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#### G3-AN0007-V2: Optimizing Color Rendering of Genie Nano GigE Cameras

# **Generating Color Correction Coefficients Using the Sapera LT Color Calibration Tool**

*For Nano models with P/N: G3-GCXXX with RGB output firmware 1.08 (or greater)* 

#### Overview

This application note describes how to generate user defined color correction coefficients using the Sapera LT Color Calibration tool. The Sapera LT Color Calibration tool is included as part of the Sapera LT SDK installation to generate a matrix of color correction coefficients used by supported Teledyne DALSA color cameras (such as the Genie Nano C1280) to apply color correction to acquired images.

#### **Prerequisites**

To perform color calibration a color correction chart is required. The <u>X-Rite</u> <u>ColorChecker</u> chart is an industry standard 24 patch classic target used to create custom camera profiles.



**Sapera LT SDK** (version 8.32 or greater required for GigE camera color correction), the image acquisition and control SDK for Teledyne DALSA cameras and frame grabbers is available for download from the Teledyne DALSA website <a href="http://teledynedalsa.com/imaging/support/downloads/sdks/">http://teledynedalsa.com/imaging/support/downloads/sdks/</a>



Access to certain drivers and SDK updates are restricted to Teledyne DALSA customers that have registered their development package (SDK). If you have not yet done so, please register your software before proceeding.

#### 📀 Go back to support downloads

Description	Version	Release date
Sapera LT SDK (full version) - Free Download	8.32	2018-06-20



**Note:** Administrative privileges are required to install the Sapera LT SDK.

#### 1. Launch the Sapera Color Calibration Tool

The Sapera Color Calibration tool is available from the Windows Start Menu:



The Sapera Color Calibration tool uses a command ribbon to organize parameters.

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#### 2. Select the Acquisition Device

To select the acquisition device for which to generate color coefficients, click the **Configure** button in the command ribbon (available on the Home tab).



The Acquisition Configuration dialog opens; select the required acquisition server. Optionally, a camera configuration file (\*.ccf) can be specified if available (not required).

Acquisition	n Configuration				×
	Location Acquisition Server:	,	Acquisition Device:		OK
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	Nano-C1280_1	<u> </u>	A0000389	$\sim$	Cancel
	System	_			
	Nano-C1280_1				
	Please select a CCF fil	e			<u>B</u> rowse
	File Description				
	File Name:	N/A			
	Company Name:	N/A			
	Model Name:	N/A			
	Camera Name:	N/A			
	Vic Name:	N/A			
	Server Name:	N/A			
	you n		tion file exists for your board/c xpert utility to generate your Co		ι.

Supported input data formats are RGB 24/32-bit.

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#### 3. Specify the Color Calibration Parameters

In the application command ribbon Parameters section click **Absolute** to calibrate using the absolute method.



Use the Illuminant Type drop-down list to select the <u>standard illuminant</u> that is closest in color temperature and light type (daylight or fluorescent) to the light in the target scene.



#### 4. Grab an Image of the Color Chart

The target scene lighting must contain the color chart and be the same, or as close as possible, to the expected application lighting conditions. The light should be as uniform as possible; a well distributed light ensures maximal signal on every color square of the chart.

Adjust the light intensity and exposure time of the camera so that the DN (digital number) value of the brightest component is as high as possible, but not saturated. Teledyne DALSA recommends a value between 200 and 230 for the brightest component (for an 8-bit image) to allow for variations in the target scene without saturation.

Typically, the yellow (for low temperature illuminants) or white color squares are those with the highest component DN.



Higher signal gives a more accurate calibration but saturation of any component results in an invalid calibration.

If necessary, adjust the ROI such that it surrounds the chart; all 24 color squares must be located (a green square graphic overlay indicates a successfully located color square).



#### 5. Compute and Verify the Color Calibration

Click **Calibrate and Preview** to compute the calibration coefficients.



A calibrated image is displayed to validate if the resulting image is correctly calibrated.



For visualization purposes, the calibrated image's gamma can be adjusted.

The Gamma Adjustment parameter can range from 5 to 100 and corresponds to a gamma of 0.05 to 1.0.

2	Gamma Adjustment 100 🌲



Note the Gamma Adjustment parameter setting is not saved as part of the color correction file that is loaded to the camera (see step 9. Applying Gamma Correction in CamExpert).

#### 6. Save the Color Calibration Coefficients

If the color calibration is satisfactory, save the coefficients by clicking the **Save Coefficients** button. The coefficient matrix is saved as a color correction (\*.ccor) file.



To save the current configuration (parameter settings) of the Sapera Color Calibration tool, click the application icon in the top left and use the **Save Config** command.



The configuration is saved as a Color Calib Parameters (\*.ccal) file. This file includes information such as the calibration method and the color correction matrix and can be loaded using the Open Config command.

## 7. Load Coefficients to Camera with CamExpert

Use Sapera CamExpert to load the color coefficients to the camera. In the File Access Control category, in the Upload/Download parameter field click on **Setting...** to open the File Access Control dialog.

Parameters - Visibility: Guru			×
	Parameter	Value	
Camera Information	Upload/Download	File Setting	
Sensor Control	<< Less	$\overline{}$	
I/O Controls			
Counter And Timer Control			
Advanced Processing			
Cycling Preset			
Image Format Controls			
Metadata Controls			
Acquisition and Transfer Contr			
Action Control			
Event Control			
GigE Vision Transport Layer			
File Access Control			
GigE Vision Host Controls			

In the file Type field, select *Color Correction Coefficients*, click **Browse...**to select the \*.ccor file, then click **Upload (to Camera)**.

File Access Control	×	
Select the type of file to upload or download from the device.		
File Type Available		
Type: Color Correction Coefficients		
File selector: Color Correction Coefficients		
Description: Select the color correction coefficients.		
Note: Depending on the file size and communication speed, the		
transfer could take many minutes, but must not be aborted.		File Upload Completed X
File path:		
E:\ColorCorrection.ccor Brows	:e	The file upload completed successfully.
Upload (to Camera) Download (from Camera) Dele	te	
Close		()

A dialog confirms the file upload status.

# 8. Activate Color Correction Mode Feature

To apply the user defined color correction coefficients to the camera, set the Color Correction Mode to Active and the Color Correction Current Active Set feature to User Defined. These features are available in the Advanced Processing > Color Processing sub-category.

	Parameter	Value
Camera Information	Automatic White Balance	Off
Sensor Control	White Balance On-Demand Cmd	Not Enabled
I/O Controls	White Balance Ratio Reference Compo	Not Enabled
Counter And Timer Control	Balance Ratio Selector	Red
	Balance Ratio	1.0
Advanced Processing	White Balance Period (in ms)	Not Enabled
Color Processing	Color Enhancement Selector	Color Saturation
Cycling Preset	Color Enhancement Control	1.0
Image Format Controls	Color Correction Mode	Active
		User Defined
Metadata Controls	Color Correction Current Active Set	User Denned
Metadata Controls	Color Correction Current Active Set Color Correction Algorithm	Not Enabled
Metadata Controls Acquisition and Transfer Contr		
Metadata Controls Acquisition and Transfer Contr Action Control	Color Correction Algorithm	Not Enabled
Metadata Controls Acquisition and Transfer Contr	Color Correction Algorithm Color Light Source	Not Enabled Not Enabled
Metadata Controls Acquisition and Transfer Contr Action Control	Color Correction Algorithm Color Light Source Correlated Color Temperature	Not Enabled Not Enabled Not Enabled
Metadata Controls Acquisition and Transfer Contr Action Control	Color Correction Algorithm Color Light Source Correlated Color Temperature Color Correction Spectrum Range	Not Enabled Not Enabled Not Enabled

## 9. Applying Gamma Correction

The gamma feature can be adjusted in CamExpert after applying the color calibration, if necessary. To enable gamma correction, set the LUT Mode feature to Active and the LUT Type feature to Gamma Correction. Specify the gamma value, from 0.0 to 2.0, in the Gamma Correction field. These features are available in the Advance Processing category.

Parameters - Visibility: Guru			×
Category		Parameter	Value
Camera Information	^	Defective Pixel Replacement Mode	Off
Sensor Control		Defective Pixel Replacement Map Current Active Set	Not Enabled
Auto-Brightness		Defective Pixel Replacement Algorithm	Method3: Neighboring Pixel
1/O Controls		LUT Mode	Active
,		LUT Type	Gamma Correction 🔻
Counter And Timer Control		Gamma Correction	0.6
Advanced Processing		LUT Selector	Not Enabled
Color Processing		LUT Size	10 Bits/Pixel
Cycling Preset		LUT Index	Not Enabled
Image Format Controls		LUT Value	Not Enabled
Metadata Controls		LUT Value All	Not Enabled
Acquisition and Transfer C		<< Less	
Action Control			
Event Control			
GigE Vision Transport Layer			
File Access Control	~		

#### Using Sapera Processing SDK to Generate Color Calibration Coefficients

Color correction coefficients can also be generated using the Sapera Processing SDK; the Sapera Processing Color Demo saves both \*.ccal and .ccor files.

When generating color coefficient files (\*.ccor) for on-board color correction, Genie Nano cameras require color coefficients be generated using the 3x4 Transform option.

