

quantumdata™ M41h/980

48G module

Video Analyzer/Generator



Passive DDC Monitoring – Diagnose HDMI Connection Problems

DDC Passive Monitoring Optional Feature

- Passively monitor HDMI DDC between an HDMI source and sink to view FRL Link training, HDCP and EDID transactions.
- This new passive DDC monitoring feature is available with the M41h or the 980 48G module.

The Teledyne LeCroy quantumdata M41h and 980 48G module for HDMI 2.1 Testing supports video, audio and protocol functional testing of high-end HDMI displays and sources. These instruments supports 12G data rates per lane and aggregate link rate of 48Gb/s.

The HDMI DDC passive monitoring feature (P/N 95-00230) supports passive monitoring of the HDMI DDC channel between a source and display in the FRL or TMDS mode. This feature enables analysis of FRL link training and HDCP interoperability problems between devices. *The solution uses a custom cable provided by Teledyne LeCroy.*

Connection Table for Passive DDC Cable

Connector:	To Source Tx	To Sink Rx	To TE In/R
Connection:	Connect to HDMI Source out port A	Connect HDMI Sink In port B	Connect to TE (M41h or 980 48G mod.) Rx In port C



980 48G
module

M41h



HDMI FRL Sink DUT



A

HDMI DDC

To Source Tx

To TE In/Rx

C

To Sink Rx

B

Custom HDMI cable (932885-00)



AUX CHANNEL ANALYZER (ACA)

DDC Passive Monitoring Feature

The DDC passive monitoring feature is an optional feature that enables developers and test engineers to investigate connection interoperability problems involving EDID exchange, FRL link training and HDCP authentication between two (2) HDMI 2.1 devices.

The ACA utility shown below provides insight into all the EDID, FRL link training and HDCP authentication transactions. The ACA utility provides precise timestamps for each transaction. The data viewable in the ACA can be filtered and searched using a variety of criteria. The ACA data can be exported and shared with subject matter experts at other locations or with Teledyne support personnel.

The screenshot displays the ACA Data Viewer application with two windows open. The top window, titled 'ACA Data Viewer', shows a list of events for 'My_FRL_LT_1' (291 events). The selected event at index 16 is a SCDC message (HDMI-R10) at timestamp +02:22:44.774557, labeled 'W Config_1 06 (48.71 kbps)'. The detailed view on the right shows the message type as SCDC, start time as +02:22:44.774557, and duration from 492 to 656 us. It also displays the maximum I2C rate as 48.71 kbps and the content as '31h: Config_1'. A table below lists bit fields: Bit 3-0 for FRL_Rate (Value 6, Description 'FRL, 12 Gps/lane, 4 Lane') and Bit 7-4 for FFE_Levels (Value 0). The bottom window, also titled 'ACA Data Viewer', shows a list of events for 'ACMT_HDCP_1B_01_Pass' (208 events). The selected event at index 67 is a HDCP message (HDMI-T10) at timestamp +05:15:18.396078, labeled '< AKE_Send_Cert (87.46 kbps)'. The detailed view on the right shows the message type as HDCP, start time as +05:15:18.396078, and duration as 54.066 msec. It displays the maximum I2C rate as 87.46 kbps and the content as 'Read, 534 bytes'. The register is 80h, named 'Read_Message'. The message is 'AKE_Send_Cert (534 bytes)' with msg_id: 3 and cert_rx: [4175..0]. The receiver ID is F6 BD 22 E3 80. The receiver public key is shown as a hex string: E7 5F AB 90 3B F8 1A 8B F0 BD 3B 75 1B B6 E3 45 30 00 C8 5C 9C F3 F5 8E F5 60 DD 56 C8 65 65 2D 33 06 A7 E0 7E 34 0D 29 E4 26 5E 8B 15 D9 EC B5 AF E2 15 EE BB E7 AF AB B3 A5 33 A6 1E 17 C4 FC 37 EA FA 9E 0D 00 BE 22 BE E3 11 4D B7 64 00 2F 90 C9 35 C9 76 BF E9 F8 1D A6 61 B0 6B 2B FF BA D3 DC 6F 9E 0D F3 9E E5 89 F4 10 75 BF 44 90 D6 11 B2 E4 3B C9 EF E0 1D 4C 2C 15 D3 A8 CC 08 71 01 00 01. The reserved field is 00 00. The DCP LLC signature is shown as a hex string: 51 22 C0 43 AA D4 37 77 3D 1B E3 BF C3 25 5C 3E D8 E1 58 E1 6C 69 E2 70 D9 D7 95 3A 93 37 90 62 F8 D5 63 98 D6 54 3A 89 BA CE E0 3C 56 C5 3E D5 73 C6 7A BA F8 A0 BB 9E C7 08 9C 1F 46 44 75 97 F1 5A 74 FF 96 99 62 23 93 89 D4 AA B1 65 41 3E C0 29 A9 24 0F 4C D7 7D EF 4E 2B 34 5F 03 91 53 28 2B 32 A1 88 0C 6D 8A 87 F7 66 D2 9C 27 08 A3 A1 0E 2E AA C3 4B 36 8F 8D 02 91 98 F1 AB 79 B3 57 E7 69 BD 8A 37 47 EC 96 22 94 84 18 AB 0F 1D 87 8F 92 49 59 70 96 CD 80 F6 22 C3 0F 70 35 DB 3B 2F 62 5D D9 3C 71 97 49 85 69 43 83 9D A6 A2 D5 1A FA 80 4D F4 59 28 90 40 DF EB 9A ED B0 1F 59 5C 77 CB 29 DF 93 72 DE 07 0C 7B E4 91 AE F2 03 A7 08 0C EE 1A AF CF C3 A0 1A 74 EB AD BB 3D 37 34 1A 72 5D 61 CC 08 0C 87 77 24 53 7C 97 F0 6B B3 DA 3A 01 8E 9F 5C 53 17 BA 95 B8 AD 3B F9 B2 5C F8 36 38 11 D5 AE 1C 59 8F A4 D3 6F 61.