User Manual

Cabinet Calibration System

NovaCLB-Cabinet

Rev4.1.0 NS140100038

XI'AN NOVASTAR TECH CO.,LTD.

Statement

Dear users,

Welcome to use NovaCLB, a pixel-by-pixel calibration system of cabinet. It is our great pleasure to offer this manual to help you understand and use the product. We have striven for precision and reliability during the compilation of this manual. The contents of this manual are subject to change without notice. If you have any problem in use or you have any suggestion, please feel free to contact us according to the contact information provided in this manual. We will do our utmost to satisfy your needs. We would like to express our sincere thanks to your suggestions and make assessment for adoption as soon as possible.

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Definitions of document identifiers

	NOTE: Information that requires special consideration.
	TIP: Advice or prompt for users.

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1 Overview

NovaCLB-Cabinet is a cabinet calibration software used in conjunction with M3 series of NovaStar. This application software is specialized in providing a whole solution for cabinet calibration of LED displays, which is used for calibration of regular cabinets before leaving factory, calibration of old cabinets, calibration of rental cabinets and so on. Calibration is capable of significantly improving the uniformity of LED display and eliminating the differences among cabinets as well as the border lines of cabinets.

2 Preparations before Calibration

2.1 Laying out calibration darkroom

1) Calibration darkroom is required to be sealed and not be disrupted by external light. Meanwhile, the darkroom shall be covered with low-reflectance black materials on the surroundings to reduce the reflected light.

2) Width: 3 m (recommended); length: calibration distance of camera, related to the pixel pitch: pixel pitch X 800< calibration distance < pixel pitch X 3000.

   However, our recommended best calibration distance of production line is: calibration distance = pixel pitch X 1500.

In order to guarantee the accuracy of colorimeter, we hope that the colorimeter is able to measure larger LED area and its distance depends on LED cabinet width (or height) and field angleθ;

Measuring distance = cabinet height/tanθ X 0.4. With consideration of space reserved for computer, camera and personnel activities, the maximum distance of the darkroom shall be added by 2-3 m.

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Taking the P6 cabinet of 96*96 as an example, the best correction distance of camera is about 9, and with field angle at 2°, the measurement distance of light gun is 13.2 m.

Pixel pitch(mm)	Calibration distance of camera (m)	The best calibration distance of camera(m)
16	13~48	24
10	8~30	15
6	4.8~18	9
3	2.4~9	5
2.5	2.0~6	5
1.4	2.0~6	5

Cabinet height (m)	The best measurement distance of light gun
0.4	9
0.6	14
0.8	18
1	23
1.2	27

Table. 2-1 Calibration distance recommended

	For small pitch displays with different specifications, the recommended distance of camera is 5m. In order to be compatible to most of the cabinets, the optimal length of darkroom is 20m or so. Therefore, manufacturers could decide whether to increase the length of darkroom so as to make sure that P30 cabinets with equal pitch can be calibrated.

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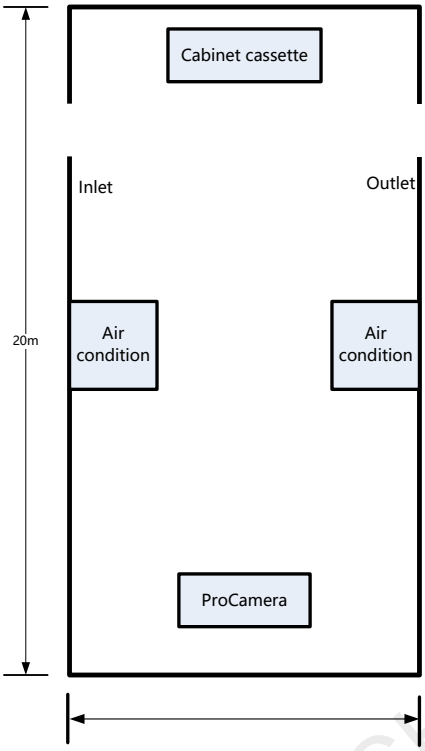

Fig. 2-1 Darkroom layout

3) Distance of calibration should be more than 20m, and draw a scale on the ground with paint to locate calibration distance.

4) Install hygrometer thermometer to track the changes of temperature and humidity. Calibration darkroom should be equipped with an air conditioner. Turned on the air conditioner half an hour before each calibration and adjust the temperature and humidity to specified values. When calibrating cabinets of the same batch, the temperature fluctuation shall be no more than 2℃.

5) Fully aging all cabinets before calibration, it is not recommended for calibrating the cabinets with different aging time.

6) During the calibration, the position of the cabinet and calibration instrument must be fixed, and the cabinet must be placed on a chassis to prevent it from being affected by the light

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reflected from the ground.

7) Suitable cabinet handling processes to avoid long time delay in cabinet replacement.

8) Equipped with high-performance computer to improve the calibration efficiency.

2.2 Locating the cabinet

1) A slot is recommended to be equipped on the chassis to fix the cabinet.

2) The outer surface of the chassis should be made of material with low reflectivity.

3) Front surface of the cabinet should be paralleled to or slightly extend from the chassis to prevent chassis from blocking LED on cabinet surface when sampling; (see the figure below)

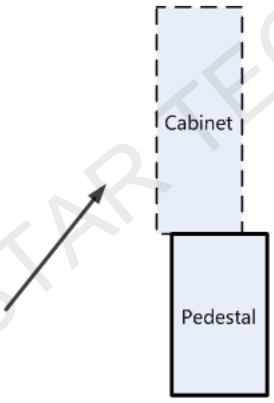

Fig. 2-2 Surface of the cabinet extends from the chassis.

4) Chassis height is approximately 0.5m, slightly higher than the minimum tripod height;

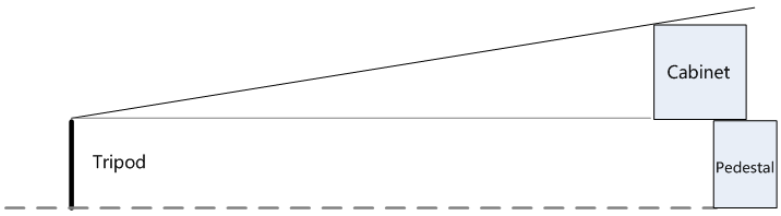

Fig. 2-3 Chassis height is slightly higher than the height of tripod (no elevation on site, generally used for indoor screens)

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5) If condition allows, chassis can be designed to support retroversion cabinet placement, in order to simulate the elevation from on-site view;

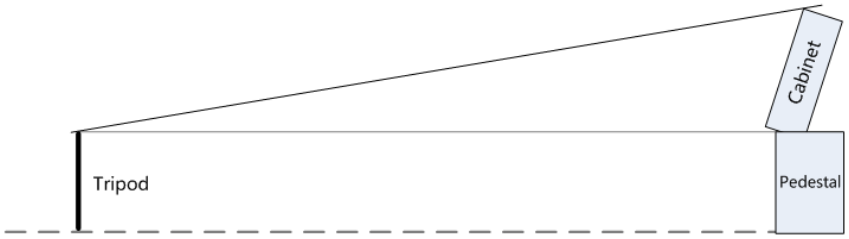

Fig. 2-4 Cabinet tilted to simulate elevator (There is elevator on site, generally used for outdoor screen)

6) Moving the position of camera and chassis is strictly prohibited during calibration.

	1. Moving camera, turning the camera focal length and other operations are strictly prohibited during the calibration. 2. Each cabinet must be placed in the same position during calibration. Otherwise, splicing results after calibration will be affected. It is suggested to **draw lines along both sides of the contact between the cabinet and the chassis** after the location of the first cabinet is determined in order to determine the location of subsequent cabinets. Consistent tilt angle for each cabinet must be ensured for cabinet tilt calibration.

3 NovaLCT-Mars Preparation

Run NovaLCT-Mars on the control computer, turn on the cabinets normally and set some general settings. Critical steps and precautions will be introduced through the following graphical representation. See *Nova M3 Series Control System User Manual* for the detailed steps of cabinets settings.

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1) Logging in the advanced user page

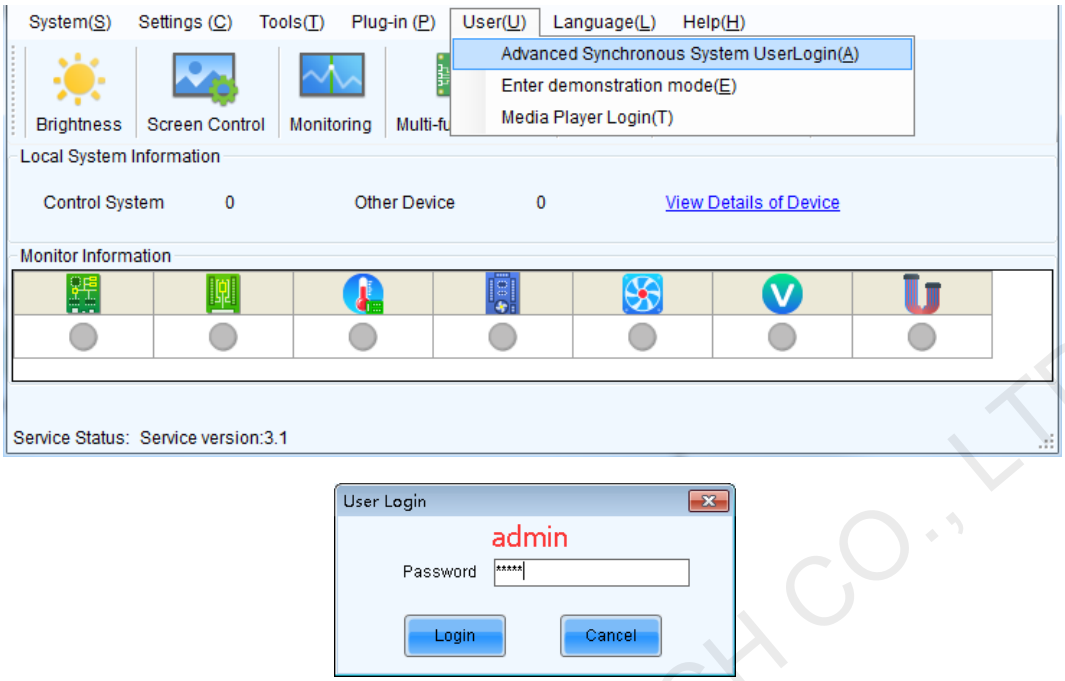
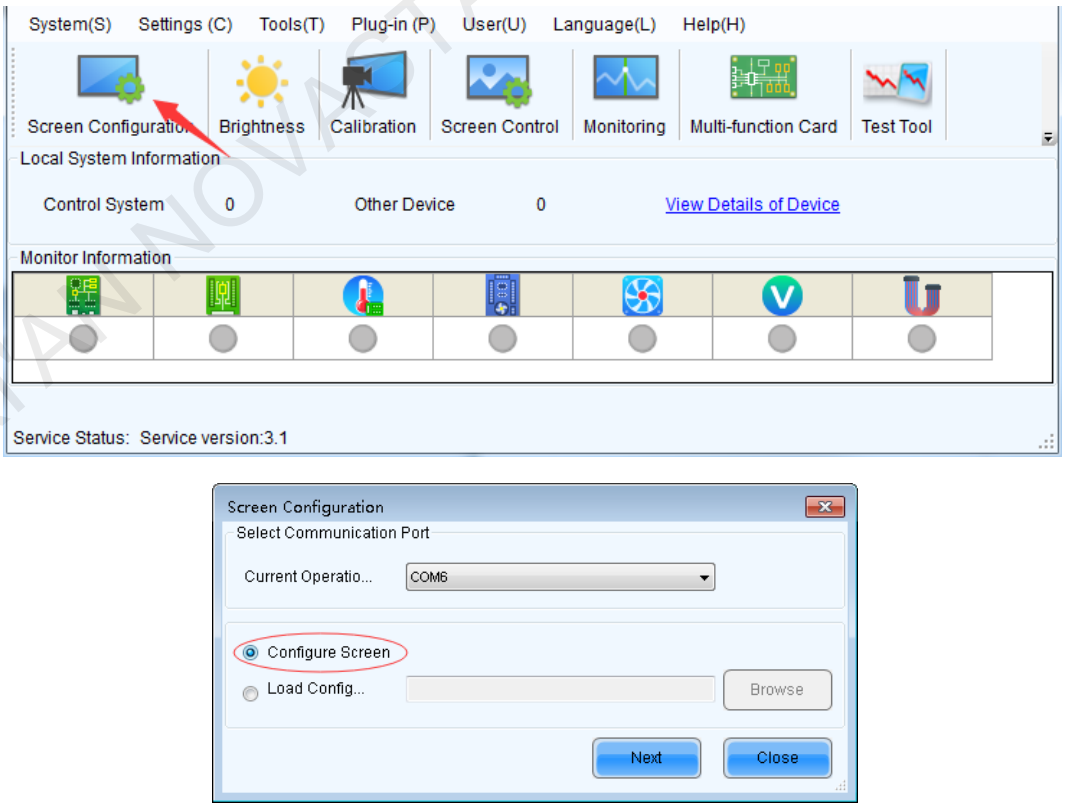


Fig. 3-1 Logging in the advanced user page of NovaLCT-Mars

2) Setting parameters of sending card



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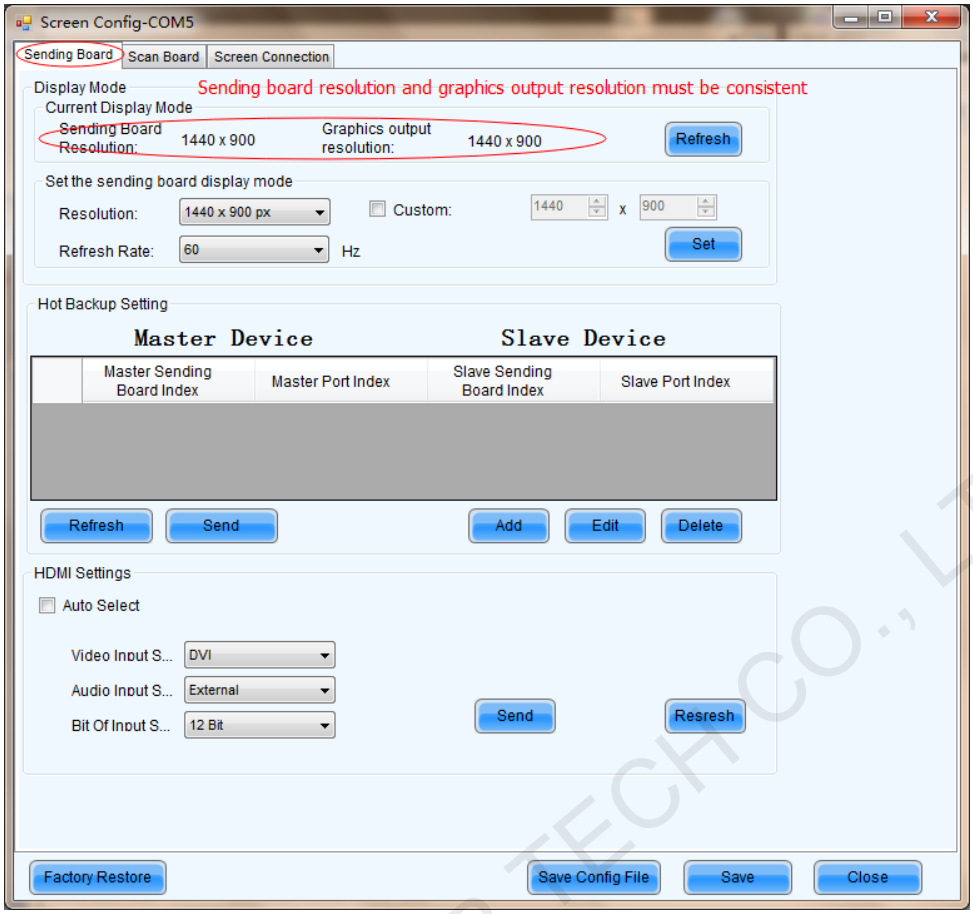

Fig. 3-2 Setting parameters of sending card

3) Start LED display(referring to ***Nova M3 Series Control System User Manual***)

4) Setting performance parameters of receiving card.

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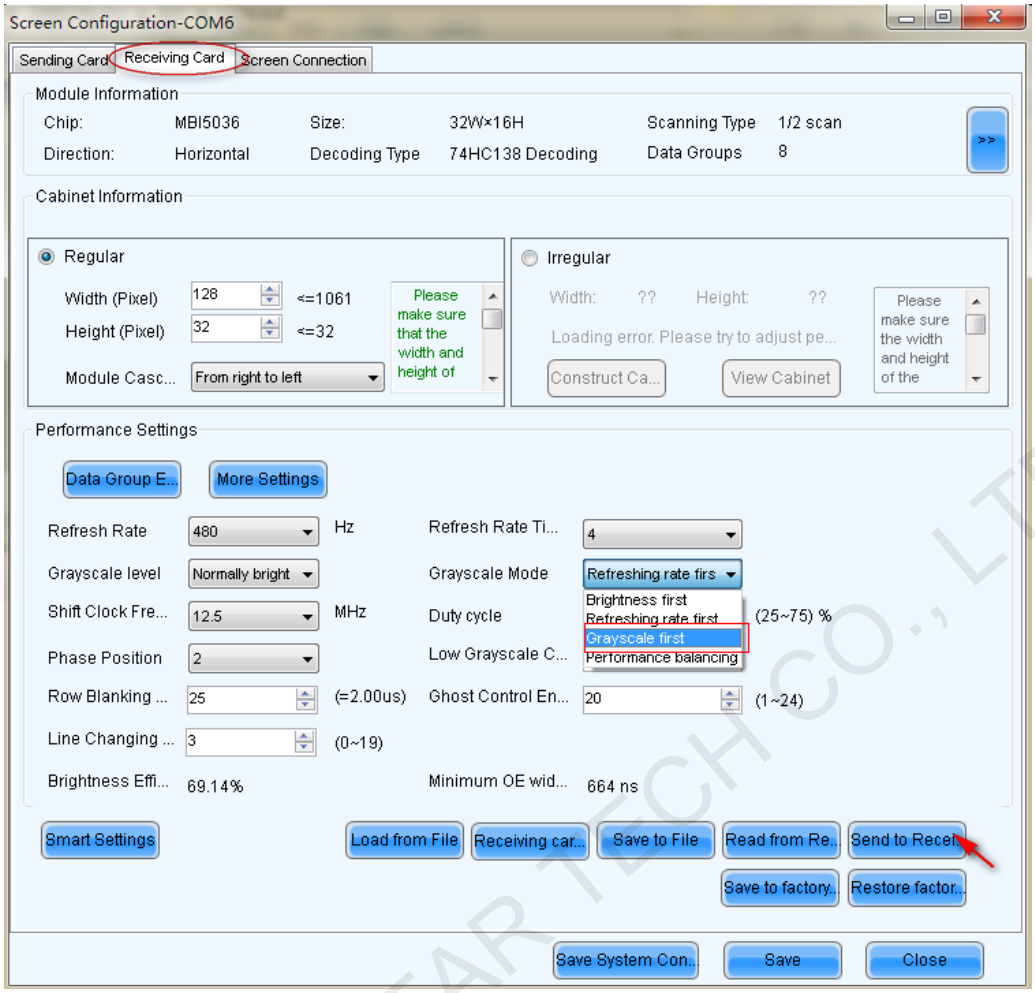

Fig. 3-3 Setting performance parameters

	The brightness of outdoor screens generally is high, which is likely to cause overexposure of photos. The brightness efficiency of "Gray First" and "Performance Balance" will be lower. So, "Gray First" and "Performance Balance" are recommended when calibrating outdoor screens.

5) Configuring LED display.

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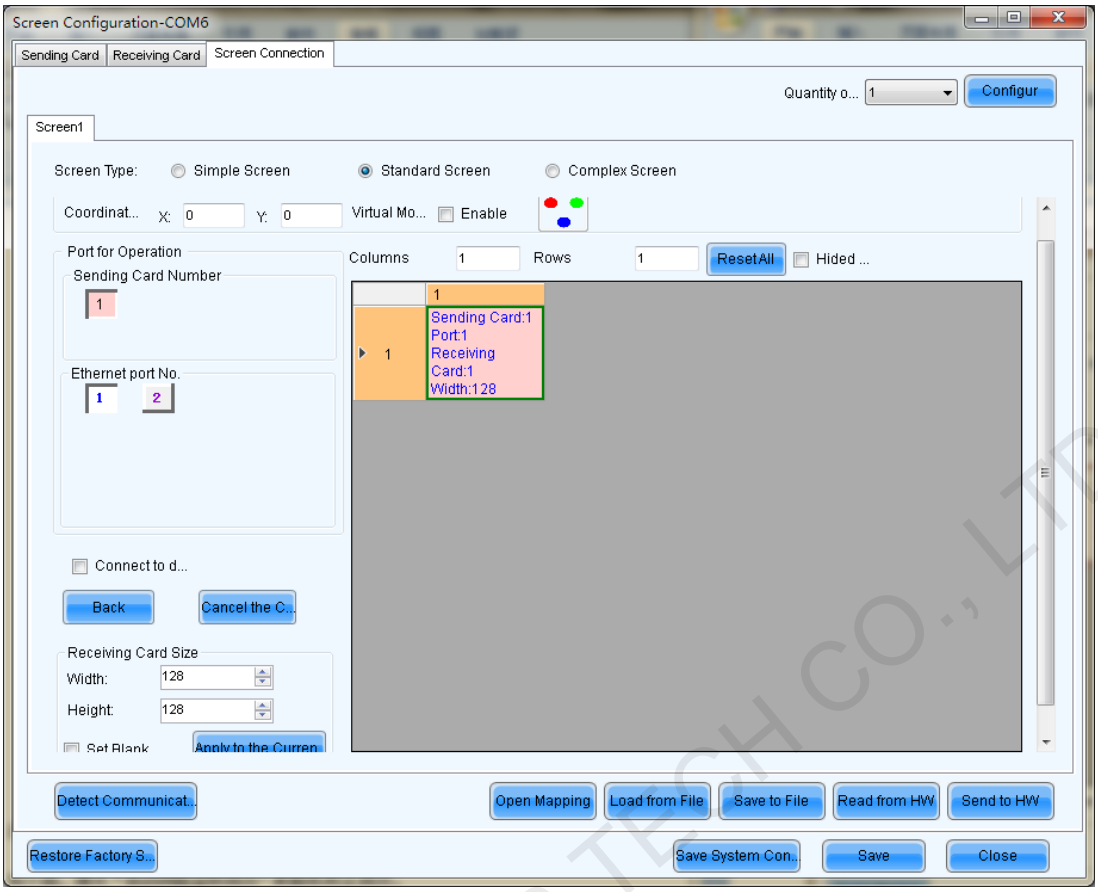

Fig. 3-4 Display configuration

6) Starting calibration

As shown in the following figure, prompt "Enable network monitoring successfully" indicates that online calibration succeeded.

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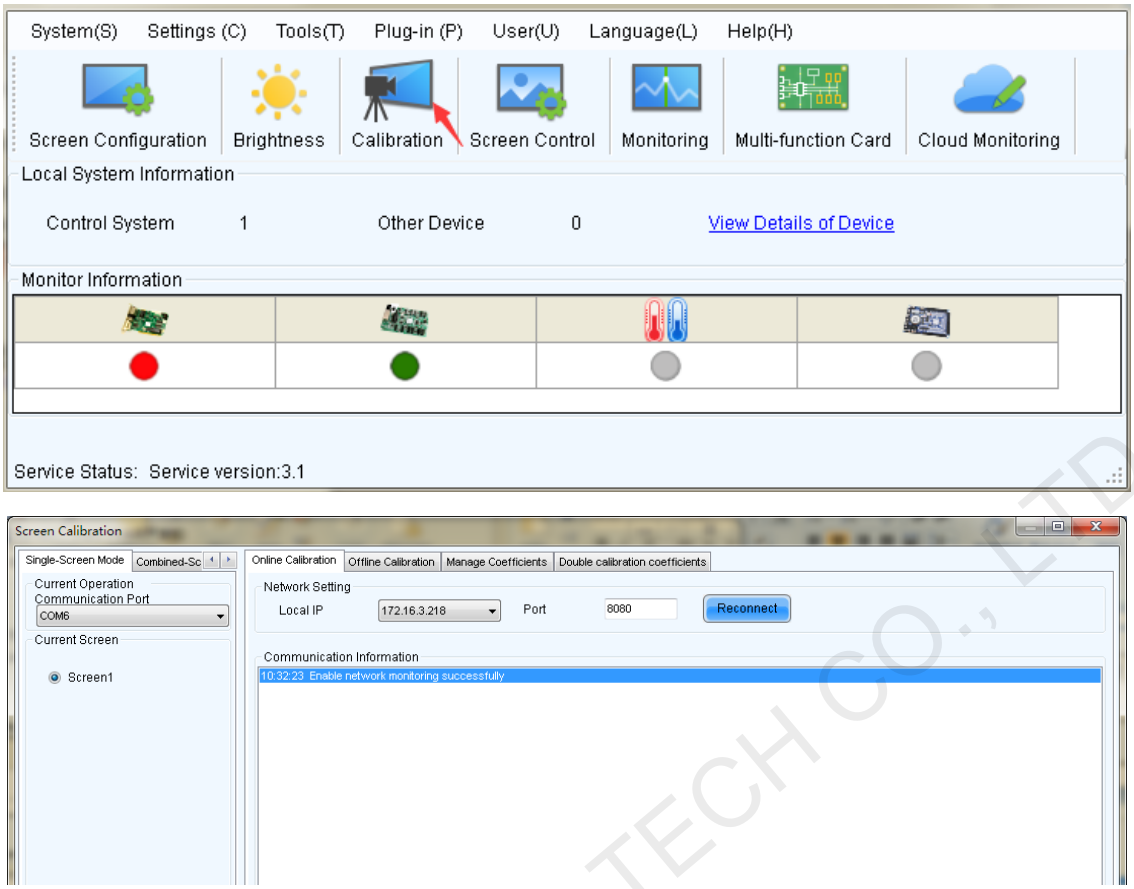

Fig. 3-5 Starting calibration

3.1 Selecting appropriate calibration methods

1) Select different calibration modes according to different conditions of cabinet.

   If calibrating a whole cabinet, select Cabinet Calibration mode.

   If the cabinet has new modules which have replaced the old or broken ones, select New Module Calibration to calibrate newly replaced modules only.

2) Select different measuring modes according to the difference of cabinet types:

- **Single measurement mode of colorimeter (light gun):** This mode requires only using once colorimeter for auxiliary calibration before calibration. The requirement of accuracy is not high. So ordinary colorimeter is acceptable. This mode supports the calibration of cabinets in

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most occasions. All the cabinets produced in the same batch and having no obviously different aging time and no obvious module effect can adopt this mode.

- **Cabinet-by-cabinet measurement mode of colorimeter:** In this mode, colorimeter is required for each cabinet calibration. CS2000 is recommended as standard equipment. This mode supports the calibration of rental cabinets of different batches and cabinets with serious module differences.

3) Select different preheating time according to the heat dissipation capacity of cabinet:

- **No preheating mode:** In this mode, there is no need to consider the changes of brightness and chroma uniformity caused by temperature changes during cabinet pre-heating. The calibration of the cabinet will be carried out immediately after the cabinet is turned on. The calibration efficiency of this method is higher and the calibration time of each cabinet is within 1 minute.
- **Preheating mode:** In this mode, the cabinet is required to be preheated for a designated time according to certain brightness and calibration begins after its temperature is becoming balanced. The calibration efficiency of this method is lower and the calibration time of each cabinet is about 4 to 6 minutes. Users can design a special preheating room to preheat the cabinet to be calibrated in advance in order to improve the calibration efficiency.

4 Cabinet Calibration

Specific calibration process is designed in order to achieve better calibration effect, improve calibration efficiency and eliminate border lines among cabinets during cabinet calibration via NovaCLB-Cabinet:

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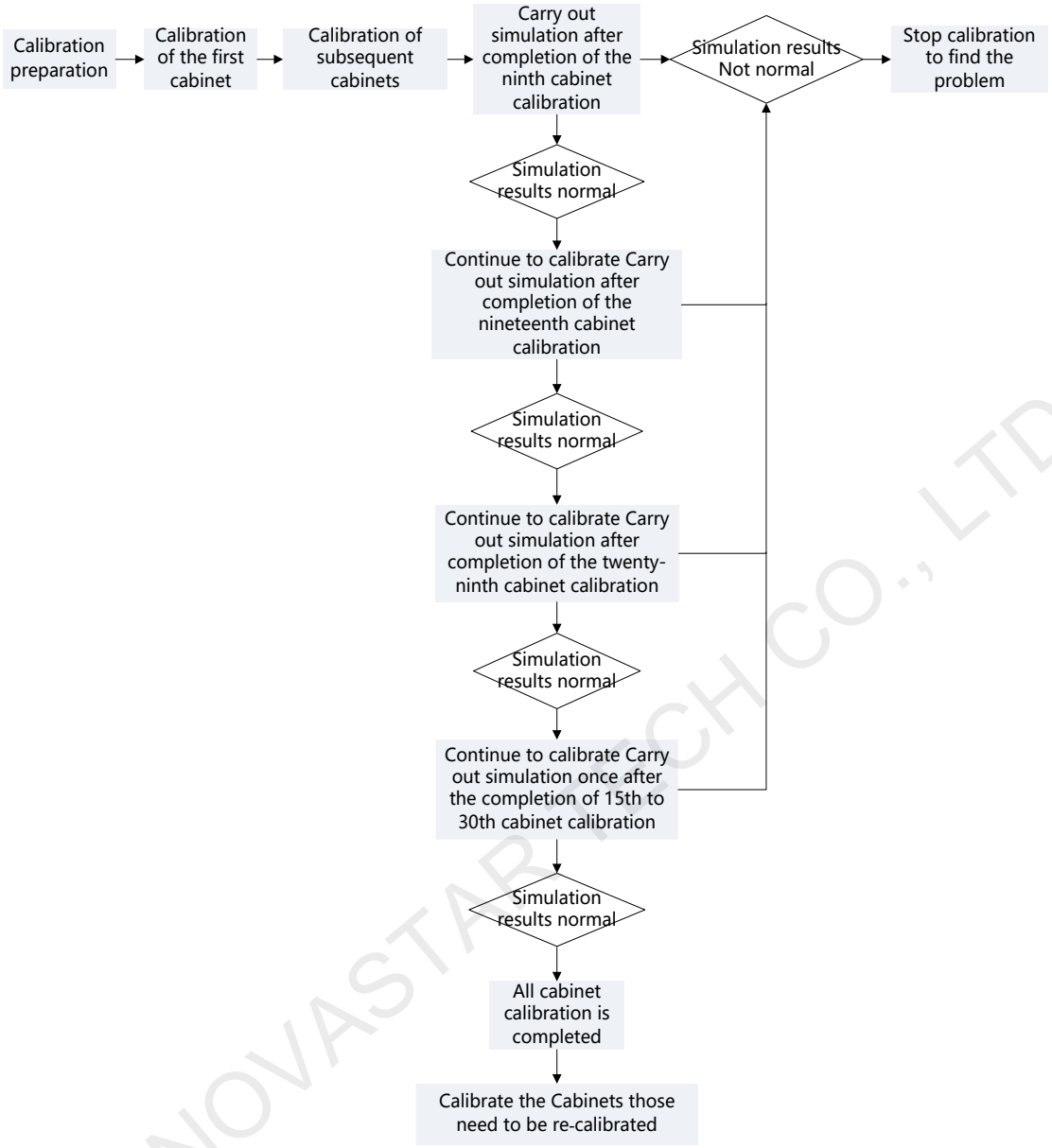

Fig. 4-1 Calibration process

In NovaCLB-Cabinet, it is required to study the measured parameters of LED cabinet of every specification. Therefore, when calibrating each batch of cabinets, the software will automatically take 5, 10 or 20 cabinets as the sample cabinets and generate common parameters. The calibration parameters may not be suitable for the sample cabinet. So, when the calibration of this batch of cabinets is fully completed, the software will automatically analyze the ID of sample cabinets to be re-calibrated, which usually ranges within 1 to 5. These cabinets need to be

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re-calibrated.

4.1 Calibration of first cabinet

Calibration software mainly includes three parts: calibration preparation→ configuration of measuring instruments→ calibration target→calibration. Details are introduced as follows:

4.1.1 Calibration preparations

4.1.1.1 Configuration of information base

The calibration information base is different from the calibration coefficient database. Information base not only records the calibration coefficients of all the cabinets of the display screen, but also manages all the parameters related to calibration. In this way, the users can record all the calibration information of each display screen, and the brightness and chromaticity standards, time of calibration, uniformity and dead point information of each cabinet before and after the calibration, etc.

Meanwhile, the software automatically control the database size in the information base. When the calibration coefficient of the cabinet exceeds 1.8 G, the software will automatically compress the data or create a new database and the user only needs to save the operation after cabinet calibration is completed.

It is suggested that clients manage the calibration information base by taking the display screen as a unit. Therefore, create an information base for this display screen while calibrating.

Select “Cabinet calibration” as calibration mode.

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Fig. 4-2 Main interface of calibration software

- **Calibration mode**: Select **Cabinet Calibration**.
- **Screen parameters**: Parameter information herein is specific to big screen of the current cabinet and can be set. As users manage the calibration information base taking a display screen as the unit, objectively recording the full screen parameters will help the later management of information base.
- **Screen information file:** A corresponding information file (calibration project) need to be created for each display screen, which will record the information of the display screen, the calibration coefficients of each cabinet, and the relevant calibration parameters.

  - **New :** Create a new calibration project;

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- **Load:** Load existed calibration project files;
- **Save as**: Modify name and path of the project files.

- **Backup database:** The software defaults to check this option. Enabling backup data can effectively prevent database file being damaged due to abnormal close of software or sudden blackout of computer.
- **Image saving address:** Select a location to save cabinet images during calibration. If "Save all cabinets' images" is checked, all cabinet images will be saved. Otherwise, only images of the current calibrated cabinet are saved.

4.1.1.2 Cabinet control

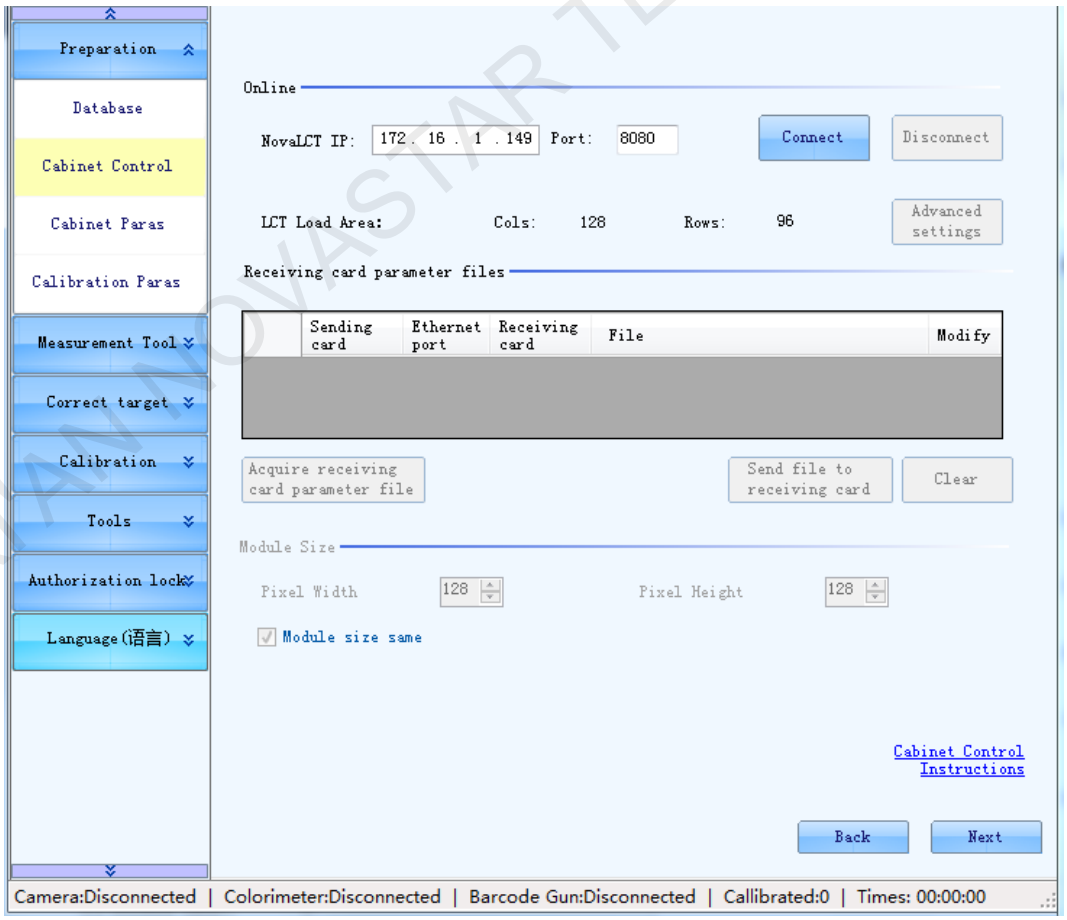

Fig. 4-3 Cabinet configuration

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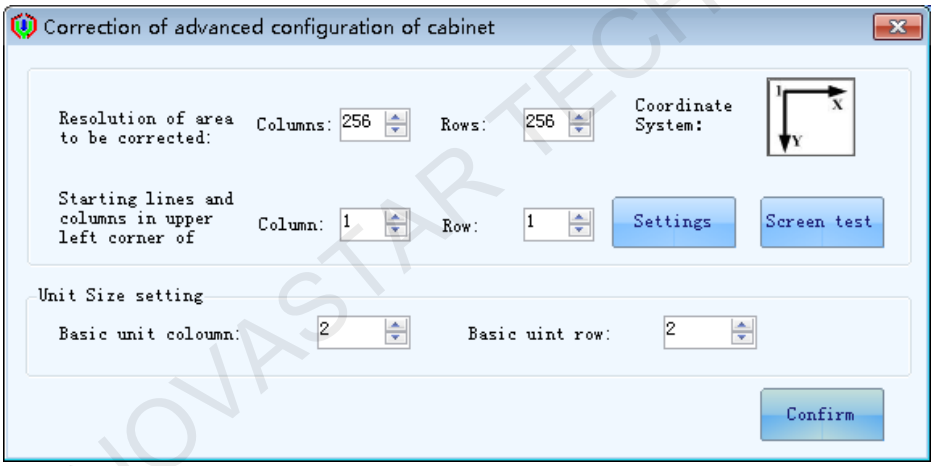
1) **Online:** Input IP of the computer operated in LCT client and port number and click "connect". After the interface prompt the connection is successful, start online calibration. At this time, control system automatically enters into calibration mode. We can see Gamma value of the LED screen is set as 1.

2) **Advanced settings**: Size of LCT loading area could be seen below this bar after connecting to LCT successfully.

Click Advanced settings according to the requirement to modify cabinet resolution, starting row/column coordinates at top left corner and unit size.



In general, there is no need to modify the default parameters after connecting to LCT during cabinet calibration process.

3) **Acquire receiving card parameter file:** Click Acquire receiving card parameter file to acquire receiving card parameter file of current batch. Single receiving card parameter could be modified. Set a name easy to recognize for the file. Select the file in the dropdown list and then send it to receiving card.

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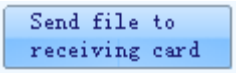
In general, click 

button during calibration process to save the configuration file to local of calibration software side after LCT configure the first cabinet of this batch successfully. After one cabinet is calibrated, switch to next one. Select send configuration file directly to turn on the cabinet. It ensures that the subsequent cabinets can use the same receiving card parameters of the first cabinet.

4) Module information

If the sizes of module are the same, check "**Module size same"** and set the rows and columns of module.

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4.1.1.3 Cabinet parameters

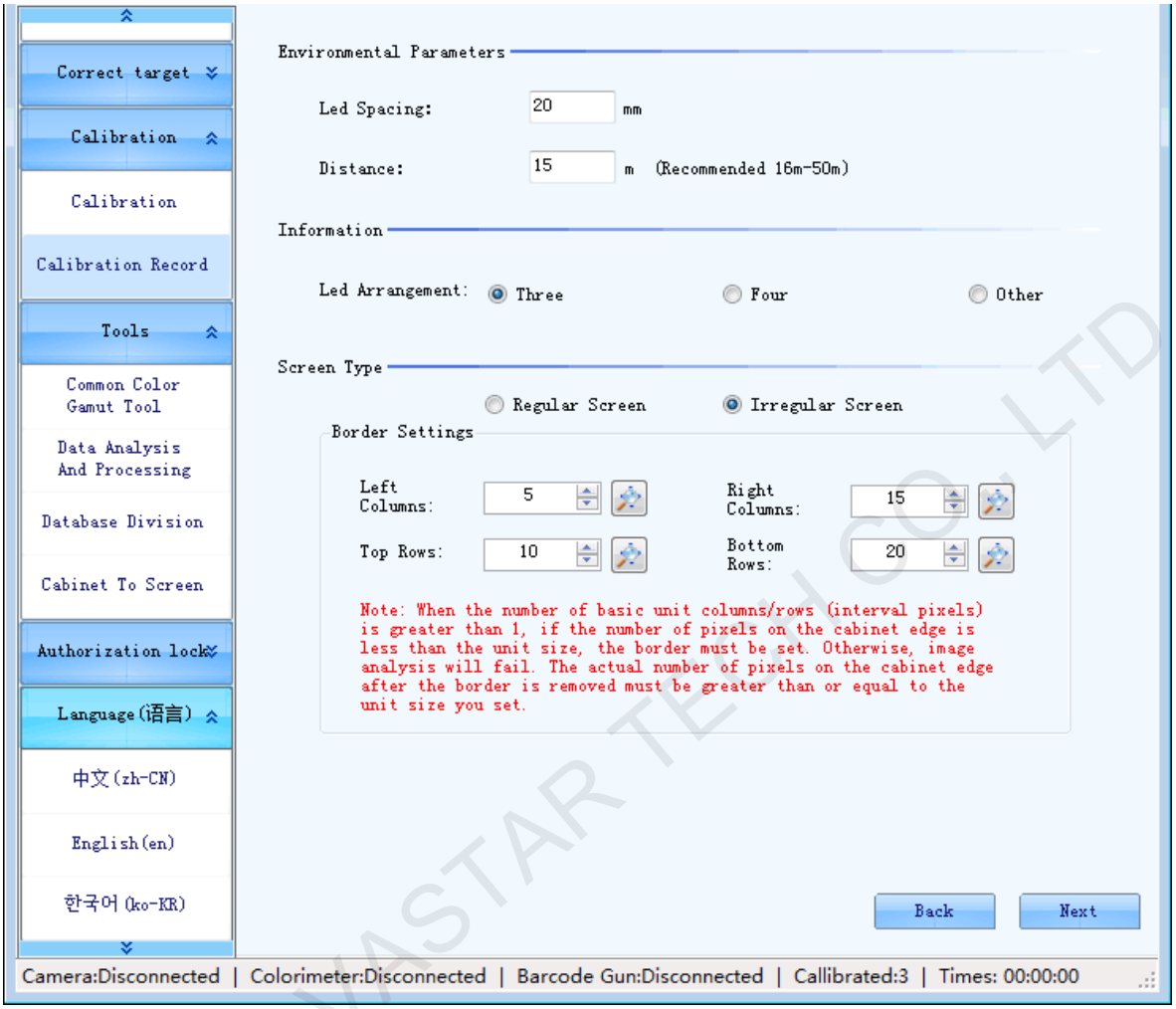

Fig. 4-4 Cabinet parameters

1) **Environmental parameters of cabinet:** It mainly refers to the environmental conditions of calibration, such as LED pixel pitch of cabinet and the calibration distance of cabinet.

2) **Cabinet information:** Set LED arrangement (which includes the number of LED in each pixel).

3) **Screen Type**: Screen types include regular and irregular screens.

   When the screen is irregular and the number of pixels in the row/column on the cabinet edge is less than the number of basic unit rows/columns, the row/column on the cabinet edge

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must be set as border. Specific setting rules are as follows.

- When the numbers of both basic unit rows and columns are 1, there is no need to set borders.
- When the number of basic unit rows or columns is greater than 1, set the row/column on the cabinet edge where the number of pixels are less than that of basic unit rows/columns as the border.

Take the following figure as an example. Currently, the numbers of both basic unit rows and columns are set to 2. The number of pixels in the row on the edge in area 1 is less than the number of basic unit rows. Therefore, the row in area 1 must be set as the border. Similarly, the number of pixels in the column on the edge in area 3 is less than the number of basic unit columns. Therefore, the column in area 3 must be set as the border.

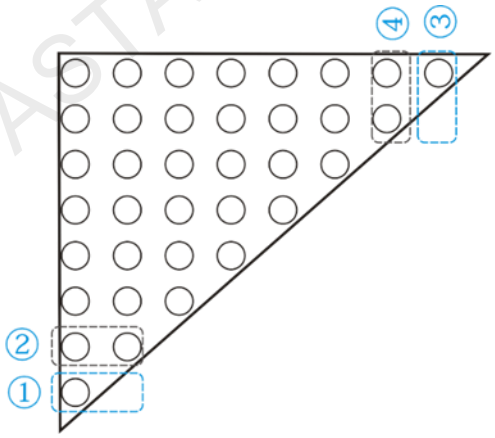

Fig. 4-5 Setting borders

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4.1.1.4 Calibration parameters

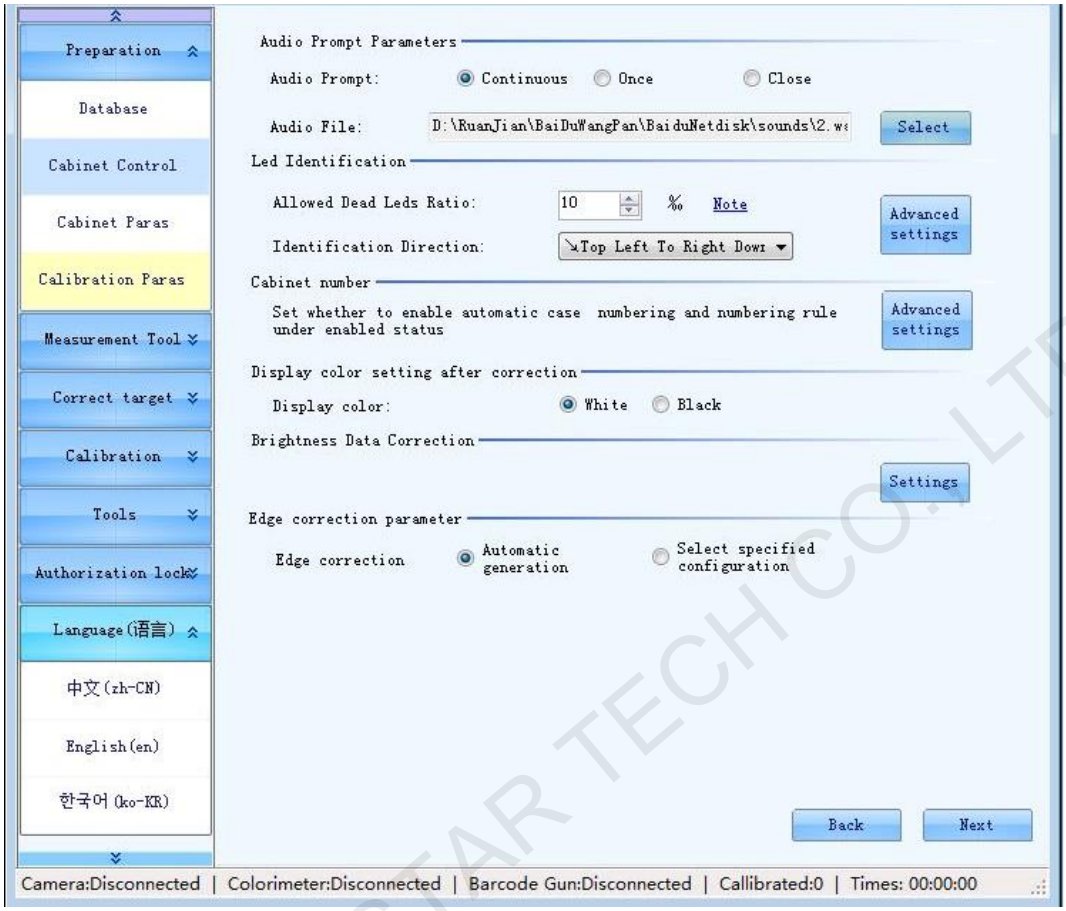
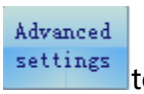


Fig. 4-6 Calibration parameters

1) Audio prompt parameters:

If the brightness of cabinet and result of module difference detection are abnormal after calibration completed, it indicates that the target value has been exceeded and it will cause a warning sound. The type of audio prompt can be set, including continues, once or closed.

2) LED pixel-by-pixel identification of the parameters

- **Advanced settings:** Click 

to set the scale of width and height of the module used for identifying LED lamp point, and it is suggested to use the default value.

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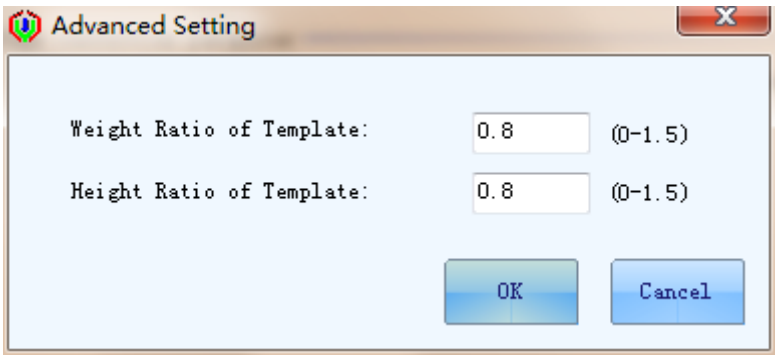

- **Directions of pixel-by-pixel identification:** Choose "↘" ("from top left to bottom right"), "↗" (from bottom left to top right), "↙" (from top right to bottom left) and "↖" ("from bottom right to top left"). When LED at top left corner of the cabinet can't display normally, try to start from the bottom right corner to identify LED.
- **Allowed Dead Leds Ratio:** If the number of LEDs that cannot be identified in the cabinet is greater than the setting proportion, calibration process will automatically stop and prompt. Please confirm whether there are too much dead point in cabinet or certain part of LED pixel in cabinet is covered at this time. If the problem is still unable to be solved, you can try to increase the proportion for forcible calibration. When the screen type is set to irregular, the maximum allowed dead LEDs are 900.

3) Cabinet numbering

It defaults to manual numbering. Click

to modify numbering mode and rule.

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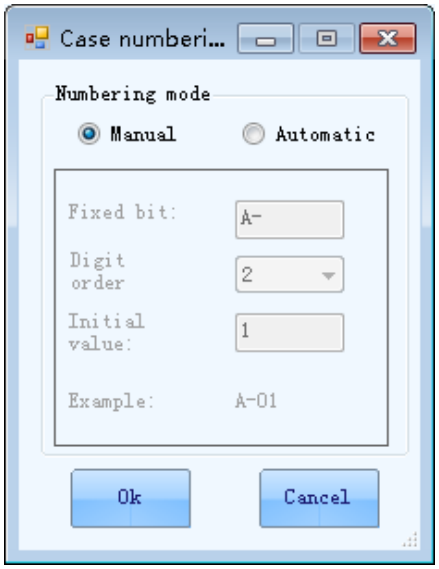

4) Brightness Data Correction

Adjust the screen data collected by the camera. You can select **Absolute Calibration** to eliminate the brightness and chroma difference among cabinets.

5) **Edge correction parameter:** Select "**Automatic generation**" or "**Specified configuration**". When the specified configuration is selected, click "**Add**" to add edge correction factor. Now select filling the correction parameters manually or check "**File import**" to import the correction parameter file which is generated through the tool "Data Analysis and Processing".

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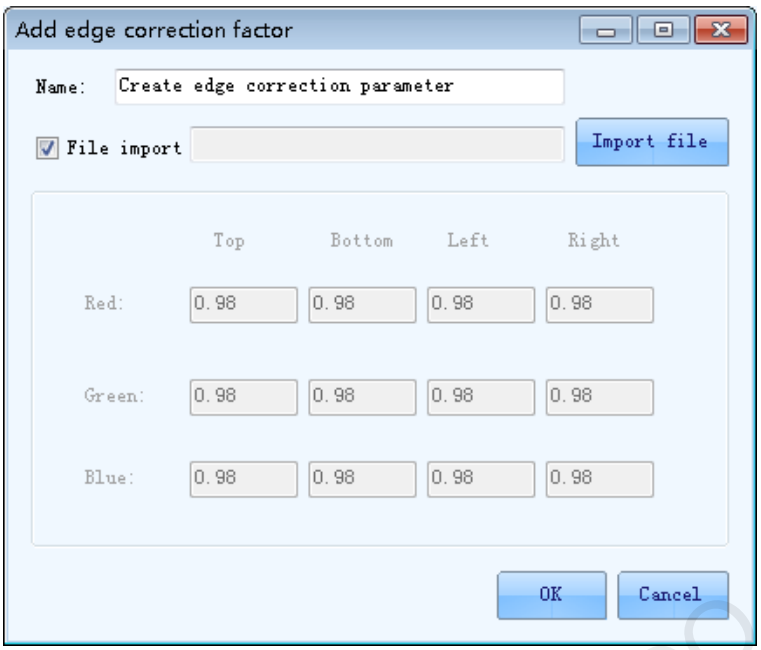

Fig. 4-7 Add edge correction factor

4.1.2 Configuration of measuring instruments

4.1.2.1 Camera

Adjust the saturation of camera to "**Normal**" and imaging size to "**Fit**".

Automatic adjustment and manual adjustment could be selected during the process.

Please refer to *10.4 Operating skills of camera*.

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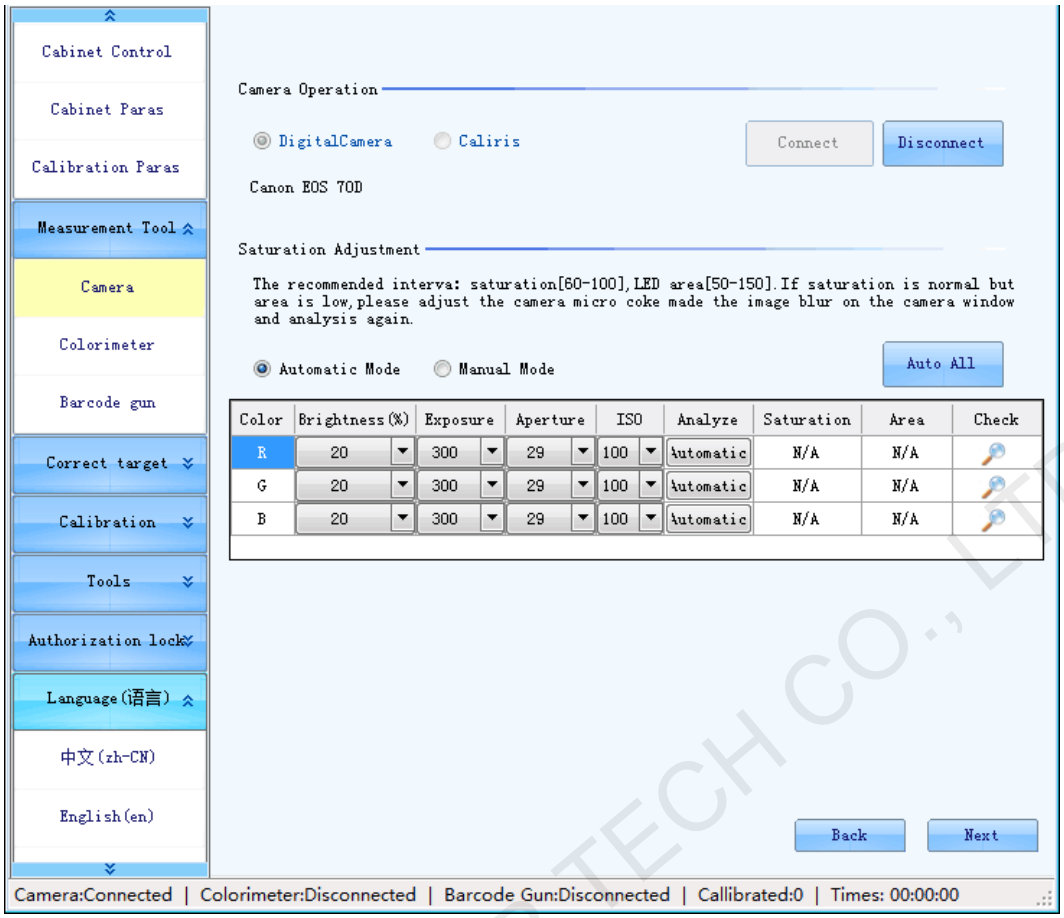

Fig. 4-8 Adjusting saturation of digital camera

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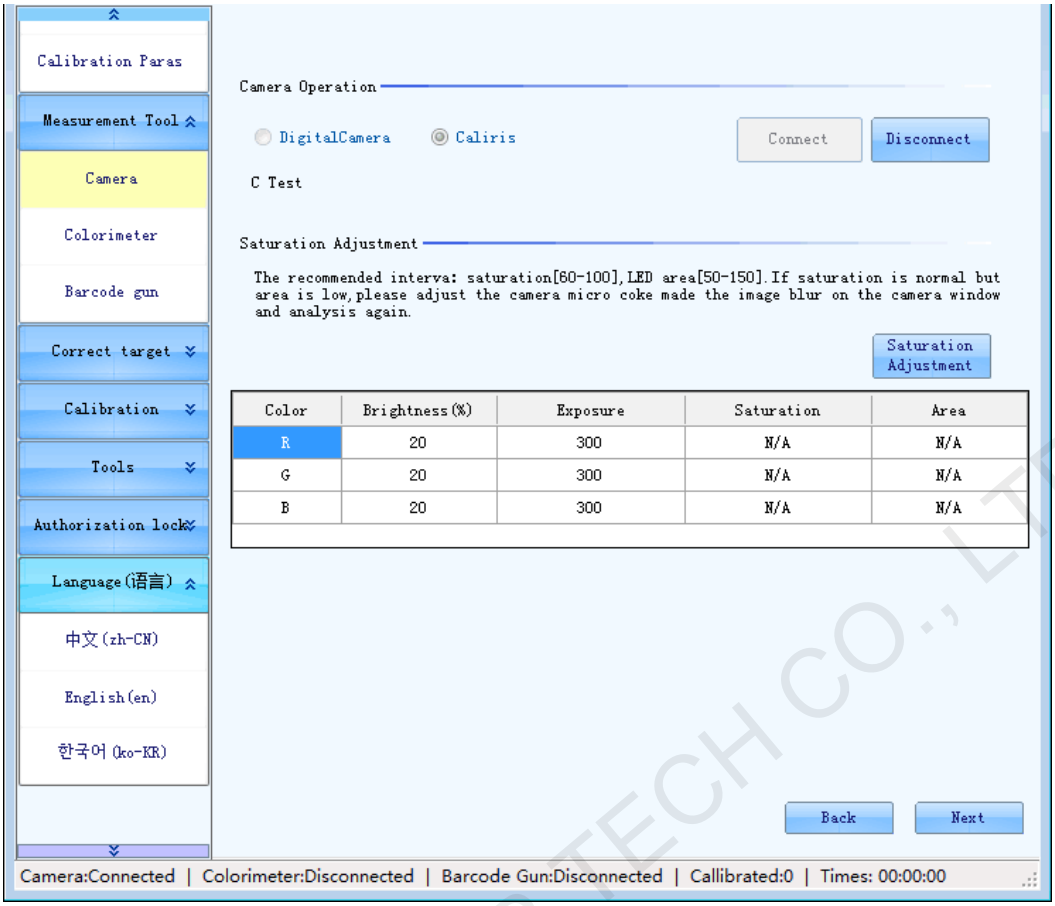

Fig. 4-9 Adjusting saturation of Caliris camera

After the digital camera is connected successfully, the **Camera** page is displayed as Figure 4-8. You can adjust the parameters to adjust the saturation and area. Saturation adjustment can be automatic or manual.

- Automatic Mode: Click **Auto All**, and the brightness, exposure, aperture and ISO parameters will be adjusted automatically until the **Saturation** and **Area** values become **Normal**.
- Manual Mode: Modify the brightness, exposure, aperture and ISO parameters manually to adjust the **Saturation** and **Area** values until they become **Normal**.

If a Caliris camera is connected, click **Saturation Adjustment** to enter the adjustment page.

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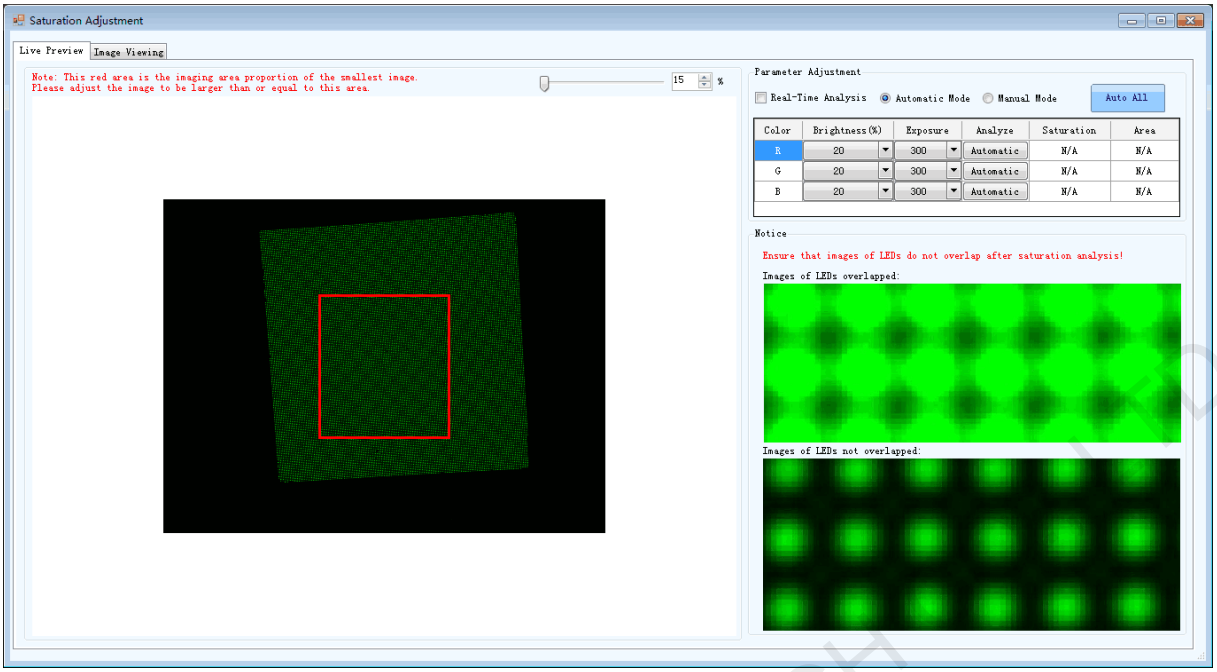
As shown in the below figure, the adjustment page has 2 tabs, described as below.



- **Live Preview**: Preview the live image of LED screen shown in the camera. The preview image can be zoomed by the following 2 methods with a zooming range of 15%–3200%.
  - ➢ Drag the slider.
  - ➢ In the preview area, double click to zoom in and double right-click to zoom out.
- **Image Viewing**: View the images captured by the camera during saturation analysis. Users can view the image in Red, Green and Blue separately.
- **Parameter Adjustment**: The **Real-Time Analysis** function is available only for Caliris camera.
  - ➢ If **Real-Time Analysis** is selected, after users select a color for preview, the system will analyze the image of that color in live preview in real time and adjust its **Saturation** and **Area** values to be **Normal**.
  - ➢ If **Real-Time Analysis** is not selected, the color selection buttons are hidden, but the **Automatic Mode**, **Manual Mode**, and **Auto All** buttons appear. The adjustment parameters for Caliris and digital cameras are the same.

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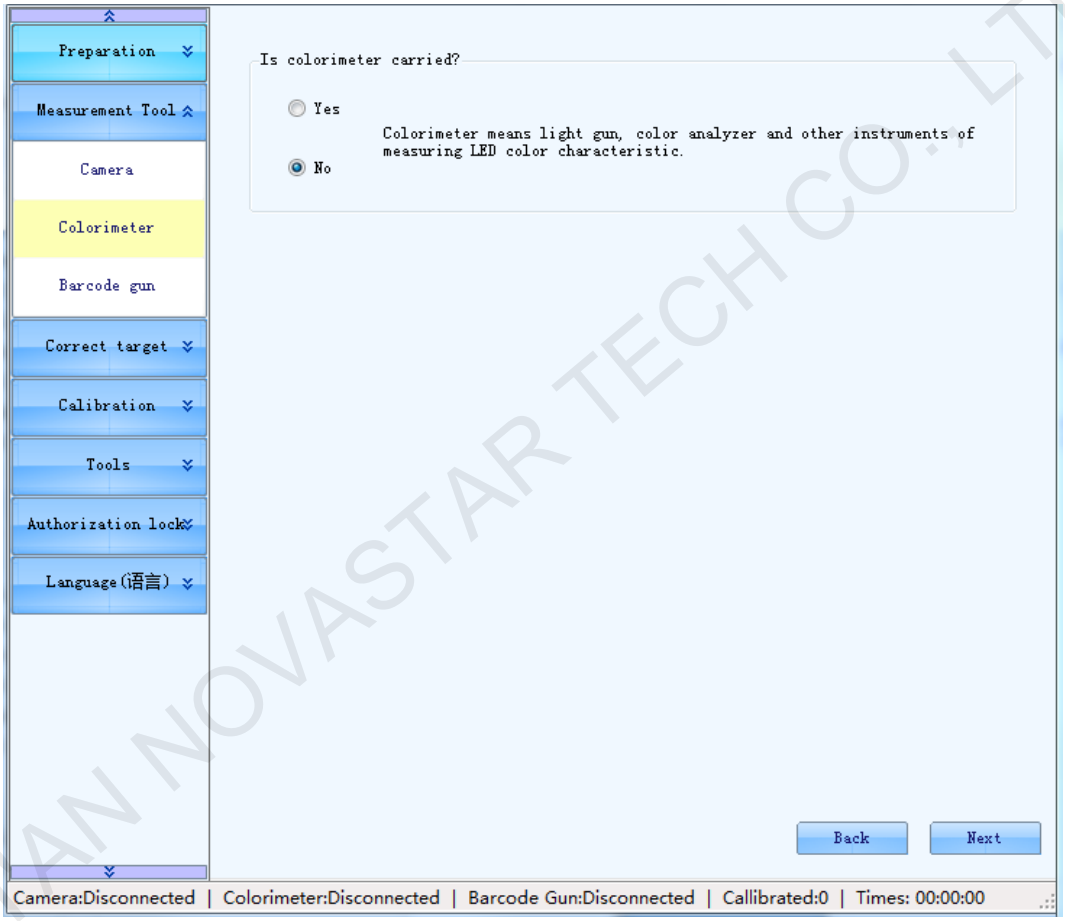
After saturation analysis, ensure that the images of LEDs are not overlapped. If they are overlapped, please adjust the camera parameters again to ensure that the saturation analysis result is normal and they are not overlapped.

4.1.2.2 Configuration of colorimeter

Please install the driver of colorimeter (CS2000, CS100 or CS150) and connect USB data cable to the USB interface on computer without converting cable before using colorimeter.



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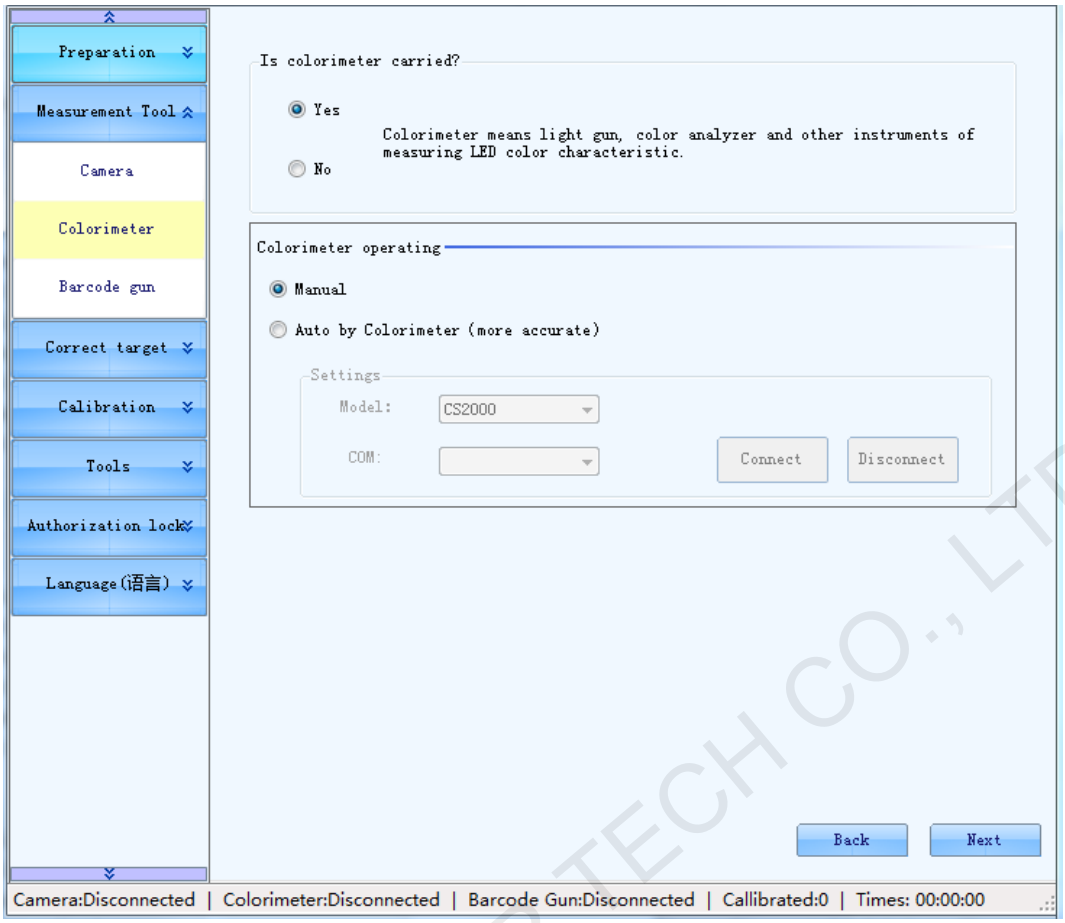

Fig. 4-10 Colorimeter configuration

4.1.2.3 Barcode scanner

If the system is equipped with a barcode scanner, port and Baud rate need to be set under this interface, and the software shall be connected. After calibration is enabled, there is no need to input cabinet number because the barcode scanner can automatically read the cabinet number.

The Baud rate of the software is 9600 by default and it is not necessary to modify. The "COM", namely the device port of computer corresponding to the barcode scanner cannot have conflict with other device ports.

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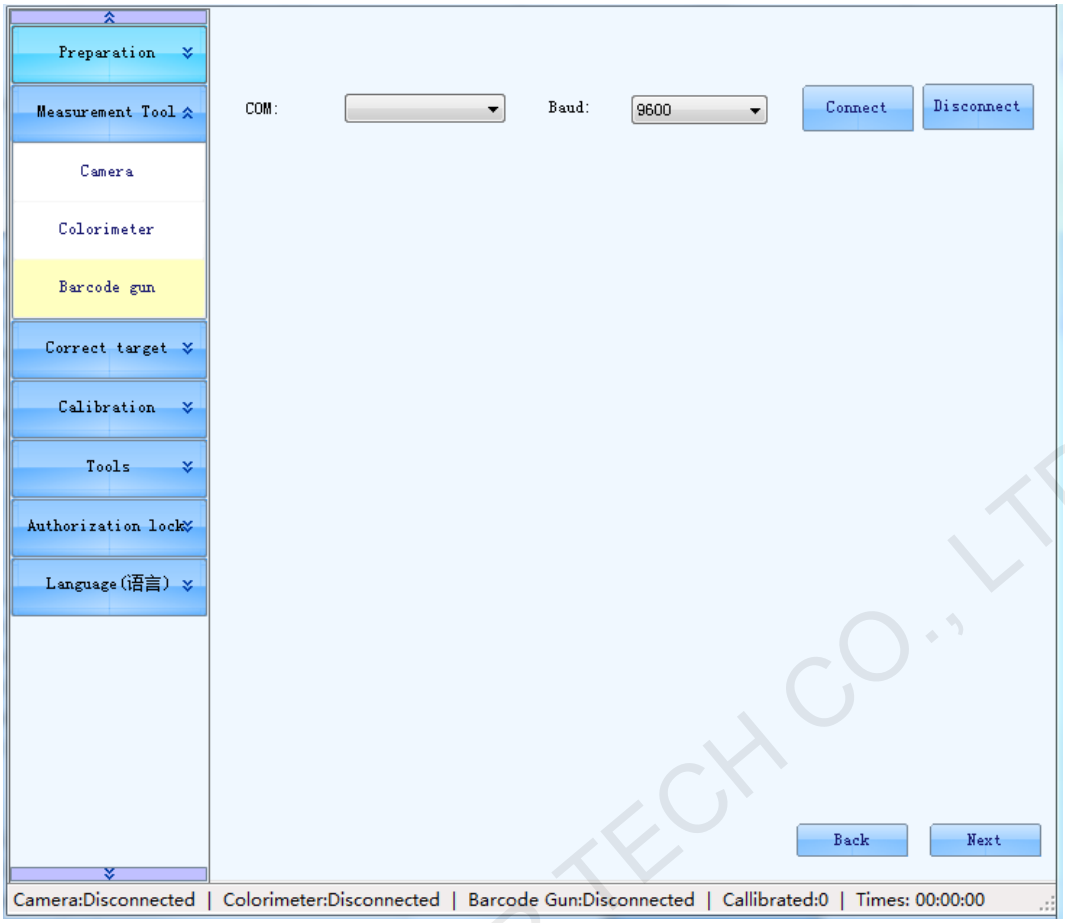

Fig. 4-11 Barcode scanner setting

4.1.3 Calibration target

NovaCLB provides different calibration target setting modes for users to select based on actual cabinet situations.

These situations are: there is no brightness and chroma difference among modules or cabinets, there is brightness and chroma difference among modules or cabinets, Supplementary order (cases delivered from go down in different time need to be put together).

Calibration target setting includes original value obtainment and target value setting.

	1) If 10 cabinets have been calibrated, the target value cannot be modified anymore. If the current target value is far from satisfaction, give up the

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	previous calibration and rebuild database. Then re-calibrate all cabinets. 2) If the calibration target value is modified when less than 10 cabinets have been calibrated, the previously calibrated cabinets need re-calibrate and appear in the list of cabinets requiring re-calibration.

4.1.3.1 There is no brightness and chroma difference among modules or cabinet

1) Measuring original value

If no colorimeter is available, skip this step and adopt default value as original value.

2) Setting target value

The software supports the three modes of **Brightness calibration**, **Ordinary chroma calibration**, and **Multiple bin chroma calibration**. **Brightness calibration** will only change the brightness of three primary colors R, G and B without loss of the color gamut of the display screen. But it could not eliminate the difference of chroma on the LED. **Ordinary chroma calibration** will change the brightness of the three primary colors and lose a small part of the color gamut. But it could make the LED brightness and chroma attain high consistency. **Multiple bin chroma calibration** can eliminate difference of brightness and chroma among modules or cabinets and supports blue adjustment which is mainly to optimize blue effect. But it will lose some of the white effect.

Setting calibration target through the following method:

Drag "brightness decay" pull rod and choose the proper brightness decay proportion. When "Ordinary chroma calibration" is selected, the software will generate a coefficient in accordance

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with the "chromaticity calibration standard". When "Brightness calibration" is selected, it will generate the coefficient in accordance with the "brightness calibration standard". When "Multiple bin chroma correction" is selected, it will generate the coefficient in accordance with the "Multiple bin chroma calibration standard", for example, when "20%" is selected for the brightness calibration, the brightness after the calibration will be 20% decayed than the brightness before the calibration.

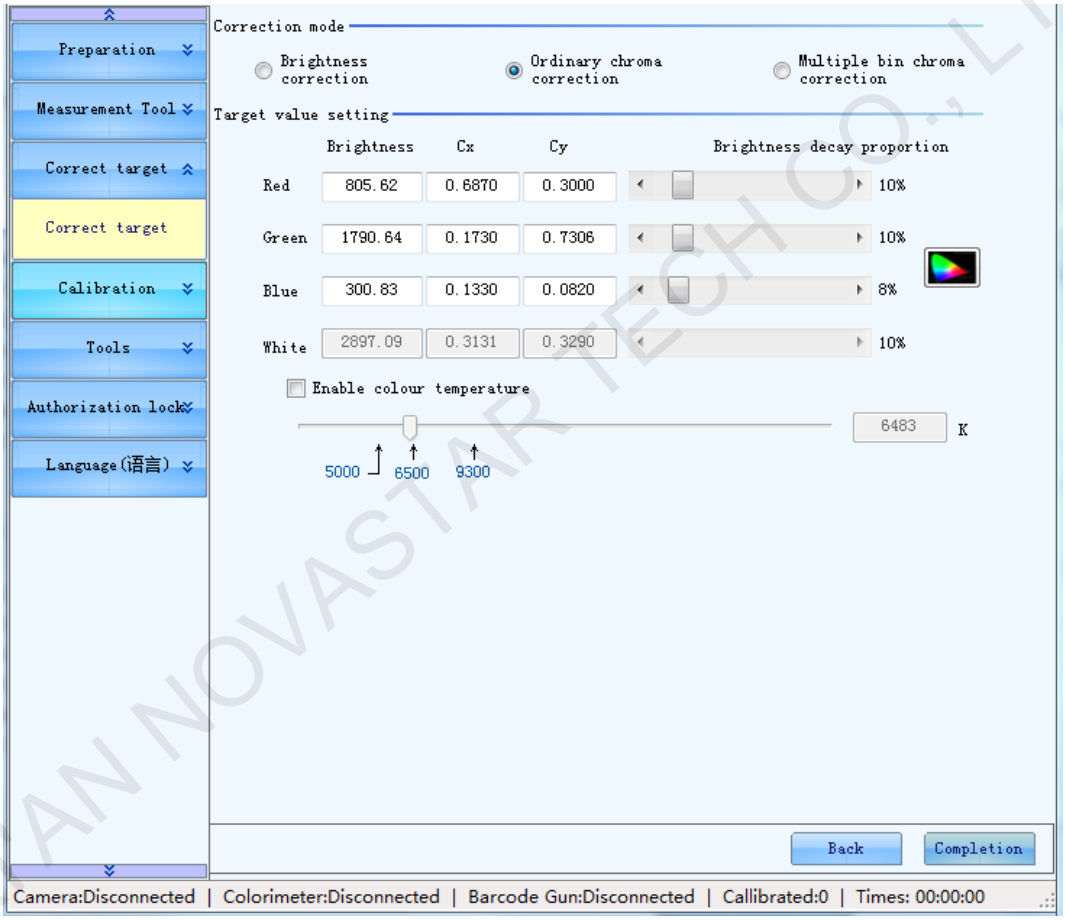

Fig. 4-12 Setting calibration mode and target value

Check "Enable color temperature". The color temperature of the screen will not be changed when pulling the rod to set brightness decay.

Click the color button in interface to set chroma value in color gamut mapping.

Note: The original color gamut value here is not the true original value of the display. It' s just a relative original value of software default. The target value acquired is also relative target value.

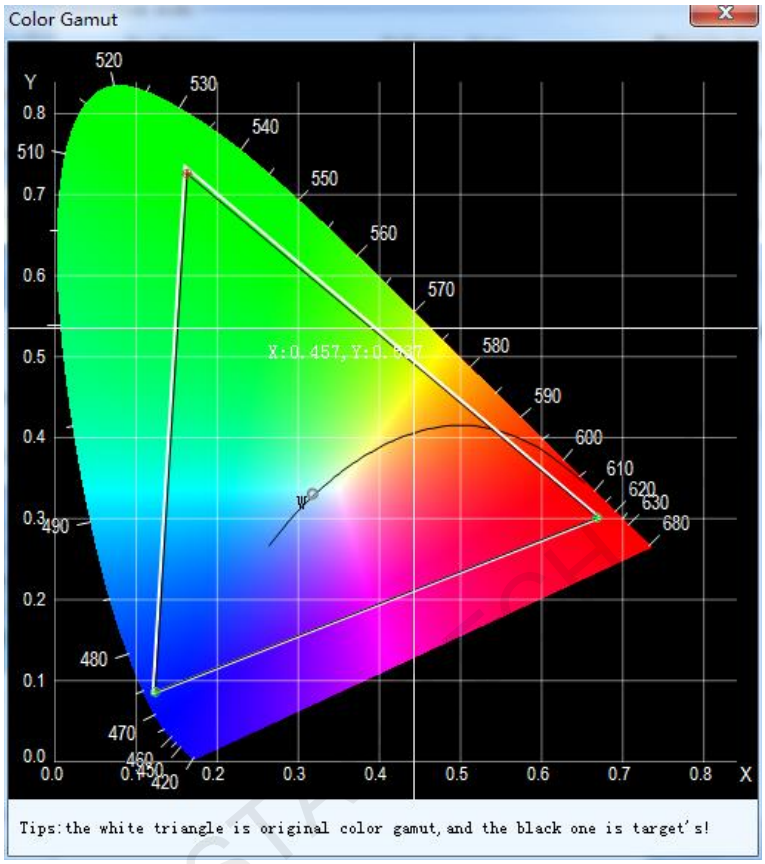

Fig. 4-13 Custom adjustment of color gamut

3) After setting target value is completed, click "Completion" enter next interface. If not satisfied with the target value, click "Reset" to return to last step to reset.

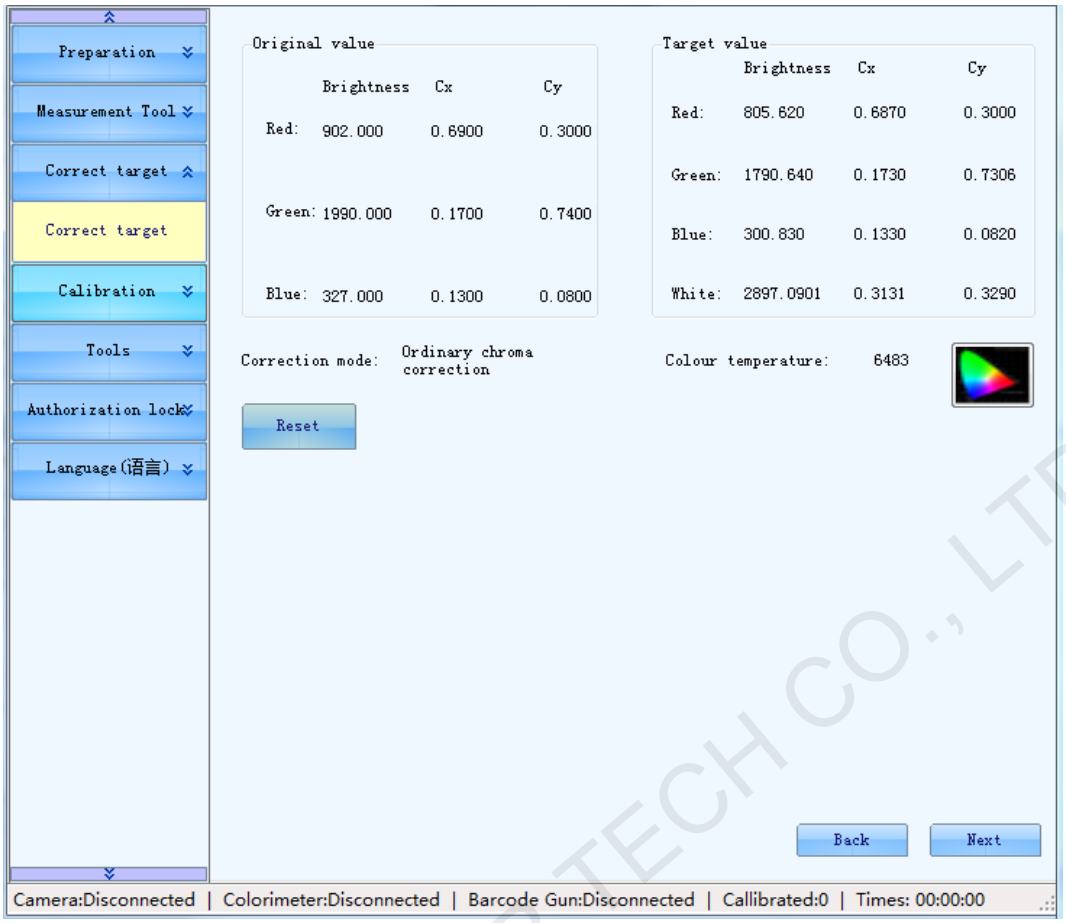

Fig. 4-14 Original value and target value after setting

4.1.3.2 There is some bright and color difference among cabinets or modules

When there is some bright and color difference among cabinets to be calibrated, the original value must be measured by colorimeter.

1) Measuring original values

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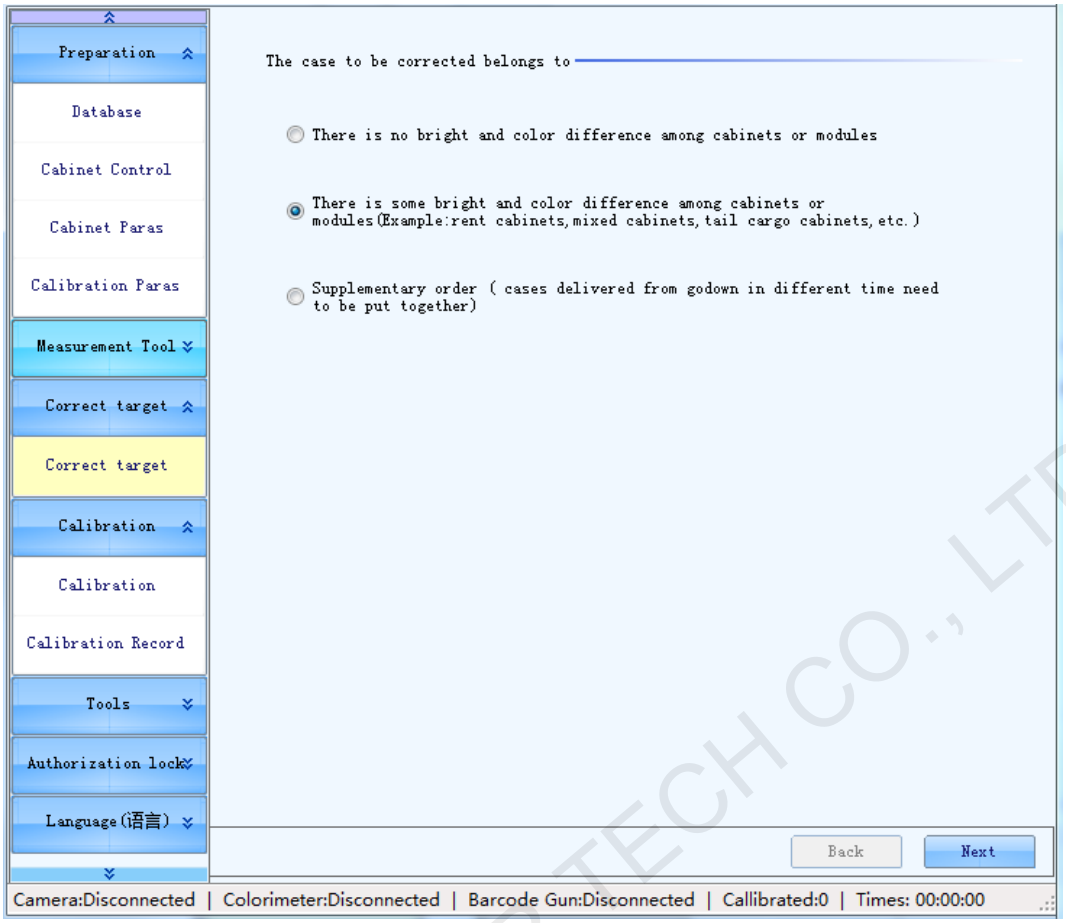

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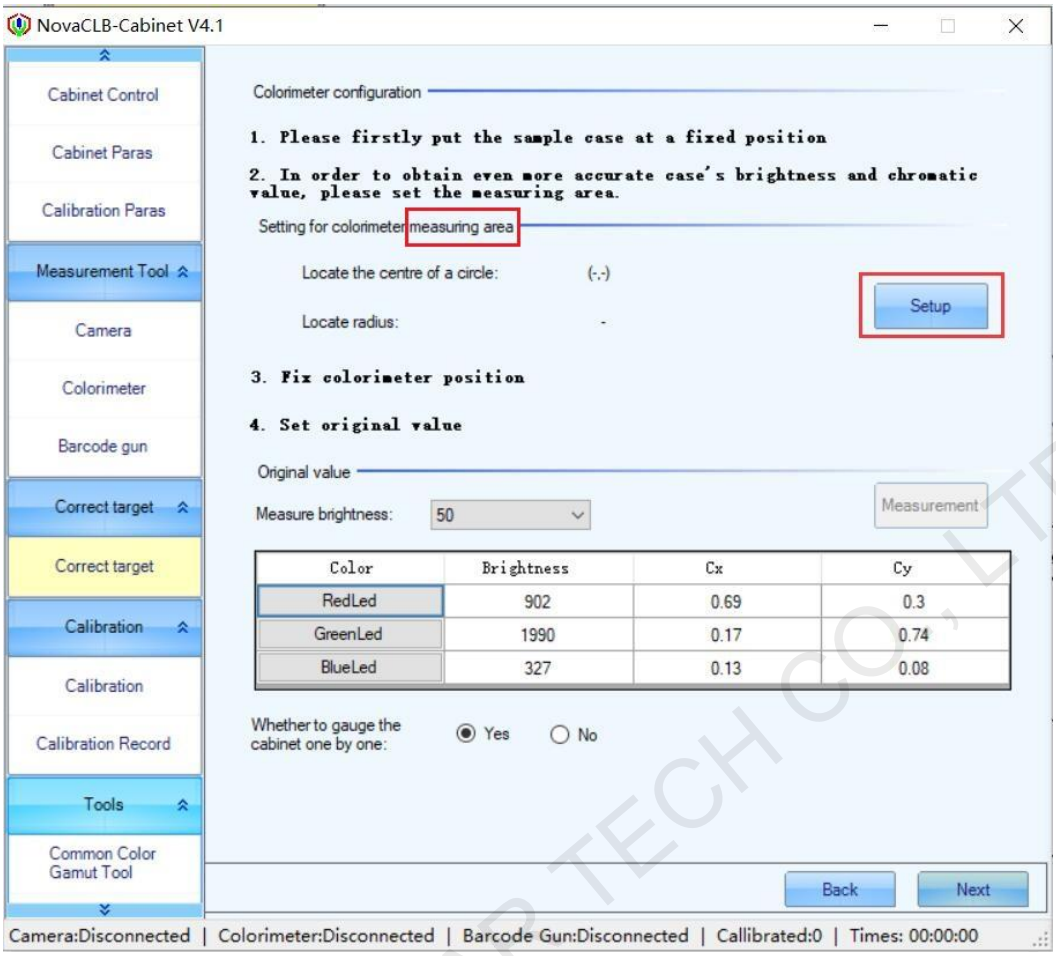

Measuring area: As the colorimeter has limited focal circle size when measuring the brightness and chromaticity of cabinets, set the measuring area before using the colorimeter to measure it in order to more precisely acquire the brightness and chromaticity distribution of cabinets.

Click and the interface below appears:

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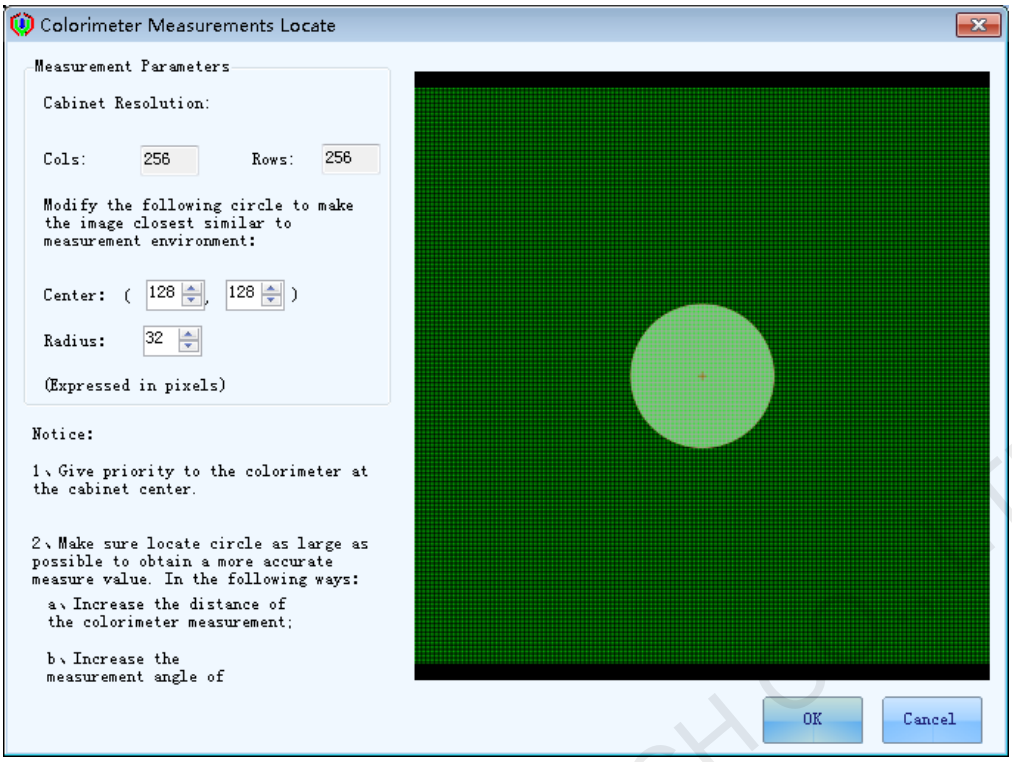

Fig. 4-15 Setting of measuring area

Modify the "center" and "radius" of the circle to make sure the green part in the figure above is the same as the location and ratio of the measurement area of actual colorimeter in the cabinet. Then click "OK".

Measurement mode: There are two modes including "Manual" and "Auto by colorimeter". "Manual", in which the user shall fill in the brightness and chromatic value. "Auto by colorimeter" means that after connecting the colorimeter to the computer, click the "Measure" button and the software will automatically control the colorimeter to make the measurement. At present it supports CS-2000 and CS100 colorimeter produced by Konica Minolta Inc.

Measured values: Regulate measurement brightness of colorimeter.

Whether to gauge the cabinet one by one: Check **"Yes"**, and the colorimeter will be started to measure the cabinets one by one. If the present calibration software has been connected to the

colorimeter (currently supporting CS2000/CS100/CS150), the software will automatically collect the brightness and chromaticity measured values of the cabinets when executing "gauge one by one". If it is not connected to a colorimeter, the following dialogue box will pop up when start calibration, requesting the user to manually fill in the measured value. Click "OK" and go to the next step.

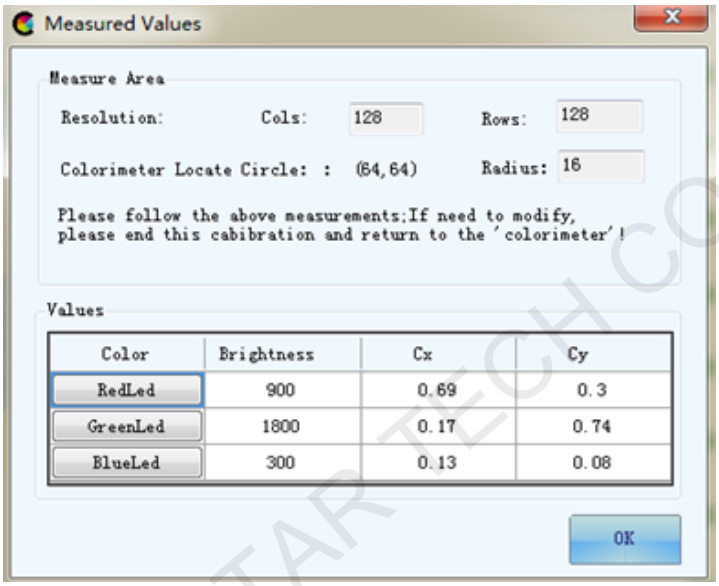

Fig. 4-16 Measuring brightness and chroma

2) Selecting a calibration mode and set target values

The software supports the three modes of **Brightness calibration**, **Ordinary chroma calibration**, and **multiple bin chroma calibration**. **Brightness calibration** will only change the brightness of three primary colors R, G and B without loss of the color gamut of the display screen. But it could not eliminate the difference of chroma on the LED. **Ordinary chroma calibration** will change the brightness of the three primary colors and lose a small part of the color gamut. But it could make the LED brightness and chroma attain high consistency. **Multiple bin chroma calibration** can eliminate difference of brightness and chroma among modules or cabinets and supports blue

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adjustment which is mainly to optimize blue effect. But it will lose some of the white effect.

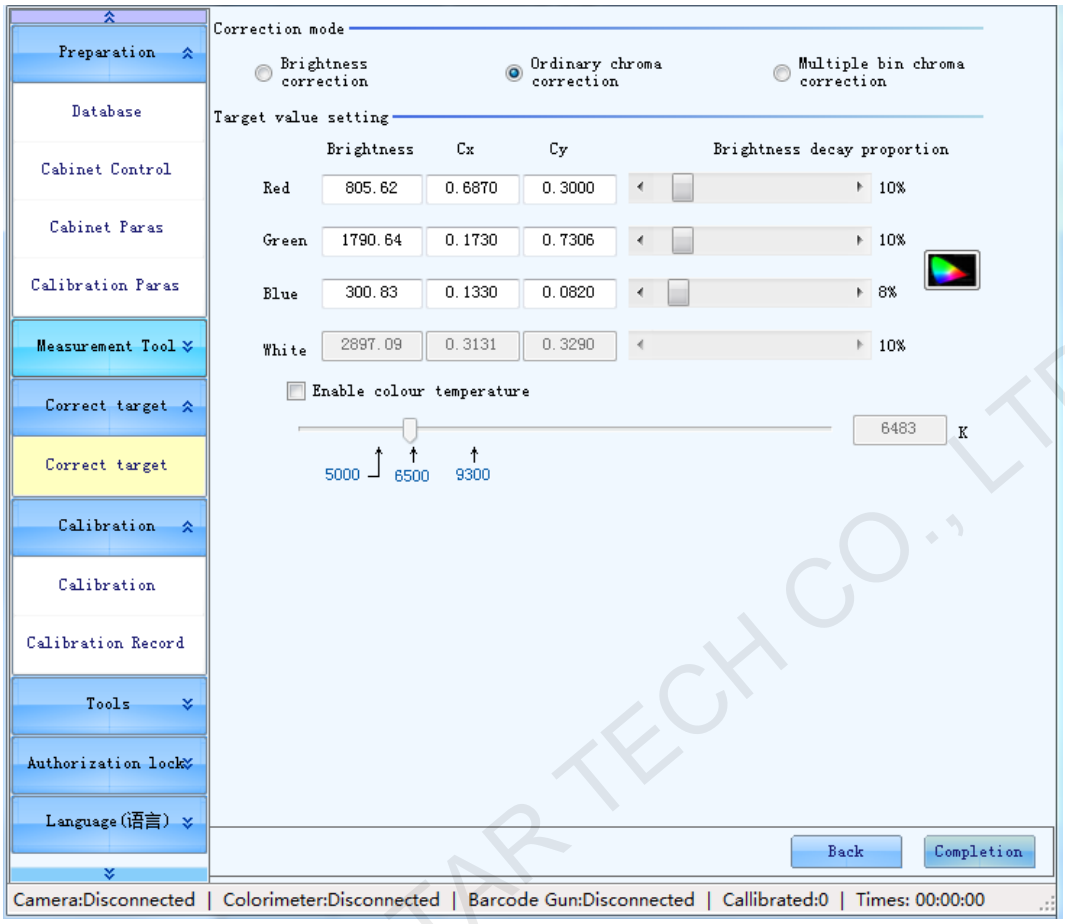

Fig. 4-17 Setting calibration target

Use the following methods to set calibration targets:

Drag "brightness decay" pull rod and choose the proper brightness decay proportion. When "Ordinary chroma calibration" is selected, the software will generate a coefficient in accordance with the "chromaticity calibration standard". When "Brightness calibration" is selected, it will generate the coefficient in accordance with the "brightness calibration standard". When "Multiple bin chroma correction" is selected, it will generate the coefficient in accordance with the "Multiple bin chroma calibration standard", for example, when "20%" is selected for the brightness calibration, the brightness after the calibration will be 20% decayed than the

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brightness before the calibration.

Select "**Enable color temperature**" to set a proper color temperature and then modify other parameters.

Look over color gamut figure: Click the color button in interface, the following form interface will pop up:

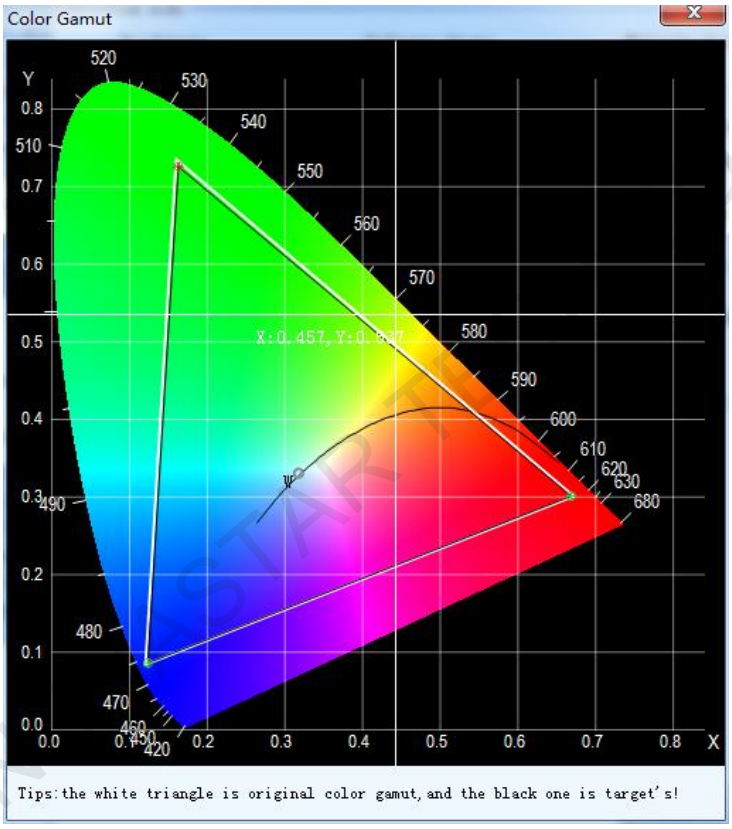
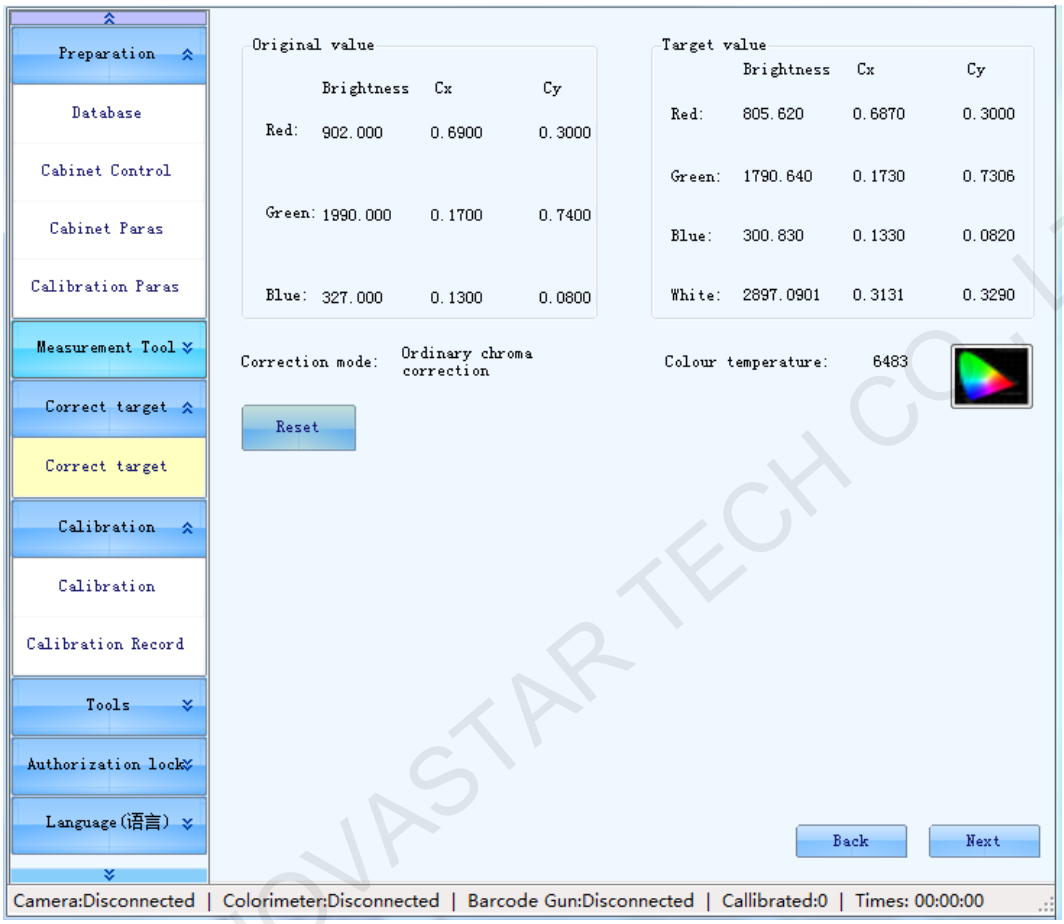


Fig. 4-18 Color gamut

The white triangle in the above diagram is the original value of the software. If measured by colorimeter, it is the real color gamut of the cabinet. The black triangle is the target color gamut to be reached after the calibration. With this diagram, the change of cabinet color gamut before and after the calibration is shown clearly. By right clicking "add" to change target color gamut. By right clicking "expand" to set the true color gamut of the cabinet as the expect color gamut, i.e.,

losing no color gamut.

3) After setting target value is completed, click Completion enter next interface. If not satisfied with the target value, click Reset to return to last step to reset.



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4.1.3.3 Supplementary order (cases delivered from go down in different time need to be put together)

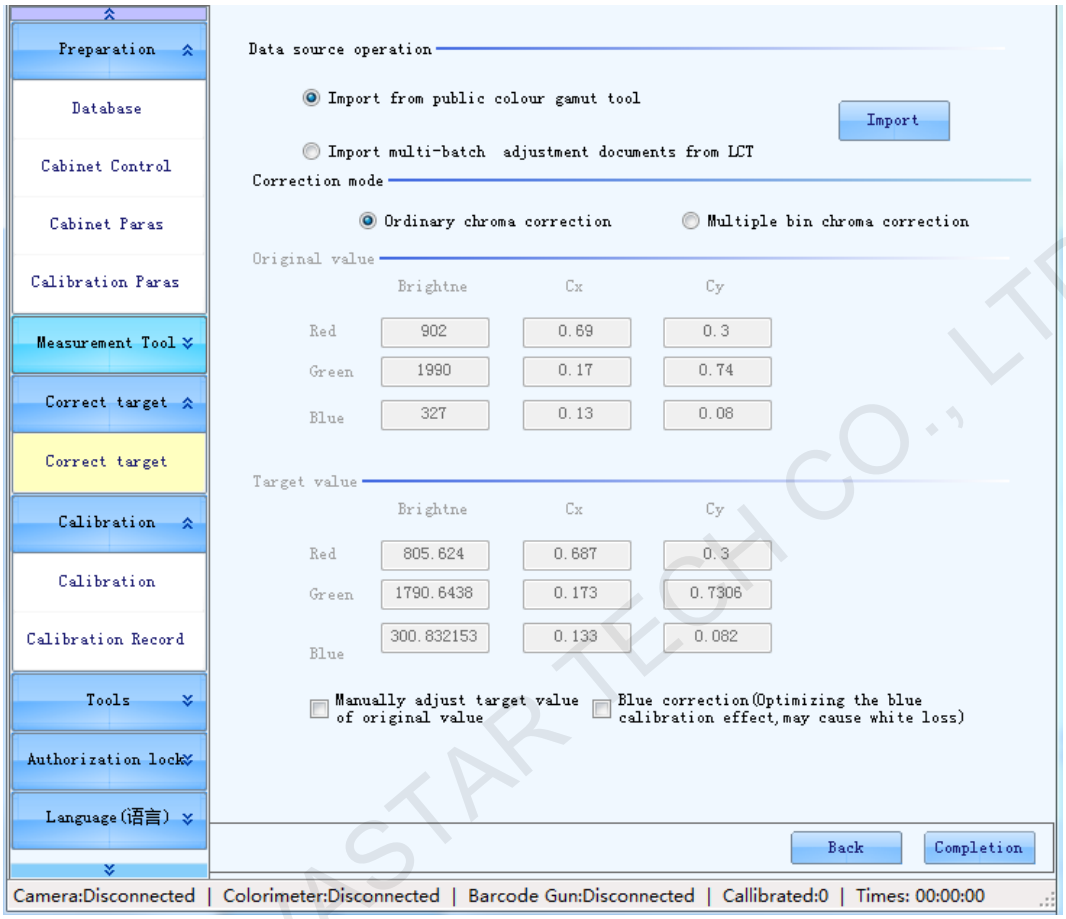

Fig. 4-19 Calibration of supplementary order

1) Importing original values from public color gamut tool.

It is necessary to import the original value and the target value of the batch to be calibrated.

Click “Common color gamut tool” in the menu bar to select the batch being calibrated.

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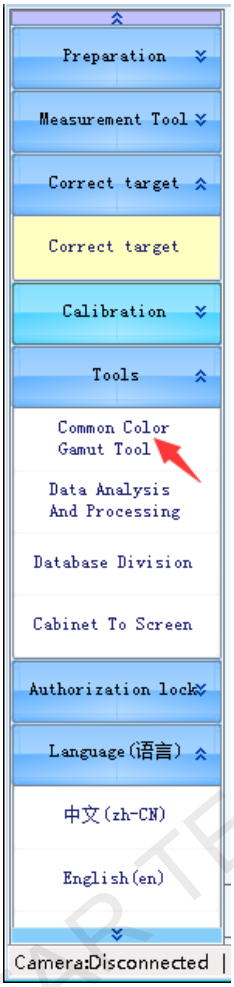

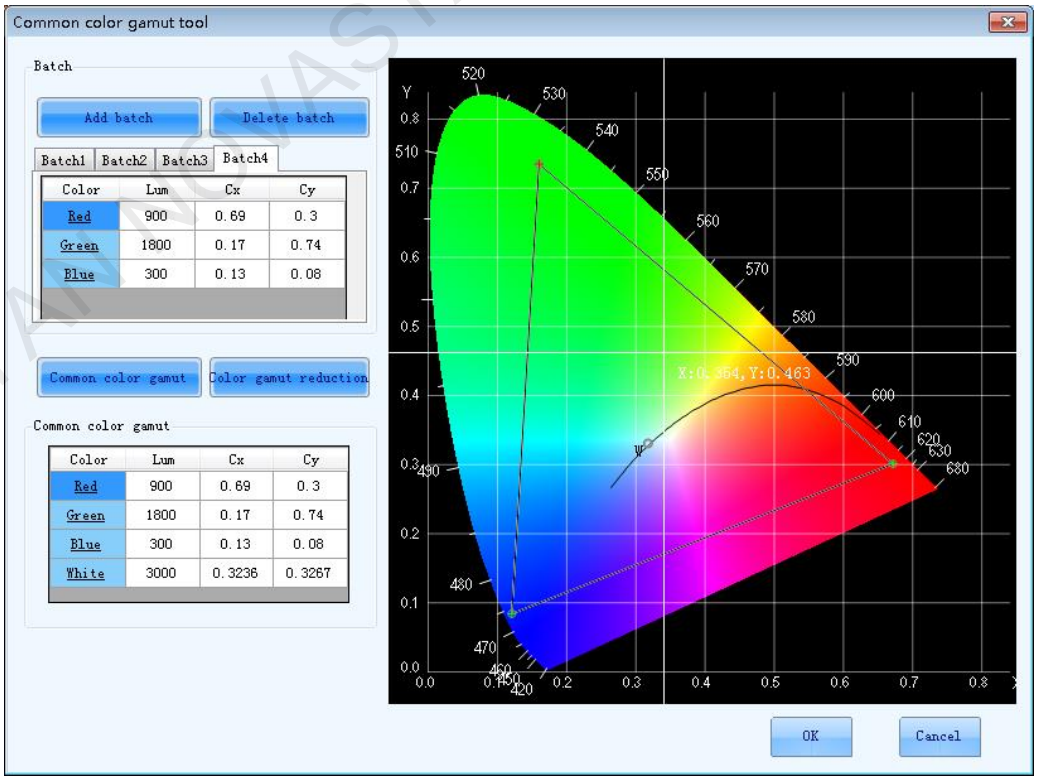

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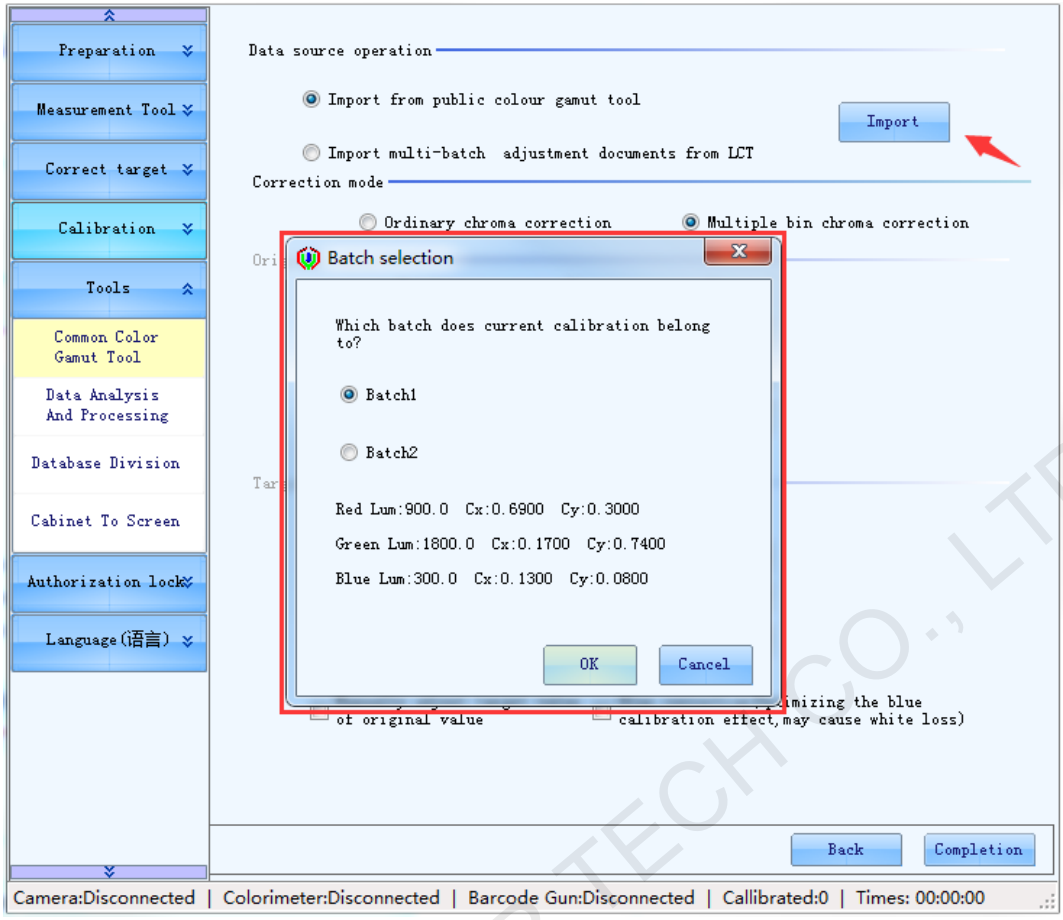
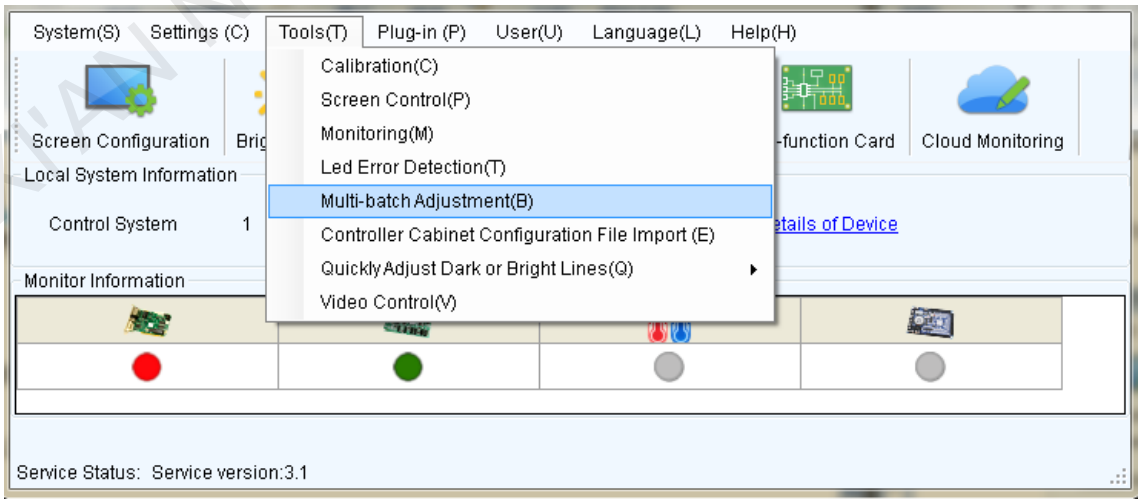


Fig. 4-20 using common color gamut tool to set target value

2) Importing original value and target value file

The file is in .lxy format generated through LCT multi batch adjustment.



It is necessary to import the files of current batch to be calibrated.

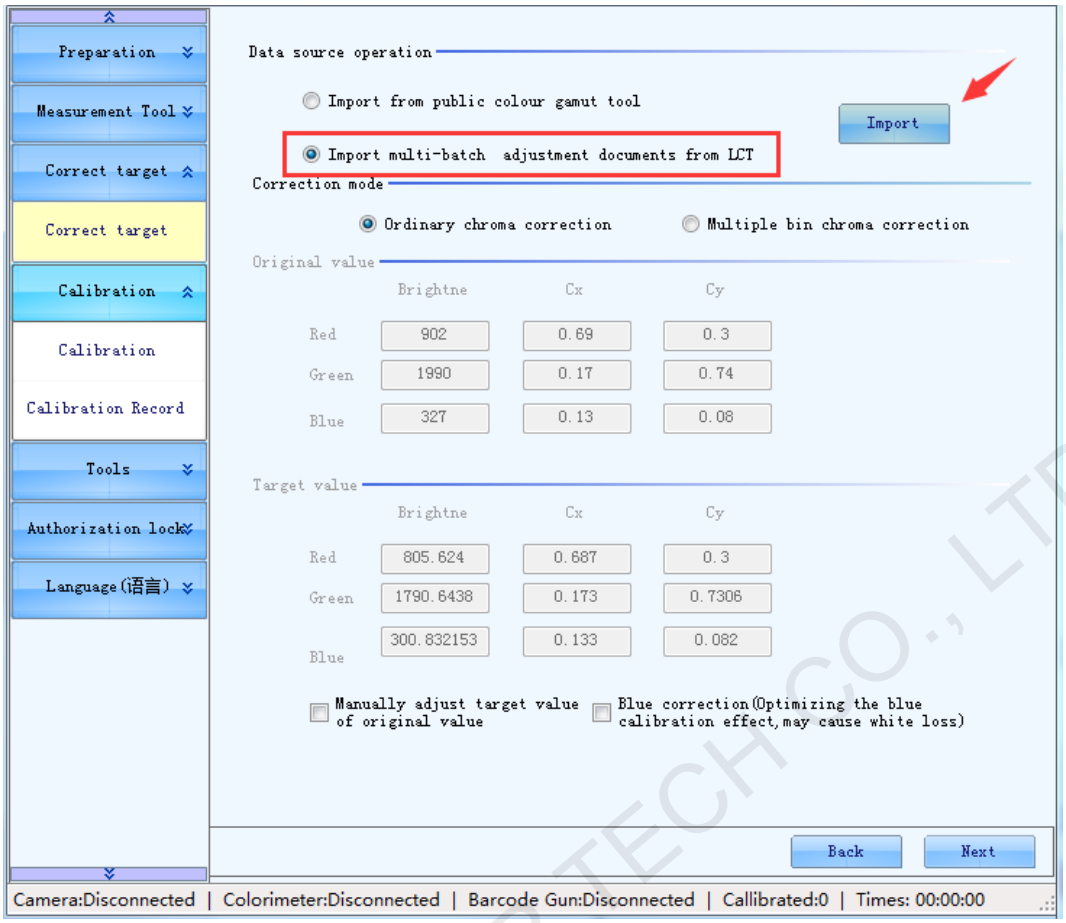


Fig. 4-21 Importing original value and target value files

3) Manually adjusting the original and target brightness and chroma of RGB.

The software supports the two modes of **Ordinary chroma calibration** and **Multiple bin chroma calibration**. **Ordinary chroma calibration** will change the brightness of the three primary colors and lose a small part of the color gamut. But it could make the LED brightness and chroma attain high consistency. **Multiple bin chroma calibration** can eliminate difference of brightness and chroma among modules or cabinets and supports blue adjustment which is mainly to optimize blue effect. But it will lose some of the white effect.

Check "Manually adjust original value and target value" and select calibration mode. Select the number and double click to modify the value.

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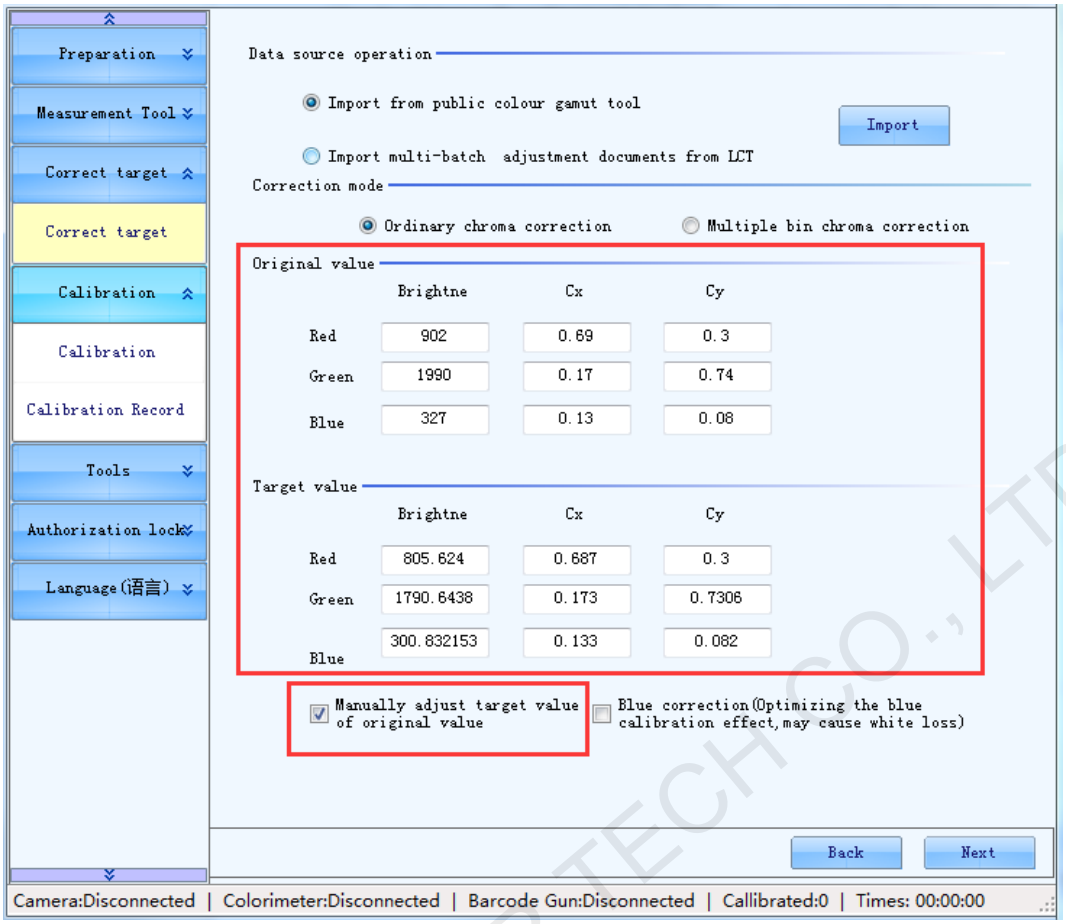

Fig. 4-22 Manually setting original and target value

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4.1.4 Calibration

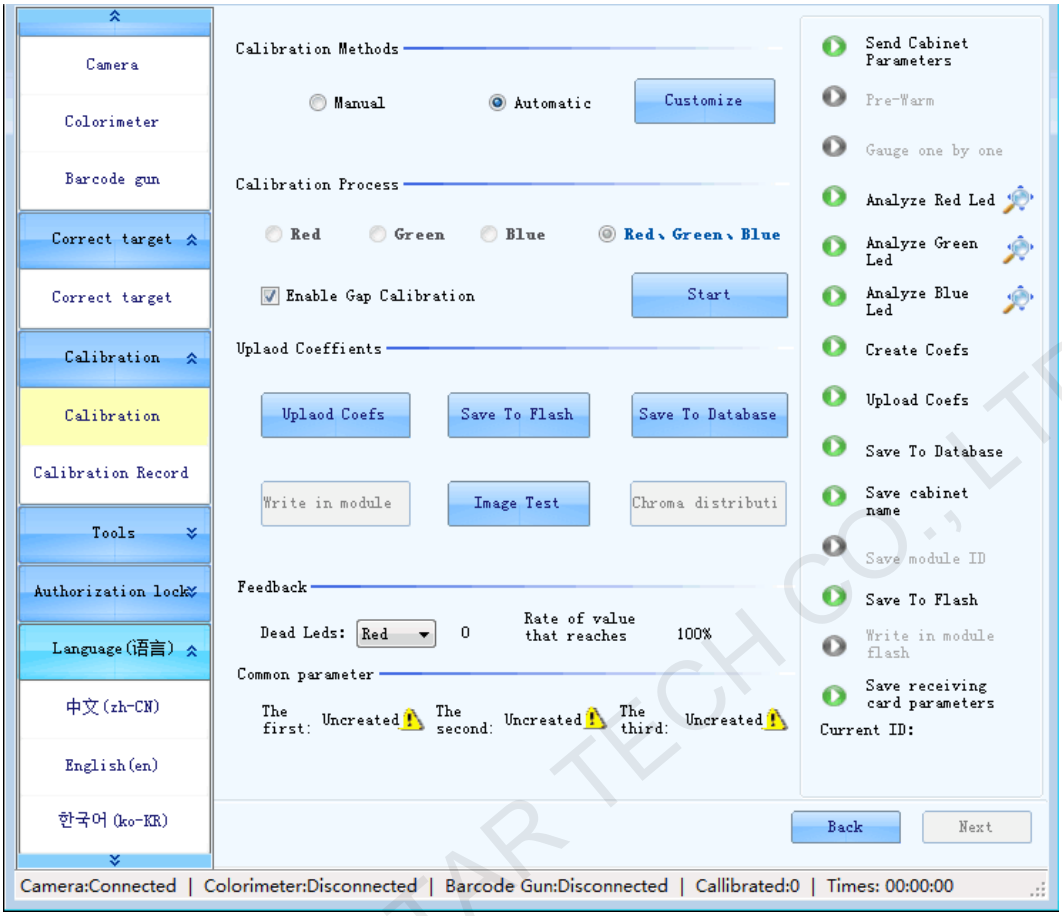

Fig. 4-23 Before calibration

Calibration methods: Including "**Manual**" and "**Automatic**".

1) **"Manual"** refers to conduct each step of the calibration separately, which requires users to manually start next step after finishing the previous step on the software. The advantage is that the step can be conducted again if not satisfied after conducting any one step.

2) **"Automatic"**, the so-called automatic calibration is actually to add each step of the "Manual" to an automatically operated process. After clicking "Start", the software will automatically operate the customized process.

After selecting "automatic", users can click "customize" button and select the step to be

automatically executed by the software as shown in the screenshot below:

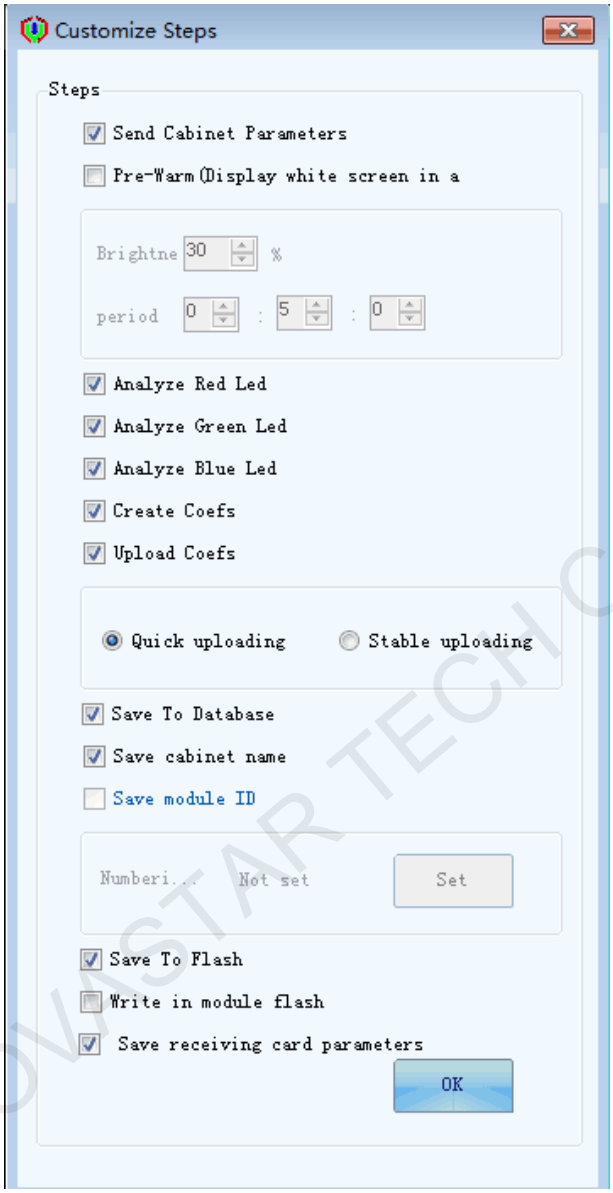

Fig. 4-24 Customizing automatic calibration process

- **Pre-warm**: It is a unique function of "Automatic". Check" Pre-warm" to enable pre-warm mode. This mode is to prevent some cabinets from changing after working a period of time and leading to the change of the brightness and chroma uniformity of the cabinets. Therefore, cabinets need to be pre-warmed before calibration. It is suggested to enable this function for the cabinets with poor heat dissipation and use the default

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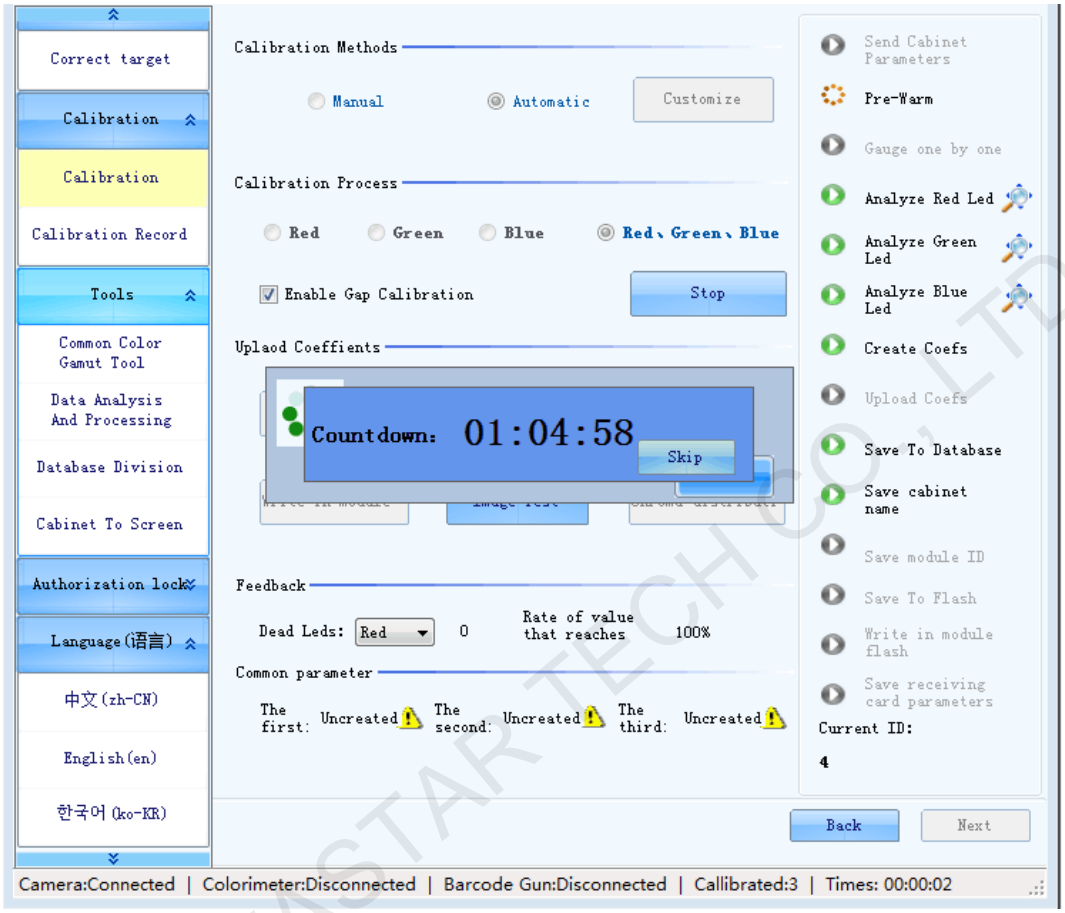
parameters. If the pre-warm function is selected, the calibration page will be displayed as follows.



- **Upload Coefs:** You can choose to upload the coefficients to receiving card stably or quickly. Stable uploading ensures data accuracy. The coefficient uploading method defaults to quick uploading which uploads coefficients quickly.
- **Save cabinet name:** Support for one cabinet with two cards.
- **Save module ID**: Supports the receiving cards with module flash function.

a) Flash arrangement settings must be done first on receiving card configuration page of LCT. See detailed operations in the figure below.

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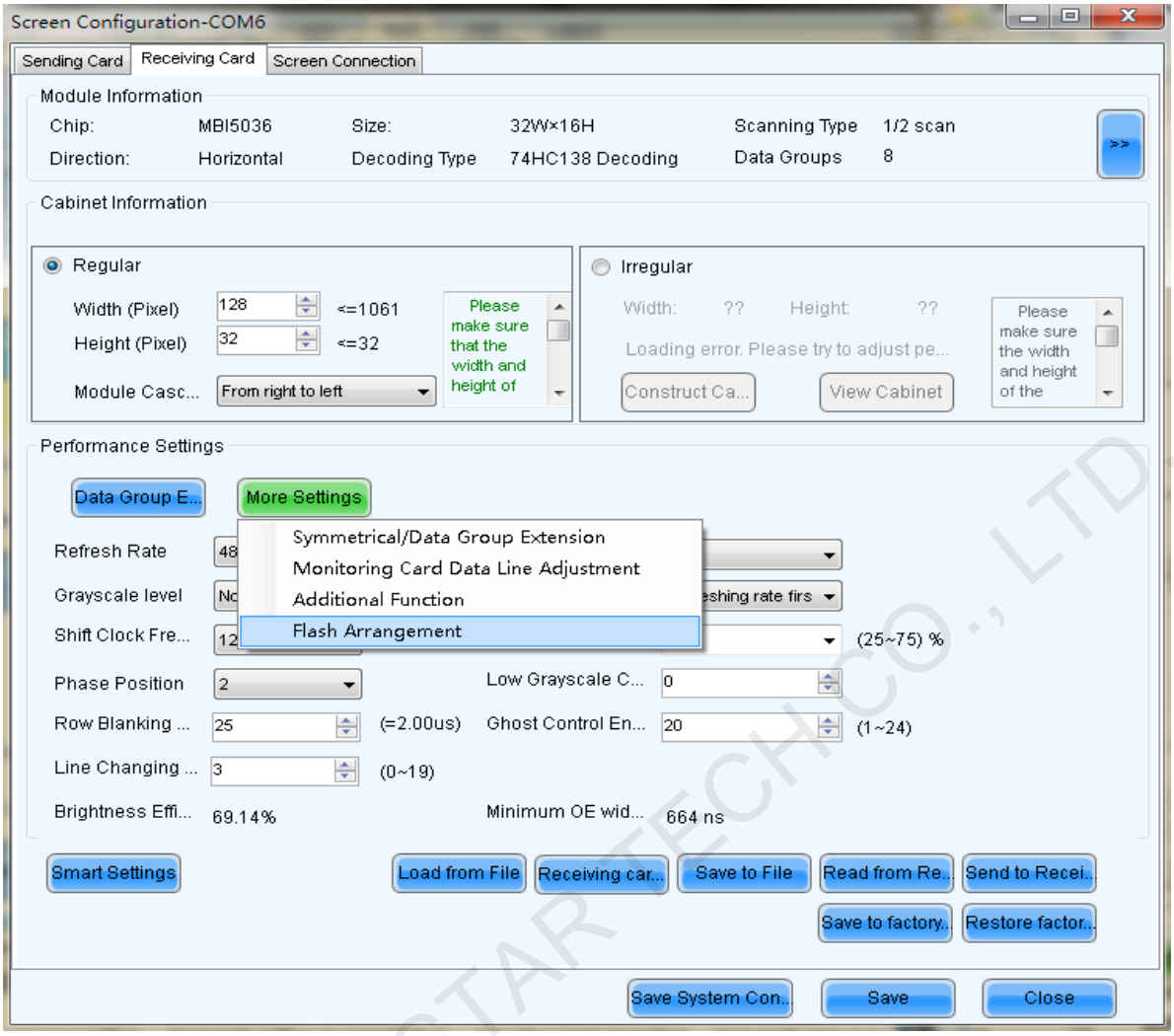

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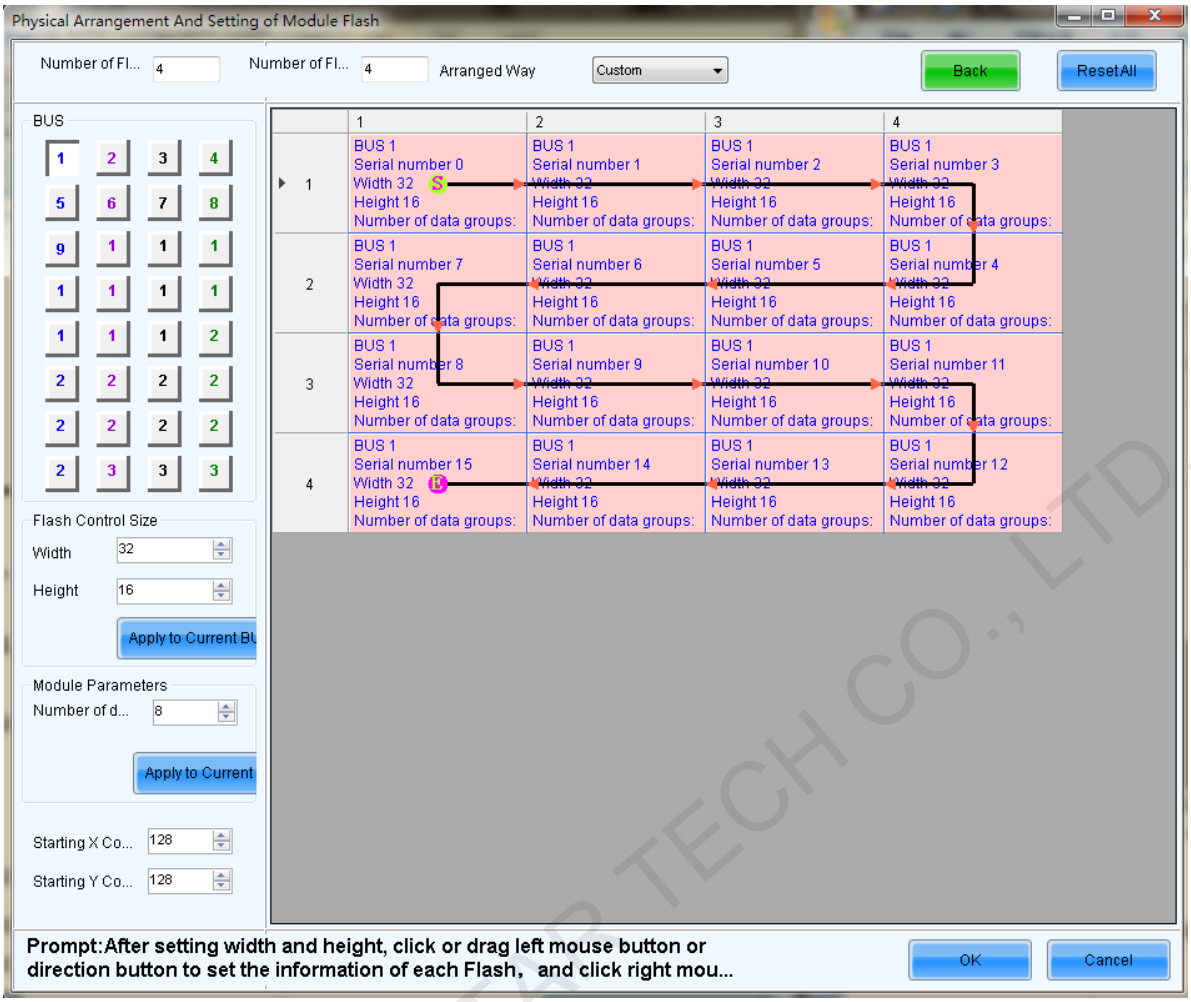

Fig. 4-25 Physical Arrangement and of Module Flash

b) Send module flash arrangement settings to receiving card.

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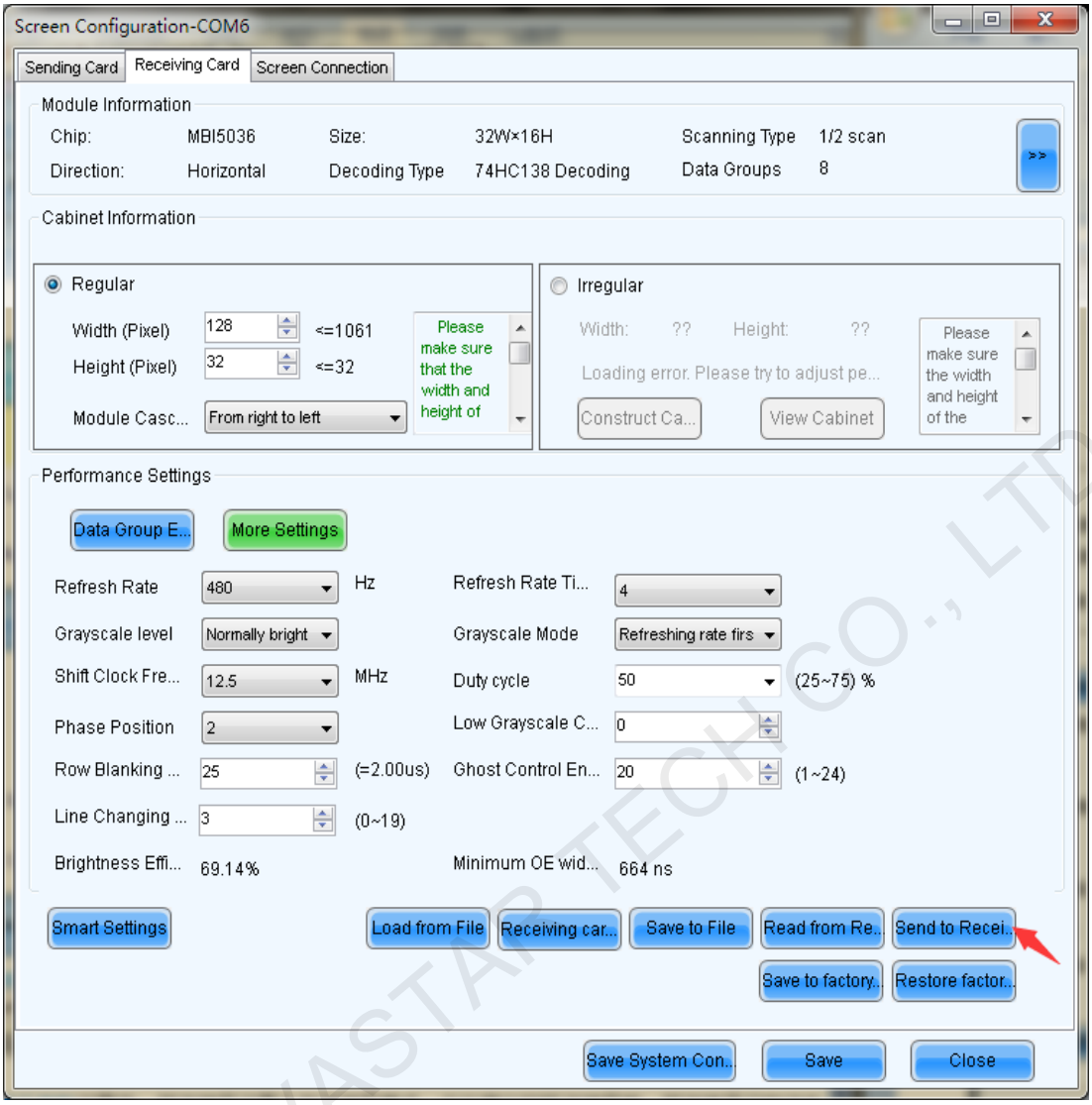
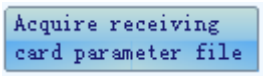


Fig. 4-26 Send to receiving card

c) Back to "Cabinet Control" interface and click 

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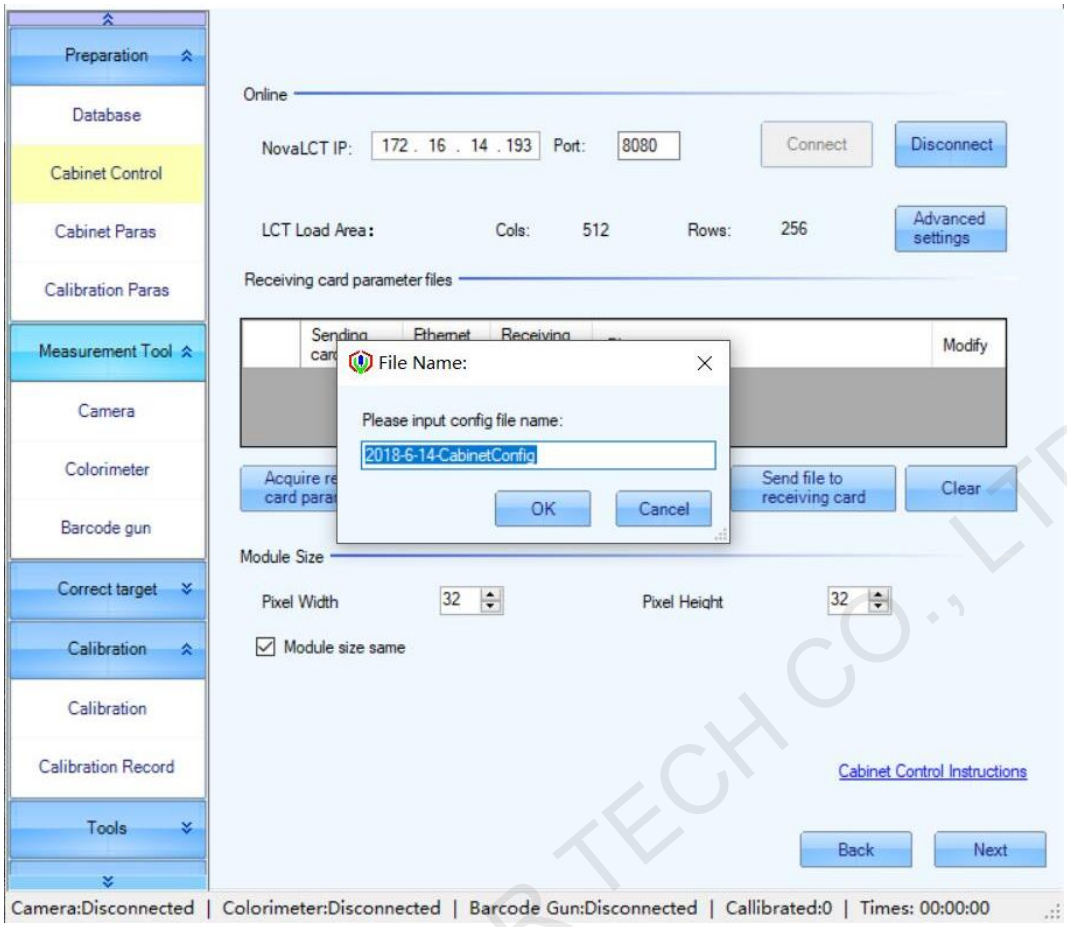


XI'AN NOVASTAR TECH CO., LTD.

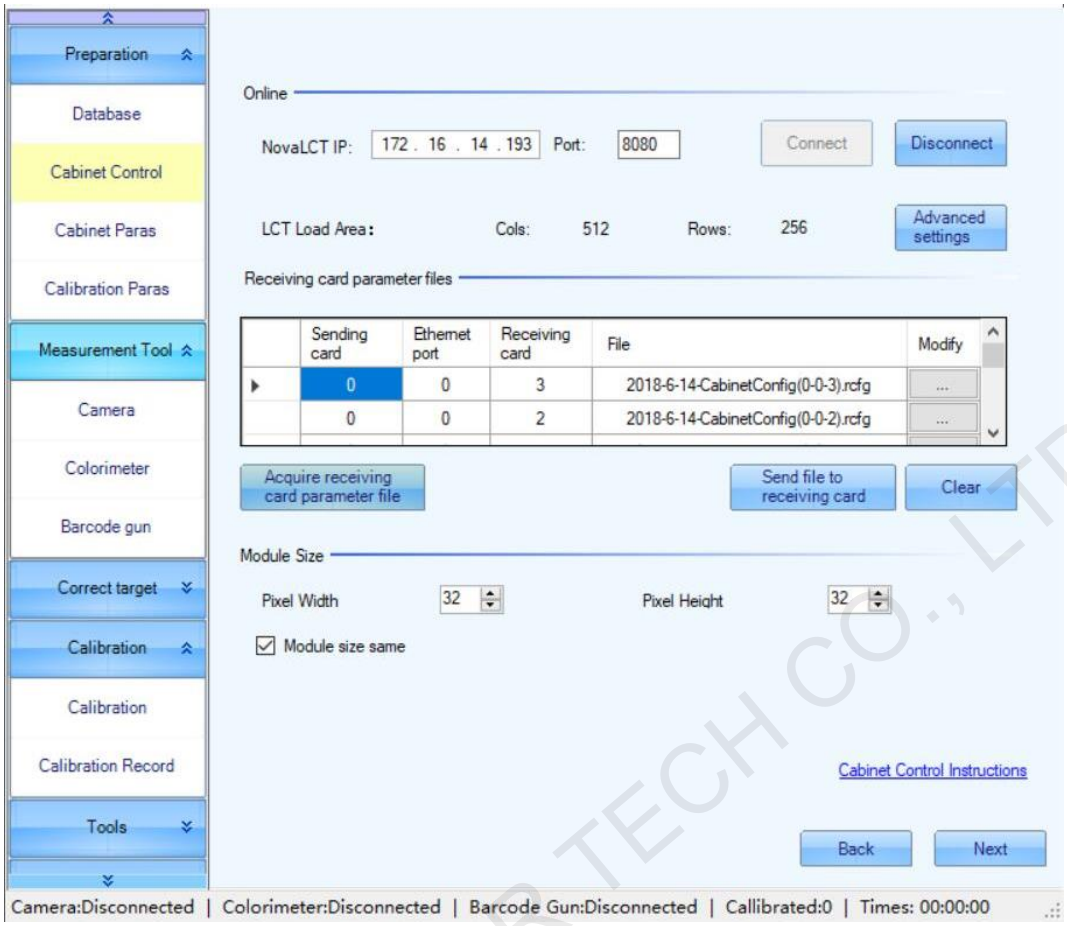
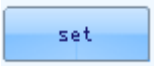


Fig. 4-27 Acquire receiving card parameter file

d) Back to calibration custom process again and check “Save module ID”. Click 

to start to set module number.

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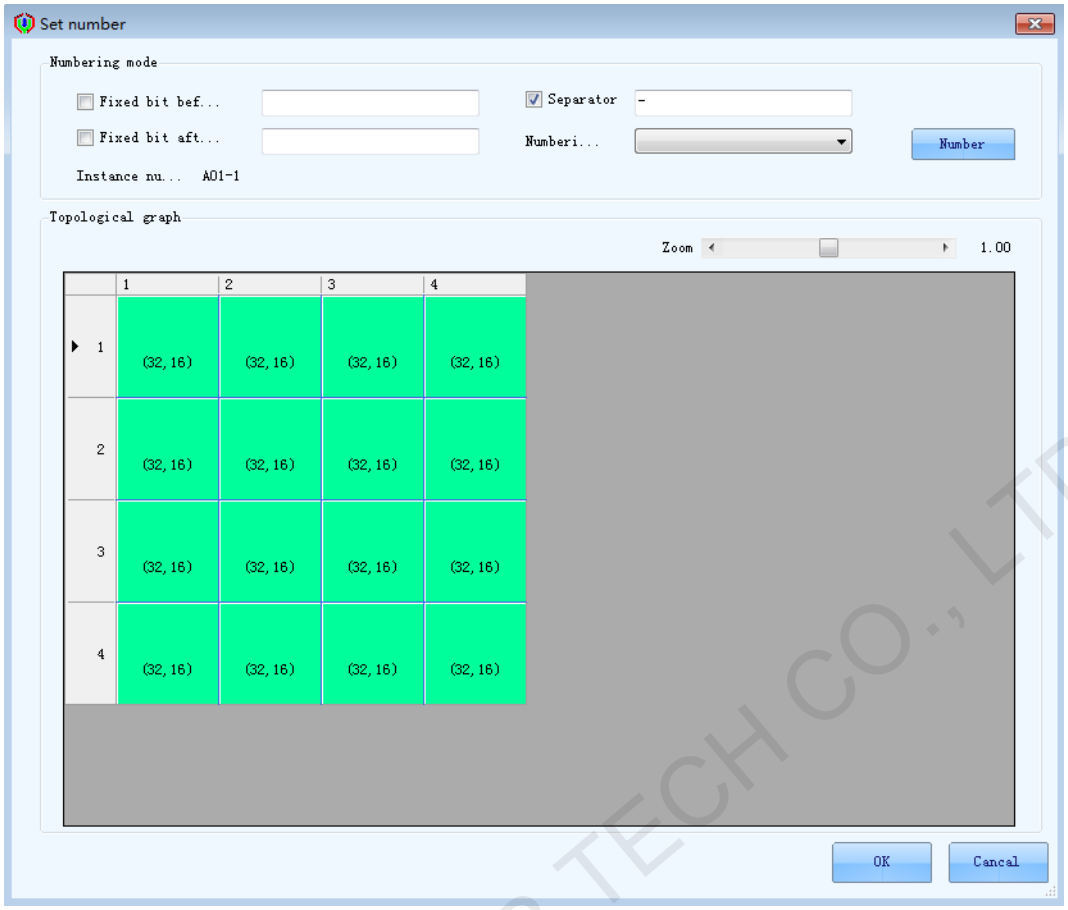

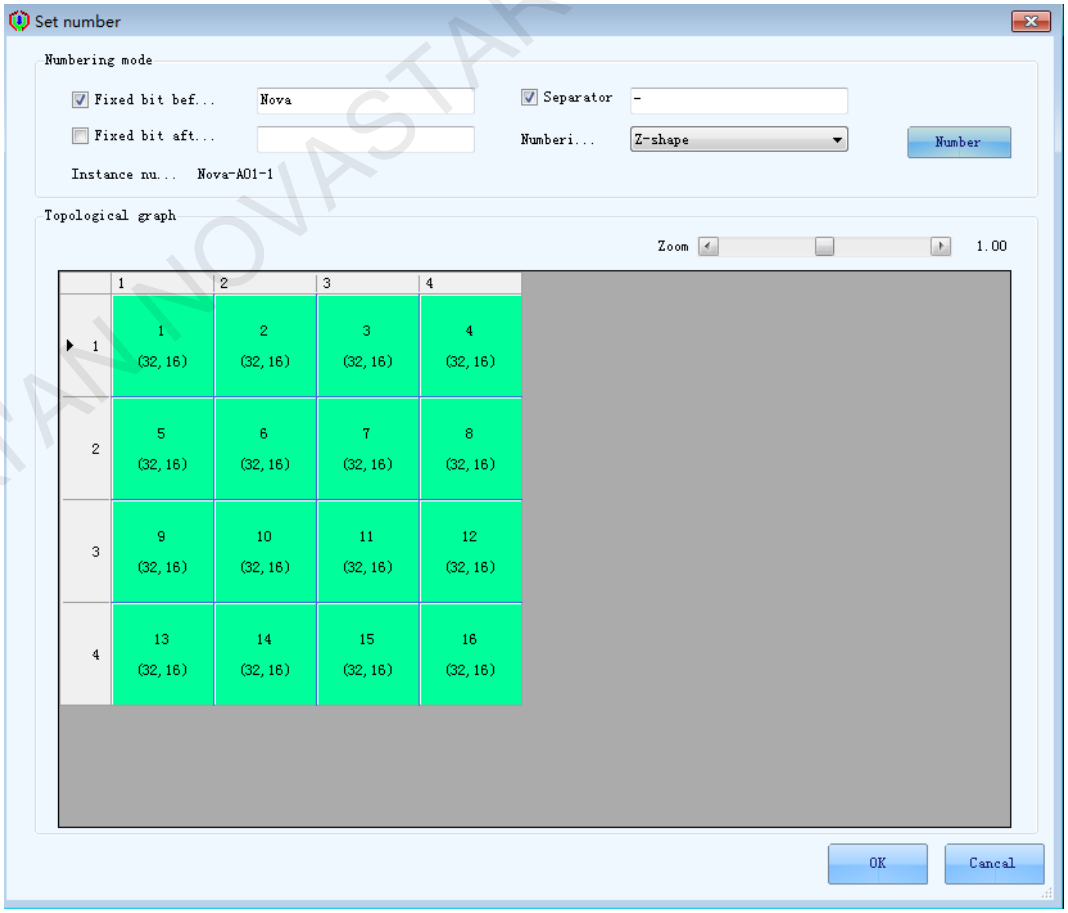

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Fig. 4-28 Set module number

- **Save receiving card parameters:** Check this option to save parameters to receiving card and the parameters won't lost if the power is terminated.

4.1.4.1 Calibration process

1) Starting calibration

a) Make sure that the lens of the camera is directed to the cabinet to be calibrated. If the system is connected to a barcode scanner, scan the bar code of the cabinet directly and the calibration will be started automatically.

You can see the Cabinet ID has been read automatically on the pop-up "cabinet ID" window. Just click "OK". When the barcode scanner is not connected, click "start". The "Cabinet ID" window will pop up and you need to enter the ID of the present cabinet.

If the Cabinet ID was set as automatic mode in *4.1.1.4 Calibration parameters*, you can see the Cabinet ID has been generated automatically on the pop-up "Cabinet ID" window and just click "OK".

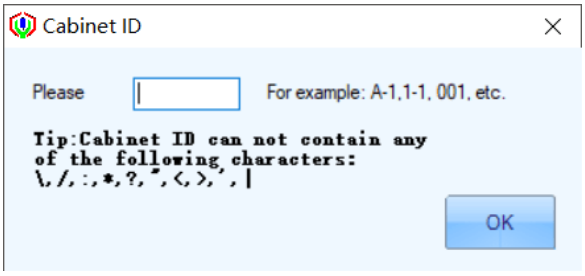

Fig. 4-29 Cabinet ID

"Cabinet ID" is the unique identifier for the cabinet in the batch and can't be repeated.

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After it is entered, click "OK" button to start the calibration. Then the button changes to "End Calibration".

b) During the process, the calibration software will automatically control the screen to display the corresponding colors. Operate the camera to collect image and analyze it intelligently. The corresponding progress can be viewed in the progress list on the right of the interface. During the calibration process, click "End Calibration" button to stop the current calibration process and cancel the calibration. If an error prompt appears during calibration, the process stops automatically. Follow the prompt to change the settings and then click "Start Calibration" button to start the calibration again.

2) Adjusting calibration target

Before generating the coefficient, following interface will pop up. Adjust target value on the interface or directly adjust color gamut if not satisfied with previous target value. Click "Apply" to apply new value and subsequent cabinets will use this value as well.

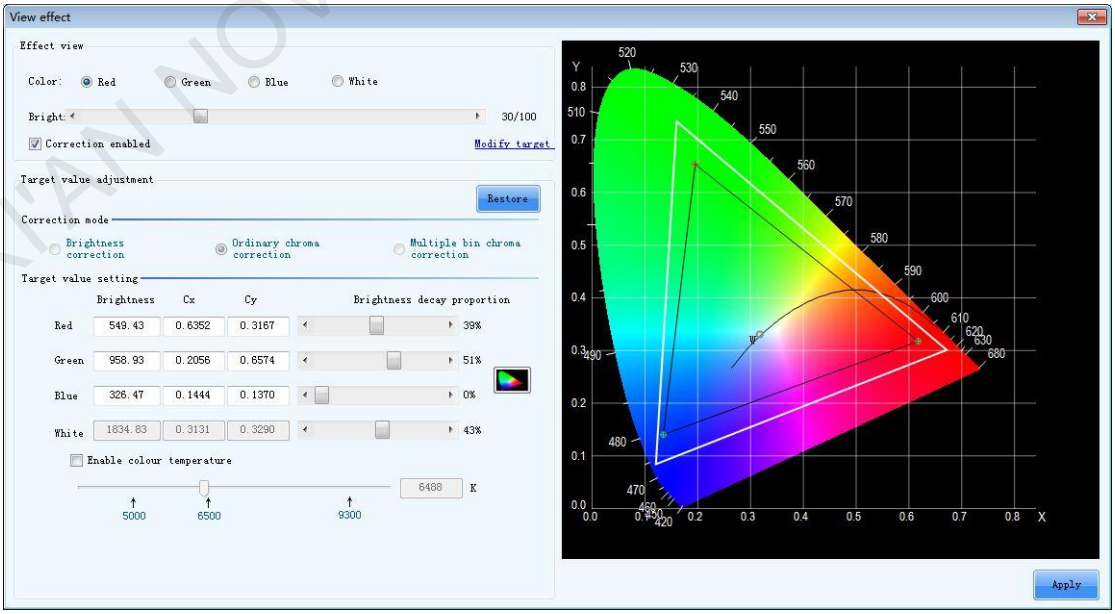

Fig. 4-30 Modify target value-with colorimeter

3) Uploading coefficient

a) Click the

button and upload it to the coefficient control system. The screen will display the calibration results. If you are not satisfied, you can re-set the "Calibration Standard" for red, green and blue and upload again.

b) Click

to save the generated coefficients to hardware.

c) Click

to save the generated coefficients to database.

d) Click "Write in module flash". The software will check the consistency of coefficients saved in the Flash chip of current cabinet and the calibration coefficients sending from software to the cabinet. If they are consistent, the software will save the coefficient to Flash.

e) Click the "View Results" button and the following dialog box will pop up. Switch colors and calibration switch to view the calibrated results.

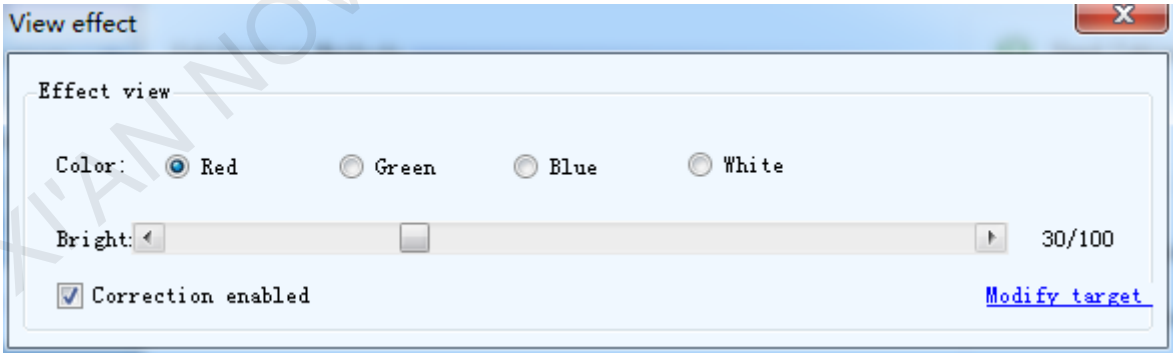

Fig. 4-31 Cabinet image control

f) Click "Brightness data export" to export the brightness data of each lamp to the local Excel file.

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4) Calibration information feedback

This column is mainly used to display the dead lamp information of current calibrated cabinet and inconsistent information before and after calibration.

5) Common parameter

The common parameters will be computed for three times during calibration. They will be generated respectively in the 5th, 10th and 20th cabinet. If the common parameter is not generated in the cabinet of the set number, it will be continuously generated in the following cabinet until it is generated. And the common parameter will be automatically saved to the database.

6) Calibration of first cabinet is completed

If "Manual calibration" is selected, the result of the single step will prompt after each step is completed such as "analysis completed", "uploading of coefficients completed", etc. If "Automatic calibration" is selected, it will display the information of the current step execution status in the status bar below and update the icon on the right side in real time. After all the calibration steps are completed, a dialogue box as shown below will pop up to prompt that the calibration of the present cabinet has been completed.

After the calibration of the cabinet is completed, the screen will be displayed as black so as to avoid being continuously lighted which may cause inconsistent brightness decay as the surrounding cabinets. If you need to view the calibration effect of other colors, click "View effect" to view.

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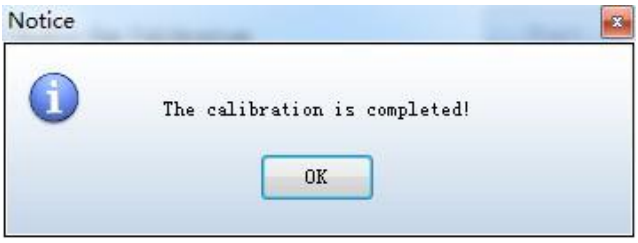

Fig. 4-32 Notice for the completion of calibration

4.1.4.2 Calibration record

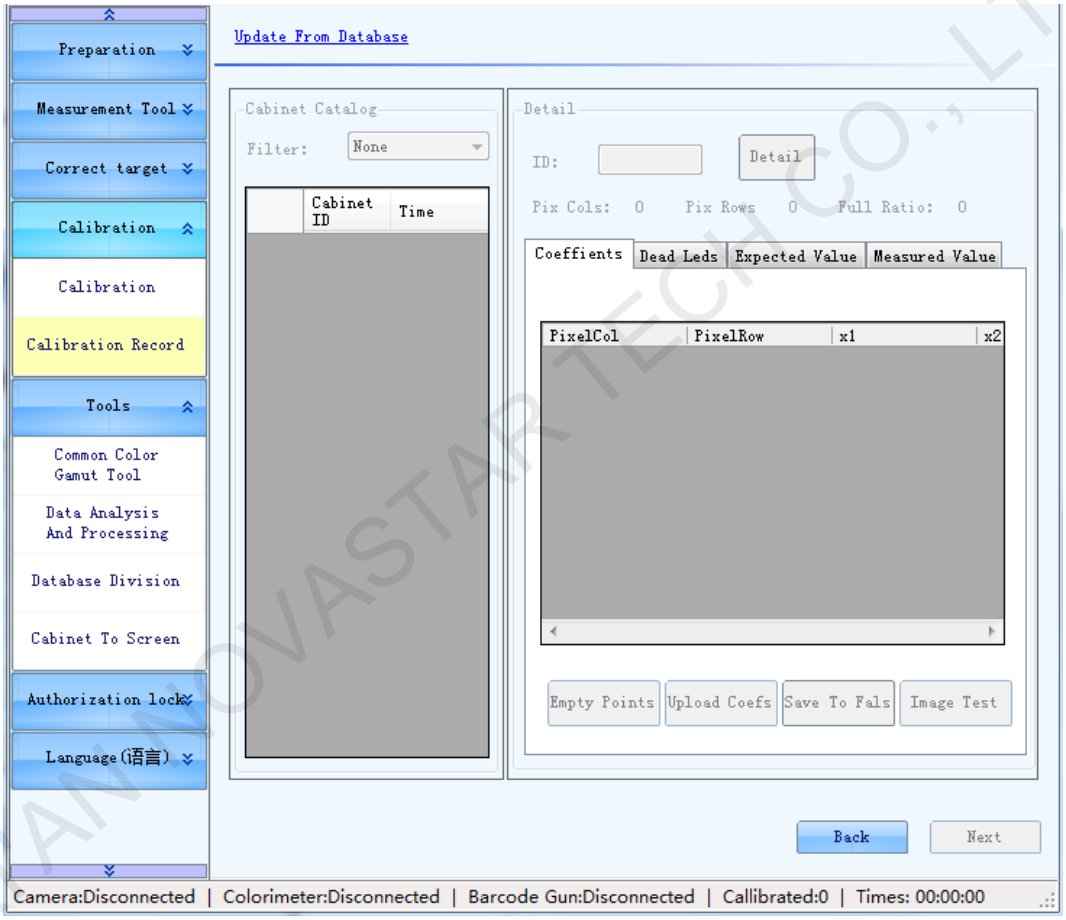

Fig. 4-33 Calibration record

1) **Cabinet Catalog:** The catalog shows all the cabinet IDs saved in the database. Double-click an entry or selecting an entry and click "check" button, the column in the right will show the detailed data information of the cabinet.

2) **Detail:** This column lists the basic information of the cabinet, including calibration coefficient, uniformity, dead light records, target value of calibration, measured brightness and chroma. After reading calibration coefficient of a cabinet from the database, directly click "Upload Coefficient" at the bottom to upload.

4.2 Calibration of subsequent cabinets

Move on to next cabinet and calibrate the subsequent cabinets according to the steps as shown in the figure below.

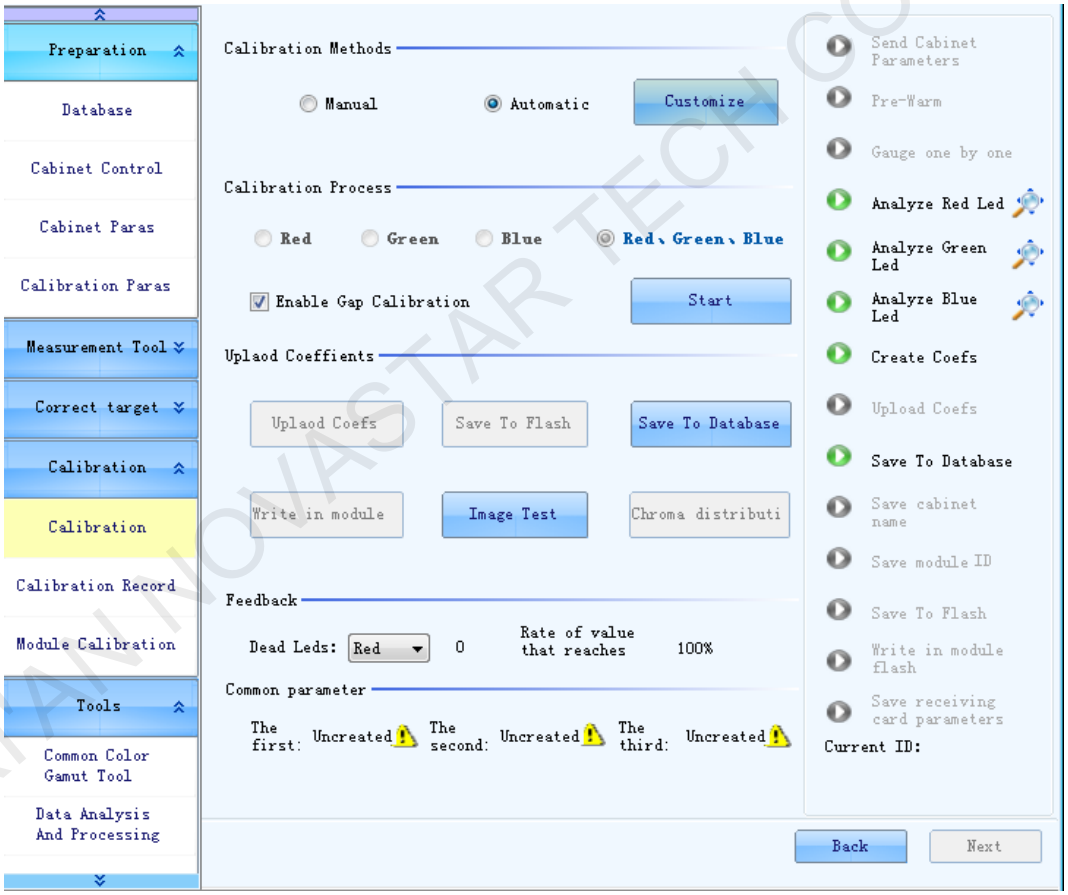

Fig. 4-34 Start calibration for subsequent cabinet

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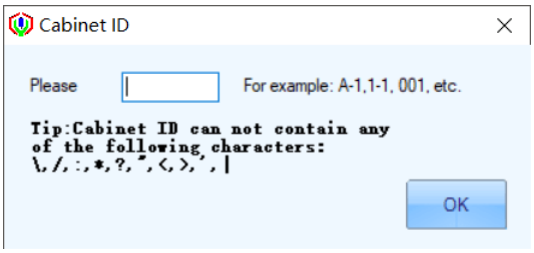
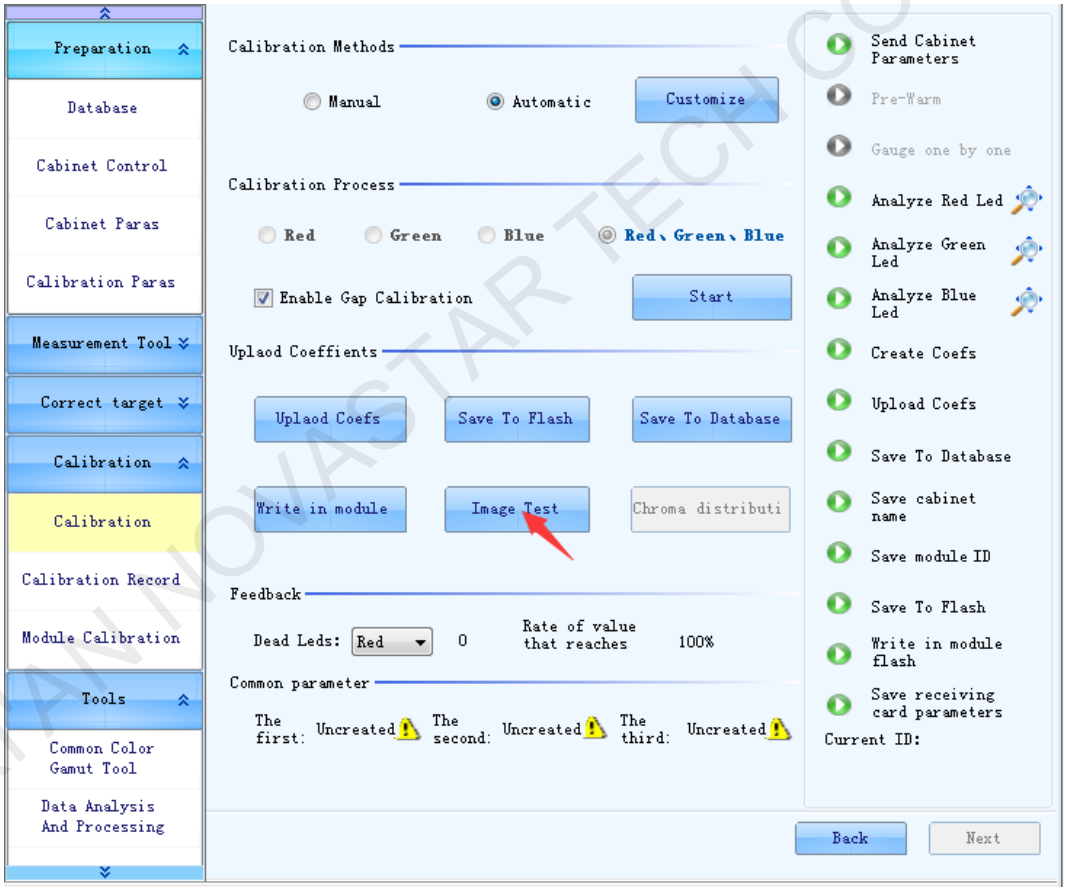


Fig. 4-35 ID of subsequent cabinet

Click "**Image Test**" on the main interface to modify target value. Click "**Preview**" after the value has been modified to view result. If satisfied, click "**Apply**" to apply the calibration target to the subsequent cabinets.



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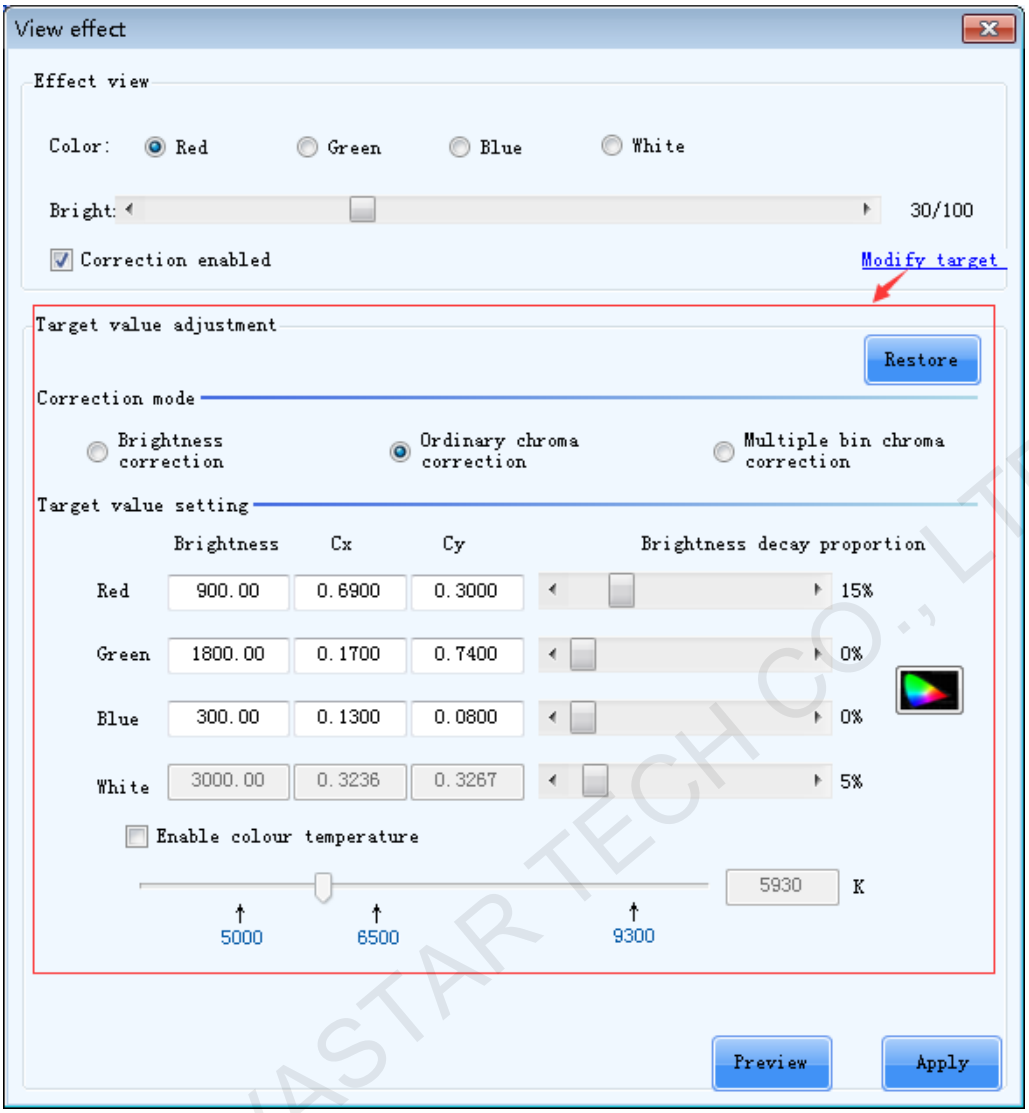

Fig. 4-36 Viewing result

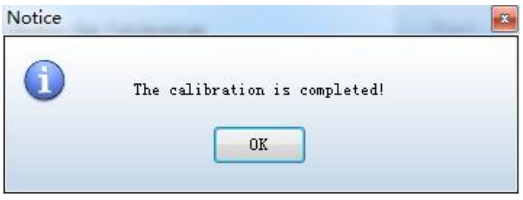

Fig. 4-37 One click to complete the calibration of subsequent cabinets

	1) During the entire calibration process, the location of the chassis of the cabinet and the camera, focal length and configuration must remain unchanged. In case the improper operation causes the damage of the

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	calibration site, a new database shall be rebuild to calibrate the remaining cabinets which are regarded as another batch (Make sure that the brightness and chroma standard for both calibrations shall remain unchanged). 2) The location of each cabinet is required in strict consistency. 3) Every 20 cabinets are monitored for calibration results using the functional module "Simulate and Adjust coefficients" of "Data Analysis And Processing" tool.

Cabinets requiring recalibration

After all cabinets are calibrated, it needs to calibrate the cabinet requiring recalibration again to ensure splicing results after calibration.

The list of cabinets requiring calibration will be directly displayed at the right side of the software interface. The reason why the cabinets need re-calibration will be judged automatically, and the user can check the reasons and pick out the cabinets requiring recalibration for the same reason, which is convenient to solve the problem once for all and recalibrate.

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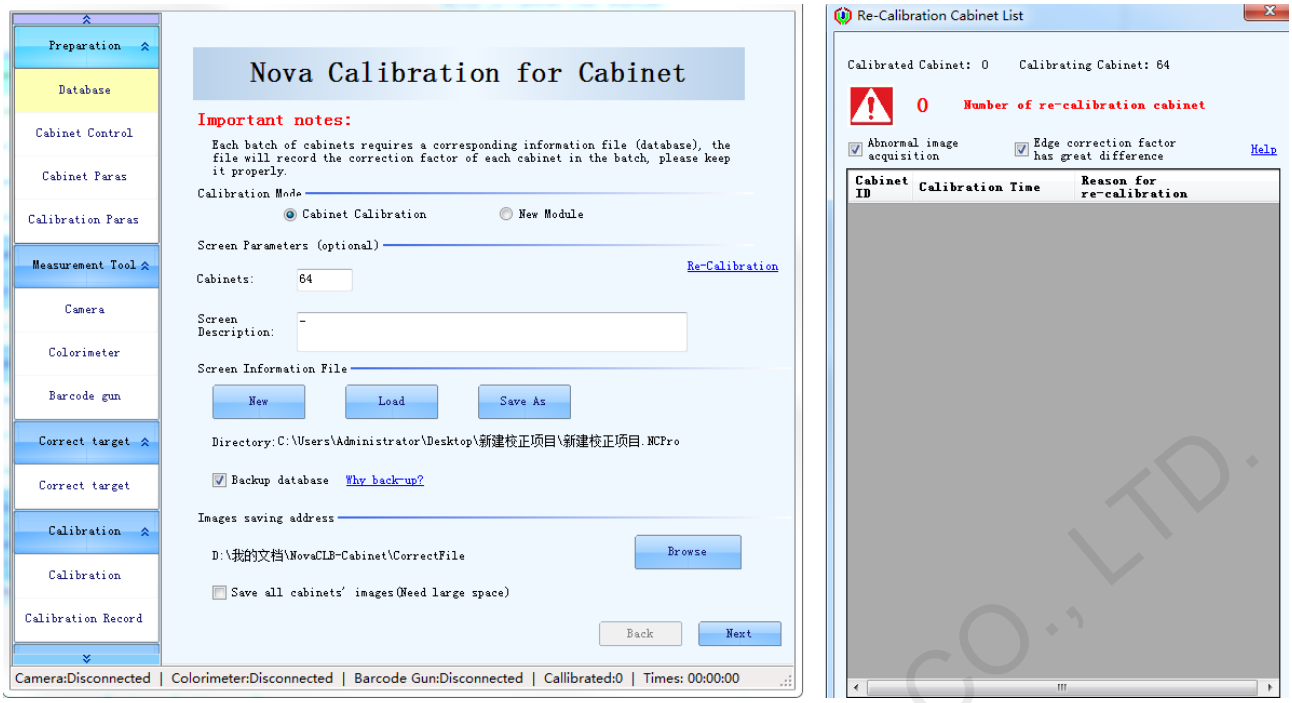

Fig. 4-38 Recalibration

	1) During the whole calibration process, the location of the cabinet pedestal and the position, focal length and configurations of the camera must remain unchanged. If improper operation results in any change to the calibration site, a new database must be created to calibrate the remaining cabinets which are seemed as another batch. Ensure that the brightness and chroma standards must be the same as the first batch)..
	2) For the first 30 cabinets, every 10 cabinets will be monitored by measurement data simulation software for their calibration effects. After the first 30 cabinets, every 20-40 cabinets will be simulated at the same time. The simulation of calibration database is a very important part of cabinet calibration.

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4.3 Identification of simulation diagram

Simulation diagram is generated through some calculation based on the calibration coefficient of the cabinet. What the simulation diagram simulates is **the splicing of the cabinet before calibration**. So the simulation diagram could be interpreted as **the brightness analog diagram of cabinet.**

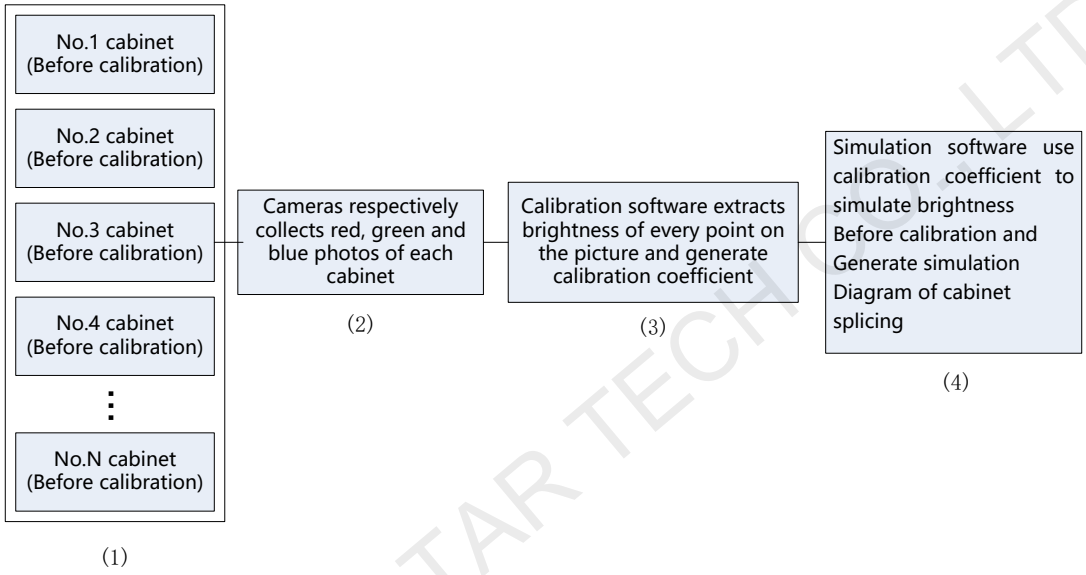

Fig. 4-39 Generating principle of simulation diagram

The above diagram shows the simulation diagram generation principle. If simulation diagram is unreasonable, look for reasons from three aspects:

(1) Unreasonable splicing before cabinet calibration (from the calibration direction).

It means abnormal situation on simulation diagram is caused by cabinet itself, please check the measured red, green and blue image in calibration software.

(2) Something wrong with the pictures collected by camera.

If most cabinets have problems, please adjust the camera or camera parameters for re-calibration;

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If individual cabinet has problems, please re-calibrate the cabinet.

(3) Something wrong with the calibration software.

Simulation diagram identification method will be further introduced in Chapter 4.5.

The usage of measured data simulation software and the identification of simulation diagram will be briefly introduced as follows with examples (Please refer to "Cabinet measured data analysis software help file" for more information).

4.4 Method to view simulation diagram

Click "Data Analysis And Processing" to enter the cabinet database management platform NovaCLB-CabSolver.

Then click "Simulate and Adjust coefficients" to generate the simulation image under this function option.

Besides the function of simulation, NovaCLB-CabSolver also has the functions of brightness analysis, database combination, and exporting/deleting cabinet.

Please refer to ***NovaCLB-CabSolver Quick Start*** for detailed operation instructions of the management

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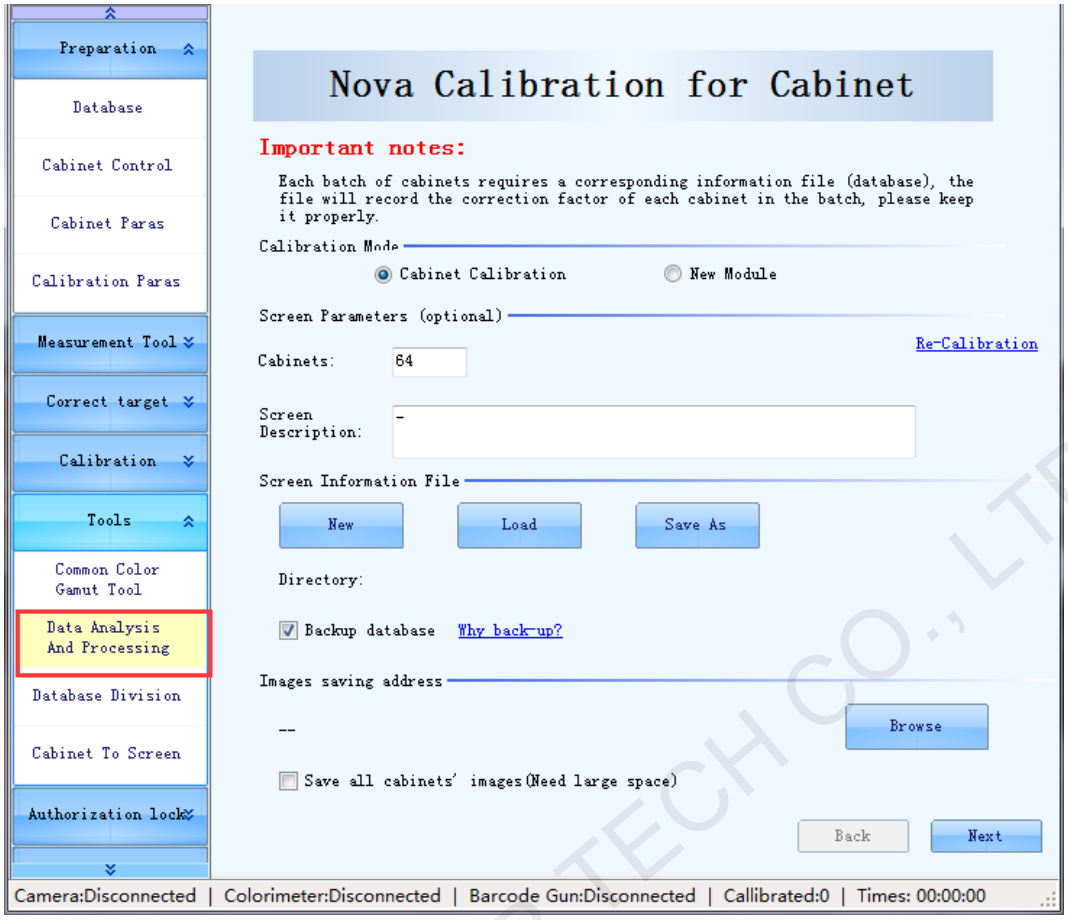

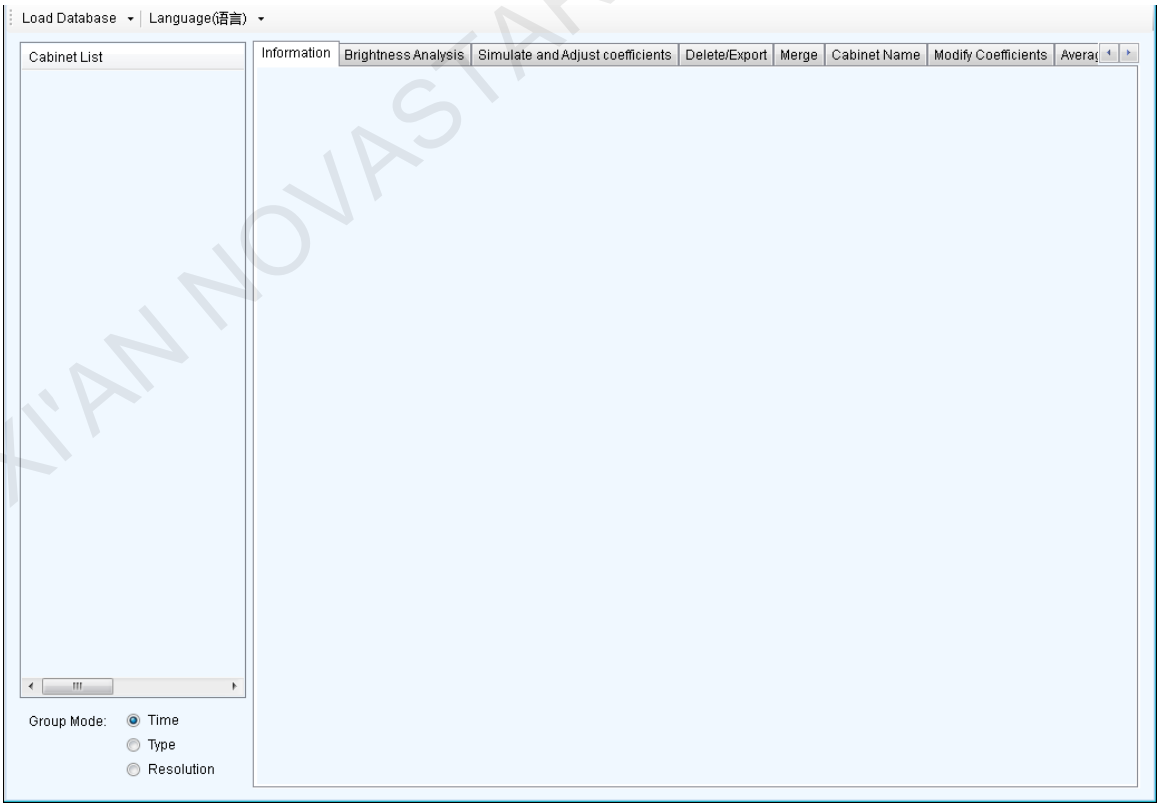

Fig. 4-40 Access to cabinet calibration management software

1) Loading cabinet database

Click "Load database" and click "**Add files**" to directly import calibration database or click "**Add folders**" to import the databases of already calibrated cabinets in the folder as shown in the figure below.

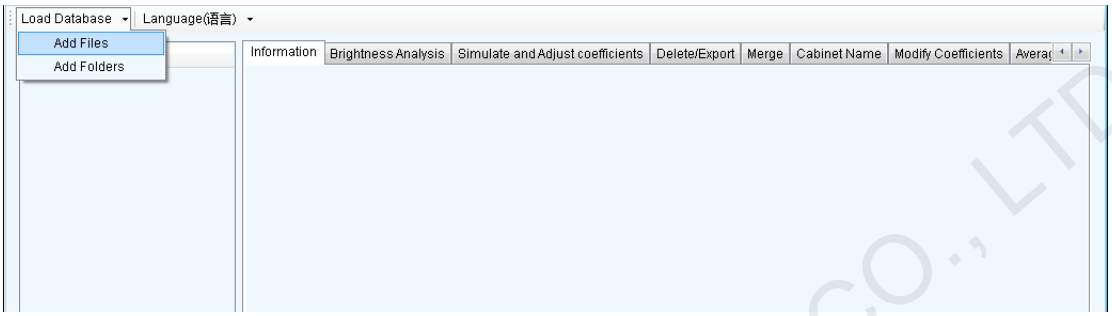

Fig. 4-41 Loading cabinet database

2) Select "**Order Splicing Simulation**" or "**Random Splicing Simulation**":

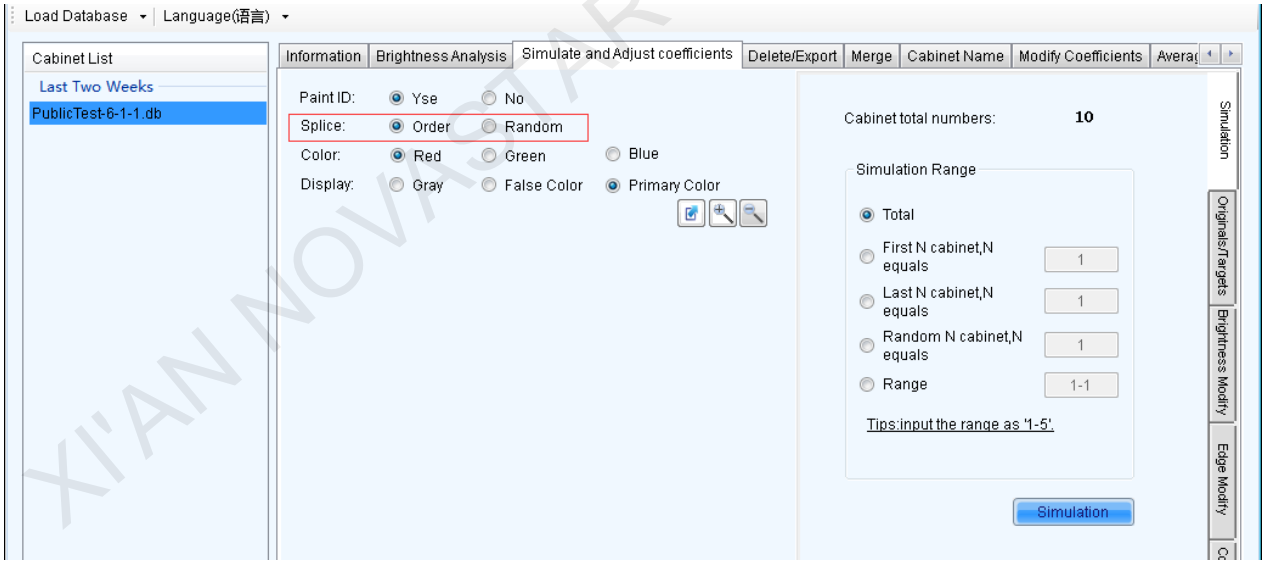

Fig. 4-42 Selecting simulation type

3) Switching "**Do Not Draw ID**" and "**Draw All the IDs**" to view whether the splicing among cabinets shown in the simulation diagram is normal.

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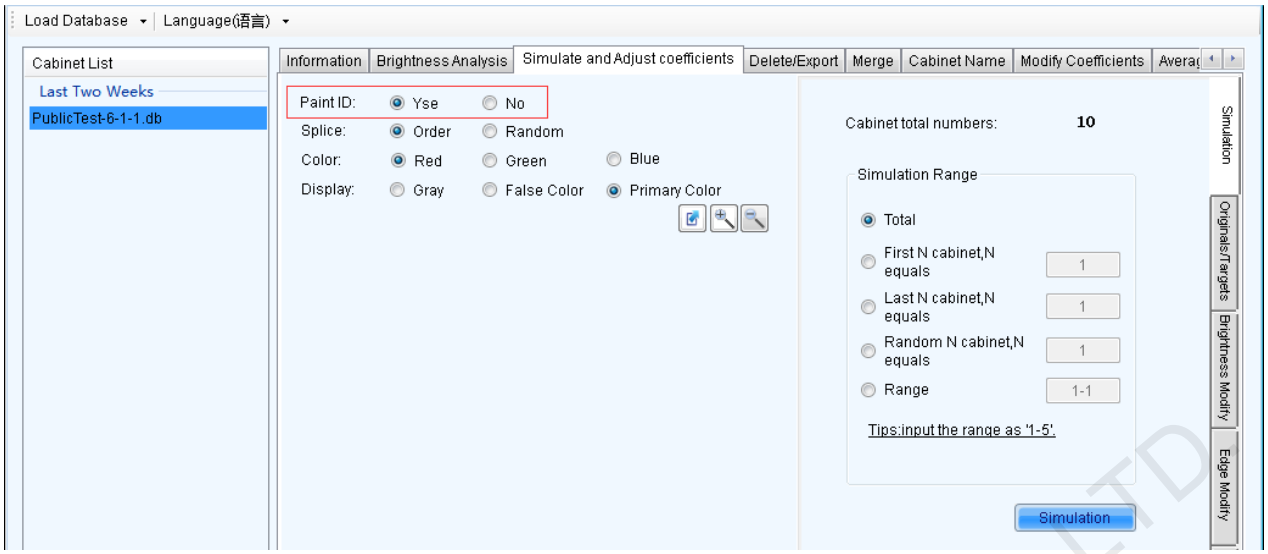


Fig. 4-43 Selecting whether simulation diagram to draw ID or not

4) Switch display mode. Primary color, graying and pseudo color are the three expressions of measuring brightness. Some brightness differences difficult to be identified on the primary color diagram are easy to be identified on grayscale, pseudo color diagram.

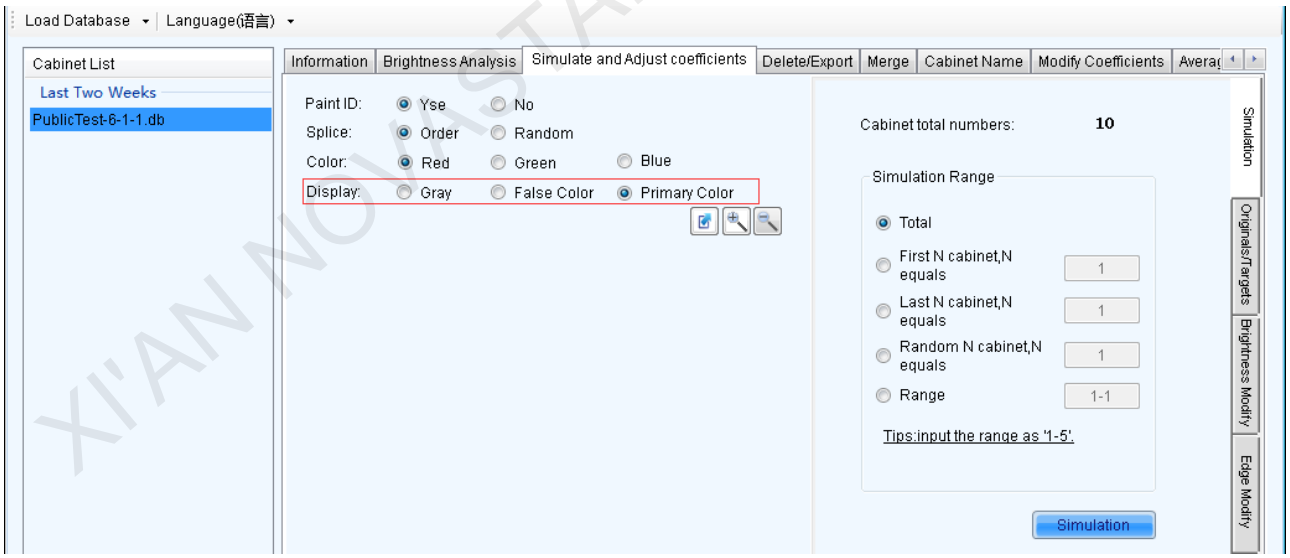
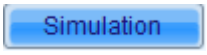


Fig. 4-44 Switch display mode

5) Select simulation range, and then click 

to generate the simulation diagram.

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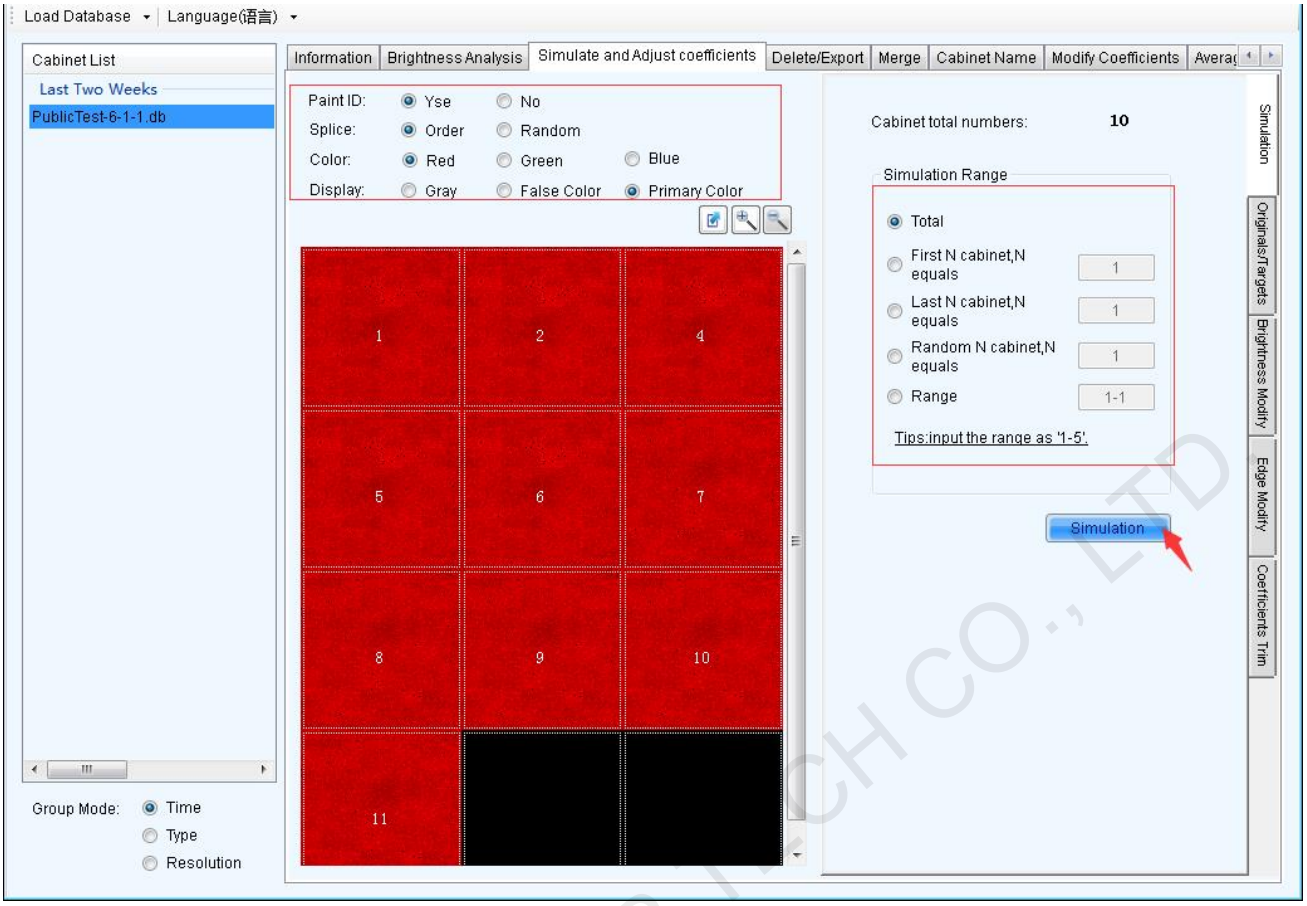

Fig. 4-45 Simulation diagram

4.5 Cases of the identification of simulation diagram

The simulation diagram of NovaCLB-CabSolver is generated by calculation based on the cabinet calibration coefficients. What the simulation diagram simulates is the splicing results of the cabinets before calibration. The simulation diagram can be considered as the diagram of cabinet brightness simulation before calibration. With the simulation diagram, calibration engineers can see the rough result of spliced cabinets on the site (before calibration). If there is anything wrong with the measured brightness data, the engineers can see the unreasonable situations, for example:

- There are obvious boundary lines or difference between cabinets, but actually there is none (See Case 5).

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Reasons: Modules on edges of cabinets or some lines of LEDs may have a problem.

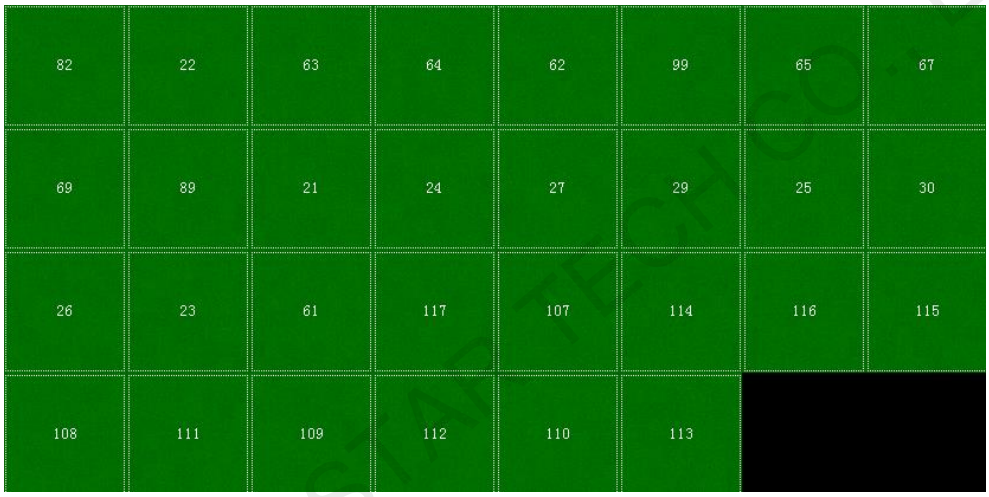
- Most cabinets have serious modularity inside or regular defects (See Case 3 & 4).

  Reasons: It is generally caused by the cabinet process. On-site calibration is recommended.

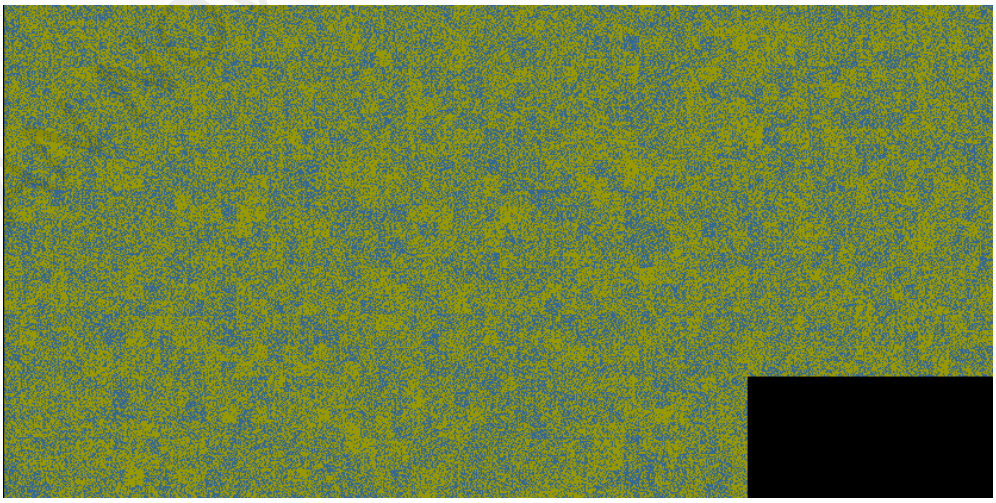
- On the simulation diagram, a few cabinets have significant differences from other cabinets (gray or false color image) (See Case 6).

  Reasons: Maybe the camera is not stable during image capturing. It is recommend that these abnormal cabinets be re-calibrated.

Case 1: good effect and normal cabinet



Case1 (a) Green in primary color mode



Case1 (b) Green in pseudo color mode

Fig. 4-46 Case 1

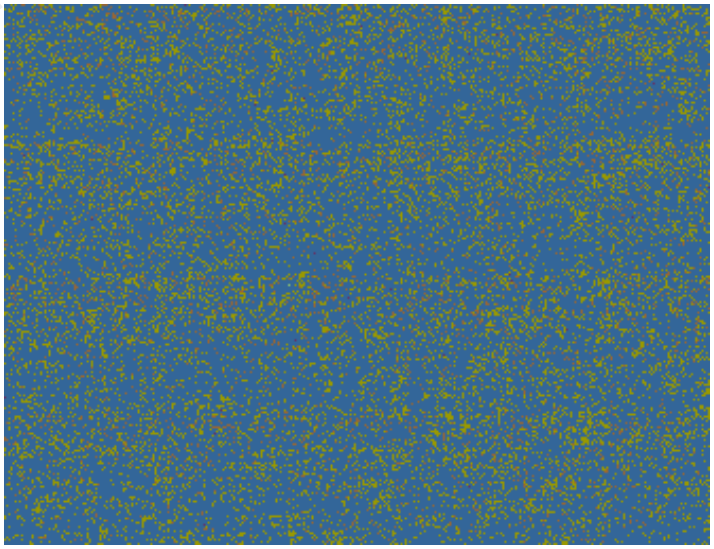
Analysis: The measured data of green before calibration is rather ideal in this case. There is no significant abnormal data, and it also reflects that this batch of display screens has no obvious process problems although they have a handful of modular and slight blurred screen phenomenon at the same time. In addition, obvious lines within cabinet can be seen in the case, which is caused by module joints within cabinet and normal.

Conclusion: Normal.

Case 2: Edge lines among cabinets

B21	B20	B23	B22	B24	D14	E03
E02	E05	E04	F02	F16	F14	E12
E13	B27	A15	B25	B26	B19	D03
A17	A18	A19	A20	D02	D01	C14

Case2 (a) Green in primary color mode



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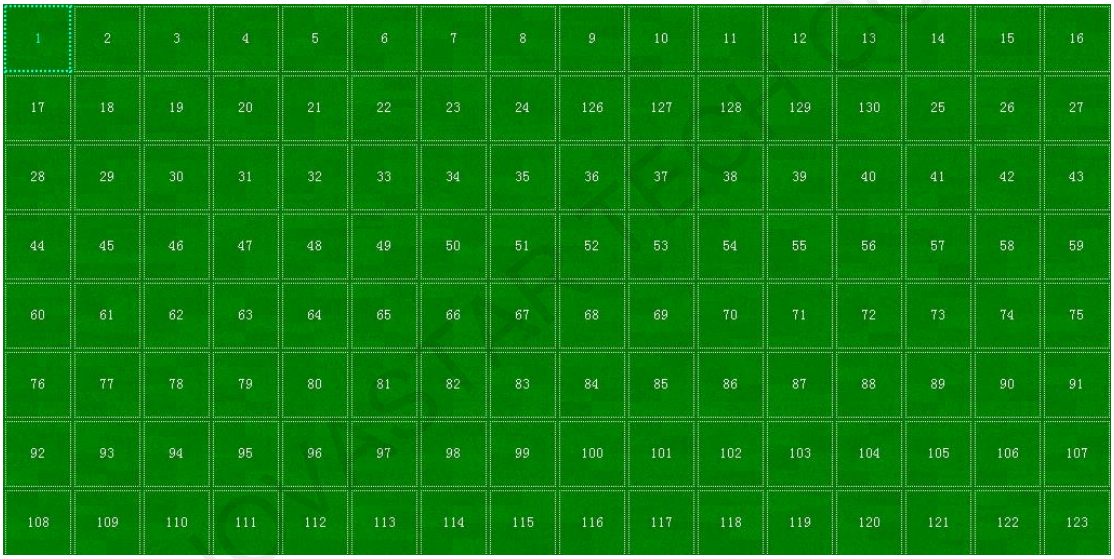
Case2 (b) Green in pseudo color mode

Fig. 4-47 Case 2

Analysis: Obvious seam lines can be seen among the green cabinets in the case and show as horizontal lines. It is extremely unreasonable. Generally there should be no such condition before cabinet calibration. Therefore, there is something wrong with the pictures shot by camera.

Conclusion: It is suggested to decrease saturation and recalibrate.

Case 3: Serious effect of module



Case3 (a) Green in primary color mode

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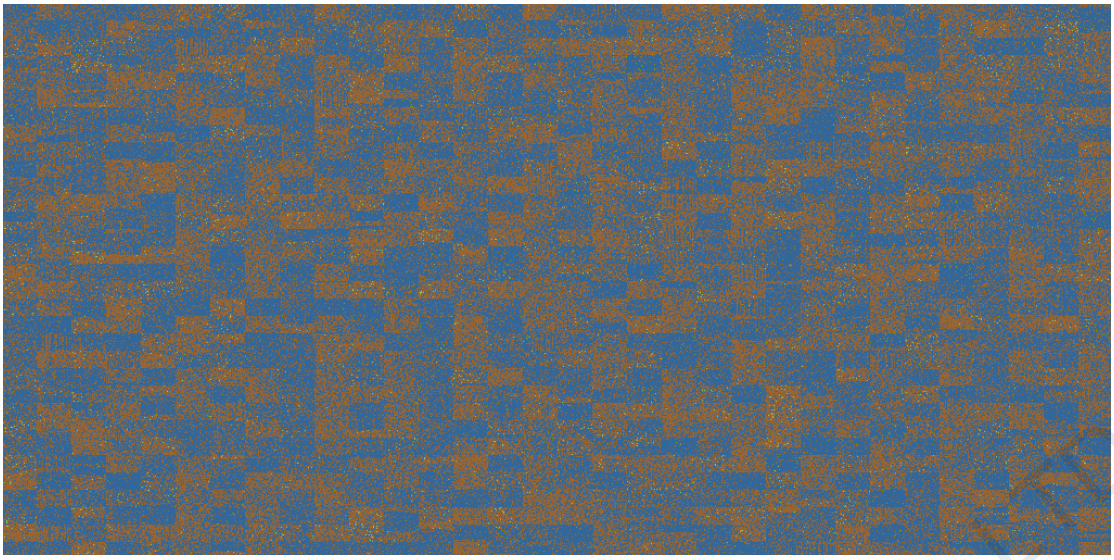


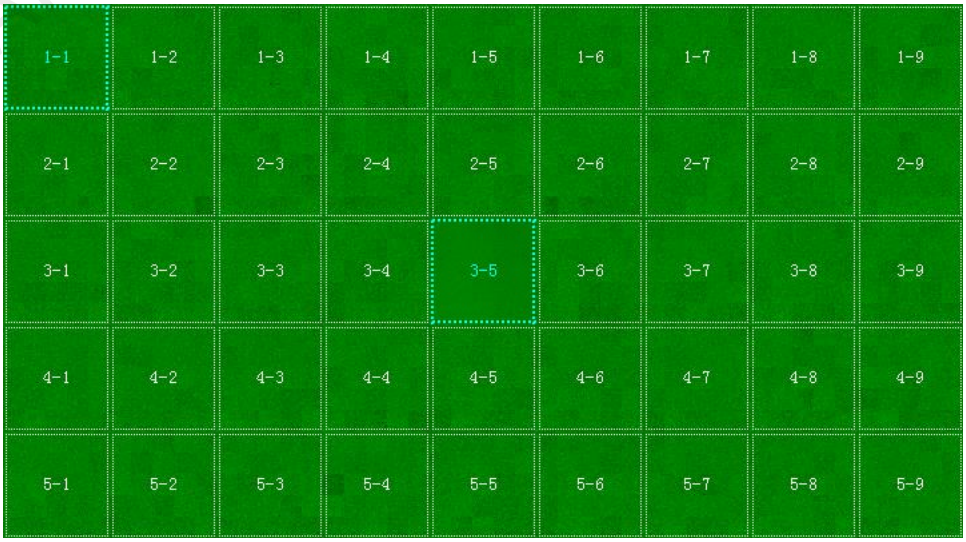
Case 3 (b) Green in pseudo color mode

Fig. 4-48 Case 3

Analysis: Green module effect in this case is very sever. In this situation, though the cabinet calibration can greatly improve the uniformity of cabinets, it is difficult to avoid a small brightness difference among the cabinets after splicing on the site since the brightness varies obviously.

Conclusion: It is suggested to calibrate on site to ensure to achieve the optimal effect. Cabinet calibration is able to improve a lot but unable to solve the problem completely.

Case: 4：There are several cabinets with quite optimal uniformity



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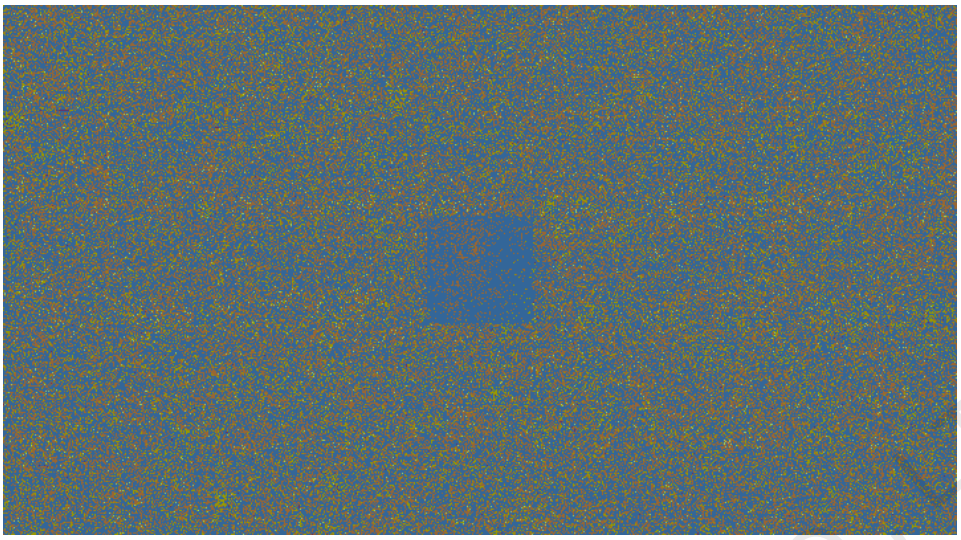
Case4 (a) Green in primary color mode



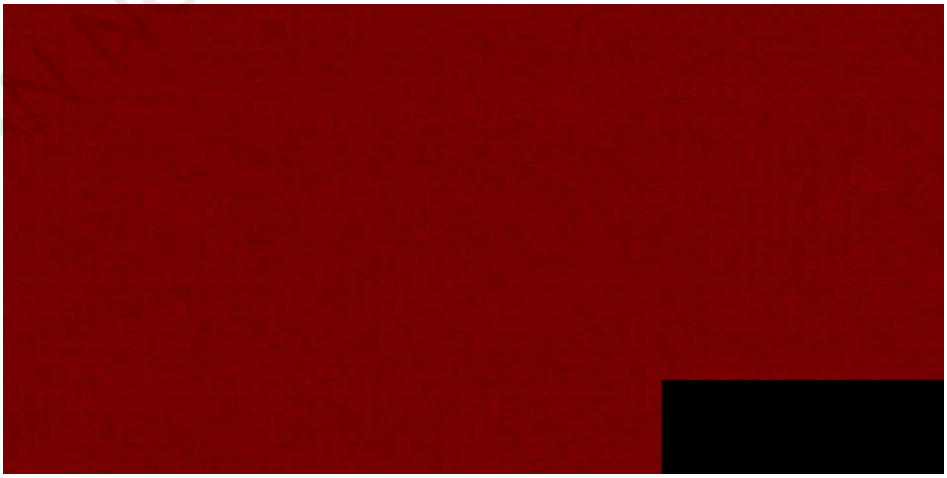
Case4 (b) Green in pseudo color mode

Fig. 4-49 Case 4

Analysis: The measured data of green is quite normal before calibration in this case. But the uniformity of cabinet3-5 is much better than other cabinets, which is quite abnormal.

Conclusion: Cabinet3-5 need recalibration.

Case5: Abnormal dark lines on cabinet edges



Case5 (a) Red in primary color mode

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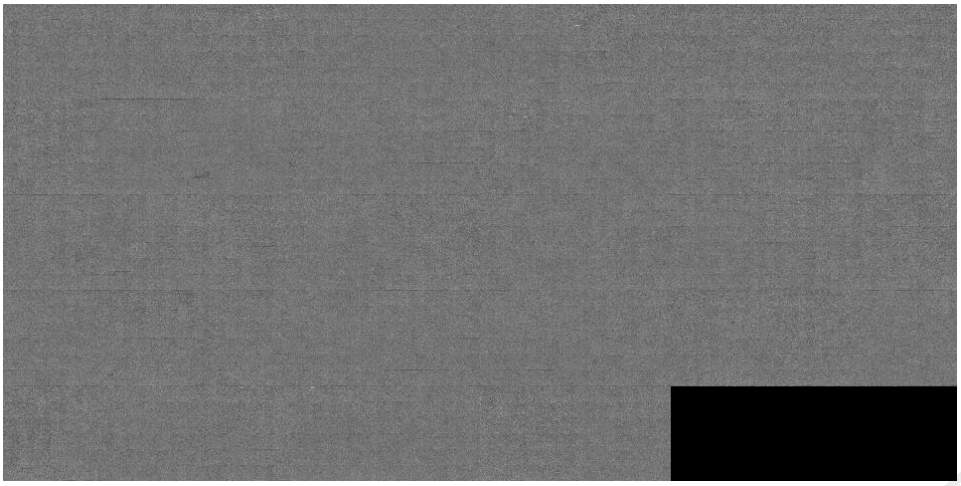

Case5 (b) Red in graying mode

Fig. 4-50 Case 5

Analysis: The simulation diagram in the case show that obvious dark lines can be found among cabinets before calibration of red. View the photos and find that the last line of red lights of the cabinet is darker. View the cabinet and find that the last line of red lights of the cabinet are tilted.

Conclusion: It is suggested to calibrate the lights in the last row after making them in the right location. Although the cabinet calibration can improve this situation in the calibration direction, it will still have dark line problem when viewing it in another direction after calibration.

5 Calibration of Newly-installed Modules

Calibrate the newly-installed modules which have replaced old or broken modules in order to keep uniform visually with the surrounding modules.

5.1 Preparations

5.1.1 Configuration of information database

The calibration information base is different from the calibration coefficient database. Information base not only records the calibration coefficients of all the cabinets of the display screen, but also

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manages all the parameters related to calibration. In this way, the users can record all the calibration information of each display screen, and the brightness and chromaticity standards, time of calibration, uniformity and dead point information of each cabinet before and after the calibration, etc.

Meanwhile, the software automatically control the database size in the information base. When the calibration coefficient of the cabinet exceeds 1.8 G, the software will automatically compress the data or create a new database and the user only needs to save the operation after cabinet calibration is completed.

It is suggested that clients manage the calibration information base by taking the display screen as a unit. Therefore, firstly create an information base for this display screen while calibrating.

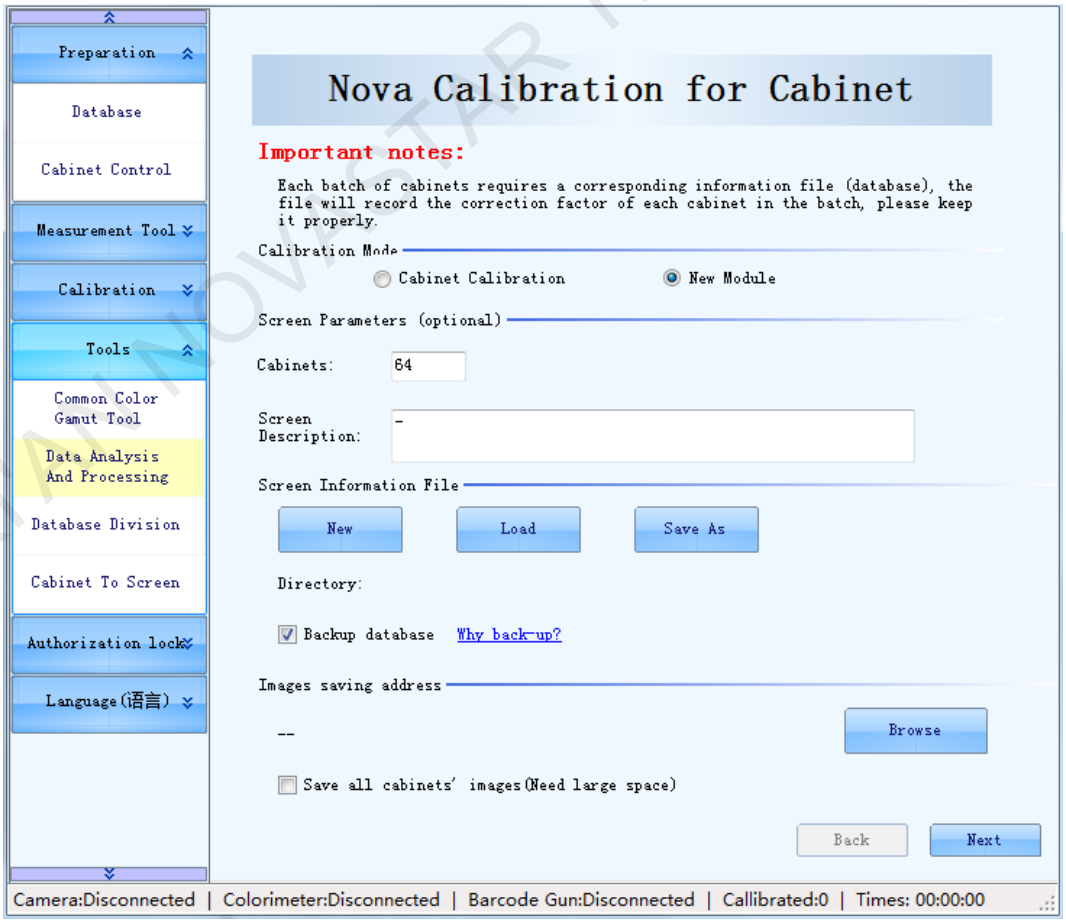

Fig. 5-1 Main interface of calibration software

1) **Screen parameters:** Parameter information herein is specific to big screen of the current cabinet and can be adjusted. As users manage the calibration information base taking a display screen as the unit, objectively recording the full screen parameters will help future management of information base.

2) **Screen information file:** A corresponding information file (calibration project) need to be created for each display screen, which will record the information of the display screen, the calibration coefficients of each cabinet, and the relevant calibration parameters.

- **New :** Create new project files of cabinet calibration and the database is the database of the module;
- **Load:** Load project files of the cabinet in which the module locates. Database in this file includes the database of the cabinet in which the module locate;
- **Save as**: Modify name and path of the project files.

3) **Backup database:** The software defaults to check this option. Enabling backup data can effectively prevent database file being damaged due to abnormal close of software or sudden blackout of computer.

4) **Image saving address:** Select a location to save cabinet images during calibration. If "Save all cabinets' images" is checked, all cabinet images will be saved. Otherwise, only images of the current calibrated cabinet are saved.

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5.1.2 Cabinet control

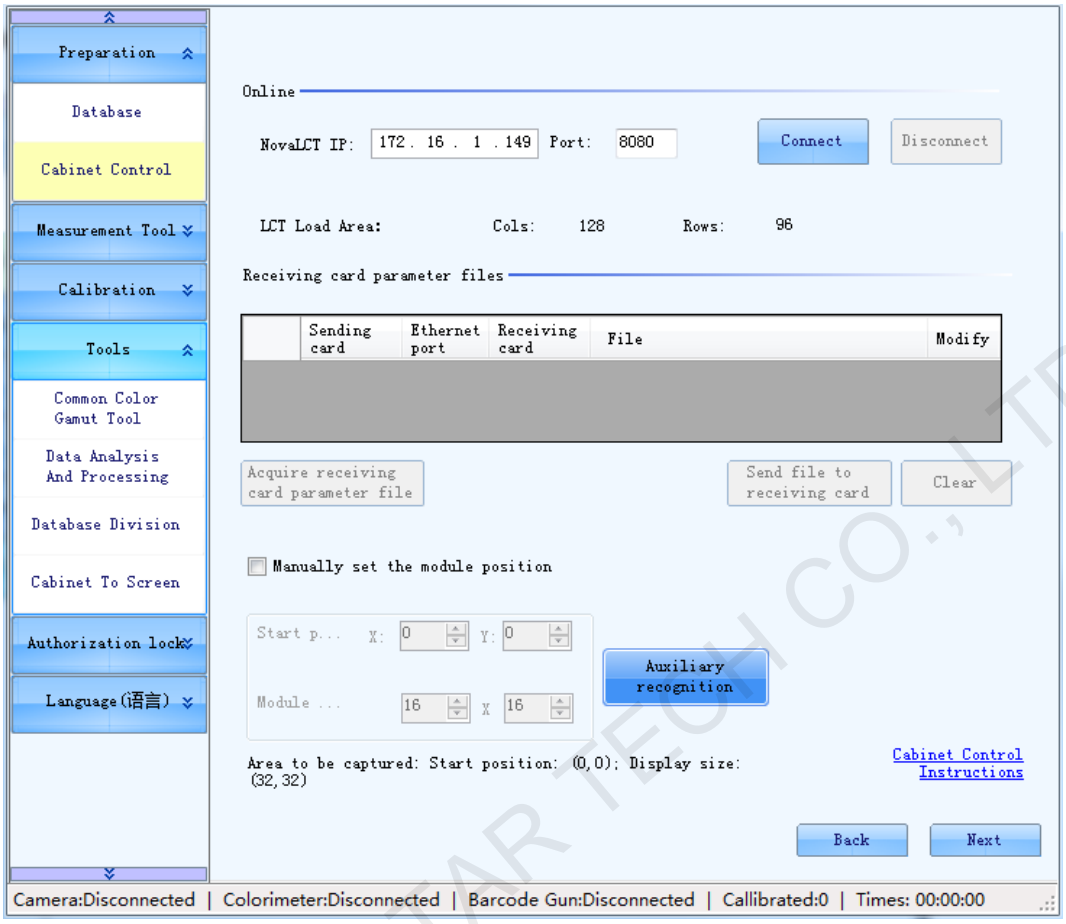
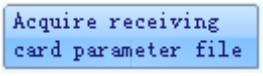


Fig. 5-2 Cabinet configuration

1) **Online:** Input IP of the computer operated in LCT client and port number and click "connect". After the interface prompt the connection is successful, start online calibration. At this time, control system automatically enters into calibration mode. We can see Gamma value of the LED screen is set as 1.

2) **Acquire receiving card parameter file:** Click 

to acquire receiving card parameter file of current batch. Single receiving card parameter could be modified. Set a name easy to recognize for the file. Select the file in the dropdown list and then send it to receiving card.

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In general, click "Save configuration file" button during calibration process to save the configuration file to local of calibration software side after LCT configure the first cabinet of this batch successfully. After one cabinet is calibrated, switch to next one. Select send configuration file directly to turn on the cabinet. It ensures that the subsequent cabinets can use the same receiving card parameters of the first cabinet.

3) Module location

It is necessary to locate the new module so as to calibrate new module precisely.

a) Manual setting

If the operator know about the location of the coordinates of new module, use manual setting to set. Set coordinates and module size quickly and click "Next" to connect camera.

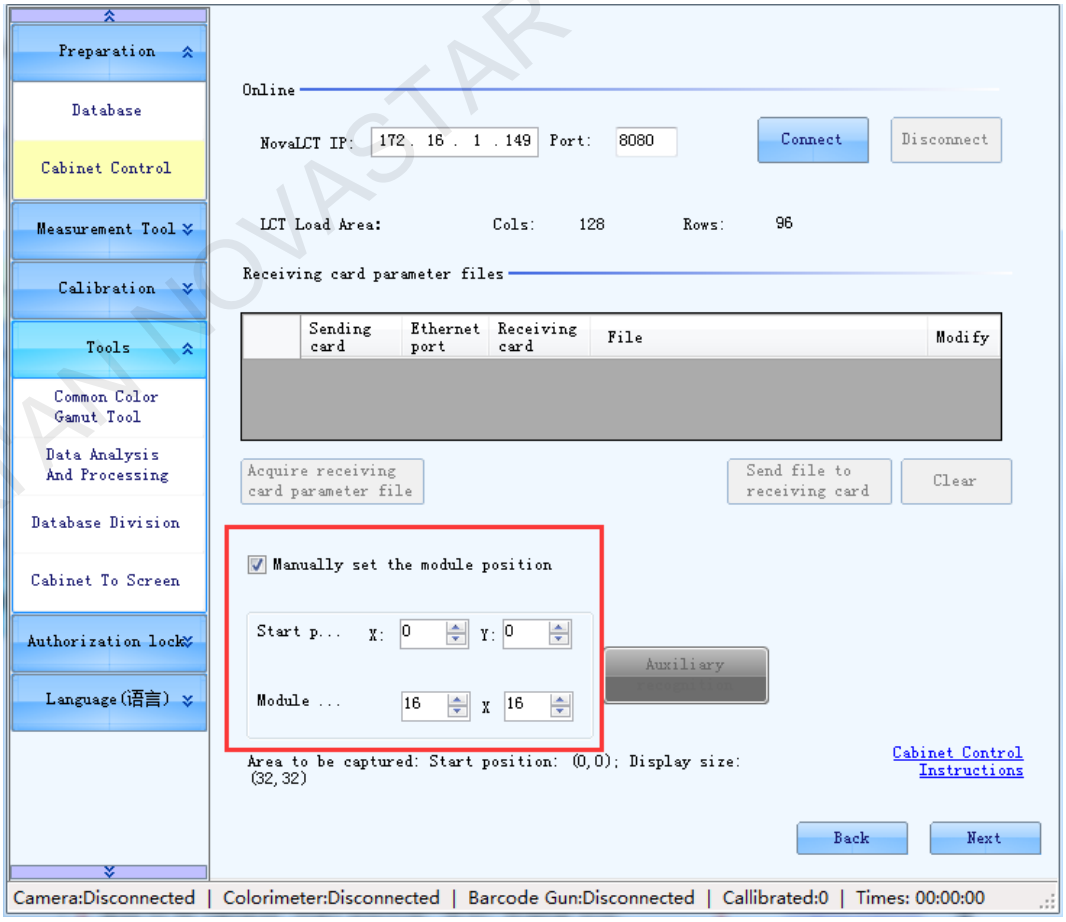

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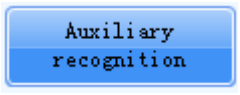
Fig. 5-3 Manually set the location of new module

b) Auxiliary identification

If unable to locate the location of module, click 

and the following steps shown as the figure below.

NovaPro doesn’ t support auxiliary identification.

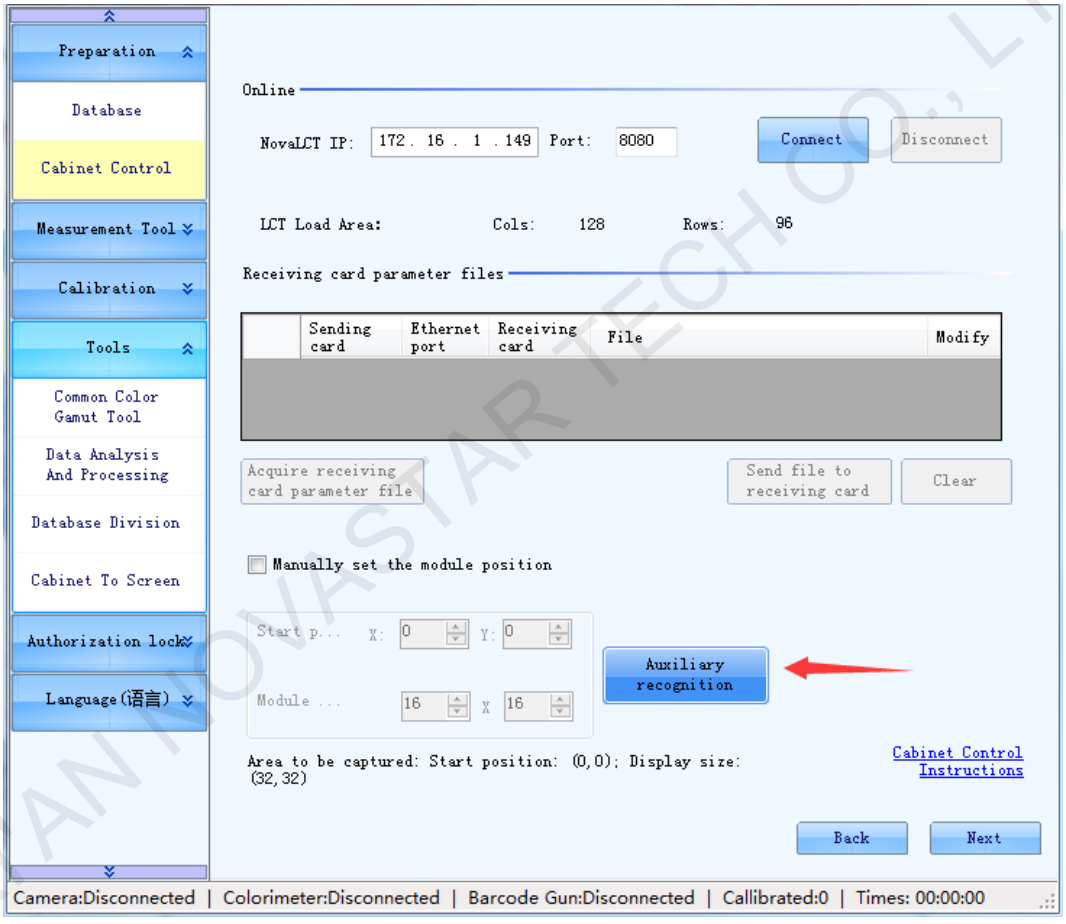


Fig. 5-4 Auxiliary identification

a) Set module size and click “Next”. The screen is divided into many partitions with number. (Software defaults to divide according to 4x4).

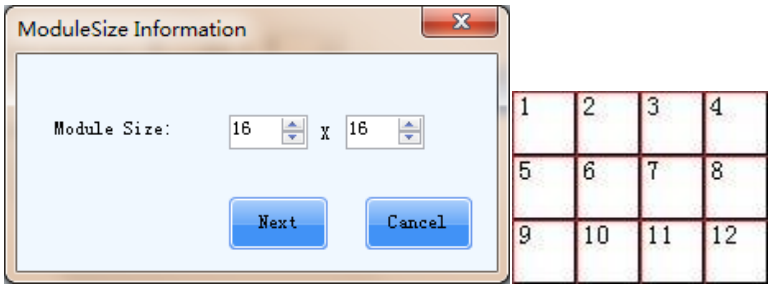


Fig. 5-5 Module size

b) Confirm the number of new module and click "OK".

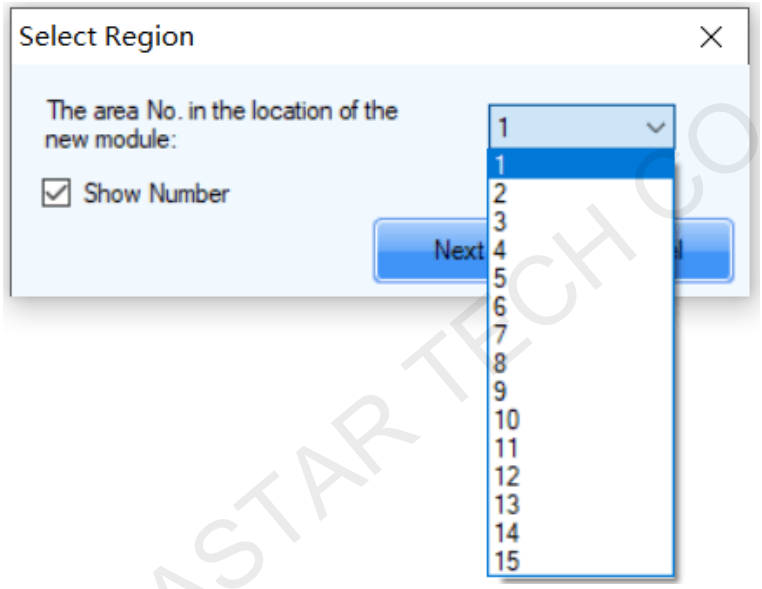


Fig. 5-6 Confirming new module number

5.2 Camera

Adjust the saturation of camera to "Normal" and imaging size to "Appropriate".

Automatic adjustment and manual adjustment could be selected during the process.

Please refer to 10.4 Operating skills of camera.

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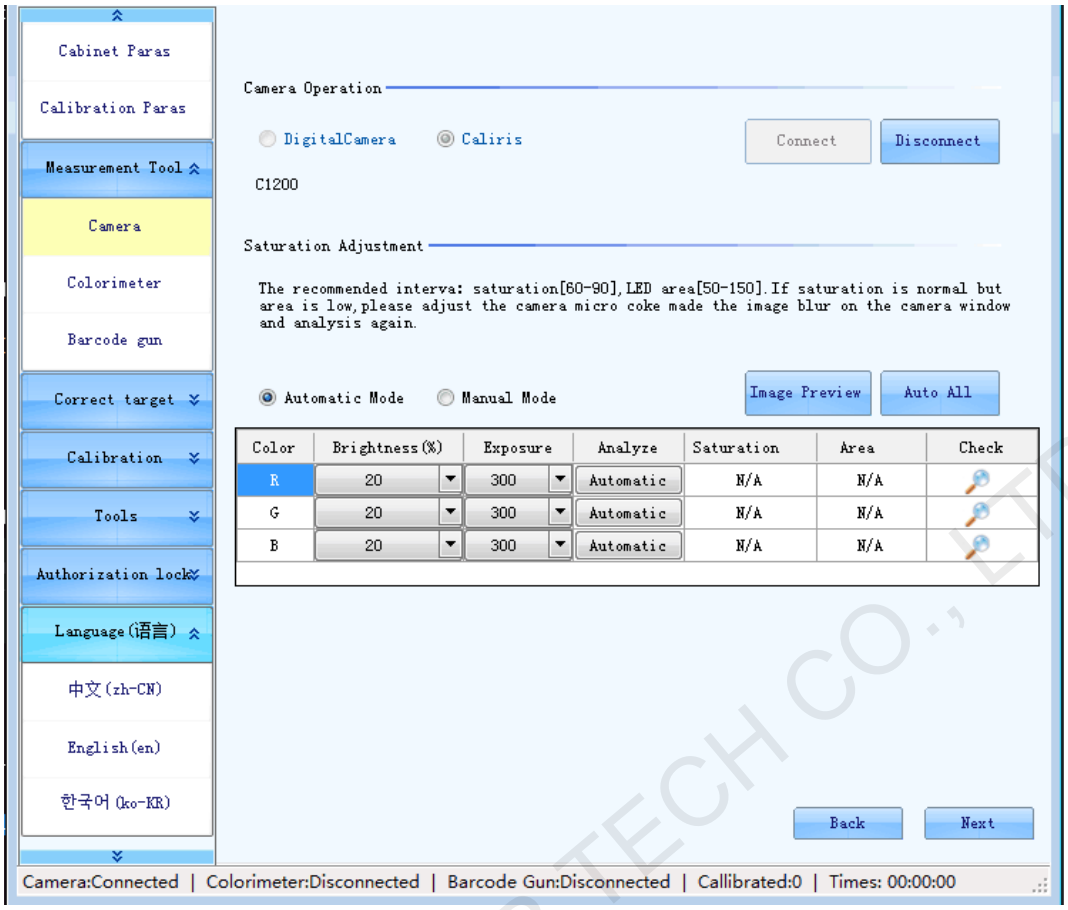

Fig. 5-7 Camera configuration

5.3 Module calibration

Calibration modes include **Manual** and **Automatic.** Automatic calibration allows customization. Please refer to 4.1.4 Calibration for calibration mode and operating skills.

Note: **Save to database** has two cases:

1) Module database is created in 5.1.1 Configuration of information database. So the database saved here is the database of latest calibrated module.

2) 5.1.1 Configuration of information database has loaded the database of the cabinet in which the module locates. So input the ID of the cabinet in which the module locates during input of cabinet ID. Saved database is the cabinet database including the calibration coefficient of

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newly calibrated module.

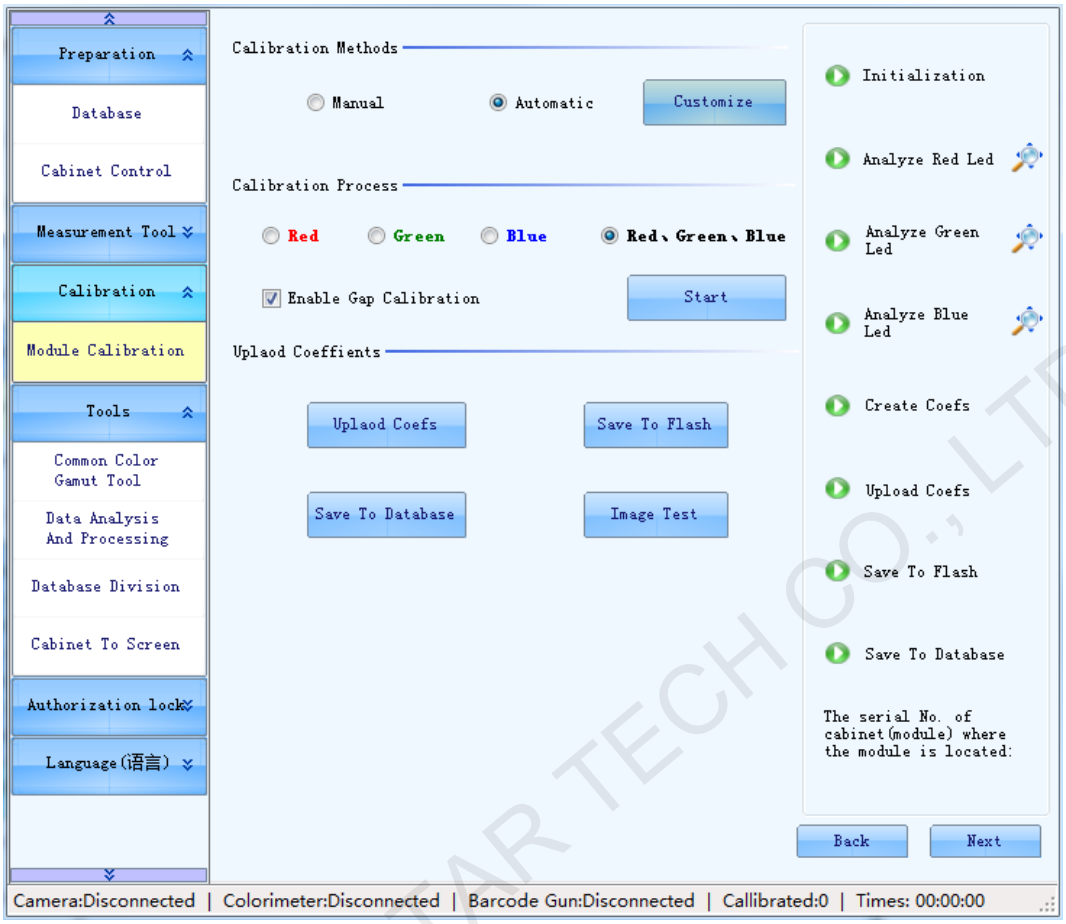

Fig. 5-8 Module calibration

6 Uploading Coefficients (factory use)

The function is designed for cabinet calibration. After the calibration of all cabinets is completed, connect cabinet to full screen according to ID of receiving card via NovaLCT (above V4.4.1) and upload it to hardware. Operating steps are shown in the figure below:

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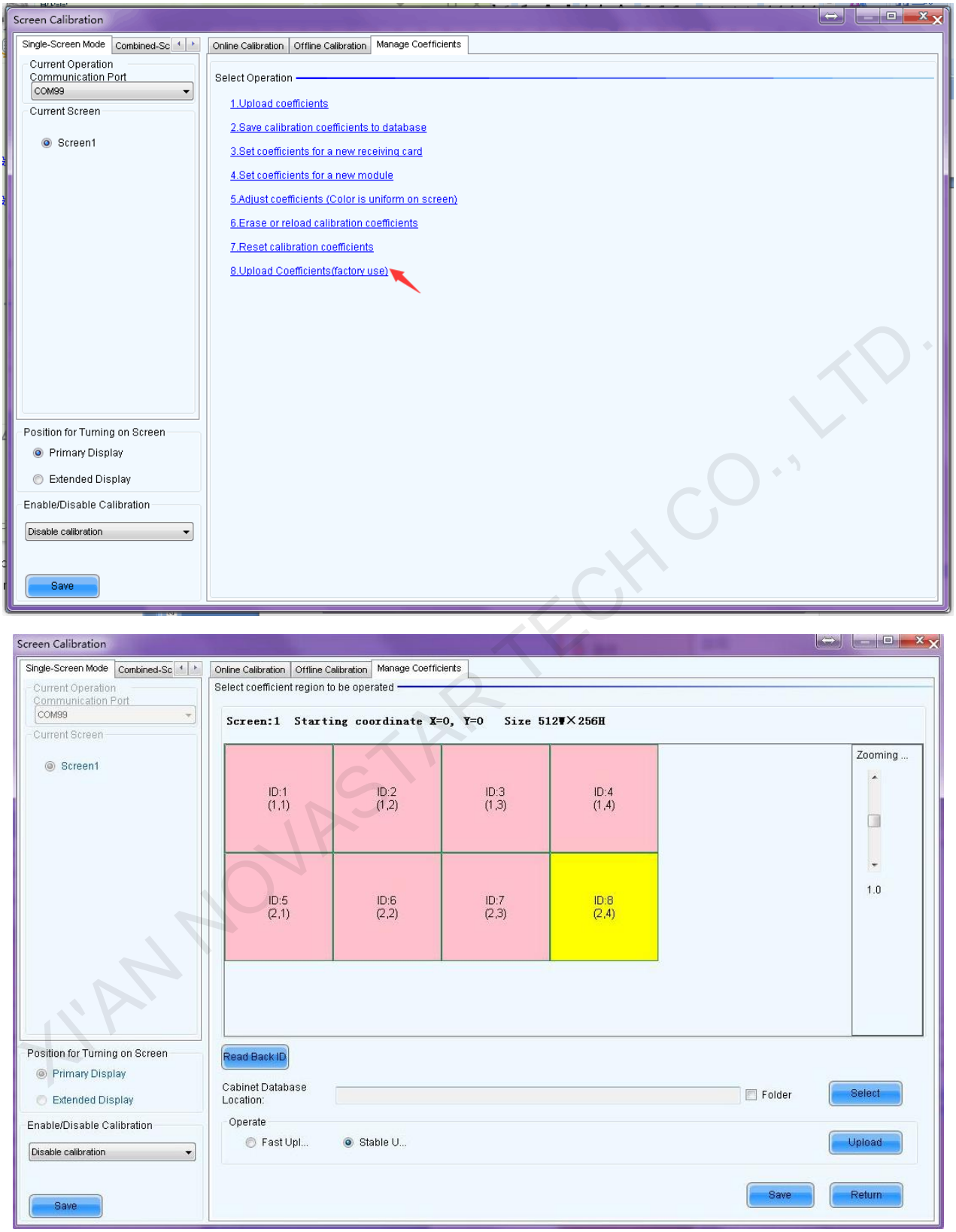
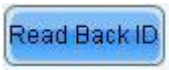


Fig. 6-1 Uploading coefficients (factory use)

Then click  to read ID of receiving card. The ID may be empty because lower version

of NovaLCT haven’ t number the receiving card. Try to double click the cabinet on topological graph. ID information including starting coordinates, partition size and ID of receiving card can be modified on the following interface.

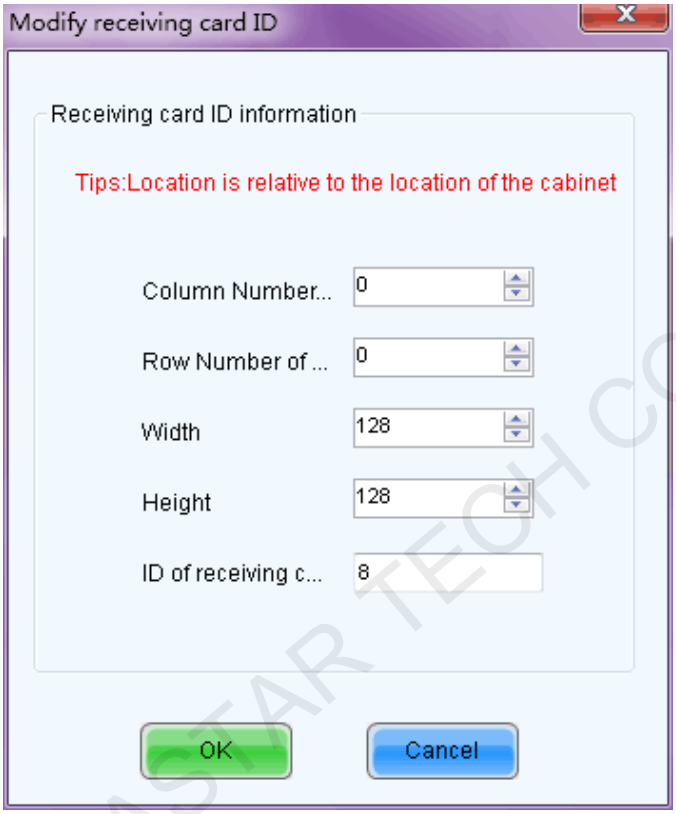


Fig. 6-2 ID information of receiving card

Click Select to load cabinet database. If multiple databases are saved by taking cabinet as a unit, check “Folder” to import all cabinet at one time.

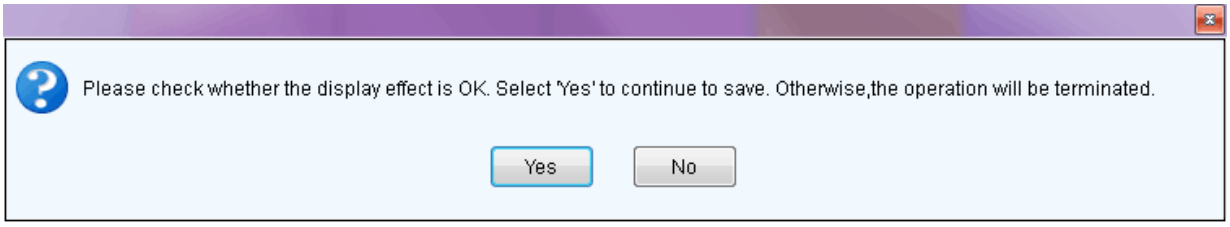
Click Upload to upload all the cabinet databases.

- **Quick upload**: calibration coefficients will be uploaded to hardware in a short period of time.
- **Stable upload**: The upload speed is slower than quick upload. But it is more stable during uploading data.

Click Save. The window below will pop u. Check whether the effect of current display is

normal.

Click Yes and the current coefficients will be saved to receiving card.



7 Cabinet Database Division

The function of Database Dividing Software is to divide cabinet database into cabinet database of single board or module database according to specific resolution. (Module database format is same to cabinet database and only the resolution is different).

7.1 Operating procedure

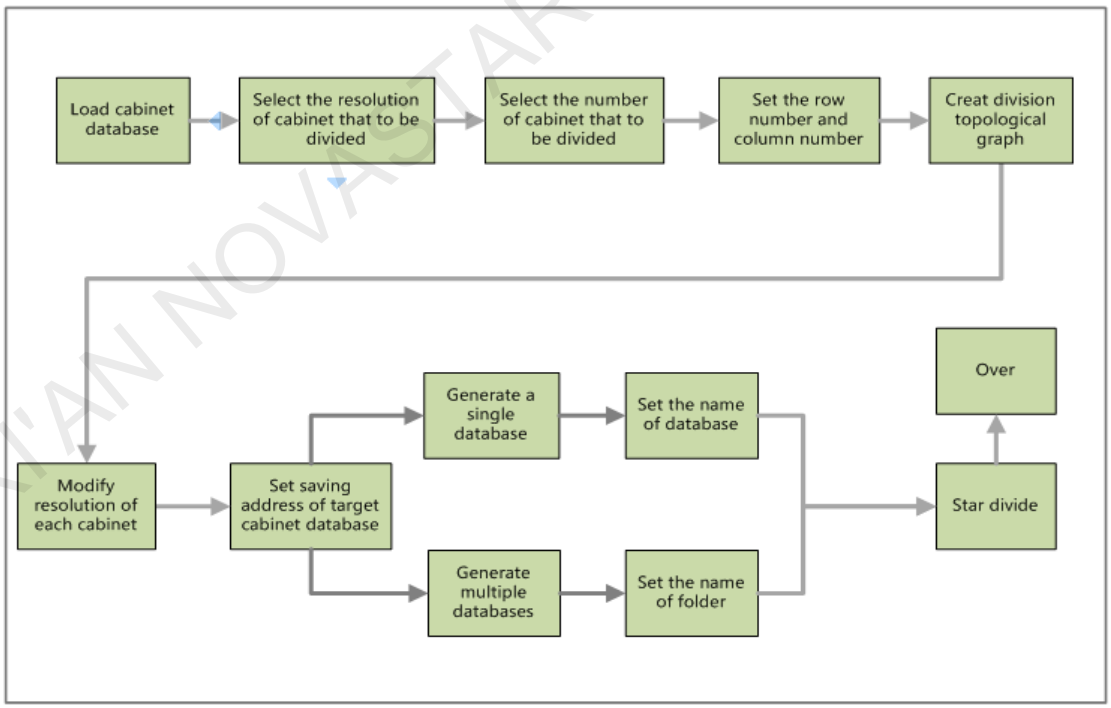


Fig. 7-1 Operating procedure of cabinet database division

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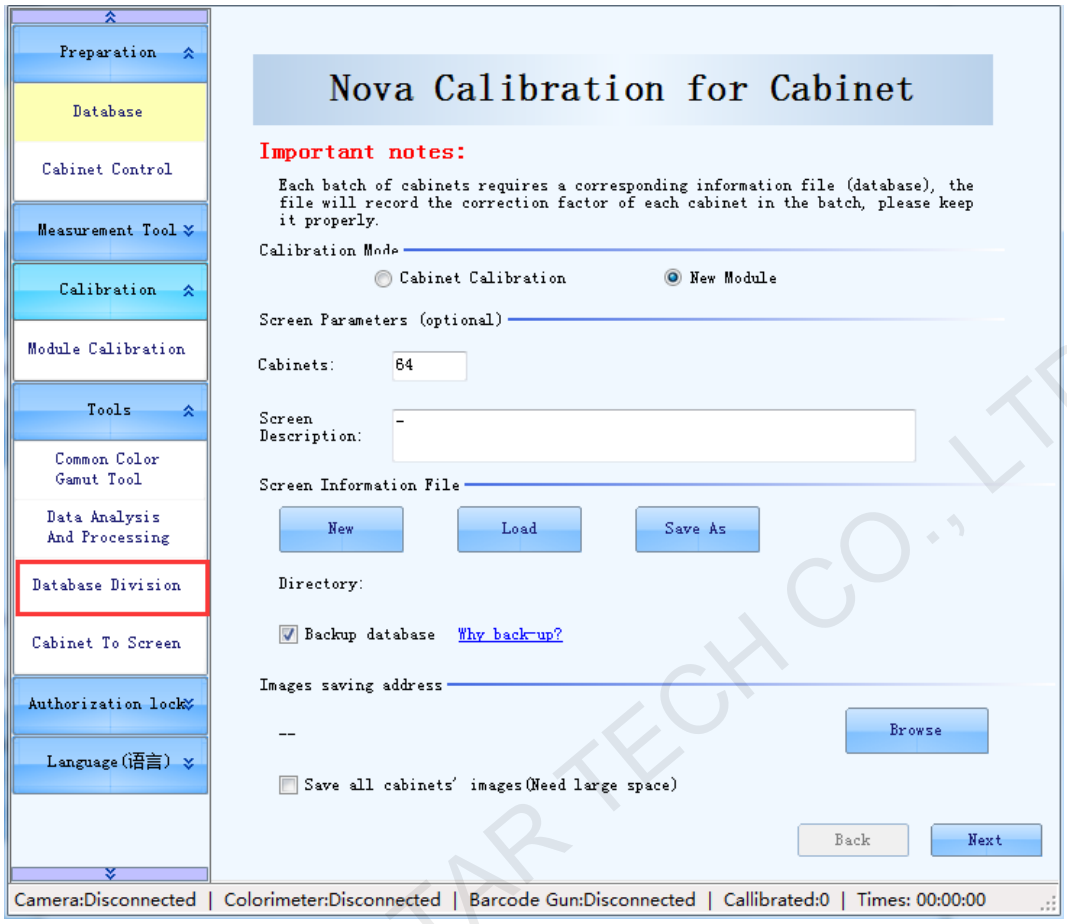
7.2 Procedure demonstration



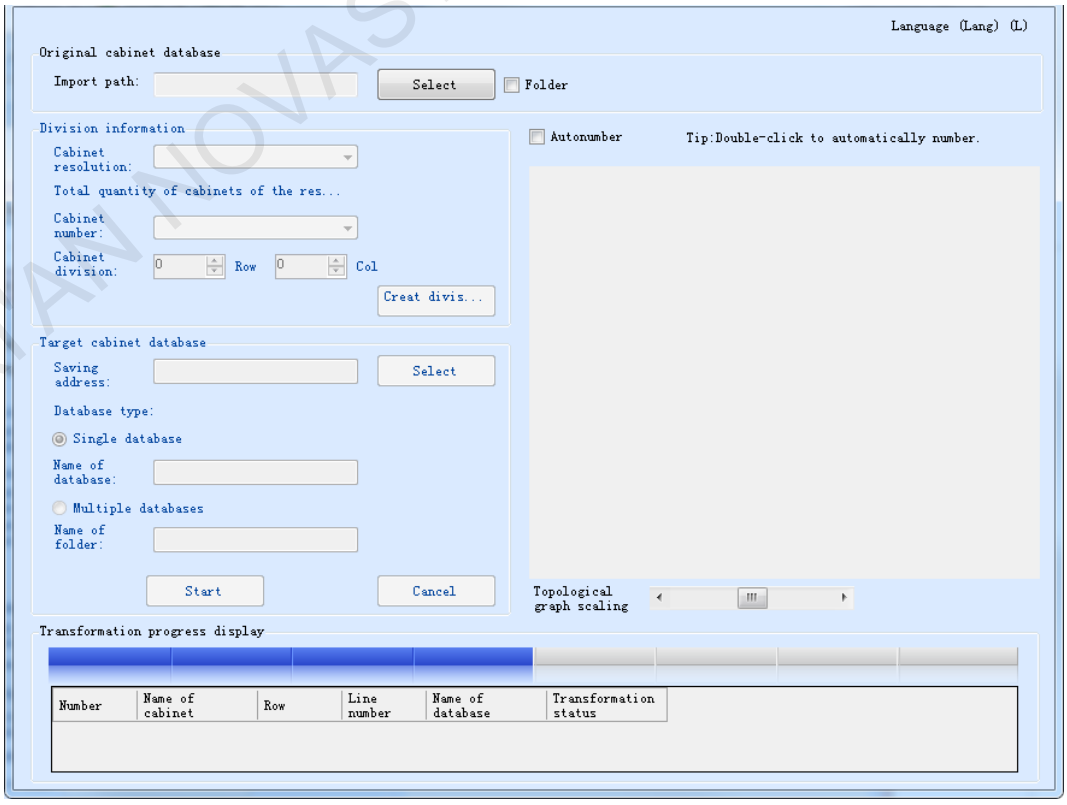


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Fig. 7-2 Open cabinet database division

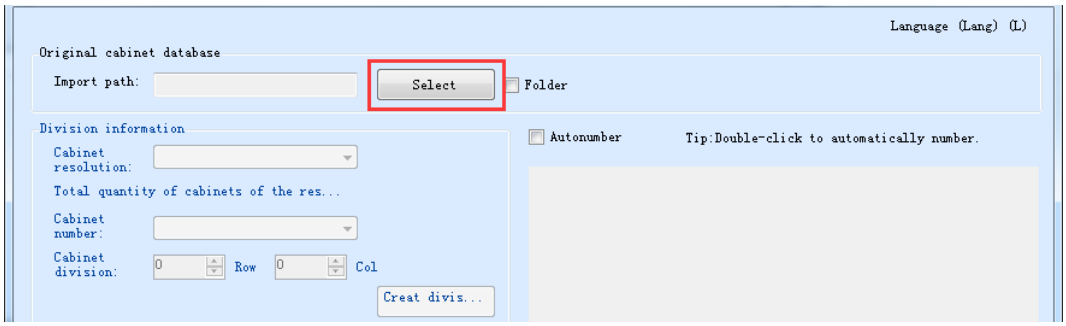

Fig. 7-3 Loading original cabinet database

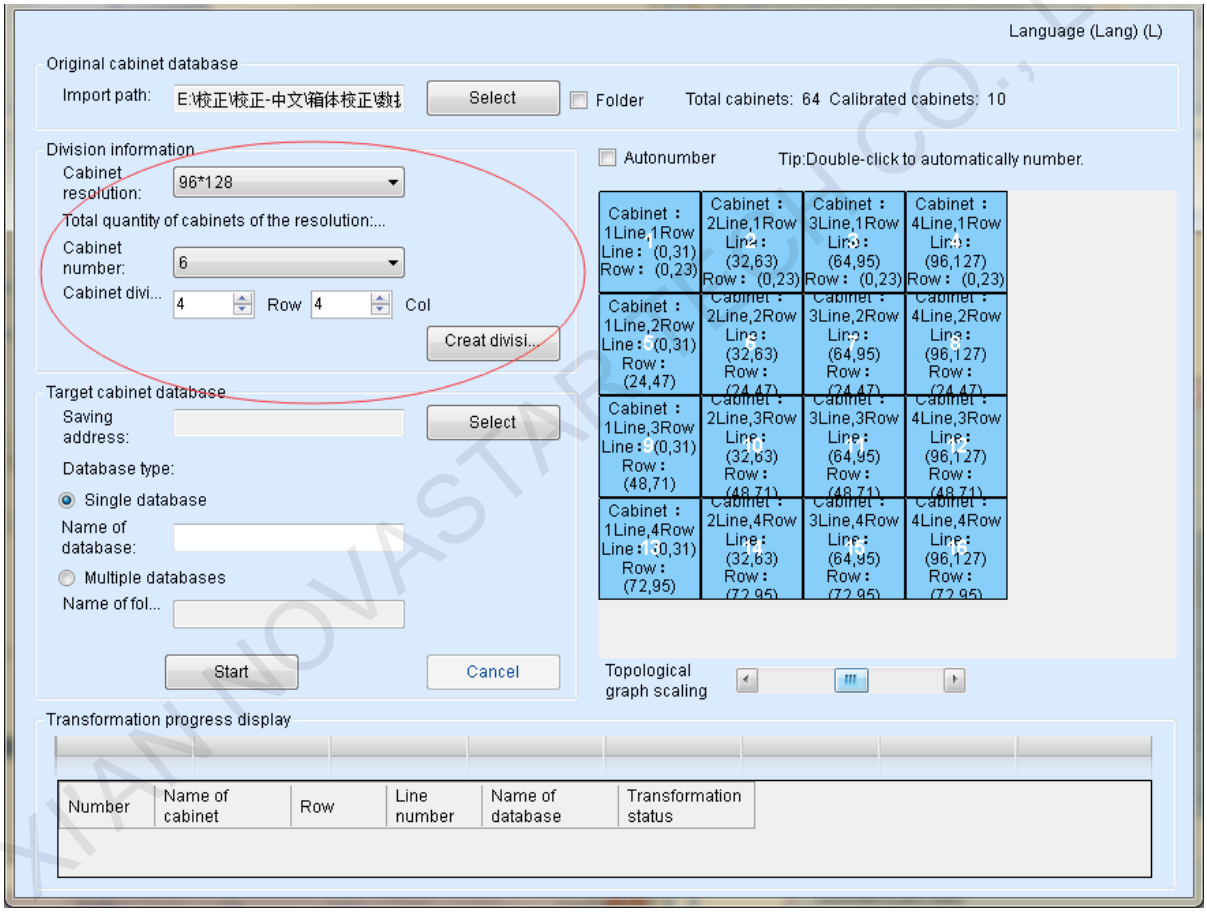

Fig. 7-4 Inputting division information

Cabinet resolution: Screen cabinets to convert by solution. As shown in the preceding figure, select the cabinets with resolution 96*96 (96 rows * 96 columns).

Select cabinet number: Select cabinet No. to be converted.

Generate divided cabinet topology: Divide a cabinet into multiple equal parts based on the cabinet No.

Modify resolution or No.: Select a cabinet from the topology and right-click to change its resolution or No.

Automatic numbering: Select this option and double-click a cabinet to automatically number it.

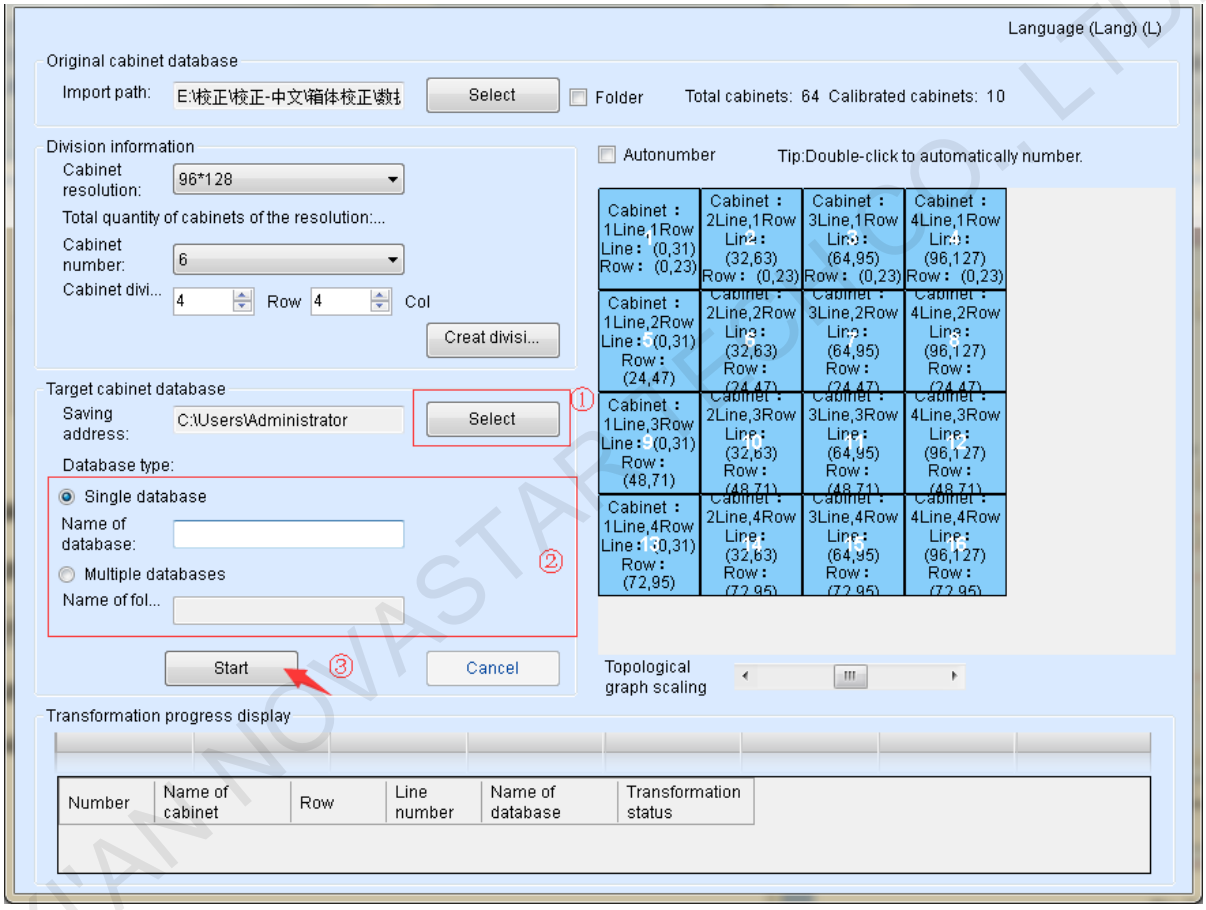

Fig. 7-5 Setting conversion information

Select: Select a location to save converted database.

Single database: Divide generated data based on No. and save it into a database.

Database name: Set the name of the database generated after division.

Multiple databases: Divide generated data based on No. and save it into different databases.

These databases are saved in a folder.

Folder name: Set folder name and save cabinet databases.

Start to convert: Start to divide database.

Operation information list: Display conversion state in real time.

8 Cabinet to Screen

When uploading cabinet database, upload one cabinet each time. For a screen that is composed of many cabinets, it takes a lot of time to upload databases of all cabinets. Now, use the cabinet-to-screen tool NovaCLB-CabinetToScreen to change cabinet database into a screen database, and database uploading can be completed once.

The specific operation is as follows:

1) Import cabinet database

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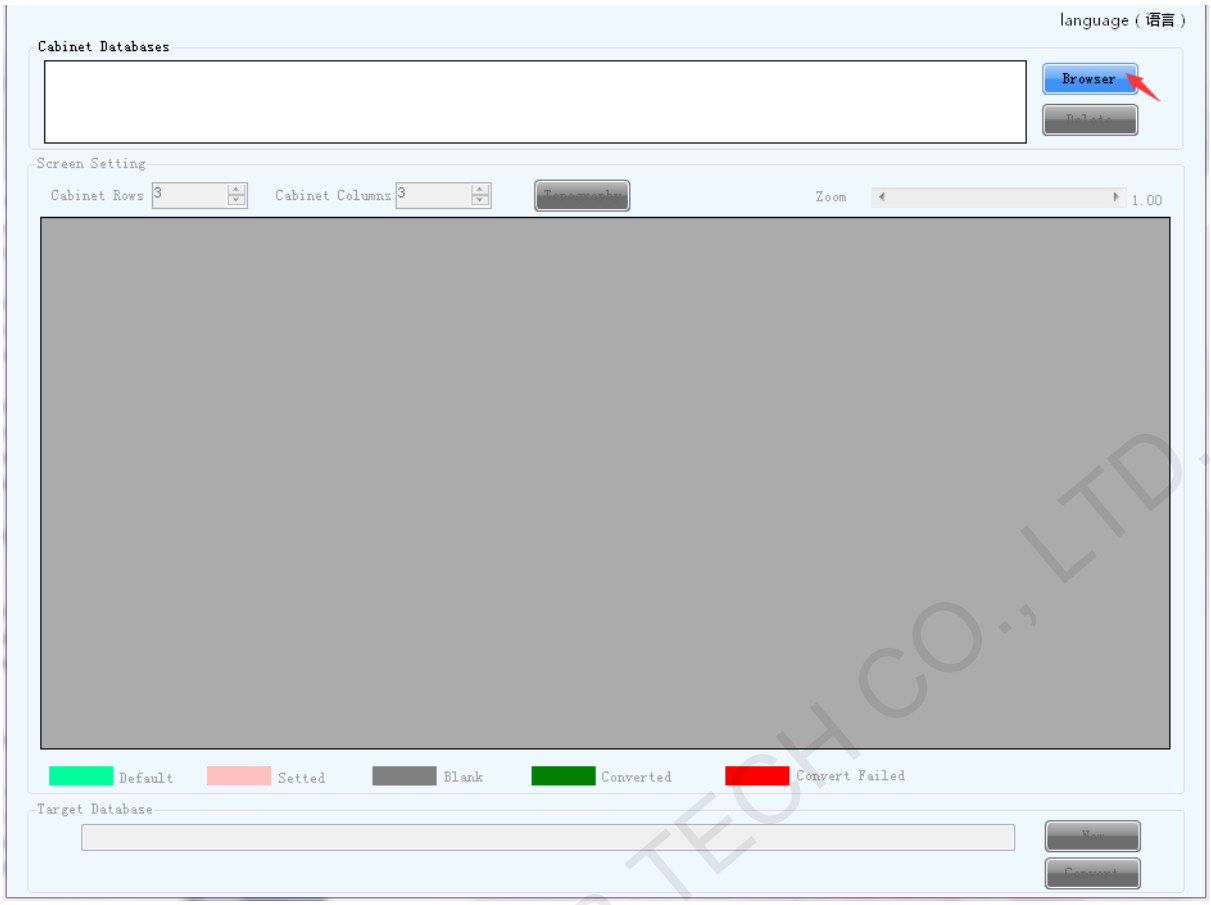

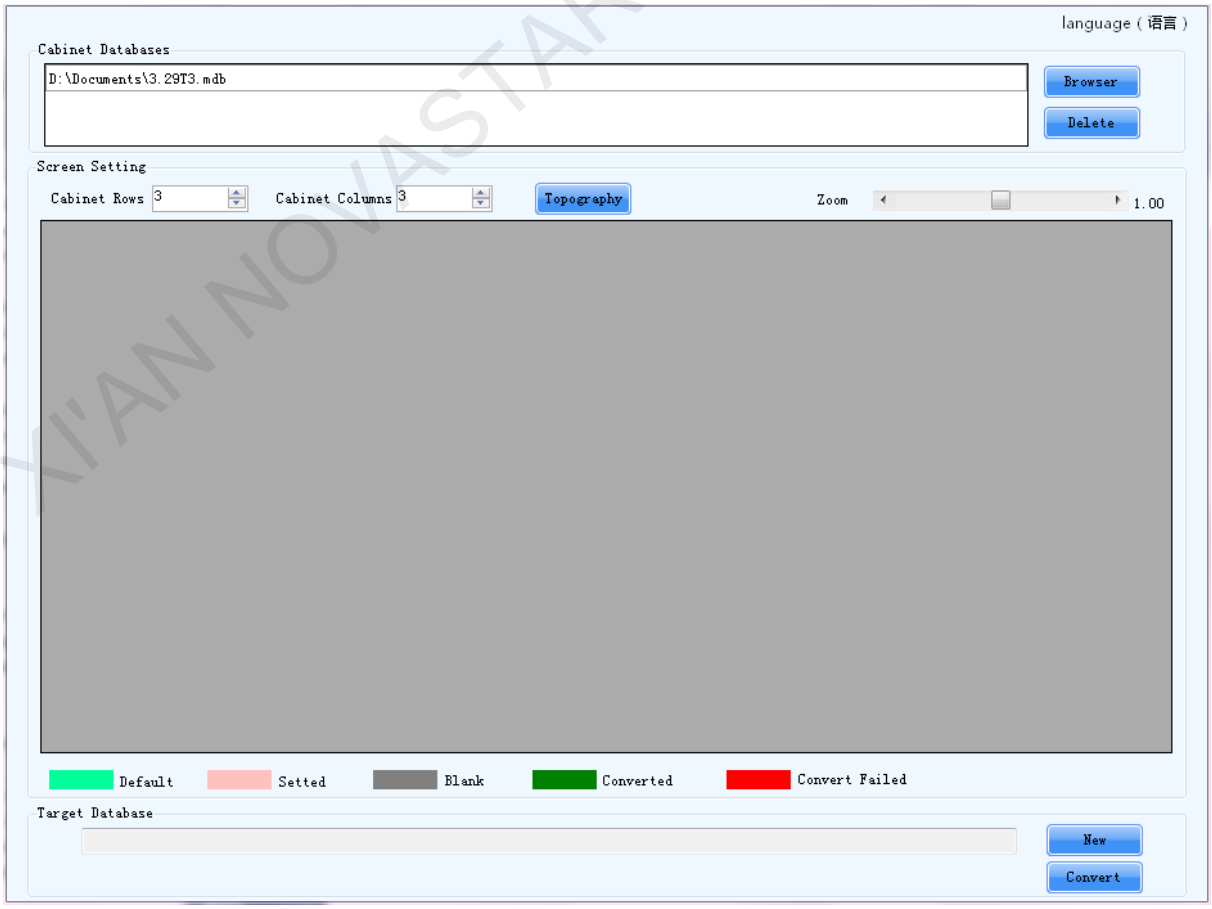

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Fig. 8-1 Import cabinet database

2) Configuration cabinet topological graph

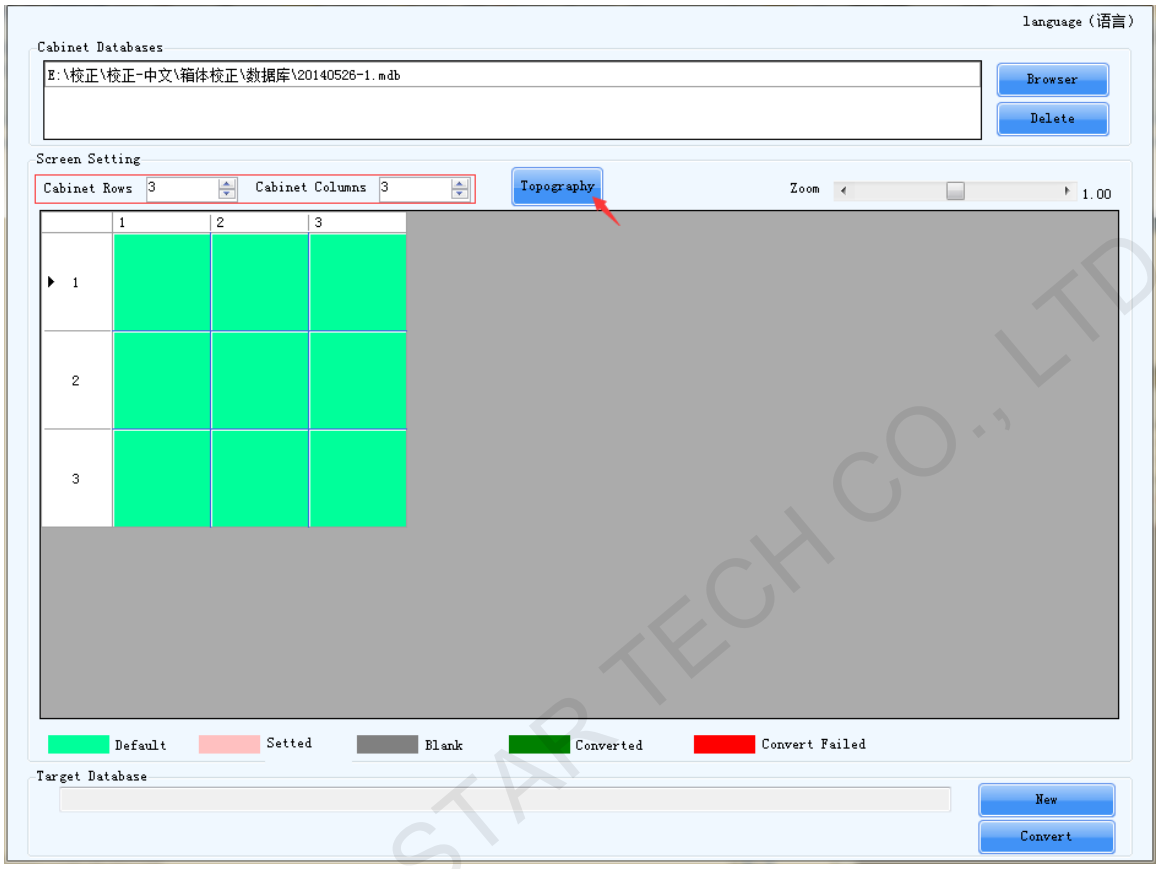

Fig. 8-2 Configuration of cabinet topological graph

3) Setting cabinet ID

Double click a cabinet on the topology and enter its ID (for viewing onsite). Cabinet ID should be manually entered.

To set a position of the screen black, double-click this position. Check “set black”, and enter the pixel row and column number.

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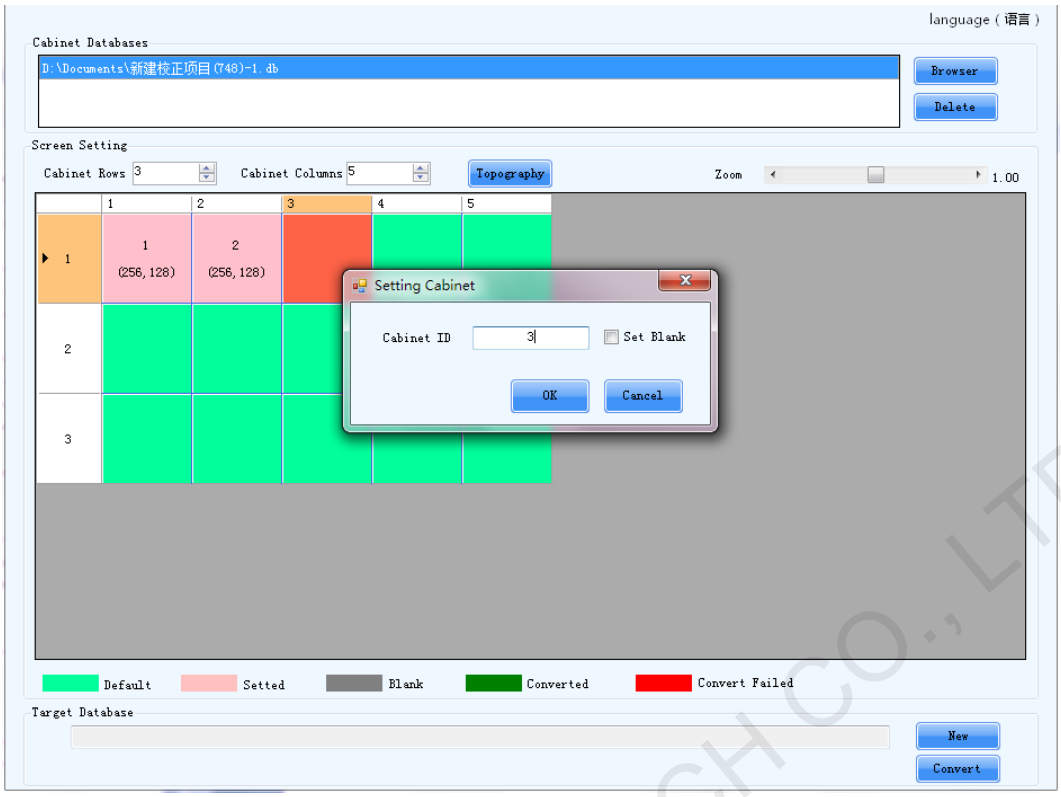

Fig. 8-3 Setting cabinet ID

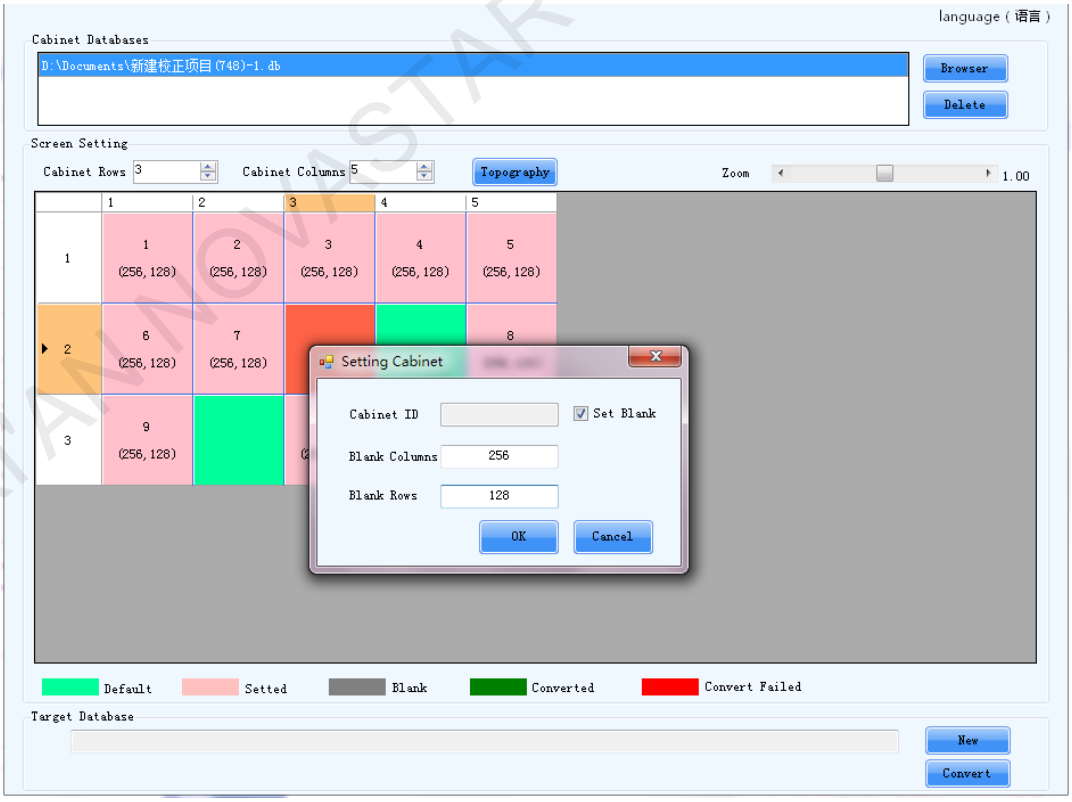

Fig. 8-4 Set Blank

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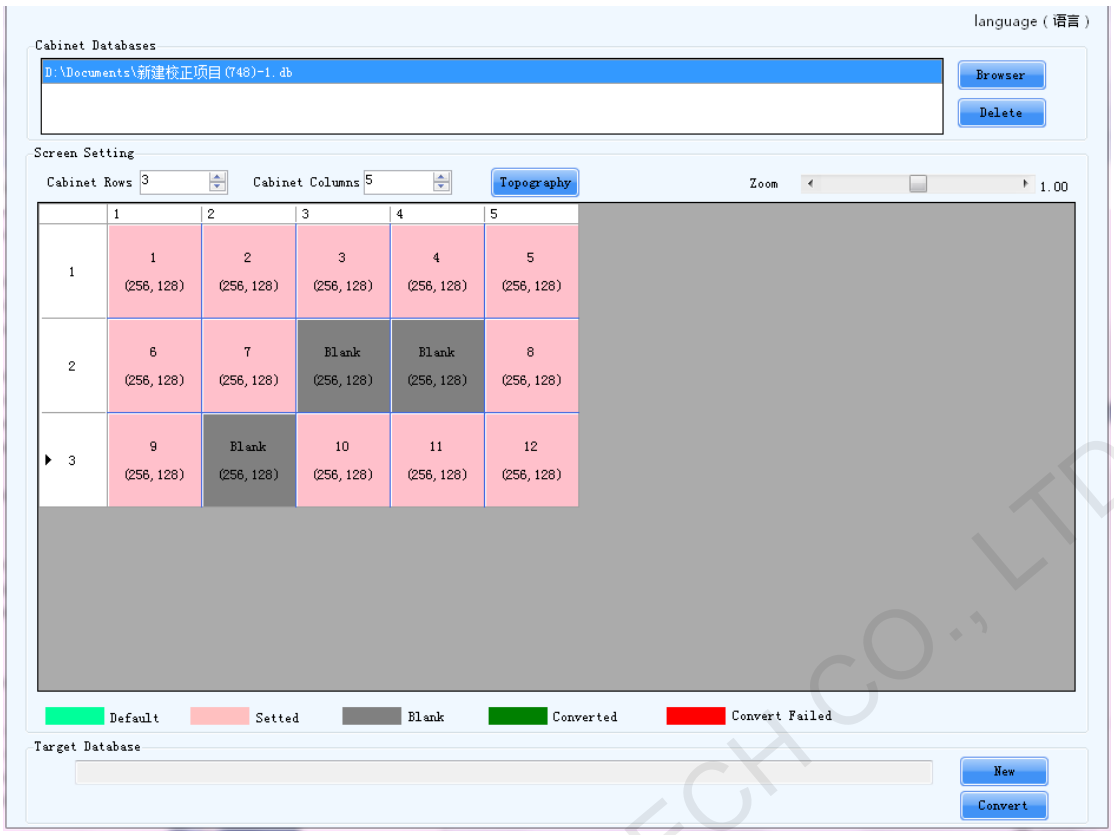

Fig. 8-5 Configuration completed

4) Create target database, namely full screen database.

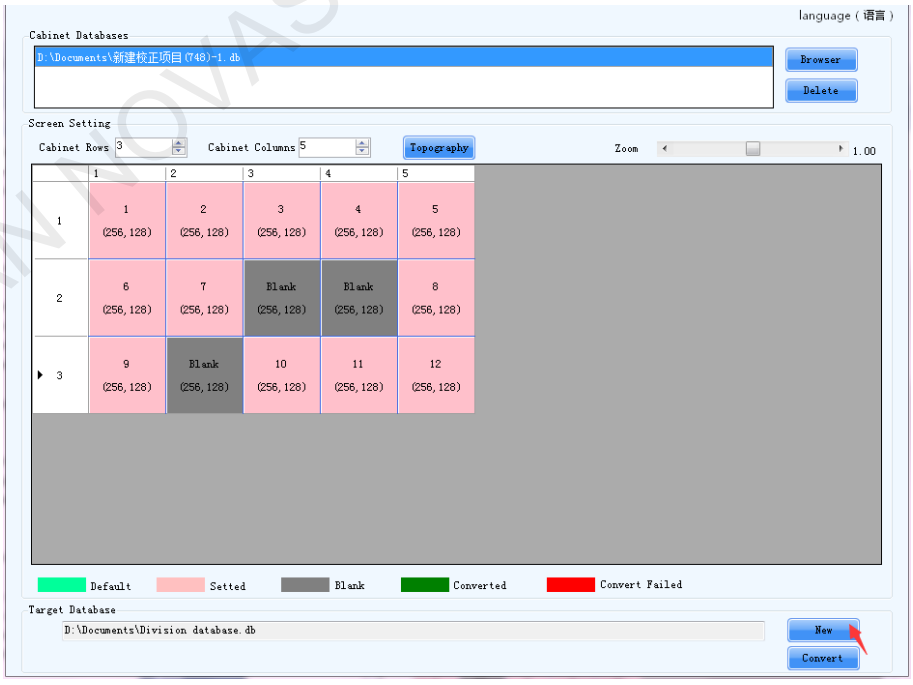

Fig. 8-6 Create target database

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5) Click "Convert" to convert the cabinet database into a full-screen database.

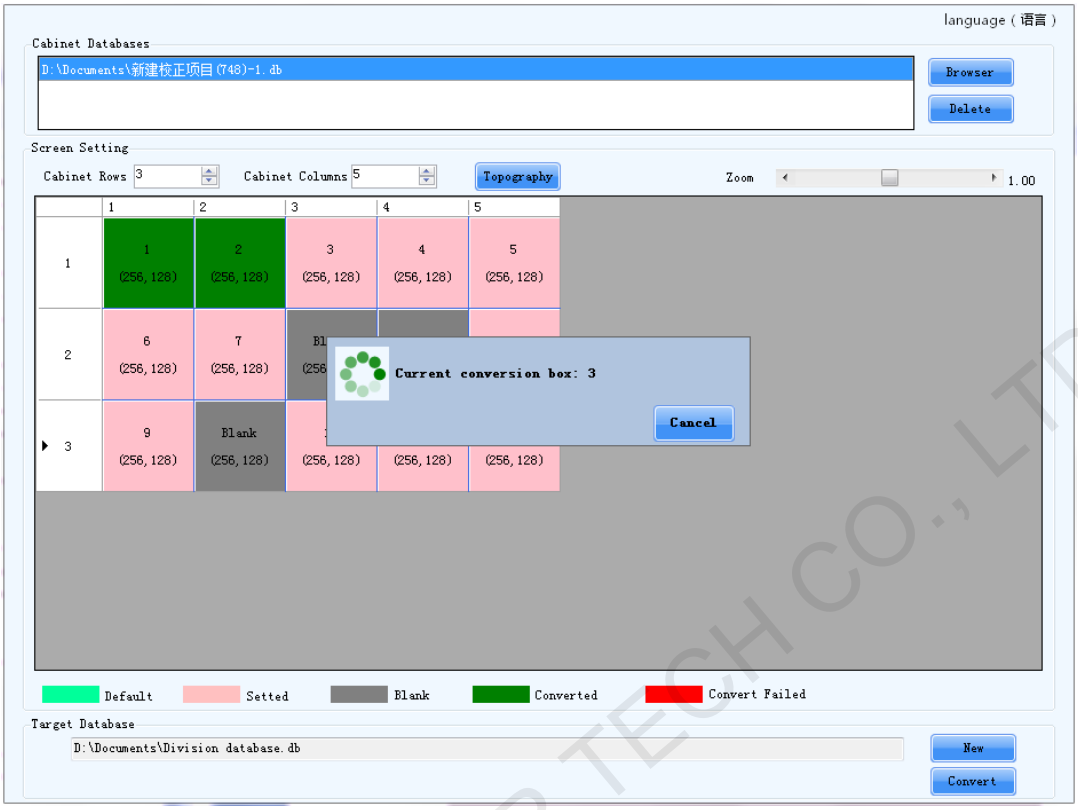

Fig. 8-7 Converting process

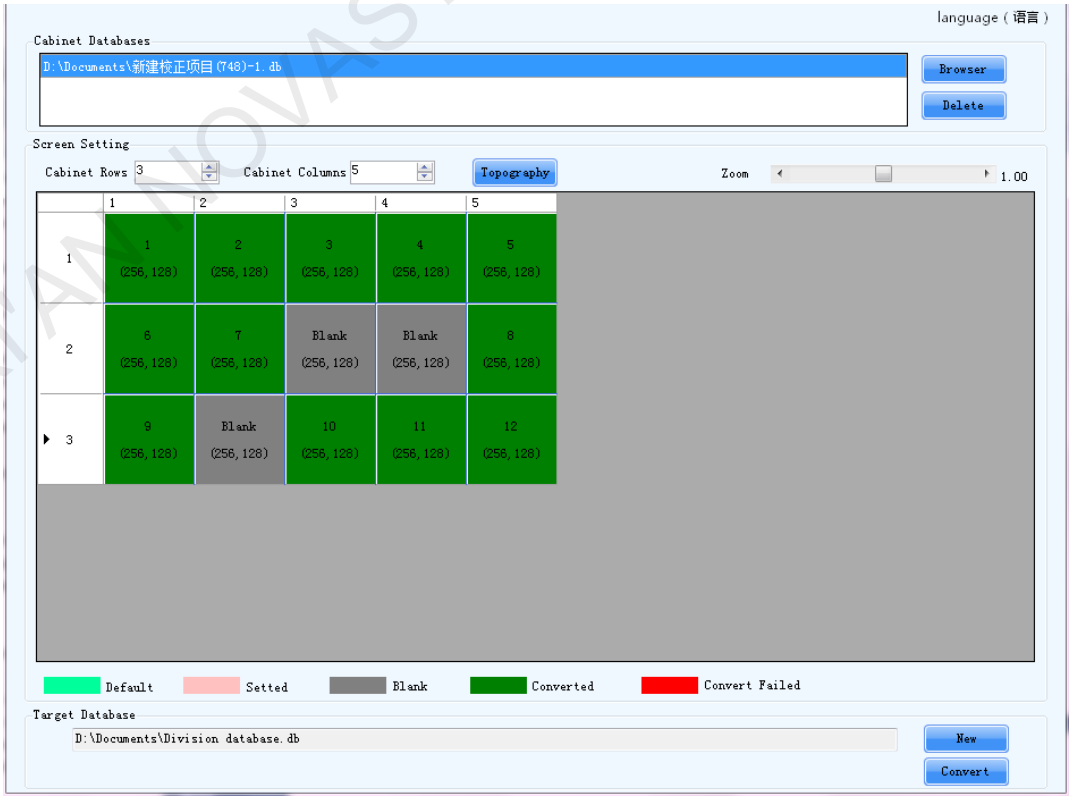

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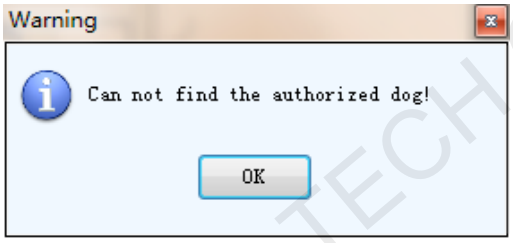
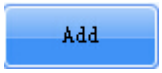
Fig. 8-8 Converting completed

9 Authorization

NovaCLB-Cabinet adopts the management methods of encryption lock and authorized file binding authorization; and every dongle corresponds to one authorized file, which is combined with the file authorization.

When the software is operated, the following window will appear; click OK to open the software, where the software is not authorized and it cannot be used normally.



Insert dongle to the USB port of the computer. Click "Authorize lock management" on the software. Then click 

to import the authorized file (in the disk) corresponding to the dongle.Multiple authorized file can be imported, thus, the software (after being copied to other computers) can be used by inserting the dongle.

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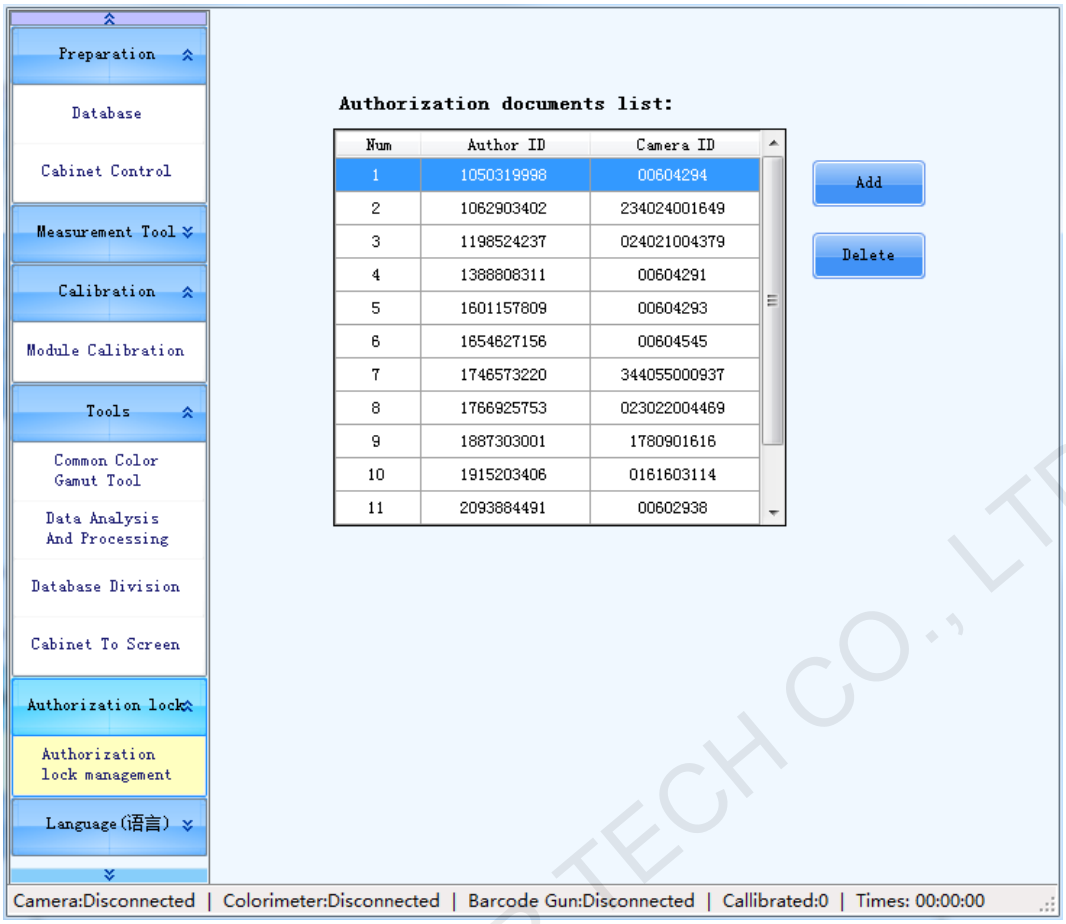

Fig. 9-1 Authorization management

10 Precautions

10.1 Precautions for database and batch management

The cabinet calibration software takes one batch of screens as a management unit. For each batch of the screens, a new database shall be created to manage the calibration parameters and calibration coefficients of these screens, which shall be properly managed by the manufacturer:

1) The cabinets to be calibrated and managed by the same database shall go through an aging process before they are calibrated. The time for aging must be almost approximately the same. Take a new screen for instance: the recommended time for aging before the calibration is 48h, and the aging time difference among different cabinets shall be no longer than 24h.

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2) If there are cabinets from different batches, different databases must be separately created for the cabinets.

3) Even in the same batch of cabinets, if there are cabinets of different sizes (for example, of different resolution), they must be calibrated as cabinets of another batch, and separate database should be created for them.

4) It shall be guaranteed that when calibrating the same batch of cabinets, the position of the cabinet to be calibrated and the camera, focus length and configuration shall remain unchanged. In case the improper operation result in the damage of the calibration site, a new database shall be created to calibrate the remaining cabinets which are seemed as another batch (At the same time, it shall be guaranteed that brightness and chromaticity standard for both calibrations shall remain unchanged).

10.2 Precautions for calibration process

Please strictly follow the calibration process of cabinet calibration software to calibrate cabinets one by one.

10.3 Precautions for calibration results detection

We can’ t visually observe the splicing results of LED display after the cabinet calibration. The untimely discovery of software error or improper operation may lead to unsatisfactory site splicing results. In this case, cabinet splicing simulation software (using the functional module "Simulate and Adjust coefficients" of" Data Analysis And Processing" tool) is needed for conducting simulation testing on calibrated cabinet, precautions are as follows:

1) After calibrating the 9th, 19th and 29th cabinets, please use the functional module "Simulate

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and Adjust coefficients" of" Data Analysis And Processing" tool to observe the calibration data, and if the data seems to be normal, you may go on with the calibration, and monitor the observed calibration result after the simulation of every 15~30 cabinets. If abnormal condition occurs, please timely adjust or contact NovaStar for troubleshooting.

2) Be sure to pick the cabinet in need of re-calibration hinted by calibration software and calibrate again. After the 20th cabinet calibration is completed, it is suggested to pick and calibrate cabinets need to be calibrated again, and subsequent cabinets should be calibrated from time to time. You can also pick and calibrate cabinets need to be calibrated again after all cabinets are calibrated.

3) For the display screen whose cabinets can't be all spliced to check the calibration results, we suggest you to splice 3×3 cabinets to see the splicing results after the cabinet calibration.

10.4 Operating skills of camera

1) Preparations

A. Connect camera to computer through USB cable and keep the camera in ON status. Click "Connect camera" and prompt "Connection succeeded." Then control the camera via software automatically.

B. Set mode dial as M (manual) and switch focusing to M (manual). Turn off if the lens has the function of anti-shaking (Sigma is OS).

C. Switching between eyepiece and LCD screen viewfinder: Enable "Live View Shooting" in

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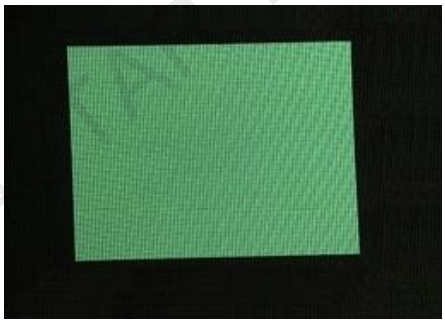
the menu and press

to switch between eyepiece and LCD screen viewfinder

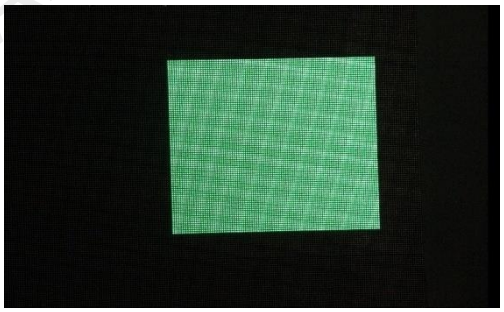
2) Camera focusing

When calibrating cabinet, place the camera lens towards the cabinet to be calibrated and adjust the focal length to include the cabinet into the field of the camera.

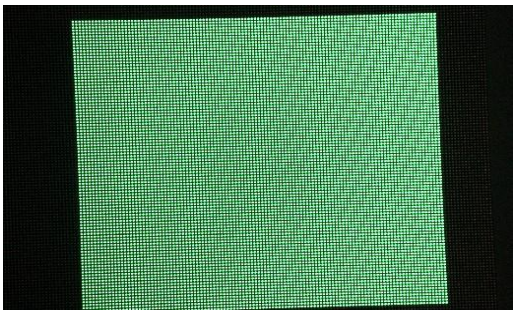
The number of pixels of cabinet is generally less than the pixels that can be collected by the camera each time (The digital camera collects less than or equal to 224×150 pixels each time and the Caliris camera, 480×330 pixels.) Therefore, adjust the focal length to let the cabinet locate in the center of the camera imaging and let the cabinet take up half of the width and length of the imaging, i.e., reserve 1/5 of the total length and width on the four sides.



(a) Standard imaging



(b) Imaging is too small



(c) Imaging is too large

Fig. 10-1 imaging size of a subarea

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Adjust imaging to a proper size. Then adjust focusing to set pixel size of module to above 50. After adjustment is completed, analyze camera parameters. Keep adjusting until the imaging size is normal.

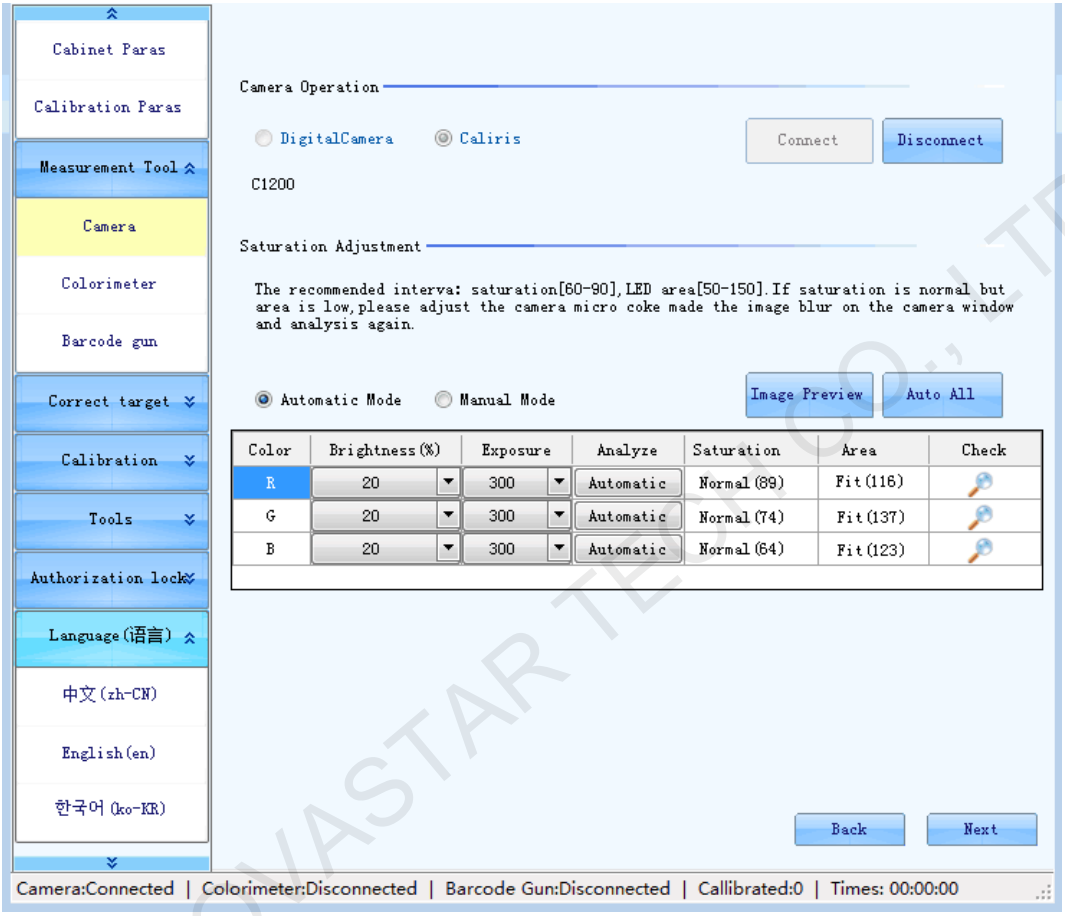
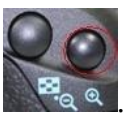


Fig. 10-2 Proper imaging size

	When enabling LCD Screen viewfinder, press to zoom in the image 5 times or 10 times of the original size  .

3) Saturation adjustment

Click "Analyze." The software automatically calculates the saturation. Adjust the aperture size, time of exposure and calibration brightness value to enable the saturation to be normal. The

saturation value ranging from 60 to 100 is normal, and the area value ranging from 50 to 150 is fit. The adjustment principle is as follows: the adjustment must be conducted in the following order: aperture size > time of exposure > calibration brightness value. Generally, the aperture value is inversely proportional to the saturation, and the time of exposure and brightness are directly proportional to the saturation. After the red (R) saturation, green (G) saturation and blue (B) saturation are normal, click "Apply".

	If imaging size is “Too small”, properly defocus. If it is still unreasonable after defocusing, try to adjust by moving camera.

10.5 Precautions for use of camera

During image capture, please check whether the camera is in "Full PC” if the camera has no action for a long time. If it is so, the camera need to be reset, and calibration can be conducted after reconnection.

10.6 Precautions for saving database

When the software is saving the database (calibration coefficient), please do not close the software, otherwise it may result in abnormality of the software. Abnormal information prompt will show abnormality of database operation.

11 Troubleshooting

Problem	Troubleshooting
Software alert: Point positioning errors	Change **Identification Direction** on the **Calibration Paras** page. Increase **Allowed Dead LEDs Ratio** on the **Calibration Paras** page.
Screen blurred after calibration	See **Calibration** > **Measuring image**. Normally, one LED lamp is framed by one square.

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	Change **Identification Direction** and recalibrate the screen.
Software alert: Color error of image data	Check whether the screen is too dark, or the color on the screen when using camera to take pictures is wrong.
Software alert: Camera not connected	Check the connection wire between camera and control computer. Check the camera's remaining battery capacity.
Software alert: Unexpected error	Check whether the cabinet resolution is too large. 7D supports 192*144. Try to restart the calibration software, camera and computer.
Software alert: The cabinet is inclined (Actually it is not).	If the cabinet is seriously modularized, the calibration software may judge the not inclined cabinet as inclined. After you confirm that the cabinet is not inclined, choose to force the calibration to continue.
The screen composed of some calibrated in-line cabinets has great uniformity difference.	Cabinet calibration requires that the cabinets before calibrated has consistent uniformity within a certain angle ranges. Some in-line cabinets have process problems in the angle. Therefore, the screen which is composed of those calibrated in-line cabinets has great uniformity difference at different angles. Cabinet calibration cannot fix the angle process problem. It is recommended that you use NovaStar full screen calibration software to calibrate the screen which is composed of those in-line cabinets.

12 Document Version Description

Version	Date	Reasons for update
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V1.0	Nov. 12, 2012	First release
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V2.0	Jun. 18, 2013	Upgrading software
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V2.1	Sept. 9, 2013	Corresponding version of software: NovaCLB-CabinetV1.2.3
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V2.2.0	Jun. 6, 2014	Corresponding version of software: NovaCLB-CabinetV2.0.0
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V2.2.1	Jul. 2, 2014	Corresponding version of software: NovaCLB-CabinetV2.0.0

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NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V2.3.0	Oct. 13, 2014	Corresponding version of software: NovaCLB-CabinetV2.1.0
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V3.0.0	Jun. 5, 2015	Corresponding version of software: NovaCLB-CabinetV3.0.0
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V3.1.0	Jun. 6, 2016	Corresponding version of software: NovaCLB-CabinetV3.1.0
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V4.0.0	Nov. 26, 2016	Corresponding version of software: NovaCLB-CabinetV4.0.0
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V4.1.0	Jun. 13, 2018	Corresponding version of software: NovaCLB-CabinetV4.1.0
NovaCLB Cabinet Pixel-by-Pixel Calibration System User Manual -V4.1.1	Nov. 8, 2018	Corresponding version of software: NovaCLB-CabinetV4.1.1

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