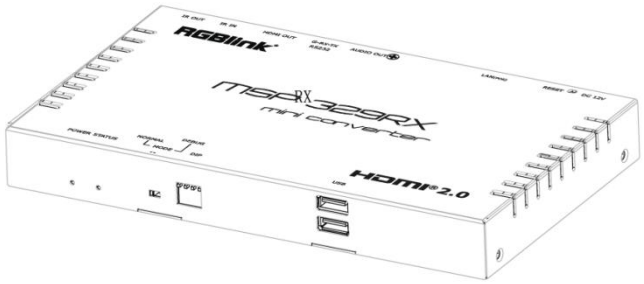
MSP 329



USER MANUAL

RGBlink®

Article No: RGB-RD-UM-MSP329 E001
Revision No: V1.0

CONTENTS

Thank you for choosing our product!
This User Manual is designed to show you how to use this video processor quickly and make use of all the features. Please read all directions and instructions carefully before using this product.

Declarations

FCC/Warranty

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the user will be responsible for correcting any interference.

Guarantee and Compensation

RGBlink provides a guarantee relating to perfect manufacturing as part of the legally stipulated terms of guarantee. On receipt, the purchaser must immediately inspect all delivered goods for damage incurred during transport, as well as for material and manufacturing faults. RGBlink must be informed immediately in writing of any complains.

The period of guarantee begins on the date of transfer of risks, in the case of special systems and software on the date of commissioning, at latest 30 days after the transfer of risks. In the event of justified notice of compliant, RGBlink can repair the fault or provide a replacement at its own discretion within an appropriate period. If this measure proves to be impossible or unsuccessful, the purchaser can demand a reduction in the purchase price or cancellation of the contract. All other claims, in particular those relating to compensation for direct or indirect damage, and also damage attributed to the operation of software as well as to other service provided by RGBlink, being a component of the system or independent service, will be deemed invalid provided the damage is not proven to be attributed to the absence of properties guaranteed in writing or due to the intent or gross negligence or part of RGBlink.
If the purchaser or a third party carries out modifications or repairs on goods delivered by RGBlink, or if the goods are handled incorrectly, in particular if the systems are commissioned operated incorrectly or if, after the transfer of risks, the goods are subject to influences not agreed upon in the contract, all guarantee claims of the purchaser will be rendered invalid. Not included in the guarantee coverage are system failures which are attributed to programs or special electronic circuitry provided by the purchaser, e.g. interfaces. Normal wear as well as normal maintenance are not subject to the guarantee provided by RGBlink either.
The environmental conditions as well as the servicing and maintenance regulations specified in this manual must be complied with by the customer.

Operators Safety Summary

The general safety information in this summary is for operating personnel.

Do Not Remove Covers or Panels

There are no user-serviceable parts within the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

Power Source

This product is intended to operate from a power source that will not apply more than 230 volts rms between the supply conductors or between both supply conductor and ground. A protective ground connection by way of grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition. Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse having identical type, voltage rating, and current rating characteristics. Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere.

Installation Safety Summary

Safety Precautions

For all MSP329 processor installation procedures, please observe the following important safety and handling rules to avoid damage to yourself and the equipment.
To protect users from electric shock, ensure that the chassis connects to earth via the ground wire provided in the AC power Cord.
The AC Socket-outlet should be installed near the equipment and be easily accessible.

Unpacking and Inspection

Before opening MSP329 processor shipping box, inspect it for damage. If you find any damage, notify the shipping carrier immediately for all claims adjustments. As you open the box, compare its contents against the packing slip. If you find any shortages, contact your sales representative. Once you have removed all the components from their packaging and checked that all the listed components are present, visually inspect the system to ensure there was no damage during shipping. If there is damage, notify the shipping carrier immediately for all claims adjustments.

Site Preparation

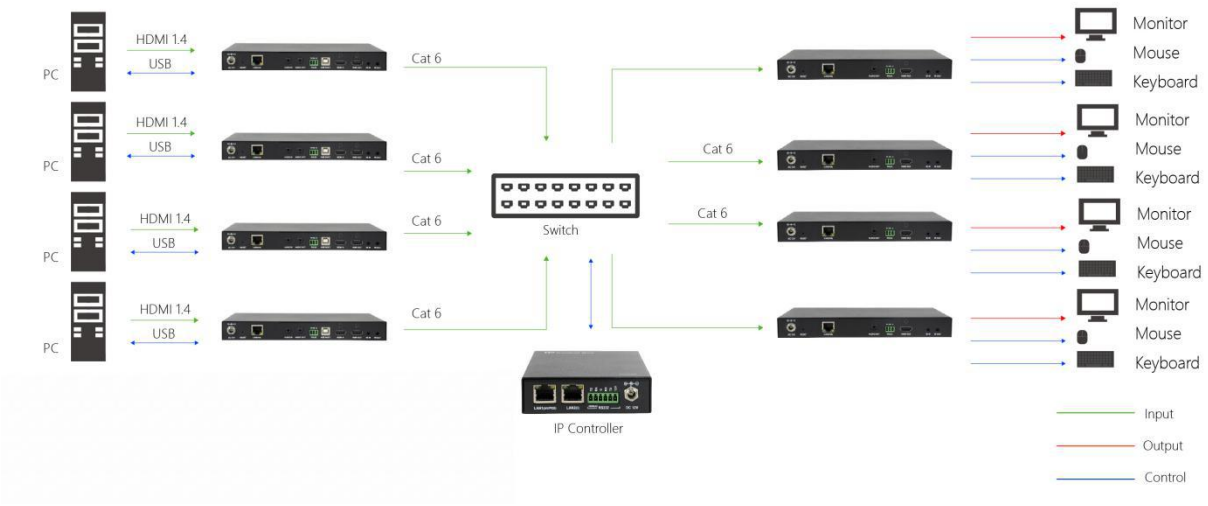
The environment in which you install your MSP329 should be clean, properly lit, free from static, and have adequate power, ventilation, and space for all components.

Chapter 1 Your Product

1.1 Product Overview

MSP329 provides the flexible, powerful, and scalable solution at resolutions up to 3840 x 2160@60Hz 4:2:0, 3840 x 2160@30Hz 4:4:4. They allow 4K UHD media to be switched and distributed over standard gigabit Ethernet networks, providing complete end-to-end streaming systems. Audio, video together with IR, and USB signals can be routed separately or as a whole throughout the matrix system. Encoders can be used with decoders to function video wall up to the dimensions of 16 x 16. Both of them have the capacity to handle and output up to 7.1 channel audio, allowing you to enjoy the finest sound.

HDCP 2.2 specifications are employed. A local area network is covered with a range up to 330ft (100m) over a single Cat 5e cable or above. Standard features like, bi-directional serial, bi-directional IR, and independent analog audio input/output are included. The codecs allow USB extension to take place to control a keyboard and a mouse. MSP329 offers integration-friendly control features——the front panel link DIP switch, Windows PC configurator(HDMIOverIPConsole), VisualM on iPad and IP controller providing simple, flexible control and management options. They are the perfect solution for any low latency and signal routing applications. Common applications include homes, classrooms, conference rooms and broadcasts.



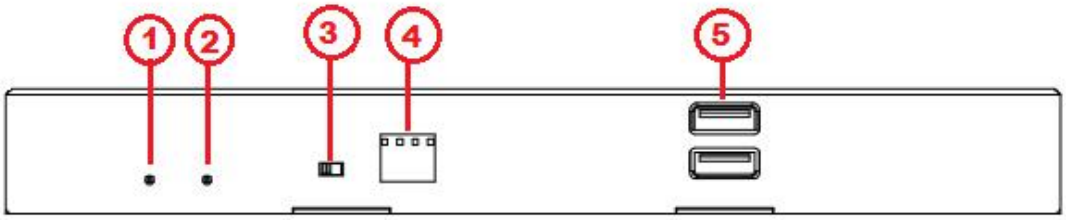
MSP329 System Connection Diagram

1.2 Front Panel

MSP329 TX

No.	Name	Description	
1	POWER Indicator	On	MSP 329 TX is powered on.
		Off	MSP 329 TX is powered off.
2	STATUS Indicator	Solid On	MSP 329 TX is connected to both an active video source and MSP 329 RX.
		Blinking	• MSP329 TX is disconnected from an active video source. • MSP329 TX is disconnected from MSP329 RX.
		Off	• MSP329 TX is powered off. • MSP329 TX is in the boot process. • Network is down.
3	Working Mode Switch	**MODE:** use this switch to toggle between normal and debug modes**.**	
		NORMAL (Default)	In this mode, you can connect the rear panel RS232 port to a RS232 device such as a computer for bi-directional serial communication with a RS232 device on the IP controller side.
		DEBUG	In this mode, you can connect the rear panel RS232 port to a RS232 device such as a computer for debugging MSP329 TX.
4	Link DIP Switch 	**DIP**: this DIP switch consists of four manual switches, which are used to route audio, video together with IR, and USB signals between MSP329 TX and MSP329 RX based on their positions. By default, each individual switches is in the up position. For more information, see "Using DIP Switch to Perform Routing". **Note:For the DIP switches in both encoder and decoder, changes to them take effect immediately without rebooting the system.**	

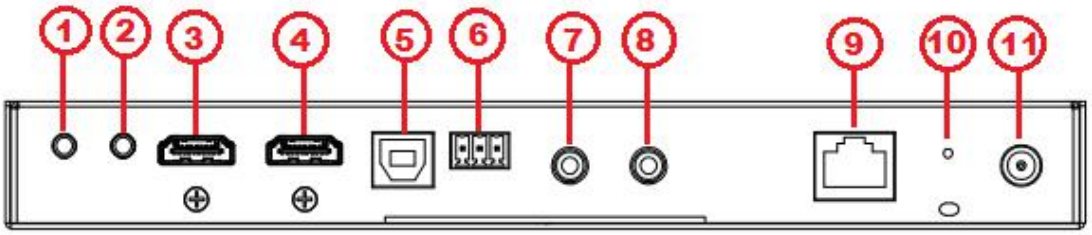
MSP329 RX

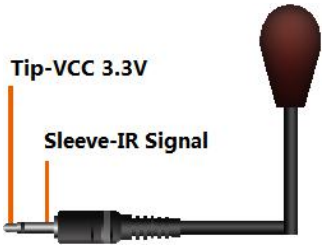
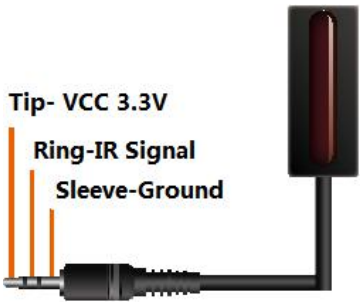


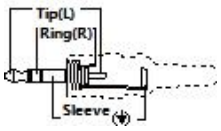
No.	Name	Description	
1	POWER Indicator	On	MSP329 RX is powered on.
		Off	MSP329 RX is powered on.
2	STATUS Indicator	Solid On	MSP329 RX is connected to MSP329 TX and the video is displayed.
		Blinking	• MSP329 RX is disconnected from MSP329 TX. • MSP329 RX is disconnected from an active video source.
		Off	• MSP329 RX is powered off. • MSP329 RX is in the boot process. • Network is down.
3	Working Mode Switch	NORMAL (Default)	In this mode, you can connect the rear panel RS232 port to a RS232 device such as a computer for bi-directional serial communication with a RS232 device on the IP controller side.
		DEBUG	In this mode, you can connect the rear panel RS232 port to a RS232 device such as a computer for debugging MSP329 RX.
4	Link DIP Switch 	**DIP**: this DIP switch consists of four manual switches, which are used to route audio, video together with IR, and USB signals between MSP329 TX and MSP329 RX based on their positions. By default, each individual switches is in the up position. For more information, see "Using DIP Switch to Perform Routing".	
5	USB Port for Peripherals	**USB DEVICE**: connect the two USB type A ports to a USB keyboard and mouse. The connections are USB 2.0 compatible, providing +5 VDC at up to 500 mA to connected USB peripherals. **Note:** • This device supports most standard keyboard keys and mouses, including standard 84/101/104 keyboard keys and most of multimedia or system control keys. • Wired keyboards and mouses are recommended for optimal performance.	

1.3 Rear Panel

MSP329 TX

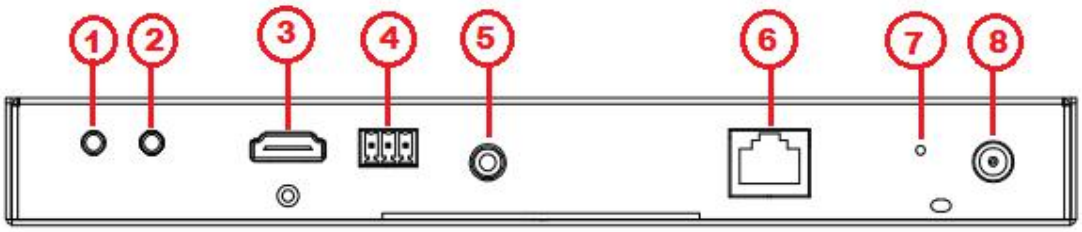


No.	Name	Description
1	IR Output	**IR OUT:** connect this 3.5 mm tip-sleeve port to an IR emitter for IR communication with an IR receiver in the MSP329 RX side on the network.
		IR Emitter:  **Note:** This IR cable illustration applies to the IR output ports in MSP329 TX and MSP329 RX.
2	IR Input	**IR IN:** connect this 3.5 mm tip-ring-sleeve port to an IR receiver for IR communication with an IR emitter in the MSP329 RX side on the network.
		IR receiver:  **Note:** This IR cable illustration applies to the IR input ports in MSP329 TX and MSP329 RX.
3	Local AV Output	**HDMI OUT:** connect this port to a local HDMI display device.
4	AV Input	**HDMI IN:** connect this port to an HDMI source device.
5	USB Port for PC	**USB HOST:** connect a type A male to type B male USB cable between this port and the USB port of a desktop or laptop. MSP329 TX is USB 2.0 compliant.
6	Serial	**RS232**: use this port to perform bi-directional serial communication and

No.	Name	Description
	Communication	device debug functions. • When the front panel "MODE" switch is moved to the "NORMAL" position, connect this port to a RS232 device such as a computer to bi-directionally communicate with a RS232 device at the IP controller side. When the front panel "MODE" switch is toggled to the "DEBUG" position, connect this port to a RS232 device such as a computer for debugging MSP329 TX.
7	Audio Output	**AUDIO OUT:** connect this 3.5 mm stereo tip-ring-sleeve port to an audio output device such as a speaker and amplifier to output unbalanced, stereo audio signals.
8	Audio Input	**AUDIO IN:** connect this 3.5 mm stereo tip-ring-sleeve port to an audio input device such as a computer to accept unbalanced, stereo audio signals.
		TRS Connector:  **Note:** This connector illustration applies to both analog audio input and output in MSP329 TX and MSP329 RX
		Note: When this audio port is connected to an audio input device, both encoder and decoder will output the audio device's audio signals instead of that from the HDMI video source. If this audio port is connected via an audio cable but no audio signals are input, you can get picture but no sound. The situations above do not apply to the HDMI loop-through port in encoder, which can still output the AV signals from the video source.
9	IP Stream Output	**LAN (POE):** 10/100/1000 Base-T port, connect this port to a gigabit Ethernet switch for IP stream output, device control and device management.
		Default protocol:
		IP address: 169.254.x.x
		Subnet mask: 255.255.0.0
		DHCP: Off
		Auto-IP: On (Default)
		Link speed and duplex level: Auto-detected
		RJ-45 port LEDs:
		 **Link LED (Left):** This green LED lights to indicate a good network connection. **Activity LED (Right):** This yellow LED blinks to indicate network activity.
		Note: For both encoder and decoder, • Each device can be powered by a PoE-enabled Ethernet switch via

No.	Name	Description
		the RJ-45 port, eliminating the need for a nearby power outlet. • Power supply via a power adapter has higher priority as compared to PoE power supply. When the device is connected to both the supplied power adapter and the PoE-enabled Ethernet switch, it receives power from the power adapter instead of the switch.
10	Reset Button (Recessed)	**RESET:** use this button to reset device. When MSP329 TX is powered on, use a pointed stylus to hold down the RESET button for five or more seconds, and then release it, it will reboot and restore to its factory defaults. **Note:** When the settings are restored, your custom data is lost. Therefore, exercise caution when using the RESET button.
11	Power Input	**DC 12V:** connect this port to the supplied 12 V 1 A power adapter.

MSP329 RX



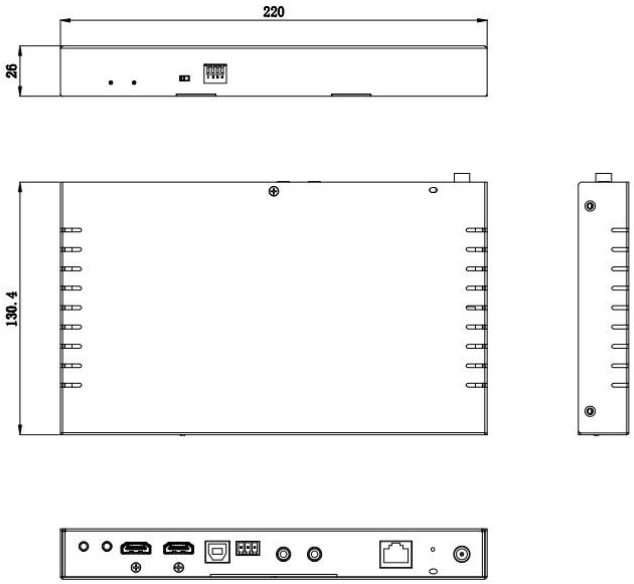
No.	Name	Description
1	IR Output	**IR OUT:** connect this 3.5 mm tip-sleeve port to an IR emitter for IR communication with an IR receiver in the MSP329 TX side on the network.
2	IR Input	**IR IN:** connect this 3.5 mm tip-ring-sleeve port to an IR receiver for IR communication with an IR emitter in the MSP329 TX side on the network.
3	AV Output	**HDMI OUT:** connect this port to an HDMI display device.
4	Serial Communication	**RS232:** use this port to perform bi-directional serial communication and device debug functions. • When the front panel "MODE" switch is moved to the "NORMAL" position, connect this port to a RS232 device such as a computer to bi-directionally communicate with a RS232 device at the IP controller side. • When the front panel "MODE" switch is toggled to the "DEBUG" position, connect this port to a RS232 device such as a computer for debugging MSP329 RX.

No.	Name	Description
5	Audio Output	• **AUDIO OUT:** connect this 3.5 mm stereo tip-ring-sleeve port to an audio output device such as a speaker and an amplifier to output unbalanced, stereo audio signals.
6	IP Stream Input	**LAN (POE):** 10/100/1000 Base-T port, connect this port to a gigabit Ethernet switch for IP stream input, device control and device management.
		Default protocol:
		IP address: 169.254.x.x
		Subnet mask: 255.255.0.0
		DHCP: Off
		Auto-IP: On (Default)
		Link speed and duplex level: Auto-detected
		RJ-45 port LEDs:
		 **Link LED (Left):** This green LED lights to indicate a good network connection. **Activity LED (Right):** This yellow LED blinks to indicate network activity.
7	Reset Button (Recessed)	**RESET:** use this button to reset device or quickly remove link relationship between decoder and encoder. • Device reset**:** When MSP329 RX is powered on, use a pointed stylus to hold down the RESET button for five or more seconds, and then release it, it will reboot and restore to its factory defaults. This function will disconnect decoder from encoder. **Note:** When the settings are restored, your custom data is lost. Therefore, exercise caution when using the RESET button. • Remove decoder and encoder link relationship quickly: When encoder is routed to decoder using PC configurator, VisualM or IP controller, hold down the RESET button for less than five seconds, and then release it, it reverts to the link relationship between encoder and decoder set via the link DIP switch. This function applies to decoder only.
8	Power Input	**DC 12V:** connect this port to the supplied 12 V 1 A power adapter.

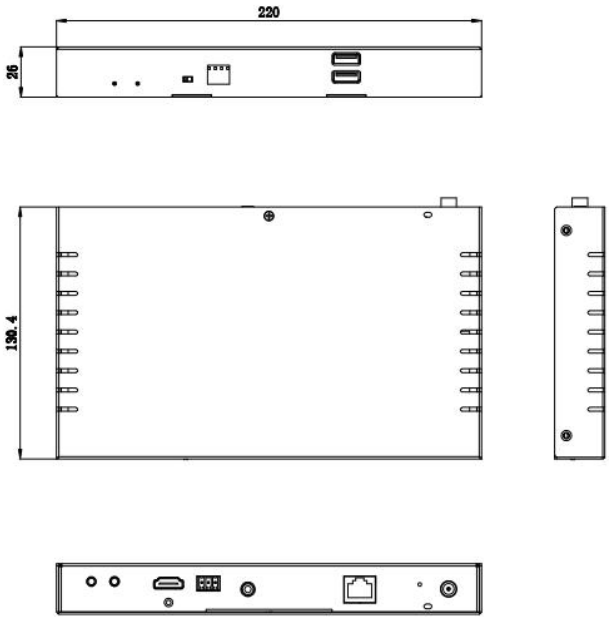
1.4 Dimension

Following is the dimension of MSP329 for your reference:

MSP329 TX: 220mm×130mm×25mm



MSP329 RX： 220mm×130mm×25mm



Chapter 2 Install Your Product

2.1 Plug in Signals

Connect input and output signals with USB or HDMI cables to the MSP329 RX/TX,and connect RX/TX to switcher with Cat6 before all devices are powered on.
Huawei Switchers such as S5720S-28P-PWR-LI-AC and S5720S-52P-PWR-LI-AC are recommended.

2.2 Plug in Main Power

Connect MSP329 RX/TX to the power with power adapter.

Chapter 3 Use Your Product

3.1 Introduction to Different Operation Tools

The MSP329 RX/TX allow you to use the front panel link DIP switch, PC configurator, VisualM and IP controller to manage and control the encoders and decoders. This section briefly introduces how to route the video from source to the display using these tools. By default, audio, video together with IR, and USB signals are routed as a whole.

The following tables describes how audio, video together with IR, and USB signals are routed using all the different tools.

Operation Tools	Description
Link DIP switch	Route audio, video together with IR, and USB signals as a whole.
PC configurator	
VisualM	
IP controller	Both of the following routing policies are available. • Route audio, video together with IR, and USB signals as a whole. • Route audio, video together with IR, and USB signals separately via IP controller's API commands.

Note:

- Operation tools PC configurator, VisualM and IP controller take priority over the link DIP switch. Link relationship between encoder and decoder performed by the DIP switch can be changed using any other tools.
- When audio, video together with IR, and USB signals are routed via PC configurator, VisualM and IP controller, press and hold the rear panel RESET button in decoder for less than five seconds to remove the current link relationship between encoder and decoder, reverting to the link relationship set by the link DIP switch.
- When audio, video together with IR, and USB signals are routed separately via IP controller's API commands, they can be routed as a whole with other operation tools.

3.2 DIP Switch for Perform Routing

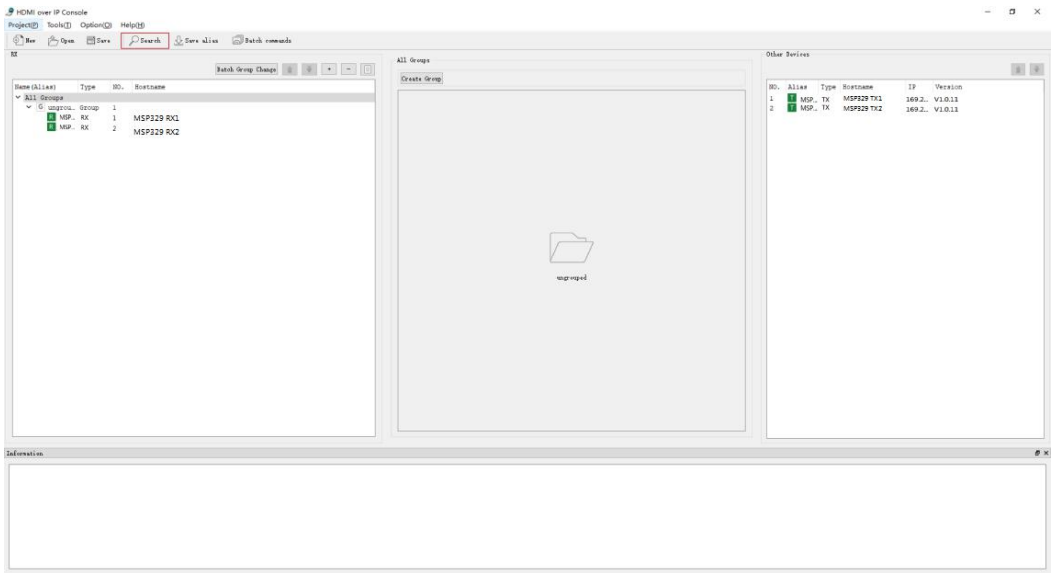
Before using the DIP switch, check that routing operations were not performed by other the tools. Otherwise, the switch function is disabled. If so, press and hold the rear panel RESET button in decoder for less than five seconds to enable the DIP switch.

To route the video from source to display, toggle each individual switches of the front panel DIP switch in decoder to the same positions as these in encoder. If you want to link the decoder to a different encoder, change the decoder switch settings in the same way as how the encoder's switch is positioned. If you want to remove their link relationship, reset decoder to its factory defaults.

3.3 PC Configurator

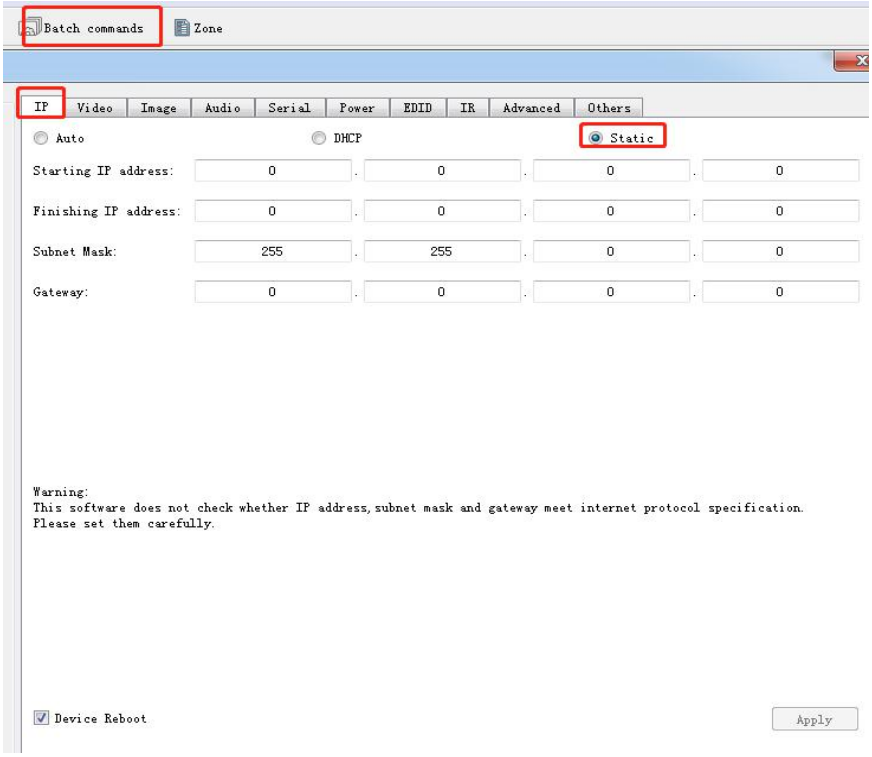
In addition to matrix switching between encoders and decoders via PC configurator, it allows users to configure them, including HDCP Hybrid and HDMI Timing Hybrid to function fast switching.

1. Launch the **HDMIoverIPConsole.exe** on your computer to open its main page. (Ensure your PC, TX and RX are on the same subnet.)
   Click **Search** to search online devices.



2. Parameter Modification of TX/RX

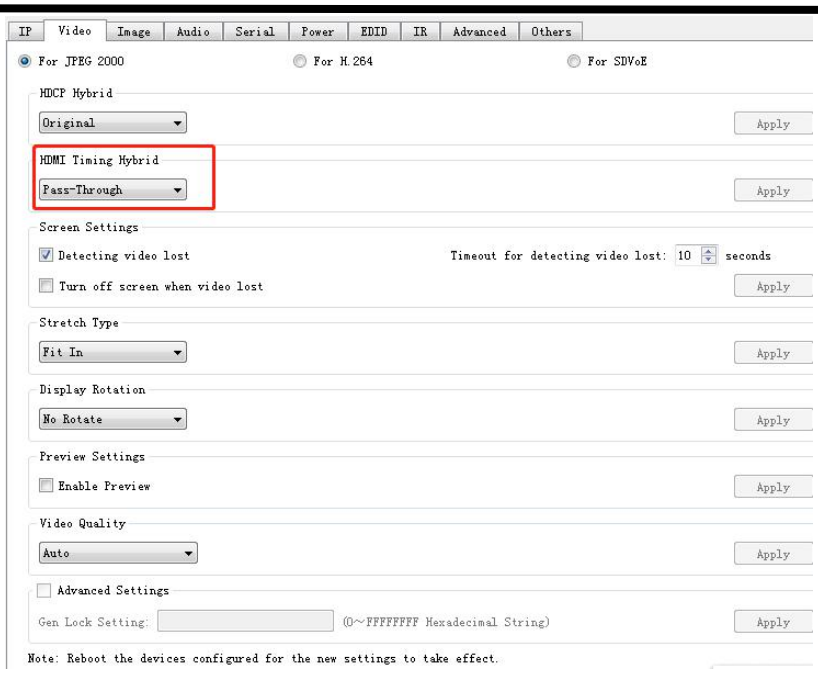
Click **Batch Commands** > **IP** > **Static** and change IP address.



Click **Video** > **For JPEG 2000**

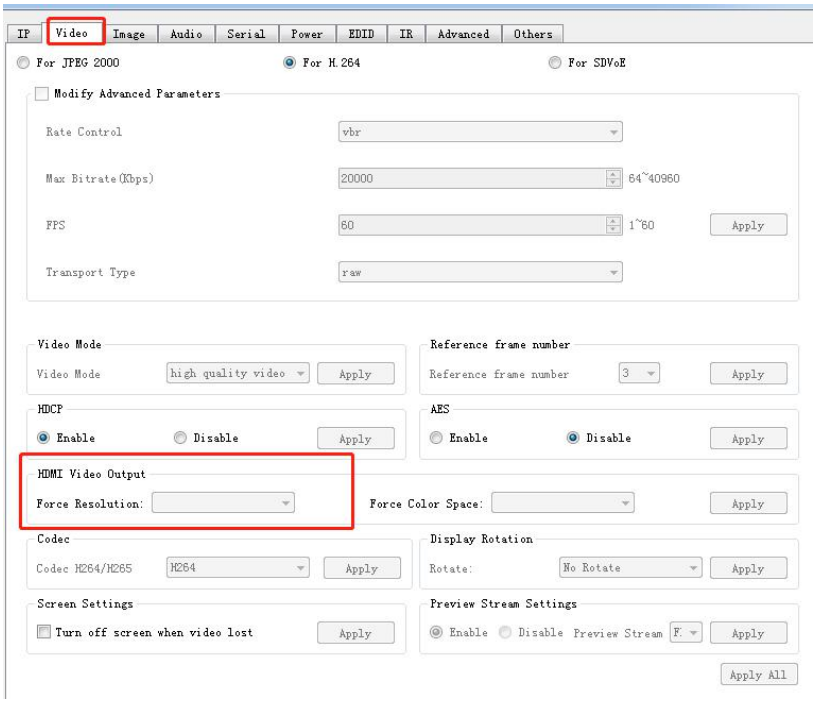
MSP329 supports HDR10 only if the HDMI Timing Hybrid is set to “Pass-through” mode (default setting).

Note : Reboot the devices configured for the new settings to take effect.

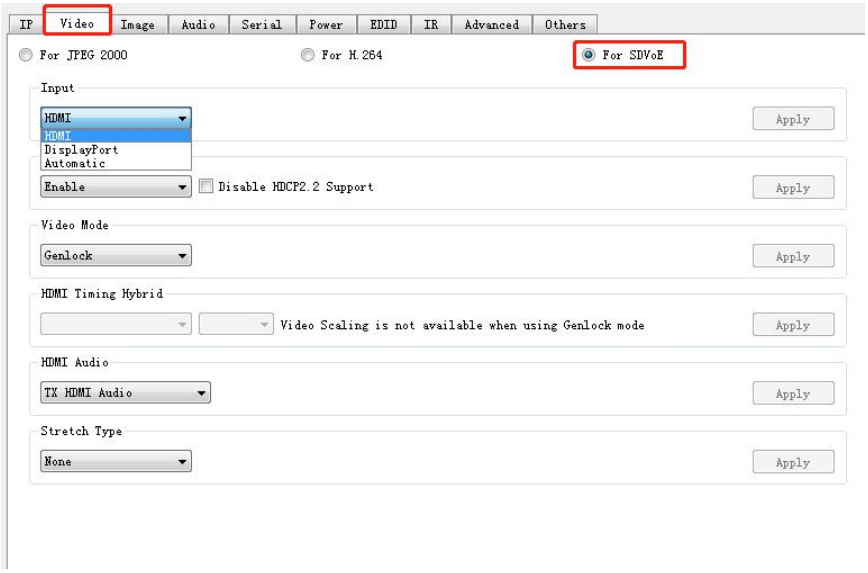


Click **Video** > **For H.264** and modify video parameters

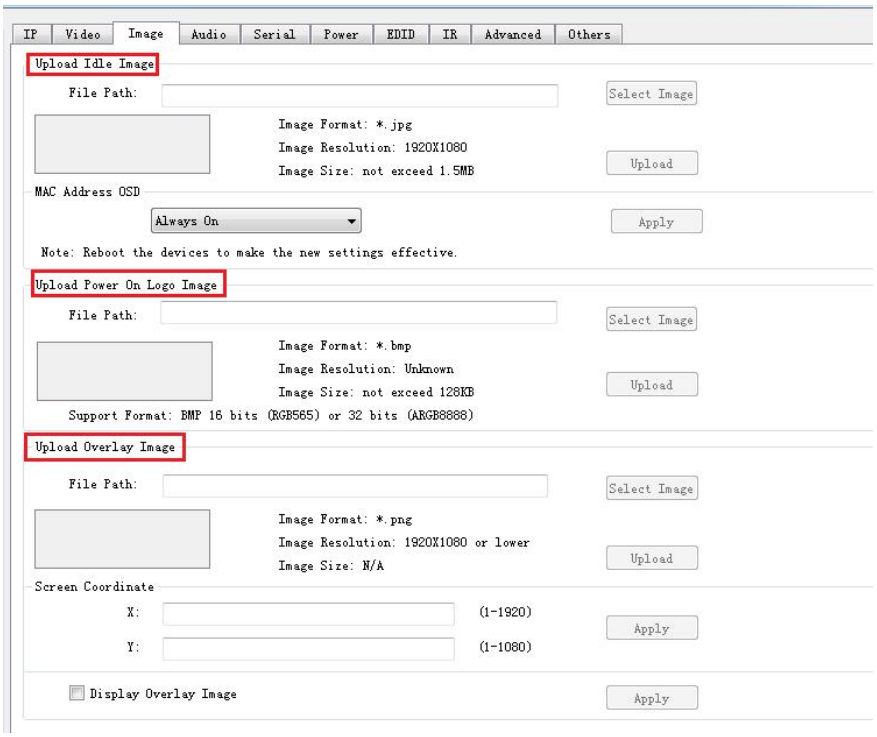
Output Resolutions: 800×600@60 | 1024×768@60 | 1280×720@60 | 1280×1024@60 | 1360×768@60 | 1440×900@60 | 1440×1050@60 | 1600×1200@60 | 1920×1080@60 | 3840×2160@30



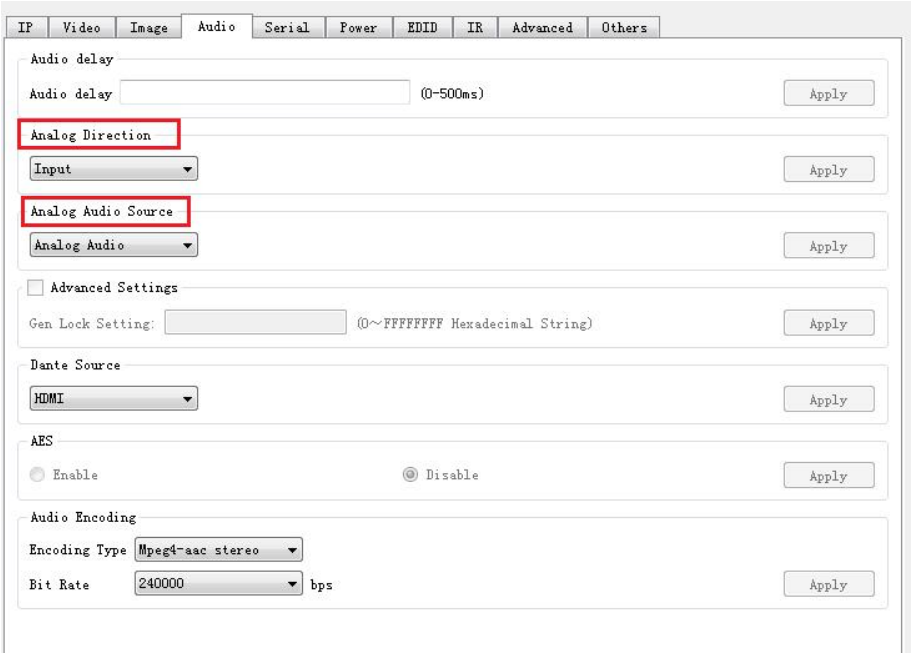
Click **Video** > **For SDVoE** and modify Input, Support HDCP, Video Mode,etc.



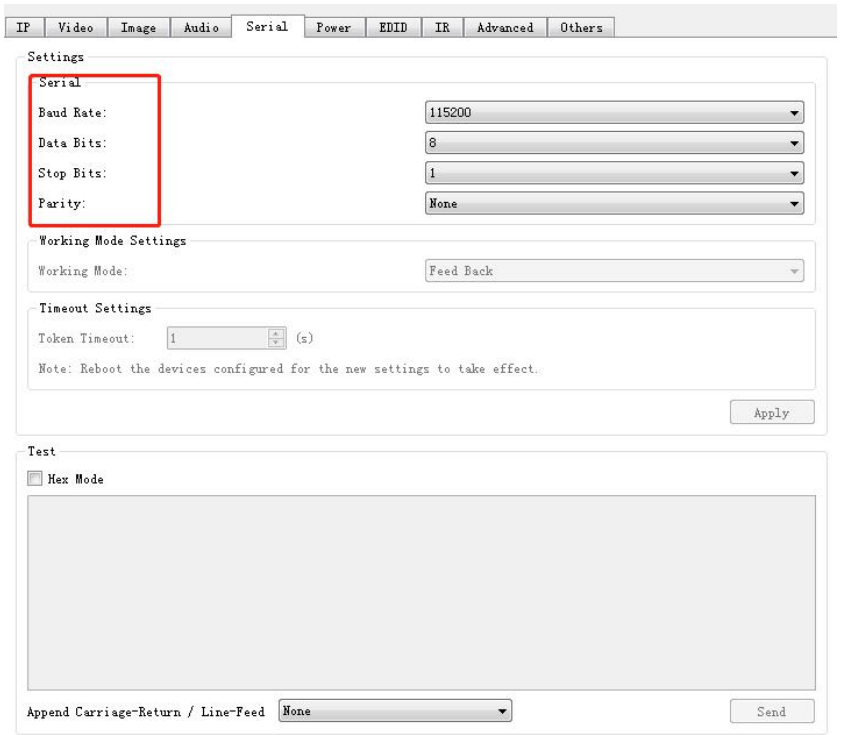
Click **Image** and upload Idle Image, Power on Logo Image and Overlay Image.



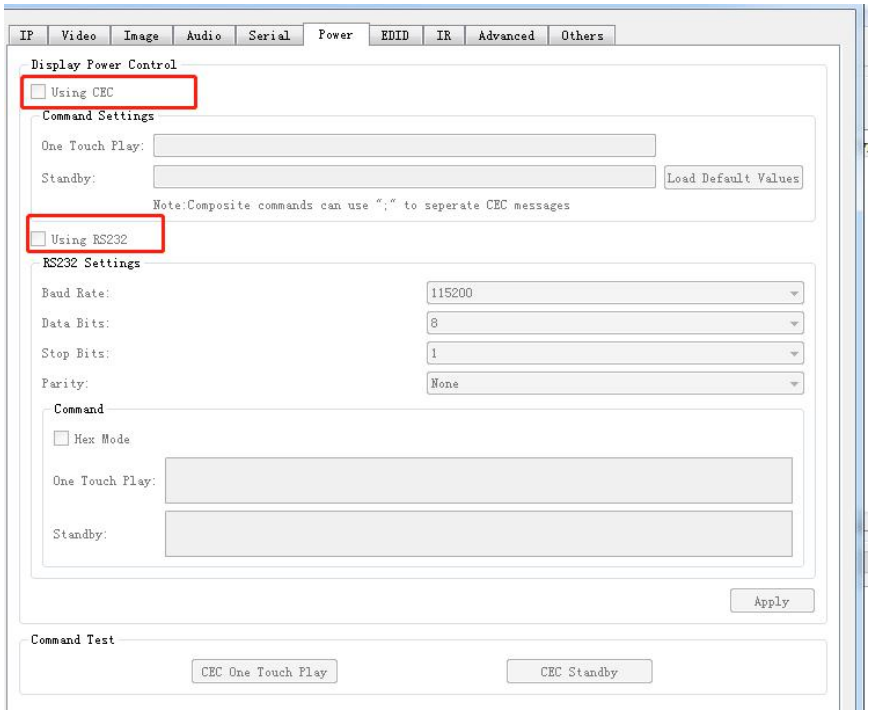
Click **Audio** and select analogy direction and source



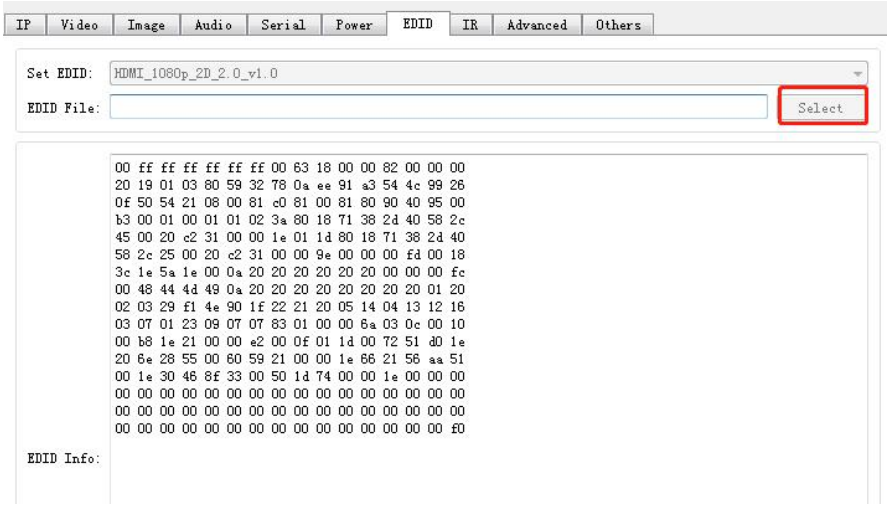
Click **Serial** and modify Baud Rate, Data Bits, Stop Bits and Parity.



Click **Power** and modify CEC and RS232 Settings

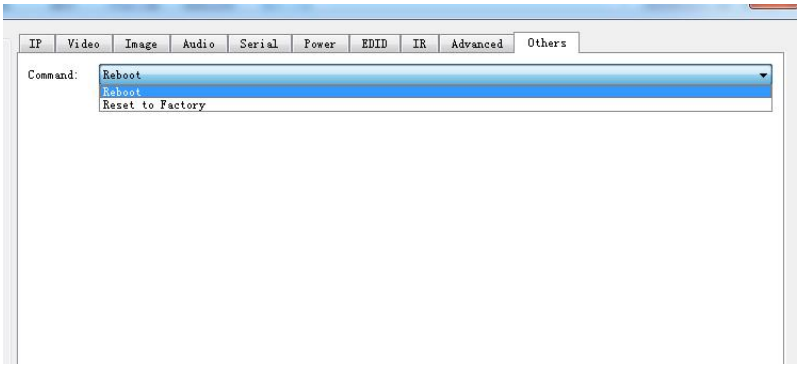


Click **EDID** and select EDID file



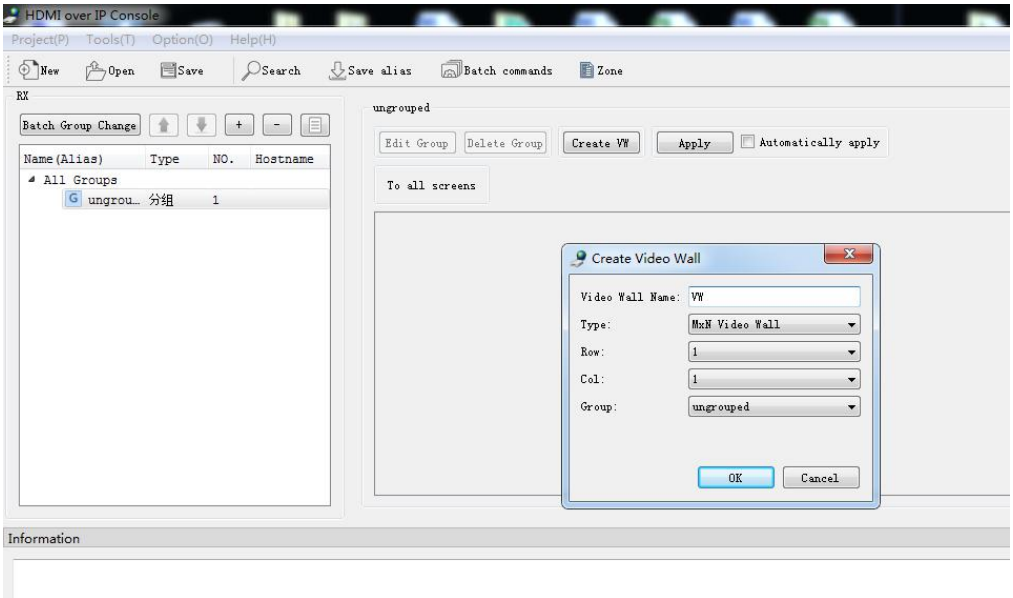
Click **Advanced** and select Video over IP/Audio over IP/USB over IP/KM over IP/Serial over IP/IR over IP

Click **Others** and select Reboot or Reset to Factory



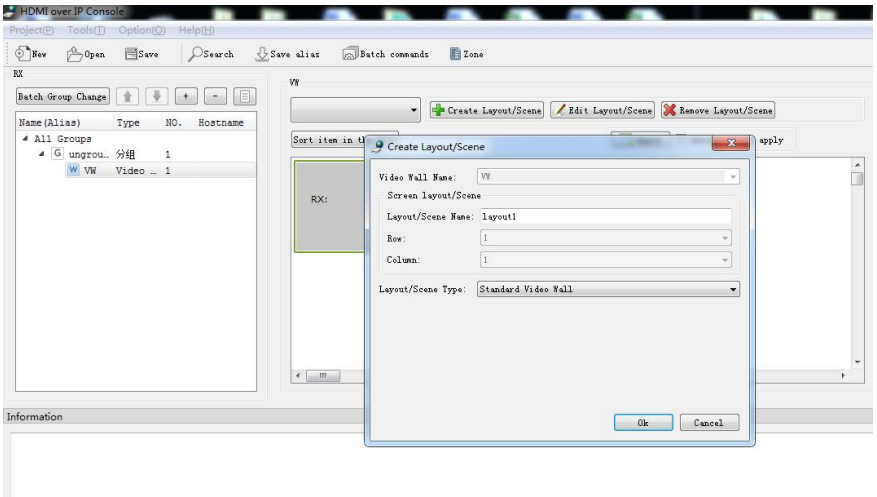
3. Create a video wall.

   Click **ungrouped** in the RX list > **Create VW** > Name a video wall **VW** and choose rows and columns > **OK**.



4. Create a layout for the video wall.

   Click **VW** in the RX list > **Create Layout/Scene** in the working area > name this layout **layout1** and choose **Standard Video Wall** > **OK**.



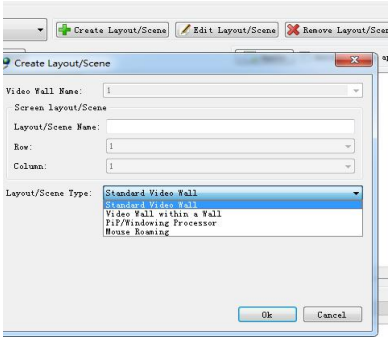
Users can choose Layout/Scene Type:

Standard Video Wall

Video Wall within a Wall

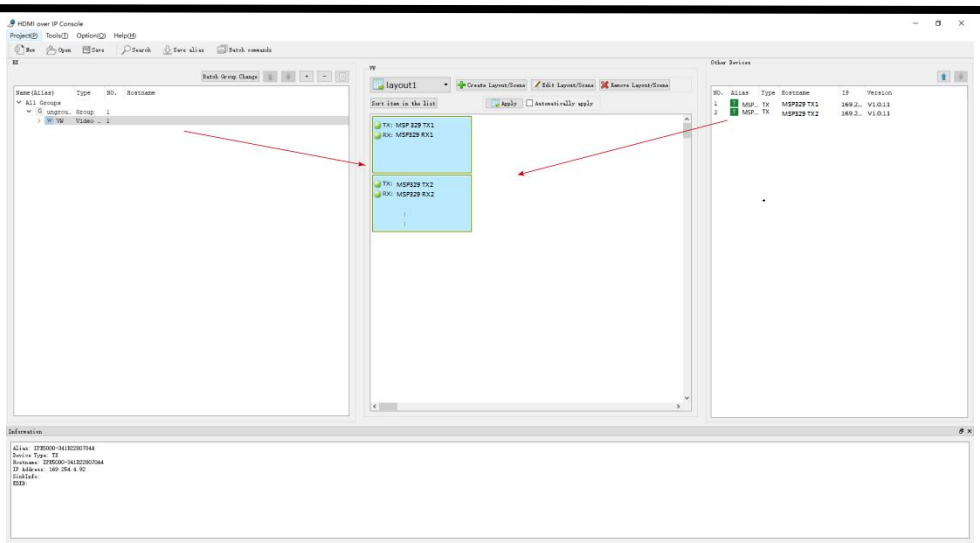
PIP/Widowing Processor

Mouse Roaming

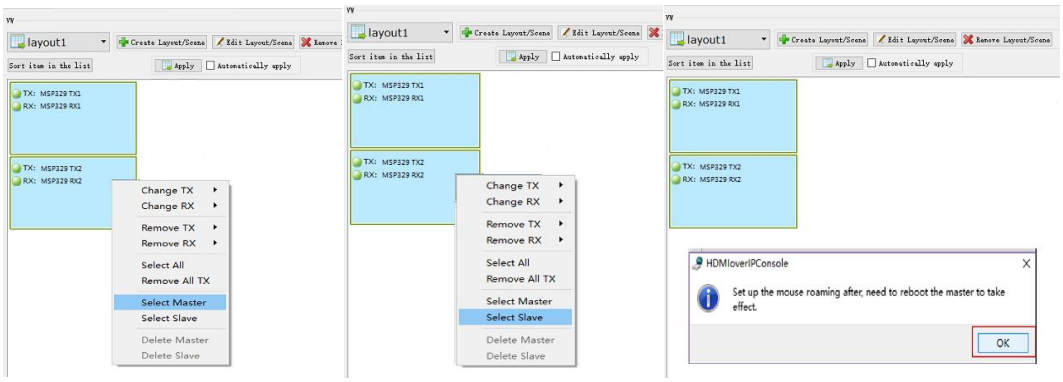


5. Configure RX and TX for layout1.

   Drag RXs from the RX list and TXs from Other Devices area to display tiles in the working area.

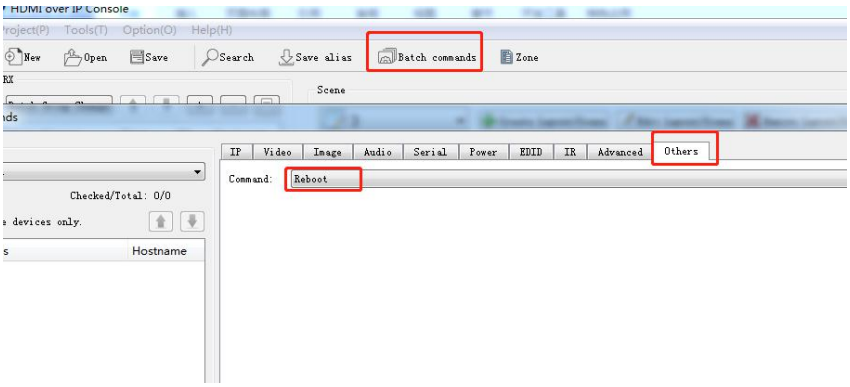


6. Configure Master and Slave.
   Right click the RX to which the mouse and keyboard are connected and choose **Select Master** > right click the other one and choose **Select Slave** > Click **Apply** > **OK**.



Note: To cancel Select Master/Select Slave setting, right click on the RX and choose **Delete Master**/**Delete Slave**.

7. Reboot the RX to make the Mouse Roaming configuration to take effect.
   Click **Batch Commands** > **Others** > select RX device > **Reboot** > **Apply**.
   Please wait for a few seconds for the RX device reboot.


HDMI over IP Console
Tools(T)
Option(O)
Help(H)
New
Open
Save
Search
Save alias
Batch commands
Zone
Scene
IP
Video
Image
Audio
Serial
Power
EDID
IR
Advanced
Others
Command:
Reboot
Checked/Total: 0/0
Hostname

Chapter 4 Ordering Codes

4.1 Product

611-0329-01-0	MSP329(TX)
611-0329-02-0	MSP329(RX)

Chapter 5 Support

5.1 Contact Us

www.rgblink.com

Inquiries

+86-592-577-1197
info@rgblink.com
rgblink.com/contact-us

Global Support

support@rgblink.com
rgblink.com/support-me

@RGBLINK /rgblink +rgblink /rgblink rgblink rgblink

RGBlink Headquarters Xiamen, China	China Regional Sales & Support Shenzhen, China	Shanghai Region Office Shanghai, China	Beijing Region Office Beijing, China	Americas Regional Sales & Support Texas, USA	Europe Regional Sales & Support Eindhoven, Holland	India Regional Sales & Support Mumbai, India
6th Floor Weiye Building Torch Park Hi Tech Zone Huli	11th Floor Baiwang Building 5318 Shahe West Road Baimang, Nanshan	No.2 Building 359 Yinxi Road Songjiang	Building 8, 25 Qixiao Road Shahe Town Changping	18668 Bandera Rd Helotes TX 78023	Flight Forum Eindhoven 5657 DW	78/626, Motilal Nagar, No1, Rd No1, Goregaon West, Mumbai
+86-592-577-1197	+86-755 2153 5149	+86- 4008-592-114	+86- 4008-592-114	+1 (210) 742 -1288	+31 (040) 202 71 83	+91 98200 86718

Chapter 6 Appendix

6.1 Terms & Definitions

●**RCA**： Connector used primarily in consumer AV equipment for both audio and video. The RCA connector was developed by the Radio Corporation of America.

●**BNC:** Stands for Bayonet Neill-Concelman. A cable connector used extensively in television (named for its inventors). A cylindrical bayonet connector that operates with a twist-locking motion .

●**CVBS**： CVBS or Composite video, is an analog video signal without audio. Most commonly CVBS is used for transmission of standard definition signals. In consumer applications the connector is typically RCA type, while in professional applications the connector is BNC type.

●**YPbPr:** Used to describe the colour space for progressive-scan. Otherwise known as component video.

●**VGA**： Video Graphics Array. VGA is an analog signal typically used on earlier computers. The signal is non-interlaced in modes 1, 2, and 3 and interlaced when using in mode

●**DVI**： Digital Visual Interface. The digital video connectivity standard that was developed by DDWG (Digital Display Work Group). This connection standard offers two different connectors: one with 24 pins that handles digital video signals only, and one with 29 pins that handles both digital and analog video.

●**SDI**： Serial Digital Interface. Standard definition video is carried on this 270 Mbps data transfer rate. Video pixels are characterized with a 10-bit depth and 4:2:2 color quantization. Ancillary data is included on this interface and typically includes audio or other metadata. Up to sixteen audio channels can be transmitted. Audio is organised into blocks of 4 stereo pairs. Connector is BNC.

●**HD-SDI:** high-definition serial digital interface (HD-SDI), is standardized in SMPTE 292M this provides a nominal data rate of 1.485 Gbit/s.

● **3G-SDI**: standardized in SMPTE 424M, consists of a single 2.970 Gbit/s serial link that allows replacing dual link HD-SDI.

●**6G-SDI:** standardized in SMPTE ST-2081 released in 2015, 6Gbit/s bitrate and able to support 2160p@30.

●**12G-SDI**:standardized in SMPTE ST-2082 released in 2015, 12Gbit/s bitrate and able to support 2160p@60.

●**U-SDI**:Technology for transmitting large-volume 8K signals over a single cable. a signal interface called

the ultra high definition signal/data interface (U-SDI) for transmitting 4K and 8K signals using a single optical cable. The interface was standardized as the SMPTE ST 2036-4.

●**HDMI：** High Definition Multimedia Interface: An interface used for the transmission of uncompressed high definition video, up to 8 channels of audio, and control signals, over a single cable.

●**HDMI 1.3:** released on June 22 2006, and increased the maximum TMDS clock to 340 MHz (10.2 Gbit/s). Support resolution 1920 × 1080 at 120 Hz or 2560 × 1440 at 60 Hz). It added support for 10 bpc, 12 bpc, and 16 bpc color depth (30, 36, and 48 bit/px), called deep color.

● **HDMI 1.4 :** released on June 5, 2009, added support for 4096 × 2160 at 24 Hz, 3840 × 2160 at 24, 25, and 30 Hz, and 1920 × 1080 at 120 Hz. Compared to HDMI 1.3, 3 more features added which are HDMI Ethernet Channel (HEC) , audio return channel (ARC),3D Over HDMI, a new Micro HDMI Connector, an expanded set of color spaces.

● **HDMI 2.0**, released on September 4, 2013 increases the maximum bandwidth to 18.0 Gbit/s. Other features of HDMI 2.0 include up to 32 audio channels, up to 1536 kHz audio sample frequency, the HE-AAC and DRA audio standards, improved 3D capability, and additional CEC functions.

● **HDMI 2.0a:** was released on April 8, 2015, and added support for High Dynamic Range (HDR) video with static metadata.

● **HDMI 2.0b:** was released March, 2016, support for HDR Video transport and extends the static metadata signaling to include Hybrid Log-Gamma (HLG).

● **HDMI 2.1** : released on November 28, 2017. It adds support for higher resolutions and higher refresh rates, Dynamic HDR including 4K 120 Hz and 8K 120 Hz.

● **DisplayPort:** A VESA standard interface primarily for video, but also for audio, USB and other data. DisplayPort (orDP) is backwards compatible with HDMI, DVI and VGA.

● **DP 1.1:** was ratified on 2 April 2007, and version 1.1a was ratified on 11 January 2008. DisplayPort 1.1 allow a maximum bandwidth of 10.8 Gbit/s (8.64 Gbit/s data rate) over a standard 4-lane main link, enough to support 1920x1080@60Hz

● **DP 1.2:** introduced on 7 January 2010, effective bandwidth to 17.28 Gbit/s support increased resolutions, higher refresh rates, and greater color depth, maximum resolution 3840 × 2160@60Hz

● **DP 1.4:** publish on 1 Mar, 2016.overall transmission bandwidth 32.4 Gbit/s ,DisplayPort 1.4 adds support for Display Stream Compression 1.2 (DSC), DSC is a "visually lossless" encoding technique with up to a 3:1 compression ratio. Using DSC with HBR3 transmission rates, DisplayPort 1.4 can support 8K UHD (7680 × 4320) at 60 Hz or 4K UHD (3840 × 2160) at 120 Hz with 30 bit/px RGB color and HDR. 4K at 60 Hz 30 bit/px RGB/HDR can be achieved without the need for DSC.

●**Multi-mode Fiber:** Fibers that support many propagation paths or transverse modes are called multi-mode fibers, generally have a wider core diameter and are used for short-distance communication links and for applications where high power must be transmitted.

●**Single-mode Fiber:** Fiber that support a single mode are called single-mode fibers. Single-mode fibers are used for most communication links longer than 1,000 meters (3,300 ft).

●**SFP**： small form-factor pluggable , is a compact, hot-pluggable network interface module used for both telecommunication and data communications applications.

●**optical fiber connector:** terminates the end of an optical fiber, and enables quicker connection and disconnection than splicing. The connectors mechanically couple and align the cores of fibers so light can pass. 4 most common types of optical fiber connectors are SC, FC, LC,ST.

●**SC:**(Subscriber Connector), also known as the square connector was also created by the Japanese company – Nippon Telegraph and Telephone. SC is a push-pull coupling type of connector and has a 2.5mm diameter. Nowadays, it is used mostly in single mode fiber optic patch cords, analog, GBIC, and CATV. SC is one of the most popular options, as its simplicity in design comes along with great durability and affordable prices.

● **LC**： (Lucent Connector) is a small factor connector (uses only a 1.25mm ferrule diameter) that has a snap coupling mechanism. Because of its small dimensions, it is the perfect fit for high-density connections, XFP, SFP, and SFP+ transceivers.
● **FC** :(Ferrule Connector) is a screw type connector with a 2.5mm ferrule. FC is a round shaped threaded fiber optic connector,mostly used on Datacom, telecom, measurement equipment, single-mode laser.

● **ST:** (Straight Tip) was invented by AT&T and uses a bayonet mount along with a long spring-loaded ferrule to support the fiber.

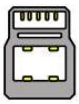
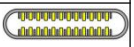
● **USB:** Universal Serial Bus is a standard that was developed in the mid-1990s that defines cables, connectors and communication protocols. This technology is designed to allow a connection, communication and power supply for peripheral devices and computers.

● **USB 1.1**: Full–Bandwidth USB, specification was the first release to be widely adopted by the consumer market. This specification allowed for a maximum bandwidth of 12Mbps.

●**USB 2.0**:or Hi–Speed USB, specification made many improvements over USB 1.1. The main improvement was an increase in bandwidth to a maximum of 480Mbps.

● **USB 3.2:** Super Speed USB with 3 varieties of 3.2 Gen 1(original name USB 3.0), 3.2Gen 2(original name USB 3.1), 3.2 Gen 2x2 (original name USB 3.2) with speed up to 5Gbps,10Gbps,20Gbps respectively.

USB version and connectors figure:

	Type A	Type B	Mini A	Mini B	Micro-A	Micro -B	Type C
USB 2.0							
USB 3.0							
USB 3.1&3.2							

●**NTSC :** The colour video standard used in North America and some other parts of the world created by the National Television Standards Committee in the 1950s. NTSC utilizes an interlaced video signals.

●**PAL:** Phase Alternate Line. A television standard in which the phase of the colour carrier is alternated from line to line. It takes four full images (8 fields) for the colour-to-horizontalimages (8 fields) for the colour-to-horizontal phase relationship to return to the reference point. This alternation helps cancel out phase errors. For this reason, the hue control is not needed on a PAL TV set. PAL, is widely used in needed on a PAL TV set. PAL, is widely used in Western Europe, Australia, Africa, the Middle East, and Micronesia. PAL uses 625-line, 50-field (25 fps) composite colour transmission system.

● **SMPTE：** Society of Motion image and Television Engineers. A global organization, based in the United States, that sets standards for baseband visual communications. This includes film as well as video and television standards.

●**VESA:** Video Electronics Standards Association. An organization facilitating computer graphics through standards.

●**HDCP:** High-bandwidth Digital Content Protection (HDCP) was developed by Intel Corporation an is in wide use for protection of video during transmission between devices.

●**HDBaseT:** A video standard for the transmission of uncompressed video (HDMI signals) and related features using Cat 5e/Cat6 cabling infrastructure.

●**ST2110:** A SMPTE developed standard, ST2110 describes how to send digital video over and IP networks. Video is transmitted uncompressed with audio and other data in a separate streams. SMPTE2110 is intended principally for broadcast production and distribution facilities where quality and flexibility are more important.

●SDVoE: Software Defined Video over Ethernet (SDVoE) is a method for transmission, distribution and management AV signals using a TCP/IP Ethernet infrastructure for transport with low latency. SDVoE is

commonly used in integration applications.

●**Dante AV:** The Dante protocol was developed for and widely adopted in audio systems for the transmission of uncompressed digital audio on IP based networks. The more recent Dante AV specification includes support for digital video.

●**NDI:** Network Device interface (NDI) is a software standard developed by NewTek to enable video-compatible products to communicate, deliver, and receive broadcast quality video in a high quality, low latency manner that is frame-accurate and suitable for switching in a live production environment over TCP (UDP) Ethernet based networks. NDI is commonly found in broadcast applications.

●**RTMP:** Real-Time Messaging Protocol (RTMP) was initially a proprietary protocol developed by Macromedia (now Adobe) for streaming audio, video and data over the Internet, between a Flash player and a server.

●**RTSP :** The Real Time Streaming Protocol (RTSP) is a network control protocol designed for use in entertainment and communications systems to control streaming media servers. The protocol is used for establishing and controlling media sessions between end points.

●**MPEG:** Moving Picture Experts Group is a working group formed from ISO and IEC developing standards that allow audio/video digital compression and Transmission.

●**H.264:** Also known as AVC (Advanced Video Coding) or MPEG-4i is a common video compression standard. H.264 was standardized by the ITU-T Video Coding Experts Group (VCEG) together with the ISO/IEC JTC1 Moving Picture Experts Group (MPEG).

●**H.265:** Also known as **HEVC** (High Efficiency Video Coding)H.265 is the successor to the widely used H.264/AVC digital video coding standard. Developed under the auspices of ITU, resolutions up to 8192x4320 may be compressed.

●**API:** An Application Programming Interface (API) provides a predefined function which allows access capabilities and features or routines via a software or hardware, without accessing source code or understanding the details of inner working mechanism. An API call may execute a function and/or provide data feedback/report.

●**DMX512:** The communication standard developed by USITT for entertainment and digital lighting systems.The wide adoption of the Digital Multiplex (DMX) protocol has seen the protocol used for a wide range of other devices including video controllers. DMX512 is delivered over cable of 2 twisted pairs with 5pin XLR cables for connection.

●**ArtNet:** An ethernet protocol based on TCP/IP protocol stack, mainly used in entertainment/events applications. Built on the DMX512 data format, ArtNet enables multiple “universes” of DMX512 to be transmitted using ethernet networks for transport.

●**MIDI:** MIDI is the abbreviation of Musical Instrument Digital Interface. As the name indicates the protocol was developed for communication between electronical musical instruments and latterly computers. MIDI instructions are triggers or commands sent over twisted pair cables, typically using 5pin DIN connectors.

●**OSC:** The principle of Open Sound Control (OSC) protocol is for networking sound synthesizers, computers, and multimedia devices for musical performance or show control. As with XML and JSON, the OSC protocol allows sharing data. OSC is transported via UDP packets between devices connected on an Ethernet.

●**Brightness：** Usually refers to the amount or intensity of video light produced on a screen without regard to colour. Sometimes called black level.

●**Contrast Ratio：** The ratio of the high light output level divided by the low light output level. In theory, the contrast ratio of the television system should be at least 100:1, if not 300:1. In reality, there are several limitations. Well-controlled viewing conditions should yield a practical contrast ratio of 30:1 to 50:1.

●**Colour Temperature:** The colour quality, expressed in degrees Kelvin (K), of a light source. The higher the colour temperature, the bluer the light. The lower the temperature, the redder the light. Benchmark colour temperature for the A/V industry include 5000°K, 6500°K, and 9000°K.

●**Saturation:** Chroma, Chroma gain. The intensity of the colour, or the extent to which a given colour in any image is free from white. The less white in a colour, the truer the colour or the greater its saturation. Saturation is the amount of pigment in a colour, and not the intensity.

●**Gamma:**The light output of a CRT is not linear with respect to the voltage input. The difference between what you should have and what is actually output is known as gamma.

●**Frame:** In interlaced video, a frame is one complete image.A video frame is made up of two fields, or two sets of interlaced lines. In a film, a frame is one still image of a series that makes up a motion image.

●**Genlock:** Allows synchronisation of otherwise video devices. A signal generator provides a signal pulses which connected devices can reference. Also see Black Burst and Color Burst.

●**Blackburst:** The video waveform without the video elements.It includes the vertical sync, horizontal sync, and the Chroma burst information. Blackburst is used to synchronize video equipment to align the video output.

●**Colour Burst:** In colour TV systems, a burst of subcarrier frequency located on the back part of the composite video signal. This serves as a colour synchronizing signal to establish a frequency and phase reference for the Chroma signal. Colour burst is 3.58 MHz for NTSC and 4.43 MHz for PAL.

●**Colour Bars：** A standard test pattern of several basic colours (white, yellow, cyan, green, magenta, red, blue, and black) as a reference for system alignment and testing. In NTSC video, the most commonly used colour bars are the SMPTE standard colour bars. In PAL video, the most commonly used colour bars are eight full field bars. On computer monitors the most commonly used colour bars are two rows of reversed colour bars

●**Seamless Switching:** A feature found on many video switchers. This feature causes the switcher to wait until the vertical interval to switch. This avoids a glitch (temporary scrambling) which often is seen when switching between sources.

●**Scaling:** A conversion of a video or computer graphic signal from a starting resolution to a new resolution. Scaling from one resolution to another is typically done to optimize the signal for input to an image processor, transmission path or to improve its quality when presented on a particular display.

●**PIP:** Picture-In-Picture. A small image within a larger image created by scaling down one of image to make it smaller. Other forms of PIP displays include Picture-By-Picture (PBP) and Picture- With-Picture (PWP), which are commonly used with 16:9 aspect display devices. PBP and PWP image formats require a separate scaler for each video window .

●**HDR:** is a high dynamic range (HDR) technique used in imaging and photography to reproduce a greater dynamic range of luminosity than what is possible with standard digital imaging or photographic techniques. The aim is to present a similar range of luminance to that experienced through the human visual system.

●**UHD:** Standing for Ultra High Definition and comprising 4K and 8K television standards with a 16:9 ratio, UHD follows the 2K HDTV standard. A UHD 4K display has a physical resolution of 3840x2160 which is four times the area and twice both the width and height of a HDTV/FullHD (1920x1080) video signal.

●**EDID:** Extended Display Identification Data. EDID is a data structure used to communicate video display information, including native resolution and vertical interval refresh rate requirements, to a source device. The source device will then output the provided EDID data, ensuring proper video image quality.

6.2 Revision History

The table below lists the changes to the Video Processor User Manual.

Format	Time	ECO#	Description	Principal
V1.0	2020-12-23	0000#	Release	Sylvia