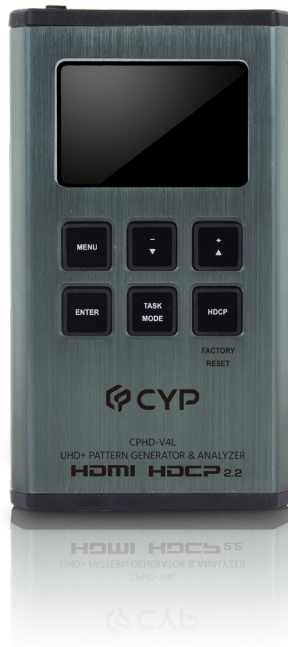




# CPHD-V4L (Dark Case)

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



**Operation Manual**

**HDMI**<sup>®</sup>  
HIGH-DEFINITION MULTIMEDIA INTERFACE

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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
<b>RDV1</b>	2019/08/02	Preliminary release (R2 hardware)
<b>RDV2</b>	2020/05/20	Updated to new layout and added details covering the R3 hardware's AOC cable support
<b>RDV3</b>	2021/02/03	Updated the suggested battery model
<b>V1.03</b>	2024/04/26	Corrected page50 \$EDID_WRITE N1 parameter to C1~C10 [User EDID copy slot index].

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## 1. INTRODUCTION

This portable HDMI Signal Generator & Analyzer provides a convenient way to test and verify all aspects of an HDMI signal path, including source and sink. This unit complies with the HDMI 2.0a and HDCP 1.4/2.2 standards. The unit's Analyzer mode complies with the CEA standard HDR static metadata extensions CEA-861-F and CEA-861.3 for EDID analysis.

The unit is powered by a single rechargeable Lithium-ion battery (not included). Beyond the Lithium-ion battery, the unit may also be powered (and the battery recharged) via the micro USB port. An external power bank can also be used to extend the portable service time. 4K sources can be scaled down to 1080p output in Analyzer mode to support a wider range of displays when analyzing high bandwidth sources.

The unit has an integrated OLED display which provides a way to quickly and clearly view the current signal state or the results of signal analysis. This portable handheld design is ideal for both the professional end user and installation engineer alike.

## 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 (Portable Version)
- 1× USB Mirco-B to USB Type-A Cable
- 1× Operation Manual

## 4. SYSTEM REQUIREMENTS

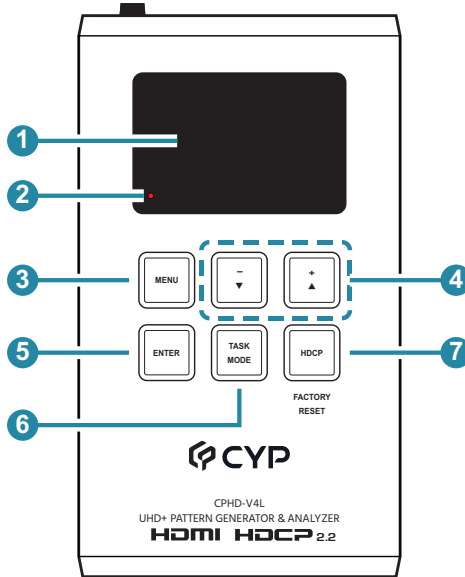
- HDMI receiving equipment such as an HDTV, monitor or audio amplifier and/or HDMI source equipment such as a media player, video game console or set-top box.
- For portable operation, a battery (not included) is required. The Panasonic NCR18650BF (3.6V/3350mAh) Lithium-ion rechargeable battery, or similar, is recommended.

## 5. FEATURES

- HDMI input and output with 18Gbps 4K UHD<sup>+</sup> support
- DVI 1.0 compliant with the use of an HDMI-DVI adaptor
- HDCP 1.4 and 2.2 compliant
- Supports UHD<sup>+</sup> resolutions up to 4096×2160@60Hz (4:4:4, 8-bit)
- Analyzer mode supports source video, audio, timing and packet analysis while bypassing the signal to a connected display
- 4K sources can be scaled to 1080p in Analyzer mode to support a wider range of displays when analyzing a high-bandwidth source
- HDR bypass, analysis and generation support complying with the CEA standard HDR static metadata extensions CEA-861-F and CEA-861.3
- HDCP and SCDC monitoring functions
- 23 selectable output resolutions available in Test Pattern mode
- 17 selectable static test patterns in Test Pattern mode
- HDMI 2.0 cable test function including tests for 5V, CEC and hot-plug detection support
- Supports AOC (Active Optical Cable) fiber optic HDMI cables (Hardware revision R3 or later only)
- Supports generation of up to 8 channels of LPCM audio with adjustable sinewave frequencies for each channel
- Comprehensive EDID management, analysis and emulation support with 10 built-in default EDIDs and 10 user-definable EDIDs
- Powered by a single Lithium-ion battery (not included) or an external USB power supply/power bank
- OLED display with rapid updates of current status information
- Supports optional Windows control software
- Portable palm-sized design with easy to use front-panel controls

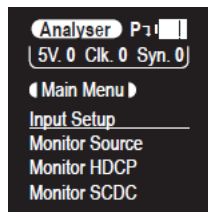
## 6. OPERATION CONTROLS AND FUNCTIONS

### 6.1 Front Panel



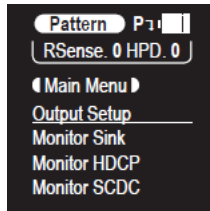
- 1 OLED:** This screen's layout changes depending on the unit's operational mode and selected function. The status lines at the top shows the unit's current operational mode (Analyzer, Pattern, or Cable Test), USB port mode (power or control), power status, and mode specific detection details. Information below the status lines consists of either the unit's menu or signal analysis data.

**Analyzer Mode:** The status line will display the 5V, TMDs clock, and sync detection state of the connected source. (1 = detected, 0 = not detected.)

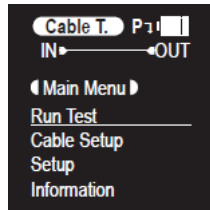




**Pattern Mode:** The status line will display the RxSense and Hot-plug detection state of the connected display. (1 = detected, 0 = not detected.)



**Cable Test Mode:** The status line will display a cable connection graphic.



- 2 **BATTERY CHARGING LED:** The battery charging LED will illuminate red when a USB power source is connected and actively charging the battery.
- 3 **MENU Button:** Press to back out from menu items and return to the main OLED menu screen.
- 4 **+/\▲ & -/\▼ Button:** Press to move up and down or adjust selections within menus.
- 5 **ENTER Button:** Press to confirm a selection or to go deeper into a menu item.

*Note: In Analyzer and Pattern modes, press and hold this button for 2 seconds to turn audio on or off.*

- 6 **TASK MODE Button:** Press to switch the unit between Analyzer Mode, Pattern Mode, and Cable Test Mode.

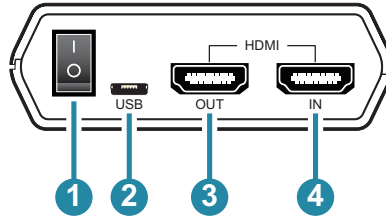
*Note: In Analyzer mode, press and hold this button for 2 seconds to toggle the input's hot plug trigger. In Pattern mode, press and hold this button for 2 seconds to enable or disable the output's AV Mute function.*

- 7 HDCP Button:** Press to switch between supported HDCP versions (1.4, 2.2) or to disable HDCP. In Analyzer mode, this changes the HDCP versions supported by the input port. In Pattern mode, this changes the HDCP required by the output port. The button's outline will light up according to the HDCP state and current version supported.

HDCP Button Outline	Status
Solid Red	HDCP 1.4
Solid Blue	HDCP 2.2
Off	HDCP Disabled
Flashing	Authentication Failure

**Factory Reset:** Pressing and holding the HDCP button during power on will reset the unit to its factory default settings.

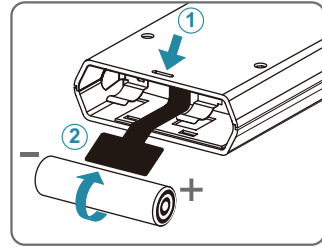
## 6.2 Top Panel



- 1 POWER Switch:** Flip this switch to turn the unit ON or OFF.
- 2 USB Port:** Multi-function port for power/battery charging, firmware update or serial command control.  
*Note: The USB operation mode is changed within the OLED menu's Setup menu.*
- 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.

## 6.3 Battery Compartment

While this unit may be powered directly via the USB port, it is more typically powered by a rechargeable Lithium-ion battery (not included) which is concealed within the bottom of the unit.



- 1 Opening the Compartment:** Use a small flathead screwdriver to gently, but firmly, press down into the slot ① behind the base panel and the bottom cover will pop out.
- 2 Removing the Battery:** If a battery is already installed, a Mylar tab ② will be visible beneath the battery. Pull on the Mylar tab to pop the battery out of its holding brackets.
- 3 Inserting the Battery:** Turn the unit so that it is face down and align the battery so that the positive terminal of the battery (marked with a +) is aligned with the positive (+) marking on the right-hand side on the back of the battery compartment. Extend the Mylar tab out of the battery compartment, then place the battery on top of the extended tab and slide the battery into the unit until it snaps into the holding brackets as shown in the illustration.
- 4 Closing the Compartment:** After the battery has been properly inserted, place the battery compartment cover back into the bottom of the unit by first fitting the 2 small tabs on the cover into the 2 slots in the case and then gently snapping the cover into place.
- 5 Charging the Battery:** Connect a USB charger (5V/2.1A minimum) to the USB port to charge the unit's battery until it is full. The typical charging time, from empty to full, is approximately 3 hours while the unit's power is off. Average operation time from a fully charged battery is roughly 4 hours, but might be less depending on specific usage and battery quality.

*Note: A battery is not included in the standard package, however the Panasonic NCR18650BF (3.6V/3350mAh) Lithium-ion rechargeable battery is recommended.*

## 6.4 Serial via USB Defaults

When the unit is set to RS-232 mode in the System menu and connected to a PC via a USB cable, the following COM port settings should be used for direct control.












Serial via USB Default Settings	
<b>Baud Rate</b>	115200
<b>Data Bits</b>	8
<b>Parity Bits</b>	None
<b>Stop Bits</b>	1
<b>Flow Control</b>	None

## 6.5 OLED Display

### 6.5.1 Power Saving Mode

The OLED display will automatically switch off after the set number of minutes. All other functions of the unit will continue normally while the display is turned off and the HDCP button will slowly flash red to indicate it is in power saving mode. To turn the OLED display back on, press any key. This power saving feature is only available while the unit is not receiving power via USB.

### 6.5.2 Special OLED Icons

USB PORT FUNCTION	
	Battery charge mode.
	RS-232 control mode.
	Firmware update mode.
POWER STATUS	
	External power only. No battery present.
	External power. Battery at max charge.
	External power. Battery charging.
	Battery power with ~100% charge.
	Battery power with ~75% charge.
	Battery power with ~50% charge.
	Battery power with under 25% charge. Icon flashes to indicate recharge needed.
	Battery power is critically low. Auto shutdown.

## 6.6 OLED Menu

All functions of this unit can be controlled by using the OLED Menu. Use the +/▲, -/▼, and ENTER buttons to navigate the OLED menu. Press the ENTER button to confirm a selection within the menu or to go deeper into a menu item. Press the MENU button to back out from any menu item. Switching between Analyzer Mode, Pattern Mode, and Cable Test Mode is accomplished by pressing the TASK MODE button.

The individual functions of the OLED Menus 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.*

### 6.6.1 Analyzer Mode

<b>MAIN MENU</b>
<b>Input Setup</b>
<b>Monitor Source</b>
<b>Monitor HDCP (v1.4)</b>
<b>Monitor HDCP (v2.2)</b>
<b>Monitor SCDC</b>
<b>Video Timing</b>
<b>Audio Timing</b>
<b>Packet</b>
<b>EDID Analyzer</b>
<b>EDID Emulator</b>
<b>EDID Copy Sink</b>
<b>EDID Burn Sink</b>
<b>Setup</b>
<b>Information</b>

INPUT SETUP	
2ND LEVEL	3RD LEVEL
Hotplug Time	50ms ~ 500ms <b>(150ms)</b>
Hotplug Toggle	
RxSense <sup>*PoR</sup>	<b>ON</b>
	Off
DDC Bus <sup>*PoR</sup>	<b>ON</b>
	Off
HDCP Port <sup>*PoR</sup>	v1.4
	<b>V1.4 + V2.2</b>
	Off
HDCP REAUTH-REQ	
4K to 1080p	On YCbCr Out
	On RGB Out
	<b>OFF</b>
SCDC Port <sup>*PoR</sup>	<b>ON</b>
	Off
PC Tolerance	1~10 <b>(1)</b>

- 1) **Hotplug Time:** Set the length of time for the hot plug to last (in milliseconds).
- 2) **Hotplug Toggle:** Forces a hot plug event on the HDMI input.
- 3) **RxSense:** Enable or Disable RxSense on the HDMI input.  
*Note: Will return to factory default settings if the power is turned off.*
- 4) **DDC Bus:** Enable or Disable the HDMI input's DDC bus.  
*Note: Will return to factory default settings if the power is turned off.*
- 5) **HDCP Port:** Select the HDCP version(s) supported by the HDMI input.  
*Note: Will return to factory default settings if the power is turned off.*
- 6) **HDCP REAUTH-REQ:** Forces the HDMI input to restart the HDCP authorization process.

- 7) **4K to 1080:** Select how the unit will handle 4K sources. Selecting “Off” will bypass all sources without modification. Selecting “YCbCr Out” or “RGB Out” will scale 4K sources to 1080p and use the selected color space for the output signal.

*Note: When scaling is enabled, no frame rate conversion is performed. For example, 4K@24Hz will output as 1080p@24Hz.*

- 8) **SCDC Port:** Enable or Disable the HDMI input’s SCDC signal.

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

- 9) **PC Tolerance:** Set the HDMI input’s clock detection tolerance when receiving PC sources.

*Note: Each step is  $\pm 1/1000$ .*

MONITOR SOURCE	
2ND LEVEL	3RD LEVEL
(T)iming	[Current Analytical Data]
HDCP	
Format	
Colorspace	
Audio	
Deep Color	
AVI, AIF, HDR, VSI1, AVMute, SPD, 3D	[Highlighted when detected]

- 1) **Monitor Source:** This page displays the real-time details of the source currently connected to the HDMI input. At the bottom of the page is a list of inframe packet types and optional features that will be highlighted when they are detected as present or active within the current signal.

*Note: Because 4K YUV 4:2:2 video does not report a bit depth and always uses 12-bits of space for color, even with 8-bit content, it will always be reported as 12-bit.*

- **AVI:** Auxiliary Video Infoframe packet.
- **AIF:** Audio InfoFrame packet.
- **HDR:** High Dynamic Range.
- **VSI1:** Vendor Specific Infoframe packet (HDMI 1.4 only).
- **AVMute:** Audio/Video Mute.



- **SPD:** Source Product Description infoframe packet.
- **3D:** 3D video content.

MONITOR HDCP (Active HDCP 1.4 Source)	
2ND LEVEL	3RD LEVEL
Source HDCP	[Current Analytical Data]
Rx HDCP Port	
Aksv	
Bksv	
Ri Source	
Ri' Rx	
Count	
Day 0 00:00:00	

- 1) **Monitor HDCP (Active HDCP 1.4 Source):** 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.

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

MONITOR HDCP (Active HDCP 2.2 Source)	
2ND LEVEL	3RD LEVEL
Source HDCP	[Current Analytical Data]
Rx HDCP Port	
TxCaps	
RxCaps	
Receiver ID	
rn	
riv	

- 1) **Monitor HDCP (Active HDCP 2.2 Source):** 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.*

MONITOR SCDC	
2ND LEVEL	3RD LEVEL
Rx SCDC Port	[Current Analytical Data]
Sink Version	
Source Ver	
Scramble Ena	
Scramble Sta	
Clock Detect	
Ch2/1/0 Locked	
CED Ch0	
CED Ch1	
CED Ch2	
ENTER Reset/Start	
[Rx EDID] HF VSDB	[Current Analytical Data]
[Rx EDID] SCDC Exists	

- 1) **Monitor SCDC:** This page displays 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.*

VIDEO TIMING	
2ND LEVEL	3RD LEVEL
(T)	[Current Analytical Data]
TMDS	
Pix	
DR	
(8/10/12)B, 3D, Y420, Scr	[Highlighted when detected]
Total	[Current Analytical Data]
Act	
Polarity	
Scan	
HFreq	
VFreq	
Offset1	
Offset2	

- 1) **Video Timing:** This page displays the real-time details of the video source currently detected on the HDMI input.

*Note: Because 4K YUV 4:2:2 video does not report a bit depth and always uses 12-bits of space for color, even with 8-bit content, it will always be reported as 12-bit.*

- **(T):** Video timing resolution and refresh rate
- **TMDS:** TMDS clock.
- **Pix:** Pixel clock.
- **DR:** Data rate.
- **B, 3D, Y4xx, Scr:** Bit depth (8/10/12-bit), 3D video, color space (4:4:4/4:2:2/4:2:0) , scramble mode.
- **Total:** Total horizontal and vertical pixels per frame.
- **Act:** Active horizontal and vertical pixels per frame.
- **Polarity:** Horizontal and vertical sync polarity.
- **Scan:** Progressive scan or interlaced video.
- **HFreq:** Horizontal sync frequency.

- **VFreq:** Vertical sync frequency.
- **Offset1:** Vertical line offset of an interlaced source's odd field.
- **Offset2:** Vertical line offset of an interlaced source's even field.

*Note: When the source is progressive scan, Offset 2 will display "Invalid".*

AUDIO TIMING	
2ND LEVEL	3RD LEVEL
ACR, AIF, ASP, HBR	[Highlighted when detected]
N	[Current Analytical Data]
CTS	
A.PLL	
A.FIFO	
A.Layout	
A.Ch No.	
C.Type	
C.Coding	
C.Ch No.	
C.Src No.	
C.Sample Rate	
C.Sample Size	

- 1) **Audio Timing:** This page displays the real-time details of the audio signal currently detected on the HDMI input.
  - **ACR, AIF, ASP, HBR:** Audio Clock Regeneration, Audio Info-frame, Audio Sample Packet, High Bitrate audio.
  - **N:** A fixed value representing the audio rate.
  - **CTS:** Cycle Time Stamp.
  - **A.PLL:** ASP PLL lock.
  - **A.FIFO:** ASP audio FIFO.
  - **A.Layout:** ASP layout
  - **A.Ch No.:** ASP channel number.
  - **C.Type:** Channel application type.

- **C.Coding:** Channel audio encoding.
- **C.Ch No.:** Number of audio channels.
- **C.Src No.:** Number of channel sources.
- **C.Sample Rate:** Channel sampling rate.
- **C.Sample Size:** Channel sampling size.

PACKET	
2ND LEVEL	3RD LEVEL
GCP 0x03	[Current Analytical Data]
AVI 0x82	
AIF 0x84	
SPD 0x83	
VSIF H14b 0x81	
DRMI (HDR) 0x87	

- 1) **Packet:** Each menu item displays detailed analytical data from the specified infoframe packet.
  - **GCP:** General Control Packet.
  - **AVI:** Auxiliary Video Infoframe packet.
  - **AIF:** Audio InfoFrame packet.
  - **SPD:** Source Product Description infoframe packet.
  - **VSIF H14b:** Vendor Specific InfoFrame packet (HDMI 1.4 only)
  - **DRMI (HDR):** Dynamic Range and Mastering Infoframe packet.

EDID ANALYZER	
2ND LEVEL	3RD LEVEL
Sink	[Current Analytical Data]
Rx EDID	[Default EDID Details]
[D1] DVI	
[D2] VGA	
[D3] 8B LPCM PC	
[D4] 8B LPCM HD	
[D5] 12 BS 720p	
[D6] 12 BS HD 3D	
[D7] 12 BS 4K6G	
[D8] 12 HBR 4K3G	
[D9] 12 HBR 4K420	
[D10] 12 HBR 4K6G	
[C1~10] Copy 01~10	[User EDID Details]

- 1) **EDID Analyzer:** This section provides a decoded view of the details of a selected EDID. All EDIDs related to the unit may be viewed, including the connected sink's EDID, the EDID currently being sent to the source, or any Default or stored User EDID.

EDID EMULATOR	
2ND LEVEL	3RD LEVEL
Copy Sink	[Use Sink EDID]
[D1] DVI	[Use Selected EDID]
[D2] VGA	
[D3] 8B LPCM PC	
[D4] 8B LPCM HD	
[D5] 12 BS 720p	
[D6] 12 BS HD 3D	
[D7] 12 BS 4K6G	
[D8] 12 HBR 4K3G	
[D9] 12 HBR 4K420	
[D10] 12 HBR 4K6G	
[C1~10] Copy 01~10	[Use Selected EDID]

- 1) **EDID Emulator:** Select the EDID to provide to the connected HDMI source. The EDID from the currently connected sink, a built-in Default EDID, or a copied User EDID may be selected for use as the unit's EDID.

EDID COPY SINK	
2ND LEVEL	3RD LEVEL
[C1~10] Copy 01~10	[Save Sink EDID to Selected Entry]

- 1) **EDID Copy Sink:** Select any of the Copy EDID items to copy and store the EDID from the currently connected display into that slot. The EDID name will be automatically filled in with name data from the copied EDID.

EDID BURN SINK	
2ND LEVEL	3RD LEVEL
[D1] DVI	[Overwrite Sink's EDID with the Selected EDID]
[D2] VGA	
[D3] 8B LPCM PC	
[D4] 8B LPCM HD	
[D5] 12 BS 720p	
[D6] 12 BS HD 3D	
[D7] 12 BS 4K6G	
[D8] 12 HBR 4K3G	
[D9] 12 HBR 4K420	
[D10] 12 HBR 4K6G	
[C1~10] Copy 01~10	

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

*Note: The connected display must support EDID update functionality.*



SETUP	
2ND LEVEL	3RD LEVEL
USB Port	<b>POWER</b>
	RS-232
OLED Contrast	0~8 <b>(8)</b>
Firmware Upd	<b>NO</b>
	Yes
Power Saving	2~10min <b>(10)</b>
	Off
EDID Reset	<b>NO</b>
	Yes
Factory Rst	<b>NO</b>
	Yes

- 1) **USB Port:** Select the USB port's operational mode.
- 2) **OLED Contrast:** Set the OLED screen's contrast level.
- 3) **Firmware Update:** Provides a way to update the unit's firmware. To begin the firmware update process, select "Yes".  
*Note: See Section 8.5 for more detailed firmware update instructions.*
- 4) **Power Saving:** Set the length of time before the screen is automatically turned off when operating on battery power.
- 5) **EDID Reset:** Selecting "Yes" will reset all of the unit's EDID settings to their factory defaults and delete all stored EDID data.
- 6) **Factory Reset:** Selecting "Yes" will reset all of the unit's settings back to their factory defaults.

INFORMATION	
2ND LEVEL	3RD LEVEL
[Displays Unit Version Details]	

- 1) **Information:** Displays the unit's hardware revision and the current firmware version.

## 6.6.2 Pattern Mode

MAIN MENU
Output Setup
Monitor Sink
Monitor HDCP
Monitor SCDC
Audio Output
EDID Analyzer
EDID Emulator
EDID Copy Sink
EDID Burn Sink
HDR Emulator
Setup
Information

OUTPUT SETUP	
2ND LEVEL	3RD LEVEL
Timing	[T1] 720x480p59
	[T2] 720x576p50
	[T3] 1280x720p25
	[T4] 1280x720p30
	[T5] 1280x720p50
	[T6] 1280x720p60
	[T7] 1920x1080i50
	[T8] 1920x1080i60
	[T9] 1920x1080p24
	[T10] 1920x1080p25
	[T11] 1920x1080p30
	[T12] 1920x1080p50
	<b>[T13] 1920x1080P60</b>

OUTPUT SETUP	
2ND LEVEL	3RD LEVEL
	[T14] 3840×2160p24
	[T15] 3840×2160p25
	[T16] 3840×2160p30
	[T17] 3840×2160p50
	[T18] 3840×2160p60
	[T19] 4096×2160p24
	[T20] 4096×2160p25
	[T21] 4096×2160p30
	[T22] 4096×2160p50
	[T23] 4096×2160p60
	Pattern
[P2] Blue	
[P3] Cyan	
[P4] Green	
[P5] Magenta	
[P6] Red	
[P7] White	
[P8] Yellow	
<b>[P9] COLOR BAR</b>	
[P10] Grayscale 256	
[P11] V Line OnOff	
[P12] Circle	
[P13] Crosshatch	
[P14] Crosshatch I	
[P15] Diagonal	
[P16] Motion	
[P17] Multiburst	

OUTPUT SETUP	
2ND LEVEL	3RD LEVEL
Format	<b>HDMI</b>
	DVI
Colorspace	<b>RGB</b>
	Y444
	Y422
	Y420
ColorRange	<b>FULL</b>
	Limited
Audio LPCM <sup>*PoR</sup>	2Ch
	5.1Ch
	<b>7.1CH</b>
HDCP Out	v1.4
	v2.2
	<b>OFF</b>
HDCP Store K	<b>OFF</b>
	On
HDCP2 Rep.Type <sup>*PoR</sup>	<b>0</b>
	1
GCP AVMute <sup>*PoR</sup>	<b>OFF</b>
	On
Output <sup>*PoR</sup>	<b>ON</b>
	Off
+5V Out	<b>FOLLOW</b>
	On

- 1) **Timing:** Select the output resolution and refresh rate.
- 2) **Pattern:** Select the test pattern to display.
- 3) **Format:** Select the video format for the output.  
*Note: DVI mode does not support audio output or the YUV color space.*
- 4) **Colorspace:** Select the color space format for the video output.  
*Note: Available color space formats will vary depending on the standards supported by the selected output resolution.*
- 5) **ColorRange:** Select the whether to output RGB with full range color (0~255) or limited range color (16~235).  
*Note: Only valid when outputting using the RGB color space.*
- 6) **Audio LPCM:** Set the number of LPCM audio channels to use when outputting test tones.  
*Note: Will return to factory default settings if the power is turned off.*
- 7) **HDCP Out:** Select the HDCP version to encode the video signal with, or disable HDCP.  
*Note: HDCP v2.2 is not supported in DVI mode.*
- 8) **HDCP Store K:** Enable or disable storing the HDCP master key from the current display.
- 9) **HDCP2 Rep. Type:** Set the HDCP v2.2 repeater type compatibility mode. Selecting 1 disables HDCP v2.2 authentication support in mixed HDCP version environments (v2.2 & v1.4). Selecting 0 allows HDCP v2.2 content to be supported by HDCP v1.4 devices.  
*Note: Will return to factory default settings if the power is turned off.*
- 10) **GCP AV Mute:** Enable or disable muting the video and audio output using the GCP AV Mute setting.  
*Note: Will return to factory default settings if the power is turned off.*
- 11) **Output:** Setting this to “Off” will completely disable the HDMI output, including sync and 5V (if it is set to “Follow” mode).  
*Note: Will return to factory default settings if the power is turned off.*
- 12) **+5V Out:** Configure the behavior of the 5V pin on the HDMI output. Setting this to “Follow” will only send 5V when there is an active video source. Setting this to “On” will force the 5V pin to always be active.

MONITOR SINK	
2ND LEVEL	3RD LEVEL
HDCP Port/Auth	[Current Analytical Data]
EDID	
SCDC Port	

- 1) **Monitor Sink:** This page displays a basic analysis of the current HDCP, EDID and SCDC capability information reported by the connected display.

MONITOR HDCP (HDCP 1.4 Output)	
2ND LEVEL	3RD LEVEL
Tx HDCP	[Current Analytical Data]
Sink HDCP Port	
Aksv	
Bksv	
Rep.Auth	
Rep.Depth	
Rep.Device	
Ri Tx	
Ri' Sink	
Count	
Day 0 00:00:00	

- 1) **Monitor HDCP (HDCP 1.4 Output):** This page displays 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 or lower.*

MONITOR HDCP (HDCP 2.2 Output)	
2ND LEVEL	3RD LEVEL
Tx HDCP	[Current Analytical Data]
Sink HDCP Port	
TxCaps	
RxCaps	
Receiver ID	
rn	
riv	
Rep.Auth	
Rep.Depth	
Rep.Device	
Rep.C.Type	
Stored km	
Sink REAUTH	
Count	
Day 0 00:00:00	

- 1) **Monitor HDCP (HDCP 2.2 Output):** This page displays 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.*

MONITOR SCDC	
2ND LEVEL	3RD LEVEL
Sink SCDC Pt	[Current Analytical Data]
Sink Version	
Source Ver	
Scramble Ena	
Scramble Sta	
Clock Detect	
Ch2/1/0 Locked	
CED Ch0	
CED Ch1	
CED Ch2	
ENTER Reset/Start	
[Sink EDID] HF VSDB	[Current Analytical Data]
[Sink EDID] SCDC Exist	

- 1) **Monitor SCDC:** This page displays 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.*



AUDIO OUTPUT	
2ND LEVEL	3RD LEVEL
Volume	0~80 ( <b>70</b> )
Sample Rate	<b>48 KHZ</b>
	96 KHz
	192 KHz
Word Length	16 Bits
	20 Bits
	<b>24 BITS</b>
Channels <sup>*PoR</sup>	2
	5.1
	<b>7.1</b>
SD0-L ~ SD3-L Freq.	200Hz ~ 1600Hz ( <b>1000Hz</b> )
	Mute
SD0-R ~ SD3-R Freq.	200Hz ~ 1600Hz ( <b>1000Hz</b> )
	Mute

- 1) **Volume:** Set the global test tone output volume.
- 2) **Sample Rate:** Set the global test tone sample rate.
- 3) **Word Length:** Set the global test tone word length.
- 4) **Channels:** Set the number of LPCM audio channels to use when outputting test tones.  
*Note: Will return to factory default settings if the power is turned off.*
- 5) **SD0-L~SD03-L Freq:** Set the test tone frequency, in 200Hz steps, for each distinct “left” channel.
- 6) **SD0-R~SD03-R Freq:** Set the 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
Sink	[Current Analytical Data]
Rx EDID	[Default EDID Details]
[D1] DVI	
[D2] VGA	
[D3] 8B LPCM PC	
[D4] 8B LPCM HD	
[D5] 12 BS 720p	
[D6] 12 BS HD 3D	
[D7] 12 BS 4K6G	
[D8] 12 HBR 4K3G	
[D9] 12 HBR 4K420	
[D10] 12 HBR 4K6G	
[C1~10] Copy 01~10	[User EDID Details]

- 1) **EDID Analyzer:** This section provides a decoded view of the details of a selected EDID. All EDIDs related to the unit may be viewed, including the connected sink's EDID, the EDID currently being sent to the source, or any Default or stored User EDID.

EDID EMULATOR	
2ND LEVEL	3RD LEVEL
Copy Sink	[Use Sink EDID]
[D1] DVI	[Use Selected EDID]
[D2] VGA	
[D3] 8B LPCM PC	
[D4] 8B LPCM HD	
[D5] 12 BS 720p	
[D6] 12 BS HD 3D	
[D7] 12 BS 4K6G	
[D8] 12 HBR 4K3G	
[D9] 12 HBR 4K420	
[D10] 12 HBR 4K6G	
[C1~10] Copy 01~10	[Use Selected EDID]

- 1) **EDID Emulator:** Select the EDID to provide to the connected HDMI source. The EDID from the currently connected sink, a built-in Default EDID, or a copied User EDID may be selected for use as the unit's EDID.

EDID COPY SINK	
2ND LEVEL	3RD LEVEL
[C1~10] Copy 01~10	[Save Sink EDID to Selected Entry]

- 1) **EDID Copy Sink:** Select any of the Copy EDID items to copy and store the EDID from the currently connected display into that slot. The EDID name will be automatically filled in with name data from the copied EDID.

EDID BURN SINK	
2ND LEVEL	3RD LEVEL
[D1] DVI	[Overwrite Sink's EDID with the Selected EDID]
[D2] VGA	
[D3] 8B LPCM PC	
[D4] 8B LPCM HD	
[D5] 12 BS 720p	
[D6] 12 BS HD 3D	
[D7] 12 BS 4K6G	
[D8] 12 HBR 4K3G	
[D9] 12 HBR 4K420	
[D10] 12 HBR 4K6G	
[C1~10] Copy 01~10	

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

*Note: The connected display must support EDID update functionality.*

HDR EMULATOR	
2ND LEVEL	3RD LEVEL
HDR Out	<b>OFF</b>
	On
AVI Colorimetry	ITU601
	ITU709
	xvYCC601
	xvYCC709
	sYCC601
	Adobe Y601
	Adobe RGB
	BT.2020 (1)
	<b>BT.2020 (2)</b>
No Data	

HDR EMULATOR	
2ND LEVEL	3RD LEVEL
EOTF	[0] SDR Lumi Range
	[1] HDR Lumi Range
	<b>[2] SMPTE ST2084.2</b>
	[3] Future EOTF
Metadata Descr.	<b>S. METADATA TYPE 1</b>
	Reserved
Max. Content L-L	0~65500 <b>(0)</b>
Max. FrameAve LL	0~65500 <b>(0)</b>
AVI Color Space	[Current Analytical Data]
Sink EDID HDR	

- 1) **HDR Out:** Enable or disable the HDR output simulation mode.  
*Note: Enabling HDR will change the HDMI output's AVI 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) **AVI Colorimetry:** Set the AVI colorimetry mode to report when HDR is enabled.
- 3) **EOTF:** Set the EOTF (Electro-Optical Transfer Function) to report when HDR is enabled.
- 4) **Metadata Descr:** Set the metadata description to report when HDR is enabled.
- 5) **Max. Content L-L:** Set the maximum content light level to report when HDR is enabled.
- 6) **Max. FrameAve L-L:** Set the maximum frame average light level to report when HDR is enabled.
- 7) **AVI Color Space:** Shows the currently active output color space.
- 8) **Sink EDID HDR:** Displays if the current display supports HDR or not.

SETUP	
2ND LEVEL	3RD LEVEL
USB Port	<b>POWER</b>
	RS-232
OLED Contrast	0~8 <b>(8)</b>
Firmware Upd	<b>NO</b>
	Yes
Power Saving	2~10min <b>(10)</b>
	Off
EDID Reset	<b>NO</b>
	Yes
Factory Rst	<b>NO</b>
	Yes

- 1) **USB Port:** Select the USB port's operational mode.
- 2) **OLED Contrast:** Set the OLED screen's contrast level.
- 3) **Firmware Update:** Provides a way to update the unit's firmware. To begin the firmware update process, select "Yes".  
*Note: See Section 8.5 for more detailed firmware update instructions.*
- 4) **Power Saving:** Set the length of time before the screen is automatically turned off when operating on battery power.
- 5) **EDID Reset:** Selecting "Yes" will reset all of the unit's EDID settings to their factory defaults and delete all stored EDID data.
- 6) **Factory Reset:** Selecting "Yes" will reset all of the unit's settings back to their factory defaults.

INFORMATION	
2ND LEVEL	3RD LEVEL
[Displays Unit Version Details]	

- 1) **Information:** Displays the unit's hardware revision and the current firmware version.

### 6.6.3 Cable Test Mode

MAIN MENU
Run Test
Cable Setup
Setup
Information

RUN TEST	
2ND LEVEL	3RD LEVEL
[Testing Configuration]	[Analytic Data] (PASS or FAIL Result)
+5V	
Hotplug	
DDC Bus	
CEC	
ARC*	
4K6G A/V	

- 1) **Run Test:** This menu allows the activation of the cable test and displays the results of the test across 2 pages. The cable under test should be connected to both the HDMI input and HDMI output at the top of the unit. Press the “Enter” button to begin testing using the current configuration. Connectivity test results will be displayed immediately. The 4K6G A/V error rate test on the second page will display a progress bar during the test, then display a final PASS or FAIL result.

It is recommended that each cable under test should be tested at least three times to help eliminate outlier results.

*Note: The ARC test is only supported by hardware revision R3 or later.*

CABLE SETUP	
2ND LEVEL	3RD LEVEL
Type	<b>COPPER</b>
	Optical
Delay	<b>ON</b>
	Off
Level	<b>NORMAL</b>
	Strict
Length	<b>2M</b>
	3m
	4m
	5m
Time	<b>2 MINUTE</b>
	5 minute
	10 minute
	15 minute
	30 minute
	1 hour
	Infinite

- 1) **Type:** Select the type of cable being tested, standard copper cable or optical (AOC) cable.  
*Note: The option is only available with hardware revision R3 or later.*
- 2) **Delay:** Enable or disable adding a slight delay to the CEC & ARC signal feature tests to compensate for cable design differences. If an AOC cable fails the CEC & ARC tests with this on, retest with it turned off.  
*Note: This is the only configuration option when Type is set to “Optical”.*
- 3) **Level:** Select the strictness level of the error testing performed. Selecting normal is recommended for standard cables.
- 4) **Length:** Select the length of the copper cable being tested.
- 5) **Time:** Select the length of time to perform error testing on copper cable.



SETUP	
2ND LEVEL	3RD LEVEL
USB Port	<b>POWER</b>
	RS-232
OLED Contrast	0~8 <b>(8)</b>
Firmware Upd	<b>NO</b>
	Yes
Power Saving	2~10min <b>(10)</b>
	Off
EDID Reset	<b>NO</b>
	Yes
Factory Rst	<b>NO</b>
	Yes

- 1) **USB Port:** Select the USB port's operational mode.
- 2) **OLED Contrast:** Set the OLED screen's contrast level.
- 3) **Firmware Update:** Provides a way to update the unit's firmware. To begin the firmware update process, select "Yes".  
*Note: See Section 8.5 for more detailed firmware update instructions.*
- 4) **Power Saving:** Set the length of time before the screen is automatically turned off when operating on battery power.
- 5) **EDID Reset:** Selecting "Yes" will reset all of the unit's EDID settings to their factory defaults and delete all stored EDID data.
- 6) **Factory Reset:** Selecting "Yes" will reset all of the unit's settings back to their factory defaults.

INFORMATION	
2ND LEVEL	3RD LEVEL
[Displays Unit Version Details]	

- 1) **Information:** Displays the unit's hardware revision and the current firmware version.

## 6.7 Test Timings & Patterns

### 6.7.1 Resolution Support (Analyzer Mode)

This unit provides 3 options for how to handle the output of 4K video input sources when in Analyzer Mode. These choices are selectable from the “Input Setup” menu using the “4K to 1080p” item.

- 1) To scale 4K sources down to 1080p and output using the YCbCr color space, select “On YCbCr Out”.
- 2) To scale 4K sources down to 1080p and output using the RGB color space, select “On RGB Out”.
- 3) To pass 4K sources unmodified set “4K to 1080p” to “Off”.

All non-4K resolutions will be passed without modification regardless of this setting. When 4K sources are scaled down to 1080p they will maintain the same refresh rate. For example, if the source is 4K@24Hz, the scaled timing will be 1080p@24Hz.

*Note: If a source resolution or timing is not natively supported, the resolution will be displayed on the unit as “Timing?”.*

### 6.7.2 Resolution Support (Pattern Mode)

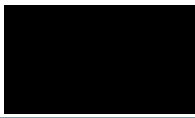







This unit supports a 23 output resolution timings in Pattern Mode.

Resolution	Hz	ID	Resolution	Hz	ID	
720x480p	59	T01	3840x2160p	24	T14	
720x576p	50	T02		25	T15	
1280x720p	25	T03		30	T16	
	30	T04		50	T17	
	50	T05		60	T18	
1920x1080i	60	T06		4096x2160p	24	T19
	50	T07	25		T20	
	60	T08	30		T21	
1920x1080p	24	T09	50		T22	
	25	T10	60		T23	
	30	T11				
	50	T12				
	50	T12				
	60	T13				

### 6.7.3 Test Patterns (Pattern Mode)

There are a total of 17 test patterns available for output when in Pattern Mode.

Test Pattern Name	ID	Test Pattern Name	ID
Black	<b>P01</b>	Grayscale 256	<b>P10</b>
Blue	<b>P02</b>	Line On/Off-V	<b>P11</b>
Cyan	<b>P03</b>	Circle	<b>P12</b>
Green	<b>P04</b>	Crosshatch	<b>P13</b>
Magenta	<b>P05</b>	Crosshatch I	<b>P14</b>
Red	<b>P06</b>	Diagonal	<b>P15</b>
White	<b>P07</b>	Motion	<b>P16</b>
Yellow	<b>P08</b>	Multiburst	<b>P17</b>
Color Bar	<b>P09</b>		

P01 - Black	P02 - Blue	P03 - Cyan	P04 - Green
			
P05 - Magenta	P06 - Red	P07 - White	P08 - 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 become unstable. The black pattern will give a good idea of the display's true minimum brightness level and is helpful for setting the viewing room lighting levels.

### P09 - Color Bar



The **Color Bar** pattern is a series of repeating vertical colored bars (white, yellow, cyan, green, magenta, red, blue, black).

*Note: Selecting this pattern will force the output color range to change to “Full”.*

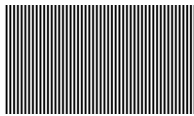
### P10 - Grayscale 256



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.

*Note: Selecting this pattern will force the output color range to change to “Full”. This pattern is not available when the resolution is below 1080i.*

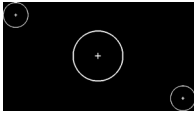
### P11 - Line On/Off-V



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.

*Note: When outputting 4K@50/60Hz the pattern will consist of double, rather than single, pixel lines. Selecting this pattern will force the output color range to change to “Full”.*

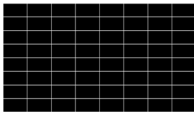
### P12 - Circle



The **Circle** pattern provides 1 large white circle in the center and 2 smaller white circles in the upper left and lower right corners of the screen. All 3 circles have center crosses. This pattern can help confirm that the display is maintaining correct geometry across the entire screen.

*Note: If the output resolution is set to 4096×2160, 128 pixels on the right side of the pattern will be cropped. Selecting this pattern will force the output color range to change to “Full”.*

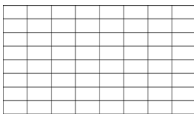
### P13 - Crosshatch 8x8



The **Crosshatch 8x8** pattern is a full black field with a pattern of crossing vertical and horizontal white 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.

*Note: If the output resolution is set to 4096×2160, 128 pixels on the right side of the pattern will be cropped. Selecting this pattern will force the output color range to change to “Full”.*

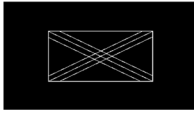
### P14 - Crosshatch 8x8 (Inverted)



The **Crosshatch 8x8 (Inverted)** pattern is a full white field with a pattern of crossing vertical and horizontal black 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.

*Note: If the output resolution is set to 4096×2160, 128 pixels on the right side of the pattern will be cropped. Selecting this pattern will force the output color range to change to “Full”.*

### P15 - Diagonal



The **Diagonal** pattern is two crossing sets of 3 diagonal lines that travel through the exact center of the display. The outer border of the pattern also has a white outline. This pattern can be used to check for alignment and geometry issues, or to help align multi-display video walls.

*Note: Selecting this pattern will force the output color range to change to “Full”.*

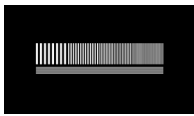
### P16 - Motion



The **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 from right to left across it.

*Note: Selecting this pattern will force the output color range to change to “Full”.*

### P17 - Multiburst



The **Multiburst** pattern provides a condensed multiburst pattern consisting of vertical white lines that decrease in thickness from left to right with an additional block of horizontal single pixel lines below it. This pattern allows the user to analyze the bandwidth and frequency response of the video path and connected display.

*Note: Selecting this pattern will force the output color range to change to “Full”.*

## 6.7.4 Audio Output Support (Pattern Mode)

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

## 6.8 Serial 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.

**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
<p><b>\$?↵</b></p> <p>Show the full command list.</p>
<p><b>\$HELP↵</b></p> <p>Show the full command list.</p>
<p><b>\$4K_TO_1080P N1↵</b></p> <p>Set the 4K downscaling mode.</p> <p>Available values for <b>N1</b>:</p> <p>OFF [No downscaling]  ON_RGB [Downscale 4K to 1080p, RGB color]  ON_YUV [Downscale 4K to 1080p, YUV color]</p>
<p><b>\$4K_TO_1080P?↵</b></p> <p>Show the current 4K downscaling mode</p>

COMMAND																																			
Description and Parameters																																			
<b>\$AUDIO_CH N1</b> ↵	<p>Set the number of internally sourced audio output channels.</p> <p>Available values for <b>N1</b>:</p> <table> <tr> <td>2</td> <td>[2 Channels (2.0)]</td> </tr> <tr> <td>6</td> <td>[6 Channels (5.1)]</td> </tr> <tr> <td>8</td> <td>[8 Channels (7.1)]</td> </tr> </table>	2	[2 Channels (2.0)]	6	[6 Channels (5.1)]	8	[8 Channels (7.1)]																												
2	[2 Channels (2.0)]																																		
6	[6 Channels (5.1)]																																		
8	[8 Channels (7.1)]																																		
<b>\$AUDIO_CH?</b> ↵	<p>Show the current number of audio output channels.</p>																																		
<b>\$AUDIO_FREQ N1,N2</b> ↵	<p>Set the internal audio output frequency of the selected channel (in Hz).</p> <p>Available Values for <b>N1</b>:</p> <table> <tr> <td>SD0_L</td> <td>[SD0 Left Channel]</td> </tr> <tr> <td>SD0_R</td> <td>[SD0 Right Channel]</td> </tr> <tr> <td>SD1_L</td> <td>[SD1 Left Channel]</td> </tr> <tr> <td>SD1_R</td> <td>[SD1 Right Channel]</td> </tr> <tr> <td>SD2_L</td> <td>[SD2 Left Channel]</td> </tr> <tr> <td>SD2_R</td> <td>[SD2 Right Channel]</td> </tr> <tr> <td>SD3_L</td> <td>[SD3 Left Channel]</td> </tr> <tr> <td>SD3_R</td> <td>[SD3 Right Channel]</td> </tr> </table> <p>Available Values for <b>N2</b>:</p> <table> <tr> <td>MUTE</td> <td>[No audio]</td> </tr> <tr> <td>200</td> <td>[200Hz]</td> </tr> <tr> <td>400</td> <td>[400Hz]</td> </tr> <tr> <td>600</td> <td>[600Hz]</td> </tr> <tr> <td>800</td> <td>[800Hz]</td> </tr> <tr> <td>1000</td> <td>[1000Hz]</td> </tr> <tr> <td>1200</td> <td>[1200Hz]</td> </tr> <tr> <td>1400</td> <td>[1400Hz]</td> </tr> <tr> <td>1600</td> <td>[1600Hz]</td> </tr> </table>	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]	MUTE	[No audio]	200	[200Hz]	400	[400Hz]	600	[600Hz]	800	[800Hz]	1000	[1000Hz]	1200	[1200Hz]	1400	[1400Hz]	1600	[1600Hz]
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]																																		
MUTE	[No audio]																																		
200	[200Hz]																																		
400	[400Hz]																																		
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800	[800Hz]																																		
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1200	[1200Hz]																																		
1400	[1400Hz]																																		
1600	[1600Hz]																																		



COMMAND																	
Description and Parameters																	
<b>\$AUDIO_FREQ? N1</b> ↵	<p>Show the internal audio output frequency of the selected channel (in Hz).</p> <p>Available Values for <b>N1</b>:</p> <table> <tr> <td>SD0_L</td> <td>[SD0 Left Channel]</td> </tr> <tr> <td>SD0_R</td> <td>[SD0 Right Channel]</td> </tr> <tr> <td>SD1_L</td> <td>[SD1 Left Channel]</td> </tr> <tr> <td>SD1_R</td> <td>[SD1 Right Channel]</td> </tr> <tr> <td>SD2_L</td> <td>[SD2 Left Channel]</td> </tr> <tr> <td>SD2_R</td> <td>[SD2 Right Channel]</td> </tr> <tr> <td>SD3_L</td> <td>[SD3 Left Channel]</td> </tr> <tr> <td>SD3_R</td> <td>[SD3 Right Channel]</td> </tr> </table>	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]
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]																
<b>\$AUDIO_MUTE N1</b> ↵	<p>Enable or disable muting the audio output.</p> <p>Available Values for <b>N1</b>:</p> <table> <tr> <td>ON</td> <td>[Muted]</td> </tr> <tr> <td>OFF</td> <td>[Unmuted]</td> </tr> </table>	ON	[Muted]	OFF	[Unmuted]												
ON	[Muted]																
OFF	[Unmuted]																
<b>\$AUDIO_MUTE?</b> ↵	<p>Show the audio output mute state.</p>																
<b>\$AUDIO_SR N1</b> ↵	<p>Set the internal audio output sampling rate (in kHz).</p> <p>Available values for <b>N1</b>:</p> <table> <tr> <td>48</td> <td>[48 kHz]</td> </tr> <tr> <td>96</td> <td>[96 kHz]</td> </tr> <tr> <td>192</td> <td>[192 kHz]</td> </tr> </table>	48	[48 kHz]	96	[96 kHz]	192	[192 kHz]										
48	[48 kHz]																
96	[96 kHz]																
192	[192 kHz]																
<b>\$AUDIO_SR?</b> ↵	<p>Show internal audio output sampling rate.</p>																
<b>\$AUDIO_VOL N1</b> ↵	<p>Set the audio output volume.</p> <table> <tr> <td><b>N1</b> = 0~80</td> <td>[Volume level]</td> </tr> </table>	<b>N1</b> = 0~80	[Volume level]														
<b>N1</b> = 0~80	[Volume level]																
<b>\$AUDIO_VOL?</b> ↵	<p>Show the current audio output volume.</p>																

COMMAND	
Description and Parameters	
<b>\$BOARD_ID?</b> ↵	Show the current board ID.
<b>\$BOOT GO</b> ↵	Reboot the unit. <i>Note: The unit won't respond to any commands during the boot process.</i>
<b>\$BOOT?</b> ↵	Show the current boot state.
<b>\$CABLE_DELAY N1</b> ↵	Turn the cable delay on or off. Available values for <b>N1</b> : ON [Cable delay enabled] OFF [Cable delay disabled]
<b>\$CABLE_DELAY?</b> ↵	Show the cable delay state.
<b>\$CABLE_LENGTH N1</b> ↵	Set the length of the cable to be tested. Available values for <b>N1</b> : 2M [2 meters] 3M [3 meters] 4M [4 meters] 5M [5 meters]
<b>\$CABLE_LENGTH?</b> ↵	Show the current cable test length.
<b>\$CABLE_LEVEL N1</b> ↵	Set the cable test level. Available values for <b>N1</b> : NORMAL [Normal testing mode] STRICT [Strict testing mode]

COMMAND	
Description and Parameters	
<b>\$CABLE_LEVEL?</b>	Show the cable test level.
<b>\$CABLE_RESULT?←</b>	Show the cable test result.
<b>\$CABLE_RESULT_I?←</b>	Show the cable test item result.
<b>\$CABLE_RUN N1←</b>	<p>Start or stop the cable testing process.</p> <p>Available values for <b>N1</b>:</p> <p>START [Start testing]</p> <p>STOP [Stop testing]</p>
<b>\$CABLE_RUN?←</b>	Show the cable test process status.
<b>\$CABLE_TIME N1←</b>	<p>Set the testing duration for the cable test.</p> <p>Available values for <b>N1</b>:</p> <p>1 [2 Minutes]</p> <p>2 [5 Minutes]</p> <p>3 [10 Minutes]</p> <p>4 [15 Minutes]</p> <p>5 [30 Minutes]</p> <p>6 [1 Hour]</p> <p>7 [Infinite]</p>
<b>\$CABLE_TIME?←</b>	Show the currently set testing duration.
<b>\$CABLE_TYPE N1←</b>	<p>Set the cable type.</p> <p>Available values for <b>N1</b>:</p> <p>COPPER [Coper core HDMI cable]</p> <p>OPTICAL [Optical core HDMI cable (AOC)]</p>

COMMAND								
Description and Parameters								
<p><b>\$CABLE_TYPE?</b> ←</p> <p>Show the cable type.</p>								
<p><b>\$COLOR_SPACE N1</b> ←</p> <p>Set the output color space.</p> <p>Available values for <b>N1</b>:</p> <table border="0"> <tr> <td>RGB</td> <td>[RGB color space]</td> </tr> <tr> <td>Y444</td> <td>[YCbCr (4:4:4) color space]</td> </tr> <tr> <td>Y422</td> <td>[YCbCr (4:2:2) color space]</td> </tr> <tr> <td>Y420</td> <td>[YCbCr (4:2:0) color space]</td> </tr> </table>	RGB	[RGB color space]	Y444	[YCbCr (4:4:4) color space]	Y422	[YCbCr (4:2:2) color space]	Y420	[YCbCr (4:2:0) color space]
RGB	[RGB color space]							
Y444	[YCbCr (4:4:4) color space]							
Y422	[YCbCr (4:2:2) color space]							
Y420	[YCbCr (4:2:0) color space]							
<p><b>\$COLOR_SPACE?</b> ←</p> <p>Show the current output color space.</p>								
<p><b>\$EDID_COPY_SINK N1</b> ←</p> <p>Copy the current HDMI sink's EDID to the designated copy slot.</p> <p><b>N1</b> = C1~C10            [User EDID copy slot index]</p> <p><i>Note: If the copy fails "\$err" will be displayed.</i></p>								
<p><b>\$EDID_MANUF? N1</b> ←</p> <p>Show the manufacturer name stored in the EDID of the selected location.</p> <p>Available values for <b>N1</b>:</p> <table border="0"> <tr> <td>RX</td> <td>[HDMI Input (Rx) Port]</td> </tr> <tr> <td>SINK_H</td> <td>[HDMI Sink]</td> </tr> </table> <p><i>Note: If the EDID fails to be read, "\$err_ddc" will be displayed. If the EDID has invalid content, "\$err_bad" will be displayed.</i></p>	RX	[HDMI Input (Rx) Port]	SINK_H	[HDMI Sink]				
RX	[HDMI Input (Rx) Port]							
SINK_H	[HDMI Sink]							
<p><b>\$EDID_MODEL? N1</b> ←</p> <p>Show the model/monitor name stored in the EDID of the selected location.</p> <p>Available values for <b>N1</b>:</p> <table border="0"> <tr> <td>RX</td> <td>[HDMI Input (Rx) Port]</td> </tr> <tr> <td>SINK_H</td> <td>[HDMI Sink]</td> </tr> </table> <p><i>Note: If the EDID fails to be read, "\$err_ddc" will be displayed. If the EDID has invalid content, "\$err_bad" will be displayed.</i></p>	RX	[HDMI Input (Rx) Port]	SINK_H	[HDMI Sink]				
RX	[HDMI Input (Rx) Port]							
SINK_H	[HDMI Sink]							

COMMAND	
Description and Parameters	
<b>\$EDID_NAME N1,N2↵</b>	<p>Set the EDID name of the selected copy slot.</p> <p><b>N1</b> = C1~C10                    [User EDID copy slot index]</p> <p><b>N2</b> = {Name}                    [20 characters max]</p>
<b>\$EDID_NAME? N1↵</b>	<p>Show the name of the selected EDID slot.</p> <p>Available values for <b>N1</b>:</p> <p>D1~D10                    [Default EDID slot index]</p> <p>C1~C10                    [User EDID copy slot index]</p>
<b>\$EDID_NATIVE? N1↵</b>	<p>Show the native resolution value stored in the EDID of the selected location. First detailed timing from Block 0.</p> <p>Available values for <b>N1</b>:</p> <p>RX                    [HDMI Input (Rx) Port]</p> <p>SINK_H                    [HDMI Sink]</p> <p><i>Note: If the EDID fails to be read, "\$err_ddc" will be displayed. If the EDID has invalid content, "\$err_bad" will be displayed.</i></p>

## COMMAND

### Description and Parameters

#### \$EDID\_READ N1,N2↵

Show the selected data block stored in the EDID of the selected location. 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.

Available values for **N1**:

D1~D10	[Default EDID slot index]
C1~C10	[User EDID copy slot index]
SINK_H	[HDMI Sink]

Available values for **N2**:

BLOCK0	[EDID Block 0]
BLOCK1	[EDID Block 1]
BLOCK2	[EDID Block 2]
BLOCK3	[EDID Block 3]

*Note: If the EDID fails to be read, "\$err\_ddc" will be displayed. If block 2 or block 3 doesn't exist, "\$err\_block" will be displayed.*

#### \$EDID\_RX N1↵

Select the EDID to use with the unit's HDMI input (Rx).

Available values for **N1**:

D1~D10	[Default EDID slot index]
C1~C10	[User EDID copy slot index]
SINK	[HDMI sink]

#### \$EDID\_RX?↵

Show the current EDID selection for the unit's HDMI input (Rx).

#### \$EDID\_TYPE? N1↵

Show the EDID type of the selected location.

Available values for **N1**:

RX	[HDMI Input(Rx) Port]
SINK_H	[HDMI 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.*

## COMMAND

### Description and Parameters

#### **\$EDID\_WRITE N1,N2 N3↵**

Directly write an EDID block to the selected EDID location. 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).

Available values for **N1**:

C1~C10	[User EDID copy slot index]
SINK_H	[HDMI Sink]

Available values for **N2**:

BLOCK0	[EDID Block 0]
BLOCK1	[EDID Block 1]

**N3** = <CR><LF>{data} [128 byte hex data]

*Note: 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.

#### **\$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: Analyzer mode only.*

#### **\$HDCP\_IN\_SW?↵**

Show the current HDCP support setting for the unit's HDMI input.

COMMAND				
<p><b>Description and Parameters</b></p>				
<p><b>\$HDCP_IN_VER N1</b> ←</p> <p>Set the HDCP version to use on the unit's HDMI input.</p> <p>Available values for <b>N1</b>:</p> <table><tr><td>V1.4</td><td>[HDCP v1.4 only]</td></tr><tr><td>V1.4+V2.2</td><td>[HDCP v1.4 &amp; v2.2]</td></tr></table> <p><i>Note: Analyzer mode only.</i></p>	V1.4	[HDCP v1.4 only]	V1.4+V2.2	[HDCP v1.4 & v2.2]
V1.4	[HDCP v1.4 only]			
V1.4+V2.2	[HDCP v1.4 & v2.2]			
<p><b>\$HDCP_IN_VER?</b> ←</p> <p>Show the current HDCP version used on the unit's HDMI input.</p>				
<p><b>\$HDCP_OUT_SW N1</b> ←</p> <p>Enable or disable HDCP support on the unit's HDMI output.</p> <p>Available values for <b>N1</b>:</p> <table><tr><td>ON</td><td>[Enable HDCP]</td></tr><tr><td>OFF</td><td>[Disable HDCP]</td></tr></table> <p><i>Note: Pattern mode only.</i></p>	ON	[Enable HDCP]	OFF	[Disable HDCP]
ON	[Enable HDCP]			
OFF	[Disable HDCP]			
<p><b>\$HDCP_OUT_SW?</b> ←</p> <p>Show the HDMI output's HDCP status.</p> <p><i>Note: A status of "Talk" means HDCP is currently performing handshaking.</i></p>				
<p><b>\$HDCP_OUT_VER N1</b> ←</p> <p>Set the HDCP version to use on the unit's HDMI output.</p> <p>Available values for <b>N1</b>:</p> <table><tr><td>V1.4</td><td>[HDCP v1.4]</td></tr><tr><td>V2.2</td><td>[HDCP v2.2]</td></tr></table> <p><i>Note: Pattern mode only.</i></p>	V1.4	[HDCP v1.4]	V2.2	[HDCP v2.2]
V1.4	[HDCP v1.4]			
V2.2	[HDCP v2.2]			
<p><b>\$HDCP_OUT_VER?</b> ←</p> <p>Show the current HDCP version for the output port.</p>				



COMMAND									
Description and Parameters									
<b>\$HDR_EOTF N1</b> ←	<p>Set the HDR EOTF (Electro-Optical Transfer Function) mode.</p> <p>Available values for <b>N1</b>:</p> <table> <tr> <td>SDR</td> <td>[Traditional gamma, SDR luminance range]</td> </tr> <tr> <td>HDR</td> <td>[Traditional gamma, HDR luminance range]</td> </tr> <tr> <td>2084</td> <td>[SMPTE ST 2084]</td> </tr> <tr> <td>RSVD</td> <td>[Reserved for future use]</td> </tr> </table>	SDR	[Traditional gamma, SDR luminance range]	HDR	[Traditional gamma, HDR luminance range]	2084	[SMPTE ST 2084]	RSVD	[Reserved for future use]
SDR	[Traditional gamma, SDR luminance range]								
HDR	[Traditional gamma, HDR luminance range]								
2084	[SMPTE ST 2084]								
RSVD	[Reserved for future use]								
<b>\$HDR_EOTF?</b> ←	<p>Show the current HDR EOTF mode.</p>								
<b>\$HDR_MCLL N1</b> ←	<p>Set the maximum content light level for HDR.</p> <p><b>N1</b> = 0~65500 [100 unit increments]</p>								
<b>\$HDR_MCLL?</b> ←	<p>Show the current maximum content light level for HDR.</p>								
<b>\$HDR_MFALL N1</b>	<p>Set the maximum frame average light level for HDR.</p> <p><b>N1</b> = 0~65500 [100 unit increments]</p>								
<b>\$HDR_MFALL?</b> ←	<p>Show the current maximum frame average light level for HDR.</p>								
<b>\$HDR_SW N1</b> ←	<p>Enable or disable HDR simulation support on the unit's HDMI output.</p> <p>Available values for <b>N1</b>:</p> <table> <tr> <td>ON</td> <td>[HDR simulation enabled]</td> </tr> <tr> <td>OFF</td> <td>[HDR simulation disabled]</td> </tr> </table>	ON	[HDR simulation enabled]	OFF	[HDR simulation disabled]				
ON	[HDR simulation enabled]								
OFF	[HDR simulation disabled]								
<b>\$HDR_SW?</b> ←	<p>Show the current HDR simulation status for the unit's HDMI output.</p>								

COMMAND																							
Description and Parameters																							
<b>\$HDR_TX_COL N1</b> ↵	<p>Set the HDMI output (Tx) AVI colorimetry mode.</p> <p>Available values for <b>N1</b>:</p> <table> <tr><td>1</td><td>[No Data]</td></tr> <tr><td>2</td><td>[ITU 601]</td></tr> <tr><td>3</td><td>[ITU 709]</td></tr> <tr><td>4</td><td>[xvYCC 601]</td></tr> <tr><td>5</td><td>[xvYCC 709]</td></tr> <tr><td>6</td><td>[sYCC 601]</td></tr> <tr><td>7</td><td>[Adobe Y601]</td></tr> <tr><td>8</td><td>[Adobe RGB]</td></tr> <tr><td>9</td><td>[BT.2020 (1) Y'<sub>C</sub>C'<sub>BC</sub>C'<sub>RC</sub>]</td></tr> <tr><td>10</td><td>[BT.2020 (2) R'<sub>G</sub>B'<sub>Y</sub>C'<sub>B</sub>C'<sub>R</sub>]</td></tr> </table>	1	[No Data]	2	[ITU 601]	3	[ITU 709]	4	[xvYCC 601]	5	[xvYCC 709]	6	[sYCC 601]	7	[Adobe Y601]	8	[Adobe RGB]	9	[BT.2020 (1) Y' <sub>C</sub> C' <sub>BC</sub> C' <sub>RC</sub> ]	10	[BT.2020 (2) R' <sub>G</sub> B' <sub>Y</sub> C' <sub>B</sub> C' <sub>R</sub> ]		
1	[No Data]																						
2	[ITU 601]																						
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5	[xvYCC 709]																						
6	[sYCC 601]																						
7	[Adobe Y601]																						
8	[Adobe RGB]																						
9	[BT.2020 (1) Y' <sub>C</sub> C' <sub>BC</sub> C' <sub>RC</sub> ]																						
10	[BT.2020 (2) R' <sub>G</sub> B' <sub>Y</sub> C' <sub>B</sub> C' <sub>R</sub> ]																						
<b>\$HDR_TX_COL?</b> ↵	<p>Show the current HDMI output (Tx) AVI colorimetry mode.</p>																						
<b>\$MODEL?</b> ↵	<p>Show the unit's model number.</p>																						
<b>\$PATTERN N1</b> ↵	<p>Select the test pattern to output.</p> <p>Available values for <b>N1</b>:</p> <table> <tr><td>1</td><td>[Black]</td></tr> <tr><td>2</td><td>[Blue]</td></tr> <tr><td>3</td><td>[Cyan]</td></tr> <tr><td>4</td><td>[Green]</td></tr> <tr><td>5</td><td>[Magenta]</td></tr> <tr><td>6</td><td>[Red]</td></tr> <tr><td>7</td><td>[White]</td></tr> <tr><td>8</td><td>[Yellow]</td></tr> <tr><td>9</td><td>[Color Bar]</td></tr> <tr><td>10</td><td>[Grayscale 256]</td></tr> <tr><td>11</td><td>[V Line On/Off]</td></tr> </table>	1	[Black]	2	[Blue]	3	[Cyan]	4	[Green]	5	[Magenta]	6	[Red]	7	[White]	8	[Yellow]	9	[Color Bar]	10	[Grayscale 256]	11	[V Line On/Off]
1	[Black]																						
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8	[Yellow]																						
9	[Color Bar]																						
10	[Grayscale 256]																						
11	[V Line On/Off]																						
<b>\$PATTERN?</b> ↵	<p>Show the current test pattern selection.</p>																						

COMMAND	
Description and Parameters	
<b>\$RX_DDC N1</b> ↵	<p>Enable or disable the DDC bus for the HDMI input (Rx).</p> <p>Available values for <b>N1</b>:</p> <p>ON [DDC bus enabled]  OFF [DDC bus disabled]</p>
<b>\$RX_DDC?</b> ↵	<p>Show the DDC bus state for the HDMI input (Rx).</p>
<b>\$RX_HOTPLUG N1</b> ↵	<p>Set the hot plug value for the HDMI input (Rx).</p> <p>Available values for <b>N1</b>:</p> <p>OFF [Set hot plug low]  ON [Set hot plug high]  TOGGLE [Toggle low→high]</p>
<b>\$RX_HOTPLUG?</b> ↵	<p>Show the current hot plug state for the HDMI input (Rx).</p>
<b>\$RX_HOTPLUG_T N1</b> ↵	<p>Set the hot plug time (in milliseconds) for the HDMI input (Rx).</p> <p><b>N1</b> = 50~500 [50ms increments]</p>
<b>\$RX_HOTPLUG_T?</b> ↵	<p>Show the current hot plug time (in milliseconds) for the HDMI input (Rx).</p>
<b>\$RX_PC_TOL N1</b> ↵	<p>Set PC source clock detection tolerance for the HDMI input (Rx).</p> <p><b>N1</b> = 1~10 [1/1000~10/1000]</p>
<b>\$RX_PC_TOL?</b> ↵	<p>Show the PC source clock detection tolerance for the HDMI input (Rx).</p>

COMMAND																					
Description and Parameters																					
<b>\$RX_SCDC N1</b> ↵	<p>Enable or disable the SCDC port function on the HDMI input (Rx).</p> <p>Available values for <b>N1</b>:</p> <table> <tr> <td>ON</td> <td>[SCDC port enabled]</td> </tr> <tr> <td>OFF</td> <td>[SCDC port disabled]</td> </tr> </table>	ON	[SCDC port enabled]	OFF	[SCDC port disabled]																
ON	[SCDC port enabled]																				
OFF	[SCDC port disabled]																				
<b>\$RX_SCDC?</b> ↵	<p>Show the current SCDC port state for the HDMI input (Rx).</p>																				
<b>\$RX_SENSE N1</b> ↵	<p>Enable or disable the RxSense function for the HDMI input (Rx).</p> <p>Available values for <b>N1</b>:</p> <table> <tr> <td>ON</td> <td>[RxSense enabled]</td> </tr> <tr> <td>OFF</td> <td>[RxSense disabled]</td> </tr> </table>	ON	[RxSense enabled]	OFF	[RxSense disabled]																
ON	[RxSense enabled]																				
OFF	[RxSense disabled]																				
<b>\$RX_SENSE?</b> ↵	<p>Show the current RxSense state for the HDMI input (Rx).</p>																				
<b>\$SINK_DETECT? N1</b> ↵	<p>Show a variety of sink detection status and informational values.</p> <p>Available values for <b>N1</b>:</p> <table> <tr> <td>HOTPLUG</td> <td>[Sink's hot plug status]</td> </tr> <tr> <td>RSENSE</td> <td>[Sink's RxSense status]</td> </tr> <tr> <td>HDCP</td> <td>[Sink HDCP status detection]</td> </tr> <tr> <td>HDCP_AKSV</td> <td>[Sink AKSV in 2-digit hex (HDCP v1.4)]</td> </tr> <tr> <td>HDCP_BKSV</td> <td>[Rx BKSV in 2-digit hex (HDCP v1.4)]</td> </tr> <tr> <td>HDCP_RXID</td> <td>[HDCP Rx ID in 2-digit hex (HDCP v2.2)]</td> </tr> <tr> <td>SCDC_SCR_ENABLE</td> <td>[Rx SCDC source enable scrambling state]</td> </tr> <tr> <td>SCDC_SCR_STATUS</td> <td>[SCDC sink scrambling status]</td> </tr> <tr> <td>SCDC_SINK_VER</td> <td>[SCDC sink version]</td> </tr> <tr> <td>SCDC_SOURCE_VER</td> <td>[SCDC source version]</td> </tr> </table>	HOTPLUG	[Sink's hot plug status]	RSENSE	[Sink's RxSense status]	HDCP	[Sink HDCP status detection]	HDCP_AKSV	[Sink AKSV in 2-digit hex (HDCP v1.4)]	HDCP_BKSV	[Rx BKSV in 2-digit hex (HDCP v1.4)]	HDCP_RXID	[HDCP Rx ID in 2-digit hex (HDCP v2.2)]	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]
HOTPLUG	[Sink's hot plug status]																				
RSENSE	[Sink's RxSense status]																				
HDCP	[Sink HDCP status detection]																				
HDCP_AKSV	[Sink AKSV in 2-digit hex (HDCP v1.4)]																				
HDCP_BKSV	[Rx BKSV in 2-digit hex (HDCP v1.4)]																				
HDCP_RXID	[HDCP Rx ID in 2-digit hex (HDCP v2.2)]																				
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]																				

## COMMAND

### Description and Parameters

#### \$SOURCE\_DETECT? N1↵

Show a variety of source detection status and informational values.

Available values for **N1**:

5V	[5V detection state]
HDCP	[Source HDCP status detection]
HDCP_AKSV	[Source AKSV in hex (HDCP v1.4)]
HDCP_BKSV	[Rx BKSV in hex (HDCP v1.4)]
HDCP_RXID	[HDCP Receiver ID in hex (HDCP v2.2)]
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]
CKDT	[TMDS clock detection]
DATA_RATE	[Video data rate in Mbps]
TMDS_FORMAT	[Detected TMDS format (DVI/HDMI)]
SCDT	[TMDS sync detection]
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	[Interlace odd field vertical offset in lines]
HVS_OFFSET2	[Interlace even field vertical offset in lines]
PIXEL_CLOCK	[Pixel clock in kHz]
SCAN	[Video scan mode]
TIMING	[Video timing (Ref. "Video Timing List")]
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]

COMMAND	
Description and Parameters	
ASP_LAYOUT	[Audio-Sample packet layout]
ASP_PLL	[Audio-Sample packet PLL]
CHS_CODE	[Channel-status audio coding]
CHS_SR	[Channel-status sampling rate in kHz]
CHS_SS	[Channel-status sampling size]
CHS_TYPE	[Channel-status app type]
HBR	[High-Bit-Rate packet status]
AIF	[Display packet-AIF data in 2-digit hex]
AVI	[Display packet-AVI data]
DRMI	[Display packet-DRMI 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]
<b>\$TASK_MODE N1</b> ←	
Set the unit's operation mode.	
Available values for <b>N1</b> :	
CABLE	[Cable Test Mode]
ANALYSER	[Analyzer Mode]
PATTERN	[Pattern Mode]
<b>\$TASK_MODE?</b> ←	
Show the unit's current operation mode.	
<b>\$TIMER_DAY?</b> ←	
Show the unit's test timer day value.	
<b>\$TIMER_HOUR?</b> ←	
Show the unit's test timer hour value.	
<b>\$TIMER_MINUTE?</b> ←	
Show the unit's test timer minute value.	
<b>\$TIMER_SECOND?</b> ←	
Show the unit's test timer second value.	

## COMMAND

### Description and Parameters

#### \$TIMING N1↵

Select the output resolution timing to use.

Available values for **N1**:

1	[720×480p@59]
2	[720×576p@50]
3	[1280×720p@25]
4	[1280×720p@30]
5	[1280×720p@50]
6	[1280×720p@60]
7	[1920×1080i@50]
8	[1920×1080i@60]
9	[1920×1080p@24]
10	[1920×1080p@25]
11	[1920×1080p@30]
12	[1920×1080p@50]
13	[1920×1080p@60]
14	[3840×2160p@24]
15	[3840×2160p@25]
16	[3840×2160p@30]
17	[3840×2160p@50]
18	[3840×2160p@60]
19	[4096×2160p@24]
20	[4096×2160p@25]
21	[4096×2160p@30]
22	[4096×2160p@50]
23	[4096×2160p@60]

#### \$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 video output format.

Available values for **N1**:

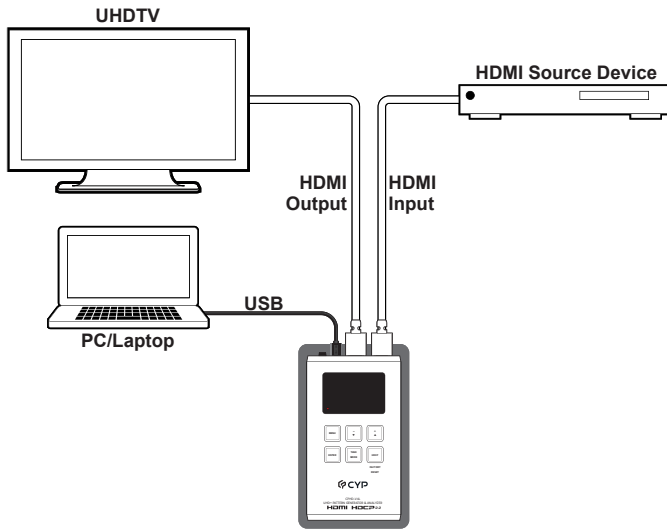
HDMI	[HDMI output mode]
DVI	[DVI output mode]

COMMAND	
Description and Parameters	
<b>\$TMDS_FORMAT?</b> ↵	Show the current video output format.
<b>\$TMDS_SW N1</b> ↵	Enable or disable video output.  Available values for <b>N1</b> : ON [Enable video output] OFF [Disables video output]
<b>\$TMDS_SW?</b> ↵	Show the current video output status.
<b>\$TX_5V N1</b> ↵	Set the unit's output +5V pin state to follow the TMDS output state or to always be on.  Available values for <b>N1</b> : FOLLOW [Only output 5V if there is a live signal] ON [Always output 5V]
<b>\$TX_5V?</b> ↵	Show the current output +5V pin setting.
<b>\$UPDATE_FW</b> ↵	Update firmware 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

<b>HDMI Bandwidth</b>	18Gbps
<b>Input Port</b>	1×HDMI (Type-A)
<b>Output Port</b>	1×HDMI (Type-A)
<b>Service/Control Port</b>	1×USB 2.0 (Micro-B)
<b>Baud Rate</b>	115200
<b>Power Supply</b>	5V/2.1A USB power or Lithium-ion battery (Not included)
<b>ESD Protection (HBM)</b>	±8kV (Air Discharge) ±4kV (Contact Discharge)
<b>Dimensions (W×H×D)</b>	80mm×124mm×26.5mm [Case Only] 80mm×126mm×26.5mm [All Inclusive]
<b>Weight</b>	260g
<b>Chassis Material</b>	Metal (Aluminum)
<b>Chassis Color</b>	Dark Silver
<b>Operating Temperature</b>	0°C – 40°C/32°F – 104°F
<b>Storage Temperature</b>	-20°C – 60°C/-4°F – 140°F
<b>Relative Humidity</b>	20 – 90% RH (Non-condensing)
<b>Power Consumption</b>	4.7W

*Note: A battery is not included in the standard package, however the Panasonic NCR18650BF (3.6V/3350mAh) Lithium-ion rechargeable battery is recommended.*

## 8.2 Video Specifications

Supported Resolutions (Hz)	Input	Output (Bypass)	Output (Pattern)
	HDMI	HDMI	HDMI
720×400p@70/85	✓	✓	×
640×480p@60/72/75/85	✓	✓	×
720×480i@60	✓	✓	×
720×480p@60	✓	✓	59.94
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	✓	✓	×
1400×1050p@60	✓	✓	×
1440×900p@60/75	✓	✓	×
1600×900p@60RB	✓	✓	×
1600×1200p@60	✓	✓	×
1680×1050p@60	✓	✓	×
1920×1080i@50/60	✓	✓	✓
1920×1080p@24/25/30	✓	✓	✓
1920×1080p@50/60	✓	✓	✓
1920×1200p@60RB	✓	✓	×

Supported Resolutions (Hz)	Input	Output (Bypass)	Output (Pattern)
	HDMI	HDMI	HDMI
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	✓	✓	✓

## 8.3 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 (Test Tone Generation)	
LPCM	
Max Channels	8 Channels
Sampling Rate (kHz)	48, 96, 192 <i>Note: 192kHz only supports 2 channels</i>
Bitstream	
Supported Formats	None

## 8.4 Cable Specifications

Cable Length	1080p		4K30	4K60
	8-bit	12-bit	(4:4:4) 8-bit	(4:4:4) 8-bit
<b>High Speed HDMI Cable</b>				
<b>HDMI Input</b>	15m	10m	5m	3m
<b>HDMI Output</b>	15m	10m	5m	3m

### 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<sup>+</sup> Video)**
  - 4K@50/60Hz (4:4:4, 8-bit)
  - 4K@50/60Hz (4:2:0, 10-bit HDR)
  - Data rates higher than 10.2Gbps

## 8.5 Operational Notes

### • **Battery**

- When the USB port is set to RS-232 mode some power is also provided to the unit via USB, however a properly charged battery is still required to operate the unit.
- Many USB hubs do not provide proper 5V power to connected devices. When using a USB hub to connect the unit to a PC, it is strongly recommended to power the unit with a fully charged battery.

### • **Firmware Update**

- From the main menu select “Setup”→“Firmware update”→“Yes”. The unit will then enter the Firmware Update mode.
- Connect a USB cable between the unit & a PC. After connection, the PC will detect the unit as a USB storage device named “USB UPDATE” and the OLED display will read “Paste FW File...”.
- Copy and paste a valid firmware \*.BIN file into the USB UPDATE drive.
- After successfully copying the file, the unit will begin the update process. The OLED display will read “Programming...” followed by the HDCP button blinking rapidly. Please do not turn off the power during the programming phase.
- Once the update is complete the unit will automatically reboot.

### • **Factory Reset**

- To return the unit to its factory default settings, please press and hold the “HDCP” key while powering the unit on.

### • **PC Control Software**

- This unit may also be controlled via a Windows PC software application. For more details, please refer to the separate Control Software for Signal Generator & Analyzer manual.

### • **Cable Testing**

- The cable testing feature performs tests based on the HDMI 2.0 error rate tolerance specification for 18Gbps signals and is provided as an advisory tool only. It is recommended that each cable under test should be tested at least three times to help eliminate outlier results.

## 9. ACRONYMS

ACRONYM	COMPLETE TERM
<b>AOC</b>	Active Optical Cable
<b>ARC</b>	Audio Return Channel
<b>ASCII</b>	American Standard Code for Information Interchange
<b>CEC</b>	Consumer Electronics Control
<b>CLI</b>	Command-Line Interface
<b>COM</b>	Communication
<b>dB</b>	Decibel
<b>DVI</b>	Digital Visual Interface
<b>EDID</b>	Extended Display Identification Data
<b>EOTF</b>	Electro-Optical Transfer Function
<b>Gbps</b>	Gigabits per second
<b>GUI</b>	Graphical User Interface
<b>HDCP</b>	High-bandwidth Digital Content Protection
<b>HDMI</b>	High-Definition Multimedia Interface
<b>HDR</b>	High Dynamic Range
<b>HDTV</b>	High-Definition Television
<b>HPD</b>	Hot Plug Detection
<b>Hz</b>	Hertz
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>kHz</b>	Kilohertz
<b>LED</b>	Light-Emitting Diode
<b>LFE</b>	Low-Frequency Effects
<b>LPCM</b>	Linear Pulse-Code Modulation
<b>mAh</b>	Milliamp-hour
<b>MHz</b>	Megahertz
<b>ms</b>	Millisecond
<b>OLED</b>	Organic Light-Emitting Diode
<b>OSD</b>	On-Screen Display



<b>ACRONYM</b>	<b>COMPLETE TERM</b>
<b>PoR</b>	Power-On Reset
<b>SCDC</b>	Status and Control Data Channel
<b>SDR</b>	Standard Dynamic Range
<b>SMPTE</b>	Society of Motion Picture and Television Engineers
<b>SNR</b>	Signal-to-Noise Ratio
<b>THD+N</b>	Total Harmonic Distortion plus Noise
<b>TMDS</b>	Transition-Minimized Differential Signaling
<b>4K UHD</b>	4K Ultra-High-Definition (10.2Gbps max)
<b>4K UHD<sup>+</sup></b>	4K Ultra-High-Definition (18Gbps max)
<b>USB</b>	Universal Serial Bus
<b>VGA</b>	Video Graphics Array
<b>WUXGA (RB)</b>	Widescreen Ultra Extended Graphics Array (Reduced Blanking)
<b>XGA</b>	Extended Graphics Array
<b>Ω</b>	Ohm







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