B4000ES

Sphere LED Controller

User Manual

Applicable to B4000S

Document version:：V2.0

Hardware Version：V1.0.0

Safety Instruction

This symbol reminds the user that there are important operation and maintenance instructions in the user manual of the equipment.

This symbol warns the user that there is dangerous voltage exposed in the casing of the equipment, and there is danger of electric shock.

Precautions

Reading Instructions Users must read and understand all safety and use instructions before using the equipment.

Save Instructions Users should save safety instructions for future use.

Obedience warning Users should observe all safety and operating instructions in the product and user's guide.

Avoid appending Do not use tools or appending equipment not recommended by the manufacturer of this product to avoid danger.

Warning

Power supply

This equipment can only use the power supply indicated on the product. The equipment must be powered by a power supply system with a ground wire. The third line (ground wire) is a safety facility, which cannot be used or skipped.

Unplug the power supply

In order to safely unplug the power supply from the equipment, please unplug the power cord of all equipment rear or desktop power supply, or any power cord connected to the mains system.

The power cord shall be properly wired to avoid being trampled or squeezed by heavy objects.

Maintenance

All repairs must be carried out by certified maintenance personnel. There are no parts in the equipment that can be replaced by users. To avoid the danger of electric shock, don't try to open the cover of the equipment to repair the equipment yourself.

Vent holes

Some equipment housings have vent slots or holes, which are used to prevent the sensitive components in the machine from overheating. Don't block the vent with anything.

Trademark

VGA and XGA are registered trademarks of IBM.

VESA is a trademark of video electronics standards association.

HDMI logo and high-definition multimedia interface are trademarks of HDMI Licensing LLC.

CONTENT

1 Update Records

Document version	Hardware version	Release time	Update record
V2.0	V1.0.0	August 18(nd), 2025	First release of document

2 Applicable Model

The product models applicable to this article are as follows:
B4000S。

3 Product Features

The B4000ES Customized Controller is a dedicated, custom-designed 40-port Gigabit Ethernet output controller. It features versatile video signal reception capabilities, ultra-high-definition full 4K×2K@60Hz image processing and transmission capabilities, and can transmit processed video to LED displays via Ethernet ports. It delivers powerful processing capabilities, ultra-stable performance, and exceptional value for money.

The B4000ES is widely applicable in non-rectangular LED displays such as sphere LED screens and circular ring displays.

3.1 Input/Output Interface

- Multiple input interfaces
  - 1×HDMI2.0
  - 1×DP1.2 (Choose 1 of the 2 options)
- Output Interface
  - 40 Gigabit Ethernet ports, supporting vertical and horizontal tiling in any configuration
  - 4-channel fiber optic bidirectional full-duplex transmission
- Control Interface
  - 1×USB interface for communication, enabling multiple sending cards to be controlled from a single PC

- 1×LAN, 100Mbps Ethernet port for connecting to a host computer for debugging
- 1×RS232 serial port for connecting to central control equipment

- Extended Control Interface (Optional)

  1×Genlock control interface, one input channel, one loop-out channel

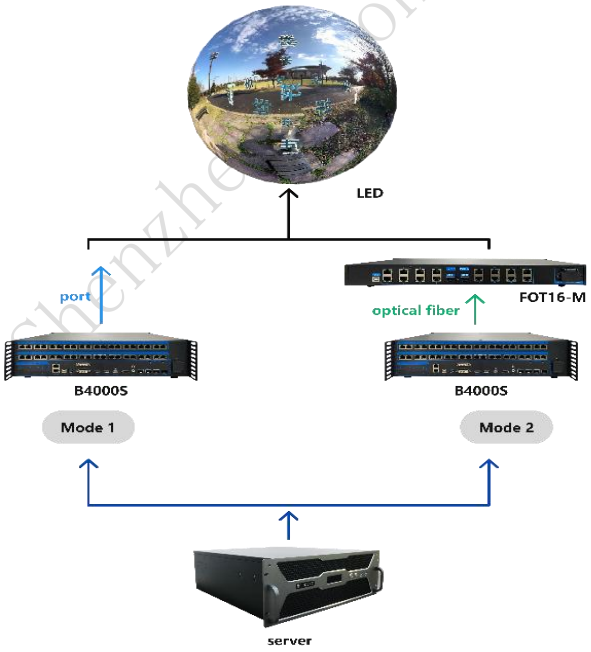
3.2 Diverse Practical Functions

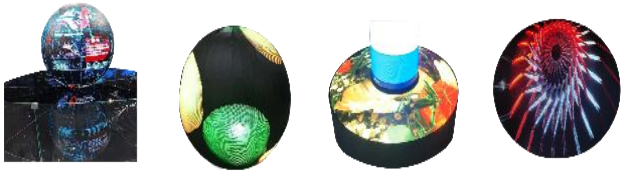
- Supports Ethernet loopback backup and dual-master backup
- Supports multiple preset resolutions and custom resolution settings
- Compatible with multiple input frame rates including 30Hz, 50Hz, 60Hz, and 120Hz
- Supports host software monitoring of sending card operating parameters and status
- Supports configuration parameter readback
- Supports Gigabit Ethernet error rate detection
- Supports 3D display, active 3D display

4 Hardware Introduction

4.1Wiring Topology Diagram

The B4000S can be widely applied in spherical, circular, and other irregular LED displays, as shown below:





4.2 Hardware Introduction

4.2.1 Front Panel

*Product images are for reference only. The actual product shall prevail upon purchase.

#	Name	Illustration	
1	Switch	Main Control Power Switch	
2	LCD	Used to display the device's current status and configure menu item parameters. LCD Resolution: 320×240	
3	Rotate Button	1. On the main interface, press the knob to enter the menu operation interface; 2. In the menu operation interface, rotate the knob to select menus; press the knob to select the current menu or enter submenus; 3. After selecting a menu with parameters, rotate the knob to adjust values. Note: Press the knob again to confirm changes after adjustment; 4. Long press to unlock menus	
4	Input Source Switch Key	DVI1 (Function disabled)	DVI1 Input Port / Digital Key 1
		DVI2 (Function disabled)	DVI2 Input Port / Digital Key 2
		HDMI1 (Function disabled)	HDMI1 Input Port / Digital Key 3
		HDMI2 (Function disabled)	HDMI2 Input Port / Digital Key 6
		HDMI3	HDMI3 Input Port / Digital Key 7
		DP	DP Input Port / Digital Key 8
5	Function	WIN (Function disabled)	Layer Selection / Num Key 4

	Button	PART (Function disabled)	Partial Fullscreen Shortcut / Num Key 5
		TEMPLATE (Function disabled)	Multi-screen Template Shortcut Key
		HDMI4 (Built-in HDMI port) (Function disabled)	HDMI4 Input Port / Number Key 9
		FREEZE (Function disabled)	Freeze Function Shortcut Key
		MODE (Function disabled)	Load Scene Shortcut Key

4.2.2 Rear Panel

*Product images are for reference only. The actual product shall prevail upon purchase.

Rear Panel		
Input Interface		
Interface	QTY	Illustration
HDMI2.0 (HDMI3)	1	Dual-signal input (select one of two) functionality; only one signal can be input at a time.

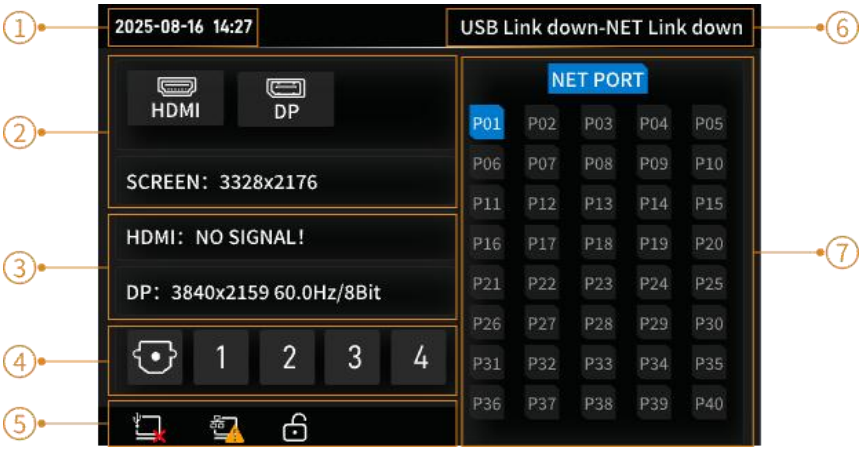
HDMI 2.0 (Built-in HDMI port) (HDMI 4) (Function not available)	1	Supports video input up to 3840×2160@60Hz resolution. Supports custom resolutions. Supports audio input and 10-bit audio. Maximum width: 7680 (7680×1080@60Hz) Maximum height: 7680 (1080×7680@60Hz)
HDMI 1.3 (HDMI1, HDMI2) (Function not available)	2	Supports video source input up to 2304×1152@60Hz resolution. Supports custom resolutions. Does not support audio input. Maximum width: 3840 (3840×640@60Hz) Maximum height: 3840 (640×3840@60Hz) Does not support interlaced signal input.
DVI (DVI1, DVI2) (Function disabled)	2	Supports video source input up to 1920×1200@60Hz resolution. Supports custom resolutions. Maximum width: 3840 (3840×640@60Hz) Maximum height: 3840 (640×3840@60Hz) Does not support interlaced signal input.
DP1.2	1	Supports video source input up to 4096×2160@60Hz resolution. Supports custom resolutions. Supports audio input, supports 10-bit audio. Maximum width: 7680 (7680×1080@60Hz) Maximum height: 7680 (1080×7680@60Hz)
Output Interface		
Name	QTY	Illustration
Gigabit Ethernet port	40	◆ Maximum load capacity: 8.84 million pixels, with a maximum width of 7680 pixels and a maximum height of 7680 pixels (special mode supports up to 16 million pixels for dual 4K graphics card stitching)

Optical Fiber	4	◆ OPT1 corresponds to Ethernet ports 1-8; single fiber port bandwidth: 10Gbit/s ◆ OPT2 corresponds to ports 9–16; each fiber port supports 10Gbit/s bandwidth ◆ OPT3 corresponds to ports 17–24; each fiber port supports 10Gbit/s bandwidth ◆ OPT4 corresponds to ports 25–32; each fiber port supports 10Gbit/s bandwidth
Audio Interface		
Name	QTY	Illustration
AUDIO IN	1	◆ External Audio Input Source
AUDIO OUT	1	◆ Audio Output: Can be configured to output audio from any windowed audio source or an external audio input source.
Control Interface		
Name	QTY	Illustration
LAN	1	100Mbps Ethernet interface for connecting to host computer for debugging
USB（B-type）	1	Connects to PC software for communication
RS232	1	1×RS232 interface for connecting to central control equipment
Extended Interface		
#	QTY	Illustration
3D	1	Connect the 3D transmitter
Genlock	1	Genlock control interface, one input channel, one loop-through output channel
AC power interface		
#	Name	Illustration
5	Power Interface	AC-100-240V-50/60HZ AC power interface

4.2.1 Rear Panel

5 Main Interface

After the processor is turned on, the LCD screen displays the use status interface.



#	Usage Status Interface Description
1	Processor Internal Clock
2	Input signal source: Displays blue when an input signal is detected, and gray when no signal is present.  : Signal detected  : No signal SCREEN：Current output screen resolution (Mapping file size)
3	Input source and input resolution information: NO SIGNAL!: The input resolution of the currently selected input signal source. No valid input detected.
4	4 fiber optic ports: connected ports display blue, unconnected ports display gray.
5	USB debugging Cable status：  : connected  : disconnected
	Network Connection Status：  : connected  : disconnected
	Display Key lock Status：  : Enabled  : Disabled

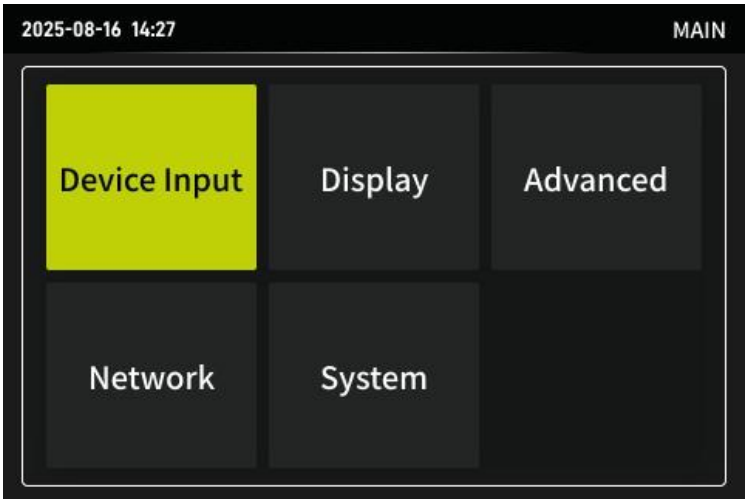
6	Connection Methods（choose 1 of 2） 169.254.219.009.8226-调试中(1)：100 Mbps connection USB连接：USB connection
7	NET PORT：Gigabit Ethernet port: When connected to the receiving card, it displays blue; when disconnected, it displays gray.

6 Menu Operation

Knob:

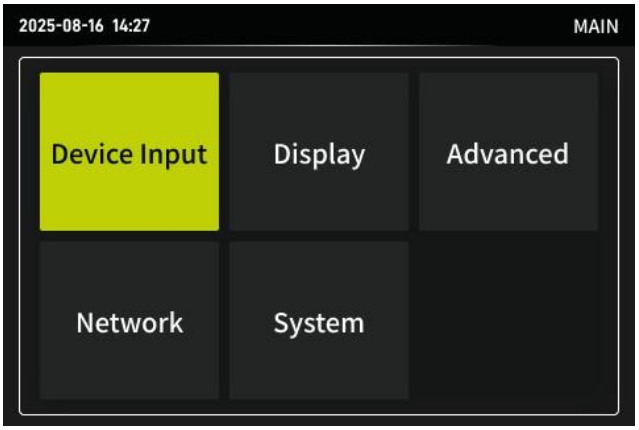
- In the main interface, press the knob to enter the menu operation interface.
- In the menu operation interface, turn the knob to select the menu function, and the selection status is blue. Press the knob to select the current menu or enter the submenu function.
- After selecting a menu with parameters, you can adjust the parameters by turning the knob. Please note that you need to press the knob again to confirm after the adjustment is completed.
- ESC: return key.
- Long press the knob to unlock the front panel keys.

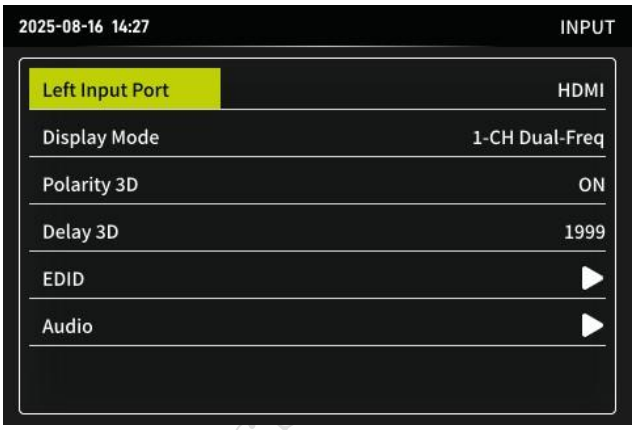
Main Menu Function Settings: The main menu contains six major settings categories:【Device Input】,【Display】, 【Advanced Functions】, 【Network Settings】, and 【System Settings】.



6.1Device Input

The device inputs include [Left Input port], [Display Mode], [Polarity 3D], [Delay 3D], [EDID], and [Audio Settings].

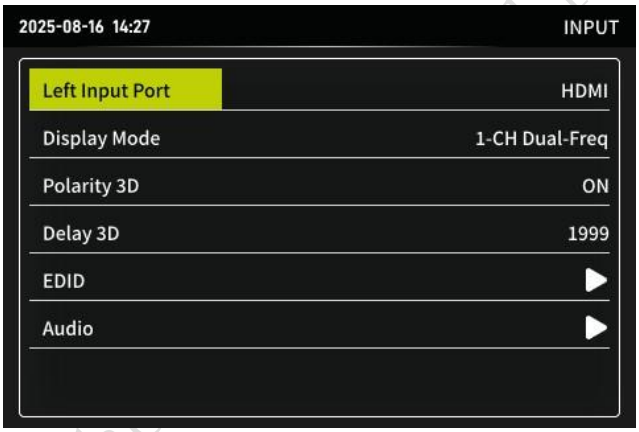


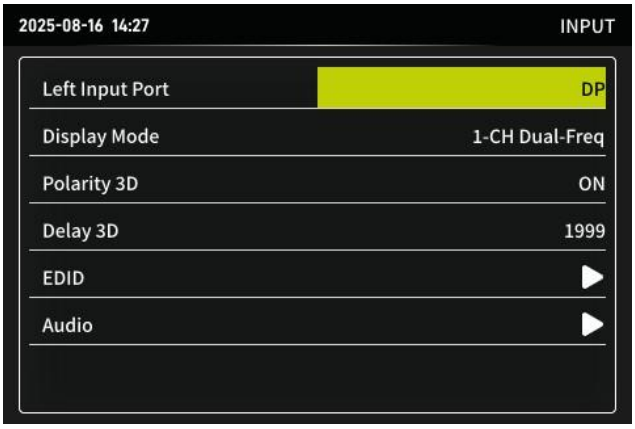


6.1.1 Left Input port

Step 1: Rotate the knob to the 【Left Input Port】 function, then press the knob to enter.

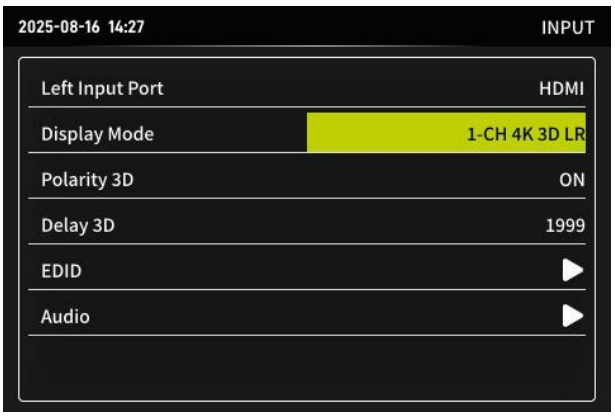
Step 2: You can select HDMI on the left or DP on the left.

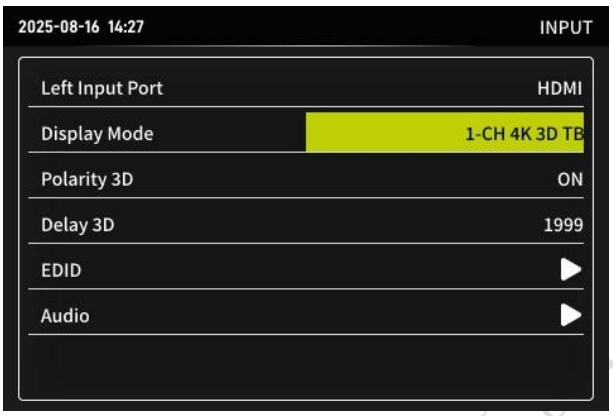


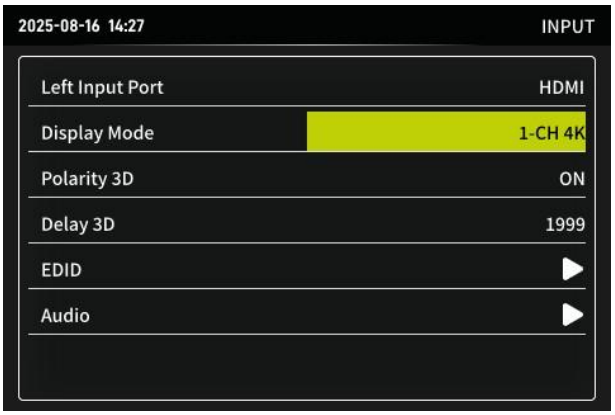


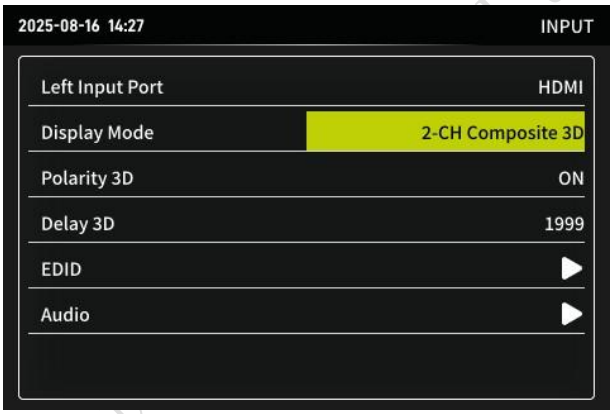
6.1.2 Display Mode

Display Modes: Single 4K Side-by-Side 3D, Single 4K Top-and-Bottom 3D, Single 4K Standard, Dual 4K Composite 3D, Single 4K Double Frequency, Single 4K Low Latency, Dual 4K Low Latency, Dual 4K Standard, Black Screen (nine modes).


2025-08-16 14:27
INPUT
Left Input Port
HDMI
Display Mode
1-CH 4K 3D LR
Polarity 3D
ON
Delay 3D
1999
EDID
Audio


2025-08-16 14:27
INPUT
Left Input Port
HDMI
Display Mode
1-CH 4K 3D TB
Polarity 3D
ON
Delay 3D
1999
EDID
Audio


2025-08-16 14:27
INPUT
Left Input Port
HDMI
Display Mode
1-CH 4K
Polarity 3D
ON
Delay 3D
1999
EDID
Audio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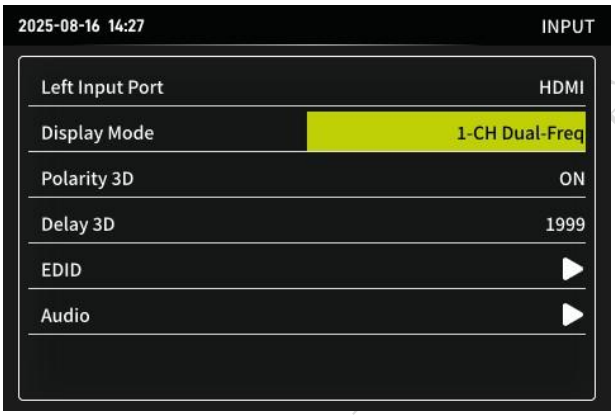
INPUT
Left Input Port
HDMI
Display Mode
2-CH Composite 3D
Polarity 3D
ON
Delay 3D
1999
EDID
Audio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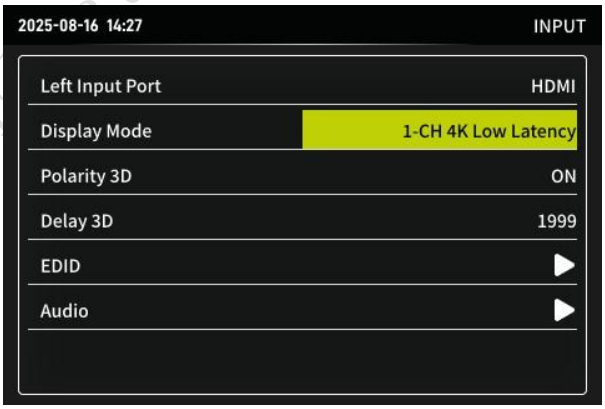
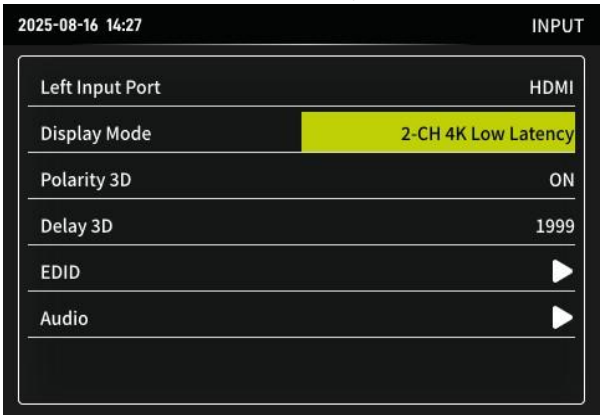
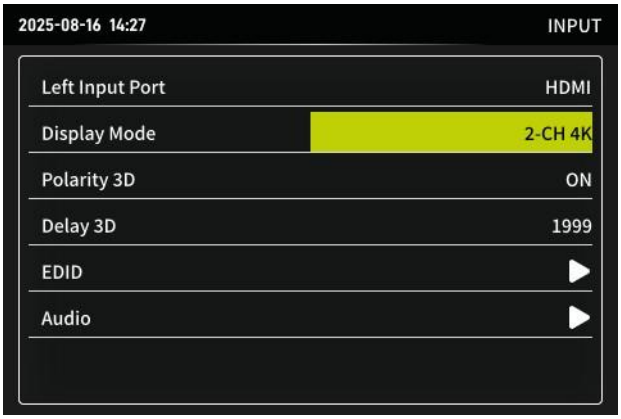
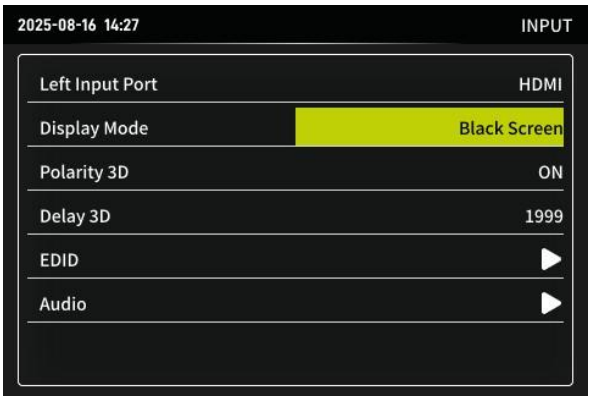
INPUT
Left Input Port
HDMI
Display Mode
1-CH Dual-Freq
Polarity 3D
ON
Delay 3D
1999
EDID
Audio


2025-08-16 14:27
INPUT
Left Input Port
HDMI
Display Mode
1-CH 4K Low Latency
Polarity 3D
ON
Delay 3D
1999
EDID
Audio


2025-08-16 14:27
INPUT
Left Input Port
HDMI
Display Mode
2-CH 4K Low Latency
Polarity 3D
ON
Delay 3D
1999
EDID
Audio

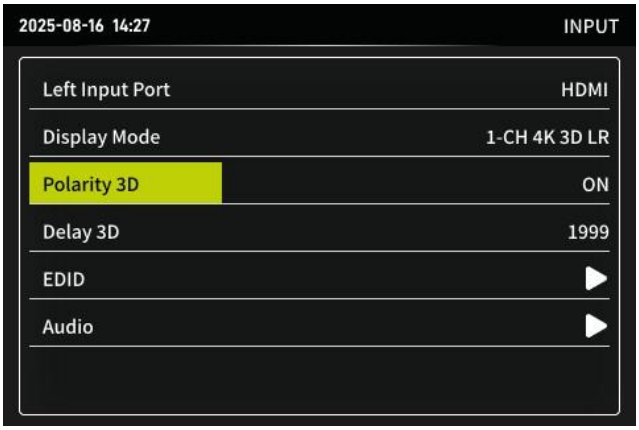

2025-08-16 14:27
INPUT
Left Input Port
HDMI
Display Mode
2-CH 4K
Polarity 3D
ON
Delay 3D
1999
EDID
Audio



Mode	Note
Single 4K Input Standard Mode	Supports HDMI3 input only, with 1-frame overall latency
Dual 4K Input Standard Mode	Supports simultaneous HDMI3 and DP inputs only, with 1-frame overall latency (image split horizontally: HDMI3 on left, DP on right; single network port cannot support two input image areas simultaneously)
Synthetic Active 3D Mode	Supports simultaneous HDMI3 and DP inputs for 3D@120Hz output synthesis only, with 1-frame overall latency
Output Refresh Rate Doubling Mode	Supports HDMI3 input only, with input source 60Hz doubled to 120Hz output, overall 1-frame latency
Single 4K Input Low Latency Mode	Supports HDMI3 input only, capable of sub-frame latency
Dual 4K Input Low Latency Mode	Supports simultaneous HDMI3 and DP inputs, capable of sub-frame latency (image split horizontally: HDMI3 on left, DP on right; single network port cannot span both input display areas)

6.1.3 Polarity 3D

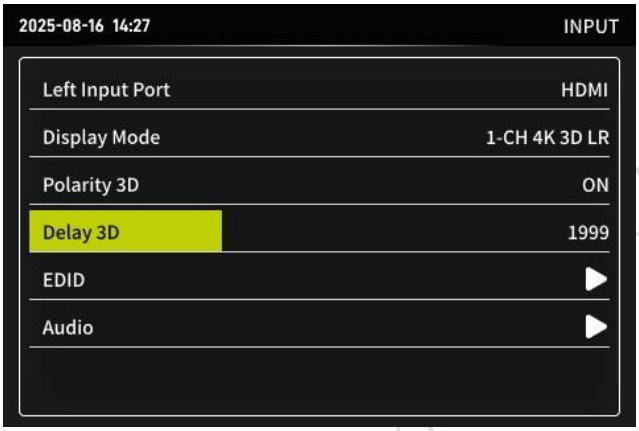
The polarity reversal 3D function is used to switch the left and right eye images. 3D display presents two images—one for the left eye and one for the right eye. The polarity reversal function can be used to control the displayed video image to match the 3D glasses.



6.1.4 Delay 3D

Delay Time: The time required to switch between left and right eye images.

Delay Range: 0 to 65535 microseconds (μs)



6.1.5 EDID

Step 1: Rotate the knob to 【EDID】, then press to enter resolution parameter adjustment.

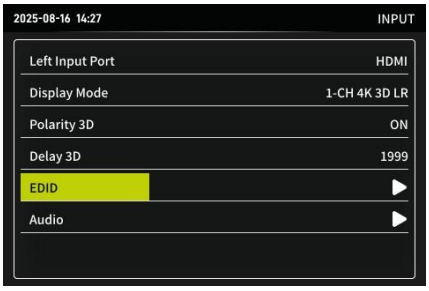
Step 2: With resolution parameters selected, rotate the knob to choose a common EDID.

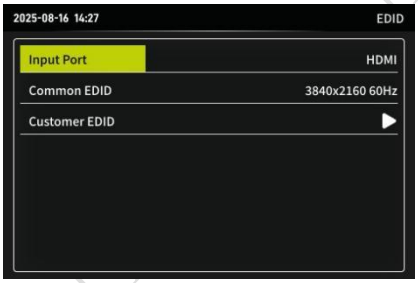
- Port selection: Input signal—select the input interface for which you wish to modify the EDID.
- Common EDID：
  - 1368x0768 60Hz
  - 1440x0900 60Hz

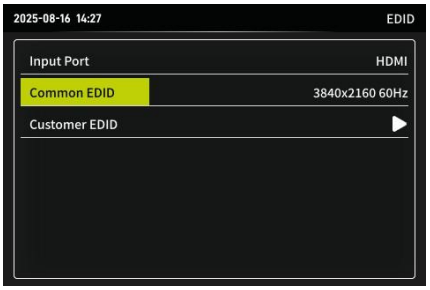
- 1920x1080 60Hz
- 2304x1152 60Hz
- 2560x0900 60Hz
- 3072x3072 60Hz
- 3840x1080 60Hz
- 3840x2160 60Hz

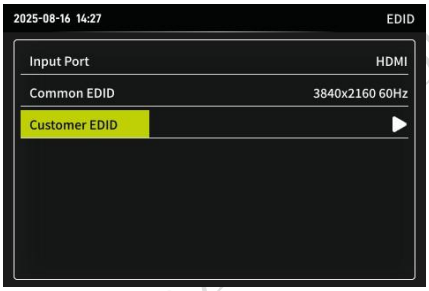
Custom EDID supports both HDMI and DisplayPort types. When extended data is enabled, it defaults to HDMI type. Horizontal size, vertical size, and refresh rate can be customized, supporting a maximum horizontal width of 4092 pixels, a maximum vertical height of 4095 pixels, and a refresh rate range of 0 to 180Hz.

Step 3: Press the knob to confirm, completing the common EDID settings.





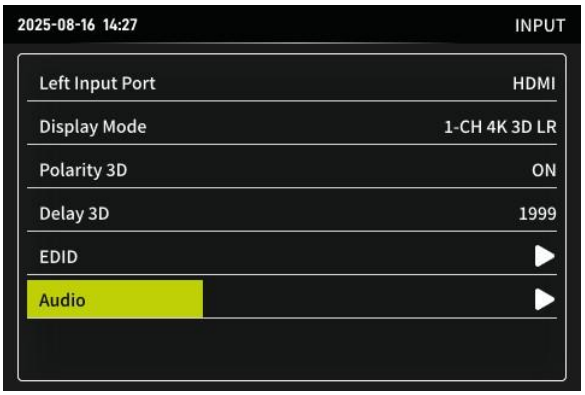




6.1.6 Audio Setting

Step 1: Rotate the knob to the 【Sound Settings】 function, then press to confirm and enter.

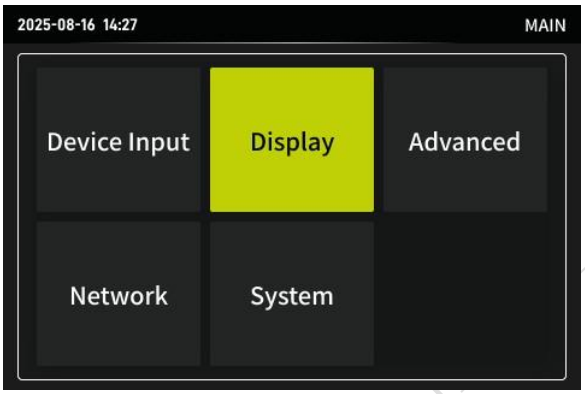
Step 2: The audio switch can be set to “On” or “Off”; select the input signal source for the output audio, with the option to use the external headphone jack input.

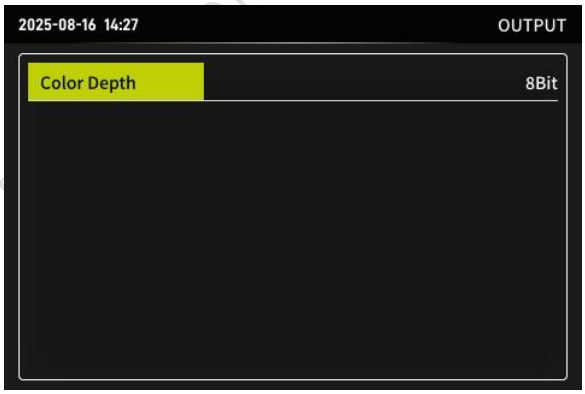


Select the input signal source for the output audio. You can choose a specific input source or the external headphone jack input.

6.2 Window Display

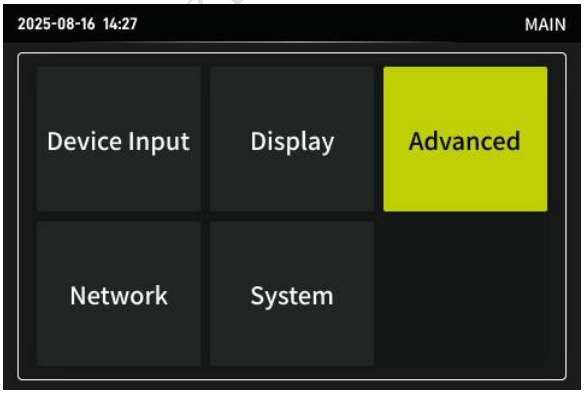
Output display settings: Color depth 8-bit.





6.3Advanced Function

Advanced Features Menu: Brightness Adjustment, Box Mapping, Port Settings



6.3.1 Brightness

Step 1: Rotate the knob to the 【Advanced Functions】-【Brightness Adjustment】 feature, then press the knob to confirm.

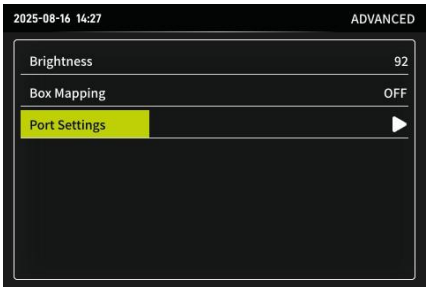
Step 2: The default brightness value is 100. Rotate the knob to adjust the receiving card brightness between 0 and 100.

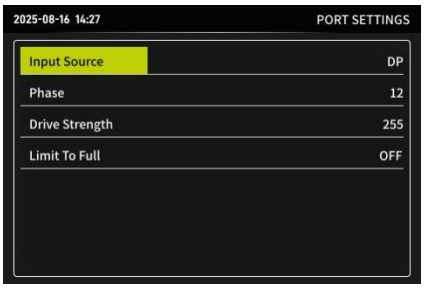
6.3.2 Box Mapping

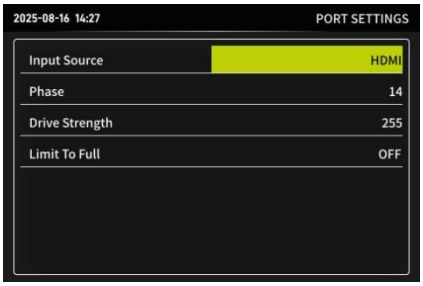
Steps: Rotate the knob to the 【BOX Mapping】 function. Press the knob to confirm selection and activate. The large screen displays the receiving card's network port information and connection sequence.

6.3.3 Port Setting

Step 1: Rotate the knob to the [Port Settings] function and press to confirm entry. Step 2: Phase & Drive Adjustment: If vertical lines or flickering dots appear in the image, adjust the signal source's phase and drive settings. Phase range: 0–15, Drive range: 0–255.







Limited to Full Range:

OFF：
(1) Input RGB Limited, Output RGB Limited: Grayscale starts from level 16. (2) (2) Input RGB Full, Output RGB Full: Grayscale starts from level 1. (3) (3) Input YUV422/YUV444, Output RGB Limited: Grayscale starts from level
ON：
(1) Input RGB Limited, Output RGB Full: Grayscale starts from level 1. (2) (2) Input RGB Full, Output RGB Limited: Grayscale starts from level 16. (3) (3) Input YUV422/YUV444, Output RGB Full: Grayscale starts from level 1.

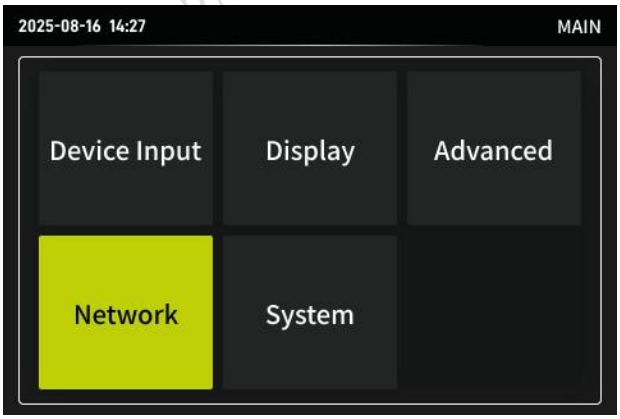
6.4 Network Settings

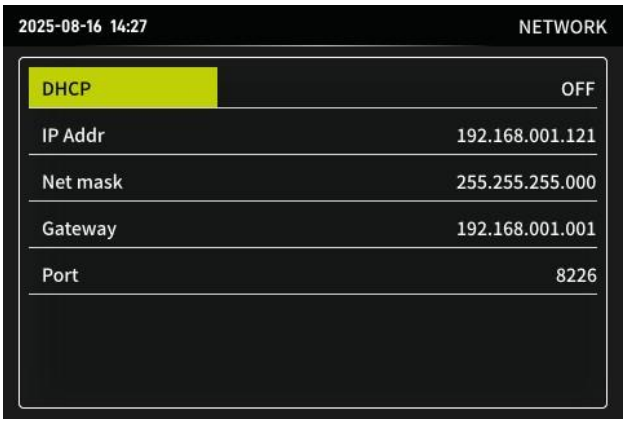
Step 1: On the Advanced Features interface, rotate the knob to Network Settings and press to enter.

Step 2: DHCP On: Automatically requests IP allocation from the router. The DHCP server can automatically assign IP addresses to devices on the network, reducing manual configuration effort.

DHCP Off: Fixed IP remains unchanged.

Step 3: Configure the “Default Gateway,” “Net Mask,” “IP Address,” and “Port Number.”





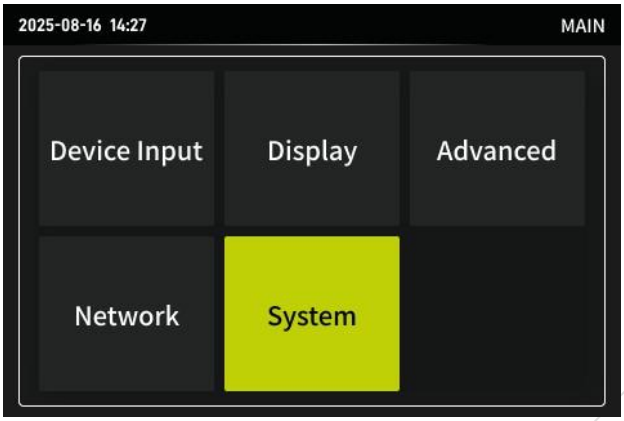
Enabled: Automatically requests IP assignment from the router device.

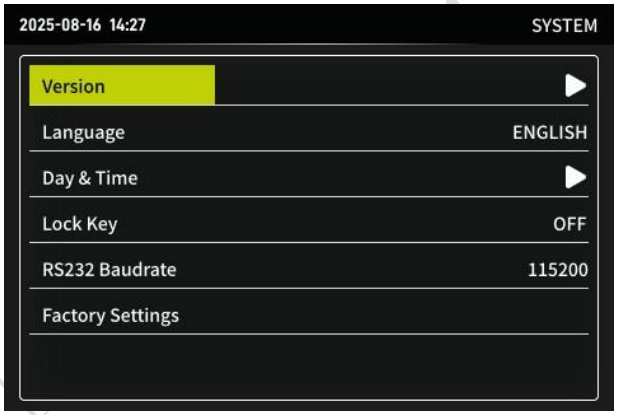
Automatic IP address allocation: The DHCP server can automatically assign IP addresses to devices on the network, reducing manual configuration efforts.

Disabled: The fixed IP remains unchanged.

6.5 System Settings

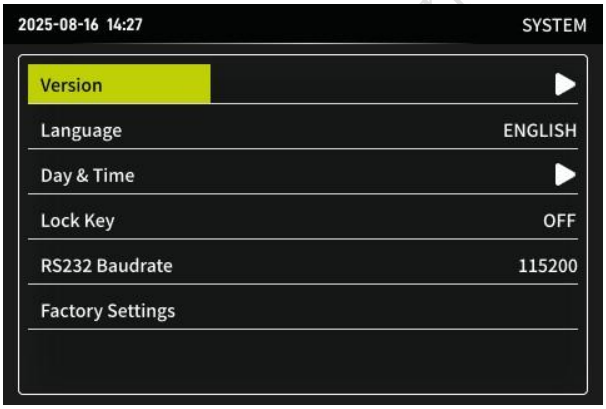
The system settings function menu includes the following seven options: [Version Information], [Time Settings], [Language], [Key Lock],, [RS232 Baud Rate], and [Factory Settings].

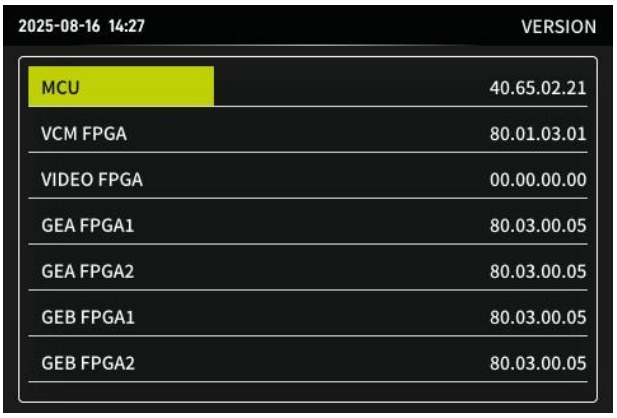




6.5.1 Version Information

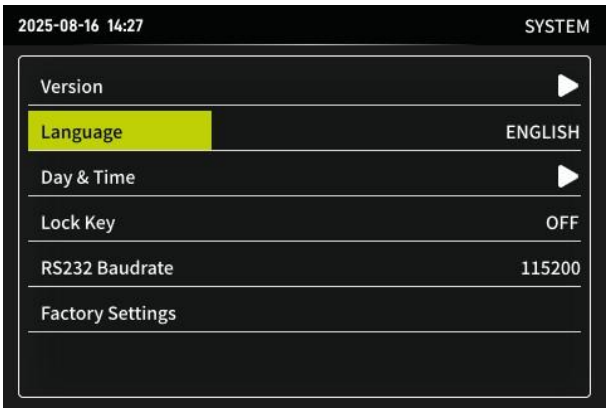
This function allows viewing the FPGA and MCU versions of the device.





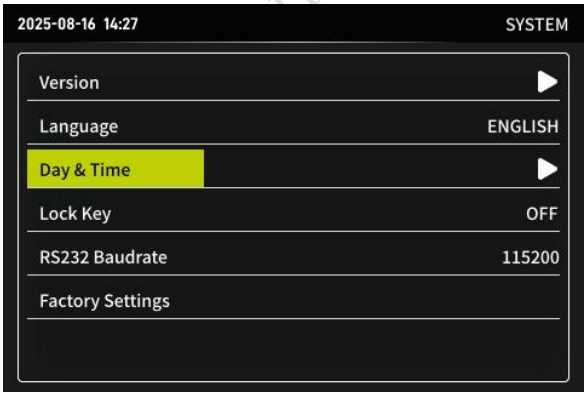
6.5.2 Language

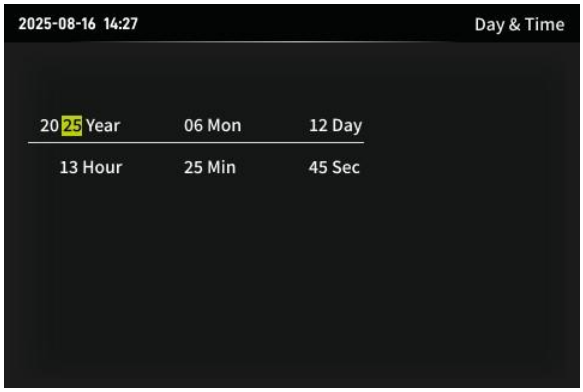
The default system language is "Simplified Chinese", which can be switched to "English" and "Traditional Chinese". Press the knob to confirm.



6.5.3 Time Setting

Set the local clock and date of the video processor. The video processor motherboard has a built-in button battery or super capacitor, allowing the clock to continue running after power loss. If the device remains unpowered for an extended period, the time and date will need to be reset upon reuse. The scheduled switching function relies on this time setting. Restoring factory settings will not alter the time configuration parameters. Rotate the knob to select the value to be adjusted, press "OK" to confirm (the selected value will turn green), then rotate the knob to adjust the value and press "OK" again to save.





6.5.4 Key Lock

The key lock function is turned on to prevent misoperation and lock the key function of the front panel. Default "on" state, automatic locking after 3 minutes of no operation; Unlocking method: After pressing the knob, there is a prompt, and long press the knob to unlock.

6.5.5 Baud rate of RS232

The data transmission rate from one device to another, that is, bits per second (bit/s), has typical baud rates of 300, 1200, 2400, 9600, 19200, 38400, 115200, 230400 and so on. It needs to be used with serial communication software.

6.5.6 Factory Settings

Press the knob to pop up the prompt message "Are you sure you want to restore the factory settings? (Confirm/Return) "; Press the knob to confirm, and press the Esc key to return.

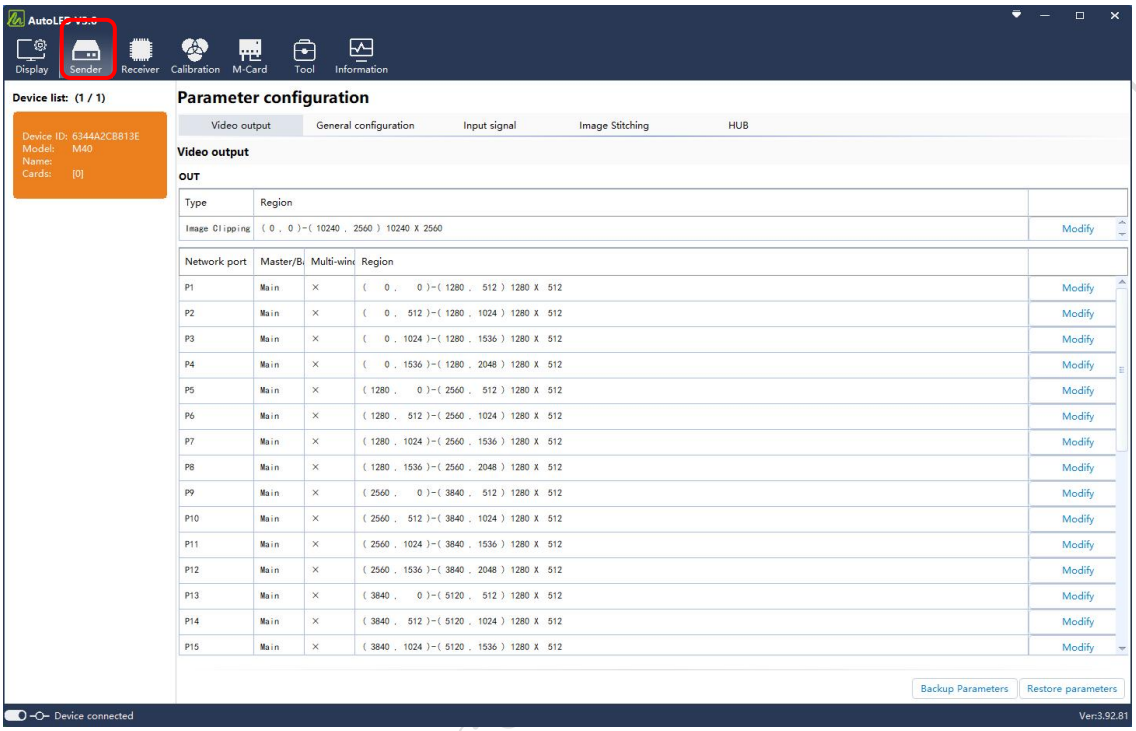
Set Parameters:

- Output Resolution: 1920X1080 60Hz
- Signal Source: HDMI
- Scaling Parameters: 0, 0, 1920, 1080
- Crop: Off
- Freeze: off
- Black Screen: Off
- Test Screen: Off

7 AutoLED Software Application

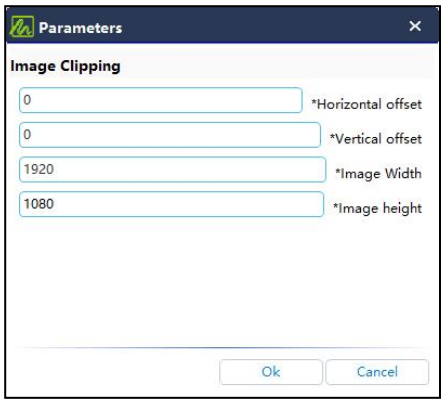
7.1 Accessing the Software Settings Interface

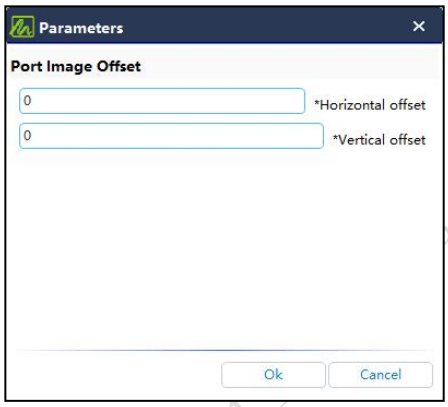
Open the AutoLED software, click "Sending Card" to enter the sending settings interface. The device list displays the recognized sending card model: B4000S



7.2 Image Output

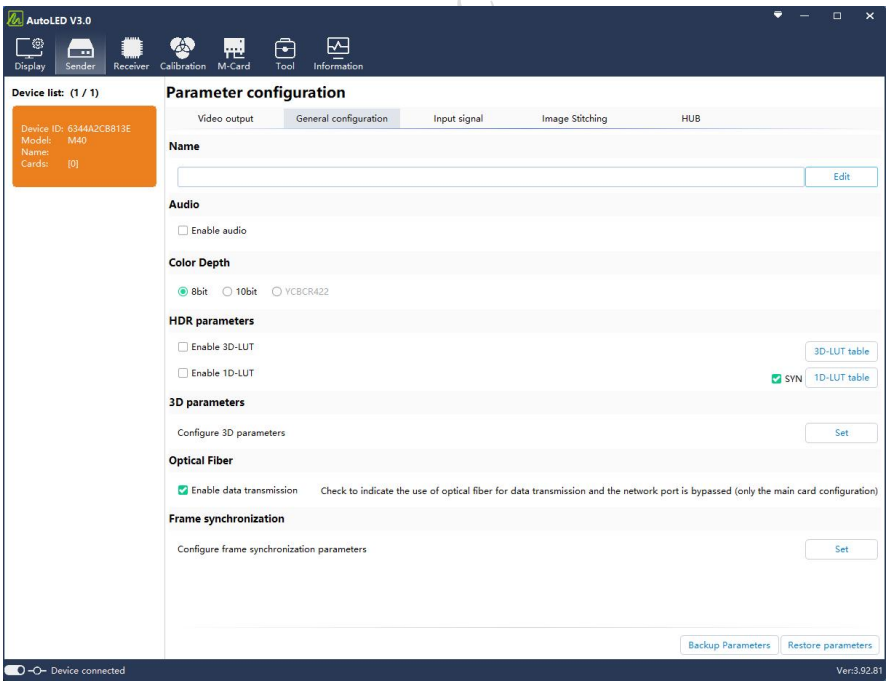
Click "Graphic Output" in the parameter configuration section. The software interface will display the position and size of the image capture area, as well as the load position and size for each network port. Click to modify the settings parameters. For image capture, you can set the horizontal and vertical offsets, as well as the width and height of the captured image. For each network port, you can set the horizontal and vertical offset positions of the image.





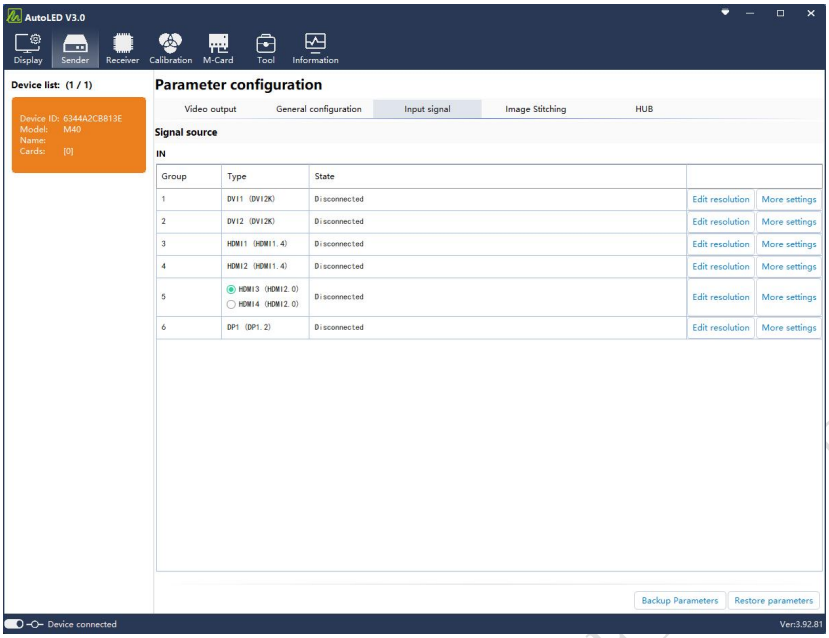
7.3 General Configuration

Click "General Configuration" in the parameter settings to edit the processor name, enable/disable audio, and set the color depth.



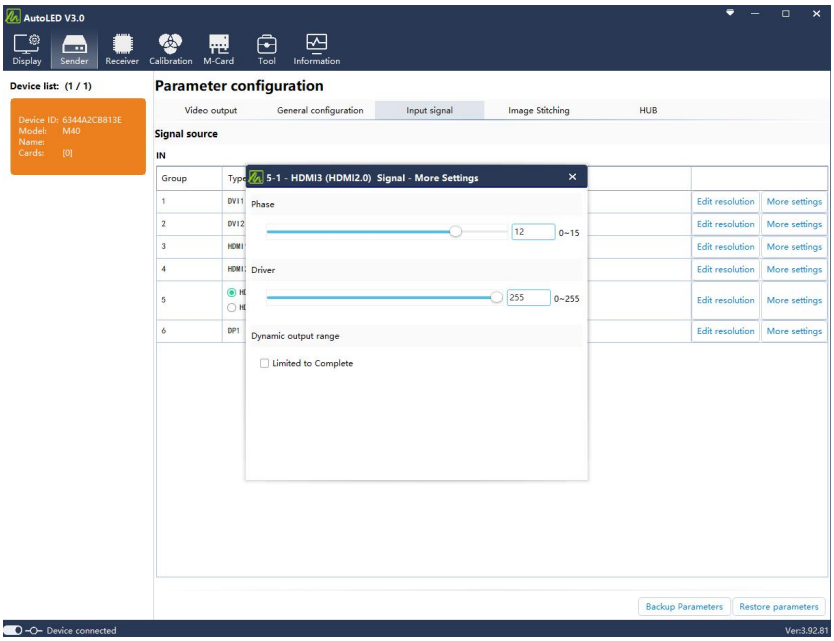
7.4 Input Signal

Click "Input Signal" in the parameter configuration to open the input signal source settings interface. Click "Modify Resolution" to set the EDID information for the corresponding input interface. When selecting a 4K input signal source, choose either HDMI 2.0 or DP 1.2.



If issues such as vertical lines or flickering dots appear in the image, adjust the phase and drive settings of the signal source:

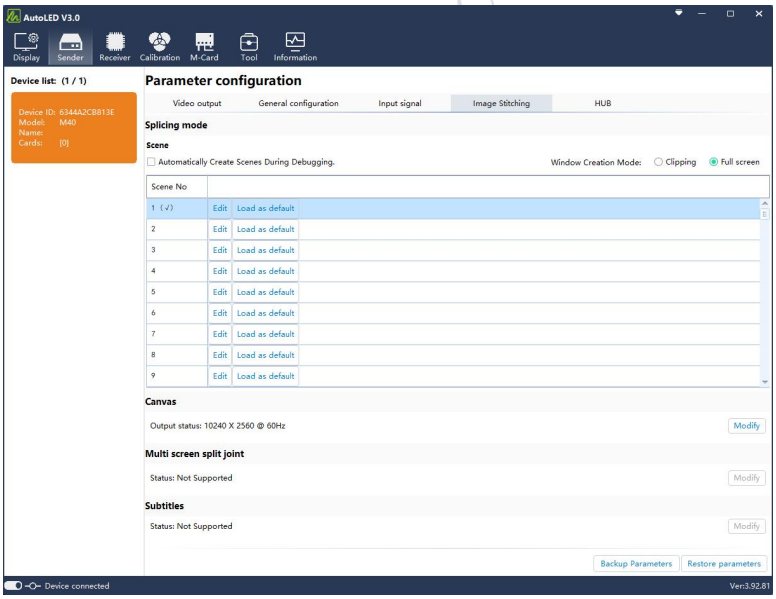
Phase adjustment range: 0–15, Drive adjustment range: 0–255



7.5 Screen Splicing

7.5.1 Scene Recall

Click "Screen Splicing" in the parameter configuration to save up to 10 different scene modes in the scene library. Click "Recall and Set as Default" to output and display the selected scene mode, indicated by a checkmark (√) next to the scene number. Click "Edit" to enter the scene settings interface.



7.5.2 Scene Editing

In the scene editing interface, you can perform the following operations: create windows, delete windows, set the size and position of each window, adjust the window stacking order, switch the input signal source for windows, and crop the input signal image for windows.

➢ Zoom In/Out: Enlarge or reduce the display size of the window and screen connection interface in the software, adjustable to a suitable viewing scale.

➢ New: Create a new window. The input signal source for the new window defaults to the currently selected source, and the position defaults to the top-left corner.

➢ Full Screen: After selecting a window, click "Full Screen" to expand the window to fill the entire display.

➢Bring to Front/Send to Back: Set the window stacking order to the topmost or bottommost layer.

➢ Move Up/Down: Adjust the window stacking order. Each click changes the selected window's layer by one level.

➢ Delete/Delete All: Remove the selected window or all windows.

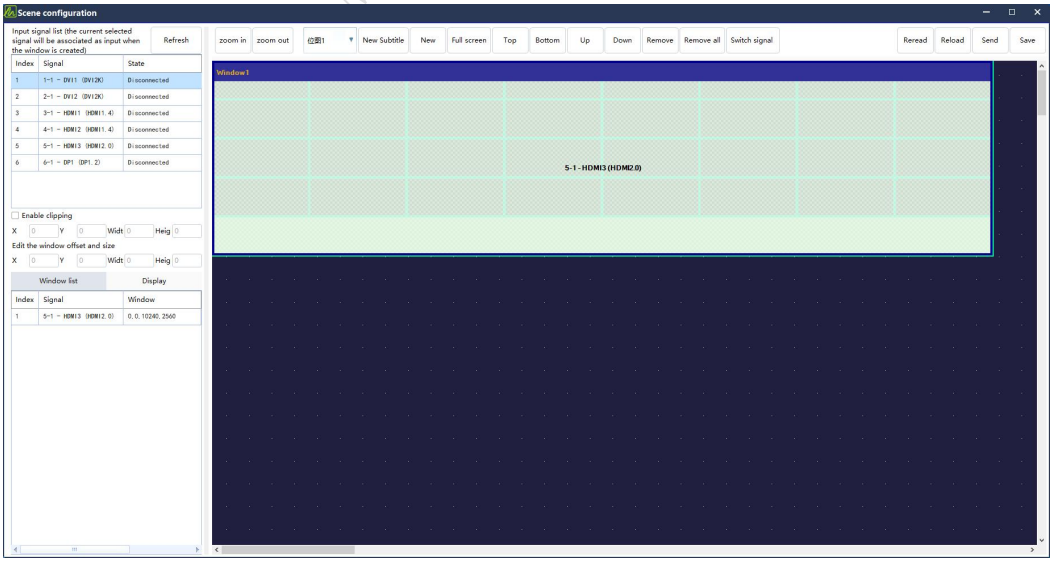
➢ Switch Signal Source: Select a window and an input signal source, then click "Switch Signal Source" to apply the change.

➢ Read Back Window: Retrieve unsaved window data parameters that have been sent to the hardware for display.

➢ Reload Window: Load saved window data from a scene preset.

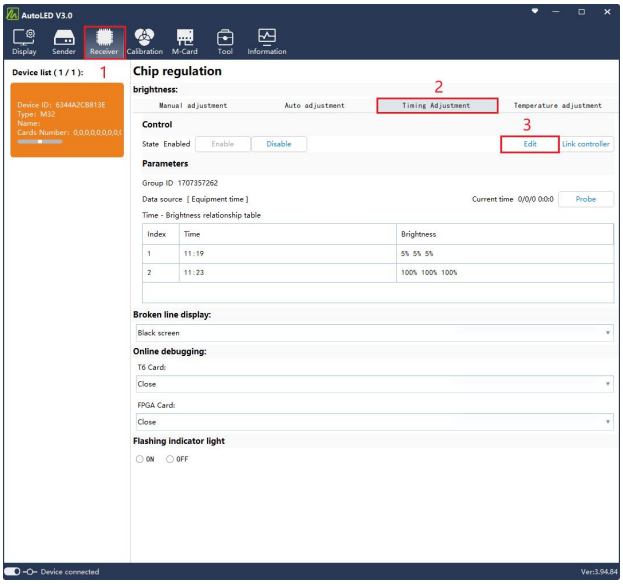
➢ Send: Transmit window data configured in the PC software to the hardware for display.

➢ Save: Store the window data sent to the hardware into a hardware scene preset.

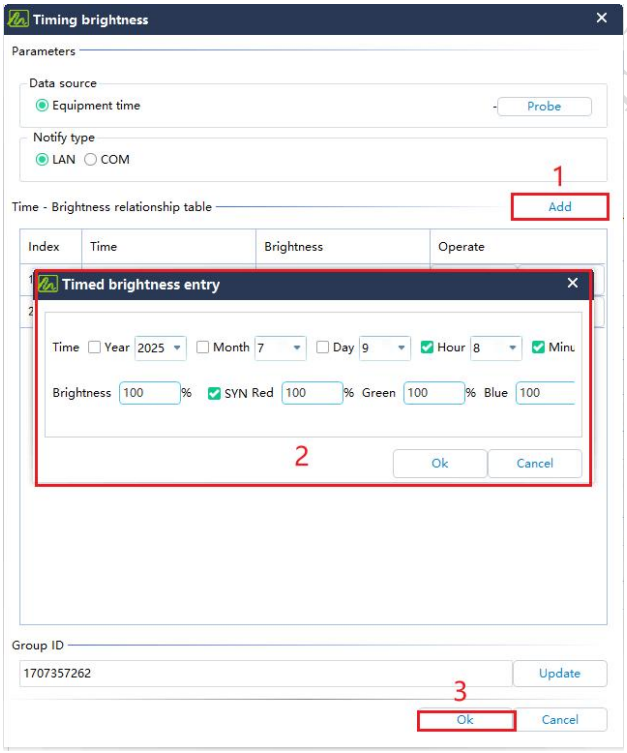


7.5.3 Timing Brightness

Step 1: In the software, navigate to [Screen Control] - [Timing Adjustment], and click Edit to enter.



Step 2: After entering the interface shown below, click "Add" to set the time and brightness value according to customer requirements, then confirm.



Note: The scheduled brightness function cannot be used while connected via a USB debugging cable; otherwise, it will not execute. Use a 100 Mbps Ethernet connection for debugging instead.

WeChat Official Account Platform

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