

DaVinci Resolve Interface to CalMAN Software Quick Start Guide

DaVinci Resolve color correction software interfaces directly with CalMAN Display Calibration Software to create a display calibration 3D LUT file for a secondary display driven through a Blackmagic Design video output device (e.g. DeckLink). DaVinci Resolve automatically produces the required test patterns (patches) as CalMAN measures the display and creates an optimized 3D LUT .cube file (in BMD format).

The 3D LUT display calibration file is then manually loaded into DaVinci Resolve to apply calibration correction to the video display. DaVinci Resolve's output signal is altered, according to the LUT data, to correct the video display performance to very accurately comply with the selected video standard (e.g. BT.709, sRGB, etc.).

Required DaVinci Resolve Software Version:

- Version 10.1 or later

Required CalMAN Software Version:

- Version 5.3.0 or later

Required CalMAN Workflow:

- Color Cube (3D LUT) workflow

CalMAN/Resolve Connectivity:

- Uses IP connection from CalMAN to DaVinci Resolve, on port 20002.
- The IP address is the network IP address of the CalMAN Windows computer.

To confirm the IP address of the CalMAN Windows computer, in a Windows command window (cmd), enter "ipconfig" then look for the IPv4 address for the Ethernet adapter or the Wireless LAN adapter.

Any firewall on either the CalMAN or the Resolve end of the link needs to either be disabled, or outbound port 20002 needs to be open on the CalMAN end, and inbound port 20002 needs to be open on the Resolve end.

To open a Windows Firewall port in Windows 7:

Control Panel / Windows Firewall / Advanced Settings / Inbound Rules, or Outbound Rules / New Rule / Port / TCP / Specific remote ports: 20002 / Allow the connection

To allow incoming connections through an active Mac firewall:

System Preferences / Security & Privacy / Firewall / Advanced / Automatically allow signed software to receive incoming connections

CalMAN/Resolve Computer Configurations

CalMAN for Resolve can control the test pattern output from DaVinci Resolve in a number of different computer configurations. These configurations are described below, starting with whether DaVinci Resolve is running on a Mac or Windows computer.

When DaVinci Resolve is running on a Mac computer, under OS X:

1. CalMAN can be installed on a separate Windows computer or on a separate Mac computer, running in a VMware Fusion virtual Windows machine or under Bootcamp with Windows*. CalMAN will connect to Resolve over TCP/IP.
2. CalMAN can be installed on and running in a VMware Fusion virtual Windows machine on the same Mac that Resolve is running on. CalMAN will connect to Resolve over TCP/IP.

** CalMAN can also run on a Mac in a Parallels virtual Windows machine, but due to occasional USB device driver issues with Parallels, it is not currently recommended.*

When DaVinci Resolve is running on a Windows computer:

1. CalMAN can be installed on a separate Windows computer or on a separate Mac computer, running in a VMware Fusion virtual Windows machine or under Bootcamp with Windows. CalMAN will connect to Resolve over TCP/IP.
2. CalMAN can be installed on and running on the same Windows computer that Resolve is running on. CalMAN will connect to Resolve over TCP/IP.

CalMAN/Resolve Luminance Levels

CalMAN needs to be configured to control the output from DaVinci Resolve at video levels. To configure CalMAN, **under Settings/Workflow Basic Options/Luminance Levels, select Video (16-235)** (10-bit displays will receive 10-bit signals).

On the DaVinci Resolve Master Project Settings page, under Video Monitoring, the Colorspace (levels) setting should be at **Video Levels**.

Note: When Video Levels is selected in DaVinci Resolve, the SDI and HDMI outputs from Blackmagic video output devices produce signals limited to SMPTE legal (studio) levels (bit levels 64-940). Signal levels between black and reference white are always accurate.

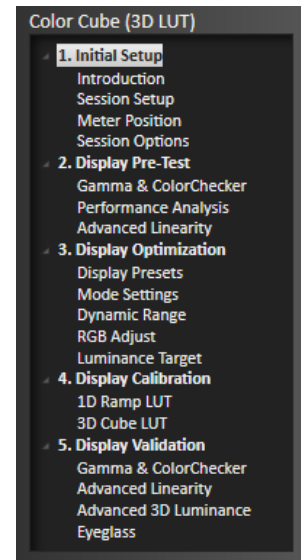
3D LUT Display Calibration

Follow this procedure to:

- a. Create a display calibration 3D LUT file for a display driven from DaVinci Resolve through a Blackmagic Design video output device.
- b. Load the 3D LUT file into DaVinci Resolve color correction software.

Create Display Calibration 3D LUT

The Color Cube workflow in CalMAN is used to create display calibration 3D cube LUTs. In the CalMAN main menu, select Open Workflow Template / Color Cube (3D LUT). Proceed through each step of the Color Cube workflow in the normal fashion, using the following notes for DaVinci Resolve specifics.



1. Initial Setup section

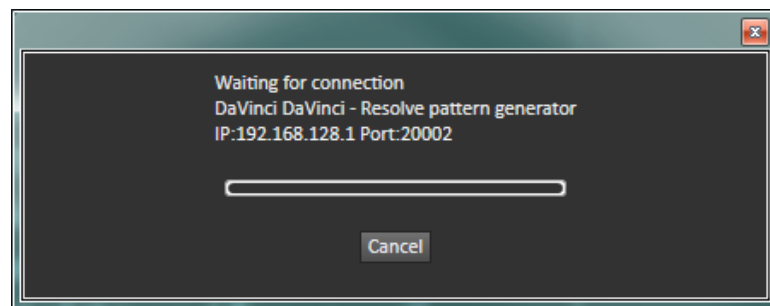
In the Initial Setup section of the Color Cube workflow, step through the following pages:

a. Session Setup - Meter Connect

- Connect your color meter to the CalMAN computer.
- On the *Session Setup* page, click the *Find Meter* button.
- On the *Find Meters* dialog, select your meter if it is listed, then click *Search*. If your meter is not listed on the dialog, just click *Search*.

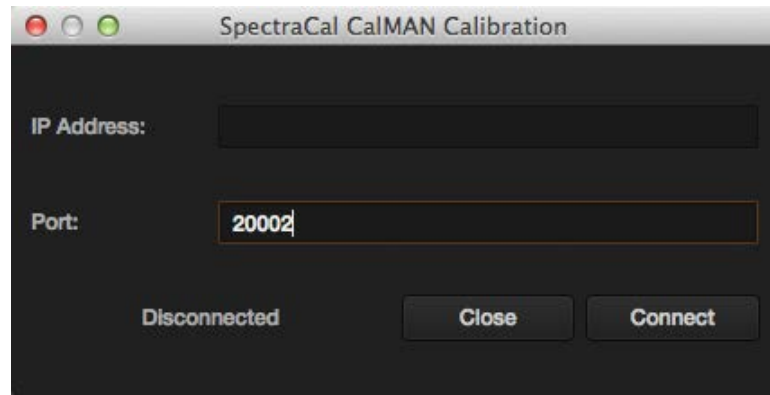
b. Session Setup - Source Connect

- On the CalMAN *Session Setup* page, click the *Find Source* button.
- On the *Source* dialog, under *Manufacturer*, select “DaVinci.” Under *Model*, select “DaVinci – Resolve pattern generator.” Click *Connect*.
- On the CalMAN “Waiting for connection” screen (shown below), note the IP address (in this example, 192.168.128.1).



- See Appendix A for important Resolve project information (Resolve requires an open project with at least one image loaded into a timeline).
- On the Resolve Color page, click “Color” in the toolbar menu, select “Monitor Calibration,” then select “SpectraCal CalMAN.”

- Enter the CalMAN computer IP address (as shown above – the default Port should be correct). Click *Connect*.



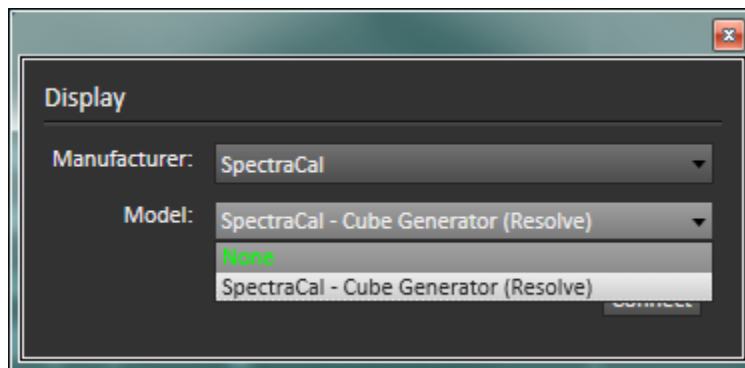
Note: If CalMAN doesn't connect with the displayed IP address, confirm that the displayed IP address is the CalMAN computer's network adapter IP address. See the CalMAN Connectivity section, above.

c. Session Setup - LUT Device Setup

On the *Session Setup* page in the Color Cube workflow, click the *Find 3D LUT Device* button. Because you want to generate a standalone LUT file, you will use the *Cube Generator* device.

- On the *Display* dialog, under *Manufacturer*, select "SpectraCal."
- Under *Model*, select "SpectraCal – Cube Generator (Resolve)."

Note: If you have the CalMAN Studio license, the selection will be "SpectraCal – Cube Generator (3D LUT)."



2. Display Pre-Test section

In the *Display Pre-Test* section of the Color Cube workflow, on the *Gamma & ColorChecker* page and on the *Advanced Linearity* pages, you can measure the performance of a display before you calibrate it.

NOTE: Be sure that in CalMAN you have selected *Video (16-235)*, under *Settings/Workflow Basic Options/Luminance Levels*.

On the Performance Analysis page, the previous display measurements are evaluated in a series of pass/fail performance parameters. If the display fails in any of these parameters, you should consider using the following *Display Optimization* workflow section to optimize adjustments on the display itself.

If the display passes all of these parameters, you can skip the *Display Optimization* section and go immediately to the *Display Calibration* section of the workflow.

3. Display Optimization section

In the *Display Optimization* section of the Color Cube workflow, you are guided to optimize any controls the display may have for picture mode, color gamut, color temp, gamma, dynamic range, white point balance, or white point luminance.

On the *Dynamic Range* page, if the display has a Brightness control, set black to signal level 16/64.

On the *RGB Adjust* page, if the display has RGB Gain controls, under the *Two Point Levels* selection, select "2 Point 30, 100%." Click *Read Continuous* and adjust the monitor's RGB Gain controls for RGB balance at 100%.

4. Display Calibration section

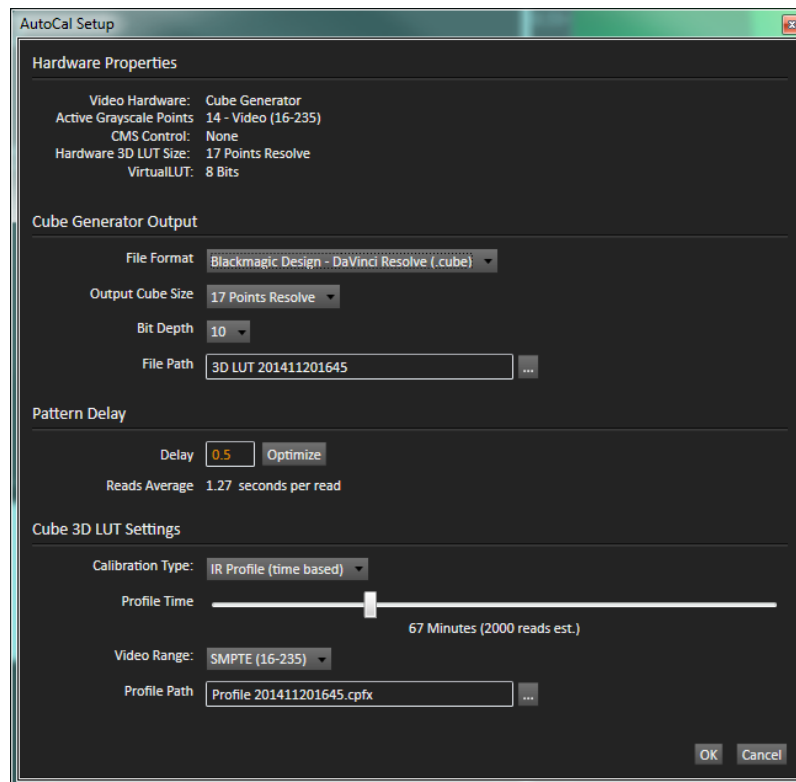
In the *Display Calibration* section of the Color Cube workflow, there are provisions for calibrating both a 1D LUT (1D Ramp LUT page) and a 3D LUT (3D Cube LUT page). When we are using the CalMAN Cube Generator function to produce a 3D LUT file, we will skip the 1D LUT page and use only the 3D Cube LUT page.

a. 1D Ramp LUT page

Skip over this page when using the CalMAN Cube Generator function to produce a 3D LUT file for DaVinci Resolve.

b. 3D Cube LUT page

- On the 3D Cube LUT page, click the *AutoCal* (rotating arrows) button at the right end of the meter action buttons. The *AutoCal Setup* dialog then appears (see below).



1. For *File Format*, select “Blackmagic Design – DaVinci Resolve (.cube).”
2. For *File Path*, select a convenient LUT file name and computer drive location.
3. Under *Calibration Type*, select the desired type of 3D LUT calibration process.
 - **IR Profile (time based)**: Creates the best quality display calibration 3D LUT possible in the selected period of time. You select how much display quality you have time for, from 30 minutes to maximum display quality (6,000 points max). Uses Intelligent Resolution Profiling to search out the most nonlinear color space areas and correct those first.
 - **IR Profile (point based)**: Creates the best quality display calibration 3D LUT possible with the selected number of measurement points (1,000 - 10,000 points). Uses Intelligent Resolution Profiling to search out the most nonlinear color space areas and correct those first.
 - **Lightning LUT**: Creates a display calibration 3D LUT in five minutes or less. Produces a very high quality result on professional displays with moderate linearity. Displays with significant nonlinearity may produce marginal results.
4. Under *Video Range*, select “SMPTE (16-235)” if you are calibrating a video display that clips or compresses signals above reference white, as tested on the CalMAN Dynamic Range page.
5. Click the *OK* button to initiate the 3D cube LUT calibration process.

When the AutoCal process completes, you are ready to Load the CalMAN 3D LUT File into DaVinci Resolve.

NOTE: *The .cube format LUT file produced by CalMAN is compatible with DaVinci Resolve and it is also compatible with BMD HDLink Pro. However, other devices that use a .cube format LUT file have a different internal file data structure. LUT file format conversion would be required to use this .cube file with other devices.*

Load CalMAN 3D LUT File into DaVinci Resolve

Follow this procedure to load the 3D LUT you just created into DaVinci Resolve as a Display Calibration LUT.

1. When the CalMAN AutoCube calibration process is complete, copy the .cube LUT file to your DaVinci Resolve LUT folder.

For DaVinci Resolve on Mac, copy the LUT file to :

/Library/Application Support/Blackmagic Design/DaVinci Resolve/LUT
(Finder/Go/Computer/Macintosh HD/Library...)

For DaVinci Resolve on Windows, copy the LUT file to :

C:\ProgramData\Blackmagic Design\DaVinci Resolve\Support\LUT

2. Start or Restart DaVinci Resolve.
3. On any DaVinci Resolve page, click the gear button, at the bottom left corner of the page. The *Project Settings* window opens in the middle of the screen.
4. On the left sidebar, click on *Lookup Tables* to open the LUTs panel.
5. In the *Timeline Lookup Tables* top section, under the *3D Video Monitor Lookup Table* dropdown menu, select the .cube LUT file that you copied to the DaVinci Resolve LUT folder.
6. Under the *3D Color Viewer Lookup Table* dropdown menu, select 'No LUT selected.'
7. Under the *3D Scopes Lookup Table* dropdown menu, select 'No LUT selected.'
8. Click the *Apply* button, then close the *Project Settings* window.

Note 1: The last two 'No LUT' selections prevent the 3D display calibration LUT from improperly affecting the DaVinci Resolve GUI display.

Note 2: Do not apply the video display 3D calibration LUT directly to the media or to the output node, as this will improperly also apply the 3D LUT to the DaVinci Resolve GUI display.

5. Display Validation section

After you have loaded a 3D display calibration LUT into Resolve, if you wish to validate the display calibration through the Resolve output, you need to run the *Resolve CalMAN Test Patterns.drp* project (see Appendix A) to generate test patterns, as Resolve does not apply a loaded 3D LUT to its internally generated test patterns.

To validate a Resolve 3D calibration LUT:

1. In DaVinci Resolve, close the CalMAN Calibration connection.
2. If you do not already have the "*Resolve CalMAN Test Patterns*" project open, open it now. (See Appendix A for how to download that project and import it into Resolve.)
3. On the Resolve Edit page, select the *Color Checker Classic* timeline.
4. On the Resolve Color page, select the first frame of that timeline.
5. On the CalMAN Source Settings tab, click the Disconnect button to disconnect from the Resolve pattern generator.

6. On the Source Settings tab, select the “Pattern Change Prompts” option.
7. In the CalMAN Color Cube workflow, go to the *Gamma & ColorChecker* validation page.
8. To begin the calibration validation, click the Read Series button.
9. On the CalMAN pattern prompt dialog, click OK to make the first measurement.
10. On the Resolve computer, advance to the next project frame (cursor-down), then click OK on the CalMAN pattern prompt dialog to make the next measurement.
11. Repeat the previous step for the remainder of the 35 test images in the *Color Checker Classic* timeline.

Appendix A – Resolve Project with LUT Validation Patterns

To produce automated test pattern output, Resolve requires an open project with at least one image loaded into a timeline. This project can be one of your regular video production projects, or it can be the “*Resolve CalMAN Test Patterns.drp*” test project that is available from SpectraCal, which can also be used for final LUT validation.

Also, after you have loaded a display calibration LUT into Resolve, if you wish to verify the display calibration through the Resolve output, you need to run the *Resolve CalMAN Test Patterns.drp* project to generate test patterns, as Resolve does not currently apply a loaded 3D LUT to its internally generated test patterns.

To download the “*Resolve CalMAN Test Patterns*” project and import it into Resolve:

1. Download the *Resolve CalMAN Test Patterns.zip* file from the following page to your Resolve computer:

<http://studio.spectracal.com/calman-for-davinci-resolve-project-file>

2. Extract the file to a convenient folder location.
3. Import the project into Resolve. For help with this process, view the tutorial file from the above page.