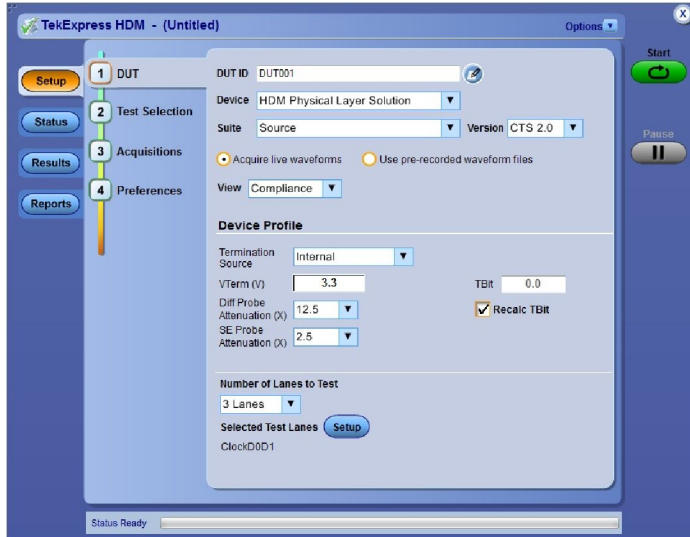
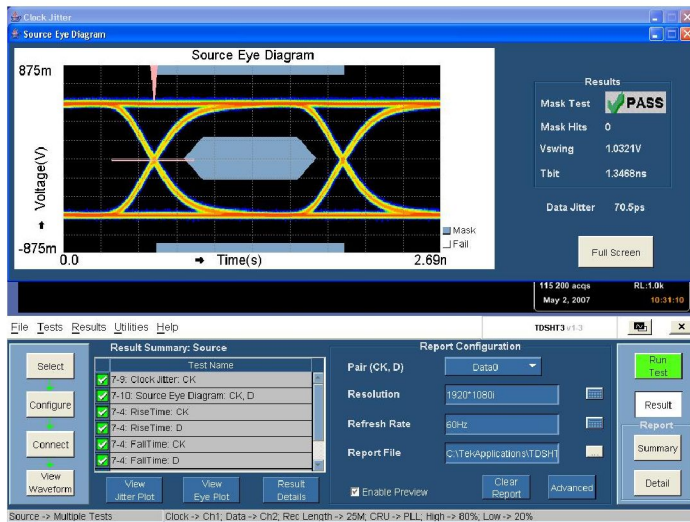


HDMI compliance test software

Option HDM, Option HDM-DS, Option HT3, Option HT3-DS Datasheet



HDM software



HT3 software

HDMI compliance test software

Engineers designing and validating the HDMI physical layer of their devices face constant pressure to improve efficiency. Designers need to perform a wide range of compliance tests quickly and reliably right on their bench. HDMI 2.0 supports features like 2160p (also known as Ultra HD/4K 2K 60/50 Hz), operating at 5.94 Gcps apart from 4K 2K 4:2:0, using the same Cat 2 cable and HDMI 1.4b connector. HDMI 1.4a/b introduces Automotive HDMI (Type E) in addition to Mobile HDMI (Type D), HEAC, 3D HDMI, 4K x 2K patterns, and new Calorimetric patterns, all operating up to 3.4 Gb/s.

Option HDM and HDM-DS Advanced Analysis and Compliance Software automates a comprehensive range of tests as per CTS 2.0. TDSHT3 and HT3-DS HDMI Compliance Test Software automate a comprehensive range of tests as per CTS 1.4b - enabling unprecedented efficiency with reliable results. HDMI 1.4b compliance testing is a PREREQUISITE for HDMI 2.0 testing.

Key features

- Conformance to HDMI 2.0 Compliance Test Specification (CTS)
- Introducing the innovative HDMI protocol analyzer solution for HDMI 1.4b
- One-box solution for HDMI 1.4b physical-layer and protocol-layer testing
- Fast, efficient direct synthesis solution
- Conformance to HDMI 1.4a/b Standards and Compliance Test Specification 1.4a/b (CTS)
- Complete validation to standards with wide range of tests for source, sink, and cable devices
- Accurate source tests using precise measurement techniques
- Dependable sink tests with closed-loop measurements that eliminate nonlinearities in test setup
- Automation of complex sink and cable tests with remote control of signal sources and software emulation of cable effects, eliminating the need for hardware transition time converters (TTC) and cable emulators
- Quick results with automatic mask fit, measurements and Pass/Fail notification, and in-depth results with statistical analysis and mask margins
- Quick testing with one-button selection of multiple tests and CSV-format test summary and reports
- Comprehensive HDMI 2.0/1.4a/b solution including test fixtures, DPO/ DSA/MSO70000 real-time oscilloscopes, P7313SMA differential probes, AWG70000/7000 signal sources, HDMI fixtures, and DSA8300 sampling oscilloscopes

Applications

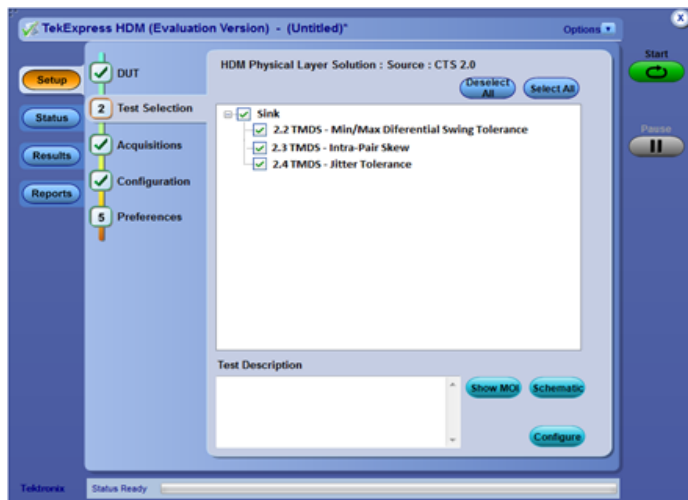
- Design and validation of HDMI 2.0/1.4a/b physical layer

Reliable and dependable results

Option HDM embeds HDMI forum CTS 2.0 compliance test procedures, ensuring reliable results. TDSHT3 embeds the HDMI CTS 1.4a/b compliance test procedures, including the software clock recovery (SoftCRU), ensuring dependable results. Accurate eye rendering and precise violation testing deliver credible results. Perform accurate Sink tests with closed-loop measurements that eliminate nonlinearities of the test setup. Authentic measurement techniques and automation eliminate errors to provide repeatable results.

Faster validation cycles

The unparalleled automation offered on the HDM, HDM-DS, TDSHT3 and HT3-DS enables faster validation. Reduce test times for complete HDMI Sink testing with HDM, HDM-DS, TDSHT3 and HT3-DS by digitally controlling cable emulator and TTC effects allowing for a single hardware connection for all resolutions. Demonstrate efficiency by using the "Select All" feature to perform multiple tests. Quickly generate CSV-format summaries or detailed reports at a press of a button.



HDM-DS software



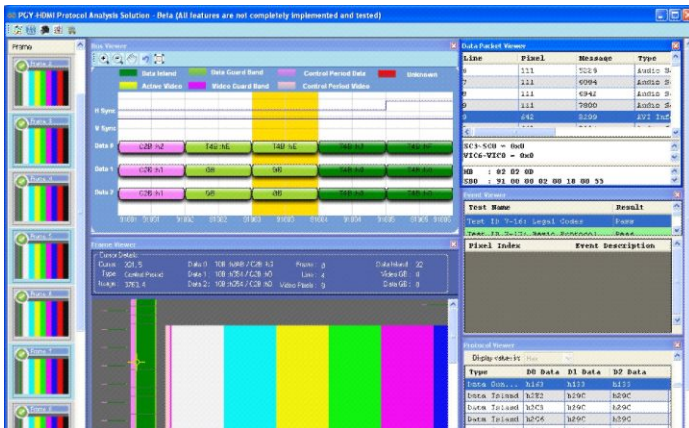
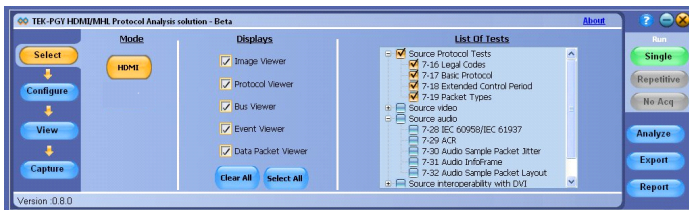
HT3-DS software

Test descriptions

Test	Description
Source tests	
Eye diagram ¹	PLL, raw, and ideal clock
Clock jitter ¹	PLL, raw, and ideal clock
Clock duty cycle	
Rise time and fall time	
Inter-pair skew	Data-Data
Low amplitude	
Sink tests	
Jitter tolerance ¹	
Jitter frequencies (D/CK)	500 kHz/10 MHz or 1 MHz/7 MHz
DUT frequency (pixel clock) for HDMI 1.4b	25, 27, 74.25, 148.5, 165, 225, 297, 330 MHz
DUT data rate for HDMI 2.0	3.71, 4.46, 5.94 Gbps
Direct Synthesis Solution provides selection of cable emulators' emulation in the software. 1st Cable Emulator or 2nd Cable Emulator or Both. Covering the various Type 1, Type 2, Type 3, and Type E cable emulators required in CTS for HDMI 2.0/1.4a/b as per resolution selection.	
Min/Max differential swing tolerance	250 mV - 70 mV, 20 mV steps. Direct Synthesis setup can also be used for this test
Intra-pair skew	<1 ns, 0.1 T _{bit} steps. Direct Synthesis setup can also be used for this test
Deep color tests	Selection under Direct Synthesis method
Cable tests	
Eye diagram ¹	TP1 and TP2. Direct Synthesis setup can also be used for this test
Repeater cable inter-pair skew test	Selection under Direct Synthesis method only

¹ Requires record length of more than 16M on each channel. HDMI 2.0 Eye Diagram is at TP2 after cable emulator effect.

TEK-PGY-HDMI-PA-SW



Tektronix is pleased to introduce the HDMI protocol analyzer software developed by our third-party partner for our DPO/DSA/MSO70000B/C/D Series real-time oscilloscopes with bandwidth ≥ 12.5 GHz and above. Salient features include:

- One-box solution for both HDMI physical- and protocol-layer testing leveraging real-time oscilloscopes.
- Detailed HDMI protocol decodes. Multi-view decode capability:
 - Bus viewer
 - Frame viewer
 - Event viewer
 - Data packet viewer
 - Protocol viewer
- Seamless link layer to physical layer analysis and decode capability:
 - Ability to view analog waveform with protocol decode
- Common probing technique for physical-layer and protocol-layer testing.

Refer to the Prodigy techno visions website (<http://www.prodigytechno.com>) for more details on the HDMI protocol analyzer software.

HDMI Protocol Tests (as per CTS 1.4a/b)

Source protocol tests:

- 7-16 legal codes
- 7-17 basic protocol
- 7-18 extended control period
- 7-19 packet types
- 7-23/7-24 pixel encoding
- 7-25 video format timing
- 7-26 pixel reception
- 7-27 AVI info frame

Source audio:

- 7-28 IEC 60958/IEC 61937
- 7-29 ACR
- 7-30 audio sample packet jitter
- 7-31 audio info frame
- 7-32 audio sample packet interoperability
- 7-33 source interoperability with DVI

Source advanced features:

- 7-34 deep color
- 7-35 gamut metadata transmission
- 7-36 high bit rate audio
- 7-37 one-bit audio
- 7-38 3D video format timing
- 7-39 4KX2K video format timing – record length dependent
- 7-40 extended colorimetry transmission

Combined HDMI and MHL protocol solution

We are also pleased to announce the availability of the combined HDMI and MHL protocol analyzer software to enable customers who work on both the technologies to leverage a cost-effective protocol software bundle. For details on MHL protocol analyzer software refer to MSR#1992010. The bundled HDMI/MHL protocol analyzer software is a stand-alone option for the Tektronix real-time oscilloscopes with the following nomenclature: TEK-PGY-HDMH-PA-SW.

MHL protocol compliance tests (as per CTS 1.1)

Source Protocol Tests:

- Legal Codes
- Basic Protocol
- Packet Types
- Source Video
- Pixel Encoding
- Video Format Timing
- Video Quantization Test
- AVI Info Frame

Source Audio Tests:

- Audio Test
- Audio Clock Regeneration Test
- Audio Info Frame

Supported Tektronix instruments

- Real-time oscilloscopes

DPO/DSA/MSO70000 series real-time oscilloscopes support HDM, HDM-DS, HT3, HT3-DS, DPOFL-HDM and DPOFL-HDM-DS

Note: The recommended oscilloscope bandwidth for HDMI 2.0 is ≥ 16 GHz. Although a 12.5 GHz bandwidth oscilloscope is supported, it will have as much as a 10% inaccuracy in test results.

- Sampling oscilloscopes

TDR tests: DSA8300 oscilloscope with 80E03 and 80E04 modules

- Generators (using direct synthesis method)

AWG70002A with Opt. 02, Opt. 225 and Opt. 03 (sequencing option) (Qty: 2), or AWG7122B/C with Opt. 01, Opt. 02/06 and Opt. 08 (Qty: 2)

AFG3102/C or AFG3252/C - Used for synchronizing and triggering the 2 AWGs in the direct synthesis setup

Ordering information

HDM test software

Test software includes: Application CD, HDMI direct synthesis AWG patterns DVDs, and electronic documentation.

Software options

To order with oscilloscope

Product/feature	Description
Option HDM	HDMI 2.0 Advanced Analysis and Compliance Software for Source testing. (Prerequisite for HDMI 2.0 is HDMI 1.4b testing; hence HT3 is required. Prerequisite is Option DJA, Opt 10XL (required for 100M RL), Opt SR-EMBD and SR-CUST).
Option HDM-DS	HDMI 2.0 Advanced Analysis and Compliance Software for Sink testing (Prerequisite HDM and HT3-DS). Since HDMI 1.4b is a prerequisite for HDMI 2.0 testing, HT3-DS is needed.
Option HT3	HDMI 1.4b Compliance Test Software
Option HT3-DS	HDMI 1.4b Direct Synthesis Software (requires Opt. HT3)
TEK-PGY-HDMI-PA-SW	HDMI 1.4b - only Protocol Analyzer Software (requires Option 20XL and (4) P7313SMA probes)
TEK-PGY-HDMH-PA-SW	Combined HDMI 1.4b and MHL Protocol Analyzer Software (requires Option 20XL, and (4) P7313SMA probes for HDMI protocol testing or (2) P7313SMA and (1) P7240 probes for MHL protocol testing)
DPOFL-HDM	Advanced Analysis and Compliance Software for HDMI 2.0 Tx floating license
DPOFL-HDM DS	Advanced Analysis and Compliance Software for HDMI 2.0 Rx floating license
DPOFT-HDM	Advanced Analysis and Compliance Software for HDMI 2.0 Tx floating license (trial version)
DPOFT-HDM DS	Advanced Analysis and Compliance Software for HDMI 2.0 Rx floating license (trial version)

Software upgrades

To upgrade an existing oscilloscope

Product/feature	Description
DPO/DSA/MSO70000	Order DPO-UP – Opt. HDM
DPO/DSA/MSO70000	Order DPO-UP – Opt. HDM-DS
DPO/DSA/MSO70000	Order DPO-UP – Opt. HT3
DPO/DSA/MSO70000	Order DPO-UP – Opt. HT3-DS ²
TEK-PGY-HDMI-PA-SW	HDMI-only Protocol Analyzer Software (requires Option 20XL and (4) P7313SMA probes)
TEK-PGY-HDMH-PA-SW	Combined HDMI and MHL Protocol Analyzer Software (requires Option 20XL, and (4) P7313SMA probes for HDMI protocol testing or (2) P7313SMA and (1) P7240 probes for MHL protocol testing)
Note: The recommended oscilloscope bandwidth for performing both physical-layer and protocol-layer testing using the same oscilloscope is ≥ 12.5 GHz, as the protocol analyzer software requires the 20XL record length option.	

² HT3-DS is available on DPO/DSA/MSO70000 series scopes with bandwidth greater than 8 GHz.

Recommended equipment and accessories

Accessory	Description
Oscilloscope	16M Record Length / Ch or more - Opt. 2XL on DPO/DSA/MSO70000 oscilloscopes (for eye diagram and jitter tests) 250M Record Length / Ch - Opt. 20XL on DPO/DSA/MSO70000 oscilloscopes (for protocol analysis) Opt 10XL (100M RL) needed for HDMI 2.0. Option DJA, Opt SR-EMBD and SR-CUST also needed as a pre-requisite for HDM Software.
Signal sources	AWG70002A with opt 01, 03 and 225 or AWG7122B/C with option 01, 02/06, and 08 (for direct synthesis method)
Probes	
Differential probes	P7350SMA (2 probes required) - for testing TMDS clock rates less than or equal to 74.25 MHz P7313SMA (minimum 2 probes required) - for testing all resolutions (recommended for 1.4a/b specs testing) and are also used for single-ended testing. 4 probes are recommended for faster physical layer testing of all 4 HDMI and HDMI 2.0 channels. 4 P7313SMA probes are required for protocol analysis
Active probes	P7240 used with old 1.2 test fixtures (2 probes required); P7313SMA probes can also be used to test single-ended tests using 50 Ω short
Probe positioner	PPM100 flexible arm probe positioner
HDMI direct synthesis accessory kit (required with Option HT3-DS and Option HDM-DS)	Consists of: Minicircuits bias tees (ZX85-12G-S+) (Qty: 8) Matched SMA cables (174-4944-xx) (Qty: 10) Picosecond pulse labs TTC filter (5915-110-120PS) (Qty: 8) BNC cables (012-0057-xx) (Qty: 4) BNC-T adapter (015-1016-xx) (Qty: 1) GPIB cables from NI (763061-xx) 6 dB attenuator from mini circuits (BW-S6W2+) (Qty: 8) 112PS delay line for HDMI 2.0 Sink Jitter Tolerance test (Qty: 4)
Sink test automation ³	
NI GPIB-USB-A/B	USB-to-GPIB controller (with driver software)
NI GPIB-ENET/100	Ethernet GPIB controller (with driver software)

HDMI type 2.0 fixtures

- TF-HDM-TPA-S
- TF-HDMI-TPA-T (Termination fixture)
- TF-HDM-TPA-STX
- TF-HDMD-TPA-STX

³ For ordering, contact National Instruments (ni.com).

HDMI 1.4b type A fixtures

- TF-HDMI-TPA-S Test Adapter Set (used for Source, Sink, and Cable test) includes the following:
 - TF-HDMI-TPA-P plug fixture
 - TF-HDMI-TPA-CE EDID board with EDID EEPROM
- TF-HDMI-TPA-STX Test Adapter Set (used for Source and Sink test) includes the following:
 - TF-HDMI-TPA-P plug fixture
 - TF-HDMI-TPA-R receptacle fixtures (Qty: 2)
 - Calibration fixture
 - TF-HDMI-TPA-CE EDID board with EDID EEPROM

HDMI 1.4b type C fixtures

- TF-HDMIC-TPA-S Test Adapter Set (used for Source, Sink, and Cable testing) includes the following:
 - TF-HDMIC-TPA-P plug fixture
 - TF-HDMIC-TPA-R receptacle fixtures (Qty. 2)
 - Calibration fixture
 - TF-HDMI-TPA-CE EDID board with EDID EEPROM
- TF-HDMIC-TPA-STX Test Adapter Set (used for Source testing only) includes the following:
 - TF-HDMIC-TPA-P plug fixture
 - TF-HDMI-TPA-CE EDID board with EDID EEPROM

HDMI 1.4b type D fixtures

- TF-HDMID-TPA-P Plug Board
- TF-HDMID-TPA-R Receptacle Board
- TF-HDMI-TPA-CE consisting of (to be ordered separately):
 - EDID Fixture PCBA
 - EEPROM with HDMI 1.4a/b Software
 - Ribbon Cable (174-5746-xx)
 - Customer Documentation

HDMI 1.4b type E fixtures

- TF-HDMIE-TPA-KIT Test Adapter Kit (used for Source, Sink, and Cable testing) includes the following:
 - 1 TF-HDMIE-TPA-P plug board
 - 2 TF-HDMIE-TPA-R receptacle boards
- TF-HDMI-TPA-CE consisting of (to be ordered separately):
 - EDID Fixture PCBA
 - EEPROM with HDMI 1.4a/b Software
 - Ribbon Cable (174-5746-xx)
 - Customer Documentation



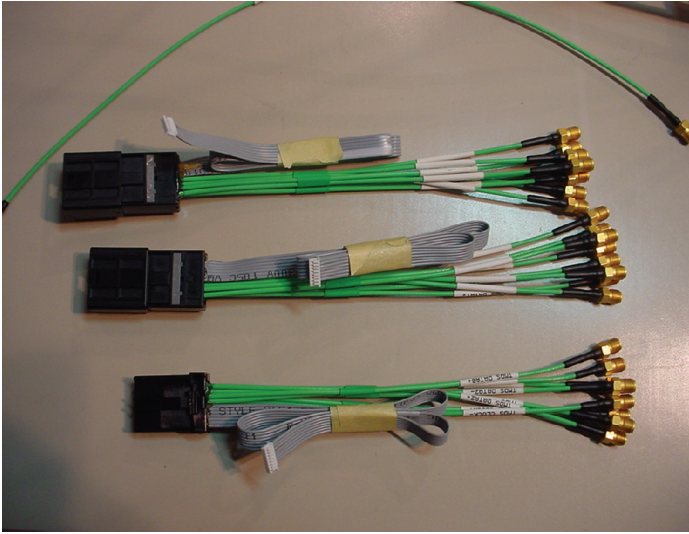
TF-HDMI-TPA-STX



TF-HDMI-TPA-P/R



TF-HDMI-TPA-T



Tf-HDMIE-TPA-KIT



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.



Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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