CPHD-V4

4K UHD+ HDMI Signal Generator & Analyzer (Bench Version)

Operation Manual

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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.
- Please completely disconnect the power when the unit is not in use to avoid wasting electricity.

VERSION HISTORY

REV.	DATE	SUMMARY OF CHANGE
VS1	2016/09/07	Final technical review
VS2	2017/08/01	Updated sections 6.7 & 6.9
VS3	2018/02/01	Added timings & patterns
VS4	2018/07/27	Updated Section 6.5.2
VS5	2020/07/20	Update to new format. Added new features.

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1. INTRODUCTION

This HDMI Signal Generator & Analyzer is an advanced and handy tool for generating, testing and verifying the signal path within your 18Gbps HDMI ecosystem. With 90 built-in resolutions, 59 test patterns and dozens 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 SCDC (Status and Control Data Channels) on the HDMI input and output can be directly monitored providing for additional analysis options. Up to 8 channels of LPCM audio test tones can be generated with a wide range of frequencies. This 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 Signal Generator & Analyzer (Bench Version)
- 1× 5V/2.6A DC Power Adapter
- 1× DC to USB Type-A Power Cable
- 1× Remote Control (CR-174)
- 1× Operation Manual

4. SYSTEM REQUIREMENTS

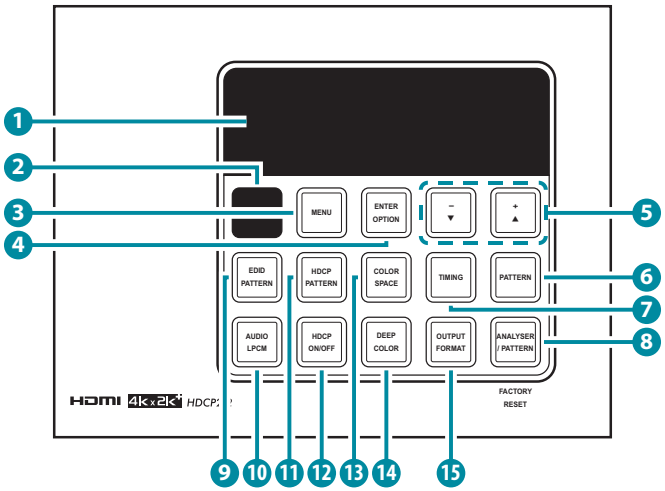
- HDMI/VGA receiving equipment such as an HDTV, monitor or audio amplifier and/or HDMI source equipment such as a media player, video game console or set-top box.
- Analog audio source equipment such as a PC or media player and/or analog audio receiving equipment such as headphones, an audio amplifier or powered speakers.

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 18Gbps HDMI signals
- Generates HDMI timings up to 18Gbps (4096×2160@60Hz 4:4:4, 8-bit) and VGA timings up to 165MHz (WUXGA, 1920×1200@60Hz RB)
- Sources can be scaled in Analyzer mode to support a wider range of displays when analyzing potentially incompatible sources
- 59 selectable test patterns in Pattern mode
- Analysis of HDMI data packets, including SCDC
- Analysis and control of HDCP v1.4 and v2.2
- Analysis and emulation of EDID data
- Analysis of input audio signals
- HDR emulation, bypass, and analysis support
- HDR analysis supports HDR10, HLG, and Dolby Vision
- 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
- Small and portable unit with OLED display with rapid updates of current status information
- Firmware update support via USB
- Supports optional Windows control software
- Control via front-panel buttons with detailed OSD/OLED, RS-232, Telnet, and IR remote

6. OPERATION CONTROLS AND FUNCTIONS

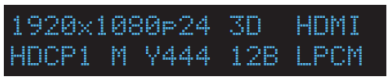
6.1 Front Panel



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

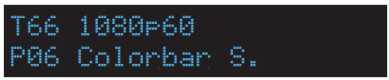
- **Analyzer Mode (ANALYZER/PATTERN Button is RED):** In Analyzer mode, if there is no live video source detected on the input port, the OLED will display any voltage, TMDS or sync that might be present.

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, RxSense, 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 Button:** Press to enter the OSD menu, or to back out from menu items.

4. **ENTER/OPTION Button:** 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. **+/▲ & −/▼ Buttons:** 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 Button:** 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 PATTERN button additional times.

   Title-Safe Overlay: Within Analyzer mode, press to cycle through a variety of "title-safe/action-safe" overlays.

   Note: This feature is not available when the output resolution is set to bypass mode.

7. **TIMING Button:** 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.

   Force Bypass: In Analyzer mode, press and hold this button for 2 seconds to force the output to use Bypass mode.

   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 TIMING button's LED will blink red when the timing is set to Bypass.

8. **ANALYZER/PATTERN Button:** Press to switch the unit between Analyzer Mode (LED=Red) and Pattern Mode (LED=Blue).

Force Hot-Plug: When in Analyzer Mode, press and hold the button for 2 seconds to force a hot-plug on the HDMI input.

AV Mute: 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 Button:** 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 Button:** Within Analyzer mode, press to select which Serial Data audio source pair (SD0~SD3) 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.

    Volume Control: Press and hold this button for 2 seconds to allow adjustment of the output volume by using the +/▲ & −/▼ buttons.

11. **HDCP PATTERN Button:** 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 Button:** 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 Button:** 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.

    Note: This control is not valid when the output resolution is set to bypass mode.

14. **DEEP COLOR Button:** 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.

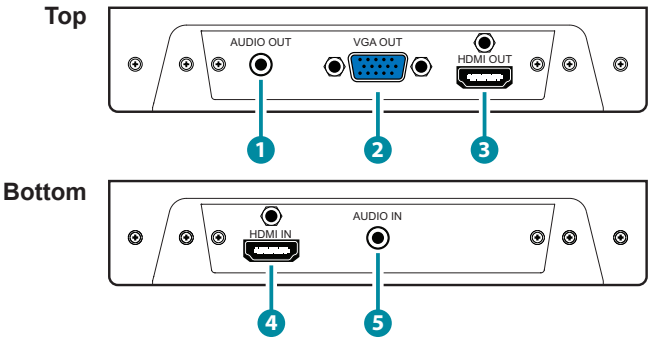
Note: This control is not valid when the output resolution is set to bypass mode.

15 **OUTPUT FORMAT Button:** Press to switch between DVI (LED=Blue) and HDMI (LED=Red) output formats.

Disable Output: 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.

Note: This control is not valid when the output resolution is set to bypass mode.

6.2 Top and Bottom Panels



1 **AUDIO OUT Port:** Connect to powered speakers or an amplifier for stereo analog audio output with a 3.5mm phone jack cable.

2 **VGA OUT Port:** Connect to a VGA (RGBHV) monitor or display for analog video output.

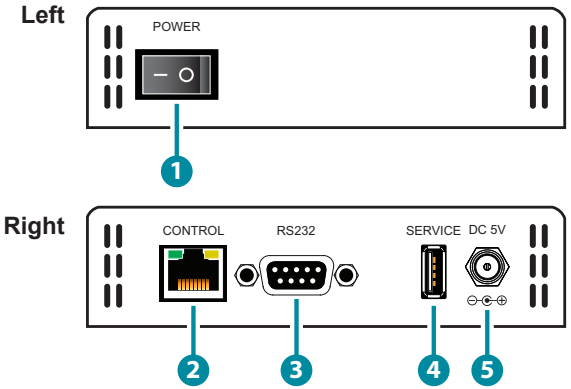
Note: Only supports RGBHV output (YUV, RGBS, and RGsB are not supported). In Analyzer mode the VGA output is disabled. OSD Menu display is not supported.

3 **HDMI OUT Port:** Connect to an HDMI TV, monitor or amplifier for digital video and audio output.

4 **HDMI IN Port:** Connect to HDMI source equipment such as a media player, game console or set-top box.

5 **AUDIO IN Port:** Connect to the stereo analog output of a device such as a CD player or PC.

6.3 Left and Right Panels



1. **POWER Switch:** Flip this switch to turn the unit ON or OFF after connecting an appropriate power source.
2. **CONTROL Port:** Connect directly, or through a network switch, to your PC/laptop to control the unit via Telnet.
3. **RS-232 Port:** Connect directly to your PC/laptop to send RS-232 commands to control the unit.
4. **SERVICE Port:** This slot is used for firmware updates and uploading customer designed test pattern files.

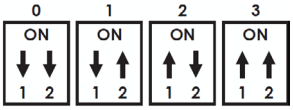
   *Note: Test patterns are restricted to 640×480 and 1920×1080. Only *.bmp 24-bit RGB bitmap files are supported.*
5. **DC 5V Port:** Plug the 5V DC power supply into the unit and connect it to an AC wall outlet for power or use the DC to USB adapter cable to connect to a portable USB power bank (2.1A minimum) for power.

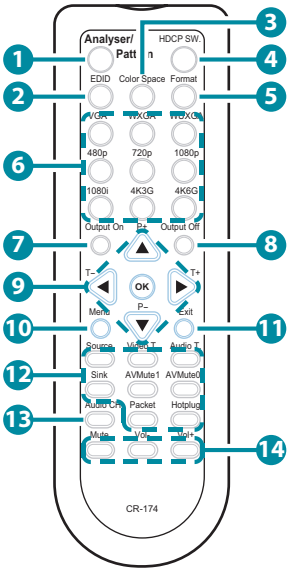
6.4 Remote Control

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.

To configure this, 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 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).

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 & 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. **For use in Analyzer Mode only:**

    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.

    For use in Pattern Mode only:

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

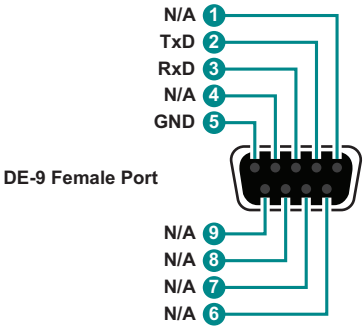
    AV Mute1: Press to turn on the AVMute bit within the output's GCP.

    AV Mute0: Press to turn off the AVMute bit within the output's GCP.

    Audio CH: Within Analyzer mode, press to select which Serial Data audio source pair (SD0–SD3) is routed to the primary stereo channel for monitoring. Within Pattern mode, press to switch between LPCM 2.0, 5.1 & 7.1 channel test tone output formats.
13. **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.

6.5 RS-232 Pinout and Defaults

Serial Port Default Settings	
Baud Rate	115200
Data Bits	8
Parity Bits	None
Stop Bits	1
Flow Control	None



6.6 OSD Menu

All functions of this unit can be controlled by using the OSD (On Screen Display) which is activated by pressing the MENU button on the front of the unit. Use the + (PLUS), − (MINUS), and ENTER buttons to navigate the OSD menu. Press the MENU button to back out from any menu item and then press it again to close the menu. Switching between Analyzer Mode and Pattern Mode is accomplished by pressing the ANALYZER/PATTERN button.

MAIN MENU	
Analyzer Mode	**Pattern Mode**
Source Monitor	**Sink Monitor**
Video Timing	**Pattern**
Audio Timing	**Audio Output**
Packet	**EDID Analyzer**
EDID Analyzer	**EDID Emulator**
EDID Emulator	**HDCP Output Monitor**
HDCP Input Monitor	**HDR Output Emulator**
SCDC Input Monitor	**SCDC Output Monitor**
Rx Port Controls	**Tx Port Controls**
Output Resolution	**Output Resolution**
OSD Settings	**OSD Settings**
Ethernet	**Ethernet**
Setup	**Setup**
Information	**Information**

The individual functions of the OSD will vary depending on the mode (Analyzer or Pattern) the unit is in and will be introduced in the following section. Items marked in BOLD are the factory default settings.

*Note: Settings marked with *PoR follow "Power-On Reset" rules and will always return to their factory default settings when the power is turned off or if the operational mode is changed.*

6.6.1 Analyzer Mode

SOURCE MONITOR	
2ND LEVEL	
[Resolution Data]	[Signal Data]
[Packet Data]	[Format Data]

1) **Source Monitor:** This screen displays a simplified collection of data about the current HDMI source.
   - **Resolution Data:** Displays the currently detected resolution and timing information.
   - **Signal Data:** Displays the current signal format (HDMI/DVI) and HDCP version.
   - **Packet Data:** Displays which infoframe packet types are currently present in the signal.
   - **Format Data:** Displays the current signal's color and audio format information.

VIDEO TIMING	
2ND LEVEL	3RD LEVEL
Timing	[Current Analytical Data]
TMDS Clock	
Pixel Clock	
Data Rate	
H Frequency	
H Total	
H Active	
H Back Porch	
H Sync Width	
H Front Porch	
H Sync Polarity	
V Frequency	
V Total	
V Active	

VIDEO TIMING	
2ND LEVEL	3RD LEVEL
V Back Porch	
V Sync Width	
V Front Porch	
V Sync Polarity	
HV Sync Offset 1	
HV Sync Offset 2	
Scan Mode	

1) **Video Timing:** These pages display the real-time details of the video source currently connected to the HDMI input.
   - **Timing:** Current resolution and refresh rate.
   - **TMDS Clock:** Current TMDS clock in kHz.
   - **Pixel Clock:** Current pixel clock in kHz.
   - **Data Rate:** Current data rate in Gbps.
   - **H Frequency:** Current horizontal frequency in Hz.
   - **H Total:** Current total horizontal resolution in pixels.
   - **H Active:** Current active horizontal resolution pixels.
   - **H Back Porch:** Current horizontal back porch in pixels.
   - **H Sync Width:** Current horizontal sync width in pixels.
   - **H Front Porch:** Current horizontal front porch in pixels.
   - **H Sync Polarity:** Current horizontal sync polarity.
   - **V Frequency:** Current vertical frequency in Hz.
   - **V Total:** Current total vertical resolution in lines.
   - **V Active:** Current active vertical resolution in lines.
   - **V Back Porch:** Current vertical back porch in lines.
   - **V Sync Width:** Current vertical sync width in lines.
   - **V Front Porch:** Current vertical front porch in lines.
   - **V Sync Polarity:** Current vertical sync polarity.
   - **HV Sync Offset 1:** Vertical line offset of an interlaced source's odd field.

- **HV Sync Offset 2:** Vertical line offset of an interlaced source's even field.
- **Scan Mode:** Current scan mode (progressive/interlaced).

AUDIO TIMING	
2ND LEVEL	**3RD LEVEL**
ACR	[Current Analytical Data]
AIF	
HBR	
ACR N	
ACR CTS	
-ASP Monitor-	
ASP	[Current Analytical Data]
PLL	
FIFO	
ACR Re-gen	
Packet Layout	
Channel Number	
Sample Present	
SD0 Out Swap	
-ASP Channel Status-	
App. Type	[Current Analytical Data]
Audio Coding	
Channel Number	
Source Number	
Sampling Rate	
Sampling Size	

AUDIO TIMING	
2ND LEVEL	3RD LEVEL
-ASP LPCM Level-	
SD0-L	[Current Analytical Data]
SD0-R	
SD1-L	
SD1-R	
SD2-L	
SD2-R	
SD3-L	
SD3-R	

1) **Audio Timing:** These pages display the real-time details of the audio signal currently detected on the HDMI input.

   Note: Only LPCM sources can be monitored in detail. Bitstream sources will be identified as NLPCM (Not LPCM) and will have reduced information available.

   - **ACR:** Indicates if Audio Clock Recovery is currently active.
   - **AIF:** Indicates if an Audio InfoFrame is currently detected.
   - **HBR:** Indicates if High Bitrate audio is currently detected.
   - **ACR N:** Current ACR N value.
   - **ACR CTS:** Current ACR Cycle Time Stamp value.
   - **ASP:** Indicates if an Audio Sample Packet is detected.
   - **PLL:** The audio signal's current PLL state.
   - **FIFO:** The audio signal's current FIFO status.
   - **ACR Re-gen:** Indicates if ACR regeneration is performing properly.
   - **Packet Layout:** Indicates if the packet's audio is stereo (0) or multi-channel (1).
   - **Channel Number:** The number of LPCM channels currently detected.
   - **Sample Present:** Lists which Serial Data audio channel pairs are detected (SD0, SD1, SD2, SD3).

- **SD0 Out Swap:** Indicates which Serial Data audio channel pair is currently being output over the primary stereo channel (SD0) for monitoring. This channel can be changed by pressing the “Audio LPCM” button.

  Note: Not valid when the output resolution is set to “Bypass” mode.
- **App. Type:** Indicates the current signal usage identification tag.
- **Audio Coding:** Indicates the current audio signal encoding format.
- **Channel Number:** The channel position identification provided by the current audio source.

  Note: This value’s use is vendor specific and devices from different vendors may not match even with similar source audio formats.
- **Source Number:** The LPCM source number reported by the current audio source.

  Note: This value’s use is vendor specific and devices from different vendors may not match even with similar source audio formats.
- **Sampling Rate:** The current audio sampling rate in kHz
- **Sampling Size:** The current audio sample size in bits.
- **SD0~3-L, SD0~3-R:** Real time volume level meters for all 8 LPCM audio channels.

  Note: Channels that are not present will be greyed out.

PACKET (Monitor)		
2ND LEVEL	**3RD LEVEL**	**4TH LEVEL**
Monitor	1h ACR	[Current Analytical Data]
	2h ASP	
	3h GCP	
	4h ACP	
	5h ISRC1	
	6h ISRC2	
	7h One Bit	
	8h DST	
	9h HBR	
	Ah Gamut	
	Bh ASP 3D	
	Ch One Bit 3D	
	Dh Audio Metadata	
	Eh ASP Multi	
	Fh One Bit Multi	
	81h VSIF H14b	
	81h VSIF HF	
	82h AVI	
	83h SPD	
	84h AIF	
	85h MPEG Source	
	87h DRMI (HDR)	

1) **Packet Monitor:** These pages indicate which packet types and features have been detected in the current HDMI source.

   Note: For packet types with individual details pages, if a packet type is not detected the page will be populated with question marks. Unavailable or undecipherable data will also be indicated by question marks.

PACKET (GCP)		
2ND LEVEL	3RD LEVEL	4TH LEVEL
GCP	GCP	[Current Analytical Data]
	HB0~HB2	
	SB0~SB4	
	SB5~SB6	
	AVMUTE	
	Color Depth	

1) **GCP Packet:** This page displays the current details contained within the General Control infoframe Packet.

PACKET (AVI)		
2ND LEVEL	3RD LEVEL	4TH LEVEL
AVI	AVI	[Current Analytical Data]
	Type	
	Version	
	Length	
	Checksum	
	DB 1~DB 5	
	DB 6~DB10	
	DB11~DB13	
	Color Space	
	AFD Present	
	Bar Info	
	Scan Info	
	Colorimetry	
	Pic.Aspect Ratio	
	AFD	
	IT Content	
	Ext.Colorimetry	
	RGB Quant.Range	

PACKET (AVI)		
2ND LEVEL	3RD LEVEL	4TH LEVEL
	Non-Uniform Scale	
	VIC 97	
	YCC Quant.Range	
	IT Contents Type	
	Pixel Repetition	

1) **AVI Packet:** This page displays the current details contained within the Auxiliary Video Information infoframe packet.

PACKET (AIF)		
2ND LEVEL	3RD LEVEL	4TH LEVEL
AIF	AIF	[Current Analytical Data]
	Type	
	Version	
	Length	
	Checksum	
	DB 1~DB 5	
	DB 6~DB10	
	Coding Type	
	Channel Count	
	Sampling Rate	
	Sampling Size	
	Ext. Coding Type	
	Speaker Placement	
	Level Shift	
	Down Mix	
	LFE Playback Level	

1) **AIF Packet:** This page displays the current details contained within the Audio InfoFrame packet.

PACKET (SPD)		
2ND LEVEL	3RD LEVEL	4TH LEVEL
SPD	SPD	[Current Analytical Data]
	Type	
	Version	
	Length	
	Checksum	
	DB 1~DB 5	
	DB 6~DB10	
	DB11~DB15	
	DB16~DB20	
	DB21~DB25	
	Vendor	
	Product	
	Source Information	

1) **SPD Packet:** This page displays the current details contained within the Source Product Description infoframe packet.

PACKET (VSIF H14b)		
2ND LEVEL	3RD LEVEL	4TH LEVEL
VSIF H14b	VSIF H14b	[Current Analytical Data]
	Type	
	Version	
	Length	
	Checksum	
	DB 1~DB 5	
	DB 6~DB10	
	DB11~DB15	
	DB16~DB20	
	DB21~DB25	
	DB26~DB27	

PACKET (VSIF H14b)		
2ND LEVEL	3RD LEVEL	4TH LEVEL
	IEEE ID	
	HDMI Video Format	
	Ext. HDMI VIC	
	3D Structure	
	3D Ext. Data	

1) **VSIF (HDMI 1.4b) Packet:** This page displays the current details contained within the Vendor Specific InfoFrame packet.

   Note: This information is typically from HDMI 1.4b sources only.

PACKET (DRMI (HDR))		
2ND LEVEL	3RD LEVEL	4TH LEVEL
DRMI (HDR)	DRMI (HDR)	[Current Analytical Data]
	Type	
	Version	
	Checksum	
	DB 1~DB 5	
	DB 6~DB10	
	DB11~DB15	
	DB16~DB20	
	DB21~DB25	
	DB26	
	EOTF	
	Metadata Descriptor	
	display primaries x0	
	display primaries y0	
	display primaries x1	
	display primaries y1	
	display primaries x2	

PACKET (DRMI (HDR))		
2ND LEVEL	3RD LEVEL	4TH LEVEL
	display primaries y2	
	white point x	
	white point y	
	max disp mastering lumi	
	min disp mastering lum	
	Max Content Light-Level	
	Max Frame-average L-L	
	AVI Color Space	
	AVI Colorimetry	

1) **DRMI (HDR) Packet:** This page displays the current details contained within the Dynamic Range and Mastering Infoframe packet.

   Note: The 2nd and 3rd pages are duplicated information with the 3rd page displaying the hex values of the items on the 2nd page.

EDID ANALYZER		
2ND LEVEL	**3RD LEVEL**	**4TH LEVEL**
HDMI Sink	Summary	[EDID Data Summary]
	Block0 Binary List	[EDID Block 0 Hex Contents]
	Vendor/Product ID	[EDID Block 0 Deciphered Data]
	Display Parameter & Feature	
	Color Characteristic	
	Established Timings	
	Standard Timings	
	Detail Timings & Monitor	
	Block1 Binary List	[EDID Block 1 Hex Contents]
	DTV Monitor Support	[EDID Block 1 Deciphered Data]
	Data Block Summary	
	Video Data Block	
	Audio Data Block	
	H14b VSDB 1	
	H14b VSDB 2	
	HF-VSDB	
	HDR Static Metadata	
	Y420 Video Data Block	
	Y420 Capability Map	
	Video Format Preference	
	Speaker & Colorimetry	
	Video Capability	
	Vendor Specific Video DB	
	Detail Timings	
VGA Sink	[Same as HDMI Sink]	
Rx EDID	[Same as HDMI Sink]	

EDID ANALYZER		
2ND LEVEL	**3RD LEVEL**	**4TH LEVEL**
Default & Copied EDID	[D1] DVI	[Same as HDMI Sink]
	[D2] VGA	
	[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	
	[C1]~[C10]	

1) **HDMI Sink:** These pages provide both a raw hex and decoded view of the contents of the first 2 EDID blocks provided by the currently connected HDMI display.

   Note: The EDID Analyzer does not support 4-block analysis.

2) **VGA Sink:** These pages provide both a raw hex and decoded view of the contents of the first 2 EDID blocks provided by the currently connected VGA display.

   Note: For typical VGA displays, block 1 will be empty (hex view will display all "FF"). If no VGA display is connected all categories will display "DDC Bus Fail".

3) **Rx EDID:** These pages provide both a raw hex and decoded view of the contents of the first 2 blocks from the EDID currently assigned to the HDMI input.

4) **Default & Copied EDID:** These pages provide both a raw hex and decoded view of the contents of the first 2 EDID blocks of each internally stored Default or Copied User EDID.

   - **D1~D10:** Internal Default EDIDs 1 through 10.
   - **C1~C10:** User Copied EDIDs 1 through 10.

EDID EMULATOR	
2ND LEVEL	**3RD LEVEL**
Rx EDID Select	Copy HDMI Sink
	[D1] DVI
	[D2] VGA
	[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
	[C1]~[C10]
Copy HDMI Sink EDID to...	[C1]~[C10]
Copy VGA Sink EDID to...	[C1]~[C10]
Copy USB Stick EDID to...	[C1]~[C10]
Rename Copied Sink EDID	[C1]~[C10]
Burn EDID to HDMI Sink	[D1]~[D10]
	[C1]~[C10]
Burn EDID to VGA Sink	[D1]~[D10]
	[C1]~[C10]

1) **Rx EDID Select:** Select the EDID to provide to the connected HDMI source. The EDID from the currently connected HDMI display, a built-in Default EDID (D1~D10), or a user Copied EDID (C1~C10) may be selected for use as the unit's EDID.

2) **Copy HDMI Sink EDID to...:** Select a Copy EDID numbered slot (C1~C10) to copy and store the EDID from the currently connected HDMI display into that slot. The EDID name will be automatically filled in with name data from the copied EDID.

   Note: If a slot already contains EDID data, it will be overwritten by the new EDID.

3) **Copy VGA Sink EDID to...:** Select a Copy EDID numbered slot (C1~C10) to copy and store the EDID from the currently connected VGA display into that slot. The EDID name will be automatically filled in with name data from the copied EDID.

   Note: If a slot already contains EDID data, it will be overwritten by the new EDID

4) **Copy USB Stick EDID to...:** Select a Copy EDID numbered slot (C1~C10) to copy an EDID from a USB stick. After selecting a slot, follow the on-screen prompt and insert a FAT32 formatted USB stick containing a single valid EDID file in the root directory (*.bin format, filename must begin with “EDID_USER_”) and the EDID copy process will begin. The EDID name will be automatically filled in with name data from the copied EDID.

   Note: After the EDID has been copied, whether successful or not, the unit will automatically reboot.

5) **Rename Copied Sink EDID:** Select a Copy EDID numbered slot (C1~C10) to manually rename the EDID. Press the ▲/▼ buttons to change the current letter and press the “Enter” button to move to the next character. Press the “Menu” button to exit the edit mode and save the current name.

6) **Burn EDID to HDMI Sink:** Select an EDID from the list to overwrite the EDID of the currently connected HDMI display with it.

   Note: The connected display must support EDID update functionality.

7) **Burn EDID to VGA Sink:** Select an EDID from the list to overwrite the EDID of the currently connected VGA display with it.

   Note: The connected display must support EDID update functionality.

HDCP INPUT MONITOR (HDCP 1.x)	
2ND LEVEL	**3RD LEVEL**
Source HDCP	[Current Analytical Data]
Rx HDCP Port	
Source writes Ainfo to Rx	
Source writes An to Rx	
Source writes Aksv to Rx	
Source reads Rx Bksv	
-Link Integrity-	
Ri Source	[Current Analytical Data]
Ri' Rx	
Count	
Day	

1) **HDCP Input Monitor (HDCP 1.x):** This page displays the real-time details of HDCP 1.4 communication between this unit and the source currently connected to the HDMI input. "Count" lists how many successful key authorizations have occurred and "Day" lists how long the connection has been active and authenticated.

   These details will only display when the source is encrypted with HDCP v1.4 or lower.

HDCP INPUT MONITOR (HDCP 2.2)	
2ND LEVEL	3RD LEVEL
Source HDCP	[Current Analytical Data]
Rx HDCP Port	
rtx	
TxCaps	
Receiver ID	
rrx	
RxCaps	
Ekpub_km	
Ekh_km	
rn	
Edkey_ks	
riv	

1) **HDCP Input Monitor (HDCP 2.2):** This page displays the real-time details of HDCP 2.2 communication between this unit and the source currently connected to the HDMI input.

   Note: These details will only display when the source is encrypted with HDCP 2.2. Count and Day information is not available for HDCP 2.2 sources.

SCDC INPUT MONITOR	
2ND LEVEL	**3RD LEVEL**
Rx SCDC Port	[Current Analytical Data]
Sink Version	
Source Version	
Scrambling Enable	
TMDS Bit Clock Ratio	
Scrambling Status	
RR Enable	
Test Read Request	
Test Read Delay	
RR Test	
Status Update	
Clock Detected	
Ch2/1/0 Locked	
CED Update	
Count	
CED Count Ch0	
CED Count Ch1	
CED Count Ch2	
CED Checksum	
Timer	
[ENTER] Reset/Start Counter	
OUI3/2/1	[Current Analytical Data]
Device ID	
H/W Major Rev.	
H/W Minor Rev.	
S/W Major Rev.	
S/W Minor Rev.	
Manufacturer Specific	

SCDC INPUT MONITOR	
2ND LEVEL	3RD LEVEL
[Rx EDID]	
HDMI Forum VSDB	[Current Analytical Data]
Version	
Max TMDS Char. Rate	
LTE 340Mcsc Scramble	
SCDC RR Capable	
SCDC Present	

1) **SCDC Input Monitor:** These pages display the details of the SCDC (Status and Control Data Channel) of the source currently connected to the HDMI input. The CED (Character Error Detection) data for each of the 3 channels can be monitored in real time. Pressing “Enter” on the CED status page will start live monitoring. While monitoring is live, a time counter will run and each channel will record any errors detected. Pressing “Enter” again will reset the error counters and clock while continuing to monitor.

   Note: Leaving the CED details page will reset the time counter and error counts.

RX PORT CONTROLS	
2ND LEVEL	**3RD LEVEL**
Hot Plug Preset	**TOGGLE**
	High
	Low
Hot Plug Toggle Time	50ms~500ms **(150ms)**
Hot Plug Run	
RxSense *PoR	**ON**
	Off
DDC *PoR	**ON**
	Off
V.Freq/1.001 Detection	**ON**
	Off
PC Clock Tolerance	1/1000~10/1000 **(1/1000)**
HDCP Port On/Off *PoR	**ON**
	Off
HDCP Port Version	v1.4
	v1.4+v2.2
HDCP REAUTH_REQ Toggle	
HDCP Counter Reset	
SCDC Port On/Off *PoR	**ON**
	Off
SCDC CED Ch Auto Clear	On
	OFF

1) **Hot Plug Preset:** Set the unit's behavior when the "Hot Plug Run" setting is activated.
2) **Hot Plug Toggle Time:** Set the length of time for the hot plug to remain low when in toggle mode (in milliseconds).
3) **Hot Plug Run:** Forces a hot plug event on the HDMI input.

   Note: Behavior is based on the current "Hot Plug Preset" setting.

4) **RxSense:** Enable or Disable RxSense on the HDMI input.

   Note: Will return to factory default settings if the power is turned off.

5) **DDC:** Enable or Disable the HDMI input's DDC bus.

   Note: Will return to factory default settings if the power is turned off.

6) **V.Freq/1.001 Detection:** When enabled, treats close timings, such as 60Hz/59.94Hz for example, as independently distinct timings. When disabled, 60Hz and 59.94Hz will both be detected as "60Hz".

   Note: Unstable sources with a large amount of signal jitter that are difficult to lock onto may benefit from disabling this setting.

7) **PC Clock Tolerance:** Set the HDMI input's clock detection tolerance when receiving PC sources.

8) **HDCP Port On/Off:** Enable or disable HDCP support on the HDMI input.

   Note: Will return to factory default settings if the power is turned off.

9) **HDCP Port Version:** Select the HDCP version(s) supported by the HDMI input.

10) **HDCP REAUTH_REQ Toggle:** Forces the HDMI input to restart the HDCP authorization process.

    Note: Valid for HDCP v2.2 only.

11) **HDCP Counter Reset:** Reset the HDCP Input Monitor's counter value.

    Note: Valid for HDCP v1.4 or lower only.

12) **SCDC Port On/Off:** Enable or Disable the HDMI input's SCDC signal.

    Note: Will return to factory default settings if the power is turned off.

13) **SCDC CED Ch Auto Clear:** When disabled, this setting allows the unit to accumulate CED values while monitoring, rather than the value being automatically cleared.

OUTPUT RESOLUTION					
ID	Resolution	Hz	ID	Resolution	Hz
T01	640×350p	85	T47	480i	59.94
T02	640×480p	59.94	T48		60
T03		72	T49	480p	59.94
T04		75	T50		60
T05		85	T51	576i	50
T06	720×400p	70	T52	576p	50
T07		85	T53	720p	50
T08	800×600p	56	T54		59.94
T09		60	T55		60
T10		72	T56	1080i	50
T11		75	T57		59.94
T12		85	T58		60
T13	848×480p	60	T59	**1080P**	23.976
T14	1024×768p	60	T60		24
T15		70	T61		25
T16		75	T62		29.97
T17		85	T63		30
T18	1152×864p	75	T64		50
T19	1280×768p	60 (RB)	T65		59.94
T20		60	**T66**		**60**
T21		75	T67	2048×1080p	23.976
T22		85	T68		24
T23	1280×800p	60 (RB)	T69		25
T24		60	T70		29.97
T25		75	T71		30
T26		85	T72		50

OUTPUT RESOLUTION					
ID	Resolution	Hz	ID	Resolution	Hz
T27	1280×960p	60	T73		59.94
T28		85	T74		60
T29	1280×1024p	60	T75	3840×2160p	23.976
T30		75	T76		24
T31		85	T77		25
T32	1360×768p	60	T78		29.97
T33	1366×768p	60 (RB)	T79		30
T34		60	T80		50
T35	1400×1050p	60 (RB)	T81		59.94
T36		60	T82		60
T37		75	T83	4096×2160p	23.976
T38	1440×900p	60 (RB)	T84		24
T39		60	T85		25
T40		75	T86		29.97
T41		85	T87		30
T42	1600×900p	60 (RB)	T88		50
T43	1600×1200p	60	T89		59.94
T44	1680×1050p	60 (RB)	T90		60
T45		60	T91	Auto►[Native]	
T46	1920×1200p	60 (RB)	T92	Bypass	

1) **Output Resolution:** Select a standard scaled resolution (T01~T91) for the source currently being analyzed to be output as, or allow the source to be output completely unmodified by selecting “Bypass” (T92). Selecting “Auto” mode (T91) will automatically select a resolution based on the native EDID indicated by the connected display’s EDID.

   Note: “Auto” mode (T91) will default to 1080p@60Hz if no supported resolution is detected from the connected sink.

OSD SETTINGS	
2ND LEVEL	**3RD LEVEL**
H Position	0%~100% **(10%)**
V Position	0%~100% **(10%)**
Transparency	0~7 **(4)**
A Mode Color	**RED**
	Blue
	Black
P Mode Color	Red
	BLUE
	Black
Font Type	**NARROW**
	Wide

1) **H/V Position:** Set the horizontal and vertical position of the OSD menu.
2) **Transparency:** Set the transparency level of the OSD menu's background. The available range is from 0 (fully opaque) to 7 (fully transparent).
3) **A Mode Color:** Set the OSD menu color to use when in Analyzer Mode.
4) **P Mode Color:** Set the OSD menu color to use when in Pattern Mode.
5) **Font Type:** Set the preferred font width to use in the OSD menu.

ETHERNET	
2ND LEVEL	**3RD LEVEL**
IP Mode	**DHCP**
	Static
-Static IP Config-	
IP Address	X.X.X.X **(192.168.1.50)**
Subnet Mask	X.X.X.X **(255.255.255.0)**
Gateway	X.X.X.X **(192.168.1.254)**
-Link Status-	
IP Mode	[Current Ethernet Details]
IP Address	
Subnet Mask	
Gateway	
MAC Address	[Unit's MAC Address]

1) **IP Mode:** Set the unit to Static or DHCP mode. When DHCP mode is selected, all IP address information will be assigned automatically by the local DHCP server. When Static is selected, the IP address, netmask and gateway must be set manually and additional menu items become available.

2) **Static IP Config:** The unit's static IP address, netmask, and gateway address can be set here. Press the "Enter" button to begin editing an address. Press the ▲/▼ buttons to change the current value and press the "Enter" button to move to the next segment of the address. Press the "Menu" button to exit the edit mode and save the current address.

   Note: The unit's default static IP address is 192.168.1.50.

3) **Link Status:** Displays the current Ethernet settings as well as the unit's MAC address.

SETUP	
2ND LEVEL	**3RD LEVEL**
Firmware Update	**NO**
	Yes
Image 640×480 Update	**NO**
	Yes
Image 1920×1080 Update	**NO**
	Yes
[Colorbar] with border	**NO**
	Yes
[Letter H] Option 2	**MEDIUM**
	Small
3D Source Image Bypass	**NO**
	Yes
Information Refresh	1 Sec
	2 SEC
	Manual
IR Controller Address	0~3 **(0)**
OLED Screen Saving	**NO**
	Yes
Copied EDID Reset	**NO**
	Yes
Ethernet Reset	**NO**
	Yes
Factory Reset	**NO**
	Yes

1) **Firmware Update:** Provides a way to update the unit's firmware via USB. After selecting "Yes", follow the on-screen prompt and insert a FAT32 formatted USB stick, with a valid firmware file (*.bin format) in the root directory, into the unit's USB service port. The update process will begin automatically.

Note: After the update process has been initiated, whether successful or not, the unit will automatically reboot.

2) **Image 640×480 Update:** Provides a way to upload a custom image to replace the default 640×480 variation of the "Image" pattern. After selecting "Yes", follow the on-screen prompt and insert a FAT32 formatted USB stick, with a valid image file (RGB, 24-bit, bitmap, named IMG_480.BMP) in the root directory, into the unit's USB service port. The file copy process will begin automatically.

   Note: After the file copy process has been initiated, whether successful or not, the unit will automatically reboot.

3) **Image 1920×1080 Update:** Provides a way to upload a custom image to replace the default 1920×1080 variation of the "Image" pattern. After selecting "Yes", follow the on-screen prompt and insert a FAT32 formatted USB stick, with a valid image file (RGB, 24-bit, bitmap, named IMG_1080.BMP) in the root directory, into the unit's USB service port. The file copy process will begin automatically.

   Note: After the file copy process has been initiated, whether successful or not, the unit will automatically reboot.

4) **[Colorbar] with border:** Enable or disable a pair of grey border lines around the unit's color bar patterns (P13~P18).

5) **[Letter H] Option 2:** Set the font size of the Letter H (P37) pattern's second display variation.

6) **3D Source Image Bypass:** Enable or disable showing a 3D source's full video content in scaled output mode. When enabled, both the left and right eye content will be shown simultaneously with the signal's native orientation and spacing. When disabled, only the left eye's view will be output.

   Note: Top-Bottom and Side-by-Side 3D only, frame-packed sources are not supported.

7) **Information Refresh:** Set the frequency with which the information displayed on analysis monitoring pages is refreshed.

8) **IR Controller Address:** Assign an address number (from 0 to 3) that matches the setting on the remote that is to be used with the unit.

   Note: The standard remote's default factory setting is 0.

9) **OLED Screen Saving:** Enable or disable the OLED display's screensaver function.

10) **Copied EDID Reset:** Selecting "Yes" will clear all of the unit's Copied EDIDs.

11) **Ethernet Reset:** Selecting “Yes” will reset the unit’s Ethernet settings back to their factory defaults.

12) **Factory Reset:** Selecting “Yes” will reset all of the unit’s settings back to their factory defaults.

Note: Ethernet settings and Copied EDIDs are not affected by this reset.

INFORMATION	
2ND LEVEL	**3RD LEVEL**
5V	[Current Unit Details]
CKDT	
SCDT	
Resolution	
Format	
AVMute	
HDCP Port	
HDCP Auth	
EDID	
Packet	
VIC 16	
SPD	
Color Space/Depth	
H14b	
Audio Format	
Audio PLL	
FW Ver	

1) **Information:** Displays details about the unit’s current status. To refresh the information on this page, press “Enter”.

6.6.2 Pattern Mode

SINK MONITOR	
2ND LEVEL	
[Connection Data]	[EDID Data]
[HDCP Data]	

1) **Sink Monitor:** This page displays a basic analysis of the current connection, HDCP, and EDID capability information reported by the connected display.
   - **Connection Data:** Displays the current RSense and hot plug state of the unit's HDMI output.
   - **EDID Data:** Displays a short description of the capabilities reported by the display's EDID.
   - **HDCP Data:** Displays the HDCP versions supported by the display and what HDCP version is currently active, if any.

PATTERN					
ID	Pattern Name	Var.	ID	Pattern Name	Var.
P01	Border		P31	Grayscale 256	4
P02	Checkerboard	3	P32	Grayscale 256 RGB	
P03	Circle 1		P33	Grayscale Adjust	
P04	Circle 4		P34	Grayscale H	
P05	Color Black		P35	Grid	
P06	Color Blue		P36	Image	2
P07	Color Cyan		P37	Letter H	2
P08	Color Green		P38	Line On/Off-H	
P09	Color Magenta		P39	Line On/Off-V	2
P10	Color Red		P40	Line On/Off-V 4K	
P11	Color White		P41	Local Dimming	2
P12	Color Yellow		P42	Motion-H	4
P13	Colorbar Delay		P43	Motion-V	4
P14	Colorbar-H		P44	Multiburst	3
P15	Colorbar Motion	2	P45	Needles	
P16	**COLORBAR S.**		P46	Overscan	
P17	Colorbar Split		P47	PLUGE	2
P18	Colorbar-V	3	P48	Process 4:4:4	

PATTERN					
ID	Pattern Name	Var.	ID	Pattern Name	Var.
P19	Cross Hatch 8	2	P49	Square H8	2
P20	Cross Hatch 16	2	P50	Square H16	2
P21	Cross Hatch 32	2	P51	Square H32	2
P22	Diagonal 1		P52	Text	4
P23	Diagonal 2		P53	Window Blue	4
P24	Dot		P54	Window Cyan	4
P25	General	3	P55	Window Green	4
P26	General 2	3	P56	Window Magenta	4
P27	Grayscale 8	3	P57	Window Red	4
P28	Grayscale 16	3	P58	Window White	4
P29	Grayscale 32	3	P59	Window Yellow	4
P30	Grayscale 64	3			

1) **Pattern:** Select the test pattern to display. For patterns with multiple variations, press “Enter” to sequentially switch through them.

   Note: See section 6.7 for detailed pattern descriptions.

AUDIO OUTPUT	
2ND LEVEL	**3RD LEVEL**
Source *PoR	HDMI In
	Analog In
	INT. SINEWAVE
Volume	0~80 **(70)**
Analog Out CH	**SD0 L/R**
	SD1 L/R
	SD2 L/R
	SD3 L/R
Sampling Rate	**48 KHZ**
	96 kHz
	192 kHz
Word Length	16 Bits
	20 Bits
	24 BITS
Channels	2Ch
	5.1Ch
	7.1CH
SD0-L ~ SD3-L Freq.	Mute
	200Hz~1600Hz **(1000Hz)**
SD0-R ~ SD3-R Freq.	Mute
	200Hz~1600Hz **(1000Hz)**

1) **Source:** Select the audio source to output from.

   Note: When HDMI In is selected, only LPCM audio is supported over the analog output. This setting will return to the factory default settings if the power is turned off.

2) **Volume:** Set the global audio output volume.

   Note: LPCM audio sources only.

3) **Analog Out CH:** Select which audio channel pair to output over the analog audio output.

   Note: LPCM audio sources only.

4) **Sampling Rate:** Set the internal sine wave test tone sample rate.

   Note: When 192 kHz is selected, only 2 channel output is supported.

5) **Word Length:** Set the internal sine wave test tone word length.

6) **Channels:** Set the number of LPCM audio channels to have active when outputting the internal sine wave test tone.

7) **SD0-L~SD03-L Freq:** Set the internal sine wave test tone frequency, in 200Hz steps, for each distinct “left” channel.

8) **SD0-R~SD03-R Freq:** Set the internal sine wave test tone frequency, in 200Hz steps, for each distinct “right” channel.

   Note: In 5.1 and 7.1 arrangements, the “center” channel is typically the “SD1-R” channel and the “LFE” channel is typically the “SD1-L” channel.

EDID ANALYZER		
2ND LEVEL	**3RD LEVEL**	**4TH LEVEL**
HDMI Sink	Summary	[EDID Data Summary]
	Block0 Binary List	[EDID Block 0 Hex Contents]
	Vendor/Product ID	[EDID Block 0 Deciphered Data]
	Display Parameter & Feature	
	Color Characteristic	
	Established Timings	
	Standard Timings	
	Detail Timings & Monitor	
	Block1 Binary List	[EDID Block 1 Hex Contents]
	DTV Monitor Support	[EDID Block 1 Deciphered Data]
	Data Block Summary	
	Video Data Block	
	Audio Data Block	
	H14b VSDB 1	
	H14b VSDB 2	
	HF-VSDB	
	HDR Static Metadata	
	Y420 Video Data Block	
	Y420 Capability Map	
	Video Format Preference	
	Speaker & Colorimetry	
	Video Capability	
	Vendor Specific Video DB	
	Detail Timings	
VGA Sink	[Same as HDMI Sink]	
Rx EDID	[Same as HDMI Sink]	

EDID ANALYZER		
2ND LEVEL	**3RD LEVEL**	**4TH LEVEL**
Default & Copied EDID	[D1] DVI	[Same as HDMI Sink]
	[D2] VGA	
	[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	
	[C1]~[C10]	

1) **HDMI Sink:** These pages provide both a raw hex and decoded view of the contents of the first 2 EDID blocks provided by the currently connected HDMI display.

   Note: The EDID Analyzer does not support 4-block analysis.

2) **VGA Sink:** These pages provide both a raw hex and decoded view of the contents of the first 2 EDID blocks provided by the currently connected VGA display.

   Note: For typical VGA displays, block 1 will be empty (hex view will display all "FF"). If no VGA display is connected all categories will display "DDC Bus Fail".

3) **Rx EDID:** These pages provide both a raw hex and decoded view of the contents of the first 2 blocks from the EDID currently assigned to the HDMI input.

4) **Default & Copied EDID:** These pages provide both a raw hex and decoded view of the contents of the first 2 EDID blocks of each internally stored Default or Copied User EDID.

   - **D1~D10:** Internal Default EDIDs 1 through 10.
   - **C1~C10:** User Copied EDIDs 1 through 10.

EDID EMULATOR	
2ND LEVEL	**3RD LEVEL**
Rx EDID Select	Copy HDMI Sink
	[D1] DVI
	[D2] VGA
	[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
	[C1]~[C10]
Copy HDMI Sink EDID to...	[C1]~[C10]
Copy VGA Sink EDID to...	[C1]~[C10]
Copy USB Stick EDID to...	[C1]~[C10]
Rename Copied Sink EDID	[C1]~[C10]
Burn EDID to HDMI Sink	[D1]~[D10]
	[C1]~[C10]
Burn EDID to VGA Sink	[D1]~[D10]
	[C1]~[C10]

1) **Rx EDID Select:** Select the EDID to provide to the connected HDMI source. The EDID from the currently connected HDMI display, a built-in Default EDID (D1~D10), or a user Copied EDID (C1~C10) may be selected for use as the unit's EDID.

2) **Copy HDMI Sink EDID to...:** Select a Copy EDID numbered slot (C1~C10) to copy and store the EDID from the currently connected HDMI display into that slot. The EDID name will be automatically filled in with name data from the copied EDID.

   Note: If a slot already contains EDID data, it will be overwritten by the new EDID.

3) **Copy VGA Sink EDID to...:** Select a Copy EDID numbered slot (C1~C10) to copy and store the EDID from the currently connected VGA display into that slot. The EDID name will be automatically filled in with name data from the copied EDID.

   Note: If a slot already contains EDID data, it will be overwritten by the new EDID

4) **Copy USB Stick EDID to...:** Select a Copy EDID numbered slot (C1~C10) to copy an EDID from a USB stick. After selecting a slot, follow the on-screen prompt and insert a FAT32 formatted USB stick containing a single valid EDID file in the root directory (*.bin format, filename must begin with “EDID_USER_”) and the EDID copy process will begin. The EDID name will be automatically filled in with name data from the copied EDID.

   Note: After the EDID has been copied, whether successful or not, the unit will automatically reboot.

5) **Rename Copied Sink EDID:** Select a Copy EDID numbered slot (C1~C10) to manually rename the EDID. Press the ▲/▼ buttons to change the current letter and press the “Enter” button to move to the next character. Press the “Menu” button to exit the edit mode and save the current name.

6) **Burn EDID to HDMI Sink:** Select an EDID from the list to overwrite the EDID of the currently connected HDMI display with it.

   Note: The connected display must support EDID update functionality.

7) **Burn EDID to VGA Sink:** Select an EDID from the list to overwrite the EDID of the currently connected VGA display with it.

   Note: The connected display must support EDID update functionality.

HDCP OUTPUT MONITOR (HDCP v1.4 Output)	
2ND LEVEL	**3RD LEVEL**
Tx HDCP	[Current Analytical Data]
Sink HDCP Port	
Tx writes An to Sink	
Tx writes Aksv to Sink	
Tx reads Sink Bksv	
Compare R0/R0'	
-Repeater-	
Authentication	[Current Analytical Data]
Cascade Depth	
Downstream Device	
-Link Integrity-	
Ri Tx	[Current Analytical Data]
Ri' Sink	
Count	
Day	

1) **Monitor HDCP (HDCP 1.4 Output):** These pages display the real-time details of HDCP 1.4 communication between this unit and the device currently connected to the HDMI output. "Count" lists how many successful key authorizations have occurred and "Day" lists how long the connection has been active and authenticated.

   Note: These details will only display when the output is encrypted with HDCP v1.4.

HDCP OUTPUT MONITOR (HDCP v2.2 Output)	
2ND LEVEL	3RD LEVEL
Tx HDCP	[Current Analytical Data]
Sink HDCP Port	
rtx	
TxCaps	
AKE_Init()	
AKE_Send_Cert()	
Receiver ID	
rrx	
RxCaps	
Verify CertRx	
AKE_Stored_km()	
Ekpub_km	
AKE_No_Stored_km()	
AKE_Send_H_prime()	
Compare H/H’	
AKE_Send_Pairing_Info()	
Ekh_km()	
rn	
LC_Init()	
LC_Send_L_prime()	
Compare L/L’	
Edkey_ks	
riv	
SKE_Send_Eks()	

HDCP OUTPUT MONITOR (HDCP v2.2 Output)	
2ND LEVEL	**3RD LEVEL**
-Repeater-	
Authentication	[Current Analytical Data]
Cascade Depth	
Downstream Device	
Content Type	
-Link Integrity-	
RxStatus.REAUTH_RQ	[Current Analytical Data]
Count	
Day	

1) **Monitor HDCP (HDCP 2.2 Output):** These pages display the real-time details of HDCP 2.2 communication between this unit and the device currently connected to the HDMI output. “Count” lists how many successful key authorizations have occurred and “Day” lists how long the connection has been active and authenticated.

   Note: These details will only display when the output is encrypted with HDCP v2.2.

HDR OUTPUT EMULATOR	
2ND LEVEL	**3RD LEVEL**
HDR Out On/Off	On
	OFF
Settings	1~3 **(1)**
Value Unit	Hex
	NIT (CD/M*M)
Tx AVI Colorimetry	No Data
	ITU601
	ITU709
	xvYCC601
	xvYCC709
	sYCC601

HDR OUTPUT EMULATOR	
2ND LEVEL	**3RD LEVEL**
	Adobe Y601
	Adobe RGB
	BT.2020 (1)
	BT.2020 (2)
EOTF	0: SDR Luminance Range
	1: HDR Luminance Range
	2: SMPTE ST 2084[2]
	3: Future EOTF
Metadata Descriptor	**Static Metadata Type 1**
	Reserved
Display primaries x0~2	0.0000~1.3100 **(0.0000)**
Display primaries y0~2	0.0000~1.3100 **(0.0000)**
White point x	0.0000~1.3100 **(0.0000)**
White point y	0.0000~1.3100 **(0.0000)**
Max disp mastering lumi	0~65500 **(0)**
Min disp mastering lumi	0.0000~6.5500 **(0.0000)**
Max Content Light Level	0~65500 **(0)**
Max Frame-average L-L	0~65500 **(0)**
Tx AVI Color Space	[Current Analytical Data]
Sink EDID supports HDR	

1) **HDR Out On/Off:** Enable or disable the HDR output simulation mode.

   Note: Enabling HDR will change the HDMI output's AVI and DRMI packets to indicate an HDR signal to the connected display and activate the connected display's HDR mode, however all test patterns generated by this unit will continue to be 8-bit color within the SDR color range.

2) **Settings:** Select the HDR preset group to edit. Up to 3 different HDR configurations may be stored in the unit for testing.

3) **Value Unit:** Select the unit type to use when representing and editing HDR luminance values.

4) **Tx AVI Colorimetry:** Set the AVI colorimetry mode when HDR output is enabled.
5) **EOTF:** Set the EOTF (Electro-Optical Transfer Function) when HDR is enabled.
6) **Metadata Descriptor:** Set the metadata description when HDR is enabled.
7) **Display primaries x0~2:** Set the chrominance levels for display primaries x0 through x2 when HDR is enabled.
8) **Display primaries y0~2:** Set the chrominance levels for display primaries y0 through y2 when HDR is enabled.
9) **White point x:** Set the white point for x display primaries when HDR is enabled.
10) **White point y:** Set the white point for y display primaries when HDR is enabled.
11) **Max disp mastering lumi:** Set the maximum luminance supported by the reference HDR mastering display.
12) **Min disp mastering lumi:** Set the minimum luminance supported by the reference HDR mastering display.
13) **Max Content Light Level:** Set the maximum content light level when HDR is enabled.
14) **Max Frame-average L-L:** Set the maximum frame-average light level when HDR is enabled.
15) **Tx AVI Color Space:** Shows the currently active output color space.
16) **Sink EDID supports HDR:** Display the reported HDR capability of the connected display.

SCDC OUTPUT MONITOR	
2ND LEVEL	**3RD LEVEL**
Sink SCDC Port	[Current Analytical Data]
Sink Version	
Source Version	
Scrambling Enable	
TMDS Bit Clock Ratio	
Scrambling Status	
RR Enable	
Test Read Request	
Test Read Delay	
RR Test	
Status Update	
Clock Detected	
Ch2/1/0 Locked	
CED Update	
Count	
CED Count Ch0	
CED Count Ch1	
CED Count Ch2	
CED Checksum	
Timer	
[ENTER] Reset/Start Counter	
OUI3/2/1	[Current Analytical Data]
Device ID	
H/W Major Rev.	
H/W Minor Rev.	
S/W Major Rev.	
S/W Minor Rev.	
Manufacturer Specific	

SCDC OUTPUT MONITOR	
2ND LEVEL	3RD LEVEL
[Sink EDID]	
HDMI Forum VSDB	[Current Analytical Data]
Version	
Max TMDS Char. Rate	
LTE 340Mcsc Scramble	
SCDC RR Capable	
SCDC Present	

1) **SCDC Output Monitor:** These pages display the details of the SCDC (Status and Control Data Channel) of the display currently connected to the HDMI output. The CED (Character Error Detection) data for each of the 3 channels can be monitored in real time. Pressing “Enter” on the CED status page will start live monitoring. While monitoring is live, a time counter will run and each channel will record any errors detected. Pressing “Enter” again will reset the error counters and clock while continuing to monitor.

   Note: Leaving the CED details page will reset the time counter and error counts.

TX PORT CONTROLS	
2ND LEVEL	**3RD LEVEL**
+5V Out On/Off	**FOLLOW TMDS**
	Always On
HDCP Output On/Off *PoR	On
	OFF
HDCP Output Version	**V1.4**
	v2.2
HDCP Counter Reset	
HDCP2 AKE_Stored_km()	On
	OFF
HDCP2 Rep. Content Type	0~1 **(0)**
SCDC CED Counter Read	**ON**
	Off
SCDC CED Always Read	**ON**
	Off
SCDC CED Ch Auto Clear	On
	OFF

1) **+5V Out On/Off:** Set the behavior of the +5V pin on the HDMI output. Selecting “Follow TMDS” will cause the HDMI output to only provide 5V when there is a live video signal.
2) **HDCP Output On/Off:** Enable or disable HDCP support on the HDMI output.

   Note: Will return to factory default settings if the power is turned off.
3) **HDCP Output Version:** Select the HDCP version to support when HDCP is enabled.
4) **HDCP Counter Reset:** Reset the HDCP Output Monitor’s counter value.

   Note: Valid for HDCP v1.4 or lower only.
5) **HDCP2 AKE_Stored_km():** Enable or disable the unit storing exchanged and decrypted km() keys from a connected sink for use when the sink is reconnected later.

Note: Enabling this feature can save time when frequently switching between different displays, but it should not be enabled if HDCP functionality is under test.

6) **HDCP2 Rep. Content Type:** Set the allowed HDCP downgrade capability for connected HDCP repeater devices. Setting it to “0” allows upstream repeaters to downgrade from HDCP v2.2 to v1.4 if necessary, setting it to “1” requires HDCP v2.2 compliance to be maintained all the way to the sink.
7) **SCDC CED Counter Read:** When enabled, the unit will read the sink’s Ch0~2 Error Counter.
8) **SCDC CED Always Read:** When enabled, the unit will ignore the sink’s CED_Update flag.
9) **SCDC CED Ch Auto Clear:** When disabled, this setting allows the unit to accumulate CED values while monitoring, rather than the value being automatically cleared.

OUTPUT RESOLUTION					
ID	Resolution	Hz	ID	Resolution	Hz
T01	640×350p	85	T47	480i	59.94
T02	640×480p	59.94	T48		60
T03		72	T49	480p	59.94
T04		75	T50		60
T05		85	T51	576i	50
T06	720×400p	70	T52	576p	50
T07		85	T53	720p	50
T08	800×600p	56	T54		59.94
T09		60	T55		60
T10		72	T56	1080i	50
T11		75	T57		59.94
T12		85	T58		60
T13	848×480p	60	T59	**1080P**	23.976
T14	1024×768p	60	T60		24
T15		70	T61		25
T16		75	T62		29.97
T17		85	T63		30
T18	1152×864p	75	T64		50
T19	1280×768p	60 (RB)	T65		59.94
T20		60	**T66**		**60**
T21		75	T67	2048×1080p	23.976
T22		85	T68		24
T23	1280×800p	60 (RB)	T69		25
T24		60	T70		29.97
T25		75	T71		30
T26		85	T72		50

OUTPUT RESOLUTION					
ID	Resolution	Hz	ID	Resolution	Hz
T27	1280×960p	60	T73		59.94
T28		85	T74		60
T29	1280×1024p	60	T75	3840×2160p	23.976
T30		75	T76		24
T31		85	T77		25
T32	1360×768p	60	T78		29.97
T33	1366×768p	60 (RB)	T79		30
T34		60	T80		50
T35	1400×1050p	60 (RB)	T81		59.94
T36		60	T82		60
T37		75	T83	4096×2160p	23.976
T38	1440×900p	60 (RB)	T84		24
T39		60	T85		25
T40		75	T86		29.97
T41		85	T87		30
T42	1600×900p	60 (RB)	T88		50
T43	1600×1200p	60	T89		59.94
T44	1680×1050p	60 (RB)	T90		60
T45		60	T91	Auto►[Native]	
T46	1920×1200p	60 (RB)			

1) **Output Resolution:** Select an output resolution (T01~T91) for the currently selected test pattern. Selecting “Auto” mode (T91) will automatically select a resolution based on the native EDID indicated by the connected display’s EDID.

   Note: “Auto” mode (T91) will default to 1080p@60Hz if no supported resolution is detected from the connected sink.

OSD SETTINGS	
2ND LEVEL	**3RD LEVEL**
H Position	0%~100% **(10%)**
V Position	0%~100% **(10%)**
Transparency	0~7 **(4)**
A Mode Color	**RED**
	Blue
	Black
P Mode Color	Red
	BLUE
	Black
Font Type	**NARROW**
	Wide

1) **H/V Position:** Set the horizontal and vertical position of the OSD menu.
2) **Transparency:** Set the transparency level of the OSD menu's background. The available range is from 0 (fully opaque) to 7 (fully transparent).
3) **A Mode Color:** Set the OSD menu color to use when in Analyzer Mode.
4) **P Mode Color:** Set the OSD menu color to use when in Pattern Mode.
5) **Font Type:** Set the preferred font width to use in the OSD menu.

ETHERNET	
2ND LEVEL	**3RD LEVEL**
IP Mode	**DHCP**
	Static
-Static IP Config-	
IP Address	X.X.X.X **(192.168.1.50)**
Subnet Mask	X.X.X.X **(255.255.255.0)**
Gateway	X.X.X.X **(192.168.1.254)**
-Link Status-	
IP Mode	[Current Ethernet Details]
IP Address	
Subnet Mask	
Gateway	
MAC Address	[Unit's MAC Address]

1) **IP Mode:** Set the unit to Static or DHCP mode. When DHCP mode is selected, all IP address information will be assigned automatically by the local DHCP server. When Static is selected, the IP address, netmask and gateway must be set manually and additional menu items become available.
2) **Static IP Config:** The unit's static IP address, netmask, and gateway address can be set here. Press the "Enter" button to begin editing an address. Press the ▲/▼ buttons to change the current value and press the "Enter" button to move to the next segment of the address. Press the "Menu" button to exit the edit mode and save the current address.

   Note: The unit's default static IP address is 192.168.1.50.
3) **Link Status:** Displays the current Ethernet settings as well as the unit's MAC address.

SETUP	
2ND LEVEL	**3RD LEVEL**
Firmware Update	**NO**
	Yes
Image 640×480 Update	**NO**
	Yes
Image 1920×1080 Update	**NO**
	Yes
[Colorbar] with border	**NO**
	Yes
[Letter H] Option 2	**MEDIUM**
	Small
3D Source Image Bypass	**NO**
	Yes
Information Refresh	1 Sec
	2 SEC
	Manual
IR Controller Address	0~3 **(0)**
OLED Screen Saving	**NO**
	Yes
Copied EDID Reset	**NO**
	Yes
Ethernet Reset	**NO**
	Yes
Factory Reset	**NO**
	Yes

1) **Firmware Update:** Provides a way to update the unit's firmware via USB. After selecting "Yes", follow the on-screen prompt and insert a FAT32 formatted USB stick, with a valid firmware file (*.bin format) in the root directory, into the unit's USB service port. The update process will begin automatically.

Note: After the update process has been initiated, whether successful or not, the unit will automatically reboot.

2) **Image 640×480 Update:** Provides a way to upload a custom image to replace the default 640×480 variation of the "Image" pattern. After selecting "Yes", follow the on-screen prompt and insert a FAT32 formatted USB stick, with a valid image file (RGB, 24-bit, bitmap, named IMG_480.BMP) in the root directory, into the unit's USB service port. The file copy process will begin automatically.

   Note: After the file copy process has been initiated, whether successful or not, the unit will automatically reboot.

3) **Image 1920×1080 Update:** Provides a way to upload a custom image to replace the default 1920×1080 variation of the "Image" pattern. After selecting "Yes", follow the on-screen prompt and insert a FAT32 formatted USB stick, with a valid image file (RGB, 24-bit, bitmap, named IMG_1080.BMP) in the root directory, into the unit's USB service port. The file copy process will begin automatically.

   Note: After the file copy process has been initiated, whether successful or not, the unit will automatically reboot.

4) **[Colorbar] with border:** Enable or disable a pair of grey border lines around the unit's color bar patterns (P13~P18).

5) **[Letter H] Option 2:** Set the font size of the Letter H (P37) pattern's second display variation.

6) **3D Source Image Bypass:** Enable or disable showing a 3D source's full video content in scaled output mode. When enabled, both the left and right eye content will be shown simultaneously with the signal's native orientation and spacing. When disabled, only the left eye's view will be output.

   Note: Top-Bottom and Side-by-Side 3D only, frame-packed sources are not supported.

7) **Information Refresh:** Set the frequency with which the information displayed on analysis monitoring pages is refreshed.

8) **IR Controller Address:** Assign an address number (from 0 to 3) that matches the setting on the remote that is to be used with the unit.

   Note: The standard remote's default factory setting is 0.

9) **OLED Screen Saving:** Enable or disable the OLED display's screensaver function.

10) **Copied EDID Reset:** Selecting “Yes” will clear all of the unit’s Copied EDIDs.

11) **Ethernet Reset:** Selecting “Yes” will reset the unit’s Ethernet settings back to their factory defaults.

12) **Factory Reset:** Selecting “Yes” will reset all of the unit’s settings back to their factory defaults.

Note: Ethernet settings and Copied EDIDs are not affected by this reset.

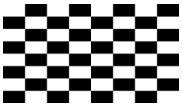
INFORMATION	
2ND LEVEL	**3RD LEVEL**
-Sink-	
RSense	[Current Display Details]
Hotplug	
HDCP Port	
EDID	
-Tx-	
Resolution	[Current Output Details]
Format	
HDCP Auth	
HDR Emulator	
Color Space/Depth	
Audio Source	
Audio Format	
FW Ver	[Current Firmware]
[ENTER] Refresh	

1) **Information:** Displays details about the unit’s current output status and detected details from the connected display. To refresh the information on this page, press “Enter”.

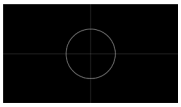
6.7 Test Patterns

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			
Variation 1	Variation 2	Variation 3	
			
8×8	24×24	48×48	

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: 8×8, 24×24 and 48×48.

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.

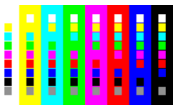
4. Circle 4


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.

5~12. Color			
5. Black	6. Blue	7. Cyan	8. Green
			
9. Magenta	10. Red	11. White	12. Yellow
			

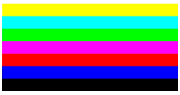
These patterns are full screen purity tests offering eight different full field patterns: **Black, Blue, Cyan, Green, Magenta, Red, White, Yellow.** The color patterns should display an even distribution of brightness and consistent color tone across the screen. The 100% white pattern should display evenly across the screen and not cause the display's overall brightness to lower, or for the image to become instable. 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



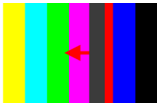
The **Colorbar Delay** pattern provides a sequence of standard 100% color bars with a full set of smaller color squares within each bar. This test is primarily to detect if any of the color components of the video signal are delayed/skewed relative to each other. Pay close attention to the left and right 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

Variation 1	Variation 2	
		
Slow Motion	**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.

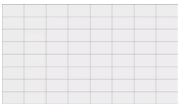
17. Colorbar Split

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.

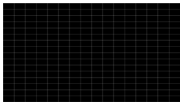
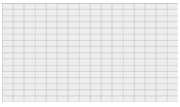
18. Colorbar-V

Variation 1	Variation 2	Variation 3	
			
100%	75%	100% & 75%	

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		
Variation 1	Variation 2	
		
Normal	Inverse	

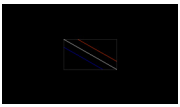
The **Cross Hatch 8** pattern is a full field black & white pattern of crossing vertical and horizontal lines dividing the screen into 8 sections in each direction. This pattern is primarily used to check for color convergence and pincushion issues in projectors. There are 2 variations: Normal (white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

20. Cross Hatch 16		
Variation 1	Variation 2	
		
Normal	Inverse	

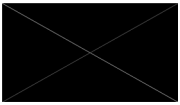
The **Cross Hatch 16** pattern is a full field black & white pattern of crossing vertical and horizontal lines dividing the screen into 16 sections in each direction. This pattern is primarily used to check for color convergence and pincushion issues in projectors. There are 2 variations: Normal (white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

21. Cross Hatch 32		
Variation 1	Variation 2	
		
Normal	Inverse	

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.|

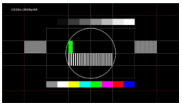
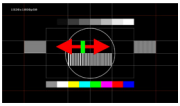
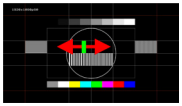
23. Diagonal 2


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

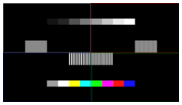
The **Dot pattern** is a full field black & white pattern with a repeating pattern of single-pixel (resolutions below 4K) or 4-pixel (at 4K) white dots surrounded by single pixels of black. This pattern is ideal for testing the signal path/ display for bandwidth issues, interference, cross-talk or scaling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

25. General

Variation 1	Variation 2	Variation 3	
			
No Motion	Slow Motion	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 an optional motion pattern. There are 3 variations: No motion, slow motion and fast motion.

26. General 2

Variation 1	Variation 2	Variation 3	
			
Slow Motion	Fast Motion	No Motion	

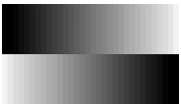
The **General 2** pattern is a simplified all-purpose, multi-pattern test to visually check for multiple issues simultaneously. It includes color bars, 8-step greyscale, vertical and horizontal multi-burst, multi-color center/edge alignment lines, and an optional block motion pattern. There are 3 variations: No motion block, slow motion and fast motion.

27. Grayscale 8			
Variation 1	Variation 2	Variation 3	
			
Vertical Bar	Vertical L/R Bar	Horizontal Bar	

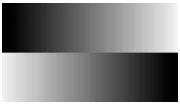
The **Grayscale 8** pattern provides a way to check and adjust the contrast, brightness and grayscale tracking of your display with 8 bars progressing from 0% to 100% brightness in even steps. When testing a display, no color should be visible in any of the bars, and all bars should be visible and distinct.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

28. Grayscale 16			
Variation 1	Variation 2	Variation 3	
			
Vertical Bar	Vertical L/R Bar	Horizontal 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.

29. Grayscale 32			
Variation 1	Variation 2	Variation 3	
			
Vertical Bar	Vertical L/R Bar	Horizontal Bar	

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.

30. Grayscale 64			
Variation 1	Variation 2	Variation 3	
			
Vertical Bar	Vertical L/R Bar	Horizontal Bar	

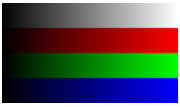
The **Grayscale 64** pattern provides a way to check and adjust the contrast, brightness and grayscale tracking of your display with 64 bars progressing from 0% to 100% brightness in even steps. When testing a display, no color should be visible in any of the bars, and all bars should be visible and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

31. Grayscale 256

Variation 1	Variation 2	Variation 3	Variation 4
			
Gray Gradient	Red Gradient	Green Gradient	Blue Gradient

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.

32. Grayscale 256 RGB



The **Grayscale 256 RGB** 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.

33. Grayscale Adjust (256 Levels)

Adjustable from 0 to 256

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.

34. 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.

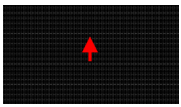
35. Grid

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.

36. Image		
Variation 1	Variation 2	
		
1920×1080	640×480	

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.

37. Letter H		
Variation 1	Variation 2	
		
Large H	Small H	

The **Letter H** pattern is a screen filled with a series of large or small 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.

38. 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.

39. Line On/Off-V

Variation 1	Variation 2	
		
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 field (grey, white or black), 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 variations are not available if the selected output resolution is 4K. This version of the pattern can't display single pixel lines in 4K resolutions, please use the Line On/Off-V 4K pattern.

40. Line On/Off-V 4K

The **Line On/Off-V 4K** 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 field (grey, white or black), then it is possible that your display does not fully support the resolution you are currently sending to it.

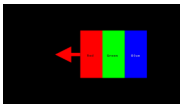
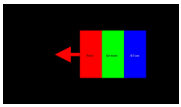
Note: This pattern is only available for the following resolutions: 3840×2160@24/25/30Hz & 4096×2160@24Hz, and the color space will be forced to output as RGB with a color depth of 8-bit. If a non-supported resolution is selected the pattern will automatically change to Line On/Off-V.

41. Local Dimming

Variation 1	Variation 2	
		
White Line	White Square	

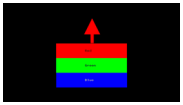
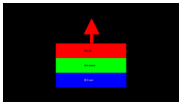
The **Local Diming** pattern generates either a white line, or white square that moves slowly across a black screen to test the behavior and quality of a display's local dimming function. The white line variation moves left to right, then top to bottom while the white square variation moves clockwise around the outer edge of the display, then diagonally, from corner to corner. If a display has local dimming support you should be able to see each backlight section brighten as the pattern's white element passes through it while the rest of the display remains completely black. If a display does not support local dimming, then no change in local backlight brightness will be visible as the pattern moves around.

Note: This pattern is best viewed in a dark room so the changes in backlight level are more visible.

42. Motion-H			
Variation 1	Variation 2	Variation 3	Variation 4
			
Slow RGB Block	Fast RGB Block	Slow Text String	Fast Text 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/blue, slow moving sample text, fast moving sample text.

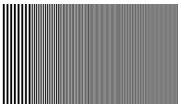
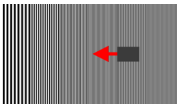
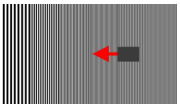
Note: The contents of the text can be modified using an RS-232 or telnet command and can be up to 20 characters long.

43. Motion-V			
Variation 1	Variation 2	Variation 3	Variation 4
			
Slow RGB Block	Fast RGB Block	Slow Text String	Fast Text 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/blue, slow moving sample text, fast moving sample text.

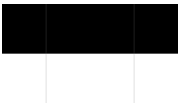
Note: The contents of the text can be modified using an RS-232 or telnet command and can be up to 20 characters long.

44. Multiburst

Variation 1	Variation 2	Variation 3	
			
No Motion	Slow Motion	Fast Motion	

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.

45. 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.

46. 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.

47. PLUGE

Variation 1	Variation 2	
		
Full RGB Range	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).

48. Process 4:4:4

The **Process 4:4:4** pattern is designed to help determine if a signal path has been color sub-sampled to 4:2:2 or 4:2:0 somewhere in the signal path between the Test Generator and the display's panel. If the signal has not been sub-sampled, the multi-colored curved line will be composed of 3 distinct colored lines (red, blue and green) with no merging or loss of color/detail. The red/green/blue/white patterns on the left will also present clean and distinct color lines without breaks in the vertical pattern.

49. Square H8		
Variation 1	Variation 2	
		
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).

50. Square H16		
Variation 1	Variation 2	
		
Normal	Inverse	

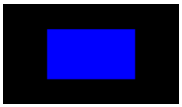
The **Square H16** pattern is a full field black & white pattern of squares dividing the screen horizontally into 16 sections. This pattern is primarily used to check projector linearity. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

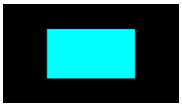
51. Square H32		
Variation 1	Variation 2	
		
Normal	Inverse	

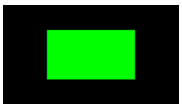
The **Square H32** pattern is a full field black & white pattern of squares dividing the screen horizontally into 32 sections. This pattern is primarily used to check projector linearity. There are 2 variations: Normal (white lines, black field) and Inverse (black lines, white field).

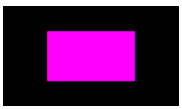
52. Text			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal & Small	Inverse & Small	Normal & Big	Inverse & Big

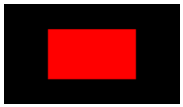
The **Text** pattern is used to check the clarity of text at various sizes and colors. This is primarily a test for projectors. There are 4 variations: Small multi-color text on a black background, small multi-color text on a white background, large multi-color text on a black background, and large multi-color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

53. Window Blue			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal 75%	Inverse 75%	Normal 50%	Inverse 50%

54. Window Cyan			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal 75%	Inverse 75%	Normal 50%	Inverse 50%

55. Window Green			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal 75%	Inverse 75%	Normal 50%	Inverse 50%

56. Window Magenta			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal 75%	Inverse 75%	Normal 50%	Inverse 50%

57. Window Red			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal 75%	Inverse 75%	Normal 50%	Inverse 50%

58. Window White			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal 75%	Inverse 75%	Normal 50%	Inverse 50%

59. Window Yellow			
Variation 1	Variation 2	Variation 3	Variation 4
			
Normal 75%	Inverse 75%	Normal 50%	Inverse 50%

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.

6.8 Telnet Control

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

Start your preferred Telnet/Console client, or use the built in client provided by most modern computer operating systems. After starting the client, connect by using the current IP address of the unit and port 23 (if the communication port number used by the unit has not been changed previously). This will connect us to the unit we wish to control and commands may now be entered directly.

Note 1: If the IP address of the unit is changed then the IP address required for Telnet access will also change accordingly.

Note 2: The default IP address is 192.168.1.50 and the default communication port is 23.

6.9 Serial and Telnet Commands

Before using these commands, please read the following:

Syntax:

All commands MUST start with the "$" character or the command will not be recognized by the unit. Commands must end with a carriage return (0x0D). Use of a line feed (0x0A) is optional. Commands are not case-sensitive.

Parameters:

The characters "[" and "]"are placed around descriptions of the variable parameters where additional explanation was needed. Please type the selected parameter without the contents inside the "[" and "]"characters when entering the command.

Responses:

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).

Cautions:

Only one command may be processed at a time. Additional commands should not be sent until the response from the previous command has been received.

COMMAND Description and Parameters
$?↵ Show the full command list.
$help↵ Show the full command list.
$audio_ch N1↵ Set the number of internally sourced audio output channels. Available values for **N1**: 2 [2 Channels (2.0)] 6 [6 Channels (5.1)] 8 [8 Channels (7.1)]
$audio_ch?↵ Show the current number of audio output channels.
$audio_freq N1,N2↵ Set the internal audio output frequency of the selected channel (in Hz). Available Values for **N1**: SD0_L [SD0 Left Channel] SD0_R [SD0 Right Channel] SD1_L [SD1 Left Channel] SD1_R [SD1 Right Channel] SD2_L [SD2 Left Channel] SD2_R [SD2 Right Channel] SD3_L [SD3 Left Channel] SD3_R [SD3 Right Channel] Available Values for **N2**: MUTE [No audio] 200 [200 Hz] 400 [400 Hz] 600 [600 Hz] 800 [800 Hz] 1000 [1000 Hz] 1200 [1200 Hz] 1400 [1400 Hz] 1600 [1600 Hz]

COMMAND Description and Parameters
$audio_freq? N1↵ Show the internal audio output frequency of the selected channel (in Hz). Available Values for **N1**: SD0_L [SD0 Left Channel] SD0_R [SD0 Right Channel] SD1_L [SD1 Left Channel] SD1_R [SD1 Right Channel] SD2_L [SD2 Left Channel] SD2_R [SD2 Right Channel] SD3_L [SD3 Left Channel] SD3_R [SD3 Right Channel]
$audio_mute N1↵ Enable or disable muting the audio output. Available values for **N1**: ON [Mute enabled] OFF [Mute disabled]
$audio_mute?↵ Show the current audio output mute state.
$audio_source N1↵ Set the audio output source. Available values for **N1**: ANA [Analog Input] HDMI [HDMI Input] INT [Internal]
$audio_source?↵ Show the current audio output source.
$audio_sr N1↵ Set the internal audio output sampling rate (in kHz). Available values for **N1**: 48 [48 kHz] 96 [96 kHz] 192 [192 kHz]

COMMAND Description and Parameters
$audio_sr?↵ Show the current internal audio output sampling rate.
$audio_vol N1↵ Set the audio output volume. **N1** = 0~80 [Volume level]
$audio_vol?↵ Show the current audio output volume.
$boot go↵ Reboot the unit. *Note: The unit won't respond to any commands during the boot process.*
$boot?↵ Show the current boot state.
$color_space N1↵ Set the output color space. Available values for **N1**: RGB [RGB 4:4:4] Y444 [YCbCr 4:4:4] Y422 [YCbCr 4:2:2] Y420 [YCbCr 4:2:0]
$color_space?↵ Show the current output color space.
$deep_color N1↵ Set the output color bit depth. Available values for **N1**: 8 [8 bits] 10 [10 bits] 12 [12 bits]
$deep_color?↵ Show the current output color bit depth.

COMMAND Description and Parameters
$edid_copy_sink N1↵ Copy the current HDMI sink's EDID to the designated copy slot. **N1** = C1~C10 [Copy EDID number] *Note: If the copy fails "$err" will be displayed.*
$edid_manuf? N1↵ Show the manufacturer name stored in the EDID of the selected location. Available values for **N1**: RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] SINK_V [VGA Sink] *Note: If the EDID fails to be read, "$err_ddc" will be displayed. If the EDID has invalid content, "$err_bad" will be displayed.*
$edid_model? N1↵ Show the model/monitor name stored in the EDID of the selected location. Available values for **N1**: RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] SINK_V [VGA Sink] *Note: If the EDID fails to be read, "$err_ddc" will be displayed. If the EDID has invalid content, "$err_bad" will be displayed.*
$edid_name N1,N2↵ Set the EDID name of the selected copy slot. **N1** = C1~C10 [Copy EDID number] **N2** = {Name} [20 characters max]
$edid_name? N1↵ Show the name of the selected EDID slot. Available values for **N1**: D1~D10 [Default EDID number] C1~C10 [Copy EDID number]

COMMAND Description and Parameters
$edid_native? N1↵ Show the native resolution value stored in the EDID of the selected location. Available values for **N1**: RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] SINK_V [VGA Sink] *Note: First detailed timing from Block 0. If the EDID fails to be read, "$err_ddc" will be displayed. If the EDID has invalid content, "$err_bad" will be displayed.*
$edid_read N1,N2↵ Shows the selected data block stored in the EDID of the selected location. Available values for **N1**: D1~D10 [Default EDID 1~10] C1~C10 [Copy EDID 1~10] SINK_H [HDMI Sink] SINK_V [VGA Sink] Available values for **N2**: BLOCK0 [EDID Block 0] BLOCK1 [EDID Block 1] BLOCK2 [EDID Block 2] BLOCK3 [EDID Block 3] *Note: This data is output as a bit stream of 128 bytes following the <CR><LF> of the command acknowledgement. Each hex data unit is composed of 3 digits. The first 2 digits are the hex value. The 3rd digit is a space (0x20). Blocks 2 & 3 are only supported from the HDMI Sink.*
$edid_rx N1↵ Select the EDID to use with the unit's HDMI input (Rx). Available values for **N1**: D1~D10 [Default EDID number] C1~C10 [Copy EDID number] SINK [Currently connected HDMI sink]

COMMAND Description and Parameters
$edid_rx?↵ Show the current EDID selection for the unit's HDMI input (Rx).
$edid_type? N1↵ Show the current EDID type of the selected location. Available values for **N1**: RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] SINK_V [VGA Sink] *Note: If the EDID fails to be read, "$err_ddc" will be displayed. If the EDID has invalid content, "$err_bad" will be displayed.*
**$edid_write N1,N2 N3↵** Directly write an EDID block to the selected EDID location. Available values for **N1**: RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] SINK_V [VGA Sink] **N2** = BLOCK0~BLOCK1[EDID block to write to] **N3** = <CR><LF>{Data} [128 byte hex data] *Note: The data must be sent as a 128 byte hex data bit stream following the <CR><LF> in the N3 part of the command. Each hex data unit is composed of 3 digits. The first 2 digits are the hex value. The 3rd digit is a space (0x20). If the sum of the 128 byte data isn't 0, "$err_checksum" will be displayed.*
$factory↵ Execute a factory reset and reboot the unit. *Note: Stored Copy EDIDs and Ethernet settings will not be reset.*
$fwver?↵ Show the current firmware version.

COMMAND Description and Parameters
$hdcp_in_sw N1↵ Enable or disable HDCP support for the unit's HDMI input. Available values for **N1**: ON [Enable HDCP] OFF [Disable HDCP] *Note: Affects Analyzer mode only.*
$hdcp_in_sw?↵ Show the current HDCP support setting for the unit's HDMI input.
$hdcp_in_ver N1↵ Set the HDCP version to use on the unit's HDMI input. Available values for **N1**: V1.4 [HDCP v1.4 only] V1.4+V2.2 [HDCP v1.4 & v2.2] *Note: Affects Analyzer mode only.*
$hdcp_in_ver?↵ Show the current HDCP version used on the unit's HDMI input.
$hdcp_out_sw N1↵ Enable or disable HDCP support on the unit's HDMI output. Available values for **N1**: ON [Enable HDCP] OFF [Disable HDCP] *Note: Affects Pattern mode only.*
$hdcp_out_sw?↵ Show the HDMI output's current HDCP status. *Note: A status of "Talk" means HDCP is currently performing handshaking.*

COMMAND Description and Parameters
$hdcp_out_ver N1↵ Set the HDCP version to use on the unit's HDMI output. Available values for **N1**: V1.4 [HDCP v1.4] V2.2 [HDCP v2.2] *Note: Affects Pattern mode only.*
$hdcp_out_ver?↵ Show the current HDCP version used by the output port.
$hdr_eotf N1↵ Set the HDR EOTF (Electro-Optical Transfer Function) mode. Available values for **N1**: SDR [Traditional gamma, SDR lum. range] HDR [Traditional gamma, HDR lum. range] 2084 [SMPTE ST 2084] RSVD [Reserved for future use]
$hdr_eotf?↵ Show the current HDR EOTF mode.
$hdr_mcll N1↵ Set the maximum HDR content light level. **N1** = 0~65500 [Incremented in 100 unit steps]
$hdr_mcll?↵ Show the current maximum HDR content light level.
$hdr_mfall N1↵ Set the maximum HDR frame-average light level. **N1** = 0~65500 [Incremented in 100 unit steps]
$hdr_mfall?↵ Show the current maximum HDR frame-average light level value.

COMMAND Description and Parameters
$hdr_set N1↵ Select the current HDR preset group. **N1** = 1~3 [HDR preset group]
$hdr_set?↵ Show the currently selected HDR preset group.
$hdr_sw N1↵ Enable or disable HDR support on the unit's HDMI output. Available values for **N1**: ON [Enable HDR] OFF [Disable HDR]
$hdr_sw?↵ Show the current HDR support status for the unit's HDMI output.
$hdr_tx_col N1↵ Set the HDMI output (Tx) AVI Colorimetry mode. Available values for **N1**: 1 [No Data] 2 [ITU601] 3 [ITU709] 4 [xvYCC601] 5 [xvYCC709] 6 [sYCC601] 7 [AdobeY601] 8 [Adobe RGB] 9 [BT.2020(1) $Y'_{C}C'_{BC}C'_{RC}$] 10 [BT.2020(2) R'G'B' or $Y'C'_{B}C'_{R}$]
$hdr_tx_col?↵ Show the current HDMI output (Tx) AVI Colorimetry mode.
$model?↵ Show the unit's model name.

COMMAND Description and Parameters
$motion_text N1↵ Set the text used for the Motion-H and Motion-V patterns. **N1** = {ASCII text} [20 characters max]
$motion_text?↵ Show the current text used for the Motion-H and Motion-V patterns.
$net_gate?↵ Show the unit's current gateway address.
$net_ip?↵ Show the unit's current IP address.
$net_ip_mode N1↵ Set the unit's IP address assignment mode. Available values for **N1**: DHCP [DHCP mode] STATIC [Static IP address mode]
$net_ip_mode?↵ Show the current IP address assignment mode.
$net_link?↵ Show the unit's current Ethernet link status.
$net_mac?↵ Show the unit's MAC address.
$net_mask?↵ Show the unit's current netmask address.
$net_static_gate N1↵ Set the unit's static gateway address. **N1** = X.X.X.X [X = 0~255, static gateway address]
$net_static_gate?↵ Show the unit's static gateway address.

COMMAND Description and Parameters
$net_static_ip N1↵ Set the unit's static IP address. **N1** = X.X.X.X [X = 0~255, static IP address]
$net_static_ip?↵ Show the unit's static IP address.
$net_static_mask N1↵ Set the unit's static netmask address. **N1** = X.X.X.X [X = 0~255, static netmask]
$net_static_mask?↵ Show the unit's static netmask address.
$pattern N1↵ Select the test pattern to output. **N1** = 1~59 [Test pattern number]
$pattern?↵ Show the current test pattern selection.
$rx_ddc N1↵ Enable or disable the DDC bus for the HDMI input (Rx). Available values for **N1**: ON [Enable DDC] OFF [Disable DDC]
$rx_ddc?↵ Show the DDC bus state for the HDMI input (Rx).
$rx_hotplug N1↵ Set the hot plug value for the HDMI input (Rx). Available values for **N1**: OFF [Set hot plug low] ON [Set hot plug high] TOGGLE [Toggle hot plug low->high or high->low]

COMMAND Description and Parameters
$rx_hotplug?↵ Show the current hot plug state for the HDMI input (Rx).
$rx_hotplug_t N1↵ Set the hot plug time (in milliseconds) for the HDMI input (Rx). **N1** = 50~500 [Incremented in 50ms steps]
$rx_hotplug_t?↵ Show the current hot plug time (in milliseconds) for the HDMI input (Rx).
$rx_pc_tol N1↵ Set PC source clock detection tolerance for the HDMI input (Rx). **N1** = 1~10 [PC clock tolerance]
$rx_pc_tol?↵ Show the current PC source clock detection tolerance for the HDMI input (Rx).
$rx_scdc N1↵ Enable or disable the SCDC port function on the HDMI input (Rx). Available values for **N1**: ON [Enable SCDC] OFF [Disable SCDC]
$rx_scdc?↵ Show the current SCDC port state for the HDMI input (Rx).
$rx_sense N1↵ Enable or disable the RxSense function for the HDMI input (Rx). Available values for **N1**: ON [Enable RxSense] OFF [Disable RxSense]
$rx_sense?↵ Show the current RxSense state for the HDMI input (Rx).

COMMAND	Description and Parameters
$sink_detect? N1↵	
Displays a variety of sink detection status and informational values.	
Available values for **N1**:	
HOTPLUG	[Sink's hot plug status.]
RSENSE	[Sink's RxSense status.]
HDCP	[Sink's HDCP port status.]
HDCP_AKSV	[Source HDCP AKSV in hex. (HDCP v1.4)]
HDCP_BKSV	[Rx HDCP BKSV in hex. (HDCP v1.4)]
HDCP_RXID	[Rx Receiver ID in hex. (HDCP v2.2)]
SCDC	[SCDC port status.]
SCDC_SCR_ENABLE	[Rx SCDC source scrambling setting.]
SCDC_SCR_STATUS	[SCDC sink scrambling status]
SCDC_SINK_VER	[SCDC sink version.]
SCDC_SOURCE_VER	[SCDC source version.]
$source_detect? N1↵	
Displays a variety of source detection status and informational values.	
Available values for **N1**:	
5V	[5V detection state]
CKDT	[TMDS clock detection]
DATA_RATE	[Video data rate in Mbps]
TMDS_FORMAT	[Detected TMDS format (DVI or HDMI)]
SCDT	[TMDS sync detection]
HDCP	[Source HDCP status detection]
HDCP_AKSV	[Source AKSV in 2-digit hex (HDCP v1.4)]
HDCP_BKSV	[Rx BKSV in 2-digit hex (HDCP v1.4)]
HDCP_RXID	[HDCP Receiver ID in 2-digit hex (HDCP v2.2)]
HA	[Horizontal active pixels]
HBP	[Horizontal back porch pixels]
HFP	[Horizontal front porch pixels]
HSW	[Horizontal sync width pixels]
HT	[Total horizontal pixels]
HSP	[Horizontal sync polarity]
HVS_OFFSET1	[Horizontal/vertical sync offset1 in dot]
HVS_OFFSET2	[Horizontal/vertical sync offset2 in dot]
PIXEL_CLOCK	[Pixel clock in kHz]
SCAN	[Video scan mode (P = Progressive, I = Interlaced)]

COMMAND	
Description and Parameters	
TIMING	[Video timing (See Section 8.2.3)]
TMDS_CLOCK	[TMDS clock in kHz]
VA	[Vertical active lines]
VBP	[Vertical back porch lines]
VFP	[Vertical front porch lines]
VSW	[Vertical sync width lines]
VT	[Total vertical lines]
VSP	[Vertical sync polarity]
ACR	[Audio-Clock-Recovery packet status]
ACR_CTS	[Audio-Clock-Recovery CTS value]
ACR_N	[Audio-Clock-Recovery N value]
ASP	[Audio-Sample Packet status]
ASP_CH	[Audio-Sample packet channel number]
ASP_FIFO	[Audio-Sample Packet audio FIFO (error or normal)]
ASP_LAYOUT	[Audio-Sample Packet layout]
ASP_PLL	[Audio-Sample Packet PLL (locked or unlocked)]
CHS_CODE	[Channel-status audio coding]
CHS_SR	[Channel-status sampling rate in kHz]
CHS_SS	[Channel-status sampling size]
CHS_TYPE	[Channel-status application type (consumer or professional)]
HBR	[High-Bit-Rate packet status]
AIF	[Display packet-AIF data in 2-digit hex]
AVI	[Display packet-AVI data]
DRMI	[Display packet-DMI data]
GCP	[Display packet-GCP data]
SPD	[Display packet-SPD data]
VSI	[Display packet-VSI data]
SCDC_SCR_ENABLE	[Rx SCDC source enable scrambling state]
SCDC_SCR_STATUS	[SCDC sink scrambling status]
SCDC_SINK_VER	[SCDC sink version]
SCDC_SOURCE_VER	[SCDC source version]

$task_mode N1↵

Set the unit's operation mode to Signal Analyzer or Pattern Generation.

Available values for **N1**:

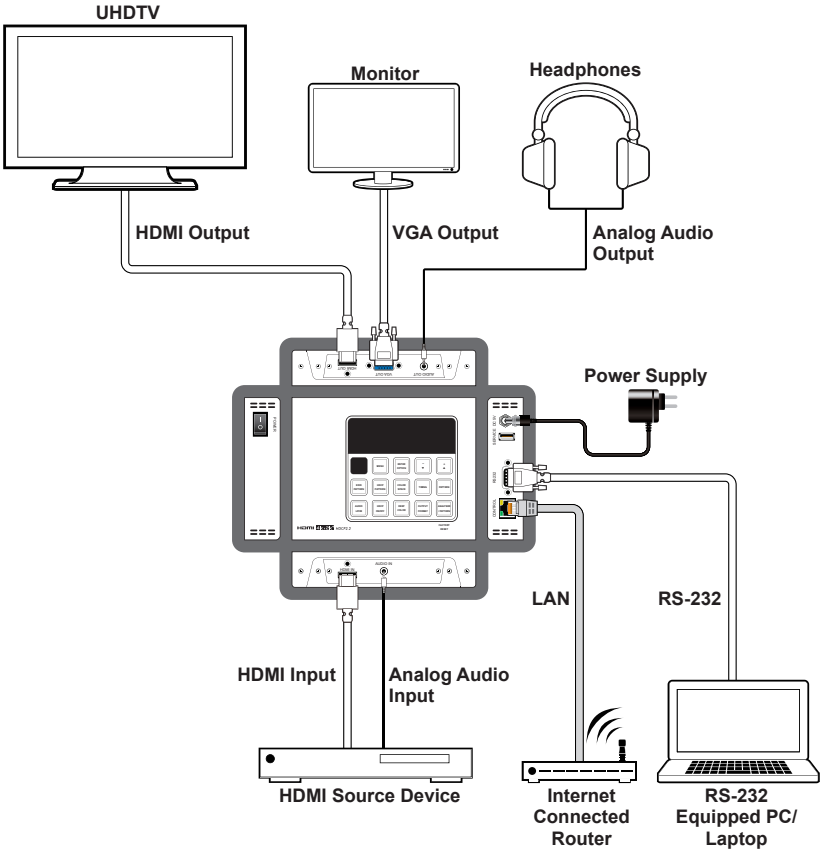
ANALYSER	[Analyzer mode]
PATTERN	[Test pattern mode]

COMMAND Description and Parameters
$task_mode?↵ Show the unit's current operation mode.
$timing N1↵ Select the output resolution timing to use. Available values for **N1**: 1~91 [All available standard output resolutions.] 92 [Bypass (Analyzer mode only)]
$timing?↵ Show the unit's current output resolution timing by timing number.
$timingx?↵ Show the unit's current output resolution timing by timing name.
$tmds_format N1↵ Set the TMDS output format. Available values for **N1**: HDMI [HDMI signal mode] DVI [DVI signal mode]
$tmds_format?↵ Show the current TMDS output format.
$tmds_sw N1↵ Enable or disable TMDS output. Available values for **N1**: ON [Enable TMDS] OFF [Disable TMDS. Disables all video output]
$tmds_sw?↵ Show the current TMDS output state.

COMMAND Description and Parameters
$tx_5v N1↵ Set the unit's output +5v pin state to follow the TMDS output state or to always be on. Available values for **N1**: FOLLOW [Only output 5v if there is a live signal.] ON [Always output 5v.]
$tx_5v?↵ Show the current output +5v pin setting.
$update_fw↵ Update firmware from USB & reboot the unit.
$update_img1080↵ Update the 1920×1080 image from USB & reboot the unit.
$update_img480↵ Update the 640×480 image from USB & reboot the unit.

Note: Commands will not be executed unless followed by a carriage return. Commands are not case-sensitive.

7. CONNECTION DIAGRAM



8. SPECIFICATIONS

8.1 Technical Specifications

HDMI Bandwidth	18Gbps
VGA Bandwidth	165MHz
Input Ports	1×HDMI (Type-A) 1×Stereo Audio (3.5mm)
Output Ports	1×HDMI (Type-A) 1×VGA (HD-15) 1×Stereo Audio (3.5mm)
Control Ports	1×RS-232 (DE-9) 1×IP Control (RJ-45)
Service Port	1×USB 2.0 (Type-A)
IR Frequency	38kHz
Baud Rate	115200
Power Supply	5V/2.6A DC (US/EU standards, CE/FCC/UL certified)
ESD Protection (HBM)	±8kV (Air Discharge) ±4kV (Contact Discharge)
Dimensions (W×H×D)	120mm×155mm×30mm [Case Only] 125mm×162mm×30mm [All Inclusive]
Weight	796g
Chassis Material	Metal (Steel)
Chassis Color	Black
Operating Temperature	0˚C – 40˚C/32˚F – 104˚F
Storage Temperature	-20˚C – 60˚C/-4˚F – 140˚F
Relative Humidity	20 – 90% RH (Non-condensing)
Power Consumption	8.4W

8.2 Video Specifications

8.2.1 Standard Resolution Support

Supported Resolutions (**Hz**)	Input	Output	
	HDMI	HDMI	**VGA**
720×400p@70/85	✓	✓	✓
640×480p@60/72/75/85	✓	✓	✓
720×480i@60	✓	✓	×
720×480p@60	✓	✓	✓
720×576i@50	✓	✓	×
720×576p@50	✓	✓	✓
800×600p@56/60/72/75/85	✓	✓	✓
848×480p@60	✓	✓	✓
1024×768p@60/70/75/85	✓	✓	✓
1152×864p@75	✓	✓	✓
1280×720p@50/60	✓	✓	✓
1280×768p@60/75/85	✓	✓	✓
1280×800p@60/75/85	✓	✓	✓
1280×960p@60/85	✓	✓	✓
1280×1024p@60/75/85	✓	✓	✓
1360×768p@60	✓	✓	✓
1366×768p@60/60RB	✓	✓	✓
1400×1050p@60/60RB	✓	✓	✓
1440×900p@60/60RB/75/85	✓	✓	✓
1600×900p@60RB	✓	✓	✓
1600×1200p@60	✓	✓	✓
1680×1050p@60/60RB	✓	✓	✓
1920×1080i@50/60	✓	✓	×
1920×1080p@24/25/30	✓	✓	×
1920×1080p@50/60	✓	✓	✓
1920×1200p@60RB	✓	✓	✓

Supported Resolutions (Hz)	Input	Output	
	HDMI	HDMI	VGA
2560×1440p@60RB	×	×	×
2560×1600p@60RB	×	×	×
2048×1080p@24/25/30	✓	✓	×
2048×1080p@50/60	✓	✓	×
3840×2160p@24/25/30	✓	✓	×
3840×2160p@50/60 (4:2:0)	✓	✓	×
3840×2160p@24, HDR10	✓	✓	×
3840×2160p@50/60 (4:2:0), HDR10	✓	✓	×
3840×2160p@50/60	✓	✓	×
4096×2160p@24/25/30	✓	✓	×
4096×2160p@50/60 (4:2:0)	✓	✓	×
4096×2160p@24, HDR10	✓	✓	×
4096×2160p@50/60 (4:2:0), HDR10	✓	✓	×
4096×2160p@50/60	✓	✓	×

8.2.2 Color Format Support

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	✓	✓	✓	✓	✓	✓	✓	×	×	×	×
4K@23~30	✓	✓*	✓*	✓	✓*	✓*	✓	×	×	×	×
4K@50~60	✓*	×	×	✓*	×	×	✓*	×	✓	✓*	✓*

✓ = Specified color depth is supported.

* = TMDS scrambling is active.

8.2.3 Source Video Timing Index

Source Video Timing Index					
ID	Resolution	Hz	ID	Resolution	Hz
1	640×350p	85	49	480i	59.94
2	640×480p	59.94	50		60
3		72	51	480p	59.94
4		75	52		60
5		85	53	576i	50
6	720×400p	70	54	576p	50
7		85	55	720p	25
8	800×600p	56	56		29.97
9		60	57		30
10		72	58		50
11		75	59		59.94
12		85	60		60
13	848×480p	60	61	1080i	50
14	1024×768p	60	62		59.94
15		70	63		60
16		75	64	1080p	23.976
17		85	65		24
18	1152×864p	70	66		25
19		75	67		29.97
20		85	68		30
21	1280×768p	60 (RB)	69		50
22		60	70		59.94
23		75	71		60
24		85	72	2048×1080p	23.976
25	1280×800p	60 (RB)	73		24

Source Video Timing Index					
ID	Resolution	Hz	ID	Resolution	Hz
26		60	74		25
27		75	75		29.97
28		85	76		30
29	1280×960p	60	77		50
30		85	78		59.94
31	1280×1024p	60	79		60
32		75	80	3840×2160p	23.976
33		85	81		24
34	1360×768p	60	82		25
35	1366×768p	60 (RB)	83		29.97
36		60	84		30
37	1400×1050p	60 (RB)	85		50
38		60	86		59.94
39		75	87		60
40	1440×900p	60 (RB)	88	4096×2160p	23.976
41		60	89		24
42		75	90		25
43		85	91		29.97
44	1600×900p	60 (RB)	92		30
45	1600×1200p	60	93		50
46	1680×1050p	60 (RB)	94		59.94
47		60	95		60
48	1920×1200p	60 (RB)	254	Not Supported	

8.3 Audio Specifications

8.3.1 Digital Audio

HDMI Input / Output (Bypass)	
LPCM	
Max Channels	8 Channels
Sampling Rate (kHz)	32, 44.1, 48, 88.2, 96, 176.4, 192
Bitstream	
Supported Formats	Standard & High-Definition

HDMI Output (Internal Sinewave)	
LPCM	
Max Channels	8 Channels
Sampling Rate (kHz)	48, 96, 192 *Note: 192kHz only supports 2 channels*
Bitstream	
Supported Formats	None

Internal Sinewave Notes:

- *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, and 4096×2160p@29/30Hz resolutions.*
- *192kHz is NOT supported at 1366×768p@60Hz (RB) or 2048×1080p@29/30Hz resolution.*

8.3.2 Analog Audio

Analog Input	
Max Audio Level	2Vrms
Impedance	10kΩ
Type	Unbalanced

Analog Output	
Max Audio Level	2Vrms
THD+N	< −1dB@0dBFS 1kHz (A-wt)
SNR	> 70dB@0dBFS
Frequency Response	< ±3dB@20Hz~20kHz
Crosstalk	< −60dB@10kHz
Impedance	560Ω
Type	Unbalanced

8.4 Cable Specifications

Cable Length	1080p		4K30	4K60
	8-bit	12-bit	(4:4:4) 8-bit	(4:4:4) 8-bit
High Speed HDMI Cable				
HDMI Input	15m	10m	5m	3m
HDMI Output	15m	10m	5m	3m
VGA Cable				
VGA Output	2m		×	

Bandwidth Category Examples:

- **1080p (FHD Video)**
  - Up to 1080p@60Hz, 12-bit color
  - Data rates lower than 5.3Gbps or below 225MHz TMDS clock
- **4K30 (4K UHD Video)**
  - 4K@24/25/30Hz & 4K@50/60Hz (4:2:0), 8-bit color
  - Data rates higher than 5.3Gbps or above 225MHz TMDS clock but below 10.2Gbps
- **4K60 (4K UHD+ Video)**
  - 4K@50/60Hz (4:4:4, 8-bit)
  - 4K@50/60Hz (4:2:0, 10-bit HDR)
  - Data rates higher than 10.2Gbps

9. ACRONYMS

ACRONYM	COMPLETE TERM
ADC	Analog-to-Digital Converter
ARC	Audio Return Channel
ASCII	American Standard Code for Information Interchange
Cat.5e	Enhanced Category 5 cable
Cat.6	Category 6 cable
Cat.6A	Augmented Category 6 cable
Cat.7	Category 7 cable
CEC	Consumer Electronics Control
CLI	Command-Line Interface
DAC	Digital-to-Analog Converter
dB	Decibel
DHCP	Dynamic Host Configuration Protocol
DVI	Digital Visual Interface
EDID	Extended Display Identification Data
GbE	Gigabit Ethernet
Gbps	Gigabits per second
GUI	Graphical User Interface
HDCP	High-bandwidth Digital Content Protection
HDMI	High-Definition Multimedia Interface
HDR	High Dynamic Range
HDTV	High-Definition Television
HPD	Hot Plug Detection
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
IR	Infrared
kHz	Kilohertz
LAN	Local Area Network
LCD	Liquid-Crystal Display

ACRONYM	COMPLETE TERM
LED	Light-Emitting Diode
LPCM	Linear Pulse-Code Modulation
MAC	Media Access Control
MHz	Megahertz
OLED	Organic Light-Emitting Diode
OSD	On-Screen Display
PLL	Phase-Locked Loop
PoR	Power-On Reset
RB	Reduced Blanking
SCDC	Status and Control Data Channel
SNR	Signal-to-Noise Ratio
TCP	Transmission Control Protocol
THD+N	Total Harmonic Distortion plus Noise
TMDS	Transition-Minimized Differential Signaling
4K UHD	4K Ultra-High-Definition (10.2Gbps max)
4K UHD+	4K Ultra-High-Definition (18Gbps max)
UHDTV	Ultra-High-Definition Television
USB	Universal Serial Bus
VGA	Video Graphics Array
WUXGA (RB)	Widescreen Ultra Extended Graphics Array (Reduced Blanking)
XGA	Extended Graphics Array
Ω	Ohm

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