## Set the Tolerance for the Key

The first step in pulling a key is to set the colour or range of colours to be keyed out. This is called the tolerance. In this exercise, set the tolerance using the HLS colour model.

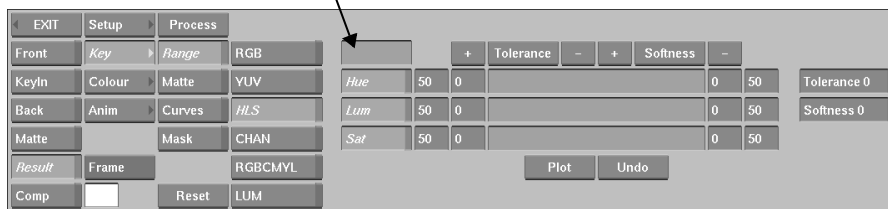
1. The properties of the key can be animated. Go to frame 1 (**CTRL+LEFT ARROW**) to set the key properties for the entire clip.
2. Click Result (**F4**) to view the composite as you create the key.
3. Select the HLS colour model:

- a) Click Key.    b) Click Range.    c) Click HLS.

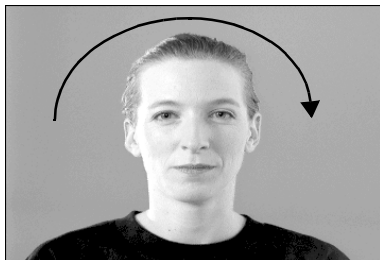


4. First, select an average colour to be keyed out:

- a) Click the Average Colour field.



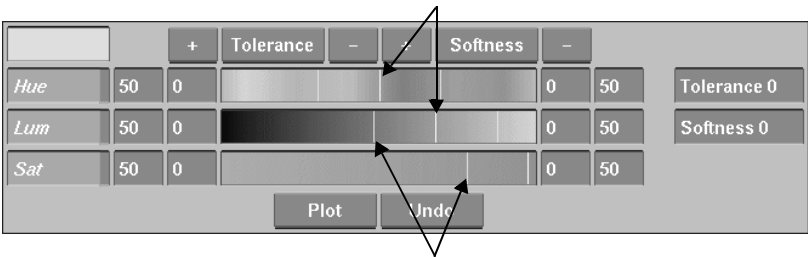
- b) Drag the eyedropper around the talent's head to select the average colour to be keyed out.



The selected colour appears in the Average Colour field, and the pixels with this value are keyed out.

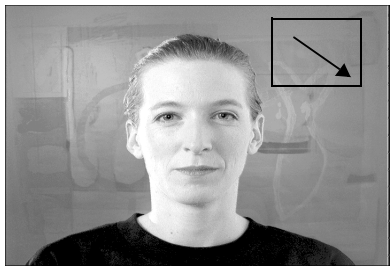


The white lines on the HLS colour bars indicate the hue, luminance, and saturation values of the selected colour. Pixels with these values are now black in the matte.

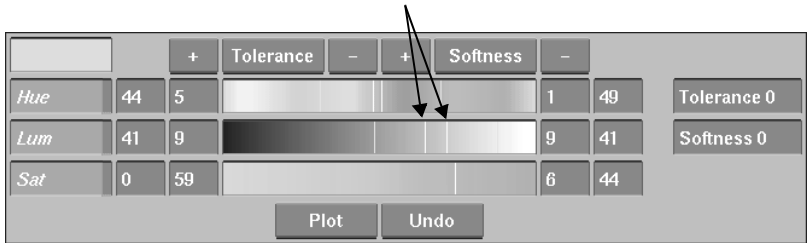


The yellow lines indicate the softness range, which is automatically set to 50 to preserve some grey at the edge of the matte. The grey areas of the matte are partially transparent. This produces a soft transition between the front object and the background of the composite.

- 5. There is still some blue in the background of the composite. To adjust the tolerance of the key to remove a range of blues from the background, press **CTRL** while dragging the cursor diagonally across the area to be keyed out.



The range of colour values within the selected area are keyed out. The range, called the tolerance range, is indicated by two white lines on each HLS colour bar.



For more information, see “Adjusting the Tolerance and Softness” on page 150.

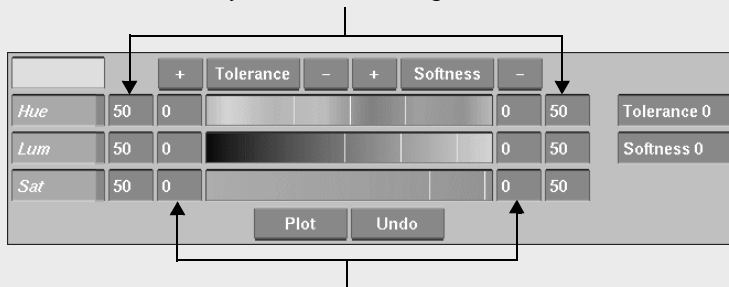
- Repeat step 5 for any remaining blue areas.

Do not worry about the edges of the frame or the remaining blue spill around the talent. You will use a garbage mask to hide the edges, and colour suppression to remove the spill around the talent's head. It is more important to have softness at the edge of the key than it is to have the background of the matte completely opaque.

## Adjusting the Tolerance and Softness

There are several ways to adjust the tolerance and softness ranges:

- Increase the range by clicking + next to the Tol or Soft button and clicking or dragging on the image. Click - to reduce the range.
- Use these fields to adjust the softness range for individual channels.

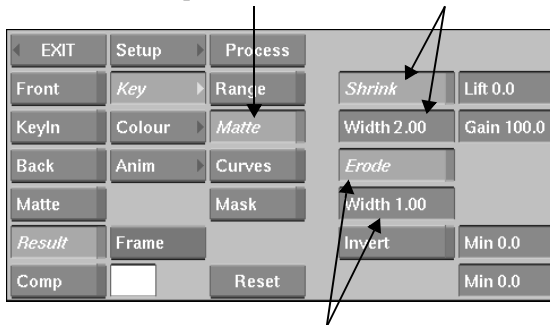


- Use these fields to adjust the tolerance range for individual channels.
- Adjust the range by the same amount for all channels by entering a value in the Tolerance or Softness field.

## Improve the Edges of the Key

After setting the tolerance, you can improve the edges of the key using Shrink and Erode:

- a) Click Matte to open the Matte menu.    b) Click Shrink and set Width to 2.



- c) Click Erode and set Width to 1.

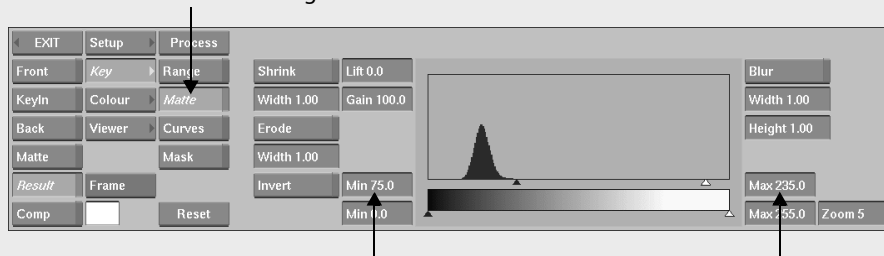
Shrink removes pixels from the edge of the matte, and should not be used when the subject to be keyed has fine details, such as hair. Although the subject in this clip has hair, you can use Shrink because there is not a lot of fine detail.

Erode is a fast, effective tool for softening the edge of the matte.

## Using the Histogram

If the matte still contains grey areas after setting the tolerance, you can remove the greys by using the histogram to re-map the luminance of the matte. The histogram shows the distribution of pixels for the luminance channel of the source image. The luminance values are plotted on the horizontal axis, from 0 (black) at the left to 255 (white) at the right. The number of pixels for each value is plotted on the vertical axis.

Click Matte to access the histogram.



To remove greys from the black area of the matte, increase the minimum input level. All pixels with values below the new minimum are set to black.

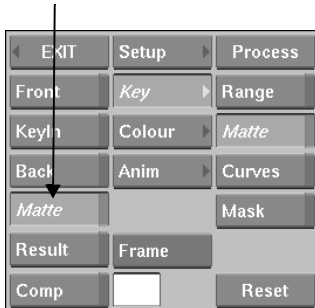
To remove greys from the white area of the matte, decrease the maximum input level. All pixels with values above the new maximum are set to white.

## Use a Garbage Mask

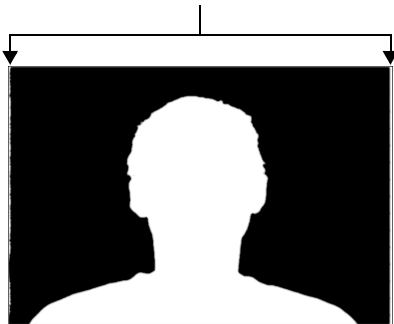
Use a garbage mask to key out a specific area of a clip by drawing a rough outline around the area to be keyed out, or around the area to remain in the key. Garbage masks are spline-based, so their shape can be animated.

In this step, use a garbage mask to key out the bad edges of the frame by drawing a mask around the talent.

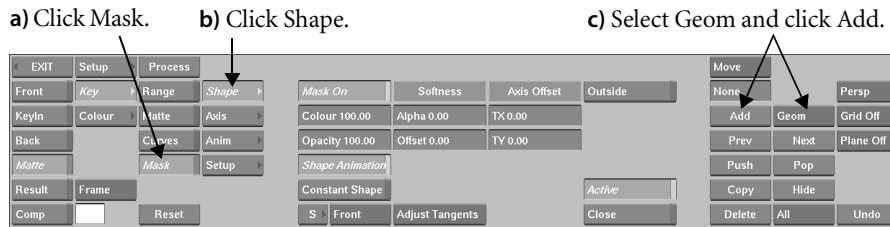
1. Click **Matte (F3)** to view the matte.



There is a white strip on both the left and right borders of the frame.



2. Use a garbage mask to hide the frayed borders:

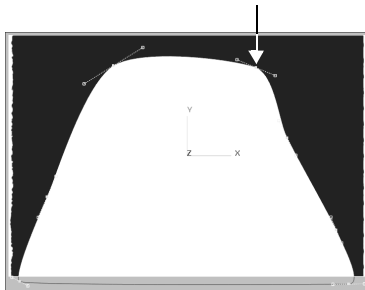


An axis for the garbage mask appears in the image window. Learn how to use the axis to animate a garbage mask in Lesson 8, “One and Two-Point Tracking”.

**Hint:** You can also press **N** or select Create edit mode to add a garbage mask.

3. Draw the garbage mask around the talent's head:

a) Click to add the first vertex.

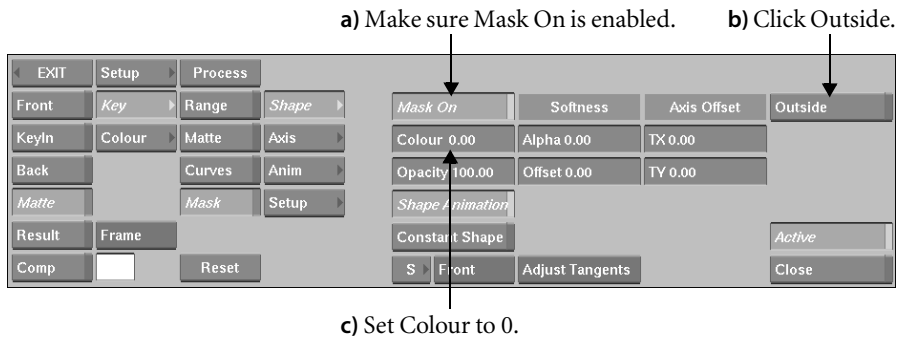


b) Continue clicking to add vertices to the garbage mask. The vertices are connected automatically. Notice that you can draw outside the image window. This makes it easier to surround the figure.

c) To close the garbage mask, click again on the first vertex or click Close.

**Hint:** You can also press **M** to close the garbage mask and select Move edit mode at the same time. This is handy if you need to adjust the position of any of the vertices on the mask.

4. Set the garbage mask to hide the background of the clip:



Setting Colour to 0 makes the selected area of the matte black. Since Outside is enabled, the area outside of the garbage mask is keyed out.

**Hint:** The Colour value determines the colour of the garbage mask, from black (0) to white (100). Use an intermediate value for a partially transparent key. This value can also be animated.

## Remove the Colour Spill

Blue light from the background of the front clip has caused some discolouration on the talent. This discolouration is called colour spill. Use the Keyer's colour correction tools to remove the colour spill.

1. Click Result (**F4**) to view the composite and click + (**CTRL+UP ARROW**) to zoom in.

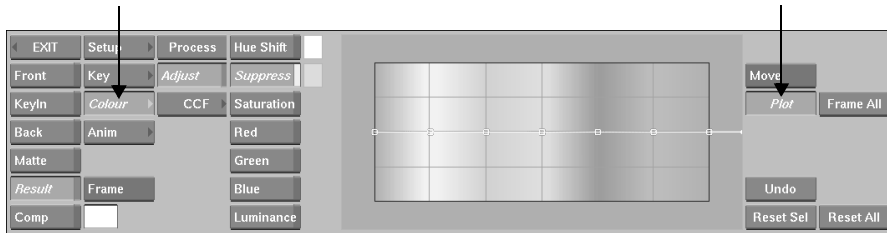
The blue from the background of the front clip has spilled onto the subject in the composite clip.



## 2. Plot the colour value of the spill above the talent's left ear:

a) Click Colour to open the Colour Curves menu.

b) Click Plot.



c) Select a pixel within the spill above the talent's left ear.

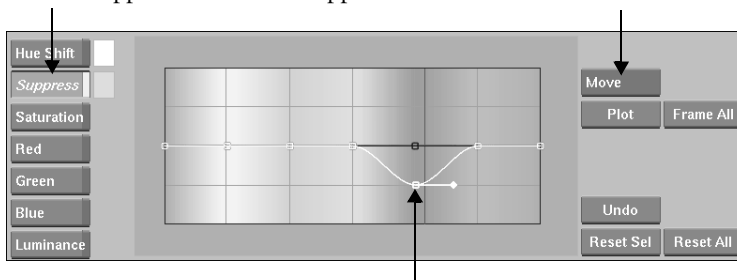


A thin red line appears in the blue area of hue spectrum, showing the exact colour value of the selected pixel.

## 3. Suppress the blue spill:

a) Click Suppress to select the suppression curve.

b) Select Move.



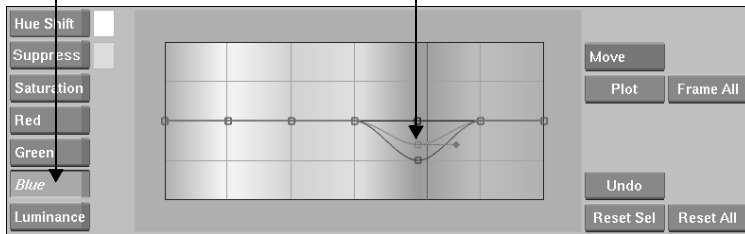
c) Select the point closest to the red line and drag it downwards until the value displayed is 25. Position the point on the red line.

The suppressed colour is shown in the colour field next to the Suppress button. This is the same colour as the one you selected in the HLS menu. The Keyer extracts this colour from the selected pixels to neutralize the blue spill.

4. The area above the talent's left ear still has a bluish tone. Adjust the blue channel curve:

a) Click Blue.

b) Select the point on the blue curve closest to the red line and drag it downwards until the value displayed is 35.

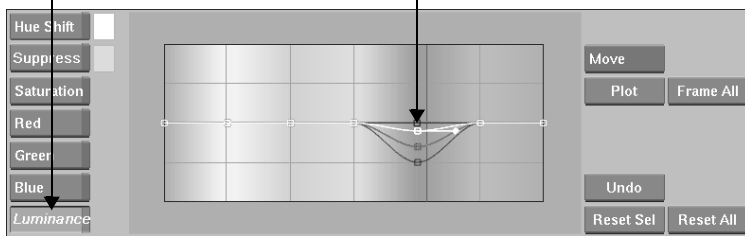


The Keyer further reduces the value of the blue channel.

5. Make a small adjustment to the luminance of the spill:

a) Click Luminance.

b) Select the point on the luminance curve closest to the red line and drag it downwards until the value displayed is 45.



6. Plot a pixel value from the colour spill on the talent's neck:

a) Zoom in a bit more to clearly see the colour spill.

b) Click Plot.



c) Select a pixel in this area.

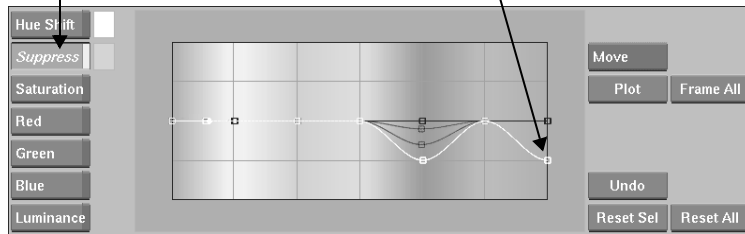
The red line showing the colour value of the selected pixel appears on the red side of the hue spectrum.



7. Suppress the blue in the spill:

a) Click Suppress.

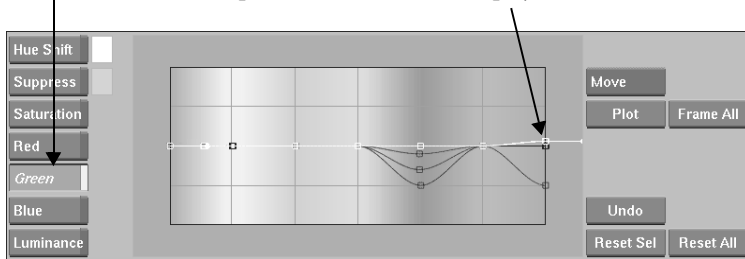
b) Select the point closest to the red line and drag it downwards until the value displayed is 25.



8. Add some green to make the flesh tones in the selected area a little warmer:

a) Click Green.

b) Select the point closest to the red line and drag it upwards until the value displayed is 53.



**Hint:** You can access the Colour Corrector from the Keyer by clicking the CCF button. You could, for example, use the Colour Corrector to match the brightness or saturation of the front and back clips. Learn more about the Colour Corrector in Lesson 11.

## Check Your Results

Save the setup, process the clip, and compare your result clip to the *05\_result* clip.

### 1. Save the setup:

a) Click Setup to open the Setup menu.

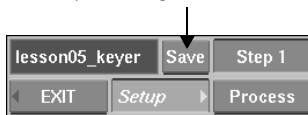


b) Click Save As to view the file browser.

c) Type a name for the setup file such as "lesson05\_keyer" and press **ENTER**.

By default, Keyer setups are saved in the directory */usr/discreet/project/effects/<project name>/key*.

You are returned to the Keyer Setup menu. The setup name appears in the black field in the menu. If you make further adjustments to the key, you can save the setup under the same name by clicking Save.



## Naming Setup Files

UNIX, **flame** and **inferno** are case-sensitive. For your convenience, use a standard convention when naming clips, image files, and setup files. For example, always use lower case letters.

You can use any of the following characters when naming files:

- Alphanumeric, 0-9, a-z, A-Z
- Underscore, "\_"
- Period, "."
- Hyphen, "-"
- Comma, ","

Do not use symbols such as !, @, %, \*, or \$.

Do not use spaces when naming a setup file, otherwise UNIX will interpret it as two separate files and you will not be able to read the file.

2. Click Result (**F4**) to view the composite.
3. Click Home (**HOME**) to zoom out.
4. Go to frame 1 and click Process.

**Hint:** If you want to process the matte clip instead of the composite, click Matte (**F3**) to display the matte, then click Process.

5. When the clip has been processed, click EXIT to return to the reels.

The processed clip appears on the destination reel.

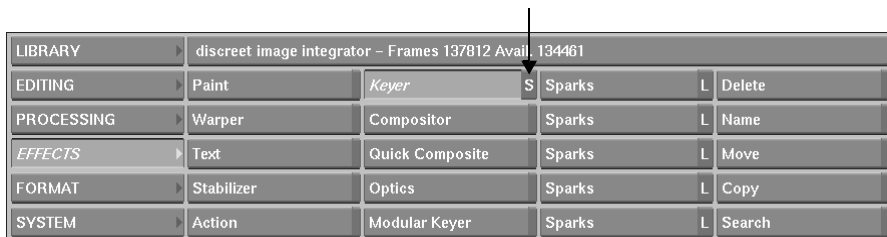
6. Use the Player to view your result clip. Compare your result to the *05\_result* clip.

## Load the Exercise Setup File

If your result clip does not match the *05\_result* clip, load the setup file provided for this exercise to see how the settings should appear. If you are happy with your result, skip to the next step, “Save Your Clip” on page 160.

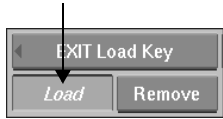
In Lesson 2, you copied all the setup files for the lessons from CD 2 to your system disk. If you have not copied the setup files yet, complete the step “Copy the Setup Files to Your System Disk” on page 53.

1. Click Keyer in the Effects menu.
2. Click the S (same) option on the Keyer button to load the same clips as the last time you opened the Keyer, then select a destination reel.



3. Open the Setup menu and click Load.
4. Use the file browser to go to the */usr/discreet/project/effects/Tutorial/setups/lesson\_05* directory. For instructions on using the file browser, see page 60.

5. Make sure Load is enabled.



6. Select the *05\_keyer* setup file.

When you load a setup file, all of the current menu settings are replaced by those saved in the setup file. Remember to save your current setup before loading a new one.

7. Examine the settings to see how they differ from your setup, then exit to the reels.

## Save Your Clip

1. Save your result clip in your clip library.
2. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- To create a composite in the Keyer, you need a front clip, a back clip, and a key-in clip.
- To generate a matte, the Keyer extracts, or keys out, a range of colours in the key-in clip. You can use the Channel range to extract red, green, blue, or a custom colour, or define the range using the RGB, YUV, HLS, or RGB-CMYL colour model.
- The range of colours to be keyed out is called the tolerance.
- The softness determines the amount of grey at the edge of the matte, and is used to soften the transition between the front object and the background of the composite.
- Use Shrink and Erode to improve the edges of the key.
- Use a garbage mask to key out problem areas in the key-in clip.
- Use the colour suppression tools in the Colour menu to remove colour spill at the edges of the key.

# Animating Composites

Action is a multi-layer compositing tool for creating complex visual effects. Use Action to animate clip layers in three dimensions and add camera, lighting, and shadow effects to the composite.

In this lesson:

- Learn about layers and surfaces
- Learn the basics of animating objects in Action
- Create a multi-layer composite
- Build a hierarchy in Schematic view
- Learn about motion paths and the speed curve
- Compare motion path animation and explicit animation

## **Need Help?**

If you need help animating the composites, load the setup file provided for this lesson. Click Setup in the Action menu, then click Load to open the file browser. Go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_06* and load the setup file *06\_action*.

Time to complete this lesson: 60-75 minutes

# About Action

In Action, you create effects and animations by manipulating objects in the scene. There are many types of objects in Action, including surfaces, axes, lights, shadows, and the camera. In this exercise, you link three surfaces together to create a butterfly; the surfaces can then be manipulated individually or together.

To understand how Action works, you must understand the differences between a layer and a surface.

## Layers

A layer consists of a front clip and a matte clip loaded from the reels. You can load multiple layers into Action, limited only by the amount of memory on your system.

You load the front and matte clips for the first layer when you open Action. You can then load additional layers from within Action. All layers loaded into Action appear in the Layers List. For example, in this exercise you select the following front and matte clips to open Action. The selected clips are loaded into the first layer and appear in the Layers List.

00:00:00:00 - 00001

06\_front\_body - 1

⏮ ⏪ ⏩ ⏭

00:00:00:00 - 00001

06\_matte\_body - 1

⏮ ⏪ ⏩ ⏭

Reels

Front clip

Matte clip

Add	# ▾	Front	Matte	Δ	K	MK	CC	CM
Delete	B	06_front_body (1)			G	C	Soft 0	
Apply	1	06_front_body (1)	06_matte_body (1)		X 0.00		MX 0.00	
	2				Y 0.00		MY 0.00	
Displace	3				Shadow		Soft 0.00	
Frame	4				F slp 0		M slp 0	
B slp 0	5							
	6							
Select All	7			▽	Reset		All	

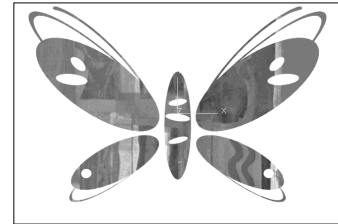
Layers List

## Surfaces

A surface is used to display a layer. To see a layer, you must add a surface for that layer to the scene. As you learn in this exercise, you can add more than one surface for the same layer. There are three types of surfaces: image, bilinear, and bicubic.

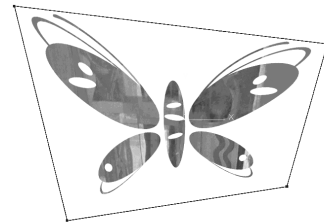
### Image Surface

An image surface is flat. You cannot change its shape because it has no control points. You use image surfaces in this exercise.



### Bilinear Surface

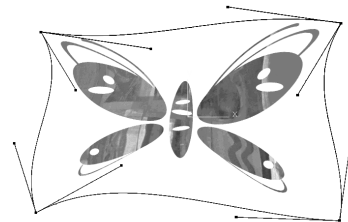
A bilinear surface has four control points: one for each corner. The control points are joined using linear interpolation (straight lines). You can move the control points to change and animate the shape of the bilinear surface.



### Bicubic Surface

A bicubic surface also has a control point at each corner, joined using bicubic interpolation. Each point has two tangent handles that can be used to change and animate the shape of the surface. Bicubic surfaces can be used for a variety of effects, including page turns.

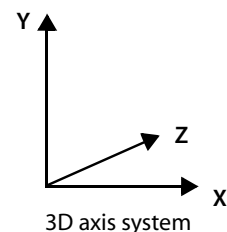
You can also use an extended bicubic surface, which can be subdivided to create a mesh of control points. You can manipulate the mesh to animate the surface in 3D space.



## The Surface Axis

As you add surfaces to the scene in Action, you create a composite of 2D layers in a 3D environment. The three directions of the scene are: left/right (X axis), up/down (Y axis), and in/out (Z axis).

Each surface added to the scene has its own X,Y,Z axis. Use the axis to move, rotate, scale, or shear the surface.



## Animation Basics

In **flame** and **inferno** you can create an animation by changing the value of a property at different frames of the clip. Here are some examples of properties that can be animated in the various modules:

- The position, rotation, or scaling of an object created in Action
- The transparency of a matte or the position of a garbage mask in the Keyer
- The gamma value of the red, green, or blue colour channels of the image in the Colour Corrector
- The size of the brush in Paint. For example, see “Exercise 2: Painting a Stardust Effect” in Lesson 4.

## The Channel Hierarchy

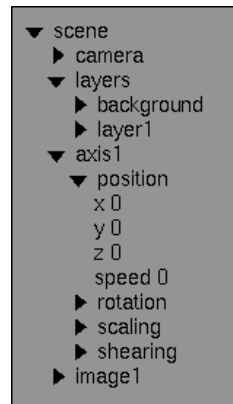
A property that can be animated is called a channel. In each module, the channels are organized into a Channel Hierarchy. Within the Channel Hierarchy, related channels are grouped into folders. A black triangle next to a name in the Channel Hierarchy indicates a folder containing channels or other folders.

Since each module has a different set of channels, the Channel Hierarchy does not look the same in each module. An example of the Channel Hierarchy in Action is shown below.

At the top of the hierarchy is the scene folder. It contains the folders for all channels in the module.

In Action, you can animate surfaces, axes, lights, shadows, and the camera. Here, the axis1 folder is open, showing the properties of axis1 that can be animated.

The axis1>position folder contains the X (horizontal), Y (vertical), and Z (depth) channels for the position of axis1.

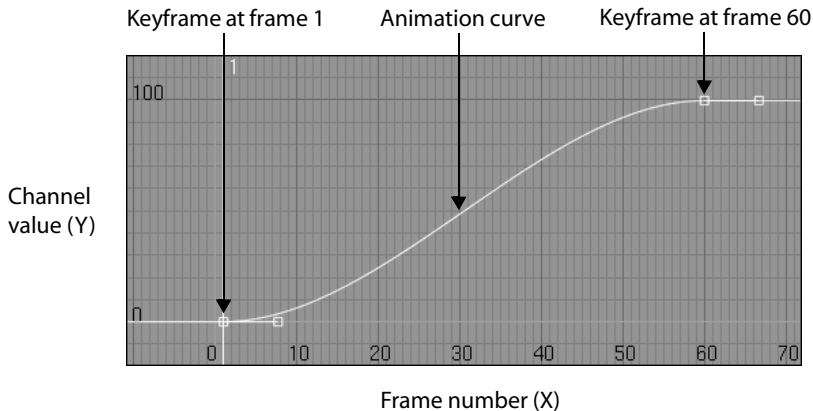




## Keyframes and Animation Curves

Changing the value of a channel creates a keyframe. A keyframe is expressed using (X, Y) coordinates, where X is the number of the frame at which the value is set and Y is the channel value.

All keyframes for a channel are plotted on an animation curve. The frame number is plotted on the X (horizontal) axis, and the channel value is plotted on the Y (vertical) axis. The following animation curve has two keyframes, as shown by the two points on the curve.



The process of calculating the values between keyframes to create the animation curve is called interpolation. This process is done automatically by **flame** or **inferno**.

Each channel has a separate animation curve. Adding a keyframe for a channel adds another point to the corresponding animation curve. In this lesson, learn how to add keyframes and adjust the shape of the curves to control the animation.

## Motion Path and Explicit Animation

In Action, you can use two different techniques to animate the position of an object:

- Motion path animation—using a spline (curved line) and timing curve to animate the position of objects, light sources, the camera, and particle manipulators.
- Explicit animation—using the Channel Editor to animate X, Y, and Z position values.

Learn more about these two types of animation in Exercise 2 of this lesson.

## Exercise 1: Multi-Layer Compositing

In this exercise, create a butterfly in Action using three clip layers and then animate its wings to make them flap. Create a second butterfly by copying the first one. In Exercise 2, you animate the two butterflies to fly across the frame.

Load the *06\_action* reel onto the desktop from CD 2, “setups & images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

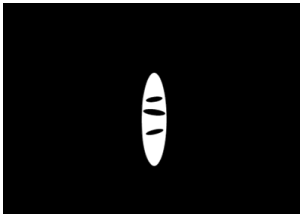
The reel contains the following clips.



*06\_matte\_left:*  
The matte for the left wing.



*06\_matte\_right:*  
The matte for the right wing.



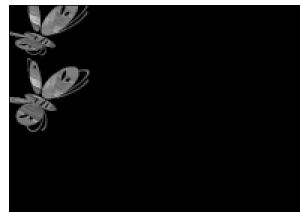
*06\_matte\_body:*  
The matte for the body.



*06\_front\_wing:*  
The background for the wings.



*06\_front\_body:*  
The background for the body.



*06\_result:*  
The final result for Exercise 2.

To preview the animation, play the *06\_result* clip using the Player.

# Open Action

Load the source clips for Layer1 and reset Action.

1. Click Action in the Effects menu.

LIBRARY	discreet image integrator - Frames 137812 Avail. 134461				
EDITING	Paint	Keyer	Sparks	L	Delete
PROCESSING	Warper	Compositor	Sparks	L	Name
EFFECTS	Text	Quick Composite	Sparks	L	Move
FORMAT	Stabilizer	Optics	Sparks	L	Copy
SYSTEM	Action	Modular Keyer	Sparks	L	Search

2. To open Action, you must load a front clip, back clip, and matte clip. Select *06\_front\_body* as the front clip, *06\_front\_body* again as the back clip, and *06\_matte\_body* as the matte clip.
3. Select any reel on the desktop as the destination reel.

The Action menu appears.

4. If necessary, click Layers to view the Layers List.

EXIT	Setup	Process	Add	# ▾	Front	Matte	Δ	K	MK	CC	CM
Front	On	Layers ▾	Delete	B	06_front_body (1)			G	C	Soft 0	
Back	On	Camera ▾	Apply	1	06_front_body (1)	06_matte_body (1)		X 0.00	MX 0.00		
Matte	On	Surface ▾	Displace	2				Y 0.00	MY 0.00		
Result	Frame	Axis ▾	Frame	3				Shadow	Soft 0.00		
		Light ▾	B slp 0	4				F slp 0	M slp 0		
Preview	Viewer	Text ▾	Select All	5							
				6							
				7				▽	Reset	All	

An image surface and axis for Layer1 have been added to the scene and appear in the image window. The front and matte clips have been loaded into Layer1 and are listed in the Layers List.

	Layer 1	Back clip									
Add ▾	# ▾	Front	Matte	Δ	K	MK	CC	CM			
Delete	B	06_front_body (1)			G	C	Soft 0				
Apply	1	06_front_body (1)	06_matte_body (1)		X 0.00	MX 0.00					
Displace	2				Y 0.00	MY 0.00					
Frame	3				Shadow	Soft 0.00					
	4				F slp 0	M slp 0					
B slp 0	5										
Select All	6										
	7				▽	Reset	All				

The back clip is listed above Layer1 by default. Since the back clip cannot be animated, it is not really considered to be a layer. Because you are not using a background in this exercise, it is not important which clip is selected as the back clip. You turn off the back clip later in the exercise.

**Hint:** If you swipe the bar below the Layers List, the Priority Editor appears. Swipe the bar again to return to the Layers List. Learn about the Priority Editor in Lesson 7, “3D Objects and Texture Mapping”.

5. Action includes a Schematic view, which provides a graphical representation of the objects in the scene. Go to Schematic view either by selecting Schematic in the Scene View box or by pressing the ~ key.



## Sorting the Layers List

You can sort the Layers List by layer number or by front or matte clip name. Click the column heading to sort in ascending alphanumeric order; click again to sort in descending order. When the list is sorted by either front or matte clip name, the layer number (#) acts as a secondary sort criterion.

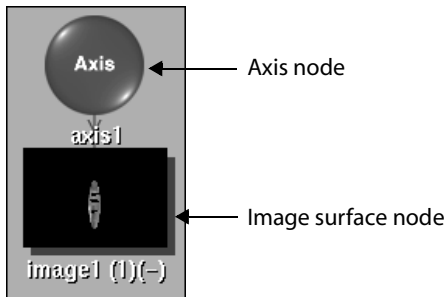
Click # to sort the list by layer number.

Click Front to sort the list by front clip name.

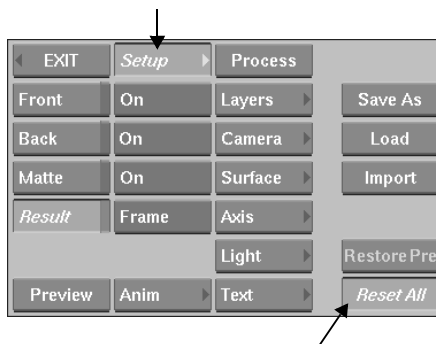
Click Matte to sort the list by matte clip name.

Add	# ▾	Front	Matte	Δ	K ▾	MK ▾	CC	CM
Delete	B	06_front_body (1)			G	C	Soft 0	
Apply	1	06_front_body (1)	06_matte_body (1)				X 0.00	MX 0.00
Displace	2						Y 0.00	MY 0.00
Frame	3						Shadow	Soft 0.00
	4						F slp 0	M slp 0
B slp 0	5						Reset	All
Select All	6							
	7			▽				

A camera node and the axis and image surface nodes for Layer1 appear. Each icon, or node, in Schematic view represents an object. The arrow linking the axis to the image surface indicates that the axis is the parent of the image surface (the child node). The child inherits the transformations applied to the parent. For example, if you rotate axis2, the image surface also rotates.



6. Return to Perspective view either by selecting Perspective in the Scene View box or by pressing ~.
7. Whenever you start a new animation, you should reset all options to their default values:
  - a) Click Setup to open the Setup menu.

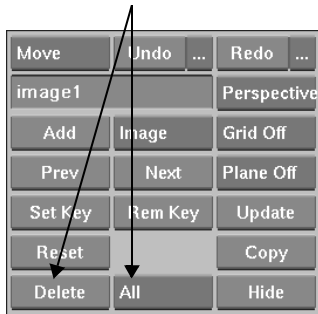


- b) Click Reset All and Confirm.

**Hint:** If you swipe the bar at the bottom of the menu panel in the Setup menu, the rendering controls appear. Swipe the bar again to return to the Setup menu.

8. When you start a new animation in Action, you should also delete any objects that may remain from the last time you used Action.

Select the All option and then click Delete.

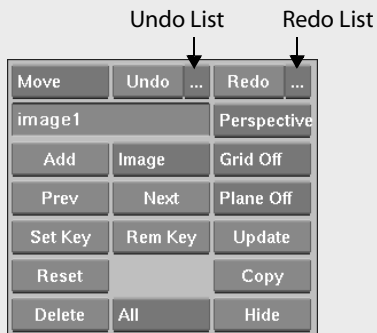


The image surface and axis for Layer1 are also deleted—you can no longer see the icons in Schematic view. Add them again later in the exercise.

**Hint:** If you delete an object accidentally, you can use Undo to restore it. For more information, see “Using Multiple Undo Levels in Action” below.

## Using Multiple Undo Levels in Action

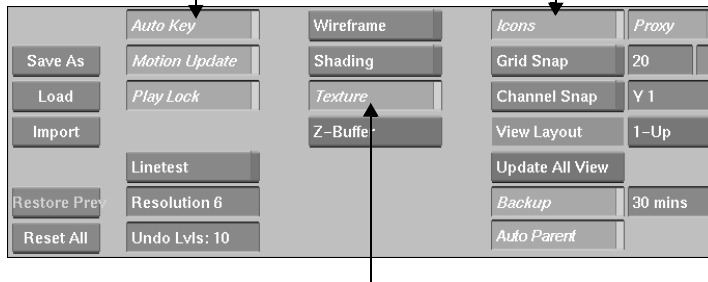
Action uses multiple levels of Undo. Set the number of undo levels you want in the Undo Lvl field of the Setup menu. To undo an action, click Undo. To undo multiple actions, click the Undo List and select an action. All actions up to and including the one selected are undone. Use the Redo list in the same way to redo actions.



9. Select the setup options in the Setup menu:

**a)** Enable Auto Key if it is not already enabled. A keyframe is automatically created whenever you change a channel value.

**b)** Enable Icons to view the axis icons in Perspective view.



**c)** Enable Texture. This activates texture-mapping hardware that improves interaction and rendering speed in Action. See also “Improving Interaction and Rendering Speed” below.

## Improving Interaction and Rendering Speed

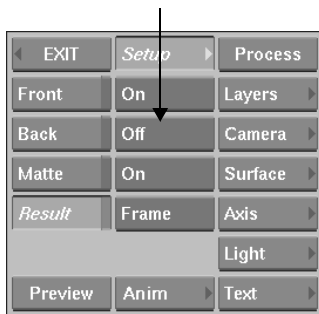
To improve the interaction and rendering speed in Action, enable Texture in the Setup menu.

You can improve the speed of interaction when Texture is disabled using the Resolution field in the Setup menu. Increasing the Resolution value decreases the resolution at which the clip is displayed in the image window. For example, at a Resolution of 2, the clip is displayed at half resolution. At a Resolution of 6, the clip is displayed at one sixth resolution.

You can also decrease rendering time with Texture disabled by enabling Linetest in the Setup menu before processing. The clip is rendered at the selected resolution. This allows you to generate intermediate clips quickly while building an animation. When Linetest is disabled, the clip is rendered at full resolution.

To preview the current frame at full resolution when Texture is disabled, click Preview.

10. Turn off the back clip by selecting Off next to the Back button. The butterflies will appear on a black background in the rendered clip.



The image window is now blank because Layer1 has no image surface, and the back clip is turned off.

11. Set the clip length to 60 frames.



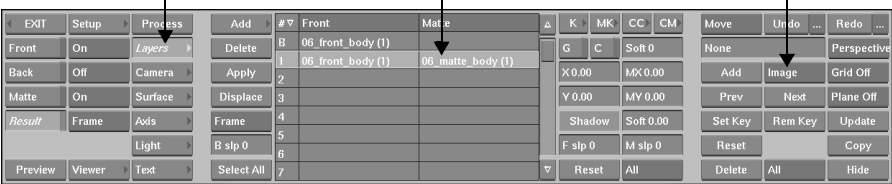


# Add an Image Surface to the Scene

To use Layer1, you must add a surface to the scene.

1. Add an image surface for the butterfly body using Layer1:

- a) Click Layers to view the Layers List.    b) Select Layer1.    c) Select Image and click Add.

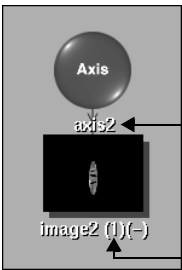


You can now see the image surface for Layer1 in the image window.

2. Go to Schematic view either by selecting Schematic or by pressing ~.



The image surface node and axis node for Layer1 appear.



Since objects added to the scene are numbered sequentially, the nodes in your schematic may have different numbers from those shown here. The number is reset to 1 only when you restart **flame** or **inferno**.

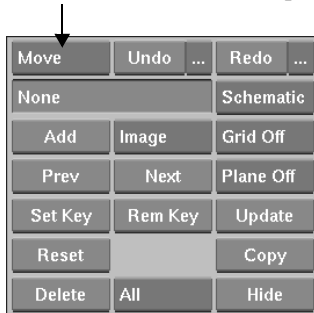
This (1) indicates that this image surface uses Layer1.

## Name the Axis

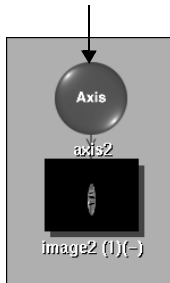
It is a good idea to give the axes and/or surfaces meaningful names, especially when building a complex hierarchy.

### 1. Select the axis node:

a) Select Move edit mode or press **M**.

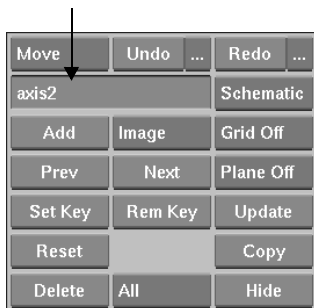


b) In Schematic view, click the axis node to select it.



### 2. Name the axis node:

a) Click the Node Name field.



b) Press **ESC** to clear the name.

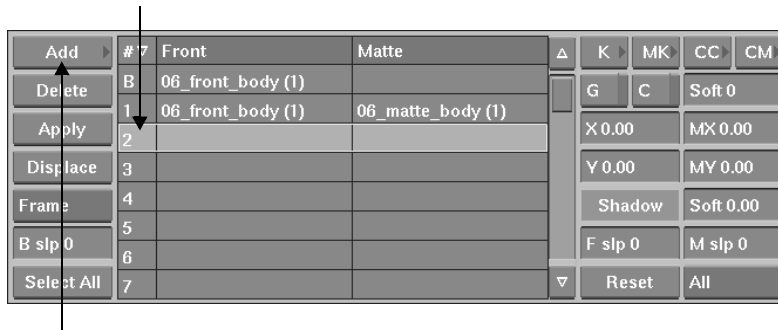
c) Type “mp\_bfly” (motion path butterfly) and press **ENTER**. The axis name is changed.

## Load the Layers for the Wings

Load the layers for the left wing and right wing from the reels.

### 1. Load the clips for the left wing into Layer2:

a) Select Layer2 in the Layers List.



b) Click Add to view the reels.

c) Select *06\_front\_wing* as the front clip and *06\_matte\_left* as the matte clip.

The names of the selected clips appear in the Layers List.

### 2. Load the clips for the right wing into Layer3:

a) Select Layer3 in the Layers List.

b) Click Add to view the reels.

c) Select *06\_front\_wing* as the front clip and *06\_matte\_right* as the matte clip.

The names of the selected clips appear in the Layers List.

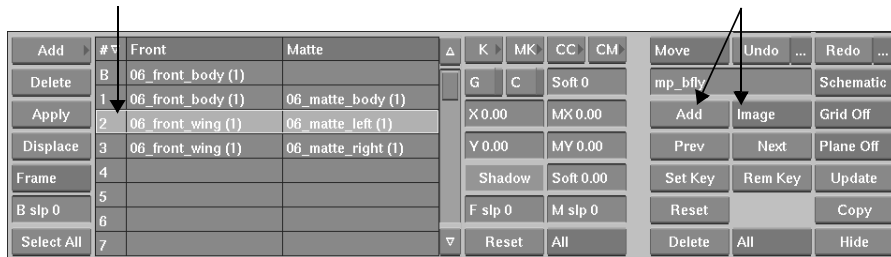
## Add Image Surfaces for the Wings

To display the wings, add two image surfaces to the scene, one for the left wing and another for the right wing.

1. Add an image surface for the left wing using Layer2:

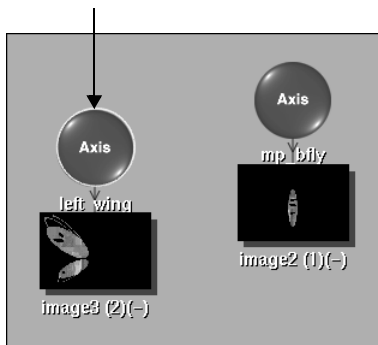
a) Select Layer2 in the Layers List.

b) Select Image and click Add.



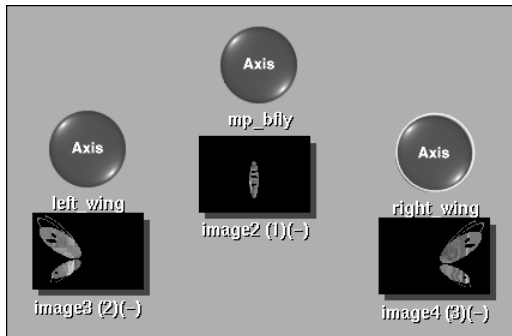
An image surface node and its axis appear in Schematic view.

2. Name the new axis “left\_wing”. For instructions, see “Name the Axis” on page 174.
3. Add an image surface for the right wing using Layer3: select Layer3 in the Layers List, select the Image option, then click Add.
4. Name the new axis “right\_wing”.
5. Move the *left\_wing* axis and surface nodes to the left of the *mp\_bfly* axis:
  - a) Select Move edit mode (**M**).
  - b) While pressing **ALT**, drag the new axis node to the left of the *mp\_bfly* axis. Pressing **ALT** while dragging moves the node and its children.



6. Press **ALT** and drag the *right\_wing* axis and surface nodes to the right of the *mp\_bfly* axis.
7. Move the Camera node out of the way.

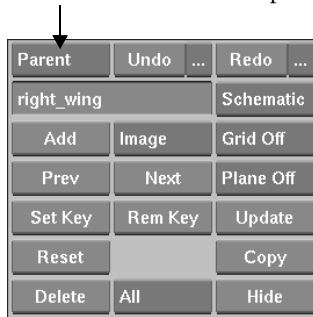
Your schematic should look like this.



## Build the Butterfly Hierarchy

Build the butterfly hierarchy by making the *mp\_bfly* axis the parent of both wing axes. Making one object the parent of another object is called parenting. To create the link, you draw an arrow from the parent to the child.

1. Select Parent edit mode or press **P**.

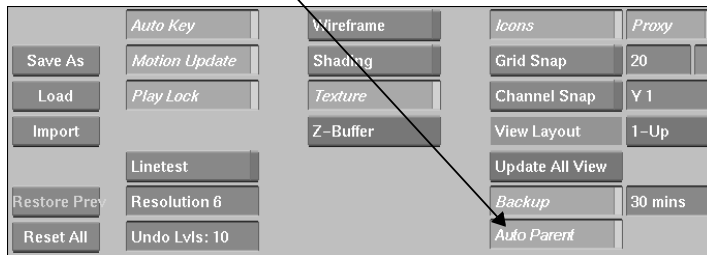


2. Drag the cursor from the *mp\_bfly* axis to the *left\_wing* axis to create the parent link.

3. Use a shortcut for creating the second parent link while in Move edit mode:

a) Click Setup to view the Setup menu.

b) Enable Auto Parent.

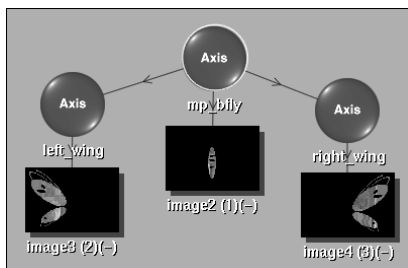


c) Select Move edit mode (**M**).

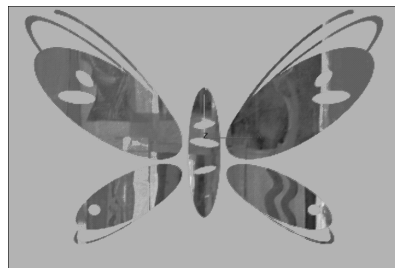
d) Position the cursor at the edge of the *mp\_bfly* node. The cursor changes to an arrow.

e) Drag the cursor from the *mp\_bfly* axis to the *right\_wing* axis to create the parent link.

The hierarchy in Schematic view and the butterfly in Perspective view are shown below. Switch between Schematic view and Perspective view by pressing ~.



Schematic view



Perspective view

**Hint:** Pressing **ALT** and dragging a node while in Move mode temporarily disables Auto Parent.

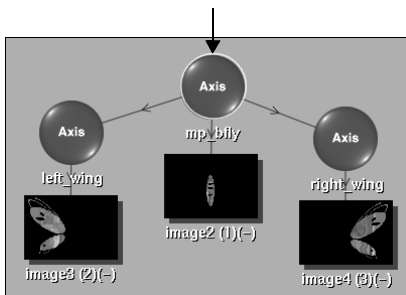
## Add Perspective to the Scene

Resize and rotate the butterfly to add perspective to the scene.

1. Press **CTRL+LEFT ARROW** to go to frame 1.

Changing a property value sets a keyframe for that property. To set the size and rotation of the butterfly for the entire clip, create two keyframes at frame 1.

2. Select the *mp\_bfly* axis in Schematic view.

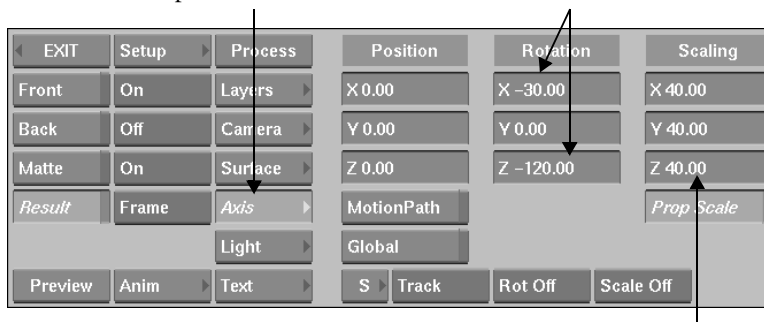


Rotation and size values applied to the parent *mp\_bfly* axis are passed on to the two child axes, *right\_wing* and *left\_wing*.

3. Press **~** to go to Perspective view to see the butterfly change size and rotate as you enter the new values.
4. Resize the butterfly and rotate it to face right:

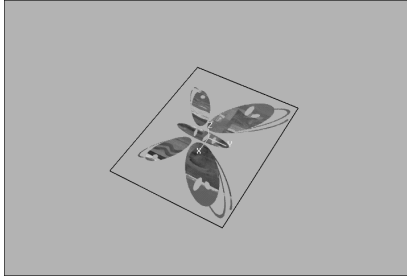
a) Click Axis to open the Axis menu.

b) Set Rotation X to -30 and Z to -120.



c) Set the scale to 40 by entering 40 in any of the Scaling fields.

Since Prop Scale (proportional scaling) is enabled, the butterfly is scaled in proportion on the X, Y, and Z axes. The butterfly is now facing towards the bottom-right and is rotated slightly on the X axis.

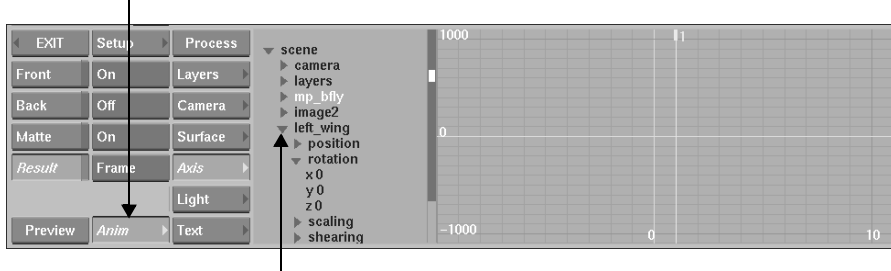


## Animate the Left Wing

Make the butterfly flap its left wing by setting keyframes for the rotation of the wing.

1. Open the Channel Editor and the folder for the *left\_wing* axis:

- a) Click Anim to open the Channel Editor.



- b) Click ► next to the *left\_wing* folder to open it.

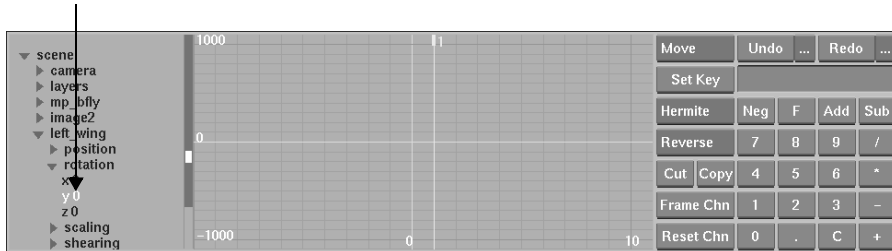
- c) Click ► next to the rotation folder to open it.

Notice there are no keyframes in the rotation folder. The rotation values you set in the last step apply to the *mp\_bfly* axis. The *left\_wing* axis still has rotation 0 relative to the parent *mp\_bfly* axis.



2. At frame 1, set a keyframe for the left wing's Y rotation channel:

a) Click the Y rotation channel value in the Channel Hierarchy to open the numeric keypad. Be sure to click the value (0), not the "Y."



b) Enter 45 using the keypad.



3. Set the second keyframe:

a) Go to frame 10 by entering 10 in the Frame Number field.



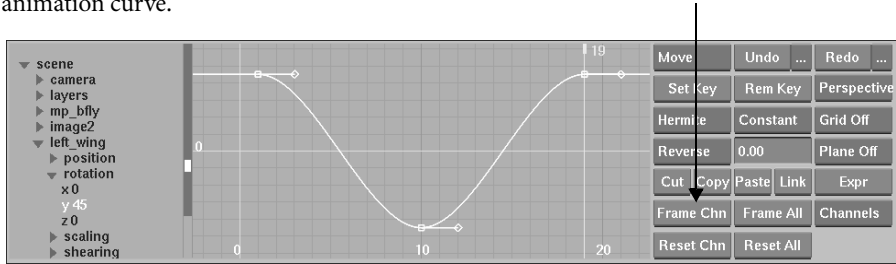
b) Set the Y rotation channel to -45.

Notice the blue bar at frame 1 in the timeline. This is a keyframe indicator, and shows the relative frame position of the first keyframe set for the selected channel. The indicator for the second keyframe you just created is hidden under the yellow bar marking the current frame.

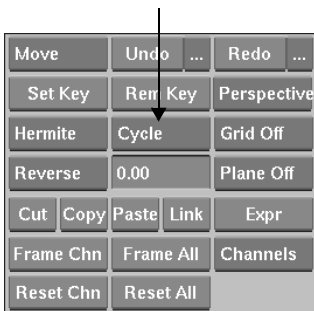
Keyframe indicators are only visible when a single channel is selected. Use  (next keyframe) and  (previous keyframe) to go to the various keyframes for the channel.

4. Go to frame 19 and set the Y rotation channel to 45.

5. Click Frame Chn to centre the animation curve. You can now see the three keyframes on the animation curve.



6. Now that you have created one complete cycle for the left wing, select Cycle extrapolation to repeat the 20-frame animation cycle throughout the clip.



## Interpolation and Extrapolation Modes

You can adjust the behaviour of the animation by changing the interpolation and extrapolation modes.

- The interpolation mode affects the shape of the animation curve between keyframes, which in turn affects the behaviour of the animation.
- The extrapolation mode determines the animation's behaviour before the first and after the last keyframe.

For more information about the available modes, see the chapter “Animation” in the *flame* or *inferno* User's Guide.



7. Frame Chn frames the animation curve between first and last keyframes. Since you only set two keyframes, you cannot use it to view the effect of the cycle. To view the animation curve:
  - a) Select Zoom edit mode (**Z**) and drag the cursor across the channel window to zoom out until the entire curve is visible.
  - b) Use Pan edit mode (**ALT-P**) to pan the channel window if necessary.
  - c) Press **M** to return to Move edit mode.

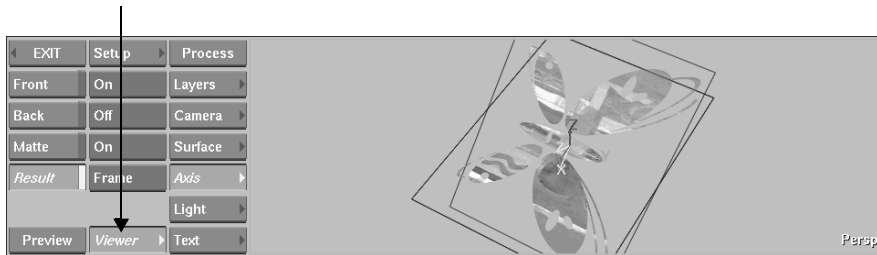
## Change the View of the Channel Editor

To make it easier to work with animation curves, you can enlarge the view of the Channel Editor, and view the Channel Editor, Schematic, and image simultaneously.

1. To look more closely at the animation curves, swipe the bar at the right or left edge of the menu panel.

The Channel Editor appears in the top area of the screen. You may find it easier to work with animation curves in this display mode, especially when creating complex animations.

2. Click Viewer to toggle the menu panel between a view of the image and of the last selected menu (in this case, the Axis menu).



3. To return to the image window display mode, swipe the bar at the right or left side of the menu panel.

## 4. Change the layout of the screen:

a) Click Setup to view the Setup menu.

b) Select 2-Up.



The top area of the screen is divided into two viewing areas.

## 5. Set the layout to view Perspective view and the Channel Editor:

a) In the top area of the screen, click the view on the left.

b) In the Scene View box, select Channel.



c) In the top area of the screen, click the view on the right.

d) In the Scene View box, select Perspective.

You can set the layout to 3 or 4 views by selecting 3-Up or 4-Up in the Setup menu. In addition to Perspective view and the Channel Editor, each view can be set to show Schematic, Top, Front, or Side view, or the front, back, or matte clip.

**Hint:** To update all views as you are working, enable Update All View in the Setup menu. When this button is disabled, only the selected view is updated.

## 6. Select 1-Up and Perspective view to view just the image, or leave the view as 2-Up to view both the image and Channel Editor as you complete the exercise.

## 7. Click Anim to view the Channel Editor in the menu panel.

## Animate the Right Wing

Next, make the right wing flap. Instead of setting keyframes for the right wing, copy the animation curve for the left wing.

1. Copy the Y rotation curve for the left wing:

a) In the Channel Editor, select the left\_wing>rotation>Y channel.

b) Click Copy to copy the animation curve.

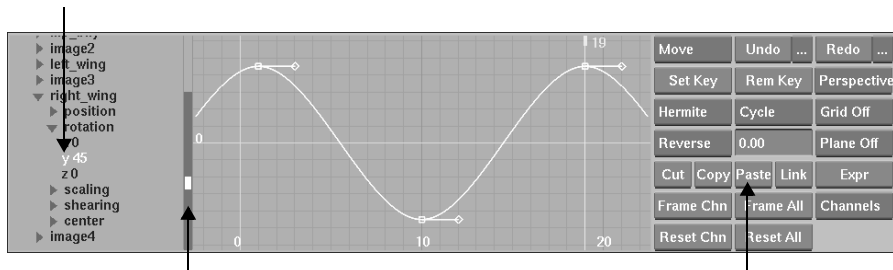


2. Paste the animation curve into the Y rotation channel of the *right\_wing* axis:

a) Click ▼ next to the left\_wing folder to close the folder and hide its animation curves.

b) Open the right\_wing> rotation folder.

c) Select the Y rotation channel.



d) If necessary, scroll the Channel Hierarchy to view the contents of the right\_wing>rotation folder by dragging the scroll bar.

e) Click Paste to paste the copied curve into the selected channel.

**Hint:** Be sure to click the "Y," not the value, to select the channel without opening the keypad. If you do open the keypad by mistake, close it by clicking the channel name.

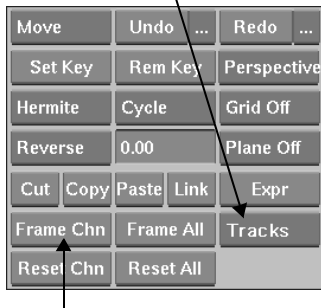
3. In Perspective view, click the play button  or press **ENTER** to view the animation. Since the animation of the two wings is identical, the wings do not flap properly.

## Offset the Animation

To make the wings flap in unison, use the Track Editor to offset the animation of the *right\_wing* axis.

1. Open the Track Editor:

- a) Select Tracks.



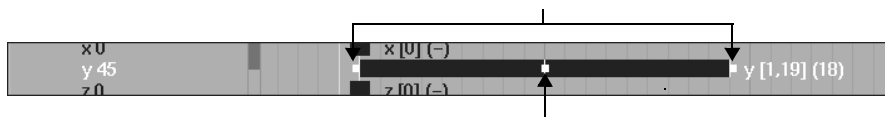
- b) Click Frame Chn to centre the Y rotation track for the right wing.

In the Track Editor, channels and folders are shown as tracks (horizontal black bars) representing the timing of each channel's animation. The channel or folder name, the first and last keyframe number, and the length of the channel animation are shown beside each track.



When a channel is selected, three handles (white squares) appear on the track. To change the timing of a channel, drag one of the handles:

- Move the left (or right) handle to stretch or compress the animation relative to the first (or last) keyframe. The number of frames used for the animation is changed.

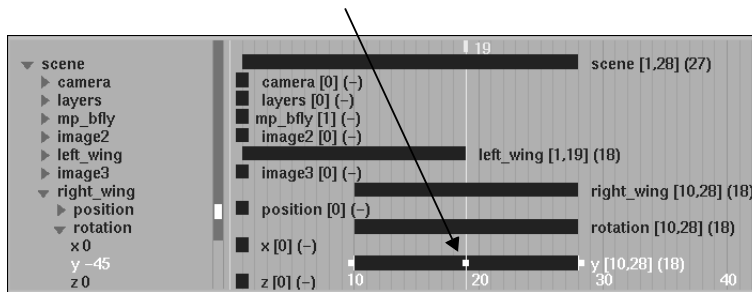


- Move the middle handle to offset the animation without changing the number of frames.

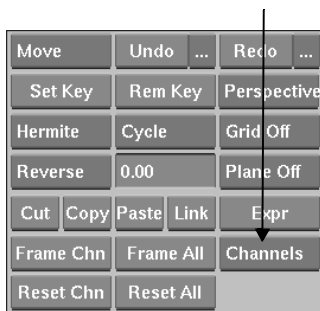
2. Make the animation begin at frame 10:

a) Select Move edit mode (**M**).

b) Drag the middle handle of the `right_wing>rotation>Y` track until the numbers next to the track are [10, 28].

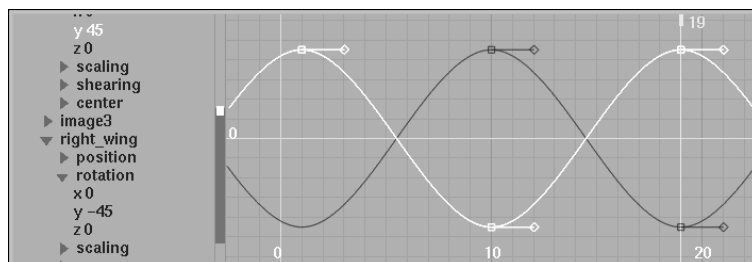


3. Select Channels to return to the view of the animation curves.



4. To view the `left_wing` and `right_wing` rotation curves at the same time, open both the `left_wing>rotation` and the `right_wing rotation` folders.

The animation curves for the *right\_wing* and *left\_wing* axes are offset by 10 frames.



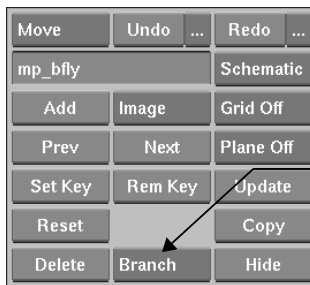
5. Go to frame 1 and play the animation (**ENTER**).

6. Close the `left_wing` and `right_wing` folders to hide the animation curves.

## Create the Second Butterfly

Create the second butterfly. Instead of building a new hierarchy, copy the `mp_bfly` hierarchy. This copies the image surfaces as well as the animation channels.

1. Go to Schematic view (~) and select the `mp_bfly` axis.
2. Copy the hierarchy:

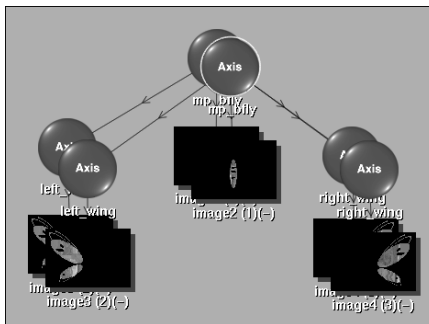


a) Click Layers.

b) Select Branch to copy the selected axis and all of its children.

c) Click Copy.

An identical copy of the `mp_bfly` hierarchy appears.



3. Rename the parent axis of the new hierarchy `exp_bfly` (explicit animation butterfly) and move it to the right of the original butterfly hierarchy. Remember to press **ALT** as you drag the parent axis.
4. Select the `mp_bfly` axis and return to Perspective view (~).

You only see one butterfly because the two butterflies are in exactly the same position.



5. To see both butterflies, move the *mp\_bfly* butterfly to the side:

a) Go to frame 1 (**CTRL+LEFT ARROW**).

b) In the image window, click the centre point of the butterfly's axis (the point where the X, Y, and Z axes meet) and drag.

You now have two butterflies that can flap their wings. In the next exercise, make them fly!

## Exercise 2: Motion Path / Explicit Animation

In Action, you can animate the position of an object using either a motion path or explicit animation. You must decide which type of animation to use before creating the animation because the two types are not interchangeable.

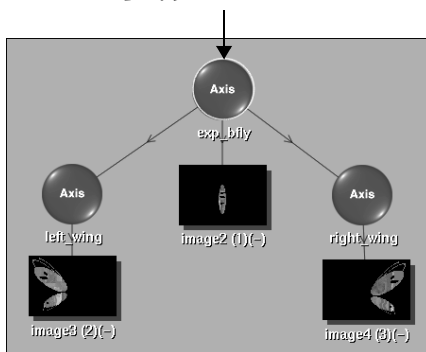
- A motion path provides a visual reference for the object's position. You can change the speed of the object without affecting its position.
- Explicit animation provides greater control over the position of the object, but changing its speed affects its position.

In this exercise, animate the two butterflies you created in Exercise 1 to fly across the frame, one using a motion path, and the other using explicit animation.

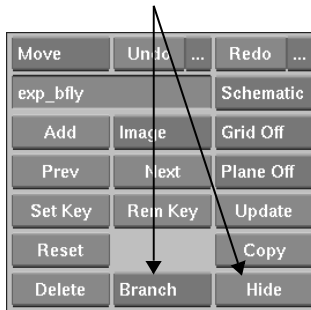
### Hide the *exp\_bfly* Butterfly

First, hide the *exp\_bfly* hierarchy so as to not confuse the two butterflies when creating the motion path animation:

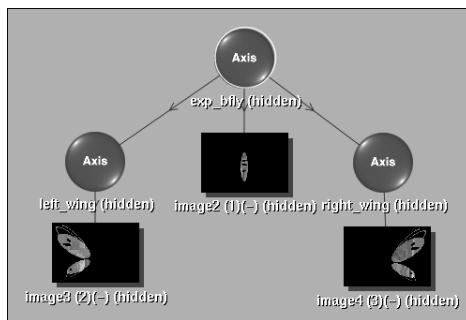
1. Go to Schematic view (~).
2. Select the *exp\_bfly* axis.



3. Select Branch and then click Hide or press **H**.



Each node in the *exp\_bfly* hierarchy is labelled *(hidden)*.



Now you are ready to animate the first butterfly.

## Create a Motion Path for the Butterfly

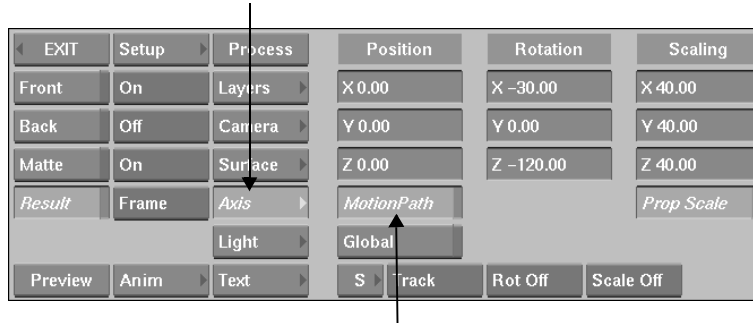
In Action, motion paths can be used to animate the position of axes, lights, and the camera. Creating a motion path is similar to creating an animation curve. You set keyframes for the object's position at different frames of the clip. The motion path is drawn between keyframes in the image window.

Use motion path animation to make the *mp\_bfly* butterfly fly across the frame.

1. Select the *mp\_bfly* axis in Schematic view.

2. Enable the motion path for the *mp\_bfly* axis:

a) Click Axis to view the Axis menu for the selected axis.

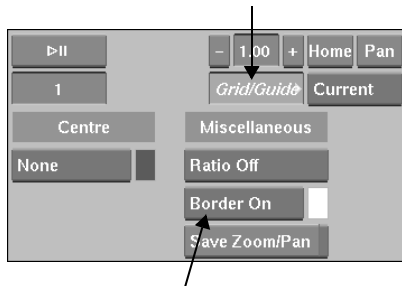


b) Enable MotionPath. The button is highlighted when enabled.

3. Go to Perspective view (~).

4. Enable the border for the image window:

a) Click Grid/Guide to view the Grid/Guide menu.



b) Select Border On.

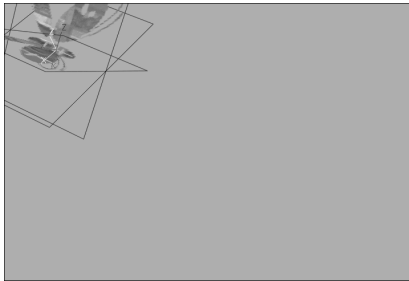
A border appears, showing the perimeter of the image window. The image visible within this border appears in the processed clip.

c) Click Grid/Guide to return to the Axis menu.

**Hint:** You can change the colour of the border using the colour pot next to the Border button.

## 5. Set the first keyframe:

- a) Go to frame 1 (**CTRL+LEFT ARROW**).
- b) Click the centre point of the butterfly's axis (the point where the X, Y, and Z axes meet). A white control point appears.
- c) Press the white control point and drag the butterfly to the top-left corner of the image window. Position the butterfly so the wings are partially outside of the image window.



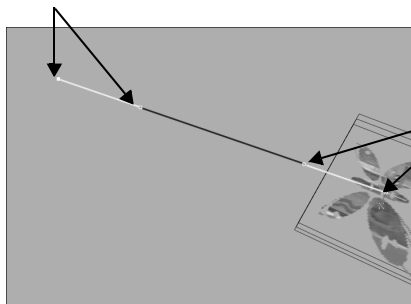
**Hint:** To constrain the movement to a specific axis (X, Y, or Z), drag the cone icon at the end of the axis

## 6. Set the second keyframe:

- a) Go to frame 60 (**CTRL+RIGHT ARROW**).
- b) Press the X or Y axis and drag the butterfly axis to the lower half of the right side of the image window. Do not drag the white control point, as this changes the beginning point of the motion path instead of setting a keyframe.

A motion path is drawn between the two keyframes showing the path along which the butterfly travels. Notice there is one control point on the motion path for each of the two defined keyframes. You can add control points to the motion path by changing the position of the butterfly at intermediate frames. Each control point also has a tangent handle that controls the shape of the motion path. The tangent handles allow you to modify the shape of the path.

Control point and tangent handle at frame 1



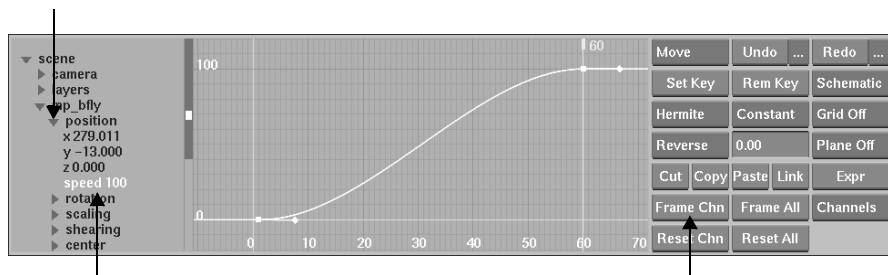
Control point and tangent handle at frame 60

A B-spline is used for the motion path to provide greater control over the path of the object. The motion path consists of red and blue segments. There is one segment for each frame of the clip. A single segment represents the distance the butterfly moves in that frame. The length of a segment indicates the butterfly's speed: the longer the segment, the faster the butterfly is moving in that frame.

7. Creating a motion path also creates a speed curve in the Channel Editor. Examine the speed curve:

a) Click Anim to open the Channel Editor.

b) Open the mp\_bfly>position folder.



c) Select the speed channel.

d) Click Frame Chn to view the entire curve.

The speed curve determines how fast the object moves in the animation. The speed value at any frame represents the percentage of the distance the object has travelled along the motion path.

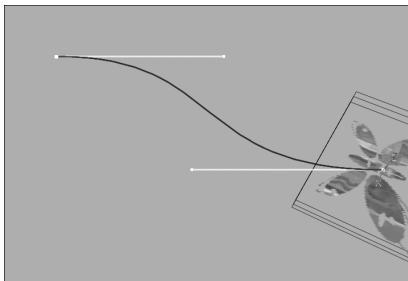
8. Play the animation (**ENTER**).

The default S-shaped speed curve describes a slow-in slow-out motion. The butterfly moves slowly at the beginning of the motion path, speeds up, then slows down again.

## Change the Shape of the Motion Path

Adjust the tangent handles in the image window at the first and last frames to make an S-shaped motion path.

1. Select Move edit mode (**M**).
2. Drag the tangent handle of the first control point until the motion path is curved. The first tangent handle should be past the middle of the image window (see below).
3. Drag the tangent handle of the second control point until the motion path is S-shaped.



**Hint:** Because motion paths are drawn in the scene and not in the Channel Editor, you don't have to be at a keyframe to change the shape of a motion path. Use Move edit mode to move any point or adjust any tangent handle at any frame.

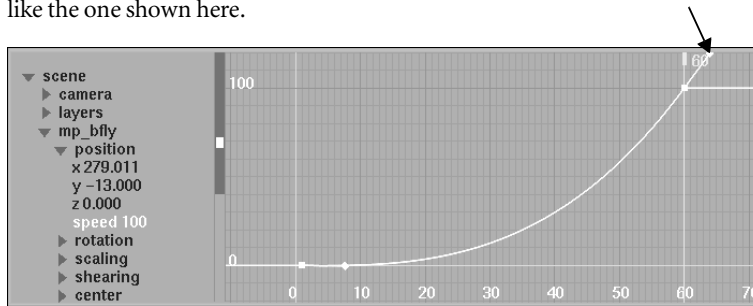
4. Play the animation (**ENTER**).

Notice that changing the shape of the motion path did not change the speed of the animation. The butterfly moves at the same speed along the S-shaped motion path as it did along the straight motion path.

## Change the Speed of the Motion Path Animation

Change the speed curve for the butterfly to make the butterfly begin slowly and accelerate halfway through the animation.

1. Adjust the tangent handle of the control point at the last frame to make the speed curve look like the one shown here.

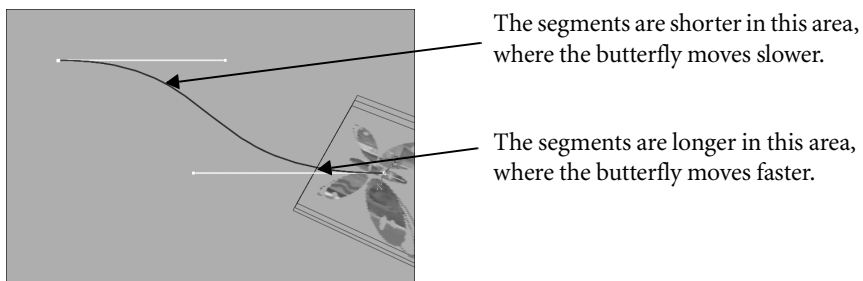


2. Play the animation (**ENTER**).

The slope of the speed curve determines the speed at which the butterfly moves along the motion path: the steeper the slope, the faster the motion. The butterfly starts off slowly, then begins to accelerate at frame 25 as the slope of the speed curve becomes steeper.

3. Examine the motion path in the image window.

Notice that changing the shape of the speed curve does not change the shape of the motion path, so does not affect the position of the butterfly. However, the length of the segments has changed.



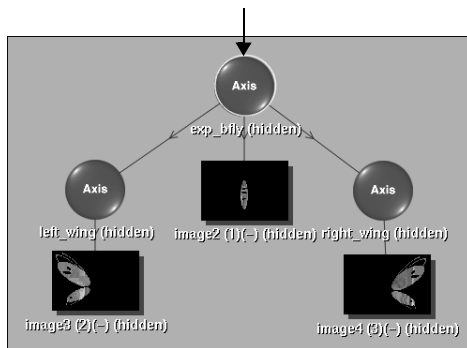
**Hint:** For even greater control over the speed of the object, you can add points to the speed curve without affecting the shape of the motion path. You can even make the object move backwards by creating a negative slope (downwards) on the speed curve.

## Animate the Second Butterfly

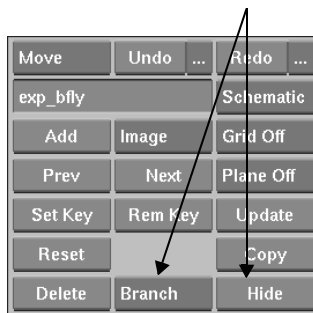
Animate the *exp\_bfly* using explicit animation.

Instead of creating a motion path, explicit animation sets keyframes on the X, Y, and Z position curves in the Channel Editor. The X, Y, and Z curves provide great control over the position of the object. However, to change the speed at which the object moves in the explicit animation, you must change the shape of the position curves. This affects both the speed of the animation and the position of the object.

1. Open the Axis menu:
  - a) Go to Schematic view (~).
  - b) Click the *exp\_bfly* axis.



- c) Click Axis to view the Axis menu.
2. Select Branch and then click Hide (H) to unhide the *exp\_bfly* hierarchy.

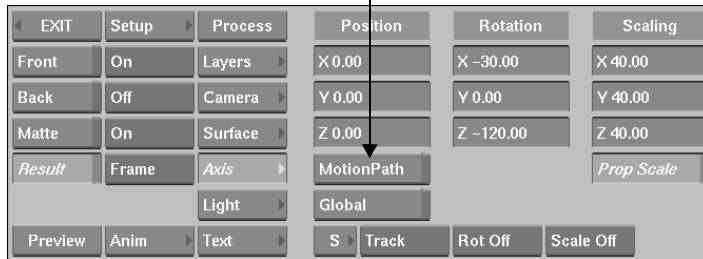


3. Go to Perspective view (~).

There are two butterflies in the scene.

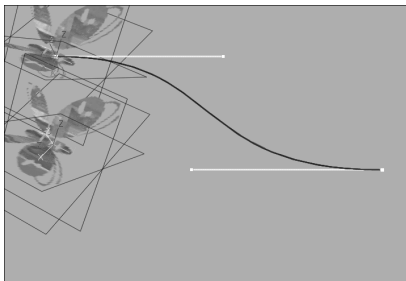


4. Disable the motion path for the *exp\_bfly* axis by disabling MotionPath in the Axis menu.



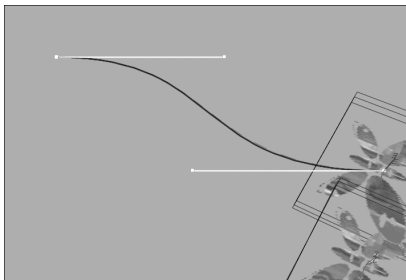
5. Set the first keyframe:

- Go to frame 1.
- Press the second butterfly's axis and position it beneath the first butterfly.



6. Set the second keyframe:

- Go to frame 60.
- Drag the axis of the second butterfly across the image window and position it below the first butterfly.



No motion path is drawn between the keyframes because the motion path for this axis is disabled.

7. Play the animation (**ENTER**).

The second butterfly moves across the image window beneath the motion path butterfly.

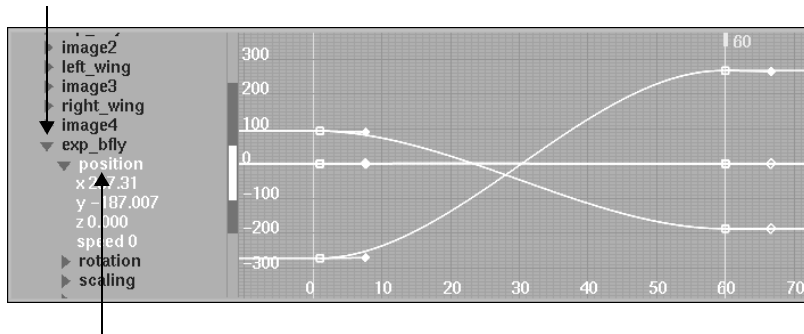
## Change the Speed of the Explicit Animation

Because the motion path for the *exp\_bfly* axis is disabled, setting the position of the butterfly in the first and last frames creates X, Y, and Z position curves for the *exp\_bfly* axis.

1. Open the Channel Editor to view the X,Y, and Z position curves for the *exp\_bfly* axis:

a) Click Anim to open the Channel Editor.

b) Open the *exp\_bfly* > position folder.

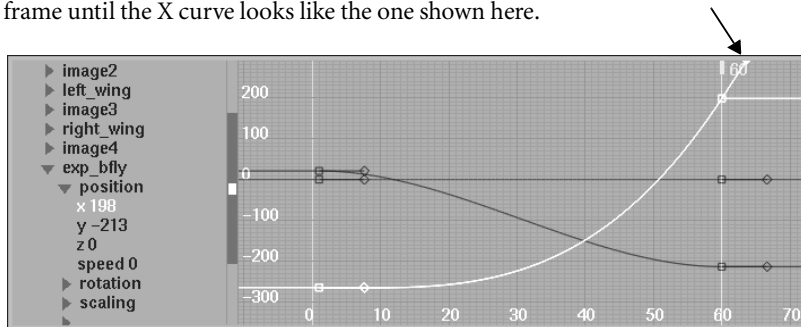


c) Select the position folder.

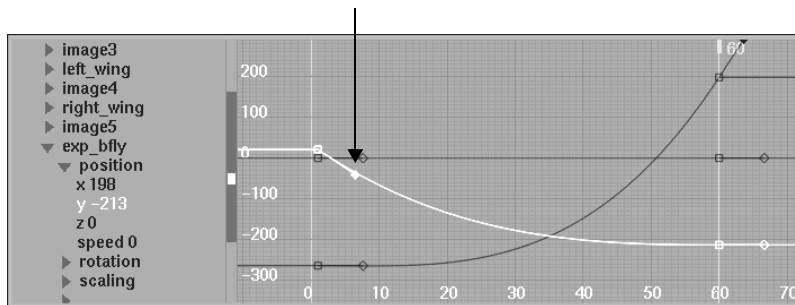
d) Click Frame Chn to view the X, Y, and Z position curves.

Although the speed curve is shown, it is not used with explicit animation. To change the speed of the object in the animation, adjust the position curves.

## 2. Select the X position channel and adjust the tangent handle of the control point in the last frame until the X curve looks like the one shown here.



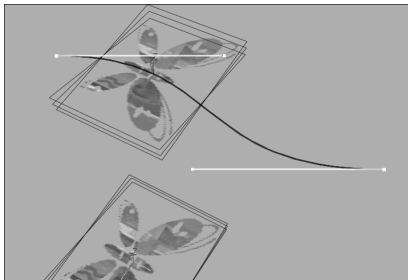
3. Select the Y position channel and adjust the tangent handle of the control point in the first frame until the Y curve looks like the one shown here.



4. Play the animation of the two butterflies (**ENTER**).

Changing the shape of the X and Y position curves changes the speed of the animation. The steeper the slope of the position curves, the faster the explicit animation butterfly moves.

Changing the position curves to change the speed also changes the position of the object. The explicit animation butterfly now moves in an arc instead of a straight line.

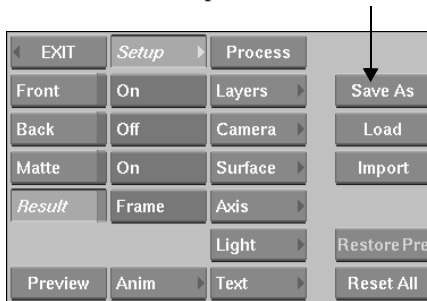


## Check Your Results

Save the setup, process the clip, and compare your result to the *06\_result* clip.

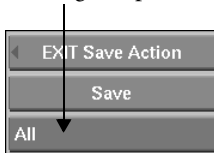
1. Save the setup:

- a) Click Setup to open the Setup menu.
- b) Click Save As to open the file browser.



By default, Action setups are saved in the directory */usr/discreeet/project/effects/<project name>/action*.

- c) Select All. In addition to saving the menu settings and the channel animations for all layers, Action also saves references to the clips currently loaded in the layers. See “Saving and Loading Setups in Action” on page 201.



- d) Click the File field, type a name for the setup file, and then press **ENTER**.

You are returned to the Action menu.

2. Go to frame 1 and click Process.
3. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *06\_result* clip.

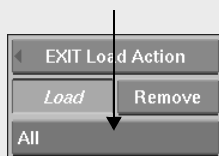
5. (Optional) If the two clips do not match, return to Action and load the *06\_action* setup file from the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_06* to see how the settings should appear. For further instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.
7. Delete the result clip and exercise reel from the desktop.

## Saving and Loading Setups in Action

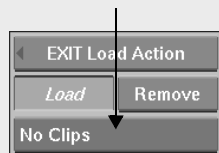
As in other modules, saving a setup in Action saves all channel animations and most menu settings. It also saves references to the clips currently loaded in the layers.

You can choose to load an Action setup with or without references to the clips.

- Select All to load the setup with references to the clips. Action looks for the referenced clips on the desktop or in the accessible clip libraries, and loads them into the correct layers. If Action cannot find the referenced clips, the setup is loaded, but the image surfaces are shown as outlines and the Layers List entries appear in red.



- Select No Clips to load the setup without clip references. Action loads the channel animations and menu settings using the clips currently loaded in the layers.



For information about other available options for loading setups in Action, see the chapter “Action: Overview and Setup Options” in the *flame* or *inferno* User’s Guide.

## Things to Remember

- To create an animation, change the value of a property at different frames of the clip. Properties that can be animated are listed as channels in the Channel Editor.
- Changing a channel value at a frame creates a keyframe. Keyframes are plotted on animation curves in the Channel Editor.
- The shape of an animation curve affects the behaviour of an animation. The shape of the curve is determined by the interpolation and extrapolation modes.
- Use the Track Editor to modify the timing of an animation.
- Motion paths are used in Action to animate the position of axes, lights, and the camera.
- A motion path is a B-spline drawn between position keyframes in the image window. The motion path shows the position of the object for each frame of the animation.
- Creating a motion path also creates a speed curve in the Channel Editor. The speed value at each frame represents the percentage of the distance the object has travelled along the motion path. The shape of the speed curve describes the rate at which the object moves in the animation: the steeper the slope, the faster the object moves.
- The speed curve provides better control over the speed of the object in the animation than is provided by X, Y, and Z position curves.
- You can modify the speed curve and the motion path independently, which means you can modify the position of the object without affecting the speed of the animation.
- With explicit animation, the X, Y, and Z position curves describe both the position and speed of the animation. Modifying the position of the object also changes the speed of the animation.
- Explicit animation provides greater control over the exact position of an object than is provided by motion path animation.

# 7

## 3D Objects and Texture Mapping

A powerful feature of Action is its ability to import 3D models created in other software packages. The 3D models, or 3D objects as they are also called in Action, can be animated in the scene with other 2D layers. Action also generates 3D Text which can be manipulated and animated to produce a variety of effects.

In this lesson:

- Learn about mapping textures to 3D objects
- Import and manipulate a 3D object in Action
- Change the drawing order of surfaces using the Priority Editor
- Enter a text string as a 3D object in Action
- Create three different 3D text deformation effects

Before starting this lesson, complete Lesson 6, “Animating Composites” to learn about layers, surfaces, and hierarchies.

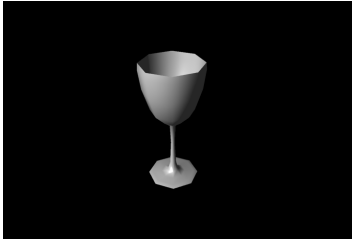
### Need Help?

If you need help creating and animating the 3D object, load the setup file provided for this lesson. Click the Setup button in the Action menu, then click Load to open the file browser. Go to the directory `/usr/discreet/project/effects/Tutorial/setups/lesson_07` and load the setup file `07_3d_object_setup`.

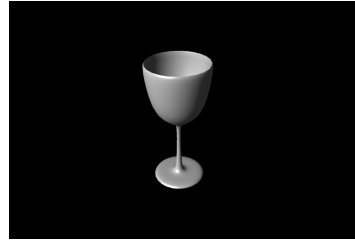
Time to complete this lesson: 30-45 minutes

## About 3D Objects

You can import polygon mesh objects into Action. A polygon mesh object is a computer-generated 3D model whose surface is composed of a mesh of polygons. The greater the number of polygons in a mesh, the smoother the surface of the object. For example:



This model is composed of less than 1000 polygons. The level of detail is low.



This model is composed of more than 10,000 polygons. The level of detail is much higher.

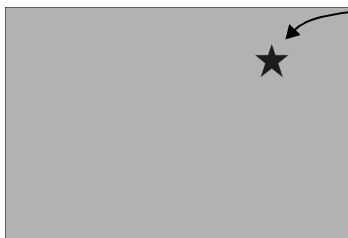
The more polygons there are in the model, the longer it takes to display and manipulate the model on the screen. As a result, it would be inefficient to model an intricate surface with roughness or texture, such as human skin. You also need a way to apply non-uniform colours to the model. Texture mapping provides the solution to both of these requirements.

You can also generate a 3D text string in Action. The generated text string has the same properties as an imported 3D model. You will work with 3D text strings in “Exercise 2: Create 3D Text Deformation Effects” on page 222.

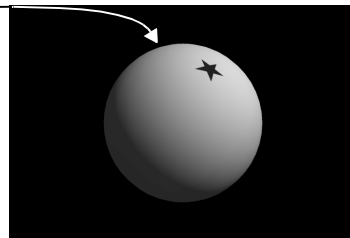
## Texture Mapping, Coordinates, and Normals

Texture mapping applies a 2D picture to a 3D model, like taking a flat piece of plastic and vacuum-sealing it to a bottle.

A texture coordinate determines how a texture conforms with the object to which it is mapped, similar to a line of longitude or latitude on a globe. Each coordinate on the globe corresponds to a point on a flat projection map.



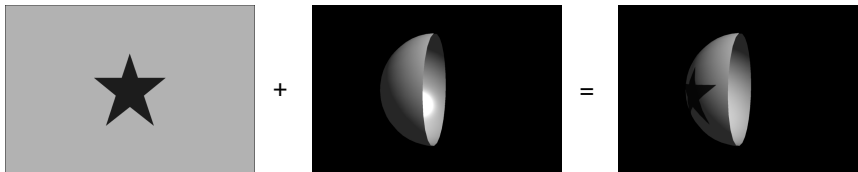
Flat projection map



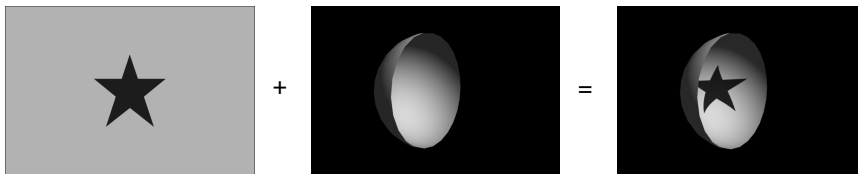
Globe



Texture coordinates are defined in the 3D system in which the 3D model is created. Texture coordinates are usually dependent on the vertices of the polygon mesh. Since a polygon mesh is hollow, you could theoretically put the surface of the object on the inside or the outside of the model. Normals are used to determine which side of the polygons in a mesh represents the “surface” of the model. For example:



Normals facing outward: the texture is mapped to the outside surface of the object.



Normals facing inward: the texture is mapped to the inside surface of the object.

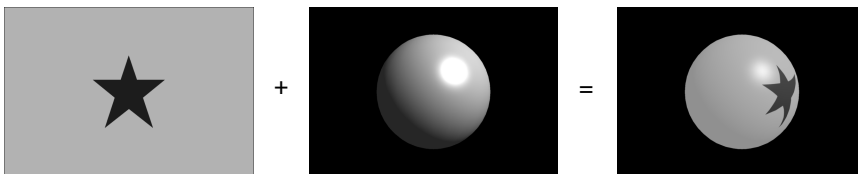
You cannot create 3D models, assign texture coordinates, or reorient normals in Action. However, you can import models with or without pre-assigned texture coordinates.

## Texture Mapping Modes

There are four ways to map textures to 3D objects in Action: reflection, planar, wrap, and cylindrical.

### Reflection

Reflection mapping mode applies the 2D texture as though the 3D object is reflecting the texture.



Reflection mapping sometimes distorts or scales the texture, since it is wrapped around the entire object. If you move the 3D object, the texture moves with the object.

## Planar

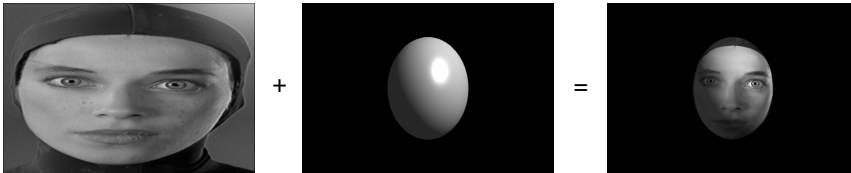
Planar mapping mode applies the texture without distortion to the front plane of the 3D object, similar to a movie projector casting an image onto a screen. Planar mapping positions the bottom-left corner of the texture at the 3D object's axis.



When you apply planar mapping, any surfaces on the 3D object perpendicular to the front plane cause the pixels at the edge of the texture to project along the “sides” of the object.

## Wrap

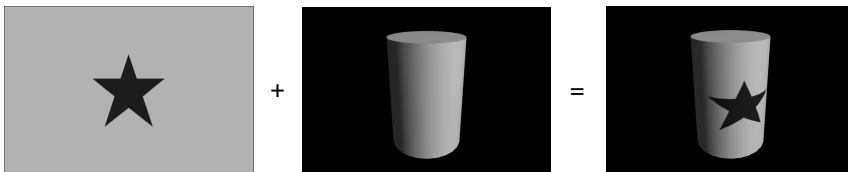
Wrap mapping mode completely envelops the 3D object with the texture according to the object's texture coordinates.



**Note:** If the 3D object has no texture coordinates and you choose wrap mapping mode, the texture reverts to planar mapping mode.

## Cylindrical

Cylindrical mapping mode wraps the texture around the 3D object in a cylindrical manner, starting from the bottom-left corner of the texture. For example, use cylindrical wrapping to put a label on a model of a soda can.

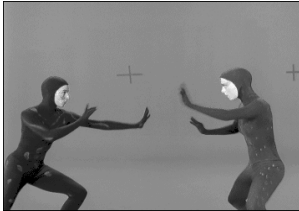


## Exercise 1: Using a 3D Object in a Multi-Layer Scene

In this exercise, build a scene in which two dancers circle a pole. To create the pole, import a 3D object and apply a texture map.

Load the *07\_3d\_object* reel onto the desktop from CD 2, “setups & images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*07\_front*: This clip contains the dancers in front of a blue screen.



*07\_back*: The background for the scene.



*07\_matte1*: The matte for the dancer on the left.



*07\_matte2*: The matte for the dancer on the right.



*07\_texture*: The texture you apply to the 3D object.



*07\_result*: This clip shows the expected result.

To preview the composite, play the *07\_result* clip using the Player.

## Open Action

Load the source clips for Layer1 and reset Action.

1. Click Action in the Effects menu.
2. Select *07\_front* as the front clip, *07\_back* as the back clip, and *07\_matte1* as the matte clip.
3. Select a destination reel.

The Action menu appears. The front and matte clips are loaded into Layer1 and are listed in the Layers List.

4. Reset all options to their default settings: go to the Setup menu, click Reset All and Confirm.
5. Delete any objects that may remain from the last Action session: select All next to the Delete button and click Delete.

Because the surface for Layer1 is deleted, the dancer is no longer visible. You add the surface again in the next step.

6. Select the setup options in the Setup menu:
  - a) Enable Auto Key, Texture, and Icons.
  - b) Disable Play Lock to be able to play the clip in Action. Otherwise, the clip is locked at the current frame and is not updated when you play it.

## Add an Image Surface to the Scene

Add the image of the first dancer to the scene.

1. Add the image of the first dancer using Layer1:

**a) Click Layers to view the Layers List.**

**b) Select Layer 1.**

**c) Select Image and click Add.**

2. Go to Schematic view by either selecting Schematic in the Scene View box or pressing ~.

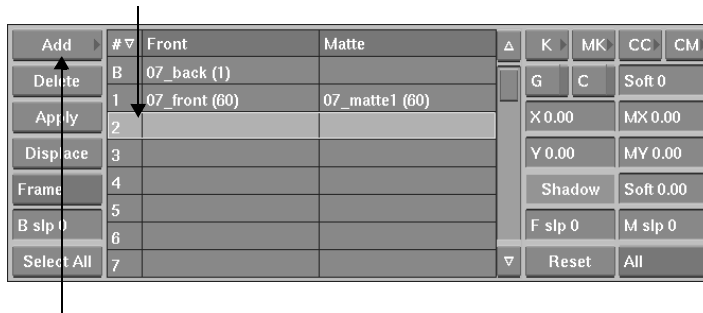
3. Select the axis node and name it “green\_dancer”. For instructions, see “Name the Axis” on page 174.

## Load the Second Layer

Load the source clips for Layer2 and add an image of the second dancer.

1. Load the second layer from the reels:

- a) Select Layer2 in the Layers List.



- b) Click Add to view the reels.

- c) Select *07\_front* as the front clip and *07\_matte2* as the matte clip.

You are returned to the Layers menu.

2. Add an image surface for the second dancer using Layer2: select the Image option and then click Add.
3. In Schematic view, select the new axis node and name it “brown\_dancer”.
4. Go to Perspective view (~).

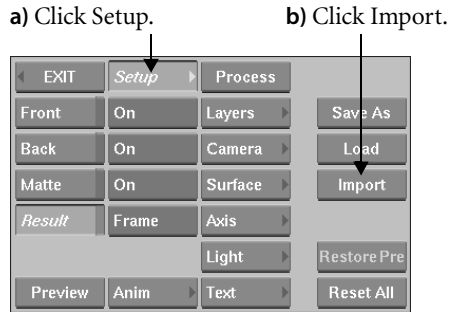
The composite looks like this.



## Import the 3D Object

Import the 3D object (a cylinder) and scale it down to make it look like a pole.

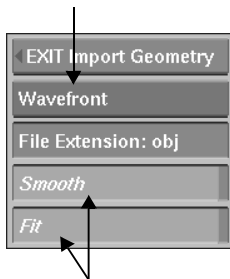
1. Open the Import Geometry menu:



The Import Geometry menu appears with the file browser.

2. Select the Import Options:

- a) Select Wavefront.

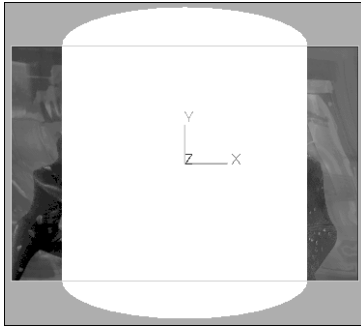


- b) Make sure Smooth and Fit are enabled (see “Smooth and Fit” on page 211).

**Hint:** You can import models created in 3d studio max® by selecting 3DStudio as the file type.

- Using the file browser, go to the directory `/usr/discreet/project/effects/Tutorial/setups/lesson07` and select the file `07_3d_object`.

The 3D object appears in the scene.



- Go to Schematic view (~).



← The Geom node represents the 3D object you just loaded.

- Select the axis of the Geom node and name it “3d\_object”.
- Go to frame 1 (**CTRL+LEFT ARROW**).

## Smooth and Fit

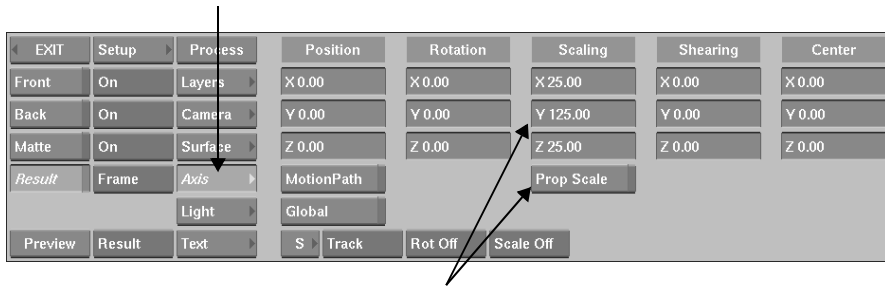
When you import an object from a software package that does not compute normals, normals are created during the import process. The Smooth feature configures the normals to make the surface of the object smooth. When Smooth is turned off, the object’s surface may appear faceted. It is usually a good idea to leave the Smooth button enabled.

The Fit feature automatically scales the object to fit within the image window. Since 3D objects are imported using the scale with which they were created, the object may be too large or too small for the image window. Therefore, you should always leave the Fit button enabled.

7. Resize the 3D object to make it look like a pole:

a) Make sure the *3d\_object* axis is still selected.

b) Click Axis to open the Axis menu.



c) Disable Prop Scale and set Scaling X to 25, Y to 125, and Z to 25.

**Hint:** You can also open the Axis menu by double-clicking the axis node in Schematic view.

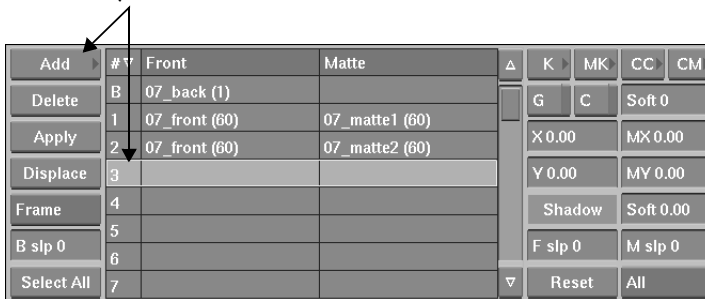
## Apply the Texture Map

Load the texture from the reels and map it onto the 3D object.

1. Load the texture into Layer3:

a) Click Layers to view the Layers List.

b) Select Layer3 and then click Add to view the reels.

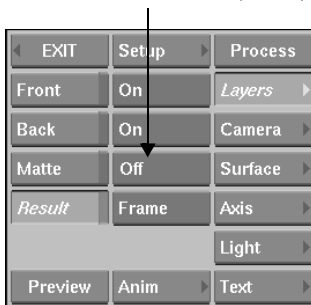


c) Select *07\_texture* as the front and matte clips.

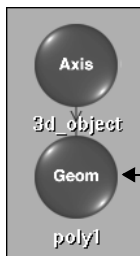
You are returned to the Layers menu.



2. Disable the matte for Layer3 by selecting Off next to the Matte button.



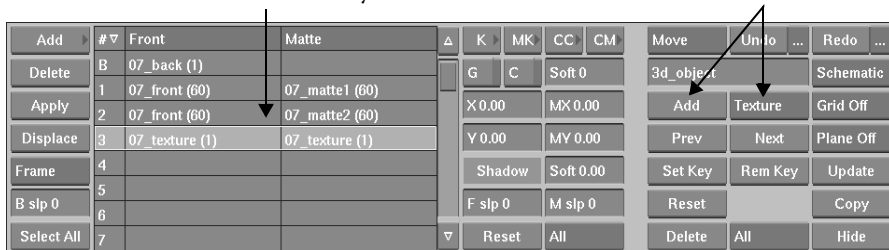
3. Add the texture to the 3D object using Layer3 as the texture source:



a) Select the Geom node in Schematic view.

b) Make sure Layer3 is selected.

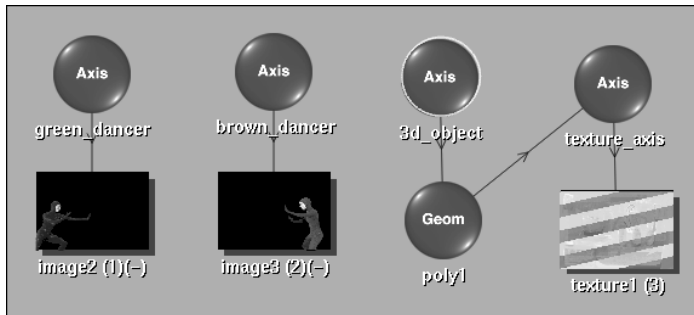
c) Select Texture and click Add.



An axis node and a texture node appear in Schematic view. Notice that the new axis and texture nodes are children of the Geom node.

4. Name the axis of the texture node “texture\_axis”.

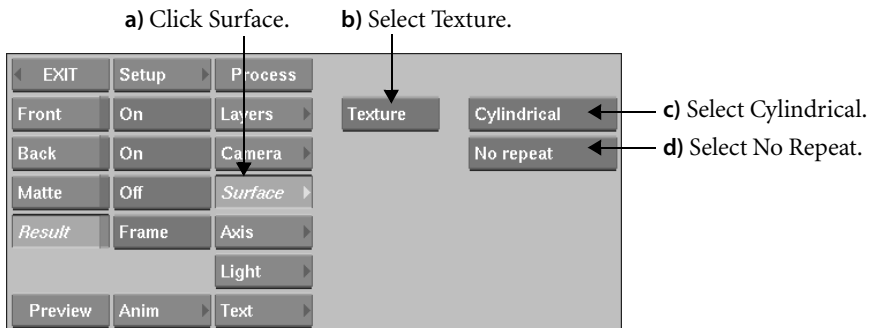
After aligning the nodes, the schematic looks like this.



## Modify the Texture Map

Modify the texture map to wrap the stripes around the pole.

1. Select the *texture\_axis* in Schematic view.
2. Go to Perspective view (~).
3. Open the Surface>Texture menu and select Cylindrical texture mapping mode:



The axis of the texture is added at the same coordinate value as the axis of the 3D object. Whereas the axis of the 3D object is at the centre of the cylinder, the axis of the texture is at the bottom-left corner of the texture. In Perspective view, notice the texture is offset from the base of the cylinder.

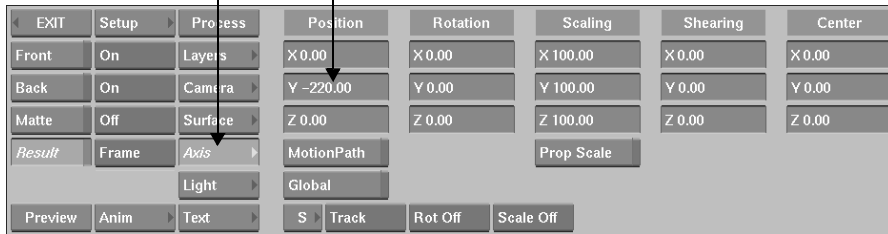
**Note:** There are two Repeat options: Repeat (fast) and Repeat (smooth). If the surface is larger than the texture, these options repeat the texture to cover the entire surface. The Repeat (fast) option results in a slightly lower quality, but a faster processing time. The

Repeat (smooth) option gives better results but takes longer to process. In this exercise, however, the texture used does not tile seamlessly. Instead of repeating the texture on the 3D object, it is better to reposition the 3D object so the textured area fills the frame (see instruction 4 following).

4. Move the *texture\_axis* to fit the texture to the 3D object:

a) Click Axis.

b) Set Position Y to -220.



**PAL**

If you are working in PAL, set Position Y to -170. Disable Prop Scale and set Scaling Y to 65.

5. Enable Shading in the Setup menu to add shading to the 3D object. A default light source supplies diffuse light at 20% intensity.

a) Click Setup.

b) Enable Shading.



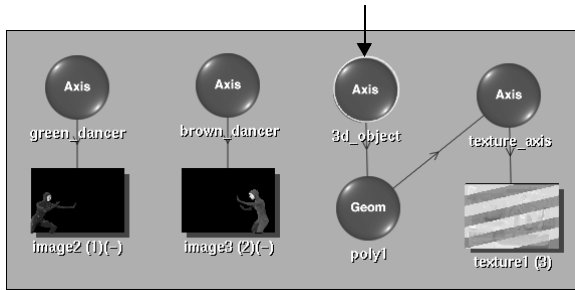
The composite looks like this.



## Animate the 3D Object

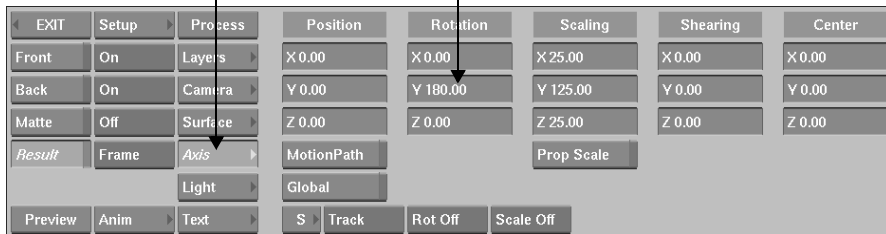
Animate the pole to make it rotate throughout the clip.

1. Go to frame 1.
2. Go to Schematic view (~) and select the *3d\_object* axis.



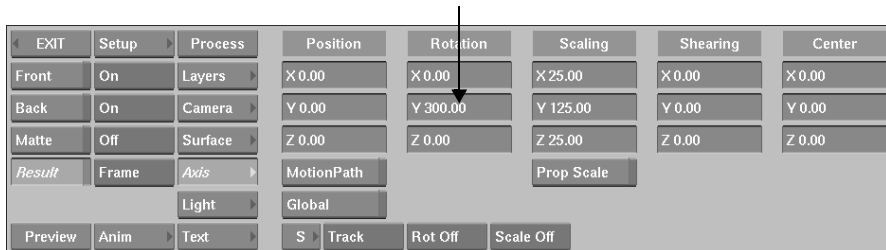
3. Set the rotation value at the first frame:

- a) Click Axis.
- b) Set Rotation Y to 180.



4. Set the rotation value at the last frame:

- a) Go to the last frame.
- b) Set Rotation Y to 300.



5. Return to Perspective view (~).
6. Play the clip to see the animation.

## Correct the Drawing Order of the Objects

When you play the clip, notice that the pole appears in front of both dancers throughout the clip. The three surfaces are actually at the same position on the Z axis; the pole is in front because by default, the surfaces are drawn in the order in which they were loaded into Action—the most recently added surface appears on top.

To make it look like the dancers are circling the pole, you need to move the green dancer in front of the pole at frame 21. Use the Priority Editor to change the drawing order of the objects in the scene.

1. Go to frame 21. Notice that the green dancer's hand is behind the pole.



2. Open the Priority Editor to view the drawing order of the objects:

a) Click Layers to open the Layers menu.

b) Swipe the bar below the Layers List.

The Priority Editor appears.





The Priority Editor shows the bottom-up drawing order, or drawing priority, of the objects in the scene: the green dancer is drawn first, the brown dancer is drawn second, and the 3D object is drawn last or closest to the camera (on top). Changing the order of the objects in the Priority Editor changes the drawing order of the objects in the scene.

3. Bring the green dancer in front of the pole at frame 21:

a) Select the *green\_dancer* icon.

b) Click  twice.



Each time you click  the selected surface moves up one position in the drawing order. Clicking  twice moves the green dancer in front of both the brown dancer and the pole.



## Turn Off the Z-Buffer

The Z-buffer activates depth in the scene. You should turn it on if you intend to place objects at different positions on the Z-axis. Because you are keeping the pole and dancers at the same position on the Z-axis and simply using the Priority Editor to control the drawing order, you should turn the Z-buffer off.

1. Turn off the Z-buffer to prevent artifacts from appearing:



For more information about the Z-buffer and its effect on the drawing order, see “The Z-Buffer” on page 221.

The green dancer’s hand is now in front of the pole at frame 21.



Also, when the Priority Editor is open, a keyframe indicator appears in the timeline to show the frame number at which the order of the objects changes.



**PAL**

If you are working in PAL, the clip is only 50 frames long.

## Check Your Results

Save the setup, process the clip, and compare your result to the *07\_result* clip.

1. Go to the Setup menu and save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
2. Go to frame 1 and click Process to render the clip.
3. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *07\_result* clip.
5. (Optional) If the two clips do not match, return to Action and load the *07\_3d\_object\_setup* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_07* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.
7. Delete the result clip and exercise reel from the desktop.



## The Z-Buffer

The order in which the surfaces appear in the scene depends on:

- The drawing order, if the Z-buffer is off
- Their position on the Z-axis, if the Z-buffer is on

### Z-Buffer On

When the Z-buffer is on (default setting), the surfaces appear in the scene according to the Z position value of each surface axis. The Z position of the axis (Position Z in the Axis menu) is the distance of the surface from the camera eye.

### Z-Buffer Off

When the Z-buffer is off, the surfaces appear in the rendered clip according to their drawing order (the order shown in the Priority Editor). The Z positions of the surfaces are not considered.

If the surfaces are at the same Z position, turn the Z-buffer off to prevent artifacts from appearing.

### Sorting Using the Priority Editor

When the Z-buffer is on, artifacts may appear on the surface edges if the drawing order of the surfaces does not correspond to their Z positions. Use Analyze or Z-Sort in the Priority Editor to analyze the clip and change the drawing order to correspond to their Z positions in the scene; the edges of the surfaces are drawn correctly.

- Click Analyze in the Priority Editor to analyze the entire clip.
- Click Z-Sort to analyze the current frame only.

A keyframe indicator is placed on the timeline if there is a change in drawing order.

## Exercise 2: Create 3D Text Deformation Effects

In Action, you can create 3D text strings which have the same properties as imported 3D objects. The deformations you apply to the generated 3D text string in this exercise can also be applied to imported 3D objects.

In this exercise, create three different text deformation effects. A Deform mesh is added to the 3D text string, and then manipulated and animated to produce a sliding, magnifying, and oscillating effect.

Load the *07\_3d\_text\_ex2* reel onto the desktop from CD 2, “setups & images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*07\_texture\_ex2*: This clip is used as a texture for the third effect.



*07\_result1\_ex2*: This clip shows the expected result of the first text deformation. The 3D text string appears as though it is sliding into place out of thin air.



*07\_result2\_ex2*: This clip shows the expected result of the second text deformation. The Deform mesh is manipulated and animated to create the effect of a magnifying glass passing over the 3D text string.



*07\_result3\_ex2*: This clip shows the expected result of the third text deformation. A texture is applied to the animated text string, and the animation is enhanced with a motion blur.

To preview the result clips, play them using the Player.

## Open Action

Open Action with a single coloured frame as source material.

1. Create a single black frame using Coloured Frame in the Processing menu.
2. Click Action in the Effects menu.
3. Select the black frame as the front, back, and matte clips, then select a destination reel.  
Action opens.
4. Reset all options to their default values: go to the Setup menu, click Reset All, and Confirm.
5. Delete any objects that may remain from the last Action session: select All next to the Delete button and click Delete.
6. Select the required options in the Setup menu:
  - a) Because the text and image layer used in this exercise will be at the same Z-position, select Z-Buffer Off to prevent artifacts from appearing.
  - b) Enable Shading to add shading to the 3D text.
  - c) In **inferno** only, enable Multi Sample to use hardware anti-aliasing for smoother edges.
7. Set the length of the clip to be generated to 30 frames by entering 30 in the Total Frames field.

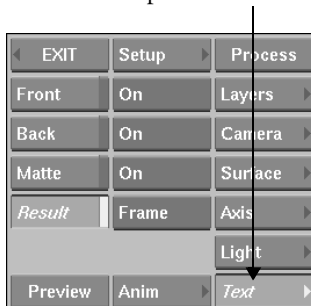
**PAL**

If you are working in PAL, set the length of the clip to 25 frames.

## Create a 3D Text String

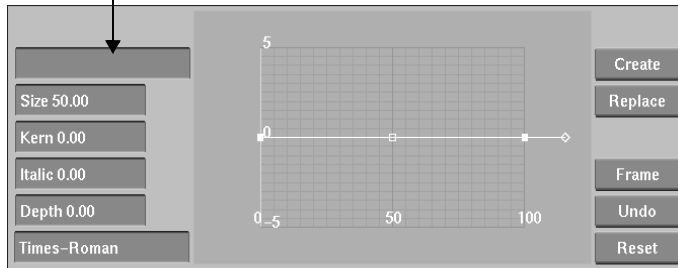
Use the Text menu to enter a text string and set its properties.

1. Click Text to open the Text menu.



## 2. Enter a text string:

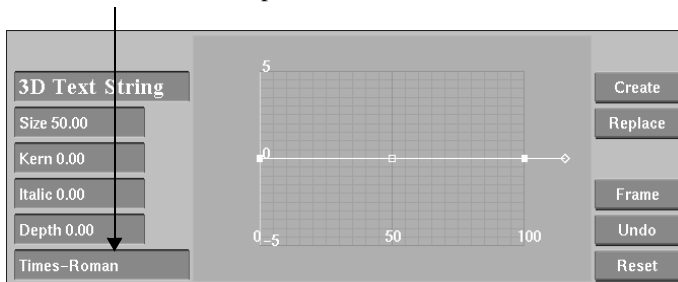
a) Click the Text field to open the on-screen keyboard.



The on-screen keyboard displays the characters of each key in the selected font.

b) Type “3D Text String” and press **ENTER**.**Hint:** You can access other ASCII characters by enabling Up ASCII.3. By default, the Text menu selects the font declared in the TextDefaultFont line of the *init.cfg* configuration file, which is generally Times-Roman. Select a different font:

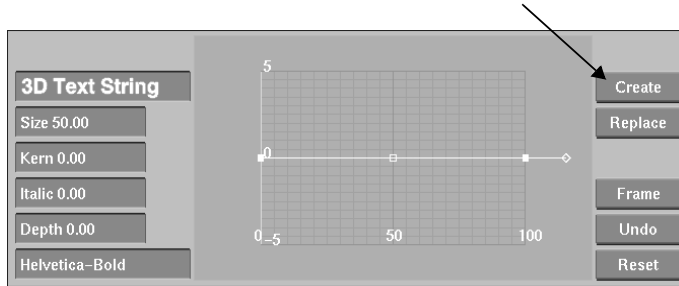
a) Click the Font field to open the file browser.



b) Select Helvetica-Bold in the list of fonts.

You are returned to the Text menu, and Helvetica-Bold appears in the Font field.

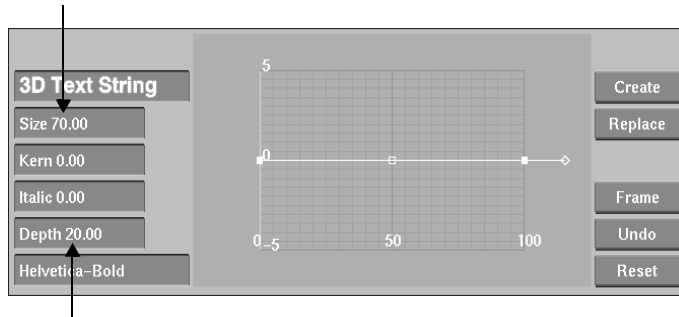
4. Click Create.



The 3D text string appears in the frame.

5. Set the properties for the font:

- a) Set Size to 70.



- b) Set Depth to 20.

For more information on text properties, see “Adjusting the Bevel Curve” on page 226.

6. Zoom in and rotate the text string to see the depth better:

- a) Zoom in (**CTRL+UP ARROW**) on the text string.

b) Click Axis to open the Axis menu.

c) Set Rotation Y to 40.

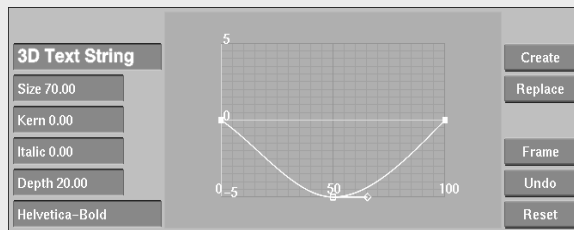


7. Return the text string to its original position by setting Rotation Y to 0.

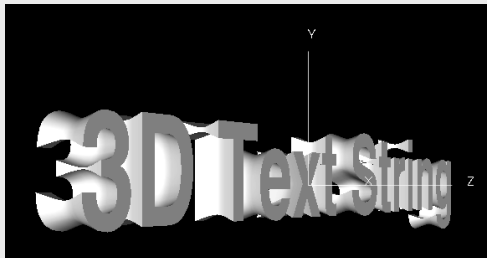
## Adjusting the Bevel Curve

The Bevel curve is a scaled profile of the bevel applied to the depth of the text string. You can move and add points, and adjust tangent handles to produce different effects.

You can, for example, set the Bevel curve with the following shape.



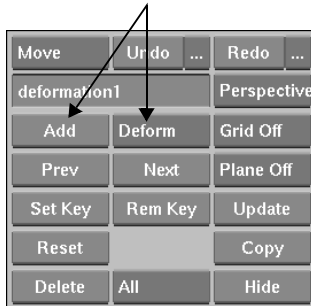
Click Replace to see the changes. A text string generated with this bevel curve looks like this.



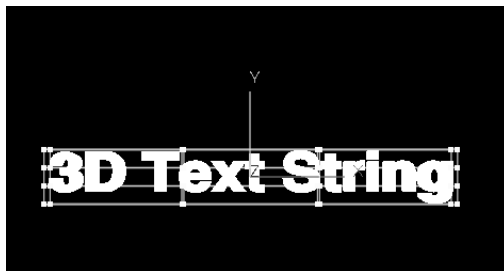
## Add a Deform Mesh to the Text String

Add a simple deform mesh to the 3D text string.

1. Add a Deform mesh: select Deform and click Add.



A Deform mesh appears around the text string.



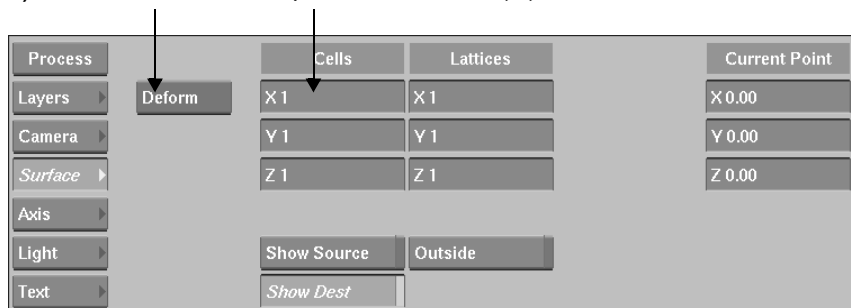
**Hint:** You can also add a Deform mesh to 3D objects, images, bicubics, and extended bicubics.

2. By default, the Deform mesh consists of a 3X3 grid of cells. Simplify the Deform mesh:

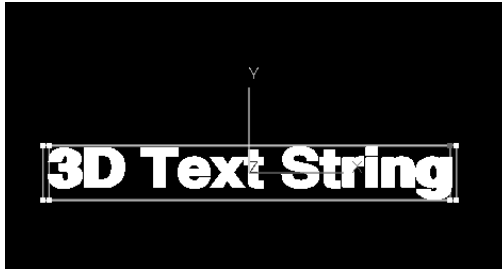
a) Click Surface to open the Surface menu.

b) Select Deform.

c) Set the number of X, Y, and Z cells to 1.



The Deform mesh is now a simple 3D box.



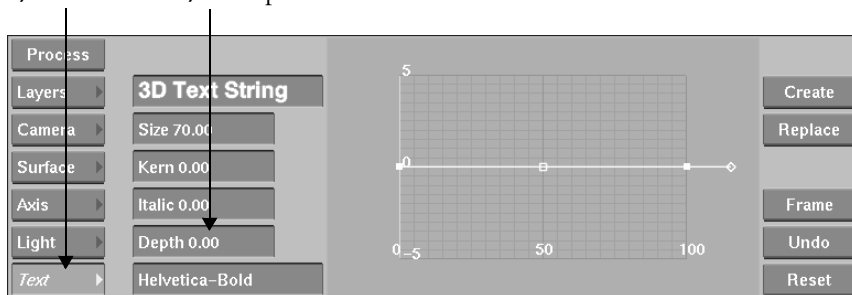
**Hint:** The more lattices and cells there are on each axis, the more articulations can be added to the deformation effect. The greater the number of lattices and cells, however, the slower the rendering process. Try to use only as many lattices and cells as you need to produce the effect you want. For more information, see “Lattices and Cells in the Deform Mesh” on page 229.

## Animate the Deform Mesh

You can animate the Deform mesh independently of the text string to produce a variety of effects. In this step, animate the Deform mesh to make to create a slide effect.

1. Set the depth of the text string to 0:

- a) Click Text.
- b) Set Depth to 0.

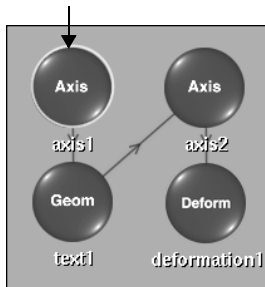


Although the text string is flattened, the depth of the Deform mesh is unchanged. The sliding effect is produced by manipulating and animating the 3D Deform mesh around the flattened 3D text string.



## 2. Rotate the text string:

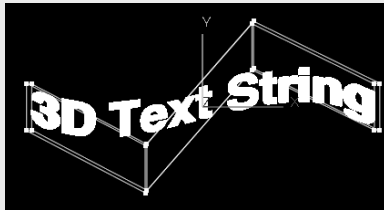
a) Go to Schematic view (~) and select the text string axis.



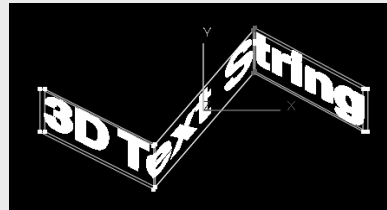
## Lattices and Cells in the Deform Mesh

The Deform mesh allows you to deform a 3D object or text string by manipulating its divisions. Two kinds of divisions are used: lattices and cells. Both can be used to manipulate the text string, but in different ways. Lattice points are anchored to the text string, whereas cell points are not.

The following examples show lattice and cell divisions on the X-axis, with Y- and Z-axes set to 1 lattice and 1 cell. You can set up to 3 cells, and up to 100 lattices for each axis.

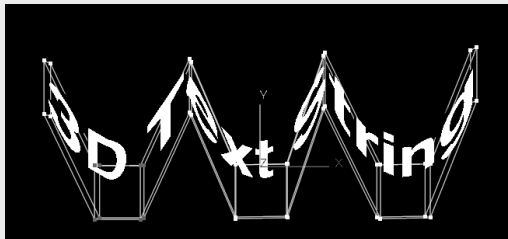


A 3D text string with 1 lattice and 3 cells.



A 3D text string with 3 lattices and 1 cell.

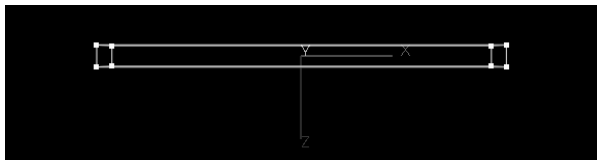
Cells divide lattices: if you set a Deform mesh to 3 cells and 3 lattices on the X-axis, you will have a total of 9 cells, 3 in each lattice, like the following text string.



b) Select Top to go to Top view.

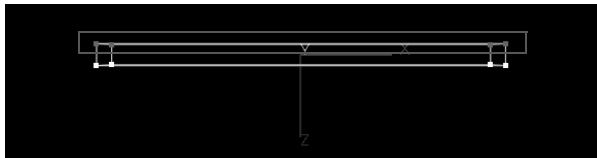


You now see the Deform mesh from the top, which allows you to select the four rearmost points.



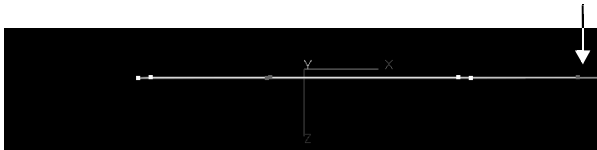
3. Select the four rearmost points of the mesh:

- a) Click the Deform mesh to select it. The cage is yellow when selected.
- b) Press **CTRL** and drag a box around the four rearmost points. The points are red when selected.



4. Stretch and flatten the Deform mesh:

- a) Press any of the selected points and drag the back of the Deform mesh down and to the right to the same level as the other four points.



b) Select Perspective to return to Perspective view.

c) If you are still zoomed in, click Home.

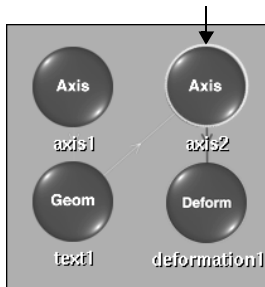
d) Click Undo and Redo to view the change to the text string.

The text string is no longer centred in the image window. It has been offset to the right by stretching the Deform mesh.

5. Animate the Deform mesh independently of the text string. Set a keyframe at the first frame:

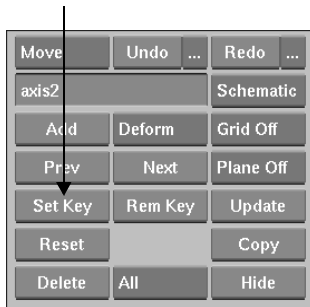
a) Go to Schematic view (~).

b) Double-click the Deform mesh axis to open the Axis menu.



c) Go to frame 1 (**CTRL+LEFT ARROW**).

d) Click Set Key to set a keyframe for the initial position.



6. Set a keyframe at the last frame:

a) Go to the last frame (**CTRL+RIGHT ARROW**).

b) In the Axis menu, set Position X to 500.

7. Return to Perspective view (~), go to frame 1 and play the clip.

The slide effect is the result of the stretched and collapsed 3D Deform mesh. To complete the effect, however, the 3D text string prior to the slide effect should be hidden. This will make the text string appear to slide in out of thin air.

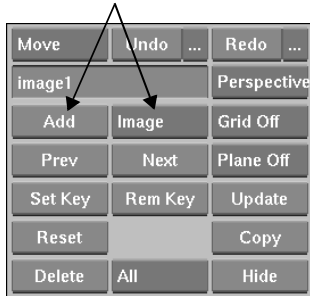
## Complete the Slide-in Effect

To complete the slide-in effect, use a black frame to mask the text string as it slides into place.

1. Add a black frame to the scene:

a) In the Layers List, select Layer1 (the black frame).

b) Select Image and click Add.



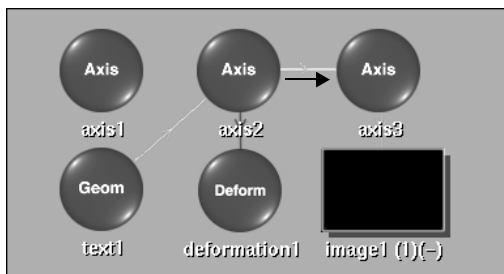
c) To make the black frame opaque, turn the matte clip off by selecting Off next to the Matte button.

2. Make the Deform mesh axis the parent of the black frame axis:

a) Go to Schematic view (~)

b) Select Parent edit mode (P).

c) Drag from the Deform mesh axis to the parent axis of the black frame.

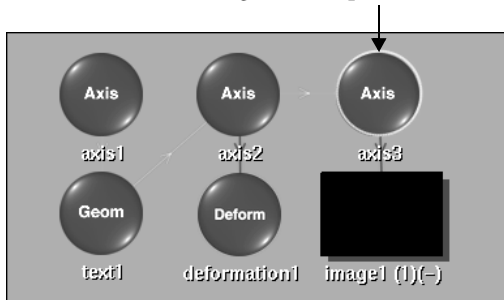


Transformations applied to the Deform mesh axis are passed on to the image axis. As a result, the black frame is animated with the Deform mesh.

3. Set the black frame to conceal the text string prior to the slide effect:

a) Select Move edit mode (**M**).

b) Double-click the image axis to open the Axis menu.



c) Go to Perspective view (~).

d) Go to frame 1 and set Position X to 90.

**PAL**

If you are working in PAL, set Position X to 230.

The edge of the black frame is now closer to the beginning of the text string, although it continues to mask the text entirely.

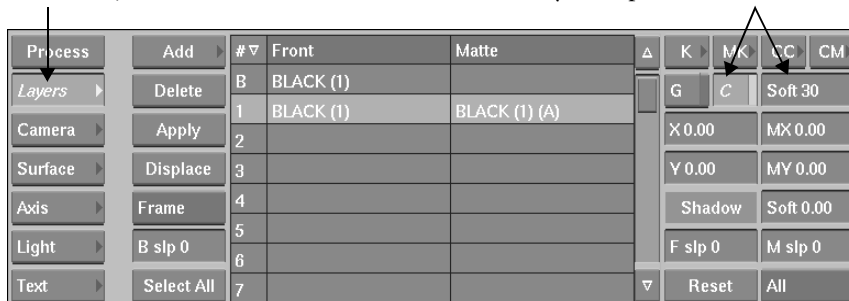
4. Play the clip to view the result.

The black frame masks the text string before the slide effect, but the effect is too abrupt.

5. Soften the edge of the masking image:

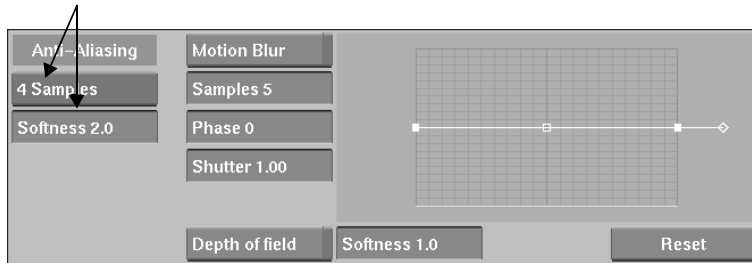
a) Click Layers.

b) Click C to enable Layer Crop and set Softness to 30.



The edge of the masking image is softened, adding a fade-in effect for the sliding text string.

6. Set the rendering options to improve anti-aliasing:
  - a) Click Setup and then swipe across the bottom of the screen to view the rendering controls.
  - b) Select 4 Samples and set Softness to 2.



## Check Your Results

Save the setup, process the clip, and compare your result to the *07\_result1\_ex2* clip.

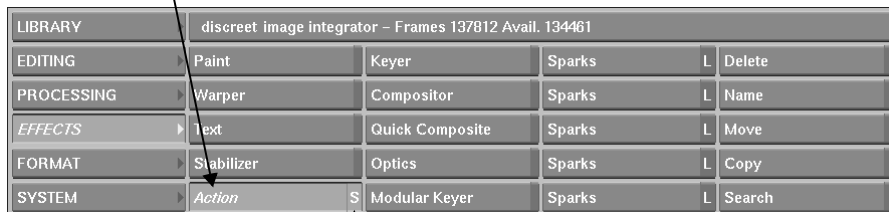
1. Swipe across the bottom of the screen to return to the Setup menu and then save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
2. Go to frame 1 and click Process to render the clip.
3. When the clip has been processed, click Exit to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *07\_result1\_ex2* clip.
5. If the two clips do not match, return to Action and load the *07\_3d\_text1* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_07* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.

## Create a Magnifying Glass Effect

With a more complex Deform mesh, you can manipulate the 3D text string to create true 3D deformations.

### 1. Open Action with the pre-selected clips:

#### a) Click Action.



#### b) Click S to open Action with the clips selected for the first effect.

#### c) Select a destination reel.

### 2. Set the required Setup properties:

#### a) Reset all options to their default values: go to the Setup menu, click Reset All, and Confirm.

#### b) Delete any objects that may remain from the last Action session: select All next to the Delete button and click Delete.

#### c) Enable Shading in the Setup menu.

#### d) In **inferno** only, enable MultiSample to use hardware anti-aliasing for smoother edges.

#### e) Set the length of the clip to 30 frames.

**PAL**

If you are working in PAL, set the length to 25 frames.

### 3. Create a text string:

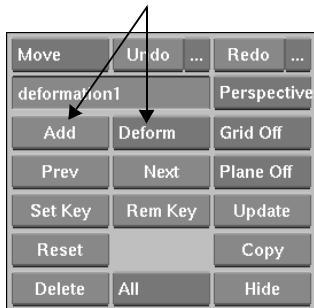
#### a) Click Text to open the Text menu. The text string from the previous step is still in the Text field.

#### b) Click Create.

#### c) Set Depth to 20 and Size to 70.

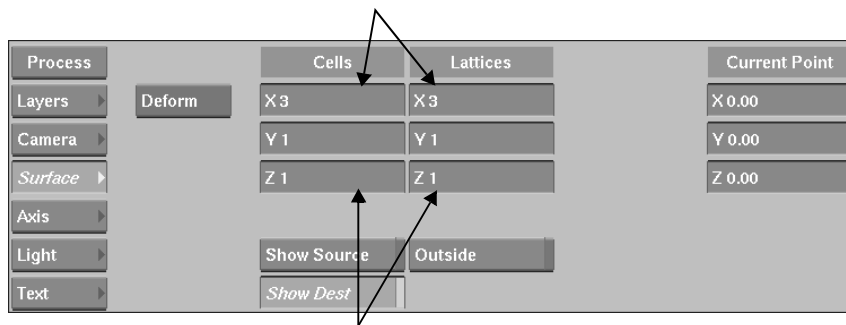
#### d) Select Helvetica-Bold.

4. Add a Deform mesh: select Deform and click Add.



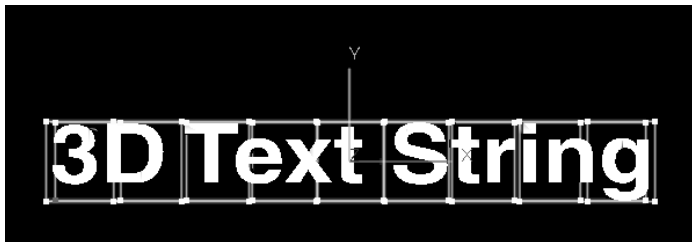
5. Modify the Deform mesh:

- a) Click Surface, then select Deform.
- b) Set the number of X cells and lattices to 3.



- c) Set the number of Y and Z cells to 1.

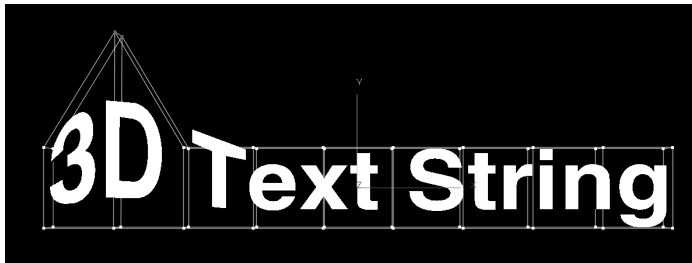
The Deform cage should look like this.



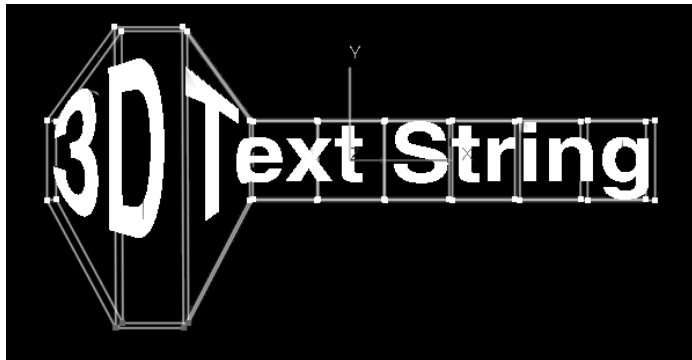
**Hint:** If you have moved the points of a Deform mesh, you must reset the Deform mesh before changing the number of cell and lattice points.



6. Manipulate the shape of the Deform mesh to produce a magnifying glass effect:
- a) Click the mesh to select it.
  - b) Move the paired front and rear points at the same time by pressing **CTRL** and drawing a box around each pair before moving them. You may want to zoom in on the Deform mesh to manipulate the points more easily.

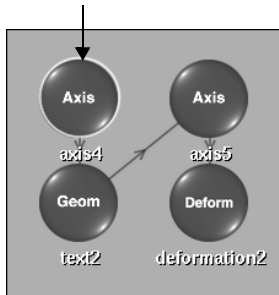


- c) Move the two pairs of front and rear lattice points at the top and bottom of the leftmost cell and arrange them as shown below.



## 7. Rotate the text string:

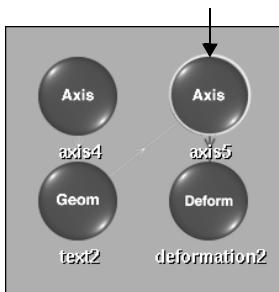
- a) Go to frame 1.
- b) Go to Schematic view (~).
- c) Double-click the text string axis to open the Axis menu.



- d) Return to Perspective view (~).
- e) Set Rotation X to -33.

## 8. Set the keyframes for the Deform mesh animation:

- a) In Schematic view (~), double-click the Deform mesh axis to view its Axis menu.



- b) Return to Perspective view (~).
- c) At frame 1, set Position X to -160 to move the magnifying part of the Deform mesh to the left of the text string.
- d) Go to the last frame.
- e) Set Position X to 500 to move the magnifying part of the Deform mesh to the right of the text string.

9. Set the rendering options to improve anti-aliasing:
  - a) Click Setup and then swipe across the bottom of the screen to view the rendering controls.
  - b) Select 8 Samples.
  - c) Set Softness to 2.

## Check Your Results

Save the setup, process the clip, and compare your result to the *07\_result2\_ex2* clip.

1. Swipe across the bottom of the screen to return to the Setup menu and then save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
2. Go to frame 1 and click Process to render the clip.
3. When the clip has been processed, click Exit to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *07\_result2\_ex2* clip.
5. If the two clips do not match, return to Action and load the *07\_3d\_text2* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_07* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.

## Create a Wave Effect Using a Textured Text String

Because 3D text strings have the same properties as imported 3D objects, you can apply textures to them. In this step, apply a texture to the text string, animate the Deform cage to produce a wave effect, and add a motion blur to bring out the movement in the animation.

### 1. Open Action:

- a) Click Action in the Effects menu.
- b) Select *07\_texture\_ex2* as the front clip, the black frame as the back clip, and *07\_texture\_ex2* as the matte clip.
- c) Select a destination reel.

### 2. Set the required Setup properties:

- a) Reset all options to their default values: go to the Setup menu, click Reset All, and Confirm.
- b) Delete any objects that may remain from the last Action session: select All next to the Delete button, and click Delete.
- c) Enable Shading and Texture in the Setup menu.
- d) In **inferno** only, enable MultiSample to use hardware anti-aliasing for smoother edges.

### 3. Create a text string:

- a) Click Text to open the Text menu. The text string from the previous step is still in the Text field.
- b) Click Create.
- c) Set Depth to 20 and Size to 70.
- d) Select Helvetica-Bold.

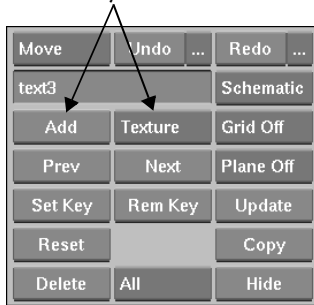
### 4. Add a Deform mesh: select Deform and click Add.

5. Add a multi-frame texture to the text string to produce an animated texture:

a) Go to Schematic view (~).

b) Select the Geom node.

c) With Layer1 selected in the Layers List, select Texture, then click Add.

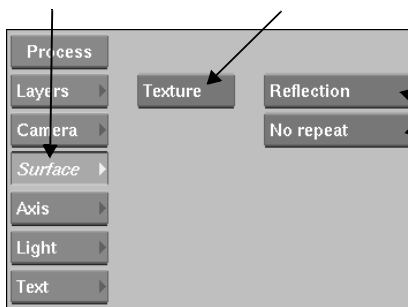


d) Turn off the matte for the texture by selecting Off next to the Matte button.

6. Set the properties of the texture:

a) Click Surface.

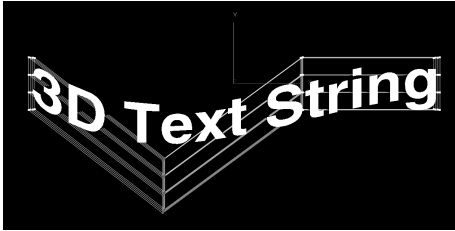
b) Select Texture.



c) Select Reflection and No Repeat. See “Modify the Texture Map” on page 214.

7. Set the first keyframe of the Deform mesh animation at frame 1:

- a) Select the Deform node.
- b) Go to Perspective view (~).
- c) Go to frame 1.
- d) Select the vertices joining the leftmost and middle cells and drag them downward.



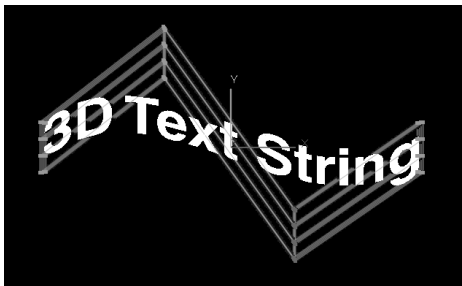
- e) Select the vertices joining the middle and rightmost cells and drag them upward.



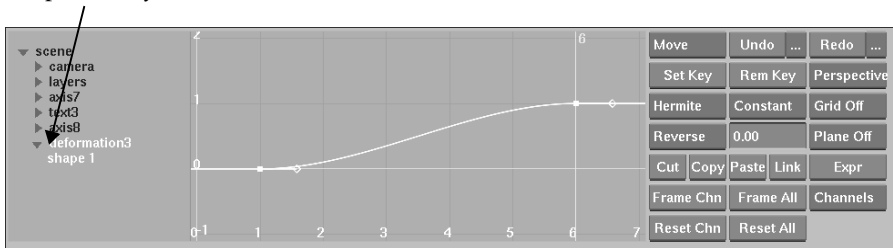
8. Set a second keyframe:

- a) Go to frame 6.
- b) Select the vertices joining the leftmost and middle cells and drag them upward.
- c) Select the vertices joining the middle and rightmost cells and drag them downward.

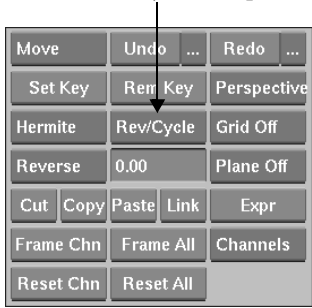
The Deform mesh should look like this.



- 9. Cycle the Deform mesh animation:
  - a) Click Anim to open the Channel Editor.
  - b) Open the *deformation* channel.



- c) Click Frame Chn to view the animation curve.
  - d) Select Rev/Cycle extrapolation mode.

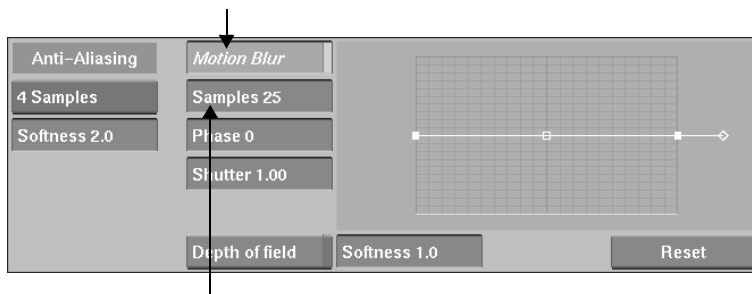


Rev/Cycle extrapolation reverses and repeats the animation curve, to produce smooth transitions between cycles.

## Add a Motion Blur Effect

Enable Motion Blur to enhance the Deform mesh animation.

1. Click Setup and then swipe across the bottom of the screen to view the rendering controls.
2. Set the rendering options to improve anti-aliasing:
  - a) Select 4 Samples.
  - b) Set Softness to 2.
3. Add the motion blur effect:
  - a) Enable Motion Blur.



- b) Set Samples to 25. This value affects the rendering of the motion blur only: the higher the value, the more blur is rendered.

**Note:** The effect of the Motion Blur will be evident only after processing. For more information on rendering settings see the chapter “Action: Overview and Setup Options” in the *flame* or *inferno* User's Guide.



## Check Your Results

Save the setup, process the clip, and compare your result to the *07\_result3\_ex2* clip.

1. Swipe across the bottom of the screen to return to the Setup menu and then save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
2. Go to frame 1 and click Process to render the clip.
3. When the clip has been processed, click Exit to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *07\_result3\_ex2* clip.
5. If the two clips do not match, return to Action and load the *07\_3d\_text3* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_07* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.
7. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- You can import 3D objects from other software applications, including 3d studio max, into Action.
- Texture mapping applies a 2D picture to the surface of a 3D object.
- There are four ways to map a texture onto a 3D object: reflection mapping makes the 3D object look like it is reflecting the 2D image; planar mapping projects the 2D image onto the 3D image; wrap mapping envelops the 3D object with the 2D image; cylindrical mapping wraps the 2D image around the 3D object in a cylindrical manner.
- Surfaces are drawn in the order shown in the Priority Editor. To obtain good edges in the rendered clip, use the Priority Editor to make the drawing order correspond to the Z positions of the surfaces.
- If the surfaces are at the same Z position, turn the Z-buffer off and use the Priority Editor to move one surface in front of or behind another surface.
- You can generate 3D text strings in the Text menu in Action.
- 3D text strings have the same properties as imported 3D objects.
- You can add a Deform mesh to a 3D object or text string and manipulate the shape of the object, and animate the Deform mesh to produce a variety of effects.
- Adding a multi-frame clip to a 3D object as a texture produces an animated texture.

# One and Two-Point Tracking

The Stabilizer is a powerful tool that can be used both for eliminating camera jitter in a clip and for image tracking. With image tracking, you use the Stabilizer to make an object follow a reference point in another image. Because the Stabilizer is fully integrated in Action, you can use image tracking to accurately position elements in a moving composite.

In this lesson:

- Learn about one-point and two-point tracking and tracking techniques
- Use one-point tracking to make a garbage mask in the Keyer hide a moving feature in a clip
- Use two-point tracking to replace the background in a clip that contains a camera pan and zoom

Before starting this lesson, complete Lesson 5, “Precision Keying” to learn how to create a key, and Lesson 6, “Animating Composites” to learn about layers, surfaces, and hierarchies in Action.

## Need Help?

If you need help with tracking, load the setup file provided for this lesson. Click Setup in the Action menu, then Load to open the file browser. Go to the directory `/usr/discreet/project/effects/Tutorial/setups/lesson_08` and load the setup file `08_tracking_action`.

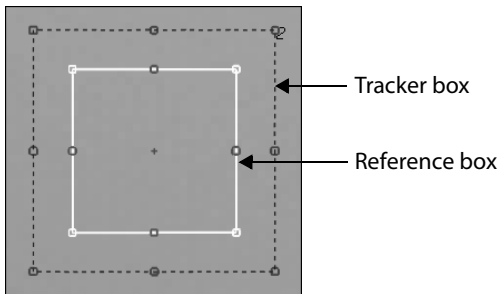
Time to complete this lesson: 45-60 minutes

## About Tracking

Use the Stabilizer to make an image track, or follow the movement of, a reference point in a clip. For example, you can use tracking to paste a logo to the side of a moving car.

The Stabilizer uses trackers to generate the tracking data. Each tracker consists of a solid box, called the reference box, and a dashed box, called the tracker box.

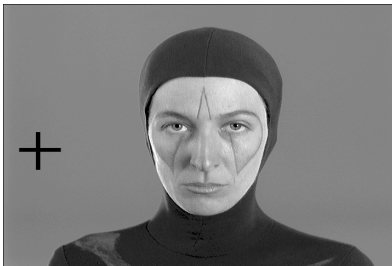
- The reference box identifies the starting position of the reference point (the feature to track).
- The tracker box follows the frame-to-frame movement of the reference point.



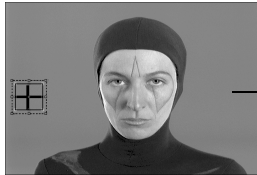
You select a reference point on your clip by placing a tracker over the feature you want to track.

After selecting the reference point, you start the tracking process. This is called analyzing the clip. During the analysis, the tracker box moves as the Stabilizer looks for a pattern that matches the reference point in each frame of the clip. The reference box stays at its initial position. (In some cases, you may need to change the position of the reference box; see “Tracking Techniques” on page 250).

In the following example, suppose you want to track the cross in order to composite a picture onto the wall behind the talent.

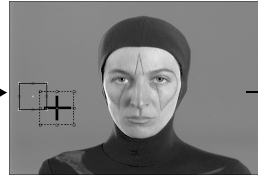


Initially, reference and tracker boxes are superimposed.



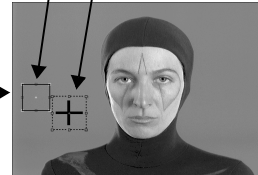
Frame 1

In subsequent frames, the tracker box follows the pattern.



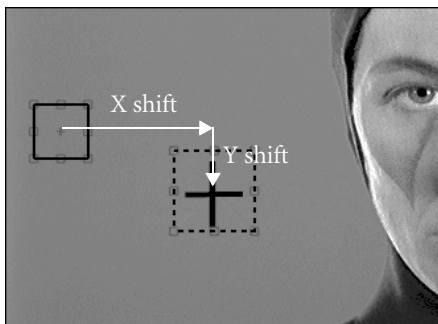
Frame 30

Reference box  
Tracker box



Frame 60

At each frame, the Stabilizer calculates the difference between the position of the tracker box and the position of the reference box to produce X and Y shift values. Shift values are a measure in pixels and subpixels of how far the reference point has moved between frames.



To track, the Stabilizer applies the shift values to the front image in the composite. The result—subpixel-accurate positioning of the front image.

## Selecting a Reference Point

A good reference point is a high-contrast pattern that has good definition both vertically and horizontally, which allows for perfect registration in both directions.

Selecting a good reference point is a process of trial and error. Play the clip several times to become familiar with the material. Ideally, you should try to find a pattern that is visible in every frame. However, this is not always possible, and you may have to track two different patterns, track an object that disappears behind another one, or track an object that moves out of the frame.

## Tracking Techniques

Sometimes the Stabilizer is unable to find the reference point within the boundaries of the tracker box. For example, in a live action shot:

- An object may move in front of the reference point
- The reference point may move out of frame
- The reference point may change size, shape, or luminance value

In these situations, the tracker box moves away from the reference point and creates incorrect shift keyframes. There are several ways to help the Stabilizer analyze the clip.

### Change the tolerance

Tolerance is the amount of discrimination the Stabilizer uses when matching the reference point during the analysis. At 100%, anything is accepted as a match and a keyframe is set. At 0%, only a perfect match is accepted. Use the Tol field in the Stabilizer menu to adjust the tolerance.

### Change the size of the tracker box

If the reference point moves a lot from one frame to the next, it may leave the boundaries of the tracker box. If so, increase the size of the tracker box (this increases processing time).

### Track the reference point manually

If the reference point moves out of frame, or if something moves in front of it, switch to manual tracking until the reference point is visible again. If necessary, remove incorrect keyframes and analyze the clip one frame at a time.

### Change the reference point

If the reference point moves out of frame, or if something moves in front of it, you can also choose another reference point just before losing the original reference point. The Stabilizer uses the offset between the two reference points to predict the position of the original reference point for calculating shift values.

### Disable Fixed Reference

If the reference point changes during the clip, for example by rotating or changing size, disable the Fixed button to update the reference point at each frame. Instead of the tracker box following the reference point specified at the first frame, it looks for the reference point from the previous frame, based on the last shift keyframe set by the tracker box.

### Analyze the clip backwards

If the feature to track gets bigger or is out of frame at the beginning of the clip, analyze the clip backwards.

## Exercise: Tracking in Action and the Keyer

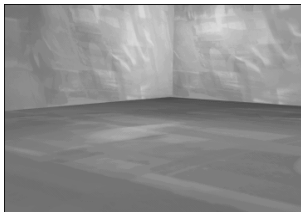
In this exercise, use tracking to help you build a composite from a live-action blue screen shot and a static background.

Load the *08\_tracking* reel onto the desktop from CD 3, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

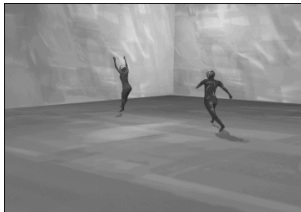
The reel contains the following clips.



*08\_front*: This clip contains two dancers in front of a blue screen, with two crosses on the walls which can be tracked. Use the Keyer to pull a matte from this clip, and then use tracking to animate garbage masks to hide moving elements in the background.



*08\_background*: This is the new background for the composite. Use two-point tracking to make the background match the camera pan and zoom of the front clip.



*08\_result*: This clip shows the final composite.

To preview the final composite, play the *08\_result* clip using the Player.

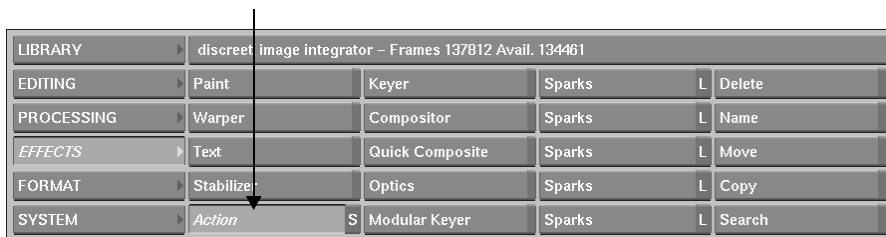
## Open Action

Since you can access both the Keyer and the Stabilizer from Action, open Action now and complete all steps from within Action.

In this exercise, you track two reference points on the blue screen clip (*08\_front*) to generate data for the new background. Load the blue screen clip as the front, back, and matte clips. When you open the Stabilizer in Track mode from Action, the back clip is always loaded into the Stabilizer as the clip that is being tracked. In this exercise, it is the *08\_front* clip that is being tracked.

Load the new background (*08\_background*) as a new layer later in the exercise.

1. Click Action in the Effects menu.

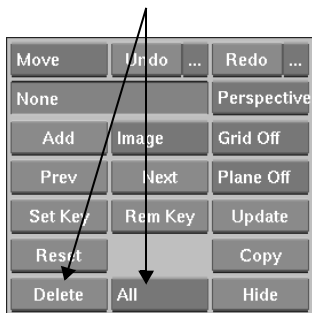


2. Select the *08\_front* clip as the front, back, and matte clips.

3. Select a destination reel.

The Action menu opens.

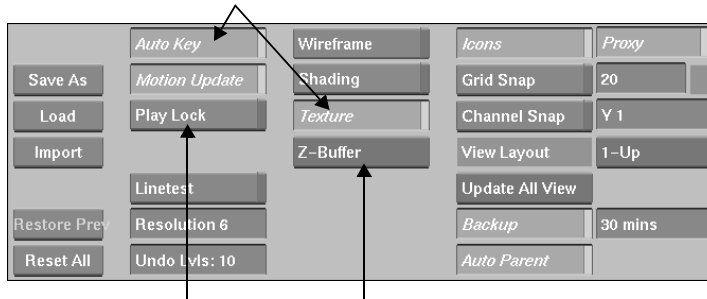
4. Reset all options to their default values: go to the Setup menu, click Reset All and Confirm.
5. Select All and click Delete to delete any objects that may remain from the previous Action session.





6. Select the setup options in the Setup menu:

a) Enable Auto Key and Texture.



b) Disable Play Lock.

c) Select Z-Buffer Off.

This exercise uses two image surfaces. The image surfaces are drawn in the order in which they are added to the scene and are at the same position on the Z axis. As a result, artifacts may be produced by the pixels of one surface mixing with the pixels of the other surface. Select Z-Buffer Off to prevent artifacts from forming. For more information, see “The Z-Buffer” on page 221.

## Add an Image Surface for the Dancers

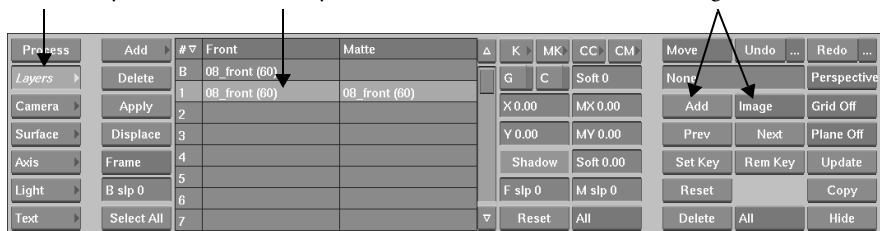
Next, add an image surface for Layer1 so that you can use this layer.

1. Add an image surface for Layer1:

a) Click Layers.

b) Select Layer1.

c) Select Image and click Add.



An image surface and axis are created for Layer1.

2. Go to Schematic view (~) and name the axis node “dancers”. For instructions, see “Name the Axis” on page 174.

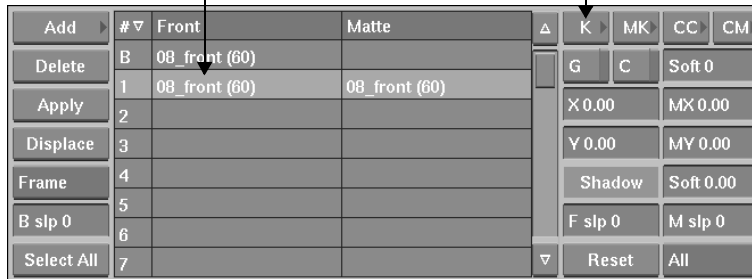
## Open the Keyer

Open the Keyer to pull the matte for the *08\_front* clip.

1. Open the Keyer directly from Action:

a) Select Layer 1 in the Layers List.

b) Click K to open the Keyer.

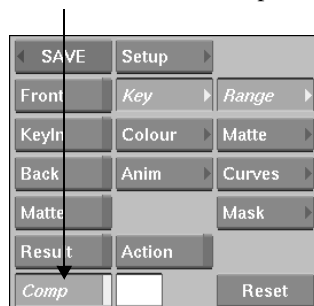


2. Reset all options in the Keyer to their default values: go to the Setup menu, click Reset All and Confirm.
3. Go to frame 1 (**CTRL+LEFT ARROW**).

## Set the Tolerance and Softness for the Key

Set the range of colours to be keyed out and adjust the softness.

1. Click Comp to view the key as you are working. Comp provides a solid white background in place of the back clip. This makes it easier to see the key in this example, since the back clip is the same as the front clip.



2. Use the HLS Range menu to set the tolerance for the key:

a) Click Key, Range, and HLS.

b) Click the Average Colour field and drag the cursor over the blue background.

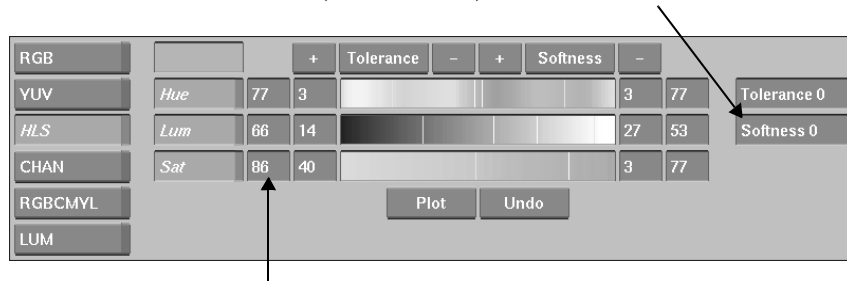


c) Adjust the tolerance to remove a range of blue colour values: press **CTRL** while dragging the cursor diagonally across the area to be keyed out. Avoid touching the dancers' shadows.

For more information about using the HLS Range menu, see "Set the Tolerance for the Key" on page 148.

3. Increase the softness to make the dancer's shadows more transparent:

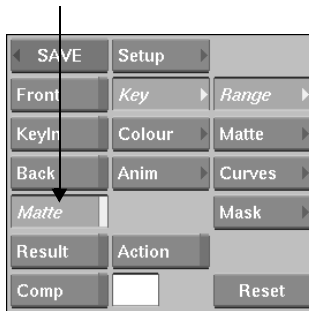
a) Enter 30 in the Softness field (see note below).



b) Set the minimum softness for the saturation channel to 86.

**Note:** The Softness value is added to all channels. After entering the value, the Softness field returns to 0.

4. Click Matte (**F3**) to view the matte.



After setting the tolerance and softness, the matte looks like this.



5. Adjust the edges of the key: go to the Matte menu and enable Erode using a Width of 1.
6. Go back to Comp view.

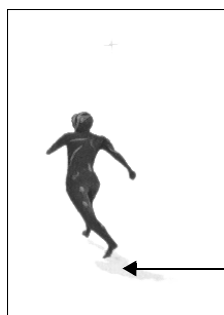
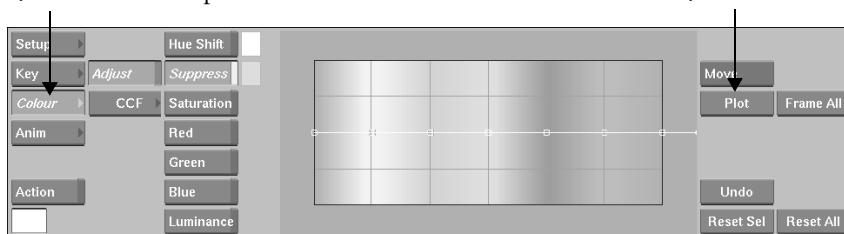
## Remove the Colour Spill

Blue light from the background has caused some discolouration on the dancers' shadows. Use the Keyer's colour correction tools to remove the colour spill.

1. Plot a point in the colour spill:

a) Click Colour to open the Colour menu.

b) Click Plot.



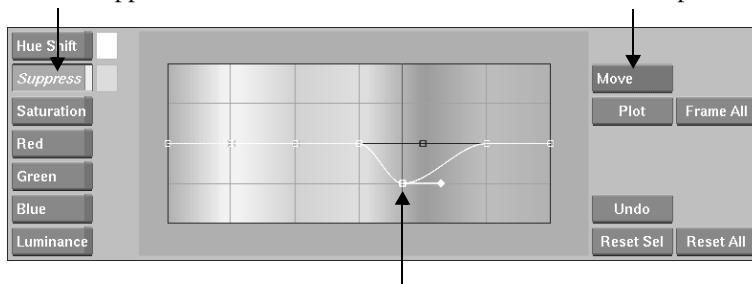
c) Select a point in the dancer's shadow.

A red line appears in the blue area of the hue spectrum.

2. Suppress the blue spill:

a) Click Suppress.

b) Select Move or press M.

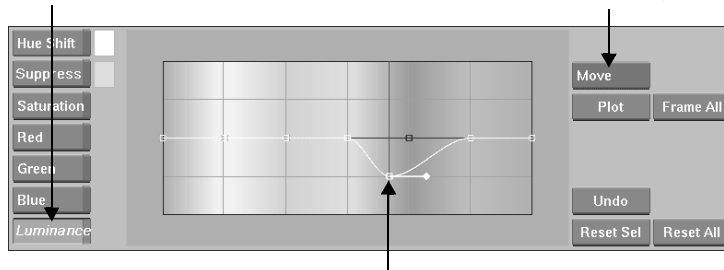


c) Drag the point closest to the red line downwards until the value displayed is 25. Position the point on the red line.

3. The dancers' shadows are grey. Decrease the luminance in that area to darken the shadows:

a) Click Luminance.

b) Select Move (M).



c) Drag the point closest to the red line downwards until the value displayed is 25. Position the point on the red line.

Make further adjustments using the Colour menu until you are satisfied with the key.

## Add a Garbage Mask

The two crosses on the background of the front clip are still visible in the composite. Later in the exercise, you track the two crosses to replace the background with another clip. To create the matte however, you need to mask them out.

The position of the crosses changes in the clip due to the camera pan. There are two ways to mask out a moving object:

- Add the garbage mask at frame 1 and move the points on the mask in subsequent frames to create shape keyframes. Use this technique if the object does not move very much in the clip or if it is difficult to track.
- Add the garbage mask at frame 1 and use the Stabilizer to generate tracking data for the object. The Keyer uses the tracking data to animate the position of the garbage mask. In this exercise, use this technique to mask out the two crosses.

1. Add a garbage mask:

a) Click Key, Mask, and Shape.

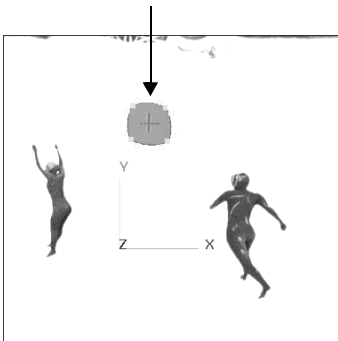
b) Select Geom, then click Add.



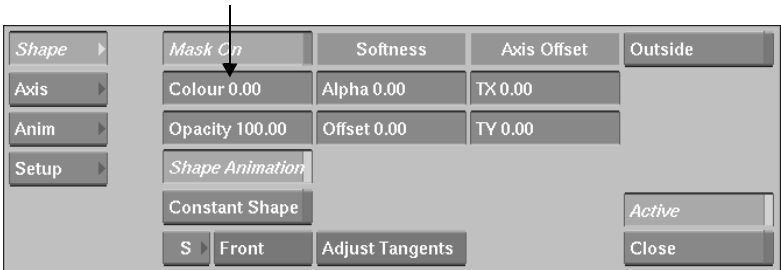
An axis for the garbage mask appears in the image window.

**Hint:** You can also press **N** or select Create edit mode to add a garbage mask.

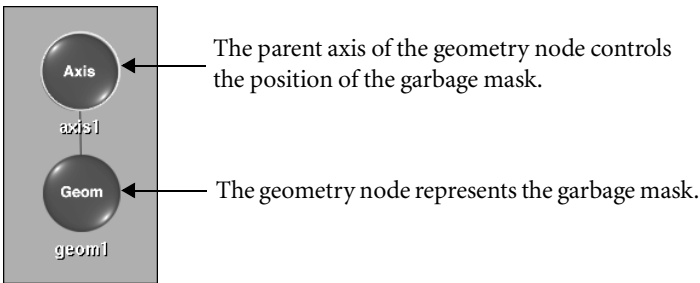
2. Draw a garbage mask around the cross on the left. (To learn how, complete Lesson 5, “Precision Keying”.)



3. Make the garbage mask opaque: make sure Mask On is enabled, then set Colour to 0.



4. Each garbage mask you add is a geometry object with its own axis. The masks and their axes are represented graphically in Schematic view. Press ~ to go to Schematic view.

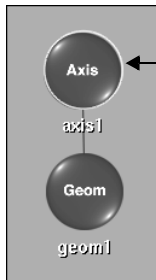


**Hint:** By adding and parenting axes and geometry nodes, you can build a hierarchy for garbage masks. If there are several garbage masks in the scene, you can animate each one independently or all as a group. For more information about hierarchies, see Lesson 6, “Animating Composites”.

## Generate the Tracking Data

Use one-point tracking to track the cross. The tracking data is applied to the axis of the garbage mask in the Keyer to make the garbage mask follow the movement of the cross.

1. To track the cross, load the front clip into the Stabilizer:

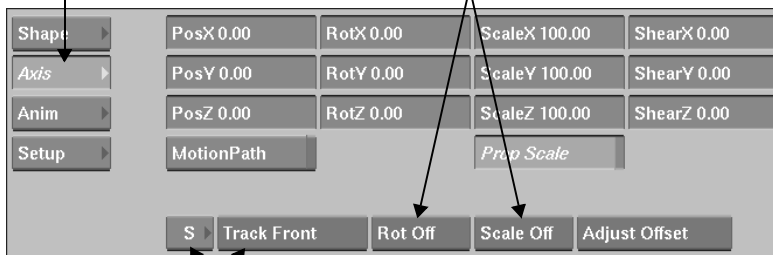


**a)** Select the axis of the garbage mask in Schematic view. This is the axis to which the tracking data is applied.

Nodes added to the schematic are numbered sequentially. The numbering in your schematic may differ from that shown here.

**b)** Click Axis.

**c)** Select Rot Off and Scale Off.



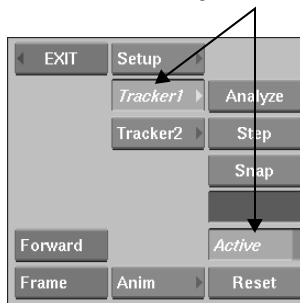
**d)** Select Track Front and click S to enter the Stabilizer from the Keyer.

The Stabilizer opens and the front clip appears in the image window.

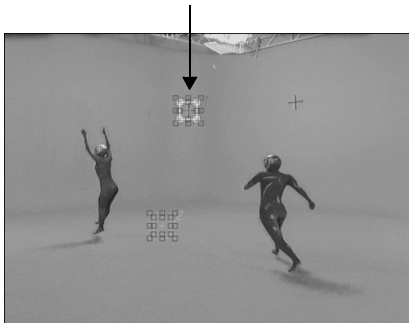
**Hint:** When tracking in the Keyer, you can track either the front or the back clip. To track a point on the back clip, select Track Back before clicking S.



2. Tracker1 is used to generate the tracking data. Make sure Tracker1 and Active are enabled.



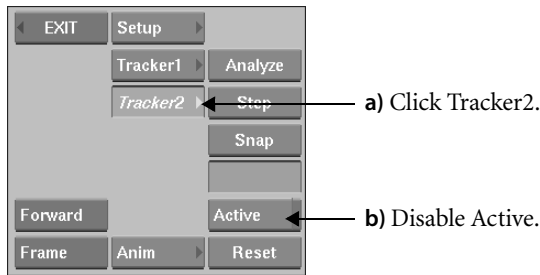
3. Position Tracker1: press **CTRL** and drag Tracker1 over the cross on the left. As you drag, the selected area is magnified to improve your accuracy. Position the crosshair at the centre of Tracker1 over the centre of the cross.



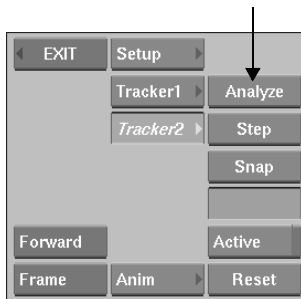
You can also press in the centre of the reference and tracker boxes to drag them, but use **CTRL** to avoid resizing the boxes by mistake.

**Hint:** You can change the degree of magnification using the Zoom field in the Setup menu.

4. Since you are tracking only one point in this exercise, disable Tracker2:



5. Click Analyze to generate the tracking data.



## One-Point Tracking

With one-point tracking, an object follows the movement of a single reference point in the clip. Tracking one reference point produces translation information only. One-point tracking does not take into account a camera pan or zoom in the clip, or a change in size or rotation of the reference point.

With one-point tracking, the tracking data is always assigned to the axis that is selected when you open the Stabilizer. You can apply one-point tracking data to:

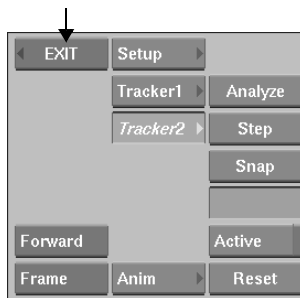
- A garbage mask axis in the Keyer
- A paint stroke axis in AutoPaint
- The axis of the front object in the Compositor
- An axis in Action; for example, the axis of a surface or 3D object
- A source mesh axis in the Warper

The final tracker path looks like this.



**Hint:** Depending on the clip and the selected reference point, the tracker box may move away from the reference point during the analysis and create an erratic tracking point. If this happens, return to frame 1, click Tracker1, and then click the Reset button and Confirm. Reposition Tracker1 over the cross and then re-analyze the clip. For more tracking techniques, see page 250.

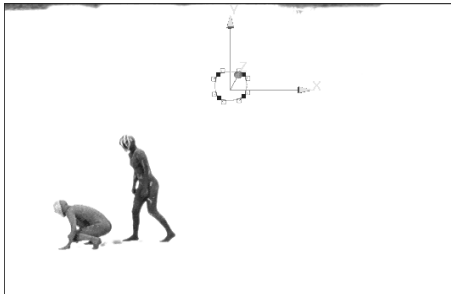
6. Click EXIT to return to the Keyer.



7. In the Keyer, return to Perspective view (~).

The tracking data is applied automatically to the axis of the garbage mask. Notice the axis is positioned over the point used as the reference point for Tracker1. The garbage mask remains in its original position.

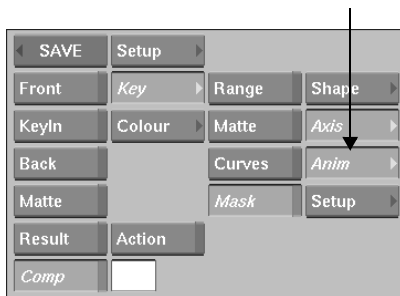
## 8. Play the clip.



The garbage mask follows the movement of the cross.

9. The tracking values (shift values) generated by the Stabilizer for the garbage mask axis are in the *axis $n$ >position* folder (where  $n$  is the number of your garbage mask axis).

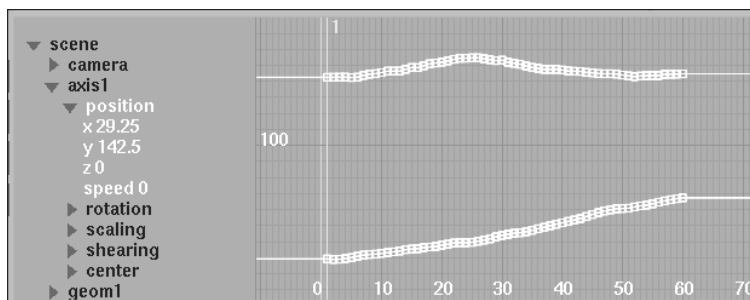
a) Click **Anim** to view the Channel Editor for the garbage masks.



b) Open and select the *axis $n$ >position* folder.

c) Click **Frame Chn.** Channels must be selected before you click **Frame Chn.**

Now you can see the garbage mask's X and Y position curves.



## Add Additional Garbage Masks

Complete the matte by masking out the other background elements.

1. Go to frame 1.
2. Add a second garbage mask:
  - a) Click Shape to open the Shape menu.
  - b) Click Add or press **N** to add the garbage mask axis.
  - c) Draw a garbage mask around the cross on the right.
  - d) Set Colour to 0.

### Animating the Shape of a Garbage Mask

You can animate the shape of a garbage mask by moving individual points on the mask at different frames. You can also use the Stabilizer to track selected reference points on the image and apply the tracking data to the points on the mask. To do this:

1. Go to the Shape menu and draw the garbage mask at frame 1, placing the points you want to track at easily trackable spots on the image.
2. Press **SHIFT** and select the points on the garbage mask that you want to follow the shape of the image. The selected points are highlighted in red.

**Hint:** You can also select multiple points by selecting the garbage mask, pressing **CTRL**, and dragging a selection box around the points.

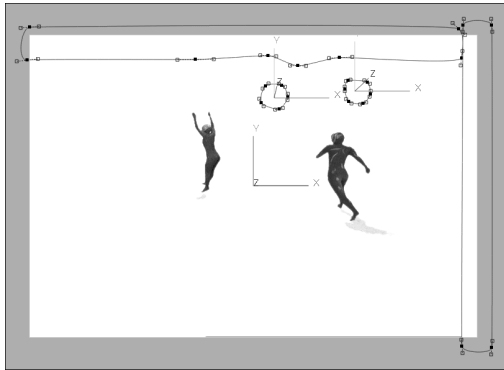
3. In the Shape menu, select Front and click S to open the Stabilizer.



4. In the Stabilizer, there is one tracker for each point selected on the garbage mask. If needed, position the trackers, and then analyze the clip.
5. Click EXIT to return to the Keyer. The selected points on the garbage mask follow the reference points on the image to animate the shape of the garbage mask, and a shape keyframe is set at every frame for the mask.

3. Follow the instructions in “Generate the Tracking Data” on page 260 to make the garbage mask track the second cross. (Because you are using a different garbage mask, continue to use Tracker1 to generate the tracking data.)
4. Go to frame 1 and add two more garbage masks to hide the lighting equipment and the frayed right border of the frame. Set Colour to 0 for each garbage mask. These garbage masks do not need to be animated.

After adding the four garbage masks, the scene looks like this.



## Save the Setup and Return to Action

The key is now complete; save your setup.

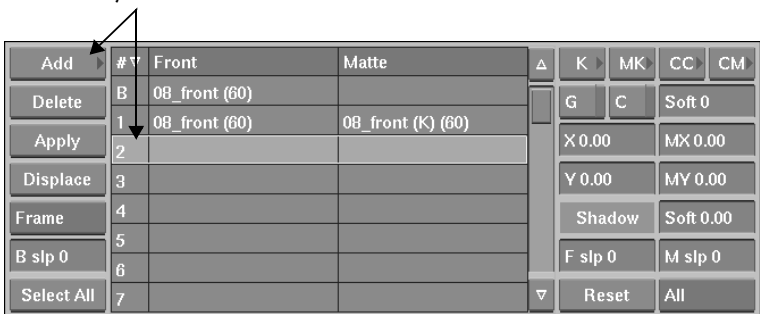
1. Click Matte (**F3**) to view the matte.
2. Save your setup:
  - a) Open the Setup menu and click Save As.
  - b) Make sure you are in the `/usr/discreet/project/effects/<project name>/key` directory.
  - c) Name your setup file “08\_key” and press **ENTER**.
3. Click SAVE to return to Action.

# Add a Layer for the New Background

Add a layer and image surface for the new background of the scene.

## 1. Add a new layer:

- a) Click Layers to view the Layers List.
- b) Select Layer2 and then click Add to view the reels.



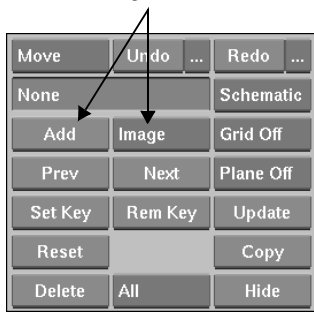
Add	# ▾	Front	Matte	Δ	K	MK	CC	CM
Delete	B	08_front (60)			G	C	Soft 0	
Apply	1	08_front (60)	08_front (K) (60)		X 0.00	MX 0.00		
Displace	2				Y 0.00	MY 0.00		
Frame	3				Shadow	Soft 0.00		
	4				F slp 0	M slp 0		
B slp 0	5							
	6							
Select All	7			▽	Reset	All		

- c) Select *08\_background* as both the front and matte clips.

The selected clips appear in the Layers List.

## 2. Add an image surface for the background:

- a) Make sure Layer2 is still selected.
- b) Select Image and click Add.



Move	Undo ...	Redo ...
None		Schematic
Add	Image	Grid Off
Prev	Next	Plane Off
Set Key	Rem Key	Update
Reset		Copy
Delete	All	Hide

- 3. Turn off the matte clip for Layer2 by selecting Off next to the Matte button.
- 4. Go to Schematic view (~) and name the axis node “background”.


## Reorder the Surfaces

The new background is in front of the dancers. Use the Priority Editor to change the drawing order of the surfaces.

1. Swipe the bar below the Layers List to view the Priority Editor.

2. Use the Priority Editor to change the drawing order of the surfaces:

a) Select the *background* icon.

b) Click  to move the background surface below the image surface of the dancers.



The dancers appear in front of the new background. To learn more about the Priority Editor, see Lesson 7, “3D Objects and Texture Mapping”.

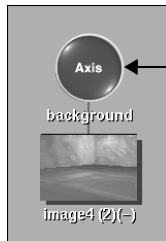
## Generate the Tracking Data

You now have a matte for the front clip and an image surface for the new background. However, the front clip contains a pan and a zoom, while the back clip is a still image. To make the new background follow the pan and the zoom, use the two crosses in the blue screen clip to generate tracking data for two points and apply the tracking data to the new background.

When tracking in Action, the back clip supplies the feature to track, and the selected axis supplies the image doing the tracking. When you first opened Action, you specified the *08\_front* clip as the back clip.



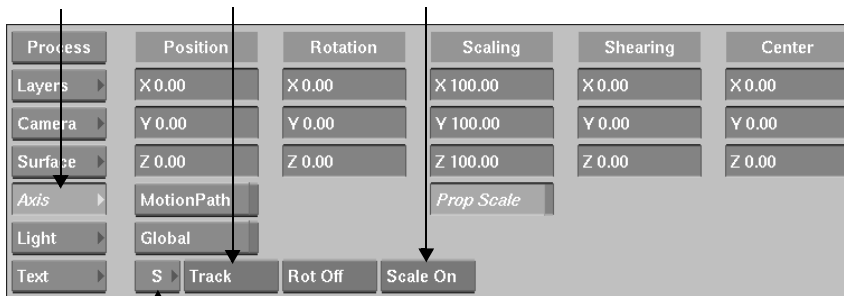
1. Load the blue screen clip (the back clip) into the Stabilizer. Because the camera zooms in on the wall, turn on the scaling option to generate both scaling and tracking data:



a) Select the *background* axis in Schematic view.

This is the axis to which the tracking data is applied.

- b) Click Axis.    c) Select Track.    d) Select Scale On.



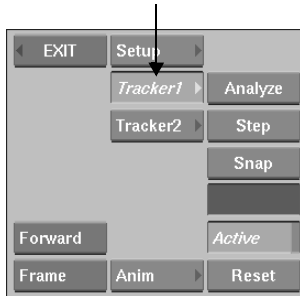
e) Click S.

The Stabilizer menu opens and the blue screen clip (the back clip) appears in the image window.

2. Go to frame 1 to position the trackers.

### 3. Tracker1 is used to generate the translation data. Position Tracker1:

#### a) Click Tracker 1.



#### b) Press **CTRL** and drag Tracker1 over the centre of the cross on the left.



## Two-Point Tracking

Use two-point tracking if the clip contains a pan or a zoom, or if the feature to be tracked changes size or rotates. Two-point tracking uses Tracker1 and Tracker2 in the Stabilizer to track two reference points in the clip.

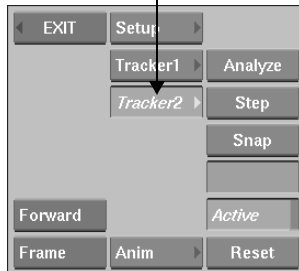
- Tracker1 generates the translation information. Position Tracker1 over the feature you want to track.
- Tracker2 generates the rotation and scaling information. Position Tracker2 over a point that represents the rotation or change in size of the feature you are tracking. The Stabilizer compares the positions of the two trackers in each frame to generate the rotation and scaling data.

With two-point tracking, the tracking data is always applied to the axis that is selected when you open the Stabilizer. You can apply two-point tracking data to:

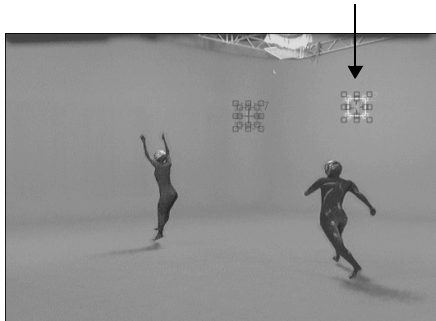
- A garbage mask axis in the Keyer
- The axis of the front object in the Compositor
- An axis in Action; for example, the axis of a surface or 3D object
- A source mesh axis in the Warper

4. Tracker 2 is used to calculate the scaling information. Position Tracker2:

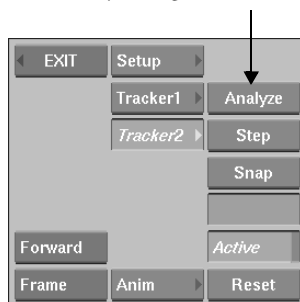
a) Click Tracker2.



b) Press **CTRL** and drag Tracker2 over the centre of the cross on the right.



5. Click Analyze to generate the tracking data.

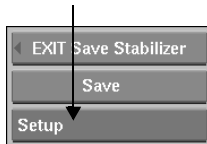


6. Save the setup in case you want to recall it later:

a) Go to the Setup menu and click Save As.

The file browser opens. The default pathname for the Stabilizer directory is */usr/discreet/project/effects/<project name>/stabilizer*.

b) Select Setup.



c) Click the File field, type a name for the setup file, and press **ENTER**.

You are returned to the Stabilizer.

7. Click EXIT to return to Action.

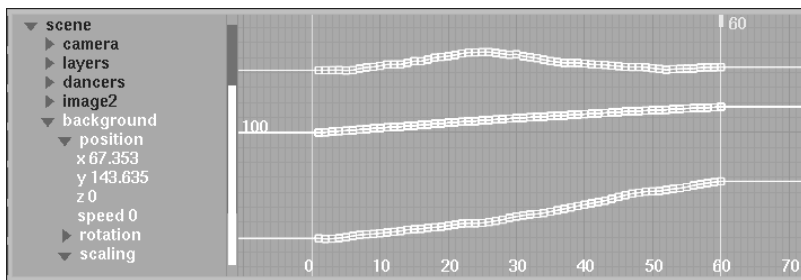
The tracking data and scaling data are applied to the *background* axis.

8. View the animation curves:

a) Click Anim to open the Channel Editor.

b) Open the background>position and background>scaling folders in the Channel Hierarchy.

c) Click Frame Chn.

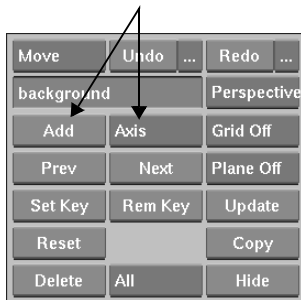


## Correct the Offset for the Background

In Perspective view, notice that the *background* axis is positioned over the cross on the left. Because the axis is at the centre of the image surface (coordinates 0,0), the background is not aligned properly with the blue screen clip. You must reposition the *background* axis without affecting the tracking data. To do this, add an axis for the position data and make the tracking axis the parent of the position axis.

**Hint:** Always make the tracking axis the parent of the position (or scale or shearing) axis. This allows you to reposition (or scale or shear) the object without modifying the tracking data.

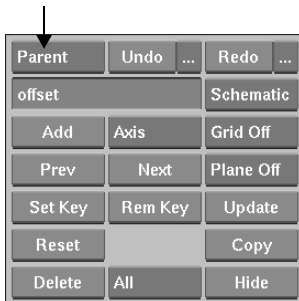
1. Click Layers to return to the Layers menu.
2. Select Axis and click Add to add an axis.



3. Go to Schematic view and name the new axis “offset”.

4. Make the *background* axis the parent of the *offset* axis:

a) Select Parent edit mode or press **P**.



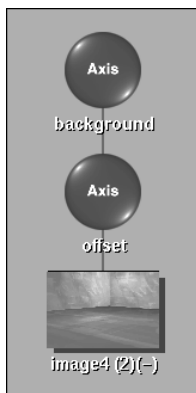
b) Drag the cursor across the link between the *background* axis node and the image surface node to cut the link.

c) Draw a link from the *background* axis to the *offset* axis.

d) Draw a link from the *offset* axis to the image surface.

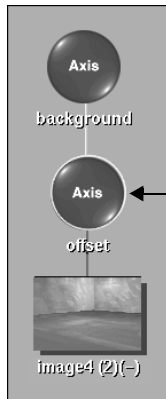
e) Select Move edit mode (**M**) and align the nodes.

Your schematic should look like this.



5. Go to frame 1.

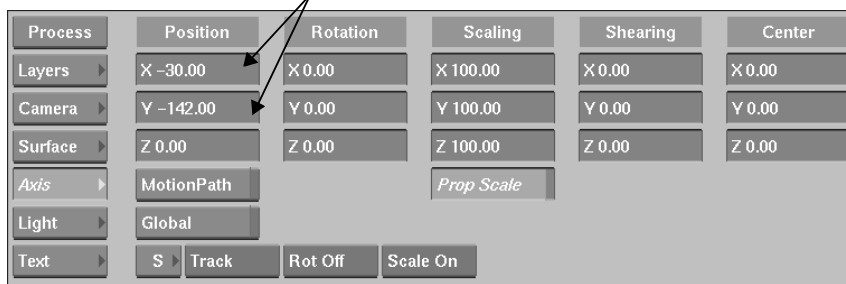
## 6. Reposition the background:



a) Double-click the *offset* axis to open the Axis menu.

b) Go to Perspective view to see the changes as you apply them.

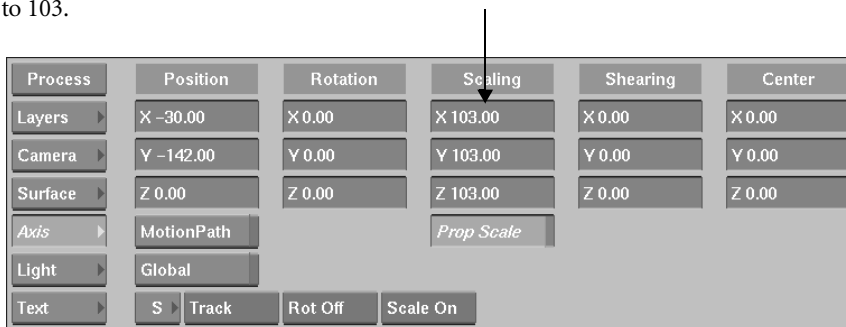
c) Set Position X to -30 and Position Y to -142.



**PAL**

If you are working in PAL, set Position X to -84 and Position Y to -168.

## 7. Increase the size of the background to remove the border on the image by setting the scale to 103.



The scene is now complete.

## Check Your Results

Save the setup, process the clip, and compare your result to the *08\_result* clip.

1. Go to the Setup menu and save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
2. Go to frame 1 and click Process.
3. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *08\_result* clip.
5. (Optional) If the two clips do not match, return to Action and load the *08\_tracking\_action* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_08* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.
7. Delete the result clip and exercise reel from the desktop.



## Things to Remember

- When using the Stabilizer for tracking, place the reference box over the reference point in the first frame of the clip. A good reference point is a unique pattern with sharp edges that appears in every frame of the clip.
- The tracker box is positioned on top of the reference box at the first frame. As the clip is analyzed, the tracker box follows the frame-to-frame movement of the reference point. For each frame, the Stabilizer calculates the change in position, or shift values, of the tracker box.
- One-point tracking generates translation data only.
- Two-point tracking generates rotation and scaling data as well as translation data. Use two-point tracking if the clip contains a camera pan or zoom, or if the feature you want to track rotates or changes size.
- With one-point and two-point tracking, the tracking data is assigned to the axis that is selected when you open the Stabilizer.
- With one-point and two-point tracking, you may have to reposition the image after tracking. To reposition the image without interfering with the tracking data, add an axis and make the tracking axis the parent of the offset axis.
- You can use the Stabilizer to make a garbage mask track a moving object in the front clip. To do this, access the Stabilizer from the Keyer.
- You can use tracking to replace the background in a clip that contains a pan or zoom. To do this, access the Stabilizer from Action.
- To use tracking in Action, the clip to be tracked must be loaded as the back clip.



# 9

## Generating Particles

With Action's 3D particle system, you can generate realistic natural effects, such as snow, rain, fog, and tornadoes.

In this lesson:

- Generate particles using a light source
- Use gravity and vortex manipulators to create swirling snow

To use the particle system, you should have a basic knowledge of how to work in Action. To learn more, please complete Lesson 6, “Animating Composites”.

### Need Help?

If you need help with particle generation, load the setup file provided for this lesson. Click Setup in the Action menu, then Load to open the file browser. Go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_09* and load the setup file *09\_particles*.

Time to complete this lesson: 30-45 minutes

## About Particles

Particles are 3D objects that originate from a surface, light, or 3D model in Action. The particles can be spheres, cones, squares, points, or lines. You can also use an image, 3D text, or a 3D model created in your favourite 3D authoring software.

The particles are generated in the direction of the normals of the surface, light, or 3D model. A normal is a line perpendicular to the surface of the object. For example:

- If you are using an image surface to generate particles, all of the particles are generated in the same direction, perpendicular to the image surface.
- If you are using a bicubic surface, you can change the shape of the surface so that the particles are generated in different directions.
- If you are using a light source, the particles are generated from all sides of the light and radiate outwards. You can change the spread angle of the light to direct the particle stream.

The particle system uses three types of nodes: particle generators, particle manipulators, and particle bouncers.

- Use a particle generator to generate particles from a surface, light, or 3D model.
- A particle manipulator influences the position and/or speed of the particles. Use a manipulator to simulate the effects of gravity or a vortex or to pull the particles towards a point, line, or plane.
- Use a particle bouncer to make the particles bounce off an image surface or a sphere.

In addition to generating particles, you can also use the particle system to explode a 3D model or an image.

## Example Particle Setups

Ten example particle setups are provided in the following directories:

- `/usr/discreet/project/effects/Tutorial/setups/particles_examples`. If you have not already copied the setup files from CD 2, “setups & images,” see “Copy the Setup Files to Your System Disk” on page 53.
- `/usr/discreet/<product directory>/examples`. This directory, created at software installation, includes the same particles setups as provided on the Tutorial CD, as well as other setup files.

After you have completed this lesson, load the example particle setups to learn more about using particle generators, manipulators, and bouncers. To load one of the setup files, open Action using a black frame as the front, back, and matte clips.

A brief description of each example particle setup is provided in the following table.

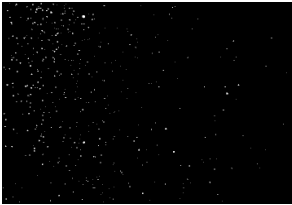
Setup File Name	Description
<i>BounceExample</i>	Uses a gravity manipulator and a bouncer attached to an axis. The bouncer appears as a sphere in Perspective view. The particles fall down and bounce off the bouncer.
<i>BounceExample2</i>	Uses a gravity manipulator and two image surface bouncers. For instructions on using an image surface as a bouncer, see the chapter “Action: The Particle System” in the <i>flame</i> or <i>inferno</i> <i>User’s Guide</i> .
<i>BounceExample3</i>	Uses an accpoint manipulator and a bouncer linked to an axis. The bouncer follows the accpoint manipulator.  <b>Hint:</b> To apply a texture to the particles, load any clip into Layer 2, select the texture node in Schematic view, and then click Apply.
<i>ExplodeExample</i>	An example of exploding 3D text. The Geom node is hidden in Schematic view. The setup uses an Explode generator and Polygon particles.  <b>Hint:</b> To add 3D text (Geom node), go to the Text menu, click the text field and type the text string, then click Create.
<i>ExplodeExample2</i>	An example of exploding an image surface. The image surface is hidden. Layer1 is applied to the generator as a texture and uses Wrap mapping mode. Replace Layer1 with an image of your choice.
<i>FireWorksExample</i>	Uses two linked generators. The first generator generates few particles at each frame. When these reach the end of their lifetime, the second generator is activated.
<i>FunctionExample</i>	Uses a function manipulator that increases the particles’ transparency as they reach the end of their lifetime.
<i>FunctionExample2</i>	Uses a function manipulator with sine and cosine functions to modify the speed of the particles.
<i>NodeExample</i>	An example of using 3D text for the particles. The Geom node (the 3D text) must be named “ParticleDraw”. The generator is parented to the axis of the Geom node, and the selected particle type is Node.
<i>TransformExample</i>	Uses a transform manipulator.

## Exercise: Creating Snow

In this exercise, use a particle generator and two particle manipulators to create snow. The particles are generated using a light source.

Load the *09\_particles* reel onto the desktop from CD 3, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clip.



*09\_result*: This clip shows the expected result.

To preview the final result, play the *09\_result* clip using the Player.

## Open Action

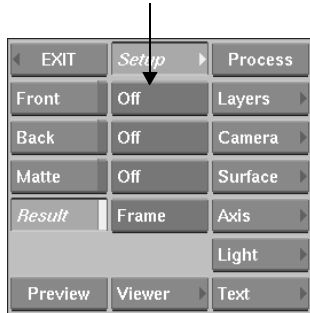
In this exercise, use a light source to generate the particles. It doesn't matter which source clips you load, because you turn them all off inside Action.

1. Create a frame of any colour using Coloured Frame in the Processing menu.
2. Click Action in the Effects menu.
3. Select the coloured frame as the front, back, and matte clips.
4. Select a destination reel.

Action opens.

5. Reset all options to their default values: go to the Setup menu, click Reset All and Confirm.
6. Delete any objects that may remain from the last Action session: select All next to the Delete button, then click Delete.

7. Turn off the front, back, and matte clips by selecting Off next to the Front, Back, and Matte buttons.



8. Set the length of the clip to 200 frames by entering 200 in the Total Frames field.



## Add a Particle Generator

Add a light source to the scene and attach a particle generator to it.

1. Add a light source to the scene: select Light and click Add.



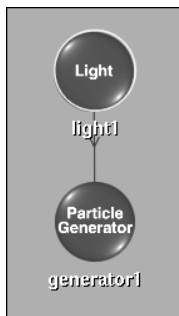
**Hint:** Result view must be selected to see the light in the image window.

2. Add a particle generator:

a) Select PartGen and click Add.



b) Go to Schematic view (~) to see the particle generator node. Notice that the light source is the parent of the particle generator.



3. Go to frame 1 and play the clip in Perspective view to preview the result using the default particle generator values.

The particles are emitted from all sides of the light source.

## Adjust the Particle Generator Properties

Adjust the properties of the particle generator to make the particles look like snow.

1. The particle generator values can be animated. Go to frame 1 to set the values for the entire clip.
2. Select the particle generator in Schematic view and return to Perspective view.



3. Open the Particle Generator menu:

a) Click Surface.

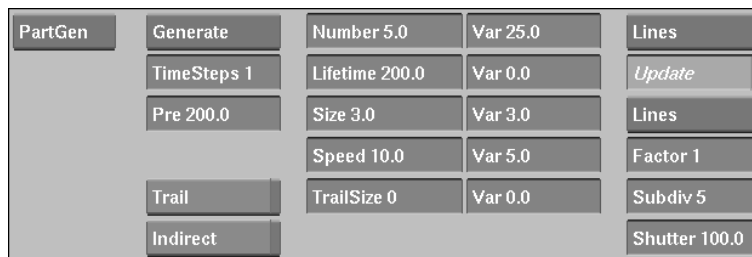
b) Select PartGen.



4. Enable Update to update the scene each time a particle generator property is changed. Depending on the complexity of the scene, enabling Update may decrease interaction speed.

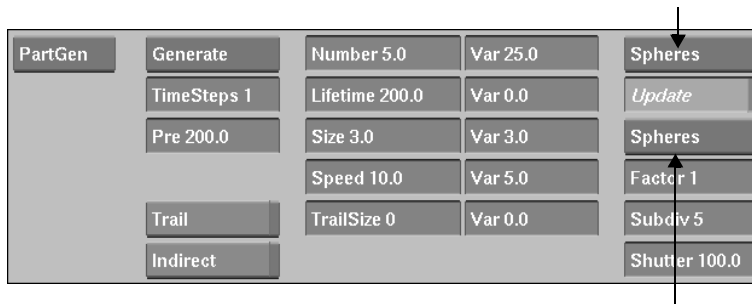
5. Set the following values in the Particle Generator menu (shown below). Each time you change a value, play the clip to preview the change, then return to frame 1:

- a) Set Number (the number of particles generated at each frame) to 5 with a Var (variance) of 25.
- b) Set Lifetime (the number of frames over which you can see a particle) to 200.
- c) Set Size to 3 with a Var of 3 to generate particles of varying sizes.
- d) Set Speed to 10 with a Var of 5 to make the particles fall at different rates. Speed is measured in pixels per frame.
- e) Set Pre to 200 to simulate generating 200 frames of particles before frame 1.



## 6. Change the type of particle from line to sphere:

a) Select Spheres in the Interactive box.



b) Select Spheres in the Render box.

Use the Interactive box to select the type of particles used to set up the scene. Selecting Points or Lines as the interactive type can improve interaction speed. Use the Render box to select the type of particles used to process the scene. See also “Particle Types” below.

## Particle Types

The types of particles that can be used in Action are described in the following table.

Select:	To use:
<b>Node</b>	Your own 3D model, text, or a surface. See the chapter “Action: The Particle System” in the <i>flame</i> or <i>inferno</i> User’s Guide.
<b>Cones</b>	Spheres with tails. Adjust the size of the tail using the generator>parameters>tailSize channel in the Channel Editor.
<b>Spheres</b>	Spheres.
<b>Polygons</b>	Particles for exploding 3D models. See the chapter “Action: The Particle System” in the <i>flame</i> or <i>inferno</i> User’s Guide.
<b>Quads</b>	Squares with tails. Adjust the size of the tail using the generator>parameters>tailSize channel in the Channel Editor.
<b>Squares</b>	Squares. Squares are normalized to the camera.
<b>Lines</b>	Lines of pixels.
<b>Points</b>	Single pixels.

**Hint:** You can also improve interaction speed using the Factor field. While you create the animation, Action divides the Number value by the Factor value to determine the number of particles generated per frame. Fewer calculations are required to update the particles in each frame. The total number of particles is rendered when you click Preview or Process.

7. Play the clip to preview the effect and then return to frame 1.

## Reposition the Light Source

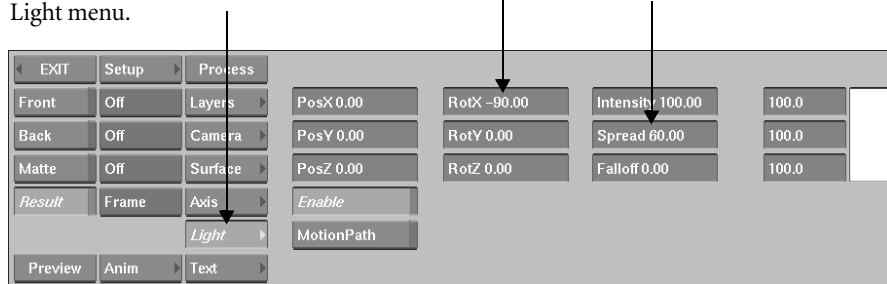
Reposition the light source to make it look like the particles are falling from the sky. Change the spread so particles are not emitted in all directions around the light source, but are directed towards the bottom of the frame.

1. Temporarily change the spread angle and direction of the light source to see how these properties affect the particle stream:

a) Click Light to open the Light menu.

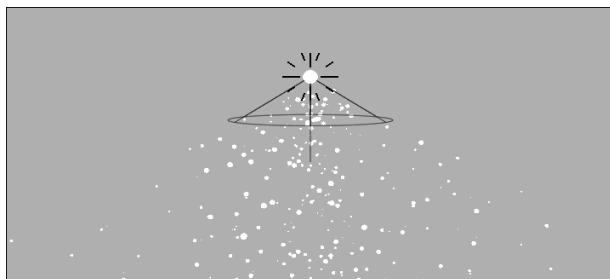
b) Set RotX to -90.

c) Set Spread to 60.



2. Play the clip to view the result.

Reducing the spread angle to less than 90 degrees creates a conical light source, which restricts and directs the particle stream.

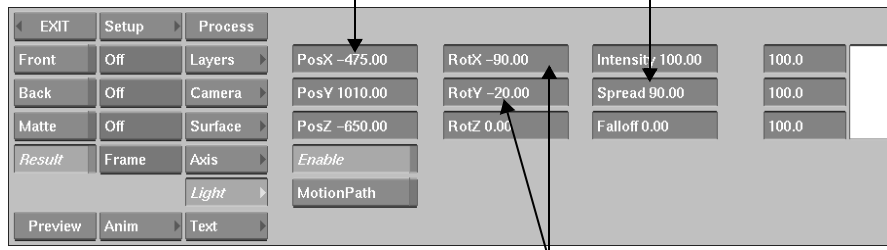


3. Return to frame 1.

4. Set the position, rotation, and spread angle of the light source to create the particle snow:

a) Set PosX to -475, PosY to 1010, and PosZ to -650.

b) Set Spread to 90.



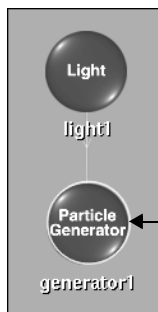
c) Set RotX to -90 and RotY to -20.

5. Play the clip to view the result and then return to frame 1.

## Add a Gravity Manipulator

Add a gravity particle manipulator to direct the particle stream and make the snow more realistic. A gravity manipulator pulls the particle stream in the direction the manipulator is pointing.

1. Add the particle manipulator.



a) Go to Schematic view (~) and select the particle generator node.

b) Select PartMan and click Add.



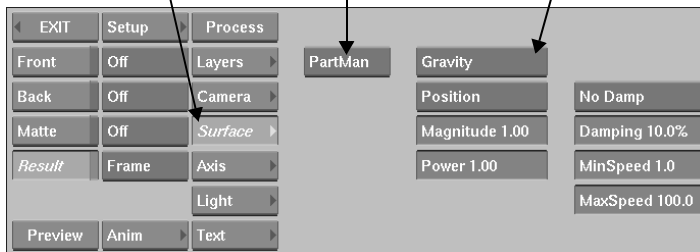
A manipulator node appears in Schematic view. The manipulator is the child of the particle generator. For a list of the types of particle manipulators, see “Using Manipulators” on page 290.

2. Select the manipulator node and name it “gravity”. For instructions, see “Name the Axis” on page 174.
3. Make the particle manipulator a gravity manipulator:

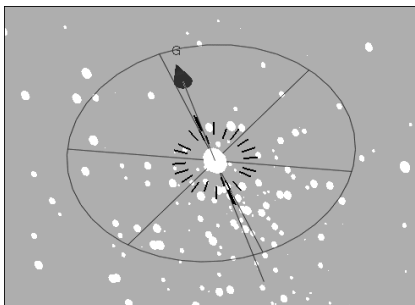
a) Click Surface.

b) Select PartMan to open the Particle Manipulator menu.

c) Select Gravity.



In Perspective view, zoom out until you can see the light icon, and then pan and zoom in to see the gravity manipulator icon (an arrow labelled G).



## Using Manipulators

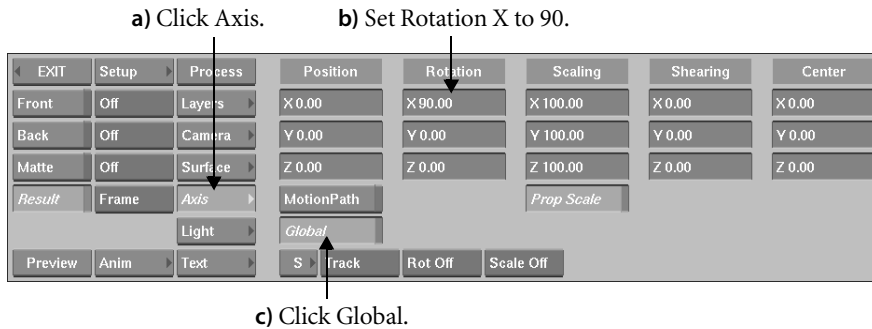
There are several types of manipulators available in the particle system.

Select:	To:
Gravity	Simulate the effect of gravity.
Transform	Apply transformations from the Axis menu. For an example, load the particles setup file <i>TransformExample</i> .
Vortex	Simulate the effect of a vortex.
Acc Point	Pull the particles towards a point. The particles are affected on the X, Y, and Z axes. Use the Position fields in the Axis menu to position the point in the scene. For an example, load the particles setup file <i>BounceExample3</i> .
Acc Line	Pull the particles towards a line. The particles are affected on two axes. Use the Position and Rotation fields in the Axis menu to position the line in the scene.
Acc Plane	Pull the particles towards a plane. The particles are affected on one axis only. Use the Position and Rotation fields in the Axis menu to position the plane in the scene.
Path	Make the particles follow a path.
Function	Enter a mathematical function to use as a particle manipulator. For an example, load the particles setup file <i>FunctionExample</i> or <i>FunctionExample2</i> .

For more information about manipulators, see the chapter “Action: The Particle System” in the *flame* or *inferno* *User's Guide*.

The example particles setup files are in the directory `/usr/discreet/project/effects/Tutorial/setups/particles_examples`. For information on copying the setup files from the CD, see “Copy the Setup Files to Your System Disk” on page 53.

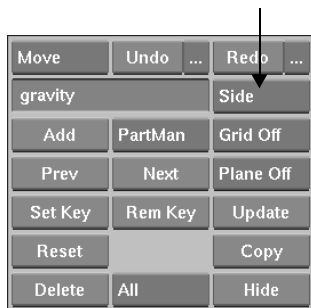
4. A particle manipulator has the properties of a regular axis. You can set the position, rotation, scale, and shear of the manipulator using the Axis menu. Go to frame 1 and rotate the gravity manipulator to make it pull the particle snow downwards:



When Global is enabled, the manipulator ignores the position, rotation, scale, or shear transformations applied to its parent particle generator and all other axes above it in the hierarchy, and moves to position coordinates (0, 0, 0) at the centre of the image window.

5. Click Home to see the gravity manipulator icon at the centre of the image window.
6. A manipulator can influence either the position or the speed of the particles. To see the difference between the influence of speed or position, do the following:

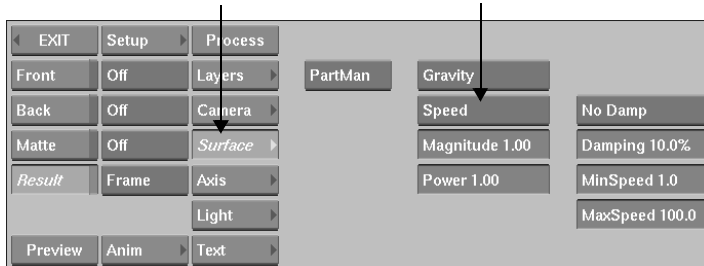
- a) Select Side view in the Scene View box.



b) Zoom out from the scene and pan until you can see the light source.

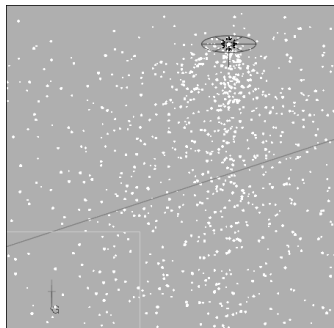
c) Click Surface to open the Surface menu.

d) Use this field to toggle between Speed and Position.

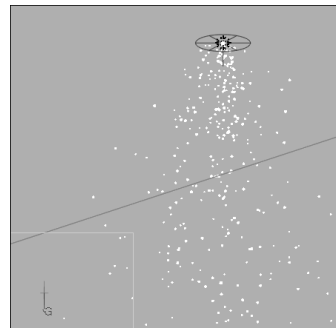


When Position is selected, Action uses the position of a particle at the previous frame to calculate the position at the current frame. This produces a linear effect. Since the magnitude of the influence is low in this example, the particles still have a wide-spread fallout.

When Speed is selected, Action uses the velocity of a particle at the previous frame to calculate the position at the current frame. This produces a parabolic effect on the particle fallout.



Position selected



Speed selected

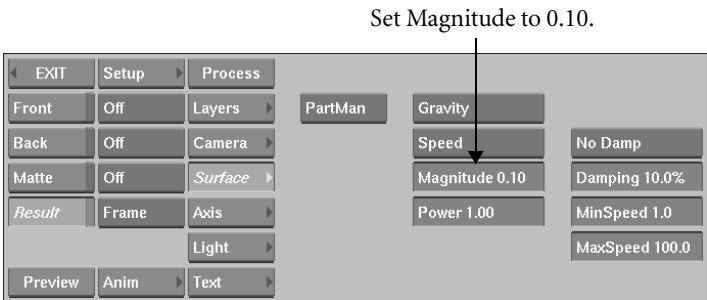
e) Play a few frames with Position selected, then with Speed selected. Return to frame 1.

f) Click Home and return to Perspective view.

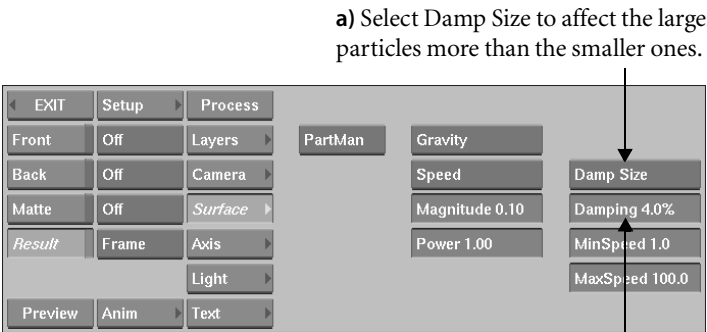
For another example showing the difference between Speed and Position, see “Influencing Particles Using Position or Speed” on page 299.



- 7. Select Speed as the type of influence for the gravity manipulator.
- 8. When using a gravity manipulator, the magnitude determines the strength of the gravitational pull. Since a snowflake is light, use a low magnitude so the particles do not fall too fast:



- 9. Use damping to simulate air resistance. Damping slows down the particles according to their mass or their size.



b) Set Damping to 4%.

**Hint:** Select Damp Mass to slow down the particles according to their mass. Use the generator>parameters>mass channel in the Channel Editor to set the particle mass.

10. Specify a maximum speed for the particles to make sure they do not fall too fast:

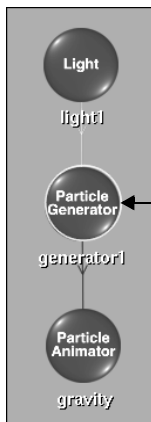


**Hint:** Damping must be enabled to use either MaxSpeed or MinSpeed. To use a minimum or maximum speed without applying damping to the particles, set Damping to 0% and select Damp Mass, Damp Size, or Damp Both.

## Add a Vortex Manipulator

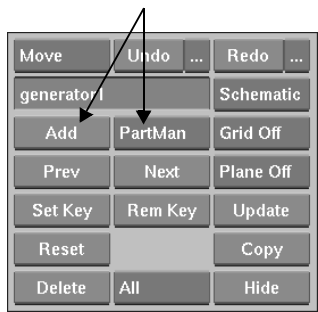
Add and animate a vortex particle manipulator to simulate blowing and swirling snow.

1. Go to Schematic view (~).
2. Add a second particle manipulator:



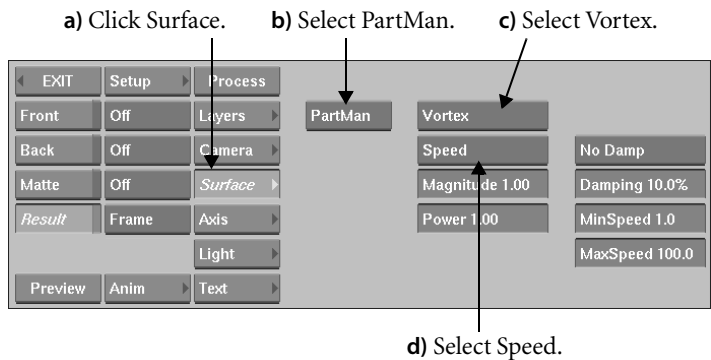
a) Select the particle generator.

b) Select PartMan and click Add.



3. Select the new manipulator node and name it “vortex”.

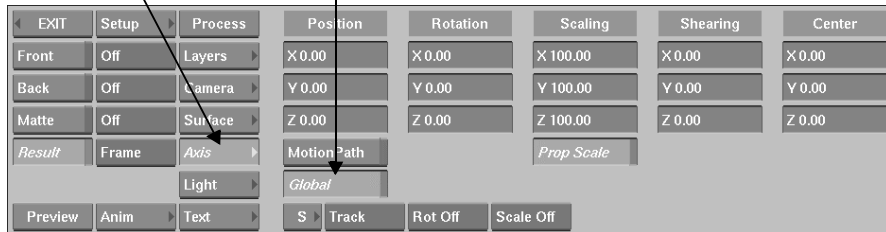
4. Use a vortex manipulator:



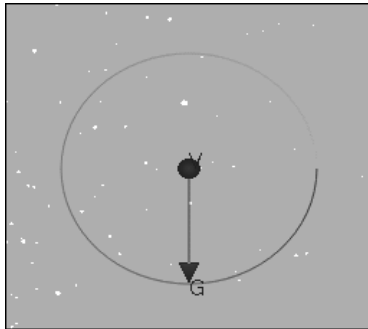
5. Use the Global override to make the vortex manipulator ignore the transformations of its parent particle generator:

a) Click Axis.

b) Click Global.



In Perspective view, the vortex manipulator icon (an arrow labelled V) moves to position coordinates (0, 0, 0) at the centre of the image window.



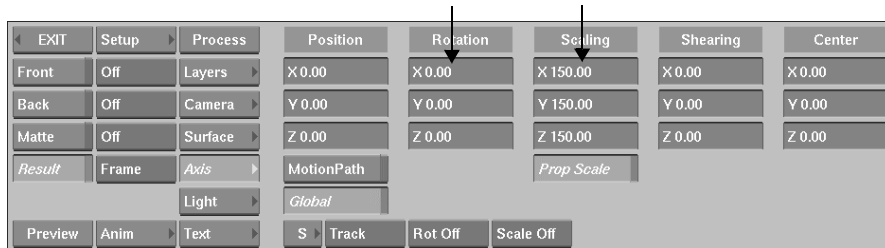
6. Animate the rotation of the vortex manipulator to enhance the effect of swirling snow. Set keyframes at frame 1 with rotation value 0.

To set keyframes at this frame, you must enter 0 in the rotation fields even though the values shown are already 0. You can also click each field and click Set Key.

a) Go to frame 1.

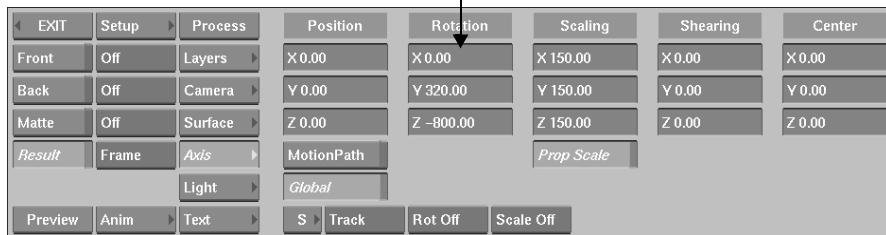
b) Set Rotation X, Y, and Z to 0.

c) Set Scaling to 150.



## 7. Set rotation keyframes at frame 150:

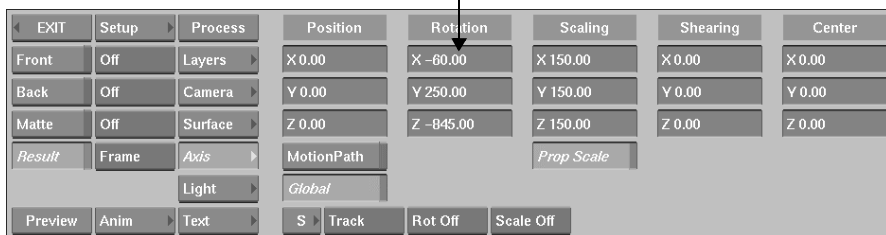
- a) Go to frame 150.      b) Set Rotation X to 0, Y to 320, and Z to -800.



EXIT	Setup	Process	Position	Rotation	Scaling	Shearing	Center
Front	Off	Layers	X 0.00	X 0.00	X 150.00	X 0.00	X 0.00
Back	Off	Camera	Y 0.00	Y 320.00	Y 150.00	Y 0.00	Y 0.00
Matte	Off	Surface	Z 0.00	Z -800.00	Z 150.00	Z 0.00	Z 0.00
Result	Frame	Axis	MotionPath		Prop Scale		
		Light	Global				
Preview	Anim	Text	S	Track	Rot Off	Scale Off	

## 8. Set rotation keyframes at frame 200:

- a) Go to frame 200.      b) Set Rotation X to -60, Y to 250, and Z to -845.



EXIT	Setup	Process	Position	Rotation	Scaling	Shearing	Center
Front	Off	Layers	X 0.00	X -60.00	X 150.00	X 0.00	X 0.00
Back	Off	Camera	Y 0.00	Y 250.00	Y 150.00	Y 0.00	Y 0.00
Matte	Off	Surface	Z 0.00	Z -845.00	Z 150.00	Z 0.00	Z 0.00
Result	Frame	Axis	MotionPath		Prop Scale		
		Light	Global				
Preview	Anim	Text	S	Track	Rot Off	Scale Off	

## 9. Play the clip to view the result.

**Hint:** To create more snow, select the light node in Schematic view and copy the branch. In Perspective view, move the new light to the right side of the scene and adjust its rotation. To see the suggested settings for the second branch, load the *09\_particles* setup file from the directory `/usr/discreet/project/effects/Tutorial/setups/lesson_09`. The gravity and vortex manipulators influence the particles generated by their parent particle generator only.

## Check Your Results

Save the setup, process the clip, and compare the result to the *09\_result* clip.

1. Go to the Setup menu and save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
2. Go to frame 1 and click Process.
3. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *09\_result* clip.

**Note:** The *09\_result* clip was processed using 100 frames (50 frames in PAL) and a single light source and particle generator.

5. (Optional) If the two clips do not match, return to Action and load the *09\_particles* setup file from the `/usr/discreet/project/effects/Tutorial/setups/lesson_09` directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.

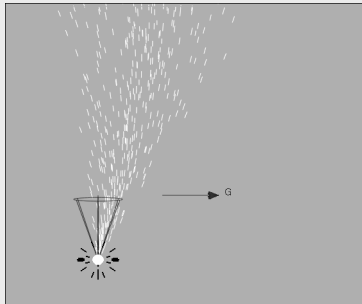
**Note:** The *09\_particles* setup file uses two light nodes and two particle generators.

6. Save your result clip in your clip library.
7. Delete the result clip and exercise reel from the desktop.

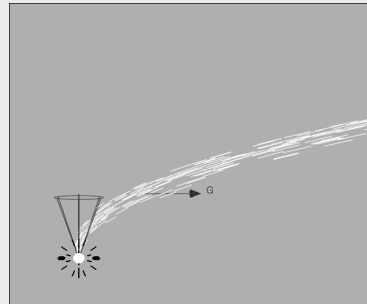
## Influencing Particles Using Position or Speed

Try this setup as a second example of influencing particles using either speed or position.

1. Set the clip length to 100 frames.
2. Add a light source.
3. Go to the Light menu and enter the following values:  
 PosX = 0      RotX = 90      Spread = 20  
 PosY = -150  
 PosZ = 0
4. Add a particle generator with a lifetime of 100.
5. Add a gravity particle manipulator.
6. Select the gravity manipulator, go to the Axis menu, and enter the following values:  
 Position X = 90    Rotation Y = 90  
 Position Y = 0  
 Position Z = -100
7. Go to the Particle Manipulator menu, select Position, and set Magnitude to 2.
8. Play the clip. The particles are drawn towards the gravity manipulator along a straight diagonal line.
9. In the Particle Manipulator menu, select Speed.
10. Play the clip. The particles are drawn towards the gravity manipulator along a curved path and also accelerate.



Position selected



Speed selected

**Hint:** Leave the particle manipulator at its default position to create a fountain or fireworks effect.

## Things to Remember

- Particles are 3D objects generated by an image, bilinear, or bicubic surface, a light source, or a 3D model in Action. To generate particles, add a particle generator to a specific branch of the scene.
- A particle manipulator influences the position or the speed of the particles. You can use several particle manipulators to influence the same particle stream.
- A particle manipulator has the same properties as a regular axis. Use the Global override in the Axis menu to make the manipulator ignore the transformations of its parent particle generator and all axes above it in the hierarchy.



# 10

## Morphing

---

Use the Warper to distort or morph two source clips. For example, you can adjust the lip movement of a character, stretch or bulge an object, or make one character metamorphose into another.

In this lesson:

- Learn about morphing
- Morph a human into an alien

### **Need Help?**

If you need help with morphing, load the setup file provided for this lesson. Click the Load button in the Setup menu to open the file browser and go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_10*. Load the setup file *10\_morph*.

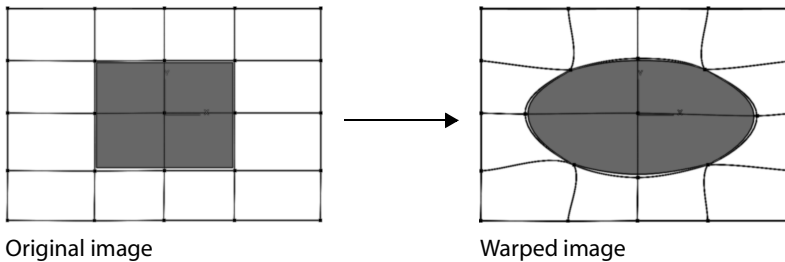
Time to complete this lesson: 60-90 minutes

## About the Warper

Use the Warper to warp or morph a clip.

- Warping a clip changes the shape of the image in a clip.
- Morphing a clip transforms the image in the front clip into the image in the back clip. For example, in this lesson you morph a human into an alien.

The Warper uses a system of meshes to define the shape of the image before and after it is warped. Pixels in the image are assigned to points, or vertices, on a mesh. Pulling the vertices moves the pixels to create the warp.



Two meshes are used to generate the warp: a source mesh and a destination mesh.

### The Source Mesh

The source mesh defines the shape of the original image at each frame of the clip. In a live-action clip, the source mesh must follow the movement of the image. Move the mesh manually at each frame or use the Stabilizer to generate tracking data for the mesh.

### The Destination Mesh

The destination mesh defines the shape of the warped image. Changing its shape sets a keyframe at that frame. The difference between the shape of the source and destination meshes at each frame produces the warp.

You learn one of several techniques for drawing meshes in this lesson. The technique you use to draw a mesh depends on your personal preference and on the effect you want. The more detail you add to the mesh, the more control you have when creating the warp or morph.

## About Morphing

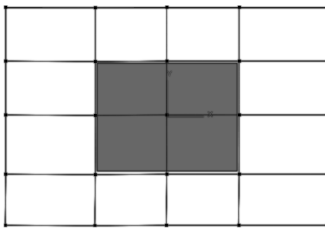
Morphing transforms the image in the front clip into the image in the back clip. The effect is achieved by warping the two images and dissolving between the front and back clips.

Warping the two images requires source and destination meshes for both the front clip and the back clip.

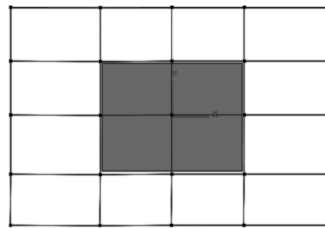
- The front source mesh defines the original shape of the front image at each frame.
- The back source mesh defines the original shape of the back image at each frame.
- Both the front and back destination meshes correspond to the warped image. At the first frame, they both correspond to the original shape of the front image. At the last frame, they both correspond to the original shape of the back image.

Here is an example of the source and destination meshes used to morph a square into a circle.

#### Front source mesh

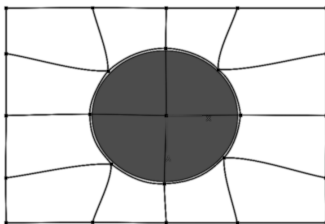


First frame

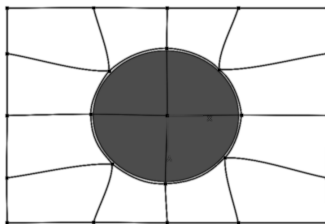


Last frame

#### Back source mesh

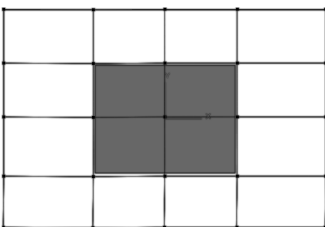


First frame

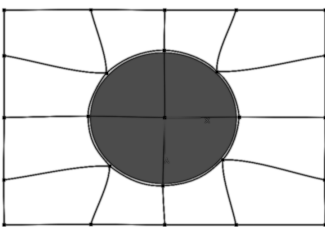


Last frame

#### Front and back destination meshes



First frame



Last frame

### Source Interpolation

To create a straight morph from the front image to the back image, define the front source mesh and the back source mesh, then use a process called source interpolation to morph the clips. Source interpolation automatically calculates the transition between the front source mesh at the first frame and the back source mesh at the last frame of the clip.

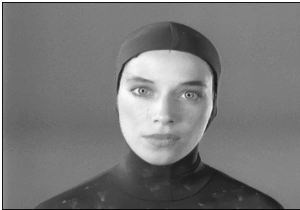
If you want to add another effect, such as scaling, during the morph, do not use source interpolation; you must define the front and back destination meshes.

## Exercise: Morphing Two Live-Action Clips

In this exercise, morph a human into an alien using two live-action clips.

Load the *10\_morph* reel onto the desktop from CD 3, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*10\_front*: This is the clip of the human.



*10\_back*: This is the clip of the alien.



*10\_result*: This clip shows the expected result. The frame shown here is at the midpoint of the clip.

To preview the morph, play the *10\_result* clip using the Player.

## Open the Warper

Load the source clips and reset the Warper.

1. Click Warper in the Effects menu and select Front Back input mode.

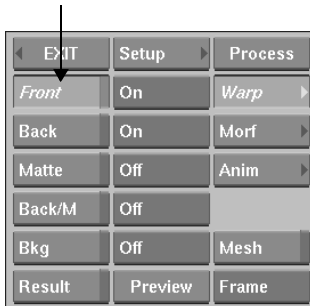


2. Select *10\_front* as the front clip and *10\_back* as the back clip.

3. Select a destination reel.

The Warper opens.

4. Click Front to view the front clip.



5. Reset all options to their default values: go to the Setup menu, click Reset All and Confirm.

## Create the Front Source Mesh

With a morph, you work with source and destination meshes for both the front and back clips. The meshes for the front clip are called front source and front destination, and the meshes for the back clip are called back source and back destination.

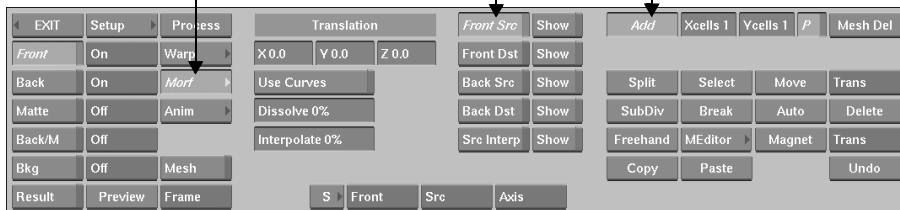
In this exercise, build the front source mesh patch by patch.

1. Go to frame 1.
2. Add a patch around the mouth:

a) Click Morf to open the Morf menu.

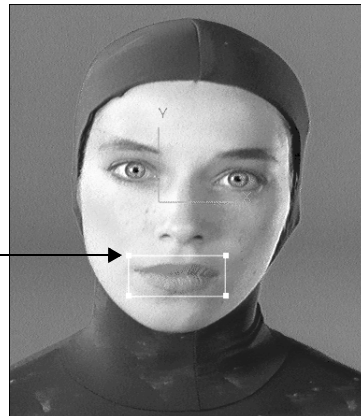
b) Click Front Src to select the front source mesh.

c) Click Add or press **A**.



The cursor changes to a green cross, indicating that you can add a patch.

d) Draw a patch around the mouth by placing the cursor here and dragging diagonally downwards and to the right.



**Hint:** If you are not happy with the patch, click Undo and re-draw it.

3. Press **CTRL+UP ARROW** to zoom in on the mouth. Pan the image by pressing **SPACEBAR** and dragging the image.

#### 4. Shape the mesh around the mouth:

a) Click Move or press **M**.



b) Position the vertices as shown.

c) When you click a vertex, tangent handles appear. Drag the tangent handles to shape the mesh to the contour of the lips.

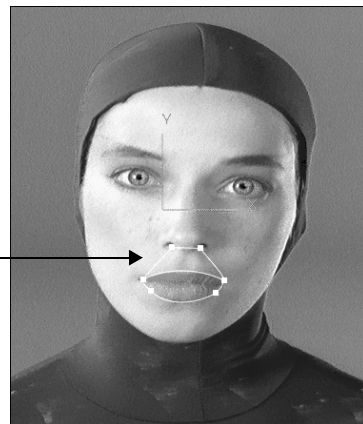


#### 5. Add a patch above the mouth patch:

a) Click Add (**A**).

b) Click the top line of the patch to add a second patch above the mouth.

c) Click Move (**M**) and shape the new patch as shown.

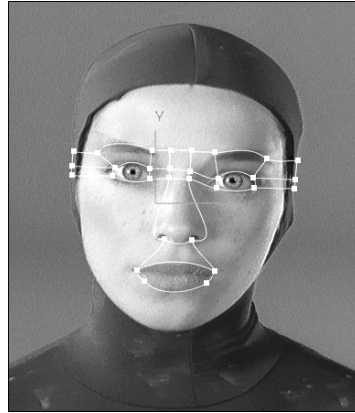


6. Continue building the mesh by adding patches and shaping them around prominent features:

a) Add and shape patches around the nose and eyes.



b) Add and shape patches above the nose and eyes.



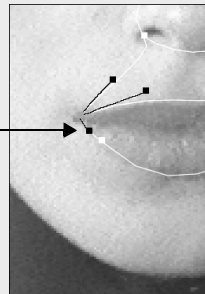
## Adjusting Tangent Handles

Use Break to make the tangent handles work independently on either side of the vertex:

a) Click Move (**M**) and then click the vertex to view the handles.

b) Click Break (**B**).

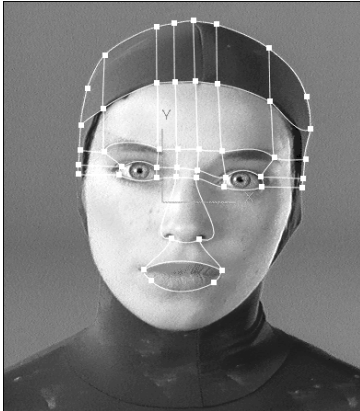
c) Click one of the tangent handles (shown here in black). The handles are filled in to show that they work independently.



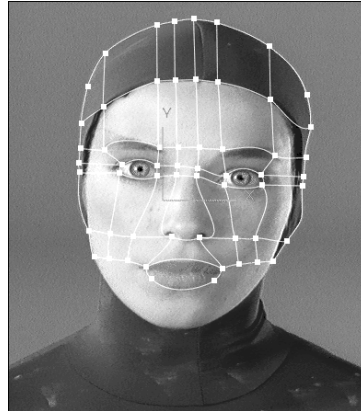
If the vertex has four handles, click one handle of each pair to make all four handles work independently. To “unbreak” a tangent, select the vertex, click Auto, and then click one of the tangent handles; the handles move together again.



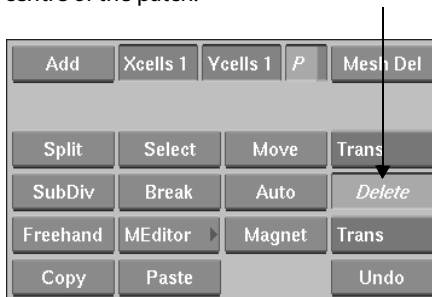
c) Add and shape patches on the forehead and the top of the head.



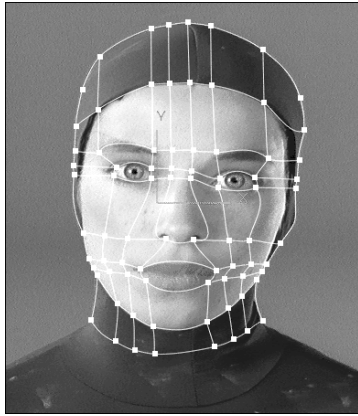
d) Add and shape patches below the eyes.



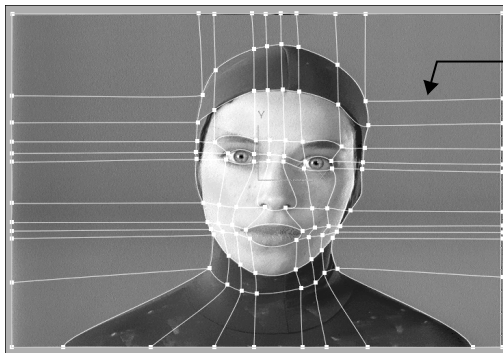
**Hint:** If you make a mistake and want to delete a patch, click Delete (D) and click in the centre of the patch.



7. Extend the mesh below the mouth to the neck.



8. Finish building the mesh by extending it beyond the face to the shoulders and to each side of the frame. Make sure all areas of the frame are covered by the mesh.



To add a patch in the corner,  
click this line.

**Hint:** To make side patches automatically extend to the edge of the image, add one patch, extend it to the edge, then add adjacent patches. They all extend to the edge.

# Move the Front Source Mesh

Make the front source mesh follow the movement of the talent's head by moving the mesh manually.

**Hint:** When an image has trackable points, you can use the Stabilizer to automate this process. For instructions, see the chapter “The Warper” in the *flame* or *inferno* User's Guide.

1. Go to frame 5.

The position of the talent's head has changed.

## Changing the Colour of the Mesh

You can change the colour of the mesh to make it more visible in the clip.

1. Go to the Setup menu.
2. Click the colour box next to one of the mesh buttons to view the colour picker. For example, click this colour box to change the colour of the front source mesh.



3. Use the colour picker to select the new colour for the mesh.
4. Click the colour box to save the selected colour.

You can also change the colour of:

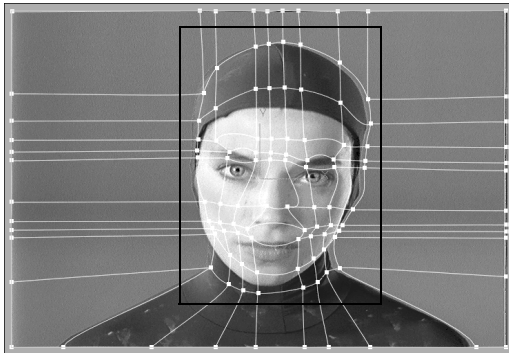
- The tangent handles. Change the colour in the Tangent box.
- A selected mesh point. Change the colour in the Vertex box.
- A selected line between two mesh points. Change the colour in the Spline box.

2. Edit the front source mesh to fit the position of the features at frame 5:

- a) Click Move (**M**).

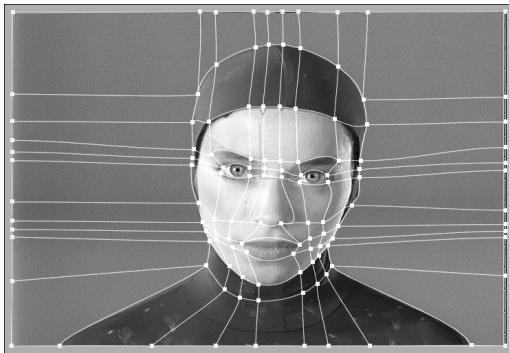
- b) While pressing **CTRL**, drag a selection box around the entire head.

All vertices within the box are selected and are highlighted.



- c) Press one of the selected vertices and drag the head mesh to position it over the face.

3. Adjust the mesh. Use the procedure described in instruction 2 above to select and move multiple vertices around the forehead, eyes, mouth, chin, and shoulders.



**Hint:** You can also select multiple vertices by clicking Select (or pressing **S**) and clicking individual vertices.

4. Repeat instructions 2 and 3 at frames 10, 15, 20, 25, and 30 to set shape keyframes for the front source mesh.

The Warper interpolates between the keyframes to make the front source mesh follow the movement of the head throughout the clip.

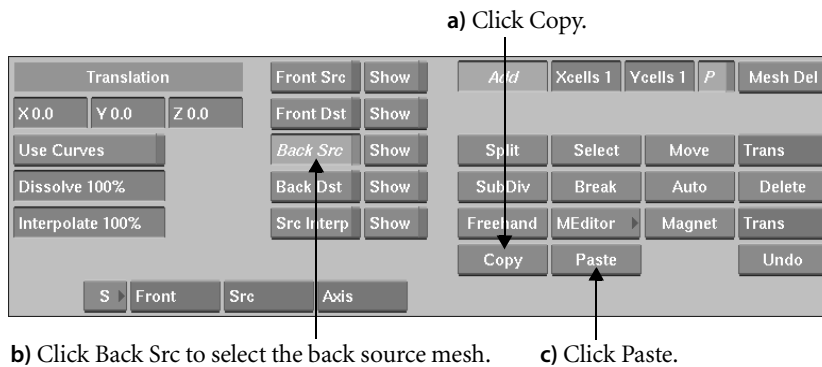
**Hint:** To view the shape keyframes, click Anim to open the Channel Editor, and then select the front\_src>shape channel.

5. Play the front clip to see how well the mesh follows the prominent features. Make any necessary modifications.

## Define the Back Source Mesh

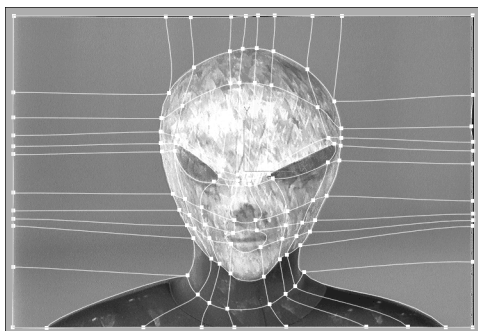
Define the source mesh for the back clip (the alien). The back source mesh always contains the same number of vertices and patches as the front source mesh. Copy the front source mesh that you just created to the back source as a starting point, then adapt it to the alien's shape.

1. Go to frame 1.
2. Copy the front source mesh and paste it into the back source mesh:



3. Click Back to view the back clip.

- Align the vertices on the back source mesh to fit the features on the alien's head. Do not add any new patches or vertices.



- The back source mesh must follow the movement in the back clip. Repeat instruction 4 at frames 5, 10, 15, 20, 25, and 30 to set shape keyframes for the back source mesh.

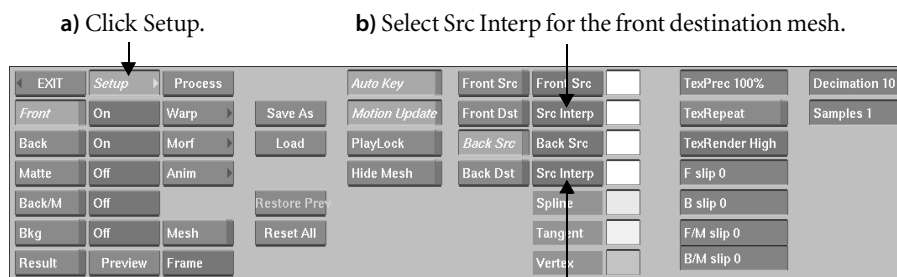
The Warper interpolates between the keyframes to make the back source mesh follow the movement of the alien throughout the clip.

- Play the back clip to see how well the back source mesh follows the alien's features. Make any necessary modifications.

## Select Source Interpolation

Use source interpolation to automatically interpolate between the front source mesh at the first frame and the back source mesh at the last frame. With source interpolation, you don't have to define the front and back destination meshes.

- Select source interpolation:

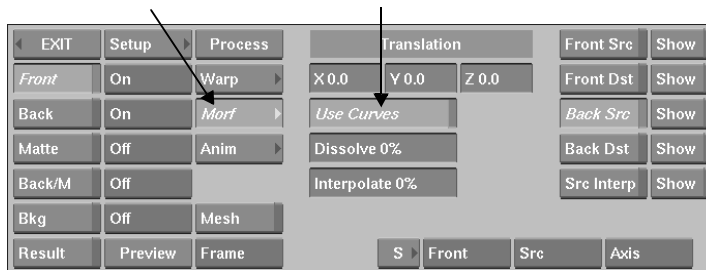


2. Source interpolation uses predefined interpolation and dissolve animation curves.
  - The interpolation curve defines the percentage change in the position of the image during the morph.
  - The dissolve curve defines the percentage change in the colour of the pixels during the morph.

Activate the interpolation and dissolve curves:

a) Click Morf.

b) Click Use Curves.

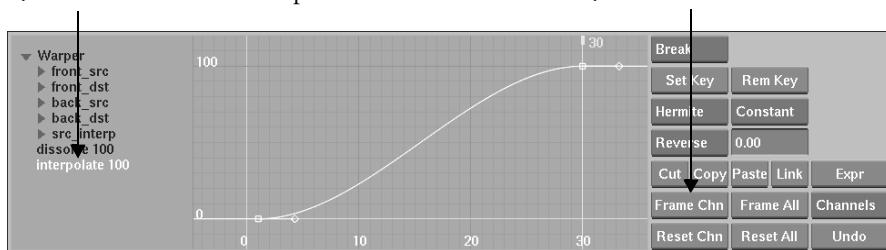


3. Open the Channel Editor to view the dissolve and interpolation curves:

a) Click Anim.

b) Select the dissolve or interpolate channel.

c) Click Frame Chn.



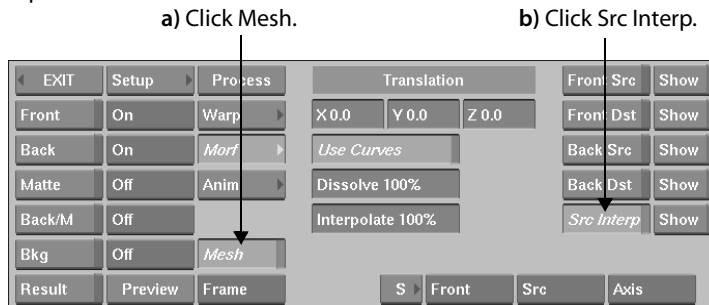
Using the default curves creates a smooth transition between the front and back images.

**Hint:** To change the rate at which the morph occurs, modify the curves.

4. Click Result and play the clip.

The human morphs into the alien. Make any necessary modifications to the meshes before processing.

**Hint:** You can preview the morph with the source interpolation mesh. Before playing the clip:



## Check Your Results

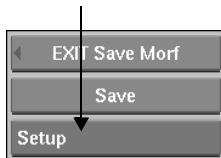
Save the setup, process the clip, and compare the result to the *10\_result* clip.

### 1. Save the setup:

a) Go to the Setup menu and click Save As to open the file browser.

By default, the Warper setups are saved in the */usr/discreet/project/effects/<project name>/morf* directory.

b) Select Setup, type a name for the file, and then press **ENTER**.



### 2. Go to frame 1 and click Process.

**Hint:** In the Setup menu you can choose from three different rendering options, which vary in rendering quality and speed. Process the clip using the default rendering setting, TexRenderHigh. For more information, see the chapter “The Warper” in the *flame* or *inferno* User’s Guide.

3. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.

4. Use the Player to view your result clip. Compare your result to the *10\_result* clip.



5. (Optional) If the two clips do not match, return to the Warper and load the *10\_morph* setup file from the `/usr/discreet/project/effects/Tutorial/setups/lesson_10` directory to see how the meshes should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.
7. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- Warping an object in a clip changes the shape of the object.
- Use a source mesh and a destination mesh to create a warp. The source mesh defines the shape of the original image. The destination mesh defines the shape of the warped image.
- A morph requires a front source mesh and a back source mesh. The front source mesh defines the shape of the image in the front clip, and the back source mesh defines the shape of the image in the back clip.
- The front and back source meshes always have the same number of patches and vertices.
- The complexity of your mesh depends on the level of control and quality of the warp or morph required.
- When warping or morphing a live-action clip, the mesh must follow the movement of the object. Move the mesh manually or use the Stabilizer to generate tracking data for the mesh.
- Source interpolation automatically calculates the transition between the front and back source meshes: the interpolation curve defines the percentage change in the shape of the image during the morph; the dissolve curve defines the percentage change in the colour of the pixels during the morph.



# 11

## Colour Correction

The Colour Corrector provides tools for modifying the colour and brightness of a clip. Colour correction is subjective because it relies on individual perception and interpretation of colour. Although no set method of colour correction works in all cases, this lesson demonstrates how to achieve consistent results using the Colour Corrector.

In this lesson:

- Learn a general approach to colour correction
- Adjust the gamma, gain, and offset of an image
- Work with the colour curves in the Colour Corrector

### Need Help?

If you need help using the Colour Corrector, load the setup file provided for this lesson. Click the Load button in the Setup menu to open the file browser and go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_11*. Load the setup file *11\_cc\_ex1* or *11\_cc\_ex2*, depending on which exercise you are doing.

Time to complete this lesson: 45 minutes

## About Colour Correction

It is important to take a systematic approach to identifying and correcting colour problems in your images. Here is a general approach to help you produce professional results.

### Maintain a Stable Working Environment

To make it easier to obtain the best possible results, pay attention to the conditions in your working environment.

- Minimize reflections on your monitor.
- Control ambient lighting in your studio. Lights should be dimmed and steady. Avoid working near a window.
- Calibrate your monitor. For instructions, see the chapter “Monitor Calibration” in the *flame* or *inferno User’s Guide*.

### Analyze the Image

Before making corrections, perform a visual analysis of the image. Take into consideration the type of lighting used in the shot (cool, warm, indoor, sunshine at noon, sunset, rainy day, direct source, diffuse, dim, and so on).

Use the histogram or the Curves menu in the Colour Corrector to examine the distribution of colour values in the image. Learn how to use these tools in this lesson.

**Hint:** If great accuracy is required, separate the red, green, and blue channels using the Separate command in the Format menu and load each channel into the Colour Corrector separately. This enables you to compare the brightness of individual channels using the colour patches.

### Determine the Sequence of Corrections

Once you have determined what should be corrected, decide in what sequence to make the corrections. For example, do not adjust saturation before applying a hue shift, because the hue shift affects the saturation adjustments.

In general, you should perform corrections in the following sequence for best results:

1. Correct the hue and/or the colour balance.
2. Correct the light and dark areas of the image (gamma, gain, offset, and contrast).
3. Correct the saturation. Consider the lighting conditions of the shot (outdoor, indoor, sunshine, and so on) and compare how colours appear under these conditions in real life.

## The RGB Colour Model

A colour model identifies and describes a colour. It is like a reference chart for reproducing colour in a predictable way. The Colour Corrector uses the RGB colour model.

The RGB colour model is used by video monitors to display colours. This model uses the three primary colours of red (R), green (G), and blue (B). Other colours are created by combining different values of red, green, and blue.

In 8-bit colour, the range of values (intensity) for each primary colour is 0 to 255, where zero is a complete absence of the colour and 255 is full saturation. This range provides 256 possible values for each primary colour, including zero. Multiplying all possible combinations ( $256 \times 256 \times 256$ ) gives 16,777,216 possible colours with the RGB model.

**flame** and **inferno** also support 12-bit colour, which has a range of values from 0 to 4095. Working in 12-bit colour provides greater colour resolution and dynamic range, resulting in fewer problems with banding, particularly for clips with high contrast. In 12-bit, the channels in the Colour Corrector are automatically updated to range between 0 and 4095. (To work in 12-bit colour, you must create a partition with the proper parameters, set the proper monitor resolution, and work with at least one gigabyte of RAM. For more information, see the “Framestore Setup” chapter in the *flame* or *inferno* User’s Guide.)

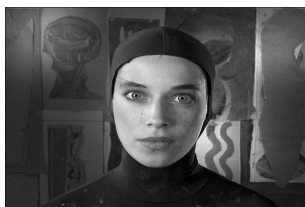
The exercises in this lesson use 8-bit colour.

## Exercise 1: Adjusting Gamma and Gain

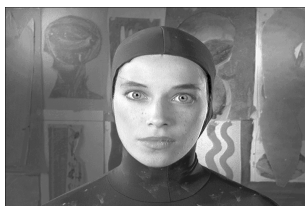
In this exercise, analyze a clip using the histogram and make necessary corrections by adjusting gamma and gain for the red, green, blue, and RGB channels.

Load the *11\_colour\_correct* reel onto the desktop from CD 3, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*11\_front*: The image before colour correction.



*11\_result*: The image after colour correction.

## Open the Colour Corrector

Load the front and result clips into the Colour Corrector.

1. Click Colour Correct in the Processing menu and select Front Back input mode.



2. Select *11\_front* as the front clip and *11\_result* as the back clip. Use *11\_result* as a reference as you make the corrections.

3. Select a destination reel.

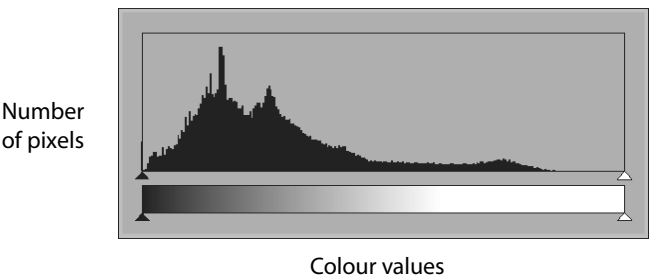
The Colour Corrector opens and the image to be corrected appears in the image window.

4. Reset all options to their default values: go to the Setup menu, click Reset All and Confirm.

## Analyze the Clip

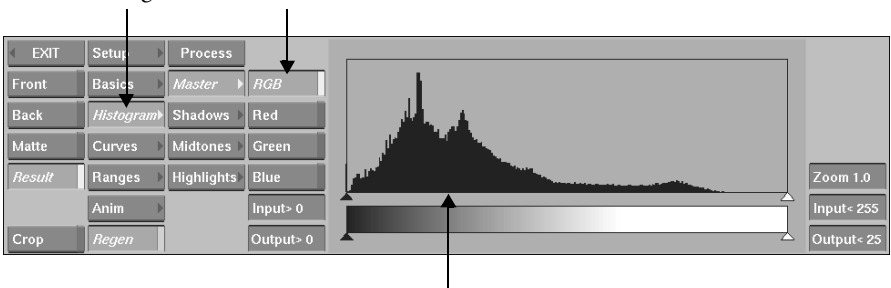
The most obvious problem with the clip is that there is too much blue. Remember to analyze the entire image before making any changes. Consider how the red, green, and RGB channels might be affected by changing the blue channel.

In this exercise, use the histogram to analyze the image. The histogram shows the colour distribution of pixels for the selected channel of the source image. The colour values are plotted on the horizontal axis, from 0 (black) at the left to 255 (white) at the right. The number of pixels for each value is plotted on the vertical axis.



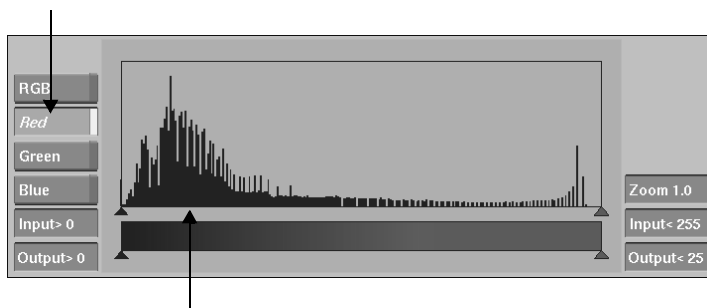
1. Examine the RGB channel:

- a) Click Histogram.      b) Click RGB to select the RGB channel.



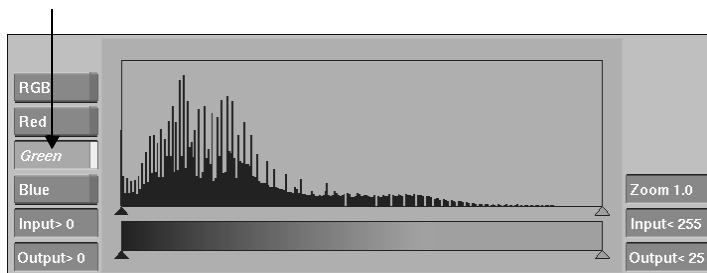
The pixels are concentrated at the left of the histogram, suggesting that the shadow areas are too prominent. To correct this problem, increase the gain and gamma of the RGB channel.

2. Click Red to examine the red channel.



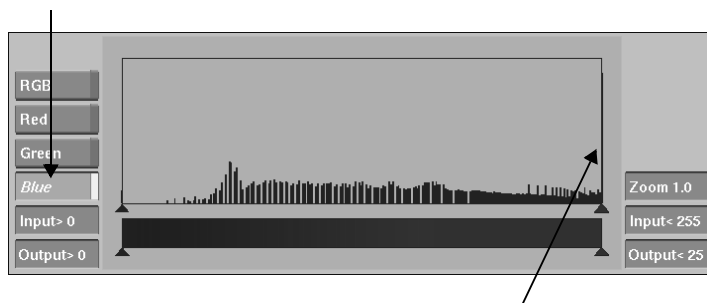
The red pixels are concentrated in the shadows area. To avoid losing the red in the midtones and highlights, increase the gain and gamma of the red channel.

3. Click Green to examine the green channel.



The green channel looks similar to the RGB channel, as is often the case, since the green channel has more influence on the overall brightness of an image. Because of this relationship, do not adjust the green channel until you have changed the other channels.

4. Click Blue to examine the blue channel.



The blue channel is the most problematic. To correct the concentration of blue at the maximum, decrease the gain and gamma of the blue channel.



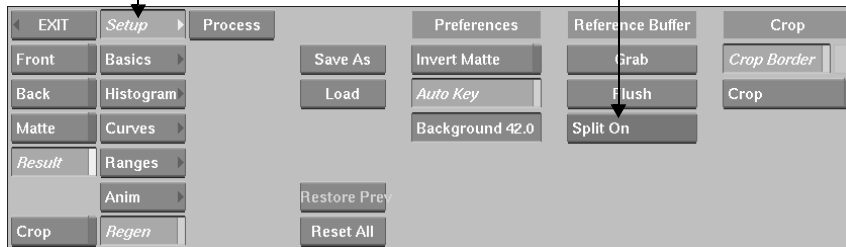
## Compare the Source and Result Images

The Colour Corrector includes a reference buffer that holds a clip that you can refer to as you work. Use the reference buffer to compare the corrections made to the front clip to the *11\_result* clip.

1. Turn on the reference buffer:

a) Click Setup.

b) Select Split On.



A split bar appears, separating the reference buffer from the clip. With the split bar at its default position below the image window, you see only the clip.

2. Adjust the split bar to view both the reference buffer and the clip:

a) Leave the pivot point of the split bar (the square with the centre dot) in its default position at the bottom-left of the image window.

b) Drag the right end of the split bar towards the top-right corner of the image window.

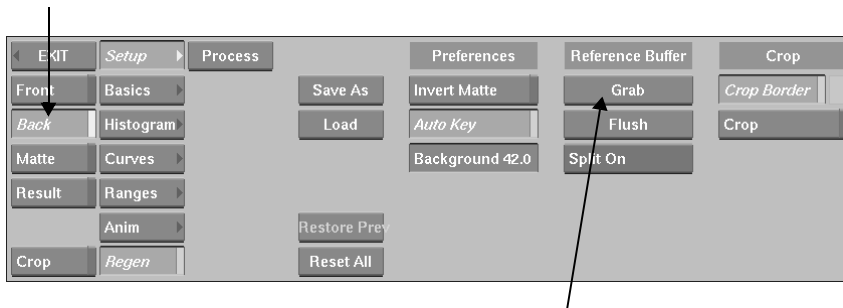
The image window is divided diagonally, with the clip above the split bar and the reference buffer below. The letter R indicates which side of the bar displays the reference buffer. Because the reference buffer is empty, no image is displayed below the bar.



**Hint:** If an image does appear in the reference buffer, click Flush to clear it.

3. Load the back clip into the reference buffer:

a) Click Back or press **F2** to view the back clip (*11\_result*) in the image window.



b) Click Grab to copy the back clip to the reference buffer.

You can now see the back clip both above the bar (the clip) and below the bar (the reference buffer).

4. Click Result (**F4**) to view the current result clip (*11\_front*).

You can now compare the result clip above the bar to the reference image below the bar as you work.

Result clip



**Hint:** You can adjust the position of the split bar as you work to compare different areas of the image. Drag the pivot point to move the bar, or drag the bar to rotate it. To reset the bar, **CTRL**-click the pivot point. To hide or show the bar, **CTRL**-click the bar.

**Hint:** Using the split bar to view the clip and the reference buffer affects only the image display; the colour correction is applied to the entire clip. To restrict the area of the image that is corrected, use the crop box. Only the area inside the crop box is corrected.

## Make the Corrections

Now that you have analyzed all four channels, make the necessary corrections using the Gamma Gain, and Offset controls.

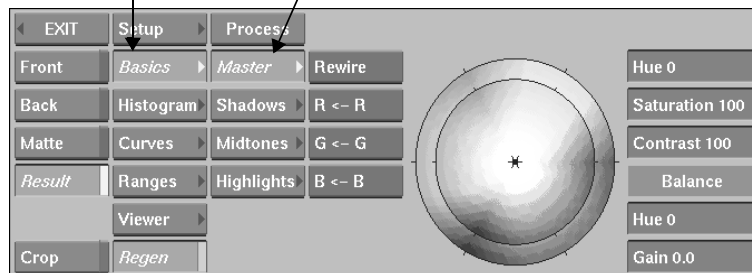
- Adjusting the gamma increases or decreases the influence of the midtones in the image. As a result, the image is darkened or lightened without greatly affecting the highlights and shadows. The solid black and white areas of the image are not affected.
- Adjusting the gain affects the brightness of the midtones and highlights without greatly affecting the shadows.
- Adjusting the offset affects the highlights, midtones, and shadows proportionately. Both the white point and the black point of the image are also affected.

**Hint:** If you are unfamiliar with the effects of adjusting gamma, gain, and offset on an image, you can experiment with values in the Basics controls before continuing. When you are finished, click Reset All to reset the values to their defaults.

1. Select the tonal range to correct:

a) Click Basics.

b) Enable Master to make corrections over the entire image.



When correcting the gamma, gain, offset, and contrast of an image, you can control the range of tones affected.

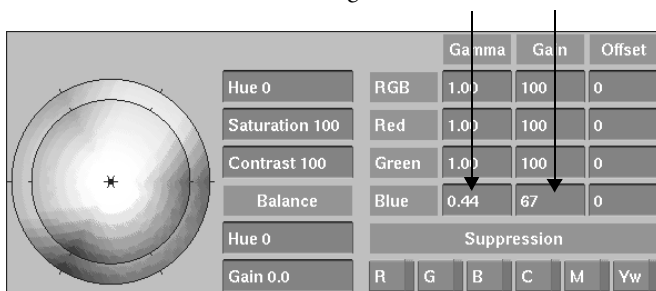
Click:	To correct:
Master	All values uniformly across the image.
Shadows	The darkest parts of the image (RGB values between 0 and 85)
Midtones	The midtones of the image (RGB values between 86 and 170).
Highlights	The lightest parts of the image (RGB values between 171 and 255).

## 2. Enable Regen.

When Regen is enabled, you see the changes in real time as you adjust the values in the various fields. When Regen is disabled, you do not see changes until you have completed the adjustment.

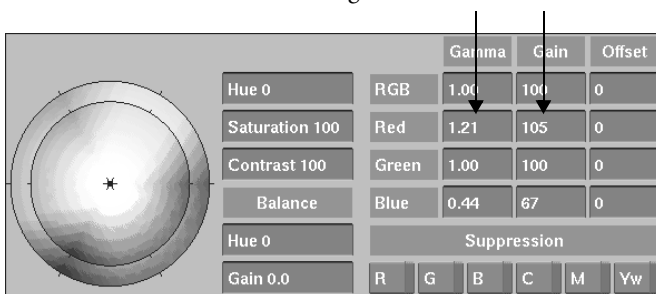
## 3. Adjust the blue channel:

- a) Decrease the gamma to 0.44.      b) Decrease the gain to 67.



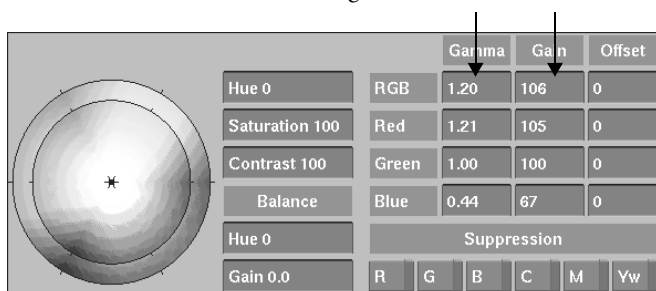
## 4. Adjust the red channel:

- a) Increase the gamma to 1.21.      b) Increase the gain to 105.



## 5. Adjust the RGB channel:

- a) Increase the gamma to 1.20.      b) Increase the gain to 106.



- Adjust the green channel by increasing the gamma to 1.18.



**Hint:** Corrections made with Gamma, Gain, and Offset can be animated. To do this, change the channel values at different frames of the clip.

## Process the Clip

Save your setup and process the clip.

- Save the setup: open the Setup menu, click Save As, type a name for the setup file, and then press **ENTER**. The default pathname for the Colour Corrector directory is */usr/discreet/project/effects/<project name>/correct*.
- (Optional) If the colours in the two images do not match, load the *11\_cc\_ex1* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_11* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
- Click Process to process the clip.
- Click EXIT to return to the reels. The processed clip appears on the destination reel.
- Save your result clip in your clip library.

## Using the Histogram to Adjust Contrast

Colour correcting an image changes the colour values of the pixels. This is called remapping the colour values.

- The colour values of the pixels in the source image are called the input values.
- The colour values of the pixels in the result image are called the output values.

To make it easier to perform other corrections, use the histogram to change the maximum and minimum input and output values in an image.

For example, to correct an image with low contrast:

1. Find the general black point in the image. Click the Front patch to the right of the histogram and then pick a pixel in the darkest area of the image.

On the histogram with RGB enabled, the position of this value is marked by a red line.

2. Make the black point the new minimum input value by dragging the minimum input level to the right until it is at the same level as the red line.

All pixels in the image with colour values lower than the black point are remapped to 0 (black).

3. Next, find the general white point. Click the Front patch and then pick a pixel in the lightest area of the image.

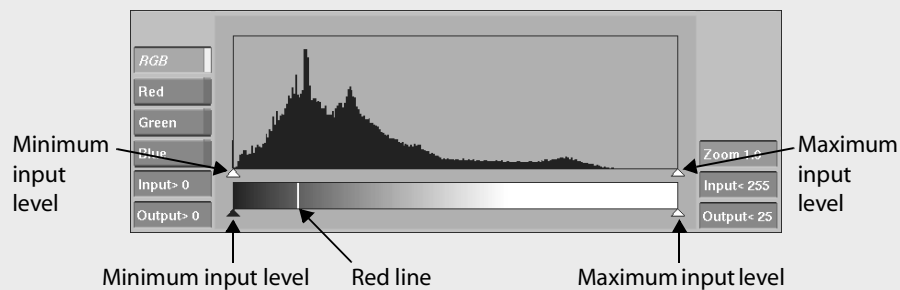
On the histogram, the position of this value is marked by a red line.

4. Make the white point the new maximum input value by dragging the maximum input level to the left until it is at the same level as the red line.

All pixels with colour values greater than the white point are remapped to 255 (white). All other pixels are remapped between the new minimum and maximum input values.

R	16
G	7
B	50
Front	
R	16
G	7
B	50
Result	
R	251
G	163
B	109
Back	
bits RGB	

To correct an image that has too much contrast, adjust the output levels.



## Exercise 2: Working with Curves

In this exercise, use the Curves menu to remap the colour values for the overall RGB channel, as well as the individual red, green, and blue channels. Using the Curves, you can achieve the same results as when using Gamma, Gain, and Offset in the Basics menu. There are two advantages to using the Curves:

- You have more control over the corrections. Because you can add and move control points on the curves, you can make fine adjustments within a defined colour range without affecting values outside of the range.
- The adjustments are more interactive. You can see the relationship between the shape of the curve and the effect it has on the image.

The disadvantage of using the Curves is that the adjustments you make cannot be animated.

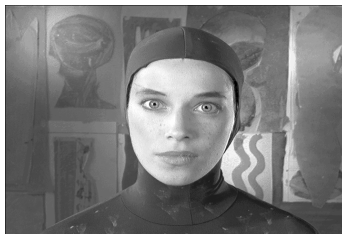
In the first part of this exercise, learn how adjusting the RGB curve affects the image. In the second part, correct an image by adjusting gamma and gain using the Curves menu.

### Open the Colour Corrector

Load the clips into the Colour Corrector to see the effects of modifying the RGB curve.

1. Load the *11\_colour\_correct* reel, the same reel as in Exercise 1, onto the desktop.
2. Click Colour Correct in the Processing menu and select Front Back input mode.
3. Click the S on the Colour Correct button to load the *11\_front* and *11\_result* clips.
4. Select a destination reel.

The Colour Corrector opens and the selected clip appears in the image window.

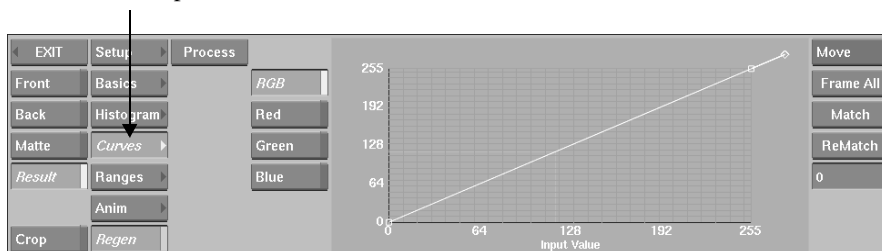


5. Reset all options to their default values: go to the Setup menu, click Reset All and Confirm.
6. Reset the position of the split bar by clicking the bar's pivot point (the square with the centre dot).

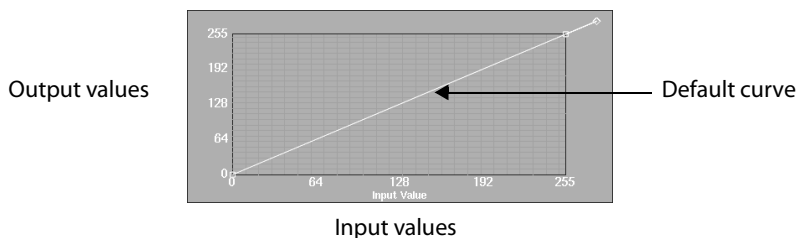
## Open the Curves Menu

In this exercise, use the Curves menu to analyze the clip and make the corrections.

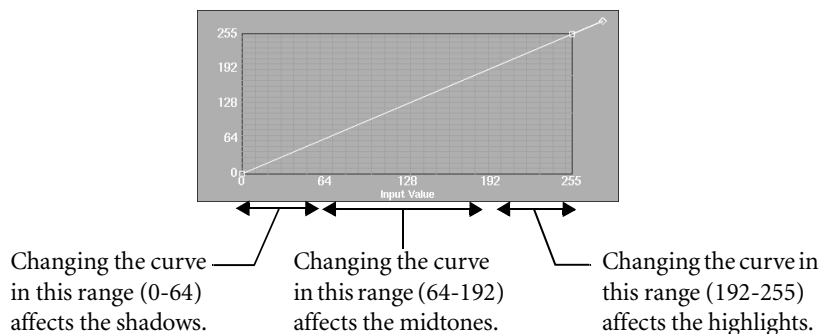
1. Click Curves to open the Curves menu.



The colour curves for the RGB, red, green, and blue channels are plotted on the graph in the Curves menu. The input colour values for the source image are plotted on the horizontal axis. The output colour values for the corrected image are plotted on the vertical axis.



The default diagonal curve means that the input colour values of the source image equal the output values of the result image. Colour corrections are made by changing the shape of the curve.

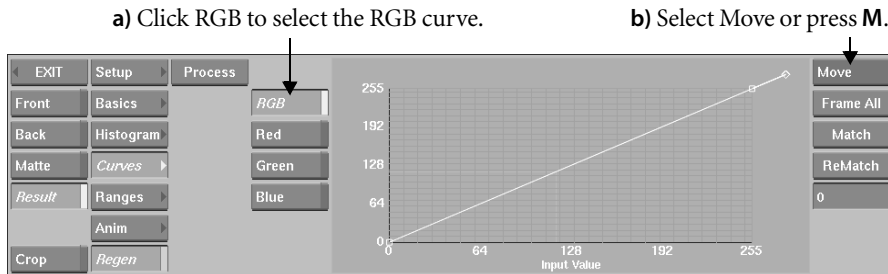




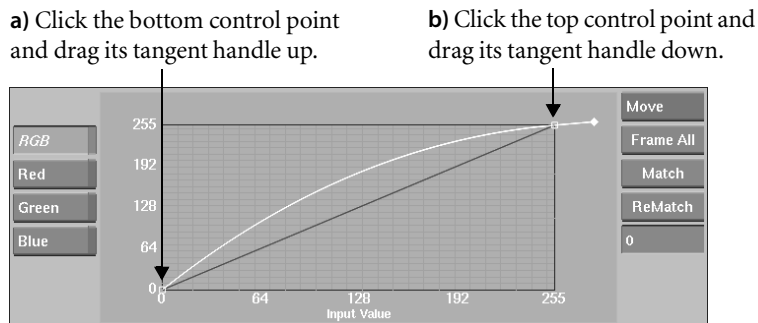
## Adjust the Gamma

Practice adjusting the gamma by modifying the RGB curve.

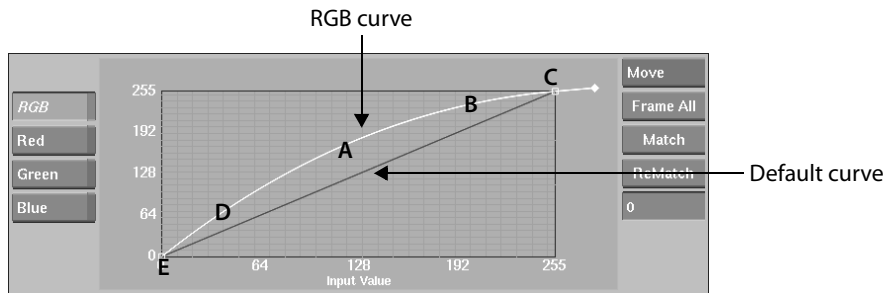
1. Select the RGB curve:



2. Pull the RGB curve up to increase the gamma:

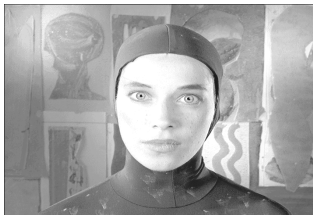


3. Examine the RGB curve.

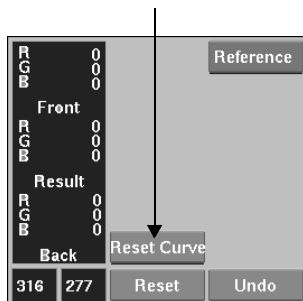


- A Adjusting the gamma mostly affects the midtones.
- B The highlights are slightly affected.
- C The white point (or maximum input value) does not change.
- D The shadows are slightly affected.
- E The black point (or minimum input value) does not change.

4. Examine the result image. The midtones are lightened.



5. Click Reset Curve to reset the RGB curve.

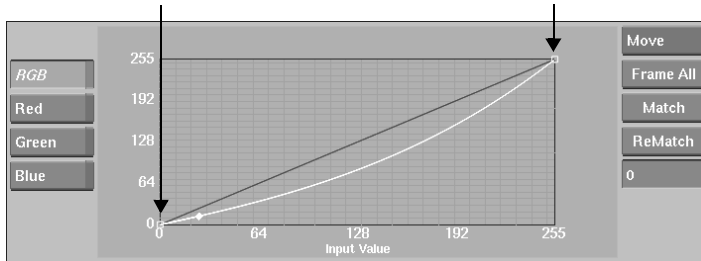


**Hint:** Clicking Reset Curve resets the selected curve only. Clicking Reset resets all curves.

6. Push the RGB curve down to decrease the gamma:

a) Click the bottom control point and drag its tangent handle down.

b) Click the top control point and drag its tangent handle up.



7. Examine the result image. The midtones are darkened.



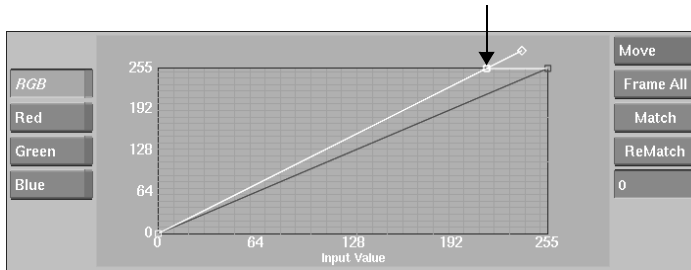
8. Reset the RGB curve by clicking Reset Curve.

## Adjust the Gain

Practice adjusting the gain by modifying the RGB curve.

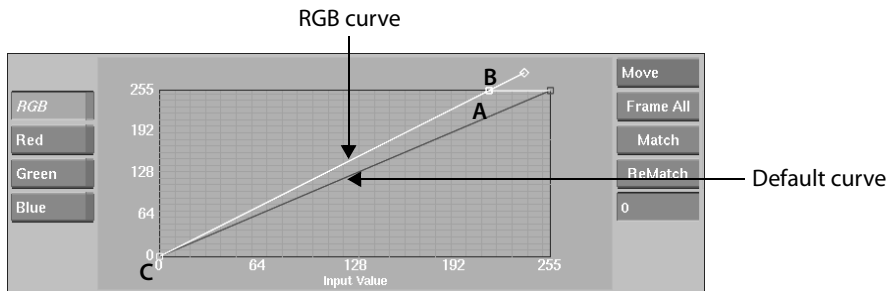
1. Increase the slope of the RGB curve to increase the gain:

- a) Drag the top control point to the left until the displayed values are (215, 255).



Moving the top control point to the left changes the maximum input value from 255 to 215; it has the same effect as moving the histogram's maximum input level to the left (see "Using the Histogram to Adjust Contrast" on page 330).

2. Examine the RGB curve.

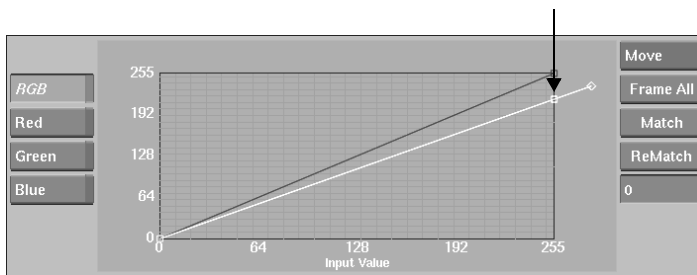


- A Adjusting the gain affects the highlights substantially and also affects the midtones.
- B Because the maximum input level is changed, clipping occurs in the highlights. In this example, all pixels with an input value of 215 or greater are remapped to an output value of 255 (white).
- C The shadows are not substantially affected and the black point is not changed.

3. Examine the result image. The highlights and midtones are brightened; the shadows remain essentially the same.

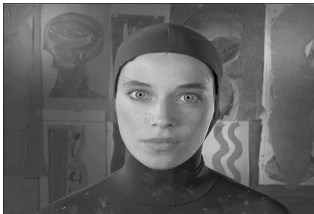


4. Reset the RGB curve by clicking Reset Curve.
5. Decrease the slope of the RGB curve to decrease the gain:
  - a) Drag the top control point down until the displayed values are (255, 215).



Moving the top control point down changes the maximum output value from 255 to 215; it has the same effect as moving the histogram's maximum output level to the left. See "Using the Histogram to Adjust Contrast" on page 330. In this example, all pixels with an input value of 255 are remapped to an output value of 215.

6. Examine the result image. The highlights and midtones are darkened; the shadows remain essentially the same.



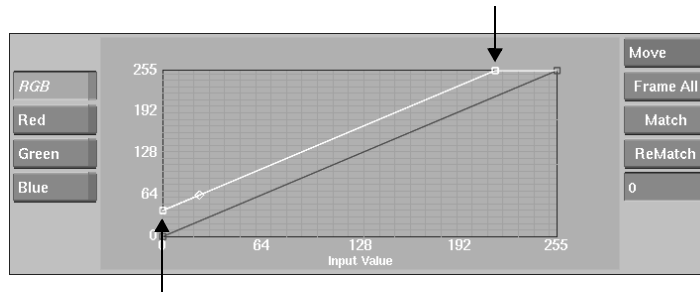
7. Reset the RGB curve by clicking Reset Curve.

## Adjust the Offset

Practice adjusting the offset by modifying the RGB curve.

1. Move the entire RGB curve up to increase the offset:

a) Drag the top control point to the left until the displayed values are (215, 255).

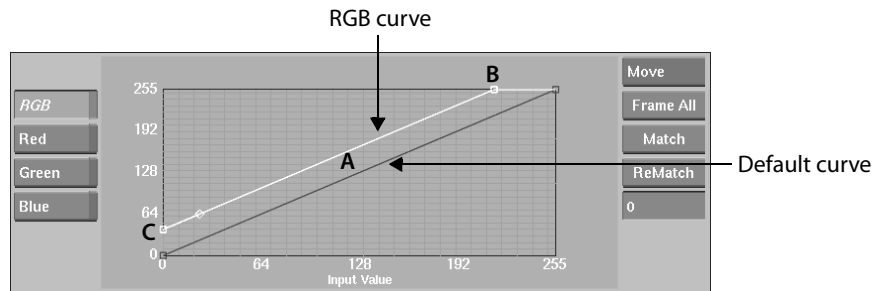


b) Drag the bottom control point up until the displayed values are (0, 40).

As you learned on page 336, moving the top control point to the left changes the maximum input value from 255 to 215.

Moving the bottom control point up changes the minimum output value from 0 to 40; it has the same effect as moving the histogram's minimum output level to the right.

2. Examine the RGB curve.



**A** Adjusting the offset affects the highlights, midtones, and shadows proportionately.

**B** Because the maximum input value is changed, clipping occurs in the highlights. In this example, all pixels with an input value of 215 or greater are remapped to an output value of 255 (white); the highlights are lightened.

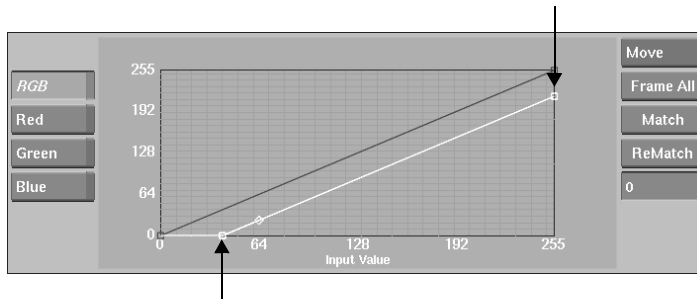
**C** The minimum output value is also changed. In this example, all pixels with an input value of 0 (black) have an output value of 40; the shadows are lightened.

3. Examine the result image. All colours in the image are lightened.



4. Reset the RGB curve by clicking Reset Curve.
5. Move the entire RGB curve down to decrease the offset:

- a) Drag the top control point down until the displayed values are (255, 215).

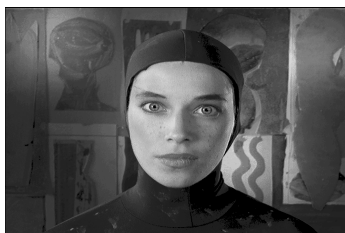


- b) Drag the bottom control point to the right until the displayed values are (40, 0).

As you learned on page 336, moving the top control point down changes the maximum output value from 255 to 215.

Moving the bottom control point to the right changes the minimum input value from 0 to 40; it has the same effect as moving the histogram's minimum input level to the right. In this example, all pixels with an input value of 40 or less are remapped to an output value of 0 (black).

6. Examine the result image. All colours in the image are darkened.



7. Reset the RGB curve by clicking Reset Curve.

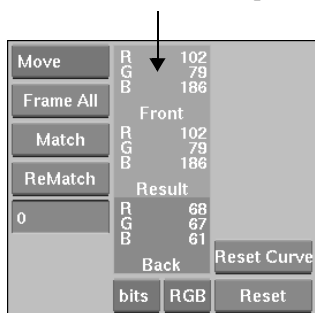
You are now ready to analyze the clip and make the corrections using the Curves menu.

## Analyze the Clip

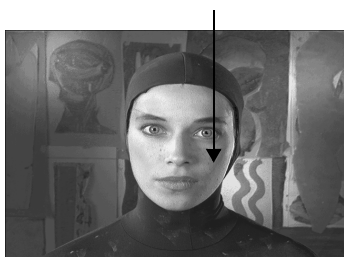
Although you have already analyzed this image using the histogram, use the Curves menu to check the distribution of colour values.

1. Pick a colour from an obvious problem area of the image:

- a) Click the Front colour patch.



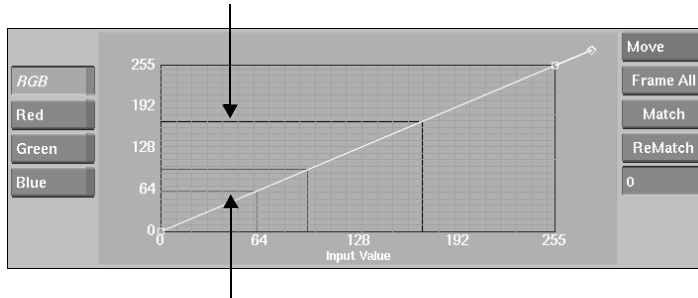
- b) Click the blue highlights on the talent's face.





Red, green, and blue markers appear on the graph to show the input values of the selected colour:

- The blues are too high. To correct this problem, you will decrease the gain and gamma of the blue channel.



- The reds and greens are too low. To correct this problem, you will increase the gain and gamma of both the red and green channels.
2. Use the reference buffer to compare the corrections made to the front image to the *11\_result* clip. Set up the split bar to view the back clip (*11\_result*) in the reference buffer as described in “Compare the Source and Result Images” on page 325.

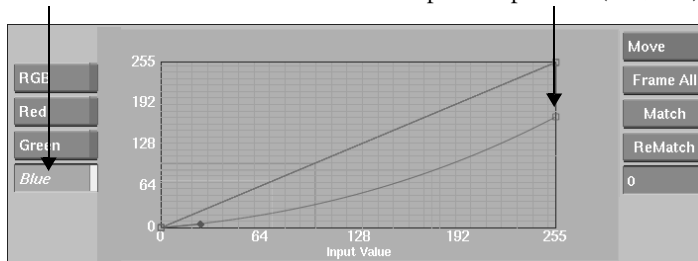
## Make the Corrections

Make the necessary corrections by adjusting the curves. Since you have to drag the control points and handles to adjust the curves instead of using the keypad to enter values, you may not be able to get the exact values listed in the instructions.

1. Adjust the blue channel:

a) Click Blue to select the blue curve.

b) Decrease the gain by dragging the top control point to position (255, 170).

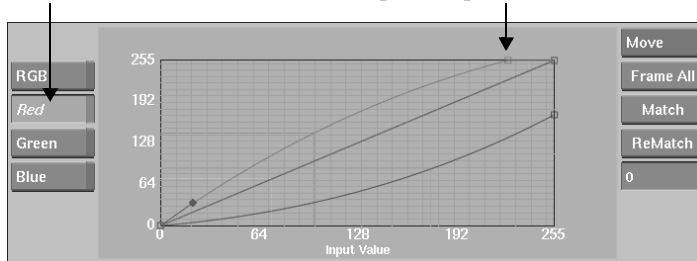


c) Decrease the gamma by moving the top tangent handle to 1.26 and the bottom tangent handle to 0.21.

2. Adjust the red channel:

a) Click Red to select the red curve.

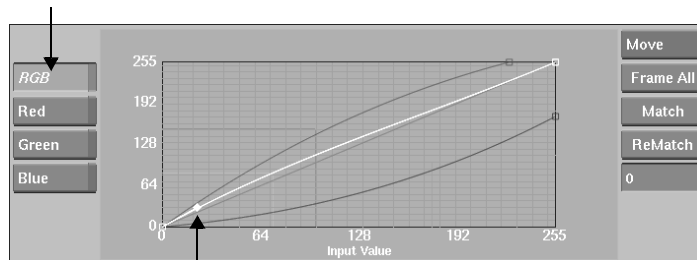
b) Increase the gain by dragging the top control point to position (225, 255).



c) Increase the gamma by moving the top tangent handle to 0.62 and the bottom tangent handle to 1.69.

3. Adjust the RGB channel:

a) Click RGB to select the RGB curve.

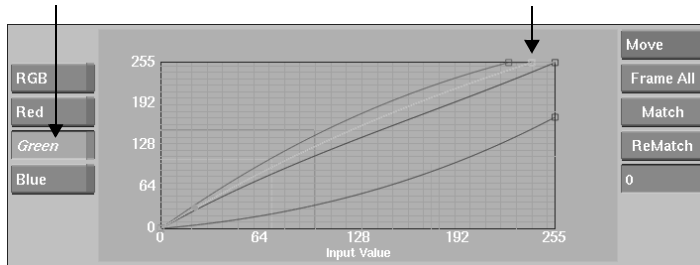


b) Increase the gamma by moving the bottom tangent handle to 1.33.

#### 4. Adjust the green channel:

**a)** Click Green to select the green curve.

**b)** Increase the gain by dragging the top control point to position (240, 255).



**c)** Increase the gamma by moving the top tangent handle to 0.77 and the bottom tangent handle to 1.45.

## Process the Clip

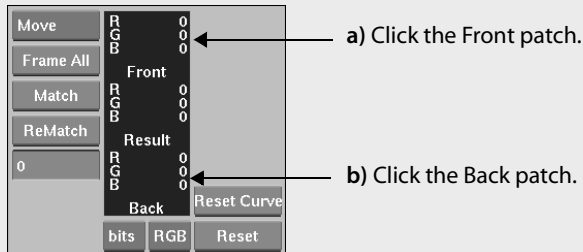
Save your setup and process the clip.

1. Save your setup. Open the Setup menu and click Save As. Make sure you are still in the `/usr/discreet/project/effects/<project name>/correct` directory. Type a name for your setup file and press **ENTER**.
2. (Optional) If the colours in the two images do not match, load the `11_cc_ex2` setup file from the `/usr/discreet/project/effects/Tutorial/setups/lesson_11` directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
3. Click Process to process the clip.
4. Click EXIT to return to the reels. The processed clip appears on the destination reel.
5. Save your result clip in your clip library.
6. Delete the exercise reel and result clips from the desktop.

## Matching Colours

Now that you have learned how to use the Curves menu, use the Match function to do a quick colour correction.

1. Set up the split bar to view the back clip (*11\_result*) in the reference buffer as described in “Compare the Source and Result Images” on page 325.
2. In the Curves menu:



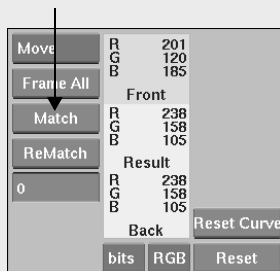
3. Pick a representative colour on the talent's face that you want to match, for example on the tip of her nose.



The RGB values for the sampled pixel of the back clip appear in the Back patch.

The RGB values for the corresponding pixel in the uncorrected front clip appear in the Front and Result patches.

4. Click Match.



The colours in the clip are updated. Notice that the RGB values in the Result patch match those in the Back patch.

The curves are also updated to show the corrections. Fine tune the corrections using the curves.

**Hint:** When sampling colours, you can display either the RGB, HLS, or luminance (Y) values. Since the Colour Corrector has controls for adjusting the gamma, gain, and offset of the red, green, and blue channels, select the RGB option when adjusting the chrominance of an image. When adjusting the luminance, you may find it helpful to select Y.

## Things to Remember

- To produce professional results when colour correcting a clip, analyze the distribution of colours in the clip using the histogram or the Curves menu.
- Adjust the gamma, gain, and offset of the overall RGB channel or of the individual red, green, and blue channels using either the Basics menu or the Curves menu. Using the Curves menu is more interactive and gives you more control than using the Basics menu, but you cannot animate the corrections.
- Use the histogram to reset the black point and white point in an image. This can make other corrections easier.
- Use the colour patches and the Match function to match colours in the front clip to those in the back clip.
- Use the reference buffer to compare the source image to a reference image as you make the corrections.



# 12

## Batch Processing

Often, when creating a complex effect, you use the output of one module as the input for another. For instance, you may add a blur filter to a clip, adjust the blurred clip's brightness, then convert the clip to greyscale.

Each time you add an element to the effect, the clip needs to be processed, which takes time and uses space on the framestore. Batch processing eliminates the need to pre-process your intermediate clips. You produce only one final output, helping you work more efficiently and saving space on the framestore.

In this lesson:

- Create a Batch process tree
- Use the Regrain tool to add grain to your source clip
- Use the Colour Corrector to add a strobe effect and sepia tint to your clip

### Need Help?

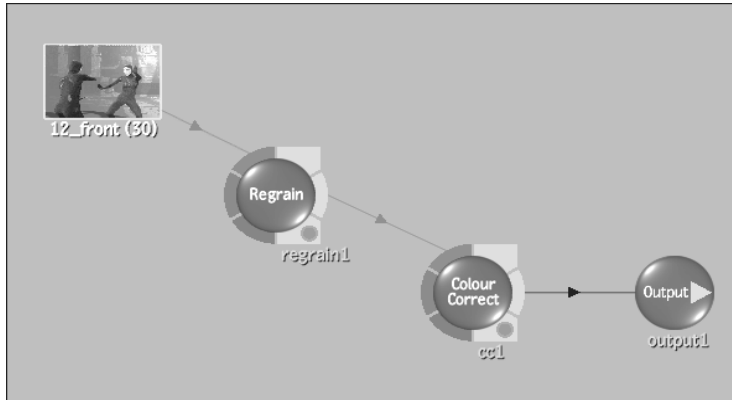
If you need help creating the Batch process tree, load the setup file provided for this lesson. Click Load in the Batch Setup menu to open the file browser, go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_12*, and then load the setup file *12\_batch*.

Time to complete this lesson: 30 minutes.

## About Batch

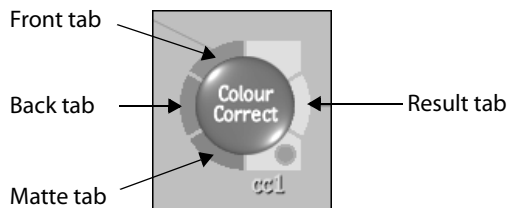
Use Batch to assemble a series of tasks where the result of one task is used as the source for the next task. This series of tasks is called a process tree. Each operation in the process tree is a process node and corresponds to one of the commonly used modules in **flame** or **inferno**, including Action, the Colour Corrector, AutoMatte, and Logic Ops.

For example, the process tree you create in this lesson looks like this.



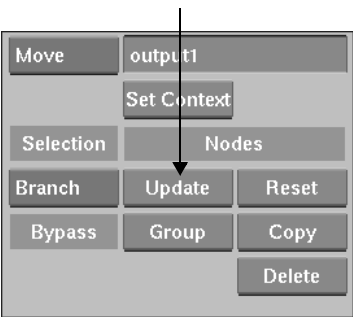
You can preview the result at any point in the process tree. If you don't like the result of one operation, you can modify or delete it without affecting the others in the sequence.

A process node has one to four coloured tabs used to connect the output of one node to the input of the next. The coloured tabs on the node's left are called source tabs. The source tabs correspond to the cursor colours for Front, Back, and Matte when selecting clips from the reels. The yellow tab on the node's right is called the Result tab.

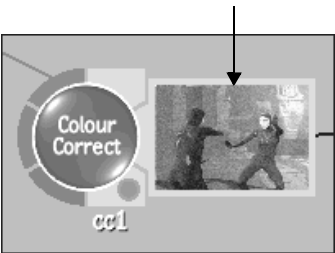




The Result tab features a proxy display. Double-click the Result tab to open a proxy window, then click Update in the Batch menu.



The current output of the node appears in the proxy window.



The following table summarizes the node tab conventions and functions.

Colour	Name	Description
Red	Front	Used to connect a front clip to the process node.
Green	Back	Used to connect a back clip to the process node.
Blue	Matte	Used to connect a matte clip to the process node.
Grey	Disabled	Disabled tab.
Yellow	Result	Used to connect the result of a process node to one or more other nodes.

## Exercise: Creating an Old-style Sepia Film Clip

In this exercise, make a clip look like an old-style film clip by adding grain to your source clip, creating a strobe effect that mimics old motion picture projectors, and tinting the clip a sepia colour.

Load the *12\_batch* reel onto the desktop from CD 3, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*12\_front*: This is the clip that you want to make look like an old-style film clip.



*12\_result*: This clip shows the expected result.

To preview the final composite, play the *12\_result* clip using the Player.

## Open Batch

Access the Batch module and begin building the process tree.

### 1. Open Batch:

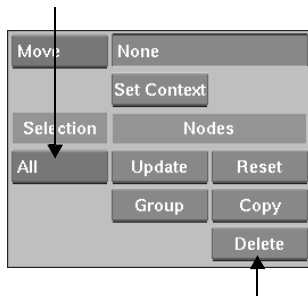
a) In the Processing menu, click Batch.

LIBRARY	discreet image integrator – Frames 137812 Avail. 134461			
EDITING	Filter	Difference	Monochrome	Delete
PROCESSING	Average	Auto Matte	Negative	Name
EFFECTS	Compound	<b>Batch</b>	Colour Correct	Move
FORMAT	Flip	DeGrain	Posterise	Copy
SYSTEM	Logic Ops	ReGrain	Coloured Frame	Search

b) Select a destination reel.

2. If there are any nodes or images on the Batch desktop, delete them:

a) Select All.

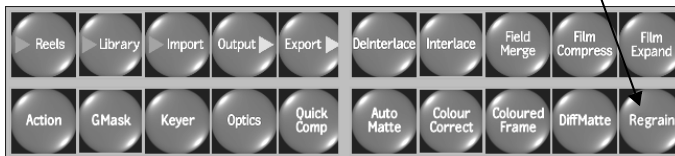


b) Click Delete, and then Confirm.

3. The first step in modifying the clip is to add film grain. To do this, you need to add a Regrain node to the Batch desktop:

a) Swipe the bar at the left or right side of the menu panel to view the node bar.

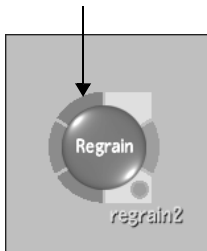
b) Drag a Regrain node from the node bar to the Batch desktop.



4. Load the source clip:

a) Select the Regrain node on the desktop.

b) Double-click the red Front tab on the Regrain node to view the reels.

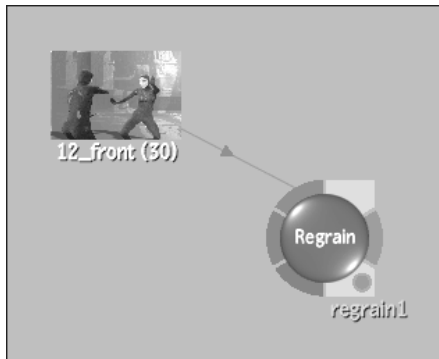


c) Select *12\_front\_ex1* as the front source clip.

Notice the arrow cursor is green, which usually indicates you need to select another source clip. In Batch, you can add up to six clips at once.

d) In this example, only one source clip is required. Click EXIT Clip Select to return to the process tree.

The source clip is automatically connected to the corresponding Front tab of the Regrain node. The process tree looks like this.



**Hint:** You can replace a source clip in the process tree by double-clicking the clip and selecting a new clip from the reels. To load several clips at the same time, drag a Reels node from the node bar to the desktop; the reels appear.

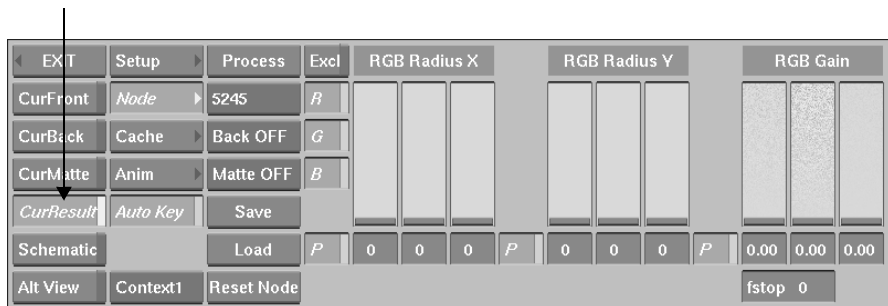
## Add Grain to the Clip

Use the Regrain tool to simulate the grain commonly found on an old-style film clip and add it to your source clip.

1. Select the Regrain node in the process tree.

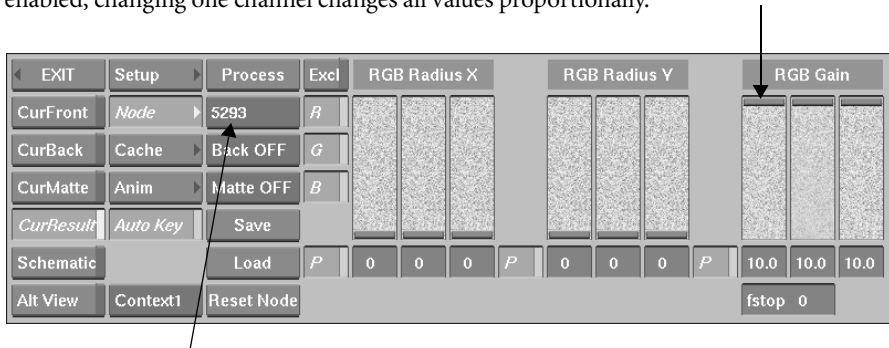
The Regrain menu appears.

2. Click CurResult or press **F4** to view the result clip for the selected node.



3. Increase the grain brightness and select an appropriate film type:

- a) Set RGB Gain to 10. You can either drag the sliders or enter the value. Because P is enabled, changing one channel changes all values proportionally.

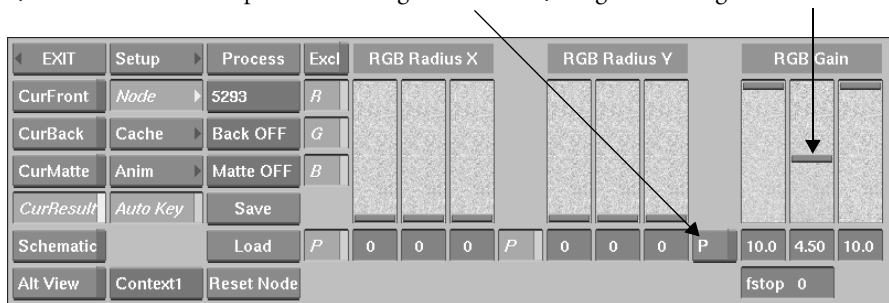


- b) Select Stock 5293.

4. The grain is a bit too green. It needs to be adjusted:

- a) Click P to disable Proportional Change.

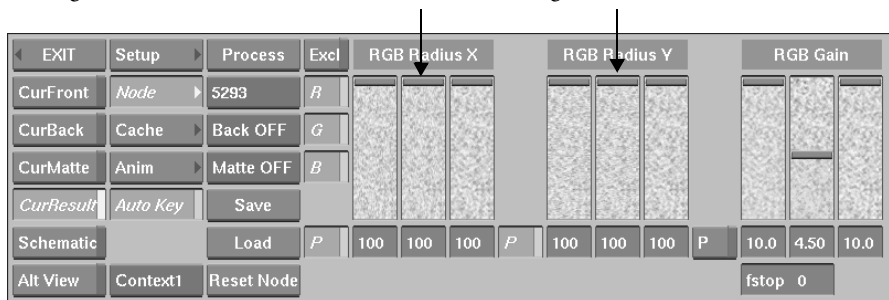
- b) Drag the Green gain down to 4.5.



5. Increase the size of the grain:

- a) Drag the RGB Radius X sliders to 100.

- b) Drag the RGB Radius Y sliders to 100.



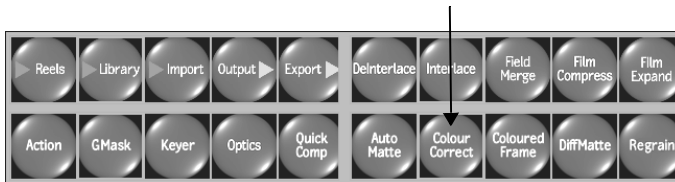
6. When you are satisfied with the grain, click Schematic or press ~.

You are returned to a view of the process tree.

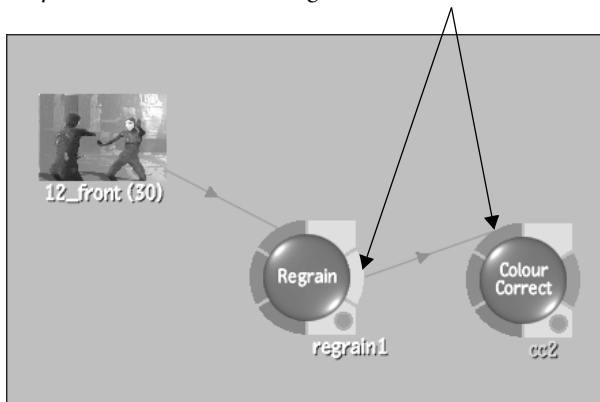
## Add a Colour Correct Node to the Process Tree

Add the sepia tint to the clip using a Colour Correct node.

1. Add a Colour Correct node to the Batch desktop:
  - a) Swipe the bar at the left or right side of the menu panel to view the node bar.
  - b) Drag a Colour Correct node to the desktop and drop it to the right of the Regrain node.



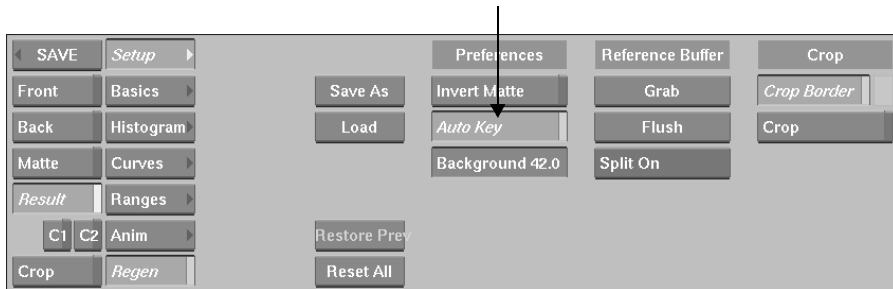
2. Specify the output of the Regrain node as the input to the Colour Correct node. Drag from the yellow Result tab on the Regrain node to the red Front tab on the Colour Correct node.



## Open the Colour Corrector

From the process tree, you can access the Colour Corrector.

1. Double-click the Colour Correct node in the process tree to open the Colour Corrector.
2. Go to the Setup menu and then enable Auto Key to automatically add a keyframe to the animation curve each time you change a channel value.



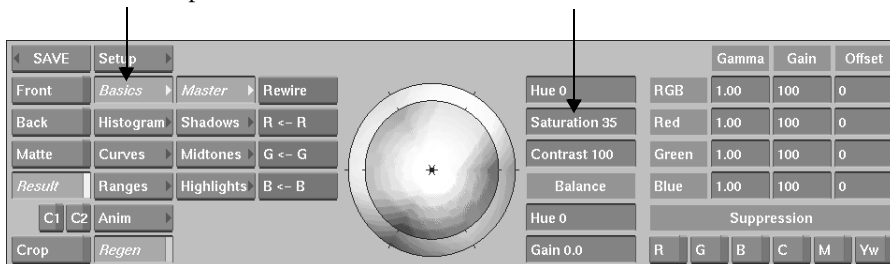
## Give the Clip a Sepia Tint

Tint the clip to add an antique look by adjusting the master saturation and hue.

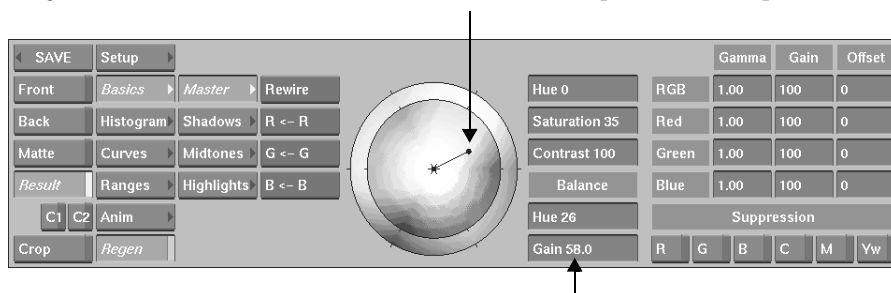
1. Using the Colour Corrector, you can animate the saturation and hue in a clip. Go to frame 1 to set the saturation for the entire clip.
2. Lower the saturation to reduce the intensity of the colours in the clip:

a) Click Basics to open the Basics menu.

b) Set Saturation to 35.



3. Drag the centre dot of the colour wheel as shown to add a sepia tint to the clip.



You can also by enter the values. Setting Hue to 26 and Gain to 58 gives a good result.

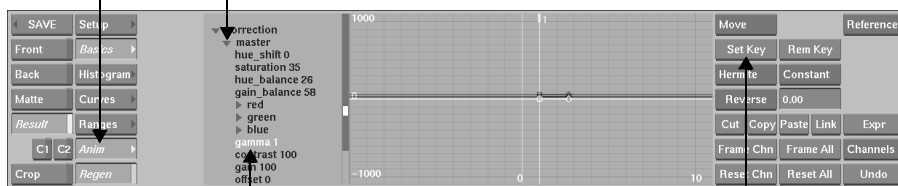
## Add the Strobe Effect

Animate the master gamma value to produce the strobe effect of an old movie projector.

1. Create a keyframe for the master gamma at frame 1:

a) Click Anim.

b) Open the master folder.



c) Click gamma. The value shown should be 1.

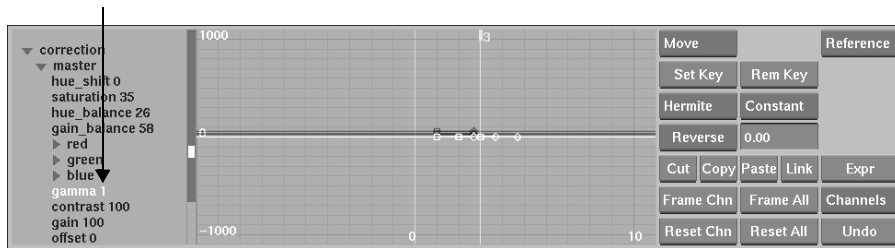
d) Click Set Key to set a keyframe for the gamma.

2. Set a second keyframe: go to frame 2 and change the gamma to 1.28.

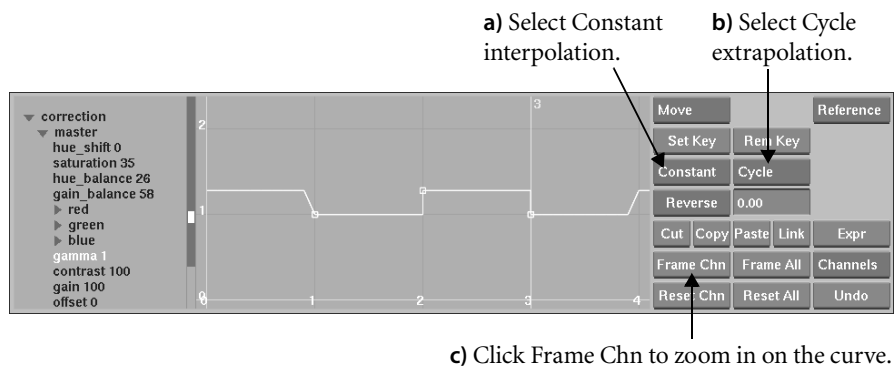




3. Set a third keyframe. Go to frame 3 and change the gamma back to 1.



4. You have created a single strobe between frames 1 and 3. Now cycle the strobe effect:

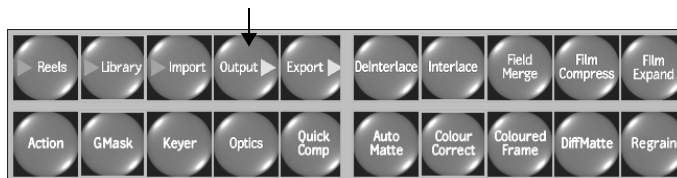


5. Click SAVE to return to Batch.

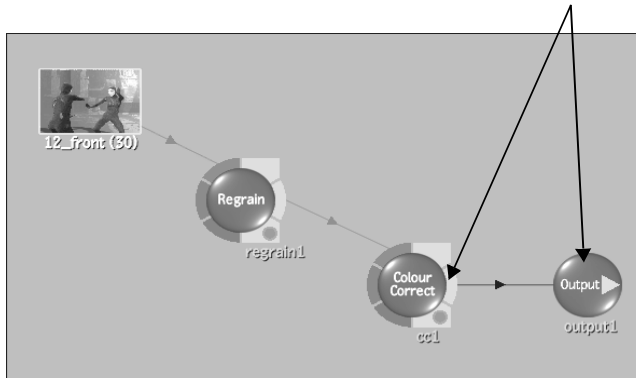
## Add an Output Node

You have added all the effects you need to create an old-style movie clip. Add an Output node to the process tree so you can output the final clip.

1. Swipe the bar at the left or right side of the menu panel to view the node bar.
2. Drag an Output node from the node bar to the Batch desktop.



3. Connect the Colour Correct node to the Output node. Drag from the Result tab on the Colour Correct node to the Output node.



## Check Your Results

Save the setup, process the clip, and compare your result to the *12\_result* clip.

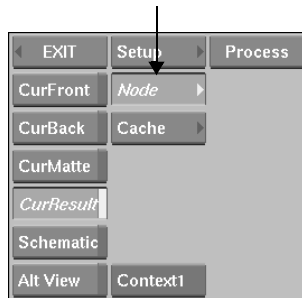
1. Save the Batch setup:
  - a) Click Setup to open the Setup menu.
  - b) Click Save As to open the browser.
  - c) Type a name for the setup file and press **ENTER**.

By default, Batch setups are saved in the `/usr/discreet/project/effects/<project name>/batch` directory.

**Hint:** You can save Batch setups and use them to apply frequently-used series of effects to other clips.

2. Open the Output menu:

a) Click Node.

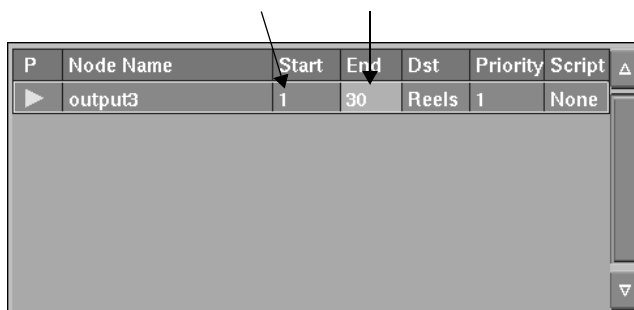


b) Select the Output node in the process tree to open the Output menu.

3. Set the length for the final clip:

a) Enter 1 in the Start box.

b) Enter 30 in the End box.



4. Click Process.

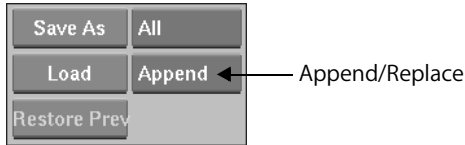
A clip of 30 frames is generated.

5. Click EXIT to return to the reels.

6. Use the Player to view your result clip. Compare your result to the *12\_result* clip.

7. (Optional) If the two clips do not match, return to Batch, go to the Setup menu and load the *12\_batch* setup file to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.

**Hint:** You can work with both your process tree and the one generated by the setup file at the same time by selecting Append in the Setup menu before loading the setup. Use the result proxies to compare results at each step.



8. Save your result clip in your clip library.
9. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- To produce a complex effect, you can eliminate the amount of processing time required for intermediate steps by building a process tree in Batch. You process the clip only once at the end.
- Building a process tree rather than processing intermediate steps also saves space on the framestore. Only the final output clip is generated.
- You build a process tree by adding and connecting process nodes. Each process node corresponds to a module of **flame** or **inferno**.
- You can apply grain to a clip using Regrain.
- To simulate a strobe effect, animate the Gamma value in the Colour Corrector.
- In Batch, you can work with more than one setup at once, use the result proxies at each step to compare the setups, and make modifications as needed.

# 13

## Modular Keying: Basic Techniques

You have already learned how to pull keys and create animated garbage mattes. Now, use the Modular Keyer to go beyond the limits of traditional keying techniques.

In this lesson:

- Learn about keying in three dimensional RGB colour space
- Use several techniques for setting softness, including using patches, modifying the softness ellipsoid, and vertex scaling
- Use the Modular Keyer's noise analysis tool to remove grain
- Modify the luminance of the edge in the composite using the front and back matte curves
- In Action, use a matte source node to apply the matte of one layer to another

### Need Help?

If you need help completing the exercises, load the setup file provided:

- In Exercise 1, click Load in the Action Setup menu, go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_13*, and load the setup file *13\_modular\_keyer\_ex1*.
- In Exercise 2, click Load in the Modular Keyer Setup menu, go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_13*, and load the setup file *13\_modular\_keyer\_ex2*.

## About the Modular Keyer

The Modular Keyer combines the power of the traditional Keyer with the flexibility and interactivity of Batch processing. There are tools for setting tolerance and softness, edge detection and refinement, noise analysis and removal, blending mattes, colour correction and suppression, and more. Using multiple nodes on processing branches dedicated to the front, back, and key-in clips, you can use the tools in any combination to build keys otherwise difficult or impossible to achieve.

## Using the 3D Keyer and RGB Viewer

The cornerstone of the Modular Keyer is the 3D Keyer. With the 3D Keyer and its accompanying RGB Viewer you interactively visualize and modify the various components of a key-in clip in three dimensional colour space.

The keying technique in the 3D Keyer consists of the following basic steps:

- sampling for tolerance
- sampling for softness
- analyzing and minimizing noise in softened areas
- removing unwanted greys in the key
- removing all remaining colour spill from the edge of the key

## Building the Processing Pipeline

Alongside the 3D Keyer is a vast selection of processing nodes, including: colour blending and correction, garbage mask, edge detection, logic ops, and many more. By placing nodes in the front, back, and key-in branches of the processing pipeline, you can layer different mattes, colour correct selected regions, mask others, and animate all of these to follow movement in the key-in clip.

Easy to manage, maintain, and update, the most complex keying strategies are processed in one step.

## Exercise 1: Basic Keying and Shadow Simulation

In this exercise, use the Modular Keyer to pull a key from a blue screen clip, keeping all of the detail in the talent's hair. Once you have the matte, apply it to a black frame in Action to create a shadow for the talent. By using an extended bicubic surface for the shadow, you can bend the shadow in 3D space to match it to the background of the composite.

Load the *13\_modular\_keyer\_ex1* reel onto the desktop from the clip archive on CD 3, "images." For instructions, see "Exercise 1: Loading the Source Clips" on page 71.

The reel contains the following clips.



*13\_front\_ex1*: This is the blue screen clip to be keyed.



*13\_back\_ex1*: This is the background for the composite.



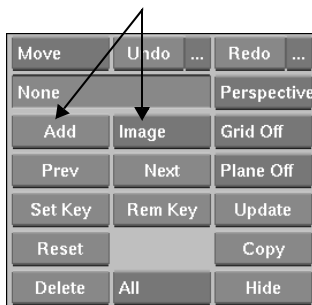
*13\_result\_ex1*: This is the final composite.

To preview the final composite, play the *13\_result\_ex1* clip using the Player.

## Access the Modular Keyer through Action

Like the traditional Keyer, you can access the Modular Keyer either from the Effects menu or through Action. In this exercise, you will key a clip and apply the matte to two layers in Action: one to create the foreground, and one to create the shadow. To do this, access the Modular Keyer through Action.

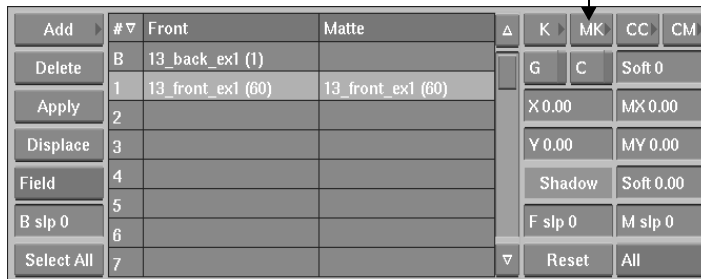
1. Create a black frame using Coloured Frame in the Processing menu. You will use this frame to create the shadow layer in Action later in the exercise.
2. Open Action:
  - a) Click Action in the Effects menu.
  - b) Select *13\_front\_ex1* as the front clip, *13\_back\_ex1* as the back clip, and *13\_front\_ex1* again as the matte clip (this is the key-in clip for the Modular Keyer).
  - c) Select a destination reel.
3. Reset all options to their default values: go to the Setup menu, click Reset All and Confirm.
4. Delete any objects that may remain from the last Action session: select All next to the Delete button, then click Delete.
5. In the Setup menu, enable the Texture button.
6. Add an image surface for Layer1:
  - a) Click Layers and select Layer1 in the Layers List.
  - b) Select Image and click Add.



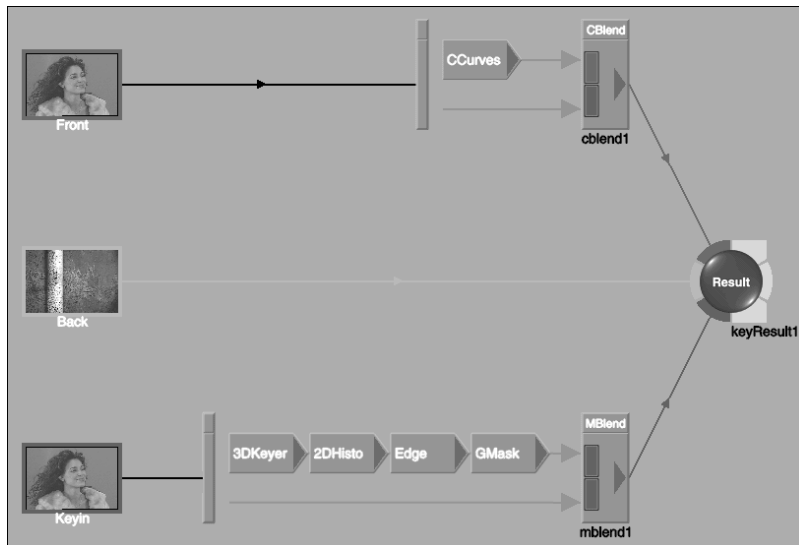
The image of the talent appears in the image window.



7. Click MK to load the source clips for Layer1 into the Modular Keyer.



The processing pipeline of the Modular Keyer appears on the desktop. The processing pipeline provides a flexible and interactive environment for creating keys. The basic pipeline consists of a branch for each of the front, back, and key-in clips.



The Front and Key-in branches consist of one or more nodes. Each node is a specific operation used to build the key, such as degraining or colour suppression.

- The Front branch is used for colour correction and colour suppression.
- The Key-in branch is used to create the matte.

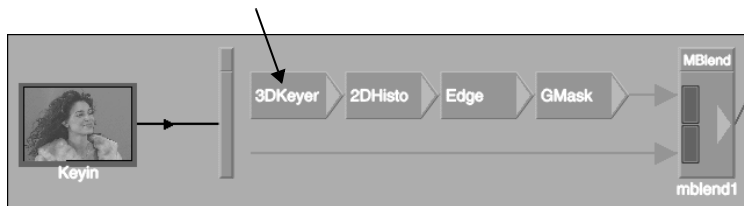
By default, there are no nodes on the Back branch. However, when you access the Modular Keyer from the desktop, you can add nodes to process the back clip if required. Additional processing is not applied to the back clip if you access the Modular Keyer through Action.

As you complete the following exercises, you will learn how to use each of the nodes, add and delete nodes, and modify the pipeline. For complete information on adding nodes to the processing pipeline, see the chapter “The Modular Keyer” in the *flame* or *inferno* *User’s Guide*.

## Set the Tolerance for the Key

As you learned in Lesson 5, “Precision Keying”, the first step in pulling a key is to set the tolerance (the range of colours to be keyed out). To do this, use the 3D Keyer.

1. Click the 3DKeyer node.



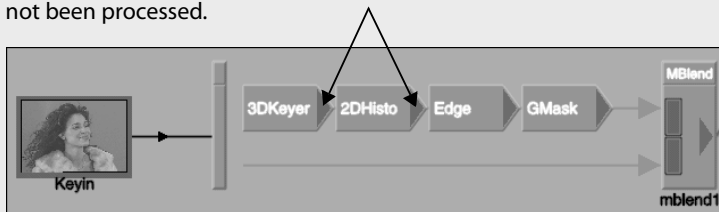
The 3D Keyer menu appears. Unlike the traditional Keyer, you do not have the option of selecting a particular colour space in which to set the tolerance. The tolerance is always set in RGB colour space.

**Hint:** When working with shadows and other difficult to key areas, you can choose to work with the luma axis of YUV colour space. For an example, see “Exercise 2: Keying a Shadow” on page 405.

## Colours Used in the Processing Pipeline

As on the reels, red, green, and blue are used to identify the front, back, and matte (or key-in) clips in the Modular Keyer, as well as the output of each of the branches in the pipeline.

Initially, all nodes in the pipeline contain a red triangle, which indicates that the node has not been processed.



When you click a node, its triangle and the triangles on all other nodes before it in the processing pipeline turn green. A green triangle indicates the node has been processed.

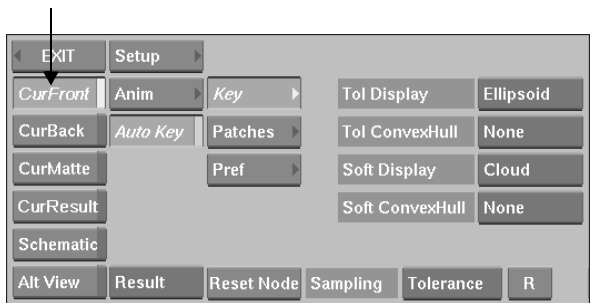
2. As in the traditional Keyer, the key setup in the 3D Keyer can be animated. It is important to set the tolerance and softness at frame 1, and make adjustments at subsequent frames if required:

a) If necessary, enable the Timeline button to view the timeline.



b) Go to frame 1.

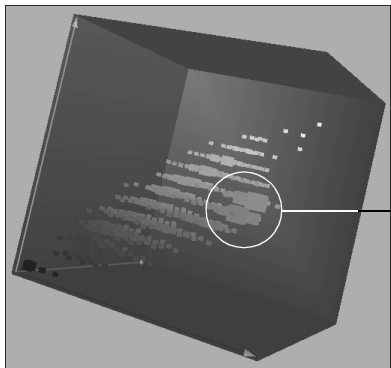
3. Select CurFront or press **F1** to view the key-in clip.



CurFront selects the front clip of the current node—in this case, the 3D Keyer node. The RGB Viewer also appears on the desktop.

4. The RGB Viewer is a representation of three-dimensional RGB colour space. To rotate the Viewer to see the red, green, and blue axes, press **CTRL** and drag the cursor over the Viewer.

Within the RGB Viewer, the 3D Histogram shows the distribution of colours in the image in 3D RGB colour space. The larger the size of the colour cube in the histogram, the greater the amount of that colour in the image.



In this example, the largest cubes are blue, indicating that this is the most prevalent colour. For more information on the distribution of colours, see “Understanding the 3D Histogram” on page 369.

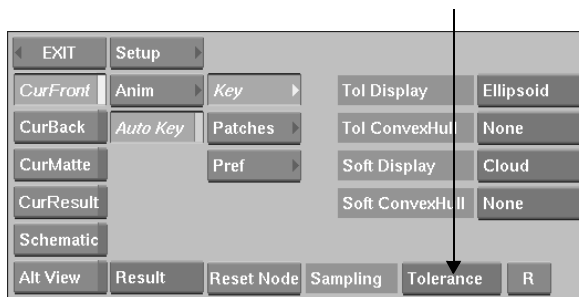
**Hint:** You can control the amount of detail visible in the histogram using the Opacity, Scaling, and Threshold controls in the 3D Keyer Preferences menu. Click Pref to open the Preferences menu. For more information about these controls, see the chapter “The 3D Keyer” in the *flame* or *inferno* User’s Guide.

5. Press **SPACEBAR** and drag the image to move it so it is not covered by the RGB Viewer.

Alternately, you can press **ALT** and drag the RGB Viewer.

6. Set the tolerance for the key:

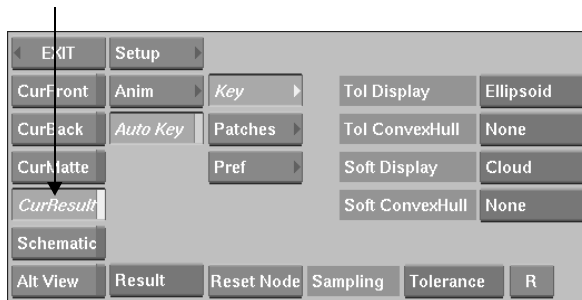
- a) Select Sampling Tolerance or press **T**.



- b) While pressing **CTRL**, drag a selection box over the blue background to be keyed out. Do not include the fine hairs of the talent in the sample. Repeat this procedure in several areas of the image to select a representative sample of pixels.



7. Select CurResult (F4) to view the matte so far. CurResult selects the result of the current node.

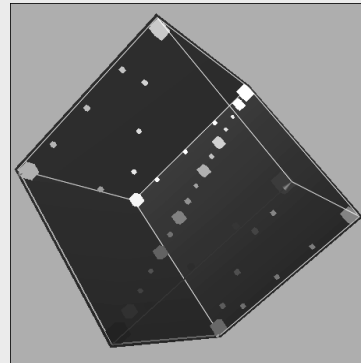


## Understanding the 3D Histogram

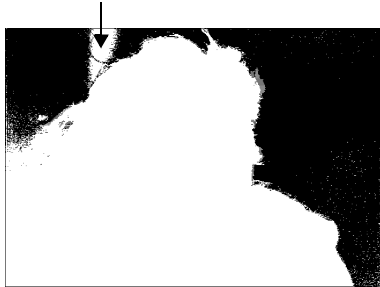
To understand how the colours in an image are plotted in the 3D Histogram, use Coloured Frame in the Processing menu to create a frame of PAL bars at 100%, and load this frame into the Modular Keyer.

The largest cubes of colour represent the solid colours of the bars. The smaller cubes represent the gradations of colour between the bars.

- The red cube is positioned at the maximum position of the red axis ( $R = 255, G = 0, B = 0$ ).
- Similarly, the green and blue cubes are positioned at the maximum positions of their respective axes.
- The pink cube is positioned at the maximum of the red and blue axes ( $R = 255, G = 0, B = 255$ ).
- The yellow cube is positioned at the maximum of the red and green axes.
- The cyan cube is positioned at the maximum of the green and blue axes.
- The point where the three axes meet is black ( $R = 0, G = 0, B = 0$ ).
- The maximum point on all three axes is white ( $R = 255, G = 255, B = 255$ ).
- The gradation of greys along the axis from black to white represents the brightness axis.



The white pixels on the background of the matte indicate that there are still some areas to be keyed out.



**Note:** Depending on the exact selections made when setting the tolerance and softness, the mattes obtained as you build your key may differ from those shown here. These illustrations should be used as a guideline only.

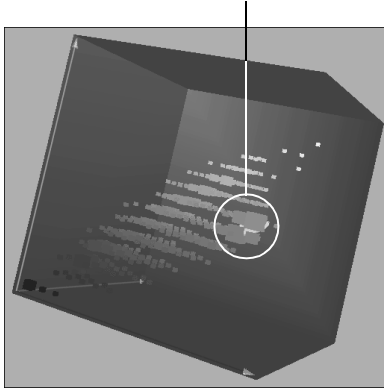
8. While pressing **CTRL**, drag a selection box over an area to be keyed out. Repeat until most of the background around the subject is black. The matte should look like this.



Remember, do not use tolerance to make the background completely opaque, or you will not have a large enough range in which to set the softness. You can always use a garbage mask to hide problem areas of the clip. In this example, the few pixels of white that may remain will be taken care of when you set the softness.

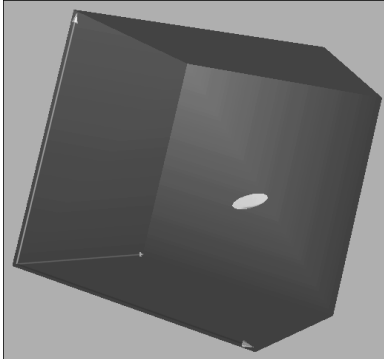
## View the Tolerance Ellipsoid

As you set the tolerance, an ellipsoid appears in the blue area of the 3D Histogram. All pixels with colour values inside the ellipsoid are keyed out (black) in the matte.



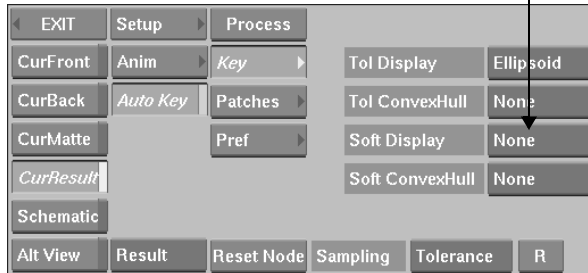
To understand how the tolerance of the key is determined by the ellipsoid, change the display in the RGB Viewer.

1. Press **H** to turn off the histogram (or disable Histogram in the 3D Keyer Preferences menu).

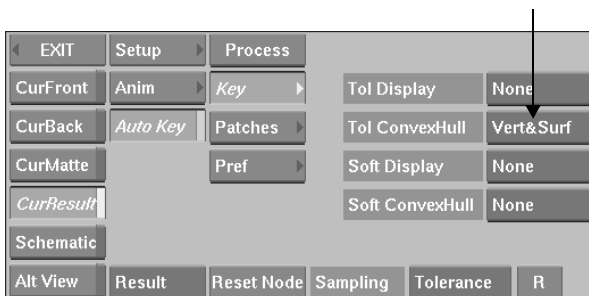


2. Zoom in on the ellipsoid by pressing **SHIFT** while dragging horizontally over the RGB Viewer.

3. By default, the softness for the key is set to the same value as the tolerance (you cannot have softness less than the tolerance). A softness ellipsoid or cloud is displayed with the tolerance ellipsoid. Set Soft Display to None to turn off the softness display.

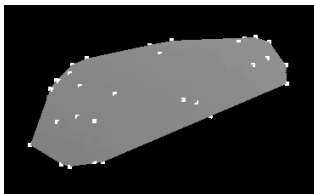


4. You can now see the blue ellipsoid, which represents the tolerance selected from the image. Set Tol Display to None to turn off this view.
5. Set Tol ConvexHull to Vert&Surf.



The tolerance range is now represented using an irregular shape called a convex hull. The red vertices on the convex hull represent the individual colour values selected when sampling the tolerance. The convex hull is built by connecting the red vertices.

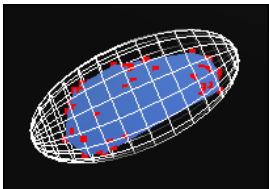
You may need to zoom in further to see the vertices clearly: press **SHIFT** while dragging horizontally over the RGB Viewer, and **ALT**-drag to pan.





It would take much too long to calculate and update the tolerance for the entire clip using this irregular shape. Instead, the Modular Keyer calculates the smallest possible ellipsoid that includes all selected points; this is called the minimal ellipsoid.

6. Set Tol Display to WireFrame to view the tolerance ellipsoid in wireframe mode. You can still see the convex hull within the ellipsoid.



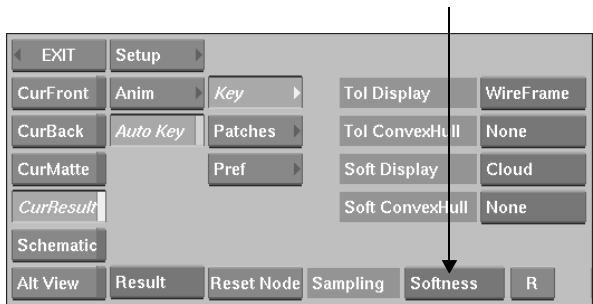
7. Set Soft Display to Cloud to turn on the softness display.
8. Set Tol ConvexHull to None to turn off the display of the tolerance convex hull.

As mentioned above, the softness is currently the same size as the tolerance ellipsoid. In the next step, increase the softness of the key.

## Set the Softness

Now that you have set the tolerance, set the softness for the key to remove the blue from the fine detail areas of the image.

1. Select Sampling Softness or press **S**.



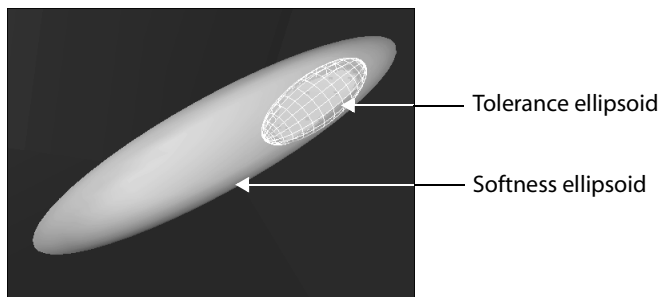
2. Click at the edge of the talent's hair and drag the eyedropper cursor towards the centre of the image.



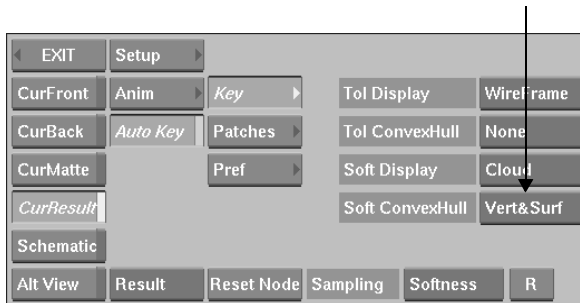
Softness is added to the key as you sample. It is a good idea to sample in small increments. If you add too much softness, you can click Undo to undo the last sample, or click R next to Softness to reset the softness and start again. Keep in mind that sampling in different areas may produce different results. Stop sampling when you can see a fair amount of detail in the hair.



As you sample the softness, the size of the softness ellipsoid in the RGB Viewer increases. Pixels with values inside the softness ellipsoid (but outside the tolerance ellipsoid) are grey in the matte.



**Hint:** The softness ellipsoid is calculated in the same way as the tolerance ellipsoid. To view its vertices and convex hull, select Vert&Surf next to Soft ConvexHull.



## Minimize Noise to Improve the Softness

There is a lot of noise in the talent's hair created by random white pixels in the softness range. The 3D Keyer includes a noise analysis tool to help you effectively minimize noise in a clip. Analyze the image, then scale the softness along the predetermined axis to remove the noise.

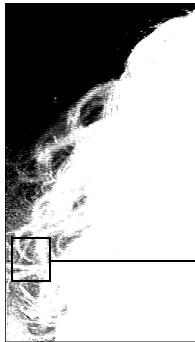
**Hint:** If the key-in clip itself contains grain, you may have problems setting the tolerance for the key because of the uneven distribution of colours. You can remove the grain from the key-in clip by adding a Degrain node to the processing pipeline before the 3DKeyer node. The grain in the front clip is not affected.

1. Select Minimize Noise in the Softness controls.



An arrow appears on the softness ellipsoid in the RGB Viewer.

2. While pressing **N**, drag a selection box over an area of noise in the image.

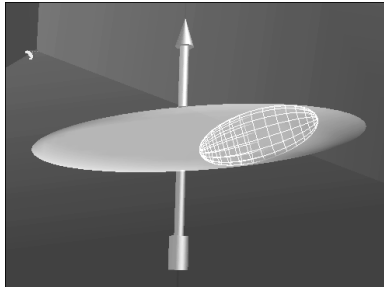


In this example, sample an area within the talent's hair.

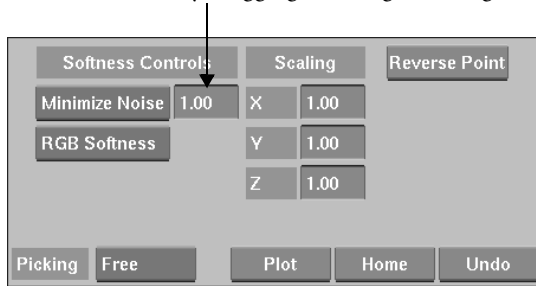
Notice that the selection box for noise analysis is yellow, instead of the red selection box used when sampling tolerance.

The sampled area is analyzed, and the arrow is repositioned on the softness ellipsoid. Resizing the softness ellipsoid along this axis minimizes the noise in the image.

3. Press **CTRL** and drag to rotate the Viewer so you can see the head and tail of the arrow from the side. (This step is not necessary to complete the procedure, but helps you to see what is happening as you scale the softness.)



4. Scale the softness by dragging to the right in the global softness field.



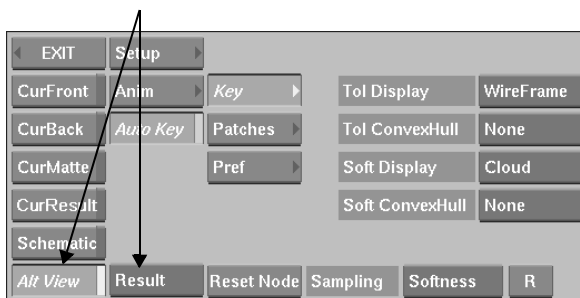
As you increase the softness, the ellipsoid is scaled along the directional axis, and noise is removed from the image. Notice that because the arrow is mapped on the XYZ axis in 3D space, the ellipsoid is scaled on all three axes simultaneously. When you release the cursor, the change is applied and the value in each field is set to 1.

5. Continue scaling the softness until grey areas begin to appear in the white region of the matte.



6. Toggle between CurFront (F1) and CurResult (F4) to see how the details in the hair are emerging.

You can also select Result and click Alt View (or press 4) to see the composite, which is the result of the entire processing pipeline.



7. To fine-tune the noise removal, try adjusting the individual softness scaling channels. In this example, increasing the Z scale may give a good result; the ellipsoid is scaled only along the Z component of the directional axis.



As in the previous instruction, increasing the softness removes noise but adds softness within the key. The next step is to remove these unwanted greys.

## Remove Unwanted Greys by Adjusting the Softness Ellipsoid

To get just the right amount of softness at the edges, you often end up with grey in the white areas of the matte. The foreground will be transparent in these areas unless you remove the grey. There are several ways to do this in the 3D Keyer:

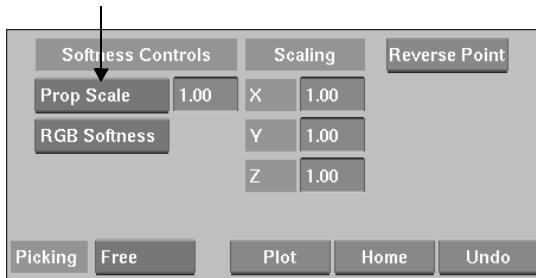
- In this step, adjust the softness ellipsoid to remove the grey.
- In the following step, use patches to achieve the same result.

For this step, you can use either the matte you are building, or load the setup provided for this part of the exercise. In either case, it is a good idea to save your key periodically as you are building it—if you add or remove too much softness, you can always return to an earlier stage in the process by loading the setup.

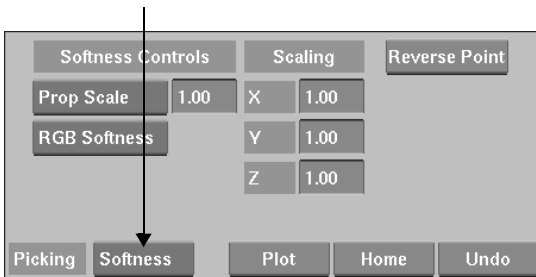
1. Save your setup so far:

- a) Click Setup to open the Setup menu.
- b) Click Save As to open the file browser. You should be at the default directory */usr/discreet/project/effects/<project name>/modularKeyer*.
- c) Type a name for your setup and press **ENTER**.

2. Load the setup for this part of the exercise:
  - a) Click Load to open the file browser.
  - b) Go to the directory `/usr/discreet/project/effects/Tutorial/setups/lesson_13` and select the setup file `13_patches_ex1`.
  - c) Remember that loading a setup overwrites the existing setup. As long as you saved your setup in the previous step, click Confirm.
3. Return to the 3D Keyer:
  - a) Press `~` to view the processing pipeline.
  - b) Click the 3DKeyer node.
  - c) Click CurResult (**F4**) to view the matte (the result of the current node).
4. Select Prop Scale (proportional scaling).



5. Select the softness ellipsoid:
  - a) Press **L** to view selection lines in the RGB Viewer (or enable Lines in the 3D Keyer Preferences menu).
  - b) Select Picking Softness.



A green outline box appears around the softness ellipsoid to show it is selected.

**Hint:** When Picking Free is selected, you can make a selection by clicking the ellipsoid or patch in the RGB Viewer.

6. Click Plot or press **O** (the letter O), then sample a point in the grey area to be removed.

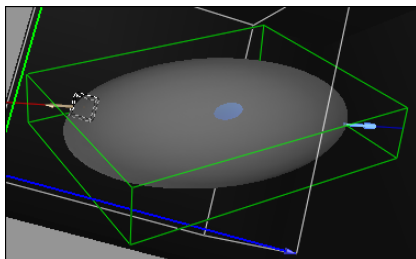


A plot point (outline cube) appears on the softness ellipsoid, indicating the position of the selected point. An arrow passes through the centre of the plot point.

**Hint:** Click Plot or press **O** each time you want to sample a point; otherwise you will add to the softness or tolerance.

7. Use directional-lock scaling to scale down the softness ellipsoid:

a) Press **CTRL** and drag to rotate the RGB Viewer to see the head and tail of the arrow from the side. (This step is not necessary to complete the procedure, but will help you to see what is happening as you scale the softness.)



b) While pressing **0** (zero), drag the cursor to the left across the Viewer to decrease the size of the ellipsoid. Stop when the plot point is just outside the softness ellipsoid and most of the grey is removed from the white areas of the matte.

With directional-lock scaling, the size of the ellipsoid at the head of the arrow is affected, but the point on the opposite side is locked to the arrow tail. This procedure removes the plotted point from the softness with the least impact on other points. See also “Adjusting the Softness Ellipsoid” on page 381.



8. Fine tune the result using the individual Softness Scaling fields. Remember that these reset to zero when the change is applied.
9. Save the setup before continuing with the next step.

## Use a Patch to Remove Unwanted Greys

In this step, learn how to use patches to remove grey from white areas of the matte. A patch is like a garbage mask in that it is used to hide problem areas within the key. However, instead of being spline-based, a patch is drawn by sampling the colour of the problem area.

1. Load the *13\_patches\_ex1* setup from the */usr/discreet/project/effects/Tutorial/setups/lesson13* directory. The following instructions apply specifically to this key setup. However, you can use the same techniques to remove the greys in your own setup.
2. Return to the 3D Keyer menu:
  - a) Press ~ to view the processing pipeline.
  - b) Click the 3DKeyer node.
  - c) Click CurResult (**F4**) to view the matte.

### Adjusting the Softness Ellipsoid

Several hot keys are available for adjusting the softness ellipsoid. First select the softness ellipsoid, then press the hot key and drag the cursor horizontally across the RGB Viewer until the required softness is achieved.

Press:	To:
<b>6</b>	Translate the ellipsoid in the direction of the arrow.
<b>7</b>	Rotate the ellipsoid. The arrow is used as the axis of rotation.
<b>8</b>	Scale the ellipsoid.
<b>9</b>	Use directional scaling. The ellipsoid is scaled in the direction of the arrow.
<b>0</b>	Use directional-lock scaling. The ellipsoid is scaled in the direction of the arrow head, but the point at the intersection of the arrow tail and the ellipsoid is locked in position.
<b>V</b>	Use vertex scaling. See "Refine the Softness Using Vertex Scaling" on page 412.

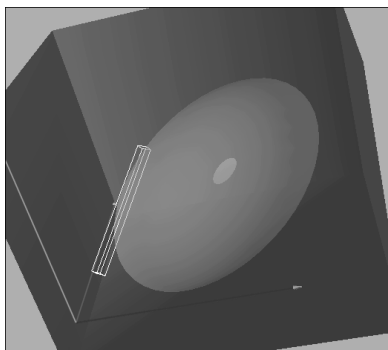
## 3. Create the patch:

a) Click Patches to open the Patches menu.

b) Click Active to enable Patch 1.

c) Select Sampling Patch1 or press **ALT-1**.d) While pressing **CTRL**, drag a selection box over an area of grey. Keep the selection box as small as possible and avoid including white areas of the key.

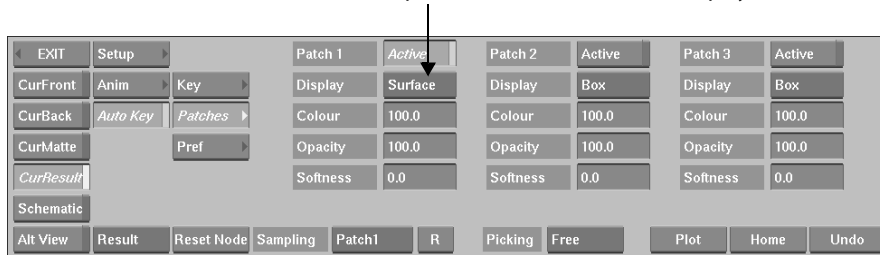
A patch box appears in the RGB Viewer. All pixels with colour values inside the box are set to white in the matte, and the grey in this area is removed.



Notice the box for Patch 1 intersects the softness ellipsoid. Because pixels with values in this region are set to white in the matte, the edge softness of the key may be reduced in certain areas. For this reason, a patch may not be effective in all cases. If the colours within the key and at the edge are too close together, you may need to use a garbage mask to hide the problem area.

4. Verify that the patch does not interfere with the edge softness: alternate between CurResult (**F4**) and Alt View Result (**4**) to toggle between the matte and the composite.

**Hint:** The patch is calculated in the same way as the tolerance and softness ellipsoids. To view the convex hull and vertices of the patch, select Surface as the display mode.



## Add a Second Patch

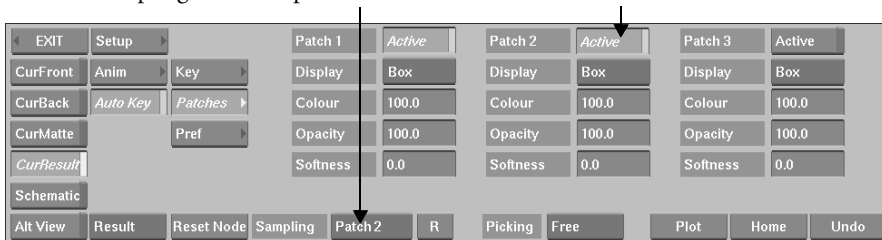
Use a second patch to remove the grey remaining in the area of the eyebrows.

1. Alternate between CurResult (**F4**) and Alt View Result (**4**) to toggle between the matte and the composite.

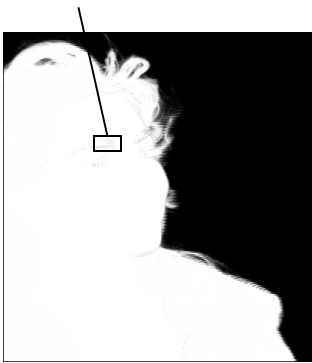
You can see that the colour in the area of the eyebrows is quite different from that in the coat where the first patch was used. Instead of adding to Patch 1, you need to create a second patch to remove this grey.

2. Create the second patch:

- a) Select Sampling Patch2 or press **ALT-2**.
- b) Click Active to enable Patch 2.



c) Press **CTRL** and drag a selection box over the grey eyebrow area.



A second patch box appears in the RGB Viewer, and the grey is removed.

3. If there is any grey remaining in the eyebrow area, remove it by adding to Patch 2: with Sampling Patch 2 still selected, press **CTRL** and select the remaining grey eyebrow area.

In certain cases, you may decide to add a third patch. However, because using a third patch increases processing time, it is usually better either to use other methods of adjusting the softness, or to use a garbage mask to hide the problem area.

4. Verify that Patch 2 does not interfere with the edge softness: alternate between CurResult (**F4**) and Alt View Result (**4**) to toggle between the matte and the composite.

Keep in mind that using patches achieves better results in some clips than in others. Depending on your clip, you may want to use a combination of techniques to remove unwanted greys, including:

- adjusting the softness ellipsoid
- using patches
- using a garbage mask

In “Exercise 2: Keying a Shadow”, you will learn how to use vertex scaling for even more precise adjustment of the softness.

**Hint:** You can also adjust the Colour, Opacity, and Softness of a patch. As you have seen in this example, setting Colour to 100 sets all pixels in the selected area of the matte to white. Setting Colour to 0 sets the pixels to black, allowing you to key out selected areas of the clip.

5. Save the setup before continuing with the next step.

## Animate the Key

In live-action clips, the tolerance and/or softness of the key may need to be adjusted as the subject moves. As you make the adjustments at different frames, the tolerance and softness are animated.

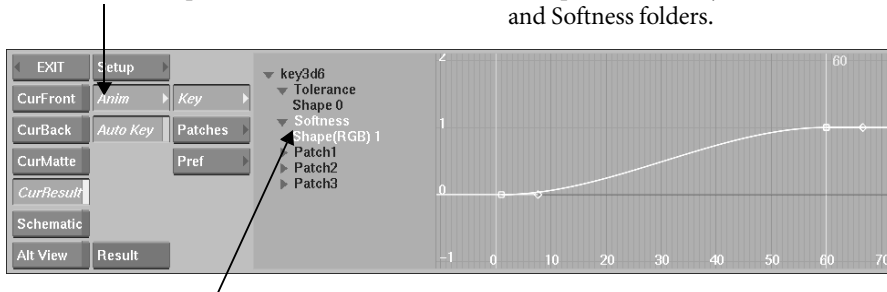
1. Load any of the setups you have created in this exercise.
2. Check the key every 5 frames (or 10 frames in longer clips) for additional grey areas to be removed. Adjust the softness as required using the techniques you have learned in this exercise.

**Hint:** It is important to make adjustments sequentially; jumping from the beginning to the end of the clip makes it difficult to predict the results of the interpolation, and can produce undesirable effects at intermediate frames.

3. View the animation curves:

a) Click Anim to open the Channel Editor.

b) Expand the 3DKeyer Tolerance and Softness folders.



c) Select the Softness folder and click Frame Chn.

The Tolerance and Softness each have a Shape channel. Adjusting either the tolerance or the softness at an intermediate frame of the clip creates a keyframe for the shape of the ellipsoid.

**Hint:** If the image changes dramatically from one frame to the next (for example, if a light is turned on in the shot), press **CTRL+ALT** to resample the tolerance at that frame. This resets and samples the tolerance, instead of simply adding to the existing tolerance range.

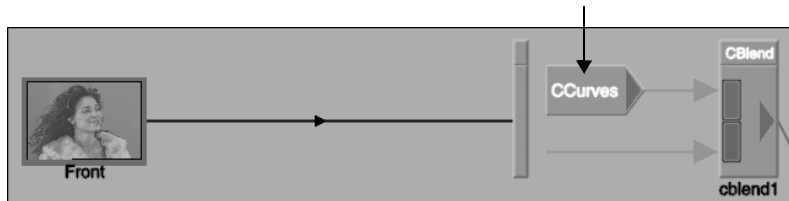
4. Click Alt View Result (4) to view the result so far.

There is still some colour spill to be suppressed.

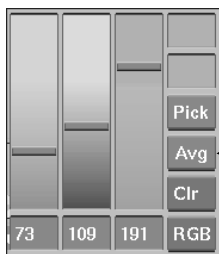
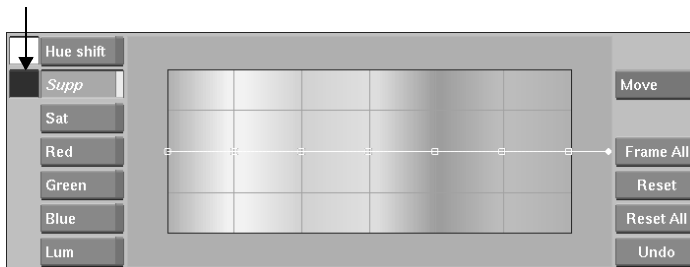
## Suppress the Colour Spill

The Colour Curves menu used to suppress colour spill in the Modular Keyer is the same as that used in the traditional Keyer.

1. Press ~ to view the processing pipeline.
2. Click the CCurves node on the Front branch to open the Colour Curves menu.



3. Click CurFront (F1) to view the front clip (the input clip for the current node).
4. Select the colour to be suppressed:
  - a) Click the Suppression colour box to open the colour picker.



- b) Click Avg in the colour picker.



c) While pressing **CTRL**, drag a selection box over the blue background to sample an average colour.

d) Click the Suppress colour box a second time to transfer the selected colour.

5. Click at the edge of the talent to sample the colour to be suppressed.

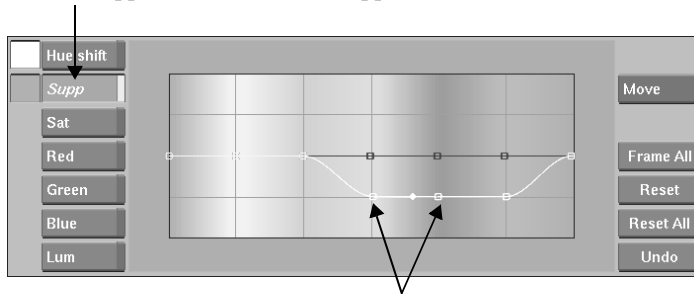
A red line showing the colour value of the selected pixel appears in the blue area of the hue spectrum.

6. Suppress the colour spill:

a) Go to frame 1.

b) Click Alt View Result (4) to view the result.

c) Click Supp to select the colour suppression curve.

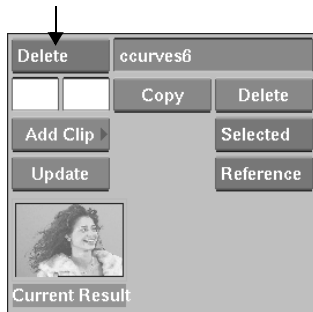


d) Drag the points on either side of the red line downwards until the value is 25. You may also want to lower the point in the magenta area as shown here.

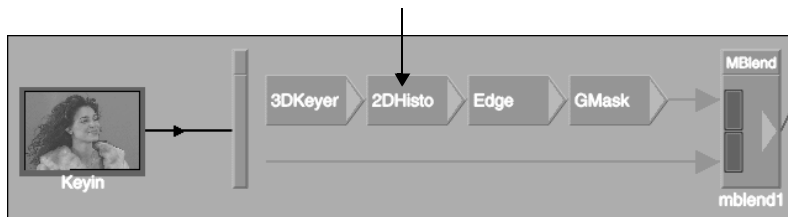
## Delete Unused Nodes

You may want to delete the nodes you are not using from the processing pipeline. This step is optional—nodes that appear in the pipeline after the 3DKeyer node but are not used do not affect the result. For more information on adding and deleting nodes, see the chapter “The Modular Keyer” in the *flame* or *inferno* *User’s Guide*.

1. Press ~ to return to the processing pipeline.
2. Select Delete or press **D**.



3. Click the 2DHisto node and Confirm to delete the node.



4. Click each of the Edge and GMask nodes, confirming each deletion.
5. Select Move or press **M** to disable Delete mode.



## Use the Matte Curves to Fine-tune the Key

As you create the matte for the front clip, the Modular Keyer automatically creates a matte to specify which part of the back clip is used in the composite. By default, the back matte is the inverse of the front matte.



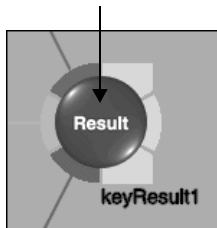
Front matte



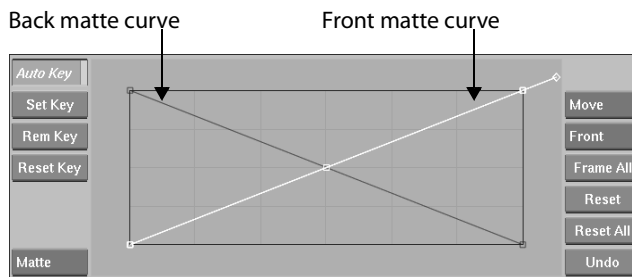
Back matte

To fine-tune the key, use the Matte Curves to adjust the size of the front and back mattes. This affects the luminance of the key edge, allowing either more of the front clip or more of the back clip to come through in the composite.

1. Click the Result node to open the Matte Curves menu.



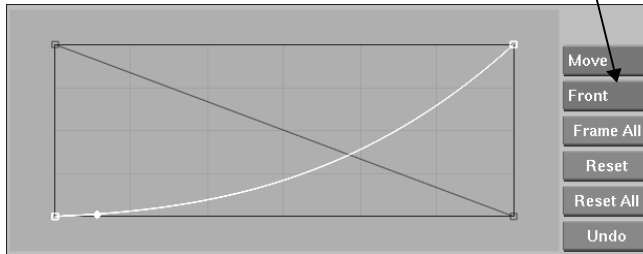
The matte curves represent the luminance values of the front and back mattes. Adjusting the slope of either curve affects the greys in the matte.



2. Click Alt View Result (4) to view the result clip.

**3. Adjust the front matte curve to make the hair a bit darker:**

- a)** Select Front to select the front matte curve.

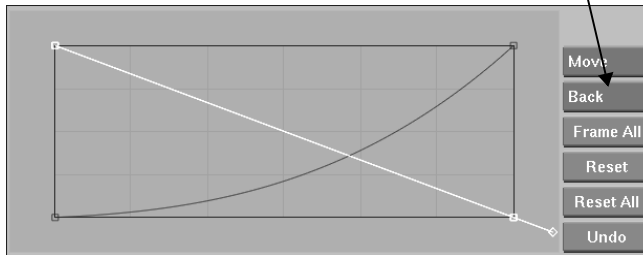


- b)** Adjust the tangent handles of the left and right control points to make the curve slightly concave.

The grey values of the front matte are lowered, thereby shrinking the front matte. More of the back clip shows through at the edges.

**4. Adjust the back matte curve to remove noise and soften the result:**

- a)** Select Back to select the back matte curve.



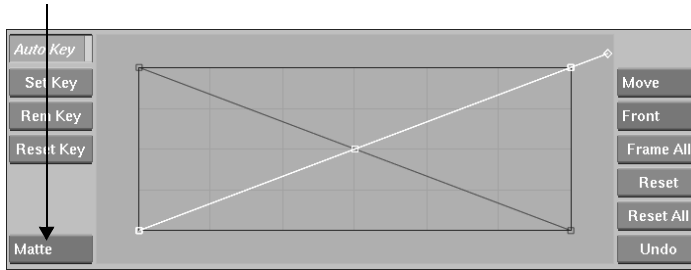
- b)** Adjust the tangent handles of the left and right control points to make the curve slightly convex.

The grey values of the back matte are raised, thereby expanding the back matte. More of the back clip shows through at the edges.

**5. Fine-tune the curves until you are satisfied with the result.**

The adjustments made with the Matte Curves are dependent on the clips used, the edge softness, and your personal preference. Some experimentation with the curves is usually required to obtain the best result.

**Hint:** Select Matte or BMatte to view the front and back mattes, respectively. Make sure Result is selected in order to view the result clip when you click Alt View Result (4).



6. Some noise remains in the bottom-left corner of the key. Adjust the tolerance to remove it:

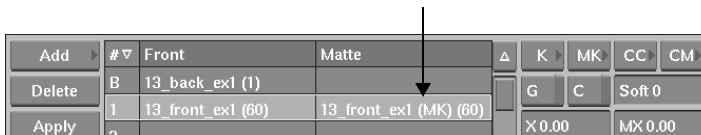
- a) Press ~ to return to Schematic view.
- b) Click the 3DKeyer node.
- c) Go to frame 1.
- d) Click CurResult (F4) to view the matte.
- e) Press T to select Sampling Tolerance.
- f) Click in the bottom-left corner of the image to add to the tolerance.

**Hint:** Whenever you add to the tolerance, verify that the overall key is not affected. You may want to use a garbage mask to hide problem areas instead.

7. The key is finally complete:

- a) Save your setup.
- b) Click Exit to return to Action.

Notice that the notation (MK) appears next to the layer name in the Layers List, indicating this layer has been keyed using the Modular Keyer.

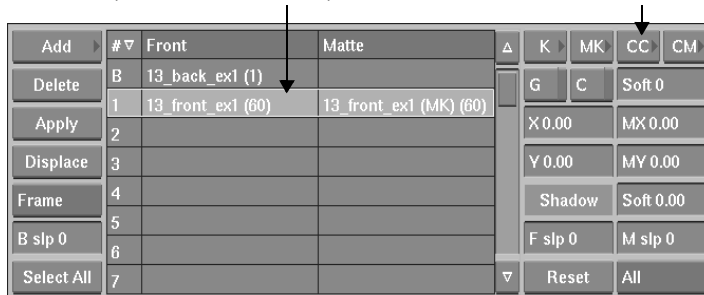


## Make a Final Colour Correction

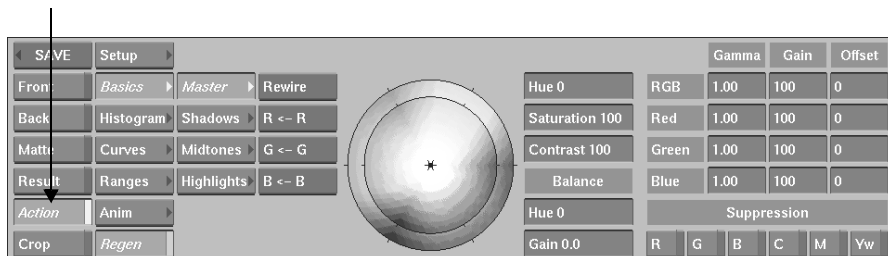
Make a final adjustment to the composite by colour correcting the talent to fit with the background. It's easy to match colours in different layers of a composite using in-context colour correction.

1. Load the front clip of Layer1 into the Colour Corrector:

- a) Click Layers.      b) Select Layer1.      c) Click CC (colour correct).



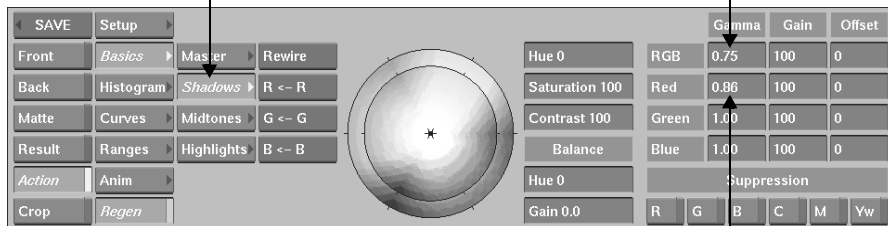
2. To view the scene as it appears in Action, click Action in the Colour Corrector menu.



3. To darken the front image, reduce the gamma of various channels. The specific values used in the setup provided for this exercise are given below. You may want to experiment using your own values.

a) Click Shadows to adjust the shadow areas.

b) Set the gamma of the RGB channel to 0.75.



c) Set the gamma of the red channel to 0.86.

4. Adjust the midtones:

a) Click Midtones.

b) Set the gamma of the RGB channel to 0.83.

c) Set the gamma of the red channel to 0.96.

5. Adjust the highlights:

a) Click Highlights.

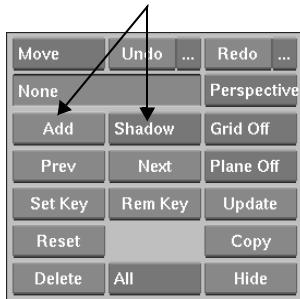
b) Set the gamma of the RGB channel to 2.31.

c) Set the gamma of the blue channel to 1.31.

6. Click SAVE to return to Action.

## Add a Shadow

In Action, you can add a shadow for a layer simply by selecting Shadow and clicking Add.

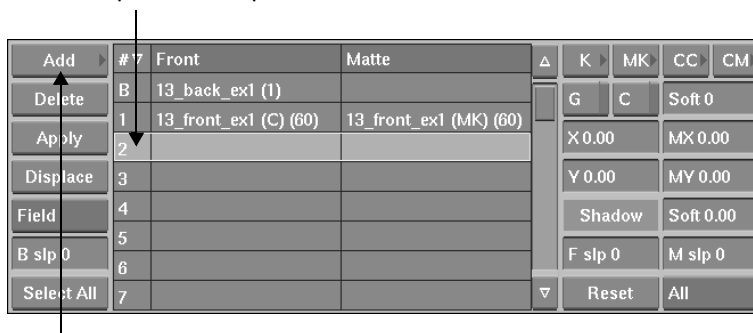


A shadow added in this way is a drop shadow created from the matte of the layer. You can adjust the transparency and softness of the shadow using the Surface Shadow menu, or blur it using the Shadow Softness field in the Layers menu.

However, suppose you want to cast the shadow along a floor and then have it bend up a wall. You cannot do this with a drop shadow, because the shape of the surface cannot be changed. In the following steps, add a shadow using a matte source node and an extended bicubic surface.

- A matte source node is used to separate the matte from the image of a layer. You can then animate the matte independently of the image, or, as in this exercise, use a matte from a different layer.
  - An extended bicubic can be subdivided to make a mesh, which can then be manipulated in 3D space.
1. Before adding the extended bicubic, you need to add a second layer. Load a black frame to use for the shadow into Layer2:

a) Select Layer2 in the Layers List.



b) Click Add to view the reels.

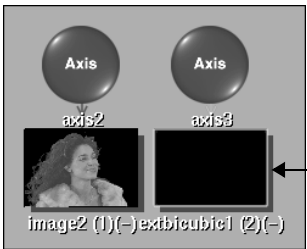
c) Select the black frame as the front and matte clips.

2. With Layer2 still selected, select ExtBicubic and click Add.



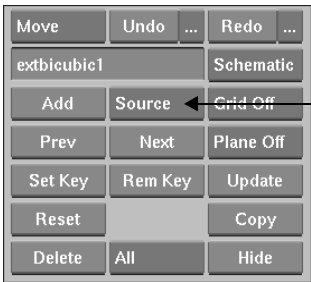
The extended bicubic appears in the image window. The image is transparent because the matte is on, but the control points and axis are visible. When first added, the extended bicubic has the same number of control points and tangent handles as a regular bicubic surface. You will subdivide it to create a mesh later in the exercise.

3. To make the black frame look like the shadow of the talent, you need to apply the matte of Layer1 to the extended bicubic. First, add the matte source node:



a) Press ~ to go to Schematic view.

b) Select the extended bicubic.

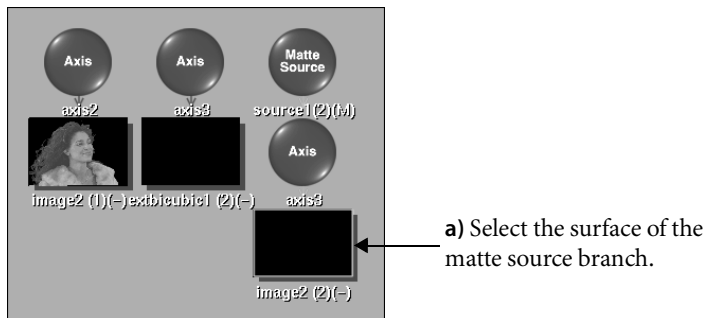


c) Select Source and click Add.

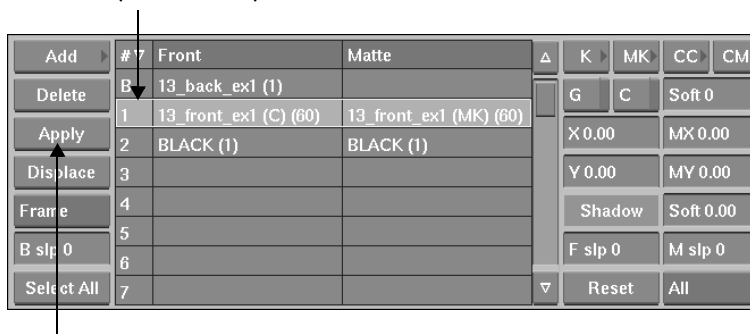
The matte source node appears in the schematic.

**Hint:** A front source node is used to separate the front image from the matte.

4. Next, apply the matte of Layer1 to the matte source node:

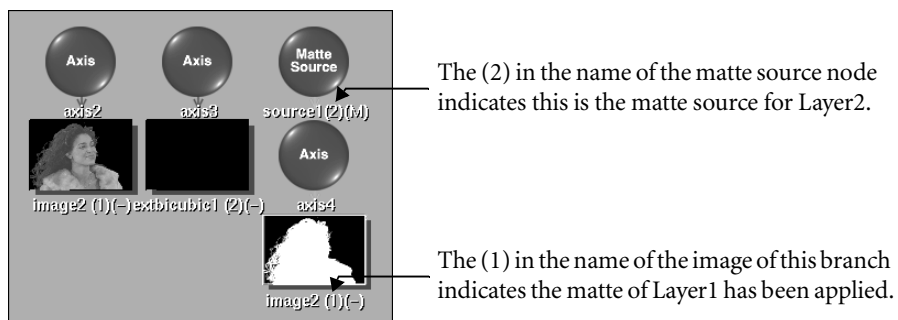


- b) Select Layer1 in the Layers List.



- c) Click Apply.

The matte of Layer1 is applied to the surface of the matte source branch.



5. Press ~ to return to Perspective view.

The shadow appears in front of the talent. The next step is to reposition the layers.

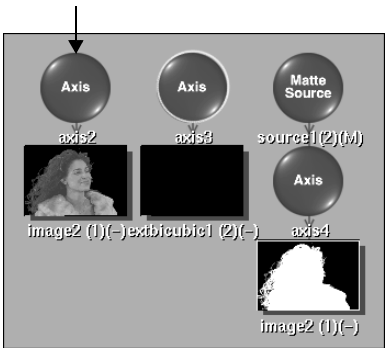


# Position and Adjust the Shadow

Position the shadow behind the talent, then add some transparency and softness to make the shadow more realistic.

1. Bring the talent in front of the shadow:

a) Go to Schematic view (~) and double-click the axis of the talent to open the Axis menu.



b) Return to Perspective view.

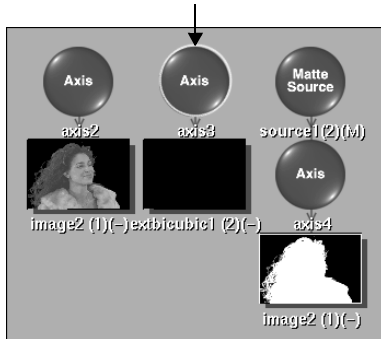
c) In the Axis menu, set Position Z to 20.

EXIT	Setup	Process	Position	Rotation	Scaling	Shearing	Center
Front	On	Layers	X 0.00	X 0.00	X 100.00	X 0.00	X 0.00
Back	On	Camera	Y 0.00	Y 0.00	Y 100.00	Y 0.00	Y 0.00
Matte	On	Surface	Z 20.00	Z 0.00	Z 100.00	Z 0.00	Z 0.00
Result	Frame	Axis	MotionPath	Prop Scale			
		Light	Global				
Preview	Anim	Text	S	Track	Rot Off	Scale Off	

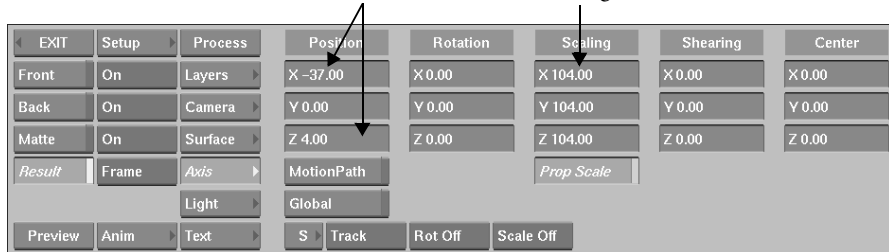
The talent appears in front of the shadow.

## 2. Offset the shadow:

a) In Schematic view, select the axis of the extended bicubic. Return to Perspective view.



b) Set Position X to -37 and Position Z to 4.      c) Set Scaling to 104.



Notice the artifacts in the region of the talent's hair.

**PAL**

If you are working in PAL, set Position X to -56 and Scaling to 102.

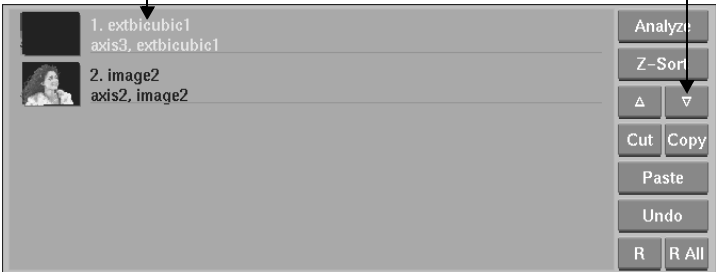
## 3. Remove the artifacts by changing the priority of the layers:

a) Go to frame 1 before changing the priority.

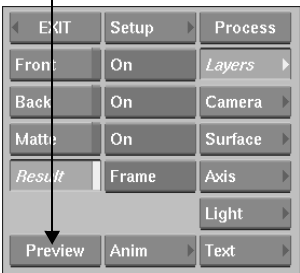
b) Click Layers to view the Layers List.

c) Swipe the cursor across the bottom of the Layers List to view the Priority Editor.

- d) Select the extended bicubic.
- e) Click ▾ to push the shadow behind the talent.



4. Click Preview to render the current frame.



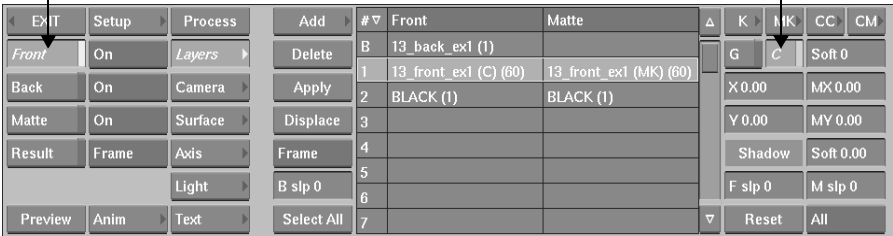
Because the image is smaller than the frame size, there is a black line in the result. You need to either crop or resize the layers to get rid of the black line.

**PAL**

If you are working in PAL, the black line does not appear. The image has already been resized during the NTSC-to-PAL conversion. Proceed to instruction 7 on page 400.

5. Crop Layer1:

- a) Select Layer1 in the Layers List.
- b) Click Front (F1) to view the front clip.
- c) Click C (crop) to enable the crop box.



d) Drag the control points at the corners of the crop box to crop the black edges.



6. Crop Layer2 in the same manner:

a) Select Layer2 in the Layers List.

b) Press **F1** to view the front clip (the black frame).

c) Click C to enable the crop box.

d) Position the control points to crop the image as for Layer1.

e) Press **F4** and click Preview to check the result. If you still see a black line, adjust the position of the crop box.

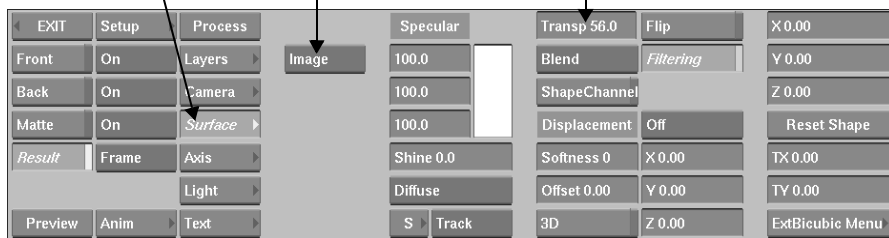
7. Add some transparency to the shadow:

a) Select the extended bicubic in Schematic view, then return to Perspective view.

b) Click Surface.

c) Select Image.

d) Set Transp (transparency) to about 56.



8. Blur Layer2 to add some softness to the shadow:

a) Click Layers.

b) Select Layer2.

c) Set X and Y blur to 5.

EXIT	Setup	Process	Add	# 7	Front	Matte	Δ	K	MK	CC	CM
Front	On	Layers	Delete	B	13_back_ex1 (1)			G	C	Soft 0	
Back	On	Camera	Apply	1	13_front_ex1 (C) (60)	13_front_ex1 (MK) (60)		X 5.00		MX 0.00	
Matte	On	Surface	Displace	2	BLACK (1) (A)	BLACK (1) (A)		Y 5.00		MY 0.00	
Result	Frame	Axis	Frame	3				Shadow		Soft 0.00	
		Light	B slp 0	4				F slp 0		M slp 0	
Preview	Anim	Text	Select All	5							
				6							
				7				Reset		All	

Bend the Shadow

Bend the shadow around the column in the back clip.

1. Hide Layer1 in order to work with the extended bicubic:

a) Select the axis for Layer1 in Schematic view.

Axis

axis2

Image2 (1)(-)

Axis

axis3

extbicubic1 (2)(-)

Matte Source

source1 (2)(M)

Axis

axis4

image2 (1)(-)

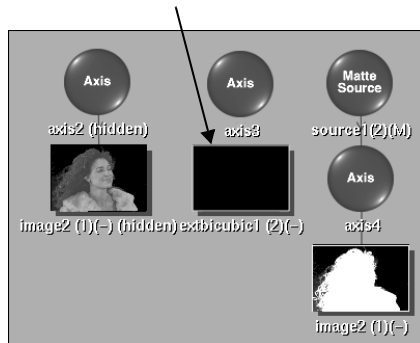
Move	Undo ...	Redo ...
axis2		Schematic
Add	Source	Grid Off
Prev	Next	Plane Off
Set Key	Rem Key	Update
Reset		Copy
Delete	Branch	Hide

b) Select Branch.

c) Click Hide or press H.

## 2. Open the Extended Bicubic menu:

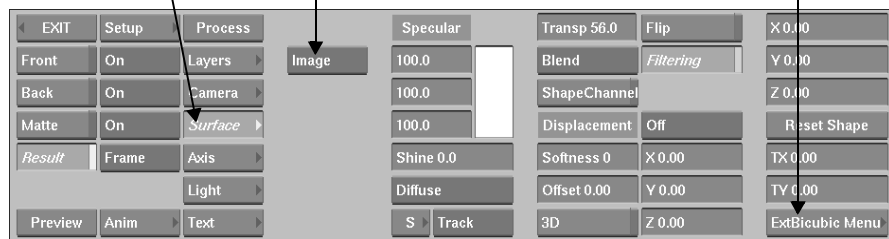
### a) Select the extended bicubic.



### b) Click Surface.

### c) Select Image.

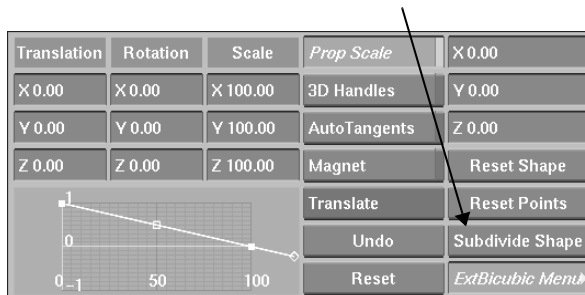
### d) Click ExtBicubic Menu.



## 3. Subdivide the extended bicubic to make more mesh points available for manipulation:

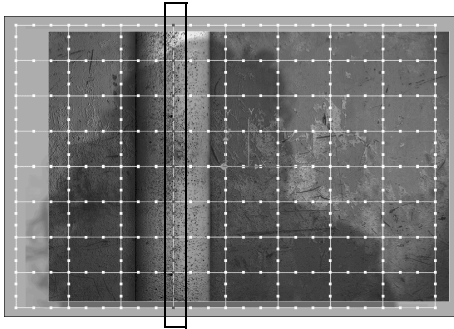
### a) Return to Perspective view (~).

### b) Click Subdivide Shape three times.

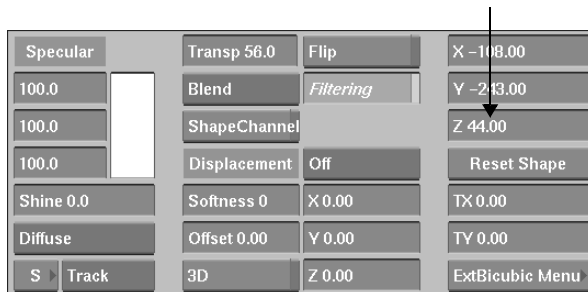


4. To make the shadow look like it is wrapped around the column, bring the mesh points over the column forward on the Z axis:

a) While pressing **CTRL**, drag a selection box around the mesh points on top of the column. (It does not matter whether you include the tangent handles of the points in the selection or not.)



b) Set the Z position of the selected points to 44.

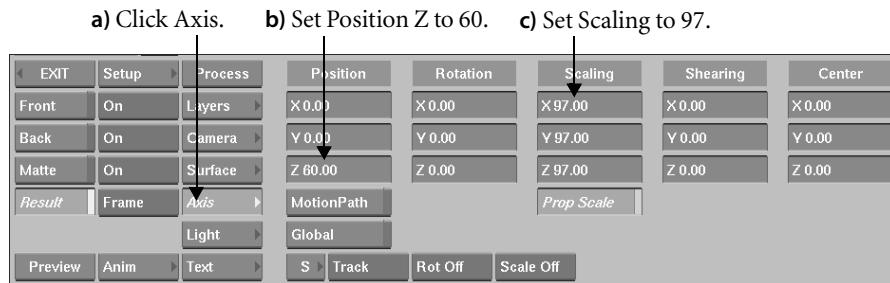


For other methods of changing the shape of an extended bicubic, see the chapter “Action: 3D Geometry” in the *flame* or *inferno* User’s Guide.

5. Unhide Layer1:
- Select the axis for Layer1 in Schematic view.
  - Press **H**.
  - Return to Perspective view (~).

Because you brought the points on the extended bicubic forward on the Z axis, they poke through Layer1.

6. Bring Layer1 forward on the Z axis, so it is in front of the modified extended bicubic:



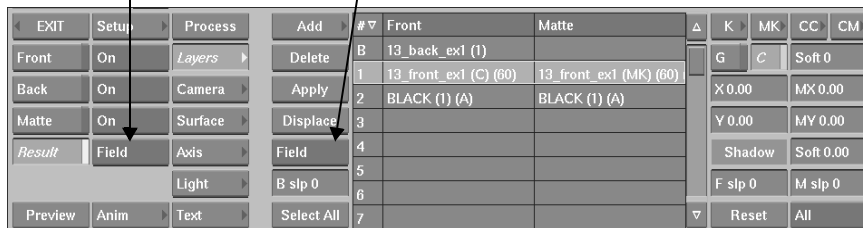
Congratulations! The composite is finally complete.

## Check Your Results

Save the setup, process the clip, and compare the result to the *13\_result\_ex1* clip.

1. Since the clip was shot in fields, render the result in fields:

- a) Select Field in the Global Rendering box.      b) Make sure Field rendering is also selected for Layer1.



**Hint:** Unless otherwise specified, the Global Rendering option is applied to all layers. You can select frame or field rendering for individual layers using the Frame/Field box next to the Layers List.

- Go to the Setup menu and save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
- Go to frame 1 and click Process.
- When the clip has been processed, click Exit to return to the reels. The processed clip appears on the destination reel.



5. Use the Player to view your result clip. Compare your result to the *13\_result\_ex1* clip.
6. If the two clips do not match, return to Action and load the setup file *13\_modular\_keyer\_ex1* from the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_13* to see how the key should appear. For instructions, see “Load the Exercise Setup File” on page 159.
7. Save your result in your clip library.
8. Delete the result clip and exercise reel from the desktop.

## Exercise 2: Keying a Shadow

In this exercise, use the Modular Keyer to key a subject and shadow in one pass.

Load the *13\_modular\_keyer\_ex2* reel from the clip archive on CD 3, “images” onto the desktop. For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*13\_front\_ex2*: This is the blue screen clip to be keyed.



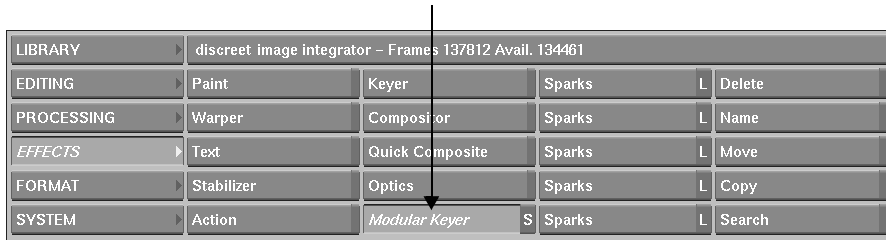
*13\_result\_ex2*: This is the keyed shot on a white background.

To preview the composite, play the *13\_result\_ex2* clip using the Player.

## Open the Modular Keyer

Load the source clips and reset the Modular Keyer.

1. Create a white frame to use as the background using Coloured Frame in the Processing menu.
2. Click Modular Keyer in the Effects menu.

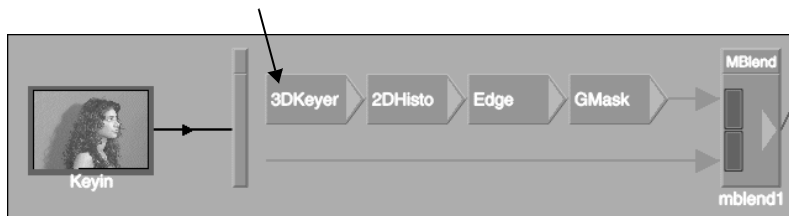


3. Select *13\_front\_ex2* as the front clip, the white frame as the back clip, and *13\_front\_ex2* as the key-in clip.
4. Select a destination reel.  
The Modular Keyer menu and processing pipeline appear.
5. Reset all options to their default values: go to the Setup menu, click Reset All and Confirm.

## Set the Tolerance for the Key

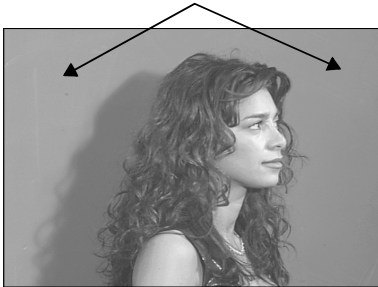
Use the 3D Keyer to set the tolerance for the key.

1. Go to frame 1 to build the key.
2. Click the 3DKeyer node.



3. Set the tolerance:

- a) Click CurFront (**F1**) to view the front clip.
- b) Press **T** to select Sampling Tolerance.
- c) While pressing **CTRL**, drag a selection box over the blue background to be keyed out. Do not sample in the shadow. Repeat in another area of the image to select a representative sample of pixels.



4. Click CurResult (**F4**) to view the matte so far (the current result).



**Note:** Depending on the exact selections made when setting the tolerance and softness, the mattes obtained as you build your key may differ from those shown here. These illustrations should be used as a guideline only.

- 5. If necessary, key out any large white areas remaining in the background (outside of the shadow): press **CTRL** and drag over the white areas.

## Set the Softness and Minimize Noise

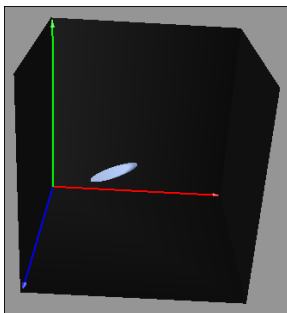
Set the softness using the luma axis of the YUV colour space. This results in less grain in the shadow softness.

1. Press **H** to turn off the histogram to see the softness ellipsoid more clearly.
2. Select YUV Softness.

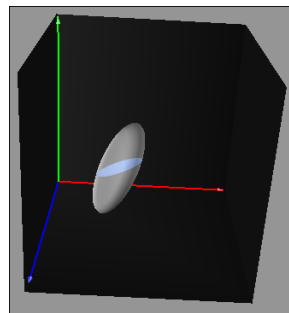


Notice that the softness ellipsoid is re-oriented in the RGB Viewer.

With RGB Softness, the softness ellipsoid has the same axis of orientation as the tolerance ellipsoid.



With YUV Softness, the softness ellipsoid is re-oriented along the luma axis of YUV colour space.



Selecting YUV Softness orients the softness along a “virtual luma axis” within the RGB Viewer. The colour space mapping within the Viewer itself does not change.

3. Sample softness:

- a) Press **S** to select Sampling Softness.
- b) Click at the edge of the shadow and drag the eyedropper cursor inwards.

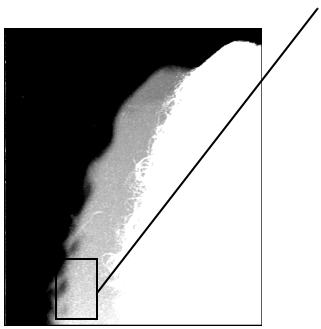


4. Use Minimize Noise to reduce the graininess of the shadow:

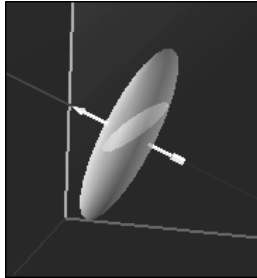
- a) Select Minimize Noise.



- b) While pressing **N**, drag a selection box to sample a fairly large area within the shadow.

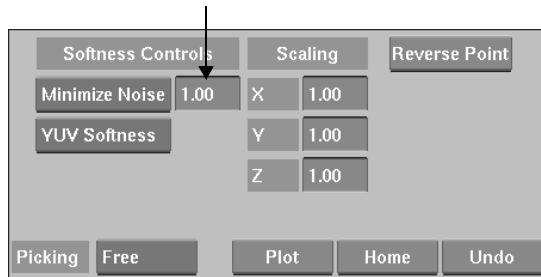


An arrow appears on the softness ellipsoid, indicating the best direction in which to scale the softness to minimize the noise in the key.



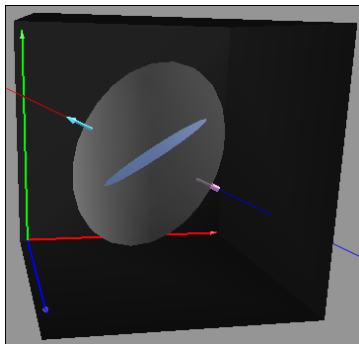
5. Scale the softness to reduce the noise in the key:

a) Increase the softness by dragging right in the global softness field.

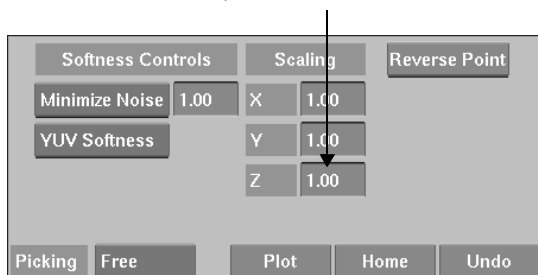


b) Continue scaling up the softness until there is no further improvement in the softness.

At this point, the softness ellipsoid looks something like this.

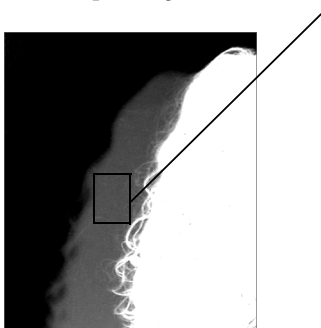


6. Fine-tune the noise removal by adjusting the individual softness scaling channels. In this example, increasing the Z scale may produce a good result. You should be able to include all the fine hairs in the key.



7. Perform a second noise analysis:

- a) While pressing **N**, select an area within the shadow.



- b) Increase the softness by dragging right in the global softness field. Stop scaling when there is no further improvement in the softness.

- c) Fine tune the noise removal by adjusting the individual softness scaling channels.

Stop scaling when there is no further improvement in the softness, or when grey areas appear in the white region of the matte.

As you learned in the previous exercise, you may need to compromise some softness to make the subject of the key opaque. For now, get the best softness, then use other tools to fix the white areas.

## Refine the Softness Using Vertex Scaling

In this step, make further refinements to the softness using vertex scaling. This technique involves selecting a point in the area you want to include in the softness, and reshaping the softness convex hull to include the selected point.

1. Click Alt View and select Result, or press **4** to view the result so far.

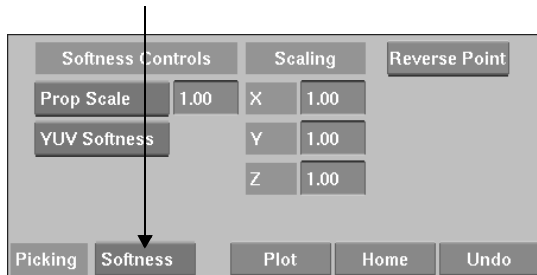
By refining the softness even further, it is possible to reduce the blue halo around the talent.



2. Turn off the minimize noise feature by selecting Prop Scale.



3. Select the softness ellipsoid by selecting Picking Softness.

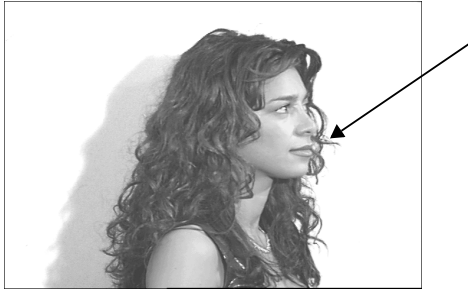


**Hint:** To view the selection lines in the RGB Viewer, press **L**.



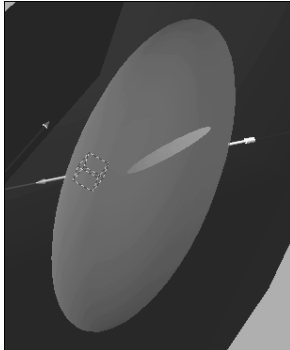
4. Plot a point in the blue:

- a) Click Plot or press **O**, then pick a point in the blue halo around the talent's hair.



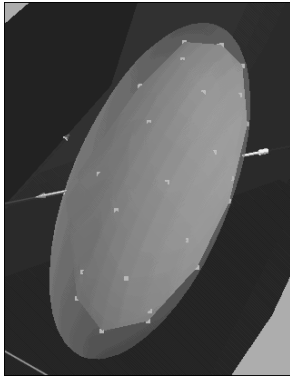
A plot point (outline cube) appears on the softness ellipsoid, indicating the position of the selected point. An arrow passes through the centre of the plot point, indicating the direction in which scaling should occur.

- b) Press **CTRL** and drag the Viewer until you can see the arrow from the side. (This step is not necessary to complete the procedure, but helps you to see what is happening as you scale the softness.)



5. While pressing **V**, drag to the right over the Viewer.

As you are dragging, the softness convex hull appears and a point is added where the arrow head and convex hull intersect. Dragging to the right pulls the point and reshapes the convex hull. The softness ellipsoid is recalculated based on the new shape.



When adjusting softness, vertex scaling is more accurate than scaling or translating the softness ellipsoid because you are recalculating the minimal ellipse instead of resizing or moving the entire softness ellipsoid.

**Hint:** You can also use vertex scaling to reduce the softness or remove unwanted greys. Plot a point in the required area as described above, then press **V** and drag over the Viewer to reshape the convex hull and exclude the selected point.

6. Toggle between the result (4) and the matte (**F4**). Stop scaling when you are satisfied with the edge softness.

Scaling the softness may have introduced grey in the white region of the matte. In the next step, use patches to correct the matte opacity.



## Use Patches to Remove Grey from the White Areas

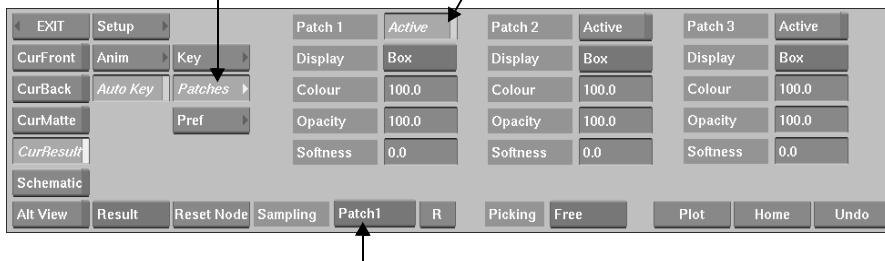
As you learned in the previous exercise, there is more than one way to remove grey from the white areas of the matte. When creating the key for this clip, we found that using a patch effectively removes the grey without greatly affecting the edge softness. Depending on how you set the tolerance and softness in your clip, using a patch may or may not be the best technique. Instead, you may decide to use any of the other available techniques, including:

- vertex scaling
- scaling or translating the softness ellipsoid
- using a garbage mask

### 1. Create the patch:

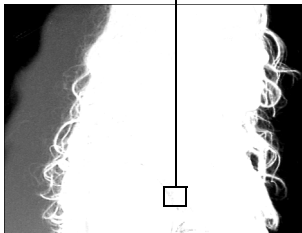
a) Click Patches to open the Patches menu.

b) Click Active to enable Patch 1.



c) Select Sampling Patch1 or press **ALT-1**.

d) While pressing **CTRL**, drag a small selection box over an area of grey.



A patch box appears in the RGB Viewer. All pixels with colour values inside the patch are set to white in the matte.

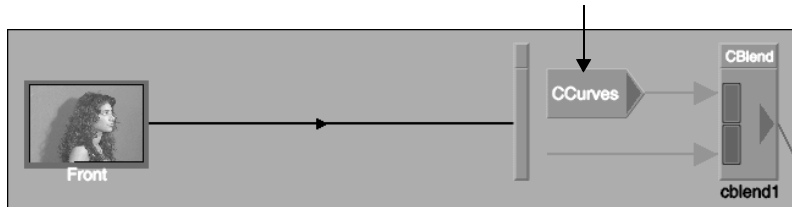
2. If there is any remaining grey, remove it by adding to Patch 1: press **CTRL** and drag over the grey area.

3. Verify that using the patch does not adversely affect the edge softness of the result:
  - a) Press **4** to view the result clip.
  - b) Toggle the Active button for Patch 1 on and off.
4. Check the key every 5 frames and adjust the softness as required.

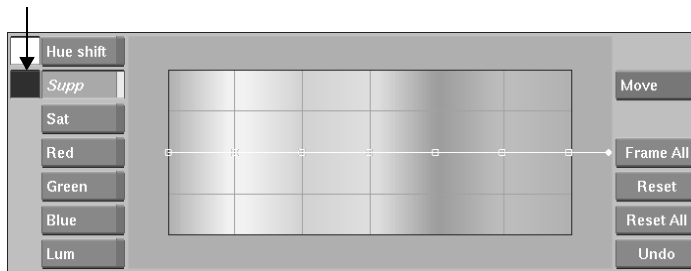
## Remove the Colour Spill

Next, use the Colour Curves menu to remove the remaining colour spill.

1. Press **~** to view the processing pipeline.
2. Click the CCurves node on the Front branch to open the Colour Curves menu.



3. Press **F1** to view the front clip (the current input clip).
4. Select the colour to be suppressed:
  - a) Click the Suppression colour box to open the colour picker.



- b) Click Avg in the colour picker.
- c) While pressing **CTRL**, draw a selection box over the blue background to sample an average colour.
- d) Click the Suppress colour box a second time to transfer the selected colour.

## 5. Suppress the spill:

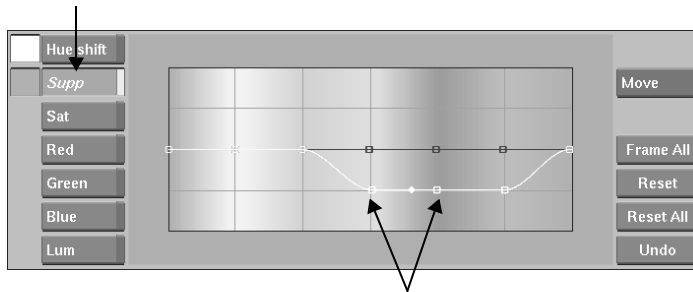
a) Press **4** to view the result.

b) Go to frame 1.

c) Click at the edge of the talent to sample the colour to be suppressed.

A red line showing the colour value of the selected pixel appears in the blue area of the hue spectrum.

d) Click Supp to select the colour suppression curve.



e) Drag the points on either side of the red line downwards until the value is 25. You may also want to lower the point in the magenta area as shown here.

## Check Your Results

Save the setup, process the clip, and compare the result to the *13\_result\_ex2* clip.

1. Go to the Setup menu and save the Setup.
2. Go to frame 1 and click Process.
3. When the clip has been processed, click Exit to return to the reels. The processed clip appears on the destination reel.
4. Use the Player to view your result clip. Compare your result to the *13\_result\_ex2* clip.
5. If the two clips do not match, return to the Modular Keyer and load the setup file *13\_modular\_keyer\_ex2* from the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_13* to see how the key should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result in your clip library.
7. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- The processing pipeline of the Modular Keyer contains a Front branch for correcting and suppressing colours in the front clip, and a Key-in branch for creating the matte. Each node on the pipeline is a specific operation used to build the composite.
- Use the 3D Keyer node to set the tolerance and softness for the key in three-dimensional RGB colour space.
- The tolerance and softness are represented using ellipsoids in the RGB Viewer.
- Use the noise analysis tool to minimize noise in the softness areas. To analyze, press **N** and drag a selection box over an area of noise in the softness. Use the global softness field to scale the softness value and minimize the noise.
- The most accurate method for adjusting the softness of the key is vertex scaling. With the softness ellipsoid selected, press **O**, then pick a point in the area to be adjusted; the selection appears as a plot point in the RGB Viewer. While pressing **V**, drag over the RGB Viewer to either include or exclude the plot point in the softness ellipsoid.
- You can use patches to hide problem areas in either the white or the black areas of the matte. Use three patches only in exceptional circumstances, as the third patch slows down processing speed considerably.
- You can also remove unwanted greys from the key by scaling or translating the softness ellipsoid.
- Use the Matte Curves to fine-tune the key. Adjusting the curves affects the luminance of the key edge, allowing either more of the front clip or more of the back clip to come through in the composite.
- In Action, use an extended bicubic to manipulate the shape of a surface in 3D space.
- In Action, a matte source node is used to separate the matte from the image of a layer. You can then animate the matte independently of the image, or use a matte from a different layer.

# 14

## Modular Keying: The Tracer

The Tracer is a powerful tool for pulling keys from clips containing fine detail, even when the fine detail consists of colours similar to those in the background.

In this lesson:

- Learn the basic Tracer techniques
- Set the Tracer to pull a key from high-detail content, and then animate it to follow the movement in the clip
- Use the edge detection node to generate an edge matte
- Use multiple layers in the CBlend node to perform selective colour correction

### Need Help?

If you need help using the Tracer, load the setup file provided for the exercise. Click Load in the Modular Keyer Setup menu to open the file browser, and then go to the directory */usr/discreet/project/effects/Tutorial/lesson\_14*. For Exercise 1, load the setup file *14\_tracer\_ex1*. For Exercise 2, load the setup file *14\_tracer\_ex2*.

## About the Tracer

A main feature of the Modular Keyer is the Tracer, which allows you to pull a key from difficult, finely detailed key-in material, even in cases where the background of the key-in clip contains colours similar to those of the foreground. To do this, the Tracer uses regional sampling along the key edge, within a user-defined softness range, and then pieces together the regional mattes to assemble the final high quality matte.

Keying using the Tracer consists of the following basic steps:

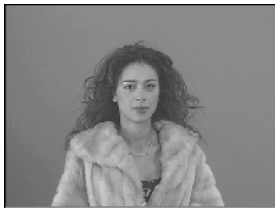
- draw a garbage mask around the key content
- enable the Tracer and set a softness range
- activate and place pickers to generate regional mattes
- move and enlarge pickers to get the best result for each regional matte
- animate the points and pickers to follow the movement in the key-in clip

## Exercise 1: Using the Tracer

In this exercise, use the Tracer to pull a key from a blue screen clip containing fine detail.

Load the *14\_tracer\_ex1* reel onto the desktop from the clip archive on CD 4, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*14\_front\_ex1*: This is the blue screen clip to be keyed.



*14\_result\_ex1*: This is the final composite.

To preview the final composite, play the *14\_result\_ex1* clip using the Player.



## Open the Modular Keyer

Load the source clips and reset the Modular Keyer.

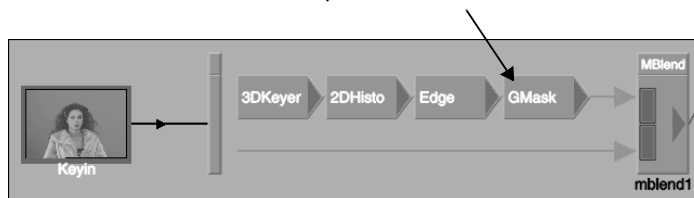
1. Create a single white frame using Coloured Frame in the Processing menu.
2. Open the Modular Keyer:
  - a) Click Modular Keyer in the Effects menu.
  - b) Select *14\_front\_ex1* as the front clip, the single white frame as the back clip, and *14\_front\_ex1* as the key-in clip.
  - c) Select any work reel as the destination reel.
3. Go to the Setup menu and reset all options to their default values: click Setup, and then click Reset All and Confirm.

## Set a Context Point

In the Modular Keyer, you can set up to two context points which allow you to view the changes made in one node in the context of another node downstream in the processing pipeline.

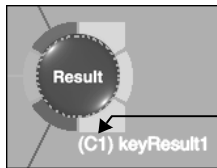
When working with the 3D Keyer node, you can view the final output of the Result node by pressing **4**. When working with the GMask node, you must set the Result node as a context point in order to view its output.

1. Click the GMask node on the Keyin branch.



Instead of a full menu appearing, only an Edit button appears. You must either click Edit or double-click the node to open the GMask menu. To view the effects of your garbage mask in the context of the overall result, you must set the Result node as a Context point.

2. Set the Result node of the processing pipeline as Context 1: while pressing  $\equiv$ , click the Result node.



A green dotted outline appears on the Result node.

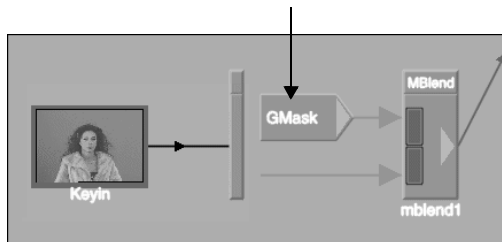
The (C1) indicates this node is Context 1.

With the Result node set as Context 1, you can see the result of your work in the GMask node in the context of the final result by selecting Context 1 view.

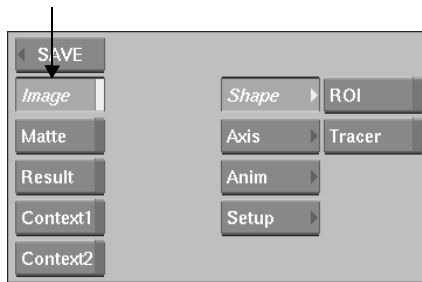
## Set Up the Tracer to Pull a Key

Access the Tracer through the GMask node to set up the basic Tracer garbage mask.

1. Because the 3DKeyer node outputs an all-white matte by default, it must be deleted if not used. Delete unwanted nodes from the MBlend node:
  - a) Select Delete (**D**).
  - b) Click the 3DKeyer node, and then Confirm to Delete.
  - c) Click each of the 2DHisto and Edge nodes, confirming each deletion.
2. Select Move (**M**), and then double-click the GMask node to open the Garbage Mask menu.



3. Click Image (**F1**) to view the current input clip.



4. Go to frame 1.
5. Draw a garbage mask to define the region to be keyed:

a) Select Geom and click Add, or press **N**.

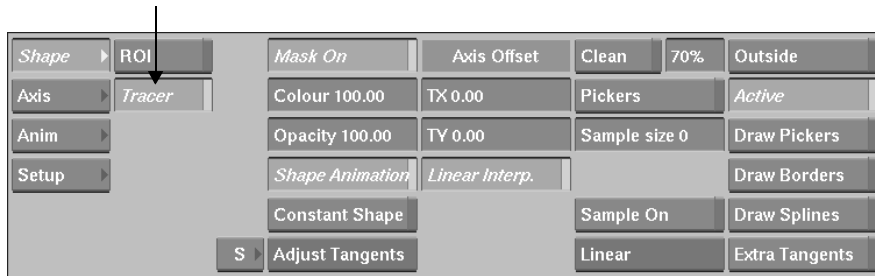
b) Draw the mask to follow the talent's outline. Click to add each point, and then press **M** to close the mask in Move mode. To make adjusting and animating the Tracer easier, use as few points as possible when drawing the mask. You can always add more points later.



Each point on the mask is called an anchor point.

**Hint:** To hide the split bar while working in the Tracer, press **CTRL** and click the bar.

## 6. Click Tracer.

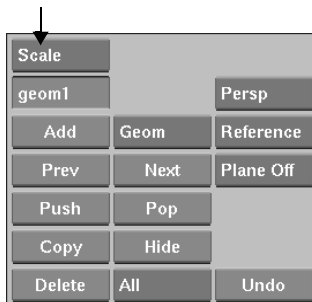


Two green lines appear on either side of the blue garbage mask outline, defining the softness range. The green lines can be adjusted to customize the softness range over the entire circumference of the Tracer.

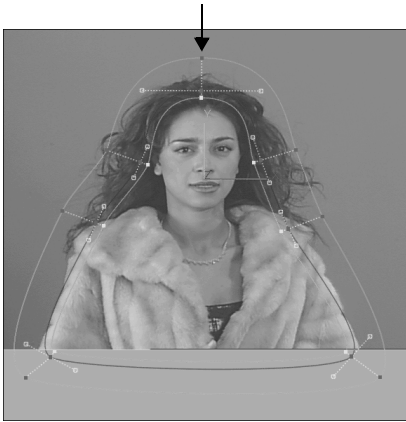
## 7. Set the outer softness range:

a) Select all the points of the Tracer by pressing **CTRL** and dragging a selection box around them, or press **CTRL+A**.

b) Select Scale (**X**).



- c) Press an outer point then drag the cursor to the right to move all points outward at once to include most of the detail of the talent's hair.



**Hint:** If the softness range is very small, it may be difficult to select the inner and outer softness range points. If a softness range point is on top of the anchor point, the anchor point is selected by default. To select a softness range point instead of an anchor point, press **Q** then click to toggle between the two.

8. Set the inner softness range: press an inner point and drag to the right to move all the inner softness range points inwards until most of the talent's hair is within the softness range.



9. Move points individually to adjust the softness range more precisely:

a) Click anywhere to deselect the points.

b) Select Move (**M**).

c) Move the points individually. The outer points should lie outside even the finest detail of the talent's hair. The inner points should lie inside any blue background that might show through the hair.



**Hint:** Try to keep the line joining the inner and outer softness range relatively straight. This gives better results in terms of controlling the merging of the regional mattes.

10. The matte so far is a simple garbage mask with a defined softness range. Press **F4** to view the matte.

## Activate and Adjust the Pickers

The pickers sample the colour of the foreground and background of the clip to generate the regional mattes.

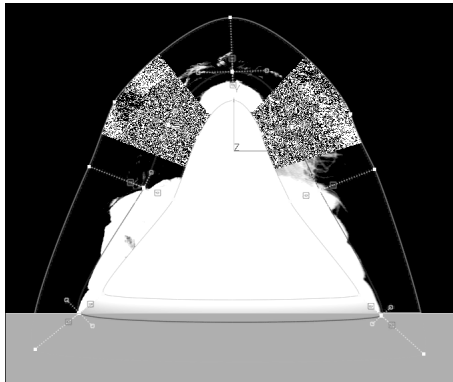
1. Activate the pickers for all points:

a) Press **CTRL+A** to select all points.

b) Enable Pickers.



The pickers appear with pink sampling boxes, defining default softness and edge specifications for the matte.



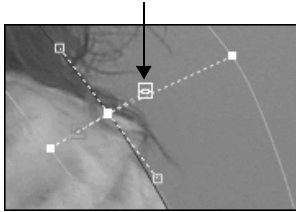
**Note:** Depending on where you placed the Tracer anchor points, your matte may differ from the one shown here.

2. Click Image (**F1**) to view the current input.

3. Move outer pickers to blue areas:

a) Select Scale (**X**).

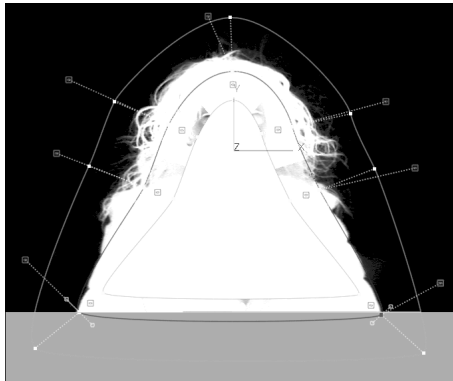
b) Press one of the outer pickers then drag to move all of them to solid blue areas of the background outside the softness range.



c) Some pickers might not have been moved to an all-blue area. Deselect all by clicking anywhere on the image, select Move (**M**), and then move the pickers individually, if necessary.

d) Toggle between Image (current input, **F1**), Result (**F4**), and Context 1 (final result, **3**) to see the effect of the picker placement on the matte.

The matte should look like this.

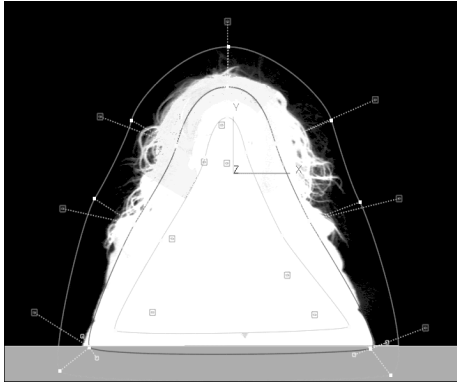


4. Move the inner pickers to areas of the talent which contain both highlights and shadows.

The Tracer is a very flexible tool; small adjustments made to the pickers can have great effects on the area for which they define the matte. For the moment, don't worry too much



about small amounts of grey within the softness range. At this stage, the matte should look like this.



## Fine-Tune the Tracer Matte

The Tracer is a very precise tool. There are a number of ways you can fine-tune the matte. You can enlarge the sample area of each picker, move the anchor points, add new points, and adjust the inner softness range to obtain the desired matte. When your matte is ready at the first frame, modify it by animating the points and pickers to follow the movement in the clip from frame to frame.

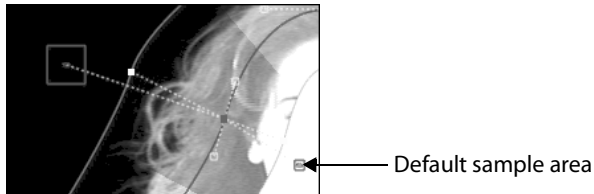
The following steps are not necessarily to be followed sequentially, but demonstrate techniques which can be used in certain cases to fine-tune the matte. Although your matte may not have the same properties as the one shown here, experiment with the techniques presented in each step to learn how the Tracer works.

**Hint:** Remember to toggle between Image (current input, **F1**), Result (**F4**), and Context 1 (final result, **3**) to see the effect of the picker placement on the matte.

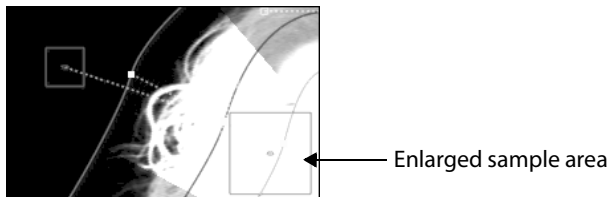
1. Go to frame 1 to fine tune the matte at the first frame of the clip.

2. Enlarge the pickers: Select a picker, press **TAB** and drag the cursor over the picker box to resize the sample area.

Try enlarging a picker over an area where the matte is not very good. In the example below, the sample areas around the face do not allow the Tracer to key-in the talent's hair.



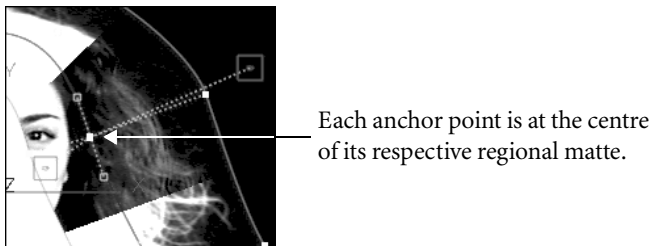
By increasing the sampling area, you collect more colour information with which the Tracer can calculate the matte. As a result, the regional matte is less sensitive to noise and fluctuation from frame to frame.



For this example, enlarging all of the inner sampling areas may produce a good result.

3. Move the Tracer anchor points along the blue line to improve the regional mattes.

The anchor points defining the Tracer delimit regional mattes which are combined to produce the final result.

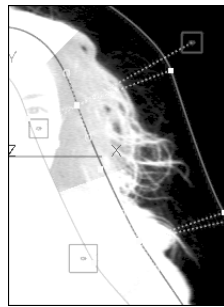
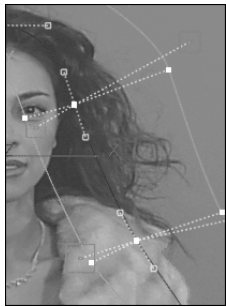


After activating and placing the pickers, sometimes it can help to move the anchor points, thus moving the pickers as well.

4. Add anchor points to obtain more specific regional mattes at the more difficult areas of the matte.

In general it is best to work with the fewest number of points. With fewer points there are fewer factors to manage when animation of the Tracer is required. However, when you have areas of the key-in clip where colour values vary dramatically, it is often better to add points to produce more specific regional mattes.

In this example, consider the top of the talent's shoulder where her hair falls over her fur coat. The matte view shows how the dramatic colour change makes for a difficult transition.

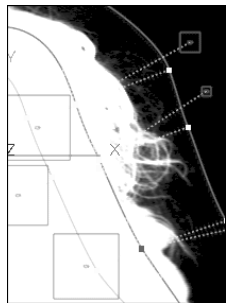


The hair is much darker than the fur coat, both of which are calculated against the blue screen background. Notice the sharp break between the two regional mattes, even though they both sample similar colour areas.

To add a point:

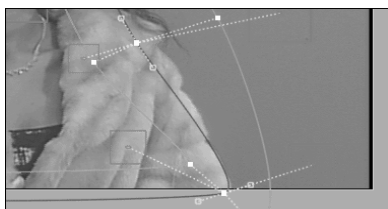
- a) Select Add (**A**).
- b) Click anywhere along the blue Tracer outline to add an anchor point.
- c) Enable Pickers.
- d) Select Move (**M**) and place the pickers, enlarging them if necessary.

The matte can be greatly improved with good point placement.

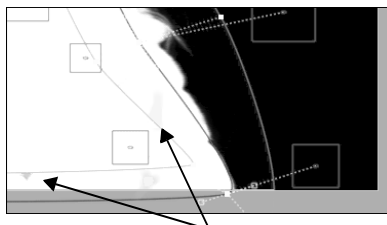


5. Adjust the inner softness range to mask areas where the edge does not need to be so soft.

Some areas of the key have a good edge, but are compromised by grey regions in the white area. In the example below, some of the shadow in the folds of the fur coat and a little bit of the talent's dress are punching through the key.



The dark areas falling within the softness range punch through.

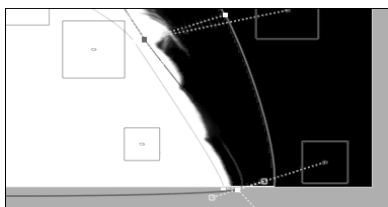


The edge is good, but these greys should be removed.

Move the inner softness range line towards the blue Tracer outline to mask the grey areas:

**a) Select Move (M).**

**b) Drag the points on the inner softness range line towards the Tracer anchor points to remove the greys.**

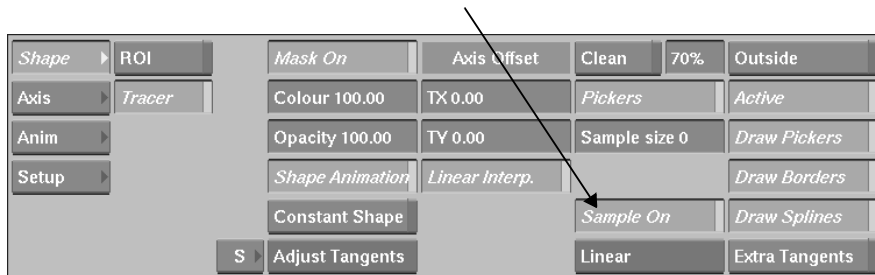


6. Play the result clip.

You may notice flickering in the result, or some frames where the matte needs to be adjusted. By default, colour values for the pickers are sampled at each frame. Because colour values are fairly consistent in the clip, try sampling at one frame only.

7. Disable Sample On to sample picker values at the first frame only:

- a) At the first frame, Sample On should be enabled. Picker values are sampled at this frame.
- b) Go to frame 2.
- c) Select all points by pressing **CTRL+A**.
- d) Disable Sample On.



The Tracer uses the sampled picker values from the first frame throughout the clip. If movement in the clip causes the sampled area to move away from a picker, you do not need to adjust the picker to get a good result.

8. If necessary, animate the Tracer.

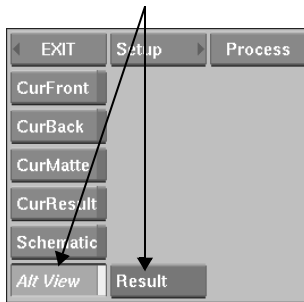
Verify the matte every 10 frames, resizing pickers, moving or adding points, and adjusting the softness range as needed. If necessary, verify the matte again every 5 frames, and even from frame to frame to adjust for sudden movements. Always animate the Tracer in a linear fashion, from the beginning of the clip to the end.

9. Click Save to return to the Modular Keyer desktop.

## Remove the Colour Spill and Fine-Tune the Key

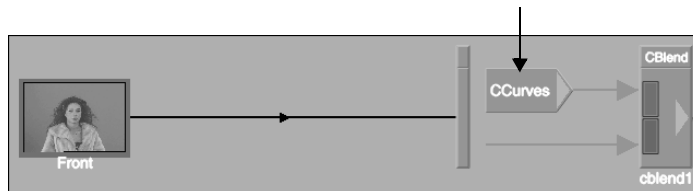
Suppress the blue spill using the CCurves node, and then fine-tune the key using the Matte Curves.

1. Select Result and click Alt View, or press **4** to view the result of the processing pipeline.



There is still some blue spill at the edges of the key, especially in the fine detail in the hair.

2. Press **~** to view the processing pipeline.
3. Click the CCurves node to open the Colour Curves menu.

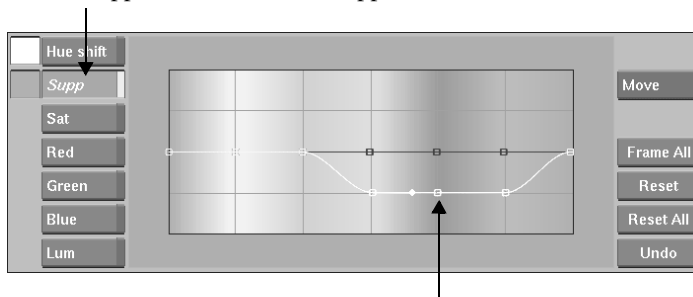


4. Press **F1** to view the front clip.
5. Select the colour to be suppressed:
  - a) Click the Suppression colour box to open the colour picker.
  - b) Click Avg in the colour picker.
  - c) While pressing **CTRL**, drag the cursor over the blue background to sample an average colour.
  - d) Click the Suppression colour box a second time to transfer the selected colour.
6. Click a point at the edge of the talent to sample the colour to be suppressed.

A red line appears in the blue area of the hue spectrum, plotting the value of the selected pixel.

**7. Suppress the colour spill:**

- a)** Go to frame 1.
- b)** Press **4** to view the final result.
- c)** Click Supp to select the colour suppression curve.



- d)** Drag the cyan, blue, and magenta points downwards to a level of 25.

**8. Adjust the matte curves:**

- a)** Press **~** to view the processing pipeline.
- b)** Click the Result node to view the Matte Curves.
- c)** Press **4** to view the Result.
- d)** Adjust the matte curves if necessary. For more information, see “Use the Matte Curves to Fine-tune the Key” on page 389.

## Check Your Results

Process the final result and compare it to the *14\_result\_ex1* clip.

1. Save the Modular Keyer setup:
  - a) Click Setup, and then click Save As to open the file browser.
  - b) Type a name for the setup file and press **ENTER**.
2. Press ~ to view the processing pipeline, and then select the Result node.
3. Click Process.
4. Click Exit to return to the reels.
5. Use the Player to view your result clip. Compare your result to the *14\_result\_ex1* clip.
6. If the two clips do not match, return to the Modular Keyer and load the *14\_tracer\_ex1* setup file from the `/usr/discreet/project/effects/Tutorial/setups/lesson_14` directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
7. Save your result clip in your clip library.
8. Delete the result clip and exercise reel from the desktop.



## Exercise 2: Using Edge Mattes for Selective Colour Correction

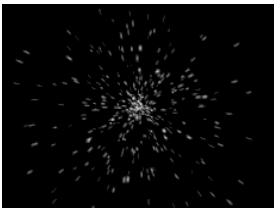
In this exercise, use the Tracer to pull a key from a blue screen clip containing fine detail. Generate an edge matte to perform a selective colour correction, and then blend the colour corrected region with the front clip to produce the final result.

Load the *14\_tracer\_ex2* reel onto the desktop from the clip archive on CD 4, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

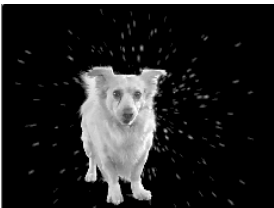
The reel contains the following clips.



*14\_front\_ex2*: This is the blue screen clip to be keyed.



*14\_back\_ex2*: This is the background for the composite.



*14\_result\_ex2*: This is the final composite.

To preview the final composite, play the *14\_result\_ex2* clip using the Player.

## Open the Modular Keyer

Load the source clips and reset the Modular Keyer.

1. Open the Modular Keyer:
  - a) Click Modular Keyer in the Effects menu.
  - b) Select *14\_front\_ex2* as the front clip, *14\_back\_ex2* as the back clip, and *14\_front\_ex2* as the key-in clip.
  - c) Select any work reel as the destination reel.
2. Go to the Setup menu and reset all options to their default values: click Setup, and then click Reset All and Confirm.
3. Set the Result node of the processing pipeline as Context 1: while pressing  $\equiv$ , click the Result node.

With the Result node set as Context 1, you can see the result of the GMask node in the context of the final result by selecting Context 1 view.

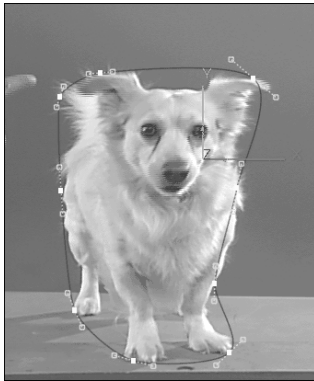
## Set up the Tracer to Pull a Key

Access the Tracer through the GMask node, and then set up the Tracer garbage mask.

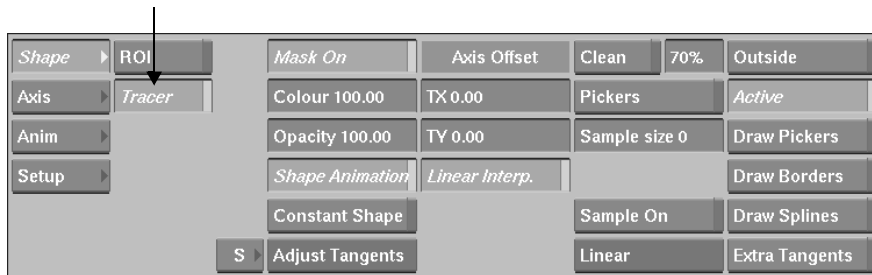
1. Delete the unused nodes:
  - a) Delete the 3DKeyer and 2DHisto nodes: select Delete (**D**), click the node to be deleted, and Confirm.
  - b) Select Move (**M**).
  - c) Because you will be using an Edge node at a later step, you do not need to delete the Edge node. Instead, put it aside until it is needed. While pressing **CTRL+ALT**, drag the Edge node off the MBlend node, and put it to the side of the Modular Keyer desktop.
2. Double-click the GMask node in the Keyin branch to open the Garbage Mask menu.
3. Click Image (**F1**) to view the current input clip.

4. Draw the garbage mask to define the region to be keyed:

- a) Select Geom and click Add, or press **N**.
- b) Draw the mask around the dog, using as few points as possible.



5. Click Tracer.

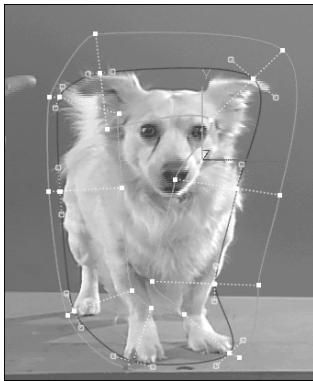


Two green lines defining the softness range appear on either side of the blue garbage mask outline.

6. Set the outer softness range:

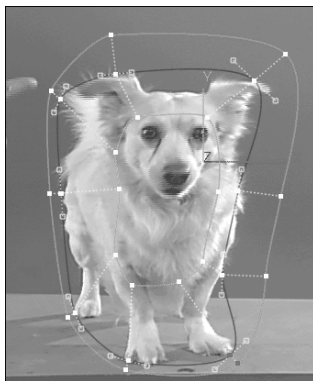
- a) Select all the points of the Tracer by pressing **CTRL+A**.
- b) Select Scale (**X**).
- c) Select one of the outer softness range points, and then drag the cursor to set the softness range to include all of the dog's fine detail.

7. Set the inner softness range:
  - a) Press an inner softness range point.
  - b) Drag the cursor to move all inner softness range points inwards.
8. Move points individually to adjust the softness range more precisely:
  - a) Click anywhere to deselect the points.
  - b) The outer softness range points on the left side should be moved in to avoid the hand in the frame. Select Move (M) and then move the points as needed.



- c) The inner softness range points at the bottom should be moved upwards to avoid blue areas between the dog's legs. Move the points as needed.

The Tracer should look like this.



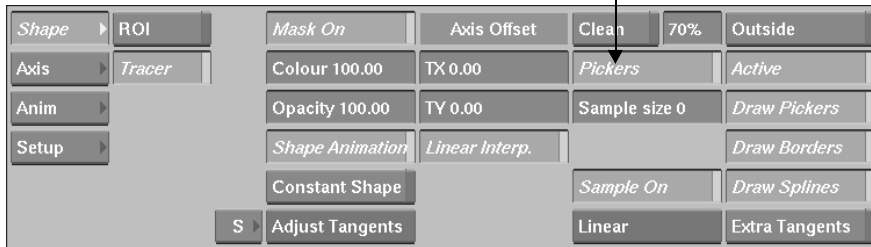
## Activate and Adjust the Pickers

The pickers sample the colour of the foreground and background of the clip to generate the regional mattes.

### 1. Activate the pickers for all points:

a) Press **CTRL+A** to select all points.

b) Click Pickers.



The pickers appear with pink sampling boxes, defining default softness and edge specifications for the matte.

### 2. Move outer pickers to blue areas:

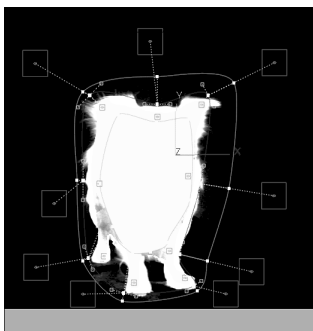
a) Click Image (**F1**) to view the current input.

b) Select Scale (**X**).

c) Press one of the outer pickers then drag to move all of them to solid blue areas of the background outside the softness range.

d) Enlarge the pickers: press **TAB** and drag over one of the Pickers to enlarge them all.

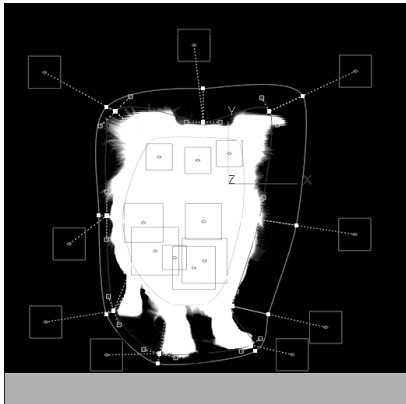
e) Move pickers independently if necessary to ensure they are sampling blue areas: click anywhere to deselect all points, and then move the required pickers. The Tracer matte should look like this.



**Note:** Depending on where you placed the anchor points, your matte may differ from the one shown here.

3. Move the inner pickers to areas of the dog which contain both highlights and shadows, and then enlarge them as needed to produce a good matte. For tips on fine-tuning the matte, see “Fine-Tune the Tracer Matte” on page 429.

Your final matte for frame 1 should look like this.



4. Disable Sample On to sample picker values at the first frame only:
  - a) At the first frame, Sample On should be enabled. Picker values are sampled at this frame.
  - b) Go to frame 2.
  - c) Select all points (**CTRL +A**).
  - d) Disable Sample On.
5. View the matte clip and animate the Tracer points and pickers as needed to maintain a good matte through the entire clip.
6. Click Save to return to the Modular Keyer desktop.

## Remove the Colour Spill

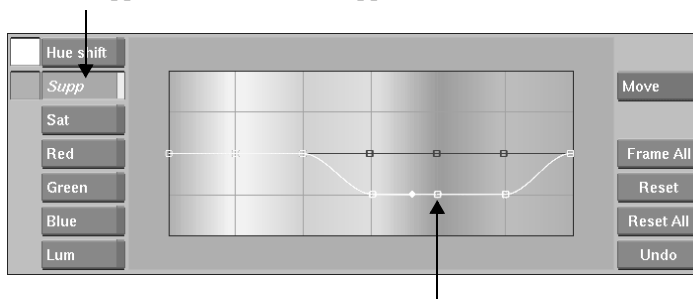
Suppress the blue spill using the CCurves node.

1. Click Alt View Result or press **4** to view the result so far.

There is still some blue spill at the edges of the key, especially in the fine detail.

2. Press **~** to view the processing pipeline.

3. Click the CCurves node on the Front branch to open the Colour Curves menu.
4. Press **F1** to view the front clip.
5. Select the colour to be suppressed:
  - a) Click the Suppression colour box to open the colour picker.
  - b) Click Avg in the colour picker.
  - c) While pressing **CTRL**, drag the cursor over the blue background to sample an average colour.
  - d) Click the Suppression colour box a second time to transfer the selected colour.
6. Click a point at the edge of the dog to sample the colour to be suppressed.  
A red line appears in the blue area of the hue spectrum, plotting the value of the selected pixel.
7. Suppress the colour spill:
  - a) Go to frame 1.
  - b) Go to Result view (4).
  - c) Click Supp to select the colour suppression curve.

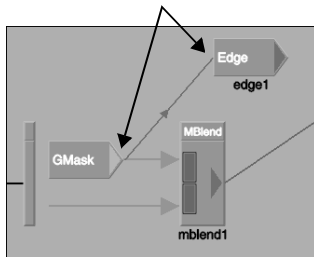


- d) Drag the cyan, blue, and magenta points downwards to a level of 25.

## Create an Edge Matte

Use the edge detection feature to generate a matte which keys only the edge area of the dog. You will use the edge matte to perform selective colour correction.

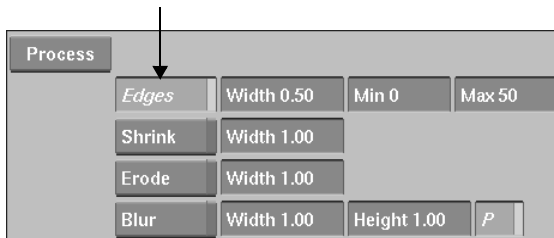
1. Move the Edge node set aside in an earlier step:
  - a) Press ~ to view the processing pipeline.
  - b) Drag the Edge node above the MBlend node of the Keyin branch.
  - c) Position the cursor over the output tab of the GMask node. The cursor changes to an arrow.
  - d) Drag from the Gmask node in the Keyin branch to the input side of the Edge node.



The GMask node on the Keyin branch generates the global matte for the composite. The Edge node uses this matte to generate an edge matte for selective colour correction of the front clip. The Edge node is connected to the CBlend node in a later step.

**Hint:** You can also select Parent mode (P) to connect the GMask node to the Edge node.

2. Double-click the Edge node, and then click Edges to enable edge detection.





3. Press **F4** to view the result of the Edge node.

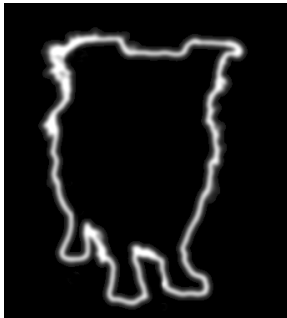
The edge matte should look like this.



4. Expand and soften the edge matte:

- a) Enable Shrink with Width set to -3.
- b) Enable Erode with Width set to 2.
- c) Enable Blur with Width set to 2.

The enlarged and softened edge matte should look like this.



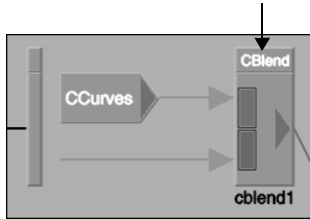
## Generate a Second Layer for the CBlend Node

To combine the front clip with its selectively colour corrected edge area, you must add another layer to the CBlend node.

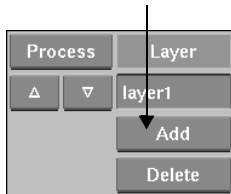
1. Add a layer to the CBlend node on the Front branch:

a) Press ~ to view the processing pipeline.

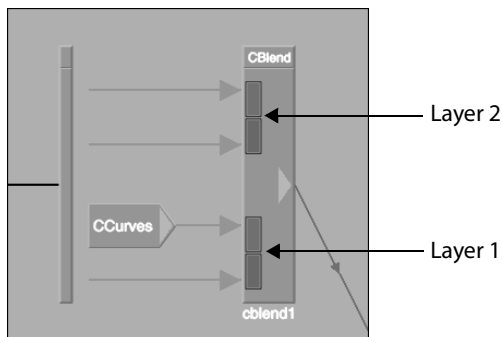
b) Click the CBlend node.



c) Click Add.

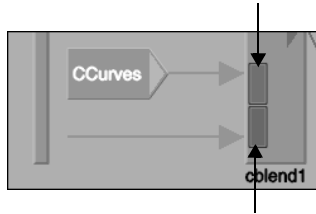


A second layer is added to the CBlend node, above the first. This is similar to using multiple layers in the Priority Editor in Action; layers at the top of the list appear in front of the ones below.



Each layer consist of two pipes: front and matte.

- The red box marks the front pipe. Nodes on the front pipe are used to colour correct the front clip.

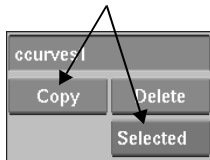


- The blue box marks the matte pipe. Nodes on the matte pipe are used to generate a matte for the colour correction.

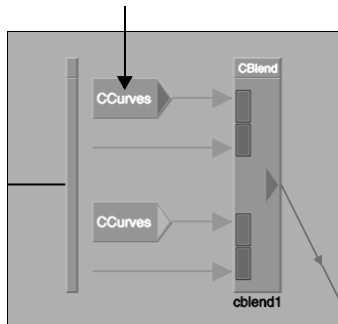
## 2. Copy the CCurves node to the new CBlend layer:

a) Select the CCurves node.

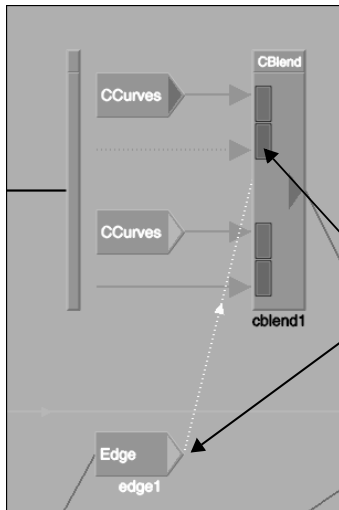
b) Choose Selected and click Copy.



c) Drag the new CCurves node to the front pipe of the new CBlend layer.



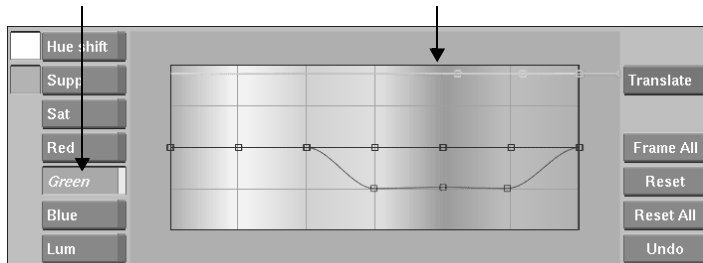
3. Use the Edge matte as the matte for the new CBlend layer:



Drag from the output side of the Edge node to the blue matte output box of Layer 2 (the upper layer) of the CBlend node. The link is shown using a dotted arrow.

You could also copy the GMask node from the Keyin branch and place it with the Edge node on the matte pipe of Layer 2. Because using two GMask nodes would increase the processing time, it is more efficient to parent the Edge node in the way shown above.

4. Use selective colour correction to create a green aura around the dog:
- Select Move (**M**), and then click the CCurves node on the upper layer of the CBlend node (the layer that uses the edge matte).
  - Press **4** to view the result of the colour curve adjustment.
  - Click Green to select the green curve.
  - Select Translate (**T**) and drag the green curve to the top of the hue spectrum.



## Check Your Results

Process the final result and compare it to the *14\_result\_ex2* clip.

1. Save the Modular Keyer setup:
  - a) Click Setup and then click Save As to open the file browser.
  - b) Type a name for the setup file and press **ENTER**.
2. Press ~ to view the processing pipeline, and then select the Result node.
3. Click Process.
4. Click Exit to return to the reels.
5. Use the Player to view your result clip. Compare your result to the *14\_result\_ex2* clip.
6. If the two clips do not match, return to the Modular Keyer and load setup file *14\_tracer\_ex2* from the */usr/discreet/project/effects/Tutorial/setups/lesson\_14* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
7. Save your result clip in your clip library.
8. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- You can use the Tracer to pull keys from source material containing fine detail, even when the detail has colours similar to those of the background.
- Access the Tracer from the GMask node in the Modular Keyer.
- The Tracer is a garbage mask with a user defined softness range. Define the softness range by placing the inner and outer softness range points.
- Activate the Tracer matte by enabling the pickers. The pickers sample colours to calculate regional mattes, which are combined to make the global Tracer matte.
- In clips with consistent colour values, enable Sample On at one frame only to use the same sample values for pickers throughout the clip.
- To use the edge detection feature, enable Edges in the Edge node.
- Multiple layers in the CBlend node on the Front branch allow for colour blending of different layers of the front clip.
- You can use an edge matte to perform a selective colour correction.

# 15

## The Colour Warper

Use the Colour Warper to perform advanced colour corrections on images and clips. With the intuitive tools and interface, you can manipulate colours with incredible precision and ease.

The Colour Warper is available from Batch and the Modular Keyer.

In this lesson:

- Balance colours to remove a colour cast from an image
- Use the Match feature to match colours in two clips
- Use Selective correction to adjust a specific range in a clip

### Need Help?

If you need help using the Colour Warper, load the setup file provided for this lesson. Click the Load button in the Setup menu to open the file browser, go to the directory */usr/discreet/project/effects/Tutorial/setups/lesson\_15*, and load the setup file *15\_colourwarper\_ex1* for Exercise 1, or *15\_colourwarper\_ex2* for Exercise 2.

Time to complete this lesson: 60-75 minutes

## About the Colour Warper

The Colour Warper combines intuitive interaction models with advanced colour manipulation algorithms. Using the Colour Warper, you can match colours automatically, make global colour corrections as you would with traditional tools, or make selective adjustments to specific ranges of colour. You can even animate your colour manipulations over time.

In the Colour Warper, original data in an image is always preserved, so you can manipulate colours without the risk of permanently losing colour information due to clamping. In addition, because colour warping is performed in a single calculation, the processing order has no effect on the final result—you can adjust colour parameters in any sequence and get predictable results.

The Colour Warper also features two new methods for viewing colour information: the 2D vectorscope and the RGB viewer.

### The 2D Vectorscope

The 2D vectorscope is a colour “map” that shows the distribution of colours in the source and destination clips.

Use the 2D vectorscope to monitor colour corrections as you make them. As you adjust the colour in a clip, the 2D vectorscope automatically updates with the changes and the new colours are plotted in the 2D vectorscope. The position of the original colours in the clip are shown in black. When you pick a colour in the image, the specific colour is highlighted in the 2D vectorscope.

### The RGB Viewer

The RGB viewer contains a 3D histogram with axes representing the red, green, and blue components of RGB colour space. Cubes of colour show the distribution of all the colours of the clip in RGB colour space. When you scroll through a clip, the 3D histogram updates to display the colour distribution of each frame.

Use the RGB viewer to analyse the colour mapping of the clip and to locate specific colours. For more information on the RGB viewer, see “Understanding the 3D Histogram” on page 369.



## Exercise 1: Correcting Colour Balance

In this exercise, use the Colour Warper to improve colour balance in an image.

Load the *15\_colour\_warper\_ex1* reel onto the desktop from CD 4, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*15\_front\_ex1*: This clip has low contrast and a blue cast.



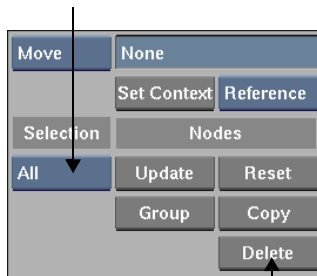
*15\_result\_ex1*: This clip shows the expected result after balancing the colours using the Colour Warper.

To preview the final image, play the *15\_result\_ex1* clip using the Player.

## Open Batch

Open Batch and create a process tree using a Colour Warper node, an Output node, and the image used in the exercise.

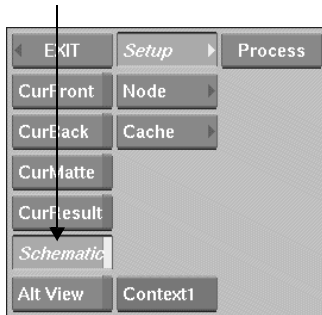
1. In the Processing menu, click Batch and select a destination.
2. If there are any nodes or images on the Batch desktop, delete them:
  - a) Select All.



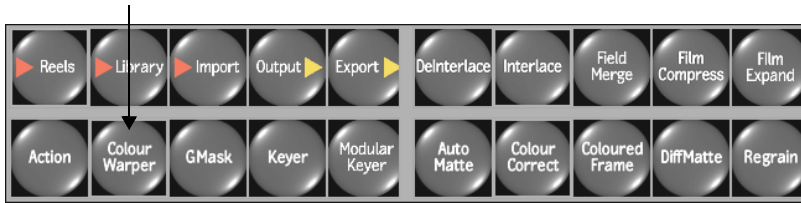
- b) Click Delete, and then Confirm.

3. Add a Colour Warper node:

a) Click Schematic (or press ~).



b) Drag a Colour Warper node from the node bar to the centre of the desktop.

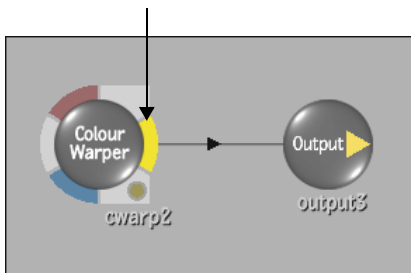


**Hint:** If you do not see the node bar, swipe the bar at the left or right side of the menu panel to display it.

4. Parent an Output node to the Colour Warper node:

a) Drag the Output node to the right of the Colour Warper node.

b) Press the Result tab of the Colour Warper node and drag to the Output node.



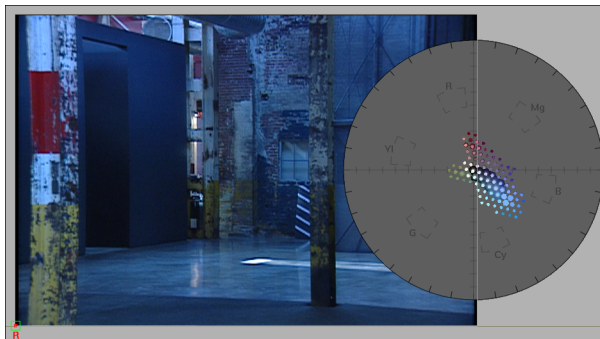
5. Load an image from the desktop into the Colour Warper:
  - a) Double-click the red Front tab of the Colour Warper node to view the reels.
  - b) Select *15\_front\_ex1* as the front clip.
  - c) Click EXIT Clip Select to exit the reels.

The *15\_front\_ex1* clip is loaded as the front source for the Colour Warper.

**Hint:** Alternatively, you can drag a Reels node to the desktop, select the *15\_front\_ex1* clip, and then parent it to the Front tab of the Colour node.

6. View the current result:
  - a) Click the Colour Warper node to display the Colour Warper controls.
  - b) Click CurResult or press **F4**.

The current result and the 2D vectorscope appear.



7. **ALT**-drag the 2D vectorscope to move it to the side for now.
 

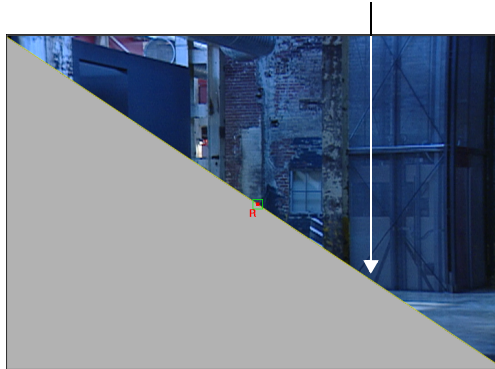
**Hint:** You can also **SHIFT**-drag the 2D vectorscope to resize it.

8. Set the reference buffer and the split bar to view the original clip and the result of your colour corrections in the image window at the same time:

a) Drag the pivot point of the split bar to divide the image window in half.



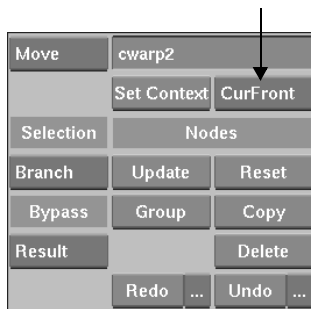
b) Drag the split bar to rotate it 45 degrees.



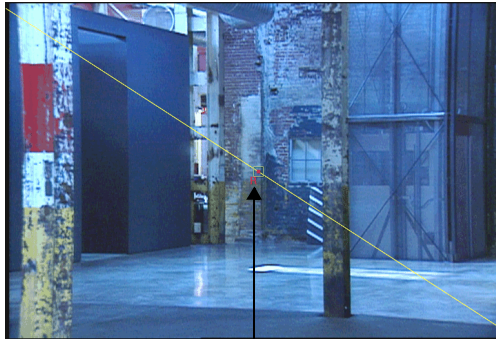
You can move the split bar as needed to see more of the clip at any time.

**Hint:** To reset the split bar, **CTRL-click** the pivot point. To hide the line, **CTRL-click** the split bar; **CTRL-click** the split bar again to redisplay the line.

9. From the Reference box, select CurFront.



The front clip is set as the reference. The current result clip is shown in the top half of the image window.



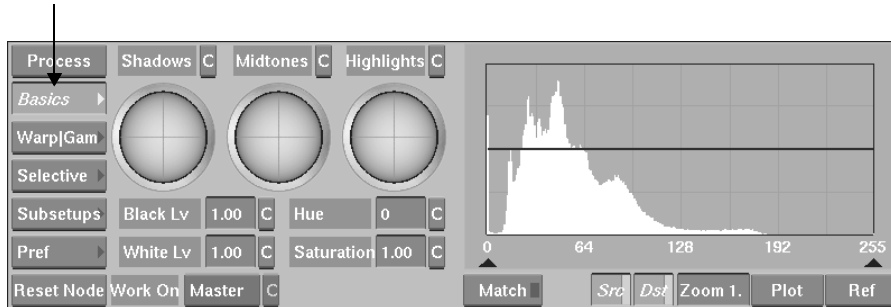
The reference clip, marked by an “R” below the split bar, is displayed in the bottom half of the image window.

This procedure produces the same result as clicking CurFront to view the front clip of the current node, and then clicking Grab in the Setup menu (a technique you learned in “Compare the Source and Result Images” on page 325). With either method, the front clip is loaded into the reference buffer.

## Adjust the Black and White Level

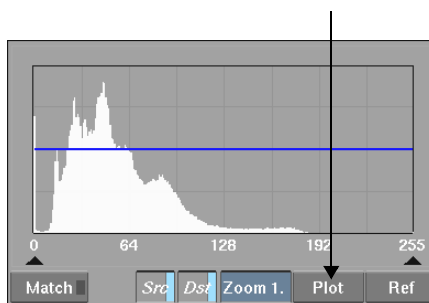
Plot the current black and white levels in the image and use the histogram to make adjustments.

1. Click Basics.

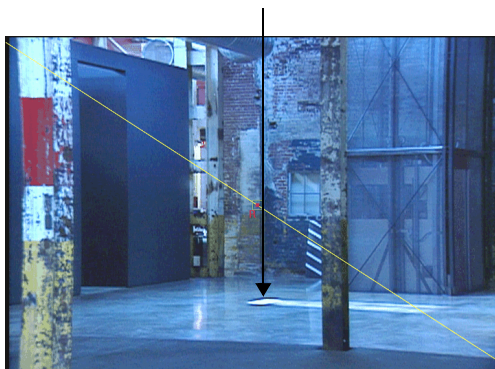


2. Plot the current level of whites in the image:

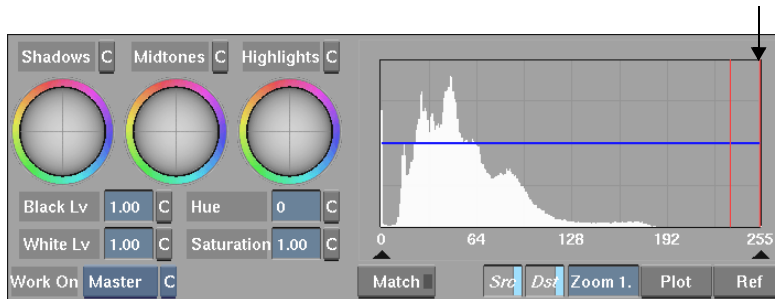
- a) Click Plot.



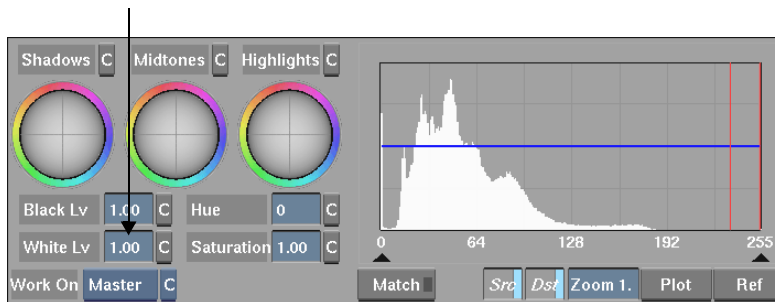
- b) Sample the lightest area in the image: drag over the spill of light in the middle of the floor.



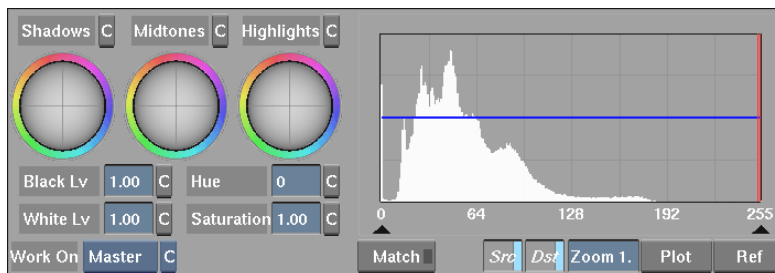
A red line shows the location of the plotted value in the histogram, indicating the position of the colour in relation to pure white (the right edge of the histogram).



3. Drag the WhiteLv field to the right to move the red line towards the right edge of the histogram. Monitor the image as you make the adjustment: you want to brighten the image without losing too much detail in the highlights.



When you stop dragging, the field returns to 1.00 and the white level is increased to the level you set.

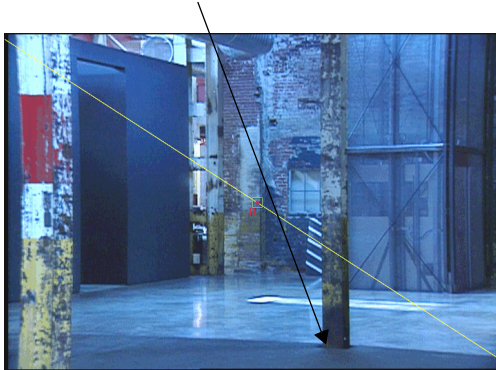


The result clip is visibly brightened in the image window. If you are not satisfied with the white level in the image, click the C beside the White Lv field to clear the changes and try again.

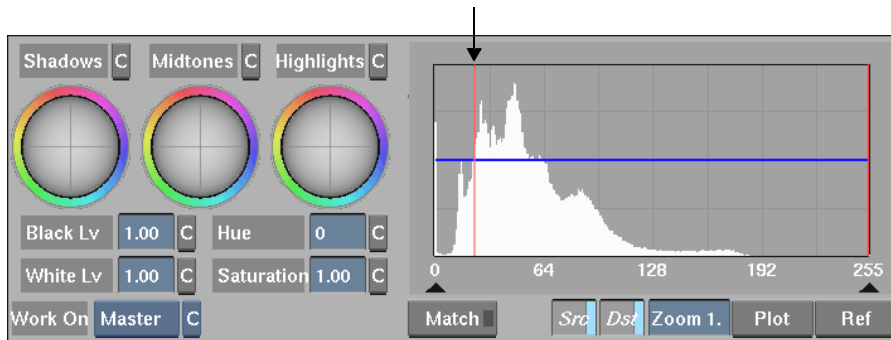
#### 4. Plot the black level:

a) Click Plot.

b) Click a dark area in the image to determine the current lowest value for the blacks, for example, a shadowed area such as the base of the post.

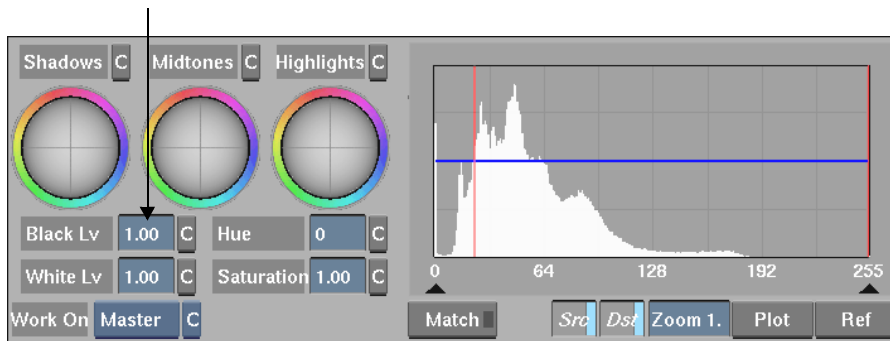


A red line shows the location of the plotted value in the histogram. Note that the value is not pure black (the left edge of the histogram).





5. Drag the BlackLv field to the left to move the red line towards the left edge of the histogram while monitoring the result to make sure you do not lose detail in the shadowy areas.



The black level in the image is decreased and the contrast is improved. If you are not satisfied with the black level, click C to clear changes to the black level and try again.

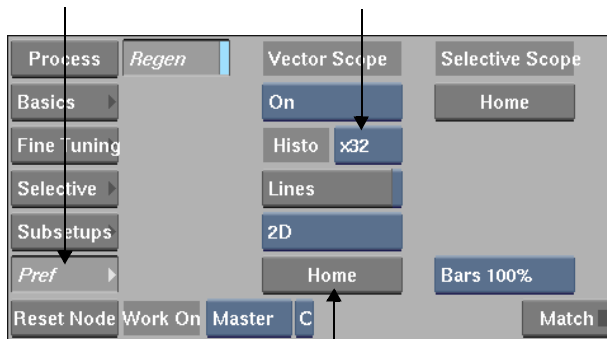
## Adjust Saturation

Although the contrast is better, the colours in the image are still somewhat washed out. Increase the overall saturation to correct this.

1. Increase the level of detail in the 2D vectorscope:

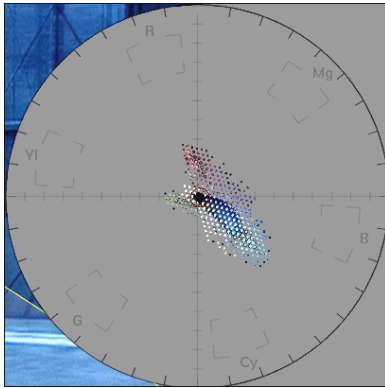
a) Click Pref.

b) From the Histo box, select x32.



c) Click Home to return the vectorscope to its default position.

2. Examine the 2D vectorscope.

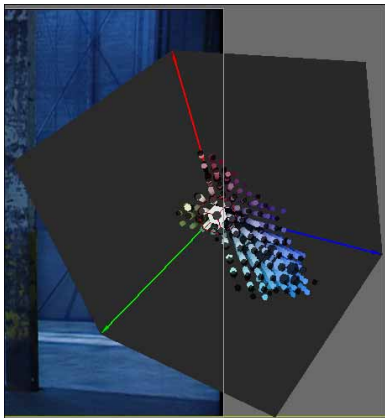


Colours are mapped in the 2D vectorscope as they would appear in a colour wheel. The distance from the center to the perimeter of the scope maps colour saturation, with the outside edge of the scope delineating pure colour.

3. Examine the RGB viewer:

a) Double-click the 2D vectorscope.

The RGB viewer appears, displaying a 3D map of the colours.



b) CTRL-drag to rotate the scope to view the colour distribution.

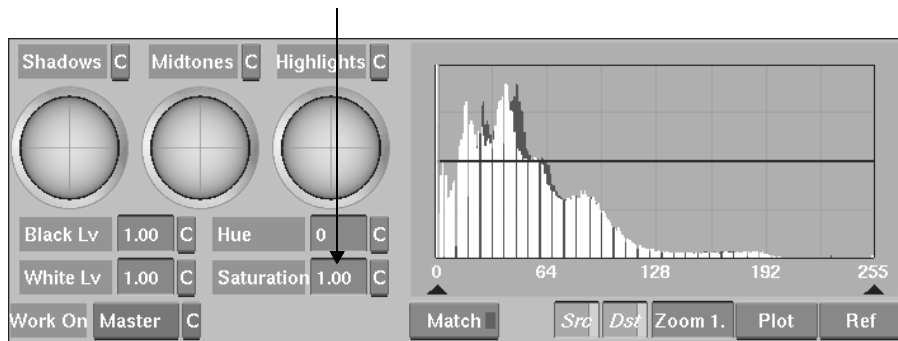
**Hint:** As with the 2D vectorscope, you can **ALT**-drag to move the RGB viewer, and **SHIFT**-drag to resize it.

c) Double-click the RGB viewer to view the 2D vectorscope again.

#### 4. Increase the Saturation:

a) Click Basics.

b) Drag the Saturation field to the right to increase saturation.



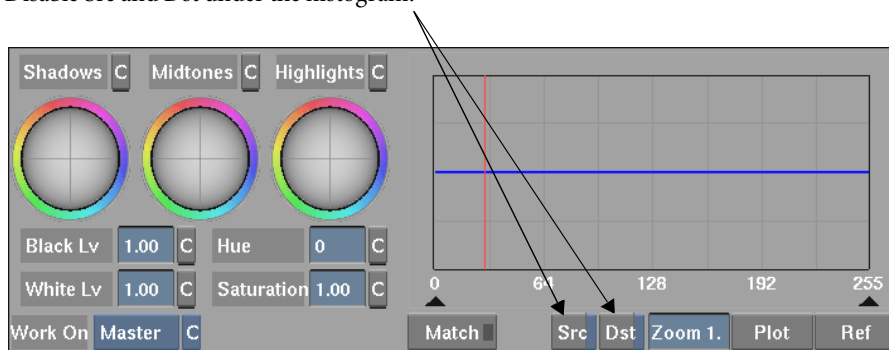
**Hint:** A good result is achieved with a value of 1.30, which you can also enter by clicking the field to view the onscreen calculator.

Note the effects in the 2D vectorscope. The colours of the current result extend towards the perimeter of the vectorscope as they become more saturated.

## Remove the Colour Cast

By increasing saturation, the colour cast of an image is often intensified. In this image, the blues are too strong. Plot the colour cast in the 2D vectorscope and then use the trackballs to eliminate it.

1. Disable Src and Dst under the histogram.

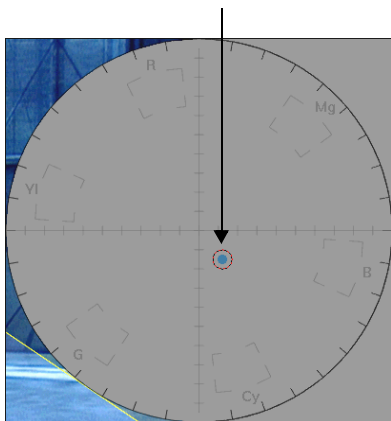


The Src and Dst buttons enable real-time views of the histogram in the histogram window and the 2D vectorscope. The Src button shows the histogram for the original (source) clip. The Dst button shows the histogram for the result (destination) clip.

Turning the histograms off makes it easier to see the exact effect of your colour corrections on plotted colours.

2. Click Plot and drag over the center of the image.

A red dotted circle appears in the 2D vectorscope, showing the position of the average colour.



3. Sample a larger selection of colour to plot the colour more accurately. Click Plot again, then press **CTRL** and drag a selection box over the image. Try to include a wide range of darks, lights, and midtones in the selection.

The new averaged colour appears in the 2D vectorscope.

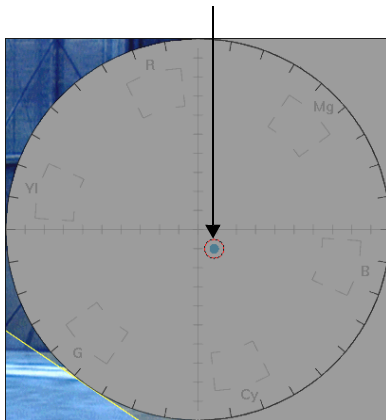
4. Using the position of the colour in the 2D vectorscope as a reference, you can use the trackballs to apply colour correction and eliminate the colour cast. By moving the sampled colour to the centre of the scope, the colours in the image are automatically balanced.

In the following steps, use the shadows, midtones, and highlights trackballs to correct the colour cast in each range. Continually monitor both the 2D vectorscope and the result image while making adjustments. The goal is to move the plotted colour towards the centre of the 2D vectorscope without overcorrecting the range you are currently working on:

- a) Position the cursor at the centre of the Highlights trackball and drag away from the blues as shown by the arrow in the following figure. This moves the plotted colour towards the centre of the 2D vectorscope.



The new position of the plotted colour may vary depending on the area you originally sampled; however, the following example shows a typical adjustment.



**Hint:** If you drag a trackball too far and are unhappy with the result, you can drag it back to apply a counter-correction, or click C to clear the changes.



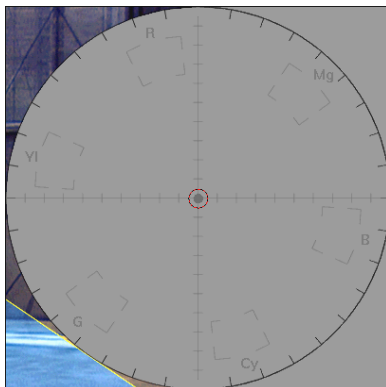
b) Drag the Midtones trackball away from the blues to move the plotted colour towards the centre of the 2D vectorscope.



c) Drag the Shadows trackball away from the blues to move the plotted colour towards the centre of the 2D vectorscope.



Using the three trackballs, you should be able to move the plotted colour to the centre of the 2D vectorscope.



5. Move the split bar to compare the final result to the original.

You can continue to adjust the trackballs as necessary until you are satisfied with the colour balance.

## Check Your Results

Save the setup, process the clip, and compare your result to the *15\_result\_ex1* clip.

1. Go to the Setup menu and save the setup.
2. In the Output node, set Start to 1 and End to 30. For instructions, see “Check Your Results” on page 358.
3. Go to frame 1 and click Process.
4. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
5. Use the Player to view your result clip. Compare your result to the *15\_result\_ex1* clip.
6. (Optional) If the two clips do not match, return to Batch and load the *15\_colourwarper\_ex1* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_15* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
7. Save your result clip in your clip library.
8. Delete the result clip and exercise reel from the desktop.

## Exercise 2: Matching Colours between Clips

Use the Match tool to match the colours of clips to create more effective composites and edits. You can match a specific colour, match light and dark areas, or perform global matches between entire clips.

In this exercise, match the colours between two clips. In addition, use the Selective colour correction tools to isolate colours for additional correction.

Load the *15\_colour\_warper\_ex2* reel onto the desktop from CD 4, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips.



*15\_front\_ex2*: This aerial shot of Stonehenge in overcast conditions is the clip you will colour correct.



*15\_match\_ex2*: This close-up shot of Stonehenge at dusk is the reference clip. The colours in the clips must match so they can be edited together seamlessly.



*15\_result\_ex2*: This image shows the expected result.

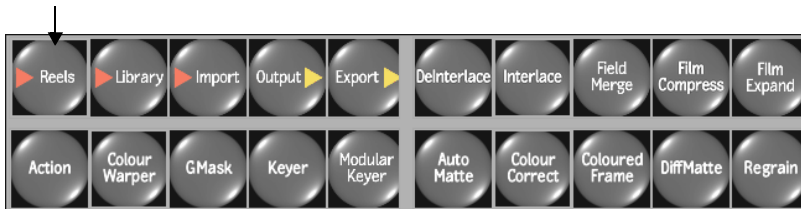
To preview the final image, play the *15\_result\_ex2* clip using the Player.



## Open Batch

Open Batch, add a Colour Warper node and an Output node, and then load the images used in the exercise.

1. In the Processing menu, click Batch and select a destination.
2. Delete everything on the Batch desktop:
  - a) Select All.
  - b) Click Delete, and then Confirm.
3. Add a Colour Warper node and an Output node to the desktop.
4. Press the Result tab of the Colour Warper node and drag to the Output node to parent them.
5. Load the clip to colour correct, *15\_front\_ex2*, into the Colour Warper:
  - a) Double-click the red Front tab of the Colour Warper node to view the reels.
  - b) Select the *15\_front\_ex2* clip as the front clip.
  - c) Click EXIT Clip Select to exit the reels.
6. Load the reference clip, *15\_match\_ex2*, onto the Batch desktop:
  - a) Drag a Reels node to the desktop.



The reels appear.

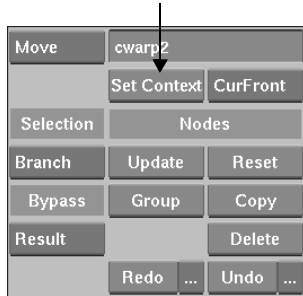
- b) Select *15\_match\_ex2* and click EXIT Clip Select.

The *15\_match\_ex2* clip appears on the desktop.

7. Set a context on the *15\_match\_ex2* clip so you can use it as a reference clip:

a) On the Batch desktop, click the *15\_match\_ex2* clip to select it.

b) Click Set Context.



A green dotted line appears around the clip to indicate that it is now loaded in the reference buffer as a context. (C1) appears next to the name on the desktop indicating that it is set as Context 1.

## Set the Split Bar

Use the split bar to view the clips to match at the same time.

1. Click the Colour Warper node to view the Colour Warper controls.

2. Click CurResult (**F4**).

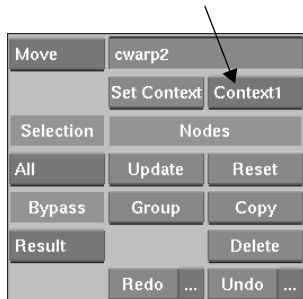
3. Set the split bar to view two clips in the image window at the same time:

a) **ALT**-drag the 2D vectorscope to the side.

b) Drag the pivot point of the split bar to divide the image window in half.

c) Drag the split bar to rotate it 45 degrees.

4. Select Context 1.



The reference clip is shown in the image window with the result clip. The poor match of the colours in the two clips is obvious.



## Match the Dark Areas

By matching the whites and blacks, you can correct differences in contrast between clips. For now, match the dark areas. You will match the light areas later.

1. Adjust the split bar to see more of the *15\_front\_ex2* clip, the aerial view.
2. Select the darkest range of colours in the *15\_front\_ex2* clip:

a) Click Match below the histogram.

The message “MATCHING: Select an area to be modified” appears in the status bar.

b) Drag a selection box over the darkest area in the *15\_front\_ex2* clip: the shadows on a stone. Be careful not to drag the selection box over any other area except the shadows.



The blue indicator on the Match button is enabled, indicating that you must now select a source sample.

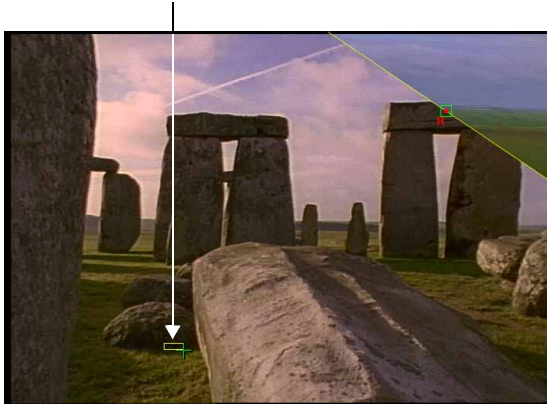
**Note:** If you make a mistake sampling the dark areas, continue with the Match procedure and then click Undo to reset the changes.

3. Adjust the split bar to see more of the *15\_match\_ex2* clip.
4. Select the darkest range of colours in the *15\_match\_ex2* clip:

a) Click Match.

The message “MATCHING: Select an area to match to” appears in the status bar.

b) Drag a selection box over the darkest area in the *15\_match\_ex2* clip: the shadows under a stone.



The blacks in the *15\_front\_ex2* clip are matched to the blacks in the *15\_match\_ex2* clip. The contrasts of each clip are now comparable.

## Match the Grass

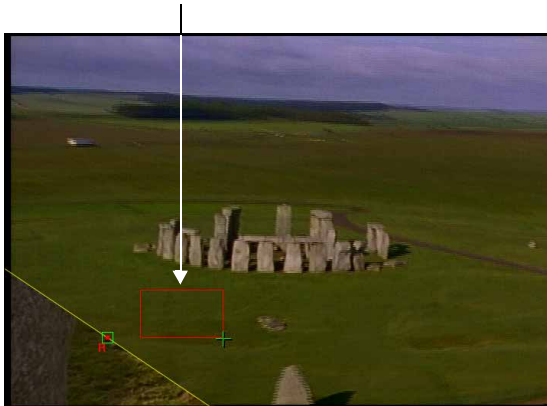
To correct differences in hue and saturation, use the Match tool to match a single colour. The grass in the *15\_match\_ex2* clip is less bright and has some brown tones. Match the grass in the *15\_front\_ex2* clip.

1. Adjust the split bar to see more of the *15\_front\_ex2* clip.

2. Sample an area of the grass in the *15\_front\_ex2* clip:

a) Click Match.

b) Drag a selection box over an area of the grass.

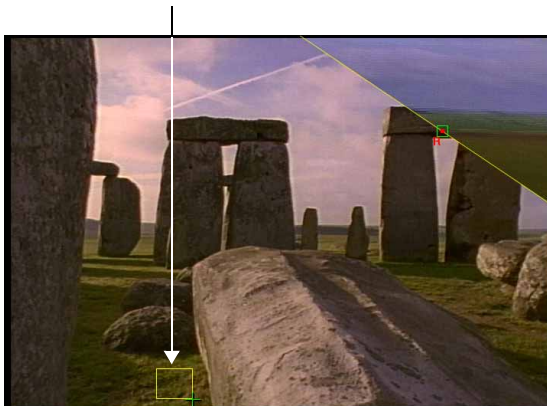


3. Adjust the split bar to see more of the *15\_match\_ex2* clip.

4. Sample an area of the grass in the *15\_match\_ex2* clip:

a) Click Match.

b) Drag a selection box over an area of the grass, but try not to sample too much of the brown earth.

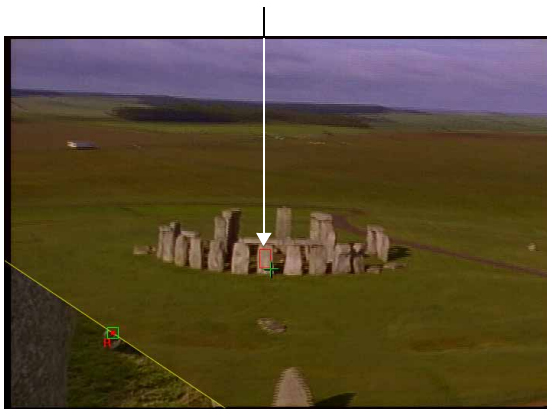


The colour of the grass in the two clip is more closely matched.

## Match the Stones

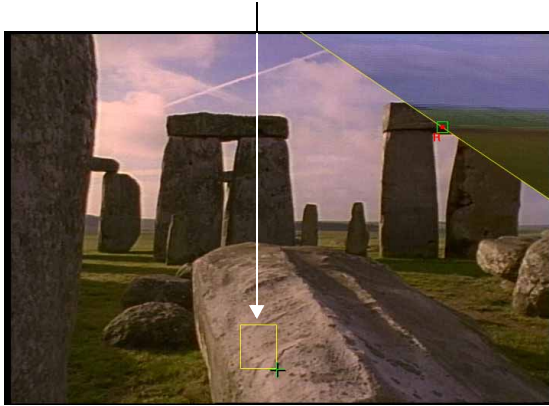
The standing stones in the *15\_match\_ex2* clip have a slightly pinkish cast from the setting sun. Match the stones in the *15\_front\_ex2* clip. Because the stones also contain the highlights, you will also better match the lighter areas and improve contrast.

1. Adjust the split bar to see more of the *15\_front\_ex2* clip.
2. Sample the colour of the stones in the *15\_front\_ex2* clip:
  - a) Click Match.
  - b) Drag a selection box over a stone.



3. Adjust the split bar to see more of the *15\_match\_ex2* clip.

4. Sample the colour of the stones in the *15\_match\_ex2* clip:
  - a) Click Match.
  - b) Drag a selection box over a stone in the *15\_match\_ex2* clip.



The colours of the stones are now matched in the two clips.

## Matching Colours Effectively

Here are some tips for matching:

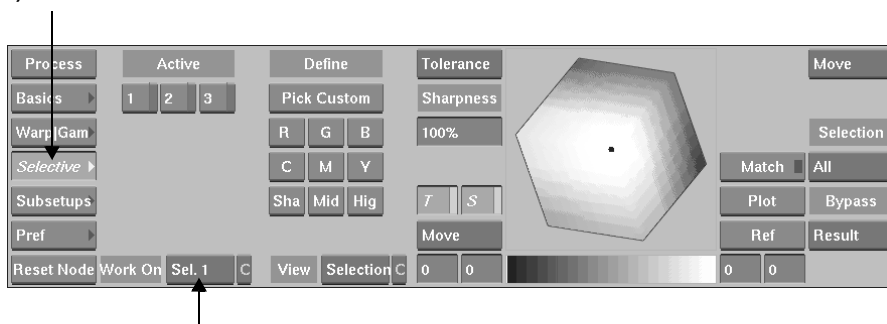
- In general, always match similar colours, or match blacks, whites, and overall saturation. Matching two distinct colours is unpredictable.
- Use the Match tool several times to achieve a more precise match without compromising the original match. For example, you can match colours, then switch to the Basics menu to fine-tune saturation, and then match colours again.
- You can undo any match by clicking the Undo list and selecting the match that you are not satisfied with. The remaining matches are not affected.

## Colour Correct the Sky

Next, fine-tune colours in the sky without affecting the colours in the stones and grass, which are properly matched. To do this, use the Selective menu to isolate the specific range of colours before making the corrections.

1. Adjust the split bar to see both clips equally.
2. Enable selective colour correction:

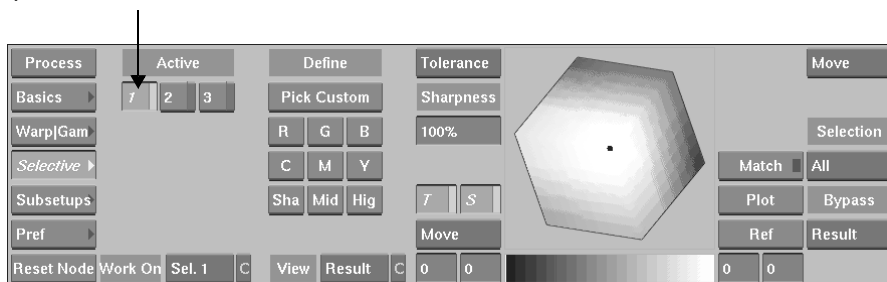
a) Click Selective.



b) In the Work On box, select Sel 1.

You are now working on Selective 1. The colours affected by Selective are not yet defined.

c) Enable Active 1.



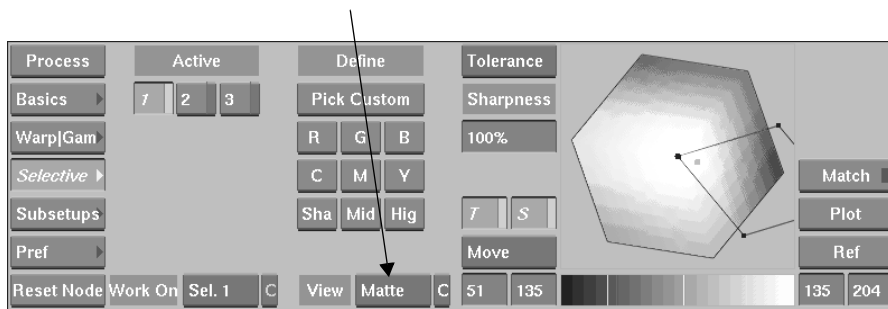
Selective 1 is active. Any colour corrections you make will be applied only to the areas defined by Selective 1.

**Hint:** With the Selective menu, you can correct colours in up to three separately defined selections.

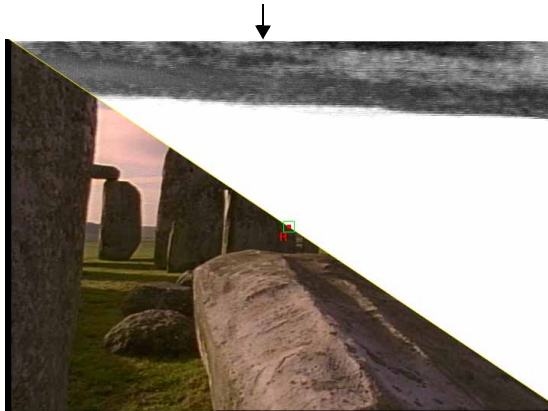


3. To isolate an area, a matte must be generated. Create a matte by sampling the sky:

- a) Click Pick Custom.
- b) Drag the cursor along the top edge of the sky.
- c) From the View box, select Matte.



The generated matte appears.



**Hint:** With the hue cube and the softness and tolerance controls in the Selective menu, you can create more complex and precise mattes. For more information, see the “Colour Warper” chapter in the *flame* or *inferno* User’s Guide.

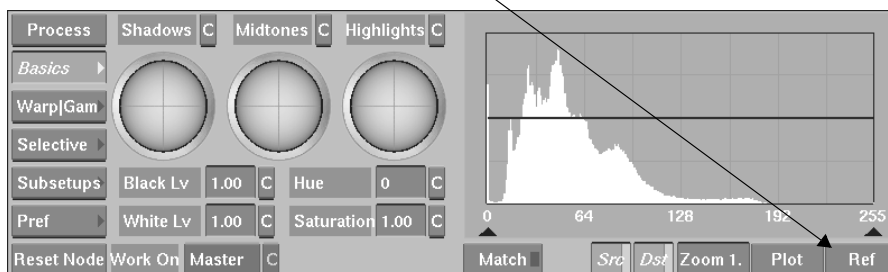
4. Click Basics to view the Basics menu.

The result appears in the image window automatically so you can begin colour correcting the areas defined in Selective 1.

5. Adjust the split bar to see the sky in both clips side by side.

## 6. Sample the colours of both skies:

a) Click Ref to plot colours in the reference clip.

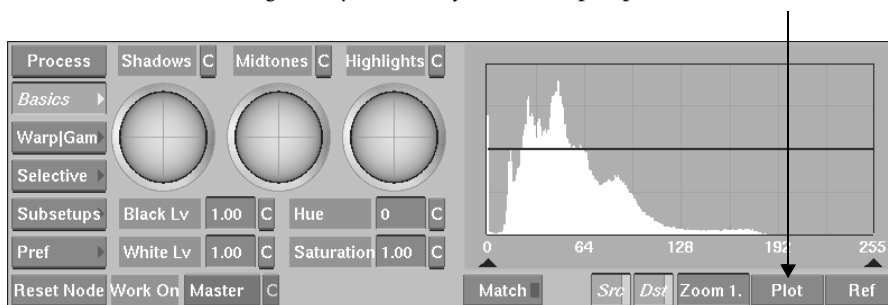


Using the Plot tool, you can only select colours from the CurResult layer. With the Ref tool, you can plot any pixel shown in the image window.

b) **CTRL**-drag the sky of the *16\_match\_ex2* clip to set an average colour for the sky as a reference.

The colour appears highlighted in yellow in the 2D vectorscope. The sky is now better matched, and the colour corrections to the stones and grass are unaffected.

c) Click Plot and **CTRL**-drag the sky of the *16\_front\_ex2* clip to plot the colours to match.



## 7. Drag the trackballs to move the plotted colour over the reference colour in the 2D vectorscope.



8. Adjust other properties such as Saturation and White Level until you are satisfied with the result.

## Check Your Results

Save the setup, process the clip, and compare your result to the *15\_result\_ex2* clip.

1. Go to the Setup menu and save the setup.
2. In the Output node, set Start to 1 and End to 30. For instructions, see “Check Your Results” on page 358.
3. Go to frame 1 and click Process.
4. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
5. Use the Player to view your result clip. Compare your result to the *15\_result\_ex2* clip.
6. (Optional) If the two clips do not match, return to Batch and load the *15\_colourwarper\_ex2* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_15* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
7. Save your result clip in your clip library.
8. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- To compare two clips or to view a result clip with the original, select the reference clip in the Reference box and use the split bar to divide the image window.
- Correct contrast by adjusting Black and White levels in the Basics menu.
- Toggle between the 2D vectorscope and the RGB viewer by double-clicking the currently active scope.
- To remove a colour cast from a clip, use the trackballs to move a plotted colour to the centre of the 2D vectorscope.
- To match colours, click Match and select the colour(s) to be modified; click Match again and select the reference colours to match.
- You can selectively colour correct up to three defined ranges of colour using the Selective menu. Use channel presets or pick custom colours to create a matte directly in the Colour Warper and then apply colour correction.

# 16

## 3D Tracking

*for inferno only*

Use 3D trackers in Action to compute the motion of a live-action camera in 3D space. Using the calculated position and motion of the virtual camera, you can add objects or layers to clips that follow camera movement identically. You can also export the camera data to be used in 3D programs such as 3d studio max.

In this lesson:

- Set up trackers to generate 2D tracking data
- Create a coordinate system to define the 3D space
- Generate 3D tracking data for the camera motion
- Add 3D text to the scene

### Need Help?

If you need help using the 3D Tracker, load the setup file provided for this lesson. Click the Load button in the Setup menu to open the file browser, go to the directory `/usr/discreet/project/effects/Tutorial/setups/lesson_16`, and load the setup file `16_3dtracking`.

Time to complete this lesson: 60 minutes

## About 3D Tracking

Use 3D tracking data to make the perspective of any element you place in a scene change with the perspective of the background as the camera moves. The virtual camera motion is identical to the motion of the actual camera that shot the scene.

To begin, set up 2D trackers on the back clip using the Stabilizer. Before you start, always examine the clip closely to determine the points you want to track. The quality of the 2D track has a direct impact on the 3D tracking result, so it is important that you have a strategy for positioning the trackers in the clip sequence.

Next, create the 3D space by establishing an origin and a set of reference coordinates (x, y, z). Specify a track point of origin and the units that establish the 3D tracking coordinate system. You can also set relations between points and specify camera parameters to increase the accuracy of the 3D track if necessary.

Finally, analyse the 3D tracking data and evaluate your results. If the track is accurate, parent the 3D track axis to apply the data to the objects you add to the scene. If the track is not perfect, you can go back and adjust or add individual trackers in the Stabilizer and try again.

## Exercise: Analyse and Apply 3D Tracking Data

Analyse 3D positional data for a 2D scene so you can add 3D text that follows the camera movement.

Load the *16\_3dtracking* reel onto the desktop from CD 4, “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71. The reel contains the following clips.



*16\_front*: This clip shows a shot of Stonehenge.



*16\_result*: This clip shows the expected result of analysing 3D tracking data and applying it to 3D text.

To preview the final image, play the *16\_result* clip using the Player.

## Open Action

Open the image used in the exercise in Action.

1. Open Action:
  - a) In the Effects menu, click Action.
  - b) Select *16\_front* as the front, back, and matte clip.
  - c) Select a destination.
2. Reset all options to their default values: go the Setup menu, click Reset All and Confirm.
3. In the Setup menu, disable Play Lock.
4. Delete any objects that may remain from the last Action session: select All next to the Delete button, and click Delete.

## Set the Reference Points for the 2D Track

Set the initial reference points on the back clip to track the basic camera motion in 2D.

The more trackers you set to reference points, the more accurate and smooth the final track will be. Each frame in the clip must contain at least six trackers. In addition, the clip must also have at least two frames containing a minimum of eight of the same trackers. These two frames should be at the beginning and end of the widest camera movement.

If you need additional help using the Stabilizer, see Lesson 8, “One and Two-Point Tracking” for more information.

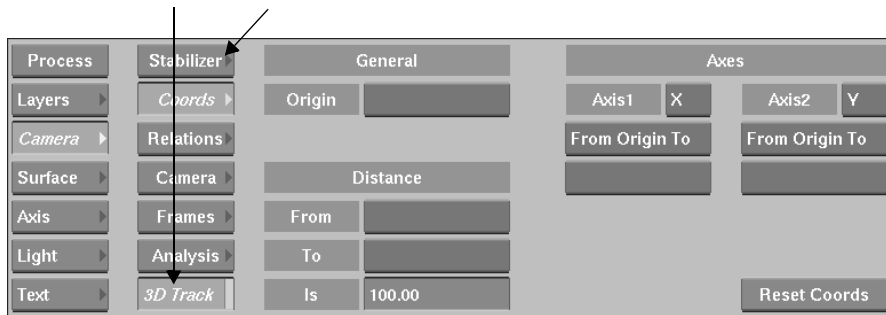
1. Click Result to view the result clip.
2. Before adding trackers, play the clip several times to determine good reference points.

For more information about selecting reference points for 3D tracking, see “Selecting Reference Points for 3D Tracking” on page 484.

Although you could select your own reference points to complete this exercise, it will be easier to follow the steps for defining axes by using the reference points suggested in the exercise. It will become clear why these specific reference points were selected as you complete the exercise.

## 3. Open the Stabilizer menu:

- a) Enable 3D Track.      b) Click Stabilizer.



## 4. Go to frame 1.

## Selecting Reference Points for 3D Tracking

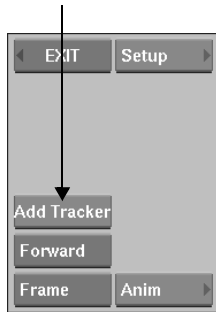
To accurately track camera movement, you must carefully choose where to place your trackers. If you do not get good results, experiment with different points and coordinates. Here are some tips:

- Look for elements with a high-contrast pattern that has good definition both vertically and horizontally and remains in the frame for all or most of the clip.
- Scatter the trackers by placing them on markings, corners, and shadows over the widest area possible, concentrating on areas where you might place a 3D object or any other object.
- Create a sense of depth by positioning trackers on points that lie in different planes, as well as on points located in the foreground and the background of the sequence.
- Avoid tracking points such as highlights or a point where the foreground and a background object meet, as they do not represent physical 3D points.
- Balance the number of trackers within each frame of the sequence so that as you move through the clip, some points leave the frame and other points appear in the frame. However, maintain a balance to prevent too many points from entering or leaving the frame at the same time.
- Avoid positioning the trackers in uniform areas or on linear edges where the reference points may slide along the edge.



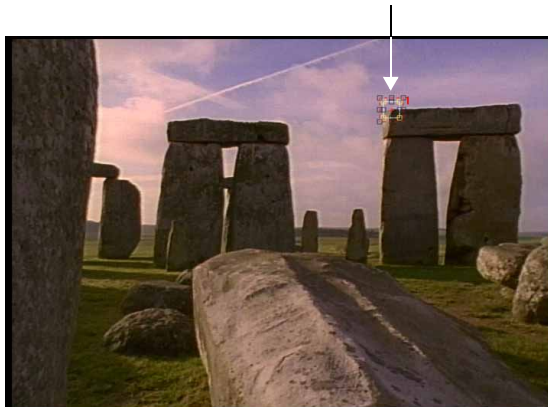
5. Add a tracker and position it over the first reference point:

a) Click Add Tracker.



A tracker, consisting of a tracker box and a reference box, appears in the centre of the frame.

b) Press **CTRL** and drag the tracker to the following reference point.



6. Add more trackers and position them over reference points in the scene:

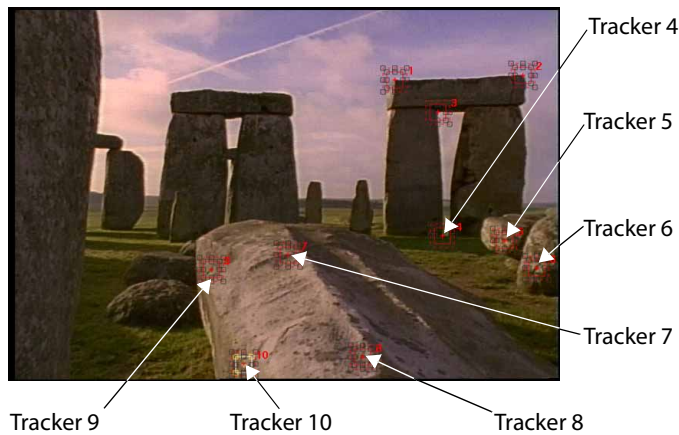
a) Click Add Tracker and **CTRL**-drag the second tracker to the following reference point.



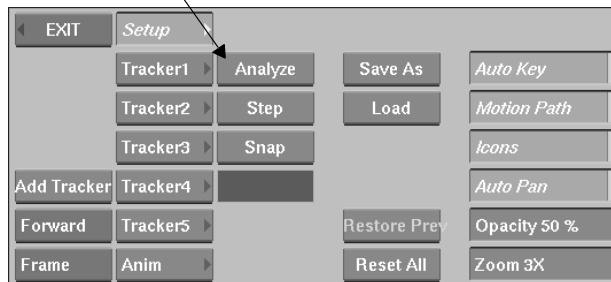
b) Click Add Tracker and **CTRL**-drag the third tracker to the following reference point.



7. Add seven more trackers to the following reference points, in the order indicated.



8. Click Analyze to generate the tracking data.



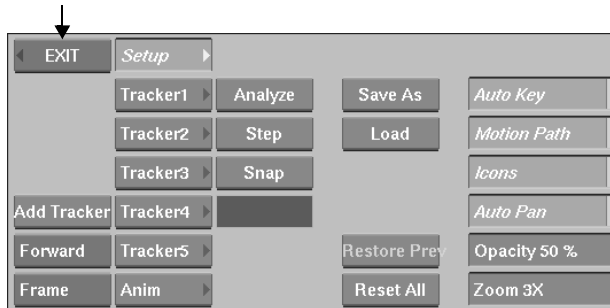
**Hint:** When using the 2D tracker, you can either analyse with all the trackers enabled at once, or analyse as you add each tracker to see if it tracks correctly. If you notice a tracker is moving erratically, reset it before reanalysing. Go to frame 1, enable the solo tracker, then click the Reset button and Confirm.

## Set the Coordinates for 3D Tracking

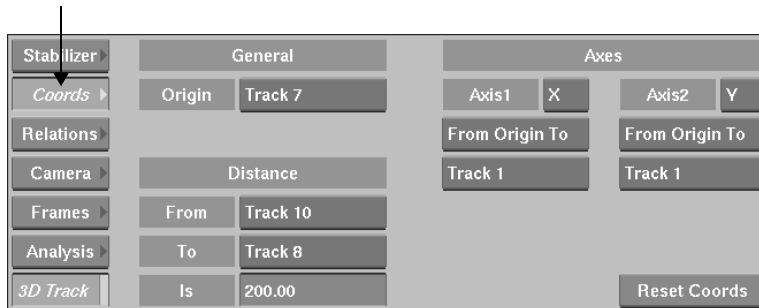
Once you are satisfied with your 2D track, you are ready to build the 3D track. To do this, you need to specify both an origin and a set of reference coordinates in order to establish the 3D space.

Keep in mind that it is the camera that is moving, not the reference points, which are fixed in the scene.

1. Click EXIT.



2. Click Coords to open the Coordinates menu.



3. Distance defines the scaling of objects in Action, or equally, how close the camera is to the object. You can set the distance by approximating the distance in pixels between two points that are close to the camera:

- a) Select Track 10 as From.      b) Select Track 8 as To.

Stabilizer ▶	General		Axes	
Coords ▶	Origin	Track 1	Axis1	X
Relations ▶			Axis2	Y
Camera ▶	Distance		From Origin To	From Origin To
Frames ▶	From	Track 10	Track 1	Track 1
Analysis ▶	To	Track 8		
3D Track	Is	200.00	Reset Coords	

- c) In the Is field, enter 200.

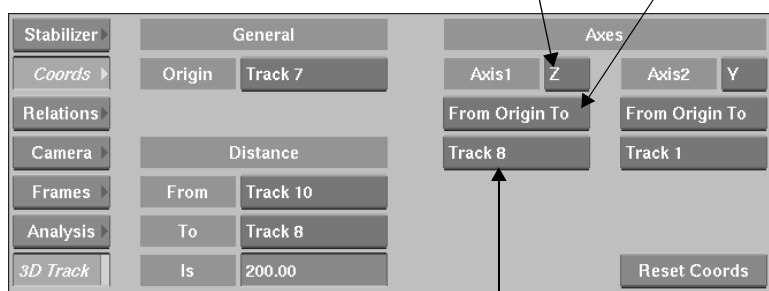
4. In the General area, select Track 7 as the origin.

Stabilizer ▶	General		Axes	
Coords ▶	Origin	Track 7	Axis1	X
Relations ▶			Axis2	Y
Camera ▶	Distance		From Origin To	From Origin To
Frames ▶	From	Track 10	Track 1	Track 1
Analysis ▶	To	Track 8		
3D Track	Is	200.00	Reset Coords	

You can set any tracker as the origin of the coordinate system; however, it is best to select a point that is easy to reference.

5. The stone in the foreground is good for defining the depth in the scene. Define the Z-axis using two of the reference points you set:

a) Select Z as Axis 1.      b) Select From Origin To as the first point defining the Z-axis.

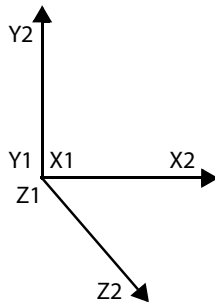


c) Select Track 8 as the second point defining the Z-axis.

The Z-axis is now defined between Tracker 7 and Tracker 8.



When defining axes for 3D tracking, you must always use positive scaling. Examine the diagram.



Using positive scaling, the second point of the Z-axis is always set closer to the camera. For the X-axis, the second point is always to the right of the first point you define. For the Y-axis, the second point is always above the first point in the frame.

#### 6. Define the X-axis:

**a) Select X as Axis 2.**      **b) Select Through Two Points.**

**c) Select Track 1 as the first point.**      **d) Select Track 2 as the second point.**

The X-axis is now defined between Tracker 1 and 2.



Only two axes need to be defined in the coordinate system. The third axis, in this case the Y-axis, is calculated automatically.

**Hint:** Select Normal to 3 Points from the Transversal Point box to define an axis based on the normal of a plane created by any three selected reference points.

## Set Camera Parameters

You can specify camera parameters to include in the 3D tracking calculations. Any available camera information will help achieve an accurate track and speed up the processing.

1. Click Camera.





## 2. Set general parameters for the camera:

- a) Click General.      b) Select NTSC.

Stabilizer ▶	General ▶	Film Back	Image Resolution	Pixel Aspect Ratio
Coords ▶	Focal Length	NTSC	Width 720	Fixed
Relations ▶	Distortion	Width 0.792	Height 486	Ratio 0.9000
Camera ▶		inches	Ratio 1.481	
Frames ▶				
Analysis ▶				
3D Track				Reset Camera

**PAL**

If you are working in PAL, select PAL as the Film Back.

## 3. Set the focal length of the camera:

- a) Click Focal Length.      b) Select Constant Initialized.

Stabilizer ▶	General ▶	Focal Length	
Coords ▶	Focal Length ▶	Constant Initialized	
Relations ▶	Distortion ▶	Length 20.00	
Camera ▶		mm	
Frames ▶			
Analysis ▶			
3D Track			Reset Camera

- c) Set Focal Length to 20.00.

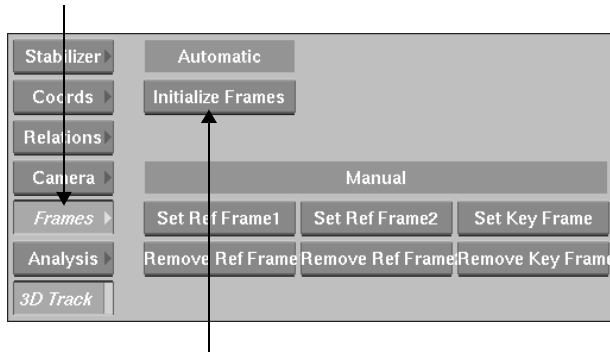
If you do not have the camera details, you can experiment with values and compare the tracker residuals after analysing to determine the optimum settings. For more information on the camera parameters, see the “3D Tracking” chapter in the *flame* or *inferno* User's Guide.

## Initialize the Frames

Before analysing the 3D tracks, you must first initialize frames. The Initialize Frames function creates keyframes that set the intervals between which the camera data is interpolated. The intermediate frames are interpolated between the keyframes and the camera parameters are refined using the estimated 3D point information.

1. Initialize frames for the clip:

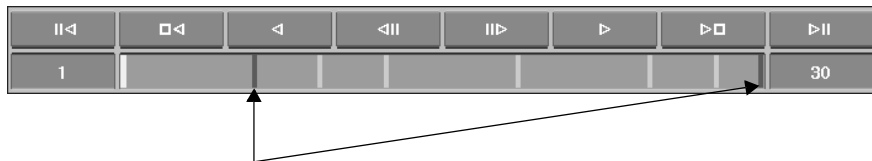
a) Click Frames.



b) Click Initialize Frames.

The 3D tracker automatically creates keyframes for the tracking data.

2. Examine the timeline.



Two red bars are shown on the timeline. These are the reference frames, which coincide with the beginning and the end of the camera motion.

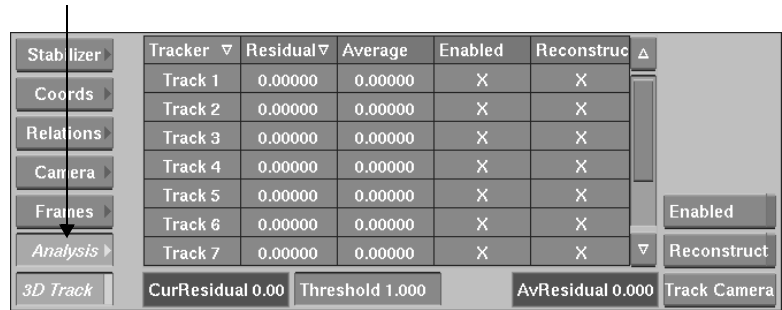
The blue bars are keyframe indicators, which define the camera position. All movement is interpolated between the keyframes. In smooth shots, there are less keyframes; in jittery shots, there are more keyframes.

If the original 2D track is accurate, a good 3D track will usually have keyframes set approximately every 5 frames.

# Analyse 3D Tracks

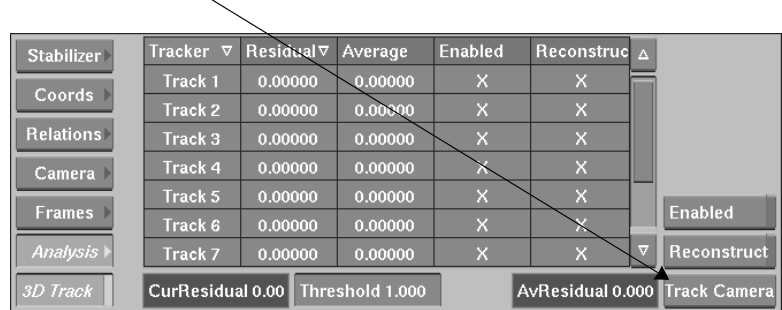
Once the frames are initialized, you are ready to analyse the 3D track.

- 1. Click Analysis.



The Analysis menu appears. Statistical information about each tracker is displayed in the table.

- 2. Click Track Camera.



Axes appear on each track point.

- 3. Play the clip to examine the axes on each track point to see if they match the 3D scene or if they drift off the reference points.

**Hint:** If the axes do not move at all, enable Motion Update in the Setup menu.

- 4. Examine the residuals.

The residual values indicate the drift of each tracker after analysis. By default, the threshold is set to 1. With NTSC footage, residuals for each tracker should be less than 1. Otherwise, the trackers are not sufficiently accurate.

**Note:** When working at film resolutions, a residual threshold of up to 5 pixels is often accurate enough.

Red bars appear in the timeline at each frame where trackers have residual above the threshold.

5. Go to any frame marked by a red bar and examine the residuals for each tracker.

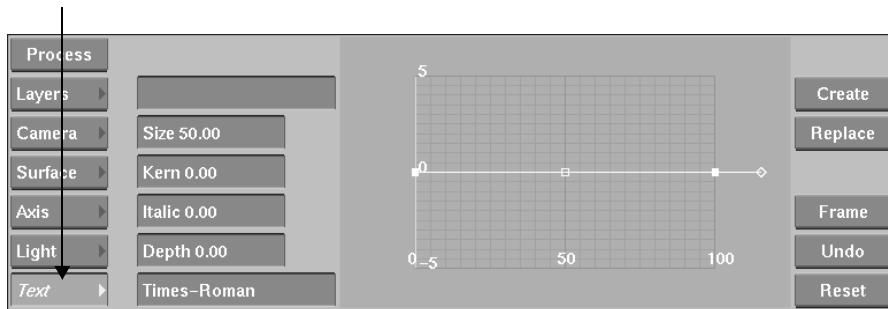
If a particular tracker has a residual above the threshold at all or most frames, it will be necessary to reset the tracker and try another reference point. However, a small number of trackers may drift at a few frames without causing a serious degradation to the 3D track. You should first examine how well the axes follow the shot, and then decide whether the 3D track is accurate before fixing individual trackers.

6. If you need to fix any trackers, do the following:
  - a) Determine the trackers that are drifting using the red bars in the timeline to identify the frames, and then examine the tracker residual statistics.
  - b) Select new reference points for the problematic trackers, or fix them using the techniques you learned in Lesson 8, “One and Two-Point Tracking”.
  - c) Go to Schematic view and delete all tracker axes.
  - d) Click Track Camera to reanalyse all the trackers.

## Add 3D Text to the Clip

Now that the 3D tracking data has been created, add 3D text that follows the camera movement in the clip.

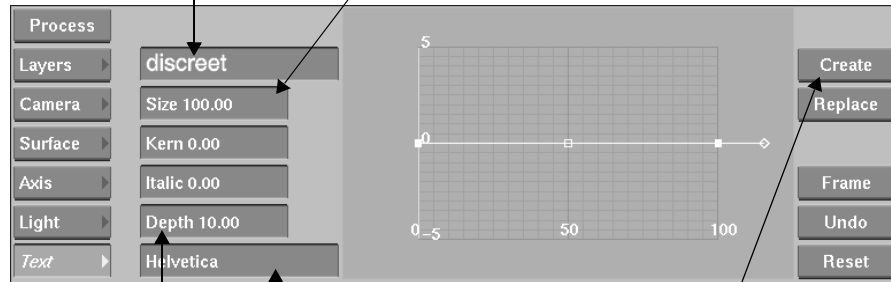
1. Go to frame 1.
2. Click Text.



3. Enter the text and set options:

a) Type "discreet".

b) Set Size to 100.



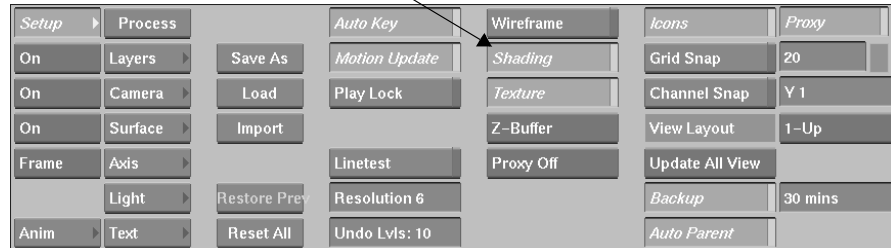
c) Set Depth to 10.

d) Select Helvetica.

e) Click Create.

The text is added to the scene. Despite the font size, the text appears very small because it is by default centered on the origin you set when building the 3D coordinate system.

4. In the Setup menu, enable Shading.



# 5. View the surface properties of the text:

## a) Click Surface.



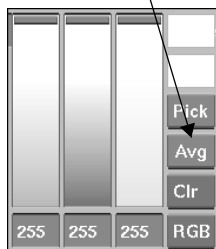
## b) Select Geometry.

# 6. Set the colour of the text to match the stones:

## a) Click the Diffuse colour box.



## b) Click AVG.



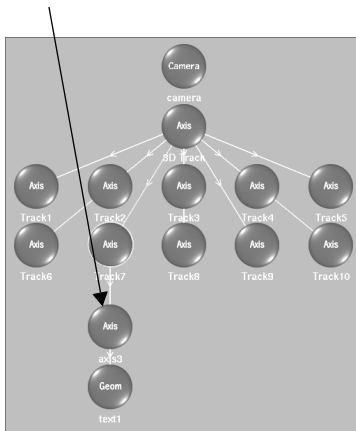
## c) Drag the cursor over the foreground stone to sample the colour.

## d) Click the Diffuse colour box again.

The averaged colour is applied to the text.

7. Parent the tracker axis to the text axis:

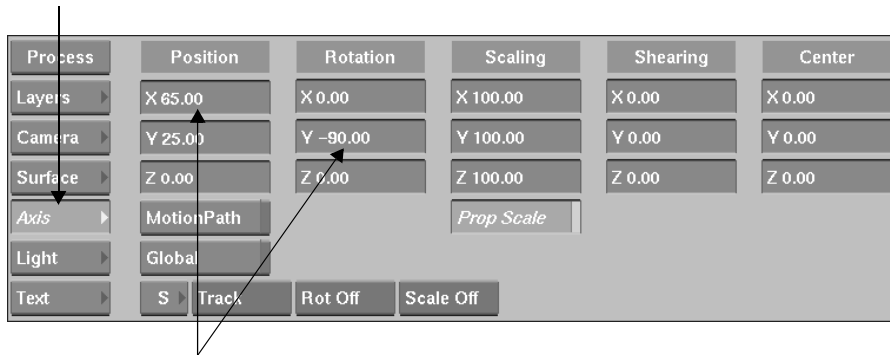
- a) Press ~ to go to Schematic view.
- b) **ALT**-drag the Text1 axis below the Track7 axis.
- c) Drag from the edge of the Track7 axis to the Text1 axis to parent it.



By parenting a tracker to the text, the text is centred on its reference point. You can visually determine the exact position of the object in the scene as they now share the same position in 3D space. Any adjustments to keep the text in perspective as the camera moves can now be made relative to the reference point of the parented tracker.

**8. Position the text on the stone:**

- a)** In Schematic view, select the text axis.
- b)** Click Result to go to Result view.
- c)** Click Axis.



- d)** Set Position X to 65.00, Position Y to 25, and Rotation Y to -90.00.

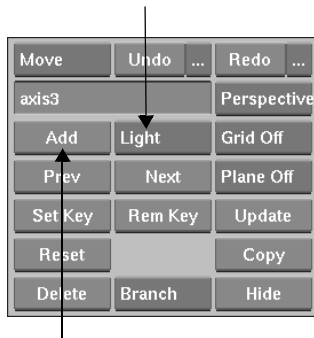
The 3D text is positioned on the stone.

## Add a Light

Add and position a light to shade the text so it matches the lighting on the stones.

- 1.** Go to frame 1.
- 2.** Add a light to the scene:

- a)** Select Light.



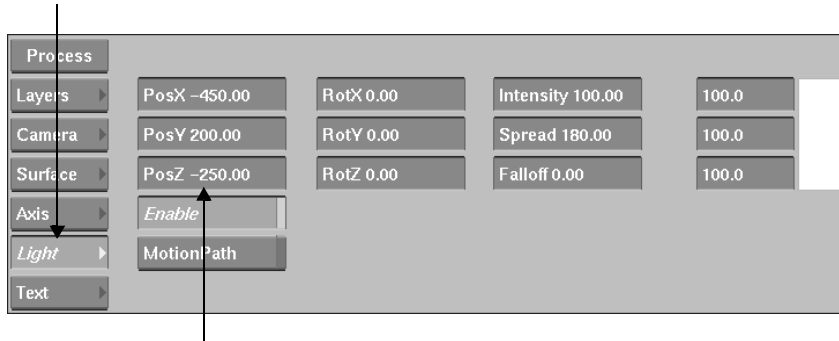
- b)** Click Add.

The light is added to scene, centered on the origin.



### 3. Change the position of the light:

a) Click Light.



b) Set Position X to -450, Position Y to 200, and Position Z to -250.

The text is properly lit.

## Check Your Results

Save the setup, process the clip, and compare your result to the *16\_3dtracking\_result* clip.

1. Go to the Setup menu and save the setup. Remember to select All to save the setup with the clip references (see “Saving and Loading Setups in Action” on page 201).
2. Go to frame 1 and click Process.
3. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
4. Compare the processed clip to the *16\_3dtracking\_result* clip using the Player to play each clip. For instructions, see “Play the Clip” on page 44.
5. (Optional) If the two clips do not match, return to Action and load the *16\_3dtracking* setup file from the `/usr/discreet/project/effects/Tutorial/setups/lesson_16` directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
6. Save your result clip in your clip library.
7. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- During initial 2D tracking, add trackers to reference points in the foreground, background, and middle ground of the scene in order to help establish the 3D space later.
- To successfully track in 3D, every frame must contain a minimum of six trackers.
- At least two frames must contain a minimum of eight trackers, ideally positioned at the beginning and end of the widest camera movement.
- Use the Coordinates menu to set the reference coordinates and create the 3D space for the track.
- Use the Camera menu to set camera parameters to speed up and improve 3D tracking calculations.
- Click Initialize Frames to create keyframes and interpolate camera data during a clip. You must initialize frames before you can analyse a 3D track.
- Examine residual values to determine the accuracy of each 3D tracker. When working with NTSC footage, set the threshold for tracker residuals to 1; when working in film resolution, set the threshold to 5.

# 17

## Motion Estimation

*for inferno only*

You can change the speed of a clip by applying either a basic timewarp or an advanced timewarp to the clip. With basic timewarps, frames or fields are duplicated, removed, or reversed. Advanced timewarps can be created with Motion Estimation. With Motion Estimation, new frames are created using morphing techniques that calculate motion changes between frames.

In this lesson:

- Build a batch process tree
- Apply Motion Estimation to double the length of a clip
- Correct pixel distortions created by the timewarp

### Need Help?

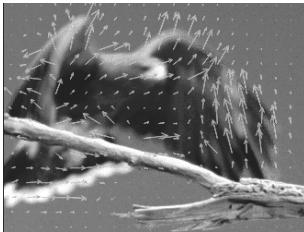
If you need help applying Motion Estimation to the clip, load the setup file provided for this lesson. Click the Setup button in the Action menu, then click Load to open the file browser. Go to the directory `/usr/discreet/project/effects/Tutorial/setups/lesson_17` and load the setup file `17_motion`.

Time to complete this lesson: 20-30 minutes

## About Motion Estimation

Depending on the footage, you may achieve better results with Motion Estimation than with a basic timewarp. For example, a basic timewarp may produce choppy results. With a clip that contains live action or lots of motion, it is best to apply Motion Estimation. For more information about which timewarp is best for your needs, see the chapter “Timewarps” in the *inferno User’s Guide*.

Motion Estimation increases or decreases the length of a clip by creating new frames based on data collected from original frames. First an adjustable grid is placed over the image. Then vectors are mapped onto this grid as arrows.



- The length of each arrow represents the amount of motion from one frame to the next.
- The direction of each arrow represents the direction of motion from one frame to the next.

New frames are then created by morphing the original images along these motion vectors.

Depending on the motion in the original scene, you can modify the size of the grid, the direction or size of the vectors, the amount of displacement, or the duration of the final clip to get the best results for your timewarp.

Because Motion Estimation is based on frame-by-frame calculations rather than field information, use frame-based material. Only basic timewarps can use field information to change clip lengths.

## Exercise: Applying Motion Estimation

Use Motion Estimation to double the length of the source clip. First, apply Motion Estimation through Batch and then review the results to correct distortions.

Load the *17\_motion* reel onto the desktop from CD 4 “images.” For instructions, see “Exercise 1: Loading the Source Clips” on page 71.

The reel contains the following clips:



*17\_front*: The front clip contains camera motion, moving water, and steam that passes across the front of the scene. All this movement would complicate a basic timewarp; for a smooth finish, Motion Estimation is required.



*17\_result*: This clip shows the expected result after applying both Motion Estimation and distortion corrections.

To preview the final clip, play the *17\_result* clip using the Player.

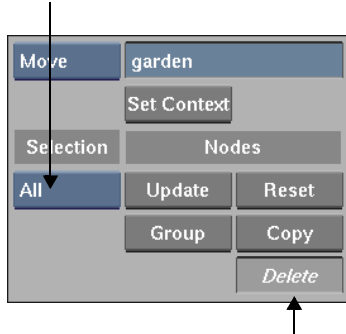
### Open Batch

Open Batch and build a process tree using a Motion Estimation node, an output node, and the clip used in the exercise.

1. Play through the source clip first, taking note of motion in the water, the steam, and the camera position.
2. In the Processing menu, click Batch and select a destination.

3. If there are any nodes or images on the Batch desktop, delete them:

a) In the Selection Mode box, select All.

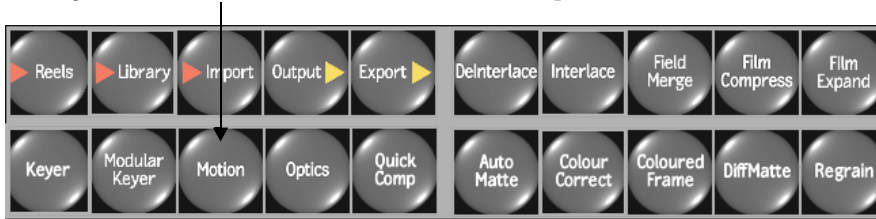


b) Click Delete and then Confirm.

4. Add a Motion Estimation node:

a) Click Schematic (or press ~) to view the Batch desktop.

b) Drag a Motion node from the node bar to the desktop.



**Hint:** If you do not see the node bar, swipe the bar at the left or right side of the menu panel to display it.

5. Load the source clip from the desktop into Motion Estimation:

a) Double-click the red Front tab of the Motion node.

b) Select *17\_front* as the Front clip

c) Click EXIT Clip Select to exit the reels.

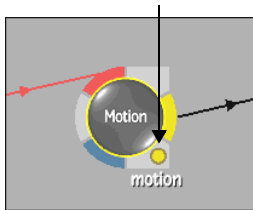
**Hint:** Motion estimation can process both a front clip and a matte. When you use a matte, motion vectors are only estimated for the white areas of the matte. Use a matte where there is a lot of motion in the background, or to eliminate artifacts that might appear in the foreground element after processing.

6. Parent the Motion node with an Output node:
  - a) Drag the Output node to the right of the Motion node.
  - b) Press the Result tab of the Motion node and drag to the output node.
7. In the Output node, set Start to 1 and End to 60. For instructions, see “Check Your Results” on page 358.

## Apply Motion Estimation

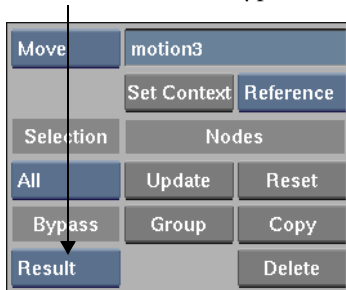
Apply Motion Estimation to double the length of the source clip. The result clip will play back at half speed.

1. Set up the Motion node to save intermediate result frames to a cache. This will make playing through and corrected processed frames more efficient later. Click the Motion cache tab once to set it to Read/Write mode (a yellow circle).



When the tab displays a yellow circle with a grey center, the cache is set to Read Only mode. When the tab is completely grey, the cache is turned off. For more information about cache modes, see the chapter “Batch Processing” in the *inferno User's Guide*.

2. Select Result from the Bypass box.

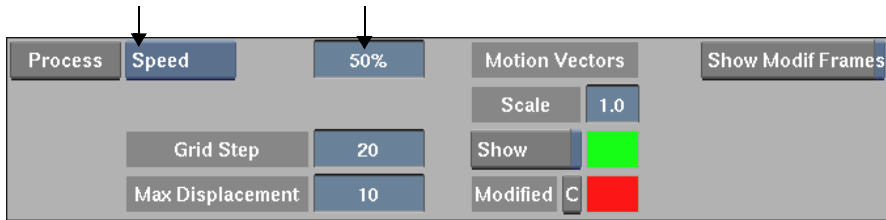


3. Click CurResult view.

4. Double the length of the clip to make it play back at half speed:

a) Select Speed.

b) Enter 50% in the Speed field.



**Hint:** You can also choose Length and enter source and destination frame values to change the clip length.

5. Go to frame 1 and click Process.

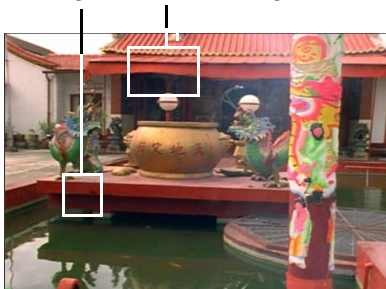
When you click Process, Motion Estimation creates a grid of motion vectors that records changes from frame to frame. Using these changes as a guideline, Motion Estimation creates addition frames and inserts them into the clip.

6. Play the clip to review the results:

a) Click Play to open the Play menu.

b) Play the clip and look for distortions.

For example, in frame 4 there are misplaced pixels on the platform and on the roof. Notice the irregularities in the image. These distortions distract the eye when the clip is in motion.



**PAL**

If you working with PAL, the first misplaced pixels are in frame 2, in the roof shingles.

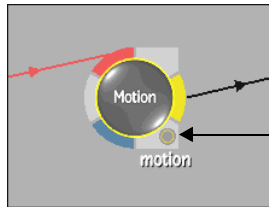
c) Click Exit Play to return to the Batch desktop.



## Correct the Distortions

Correct image distortions by manually adjusting motion vectors.

1. Click Schematic.
2. Change the Motion cache mode so that you can play through the clip without reprocessing the results. Click the cache tab to change it from Read/Write to Read Only.



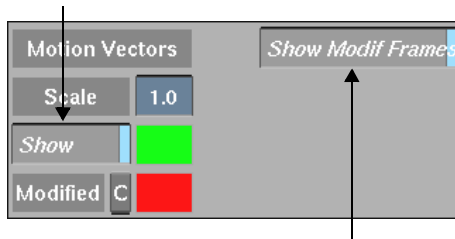
Read Only cache mode is represented by a yellow circle with a grey centre.

3. Click CurResult.
4. Go to frame 4, where the first distortions appear.
5. Zoom in (**CTRL+UP ARROW**) and pan (**SPACEBAR**) to view the distorted pixels on the platform.



6. Display the motion vectors:

- a) Click the Node button.
- b) Enable Show to display the vector grid.

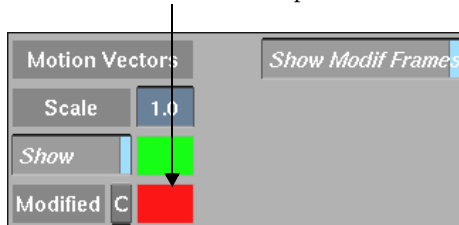


- c) Enable Show Modif Frames to automatically create a blue marker in the timeline for every interpolated frame.

The motion vectors appear. Next, correct the distortions by changing the vectors' direction or length. These vector adjustments alter the pixels surrounding them.

7. When a motion vector is adjusted, it changes to the colour indicated in the Modified colour pot. For this clip, the default colour red does not show up particularly well. Change the colour of adjusted vectors to blue:

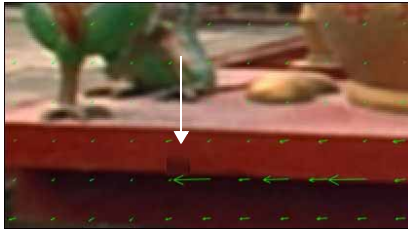
- a) Click the Modified colour pot.



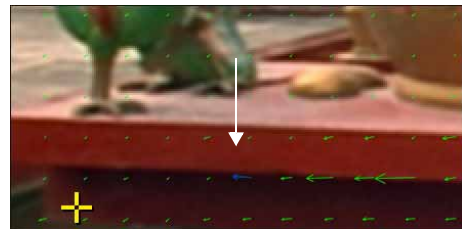
- b) Select blue from the colour picker.
- c) Click the Modified colour pot again to assign the new colour.

8. Adjust the vectors in the area to correct the error.

You can adjust both the length and direction of a motion vector by dragging the vector's head. Adjust the vectors closest to the distortion until you have corrected the pixels' displacement. In this example, try adjusting the vector directly below the distorted area.



Before the adjustment



After the adjustment

9. Pan (**SPACEBAR**) to the distorted pixels in the roof, and repeat the correction process.
10. Repeat this process for the remaining distortions throughout the clip.

Notice the blue keyframe indicators that appear in the timeline to mark the frames you correct.

**Hint:** For additional ways to correct distortions in an image, see the chapter “Timewarps” in the *inferno User's Guide*.

## Check Your Results

Save the setup, process the clip, and check your results to the *17\_result* clip.

1. Click Schematic.
2. Change the cache mode to Read/Write to save changes made. Click the Motion cache tab, changing it to a yellow circle.
3. Go to frame 1 and click Process.
4. When the clip has been processed, click EXIT to return to the reels. The processed clip appears on the destination reel.
5. Use the Player to view your result clip. Compare your result to the *17\_result* clip.

6. (Optional) If the two clips do not match, return to Batch and load the *17\_motion* setup file from the */usr/discreet/project/effects/Tutorial/setups/lesson\_17* directory to see how the settings should appear. For instructions, see “Load the Exercise Setup File” on page 159.
7. Save your result clip in your clip library.
8. Delete the result clip and exercise reel from the desktop.

## Things to Remember

- Clips with lots of motion and camera movement are best manipulated using Motion Estimation.
- Build a Batch process tree to apply Motion Estimation to a source clip.
- You can specify either length or speed values to create a new clip length.
- To increase efficiency when working with Motion Estimation, use the cache.
- To correct distortions created by Motion Estimation, display the grid and adjust its vectors.

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