

Calibration Pro

User Manual

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Chapter1 Calibration System

Calibration Pro is a professional software developed by Colorlight for LED display calibration. It integrates advanced algorithms such as AI intelligence and machine vision, enabling LED display calibration with high accuracy and high efficiency.

1.1 Operating Environment

Operating system	Windows10 or later (64-bit or above)
	16G or more (64G RAM is recommended for calibration
RAM	with CCM6000 camera. RAM smaller than 64G will
	affect the calibration efficiency.)
	With multi-media port (e.g.: HDMI), USB port, and
Communication	Gigabit network port.
	Either with a graphics card that supports full-screen
Display	pixel-to-pixel display, or with a sender that supports
	controlling LED display via USB.

1.1.1 System Requirement

1.1.2 Capture Device

1.1.2.1 Industrial Camera

• Camera: CCM6000

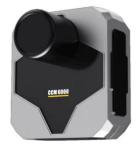


Fig.1-1 Camera body of CCM6000



• Lens: Milvus 1.4/50 (Standard); Or, Milvus 2/35 or Milvus 2/100 (Optional)



Fig.1-2 Milvus 2/35







Fig.1-4 Milvus 2/100

• Tripod head: Manfrotto 405 geared tripod head (Standard)



Fig.1-5 Manfrotto 405 geared tripod head

• Tripod: Manfrotto MT190GOC4TB tripod (Standard)



Fig.1-6 Manfrotto MT190GOC4TB tripod

• Cable: Special power adapter and USB 3.0 cable (Standard)



Fig.1-7 Power adapter and USB 3.0 cable

1.1.2.2 Canon Camera

 Camera: Support for Canon70D, 80D, 90D, 7D, and 7D MarkII. Canon 90D is recommended.



Fig.1-8 Canon camera

• Lens: Canon EF 70-300mm f/4-5.6L IS USM is recommended.



Fig.1-9 Canon EF 70-300mm f/4-5.6L IS USM

• Tripod head: Manfrotto-410 tripod head is recommended.



Fig. 1-10 Tripod head

• Tripod: MT190GOC4TB -190GO tripod is recommended.





Fig.1-11 Tripod

• Power adapter:



Fig.1-12 Power adapter

• Cable: Subject to the model of Canon camera.

1.2 Install and Uninstall

1.2.1 Install Calibration Pro

Download the latest version of *Calibration Pro* from Colorlight's official website first. Then, double-click the installer ^{Calibration_Setup} to start the installation.

1) Select the default software language.

Installer	anguage	×
0	Please select a language.	
	English	~
	ОК	Cancel

Fig. 1-13 Select the default language

2) Select an installation method at the first page of the setup wizard.





Fig.1-14 Calibration Pro setup wizard

- Quick Install: Select Quick Install and then click Next to start auto installation.
- Custom Install: Select Custom Install and then click Next to continue.
 - Select a path for the installation and then click Next.

Choose Install Location	
Choose the folder in which to install Calibration 7.20.	
Setup will install Calibration 7.20 in the following folder Browse and select another folder. Click Next to contin	
Destination Folder	
Destination Folder C:\Program Files\Calibration	Browse
	Browse

Fig 1-15 Select Installation path

Select the components you want for *Calibration Pro*, and then click
 Install (in order to ensure the full functioning of *Calibration Pro*,



please select all components for the first-time installation or version update).

hoose Components			-	
Choose which features of Calib	ration 7.20 you want to install.		2	
Check the components you war install. Click Install to start the i		mponents you don't	want to	
Select components to install:	Common Files	Description Dependens Fil files must be ir the first time.		
Space required: 224,4MB				
	< Back	Install	Cancel	-32

Fig.1-16 Select components

Click Finish to exit the setup wizard. Calibration Pro is now ready for use.



Fig.1-17 Installation complete

Once you have finished the installation, the icon of Calibration Pro



will automatically appear on the PC desktop. You can double-click the icon to launch the software.

1.2.2 Uninstall Calibration Pro

Taking the Windows 10 operating system as an example, if you want to uninstall *Calibration Pro*, you can navigate to **Start** > **Calibration**, and then right-click on any icon under the **Calibration** folder to bring up a context menu. Next, select **Uninstall** to access the uninstallation guide.

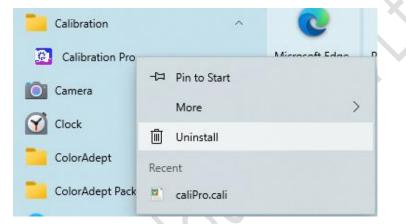


Fig.1-18 Uninstall Calibration Pro

Chapter2 Quick Start

2.1 Before Calibration

2.1.1 Complete System for Calibration

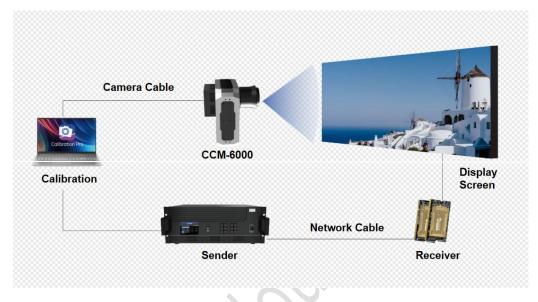


Fig.2-1 The complete system for calibration

- Install *Calibration Pro* on your PC.
- Connect your PC to the sender using network cable.
- Connect your PC to the camera using the camera cable.

2.1.2 Parameter Configuration

Configure the screen parameters (receiver parameter and topology) properly using the software *LEDVISION*. During parameters configuration, disable calibration and other adjustment functions to ensure the original display effect of the screen. Once you have finished the configuration, send and save the parameters to the receiver. Next, exit *LEDVISION* and other LED display control software.

2.2 Start Screen

The start screen of *Calibration Pro* is as shown in Figure 2-2.

O Calibration Pro		e 6	8 Č	<u>ි</u>]් Connected	Opened	모문 Con	inected	8		×
Welcome to Calib	oration Pro!									
New Project	Language and He	elp								
New full-screen calibration	中文									
New cabinet calibration	English									
New Subscreen	O User manua	d								
Copy from										
Open Project										
E:\未知文件夹\6.2工程文件\Test00	1									
E:\未知文件夹\6.2工程文件\Test00	2									
E:\未知文件夹\6.2工程文件\Test00	4									
E:\未知文件夹\6.2工程文件\Test00	3									
Browse										
-										

Fig.2-2 Calibration Prostart screen

2.2.1 New Project

- New full-screen calibration: Click to start creating a new full-screen calibration project.
- __

New cabinet calibration: Click to start creating a new single-cabinet calibration project.

Copy from: Click to apply project setup wizards of a saved project for calibrating multiple screens with the same specification.

2.2.2 Language and Help

*2

中文: Click to set Chinese as the software language.



English: Click to set English as the software language.



User manual: Click to access the Calibration Pro User Manual.

2.2.3 Open Project

You can find your recent projects below **Open Project** and click on any one of the projects to access its editing interface.



Browse: Click to select a calibration project from a desired folder.

2.2.4 Status Bar

The status bar is located at the top right of the main interface, allowing users to obtain information about the current status through icons and text prompts.



Fig.2-3 Status bar

- New: Click the icon 🗈 to access the calibration project setup wizard.
- **Open:** Click the icon 🗁 to select a saved project file.
- Save: Click the icon 🖹 to save the current project parameters.
- **Connect:** Click the icon it to connect to the camera. The icon will appear as ince the camera has been connected.
- Start EVF: Click the icon 🖾 to enable EVF. The icon will appear as 🖾 once the EVF has worked successfully, and you can view the image captured in the monitoring area in real time.
- **Display control connection:** Click the icon 🐨 to access the interface for connecting the control PC. The icon will appear as 😨 once the control PC has been connected.

Chapter3 Calibration with Industrial Camera

3.1 CCM6000 Assembly

3.1.1 Tripod Setup

Unfold the tripod and adjust its height, making it face the screen center, or at a height close to the user's eye level.



Fig.3-1 Unfold the tripod

3.1.2 Mount Tripod Head

Align the screw hole at the bottom of the tripod head with the mounting screw of the tripod, and then screw the tripod head clockwise.



Fig.3-2 Mount the tripod head

3.1.3 Mount Camera

1) Adjust the quick-release lever of the tripod head to the left.

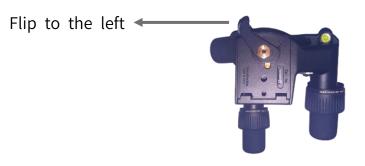


Fig.3-3 Mount tripod head

2) Adjust the lens direction to make it align with that of the tripod head.

3) Mount the camera onto the plate of the tripod, and the lever will be automatically released to fix the camera.



Fig. 3-4 Mount the camera

3.2 Full-Screen Calibration

3.2.1 New Full-Screen Calibration

Step 1: Full-screen project wizard-1

In the start screen, click **New full-screen calibration** to access the **Full-screen project wizard-1**. See Figure 3-5.



20	te			Service not found?	
Status	PC name	User name	IP	Usage status	

Fig.3-5 Select Local

1) For calibration with a single control PC, select **Local** to connect to the control PC.

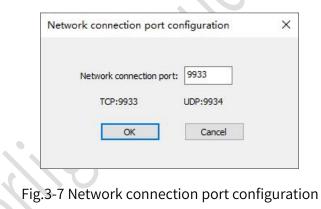
2) For calibration with 2 PCs, select **Remote** and then select a PC from the sheet below as the control PC (available PCs in the currently used LAN will automatically be shown in the sheet). Once you have selected the target PC, click **Connect**.

	Remo	te			Service not fou	ind?
	Status	PC name	User name	IP	Usage statu:	s
2						
		C port 9933	TCP:9933 UDP		onnect Disconn	

Fig.3-6 Select Remote

Notes:

- ① It is recommended that you select **Remote** when the sender is placed far from the LED screen, and the control PC cannot physically connect to the sender via a cable.
- ⁽²⁾ For calibration with 2 PCs, the PCs should share the same LAN (connected via WIFI or network cable), and the firewalls of them should be turned off. The 2 PCs should install *Calibration Pro* of the same version.
- ③ The PC for display capture will automatically launch *CaliPro Server* and should be connected to the control PC.
- ④ The Control PC port is 9933 by default. If the default port has been occupied by other devices, you will need to set a port number for both the control PC and the PC for display capture. To modify the port number, right-click the software interface or minimize the interface in the control PC, and then access the network setup window to enter a new port number. See Figure 3-7.



After the control PC finished network connection, click **Next** to bring up the **Full-screen project wizard-2**.

Step 2: Full-screen project wizard-2

In the **Full-screen project wizard-2**, you will be able to view information about the amount of the connected sender and receiver, their model, and their program version. See Figure 3-8.

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Full-screen project wizard-2	×	
Sender		
X100 Pro 1.001 total		
Control LED display via USB (if send	ler supports)	
Receiver		
i10 1.001 total	Refresh	
Select screen group		
Screen Group Name	Status	
Screen group 1	✓	5
Screen group 2		
Back Next	Cancel	

Fig.3-8 Full-screen project wizard-2

- If the sender supports display control via USB, you can select the Control LED display via USB (if sender supports) checkbox. This will allows for pixel-to-pixel calibration image display without video signal.
- If the sender does not support USB control, you can perform calibration using video signal. Note that you should perform calibration with an extended screen in this case (see Project settings-Canvas settings in the following descriptions for reference).
- If the sender supports controlling screen group, you will be able to select the desired group for control in this window.

Then, you can click Next to move on to the Full-screen project wizard-3.

Step 3: Full-screen project wizard-3

You can finish camera settings in this step. See Figure 3-9.

○ Canon	
-	``
Lens model Milvus 1.4/	50 ~

Fig.3-9 Full-screen project wizard-3

- If your PC has not connected to the camera, you should finish settings in this step according to the camera you use. Supported camera models include: CCM1600, CCM2600, CCM6000, and CCM900C.
- If your PC has connected to the camera, the camera model will be automatically selected.
- If the camera you use is the CCM6000, you will need to select the lens model. The supported lens include: Milvus1.4/50, Milvus2/35, Milvus2/100, Canon 35, and Canon 70-300.

Once you have finished the camera settings, you can click **Next** to bring up the **Full-screen project wizard-4**.

Step 4: Full-screen project wizard-4

Full-screen project wizard-4				×
O High brightness calibration	O Brightness	◯ Chroma	◯ Seam co	rrection (only)
O Low brightness calibration	High-precision (apture 🗸		
		Back	Next	Cancel

Fig.3-10 Full-screen project wizard-4

Colorlight

You can select the calibration mode in this step. See Figure 3-10. You should first select **High brightness calibration** or **Low brightness calibration** according to your need. Then, you can select calibration mode among **Brightness, Chroma,** and **Seam correction (only). High-precision capture** and **Quick capture** are supported in **Low brightness calibration** mode.

- Brightness: Supports calibrating screen for brightness uniformity.
- **Chroma**: Supports calibrating screen for brightness and color uniformity.
- Seam correction (only): Supports calibrating the bright and dark lines that appears on the screen after the assembling.

After the selection, you can click **Next** to move on to the **Full-screen project wizard-5**.

Step 5: Full-screen project wizard-5

You can finish the setup of the module, cabinet, and screen in this step. See Figure 3-11.

Module			
Width 80 🗸	Transpare	ent	
Height 60 V	СОВ		
Pixel pitch 1 m	m IMD	Virtual pixel	4 LEDs (G)
Cabinet			
With cabinet (Only for	screen with single-t	type cabinet)	
Width 160		Height 120	
Note: Set size manually fo	or cabinet with multi-	receiver.	
	or cabinet with multi-	-receiver.	
Note: Set size manually fo	or cabinet with multi-	receiver. Height 360	
Note: Set size manually fo			mm

Fig.3-11 Full-screen project wizard-5

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- With Cabinet (Only for screen with single-type cabinet): This checkbox is selected by default. Select this checkbox when the screen is composed of cabinets of only one type.
- **Transparent:** This checkbox should be selected when the horizontal pixel pitch is different from the vertical one.
- **COB:** Select this checkbox when COB module is used for the currently calibrated screen.
- IMD: Select this checkbox when IMD module is used for the currently calibrated screen.
- Virtual pixel: Select this checkbox when virtual pixel is used for the currently calibrated screen. Available options for this include: 4 LEDs (R), 4 LEDs (G), 4 LEDs (B), and 6 LEDs.
- **Pixel pitch:** *Calibration Pro* will recommend a proper pixel pitch once the receiver is detected. Normally it is 0 by default, and you can enter a new pitch according to the real situation.

•	Irregular screen settings
---	---------------------------

Irregular screen setti	ngs	×
Screen type One-fold Width:	Curved screen Regular screen Curved screen Polygonal screen LED dome screen Sector-shaped screen LEDs-diamond-layout screen	0
	OK Cancel	

Fig.3-12 Irregular screen settings

• **Curved screen:** Select this checkbox when the screen is a curved one assembled by modules with the same LEDs in row and in column. You



should also enter a value in the **One-fold Width** input box for a curved screen according to the real situation. See Figure 3-13.

Irregular screen setti	ngs	×
Screen type	Curved screen V	0
One-fold Width:	32	
	LEDs-diamond-layout screen	0
	OK Cancel	

Fig.3-13 Curved screen settings

- Polygonal screen: Select this checkbox when the screen is an irregular one assembled by rectangular modules with the same LEDs in row and in column.
- LED dome screen: Select this checkbox when the screen is an irregular one assembled by modules with the same LEDs in row or in column. You will need to set the module layout for this type of screen according to the real situation.

Irregular screen setti	ngs	×
Screen type	LED dome screen	~ ?
Module layout	Same in rows Same in rows Same in columns LEDs-diamond-lay	out screen
	ОК	Cancel

Fig.3-14 LED dome screen settings



Sector-shaped screen: Select this checkbox when the screen is sector-shaped and is formed by identical triangular modules. You will need to select the corresponding module layout and enter a value in the Sector Width input box according to the real situation.

Irregular screen settir	ngs	×
Screen type	Sector-shaped screen	0
Module layout	Same in rows	0_{X}
Sector Width:	32	
	LEDs-diamond-layout screen	3
	OK Cancel	

Fig.3-15 Sector-shaped screen settings

• **Distance to ground:** This field indicates the real distance between the bottom of the screen and the ground (unit: mm).

Click Next when you finish this step.

Step 6: Full-screen project wizard-6

You can set the margins of the screen in this step. See Figure 3-16.

Full-screen project wizard-6	×
Margins 0	7
0	0
0	
Back Next	Cancel

Fig.3-16 Full-screen project wizard-6

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In this step, the screen will display a white frame. In this window, you can enter the number of LEDs that will not be lit during calibration respectively in the four input boxes around the frame, according to the installation of the screen at site.

• When *Calibration Pro* has detected more than 1 sender, you will need to set the sender layout before continuing the wizard-6. See Figure 3-17.



Fig 3-17 Sender layout settings

In this step, you should enter the rows and columns of the senders according to their real layout. Click a sender to set its size and position in the load area. You can also exchange the control area and position of two senders by dragging them in this interface. Once you have finished the sender settings, you can click **Next** to move on to the setup of **Margins** and do as described above. See Figure 3-16.

Once you have finished setting the margins, click **Next** to continue.

Step 7: Full-screen project wizard-7

You can name the calibration project and select a path for saving it in this step. See Figure 3-18.

Save as					
Name	<enter a="" nar<="" project="" td=""><td>me></td><td></td><td></td><td></td></enter>	me>			
Location	E:\未知文件夹\6.2	工程文件\	 		
				1	

Fig.3-18 Full-screen project wizard-7

Name: Enter the name of the calibration project in this field.

Location: Select a path for saving the project file and data in this field.

Once you have finished this step, you can click **Save** to apply all the settings finished in the above 7 steps, and you will be prompted the recommended shooting distance (see Figure 3-19). Next, click **OK** to finish the full-screen calibration project setup and access the main interface for this project.

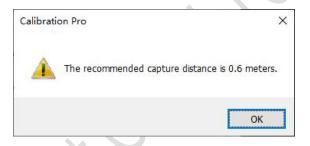


Fig.3-19 The reminding message for the recommended shooting distance

3.2.2 Project Settings

The main interface of the full-screen project is as shown in Figure 3-20. You should first set the basic parameters for the project in the **Project Settings** tab.



oject path	ljustment 🛛 🔛 Image Ca		1 	Display at i Brightne
::\未知文件夹\6.2工程文件\10		Browse	1-1	
ender control mode	Calibration mode			
Sender No sender detected Detect	Chroma	Seam correction		
Receiver No receiver detected Settings	Auto-Detect	Effects settings		
reen settings				
Screen width 256 Cabinet width 64	Module width 32	Margins		Shoot Analyze
creen height 256 Cabinet height 64	Module height 32			
artition size				
Width 256 Column count	1	Modify		
Height 256 Row count	1			

Fig.3-20 Main interface of full-screen project

3.2.2.1 Sender Mode

In the **Project Settings** tab, *Calibration Pro* will automatically detect senders and receivers once the control PC has been connected, and the senders and receivers that have been detected will be shown in the tab. See Figure 3-21.

Sender cor	ntrol mode			Calibration mode	
Sender S20	Pro 1. 02 t	otal D	etect	Chroma	Seam correction
Receiver i9+	15.51 16 to	otal	tings	Auto-Detect	Effects settings
Screen set	tings				
Screen v	vidth 256	Cabinet wid	th 64	Module width 32	Margins
	-	_			
	eight 256	Cabinet heig	ht 64	Module height 32]
	-	Cabinet heig	ht 64	Module height 32]
Screen he	-	_	ht 64	Module height 32	Modify

Fig.3-21 Basic information in sender mode

• **Detect**: Click **Detect** to detect the currently connected senders and receivers, and then you will be able to view information about the model, version number, and amount of the detected senders and receivers.

• Settings...:

1) Click Settings... to bring up a pop-up window for setting the sender control mode. If there is no more than 1 sender detected, you can only enable or disable the option Control LED display via USB (if sender supports). See Figure 3-22.



Fig.3-22 Control LED display via USB (if sender supports)

Note: When the serving end is connected, selecting **Control LED display via USB** will maximize the canvas to foreground, and deselecting the option will minimize the canvas to background.

2) If the amount of the senders that have been detected exceeds 1 (there are multiple senders cascaded for calibration), you will be able to set the layout of the senders in sender setup wizards.

Sender setup wizard-1

In **Sender setup wizard-1**, you can divide the screen into several partitions according to the load capacity of the sender. There are 2 ways available, as shown in Figure 3-23.



ns 2
nn 2 ~

Fig.3-23 Sender setup wizard-1

① **By size**: Divide the screen based on the size of each partition.

② **By block count**: Divide the screen according to the rows, columns, and number of partitions you set.

Once you have set up the principle for screen partitions based on the real control area of the senders, you can click **Next** to continue.

Sender setup wizard-2

In this step, you can set up the partitions. See Figure 3-24.

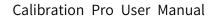




Image: Second secon	ler setup wizard-2)
1 0 960 540 2 100 0 960 540 3 0 540 960 540			Regular la	ryout			Reset	
2 100 0 540 3 0 540 960 540			Block	Start Y	Start X	Width	Height	
3 0 540 960 540								
				and the second se	and the second se	and the second		
1 2 3 4 960 540 960 540 3 4								
1 2 3 4			4	960	540	960	540	J
	3	4						
					Back	Save	Cance	H
Back Save Cancel								-

Fig.3-24 Sender setup wizard-2

- Regular layout: If you select this checkbox, you can only set the size of the sender-control area in a way that makes the partitions align in rows and columns. You can modify the size of each sender-control area individually after deselecting this checkbox.
- **Reset**: Click to reset the positions and size of the sender-control area.

Click Save once you have finished the setting process.

3.2.2.2 Calibration Mode

Click **Switch** to choose a calibration mode. Available options include: **Brightness**, **Chroma**, and **Seam correction** (only). See Figure 3-25.

Calibration mode	×
OBrightness	
Chroma	
O Seam correction ((only)

Fig.3-25 Available calibration modes

3.2.2.3 Seam Correction

A dark line will appear when the seam between modules or cabinets is too wide. Similarly, a bright line will appear when the width of the seam is less than the pixel pitch. Such dark or bright line issue can be fixed by adjusting the brightness of the LEDs on the target seam.

• Seam correction: Click Seam correction in the Project Settings tab, and then select the Enable checkbox in the pop-up window to enable the seam correction function. See Figure 3-26.

eam correction		×
Intensity		
<u> </u>		1.00
Recommended		
	ОК	Cancel

Fig.3-26 Seam correction settings

• Intensity: If you find the correction effect not as expected, you can move the slider below to change the adjusting intensity for seam correction. The default intensity is 1. If the original dark (or bright) line turns to be too bright (or too dark) after seam correction, you can lower the intensity appropriately. However, if you find the line still relatively dark (or bright) after the correction, you can increase the intensity appropriately.

Note: If you have selected **Seam correction (only)** before, you cannot perform the brightness/chroma calibration, and the seam correction function will be enabled by default. See Figure 3-27.



eam correction		×
🗹 Enable 🛛 🗹 Seam	correct	
Intensity		1.00
Recommended		
	ОК	Cancel

Fig.3-27 Seam correction (only) settings

3.2.2.4 Effects Settings

You can click **Effects settings** to access the corresponding interface. See Figure 3-28.

- Interchangeable after calibration: This option is selected by default to enable eliminating differences between the partitions after calibration.
- Image dust off: This option is selected by default to enable eliminating the post-calibration bright spots caused by dust from camera/lens.
- Ambient light intensity: The industrial camera can work for calibration when ambient light exists, but the camera cannot adjust itself automatically to match the light. Therefore, you can select Strong, Weak, or None according to the real situation of the ambient light at site.
- Dead pixel rate: This field shows the ratio of dead pixels to the entire screen. You can adjust the ratio based on the actual situation (0-50‰). Note that if the actual dead pixel rate exceeds the rate you have set, a failure will occur.



Effects options		- T	
Description partitions, I	eable after calibration geable after calibration) : Eliminate the difference be Disable it when there are blo t color differences.		
🗹 Color moiré	removal		
	: Eliminate the post-calibrati ed by dust from camera/lens		
Ambient light in	tensity		
Auto	⊖ Strong ⊖ Weak	None	
	o re-analysis is needed after		
changing lig	ght intensity.		
Dead pixel 3	%0		. X(

Fig.3-28 Effects settings for the CCM-6000 camera

COB: If you have selected **COB** before, the available options in **Effects settings** will not include **Interchangeable after calibration** and **Image dust off**, as shown in Figure 3-29.

Effects options Ambient light in	tensity		
Auto		⊖ Weak	None
changing lig	o re-analysis is r ht intensity.	eeded afte	r
Dead pixel 3	%0		
	OK		Cancel

Fig.3-29 Effects settings for CCM6000 (COB module)

3.2.2.5 Screen Settings

creen width	256	Cabinet width 64	4	Module width	32	Margins
creen height	256	Cabinet height 64	4	Module height	32	Canvas settings

Fig.3-30 Screen settings



Screen width and height: Set the width and height of the full-screen.

Cabinet width and height: Set the width and height of a single cabinet.

Module width and height: Set the width and height of a single module.

• Margins: Please refer to relevant description in Step 6: Full-screen project wizard-6 above.

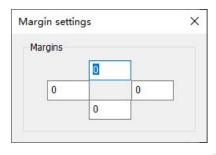


Fig.3-31 Margin settings

 Canvas settings: If you have not selected Control LED display via USB (if sender supports), you will find the Canvas settings option in Screen settings. Click this option to access the pop-up window where you can set the start coordinates of the canvas.

Canvas settings	
Canvas location	
Start X:	
Start Y: 0	

Fig.3-32 Canvas settings

3.2.2.6 Partition Size

Regular screen calibration

Calibration Pro will recommend a proper partition size according to the size of the screen. You can click **Modify** to change the partition size if necessary.



lodify

Fig.3-33 Partition size settings

Note:

1) For a regular screen by default, 16 LEDs will overlap between partitions, and for a COB screen, 256 LEDs will overlap between partitions by default.

2) Once you have finished modifying the partition size, the number of intervals will automatically be calculated. Below the **Number of intervals** field, you can view a reminder telling you the number of photos that will be captured in each partition. See Figure 3-34.

×
Supersampling ? Auxiliary intervals 1
Width 256 Column count 1
Height 256 Row count 1
Note: It is recommended that the size of a single JumpPoint photo per partition should not exceed 960*640.
Horizontal overlapping pixels 256
Vertical overlapping pixels 256
Note: Overlapping pixels between partitions
Number of intervals 0
Note: Take 3 photos per partition.
Сапсеl

Fig.3-34 Modify the partition size

3) **Supersampling** can be enabled to reduce the impact of display coupling on calibration. The **Auxiliary intervals** is 1 by default and is modifiable.



4) If LEDs-diamond-layout screen has been selected before, an additional option Photo capture settings will be available in the Modify partition size settings window. You can select photos captured at intervals for metering based on your need.

Photo capture settings					×
Metering	5	~			
Photo captu	e settings				
	1	2	3	4	
	5	6	7	8	
	9	10	11	12	
	13	14	15	16	

Fig.3-35 Photo capture settings for screen with diamond-layout LEDs

You can select a partition from the **Partition preview** window or from the right side of the **Project Settings** tab. The selected partition will then be displayed with a white frame on the LED screen.

	Row: Column: 12	Browse	Drawing se		OverSamp	
	Row: S Column: 12	Browse	Drawing se	ettings		
	1-1	2-1		1	Selected partition settings	
	1				x <u>0</u>	Y 160 Module settings.
	1-2		2-2		Width 736	Apply to Row Column
	1-2		2-2		Height 288	Apply to Row Column Apply
. 1	2				Pixels overlapped (H) 0	Apply to Row Column
				l.	Pixels overlapped (V) 0	Apply to Row Column
(
	1-3			2-3	Intervals (H) 0	
					Intervals (V) 0	
	3				Intervals (v)	
	1-4			2-4		
	1-4			2.4		
					ок	Cancel
	4			0 0		
				÷ C		

• LED dome screen and sector-shaped screen calibration

Fig.3-36 Modify partition size of LED dome screen and sector-shaped screen

Colorlight

1) In the window, you can see the recommended partition size based on the module size. You can modify the size and apply the new partitions to corresponding rows or columns. You can also modify the partition size by changing the row count and column count.

2) By default, there is no pixel overlapping both horizontally and vertically. You can modify the number according to your need and then apply the change to corresponding rows or columns.

3) The default horizontal and vertical intervals are recommended results from *Calibration Pro*, and you can modify them manually according to your need.

4) If you have selected **Same in rows** (i.e., the modules are the same horizontally) before, you should click **Drawing settings** and then enter the receiver row count in corresponding field. Next you can import the actual pixel drawing table.

Receiver row count:	37	W × H 110	40x3520	
Receiver row	File name	Status	Operation	W × H
1	1.csv	ОК	ъхq	552×64
2	2.csv	ОК	ωхq	552×96
3	3.csv	ок	ъхq	368×96
4	4.csv	ок	le x q	368×96
5	5.csv	ОК	ъхq	368×96
6	6.csv	ОК	ωхq	184×96
7	7.csv	ок	Έxα	18 <mark>4x</mark> 96
8	8.csv	ОК	15 X Q	184×96

Fig.3-37 Drawing settings when modules are the same horizontally

5) If you have selected **Same in columns** (i.e., the modules are the same vertically) before, you should click **Drawing settings** and then enter the receiver column count in corresponding field. Next, you can import the actual pixel drawing table.



leceiver column count: 3	7	W × H 352	0x11040		
Receiver column	File name	Status	Operation	W × H	4
1	1.csv	ОК	ωхq	64×552	-
2	2.csv	ОК	ъхq	96×552	1
3	3.csv	ок	ъхq	96x368	
4	4.csv	ОК	le x ⊄	96×368	
5	5.csv	ОК	ъхq	96x368	
6	6.csv	ОК	ъхq	96x18 <mark>4</mark>	
7	7.csv	ОК	ъхα	96x184	
8	8.csv	ОК	K X Q	96×184	

Fig.3-38 Drawing settings when modules are the same vertically

Note: The only supported unit of the drawing table is module.

6) If you have selected **Same in rows** before, you can click **Module settings** and then import the actual LEDs count in each row.

		Module settings			×
	Row: 8 Column:	1 □Consecutive data group + X ≤ 2	LEDs row	LED count	
	1-1	Row count: 96	Row 1	37	
1		M3	Row 2	37	160 Module settings
		M3 M4 M5	Row 3	37	
	1-2		Row 4	37	pply to Row Column
			Row 5	37	pply to Row Column Apply
			Row 6	37	
2			Row 7	37	pply to Row Column
			Row 8	37	pply to Row Column
			Row 9	37	
	1-3		Row 10	37	
			Row 11	37	
			Row 12	37	
3			Row 13	37	_
2			Row 14	37	
			Row 15	37	
			Row 16	37	
			Row 17	37	
	1-4		Row 18	37	
			Row 19	37	
			Row 20	37	Cancel
4			Row 21	37	
			Row 22	37	
			Row 23	37	
			D 34	77	

Fig.3-39 Module settings when modules are the same horizontally

7) If you have selected **Same in columns** before, you can click **Module settings** and then import the actual LEDs count in each column.



		Module settings			×
Row: 1	D Column:	8 □Consecutive data group + X ≦ [2]	LEDs column	LED count	
1-1	2-1	Column count: 96	Column 1	37	
		M3	Column 2	37	0 Module settings
		M3 M4 M5	Column 3	37	
			Column 4	37	pply to Row Column
			Column 5	37	pply to Row Column Apply
L			Column 6	37	
			Column 7	37	pply to Row Column
			Column 8	37	pply to Row Column
			Column 9	37	
			Column 10	37	
			Column 11	37	
1-2			Column 12	37	
			Column 13	37	
			Column 14	37	
			Column 15	37	
	2-2		Column 16	37	
2			Column 17	37	
			Column 18	37	
			Column 19	37	
			Column 20	37	Cancel
			Column 21	37	
			Column 22	37	
			Column 23	37	
			C-1	77	

Fig.3-40 Module settings when modules are the same vertically

3.2.2.7 Gray Level

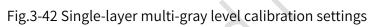
1) High Brightness calibration:

Gray level settings High brightness calibration		
Low brightness calibration	Inable	
Low brightiess calibration	Multi-layer calibration ?	1ulti-gray level
	High layer	
	Capture gray level 217	

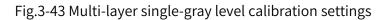
Fig.3-41 Single-layer single-gray level calibration settings



Gray level settings		×
High brightness calibration	✓ Enable	
	Multi-layer calibration ? Secondary calibration ?	
	High layer	
	Enable 🗸 Capture gray level 217	
	Enable Capture gray level 233	



o I I	
Gray level settings	
High brightness calibration	
Low brightness calibration	I Enable
	Multi-layer calibration ? Secondary calibration ? Multi-gray level
	High layer Low layer
	Capture gray level 217 VR VG VB





Gray level settings		×
High brightness calibration	✓ Enable	
	Multi-layer calibration ? Secondary calibration ? Multi-gray level	
	High layer Low layer	
	Enable Capture gray level 217	
	Enable 🗸 Capture gray level 233	

Fig.3-44 Multi-layer multi-gray level calibration settings

① Secondary calibration: Once you have selected this option, the currently selected gray level will be calibrated for the second time.

⁽²⁾ **Gray level**: You can enter the gray level you want to display on the screen when the camera is capturing photos. If it is multi-gray level calibration, you must finish capturing the gray level before obtaining the corresponding parameters. You can select the checkbox in this field to decide whether to capture the corresponding gray level or not.

③ Multi-layer calibration: The R, G, and B are enabled by default and those in the higher layer are independent to those in the lower layer. If you deselect R, G, or B, the corresponding color will not be captured for calibration. Note that R, G, and B should all be selected for at least one layer.



Gray level settings		×
High brightness calibration	Enable Dow Brightness Truncation Truncated gamma 32	
	Multi-layer calibration ?	
	High layer	
	Capture gray level 217	

Fig.3-45 Low brightness truncation

④ Low brightness truncation: If supported by the receiver, this option will be available in the window together with the setting field for Truncated gamma.

2) Low brightness calibration:

- Single level iterative:
 - Chip type: Options include XM, SCL6bit, SCL16bit, ICN2260, ICN2270, LYD23221.
 - Gamma capture: Set the Gamma value (64 by default) that is needed to be captured.
 - Initial value: You can set the coefficients according to the color temperature and initial gray level you need.
 - **Capture times**: You can set the times for iterative calibration. By default, it is 3 times.
 - **Step**: This should not exceed the set initial value.
 - IC color block: You can calibrate the IC color block separately in low brightness when this option is selected.



ay level settings					×
gh brightness calibration	Enable IC color blog	* (]			
			Chi	o type XM	~
	Gamma capture 64				
	Initial value: R 16	G 16	в 16		
	Adjust dark spot R 3.0	G 5.0	в 1.0		
	Step settings Capture times: 3				
		R	G	в	
	1	1.0	2.0	2.0	
	2	1.0	2.0	2.0	
	3	1.0	2.0	2.0	

Fig.3-46 Single level iterative

3.2.3 Camera Adjustment

1) Adjust camera for framing: Position the camera so that it faces the center of the screen. Adjust the camera's height to align it with the target screen area. If the screen is positioned too high or too low, it is recommended to adjust the camera's height to align it with the user's view.

2) Select the central partition of the screen as the area for adjusting camera. Adjust the camera's capturing distance so that the shooting area aligns with and fills the camera frame. (Make sure the shooting view is between the red and white frames.) See Figure 3-47.



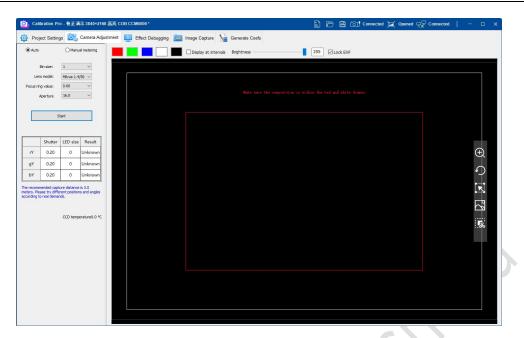


Fig.3-47 Adjust camera for framing

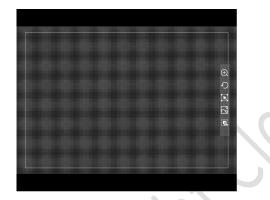
3) Select one color from **R**, **G**, and **B**, and then select **Display at intervals** and **Lock EVF**. Then, adjust the focus ring on the lens to ensure a clear focus for framing. Next, zoom in on the image in the camera frame using the tool of the camera or the mouse wheel to get a view on the LEDs. You can adjust the focus of the lens appropriately for a clear view. The assistance tools for framing can be found on the right side of the camera frame. From top to bottom, the tools allow zooming in on the image around the cursor, resuming full view (1:1), zooming in on a selected part, and viewing photos.

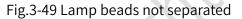
A clear focus ensures that the lamp beads in the image are separated from each other, and the brightness of each individual lamp bead gradually darkens from the center to the periphery. See Figure 3-48.



) Auto		() Manu	al metering		Display at intervals	Brightness	255	Lock EVF	
G	ray level:	217	~						
	Bin size:	1							
Len	is model:	Milvus 1.4	/50 ~						
ocus rii	ng value:	0.60	~						
,	Aperture:	16.0	\sim						
	s	tart							
			-					Ð	
		LED size					1.0	<i>1</i>	
rX	0.20	0	Unknown					ĸ	
rY	0.20	0	Unknown						
gХ	0.20	0	Unknown					2	
gY	0.20	0	Unknown					5%	
gZ	0.20	0	Unknown					:	
bХ	0.20	0	Unknown						
bY	0.20	0	Unknown						
bZ	0.20	0	Unknown						

Fig.3-48 Lamp beads in the image





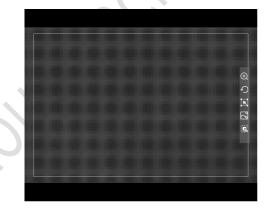


Fig.3-50 Brightness distribution error

4) Metering component: Metering component can be different depending on the calibration mode you select. If you have selected **Seam correction (only)**, you only need to conduct metering for Green; If you have selected **Brightness** (including **Receiver low brightness compensation** and **Chip low brightness**), you need to conduct metering for Red, Green, and Blue; If you have selected **Chroma**, you need to conduct metering for 8 color components, namely, rX, rY, gX, gY, gZ, bX, bY, and bZ.

1.	Shutter	LED size	Result
rY	0.20		Unknown
gY	0.20	0	Unknown
bΥ	0.20		Unknown

Fig.3-51 Metering components for Seam correction (only) mode

	Shutter	LED size	Result
rY	0.20	0	Unknown
gY	0.20	0	Unknown
bγ	0.20	0	Unknown

E' - 2 E2 Materia		
Fig.3-52 Metering co	omponents for Brightness	(calibration) mode

	Shutter	LED size	Result
rХ	0.20	0	Unknown
r٧	0.20	0	Unknown
gX	0.20	0	Unknown
gY	0.20	0	Unknown
gZ	0.20	0	Unknown
bХ	0.20	0	Unknown
ЬΥ	0.20	0	Unknown
bZ	0.20	0	Unknown

Fig.3-53 Metering components for Chroma (calibration) mode

5) Auto metering: Select the aperture and the current focus ring value, and then click **Start**. *Calibration Pro* will automatically adjust the shutter time for normal metering. Once the shutter time has been adjusted appropriately, you will be prompted "Succeeded. Switch to "Image Capture" for shoot. "

6) Manual metering: Select Manual metering in the Camera Adjustment tab. Then, select the aperture and the current focus ring value. Next, adjust the shutter time manually and then click **Detect**. If you are prompted "Too dark" or "Too bright", you can increase or decrease the shutter time respectively and then click **Detect**. You can repeat this step until you get a normal results.

7) Multi-layer calibration: You need to conduct metering for each layer individually.

8) Secondary calibration: Metering is required for both calibrations. After you have finished the first-time calibration, you should enable calibration again and conduct metering for the second-time calibration.

3.2.4 Effect Debugging

If the project is for chip low brightness calibration and you have selected **Single level iterative**, you can perform **Effect Debugging** for adjusting the step. In this tab, you can click **Start auto-adjustment**, and then *Calibration Pro* will automatically adjust the step to an appropriate value. See Figure 3-54.

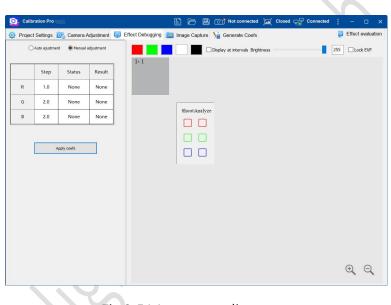
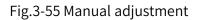


Fig.3-54 Auto step adjustment

You can also manually adjust the step if you find the auto adjustment effect not as expected. You can enter step values for R, G, and B respectively, and then click **Apply coefs**. The larger the step value, the greater the adjustment to the initial value will be.

	Step	Status	Result
R	1.0	None	None
G	2.0	None	None
в	2.0	None	None



3.2.5 Image Capture

3.2.5.1 Capture Manually

Once you have finished setting the **Camera Adjustment** and **Effect Debugging**, you can click **Image Capture** to access corresponding tab. In the tab, select a gray level and then select the shooting area. Align the camera with the target shooting area and then click **Shoot**. *Calibration Pro* will automatically control the camera to capture images of the target gray level. You can place the mouse on the shooting area to view the shooting and analyzing progress. See Figure 3-56.

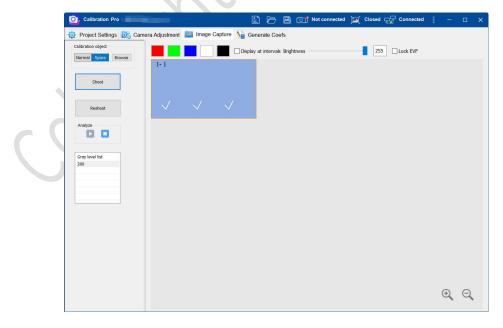
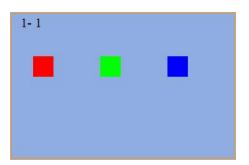
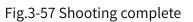


Fig.3-56 Image capture (Delete photo is selected by default)

Colorlight

When all components of one color have been captured, the capture area will show a rectangle in the corresponding color. Once the analysis of the components is completed, a check mark will appear below the corresponding color. Once all colors have been captured, the background color of the area will change to light blue (see Figure 3-57). When the analysis of all colors is completed, the background color will change to dark blue (see Figure 3-58).





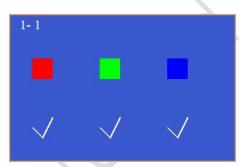


Fig.3-58 Shooting and analysis complete

Virtual pixel calibration: For brightness calibration, the virtual pixel will be added after every RGB captured (color component gvY will be added in the case of 4 LEDs virtual Green). For chroma calibration, the virtual pixel will be added after every RGB captured (color components gvX, gvY, and gvZ will be added in the case of 4 LEDs virtual Green).

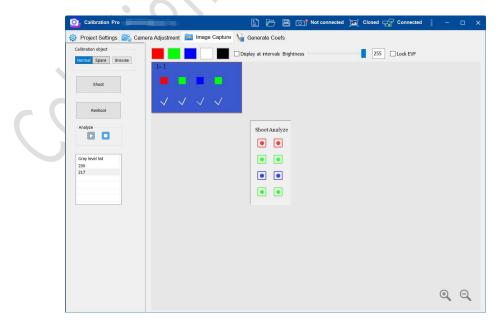


Fig.3-59 Shooting and analyzing complete

Colorlight

Crop: Select **Auto crop** in the **Project Settings** tab to let *Calibration Pro* automatically select partition before shooting each partition of the full screen. Right-clicking on the selected partition can delete it. You can also click the icon for crop on the right side to freely select area within the camera frame.

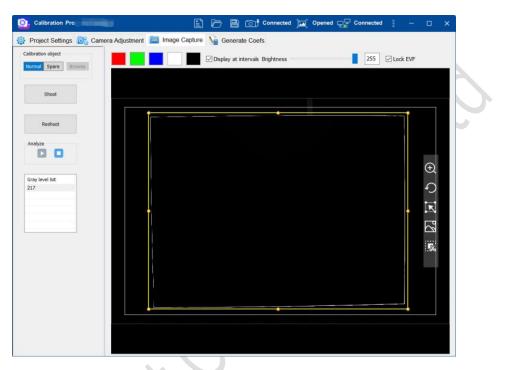


Fig.3-60 Shooting and analyzing complete

3.2.5.2 Automatic Calibration-Secondary Calibration

When **Secondary calibration** is selected, and **Analyze** is enabled (the software will analyze the image captured automatically), once you click **Shoot** after selecting -1 gray level in the **Gray level list**, a window for secondary calibration will pop up and perform secondary calibration automatically.

Automatic calibration - secondary calibration	×	
0%	Running First: Photo capture	
First: Photo capture)	
First: Coefs generation	•	
First: Coefs sending	•	
Second: Cali metering	•	
Second: Photo capture	•	\sim
Second: Coefs generation	n 😶	
Second: Coefs sending	•	

Fig.3-61 Automatic calibration -secondary calibration

3.2.6 Generate Coefs

3.2.6.1 Brightness After Calibration

Once the shooting and analyzing have been completed, you can access the interface for generating coefficients. Next, you can click **Generate luminance map** to view the luminance map of the current gray level. The brightness loss will also be automatically calculated and displayed.

• Chroma calibration mode: The brightness of Red, Green, and Blue will share the same brightness loss after the calibration.

Brightness	89.8

Fig.3-62 Chroma calibration

 Brightness calibration / Seam correction (only): The brightness loss of Red, Green, and Blue can be set individually.

Br	ightnes	ss af	ter cali	brati	on (%)
R	85.0	G	85.0	В	85.0
	Targe temp	t co	lor	Setti	ngs,

Fig.3-63 Brightness calibration

3.2.6.2 Settings

In brightness calibration mode, you can select a target color for settings.
 See Figure 3-64.

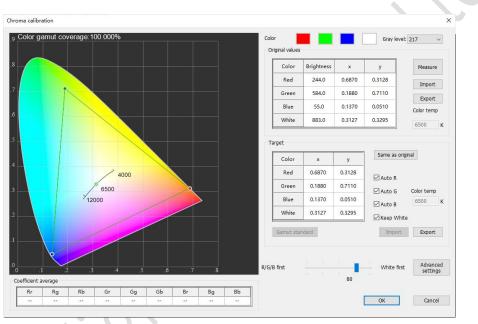


Fig.3-64 Target color temperature settings in brightness calibration mode

- Color: Click on a colored box to let the screen display the corresponding color.
- Original values: You can measure the original values by clicking Measure after connecting to the color meter. Besides, you can also import the existing brightness value and coordinates, or double-click the value to modify (the original values of all gray levels can be set as needed; you can also set the values for the higher gray level and let the software automatically calculate the values for the lower gray level). *Calibration Pro* will calculate the white point' s color temperature based on the

original values. You can export the original values by clicking **Export**. If you don't need to adjust the target temperature, you can simply skip this step.

- Target: You can adjust the coordinates of the target white point in this sheet. Click Import to import the existing target values. Clicking Export allows for saving the new target values. You can also click Set as D65 to set the color temperature to the standard 6500K. In addition, you can double-click the brightness, x, and y of White in the sheet, and then enter the new values.
- Coefficient average: Shows the average value of the color components generated after the latest calibration.

3.2.6.3 Color Gamut Settings

Color gamut settings is only available in **Chroma calibration** mode. The settings allows for adjusting target color gamut and color temperature.

•	Generate luminance ma	
	Generate fuminance ma	Ψ
X	Color gamut settings	•
~~	Generate coefs	
	Export coefs	
	Save coefs	

Fig.3-65 The option Color gamut settings



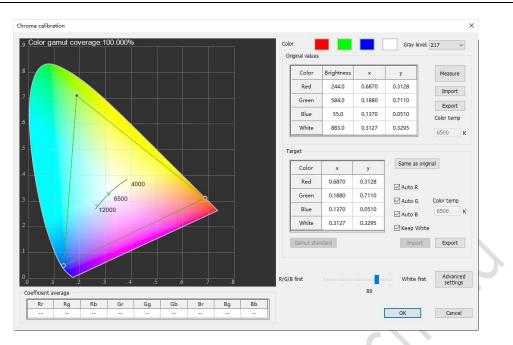


Fig.3-66 Color gamut settings interface

- **Color**: Click on a colored box to let the screen display the corresponding color.
- Gray level: Select the gray level for the settings.
- Original values: You can measure the original values by clicking Measure after connecting to the color meter. Besides, you can also import the original screen brightness and color gamut, or double-click the input boxes to modify the value. Clicking **Export** allows for exporting and saving the original values. If you don't need to modify the values, you can simply skip this step.
- **Target**: You can adjust the target color gamut and the color temperature coordinates in this sheet. By default, the values in this sheet are calculated automatically. You can deselect **Auto** and double-click the input boxes to enter the new values if necessary. Besides, you can also apply the standard color gamut settings (*Calibration Pro* provides parameters of sRGB, AdobeRGB, PAL, NTSC, Rec.601, Rec.709, Rec.2020, and DCI-P3). If you select **Same as original**, there will not be color gamut loss.



- Priority: You can move the slider toward R/G/B first or White first to adjust the effect of the calibration to the color Red/Green/Blue and the color white.
- Advanced settings: In Advanced settings, you can adjust the Color block intensity (only available when you have selected COB) and the Compensation intensity.

	X	
Color block intensity	Compensation intensity	
R: 1.10 ~	R: 100 ~	
G: 1.10 V Link	G: 100 V 🗌 Link	
B: 1.10 V	B: 100 ~	

Fig.3-67 Advanced settings

- **Color spot reduction**: This option is available during chroma calibration for regular screen. You can select this option to optimize the color spot issue after the calibration.
- **Coefficient average**: This sheet shows the average value of each color component' s coefficients generated in the last calibration.

3.2.6.4 Sending and Exporting Coefficients

1) Generate luminance map

You can click **Generate luminance map** and then control the screen color and brightness on the control bar. In addition, you can also select **Zoom in**, **Zoom out**, or **1:1** to control the display of the selected gray level of the luminance map. If you want to view the distribution of the shooting area on the screen, you can select the **Show partition line** checkbox.



Red	Green	Blue	White	Black	-	-		
11. 				255	Zoom in	Zoom out	1:1	Show partition lin

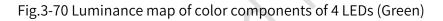
Fig.3-68 Display control bar

• In the chroma calibration mode, all of the color components will appear on the upper left corner of the luminance map. You can select one component to switch to its luminance map. When the screen resolution exceeds 8K (7680 × 3840), the color components will not be shown and you can only switch the luminance map in the display control bar.

rX	rY	gX	gY	gΖ	bX	bY	bΖ

Fig.3-69 Luminance map of color components





2) Generate coefs

You can obtain coefficients of all gray levels by clicking on **Generate coefs**. Once the coefficients have been successfully generated, you can click **Save coefs** to save the coefficients to all areas or a specified area. You can then switch on/off the calibration.

3) Export coefs

You can click **Export coefs** and then select **Export all**, **Export coefs by sender**, or **Export by partition** based on your need to save the calibration coefficients.

Note: In the Chip low brightness calibration mode, you should select the coefficients from the last iterative capture so as to obtain the final effect. You don't need to generate luminance map or coefficients again in multi-gray level mode. The map and coefficients of all gray levels will be generated all at once, and you can directly select a gray level for the export. After modifying the color gamut settings or the target settings, you need to

generate the new luminance map to let the modification take effect.

For virtual pixel calibration, the coefficients from brightness calibration will be generated in .4wCoef format, and those from chroma calibration will be generated in .12wCoef format.

4) Spare calibration

Select Calibration object > Switch > Spare, and then click OK. You will then access the interface for spare calibration. Next, you can select the partition that you want to replace with a spare. And then you can click **Shoot** to start the spare calibration.

5) LED dome screen calibration

Select **Same in rows** in the project wizard. Then, click **Gradient settings** to set the gradient of the LED dome screen.

- **Reference pitch**: The reference pixel pitch auto calculation for the first and last row.
- Start row pitch / End row pitch: This value will be saved individually according to the actual pixel pitch between modules in the first / last row.
- Auto: Automatically calculate the pixel pitch of each row of the module based on the reference pixel pitch, and the pixel pitch of the start row and the end row.
- Module row count: This valued can be calculated based on the set module layout.
- **Confirm**: Click **Confirm** to save the new pixel pitch data and update the pixel pitch table located in the project file path accordingly.



• Adjust pitch: Select this checkbox to adjust the gradient of the row pixel pitch based on the pixel pitch value of the module on each row.

Start row pitch 0.0	00000 E	ind row pitch 0.0000	X 🖆		
Adjust pitch		Module row 1	 ✓ Confir 	m	
LEDs row		Pixel Pitch(mm)		^	
Row 1					
Row 2					
Row 3					
Row 4					
Row 5					
Row 6					
Row 7					
Row 8					
Row 9				~	
RGB linked Pa	artition row: 1	✓ Partition col	umn: 1	~	
	R	G	В		
Top	0.00000	0.00000	0.00000		
Bottom	0.00000	0.00000	0.00000		
Left	0.00000	0.00000	0.00000		
Right	0.00000	0.00000	0.00000	-	

Fig.3-71 Gradient settings for the same module in rows

Select **Same in columns** in the project wizard. Then, click **Gradient settings** to set the gradient of the LED dome screen.

- **Reference pitch**: The reference pixel pitch auto calculation for the first and last column.
- Start col pitch / End col pitch: This value will be saved individually according to the actual pixel pitch between modules in the first / last column.
- Auto: Automatically calculate the pixel pitch of each column of the module based on the reference pixel pitch, and the pixel pitch of the start column and the end column.
- Module column count: This valued can be calculated based on the set module layout.
- **Confirm**: Click **Confirm** to save the new pixel pitch values and update the pixel pitch table located in the project file path accordingly.



• Adjust pitch: Select this checkbox to adjust the gradient of the column pixel pitch based on the pixel pitch value of the module on each column.

Reference pitch: 0.0 Start col pitch 0.0		and col pitch 0.0000	× ≦ [⊂	1
Adjust pitch		Module 1	 Confirm 	
LEDs column	1	Pixel Pitch(mm)	^	
Column 1				
Column 2				
Column 3				
Column 4				
Column 5				
Column 6				
Column 7				
Column 8				
Column 9			~	
RGB linked Pa	artition row: 1	✓ Partition col	umn: 1 ~	j
	R	G	В	
Тор	0.00000	0.00000	0.00000	
Bottom	0.00000	0.00000	0.00000	1
Left	0.00000	0.00000	0.00000	1
Right	0.00000	0.00000	0.00000	

Fig.3-72 Gradient settings for the same module in columns

 Partition row / Partition column: Select the partition row and column, and then set the actual gradient of the borders of the corresponding row/column so as to adjust the gradient between partitions.

3.2.7 Effect Evaluation

In **Brightness calibration** mode, once a partition has finished calibration, the calibration parameters can be saved to receivers. With the calibration function enabled, you can capture the calibrated partition again to evaluate the calibration effect. You can access the evaluation window by clicking on the icon at the right end of the toolbar.



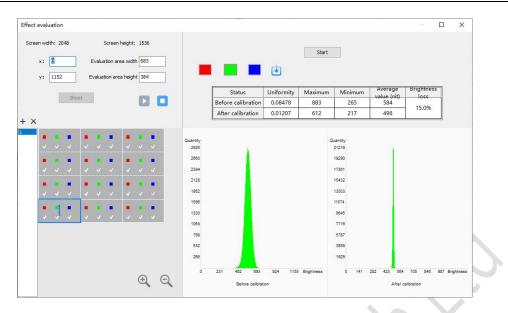


Fig.3-73 Effect evaluation window

1) The **Screen width** and **Screen height** represent the width and height of the full-screen of the current project.

2) The **x** and **y** indicate the initial coordinates of the selected partition. Modifying the coordinates can change the evaluated partition. Also, you can add partitions for evaluation by clicking on the + icon above the evaluated partition list. Each partition is seen as an individual evaluation area, which is marked by a number that corresponds to its number in the evaluation list.

3) Select one evaluated partition from the list, and then adjust the tripod head to make the camera face the lit part of the screen. Then, with the calibration function enabled, click **Shoot** to let *Calibration Pro* capture and analyze images of the evaluated partition. Next, click **Start** to begin the evaluation. The right side of the interface will display a statistical table that contains data before and after the calibration respectively. Below the table are 2 histograms representing the situation before and after the calibration.

4) The statistical table shows information about the evaluated partition before and after calibration, including **Uniformity**, **Maximum** (brightness), **Minimum** (brightness), **Average value (nit)**, and **Brightness loss**.



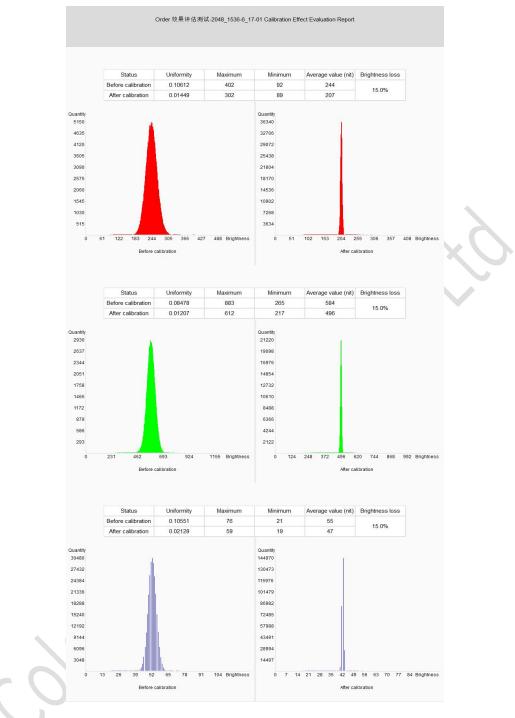


Fig.3-74 Effect evaluation report

5) You can view the statistical information and the layout of the LEDs (Red, Green, and Blue) by clicking on the icons , and respectively. Then, you can click the icon \checkmark to save the evaluation report to your PC.

3.3 Cabinet Calibration

3.3.1 New Cabinet Project

Step 1: Cabinet project wizard-1

In the start screen of *Calibration Pro*, click **New cabinet project** to access the **Cabinet project wizard-1** (see Figure 3-75). Then, select a way for control PC connection.

Local Remo	te			Service not found?	
Status	PC name	User name	IP	Usage status	

Fig.3-75 Select Local

Step 2: Cabinet project wizard-2

Sender	
X7 1.021 total	
	-
Control LED display via USB (if sen	der supports)
Receiver	der supports)
	der supports)
Receiver	

Fig.3-76 Cabinet project wizard-2

Note: You can refer to Full-screen project wizard-2 for reference.



Step 3: Cabinet project wizard-3

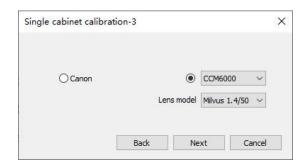


Fig.3-77 Cabinet project wizard-3

Note: You can refer to Full-screen project wizard-3 for reference.

Step 4: Cabinet project wizard-4

ingle cabinet calibration	-4		~
High brightness calibral	Brightnes	ss 🔿 Ch	roma
Low brightness calibrat	High-precis	ion capture	\sim
	Back	Next	Cancel

Fig.3-78 Cabinet project wizard-4

Note: You can refer to Full-screen project wizard-4 for reference. High brightness calibration and Low brightness calibration can be selected and performed at the same time.

Step 5: Cabinet project wizard-5

	Cabinet Width 480	Height 270
ť,	Module Width 120 ~	□ Transparent □ Virtual pixe 4 LEDs (G) ∨
	Height 135 V	Сов
:	Number of intervals 0 v	

Fig.3-79 Cabinet project wizard-5

- (Cabinet) Width/Height: The resolution of the currently calibrated cabinet.
- (Module) Width/Height: The resolution of the currently calibrated module.
- Number of intervals: *Calibration Pro* will recommend a number once the cabinet width and height have been adjusted. You can also modify it manually.
- **Transparent:** This checkbox should be selected when the horizontal pixel pitch is different from the vertical one.
- COB: Select this checkbox when COB module is used for the currently calibrated screen.
- IMD: Select this checkbox when IMD module is used for the currently calibrated screen.
- Virtual pixel: Select this checkbox when the calibrated screen employs virtual pixel. Available options include: 4 LEDs (R), 4 LED (G), 4 LED (B), and 6 LEDs.

Step 6: Cabinet project wizard-6

Single cabinet calib	pration-6	×
Name prefix		
Count	1	
Naming method	Cabinet number 🛛 🗸	
Cabinet per row	1	
Start number	1	
Example	[0001],[0002]	
Ba	ack Next Cance	4

Fig.3-80 Cabinet project wizard-6

- **Prefix:** Enter the prefix for the name of the new cabinets.
- Counts: The number of cabinets that have been added to the cabinet list

Colorlight

automatically.

- Naming method: Available options include: Cabinet number, Row-Column, and Column (ABC)-Row.
- Cabinet per row: Enter the number of cabinets on each row. The number you enter in this field will automatically change the cabinet name.
- Example: This field shows the example of a cabinet name automatically based on the Prefix, Naming method, and Cabinet per row you set before.

Step 7: Cabinet project wizard-7

Save as			
Name	<enter a="" name="" project=""></enter>		
Location	E:\未知文件夹\6.2工程	文件\	

Fig.3-81 Cabinet project wizard-7

Note: You can refer to Full-screen project wizard-7 for reference.

3.3.2 Project Settings

3.3.2.1 Sender Mode

In the **Project Settings** tab, *Calibration Pro* will automatically detect senders and receivers once the control PC has been connected, and the senders and receivers that have been detected will be shown in the tab. See Figure 3-82.



roject path E:\未知文件夹\6.2工程文件\22		Browse	[0001]	Display at intervals Brightness
ender sottel mode Server No sander detected Recover the receiver detected Gettings Cohnet width (41 Module width (22 abinet height (64 Module height (22)	Caleration mode Chroma Auto-Detect Cab	Seam correction Effects settings inet params settings Gray level settings		ShootAnalyze
		Partition settings		

Fig.3-82 Main interface of cabinet project

- Detect: Click Detect to detect the currently connected senders and receivers, and then you will be able to view the model, version number, and amount of the senders and receivers detected.
- Settings...: Click Settings... to bring up a pop-up window where you can enable or disable the option Control LED display via USB (if sender supports). See Figure 3-84.

USB control settings	×
Control LED display via USB (if supported by the sender)	

Fig.3-83 Control LED display via USB (if sender supports)

3.3.2.2 Calibration Mode

Click **Switch** to choose a calibration mode. Available options include: **Brightness** and **Chroma**. See Figure 3-84.

Calibration mode	×
Brightness	
O Chroma	

Fig.3-84 Available calibration modes

3.3.2.3 Seam Correction

eam correction	×	
Enable		
Intensity		
	1.00	
Recommended		
Cabinet edge coefs		
1.000 • Reset 1.000 •		
		$\langle X \rangle$
OK	Cancel	

Fig.3-85 Seam Correction

- Seam correction: This function is enabled by default. You can disable it according to your need. See Figure 3-85.
- Intensity: This field indicates the intensity of brightness adjustment for LEDs at the edges of the cabinet. The default intensity is 1. If the dark (or bright) line turns to be too bright (or too dark) after seam correction, you can lower the intensity appropriately. However, if you find the line still relatively dark (or bright) after correction, you can then increase the intensity appropriately.

If you have selected **Seam correction (only)** before, you cannot perform the brightness/chroma calibration, and the seam correction function will be enabled by default. See Figure 3-86.



am correction	×
Enable Seam correct	
ntensity	
1.00	8
Recommended	
1.000 • 1.000 • 1.000 • Reset 1.000 • 1.000 • 1.000 • •	
OK Cance	2

Fig.3-86 Seam correction (only) settings

• Cabinet edge coefs: You can fine tune the coefficients of the cabinet edge based on the existing calibration coefficients in this field. This operation can fix the dark and bright lines between cabinets.

3.3.2.4 Effect Settings

You can refer to **Section 3.2.2.4 Effect Settings** for reference.

3.3.2.5 Screen Settings

In this field, you can set the width and height of the current cabinets and modules.

Cabinet width 64	Module width 32	Canvas settings
Cabinet height 64	Module height 32	

Fig.3-87 Screen settings

Canvas settings: If you have not selected **Control LED display via USB (if sender supports)**, you will find the **Canvas settings** option in **Screen settings**. Click this option to access the pop-up window where you can set the start coordinates of the canvas.

Canvas settings	\times
Canvas location	
Start X:	
Start Y: 0	F.

Fig.3-88 Canvas settings

3.3.2.6 Cabinet Parameters Settings

Connect to the sample cabinet that has saved receiver parameters and topology. Then, click **Read params** to save the parameters and topology from the sample cabinet. Once the parameters have been successfully read, you can select **Save params before shoot** so that the real-time parameters and topology will be automatically sent to the receivers before shooting photo for cabinet calibration. See Figure 3-89.

R	lead params
Save	params before

Fig.3-89 Cabinet parameters settings

If you have selected **High brightness calibration** and **Low brightness calibration**, you will find the option **Gray level settings** in the **Cabinet** params **settings** field.

ray level settings

Fig.3-90 Parameter settings

3.3.2.7 Partition Settings

You can modify the intervals if necessary.

Supersampling allows for increasing the number of LEDs per capture (which means, you can halve the number of intervals for cabinet of the same size). However, it will also increase the analyzing duration.

Partition settings	×	
Supersampling ?		0
Number of intervals		
Note: Take 8 photos per partition.		
Fig.3-91 Partition settings		

3.3.2.8 Gray level

1) High brightness calibration

In chroma calibration or high brightness calibration mode, the interface of **Gray level settings** is as shown in Figure 3-92 and Figure 3-93. You can select **Single-layer calibration** or **Multi-layer calibration**. The **R**, **G**, and **B** options are selected by default. If you unselect **R**, **G**, or **B**, the corresponding color will not be captured for calibration. Note that you should select all **R**, **G**, and **B** for at least one layer.

High brightness calibration	✓ Enable	
Low brightness calibration		
	Multi-layer calibration ?	
	High layer	
	5 J J 100	
	Capture gray level 100	

Fig.3-92 Single-layer calibration settings



Gray level settings		×
High brightness calibration Low brightness calibration	Enable Multi-layer calibration	
	High layer Low layer	
	Capture gray level 100 VR G B	

Fig.3-93 Multi-layer calibration settings

• Low brightness truncation: If supported by the receiver, this option will be available in the window together with the setting field for Truncated gamma.

Gray level settings		\times
High brightness calibration Low brightness calibration	Enable Low Brightness Truncation Truncated gamma 32	
	Multi-layer calibration ?	
	High layer	
	Capture gray level 217	
. 70	Fig.3-94 Low brightness truncation	



2) Low brightness calibration

• Single level iterative

Gray level settings						×	
High brightness calibration	🖂 Enable						
Low brightness calibration	Calibration mode Sir	ngle level iterative		✓ Chip type SCL16	bit V		
	Gamma capture	4					
	Initial value: R 6	00 G	810	в 1680			
	Adjust dark spot R	.0 G	5.0	в 1.0			
	Step settings						
	Capture times: 3	•					
	1 1	R 4.0	G 19.8	B 35.6			
	2 1	4.0	19.8	35.6			•
	3 1	4.0	19.8	35.6			

Fig.3-95 Single level iterative settings

Chip type: Available options include: XM, SCL6bit, SCL16bit, ICN2260,
 ICN2270, and LYD23221.

• Gamma capture: Set the Gamma value (64 by default) that is needed to be captured.

• Initial value: You can set the initial calibration coefficients based on the required color temperature and initial gray level.

• **Capture times**: You can set the times for iterative calibration. By default, it is 3 times.

Step: This should not exceed the set initial value.

3) Perform high brightness calibration and low brightness calibration together

• Single level iterative and high brightness calibration

Select the Enable checkbox respectively in High brightness calibration and Low brightness calibration tabs. Select Single level iterative as the



calibration mode and XM as the chip. You can find the field for High/Low brightness calibration params, and the options of Load and Read at top of the tabs.

Calibration mode	Single level iterative	ve v	 Chip type XM 	
Gamma captur	e 64			
Initial value: R	. 16 (G 16 E	8 16	
Adjust dark spot R	3.0	G 5.0 E	3 1.0	
Step settings				
Capture times:	3			
1	R	G 2.0	B 2.0	
2	1.0	2.0	2.0	
3	1.0	2.0	2.0	
	Initial value: R Adjust dark spot R Step settings Capture times: 1 2	Initial value: R 16 Adjust dark spot R 3.0	Initial value: R 16 G 16 E Adjust dark spot R 3.0 G 5.0 E Step settings Capture times: 3 • R G 1 1.0 2.0 2 1.0 2.0	Initial value: R 16 G 16 B 16 Adjust dark spot R 3.0 G 5.0 B 1.0 Step settings

Fig.3-96 Single level iterative in high/low brightness calibration mode

• IC color block: You can calibrate the IC color block separately in low brightness when this option is selected.

3.3.3 Camera Adjustment

uto Manual metering Gray level: 100 ~ Bin size: 1 Lens model: Miltitus 1.4/50 ~ Is ring value: 0.60 ~	[0001]	Display at intervals E ShootAnalyze	rightness	255 Lock EVF
Bin size: 1 Lens model: Milvus 1.4/50 ~ is ring value: 0.60 ~	[0001]			
Aperture: 15.0 Start				
	0.04 0 Unknown 0.08 0 Unknown 0.11 0 Unknown 0.02 0 Unknown 0.55 0 Unknown 0.17 0 Unknown 0.17 0 Unknown 0.02 0 Unknown 0.17 0 Unknown 0.02 0 Unknown 0.02 0 Unknown	0.04 0 Unknown 0.08 0 Unknown 0.11 0 Unknown 0.02 0 Unknown 0.55 0 Unknown 0.17 0 Unknown 0.17 0 Unknown 0.02 0 Unknown 0.17 0 Unknown 0.02 0 Unknown 0.62 0 Unknown	0.04 0 Unknown 0.08 0 Unknown 0.11 0 Unknown 0.02 0 Unknown 0.55 0 Unknown 0.55 0 Unknown 0.17 0 Unknown 0.02 0 Unknown 0.02 0 Unknown 0.02 0 Unknown 9.02 0 Unknown	0.04 0 Unknown 0.08 0 Unknown 0.11 0 Unknown 0.02 0 Unknown 0.55 0 Unknown 0.55 0 Unknown 0.17 0 Unknown 0.02 0 Unknown 0.17 0 Unknown 0.02 0 Unknown 0.82 0 Unknown



Note: You can refer to Section 3.2.3 Camera Adjustment for reference.

- In the case when high and low brightness calibration are performed at a time, when the XM chip is selected for low brightness calibration, you should select Auto at top of the Camera Adjustment tab. Then, *Calibration Pro* will first send low brightness parameters before sending low brightness initial coefficients. Next, the software will automatically perform metering from low brightness gray level. After the end of low brightness auto metering, the software will send high brightness parameters and start metering for high gray level. This way, the software completes metering for all gray levels in both high and low brightness calibration modes.
- When the other type of chip is selected for low brightness calibration, you should select **Auto** at top of the **Camera Adjustment** tab. Then, *Calibration Pro* will automatically start metering from low brightness gray level. After the end of low brightness auto metering, the metering for high brightness gray level will be performed. This way, the software completes auto metering for all gray levels in both high and low brightness calibration modes.
- The interface of metering for brightness calibration will be shown in low brightness auto metering mode. For high brightness metering, the exact interface depends on the exact calibration mode selected.

				-		Coefs Assembly	
() Aut	0	O Manual r	metering		Display at inter	vals Brightness	255
	Sray level:	100	~	[0001]	ShootAnal	yze	
	Bin size:	100				1	
Le	ns model:	Milvus 1.4/50	0 ~				
Focus	ing value:	0.60	~			L	
	Aperture:	16.0	~]	
				\checkmark \checkmark			
	s	Start		1.20			
					21		
	_		Result				
rX	0.04	0 0	Inknown				
rY	0.04	0 UI 0 UI	Inknown Inknown				
	0.04	0 Ui 0 Ui 0 Ui	Inknown Inknown Inknown				
rY	0.04	0 Ui 0 Ui 0 Ui	Inknown Inknown				
r¥ gX	0.04 0.08 0.11		Inknown Inknown Inknown				
rY gX gY	0.04 0.08 0.11 0.02		Inknown Inknown Inknown Inknown				
rV gX gV gZ	0.04 0.08 0.11 0.02 0.55		Inknown Inknown Inknown Inknown				

Fig.3-98 Camera Adjustment tab



3.3.4 Effect Debugging

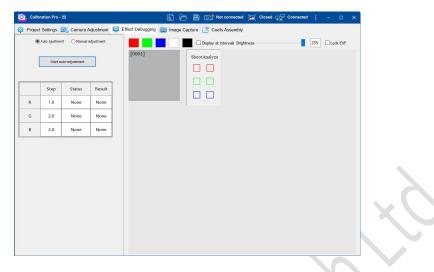


Fig.3-99 Step change in Auto adjustment mode

Note: You can refer to Section 3.2.4 Effect Debugging for reference.

3.3.5 Image Capture

3.3.5.1 Capture Settings

The interface of image capture for single cabinet calibration is as shown in Figure 3-100.

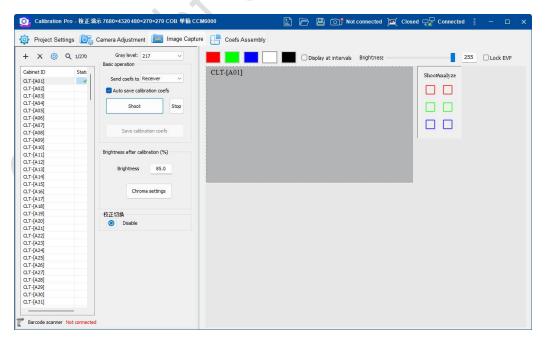


Fig.3-100 Single cabinet image capture in chroma calibration mode

1) Settings

In Image Capture tab, available options above the cabinet list include: + (Add cabinet), \times (Delete the selected cabinet), \bigotimes (Settings), and \mathbf{Q} (Search in cabinet list).

• **Pre-warm before shoot**: Control the temperature of the captured gray level before the capture.

Pre-warm before shoot			K N
Coefs blending settings	Preheat type		
Cabinet ID settings	Preheat by temperature		
	Support thermometer model FST (0	-100°C) high precision version.	
	Capture gray level:	217	
	Target temperature(PC):	27	
	Temperature difference(0.1	
		确定取消	

Fig.3-101 Pre-warm before shoot

- Pre-warming type: Available options include Pre-warm by temperature and Pre-warm by time.
- Capture gray level: Switch capture gray level for current settings.
- Target temperature(°C), Temperature difference(°C): Start capture the set gray level when the temperature detected by the thermometer reaches the value calculated by target temperature ± temperature difference.
- **Pre-warming time**: Start shoot after this set time.
- High brightness calibration: Select Coefs blending settings to access the tab. See Figure 3-102.



e-warm before shoot	Thermal effects settings		
efs blending settings	Enable Thermal effects model:	Load	
Cabinet ID settings			
	Coefs blending settings		
	🕝 Enable		
	○ Number of blending cabinets	9	
	 Import coefs 		
	High layer	Load	Cabinet location
	Low layer	Load	
			Apply&generate coefs

Fig.3-102 Single cabinet calibration settings

Select Import coefs, and then click Load to import high brightness model coefficients. Next, click Cabinet location to set the place for importing the warm cabinet coefficients.

Coe	efs count (by cabinet): 9	Row: _3	Column: 3
Cabi	net location settings		
	CLT-[01-01]	CLT-[01-02]	CLT-[01-03]
	CLT-[01-04]	CLT-[02-01]	CLT-[02-02]
	CLT-[02-03]	CLT-[02-04]	CLT-[03-01]

Fig.3-103 Import coefficients settings

 Margin settings: The default margin is 0. You can enter the actual margin of the model coefficients.



	Incoloc			
M	largins			
		O		
	0		0	
	1	0		

Fig.3-104 Margin settings

- Click Apply & generate coefs in the Coefs blending settings tab once you have finished the above steps, and a model file will automatically be generated.
- Low brightness calibration: Select **Coefs blending settings** to access the tab. See Figure 3-105.

ings					
Pre-warm before shoot	Thermal effects settings				
Coefs blending settings	Enable Thermal effe	cts model:	Load		
Cabinet ID settings					
	Coefs blending settings				
	🕜 Enable				
	O Number of bler	nding cabinets	9		
	O Import coefs				
	Low brightness		Load		
	Adjust low brightness coefs				
	Adjust low brightness coefs	R	G	В	1
	Adjust low brightness coefs	R 0.0	G 0.0	B 0.0	[
	Vertical gradient Horizontal	0.0	0.0	0.0	
	Vertical gradient Horizontal	0.0	0.0	0.0	

Fig.3-105 Coefficient blending settings in low brightness

 Select Import coefs, and then click Load to import low brightness coefficients. A model will be generated automatically.



- The default gradient in the Adjust low brightness coefs table is 0. You can manually set the R, G, and B values for the horizontal and vertical gradients to adjust the gradient.
- Perform high and low brightness calibration at a time: Select Coefs blending settings to access the tab. See Figure 3-106.

e-warm before shoot				
e-warm before shoot	Thermal effects settings			
oefs blending settings	Enable Thermal effe	cts model:	Load	
Cabinet ID settings				
erial number settings	Coefs blending settings			
	🕝 Enable			
	O Number of ble	nding cabinets	9	
	O Import coefs			
	High layer		Load	Cabinet location
	(ign is yes	nigntayer		(dabilice locadorini)
	Low layer		Load	
	Low brightness		Load	
	Adjust low brightness coefs			
		R	G	В
	Vertical gradient	0.0	0.0	0.0
	Horizontal gradient	0.0	0.0	0.0

Fig.3-106 High and low brightness coefficients blending settings

- Click Import coefs to import the high brightness coefficients and low brightness coefficients separately.
- Thermal effects settings: This option is for importing the thermal effects removal model to eliminate the negative effects caused by warm screen.
- Apply & generate coefs: Click to let the software automatically generate cabinet coefficients of all the calibrated cabinets based on the reference model and the coefficients blending settings.



ttings						>
Pre-warm before shoot	Cabinet ID settir	ngs				
Coefs blending settings	Count	270				
Cabinet ID settings	Prefix	CLT				
Serial number settings	Naming method	Row - Column	 ✓ Ca 	abinet per row	16	
	Example	CLT-[01-01],CLT-[0	01-02]			

Fig.3-107 Cabinet ID settings

• Cabinet ID settings: You can refer to Cabinet project wizard-6.

Double-click the target cabinet ID in the cabinet list to bring up the window where you can modify the ID. Once you have changed the cabinet ID, the calibration data will also change accordingly. After the end of shooting and analyzing, the background color of the cabinet list will change to light blue, and when the coefficients have been successfully sent, a green check mark will appear on the status column.



tings			×
Pre-warm before shoot	Serial number settings		
Coefs blending settings	⊖ Add S/N	• Read S/N	
Cabinet ID settings	U Add S/N	C Read S/N	
Serial number settings	Export coefficients by S/N	S/N export method Cabinets and modules	

Fig.3-108 Serial number settings

- Serial number settings: The option Read S/N is selected by default. When you click Shoot, the software will read the cabinet's serial number and then automatically create a cabinet named by that serial number in the cabinet list. The newly created cabinet will then be automatically selected.
- Select Add S/N, and then click Shoot. Then, a pop-up window will appear and you can set the rule for writing serial number according to the real situation.

Scan order] =		Front view
test1		test5	test7
test2	test4	test6	test8

Fig.3-109 Read/Write S/N

• Select **Export coefficients by S/N**, and then select a way to export the coefficients. The coefficients will be exported to your PC in the selected way once generated.

Note: The receiver must support writing and reading S/N, and a smart module is required. Besides, you must select **Detect smart module** in the **Project Settings** tab first.

- 2) Coefficient saving
- High brightness calibration

The coefficients will be sent to receivers in high brightness calibration mode by default. When smart module is adopted, you can send the coefficients to either **Receiver**, **Receiver&module**, or **Module**.

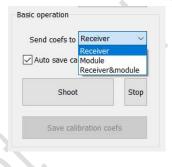


Fig.3-110 High brightness capture

• Chip low brightness

The coefficients will be sent to the chip in chip low brightness mode by default. When smart module is adopted, you can select a target to send the coefficients. Available options include: **Chip**, **Module**, and **Chip&module**.

Send coefs to	Chip ~
Auto save ca	Chip Module Chip&module
Shoot	t Stop

Fig.3-111 Chip low brightness

Perform high brightness calibration and low brightness calibration together

The coefficients will be sent to the chip in chip low brightness mode and to the receiver in high brightness calibration mode by default. The coefficients will be saved to the selected place in both modes.

• Auto save calibration coefs is selected by default. When the coefficients are generated after image analyzing, the coefficients will automatically be sent to the receivers, modules, and chips.

3) Chroma calibration mode

The brightness after calibration is 85% by default. You can click the input box in the **Brightness after calibration** field to modify the brightness. Click **Chroma settings** to bring up the window where you can change the original color gamut and the target gamut. You should do the settings once for the first calibrated cabinet. The settings will then be applied to the subsequent cabinets.

	-
Brightness	85.0
Chrom	na settings

Fig.3-112 Brightness after calibration



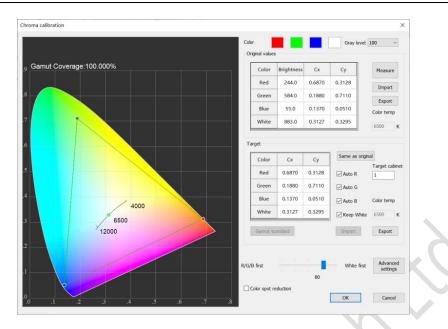


Fig.3-113 Chroma settings

- Original values: You can measure the original values by clicking Measure after connecting to the color meter. Besides, you can also import the existing brightness value and coordinates, or click the value to modify. Clicking Export allows for exporting and saving the original values.
- Target: Calibration Pro will give a target gamut based on the data captured by the camera. If you want to modify the target gamut, you can deselect Auto R/G/B. If you want to apply standard gamut, you can select the standard (available standards include sRGB, AdobeRGB, PAL, NTSC, Rec.601, Rec.709, Rec.2020, and DCI-P3), and then click Import to import the target gamut. Besides, you can also double-click the input boxes to enter the desired values. If you select Same as original, the target gamut will not be adjusted after calibration.
- Priority: You can move the slider toward R/G/B first or White first to adjust the effect of the calibration to the color Red/Green/Blue and the color white.



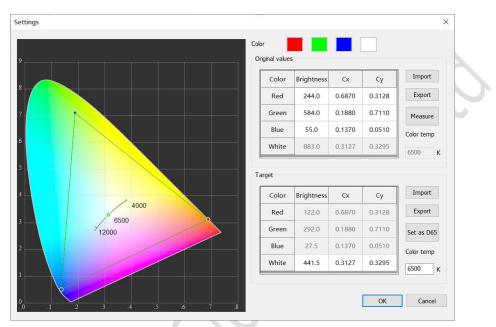
Color block intensity	Compensation intensity
R: 1.10 ~	R: 100 ~
G: 1.10 ~ Link	G: 100 ~ Link
B: 1.10 ~	B: 100 ~
	di di secondo di second

Fig.3-114 Advanced settings for chroma calibration

- Advanced settings: The Color block intensity is used for setting the range of color block adjustment. If the block is relatively too bright (or too dark) after calibration, you can increase the intensity.
- **Compensation intensity**: The default intensities for Red, Green, and Blue are 100, 100, and 50 respectively. You can change the intensity for any one of the 3 colors (Red, Green, and Blue). The higher the intensity, the more color compensation is.
- **Color spot reduction**: This can enhance the uniformity of the color compensation.
- Target cabinet count: When the target cabinet count is 0, each cabinet will calculate its own target color gamut based on its tristimulus values(R, G, B). When the count is 1, the cabinet's RGB values will be followed by the subsequent cabinets for their own gamut. When the count is N (N > 1), a common target gamut will be calculated based on the RGB values of all the N cabinets, and the subsequent cabinets will adopt this gamut to generate coefficients.
- After you set the target cabinet count, you can click **Apply & generate coefs** to make the settings take effect.



 In Multi-layer calibration mode, the gamut settings for each layer will be saved individually. When you finish the calibration, the target color gamut of the lower layer will receive recommendation based on that of the higher layer.



4) Brightness calibration

Fig.3-115 Target settings for brightness calibration

- **Color:** Click on a colored box to let the screen display the corresponding color.
- Original values: You can measure the original values by clicking Measure after connecting to the color meter. Besides, you can also import the existing brightness value and coordinates, or double-click the value to modify. *Calibration Pro* will calculate the white point's color temperature based on the original values. You can export the original values by clicking **Export**. If you don't need to adjust the target temperature, you can simply skip this step.
- Target: You can adjust the coordinates of the target white point in this sheet. Click Import to import the existing target values. Clicking Export allows for saving the new target values. You can also click Set as D65 to



set the color temperature to the standard 6500K. In addition, you can double-click the brightness, x, and y of White in the sheet, and then enter the new values.

	Modify	
R	G	В
50.0	50.0	50.0

Fig.3-116 Brightness after calibration

• The brightness after calibration is 85% by default. You can click the input boxes below **R**, **G** and **B** respectively to modify the brightness. You should do the settings once for the first calibrated cabinet. The settings will then be applied to the subsequent cabinets.

3.3.5.2 Cabinet Capture Procedure

1) Click **Shoot** to start capturing cabinets from the selected cabinet list.

Chip low brightness calibration: Click **Shoot** first. The software will then send the initial coefficients and finish calibrating the captured gray levels in turn.

2) After the end of analyzing image and generating coefficients, the calibration coefficients will automatically be saved to receivers, module, and chip. The **Auto save calibration coefs** is enabled by default. You can unselect the function.

3) You will be prompted once the coefficients have been successfully saved. Clicking **OK** can continue calibrating the next cabinet. You can also click the color on top of the interface to check the calibration effect.



Fig.3-117 Display control area

4) Repeat the step 1-3 to calibrate the rest cabinets.

3.3.6 Calibration Log

The calibration log records the abnormal event and the progress information of the calibration. When a cabinet finished calibration, or was added, deleted, or renamed, the event will be recorded into **Progress** sheet of the log. The operations such as switching calibration mode and modifying post-calibration brightness that will affect the calibration progress and effects will be recorded into the **Exception** sheet.



- Planned cabinet count: This number conforms to the cabinet count in the cabinet list.
- Remaining cabinet count = Planned cabinet count calibrated cabinet count
- Exception: This field shows the number of abnormal cabinets during calibration.

- All: This field shows the progress and exception records of the project.
- By date: Click the downward arrow to select a date from the drop-down calendar so as to check the calibration record generated on the selected date.

3.3.7 Coefs Assembly

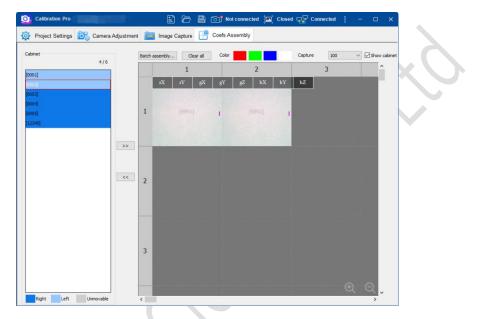


Fig.3-119 Coefficient assembly

You can access the **Coefs Assembly** tab after the end of cabinet calibration. In cabinet list on the left side of the tab, the cabinets that have finished calibration will be colored dark blue. You can assemble the luminance map on the right side of the tab.

Select a cabinet with dark blue background and then click the rightward double arrows button in the middle of the interface to add the luminance map of the selected cabinet to the assembly area on the right side. The added map can move freely on the assembly area. If you want to remove a map from the area, you can simply select the map and then click the leftward double arrows button in the middle of the interface. A cabinet with gray background indicates it has not finished calibration and its luminance map cannot be added to the assembly area.

When there are multiple capture gray levels for the cabinet (performing high and low brightness calibration, and multi-layer calibration), you can switch the current gray level to view corresponding luminance map in the assembly area.

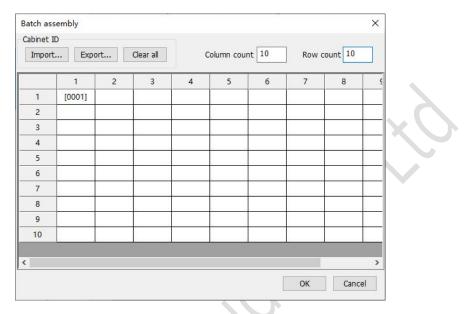


Fig.3-120 Batch assembly

Batch assembly: Enter target cabinets' names into an Excel table first. Then, in the **Batch assembly** window, import the Excel table. The cabinets' luminance maps will then automatically be assembled according to the naming method of the cabinets. Next, click **Export coefs** to export the assembled cabinet coefficients based on the cabinets' layout in the assembly area. The coefficients will be exported either as full-screen coefficients or by partitions or by modules.

For the luminance maps of the assembled cabinets, you can right-click on the map to add an **Image dust off** mark frame. Then, you can set the mark frame to apply it to the current cabinets, the subsequent cabinets, or all cabinets. Next, click **Apply** to make the settings take effect.

Chapter4 Calibration with Canon Camera

4.1 Canon Camera Assembly

4.1.1 Tripod Setup

Unfold the tripod and adjust its height, making it face the screen center, or at a height close to the user's eye level.



4.1.2 Mount Tripod Head

Align the screw hole at the bottom of the tripod head with the mounting screw of the tripod, and then screw the tripod head clockwise.



Fig.4-2 Mount the tripod head

4.1.3 Attach Lens

1) Rotate the lens cap and the body cap to remove them.

2) Align the red mount index on the lens with the red mount index on the camera and turn the lens as shown by the arrow until it clicks in place. See Figure 4-3.



Fig.4-3 Attach lens

3) Switch the focus mode to <MF> and then switch off the stabilizer of the lens (marked as OS on Sigma lens and IS on Canon lens). See Figure 4-4.



Fig.4-4 Adjust the focus mode

4.1.4 Mount Camera

1) Flip the quick-release lever of the tripod head to the direction as depicted in Figure 4-5.

2) Adjust the lens direction to make it align with that of the tripod head.

3) Mount the camera onto the plate of the tripod, and the lever will be automatically released to fix the camera. See Figure 4-6.



Fig.4-6 Mounting complete



4.2 Full-Screen Calibration

4.2.1 New Full-Screen Calibration

Step 1: Full-screen project wizard-1

In the start screen, click **New full-screen calibration** to access the **Full-screen project wizard-1**. See Figure 4-8.

	Full-screen project wiz	zard-1		
	Local Remote		Service no	t found?
1	Status PC name	User name IP	Usage s	status
10	<			>
0,	Control PC port 9933	TCP:9933 UDP:9934	Connect Dis	connect
			Next	Cancel

Fig.4-8 Select Local

1) For calibration with a single control PC, select **Local** to connect to the control PC.

2) For calibration with 2 PCs, select **Remote** and then select a PC as the control PC from the sheet below (available PCs in the currently used LAN



will be automatically shown in the sheet). Once you have selected the target PC, click **Connect**.

863 241 1		1 August 1			
Status F	°C name	User name	IP	Usage status	
<				>	
Control PC	port 9933 1	CP:9933 UDP	:9934 Connec	t Disconnect	

Notes:

- ① It is recommended that you select **Remote** when the sender is placed far from the LED screen and the control PC cannot physically connect to the sender via a cable.
- ⁽²⁾ For calibration with 2 PCs, the PCs should share the same LAN (connected via WIFI or network cable), and the firewalls of them should be turned off. Both PCs should also install *Calibration Pro* of the same version.
- ③ The PC for display capture will automatically launch CaliPro Server and should be connected to the control PC.
- ④ The Control PC port is 9933 by default. If the default port has been occupied by other devices, you will need to set a port number for both the control PC and the PC for display capture. To modify the port number, right-click the software interface or minimize the interface in the control PC, and then access the network setup window to enter a new port number. See Figure 4-10.



Network connection port of	9	
Network connection port:	9933	
TCP:9933	UDP:9934	
ОК	Cancel	

Fig.4-10 Network		and the second s	C
$-1\sigma / - 111 NOT MORV$	CONNECTION	nort	contiguiration
	CONTRACTION	LIX III	COMPANIATION
		P 0	

After the control PC finished network connection, click **Next** to bring up the **Full-screen project wizard-2**.

Step 2: Full-screen project wizard-2

In the **Full-screen project wizard-2**, you will be able to view information about the amount of connected sender and receiver, their model, and their program version. See Figure 4-11.

Sender	1 total	
A7 1.02.		
Contro	l LED display via USB (if :	sender supports)
Contro Receiver	ol LED display via USB <mark>(</mark> if	sender supports)
Receiver	ol LED display via USB (if: 2 total	sender supports)

Fig.4-11 Full-screen project wizard-2

- If the sender supports display control via USB, you can select the Control LED display via USB (if sender supports) checkbox. This will allows for pixel-to-pixel calibration image display without video signal.
- If the sender does not support USB control, you can perform calibration using video signal. Note that you should perform calibration with an extended screen in this case (see Project settings-Canvas settings in the following descriptions for reference).

• If the sender supports controlling screen group, you will be able to select the desired group for control in this window. After your selection, the selected screen group will display red at 255 grayscale, and other groups will display black.

Full-screen project wizard-2	×
Sender	
X100 Pro 1.001 total	
Control LED display via USB (if sen	der supports)
eceiver	
10 6.031 total	Refresh
creenGroup Select	
Screen Group Name	Status
Screen Group1	 Image: A second s
Screen Group2	
Back Next	Cancel

Fig.4-12 Full-screen project wizard-2-multiple screen groups

Then, you can click Next to move on to the Full-screen project wizard-3.

Step 3: Full-screen project wizard-3

Select Canon to finish camera settings in this step. See Figure 4-12.

Full-screen project wi:	zard-3		
Canon		О ССМ1	500 🗸
	Back	Next	Cancel

Fig.4-13 Full-screen project wizard-3



Step 4: Full-screen project wizard-4

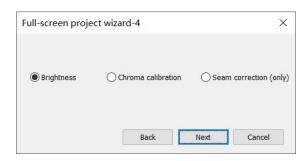


Fig.4-14 Full-screen project wizard-4

You can select the calibration mode in this step. See Figure 4-13. Available modes include: **Brightness**, **Chroma**, **Seam correction (only)**, and **Chip low brightness** (if supported by receiver).

After the selection, you can click **Next** to move on to the **Full-screen project wizard-5**.

Step 5: Full-screen project wizard-5

You can finish the setup of the module, cabinet, and screen in this step. See Figure 4-15.

	Full-screen project wizard-5		×
L	Module Width 32 V Height 32 V Pixel pitch 1 mm	□ Transparent ☑ Different color □ IMD	
C_{0}	Cabinet With cabinet (Only for scre Width 64 Note: Set size manually for ca	Height 64	
	Screen Width 256 Irregular screen Distance	Height 256	
	Back	Next Cance	el 🛛

Fig.4-15 Full-screen project wizard-5

- With Cabinet (Only for screen with single-type cabinet): This checkbox is selected by default. Select this checkbox when the screen is composed of cabinets of only one type.
- **Transparent:** This checkbox should be selected when the horizontal pixel pitch is different from the vertical one.
- **Different color**: Select this checkbox when the calibrated screen has modules with color difference.
- IMD: Select this checkbox when IMD module is used for the currently calibrated screen.
- **Pixel Pitch:** *Calibration Pro* will recommend a proper pixel pitch once the receiver is detected. Normally it is 0 by default, and you can enter a new pitch according to the real situation.
- Irregular screen settings
 - Curved screen: Select this checkbox when the screen is a curved one assembled by modules with the same LEDs in row and in column. You should also enter a value in the One-fold Width input box for a curved screen according to the real situation. See Figure 4-15.
 - Polygonal screen: Select this checkbox when the screen is an irregular one assembled by rectangular modules with the same LEDs in row and in column.

	Screen type	Curved screen V	1
On	ne-fold Width:	32	
		LEDs-diamond-layout screen	1

Fig.4-16 Irregular screen settings

• **Distance to ground:** This field indicates the real distance between the bottom of the screen and the ground (unit: mm).

Click Next when you finish this step.

Step 6: Full-screen project wizard-6

You can set the margins of the screen in this step. See Figure 4-17.

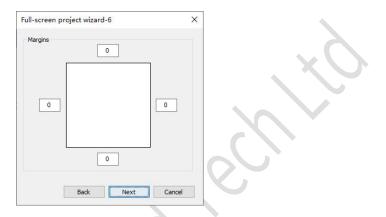


Fig.4-17 Full-screen project wizard-6

In this step, the screen will display a white frame. In this window, you can enter the number of LEDs that will not be lit during calibration respectively in the four input boxes around the frame, according to situation at site.

• When *Calibration Pro* has detected more than 1 sender, you will need to set the sender layout before continuing the wizard-6. See Figure 4-18.

	Full-screen pro	ect wizard-6				×
0	1	2				
	Sender	Row 1 v	Column 2 ~	Sender 1:	Width 1920	Height 1080
				i	Back Next	Cancel

Fig.4-18 Sender layout settings

In this step, you should enter the rows and columns of the senders according to their real layout. Click a sender to set its size and position in the load area. You can also exchange the control area and position of two senders by dragging them in this interface. Once you have finished the sender settings, you can click **Next** to move on to the setup of **Margins** and do as described above.

Once you have finished setting the margins, click **Next** to continue.

Step 7: Full-screen project wizard-7

You can name the calibration project and select a path for saving it in this step. See Figure 4-19.

Save as			
Name	Test001		
ocation	E:\未知文件夹\6.2工程	文件\	

Fig.4-19 Full-screen project wizard-7

Name: Enter the name of the calibration project in this field.

Location: Select a path for saving the project file and data in this field.

Once you have finished this step, you can click **Save** to apply all the settings finished in the above 7 steps, and you will be prompted the recommended shooting distance (see Figure 4-20). Next, click **OK** to finish the full-screen calibration project setup and access the main interface for this project.

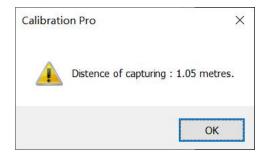


Fig.4-20 The reminding message for the recommended shooting distance

4.2.2 Project Settings

The main interface of the full-screen project is as shown in Figure 4-21. You should first set the basic parameters for the project in the **Project Settings** tab.

Calibration Pro - Test0	01	Ē	🔁 🖹 🛅 Not co	onnected 💽 Closed 🖵	Connected	ê —	o x
Project Settings	Camera Adjust	ment [🔤 Image Cap	oture 🔥 Generate C	oefs			
Project path E:\未知文件夹\6.2工程文件	Test001					Display :	at intervals
	100001		Browse	1-1			
Sender control mode		Calibration mode					
Sender No sender detected	Detect	Chroma	Seam correction				
Receiver No receiver detected	Settings	Auto-Detect	Effects settings				
creen settings							
	inet width 64	Module width 32	Margins				
		Module height 32					
Screen height 256 Cabi	net height 64						
artition size							
Width 256	Column count 1		Modify				
Height 256	Row count 1						

Fig.4-21 Main interface of full-screen project

4.2.2.1 Sender Mode

In the **Project Settings** tab, *Calibration Pro* will automatically detect senders and receivers once the control PC has been connected, and the senders and receivers that have been detected will be shown in the tab. See Figure 4-22.



CI SICVED	7件夹\6.2工程文	ζ件\Test001		Browse
ender cor	ntrol mode		Calibration mode	
Sender No s	ender detected	Detect	Chroma	Seam correction
Receiver No ri	eceiver detected	Settings	Auto-Detect	Effects settings
Screen he	eight 256 (Cabinet height 64	Module height 32	
Screen he		Cabinet height 64	Module height 32	
	ze	Cabinet height 64		Modify
artition si	ze			Modify

Fig.4-22 Basic information in sender mode

- Detect: Click Detect to detect the currently connected senders and receivers, and then you will be able to view the model and version number of the senders and receivers detected, as well as the amount of the receivers.
- Settings...

1) Click Settings... to bring up a pop-up window for setting the sender control mode. When the amount of the senders that have been detected is no more than 1, you can only enable or disable the option Control LED display via USB (if sender supports). See Figure 4-23.



Fig.4-23 Control LED display via USB (if sender supports)

2) When the amount of the senders that have been detected exceeds 1 (i.e., there are multiple senders for cascading calibration), you will be able to set the layout of the senders in the pop-up window.

Sender setup wizard-1

In **Sender setup wizard-1**, you can divide the screen into several partitions according to the load capacity of the sender. There are 2 ways available, as shown in Figure 4-24.

⊖ By size			
By block count	Number of partition	ons 2	
Row 1	∽ Colu	umn 2	~

Fig.4-24 Sender setup wizard-1

① **By size**: Divide the screen based on the size of each partition.

② **By block count**: Divide the screen according to the rows, columns, and number of partitions you set.

Once you have set up the screen partitions based on the real control area of the senders, you can click **Next** to continue.

Sender setup wizard-2

In this step, you can set up the partitions. See Figure 4-25.



	Block	Start Y	Start X	Width	Height
	1	0	0	960	540
	2	960	Ø	960	540
	3	0	540	960	540
	4	960	540	960	540
-					
\mathbf{Q}					
<u> </u>					

Fig.4-25 Sender setup wizard-2

- Regular layout: If you select this option, you can only set the size of the sender-control area in a way that can make the partitions align in rows and columns. You can modify the size of each sender-control area individually when the Regular layout checkbox has not been selected.
- **Reset**: Click to reset the position and size of the sender-control area.

Click Save once you have finished the setting process.

4.2.2.2 Calibration Mode

Click **Switch** to choose a calibration mode. Available options include: **Brightness**, **Chroma**, and **Seam correction** (only). See Figure 4-26.

Calibration mode	×
OBrightness	
Chroma	
O Seam correction	(only)

Fig.4-26 Available calibration modes

4.2.2.3 Seam Correction

A dark line will appear when the seam between modules or cabinets is too wide. Similarly, a bright line will appear when the width of the seam is less than the pixel pitch. Such dark or bright line can be fixed by adjusting the brightness of the LEDs on the border of the target seam.

• Seam correction: Click Seam correction in the Project Settings tab, and then select the Enable checkbox in the pop-up window to enable the seam correction function. See Figure 4-27.

Seam correction			×
🗹 Enable			
Intensity			
		1.00	
Recommended			
	ОК	Cancel	

Fig.4-27 Seam correction settings

• Intensity: You can move the slider below to change the adjusting intensity for seam correction, if you find the correction effect is not as is expected. The default intensity is 1. If the original dark (or bright) line turns to be too bright (or too dark) after seam correction, you can lower the intensity appropriately. However, if you find the line still relatively dark (or bright) after correction, you can then increase the intensity appropriately.

Note: If you have selected **Seam correction (only)** before, you cannot perform the brightness/chroma calibration, and the seam correction function will be enabled by default. See Figure 4-28.

Seam correction		3
Enable Seam correct		
Intensity		7.000
Recommended		1.00
	ОК	Cancel

Fig.4-28 Seam correction (only) settings

4.2.2.4 Effects Settings

You can click **Effects settings** to access corresponding interface. See Figure 4-29.

- Interchangeable after calibration: This option is selected by default to enable eliminating differences between the partitions after calibration.
- **De-vignetting**: This option is selected by default to enable eliminating dark clusters caused by lens halo.
- Image dust off: This option is selected by default to enable eliminating the post-calibration bright spots caused by dust from camera/lens.
- **Color moiré removal**: This option can be selected to eliminate the moiré generated during the calibration.
- Ambient light intensity: The Canon camera can work for calibration when ambient light exists, and the camera can adjust itself automatically to match the light. You can also select **Strong**, **Weak**, or **None** according to the real situation of the ambient light at site.
- Dead pixel rate: This field shows the ratio of dead pixels to the entire screen. You can adjust the ratio based on the actual situation (3-50‰). Note that if the actual dead pixel rate exceeds the rate you have set, a failure will occur.



dvanced settings	×
Effects options Interchangeable after calibration (Interchangeable after calibration) Description: Eliminate the difference be partitions. Disable it when there are be linear bright color differences. De-vignetting Description: Eliminate dark clusters cau halo.	locky and
Color moiré removal	
Description: Eliminate the post-calibrati spots caused by dust from camera/len	
☑ 消除摩尔纹 Description: Eliminate the colored moir by capture, and photo re-analysis is ne	
Ambient light intensity	
Auto O Strong O Weak	None
Note: Photo re-analysis is needed after changing light intensity.	ε.
Dead pixel 3 %o	
ОК	Cancel

Fig.4-29Effects settings for the Canon camera

• COB: If you have selected COB before, the available option in Effects settings will only include Image dust off. See Figure 4-30.

Effects options		
Color moiré ren		
	minate the post-calibr	
spors caused b	y dust from camera/le	HIS.
Ambient light inten	citu/	
Ambienc light inten	SILY	
Auto	O Strong O Weak	None 💿
	-analysis is needed af	ter
changing light	intensity.	
Dead pixel 3	%0	
	ок	Grand
Г		

Fig.4-30 Effects settings for Canon camera (COB module)

4.2.2.5 Screen Settings

Cabinet width 64	Module width 32	Margins
Cabinet height 64	Module height 32	
]	

Fig.4-31 Screen settings

Screen width and Screen height: Set the size of the full-screen.

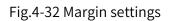
Cabinet width / height: Set the width and height of a single cabinet.



Module width / height: Set the width and height of a single module.

• Margins: Please refer to relevant description in Step 6: Full-screen project wizard-6 above.

Μ	largins			
		0		
	0	-	0	
	1	0		



 Canvas settings: If you have not selected Control LED display via USB (if sender supports), you will find the Canvas settings option in Screen settings. Click this option to access the pop-up window where you can set the start coordinates of the canvas.

Canvas settings	×
Canvas location	
Start X:]
Start Y: 0	1

4.2.2.6 Partition Size

Calibration Pro will recommend a proper partition size according to the size of the screen. You can click **Modify** to change the partition size if necessary.

Width	256	Column count	1	Modify
leight	256	Row count	4	

Fig.4-34 Partition size settings

Note: For a regular screen by default, 16 LEDs will overlap between partitions, and for a COB screen, 256 LEDs will overlap between partitions by



default. Once you have finished modifying the partition size, the number of intervals will automatically be calculated.

Modify partition size setting	js			×	
1-1	2- 1			Note: It is recommended that the unit block size should not exceed 150°100. Width ISO Column count 2 Height Z70 Row count 2	
1-2	2-2 ■ ✓	~	■	Height 2/0 Kow Count 2 Horizontal overlapping pixels 16 Apply to Row Column Vertical overlapping pixels 16 Apply to Row Column Note: Overlapping pixels 2 . Number of intervals 2 . . Note: Take 27 photos per partition. .	6
			⊕	OK Cancel	

Fig.4-35 Modify the partition size

You can select a partition from the **Partition preview** window or from the right side of the **Project Settings** tab. The selected partition will then be displayed with a white frame on the LED screen.

4.2.3 Camera Adjustment

1) Adjust the position of the camera and the tripod head to make the selected area of the LED screen be captured on the white frame of the preview area for framing.



💁 Calib	ration F	Pro - Te	st004 *				E) 6	5	8 (্যা	Conn	ected		Open	d 🖵	Con	necte	d 🔋		- 0	x נ
🄯 Projec	t Settin	gs 🔯	Camera	Adjustm	ent 📜	Image	e Captur	e N	Ger	nerate	Coef	s							Ę	Eff	ect eva	aluation
Auto	0) Manuai	metering							Display	at inti	ervals	Brighti	ness					255		ock EVF	3
	Start																					
	Red	Green	Blue																			_
Brightnes	191	166	196																			
	Norma I	Norma	Norma										- 54									1
LED size	164	176	170																			
postions and demands. 1. Make surr fills the white 2. Recomm 150-270. 3. Focus as seam correc 4. Turn off stabilization) M(manual) r 5. Ensure th photo mode	e the sh viewing ended ir clearly tion. the OIS and swi node.	ooting p area. maging s as possi i (optical tch to	artition size: ble for l image																			

Fig.4-36 Camera framing

Note: The selected area should generally align with the frame; The selected area should generally fill with the frame (exceeding the frame a little bit is acceptable); The selected area should not exceed the preview area; Adjust the lens to get a clear focus first, and then fine tune the lens to make the framing a little bit fuzzy.

2) Auto metering: Select **Auto** and then click **Start**. *Calibration Pro* will automatically adjust the shutter time for normal metering, and you can check the size of the LEDs when metering can be performed normally.

① If the captured size of LEDs is less than 150, you should adjust the lens focus to make the image a little bit fuzzy, and then click **Start** again.

② If the captured size of LEDs is over 270, you should adjust the lens focus to make the image look sharper, and then click **Start** agian.

③ The normal metering result for the captured size of LEDs should be within the range of 150-270. Once you have obtained this result, you can finish the metering.

	Start	:	
	Red	Green	Blue
Brightnes s	191	166	196
Result	Norma I	Norma I	Norma I
LED size	164	176	170

Fig.4-37 Auto metering complete

3) Manual metering: Select Manual metering and then click Measure.

① If the captured size of LEDs is less than 150, you should adjust the lens focus to make the image a little bit fuzzy.

② If the captured size of LEDs is over 270, you should adjust the lens focus to make the image look sharper.

③ If the measurement result is too dark, you should increase the shutter time or the brightness.

④ If the measurement result is too bright, you should decrease the shutter time or the brightness.

(5) You should click **Measure** every time when you have adjusted the shutter time, brightness, or lens focus until the measurement result is normal and the captured size of the LEDs is between 150-270.



⊖ Auto	(Manua	l metering
Red Gr	reen E	Blue	
Shut	ter	0"8	~
Apert	ure	32	\sim
I	SO	100	~
Brightne	ess	166	
Res	sult	Normal	
LED s		181	
Recommer	Mea		150-270
	Mea	sure	_
Too			Too
	Red	Green	Blue
Shutter	0"5	0"8	0"5
Aperture	32	32	32
ISO	100	100	100

Fig.4-38 Manual metering

Note: When the captured size of the LEDs is far from the range (150-270), you will be prompted "WARNING: Too few pixels marked." or "WARNING: Too many pixels marked." In this case, you should check whether there are too many dead pixels or whether the screen have been blocked.

4.2.4 Image Capture

Click **Image Capture** to access corresponding tab. In the tab, select a partition and then adjust the position of the tripod head to make the camera face the selected partition. Then, click **Shoot**. *Calibration Pro* will automatically control the camera to capture image of the selected partition and conduct analysis. Once the procedure for the partition has finished, the software will automatically repeat the same process to the next partition until all partitions are captured and analyzed. During this period, you can put the mouse on the partition that is undergoing the procedure to view the progress of the task. See Figure 4-39.



alibration Pro	E Consected : >
roject Settings 🔯 Camera Adjustment 📄	Display at intervals Brightness
1-1	2-1
Reshoot 1-2	2-2
	Sboot Analyze
	000 000 000 000 000 000
	 (1) (2) (3) (4) (5) (6) (7) (7)

Fig.4-39 Image capture

 Once a color (Red, Green, or Blue) of a partition has been captured, it will be shown on the corresponding partition and the background color of that partition will change to light blue (see Figure 4-39).

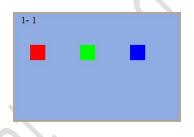


Fig.4-40 Shooting complete

 Once the analysis of the components is completed, a white check mark will appear below the corresponding color. When a partition has been captured and analyzed, its background color will change to dark blue (see Figure 4-41).

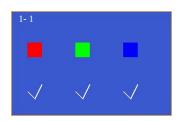


Fig.4-41 Shooting and analysis complete

4.2.5 Generate Coefs

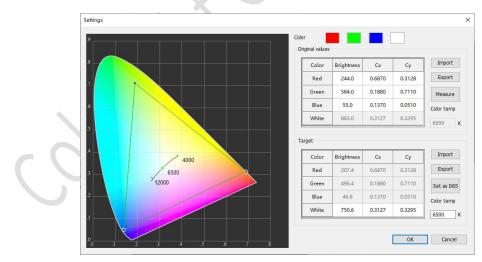
4.2.5.1 Brightness After Calibration

Once the shooting and analyzing have been completed, you can access the interface for generating coefficients. Next, you can click **Generate luminance map** to view the brightness loss automatically calculated. You can also modify the post-calibration brightness to change the brightness loss.

Brightness after calibration (%)	Red	Green Blu	e White	Black	700	m in Zoom	aut	Brightness after	calibration (%)	Red	Green	Blue	White	Black		1
R 85.0 G 85.0 B 85.0			-	255	200	2001	out	Brightness	85.0					255	200m in	Zoom out
Target color te Settings								Calibration object	_							
Calibration object								Normal Spare	Browse							
Normal Spare Browse								Generate lum	inance map							
Generate luminance map								Color gamut	settings							
Generate coefs								Generat	e coefs							
Export coefs								Export c	oefs							
Save coefs								Save o	oefs							
Calibration status								Calibration statu	IS							
Chip low brightness								Chip low brig	otness							
Disable calibration								Disable calibr								
O Calibrate by receiver								Calibrate by								

Fig.4-42 Brightness calibration mode

Fig.4-43 Chroma calibration mode



4.2.5.2 Settings

Fig.4-44 Target color temperature settings in brightness calibration mode

- **Color**: Click on a colored box to let the screen display the corresponding color.
- Original values: You can measure the original values by clicking Measure

after connecting to the color meter. Besides, you can also import the existing brightness value and coordinates, or double-click the value to modify. *Calibration Pro* will calculate the white point's color temperature based on the original values. You can export the original values by clicking **Export**. If you don't need to adjust the target temperature, you can simply skip this step.

• Target: You can adjust the coordinates of the target white point in this sheet. Click Import to import the existing target values. Clicking Export allows for saving the new target values. You can also click Set as D65 to set the color temperature to the standard 6500K. In addition, you can double-click the brightness, x, and y of White in the sheet, and then enter the new values.

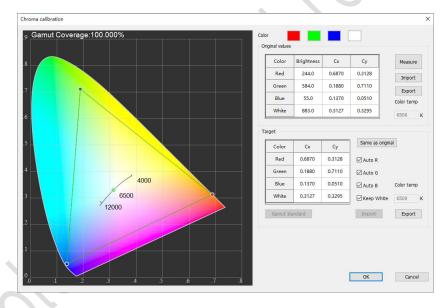


Fig.4-45 Color gamut settings interface

- **Color**: Click on a colored box to let the screen display the corresponding color.
- Original values: You can measure the original values by clicking Measure after connecting to the color meter. Besides, you can also import the original screen brightness and color gamut, or double-click the input boxes to modify the value. Clicking **Export** allows for exporting and

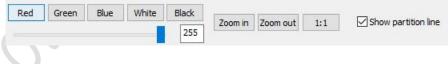
Colorlight

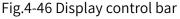
saving the original values. If you don't need to modify the values, you can simply skip this step.

- Target: You can adjust the target color gamut and the color temperature coordinates in this sheet. By default, the values in this sheet are calculated automatically. You can unselect Auto and double-click the input boxes to enter the new values if necessary. Besides, you can also apply the standard color gamut settings (*Calibration Pro* provides parameters of sRGB, AdobeRGB, PAL, NTSC, Rec.601, Rec.709, Rec.2020, and DCI-P3). If you select Same as original, there will not be color gamut loss.
- Color spot reduction: This option is available during chroma calibration for regular screen. You can select this option to optimize the color spot issue after the calibration.

4.2.5.3 Sending and Exporting Coefficients

 You can click Generate luminance map and then control the screen color and brightness on the control bar. In addition, you can also select Zoom in, Zoom out, or 1:1 to control the display of the luminance map. If you want to view the distribution of the shooting area on the screen, you can select the Show partition line checkbox.





- You can obtain coefficients by clicking on Generate coefs.
- Once the coefficients have been successfully generated, you can click **Save coefs** to save the coefficients to all areas or a specified area.
- You can then switch on/off the calibration.
- You can click Export coefs and then select Export all, Export coefs by



sender, or **Export by partition** based on your need to save the calibration coefficients.

 Spare calibration: Select Calibration object > Switch > Spare, and then click OK. You will then access the interface for spare calibration. Next, you can select the partition that you want to replace with a spare. And then you can click Shoot to start the spare calibration.

4.2.6 Effect Evaluation

Once a partition has finished calibration, the calibration parameters can be saved to receivers. With the calibration function enabled, you can then capture the calibrated partition again to evaluate the calibration effect. You can access the evaluation window by clicking on the icon is at the right end of the toolbar.

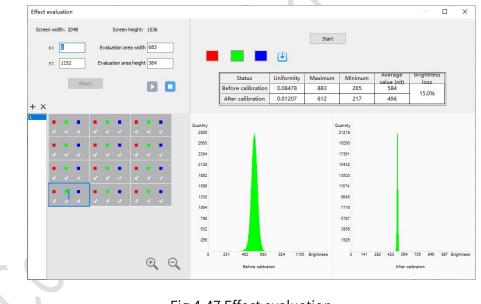


Fig.4-47 Effect evaluation

1) The **Screen width** / **Screen height** represents the width/height of the full-screen of the current project.

2) The **x** and **y** indicate the initial coordinates of the selected partition. Modifying the coordinates can change the evaluated partition. Also, you can add partitions for evaluation by clicking on the + icon above the

Colorlight

evaluated partition list. Each partition is seen as an individual evaluation area, which is marked by a number that corresponds to its number in the evaluation list.

3) Select one evaluated partition from the list, and then adjust the tripod head to make the camera face the lit part of the screen. Then, with the calibration function enabled, click **Shoot** to let *Calibration Pro* capture and analyze images of the evaluated partition. Next, click **Start** to begin the evaluation. The right side of the interface will display a statistical table that contains data before and after the calibration respectively. Below the table are 2 histograms representing the situation before and after the calibration.

4) The statistical table shows information about the evaluated partition before and after calibration, including **Uniformity**, **Maximum** (brightness), **Minimum** (brightness), **Average value (nit)**, and **Brightness loss**.



Order 效果评估测试-2048_1536-6_17-01 Calibration Effect Evaluation Report Status Uniformity Maximum Minimum Average value (nit) Brightness loss Before calibration 0.10612 15.0% After calibration 0.01449 Quantity 36340 Quantity 5150 408 Brightness Bright Before calibration After calibration Brightness loss Status Uniformity Minimum Maximum Average value (nit) Before calibration 0.08478 15.0% After calibration 0.01207 Quanti 1155 Brightness 744 868 992 Brightness Before calibration After calibration Status Uniformity Maximum Minimum Average value (nit) Brightness loss Before calibration 0.10551 15.0% After calibration 0.02128 Quantity 144970 Quantity 30480



Fig.4-48 Effect evaluation report

5) You can view the statistical information and the layout of the LEDs (Red, Green, and Blue) by clicking on the icons , and respectively. , Then, you can click the icon 🚺 to save the evaluation report to your PC.

4.3 Cabinet Calibration

4.3.1 New Cabinet Project

Step 1: Cabinet project wizard-1

In the start screen of *Calibration Pro*, click **New cabinet project** to access the **Cabinet project wizard-1** (see Figure 4-49). Then, select a way for control PC connection.

Remote Service not found? Status PC name User name IP Usage status	Service not found?			
Status Pe name User name in Usage status	Ucago status	User name IP		
	obuge status	ober name 1	r e nume	Status
< >	>			<
Control PC port 9933 TCP:9933 UDP:9934 Connect Disconnect	Connect Disconnect	TCP:9933 UDP:9934	C port 9933	Control P

Fig.4-49 Cabinet project wizard-1

Step 2: Cabinet project wizard-2

	Single cabinet calibration-2	×
	Sender	
	X7 1.021 total	
S	Control LED display via USB (if sender s	supports)
	K10 8.202 total	Refresh
	Back Next	Cancel

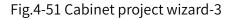
Fig.4-50 Cabinet project wizard-2

Note: You can refer to Full-screen project wizard-2 for reference.

Step 3: Cabinet project wizard-3

Select Cannon in this step. See Figure 4-51.

ingle cabinet calibra	tion-3			×
Canon		О ССМ1	500 🗸	



Step 4: Cabinet project wizard-4

Single cabinet ca	alibration-4		×
Brightness	Chroma calibration	⊖ Sean	n correction (only)
	Back	Next	Cancel

Fig.4-52 Cabinet project wizard-4

Note: You can refer to Full-screen project wizard-4 for reference.

Step 5: Cabinet project wizard-5

Single	cabinet cali	orauo	-D		>
Cabin	et Width	64		Height 64	
Modul	e Width	32	~	Transparent	
	Height	32	~	Different color	
Numbe	r <mark>of int</mark> ervals	0	\sim		

Fig.4-53 Cabinet project wizard-5

- (Cabinet) Width/Height: The resolution of the currently calibrated cabinet.
- (Module) Width/Height: The resolution of the currently calibrated module.
- Number of intervals: *Calibration Pro* will recommend a number after the cabinet width and height have been adjusted. You can also modify it manually.
- **Transparent:** This checkbox should be selected when the horizontal pixel pitch is different from the vertical one.
- **Different color:** Select this checkbox when the calibrated screen has modules with color difference.
- IMD: Select this checkbox when IMD module is used for the currently calibrated screen.

Step 6: Cabinet project wizard-6

- **Prefix:** Enter the prefix for the name of the new cabinets.
- **Count:** The number of cabinets that have been added to the cabinet list automatically.
- Naming method: Available options include: Cabinet number, Row-Column, Column (ABC)-Row, and Row (ABC)-Column.
- **Cabinet per row:** Enter the number of cabinets on each row. The number you enter in this field will automatically change the cabinet name.
- Example: This field shows the example of a cabinet name automatically based on the Prefix, Naming method, and Cabinet per row you set before.



Name prefix		
Count	1	
Naming method	Cabinet number \checkmark	
Cabinet per row	1	
Start number	1	
Example	[0001],[0002]	
	ack Next Cance	

Step 7: Cabinet project wizard-7

Save as					
Name	<enter a="" na<="" project="" th=""><th>me></th><th></th><th></th><th></th></enter>	me>			
Location	E:\未知文件夹\6.2	工程文件\	8		

Fig.4-55 Cabinet project wizard-7

- Name: Enter the name of the calibration project in this field.
- Location: Select a path for saving the project file and data in this field.

Note: You can refer to Full-screen project wizard-7 for reference.

4.3.2 Project Settings

4.3.2.1 Sender Mode

In the **Project Settings** tab, *Calibration Pro* will automatically detect senders and receivers once the control PC has been connected, and the senders and receivers that have been detected will be shown in the tab. See Figure 4-56.



Project Settings	<i>µ</i>		Capture 📑 Coefs Asser	-i <u></u> -	
roject path E:\未知文件夹\6.2工程文件\	Tect003				Display at interva
C PROMONTING PRODUCTION OF			Browse	[0001]	Shoot Analyze
ender control mode		Calibration mode			
Sender X7 1.021 total	Detect	Brightness	Seam correction		
Receiver K10 8.202 total	Settings	Auto-Detect	Effects settings		
creen settings			Cabinet params settings		
Cabinet width 64 Mod	ule width 32		Read params		
abinet height 64 Modu	le height 32	Canvas settings	Save params before shoot		

Fig.4-56 Main interface of cabinet project

- **Detect**: Click **Detect** to detect the currently connected senders and receivers, and then you will be able to view the model, version number, and amount of the senders and receivers detected.
- Settings...: Click Settings... to bring up a pop-up window where you can enable or disable the option Display control via USB (if sender supports). See Figure 4-57.

USB control settings	×
Control LED display via USB (if supported by the sender)	

Fig.4-57 Control LED display via USB (if sender supports)

4.3.2.2 Calibration Mode

Click **Switch** to choose a calibration mode. Available options include: **Brightness** and **Chroma**. See Figure 4-58.

Calibration mode	×
Brightness	
O Chroma	

Fig.4-58 Available calibration modes



4.3.2.3 Seam Correction

Seam correction	>
Intensity	
Recommended	1.00
Cabinet edge coefs	
1.000 + Reset 1.000	*
1.000	

Fig.4-59 Seam Correction

- Seam correction: This function is enabled by default. You can disable it according to your need. See Figure 4-59.
- Intensity: This field indicates the intensity of brightness adjustment for LEDs at the edges of the cabinet. The default intensity is 1. If the dark (or bright) line turns to be too bright (or too dark) after seam correction, you can lower the intensity appropriately. However, if you find the line still relatively dark (or bright) after correction, you can then increase the intensity appropriately.

If you have selected **Seam correction (only)** before, you cannot perform the brightness/chroma calibration, and the seam correction function will be enabled by default. See Figure 4-60.

	Seam correction	>
- ~~	Enable Seam correct	
\mathbf{S}	Intensity	1.00
	Recommended	
	Cabinet edge coefs	
	ОК	Cancel

Fig.4-60 Seam correction (only) settings

• Cabinet edge coefs: You can fine tune the coefficients of the cabinet edge based on the existing calibration coefficients in this field. This operation can fix the dark and bright lines between cabinets.

4.3.2.4 Effect Settings

You can refer to Section 4.2.2.4 Effect Settings for reference.

4.3.2.5 Screen Settings

In this field, you can set the width and height of the current cabinets and modules.

Cabinet width	64	Module width 32	
			Canvas settings
abinet height	64	Module height 32	

Fig.4-61 Screen settings

Canvas settings: If you have not selected **Display control via USB (if sender supports)**, you will find the **Canvas settings** option in **Screen settings**. Click this option to access the pop-up window where you can set the start coordinates of the canvas.

Canvas se	ettings	×
Canvas	ocation	
Start	x: 🖸	
Start		

Fig.4-62 Canvas settings

4.3.2.6 Cabinet Parameters Settings

Connect to the sample cabinet that has saved receiver parameters and topology. Then, click **Read reference cabinet params** to save the parameters and topology from the sample cabinet. Once the parameters have been successfully read, you can select **Save params before shoot** so that the

real-time parameters and topology will be automatically sent to the receivers before shooting photo for cabinet calibration. See Figure 4-63.

 d params

Fig.4-63 Cabinet parameters settings

4.3.3 Camera Adjustment

Note: You can refer to Section 4.2.3 Camera Adjustment for reference.

4.3.4 Image Capture

4.3.4.1 Capture Settings

The interface of image capture for single cabinet calibration is as shown in Figure 4-64.

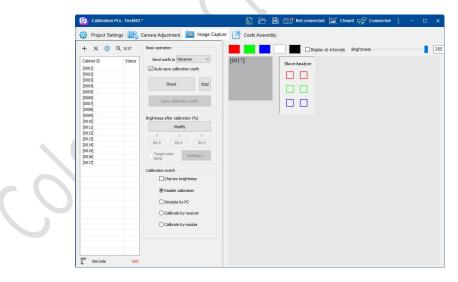


Fig.4-64 Single cabinet image capture

1) Settings

In Image Capture tab, available options above the cabinet list include: + (Add cabinet), \times (Delete the selected cabinet), \bigotimes (Settings), and



Q (Search in cabinet list). Click Settings icon 🐼 to bring up the corresponding window. See Figure 4-65.

ettings Coefs blending settings	The start of the start process	
Cabinet ID settings	Thermal effects settings	
	Enable Thermal effects model:	
Serial number settings	Coefs blending settings	
	Number of blending cabinets 9	
	O Import coefs	
	High brightness Load Cabinet location	
	Apply&generate coefs	
	Appryogenerate coers	
		l l

Fig.4-65 Single cabinet calibration settings

- Thermal effects settings: This option is for importing the thermal effects removal model to eliminate the negative effects caused by warm screen. You can select this checkbox to enable Thermal effects removal for the subsequent cabinets.
- Coefs blending settings: Use the data applied to the Number of blending cabinets so as to automatically eliminate the vignetting of the camera and the lens. By default, this number for modules with different colors is 9. With this function enabled, a de-vignetting model will automatically be generated when the number of calibrated cabinets reaches the set number of blending cabinets. The model will automatically be applied to the subsequent cabinets. In this case, the coefficients should also be recent. If this function is not enabled, the model will not be applied to the subsequent cabinets.
- Apply & generate coefs: Click this button to let the software automatically generate cabinet coefficients of all the calibrated cabinets based on the reference model and the coefficients blending settings.

- Cabinet ID settings: You can refer to Cabinet project wizard-6.
- Double-click the target cabinet ID in the cabinet list to bring up the window where you can modify the ID. Once you have changed the cabinet ID, the calibration data will also change accordingly. After the end of shooting and analyzing, the background color of the cabinet list will change to light blue, and when the coefficients have been successfully sent, a green check mark will appear on the status column.

2) Coefficient saving

• The coefficients will be sent to receivers by default; when smart module is adopted, you can select a target to send the coefficients. Available options include: **Receiver, Receiver&module**, and **Module**.

Send coefs to	Receiver	×
Auto save ca	Receiver Module Receiver&mo	dule
Shoot		Stop
Save cali	pration coefs	

Fig.4-66 High brightness capture

Auto save calibration coefs is selected by default. When the coefficients are generated after image analyzing, the coefficients will automatically be sent to the receivers, modules, and chips.

3) Chroma calibration mode

The brightness after calibration is 85% by default. You can click the input box in the **Brightness after calibration** field to modify the brightness. Click **Chroma settings** to bring up the window where you can change the original color gamut and the target gamut. You should do the settings once for the first calibrated cabinet. The settings will then be applied to the subsequent cabinets.

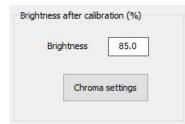


Fig.4-67 Brightness after calibration

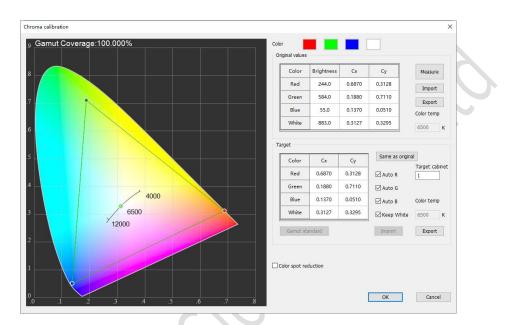


Fig.4-68 Chroma settings

- Original values: You can measure the original values by clicking Measure after connecting to the color meter. Besides, you can also import the existing brightness value and coordinates, or click the value to modify. Clicking Export allows for exporting and saving the original values.
- Target: *Calibration Pro* will give a target gamut based on the data captured by the camera. If you want to modify the target gamut, you can deselect Auto R/G/B. If you want to apply standard gamut, you can select the standard (available standards include sRGB, AdobeRGB, PAL, NTSC, Rec.601, Rec.709, Rec.2020, and DCI-P3), and then click Import to import the target gamut. Besides, you can also double-click the input boxes to enter the desired values. If you select Same as original, the target gamut will not be adjusted after calibration.

4) Brightness calibration

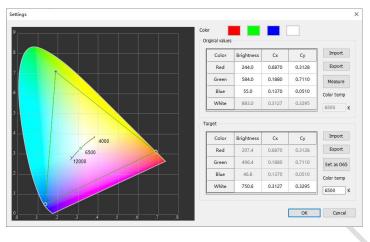


Fig.4-69 Target settings for brightness calibration

- **Color:** Click a colored box to let the screen display the selected color.
- Original values: You can measure the original values by clicking Measure after connecting to the color meter. Besides, you can also import the existing brightness value and coordinates, or double-click the value to modify. *Calibration Pro* will calculate the white point's color temperature based on the original values. You can export the original values by clicking **Export**. If you don't need to adjust the target temperature, you can simply skip this step.
- Target: You can adjust the coordinates of the target white point in this sheet. Click Import to import the existing target values. Clicking Export allows for saving the new target values. You can also click Set as D65 to set the color temperature to the standard 6500K. In addition, you can double-click the brightness, x, and y of White in the sheet, and then enter the new values.

	Modify	
R	G	В
85.0	85.0	85.0

Fig.4-70 Brightness after calibration

• The brightness after calibration is 85% by default. You can click the input boxes below **R**, **G** and **B** respectively to modify the brightness. You should do the settings once for the first calibrated cabinet. The settings will then be applied to the subsequent cabinets.

4.3.5.2 Cabinet Capture Procedure

1) Click **Shoot** to start capturing cabinets from the selected cabinet list.

2) After the end of analyzing image and generating coefficients, the calibration coefficients will automatically be saved to receivers, module, and chip. The **Auto save calibration coefs** is enabled by default. You can unselect the function.

3) You will be prompted once the coefficients have been successfully saved. Clicking **OK** can continue calibrating the next cabinet. You can also click the color on top of the interface to check the calibration effect.





4) Repeat step 1-3 to calibrate the rest cabinets.

4.3.5 Calibration Log

The calibration log records the abnormal event and the progress information of the calibration. When a cabinet finished calibration, or was added, deleted, or renamed, the event will be recorded into **Progress** sheet of the log. The operations such as switching calibration mode and modifying post-calibration brightness that will affect the calibration progress and effects will be recorded into the **Exception** sheet.



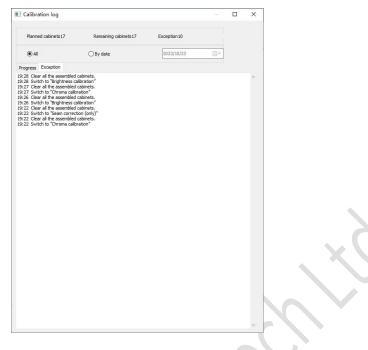


Fig.4-72 Calibration log

- Planned cabinet count: This number conforms to the cabinet count in the cabinet list.
- Remaining cabinet count = Planned cabinet count calibrated cabinet count
- **Exception**: This field shows the number of abnormal cabinets during calibration.
- All: This field shows the progress and exception records of the project.
- By date: Click the downward arrow to select a date from the drop-down calendar so as to check the calibration record generated on the selected date.

4.3.6 Coefs Assembly

	batch	assembly	Clear al	Color				Show cabinet	t ID	Export coe	fs		
0 / 17		1	2	3	4	5	6	7	8	9	10	11 ^	
1] 2]													
3]	1												
4]													
5]	2												
6]	2												
7]													
01	3												
a] >>	<u>></u>												
0]													
1]	4												
2]	<		To	assemble	e cabinet	s, use on	e of the f	ollowing	methods	•			
3]	5												
4]													
5]													
6]	6												
7]	_												K
	7												
	1												
	8												

Fig.4-73 Coefficient assembly

You can access the **Coefs Assembly** tab after the end of cabinet calibration. In cabinet list on the left side of the tab, the cabinets that have finished calibration will be colored dark blue. You can assemble the luminance map on the right side of the tab.

Select a cabinet with dark blue background and then click the rightward double arrows button in the middle of the interface to add the luminance map of the selected cabinet to the assembly area on the right side. The added map can move freely on the assembly area. If you want to remove a map from the area, you can simply select the map and then click the leftward double arrows button in the middle of the interface. A cabinet with gray background indicates it has not finished calibration and its luminance map cannot be added to the assembly area.



nport	. Expo	ort	Clear all	С	olumn cour	nt 10	Row c	ount 10	
	1	2	3	4	5	6	7	8	ç
2									
3									
1							<		
5									
5									
7									
3									
)									
0									
0									>

Fig.4-74 Batch assembly

Batch assembly: Enter target cabinets' names into an Excel table first. Then, in the **Batch assembly** window, import the Excel table. The cabinets' luminance maps will then automatically be assembled according to the naming method of the cabinets. Next, click **Export coefs** to export the assembled cabinet coefficients based on the cabinets' layout in the assembly area. The coefficients will be exported either as full-screen coefficients or by partitions or by modules.

Chapter5 Menu

5.1 Default Settings

Click the **Menu** button i and then select **Settings** > **Default settings** to bring up a pop-up window where you can perform photo deleting settings, set up brightness after single gray level calibration, and select default location for saving project. See Figure 5-1.

Default settings	×	
Enable photo deleting		
O Delete all		
Delete monochrome phtoto (only CCM camera is valid)		
Detect smart module		
Auto crop		
Lumi Send Chroma Coef		
Pre-shooting delay 0.0 s		
Confirm calibration effect (Gray level)		
Low brightness 10 High brightness 255]	
Complete prompt sound		
Default project location D:\Project\test\	Browse	
OK Cance		

Fig.5-1 Default settings

- Enable photo deleting: If you select this checkbox, the software will automatically delete the photos that have been fully analyzed during the camera capturing process. The monochrome photo is only available in an operating environment using industrial camera. After deleting the monochrome photo, you can still gain the analysis result.
- Detect smart module: If you select this checkbox, the smart modules will be detected, if any. If there is a smart module detected, you can send coefficients to the module.

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- Auto crop: When this option is selected, the image captured will automatically be cropped for an effective area, reducing the negative impact of oversize image and non-related area on the analysis.
- **Brightness calibration sends chroma coefs**: This option is only available for high brightness calibration project.
- **Pre-shooting delay:** The default delay is 0. You can set a countdown for shooting, activating the capture after the designated time from the moment you click **Shoot**.
- Confirm calibration effect (Gray level): The default gray level in low brightness is 10. After the end of low brightness calibration, the software will automatically enable this calibration and display color white at gray level 10 on the screen for you to check the calibration effect. The default gray level in high brightness is 255. After the end of high calibration, the software will automatically enable this calibration and display color white at gray level 255 on the screen for you to check the calibration and display color white at gray level 255 on the screen for you to check the calibration effect.
- **Completion sound**: When selected, the software will play a reminding sound once the calibration is completed.

5.2 Hardware Device

Click the three-dot button for menu, then select Hardware device for a pop-up management window. The hardware devices include **Camera**, **PLC**, **Scanner**, and **Color meter**. The tabs for **PLC** and **Scanner** management are only available with an open project.

• Camera

In this tab, you can control the connection and EVF of the camera. After the connection, you can view information of the camera. If it is an industrial camera, you can view its model, CCD temperature, resolution, and driver



version. If it is a Canon camera, you can view its resolution, exposure mode, current shutter, current aperture, focus ring value, and the quality of the photos captured by it.

Disconnect Camera model: 2D target temperatur		Evf CCM	16000		
	e(°C):				
CD target temperatur	e(°C):	0.0	Ť.		
			Current Temp	: 6.3⁰C	
Driver version	23.07.26	.0]	
Camera	9576x63	88]	
		0	ĸ	Cancel]
Fig 5	2 Can	aora	<u>}</u>		
				Camera 9576x6388	OK Cancel

PLC

You can configure the PLC connection in this tab.

	Camera			>
		Use PLC	control	
	PLC	IP:	127 . 0 . 0 . 1	
	Scanner	Port :	502	
5	Chroma		Connect Positon	
			OK Car	ncel

Fig.5-3 PLC



• Scanner

You can manage the scanner connection and enable **Calibration with** scanner in this tab.

Hardware device			×	
PLC	Scanner Calibra	tion		
Scanner		Connect		
Chroma				$\chi \chi$
		ОК	Cancel	

Fig.5-4 Scanner

• Color meter

In the tab, you can connect to the color meter CS2000. Click **Measure** upon connecting to the color meter. Then, the spectral data of the 3 colors (Red, Green, and Blue) of the screen will be measured and shown in the tab. You can then click **Export spectral data** to export the RGB spectral data in .csv (Excel) format.

	Hardware devi	ce		
	Camera	Color meter initialization comp	blete	
		Connect color meter	Measure	Export spectral data
- () '	PLC			No. E
		0.0000 -		
	Scanner			
	Chroma			
	Chroma			
		380		
		580		
			ОК	Cancel

Fig.5-5 Color meter measurement - Green



5.3 Image Viewing

Click the **Menu** button and then select **Tools** > **Image viewing** to view the captured images. See Figure 5-6.

Image viewing									×	
	Image path									
Open										
Save as JPG										
Image information										
Red										
Green										
Blue										
Normal										
Monochrome										
Histogram										
Mark LED										
LEDs layout										
LED count 0										
LED size 0										
		١ <u>ڦ</u>	1:1	←	\rightarrow	Q	æ			
					-	_				

Fig.5-6 View image

- **Open...**: Click **Open...** to select a photo to view.
- Save as JPG: Click Save as JPG to save the currently opened photo in .JPG format.
- Image information: Click Image information to check information about the currently opened photo, including: Width, Height, Time, Shooting mode, Shutter, Aperture value, ISO, Focal length, Color temp, Temp, Manufacturer, camera model, and Lens model.

Image information	×
Width	
Height	
Time	
Shooting mode	
Shutter	
Aperture value	
ISO	
Focal length	Ę
Color temp	=
Temp	=
Manufacturer	_
Camera model	
Lens model	

Fig.5-7 Image viewing - Image information

- **Red/Green/Blue/Normal**: Respectively shows the RGB information and the comprehensive information of the current photo.
- Monochrome: Shows the gray level layout information of the current photo.
- **Histogram**: Shows the brightness layout information of the current photo.
- Mark LED: Shows the LEDs identified and marked by the software.
- LEDs layout: Shows the LEDs layout of the current photo.
- LED count: Shows the LED count of the current photo.
- LED size: Shows the LED size of the current photo.
- You can click the icon № to view the complete image, or select 1:1 to view the current photo pixel to pixel. Clicking ← can return to the previous photo and clicking → can access the next photo. You can also zoom in / zoom out on the photo by clicking ♀ / ♀.

5.4 Tools

5.4.1 CoefRotateTools

By cabinet	Cabinet width 480	
	Rotation angle	e 90° ~
O By full-screen	Cabinet height 270	
Original coefs	D:\temp\系数调整\调整前\	Browse
Adjusted coefs	D:\temp\系数调整\调整后\	Browse
	Start	

Fig.5-8 Coefficient rotation settings

You can rotate the cabinet or screen coefficients (clockwise by default).

- **By cabinet**: Set the width and height of the cabinet.
- **By full-screen**: Set the width and height of the screen.
- **Rotation angle**: Set the rotation angle for the coefficients. By default, the coefficients will be rotated in a clockwise direction. Available angles include: 90, 180, and 270.
- Original coefs: Select the location for saving the original coefficients.
- Adjusted coefs: Select the location for saving the adjusted coefficients.

You can click **Start** once you have finished the above settings. The original coefficients will then be rotated and saved according to the settings.

5.4.2 CrossTools

Based on the difference between the cold and warm screen coefficients, the **CrossTools** can be used to fix the problem caused by the thermal effect of the screen. The corrected coefficients can be saved locally.

	_		
Cabinet width	256	Cabinet height	256
Screen width	2560	Screen height	256
Reference			
Cold	d cabinet coefs	E:\十字线系数模型\cool\	Browse
Warn	n cabinet coefs	E:\十字线系数模型\hot\	Browse
Application			
	l cabinet coefs	E:\十字线系数模型\修复系数-旧\	Browse
Calibrated	d cabinet coefs	E:\十字线系数模型\修复系数-新\	Browse
Smoothing			
ooo.ug	Widt	h Default Height Default	
Inten	sity coefs	1.00	
		Recommended	
	Start	Export reference	model
			Cloud Tech L

Fig.5-9 CrossTools for thermal effect removal

- Cabinet width and height: Set the cabinet size.
- Screen width and height: Set the screen size.

- Cold cabinet coefs: Select a location for saving the cold cabinet coefficients.
- Warm cabinet coefs: Select a location for saving the warm cabinet coefficients. The name of the cold cabinet coefficient should be the same as that of the warm cabinet coefficient.
- Original cabinet coefs: Select a location for saving the original coefficients.
- Calibrated cabinet coefs: Select a location for saving the coefficients after thermal removal.
- Intensity coefs: The default intensity is 1. You can change the intensity if necessary.

You can click **Start** once you have finished the above settings. The cabinet calibration coefficients after thermal removal will be generated automatically. You can then click **Export reference model** to export the coefficients.

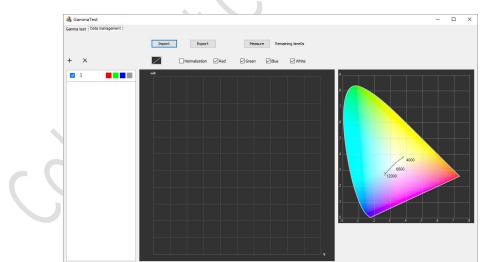
5.4.3 Gamma Test

You can use color meter (model CA-VP427 or CS2000) to test the Gamma linearity of the screen.

GammaTest		- 0	3
ma test Data management			
Connect screen	Connect color meter		
Preparation			
Screen parameters E:\未知文件类\6.2工程文件	\佳能cob单箱-8_1-02\param\rcv2023-08-01.rcvbp Load		
Maximum Gamma 8191			
Save parameters reset screen	Screen test		
Measurement parameters			
Color 🗹 Red 🛛 🗹 Gree	n 🗹 Blue 🗹 White		
Screen pre-warming time 1 s			
Range 0 8	91 🖌 Al		
Step 100 Def	ult Gamma table Custom Gamma table Load		
Count 3			
Save to: D: \Desktop \桌面文件\软件包\伽	Biglittill Browse		

Fig.5-10 Gamma test settings

- **Connect screen**: Click this button to detect sender and control the screen.
- **Connect color meter**: Connect to the currently adopted color meter.
- Screen test: Click this button to test the screen color.
- Color: Select colors to be tested.
- Screen pre-warming time: Set a duration for screen pre-warming.
- **Range**: Shows the range of Gamma value (0-Max. Value) by default. The range can be modified manually.
- Step: Set the increment of the Gamma test. If you select **Default Gamma table**, the Gamma table of the current screen will be tested. You can also click **Load** to load a customized Gamma table. A green check mark will appear on the right side if the loading is successful.
- **Count**: Set the times for testing a same Gamma value.



• Save to: Select a location for saving the data generated during the test.

Fig.5-11 Gamma test - Date management

- Import: Import the previous Gamma test data.
- **Export**: Export the current Gamma test data.

- Measure: Measure the Gamma based on the current Gamma test settings.
- **Draw line segments** Select 2 points on the area below by clicking to draw a line segment connecting the 2 points.

5.4.4 Adjust Coefs

You can fix the problem of obvious color difference when the spare modules are changed to other position.

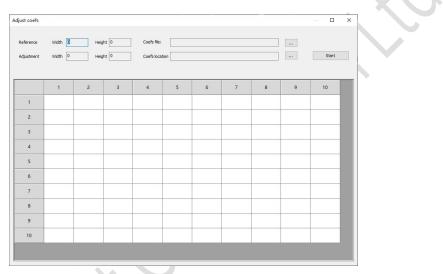


Fig.5-12 Coefficient adjustment tool

- **Coefs file** (next to **Reference**): Select a location for saving the full-screen calibration coefficients before changing spares.
- **Coefs location** (next to **Adjustment**): Select a location for saving coefficients of the spares that need to be adjusted.

Select the destination that you want to change the spare to, and enter the spare coefficient name. Then, you can click **Start**. A new full-screen coefficient after changing spares will be exported to the location you set (**Coefs file**), and a new coefficient after the adjustment will be exported to the **Coefs location** that you have selected before.

5.4.5 Calibration coefs mapping

In this window, you can re-map the LEDs coefficients based on the pixel drawing table.

Calibration coefs mapping	×
Original coefs	
Pixel drawing table:	Browse
Coefs location:	Browse
Target coefs	
Pixel drawing table:	Browse
Coefs location:	Browse
Start	

Fig.5-13 Coefficient remapping tool

5.4.6 Thermometer

You can view the real-time temperature of the screen in this window once a thermometer is connected.

	Thermometer	×
\mathcal{O}	Current temperature: °C	

Fig.5-14 Thermometer

Chapter6 FAQs

• Q: Failed to detect receiver?

A: 1. Make sure you have connected the power supply.

2. Ensure a stable connection.

• Q: Failed to launch *Calibration Pro* after installation?

A: 1. Make sure all components have been installed.

- 2. Do not launch the software EOS Utility.
- Q: Failed to connect to the control PC?
 - A: 1. Ensure a stable firmware connection.

2. Ensure a correct IP (if you have selected the local PC as the control PC, the IP should be 127.X.X.X), and then check if the ping is successful.

3. Make sure the control PC and the client end share the same port, and try to establish ping with the target port (if the IP ping is successful but the port ping is not, it is usually caused by the firewall or router logic issue).

• Q: Abnormal screen display after launching *Calibration Pro* (such as screen flashing and screen artifact)?

A: Use the software LEDVISION to adjust the display and then save the new parameters to the receivers.

- Q: Failed to connect to the camera?
 - A: 1. Make sure the camera is supported by *Calibration Pro* (supported models include: CCM6000, Canon 70D, 80D, 90D, 7D, and 7D MarkII).

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- 2. Ensure a stable firmware connections.
- 3. Make sure the camera is open and is not in the standby mode.
- 4. Make sure the camera is in manual mode (M mode).

5. Make sure the dongle has been inserted to your PC when you are using CCM6000 for calibration.

- Q: Failed to capture?
 - A: 1. Make sure you are using supported camera for calibration.
 - 2. Make sure the camera is in manual mode (M mode).
 - 3. Make sure the MF of the lens has been enabled.
- Q: The shutter speed is 1/30 and cannot be increased?

A: 1. Make sure the camera is in manual mode (M mode).

2. Make sure the camera is in picture mode (for taking photos) instead of in shooting mode (for taking videos).

• Q: Failed to analyze photos?

A: 1. Make sure you are using supported camera for calibration.

2. Reinstall Calibration Pro to ensure complete components.

3. Check the quality of capturing via Image viewing. In the Image viewing tab, you can first open a photo and then click Measure brightness, or view the monochrome and histogram to check whether the photo has the problem of focus error, overexposure, underexposure, or camera shake.

4. This problem might be caused by over-dense LEDs as the partition is too big. In this case, you can add intervals among pixels to decrease the LED density. 5. This problem might be caused by too many dead pixels or pixel displacement.

6. This problem might be caused by the lack of memory.

- Q: Photo quality unable to be improved even after repeated capturing?
 - A: Possible causes include: Focus error, overexposure or underexposure, or camera shake.

If it is caused by focus error, you can:

- 1. If you are using SLR camera, you should enable the viewfinder of the camera or switch to LIVE mode for focusing.
- 2. Try the MF mode to enhance focus accuracy.

If it is caused by overexposure/Underexposure, you can:

Set new camera parameters in Camera Adjustment tab.

If it is caused by camera shake, you can:

- 1. Ensure stable camera placing.
- 2. Disable the lens' stabilizer (if any) and the camera' s stabilizer (if any).
- Q: Screen brightness/saturation decreased after calibration?
 - A: *Calibration Pro* will decrease the brightness of the relatively brighter point of the screen to ensure uniform brightness when performing brightness calibration, hence the decreased full-screen brightness after the calibration. When performing chroma calibration, the software will decrease saturation to ensure a uniform screen display and the brightness will also be calibrated during this process, hence the decreased full-screen brightness and saturation.

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- Q: Screen artifact (with color spot) after calibration?
 - A: 1.Check the quality of capturing via Image viewing. In the Image viewing tab, you can first open a photo and then click Measure brightness, or view the monochrome and histogram to check whether the photo has the problem of focus error, overexposure, underexposure, or camera shake.

2. This problem might be caused by over-sized partition, which leads to too small imaging size and increase sampling error.

3. This problem might be caused by inconsistency between the simulated calibration Gamma table and the target. Try to send parameters to receivers in this case.

4. Deselect Image dust off.

- Q: Scan lines appeared after calibration?
 - A: 1. This problem might be caused by too fast shutter speed. In this case, try to increase shutter and decrease the brightness at the same time.
 - 2. This problem might be caused by too low refresh rate. Try to increase the refresh rate in this case.
- Q: Color moiré (rippling effect) appeared after calibration?
 - A: When you are capturing a high-resolution screen, the LED refresh rate might interfere with the pixel resolution, which leads to system error. The error include position error and brightness error. To fix this problem, you can:
 - 1. Make sure the camera frame is filled with image.
 - 2. Decrease partitions and increase focal length (you should perform metering again after adjusting the focal length).

- 3. Reduce the focus a little bit (you should perform metering again after adjusting the focus), and then try to capture with a little focus error (the error should not be too big to ensure normal analysis). And add intervals among pixels if necessary.
- 4. Disable Seam correction to eliminate the effect of position error.

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Statement

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Colorlight Cloud Tech Ltd

Official Website: www.colorlightinside.com Head Office Address: 37F-39F, Building 8, Zone A, Shenzhen International Innovation Valley, Vanke Cloud City, Nanshan District, Shenzhen, China

