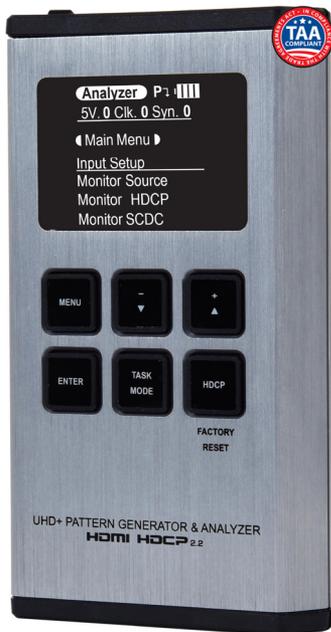


# ANI-4KANA-L

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



## PACKAGE CONTENTS

Before attempting to use this unit, please check the packaging and make sure the following items are contained in the shipping carton:

- HDMI Signal Generator & Analyzer (Portable Version)
- USB Micro-B to USB Type-A Cable

**Note:** A battery is not included in the standard package, however any 18650BF (3.6V or 3.7V/3350mAh) compatible Lithium-ion rechargeable battery is recommended.



## SAFETY INFORMATION



1. To ensure the best results from this product, please read this manual and all other documentation before operating your equipment. Retain all documentation for future reference.
2. Follow all instructions printed on unit chassis for proper operation.
3. To reduce the risk of fire, do not spill water or other liquids into or on the unit, or operate the unit while standing in liquid.
4. Make sure power outlets conform to the power requirements listed on the back of the unit. Keep unit protected from rain, water and excessive moisture.
5. Do not attempt to clean the unit with chemical solvents or aerosol cleaners, as this may damage the unit. Dust with a clean dry cloth.
6. Do not use the unit if the electrical power cord is frayed or broken. The power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords and plugs, convenience receptacles, and the point where they exit from the appliance.
7. Do not force switched or external connections in any way. They should all connect easily, without needing to be forced.
8. Always operate the unit with the AC ground wire connected to the electrical system ground. Precautions should be taken so that the means of grounding of a piece of equipment is not defeated.
9. AC voltage must be correct and the same as that printed on the rear of the unit. Damage caused by connection to improper AC voltage is not covered by any warranty.
10. Turn power off and disconnect unit from AC current before making connections.
11. Never hold a power switch in the "ON" position.
12. This unit should be installed in a cool dry place, away from sources of excessive heat, vibration, dust, moisture and cold. Do not use the unit near stoves, heat registers, radiators, or other heat producing devices.
13. Do not block fan intake or exhaust ports. Do not operate equipment on a surface or in an environment which may impede the normal flow of air around the unit, such as a bed, rug, carpet, or completely enclosed rack. If the unit is used in an extremely dusty or smoky environment, the unit should be periodically "blown free" of foreign dust and matter.
14. To reduce the risk of electric shock, do not remove the cover. There are no user serviceable parts inside. Refer all servicing to qualified service personnel. There are no user serviceable parts inside.
15. When moving the unit, disconnect input ports first, then remove the power cable; finally, disconnect the interconnecting cables to other devices.
16. Do not drive the inputs with a signal level greater than that required to drive equipment to full output.
17. The equipment power cord should be unplugged from the outlet when left unused for a long period of time.
18. Save the carton and packing material even if the equipment has arrived in good condition. Should you ever need to ship the unit, use only the original factory packing.
19. Service Information Equipment should be serviced by qualified service personnel when:
  - A. The power supply cord or the plug has been damaged.
  - B. Objects have fallen, or liquid has been spilled into the equipment.
  - C. The equipment has been exposed to rain.
  - D. The equipment does not appear to operate normally, or exhibits a marked change in performance.
  - E. The equipment has been dropped, or the enclosure damaged.

THIS SAFETY INFORMATION IS OF A GENERAL NATURE AND MAY BE SUPERSEDED BY INSTRUCTIONS CONTAINED WITHIN THIS MANUAL.

## 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.

## DISCLAIMERS

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**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. This unit comes with a 3 year warranty.

**IMPORTANT OPERATION INFORMATION:**

**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 fully 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.

## FEATURES

- HDMI input and output with 18Gbps 4K UHD+ support
- DVI 1.0 compliant with the use of an HDMI-DVI adaptor
- HDCP 1.4 and 2.2 compliant
- Supports UHD+ resolutions up to 4096x2160@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

## SPECIFICATIONS / CABLE SPECIFICATIONS

### SPECIFICATIONS

- **HDMI Bandwidth:** 18Gbps
- **Input Port:** HDMI (Type-A)
- **Output Port:** HDMI (Type-A)
- **Service/Control Port:** USB 2.0 (Micro-B)
- **Baud Rate:** 115200
- **Power Supply:** 5V/2.1A USB power or **Lithium-ion Battery** (Not included)
- **ESD Protection (HBM):** ±8kV (Air Discharge) / ±4kV (Contact Discharge)
- **Dimensions (WxHxD):** 3.15 x 4.9 x 1 in (80x124x26.5mm) [Case Only] 3.15 x 5 x 1 in (80x126x26.5mm) [All Inclusive]
- **Weight:** 9.2 oz / 260g
- **Chassis Material:** Metal (Aluminum)
- **Chassis Color:** Dark Silver
- **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:** 4.7W

**Note:** A battery is not included in the standard package, however any 18650BF (3.6V or 3.7V/3350mAh) compatible Lithium-ion rechargeable battery is recommended.

As product improvements are continuous, specifications are subject to change without notice.

### CABLE SPECIFICATIONS

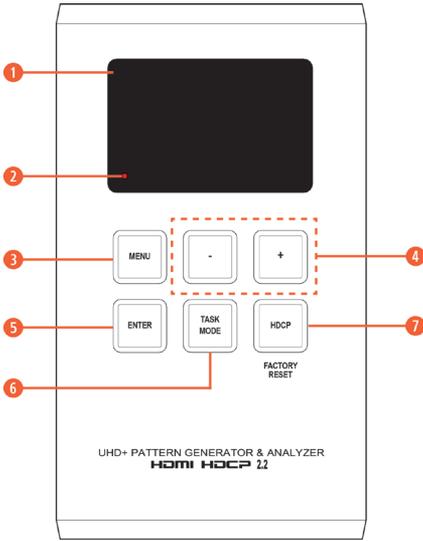
Cable Length	1080p		4K30	4K60
	8-bit	12-bit	(4:4:4) 8-bit	(4:4:4) 8-bit
High Speed HDMI Cable				
HDMI Input	49ft/15M	32ft/10M	16ft/5M	9ft/3m
HDMI Output	49ft/15M	32ft/10M	16ft/5M	9ft/3m

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

# OPERATION CONTROLS & FUNCTIONS

## 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.

## OPERATION CONTROLS & FUNCTIONS

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:** Press to back out from menu items and return to the main OLED menu screen.

4 **+/- & ▲ /▼ :** Press to move up and down or adjust selections within menus.

5 **ENTER:** 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:** 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.*

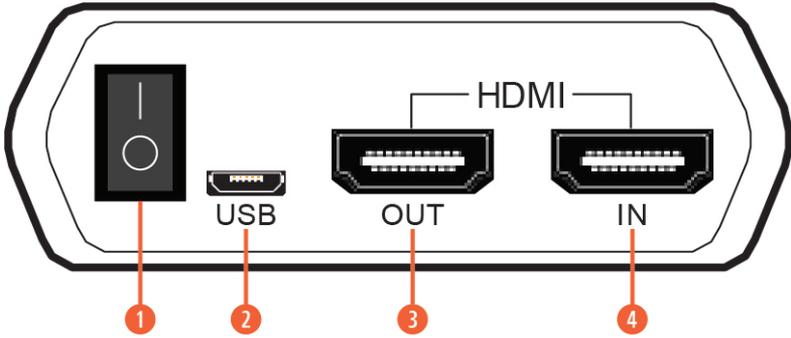
7 **HDCP:** Press to switch between supported HDCP versions (1.4, 2.2) or to disable HDCP. In Analyzer mode, this changes the HDCP versions supported by the input port. In Pattern mode, this changes the HDCP required by the output port. The button's outline will light up according to the HDCP state and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

# OPERATION CONTROLS & FUNCTIONS

## TOP PANEL



❶ **POWER:** Flip this switch to turn the unit ON or OFF.

❷ **USB:** Multi-function port for power/battery charging, firmware update or serial command control.

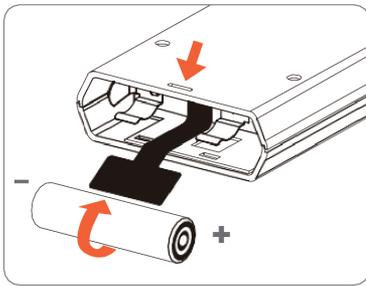
**NOTE:** The USB operation mode is changed within the OLED menu's Setup menu.

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

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

## 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.



❶ **OPENING THE COMPARTMENT:** Use a small flathead screwdriver to gently, but firmly, press down into the slot ❶ behind the base panel and the bottom cover will pop out.

❷ **REMOVING THE BATTERY:** If a battery is already installed, a Mylar tab ❷ will be visible beneath the battery. Pull on the Mylar tab to pop the battery out of its holding brackets.

The 18650 is available in two different versions. Only the version with a flat positive terminal is compatible. The version with a raised positive terminal is **NOT** compatible.



# OPERATION CONTROLS & FUNCTIONS / SYSTEM REQUIREMENTS / APPLICATIONS

## OPERATION CONTROLS & FUNCTIONS

**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 any 18650BF (3.6V or 3.7V/3350mAh) compatible Lithium-ion rechargeable battery is recommended.

## 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, however any 18650BF (3.6V or 3.7V/3350mAh) compatible Lithium-ion rechargeable battery is recommended.

## 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

# OLED DISPLAY

## OLED DISPLAY

**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.

## 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.

# OLED DISPLAY

## 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.

## 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>

# OLED DISPLAY

## ANALYZER MODE

LEVEL 2	LEVEL 3
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> )

❶ **Hotplug Time:** Set the length of time for the hot plug to last (in milliseconds).

❷ **Hotplug Toggle:** Forces a hot plug event on the HDMI input.

❸ **RxSense:** Enable or Disable RxSense on the HDMI input.

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

❹ **DDC Bus:** Enable or Disable the HDMI input's DDC bus.

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

❺ **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 .

❻ **HDCP REAUTH-REQ:** Forces the HDMI input to restart the HDCP authorization process.

## OLED DISPLAY

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

LEVEL 2	LEVEL 3
(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 infoframe 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.

# OLED DISPLAY

## MONITOR HDCP (ACTIVE HDCP 1.4 SOURCE)

LEVEL 2	LEVEL 3
Source HDCP	[Current Analytical Data]
Rx HDCP Port	
Aksv	
Bksv	
Ri Source	
Ri' Rx	
Count	
Day 0 00:00:00	

🔴 **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)

LEVEL 2	LEVEL 3
Source HDCP	[Current Analytical Data]
Rx HDCP Port	
TxCaps	
RxCaps	
Receiver ID	
rn	
riv	

🔴 **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.

# OLED DISPLAY

## MONITOR SCDC

LEVEL 2	LEVEL 3
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	

**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

LEVEL 2	LEVEL 3
(T)	[Current Analytical Data]
TMDS	
Pix	
DR	
(8/10/12)B, 3D, Y420, Scr	[Highlighted when detected]
Total	[Current Analytical Data]
Act	

## OLED DISPLAY

LEVEL 2	LEVEL 3
Polarity	[Current Analytical Data]
Scan	
HFreq	
VFreq	
Off set1	
Off set2	

**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.
- **Off set1:** Vertical line off set of an interlaced source's odd field.
- **Off set2:** Vertical line off set of an interlaced source's even field.

## AUDIO TIMING

LEVEL 2	LEVEL 3
ACR, AIF, ASP, HBR	[Highlighted when detected]
N	[Current Analytical Data]
CTS	
A.PLL	
A.FIFO	
A.Layout	

## OLED DISPLAY

LEVEL 2	LEVEL 3
A.Ch No.	[Current Analytical Data]
C.Type	
C.Coding	
C.Ch No.	
C.Src No.	
C.Sample Rate	
C.Sample Size	

**🔴 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

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

## OLED DISPLAY

- ❶ **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

LEVEL 2	LEVEL 3
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]

❶ **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

LEVEL 2	LEVEL 3
Copy Sink	[Use Sink EDID]
[D1] DVI	[Use Selected EDID]
[D2] VGA	

## OLED DISPLAY

LEVEL 2	LEVEL 3
[D3] 8B LPCM PC	[Use Selected EDID]
[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	[Use Selected EDID]
[C1~10] Copy 01~10	

**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

LEVEL 2	LEVEL 3
[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

LEVEL 2	LEVEL 3
[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	

## OLED DISPLAY

LEVEL 2	LEVEL 3
[D8] 12 HBR 4K3G	[Overwrite Sink's EDID with the Selected EDID]
[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

LEVEL 2	LEVEL 3
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 fi rmware update instructions.*

**4 Power Saving:** Set the length of time before the screen is automatically turned off when operating on battery power.

# OLED DISPLAY

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

LEVEL 2	LEVEL 3
[Displays Unit Version Details]	

1 **Information:** Displays the unit’s hardware revision and the current firmware version.

## 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

LEVEL 2	LEVEL 3
Timing	[T1] 720x480p59
	[T2] 720x576p50
	[T3] 1280x720p25
	[T4] 1280x720p30

# OLED DISPLAY

LEVEL 2	LEVEL 3	
Timing	[T5] 1280x720p50	
	[T6] 1280x720p60	
	[T7] 1920x1080i50	
	[T8] 1920x1080i60	
	[T9] 1920x1080p24	
	[T10] 1920x1080p25	
	[T11] 1920x1080p30	
	[T12] 1920x1080p50	
	<b>[T13] 1920x1080P60</b>	
	[T14] 3840x2160p24	
	[T15] 3840x2160p25	
	[T16] 3840x2160p30	
	[T17] 3840x2160p50	
	[T18] 3840x2160p60	
	[T19] 4096x2160p24	
	[T20] 4096x2160p25	
	[T21] 4096x2160p30	
	[T22] 4096x2160p50	
	[T23] 4096x2160p60	
	Pattern	[P1] Black
		[P2] Blue
		[P3] Cyan
		[P4] Green
[P5] Magenta		
[P6] Red		
[P7] White		
[P8] Yellow		
<b>[P9] COLOR BAR</b>		
[P10] Grayscale 256		

# OLED DISPLAY

LEVEL 2	LEVEL 3
Pattern cont'd	[P11] V Line OnOff
	[P12] Circle
	[P13] Crosshatch
	[P14] Crosshatch I
	[P15] Diagonal
	[P16] Motion
	[P17] Multiburst
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

## OLED DISPLAY

LEVEL 2	LEVEL 3
+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.

# OLED DISPLAY

## MONITOR SINK

LEVEL 2	LEVEL 3
HDCP Port/Auth	[Current Analytical Data]
EDID	
SCDC Port	

🔴 **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)

LEVEL 2	LEVEL 3
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	

🔴 **Monitor HDCP (HDCP 1.4 Output):** This page displays the realtime 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.

# OLED DISPLAY

## MONITOR HDCP (HDCP 2.2 OUTPUT)

LEVEL 2	LEVEL 3
Tx HDCP	[Current Analytical Data]
Sink HDCP Port	
TxCaps	
RxCaps	
Receiver ID	
m	
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 realtime 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 HDCP (HDCP 2.2 OUTPUT)

LEVEL 2	LEVEL 3
Sink SCDC Pt	[Current Analytical Data]
Sink Version	
Source Ver	
Scramble Ena	
Scramble Sta	
Clock Detect	

# OLED DISPLAY

## MONITOR HDCP (HDCP 2.2 OUTPUT)

LEVEL 2	LEVEL 3
Ch2/1/0 Locked	[Current Analytical Data]
CED Ch0	
CED Ch1	
CED Ch2	
ENTER Reset/Start	
[Sink EDID] HF VSDB	[Current Analytical Data]
[Sink EDID] SCDC Exist	

❶ **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

LEVEL 2	LEVEL 3
Volume	0~80 (70)
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

## OLED DISPLAY

LEVEL 2	LEVEL 3
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

LEVEL 2	LEVEL 3
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]

## OLED DISPLAY

**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

LEVEL 2	LEVEL 3
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

LEVEL 2	LEVEL 3
[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.

# OLED DISPLAY

## EDID BURN SINK

LEVEL 2	LEVEL 3
[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

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

## OLED DISPLAY

LEVEL 2	LEVEL 3
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

LEVEL 2	LEVEL 3
USB Port	<b>POWER</b>
	RS-232
OLED Contrast	0~8 <b>(8)</b>

## OLED DISPLAY

LEVEL 2	LEVEL 3
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

LEVEL 2	LEVEL 3
[Displays Unit Version Details]	

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

# OLED DISPLAY

## CABLE TEST MODE

MAIN MENU
Run Test
Cable Setup
Setup
Information

## RUN TEST

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

**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

LEVEL 2	LEVEL 3
Type	COPPER
	Optical
Delay	ON
	Off

## OLED DISPLAY

LEVEL 2	LEVEL 3
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

LEVEL 2	LEVEL 3
USB Port	<b>POWER</b>
	RS-232

## OLED DISPLAY

LEVEL 2	LEVEL 3
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

LEVEL 2	LEVEL 3
[Displays Unit Version Details]	

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

# TEST TIMINGS & PATTERNS

## 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?”.

## 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
1920x1080p	60	T08		30	T21
	24	T09		50	T22
	25	T10		60	T23
	30	T11			
	50	T12			
60	T13				

# TEST TIMINGS & PATTERNS

## TEST PATTERNS (PATTERN MODE)

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

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"**.

## TEST TIMINGS & PATTERNS

### 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”.*

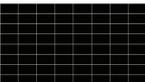
### P12 - CIRCLE



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 4096x2160, 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

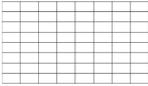


The **Crosshatch 8x8** pattern is a full black field with a pattern of crossing vertical and horizontal white lines dividing the screen into 8 sections in each direction. This pattern is primarily used to check for color convergence and pincushion issues in projectors.

**Note:** *If the output resolution is set to 4096x2160, 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”.*

## TEST TIMINGS & PATTERNS

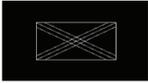
### P14 - CROSSHATCH 8X8 (INVERTED)



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 4096x2160, 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 multidisplay 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”**.

## 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, 7.1	16, 20, 24	Mute, 200 ~ 1600	SD0~3 L/R
	96				SD0 L/R
	192	2.0			

# RS-232 PROTOCOL & SERIAL COMMANDS

## RS-232 PROTOCOL

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.

Baud Rate: 115200bps

Data Bits: 8

Parity: None

Flow Control: None

Stop Bit: 1

## SERIAL COMMANDS

Before using the 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.

# RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS
<b>\$?←</b>	Show full command list.
<b>\$HELP ←</b>	Show full command list.
<b>\$4K_TO_1080P N1 ←</b>	Set the 4K downscaling mode. Available values for <b>N1</b> : OFF [No downscaling] ON_RGB [1080p, RGB color] ON_YUV [1080p, YUV color]
<b>\$4K_TO_1080P? ←</b>	Display the current 4K downscaling mode.
<b>\$AUDIO_CH N1 ←</b>	Set the number of internally sourced audio output channels. Available values for <b>N1</b> : 2 [2 Channels (2.0)] 6 [6 Channels (5.1)] 8 [8 Channels (7.1)]
<b>\$AUDIO_CH? ←</b>	Display the current number of audio output channels.
<b>\$AUDIO_FREQ N1,N2 ←</b>	Set the internal audio output frequency of the selected channel (in Hz). Available Values for <b>N1</b> : SD0_L [SD0 Left Channel]                      SD2_L [SD2 Left Channel] SD0_R [SD0 Right Channel]                   SD2_R [SD2 Right Channel] SD1_L [SD1 Left Channel]                     SD3_L [SD3 Left Channel] SD1_R [SD1 Right Channel]                  SD3_R [SD3 Right Channel] Available Values for <b>N2</b> : MUTE [No audio]      1000 [1000Hz] 200 [200Hz]            1200 [1200Hz] 400 [400Hz]            1400 [1400Hz] 600 [600Hz]            1600 [1600Hz] 800 [800Hz]
<b>\$AUDIO_FREQ? N1 ←</b>	Show the internal audio output frequency of the selected channel (in Hz). Available Values for <b>N1</b> : SD0_L [SD0 Left Channel]                      SD2_L [SD2 Left Channel] SD0_R [SD0 Right Channel]                   SD2_R [SD2 Right Channel] SD1_L [SD1 Left Channel]                     SD3_L [SD3 Left Channel] SD1_R [SD1 Right Channel]                  SD3_R [SD3 Right Channel]
<b>\$AUDIO_MUTE N1 ←</b>	Enable or disable muting the audio output. Available Values for <b>N1</b> : ON [Muted]            OFF [Unmuted]
<b>\$AUDIO_MUTE? ←</b>	Show the audio output mute state.
<b>\$AUDIO_SR N1 ←</b>	Set the internal audio output sampling rate (in kHz). Available values for <b>N1</b> : 48 [48 kHz]            96 [96 kHz]            192 [192 kHz]

# RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS
\$AUDIO_SR? ↵	Show 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.
\$BOARD_ID? ↵	Show the current board ID.
\$BOOT GO ↵	Reboot the unit. <b>Note:</b> <i>The unit won't respond to any commands during the boot process.</i>
\$BOOT? ↵	Show the current boot state.
\$CABLE_DELAY N1 ↵	Turn the cable delay on or off . Available values for N1: ON [Cable delay enabled]          OFF [Cable delay disabled]
\$CABLE_DELAY? ↵	Show the cable delay state.
\$CABLE_LENGTH N1 ↵	Set the length of the cable to be tested. Available values for N1: 2M [2 meters]          4M [4 meters] 3M [3 meters]          5M [5 meters]
\$CABLE_LENGTH? ↵	Show the current cable test length.
\$CABLE_LEVEL N1 ↵	Set the cable test level. Available values for N1: NORMAL [Normal testing mode] STRICT [Strict testing mode]
\$CABLE_LEVEL? ↵	Show the cable test level.
\$CABLE_RESULT? ↵	Show the cable test result.
\$CABLE_RESULT_I? ↵	Show the cable test item result.
\$CABLE_RUN N1 ↵	Start or stop the cable testing process. Available values for N1: START [Start testing]          STOP [Stop testing]
\$CABLE_RUN? ↵	Show the cable test process status.
\$CABLE_TIME N1 ↵	Set the testing duration for the cable test. Available values for N1: 1 [2 Minutes]          4 [15 Minutes]          7 [Infinite] 2 [5 Minutes]          5 [30 Minutes] 3 [10 Minutes]          6 [1 Hour]
\$CABLE_TIME? ↵	Show the currently set testing duration.

## RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS
<b>\$CABLE_TYPE</b> <b>N1</b> ↵	Set the cable type. Available values for <b>N1</b> : COPPER [Copper core HDMI cable] OPTICAL [Optical core HDMI cable (AOC)]
<b>\$CABLE_TYPE</b> ↵	Show the cable type.
<b>\$COLOR_SPACE</b> <b>N1</b> ↵	Set the output color space.
<b>\$EDID_COPY_SINK</b> <b>N1</b> ↵	Copy the current HDMI sink's EDID to the designated copy slot. <b>N1</b> = C1~C10 [User EDID copy slot index] <b>Note:</b> If the copy fails " <b>\$err</b> " will be displayed.
<b>\$EDID_MANUF?</b> <b>N1</b> ↵	Show the manufacturer name stored in the EDID of the selected location. Available values for <b>N1</b> : RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] <b>Note:</b> If the EDID fails to be read, " <b>\$err_ddc</b> " will be displayed. If the EDID has invalid content, " <b>\$err_bad</b> " will be displayed.
<b>\$EDID_MODEL?</b> <b>N1</b> ↵	Show the model/monitor name stored in the EDID of the selected location. Available values for <b>N1</b> : RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] <b>Note:</b> If the EDID fails to be read, " <b>\$err_ddc</b> " will be displayed. If the EDID has invalid content, " <b>\$err_bad</b> " will be displayed.
<b>\$EDID_NAME</b> <b>N1,N2</b> ↵	Set the EDID name of the selected copy slot. <b>N1</b> = C1~C10 [User EDID copy slot index] <b>N2</b> = {Name} [20 characters max]
<b>\$EDID_NAME?</b> <b>N1</b> ↵	Show the name of the selected EDID slot. Available values for <b>N1</b> : D1~D10 [Default EDID slot index] C1~C10 [User EDID copy slot index]
<b>\$EDID_NATIVE?</b> <b>N1</b> ↵	Show the native resolution value stored in the EDID of the selected location. First detailed timing from Block 0. Available values for <b>N1</b> : RX [HDMI Input (Rx) Port] SINK_H [HDMI Sink] <b>Note:</b> If the EDID fails to be read, " <b>\$err_ddc</b> " will be displayed. If the EDID has invalid content, " <b>\$err_bad</b> " will be displayed.
<b>\$EDID_READ</b> <b>N1,N2</b> ↵	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).

## RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS
<b>\$EDID_READ N1,N2</b> ↵ cont'd	Blocks 2 & 3 are only supported from the HDMI sink. Available values for <b>N1</b> : D1~D10 [Default EDID slot index] C1~C10 [User EDID copy slot index] SINK_H [HDMI Sink] Available values for <b>N2</b> : BLOCK0 [EDID Block 0]            BLOCK2 [EDID Block 2] BLOCK1 [EDID Block 1]            BLOCK3 [EDID Block 3] <b>Note:</b> 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.
<b>\$EDID_RX N1</b> ↵	Select the EDID to use with the unit's HDMI input (Rx). Available values for <b>N1</b> : D1~D10 [Default EDID slot index] C1~C10 [User EDID copy slot index] SINK [HDMI sink]
<b>\$EDID_RX?</b> ↵	Show the current EDID selection for the unit's HDMI input (Rx).
<b>\$EDID_TYPE? N1</b> ↵	Show the EDID type of the selected location. Available values for <b>N1</b> : RX [HDMI Input(Rx) Port]            SINK_H [HDMI Sink] <b>Note:</b> If the EDID fails to be read, “\$err_ddc” will be displayed. If the EDID has invalid content, “\$err_bad” will be displayed.
<b>\$EDID_WRITE N1,N2 N3</b> ↵	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 <b>N1</b> : C1~C10 [User EDID copy slot index] Available values for <b>N2</b> : BLOCK0 [EDID Block 0]            BLOCK1 [EDID Block 1] <b>N3</b> = <CR><LF>{data} [128 byte hex data] <b>Note:</b> If the sum of the 128 byte data isn't 0, “\$err_checksum” will be displayed.
<b>\$FACTORY</b> ↵	Execute a factory reset and reboot the unit. <b>Note:</b> Stored Copy EDIDs and Ethernet settings will not be reset.
<b>\$FWVER?</b> ↵	Show the current firmware version.
<b>\$HDCP_IN_SW N1</b> ↵	Enable or disable HDCP support for the unit's HDMI input. Available values for <b>N1</b> : ON [Enable HDCP]            OFF [Disable HDCP] <b>Note:</b> Analyzer mode only.
<b>\$HDCP_IN_SW?</b> ↵	Show the current HDCP support setting for the unit's HDMI input.

## RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS
\$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] <b>Note:</b> 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] <b>Note:</b> Pattern mode only.
\$HDCP_OUT_SW? ←	Show the HDMI output's HDCP status. <b>Note:</b> A status of "Talk" means HDCP is currently performing handshaking.
\$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] <b>Note:</b> Pattern mode only.
\$HDCP_OUT_VER? ←	Show the current HDCP version for the output port.
\$HDR_EOTF N1 ←	Set the HDR EOTF (Electro-Optical Transfer Function) mode. Available values for N1: SDR [Traditional gamma, SDR luminance range] HDR [Traditional gamma, HDR luminance range] 2084 [SMPTE ST 2084] RSVD [Reserved for future use]
\$HDR_EOTF? ←	Show the current HDR EOTF mode.
\$HDR_MCLL N1 ←	Set the maximum content light level for HDR. N1 = 0~65500 [100 unit increments]
\$HDR_MCLL? ←	Show the current maximum content light level for HDR.
\$HDR_MFALL N1 ←	Set the maximum frame average light level for HDR. N1 = 0~65500 [100 unit increments]
\$HDR_MFALL? ←	Show the current maximum frame average light level for HDR.
\$HDR_SW N1 ←	Enable or disable HDR simulation support on the unit's HDMI output. Available values for N1: ON [HDR simulation enabled] OFF [HDR simulation disabled]
\$HDR_SW? ←	Show the current HDR simulation status for the unit's HDMI output.

# RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS																		
<b>\$HDR_TX_COL N1</b> ←	Set the HDMI output (Tx) AVI colorimetry mode. Available values for N1: <table border="0"> <tr> <td>1 [No Data]</td> <td>6 [sYCC 601]</td> </tr> <tr> <td>2 [ITU 601]</td> <td>7 [Adobe Y601]</td> </tr> <tr> <td>3 [ITU 709]</td> <td>8 [Adobe RGB]</td> </tr> <tr> <td>4 [xvYCC 601]</td> <td>9 [BT.2020 (1) Y'<sub>C</sub> C'<sub>BC</sub> C'<sub>RC</sub>]</td> </tr> <tr> <td>5 [xvYCC 709]</td> <td>10 [BT.2020 (2) R'G'B'/Y'<sub>C</sub>'BC'<sub>R</sub>]</td> </tr> </table>	1 [No Data]	6 [sYCC 601]	2 [ITU 601]	7 [Adobe Y601]	3 [ITU 709]	8 [Adobe RGB]	4 [xvYCC 601]	9 [BT.2020 (1) Y' <sub>C</sub> C' <sub>BC</sub> C' <sub>RC</sub> ]	5 [xvYCC 709]	10 [BT.2020 (2) R'G'B'/Y' <sub>C</sub> 'BC' <sub>R</sub> ]								
1 [No Data]	6 [sYCC 601]																		
2 [ITU 601]	7 [Adobe Y601]																		
3 [ITU 709]	8 [Adobe RGB]																		
4 [xvYCC 601]	9 [BT.2020 (1) Y' <sub>C</sub> C' <sub>BC</sub> C' <sub>RC</sub> ]																		
5 [xvYCC 709]	10 [BT.2020 (2) R'G'B'/Y' <sub>C</sub> 'BC' <sub>R</sub> ]																		
<b>\$HDR_TX_COL?</b> ←	Show the current HDMI output (Tx) AVI colorimetry mode.																		
<b>\$MODEL?</b> ←	Show the unit's model number.																		
<b>\$PATTERN N1</b> ←	Select the test pattern to output. Available values for N1: <table border="0"> <tr> <td>1 [Black]</td> <td>7 [White]</td> <td>13 [Crosshatch]</td> </tr> <tr> <td>2 [Blue]</td> <td>8 [Yellow]</td> <td>14 [Crosshatch I]</td> </tr> <tr> <td>3 [Cyan]</td> <td>9 [Color Bar]</td> <td>15 [Diagonal]</td> </tr> <tr> <td>4 [Green]</td> <td>10 [Grayscale 256]</td> <td>16 [Motion]</td> </tr> <tr> <td>5 [Magenta]</td> <td>11 [V Line On/Off]</td> <td>17 [Multiburst]</td> </tr> <tr> <td>6 [Red]</td> <td>12 [Circle]</td> <td></td> </tr> </table>	1 [Black]	7 [White]	13 [Crosshatch]	2 [Blue]	8 [Yellow]	14 [Crosshatch I]	3 [Cyan]	9 [Color Bar]	15 [Diagonal]	4 [Green]	10 [Grayscale 256]	16 [Motion]	5 [Magenta]	11 [V Line On/Off]	17 [Multiburst]	6 [Red]	12 [Circle]	
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6 [Red]	12 [Circle]																		
<b>\$HDR_TX_COL?</b> ←	Show the current test pattern selection.																		
<b>\$RX_DDC N1</b> ←	Enable or disable the DDC bus for the HDMI input (Rx). Available values for N1: ON [DDC bus enabled]                      OFF [DDC bus disabled]																		
<b>\$RX_DDC?</b> ←	Show the DDC bus state for the HDMI input (Rx).																		
<b>\$RX_HOTPLUG N1</b> ←	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 low→high]																		
<b>\$RX_HOTPLUG?</b> ←	Show the current hot plug state for the HDMI input (Rx).																		
<b>\$RX_HOTPLUG_T N1</b> ←	Set the hot plug time (in milliseconds) for the HDMI input (Rx). N1 = 50~500 [50ms increments]																		
<b>\$RX_HOTPLUG_T?</b> ←	Show the current hot plug time (in milliseconds) for the HDMI input (Rx).																		
<b>\$RX_PC_TOL N1</b> ←	Set PC source clock detection tolerance for the HDMI input (Rx). N1 = 1~10 [1/1000~10/1000]																		
<b>\$RX_PC_TOL?</b> ←	Show the PC source clock detection tolerance for the HDMI input (Rx).																		
<b>\$RX_SCDC N1</b> ←	Enable or disable the SCDC port function on the HDMI input (Rx). Available values for N1: ON [SCDC port enabled]                      OFF [SCDC port disabled]																		

## RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS
<b>\$RX_SCDC?</b> ←	Show the current SCDC port state for the HDMI input (Rx).
<b>\$RX_SENSE N1</b> ←	Enable or disable the RxSense function for the HDMI input (Rx). Available values for <b>N1</b> : ON [RxSense enabled] OFF [RxSense disabled]
<b>\$RX_SENSE?</b> ←	Show the current RxSense state for the HDMI input (Rx).
<b>\$SINK_DETECT? N1</b> ←	Show a variety of sink detection status and informational values. Available values for <b>N1</b> : 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]
<b>\$SOURCE_DETECT? N1</b> ←	Show a variety of source detection status and informational values. Available values for <b>N1</b> : 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 off set in lines] HVS_OFFSET2 [Interlace even field vertical off set in lines] PIXEL_CLOCK [Pixel clock in kHz]

# RS-232 PROTOCOL & SERIAL COMMANDS

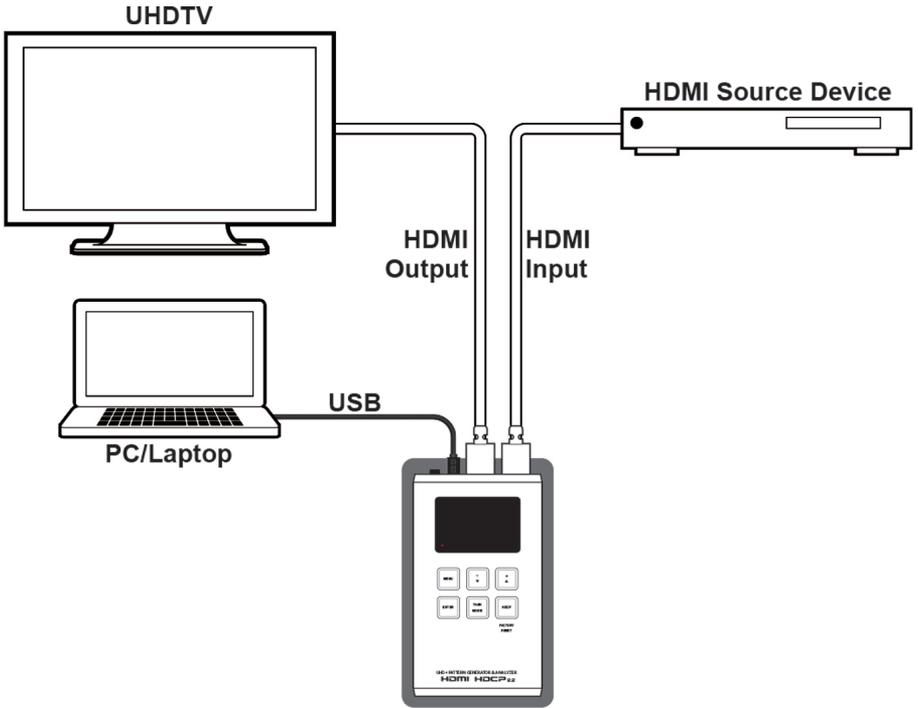
COMMAND	DESCRIPTION AND PARAMETERS
<b>\$SOURCE_DETECT? N1 ↵</b>  <b>cont'd</b>	SCAN [Video scan mode]
	TIMING [Video timing (Ref. "Video Timing List")]
	TMDS_CLOCK [TMDS clock in kHz]
	VA [Vertical active lines]
	VBP [Vertical back porch lines]
	VFP [Vertical front porch lines]
	VSW [Vertical sync width 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]
	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.

# RS-232 PROTOCOL & SERIAL COMMANDS

COMMAND	DESCRIPTION AND PARAMETERS																								
<b>\$TIMER_MINUTE?</b> ↵	Show the unit's test timer minute value.																								
<b>\$TIMER_SECOND?</b> ↵	Show the unit's test timer second value.																								
<b>\$TIMING N1</b> ↵	Select the output resolution timing to use. Available values for <b>N1</b> : <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">1 [720x480p@59]</td> <td style="width: 33%;">13 [1920x1080p@60]</td> </tr> <tr> <td>2 [720x576p@50]</td> <td>14 [3840x2160p@24]</td> </tr> <tr> <td>3 [1280x720p@25]</td> <td>15 [3840x2160p@25]</td> </tr> <tr> <td>4 [1280x720p@30]</td> <td>16 [3840x2160p@30]</td> </tr> <tr> <td>5 [1280x720p@50]</td> <td>17 [3840x2160p@50]</td> </tr> <tr> <td>6 [1280x720p@60]</td> <td>18 [3840x2160p@60]</td> </tr> <tr> <td>7 [1920x1080i@50]</td> <td>19 [4096x2160p@24]</td> </tr> <tr> <td>8 [1920x1080i@60]</td> <td>20 [4096x2160p@25]</td> </tr> <tr> <td>9 [1920x1080p@24]</td> <td>21 [4096x2160p@30]</td> </tr> <tr> <td>10 [1920x1080p@25]</td> <td>22 [4096x2160p@50]</td> </tr> <tr> <td>11 [1920x1080p@30]</td> <td>23 [4096x2160p@60]</td> </tr> <tr> <td>12 [1920x1080p@50]</td> <td></td> </tr> </table>	1 [720x480p@59]	13 [1920x1080p@60]	2 [720x576p@50]	14 [3840x2160p@24]	3 [1280x720p@25]	15 [3840x2160p@25]	4 [1280x720p@30]	16 [3840x2160p@30]	5 [1280x720p@50]	17 [3840x2160p@50]	6 [1280x720p@60]	18 [3840x2160p@60]	7 [1920x1080i@50]	19 [4096x2160p@24]	8 [1920x1080i@60]	20 [4096x2160p@25]	9 [1920x1080p@24]	21 [4096x2160p@30]	10 [1920x1080p@25]	22 [4096x2160p@50]	11 [1920x1080p@30]	23 [4096x2160p@60]	12 [1920x1080p@50]	
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6 [1280x720p@60]	18 [3840x2160p@60]																								
7 [1920x1080i@50]	19 [4096x2160p@24]																								
8 [1920x1080i@60]	20 [4096x2160p@25]																								
9 [1920x1080p@24]	21 [4096x2160p@30]																								
10 [1920x1080p@25]	22 [4096x2160p@50]																								
11 [1920x1080p@30]	23 [4096x2160p@60]																								
12 [1920x1080p@50]																									
<b>\$TIMING?</b> ↵	Show the unit's current output resolution timing by timing number.																								
<b>\$TIMINGX?</b> ↵	Show the unit's current output resolution timing by timing name.																								
<b>\$TMDS_FORMAT N1</b> ↵	Set the video output format. Available values for <b>N1</b> : HDMI [HDMI output mode]      DVI      [DVI output mode]																								
<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.

# CONNECTION DIAGRAM



# 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 (Anapat). See further in this document for more details.

## 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.

# ACRONYMS

ACRONYM	COMPLETE TERM
AOC	Active Optical Cable
ARC	Audio Return Channel
ASCII	American Standard Code for Information Interchange
CEC	Consumer Electronics Control
CLI	Command-Line Interface
COM	Communication
dB	Decibel
DVI	Digital Visual Interface
EDID	Extended Display Identification Data
EOTF	Electro-Optical Transfer Function
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
Hz	Hertz
IEEE	Institute of Electrical and Electronics Engineers
kHz	Kilohertz
LED	Light-Emitting Diode
LFE	Low-Frequency Effects
LPCM	Linear Pulse-Code Modulation
mAh	Milliamp-hour
MHz	Megahertz
ms	Millisecond
OLED	Organic Light-Emitting Diode
OSD	On-Screen Display
PoR	Power-On Reset

## ACRONYMS

ACRONYM	COMPLETE TERM
<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+</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

# ANAPAT SOFTWARE

## INSTALLATION

Before beginning the installation of the software, please remember to uninstall any previously installed versions of the software, to avoid potential conflicts, by using the Windows “**Add or Remove Programs**” function.

Next, please obtain the “[Anapat](#)” software directly from A-NeuVideo website (listed under the product) and save it in a directory where you can easily find it. Extract all files from the [Anapat 2.23.zip](#) file, find the Setup.exe file and execute it to launch the Installation Wizard.

Follow the installation prompts and select your preferred installation location to complete the installation.



After the installation has completed, a copy of the **Anapat** shortcut will be placed within your **Start** menu and it will have the same icon as seen here.

## CONNECTION

The Anapat software can connect to the ANI-4KANA via RS-232 or Ethernet. The ANI-4KANAL via RS-232 (Using the Micro-USB port). Please follow the steps below to connect using the method appropriate for the device you wish to control.

### CONNECT VIA ETHERNET (ANI-4KANA Only)

**Step 1:** Start the Anapat software by clicking on it in the **Start** Menu.

**Step 2:** Select “**Ethernet**” as the control interface.

**Step 3:** *(If you already know the IP address of the unit, skip to Step 4.)* If you do not know the IP address of the unit you wish to connect to, click on the “**Find IP**” button. This will open up a window listing all available units on the local network.

**Step 4:** Double click on the IP address of the unit you want to connect to or manually type it into the space provided.

## ANAPAT SOFTWARE

**Step 5:** If the connection button is showing **Red ( ■ )**, click it to initiate the connection. The **“Not Linked”** message should change to **“Accepted”** and the connection button will turn **Green ( ■ )**.

### CONNECT VIA RS-232

**Step 1:** Start the Anapat software by clicking on it in the **Start** Menu.

**NOTE:** If you are attempting to connect to the ANI-4KANAL, remember to change the USB connection to **“RS-232”** in the unit’s **“Setup”** menu before connecting it to the PC’s USB port.

**Step 2:** Select **“RS-232”** as the control interface.

**Step 3: (If you already know the COM port of the unit, skip to Step 4.)** If you do not know the COM port of the unit you wish to connect to, click on the **“Device Manager”** button which will open up the Windows Device Manager. Browse through the devices listed under **“Ports (COM & LPT)”** to find the correct COM port.

**Step 4:** Select the correct COM port of the unit from the dropdown in the Anapat software and the software should automatically connect to the unit. If it is successful the connection button will turn **Green ( ■ )** and the **“Not Linked”** message will change to read **“Accepted”**.

**Step 5:** If the connection button is still showing **Red ( ■ )**, double check that you have selected the correct COM port and that the cable is properly connected. Click the button to attempt to re-initiate the connection.

### SOFTWARE OPERATION

All major functions of the Signal Generator & Analyzer units are accessible from the tabs and buttons provided in the main window of the Anapat software. These include operation mode selection, EDID management, output resolution selection, pattern selection, function control, sink/source monitoring, and cable testing (**ANI-4KANAL only**).

### OPERATIONAL MODE

The Signal Generator & Analyzer units have (2) main operational modes, Analyzer Mode and Pattern Mode. The ANI-4KANAL has an additional 3rd mode, cable testing.

### Figure 1: Mode Selection

Select the preferred mode of operation by clicking the appropriate button in the **Mode Selection** area of the software. The unit will take a few seconds to change modes and refresh its data. Once the process has completed the button will be highlighted and normal control can resume.

You may now select one of the **Main Function** buttons on the left side of the interface. This will populate the interface with all appropriate controls and data relating to the selected function.

If at any time you feel that the currently displayed data is not correct or up to date (*due to direct manual operation of the unit, for example*) you may click on the **REFRESH** button to force a re-download of the unit's data to the software.

Clicking on the **COMMAND MONITOR** button () will open a second window that displays all command responses from the connected unit. Individual Telnet commands may also be entered here to test command syntax or to control the unit directly.

**Figure 2: Command Window**

**EDID MANAGEMENT (Analyzer Mode & Pattern Mode)**

This tab provides control over the unit's EDID Management including options to select, read, write, analyze and save any EDID available to the unit. These functions are primarily used when in Analyzer Mode, however they are available in both modes.

**Figure 3: EDID Management in Analyzer Mode, ANI-4KANA**

Figure 4: Rx EDID Selection in Analyzer Mode, ANI-4KANA

- 1 **RENAME:** Renames the currently selected “Write to:” EDID to the text typed into the entry box.
- 2 **PRE-F:** Opens a quick-access list of recently opened EDID files.
- 3 **OPEN:** Loads a previously saved EDID file (**\*.bin format**) from the local PC/Laptop and places it into the left window.
- 4 **WRITE:** Writes the EDID from the left window to the EDID destination selected in the “Write to:” dropdown menu.
- 5 **READ:** Reads the EDID from the currently selected source/sink listed in the “Read from:” dropdown menu and places it into the right window.
- 6 **COMPARE:** Compares the EDID in the left window with the EDID in the right window. Any data that is different between the EDIDs will be marked in red.
- 7 **<= COPY:** Copies the EDID in the right window to the left window.
- 8 **COPY SINK:** Allows directly copying the EDID from the current HDMI sink to any of the Copy EDID slots.
- 9 **ANALYZE:** Generates a short analysis report for the EDID (from the left or right window, depending on the button pressed) in a new window. The report may be saved to the local PC/Laptop if desired.
- 10 **SAVE:** Saves a copy of the EDID (from the left or right window, depending on the button pressed) to a file on the local PC/ Laptop.

**11 CLEAR:** Clears the copy of the EDID (from the left or right window, depending on the button pressed) from memory.

**12 RX EDID:** Allows selection of any EDID stored in the unit, or copied from a connected sink. The selected EDID will be set as the EDID to be sent to any device connected to the HDMI input (Rx) of the unit.

### OUTPUT RESOLUTION (Analyzer Mode & Pattern Mode)

This tab provides control over the unit's Output Resolutions and allows setting "**Favorite Timings**" for quick selection. These functions are available for both Analyzer Mode and Pattern Mode.

**NOTE:** The "**Bypass**" output resolution only works in Analyzer mode. The image below is from the ANI-4KANA of the unit. The list of available resolutions for the ANI-4KANAL is more limited.

**Figure 5: Output Resolution in Pattern Mode, ANI-4KANA**

The output resolution that is currently in use is displayed near the top of the window. Selecting a new resolution for output can be done in one of two ways. Click on a resolution in the "**Favorite Timings**" list or find the resolution in the list on the left and double-click the resolution name.

To add a resolution to the "**Favorite Timings**" list, find it in the full list on the left and click its check box. To remove a resolution from the list, find it in the full list on the left and uncheck the checkbox. To remove all resolutions from the "**Favorite Timings**" list, click the "**Check None**" button.

**NOTE:** Favorites are not permanently saved and will be reset to the defaults when the software is closed.

When connected to the ANI-4KANAL in Analyzer Mode the available Output Resolution choices are limited to 3 options: A pure Bypass mode, a mode that down-converts 4K sources to 1080p and outputs as RGB (same frame rate as the source), and a mode that down-converts 4K sources to 1080p and outputs as YCbCr (same frame rate as the source).

**Figure 6: Output Resolution in Analyzer Mode, ANI-4KANAL**

**TEST PATTERN** (Pattern Mode Only)

This tab provides control over the unit's test patterns and allows setting "**Favorite Patterns**" for quick selection. This function is only available in Pattern Mode.

**NOTE:** *The image below is from the ANI-4KANA of the unit. The list of available patterns for the ANI-4KANAL is more limited.*

**Figure 7: Test Pattern in Pattern Mode, ANI-4KANA**

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The pattern that is currently in use is displayed near the top of the window. Selecting a new pattern for output can be done in one of two ways. Click on a pattern in the “**Favorite Patterns**” list or find the pattern in the list on the left and double-click the resolution name. Patterns with multiple versions or modes are marked with an (\*). The additional versions of the pattern are activated by re-selecting the pattern multiple times.

To add a pattern to the “**Favorite Patterns**” list, find it in the full list on the left and click its check box. To remove a pattern from the list, find it in the full list on the left and uncheck the checkbox. To remove all patterns from the “**Favorite Patterns**” list, click the “**Check None**” button.

**NOTE:** *Favorites are not permanently saved and will be reset to the defaults when the software is closed.*

### CONTROL PANEL (Analyzer Mode & Pattern Mode)

This tab provides control over the unit’s additional features, functions and settings that are not covered by the other tabs. The available controls change depending on the unit’s current operational mode (Analyzer or Pattern), and which functions are appropriate based on the unit’s current output resolution and pattern selection.

**Figure 8: Control Panel in Analyzer Mode, ANI-4KANA**

**Figure 9: Control Panel in Pattern Mode, ANI-4KANA**

The primary controls contained here are for HDCP, Color Space/ Bit-depth/HDR, Audio, and Hot Plug/Voltage. Additionally, this tab provides controls for performing a Factory Reset or rebooting the unit.

**REAL-TIME MONITORING (Analyzer Mode & Pattern Mode)**

This tab provides access to a full suite of real-time monitoring and analysis functions covering a wide range of data from both the input and output.

**Figure 10: Monitoring in Analyzer Mode, ANI-4KANA**

**Figure 11: Monitoring in Pattern Mode, ANI-4KANA**

The available Real-time Monitor categories are:

- ➊ **SYSTEM:** Basic source, sink and unit signal information.
- ➋ **VIDEO TIMING (ANALYZER MODE ONLY):** Detailed information about the source's video timing.
- ➌ **AUDIO TIMING (ANALYZER MODE ONLY):** Detailed information about the source's audio format.
- ➍ **PACKET (ANALYZER MODE ONLY):** Detailed information about the source's GCP, AVI, AIF, SPD, VSI, and DRMI packets.
- ➎ **HDCP & SCDC (ANALYZER MODE):** Detailed information about the source's HDCP and SCDC interaction with the unit.
- HDCP & SCDC (PATTERN MODE):** Detailed information about the sink's HDCP and SCDC interaction with the unit.

Additionally, reports can be generated for each monitoring type, or any combination of multiple types. The report can be viewed directly in the window, or saved to the local PC/Laptop as a text file.

### CABLE TESTING (ANI-4KANAL Only)

The ANI-4KANAL of the Signal Generator & Analyzer includes a cable testing function to help quantify the general feature support and error resistance capabilities of the cable being tested. The Cable Test tab contains the controls required to perform a cable test.

To perform a cable test:

**Step 1:** Connect the cable to be tested to both the HDMI input and HDMI output of the unit.

**Step 2:** Select the preferred Test Level (Normal or Strict).

**Step 3:** Click on the **“Start”** button and wait for the test process bar to complete. A test in **“Normal”** mode usually takes about two minutes to complete.

**Step 4:** The software will display the result of the testing (PASS or FAIL). More detailed information from the test is available on the unit itself.

**NOTE:** *A FAIL result does not necessarily mean that the cable cannot pass an 18Gbps signal under ideal circumstances, however it is an indication of a high number of detected data errors that could result in unreliable or unstable performance with high-bitrate signals in less than optimal conditions.*

# VIDEO SPECIFICATIONS

Supported Resolutions (Hz)	Input	Output (Bypass)	Output (Pattern)
	HDMI	HDMI	HDMI
720x400p@70/85	✓	✓	x
640x480p@60/72/75/85	✓	✓	x
720x480i@60	✓	✓	x
720x480p@60	✓	✓	59.94
720x576i@50	✓	✓	x
720x576p@50	✓	✓	✓
800x600p@56/60/72/75/85	✓	✓	x
848x480p@60	✓	✓	x
1024x768p@60/70/75/85	✓	✓	x
1152x864p@75	✓	✓	x
1280x720p@50/60	✓	✓	✓
1280x768p@60/75/85	✓	✓	x
1280x800p@60/75/85	✓	✓	x
1280x960p@60/85	✓	✓	x
1280x1024p@60/75/85	✓	✓	x
1360x768p@60	✓	✓	x
1366x768p@60	✓	✓	x
1400x1050p@60	✓	✓	x
1440x900p@60/75	✓	✓	x
1600x900p@60RB	✓	✓	x
1600x1200p@60	✓	✓	x
1680x1050p@60	✓	✓	x
1920x1080i@50/60	✓	✓	✓
1920x1080p@24/25/30	✓	✓	✓
1920x1080p@50/60	✓	✓	✓
1920x1200p@60RB	✓	✓	x
2560x1440p@60RB	✓	✓	x
2560x1600p@60RB	✓	✓	x
2048x1080p@24/25/30	✓	✓	x
2048x1080p@50/60	✓	✓	x
3840x2160p@24/25/30	✓	✓	✓
3840x2160p@50/60 (4:2:0)	✓	✓	x
3840x2160p@24, HDR10	✓	✓	✓
3840x2160p@50/60 (4:2:0), HDR10	✓	✓	x
3840x2160p@50/60	✓	✓	✓

## VIDEO SPECIFICATIONS / AUDIO SPECIFICATIONS

Supported Resolutions (Hz)	Input	Output (Bypass)	Output (Pattern)
	HDMI	HDMI	HDMI
4096x2160p@24/25/30	✓	✓	✓
4096x2160p@50/60 (4:2:0)	✓	✓	x
4096x2160p@24, HDR10	✓	✓	✓
4096x2160p@50/60 (4:2:0), HDR10	✓	✓	x
4096x2160p@50/60	✓	✓	✓

## AUDIO SPECIFICATIONS

### 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

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