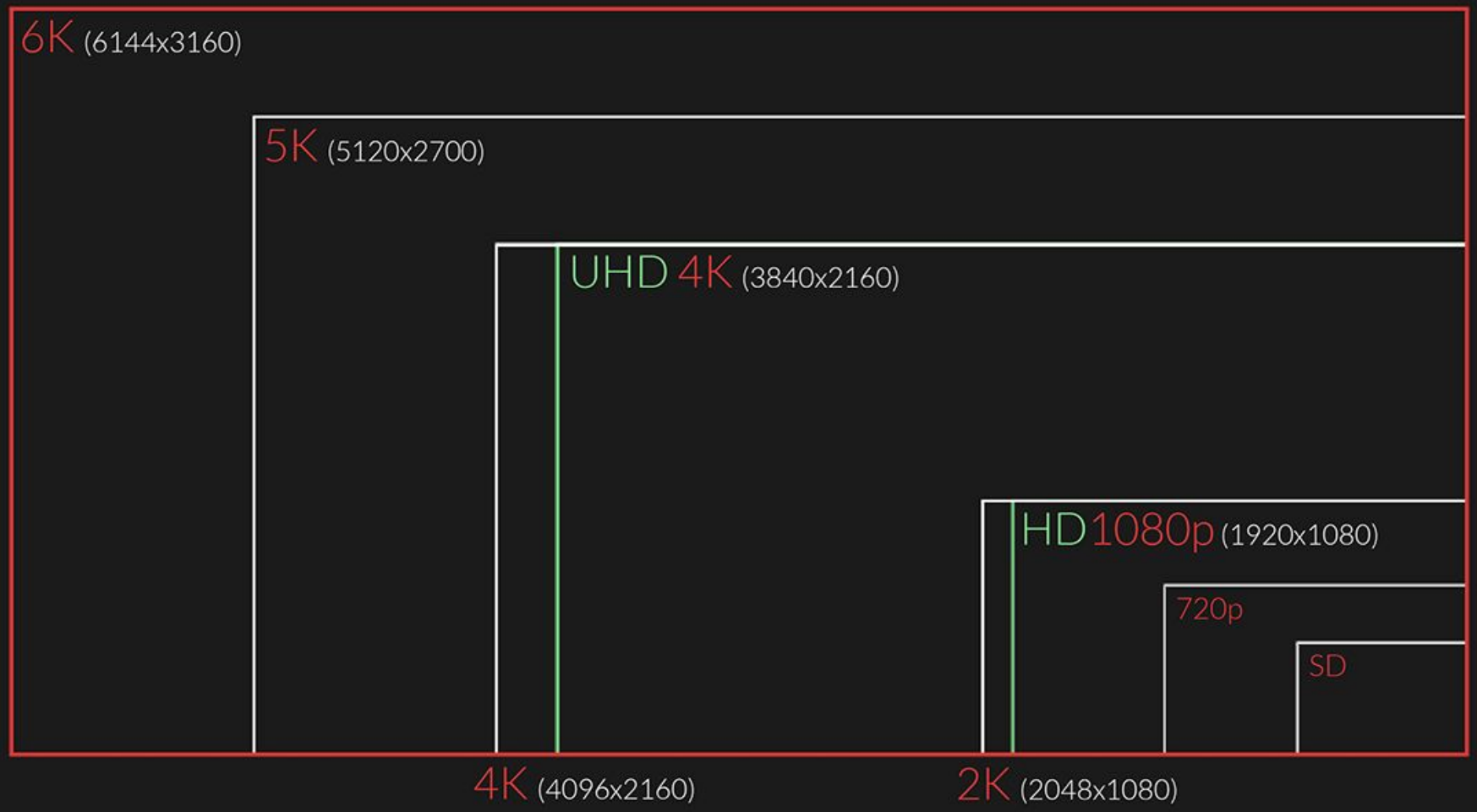
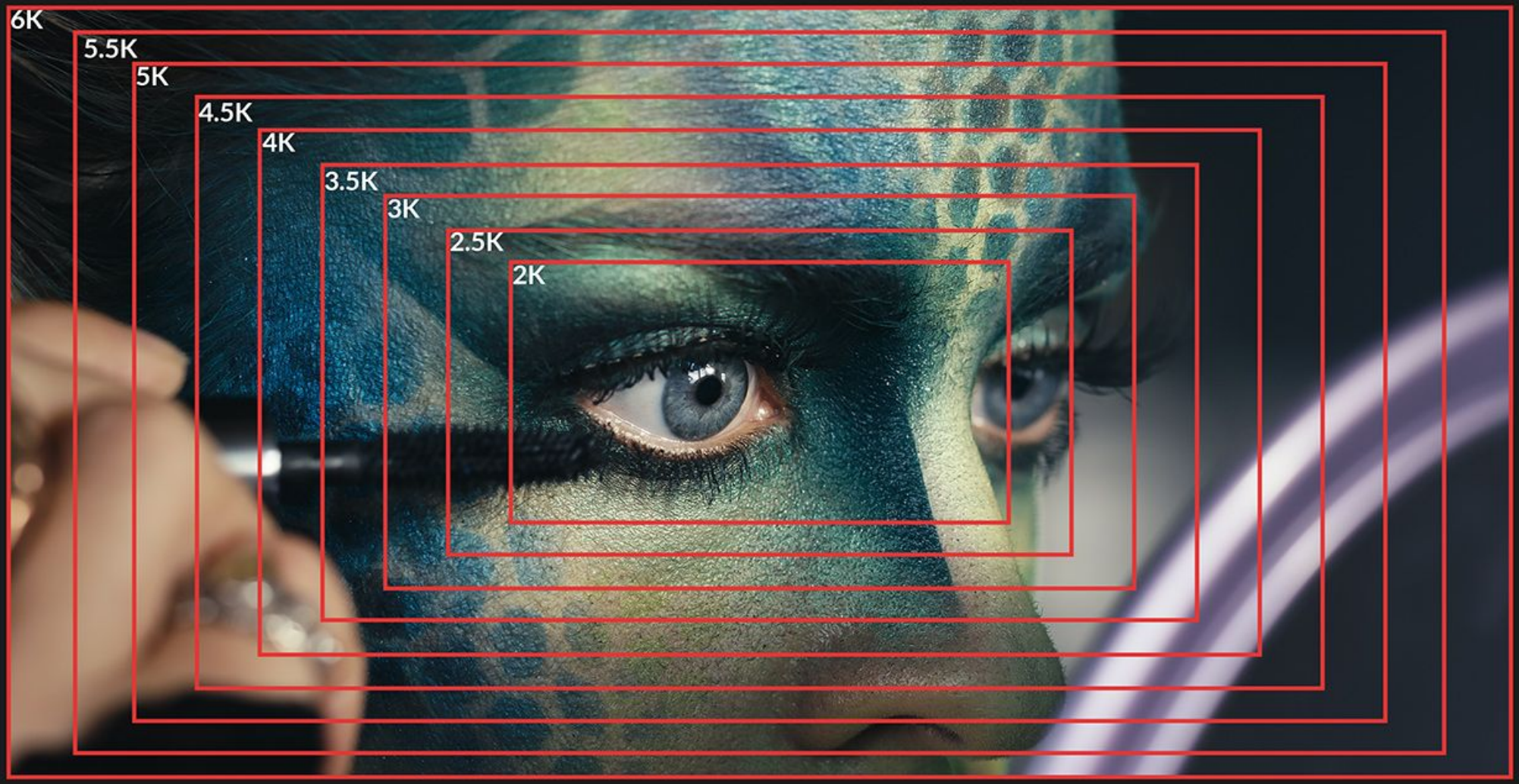
RED DRAGON - WHAT IS 6K?



- 6K is the maximum resolution of Epic Dragon. 6144x3160 or 19.4 megapixels at a 1.94:1 aspect ratio.
- 6K is 56.18x more pixels than Standard Definition.
- 6K is 9.36x more pixels than 1080p.
- 6K is 8.78x more pixels than 2K.
- 6K is 2.2x more pixels than 4K.
- 6K is 1.4x more pixels than 5K.
- At 300 DPI you can make a 20.48x10.53 inch print from a full 6K Dragon image.
- At 150 DPI you can make a 40.96x21.067 inch print from a full 6K Dragon image.
- At 72 DPI you can make a 85.3x43.9 inch print from a full 6K Dragon image.
- 6K is 14% more resolution than 5K for a pristine full debayer down to 4K. Meaning it's a 66.7% down sample/debayer to 4K.

RED DRAGON MULTI-FORMAT SYSTEM



Red Dragon is a multi-format capture system. Meaning you can select which resolution/format you would like to record in and you will be shooting within that "window" or "crop" of the full sensor size. This image is then recorded straight into a REDCODE RAW file with that given resolution. REDCODE RAW is always recorded out at the chosen resolution/format and there is no in camera scaling applied.

Windowing or Cropping down on the sensor allows for Dragon to record even higher desired Frame Rates.

If recording or monitoring the stream through HD-SDI or HDMI you will be seeing a 1080p scaled version of the image. If utilizing the 4K Broadcast Module you will be seeing a UHD 4K (2160p) scaled version of the image being recorded.

RED DRAGON FORMAT ASPECT RATIOS

Each unique resolution (6K, 5K, 4K, etc...) has several “formats” that reflect different aspect ratios when recording your images. The “FF” designation refers to the maximum X and Y resolution of the given format. For instance if shooting on Epic Dragon and recording the full frame image it is referred to as 6K FF. Within those “FF” formats are other common motion picture aspect ratios useful when targeting a particular delivery aspect ratio.

HD formats are a 16x9 (1.78:1) aspect ratio. WS formats are a 2:37:1 widescreen aspect ratio. 2:1 is a useful format/aspect ratio to natively record in as it’s a nice format itself while also suited for HD or WS extraction or creative reframming after the fact.

RED DRAGON - FILM RELEVANCE

FORMAT SIZE

Red Dragon has some spot on relevance to common Motion Picture Film Formats. Notably, Dragon 6K is approximately as tall as the Academy 35mm Frame, 5K is essentially Super 35mm 3-perf. Also, 2.5K is essentially Super 16mm. This holds importance related to the actual resolving power of film on a per format basis.

COLOR/FORMAT KEY:
RED DRAGON (6K-2K Full)
Super 35mm 4-Perf Full Ap
Super 35mm 3-Perf
Academy 35mm
Super 16mm

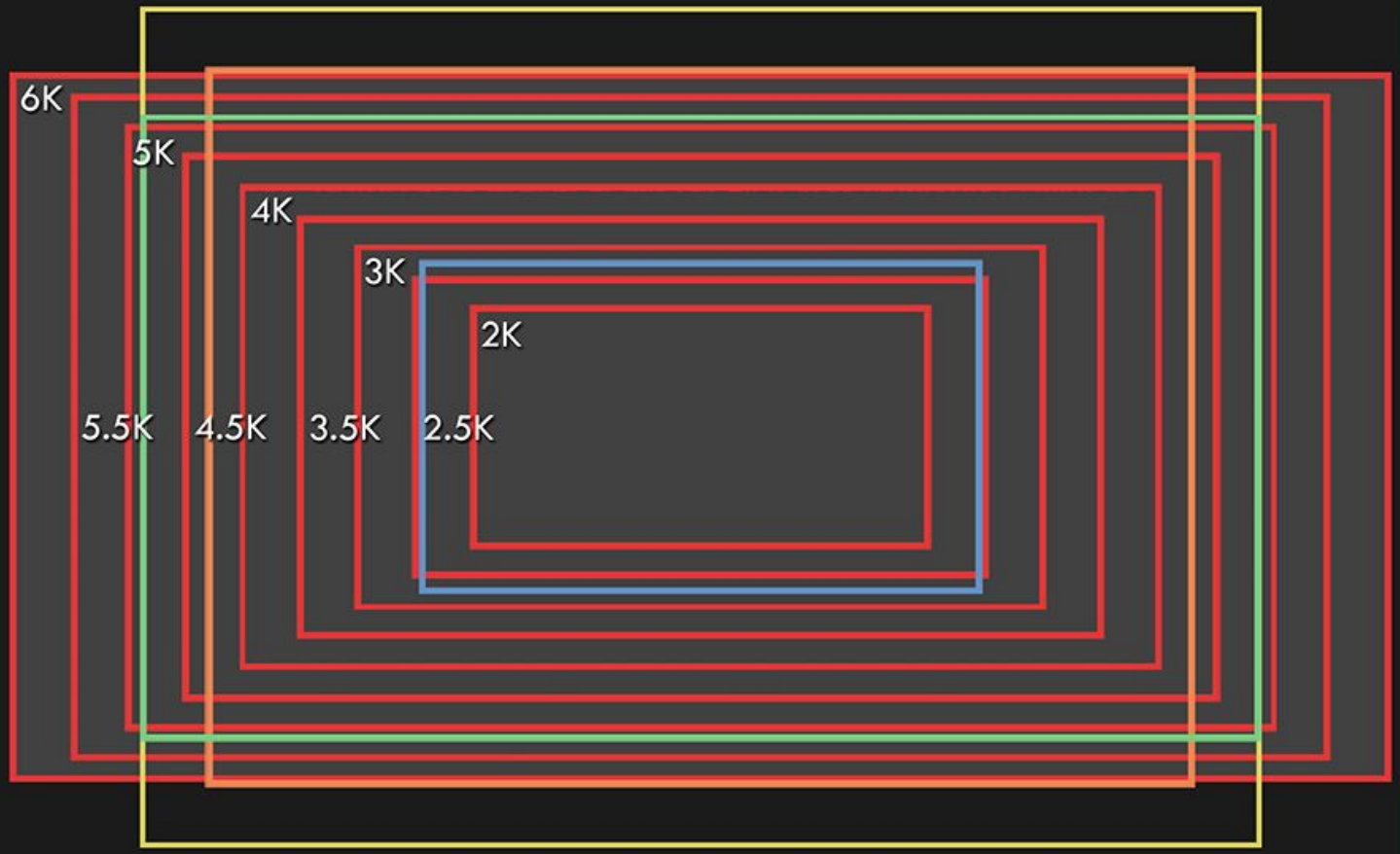


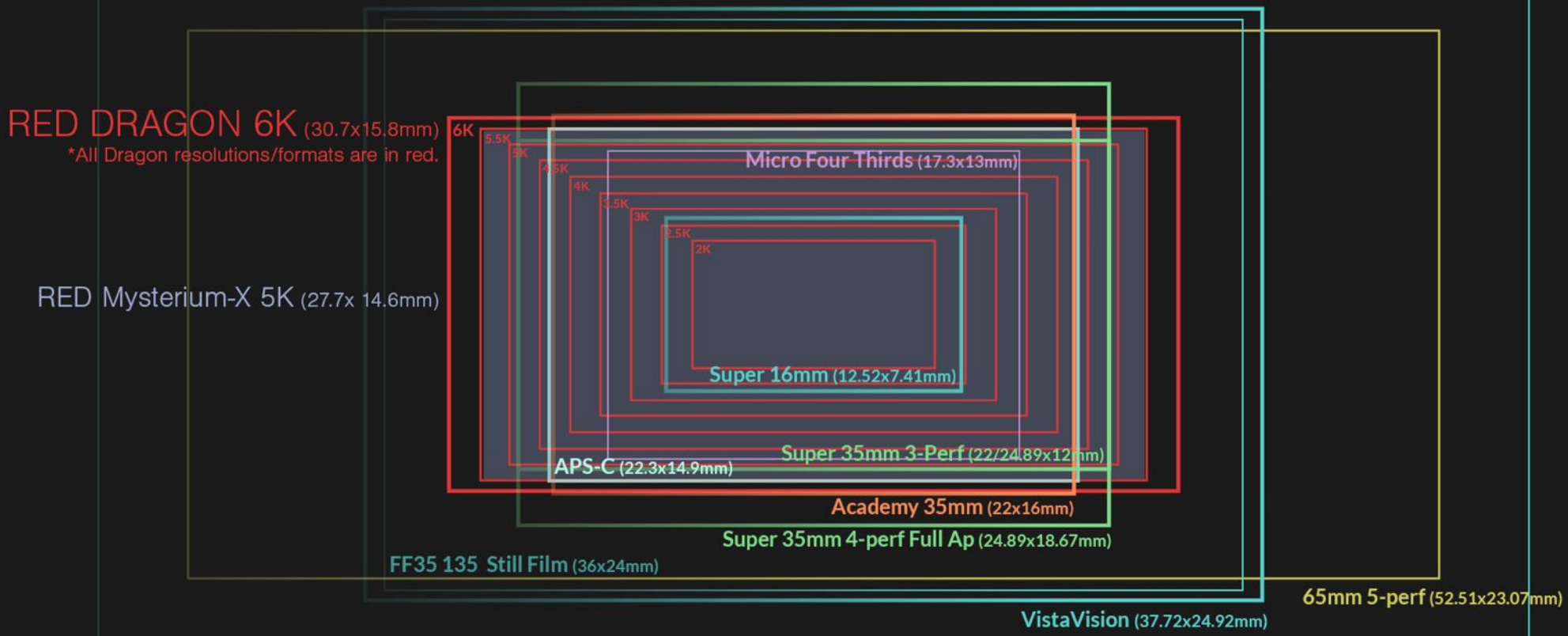
IMAGE TEXTURE CHARACTER

Much like Motion Picture Film Stock, Red Dragon has a variable image texture depending on what ISO rating you decide to utililize while producing a “cleaner” image at equivelent sensitivitives.

NATURAL IMAGING

Dragon from top to bottom has been tuned to provide a far more natural feel to the images that come out of it. This is most apparent in the Highlight Roll-Off and Clip which leaves no “hard edged” digital fingerprint. It is also very noticeable in the tonal response. color science, and broad Dynamic Range.

RED, Digital, and Film Format Size Chart



ALL FORMATS EXACTLY TO SCALE

made by Phil Holland 5/31/2014

645 220 Still Film (60x45mm)

70mm IMAX 15-perf (70.41x52.62mm)

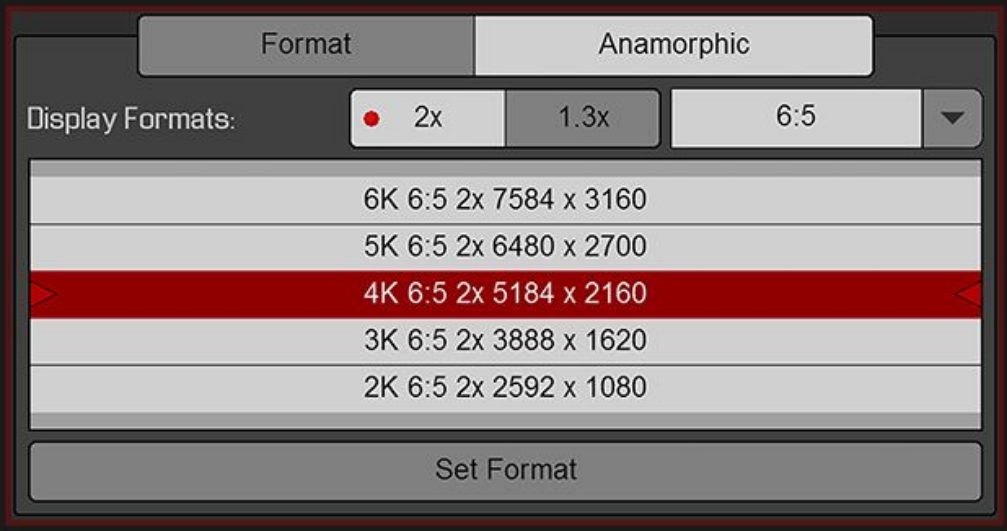
Phil Holland
PHFX.COM

RED DRAGON - ANAMORPHIC SHOOTING

ANAMORPHIC MODES

Red Dragon supports both 2X and 1.3X Anamorphic Shooting Modes. It has several special formats and resolutions that are ideally suited for anamorphic lenses and Common Motion Picture Aspect Ratios.
When shooting anamorphic the image you are monitoring is an "unsqueezed" preview of what's actually being recorded.

You can set your format by going to:
MENU>SETTINGS>PROJECT>FORMAT
Or by simply tapping the Resolution and Format with the LCD Touch.



DRAGON 6K 6:5 2X Anamorphic

DRAGON 6K 6:5 2X Anamorphic Unsqueezed (2.40:1)

ANAMORPHIC FOR COMMON MOTION PICTURE ASPECT RATIOS

The following are some of the ideal formats for commonly used anamorphic aspect ratios:

Any 6:5 Format with 2X = 2.40:1 Widescreen
Any 4:3 Format with 1.3X = 1.78:1 or 16x9 HD/UHD
Any HD Format with 1.3X = 2.37:1 Widescreen
Any 3:2 Format with 1.3X = 2:1
Any 3:2 Format with 2X = 3:1

CREATIVE TIP - You can of course get creative and shoot with anamorphic lenses using various other formats to get some extremely widescreen aspect ratios. While not practical for typical production use it might be nice to have a bit more image area if you intend on cropping into the image later in post. Also useful if you are doing any sort of widescreen shoting that could potentially span several screen for installations or special projections.

RED DRAGON - ISO / FLUT BREAKDOWN

Red Dragon at any given point in time is capturing it's total accesable Dynamic Range, measured at 16+ stops. When selecting (also called rating) your ISO you are essentially utlizing a Look Up Table to remap the tonal curve and moving Middle Gray. An easy way to think about this is to imagine an oversized rug in room with a loud Stereo on one side and a bright Light on the other. The rug will have a lump that you can move around the room. This lump can be considered your Middle Gray. The closer to the Stereo you push your lump the more noise you will experience, the further away the more quiet it gets. Thus at lower ISO ratings you have a cleaner image, higher ratings will have more noise and texture. This function is rather similar to selecting a specific film speed, ASA and the characteristics that come with more sensitive film stocks.

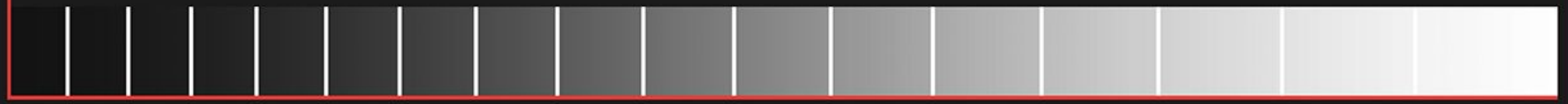
An important note. Dragon doesn't utilize any in camera noise reduction. You are capturing the maximum amount of detail at any ISO value. In camera noise reduction techniques often eliminate subtle detail and image texture which you can't get back once it's "gone".

Exposure = ISO 800, "The Sweet Spot"

* Note even "volumes" of tones distribution, this is where there are equal tones above and below middle gray

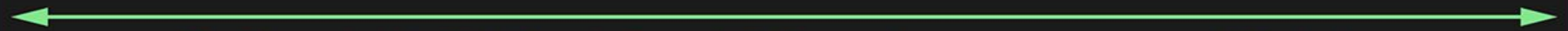
Exposure = - 1 Stop, ISO 400, or - 1 FLUT

* Note compressed shadow tones and expanded highlight tones



Exposure = + 1 Stop, ISO 1600, or + 1 FLUT

* Note expanded shadow tones and compressed highlight tones



Total Captured and Available Dynamic Range of 16+ Stops and gets mapped to your current ISO selection.
The Color Science is tuned to provide accurate tones and color response across the recommended ISO Range of ISO 250-2000.

RED DRAGON - ISO EXAMPLES

To further visualize how ISO works and looks on the Red Dragon sensor here are a few captured patches showing the flatter REDlogFilm image with and without a standard S-Curve applied. Also, I have provided samples from the Recommended ISO Range using the gamma space of REDgamma4 that shows how the Rated Middle Gray and Captured Dynamic Range gets moved around at each ISO Value.

Each Patch is One Full Stop

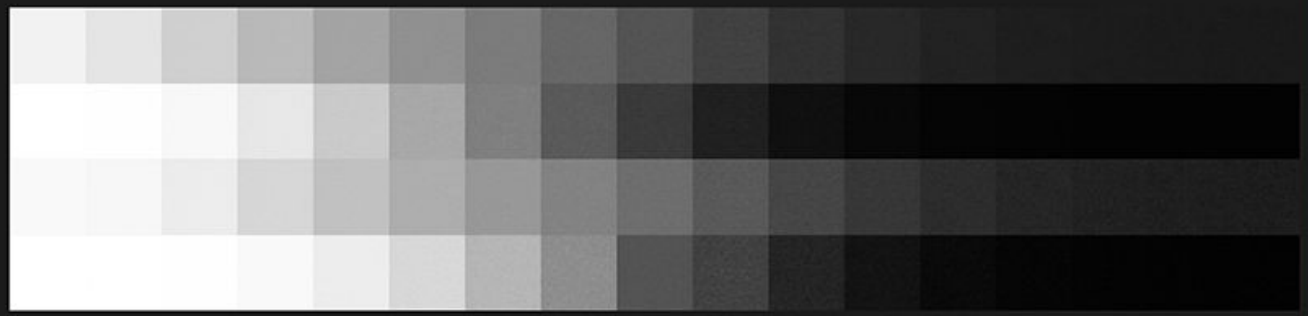
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

DRAGONcolor/REDlogFilm ISO 800 - No Curve

DRAGONcolor/REDlogFilm ISO 800 - With Curve

DRAGONcolor/REDlogFilm ISO 2000 - No Curve

DRAGONcolor/REDlogFilm ISO 2000 - With Curve



Recommended ISO Samples

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

DRAGONcolor/REDgamma4 ISO 250

DRAGONcolor/REDgamma4 ISO 320

DRAGONcolor/REDgamma4 ISO 400

DRAGONcolor/REDgamma4 ISO 500

DRAGONcolor/REDgamma4 ISO 640

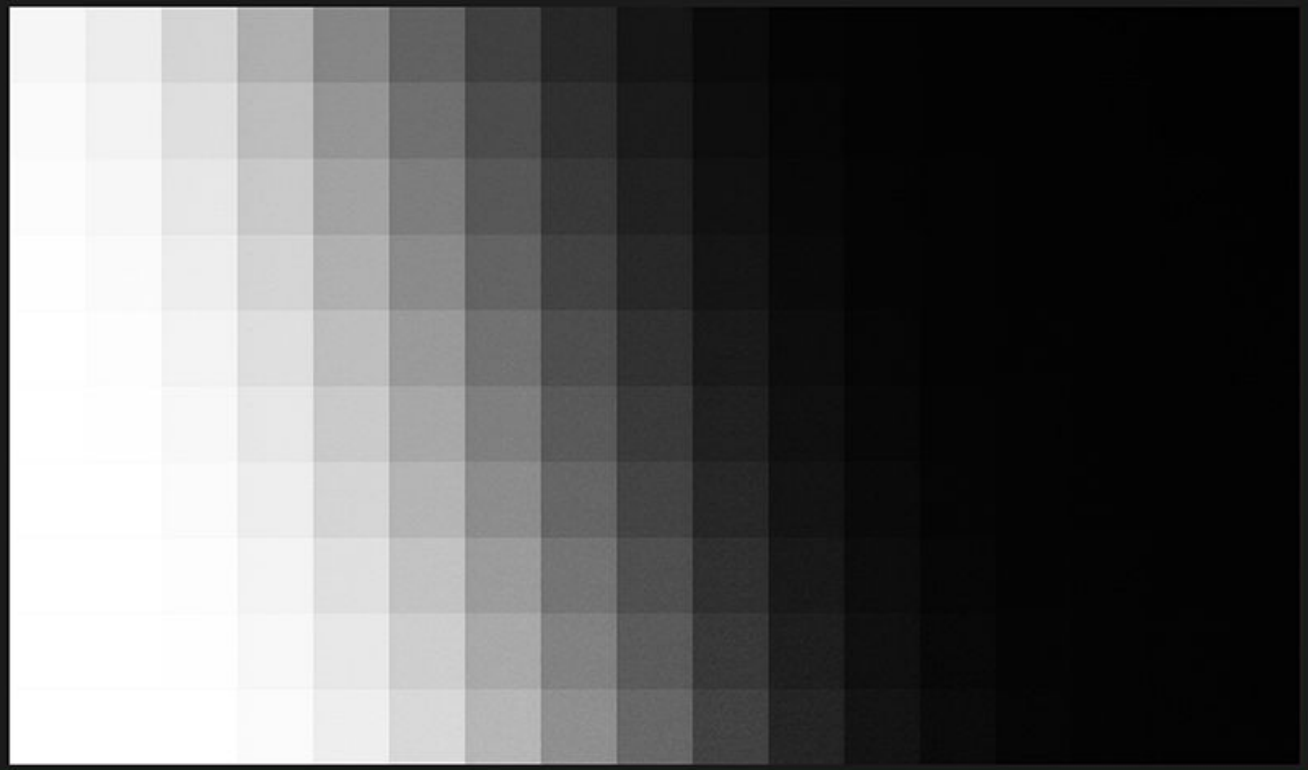
DRAGONcolor/REDgamma4 ISO 800

DRAGONcolor/REDgamma4 ISO 1000

DRAGONcolor/REDgamma4 ISO 1280

DRAGONcolor/REDgamma4 ISO 1600

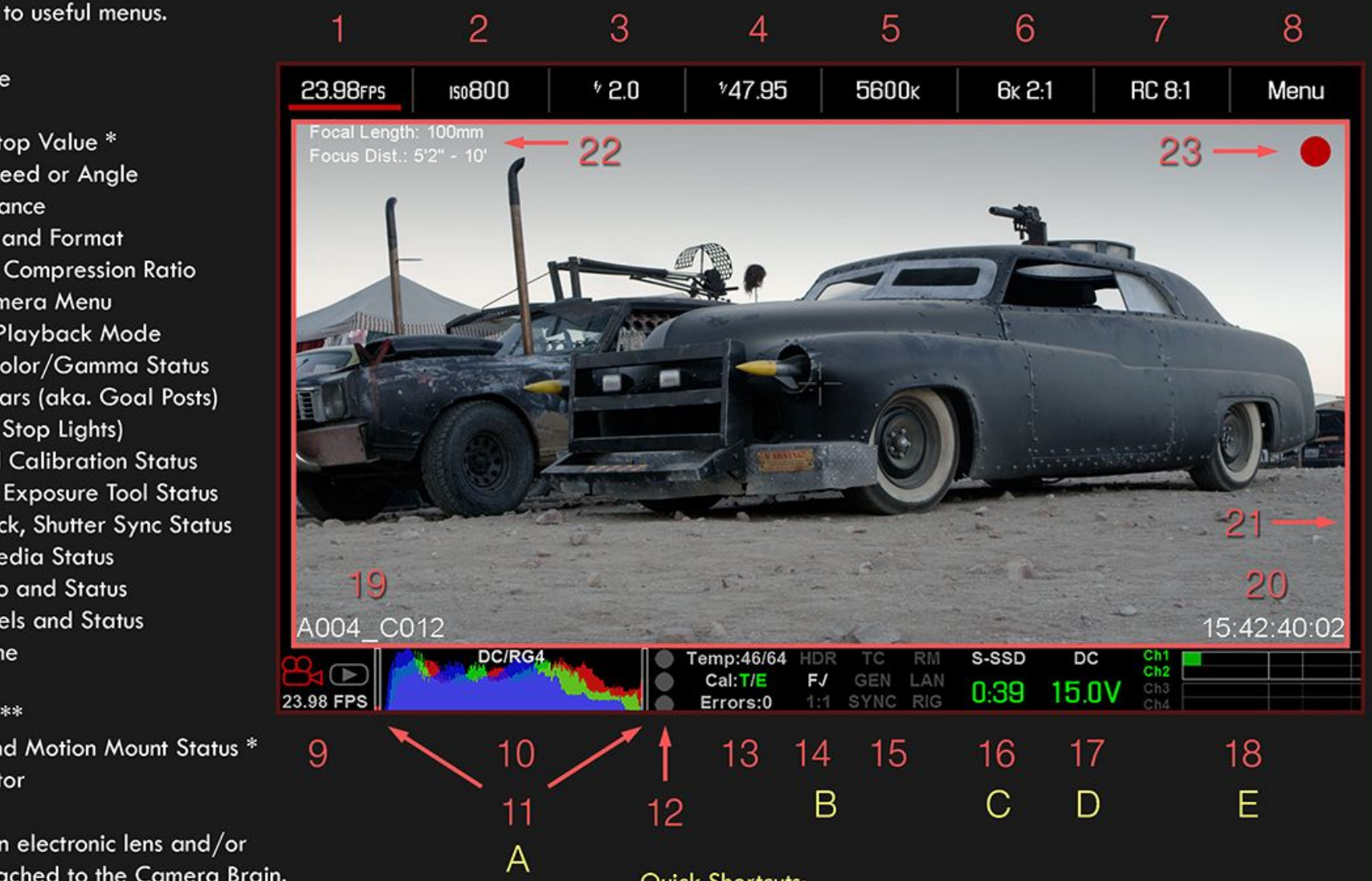
DRAGONcolor/REDgamma4 ISO 2000



RED DRAGON - GUI OVERVIEW

The Red Dragon Graphic User Interface is pretty straight forward and easy to navigate. This page quickly tells you exactly what you are looking at. If using one of the LCD Touch Displays touching one of these areas quickly accesses it's appriate sub menu. Additionally, on the bottom row their are a few Quick Shortcuts to useful menus.

1. Current Frame Rate
2. Current ISO Value
3. Electronic Lens F-Stop Value *
4. Current Shutter Speed or Angle
5. Current White Balance
6. Current Resolution and Format
7. Current REDCODE Compression Ratio
8. Access the Full Camera Menu
9. Toggle Record or Playback Mode
10. Histogram and Color/Gamma Status
11. Noise and Clip Bars (aka. Goal Posts)
12. Clip Meter (aka. Stop Lights)
13. Temperature and Calibration Status
14. HDRx, Focus and Exposure Tool Status
15. Timecode, Genlock, Shutter Sync Status
16. REDMAG SSD Media Status
17. Power Source Info and Status
18. Audio Signal Levels and Status
19. Current Clip Name
20. Timecode Status
21. Live Action Area **
22. Electronic Lens and Motion Mount Status *
23. Recording Indicator



* Only visible when an electronic lens and/or a Motion Mount is attached to the Camera Brain.

** Within the Live Action area on the left and right side you can setup and configure up to 8 "Soft Keys" for further customization. These can be accessed via one of the LCD Touch Displays by simply touching that area.

Quick Shortcuts:

A. Press Histogram for Focus and Exposure Check Tools
B. Press the area for System Status
C. Press SSD Status for Media Formating Options
D. Press Power Source Status for Power Save and Camera Shutdown
E. Press Audio Signal Levels for Full Audio Menu

RED DRAGON - BLACK SHADE, TEMP, & FANS

BLACK SHADING CALIBRATION - INFORMATION

Black Shading Calibration is applied on camera boot or can be set in camera and removes the fixed noise pattern of the Dragon Sensor and applies random noise pattern as well as performing a couple other pixel and sensor checks.

The important thing to remember that Black Shading is tied to both the Sensor Temperature and Exposure Time. You can check your calibration status via the On Screen GUI via the "Temp" and "Cal" indicators. "Temp" displays both the Camera Sensor and Core Temperature in Celsius. The "Cal" indicator delivers color based Black Shade Status for the Sensor and Core with the "T" and the Exposure Time with the "E". The CAL: T/E Color Key is:

GREEN - Good Calibration Temperature and Exposure Time
YELLOW - Slightly out of Calibration Range.
RED - Significantly out of Calibration Range.
* You will also see a "-" or "+" to show which way the Sensor Temperature or Exposure Time has Decreased or Increased.

When you first power up the camera you will want to wait until you see GREEN on your CAL: T/E. If changing the Exposure Time and you find yourself outside of Calibration Range it's best to select a Black Shading Preset or apply a new Black Shade for that new Exposure Time.

BLACK SHADING CALIBRATION - PROPER CALIBRATION

- Securely attach the Red Lens Mount Body Cap
- Turn the camera on
- Set the desired Exposure Time (this also can be set in the Calibration Page).
- Wait for the temp to hit the Operating Temperature for the given Fan Mode
- Go to MENU>SETTINGS>MAINTENANCE>CALIBRATE>SENSOR
- Run the Black Shading Calibration Pass (or Passes *)

* Red Dragon can hold 4 custom user Black Shading Presets and it's possible to calibrate all 4 at once and also choose which to use through Calibration Management.

FAN MODES

MENU>SETTINGS>SETUP>FAN CONTROL

In combination with the original fan or the newer dual DSMC Fan 2.0 setup there are various Fan Modes that can control the temperature of your camera and sensor. Rather than go into specifics on how each mode operates I will focus on the two newest Fan Algorithms as they are the most important and useful for 99.5% of shooting situations.

ADAPTIVE

This is the defaul fan configuration and runs the camera at 65°C. It is a nice balance between quiet fan performance and optimal operating temperature. The camera regulates it's own temperature and adjusts the fans as needed to hit the target temperature.
I highly recommend using this the ADAPTIVE Fan Mode.

ADAPTIVE PREVIEW QUIET RECORD

This particular mode is useful if you are wishing to record in shorter takes with quiet bursts. It will attempt to run the Bottom Fan at a selected percentage and then will adapt it's way towards the target temperature. Useful if recording audio with a subject very close to the lens.

** The other three Fan Modes (AUTO, QUIET, and MANUAL) I recommend avoiding unless you are a very experienced shooter.

GENERAL ADVICE

The Black Shade Calibration provides a GREEN Exposure Time Operating Range. When changing your Shutter Speed/Angle pay special attention to the Cal Indicator. You should Black Shade after every Firmware Update. Also, if you find yourself in a major climate change from where you Black Shaded it's a good idea to fire off a fresh calibration pass. For Assistant Camera it is common to Black Shade at the begining of a project during camera prep. Since Dragon can hold several Black Shade Presets I personally calibrate to common shutters speeds I use at various frame rates.

RED DRAGON - ON SCREEN EXPOSURE TOOLS

ON SCREEN EXPOSURE TOOLS

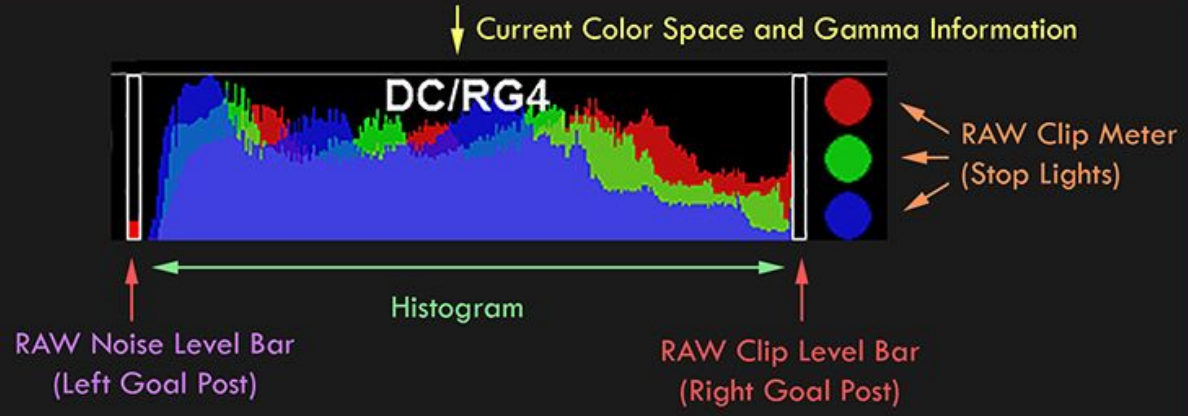
Histogram - The Histogram is a graphic representation of the tonal and chromatic distribution for your given ISO, Color Space, Gamma, and in camera Look.

Color Space and Gamma Information - Displays the current Color Space and Gamma information. In the example to the right that is DRAGONcolor and REDgamma4. You can change the Color Space and Gamma in MENU>Settings>Look>Color/Gamma. Additionally, this indicator's status will change when in "RAW View".

RAW Noise Level Bar - The "Left Goal Post" indicates the relative amount of RAW pixels that are noise in frame. If you see the bar fill with red about 1/4 of the way that means about 1/4 of your frame is noise. Anything that lands here is underexposed and will be nothing but noise with no detail information and if lifted up in post. However, this is fine if you desire have "pure crushed black" in frame.

RAW Clip Level Bar - The "Right Goal Post" indicates the relative amount of pixels that are potentially clipping outside of the RAW capture in frame. Meaning there will be no detail found in the over exposed highlights as the are outside of the capturable dynamic range of the sensor. If you're going for a "blown out" over exposed highlight this is fine. If you are seeing about 1/4 of the bar filled with red you have approximately 1/8 of your frame potentially clipping.

RAW Clip Meter - The "Stop Lights" inform you if any of the Red, Green, or Blue channels are clipping in RAW. Once clipping occurs there's no way to get the over exposured information back as it's outside of what the sensor can see.



GENERAL ADVICE

The On Screen Exposure Tools serve as quick and useful potential warnings. The most important things to look for happen in the RAW Noise Level Bar, RAW Clip Level Bar, and RAW Clip Meters as what "fills up" in these indicators are generally outside of what the camera and the recorded REDCODE RAW image can see for your given exposure and lighting conditions.

If you find you are getting a little red filled up in your Noise or Clip Bars you are likely shooting into a pocket of shadow not hit by light and in the clip you might be hitting a specular highlight on a shiny object that is clipping that area. This would be the sort of thing that you'd like to be aware of, but isn't going to negatively effect your image as that's what is to be expected. If you see a bar fill up 1/4 or more of the way that indicates you have a fair amount of your frame might be noise that crushes to pure black or pure white to clip.

Again, to stress this point, if you are looking for a pure crushed black or an over exposed highlight for a particular aesthetic there may be reasons to have a RAW Noise Level Bar that's filled up. For instance, when shooting a Low Key image that is mostly shadow through midtone. Conversely, if shooting a higher key situation where most of your information lands in midtone through highlight and you have maybe an over exposed sky behind a back lit subject your RAW Clip Level Bar might "blow out" for that effect.

RED DRAGON - IN CAMERA EXPOSURE TOOLS

IN CAMERA EXPOSURE TOOLS

Red Dragon has several In Camera Exposure tools. Getting familiar with these tools can lead to precise, predicatable, and accurate exposure. Exposure for motion picture and stills have both technical and subjective methods. In addition to the GUI Exposure Tools the In Camera Exposure Tools can be used effectively for both exposure methods.

FALSE COLOR VIEW MODES

False Color View Modes provide visual assistance to help you determine that the images you are recording are what is desired. There are three False Color View Modes available and they can be accesed here:
MENU>SETTINGS>DISPLAY>TOOLS
Also, the quick shortcut on the GUI is to simply tap the Histogram on the LCD Touch Screen and you will load up the Tools Menu.

EXPOSURE CHECK

Exposure Check creates a monochramatic image on screen and presents the RAW image with color overlays to assist with exposure and is not effected by the current Color Space and Gamma information.

PURPLE - Purple represents under exposure and is showing the pixels that are in the noise floor where no detail can be seen by the camera.
RED - Red represents pixels that are close to or are clipping.

This tool is particularly useful when noticing that the RAW Noise Level Bar or the RAW Clip Level Bar have filled up to any degree so you can inspect what is under and over exposing.

Additionally there is another color displayed when in Exposure Check. That is GREEN. Green takes into account the current ISO, Color Space, and Gamma information and represents IRE 41-48. This GREEN value is traditionally where Middle Gray or 18% would land and is also what all standard Light Meters are commonly calibrated to. If checking exposure to a color chart or gray chart with an 18% patch confirm that the patch is filled with Green to "know" you've nailed that exposure.

VIDEO CHECK

Video Check provides multiple color overlays that do take into account the current Color Space and Gamma Information.

- PURPLE - IRE 0-4 (Under Exposed, Pure Noise, Crushed Black)
- BLUE - IRE 5 (Ideal Pure Black)
- TEAL - IRE 10-12 (A Common Place for Detailed Shadows)
- GREEN - IRE 41-48 (MIDDLE GRAY and 18% GRAY)
- PINK - IRE 61-70 (Commonly where Caucasions Skin Tones Land)
- STRAW - IRE 92-93 (Common Place to Expose for "White")
- YELLOW - IRE 94-95 (Common Place to Expose for "Hot White")
- ORANGE - IRE 96-98 ("Super White")
- RED - IRE 99-100 (Near or Over Exposed Clipping Highlights)

RAW VIEW

RAW View provides a look at the Dragon sensor's "sweet spot". It provides a "fixed" ISO 800, REDcolor2, REDlogFilm (no curve/flat), with a White Balance of 5600 Kelvin. This is useful as you can see a good deal of what the sensor can see. It is possible to have RAW View and Exposure Check enabled which provides a good visual on what's under and what's potentailly over exposed. I do not recommend utilizing Video Check in combination with RAW View however as it's designed to be used with a Color Space and Gamma Curve.

ZEBRA STRIPES

In camera there are two available Zebra Stripe Overlays that can be toggled on and off in combination with each other or individually. They are found in this menu:
MENU>SETTINGS>DISPLAY>ZEBRA
By default Zebra 1 is set to IRE 98-100 to alert you for potential clipping highlights. Zebra 2 is set to IRE 41-48 to assist in exposing for Midtones, 18%, and Middle Gray. You can also customize both Zebra Stripes to a preferred IRE value. I recommend leaving them at default as they are bloody well useful right where they are.

RED DRAGON - FOCUS AND WHITE BALANCE

LOCKING CRITICAL FOCUS

Red Dragon has a few powerful In Camera Focus Tools that can assist you with locking precise critical focus. Like the In Camera Exposure Tools, the In Camera Focus Tools are found in:
MENU>SETTINGS>DISPLAY>TOOLS
Or using the quick shortcut on the GUI via the LCD Touch Screen by tapping the Histogram.

FOCUS

The Focus Mode creates a silver outline to any edge or texture that has contrast while showing through a normal iamge.
This is generally the most useful tool when pulling focus and focusing on in frame content.

EDGE

Edge Focus Mode only displays an outline of any edge or textured surface that has visible contrast. The rest of the image is very dark. This mode is useful when pulling focus with tricky subject matter under difficult situations.

MAGNIFY

Magnify zooms in on a 1:1 area of the screen. By default this is the center of the frame. However, by Cycling the AF Mode you can draw a Red Rectangle on screen that you can place with the directional keys or by simply tapping and dragging on the LCD Touch to where you would like to
combination of magnify

PERSONAL TIP - I like to create a shortcut on my DSMC SIDE HANDLE to toggle AF Mode Cycle and Magnify so I can quickly punch in and verify focus on locked off shots. By Default the 1 Key on the LCD Touch Screens is the shortcut for Magnify. You can customize any Key or Soft Key via the menu:
MENU>SETTINGS>SETUP>KEYS

ENHANCED AF

Enhanced AF is a special feature that creates an indicator near the AF Confirm Box when you use AF Mode Cycle. This manifests as a circle, pie, or bar. As the sensor detects contrast the graphic indicator will fill up or grow/shrink as the object under the AF Confirm Box gets closer to being in focus. Useful for most situations, this mode can be tricked if the subject in your frame lacks surface or edge contrast. So it's still best to use the Focus, Edge, or Magnify to confirm you have your critical focus locked.
To configure and use Enhanced AF it can be found here:
MENU>FOCUS

WHITE BALANCE and COLOR TEMPERATURE

White Balance information is merely metadata contained in the REDCODE RAW file. However, it is often more practical to dial in the general Kelvin and Tint or read the White Balance information in a frame based off a white or gray target to create the most accurate in camera image.

To access the Color Temp Menu:
MENU>SETTINGS>LOOK>COLOR TEMP - ADVANCED
Or simply press on the LCD TOUCH the Current White Balance Temperature to load the Basic and/or Advanced Menu.

In the Advanced Menu there are common presets which are useful if you know you are shooting under one of those particular conditions.

PERSONAL TIP - If using Auto White Balance take note that it is looking at the entire frame to calculate and average the best possible White Balance. Frame your white or gray target appropriately. However, a useful tip is combining the Magnify Focus Tool and punching in on your white or gray target and Auto White Balance while at the 1:1 Magnification. It will use what's in that frame to calculate.

RED DRAGON - INTERCHANGEABLE OLPF

OLPF PRIMER

An OLPF (Optical Low Pass Filter) is an Anti-Aliasing filter that is positioned between the lens and sensor. Dragon is a very light sensitive, high resolution, and small pixel pitch CMOS Bayer Pattern Sensor. The inclusion of the OLPF is there to minimize or eliminate Aliasing, Color Moire, and False Color by removing the highest frequency detail and ever so slightly "soften" the image. OLPF design typically includes several other layers that provide an Anti-Reflective Coating, an Infrared Coating, and Infrared Absorbtion Glass. These additional coatings and layers on the OLPF itself block light hitting the sensor to a degree.

With Dragon the Interchangeable OLPF system provides a flexible solution for users who desire certain things like cleaner low light performance or a focus the best possible color. There are also speciality OLPFs in development for IR Color, IR Black and White, and Underwater Shooting as well as the upcoming "Dragon Standard".

CURRENTLY AVAILABLE OLPFs

SKIN TONE - HIGHLIGHT - This OLPF is designed to produced the highest quality image overall out of Dragon. It allows Dragon to reproduce colors naturally and accurately. With the "STH" OLPF you do not need additional IR Cutting when using ND Filters.

LOW LIGHT OPTIMIZED - This OLPF is designed for optimimal low light performance. The "LLO" OLPF produces an image that is approximately 1 to 1.3 stops "cleaner" than the SKIN TONE - HIGHLIGHT OLPF. Meaning that ISO 800 on the STH OLPF looks a bit like ISO 1600-2000 with the LLO OLPF. This "less aggressive" OLPF produces very good color, but comes with a couple of notes. When shooting with lenses at smaller apertures (like at T16) and having a light source pointing into the lens you can sometimes generate a Red Dot Grid Pattern. Also, similarly on point sources you may occasionally produce an Orb that surrounds the highlights. These are things to be aware of when shooting, but also can be used for aesthetic reasons. IR Cut ND Filtration is also not necessary.

SWAPPING OUT THE OLPF

Changing the OLPF in Dragon is similar to swapping out the DSMC LENS MOUNT. Certain precautions should be made as you are removing optical elements and revealing the Sensor Box to the environment.

TOOLS NEEDED AND RECOMMENDED

- A generally clean working area
- T-20 Torx Driver (for the DSMC Lens Mount)
- T-6 Torx Driver (for the OLPF)
- Your desired OLPF
- A flashlight
- A hand blower

* Both Torx Drivers can be found on the RED SIDEWINDER

OLPF SWAP PROCEDURE

1. SHUTDOWN the Dragon Camera.
2. Using the T-20 Torx unistall the DSMC Lens Mount
3. Using the T-6 Torx Driver remove the currently installed OLPF
4. While the OLPF is removed inspect the Sensor Box for any particles
5. If there are particles found use the hand blower to blow them out
6. Find the OLPF you want to install and inspect it as well
7. Insert the OLPF with the OLPF Name Text facing right side up
8. Clockwise from the upper-left gently bolt on the OLPF.
9. Reattach the DSMC Lens Mount
10. POWER UP the Dragon Camera
11. In Menu>Settings>Maintenance>OLPF select the installed OLPF
    * You do not need to Black Shade after swapping OLPFs
    * Each OLPF has it's name on the front face

RED DRAGON - REDCODE AND REDMAG INFO

UNDERSTANDING REDCODE RAW

Red Cameras record RAW sensor data using the proprietary wavelet based compression codec called REDCODE RAW. REDCODE is a powerful, efficient, and flexible recording format. It allows shooters to control the visual quality versus the data rate by adjusting the REDCODE compression ratio. REDCODE always records the full resolultion of the given format and does not scale down to a specific output resolution.

The general concept behind REDCODE RAW is the lower the compression ratio the higher the visual quality of the footage is. However, using higher compression ratios allows for Red cameras to shoot at higher frame rates.

To note, REDCODE has been uniquely optimized for Dragon and allows for much better overall performance and quality across the Compression Ratio Range.

REDMAG MEDIA and MEDIA TYPES

REDCODE RAW records directly on camera to REDMAG SSD (Solid State) Media. The metal housed REDMAGs are compact, rugged, and designed to handle rigourous regular use on location.

Currently there are two ways to record REDCODE RAW to REDMAG SSD Media. The most common is utlizing the DSMC SIDE MODULE which mounts on the left side of the camera brain. This Module also has a large red record button, two user defined customizable keys, and an LCD/EVF port.

Additionally there is a REAR SSD MODULE. This Module mounts to the rear of the camera brain via the MODULE ADAPTER.

There are currently two different form factors for REDMAG Media. The REDMAG 1.8" and the new compact and high speed MINI-MAG REDMAG MEDIA.

REDMAG media is available in the following capacities:

REDMAG 1.8" - 48, 64, 128, 240, 256, 512GB
MINI-MAG - 512GB

The REDMAGs labelled RED are known as "high speed" which allows for even lower REDCODE Compression Ratious. With the MINI-MAGs you can also benefit from faster offload/down.oad speeds via the MINI-MAG READER.

REDCODE ADVANTAGES

Shooting with REDCODE provides several advantages when compared to other lossy codecs. With it's high bit depth and wavelet based compression scheme REDCODE RAW material holds up very well to up-scaling, sharpening, and aggressive color processing without the typical "blocky" artifacts seen in other lower bit depth codecs. This is useful when mixing and matching REDCODE material captured at different resolutions. REDCODE also lends a hand into providing a more organic look to the recorded pixels in the sense that the wavelets themselve are more "globular" in nature and aren't recorded in blocks.

FILE STRUCTURE

On the REDMAG SSD Media you will see a Mag Folder (.RDM) that contains Clip Folders (.RDC) which contain individual .R3D Clips and the .RMD Metadata File. The Mag Folder is labeled when formatting the REDMAG in camera and it can have as many Clip Folders for each take you shoot until the REDMAG is full. The .R3D Clips will then get split up in 4GB sizes and create new .R3Ds within the Clip Folder if rolling longer takes.

When ingesting and working with REDCODE it's highly recommended not to rename or change the data structure. Copy entire Mag Folders and/or Clip Folders when downloading a REDMAG.

GENERAL SHOOTING ADVICE

With 4K or Theatrical Delivery in mind: It's common for most productions to shoot with a REDCODE Compression Ratio between 5:1 and 8:1 when shooting at 4K+ resolutions. Lower compression ratios work well for scenes with high frequency detail, fine shadow detail, or simply if you are intending primarily to pull stills from your motion material.

When shooting at formats/resolutions below 4K it's advised to shoot at the lowest possible REDCODE Compression Ratio for the given frame rate and resolution to yield the highest quality image for potential image upscaling.

With 2K/1080p in mind: If shooting at 4K+ for a 2K/1080p finish it's common for shooters to use REDCODE Compression Ratios between 5:1 and 12:1. Since this material is scaled down to the delivery format you can maintain a good balance between visual quality and having the added benefits of being able to role longer takes or extending the recorde time on REDMAG Media due to the lower data rates.

RED DRAGON - FORMAT KEY 2014 - 4K-6K

FORMAT	EPIC MAX FPS	SCARLET MAX FPS	RESOLUTION	ASPECT RATIO	DIMENSIONS	DIAGONAL	FF35CF	S35CF
6K FF	82.81	12.08	6144x3160	1.94:1	30.7x15.8	34.53	1.17x	0.81x
6K 2:1	84.51	N/A	6144x3072	2:1	30.7x15.35	34.32		
6k WS	100.21	N/A	6144x2592	2.37:1	30.7x12.95	33.32		
6K HD	83.12	N/A	5568x3132	1.78:1/16x9	27.82x15.65	31.92		
6K 6:5	82.81	N/A	3792x3160	6:5	18.95x15.79	24.7		
6K 4:1	166.77	N/A	6144x1536	4:1	30.7x7.68	31.6		
6K 8:1	324.89	N/A	6144x768	8:1	30.7x3.84	30.9		
5.5K FF	87.66	N/A	5632x2948	1.89:1	28.14x14.73	31.65	1.28x	0.88x
5.5K 2:1	91.69	N/A	5632x2816	2:1	28.14x14.07	31.28		
5.5K WS	108.29	N/A	5632x2376	2.37:1	28.14x11.87	30.36		
5.5K HD	85.16	N/A	5376x3072	1.78:1/16x9	26.86x15.11	30.24		
5.5K 4:1	180	N/A	5632x1408	4:1	28.14x7.04	29		
5.5K 8:1	347.17	N/A	5632x704	8:1	28.14x3.52	28.4		
5K FF	95.69	48	5120x2700	1.90:1	25.58x13.49	28.92	1.4x	0.97x
5K 2:1	100.83	50	5120x2560	2:1	25.58x12.79	28.6		
5K WS	119.08	60	5120x2160	2.37:1	25.58x10.79	27.76		
5K HD	95.69	48	4800x2700	1.78:1/16x9	23.98x13.49	27.51		
5K 6:5	95.69	48	3240x2700	6:5	16.19x13.49	21.1		
5K 4:1	197.86	N/A	5120x1280	4:1	25.58x6.4	26.4		
5K 8:1	381.39	N/A	5120x640	8:1	25.58x3.2	25.8		
4.5K FF	107.06	N/A	4608x2432	1.89:1	23.03x12.15	26.04	1.56x	1.08x
4.5K 2:1	111.98	N/A	4608x2304	2:1	23.03x11.51	25.75		
4.5K WS	132.24	N/A	4608x1944	2.37:1	23.03x9.71	24.99		
4.5K HD	108.29	N/A	4320x2432	1.78:1/16x9	21.59x12.15	24.77		
4.5K 3:2	89.94	N/A	4320x2880	3:2	21.59x14.39	25.9		
4.5K 4:1	219.66	N/A	4608x1152	4:1	23.03x5.76	23.7		
4.5K 8:1	399.6	N/A	4608x576	8:1	23.04x2.88	23.2		
4K FF	119.51	60	4096x2160	1.90:1	20.47x10.79	23.14	1.75x	1.21x
4K 2:1	124.01	60	4096x2048	2:1	20.47x10.23	22.88		
4K WS	148.68	75	4096x1728	2.37:1	20.47x8.63	22.21		
4K HD	119.51	60	3840x2160	1.78:1/16x9	19.19x10.79	22.02		
4K 6:5	119.51	60	2592x2160	6:5	12.95x10.79	16.9		
4K 3:2	101.14	N/A	3840x2560	3:2	19.19x12.79	23.1		
4K 4:3	90.06	N/A	3840x2880	4:3	19.19x14.39	24		
4K 5:4	84.51	N/A	3840x3072	5:4	19.19x15.35	24.6		
4K 4:1	239.67	N/A	4096x1024	4:1	20.47x5.12	21.1		
4K 8:1	399.6	N/A	4096x512	8:1	20.47x2.56	20.6		

RED DRAGON - FORMAT KEY 2014 - 2K-3.5K

FORMAT	EPIC MAX FPS	SCARLET MAX FPS	RESOLUTION	ASPECT RATIO	DIMENSIONS	DIAGONAL	FF35CF	S35CF
3.5K FF	135.51	N/A	3584x1876	1.91:1	17.91x9.37	20.21	2x	1.39x
3.5K 2:1	141.63	N/A	3584x1792	2:1	17.91x8.95	20.02		
3.5K WS	166.77	N/A	3584x1512	2.37:1	17.91x7.56	19.44		
3.5K HD	130.92	N/A	3360x1876	1.78:1/16x9	16.79x9.37	19.23		
3.5K 3:2	114.12	N/A	3360x2240	3:2	16.79x11.19	20.2		
3.5K 4:3	101.76	N/A	3360x2520	4:3	16.79x12.59	21		
3.5K 5:4	95.55	N/A	3360x2680	5:4	16.79x13.39	21.5		
3.5K 4:1	273.55	N/A	3584x896	4:1	17.91x4.48	18.5		
3.5K 8:1	399.6	N/A	3584x448	8:1	17.91x2.24	18		
3K FF	159.1	75	3072x1620	1.90:1	15.35x8.09	17.35	2.33x	1.61x
3K 2:1	167.62	75	3072x1536	2:1	15.35x7.68	17.16		
3K WS	197.86	100	3072x1296	2.37:1	15.35x6.48	16.66		
3K HD	159.1	75	2880x1620	1.78:1/16x9	14.39x8.09	16.51		
3K 6:5	159.1	75	1944x1620	6:5	9.71x8.09	12.6		
3K 3:2	134.68	N/A	2880x1920	3:2	14.39x9.59	17.3		
3K 4:3	117.94	N/A	2880x2160	4:3	14.39x10.79	18		
3K 5:4	112.56	N/A	2880x2304	5:4	14.39x11.51	18.4		
3K 4:1	328.13	N/A	3072x768	4:1	15.35x3.84	38.4		
3K 8:1	399.6	N/A	3072x384	8:1	15.35x1.92	15.5		
2.5K FF	192.09	N/A	2560x1340	1.91:1	12.79x6.7	14.44	2.8x	1.94x
2.5K 2:1	200.88	N/A	2560x1280	2:1	12.79x6.4	14.3		
2.5K WS	237.08	N/A	2560x1080	2.37:1	12.79x5.4	13.88		
2.5K HD	194.36	N/A	2400x1340	1.78:1/16x9	11.99x6.7	13.73		
2.5K 3:2	161.45	N/A	2400x1600	3:2	11.99x7.99	14.4		
2.5K 4:3	143.8	N/A	2400x1800	4:3	11.99x8.99	15		
2.5K 5:4	134.95	N/A	2400x1920	5:4	11.99x9.59	15.4		
2.5K 4:1	392.77	N/A	2560x640	4:1	12.79x3.2	13.2		
2.5K 8:1	399.6	N/A	2560x320	8:1	12.79x1.6	12.9		
2K FF	237.94	120	2048x1080	1.90:1	10.23x5.4	11.57	3.5x	2.42x
2K 2:1	239.67	120	2048x1024	2:1	10.23x5.12	11.44		
2K WS	295.68	150	2048x864	2.37:1	10.23x4.32	11.1		
2K HD	237.94	120	1920x1080	1.78:1/16x9	9.59x5.4	11.01		
2K 6:5	237.94	120	1296x1080	6:5	6.48x5.4	8.44		
2K 3:2	201.5	N/A	1920x1280	3:2	9.59x6.4	11.5		
2K 4:3	179.51	N/A	1920x1440	4:3	9.59x7.2	12		
2K 5:4	168.47	N/A	1920x1536	5:4	9.59x7.68	12.3		
2K 4:1	399.6	N/A	2048x512	4:1	10.23x2.56	10.5		
2K 8:1	399.6	N/A	2048x256	8:1	10.23x1.28	10.3		

RED DRAGON - RECORD TIMES 24FPS 256GB REDMAG

	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1	12:1	13:1	14:1	15:1	16:1	17:1	18:1
6K FF			25	29	34	39	44	49	54	59	64	69	74	79	84	88
6K 2:1			25	30	35	40	46	51	56	61	66	71	76	81	86	91
6k WS		24	30	36	42	48	54	60	66	72	78	84	90	96	102	108
6K HD			27	33	38	44	49	55	60	66	71	77	82	88	93	99
5.5K FF			29	35	40	46	52	58	63	69	75	81	86	92	98	104
5.5K 2:1		24	30	37	43	49	55	61	67	73	79	85	91	97	103	110
5.5K WS		29	36	43	51	58	65	72	79	87	94	101	108	116	123	130
5.5K HD		24	31	37	43	49	55	61	67	73	79	85	92	98	104	110
5K FF		28	35	41	48	55	62	69	76	83	90	97	104	110	117	124
5K 2:1		29	36	44	51	58	66	73	80	87	95	102	109	117	124	131
5K WS	26	35	43	52	60	69	78	86	95	104	112	121	129	138	147	155
5K HD		29	37	44	52	59	66	74	81	88	96	103	110	118	125	133
4.5K FF	26	34	43	51	60	68	77	85	94	102	111	119	128	136	145	153
4.5K 2:1	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162
4.5K WS	32	43	53	64	75	85	96	107	117	128	139	149	160	170	181	192
4.5K HD	27	36	45	55	64	73	82	91	100	109	118	127	136	145	154	164
4K FF	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194
4K 2:1	34	46	57	68	80	91	102	114	125	137	148	159	171	182	193	205
4K WS	40	54	67	81	94	108	121	135	148	162	175	189	202	216	229	243
4K HD	35	46	58	69	81	92	104	115	127	138	150	161	173	184	196	207
3.5K FF	43	57	71	85	99	114	128	142	156	170	185	199	213	227	241	256
3.5K 2:1	45	59	74	89	104	119	134	149	163	178	193	208	223	238	253	267
3.5K WS	53	70	88	106	123	141	159	176	194	211	229	247	264	282	299	317
3.5K HD	45	61	76	91	106	121	136	151	167	182	197	212	227	242	257	273
3K FF	58	77	96	115	134	153	173	192	211	230	249	268	288	307	326	345
3K 2:1	61	81	101	121	142	162	182	202	222	243	263	283	303	324	344	364
3K WS	72	96	120	144	168	192	216	240	264	288	312	336	360	384	408	432
3K HD	61	82	102	123	143	164	184	205	225	245	266	286	307	327	348	368
2.5K FF	83	111	139	167	195	223	250	278	306	334	362	390	417	445	473	501
2.5K 2:1	87	117	146	175	204	233	262	291	320	350	379	408	437	466	495	524
2.5K WS	104	138	173	207	242	276	311	345	380	414	449	483	518	552	587	621
2.5K HD	89	119	148	178	208	237	267	297	326	356	386	415	445	475	505	534
2K FF	129	173	216	259	302	345	388	432	475	518	561	604	647	690	734	777
2K 2:1	137	182	228	273	319	364	410	455	501	546	592	637	683	728	774	819
2K WS	162	216	270	324	378	432	485	539	593	647	701	755	809	863	917	971
2K HD	138	184	230	276	322	368	414	460	506	552	598	644	690	736	782	829