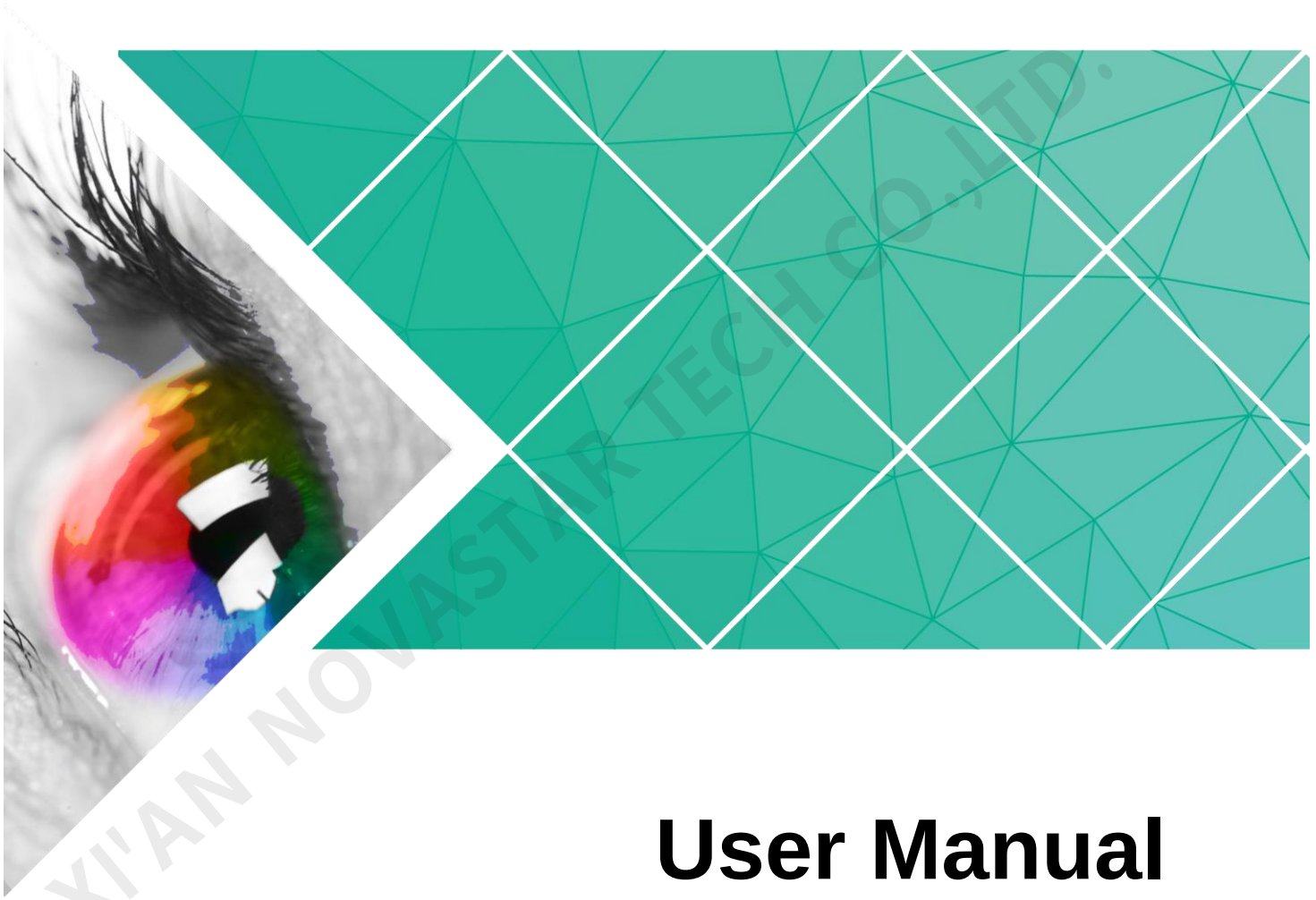
MCTRL R5

LED Display Controller



User Manual

Document Version: V1.0.2

Document Number: NS110100814

Trademark

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

Statement

You are welcome to use the product of Xi'an NovaStar Tech Co., Ltd. (hereinafter referred to as NovaStar). 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 contact info given in document. We will do our best to solve any issues, as well as evaluate and implement any suggestions.

Change History

Document Version	Firmware Version	Release Date	Description
V1.0.2	V1.0.2.0	2019-09-06	Optimized the document content.
V1.0.1	V1.0.2.0	2018-06-04	Updated the document style.
V1.0.0	V1.0.0.0	2016-06-06	First release

Contents

1 Overview

The MCTRL R5 is the first LED display controller of NovaStar that supports display rotation. A single MCTRL R5 features a loading capacity of up to 3840×1080@60Hz. It supports any custom resolutions within this capacity, meeting the on-site configuration requirements of ultra-long or ultra-wide LED displays.

Working with the A8s or A10s Plus receiving card, the MCTRL R5 supports free screen configuration in SmartLCT and allows for display rotation at any angle to present a variety of images and bring an amazing visual experience to users.

The MCTRL R5 can be mainly used in rental and fixed applications, such as concerts, live events, monitoring centers, Olympic Games and various sports centers.

2 Features

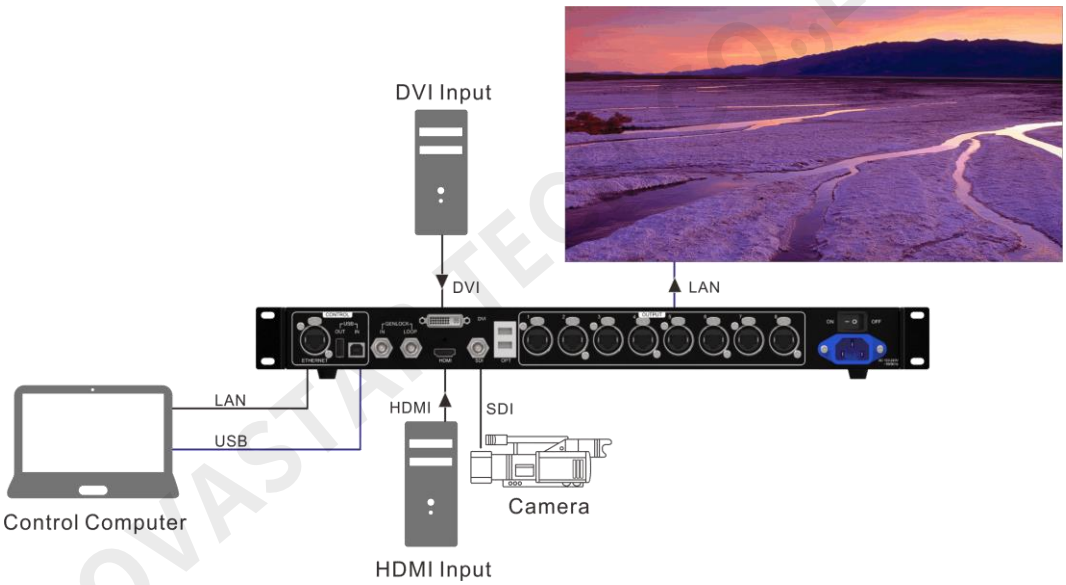
2.1 Features

- 1 × 6G-SDI, 1 × D-DVI and 1 × HDMI 1.4 inputs, pixel capacity of each up to 4,140,000 pixels
- 8 × Gigabit Ethernet and 2 × fiber optic outputs
- Display rotation at any angle
- Innovative architecture to enable smart configuration and shorter stage preparation time
- NovaStar G4 engine to enable a stable and smooth display with good sense of depth and no flickering or scanning lines
- Supports the new generation of NovaStar pixel level calibration technology, which is fast and efficient.
- Supports quick and easy manual adjustment of screen brightness.
- Supports firmware update via USB port on the front panel.
- Multiple controllers can be cascaded for uniform control.

2.2 Video Formats Supported

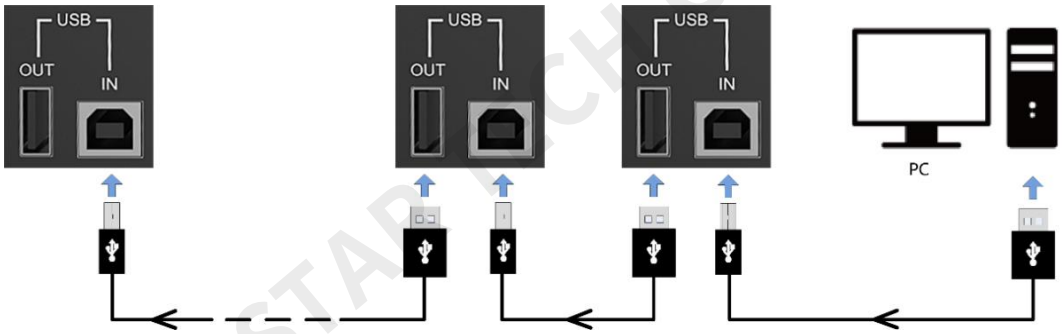
Input Connector	Features		
	Bit Depth	Sampling Format	Maximum Input Resolution
HDMI1.4	8 bit	RGB 4:4:4 YCbCr 4:4:4 YCbCr 4:2:2	3840×1080@60Hz
Dual link DVI	8 bit	RGB 4:4:4	3840×1080@60Hz
6G-SDI	Maximum input resolution: 3840×1080@60Hz Note: Do not support input resolution settings or interlaced signals.		

3 Applications



4 Cascading Devices

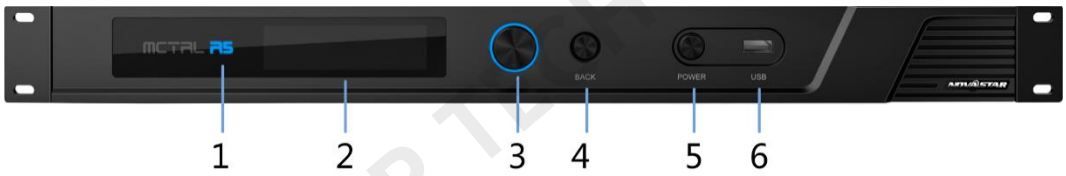
If the control computer needs to control multiple MCTRL R5 units, you can cascade the units via USB IN and USB OUT of the MCTRL R5 according to the figure below. Up to 8 units can be cascaded.



5 Hardware Structure

5.1 Appearance

Front Panel



No.	Name	Description
1	R5 indicator	Blue: The device is operating normally Red: The device has an alarm. Orange: The device has no signal. Breathing blue: The device is in standby mode.
2	OLED screen	Display the menu.
3	Knob	• Press to enter a menu or confirm an option. • Rotate to select a menu item or adjust a menu parameter. • Hold down the knob and **BACK** button simultaneously for 5s to lock or unlock all the buttons.
4	BACK	Press to go back to the previous menu.
5	POWER	Standby button
6	USB	Insert USB drive to update firmware.

Rear Panel

Input	
SDI	• 6G-SDI input, resolutions up to 3840×1080@60Hz • Maximum input resolution: 3840×1080@60Hz • Support progressive input only Note: Do not support input resolution settings.
HDMI	• HDMI1.4 input, with a maximum resolution of 3840×1080@60Hz and minimum resolution of 800×600@24Hz • Pixel capacity: 4,140,000 pixels • Custom resolution supported Resolution limit with maximum width: 3840×1080@60Hz Resolution limit with maximum height: 800×3840@60Hz • HDCP 1.4 compliant • Supported standard resolutions: 1024×768@(24/25/30/48/50/60/72/75/85/100/120)Hz 1280×720@(24/25/30/48/50/60/72/75/85/100/120)Hz 1280×1024@)24/25/30/48/50/60/72/75/85/100/120)Hz 1366×768@(24/25/30/48/50/60/72/75/85/100/120)Hz 1440×900@(24/25/30/48/50/60/72/75/85/100/120)Hz 1536×1536@(24/25/30/48/50/60/72/75/85/100)Hz 1600×1200@(24/25/30/48/50/60/72/75/85/100/120)Hz 1920×1080@(24/25/30/48/50/60/72/75/85/100/120)Hz 1920×1200@(24/25/30/48/50/60/72/75/85/100)Hz 2048×640@(24/25/30/48/50/60/72/75/85/100/120)Hz 2048×1152@(24/25/30/48/50/60/72/75/85/100)Hz 2304×1152@(24/25/30/48/50/60/72/75/85/100)Hz 2560×816@(24/25/30/48/50/60/72/75/85/100/120)Hz 2560×1600@(24/25/30/48/50/60)Hz 3840×1080@(24/25/30/48/50/60)Hz
D-DVI	• Dual link DVI input, with a maximum resolution of 3840×1080@60Hz and minimum resolution of 800×600@24Hz • Pixel capacity: 4,140,000 pixels • Custom resolution supported Resolution limit with maximum width: 3840×1080@60Hz Resolution limit with maximum height: 800×3840@60Hz • Supported standard resolutions: 1024×768@(24/25/30/48/50/60/72/75/85/100/120)Hz 1280×720@(24/25/30/48/50/60/72/75/85/100/120)Hz 1280×1024@(24/25/30/48/50/60/72/75/85/100/120)Hz 1366×768@(24/25/30/48/50/60/72/75/85/100/120)Hz 1440×900@(24/25/30/48/50/60/72/75/85/100/120)Hz 1536×1536@(24/25/30/48/50/60/72/75/85)Hz

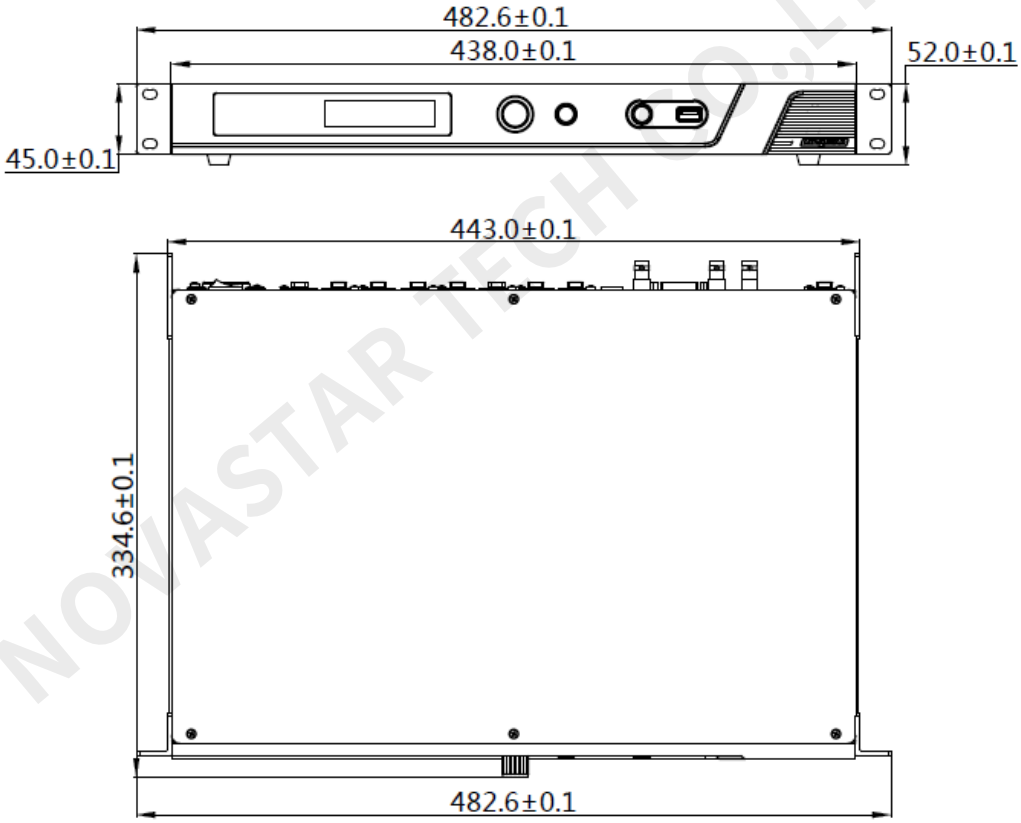
	1600×1200@(24/25/30/48/50/60/72/75/85/100/120)Hz 1920×1080@(24/25/30/48/50/60/72/75/85/100)Hz 1920×1200@(24/25/30/48/50/60/72/75/85/100)Hz 2048×640@(24/25/30/48/50/60/72/75/85/100/120)Hz 2048×1152@(24/25/30/48/50/60/72/75/85/100)Hz 2304×1152@(24/25/30/48/50/60/72/75/85)Hz 2560×816@(24/25/30/48/50/60/72/75/85/100)Hz 2560×1600@(24/25/30/48/50/60)Hz 3840×1080@(24/25/30/48/50/60)Hz
Output	
RJ-45 Gigabit Ethernet	• 8 × RJ-45 Gigabit Ethernet outputs • Maximum pixel capacity of each port: 650,000 pixels • Do not support audio output. • Support redundancy between Ethernet ports.
OPT1–2	• 10G optical ports – Single-mode twin-core fiber: Support LC optical connectors; wavelength: 1310 nm; transmission distance: 10 km; OS1/OS2 recommended. – Dual-mode twin-core fiber: Support LC optical connectors; wavelength: 850 nm; transmission distance: 300 m; OM3/OM4 recommended. • The maximum loading capacity of a single optical port equals to that of all the 8 Ethernet ports. • 2 × OPT inputs/outputs – OPT1 transmits data of Ethernet ports 1–8. – OPT2 is a duplicate channel of OPT1.
Control	
ETHERNET	Fast Ethernet port to connect to PC. Support TCP/IP.
USB IN	Input port for cascading devices, or connecting to PC
USB OUT	Output port for cascading devices. Up to 8 MCTRL R5 units can be cascaded.
GENLOCK	
IN	GENLOCK input connector • GENLOCK type: Blackburst • Input GENLOCK sync signal to ensure synchronization and same refresh rate between the output signals of cascaded MCTRL R5 units and the external Genlock input signal.
LOOP	GENLOCK loop output connector. Up to 8 MCTRL R5 units can be cascaded.
Power	

Power supply	AC 100 V–240 V, 50/60Hz
Power switch	ON/OFF

Note:

- Type-A USB port is prohibited from being connected to the control computer directly.
- This product can only be worked horizontally. Wall mounting is not permitted.

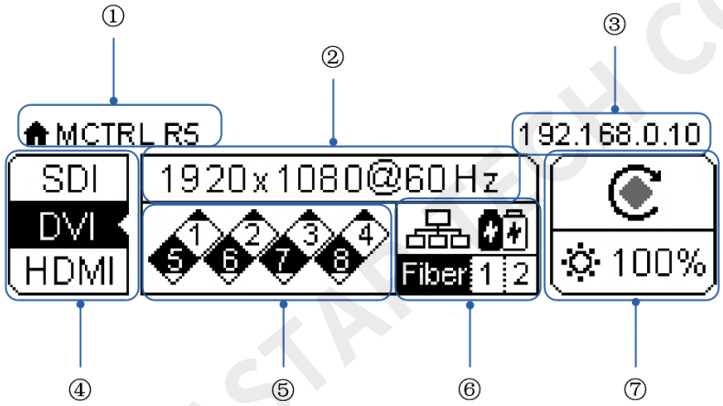
5.2 Dimensions



Unit: mm

6 Homepage

After the MCTRL R5 is powered on, the home screen is shown in the figure below.



No.	Description	
①	Name of the device	
②	Resolution and frame rate of the current input source.	
③	IP address	
④	Video source connection status, types of video sources supported	
⑤	Ethernet port connection status: • Black: The Ethernet port connection works and the port serves as master. • White: The Ethernet port is not connected or the connection does not work. • A mark on top corner of icon: The Ethernet port connection works and is in redundancy mode.	
⑥	Operating status description:	
		Power voltage of the motherboard
		Temperature inside the device
		Screen brightness

No.	Description	
	Fiber 1~2	Optical port connection status: • Black: The optical port connection works and the port serves as master. • White: The optical port is not connected or the connection does not work.
		Connection status of control ports: USB connected/Ethernet connected/GENLOCK connected
		Rotation enabled/disabled

7 Menu Operations

The MCTRL R5 is powerful and easy to use. You can quickly configure the LED screen to light it up and display the entire input source following steps in 7.1 Quick Screen Configuration. With other menu settings, you can further improve the LED screen display effect.

Instruction on knob operations:

- Press the knob to enter a menu or confirm an operation.
- Rotate the knob to select a menu item or adjust a menu parameter.
- Hold down the knob and **BACK** button simultaneously for 5s to lock or unlock all the buttons.

7.1 Quick Screen Configuration

Following the 3 steps below, namely Setting Input Source > Setting Input Resolution > Quickly Configuring Screen, you can quickly light up the LED screen to display the entire input source.

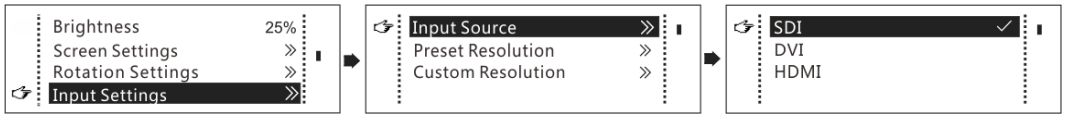
7.1.1 Step 1 Setting Input Source

Supported input sources include SDI, HDMI and DVI. Select an input source that matches the type of the inputted external video source.

Constraints:

- Only one video input source can be selected at the same time.
- SDI video sources do not support the following functions:
  - Preset resolution
  - Custom resolution
- The 10-bit video sources are not supported when calibration function is enabled.

Figure 7-1 Input source settings



Step 1 On the home screen, press the knob to enter the menu.

Step 2 Chose **Input Settings** > **Input Source** to enter its submenu.

Step 3 Select the target video source and press the knob to enable it.

7.1.2 Step 2 Setting Input Resolution

Constrains: SDI input sources do not support input resolution settings.

The input resolution can be set through either of the following methods.

Method 1: Selecting a Preset Resolution

Select an appropriate preset resolution and refresh rate as the input resolution.

Figure 7-2 Preset resolution

Step 1 On the home screen, press the knob to enter the menu.

Step 2 Choose **Input Settings** > **Preset Resolution** to enter its submenu.

Step 3 Select a resolution and refresh rate, and press the knob to apply them.

The MCTRL R5 supports the following preset resolutions.

- 1024×768@(24/25/30/48/50/60/72/75/85/100/120)Hz
- 1280×720@(24/25/30/48/50/60/72/75/85/100/120)Hz
- 1280×1024@(24/25/30/48/50/60/72/75/85/100/120)Hz
- 1366×768@(24/25/30/48/50/60/72/75/85/100/120)Hz
- 1440×900@(24/25/30/48/50/60/72/75/85/100/120)Hz
- 1536×1536@(24/25/30/48/50/60/72/75/85)Hz
- 1600×1200@(24/25/30/48/50/60/72/75/85/100/120)Hz
- 1920×1080@(24/25/30/48/50/60/72/75/85/100)Hz
- 1920×1200@(24/25/30/48/50/60/72/75/85/100)Hz
- 2048×640@(24/25/30/48/50/60/72/75/85/100/120)Hz
- 2048×1152@(24/25/30/48/50/60/72/75/85/100)Hz
- 2304×1152@(24/25/30/48/50/60/72/75/85)Hz
- 2560×816@(24/25/30/48/50/60/72/75/85)Hz
- 2560×1600@(24/25/30/48/50/60)Hz
- 3840×1080@(24/25/30/48/50/60)Hz

Method 2: Customizing a Resolution

Customize a resolution by setting a custom width, height and refresh rate.

Figure 7-3 Custom resolution

Step 1 On the home screen, press the knob to enter the menu.

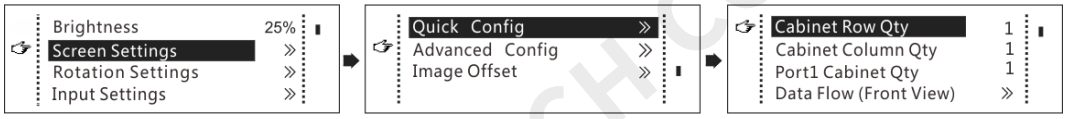
Step 2 Choose **Input Settings** > **Custom Resolution** to enter its submenu and set the screen width, height and refresh rate.

Step 3 Select **Apply** and press the knob to apply the custom resolution.

7.1.3 Step 3 Quickly Configuring Screen

This function is used to quickly configure a screen.

Figure 7-4 Quick configuration



Step 1 On the home screen, press the knob to enter the menu.

Step 2 Choose **Screen Settings** > **Quick Config** to enter its submenu and set the parameters

- Set **Cabinet Row Qty** and **Cabinet Column Qty** (number of cabinet rows and columns to be loaded).
- Set **Port 1 Cabinet Qty** (number of cabinets loaded by Ethernet port 1). The device has restrictions on the number of cabinets loaded by the Ethernet ports. For details, see Note a).
- Set **Data Flow** of the screen. For details, see Note c), d), and e).

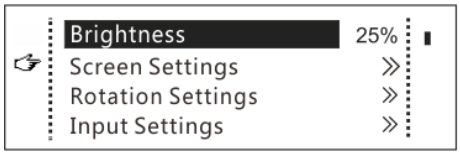
Note	
a). If *n* ports are used to load the screen, the number of cabinets loaded by each of the first (*n*–1) ports must be the same and the integral multiple of the number of cabinet rows or columns, and it cannot be less than the number of cabinets loaded by the last port.	Example: If all the 8 Ethernet ports are used to load the screen, the number of cabinets loaded by ports 1–7 must be the same and the integral multiple of the number of cabinet rows or columns. Therefore, you need to set only the number of cabinets loaded by port 1 according to the actual situation. The number of cabinets loaded by port 8 must be less than or equal to the number of cabinets loaded by port 1.
b). Irregular screens must be configured in NovaLCT.	
c). Rotate the knob to select the target data flow which can be previewed on the LED screen in real time and then press the knob to save the one you select.	
d). Ensure that the cabinets loaded by each Ethernet port are connected one by one in the same direction.	
e). Ensure that the Ethernet port 1 is at the beginning position of the whole physical	

connection.
f). If the rotation function is enabled, when you choose **Screen Settings** > **Quick Config**, a message asking “Disable rotation, are you sure?” will appear. Please choose **Yes** to continue.

7.2 Brightness Adjustment

Adjust the LED screen brightness value based on the current ambient brightness and eye comfort. Appropriate brightness can extend life of LEDs in LED screen.

Figure 7-5 Brightness adjustment



Step 1 On the home screen, press the knob to enter the menu.

Step 2 Select **Brightness** and press the knob to enter the adjustment status.

Step 3 Rotate the knob to adjust the brightness value. The LED screen displays the adjustment effect in real time. Press the knob to apply the brightness value.

7.3 Screen Settings

Configure the LED screen to ensure the screen can display the whole image normally.

Screen configuration methods include quick and advanced configurations.

There are constrains on these methods, explained as below.

- The two methods cannot be enabled at the same time.
- Do not use any of the two methods on MCTRL4K to configure the screen again after the screen is configured the in NovaLCT.

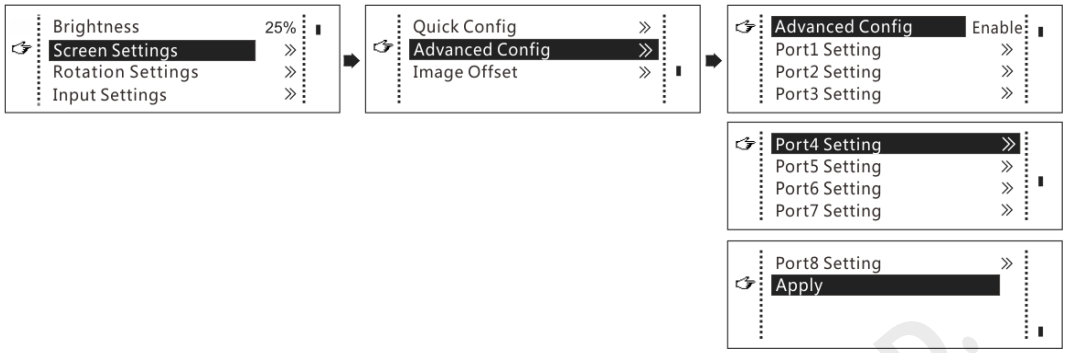
7.3.1 Quick Configuration

Configure the whole LED screen uniformly and quickly. For details, see 7.1.3 Step 3 Quickly Configuring Screen.

7.3.2 Advanced Configuration

Set parameters for each Ethernet port, including number of cabinet rows and columns (**Cabinet Row Qty** and **Cabinet Column Qty**), horizontal offset (**Start X**), vertical offset (**Start Y**), and data flow.

Figure 7-6 Advanced configuration



Step 1 On the home screen, press the knob to enter the menu.

Step 2 Choose **Screen Settings** > **Advanced Config** to enter its submenu.

Step 3 Enable **Advance Config** and set the parameters of target Ethernet ports.

7.3.3 Image Offset

After configuring the screen, adjust the horizontal and vertical offsets (**Start X** and **Start Y**) of the overall display image to ensure it is displayed in the target position.

Figure 7-7 Image offset

Step 1 On the home screen, press the knob to enter the menu.

Step 2 Choose **Screen Settings** > **Image Offset** to enter its submenu.

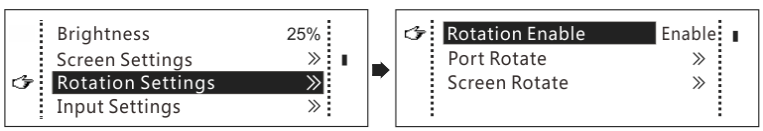
Step 3 Set the **Start X** and **Start Y** values.

7.4 Rotation Settings

There are 2 rotation methods: port rotation and screen rotation.

- Port rotation: Display rotation of cabinets loaded by Ethernet port (For example, set the rotation angle of port 1, and the display of cabinets loaded by port 1 will rotate according to the angle)
- Screen rotation: Rotation of the whole LED display according to the rotation angle

Figure 7-8 Rotation settings:



Step 1 On the home screen, press the knob to enter the menu.

Step 2 Choose **Rotation Settings** > **Rotation Enable**, and choose **Enable**.

Step 3 Choose **Port Rotate** or **Screen Rotate** and set the rotation step and angle.

Note:

- The screen must be configured on the MCTRL R5 before rotation setting in LCD menu.
- The screen must be configured in SmartLCT before rotation setting in SmartLCT.
- After screen configuration is done in SmartLCT, when you set rotation function on MCTRL R5, a message saying “Reconfig screen, are you sure?” will appear. Please choose **Yes** to perform rotation settings.
- The rotation function is disabled when the calibration function is enabled.

7.5 Input Settings

Set the input source and input resolution.

7.5.1 Input Source Settings

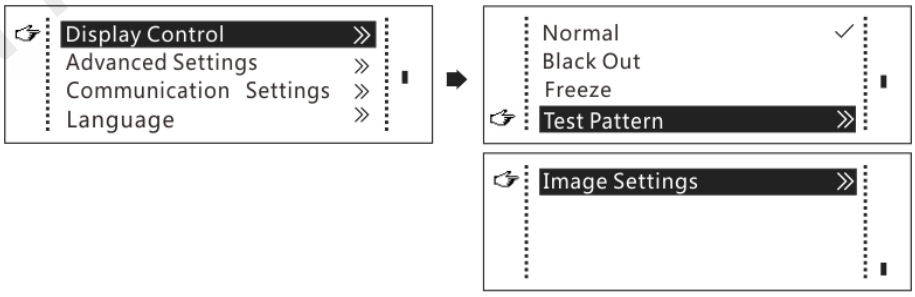
On the OLED menu screen, select an input source that matches the type of the inputted external video source. Only one video input source can be selected at the same time. For details, see 7.1.1 Step 1 Setting Input Source.

7.5.2 Input Resolution Settings

Set a preset or custom resolution for the selected input source. For details, see 7.1.2 Step 2 Setting Input Resolution.

7.6 Display Control

Figure 7-9 Display control



Normal: The LED screen displays the current input source normally.

Black Out: The LED screen goes black and does not display the input source, but the input source is still being played in the background.

Freeze: The LED screen always displays the frame when the screen is frozen, but the input source is still being played in the background.

Test Pattern: Test patterns are used to check the display effect and pixel operating status. There are 8 test patterns, including pure colors and line patterns.

Image Settings: This function is used to set the color temperature, brightness of red, green and blue, and Gamma of the image.

Note:

The image settings function is disabled when the calibration function is enabled.

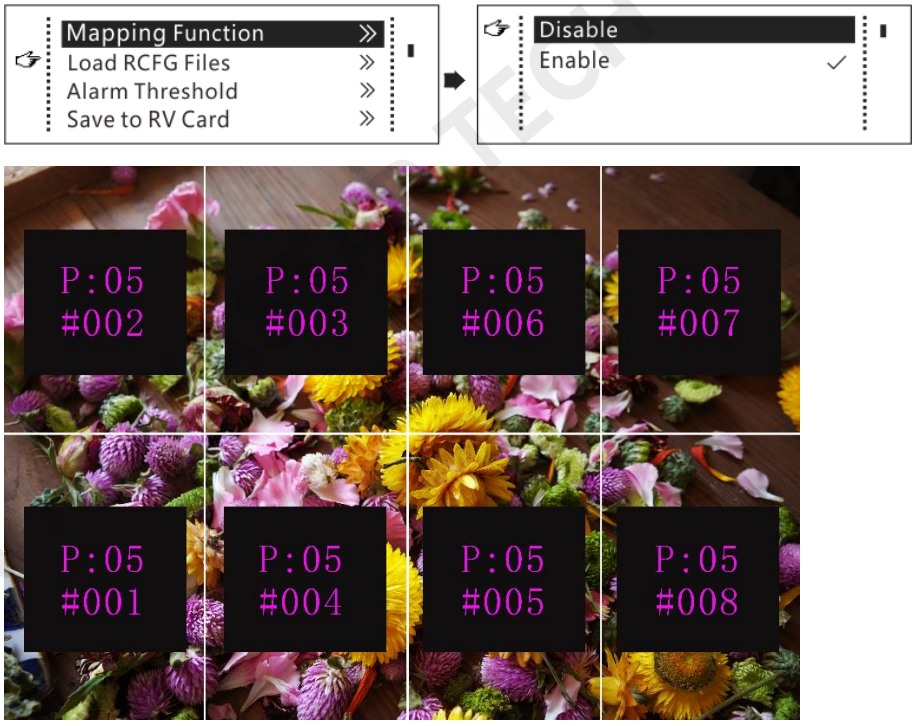
7.7 Advanced Settings

7.7.1 Mapping Function

When mapping function is enabled, each cabinet will display its cabinet No. and the No. of the Ethernet port that loads the cabinet.

Note: Receiving cards used by the system must support mapping function.

Figure 7-10 Mapping function



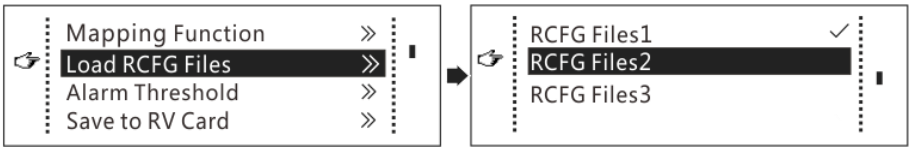
Example: **P: 05** indicates the Ethernet port No. **#001** indicates the cabinet No.

7.7.2 Load RCFG Files

Before you begin: Save the cabinet configuration file (*.rcfgx or *.rcfg) to the local PC.

Note: Configuration files of irregular cabinets are not supported.

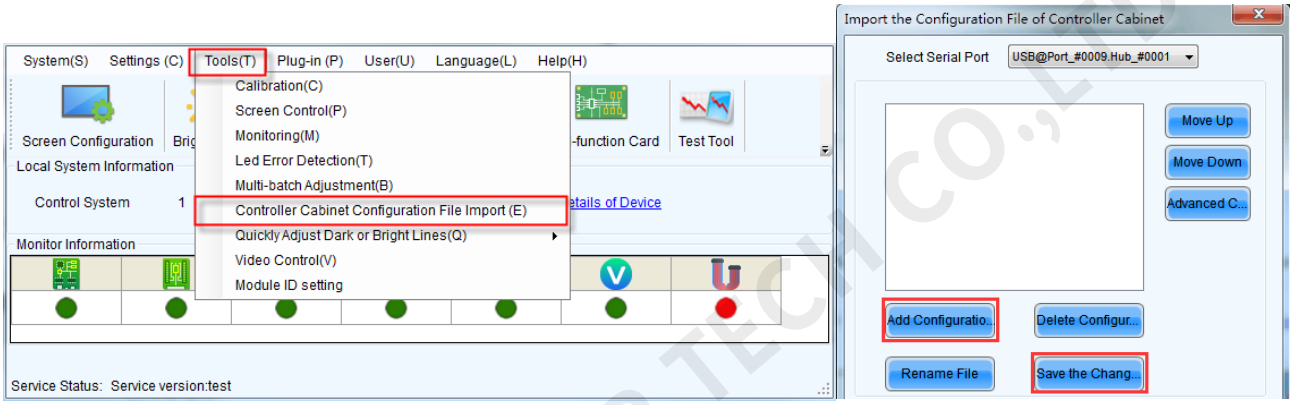
Figure 7-11 Loading RCFG files



Step 1 Run NovaLCT and choose **Tools** > **Controller Cabinet Configuration File Import**.

Step 2 On the displayed page, select the currently used serial port or Ethernet port, click **Add Configuration File** to select and add a cabinet configuration file.

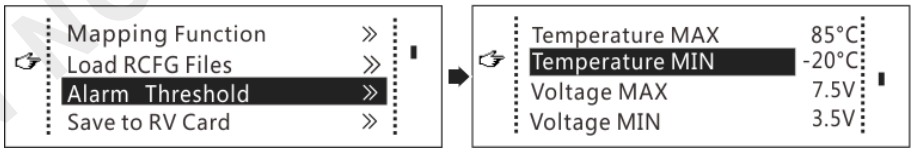
Step 3 Click **Save the Change to HW** to save the change to the controller.



7.7.3 Alarm Threshold

Set the alarm thresholds for device temperature and voltage. When a threshold is exceeded, its corresponding icon on the home screen will be flashing, instead of displaying the value.

Figure 7-12 Setting alarm threshold



- : Voltage alarm, icon flashing. Voltage threshold range: 3.5 V–7.5 V.
- : Temperature alarm, icon flashing. Temperature threshold range: -20°C–85°C.
- : Voltage and temperature alarms at the same time, icon flashing.

Note:

When there are no temperature or voltage alarms, the home screen will display the backup status.

7.7.4 Save to RV Card

By using this function, you can:

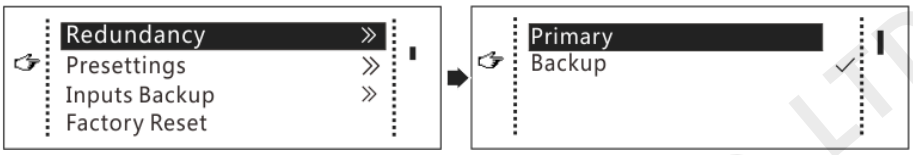
- Send and save the configuration information to the receiving cards, including brightness, color temperature, Gamma and display settings.

- Overwrite the information saved to the receiving card earlier.
- Ensure that the data saved in the receiving cards will not be lost in the event of power failure of receiving cards.

7.7.5 Redundancy

Set the controller as the primary or backup device. When the controller works as a backup device, set the data flow direction as opposite to that of the primary device.

Figure 7-13 Redundancy



Note:

If the controller is set as the backup device, when the primary device fails, the backup device will immediately take over the work of the primary device, that is, the backup takes effect. After the backup takes effect, the target Ethernet port icons on the home screen will have marks on top flashing once every 1 second.

7.7.6 Presettings

Choose **Advanced Settings** > **Presettings** to save current settings as a preset. Up to 10 presets can be saved.

- **Save**: Save current parameters as a preset.
- **Load**: Read back the parameters from the saved preset.
- **Delete**: Delete the parameters saved in the preset.

7.7.7 Inputs Backup

Set a backup video source for each primary video source. Other input video sources supported by the controller can be set as backup video sources.

After a backup video source takes effect, the video source selection is irreversible.

Table 7-1 Video source backup

Primary Video Source	Backup Video Source
SDI	NULL/DVI/HDMI
DVI	NULL/SDI/HDMI
HDMI	NULL/DVI/SDI

7.7.8 Factory Reset

Reset the controller to factory settings.

7.7.9 Go Homepage (s)

Set the time of staying on the current screen before going back to the homepage when no action is performed.

7.7.10 OLED Brightness

Adjust the brightness of the OLED menu screen on the front panel. The brightness range is 4–15.

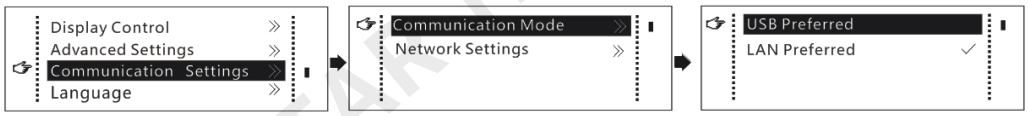
7.7.11 HW Version

Check the hardware version of the controller. If a new version is released, you can connect the controller to a PC to update the firmware programs in NovaLCT (V5.1.0 or later).

7.8 Communication Settings

Set the communication mode and network parameters.

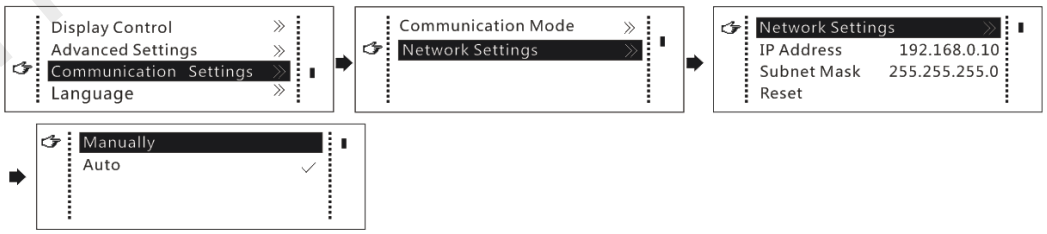
Figure 7-14 Communication mode



- Communication mode: USB preferred and Local Area Network (LAN) preferred

  The controller connects to PC via USB port and Ethernet port. If **USB Preferred** is selected, the PC prefers to communicate with the controller via the USB port, or else via the Ethernet port.

Figure 7-15 Network settings



- Network settings can be manual or automatic.
  - Manual settings parameters include controller IP address and subnet mask.
  - Automatic settings can read the network parameters automatically.
- Reset: Reset the network parameters to default values.

7.9 Language

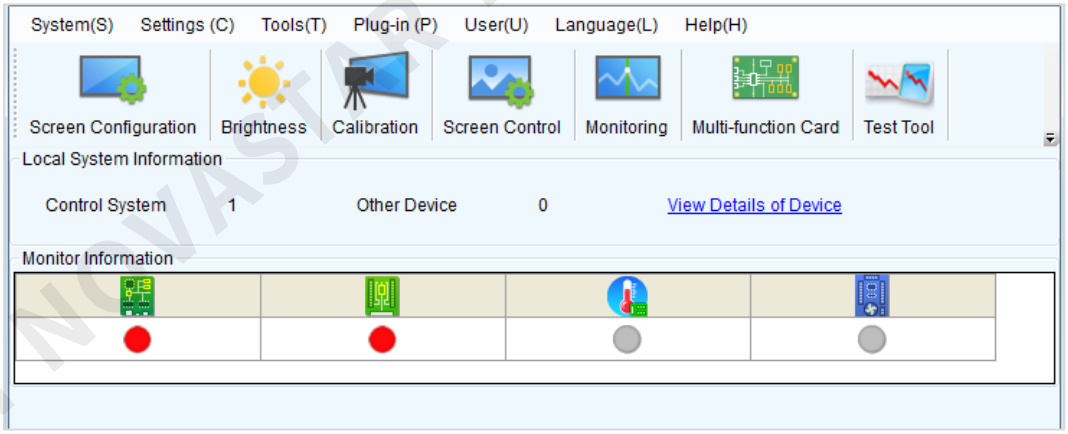
Change the UI language of the MCTRL R5 unit.

8 Operations on PC

8.1 Software Operations on PC

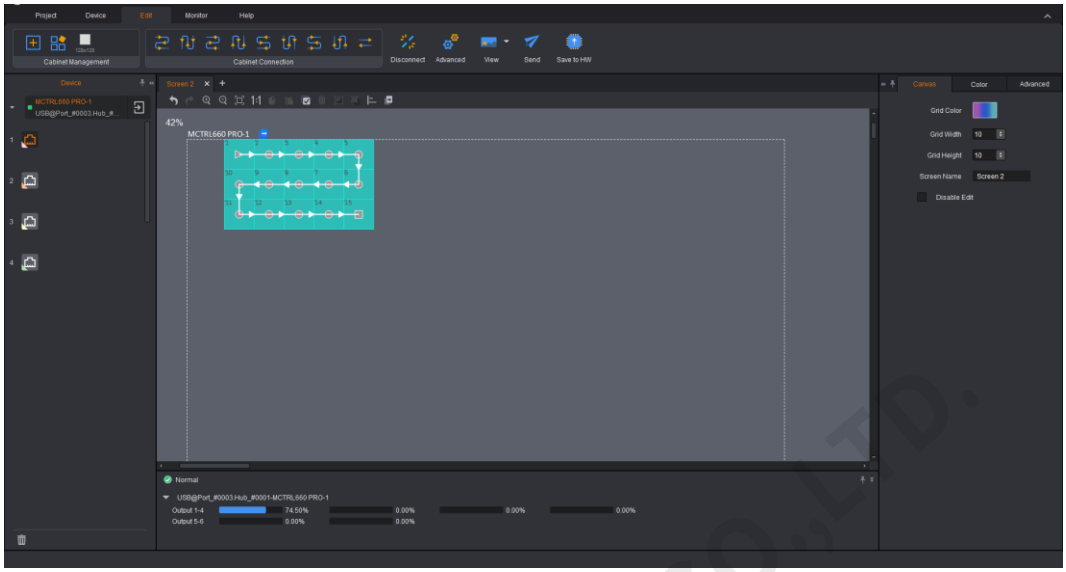
8.1.1 NovaLCT

Connect the MCTRL R5 to the control computer installed with NovaLCT (V5.1.0 or later) via USB port to perform screen configuration, brightness adjustment, calibration, display control, monitoring, etc. For details on their operations, see *NovaLCT LED Configuration Tool for Synchronous System User Guide*.



8.1.2 SmartLCT

Connect the MCTRL R5 to the control computer installed with SmartLCT (V3.2.0 or later) via USB port to perform building-block cabinet configuration, seam brightness adjustment, real-time monitoring, hot backup, etc. For details on their operations, see *SmartLCT User Manual*.



8.2 Firmware Update

8.2.1 NovaLCT

In NovaLCT, perform the following steps to update the MCTRL R5 firmware.

Step 1 Start NovaLCT and choose **User** > **Advanced Synchronous System User Login** and log in as an advanced user.

Step 2 Type the secret code "**admin**" to enter the program loading page.

Step 3 Click **Browse** to select the update program path and then click **Update**.

8.2.2 SmartLCT

In SmartLCT, perform the following steps to update the MCTRL R5 firmware.

Step 1 Start SmartLCT and enter the V-Sender page.

Step 2 In the properties area on the right, click  to enter the **Firmware Upgrade** page.

Step 3 Click  to select the update program path.

Step 4 Click **Update**.

9 Specifications

Electrical Specifications	Input voltage	AC 100 V–240 V, 50/60 Hz
	Rated power consumption	25 W
Operating Environment	Temperature	-20°C–60°C
	Humidity	0% RH–90% RH, non-condensing
Physical Specifications	Dimensions	482.6 mm × 334.6 mm × 52.0 mm
	Weight	4.3 kg
Packing Information	Carrying case	530 mm × 370 mm × 140 mm, white cardboard box
	Packing box	550 mm × 400 mm × 175 mm, craft paper box
	Accessory box	405 mm × 290 mm × 48 mm, white cardboard box
	Accessories	1 × power cord 1 × Ethernet cable 1 × USB cable 1 × HDMI cable 1 × DVI cable
	Packing rules	The product and accessory box (containing related cables) packed in the carrying case and the carrying case packed in the packing box
Certifications	FCC, RoHS, UL&CUL, EMC, LVD, CB, IC	