
quantumdata™ 780 Series Handheld Test Instruments Overview of Applications



quantumdata 780 Series

Model 780



780 Handheld Test Instrument – Interfaces / Options



780 Front Edge



**780 Rear Edge
without optional ACA board**



**780 Rear Edge
with optional ACA board**

780 Handheld Test Instrument – Interfaces / Options

Interfaces:

- HDMI Tx & Rx ports – 165MHz pixel rate.
- VGA output port - RGB and component YCbCr up to 80MHz pixel rate.
- Digital audio – SPDIF/Optical.

Standard Features:

- 4.3 inch touch screen – 480 x 272 resolution.
- Battery-power, convenient size.
- Format and test pattern library, add custom bitmaps.
- Command line control via USB serial.
- Software upgradable.

Options:

- Network Analyzer – Test HDMI protocols and timing on source and sink devices.
- Cable Test – Test HDMI cables and distribution networks.
- Test pattern packs – ISF, THX China Resolution
- Auxiliary Channel Analyzer (emulation) – Monitor HDCP, EDID transactions, hot plug events and CEC messages with source or sink DUT.
- Auxiliary Channel Analyzer (passive) – Monitor HDCP, EDID transactions, hot plug events and CEC messages between multiple source or sink DUTs.

quantumdata 780 Series

Model 780AH



780AH Handheld Test Instrument – Interfaces / Options



780AH Front Edge



**780AH Rear Edge
without optional ACA board**



780AH Front Edge



**780AH Rear Edge
with optional ACA board**

780AH Handheld Test Instrument – Interfaces / Options

Interfaces:

- HDMI Tx & Rx ports – 300MHz pixel rate.
Note: Supports HDCP 2.2 testing.
- VGA output port - RGB and component YCbCr up to 80MHz pixel rate.
- Digital audio – SPDIF/Optical.

Standard Features:

- 4.3 inch touch screen – 480 x 272 resolution.
- Battery-power, convenient size.
- Format and test pattern library, add custom bitmaps.
- Headphone jack and speakers.
- Command line control via USB serial.
- Software upgradable.

Options:

- Network Analyzer – Test HDMI protocols and timing on source and sink devices.
- Cable Test – Test HDMI cables and HDMI / HDBaseT distribution networks.
- Test pattern packs – ISF, THX China Resolution.
- Auxiliary Channel Analyzer (emulation) – Monitor HDCP, EDID transactions, hot plug events and CEC messages with source or sink DUT.
- Auxiliary Channel Analyzer (passive ACA board) – Monitor HDCP, EDID transactions, hot plug events and CEC messages between multiple source or sink DUTs.

quantumdata 780 Series

Model 780BH



780BH Video Generator / Protocol Analyzer – Interfaces / Options



780BH Front Edge



**780BH Rear Edge
without optional ACA board**



780BH Front Edge



**780BH Rear Edge
with optional ACA board**

780BH Video Generator / Protocol Analyzer – Interfaces / Options

Interfaces:

- HDMI Tx & Rx ports – 300MHz pixel rate.
Note: Supports HDCP 2.2 testing.
- VGA output port - RGB and component YCbCr up to 80MHz pixel rate.
- Digital audio – SPDIF/Optical.

Standard Features:

- 7 inch touch screen – 800 x 480 resolution.
- Battery-power, convenient size.
- Format and test pattern library, add custom bitmaps.
- Real time status bar.
- Headphone jack and speakers.
- Command line control via RS-232 or USB serial.
- Software upgradable.

Options:

- Cable Test – Test HDMI cables and HDMI / HDBaseT distribution networks.
- Test pattern packs – ISF, THX China Resolution.
- Auxiliary Channel Analyzer (emulation) – Monitor HDCP, EDID transactions, hot plug events and CEC messages with source or sink DUT.
- Auxiliary Channel Analyzer (passive ACA board) – Monitor HDCP, EDID transactions, hot plug events and CEC messages between multiple source or sink DUTs.

quantumdata 780 Series

Model 780C



780C Video Generator / Protocol Analyzer – Interfaces / Options



780C Top



780C Rear Edge

780C Video Generator / Protocol Analyzer – Interfaces / Options

Interfaces:

- HDMI Tx & Rx ports – 300MHz pixel rate.
- HDBaseT Tx & Rx ports – 300MHz pixel rate.
- 3G-SDI Tx & Rx ports – 2.97Gb/s data rate.
- VGA output port - RGB and YCbCr up to 80MHz pixel rate.
- Digital audio – SPDIF/Optical.

Standard Features:

- 7 inch touch screen – 800 x 480 resolution. Convenient size.
- Format and test pattern library, add custom bitmaps.
- Real time status bar.
- Headphone jack and speakers.
- Command line control via RS-232 or USB serial.
- Software upgradable.

Options:

- Cable Test – Test HDMI cables and distribution networks.
- Test pattern packs – ISF, THX China Resolution.
- Auxiliary Channel Analyzer (passive & emulation) – Monitor HDCP, EDID transactions, hot plug events and CEC messages between source and sink DUTs.

quantumdata 780 Series

Model 780D



780D Video Generator / Protocol Analyzer – Interfaces/Options



780D Top



780D Front Edge



780D Rear Edge

780D Video Generator / Protocol Analyzer – Interfaces/Options

Interfaces:

- HDMI Tx & Rx ports – 600MHz pixel rate.
Note: Supports HDCP 2.2 testing.
- HDBaseT Tx & Rx ports – 300MHz pixel rate.
- VGA output port - RGB and YCbCr up to 80MHz pixel rate.
- Digital audio – SPDIF/Optical.

Standard Features:

- 7 inch touch screen – 800 x 480 resolution. Convenient size.
- Format and test pattern library, add custom bitmaps.
- Real time status bar.
- Headphone jack and speakers.
- Command line control via RS-232 or USB serial.
- Software upgradable.

Options:

- Cable Test – Test HDMI cables and distribution networks.
- Test pattern packs – ISF, THX China Resolution.
- Auxiliary Channel Analyzer (passive & emulation) – Monitor HDCP, EDID transactions, hot plug events and CEC messages between source and sink DUTs.

quantumdata 780 Series

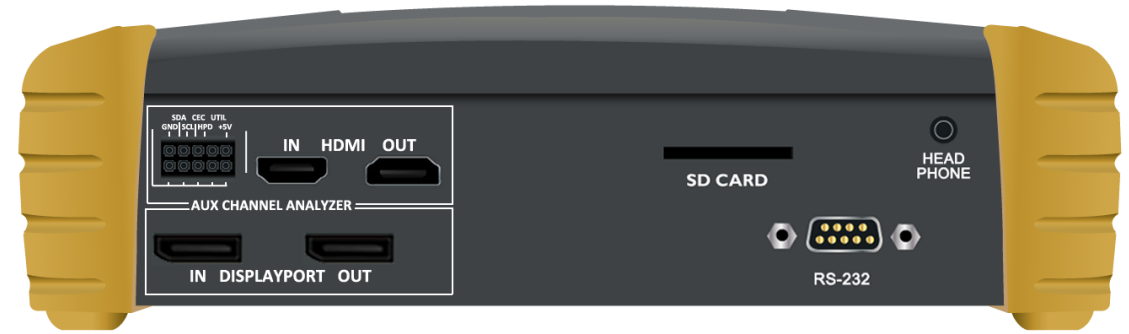
Model 780E



780E Video Generator / Protocol Analyzer – Interfaces/Options



780E Top



780E Front Edge



780E Rear Edge

780E Video Generator / Protocol Analyzer – Interfaces/Options

Interfaces:

- HDMI Tx & Rx ports – 600MHz pixel rate.
Note: Supports HDCP 2.2 testing.
- HDBaseT Tx & Rx ports – 300MHz pixel rate.
- DisplayPort Tx & Rx ports – 5.4 Gb/s link rate; 1, 2, 4 lanes.
Note: Supports HDCP 2.2 testing.
- Digital audio – SPDIF/Optical.

Standard Features:

- 7 inch touch screen – 800 x 480 resolution. Convenient size.
- Format and test pattern library, add custom bitmaps.
- Real time status bar.
- Headphone jack and speakers.
- Command line control via RS-232 or USB serial.
- Software upgradable.

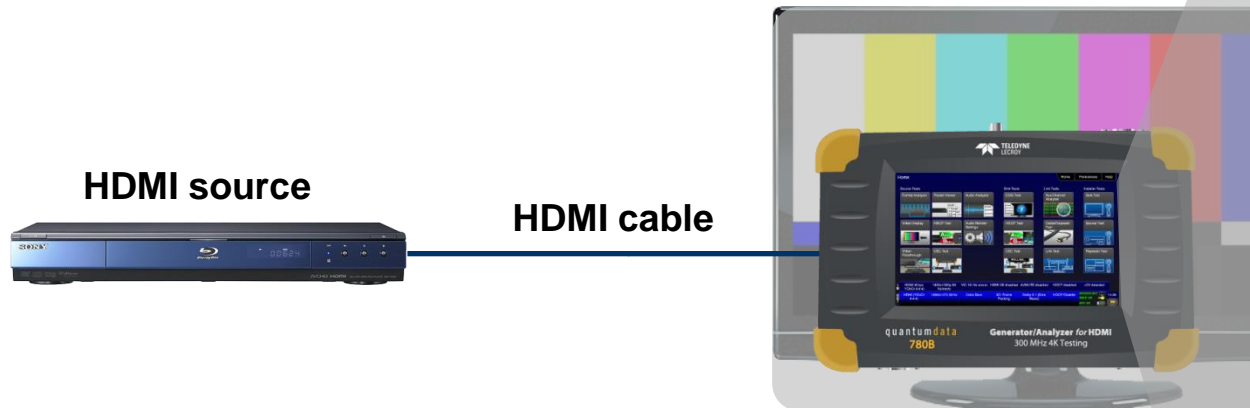
Options:

- Cable Test – Test HDMI cables and distribution networks.
- Test pattern packs – ISF, THX China Resolution.
- Auxiliary Channel Analyzer (passive & emulation) – Monitor HDCP, EDID transactions, hot plug events and CEC messages between source and sink DUTs.

Applications - HDMI

780 Sample Application – HDMI Source Testing

- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Verify video and timing and video parameters of an HDMI source device.



Video Display Home Preferences Help

Timing: 3840 x 2160
~60 frames/sec, Progressive
Video type: HDMI
Color space: YCbCr 4:2:2
Colorimetry: ITU-709
Range: Limited
VIC code: 4
AV Mute: Disabled
HDCP: Disabled



Format Analyzer Home Preferences Help

Errors:
None

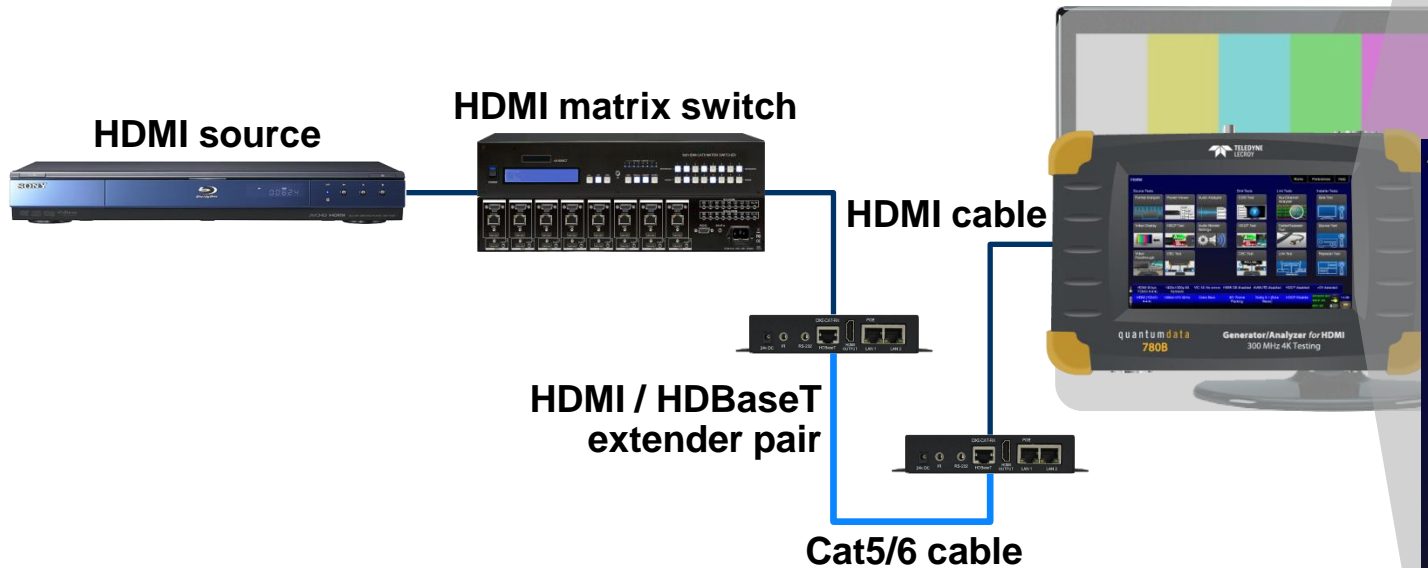
| | |
|---------------------------------|--|
| Video type: HDMI | Color space: YCbCr 4:2:2 |
| Total: 2200 x 1125 | Colorimetry: ITU-709 |
| Active: 1920 x 1080 | Pixels repeated 0 times |
| Frames/sec: 60.5 (121.1 fields) | Video ID code (VIC): 46 (1920 x 1080 i @119.88/120Hz 16:9) |
| Scan type: Interlaced | AV Mute Status: Not muted |
| HSYNC delay: 88 | HDCP: Not encrypted |
| HSYNC width: 44 | |
| VSYNC delay: 2 | |
| VSYNC width: 5 | |
| HSYNC polarity: + | |
| VSYNC polarity: + | |

| | | | | | | | |
|---|-------------------------------------|------------------------|---------------------|------------------|-----------------------------------|--------------|---------------------------------|
| I | HDMI (8 bpc YCbCr 4:2:2) | 3840x2160p 30 frames/s | Unknown | HDMI 3D disabled | AVMUTE disabled | HDCP enabled | +5V detected |
| O | Interface: HDMI (8 bpc YCbCr 4:2:2) | Format: 3840x2160 30Hz | Pattern: Color Bars | 3D: Disabled | Audio (Optical): LPCM 2.0ch 48kHz | Disable HDCP | AVMUTE OFF HDCP OK HPD OK |

00:44

780 Sample Application – HDMI Source Testing

- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Verify video, video parameters and timing of an HDMI upstream distribution network.



The screenshot shows the software interface with two main panels: **Video Display** and **Format Analyzer**.

Video Display shows a video of a horse. The parameters listed are:

- Timing: 3840 x 2160
- ~60 frames/sec, Progressive
- Video type: HDMI
- Color space: YCbCr 4:2:2
- Colorimetry: ITU-709
- Range: Limited
- VIC code: 4
- AV Mute: Disabled
- HDCP: Disabled

Format Analyzer shows a **Read** button and the following parameters:

- Video type: HDMI
- Total: 2200 x 1125
- Active: 1920 x 1080
- Frames/sec: 60.5 (121.1 fields)
- Scan type: Interlaced
- HSYNC delay: 88
- HSYNC width: 44
- VSYNC delay: 2
- VSYNC width: 5
- HSYNC polarity: +
- VSYNC polarity: +
- Color space: YCbCr 4:2:2
- Colorimetry: ITU-709
- Pixels repeated 0 times
- Video ID code (VIC): 46 (1920 x 1080 i @119.88/120Hz 16:9)
- AV Mute Status: Not muted
- HDCP: Not encrypted

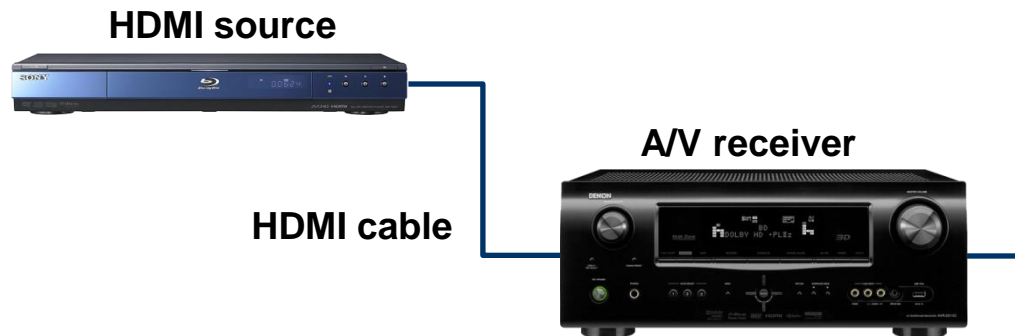
At the bottom, there is a status bar with the following information:

| | | | | | | |
|-------------------------------------|------------------------|---------------------|------------------|-----------------------------------|--------------|---------------------------------|
| HDMI (8 bpc YCbCr 4:2:2) | 3840x2160p 30 frames/s | Unknown | HDMI 3D disabled | AVMUTE disabled | HDCP enabled | +5V detected |
| Interface: HDMI (8 bpc YCbCr 4:2:2) | Format: 3840x2160 30Hz | Pattern: Color Bars | 3D: Disabled | Audio (Optical): LPCM 2.0ch 48kHz | Disable HDCP | AVMUTE OFF HDCP OK HPD OK |

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780 Sample Application – HDMI Source Testing

- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Verify audio (and video) and audio metadata of an HDMI audio source device.



The screenshot shows the 780B Generator/Analyzer for HDMI software interface. The **Video Display** section shows a video of a horse and the following metadata:

| | |
|--------------------------|-----------------------------|
| Timing: 3840 x 2160 | ~60 frames/sec, Progressive |
| Video type: HDMI | |
| Color space: YCbCr 4:2:2 | |
| Colorimetry: ITU-709 | |
| Range: Limited | |
| VIC code: 4 | |
| AV Mute: Disabled | |
| HDCP: Disabled | |

The **Audio Analysis** section shows the following metadata:

| | | | | | | | | | |
|-------------------------------------|------------------------|---------------------|--------------|-----------------------------------|--------------|------------|---------|--------|-------|
| Interface: HDMI (8 bpc YCbCr 4:2:2) | Format: 3840x2160 30Hz | Pattern: Color Bars | 3D: Disabled | Audio (Optical): LPCM 2.0ch 48kHz | Disable HDCP | AVMUTE OFF | HDCP OK | HPD OK | 00:44 |
|-------------------------------------|------------------------|---------------------|--------------|-----------------------------------|--------------|------------|---------|--------|-------|

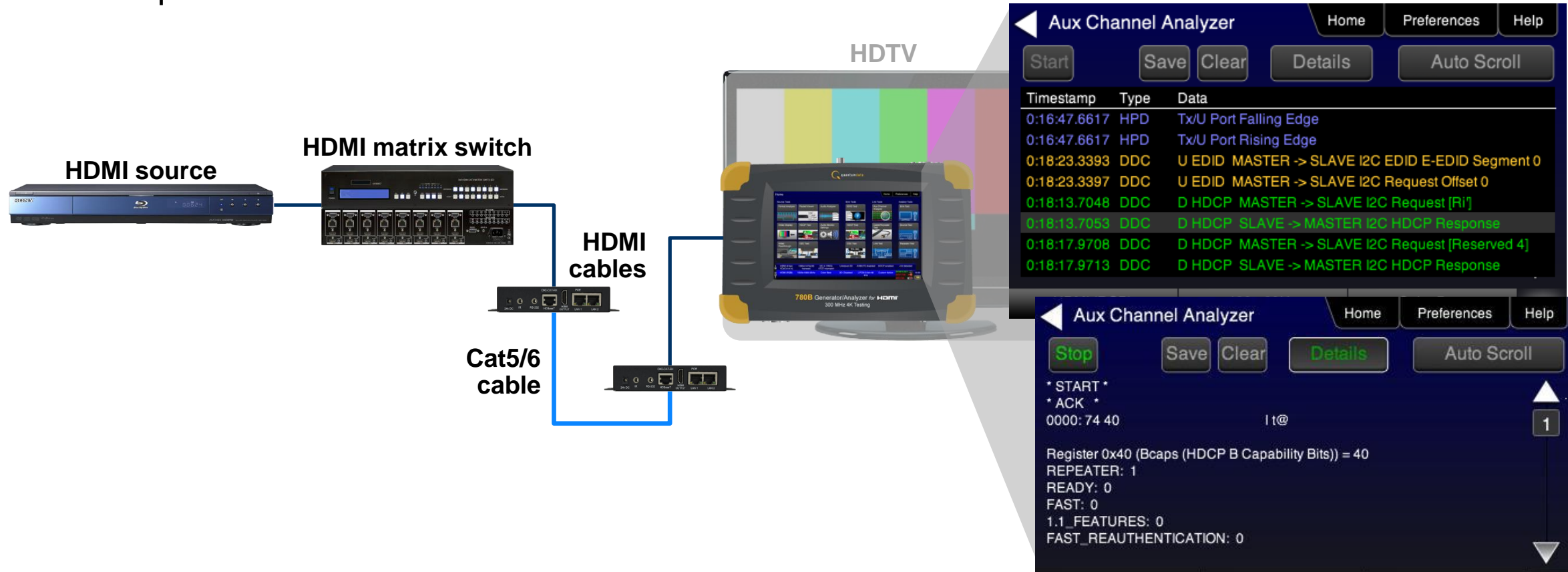
The **Audio InfoFrame data** section shows:

| | | |
|-------------------------------|---|--|
| Dolby: 5ch. [L, C, R, SL, SR] | Channel count: 6 channels | Channel status bits: Application: Consumer |
| 48kHz sampling rate | Coding type: 0 (Refer to stream header) | Sample words: Other |
| 448 KHz target bitrate | Word length: Refer to stream header | Copyright asserted: Yes |
| | Sampling freq.: Refer to stream header | Format info: 2 ch., no pre-emph. |
| | Channel allocation: --- RR RL FC LFE | Mode: 0 |
| | FR FL | Category code: 00 |
| | | Source number: 0 |
| | | Channel number: 0 |
| | | Sampling freq.: 48 KHz |
| | | Word length: 16 bits |

The bottom of the interface shows **HDMI (RGB)**, **1080p 60Hz**, and **3D Contrast** settings.

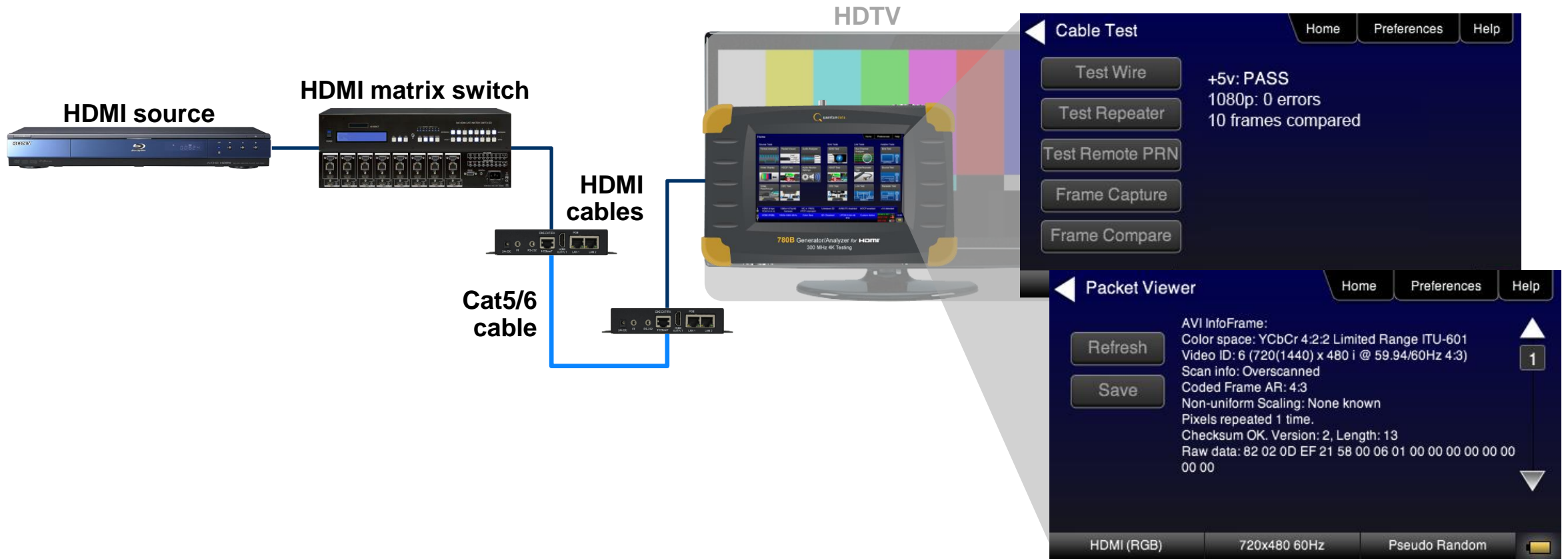
780 Sample Application – HDMI Distribution Network

- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Monitor DDC (HDCP & EDID) and hot plug events of an HDMI source device or upstream distribution network.



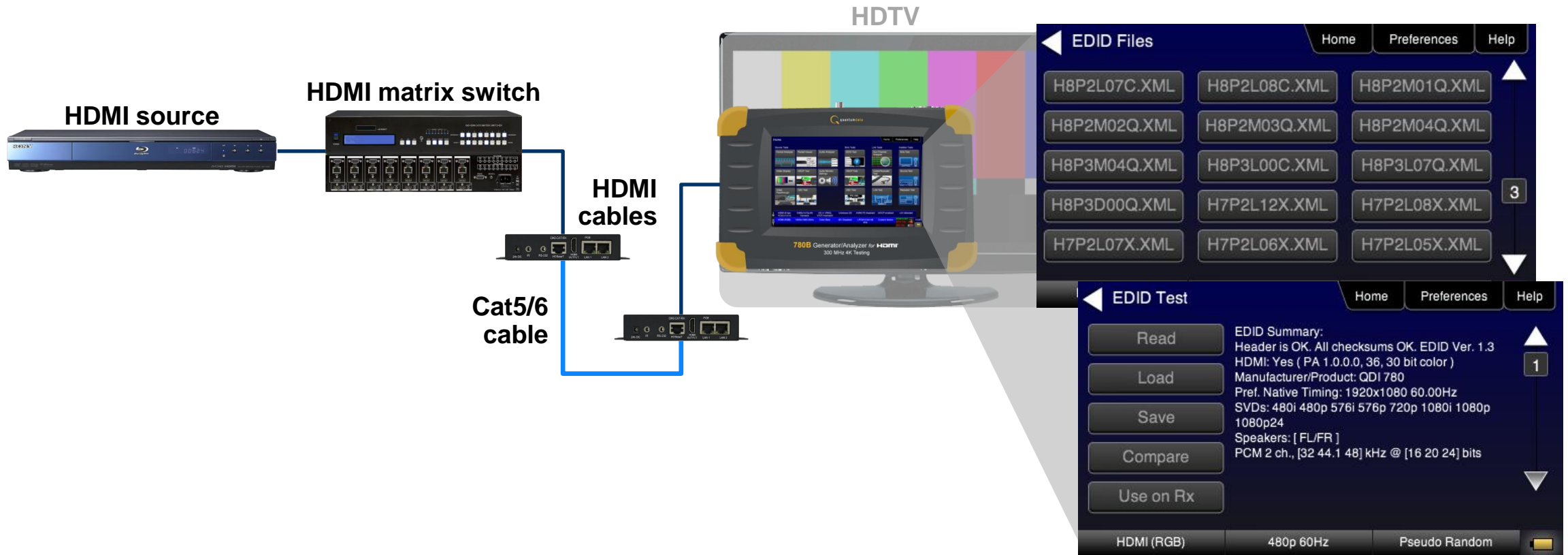
780 Sample Application – HDMI Distribution Network

- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Check for pixel errors and view metadata packets on an upstream HDMI / HDBaseT distribution network.



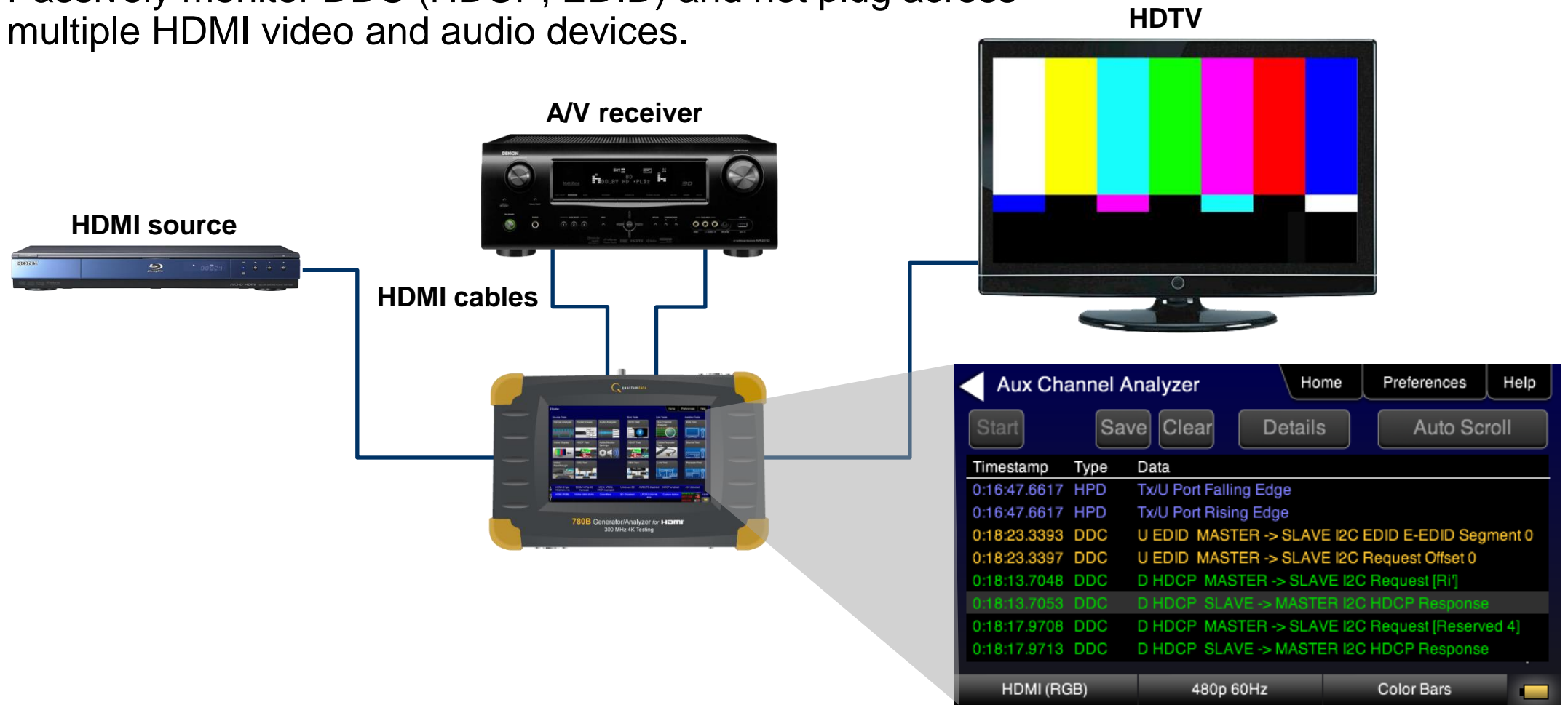
780 Sample Application – HDMI Network EDID Test

- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Verify HDMI source or distribution network's handling of various HDMI EDIDs.



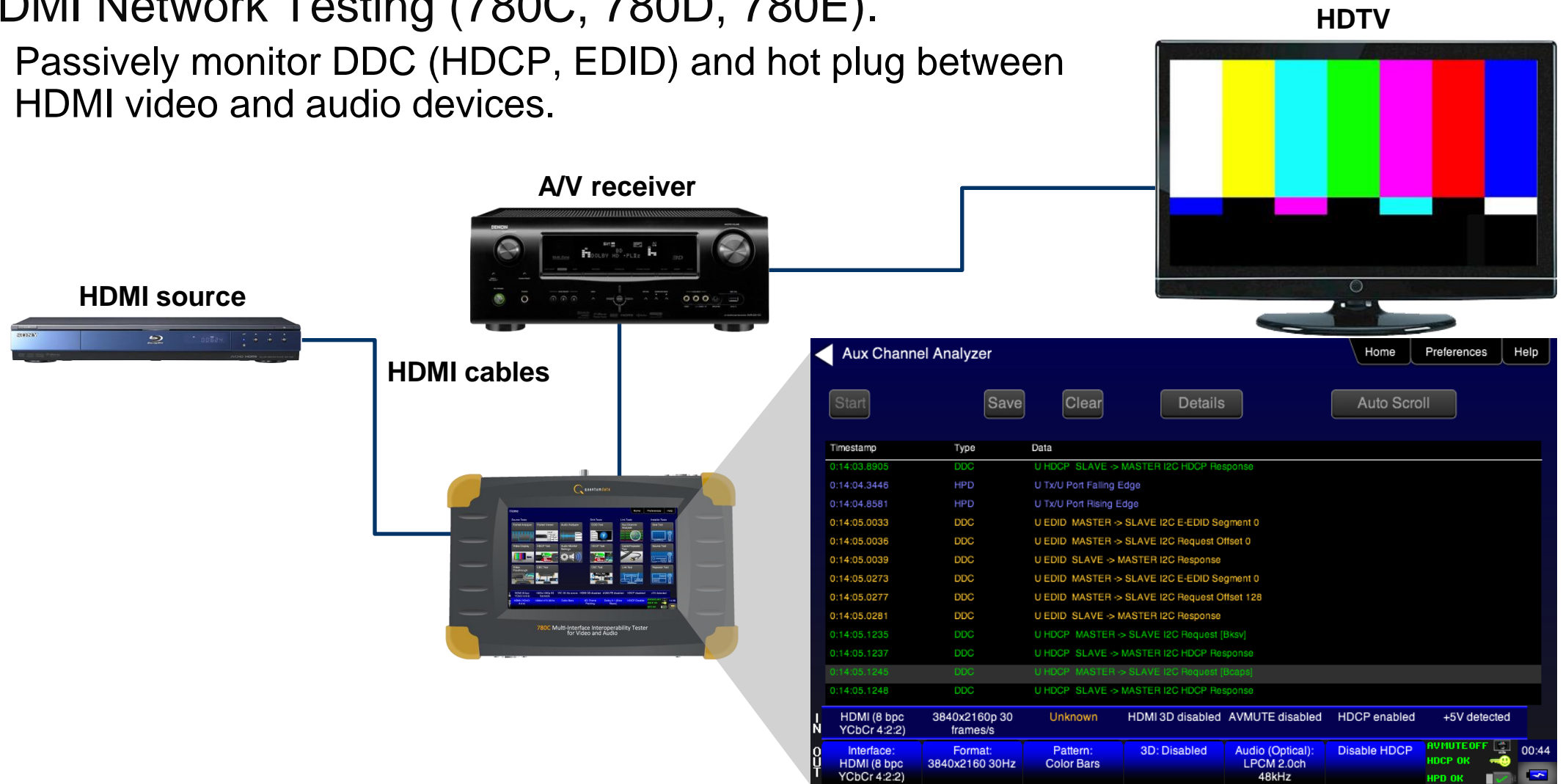
780 Sample Application – HDMI Network Testing

- HDMI Network Testing (780, 780AH, 780BH, 780D, 780E)
 - Passively monitor DDC (HDCP, EDID) and hot plug across multiple HDMI video and audio devices.



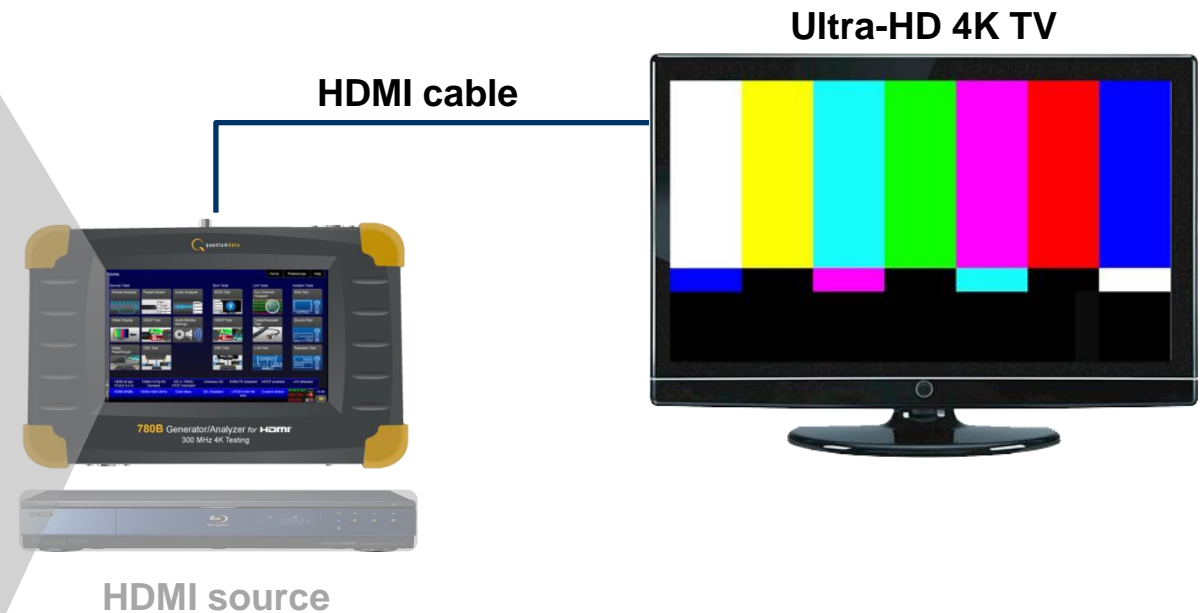
780 Sample Application – HDMI Network Testing

- HDMI Network Testing (780C, 780D, 780E).
 - Passively monitor DDC (HDCP, EDID) and hot plug between HDMI video and audio devices.



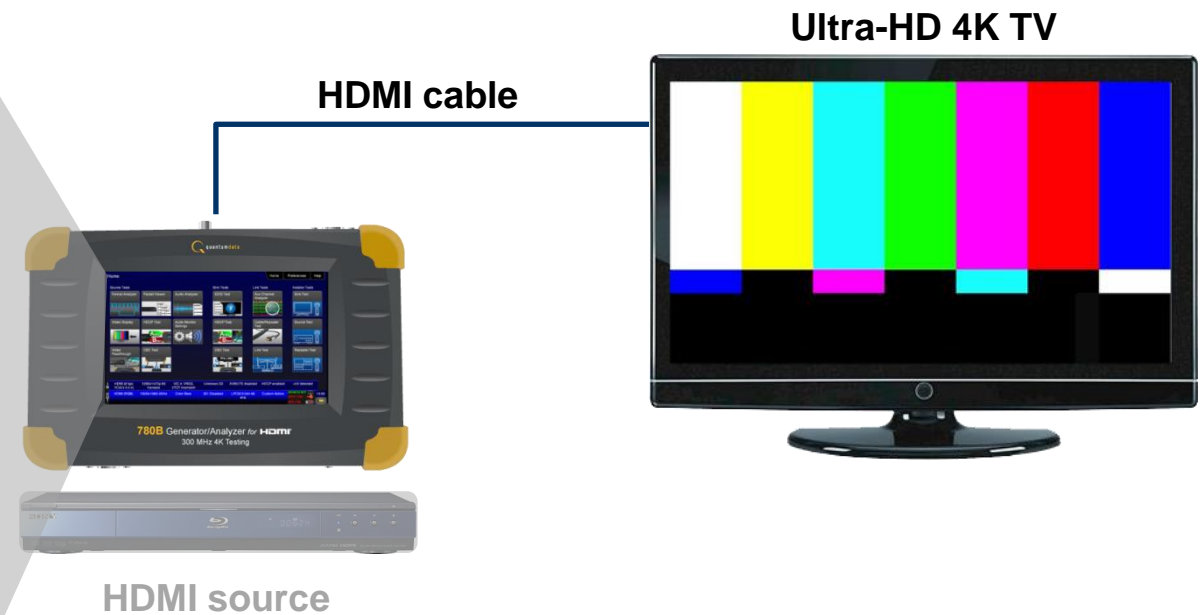
780 Sample Application – HDMI Sink Testing

- HDMI Sink Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Basic video functional test of an HDMI sink device.
 - Supports UHD 4K formats & HDMI 2.0 4:2:0 pixel encoding (780AH, 780BH, 780C, 780D, 780E).



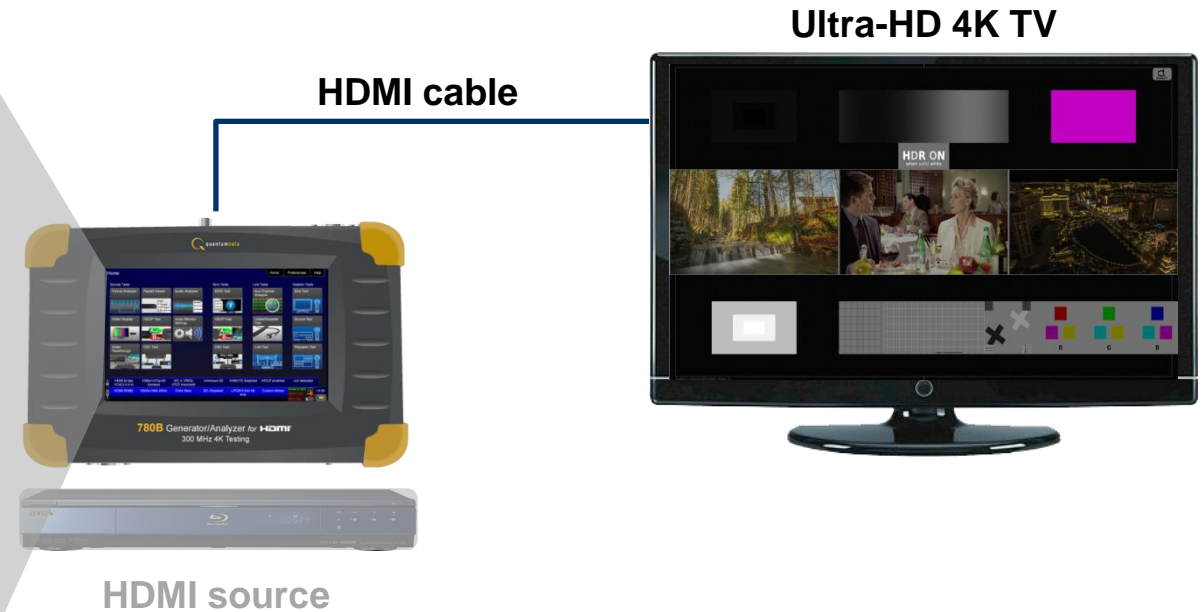
780 Sample Application – HDMI Sink Testing

- HDMI Sink Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Basic video functional test of an HDMI sink device.
 - Provides library of standard test patterns.



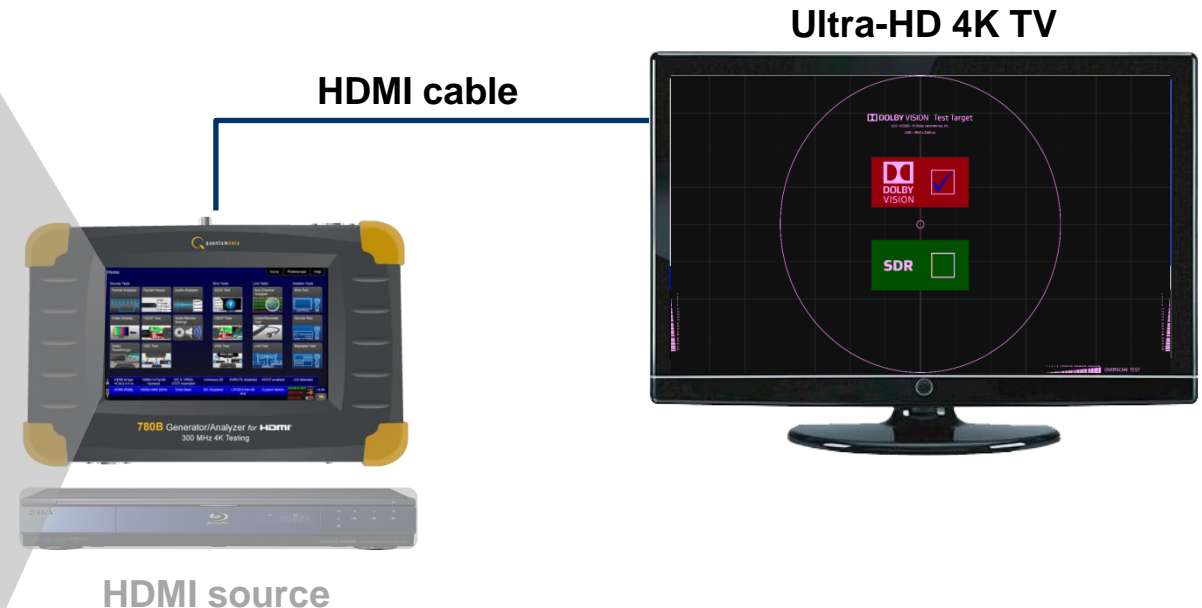
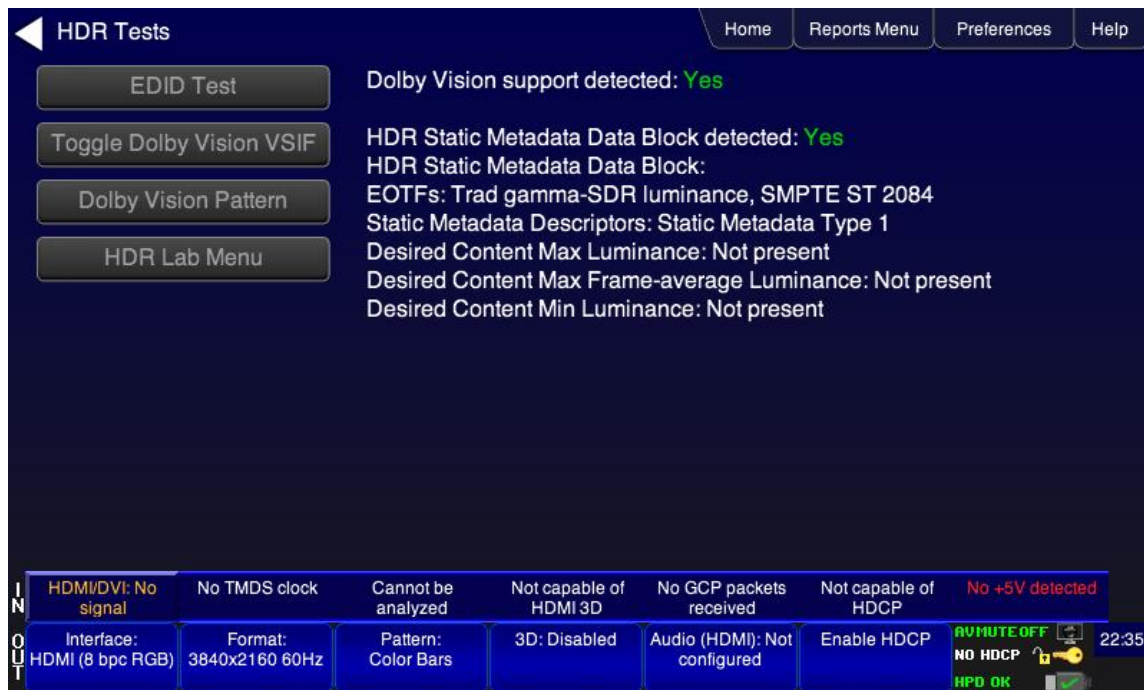
780 Sample Application – HDMI Sink Testing with "HDR Lab"

- HDMI High Dynamic Range (HDR) Sink Testing with "HDR Lab" (780E)
 - Verify an Ultra HD TV's HDR capabilities.
 - Use "HDR Lab" test images and test patterns.
 - Test for peak brightness, native contrast, average brightness level, clipping and color gamut.



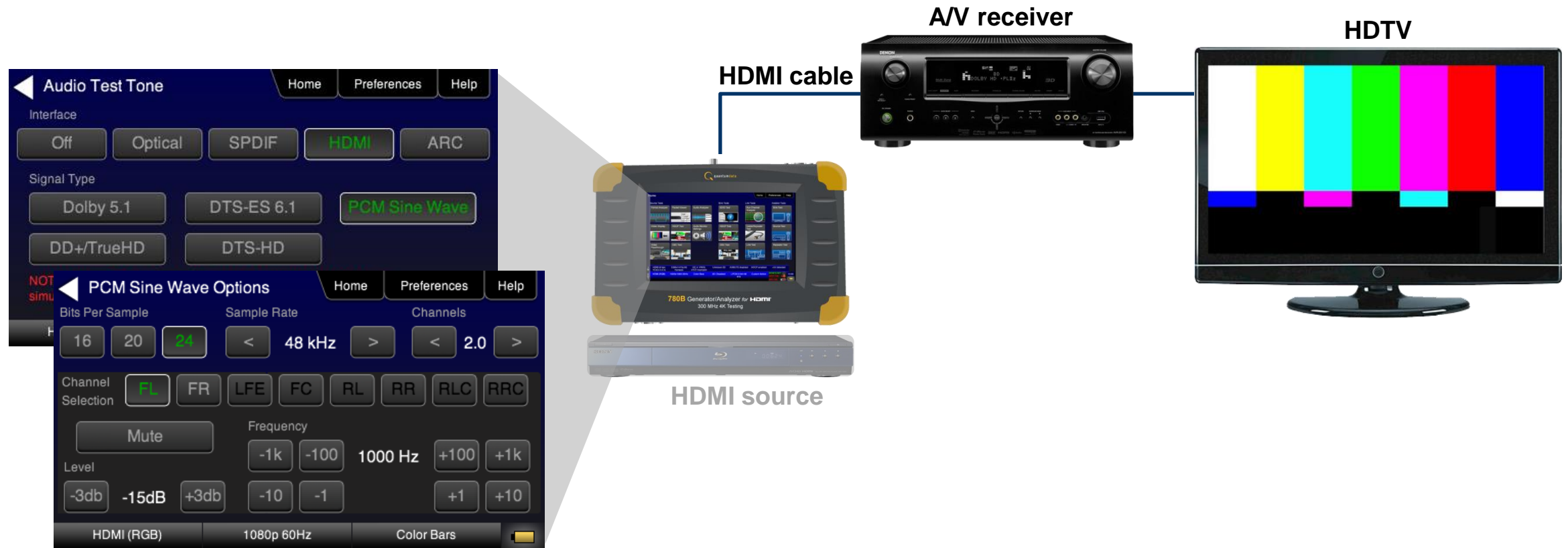
780 Sample Application – HDMI Sink Testing with HDR Dolby Vision

- HDMI High Dynamic Range (HDR) Sink Testing with Dolby Vision (780E)
 - Dolby Vision test image verifies embedded HDR metadata.



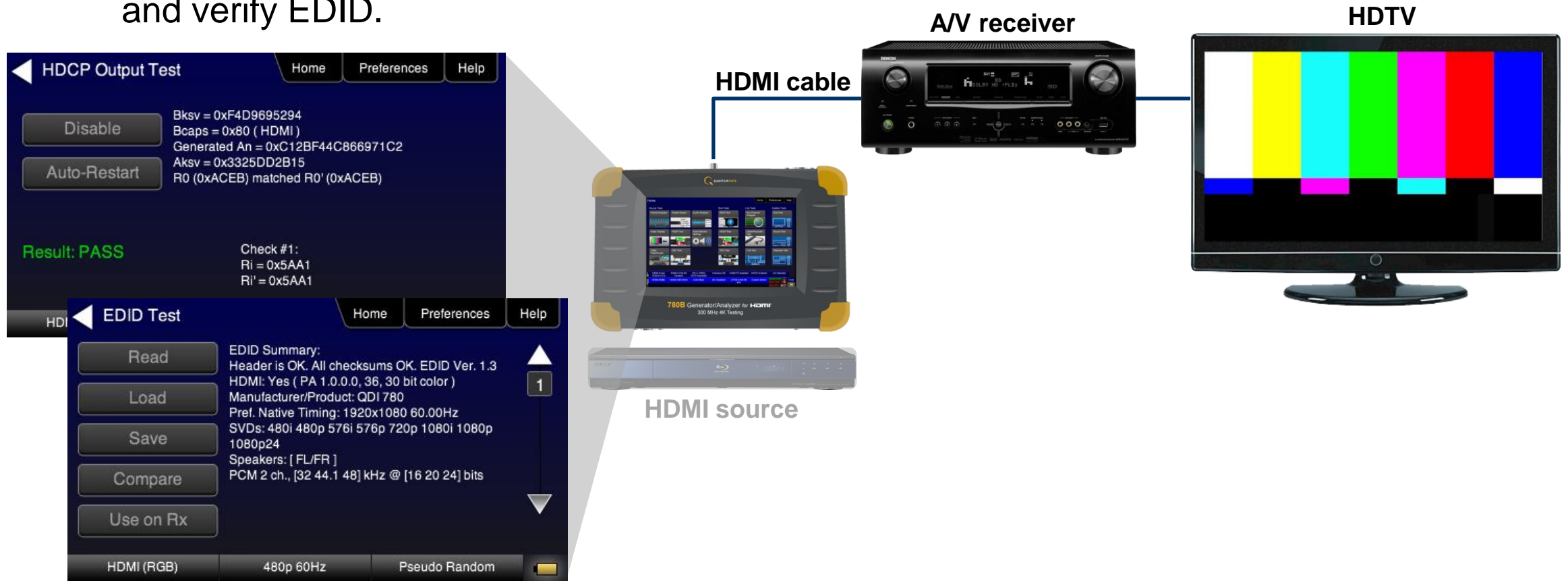
780 Sample Application – HDMI Sink Testing

- HDMI Sink Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Audio functional test of an HDMI audio rendering sink device.
 - Supports uncompressed LPCM and Dolby or DTS compressed formats.



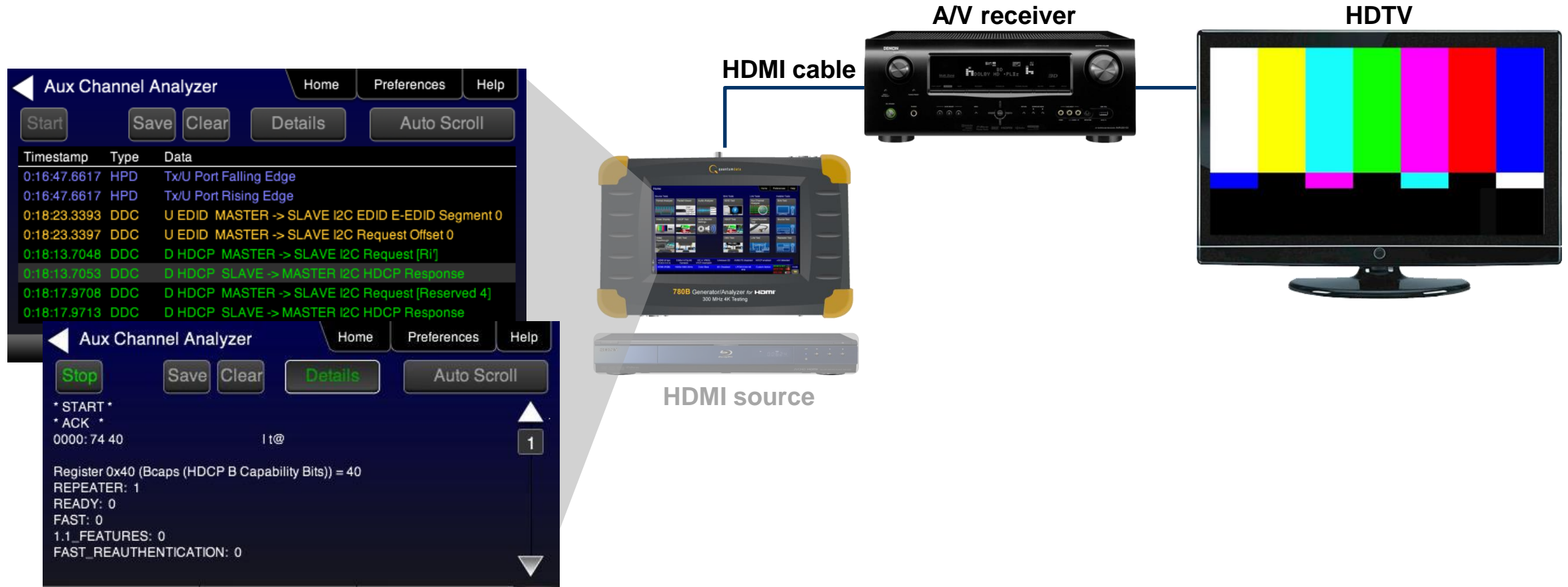
780 Sample Application – HDMI Sink Testing

- HDMI Sink Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Basic protocol functional test of an HDMI sink device.
 - Test HDCP (780AH, 780BH, 780D & 780E support HDCP 2.2) authentication and verify EDID.



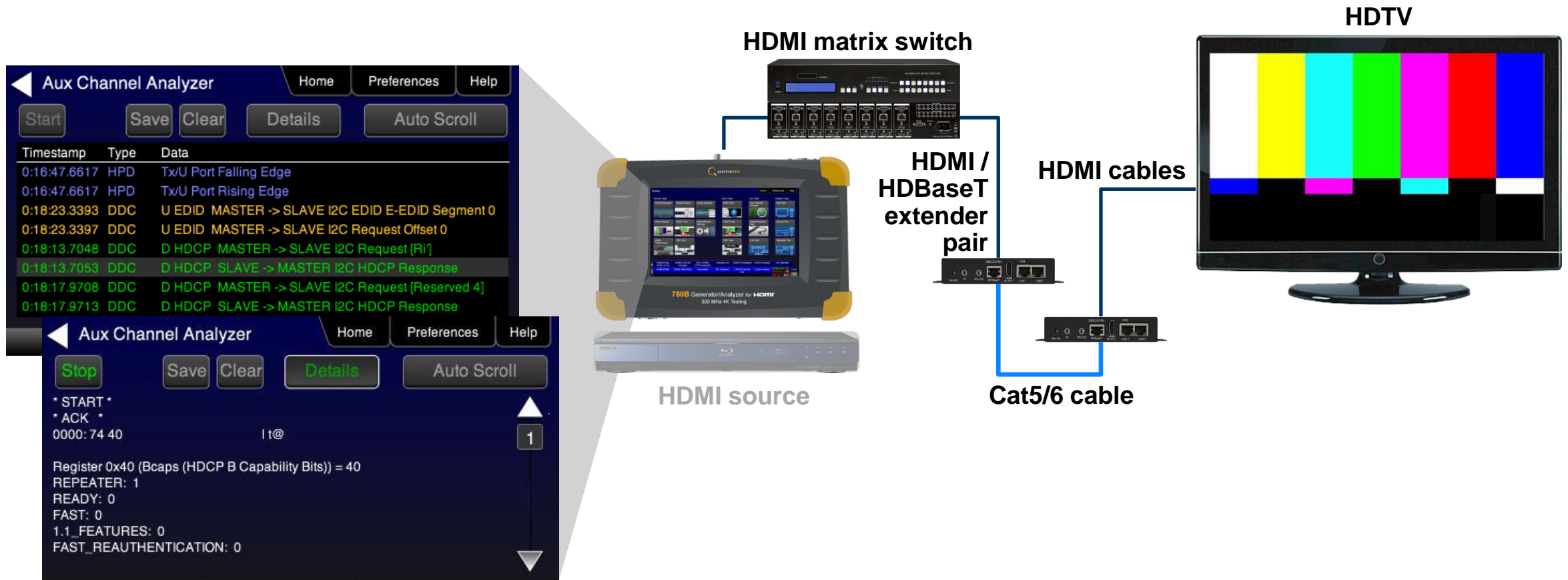
780 Sample Application – HDMI Sink Testing

- HDMI Sink Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Monitor DDC (HDCP & EDID) and hot plug events with an HDMI sink device.



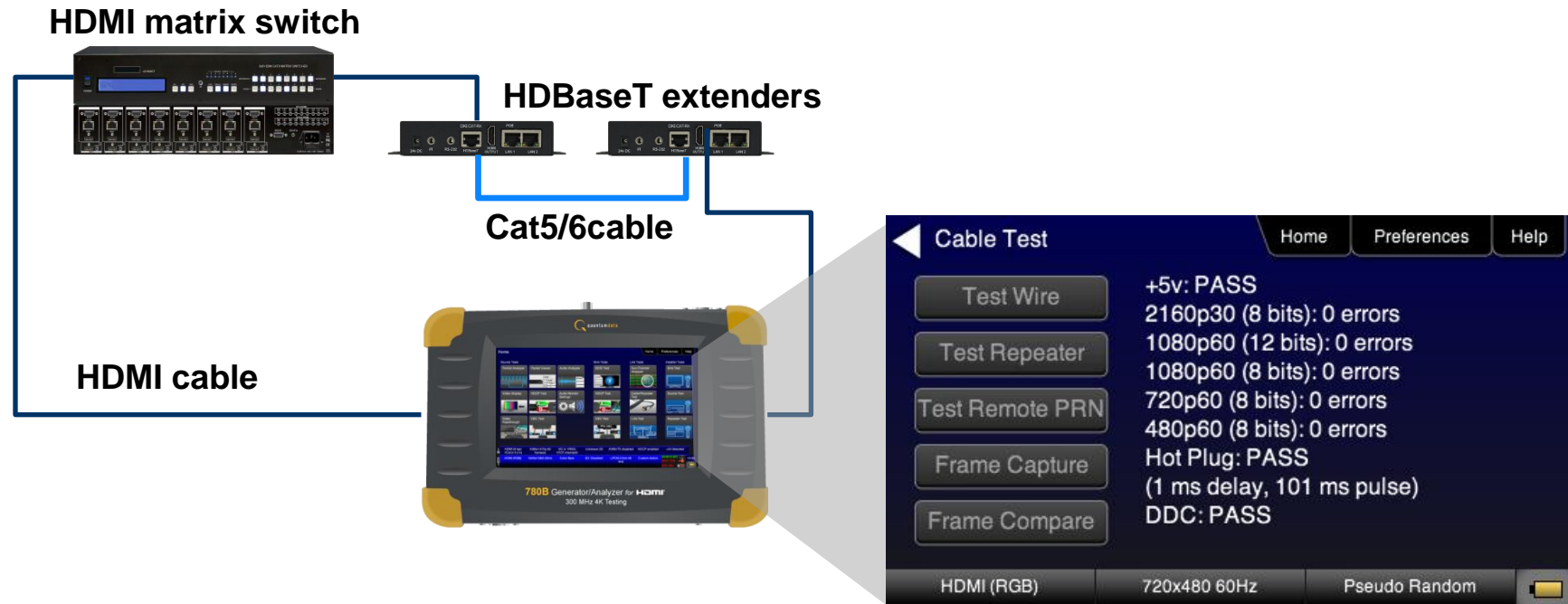
780 Sample Application – HDMI Sink Testing

- HDMI Sink Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Monitor DDC (HDCP & EDID) and hot plug events with an HDMI sink device or downstream distribution network.



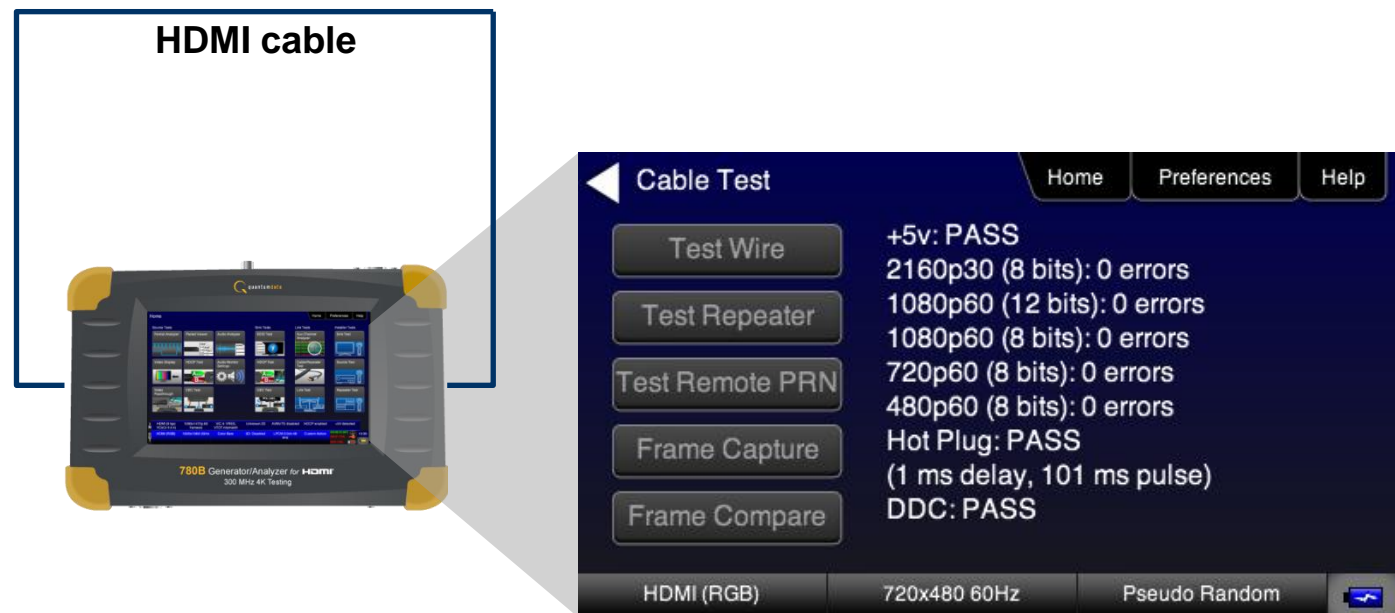
780 Sample Application – HDMI Distribution Network

- HDMI Distribution Network Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Check for pixel errors on an HDMI / HDBaseT distribution network.



780 Sample Application – HDMI Cable Test

- HDMI Cable Testing (780, 780AH, 780BH, 780C, 780D, 780E)
 - Check for pixel errors on an HDMI cable.



Applications - HDBaseT

780 Sample Application – HDBaseT Device Testing

- HDBaseT Sink Testing (780C, 780D, 780E)
 - Basic video functional test of an HDBaseT sink device.
 - Supports 4K formats.



HDBaseT
Cat5/6 cable

HDBaseT Projector



780 Sample Application – HDBaseT Device Testing

- HDBaseT Sink Testing (780C, 780D, 780E)
 - Basic video functional test of an HDBaseT sink device.
 - Provides library of standard test patterns.



HDBaseT
Cat5/6 cable

HDBaseT Projector



780 Sample Application – HDBaseT Device Testing

- HDBaseT Device Testing (780C, 780D, 780E)
 - Monitor DDC (HDCP & EDID) and hot plug events with an HDBaseT device connected to an HDMI sink.

Aux Channel Analyzer

Home Preferences Help

Start Save Clear Details Auto Scroll

| Timestamp | Type | Data |
|--------------|------|---|
| 0:14:03.8905 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |
| 0:14:04.3446 | HPD | U Tx/U Port Falling Edge |
| 0:14:04.8581 | HPD | U Tx/U Port Rising Edge |
| 0:14:05.0033 | DDC | U EDID MASTER -> SLAVE I2C E-EDID Segment 0 |
| 0:14:05.0036 | DDC | U EDID MASTER -> SLAVE I2C Request Offset 0 |
| 0:14:05.0039 | DDC | U EDID SLAVE -> MASTER I2C Response |
| 0:14:05.0273 | DDC | U EDID MASTER -> SLAVE I2C E-EDID Segment 0 |
| 0:14:05.0277 | DDC | U EDID MASTER -> SLAVE I2C Request Offset 128 |
| 0:14:05.0281 | DDC | U EDID SLAVE -> MASTER I2C Response |
| 0:14:05.1235 | DDC | U HDCP MASTER -> SLAVE I2C Request [Bksv] |
| 0:14:05.1237 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |
| 0:14:05.1245 | DDC | U HDCP MASTER -> SLAVE I2C Request [Bcaps] |
| 0:14:05.1248 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |

IN

| | | | | | | |
|---------------------|---------------------------|---------|------------------|-----------------|---------------|--------------|
| HDBaseT (8 bpc RGB) | 3840x2160p 30.00 frames/s | Unknown | HDMI 3D disabled | AVMUTE disabled | HDCP disabled | +5V detected |
|---------------------|---------------------------|---------|------------------|-----------------|---------------|--------------|

OUT

| | | | | | | | |
|--------------------------------|------------------------|---------------------|--------------|--------------------------------|-------------|---------------------------------|-------|
| Interface: HDBaseT (8 bpc RGB) | Format: 3840x2160 30Hz | Pattern: Color Bars | 3D: Disabled | Audio (HDMI): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF HDCP OK HPD OK | 17:51 |
|--------------------------------|------------------------|---------------------|--------------|--------------------------------|-------------|---------------------------------|-------|



HDBaseT
Cat5/6 cable

HDBaseT Projector



780 Sample Application – HDBaseT Device Testing

- HDBaseT Device Testing (780C, 780D, 780E)
 - Monitor DDC (HDCP & EDID) and hot plug events with an HDBaseT device connected to an HDMI sink.

Aux Channel Analyzer

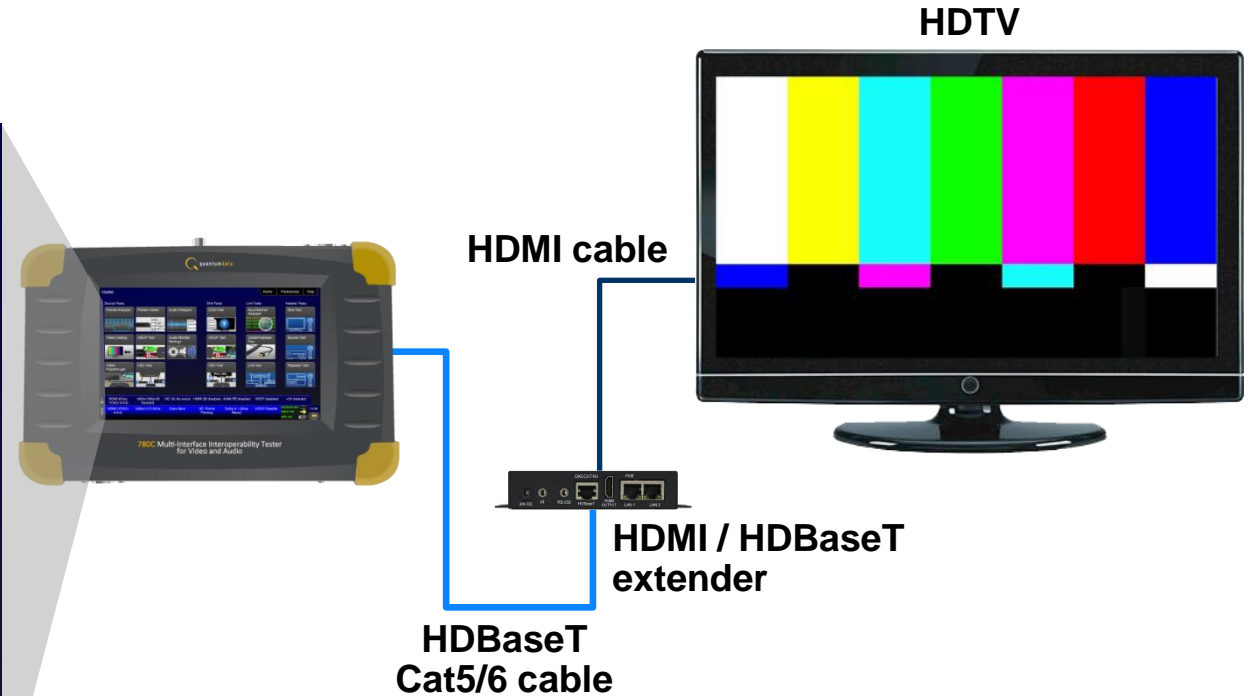
Start Save Clear Details Auto Scroll

| Timestamp | Type | Data |
|--------------|------|---|
| 0:14:03.8905 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |
| 0:14:04.3446 | HPD | U TxU Port Falling Edge |
| 0:14:04.8581 | HPD | U TxU Port Rising Edge |
| 0:14:05.0033 | DDC | U EDID MASTER -> SLAVE I2C E-EDID Segment 0 |
| 0:14:05.0036 | DDC | U EDID MASTER -> SLAVE I2C Request Offset 0 |
| 0:14:05.0039 | DDC | U EDID SLAVE -> MASTER I2C Response |
| 0:14:05.0273 | DDC | U EDID MASTER -> SLAVE I2C E-EDID Segment 0 |
| 0:14:05.0277 | DDC | U EDID MASTER -> SLAVE I2C Request Offset 128 |
| 0:14:05.0281 | DDC | U EDID SLAVE -> MASTER I2C Response |
| 0:14:05.1235 | DDC | U HDCP MASTER -> SLAVE I2C Request [Bkvs] |
| 0:14:05.1237 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |
| 0:14:05.1245 | DDC | U HDCP MASTER -> SLAVE I2C Request [Bcaps] |
| 0:14:05.1248 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |

I N
O U T

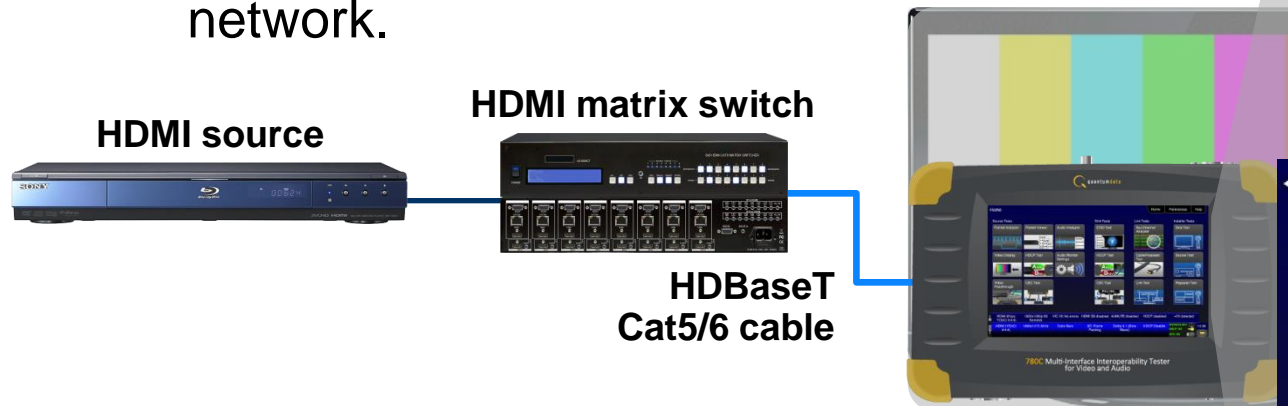
| | | | | | | |
|--------------------------------|---------------------------|---------------------|------------------|--------------------------------|---------------|---------------------------------|
| HDBaseT (8 bpc RGB) | 3840x2160p 30.00 frames/s | Unknown | HDMI 3D disabled | AVMUTE disabled | HDCP disabled | +5V detected |
| Interface: HDBaseT (8 bpc RGB) | Format: 3840x2160 30Hz | Pattern: Color Bars | 3D: Disabled | Audio (HDMI): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF HDCP OK HPD OK |

17:51



780 Sample Application – HDBaseT Device Testing

- HDBaseT Device Testing (780C, 780D, 780E)
 - Verify video and timing from an HDBaseT device through an upstream distribution network.



Video Display
Home Preferences Help

Timing: 3840 x 2160
 ~60 frames/sec, Progressive
 Video type: HDMI
 Color space: YCbCr 4:2:2
 Colorimetry: ITU-709
 Range: Limited
 VIC code: 4
 AV Mute: Disabled
 HDCP: Disabled

Format Analyzer
Home Preferences Help

Errors:
None

Read

Video type: HDMI
 Total: 2200 x 1125
 Active: 1920 x 1080
 Frames/sec: 60.5 (121.1 fields)
 Scan type: Interlaced
 HSYNC delay: 88
 HSYNC width: 44
 VSYNC delay: 2
 VSYNC width: 5
 HSYNC polarity: +
 VSYNC polarity: +

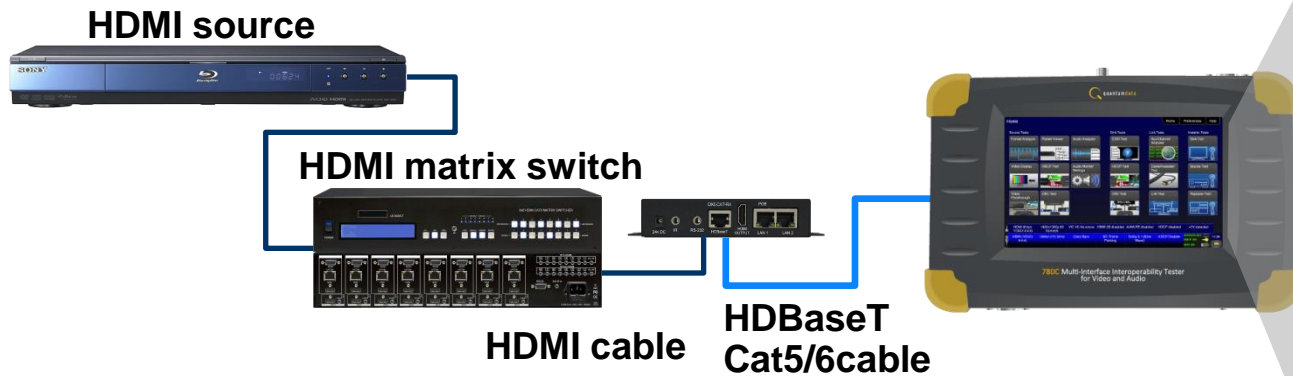
Color space: YCbCr 4:2:2
 Colorimetry: ITU-709
 Pixels repeated 0 times
 Video ID code (VIC): 46 (1920 x 1080 i @119.88/120Hz 16:9)
 AV Mute Status: Not muted
 HDCP: Not encrypted

| | | | | | | |
|-----------------------------------|------------------------------|------------------------|------------------|--------------------------------------|---------------|---------------------------------|
| HDBaseT (8 bpc RGB) | 3840x2160p 30.00 frames/s | Unknown | HDMI 3D disabled | AVMUTE disabled | HDCP disabled | +5V detected |
| Interface: HDBaseT (8 bpc RGB) | Format: 3840x2160 30Hz | Pattern: Color Bars | 3D: Disabled | Audio (HDMI): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF HDCP OK HPD OK |

17:51

780 Sample Application – HDBaseT Device Testing

- HDBaseT Device Testing (780C, 780D, 780E)
 - Verifying HDCP authentication on an HDBaseT device through an upstream distribution network.



Aux Channel Analyzer

Start Save Clear Details Auto Scroll

| Timestamp | Type | Data |
|--------------|------|---|
| 0:14:03.8905 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |
| 0:14:04.3446 | HPD | U Tx/U Port Falling Edge |
| 0:14:04.8581 | HPD | U Tx/U Port Rising Edge |
| 0:14:05.0033 | DDC | U EDID MASTER -> SLAVE I2C E-EDID Segment 0 |
| 0:14:05.0036 | DDC | U EDID MASTER -> SLAVE I2C Request Offset 0 |
| 0:14:05.0039 | DDC | U EDID SLAVE -> MASTER I2C Response |
| 0:14:05.0273 | DDC | U EDID MASTER -> SLAVE I2C E-EDID Segment 0 |
| 0:14:05.0277 | DDC | U EDID MASTER -> SLAVE I2C Request Offset 128 |
| 0:14:05.0281 | DDC | U EDID SLAVE -> MASTER I2C Response |
| 0:14:05.1235 | DDC | U HDCP MASTER -> SLAVE I2C Request [Bksv] |
| 0:14:05.1237 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |
| 0:14:05.1246 | DDC | U HDCP MASTER -> SLAVE I2C Request [Bcaps] |
| 0:14:05.1248 | DDC | U HDCP SLAVE -> MASTER I2C HDCP Response |

IN

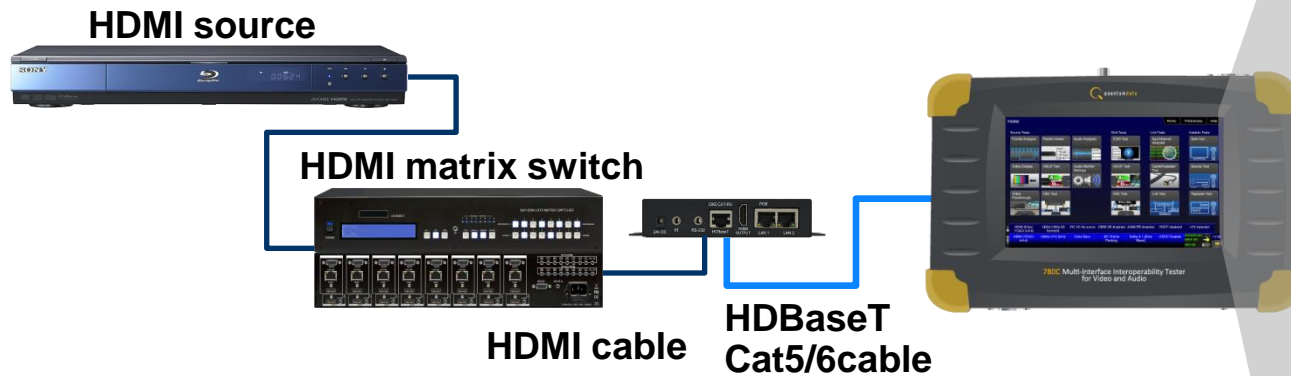
| | | | | | | |
|---------------------|---------------------------|---------|------------------|-----------------|---------------|--------------|
| HDBaseT (8 bpc RGB) | 3840x2160p 30.00 frames/s | Unknown | HDMI 3D disabled | AVMUTE disabled | HDCP disabled | +5V detected |
|---------------------|---------------------------|---------|------------------|-----------------|---------------|--------------|

OUTPUT

| | | | | | | | |
|--------------------------------|------------------------|---------------------|--------------|--------------------------------|-------------|---------------------------------|-------|
| Interface: HDBaseT (8 bpc RGB) | Format: 3840x2160 30Hz | Pattern: Color Bars | 3D: Disabled | Audio (HDMI): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF HDCP OK HPD OK | 17:51 |
|--------------------------------|------------------------|---------------------|--------------|--------------------------------|-------------|---------------------------------|-------|

780 Sample Application – HDBaseT Device Testing

- HDBaseT Device Testing (780C, 780D 780E)
 - Check for pixel errors and view packets on an HDBaseT device through a distribution network.



The image shows two screenshots from the 780C Multi-interface Interoperability Tester interface. The top screenshot is the **Cable Test** screen, showing a successful test result: **+5v: PASS**, **1920 x 1080p: 0 errors**, and **10 frames compared.** The bottom screenshot is the **Packet Viewer** screen, displaying AVI InfoFrame details for a selected packet (1). The interface includes buttons for **Test Wire**, **Test Repeater**, **Test Remote PRN**, **Frame Capture**, **Frame Compare**, **Refresh**, and **Save**.

Cable Test Home Preferences Help

Test Wire +5v: PASS
1920 x 1080p: 0 errors
10 frames compared.

Test Repeater

Test Remote PRN

Frame Capture

Frame Compare

Packet Viewer Home Preferences Help

Refresh

Save

AVI InfoFrame:
Color space: RGB Default Range
Video ID: 16 (1920 x 1080 p @ 59.94/60Hz 16:9)
Coded Frame AR: 16:9
Non-uniform Scaling: None known
Pixels repeated 0 times.
Checksum OK. Version: 2, Length: 13
Raw data: 82 02 0D 09 00 28 00 10 00 00 00 9E 08 00 00
81 07

IN
HDBaseT (8 bpc RGB) 3840x2160p 30.00 frames/s Unknown HDMI 3D disabled AVMUTE disabled HDCP disabled +5V detected
OUTPUT
Interface: HDBaseT (8 bpc RGB) Format: 3840x2160 30Hz Pattern: Color Bars 3D: Disabled Audio (HDMI): LPCM 2.0ch 48kHz Enable HDCP AVMUTE OFF HDCP OK HPD OK 17:51

Sample Applications – HDBaseT Cat5/6 Remote Cable Test

- HDBaseT Remote Cable Testing (780C, 780D, 780E)
 - Check quality of signal from near end to a far end HDBaseT Remote Terminal.
 - Solution checks main video channel and aux channel.

Cable Test

Home Reports Menu Preferences Help

Test Wire
Test Repeater
Test Remote PRN
Frame Capture
Frame Compare
Test Remote HDBaseT

Detected official Teledyne LeCroy HDBaseT device connected to HDBaseT TX port.

HDBaseT Tx Local Info:
Firmware Version: 13131510 (2016/09/26)
Operation Mode: HDBaseT
Cable length estimated to be < 20 meters

HDBaseT Tx Remote Info:
HDBT device connected to Tx: VS100RX
Firmware Version: 13131500 (2016/09/26)
Error (MSE): -22dB, -22dB, -22dB
Operation Mode: HDBaseT
Cable length estimated to be < 20 meters

Aux Channel MaxErr:
35, 34, 36, 34- GOOD

Main Channel MaxErr (2160p30):
36, 36, 38, 38- GOOD

Main Channel MaxErr (1080p60):
19, 18, 19, 18- EXCELLENT

| | | | | | | |
|--------------------------------|---------------------------|------------------------|------------------|--------------------------------|--------------------|---------------------------------|
| HDBaseT (8 bpc RGB) | 1920x1080p 60.00 frames/s | VIC 16: No errors | HDMI 3D disabled | AVMUTE disabled | Not HDCP encrypted | +5V detected |
| Interface: HDBaseT (8 bpc RGB) | Format: 1920x1080 60Hz | Pattern: Pseudo Random | 3D: Disabled | Audio (HDMI): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF NO HDCP HPD OK |

IN
OUT

20:58



HDBaseT
Cat5/6 cable


HDBaseT
Remote
Terminal



Sample Applications – HDBaseT Cat5/6 Cable Test

- HDBaseT Cable Testing (780C, 780D, 780E)
 - Check for pixel errors on an HDBaseT Cat5/6 cable.

HDBaseT Cat5/6 cable



Cable Test

Test Wire
Test Repeater
Test Remote PRN
Frame Capture
Frame Compare

+5v: **PASS**
2160p30 (8 bits): **0 errors**
1080p60 (12 bits): **0 errors**
720p60 (8 bits): **0 errors**
480p60 (8 bits): **0 errors**
Hot Plug: **FAIL**
(Never saw low HPD)
CEC: **Rx FAIL, Tx FAIL**
DDC: **FAIL (EDID read failed)**

HDBaseT Tx local info:
FW version 13072110 (2013/11/21)
Operation Mode: HDBaseT
Cable is too short to estimate length
HDBaseT Tx remote info:
HDBT device connected to Tx: VS100RX
FW version 13072100 (2013/11/21)
Signal Quality: -23db, -23db, -23db, -22db
Operation Mode: HDBaseT
Cable is too short to estimate length

HDBaseT Rx local info:
FW version 13072100 (2013/11/21)
Signal Quality: -22db, -22db, -23db, -22db
Operation Mode: HDBaseT
Cable is too short to estimate length
HDBaseT Rx remote info:
HDBT device connected to Rx: VS100TX
FW version 13072110 (2013/11/21)
Operation Mode: HDBaseT
Cable is too short to estimate length

| | | | | | | |
|--------------------------------|----------------------|------------------------|------------------|-----------------------------------|---------------|---------------------------------|
| HDBaseT (8 bpc RGB) | 720x480p 60 frames/s | VIC 2: No errors | HDMI 3D disabled | AVMUTE disabled | HDCP disabled | +5V detected |
| Interface: HDBaseT (8 bpc RGB) | Format: 720x480 60Hz | Pattern: Pseudo Random | 3D: Disabled | Audio (Optical): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF NO HDCP HPD OK |

02:03

Applications - SDI

780C Sample Application – SDI Device Testing

- SDI Sink Device Testing (780C)
 - Test video on an SDI display device.



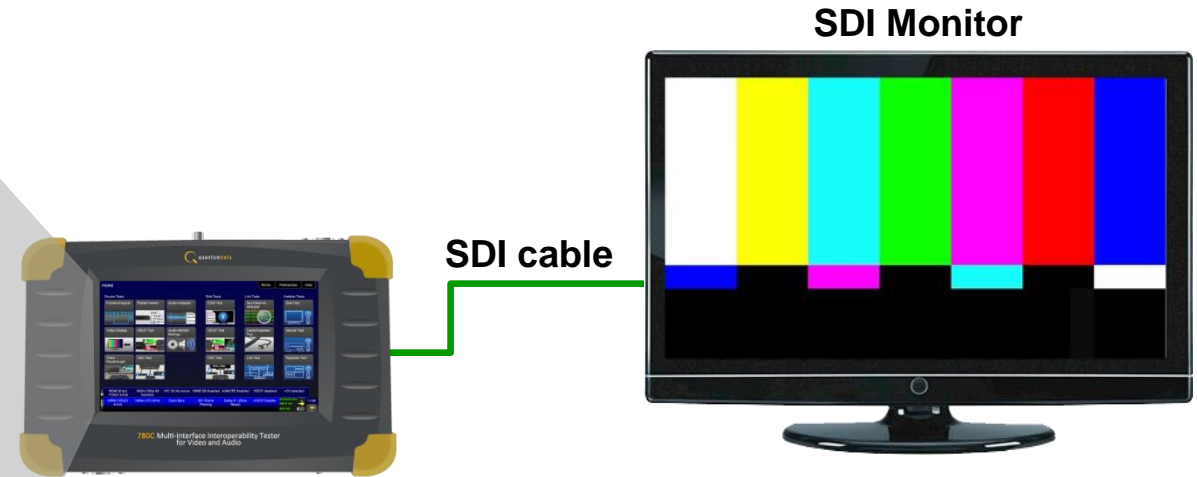
The screenshot shows the 'TV Format' menu of the 780C Multi-Interface Interoperability Tester. The menu is organized into several sections:

- 16:9 Formats:** 480p, 480i, 720x480p, 720x480i, 576p, 576i, 720x576p, 720x576i, 720p, 1080p, 1080i, 1280x720p, 1680x720p, 1920x1080p, 2560x1080p, 3840x2160p, 2160p (highlighted).
- 4:3 Formats:** 720x480p, 720x480i, 720x576p, 720x576i.
- Frame Rate:** 23.976Hz, 24Hz, 25Hz, 29.97Hz, 30Hz, 50Hz, 59.94Hz, 60Hz, 100Hz, 119.88Hz, 120Hz, 200Hz, 239.76Hz, 240Hz.
- 64:27 ("21:9") Formats:** 1280x720p, 1680x720p, 1920x1080p, 2560x1080p, 3840x2160p.
- 256:135 Formats:** 4096x2160p.

At the bottom, a status bar displays the following information:

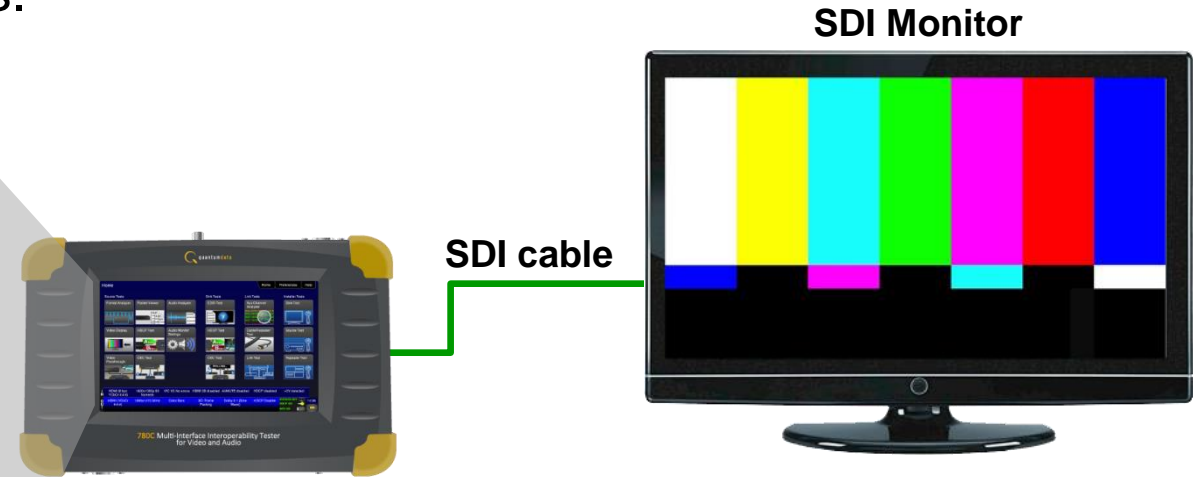
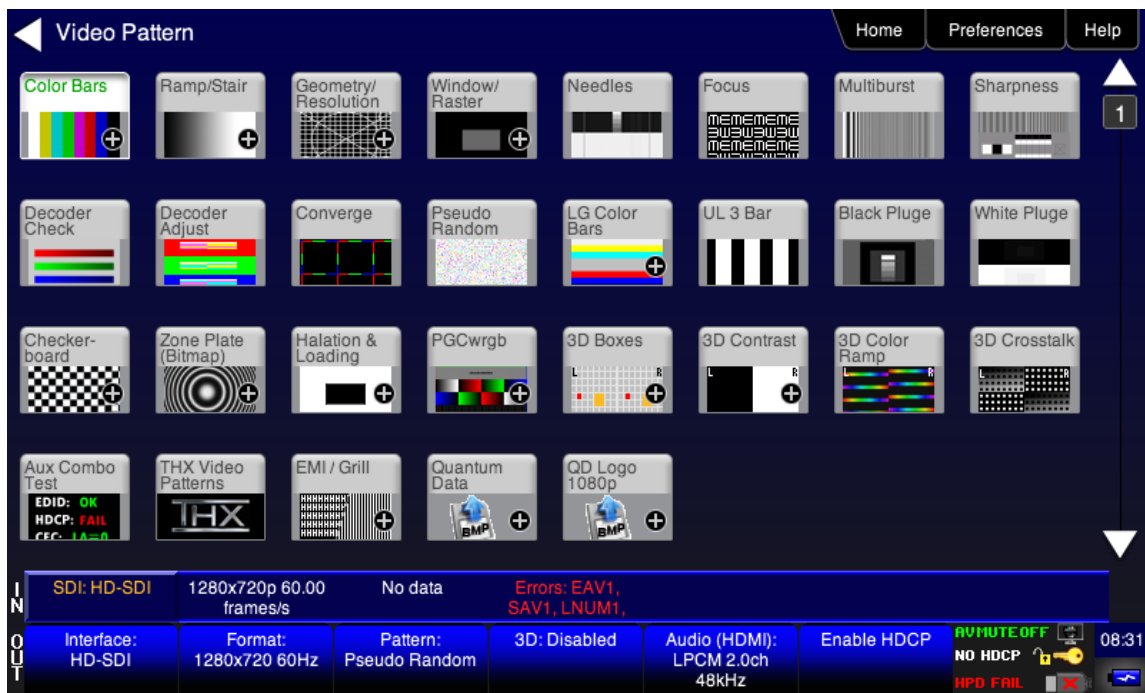
| | | | |
|-------------------|--------------------------------|------------------------|----------------------------|
| SDI: HD-SDI | 1280x720p 60.00 frames/s | No data | Errors: EAV1, SAV1, LNUM1, |
| Interface: HD-SDI | Format: 1280x720 60Hz | Pattern: Pseudo Random | 3D: Disabled |
| | Audio (HDMI): LPCM 2.0ch 48kHz | Enable HDCP | NO HDCP |
| | | | HPD FAIL |

Additional status indicators include 'MUTE OFF', 'NO HDCP', and a time display of 08:31.



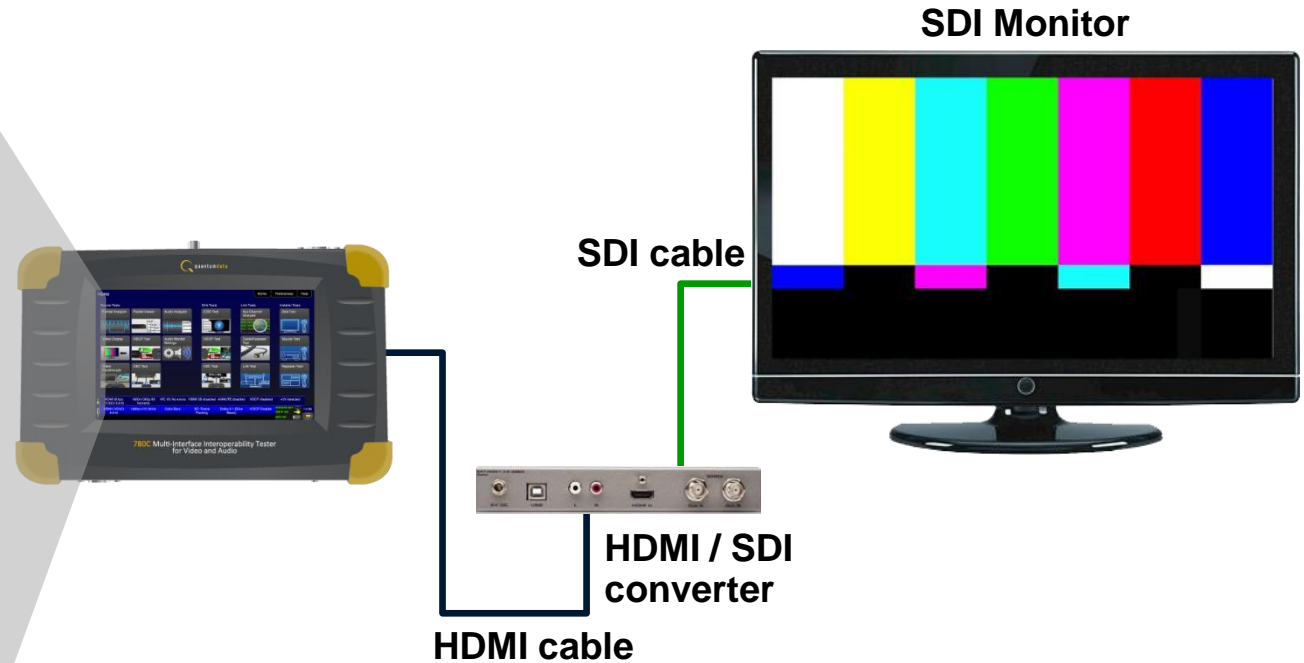
780C Sample Application – SDI Device Testing

- SDI Sink Device Testing (780C)
 - Test video on an SDI display device.
 - Supports library of standard test patterns.



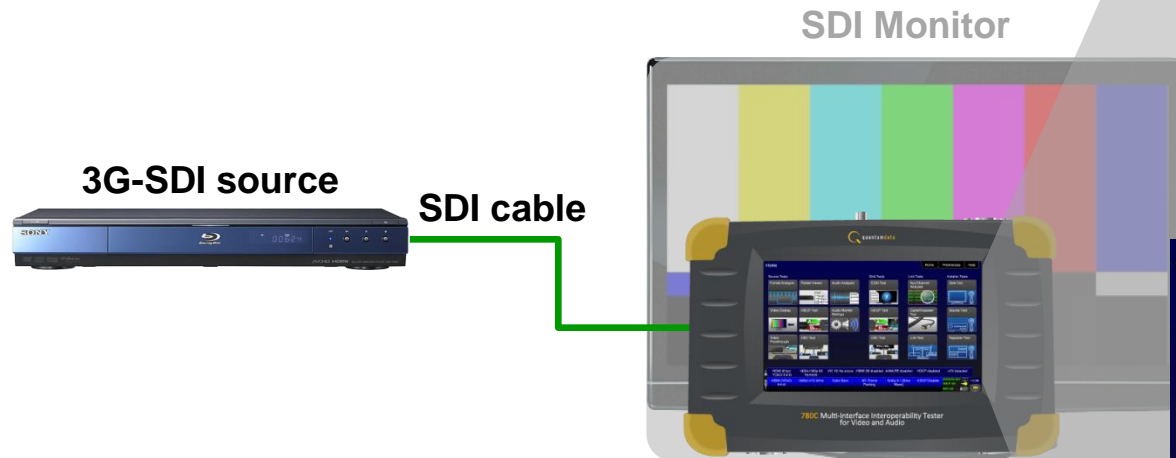
780C Sample Application – SDI Device Testing

- SDI Device Testing (780C)
 - Test video on an HDMI to SDI converter device.



780C Sample Application – SDI Device Testing

- SDI Source Device Testing (780C)
 - Verify video and timing from an SDI source device.



The screenshot shows the software interface with two main panels: 'Video Display' and 'Format Analyzer'. The 'Video Display' panel shows a video frame of a horse and its timing information. The 'Format Analyzer' panel shows detailed technical specifications for the video stream.

Video Display

Timing: 1920 x 1080
60 frames/sec, Progressive

Format Analyzer

Read

Total: 2200 x 1125
Active: 1920 x 1080
Frames/sec: 60.00
Scan type: Progressive

Errors: None

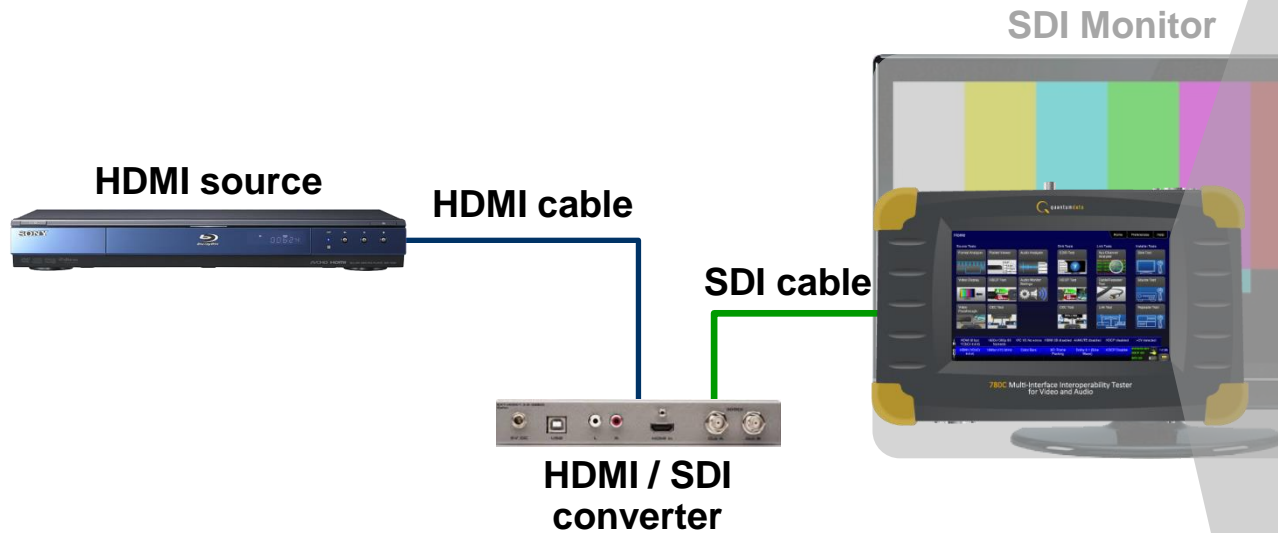
SMPTM 352M embedded packet (Stream 1):
Raw data: 0x89 0xCB 0x00 0x01
Description: 1080-line on Level A 3G-SDI
Picture rate: 0xB (60)
Sampling structure: 0x0 (4:2:2 Y/Cb/Cr)
Transport: Progressive
Picture: Progressive
Aspect ratio: Unknown
Horizontal samples: 1920
Bit depth: 10 bit

SMPTM 352M embedded packet (Stream 2):
Raw data: 0x89 0xCB 0x00 0x01
Description: 1080-line on Level A 3G-SDI
Picture rate: 0xB (60)
Sampling structure: 0x0 (4:2:2 Y/Cb/Cr)
Transport: Progressive
Picture: Progressive
Aspect ratio: Unknown
Horizontal samples: 1920
Bit depth: 10 bit

| | | | | | | | | | |
|-----|-------------|------------------------------|-----------------------------------|--------------|---------------------|-------------|------------|----------|-------|
| IN | SDI: 3G-SDI | 1920x1080p 60.00 frames/s | 3G A 1080p 60 YCC 4:2:2 1920px | Errors: None | | | | | |
| OUT | Interface: | Format: | Pattern: | 3D: Disabled | Audio (HDMI): | Enable HDCP | AVMUTE OFF | NO HDCP | 08:32 |
| | 3G-SDI | 1920x1080 60Hz | Pseudo Random | | LPCM 2.0ch 48kHz | | | MPD FAIL | |

780C Sample Application – SDI Device Testing

- SDI Device Testing (780C)
 - Verify video and timing through HDMI to SDI converter device.



The screenshot shows the 780C software interface. The top window, **Video Display**, shows a video of a horse and displays the following timing information: **Timing: 1920 x 1080 60 frames/sec, Progressive**. The bottom window, **Format Analyzer**, shows a **Read** button and the following analysis results:

Errors: None

Total: 2200 x 1125
Active: 1920 x 1080
Frames/sec: 60.00
Scan type: Progressive

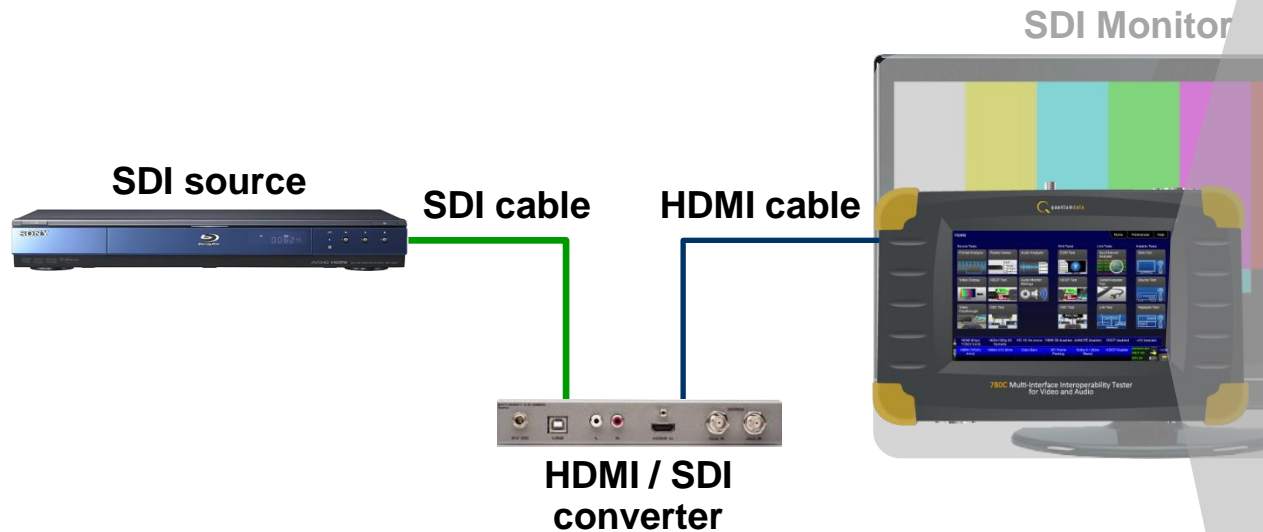
SMPTE 352M embedded packet (Stream 1):
Raw data: 0x89 0xCB 0x00 0x01
Description: 1080-line on Level A 3G-SDI
Picture rate: 0xB (60)
Sampling structure: 0x0 (4:2:2 Y/Cb/Cr)
Transport: Progressive
Picture: Progressive
Aspect ratio: Unknown
Horizontal samples: 1920
Bit depth: 10 bit

SMPTE 352M embedded packet (Stream 2):
Raw data: 0x89 0xCB 0x00 0x01
Description: 1080-line on Level A 3G-SDI
Picture rate: 0xB (60)
Sampling structure: 0x0 (4:2:2 Y/Cb/Cr)
Transport: Progressive
Picture: Progressive
Aspect ratio: Unknown
Horizontal samples: 1920
Bit depth: 10 bit

| | | | | | | | | | |
|-----|-------------|------------------------------|-----------------------------------|--------------|---------------------|-------------|------------|----------|-------|
| IN | SDI: 3G-SDI | 1920x1080p 60.00 frames/s | 3G A 1080p 60 YCC 4:2:2 1920px | Errors: None | | | | | |
| OUT | Interface: | Format: | Pattern: | 3D: | Audio (HDMI): | Enable HDCP | AVMUTE OFF | NO HDCP | 08:32 |
| | 3G-SDI | 1920x1080 60Hz | Pseudo Random | Disabled | LPCM 2.0ch 48kHz | | | MPD FAIL | |

780C Sample Application – SDI Device Testing

- SDI Device Testing (780C)
 - Verify video, video parameters and timing through SDI to HDMI converter device.

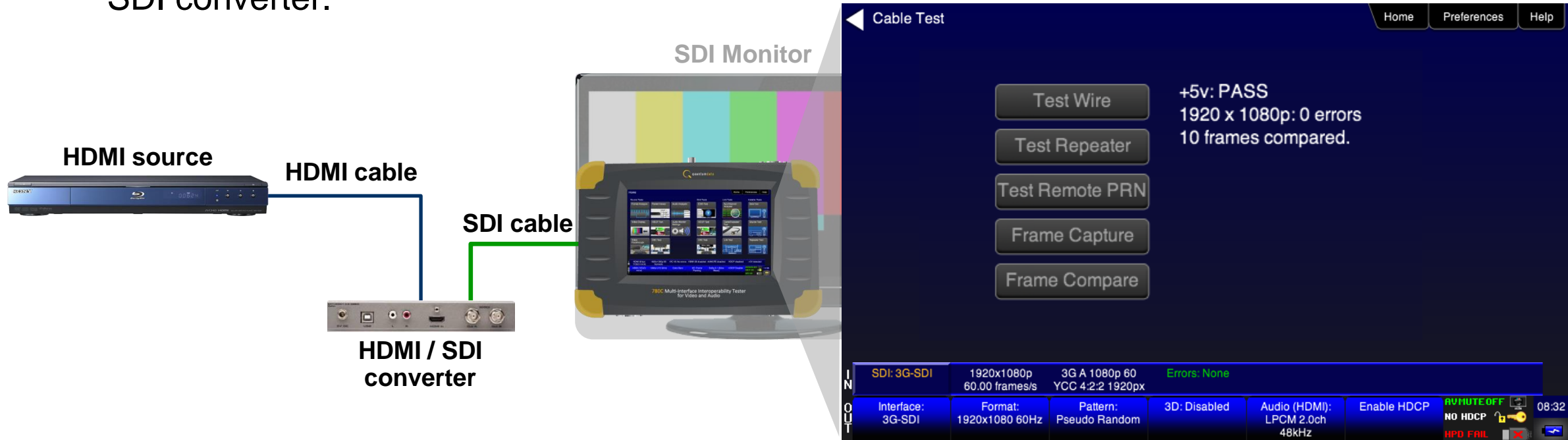


The screenshot shows the 'Video Display' and 'Format Analyzer' windows of the 780C software. The 'Video Display' window shows a video frame of a horse and reports the following timing: 1920 x 1080, 60 frames/sec, Progressive. The 'Format Analyzer' window shows a 'Read' button and reports the following video parameters: Total: 2200 x 1125, Active: 1920 x 1080, Frames/sec: 60.00, Scan type: Progressive, and Errors: None. Below the main analysis, there are two SMPTE 352M embedded packet details for Stream 1 and Stream 2, both reporting 1080-line on Level A 3G-SDI, 60 frames/sec, and 10-bit depth. At the bottom, a status bar provides a summary of the interface and format settings.

| Interface: | Format: | Pattern: | 3D: | Audio (HDMI): | Enable HDCP: | AVMUTE OFF | NO HDCP | MPD FAIL | 08:32 |
|------------|----------------|---------------|----------|------------------|--------------|------------|---------|----------|-------|
| 3G-SDI | 1920x1080 60Hz | Pseudo Random | Disabled | LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF | NO HDCP | MPD FAIL | 08:32 |

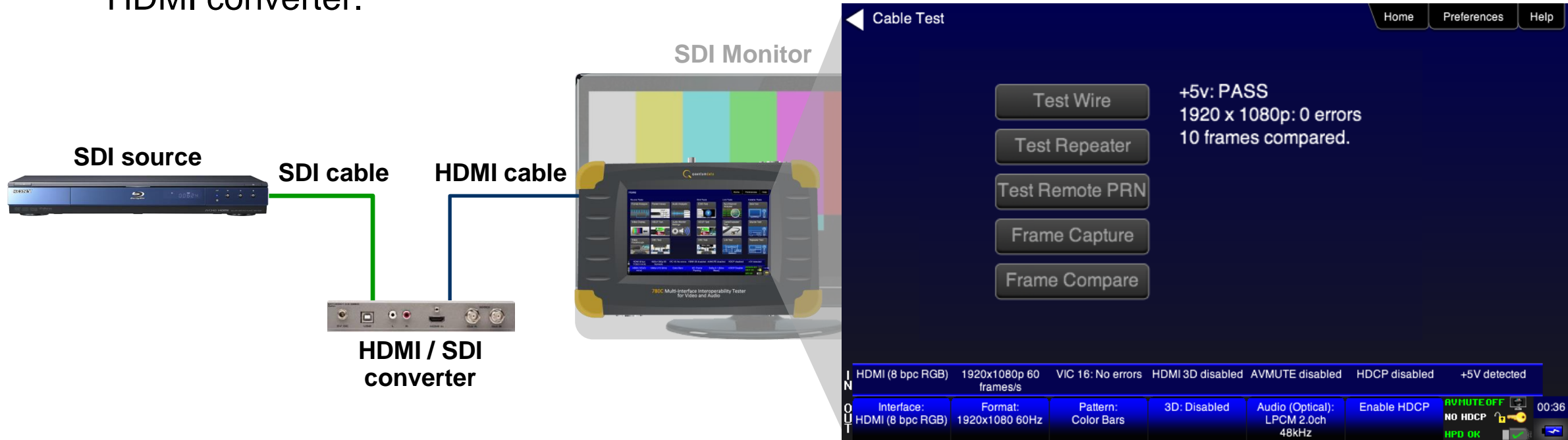
780C Sample Application – SDI Device Testing

- SDI Device Testing (780C)
 - Check for pixel errors on HDMI to SDI converter.



780C Sample Application – SDI Device Testing

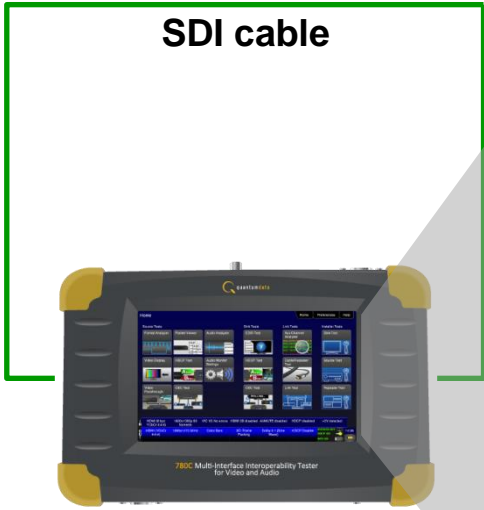
- SDI Device Testing (780C)
 - Check for pixel errors on SDI to HDMI converter.



Sample Applications – 3G-SDI Cable Test

- SDI Cable Testing (780C)
 - Check for pixel errors on an 3G-SDI cable.

SDI cable



780C Multi-Interface Interoperability Tester for Video and Audio

Cable Test

Home Preferences Help

1080p60 (3G-SDI): 0 errors
720p60 (HD-SDI): 0 errors
576i25 (SD-SDI): 0 errors

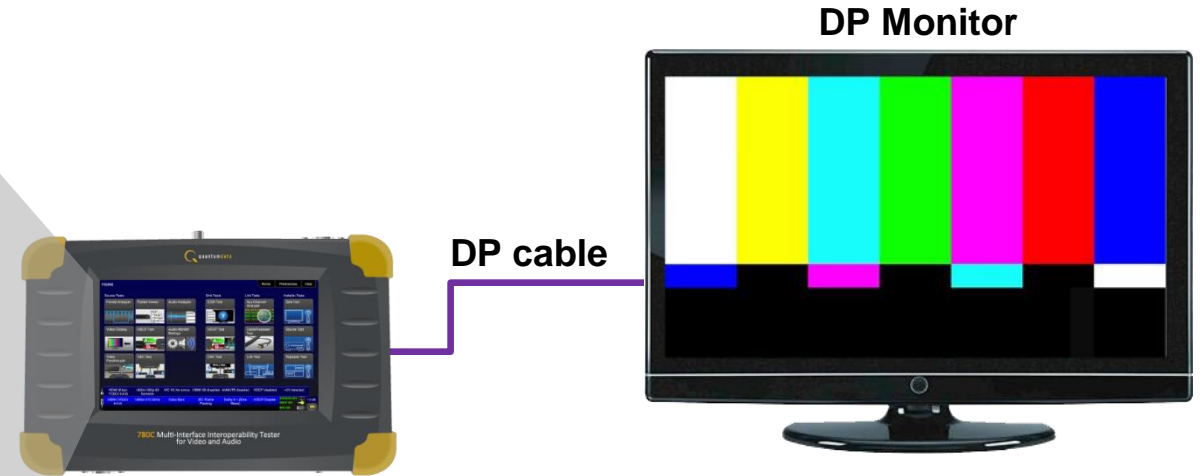
Test Wire
Test Repeater
Test Remote PRN
Frame Capture
Frame Compare

| | | | | | | | | |
|-----|-------------------|-------------------------|---------------------------------|--------------|--------------------------------------|-------------|-----------------------------------|-------|
| IN | SDI: SD-SDI | 720x576i 25.00 frames/s | 48x/576i 25 YCC 4:2:2 4:3 720px | Errors: None | | | | |
| OUT | Interface: SD-SDI | Format: 720x576i 25Hz | Pattern: Pseudo Random | 3D: Disabled | Audio (Disabled): LPCM 2.0ch 44.1kHz | Enable HDCP | A/MUTE OFF NO HDCP HPO FAIL | 23:30 |

Applications - DisplayPort

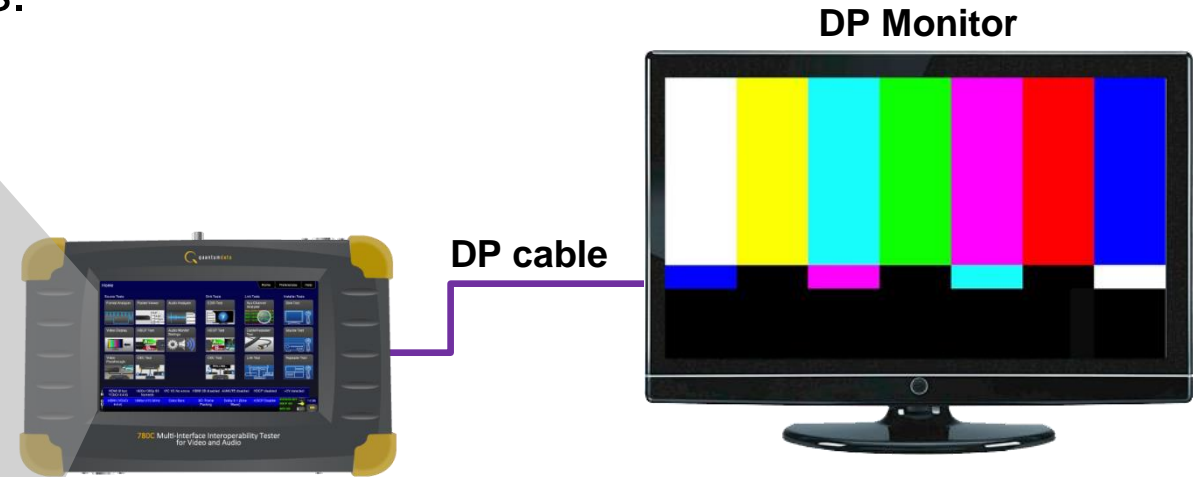
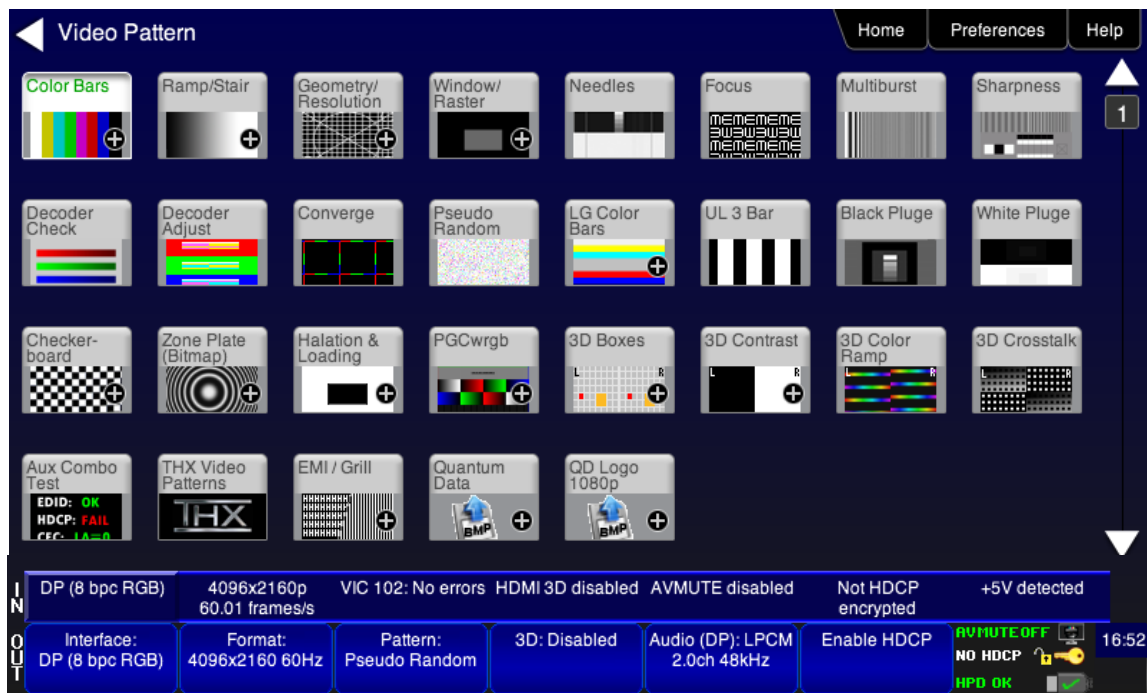
780E Sample Application – DisplayPort Device Testing

- DisplayPort Sink Device Testing (780E)
 - Test video on an DisplayPort display device.



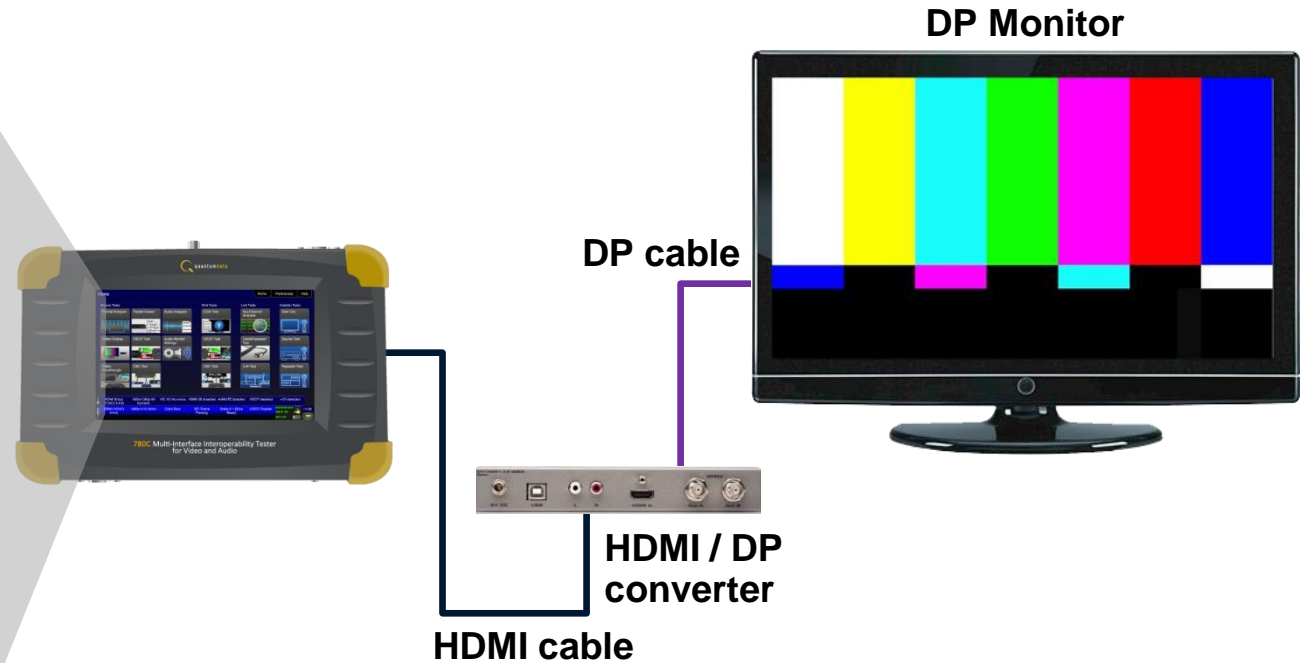
780E Sample Application – DisplayPort Device Testing

- DisplayPort Sink Device Testing (780E)
 - Test video on an DisplayPort display device.
 - Supports library of standard test patterns.



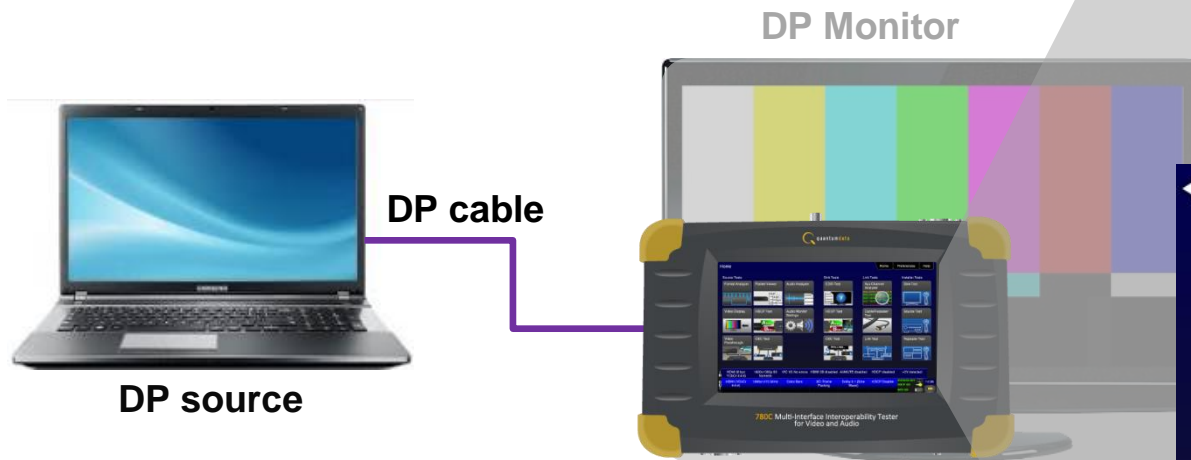
780E Sample Application – DisplayPort Device Testing

- DisplayPort Device Testing (780E)
 - Test video on an HDMI to DisplayPort converter device.



780E Sample Application – DisplayPort Device Testing

- DisplayPort Source Device Testing (780E)
 - Verify video and timing from an DisplayPort source device.



Video Display Home Preferences Help

Timing: 3840 x 2160
~60 frames/sec, Progressive
Video type: DisplayPort
Bits per color: 8
Color space: RGB
Colorimetry: No data
Range: Full
VIC code: 97
AV Mute: Disabled
HDCP: Disabled

Format Analyzer Home Preferences Help

Read

Errors: None

Video type: DisplayPort
Total: 4400 x 2250
Active: 3840 x 2160
Frames/sec: 60.00
Scan type: Progressive
HSYNC delay: 176
HSYNC width: 88
VSYNC delay: 8
VSYNC width: 10
HSYNC polarity: +
VSYNC polarity: +

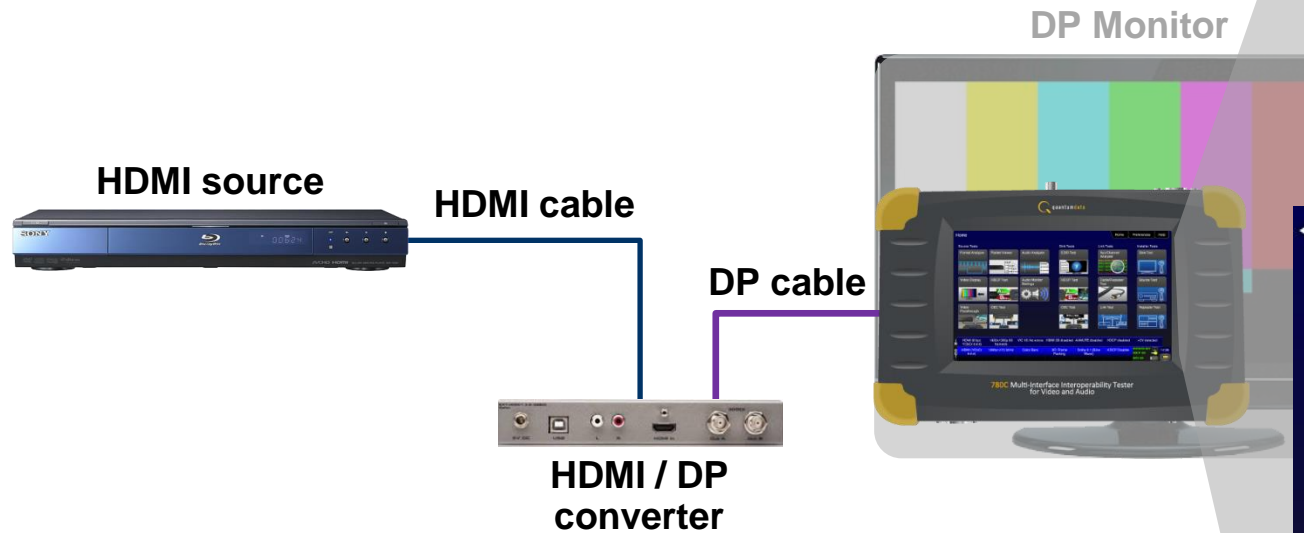
Bits per comp.: 8
Color space: RGB
Colorimetry: No data
Pixels repeated 0 times
Video ID code (VIC): 97
(3840 x 2160 p
@ 59.94Hz/60Hz 16:9)
AV Mute Status: Not muted
HDCP: Not encrypted

| | | | | | | |
|------------------------------|------------------------------|---------------------|------------------|--|--------------------|---------------------------------|
| DP (8 bpc RGB) | 3840x2160p 60.00 frames/s | VIC 97: No errors | HDMI 3D disabled | AVMUTE disabled | Not HDCP encrypted | +5V detected |
| Interface: DP (8 bpc RGB) | Format: 3840x2160 60Hz | Pattern: PGCwrgb | 3D: Disabled | Audio (Disabled): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF NO HDCP HPD OK |

21:01

780E Sample Application – DisplayPort Device Testing

- DisplayPort Device Testing (780E)
 - Verify video and timing through HDMI to DisplayPort converter device.



Video Display Home Preferences Help

Timing: 3840 x 2160
 ~60 frames/sec, Progressive
 Video type: DisplayPort
 Bits per color: 8
 Color space: RGB
 Colorimetry: No data
 Range: Full
 VIC code: 97
 AV Mute: Disabled
 HDCP: Disabled

Format Analyzer Home Preferences Help

Errors: None

Video type: DisplayPort
 Total: 4400 x 2250
 Active: 3840 x 2160
 Frames/sec: 60.00
 Scan type: Progressive
 HSYNC delay: 176
 HSYNC width: 88
 VSYNC delay: 8
 VSYNC width: 10
 HSYNC polarity: +
 VSYNC polarity: +

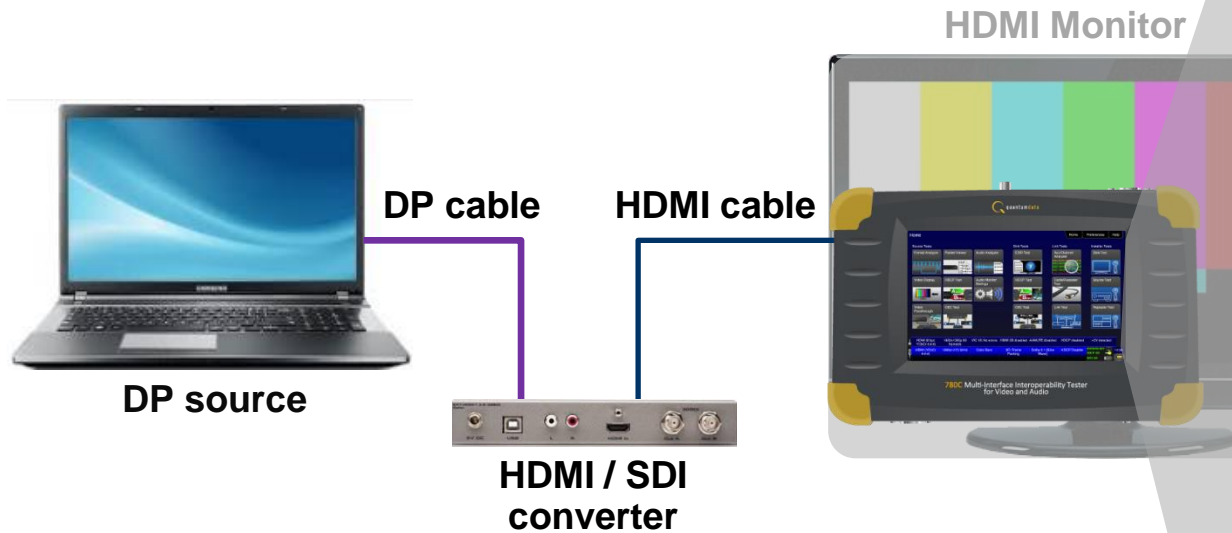
Bits per comp.: 8
 Color space: RGB
 Colorimetry: No data
 Pixels repeated 0 times
 Video ID code (VIC): 97
 (3840 x 2160 p
 @ 59.94Hz/60Hz 16:9)
 AV Mute Status: Not muted
 HDCP: Not encrypted

| | | | | | | | |
|--------|------------------------------|------------------------------|---------------------|------------------|--|--------------------|---------------------------------|
| IN | DP (8 bpc RGB) | 3840x2160p 60.00 frames/s | VIC 97: No errors | HDMI 3D disabled | AVMUTE disabled | Not HDCP encrypted | +5V detected |
| OUTPUT | Interface: DP (8 bpc RGB) | Format: 3840x2160 60Hz | Pattern: PGCwrgb | 3D: Disabled | Audio (Disabled): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF NO HDCP MPD OK |

21:01

780E Sample Application – DisplayPort Device Testing

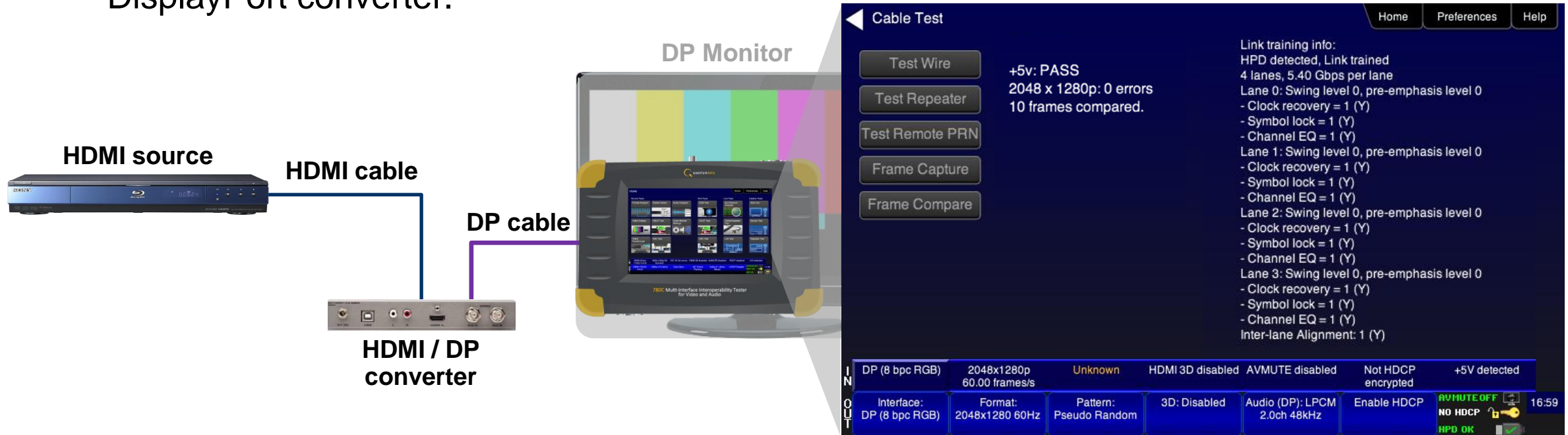
- DisplayPort Device Testing (780E)
 - Verify video, video parameters and timing through DP to HDMI converter device.



The screenshot shows the 780E software interface. The top panel, titled "Video Display", shows a video of a horse and lists the following parameters: Timing: 3840 x 2160, ~60 frames/sec, Progressive; Video type: HDMI; Color space: YCbCr 4:2:2; Colorimetry: ITU-709; Range: Limited; VIC code: 4; AV Mute: Disabled; HDCP: Disabled. The bottom panel, titled "Format Analyzer", shows a "Read" button and "Errors: None". It lists video parameters: Video type: HDMI; Total: 2200 x 1125; Active: 1920 x 1080; Frames/sec: 60.5 (121.1 fields); Scan type: Interlaced; HSYNC delay: 88; HSYNC width: 44; VSYNC delay: 2; VSYNC width: 5; HSYNC polarity: +; VSYNC polarity: +. Color space: YCbCr 4:2:2; Colorimetry: ITU-709; Pixels repeated 0 times; Video ID code (VIC): 46 (1920 x 1080 i @119.88/120Hz 16:9); AV Mute Status: Not muted; HDCP: Not encrypted. At the bottom, there is an "IN" and "OUT" status bar with the following information: IN: HDMI (8 bpc YCbCr 4:2:2), 3840x2160p 30 frames/s, Unknown, HDMI 3D disabled, AVMUTE disabled, HDCP enabled, +5V detected. OUT: Interface: HDMI (8 bpc YCbCr 4:2:2), Format: 3840x2160 30Hz, Pattern: Color Bars, 3D: Disabled, Audio (Optical): LPCM 2.0ch 48kHz, Disable HDCP, AVMUTE OFF, HDCP OK, HPD OK, 00:44.

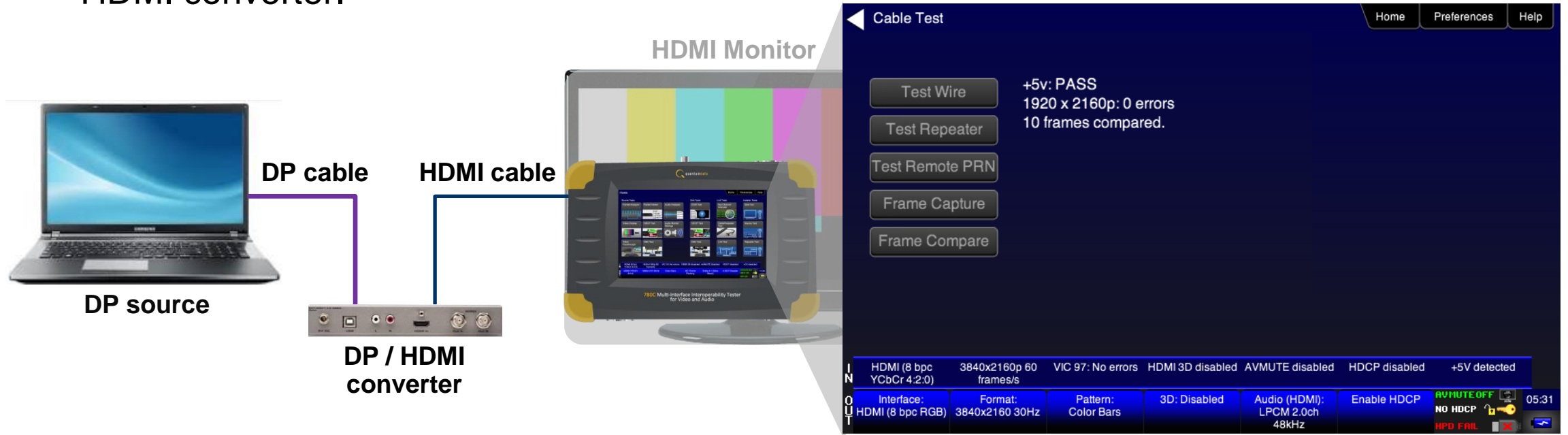
780E Sample Application – DisplayPort Device Testing

- DisplayPort Device Testing (780E)
 - Check for pixel errors on HDMI to DisplayPort converter.



780E Sample Application – DisplayPort Device Testing


- DisplayPort Device Testing (780E)
 - Check for pixel errors on DisplayPort to HDMI converter.



Sample Applications – DisplayPort Cable Test

- DisplayPort Cable Testing (780E)
 - Check for pixel errors on a DisplayPort cable.

DisplayPort cable



Cable Test

Test Wire
Test Repeater
Test Remote PRN
Frame Capture
Frame Compare

2160p30 (8 bits): **0 errors**
1080p60 (12 bits): **0 errors**
1080p60 (8 bits): **0 errors**
720p60 (8 bits): **0 errors**
480p60 (8 bits): **0 errors**
AUX (EDID Read): **PASS**

Link training info:
HPD detected, Link trained
4 lanes, 5.40 Gbps per lane
Lane 0: Swing level 0, pre-emphasis level 0
- Clock recovery = 1 (Y)
- Symbol lock = 1 (Y)
- Channel EQ = 1 (Y)
Lane 1: Swing level 0, pre-emphasis level 0
- Clock recovery = 1 (Y)
- Symbol lock = 1 (Y)
- Channel EQ = 1 (Y)
Lane 2: Swing level 0, pre-emphasis level 0
- Clock recovery = 1 (Y)
- Symbol lock = 1 (Y)
- Channel EQ = 1 (Y)
Lane 3: Swing level 0, pre-emphasis level 0
- Clock recovery = 1 (Y)
- Symbol lock = 1 (Y)
- Channel EQ = 1 (Y)
Inter-lane Alignment: 1 (Y)

| | | | | | | | |
|-----|------------------------------|------------------------------|---------------------------|------------------|---------------------------------|--------------------|---------------------------------|
| IN | DP (8 bpc RGB) | 2048x1280p 60.01 frames/s | Unknown | HDMI 3D disabled | AVMUTE disabled | Not HDCP encrypted | +5V detected |
| OUT | Interface: DP (8 bpc RGB) | Format: 2048x1280 60Hz | Pattern: Pseudo Random | 3D: Disabled | Audio (DP): LPCM 2.0ch 48kHz | Enable HDCP | AVMUTE OFF NO HDCP HPD OK |

16:59