NovaCLB-Cabinet User Manual

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Xi'an NovaStar Tech Co.,Ltd

Ver： 3.0.0

Statement

Dear users:

Welcome you to be the user of NovaCLB cabinet point-by-point calibration system. If the manual offers any help or convenience in enabling you to understand and use this manual, we would be very pleased. Though we strove to make this manual accurate and reliable in the preparation, Nova assumes no responsibility for accuracy of the information in this manual. Nova may revise or change the content of the manual from time to time without previous notices to you. If you have any problem of usage in using this manual, or any good advices, please contact us by the contact information offered in this manual. We will do our best to give support for any problem you met in the use of the manual. We are sincerely grateful for your advices and will evaluate and adopt them as soon as possible.

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Definition of document identifier

	Note: Identifies information that requires special consideration.
	Tip: Identifies advice or hints for the user.

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1 Summary

NovaCLB-Cabinet is the software used for Nova M3 series. The application software is dedicated to offer a complete solution about the cabinet calibration of LED display screen, and it can be used for factory calibration of conventional cabinets, calibration of old cabinet, and calibration of leased cabinet and various occasions, which greatly improving the uniformity of the LED display screen and at the same time, eliminating the differences among cabinets and the splicing boundary line of cabinets.

2 Preparations before calibration

2.1 Lay out calibration darkroom

The following requirements and suggestions are proposed for the arrangement of the darkroom to ensure good calibration effect:

1) The calibration darkroom has to be sealed and not disrupted by the external light, and in the meantime, the darkroom shall be covered with low-reflectance black materials on the surrounding to reduce the reflected light.

2) Width: 3 m (suggested); length: correction distance of camera, related to the pixel interval thereof: pixel interval X 800< correction distance < pixel internal X 3000; however, our suggested best correction distance of the product is: correction distance = pixel interval X 1500.

In order to guarantee the measurement accuracy of colorimeter, we hope that the colorimeter can measure a wider LED area, and its distance depends on LED cabinet

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width (or height) and field angleθ : the measurement distance = cabinet height/tan θ X 0.4. With consideration of space pre-left for the computer, camera and personnel activities, the maximum distance of the darkroom shall be added with 2-3 ms;

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 interval(mm)	Correction distance of camera (m)	The best correction 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

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For small-interval screens of different specifications, our suggesting camera distance is maintained at 5 m; to be compatible with cabinets of most specifications, the ideal length for the darkroom shall be about 20 m.

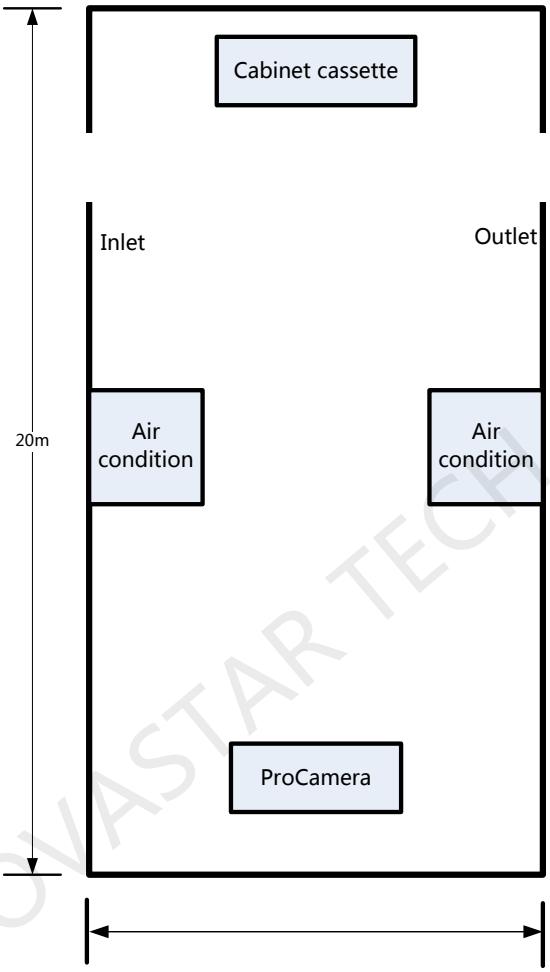

Fig.2-1Darkroom layout

3) Length of calibration room should be more than 20m, and draw a scale on the ground with paint to facilitate calibration distance positioning.

4) Install hygrometer to track change situations of temperature and humidity. The calibration darkroom should be equipped with an air conditioner, which should be turned on half an hour before each calibration to adjust the temperature and humidity to the specified value, and when calibrating cabinets of the same batch, the temperature fluctuation shall be no more than 2℃.

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5) All cabinets should be performed fully aging 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 pedestal to prevent it from being affected by the light reflected from the ground.
7) Suitable cabinet handling processes to avoid too long time delay in cabinet replacement.
8) Outfit high performance computer, improve the calibration efficiency.

2.2 Cabinet placement precautions

1) A slot is recommended to be equipped above pedestal for fixing cabinet;
2) The outer surface of pedestal should be made of material with low reflectivity;
3) Front surface of cabinet should be parallel to or slightly extend from the pedestal, to prevent pedestal from blocking LED on cabinet surface when sampling; (see figure below)

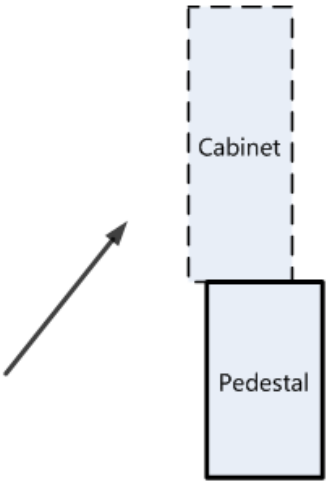

Fig. 2-2 Cabinet surface extends from pedestal

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

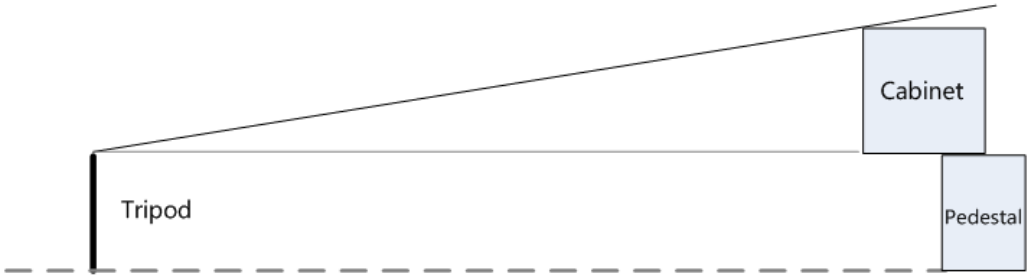

Fig. 2-3 Pedestal height is slightly higher than the tripod height(No elevation, be generally used in indoor screen)

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

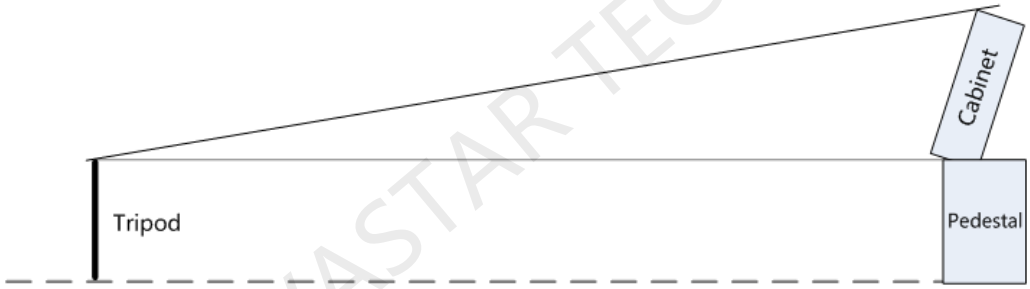

Fig. 2-4 Tilt the cabinet to mimic the elevation(Have elevation, be generally used in outdoor screen)

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

	1. Moving camera, turning the camera focal length and other operations are strictly prohibited during the calibration process; 2. Each cabinet must be placed in the same position during calibration process, otherwise splicing results after calibration will be affected. We suggest that after determining the

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	placement of the first cabinet, **draw lines along both sides of the contact between the cabinet and the pedestal** on the two sides to determine the displacement of the subsequent cabinets. Consistent tilt angle for each cabinet must be ensured for cabinet tilt calibration.

2.3 Select the appropriate calibration methods

1) According differences of cabinet types need to firstly choose the different measurement methods:

   - **Single measurement mode of colorimeter (light gun):**This mode requires only using once colorimeter for auxiliary calibration before calibration, accuracy requirement is not high, so ordinary colorimeter is acceptable. This mode supports the calibration of cabinets in 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 method.
   - **Cabinet-by-cabinet measurement mode of colorimeter:** Under this mode, colorimeter is required for each cabinet calibration, CS2000 is recommended as standard equipment. This mode supports lease cabinets of different batches and cabinets with serious module differences for calibration.

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2) It needs to select different preheat time according to the heat dissipation capacity of the cabinet:

- **No preheat mode:** Under this mode, we don’ t have to consider the change to the brightness and chromaticity uniformity brought by the temperature changes in cabinet pre-heat, the calibration of the cabinet will be carried out immediately after the cabinet is lighted. The calibration efficiency of this method is higher and the calibration time of each cabinet is within 1 minute.
- **Preheat mode:** Under this mode, the cabinet is required to preheat for a designated time according to certain brightness, and calibrate it after its temperature tends to balance. 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.

3 Calibration Process

When using the NovaCLB-Cabinet to calibrate the cabinet, a special calibration process is designed to attain a better calibration effect, improve the calibration efficiency and remove the boundary line between cabinets:

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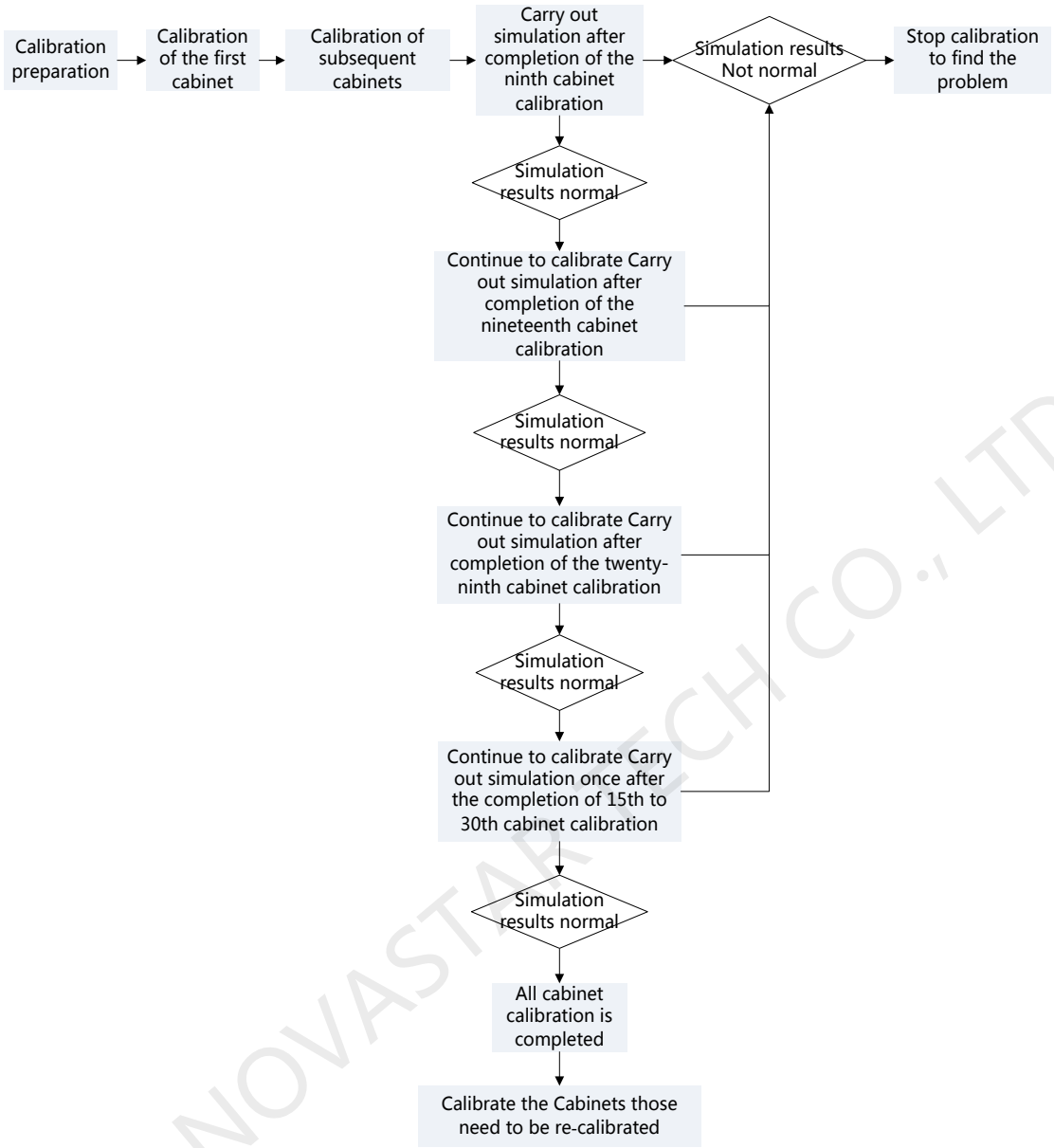

Fig. 3-1 Calibration process

In NovaCLB-Cabinet, we need to study the measured parameter of LED cabinet of every specification. Therefore, when calibrating each batch of cabinet, the software will automatically take 5, 10 or 20 cabinets as the sample cabinets and generate the common parameters. The calibration parameters may not be suitable for the sample cabinet, therefore, when the calibration of the batch of cabinets is fully completed, the software will automatically analyze the sample cabinet ID to be

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re-calibrated, which usually ranges between 1 and 5. These cabinets need to be re-calibrated.

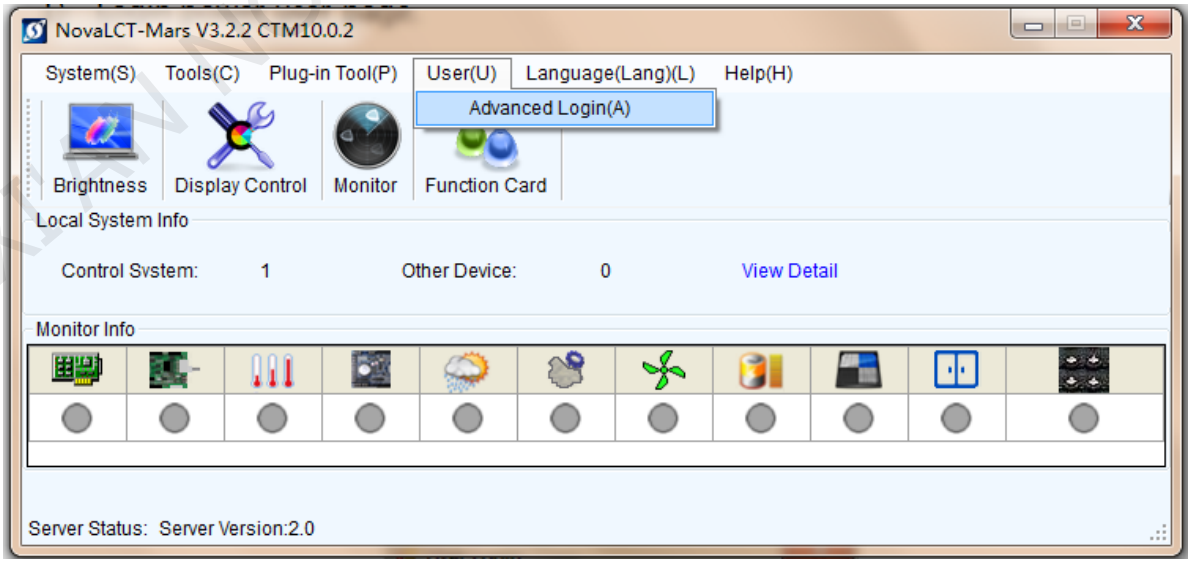
4 The calibration for the first cabinet

Calibration software is mainly divided into four parts: NovaLCT-Mars preparation→Calibration preparation→Configuration of measuring instrument→Parameter settings→Calibration Detailed introduction is as follows:

4.1 NovaLCT-Mars preparation

Operate NovaLCT-Mars on the control computer, lighten the cabinets normally and make some general configuration. Next we will describe the critical steps and the precautions through the following graphical representation. See *Nova M3 Series Control System User Manual* for the detailed steps of configuring cabinets.

1) Login power user page.



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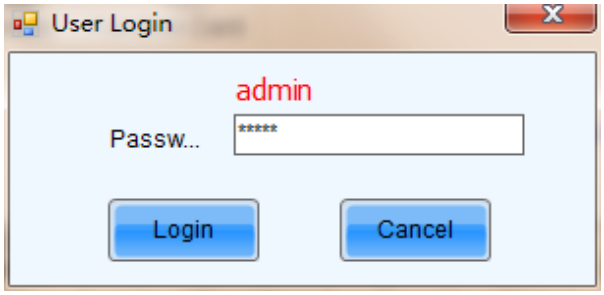
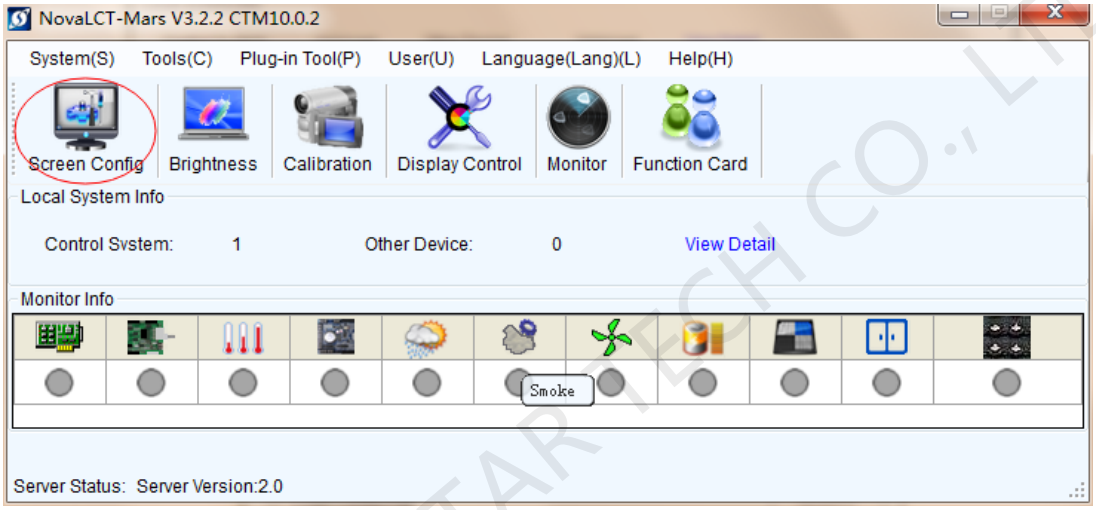
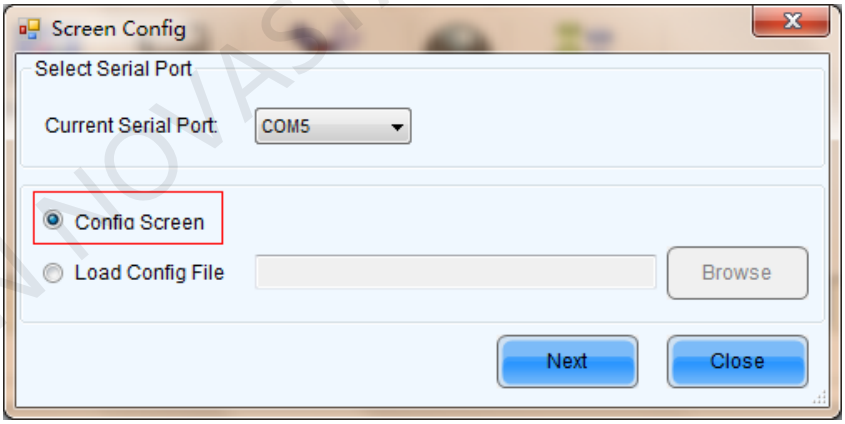


Fig. 4-1Login NovaLCT-Mars power user interface

2) Set parameters of sending card.





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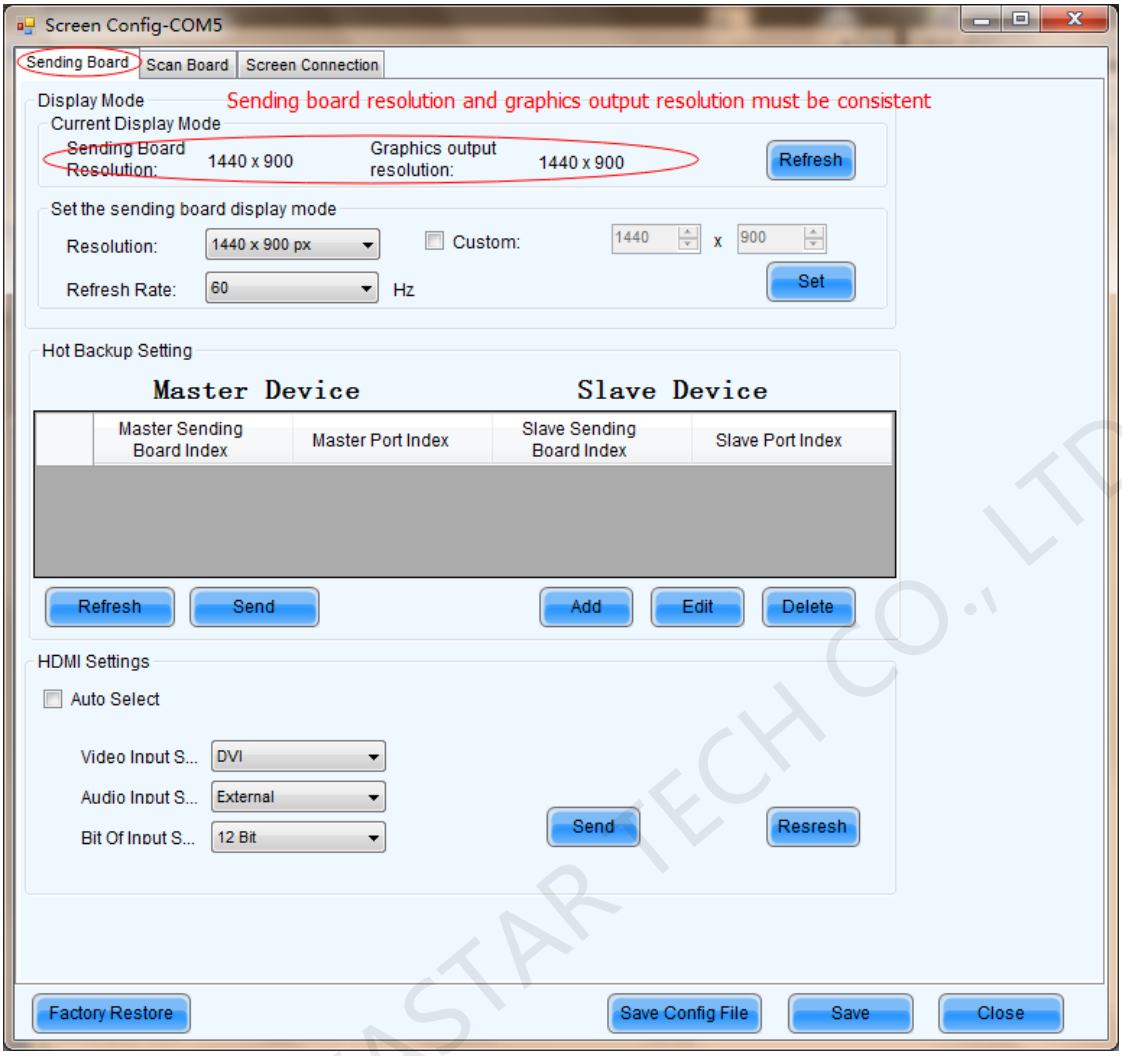

Fig. 4-2 Set parameters of sending card

3) Lighten display screen (refer to *Nova M3 Series Control System User Manual*).

4) And set performance parameters of receiving card.

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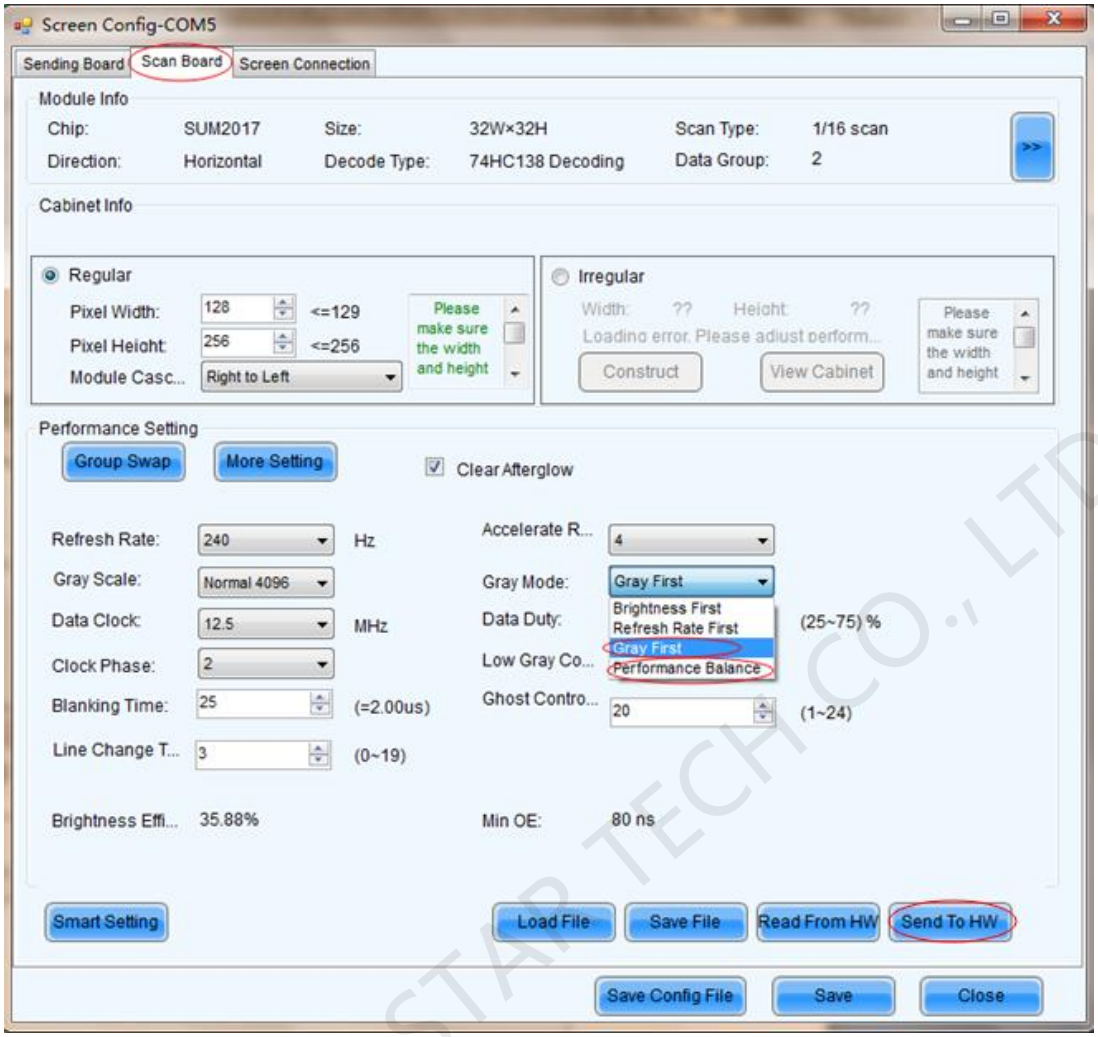

Fig. 4-3Set performance parameters

	The outdoor screens generally have high brightness, which could cause overexposure of photos easily, and the brightness efficiency of "Gray First" and "Performance Balance" will be lower, so we advise you to select "Gray First" and "Performance Balance" when calibrating outdoor screens.

5) Configure the display screen.

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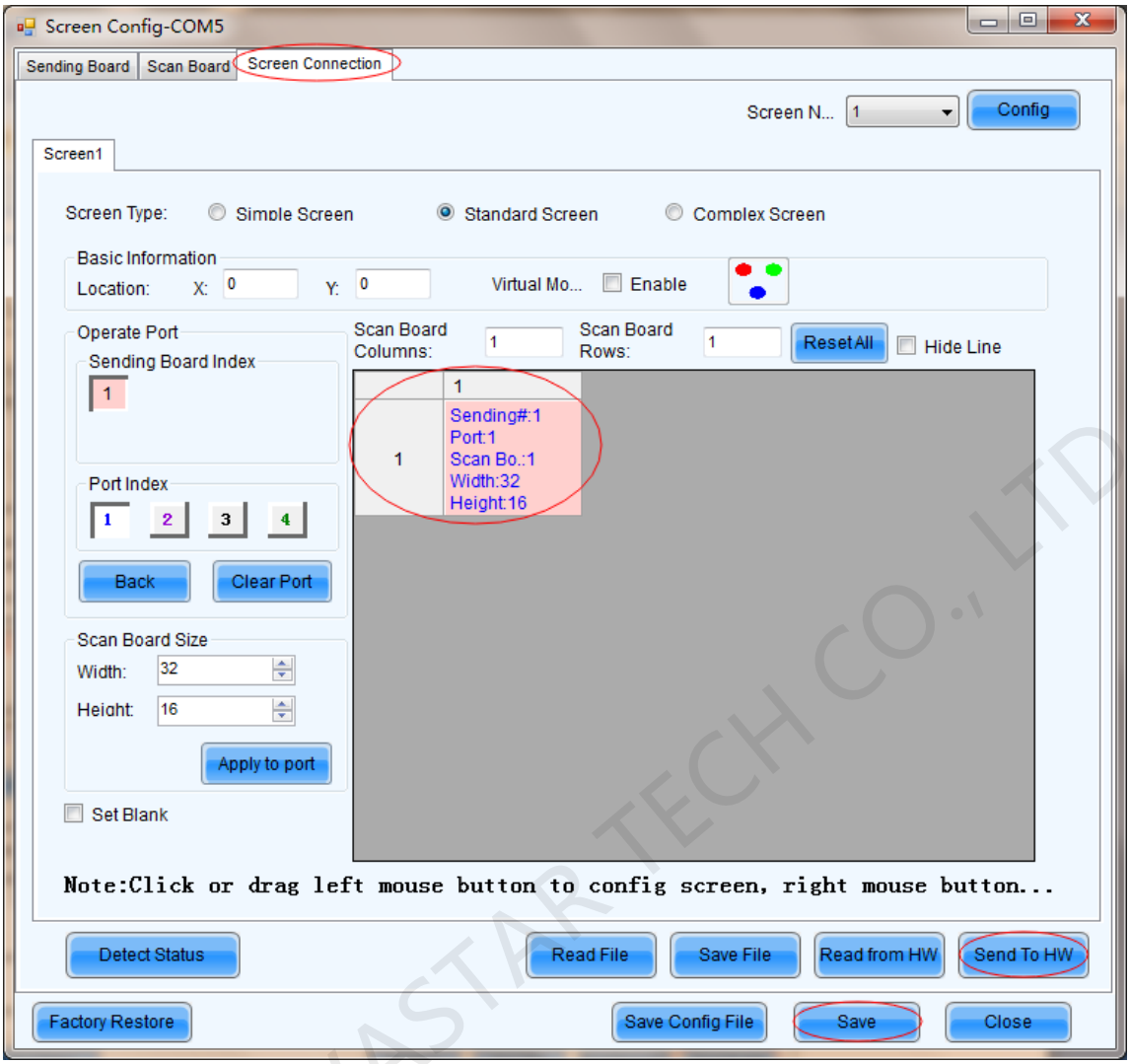

Fig. 4-4Configure the display screen

6) Start calibration.

As shown in the following figure, hints the "listening Succeed" that is the online calibration success.

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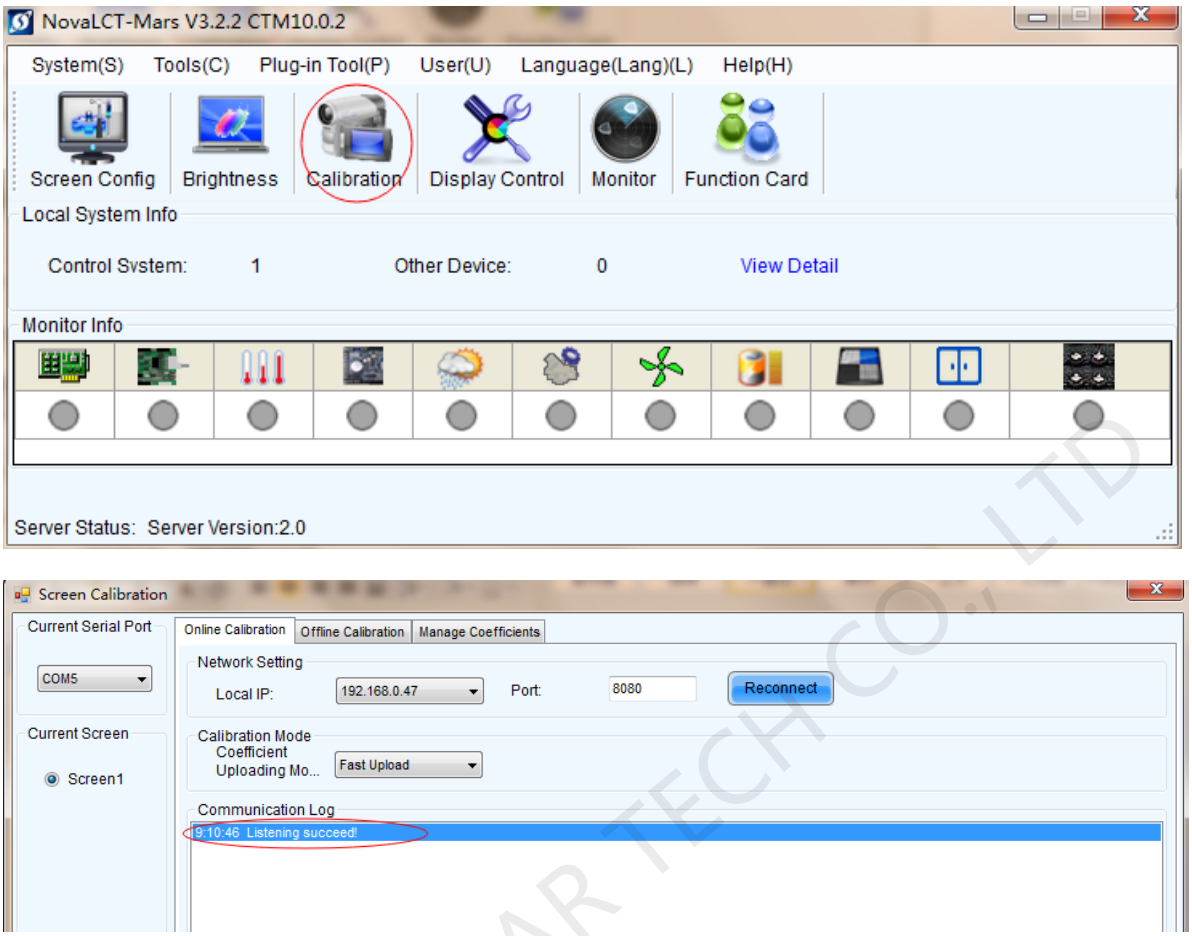

Fig. 4-5 Start calibration

4.2 Calibration preparation

4.2.1 Database

The calibration information base is different from the calibration coefficient database, as it 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 user can record all the calibration information about each display screen, and the brightness and chromaticity standards of each cabinet before and after the calibration, time of calibration, uniformity and dead point information, etc.

Meanwhile, the software automatically control the database size in the information

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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.

We advise you to manage the calibration information base taking the display screen as a unit. Therefore, before calibrating a display screen, you have to create an information base for this display screen.

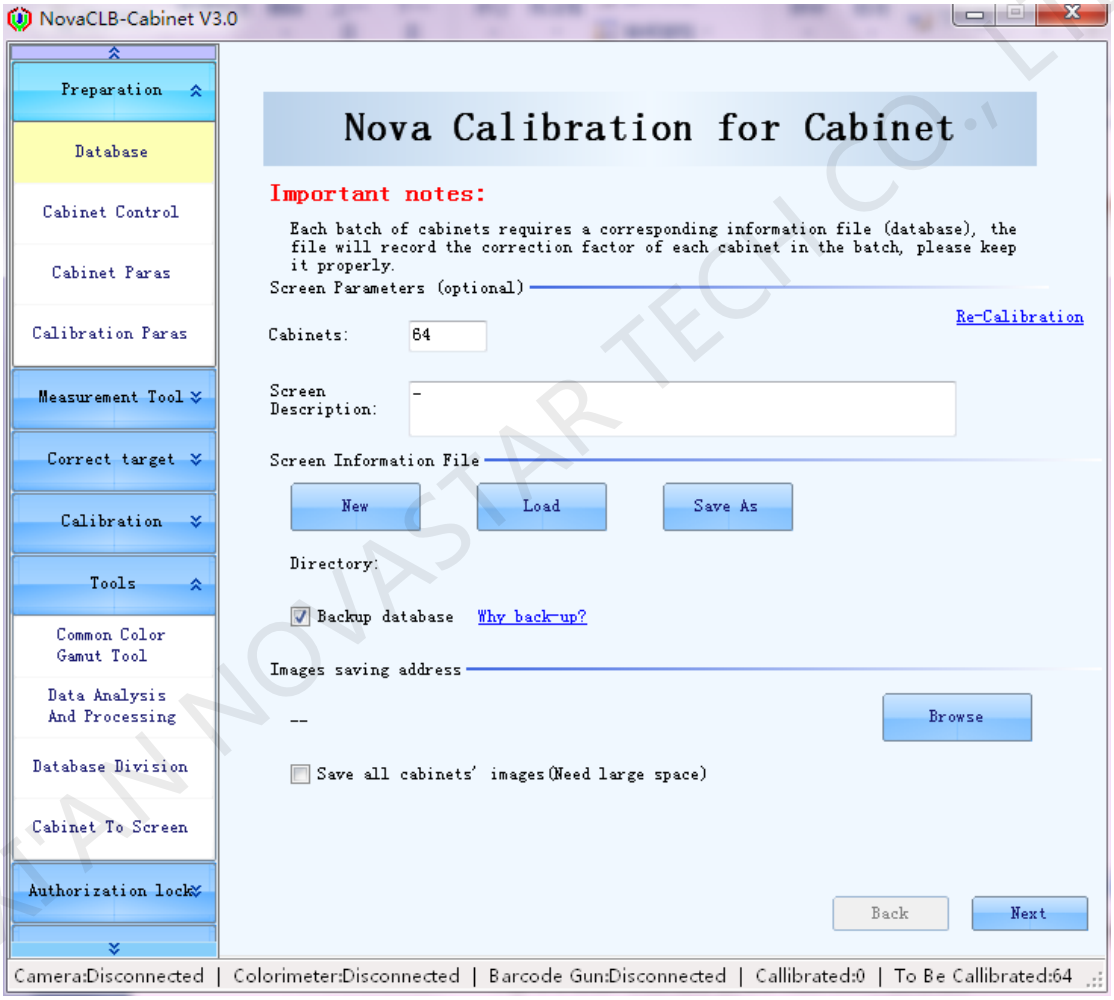

Fig. 4-6 Main interface of the calibration software

1) **Screen parameters(**optional**):**Parameter information herein is specific to big screen of the current cabinet, 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.

2) **Screen Information file:** A corresponding information file (calibration project) shall be new 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 :**New create a new calibration project;
   - **load:** Load existed calibration project files;
   - **Save as**: Modify name and route of the project files.

3) **Backup database：** The software defaults to be checked, and enabling backup data can effectively prevent database file damage due to abnormal close of software or sudden blackout of computer.

4) **Image saving address:** select a position to store cabinet images during calibration. If "Store all cabinet images" is selected, all cabinet images will be stored; otherwise, only images of the current calibrated cabinet are saved.

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4.2.2 Cabinet control

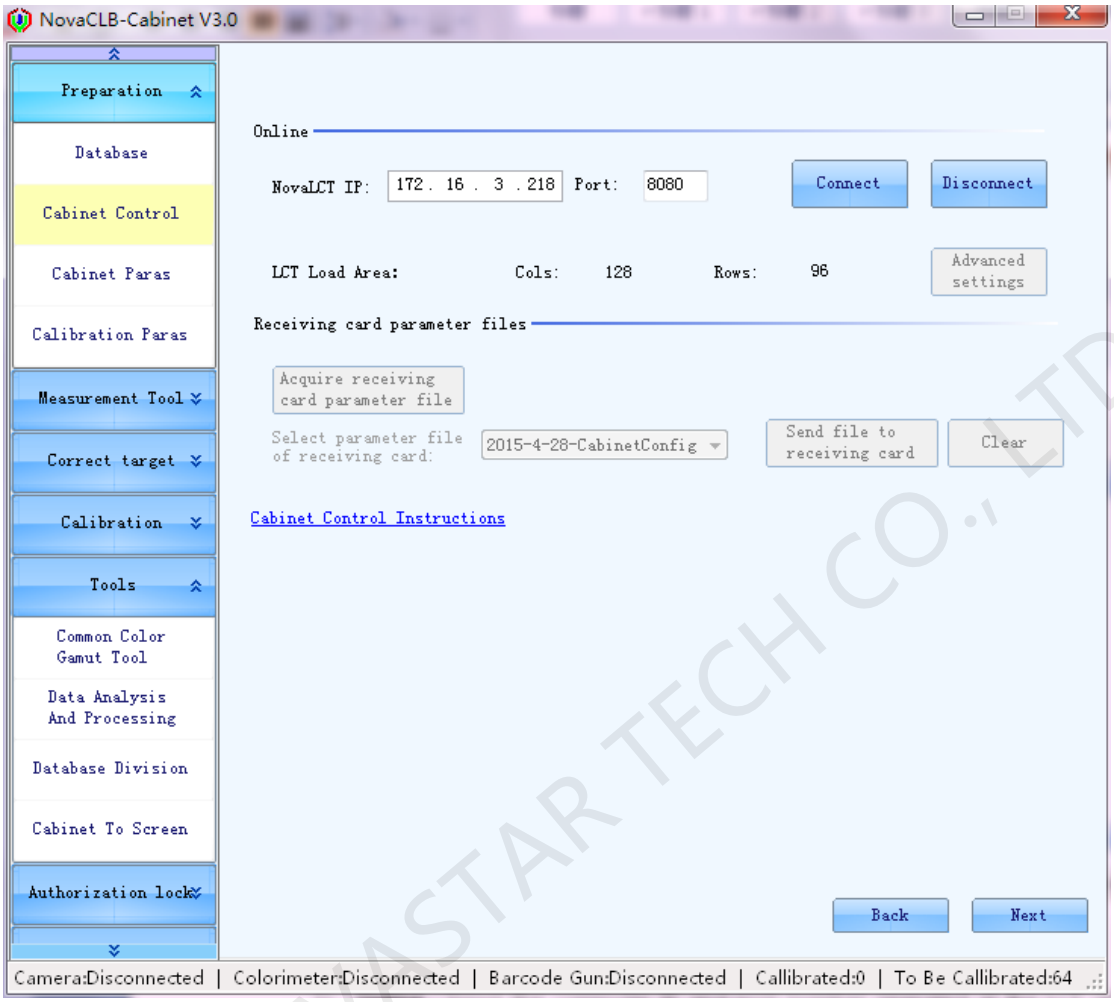

Fig. 4-7 Cabinet configurations

1) **Online :** Input the computer IP and port number operated at the LCT client, click "connect" button, and after the interface hints that the connection is successful, start the 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) **Cabinet configuration:** After successful connection with the LCT, we can see size of the area loaded by LCT at the bottom of this column. Click "Advanced

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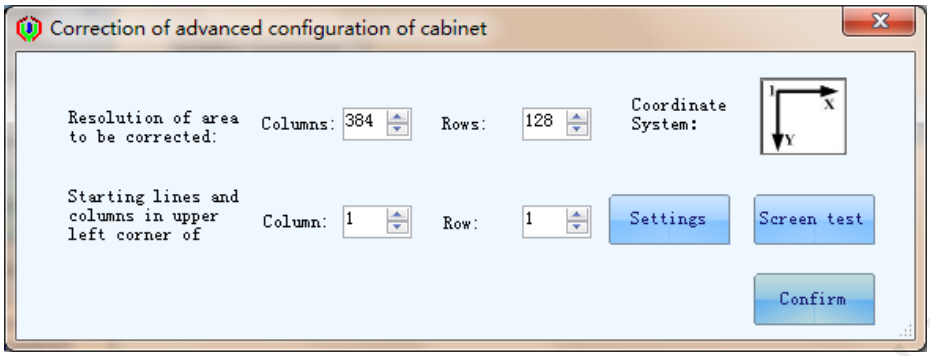
settings”to modify the cabinet resolution, starting row and column coordinates, and unit size as required.



Under normal circumstances, in the cabinet calibration process, default parameters after successful connection with the LCT is not required to modify.

3) **LCT interactive configuration file**

Click “Acquire receiving card parameter file” to acquire the parameter file of the receiving card in this calibration batch; set a distinguishable name for the file; and when calibrating the cabinets of the same batch, directly select the file in a dropdown box, and then send it to the receiving card.

In the calibration process, after configuring the first cabinet of the batch at the LCT port, click “Save Configuration File” button to save the configuration file to the local calibration software port. When switching to the next cabinet after calibrating the previous one, Select the configuration file from the dropdown box, and directly send it to light up the cabinet, so it can be ensured that the following cabinet uses the same receiving card parameter as the first cabinet.

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4.2.3 Cabinet parameters

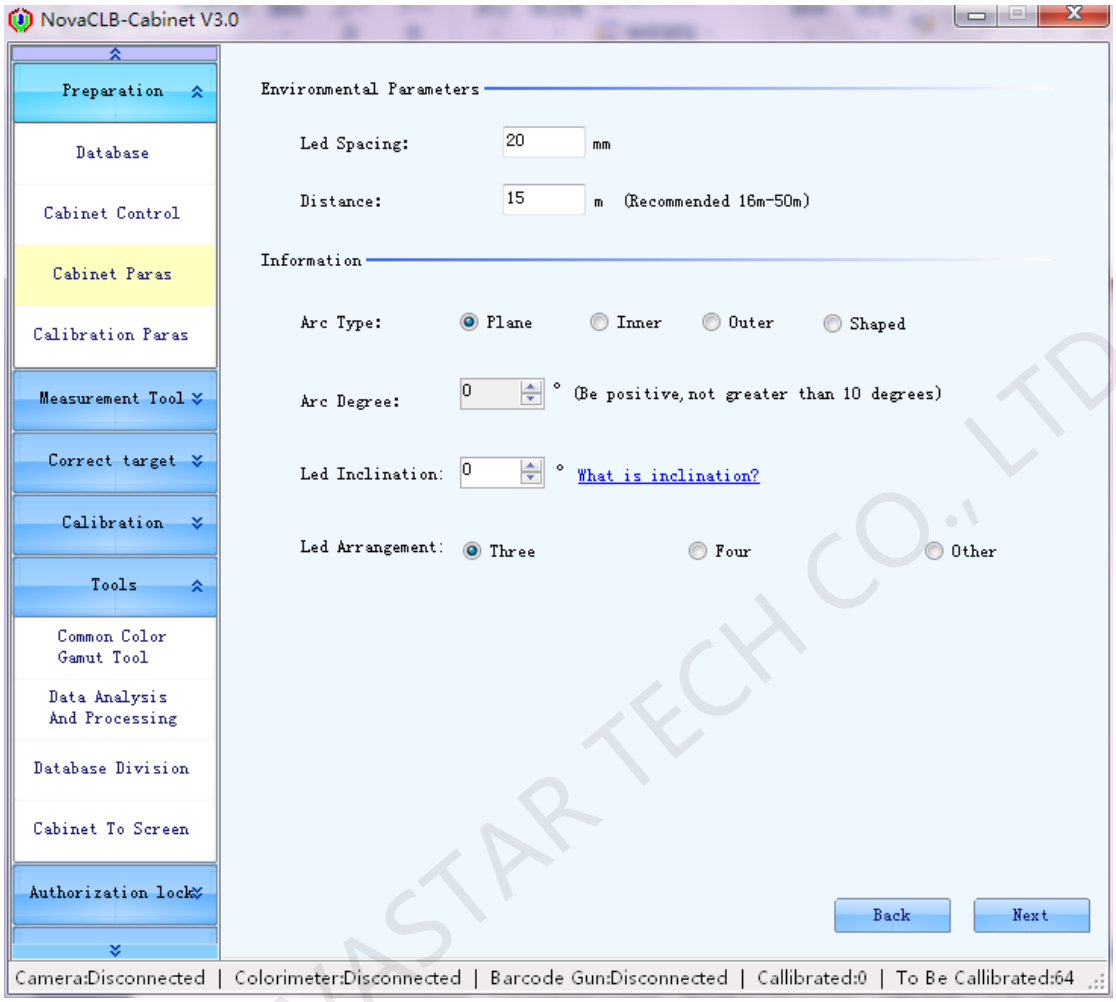

Fig. 4-8 Cabinet parameters

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

2) **Cabinet information:** Set some basic information of calibration cabinet. Mainly refer to the downward inclination angle of LED lamp point in the cabinet, whether the cabinet has an arc, LED arrangement (which includes the number of LED in each pixel).

After setting, click the "Settings" button to confirm.

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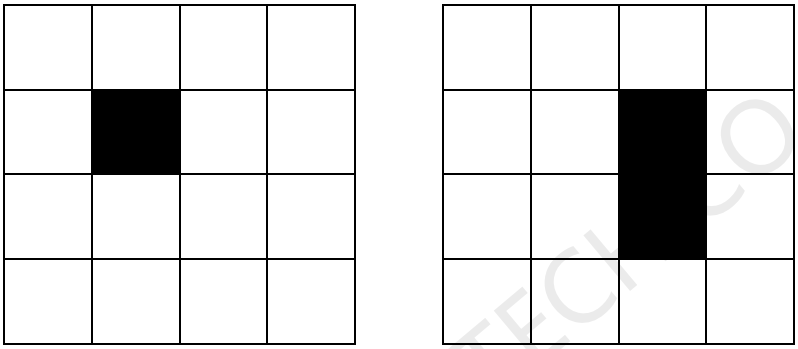
Notes: This version does not support irregular screen calibration for following two conditions temporarily, and at present, only the irregular cabinet with the dead lamp zone at the boundary is supported.

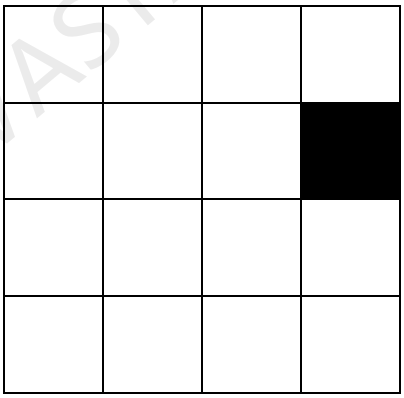
a) There is a black block in middle of cabinet.

For example:



b) There are sinking at the middle of either side of cabinet.

For example:



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4.2.4 Calibration parameters

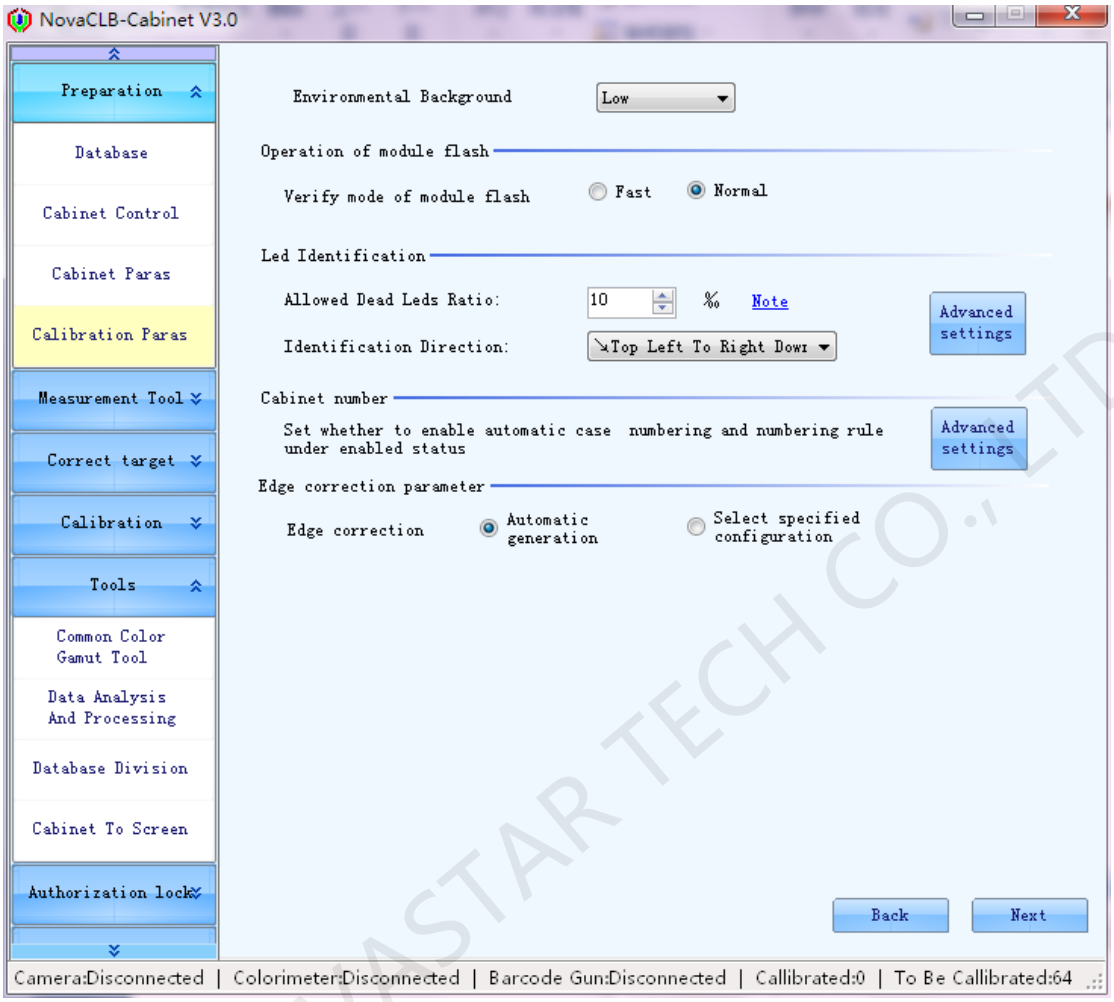

Fig. 4-9 Calibration parameters

1) **Environmental Background:** Calibration brightness when carrying out cabinet calibration, it is divided into three levels of high (lighter), middle (generally light), low (darker).

2) **Operation of module flash:** For the detection of whether the calibration coefficient of the module flash is consistent with the receiving card, the detection mode is divided into the quick mode and standard mode; the quick mode has the advantages of high efficiency, but may make mistake in detection result under individual situation; while the standard mode features in slower

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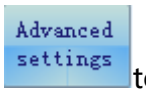
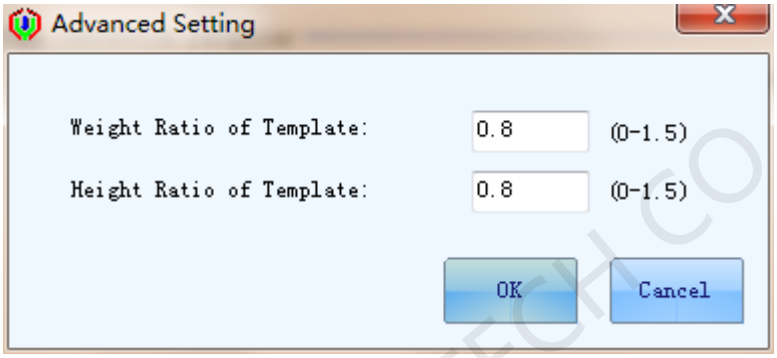
speed but guarantees 100% correction of the detection result.

3) Point-by-point identification parameters of LED:

- **Advanced settings :** Click 

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



- **Directions of point-by-point identification:** You can choose from "↘" ("left top to right bottom"), "↗" (bottom left to top right), "↙" (right top to left bottom) and "↖" ("right bottom to left top"). When LED at top left corner of cabinet can't display normally, try to start from the bottom right corner to identify LED.

- **The allowable dead light proportion:** If the number of LED unidentified within cabinet is greater than the setting proportion, the calibration process automatically stops and hints. Please confirm whether there is too much dead point in cabinet or certain part of LED pixel in cabinet is covered at this time. If the problem still unable to be solved, you can try to increase the proportion for forcible calibration.

4) Case Numbering

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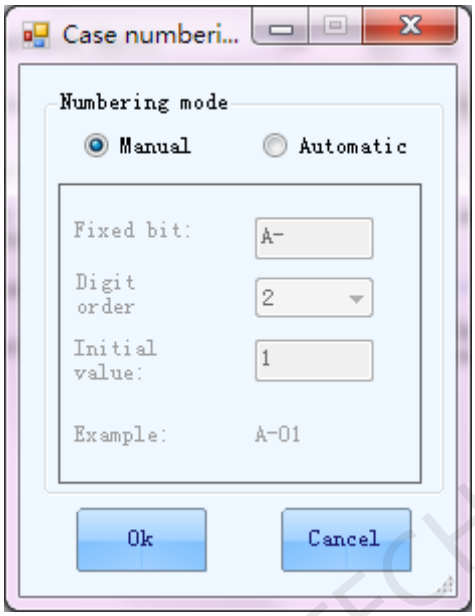
Case numbering is done manually by default. Click Advanced settings to modify numbering method and rule.



5) Edge correction parameter

Select "Automatic generation" or "Specified configuration"; when the specified configuration is selected, click "Add" to add the edge correction factor; now, you can select filling the correction parameters manually or check "File import" to import the correction parameter file which is generated through tool "Data Analysis And Processing".

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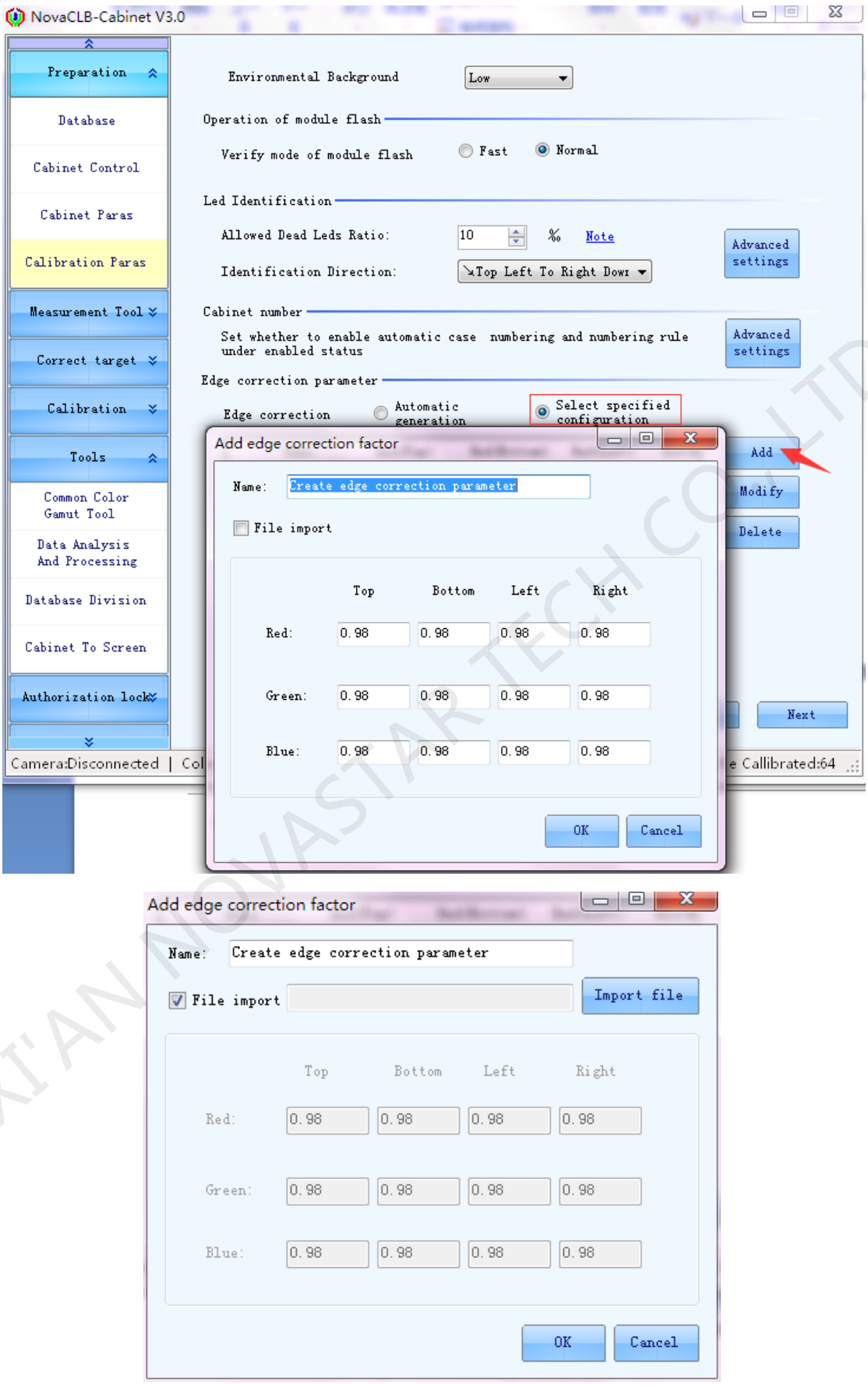

Fig. 4-10 Add edge correction factor

4.3 Configuration of measuring instrument

4.3.1 Camera

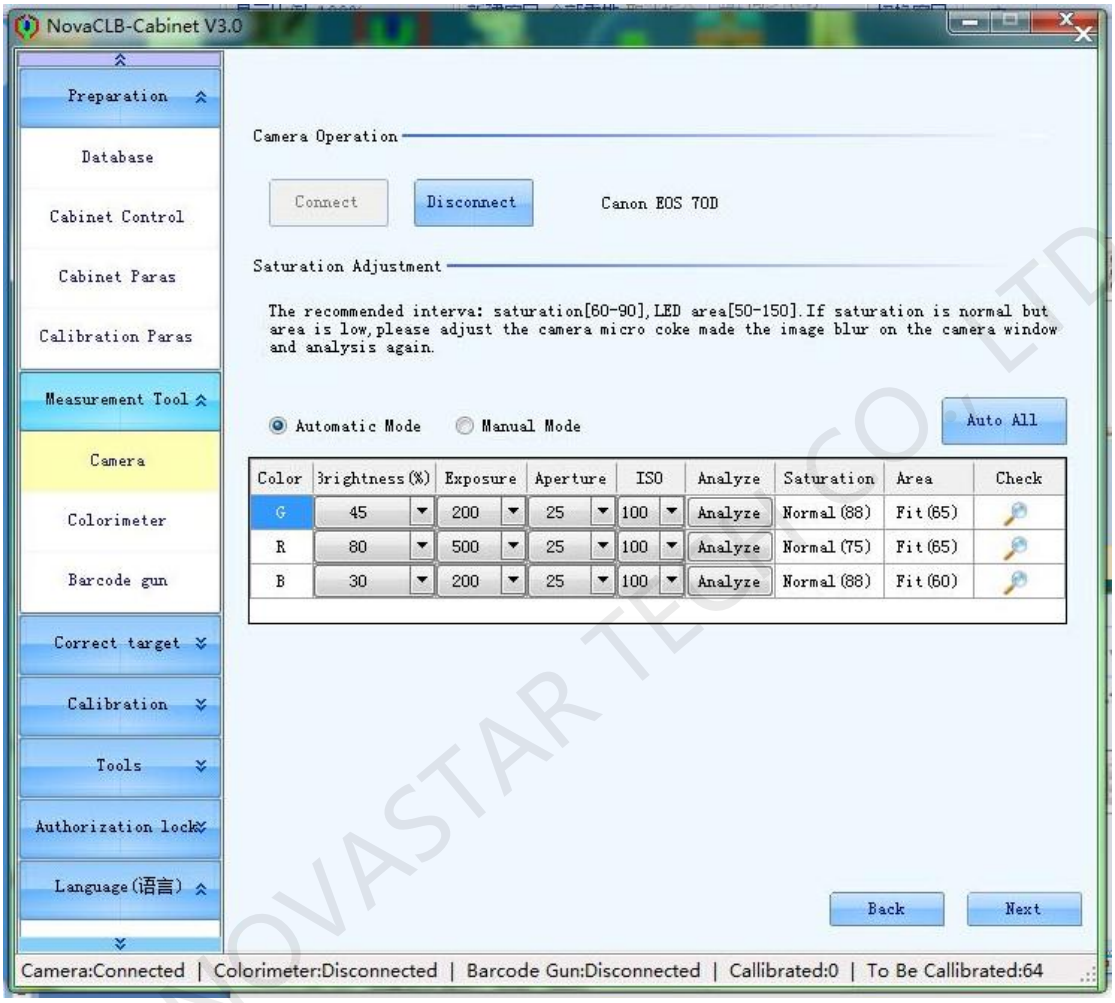

Fig. 4-11 Camera configuration

1) Camera preparation

a) Connect the camera to a computer via a USB cable, and toggle the camera switch on the ON state. Click the "Connect the Camera" button, and the camera can be controlled automatically via the software after it hinting "Connection Successful".

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b) Set the mode dial to M gear (manual), and set the lens focus to M (manual) If the lens has the anti-jitter function (Sigma is OS), turn off .

c) Switch between the eyepiece framing and LCD framing: start "real-time display shooting" in the menu of the camera, you will be able to switch between eyepiece framing and LCD framing by pressing.

2) Cameras focusing

When performing cabinet calibration, the camera lens shall be directed at the cabinet to be calibrated, and adjust the lens focal length and include the cabinet into the field of the camera. The number of pixel of the cabinet is generally less than the maximum resolution for the zone supported by the camera. Therefore, it's not advisable to adjust the focal distance to the maximum. Generally we will adjust the focal distance to let the cabinet take up the center of the image, that is, to take up half of the width and length of the image, i.e., reserve 1/5 of the total length and the width on the four sides. The imaging is too small or too large imaging will lead to the unsatisfactory of the calibration effect, so it needs to adjust the focus to make the imaging size closing to the standard size.

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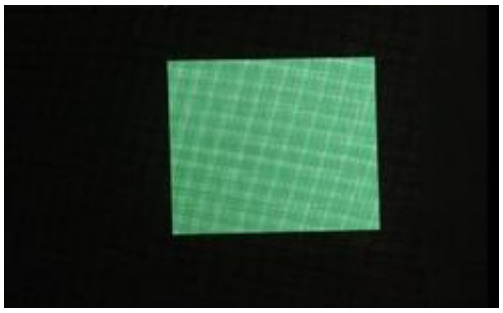
(a) Standard imaging



(b)The imaging is too small

(c) The imaging is too large

Fig. 4-12 Schematic diagram of the partition imaging size

After adjusting the imaging size to the proper size, increase pixel size to more than 50. Then analyze camera parameters and repeat adjustment until the imaging size is normal.

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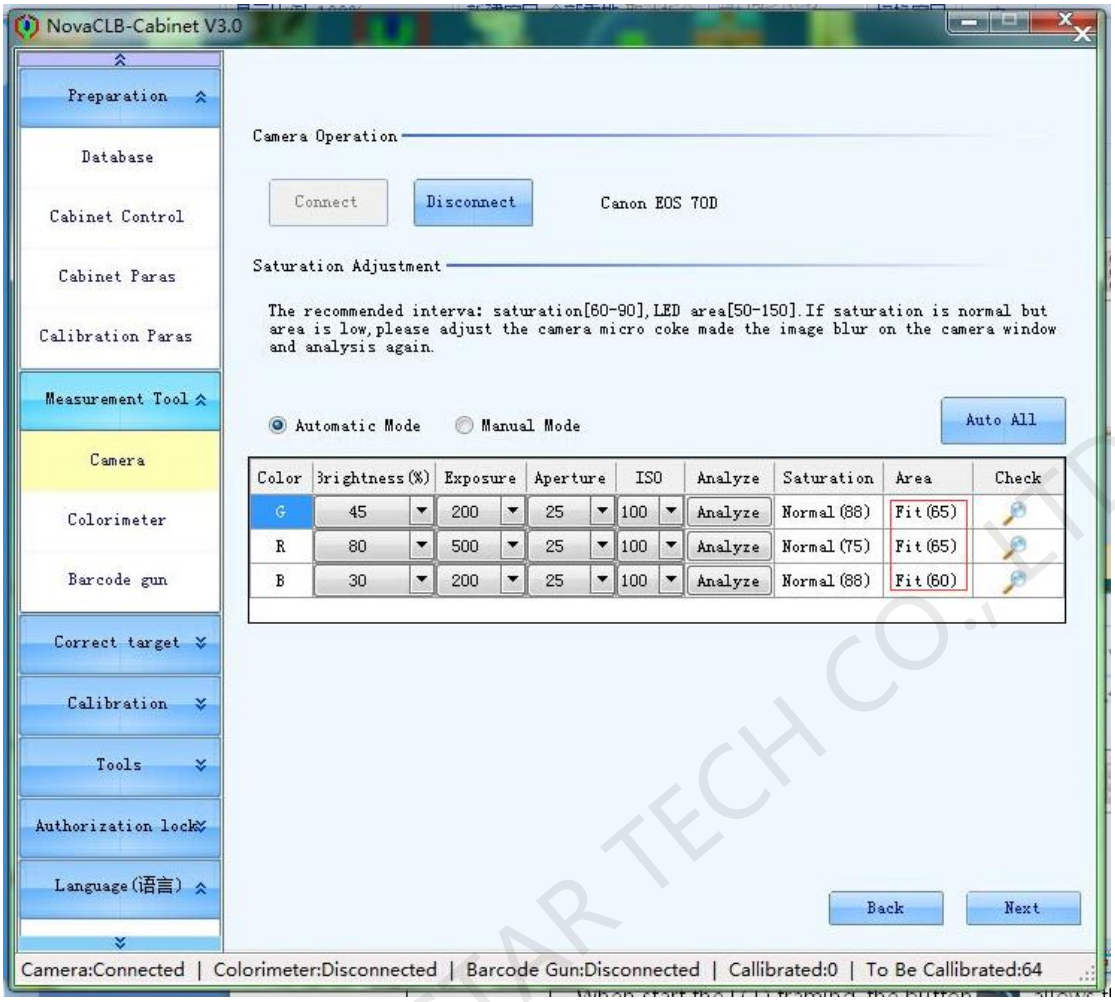

Fig. 4-13 Cabinet clear imaging schematic diagram

	When start the LCD framing, the button allows the image to switch among its original size, 5x magnification and 10x magnification

3) Saturation adjustment

Click the "Analysis" button, the software will calculate the saturation value automatically. Adjust the aperture size, exposure time and calibration brightness

value to make saturation displayed normally, and the normal value is within 60-100. The adjusting principle is adjusting the aperture size first, and then adjusting the exposure time, and finally adjusting the calibration brightness. Generally, the aperture value is inversely proportional to the saturation, and the exposure time and brightness is in proportion to the saturation. Click "Confirm Configuration" after the R, G and B saturation becoming normal.

4.3.2 **Colorimeter configuration**

Before using the colorimeter, install the CS2000 drive and connect the colorimeter with a PC over the USB interface without any transfer wire.

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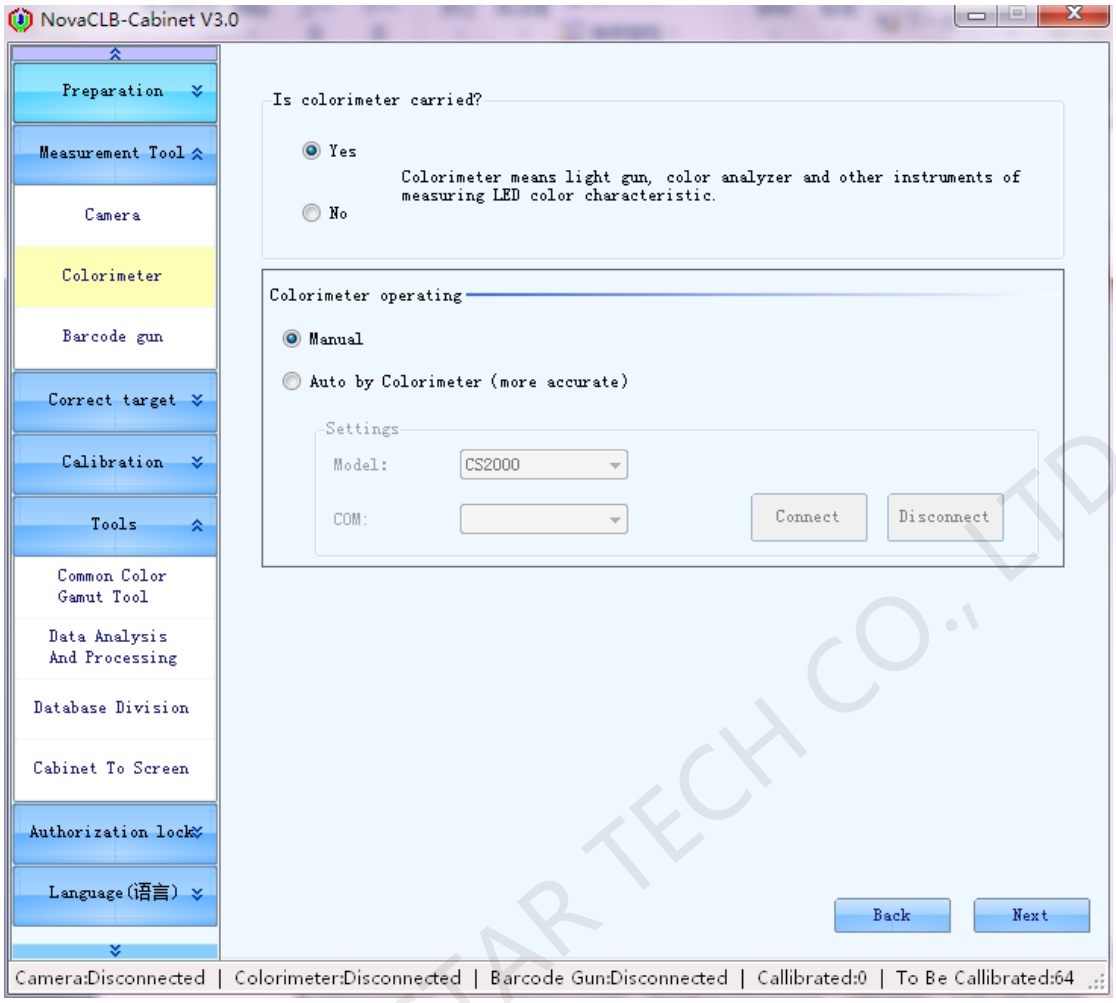

Fig. 4-14 Colorimeter configurations

4.3.3 **Barcode gun**

If the system is equipped with a barcode gun, the 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 the cabinet number anymore, because the barcode gun can automatically read the cabinet number.

The Baud rate of the software is 9600 by default, no modification is needed. The "COM", namely the computer device port corresponding to the barcode gun, cannot have conflict with other device ports.

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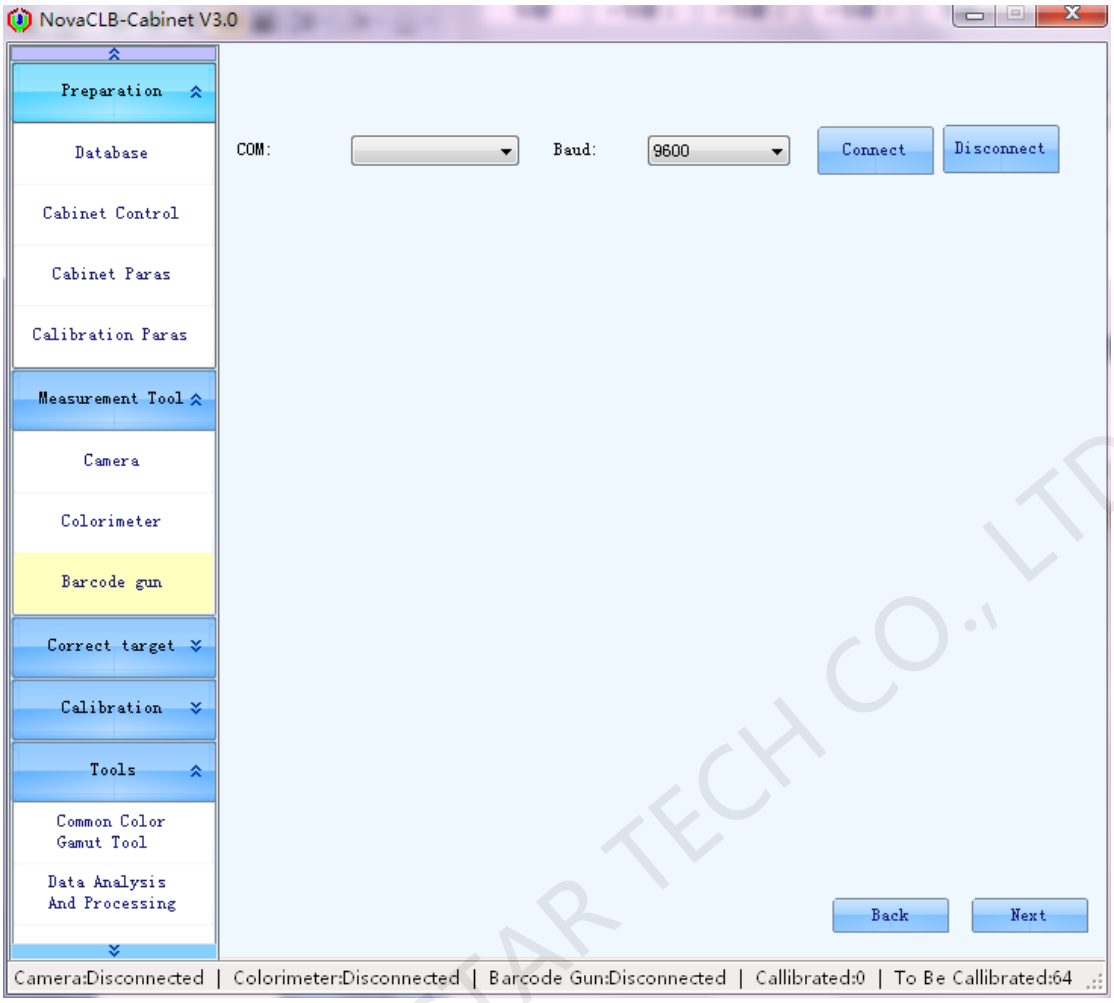

Fig. 4-15 Barcode gun

4.4 Correct target

NovaCLB provides different calibration target setting methods for users to select based on actual cabinet situation, **for example, the cabinets are from the same order; brightness and chroma between cabinets are different; cabinets are additionally ordered (cabinets delivered in different time need to be mixed).**

Calibration target setting falls into original value obtainment and target value setting.

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	1 If 10 cabinets have been calibrated, the expected value cannot be modified anymore; if the current expected value is far from satisfaction, discard the previous calibration and rebuild the database; and then re-calibrate all cabinets. 2 If the calibration expected value is modified when less than 10 cabinets have been calibrated, the previously calibrated cabinets need re-calibration and appear in the list of cabinets need re-calibration.

4.4.1 **There is no bright and color difference among cabinets or modules**

1) Measure original values

If no colorimeter is available, skip this step adopt default values.

2) Set the calibration target

The software supports the three modes of **brightness correction**, **Ordinary chroma correction**, and **Multiple bin chroma correction**. **Brightness correction** will only change the brightness of the three primary colors R, G and B, without sacrificing the color gamut of the display screen, but it could not eliminate the difference of chromaticity on the LED; **Ordinary chroma correction** will change the brightness of the three primary colors and sacrifice a small part of the color gamut, but it could make the LED brightness and chromaticity attain high consistency; **Multiple bin chroma correction** can eliminate difference of brightness and

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chroma between modules or cabinets, supports blue adjustment (mainly blue effect optimization; which will sacrifice the effect of the color white).

you can adjust the “brightness decay” pull rod and choose the proper brightness decay proportion. When “Ordinary chroma correction” is selected, the software will generate an coefficient in accordance with the “chromaticity calibration standard”; when “brightness correction” 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 correction 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.

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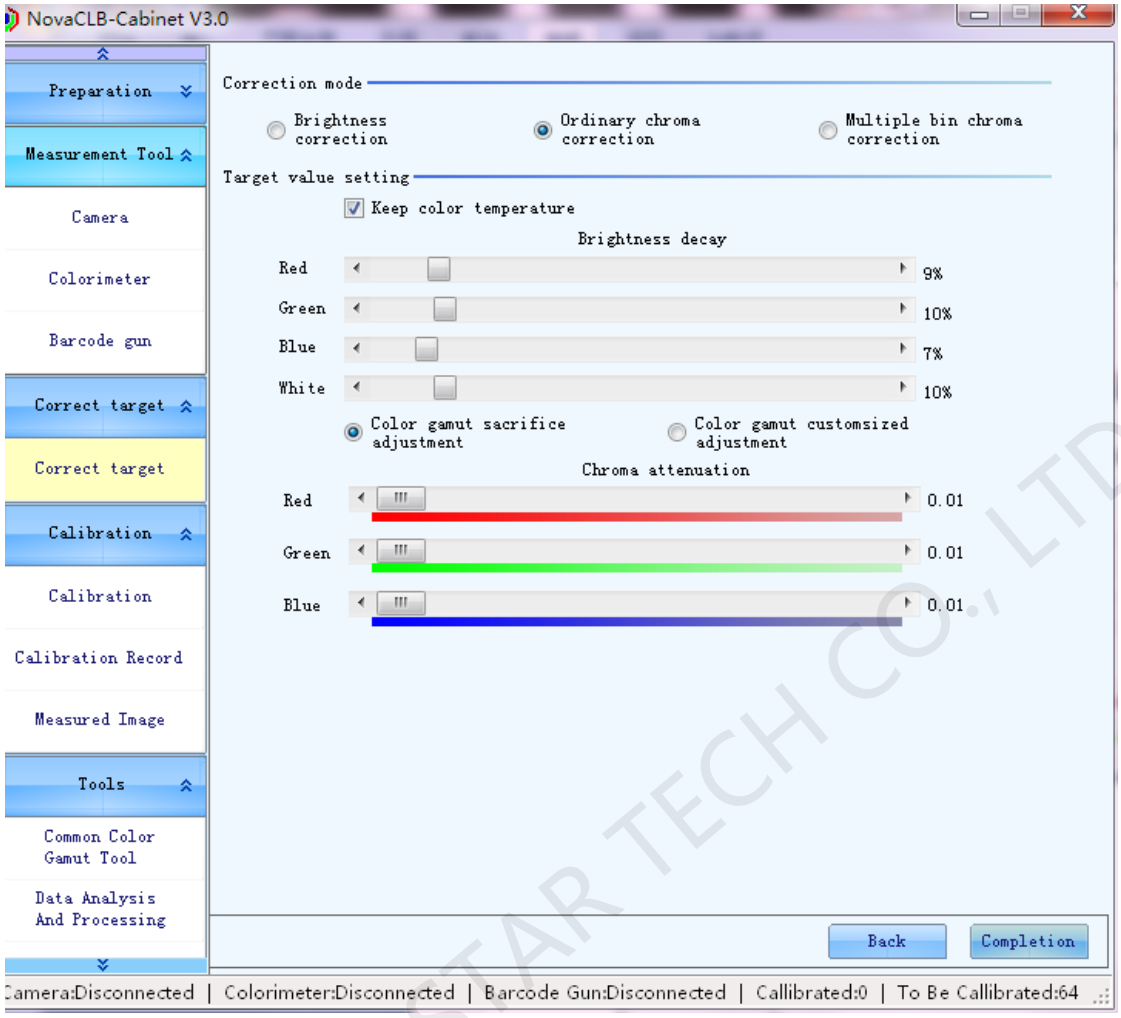

Fig. 4-16 Set the Correction mode and target value setting

Check "Keep color temperature". The color temperature of the screen will not changed when you pull the rod to set brightness decay.

Check "Color gamut sacrifice adjustment " to set chroma attenuation of each color.

Check "Color gamut customized adjustment" 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 that software default, the resulting target color gamut value is also relative target value.

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3) After target values are set, click "Finished" to enter the following interface. To modify a value, click "Re-set" to go back to the preceding step.

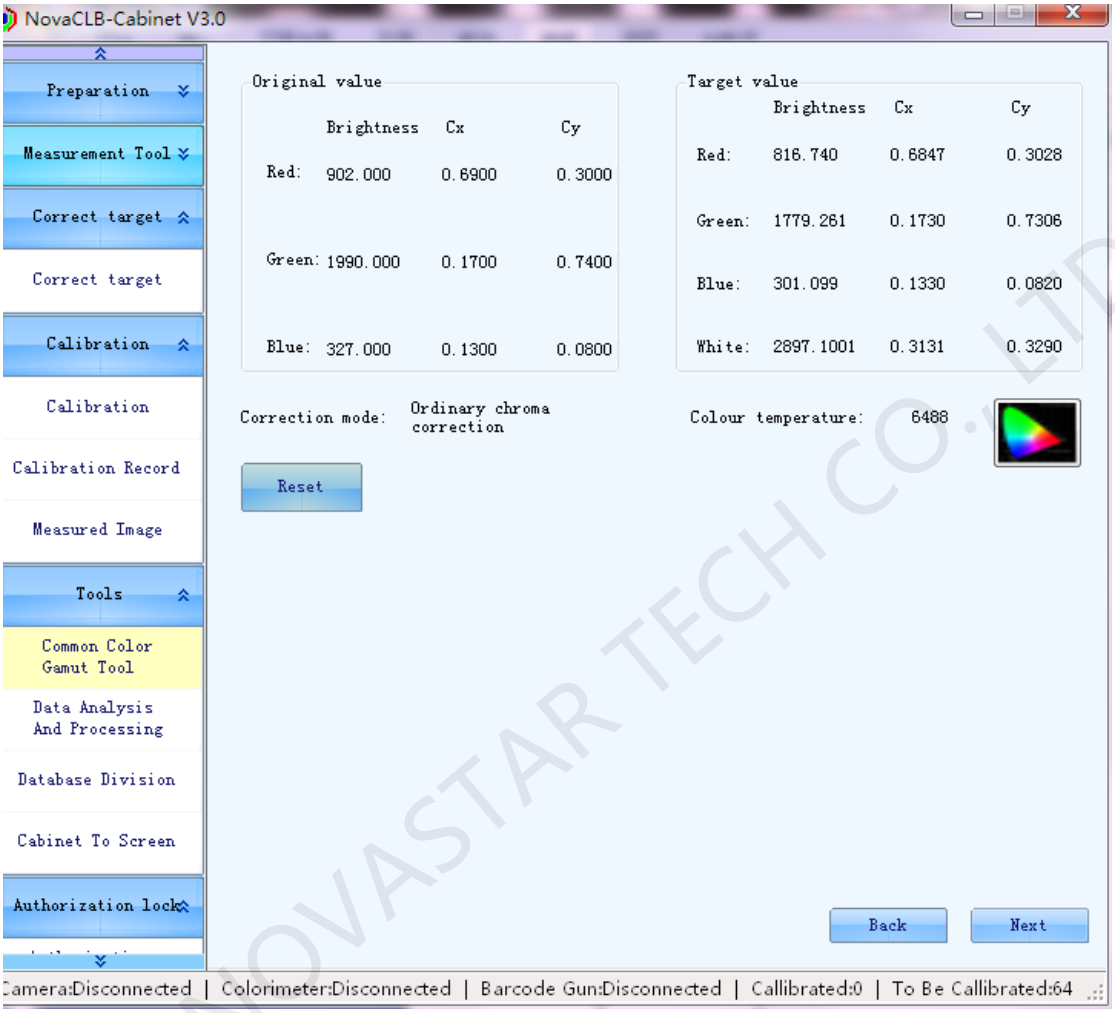

Fig. 4-17 Original value and Target value

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

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

1) Measure original values.

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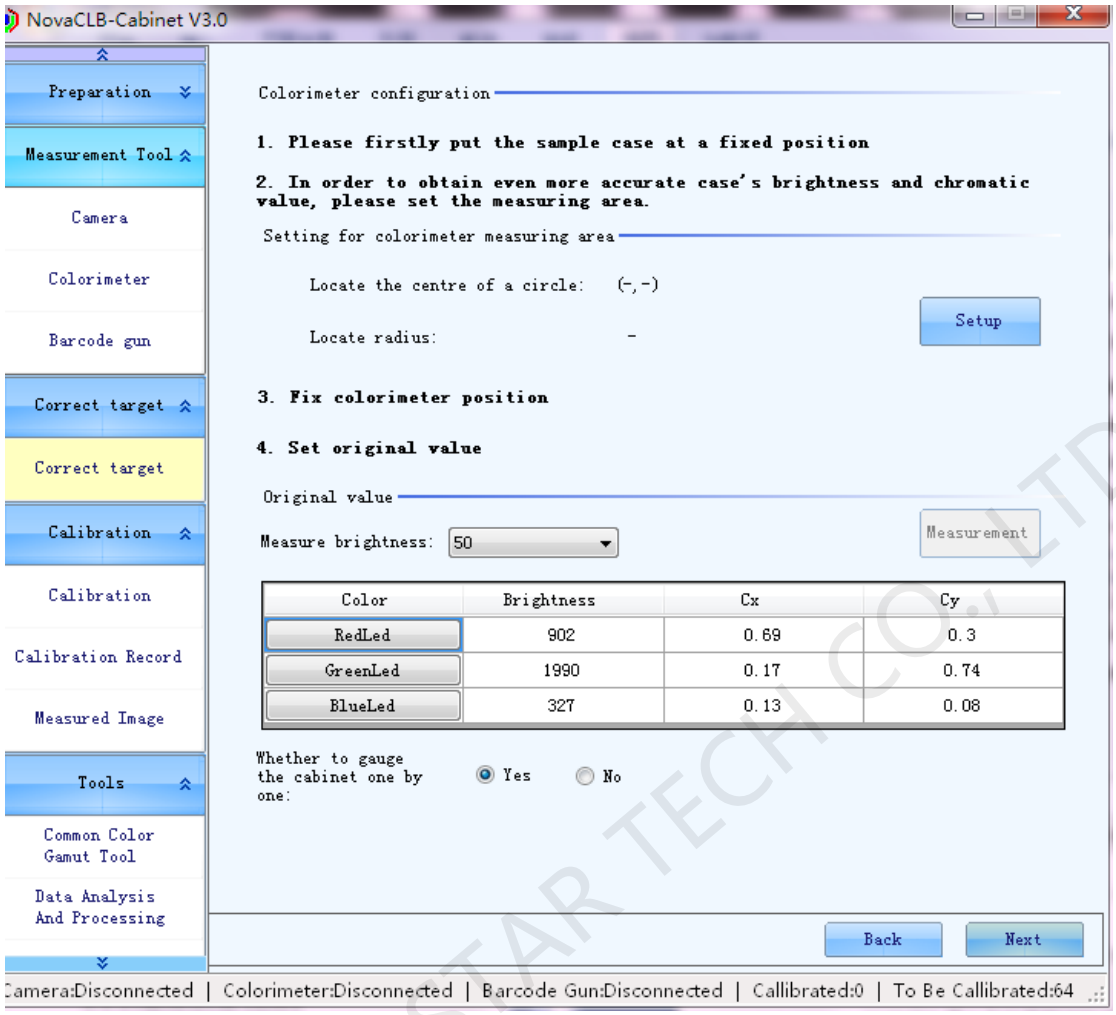

Fig. 4-18 Measure original values

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

Click the button

, show the following interface:

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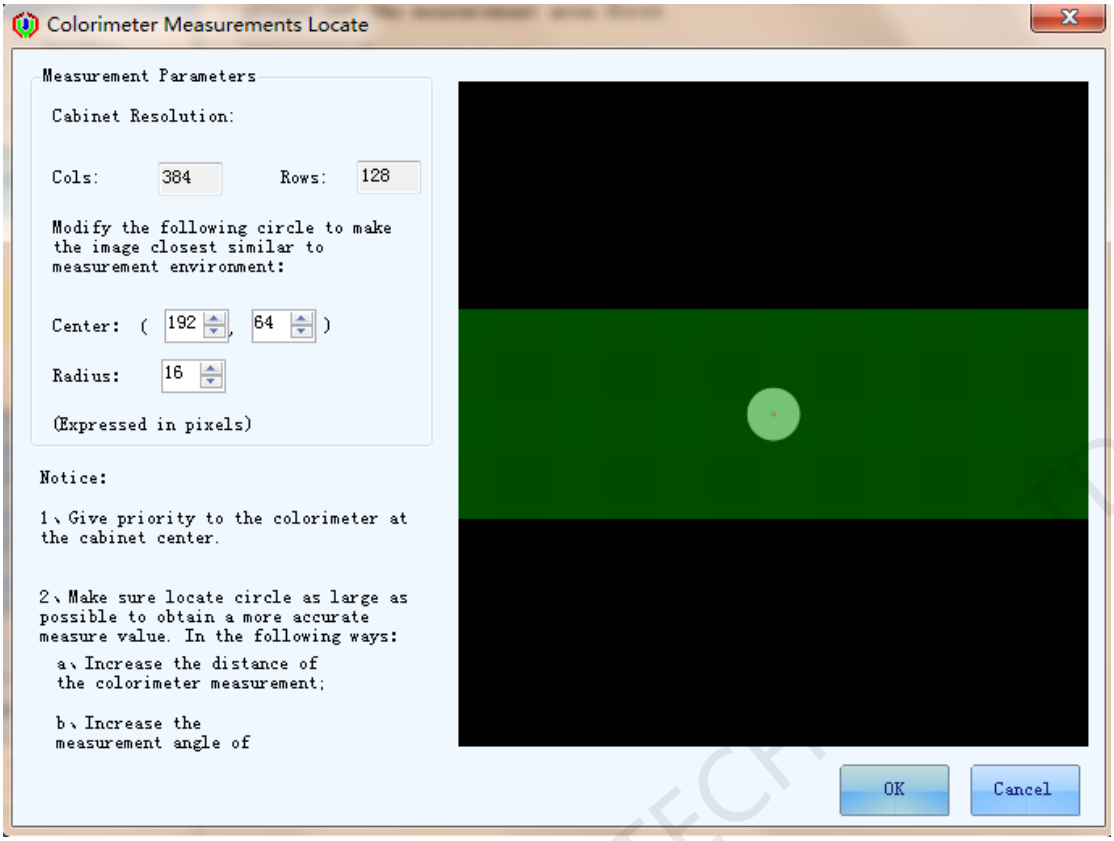


Fig. 4-19 Settings of measuring area

Modify the "center" and "radius" to make the figure shown in the green image above closest similar to the position and ratio of the actual colorimeter' s measurement area in the cabinet, and then click "ok".

Measurement mode: There are two mode such as the "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, the software will automatically control the colorimeter to make the measurement. At present it supports CS-2000 and CS-100A light gun produced by Konica Minolta Inc.

Measured values: Regulate measurement brightness of colorimeter.

Whether to gauge the cabinet one by one: Check "gauge one by one", 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 and CS200A), when executing "gauge one by one", the software will automatically collect the brightness and chromaticity measured values of the cabinets; and if it is not connected to a light gun, the following dialogue box will pop out when start calibration, requesting the user to manually fill in the measured value. Click "OK" and go to the next step.

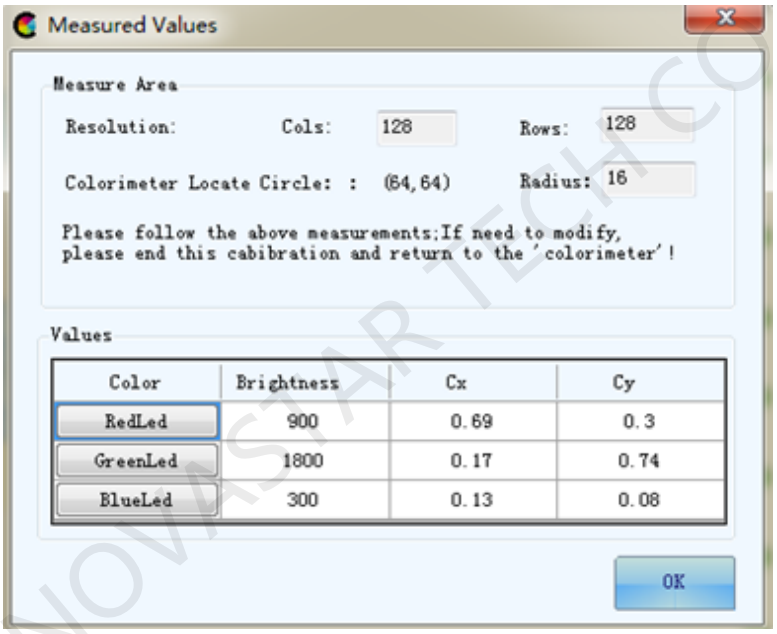


Fig. 4-20 Brightness and chromaticity measurement

2) Select a calibration mode and set target values.

The software supports the three modes of **brightness correction**, **Ordinary chroma correction**, and **Multiple bin chroma correction**. **Brightness correction** will only change the brightness of the three primary colors R, G and B, without sacrificing the color gamut of the display screen, but it could not eliminate the difference of chromaticity on the LED; **Ordinary chroma correction** will change the brightness of the three primary colors and sacrifice a small part of the color gamut,

but it could make the LED brightness and chromaticity attain high consistency; **Multiple bin chroma correction** can eliminate difference of brightness and chroma between modules or cabinets, supports blue adjustment (mainly blue effect optimization; which will sacrifice the effect of the color white).

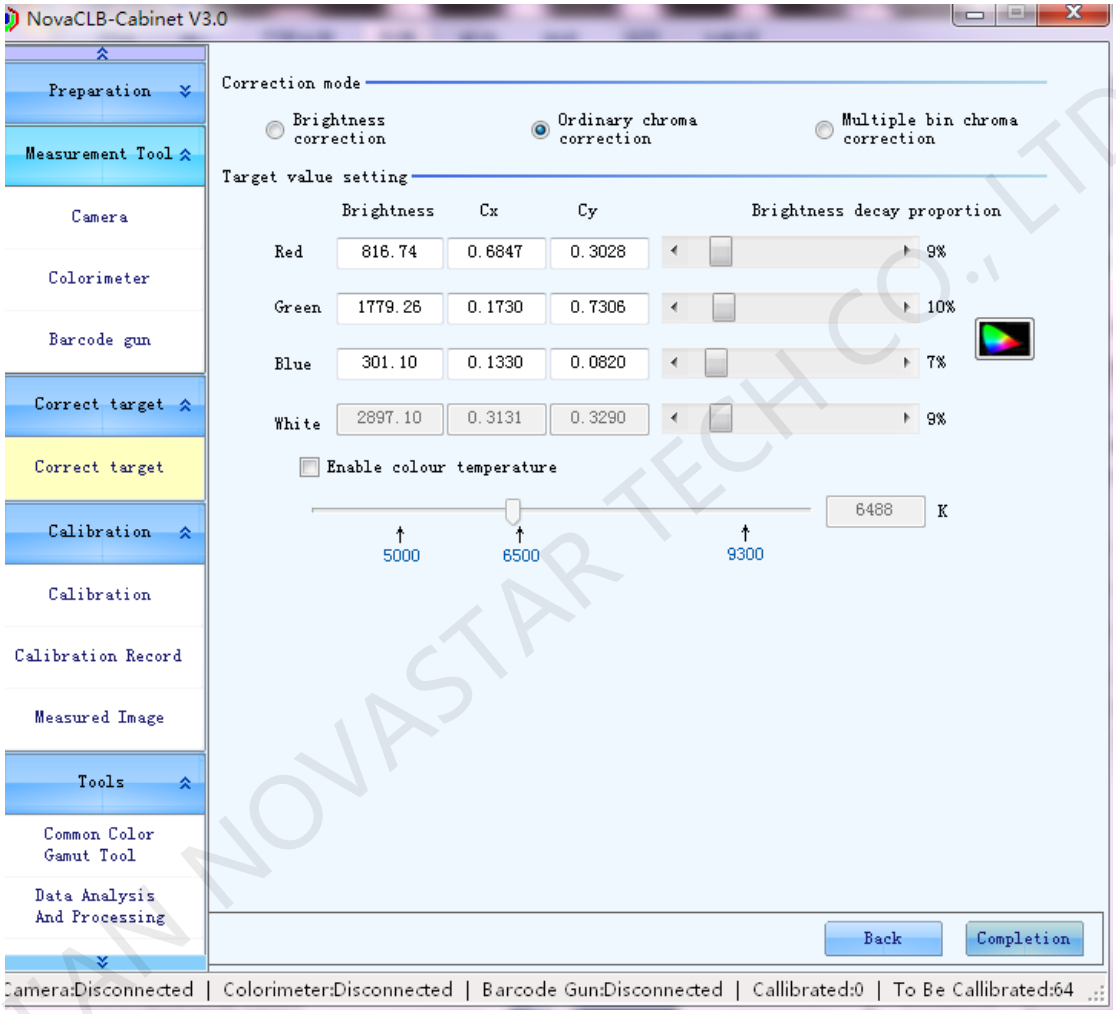


Fig. 4-21 Set Calibration target

Use the following methods to set calibration targets:

you can adjust the “brightness decay” pull rod and choose the proper brightness decay proportion. When “chromaticity” is selected, the software will generate an coefficient in accordance with the “brightness and chromaticity calibration standard”; when “brightness” is selected, it will generate the coefficient in

accordance with the “brightness 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.

Select “Enable color temperature” to set a proper color temperature and then modify other parameter values.

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

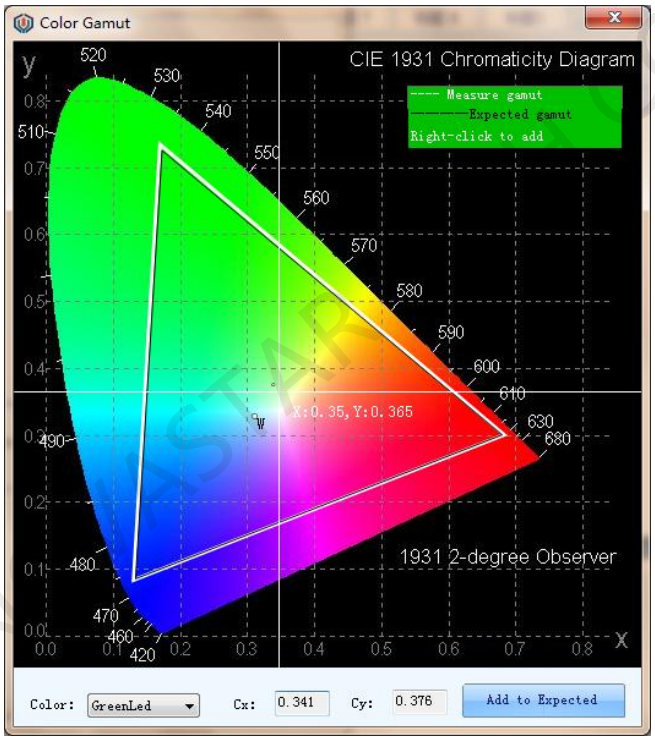


Fig. 4-22 Color gamut figure

The white triangle in the above diagram is original value of the software; if it is measured using the colorimeter, it is the real color gamut of the cabinet, and the black triangle is the expected color gamut to be reached after the calibration. With this diagram, we can clearly see the change of cabinet color gamut before and after the calibration. By right clicking to “add”, we can change the expected color

gamut, and by right clicking to “expand”, we can set the true color gamut of the cabinet as the expect color gamut, i.e., sacrificing no color gamut.

3) After target values are set, click “Finished” to enter the following interface. To modify a value, click “Re-set” to go back to the preceding step.

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

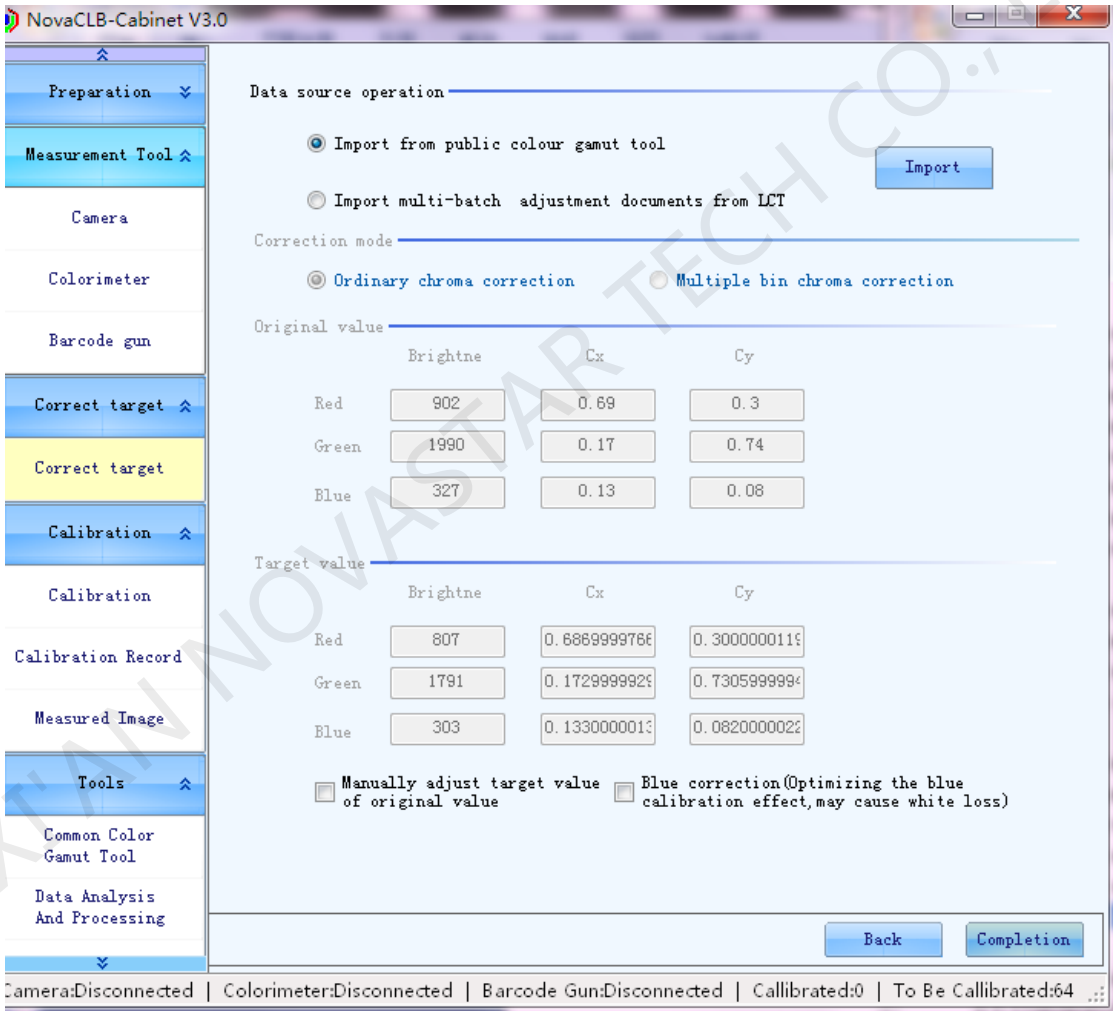
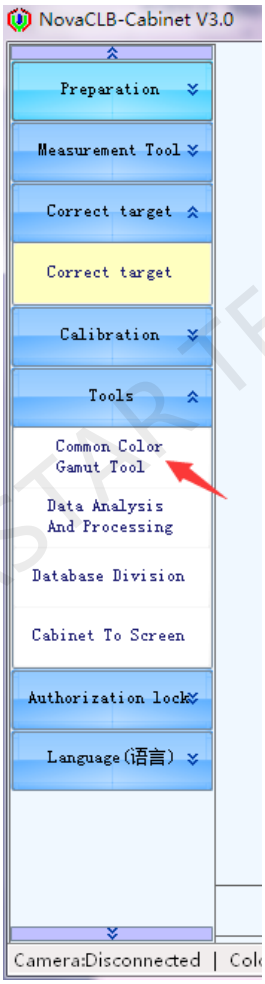


Fig. 4-23 Calibrating cabinets additionally ordered

1) Import original values from public color gamut tool.

You want to correct one batch, you must import the original value and the target value of this batch.

Click “Common color gamut tool” under the toolbar at the left screen of the software, and take the obtained common color gamut value as the target value of calibration.



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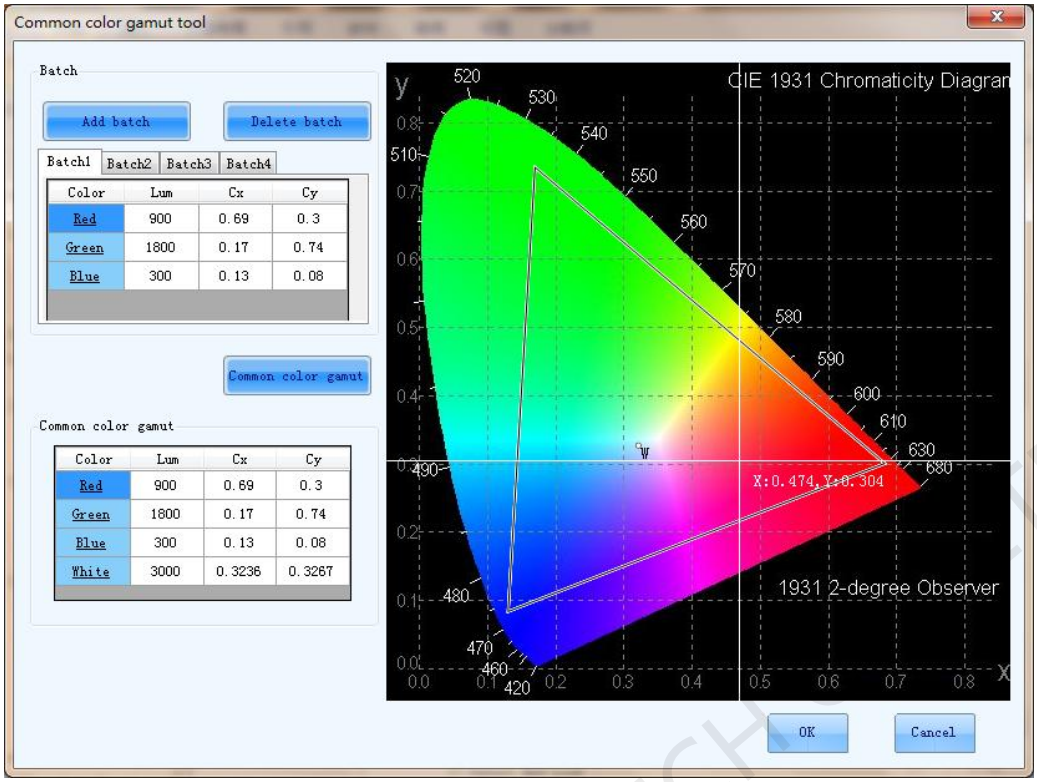


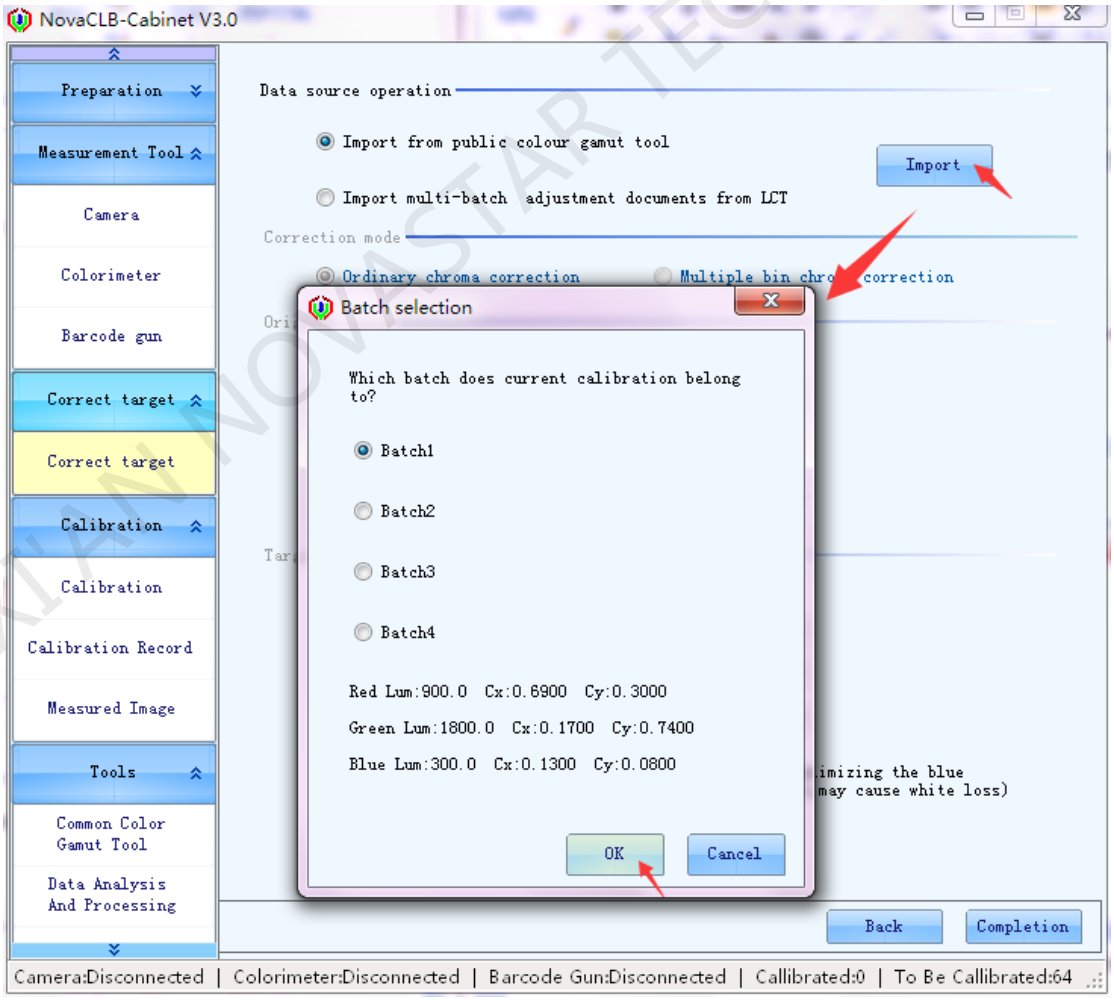


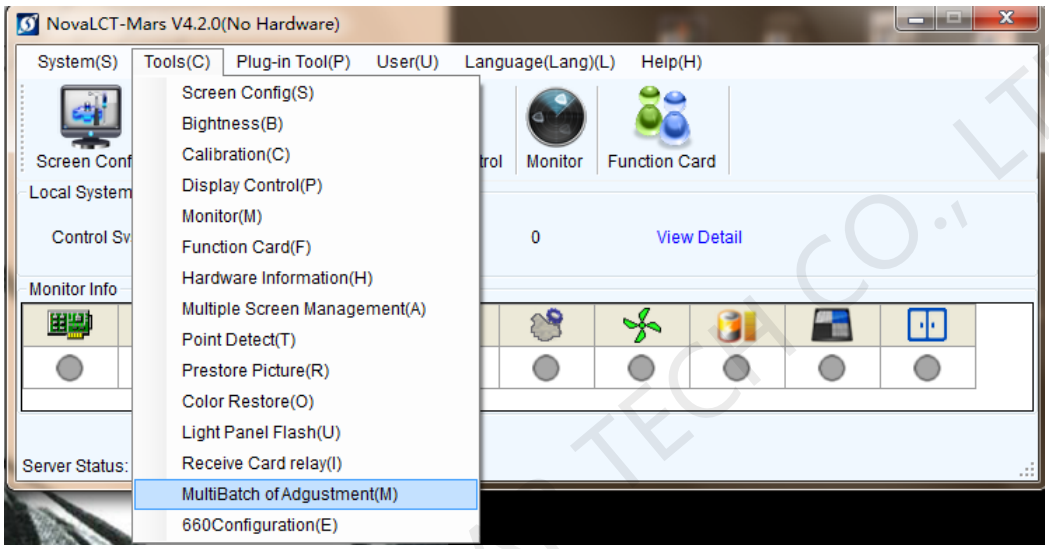
Fig. 4-24 Use common color gamut tool to set the target value of calibration

2) File import

This file is .lxy file generated through LCT.

To correct which batch, you must import the file of the current batch.

The imported target value of LCT file can only modify the rightness and chroma of the color white.



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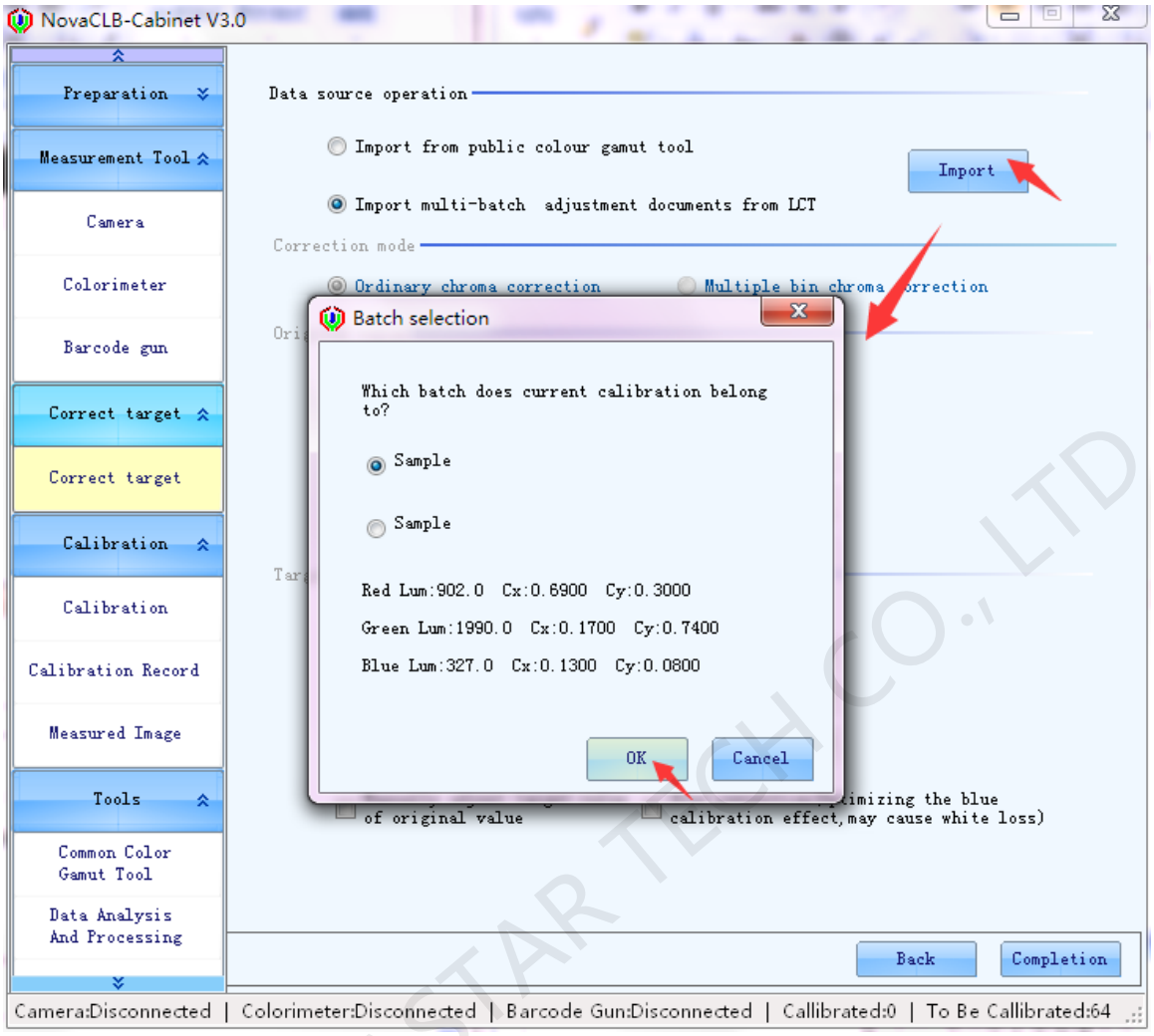

Fig. 4-25 Import expected values file

3) Manually adjust screen’ s original and target brightness and chroma for the colors RGB.

The software supports the two modes of **Ordinary chroma correction**and **Multiple bin chroma correction**. **Ordinary chroma correction** will change the brightness of the three primary colors and sacrifice a small part of the color gamut, but it could make the LED brightness and chromaticity attain high consistency; **Multiple bin chroma correction** can eliminate difference of brightness and chroma between modules or cabinets, supports blue adjustment (mainly blue effect optimization; which will sacrifice the effect of the color white).

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Select “Manually adjust original or target value”, select a calibration mode, select a value, and then double-click the value to modify it.

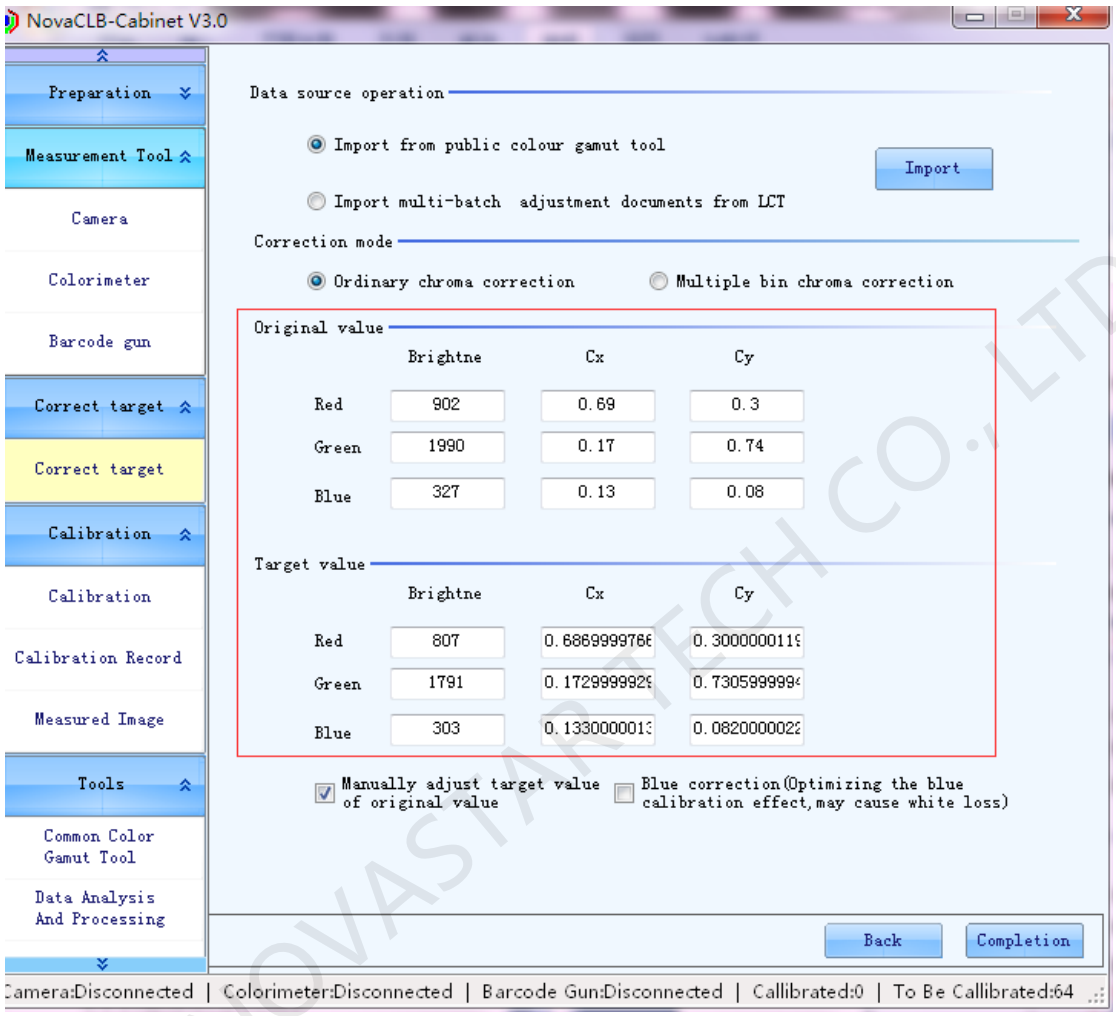

Fig. 4-26 Manually adjust target value of original value

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4.5 Calibration

4.5.1 Calibration

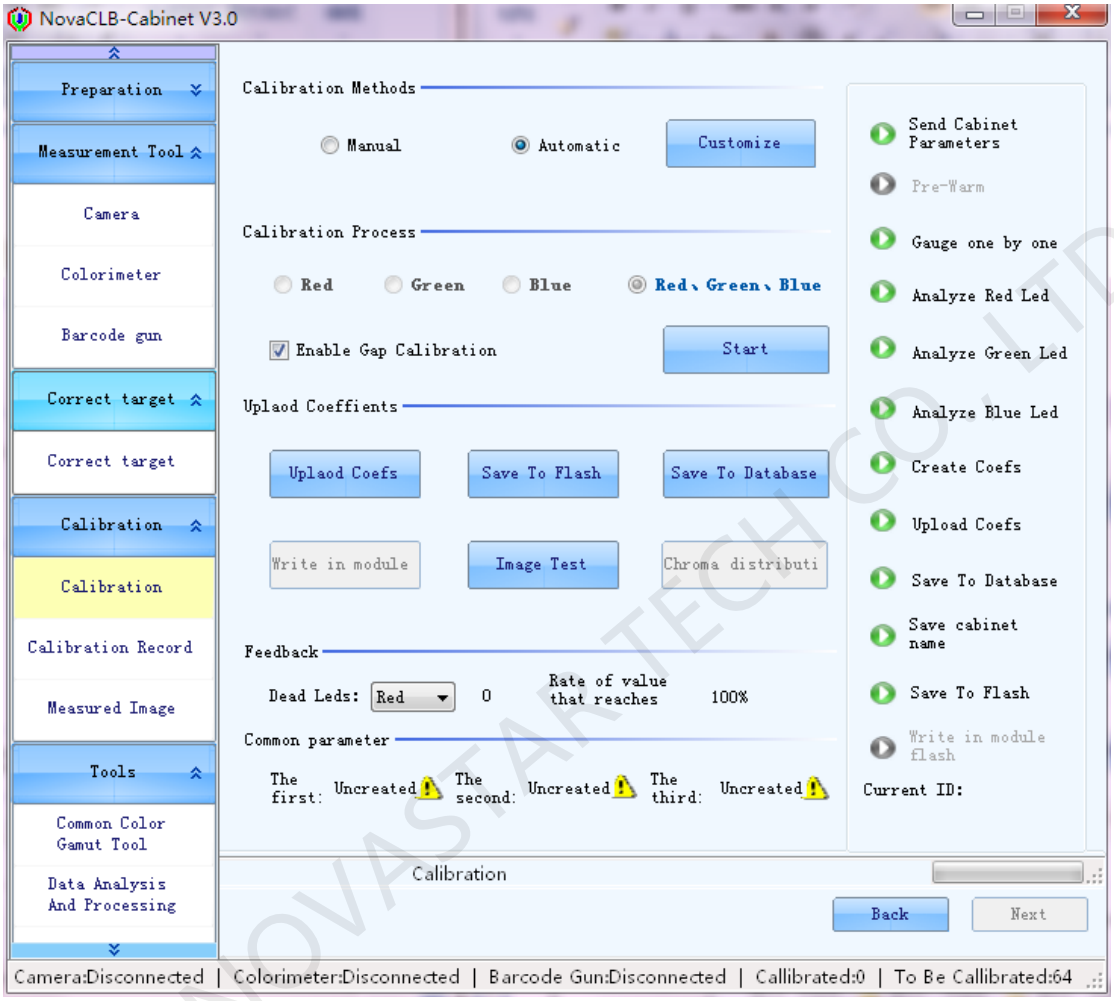

Fig. 4-27 Calibration

Calibration methods : Divided into two types: "Manual" and "Automatic".

1) **"Manual"**, means to separately conduct each step of the calibration, which requires that the user to manually operate the next step after finishing the previous step on the software. The advantage of this is that if the results are not satisfactory after conducting any one step, can re-conduct.

2) **"Automatic"**, the so-called calibration is in fact adding each step of the "Manual" into an automatically operated process. After clicking

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Start, the software will automatically operate the process defined by the customer. After selecting "automatic", the user can click "customize" button, and select the step to be automatically executed by the software, as shown in the screenshot below:

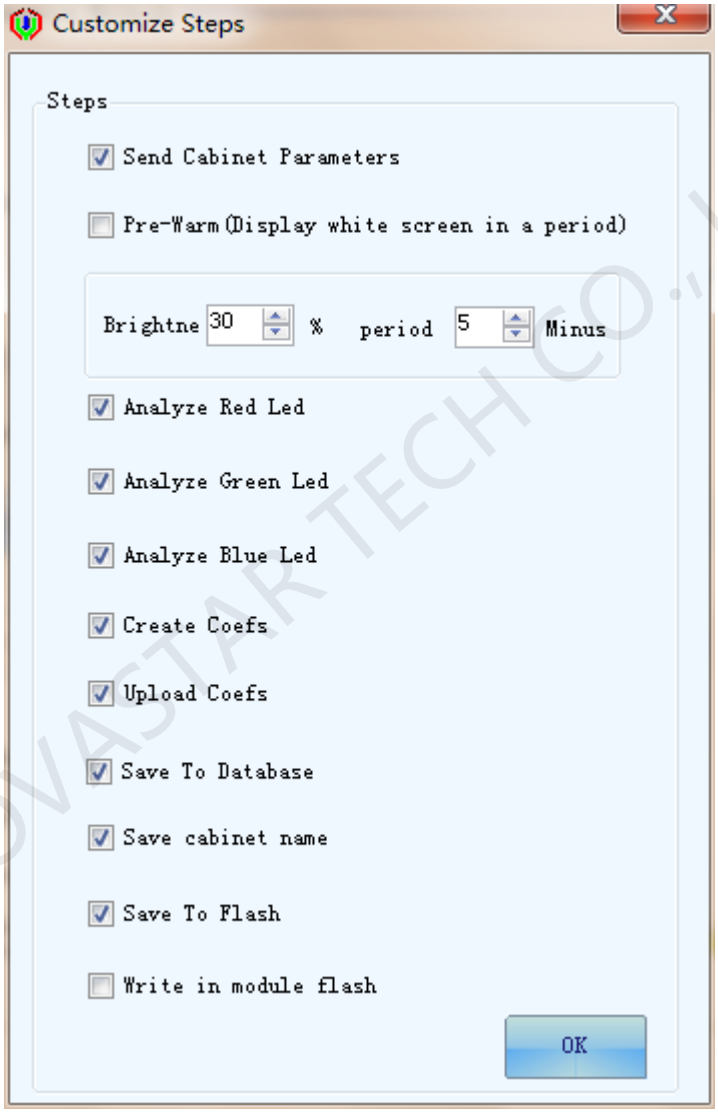

Fig. 4-28Custom automatic calibration process

The "Pre-Warm" in links as shown in above figure are specific to the "automatic calibration".

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- **"Pre-Warm" mode:** Check "Pre-Warm" option, it will start the pre-heat mode. This mode is to prevent the temperature change of cabinets after they work for a while, and thus lead to the change of brightness and chromaticity uniformity of the cabinets, therefore, before the calibration, the cabinets must be pre-heated. This function is recommended for cabinet with poor dissipation, the parameter can be default value.

1) Start 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 gun, scan the bar code of the cabinet directly and the calibration will be started automatically;

on the pop-up "cabinet ID" window, you can see the cabinet ID has been read automatically, just click "OK" .

when the bar code barcode gun is not connected, click "start", the "cabinet ID" window will pop out, in which you need to enter the ID of the present cabinet:

If that the cabinet ID was set automatic mode in 4.2.4 Calibration parameters , on the pop-up "cabinet ID" window, you can see the cabinet ID has been generated automatically, just click "OK" .

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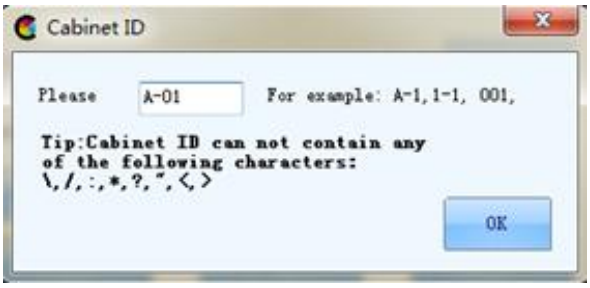

Fig. 4-29 Cabinet ID

"Cabinet ID" is the unique identifier for the cabinet in the batch, and can't be repeated. After input is completed, click "OK" button to start the calibration, button text changes to "End Calibration" at the time.

b) During which, the calibration software will automatically control the screen to show the corresponding colors, operate the camera to collect the image and make intelligent analysis. The corresponding progress can be checked from 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 hint appears during calibration, the process stops automatically. Follow the hints to change the settings and then click "Start Calibration" button again to start the calibration.

2) Adjust Calibration target

Before generating a coefficient, the following interface will show. To modify a calibration value, adjust the target value on the interface or directly adjust the color gamut and click "Apply" to apply the new value. Subsequent cabinets will use this value as well.

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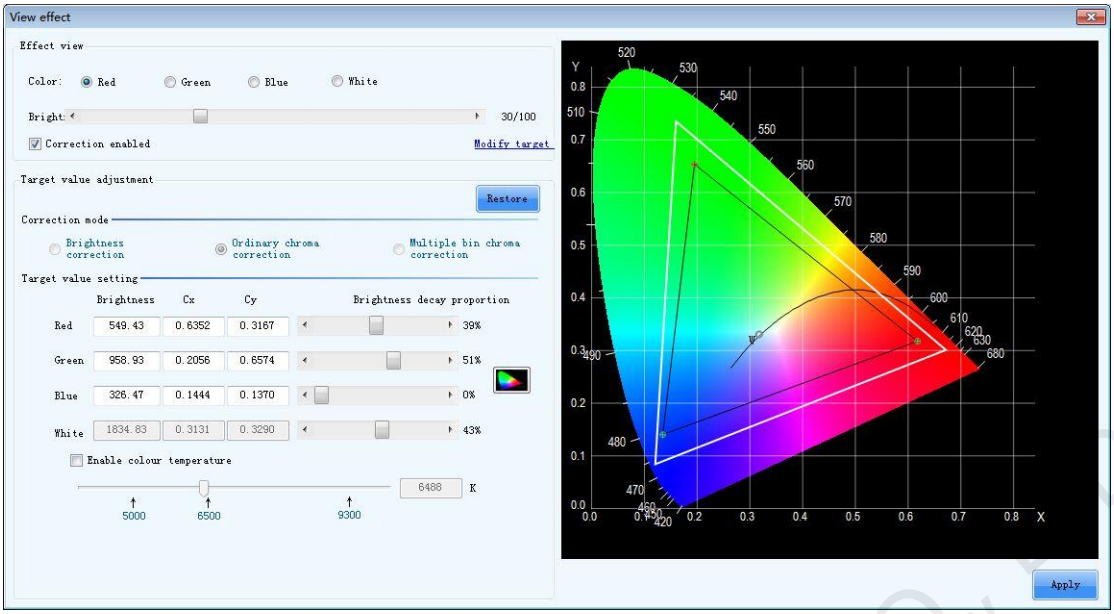

Fig. 4-30 **Adjust Calibration target**-- Colorimeter is available.

3) Coefficient uploads

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

b) Click the "Save to Hardware" button to save the generated coefficients to the hardware.

c) Click the "Save to database" button to save the generated coefficients to the database.

d) Click "check calibration" button, the software will check whether the coefficient saved in the flash chip of the present cabinet is consistent with

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the calibration coefficient sent to the cabinet from the software, If there is no difference, the software will save the coefficient in Flash.

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

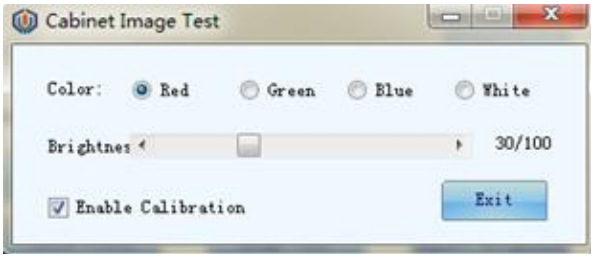

Fig. 4-31 Cabinet picture control

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

4) Calibration information feedback

This column of information 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 calculated for three times during calibration process, and 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 parameters will be automatically saved in the database.

6) The calibration for the first cabinet is completed

If "general calibration" is selected, after each one step is completed, the result of

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the single step will hint, such as "analysis completed" or "uploading of coefficients completed", etc... If in "automatic calibration" mode, it will display the information of the present step execution status in the status bar below, and update the icon display on the right in real time. After all the calibration steps are performed, a dialogue box as shown below will pop out to hint that the calibration of the present cabinet has been completed.

After the calibration of the cabinet is completed, the screen body 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.

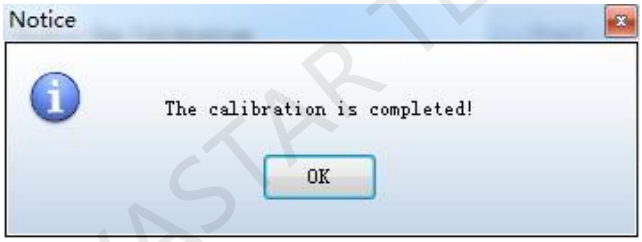

Fig. 4-32 Automatic-calibration completion hints

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4.5.2 Calibration record

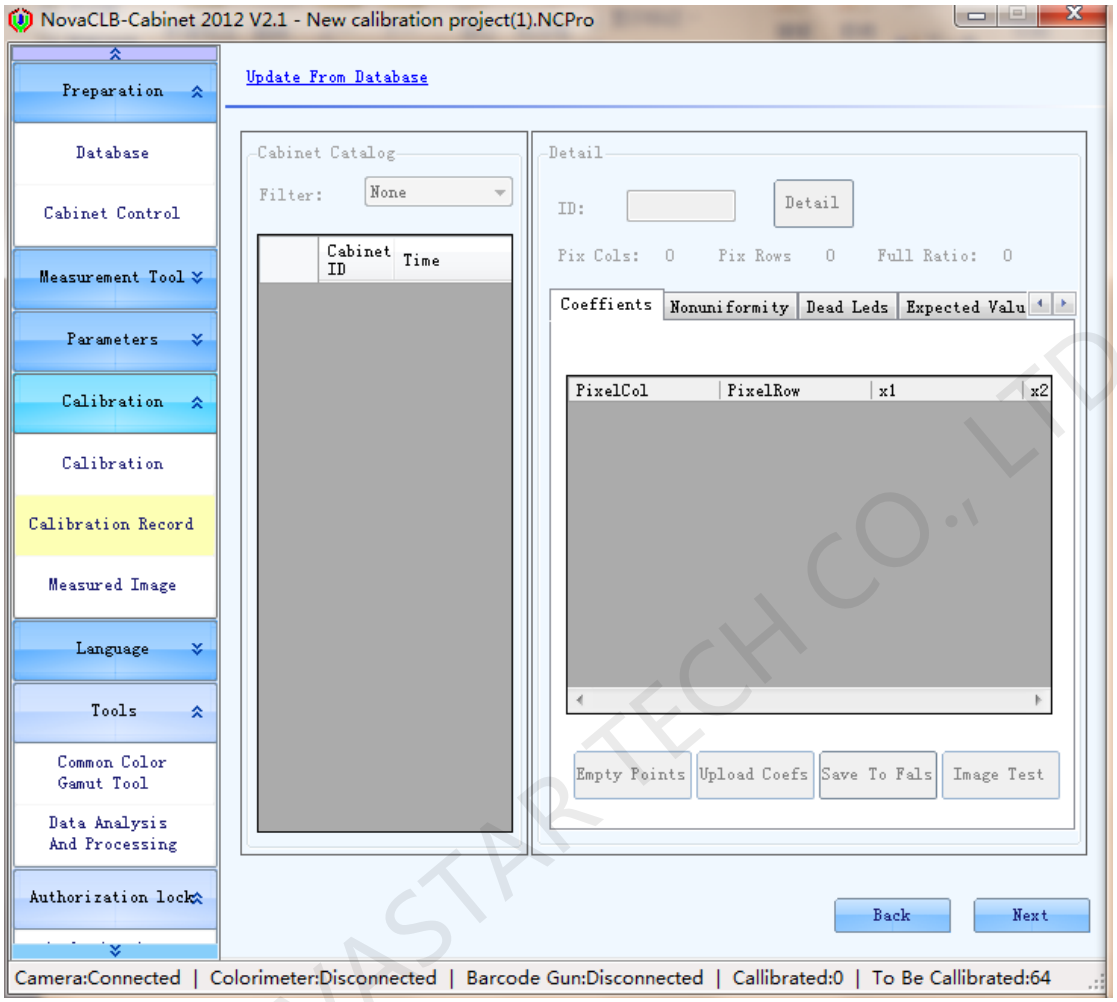

Fig. 4-33 Calibration record

1) **Cabinet contents list:** This list shows all the cabinet ID stored in the database. By double-clicking an entry or selecting an entry and clicking the "check" button, the right column will show the detailed data information of the cabinet.

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

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4.5.3 Measured image

Measured image is collected from cabinet; reasons for wrong "Calibration" sometimes can be positioned through this image.

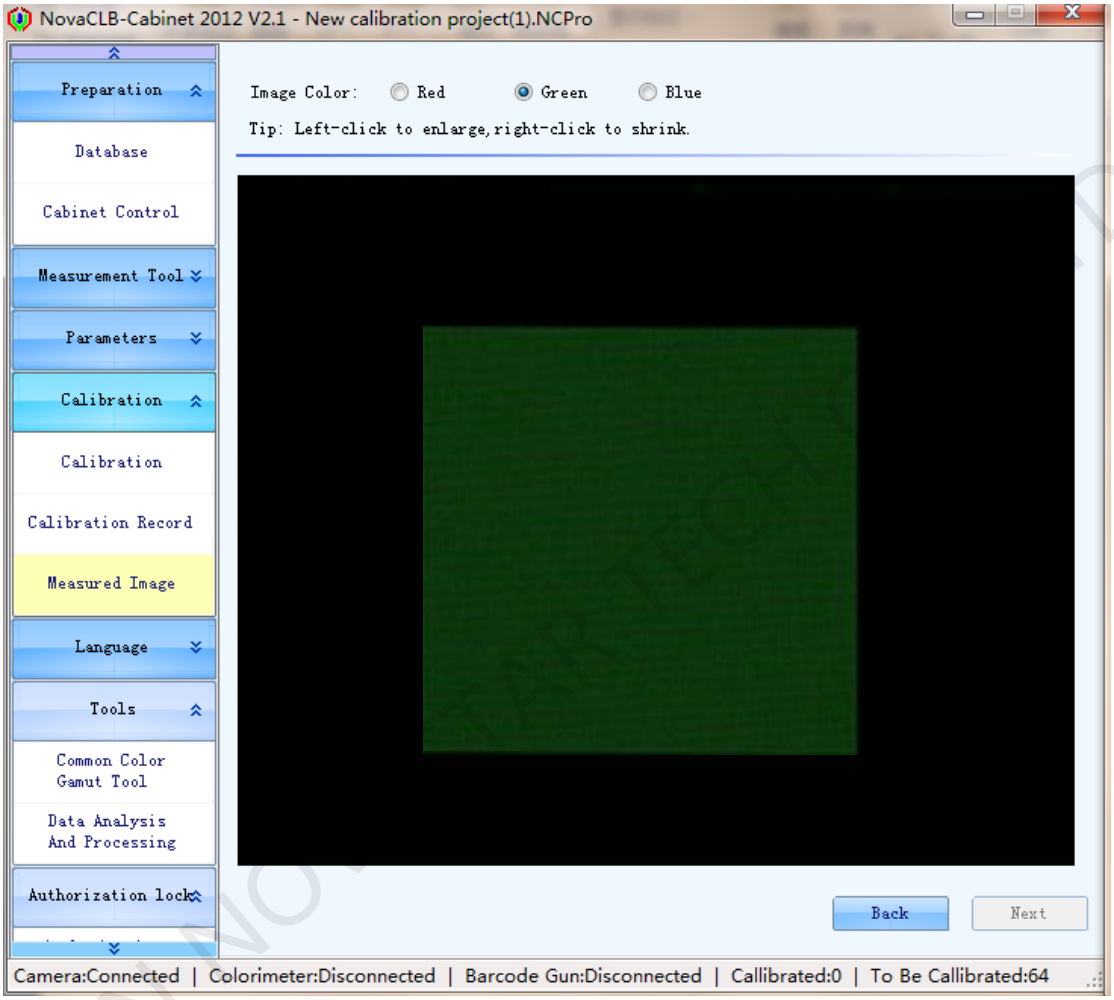

Fig. 4-34 Measured image

5 Calibration of subsequent cabinets

Replace the next cabinet, then follow the steps shown in below figure to calibrate subsequent cabinets:

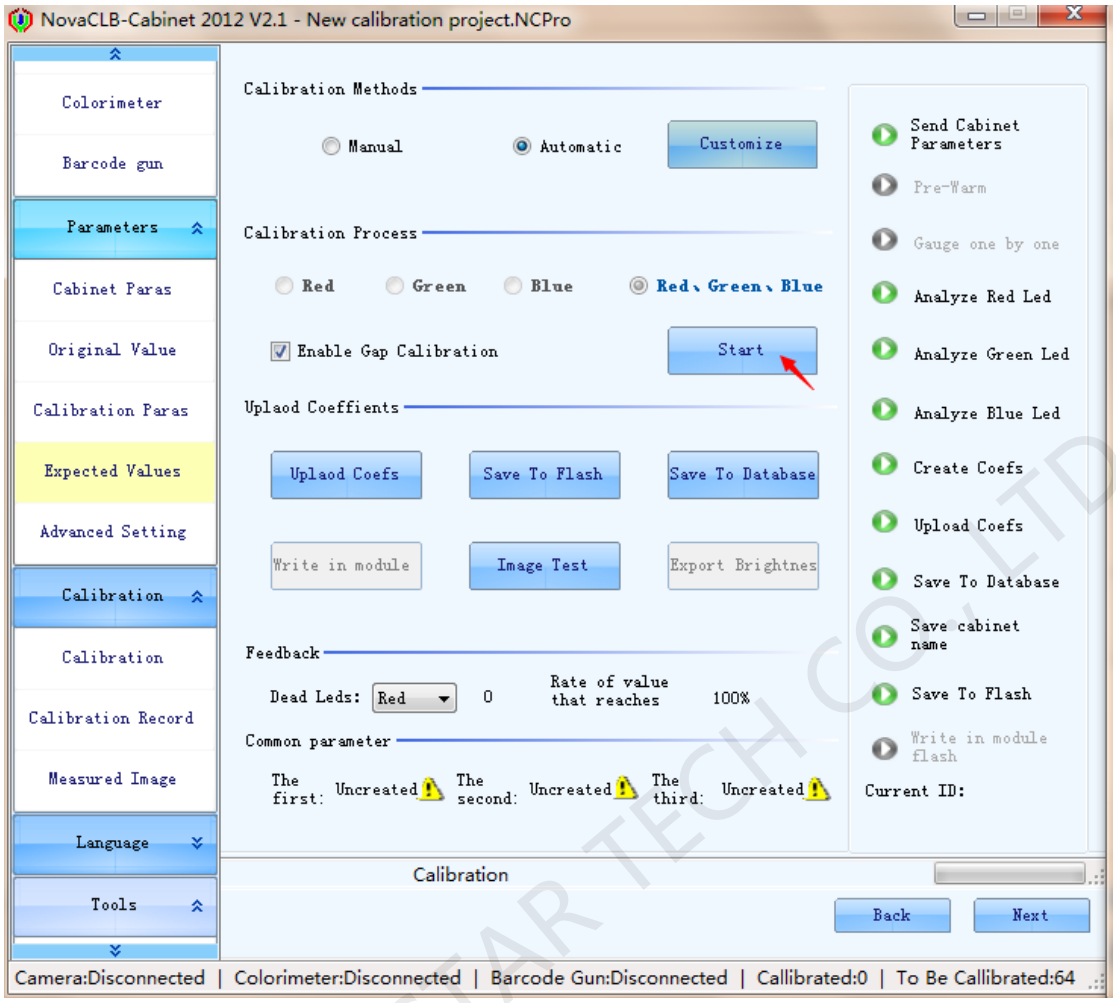

Fig. 5-1 Start calibration for subsequent cabinet

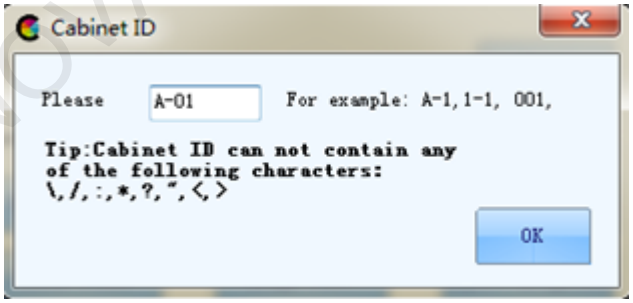

Fig. 5-2 Subsequent cabinet ID

Click "query effect" on the main interface to change the target value. After the modification, click "Preview" to view the effect and then click "Apply". Subsequent cabinets will use this value as well.

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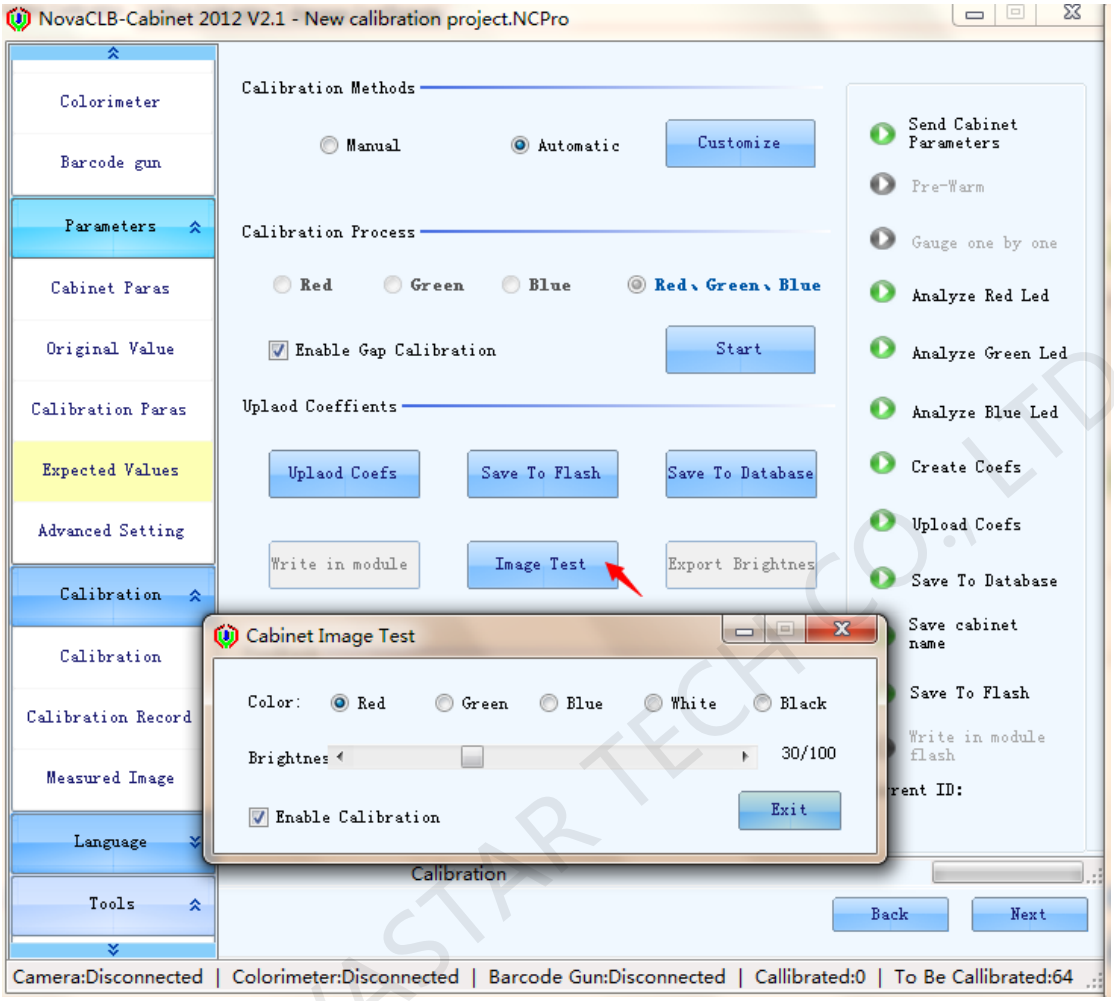

Fig. 5-3 Image Test

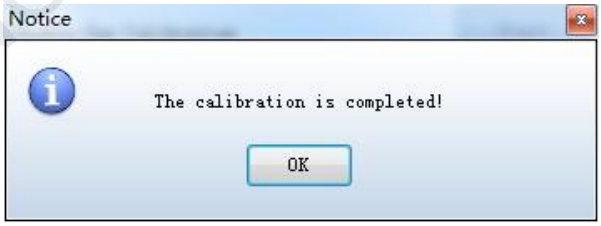

Fig. 5-4 A key calibration for subsequent cabinet is completed

	1.It shall be guaranteed that during the entire calibration process the location of the pedestal of the cabinet to be calibrated and the camera, focal length and configuration shall remain

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	unchanged. In case the improper operation result in the damage of the calibration site, a new database shall`` be established 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 calibration shall remain unchanged). 2.The locating place 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.

Cabinet re-calibration is needed

After all cabinet calibration is completed, calibrate the cabinet need to be calibrated again to ensure splicing results after calibration.

The list of cabinets needing calibration will be directly displayed at the right screen of the software; the reason why the cabinet needs re-calibration will be judged automatically, and the user can check the reasons and pick out the cabinets needing re-calibration for the same reason, which facilitates one-time problem solving and facilitates re-calibration.

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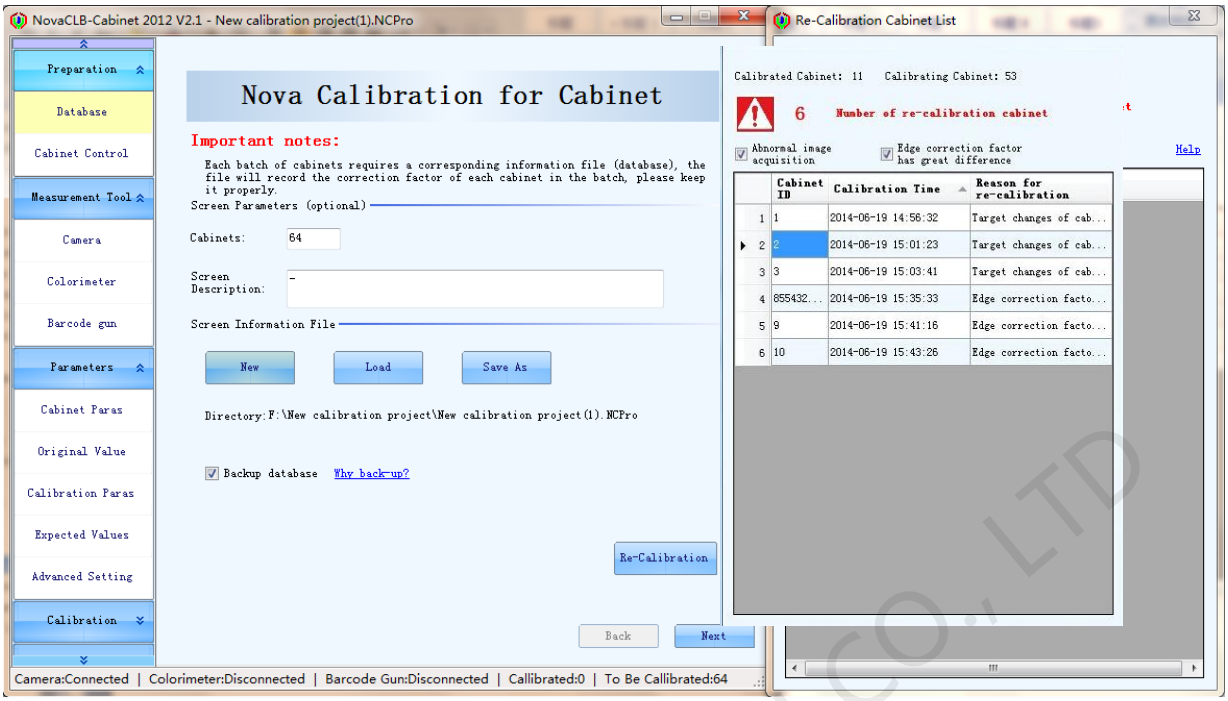

Fig. 5-5 Re-calibrate

6 The identification of the simulation diagram

The simulation diagram of measured data simulation software is generated through some calculation based on the calibration coefficient of the cabinet. And **what the simulation diagram tries to simulate is the splicing of the cabinet before the calibration**. So we can think about the simulation diagram as **the brightness analog diagram before the cabinet calibration.**

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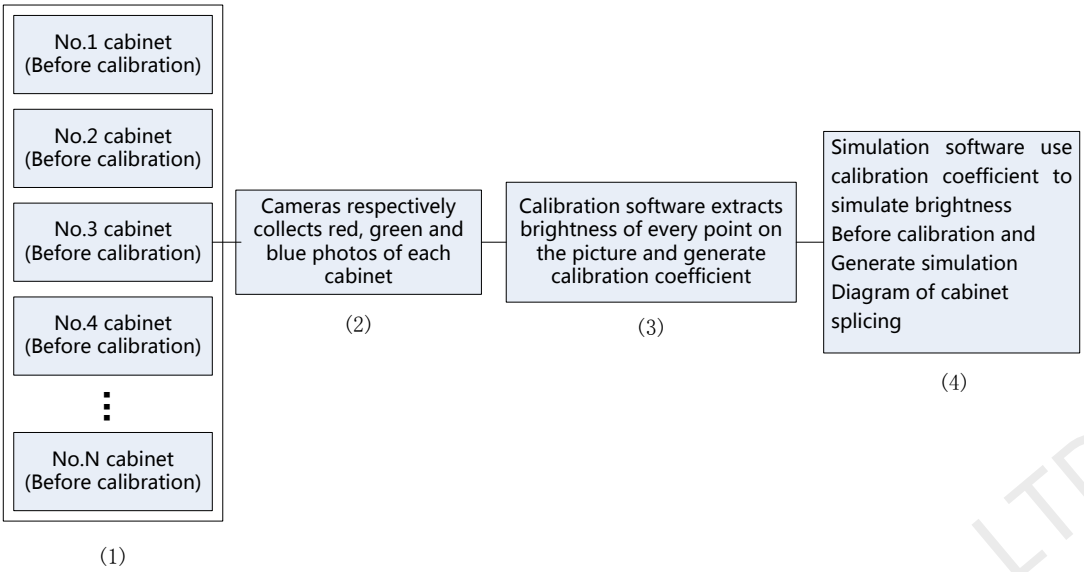

Fig.6-1Simulation diagram generation principle

The upper diagram shows the simulation diagram generation principle, if simulation diagram is unreasonable you can find the reasons from three aspects:

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

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

(2) Problem with pictures collected by camera.

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

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

(3) Problem with calibration software.

We will further illustrate simulation diagram identification method in Section 5.2.

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Next we will briefly introduce the usage of measured data simulation software (Please refer to "Cabinet measured data analysis software help file" for more information) and the identification of simulation diagram.

6.1 Operating method to view simulation image

Click the menu bar "Data Analysis And Processing" at the left lower corner to enter the cabinet database management platform NovaCLB-CabSolver.

Click the item "Simulate and Adjust coefficients" to generate the simulation image under this functional item.

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

For detailed operation instructions of the management software NovaCLB-CabSolver, please refer to **NovaCLB-CabSolver Quick Start User Manual**.

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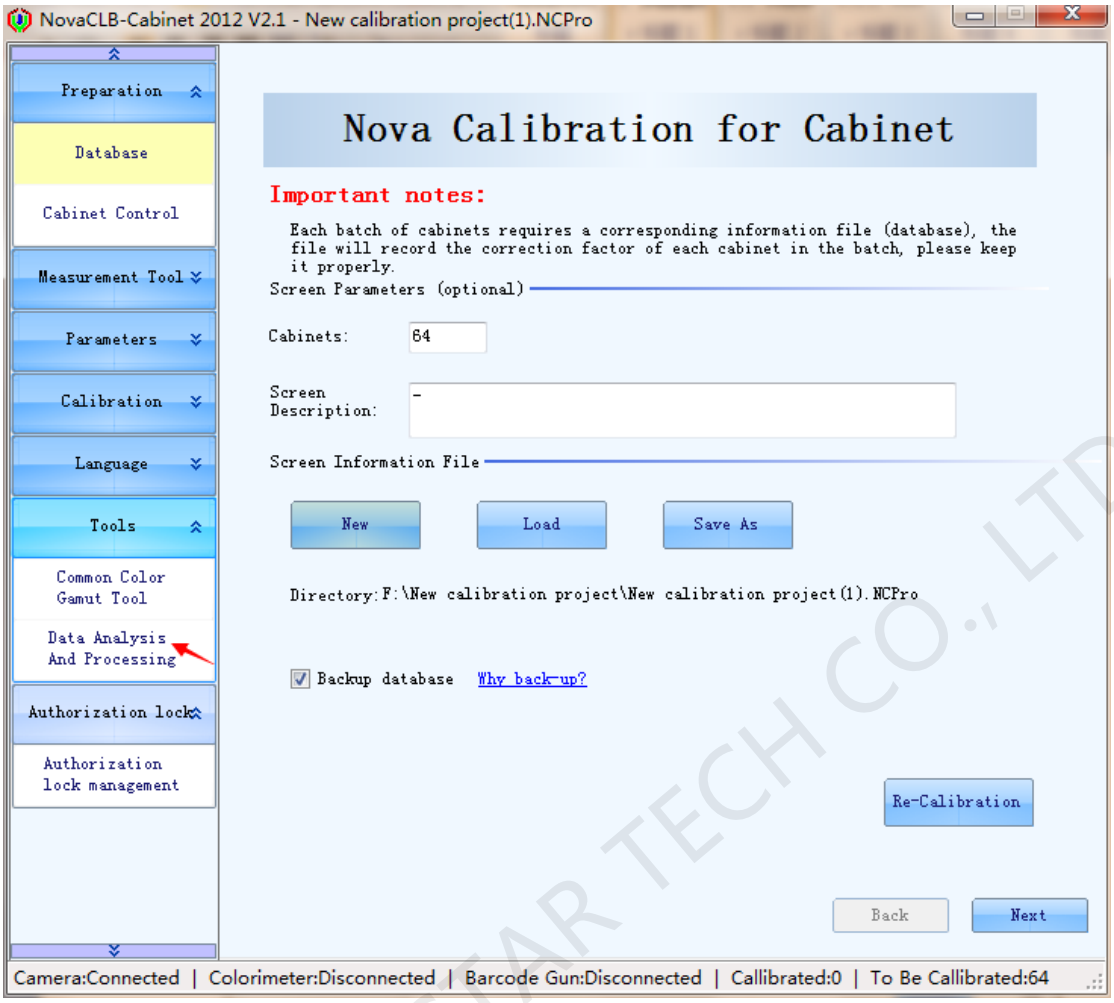

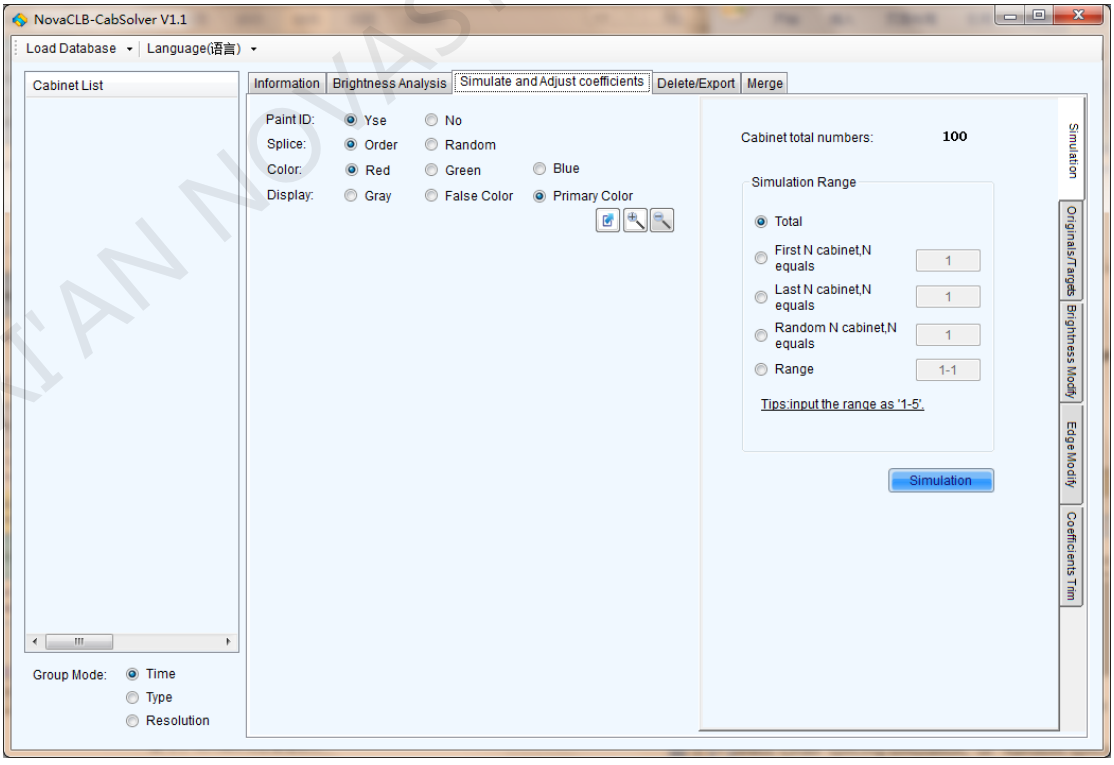

Fig. 6-2 Access to Nova Cabinet database management software

1) Load into the cabinet database:

Click "Load database", as shown in the following figure; click "Select database" to directly import the calibration database; or click "Select file" to import the database in the whole file.

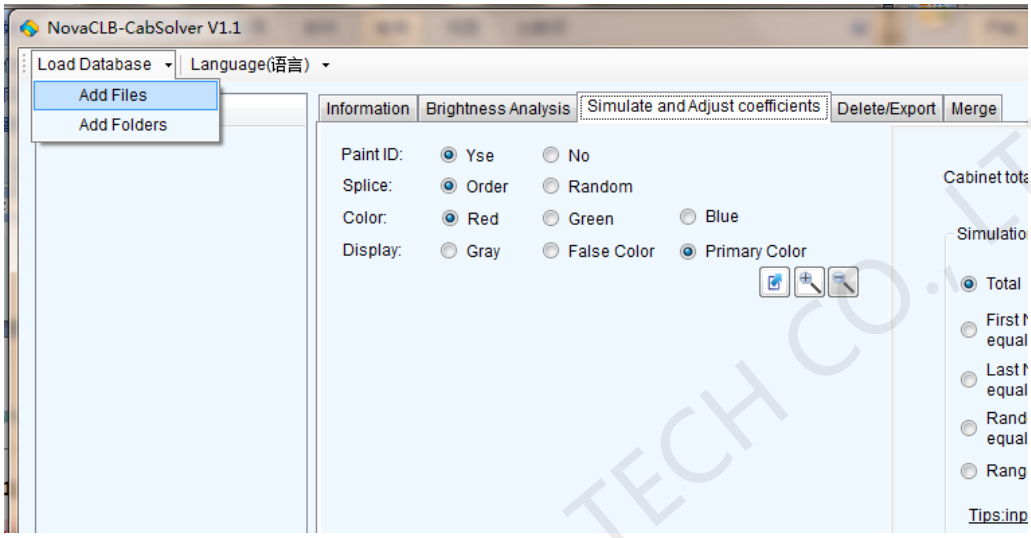

Fig. 6-3Database in a few cabinet

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

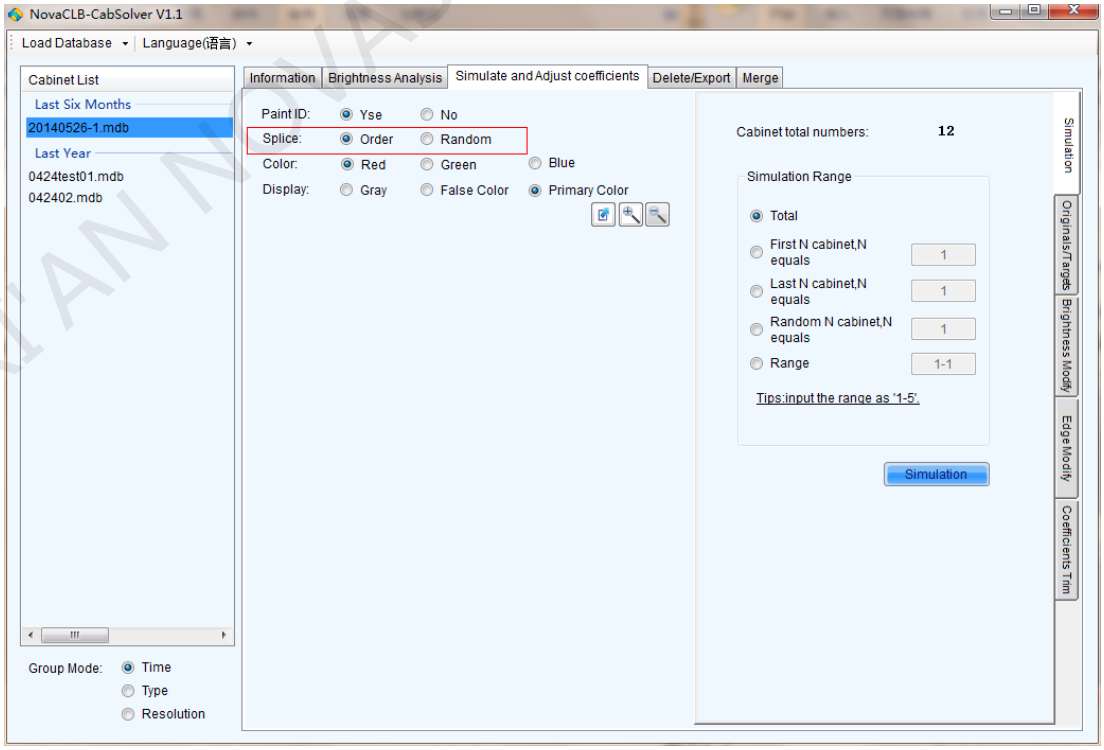

Fig. 6-4Select the simulation type

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

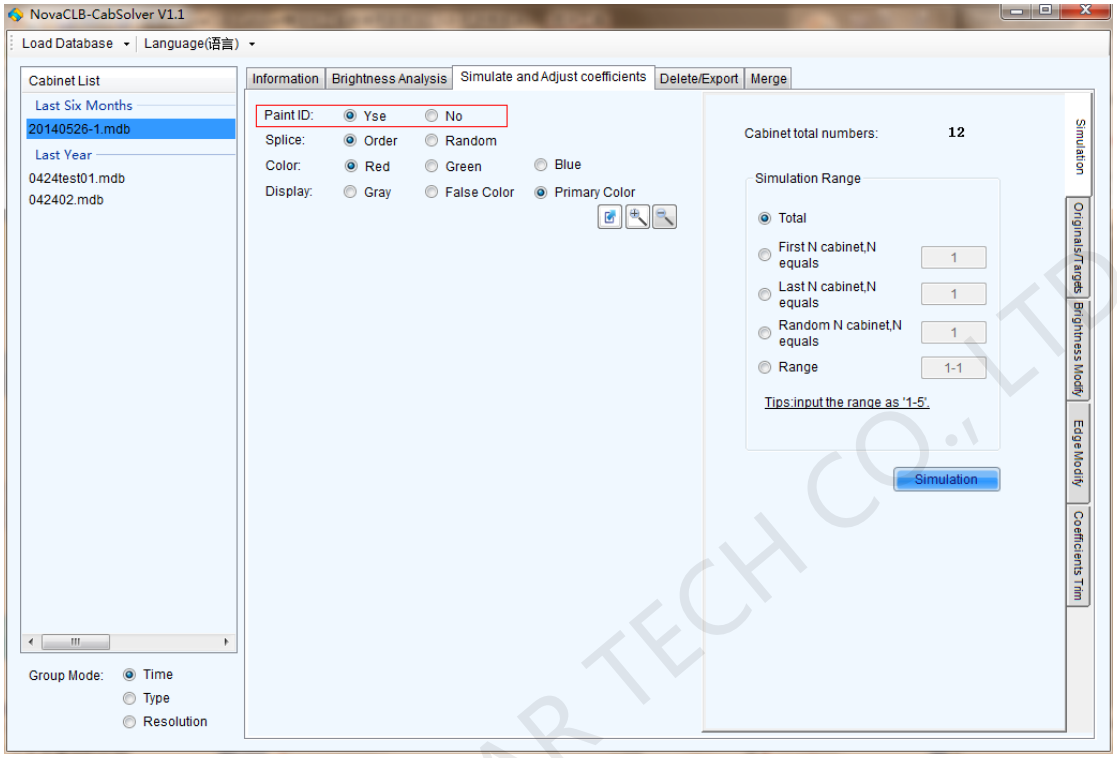

Fig. 6-5View simulation diagram

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.

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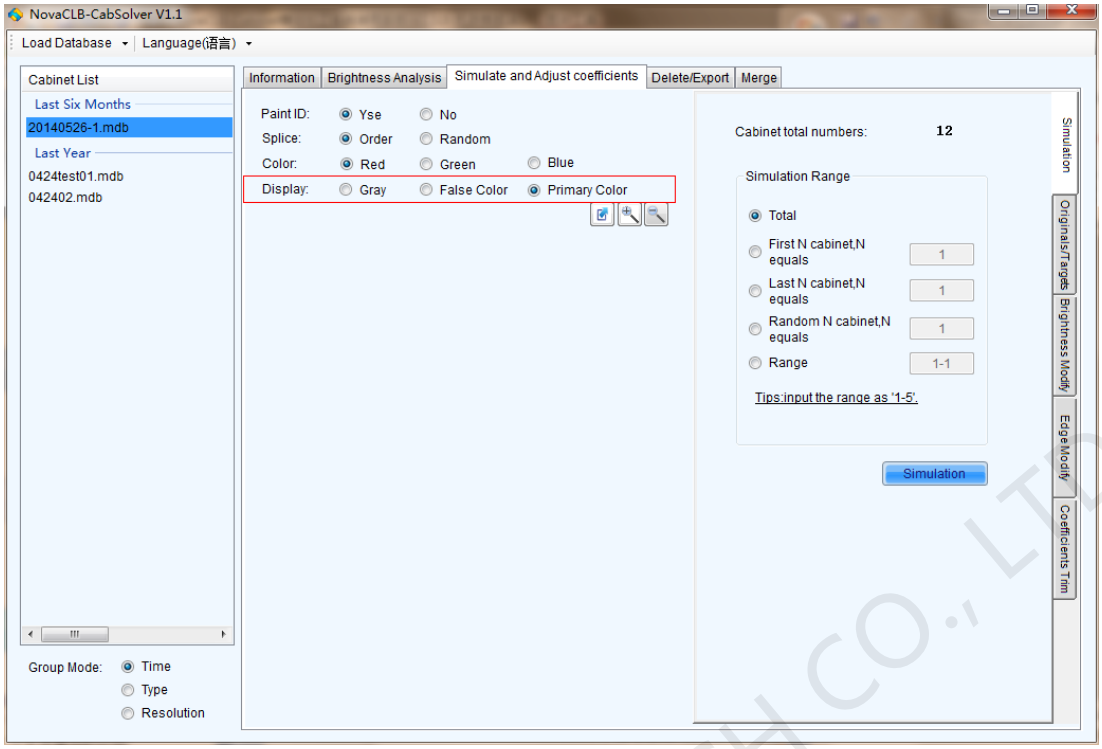

Fig. 6-6 Switch display mode

5) Select simulation range, and then click Simulation to generate the simulation image.

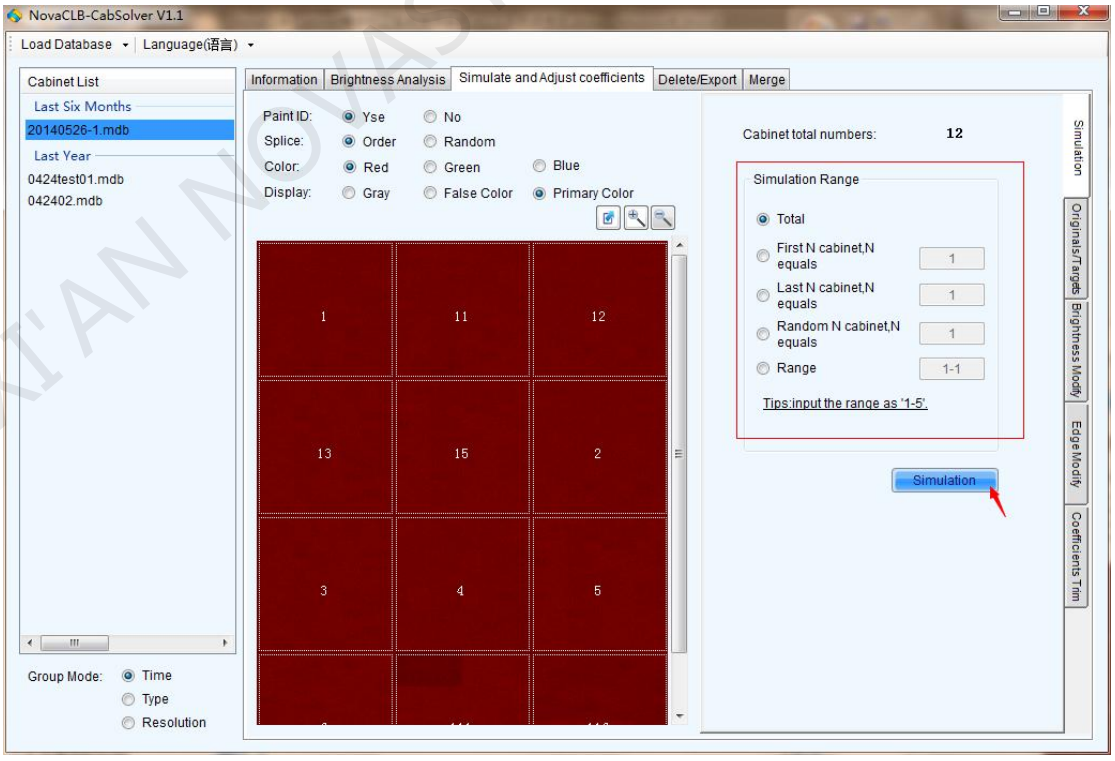

Fig. 6-7 Simulation image

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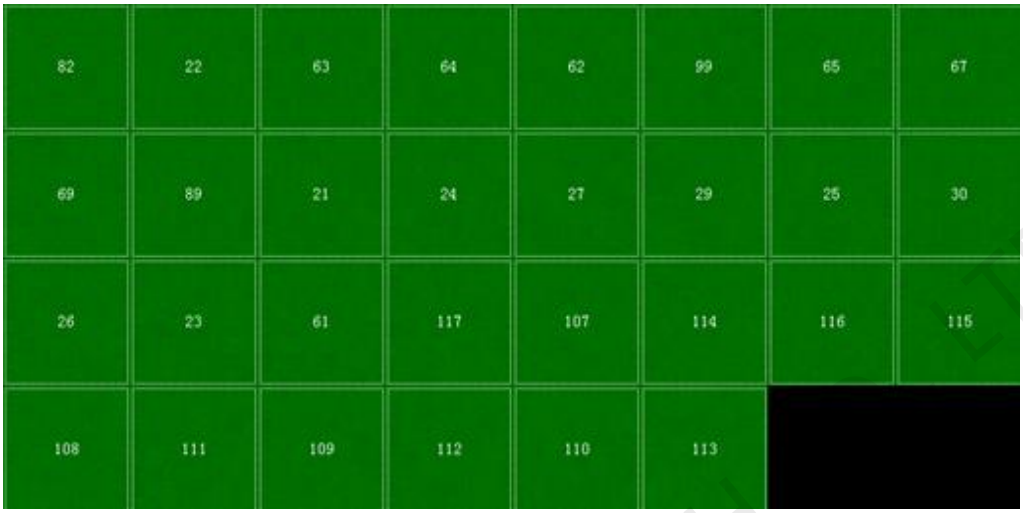
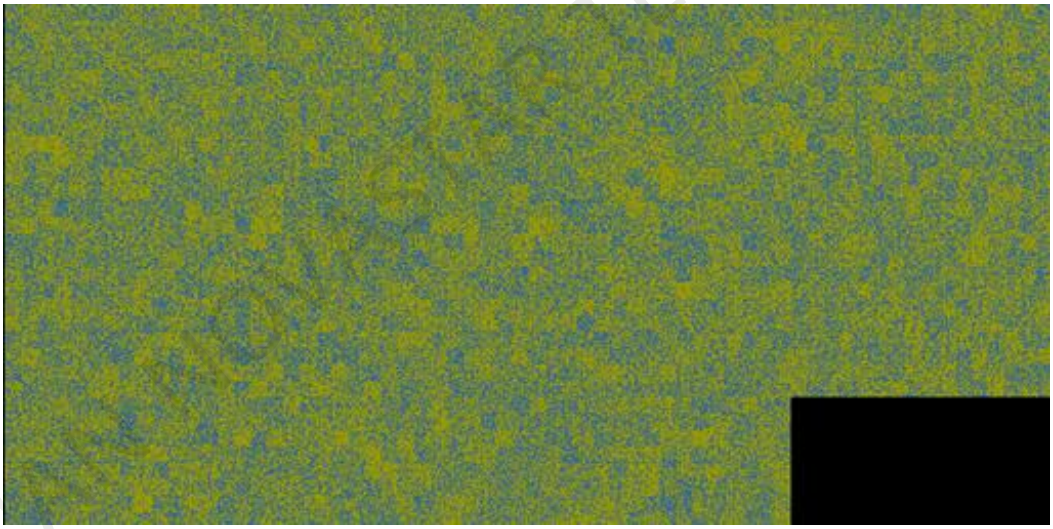
6.2 Identification case of simulation diagram

CASE 1 Good effect, qualified cabinet



Case 1 (a) Green in primary color mode



Case 1 (b)Green in pseudo color mode

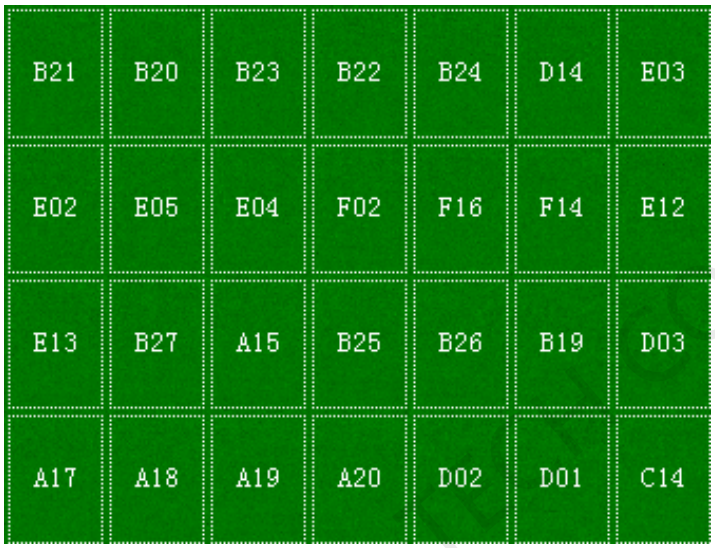
Fig. 6-8 CASE 1

Analysis: The measured data before the green calibration is more ideal in this case. There is no significant abnormal data, and at the same time, 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. In addition, obvious

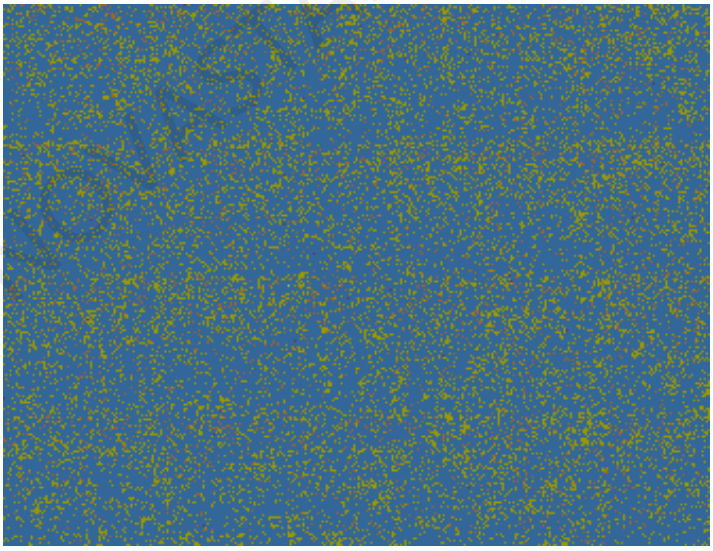
lines within cabinet can be seen in the case, it is normal situation caused by light board joint within cabinet.

Conclusion: With no problems.

CASE 2 Edge line between cabinets



Case 2(a)Green in primary color mode



Case 2(b) Green in pseudo color mode

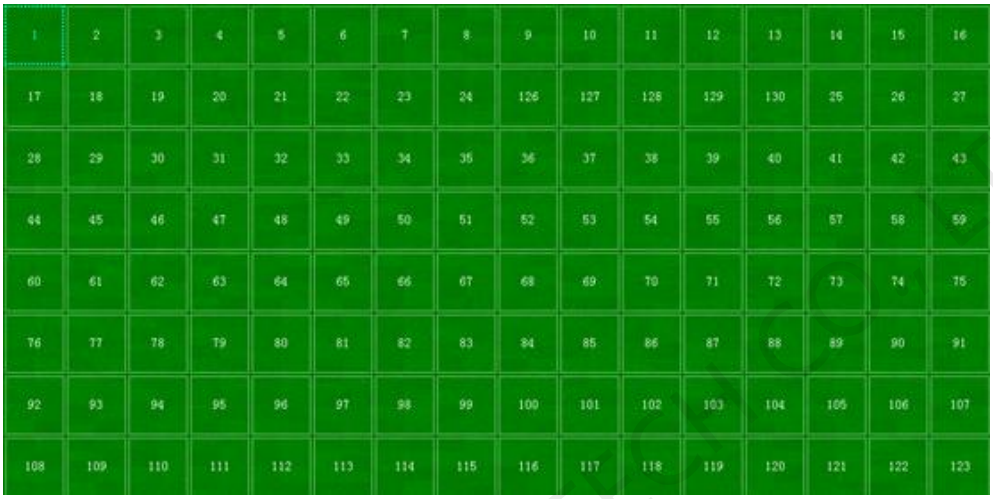
Fig. 6-9Case 2

Analysis: Obvious seam can be seen between the green cabinets in the case and expressed as horizontal lines. It is extremely unreasonable, generally there should

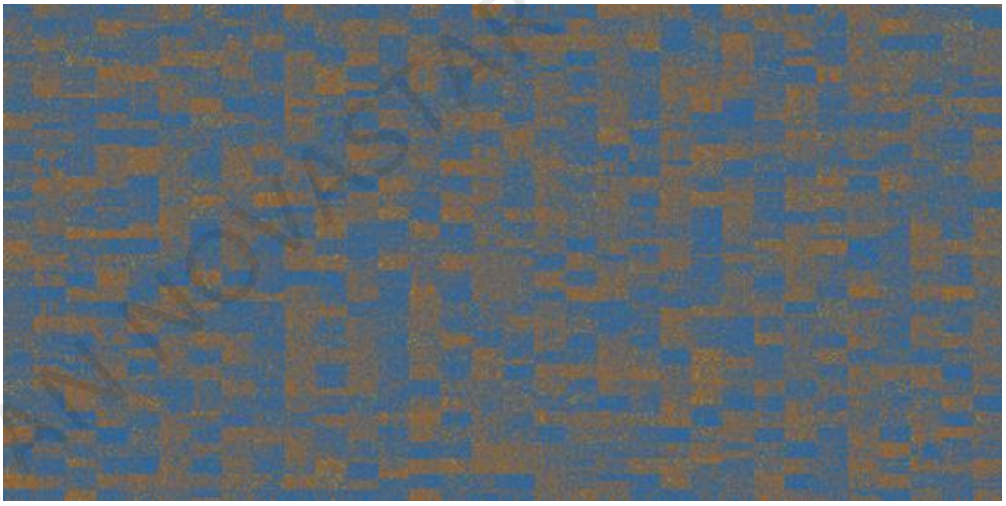
be no such condition before cabinet calibration, it is determined there are problem with pictures shot by camera.

Conclusion: It is recommended to decrease the saturation and calibrate again.

CASE 3 Serious effects of module



Case 3(a)Green in primary color mode



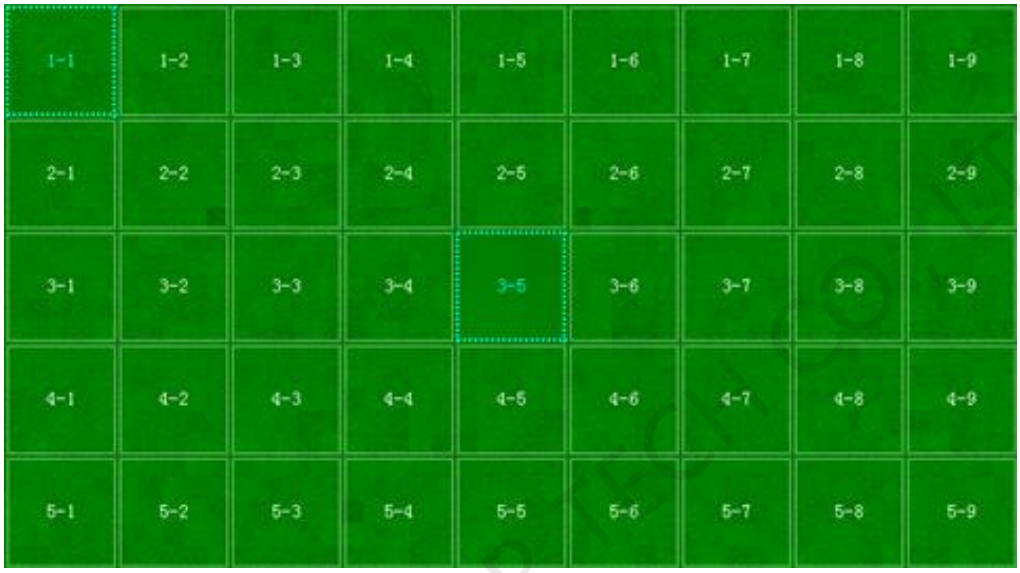
Case 3(b)Green in pseudo color mode

Fig. 6-10Case 3

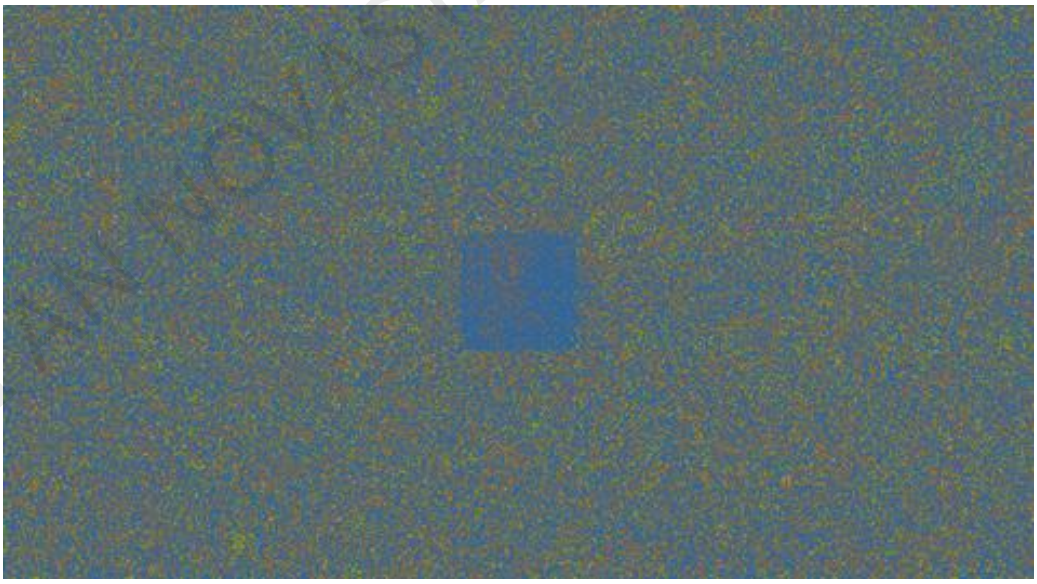
Analysis : This case shows serious module effect, in this case, though the cabinet calibration can greatly improve the uniformity of cabinets, but as their brightness varies obviously, after splicing on the site, it is difficult to avoid a small brightness difference between the cabinet.

Conclusion: Recommend calibrating it on site, and ensure the required results; The cabinet calibration can make a great improvement, but cannot solve the problem completely.

CASE: 4 Individual cabinets with specially ideal uniformity exists



Case 4(a)Green in primary color mode



Case 4(b)Green in pseudo color mode

Fig. 6-11Case 4

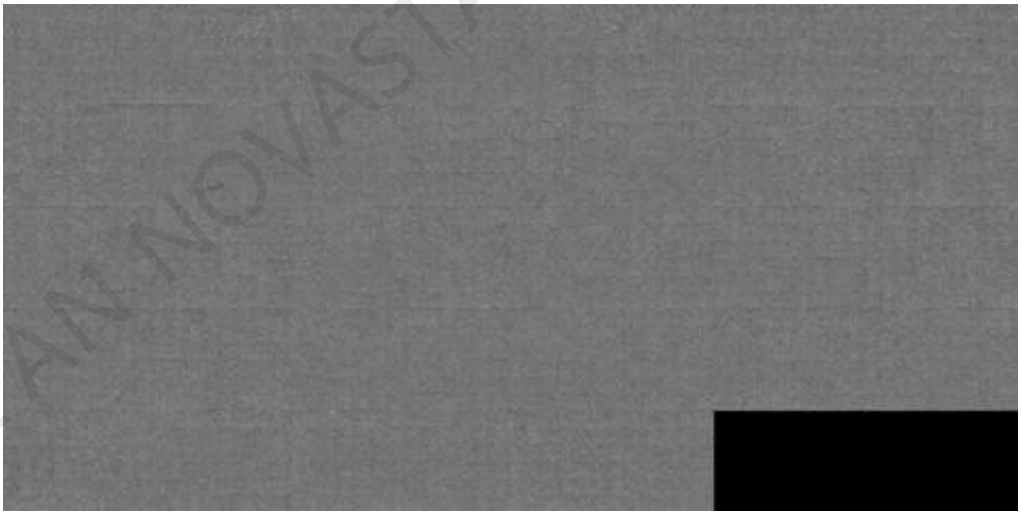
Analysis: In this case, the measured data before the green calibration are more

normal. But the uniformity of the cabinet 3-5 is obviously prior to that of all other cabinets, which seems extremely unreasonable.

Conclusion: 3-5 cabinet must be calibrated again.

CASE 5 The abnormal dark line at the edge of the cabinet

Case 5(a)Red in primary color mode



Case 5(b)Red in graying mode

Fig. 6-12 Case 5

Analysis: The simulation diagram is shown as red in the case, obvious dark line can be found in cabinet before calibration. View the photos shot by the cabinet and

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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: Recommend calibrating the pixels 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.

7 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, only the resolution is different)

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7.1 Operation procedure

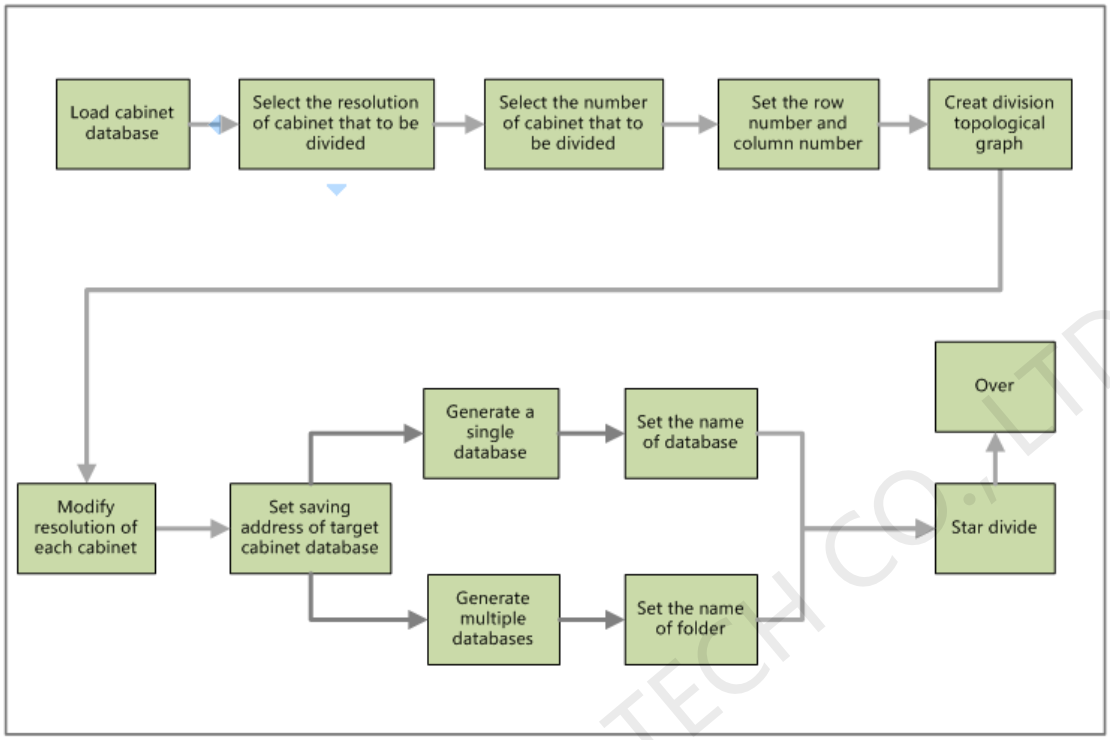

Fig. 7-1Cabinet databases division operation procedure

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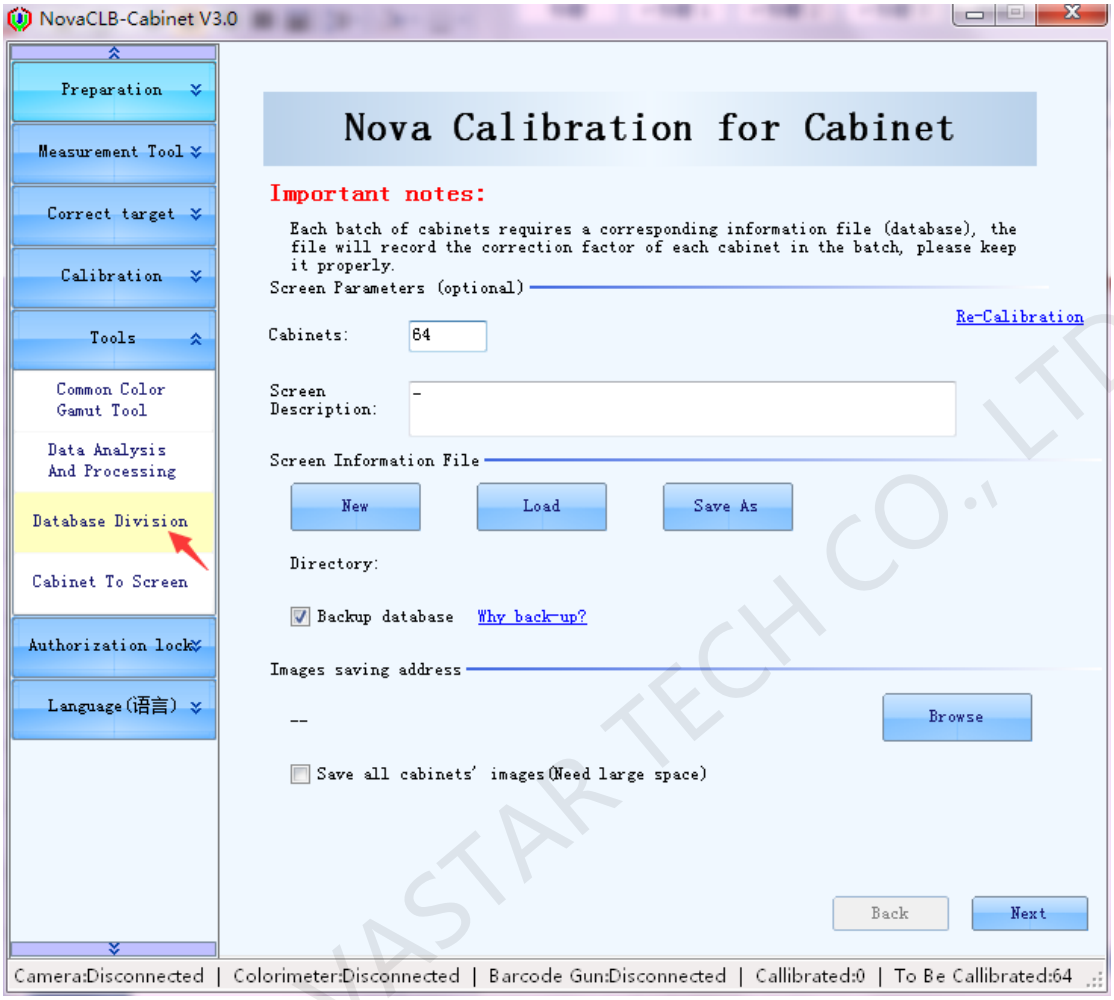
7.2 Process demonstration



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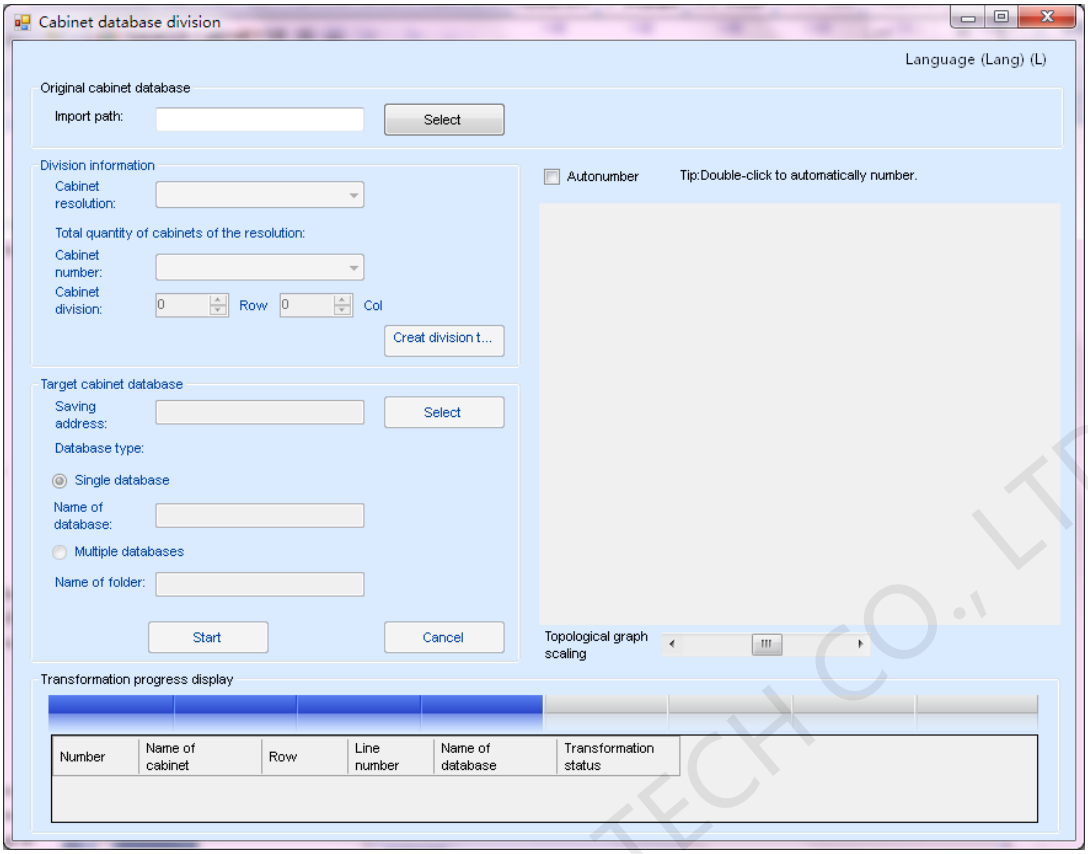

Fig. 7-2 Open software of cabinet database division

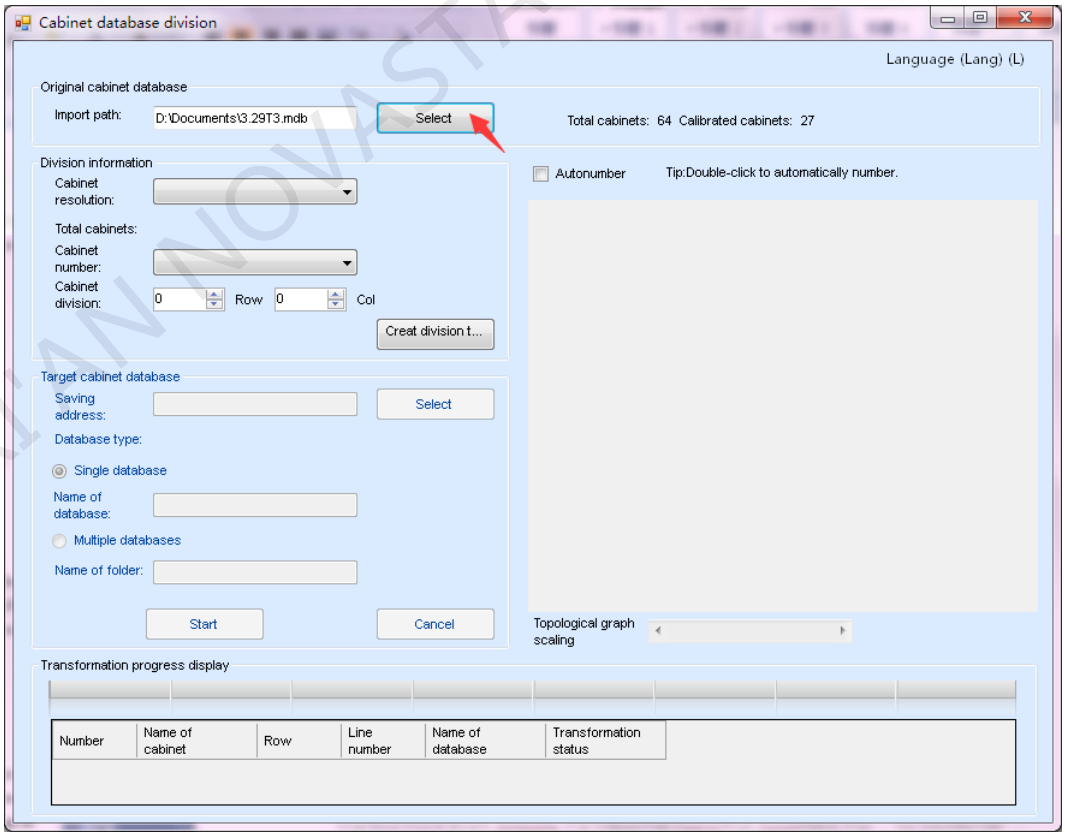

Fig. 7-3Load cabinet databases

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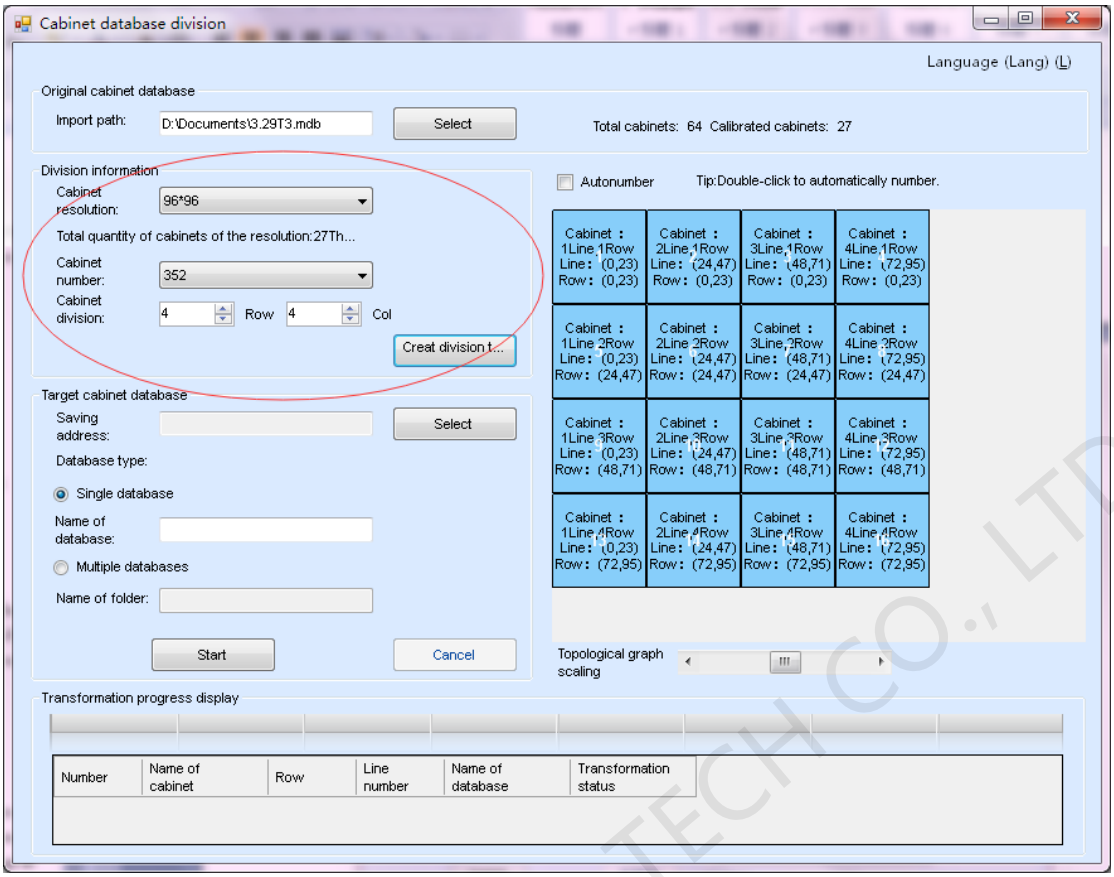

Fig. 7-4 Input the division information

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.

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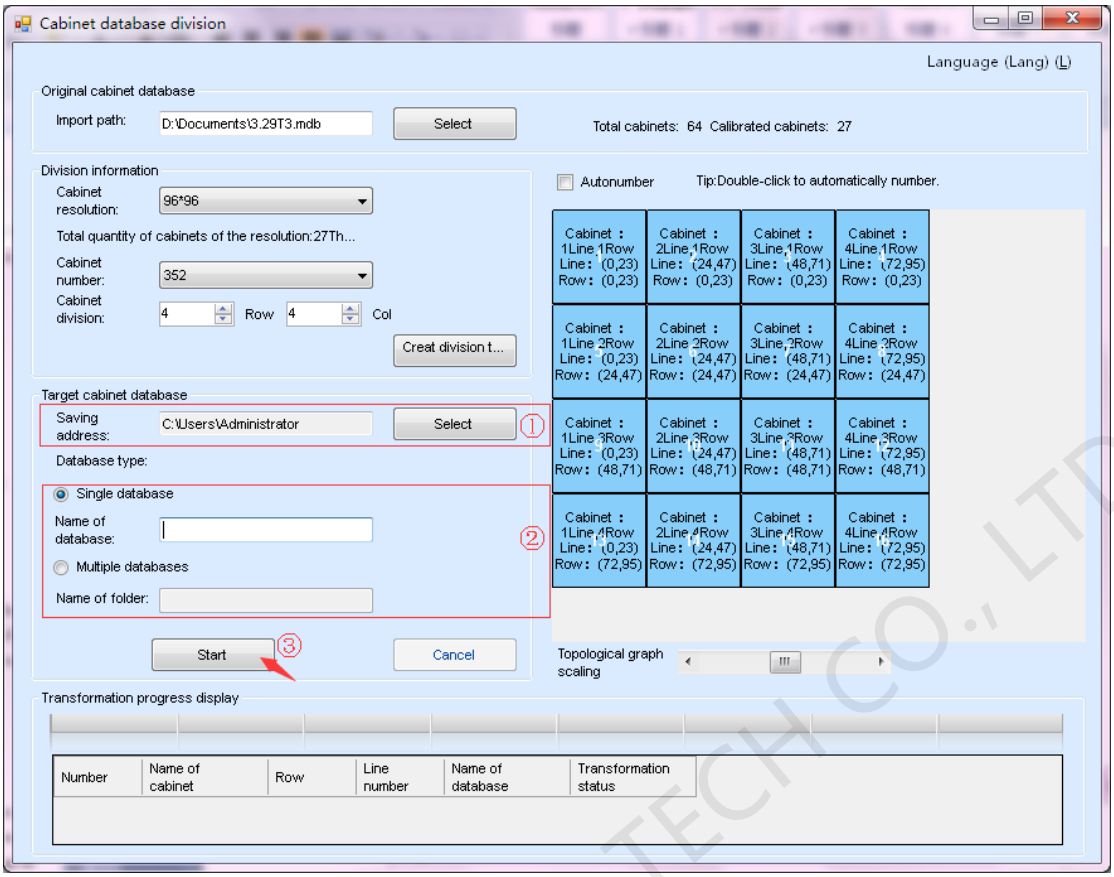

Fig. 7-5 Set the information about division

Selection: Select a position 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.

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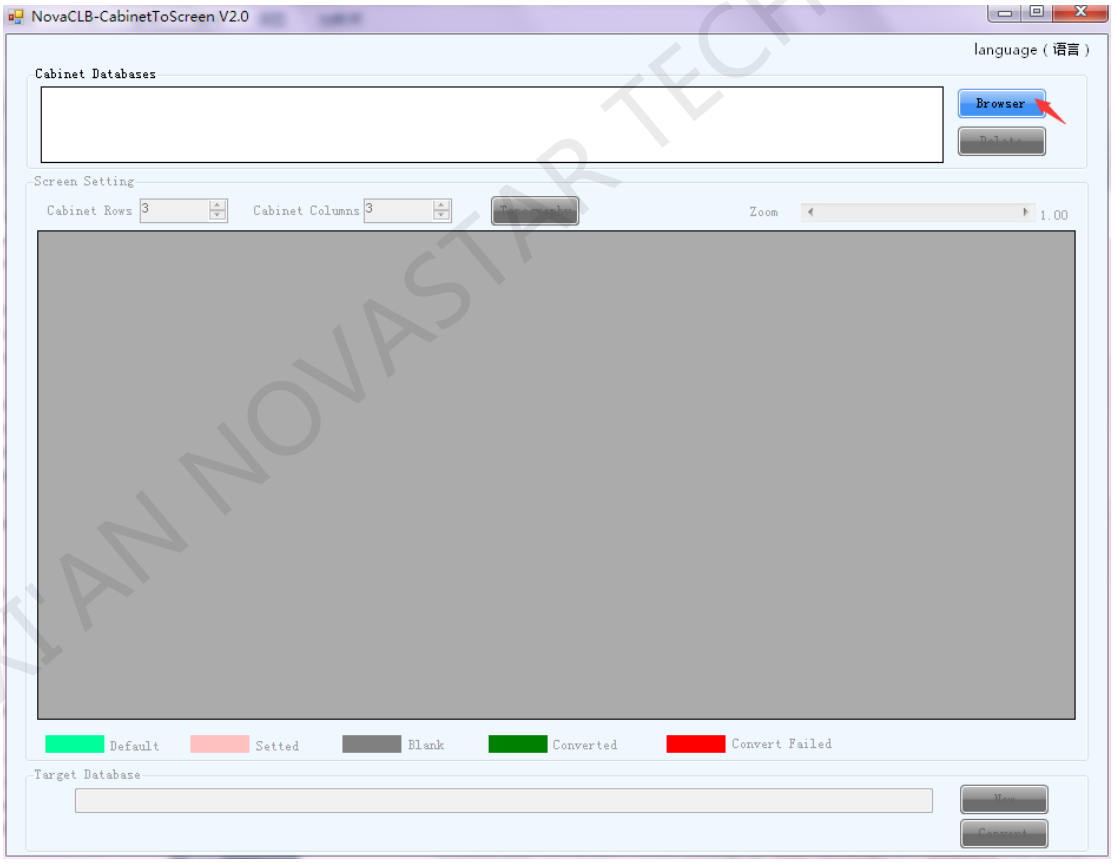
8 Cabinet To Screen

To upload cabinet database, upload one cabinet at a 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) Load cabinet databases



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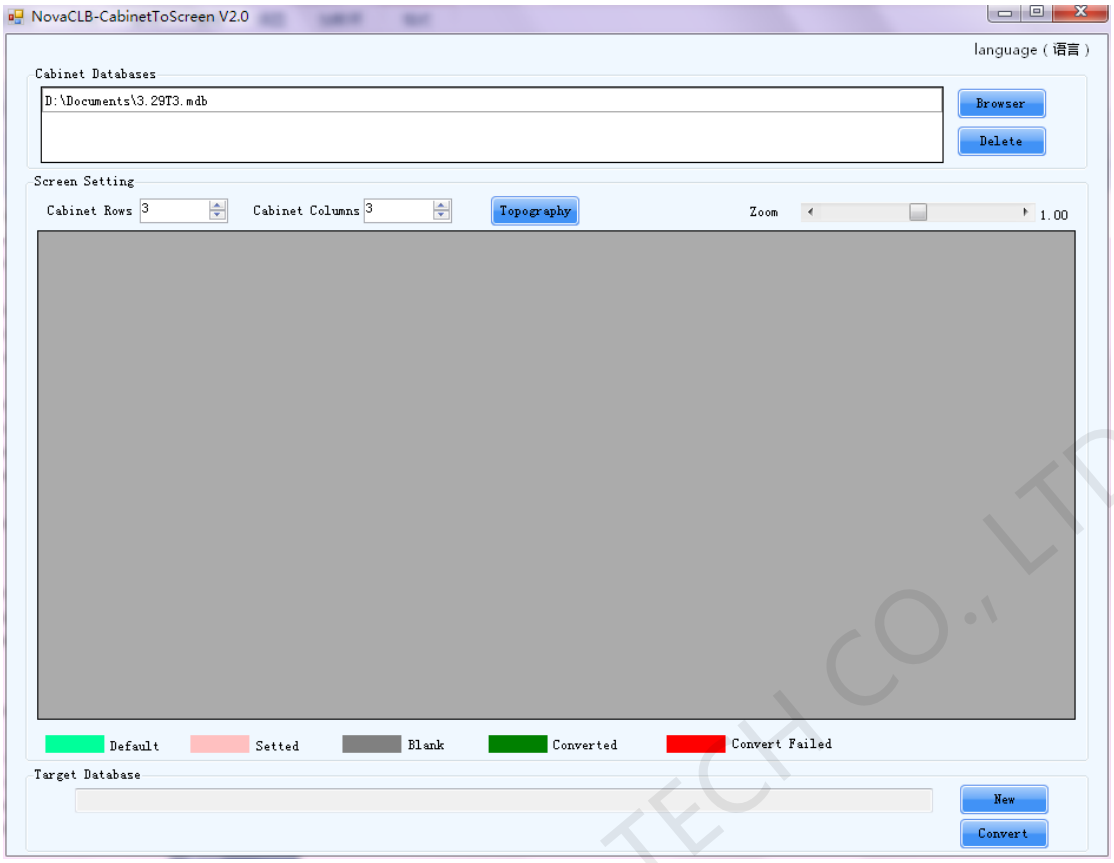

Fig. 8-1 Load Cabinet Databases

2) Topography

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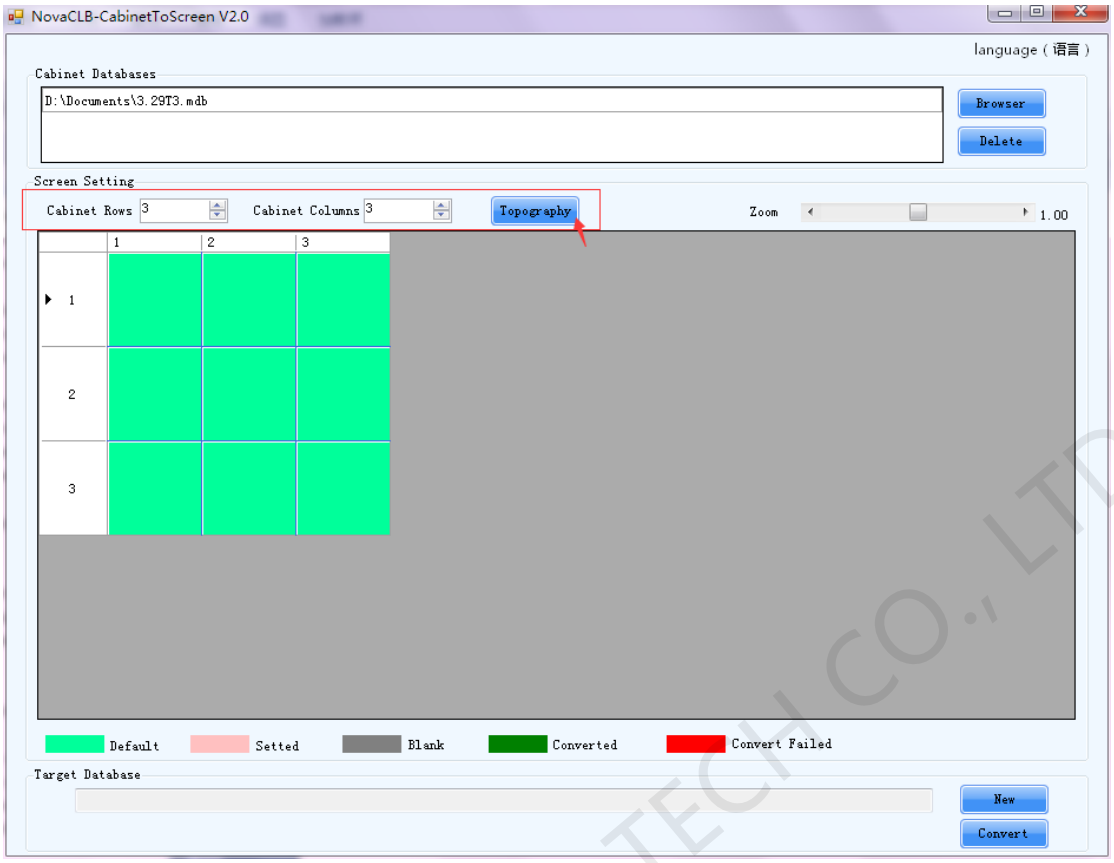

Fig. 8-2 Topography

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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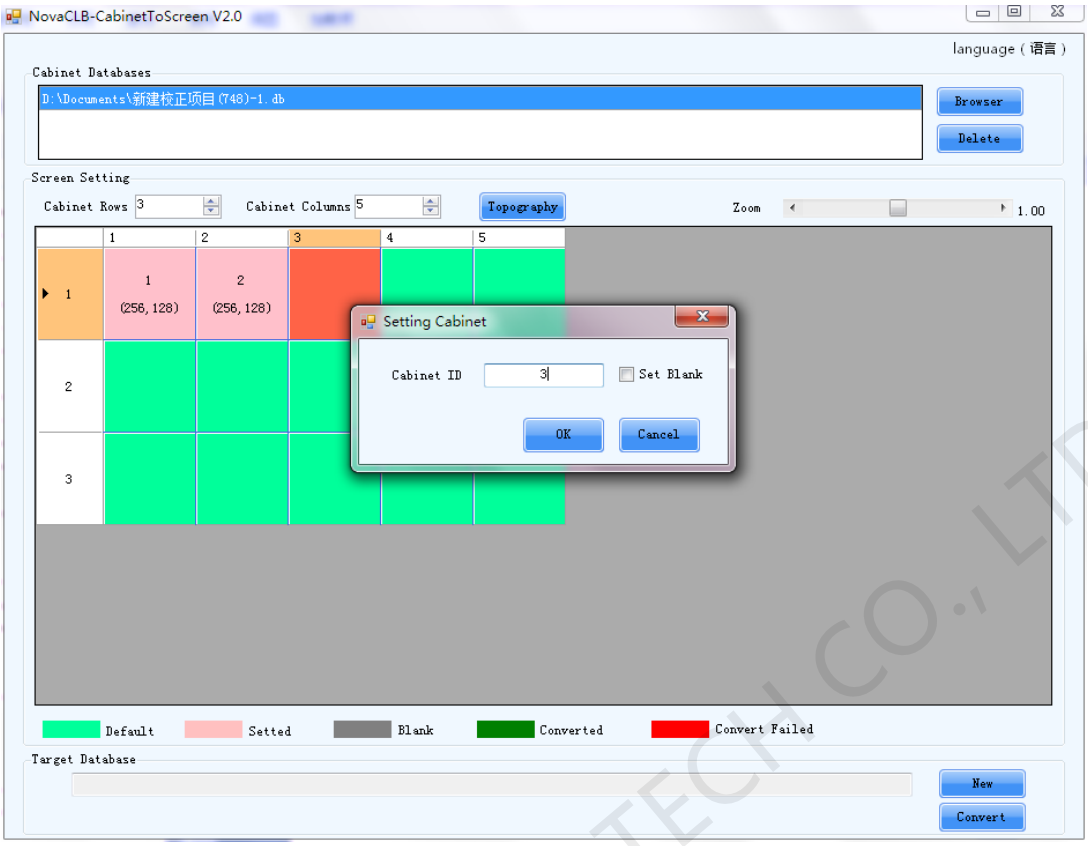

Fig. 8-3 Setting Cabinet

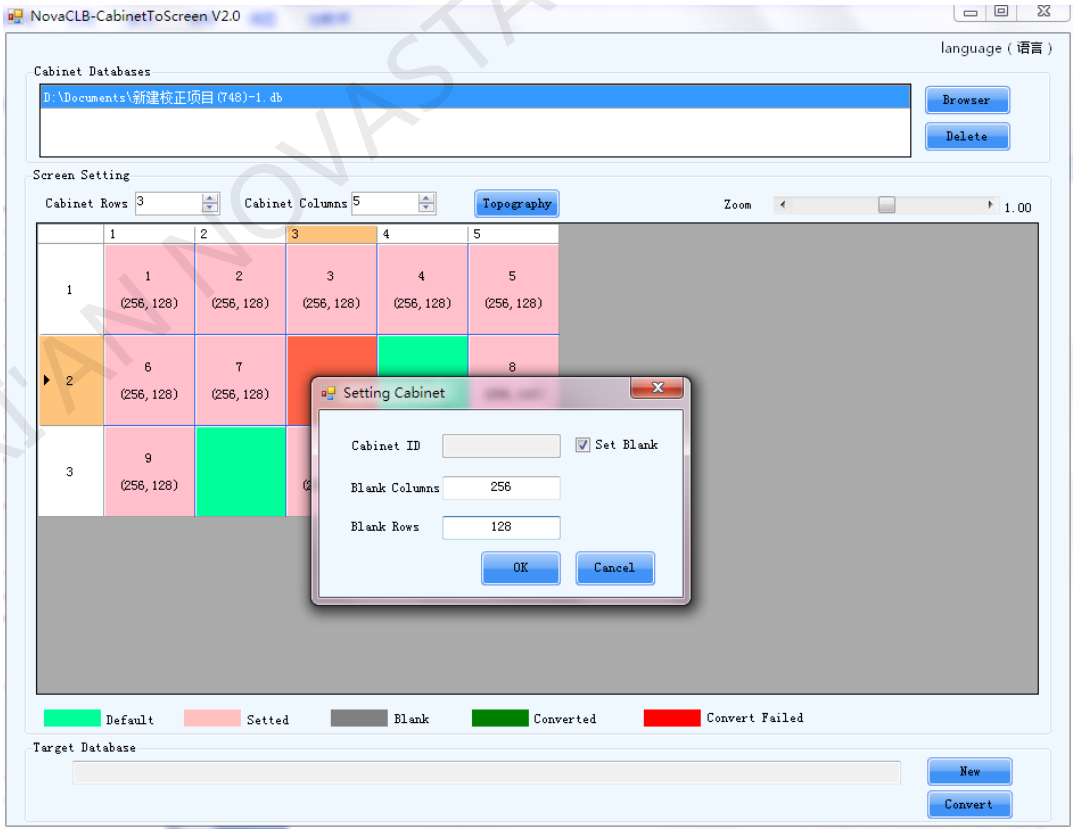

Fig. 8-4 Set Black

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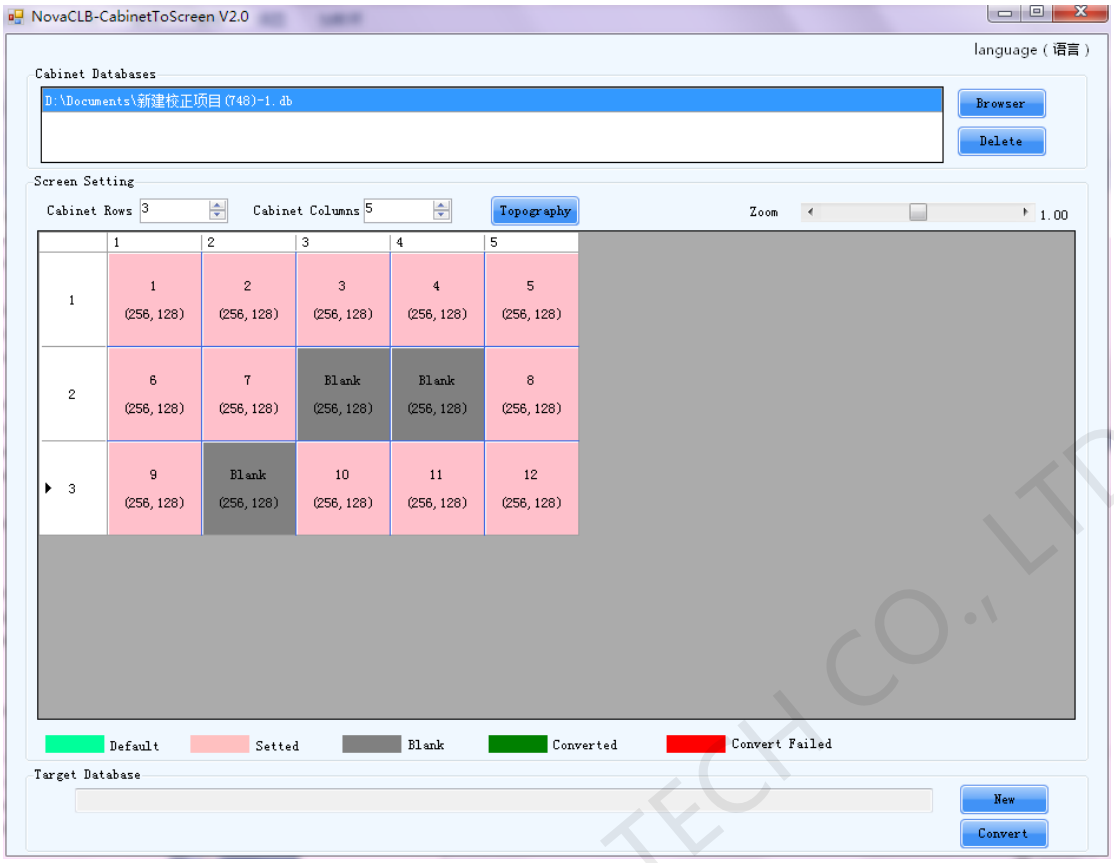

Fig. 8-5 Setting back is over

4) Create a target database, that is, a full-screen database.

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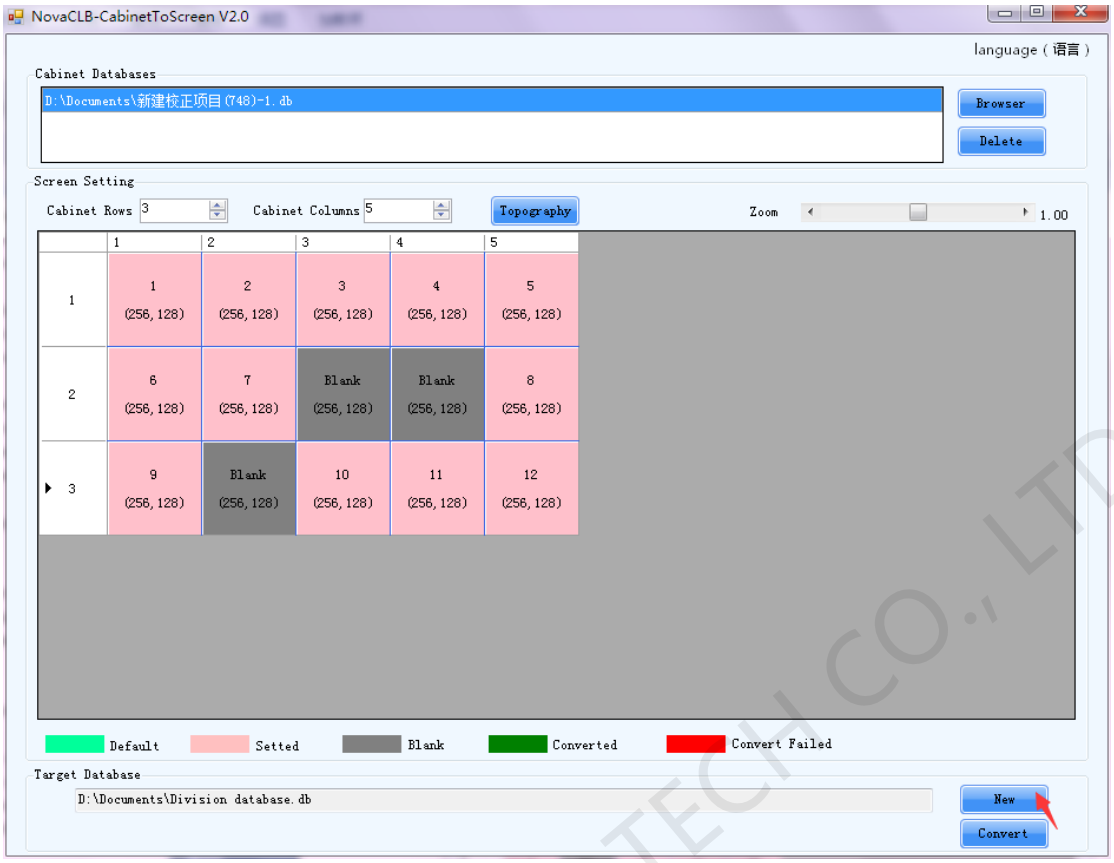

Fig. 8-6 Create a target database

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

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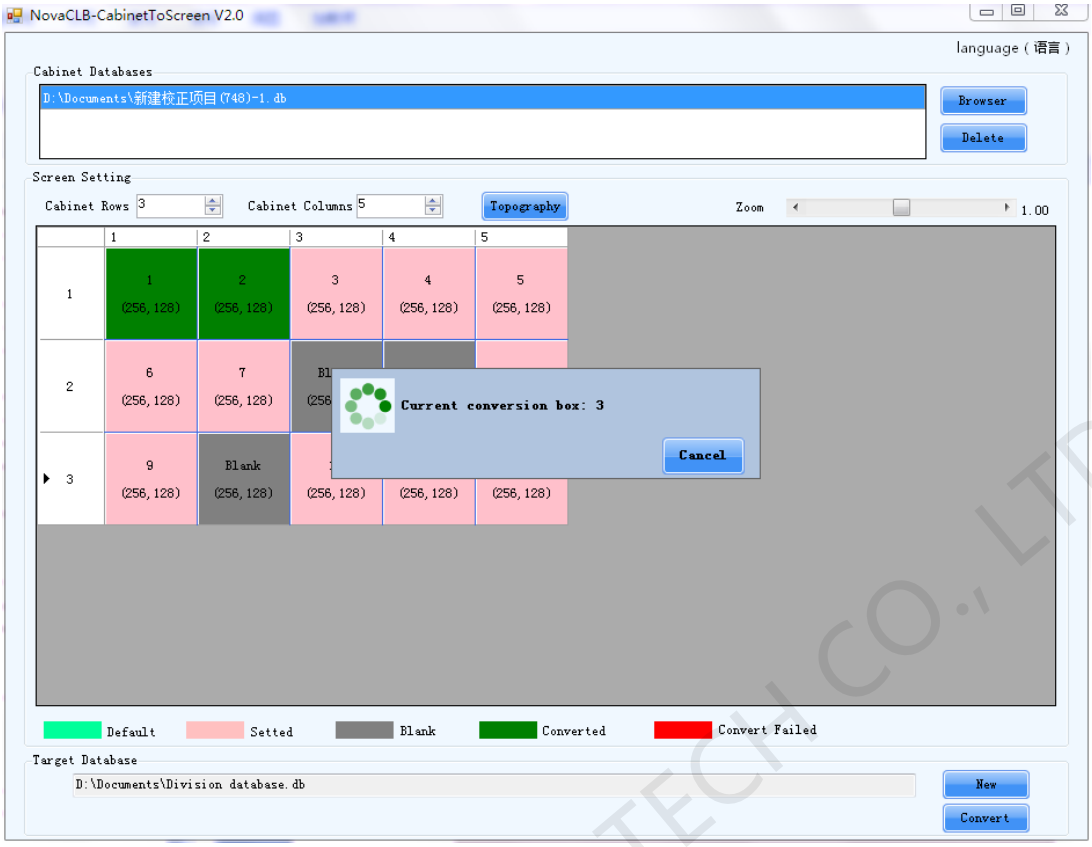


Fig. 8-7 Conversion process

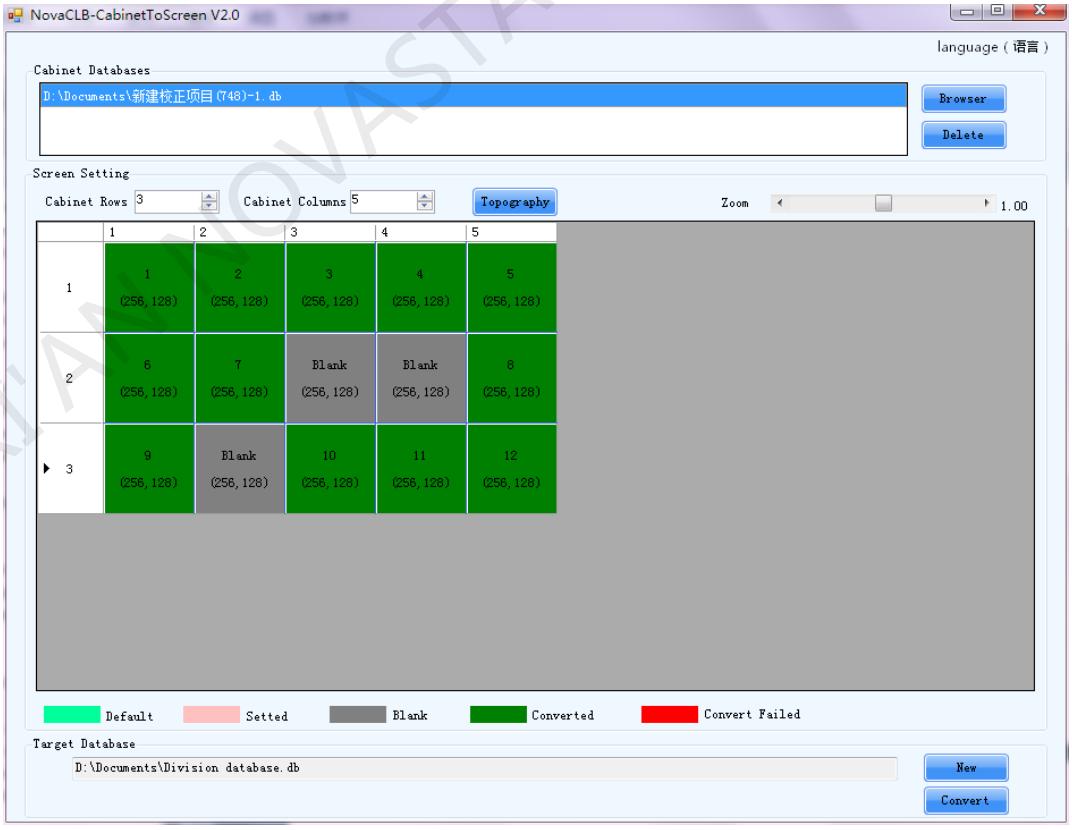
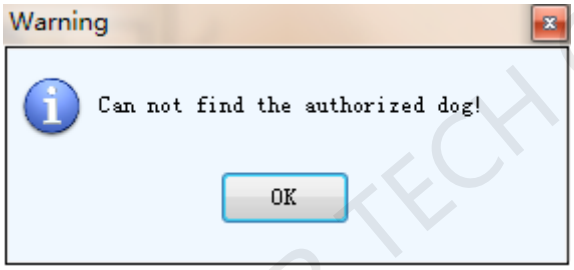


Fig. 8-8 Conversion is over

9 Authorization lock management

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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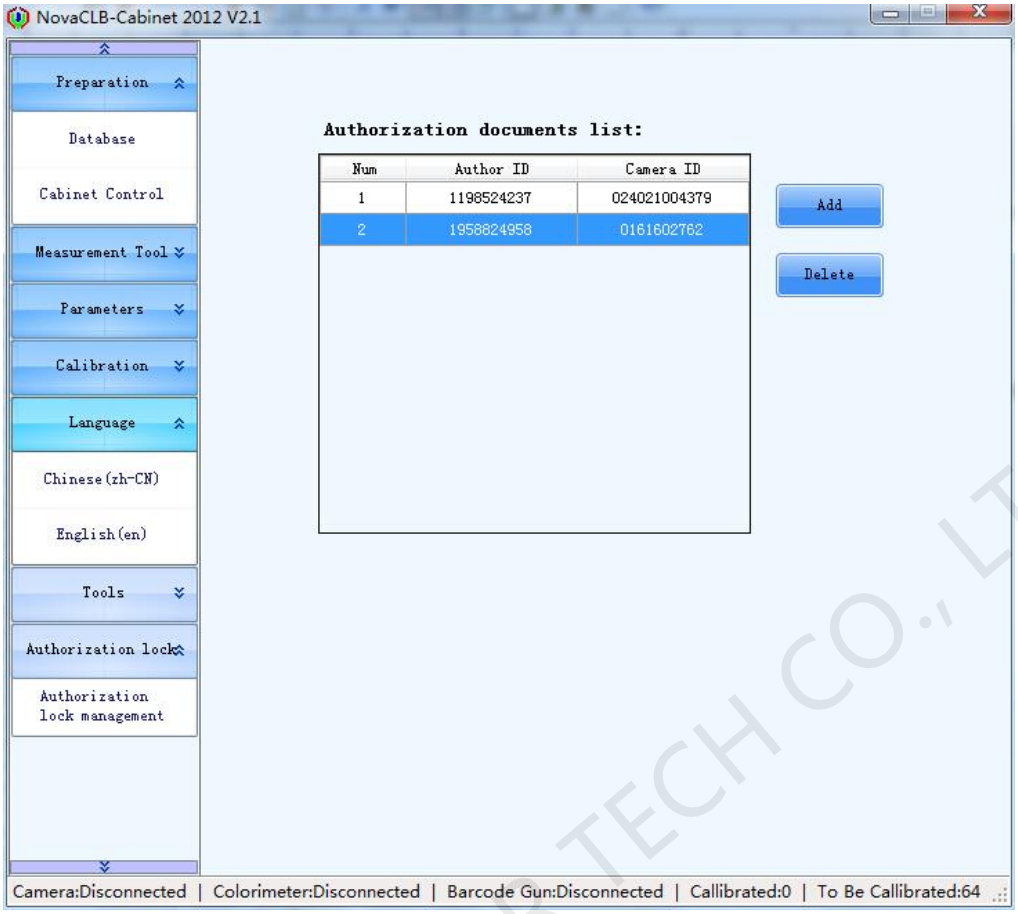

Fig. 9-1 Authorization lock management

10 Precautions

10.1 Precautions for database and batch management

The cabinet calibration software takes one batch of display screen as a management unit. For each batch of the display 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 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

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time for aging before the calibration is 48h, and the aging time difference between different cabinets shall be no longer than 24h.

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 calibration 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 the display screen after the cabinet calibration. The untimely discovery of software error or improper operation

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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 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 Notes for use of the camera

During the image capture, if the camera has no action in a long time, please check

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whether the camera is in "Full PC"; if it is so, the camera needs to be reset, and calibration can be conducted after reconnection.

10.5 Notes for saving database

When the software is saving the database (calibration coefficient), please do not close the software, or else it may result in abnormality of the software; the abnormality information tips will show abnormality of database operation.

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11 Documentation edition description

Version	Date	Reason for updating
NovaCLB cabinet point-by-point calibration system manual-V1.0	November 12,2012	The first release
NovaCLB cabinet point-by-point calibration system manual-V2.0	June18th 2013	Software upgrade
NovaCLB cabinet point-by-point calibration system user manual-V2.1	September 9th 2013	Software upgrade Corresponding software version: NovaCLB-CabinetV1.2.3
NovaCLB cabinet point-by-point calibration system user manual-V2.2.0	June 6th 2014	Software upgrade Corresponding software version: NovaCLB-CabinetV2.0.0
NovaCLB cabinet point-by-point calibration system user manual-V2.2.1	July 2nd 2014	Software upgrade Corresponding software version: NovaCLB-CabinetV2.0.0
NovaCLB cabinet point-by-point calibration system user manual-V2.3.0	Nov 14th 2014	Software upgrade Corresponding software version: NovaCLB-CabinetV2.1.0
NovaCLB cabinet point-by-point calibration system user manual-V3.0.0	June 23th 2015	Software upgrade Corresponding software version: NovaCLB-CabinetV3.0.0

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