



Camera Color Matching Application User Manual

Windows

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Introduction

This document explains Camera Color Matching Application (hereafter referred to as “this software”) settings and operations. Carefully read this document before use to ensure correct use of this software.

What is Possible With Camera Color Matching Application

This software allows you to approximate the color tone of Canon remote cameras (hereafter referred to as “source camera”) to that of a reference video production camera (hereafter referred to as “reference camera”). A 3D LUT is generated using color chart images shot by the reference and source cameras, and applied to the source camera to adjust the color tone. This software allows for efficient color matching between cameras, simplifying the process during multi-camera shooting.

User Manual

This document is intended to be read on a computer screen.


■ Notes

- 1 Any unauthorized reproduction of this document is prohibited.
- 2 The contents of this document are subject to change without any prior notice.
- 3 This document has been prepared with the utmost attention to accuracy. For questions or comments, please contact a Canon sales representative.
- 4 Canon shall assume no liability for any outcome of using this product, notwithstanding items 2 and 3 above.

■ Software Screenshots

The software screenshots samples shown in this document are for illustration only. The screenshots may differ from the actual screens displayed. Descriptions use Windows 10 for sample screens.

■ Symbols Used in This Document

Symbol	Meaning
 Note	Supplementary descriptions and reference information.

Operating Environment

For the latest information on this product (manuals, operating environment, etc.), please refer to the Canon website.

System Requirements

■ Supported Cameras

Check the compatible models listed on the download page of this product. Update the camera to the latest firmware.

Limitations

- Make sure to exit all other applications before using this software.
- Make sure to exit this software before reinstalling it or uninstalling it.
- Camera connection using this software is established via HTTPS.
- Although communication via HTTPS proxy is supported, this feature depends on the environmental variables and network settings of the computer on which it is running.
- HTTPS proxy authentication is not supported.
- The computer will not automatically go into sleep or suspend mode while this software is communicating with a camera. It is, however, possible to manually put the computer into sleep or suspend mode during communication.
- When launching this software, sometimes the following message appears: "Do you want to run this file?" Click [Run] to continue launching the software.
- If multiple IPv4 addresses (other than AutoIP) are set on the same computer when using multiple network cards, normal communication may not be possible. If this happens, it is necessary to temporarily switch to a single IPv4 address.
- Check the Canon website for the latest operating environment information when updating the operating system.

Installation

- 1 Double-click [CameraColorMatchingApplicationSetup.exe] in the installation package.



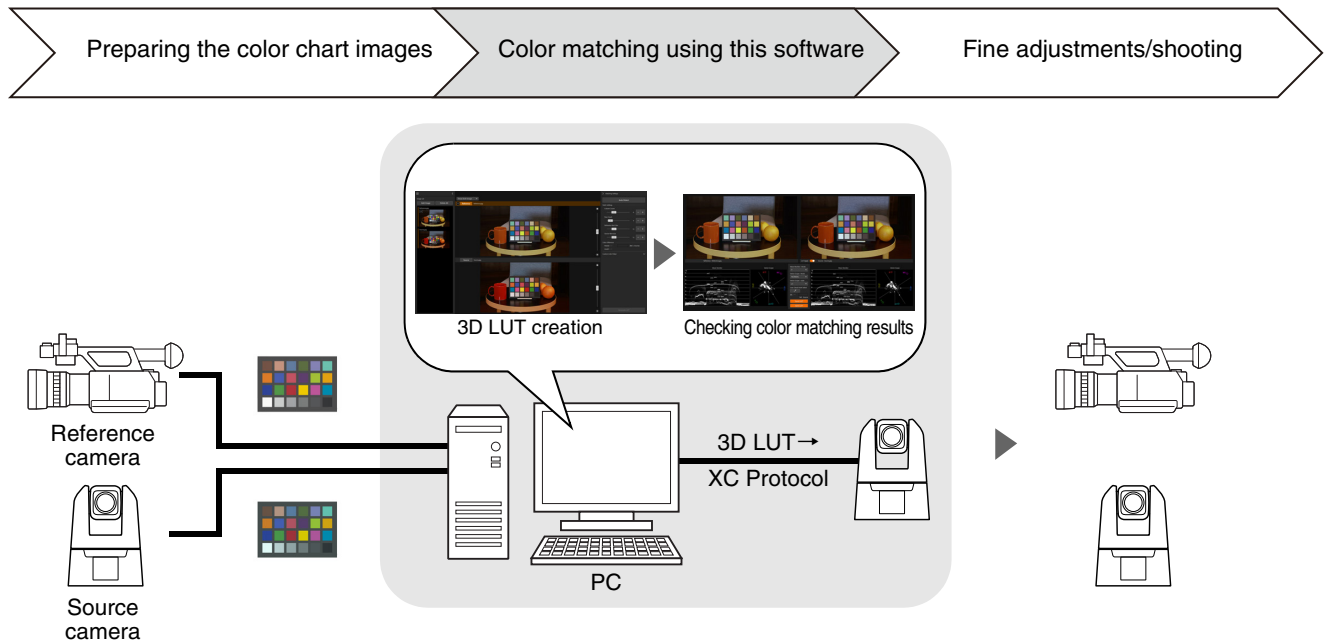
The installation screen appears.

- 2 Follow the instructions on the screen and when the installation complete window appears, click [Close].

This software's icon will be added to your desktop.

Workflow

This section describes the color matching workflow using this software in live production.



1 Prepare the color chart images.

The same color chart is shot by the reference camera and the source camera and converted to a still image (color chart image).

2 Perform color matching using this software.

- The software reads the color chart images from each camera and generates a 3D LUT used for color matching.
- Preview the image with the 3D LUT applied to check the color matching result.
- A 3D LUT is sent to the source camera and is registered as a Look File.

3 Perform fine adjustments/shooting.

If necessary, use the source camera's color adjustment function to make fine adjustments to complete color matching before shooting.

Preparations

Preparing color chart images

The process to prepare color chart images is explained below. The software supports 4 (2x2) to 225 (15x15) color chart patches.

1 Set up the reference camera.

The settings are as follows:

Item	Settings
Resolution	A value close to 1920x1080 or 3840x2160.
Gamma/color space	Same settings as the source camera, or settings with similar characteristics.
White balance	Same settings as the source camera, or a similar color temperature.
Exposure	A value where the brightest part of the color chart does not exceed 100 IRE and the dark part does not present crushed blacks.

2 Set up the source camera.

The settings are as follows:

Item	Settings
Resolution	A value close to that of the reference camera (1920x1080 or 3840x2160).
Custom picture	<ul style="list-style-type: none">• Protection: Disabled• [Gamma/Color Space]: The closest configuration to that of the reference camera• Any existing registered Look Files should be deleted• [Knee: Automatic]: Off• [Over 100%]: [Through]
White balance	A color temperature (K) similar to that of the reference camera.
Exposure	<ul style="list-style-type: none">• [Shooting Mode]: Manual exposure• [Iris (Aperture Value)], [Gain (dB)]: A value at which the video signal level matches that of the reference camera• [Shutter Mode]: [Speed (sec.)] (a value at which the video signal level matches that of the reference camera)

3 Shoot the same color chart for each camera.

Place the color chart in the location of the common subject shot by each camera.

Note

- **Recommended color chart placement:**

The following placement is recommended when shooting a color chart.

- Place it so that it covers about one-third of the width of the entire image.
- Position it as horizontally as possible in the center of the image.
- Ensure that no shadows are cast.

- After placing the color chart, do not move it until you finish shooting with each camera.

- Note that the effectiveness of color matching is reduced if the camera position differs significantly between the actual shooting and the color chart shooting.

4 Convert each camera's image to a color chart image and save it.

Use a video capture device to convert the camera image into a still image (color chart image).
Use the following settings for the conversion:

Image range	File format	Image size
Full range	.jpg .bmp .tif .png	1920x1080 3840x2160

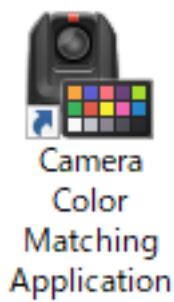


Note

For details on the settings and operation of the reference camera, source camera, and video capture device, refer to the manual of each product.

Launching Camera Color Matching Application

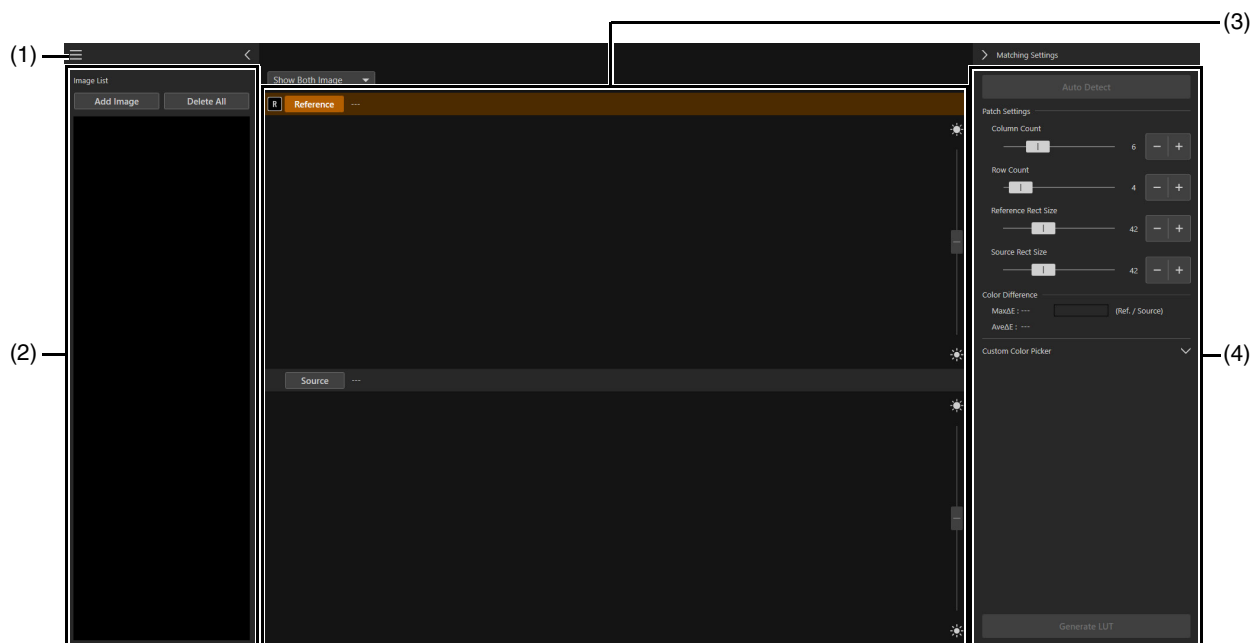
Double-click the icon on the desktop to launch this software and display the main screen.



Note

- To use this software on a computer with an active Windows firewall, it must be registered as an allowed application for communication via the firewall. If not registered, the software may be blocked by the firewall when you attempt to launch it but you can launch the software by clicking [Yes].
- When a message prompts you to install or update .NET, please follow the on-screen instructions to complete the installation.
- Use a display resolution of 1920 x 1080 or higher (scaling: 100%).

Main Screen



(1) Menu button

Displays the menu (LUT file transfer, display of software information, etc.).

(2) [Image List]

When you load a color chart image file with [Add Image], the file name and thumbnail are displayed.

Click [Delete All] to delete all color chart images from the [Image List].

Click < / > to hide/display.

(3) Image Display Area

Displays a magnified image of the thumbnail selected in the [Image List].

(4) Settings Area

Performs various settings for creating 3D LUTs.

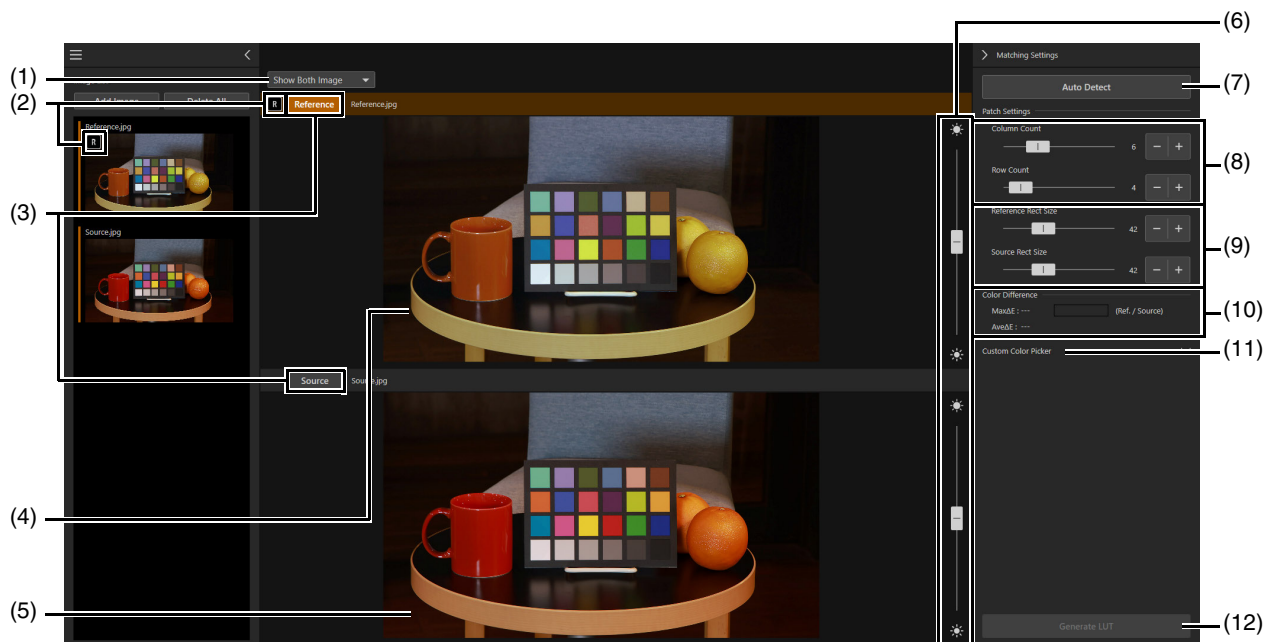
Click > / < to hide/display.

Exiting Camera Color Matching Application

Select [Exit] from the menu or click in the upper right of the main screen to exit.

Performing Color Matching

A 3D LUT is created from the color chart images of the reference camera and the source camera (reference image, source image), and it is applied to the source camera to perform color matching between the cameras.



- (1) **Screen display switch**
Switches the display mode of the image display area between two-screen display (displays both the reference image and the source image), or single-screen display (only one image is displayed).
- (2) **[R] (reference image icon)**
- (3) **[Reference], [Source]**
Displayed during two-screen display. Click to select the image to be operated.
- (4) **Reference image**
Displays the enlarged image of the thumbnail initially selected in the [Image List].
- (5) **Source image**
Displays the enlarged image of the second thumbnail selected in the [Image List].
This is the image to which the 3D LUT is applied.
- (6) **Brightness adjustment slider**
You can adjust the image brightness in 9 levels for the reference image and the source image independently. Move the slider up to brighten the image, or down to darken it. Changing the brightness does not affect the generated 3D LUT.
- (7) **[Auto Detect]**
Automatically detects the color chart in the image and displays a rectangle over each patch indicating the detection area and detection status.
- (8) **[Column Count], [Row Count]**
Sets the number of horizontal and vertical patches in the color chart.
Move the slider or click **+** / **-** to change the value.

(9) **[Reference Rect Size], [Source Rect Size]**

Adjusts the size of the patch detection area (rectangle) of the color chart separately for the reference image and the source image.

Move the slider or click  /  to change the value.

(10) **[Color Difference]**

Once color charts are detected, displays the maximum color difference between the reference and source color charts, as well as each color and the average color difference.

(11) **[Custom Color Picker]**

In addition to the color chart, you can add up to three custom colors.

(12) **[Generate LUT]**

Generates a 3D LUT using the reference and source color chart images.

Selecting color chart images


1 Click **[Add Image]** to load the color chart images from each camera (P. 7).

The respective thumbnail appears on the **[Image List]**.

It is also possible to load multiple files simultaneously.

2 On the **[Image List]**, click the reference camera's color chart image.

The thumbnail is selected (an vertical orange line appears on the left) and the enlarged image appears in the reference image display area.

 is displayed in the thumbnail and reference image display area.

3 Click the color chart image of the source camera.

The thumbnail is selected and the enlarged image appears in the source image display area.



Note

Click the thumbnail again to deselect it.

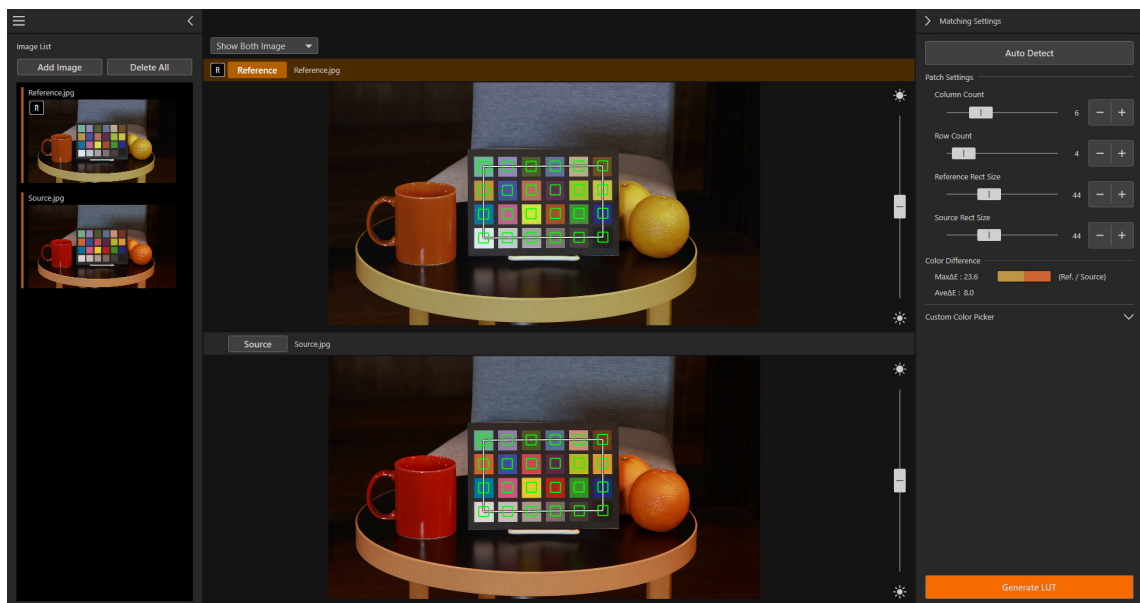
Generating a 3D LUT

You can detect the color chart automatically, or you can set the detection position of the color chart manually.

■ Automatically detecting a color chart to generate a 3D LUT

- 1 Set the screen display mode to [Show Both Image] and click [Auto Detect].

When automatic detection of a color chart is successful, a green rectangle is displayed inside each patch, and the contents of the detected color chart are reflected in the settings area.



- 2 Click [Generate LUT].

A 3D LUT is generated and the [LUT Window] screen is displayed (P. 16).

■ Manually setting the color chart detection position to generate a 3D LUT

You can manually set the color chart detection position for both the reference image and the source image.

1 Set the number of patches.

Use the sliders for [Column Count] and [Row Count] or **+** / **-** to set the number of patches horizontally and vertically.

2 Click [Reference] or [Source] to select the image to operate.

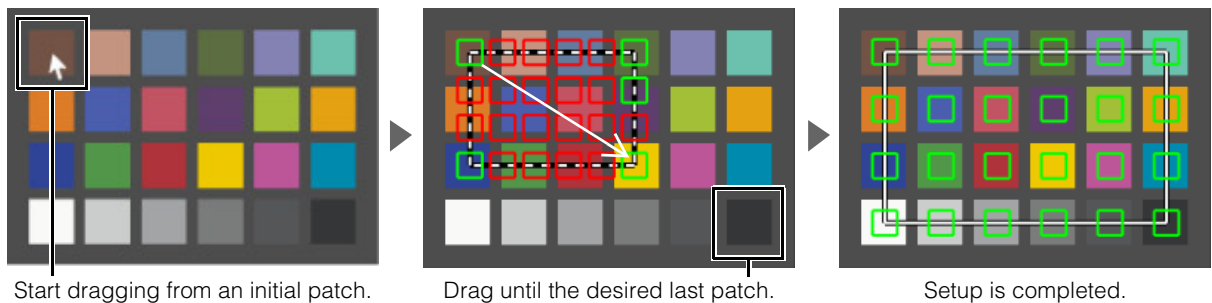
3 Set the patch detection size area as necessary.

Set with the rectangle size slider or **+** / **-**.

4 Set the detection position.

If you drag diagonally from one of the four corner patches in the color chart, a rectangle showing the number of horizontal and vertical patches appears.

Red rectangles indicate an incorrect detection position.



5 Adjust the patch detection area size and the position of individual rectangles until all of them are displayed in green.

If you drag one of the four corner rectangles, you can fine-adjust the position of other rectangles in tandem. You can make fine adjustments independently by dragging rectangles other than the four corner ones.

Note

- If you right-click on the image, the rectangles on the patch will disappear and you can redo the setting.
- When patches are small and difficult to operate, switching to single-screen display makes it easier to operate.

6 Repeat steps 2 to 5 for the other image.

7 Click [Generate LUT].

The 3D LUT is generated and the [LUT Window] screen appears (P. 16).

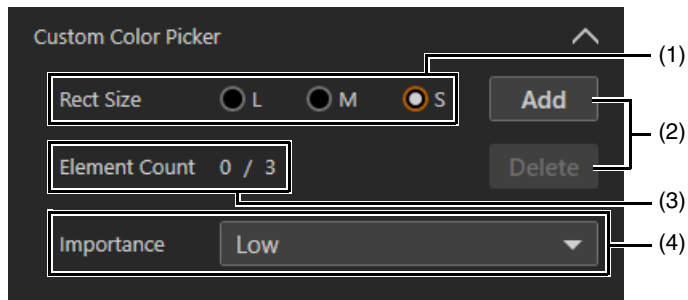
■ Adding custom colors to generate a 3D LUT

In addition to the colors in the color chart, you can add up to three colors from the image used (custom colors). By prioritizing additional colors over colors in the color chart when creating the 3D LUT, you can increase the accuracy of color matching by adding colors that you want to match specifically between cameras.

1 Perform one of the following operations to detect a color chart.

- Step 1 explained in “Automatically detecting a color chart to generate a 3D LUT” (P. 12)
- Steps 1 to 6 explained in “Manually setting the color chart detection position to generate a 3D LUT” (P. 13)

2 Click next to [Custom Color Picker].



(1) [Rect Size]

Selects the size for the custom color detection area (rectangle).

(2) [Add], [Delete]

Click [Add] to add an custom color detection point. To delete the most recently added detection point, click [Delete].

(3) [Element Count]

Displays the number of added custom color.

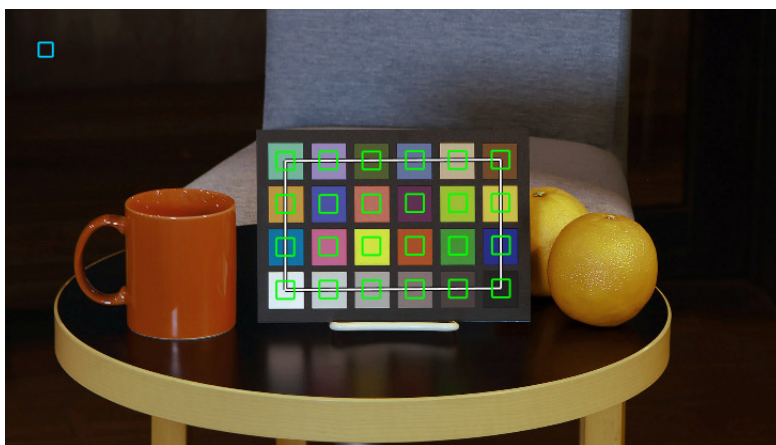
(4) [Importance]

Selects the custom color importance when creating a 3D LUT. The importance will be the same for all custom colors.

3 Select [Rect Size], then click [Add].

A rectangle* is displayed in the upper left corner of the image.

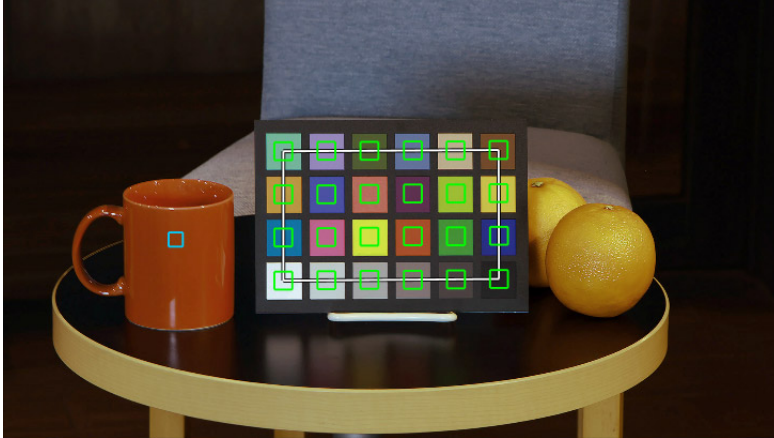
* Displayed in light blue, yellow, and orange in the order they were added.



4 Click [Reference] or [Source] to select the image to operate.

5 Drag the rectangle to the position of the custom color to be added.

If a custom color cannot be detected correctly, the rectangle turns red. If this happens, adjust the position of the rectangle.



6 Repeat steps 4 and 5 for the other image.

7 Repeat steps 3 to 6 as necessary.

8 Select the [Importance] for custom colors.

9 Click [Generate LUT].

The 3D LUT is generated and the [LUT Window] screen appears (P. 16).

■ Generating a 3D LUT from multiple color chart images

You can combine multiple color chart images to generate a 3D LUT. By using color charts shot at various brightness levels, you can generate 3D LUTs that are less affected by brightness changes during multi-camera shooting.

1 Prepare multiple color chart images shot with different brightness levels (P. 7).

2 Select the color chart images (P. 11).

Select images of the reference camera and the source camera shot with the same brightness.

3 Generate a 3D LUT (P. 12, P. 13).

Create a 3D LUT from the first combination of selected images.

4 Click **×** on the top-right part of the screen to close the [LUT Window] screen.

5 Select the color chart images (P. 11).

Select an image shot at a brightness different from that in step 2.

6 When “Do you want to add color data from another color chart to the color data used in the previous 3D LUT creation?” appears, click [Yes].

7 Generate a 3D LUT (P. 12, P. 13).

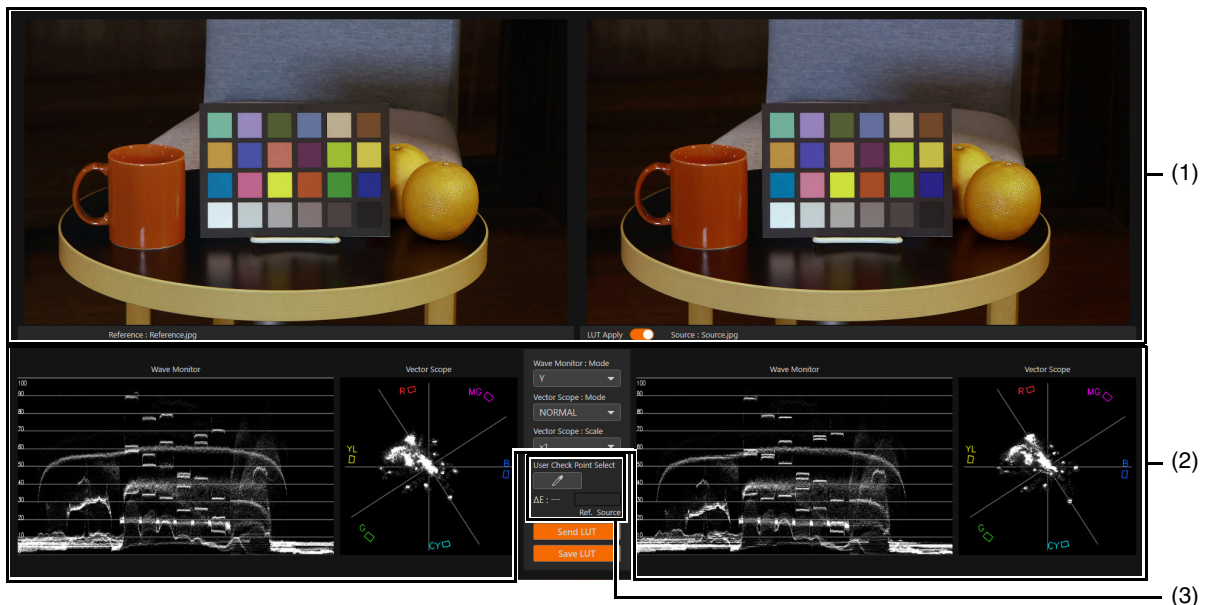
8 Repeat steps 4 to 7 as necessary.

■ Note

When combining multiple color chart images, the total number of custom colors that can be added is limited to three.

Checking the color matching results

The [LUT Window] screen displays the reference image and the preview image (the source image with the applied 3D LUT). By visually comparing both images, you can check the color matching results. In addition to comparing with the waveform monitor and vectorscope, you can also check the color difference between two specified points.



(1) Image display area

The reference image is displayed on the left and the source image is displayed on the right. You can apply or remove the 3D LUT on the source image by turning [LUT Apply] on or off.

(2) Waveform monitor and vectorscope

A waveform monitor and vectorscope for each image are displayed. It is possible to select display settings from the list in the center.



[Wave Monitor : Mode]: You can select the waveform monitor display mode between [Y] (brightness signal) or [RGB] (each RGB signal parade).

[Vector Scope : Mode]: You can select the vectorscope display mode between [NORMAL] (the entire image), [CHART] (the color chart portion), or [OVERLAP] (the color chart portions of the source image and the reference image are overlapped)*.

*The image is superimposed and displayed on the vectorscope of the source image. Red indicates the signal of the source image, and green indicates the signal of the reference image. On the vectorscope of the reference image, only the signal of the reference image is displayed in green.

[Vector Scope : Scale]: You can select the display magnification for the vectorscope.

(3) Color difference

After pressing  under [User Check Point Select], if you click the spot on each image where you want to see the color difference (between the two points) and each color are displayed. When [Vector Scope : Mode] is set to [NORMAL] or [CHART],  is displayed on the vectorscope of each image, and you can confirm the color position of the point you clicked.

Sending a 3D LUT

After checking the results in the preview image, send the generated 3D LUT to the source camera (connected to the same network) and register it as a Look File in the custom picture file*.

* The XC protocol is used when communicating with the source camera.

1 Click [Send LUT] on the [LUT Window] screen.

The [LUT Send Window] dialog appears.

The screenshot shows the [LUT Send Window] dialog box. It has a dark background with white text and input fields. The fields are labeled with numbers in parentheses on the right side: (1) points to the [Search Camera] button, (2) points to the [Destination Address] text box, (3) points to the [Port No.] text box which contains the value '443', (4) points to the [Connect As Guest User] checkbox which is checked, (5) points to the [User name] and [Password] text boxes, and (6) points to the [Show warnings about non-private communications] checkbox which is checked. At the bottom right, there are [Send] and [Cancel] buttons.

- (1) **[Search Camera]**
Searches for cameras on the network and lists them in the dialog.
- (2) **[Destination Address]**
The IP address of the source camera selected in [Search Camera] will be displayed. You can also directly enter the source camera's IP address or host name without performing a search.
- (3) **[Port No.]**
Enter the port number of the source camera.
- (4) **[Connect As Guest User]**
Check this check box to omit entering the user name and password.
The guest user must have [Camera Control] privileges for the source camera.
- (5) **[User name], [Password]**
Enter the source camera's administrator name or registered user name, and password.
To connect as a registered user, the registered user must have [Camera Control] privileges for the source camera.
- (6) **[Show warnings about non-private communications]**
When checked, "This connection is not private. Do you want to continue?" is displayed if the server certificate of the connected source camera is invalid.



Note

- Set [HTTPS Connection Policy] on the source camera to [HTTPS] or [HTTP and HTTPS].
- Adjust the source camera settings to match those used when shooting the color chart (P. 7).

2 Select the source camera from [Search Camera].

3 Enter (3) to (6) as needed.

4 Click [Send] to send the 3D LUT to the source camera.

The 3D LUT is registered as a Look File in the source camera (the file name will be "CameraColorMatchingApplication").

■ Saving a 3D LUT as a file

After checking the preview image, you can save the 3D LUT as a file. By saving the file, you can send the 3D LUT again if the settings of the source camera are reset.

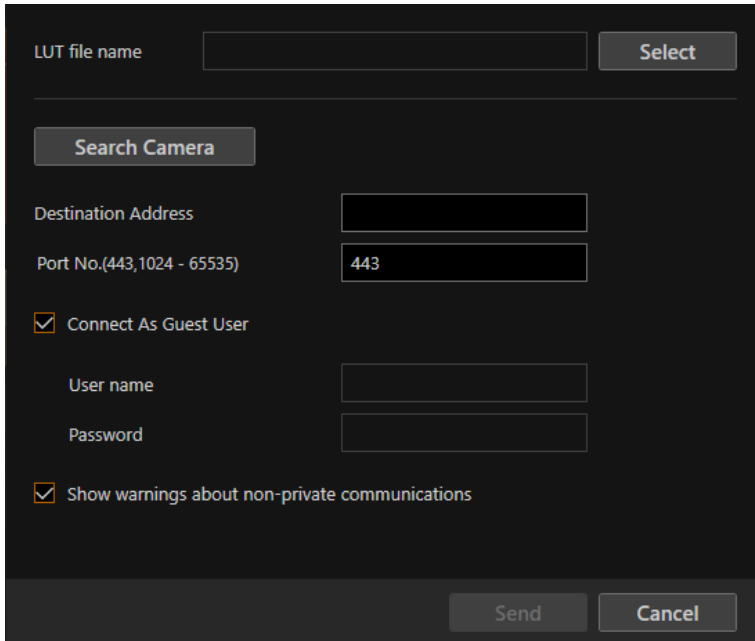
1 Click [Save LUT] on the [LUT Window] screen.

2 Save the LUT file (xxxxx.orgcube) according to the dialog box.

■ Sending a saved 3D LUT file

1 Click the menu's [Send LUT File] setting.

The [LUT Send Window] dialog appears.



2 Click [Select] to select a previously saved LUT file.

3 Perform steps 2 to 4 of "Sending a 3D LUT" (P. 17).

Troubleshooting

Before contacting the retailer from where the product was purchased or a Canon sales representative, check the following items.



Note

For information on troubleshooting for the camera or capture device, refer to the corresponding manual.

Problem	Solution
Colors do not match between cameras after adjusting with the software.	<ul style="list-style-type: none"> Make sure that the viewing angle and orientation of the color chart match between the reference camera and the source camera. This software does not completely match the colors between cameras. Fine-tune the image as needed.
Red rectangles on patches do not turn green even after adjusting their position.	Depending on the size of the patch detection area, rectangles may not turn green easily even after adjusting their position. Try resizing it from [Reference Rect Size]/[Source Rect Size].
[Generate 3D LUT] cannot be pressed even when a color chart is detected.	Patches may not be detected correctly and the rectangles may appear in red. Adjust the image brightness with the brightness adjustment slider and check the color of all rectangles.
The source camera is not detected.	<ul style="list-style-type: none"> Make sure that the source camera is connected to the computer correctly. Make sure that the source camera is turned on. Check the network settings.

List of Messages

When messages appear, take the corresponding measures as described in the following table.

Message	Description
Failed to read file.	A file other than an image file is selected. Select an image file.
Failed to detect chart automatically.	<ul style="list-style-type: none"> If the color chart is partially obscured, shoot the color chart again so that the entire chart is visible. In the following cases, set the color chart detection position manually. <ul style="list-style-type: none"> When there is a grid shaped subject other than the color chart. When the color chart is not a grid.
LUT generation failed.	<ul style="list-style-type: none"> Check that images of the same color chart taken with the reference camera and the source camera are selected as the reference image and the source image respectively. If the placement of the color chart is not as recommended (P. 7), you may not be able to create the 3D LUT.
Registration failed.	<ul style="list-style-type: none"> A connection failure occurred between the PC and the source camera when sending a 3D LUT. Check the connection. The user account does not have [Camera Control] privileges for the source camera. Grant the privileges from the Settings Page of the source camera.
The custom picture file is protected, so please cancel protection.	Disable custom picture file protection for the source camera.
Cannot connect as guest user.	The user privileges required for guest users are not set. Do one of the following: <ul style="list-style-type: none"> Grant [Camera Control] privileges to a guest user from the source camera's Settings Page. Clear the [Connect As Guest User] check box and connect from a user account with [Camera Control] privileges.
User authentication failed.	<ul style="list-style-type: none"> The account information you entered is incorrect. Please check and re-enter your account information. The user privileges required for the registered user have not been set. Grant [Camera Control] privileges to the registered user from the source camera's Settings Page.
Could not connect to camera. Check entered details.	The IP address or port number you entered is incorrect. Verify the IP address and port number and enter them again.

Message	Description
Failed to save LUT file.	<ul style="list-style-type: none"> • Unable to access save destination. Make sure that the save destination is specified correctly. • There is not enough free space in the save destination. Delete unnecessary files or specify another destination.
Failed to read LUT file.	The selected file is not a LUT file saved with this software. Please reselect the LUT file.

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