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# 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.

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# 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.

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# 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.

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# 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

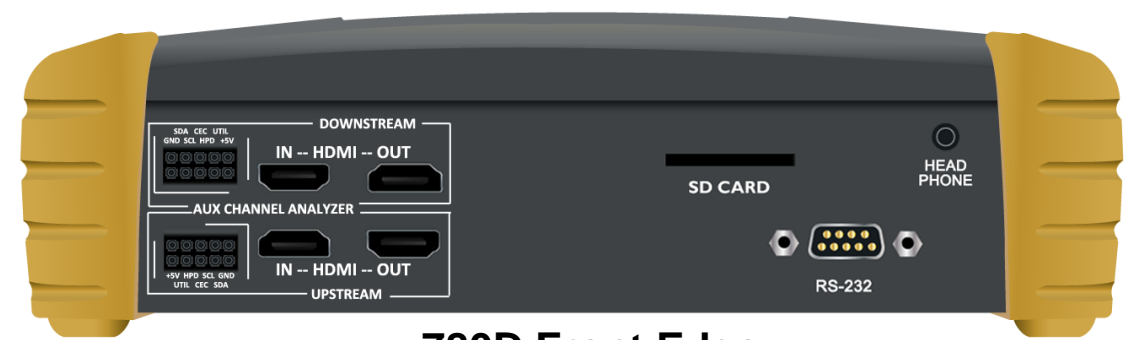




# 780D Video Generator / Protocol Analyzer – Interfaces/Options



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

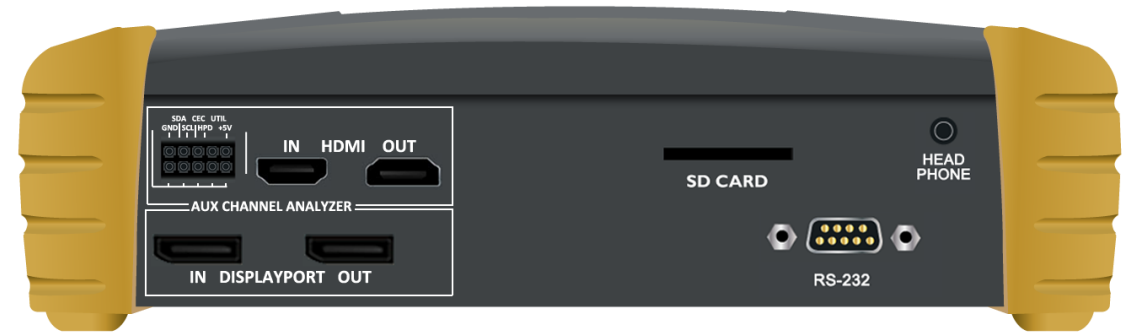
# Model 780E



# 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:

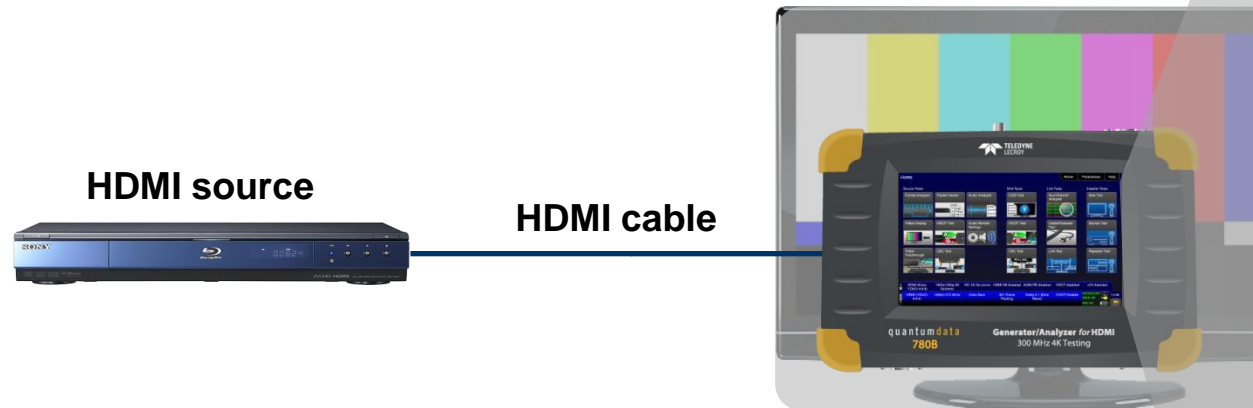
- Cable Test – Test HDMI cables and distribution networks.
- Test pattern packs – ISF, THX China Resolution.
- Auxiliary Channel Analyzer (passive & emulation) – Monitor HDCP, EDID transactions, hot plug events and CEC messages between source and sink DUTs.

# 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

Read

Errors:  
None

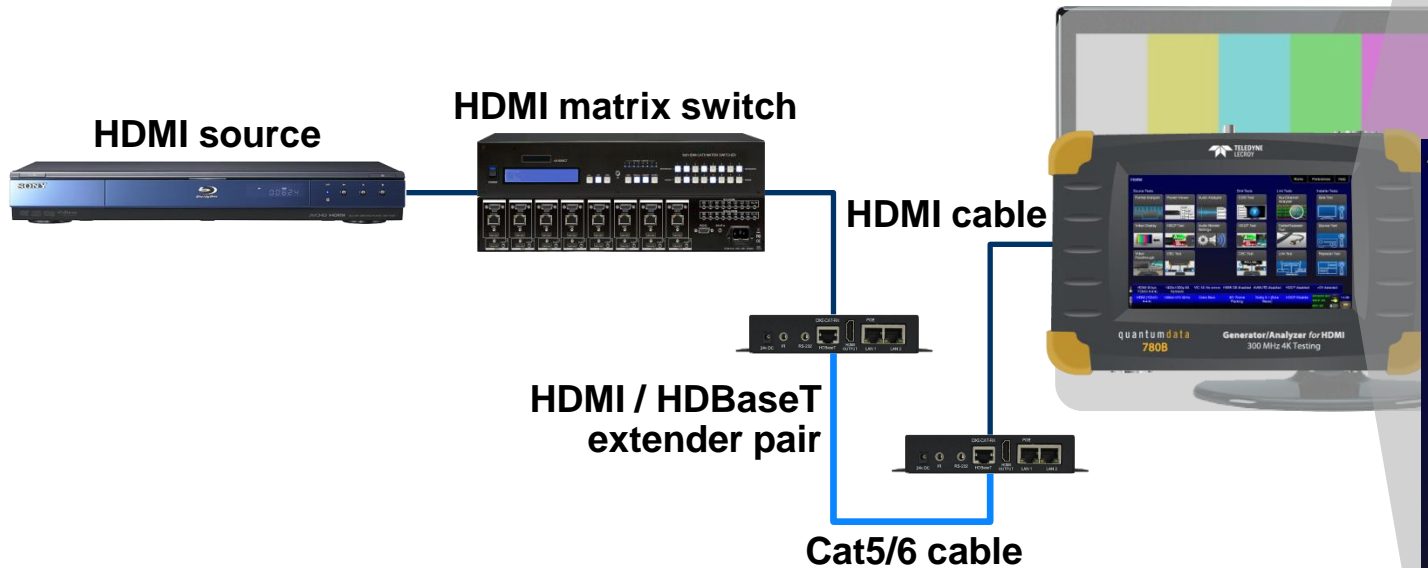
Video type: HDMI  
Total: 2200 x 1125  
Active: 1920 x 1080  
Frames/sec: 60.5 (121.1 fields)  
Scan type: Interlaced  
HSYNC delay: 88  
HSYNC width: 44  
VSYNC delay: 2  
VSYNC width: 5  
HSYNC polarity: +  
VSYNC polarity: +

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

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
U							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 two software windows from the Teledyne Lecroy application. The top window, **Video Display**, shows a video frame of a horse and displays 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 window, **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

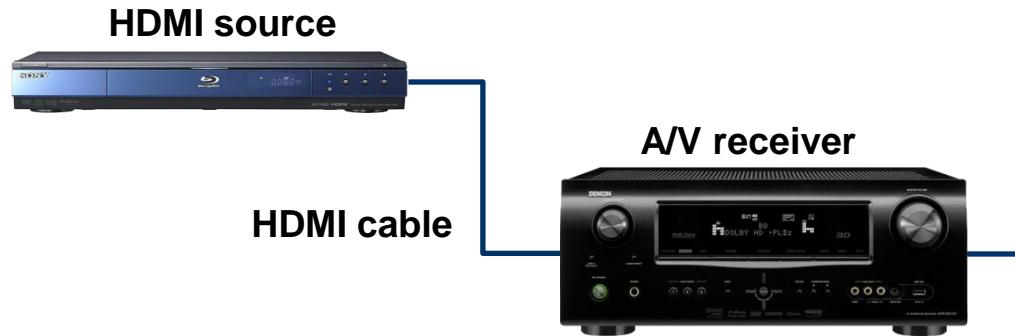
At the bottom of the Format Analyzer window, there is a status bar with the following information:

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

The status bar also shows a timer at 00:44.

# 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 top section is titled 'Video Display' and shows a video of a horse. The bottom section is titled 'Audio Analysis' and shows detailed audio metadata.

**Video Display**

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

**Audio Analysis**

Read

Dolby: 5ch. [L, C, R, SL, SR]  
48KHz sampling rate  
448 KHz target bitrate

Audio InfoFrame data:  
Channel count: 6 channels  
Coding type: 0 (Refer to stream header)  
Word length: Refer to stream header  
Sampling freq.: Refer to stream header  
Channel allocation:  
--- RR RL FC LFE  
FR FL

Channel status bits:  
Application: Consumer  
Sample words: Other  
Copyright asserted: Yes  
Format info: 2 ch., no pre-emph.  
Mode: 0  
Category code: 00  
Source number: 0  
Channel number: 0  
Sampling freq.: 48 KHz  
Word length: 16 bits

HDMI (8 bpc YCbCr 4:2:2) 3840x2160p 30 frames/s Unknown HDMI 3D disabled AVMUTE disabled HDCP enabled +5V detected

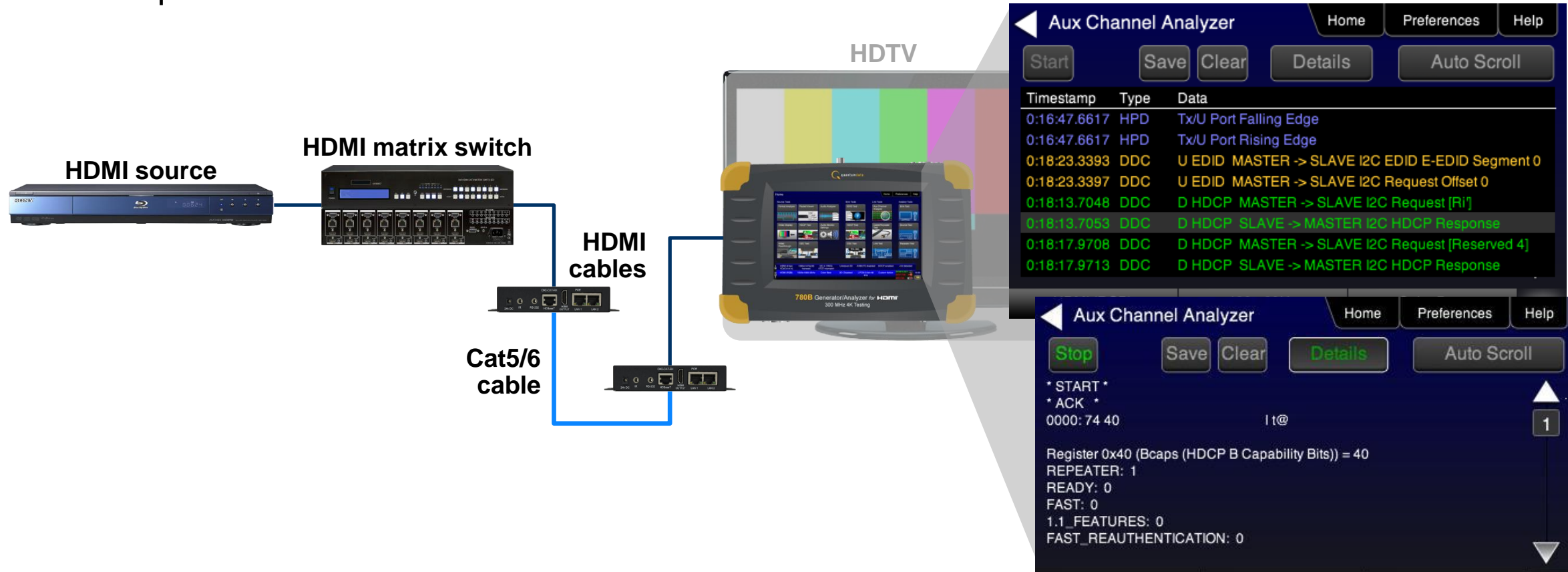
Interface: HDMI (8 bpc YCbCr 4:2:2) Format: 3840x2160 30Hz Pattern: Color Bars 3D: Disabled Audio (Optical): LPCM 2.0ch 48KHz

Disable HDCP AVMUTE OFF HDCP OK HPD OK 00:44

HDMI (RGB) 1080p 60Hz 3D Contrast

# 780 Sample Application – HDMI Distribution Network

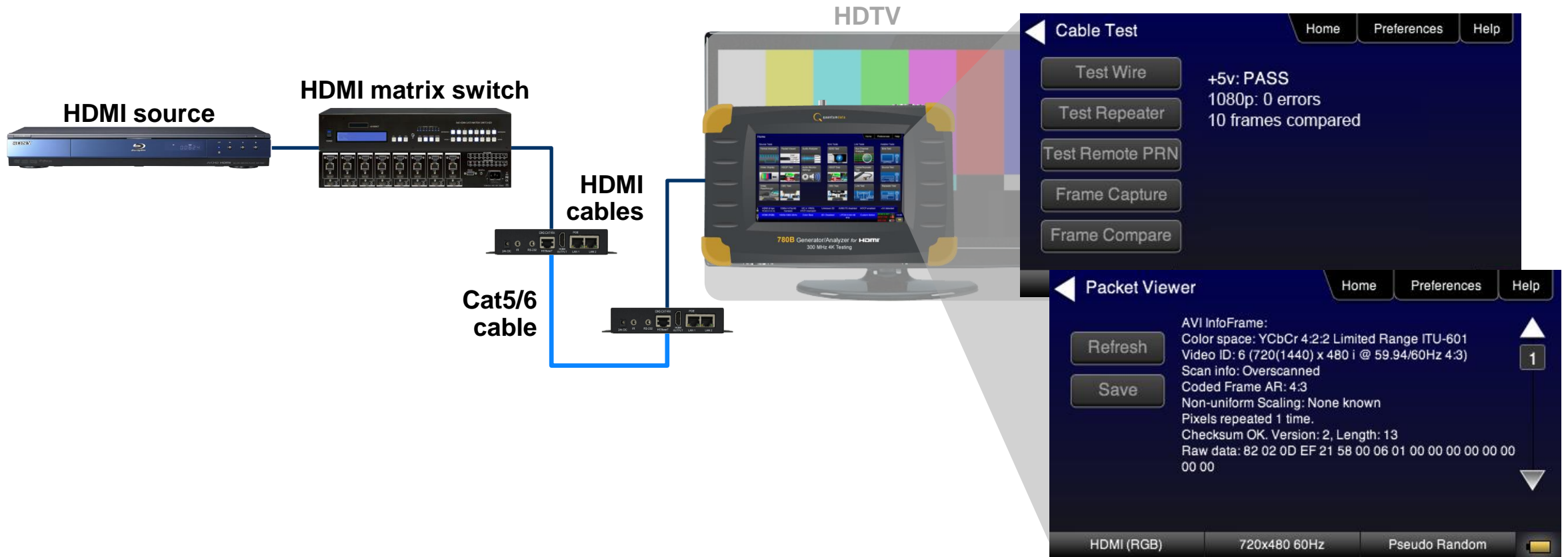
- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
  - Monitor DDC (HDCP & EDID) and hot plug events of an HDMI source device or upstream distribution network.





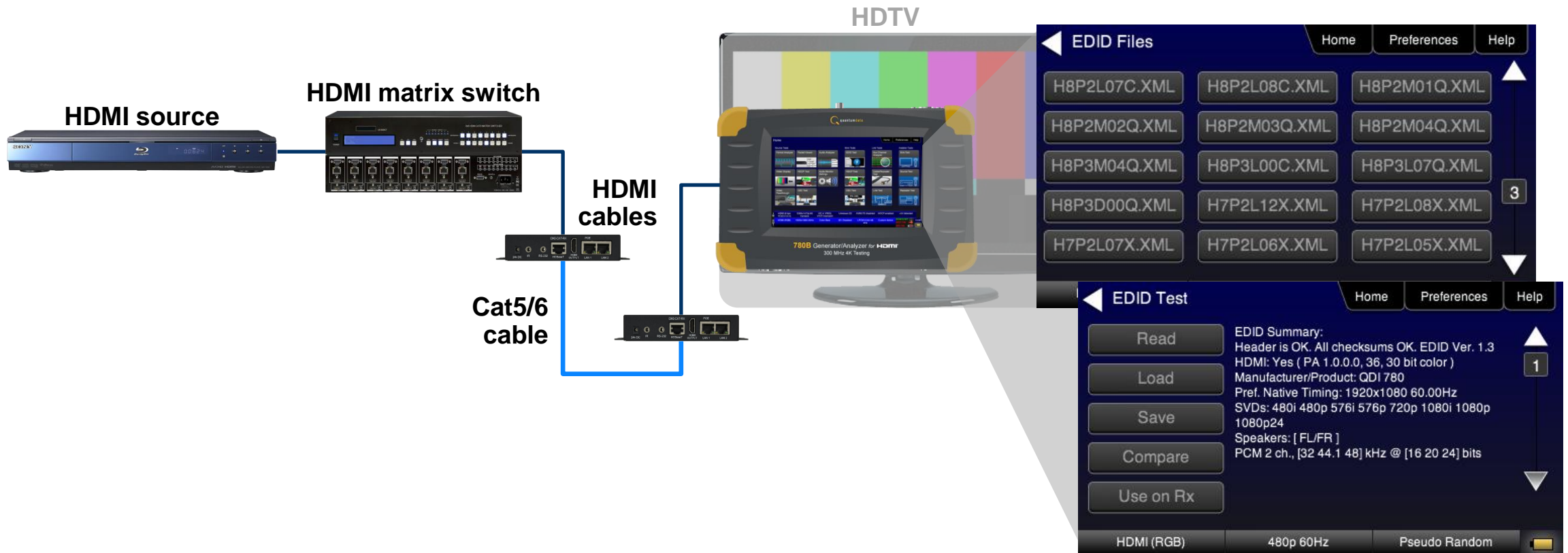
# 780 Sample Application – HDMI Distribution Network

- 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

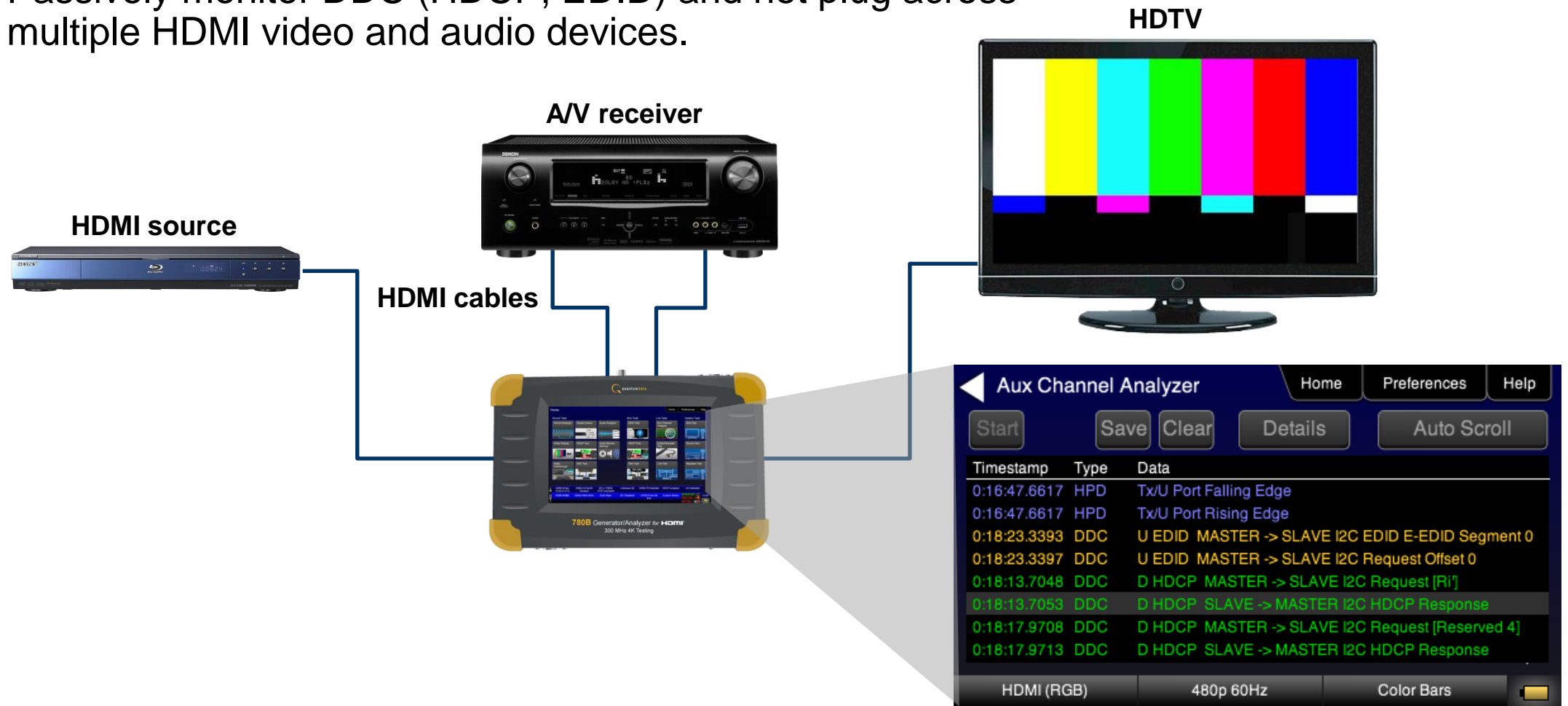
- HDMI Source Testing (780, 780AH, 780BH, 780C, 780D, 780E)
  - Verify HDMI source or distribution network's handling of various HDMI EDIDs.





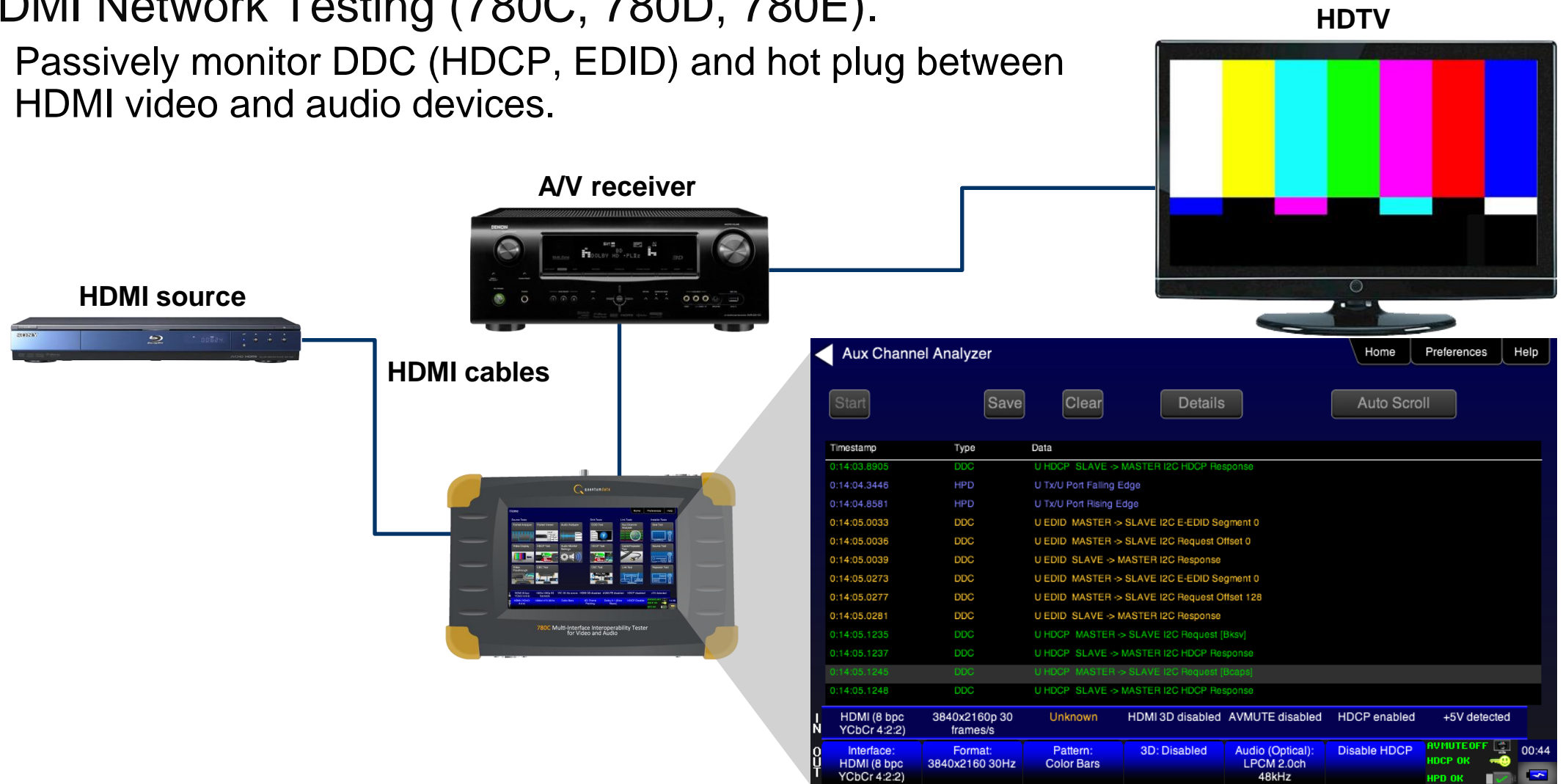
# 780 Sample Application – HDMI Network Testing

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



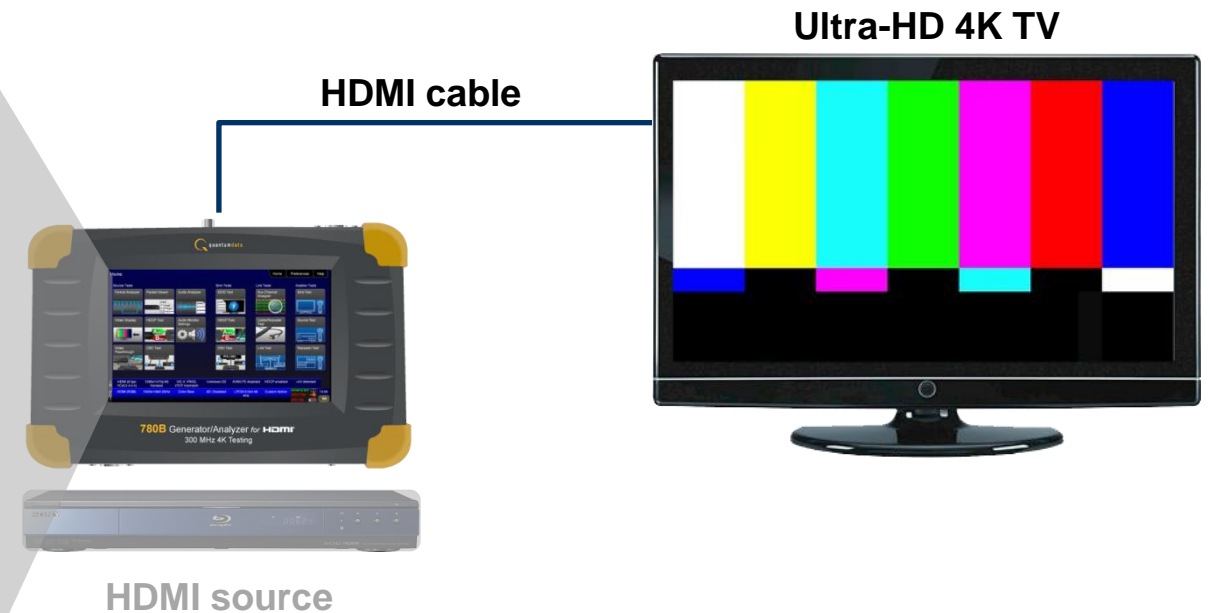
# 780 Sample Application – HDMI Network Testing

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



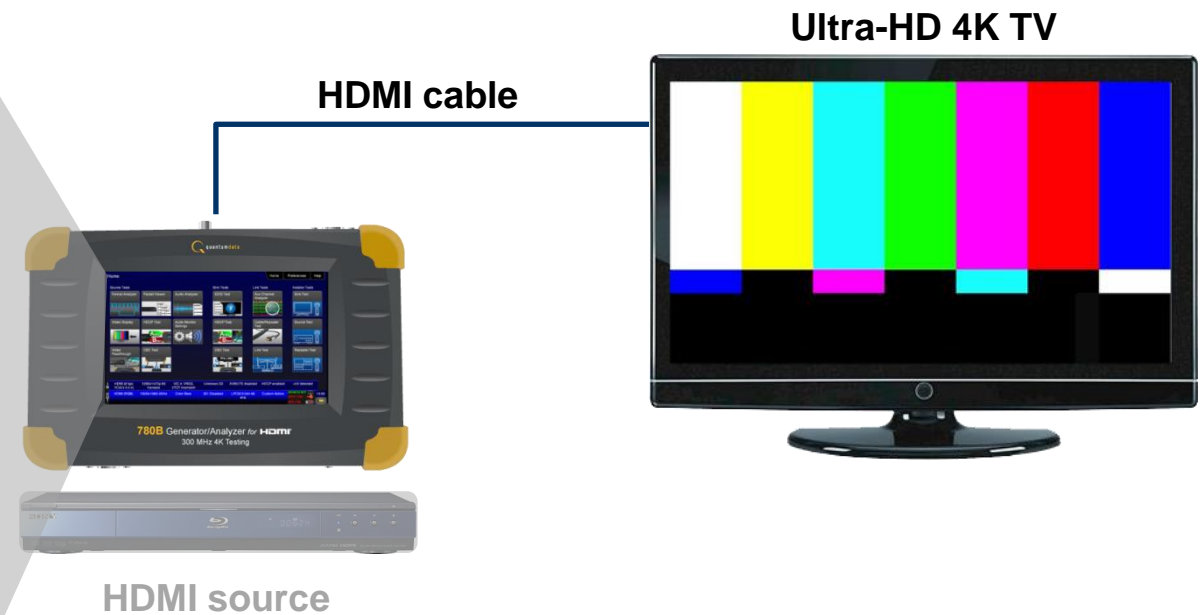
# 780 Sample Application – HDMI Sink Testing

- 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).



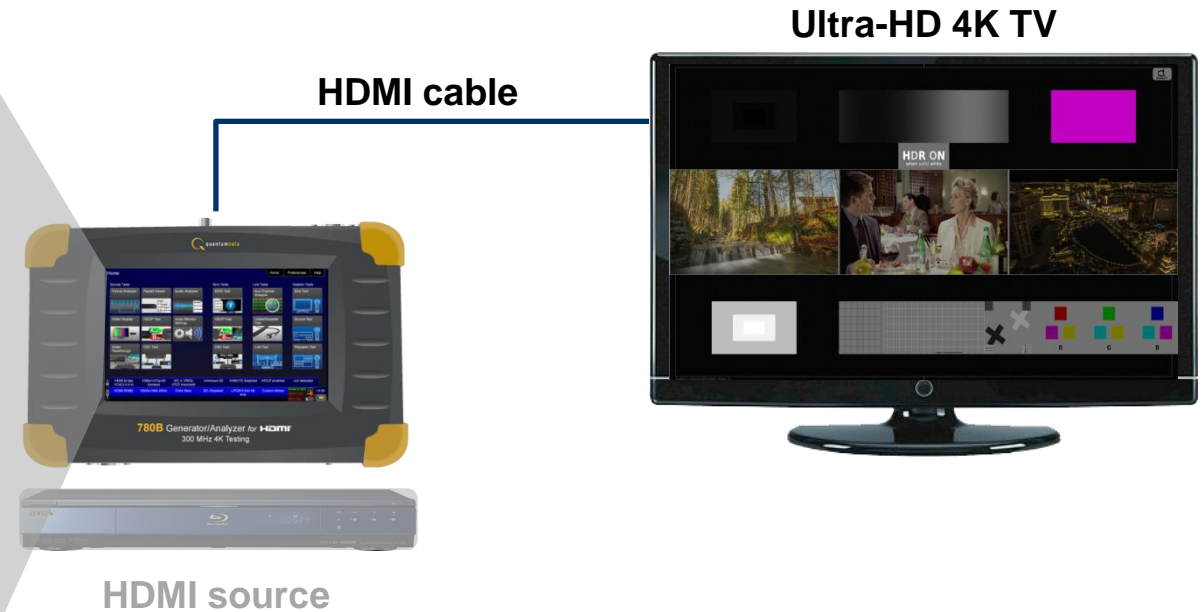
# 780 Sample Application – HDMI Sink Testing

- 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"

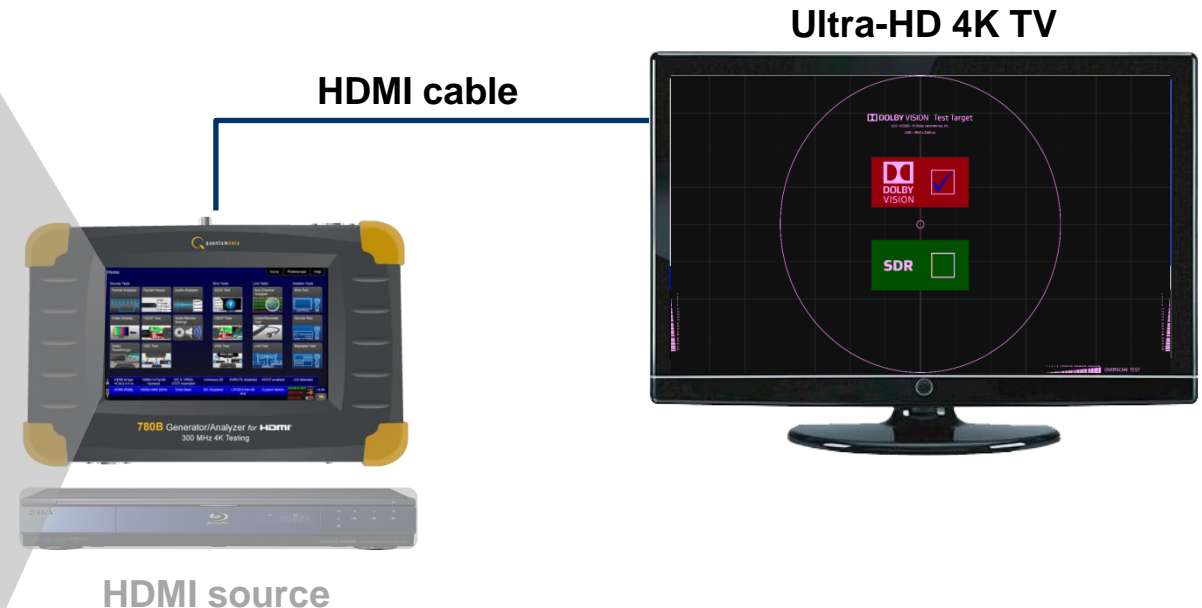
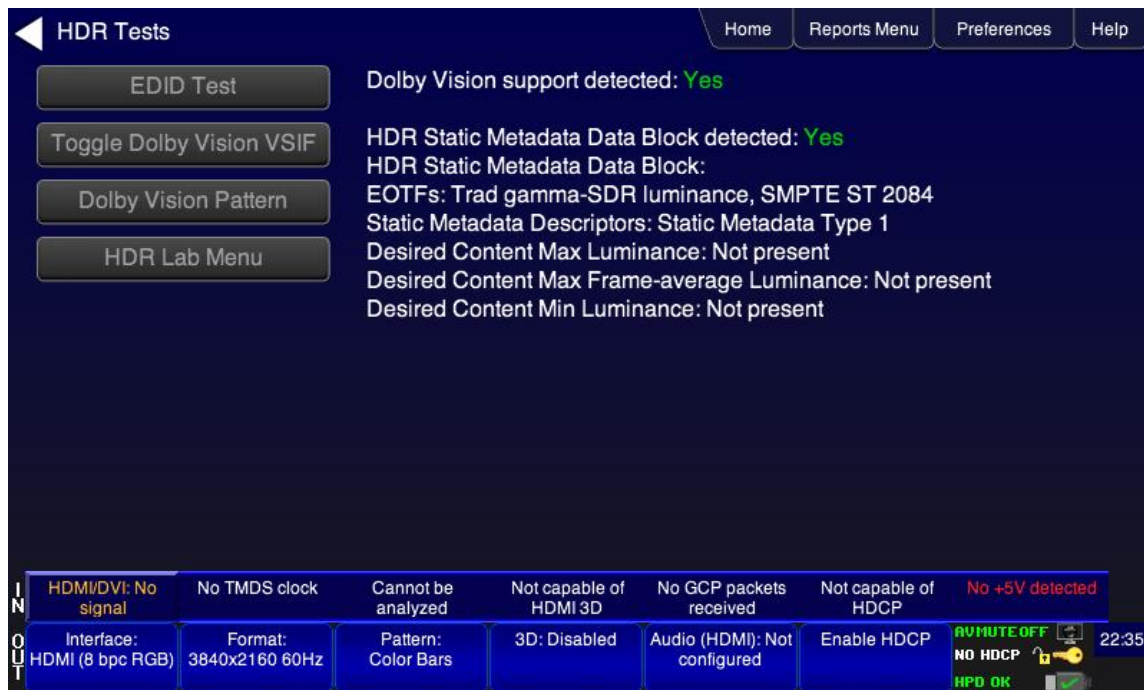
- HDMI High Dynamic Range (HDR) Sink Testing with "HDR Lab" (780E)
  - Verify an Ultra HD TV's HDR capabilities.
  - Use "HDR Lab" test images and test patterns.
  - Test for peak brightness, native contrast, average brightness level, clipping and color gamut.





# 780 Sample Application – HDMI Sink Testing with HDR Dolby Vision

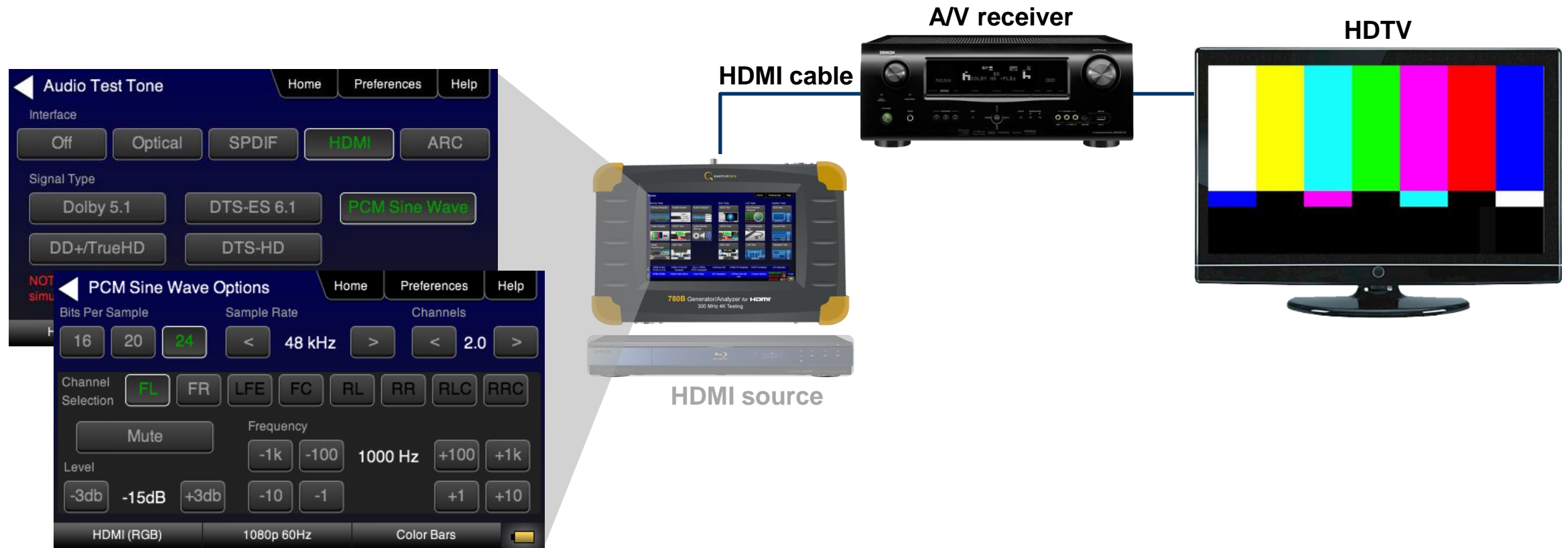
- HDMI High Dynamic Range (HDR) Sink Testing with Dolby Vision (780E)
  - Dolby Vision test image verifies embedded HDR metadata.





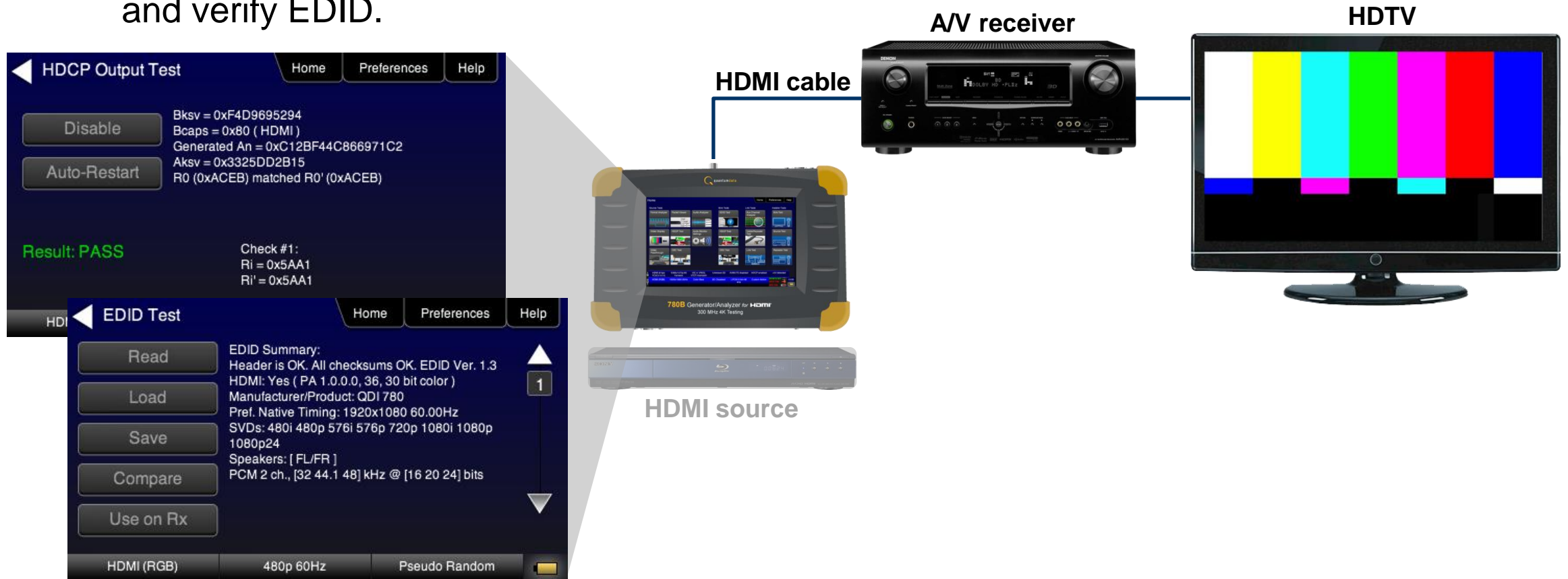
# 780 Sample Application – HDMI Sink Testing

- 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.



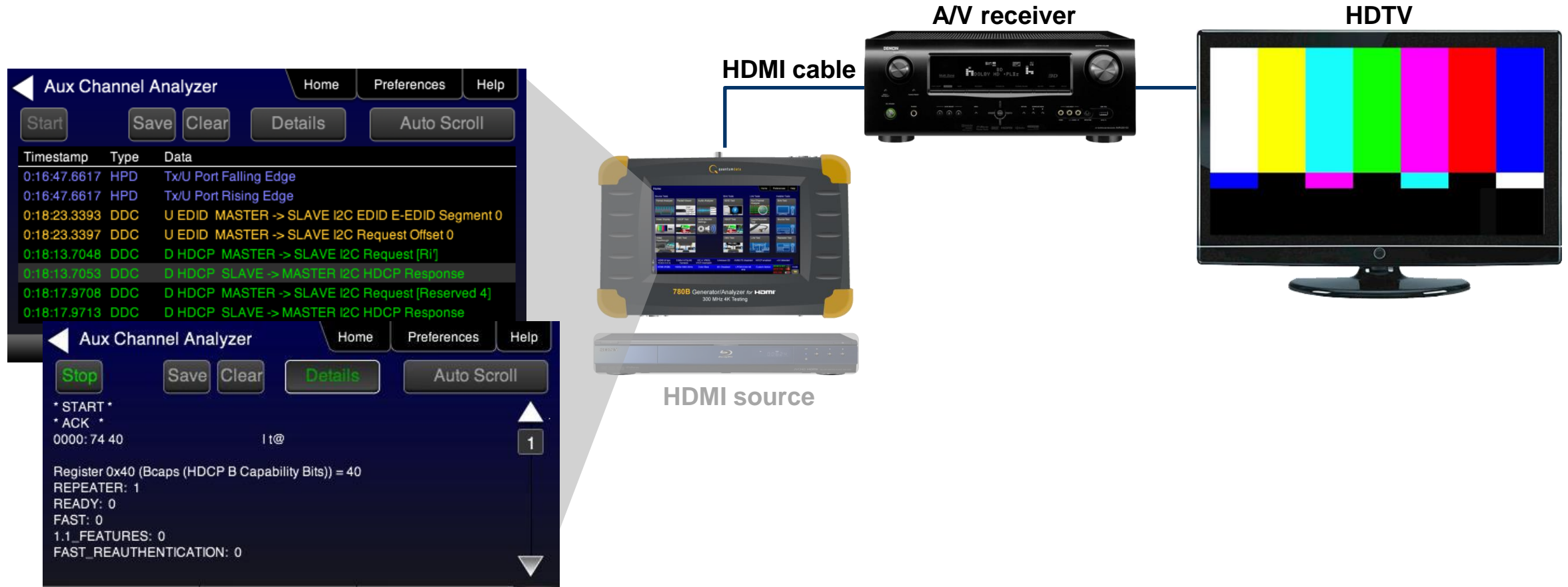
# 780 Sample Application – HDMI Sink Testing

- 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.



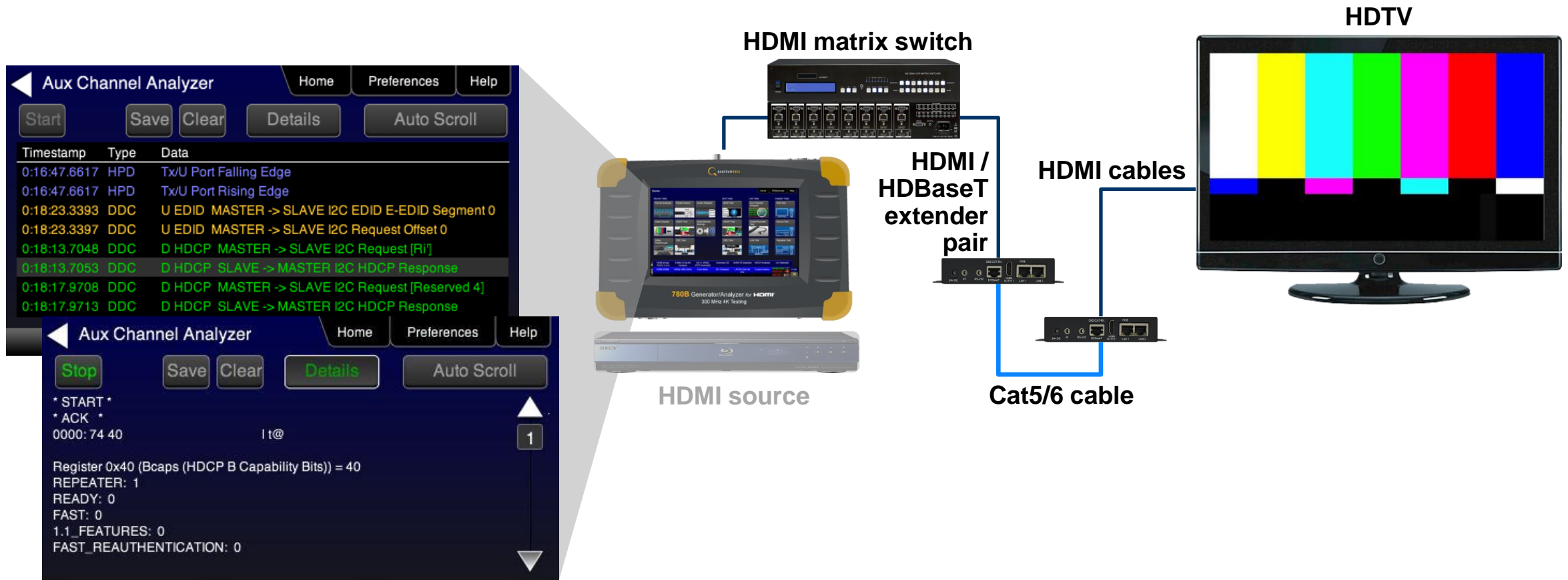
# 780 Sample Application – HDMI Sink Testing

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



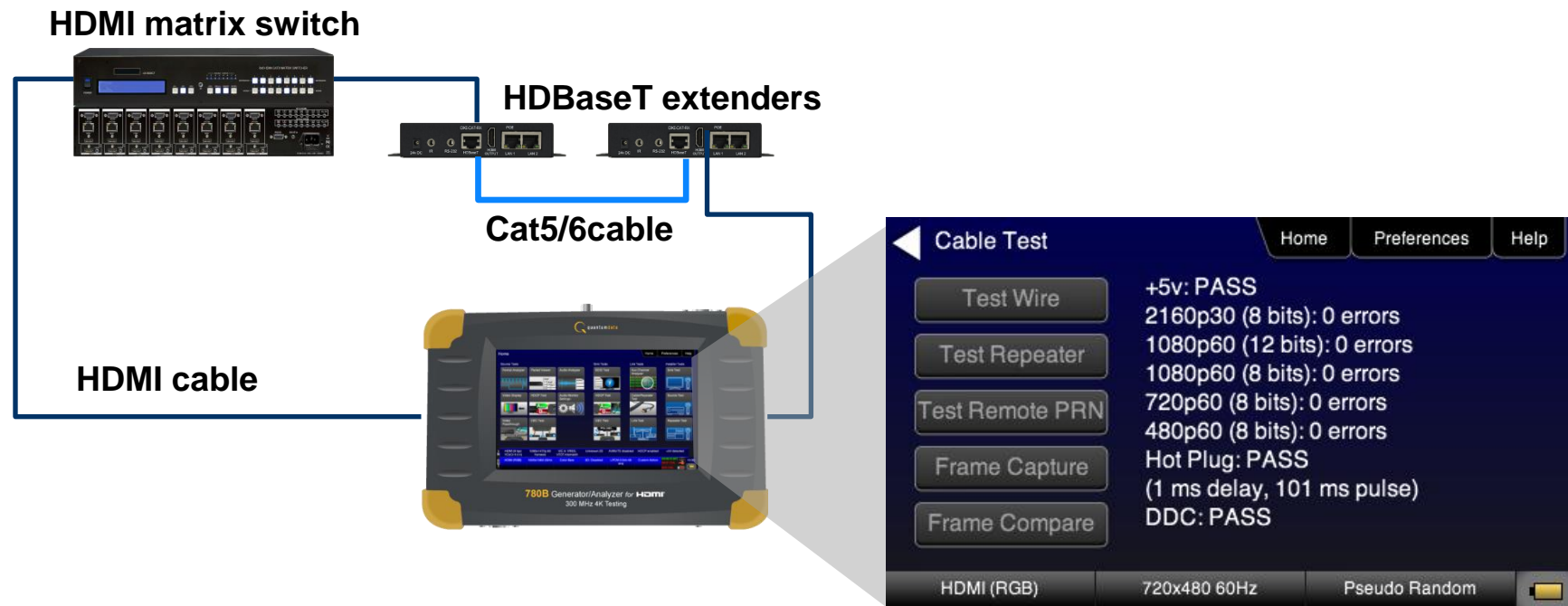
# 780 Sample Application – HDMI Sink Testing

- 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

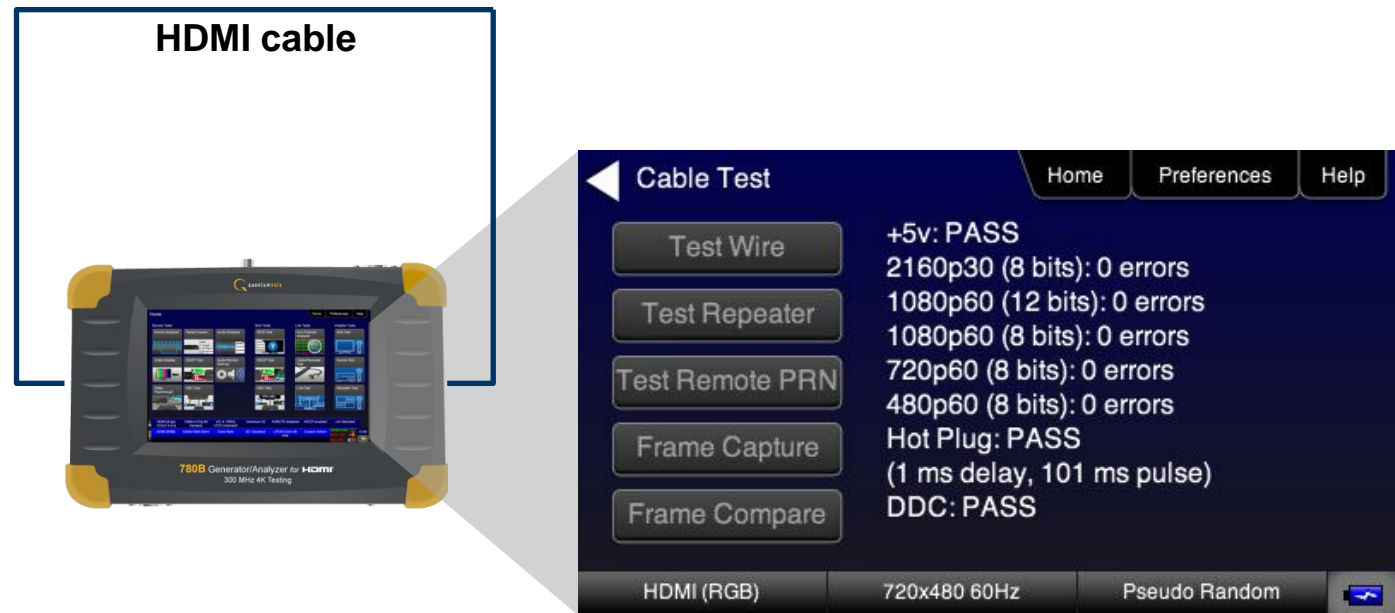
- HDMI Distribution Network Testing (780, 780AH, 780BH, 780C, 780D, 780E)
  - Check for pixel errors on an HDMI / HDBaseT distribution network.





# 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
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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
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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

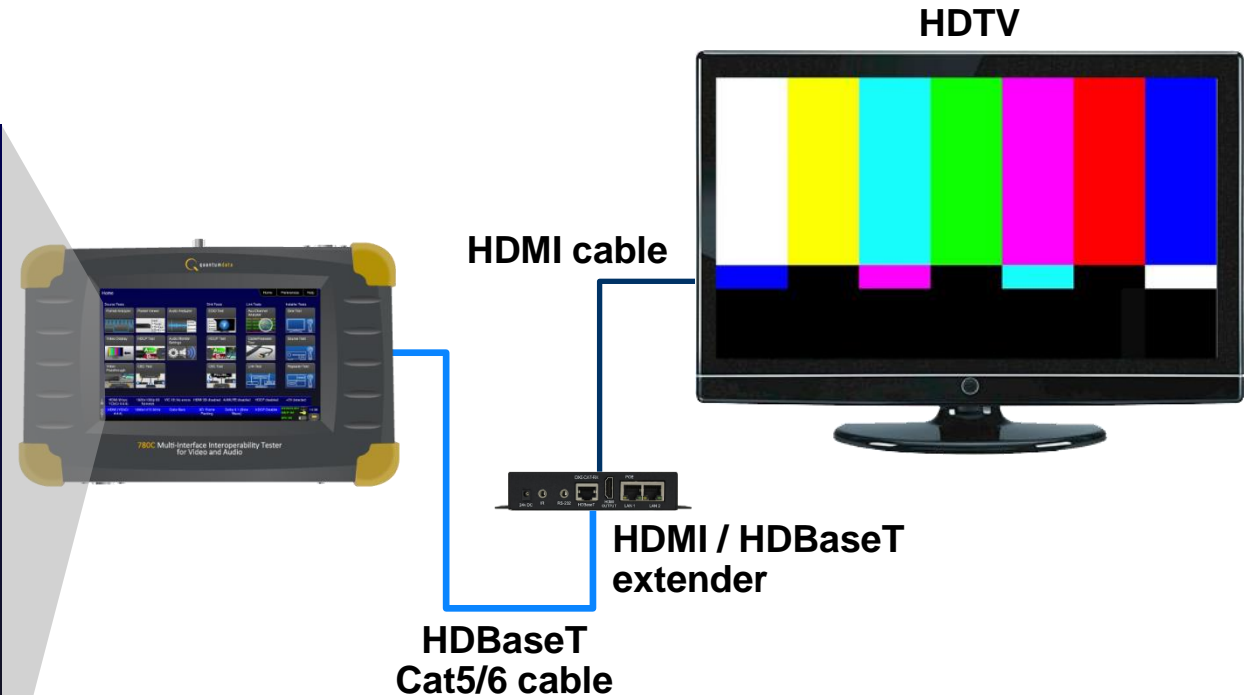
Start Save Clear Details Auto Scroll

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 T E R F A C E

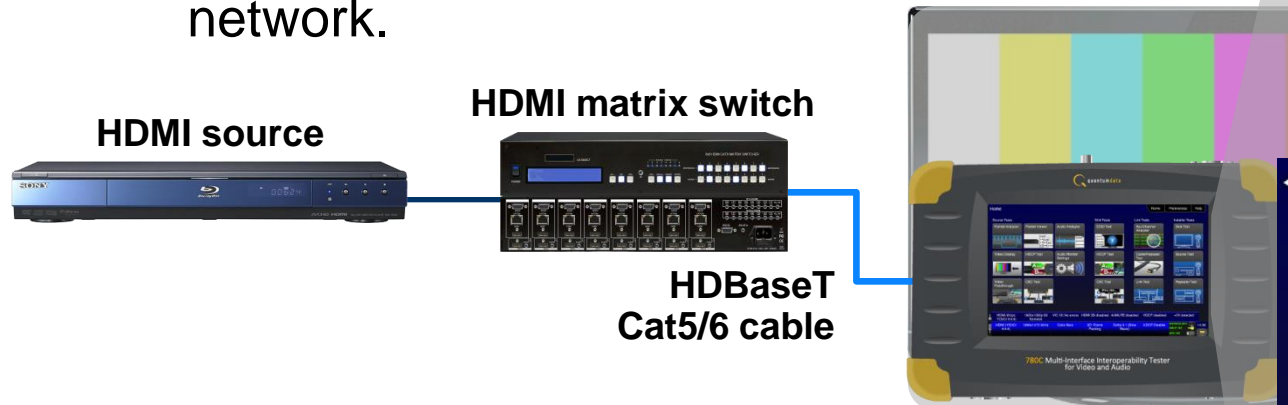
HDBaseT (8 bpc RGB)	3840x2160p 30.00 frames/s	Unknown	HDMI 3D disabled	AVMUTE disabled	HDCP disabled	+5V detected
Interface: HDBaseT (8 bpc RGB)	Format: 3840x2160 30Hz	Pattern: Color Bars	3D: Disabled	Audio (HDMI): LPCM 2.0ch 48kHz	Enable HDCP	AVMUTE OFF HDCP OK HPD OK

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

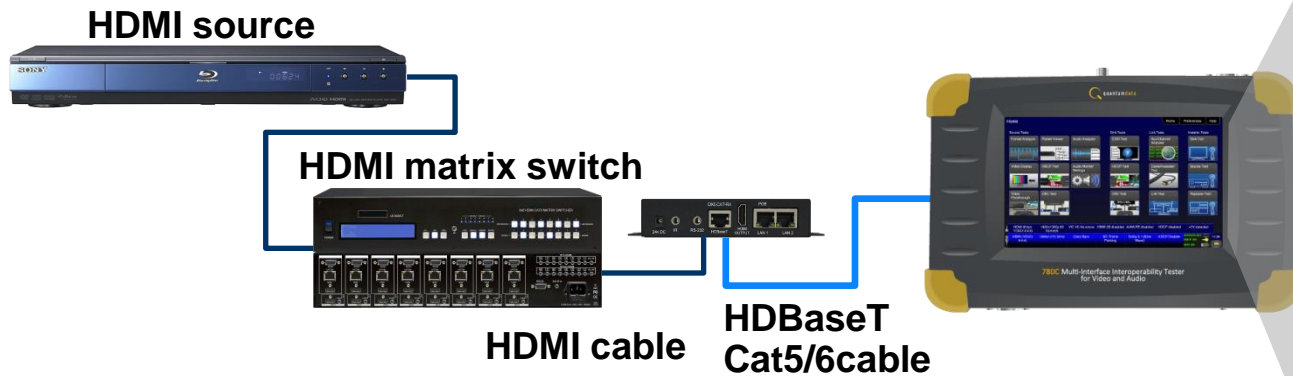
<p>Video type: HDMI                      Total: 2200 x 1125                      Active: 1920 x 1080                      Frames/sec: 60.5 (121.1 fields)                      Scan type: Interlaced                      HSYNC delay: 88                      HSYNC width: 44                      VSYNC delay: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

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



# 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

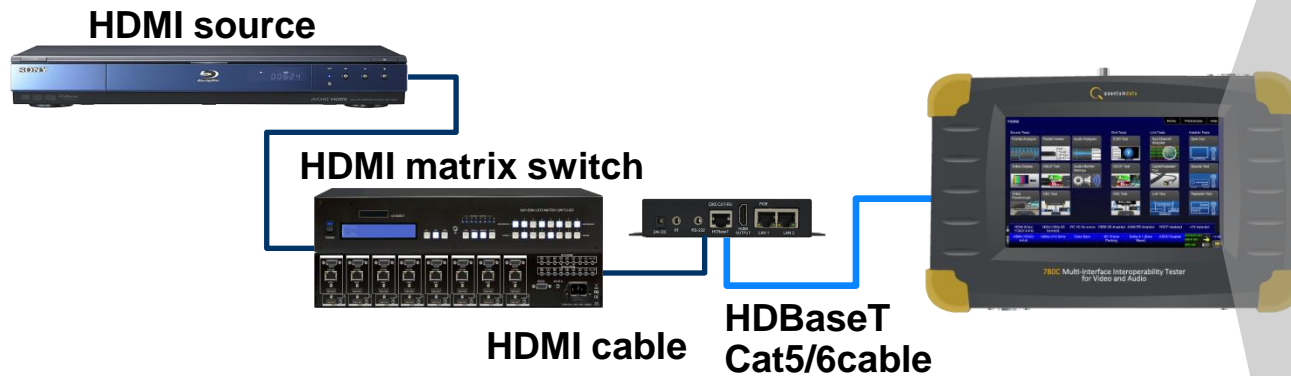
HDBaseT (8 bpc RGB)	3840x2160p 30.00 frames/s	Unknown	HDMI 3D disabled	AVMUTE disabled	HDCP disabled	+5V detected
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OUTPUT

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
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# 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.



Cable Test

Home Preferences Help

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

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

# 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

IN	HDBaseT (8 bpc RGB)	720x480p 60 frames/s	VIC 2: No errors	HDMI 3D disabled	AVMUTE disabled	HDCP disabled	+5V detected
OUT	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

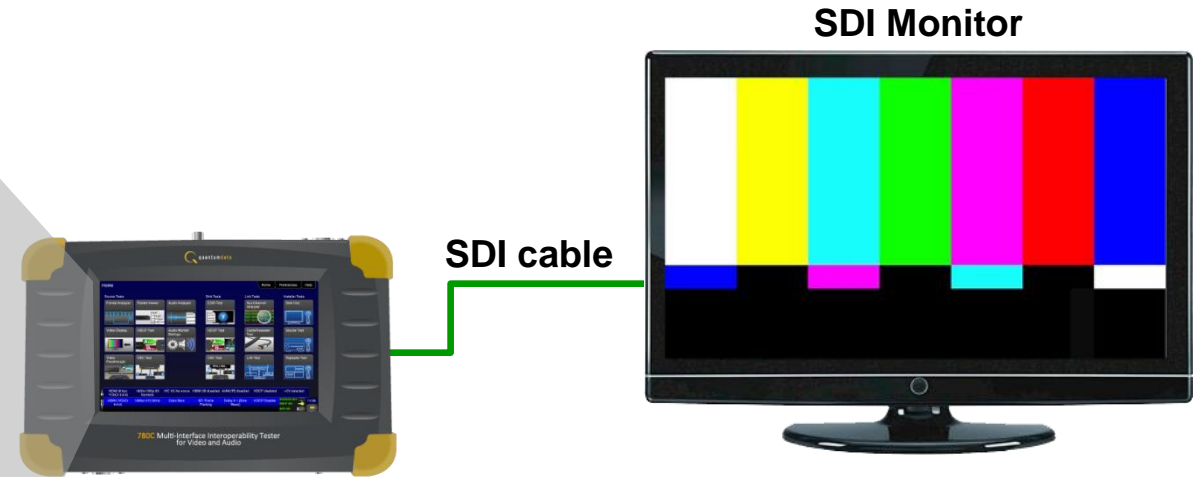
# 780C Sample Application – SDI Device Testing

- 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, and 4096x2160p.
- 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, and 240Hz.
- 64:27 ("21:9") Formats:** 1280x720p, 1680x720p, 1920x1080p, 2560x1080p, and 3840x2160p.
- 256:135 Formats:** 4096x2160p.

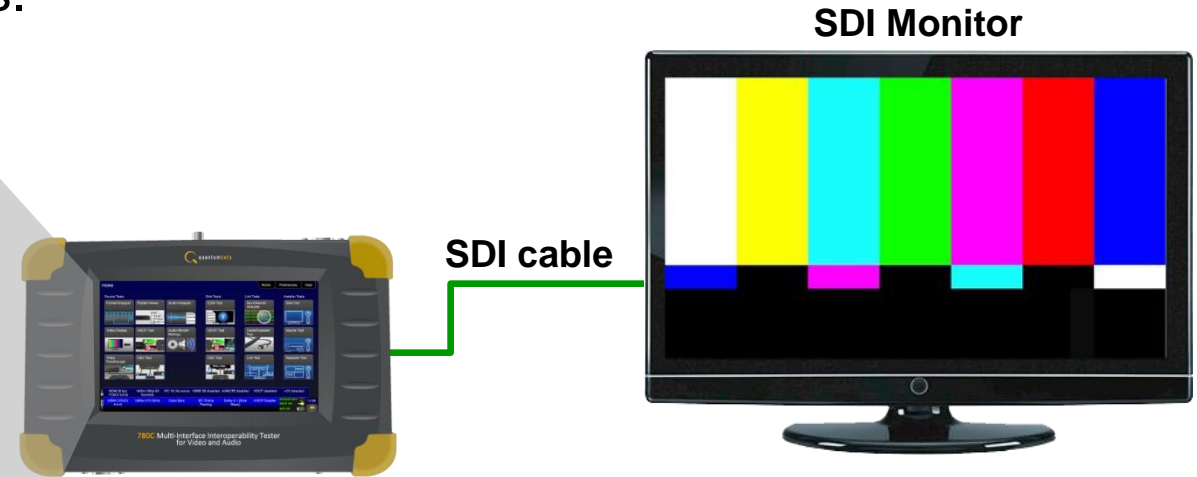
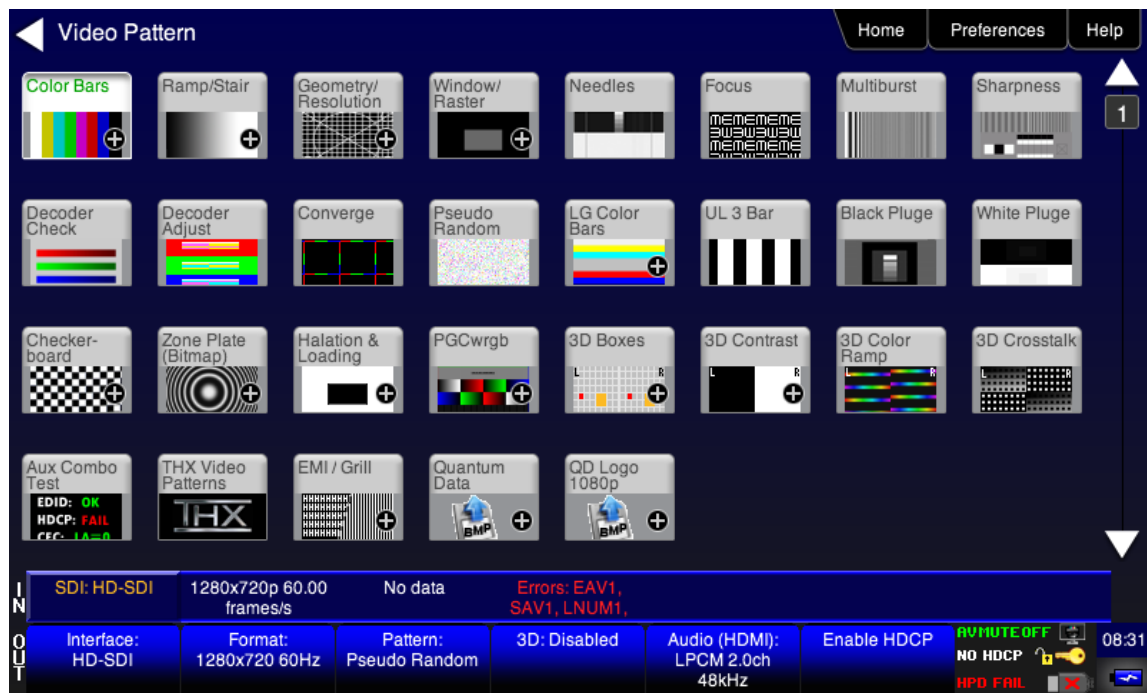
The '2160p' option is highlighted in green. At the bottom, a status bar shows 'SDI: HD-SDI', '1280x720p 60.00 frames/s', 'No data', and 'Errors: EAV1, SAV1, LNUM1'. Other status information includes 'Interface: HD-SDI', 'Format: 1280x720 60Hz', 'Pattern: Pseudo Random', '3D: Disabled', 'Audio (HDMI): LPCM 2.0ch 48kHz', 'Enable HDCP', 'AV MUTE OFF', 'NO HDCP', 'HPD FAIL', and the time '08:31'.





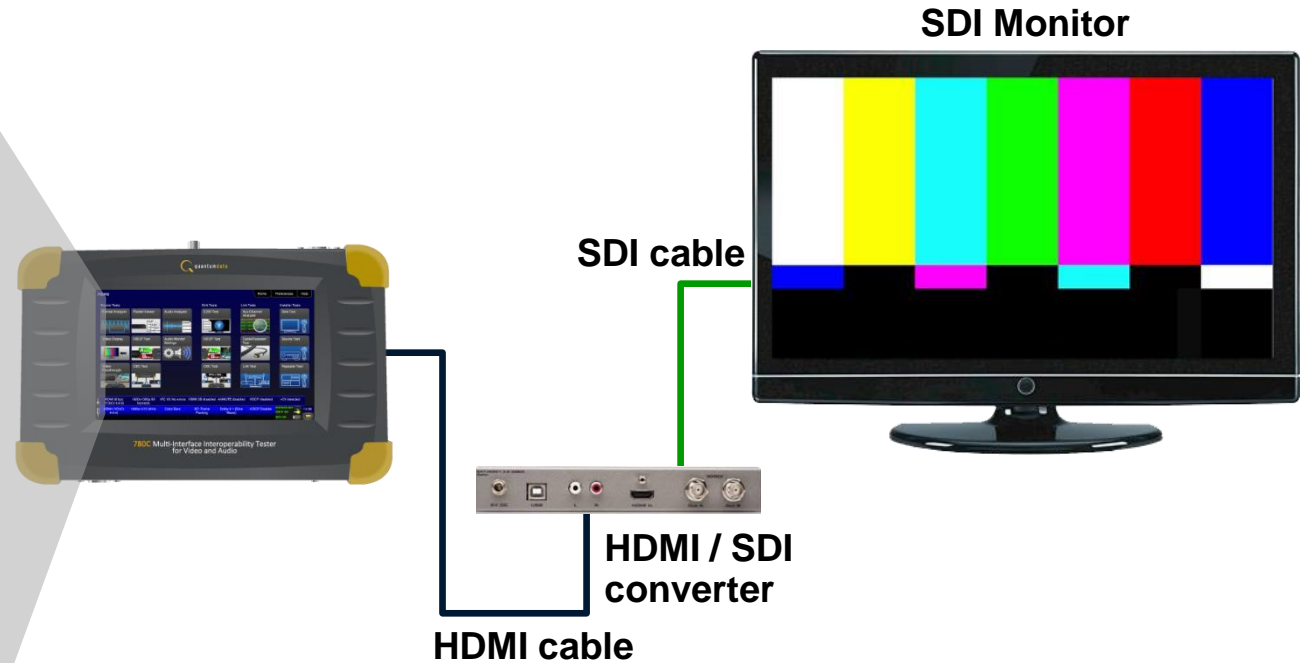
# 780C Sample Application – SDI Device Testing

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



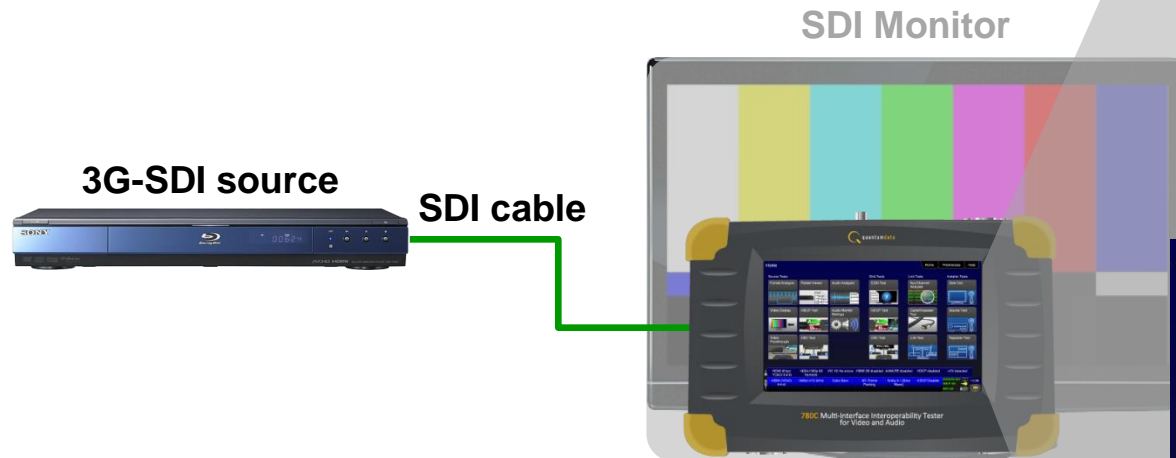
# 780C Sample Application – SDI Device Testing

- 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 signal.

**Video Display**

Timing: 1920 x 1080  
60 frames/sec, Progressive

**Format Analyzer**

Read

Errors: None

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

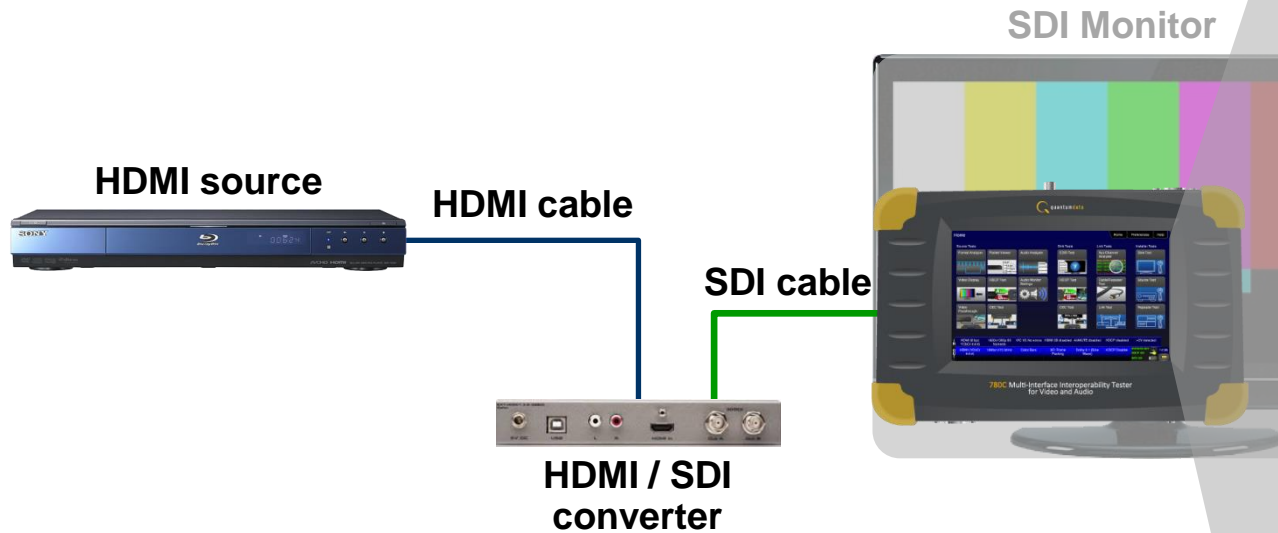
SMPTM 352M embedded packet (Stream 1):  
Raw data: 0x89 0xCB 0x00 0x01  
Description: 1080-line on Level A 3G-SDI  
Picture rate: 0xB (60)  
Sampling structure: 0x0 (4:2:2 Y/Cb/Cr)  
Transport: Progressive  
Picture: Progressive  
Aspect ratio: Unknown  
Horizontal samples: 1920  
Bit depth: 10 bit

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	3G A 1080p 60	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			MPD FAIL	
					48kHz				

# 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 Multi-Interface Interoperability Tester' software interface. It is divided into two main sections: 'Video Display' and 'Format Analyzer'.

**Video Display:** Shows a video frame of a horse in a field. The top right corner displays 'Timing: 1920 x 1080 60 frames/sec, Progressive'. The top navigation bar includes 'Home', 'Preferences', and 'Help'.

**Format Analyzer:** Shows detailed video format information. A 'Read' button is visible. The analysis results are as follows:

- Errors: None
- Total: 2200 x 1125
- Active: 1920 x 1080
- Frames/sec: 60.00
- Scan type: Progressive

Below the main analysis, there are two sections for 'SMPTE 352M embedded packet (Stream 1)' and 'SMPTE 352M embedded packet (Stream 2)'. Both sections show identical raw data and descriptions: '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', and 'Bit depth: 10 bit'.

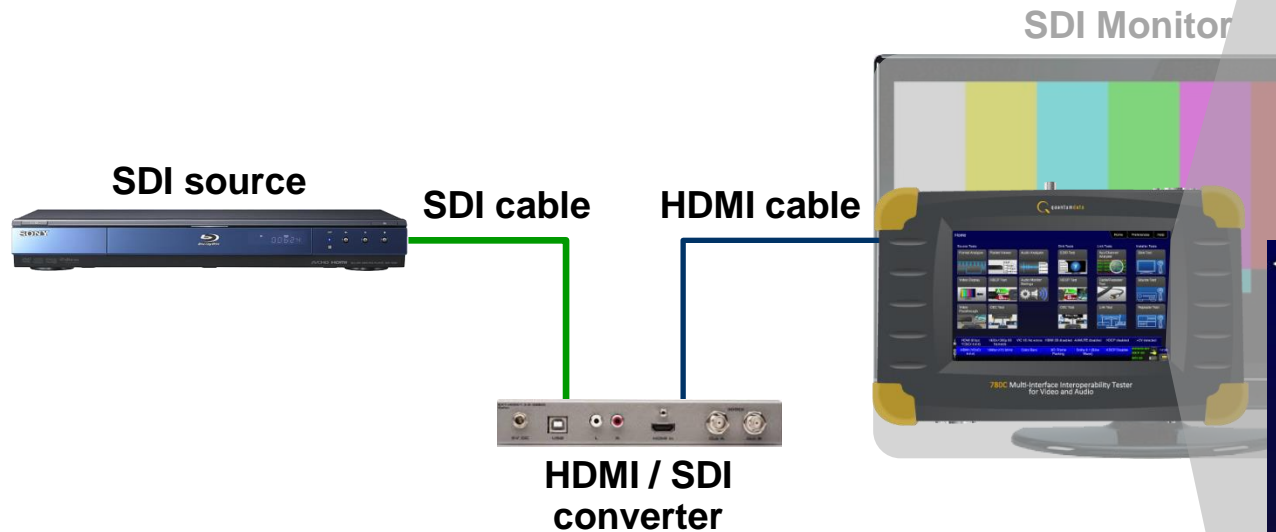
At the bottom, there is a status bar with the following information:

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	MPD FAIL	08:32
	3G-SDI	1920x1080 60Hz	Pseudo Random	Disabled	LPCM 2.0ch 48kHz					



# 780C Sample Application – SDI Device Testing

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



Video Display

Home Preferences Help

Timing: 1920 x 1080  
60 frames/sec, Progressive

Format Analyzer

Home Preferences Help

Read

Errors: None

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

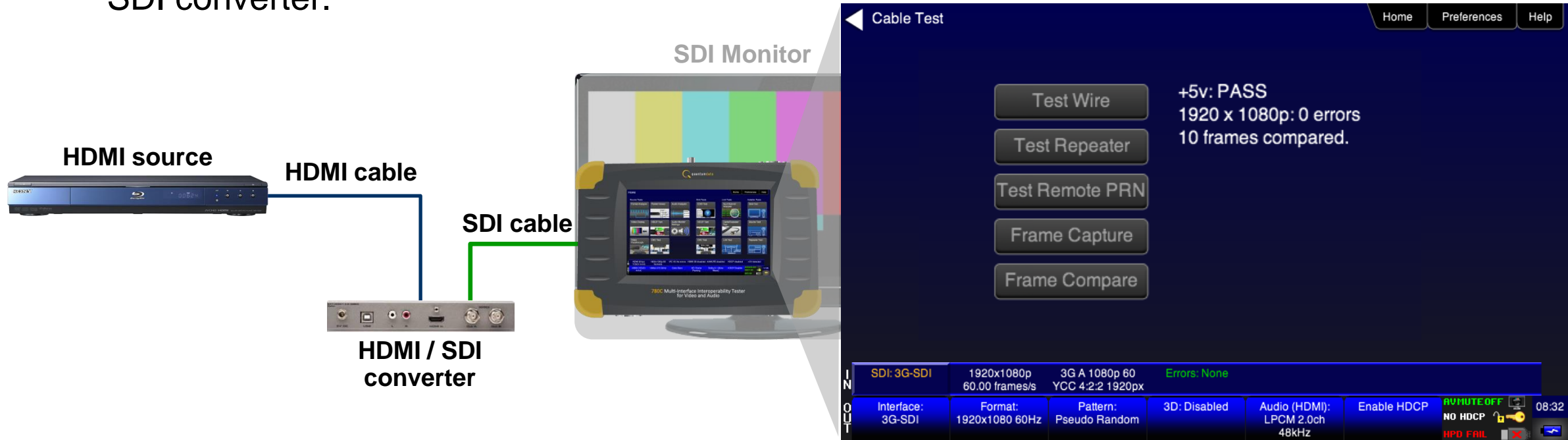
SMPTE 352M embedded packet (Stream 1):  
Raw data: 0x89 0xCB 0x00 0x01  
Description: 1080-line on Level A 3G-SDI  
Picture rate: 0xB (60)  
Sampling structure: 0x0 (4:2:2 Y/Cb/Cr)  
Transport: Progressive  
Picture: Progressive  
Aspect ratio: Unknown  
Horizontal samples: 1920  
Bit depth: 10 bit

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

SDI: 3G-SDI	1920x1080p 60.00 frames/s	3G A 1080p 60 YCC 4:2:2 1920px	Errors: None					
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

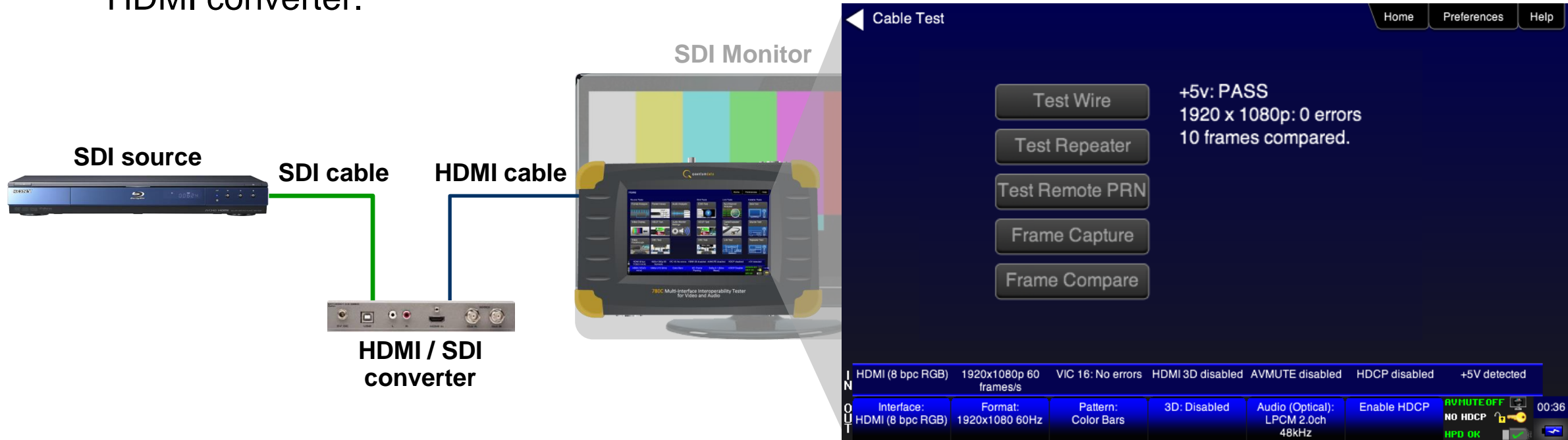
- SDI Device Testing (780C)
  - Check for pixel errors on HDMI to SDI converter.





# 780C Sample Application – SDI Device Testing

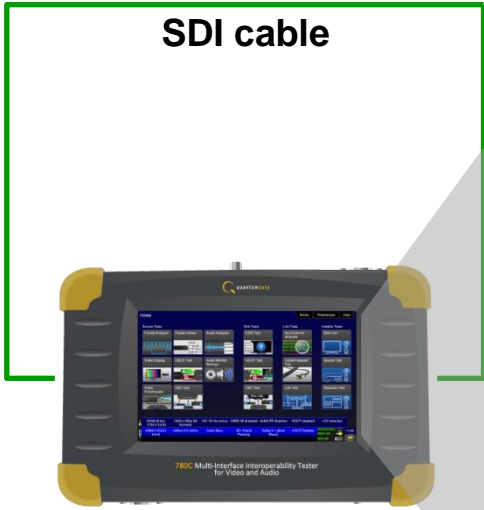
- SDI Device Testing (780C)
  - Check for pixel errors on SDI to HDMI converter.



# 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

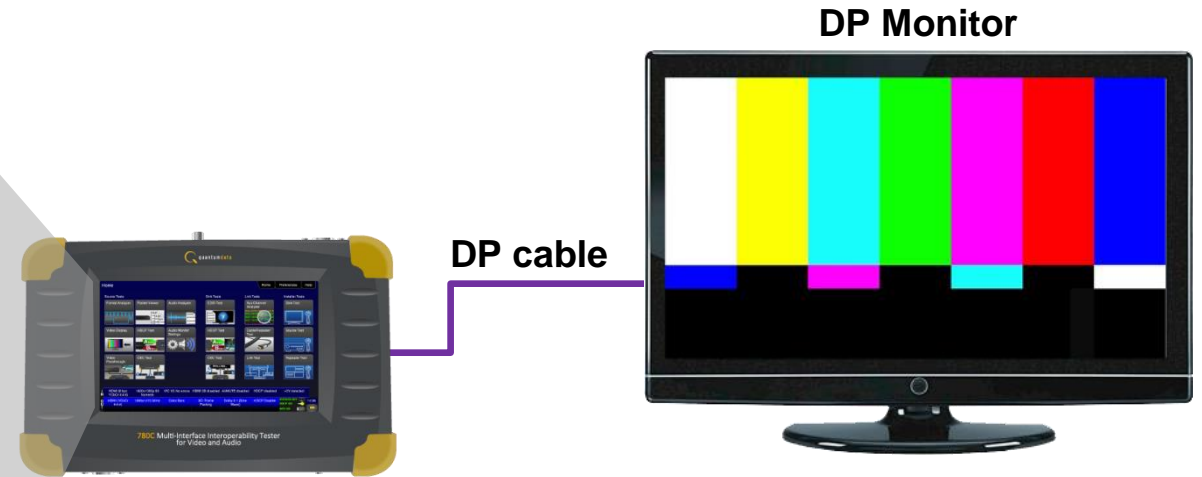
Test Wire  
Test Repeater  
Test Remote PRN  
Frame Capture  
Frame Compare

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	23:30	HPD FAIL

# Applications - DisplayPort

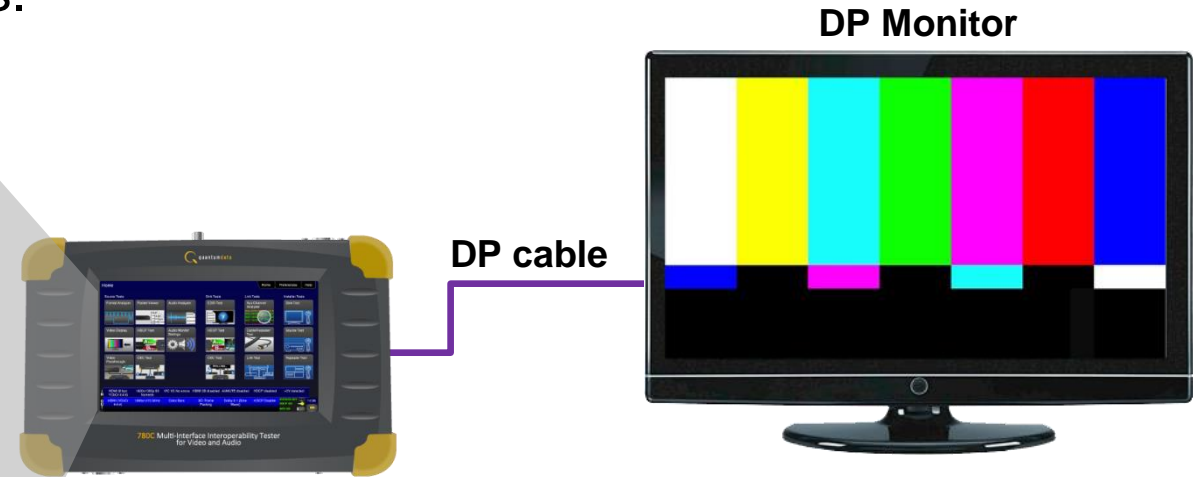
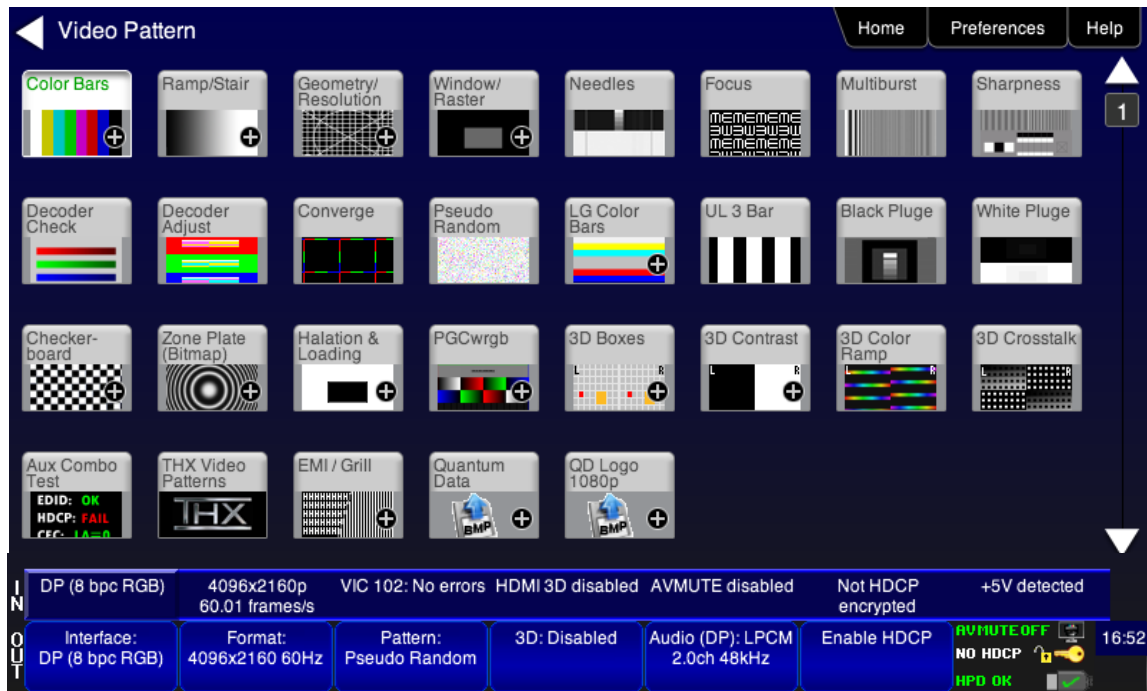
# 780E Sample Application – DisplayPort Device Testing

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



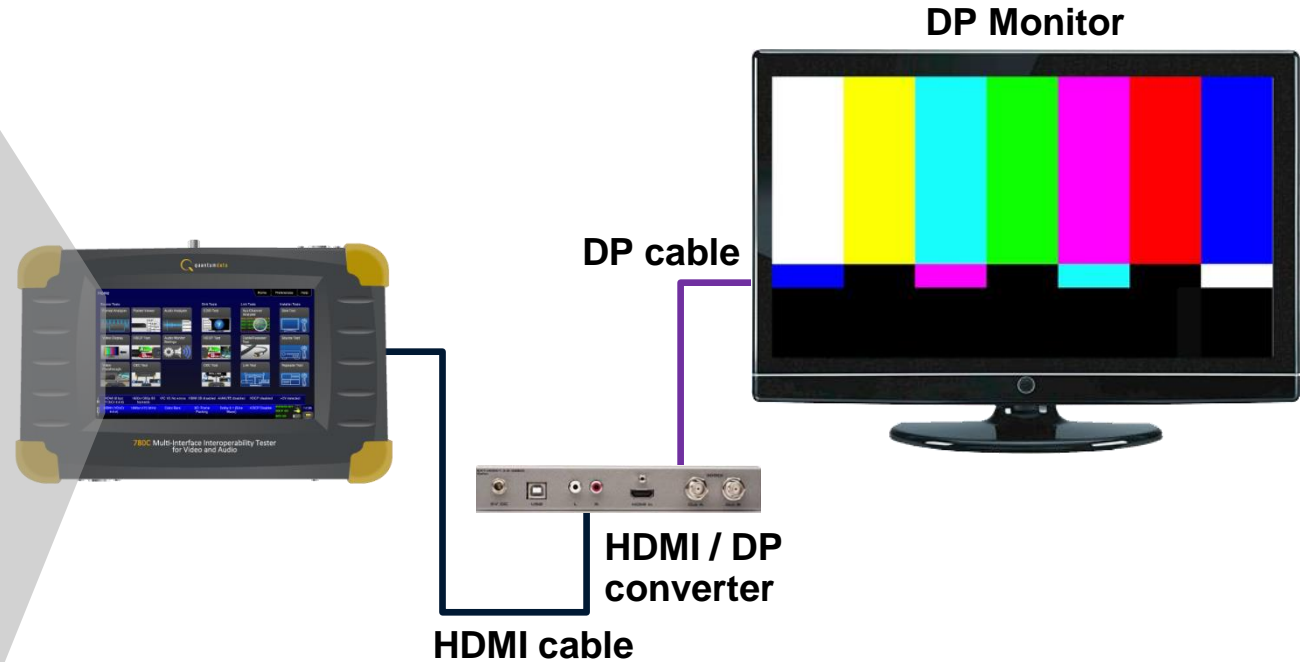
# 780E Sample Application – DisplayPort Device Testing

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



# 780E Sample Application – DisplayPort Device Testing

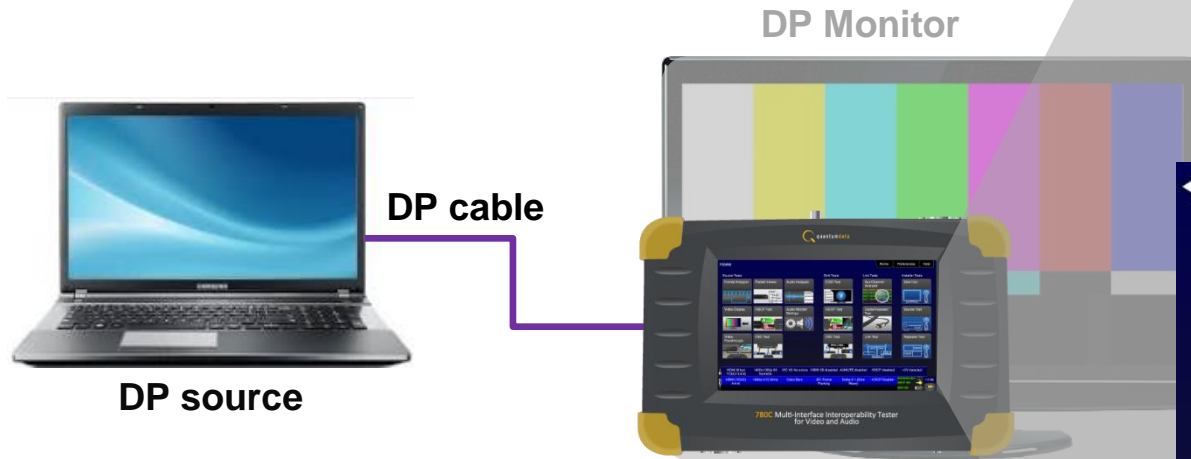
- DisplayPort Device Testing (780E)
  - Test video on an HDMI to DisplayPort converter device.





# 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: +

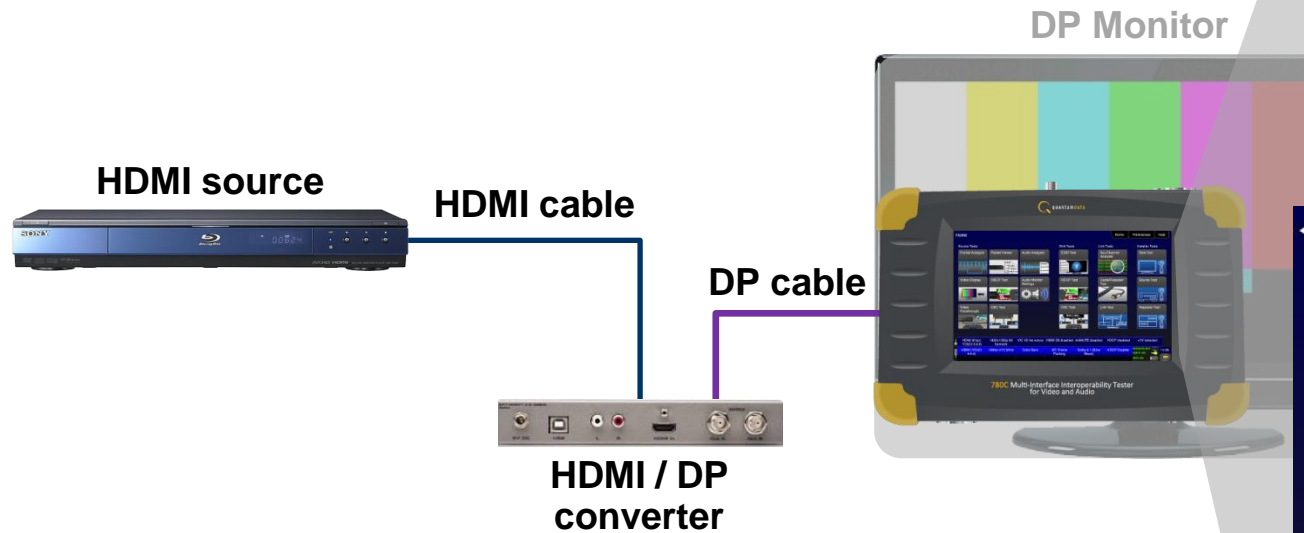
Bits per comp.: 8  
Color space: RGB  
Colorimetry: No data  
Pixels repeated 0 times  
Video ID code (VIC): 97  
(3840 x 2160 p  
@ 59.94Hz/60Hz 16:9)  
AV Mute Status: Not muted  
HDCP: Not encrypted

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

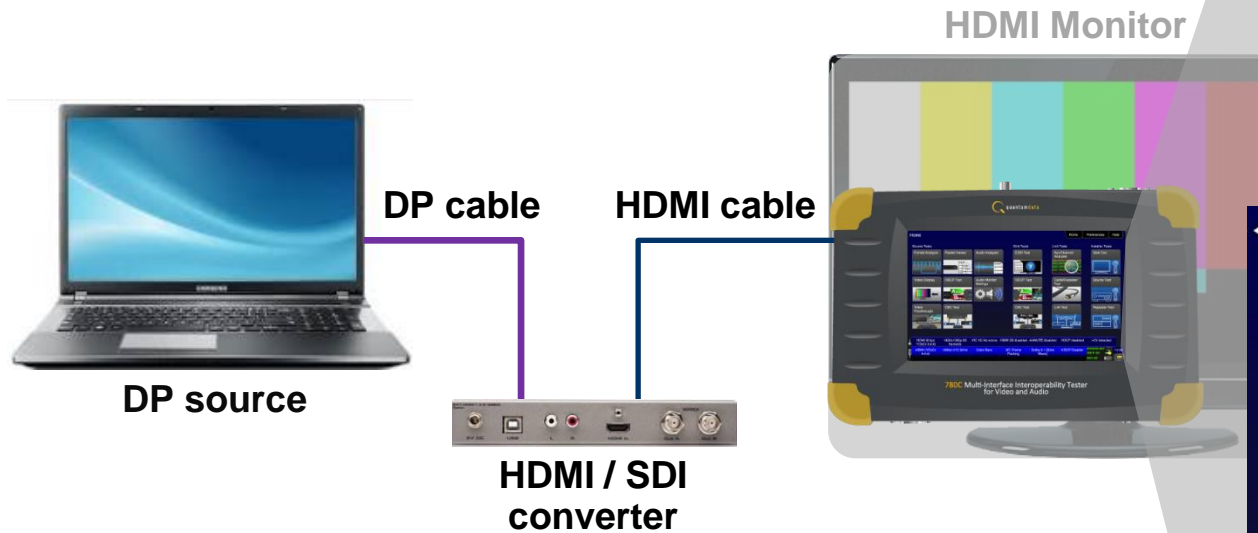
- DisplayPort Device Testing (780E)
  - Verify video and timing through HDMI to DisplayPort converter device.



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: DisplayPort; Bits per color: 8; Color space: RGB; Colorimetry: No data; Range: Full; VIC code: 97; AV Mute: Disabled; HDCP: Disabled. The bottom panel, titled 'Format Analyzer', shows a 'Read' button and lists parameters: 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: +. Below these panels is a status bar with the following information: DP (8 bpc RGB), 3840x2160p, 60.00 frames/s, VIC 97: No errors, HDMI 3D disabled, AVMUTE disabled, Not HDCP encrypted, +5V detected. The bottom right corner shows 'AV MUTE OFF', 'NO HDCP', and 'MPD OK'.

# 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 window is "Video Display" showing a horse video and its 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 window is "Format Analyzer" showing a "Read" button and "Errors: None". It displays 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

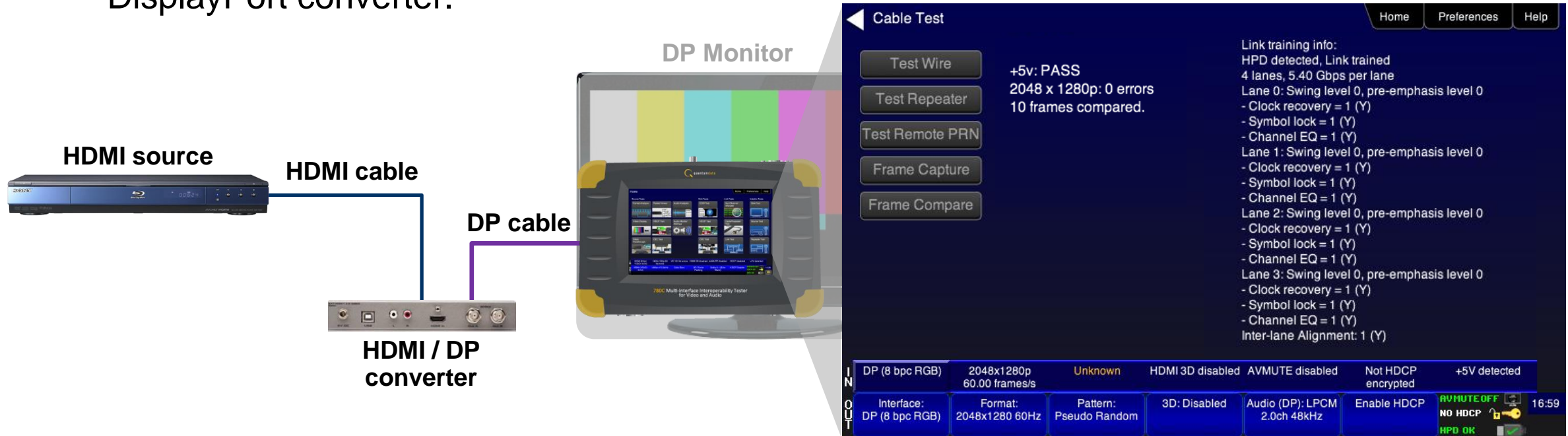
At the bottom, there is an "IN" and "OUT" status bar with the following information:

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

The bottom right corner shows a clock at 00:44.

# 780E Sample Application – DisplayPort Device Testing

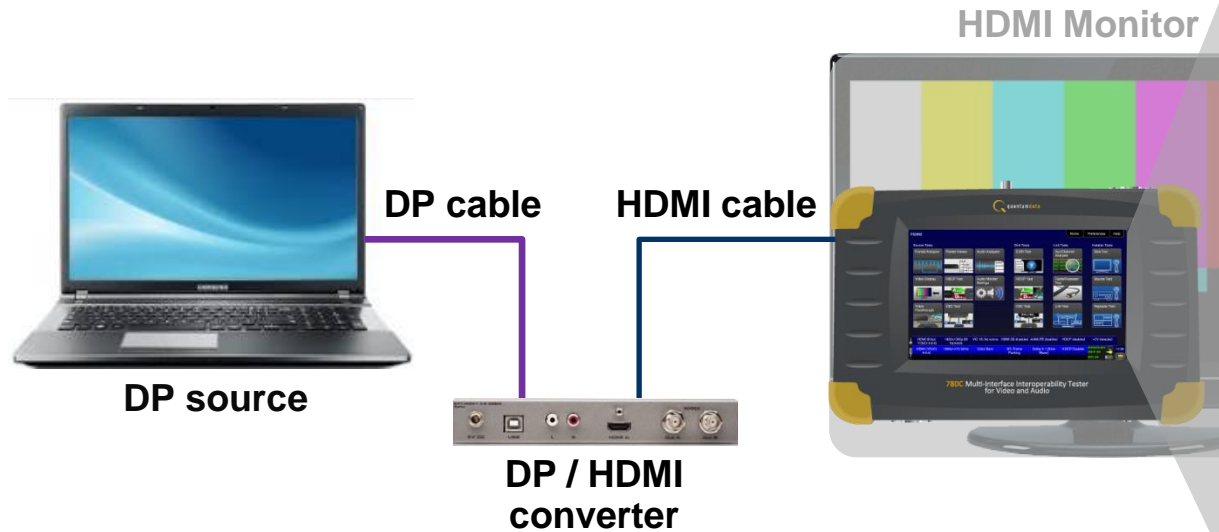
- DisplayPort Device Testing (780E)
  - Check for pixel errors on HDMI to DisplayPort converter.





# 780E Sample Application – DisplayPort Device Testing

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



The screenshot shows the "Cable Test" software interface. The main display area shows the results of a test: "+5v: PASS", "1920 x 2160p: 0 errors", and "10 frames compared.". Below this, there are buttons for "Test Wire", "Test Repeater", "Test Remote PRN", "Frame Capture", and "Frame Compare". At the bottom, there is a detailed status bar with the following information:

HDMI (8 bpc YCbCr 4:2:0)	3840x2160p 60 frames/s	VIC 97: No errors	HDMI 3D disabled	AVMUTE disabled	HDCP disabled	+5V detected
Interface: HDMI (8 bpc RGB)	Format: 3840x2160 30Hz	Pattern: Color Bars	3D: Disabled	Audio (HDMI): LPCM 2.0ch 48kHz	Enable HDCP	AVMUTE OFF NO HDCP

Additional status indicators include "MPD FAIL" and a time display of "05:31".

# 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