



HSM-44-BX

4K 4X4 HDMI Matrix Switch with HDBaseT™ and HDMI Outputs

Supports 4K UHD resolution

HDCP 2.2 and 1.4 compliant with EDID Management

Extends HDMI, IR, RS-232, IP, and Power over HDBaseT to 100meters

RS-232, IP, IR and Front panel Control with Status LCD Display

Analog and Digital Extracted Audio Outputs

UMA1251 Rev A

CUSTOMER
SUPPORT
INFORMATION

Order toll-free in the U.S. 800-959-6439
FREE technical support: 714-641-6607 or support@hallresearch.com
Hall Research, 1163 Warner Ave. Tustin, CA 92780
www.hallresearch.com

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FCC RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been designed to comply with the limits for a Class B computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are intended to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at their own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



1.0 Introduction

1.1 General

As a member of Genesis Digital Matrix™ series of switchers, the HSM-44-BX matrix provides exceptional quality, intuitive operation and powerful control methods that are hallmarks of Hall Research's video matrix switches.

The 4K matrix is a 4x4 cross-point switch in a compact 1-RU enclosure. Each output has integrated video splitter so that simultaneous HDMI and HDBaseT are provided.

The HDBaseT outputs extend HDMI, IR, RS-232, Ethernet, and Power over a single CAT6 cable to 100m (328 ft). The HDBaseT outputs are compatible with all compliant HDBaseT receivers such as the Hall Research's HBX-R which is a cost effective Receiver that provides HDMI, IR, RS-232 and IP (Ethernet) extension and gets its power from the matrix for maximum convenience.

The HSM-44-BX supports HDMI resolutions up to 4K @ 30 Hz 4:4:4 and 4K @ 60 Hz 4:2:0. It also supports HDCP 2.2 and 1.4, 3D, deep-color. PCM, Dolby, DTS, and HD audio standards. The matrix intelligently calculates EDID for each input based on the EDID of the connected sinks.

Users are able to save and recall multiple matrix routing configuration PRESETs. HDMI outputs can also be blanked. The matrix includes a two-line character LCD on its front panel in order to display the current video routing and to facilitate creating or recalling Presets.

The HSM-44-BX matrix is ideal for conference rooms, multimedia presentations, digital signage, houses of worship, and many other settings.

1.2 Features

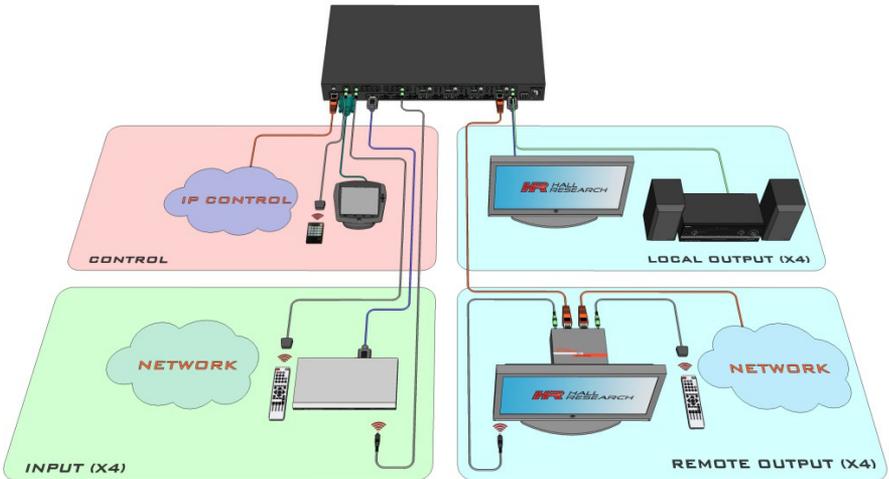
- Supports HDCP 2.2 and 4K UHD
- Simultaneous HDMI and HDBaseT on each output
- Extends HDMI, IR, RS-232, Ethernet, and Power on HDBaseT
- Intuitive front panel control with two-line LCD
- Analog and Digital Extracted Audio Outputs
- Uses Hall Research Genesis™ Control Command Set (GCCS)
- Save and Recall Presets of commonly used routing patterns
- HDMI video output can be blanked or un-blanked
- Controlled via: Front Panel, RS-232, IP (Telnet), and IR
- Internal Universal Power Supply with standard IEC C14 connector
- 1-RU rack mountable metal enclosure

2.0 Package Contents

- (1) Model the HSM-44-BX
- (1) Power cord for USA (users in other regions must provide their own cord)
- (1) IR Remote
- (1) Rack mounting brackets (2 pcs)
- (1) RS-232 Cable
- (6) IR Detectors (for use on IR Input and IR EXT ports)
- (5) IR Emitters (for use on IR Output ports)
- (8) 3 Pin screw-terminals (for use with RS-232 connectors)
- (1) User's Manual

3.0 Configuration and Operation

3.1 Connection Diagram



Typical Connection Diagram

3.2 General Operation

3.2.1 Front Panel Functions

The front panel can be used for the following purposes:

- View current input/output routings (ties) on LCD
- Make new ties either starting from input or from output
- Recall or Save Preset patterns
- Lock or Unlock the front panel
- Change EDID configuration
- View EDID configuration and preset configuration on LCD
- Monitor & Control Power On/Off status

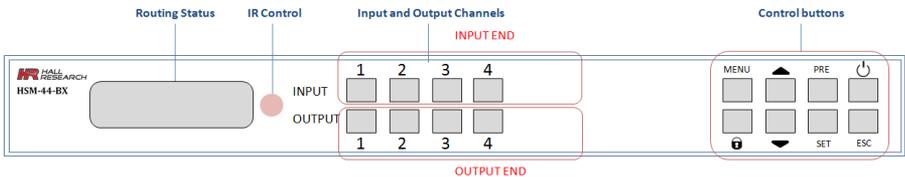
All of the front panel buttons have built-in LEDs to help with their operation. Front panel functions are designed for maximum intuitiveness. With just a little practice, one can easily learn to monitor and control the matrix.

LOCK  is used to disable all the keys on front panel. Lock the front panel by pressing LOCK button. Hold the same button for 3 seconds to unlock the panel. Locking the front panel is intended to prevent inadvertent actions for example, if the buttons are pressed unintentionally. Note that when the front panel is locked, the IR remote function is also locked, but other means to control the matrix (RS-232 and IP) are still functional.

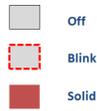


Front Panel

3.2.2 Front Panel Operation



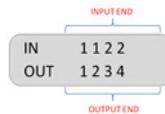
The front panel pushbuttons have LEDs built-in. The buttons can be off, on, or blinking. These modes help users control the matrix with ease.



Front panel button LED states

3.2.3 Reading the LCD routing configuration

Easy to understand routing information is displayed on the LCD. On the LCD the input row changes but the output positions are fixed and never change.



In the above example, the routing configuration can be understood from the output end as follows:

- Output 1 is tied to Input 1
- Output 2 is tied to input 1 and so on ...

3.2.4 Turning the unit on and off

Press the power button any time to turn ON the matrix. For safe operation, to turn the unit OFF, you must hold the power button for 3 seconds.

3.2.5 Making AV Routing or "Ties" from the Front Panel

Hall Research products are designed with maximum usability in mind, that's why the front panel allows users to initiate "ties" either from the OUTPUT point of view or from the INPUT.

For most users it is more logical to initiate ties starting with the OUTPUT. Think of it as: "I want OUTPUT 1 to get its video from INPUT 2" for example!

3.2.6 Making a tie starting from the OUTPUT

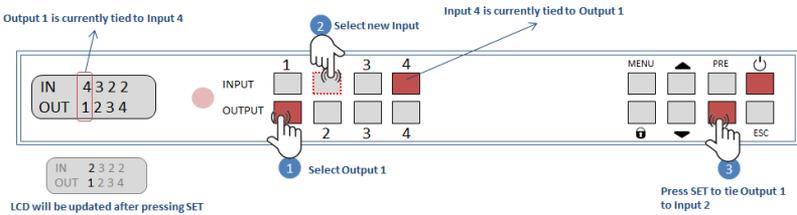
To tie an output to an input, perform the following steps:

1. Press the desired output button. The button for the currently tied input will light up. *Note: At this point, you can use the navigation (▲▼) buttons to view the previous or next Output routing.*

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2. Press the input button you want to tie to. This will make the selected input button blink. Blinking button designates it as a “candidate” choice; an actual tie is not made until you press the SET button.
3. Press the SET button. If you do not press the SET button, after a few seconds, the process times out and button lights go out.

Example: Route output 1 to input 2

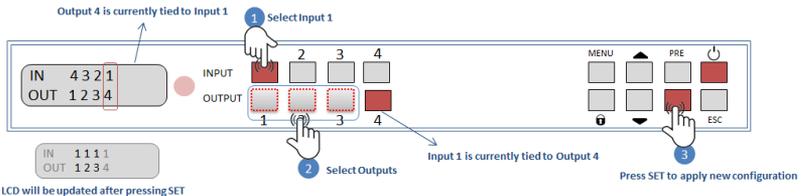


3.2.7 Making a tie starting from input

Routing from the input end is similar to the above but an input can be routed to multiple outputs.

1. Press one of the input buttons. That button will light up in solid along with ALL the outputs currently routed from that input. *Note: you can use the navigation (▲▼) buttons to view the previous or next Input routing.*
2. Select all the outputs you wish to route to. Candidate outputs can be multiple and all will be blinking until the SET button is pressed. To remove a candidate, press the blinking output again.
3. Press SET to apply the changes.

Example: Route Input 1 to Output 1, 2 and 3

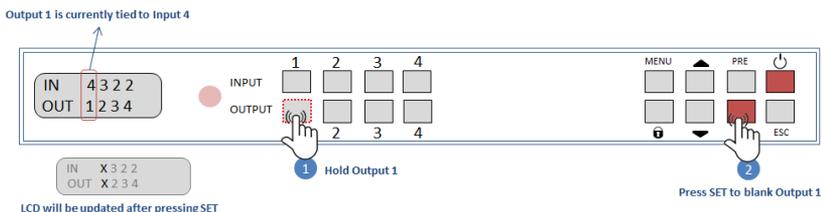


3.2.8 Blanking Outputs

The matrix allows the output to be blanked. You can blank a particular output or you can blank all the outputs that are connected to a specific input.

1. To blank an output, hold the Output button for 3 seconds or until its led starts blinking.
2. Press SET to apply the change. The blanked Output will be crossed on the front panel LCD with an "X", indicating that it is blanked.

Example: Blanking output 1



You can also blank all the outputs that are connected to a particular input.

1. Hold the input for 3 seconds.
2. Press SET to apply the change. All the affected output ports and blanked

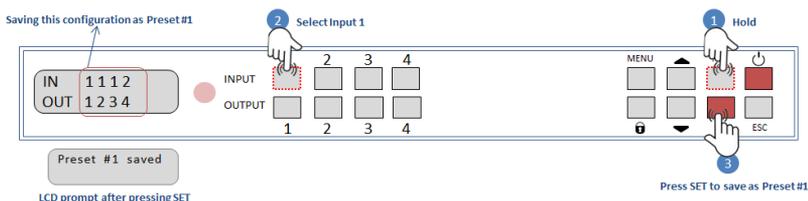
3.3 Presets (Memorized Routing Patterns)

The number of presets accessible from the front panel is the same as the total # of input buttons. Each front panel input button can memorize a pattern. Therefore, you can recall 4 presets.

3.3.1 Saving ongoing configuration as a Preset

1. To save ongoing configuration as a preset, hold PRE button for 3 seconds until it blinks.
2. Select preset position by pressing an input button
3. Press SET to save the pattern as a Preset in that key position.

Example: Saving ongoing configuration as Preset #1



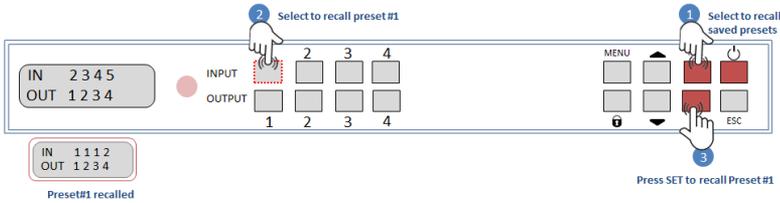
3.3.2 Recalling Presets

1. To recall a saved preset, press the PRE button.
2. Select the desired Preset # by pressing an input button.

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3. Press SET to recall the preset.

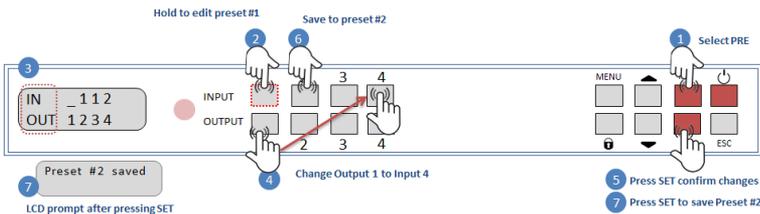
Example: Saving preset #1 from the previous example



3.3.3 Editing or Copying Presets

1. To edit a saved preset, press PRE button.
2. Hold the preset number you want to edit on the input button until you see the prompt "Editing Preset #" on LCD.
3. Start changing the preset config from the output end just like making ties from the output end. Holding an entry will clear the output. Unassigned outputs will be blanked by default.
4. Press SET and select the preset number you want to copy. Note that you can even copy the preset to the number you started editing.
5. Press SET again the save the new preset.

Example: Edit output 1 in Preset #1, which is saved in previous example and saving it to preset #2



3.4 Using the IR Remote to route video

The IR Remote included with the Matrix allows simple control of the matrix. You can use the IR remote to power the matrix on/off and you can use it to make video ties.



3.5 Rear Panel



Rear Panel

NOTE HDMI connectors have small LEDs next to them to indicate status. When an input LED is lit, the signal from source is detected; when an output LED is on, a sink is detected

HDMI Inputs: Connect to HDMI source such as Video players, PCs, STBs etc.

Output Groups:



Each output group provides simultaneous HDMI and HDBaseT outputs as well as extracted HDMI audio both in stereo analog and digital formats. HDBaseT also extends RS-232, IR and Ethernet. The RS-232 connector associated with each HDBaseT is directly above the HDBaseT RJ45 connector. Note that the IR signals that are being extended via HDBaseT are located in their own grouping as shown in the Rear panel image above. The Ethernet that extends via HDBaseT is also its own connector on the rear right side as shown above. Note that this Ethernet port operates at 100Mbps maximum throughput (limited by HDBaseT specifications). The TCP port for control of matrix is grouped with RS-232 on the left side and is not related to HDBaseT.

Control Inputs:

IR detector cable input for control using the Provided IR Remote Control



For IP/Telnet control

RS-232 Serial control

TCP/IP connects to a LAN and can be used to control the matrix using Telnet. Use the RS-232 port via DB9 cable to control the unit.

There is an IR detector on the front panel of the matrix already, so connecting the IR Detector cable to the IR control port may not be needed. But if the matrix switcher is not within line of sight of the IR remote, you can plug the supplied cable to this port to control the matrix using the IR Remote provided.

IR Extension via HDBaseT Group:



These connectors are routed to the HDBaseT port of the matrix and can be used to send or receive IR signals to compatible HDBaseT Receivers (such as the HBX-R). IR input group has individual inputs 1-4 and one input labeled ALL. If you plug an IR detector cable to the 1-4 input, then the IR signal is transmitted to the specific remote Receiver. But when connected to the “ALL” input then the IR signal is sent to all Receivers. Similarly, the 1-4 IR outputs ports mimic the signal that the IR detector senses at each particular Receiver, but the “ALL” port outputs the IR signal regardless of which Receiver it comes from.

3.6 IR Detector and Emitter Cables

The matrix included a number of IR detector and emitter cables. Since the pin-out and signal levels vary among IR cables, you must use the included cables or 100% equivalent cables. The connector pin functions of the supplied IR cables are shown below.



IR Detector Cable (typical)



IR Emitter Cable (typical)

4.0 Recommended HDBaseT Receivers

For convenience Hall Research offers the HBX-R HDBaseT Receiver for use with this matrix. These economical Receivers are sold separately and provide HDMI, RS-232, IR, and Ethernet ports.

A main advantage of using the HBX-R is that even though they are shipped with a 5v power supply, when connected to the HSM-44-BX, they get power via the HDBaseT Cat6 from the matrix and connection of the power supply adapter is not required.



HBX-R HDBaseT Receiver (front and rear views)

For even lower cost receivers we offer the UH-BTX-R (upto 100m) or the UH-BT-R (up to 70m), however these will need connection of 5v power adapter.

5.0 EDID management

The HSM-44-BX gives users the flexibility to configure the EDID for each input. The source for the EDID data associated with each input can be from one of 15 standard built-in choices or copied from any of the TVs connected to a particular output. There is also an advanced mode for dynamic “on-the-fly” EDID Computation to guarantee that all displays connected to any input will be able to display the video from that input (as explained below in Section 4.2).

By default, the EDID for all inputs are set to 1080p video with 2-channel audio for maximum compatibility but users can easily change the EDID used at all or any of the inputs.

5.1 EDID Configuration

This option allows the user to choose a specific EDID table and load it into any selected input port on the matrix. HSM-44-BX comes with 15 common EDIDs saved in its internal memory or you can copy the EDID of any TV connected to outputs.

- Press **MENU** and navigate to "EDID Config" and press **SET**.
- Browse through the 15-different preset EDIDs or any of the eight EDIDs of the current outputs.
- Press **SET** to select the EDID.
- Select an input to copy the EDID.
- Press **SET** to load the EDID to selected input.

Note: If you decide to copy EDID from an output, but the EDID of the output is not valid (for example if the output is disconnected), the Matrix does not modify the input EDID and will display an error message.

Below are the choices of EDIDs under EDID Config menu:

Index	EDID Description
1	1080p Video, 2 Ch Audio
2	1080p Video, 5.1 Audio
3	1080p Video, 7.1 Audio
4	1080i Video, 2 Ch Audio
5	1080i Video, 5.1 Audio
6	1080i Video, 7.1 Audio
7	1080p 3D Video, 2 Ch Audio
8	1080p 3D Video, 5.1 Audio

Index	EDID Description
9	1080p 3D Video, 7.1 Audio
10	4k*2k@30Hz Video, 2Ch Audio
11	4k*2k@30Hz Video, 5.1 Audio
12	4k*2k@30Hz Video, 7.1 Audio
13	4k*2k@60Hz Video, 2Ch Audio
14	4k*2k@60Hz Video, 5.1 Audio
15	4k*2k@60Hz Video, 7.1 Audio

5.2 Compute EDID

When “Compute EDID” mode is selected, the system dynamically generates the EDID for each input according to the “highest common denominator” of the TVs that are routed to that input. To select this mode:

- Press MENU and navigate to "COMPUTE-EDID" and press **SET**.
- Press **SET** again to confirm.

When the “Compute-EDID” mode is enabled, routing an input to multiple TVs with different capabilities will force the system to “compute” a new EDID for that input based on the TV with minimum resolution capability. Therefore, in this mode if the EDID changes a short interruption may result in the video signal from the source as it changes its resolution.

Example: say you have two monitors, one that supports 1080p and one that supports 4K. When a particular input is routed to both of these outputs, the system will compute an EDID with 1080p for the input because a 4K signal would not be displayable on the 1080p monitor. Now let's assume the user disconnects or switches the 1080p monitor to a different input. Then, the only monitor routed to our source is the 4K one. The system will notice this and re-compute a 4K EDID for our input causing the source to output 4K video (if it can). Switching takes a couple of seconds. If the 1080p monitor is turned back on or routed to the same input, the system will downgrade the EDID for the source to 1080p.

6.0 Network Settings

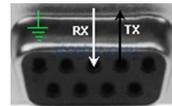
As shipped from the factory (or after restoring factory defaults), the HSM-44-BX IP address is set for static IP address of 192.168.1.1. To change the IP or to switch to DHCP, you can use either RS-232 or Telnet.

For example, to use the RS-232 port to change the IP address do the following:

- Connect a PC with Terminal-Emulator software to the RS-232 port
- DHCPn command can be used to change DHCP setting
- Please see the next section with further information on commands

7.0 Serial & Telnet Commands

Telnet port is **6324**, RS-232 port settings are:



Pin 2 = TX
Pin 3 = RX
Pin 5 = GND

Baud rate: 115200, Parity: None, Stop: 1-bit

- Commands are in ASCII format.
- Commands are case sensitive.
- Use a single <CR> character to terminate each command.
- Responses from the Matrix are terminated with <CR><LF>.
- Other than Power command (PW1), the matrix must be powered on.
- Unknown commands respond with “INVALID COMMAND”<CR><LF>.
- After plugging power to the matrix, you must wait ~45 seconds for it to fully boot up before sending any commands.
- Command characters should be sent continuously without pauses. If you pause for more than 5 seconds, the command will not execute.
- When the front panel buttons are used, some serial commands will be sent out the RS-232 port.

Command	Description	Response
CVn,m n= Output [1-4] m= Input [1-4] or m=x to blank Output (x must be lower case)	Connect Video output <i>n</i> to input <i>m</i>	CVn,m
CV*,m m= Input [1-4] m=x to blank Output (x must be lower case)	Connect all Outputs to Input <i>m</i>	CV1,m CV2,m : CV4,m

Command	Description	Response
CVn,m/n,m/n,m n= Output [1-4] m= Input [1-4] m=x to blank the output.	Connect multiple outputs	CVn,m CVn,m CVn,m
CVn,? n= Output [1-4]	Query output routing	CVn,m n= Output [1-4] m= Input [1-4] m=x means blanked
CV?,m m= Input [1-4]	Query input routing	CVn,m n= Output [1-4] m= Input [1-4]
CV	Query all the outputs	CV1,? : CV4,?
PSx x= Preset number [1 to 4]	Preset Save Saves the current configuration as a preset	PSx
PSx=1,m/2,m/3,m/4,m m=Input [1-4] m=x (to blank the output)	Define and Save a Preset on the fly	PSx=1,m/2,m/3,m/4,m
PRx x=Preset # [1 to 8]	Preset Recall	CV1,? : CV4,?
PWn n=0 -- OFF n=1 -- ON	Power On/Off	PWn
PW	Query the status of power	PWn
RB	Reboot the system	FW Version:x.xx PW1 CV1,? : LK? BP? IP ????.????.????.??? MAC ??-??-??-??-??-?? DHCP?
FD	Restore factory defaults <i>Note: Resets all parameters including network settings</i>	Same as RB (above)

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Command	Description	Response
LKn n = 0 Lock OFF n = 1 Lock ON	Lock Front Panel	Panel Unlock LK0 Panel lock LK1
LK	Lock Status Query	LKn n = 0 Lock OFF n = 1 Lock ON
HOn n = Output # [1-4]	HOT Plug Query Read the Hot Plug status of TV connected to each output. Hot Plug signal is generated by the TV (Sink)	LOW (No Sink) HIGH (Sink attached)
HIn n = Input # [1-4]	Source On Query Read the =5V_DDC signal from HDMI Source	LOW (No Source) HIGH (Source Active)
HDn n = Input # [1-4]	HDCP Query	ON OFF
ESi,m m = Input # [1-4] i = EDID Index [1-15] from table in section 5.1	Set EDID for a particular input <i>m</i>	ESi,m
ESi i = EDID Index [1-15] from table in section 5.1	Set EDID for all inputs	ESi
ERm m = Input # [1-4]	Read EDID for a particular input <i>m</i>	EDID i (i = EDID index)
ECn,m m = Input # [1-4] n = Output # [1-4]	Copy EDID for a particular input <i>m</i> from output <i>n</i>	ECn,m
ECn n = Output # [1-4]	Copy EDID from output <i>n</i> to all inputs	ECn
BPn n = 0 (beep off) n = 1 (beep on)	Beep Sound on/off	BPn
BP	Beep Sound Query	BPn (n=0 or 1)
IP	IP Address Query	IP xxx.xxx.xxx.xxx
MAC	MAC Address Query	MACxx.xx.xx.xx.xx.xx
IP xxx.xxx.xxx.xxx	Assign Static IP Address (DHCP must be off)	IP xxx.xxx.xxx.xxx

Command	Description	Response
DHCPn n = 0 (DHCP off) n = 1 (DHCP on)	Enable DHCP	DHCPn (n=0 or 1)
DHCP	DHCP Status Query	DHCPn
FW	Firmware Version Query	FW Version:x.xx
HSM	HSM Matrix Status Query	FW Version:x.xx PW1 CV1,? : LK? BP? IP ????.????.????.??? MAC ??-??-??-??-??-?? DHCP?

8.0 Troubleshooting

There are no field serviceable parts or circuits in the device. If you think the device is malfunctioning (or you have no connectivity), please try to use the following methods for troubleshooting:

- Try Rebooting the device by removing and applying power.
- Restore factory defaults (FD command)

8.1 Contacting Hall Research

If you determine that your Matrix Switch is malfunctioning, do not attempt to repair the unit. Instead contact Hall Research Technical Support at 714-641-6607. To return the unit to Hall Research you must first get a Return Authorization (RMA) number. Package the unit carefully, if returning. We recommend that you use the original container.

9.0 Specifications

Video Input Ports	4x HDMI
Video Output Ports	4x HDMI 4x HDBaseT
HDCP	HDCP 2.2 and HDCP 1.4
HD Resolutions	480i, 480p, 576i, 576p, 720p, 1080i, 1080p 8, 12 or 16 bits per channel (24, 36 or 48 bits aggregate), 4K30 4:4:4, 4K60 4:2:0
PC Resolutions	VGA through UXGA
Audio Output Ports	4x Coax (S/PDIF digital supports all formats listed below) 4x 3.5mm (Analog Stereo, L/R, supports only 2-channel formats) PCM2, PCM5.1, PCM7.1, Dolby5.1, DTS5.1, DD+, D-TrueHD, DTS-HD 16/20/24 bits per sample and up to 96 KHz Sampling Rate
Control	Front Panel / Telnet/ RS-232/ IR
Baud Rate	115200 bps
Power Supply	110-240vAC Internal (US/EU standards/ CE/FCC/UL certified)
Power consumption	50 W (Max)/0.5 W (Standby)
Housing	Metal Enclosure
Color	Black
ESD Protection	Human body model - ±12kV [air-gap discharge] & ±8kV
Operating Temp	32 to 122 °F (0 to 50 °C) 10%~90%, non-condensing
Storage Temp	-40 to +158 °F (-40 to +70 °C)
Dimensions	Device: 17.3"(440 mm) W x 7.8"(200 mm) D x 1.8"(45 mm) H Shipping: 18.9"(480mm) x 13.6"(345mm) x 3.4"(85mm)
Weight	Device: 7.6 lbs. (3450g) Shipping: 9.5 lbs. (4310g)
EMI/EMC	CE, FCC Class B
MTBF	90,000 hours



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