

Nucoda 

Phoenix 

Nucoda and Phoenix

Recommended Hardware

With UHD and High Frame Rate Guide

This guide will be updated regularly - it also contains important information regarding UHD and High Frame Rate support in Nucoda and Phoenix.

This includes some hardware recommendations as well as software setting to enhance and improve performance.

Please send any feedback to patrick.morgan@digitalvision.se

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Hardware requirements - Nucoda and Phoenix - July 2017

Workstation recommendations - (01/12/2016)

- Recommended for UHD and High frame rate up to 60p (storage dependent)
HP Z840
Dell T7910
- Recommended for HD including 1080 60p (storage dependent)
HP Z820
Dell T7610

Operating System:

Windows 10

Win 7 64bit Professional - 2017.1 was tested under Windows 10 but should run under Windows 7, however, any issues related to Windows 7 will not be fixed.

Processors:

Intel Xeon 8, 10, 12,14 or 16 core, dual configuration

- If the bulk of the work is colour grading it's better to accept less cores with higher speed
- If the bulk of the work is DVO based or Phoenix you should aim for as many cores at as high speed as you can afford where the number of cores have the highest weight of the two.

RAM:

Minimum 32GB, recommended 64GB. RAM speed should be suitable for chosen processor

Population of memory if you have dual processors :

E5 V2 or V3 has 4 memory lanes per processor so if you want 32GB RAM it should be 8pcs of 4Gb to maximize performance aka one RAM module per lane.

Memory modules should be evenly distributed so that each memory channel has the same amount of RAM

GPU

Quadro M6000 - 12gb - UHD and high frame rate - no current data for 24gb version (not tested)

Quadro M5000 - HD / 2K / UHD

Quadro M4000 - Can be used for Phoenix workstations HD /2K

Quadro P5000 / p6000 - UHD and high frame rate

Please ensure that the PCI Slot that contains the GPU is set to work as a Gen 3 slot - to check this open the NVidia Control Panel and select System Information from the Help menu. Check the details under the BIOS heading

PCI slots** Min: 2x PCI-E x16, 2x PCI-E x8

GUI Monitors - Min 1920 x 1080 (dual GUI Recommended)
Large resolution monitor recommended for Phoenix

Disks - Operating System and Project, Audio, Notes and Thumbnail
SSD Recommended - Dual mirrored drives

PCI slots are depending on configuration

GPU shall always run from a PCI-E x16 - normally double wide (Gen-3 minimum)
Kona 4 Video I/O requires PCI-E x8
Red Rocket PCI-E x8.

General Notes:

- For DVO or Phoenix - dual 12 core machines or higher are recommended, all the DVO restoration tools are highly optimised and only process on the CPU, so high core count machines are crucial for highest possible performance.
- Kona 4 and storage cards in 16x Slots and V-Sync disabled on the NVidia card.
- Please ensure that GPU's are in Gen 3 slots and the card is in Gen 3 mode.
- Multiple GPU's are currently not utilised by Nucoda - this may change in future.
- Windows 10 is officially supported FOR 2017.1
- Custom workstation are in use at facilities - use good quality components if you want to take this route. We are unable to support these solutions beyond basic recommendations.
- In the BIOS please turn off: NUMA & Hyper Threading - Ensure that PCI slots are not being forced to Gen 2
- If you are installing anti-virus, please ensure that the media and project drives are NOT scanned as this will affect performance.
- Other Nvidia GPU should work but internally we only test with workstation cards (Quadro)
- It is recommended that the system ram should be twice the amount of GPU Frame buffer RAM
- AMD GPU's should work under 2017.1 but were not past of the test cycle - please contact us for information.

Video hardware support

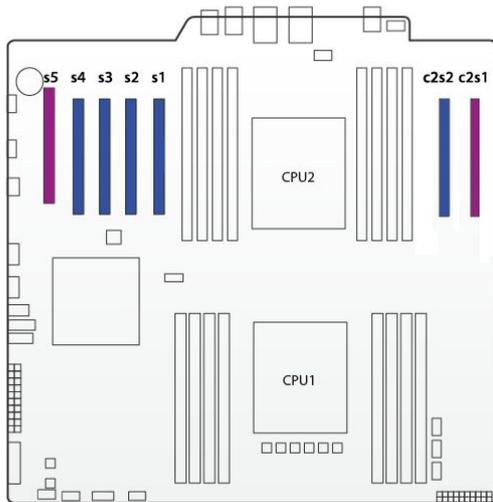
AJA Kona 4 with recommended breakout box - while you should see improved playback support on the Atomix / Centauris cards, testing was focussed on the Kona 4 card.*

- 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

***High frames rates are not supported on the DV Atomix HDMI / Atomix LT or Centauris**

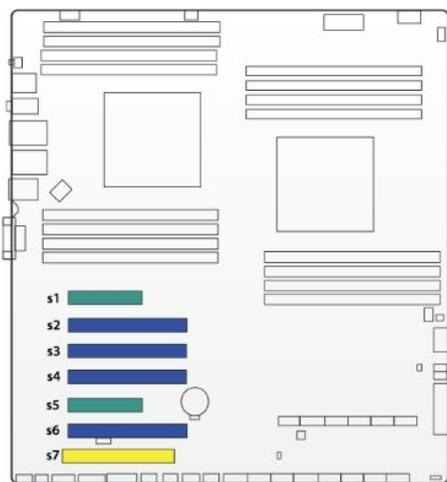
Expansion Slot Placement for: Dell T7600/T7610/T7910



Slots 1 and 2 share bandwidth in this system so, other high bandwidth cards like a storage controller or Red rocket should go on one of these slots, and the KONA can go on slot CPU2_SLOT2. If the KONA card goes in slot 1 or 2, the other slot should NOT contain a high performance card. Example: If a KONA card is in slot 1, Slot 2 should only be used for a low performance card like a 1x PCIe card, or not used at all.

Option 1	
CPU2_SLOT1	Not Compatible
CPU2_SLOT2	Recommended
Slot 1	Compatible
Slot 2	Compatible
Slot 3	Compatible
Slot 4	Compatible
Slot 5	Not Compatible

Expansion Slot Placement for: HP Z820/Z840



Option 1	
Slot 1	Compatible, except KONA 3G which is too long for this location
Slot 2	Compatible, but typically used by Graphics Card
Slot 3	Compatible, Only available with two CPU's installed.
Slot 4	Compatible, Only available with two CPU's installed.
Slot 5	Not Recommended
Slot 6	Recommended
Slot 7	Not Compatible

Images taken from : <https://www.aja.com/en/support/kona-pc-system-configuration>

Note: Specifications may change without prior notice.

Specifications are not a guarantee for performance and stability for hardware not qualified by Digital Vision.

Video playback

High Frame Rate and video playback reliability

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.

VSync 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 GFX over SDI 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 both MON and VID 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.

Changes to video settings and SDI scaling (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 it is important that these changes are made to accommodate future workflows.

Colour space - name changes

- **Video SMPTE** - working in SMPTE legal range - ideal for working with scaled Avid Media
- **Full Range** - working with the full available range 0 -1023
- **Cineon Log** - Film log working space
- **Video Log - Video log working space (not in general use)**
- **ACES** - ACES 2065-1 ACEScc ACEScct

The Video Output Scaling menu

Clip to Video Legal - Will clip levels to SMPTE legal - (94 to 960)

- Default for Video SMPTE

- Use when delivering for television to ensure legal video level on output.

- **Clip to SDI Legal** - This setting will clip full range video to SDI levels (4 - 1019 inclusive) Values 0 -3 and 1020 - 1023 are reserved for synchronisation headers and ancillary data headers - only engineers know or actually care about this.

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.

- Using this option will allow illegal values in the output

- **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 with 12 Bit Output

Users working with HDR displays must apply the PQ Transform function and have a PQ capable monitor. This is known as SMPTE ST 2084 electro-optical transfer function (EOTF)

Colour Space	Clip to SDI Legal	Clip to Video Legal	Scale to SDI Legal	Scale to Video Legal
Video SMPTE	X	X		
Full Range	X		X	X
Cineon Log	X		X	X
Video Log	X		X	X
ACES	X		X	X

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.

Performance settings and features in Nucoda and Phoenix:

Preferences and General.prefs

- Enable the "*fillOnAllocate*" preference in general.prefs - it increases initialisation time but improves UHD playback when the application is first run - set to true
- Also enable Interactive Mode in the preferences.

Interactive mode

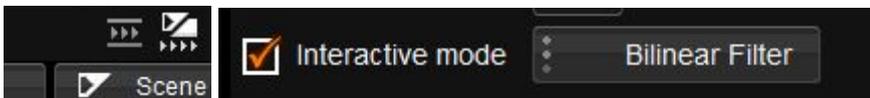
Real time proxy on the fly

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, playing to tape and using DVO Fix tools.

Turn off vsync

There is 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"

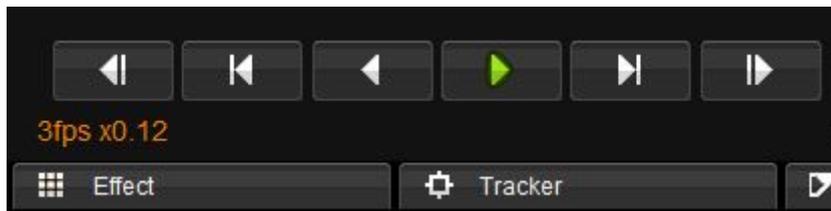
Video playback drop frame indicator - removal of P D I indicators

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. The button will remain green.



Storage requirements:

Required Bandwidth for playback:

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

For UHD EXR (Half) files more bandwidth is required.

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 local SSD caches is worthwhile, 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) - Min requirement - (* 1.5 for OpenEXR)

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

HD 1080 60p - 500 mbps

2K (2096 x 1556) - Min requirement - (* 1.5 for OpenEXR)

2K Full 24p - 313 mbps

4K (4096 x 3112) - Min requirement - (* 1.5 for OpenEXR)

4K Full 24p - 1223 mbps

UHD (3680 x 2160) - Min requirement (* 1.5 for OpenEXR)

UHD 24p - 800 mbps

UHD 25p - 833 mbps

UHD 50p - 1667 mbps

UHD 60p - 1990 mbps

UHD DCIM (4096x2160) - Min requirement - (* 1.5 for OpenEXR)

24p - 850 mbps

50p - 1769 mbps

60p - 2123 mbps

Setting up and running the system tests

Storage and System testing for Performance using AJA System Test

Please note: These test are only an indication of performance, SAN performance may not be accurate using these types of tools

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.

The AJA test application is included in the qualified drivers for Nucoda (12.5 - 2017.1)

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

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.