

quantumdata M21 Video Analyzer/Generator

November – 2022



quantumdata Product Family...Our Mission:

Help silicon and product developers bring their next-generation video solutions to market—faster, with better interoperability and lower cost



quantumdata analysis tools quicken Time-to-Insight

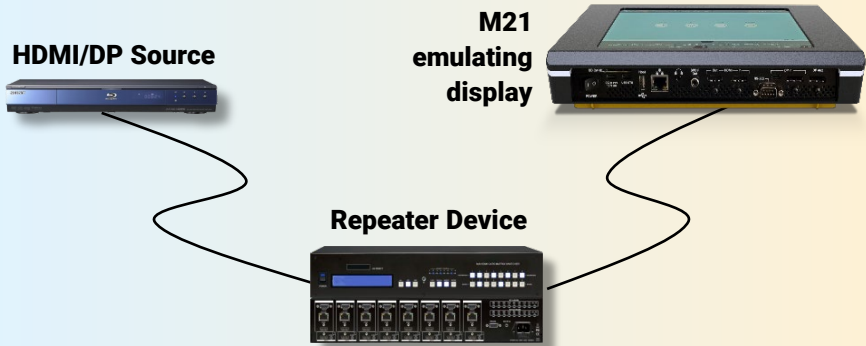


M21 Video Analyzer/Generator – Front Panel Viewing and Control

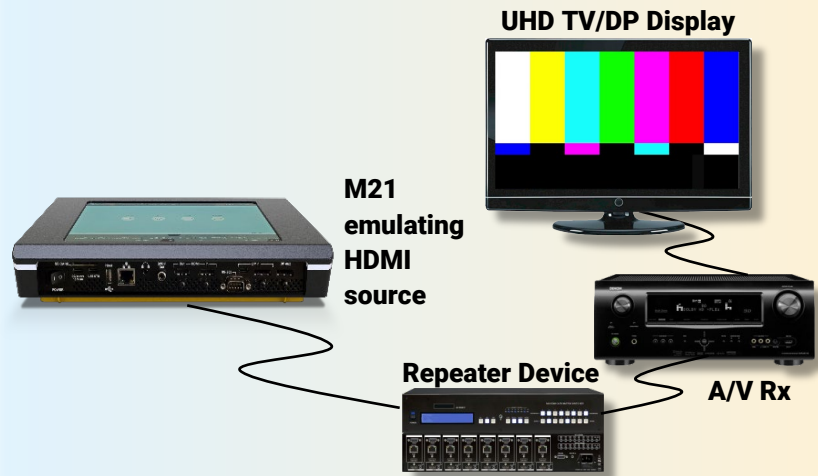


- ◆ Front Panel Display
 - ◆ 10-inch diagonal screen.
 - ◆ 1280 x 800 resolution.
 - ◆ 24-bit color.
- ◆ Enables viewing incoming HDMI or DisplayPort video and video attributes.
- ◆ Touch screen control.

M21 Video Analyzer/Generator – Sample Test Configurations



Example Source Test Setup




Sink (Display) Test Setup

M21 Video Analyzer/Generator for 8K HDMI & UHBR DP – Main Screen


Flow 4 > M21_Dashboard

TX		HDMI		VIDEO		AUDIO		RX		DP		VIDEO		AUDIO	
HDMI MODE	HDCP	COLOR/BPC	TIMING	CHANNELS	BITS	LANES	HDCP	COLOR/BPC	ACTIVE RESOLUTION	CHANNELS	BITS				
FRL 12/4 lanes	2.2	YCbCr 4:4:4 8	1680x1050@60Hz	2.1	24	4	2.2	YCbCr 4:4:4 8	1680x1050	2.1	24				
HPD		3D	HDR	SAMPLE RATE	SPDIF	BANDWIDTH		3D	TOTAL RESOLUTION	SAMPLE RATE	SPDIF				
YES		Frame Packeting	Dolby Vision	48 KHz	eARC	5.40		Frame Packeting	1920X1080	48 KHz	eARC				
		PATTERN		TYPE				HDR	REFRESH RATE	TYPE					
		Color Bars Color Ba...		LPCM			ACA ON	Dolby Vision	60.00Hz	LPCM					


Dashboard Jeff ▾




Signal Generator



Analyzer



ACA

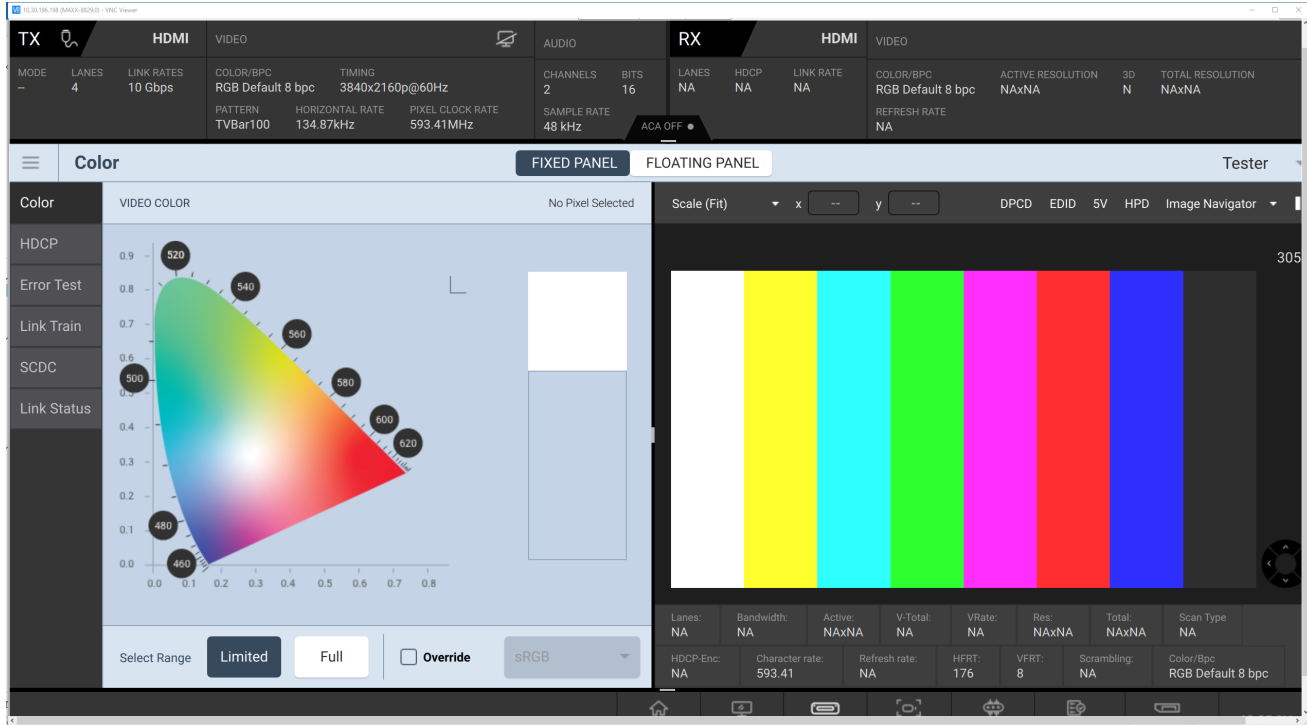


Editor

< Runtime Status > 2:51 PM
6/4/2019

- ◆ M21 Main Screen
 - ◆ Showing access to the primary applications for both video analysis and video generation.
 - ◆ Status bar at top shows current status of video generator and video analyzer.

M21 Video Analyzer/Generator – Video Analyzer Real Time View



- ◆ Video Analyzer Panel with HDMI input (DisplayPort input looks the same).
- ◆ Provides quick insight into the incoming HDMI or DisplayPort video stream.
 - ◆ Showing incoming video frames.
 - ◆ Status bar on the top showing essential video timing and parameters.
 - ◆ Shows colorimetry image.

M21 Video Analyzer/Generator – Aux Channel Analyzer

The screenshot shows the Video Protocol Suite interface in RX mode. The top bar indicates the device is connected via HDMI. The main window is divided into a list of events on the left and a detailed view on the right. The event list shows SCDC transactions for HDMI-R10, with row 137 selected. The detailed view for row 137 shows the following data:

Bit	Name	Value	Description
0	Status_Update	Y(1)	
1	CED_Update	Y(1)	
2	RR_Test	N(0)	
3	Source_Test_Update	N(0)	
4	FRL_start	N(0)	
5	FLT_Update	Y(1)	
6	RSED_Update	Y(1)	
7		0	Reserved

Below the bit stream, a hex dump shows: * START * 0000 A9 63- | . c * STOP *

- ◆ Aux Channel Analyzer.
 - ◆ Supports monitoring while emulating a sink or monitoring between an HDMI or DP source and sink passively.
 - ◆ Decodes all HDMI and DisplayPort register transactions responses.
 - ◆ Example showing monitoring of HDMI Aux Channel traffic over the DDC channel.
 - ◆ Enables viewing of EDID exchange, DisplayPort DPCD, HDMI SCDC register reads, DisplayPort or FRL link training and HDCP authentication.

M21 Video Analyzer/Generator – Link Training Configuration

Format	MODE	SETTINGS	CURRENT STATUS
Pattern	Adaptive	EDID MAX RATE OVERRIDE	State: LTS_P
Audio (TX)		Use EDID Value	Lanes: 4
Link Train	Non Adaptive	3 Lanes / 3 Gbps	Rate: 10 Gbps
Packet		3 Lanes / 6 Gbps	FFE: 0
EDID		4 Lanes / 6 Gbps	FRL PLL LOCKED: YES
HDCP		4 Lanes / 8 Gbps	
SCDC Editor		4 Lanes / 10 Gbps	
		4 Lanes / 12 Gbps	

- ◆ HDMI FRL Link Configuration Panel.
- ◆ Enables configuration of TMDS or FRL and the link configuration of FRL.
- ◆ Link configuration status shown on the right side of panel.

M21 Video Analyzer/Generator – Video Format Selection

The screenshot displays the 'Format' selection panel in the Video Protocol Suite. The interface is divided into several sections:

- TX (Transmit) Settings:** Includes Lanes (4), Link Rates (10 Gbps), Color/BPC (RGB Default 8 bpc), Timing (3840x2160p@60Hz), Pattern (TVBar100), Channels (2), Bits (16), Lanes (4), HDCP (NONE), Link Rate (10 Gbps), Color/BPC (RGB Default 8 bpc), Active Resolution (3840x2160), 3D (N), Total Resolution (4400x2250), and Refresh Rate (59.94).
- RX (Receive) Settings:** Includes Channels (2), Bits (16), Lanes (4), HDCP (NONE), Link Rate (10 Gbps), Color/BPC (RGB Default 8 bpc), Active Resolution (3840x2160), 3D (N), Total Resolution (4400x2250), and Refresh Rate (59.94).
- Format Selection Panel:**
 - RESOLUTION:** Grid of options including 240p2x, 240p4x, 480i2x, 480i4x, 288p2x, 288p4x, 576i2x, 576i4x, 480p, 480p2x, 480p4x, 576p, 576p2x, 576p4x, 720p, 1080p, 1080i, 2160p (highlighted with a yellow arrow), and 320p.
 - FRAME RATE:** Grid of options including 24/1.001, 24, 25, 30/1.001, 30, 48/1.001, 48, 50, 60/1.001, 60, 100, 120/1.001, 120, 200, 240/1.001, and 240.
- TIMINGS Table:** A list of video formats with their respective Resolution, Refresh Rate (FR), and Aspect Ratio (A). VIC 97 (3840x2160p, FR 60.00, A 16:9) is highlighted with a yellow arrow.
- SETTINGS Panel:** Includes Color Space (RGB), Subsampling, Range (Limited), Bits per Component (8), and Scrambling Override (None).

- ◆ HDMI Video Generator
 - ◆ Showing video format selection panel.
 - ◆ Video parameter Settings accessible from this panel as well.

M21 Video Analyzer/Generator – Reading EDID

The screenshot displays the M21 Video Protocol Suite interface. At the top, there are tabs for TX, RX, and ACA OFF. Below these are various signal parameters for HDMI and VIDEO, including color space (RGB Default 8 bpc), timing (3840x2160@60Hz), bit rate (10 Gbps), and resolution (3840x2160). The main window is titled 'EDID' and shows a table of EDID blocks. The 'EDID Decode' block is selected, showing the 'Base EDID' and 'CTA 861' information. The 'CTA DATA BLOCK: TAG 3, BYTES 13' section is expanded, displaying the following details:

- 24-bit IEEE Registration ID: 0xC45D08
- ✓ HDMI Forum Vendor Specific Data Block
 - Version: 1
 - Max_TMDS_Character_Rate: 600 MHz
- SCDC_Present: Yes
- RR_Capable: No
- CABLE_STATUS: No
- CCBPCI: No
- LTE_340MHz_scramble: Yes
- Independent_view: No
- Dual_View: No
- 3D_OSD_Disparity: No
- LHD_VIC: No
- DC_48bit_420: Yes
- DC_36bit_420: Yes
- DC_38bit_420: Yes
- Mdelta: No
- CNMVRR: No
- CinemaVRR: No
- FVA: Yes
- ALLM: Yes
- FAPA_start_location: No
- VRRmin: 24 Hz
- VRRMax: 240 Hz
- DSC_10bpc: Yes
- DSC_12bpc: Yes
- DSC_16bpc: No
- DSC_1p2: Yes
- DSC_All_bpp: Yes
- DSC_Native_420: Yes
- DSC_Max_FRM_Rate: 12 Gbps
- DSC_MaxSlices: Up to 16 slices and up to (400 MHz/KSliceAdjust) pixel clock per slice
- DSC_TotalChunkBytes: 63 = 65536 bytes

- ◆ HDMI Video Generator
 - ◆ Showing EDID decode panel.
 - ◆ You can read an EDID from a connected display and save it for reuse on the M21 Analyzer port for emulation.
 - ◆ Can also read the HDMI SCDC registers (not shown).

M21 Video Analyzer/Generator – Aux Channel Analyzer

The screenshot shows the Video Protocol Suite interface with the ACA (Aux Channel Analyzer) view active. The top navigation bar includes TX and RX tabs, and the ACA view is selected. The main interface is split into a table of events and a detailed data viewer.

MODE	LANES	LINK RATES	COLOR/BPC	TIMING	PATTERN	CHANNELS	BITS	LANES	HDCP	LINK RATE	COLOR/BPC	ACTIVE RESOLUTION	3D	TOTAL RESOLUTION	REFRESH RATE
	4	10 Gbps	RGB Default 8 bpc	3840x2160p@60Hz	TVBar100	2	16	4	HDCP_	10 Gbps	RGB Default 8 bpc	3840x2160	N	4400x2250	59.94
			HORIZONTAL RATE	PIXEL CLOCK RATE			SAMPLE RATE								
			134.87kHz	593.41MHz			48 kHz								

STATUS	Source Legend	Open	Export	Options
10_14_2022_14_39_41				
131	SCDC HDMI-R10	+00:30:32.662355	< 01 (48.71 kbps)	
132	SCDC HDMI-R10	+00:30:32.664812	R Update_0 (48.71 kbps)	
133	SCDC HDMI-R10	+00:30:32.665304	< 43 (48.71 kbps)	
134	SCDC HDMI-R10	+00:30:32.667761	R Update_0 (48.71 kbps)	
135	SCDC HDMI-R10	+00:30:32.668089	< 43 (48.71 kbps)	
136	SCDC HDMI-R10	+00:30:32.670547	R Update_0 (48.71 kbps)	
137	SCDC HDMI-R10	+00:30:32.671038	< 63 (48.71 kbps)	
138	SCDC HDMI-R10	+00:30:32.671530	R Status_Flags_1 (48.71 kbps)	
139	SCDC HDMI-R10	+00:30:32.671857	< 65 (48.71 kbps)	
140	SCDC HDMI-R10	+00:30:32.672185	R Status_Flags_2 (48.71 kbps)	
141	SCDC HDMI-R10	+00:30:32.672676	< 87 (48.71 kbps)	

Data Viewer Details:

```

Type: SCDC
Start Time: +00:30:32.671038
Duration: 328 to 492 us
Maximum I2C Rate: 48.71 kbps

Read, 1 byte
10h: Update_0

Bit Name           Value Description
-----
0 Status_Update    Y(1)
1 CED_Update       Y(1)
2 RR_Test          N(0)
3 Source_Test_Update N(0)
4 FRL_start        N(0)
5 FLT_Update       Y(1)
6 RSED_Update      Y(1)
7                  0 Reserved

* START *
0000 A9 63-      | . c
* STOP *
    
```

- ◆ Aux Channel Analyzer.
 - ◆ Supports monitoring while emulating an HDMI source.
 - ◆ Decodes all HDMI and DisplayPort register transactions responses.
 - ◆ Example showing monitoring of HDMI Aux Channel traffic over the DDC channel.
 - ◆ Enables viewing of EDID exchange, HDMI SCDC register reads, or FRL link training and HDCP authentication.

M21 Video Analyzer/Generator – Connector Interface Ports – Video & Audio



- ◆ M21 Connector Line Up.
- ◆ HDMI Video/Audio Ports:
 - ◆ HDMI Tx – for TMDS/FRL video generation up to 8K formats.
 - ◆ HDMI Rx - for TMDS/FRL video analysis up to 8K formats.
- ◆ DisplayPort Video/Audio Ports:
 - ◆ DP Rx – for analyzing incoming DP streams up to 13.5Gb/s.
 - ◆ DP Aux – for passively monitoring DP aux channel between a DP source and display.
- ◆ Audio Ports:
 - ◆ SPDIF Out – for monitoring incoming HDMI/DisplayPort audio.
 - ◆ Headphone Stereo Jack – for monitoring incoming LPCM audio.

M21 Video Analyzer/Generator – Connector Interface Ports - Admin



◆ Administration Ports:

- ◆ RS-232 – for command line control.
- ◆ USB-C Power – for power and battering charging from wall adapter.
- ◆ USB On-the-Go – for connection to external devices.
- ◆ USB Host – for connection to external devices.
- ◆ Ethernet – for software upgrades, command line control and control through a mouse and keyboard.

M21 Video Analyzer/Generator – Specifications



- ◆ Power Specifications:
 - ◆ AC Adapter for USB-C Port 100-240 VAC, 47-63Hz with wall adapter.
 - ◆ Battery – Nickel metal hydride for short term usage up to one (1) hour on a four (4) hour charge.
 - ◆ Operating Temperature – 32 to 104 deg F; 0 to 40 deg C.
- ◆ Physical Specifications:
 - ◆ Height 1.25 inches (3.175 cm); Width 12.1 inches (30.734 cm); Depth 8.2 inches (20.83 cm).
 - ◆ Weight – 4.40 LBS, 2.0 Kilograms.
- ◆ Accessories:
 - ◆ Soft case.
 - ◆ Power wall wart.
 - ◆ HDMI cable.
 - ◆ DisplayPort cable.
 - ◆ USB-C E-marked cable.
 - ◆ USB-C unmarked cable.
 - ◆ USB-C power cable.
 - ◆ Ethernet cable.

M21 Video Analyzer/Generator – HDMI License Options



- ◆ M21 Analyzer/Generator Base Hardware:
 - ◆ SKU: M21 Hardware 00-00262 (no functionality)
Requires either:
 - 95-00260 (HDMI)
 - 95-00265 (DisplayPort)
- ◆ M21 HDMI Analyzer/Generator SKUs:
 - ◆ HDMI TMD5 video analyzer/generator.
 - ◆ SKU: 95-00260 (requires 00-00262)
 - ◆ HDMI FRL video analyzer/generator.
 - ◆ SKU: 95-00261 (requires 95-00260)
 - ◆ HDMI Aux Channel Analyzer (ACA)
 - ◆ SKU: 95-00262 (requires 95-00260)
 - ◆ HDMI Cable test
 - ◆ SKU: 95-00263 (requires 95-00260)
 - ◆ HDMI eARC
 - ◆ SKU: 95-00264 (requires 95-00260)

M21 Video Analyzer/Generator – DisplayPort License Options



- ◆ M21 Analyzer/Generator Base Hardware:
 - ◆ SKU: M21 Hardware 00-00262 (no functionality)
Requires either:
 - 95-00260 (HDMI)
 - 95-00265 (DisplayPort)
- ◆ M21 DisplayPort Analyzer SKUs:
 - ◆ DisplayPort HBR3.
 - ◆ SKU: 95-00265 (requires 00-00262)
 - ◆ DisplayPort UHBR.
 - ◆ SKU: 95-00266 (requires 95-00265)
 - ◆ DisplayPort Aux Channel Analysis (ACA).
 - ◆ SKU: 95-00267