



Snell
Advanced
Media

User Guide

Stereo 3D

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Conventions Used

Text

- <Text> indicates a specific key press on the QWERTY keyboard.
- NN/nn indicates a value entered on a numeric keypad.
- Text/text** indicates either an application menu function or a Windows/SAM installation/system setting.

Symbols



See: Reference to items in other documents.



Notes: System, software and workflow points to consider and remember.



Tips: Useful hints and advice when undertaking tasks.

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1. Stereo GUI

1.1 Overview

This guide is for use only after the user has a thorough understanding of I/O and Edit applications together with MLT FX.



See the I/O, Timeline Editing, MLT FX and Grading User Guides for details.

1.1.1 Upgrading Versions – Important Notice

V5.2 software onwards does not support previous Stereo 3D clips with the Effects application's history – these clips cannot be converted to the new Stereo 3D multilayer timeline.



Before upgrading, ensure any current work involving Stereo 3D clips with Effects history is complete and clear any existing Effects history.

It is not possible to migrate back to V5.1 because of database changes.

1.1.2 Post and DI Functionality

Stereo 3D functionality allows stereo media to be ingested, edited, have processes applied (e.g. colour), then be previewed and played-out via the workstation.

As with mono (2D) media, the I/O application provides ingest, conform, export, playout and archive functions. The Edit application is used to initially edit clips, then by opening MLT FX, processes can be set up, such as **colour, key, dve, blur** etc., and use the 'stereo' process functions to assist with stereo specific functions such as convergence or push.

1.1.3 Broadcast Functionality

The Stereo 3D option available on specific seats (including Qube, sQ Play, sQ Record etc.) allows stereo media to be ingested via the sQ Server, viewed, edited (with MLT FX processes), published, then played-out via the sQ Server.

Stereo media can be published from the desktop or timeline to the sQ Server and played-out live to a 3D TV using sQ Play. The server can play-out separate left and right eyes on two allocated HD-SDI ports, or multiplex them together onto a single HD-SDI stream. sQ Play can control 1 or 2 stereo port pairings.

sQ seats can use the Intelligent Archive Power Portal with stereo media.

The One Shot (F8) Menu and Templating option are not available with stereo media on sQ seats.



**See sQ Record User Guide for stereo ingest details.
See sQ Play User Guide for stereo play-out details.**

1.1.4 Convert 'Old' Stereo Clips

When the application launches, if there are any clips stored as 'old' stereo clips, i.e. created in a software version earlier than V5.2, an error message displays at the bottom-right of the display:



- Press **OK** to close the message.

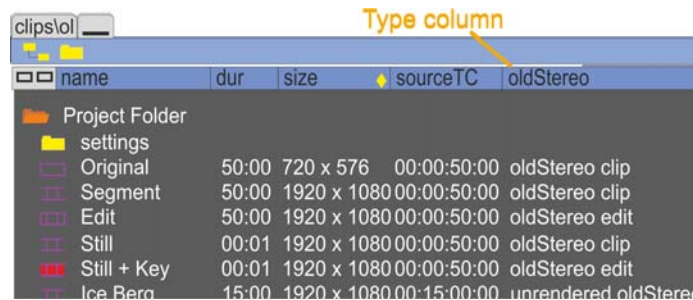
If the clips are not subsequently converted, the next time the application is opened the message displays again.


Pressing **Don't remind me again** closes the message and ensures it doesn't display next time the application opens; even if there are stereo clips in an 'old' format.

1.1.4.1 Search for 'Old' Stereo Clips

To search for 'old' stereo clips in the Clips Bin:

- Press on the **Type** column and enter 'oldStereo' as the search term, to filter the result.

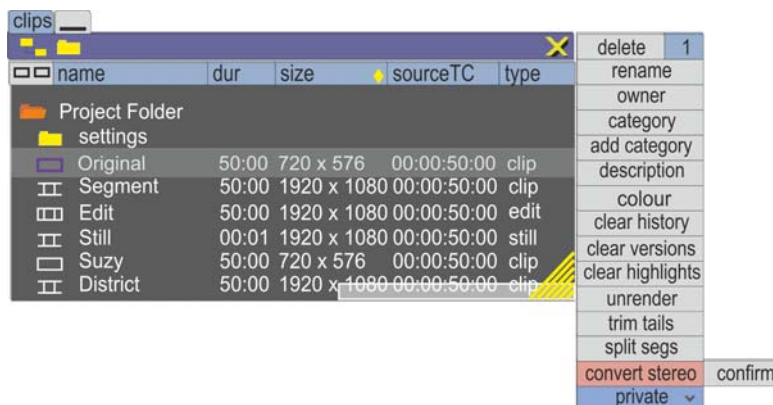


All clips stored in an 'old' stereo format display with a purple icon  in the Clips Bin, indicating that the clip should be converted to the current format.

1.1.4.2 Convert a Clip

To convert a clip:

1. Press on the clip title(s) in the media bin (i.e. Clips Bin or Server Bin).



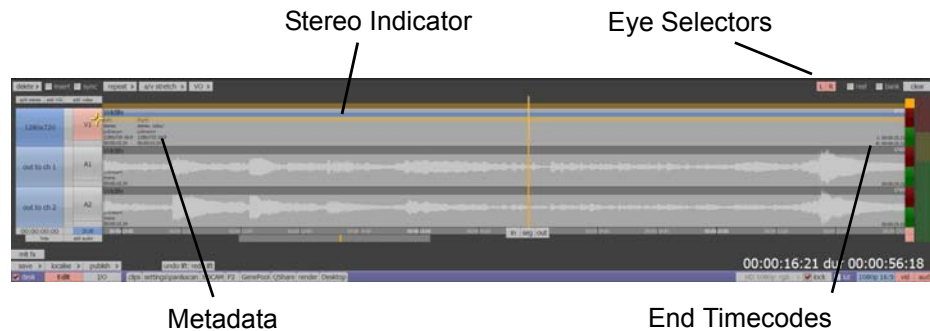
2. Select **convert stereo**.
3. Press **confirm**.

Convert multiple clips simultaneously by selecting them using <Shift> or <Ctrl> then following the previous steps.

1.2 Edit Application Functions

1.2.1 Stereo 3D Timeline

A stereo clip, consisting of both left and right eyes, displays on the timeline as one layer e.g. **V1**. A blue line across the clip segment indicates that the clip is stereo.

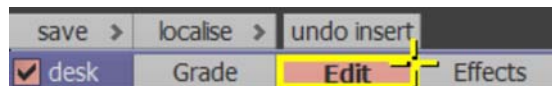


1.2.1.1 Add Stereo Media to the Timeline

The stereo timeline can be edited, trimmed, played-out and rendered like a mono timeline.

To insert a stereo clip to the timeline, do one of following:

- Drag and drop the stereo clip from a bin or the desktop onto the **Edit** tab on the Application Bar.



- Drag the stereo clip from a bin or the desktop onto **V1**.
- Drag and drop the stereo clip from a bin or the desktop into the Edit Window.

When a stereo clip is loaded onto the timeline, any GUI (or panel) functions, e.g. Pan & Scan include stereo specific functions.

1.2.1.2 Working with Multiple Layers

Multiple layers of stereo clips, e.g. **V1**, **V2**, **V3** etc. can be added to the timeline. Layers of both mono and stereo clips can be mixed on the timeline.

1.2.1.3 Add Layers

To add a new video layer:

- Press **add video**.

To use a video guide track as a reference:

- Press **VG**.



See Timeline Editing User Guide for details of using a Video Guide track.

1.2.1.4 Remove Layers

To remove a video, audio or VG layer:

- Press **delete**.
- Press on the layer to remove, e.g. **V2**.

1.2.1.5 Clear the Stereo Timeline

To remove a stereo edit from the timeline:

- Press **clear**.

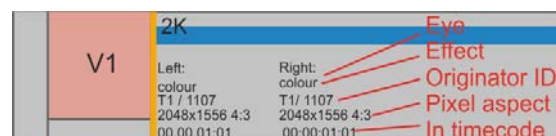
Pressing **clear** again removes the stereo clip and returns the timeline to mono mode (i.e. only **V1** displays).



See **Timeline Editing User Guide** for general details about adding or moving clips and other timeline functions.

Metadata Display on Timeline Segment

Metadata for each eye displays on the left of each timeline segment. This includes MLT FX processes (e.g. **colour**, **dve**, **text**) that have been applied to the clip, originator ID, pixel aspect, and 'in' timecode.



1.2.1.6 Display Thumbnails on the Timeline

To display thumbnails on each timeline segment:

- Select **Show Pics** from the **Editor** menu in the <F1> Configuration Window.



1.2.2 Edit Window Display

The Edit Window image displays a mono view of the left and right eye divided by a central yellow bar. The yellow bar can be dragged left or right, in order to display more or less of either eye.



- Press on the yellow bar for alternative views of the image area:

Press once, and the left side of the image displays an overlay/mix of both eyes. The right side of the image remains as a mono view of the right eye.



Drag the small vertical bar to increase or decrease the mix view.

Press a second time, and a horizontal bar displays. The top half displays both eyes using an embossed overlay to give clear view of the vergence offset. The bottom half remains as a mono view of the right eye.



Press for a third time, to return the view to the original vertical split.

1.2.2.1 Eye Selection

When a stereo clip is loaded on the timeline, use the **L** and **R** eye selectors above the timeline to toggle between different views in the Edit Window. Both eyes are on by default (i.e. pink) and the Edit Window display is split between the left and right eye.



- Deselect a button to display a single eye across the whole image area.



Both eyes cannot be muted at the same time.

1.2.3 Using a Mono/Stereo Video Guide

To add a video guide:

- Press **add VG** and then drag and drop a clip onto the timeline with the VG track on the timeline selected.

When using a video guide track (**VG**) with a stereo video track (e.g. **V1**) the Edit Window and eye selector boxes can be used as described as follows.

1.2.3.1 Compare VG Mono and V1 Stereo

When both eye selectors are on (default), the mono VG displays on the left side of the Edit Window, and the left eye of the stereo V1 displays on the right. Toggle the V1 eye by deselecting **L**. The right side then displays the right eye of the stereo V1.



1.2.3.2 Compare VG Stereo and V1 Mono

When both eye selectors are on (default) the left eye of the stereo VG displays on the left side of the Edit Window, and the mono V1 displays on the right side.



In this mode, if the Edit timeline's video track is mono only the eye selectors do not display.

1.2.3.3 Compare VG Stereo and V1 Stereo

When both eye selectors are on (default), the left eye of the stereo V1 displays on the left of the Edit Window, and the left eye of the stereo VG displays on the right side. When L is deselected both displays change to the right eye, ie the eye selectors apply to both tracks.



Opposite eyes cannot be compared on different timeline or VG tracks. When comparing two stereo tracks, either compare both left eyes or both right eyes, i.e. not a mixture.

1.2.4 Vergence, Push and Pan & Scan

Hover the cursor over the top right of the Edit window, to display a grey box. Press this box, and the Vergence and Pan & Scan menu displays below the image area.



See 'Pan & Scan' in the Timeline Editing User Guide for more details about this function.

In addition to mono Pan & Scan functions, there are three extra controls when using stereo:

- conv x** controls the depth of 3D convergence using the X plane (i.e. where in the image area the objects 'sit').
- conv y** controls the depth of 3D convergence using the Y plane (i.e. for correcting vertical offsets).
- push** allows for reframing of the shot to avoid any edging artefacts.

These controls are real-time and are keyframed in the same way as Pan & Scan. Pan & Scan can also be applied to individual tracks.



Ensure that a single track IS NOT selected when adjusting vergence.

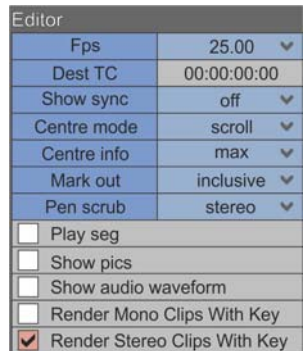
Any Vergence and Pan & Scan settings created on the Edit timeline are retained when opening MLT FX.

1.2.5 Render Clips

If there are unrendered clips on the timeline, a small orange box displays to the right of the timeline. Press the orange box to start the rendering of all unrendered clip segments and transitions.

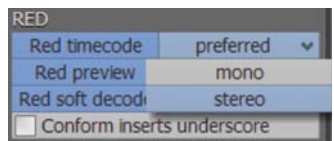
1.2.5.1 Render Stereo Clip with Key

To render a stereo clip with a key, select **Render Stereo Clips with Key** in the **Editor** menu in the <F1> Configuration Window.



1.2.6 R3D Settings

To play-back soft-mounted stereo RED clips smoothly, select **stereo** from the **Red soft decode** scroll box in the <F1> Configuration Window.

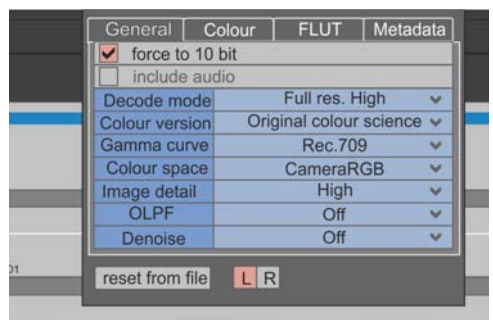


With a soft-mounted stereo Red clip loaded on the timeline, the settings for the left and right eyes can be edited.

To open the settings pop-up:

- Right-click on the stereo segment and select **r3d settings**.

In the pop-up there are **L** and **R** buttons that allow toggling between settings for the left and right eyes, e.g. when **L** is selected, only the left eye settings display.



When the pop-up opens, L is selected by default.

When setting Red size options, the settings apply to both eyes (i.e. there are no **L** and **R** buttons).

1.3 Managing Eyes

1.3.1 Combining Eyes (from Mono Clips)

Left and right eye clips (i.e. two mono clips) can be combined via the desktop, or timeline, to create a single stereo clip.

1.3.1.1 Clip Requirements

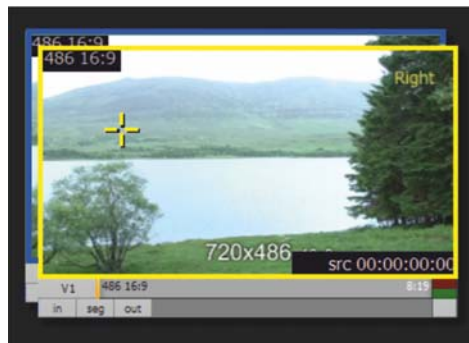
The left and right eye mono clips must have some identical elements before they can be converted to one stereo clip. These include:

- Number of tracks
- Number of segments
- Total number of frames
- Number of frames per segment
- Render video information
- Size

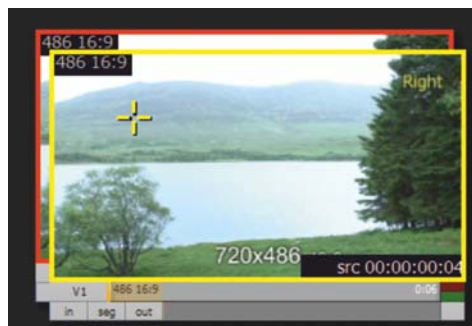
1.3.1.2 Combine Eyes via the Desktop

To combine left and right eyes via a Floating Clip on the desktop:

1. Drag one of the clips over the other, and hover (do not drop).
2. Hold down <Ctrl> and <Shift> on the keyboard.
3. When a blue outline displays on the existing clip (indicating that it is possible to create a stereo clip from the selected clips), drop the second clip onto the first.



If a stereo clip cannot be created, a red outline displays on the existing clip.



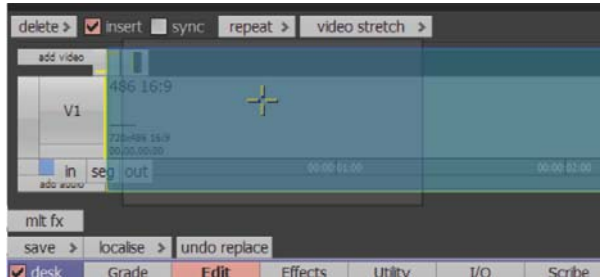
A warning message displays if a clip is dropped on top of another with a red outline.

Cannot make stereo clip, see log for details

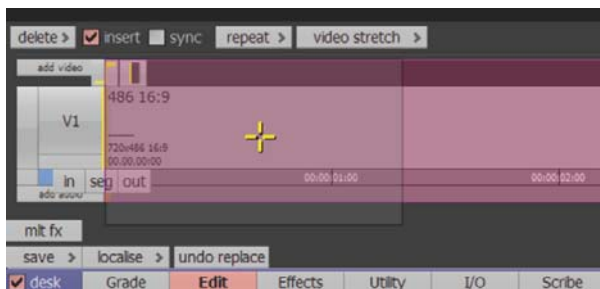
1.3.1.3 Combine Eyes via Timeline

To create a stereo clip on the timeline:

1. Drop either the left or right eye clip onto the Edit timeline.
2. Drag the other eye clip over the existing clip on the timeline, and hover (do not drop).
3. Hold down <Ctrl> and <Shift> on the keyboard.
4. When the timeline highlights blue (indicating that it is possible to create a stereo clip from the selected clips), drop the second clip onto the first.



If a stereo clip cannot be created from the selected left and right eye clips, the timeline highlights red.



A warning message displays if a clip is dropped on top of another with a red highlight.



1.3.2 Split Stereo Clips

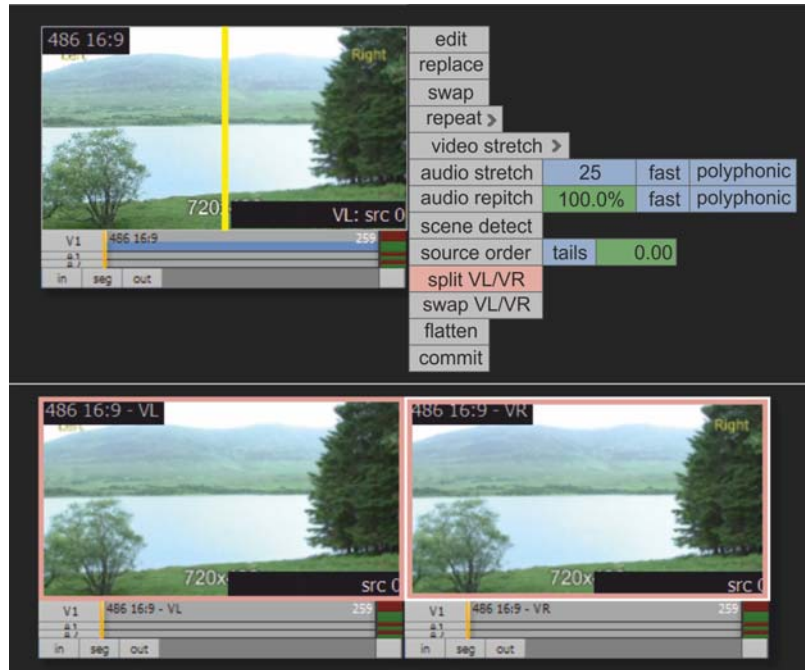
A stereo clip can be split into its component left eye and right eye parts. This function is useful to play-out or export each eye separately.

1.3.2.1 Split Clips via the Desktop

To split a stereo clip on the desktop:

1. Drop a stereo clip onto the desktop to create a Floating Clip.
2. Hover the cursor over the top-right corner of the clip, and press **more** to open the floating clip menu.
3. Press **split VL/VR**.

Two separate clips are created on the desktop with '-VL' appended to the clip title for the left eye, and '-VR' appended to the right. If the stereo clip has audio, the audio displays on both the left and right clips.



The desktop clips are locked together so that they can be saved simply, by dragging and dropping into a bin.

To unlock the clips:

- Press on the desktop first, then select one of the clips.

1.3.2.2 Split Clips via the Timeline

With a stereo clip loaded on the timeline, a segment can be split into the left and right eyes.

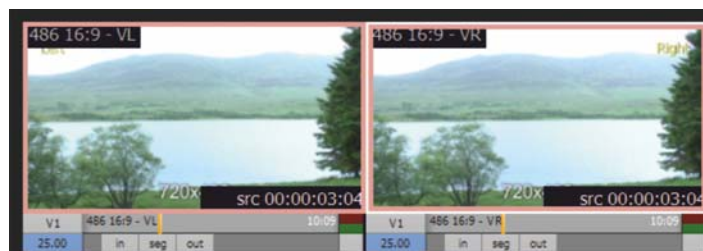
- Right-click on the segment and press **split eyes**.

Two separate clips are created on the desktop with '-VL' appended to the clip title for the left eye, and '-VR' appended to the right eye.

If the original stereo clip has audio, the audio displays on both the left and right clips.



The desktop clips are locked together so that they can be saved simply, by dragging and dropping into a bin.



To unlock the clips:

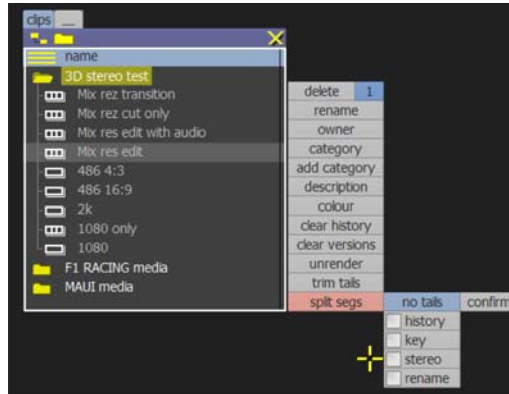
- Press on the desktop first, then select one of the clips.



When splitting clips via the timeline, the new clips display on the desktop but the original stereo clip remains on the timeline.

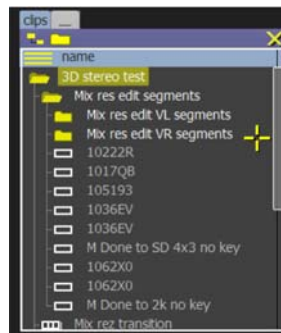
1.3.2.3 Split Segments in the Clips Bin

Existing stereo clips stored in the Clips Bin, can be split into two subfolders of segments (one for each eye) that are then stored separately in the Clips Bin, in addition to the existing stereo clip.



1. Select a stereo clip in the Clips Bin, and from the entry options on the right, press **split segs**.
2. Tick the **stereo** box.
3. Press **confirm**.

A new top level folder named 'original title + segments' now displays in the bin. Inside this folder, material is split into two sub-folders containing VL segments and VR segments.



When splitting a clip that has both mono and stereo segments, the mono segments display in the root folder with the format 'original title + segments', and the left and right eye segments in the sub-folders (VL and VR segments).

1.3.3 Swap Eyes

Swap the left and right eyes in a stereo clip. When using this function, the video is swapped, but any MLT FX processes (e.g. **colour**, **dve**, **text** etc.) applied to each eye remain on the eyes on which they were set.

MLT FX processes can be swapped independently by selecting/deselecting the appropriate process eyes in the process menu. Thus, a process can be made to follow swapped eyes, if required. See “Working with Eye Processes” on page 17.

1.3.3.1 Swap Eyes on Selected Segments via the Timeline

With a stereo clip on the timeline, eyes can be swapped on one segment, or multiple segments, by lassoing from bottom-left to top-right.

To swap eyes on the timeline:

1. Select the segment(s).
2. Right-click on the selected segment(s), and press **swap eyes**.



Video is swapped between the left and right eyes. Any MLT FX processes remain on the eyes on which they were set.

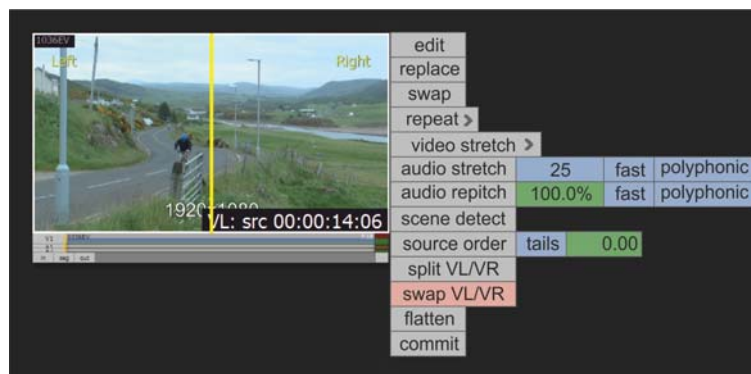
This only affects the selected segment(s) and not any underlying rushes.

1.3.3.2 Swap Eyes on All Tracks via the Desktop

Swapping eyes on a floating clip on the desktop swaps all tracks, segments, and underlying rushes.

To swap eyes on a Floating Clip:

1. Hover the cursor over the topright corner of the clip, and press **more** to open the floating clip menu.
2. Press **swap VL/VR**.



All the clip's tracks, segments and rushes are swapped.

1.3.4 Slip Eyes on the Timeline

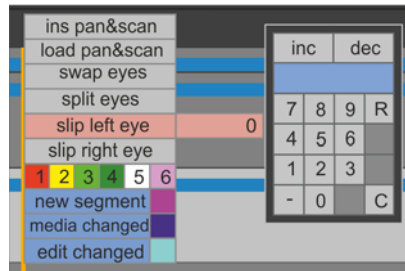
The left or right eye of a stereo clip on the timeline can be slipped forwards or backward.



This function cannot be used on clip segments that have MLT FX processes.

To slip an eye on the timeline:

1. Select the segment(s) on which to slip an eye.
2. Right-click on the selected segment(s) and press either **slip left eye**, or **slip right eye**.



3. Enter the number of frames to slip the eye using either the soft or external keyboard.

To slip an eye forward, enter a positive number of frames; to slip an eye backwards, enter a negative number of frames.

4. Press <Return> to confirm.

1.3.5 Substitute Eyes

A stereo clip on the timeline, can have one of the eyes replaced with a single segment mono clip on the desktop. The substituted eye replaces the underlying rush of the current segment.

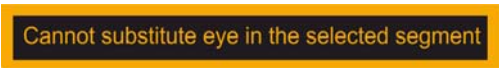


The desktop clip cannot be stereo, or have more than one segment.

To substitute an eye of the stereo clip, the desktop clip and selected stereo clip segment must have a number of identical elements. These include:

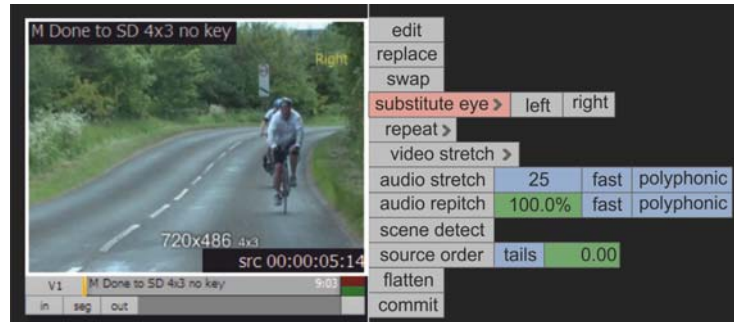
- Size
- Render video information

If the desktop clip and stereo clip segment don't have these identical elements, or if the substitute fails for any other reason, the following error message displays:



To substitute eyes:

1. Select the segment of stereo clip on the timeline to be replaced.
2. Hover the cursor over the topright corner of the clip, and press **more** to open the floating clip menu.
3. Select **substitute eye**.
4. Press either **left** or **right**.



The clip on the desktop replaces the selected eye in the stereo clip on the timeline.

1.4 MLT FX Functions

1.4.1 Working with Eye Processes

A stereo clip can be loaded on the Edit timeline and then viewed and modified in MLT FX. Any process, such as **colour**, **text**, **stereo** etc. can be applied to the left eye, right eye or both eyes, while viewing a live stereo output.

Press **mlt fx** at the bottom left of the timeline area to display all effects process menus. Scroll down using the bar to display all processes.

Each process (except the **stereo** process itself which contains left/right functions) has two square boxes; the left one indicates a process applied to the left eye, and the right box indicates a process for the right eye.

If neither the left or right eye box are selected, the process is applied to both eyes.



When a process has been applied to one eye, e.g. left, the left box turns pink and the right box turns dark-grey indicating that the right eye has no process.

A process can be masked from the output by pressing the pink box; the box then turns back to light-grey.

The boxes in the following example indicate that there is a DVE process on the right eye, a left eye colour correction and a second colour correction on both eyes.



If a large number of processes are set up, the MLT FX player may not play-back stereo in real-time.

1.4.1.1 Apply an Effect to a Single Eye

To apply an effect to one eye:

1. Press the left or right box next to the process title, e.g. **colour**.
2. Apply the process, e.g. make a colour change. The selected box now turns pink.

To apply a different process of the same type, e.g. **colour** to the other eye:

1. Press the **+** box to the left of the process menu to add a second process of the same type, e.g. **colour 2**.
2. Press the left or right boxes next to the new process to toggle between left, right and both eyes.
3. Apply the process, eg make another colour change. The selected box now turns pink to indicate that an effect has been applied.

1.4.1.2 Select One or Both Eyes

Press once on either the left or right eye box to select that eye. Press again on the same box to reselect both eyes.

1.4.1.3 Toggle a Process to the Other Eye

Press and hold a dark-grey box to toggle the identical process to the other eye.

For example, if an effect has been applied to one eye, e.g. left, the left eye box is pink, and the right eye box is dark-grey. To toggle the effect process to the other eye, press and hold on the right eye box.

1.4.1.4 Duplicate a Process to the Other Eye

Press and hold a pink box to apply the effects process to both eyes.

1.4.2 Stillstore and Storyboard

1.4.2.1 Store and Transfer Multiple Processes

Whenever multiple processes of the same type (e.g. **colour**, **colour 2**, **colour 3**, **colour 4** or **dve**, **dve 2**, **dve 3**, **dve 4** etc.) are performed on stereo clips, and are subsequently added to the Stillstore, or to the Storyboard, all processes for left, right or both eyes are stored. Both the Stillstore and Storyboard only display the left eye image (for clarity), but when the stereo clip is recalled both eyes and all processes are present.



See **MLT FX User Guide** for how to use the **Stillstore** and **Storyboard** for selective process transfer.

1.4.3 Stereo Display Modes

In MLT FX a number of stereo display modes are available: **Normal**, **Half Mix**, **Diff**, **Chequerboard**, **AnaglyphCol**, **AnaglyphMono**, and **Flicker**. By default, the stereo image displays in **Normal** mode.

When a stereo clip is playing in MLT FX, the display mode returns to **Normal** temporarily while playing, regardless of whether any other mode (e.g. **Chequerboard**) has been selected.

In all viewing modes the main output can be disabled. To toggle the main output on or off press **Main** to the right of the viewing mode scroll box under the Edit Window. The main output is on when the button is selected (i.e. pink).

To change stereo display mode:

- Select from the scroll box to the right of the navigation controls of the Edit Window.



1.4.3.1 Normal

Normal mode displays a mono image of the left and right eye with a vertical yellow bar between the two eyes. The yellow bar can be dragged left or right, in order to display more or less of either eye.

Tap on the yellow bar to toggle the image between vertical and horizontal modes. In horizontal mode the bar can be dragged up or down displaying more of less of each eye (top = left eye, bottom = right eye).



The yellow bar in this mode does not have the additional functionality that is available in the Edit Window when not in MLT FX.

1.4.3.2 Half Mix

Half Mix mode displays an image of the left and right eyes blended together.

1.4.3.3 Diff

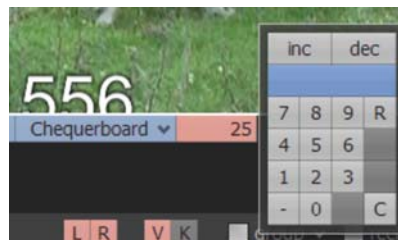
Diff (mono difference) mode displays the disparity between the two eyes.



1.4.3.4 Chequerboard

Chequerboard mode is useful for seeing and correcting colour differences between the two eyes.

The chequerboard size is adjusted by entering the number of horizontal squares required in the green box to the right of the viewing mode scroll box.



1.4.3.5 AnaglyphCol

AnaglyphCol (colour) mode is used for viewing with anaglyph glasses.



1.4.3.6 AnaglyphMono

AnaglyphMono mode is an alternative mode for viewing the disparity between the two eyes. It makes it easier to identify the separate eyes; left eye = red and right eye = cyan.

1.4.3.7 Flicker

Flicker mode alternates (flickers) between left and right eyes making it easy to see and correct any geometry errors.

The flicker rate can be set in numbers per second or fractions per second.

To adjust the flicker rate:

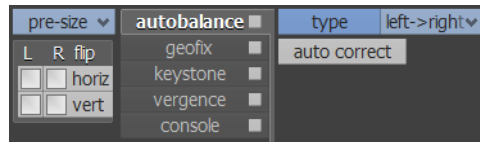
1. Select **rate** (numbers per second) or **secs** (fractions per second) from the blue scroll box to the right of the viewing mode under the Edit Window.
2. Enter the required number in the green box to the left of the **rate/secs** scroll box.
3. Press <Return>.



Flicker mode is linked to the main output on stereo enabled machines.

1.4.4 Stereo Process

In addition to the general MLT FX processes such as **dve**, **colour** and **text** that can be used on stereo media, there is a separate **stereo** process to assist with stereo specific issues. From the process menu on the left, press **stereo**.



1.4.4.1 Pre-size

This scroll box has three options:

- pre-size** In this mode the <F1> Configuration Window **Aspect Conv** setting (**box** or **cut**) is used to control sizing to fit the source media to the render format size.
- match x** Image pixels are matched 1:1 horizontally from the source media size to the render format size.
- match y** Image pixels are matched 1:1 vertically from the source media size to the render format size.

In all cases the aspect ratio is maintained.

1.4.4.2 L R Flip

These tick boxes are used to flip the left and/or the right eye in the horizontal or vertical axis.

1.4.4.3 Autobalance

Any colour mismatch between the two eyes can be automatically corrected using **autobalance**. Compare the histograms of the two eyes to determine which eye to use as the master colour for balancing, or whether a mix of the two is required. See "Console" on page 24 for information about histograms.

To correct any mismatch automatically:

1. From the **type** scroll box, select one of the following:

- left->right** balances the right eye to match the left (ie transform, lift, gamma and gain, from the left to the right).
- right->left** balances the left eye to match the right (ie transform, lift, gamma and gain, from the right to the left).
- mix** uses lift, gamma and gain from both eyes to balance between the two.

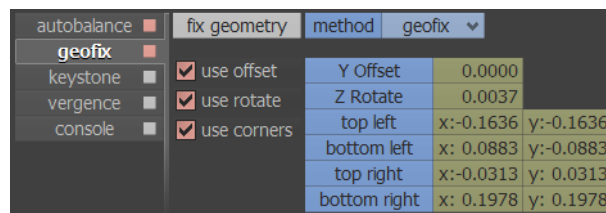
2. Select the clip segment(s) to apply autobalance to.
3. Press **auto correct**.

As with other processes, once autobalance has been setup, other clip segments can be selected to apply the same process to those segments. Autobalance affects the original input (source) and is always first process in the chain regardless of the position of **stereo** in the chain.

1.4.4.4 Geofix and Geofix2

Geofix

The **geofix** function automatically fixes stereo geometry errors between the left and right eyes.



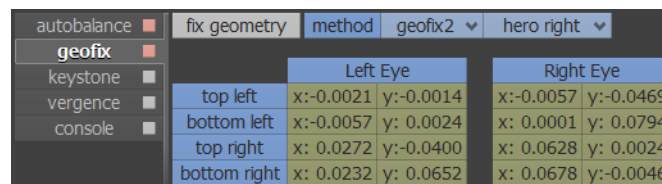
- Select **geofix** from the **method** scroll box, tick the required offset, rotate or corner options, then press **fix geometry**.

An image analysis is performed and a correction then applied to the right eye to match the left, based on which functions have been ticked, i.e. offset (vertical alignment), rotation and/or corner pinning.

All geofix values now display in the green numeric boxes. These values are keyframeable and can be manually adjusted as required.

Geofix2

To use advanced image analysis, select **geofix2** from the **method** scroll box.



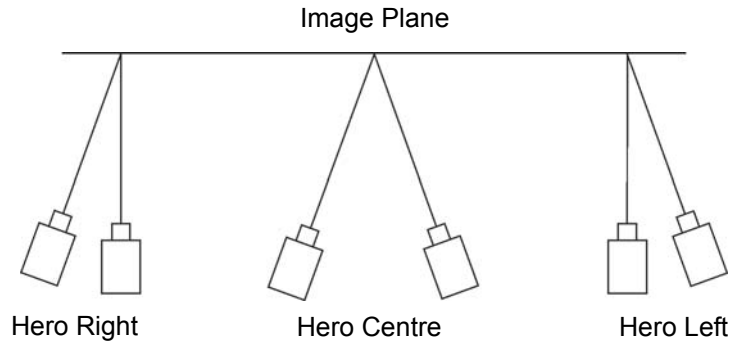
Geofix2 uses advanced image analysis techniques and applies corrections to both eyes to fix stereo geometry precisely and without compromising quality. As with geofix, all geofix2 values display in the green numeric boxes. These values are keyframeable and can be manually adjusted as required.

If required, use the **hero** scroll box used to identify the 'hero' eye when the left and right interaxial distances are not equal. The 'hero' eye is generally perpendicular to the final image plane, with the other eye off to one side or other.



Performing a geofix2 causes a short delay, due to the advanced image analysis.

Examples of 'hero' are shown in the following diagram.



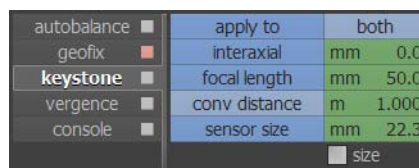
1.4.4.5 Keystone

In a convergent camera rig, the images produced contain keystone distortion that should be fixed via the **keystone** function to avoid stress to viewers' eyes.



This is a front-end process that occurs before any other creative adjustments.

In the **stereo** menu, keystone adjustments can be made to the left or right eyes separately or to both as a pair. With **both** selected from the scroll box, the interaxial distance is the total combined left and right interaxial distances.

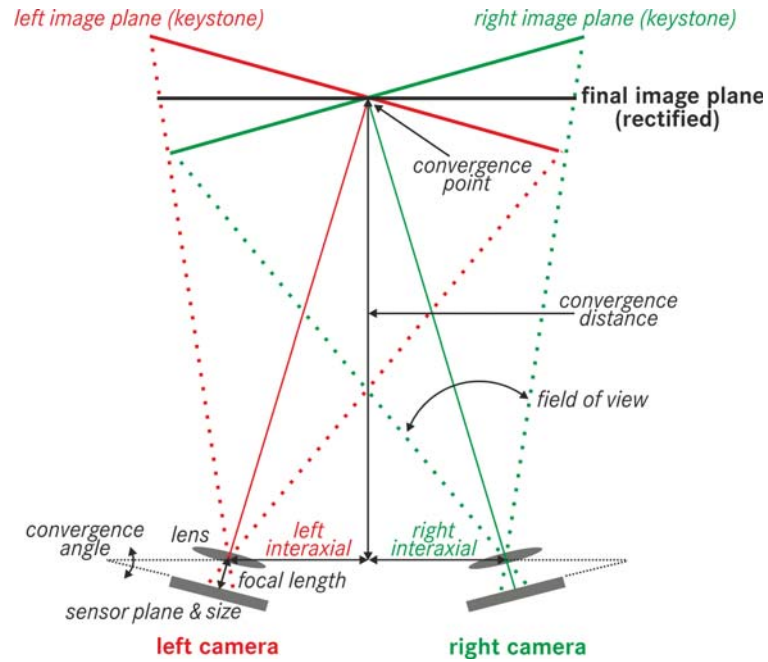


With **left** or **right** selected from the scroll box, it is still the total interaxial distance but with the assumption that the other eye is perpendicular to the screen plane.

The **size** box, when ticked, resizes the images to remove any edge artefacts introduced as part of the keystone correction.

With a limited amount of geometric information, the process calculates proportionate adjustments to corner pin positions to correct the left/right eye image distortions. It is assumed that:

- distortion is in the horizontal plane only.
- the image vertical centre line is the convergence point of the optical path.
- measurements of interaxial, focal length, sensor size, and convergence point are available.
- the effective object plane is parallel to the interaxial plane.



In a real system the interaxial distance would be measured from a point behind the lens. In the previous diagram, the simplification reduces the lens to a pin hole camera.

1.4.4.6 Vergence

autobalance	<input type="checkbox"/>	conv X/Y	px	0.00	px	0.00
geofix	<input type="checkbox"/>	push L/R	%	100.00	%	100.00
keystone	<input type="checkbox"/>	rotate L/R	°	0.000	°	0.000
vergence	<input checked="" type="checkbox"/>	float L/R	px	0	px	0
console	<input type="checkbox"/>					

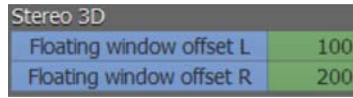
vergence is used to ‘burn-in’ any X and Y offset corrections made as a result of depth balancing a series of shots.

Enter pixel values for each eye using the **conv X/Y** controls and percentage values for **push L/R** (this zooms the image so that the shot is reframed therefore avoiding any edge artefacts). The two **rotate L/R** boxes allow rotational correction of the left/right eyes to a minimum of 0.1 of a degree to be performed.

Press on a blue **conv**, **push** or **rotate** box and drag the cursor in a circular motion (or tap once to display the number pad), both eyes are ‘locked’ together for that function and both values in the two green boxes adjust simultaneously. When rotating, the left and right eyes rotate in opposite directions to each other. During this ‘lock’ process, any offset between the eyes is maintained if an adjustment has previously been made to one eye only.

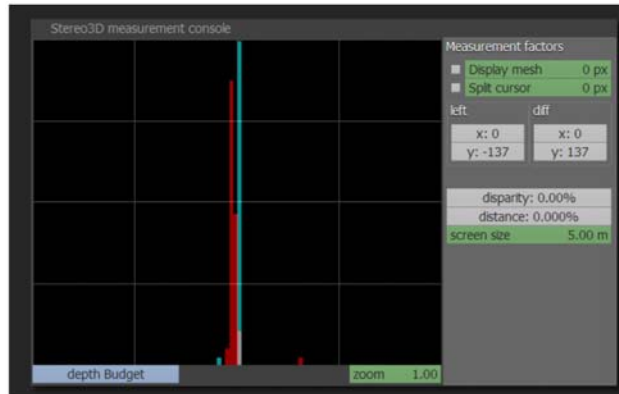
The **float L/R** controls allow the creation of ‘floating windows’ that reduce the visibility of edge borders and artefacts. This avoids ‘pushing’ or ‘zooming’ the image unnecessarily. A positive pixel value crops the left edge of the left eye together with the right edge of the right eye. A negative value crops the opposite edges.

Set a left and/or right eye default float offset using the Stereo 3D menu in the <F1> Configuration window, shown in the screen shot. Then enter a float value in the **vergence** menu; this value plus the default offset in the <F1> Configuration Window is applied to that eye.



1.4.4.7 Console

When **console** is pressed, a floating window displays providing interactive measurements according to the current clip image and any processes set.



By pressing on any point in the clip image, the measurement tools analyse the selection and provide the x and y positions of each eye in pixels, plus the **disparity** and **distance** in or out of the screen as a percentage.

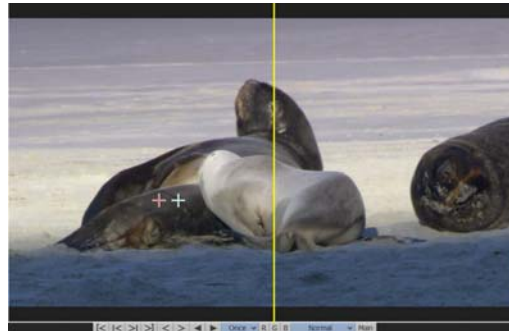
As the **distance** value is directly related to the size of the viewing screen, changing the **screen size** value adjusts the **distance** value accordingly (in proportion to the screen size).

With the console displayed, pressing <Alt> + tapping with the cursor (or right-clicking with the mouse) in the image window automatically sets the horizontal disparity to '0', therefore adjusting the vergence so that the point clicked is placed on the screen plane.

Tick **Display mesh** to display a mesh over the Edit window and the output monitor, indicating the screen plane. This mesh can be moved in z space (ie in or out of the screen), on the output monitor, by changing the numeric value to the right. This is useful to visualise where the image falls within the 3D space, and to ensure that any disparity limits are adhered to.



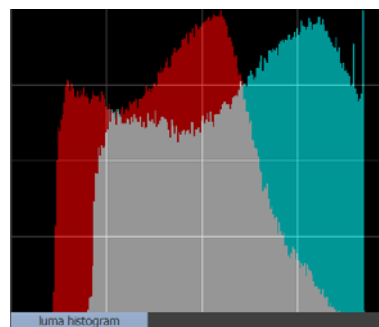
Tick **Split cursor** to display two anaglyph cursors on the output image; red for the left eye and cyan for the right eye. By placing these cursors over corresponding points on the left and right eyes, the disparity (down to a single pixel) of any object within a stereo image can be checked.



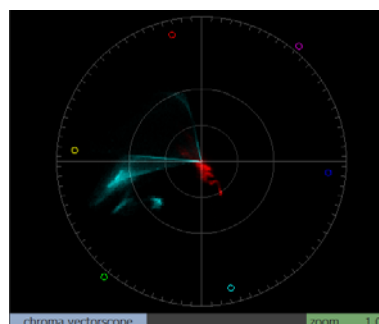
With the **Split cursor** value set to 0, tapping on the stereo image itself automatically adjusts the split cursor for the vergence at that point. Any other value overrides this, fixing the split cursor vergence value wherever the cursor is placed within the image.

From the scroll box at the bottom-left of the console, select what to display in the console window: a luminance histogram, a chroma vectorscope, or a depth budget graph.

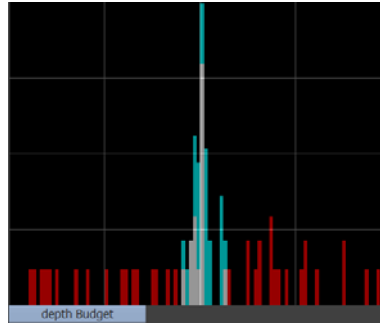
Selecting **luma histogram** displays the luminance of each eye as an anaglyph overlay. White indicates where the luminance of each eye matches the graph. Any point where the luminance is higher for an eye is indicated in red for the left (eye) and cyan for the right.



Selecting **chroma vectorscope** displays a chrominance overlay in anaglyph of the two eyes. The left eye is indicated in red and the right eye in cyan. Zoom-in on the scope by changing the **zoom** value in the green box on the bottom-right.



Selecting **depth budget** displays the amount of negative parallax, zero parallax, and positive parallax a stereo image has. The central line is the screen plane, with negative parallax moving to the left and positive parallax moving to the right.



Red lines indicate x-axis parallax and cyan lines indicate y-axis parallax.



Press any empty area of the console graph window and drag it to a new position, if required. Press the **X** in the top-right corner of the window to close it.

1.4.5 Disparity

1.4.5.1 Text and Graphics

If stereo text is created using the MLT FX **text** process, the **disparity** value can be changed controlling negative or positive parallax of any stereo text object. For example, entering -5 pixels applies negative parallax, appearing to bring the text forward of the screen.



Similarly, whenever a stereo vector shape such as a circle or rectangle is created in any process, e.g. **graphics**, **blur**, **colour**, **key** etc., the disparity value can be adjusted for that shape via the numeric box. With shapes, the **differential** tick box can be used with the **disparity** function as follows:

- differential ON** disparity adjusts each eye equally in opposite directions relative to the position of the original shape.
- differential OFF** disparity adjusts the right eye only. This enables a shape to be drawn accurately around the required area on the left eye, which then remains in position while the right eye disparity is adjusted.

1.4.5.2 Image (DVE)

When a stereo clip is loaded on the timeline, the **disparity** value in the **dve** process menu can be changed.

This controls negative or positive parallax of the left and right eye view. For example, entering -20 pixels applies a negative parallax, appearing to bring the image forward from the screen plane.



2. Panel Functions

2.1 Neo and NeoNano - Edit



Where not specified, functions in this chapter are located across the Primary Grading Area on the Neo Panel, and across the whole panel on NeoNano.

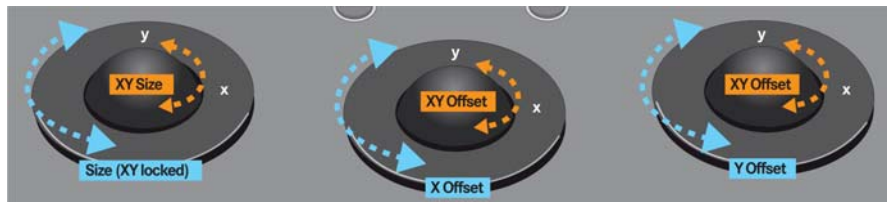
2.1.1 Primary Grading Area on Neo Panel



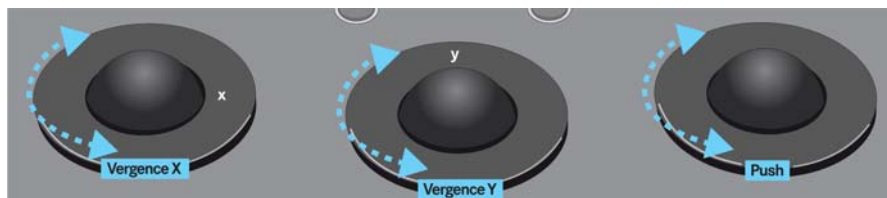
2.1.2 Pan & Scan Mode

2.1.2.1 Roller Ball and Ring Functions

With MLT FX closed, turn Pan & Scan on by pressing the **Pan + Scan** panel rotary knob to 'on'. The panel OLEDs now display applicable mono or stereo functions, depending on the current clip. Some of the panel's button functionality changes in addition to the following roller ball functionality:



With Stereo 3D media, a **3D Control** OLED/rotary knob lights. Pressing this to 'on' changes the functionality as follows:



2.1.2.2 Button Functions

The following button functions are available:

hold down reset Pan & Scan size/offset.



With the **3D Control** rotary knob 'on', the following functions are available on the buttons:

hold down reset vergence/push.



In this mode, the panel's global **bypass/reset** button can also be used as follows:

press resets Pan & Scan.

hold down deletes Pan & Scan keyframes.






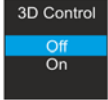

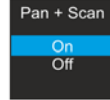
See 'Pan & Scan' in the **Timeline Editing User Guide** for more details of GUI functions.

2.1.2.3 OLED Display and Rotary Knob Functions

Edit menu: 'Pan & Scan'. MLT FX must be closed. The rotary knobs and OLEDs are used as follows (from left to right across the panel):

	Size X 1.000	Size Y 1.000	Offset X 2.250	Offset Y 3.000	Vergence X 0.000	Vergence Y 0.000
turn	adjust x size	adjust y size	adjust x offset	adjust y offset	adjust x vergence*	adjust y vergence*
press						
<Ctrl>+ press						
hold down	reset x size	reset y size	reset x offset	reset y offset	reset x vergence*	reset y vergence*

* Panel functions that display automatically with a Stereo 3D clip.

						
turn	adjust push*				apply Pan & Scan to seg or track	
press				3D panel ring functions on/off*		Pan & Scan panel & GUI functions on/off
<Ctrl>+ press						
hold down	reset push*					

* Panel functions that display automatically with a Stereo 3D clip.

2.2 Neo and NeoNano – MLT FX

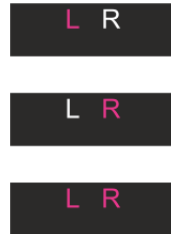
2.2.1 Selecting/Enabling Eyes

In MLT FX, the ‘track’ OLED indicates numbered stereo (and mono) timeline tracks that can be controlled with the corresponding rotary knob as follows:



- turn** select track
- press** mute track/show track
- <Ctrl> + press** toggle between track FX/seg FX
- <Shift> + press** toggle between L, R, L & R eyes
- <Shift> + <Ctrl> + press** toggle between L, R eye
- hold down** delete current track

With stereo media in MLT FX, the L and R at the top illuminates (they are greyed-out with mono media). This allows an eye to be muted/soloed on the current track by holding down <Shift> then pressing the ‘track’ rotary knob to toggle between L, R, or back to L and R.



Alternatively, hold down <Shift> and <Ctrl> then press the ‘track’ rotary knob to toggle between L or R only (not L and R together).

Each **L** or **R** box (below the GUI Edit Window) and on the panel display turns pink when an eye is enabled, and the Edit Window image updates accordingly.



Both eyes are displayed in the Edit Window and on the output by default. Both eyes cannot be muted at the same time.

2.2.2 Applying Eye Processes

With stereo media in MLT FX, processes can be inserted (e.g. **colour**) on the left eye, right eye or both eyes via the panel.



Press <Ctrl> and the **solo layer** button to switch the ‘track’ rotary knob to MLT FX 3D mode (press this later to return to normal track mode):

1. Choose the process or menu required either from the panel or by selecting the process in the GUI, e.g. **colour**.
2. Turn the rotary knob to the required track e.g. Right, then push and hold it to set the process for only the right eye.

3. Perform the required process changes; notice the GUI now displays a pink box for the right eye to indicate a change has been made.
4. While still within the same process (**colour**, in this example), choose the left eye via the track selector knob; a second process (**colour 2**) now displays in the GUI above the first one. Perform the changes as required and if necessary create a third process for both eyes.

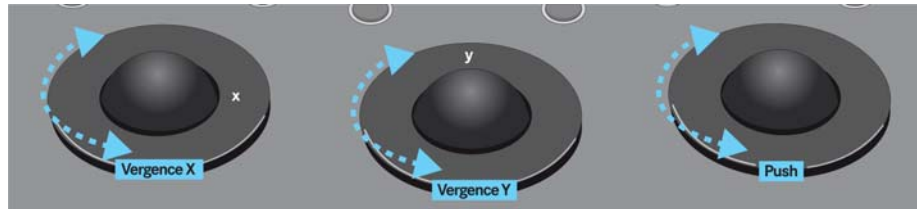
Use the rotary knob to move between processes. If more than three processes are created, only the first Left, Right or Both process in the stack can be selected via the panel knob; to select subsequent processes, e.g. **colour 2**, **colour 3**, use the GUI.



2.2.3 Vergence Menu

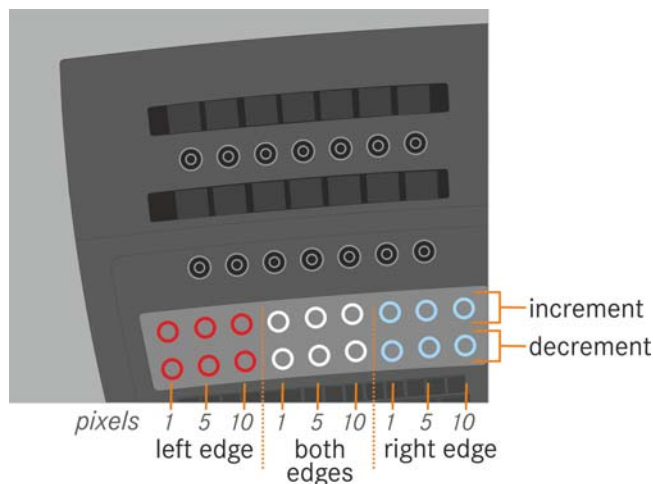
2.2.3.1 Ring Functions

For access to the following vergence ring functions, load stereo media on the timeline, and press **stereo – vergence** in MLT FX:



2.2.3.2 Button Functions (Neo only)

With stereo media loaded on the timeline and **stereo – vergence** selected in MLT FX, these 'float' functions illuminate across the Neo panel's Secondary Grading Area, as shown in the following diagram. These buttons provide an accurate way of adjusting float values in 1, 5 or 10 pixel increments.



For details of using all functions on the Neo or NeoNano panel (including colour, dve etc.) see the Grading User Guide.

2.2.3.3 OLED Display and Rotary Knob Functions

MLT FX menu: **stereo - vergence**

Ensure that stereo media is loaded on the timeline, and **vergence** is selected in MLT FX. The rotary knobs and OLEDs are used as follows (from left to right across the panel):

turn	adjust x vergence	adjust y vergence	adjust push LR	adjust push L	adjust push R	adjust float LR
press	x vergence off/on	y vergence off/on	push LR off/on	push L off/on	push R off/on	float LR off/on
<Ctrl>+ press						
hold down	reset x vergence	reset y vergence	reset push LR	reset push L	reset push R	reset float LR

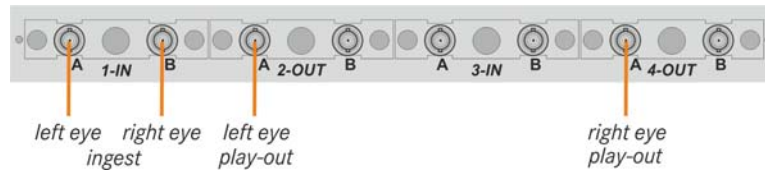
turn		adjust float L	adjust float R	rotate LR	rotate L	rotate R
press		float L off/on	float R off/on	rotate LR off/on	rotate L off/on	rotate R off/on
<Ctrl>+ press						
hold down		reset float L	reset float R	reset rotate LR	reset rotate L	reset rotate R

3. Stereo I/O

3.1 I/O (8U Workstations Only)

3.1.1 SDI In and Out Connections

With stereo media on 8U workstations, ensure that the SDI inputs and outputs on the workstation are connected as described below.

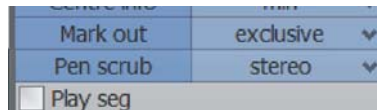


Both the A and B outputs from the VTR must be connected to the same SDI input pair on the workstation, e.g. A+B 1-IN respectively (or alternatively use A+B 3-IN). On stereo play-out, the left eye plays on the GUI and on the second monitor both eyes play together.

3.1.2 Control Output

3.1.2.1 Pen Scrub Option

The **Pen scrub** box in the <F1> Configuration Window **Editor** menu controls how a stereo clip is sent to the outputs during pen scrub/spooling on Rio systems.



With **stereo** selected, both outputs display VL and VR, providing stereo output while spooling/scrubbing. To prevent eye fatigue, select **monocular**. In this mode the track being scrubbed (i.e. the one touched with the pen) is sent to both outputs.

3.1.2.2 Set Output Format

The blue 'output format' box on the right of the Application Bar shows the specific output/play preview format currently being used.

sdi stereo out	1920x1080 24s	
scan	segframe	
aspect	16:9	
link	single	dual
colour	yuvHD	rgb
range	64 - 940	0 - 1023
sdi stereo out	1080 24s 16:9	
sdi 4 out	1080 24s 16:9	
sdi 2 out	1080 24s 16:9	
lut	1080 24s 16:9	vid aud

The same resolution and frame rate are used on both active outputs; they are locked together by using the single **sdi stereo out** control.

3.1.2.3 Play-out Separate Tracks

The **split VL/VR** box on a stereo Floating Clip can be used to play-out each eye separately. See "Managing Eyes" on page 10.

3.1.3 I/O Application Functions

The I/O application can be used to ingest, conform, play and archive stereo media. Most menu functions are used in the same way as for mono media; these are described in the I/O User Guide. Any stereo specific options are described below. To start the I/O application, press the **I/O** tab on the Application Bar.



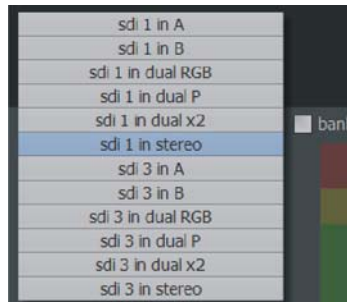
See the I/O User Guide for details of general menu functions.

3.1.3.1 Stereo Ingest

1. Check that the VTR has the correct connections and settings, then start the **I/O** application.



2. Select the **Record** menu.
3. From the scroll box on the right below **Edit Setups**, select either **sdi 1 in stereo** or **sdi 3 in stereo**, depending on the workstation IN connection.



4. Press the **go** box. The stereo clip records into the Clips Bin.
5. Drag the recorded clip from the bin onto the desktop to create a stereo Floating Clip

Use the **more – swap/replace** functions, if required, to place the clip on the Edit timeline for editing etc.

3.1.3.2 Stereo Conform

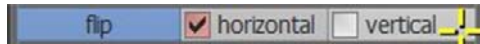
In the I/O application **Conform** menu, it is possible to conform from single HDCAM SR tapes containing stereo rushes to create stereo conformed clips, and have modified archive to allow these clips to be archived with 'minimum media' (i.e. the archive refers to the source tapes).



Stereo segments are created automatically if the corresponding sources are stereo i.e. Cineform or stereo tape deck.

Flip File Sequences on Import and Conform

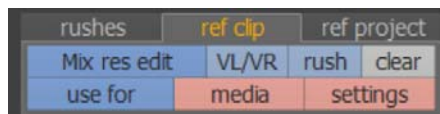
File sequences can be flipped vertically and/or horizontally by ticking the **Import** or **Conform** menus' **flip – horizontal/vertical** boxes. This eliminates the need to use the **dve** process later to flip the left or right eye.



This is not possible with soft-mounted media.

Stereo Reference Clip Options

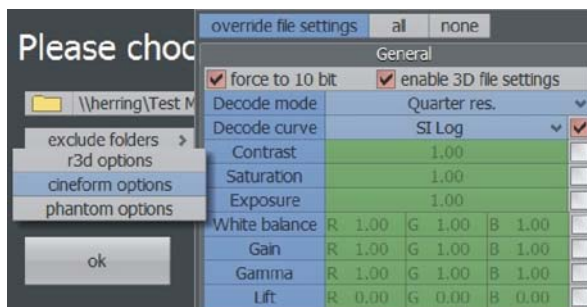
Stereo clips can be used as references during the conform process.



Drag a clip from a bin onto the **Conform** main window and it is added as a reference. Select the settings from both eyes, or either eye, as required from the **VL/VR** scroll box.

Cineform (AVI and MOV) Files

Cineform mixed stereo files containing two image streams (.avi and .mov) can be conformed from a single layer AAF to produce a stereo master.



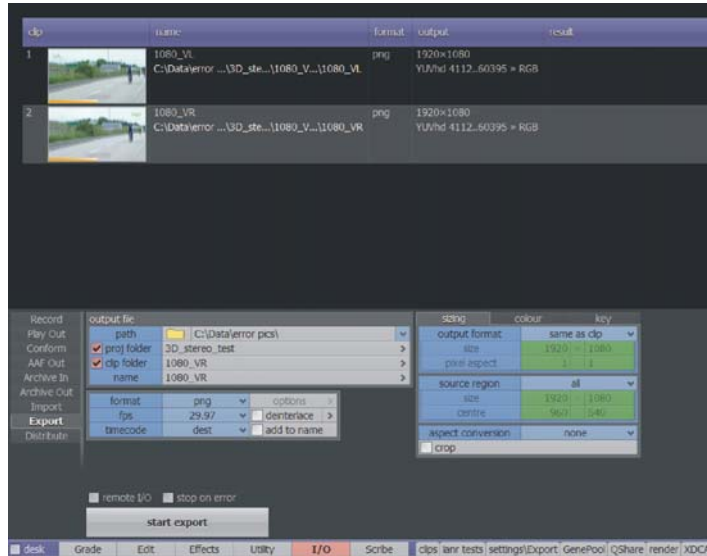
In the **cineform options - General decode** menu, tick **enable 3D file settings** and set other required parameters before starting the conform.



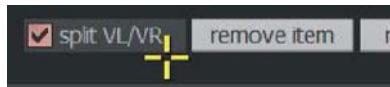
See the I/O User Guide for details of using Conform, Archive, Export and other menus.

3.1.3.3 Stereo Export

In the I/O application **Export** menu, stereo clips can be exported either as separate file sequences with VL and VR tags, or as a single side-by-side stereo clip (i.e. divided vertically through the centre) file (mov, wmv, avi etc.) or a sequence of side by side files (dpx, jpg, tga etc.).



Selection is made with the **split VL/VR** box on the right of the menu (the default state is ticked, to save separate left and right eye clips). This selection must be made before dropping a stereo clip onto the **Export** menu's desktop.



When dropping a stereo clip onto the **Export** menu's desktop it is either displayed split into left/right eye clips; one with a VL tag and the other with a VR tag, or displayed as a single stereo clip (as pre-selected by the state of the **split VL/VR** box).

If the **clip folder** tick box has been selected from the <F1> Configuration Window, the separate left and right eye clips can be placed into their corresponding left and right folders, by appending VL or VR to the **clip folder** and to the corresponding **name**.

Clips can be further categorised by defining a project folder (a sub-folder to the **path**). **proj folder** must be selected from the <F1> Configuration Window. This can be used in conjunction with clip folder, if required.