



**VIDEO  
PRODUCTS  
INCORPORATED**

1275 Danner Drive Aurora, Ohio 44202  
Tel: 330-562-2622 Fax: 330-562-1999  
www.montest.com sales@montest.com

# MONTEST-HD4K

4K HDMI Video Test Pattern Generator



Operation Manual

MAN273 REV 11-28-16

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## SAFETY PRECAUTIONS

Please read all instructions before attempting to unpack, install or operate this equipment and before connecting the power supply.

Please keep the following in mind as you unpack and install this equipment:

- Always follow basic safety precautions to reduce the risk of fire, electrical shock and injury to persons.
- To prevent fire or shock hazard, do not expose the unit to rain, moisture or install this product near water.
- Never spill liquid of any kind on or into this product.
- Never push an object of any kind into this product through any openings or empty slots in the unit, as you may damage parts inside the unit.
- Do not attach the power supply cabling to building surfaces.
- Use only the supplied power supply unit (PSU). Do not use the PSU if it is damaged.
- Do not allow anything to rest on the power cabling or allow any weight to be placed upon it or any person walk on it.
- To protect the unit from overheating, do not block any vents or openings in the unit housing that provide ventilation and allow for sufficient space for air to circulate around the unit.



# CONTENTS

<b>1. Introduction</b> .....	<b>1</b>
<b>2. Applications</b> .....	<b>1</b>
<b>3. Package Contents</b> .....	<b>1</b>
<b>4. System Requirements</b> .....	<b>2</b>
<b>5. Features</b> .....	<b>2</b>
<b>6. Operation Controls and Functions</b> .....	<b>3</b>
6.1 Front Panel .....	3
6.2 Top Panel .....	7
6.3 Bottom Panel .....	7
6.4 Left Panel .....	8
6.5 Right Panel .....	8
6.6 Remote Control .....	9
6.7 RS-232 Protocol .....	10
6.8 RS-232 and Telnet Commands .....	11
6.9 Telnet Control .....	15
6.10 OSD Menu .....	17
6.10 .1 Analyzer Mode .....	17
6.10 . 2 Pattern Mode .....	23
6.11 Test Timings.....	27
6.11.1 Input Timings .....	27
6.11.2 Output Timings .....	28
6.12 Test Patterns .....	30
<b>7. Connection Diagram</b> .....	<b>47</b>
<b>8. Specifications</b> .....	<b>48</b>
8.1 Technical Specifications .....	48
8.2 Supported Color Formats .....	49
8.3 Supported Audio Formats .....	49
<b>9. Acronyms</b> .....	<b>50</b>



## 1. INTRODUCTION

The MONTEST-HD4K Signal Generator & Analyzer is an advanced and handy tool for generating, testing and verifying the signal path within your 6G HDMI ecosystem. With 88 built-in resolutions, 55 test patterns and over a dozen types of A/V analysis functions, this unit provides an enormous range of testing options. HDMI data packet, EDID and HDCP analysis is supported along with EDID upload and emulation. Additionally the Status and Control Data Channel (SCDC) can be monitored, allowing HDMI 6G signal detection and analysis. Up to 8 channels of LPCM audio test tones can be generated with a wide range of frequencies.

The unit also supports the ability to upload up to 2 user-generated graphic files which can be used as additional test patterns. The use of multi-function and multi-color backlit buttons allows for easy operation of the unit's wide variety of functions and a clear OLED display provides a way to quickly view the current signal status information. In addition to the front panel buttons, the unit can also be controlled via RS-232, Telnet and IR providing a complete range of control options.

## 2. APPLICATIONS

- Installer/Integrator multi-function test tool
- HDMI source and sink testing
- UHD system/SCDC error identification
- Third-party equipment setup
- Source and sink EDID reading, writing and saving
- HDCP compliance verification
- Production testing
- R&D design and testing

## 3. PACKAGE CONTENTS

- 1×HDMI 6G Signal Generator & Analyzer
- 1×Remote Control
- 1×DC to USB Power Cable
- 1×5V/2.6A Power Adaptor
- 1×Operation Manual

## 4. SYSTEM REQUIREMENTS

- HDMI/VGA receiving equipment such as an HDTV, monitor or audio amplifier and/or HDMI source equipment such as a media player, video game console or set-top box.
- Analog audio source equipment such as a PC or media player and/or analog audio receiving equipment such as headphones, an audio amplifier or powered speakers.
- RS-232 or Ethernet control device such as PC/Laptop. (Optional)
- USB enabled device for uploading user test patterns.

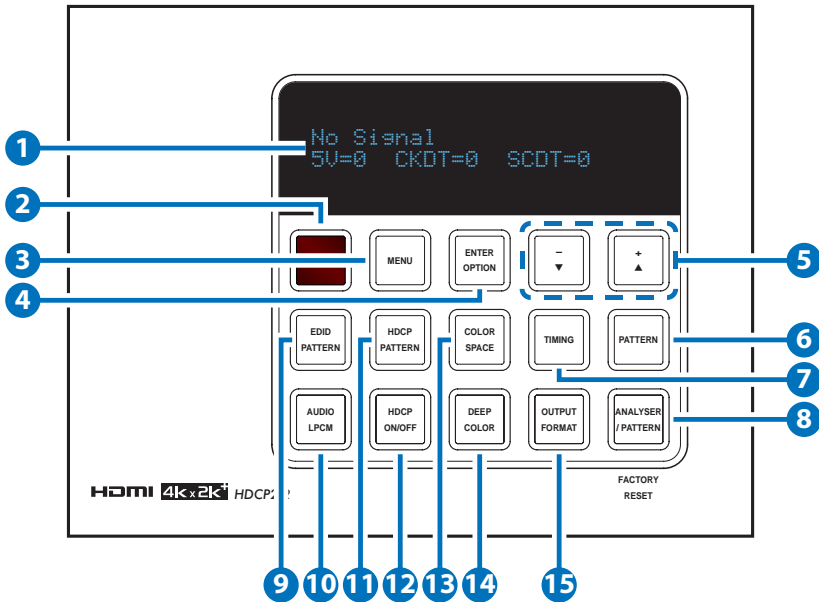
## 5. FEATURES

- HDMI 2.0 (up to 4K@60Hz 4:4:4) and DVI 1.0 compliant
- HDCP 1.4 and 2.2 compliant
- Analysis of source and sink data paths up to 6G HDMI signals
- Analysis of HDMI data packets
- Analysis and control of HDCP v1.4 and v2.2
- Analysis and emulation of EDID data, including SCDC
- Analysis of input audio signals
- HDR bypass and analysis support
- Generate HDMI timings up to 6Gbps (4096×2160@60Hz 4:4:4, 8-bit)
- Generate HDMI and VGA signal outputs
- VGA output supports 350p, 480p, 576p, 720p, 1080i, 1080p, 640×480, 800×600, 1024×768, 1280×1024, 1366×768, 1400×1050, 1440×900, 1600×900 (RB), 1600×1200, 1680×1050, 1920×1200 (RB), 2048×1080p
- HDMI output supports 350p, 480p, 576p, 720p, 1080i, 1080p, 640×480, 800×600, 1024×768, 1280×1024, 1366×768, 1400×1050, 1440×900, 1600×900 (RB), 1600×1200, 1680×1050, 1920×1200 (RB), 3G4K, 6G4K
- 2 custom user test pattern resolutions - 640×480 & 1920×1080
- External stereo audio input and output
- Generation of LPCM sinewave audio on up to 8 channels
- Front-panel, RS-232, Telnet, and IR Remote controls
- OLED display with rapid updates of current status information

- Detailed OSD for settings and informational displays
- Supports USB firmware and pattern update
- Small and portable unit

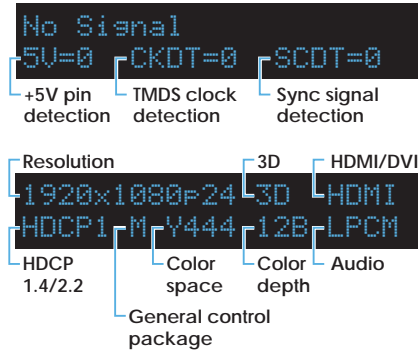
## 6. OPERATION CONTROLS AND FUNCTIONS

### 6.1 Front Panel

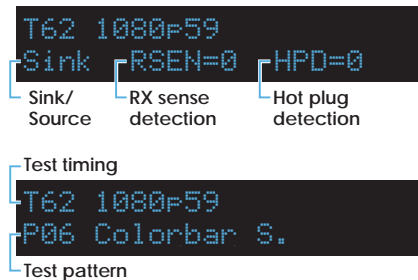


- 1 OLED Screen:** Displays the current signal analysis information or test pattern mode selection details including input and/or output resolution timing. The screen layout changes completely depending on the unit's mode.

*Analyzer Mode (Analyzer/Pattern button is RED):* In Analyzer mode, if there is no live video source detected on the input port, the OLED will display any voltage, TMDS or sync that might be present. Once a live video signal is detected, the unit will display that signal's current timing, format, HDCP version, AV Mute status, color space, color depth and audio format.



*Pattern Mode (Analyzer/Pattern button is BLUE):* In Pattern mode, when the output isn't connected to a sink, the unit will display the current output timing, RX Sense, and Hot-plug detection status. Once an active sink has been connected, the lower portion of the display will change to indicate the current test pattern number and name.



- 2 **IR Window:** Accepts IR signals from the included IR remote for control of this unit only.
- 3 **MENU:** Press to enter the OSD menu, or to back out from menu items.
- 4 **ENTER/OPTION:** Press to confirm a selection or to go deeper into a menu item. When the selected function has optional selections,



the associated button's LED will illuminate along with the ▼/▲ (-/+ buttons).

- 5 **+/- & ▲/▼**: Press to move up and down or adjust selections within menus. These buttons will illuminate when the selected function has values that can be adjusted up or down.
- 6 **PATTERN**: Within Pattern mode, press to enable selection of the test pattern used. The ▼/▲ buttons will illuminate and are used to select the new pattern. The new test pattern will automatically become active after selecting it and pausing for 2 seconds. Additional variations (if available) are selected by pressing the button additional times. Within Analyzer mode, press to turn on/off a "title-safe/action-safe" overlay.
- 7 **TIMING**: Press to enable selection of the output timing and resolution used. The ▼/▲ buttons will illuminate and are used to select the new timing. The currently selected timing will be shown on the OLED display. The new timing will automatically become active after selecting it and pausing for 2 seconds.

*Note: In Analyzer mode, please select the "Bypass" timing if you do not wish for your source's output signal to be scaled by the unit before being sent to the display. The LED will blink Red when the timing is set to Bypass.*

- 8 **ANALYZER/PATTERN**: Press to switch the unit between Analyzer Mode (LED=Red) and Pattern Mode (LED=Blue). When in Analyzer Mode, press and hold the button for 2 seconds to force an RX hot-plug. When in Pattern Mode, press and hold the button for 2 seconds to turn on/off the AVmute bit within the output's GCP (General Control Packet).

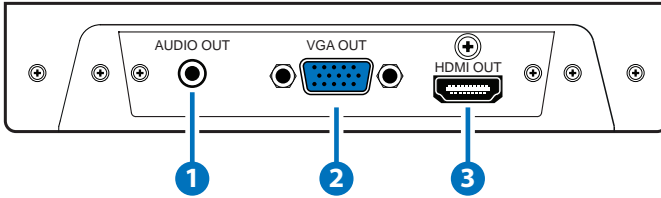
**FACTORY RESET**: Press and hold this button while powering the unit on to perform a factory reset of the unit.

- 9 **EDID PATTERN**: Press to enable selection of the EDID to use on the HDMI input port. The ▼/▲ buttons will illuminate and are used to select the new EDID. The currently selected EDID will be shown on the OLED display. The new EDID will automatically become active after selecting it and pausing for 5 seconds.
- 10 **AUDIO LPCM**: Within Analyzer mode, press to select which digital audio source pair (0-3) is routed to the primary stereo channel (LPCM 2.0 and headphone output) for monitoring. The LED color indicates the selection (Off=SD0, Red=SD1, Blue=SD2, Purple=SD3).

Within Pattern mode, press to switch between LPCM 2.0 (LED=Red), 5.1 (LED=Blue) and 7.1 (LED=Purple) channel test tone output formats. Press and hold this button for 2 seconds to allow adjustment of the output volume.

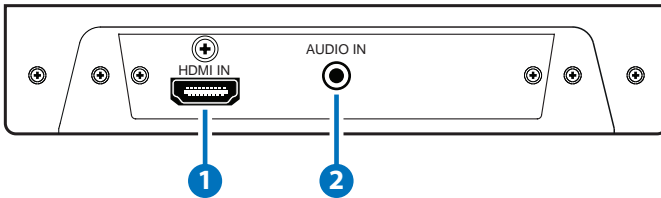
- 11 HDCP PATTERN:** Press to enable/disable the OSD display of the detected HDCP version support and handshaking information between the sink and source. In Analyzer mode the unit is the RX, in Pattern mode the unit is the TX. In Pattern mode, if HDCP handshaking fails, an error message "HDCP OUT FAIL" will be displayed on the OSD.
- 12 HDCP ON/OFF:** Press to switch between supported HDCP versions or to disable HDCP. Within Analyzer mode, OFF (LED=Off), HDCP 1.4 (LED=Red), and HDCP 1.4+2.2 (LED=Blue) modes are available for the input port. Within Pattern mode, OFF, HDCP 1.4, and HDCP 2.2 modes are available for the output port.
- 13 COLOR SPACE:** Press repeatedly to switch between the available color space formats. The button's LED is colored to indicate the current color space: Red=RGB, Blue=YCbCr 4:4:4, Purple=YCbCr 4:2:0, Off=YCbCr 4:2:2.
- 14 DEEP COLOR:** Press repeatedly to switch between the available output color bit depth options. The button's LED is colored to indicate the current bit depth: Off=8-bit, Red=10-bit, Blue=12-bit.
- 15 OUTPUT FORMAT:** Press to switch between DVI (LED=Blue) and HDMI (LED=Red) output formats. Press and hold the button for 2 seconds to disable/enable video output completely. The button's LED will turn off when output is disabled.

## 6.2 Top Panel



- 1 AUDIO OUT:** Connect to powered speakers or an amplifier for stereo analog audio output with a 3.5mm phone jack cable.
- 2 VGA OUT:** Connect to a VGA (RGB) monitor or display for analog video output.
- 3 HDMI OUT:** Connect to HDMI TVs, monitors or amplifiers for digital video and audio output.

## 6.3 Bottom Panel



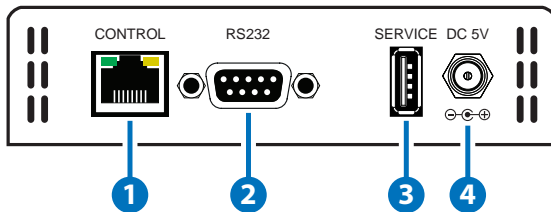
- 1 HDMI IN:** Connect to HDMI source equipment such as a media player, game console or set-top box.
- 2 AUDIO IN:** Connect to the stereo analog output of a device such as a CD player or PC.

## 6.4 Left Panel



- 1 **POWER:** Flip this switch to turn the unit ON or OFF after connecting an appropriate power source.

## 6.5 Right Panel



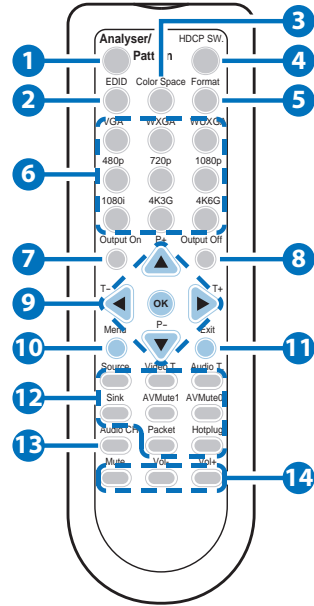
- 1 **CONTROL:** Connect directly, or through a network switch, to your PC/laptop to control the unit via Telnet.
- 2 **RS-232:** Connect directly to your PC/laptop to send RS-232 commands to control the unit.
- 3 **SERVICE:** This slot is used for firmware updates and uploading customer designed test pattern files.

*Note: The patterns are restricted to 640×480 and 1920×1080. Both must be 24-bit RGB bitmap files*

- 4 **DC 5V:** Plug the 5V DC power supply into the unit and connect it to an AC wall outlet for power or use the DC to USB adapter cable to connect to a portable USB power bank (2.1A minimum) for power.

## 6.6 Remote Control

- 1 Analyzer/Pattern:** Press to switch between Analyzer Mode and Pattern Mode.
- 2 EDID:** Press repeatedly to switch between the available EDIDs for the HDMI input.
- 3 Color Space:** Press repeatedly to switch between the available color space formats (RGB, YCbCr 4:4:4, YCbCr 4:2:2 and YCbCr 4:2:0).
- 4 HDCP SW.:** Press to switch between supported HDCP versions or to disable HDCP.



- 5 Format:** Press to switch between DVI and HDMI output formats.
- 6 VGA-4K6G:** Press to directly select the output resolution.
- 7 Output On:** Press to enable video output.
- 8 Output Off:** Press to disable video output.
- 9 T-/T+:** Press (+/-) to select a new output resolution timing. Within the OSD menu, press to adjust selections.

**P+/P-:** Press (+/-) to change the current test pattern. Within the OSD menu, press to move up and down.

**OK:** After selecting a pattern, press and hold for 2 seconds to switch to alternate variations of the pattern. Within the OSD menu, press to confirm selections.

- 10 Menu:** Press to enter the OSD menu.
- 11 Exit:** Press to exit the OSD or cancel the selection.
- 12 Source\*:** Press to display source signal information on the OSD.  
**Video T\*:** Press to display video analysis details on the OSD.  
**Audio T\*:** Press to display audio analysis details on the OSD.  
**Packet\*:** Press to display the HDMI input's packet analysis info.  
**Hotplug\*:** Press to force an RX hot-plug event on the input port.

**Sink\*\*:** Press to display HDMI output detection/information on the OSD.

**AV Mute1\*\*:** Press to turn on the AV Mute bit within the output's GCP.

**AV Mute0\*\*:** Press to turn off the AV Mute bit within the output's GCP.

*Note: \* for use in Analyzer Mode only;*

*\*\* for use in Pattern Mode only.*

- 13 Audio CH:** Within Analyzer mode, press to select which digital audio source pair (0-3) is routed to the primary stereo channel for monitoring. Within Pattern mode, press to switch between LPCM 2.0, 5.1 and 7.1 channel test tone output formats.
- 14 Mute/Vol-/Vol+:** Press the Mute button to mute both digital and analog audio outputs. Press the Vol-/Vol+ buttons to increase/decrease the volume.

## 6.7 RS-232 Protocol

SIGNAL GENERATOR		REMOTE CONTROLLER	
Pin	Assignment	Pin	Assignment
1	NC	1	NC
2	TxD	2	RxD
3	RxD	3	TxD
4	NC	4	NC
5	GND	5	GND
6	NC	6	NC
7	NC	7	NC
8	NC	8	NC
9	NC	9	NC

Baud Rate: 115200bps

Data Bits: 8

Parity: None

Flow Control: None

Stop Bit: 1

## 6.8 RS-232 and Telnet Commands

COMMAND	DESCRIPTION
<b>\$boot go</b>	Reboot the unit. During the boot process the unit won't respond to commands.
<b>\$boot?</b>	Display the boot status.
<b>\$edid_copy_sink [c1~c10]</b>	Copy the HDMI sink's EDID to a copy slot (C1~C10). (If the copy fails "err" will be displayed)
<b>\$edid_read [d1~d10/c1~c10/sink],block[0/1]</b>	Displays the selected data block from the selected EDID slot. The data is output as a bitstream of 128 bytes following the CR+LF within the response. (Not supported over Telnet)
<b>\$edid_rx [d1~d10/c1~c10/sink]</b>	Select the EDID to use on the unit's HDMI input.
<b>\$edid_rx?</b>	Display the current RX EDID selection.
<b>\$edid_write [c1~c10],block[0/1]&lt;CR&gt;&lt;LF&gt; [128 byte data]</b>	Directly write an EDID block to one of the copy slots (C1~C10). The data must be sent as a bitstream of 128 bytes following the CR+LF in the command.
<b>\$factory</b>	Perform a factory reset & restart the unit.
<b>\$fwver?</b>	Display the current firmware version.
<b>\$hdcp_in_sw [off/on]</b>	Turn HDCP on/off on the input port. (Analyzer mode only)

COMMAND	DESCRIPTION
\$hdcp_in_sw?	Display the HDCP on/off setting for the input port.
\$hdcp_in_detect?	Detect the HDCP status of the source.
\$hdcp_in_ver [v1.4/v1.4+v2.2]	Set the HDCP version to use on the input port. (Analyzer mode only)
\$hdcp_in_ver?	Display the current HDCP version on the input port.
\$hdcp_out_sw [off/on]	Turn HDCP on/off on the output port. (Pattern mode only)
\$hdcp_out_sw?	Get the HDCP output communication status. A status of "Talk" means it's currently performing handshaking.
\$hdcp_out_ver [v1.4/v2.2]	Set the HDCP version to use on the output port. (Pattern mode only)
\$hdcp_out_ver?	Display the current HDCP version on the output port.
\$help	Show command list.
\$?	Show command list.
\$model?	Display model number.
\$motion_text [text]	Set text for Motion-H and Motion-V patterns. The maximum length of the text is 20 characters.
\$motion_text?	Display the text used for the Motion-H and Motion-V patterns.
\$net_gate?	Display the gateway address.



COMMAND	DESCRIPTION
\$net_ip?	Display the IP address.
\$net_ip_mode [dhcp/static]	Set the IP mode.
\$net_ip_mode?	Display the IP mode status.
\$net_link?	Display the Ethernet link status.
\$net_mac?	Display the Ethernet MAC address.
\$net_mask?	Display the netmask address.
\$net_static_gate [xxx.xxx.xxx.xxx]	Set the static gateway address.
\$net_static_gate?	Display the static gateway address.
\$net_static_ip [xxx.xxx.xxx.xxx]	Set the static IP address.
\$net_static_ip?	Display the static IP address.
\$net_static_mask [xxx.xxx.xxx.xxx]	Set the static netmask address.
\$net_static_mask?	Display the static netmask address.
\$pattern [1/2/3/~]	Select a test pattern to display. (P01, P02, P03, etc.)
\$pattern?	Display the current test pattern selection.
\$task_mode [analyser/pattern]	Set the unit's operation mode.
\$task_mode?	Display the unit's current operation mode.
\$timing [1/2/3/~]	Select the output resolution timing to use. (T01, T02, T03, etc.)
\$timing?	Display the unit's current output resolution timing selection.
\$update_fw	Update the firmware from USB & reboot the unit.

COMMAND	DESCRIPTION
<b>\$update_img480</b>	Update the 640×480 image from USB & reboot the unit.
<b>\$update_img1080</b>	Update the 1920×1080 image from USB & reboot the unit.

Note:

- All commands **MUST** start with the "\$" character or the command will not be recognized by the unit.
- Commands are not case-sensitive.
- Commands must end with a carriage return (0x0D). Use of a line feed(0x0A) is optional.
- The characters "[" and "]" are placed around variable command parameters where there is a choice of more than one item. Please type the selected parameter without the "[" and "]" characters when entering the command.
- The unit will respond to most commands with a repeat of the original command followed by the specified parameters or requested information except where otherwise noted. If an invalid command is entered the unit will respond with "\$err".
- All unit responses end with a carriage return(0x0D) + line feed(0x0A).
- Only one command may be processed at a time. Do not send additional commands until the response from the previous command has been received.
- Some commands are not supported over Telnet.

## 6.9 Telnet Control

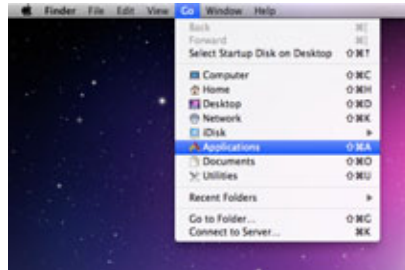
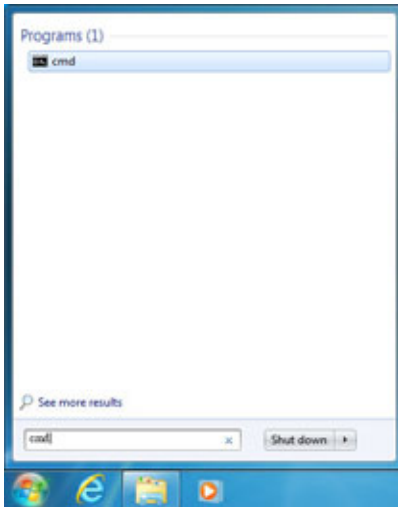
Before attempting to use telnet control, please ensure that both the unit and the PC/Laptop are connected to the same active networks.

To access Telnet in Windows 7, click on the "Start" menu and type "cmd" in the search field, then press "Enter".

Under Windows XP go to the "Start" menu, click on "Run", type "cmd" then press "Enter".

Under Mac OS X, go to Go→Applications→Utilities→Terminal

See below for reference.



Once in the CLI (Command Line Interface) type "telnet" followed by the IP address of the unit and "23", then hit "Enter". The IP address can be found in the OSD within the "Ethernet" menu item.

```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>telnet 192.168.5.88 23
```

This will connect us to the unit we wish to control. Type "\$help" or "\$?" to list the available commands.

```
$boot [go]
$boot?
$edid_copy_sink [c1/c2~c10]
$edid_read [d1/d2~d10/c1/c2~c10/sink], [block0/1]
$edid_rx [d1/d2~d10/c1/c2~c10/sink]
$edid_rx?
$edid_write [c1/c2~c10], [block0/block1]<CR><LF>[128byte data]
$err
$factory
$fuser?
$hdcv_in_sw [off/on]
$hdcv_in_sw?
$hdcv_in_detect?
$hdcv_in_ver [v1.4/v1.4+v2.2]
$hdcv_in_ver?
$hdcv_out_sw [off/on]
$hdcv_out_sw?
$hdcv_out_ver [v1.4/v2.2]
$hdcv_out_ver?
$help
$?
$model?
$motion_text [text] Max. 20 Char
$motion_text?
$net_gate?
$net_ip?
$net_ip_mode [dhcp/static]
$net_ip_mode?
$net_link?
$net_mac?
$net_mask?
$net_static_gate [xxx.xxx.xxx.xxx]
$net_static_gate?
$net_static_ip [xxx.xxx.xxx.xxx]
$net_static_ip?
$net_static_mask [xxx.xxx.xxx.xxx]
$net_static_mask?
$pattern [1/2/3/~]
$pattern?
$task_mode [analyser/pattern]
$task_mode?
$timing [1/2/3/~]
$timing?
$update_fw
$update_ing488
$update_ing1088
```

Note: Commands will not be executed unless followed by a carriage return. Commands are not case-sensitive. If the IP address is changed then the IP address required for telnet access will also change accordingly.

## 6.10 OSD Menu

### 6.10 .1 Analyzer Mode

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
Source Monitor	Analytic Data		
Video Timing	Analytic Data		
Audio Timing	Analytic Data		
Packet	Analytic Data		
EDID Analyzer	HDMI Sink	Analytic Data	
	VGA Sink	Analytic Data	
	RX EDID	Analytic Data	
	Default & Copied EDID	[D1]~[D10] Default EDID Settings & [C1]~[C10] Copied EDID Settings	
EDID Emulator	RX EDID Select	Copy HDMI Sink	[D4] 8B 2D
		[D1] DVI	2CH LPCM
		[D2] VGA	HD
		[D3] 8B 2D 2CH LPCM PC	
		[D4] 8B 2D 2CH LPCM HD	
		[D5] 12B 2D 8CH Bits 720p	
		[D6] 12B 3D 8CH Bits HD	
		[D7] 12B 2D 8CH Bits 4K6G	
		[D8] 12B 2D 8CH HBR 4K3G	
		[D9] 12B 2D 8CH HBR 4K420	
		[D10] 12B 2D 8CH HBR 4K6G	

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
<b>EDID Emulator (Cont.)</b>	RX EDID Select	[C1] Copy 01	[D4] 8B 2D 2CH LPCM HD
		[C2] Copy 02	
		[C3] Copy 03	
		[C4] Copy 04	
		[C5] Copy 05	
		[C6] Copy 06	
		[C7] Copy 07	
		[C8] Copy 08	
		[C9] Copy 09	
		[C10] Copy 10	
	Copy HDMI Sink EDID	[C1]~[C10] Copied EDID Settings	
Copy VGA Sink EDID	[C1]~[C10] Copied EDID Settings		
Rename Copied Sink EDID	[C1]~[C10] Copied EDID Settings		
Burn EDID to HDMI Sink	[D1]~[D10] Default EDID Settings & [C1]~[C10] Copied EDID Settings		
Burn EDID to VGA Sink	[D1]~[D10] Default EDID Settings & [C1]~[C10] Copied EDID Settings		
<b>HDCP Input Monitor</b>	Analytic Data		
<b>SCDC Input Monitor</b>	Analytic Data		

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
<b>RX Port Controls</b>	Hot Plug Preset	Low	Toggle
		High	
		Toggle	
	Hot Plug Toggle Time	50ms~500ms	100ms
	Hot Plug Run		
	RX Sense	On	On (PoR)
		Off	
	DDC	On	On (PoR)
		Off	
	V.Freq/1.001 Detection	On	On
		Off	
	HDCP Port On/Off	On	On (PoR)
		Off	
	HDCP Port Version	v1.4	v1.4+v2.2
		v1.4+v2.2	
	HDCP REAUTH_REQ Toggle		
HDCP Counter Reset			
SCDC Port	On	On	
	Off		
SCDC CED Ch Auto Clear	On (Auto clear while source reads CED)	Off	
	Off		
<b>Output Resolution</b>	T01 640x350p85~T88 Bypass		1080p60

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
OSD Settings	H Position	0%-100%	10%
	V Position	0%-100%	10%
	Transparency	0-7 (Solid-Transparent)	4
	A Mode Color (Analyzer Mode)	Red	Red
		Blue	
		Gray	
	P Mode Color (Pattern Mode)	Red	Blue
		Blue	
		Gray	
Ethernet	IP Mode	DHCP	DHCP
		Static	
	IP Address	a.b.c.d (Static Mode)	192.168. 5.88
	Subnet Mask	a.b.c.d (Static Mode)	255.255. 255.0
Gateway	a.b.c.d (Static Mode)	192.168. 5.254	
Setup	Firmware Update	No	No
		Yes	
	Image 640x480 Update	No	No
		Yes	
	Image 1920x1080 Update	No	No
		Yes	
	[Letter H] Option 2	Small	Medium
		Medium	
	3D Source Image Bypass	No	No
		Yes	
	Information Refresh	1 Sec	2 Sec
		2 Sec	
Manual			



MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
<b>Setup (Cont.)</b>	IR Controller Address	0-3	0
	Copied EDID Reset	No	No
		Yes	
	Ethernet Reset	No	No
		Yes	
	Factory Reset	No	No
		Yes	
<b>Information</b>	Analytic Data		

Note:

- SCDC= Status and Control Data Channel
- CED= Character Error Detection
- PoR= Power on Reset (setting is reset when the unit is powered off)
- Image file format: 640×480/1920×1080 (RGB, 24-bit, bitmap)

### Source HDR Ability:

- Parse the HDR Static Metadata data block in the sink's EDID.
- Output 4K60 (4:2:0, 10/12-bit), or 4K30 (4:4:4, 10/12-bit).
- Output DRMI (Dynamic Range & Mastering InfoFrame).

### Sink HDR Ability:

- Build an RX EDID that includes the HDR Static Metadata data block.
- Receive 4k60 (4:2:0, 10/12-bit), or 4K30 (4:4:4, 10/12-bit) signals.
- Receive DRMI and decode the HDR contents.

### Unit HDR Ability:

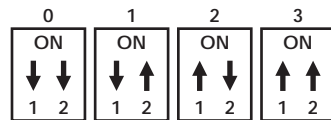
- No support for HDR output in Pattern mode.
- Supports HDR bypass & analysis in Analyzer mode.
- HDR EDID must be copied from an connected sink to the RX EDID through the EDID Emulator menu in Analyzer mode.
- EDID Analyzer & Packet.DRMI for HDR analysis in Analyzer mode.

### EDID Settings:

- The unit has 10 built-in EDIDs and 10 custom EDID slots. Within the OSD menu's "EDID Emulator" section, the EDID from the currently connected sink, a built-in EDID, or a custom EDID may be selected for use as the unit's EDID. Programming a custom EDID through the RS-232 connection is supported.

### IR Settings:

- The IR remote uses one out of 4 available address channels for control of the test pattern generator, allowing up to 4 to be located in the same area while being controlled by different remotes. Select "IR Controller Address" within the "Setup" section of the OSD's main menu. Assign an address number (from 0 to 3) that matches the setting on the remote that is to be used with the unit. The default factory setting is 0.



- The IR remote's address can be set using the two DIP switches located on the back of the remote, inside the battery cover. The default factory setting is 0 (off, off).

## 6.10. 2 Pattern Mode

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
<b>Sink Monitor</b>	Analytic Data		
<b>Pattern</b>	P01 Border ~ P55 Window Yellow		
<b>Audio Output</b>	Source	HDMI In	Int. Sinewave (PoR)
		Analog In	
		Int. Sinewave	
	Volume	0~80	70
	Analog Out CH	SD0 L/R	SD0 L/R
		SD1 L/R	
		SD2 L/R	
		SD3 L/R	
	Sampling Rate	48kHz	48kHz
		96kHz	
		192kHz	
	Word Length	16 Bits	24 Bits
		20 Bits	
		24 Bits	
	Channels	2CH	7.1CH
		5.1CH	
		7.1CH	
	SD0-L Freq.	Mute	1000Hz
		200Hz~1600Hz	
	SD0-R Freq.	Same as "SD0-L Freq."	1000Hz
	SD1-L Freq.	Same as "SD0-L Freq."	1000Hz
	SD1-R Freq.	Same as "SD0-L Freq."	1000Hz
SD2-L Freq.	Same as "SD0-L Freq."	1000Hz	
SD2-R Freq.	Same as "SD0-L Freq."	1000Hz	
SD3-L Freq.	Same as "SD0-L Freq."	1000Hz	
SD3-R Freq.	Same as "SD0-L Freq."	1000Hz	

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
EDID Analyzer	Analytic Data		
EDID Emulator	Analytic Data		
HDCP Output Monitor	Analytic Data		
SCDC Output Monitor	Analytic Data		
TX Port Controls	+5V Out On/Off	Follow TMDS	Follow TMDS
		Always	
		On	
	HDCP Output On/Off	On	Off (PoR)
		Off	
	HDCP Output Version	v1.4	v1.4
		v2.2	
	HDCP AKE_Send_Stored_km()	On	Off
		Off	
	HDCP Counter Reset		
	SCDC CED Counter Read	On	On
		Off (TX doesn't read sink CH0-3 Error-Counter)	
	SCDC CED Always Read	On (TX ignores sink CED_Update flag)	On
		Off	
SCDC CED Ch Auto Clear	On (While sink CED_Update flag=1, TX auto clear itself CH0-3 Error-Counter. And read new counter from sink)	Off	
	Off		
Output Resolution	T01 640x350p85~T88 Bypass (T88 is available in Analyzer mode)		1080p60

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
OSD Settings	H Position	0%-100%	10%
	V Position	0%-100%	10%
	Transparency	0-7 (Solid ~ Transparent)	4
	A Mode Color (Analyzer Mode)	Red	Red
		Blue	
		Gray	
	P Mode Color (Pattern Mode)	Red	Blue
		Blue	
		Gray	
Ethernet	IP Mode	DHCP	DHCP
		Static	
	IP Address	a.b.c.d (Static Mode)	192.168. 5.88
	Subnet Mask	a.b.c.d (Static Mode)	255.255. 255.0
Gateway	a.b.c.d (Static Mode)	192.168. 5.254	
Setup	Firmware Update	No	No
		Yes (CPHD-V4.BIN)	
	Image 640x480 Update	No	No
		Yes (IMG_480.BMP)	
	Image 1920x1080 Update	No	No
		Yes (IMG_1080.BMP)	
	[Letter H] Option 2	Small	Medium
		Medium	
	3D Source Image Bypass	No	No
		Yes	
	Information Refresh	1 Sec	2 Sec
		2 Sec	
Manual			

MAIN MENU	SUB MENU	ADJUSTMENTS	DEFAULT
<b>Setup (Cont.)</b>	IR Controller Address	0-3	0
	Copied EDID Reset	No	No
		Yes	
	Ethernet Reset	No	No
		Yes	
	Factory Reset	No	No
Yes			
<b>Information</b>	Analytic Data		

Note:

- SCDC= Status and Control Data Channel
- CED= Character Error Detection
- PoR= Power on Reset (setting is reset when the unit is powered off)

## 6.11 Test Timings

### 6.11.1 Input Timings

Resolutions	Vertical Frequency (Hz)	HDMI
640×350p	85	✓
640×480p	59, 72, 75, 85	✓
720×400p	70, 85	✓
800×600p	56, 60, 72, 75, 85	✓
848×480p	60	✓
1024×768p	60, 70, 75, 85	✓
1152×864p	70, 75, 85	✓
1280×768p	60 (RB), 60, 75, 85	✓
1280×800p	60 (RB), 60, 75, 85	✓
1280×960p	60, 85	✓
1280×1024p	60, 75, 85	✓
1360×768p	60	✓
1366×768p	60 (RB), 60	✓
1400×1050p	60 (RB), 60	✓
1440×900p	60 (RB), 60	✓
1600×900p	60 (RB)	✓
1600×1200p	60	✓
1680×1050p	60 (RB), 60	✓
1920×1200p	60 (RB)	✓
480i	59, 60	✓
480p	59, 60	✓
576i	50	✓
576p	50	✓
720p	25, 29, 30, 50, 59, 60	✓
1080i	50, 59, 60	✓

Resolutions	Vertical Frequency (Hz)	HDMI
1080p	23, 24, 25, 29, 30, 50, 59, 60	✓
2048×1080p	23, 24, 25, 29, 30, 50, 59, 60	✓
3840×2160p	23, 24, 25, 29, 30, 50, 59, 60	✓
4096×2160p	23, 24, 25, 29, 30, 50, 59, 60	✓

### 6.11.2 Output Timings

Resolutions	Vertical Frequency (Hz)	HDMI	DVI	VGA
640×350p	85	✓	✓	✓
640×480p	59, 72, 75, 85	✓	✓	✓
720×400p	70, 85	✓	✓	✓
800×600p	56, 60, 72, 75, 85	✓	✓	✓
848×480p	60	✓	✓	✓
1024×768p	60, 70, 75, 85	✓	✓	✓
1152×864p	75	✓	✓	✓
1280×768p	60 (RB), 60, 75, 85	✓	✓	✓
1280×800p	60 (RB), 60, 75, 85	✓	✓	✓
1280×960p	60, 85	✓	✓	✓
1280×1024p	60, 75, 85	✓	✓	✓
1360×768p	60	✓	✓	✓
1366×768p	60 (RB), 60	✓	✓	✓
1400×1050p	60 (RB), 60	✓	✓	✓
1440×900p	60 (RB), 60	✓	✓	✓
1600×900p	60 (RB)	✓	✓	✓
1600×1200p	60	✓	✓	✓
1680×1050p	60 (RB), 60	✓	✓	✓
1920×1200p	60 (RB)	✓	✓	✓
480i	59, 60	✓	✓	✓
480p	59, 60	✓	✓	✓



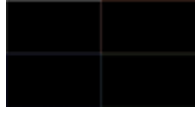
Resolutions	Vertical Frequency (Hz)	HDMI	DVI	VGA
576i	50	✓	✓	
576p	50	✓	✓	✓
720p	50, 59, 60	✓	✓	✓
1080i	50, 59, 60	✓	✓	
1080p	23, 24, 25, 29, 30	✓	✓	
	50, 59, 60	✓	✓	✓
2048×1080p	23, 24, 25, 29, 30, 50, 59, 60	✓	✓	
3840×2160p	23, 24, 25, 29, 30, 50, 59, 60	✓		
4096×2160p	23, 24, 25, 29, 30, 50, 59, 60	✓		

Note:

- *RB=Reduced Blanking*
- *87 total resolutions.*
- *VGA output limitations:*
  - *Only supports RGBHV. (No YUV, RGBS or RGsB support)*
  - *In Analyzer mode: VGA output is turned off.*
  - *In Pattern mode: VGA output has limited resolution support.*
  - *OSD Menu display is not supported.*

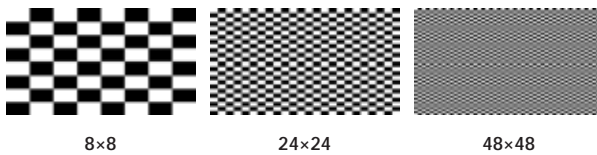
## 6.12 Test Patterns

### 1. Border



The **Border** pattern presents 4 equal-sized squares dividing the screen into 4 quadrants, forming a central white cross, with red, green, blue and white inner squares. Ideal for testing screen boundary, alignment and pincushion issues. All lines should be straight, and edge transitions should be sharp.

### 2. Checkerboard



The **Checkerboard** pattern displays a repeating black and white checkerboard image. This is ideal for checking the alignment and corner convergence of TVs or monitors. Bandwidth can be checked by observing the vertical transitions. Transitions from black to white should be sharp. There are 3 variations: 8x8, 24x24 and 48x48.

### 3. Circle 1



The **Circle 1** pattern provides a single white circle in the middle with a white cross and a white outer border line. This pattern is designed for quickly confirming that the geometry of the scene is correct and that the full source is being displayed, edge to edge.

#### 4. Circle 4



The **Circle 4** pattern provides 4 smaller white circles in each of the 4 corners of the screen. This pattern can help confirm that the display is maintaining correct geometry at the edges of the screen.

#### 5. Black



#### 6. Blue



#### 7. Cyan



#### 8. Green



#### 9. Magenta



#### 10. Red



#### 11. White

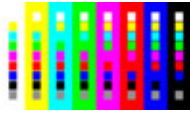


#### 12. Yellow



These patterns are full screen purity tests offering eight different full field patterns: **Black, Blue, Cyan, Green, Magenta, Red, White, Yellow**. The color patterns should display an even distribution of brightness and consistent color tone across the screen. The 100% white pattern should display evenly across the screen and not cause the display's overall brightness to lower, or for the image to become unstable. The black pattern will give a good idea of the display's true minimum brightness capability and is helpful for setting the viewing room lighting levels.

### 13. Colorbar Delay



The **Colorbar Delay** pattern provides a sequence of standard 100% color bars with a full set of smaller color squares within each bar. This test is primarily to detect if any of the color components of the video signal are delayed/skewed relative to each other. Pay close attention to the left and right sides of the squares and look for a color shift. This is a common problem when using extreme-length analog extension products, or very long analog cables.

### 14. Colorbar-H



The **Colorbar-H** pattern is a standard (white, yellow, cyan, green, magenta, red, blue, black) 100% color bar pattern using horizontal bars.

### 15. Colorbar Motion



Slow/Fast Motion

The **Colorbar Motion** pattern is a standard (white, yellow, cyan, green, magenta, red, blue, black) 100% color bar pattern using vertical bars with a grey bar moving horizontally across it. There are 2 variations: slow and fast motion of the grey bar.

## 16. Colorbar S.



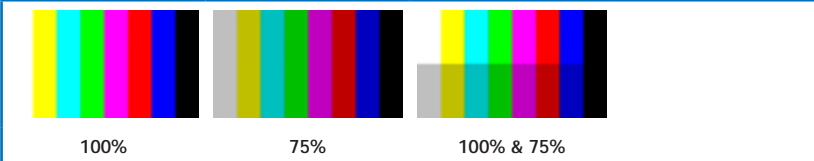
The **Colorbar S** pattern is a standard SMPTE color bar pattern which is used for rapid verification of signal color accuracy and for display setup using the Blue-Only option on your display, if it has one.

## 17. Colorbar Split



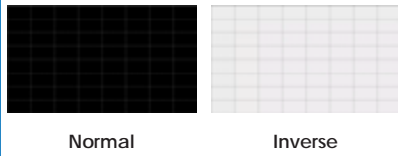
The **Colorbar Split** pattern is a vertical color bar pattern with the color bars split in the middle by large black and white sections. All colors (white, yellow, cyan, green, magenta, red, blue) are at 100% brightness.

## 18. Colorbar-V (3 variations)



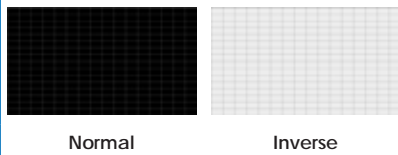
The **Colorbar-V** pattern comes in 3 variations. The first is a standard (white, yellow, cyan, green, magenta, red, blue, black) 100% color bar pattern using vertical bars. The 2nd variation has all bars at 75% brightness. The 3rd variation is split with the top half being at 100% and the lower half being at 75% brightness.

### 19. Cross Hatch 8 (2 variations)



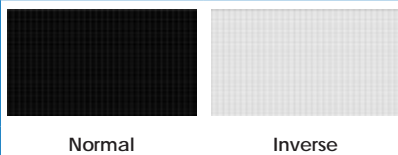
The **Cross Hatch 8** pattern is a full field black & white pattern of crossing vertical and horizontal lines dividing the screen into 8 sections in each direction. This pattern is primarily used to check for color convergence and pincushion issues in projectors. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

### 20. Cross Hatch 16 (2 variations)



The **Cross Hatch 16** pattern is a full field black & white pattern of crossing vertical and horizontal lines dividing the screen into 16 sections in each direction. This pattern is primarily used to check for color convergence and pincushion issues in projectors. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

### 21. Cross Hatch 32 (2 variations)



The **Cross Hatch 32** pattern is a full field black & white pattern of crossing vertical and horizontal lines dividing the screen into 32 sections in each direction. This pattern is primarily used to check for color convergence and pincushion issues in projectors. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

## 22. Diagonal 1



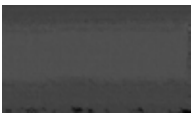
The **Diagonal 1** pattern is a set of 3 diagonal colored lines (red, white and blue) within a white square in the middle of the screen. This pattern is used to check for distortion and alignment issues in the center of the screen.

## 23. Diagonal 2



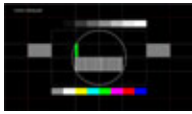
The **Diagonal 2** pattern is 2 diagonal lines that travel from the corners to the exact center of the display. This can be used to check for alignment and geometry issues, particularly with projectors. The outer border of the screen also has a white outline to verify that the full image is being displayed.

## 24. Dot



The **Dot** pattern is a full field black & white pattern with a repeating pattern of single-pixel (resolutions below 4K) or 4-pixel (at 4K) white dots surrounded by single pixels of black. This pattern is ideal for testing the signal path/display for bandwidth issues, interference, cross-talk or scaling issues.

## 25. General (3 variations)



Stop/Slow/Fast  
Motion

The **General** pattern is an all-purpose, multi-pattern test to visually check for multiple issues simultaneously. It includes color bars, 8-step greyscale, vertical and horizontal multi-burst, cross hatch, circle and motion patterns. There are 3 variations: No motion, slow motion and fast motion.

## 26. Grayscale 8 (3 variations)



Vert. Bar

Vert. L/R Bar

Hori. Bar

The **Grayscale 8** pattern provides a way to check and adjust the contrast, brightness and grayscale tracking of your display with 8 bars progressing from 0% to 100% brightness in even steps. When testing a display, no color should be visible in any of the bars, and all bars should be visible and distinct. There are 3 variations: 8 vertical bars, two sets of 8 vertical bars with the lower set reversed, and 8 horizontal bars.

## 27. Grayscale 16 (3 variations)



Vert. Bar

Vert. L/R Bar

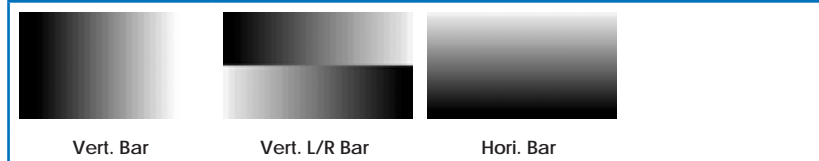
Hori. Bar

The **Grayscale 16** pattern provides a way to check and adjust the contrast, brightness and grayscale tracking of your display with 16 bars progressing from 0% to 100% brightness in even steps. When testing a display, no color should be visible in any of the bars, and all bars should be visible and distinct. There are 3 variations: 16 vertical



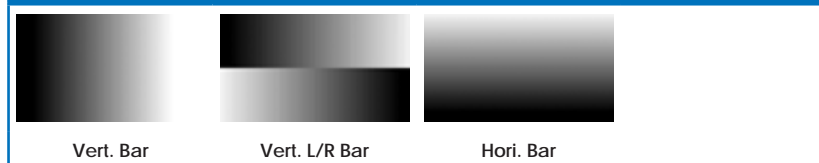
bars, two sets of 16 vertical bars with the lower set reversed, and 16 horizontal bars.

### 28. Grayscale 32 (3 variations)



The **Grayscale 32** pattern provides a way to check and adjust the contrast, brightness and grayscale tracking of your display with 32 bars progressing from 0% to 100% brightness in even steps. When testing a display, no color should be visible in any of the bars, and all bars should be visible and distinct. There are 3 variations: 32 vertical bars, two sets of 32 vertical bars with the lower set reversed, and 32 horizontal bars.

### 29. Grayscale 64 (3 variations)



The **Grayscale 64** pattern provides a way to check and adjust the contrast, brightness and grayscale tracking of your display with 64 bars progressing from 0% to 100% brightness in even steps. When testing a display, no color should be visible in any of the bars, and all bars should be visible and distinct. There are 3 variations: 64 vertical bars, two sets of 64 vertical bars with the lower set reversed, and 64 horizontal bars.

### 30. Grayscale 256 (4 variations)



The **Grayscale 256** pattern provides a way to fine tune the contrast, brightness and grayscale tracking of your display with a full 265 step gradient progressing from 0% to 100% brightness. When testing a display, no color should be visible at any point across the gradient, and the transition from black to white should appear even and consistent. There are 3 variations: 256 vertical bars, two sets of 256 vertical bars with the lower set reversed, and 265 horizontal bars.

### 31. Grayscale 256RGB



The **Grayscale 256RGB** pattern provides a way to fine tune the contrast, brightness, grayscale and color tracking of your display with a four full 265 step gradients (gray, red, green, blue) progressing from 0% to 100% brightness. When testing a display, the transition from dark to light should appear even and consistent across all 4 sections.

### 32. Grayscale Adjust (256 variations)



The **Grayscale Adjust** pattern provides a full field of grey with user adjustable brightness levels for testing display gray purity and signal response. The brightness can be freely adjusted from 0 to 255 by pressing the PATTERN button followed by the +/- buttons. The gray level number will appear in text on screen while it is in adjusting mode.

### 33. Grayscale H



The **Grayscale H** pattern provides 4 distinct gray fields in an “H” arrangement for testing luminance transition stability. No color or interference should be visible at the transitions between sections.

### 34. Grid



The **Grid** pattern provides a selection of red, green, blue and white boxes with 2×2 grids within and above them to test for pixel on pixel and color offset issues.

### 35. Image (2 variations)



The **Image** pattern is a user customizable test pattern that holds two bitmap images. One image is for use with low output resolutions (below 1920×1080) and the other is for high output resolutions (1920×1080 and above). The low resolution image is a 640×480 bitmap (RGB, 24-bit) and the high resolution image is a 1920×1080 bitmap (RGB, 24-bit).

*Note: To upload new images into the unit please the new replacement image on a USB thumb drive with the file named “IMG\_480.BMP” or “IMG\_1080.BMP” as appropriate. Plug the USB thumb drive into the USB port on the unit and navigate to the “Setup” menu. Next, activate the “Image 640×480 Update” or “Image 1920×1080 Update” menu item, as appropriate, to copy the new image to the unit.*

### 36. Letter H (2 variations)



Big/Small H

The **Letter H** pattern is a screen filled with a series of large capital “H” characters moving vertically up the screen. This is a basic test to confirm motion detail. There are 2 variations: Large “H” characters and small “H” characters.

### 37. Line On/Off-H



The **Line On/Off-H** pattern generates an alternating pattern of single-pixel horizontal white lines. This pattern can be used to analyze the vertical pixel resolution of your display. If the output appears to have mosaic patterns, or appears to be a solid gray field, then it is possible that your display does not fully support the resolution you are currently sending to it.

### 38. Line On/Off-V (2 variations)



White & Black Lines

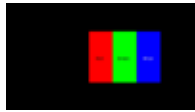


Red & Green Lines  
(Not supported in  
4K)

The **Line On/Off-V** pattern generates an alternating pattern of single-pixel vertical lines. This pattern can be used to analyze the horizontal pixel resolution of your display. If the output appears to have mosaic patterns, or appears to be a solid gray field, then it is possible that your display does not fully support the resolution you are currently sending to it. There are 2 variations: alternating white & black lines and alternating red and green lines.

Note: The red and green variation is not available if the selected output resolution is 4K. The following timings use dual-pixel lines: 3840×2160@50/60Hz & 4096×2160@25/30/50/60Hz.

### 39. Motion-H (4 variations)



Slow/Fast RGB Block



Slow/Fast String

The **Motion-H** patterns are a collection of horizontal motion tests. These can be used to test your display's pixel on/off response time. There are 4 variations: Slow red/green/blue block, fast red/green/block, slow moving sample text, fast moving sample text.

Note: The contents of the text can be modified using an RS-232 or telnet command and can be up to 20 characters long.

### 40. Motion-V (4 variations)



Slow/Fast RGB Block

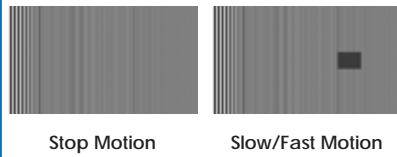


Slow/Fast String

The **Motion-V** patterns are a collection of vertical motion tests. These can be used to test your display's pixel on/off response time. There are 4 variations: Slow red/green/blue block, fast red/green/block, slow moving sample text, fast moving sample text.

Note: The contents of the text can be modified using an RS-232 or telnet command and can be up to 20 characters long.

#### 41. Multiburst (3 variations)



The **Multiburst** pattern provides a standard multiburst pattern consisting of vertical white lines that decrease in thickness from left to right allowing the user to analyze the bandwidth and frequency response of the video path and connected display. There are 3 variations: Standard multiburst, multiburst with a slow moving gray block, and multiburst with a fast moving gray block.

#### 42. Needles



The **Needles** pattern is a standard needle pulse test. The top half of the screen is black and the bottom half is white with 2 thin inverse-brightness lines crossing from top to bottom. This pattern allows for analysis of the sharpness, blooming and screen distortion issues that a display might have.

#### 43. Overscan



The **Overscan** pattern provides a quick way to determine how much overscan, or clipping, is being caused by a display. It consists of 5 concentric rectangles moving in from the outer edge of the signal. They are positioned at 0%, 2.5%, 5%, 7.5% and 10% of the screen size.

#### 44. Pluge (2 variations)



Full/Limited RGB  
Range

The **Pluge** pattern is used to perform the accurate and consistent brightness and contrast configuration of a display. Typically you will want to adjust the brightness control of the monitor so that the first bar is just barely indistinguishable from the background black while the second bar is still clearly visible. Next you should adjust the contrast so that all four segments of the greyscale box are clearly visible and distinguishable. There are 2 variations: Full RGB range (0 - 255) and Limited RGB range (16-235).

#### 45. Square H8 (2 variations)

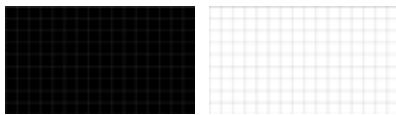


Normal

Inverse

The **Square H8** pattern is a full field black & white pattern of squares dividing the screen horizontally into 8 sections. This pattern is primarily used to check projector linearity. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

#### 46. Square H16 (2 variations)



Normal

Inverse

The **Square H16** pattern is a full field black & white pattern of squares dividing the screen horizontally into 16 sections. This pattern is primarily used to check projector linearity. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

#### 47. Square H32 (2 variations)



Normal



Inverse

The **Square H32** pattern is a full field black & white pattern of squares dividing the screen horizontally into 32 sections. This pattern is primarily used to check projector linearity. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

#### 48. Text (4 variations)



Normal & Small



Inverse & Small



Normal & Big

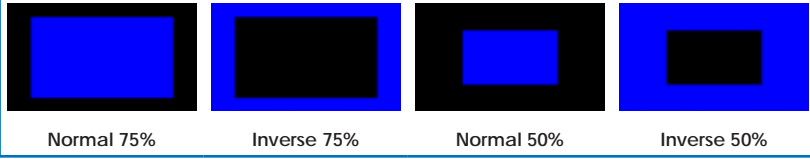


Inverse & Big

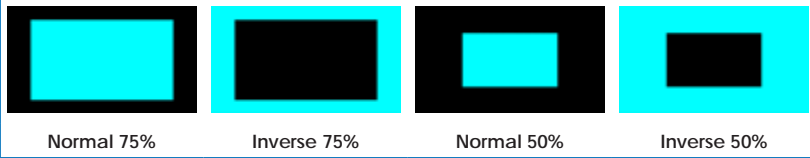
The **Text** pattern is used to check the clarity of text at various sizes and colors. This is primarily a test for projectors. There are 4 variations: Small multi-color text on a black background, small multi-color text on a white background, large multi-color text on a black background, and large multi-color text on a white background.



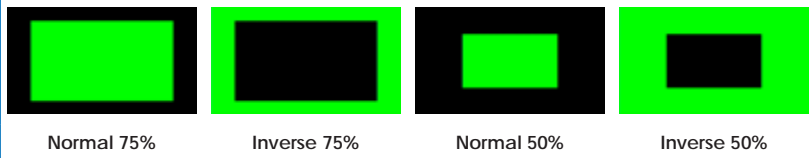
#### 49. Window Blue (4 variations)



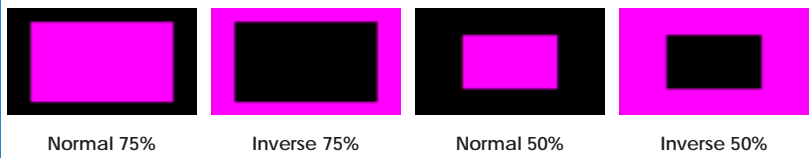
#### 50. Window Cyan (4 variations)



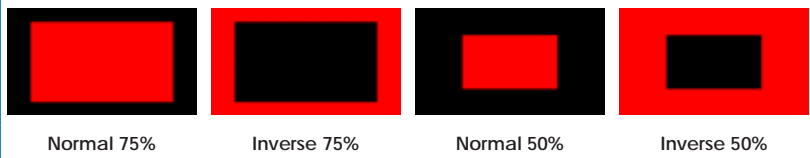
#### 51. Window Green (4 variations)



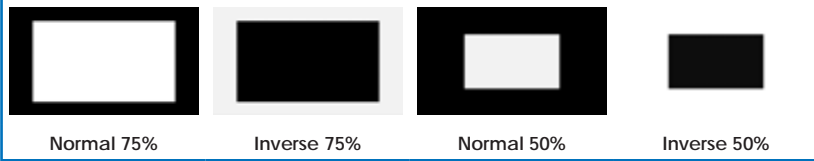
#### 52. Window Magenta (4 variations)



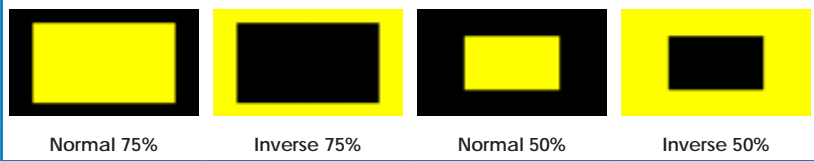
#### 53. Window Red (4 variations)



#### 54. Window White (4 variations)

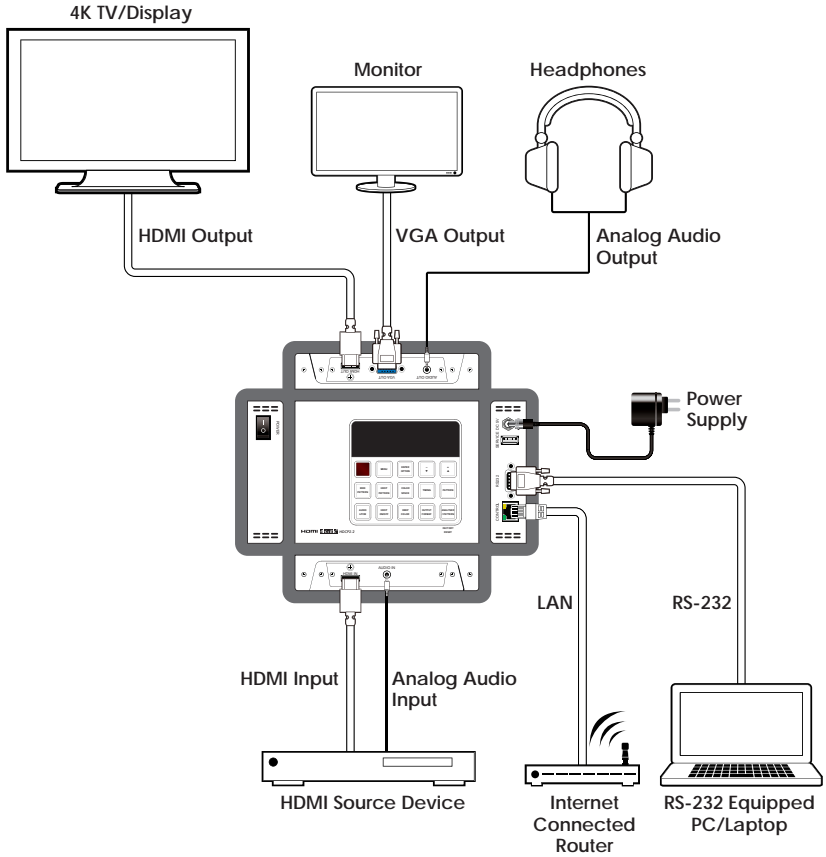


#### 55. Window Yellow (4 variations)



These **Window** patterns are additional screen purity tests offering seven different patterns with different sized windows of each color on a black field: **Blue**, **Cyan**, **Green**, **Magenta**, **Red**, **White**, **Yellow**. The color patterns should display an even distribution of brightness and consistent color tone across the screen. Each pattern has 4 variations: Normal 75% Window, Inverse 75% Window, Normal 50% Window, and Inverse 50% Window.

## 7. CONNECTION DIAGRAM



## 8. SPECIFICATIONS

### 8.1 Technical Specifications

<b>Video Bandwidth</b>	600MHz/18Gbps
<b>Input Ports</b>	1×HDMI, 1×3.5mm Stereo, 1×RS-232 (DB-9), 1×IP Control (RJ-45), 1×Service (USB)
<b>Output Ports</b>	1×HDMI, 1×VGA, 1×3.5mm Stereo
<b>Power Supply</b>	5V/2.6A DC (US/EU standards, CE/FCC/UL certified)
<b>DC to USB Power Source (Optional)</b>	2.1A (Minimum)
<b>ESD Protection</b>	Human body model: ±8 kV (air-gap discharge) ±4 kV (contact discharge)
<b>Dimensions</b>	120mm×30mm×155mm (W×H×D) [Case Only] 125mm×30mm×162mm (W×H×D) [All Inclusive]
<b>Weight</b>	796g
<b>Chassis Material</b>	Metal
<b>Color</b>	Black
<b>Operating Temperature</b>	0°C~40°C/32°F~104°F
<b>Storage Temperature</b>	-20°C~60°C/-4°F~140°F
<b>Relative Humidity</b>	20~90% RH (non-condensing)
<b>Power Consumption</b>	8.4W

## 8.2 Supported Color Formats

Output Resolution (Hz)	RGB			YCbCr 4:4:4			YCbCr 4:2:2		YCbCr 4:2:0		
	8	10	12	8	10	12	8	12	8	10	12
640×350p@85~ 2048×1080p@60	✓	✓	✓	✓	✓	✓	✓	/	/	/	/
3840×2160p@23-30	✓	*	*	✓	*	*	/	/	/	/	/
4096×2160p@23-30											
3840×2160p@50-60	*	/	/	*	/	/	/	/	✓	*	*
4096×2160p@50-60											

Note: ✓ = Specified color depth is supported; \* = Specified color depth is supported & TMDS scrambling is active.

## 8.3 Supported Audio Formats

Audio Source	Sampling Rate (kHz)	Channels	Word Length (Bits)	SD0-3 L/R Freq. (Hz)
HDMI Input	Bypass	Bypass	Bypass	Bypass
Analog Input	48	2.0	16, 20, 24	Bypass
	96	2.0		
	192	2.0		
Internal Sinewave	48	2.0, 5.1, 7.1	16, 20, 24	Mute, 200, 400-1600
	96	2.0, 5.1, 7.1		
	192	2.0		

- 48kHz supports a maximum of 2 channels at 2048×1080p@29/30Hz resolution.
- 96kHz supports a maximum of 2 channels at 480i, 576i, 480p, 576p, 640×480p@59Hz, 720×400p@70Hz, 1280×768p@60Hz (RB), 1366×768p@60Hz (RB), 2048×1080p@29/30/59/60Hz, 4096×2160p@29/30Hz resolutions.
- 192kHz is not supported at 1366×768p@60Hz (RB) or 2048×1080p@29/30Hz resolution.

## 9. ACRONYMS

ACRONYM	COMPLETE TERM
CEC	Character Error Detection
EDID	Extended Display Identification Data
HDCP	High-bandwidth Digital Content Protection
HDMI	High-Definition Multimedia Interface
IR	Infrared
OLED	Organic Light Emitting Diodes
OSD	On-Screen Display
PoR	Power on Reset
RB	Reduced Blanking
SCDC	Status and Control Data Channel

