ARRI CMS PREVIEW LUTS
Matching Digital to Film

To grade a film project in a digital grading suite, a lot of people prefer working on logarithmic files (cineon or dpx – format), as those files give the best representation of the densities on film. To display logarithmic files on a linear output device like a monitor or a digital projector a powerful Lookup Table is necessary. This Lookup Table has to perform the log to lin conversion as well as the compensation for additive color mixing on the video display and multiplicative color mixing in the film projection. To meet these requirements, ARRI provides a new set of 3D Lookup Tables as part of the ARRI Color Management System (CMS), which allow the images to be displayed on a monitor like you will see them in projection after being recorded by an ARRILASER. Those 3D Lookup Tables can be used with the grading or display systems of one of ARRI`s partners: Barco, DaVinci, Discreet, Iridas, Nucoda, Pandora, Quantel.

To provide a good match between display and film projection the following parameters have to be taken into account: monitor/display characteristics and calibration, surrounding light conditions, film projection lamp and screen reflection, print film characteristic and printer lights, negative film characteristics and calibration as well as recorder characteristics.

Having all these parameters variable makes the operation difficult and the result very specific to one set of parameters. This is why ARRI has decided to use standards wherever available in order to change some of these variables into constants. This means:

Film Projection:
SMPTE 196M; Xenon Lamp, 5500°K, 55cd/m² (16fL) D55 x0.332 y0.347

Monitor Calibration:
D65 x0.3127 y0.3290 or D55 x0.332 y0.347
20% grey 2.2 cd/m² 100% white 80 cd/m²

Print process:
LAD r=1.09 g=1.06 b=1.03 on Kodak Vision 2383

Negative recording:
EK 5242 or Fuji 8502 calibrated to carlos.aim on ARRILASER.

Each 3D Lookup Table contains a set of all these parameters. By adhering to these standards, a very close match between your digital and your film image is delivered. If one of these parameters needs to be different, a new 3D Lookup Table is necessary. In this case customized Luts can be generated. This is an extra service provided by ARRI.
The 3D Lookup Tables are calculated by the ARRI CMM (color management module), which links input and output profiles.(see whitepaper: *ARRILASER color management for video look*).
When using the ARRI CMS in the grading session, only the display is influenced by the 3D Lookup Table, not the files. Those logarithmic files (cineon or dpx) remain unmodified and will be recorded by the ARRILASER without applying any color management.

A good way to check the result of the color management: side by side projection of Sony BVM-D24E1WE (grade one monitor), Sony GDM-VW 900 (computer monitor) and film projection with ARRI Locpro Xenon.

Out-Of-Gamut Lookup Tables

If the original data comes from a digital camera or a telecine, or if the main purpose of a project is for video, working with logarithmic files might not make sense. In this case files will be shown on the display as they are and modified prior to recording by an image processing node in the ARRILASER (see whitepaper: *ARRILASER color management for video look*). As the monitor/digital projector can show colors which are not in the color gamut of the film and vice versa, it is recommendable to use an Out-Of-Gamut (OOG) Lookup Table in the grading session. This Out-Of-Gamut Lookup Table will indicate the colors which are not reproducible on film when recorded by an ARRILASER. Colors outside the recorder gamut cannot be recorded without changes, since they do not exist on film. By default, these colors would be hard clipped into the recorder gamut. This would lead to a detail loss in those areas. To smoothly clip these colors, a soft clipping needs to be used, which compresses the monitor gamut. Various soft clips are part of the ARRI CMS software in the ARRILASER. It should be noted, however, that the use of soft clipping is a compromise that will result in less-than-ideal color reproduction. Therefore it is best to avoid Out-Of-Gamut colors in the images from the beginning. ARRI Out-Of-Gamut indication is available in the ALICE software, but also available for our partners (Barco, DaVinci, Discreet, Iridas, Nucoda, Pandora, Quantel).

There are two ways using the Out-Of-Gamut Lookup Table:

1. Color Distance Mask

All in-gamut colors (reproducible on film) are shown as grey, all colored pixels indicate Out-Of-Gamut pixel. Their saturation increases with distance to gamut boundary. Thus, a “just Out-Of-Gamut pixel” will be pale, a clearly Out-Of-Gamut pixel will be highly saturated in its original color.

2. Blend to Fixed Color Indication

All in-gamut colors (reproducable on film) are shown in their original color, all Out-Of-Gamut pixels will appear in a selected color. The mixing ratio depends on the distance of the color to the gamut, with colors far outside the film gamut being displayed in the Out-Of-Gamut color only.

For further details on Color Management please contact:

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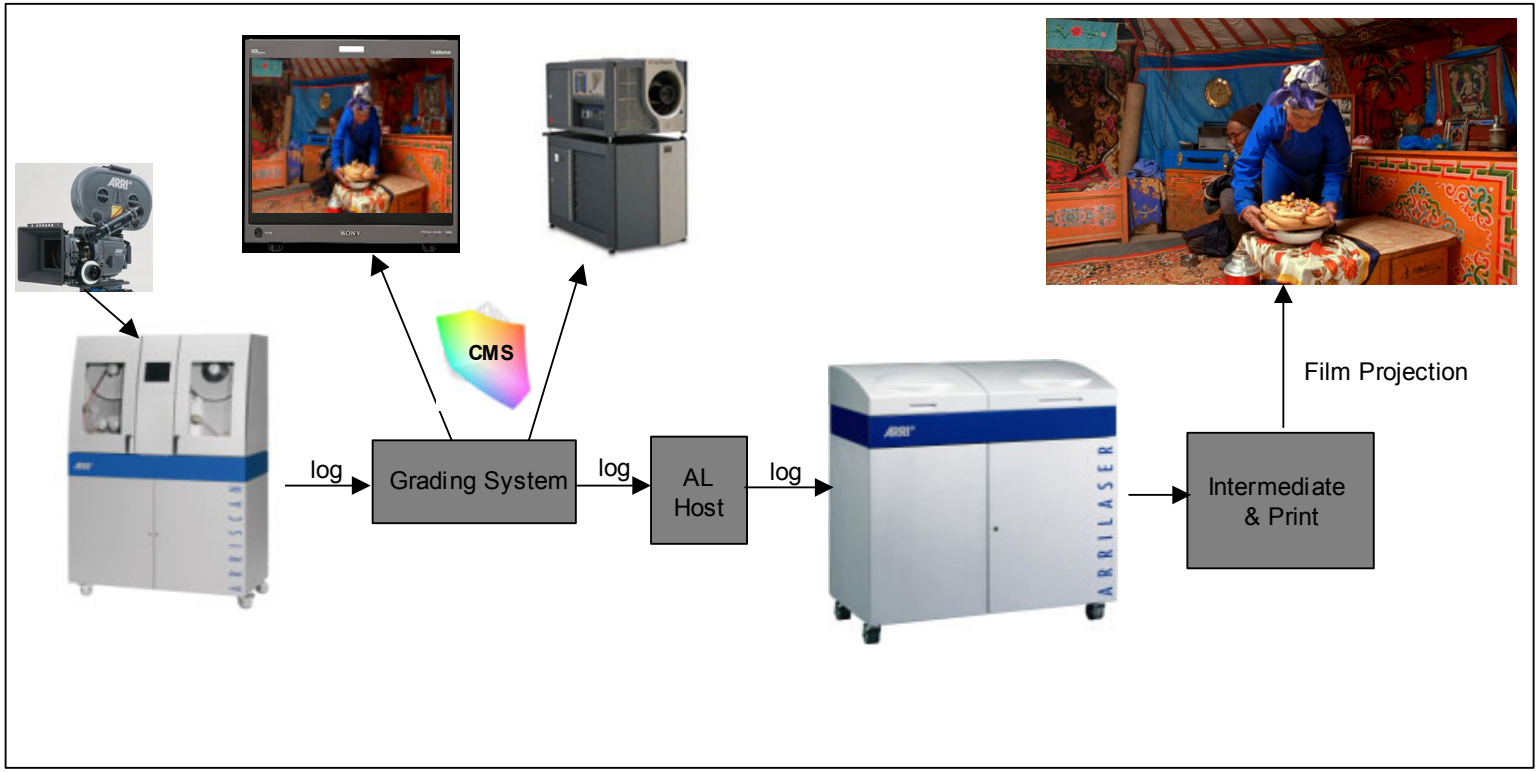
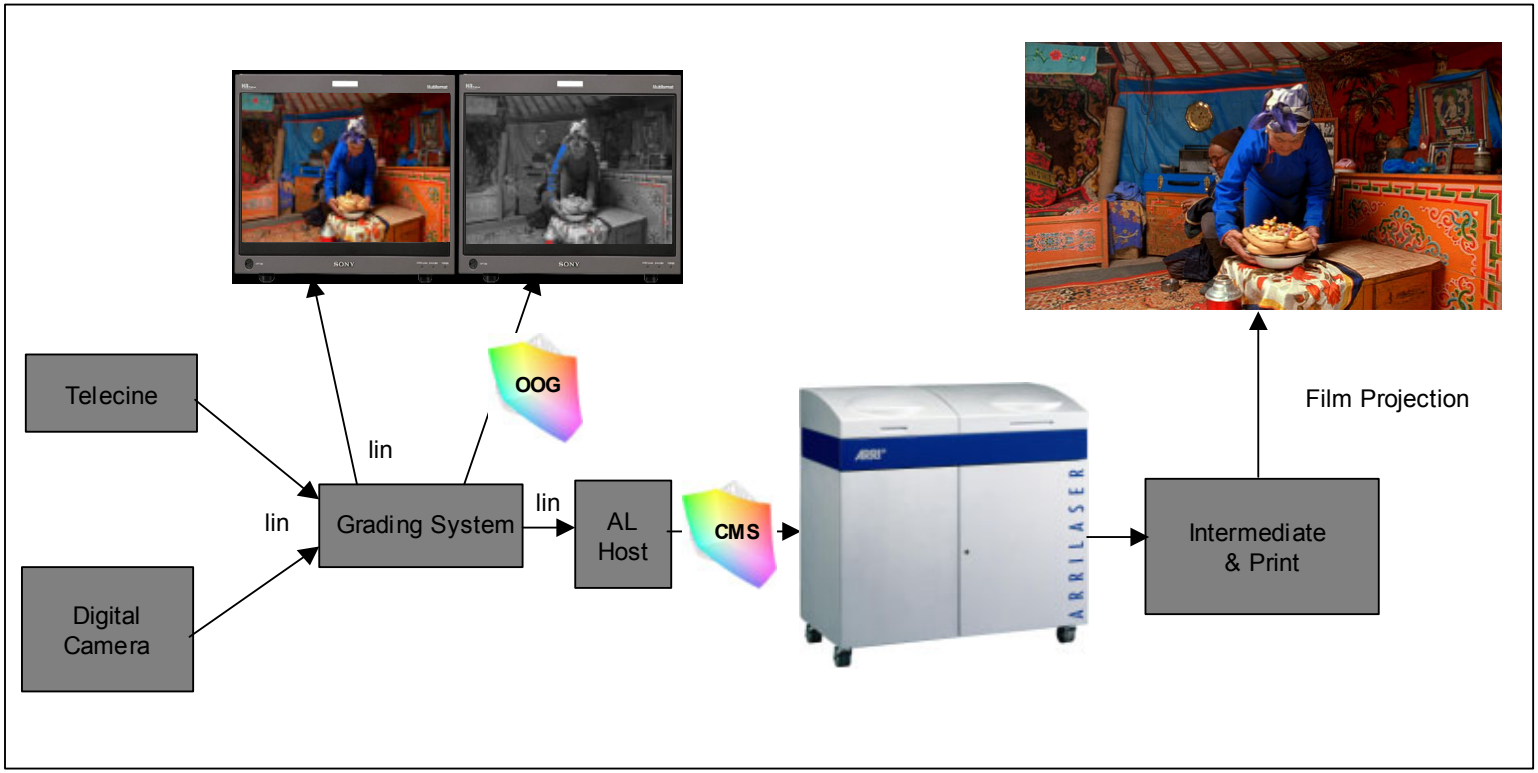
Logarithmic Workflow :



ARRI CMS is used as 3D Preview LUT to modify the display of logarithmic images in the grading session.

Linear Workflow:



ARRI CMS is used to modify the linear files in the ARRILASER prior to recording. Out-of-Gamut (OOG) LUT is applied in the grading session to verify the color gamut.