

780 HANDHELD TEST INSTRUMENT

The 780 Handheld Test Instrument is a portable multimedia generator and analyzer that enables you to conduct quick verification tests of all your HDMI® Products—source, sinks, repeaters, distribution devices—on-site or in an R&D environment. The instruments' color touch displays make them easy and convenient to use.

The 780 Test Instrument supports pixel rates up to 165MHz and TMDS clock rates up to 225MHz for deep color on the HDMI Tx port and up to 150MHz on the HDMI Rx port.

TESTING HDMI SINK DEVICES

The 780 is equipped with an HDMI output port for testing HDMI sink devices. You can test and calibrate the video on your high definition TVs with a variety of resolutions and standard 2D or 3D test patterns as well as custom patterns from THX® and ISF®. You can also verify hot plug, EDID and HDCP and CEC messaging on HDMI sink devices.

ANALYZING HDMI SOURCE DEVICES

The 780 is also equipped with an HDMI input port for verifying HDMI source devices. The HDMI input port and built-in display enable you to verify the incoming video parameters and view the entire, unscaled video image—including 4K images by panning, even when encrypted with HDCP. You can also verify the incoming audio by examining the decoded IEC audio headers, audio infoframes and channel status blocks.

TESTING HDMI CABLES & DISTRIBUTION NETWORKS

Because the 780 has both an HDMI output and an HDMI input, you can test your HDMI cables and distribution systems (splitters, extenders and switches) with the Cable Test feature. You can prequalify cables and distribution systems prior to installation or once they are installed with the Frame Compare (Pixel Error) test feature.

MONITORING HDMI PROTOCOLS

With the Auxiliary Channel Analyzer (ACA) options, you can monitor the HDMI hot plug related events and DDC transactions, EDID and HDCP, between HDMI devices and the 780 while the 780 is emulating a known-good HDMI source or sink device. The second ACA option enables you to passively monitor the HDMI hot plug-related events and DDC transactions on three HDMI connected devices.



KEY FEATURES + BENEFITS

HDMI Output Port - Pattern Testing including 3D and Deep Color Up to 225MHz with 24/30/36 bit color depths at 1080p60.

HDMI Input Port - Analysis of HDMI sources Up to 150MHz at 1080p60.

Up to TOUMHZ at TU80pou.

HDMI 3D Pattern Generation

Test Side-by-Side, Top/Bottom and Frame Packing 3D format structures.

Analog Component Video Output Pattern testing for analog component inputs on HDTVs.

Custom Formats and Bitmap Patterns

Create custom formats using Format Editor tool. Import your bitmaps for pattern testing.

Test Pattern Scrolling

Animated test pattern for testing motion artifacts.

Licensed Bitmap Images (optional)

Image packs w/ bitmap test images. Current pattern packs: THX®, China Res and ISF®.

Multichannel Digital Audio

Verify audio-capable devices using multichannel audio over HDMI, SPDIF, and Optical outputs with various audio formats at sampling rates up to 192kHz. Test LPCM and Dolby and DTS compressed audio formats.

Color Touch Screen - View Incoming Video

User friendly color touch screen enables you to operate the instrument and view incoming video and metadata from an HDMI source. View incoming video—scaled or unscaled, encrypted or unencrypted.

Installer Test Utility

Diagnose HDMI interoperability problems with simplified test interface. Verify sources, sinks, repeaters with "one button" tests. Pass/fail results provided.

HDCP Sink Test (Network Analyzer option)

Verify that an HDMI display properly responds to HDCP content protection.

HDCP Source Test (Network Analyzer option)

Check max HDMI devices supported by source.

EDID Verification (Network Analyzer option)

Verify the HDMI display's EDID for checksum and header errors. View the display's entire EDID content. Compare two EDIDs. Run portions of the EDID compliance test.

HDMI Sink Emulator (Network Analyzer option)

Emulate an HDMI sink device to test EDID on HDMI source device; test a source response to a variety of stored EDIDs. EDID.

HDMI Source Video Testing (Network Analyzer option)

View the video timing data and video inforframe data from an HDMI source device including 3D metadata. View various data island packet contents.

HDMI Source Audio Testing (Network Analyzer option)

Verify incoming audio (format, sampling rate, bit depth) by viewing the decoded IEC audio headers, audio infoframes and channel status bits...

HDMI Cable & Network Test (Cable & Link test option)

Prequalify or verify your HDMI cable and HDMI distribution network (extenders, splitters, switchers, etc) using a pseudo random noise test pattern or pixel error test with Frame Compare feature.

Aux channel analyzer (ACA optional)

Monitor the CEC HDMI hot plug related events and DDC transactions, EDID and HDCP, either while emulating a known-good HDMI device or while passively monitoring between multiple HDMI connected devices. **Note: Passive monitoring requires optional hardware configuration**.

Battery powered

Provides portability with rechargeable batteries. Can also be powered from AC through power adapter.

Command Line Control

Run automated tests through command line interface via USB.

(Note: Above image shown with optional 4-port board to support ACA passive monitoring.)

780 Handheld Test Instrument

APPLICATION TESTS

STANDARD FEATURES

Video Pattern testing

11000 1 000011	
Formats	
Formals	

Formats	
Number of formats	147 Standards
CEA-861E; VESA	
Deep Color	1080p60 30/36 bit
Patterns	
Number of patterns	More than 40 patterns
Gray levels	256
Imported bitmaps	Fixed resolution 24 bit
Imageshift	Scroll bitmap images
HDMI 3D Testing	
Test pattern	3D bitmap test images and NEW
	rendered images
3D Formats	Top & Bottom, Side-by-Side (half & full),
A 1' T 1 T	Frame Packing
Audio Test Tones	Tone
1001	10110
Sound Pressure &	Plnk Noise
Main Speaker	500-2kHz
Frequency Response	20-20kHz
Speaker Distortion	Sine wave 63 Hz, 125Hz, 1kHz, 4kHz
Early Reflections	Impulse
Polarity of speaker wires	Polarity
Sound Convergence	Autotime Delay
View incoming video	
HDMI Source Test	View incoming video image and video
	metadata from HDMI source even when
	content is protected with HDCP.
HDMI Installer Test Utility	
Туре	Function
Source Test	HDCP, video, video timing
Sink Test	Hot plug, EDID, HDCP, video, video type
Repeater Test	Hot plug, EDID, HDCP, video, video type,

	Hot plug, EDID, HDCP, video, video type
Test	Hot plug, EDID, HDCP, video, video type,
	video timing
	Hot plug, EDID, HDCP, video, video type,
	video timina

SPECIFICATIONS Video/Audio Outputs HDMI / DVI Video Output

Link Test

Connector type	(1) one HDMI Type A
TMDS protocols	HDMI, DVI
Number of links	single
Colorimetry	ITU-R BT.601-5;
	ITU-R BT.709-5
Color depth (HDMI)	24/30/36bit
	4:4:4 RGB/YCbCr
	36-bit 4:2:2
Color depth (DVI)	24-bits per pixel
	RGB 4:4:4
Encoding	RGB, YCbCr
Sampling modes	4:4:4; 4:2:2
Pixel rate (780)	165MHz
TMDS clock rate (780)	2.25Gb/s
Timings (780)	up to 1080p60
Scan types	Progressive, interlaced

Analog Video - VGA &	component
Connector type	VGA (HD15F) VGA-to-RCA adapter
	provided
Color encoding	RGB, YPbPr
Pixel rate (MHz)	80 (pixel rep for higher resolutions)
Sync types	Separate, composite

HDMI Input	
Connector type	(1) one HDMI Type A
TMDS protocols	HDMI, DVI
Number of links	single
Pixel rate (780)	150MHz
Sampling modes	4:4:4: 4:2:2

OPTIONAL FEATURES

HDMI Net

Digital Audio (HDMI)

Connector

Bits per sample

Sampling rates (kHz)

Audio stream types

Dolby TrueHD

Connector

SPDIF

OPTICAL

Bits per sample

Sampling rates (kHz)

Audio stream types

DTS-ES (IEC 61937)

DTS Master Audio

Dolby Digital (IEC 61937)

DTS-HD HRA (IEC 61937)

Digital Audio (SPDIF, OPTICAL)

HDMI IN (ARC) 780A only

Dolby Digital (IEC 61937)

User Interface - Touch Screen Screen size (active)

DTS-ES (IEC 61937)

Administration

Firmware upgrade

Command Line

Control USB peripheral

Color

Dolby Digital Plus (IEC 61937)

twork Analyzer Option HDMI Source Video Test View the HDMI video timing data and video inforframe data (including 3D metadata) from an HDMI source device. HDMI Source Audio Test View the audio format, sampling rate,	HDMI Cable & Link Test O HDMI Link (network) Test	
Bit depth of the decoded audio IEC	Auxiliary Channel Analyzer	
headers, audio infoframes, and channel status bits of an HDMI audio source. CEC Ping test HDMI CEC source & sink devices Ping HDMI devices in a network to discover CEC devices. HDCP HDMI HDCP Sink Test Verifies DTV's and repeater's handling of HDCP encrypted video. HDMI Source Test Check a sources max HDCP device	1 - Emulation Monitoring	Monitor the CEC hot plug events and the DDC transactions during a connection sequence between the 780 and another HDMI device while emulating either a known-good HDMI source device, known-good display device, or both. ludes option 1 - Emulation Monitoring) Passively monitor the CEC 5V and hot plug events and the DDC transactions during a connection sequence between HDMI devices (source,
capabilities. EDID	Note: Requires an extra boa	repeater and display device). rd with four (4) additional HDMI ports.
HDMI EDID Sink Test View entire EDID contents and check for errors. Run portions of the EDID compliance test.	Image Packs Option Images Packs	China Res Pattern Pack THX® Pattern Pack ISF® Pattern Pack
HDMI EDID Source Test Emulate any EDID and test a source's response. Store/Load EDIDs.		

(1) one HDMI Type A

Noise patterns, 5.1

High Bit Rate Audio

High Bit Rate Audio

Noise pattern 5.1

Sine wave clips 192kHz, 2.0, 5.1 & 7.1

Sine wave clips 192kHz, 5.1 & 7.1

32, 44.1, 48, 88.2, 96, 176.4, 192

In the field upgrade through USB.

16, 20, 24

Programable LPCM (IEC 60958) All sampling freq, up to 8 channel

RCA

Programable LPCM (IEC 60958) All sampling freq, up to 8 channel

JIS FOS

HDMI Type A

16, 20, 24

Noise patterns, 5.1

Noise pattern 5.1

24 bit RGB

Environmental Humidity 30% to 80% RH non condensing Operating temp 32.0, 44.1, 48, 88.2, 96, 176.4, 192 Celsius 0 to 40 Fahrenheit 32 to 104 Regulatory FCC class B RoHS Power DC 6AA NiMh batteries Battery life 2 hours between charge Battery recharge Overnight charge AC charger/converter VAC 100 to 240 Current (amps) 0.4 (max) Frequency (Hz) 47 to 63 Power (VA) 30 Weight LBS 3.25 I BS Kg 1.47 Ka Size (dimensions) Height

	inches	2.7	
	cm	6.98	
Download bitmaps, firmware upgrade	Width		
USB	inches	9.75	
005	cm	24.76	
en	Depth		
480(H) x 272(V)	inches	6	
24 bit BGB	cm	15.24	

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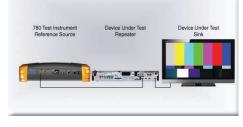
OPTIONAL FEATURES

STANDARD TESTS

Video Pattern Testing – Test a DTV to ensure that it can render a video test pattern. Scroll a pattern to test for motion artifacts.

Configurations:





Step 2. Select Video Pattern

ome		Home	Preferences Help
Video Pattern	Audio Test Tone	Test Sink (Display/TV)	Test Source (DVD/STB)
3D Output	Aux Channel Analyzer	Cable/Repeater Test	Installer Tests
		3	
HDMI (RGB)	1080p 60	Hz W	hite Pluge

Step 3. Select Image



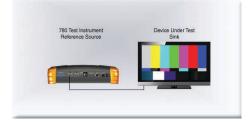
Operation: Step 1. Select Format

solution		Frame Rate		
480p	480i	23.976Hz	24Hz	25Hz
576p	576i	29.97Hz	30Hz	50Hz
720p		59.94Hz	60Hz	100Hz
1080p	1080i	119.88Hz	120Hz	200Hz
4Kx2K	4K SMPTE	239.76Hz	240Hz	

Step 4. Select Pattern Options

Window Options	; Ho	ome	Preferences	Help
Variant				
Window	Raster			
IRE Level				
-5 -1 1 ()0 +1 +5		RG	В
IRE Label			CM	
Off On			w	
HDMI (RGB)	1080p 60Hz		Window/Raster	

3D Video Pattern Testing – Test a DTV to ensure that it can render a video test pattern. **Configurations: Operation:** Step 1. Select 3D Output



Step 2. Select 3D Test Options

3D Test Options	Home	Preferences	Help
Mode	Subtype	Left	Right
Side-by-Side (Ha	f) Horizon	tal Odd	Ode
Top-and-Bottom	Quincu	nx Even	Eve
Frame Packing			
Off			
HDMI (RGB)	1280x1470 60Hz 3	D FPack 1280x720)p

780 Test Instrumer Device Under Tes

Audio Test Tone Video Pattern

Home



Step 3. Select 3D Test pattern



Audio Test Tones – Test an HDTV or A/V Receiver to ensure that it can render LPCM basic and multichannel audio and multichannel compressed audio and HDMI high bit rate audio formats.

Device Under Tes

Configurations:

Audio Pattern

Dolby 5.1

HDMI (RGB)

Signal Type

780 Test Instrume

Optical SPDIF

80n 60H

780 Test In:



Viewing HDMI Video from Source – Test an HDMI source device directly or through a repeater. View incoming HDMI video including 3D video on the built-in display.

Configurations:

Device Under Test Repeater	780 Test Instrument Reference Source	780 Test Instrument Reference Source	Device Under Test Repeater	Device Under Test Source	780 Test Instrument Reference Source	Device Under Test Repeater
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				Sec. and Proceedings		

Operation:

Step 1. Select Test Source (DVD/STB)





Step 3. Select Fullscreen or Detailed

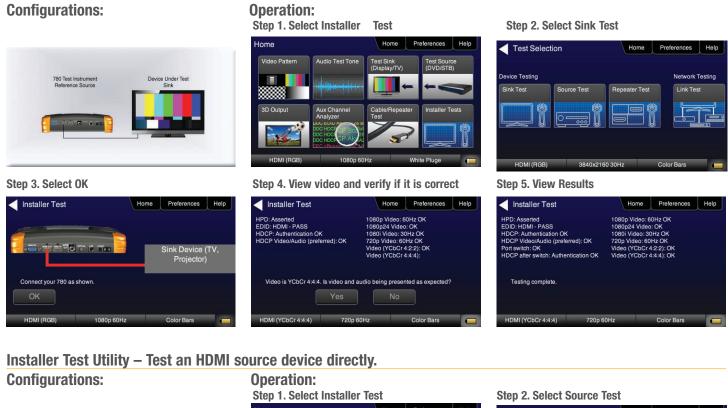


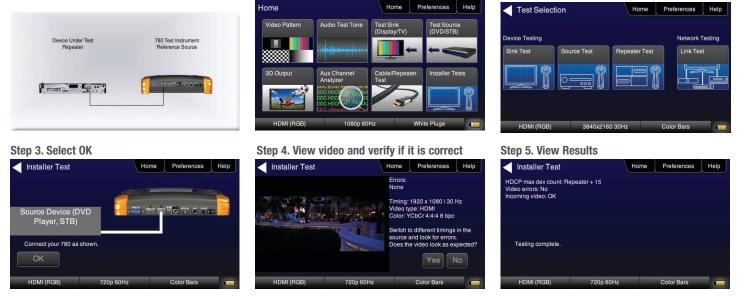


Operation: Step 1. Select Audio Test Tones Home Home



Installer Test Utility – Test an HDMI sink device directly.





Installer Test Utility – Test an HDMI repeater device directly.

Device Under Test Repeater

A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNE

Configurations:

780 Test Instrument Reference Source

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Step 4. View video and verify if it is correct

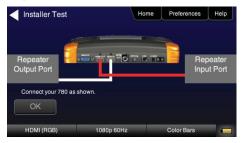
Home Preferences Help

1080p 50Hz Pseudo Random 📻

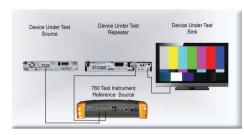
Step 2. Select Repeater Test

Test Selection Home Preferences Help Device Testing Network Testing Sink Test Source Test Image: Construction of the second of the

Step 3. Select OK



Installer Test Utility – Test HDMI Links. Configurations:



Step 3. Select OK



Operation:

HDMI (RGB)

Installer Test

D: Asserted ID: HDMI - PASS ID modified by repeater: Yes sees video without change: No CP passthrough: No CP: Authentication OK

Switch inputs on the device and then switch back



Step 4. View video and verify if it is correct



Step 2. Select Link Test

Device Testing			Network Testi
Sink Test	Source Test	Repeater Test	Link Test

HDMI NETWORK ANALYZER FEATURES (OPTIONAL)

HDCP Testing – Run an HDCP functional test connected directly to an HDMI HDTV or through a repeater to verify that it can render HDCP protected video content.

Home Preferences Help

Color Bars

Configurations:



Operation:

Step 1. Select Test Sink (DVD/STB)



Step 2. Select HDCP Test

Step 3. Select Enable and View results



Preferences Help

HDMI CEC Verification - Run an HDMI CEC verification test on an HDMI system. **Configurations:**

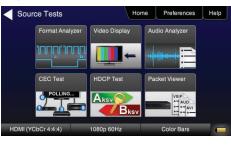
Device Under Test	780 Test Instrument	Device Under Test	Device Under Test	780 Test Instrument	780 Test Instrument	Device Under Test
Repeater	Reference Source	Source	Repeater	Reference Source	Reference Source	Repeater

Operation:

Step 1. Select Test Sink (DVD/STB)



Step 2. Select CEC Test

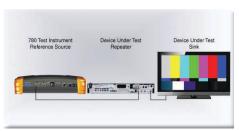


Step 3. View Results



HDMI Source and Repeater Video Test – Test an HDMI source device directly or through a repeater. Verify timing, AVI Infoframes and HDCP authentication for standard video, deep color and 3D.

Configurations:





Operation:

Sink Tests	Home	Preferences	Help
EDID Test	HDCP Test	CEC Test	
ÊØ		POLLING	

Step 3. View Results



HDMI Source Audio Test – Run an audio test on an HDMI source device or A/V receiver to verify audio headers, audio infoframe and channel status bits.

Configurations:

ument Device Under Test ource Source	Device Under Test 780 Test Instrum Repeater Reference Sour	rce Reference Source	e Repeater
			risponor
B			

Operation:

Step 1. Select Test Source (DVD/STB)



Step 2. Select Audio Analyzer

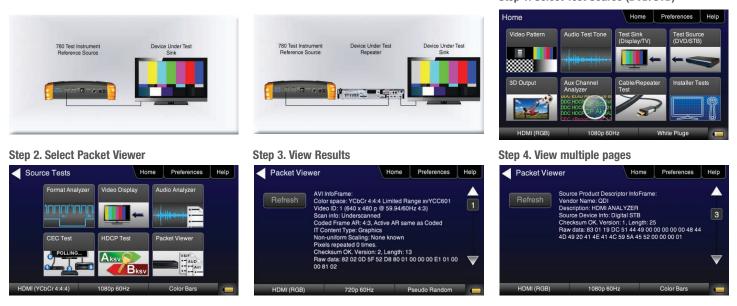


Step 3. View Results



Packet Viewer Test – View HDMI infoframe and selected data island metadata Configurations: 0

Operation: Step 1. Select Test Source (DVD/STB)



Testing Source's Response to an EDID – Provision 780's HDMI Input port with EDID from any display. Verify source responds properly to EDID. Load EDID from multiple stored EDIDs.

Device Under Test Repeater 780 Test Instrument Reference Source

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Co	nfi	gu	rati	on	S:

Device Under Test Repeater	780 Test Instrument Reference Source
ř	

Step 2. Select EDID Test



Step 3. Verify EDID has been assigned

EDID Test	н	ome	Preferences	Help
Read	EDID was successfully v	vritten	to the HDMI receiv	er. 📥
Load				1
Save				
Compare				_
Use on Rx				V
HDMI (RGB)	1080p 60Hz	I	^o seudo Random	

Step 3. Load EDID

Device Under Test Source



Operation: Step 1. Select Test Sink (DVD/STB)



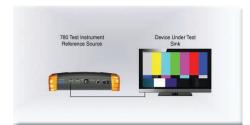
Step 3. Load an EDID to RX port

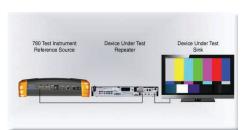


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EDID Sink Testing – Run an EDID functional test on an HDMI HDTV and/or an A/V receiver to verify EDID checksum, header, and HDMI video and audio support. View entire EDID contents. Run portions of the EDID compliance test

Configurations:





Operation: Step 1. Select Test Sink (DVD/STB)



Step 2. Select EDID Test



Step 3. Select Read and View Results (Page 1)

EDID Test Home Preferences Help Read EDID Summany: Header is OK. All checksums OK. EDID Ver. 1.3 HDMI: Yes (PA 1.0.0., 36, 30 bit color) Manufacture/reforduct: CDI 780 Pref. Native Timing: 1920x1090 60 000Hz 1 Save SyDis: 4601 440p 516 576p 7200 1080p 1080p 1080p 24 Speakers: [RLC/RRC RL/RR FC LFE FL/FR] PCM 8 ch., [32 44.1 48 88.2 96 176.4 192] kHz @ [6 20 24] bits AC-38 ch., [32 44.1 48] kHz, max rate 640 kHz Diby DD+ 8 ch., [32 44.1 48] kHz V Use on Rx DTS eh., [44.1 48] kHz Pseudo Random V

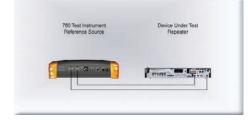
Step 4. View multiple pages (Page 25)

EDID Test	н	ome	Preferences	Help
Read	Test ID 8-2: EDID VESA - PASS	Structu	ire	
Load				
Save				
Compare				25
Use on Rx				V
HDMI (RGB)	1080i 30Hz	F	seudo Random	

HDMI CABLE & LINK TEST (OPTIONAL)

HDMI Cable or HDMI Link Test – Run a pixel error test on an HDMI cable or an HDMI system with splitters, switches and extenders using pseudo random noise.

Configurations:



Device Under Test Repeater Device Under Test Extender CATS 780 Test Instrument Reference Source/Srick

Operation: Step 1. Select Cable/Repeater Test



Step 2. Select Test Wire or Test Repeater



Step 3. View Results (Cable Test)

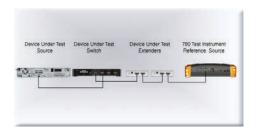


HDMI FRAME COMPARE TEST (OPTIONAL)

HDMI Frame Compare Test – Run a pixel error test on video frames.

Operation:

Configurations:



Step 1. Select Cable/Repeater Test Home Home Preferences Help Video Pattern Test Sink (Display/TV) 8 Aux Channel 3D Output

Step 2. Select Frame Capture



Step 3. Select Frame Compare



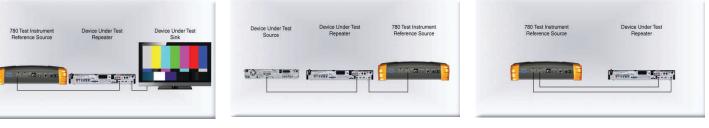
Step 4. Select Frame Capture

		ĺ	Test Remote PRN			
		[Frame Capture			
		[Frame Compare			
0p 60Hz	Pseudo Random	_	HDMI (RGB)	480p 60Hz	Pseudo Random	

HDMI AUXILIARY CHANNEL ANALYZER TEST (EMULATION OPTION) Emulation Monitoring – Monitor HDCP and EDID transactions and hot plug events while emulating either an

HDMI source, HDMI sink or both an HDMI source and sink.

Configurations:



Operation:

Step 1. Select Aux Channel Analyzer



Step 4. View Details (Bcaps)



Step 2. Select Configuration: Capture Data

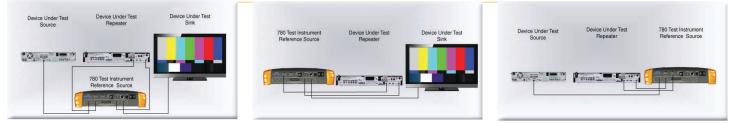


Step 3. View Results (Downstream)

Aux Ch	annel	Analyzer	Home	Preferences	Help
Start	Sa	ve Clear	Details	Auto Sci	roll
Timestamp	Туре	Data			
0:13:09.3417	DDC	D HDCP SLAV	E -> MASTER I20	HDCP Response	9
0:13:11.4768		D HDCP MAST	ER -> SLAVE I20	Request [Ri']	
0:13:11.4773	DDC	D HDCP SLAV	E -> MASTER I20	HDCP Response	
0:13:13.4956	HPD	Rx/D Port Fallin	g Edge		
0:13:14.4609	DDC	D EDID MASTE	ER -> SLAVE I2C	EDID E-EDID Seg	ment
0:13:14.4612	DDC	D EDID MASTE	ER -> SLAVE I2C	Request Offset 0	
0:13:14.4617	DDC	D EDID SLAVE	-> MASTER I2C	Response	
HDMI (RC	GB)	480p 60)Hz	Color Bars	

HDMI AUXILIARY CHANNEL ANALYZER TEST (PASSIVE OPTION)

Passive Monitoring – Passively monitor hot plug-related events, HDCP and EDID transactions between HDMI connected devices.





< Aux Char	inel Analyzer	Home	Preferences	Help
Stop	Save Clear	Details	Auto Sci	roll
* START * * ACK *				
0000: 74 40 Register 0x40 (B REPEATER: 1 READY: 0 FAST: 0 1.1_FEATURES: FAST_REAUTHE				
HDMI (RGB) 480p	60Hz	Color Bars	