ARRIRAW Toolkit
for Final Cut Studio

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System Requirements

Minimum Hardware and Software Configuration

- Intel Macintosh
- Mac OS X 10.5.8
- QuickTime 7.6.6 (or later)
- 1920 x 1200 display
- Final Cut Studio 3

Recommended Hardware and Software Configuration (Playback)

- 12-Core Intel Mac Pro System
- Mac OS X 10.6.4 (or later)
- QuickTime 7.6.6 (or later)
- 4 Gigabytes of RAM or more
- Dual 1920 x 1200 displays
- High Speed storage, such as a SAS RAID, SATA2 RAID, Fiber-channel RAID or SAN.
- Final Cut Studio 3

Playback Requirements

ARRI's ARRIRAW file format is designed to contain raw bayer sensor data from their Alexa, D-21 and D-21HD digital cinema camera models. Like DPX sequences, the ARRIRAW format is designed to have a single frame per file. Each file is about 5 Megabytes per file. ARRIRAW sequences will likely require machines with better than average performance. It is suggested that the most recent 12-Core Mac Pros be used in order to achieve full Playback.

Playback of ARRIRAW footage will also require systems with high speed storage. At minimum, a RAIDed SATA storage array, SAS Storage array, or 4G/b based directly attached Fiber-Channel storage is suggested.

Overview

QuickTime Components

The ARRIRAW QuickTime Component will perform all of the importing, playback, de-bayer, and color correction functions to the movie. All applications that use Apple's QuickTime libraries can access all aspects of the ARRIRAW image sequences. Applications ranging from Final Cut Pro right down to iMovie, can import and play these files without any sort of conversion or preprocessing steps.

There are no direct "controls" or programs to launch in order to use these components. Your QuickTime enabled application will simply "recognize" ARRIRAW sequences as another movie format that can be used. Your Macintosh will also be "aware" of the files, much the same way QuickTime movies are already available to the system.

System Preferences

The Glue Tools ARRIRAW preference pane is where you pre-set all of the settings that the components use. These settings include White Balance modes, De-bayer Algorithms, Exposure Index, Color Space, and White Point conversions. The panel also handles licensing information, Time Code support and more.

Final Cut Pro Plugins

With a purchased license, you will see new Final Cut Pro Import plugins in the File->Import menu. Included is "Glue Tools ARRI ProRes Import." "Glue Tools ARRIRAW Import." You will select either menu item to import ARRIRAW or LogC ProRes footage right into Final Cut Pro. You can also "shift select" folders containing a number of sequences to batch load a number sequences at once.

Also included is an FxPlug Filter so that you can dynamically (and non-destructively) adjust the color processing of the footage. As this is a standard Final Cut Pro FxPlug Filter, you can make adjustments on a clip by clip basis.

Spotlight Plugins

The Spotlight Plugins enable your system to see inside the ARRIRAW header. The Finder can extract specific information from the ARRIRAW ".ari" files when it does a "Get Info." You can search for camera models, encoding characteristics, or even "shot notes" from the user modifiable "description field" from the Finder's Spotlight panel. Simple shell scripts can also take advantage of the spotlight services and sift through frames for specific data.
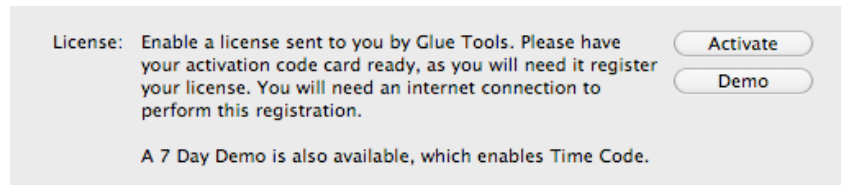
Installation and Demo Mode

Installation

Installation is as simple as double-clicking on the installer package, then selecting the hard disk that you want to install the software onto. Once installed, you will need to reboot your machine.

Note: If the system does not contain the proper version of Final Cut Studio, various parts of the ARRIRAW Package will not install. If after the installation, parts of this product do not show up, please double-check that you meet the minimum requirements.

IMPORTANT - Demo Mode

License: Enable a license sent to you by Glue Tools. Please have
           your activation code card ready, as you will need it register
           your license. You will need an internet connection to
           perform this registration.

           A 7 Day Demo is also available, which enables Time Code.

           Activate
           Demo

By default, the software needs to placed into "Demo Mode". If the demo mode is not activated, the software will not work. To activate the "Demo Mode", open your Mac's System Preferences. Look for the "ARRIRAW" Preference Pane. You should see an Info tab alone the top edge of the window. Click on it to get to the licensing section. Near the bottom, you will see the "Activate" and "Demo" button. Click on the "Demo" button to get a 7 day temporary license.

If no license is purchased, the ARRIRAW Images with drawn or exported with a large colored bar through the center of the image. The LogC Filter for LogC ProRes movies will also be drawn with a blue bar through the image. Once a license has been purchased, the time limit will be removed and all of the imagery will be rendered properly.

Licensing

License Activation

**Licensing must be done while connected to the Internet.** If you do not have an internet connection, you will not be able to activate the license. In many cases any type of network connection will get you up and running. Once activated, you will not be required to have a network connection, **unless you want to move the license to another Macintosh.**
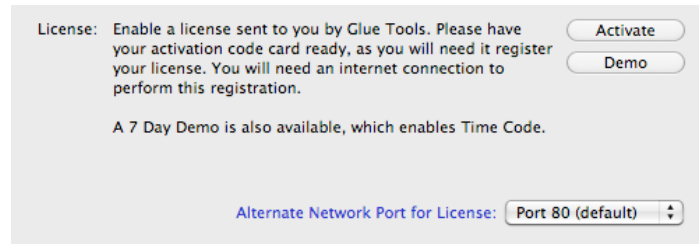
To activate the license, you will need the Registration Code that was emailed to you. Open the System Preferences, and click on the ARRIRAW preference pane. Click on the "Activate" button which will then open the panel for the Registration Code. You can then cut and paste the encryption string from the email, into the "Activation Code:" field. Once you click on the "Activate" button, the software will verify the license with our server and create a permanent license for you. Until you decide to move the license, this will be the only time that the internet is used for licensing.

Revoking/De-authorizing a License
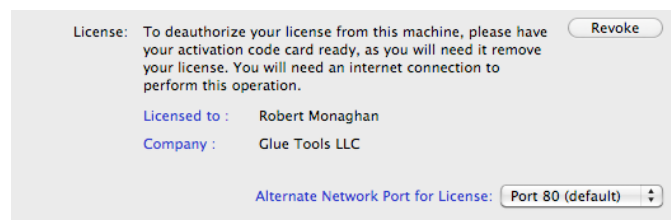
If you need to move a license to another machine, you can use the same license code to "Revoke" the license from the machine that you are on. Just as you had done with the license activation, Open the System Preferences–>ARRIRAW preference pane. Open the Info tab and click on the "Revoke" button. You can now cut and paste the same activation code into the "Acivation Code:" field. Then click on the "Revoke" button. Once deactivated, the license will be free so that another machine can be used.

License Troubleshooting

If you encounter a problem with your licensing because of network issues, consult with your IT Dept. The most common cause of problems is a blocked internet port or a Firewall Proxy system. The licensing can be modified to use one of 2 internet ports: Port 80, which is the default port or Port 44333 (an alternate port). Select either of these ports to try to perform a license authorization.
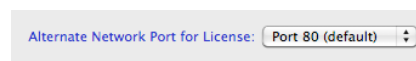
If the problem persists, email support@gluetools.com for further assistance.

Quick Start Guide

Importing an ARRIRAW Image Sequence - The Correct Way

Just about everyone has used QuickTime to load a range of individual frames and convert them into a single movie. Normally, this is done by using an "Import Image Sequence" command inside the QuickTime application. Typically these images are a series of TIFF files or JPEGs with sequential frame numbers. Under normal circumstances, this works just fine. The sequences of picture files are just what they are . . . a series of still images with no other useful data.

However, this is not true for ARRIRAW ".ari" files. The ARRIRAW sequences are in fact a single movie. The difference between a ARRIRAW "Movie" and a regular ".mov" file, is that each frame is a separate file. A ".mov" file has all of its frames inside a single file. A feature that makes ARRIRAW frames different from other Image formats, is that the ARRIRAW frames contain "metadata" that is specific to the film and HD broadcast industry. Time Code, slate information, and other information etc, is stored in the image header.

So, what does this ultimately mean? It means that to properly load an ARRIRAW sequence into you favorite application, use the "Open->File..." menu, and select A SINGLE frame from your sequence. Then click on "Load" or "Ok." The entire movie will load shortly. DO NOT use "Import Image Sequence" to load the frames.

Glue Tools has custom technology to treat these image types as a "virtual movie file" rather than a set of individual image files. This means that all of the frames in the sequence are really just a single "Movie." It also means that when you are selecting any one ARRIRAW ".ari" file from a sequence, it is the same as opening all of the frames in the sequence.

Because of this, you no longer need to shift-select all of the frames to load them. As a result of the way this works, you are able to load metadata, Time Code and other information that would normally be associated with a QuickTime movie.

But what about the "Import Image Sequence" menu command?

Using this method of loading frames, you loose the ability to import metadata, Time Code, etc. You also loose the Playback ability, too. When importing ARRIRAW frames as an Image Sequence, QuickTime believes the sequence is just a bunch of still images, not a series of frames in a movie.

Importing a Sequence into QuickTime Player

One of the most basic ways of using the ARRIRAW Toolkit is to take one of the frames from your sequence and drag and drop it over top of the QuickTime icon. Doing this will open the entire sequence inside QuickTime Player.

Exporting a New Movie from QuickTime Player

For the ease of portability with other users, you can quickly and easily convert an ARRIRAW Movie to any other QuickTime Movie format. You can do this by opening the ARRIRAW sequence using QuickTime Player, and then selecting the "File->Export...." Select your codec, location and filename as you would with any other movie, and start the export. It is that easy.

Importing a Sequence into Final Cut Pro

Final Cut Pro has a specially built interface to work with the ARRIRAW ".ari" files. To import the footage, select the "File->Import->Glue Tools ARRIRAW Import...". Locate a ".ari" file, and click "Ok." Your sequence will now appear in the browser, complete with the file's metadata.

That's it!

ARRIRAW Reference

This package consists of a number of parts that make up the whole: the ARRIRAW QuickTime component, a System Preferences Pane, and a Spotlight Plugin. Each of these pieces are briefly described in turn.

Preference Pane

The Glue Tools ARRIRAW Preferences Pane is where you can change the Global settings used by the ARRIRAW QuickTime Component. If you want of change the Exposure settings, change the Color Space from Video to LogC, or alter the Time Code settings, you can do it with the System Preferences Panel.

Let's begin by opening the System Preferences, and clicking on the Glue Tools ARRIRAW preference icon.
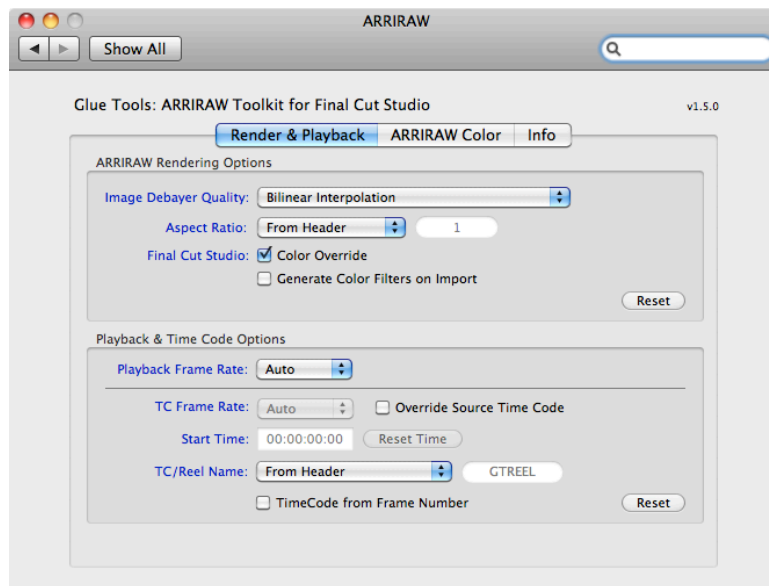
Render & Playback Tab

You will notice that the Presets Tab is divided into two sections: "Image & Playback Options" and "SMPTE Time Code Options."

**ARRIRAW Rendering Options:**

Image Debayer Quality
This pop-up menu is used to select the type of de-bayer algorithm to be used to interpolate the sensor data. Different de-bayer modes will concentrate on a specific "look" when creating an image. Some modes will simply "average" the sensor pixel values to estimate the RGB values. Other de-bayer algorithms are much more elaborate, carefully examining each pixel to best handle gradients, hard edges, and color changes. Naturally, the more elaborate the de-bayer algorithm, the more processing speed is needed by the software. On slower machines, de-bayer algorithms such as "GT Hybrid A" will significantly impact playback. However, this type of algorithm is ideal when exporting to another QuickTime movie format.

De-bayer performance is sorted by their order in the menu. The top mode menu item, "Raw Sensor Data Mode" is the fastest, as no de-bayer algorithm is being applied. "Gray Scale," "Nearest Neighbor," "Bilinear Interpolation" are the next fastest modes. The slowest yet most accurate is "GT Hybrid A" which is at the bottom of the menu.

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Aspect Ratio
This pop-up menu allows you to choose
between a number of different Aspect Ratios,
that the image will be displayed as. When
loading the Images, you can select the 2.0
Aspect Ratio, and the images will be
automatically re-sized, without any data loss.

The example image here, illustrates the
concept. The example frame is an Anamorphic
Image. On the left is an uncorrected 1.778
anamorphic image, while the right image has
been corrected for 2.35.
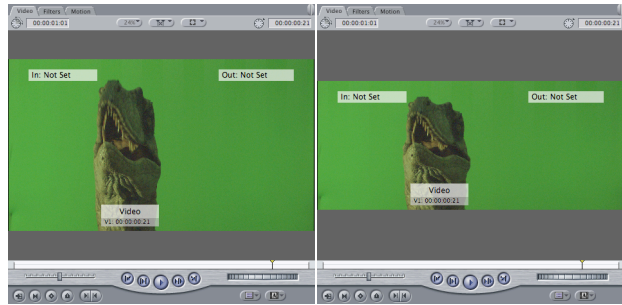
Final Cut Studio: Color Override
This checkbox will cause any ARRIRAW file without using its color information. This command is
used in conjunction with the ARRIRAW Color FxPlug filter, to allow you to modify the way the
ARRIRAW Sequence is rendered inside Final Cut Pro.

Final Cut Studio: Generate Color Filters on Import
This checkbox causes the Import->Glue Tools ARRIRAW Import plugin to automatically create
an FxPlug Filter for each ARRIRAW sequence that is imported. As each sequence is imported,
the filter will have its settings adjusted to match what is inside the ARRIRAW's header.

Playback & Time Code Options:

Playback Frame Rate
This lets you override the frame rate found inside the ARRIRAW files, and forces your
Application to use the value that you choose.

TC Frame Rate
This lets you override the time scale that the Time Code track uses. This can be different from
the playback Frame Rate. This control, combined with the playback Frame Rate pop-up can let
you simulate a Tele-cine operation. i.e.: selecting a 24 FPS for the playback Frame Rate and a
25 (or 29.97) for the Time Code.

Override Source Time Code
When enabled, you can alter any of the Time Code settings. Many of the settings are disabled
until you enable this check box. When it is disabled, Time Code is used from the Time Code
metadata within the ".ari" file.

Start Time
When enabled, you can enter in your own Time of Day start time. You can click on the "Reset
Time Code" button to bring it back to 00:00:00:00

TC/Reel Name
The "TC Source Labeling" Pop-up menu determines how QuickTime identifies the Time Code
track. You can type in your own text into this box, or use one of a number preset options in the
menu.

"User Defined" allows you to type your own description into the text field below. When selected,
you are able to type in up to 12 characters, which will be used as the Reel Name. You can use
either the "Root" file name from the first frame, or you can use the parent directory that the
frames are stored in, as the reel name.

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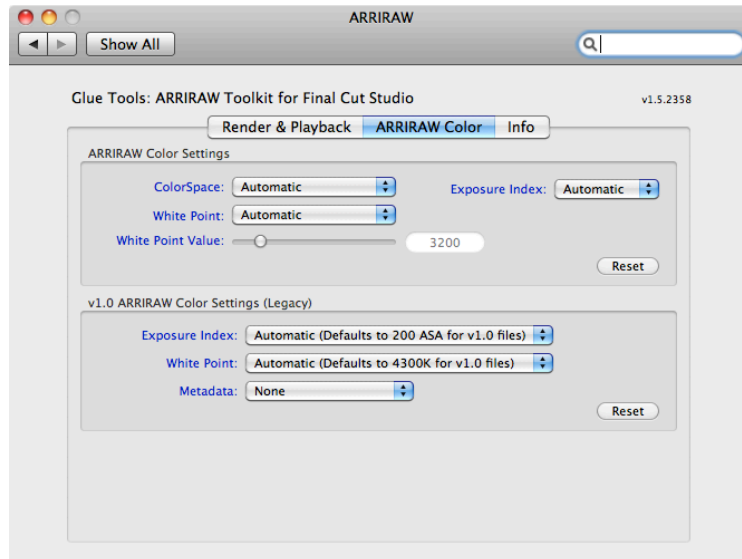
ARRIRAW Color Tab

This Tab is divided to two parts: Alexa ARRIRAW Color Settings and D-21 ARRIRAW Color Settings. Each of these section independently set the Global settings for each camera type. For instance, a setting in the D-21 section will not affect the Alexa settings.

Alexa ARRIRAW Color Settings:

Color Space
This pop-up menu lets you choose between the Rec 709, DCI P3 and LogC colorspaces. Again, this affects all Alexa ARRIRAW sequences. This settings is specific to the Alexa and is not available on the D-21.

Exposure Index
This pop-up menu lets you choose from a range of Exposure Index settings. By default, the setting that has been placed into the ".ari" file's header by the camera, is used. You can choose to override this, but keep in mind that this setting is Global for all Alexa ARRIRAW sequences.

White Point & White Point Slider
This pop-up menu and Slider lets you choose between different White Points, should the information not be available in the ARRIRAW header. By default, the setting that has been placed into the ".ari" file's header by the camera, is used. This affects all Alexa ARRIRAW sequences. This settings is specific to the Alexa and is not available on the D-21.

v1.0 ARRIRAW Color Settings (Legacy/D-21):

Exposure Index
This pop-up menu lets you choose from a range of Exposure Index settings. By default, the setting that has been placed into the ".ari" file's header by the camera, is used. You can choose to override this, but keep in mind that this setting is Global for all D-21 ARRIRAW sequences.

White Point
This pop-up menu lets you choose between a range of White Point settings. This particular setting is specific to the D-21 camera is not available for Alexa footage. Again, this affects all D-21 ARRIRAW sequences.

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Metadata (Version 1 Headers Only)
So far, at the time of this writing, only Codex Digital offers the ability to imbed the appropriate metadata into the ARRIRAW file. To enable metadata access, you can select either "Generic" or Codex Digital in the metadata popup menu. If Generic is selected, the appropriate fields in the ".ari" file will be embedded into you Final Cut Pro Project, without any pre-processing. If your frames came from a Codex Digital recorder, you can select "Codex Digital", and have the metadata processed to fit in the FCP XML structure. This allows for significantly better data tracking in your project.

Info Tab / Licensing

In the "Info" tab, you can click on links to the Glue Tools website, as well as direct links to the Support/FAQ pages, and the Registration pages. If you wish to purchase a license for the ARRIRAW Toolkit Package, visit www.gluetools.com, go to the "purchase" page and follow the instructions there.

Final Cut Studio Reference

Final Cut Pro "ARRIRAW Import" and "ARRI ProRes Import" Plugins
Final Cut Pro users can now import ARRIRAW and LogC ProRes footage with dedicated Import Panels. Each panel can be easily be accessed by selecting the "File->Import..." menu.

The ARRIRAW Import panel for Final Cut Pro provides most of the same controls that the ARRIRAW Preference Pane does. However, the panel adds the ability to extract metadata right out of the ARRIRAW file, and place the information right into your FCP project. Shot notes, color information, and other information is extracted and available in the XML that FCP generates.

The ARRI ProRes Import panel is similar to the ARRIRAW import panel, but is specifically built to batch import LogC ProRes movies and add the appropriate ARRI Camera Filter plugin.

Final Cut Pro Sequence Presets
Final Cut Pro provides a set of "Sequence Presets" which allows you to quickly configure your system for different editing scenarios. Included with the package is a set of predefined Sequence Presets. These are generic presets for standard frame rates, and image sizes. As with the other Sequence Presets that Apple provides, you can duplicate and customize these to suit your needs.

Also included with these Sequence Presets, is a set of AJA Kona3 specific Sequence Presets. These presets allow you to preview your footage out though the Kona 3 hardware.

ARRI LogC Camera FxPlug Filter

Final Cut Studio provides developers with a plugin technology for manipulating your image. We have developed plugins to let you adjust your ARRIRAW and ProRes LogC footage.

The ARRI Camera Filter plugin is designed to interactively adjust the exposure and colorspace of your footage. You have two different types of media that you can correct. You can correct ARRIRAW or ProRes "LogC" files from the Alexa Camera files.

ARRIRAW Files
To get started, select Import->Glue Tools ARRIRAW Import... but before importing some ".ari" files, click on the "Render" tab and make sure that "Color Override" and "Generate Color Filters on Import" enabled.
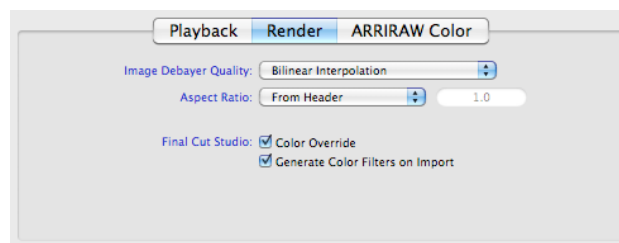
Now, you can go ahead and import a clip. Once the ARRIRAW Sequence appears in the browser, double click on it. This will display the file in the Browser:Slug window. Along the top is a bunch of tabs. Click on the "Filter" tab. This will display the newly attached ARRI LogC Color FxPlugin. With this plugin, you can modify the color as you see fit.

When you imported the ".ari" sequence, the header of the first ".ari" was read as well. Using the settings from that file, the newly created ARRI LogC Color FxPlugin was preset with all of the needed settings. This will provide you with a starting point from which you can make adjustments.

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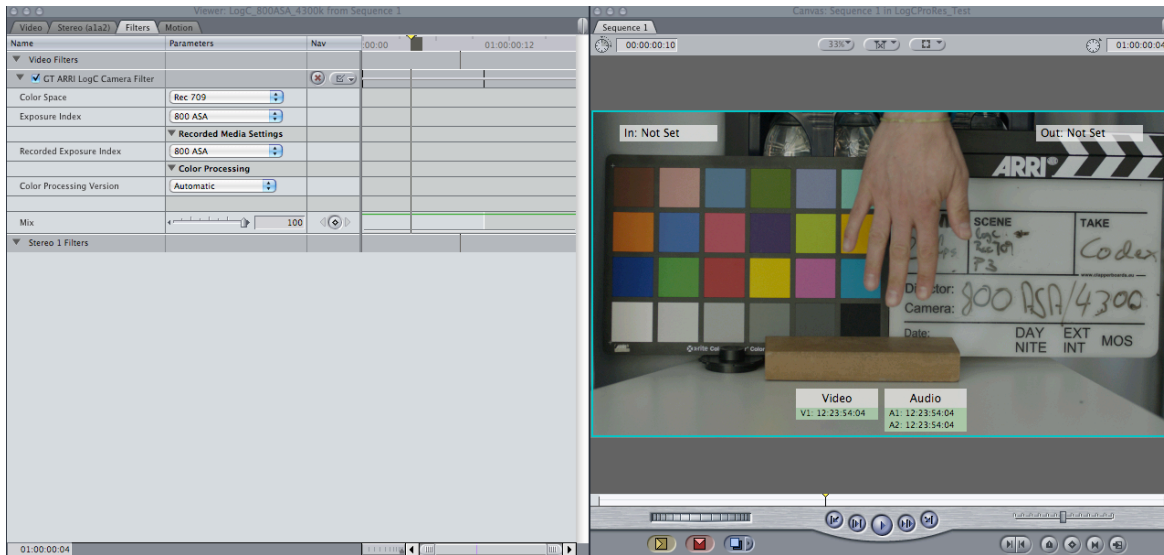
Drag your ARRIRAW clip onto the timeline and double click on it. Then select the "Filter" tab from the top of the Browser:Slug window. You will be presented with a list of sliders and pop-up menus. A description of each control is provided below. The best way to learn what they do, is to try them out. As you make each adjustment, you can see its effect on the right side of the display.

A feature of these plugins is that you can duplicate the ARRIRAW clip on the timeline several times. If you had three copies of the same ARRRAW clip on the timeline, each of the three could have different FxPlug settings. Ideally suited when you are trying to make creative color decisions in your project.

ProRes LogC Media
When the ARRI Camera Filter is applied to your LogC ProRes media, you can quickly preview the footage in Video mode, without rendering.

To get started, select Import->Glue Tools ARRI ProRes Import... but before importing MOV files, be sure to set some defaults. You can batch import several movies, and have each imported with the ARRI Camera Filter attached.

Once imported, you can drag a ProRes LogC clip onto the timeline and double click on it. Then select the "Filter" tab from the top of the Browser:Slug window. You will be presented with a list of sliders and pop-up menus. A description of each control is provided below. The best way to learn what they do, is to try them out. As you make each adjustment, you can see its effect on the right side of the display.

ARRI LogC Camera Filter Settings
This filter is applied to either LogC ProRes or ARRIRAW footage. It works with v2.0 or v3.0 based media files.

Color Space
– This pop-up menu lets you select the color space that the image will be displayed in. You can choose between Rec 709, DCI P3 or Film Look LogC color.

Exposure Index
– This pop-up menu allows you to change the Desired Exposure Index of the footage. This will allow you to change the ASA as needed.

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Recorded Exposure Index
– This pop–up menu allows you to pre–determine what the Exposure Index is of the footage. If you are using ARRIRAW or LogC ProRes footage from a v3.0 or later Alexa, this will be automatically set, when imported. Files created with cameras using older firmware versions, will need to be set manually.

Color Processing Version
– This pop–up menu lets you select the color processing version of your media. Alexa Cameras that use v3.0 will not need to be adjusted. Cameras using earlier firmware versions will need to have this manually set to version 1 or 2. If this setting isn't set according to the proper version, the resulting image will not look right.

These settings are stored inside the Final Cut Pro project file. Nothing that you adjust here will affect the ARRIRAW file. The changes are non–destructive.

Qmaster Setup for Compressor 3

Qmaster is Apples render queuing system. With it, you can harness a group of computers together, to work on a set of jobs. Ideally, you can use any of these additional computers to work on tasks that you need done, without tying up your machine. A typical job might be converting a sequence of ARRIRAW frames into a ProRes movie.

Before you can use Compressor and Qmaster with the ARRIRAW Toolkit, you will need to make some changes to your Compressor setup.

Problem: Rendering a QuickTime movie on a Qmaster node fails. The movie has one or two different frames that are repeated.

Fix: Go to the "Compressor" menu and select "Preferences." Once the panel has opened, look for the "Cluster Options" popup menu, and select "Never copy source to cluster."
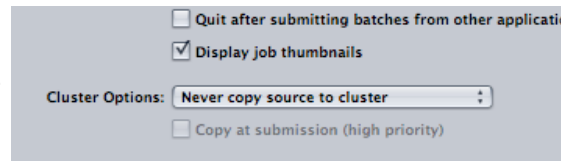
This is important, as Qmaster was never designed to work with image sequences as source frames. Qmaster doesn't understand how to copy movies that are composed of several files. This is usually the cause of rendered QuickTime movies that have repeating frames. In order for Qmaster to work with the footage, the volume that holds the source frames must be mounted on each Cluster Node. When the render job is submitted, each of the Cluster Nodes will see the frames as "locally available." So the copy step isn't required.

MacOSX Reference

Spotlight
ARRIRAW files can be indexed and searched by Spotlight. Simply typing in a relevant bit of text, into the Spotlight text field, will search all of the ARRIRAW ".ari" files' metadata on your system.

Macintosh Finder / Get Info
Get Info (Command – I) in the Finder allows you to view the details of any ARRIRAW file, as well. Much like the Spotlight window, you can get info about a single file, that you happen to click on.

The Get Info panel will display ARRIRAW specific information in the header of the selected files. This is an excellent diagnostic tool when working with the ARRIRAW file format.

You can view the following types of information, if available:
Image Size
Bit Depth
Packing Type
Frame Rate
Time Code
Frame Number
Take Number
Codec
Device Name
Project Info

Terminology

Here is some terminology that you may not be familiar with.

Bayer Pattern Imagery

Traditionally, you would assume that each pixel is a combination of Red, Green and Blue channels to make each pixel. With single sensor digital cameras, each pixel is in-fact a single color. The "Bayer Pattern" was invented by Dr. Bryce E. Bayer at Kodak, who came up with the "bayer pattern" color filter array. He came up with the way each color is arranged on the camera sensor (see attached graphic). Each line on the sensor contains alternating pixels of Green and Red, and the next line below alternates Blue and Green. By using a "de-bayer" algorithm, a proper RGB image can be reconstructed. Different types of de-bayer algorithms will reproduce different levels of image quality. Typically, "fast" de-bayer algorithms are of a poor quality. "Slow" algorithms are typically much better. (Image courtesy of Wikipedia).
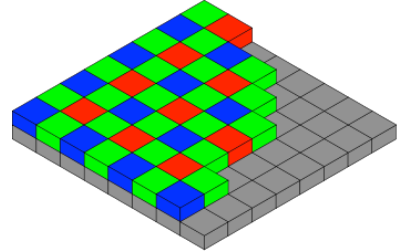
Here are examples of some de-bayer algorithms. On the left, is a "Raw" Bayer Pattern. In the centre is a "fast" Nearest-Neighbour de-bayer pattern and on the right a "better" Pixel Grouping de-bayer pattern. As you can see, there will be a a substantial quality difference, depending upon the de-bayer algorithm you choose. At this time, GT Hybrid A is our best quality de-bayer algorithm. As these de-bayer algorithms get better, you can expect to see improvements as new versions are released.
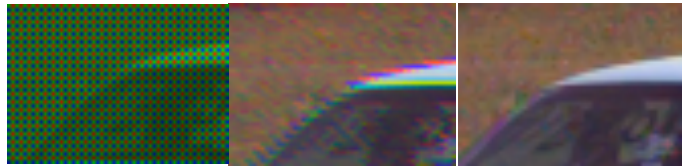
Technical Support

Support for these tools can be obtained by posting questions in the User Forum at
www.gluetools.com.

Online support also includes a FAQ section. The User Forum is a great place to ask your own
questions, if you can't find the answers. The User forum is located at:
http://www.gluetools.com/FUDforum2/index.php

Emails for help can also be sent to support@gluetools.com. Detailed consulting for specific
features and improvements is also available on a case by case basis. Please contact us with your
specific needs.

Support is available Monday – Friday, 9AM to 5PM PST/PDT.