

# UHD KVM over IP

## KH-2000

Extend HDMI, USB, RS-232, Bi-directional IR,  
and stereo audio over a Local Area Network



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# INTRODUCTION

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The UHD KVM over IP extends HDMI, USB, 2-way analog audio, RS-232, and bi-directional IR over a Gigabit Local Area Network. HDCP 1.4 and 2.2 compliant. Resolutions up to 2160p Ultra HD. The Sender and Receiver units can be automatically or manually configured to unique IP addresses to allow the connection of multiple Senders and Receivers to the same network. Multiple Receiver units can simultaneously connect to any Sender unit within the network to create a virtual cross-point matrix of up to 16 Senders and multiple Receivers up to a theoretical limit of just over 65,000 units, depending on the network bandwidth and number of ports of the network switch. USB 2.0 data rates up to 480 Mbps are supported in addition to backward-compatibility with USB 1.1. Each Receiver unit allows the connection of two USB devices with up to 500mA current draw per port, providing access to keyboard, mouse, printers, and scanners, cameras. Bi-directional analog audio capability allows audio to be transported between the Sender and the Receiver units. Built-in mic pre-amp on the Receiver unit ensures compatibility with a variety of microphones. IR commands from the Receiver side can be extended to sources located by any of the Senders. RS-232 serial control can also be extended between each Sender and the Receivers. Built-in web server interface makes set up and configuration simple and intuitive. The UHD KVM over IP is perfect for large scale remote workstation access, and for digital signage applications.

## **Important Notice**

**HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing in the United States and other countries.**

## How it connects

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If you are connecting multiple Sender units, use the 16-position selector to assign a unique numerical ID to each one. Use the HDMI cable to connect a computer or other HDMI source to the Sender's HDMI input. Use the USB and RS-232 cables to connect your computer's USB and RS-232 interfaces to the Sender unit. Connect audio Line In and audio Line Out as needed to the Sender. Sender and Receiver are built-in bidirectional IR emitter and IR receiver, user can control HDMI source or display at each side. Connect the HDMI output of the Receiver to your UHDTV display. Connect your USB devices, RS-232 devices, microphone, and headphones or amplified speakers to the Receiver unit. Connect the Sender and Receiver units to each other directly or through a Gigabit Ethernet switch, using CAT-5e or better cables. Each cable run can be up to 330 feet (100 meters) in length. Connect the included 12V power supply to the Sender and Receiver units and to available electrical outlets. Power on all associated equipment. **Use the Mode button on the Receiver to optimize the picture for sharper still images or smoother video motion. Press the USB Link button on the Receiver to toggle between the different Senders connected to the network.**

**Note: A Gigabit switch is required. The Gigabit switch must support 8k jumbo frame packets for one Sender to multiple Receiver application. And extra IGMP function for N to M matrix application.** If your LAN is not dedicated to only UHD KVM over IP products, then a managed switch is highly recommended.

## FEATURES

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- Extends HDMI, USB, RS-232, bi-directional stereo analog audio, and bi-directional IR over IP, using a Gigabit Local Area Network
- Supports resolutions up to 4Kx2K
  - 2160p30Hz Input to 2160p30Hz Output
  - 2160p60Hz(YUV420) Input to 2160p30Hz or 1080p60Hz Output
- Video hybrid mode
  - Output resolution up/down scale
  - Output to both VGA and HDMI simultaneously
  - VGA in to HDMI out
  - **HDMI (non-HDCP protected) in to VGA out**
- Audio hybrid mode
  - Output to both HDMI and Line Out simultaneously
- Supports HDMI Features:
  - **HDCP 1.4 & 2.2**
  - **Support HDR passthrough**
  - **LPCM 7.1 audio , Dolby® TrueHD , and DTS-HD Master Audio™**
  - **3D supported**
  - **Lip-Sync pass-through**
- Any size video wall with new features and enhancement
  - 90, 180, 270 clockwise image rotate
  - selectable stretching type
  - resolution hybrid mode (ex: 4K to 2x2 1080p wall)
  - tearing free in single host mode
  - pixel-wise accurate panning
  - accurate frame gap compensation
- USB 2.0 and backward-compatibility with USB 1.1
- Supports up to 16 Senders (DIP) or 250 Sender ( Command mode )
- Supports just over 65,000 Receivers, depending on the network bandwidth and number of ports of your network switch
- Mode button on Receiver for sharpness or motion optimization of image
- Field-upgradable firmware via web server interface
- **PoE supported ( Optional )**
- **SFP Cage for Fiber (3.3V Optional )**

# SPECIFICATIONS

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- Network Bandwidth: Up to 850Mbps
- Extension Distance: 120m Ethernet CAT5e
- HDCP: Support both HDCP 1.4 and **HDCP 2.2**
- Latency: Typical 1 frame (16ms) , maximum 2 frames (33ms)
- Video Input Connector (Sender): (1) HDMI Type A 19-pin, female
- Connector:

## Sender:

- 1x 12V 1A power input
- 1x USB type B female
- 1x 3.5mm earphone jack output for Line out analog audio
- 1x 3.5mm earphone jack output for Line in analog audio
- 1x VGA female input
- 1x VGA female output (loopback)
- 1x HDMI female input
- 1x RJ-45 gigabit Ethernet
- 1x DB9 serial port female
- 1x 3.5mm earphone jack output for IR emitter
- 1x 3.5mm earphone jack input for IR receiver

## Receiver:

- 1x 12V 1A power input
- 1x 3.5mm earphone jack output for Line out analog audio
- 1x 3.5mm earphone jack output for Mic in analog audio
- 1x VGA female output
- 1x HDMI female output
- 1x RJ-45 gigabit Ethernet
- 1x DB9 serial port male
- 1x 3.5mm earphone jack output for IR emitter
- 1x 3.5mm earphone jack input for IR receiver

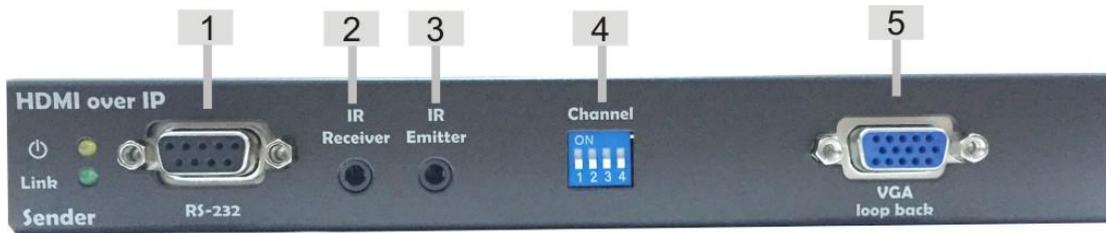
## User Controls:

- 1x 4-bits DIP switch
- 2x function buttons ( Receiver )
- 1x serial port function select switch

## Packing List

- 1 x KH2000(F)-S ( Sender unit ) or 1 x KH2000(F)-R ( Receiver unit )
- 1 x 12V 1A DC power supply
- 1 x IR emitter cable or 1 x IR receiver cable ( optional )

# Sender Panel Layout



  This LED glows orange when the unit is powered ON.

**Link**  This LED glows green when the Sender and Receiver are connected using Ethernet cable, or it will flash to try find the Receiver unit.

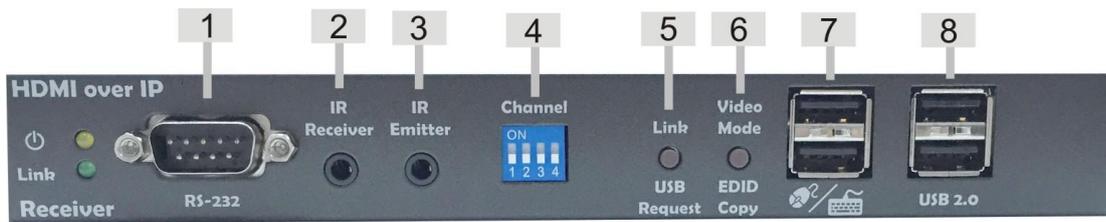
1. Connect to PC RS-232 port
2. Connect an IR Receiver cable to receive signals from the source IR remote control.
3. Connect an IR Emitter cable to control the source from the viewing location.
4. Used to set the video channel for the Sender unit.
5. VGA loopback for non-HDCP protected HDMI signal.

## Back



1. Connects the Sender to the network ( or directly to the Receiver ) using an Ethernet cable.
2. SFP Fiber module (3.3V).
3. Connects to the HDMI source.
4. Connects to the VGA source.
5. Connects a 3.5mm stereo cable from the Line out jack on the multimedia PC to this jack.
6. Connects a 3.5mm stereo cable from this jack to the Line in jack of a multimedia PC.
7. Connects a USB cable from PC to the USB port.
8. Connects the included 12V DC power supply.

# Receiver Panel Layout



  This LED glows orange when the unit is powered ON.

**Link**  This LED glows green when the Sender and Receiver are connected using Ethernet cable, or it will flash to try find the Receiver unit.

1. Connects to an RS-232 device.
2. Connect an IR Receiver cable to receive signals from the source IR remote control.
3. Connect an IR Emitter cable to control the source from the viewing location.
4. Used to set the video channel for the Receiver unit.
5. Receiver unlink or long press to request USB link.
6. Change Video mode for video or graphic mode application and update EDID to Sender.
7. USB port for Keyboard, Mouse of KVM application.
8. USB 2.0 port.



1. Connects the Receiver to the network ( or directly to the Sender ) using an Ethernet cable.
2. SFP Fiber module (3.3V).
3. HDMI output to display.
4. VGA output to display.
5. Connects a 3.5mm microphone jack to the Receiver ( only works on Unicast mode )
6. Connects a 3.5mm stereo cable to a pair of powered speakers.
7. Connects the included 12V DC power supply.

# Operating the UHD KVM over IP

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## The Linking Process

By default, the UHD KVM over IP is shipped in Auto IP mode. It should work in most cases, since the Sender and Receiver units are assigned an IP by themselves. After all the connections have been made, the UHD KVM over IP will attempt to establish a connection between the Sender and Receiver unit.

During this time, the Link LED on both the Sender and Receiver unit will begin to flash and the message “Trying to find the Transmitter...” will be displayed on the screen.



Once a successful connection is established, the Link LED on the Sender and Receiver unit(s) will glow bright green and the source signal will appear on the display.



When there are multiple Senders on the same network, Receiver can change Video Channel DIP ID to change Sender within 2 seconds directly.

## HDMI Source select

Sender will auto detect video sync when unit boots. If both HDMI and VGA plug to Sender and transmit signal to Sender, Sender will auto switch to HDMI input by default.

Sender will **Auto Detect** and **Switch** to a video input port which has signal after video signal lost over 5 seconds.

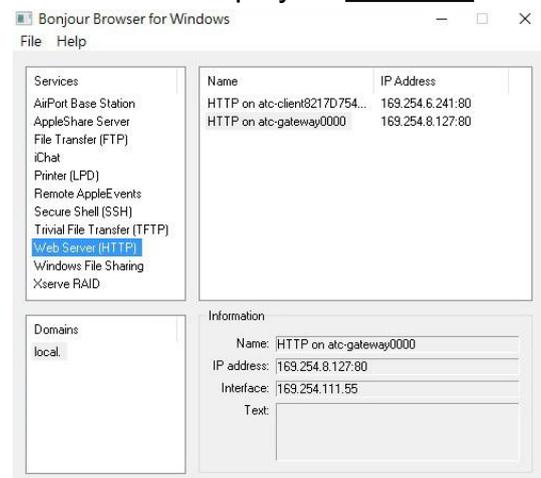
## Access the Web UI



In order to change the network options, both the Sender and Receiver unit contain a built-in Web interface. Changing the network setting may also be necessary when using special application.

Using a program that can detect those devices, the IP address can be discovered.

1. Bonjour Browser is a program that can detect IP address. It helps you to access device's Web UI easily.
2. Open Bonjour Browser and select the Web Server (HTTP) option in the Services box. Any attached devices will show up in the windows to the right.
3. HT-1520 Sender will display as atc-gateway and Receiver will display as atc-client.
4. Change the IP address of computer to be in the same IP range as HT-1520 device.



- a. For the factory default, set the computer's IP to 169.254.1.1 with a subnet mask of 255.255.0.0.
- b. For the devices not at factory default, set the computer's IP so that it has the first 3 numbers the same and the 4<sup>th</sup> number different with a subnet mask of 255.255.255.0

Example      Device IP address – 192.168.100.59  
Set computer IP address – 192.168.100.100

5. Open a web browser – Google Chrome is preferred, type in the IP address of device as shown in the Bonjour Browser. The Web UI page will open.

## Web UI configuration

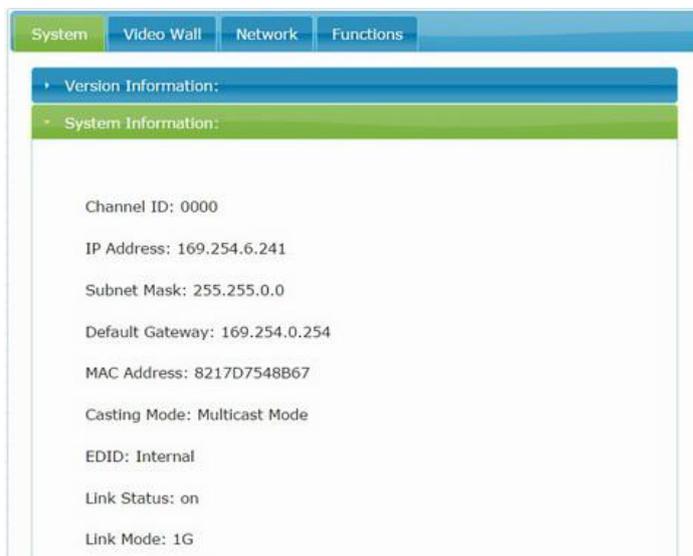
### Check Firmware

The firmware version is on the page first shown when accessing the web ui. All devices must be on the same version of firmware in order to communicate with each other.



### System Information

User can get basic system information here.



### Update Firmware

Please contact your distributor if necessary.

## Utilities

You can Reset all parameter to factory default and Reboot the unit here.  
And reset EDID to different display type ( Sender unit )  
Use Console API Command to control the unit or other setting.

Sender:

Utilities:

**Commands**

Factory Default Reboot

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**Reset EDID to Default Value:**

- Default HDMI EDID
- Default DVI EDID
- Default VGA EDID

Apply

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**Console API Command**

Output Apply

Receiver

Utilities:

**Commands**

Factory Default Reboot

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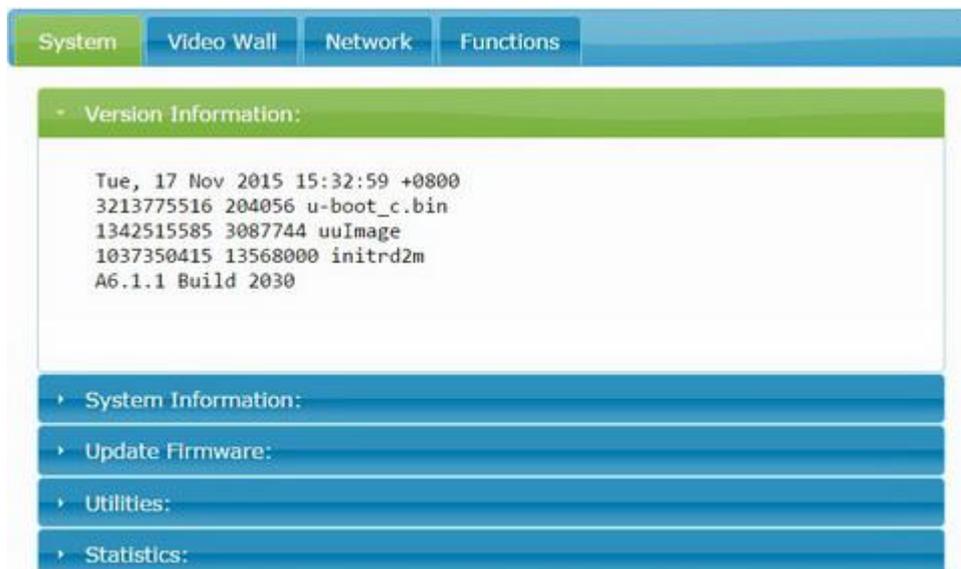
**Console API Command**

Output Apply

# Video Wall

All the 16 (4x4) Receivers use the same channel ID as the Sender.

1. Prepare Sender x 1 and Receiver x 16
  - The Sender and all Receivers must be configured as **Multicast Mode**.
2. Reboot all devices. Ensure that all remote displays and all network cables are connected correctly. (Video source is required at this step)
3. Following steps 1~2 describes how to connect to “http://atc-gateway0000.local” web UI. If you are not familiar with these steps, please reference to “**Access the Web UI**” for details.
4. If the control PC (Windows OS) doesn't install Bonjour SDK yet, please install it. Google “Bonjour SDK download” for the installation file or download it here: <http://developer.apple.com/opensource/>
5. Configure the control PC's network setting to use 169.254.xxx.xxx IP domain with netmask 255.255.0.0.
6. Open PC's web browser (Google Chrome performs best. IE is not recommended). Link to the control portal by following web address <http://atc-gateway0000.local/>
  - The 0000 part in above web address is mapping to the value of 4bits DIP switch.
  - If link success, user will see the web page as following:



7. Click on the second tab “Video Wall Setup”.

8. Once user complete the following steps in “Basic Setup”, a basic video wall configuration is done.

9. Step 1: Set common values of all devices:

- Set Bezel and Gap Compensation:

- i. This step is used to configure the bezel and gap compensation. If user don't need this, just set all values to 0.

- ii. Follow the picture and input the size of the monitor used. Note that is unit is **1mm** and the value **MUST** be integer.

- iii. Set Wall Size:

- iv. Set “Vertical Monitor Count” to 4.

- v. Set “Horizontal Monitor Count” to 4.

- Check “Single Host Mode”

- Select “All” in apply to list and press “Apply” button.

- User will notice that all screens refresh.

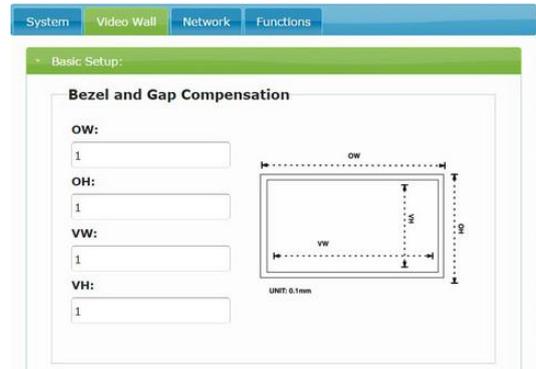
10. Step 2: Setup Row and Column Position for Each Display:

- To identify the client index lists in “apply list”, check “Show OSD”. The index number will show up on each client's display.

- Go through all client devices (in “apply list”) one by one and set the corresponding “Row Position” and “Column Position”, then apply.

- Un-check “Show OSD” when completed.

11. Basic setup for 4x4 single host mode is completed



# Network

## Configuring IP Mode

**By default**, the Sender and Receiver units are set to **Auto IP Mode**. User does not need to change it unless you know what you want.



The screenshot shows a web interface with a navigation bar containing 'System', 'Video Wall', 'Network', and 'Functions'. The 'Network' tab is active. Below the navigation bar is the 'IP Setup' section. It features three radio buttons for 'IP Mode': 'Auto IP' (selected and highlighted in green), 'DHCP', and 'Static'. Below these are three input fields: 'IP Address' with the value '169.254.10.63', 'Subnet Mask' with '255.255.0.0', and 'Default Gateway' with '169.254.0.254'.

When you apply new settings, please **Reboot** the unit to take effect. Once both units are configured for the same IP Mode, video communication will be restored.

## Multicast and Unicast Modes

Multicast mode: (**default**)

Sender can broadcast signal to multiple Receiver units. It can set up a matrix system.

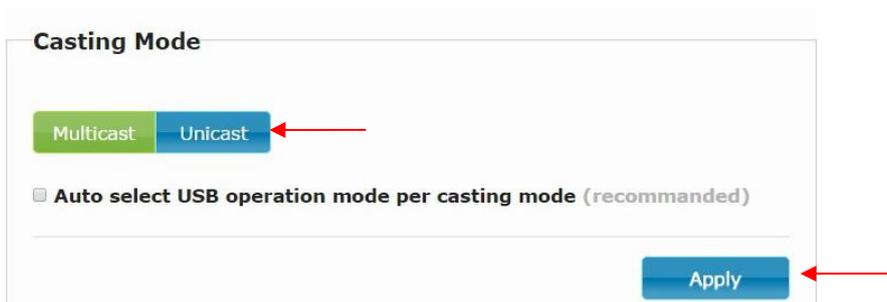
Unicast mode:

Only one Receiver unit and one Sender unit can paired on the same network.

It can set up a KVM system by one Receiver to multiple Senders.

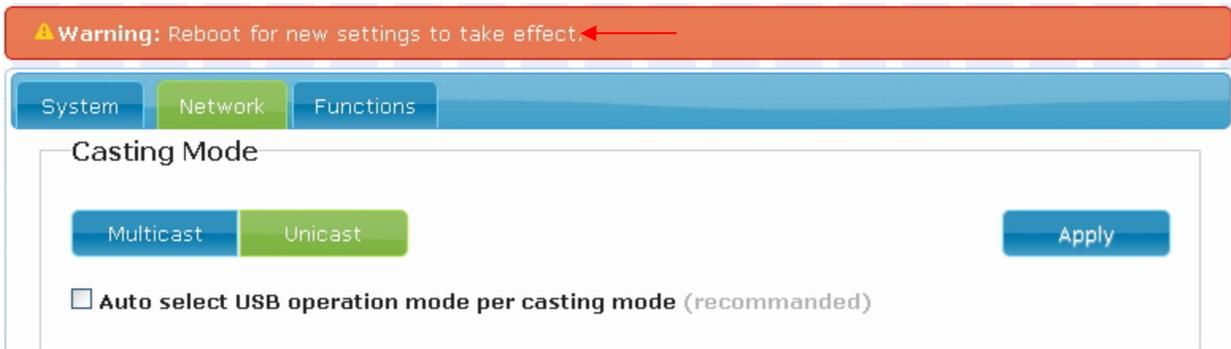
## How to change Unicast Mode

1. Access the Web interface for each Sender and Receiver unit that will be using Multicast Mode.
2. Click the **Network tab** and click **Unicast** button. When selected, the **Unicast button** will be highlighted in green. And then click the **Apply** button.



The screenshot shows the 'Casting Mode' configuration page. It has two radio buttons: 'Multicast' (highlighted in green) and 'Unicast' (highlighted in blue). A red arrow points to the 'Unicast' button. Below the radio buttons is a checkbox labeled 'Auto select USB operation mode per casting mode (recommended)'. At the bottom right, there is an 'Apply' button, with a red arrow pointing to it.

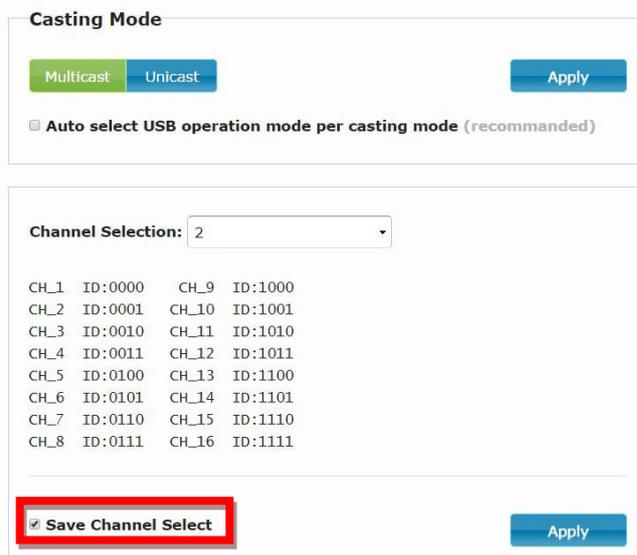
- A message will be displayed, indicating that the casting mode has been applied to the Sender unit.
- After a few seconds, another message will be displayed stating that the Sender unit must be reboot in order for the new setting to take effect.



- Reboot the Sender unit by one of these methods: 1) Disconnect and reconnect the power supply. 2) Click the **Reboot** button on the Web interface.
- Repeat steps 1 through 5 to each Sender and Receiver on the network.

## Channel Select

Receiver can switch to different Senders using this function. If you wish to restore the channel ID after power off, please check the Save Channel Select box.



## Function

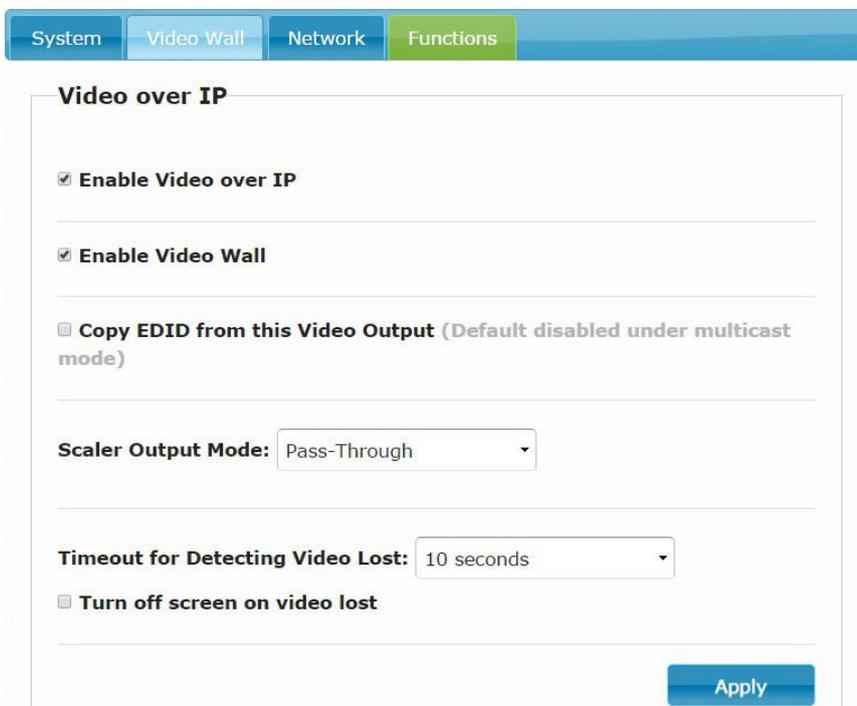
### How to Update EDID of connected display

( support Multi-channel audio and 3D )

The UHD KVM over IP features EDID Management. Before the source can send video (and/or audio) data, the source device (connected to each Sender unit) reads the EDID from the display which are connected to each Receiver unit. The EDID contains information about what type of audio/video data can be accepted from the source.

By default, the internal HDMI EDID (stored in the Sender unit) is used. However, a downstream EDID (from a display, amplifier ,etc) can be retrieved and stored in the Sender unit. **It can support Multi-channel audio and 3D function from the device which connected to the Receiver unit.**

- 1. Establish a Sender and Receiver units communication.
- 2. Unplug the power supply from Receiver unit, then press Copy EDID button in the rear of Receiver unit, then power on the Receiver unit and long press on booting until the power LED blinking.
  
- 1. Access the Web interface for Receiver.
- 2. Click the copy EDID from this Video Output check box.
- 3. User can change the output resolution by Scaler Output Mode.



The screenshot shows a web interface with a navigation bar at the top containing tabs for 'System', 'Video Wall', 'Network', and 'Functions'. The 'Functions' tab is selected. Below the navigation bar is a section titled 'Video over IP' with the following settings:

- Enable Video over IP
- Enable Video Wall
- Copy EDID from this Video Output (Default disabled under multicast mode)
- Scaler Output Mode: Pass-Through (dropdown menu)
- Timeout for Detecting Video Lost: 10 seconds (dropdown menu)
- Turn off screen on video lost

An 'Apply' button is located at the bottom right of the settings area.

- 4. Click the **Apply** button.
- 5. **Reboot** the Receiver unit.

## Using RS-232

The UHD KVM over IP supports RS-232 pass-through, allowing the control of remote RS-232 devices ( near the Receiver unit ) from the source ( Sender unit ) location. The RS-232 host (controller) and the device (client) must be set to the same baud rate. In addition, the correct baud rate must be set on the Sender and Receiver units which are being used to control the RS-232 client.

1. Access the Web interface for Sender unit.
2. Click the **Function tab** and locate the Serial over IP section.
3. Make sure that the Enable Serial over IP box is checked.



**Serial over IP**

**Enable Serial over IP**

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**Baudrate Setting :**

**Baudrate:** 115200 ▼

**Data bits:** 8 ▼

**Parity:** None ▼

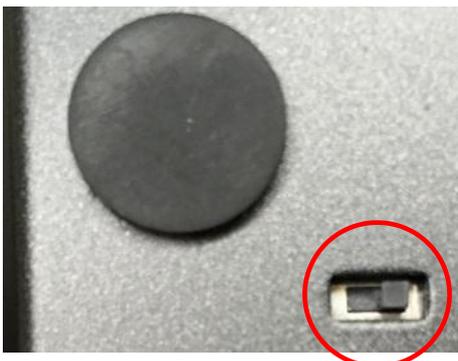
**Stop bits:** 1 ▼

**Apply**

4. After select the needed value, click the **Apply** button.
5. **Reboot** to take the new setting effect.

### ➤ **Debug Mode**

For service and debug use only.



Stem near Side : Debug mode

Stem far away Side : Serial mode  
( **default** )

## USB Control

When connecting USB devices to the UHD KVM over IP, the functionality is similar to that of video and RS-232.

### ➤ **Unicast Mode**

In Unicast mode, only a single Receiver unit will be able to communicate with a Sender unit. Use the DIP switch to change channel ID to the desired Receiver unit.

### ➤ **Multicast Mode**

In multicast mode, the USB host device can be controlled from multiple Receiver units at one time. The **Link USB** button must be **pressed for 3 seconds** on each Receiver unit in order to enable USB on each Receiver unit. In multicast mode, the UHD KVM over IP behaves like a USB hub.

Connecting multiple mouse / keyboard devices to each Receiver unit makes little sense if multiple users are attempting to control the same computer. However, if the different USB devices are connected, each remote station (Receiver unit) can use a USB device without interference.

### ➤ **Key features of KVM over IP**

- 1. USB keyboard/mouse work immediately once connected.**
- 2. Emulated as a composite USB keyboard/mouse device and attached under host's USB virtual hub.**
- 3. Support 84/101/104 standard keyboard**
- 4. Support HID system control and consumer control input.  
Which means most of non-standard keyboard keys are supported.**
- 5. Support up to 8 buttons mouse with one wheel.**
- 6. Support USB remote wakeup.**
- 7. Support under BIOS/UEFI BIOS/Linux and other operating systems.**
- 8. Client support USB keyboard hotkey.**
- 9. Can enable both USBoIP and KMoIP or exclusively.**
- 10. Can co-work with USBoIP function. Which means you can still has USB mass storage redirection when KMoIP is enabled.**

- 11. Under multicast mode, all Receivers' keyboard/mouse will redirect to host at the same time. It is different from USB0IP's multicast mode, which need "request USB access".**

## Hotkeys:

KMoIP built-in support client hotkey trigger function. By default, firmware enables 3 hotkeys.

They are:

1. Scroll lock: toggle link/unlink
2. Pause/Break: request USB0IP access (Multicast mode only)
3. Insert: toggle video/graphic mode

The hotkey is triggered by **press the hotkey 3 times in 750ms**.

## Audio Input and Output

1. Our computer has a **Mic In** jack, as part of the sound card. However, we want to be able to access this jack from the Receiver unit. Therefore, connect the microphone to the **Mic in** jack on the Receive unit.
2. In order to get the audio from the microphone into the computer, connect a 3.5mm-to-3.5mm stereo cable from **Line out** jack on the Sender unit to the **Line in** jack on the computer.
3. **HDMI audio can output to both HDMI and Line out from Receiver.**



**WARNING:** DO NOT connect the cable from the **Line out** jack on the Sender unit to the **Mic In** jack **on the computer**. Doing so will result in audio "clipping" and may cause damage to the sound card.



**Note:** HDMI audio will always be passed through to the **HDMI out** connector on the Receiver unit. However, if a 3.5mm stereo cable is connected to the **Line in** jack on the Sender unit, the embedded HDMI audio is switched off. This allows the audio signal from **Line in** jack (Sender unit) to be received on the **Line out** jack (Receiver unit)

When using a microphone, the audio behavior will differ between unicast and multicast mode:

### ➤ **Multicast Mode**

**The Mic in jack is disable in multicast mode.** However, if an audio source is connected the the Line in jack on a Sender unit, the audio signal will be distributed to all Receiver units which are set to the same video channel. Each Receiver unit would have a separate pair of power speakers connected to the Line out jack.

### ➤ **Unicast Mode**

In unicast mode, separate microphone can be connected to each Receiver unit. The audio signal coming from the microphone will be sent to the Sender unit on the same channel as the Receiver unit.

## **Video Modes**

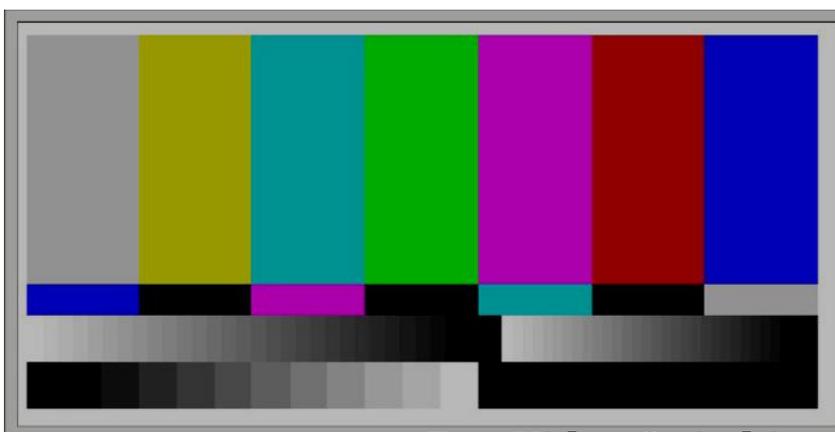
The UHD KVM over IP provides two video modes:

### **Video mode and Graphic mode**

- By default, the units are shipped in Video mode. If the Hi-Def signal is a video source, it should be displayed in best quality.



- If the Hi-Def signal is a graphic source (e.g. images, patten generator, etc.), press the Video Mode on the rear panel of Receiver unit until “ Graphic Model” is displayed in the foreground on the graphic image. Set the UHD KVM over IP to Graphic Mode to maintain the sharpest image possible.



### **Fast Video Switching**

“Fast Video Switching” is implemented under some assumption. And which means you have to meet “the requirement” in order to switch video source immediately. If you can't meet the requirement, video switching time will be longer (about 2~5 seconds). And normally, you will see the screen “black out” when the new incoming video streaming source can't meet the requirement.

Fast Video Switching need the conditions:

1. All Sources send the same resolution and timing
2. All Sources contain the same HDCP version or non-HDCP

If not, we have a few simple ways to do.

A. When Sources include HDCP and non-HDCP in the same resolution.

Please issue command to **Sender** Console API

```
astparam s hdcp_always_on y; astparam save; reboot ( for HDCP v1.x )
```

```
astparam s hdcp_always_on_22 y; astparam save; reboot ( for HDCP v2.2 )
```

B. When Sources include different resolution, please set **Receiver** to a fixed Scaler Output Mode and Reboot.

