

Nucoda

Colour Grading and Finishing

Features & Benefits
Version 2015.3 R2

Doc Rev 1



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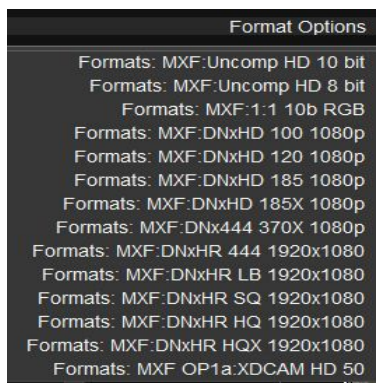
File Formats

Avid DnxHR - Reading and writing DNxHR MXF Op-atom files

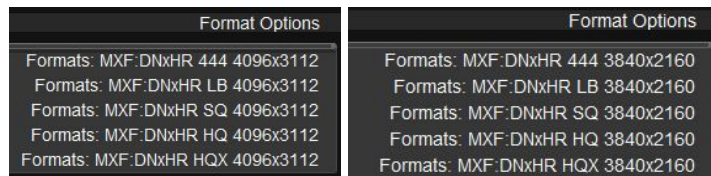
Support has been added for Avid DNxHR files - importing and exporting media - since DNxHR is resolution independent you will see options to export DNxHR files even in large resolutions like 4K but also in HD formats. AVID have started to move away from bitrate based naming, since it would be impossible to keep track in a resolution independent environment.

DNxLB, SQ, HQ and HQX and 444 are the equivalent of 36, 120, 185, 185x and 444 360 for example.

Currently the round trip workflow (AAF) is not supported with DNxHR and due to technical restrictions we cannot tag a DNxHR clip as 60p or alter the Aspect Ratio if other than 4:3 or 16:9



HD formats with DNxHR resolutions displayed



DNxHR formats available in UHD and 4096x3112

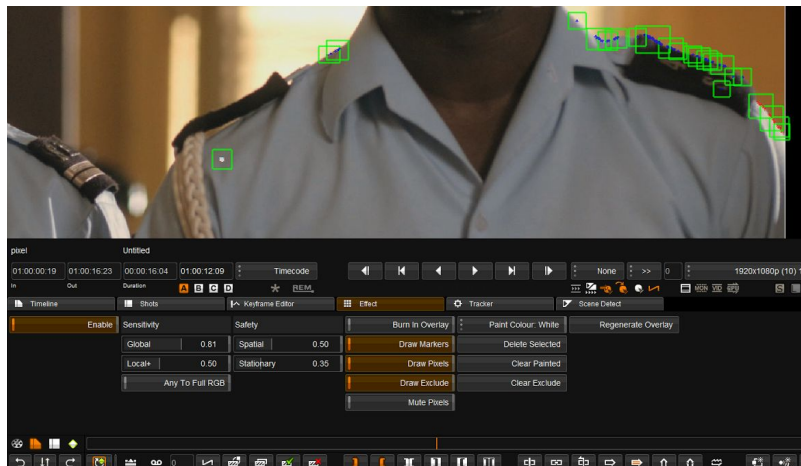
DVO Tools

DVO Pixel

[Link to online manual](#)

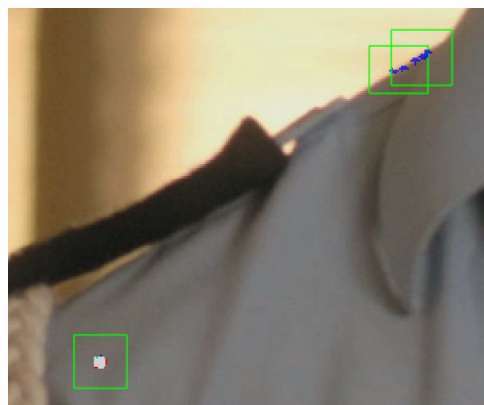
DVO Pixel is designed to automatically detect and repair dead or stuck pixels on digital camera sensors. The tool also allows users to paint a pixel or pixel cluster for removal. Area can be set to include or exclude fixes depending on the requirements. Please make sure that DVO pixel is used at the native resolution of the image and before any stabilisation is done.

This image below has quite a few matches for dead or stuck pixels, the process we use to find the pixels is quite sensitive, and even if it looks unlikely that the pixel is defective, you will find that sometimes the pixel is stuck, but is mainly one colour channel so that it will likely never be seen with the naked eye.

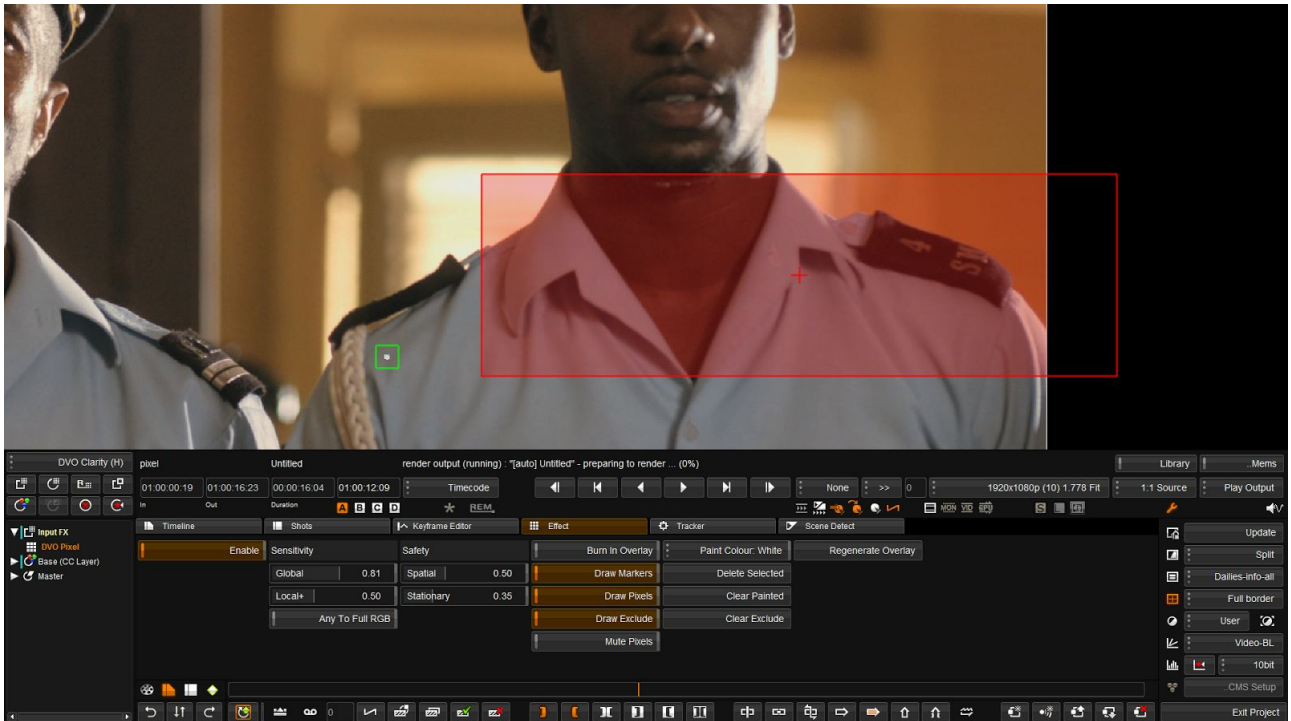


In this case these pixels are on the blue channel and one is on all channels, (as indicated by the pixel colour, white being an indication that the defect is on all channels)

The overlay is set to show the rectangle and the detected pixels and any exclude zones

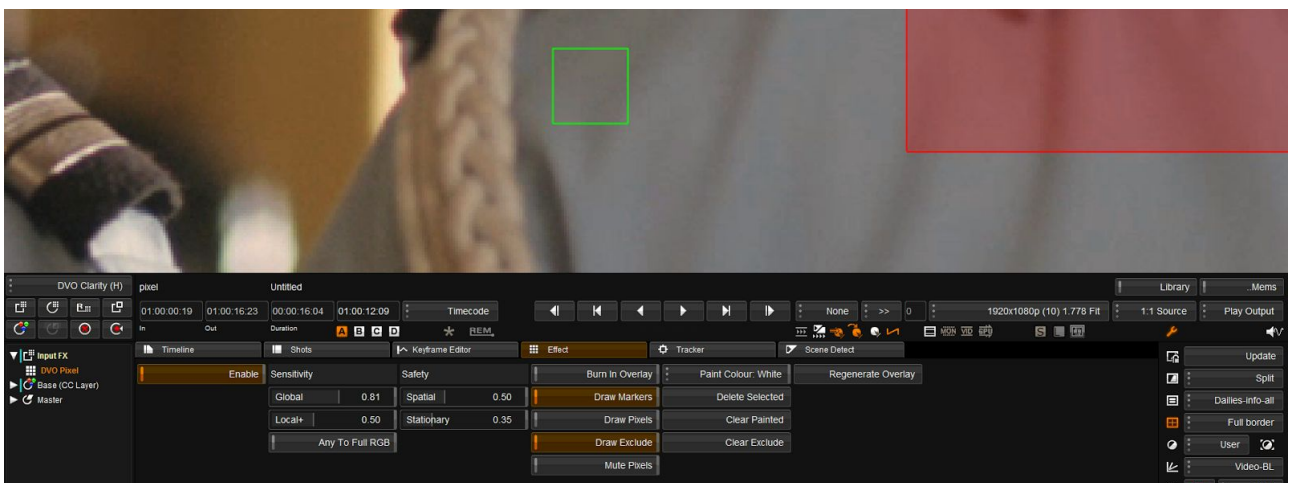


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The only pixels we clearly need to repair is the bottom box, using left Alt and the mouse, a red exclusion box is drawn over the other detected pixels, excluding them from processing.

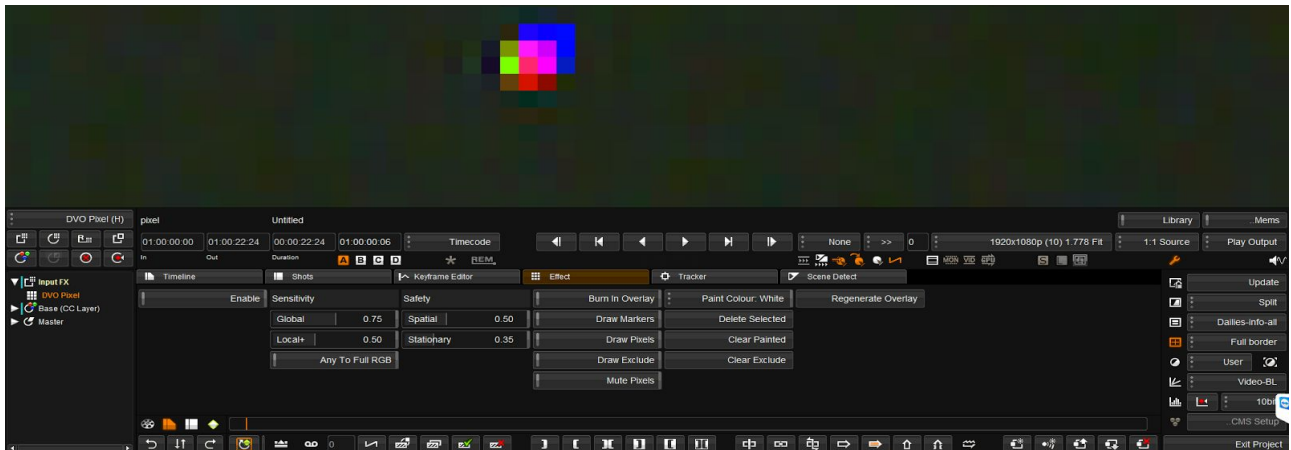
The image with the repair applied and overlay removed.



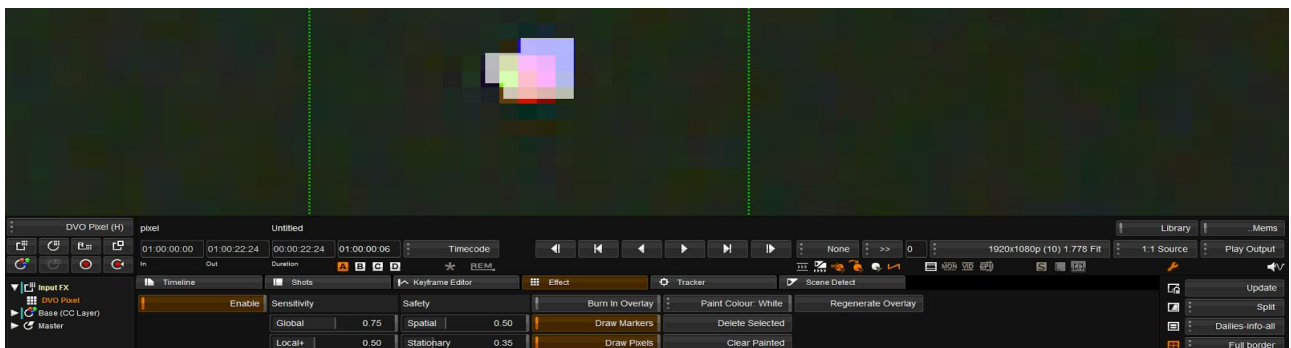
In this image, the Draw pixels option was turned of the show the fix. If you want to burn the result of the automated detection into the image, turn on the Burn In Overlay option.

Locked off or static images and manual fixes

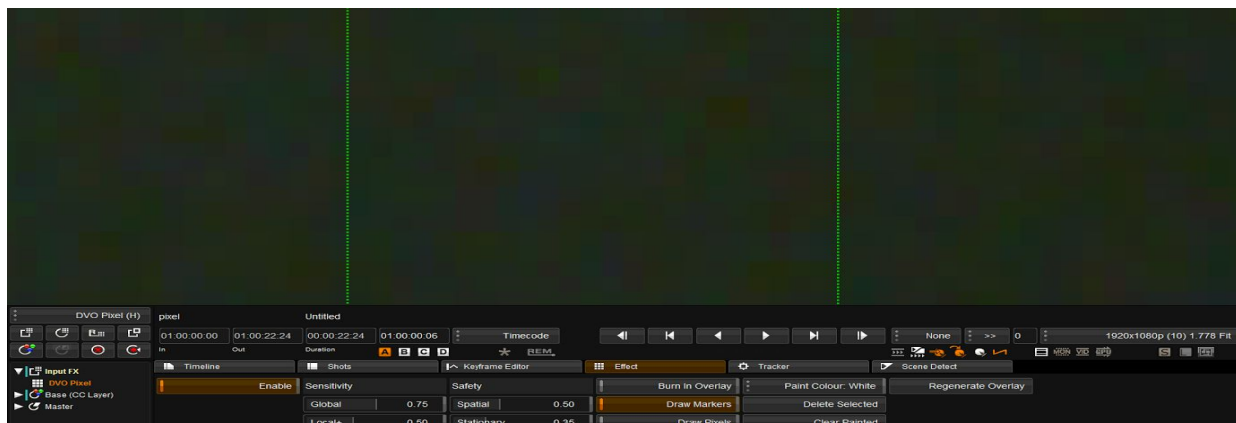
In the case of a static or locked off image, there are other options to be aware of in DVO Pixel. The image below has a very obvious cluster of dead pixels. The automated tool in default settings will not pick this up, because the image is locked off..



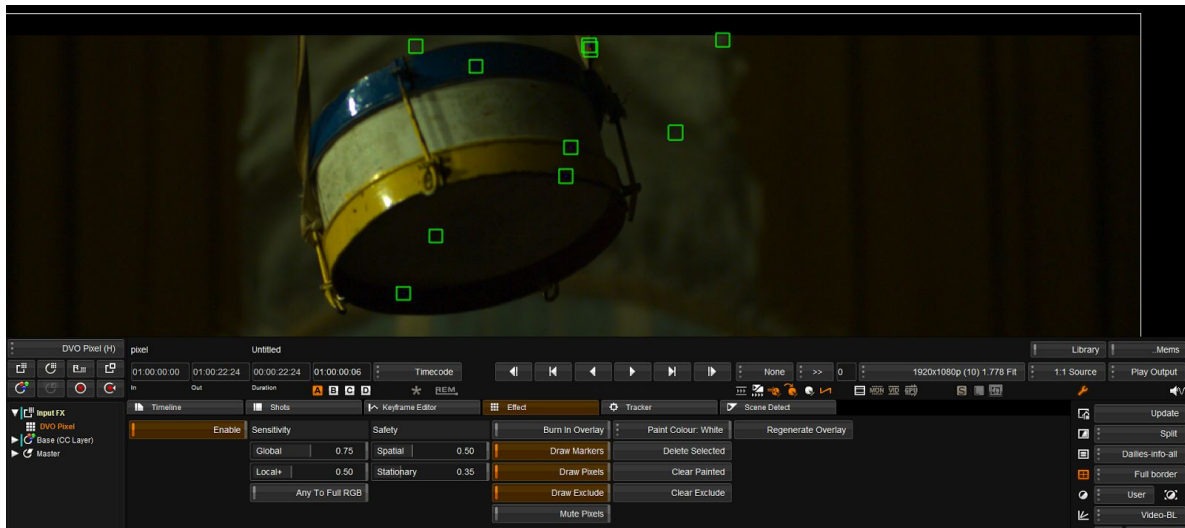
We are going to use the manual tools to indicate the fix area on this image. Select White as the paint colour (to affect all channels), hold shift and trace area of the dead pixel.



A green dotted box with white pixels will appear, this indicates that it is a user created stroke. DVO Pixel will now force the area that was painted to be concealed.



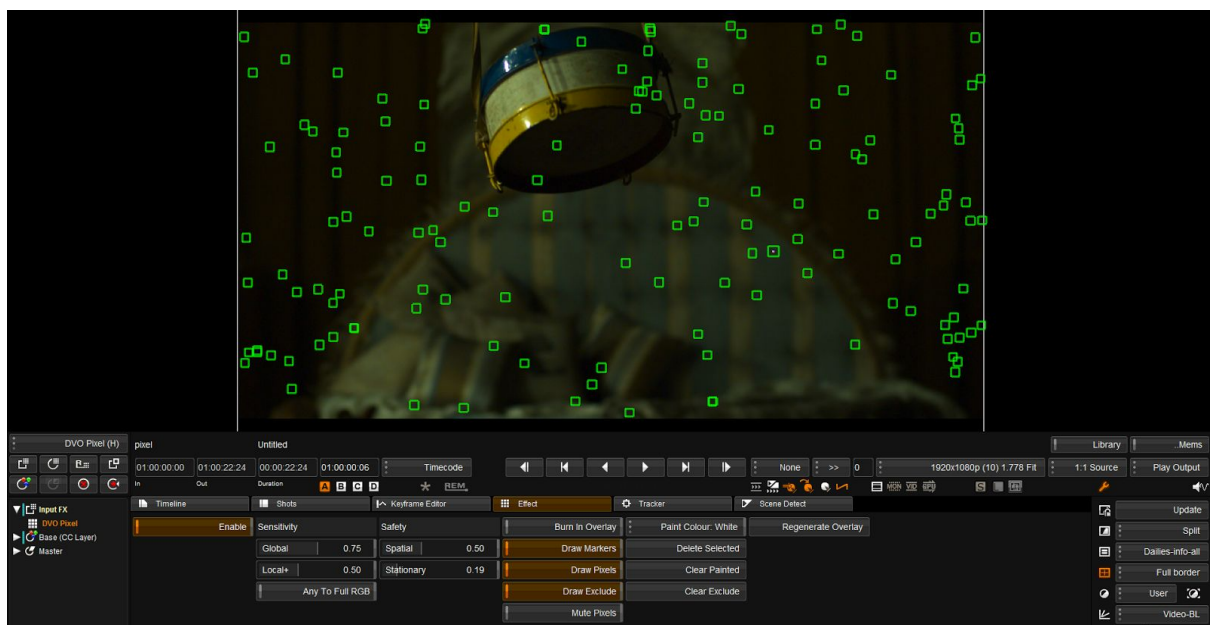
Using the exclude/include region tools



In this image we have a few stuck pixels, but the major visible defect is not picked up - this is the same locked off shot we used earlier and applied a manual fix.

If we decrease the "Stationary Safety" option it will pick up the defect - the Stationary Safety option reduces the possibility of mistaking temporally stationary features for dead pixels it will pick up the defect)

However, in changing the detection, we have also picked up some additional pixels in the blue channel, not really visible, so not something we need to process



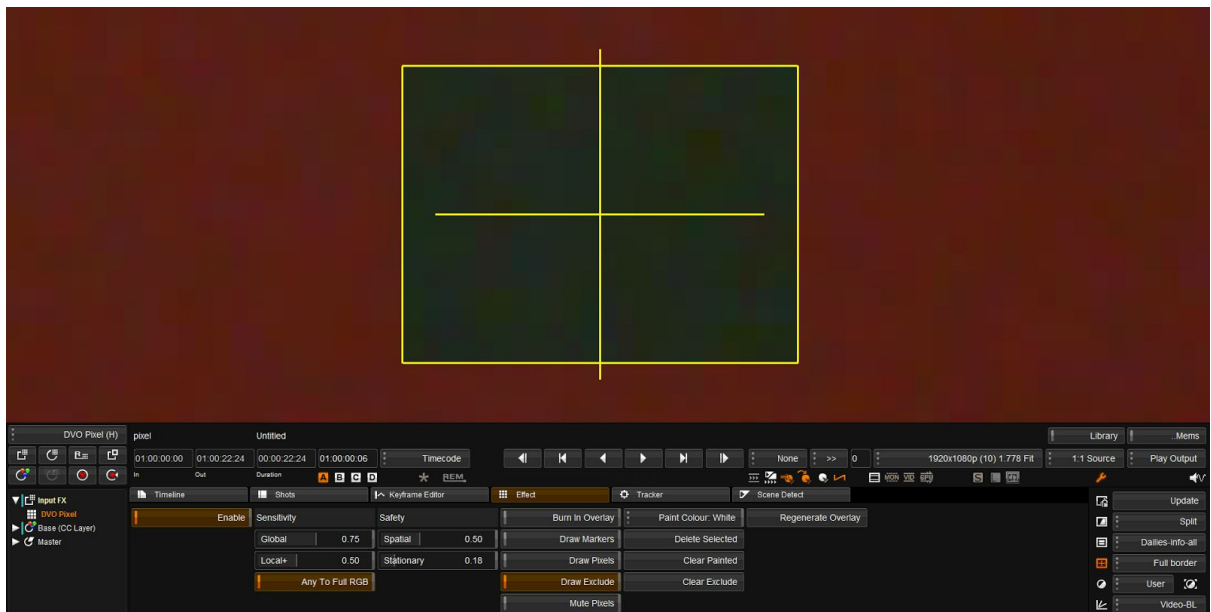
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Using the left Alt key and mouse (left click and drag) will draw an exclusion area - we select the entire image.



Now, zoom to the detected pixel, again, using the Alt key and Mouse, draw a region around the dead pixel, select the box after drawing and press 1 - this will set the region to be included for processing, even though it's inside an excluded zone.



Enhancements to DVO Fix and Paint

There have been major changes made to the DVO Fix tool (also part of DVO Dust & Fix and Paint)

The addition of the “select” button fundamentally changes the way users can use the tool for manual fixes. Previously, any paint strokes could be edited after they were created, but as soon as the next stroke was made, the option to edit any other strokes would be unavailable.

Pressing the select tool will show an outline of all strokes on any particular frame, regardless of when that stroke was made. It is then possible to select the stroke and edit the position, scaling, rotation as well as colour and grain option, even the clone source.

Multiple strokes can be selected and strokes can also be deleted at any time. This brings amazing flexibility to the fix tool, making it truly non destructive.

The following new keyboard shortcuts have been added:

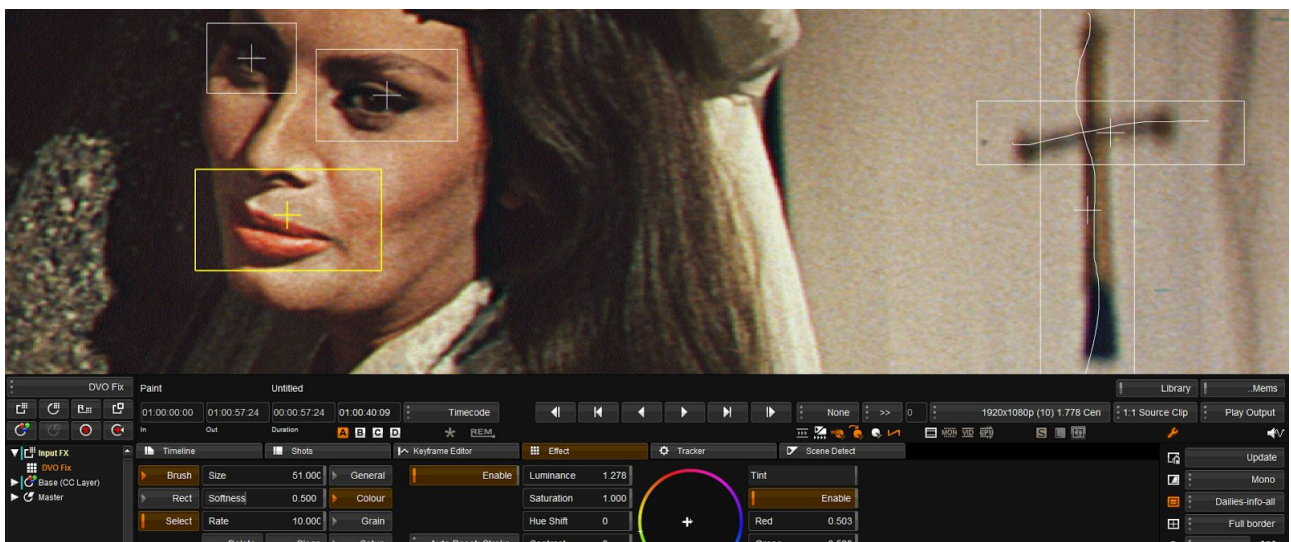
Select Mode on /off : Alt+P

Select Multi Strokes: Ctrl Click

Delete Selected: Delete

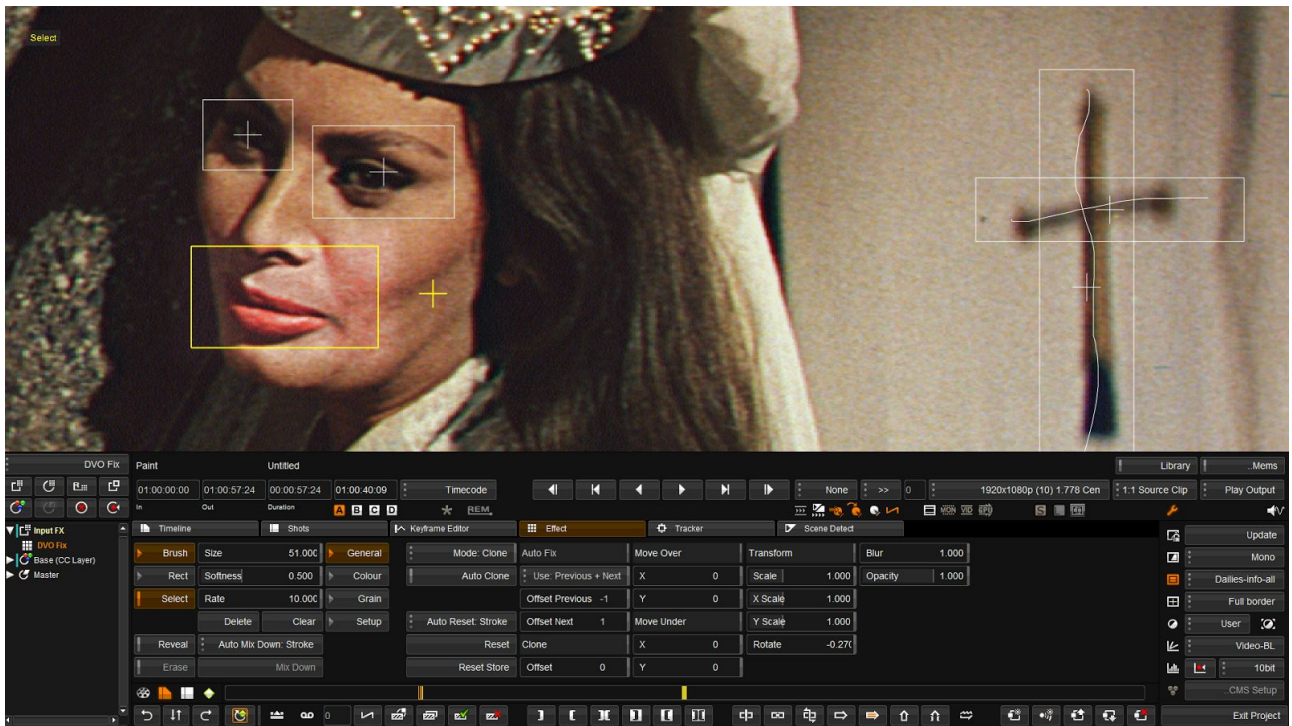
Cycle through strokes: Alt+S (Fwd) and Ctrl+Alt S (back)

Note: In the Paint tool strokes cannot be moved or original tool changed, but they can be edited and deleted.

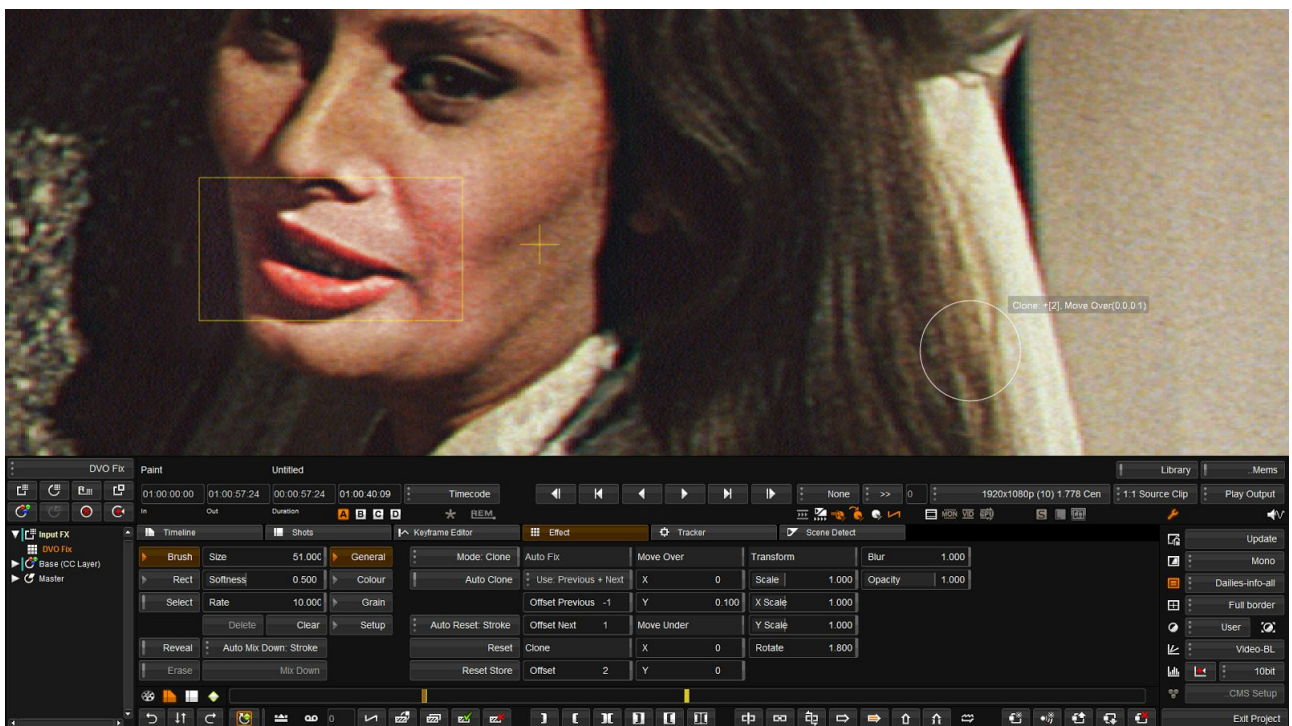


In this image you can see multiple strokes with their transform points, in “select” mode the stroke around the mouth has been selected, on the right the brush strokes can be seen

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In this image the transform point of the stroke has been edited by dragging it to the right, this will affect the scaling and rotation of the image.

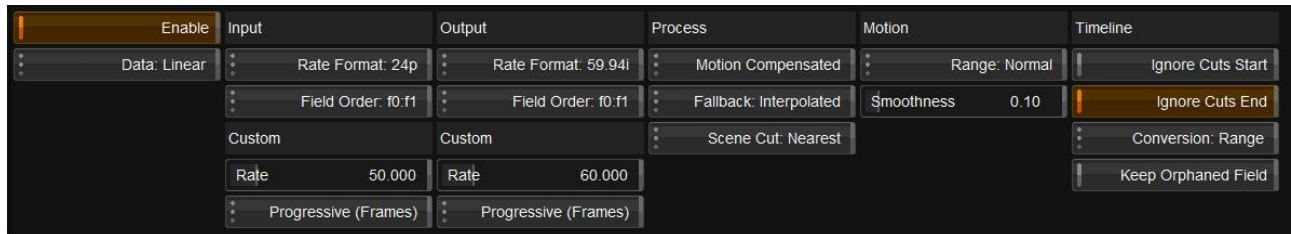


Here the selected stroke is visible as half mix, once we leave select mode, the clone origin has been edited to a different frame.

DVO Twister

Some changes have been made to DVO Twister and new defaults have been set.

The “Ignore Cuts End” setting is set by default, this option prevents DVO Twister from changing the range of frames to be processed if a cut is added to the end of a clip or if the end of a clip is trimmed.



There are two new options that change the way in which the duration of the converted clip is calculated.

There is a choice between:

- **Conversion : Range**
Based on in input range, i.e. converts frames between (and including) input start and input end, and nothing beyond (e.g. no repeat frames).
- **Conversion: Duration (Default)**
Based on input duration, with consequence that frames beyond last input frame will be repeat frames.
- **Conversion: Range and Duration**
Based on input duration and will modify the rate so that the last output frame perfectly corresponds to the last input frame.

Note that input duration doesn't necessarily correspond to an integer number of output frames - the number of output frames will be computed according to rules of normal rounding.

- **“Keep orphaned Field” on as default**
If the output is interlaced the frames computation will initially compute to number of output fields. 'Keep Orphaned (Output) Field', will say whether an odd number of fields should keep the last field (rather than drop it). In modes 'Range' and 'Duration' using 'Keep' will fill in using the "other" field which is at the same point in time (i.e. a progressive frame).

In mode 'Range+Duration', modification will always refer to the last field (whatever you choose it to be). 'Keep Orphaned Field' disabled more or less corresponds to computing number of frames as frames (rather than using intermediate fields).

Video Playback Improvements

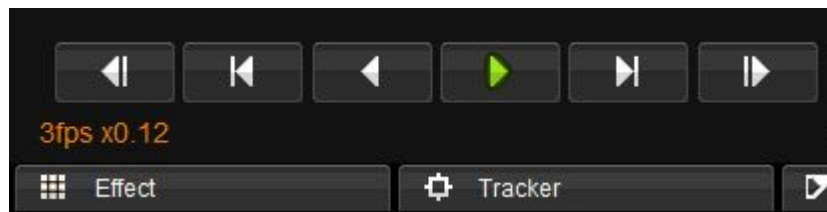
Video playback drop frame indicator - removal of P D I indicators

The P D and I indicators have been removed from the playback display and the frame rate indicator has been removed from the SDI monitor when in SDI Overlay Mode (GPU Readback)



Playback sync is now indicated by a green or red playback button, when in VID mode, green indicates that the SDI playback is real time and red indicates dropped frames - dropped frames will be shown below the play button.

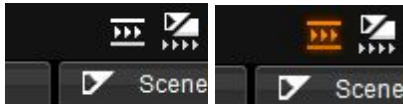
When not playing out to SDI and the frame rate is less than real time, the playback rate will be indicated below the play button.



Interactive mode

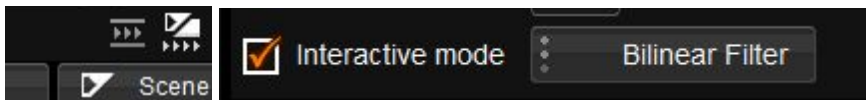
Real time proxy on the fly

Interactive mode provides a way for users to get better previews and real time playback when using heavy effects, like Sapphire or any other effects. It should improve interaction and the amount of layers you can preview in real time.



Once turned on it will create a proxy image on the fly. For UHD projects this means an HD image will be displayed during playback, but on stopping, the image will revert to full resolution image. Cloned material and caches will be used if available.

Interactive mode can be turned on in the Preferences menu and filtering can also be selected.



The default scaling amount is 0.500000 - for lower quality change to .20000
stillFrame is set to false, changing this to true, will show the proxy image when playback is stopped

```
interactiveMode
{
    scale 0.500000
    active false
    filter "Bilinear Filter"
    stillFrame false
}
```

Interactive mode will be automatically ignored when, exporting media and using DVO Fix tools.

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Video playback improvements

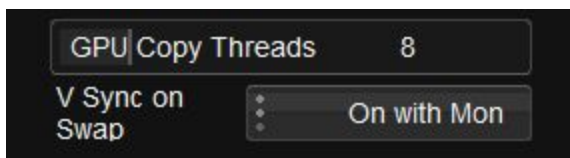
High Frame Rate and improvements to video playback reliability

A lot of work has been done to improve video playback. Support for high frame rates have been added to the **Kona 4** this includes:

1080p 30
1080p 59.94
UHD 3840 x 2160 50p
UHD 3840 x 2160 60p

DCI 4096 x 2160 50p
DCI 4096 x 2160 60p

Playback reliability for all formats and frame rates have also been improved, allowing much higher throughput in GPU readback mode and better overall playback reliability



As part of the improvements an option has been added to the preference in Monitoring I/O for copy threads and VSync. The default for upload threads is 8.

VSyn should be set to Off, unless you are using Mon, in which case the setting should be set to VSync on Mon, this is to prevent image tearing when playing back on the DVI or Displayport Monitor. This option will only control the V-Sync if the V-Sync NVIDIA driver is set to “controlled by application” - this is under the performance setting of the driver.

Please note, the high frame rate options are only available for the Kona 4, the video playback performance should improve under the DVS Atomix / Centauris cards, but were not tested. Performance does rely on the larger playback buffer available in the Kona 4.

Mon Vid and GPU Readback modes

For performance reasons the video buffer for the KONA 4 has been increased, due to this you will notice that the video in GUI will run more than a second ahead of the SDI output. This could be distracting. We recommend that you not work with MON turned on, while not playing back the video will update in the monitor as usual (scrubbing, stepping) - also, if any tracking is done, mon mode will automatically turn on while tracking and then switch off.

For more information on high frame rates and the required hardware to support them please see **[Nucoda and Phoenix UHD and High Frame Rate Support guide](#)**

Project settings (First changed in 2015.2)

We have had some questions about clarifying the new video and scaling settings. The changes were made to better reflect what is actually being done to the video signal, with HDR around the corner it is important that these changes are made to accommodate future workflows.

Default colour scaling - name changes

- **Video SMPTE** - working in SMPTE legal range
- **Full Range** - working with the full available range 0 -1023
- **Cineon Log** - Film log working space

The Video Output Scaling menu :

- **Clip to Video Legal** - The same as the original tick box and will clip Black and white levels to SMPTE legal - **Default for Video SMPTE**
- **Clip to SDI Legal** - This setting will clip the full range video to SDI levels (4 - 1019 inclusive)
Values 0 -3 and 1020 - 1024 are reserved for synchronisation headers and ancillary data headers.
(Although this setting contains the word clip - no video data is lost, the clipping occurs to values that are outside the video payload of the SDI Video signal) - This is the same as turning off the video legal clipping option.
- **Scale to Video Legal** - This setting will scale the full range video to SDI levels (4 - 1019 inclusive) Values 0 -3 and 1020 - 1024 are reserved for synchronisation headers and ancillary data headers. **Default for Full Range**
- **Scale to SDI Legal** - This setting scales **all** SDI values (0 to 1024) into range and is required when working in ST 2084 with 12 Bit Output

The ST 2084 option (PQ Transform) becomes available when the project is set to Half and the colour scaling is set to HDR - ACES

Most of our users working with HDR displays apply the PQ Transform function. This is known as SMPTE ST 2084 (Society of Motion Picture and Television Engineers) - electro-optical transfer function (EOTF)

SDI Monitoring Improvements

Improvements to SDI monitoring, accessible via preferences

The concept of a default video format in the Project Manager is removed. On exiting a project, the video I/O card's format and frame rate is not changed, so the splash screen is displayed in the same frame rate and format as the last project edited. On entering a project, the video I/O card's frame rate and format changes only if the project requires a frame rate and format different to that currently set.

On exiting the application, the video I/O card's current video frame rate, format and stereo enable state are saved to preferences named :

```
IOCard.lastOutputFormat  
IOCard.lastOutputFormatStereo
```

The settings in these preferences are restored to the video I/O card when the application next starts, on the assumption that the user is likely to want to work on the same settings as before.

The very first time the application is started after a version with this change is installed, the video I/O format defaults to PAL, as with previous versions of Nucoda.

It is still possible to set a fixed resolution for video monitoring in the video I/O and monitoring preferences.

The "Default format" drop-down list and "Always monitor default format" check-box are now combined into a single "Monitor format" drop-down list, which contains the same options as the previous "Default format" list plus a new option of "Follow Project".

When a video resolution option is chosen, the video I/O card will always be set to formats of that resolution, though frame rate and stereo will follow the project's requirements, as before.

When "Follow Project" is selected, the video I/O card's resolution will also follow the project's requirements, which is equivalent to "Always monitor default format" being turned off. The state of this option is stored in preference `IOCard.outputFormat`.

The old preferences :

```
IOCard.defaultOutputFormat  
IOCard.forceDefaultOutputFormat
```

are replaced with the equivalent setting of `IOCard.outputFormat` when a version of the application with this change is first run.

Improved performance for RED RAW files

To improve performance of RED de-bayering in Nucoda we have made two changes.

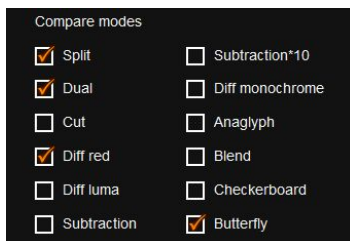
The clips.prefs file has been updated and the OLPF (Optical Low Pass Filter) now defaults to OFF when RED files are imported into Nucoda - we recommend using the DVO Aperture or DVO Sharpen tool to process images if required.

We will now create multiple decoders, based on the amount of cores available, that will substantially increase de-bayer performance in Nucoda. The instances are created in `C:\Nucoda\2015_3\root\IOWorkspace` - these files will be re-used - there is no need to delete them.

We create decoders based on this formula number of cores /2 +1 so 24 cores will create 13 decoders - to prevent excessive use of memory we will automatically limit decoders based on available RAM as well.

New and updated tools

Butterfly comparison

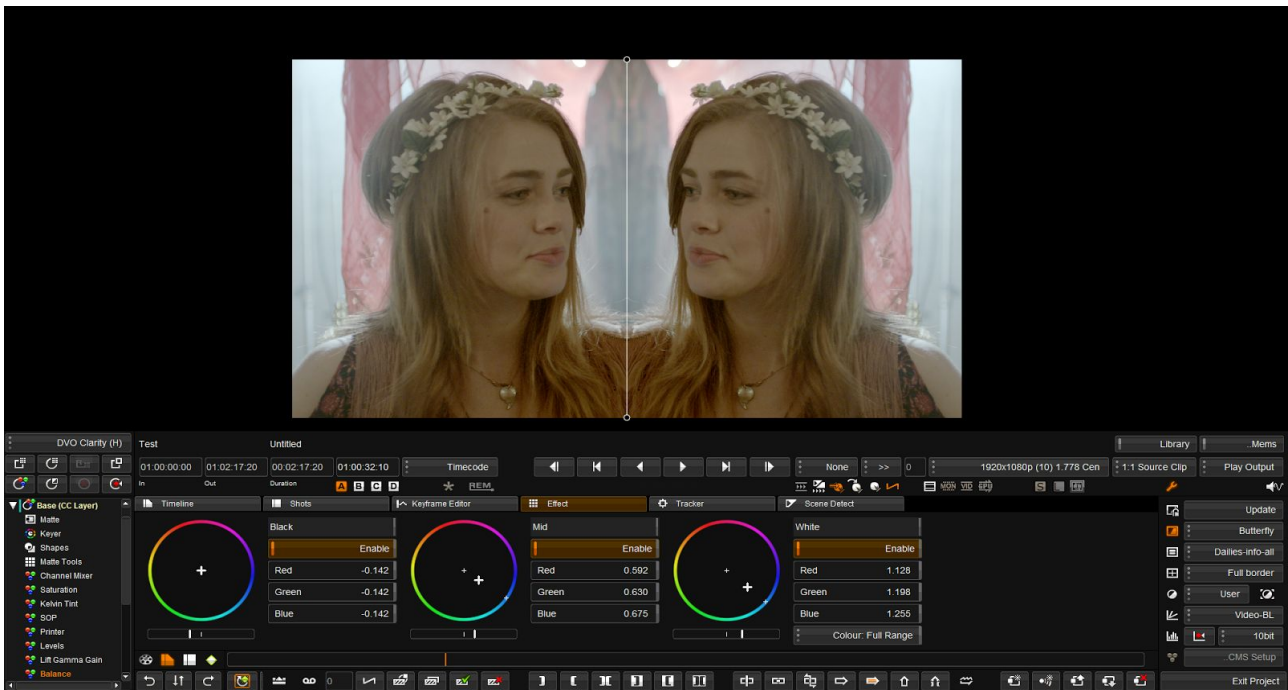


A new comparison tool called butterfly compare has been added, it allows for a mirror view of the comparison image.

From the GUI, clicking on the center cross of the split line will switch between vertical and horizontal split. Ctrl 8 will reset the line, Ctrl Shift 8 will reverse the source

On the Tangent Panel the jog wheel will switch between a vertical and horizontal split of the image, using the trackball the user can move the split line left/right and up /down. Reset buttons function to reset the wipe position and orientation.

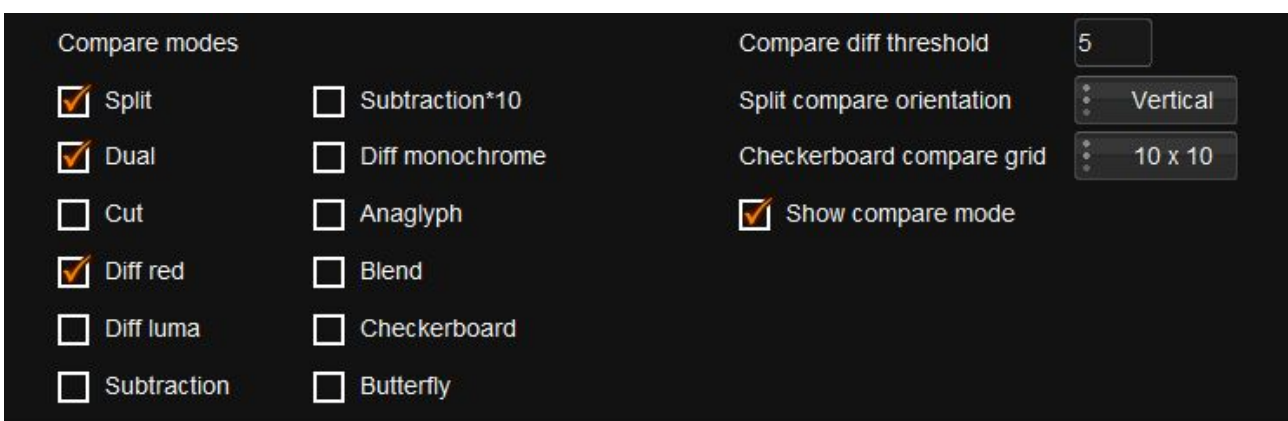
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Precision control is similar to the split wipe however pressing the joystick will switch between horizontal and vertical split. Long press will reset the wipe.

If required the user can use the mouse to move the points on the ends of the split line to move it away from horizontal or vertical.

- New default setting to select Horizontal or Vertical orientation of split and butterfly compare as default



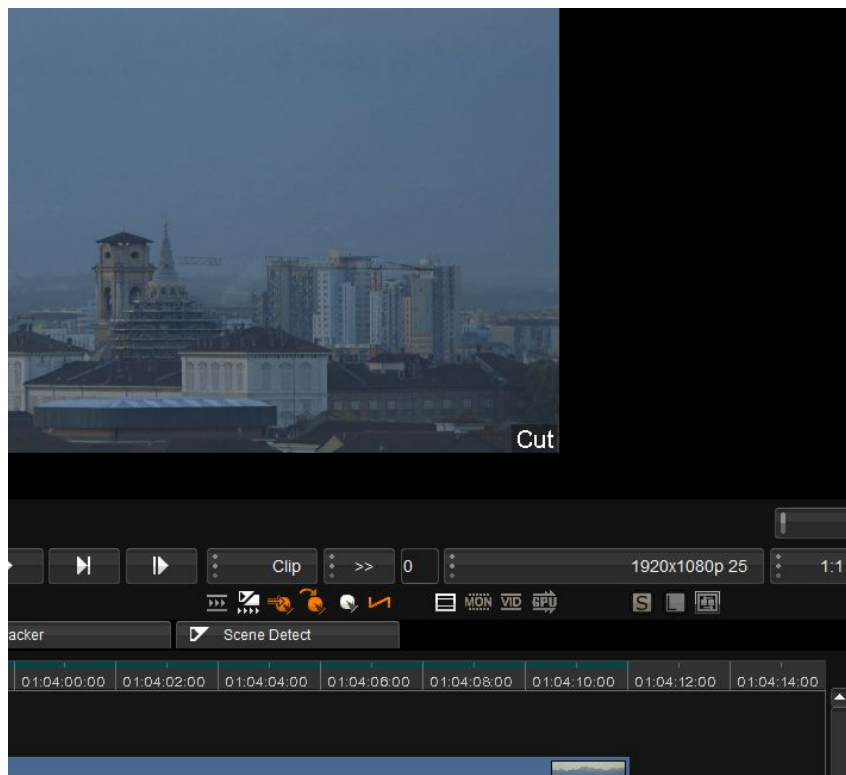
Set size for chequerboard squares

A new dropdown menu in preferences will allow the setting of preset sizes for the chequer board squares

Show current compare mode

Enabling this option will display the current compare mode name in the bottom corner of the image, especially handy when you use cut compare and forget that you're looking at the comparison*.

*Certain people come to mind, you're welcome...it's only taken 5 years ;-)



Router Tool

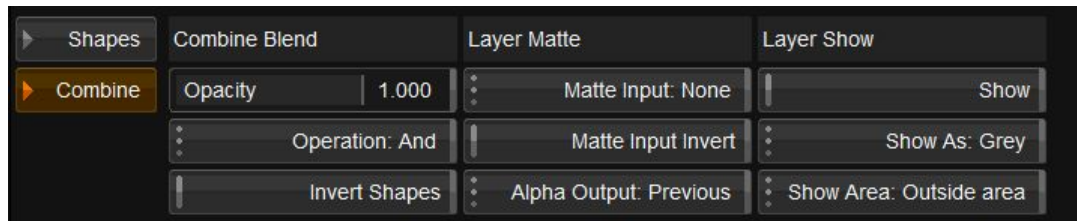
New source settings



In the router, the Key, Source and Matte input menus have been updated and Source has been added as an option. the new options are

Source
InputFX
Base
Previous

Previously you were not able to use the actual source as an input. In addition, the layer matte and layer show tools have been added to the Matte, Shape and Keyer menus, under the combine tab, they are the same controls as the ones in the router, they were just moved for the sake of convenience for Phoenix and non panel users



Automatic cloning and caching of audio files

The purpose of this feature is to allow the creation of local clones when audio files are being imported. This is especially important where media is located on external drives or network drives.

It will also facilitate the automatic cloning of audio from certain media types MXF, MOV and WAV files. the preference for cloning is set in Clips.prefs (in the all users directory)

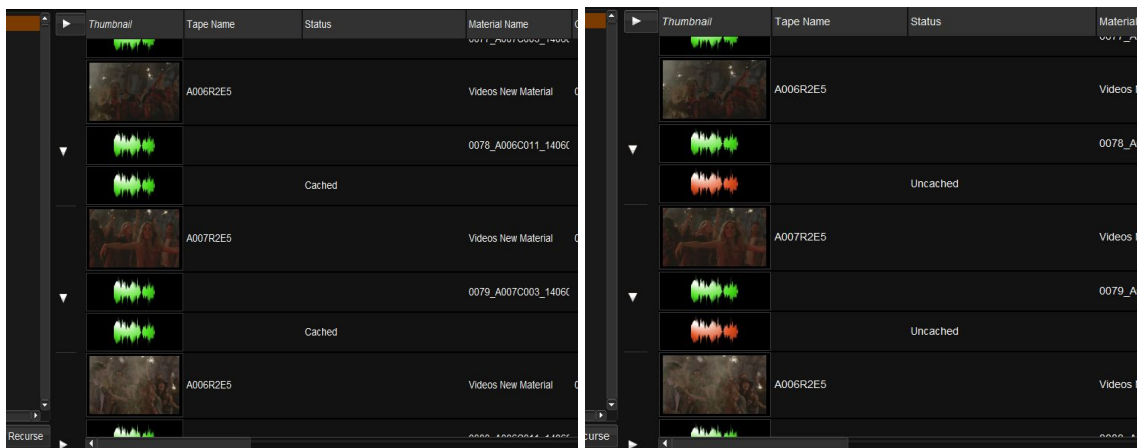
The default is for MOV and MXF files to be cloned and WAV files not.

```

334     }
335     audioCaching
336     {
337         mxf true
338         mov true
339         wav false
340     }
341 }
    
```

Files are cloned immediately upon importing into the library, so we do not wait for files to be on the timeline, note that cloning audio from large MXF or MOV sources could take some time.

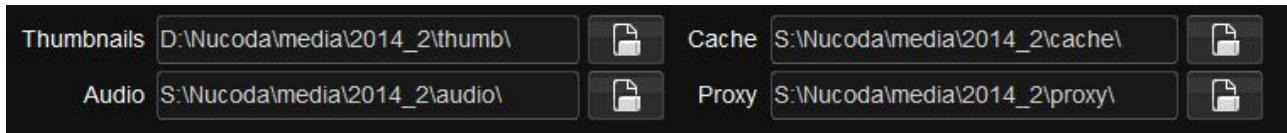
On importing into the library, you will notice the cache arrow is next to the audio thumbnail, clicking on the arrow will reveal the cloned file, if uncloned the waveform is red, during cloning it will progressively turn green. When not cached, the status will be “Uncached”



Once all the files are cached , all the thumbnails will be green, the status will change to “Cached”

New preferences for the audio caching

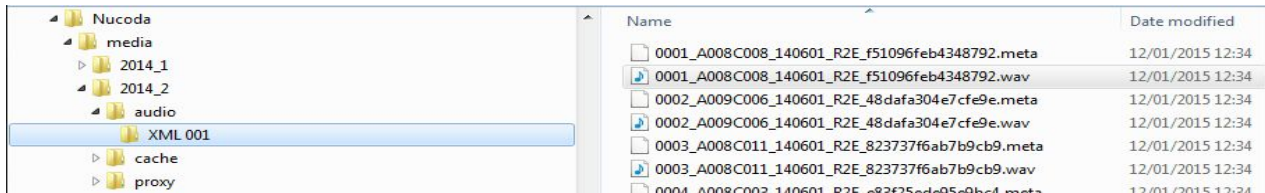
In the project library screen



And in the General.prefs file the following line:

audioCacheRootDir "S:\Nucoda\media\2014_2\audio\"

In Windows, the caches are created in a directory with the same name as the Project:

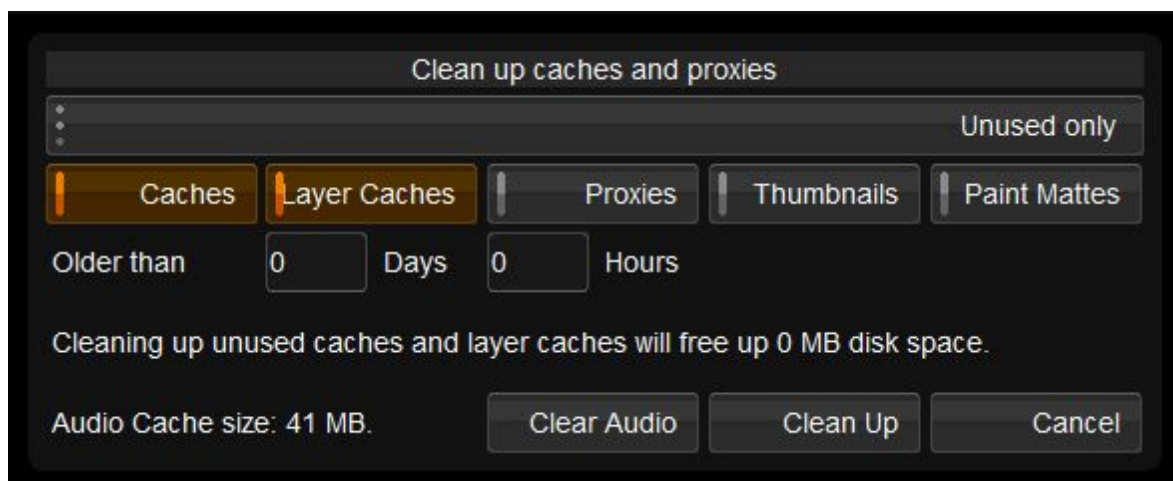


Deleting audio caches

Removing audio files can be done via the “Clean Up” option, note, that unless you turn off the “Clone” option in the properties, the files will automatically re-clone.

If you have moved the source, you will lose the audio.

The “clear audio” button will delete all the audio caches, the drop down at the top does not affect this and there is no way to clear only certain audio. It’s an all or nothing operation.



Audio cloning general notes

- We always clone the entire audio file, even if the whole file is not used.
- Waveforms will be much prettier ;-) even when zoomed in all the way
- Waveforms will now be cached, so there is no waiting for caches to be redrawn.
- Audio Clone supports files larger than 2gb (file limit) this is the only place it is supported, in Nucoda or Phoenix - not during capture, import or export.
- Files that are not 48000K will import but will not clone and will most likely be mute

Nucoda and Phoenix UHD and High Frame Rate Support

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- Current video hardware support
- Storage and System testing for Performance using AJA System Test 2.0 beta 5

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Current build with HFR and enhanced playback support : **Release 2015.3**

Workstation requirements (Under revision)

- For high frame rate UHD we would recommend Dell 7910 or HP Z840 Workstations
- Kona 4 and storage cards in 16x Slots and V-Sync disabled on the NVidia card
- To turn off vsync:
Open the Nvidia control panel
Change "3D Settings->Manage 3D Settings->Vertical Sync" from "Use the 3D application setting" to "Off"
There is also now a setting in the Nucoda/Phoenix application to turn VSync on/off, for this to function the Nvidia setting should remain on "use 3D application setting"
- Recommended video card is Nvidia K5200 - others may work but are untested.

Current video hardware support

AJA Kona 4 with recommended breakout box - while you should see improved playback support on the Atomix / Centauris cards, testing was focussed on the Kona 4 card. High frame rates are not supported on the DV Atomix HDMI / Atomix LT or Centauris

- Support for resolutions up to 4096x2160 with SDI output
- Support for 2K at 30fps and 1080 at 60fps
- Supports 23.98, 24, 25, 30 50P and 59.94, 60P for UHD

Storage and System testing for Performance using AJA System Test 2.0 beta 5

The AJA test application is an excellent way to test the performance of your system drives and of the Kona card. The instructions in the document is a test description for testing UHD performance. If you have performance issues, please set up the test according to the type of media you will be using, run the tests and send the results to the address provided.

Download the AJA Testing application and use it to run all the tests described

Please note: This test app is currently only available as part of the Kona 12.3 Driverpack, do **NOT** download and install the drivers, they are not compatible with the current Nucoda release.

ftp://software_release:Hd4_!Cs9f@ftp.digitalvision.se/AJA_Test_2/AJA_System_Test.exe

After running the each test, generate and save a report, turn off the option to generate .info file.

Storage requirements:

Required Bandwidth

$(V \text{ Res} \times \text{Hor R} \times 4 \times \text{FPS} / 1000000 = \text{Data Rate})$ Test files are RGB 10bit DPX

This requirement for the storage bandwidth is the actual data rate, in reality the rate required from

the storage should be at least 50% more than this, possibly more.

For the required rates looking into SSD is worthwhile for cache drives, striped SSD sets can provide

sustained data rates with little problem, although rates for writing could be lower on these drives.

Drive speed and performance will deteriorate as they fill up and fragment.

In order to play back reliably at any data rate, the requirement for the drive is more than just to be able to sustain the required frame rate. In order to provide stable playback the frame buffers of the video card needs to be filled and maintained at a minimum level, for UHD and 4K, the buffer available is around 24 frames, this means the storage should be capable of at least 25 to 30 frames per second faster than the required playback rate.

After running the test, make sure to check the highest and lowest performance values during reading and writing, note that you may have sudden drops in performance, this is not uncommon, having a deep buffer will help mitigate any dropped frames due to these performance drops.

HD (1920 x 1080) - Nominal requirements

HD 1080 25p - 210 mbps (Megabytes per Second)

HD 1080 60p - 500 mbps

2K (2096 x 1556) - Nominal requirements

2K Full 24p - 313 mbps

4K (4096 x 3112) - Nominal requirements

4K Full 24p - 1223 mbps

UHD (3680 x 2160) - Nominal requirements

UHD 24p - 800 mbps

UHD 25p - 833 mbps

UHD 50p - 1667 mbps

UHD 60p - 1990 mbps

UHD DCIM (4096x2160) - Nominal requirements

24p - 850 mbps

50p - 1769 mbps

60p - 2123 mbps

Setting up and running the system tests

System disk test

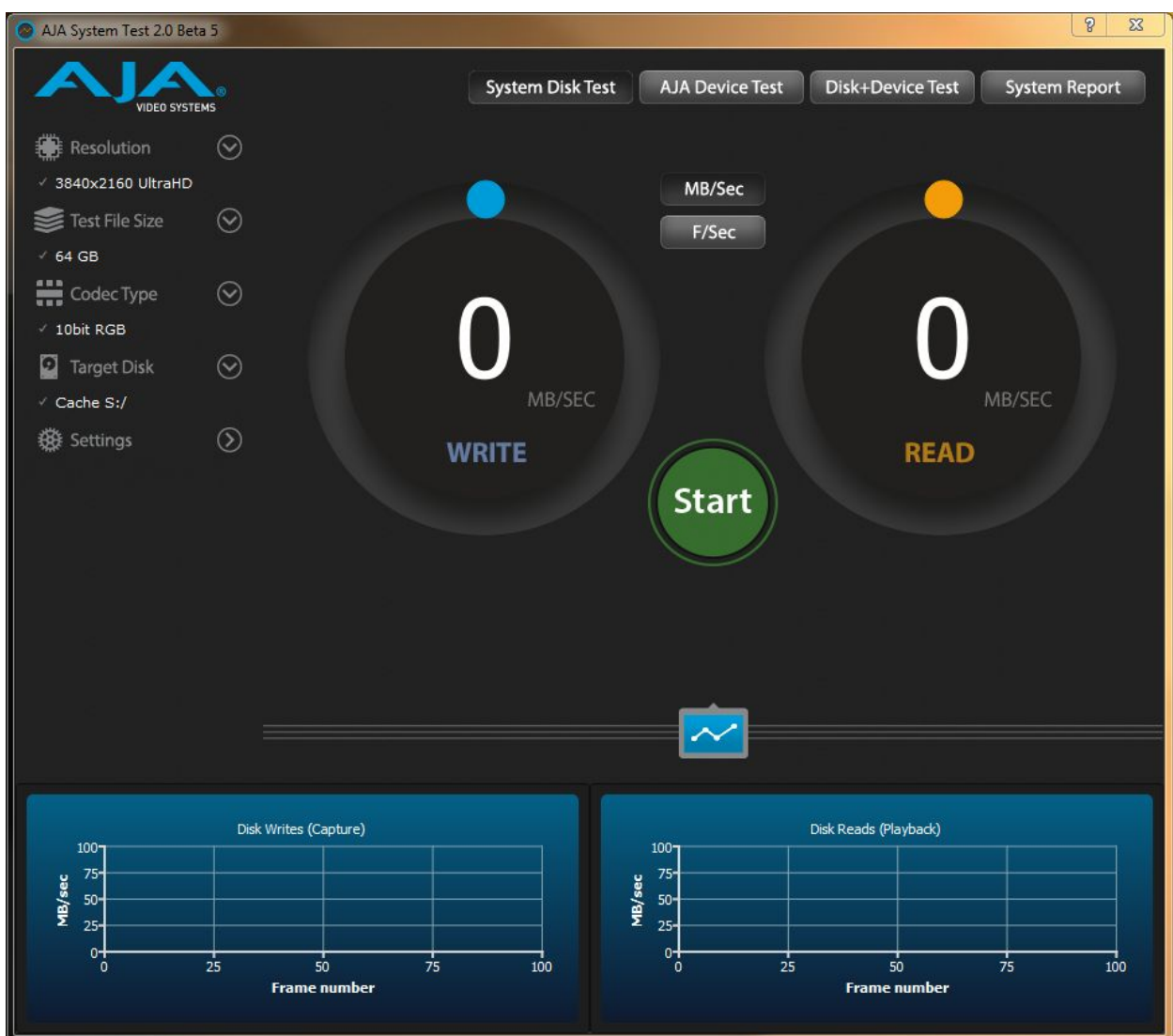
Resolution: 3840x2160 UltraHD

Test File Size: 16gb

Codec Type 10 Bit RGB

Target Disk: Your media drive

Settings: Change Disk Test to "file per frame"



AJA Device Test

Resolution: 3840x2160 UltraHD

Pixel format: 10 bit RGB

AJA Device (Auto detected)

Settings: Change Disk Test to "file per frame"

After running the test, please generate and save a report, you can turn off the option to generate .nfo file.



Disk and Device Test

Resolution: 3840x2160 UltraHD

Test File Size: 16gb

Codec Type 10 Bit RGB

Target Disk: Your media drive

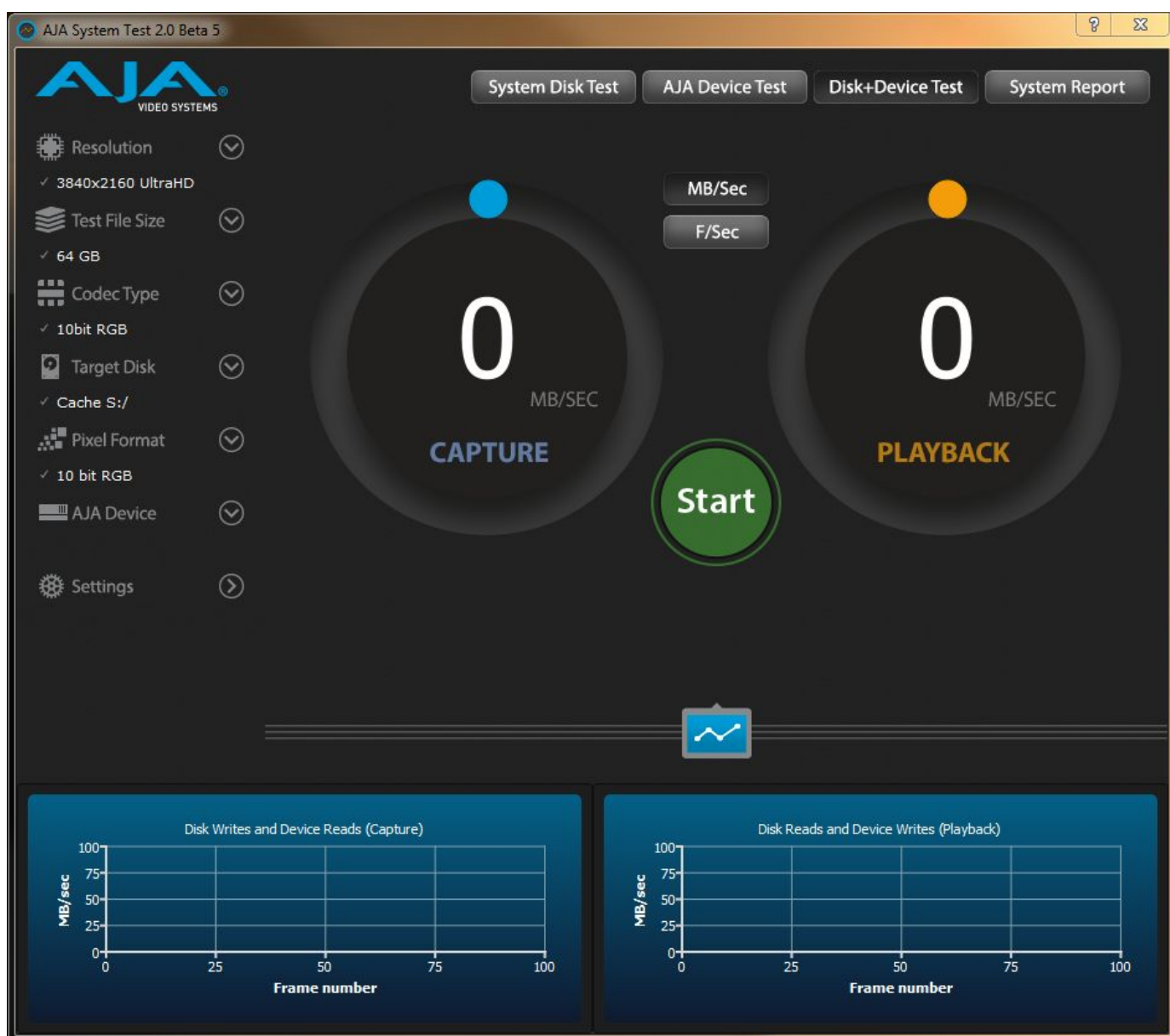
Settings: Change Disk Test to "file per frame"

Pixel format: 10 bit RGB

AJA Device (Auto detected)

Settings: Change Disk Test to "file per frame"

After running the test, please generate and save a report, you can turn off the option to generate .nfo file.



Results from AJA Test

After running each test, please generate and save a report, you can turn off the option to generate .nfo file.

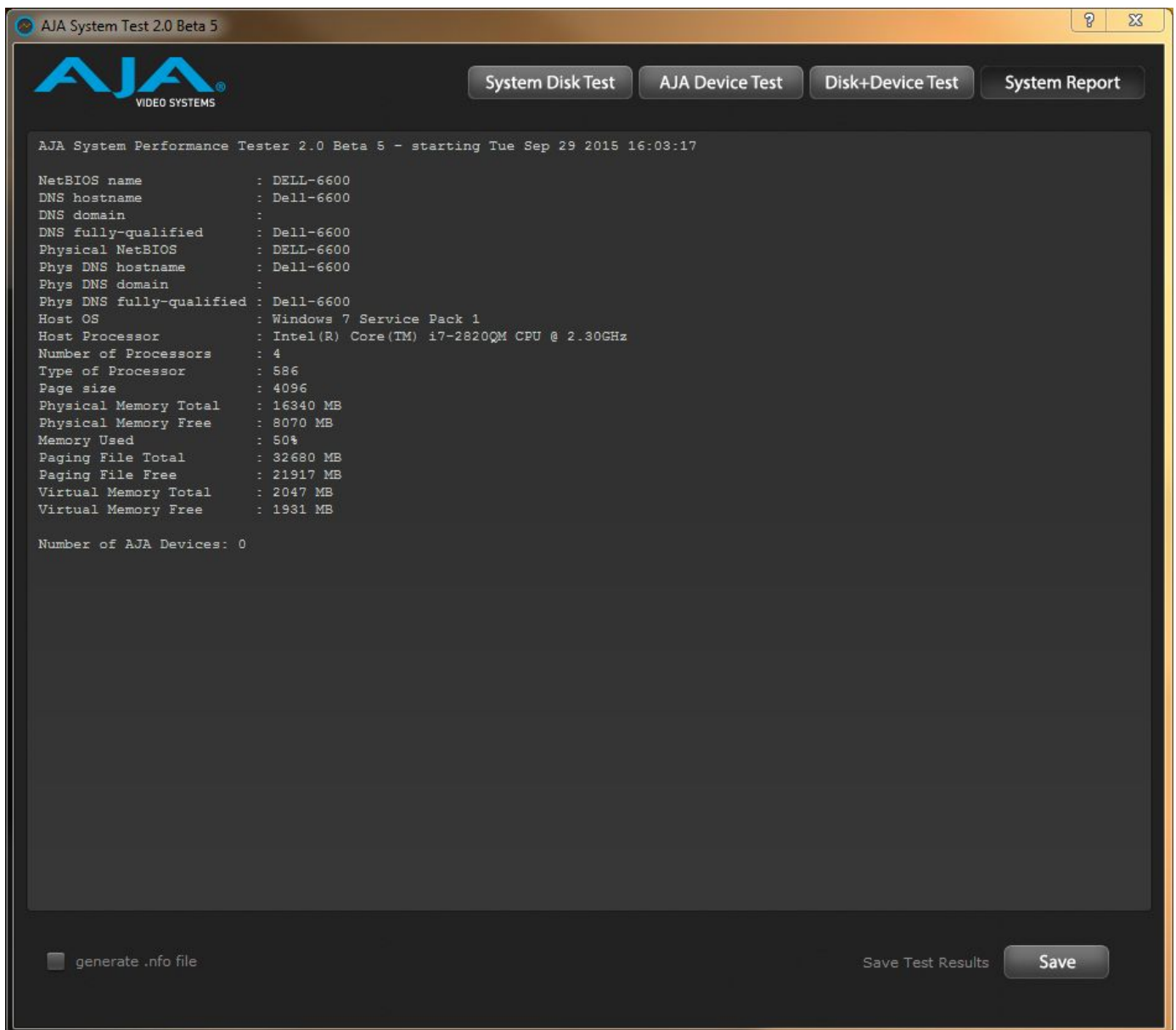
Please add the following details:

Workstation

Amount of storage - type of storage connection - RAID Level

Current slot configuration

Please email the resulting PDF's to support@digitalvision.se, and please provide your company name.



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