# NovaCLB-Cabinet

## Cabinet Calibration System

V4.1.2 NS140100057



# Quick Start Guide

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Website: http://www.novastar.tech

# Preface

## Overview

NovaCLB-Cabinet is a cabinet calibration software. This 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.

## Reader

This document is intended for the following personnel:

- Technical support engineers
- On-site operators

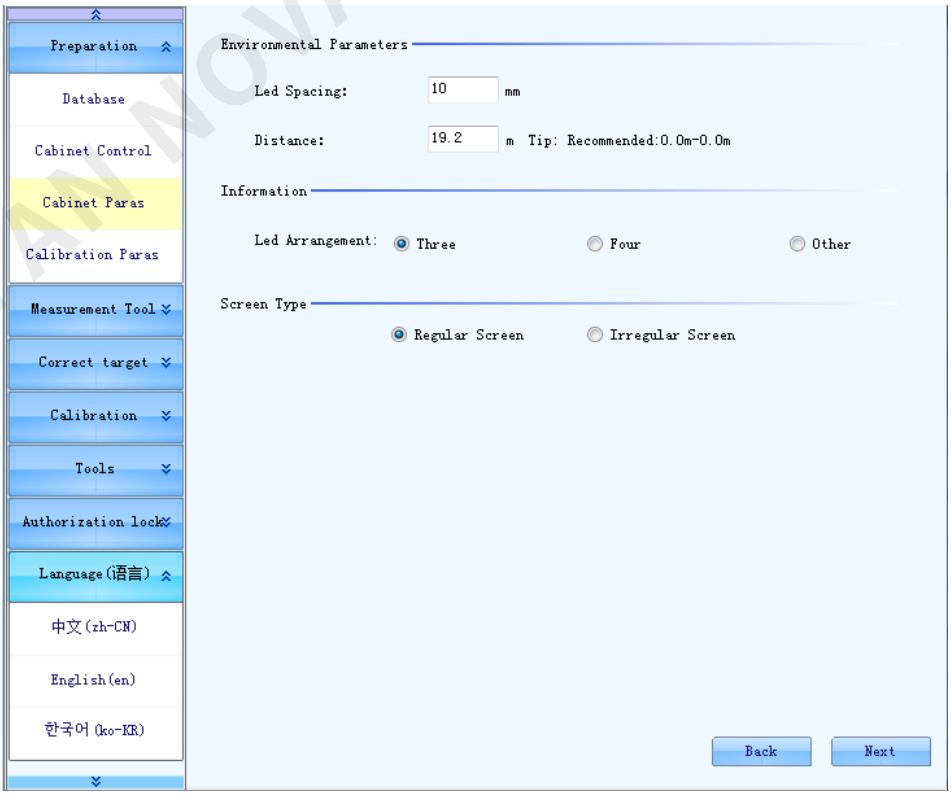
# Contents

# 1 Calibration Preparation

## 1.1 Laying out Darkroom

1. The calibration darkroom must be sealed to avoid interference by external light. It must be also covered with low-reflection black materials around it to reduce reflected light.
2. Darkroom width: 3 m (suggested); length: camera calibration distance.
   - The camera calibration distance mainly depends on the pixel pitch and LED cabinet resolution (namely the cabinet size).
   - The colorimeter measuring distance is the same as the camera calibration distance by default.

   The software automatically reads the cabinet resolution. You only need to enter the pixel pitch next to **Led Spacing** on the **Cabinet Paras** page and the calibration distance (**Distance**) can be calculated directly.



With consideration of space reserved for the computer, camera and personnel activities, the maximum distance of darkroom shall be added by 2–3 m;

Figure 1-1 Recommend calibration distance for some common cabinets

| Pixel Pitch (mm) | Cabinet Width/Height (mm) | Camera Calibration Distance Range (m) | Recommended Calibration Distance (m) |
|---|---|---|---|
| 10 | 128 | 7.4~18.4 | 12.9 |
| 7.5 | 160 | 6.9~17.2 | 12.05 |
| 6.66 | 144 | 5.5~13.8 | 9.65 |
| 3.9 | 256 | 5.8~14.3 | 10.05 |
| 2.54 | 135 | 3.8~9.4 | 6.6 |
| 1.25 | 480 | 3.5~8.6 | 6.05 |
| 0.83 | 540 | 2.6~6.5 | 4.55 |

3. When the calibration distance is greater than 20 m, please draw a mark on the ground to facilitate calibration distance positioning.
4. Install hygrometer to track temperature and humidity changes. The calibration darkroom must be equipped with air conditioners, which must be turned on half an hour before each calibration to adjust the temperature and humidity to the specified values. When calibrating cabinets of the same batch, ensure the temperature fluctuation must be within 2°C.
5. Perform fully aging on all cabinets before calibration. Calibrating cabinets with different aging time is not recommended.
6. The positions of cabinet and calibration instruments must be fixed during calibration. The cabinet must be placed on a pedestal to prevent it from being affected by the light reflected from the ground.
7. Adopt proper cabinet carrying process to avoid wasting time in cabinet replacing.
8. Use high performance computer to improve calibration efficiency.

## 1.2 Determing Prewarming Plan

Choose different prewarming time based on heat dissipation capacity of cabinets.

- **No prewarming mode:** There is no need to consider changes of brightness and chroma uniformity brought by the temperature changes during cabinet prewarming. The cabinet calibration will be carried out immediately after the cabinet is lighted up. The calibration efficiency of this method is higher, and the calibration time of each cabinet is within 2 minutes.
- **Prewarming mode:** Pre-warm the cabinet in a certain brightness for a specified period of time, and calibrate it after its temperature tends to be stable. 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 prewarming chamber to pre-warm the cabinets in advance in order to improve calibration efficiency.

**Notice:**

The pre-prewarming time of each cabinet must be the same, as different pre-warming time will result in brightness and chroma discrepancies among cabinets, which seriously affects the brightness and chroma consistency of the cabinets after calibration.

## 1.3 Selecting Calibration Position

During measuring, the camera must be placed right ahead of the cabinet and must be perpendicular to the surface of the cabinet.

Figure 1-2 The pedestal height is slightly higher than the camera tripod height (There is no elevation on site. This generally used for indoor screen).

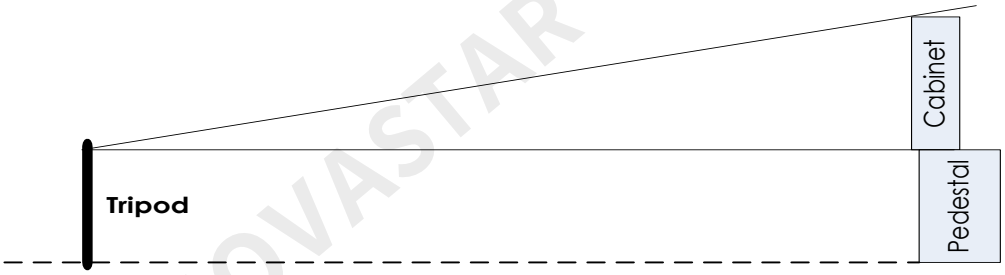
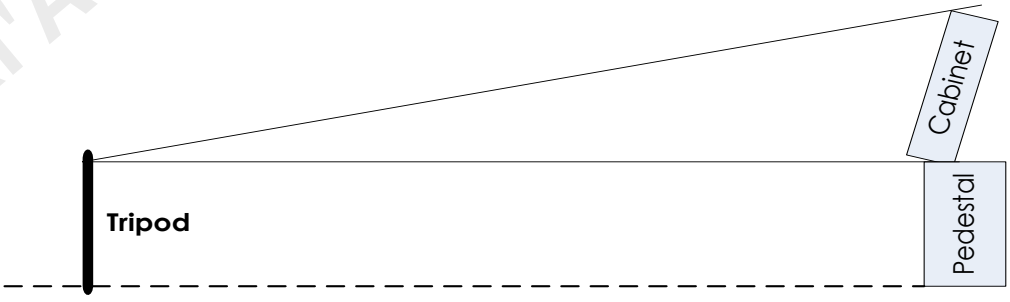



Figure 1-3 Tilt the cabinet to simulate the on-site elevation (There is an elevation on site. This is generally used for outdoor screen).




**Notice:**

Do not change the pedestal position, camera position and calibration parameters during calibration after they are set.

## 1.4 Marking Cabinet Position

Mark the position of the first cabinet. You can draw marks or use the black tape to mark the place of the first cabinet. The subsequent cabinets must be placed at the same position, including the placing angle.

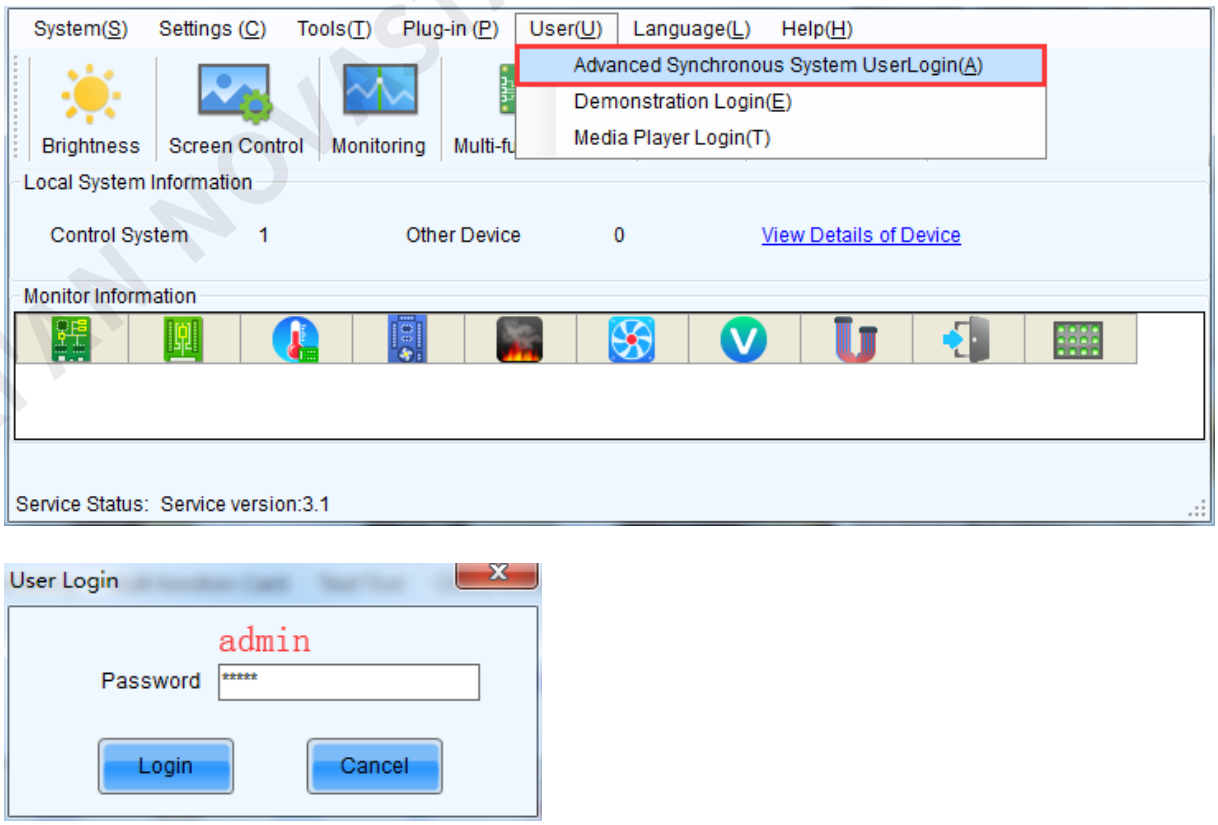
# 2 Calibration of First Cabinet

## 2.1 NovaLCT Preparation

Run the NovaLCT on the control computer to light up the cabinet and perform some general settings in NovaLCT. The key steps and precautions are illustrated by the figures below. For details about cabinet settings, see *NovaLCT LED Configuration Tool for Synchronous System User Guide*.

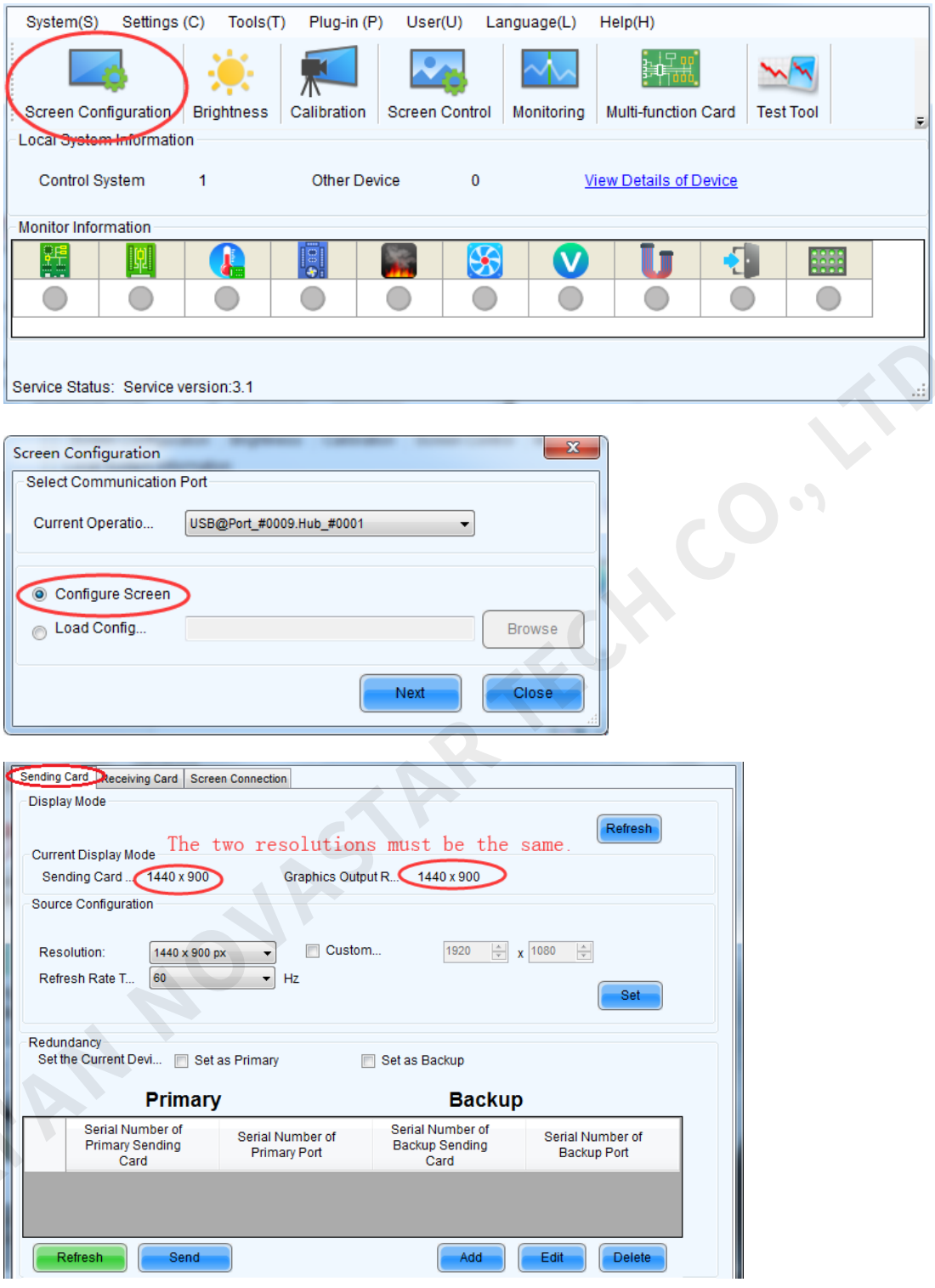
Step 1 Log into NovaLCT as an advanced user.

Figure 2-1 Logging into NovaLCT as an advanced user




Step 2 Set parameters of sending card.

Figure 2-2 Setting parameters of sending card




Step 3 Light up the screen (See *NovaLCT LED Configuration Tool for Synchronous System User Guide*).

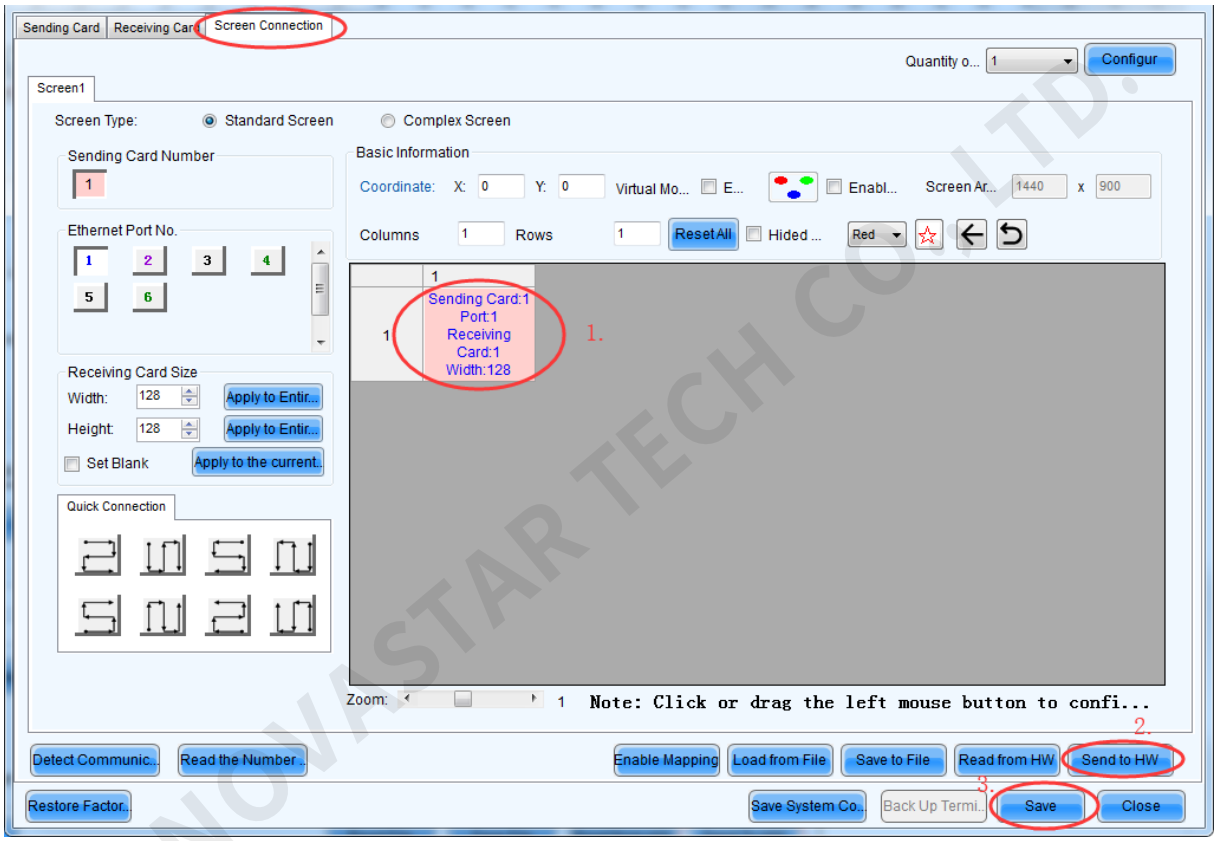
Step 4 Set parameters of receiving card.

**Note:**

The outdoor screens generally have high brightness, which causes overexposure of photos easily. To avoid this problem, please set the **Grayscale Mode** as **Grayscale First** or **Performance Balancing** since the brightness efficiency in those two modes is lower.

Step 5 Configure the screen.

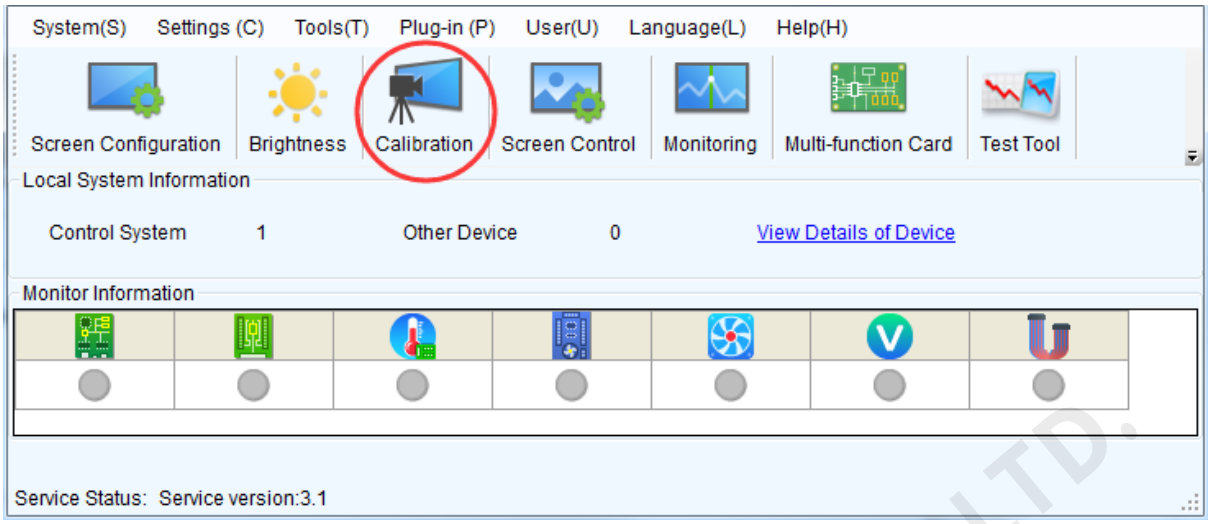
Figure 2-3 Configuring the screen




Step 6 Start calibration.

As illustrated below, if "Enable network monitoring successfully" appears, it indicates NovaLCT is ready for online calibration

Figure 2-4 Starting calibration

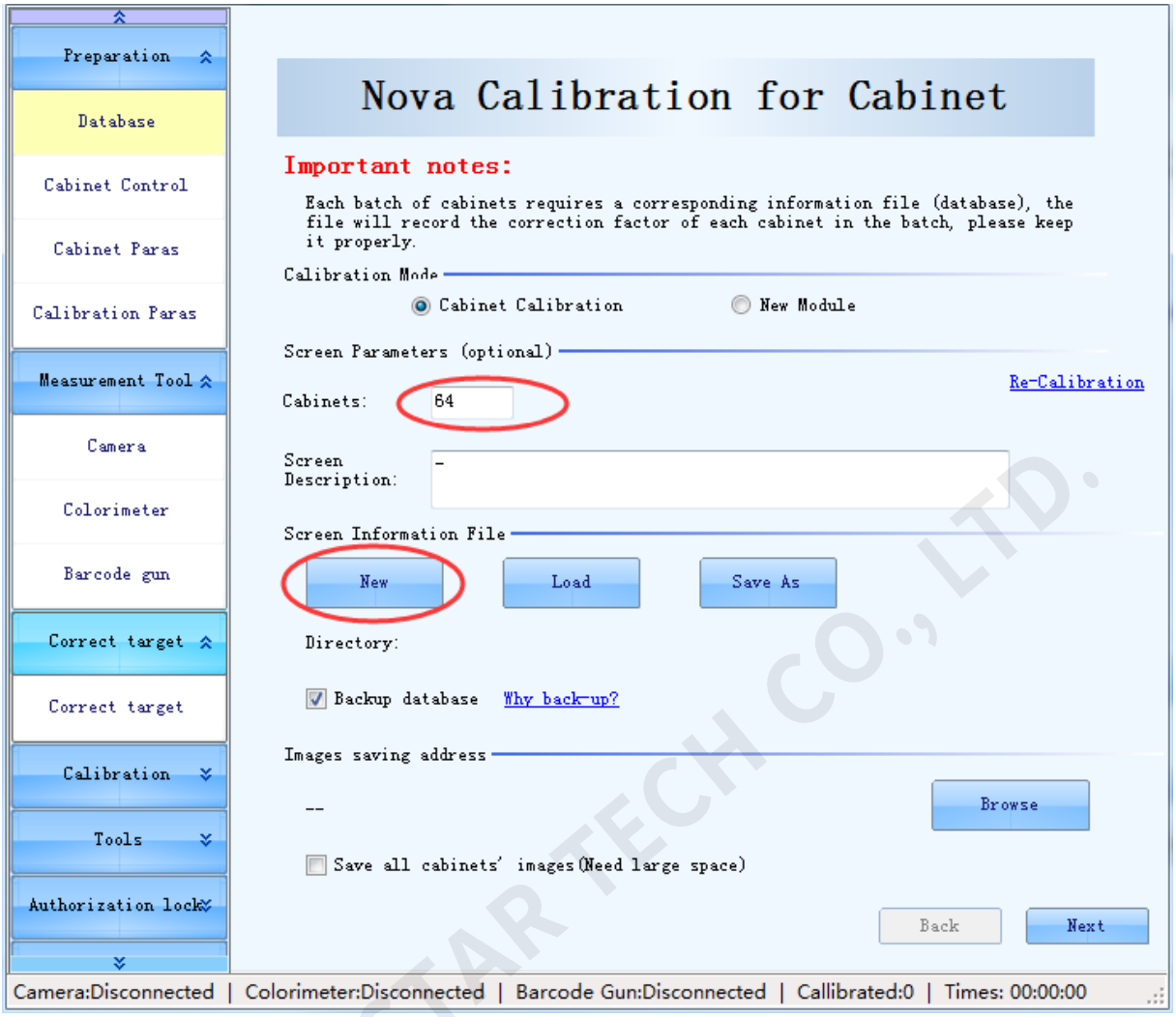




# 2.2 NovaCLB-Cabinet Operation

## 2.2.1 Calibration Preparation

Input the number of cabinets to be calibrated and click **New** to create a database.




**Online**: In NovaCLB-Cabinet, input the IP address and port No. of the computer on which the NovaLCT is running. Then, click **Connect** to establish communication between NovaCLB-Cabinet and NovaLCT.

**Receiving card configuration files:** Click **Acquire receiving card parameter file** to get the receiving card parameters (the last receiving card parameters sent by NovaLCT).

Figure 2-5 Online calibration

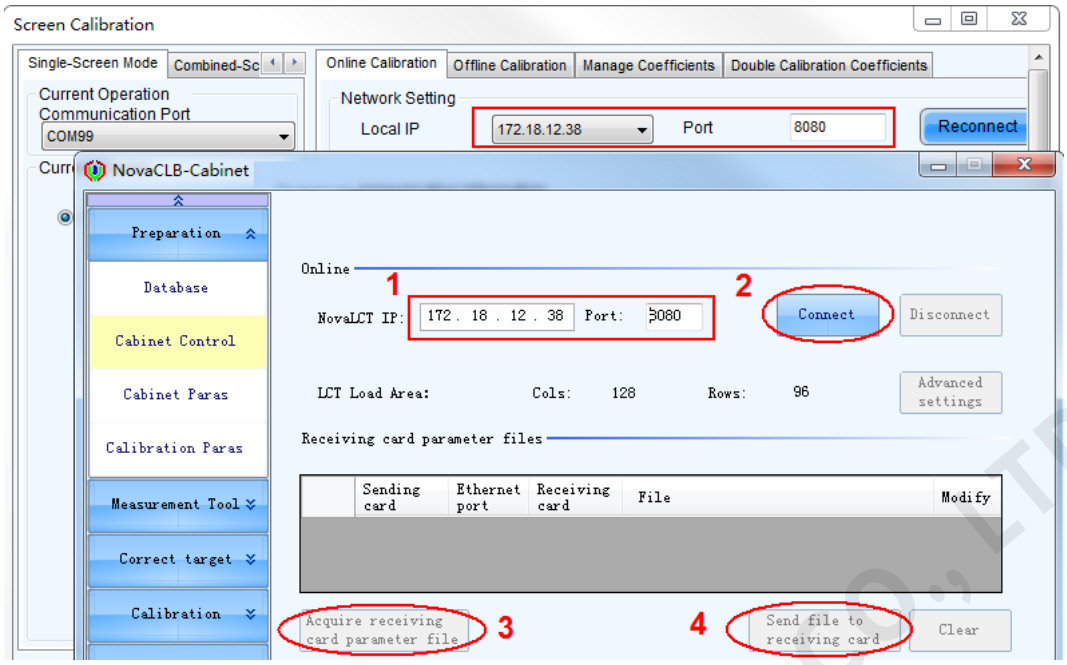



Figure 2-6 Cabinet parameters

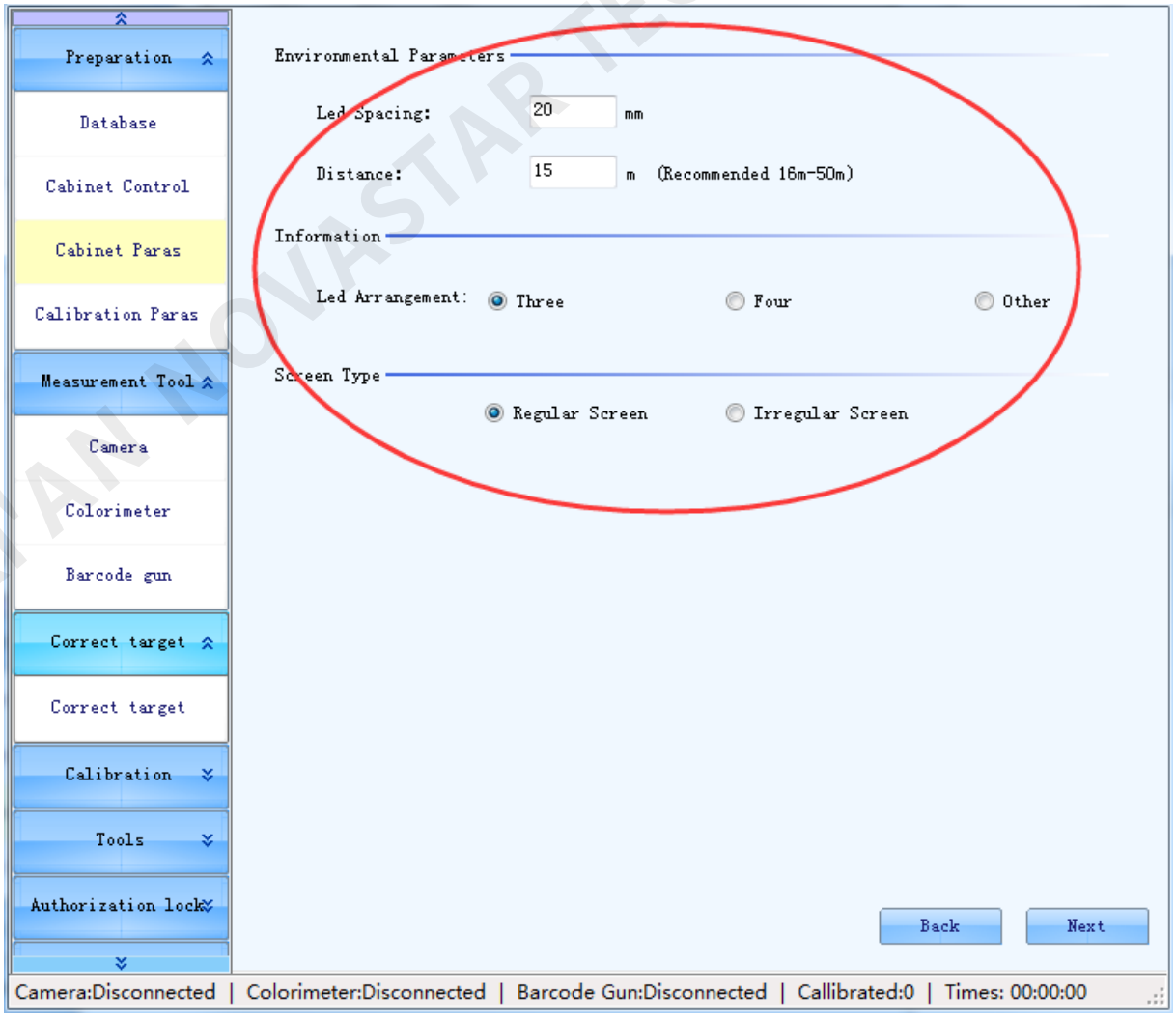
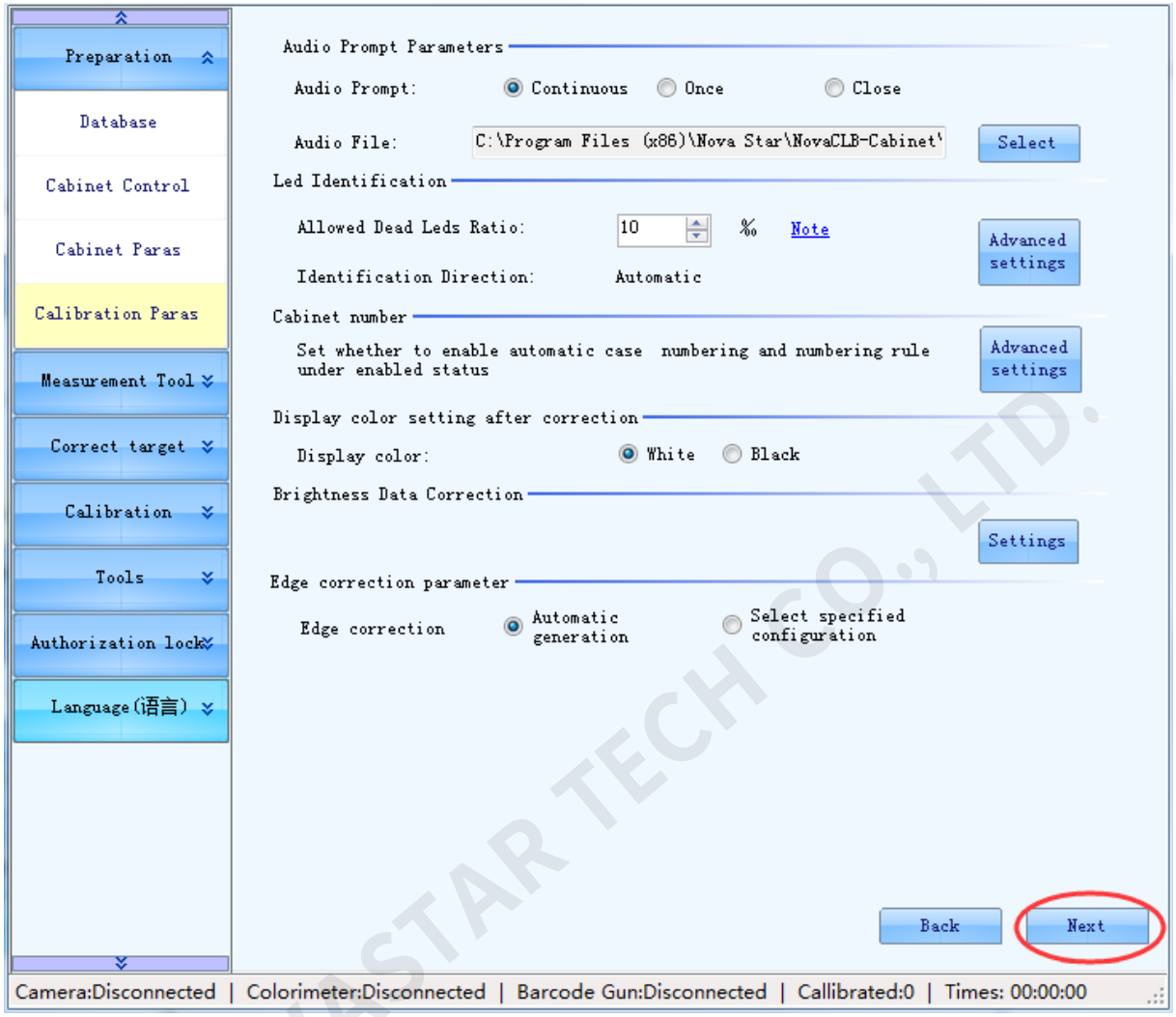


Figure 2-7 Calibration parameters




## 2.2.2 Configuration of Measuring Instruments

Step 1 Make camera preparations (for digital cameras).

a. Connect the camera to PC via USB cable and toggle the camera switch to ON. Then, click **Connect** on the **Camera** page in NovaCLB. After the software prompts that the camera is connected successfully, the camera can be controlled automatically via the software.

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. Switching between eyepiece framing and LCD framing: Enable "Real-time display shooting" in camera menu and then you can press  to switch.

Step 2 Focus the camera (for digital cameras).

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.

Figure 2-8 Standard imaging size

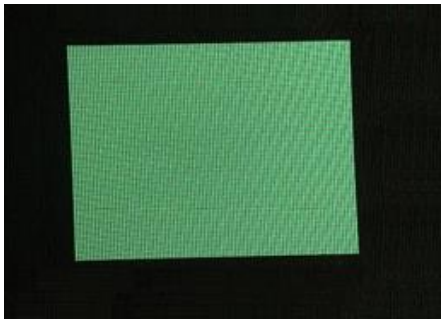


Figure 2-9 Imaging size too small

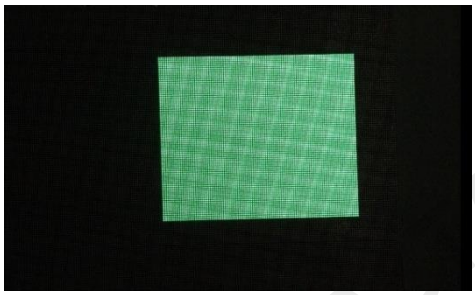
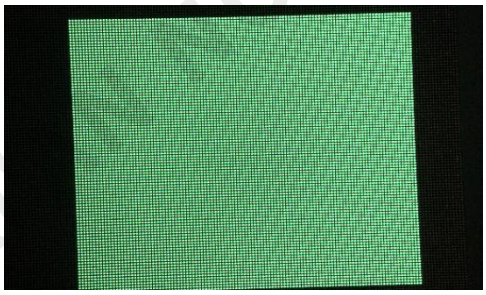
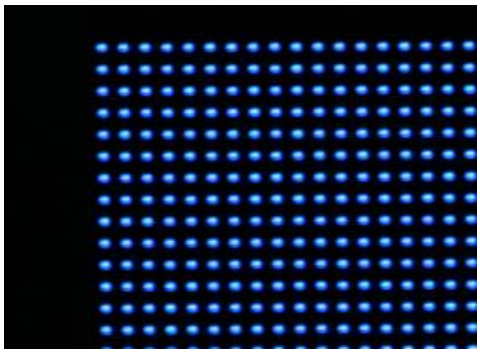


Figure 2-10 Imaging size too large



After adjusting the imaging size, focus the camera to make the pixel imaging vague a little bit. It may need to adjust focusing to make the imaging clear when analyzing camera parameters later.

Figure 2-11 Cabinet imaging



**Note:**

When using LCD framing, you can press  to make the image switch among its original size, 5x and 10x magnifications.

Step 3 Adjust camera saturation.

Figure 2-12 Adjusting saturation of digital camera

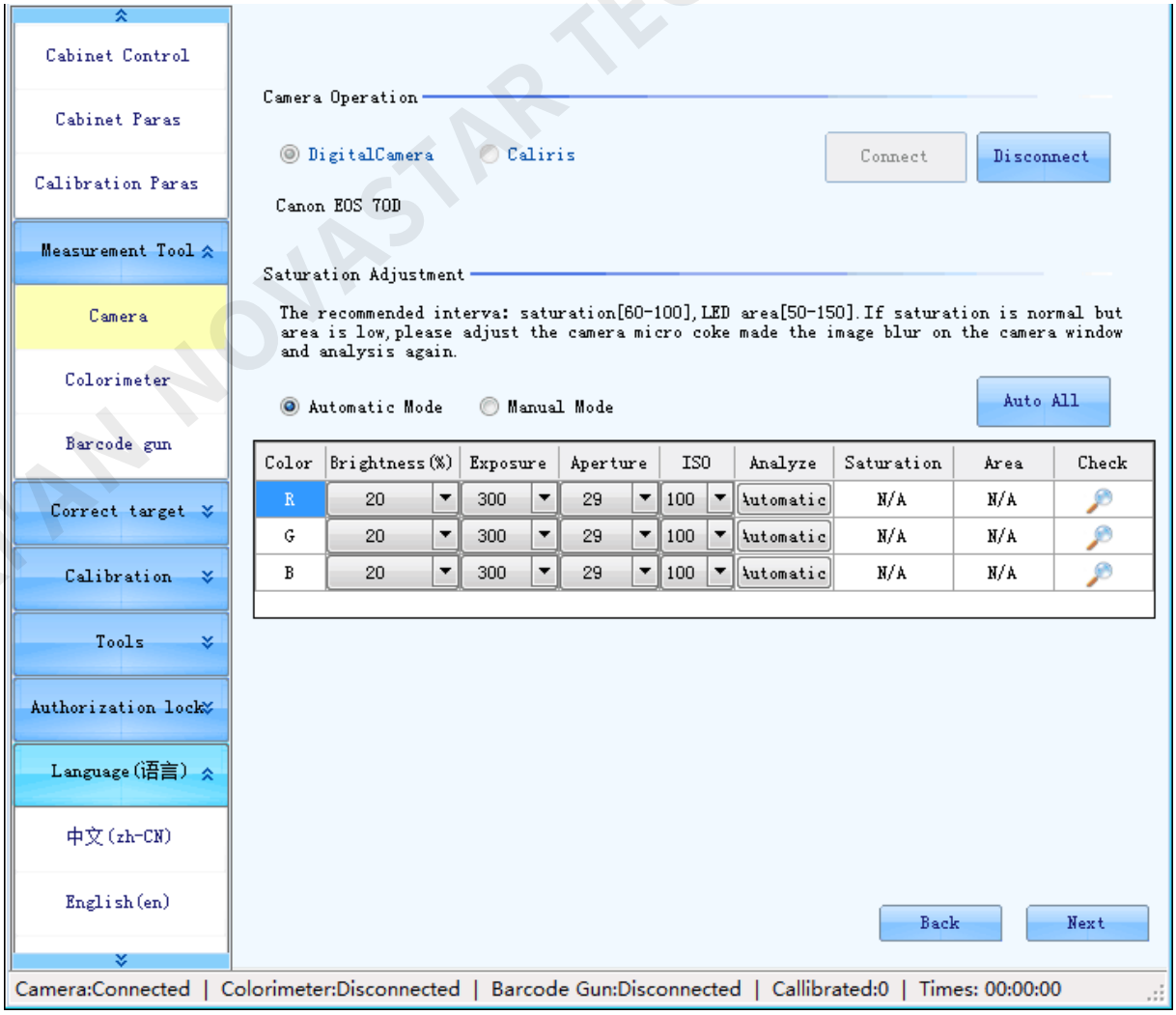
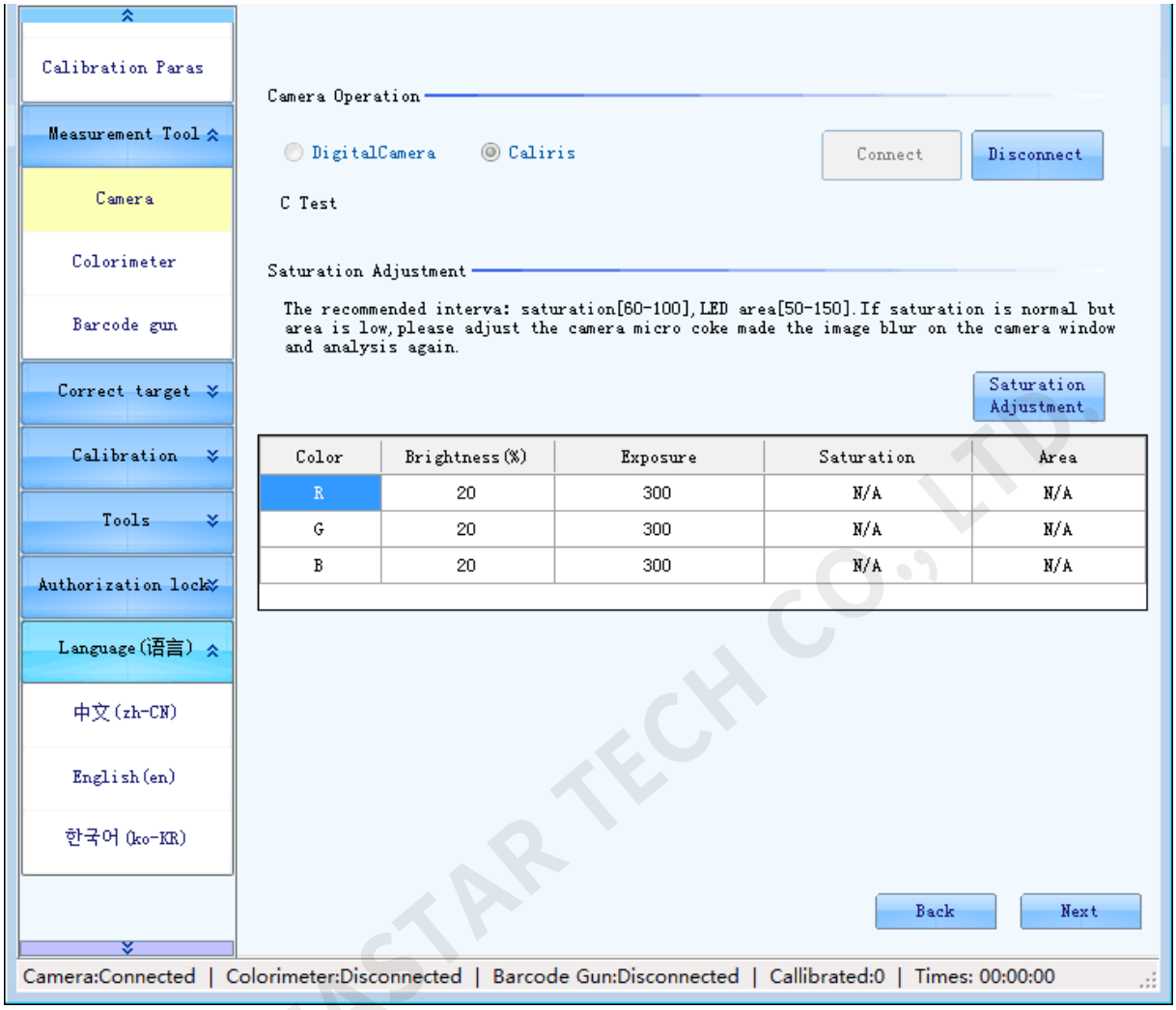


Figure 2-13 Caliris camera settings

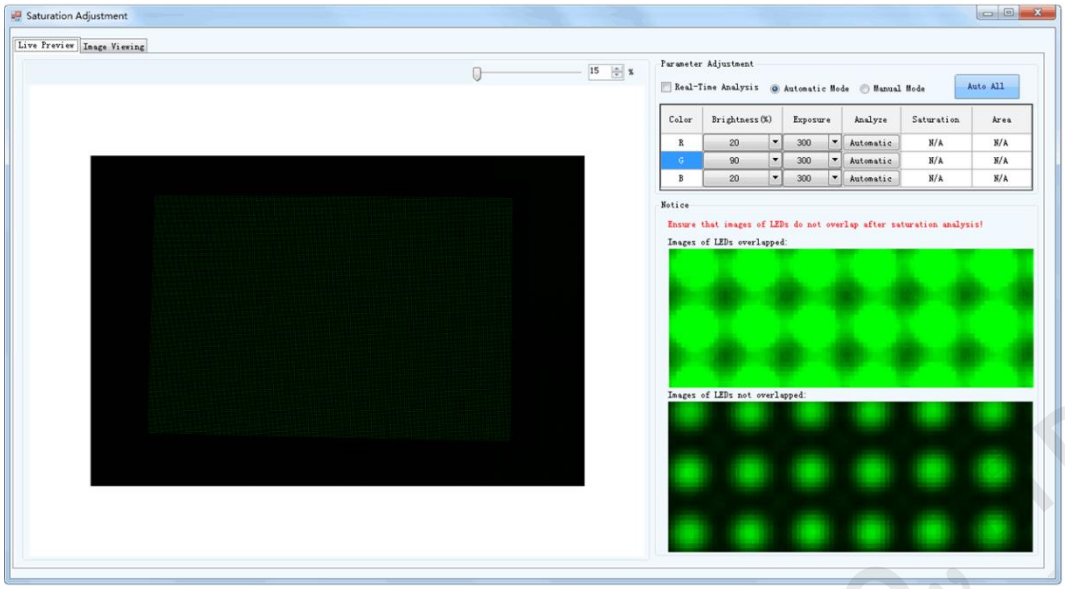



The two figures above are the pages after the digital and Caliris cameras are connected successfully. The Caliris camera does not have the preview window. To view the position of the screen in the Caliris camera, choose **Saturation Adjustment** > **Live Preview**. You can adjust the camera parameters to adjust the saturation and area. Saturation adjustment for the digital camera can be automatic or manual, and for the Caliris camera, it has the real-time analysis, automatic and manual modes.

- 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.

Figure 2-14 Saturation adjustment



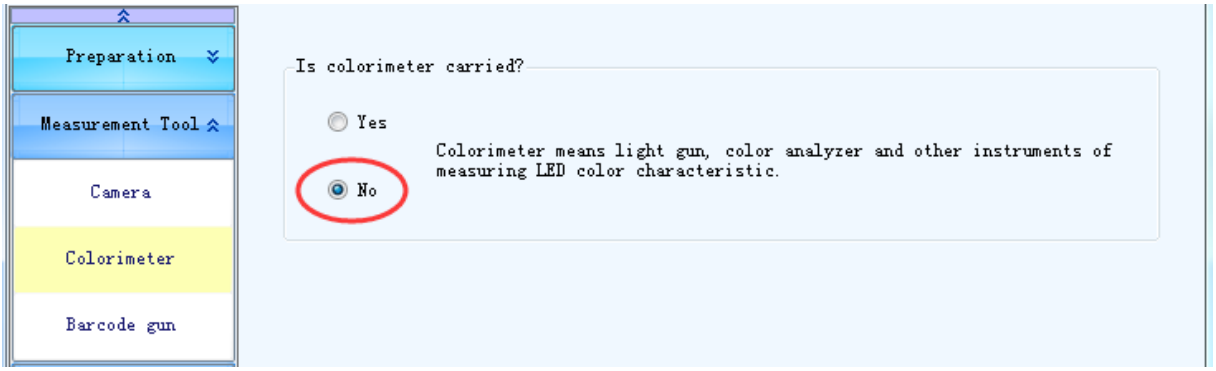

As shown in Figure 2-14, the adjustment page has 2 tabs, described as below.

- **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, click to zoom in and 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.

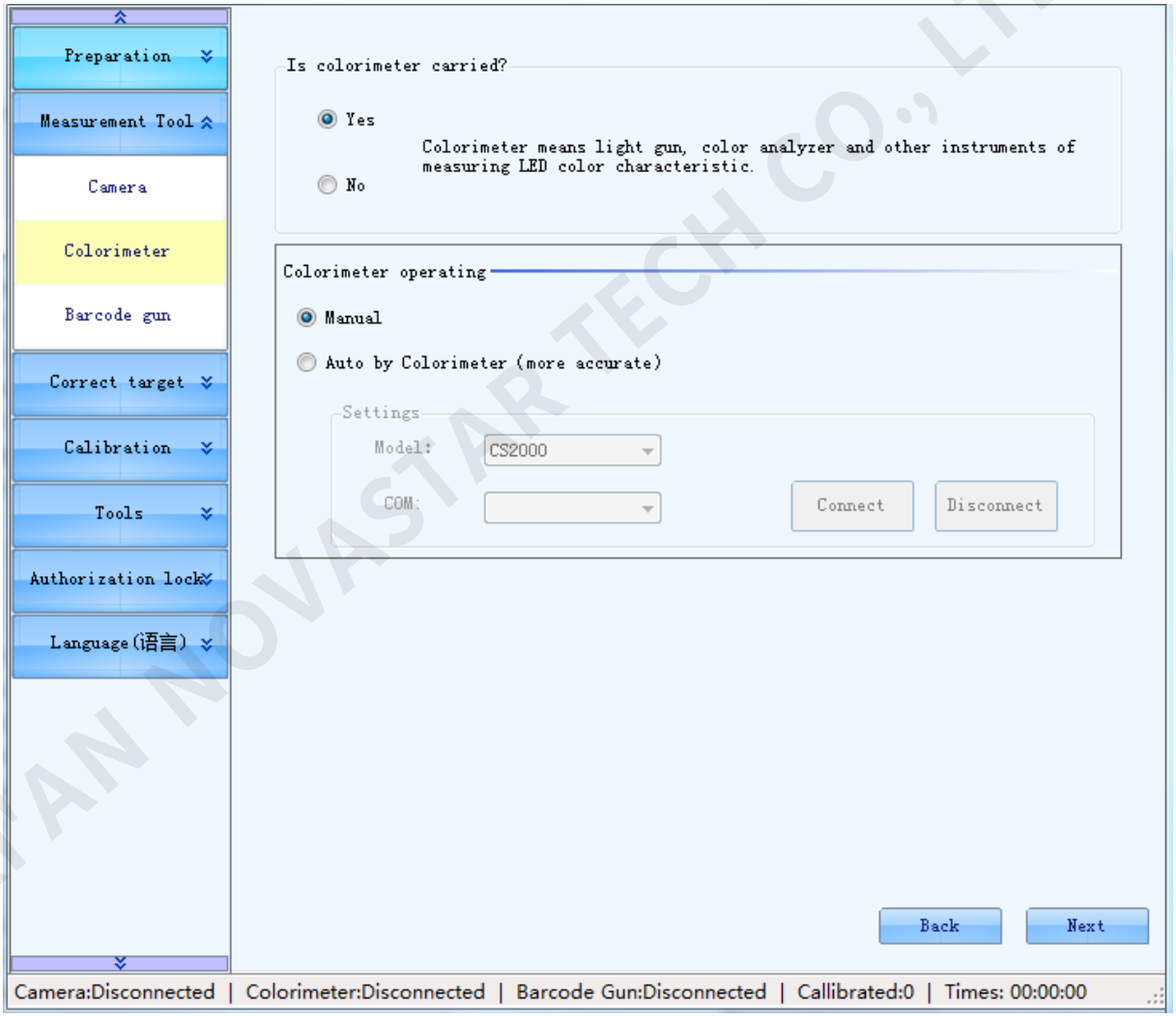
For the Caliris camera, after saturation analysis, ensure that the images of LEDs are not overlapped. If they are overlapped, please adjust the camera parameters again to ensure that the saturation analysis result is normal and they are not overlapped.

Step 4 Set the colorimeter.

Select **No** if a light gun (a kind of colorimeter) is not needed to measure the brightness and chroma values after calibration.

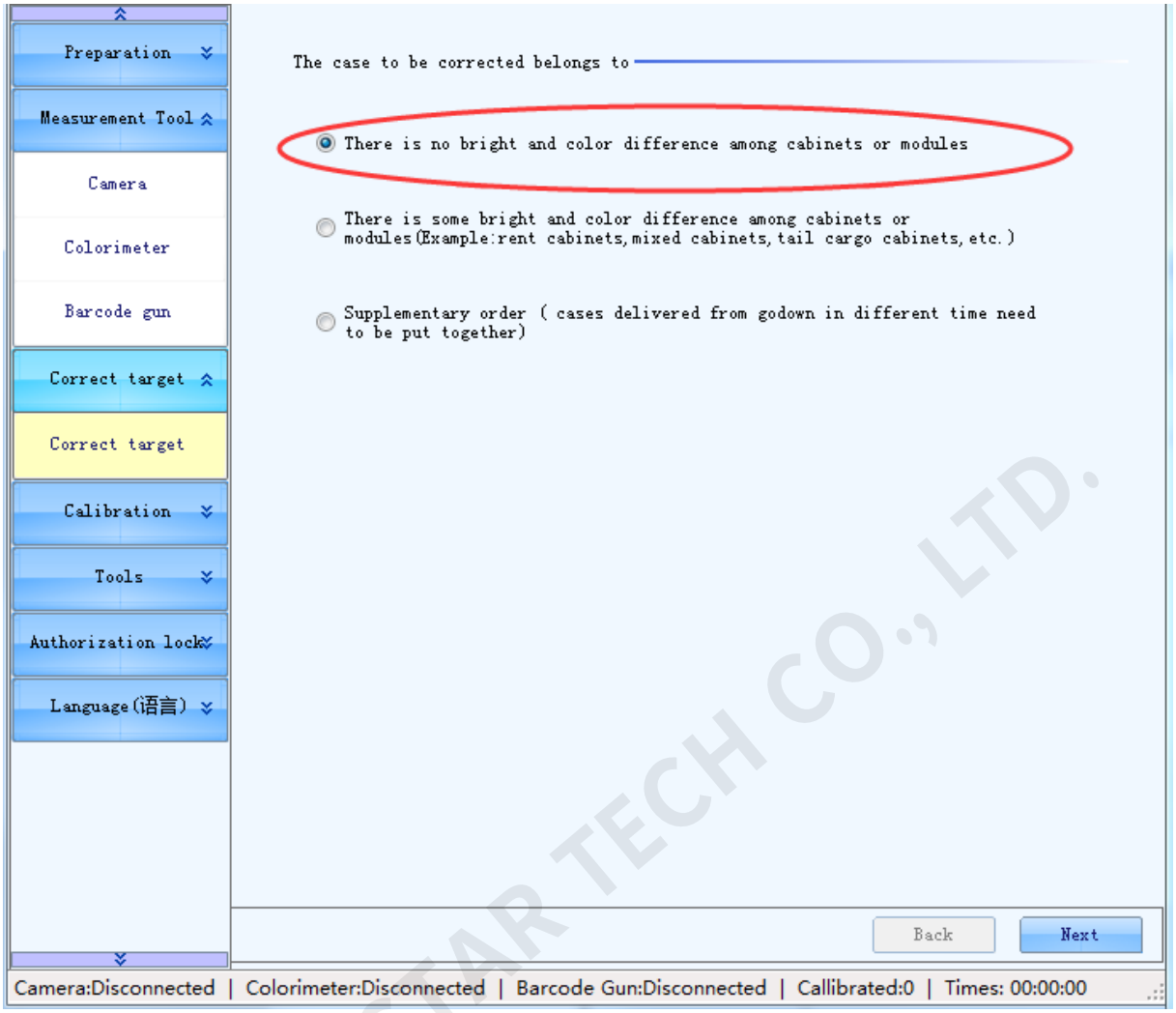



Select **Yes** if a light gun is needed. Users can manually measure the values, or connect the light gun and the values can be measured automatically by NovaCLB-Cabinet.



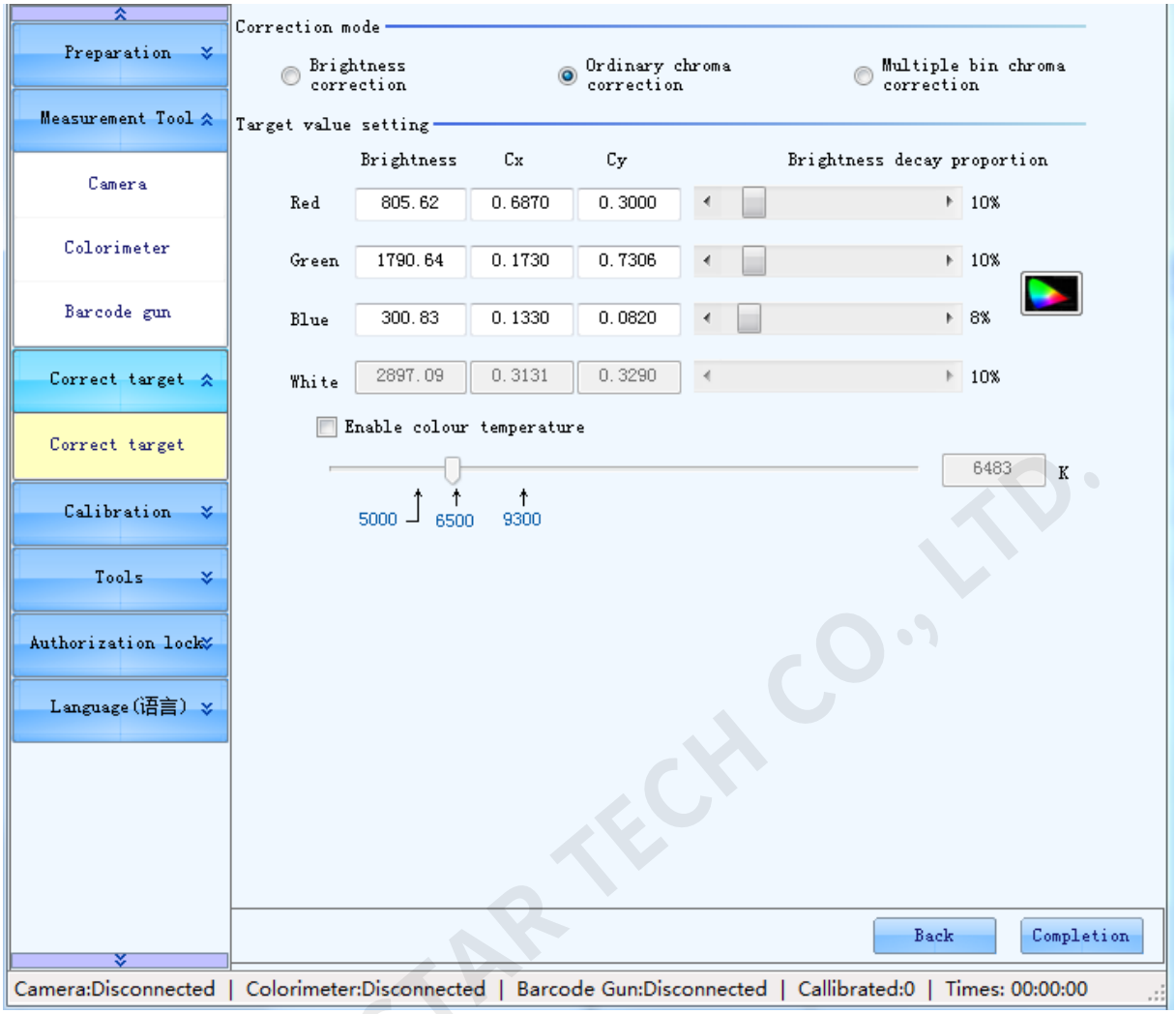

## 2.2.3 Calibration Target

- No light gun connected

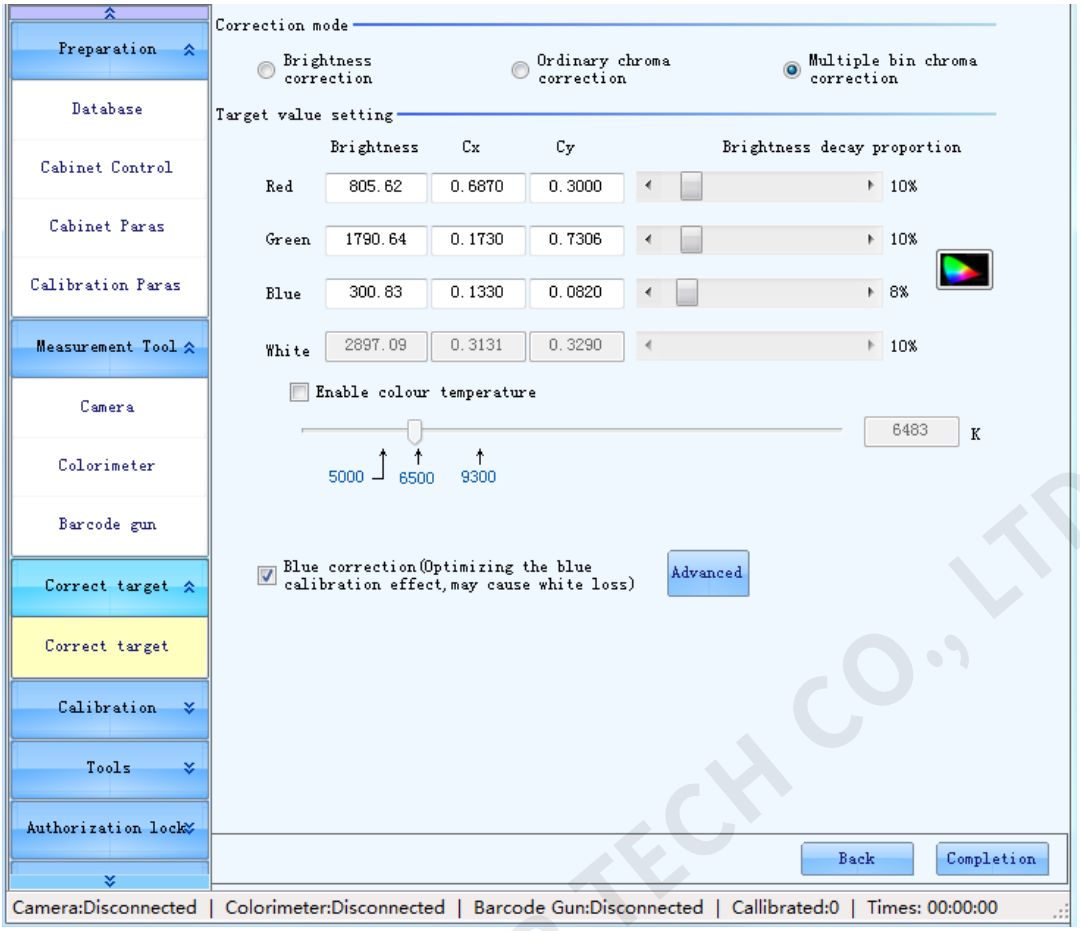


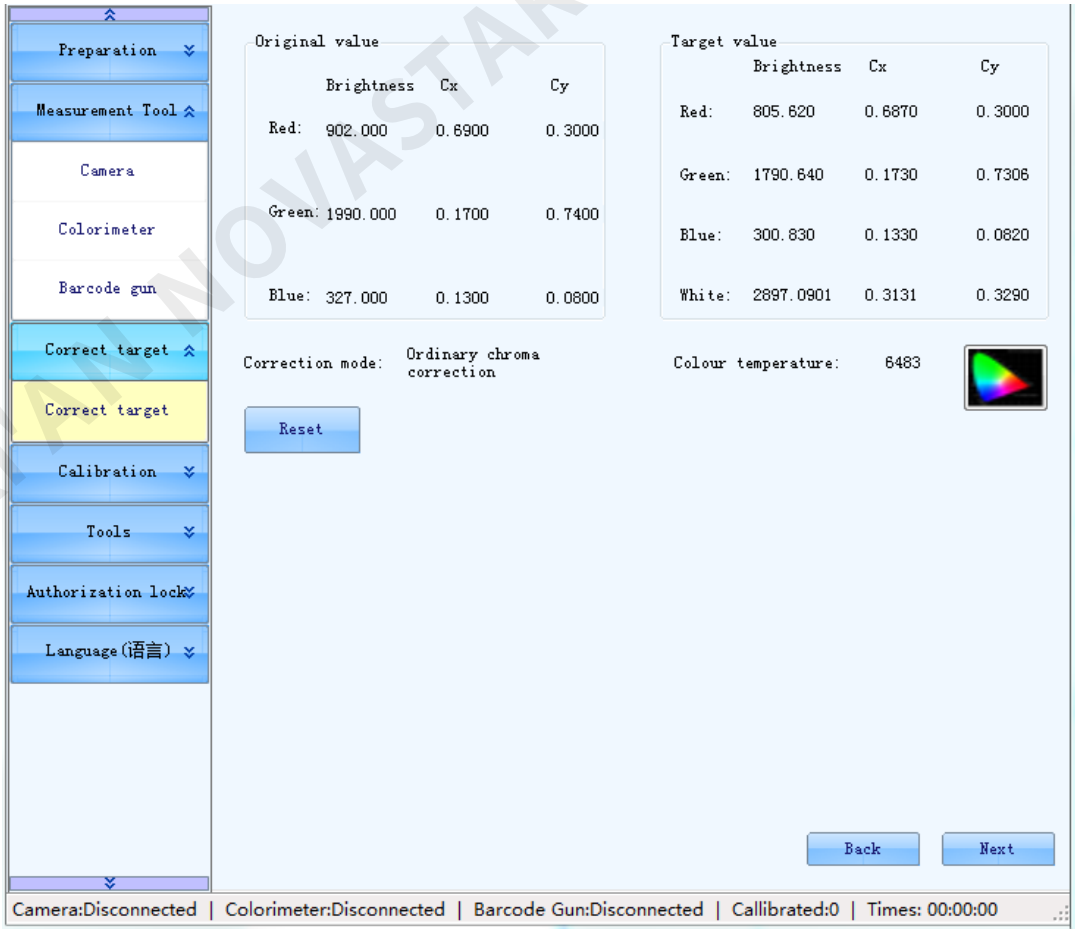

There are 3 types of calibration targets, provided for **Brightness correction**, **Ordinary chroma correction**, and **Multiple bin chroma correction**. For the cabinets which evenly use LEDs of multiple batches, use the multiple bin chroma correction mode. For cabinets of which the LED chroma discrepancy is within 5nm, use the brightness correction or ordinary chroma correction mode.

Users can drag the sliders to adjust the brightness decay proportion, which is 10% in general. When **Multiple bin chroma correction** is selected, please adjust the color gamut, or change the color gamut when calibrating the first cabinet.




For the multiple bin chroma correction, please select **Blue correction**.

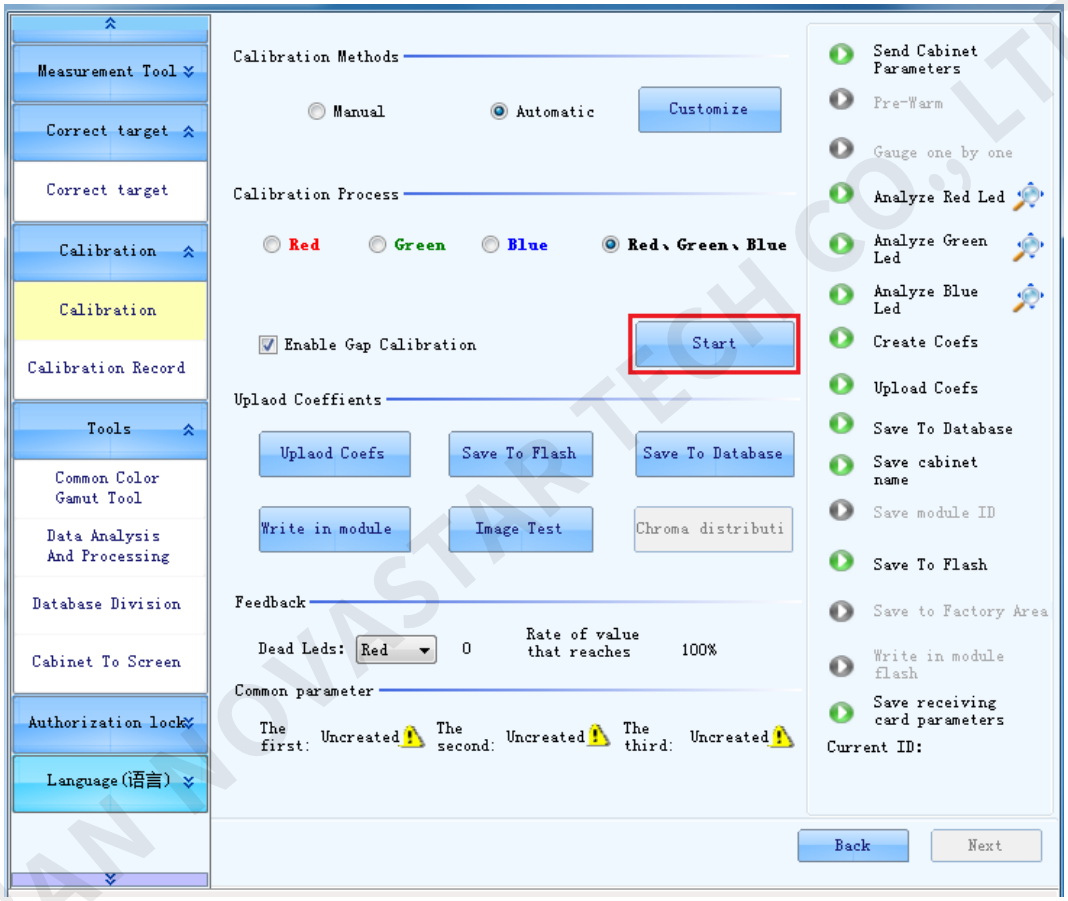


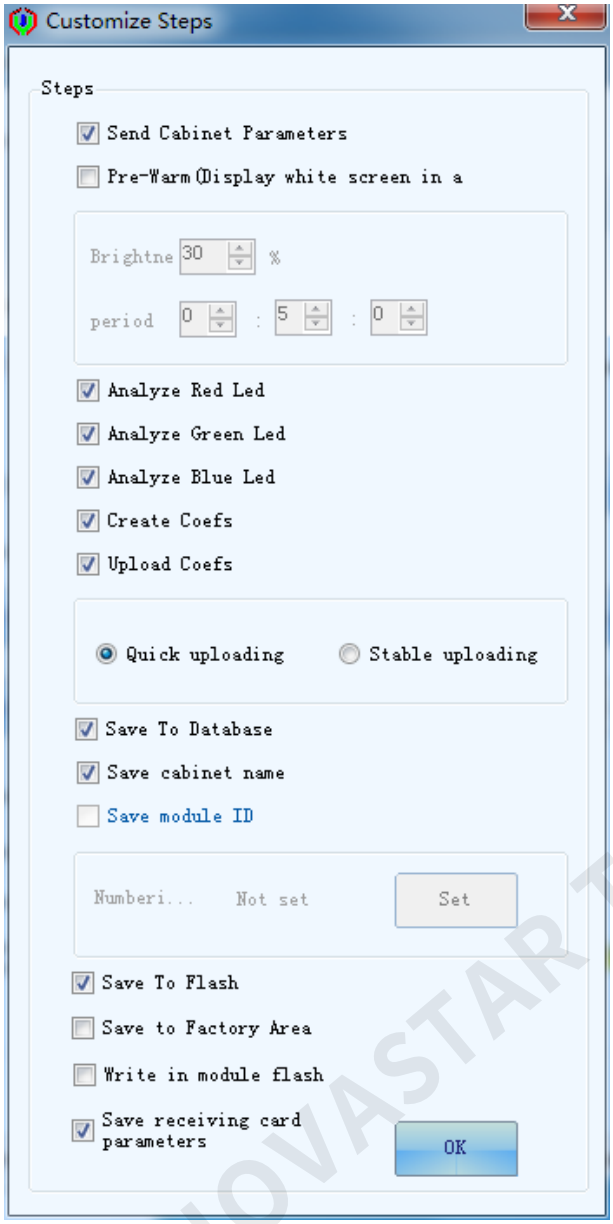



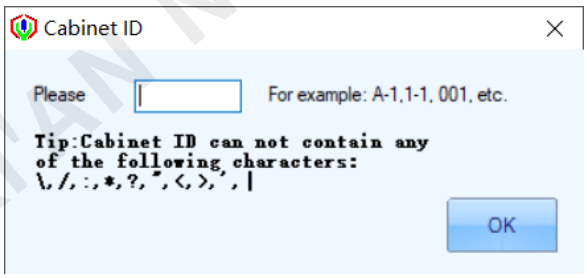
## 2.2.4 Calibration of First Cabinet

Click **Start** to start calibration and enter the cabinet ID.

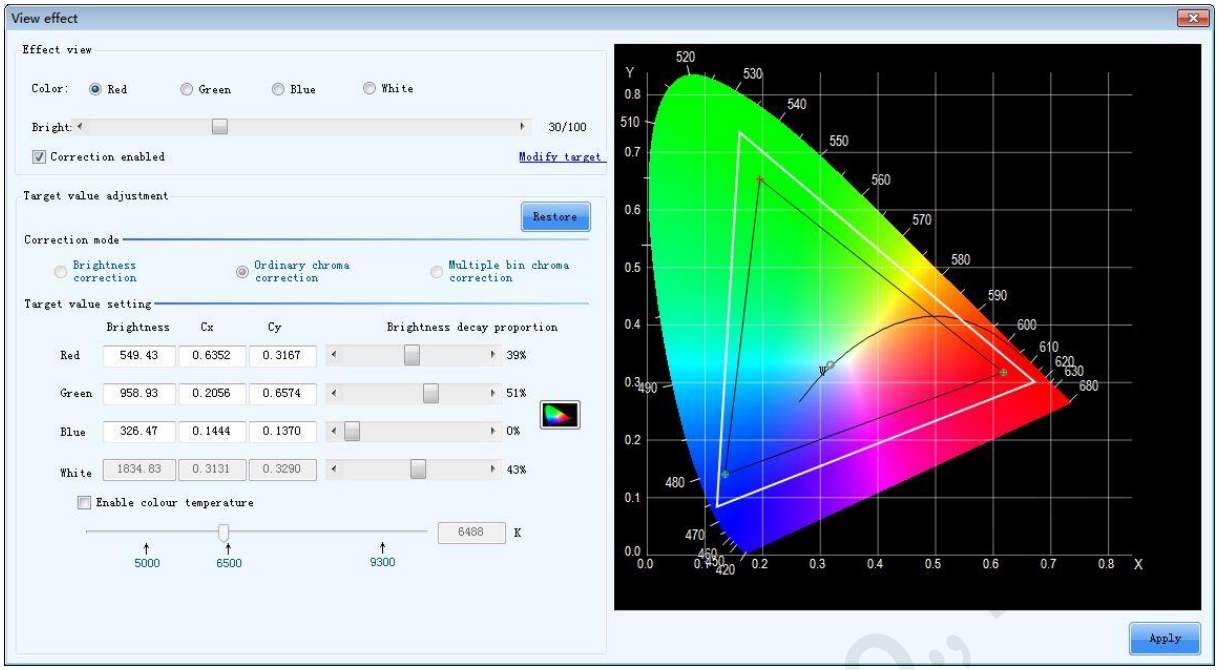
- If you need to write the calibration coefficients to the module's flash, select **Write in module flash** in **Customize Steps**.
- If you need to save the calibration coefficients to the factory area, select **Save to Factory Area** in **Customize Steps**.
- If you need to write the module ID to the module's flash, select **Save module ID** and then set the numbering rules for the module ID.






Before generating a coefficient, a page of modifying target value will show. After modifying the target value, click **Preview** to preview the effect. After you confirmed the effect, click **Apply**. At this time, the calibration of the first cabinet is finished.



# 3 Calibration of Subsequent Cabinets

Remove the first cabinet and place the next cabinet on the pedestal. Then, Click **Start** to start calibration.

Figure 3-1 Starting calibration

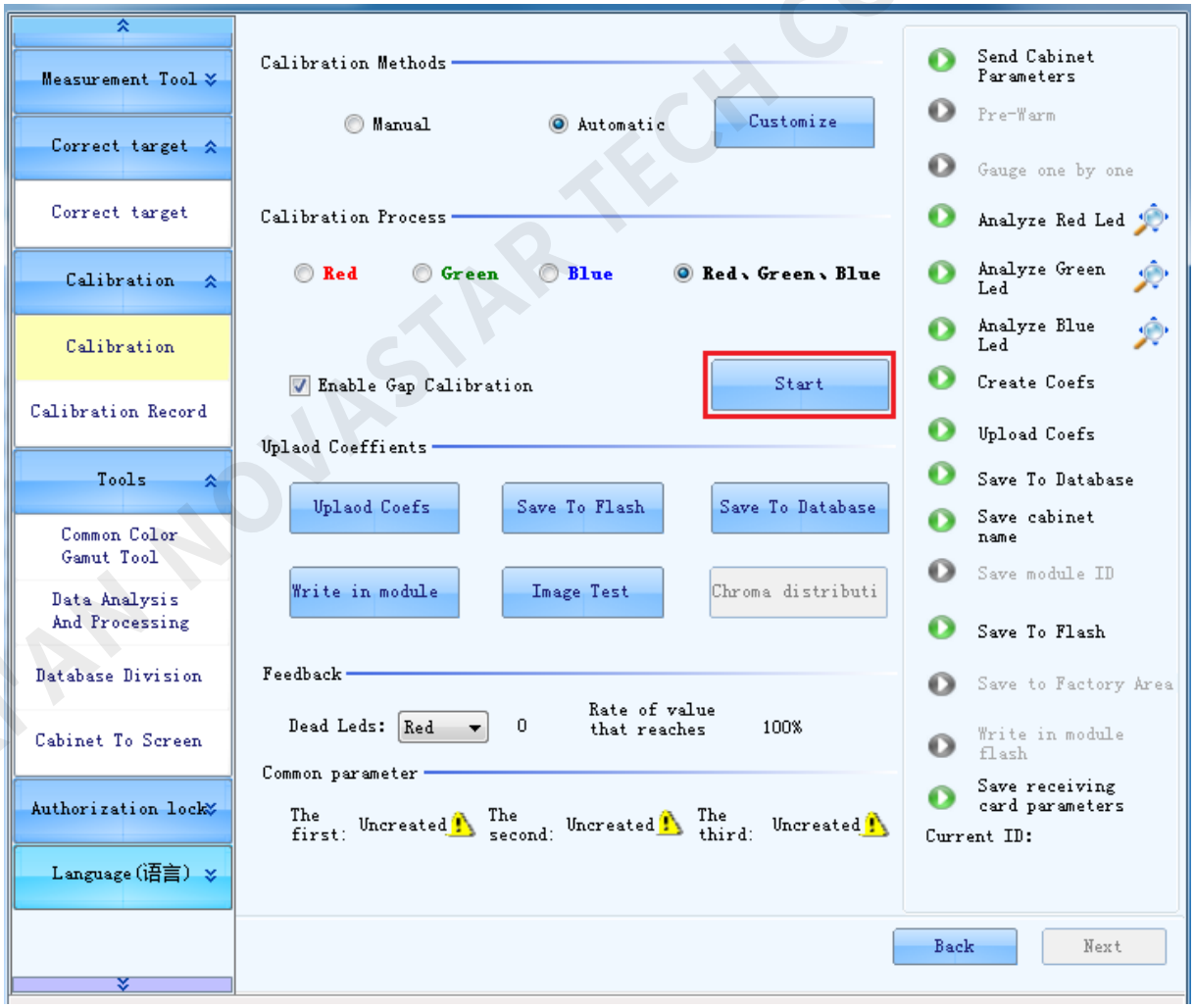
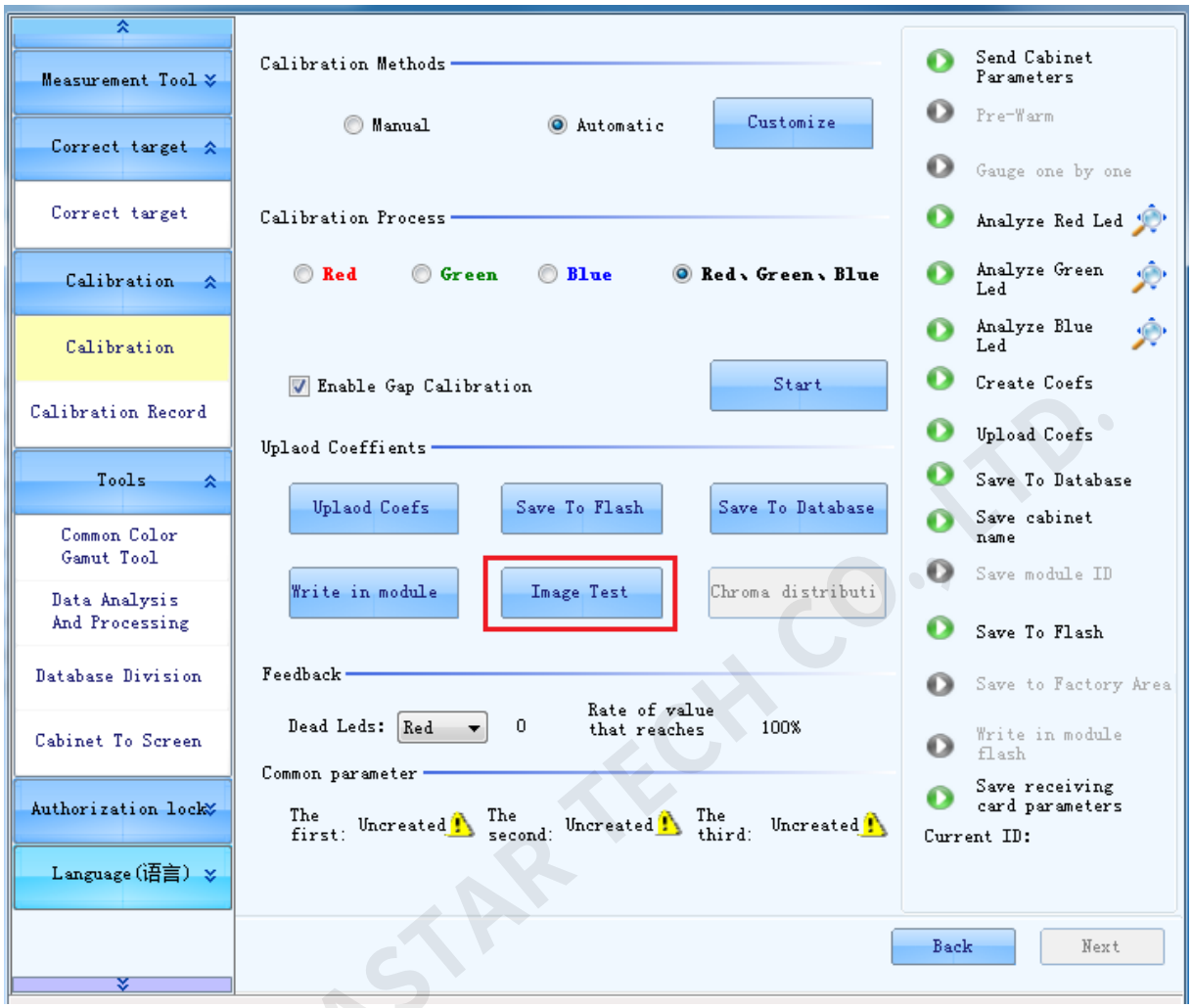


Figure 3-2 Viewing effect




**Notice:**

- 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).
- 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. In Chapter 4, detailed introduction to the identification of simulation diagram will be given.

# 4 Identification of Simulation Diagram

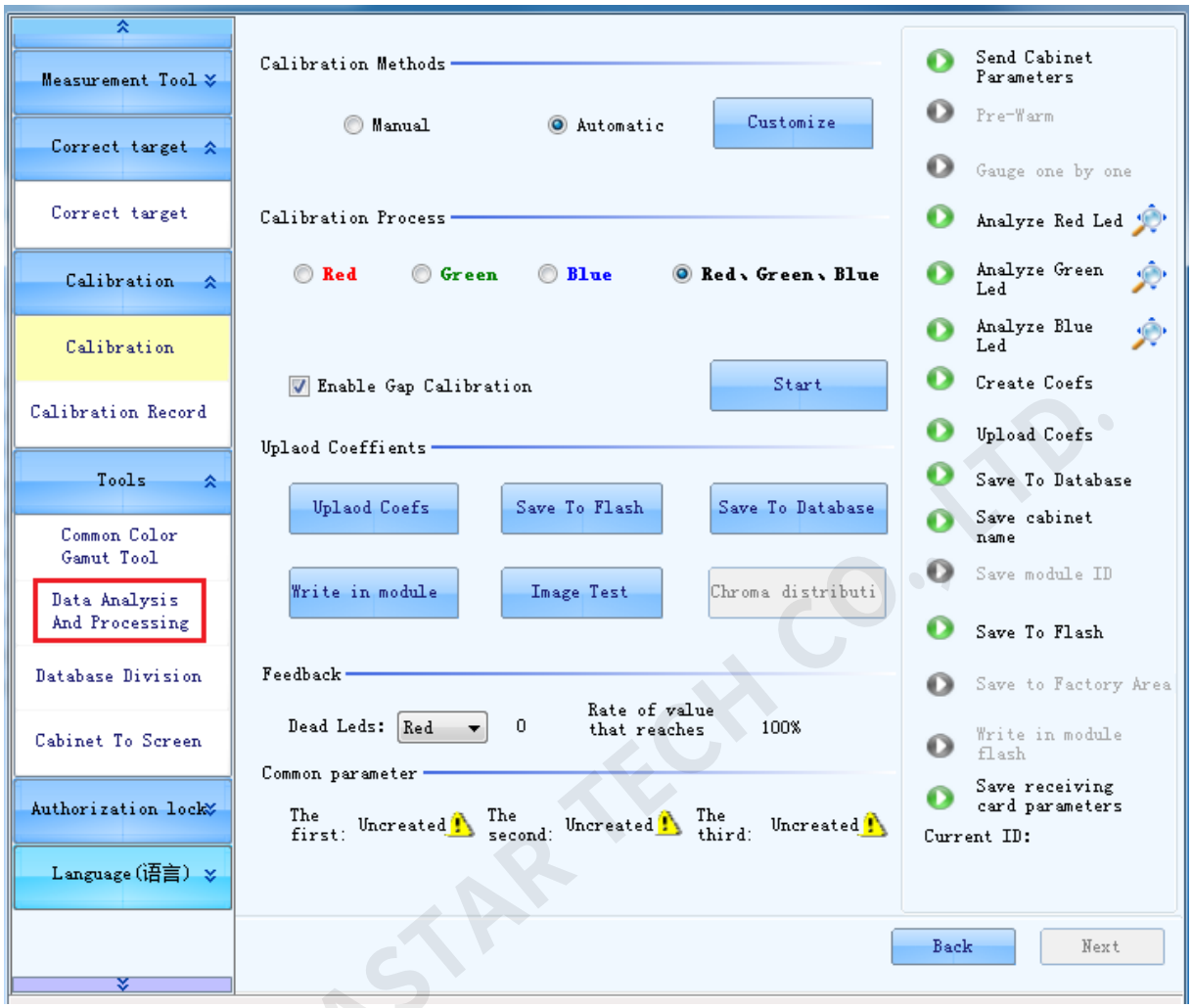
The NovaCLB-CabSolver, cabinet database management platform of NovaCLB-Cabinet, is used to make simulation analysis of part of the calibrated cabinets in advance in order to check whether the calibration effect is OK. If the effect is not OK, users can know its reason through the analysis as soon as possible, for example, there is non-standard operation performed (the camera is moved, etc.).

As splicing a simulation diagram by effective utilization of cabinets requires some experience, the simulation function will be introduced next and several cases will be used to illustrate how to judge whether the measured data is ideal with the simulation diagram.

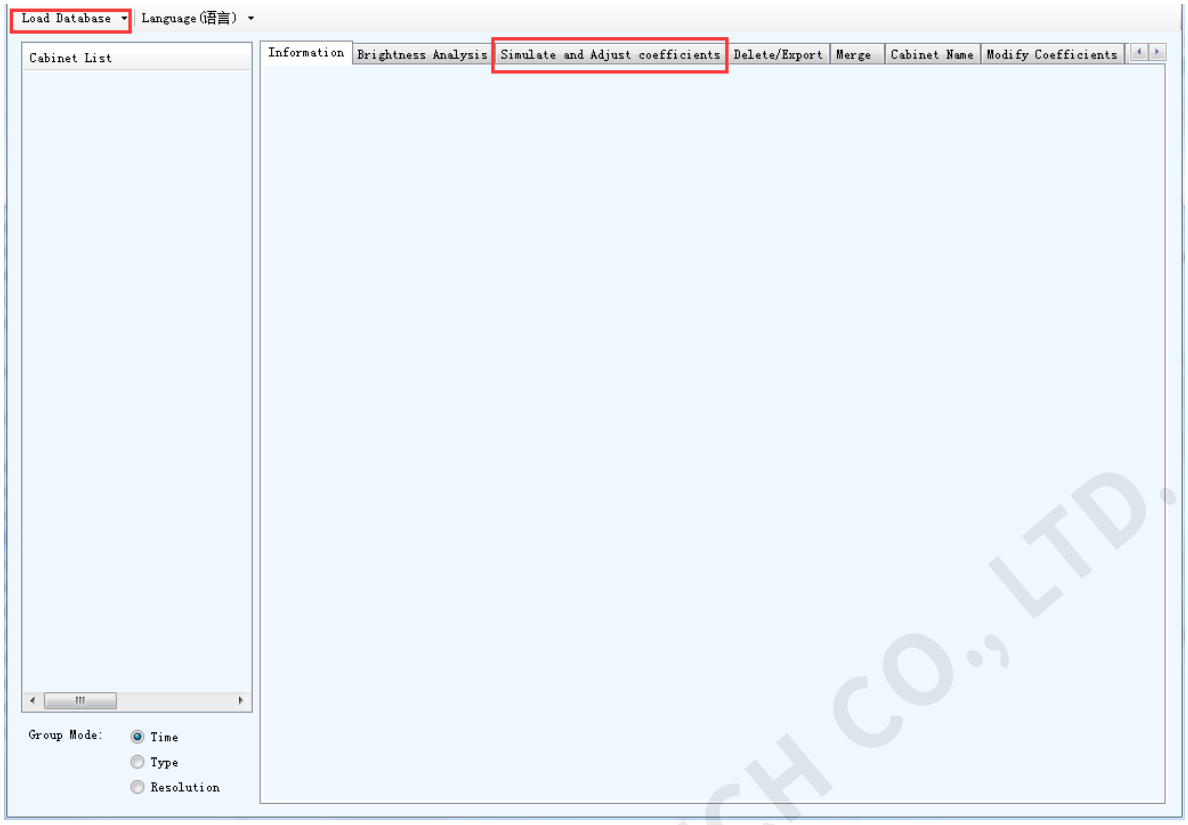
## 4.1 Use of Simulation Function

Step 1 Click **Data Analysis And Processing** to open the NovaCLB-CabSolver.

Figure 4-1 Entering data analysis and processing platform




Step 2 Load the database and click the **Simulate and Adjust coefficients** tab

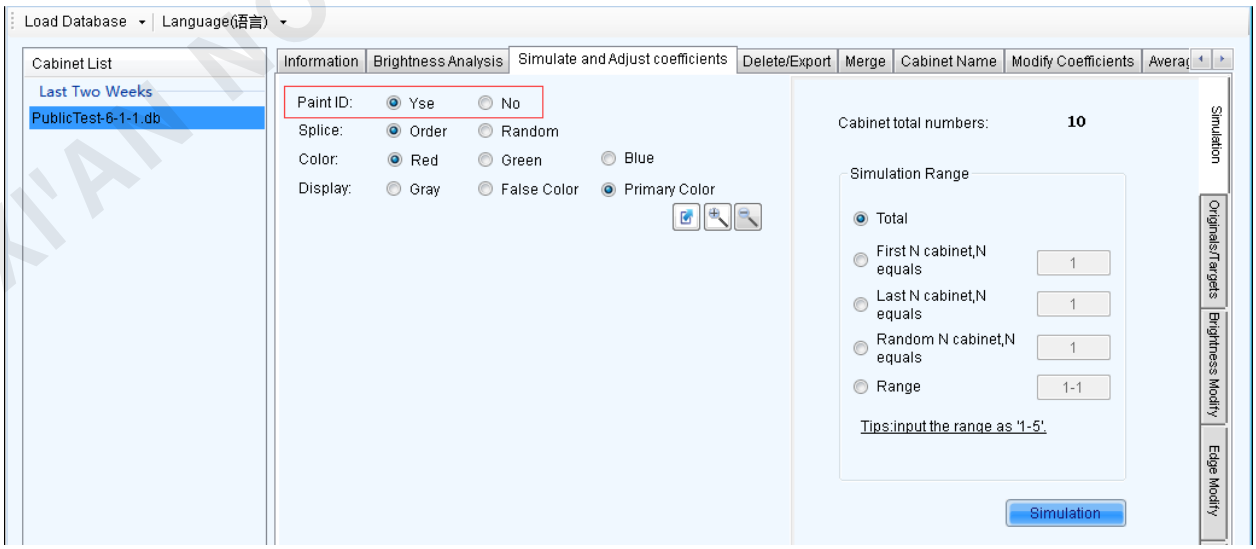



Step 3 Click the **Simulation** button.

Step 4 Select the **Splice** mode: **Order** or **Random**.

Step 5 Choose **Yes** and **No** for **Paint ID** respectively to check whether the splicing among cabinets shown in the simulation diagram is normal.

Step 6 Switch the **Display** mode. Primary color, gray and false color are three expressions of measuring brightness.



# 4.2 Cases of Identifying Simulation Diagrams

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).

  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.

## 4.2.1 Case 1: Good Effect, No Problems with All Cabinets

Figure 4-2 Case 1 (a) Green in primary color mode

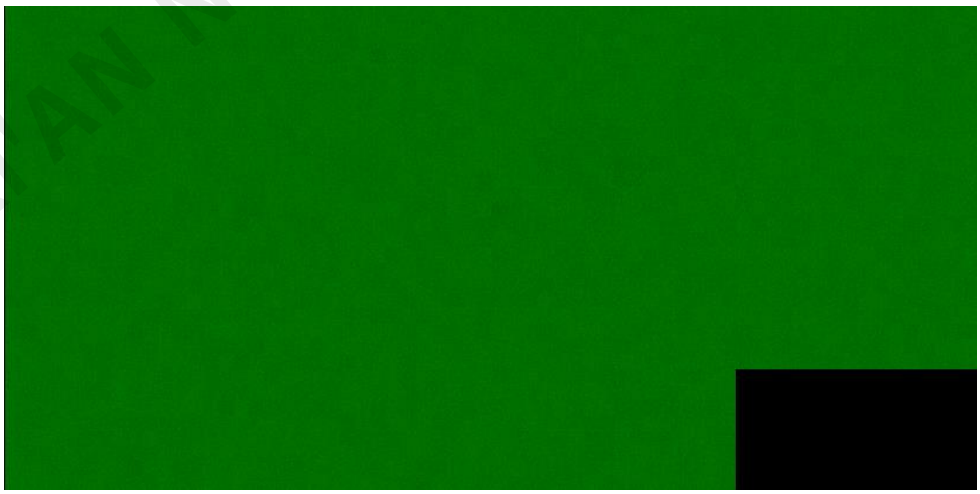
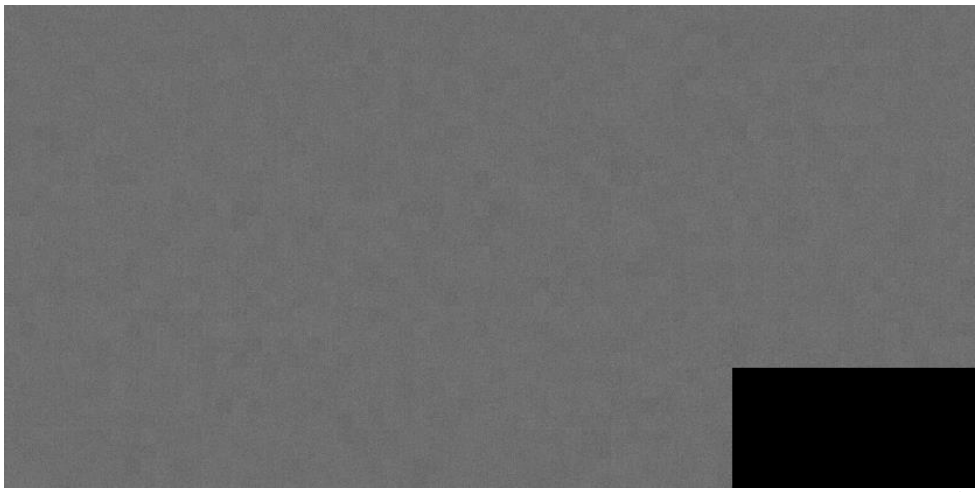


Figure 4-3 Case 1 (b) Green in gray mode



**Analysis**: The measurement data of green before calibration is quite ideal. There is no significantly abnormal data. It also reflects that this batch of cabinets has no obvious process problems although they have a few modularity phenomena and the LED screen spliced by the cabinets is slightly blurred.

**Conclusion**: No problem.

### 4.2.2 Case 2: Good Effect, No Problems with All Cabinets

Figure 4-4 Case 2 (a) Green in primary color mode

Figure 4-5 Case 2 (b) Green in gray mode

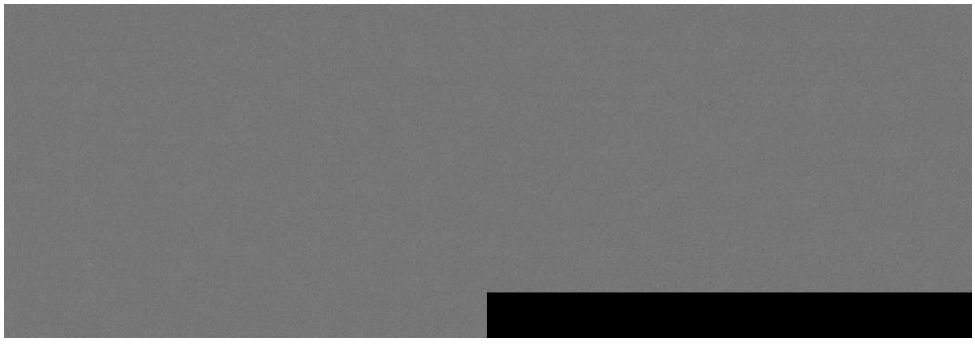


Figure 4-6 Case 2 (c) Green in false color mode

**Analysis**: The measurement data of green before calibration is quite ideal. There is no significantly abnormal data. It also reflects that this batch of cabinets has no obvious process problems although the LED screen spliced by the cabinets is blurred to a certain degree.

**Conclusion**: No problem.

### 4.2.3 Case 3: Serious Modularity Effect

Figure 4-7 Case 3 (a) Green in primary color mode

Figure 4-8 Case 3 (b) Green in gray mode

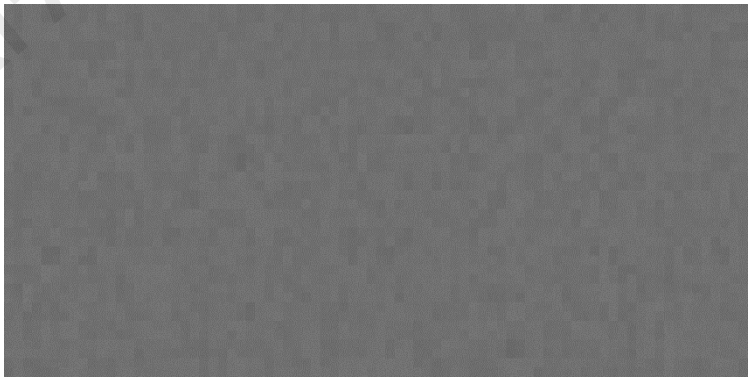
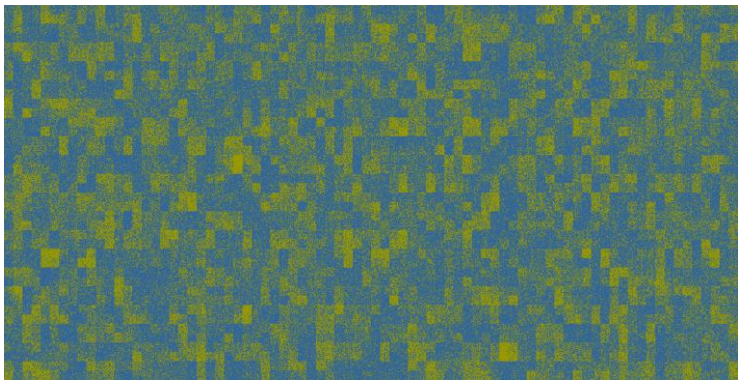


Figure 4-9 Case 3 (c) Green in false color mode



**Analysis**: The measurement data of green has serious modularity effect. In such situation, though the cabinet calibration can greatly improve the uniformity of cabinets, it is difficult to avoid brightness difference between a few cabinets after they are spliced on the site since the brightness values of cabinets vary obviously.

**Conclusion**: On-site calibration is recommended to ensure desired results. Cabinet calibration can improve effects greatly, but cannot solve the problem completely.

### 4.2.4 Case 4: Different Views of Cabinets Seen from Different Angles

Figure 4-10 Case 4 (a) Blue in primary color mode

Figure 4-11 Case 4 (b) Blue in primary gray mode

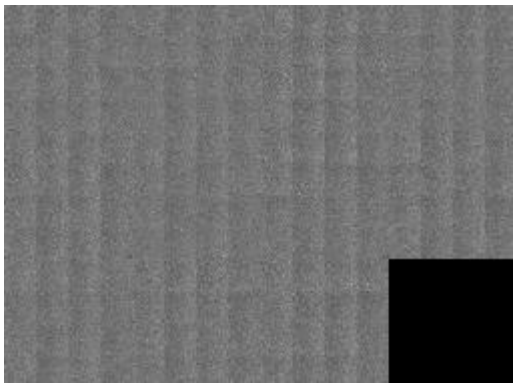
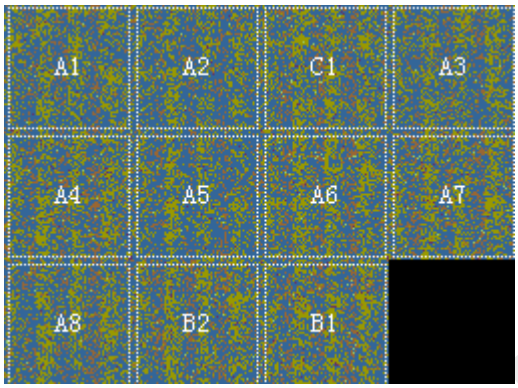


Figure 4-12 Case 4 (c) Blue in false color mode




**Analysis**: The measurement data of blue has lots of vertical bars before calibration. The cabinet is placed with an 18° back elevation angle during calibration. It is estimated that the vertical bars are caused by the emitting angle of the cabinet. Observe the performance of the cabinet before calibration: 1. The frontage of the cabinet has good performance (0° back elevation angle), and there is no vertical bars. 2. With the increase of the back elevation angle, the vertical bar problem is getting worse, and the performance on the 18° direction is consistent with the simulation diagram of Case 4. Though cabinet calibration can improve the cabinet uniformity at the 18°elevation direction, it cannot guarantee the screen uniformity at the other angles. In this case, vertical bar may appear on the frontage after the screen calibration.

**Conclusion**: On-site calibration is recommended to ensure desired results. Cabinet calibration is not recommended for those cabinets which has great difference at different directions.

## 4.2.5 Case 5: Abnormal Dark Lines at Edge of Cabinet

Figure 4-13 Case 5 (a) Red in primary color mode

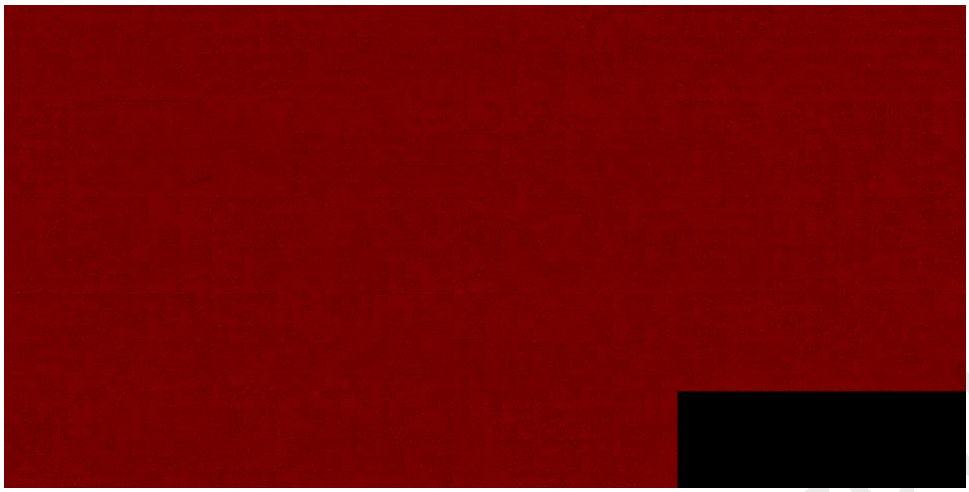
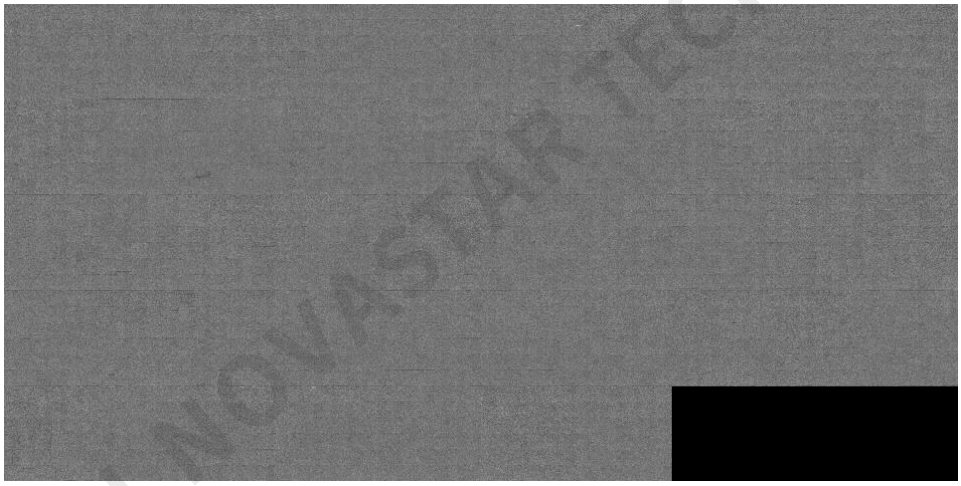


Figure 4-14 Case 5 (b) Red in gray mode



**Analysis**: There are obvious dark lines between the red cabinets. It is estimated that it is caused by the problem of red LEDs on the edge of the cabinet before calibration. After viewing the photographs of the cabinet, find that the last line of red LEDs on the cabinet are darker. Then check the cabinet and find that the last line of red LEDs on the cabinet are tilted.

**Conclusion**: Make the last line of LEDs upright and then perform calibration. Cabinet calibration can improve this situation at calibration directions, but the dark lines will still exist when the cabinets are viewed from another direction after calibration.

## 4.2.6 Case 6: Individual Cabinet with Ideal Uniformation

Figure 4-15 Case 6 (a) Green in primary color mode

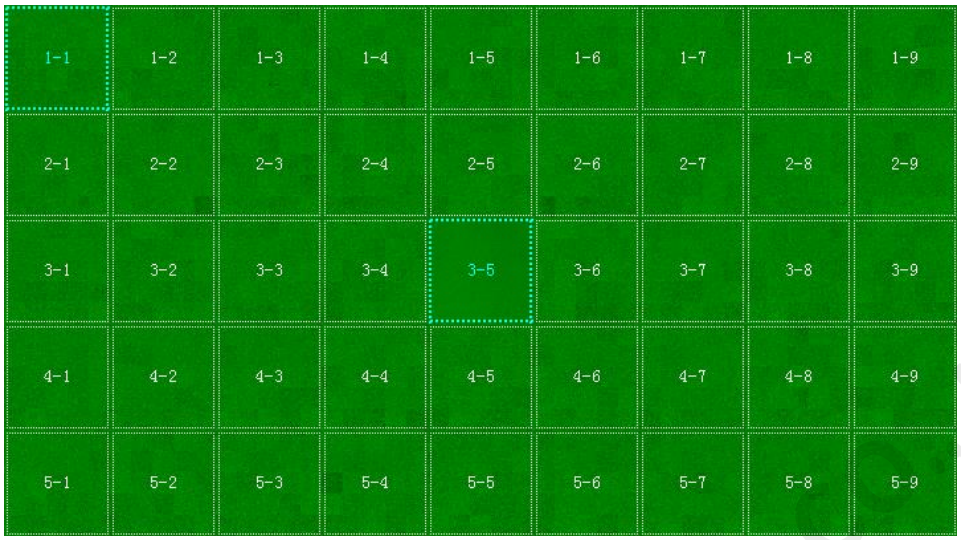
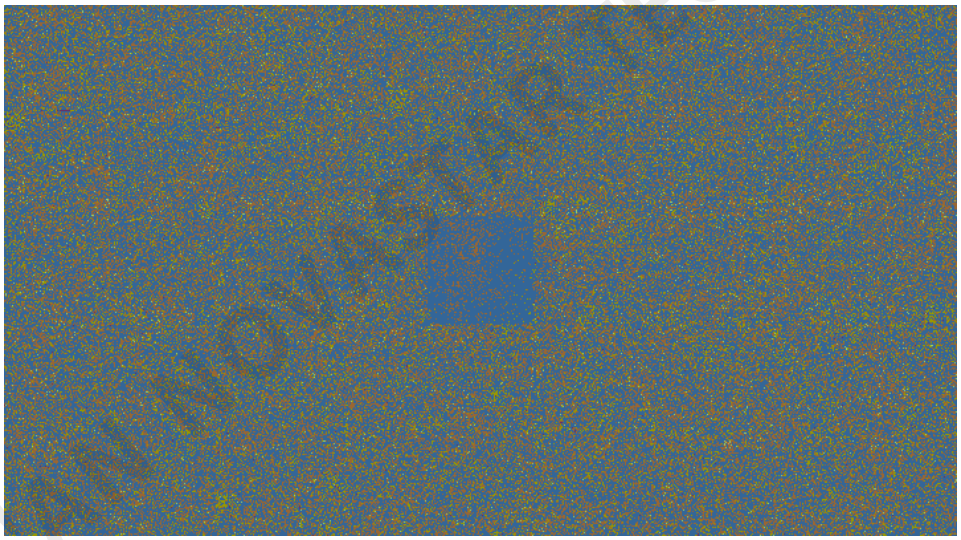



Figure 4-16 Case 6 (b) Green in gray mode



**Analysis**: The measurement data of green before calibration is quite ideal. But the uniformity of the cabinet 3-5 is obviously prior to that of all other cabinets, which is extremely unreasonable.

**Conclusion**: The cabinet 3-5 must be re-calibrated.

# 5 Troubleshooting

| Problem | Troubleshooting |
| --- | --- |
| Software alert: Point positioning errors | Change **Identification Direction** on the **Calibration Paras** page.<br>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.<br>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.<br>Check the camera's remaining battery capacity. |
| Software alert: Unexpected error | Check whether the cabinet resolution is too large. 7D supports 192*144.<br>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. |