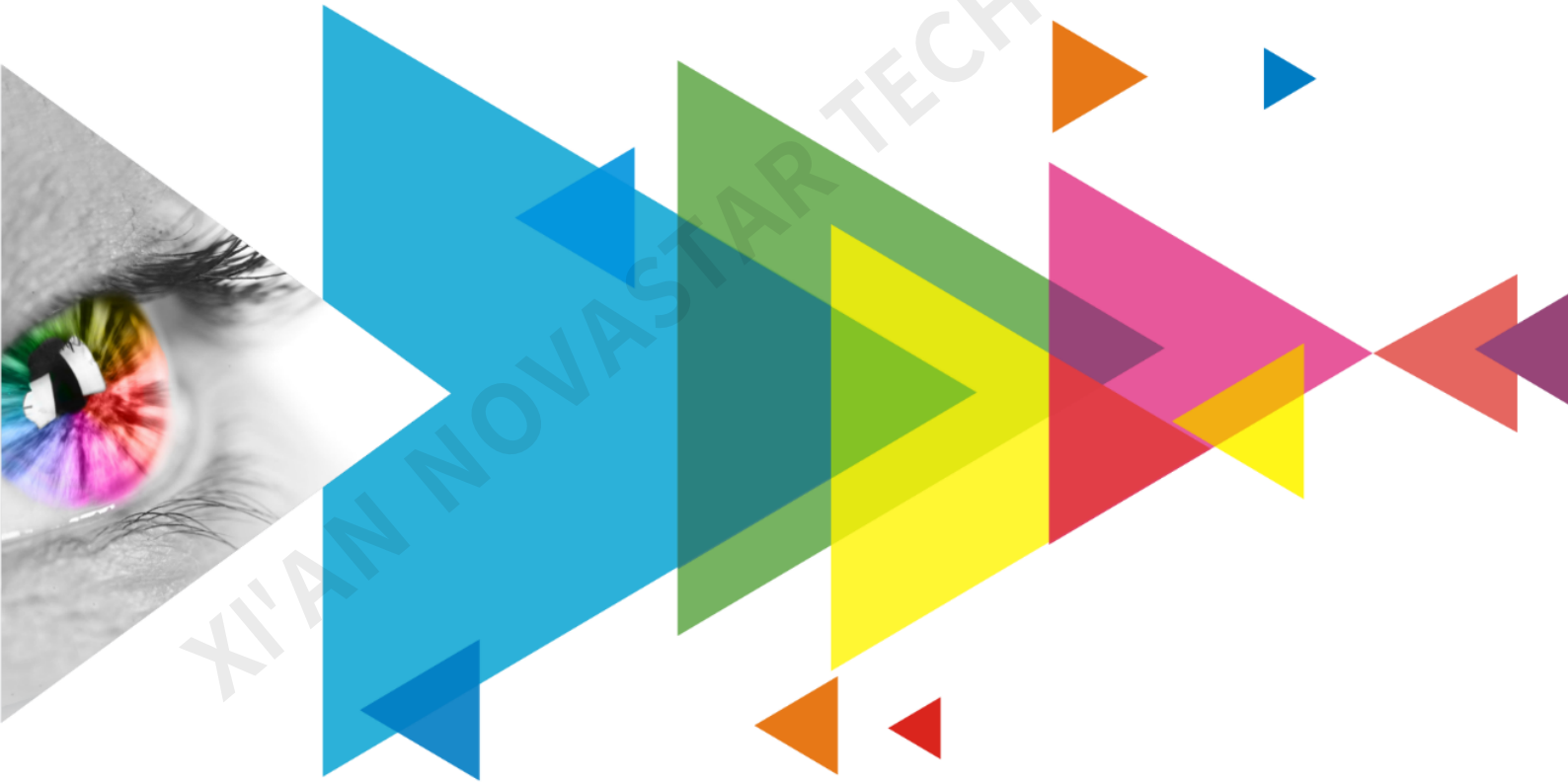
KU20

LED Display Controller



User Manual

Change History

Document Version	Release Date	Description
V1.0.1	2022-10-24	Updated the appearance diagram.
V1.0.0	2022-10-11	First release

Contents

1 Overview

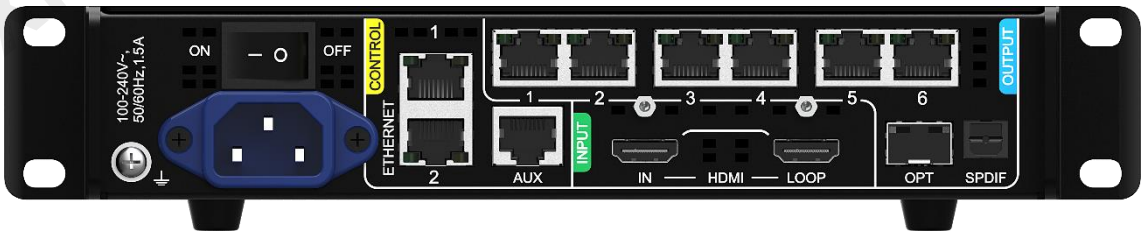
The KU20 is an LED display controller with 6 Ethernet ports in the brand-new control system COEX series of Xi'an NovaStar Tech Co., Ltd. (hereinafter referred to as NovaStar). This controller offers 1x HDMI input, 6x Ethernet outputs and 1x optical output. It can also work with the brand-new software VMP (Vision Management Platform) to provide a better operation and control experience.

2 Appearance

2.1 Front Panel

Name	Description
Running Indicator	• Solid red: Standby • Solid blue: The device is being powered on. • Solid green: The device is running normally. • Flashing red: The device is running abnormally.
Standby Button	• Press the button to power on or power off the device. • Hold down the button for 5s or longer to restart the device.
USB 2.0	Used to send cabinet configuration files and export the diagnostic result
LCD Screen	A 2.0-inch screen that displays the device status, menus, submenus and messages for parameter settings
Knob	• On the home screen, press the knob to enter the main menu screen. • On the main menu screen, rotate the knob to select a menu item or adjust the parameter value. Press the knob to confirm the operation. • Hold down the knob and **BACK** button simultaneously for 5s or longer to lock or unlock the buttons.
BACK	Go back to the previous menu or cancel the current operation.

2.2 Rear Panel



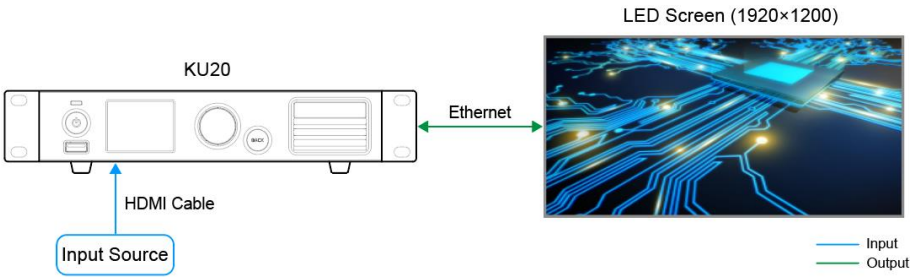
Inputs (INPUT area)			
Type	Qty	Description	
HDMI IN	1	Resolutions	Max resolution: 1920×1200@60Hz Min resolution: 800×600@60Hz

		Max width/height	Max width: 3840 (3840×600@60Hz) Max height: 2560 (800×2560@60Hz)
		Frame rates	23.98/24/25/29.97/30/47.95/48/50/59.94/60/71.93/72/75/100/119.88/120 Hz
		EDID management	Support standard resolutions, up to 1920×1200@60Hz. Support custom input resolutions.
		HDCP	HDCP 1.4 compliant
		Interlaced signal inputs	Not supported
Outputs (OUTPUT area)			
Type	Qty	Description	
1–6	6	Gigabit Ethernet output ports. Support hot backup between Ethernet ports. Max load capacity per port: • 8bit@60Hz: 650,000 pixels • 10bit@60Hz: 325,000 pixels. When the controller works with the A10s Pro receiving card, the capacity can be up to 480,000 pixels.	
OPT	1	10G optical output port	
HDMI LOOP	1	HDMI loop through	
SPDIF	1	A digital audio output (Reserved)	
Controls (CONTROL area)			
Type	Qty	Description	
ETHERNET	2	Gigabit Ethernet control ports. Support TCP/IP protocol and star topology. They have the same functions without priority and order, and can be connected to VMP software. No switch or router is needed to deploy multiple devices on the same LAN as the network switching function is already built in.	
AUX	1	An auxiliary connector that connects to the central control device (RS232) (Reserved)	
Power			
100-240V~, 50/60Hz, 1.5A	1	An AC power input connector and switch	

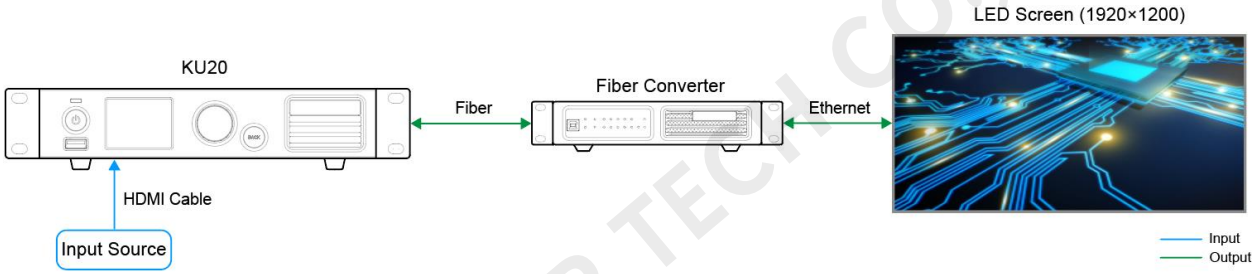
3 Applications

The KU20 has two typical application scenarios as shown below. In those application examples, the LED screen size is 1920×1200.

Application 1: Synchronous Mosaic



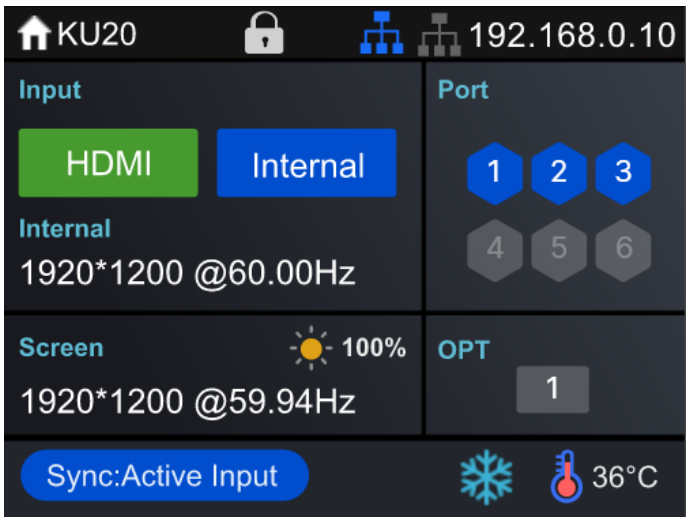
Application 2: Long-Distance Transmission via OPT Ports



4 Home Screen

After the device is powered on, the home screen is displayed as follows. On the home screen, press the knob to enter the main menu screen.

Figure 4-1 Home screen



The home screen is shown in Figure 4-1 and the home screen descriptions are shown in Table 4-1.

Table 4-1 Home screen descriptions

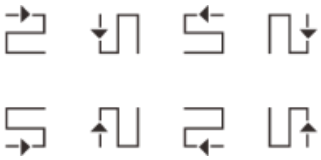
Classification	Content	Description
Top line	KU20	The device name
		The device buttons are locked. This icon is not displayed when the buttons are unlocked. The buttons will be locked only in the following situations: • Hold down the knob and BACK button simultaneously for 5s or longer. • Operate and control the device in VMP software.
		The connection status of the Ethernet ports • Blue: Connected • Gray: Disconnected
	192.168.0.10	The device IP address For related operations, please refer to 7.2 Set an IP Address.
Input	HDMI1, Internal	The device input source type and status • Green: The signal is accessed normally. • Blue: The signal is accessed normally, but not used. • Red: The signal is not accessed, or the accessed signal is abnormal. • Gray: The signal is abnormal and not used. For the input source settings, please refer to 5.1.1 Set Input Source.
	Internal	The resolution and frame rate of the currently available input

Classification	Content	Description
	1920*1080@60.00Hz	source For the resolution and frame rate settings, please refer to 6.1.2 Set Resolution and Frame Rate.
Screen	1920×1080@59.94Hz	The screen resolution and frame rate
		The screen brightness For the screen brightness settings, please refer to 6.3.1 Adjust Screen Brightness.
Port	1–6	The statuses of the Ethernet ports • Blue: Connected • Gray: Disconnected
OPT	1–4	The statuses of the OPT ports • Blue: Connected • Gray: Disconnected
Bottom line	Sync: Active Input	The sync signal currently used and the signal status • Sync: Active Input: Sync with the frame rate of the current input source • Sync: Genlock: Sync with the frame rate of the Genlock signal • Sync: Internal: Sync with the frame rate of the internal clock of the device Color code: • Blue: The signal is normal. • Red: The signal is abnormal. For the synchronization settings, please refer to 6.3.5 Set Sync Source.
		The output display is frozen. After the screen is blacked out, this icon is not displayed and  is displayed. For the display control settings, please refer to 7.4 Control Display Status.
		The temperature inside the chassis

5 Screen Configuration

If the LED screen, cabinets, data flow and cabinets loaded by Ethernet ports can meet the following requirements, you can configure the screen via the device front panel menu; otherwise, screen configuration in VMP will be your ideal choice.

- Screen: The LED screen must be a regular screen.
- Cabinet: The cabinets must be regular ones of the same size, and function well.
- Data flow: The data must run in the same way for all Ethernet ports and the data flow must be one of the followings. The starting position of the data flow is the first cabinet of Ethernet port 1, and the connections are made in sequence according to the serial number of the Ethernet port.



- Cabinets loaded by Ethernet port: If *n* ports are used to load the cabinets, the number of cabinets loaded by each of the first (*n*–*1*) ports must be the same and the integral multiple of the number of cabinet rows or columns, and it must be greater than or equal to the number of cabinets loaded by the last port.

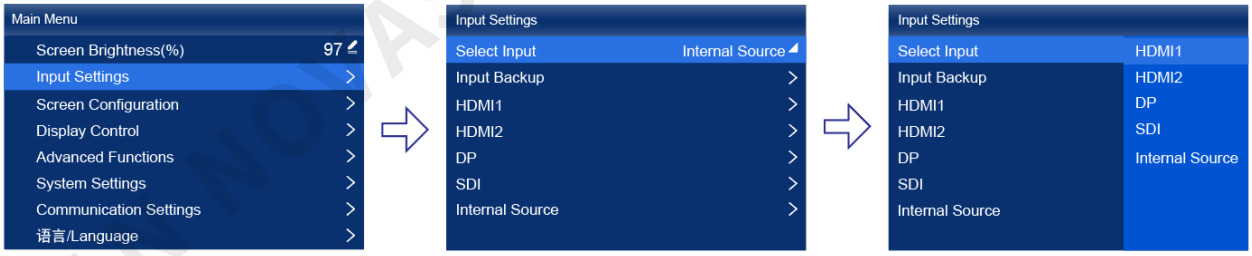
5.1 Quick Screen Configuration via Front Panel Screen

5.1.1 Set Input Source

Select the desired input source and complete the related settings, such as resolution and frame rate. If the resolutions of the input source and screen are the same, the image can be displayed pixel to pixel. A lower frame rate may result in image flickering, while a higher frame rate helps stabilize the display image.

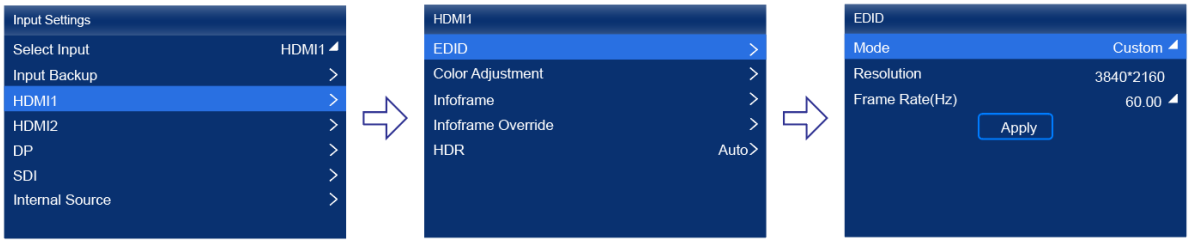
Step 1 On the main menu screen, choose **Input Settings** > **Select Input** to select a video source.

Figure 5-1 Select input source



Step 2 Perform the corresponding operations for the input source according to the input source type.

- HDMI



a. Choose **HDMI** > **EDID**.

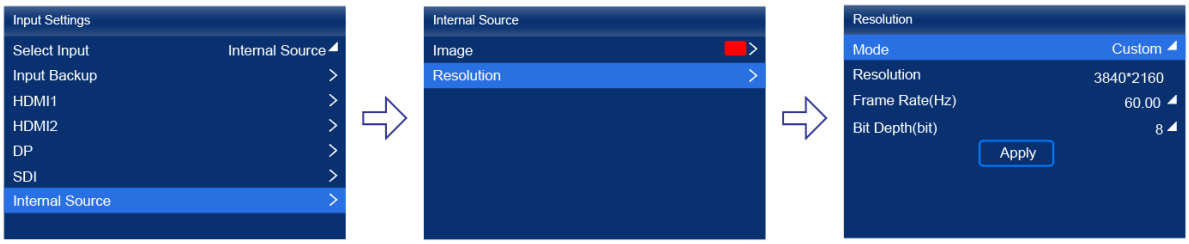
b. Set **Mode** to **Custom** or **Standard**, and then set the resolution and frame rate.

Custom: Set the resolution manually.

Standard: Select the desired resolution from the drop-down options.

c. After the settings are done, select **Apply** and press the knob.

- Internal sources



a. Choose **Internal Source** > **Image**, and then select a static picture or a motion picture.

b. When the relevant parameters of the image are displayed, set the parameters according to your actual needs; otherwise, please skip this step.

c. Press the **BACK** button to go back to the upper-level menu and select **Resolution**.

d. Set **Mode** to **Custom** or **Standard**, and then set the resolution, frame rate and bit depth.

e. After the settings are done, select **Apply** and press the knob.

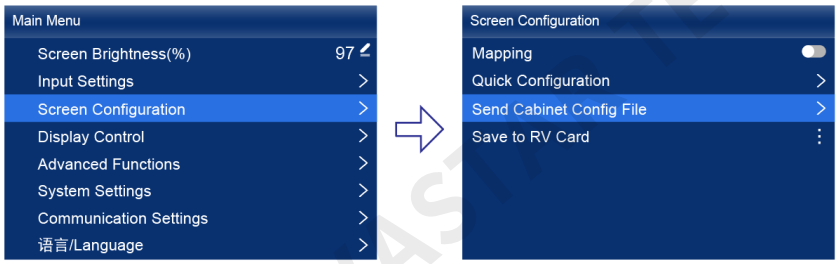
5.1.2 (Optional) Send Cabinet Config File

Send the cabinet configuration file (.rcfgx) to the cabinet and save it to display the image normally. Before the operation, please store the cabinet configuration file in the root directory of the USB drive in advance.

Step 1 Insert the USB drive into the USB connector on the device front panel.

Step 2 On the main menu screen, choose **Screen Configuration** > **Send Cabinet Config File**.

Figure 5-2 Send cabinet config file



Step 3 Select the target configuration file.

Step 4 Select **Yes** in the displayed dialog box.

After the configuration file is successfully sent, a message appears on the menu screen and then then you will automatically return to configuration file screen.

Step 5 Press the **BACK** button to go back to the upper-level menu.

Step 6 Select **Save to RV Card**.

Step 7 Select **Yes** in the displayed dialog box.

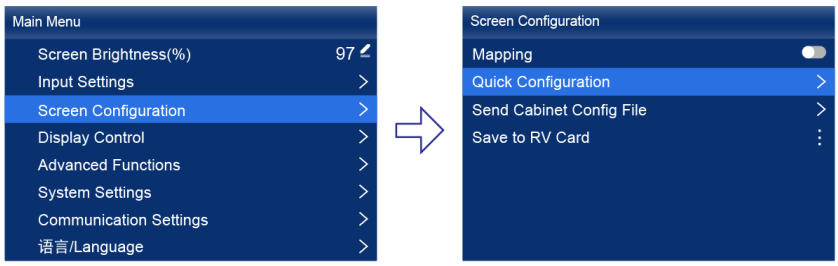
After the configuration file is successfully saved, a message appears on the menu screen.

5.1.3 Quick Configuration

Set the screen configuration parameters to quickly complete the cabinet connection, so that the LED screen can display the input source image normally.

Step 1 On the main menu screen, choose **Screen Configuration** > **Quick Configuration**.

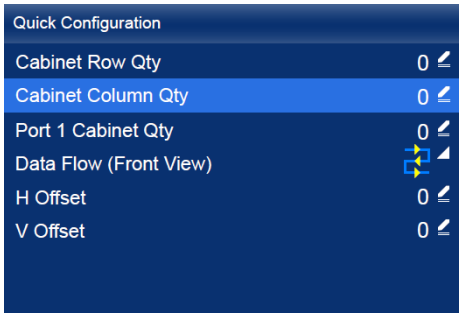
Figure 5-3 Quick configuration



Step 2 Select **Yes** in the displayed dialog box.

Step 3 Set the following parameters as required.

Figure 5-4 Screen configuration parameters



- Cabinet Row Qty: Set the quantity of cabinet rows.
- Cabinet Column Qty: Set the quantity of cabinet columns.
- Port 1 Cabinet Qty: Set the quantity of the cabinets loaded by Ethernet port 1.
- Data Flow (Front View): Select the data flow for the cabinets loaded by Ethernet port 1.
- H Offset: Set the horizontal offset of the displayed image.
- V Offset: Set the vertical offset of the displayed image.

5.2 Free Screen Configuration via VMP

The VMP software can be used to configure either the regular screens or complex screens, and supports free wiring of the cabinets, plus the ability of calculating the used loading capacity according to the cabinets that are actually loaded. For the details of performing the free screen configuration, please refer to *VMP Vision Management Platform User Manual*.

6 Display Effect Adjustment

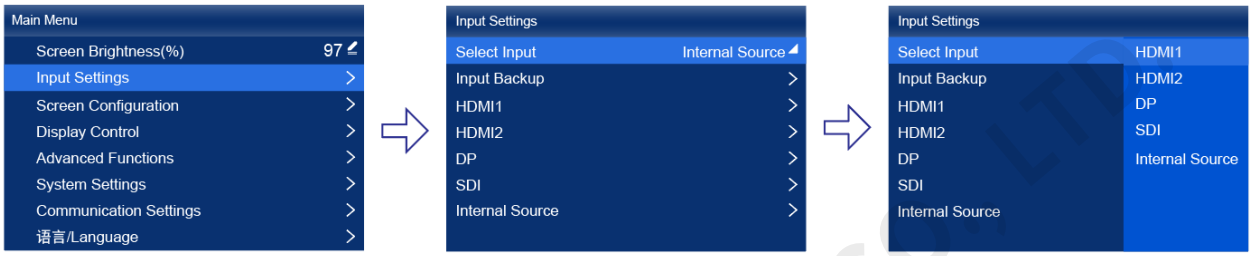
6.1 Set External Input Source Parameters

6.1.1 View Input Source Information

View the attribute values of the input source, including the resolution, frame rate, bit depth, color gamut, etc.

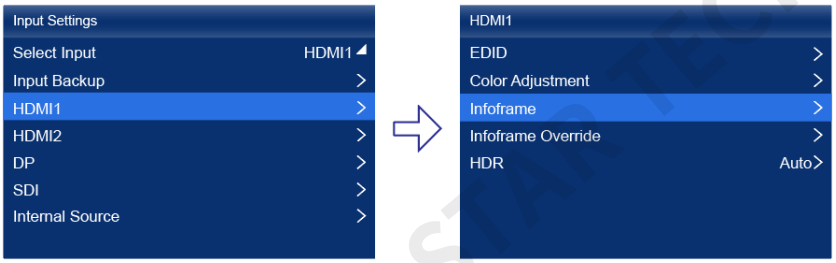
Step 1 On the main menu screen, choose **Input Settings** > **Select Input** and select **HDMI1**.

Figure 6-1 Select Input



Step 2 Choose **HDMI** > **Infoframe**.

Figure 6-2 Infoframe



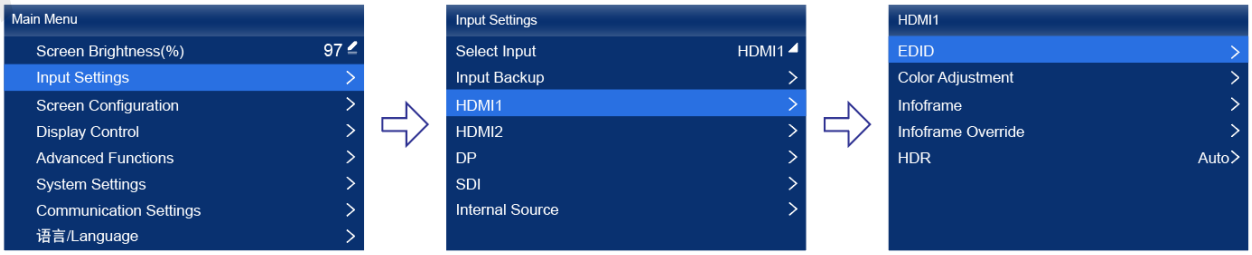
Step 3 View the input source information.

6.1.2 Set Resolution and Frame Rate

Set the resolution and frame rate of the input source. If the resolutions of the input source and screen are the same, the image can be displayed pixel to pixel. A lower frame rate may result in image flickering, while a higher frame rate helps stabilize the display image.

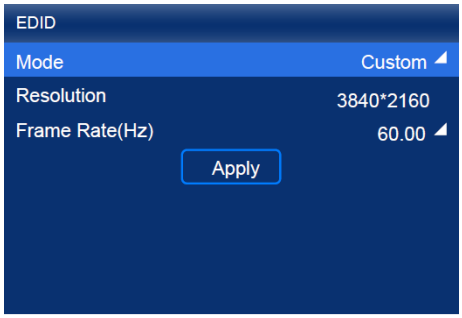
Step 1 On the main menu screen, choose **Input Settings** >**HDMI** > **EDID**.

Figure 6-3 EDID



Step 2 Set **Mode** to **Custom** or **Standard**, and then set the resolution and frame rate.

Figure 6-4 EDID parameters



- Custom: Set the resolution manually.
- Standard: Select the desired resolution from the drop-down options.

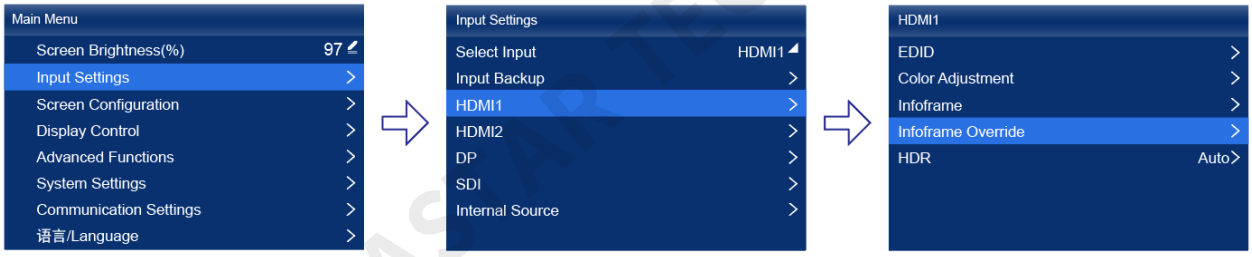
Step 3 After the settings are done, select **Apply** and press the knob.

6.1.3 Adjust Color

Set the input source override parameters and adjust the color. The override parameters will be used in the calculation of color adjustment. If the values of these parameters are not set manually, the values that come with the input source can be used.

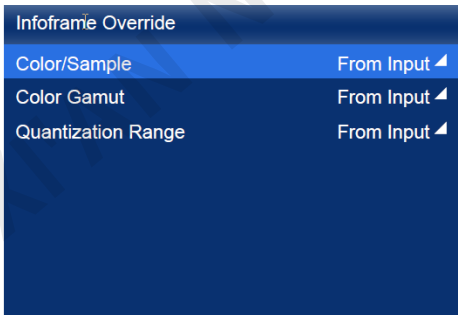
Step 1 On the main menu screen, choose **Input Settings** > **HDMI** > **Infoframe Override**.

Figure 6-5 Infoframe override



Step 2 Set the following override parameters as required.

Figure 6-6 Override parameters



Select **From Input** and the device will read the attribute value that comes with the input source.

Step 3 Press the **BACK** button to go back to the upper-level menu.

Step 4 Select **Color Adjustment**.

Step 5 Set the related parameters.

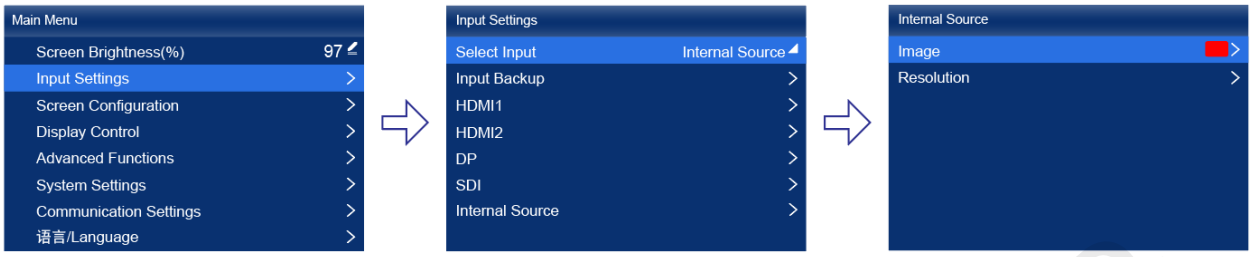
Black level is used to adjust the contrast of the dark areas of the image.

6.2 Set Internal Input Sources

Select the internal source stored in the device and set the related parameters for screen testing and troubleshooting.

Step 1 On the main menu screen, choose **Input Settings** > **Internal Source** > **Image**.

Figure 6-7 Internal source



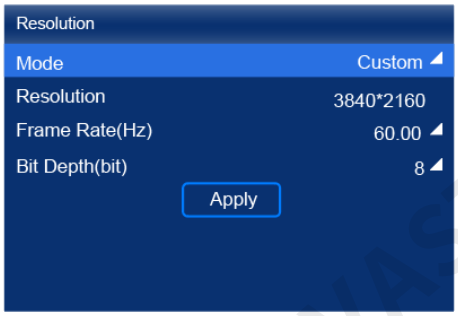
Step 2 Select a static picture or a motion picture.

Step 3 When the relevant parameters of the image are displayed, set the parameters according to your actual needs; otherwise, please skip this step.

Step 4 Press the **BACK** button to go back to the upper-level menu and select **Resolution**.

Step 5 Set **Mode** to **Custom** or **Standard**, and then set the resolution, frame rate and bit depth.

Figure 6-8 Resolution parameters



- Custom: Set the resolution manually.
- Standard: Select the desired resolution from the drop-down options.

Step 6 After the settings are done, select **Apply** and press the knob.

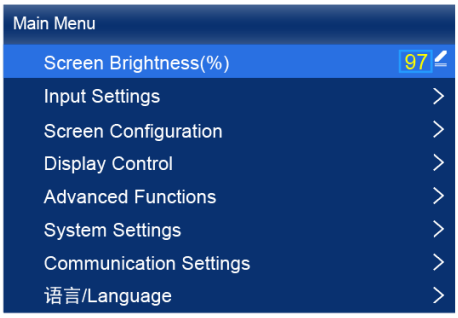
6.3 Set Output Parameters

6.3.1 Adjust Screen Brightness

Adjust and save the screen brightness.

Step 1 On the main menu screen, select **Screen Brightness** and then the brightness value becomes editable.

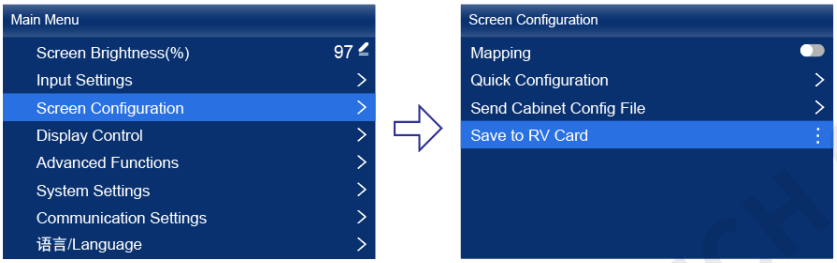
Figure 6-9 Screen brightness



Step 2 Rotate the knob to adjust the brightness to the target value, and then press the knob to confirm.

Step 3 Choose **Screen Configuration** > **Save to RV Card**.

Figure 6-10 Save to RV card



Step 4 Select **Yes** in the displayed dialog box.

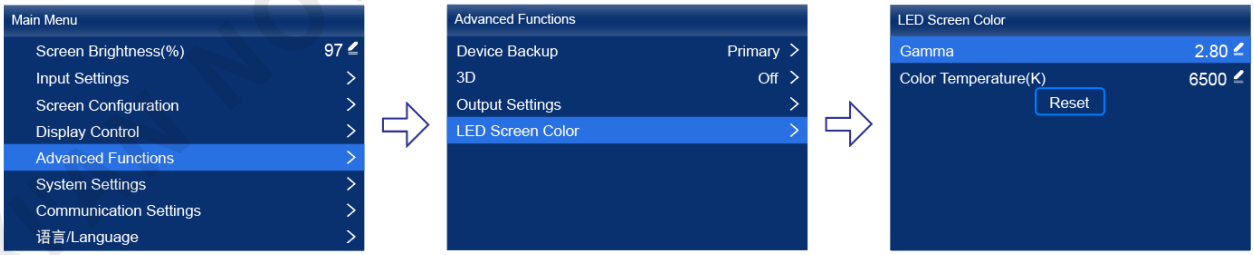
After the brightness value is successfully saved, a message appears on the menu screen.

6.3.2 Adjust Gamma and Color Temperature

Adjust and save the Gamma and color temperature.

Step 1 On the main menu screen, choose **Advanced Functions** > **LED Screen Color**.

Figure 6-11 LED screen color



Step 2 Adjust the Gamma value.

1. Select **Gamma** and then the value becomes editable.
2. Rotate the knob to adjust the Gamma to the target value, and then press the knob to confirm.

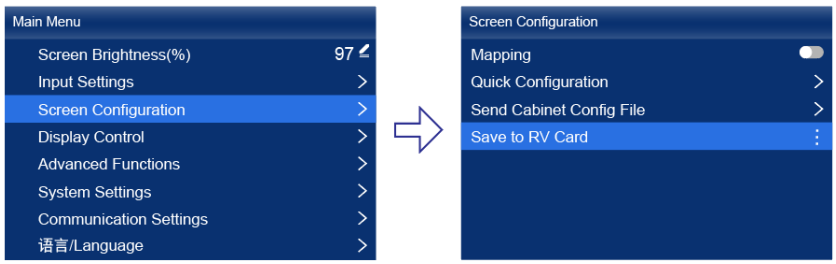
Step 3 Adjust the color temperature value.

1. Select **Color Temperature** and then the value becomes editable.
2. Rotate the knob to adjust the temperature to the target value, and then press the knob to confirm.

If you want to restore the parameters to the defaults, select **Reset**.

Step 4 Press the **BACK** button to go back to the main menu, and then choose **Screen Configuration** > **Save to RV Card**.

Figure 6-12 Save to RV card



Step 5 Select **Yes** in the displayed dialog box.

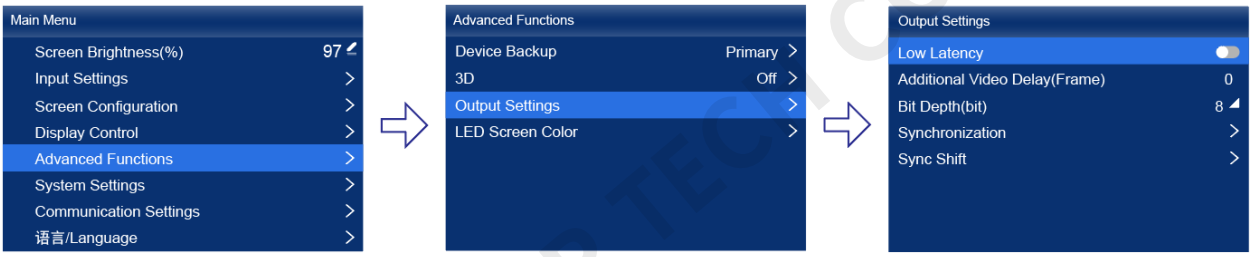
After the values are successfully saved, a message appears on the menu screen.

6.3.3 Set Low Latency

Turn on the low latency function to reduce the delay at the sending card, or increase the delay when the device is used with high-latency equipment.

Step 1 On the main menu screen, choose **Advanced Functions** > **Output Settings**.

Figure 6-13 Low latency



Step 2 Perform any of the following operations as required.

- Enable low latency

  Set the **Low Latency** switch to to enable the low latency function.

- Set additional frame delay

  a. Select **Additional Video Delay** and then the value becomes editable.

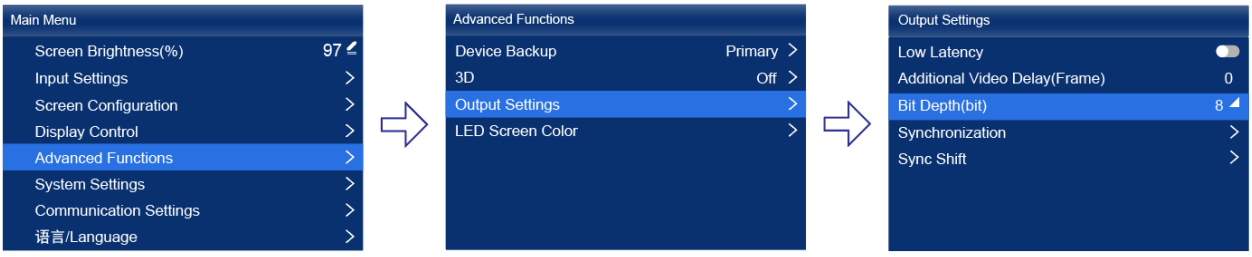
  b. Rotate the knob to adjust the parameter to the target value, and then press the knob to confirm.

6.3.4 Set Bit Depth

Set the output bit depth of the input source.

Step 1 On the main menu screen, choose **Advanced Functions** > **Output Settings**.

Figure 6-14 Bit depth



Step 2 Select **Bit Depth** and then select the desired bit depth value from the drop-down options.

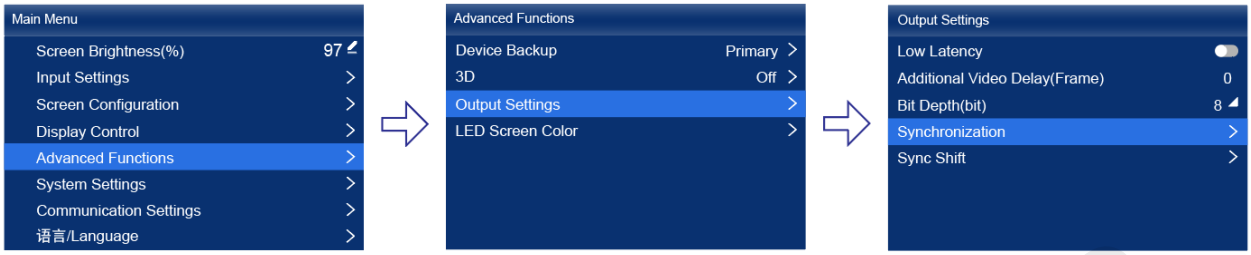
If **Auto** is selected, the output bit depth is the same as the input bit depth.

6.3.5 Set Sync Source

Select a synchronization signal for the display frame rate and set the phase offset.

Step 1 On the main menu screen, choose **Advanced Functions** > **Output Settings** > **Synchronization**.

Figure 6-15 Synchronization



Step 2 Select **Sync Source** and then select the desired sync source from the drop-down options.

- Current Input: Sync with the frame rate of the current input source.
- Internal: Sync with the frame rate of the controller's internal clock.

Step 3 Press the **BACK** button to go back to the upper level menu.

Step 4 Select **Sync Shift**.

Step 5 Choose **Adjustment Mode** and then select the desired mode from the drop-down options. When you select **Phase Angle** or **Percentage**, please set the corresponding value.

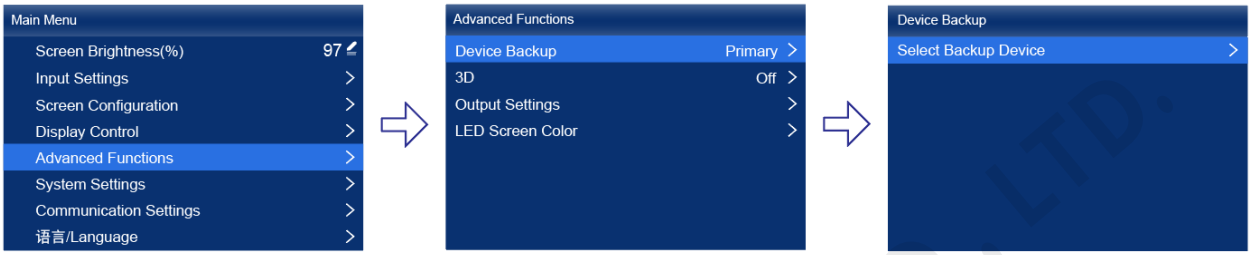
7 Device Management

7.1 Set a Backup Device

Specify a backup device for the current device so that the backup device can take over the primary device when it fails.

Step 1 On the main menu screen, choose **Advanced Functions** > **Device Backup**.

Figure 7-1 Device backup



Step 2 Choose **Select Backup Device**.

Step 3 Select a device from the devices found.

Step 4 Select **Yes** in the displayed dialog box.

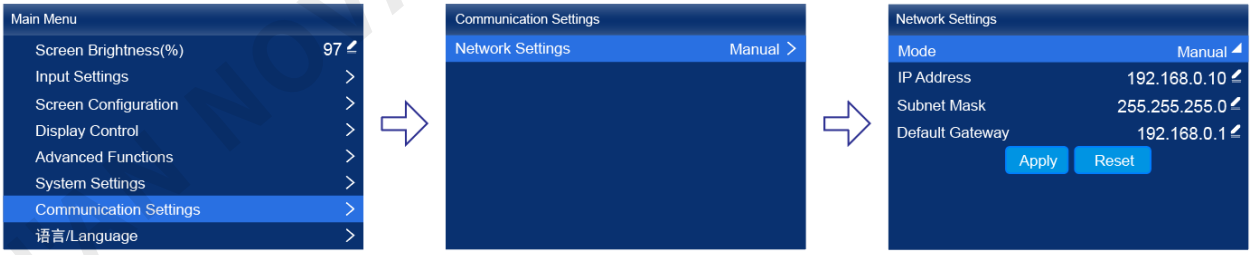
A prompt will be displayed after the operation is successful.

7.2 Set an IP Address

Manually set a static IP address for the device or set up the device to automatically obtain an IP address.

Step 1 On the main menu screen, choose **Communication Settings** > **Network Settings**.

Figure 7-2 Network settings



Step 2 Choose **Mode** and then select a mode from the drop-down options.

- Manual: Manually set a static IP address for the device.
- Auto: The device automatically obtains an IP address.

Step 3 If the manual mode is selected, set an **IP Address**, **Subnet Mask** and **Default Gateway** and select **Apply**. If the automatic mode is selected, this step is not required.

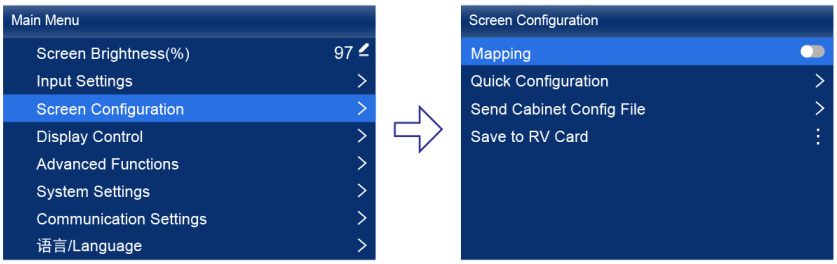
If you want to reset the network parameters to the defaults, select **Reset**.

7.3 Enable Mapping

After the Mapping function is enabled, cabinets can display the controller number, Ethernet port number and receiving card number, allowing users to easily obtain the locations and connection topology of receiving cards.

Step 1 On the main menu screen, choose **Screen Configuration** > **Mapping**.

Figure 7-3 Mapping



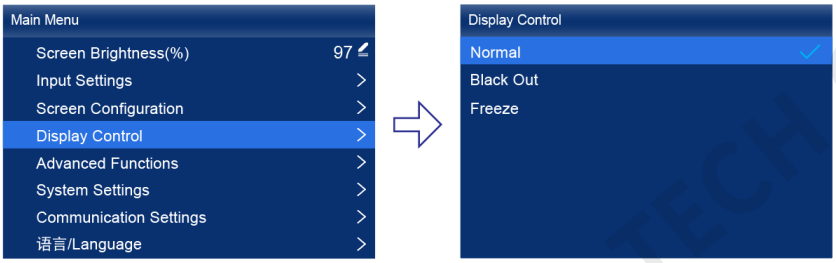
Step 2 Enable the Mapping function by toggling on this switch .

7.4 Control Display Status

Set the display loaded by the controller to a black screen or frozen status.

Step 1 On the main menu screen, choose **Display Control**.

Figure 7-4 Display control



Step 2 Select a display status as required.

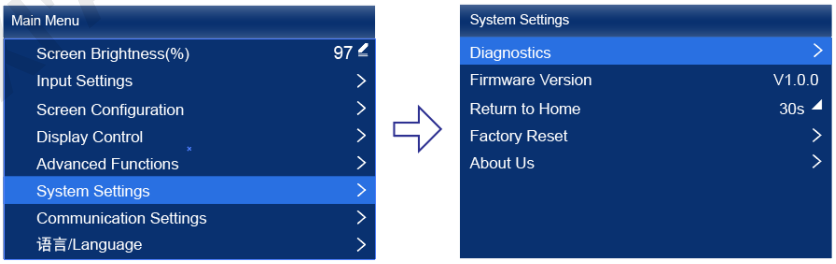
- Normal: Display the normal output screen.
- Freeze: Make the output screen always display the current frame. The input source is played normally.
- Blackout: Make the output screen go black. The input source is played normally.

7.5 Diagnostics

Perform device diagnostics, then view and export the result.

Step 1 On the main menu screen, choose **System Settings** > **Diagnostics**.

Figure 7-5 Diagnostics



Step 2 Select **Yes** in the displayed dialog box.

Step 3 After successful diagnostics, do any of the following as required.

- View the diagnostic result
  a. Select **View Results** to enter the report page.
  b. View the information of MCU, FPGA, motherboard voltage, temperature inside the device, and more.

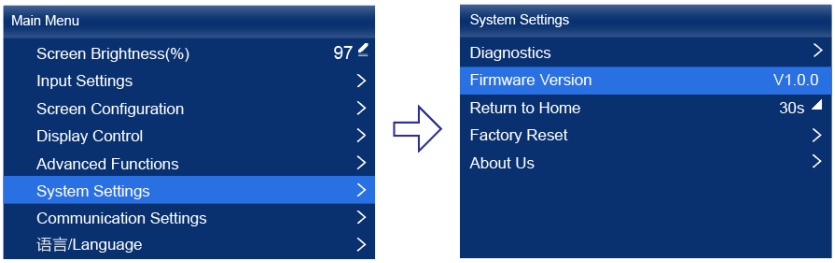
- Export the diagnostic result to a USB drive
  a. Insert the USB drive to the USB port on the front panel of the device.
  b. Select **Export to USB Drive**.
     A prompt will be displayed after the operation is successful.

7.6 View the Firmware Version

View the current firmware program version of the device.

Step 1 On the main menu screen, choose **System Settings**.

Figure 7-6 Firmware version



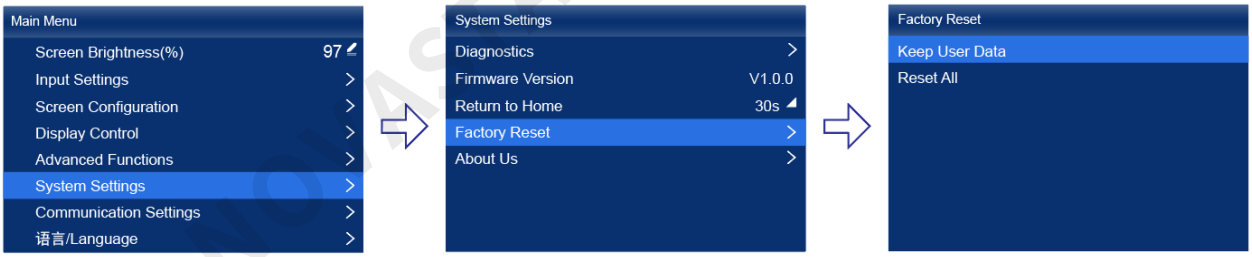
Step 2 View the current firmware program version next to **Firmware Version**.

7.7 Reset to Factory Settings

Reset part or all of the device data to the factory settings.

Step 1 On the main menu screen, choose **System Settings** > **Factory Reset**.

Figure 7-7 Factory reset



Step 2 Do any of the following according to the data you want to reset.

- Reset part of the data
  Reset all the data except the imported files, network parameters, language settings, and device name.
  a. Select **Keep User Data**.
  b. Select **Yes** in the displayed dialog box.
     The device restarts automatically while the data is being reset.
- Reset all the data (This action cannot be undone.)
  Reset all the data to factory settings.
  a. Select **Reset All**.
  b. Select **Yes** in the displayed dialog box.
     The device restarts automatically while the data is being reset.

8 Basic System Settings

8.1 Set Language

Change the system language of the device.

Step 1 On the main menu screen, choose **语言/Language**.

Figure 8-1 Language

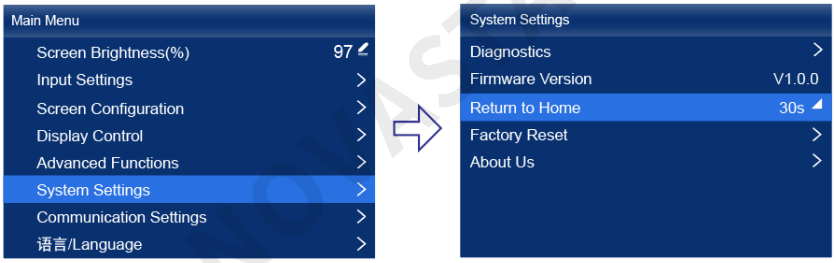
Step 2 Choose **English** or **中文** as required.

8.2 Set Session Timeout

Specify a certain amount of time for session timeout. The LCD will return to the home screen automatically after the specified amount of time if no action is performed during the time specified.

Step 1 On the main menu screen, choose **System Settings** > **Return to Home**.

Figure 8-2 Session timeout value



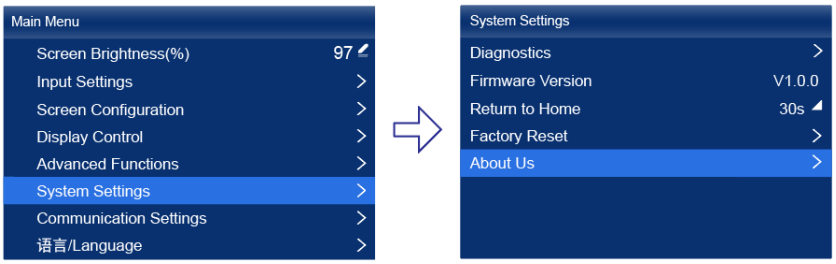
Step 2 Select **30s**, **1min** or **5min** from the drop-down options as required.

8.3 View Service Information

View the service information of NovaStar, allowing users to ask questions and give feedback.

Step 1 On the main menu screen, choose **System Settings** > **About Us**.

Figure 8-3 About us



Step 2 View the official website, technical support email address and service hotline of NovaStar.

9 Specifications

Electrical Specifications	Power input	100-240V~, 50/60Hz, 1.5A
	Max power consumption	25 W
Operating Environment	Temperature	–20ºC to +50ºC
	Humidity	0% RH to 80% RH, non-condensing
Storage Environment	Temperature	–30ºC to +80ºC
	Humidity	0% RH to 95% RH, non-condensing
Physical Specifications	Dimensions	254.3 mm × 50.6 mm × 290.0 mm
	Net weight	2.1 kg
	Gross weight	3.1 kg Note: It is the total weight of the product, accessories, and packing materials packed according to the packing specifications.
Packing Information	Outer box	387.0 mm × 173.0 mm × 359.0 mm, kraft paper box
	Packing box	362.0 mm × 141.0 mm × 331.0 mm, white cardboard box
	Accessories	• 1x Power cord • 1x Ethernet cable • 1x HDMI cable • 1x Certificate of Approval
IP Rating	IP20 Please prevent the product from water intrusion and do not wet or wash the product.	

The amount of power consumption may vary depending on various factors such as product settings, usage, and environment.

Trademark

NOVASTAR is a trademark of Xi'an NovaStar Tech Co., Ltd.

Statement

Thank you for choosing NovaStar's product. This document is intended to help you understand and use the product. For accuracy and reliability, NovaStar may make improvements and/or changes to this document at any time and without notice. If you experience any problems in use or have any suggestions, please contact us via the contact information given in this document. We will do our best to solve any issues, as well as evaluate and implement any suggestions.

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