AV over IP Extender

User Manual

Model : HKM02BP-4K

4K HDMI KVM & USB, RS232 , IR, Audio over PoE Extender

Introduction

HKM02BP-4K uses AV over IP technology to route up to 1,000 4K HDMI sources to up to 60,000 displays over IGMP and Jumbo frame protocol gigabit PoE switches, which can achieve HDMI signal extending, distributing, switching and routing.

Additionally, the boundless switching function allows you to use one mouse to operate multiple PCs by moving the mouse cursor across the monitors' borders.

HKM02BP-4K is a multifunctional system that integrates multiple media. You can perfectly apply it to large-scale security rooms, classrooms, trading rooms, and many more.

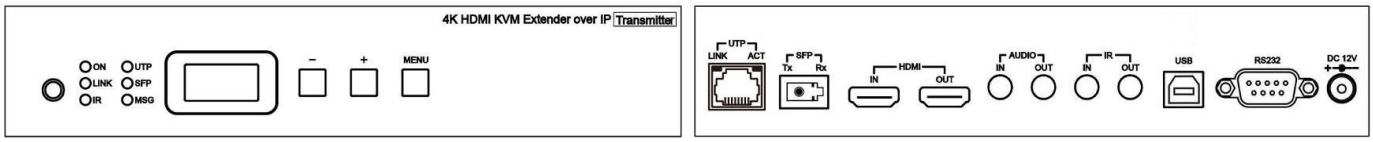
Features

- Resolution up to 4K@30Hz 4:4:4
- Signal extension up to 150M over CAT5e (or greater), 60KM over fiber optic cable.
- Workable with PoE switches for HDMI extension, distribution, switching, and matrix.
- Built-in loop out, an extra local HDMI display at TX side.
- Built-in 4 USB ports for keyboard, mouse, flash drive...etc.
- Supports up to 8 x 16 video wall.
- Supports video scaler, 4K to 1080p/ 1080p to 4K.
- Supports HDMI audio embedding and extraction function.
- Supports USB, full-duplex RS232, bi-directional IR, analog audio transmission.
- Supports RS232 signal distribution.
- Workable with SR01X (IP repeater) for longer distance.
- Managed via Windows based software, Android/iOS APP, Web GUI, IR remote, panel pushbutton, Telnet API, RS232 console.

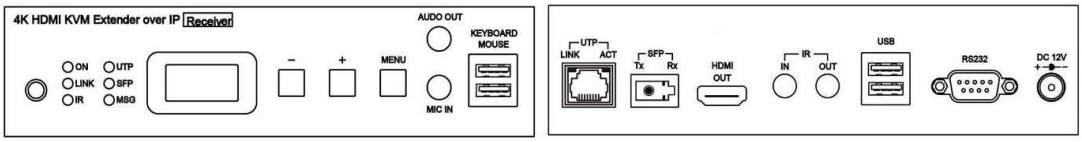
Installation view

Panel view

HKM02BT-4K



HKM02BR-4K



Panel Button Function

Button	-	+	Menu
Short Press	Reduce Number	Increase Number	Menu/Cancel
	Enter		
Press 1 seconds	Carry	Decomposition	
Press 3 seconds			Lock/Unlock Button(When no OSD menu)
Press and hold then power on	Factory Default	Engineering Mode	Set Factory Default then enter Engineering Mode

Reduce Number: switches channel or function number down
Increase Number: switches channel or function number up
Carry: shifts the three numbers in display one position to the left
Decomposition: shifts the three numbers in display one position to the right

In engineering mode Power and Link LED will be flash together, IP address of unit will be set to Static IP 192.168.0.88 temporarily, users can login to the web page by browser to update firmware.

Front Panel LED Indication

Panel LED	Status	HKM02BP-4K
Power (Green)	On	Boot completed
	Flash Twice	Booting
	Flash Slowly	Transmitter: stop link Receiver: video output be turned off
	Breathing(Fading)	Screen saver mode (not available for transmitter)
Link(Blue)	On	Connected & video is streaming
	Flash	Connecting, or no source input from transmitter
IR(Red)	On	Transmitting /receiving IR signal
UTP (Green)	On	Connected by UTP RJ45 port
	Flash	Transmitting /receiving data from UTP RJ45 port
SFP(Blue)	On	Connected by Fiber SFP port
	Flash	Transmitting /receiving data from Fiber SFP port
MSG(Red)	On	Other message (IR, RS232, System setting…)
	Flash 2~9 Times	System warning, Alert (Refer to MSG/IR Status Indication)

MSG/IR LED Status Indication

Times	HKM02BP-4K MSG LED
Always ON	IR control, RS232 control, system setting
2	IR control disabled
3	Transmitters channel conflict
4	DHCP server not found
5	Rest to factory default
6	Engineering mode / Firmware update mode
7	Manufacture setting mode
8	Aux system stopped
9	Aux system firmware boot sector error
10	Aux system firmware type error

RJ45 LED Indication

RJ45 LED	Status	Description
LINK (Green)	On	Ethernet connected
ACT (Orange)	Flash	Data transmission

RJ45 Pin Define

Video Link (TIA/EIA-568-B)

1. Orange-white DATA0 +
2. Orange DATA0 -
3. Green-white DATA1 +
4. Blue DATA2 +
5. Blue-white DATA2 -
6. Green DATA1 -
7. Brown-white DATA3 +
8. Brown DATA3 –

Cable & Transmission Distance

Link Cable use high quality CAT.5e UTP/STP/FTP or CAT.6 UTP cable
Transmission distance will be affected by equipment (Switch HUB), cable quality...etc.
When using CAT.5e/CAT.6 cable connect transmitter and receiver directly without Ethernet switch, the maximum transmission distance up to 150M.
You can also use model no: SR01X repeater for extended longer distance or using Gigabit Switch hub which support IGMP protocol and Jumbo Frame 8K for signal distribution or extend distance.

System Default Casting Mode/IP Settings

Casting Mode

Transmitter / receiver support **Unicast** and **Multicast** two mode, default is Multicast.
In Multicast mode it could be one to one, one to multi, multi to on or multi to multi applications.
The analog audio output of transmitter and input of receiver will be off in this mode, analog audio only from transmitters send to receivers.
Unicast mode suitable for one to one or multiple transmitters to one receiver applications.
Analog audio bi-direction transmission only in **Unicast** mode.

IP Mode

System default IP setting is **Static IP**, IP mapping to last 4 digits of MAC address (Hex), for example MAC XX:XX:XX:XX:12:AB, the IP address will be169.254.18.171
You could also set to **DHCP** or **Auto IP**, please refer to web setting chapter: **IP Setting: Page 18.**
In **Auto IP** mode it will assign **169.254.X.X** (subnet mask **255.255.0.0**) to transmitters and receivers without DHCP server.
We recommend Static IP mode when using APP or PC software control to prevent any IP change problem.

Bandwidth Chart

The bandwidth will be varied based on different resolution. Higher resolution may not request bigger bandwidth. Below Chart is the resolution and bandwidth status for reference.

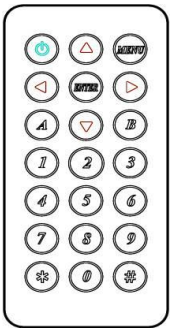
Resolution (@60Hz)	Average Bandwidth (Mbps)	Resolution (@60Hz)	Average Bandwidth (Mbps)
3840x2160 (2160p)	218 (146~268)	1280x1024 (SXGA)	113 (79~150)
1920x1080 (1080p)	133 (80~210)	1024x768 (XGA)	81 (72~120)
1280x720 (720p)	147 (112~177)	800x600 (SVGA)	66 (49~82)
1600x1200 (UXGA)	81 (57~105)	640x480 (VGA)	43 (29~56)

Above bandwidth chart not include USB transmission, it cost up to 50 Mbps when transferring mass data.

System scalability is limited only by uplink and stacking connector bandwidths, for example under Gigabit Ethernet network, the total flow must not exceed 1000Mbps to avoid any delay on video streaming. If the video play with 1080p resolution, the transmitter allow maximum up to 7 pcs for simultaneous video streaming.

For 8~16 sources: use switches which support 802.3ad Link Aggregation or smart (or intelligent) switches to get 2 Gbps or more bandwidth.
For over 16 sources: use switches which support SFP+ uplink or stackable switches to get 10 Gbps bandwidth.

IR Remote Control Setting



You could use the IR infrared remote control to preset channel selection and other menu function. Using the IR remote control aim to the front panel of receiver or external IR receiver cable will be ok.

Initial at first time use the remote control or after change battery of remote control, the IR remote control and the equipment Remote ID must be using same ID. The default Remote ID for transmitter is 7, for receiver is 8.

To setting the Remote ID, Press and hold power button, then press button 8 to complete the setting.

+ . **(without transmitter or receiver)**

IR Remote Control Button

Symbol	Button	Receiver Function	Transmitter Function
	POWER	Turn Off/On Video Output	Connect/Disconnect Receiver
		Setup Remote Control ID	
	MENU	Menu selection, input numbers after press menu button	
	UP	Increase Value	
	DOWN	Reduce Value	
	LEFT	Carry	
	RIGHT	Decomposition	
	ENTER	Enter / Show Channel Information (When no other Menu operation)	Enter
	ASTERISK	Cancel	
	NUMBER	Recall Previous Value	
	A	Favorite Channel Switching	Set RS232 to Auxiliary Mode to Receive Menu Message
	B	Back to Previous Channel	Set RS232 to Extender Mode
	1	Number 1	
	2	Number 2	
	3	Number 3	
	4	Number 4	
	5	Number 5	
	6	Number 6	
	7	Number 7	
	8	Number 8	
	9	Number 9	
	0	Number 0	

IR Remote Control Operation

Select Channel:

Mode 1: use ◀ or▲ or ▼or ▶ to select channel and press **ENTER** to confirm.
Mode 2: enter the channel number and press **ENTER** to confirm the input channel.

Select Menu Function:

Mode 1: press **MENU** then use ◀ or ▲ or ▼ or ▶ to select function, press **ENTER** to confirm.
Mode 2: press **MENU**, then input function number as below, press **ENTER** to confirm.

Wake Up Receiver:

In screen saver mode (30 seconds without video input), press any button of IR remote/pane to wake up

Connect /Disconnect Connection for Transmitter:

Press **POWER** of IR remote to connect/discount connection.

Turn On/Off Video Output for Receiver:

Press **POWER** of IR remote to turn on/off monitor, press panel button **CH-** and **CH+** together to turn on

IR Quick Block for Receiver:

 # # #: IR block mode, ignore IR control signal until press any panel button or IR remote * three times
* * * : Quit IR block mode

TV Wall Quick Switch for Receiver:

MENU+POWER: Switch between TV Wall/Single monitor modes immediately.

Add Favorite List for Receiver:

MENU+A: Add channel to favorite list in menu, maximum 32 channels.

Remove Favorite List for Receiver:

MENU+B: Remove current channel from favorite list in menu

Set RS232 Mode for Transmitter:

MENU+A: Switch to message mode to receive response instead of OSD.
MENU+B: Switch to extender mode.

IR Menu Function List

No.	Menu	Description	Option / Remark	RX	TX
0	System Information	System Information		V	V
1	Network Information	Network Information		V	V
2	Function Information	Function Information		V	V
3	Control Information	Control Information		V	V
4	Video & Audio Information	Video & Audio Information		V	V
5	RS232 Control Information	RS232 Control Information		V	V
6	Channel Information	Channel Information		V	X
7	Favorites Information	Favorites Information		V	X
8	Routing Information	Routing Information		V	X
9	Video Wall Information	Video Wall Information		V	X
10	Advanced Menu	Display advance menu	0 = Hide 1 = Display	1	1
11	Reconnection	Reconnect with TX/RX		V	V
12	Disconnection	Disconnection (keep routing channel)		V	X
13	Stop Connection	Stop all connection (Include routing channel)		V	V
14	Starting USB	Get USB control priority (in multicast mode only)		V	X
15	Casting Mode	Casting Mode setting	0 = Unicast 1 = Multicast	1	1
16	Jumbo Frame	Jumbo Frame setting	0 = Disable 1 = Enable	1	1
17	Free Routing	Free Routing setting		1	1
20	Video Function	Video Extender setting	0 = Disable 1 = Enable	1	1
21	Audio Function	Audio Extender setting		1	1
22	USB Function	USB Extender setting		1	1
23	RS232 Function	RS232 Extender setting		1	1
24	IR Function	IR Extender setting		1	1
25	Video Wall Function	Video Wall setting		1	1
27	Keyboard Mouse Function	Keyboard Mouse Extender setting		1	1
30	Button Control	Button Control setting	0 = Disable 1 = Enable	1	1
31	Button Lock	Button Lock		0	0
32	IR Control	IR Control setting		1	1
33	IR Control ID	IR Control ID setting	0 ~ 9 = IR Control ID 10 = User Define Controller	8	7
34	RS232 Control	RS232 Control setting	0 = Disable 1 = Enable (Case Sensitive) 2 = Case Insensitive	1	1
35	HDMI 5V Control	Cut HDMI 5V when switching	0 = Disable 1 = Enable	0	X
37	Rotary Switch	HKM02BT Channel Switch		X	1
41	Scaler Output Mode	Video output resolution setting	0 = Pass-Through 1 = Pass-Through (Strict) 2 = Auto Detect (Per EDID) 3 = Full HD 1080p 60Hz 4 = Full HD 1080p 50Hz 5 = Customize	0	X
42	Audio Select	TX Audio Input Select /RX Audio Output Select	0 = Digital 1 = Analog	2	2

			2 = Auto		
43	Analog Input Volume	Analog Input Volume	0 = Mute 1 ~ 100 = Volume %	85	85
44	Analog Output Volume	Analog Output Volume		85	85
45	Video Quality	Video Quality setting	0 = Graphic Mode 1 ~ 5 = Mode 1 ~ 5 6 = Video Mode	X	6
46	Anti-Dither	Anti-Dither setting	0 = Disable 1 ~ 2 = Mode 1 ~ 2	X	0
47	EDID Update	Update EDID from TX or monitor of RX		V	V
48	EDID Select	Select default EDID of TX	0 = Default HDMI 1 = Default DVI 2 = Default VGA 3 = Loopout Monitor (HKM02B Only)	X	1
49	HDCP Always On	HDCP setting	0 = Disable 1 = HDCP 1.4 Always On 2 = HDCP 2.2 Always On	0	0
50	RS232 Select	RS232 Port Mode Select	0 = Disable 1 = Extender 2 = Keypad 3 = Auxiliary 4 = Console	1	1
51	RS232 Baudrate	RS232 Extender Baudrate	0 = 115200 bps 1 = 57600 bps 2 = 38400 bps 3 = 19200 bps 4 = 9600 bps 5 = 4800 bps 6 = 2400 bps 7 = 1200 bps 8 = 600 bps 9 = 300 bps	0	0
52	RS232 Newline	RS232 Control Newline setting	0 = Linux (0x0A) 1 = Windows (0x0D, 0x0A) 2 = Mac (0x0D) 3 = Other (0x0A, 0x0D)	1	1
53	RS232 Trigger	RS232 Control Trigger setting		1	1
54	Auxiliary Baudrate	Auxiliary Baudrate	0 = 115200 bps 1 = 57600 bps 2 = 38400 bps 3 = 19200 bps 4 = 9600 bps 5 = 4800 bps 6 = 2400 bps 7 = 1200 bps 8 = 600 bps 9 = 300 bps	0	0
55	Auxiliary Newline	Auxiliary Newline setting	0 = Linux (0x0A) 1 = Windows (0x0D, 0x0A) 2 = Mac (0x0D) 3 = Other (0x0A, 0x0D)	1	1
56	Auxiliary Trigger	Auxiliary Trigger setting		1	1
57	Device No	Device No. for RS232 control	0 ~ 999	0	X
58	Group No	Group No. for RS232 control	0 ~ 99	0	X
59	Party No	Party No. for RS232 control		0	X
60	Fast Switch	Switch without stop link	0 = Disable 1 = Enable	1	1
61	Conflict Check	Check existing TX channel		X	1
62	Channel Name	Display Channel Name	0 = Hide 1 = Display	0	X
63	Only Favorites	Only Favorites Channel Available	0 = Disable 1 = Enable	0	X
64	Lock Favorites	Lock Favorites Channel		0	X

65	Auto Sort Favorites	Auto Sort Favorites Channel		0	X
66	Sort Favorites	Sort Favorites Channel	Immediately sort favorite channel	V	X
67	Scan Channel To Favorites	Scan Channel To Favorites		V	X
70	Direct Access Menu	Run menu function even hide	0 = Disable 1 = Enable	1	1
71	Menu Item “Advanced Menu”	Display/Hide “Advanced Menu”		1	1
72	Screensaver	Screen Saver setting		0	X
73	Screen Off Option	Behavior After Screen Off	0 = No Option 1 = Mute Analog Audio 2 = Stop Connection	1	X
74	Diagnostic Information	Diagnostic Information	0 = Disable 1 = Enable	1	X
75	Message Redirect	Message Redirect to Auxiliary		X	1
76	Command Redirect	Command Redirect to Auxiliary		1	1
80	Video Routing	Video Routing setting	0 ~ 999 = Specific Channel 1000=Follow Channel	1000	X
81	Audio Routing	Audio Routing setting		1000	X
82	USB Routing	USB Routing setting		1000	X
83	RS232 Routing	RS232 Routing setting		1000	X
84	IR Routing	IR Routing setting		1000	X
86	GPIO Routing	GPIO Routing setting		1000	X
87	Load Routing Mapping	Load Free Routing Mapping	0~3	V	X
88	Save Routing Mapping	Save Free Routing Mapping		V	X
90	Video Wall Max Row	Rows of Video Wall(Vertical)	0~7 (0=row 1, 1=row 2...)	0	X
91	Video Wall Max Column	Columns of Video Wall(Horizontal)	0~15 (0=column 1, 1=column 2)	0	X
92	Monitor Row Position	Monitor Position in Row	0~7	0	X
93	Monitor Column Position	Monitor Position in Column	0~15	0	X
94	Monitor Outside Width	Outer Width of Monitor	0~65000 (0.1mm)	0	X
95	Monitor Outside Height	Outer Height of Monitor		0	X
96	Monitor Viewable Width	Width of Viewable Area		0	X
97	Monitor Viewable Height	Height of Viewable Area		0	X
100	Stretch Type	Screen Stretch Type	0 = Auto 1 = Stretch Out 2 = Fit In	2	X
101	Rotate	Screen Rotation and Mirror	0 ~ 7	0	X
102	Vertical Shift	Screen Vertical Shift	400 = Default 399 ~ 0 = shift up 401 ~ 801 = shift down	400	X
103	Horizontal Shift	Screen Horizontal Shift	400 = Default 399 ~ 0 = shift left 401 ~ 801 =shift right	400	X
104	Vertical Scale	Screen Vertical Scale	0 ~ 255	0	X
105	Horizontal Scale	Screen Horizontal Scale		0	X
106	Load Video Wall	Load Video Wall Setting	0~15	V	X
107	Save Video Wall	Save Video Wall Setting		V	X
200	Backup Setting	Backup Setting to bank 0~3	0 ~ 3	V	V
201	Restore Setting	Restore Setting from bank 0~3		V	V
202	System Setting	System Setting	0~255 (Debug use, no recommend for general users)	V	V
203	Application Setting	Application Setting		V	V
333	Reset To Default	Reset to factory default		V	V
400	Preset Configuration	Set RX Group ID	0 ~ 15 (OEM Version only)	V	X
999	System Reboot	System Reboot		V	V

V = Available X = Not available Numbers = default value

Caution of IR Menu Function

- **Menu 17** Free Routing function only works in Multicast mode.
- **Menu 22** When disable USB extender function it will also disable keyboard mouse function.
- **Menu 25** Display or hide TV wall setting in the webpage.
- **Menu 27** You could disable keyboard mouse extender if any compatible issue, it will use USB extender instead of keyboard mouse extender.
- **Menu 33** To set customize IR remote, need to be import to RX by RS232 or Telnet command
- **Menu 35** For monitors which detect HDMI 5V to enter sleeping mode.
- **Menu 36** Turn off monitor by CEC command via RX.
- **Menu 41** Pass-Through means output resolution follow TX EDID, Auto Detect(Per EDID) means output resolution follow monitor EDID of RX, Customize resolution need to be setup by RS232 command or web page
- **Menu 47** Use default EDID at TX side, or copy monitor EDID at RX side. (In multicast mode)
- **Menu 49** Monitor HDCP version setting, with incorrect HDCP version setting it will show HDCP fail on black screen.

Option	Description
Disable	HDCP version follow source and Stream Type of content
HDCP 1.4 Always On	Monitor support HDCP 1.4
HDCP 2.2 Always On	Monitor support HDCP 2.2

- **Menu 50** Extender = RS232 extender, Keypad = for RS232 keypad or number key in terminal software, Auxiliary = auxiliary mode debug, Console = system console debug
- **Menu 60** Fast Switch mode works best when: resolution, frame rate, scan mode (interlaced/non-interlaced), color depth, color space, interface (HDMI/DVI), HDCP mode (ON/OFF) all above are the same.

Disable: Stop link before channel switch, is will show black screen between switching, if switch to the channel which not exist it will show diagnostic Information.
Enable: Keep link when channel switch, if switch to the channel which not exist may cause screen freeze 1~2 seconds then show diagnostic Information.

- **Menu 61** Conflict Check will check TX channel number at booting, reconnection and before switching, if channel number already existed the connection will be interrupted.
- **Menu 62** Channel Name will show full name instead of number only, the position of channel name is center of screen. Channel name can set by RS232 command or import from telnet port.
- **Menu 75** Message Redirect forward MENU message to TX RS232 port (Auxiliary mode) instead of OSD.
- **Menu 76** Command Redirect run RS232 command from Web or telnet port (Auxiliary mode).
- **Menu 80~86** Fix selected function not follow the channel, only available when free routing enabled.
- **Menu 90~107** Only available when video wall function enabled..

- **Menu 200** Will not backup the parameters of men function 107 Save Video Wall.
- **Menu 333** Will clear the parameters of men function 107 Save Video Wall.

RS232 Control

In RS232 extender mode, user could use RS232 port of transmitters to operate/setup the receivers at same channel by program like Hyper Terminal which built-in Windows XP and before version.
Hyper Terminal setting:〔**115200 bps (8-N-1), Flow control: None**〕(Properties -> Settings -> ASCII Setup... and select "**Send line ends with line feeds**" &"**Echo typed characters locally**")

We recommend set the RS232 routing for all receivers to one transmitter to avoid RS232 connection broken by video channel switching.

Command format: >CMD_Address> Command Parameters
Address, command and parameters are char, not hex code
Enter (LF or CR+LF) is required to execute the command
All accord receivers will run the command and parameters, we also add 3 kinds of user defined numbers except MAC & IP (Device No, Group No, Party No) for flexible application:

Mxxxxxx	The last 6 digits of MAC Address of receiver	e.g.: 2218688612AB = M8612AB
Ixxxx	The last 2 column of IP Address (HEX) of receiver	e.g.: 169.254.012.034 = I0C22
Dxxx	Device No	e.g.: Device No 123 = D123
Gxx	Group No	e.g.: Group No 12 = G12
Pxx	Party No	e.g.: Party No 34 = P34
Cxxx	Channel No	e.g.: Channel 123 = C123
ALL	All receivers	
TX	Transmitter which connected to RS232 port currently.	
RX	Receiver which connected to RS232 port currently.(for Auxiliary mode)	

Response format: <ACK_Address< Response character
Receivers will response message to transmitter as above format and send Newline after
When send command to multiple receivers(address as Gxx, Pxx, Cxxx, and ALL) they will not response.

Example:
>CMD_M**8612AB**> CHANNEL 12
(Set receiver which last 6 digits MAC Address is **8612AB** to Channel 12)

<ACK_M8612AB< OK
(Receiver which last 6 digits MAC Address is 8612AB response "OK")

RS232 Command and Parameters List

Command	Parameters	Description	Remark
CHANNEL	?	Show current channel number	Transmitter not support parameter NAME Receiver not support parameter CHECK
	[0~999]	Switch to specified channel	
	[0~999] NAME ?	Check current channel name	
	[0~999] NAME "string"	Set channel name, 28 character MAX	
	NAME ?	Show channel name setting	
	NAME [ENABLE | DISABLE]	Enable/disable channel name	

	NAME CLR	Clear all channel name	
	NAME IMPORT	Import channel name	
	FAST ?	Status of current fast switch	
	FAST [ENABLE | DISABLE]	Enable/disable fast switch	
	CHECK ?	Status of channel conflict check	
	CHECK [ENABLE | DISABLE]	Enable/disable channel conflict check	
FAVORITE	?	Usage of favorite channel (MAX.32)	Transmitter not support parameter FAVORITE
	ADD	Add current to favorite channel	
	ADD [0~999]	Add specified channel to favorite	
	DEL	Delete current from favorite channel	
	DEL [0~999]	Delete specified channel from favorite	
	CLR	Clear favorite channel list	
	ONLY ?	Status of favorite channel only	
	ONLY [ENABLE | DISABLE]	Enable/disable favorite channel only	
	AUTO ?	Status of auto sort favorite channel	
	AUTO [ENABLE | DISABLE]	Enable/disable auto sort favorite	
	SORT	Sort favorite channel immediately	
VIDEO	FUNC ?	Status of video extension	Transmitter not support parameter ROUTING, SCALER, CUSTOMIZE, RESUME, PAUSE, and BLACK Receiver not support parameter QUALITY and DITHER
	FUNC [ENABLE | DISABLE]	Enable/disable video extension	
	ROUTING ?	Status of video routing	
	ROUTING [FOLLOW | 0~999]	Set video routing follow or specified	
	SELECT ?	Status of video input / output mode	
	SELECT [0~2]	Set input / output, 0=DVI, 1=VGA, 2=DVI+VGA	
	SCALER ?	Status of video output resolution	
	SCALER [0~4 | 5]	Set output resolution, 5=customize	
	CUSTOMIZE ?	Status of customize resolution	
	CUSTOMIZE integer	Set customize resolution	
	QUALITY ?	Status of video quality	
	QUALITY [0 | 1~5 | 6]	Set video quality	
	DITHER ?	Status of video dither	
	DITHER [0 | 1~2]	Set video dither	
	EDID	Update EDID from TX or monitor of RX	
	RESUME	Resume stream	
	PAUSE	Pause stream	
	BLACK	Stop stream and send black screen	
VIDEOWALL	FUNC ?	Status of video wall function	Transmitter support FUNC only
	FUNC [ENABLE | DISABLE]	Enable/disable video wall	
	MODE ?	Status of video wall mode	
	MODE [ENABLE | DISABLE]	Set video wall mode/single mode	
	LOAD 0~15	Load video wall setting (all)	
	LAYOUT 0~15	Load video wall layout (MAX Row/MAX Column/Row/Column)	
	SAVE 0~15	Save video wall setting (all)	
	OW ?	Show outer width of monitor	
	OW [0~65535]	Set outer width of monitor	
	OH ?	Show outer height of monitor	
	OH ? [0~65535]	Set outer height of monitor	
	VW ?	Show width of viewable area	
	VW ? [0~65535]	Set width of viewable area	
	VH ?	Show height of viewable area	
	VH ? [0~65535]	Set height of viewable area	
	MAX_ROW ?	Show maximum row of video wall	
	MAX_ROW 0~7	Set the row 1~8 of video wall	
	MAX_COLUMN ?	Show maximum column of video wall	
	MAX_COLUMN [0~15]	Set the column 1~16 of video wall	
	ROW?	Show position in row	
	ROW [0~7]	Set position in row	
	COLUMN ?	Show position in column	

	COLUMN [0~15]	Set position in column	
	STRETCH ?	Status of stretch type	
	STRETCH [0~2]	Set stretch, 0 = Auto, 1 = Stretch Out, 2 = Fit In	
	ROTATE ?	Status of rotate type	
	ROTATE [0~7]	Set rotate, 0 = default	
	SHIFT_V	Status of vertical shift	
	SHIFT_V [0~399 | 400 | 401~801]	0~399: up, 400:default, 401~801: down	
	SHIFT_H ?	Status of horizontal shift	
	SHIFT_H [0~399 | 400 | 401~801]	0~399: up, 400:default, 401~801: down	
	SCALE_V ?	Status of vertical scale	
	SCALE_V [0~255]	Set vertical scale	
	SCALE_H ?	Status of horizontal scale	
	SCALE_H [0~255]	Set horizontal scale	
	ENABLE %1_%2_%3_%4	%1 = MAX_ROW, %2 = MAX_COLUMN, %3 = ROW, %4 = COLUMN	
	MONITOR_INFO %1_%2_%3_%4	%1 = VW, %2 = OW, %3 = VH, %4 = OH	
AUDIO	FUNC ?	Status of audio extension	Transmitter not support parameter ROUTING
	FUNC [ENABLE | DISABLE]	Enable/disable audio extension	
	ROUTING ?	Status of audio routing	
	ROUTING [FOLLOW | 0~999]	Set audio routing follow or specified	
	SELECT ?	Status of audio setting	
	SELECT [0~2]	Select audio of TX input or RX output (0=Digital, 1=Analog, 2=Auto)	
	IN ?	Status of audio input volume	
	IN [0 | 1~100]	Set audio input volume (%), 0 = Mute	
	OUT ?	Status of audio output volume	
	OUT [0 | 1~100]	Set audio output volume (%), 0 = Mute	
USB	FUNC ?	Status of USB extension	Transmitter not support parameter ROUTING and REQUEST
	FUNC [ENABLE | DISABLE]	Enable/disable USB extension	
	ROUTING ?	Status of USB routing	
	ROUTING [FOLLOW | 0~999]	Set USB routing follow or specified	
	REQUEST	Request USB access (multicast only)	
	KM FUNC ?	Status of keyboard mouse extension	
	KM FUNC [ENABLE | DISABLE]	Enable/disable keyboard mouse extension	
RS232	FUNC ?	Status of RS232 extension	Transmitter not support parameter ROUTING
	FUNC [ENABLE | DISABLE]	Enable/disable RS232 extension	
	ROUTING ?	Status of RS232 routing	
	ROUTING [FOLLOW | 0~999]	Set RS232 routing follow or specified	
	SELECT ?	Status of RS232 setting	
	SELECT [0~4]	0=Disable, 1=Extender, 2=Keypad, 3=Auxiliary, 4=Console	
	CTRL ?	Status of RS232 control setting	
	CTRL [0~2]	0=disable, 1=enable, 2=insensitive	
	BAUD ?	Status of baud rate	
	BAUD [0~9]	0=115200, 1=57600, 2=38400... 9=300	
	NEWLINE ?	Status of newline format	
	NEWLINE [0~3]	0=Linux, 1=Windows, 2=Mac, 3=Other	
	TRIGGER ?	Status of trigger	
	TRIGGER [0~3]	0=Linux, 1=Windows, 2=Mac, 3=Other	
IR	FUNC ?	Status of IR extension	Transmitter not support parameter ROUTING
	FUNC [ENABLE | DISABLE]	Enable/disable IR extension	
	ROUTING ?	Status of IR routing	
	ROUTING [FOLLOW | 0~999]	Set IR routing follow or specified	
	CTRL ?	Status of IR control setting	
	CTRL [ENABLE | DISABLE]	Enable/disable IR control	
	ID ?	Status of IR remote ID	
	ID [0~10]	Set IR remote ID	
	KEY [0~32] ?	Status of IR key setting	

	KEY [0~32] = address, command	Set mapping of third party IR remote	
	KEY IMPORT	Import IR key setting	
	BLOCK ?	Status of IR quick block	
	BLOCK [ENABLE | DISABLE]	Enable/disable IR quick block	
BUTTON	CTRL ?	Status of button control	
	CTRL [ENABLE | DISABLE]	Enable/disable button control	
	LOCK ?	Status of button lock	
	LOCK [ENABLE | DISABLE]	Enable/disable button lock	
ROTARY_SW	?	Status of rotary switch	HKM02BT only
	[ENABLE | DISABLE]	Enable/disable rotary switch	
HDCP	?	Status of HDCP Always On	
	0~2	0=Disable, 1=HDCP 1.4, 2=HDCP 2.2	
EDID	UPDATE	Update EDID from monitor of RX	Transmitter not support parameter UPDATE, only HKM02BT support loop out Receiver not support parameter SELECT and Mode
	SELECT ?	Status of TX default EDID setting	
	SELECT [0~3]	0=HDMI, 1=DVI, 2=VGA, 3=Loop Out	
	MODE ?	Status of EDID process	
	MODE [0~1]	0=normal, 1= Patch EDID	
HDMI	CTRL ?	Status of HDMI 5V control	Transmitter not support parameter CTRL
	CTRL [ENABLE | DISABLE]	Enable/disable HDMI 5V control	
SCREEN	?	Status of screen settings	Transmitter not support this command
	[ON | OFF]	Screen on/off	
	SAVER ?	Status of screen saver	
	SAVER [ENABLE | DISABLE]	Enable/disable screen saver	
	OPTION ?	Status of behavior after screen off	
	OPTION [0~2]	Set behavior after screen off	
OSD	ON “string”	Show “string” on screen (30 seconds)	Transmitter not support this command
	OFF	Turn off OSD immediately	
	OFF ?	Status of OSD duration (ms)	
	OFF [0~65535]	Set duration of OSD (ms)	
ROUTING	?	Status of free routing	Transmitter not support parameter LOAD and SAVE
	[ENABLE | DISABLE]	Enable/disable free routing	
	LOAD [0~3]	Load free routing setting	
	SAVE [0~3]	Save free routing setting	
DEVICE	?	Status of device number	Transmitter not support this command
	[0~999]	Set device number	
GROUP	?	Status of group number	Transmitter not support this command
	[0~99]	Set group number	
PARTY	?	Status of party number	Transmitter not support this command
	[0~99]	Set party number	
NET	RECONNECT	Reconnect with TX/RX	Transmitter not support parameter DISCONNECT
	DISCONNECT	Disconnection (keep routing channel)	
	STOP	Stop all connection (Include routing channel)	
	MULTICAST ?	Status of multicast	
	MULTICAST [ENABLE | DISABLE]	Disable=unicast	
	JUMBO_FRAME ?	Status of Jumbo Frame	
	JUMBO_FRAME [ENABLE | DISABLE]	Enable/disable Jumbo Frame	
	IP_MODE ?	Status of IP mode	
	IP_MODE [0~2]	0=Auto, 1=static, 2=DHCP	
	IP ?	Status of static IP address	
	IP [xxx.xxx.xxx.xxx]	Set static IP address	
	NETMASK ?	Status of subnet mask (static IP mode)	
	NETMASK [xxx.xxx.xxx.xxx]	Set subnet mask (static IP mode)	
	GATEWAY ?	Status of gateway (static IP mode)	
	GATEWAY [xxx.xxx.xxx.xxx]	Set gateway (static IP mode)	
QUERY	IP	Status of current IP address	
	MAC	Status of MAC address	

	RESOLUTION	Status of video resolution	
	VERSION	Status of firmware version	
AUXILIARY	BAUD ?	Status of auxiliary baudrate	
	BAUD [0~9]	0=115200, 1=57600, 2=38400... 9=300	
	NEWLINE ?	Status of auxiliary newline	
	NEWLINE [0~3]	0=Linux, 1=Windows, 2=Mac, 3=Other	
	TRIGGER ?	Status auxiliary trigger	
	TRIGGER [0~3]	0=Linux, 1=Windows, 2=Mac, 3=Other	
	VERSION	Status of auxiliary versions	
LOAD	DEFAULT	Load default to current setting	When load default the settings will be auto saved.
	[0~3]	Load system setting from bank 0~4	
	PRESET 0~15	Load preset 0~15 to set RX group ID	PRESET for OEM version RX only
SAVE		Save current system setting	
	[0~3]	Save system setting to bank 0~4	
REBOOT		Reboot	
CONSOLE	string	Run console API command	For debug using, if input incorrect value will cause unpredictable problem, adjust by professional installer only.
SYSTEM	[0~255] ?	Status of system function	
	[0~255]	Set system function	
APPLICATION	[0~255] ?	Status of application function	
	[0~255]	Set application function	

※RS232 command not support backspace, delete or up, down, left, right to modification. If you enter command or parameters with wrong typing, please enter newline and re-enter full command and parameters again.

※Parameters with green means need to reboot to take effect.

※ The maximum of OSD_ON is 30 characters per line, maximum 127 charcters, not support comma sign「**,**」, colon「**:**」 and double quotation marks「**"**」, some characters must use \x## format to display, ## means the characters number in ASCII HEX code
e.g.: **\x0a** is line feed, **\x28** is **(** brackets sign, **\x22** is **"** sign

Example:
>CMD_M861234> CHANNEL 12 (Set receiver which last 6 digits MAC Address is 861234 to Channel 12)
(HEX code: 3E 43 4D 44 5F 4D 38 36 31 32 33 34 3E 20 43 48 41 4E 4E 45 4C 20 31 32 0D 0A)

<ACK_M861234< OK (Receiver which last 6 digits MAC Address is F01234 response "OK")
(HEX code: 3C 41 43 4B 5F 4D 38 36 31 32 33 34 3C 20 4F 4B 0D 0A)

>CMD_I0A12> CHANNEL 3 (Set receiver which IP Address is 169.254.10.18 to Channel 3
(HEX code: 3E 43 4D 44 5F 49 30 41 31 32 3E 20 43 48 41 4E 4E 45 4C 20 33 0D 0A)

<ACK_I0A12< OK (Receiver which IP Address is 169.254.10.18 response "OK")
(HEX code: 3C 41 43 4B 5F 49 30 41 31 32 3C 20 4F 4B 0D 0A)

>CMD_G34> CHANNEL 5 (Set receivers which Group No is 34 to Channel 5)
(HEX code: 3E 43 4D 44 5F 47 33 34 3E 20 43 48 41 4E 4E 45 4C 20 35 0D 0A) (No response from multiple receivers)

>CMD_ALL> OSD ON "Hello! \x28123\x29 \x22ABC\x22" (Show「Hello! (123) "ABC"」to all monitor and send response)
(HEX code: 3E 43 4D 44 5F 41 4C 4C 3E 20 4F 53 44 20 4F 4E 20 22 48 65 6C 6C 6F 21 20 5C 78 32 38 31 32 33 5C 78 32 39 20 5C 78 32 32 41 42 43 5C 78 32 32 22 0D 0A) (No response from multiple receivers)

>CMD_ALL> OSD OFF 10000 (All receiver turn off OSD after 10 seconds)
(HEX code: 3E 43 4D 44 5F 41 4C 4C 3E 20 4F 53 44 20 4F 46 46 20 31 30 30 30 30 0D 0A)

Keypad Control

You can use RS232 Keypad or terminal program with number key to emulate IR remote operation. Before using RS232 keypad you have to select Keypad by **Menu 50 RS232 Select**, and set keypad baudrate by **Menu 54 Auxiliary Baudrate**.

Key	Description
0~9	Enter number
+	Increase value
-	Reduce value
. or **#**	Previous value
Enter	Confirm
***** or **Esc** or **Clear**	Cancel
/	Call MENU
Press **Clear** four times then press **Enter**	Call MENU

USB Hot Key Function

In multicast mode support multi USB keyboard and mouse in each receivers, just plug and play, but only one USB FLASH drive / hard disk could be used at the same time.
You have to click "**Pause/Break**" key **three times** of the keyboard on the receiver or IR remote MENU function **14** to establish USB FLASH drive /hard disk connection.

APP Control Function

APP name: B&W Video Wall Control II

Android/iOS App

App instruction

Windows 10 Software download link:
https://www.microsoft.com/store/apps/9P268VD25977

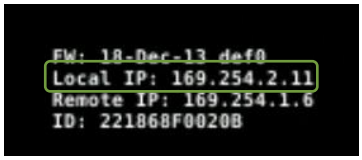
IP Setting

You could input the IP address of transmitter / receiver at link column of browser which printed in the label. If the label is missing or not able to identify you can check the IP address as below:

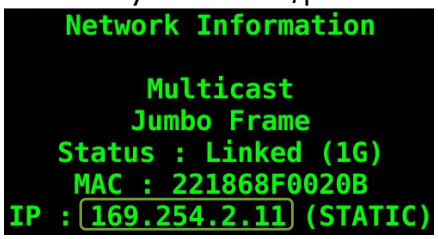
How to get the IP address of receiver:

1. Check the sticker at bottom of receiver with default IP

2. Connect monitor with receiver, Local IP shows on right bottom.

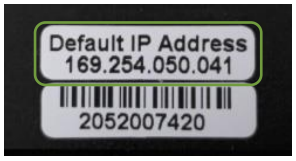


3. **MENU 1** by IR remote/panel button to shows IP Address on screen

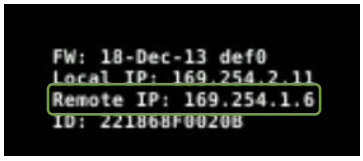


How to get the IP address of transmitter:

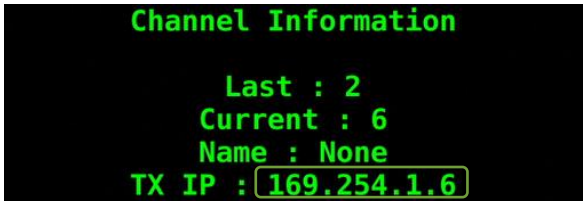
1. Check the sticker at bottom of transmitter with default IP address.



2. Connect monitor with receiver, Remote IP shows on right bottom.



3. **MENU 6** by IR remote/panel button to shows IP Address on screen



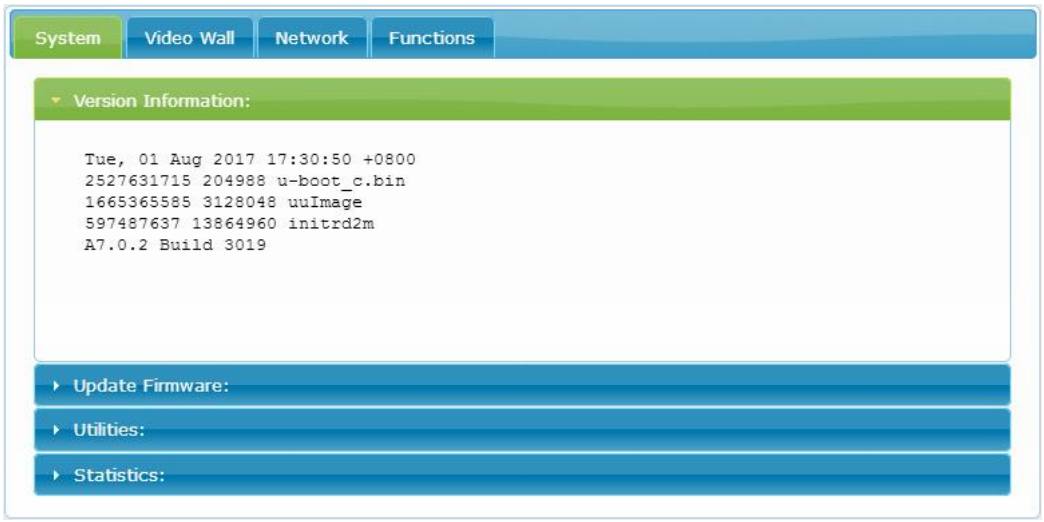
If the IP address on the label of transmitters/receivers is incorrect (maybe changed by someone), you could reset the transmitters and receiver to default in two ways below:
1. Press the channel button "-" than power on (power and link LED will be flash) to reset to default.
2. Press IR remote control MENU, 3, 3, 3, ENTER to reset to default.

Web configuration

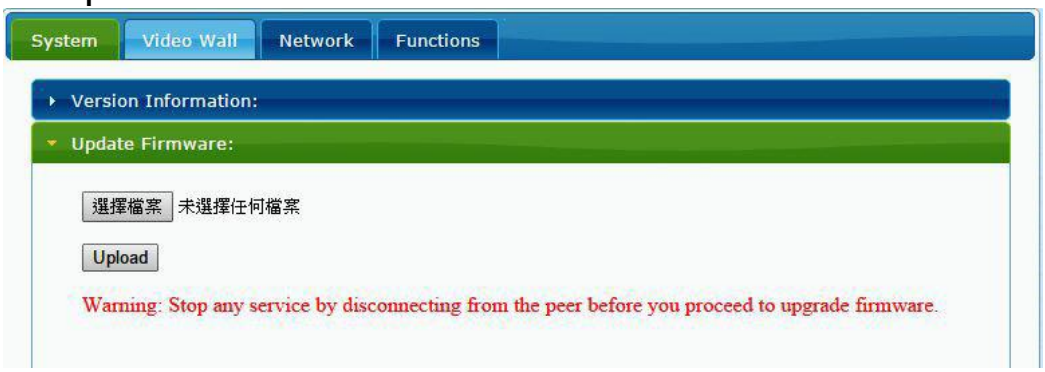
System

- **Version Information**

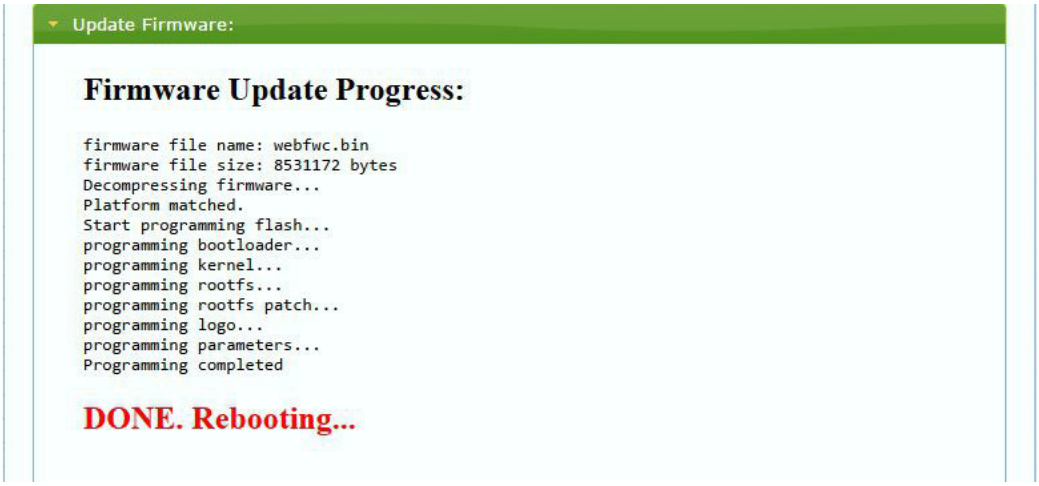
  Firmware version and other information



- **Update Firmware**

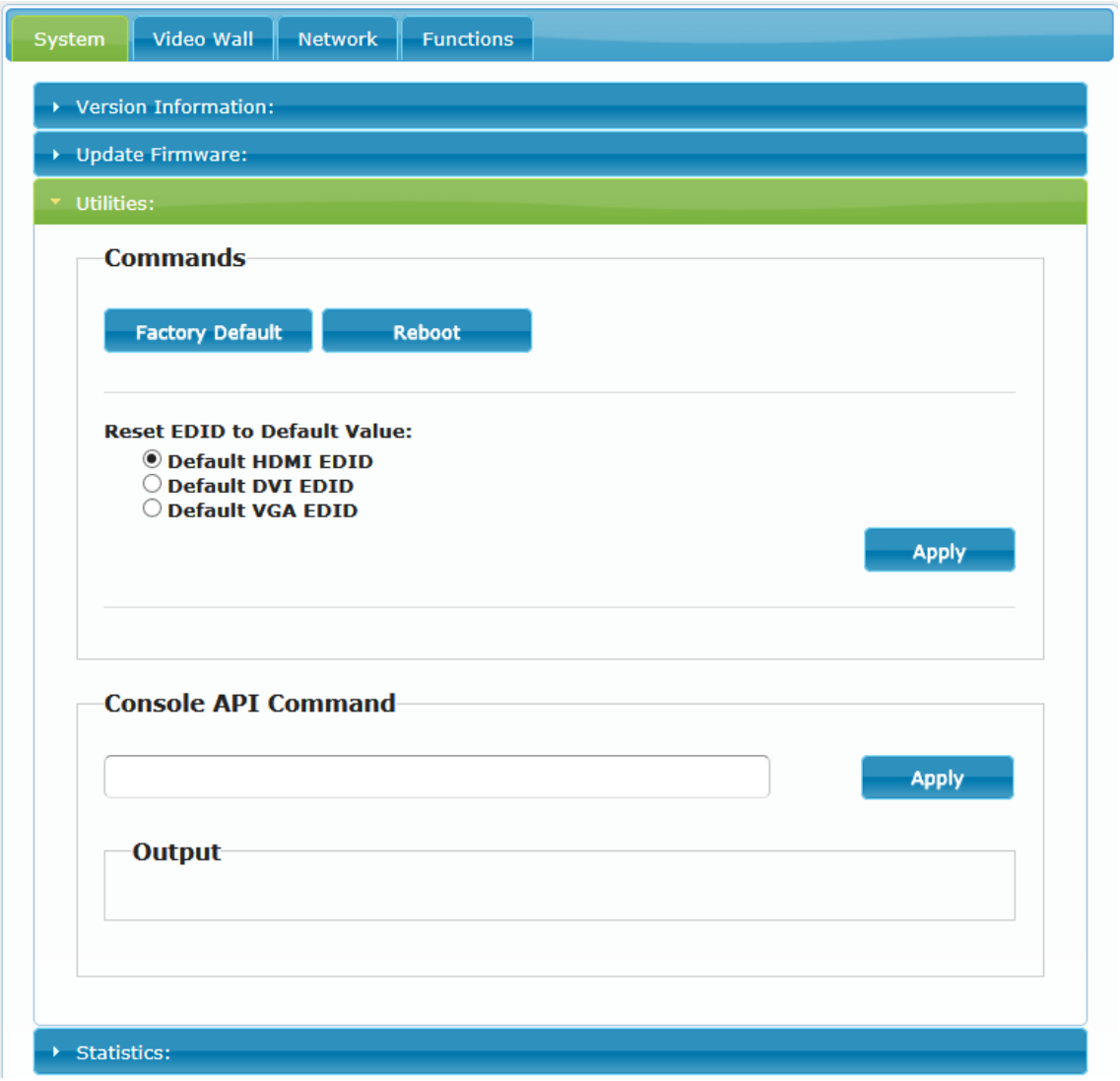


Click “Select File” to browse firmware at local disk drive then click “Upload” to start update.



During update the web will shows the status as above message. Updated unit will reboot automatically after updating firmware. If not, please reboot manually.

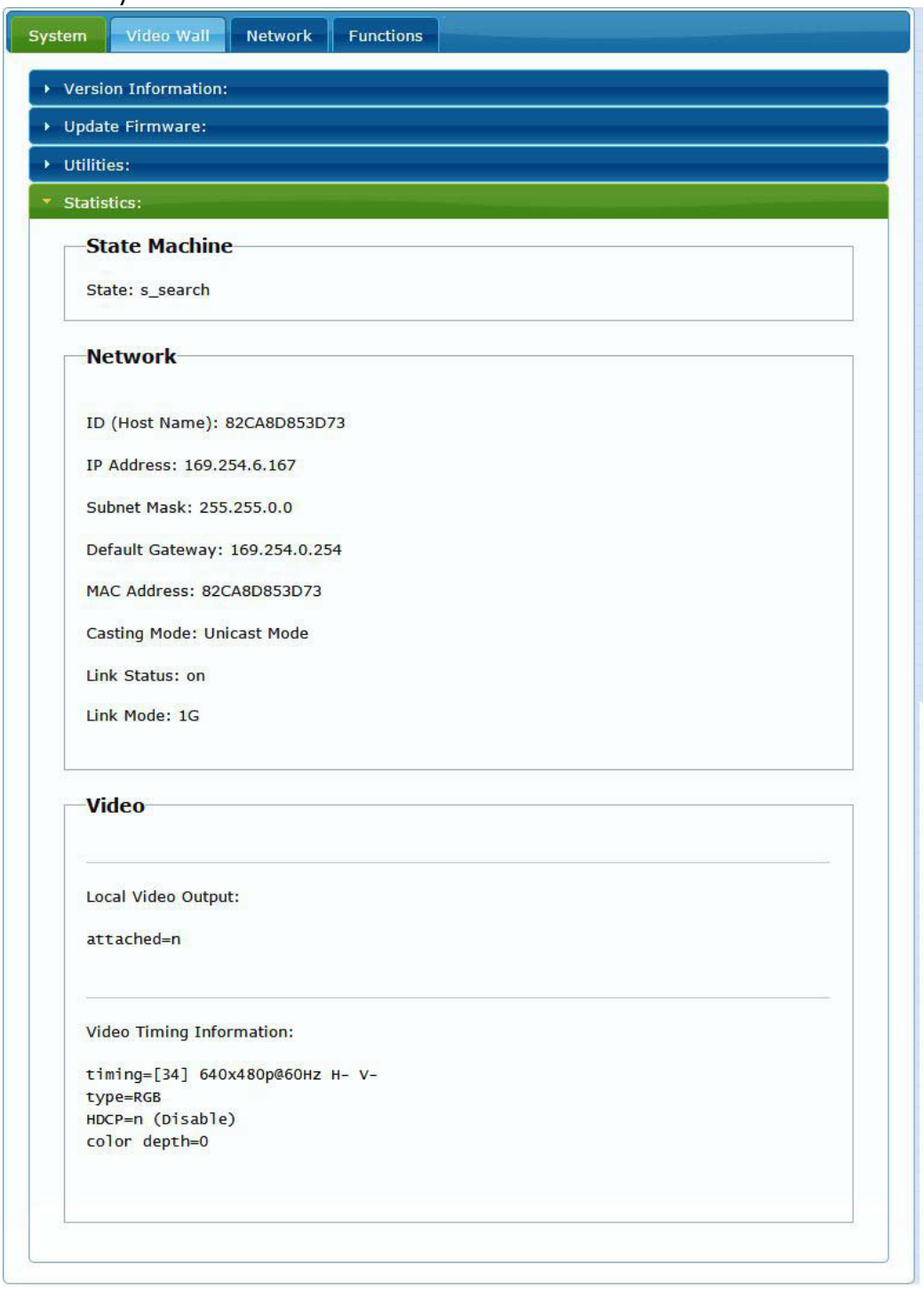
Do not refresh, close, switch tab of web browser or power off to avoid any damage during firmware update.



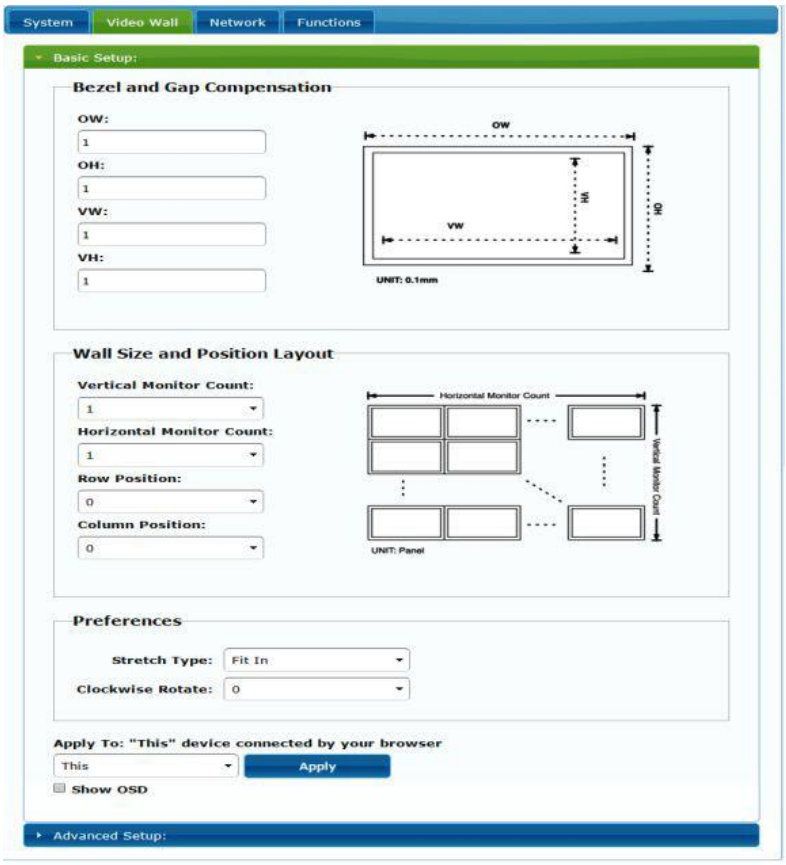
- **Utilities**
  - Factory Default — Set system to factory default
  - Reboot — Reboot system
  - Default EDID — Set EDID to default 1080p 7.1 channel audio
  - Console API Command — Enter Console API command to change setting or control

- **Statistics**

Indicate system status



Video Wall:



- **Basic Setup**
- Bezel and Gap Compensation: Set outer width/height of monitor and width/height of viewable area.
  OW: outside width **OH:** outside height **VW:** viewable width **VH:** viewable height
  Please note:
  1. The viewable width/height must be less than the outside width/height.
  2. Keep all values be 0 if you do not use this function.
  3. The value is based on millimeter and MUST be integer.

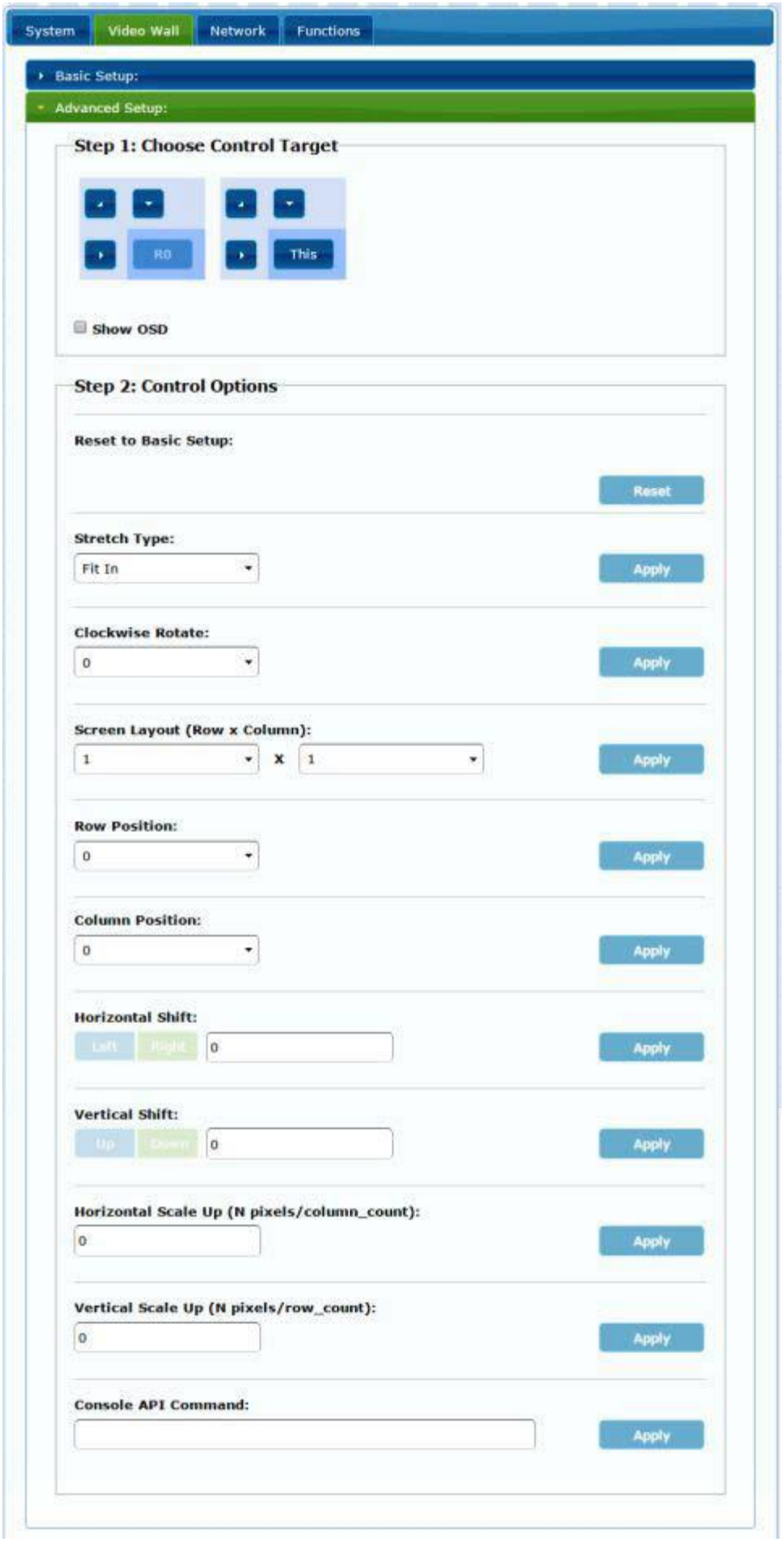
- Wall Size and Position Layout: Set scale of video wall and position of monitor
  Vertical monitor count: 1~8
  Horizontal monitor count: 1~16
  Row position: 0~7
  Column position: 0~15

- Preferences: Set extension way and rotation
  Select the video fit in the screen or stretch out and rotate angle

- Apply To:
  1. All: Configure all Transmitter and Receiver in the list.
  2. This (Local): Current device which you log in by web browser.
  3. Hosts or Clients: select which Transmitter or Receiver you want to configure.

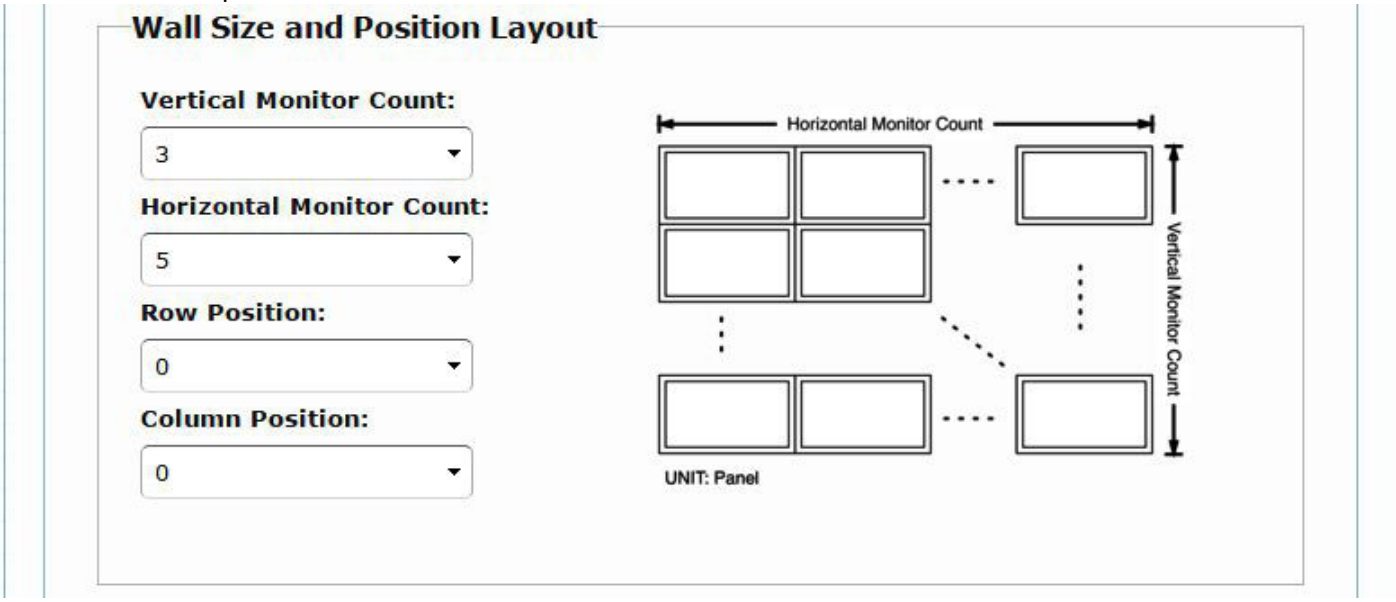
- Show OSD:
  Check this box to show receiver's specific number (follow list order) to connected monitor

- **Advance Setup:**



Before enter “Advanced Setup”, please complete the “Basic Setup” as follows:

1. In “Basic Setup”, select Vertical and Horizontal Monitor Count.



2. In “Advanced Setup”, choose the target of the video wall to control

Step 2: Control Options

- Reset to Basic Setup:

Press “Reset” if user make incorrect operations.

- Stretch Type:

Setup the video output to “Fit In’ or “Stretch Out” mode in the screen

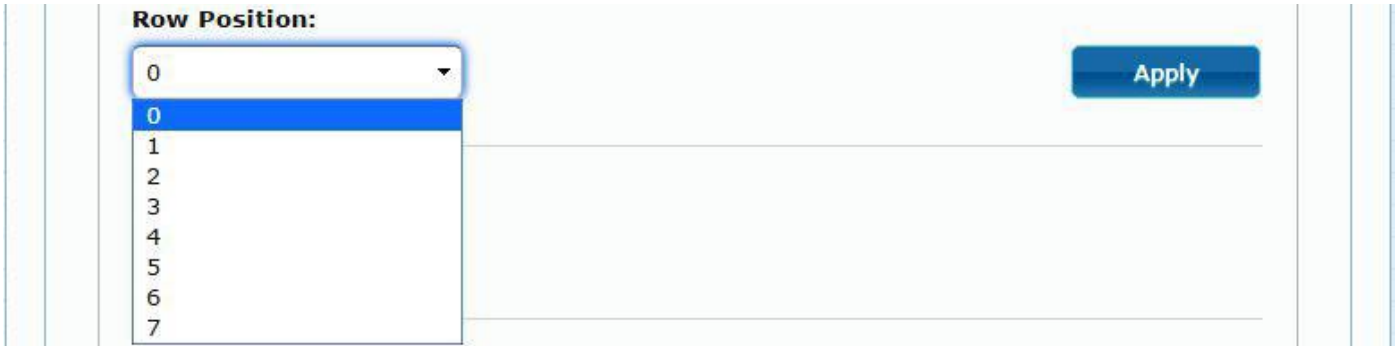
- Clockwise Rotate:

Setup the rotation angle 0,180, 270 degree of the video output

- Screen Layout (Row x Column):

Set up the number of vertical and horizontal monitor based on the video wall layout. Vertical number 1~8 and horizontal number 1~16.

- Row Position:

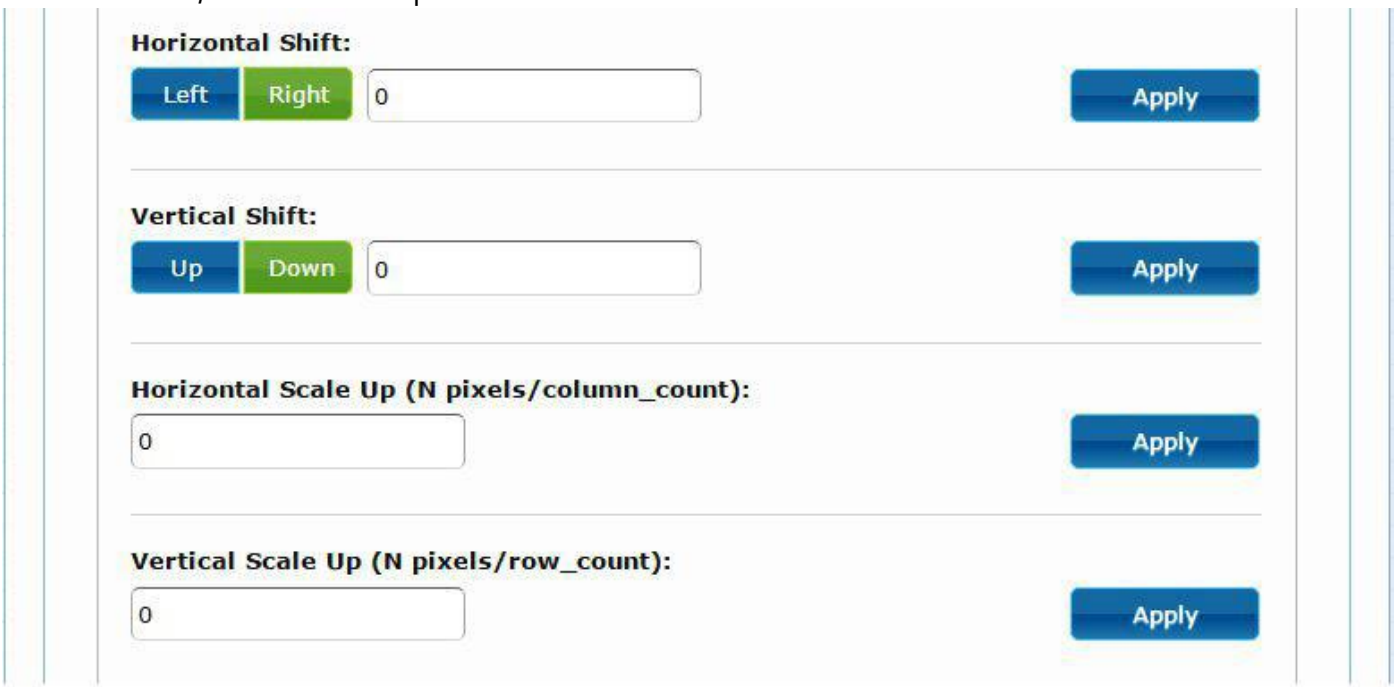


Setup the row position of monitor, number from 0 to the total number of vertical monitor.

- Column Position:

Setup the column position of monitor, number from 0 to the total number of horizontal monitor.

- Horizontal/Vertical Shift:
- Horizontal/Vertical Scale Up

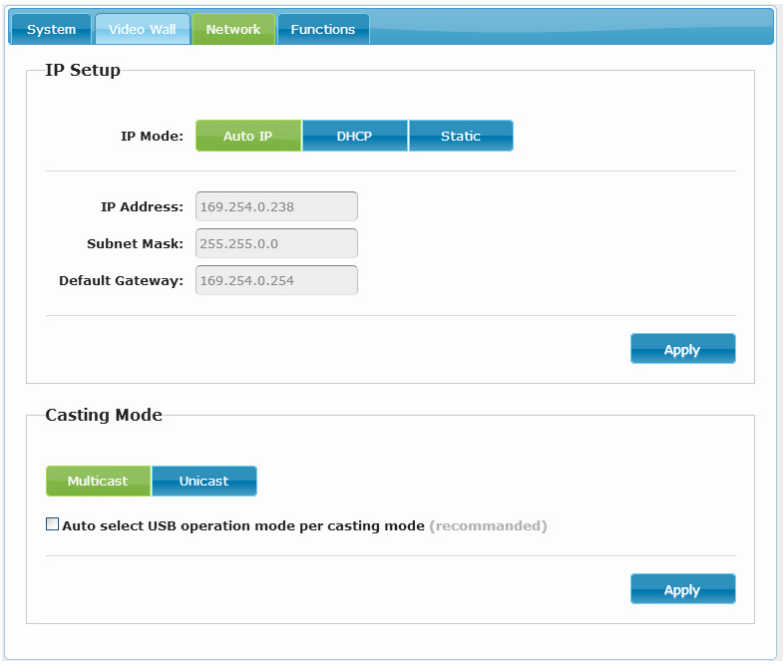


Horizontal Shift: Set the video horizontal shift, Left or Right by pixels.
Vertical Shift: Set the video vertical shift, Up or Down by pixels.
Horizontal Scale Up: Set the video horizontal scale up by pixels.
Vertical Shift Scale Up: Set the video vertical shift scale up by pixels.

- Consol API Command:

Input Linux command to do advanced setup.

Network:

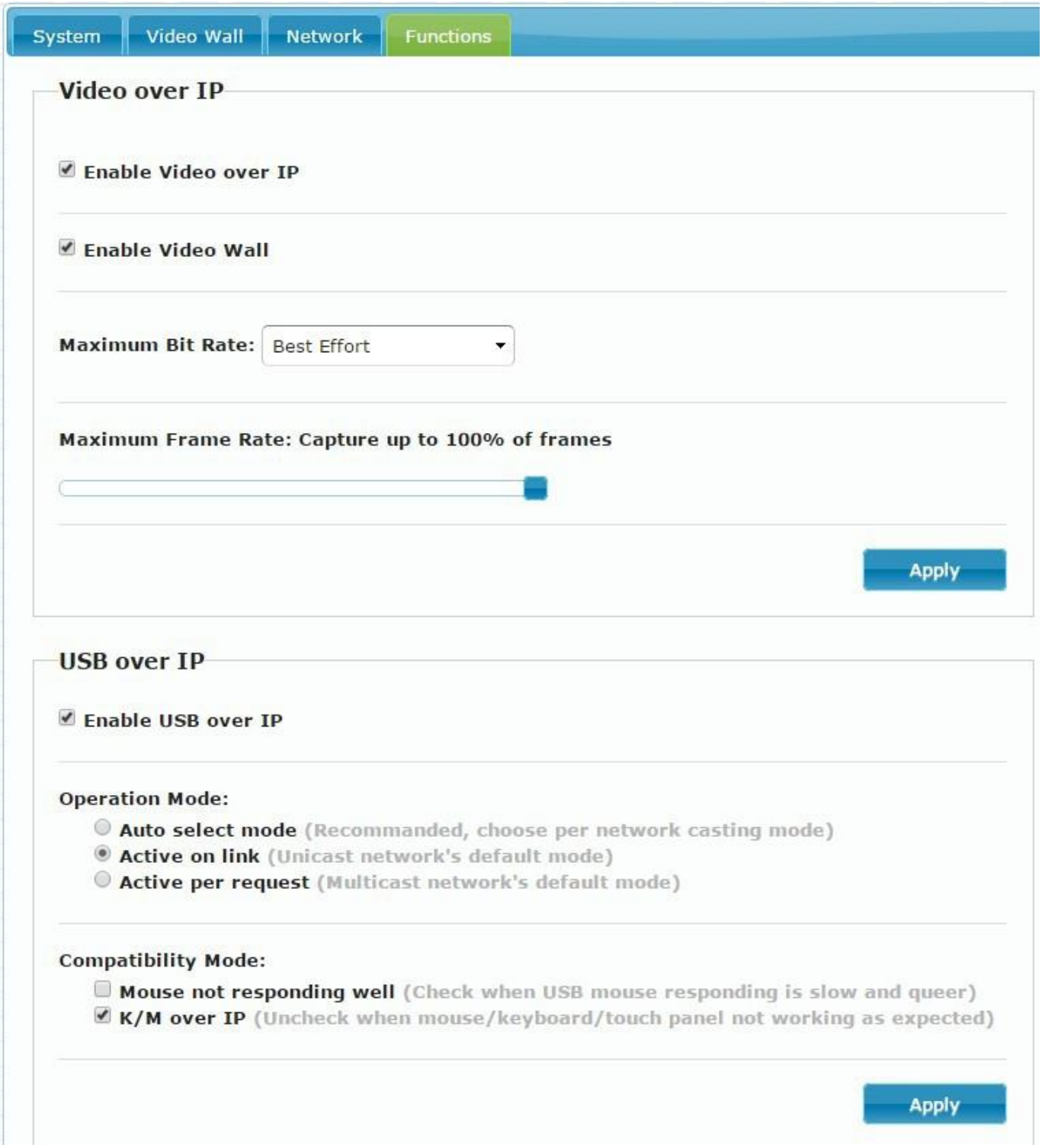


- **IP Setup:**
  IP Mode could be Auto IP, DHCP, Static three mode
  Host default setting is Static IP, client default setting is Auto IP
  For mass deploying please use static or DHCP mode.

  Notice: if there is no DHCP server in network the host/client will keep reboot, you need to set the host/client to factory default
  Press channel button "**-**" than power on (power and link LED will be flash)

- **Casting Mode :**
  Could be Multicast, Unicast mode, default is Multicast，
  When using Multicast mode, please check the "Auto select USB operation mode per casting mode" box

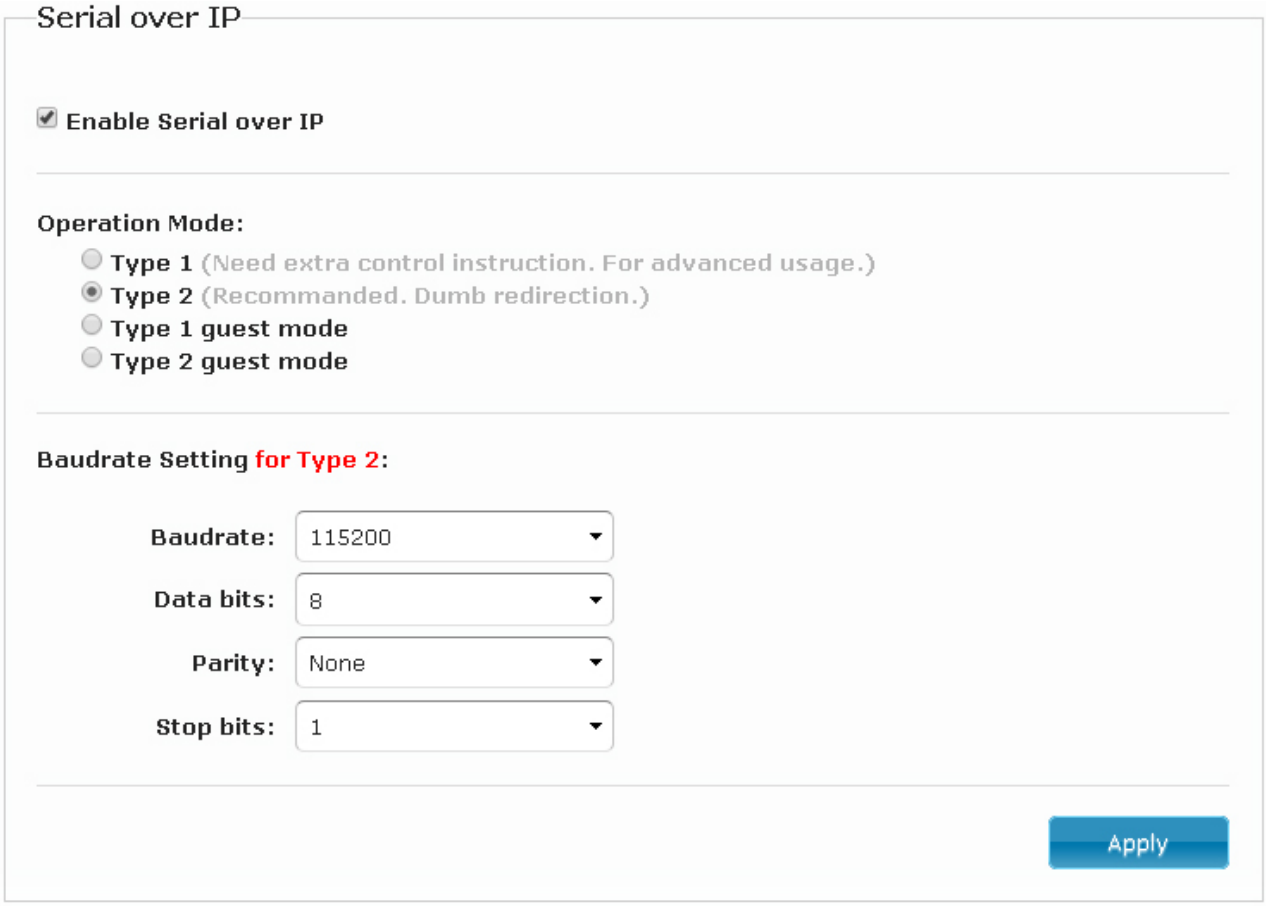
Functions for Transmitter:



- **Video over IP**
  - Enable Video over IP: This function setup the video signals send from network.
  - Enable Video Wall: This function setup the video wall, default is not checked.
  - Maximum Bit Rate: Set maximum bit rate.
  - Maximum Frame Rate: Set maximum frame rate.

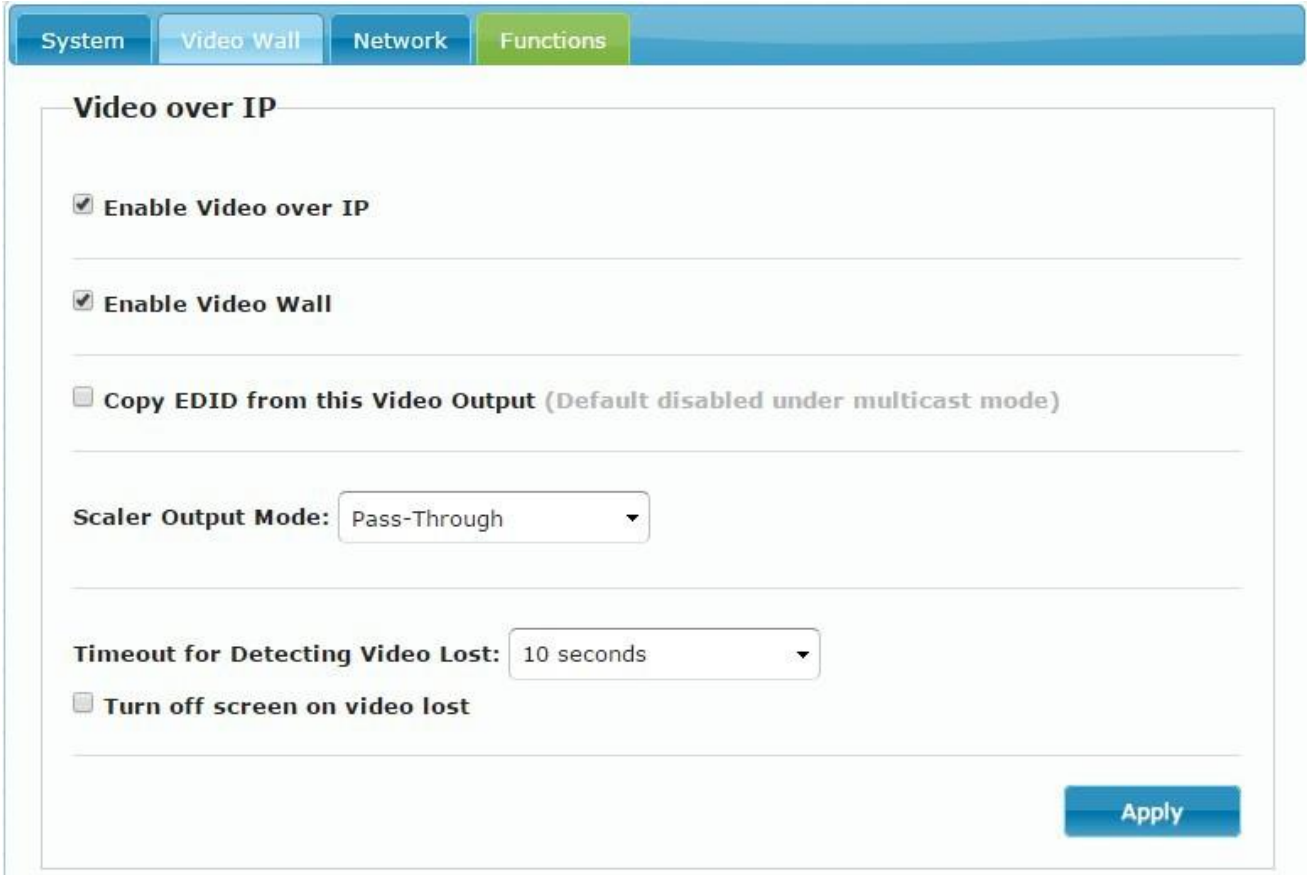
- **USB over IP**
  - Enable USB over IP: Enable/disable USB extender function.
  - Operation Mode: Set USB operation mode. **Recommand Auto select mode.**
  - Compatibility Mode: Set USB compatibility mode.

- **Serial over IP：**

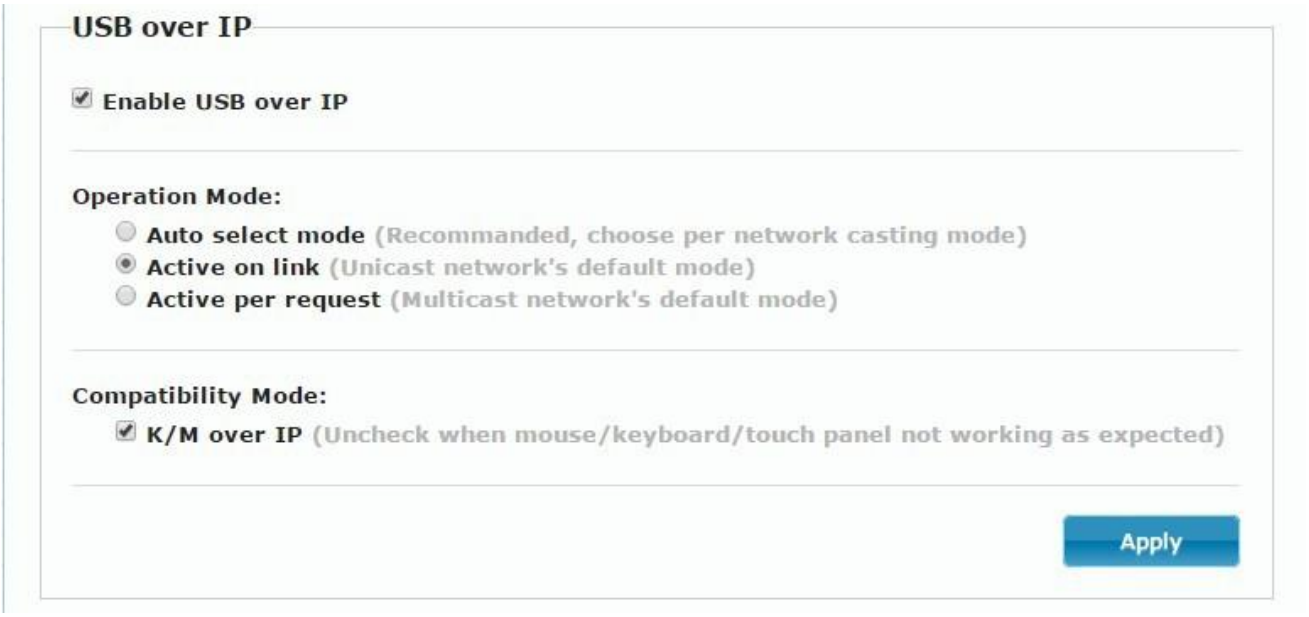


- Enable Serial over IP: setup Serial (RS232) signal sends from network
- Operation Mode:Default is “Type 2 (Recommended. Dumb redirection.)”
- Baudrate Setting for Type 2 : **default is 115200, 8, None, 1**

Functions for Receiver:



- **Video over IP**
  - Enable Video over IP: This function setup the video signals send from network.
  - Copy EDID from this Video Output: Copy EDID from TV when booting **(unicast mode only)**, default is not checked.
  - Scaler Output Mode: Select the required scalar output mode or select "Customize" and input 8 Hex values for more video output resolution and refresh rate selections.
    1) 80000004: HD 720p60
    2) 81000061: WXGA 1366x768@60
    3) 81000040: WXGA+ 1440x900@60
    4) 81000051: WUXGA 1920x1200@60
    5) 8100003C: SXGA+ 1400x1050@60
  - Timeout for Detecting Video Lose: **Please do not change this.**
  - Turn off screen on video lost: **Please do not check this box**



- **USB over IP:**
  - Enable USB over IP: Enable/disable USB extender function.
  - Operation Mode: Set USB operation mode. **Recommand Auto select mode.**
  - Compatibility Mode: Set USB compatibility mode.

Troubleshooting

1. Transmitter/receiver boot time require 30 seconds and will be able to control after booting, First time reboot after reset to default will be longer than 30 seconds.
2. Not recommend to work with existing LAN connection to avoid large video, data transmission or multicast packets to slow down your other LAN devices.
3. Gigabit switching hub muse support IGMP and Jumbo Frame over 8K in order to achieve the best quality
4. If monitor shows green screen, please check if the switch running under gigabit and IGMP/Jumbo Frame function enabled.
5. If video not smooth please check if IGMP function enabled or bandwidth of switch closes to maximum.
6. If UTP and SFP connected together the first connected one will get the priority, the other one will online automatically once another one failed.
7. If Ethernet is not connected may cause unpredictable problem or OSD message error, please connect to the Ethernet and reboot.
8. Default EDID is 1080p 7.1 audio, you can use Menu function 44 to copy EDID from monitor of RX.
9. If the monitor of RX shows shortly then turns into black but OSD shows properly, please check the HDCP version of monitor support is tally with the source required, and the casting mode of TX/RX are the same and the HDCP setting is correct.
10. If receiver switches to transmitter which no video input, it will show blank screen or last still image for seconds.
11. Fast switch mode might cause screen or audio abnormal briefly when switch channel.
12. When output resolution is fixed, the screen or OSD might be cut a little if the source resolution is much different with the output (like 4K downscale to 720p).
13. In high resolution (like 1080p or 4K) the OSD response will be delayed a little bit.
14. In video wall mode, the OSD may not be in correct size and position
15. RS232 only support data transmission (TXD, RXD), not support hardware handshake (RTS, CTS, DTR, DSR...)
16. Power from power adapter with priority than power from PoE.
17. The front panel IR will be disable when external IR cable plugged.
18. If IR remote not work properly, please check the battery (especial in low temperature) and reset IR ID.
19. Audio in of RX only works at unicast mode, and the audio in and audio out of TX must be connected.
20. Audio in of RX is designed for mono Mic in, not for stereo Line in.
21. When using computer or mobile APP management the IP address should be set in same network segment.
22. TV wall setting parameter between APP/PC software and IR menu/Web are different and might be cover each other, we recommend set TV wall by one of two ways to prevent conflict.
23. PC software and APP operation please refer to software operating instruction.
24. Not recommend control by panel, computer software and APP at the same time to prevent conflict.

Package Include

HKM02BT-4K Package Include:
Transmitter x 1 pcs
USB A to B cable x 1 pcs
IR emitter cable x 1 pcs

HKM02BR-4K Package Include:
Receiver x 1 pcs
IR emitter cable x 1 pcs
IR remote control x1 pcs

Specification

ITEM NO.	HKM02BPT-4K	HKM02BPR-4K
Support		
Compliance	HDCP 2.2, USB 1.1, USB 2.0	
Max. Video Resolution	4K@30Hz 4:4:4	
Max. Transmission Distance	150M over CAT5e Cable or Greater	
Audio Format	7.1 LPCM 192kHz, Dolby True HD, DTS-HD Master Audio, ATMOS, DTS:X	
IR Support	20-60kHz , ±45°, 5M	
Ports & Interfaces		
Video Input	1 x HDMI Type A	1 x RJ45
Video Output	1 x RJ45	HDMI Type A
Video Loop-out	1 x HDMI Type A	
Analog Audio Input	1 x 3.5mm Stereo Phone Jack (Line In)	1 x 3.5mm Mono Phone Jack (Mic In)
Analog Audio Output	1 x 3.5mm Stereo Phone Jack (Line Out)	1 x 3.5mm Stereo Phone Jack (Line Out)
USB Interface	1 x USB Type B (USB 2.0)	2 x USB Type A (USB 1.1) 2 x USB Type A (USB 2.0)
IR Interface	1 x 3.5mm Stereo Phone Jack	1 x 3.5mm Stereo Phone Jack
RS232 Interface	1 x DB9 Female	1 x DB9 Male
Link Interface	1 x RJ45, 1 x SFP	1 x RJ45, 1 x SFP
Power		
PoE Support	802.3af	802.3af
Power Consumption	8W	7W
Ambient Temperature		
Operation	0 to 55℃	
Storage	-20 to 85℃	
Humidity	Up to 95%	
Physical Characteristics		
Dimensions	210 x 123 x 40mm	167 x 103 x 40mm
Weight	710g	530g