TekExpress®
HDM Advanced Analysis and Compliance Solution
Printable Application Help

077-0926-02

Tektronix

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- In North America, call 1-800-833-9200.
- Worldwide, visit *www.tektronix.com* to find contacts in your area.

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Getting help and support

Technical support

Tektronix values your feedback on our products. To help us serve you better, please send us your suggestions, ideas, or comments on your application or oscilloscope. Contact Tektronix through mail, telephone, or the Web site, *www.tektronix.com*.

When you contact Tektronix Technical Support, please include the following information (be as specific as possible):

General Information

- All instrument model numbers
- Hardware options, if any
- Probes used
- Your name, company, mailing address, phone number, FAX number
- Please indicate if you would like to be contacted by Tektronix about your suggestion or comments.

Application Specific Information

- Software version number
- Description of the problem such that technical support can duplicate the problem
- If possible, save the setup files for all the instruments used and the application.
- If possible, save the TekExpress setup files, log.xml, *.TekX (session files and folders), and status messages text file.
- If possible, save the waveform on which you are performing the measurement as a .wfm file.

Overview and key specifications

Supported tests- HDM Source

TekExpress HDM Source supports automation of following differential and single-ended tests:

Differential tests

- HF1-2: Source TMDS Electrical – 6G – TRISE, TFALL

  This test confirms that the rise times and fall times on the TMDS differential signals fall within the limits of the specification.

- HF1-3: Source TMDS Electrical – 6G – Inter-Pair Skew

  This test confirms that the skew between two data lanes on the TMDS differential signals fall within the limits of the specification.

- HF1-5: Source TMDS Electrical – 6G – Differential Voltage

  This test confirms that the voltage level of the TMDS differential signals complies with the limits mentioned in specification.

- HF1-6: Source TMDS Electrical – 6G – Clock Duty Cycle and Clock Rate

  This test confirms that the duty cycle and clock rate of the TMDS differential clock complies with the limits mentioned in specification.

- HF1-7: Source TMDS Electrical – 6G – Clock Jitter

  This test confirms that the clock jitter of the TMDS differential clock complies with the limits mentioned in specification.

Single ended tests

- HF1-8: Source TMDS Electrical – 6G – Data Eye diagram

  This test confirms that the HDMI Data output has signal quality that meets the eye opening required by the specification

- HF1-1: Source TMDS Electrical – 6G – VL and VSwing

  This test confirms that the low voltage level of the TMDS single ended signals complies with the limits mentioned in specification.

- HF1-4: Source TMDS Electrical – 6G – Intra-Pair Skew

  This test confirms that the skew between the positive and negative lane of the TMDS single ended signals complies with the limits mentioned in specification.

Supported tests- HDM Sink

TekExpress HDM Sink supports the following automated HDM Sink Electrical and Sink Protocol tests.

These tests are supported for CTS Version 1.4b:

HDM Sink Electrical tests

- Test ID 8-5: TMDS-Min/Max Differential Swing Tolerance
- Test ID 8-6: TMDS-Intra-Pair Skew
- Test ID8-7: TMDS-Jitter Tolerance

HDM Sink Protocol tests

- Test ID 8-15: Character Synchronization
- Test ID8 -16: Acceptance of All Valid Packet Types
- Test ID 8-19: Pixel Encoding Requirements
- Test ID 8-20: Video Format Timing
- Test ID8-21: Audio Clock Regeneration
- Test ID 8-22: Audio Sample Packet Jitter
- Test ID 8-23: Audio Formats
- Test ID 8-24: Interoperability with DVI
- Test ID 8-25: Deep Color
- Test ID 8-28: One Bit Audio
- Test ID 8-29: 3D Video Format Timing
- Test ID 8-30: 4K 2K Video Format Timing
- Test ID 8-31: Extended Colors and Contents

These tests are supported for CTS Version 2.0:

HDM Sink Electrical tests

- HF 2-1-Min/Max Differential Swing Tolerance
- HF 2-2-Intra-Pair Skew
- HF 2-3-Jitter Tolerance

HDM Sink Protocol tests

- HF2-6 Sink Video Timing - 6G - 2160p 24 bit Color Depth
- HF2-7 Sink Video Timing - 6G - 2160p Deep Color
- HF2-8 Sink Video Timing - 6G - 2160p 3D
- HF2-23 Sink Pixel Decoding YCBCR 4:2:0
- HF2-24 Sink Pixel Decoding YCBCR 4:2:0 Deep Color
- HF2-25 Sink Video Timing - 21:9

- HF2-36 Sink Video Timing - 6G - Non-2160p 24 bit Color Depth
- HF2-37 Sink Video Timing - 6G - Non-2160p Deep Color
- HF2-38 Sink Video Timing - 6G - Non-2160p 3D

Supported resolutions- HDM Source

CTS 2.0: All of the TekExpress HDM tests can be performed for DUTs operating in resolutions between 3.4 GHz to 6 GHz. Other resolutions that fall within this range can be entered in the Low Resolution and High Resolution fields on the DUT tab of the Setup panel.

When Low and High resolutions are the same, the software performs the test at that one resolution.

Table 1: Supported resolutions (Source)

	DUT Configuration	
Measurement name	**Highest supported TMDS Character rate**	**Lowest supported TMDS Character rate**
HF 1-1: V_L and V_{SWING}	N/A	Yes
HF 1-7: T_{RISE} and T_{FALL}	Yes	N/A
HF 1-3: Inter-Pair Skew	Yes	N/A
HF 1-3: Inter-Pair Skew	Yes	N/A
HF 1-5: Differential Voltage	-	-
Eye Width	N/A	Yes
Maximum Differential Voltage	N/A	Yes
Maximum Differential Voltage	N/A	Yes
HF 1-6: Clock Duty Cycle and Clock rate	-	-
Maximum Duty Cycle	Yes	Yes
Minimum Duty Cycle	Yes	Yes
Clock Rate	Yes	Yes
HF 1-7- Clock Jitter	Yes	N/A
V_{Swing}	Yes	N/A
HF 1-8-Data Eye Diagram	Yes	N/A

Supported resolutions- HDM Sink

CTS 2.0: All of the TekExpress HDM Sink tests can be performed at data rates 2.97 GHz, 3.71 GHz, 4.46 GHz and 5.94 GHz.

CTS 1.4: All of the TekExpress HDM Sink tests can be performed at data rates 27 MHz, 74.25 MHz, 148.5 MHz, 222.75 MHz and 297 MHz.

Operating basics

Equipment connection setup (HDM Source)

You need the following equipment to run HDM Source tests. (For details, see *Minimum system requirements*):

- A *supported Tektronix oscilloscope*
- Four differential probes – P7313SMA, for single ended and differential tests
- Device under test (DUT)
- TF-HDM-TPA-S fixture
- A PWS4205, PWS2185 or 2220-30-1/ 2220J-30-1 Dual Power Supply (if using external power supply option)
- Any approved EDID analyzer

Connection diagrams and the tests they apply to are listed below.

Single Ended and Differential Tests

Table 2: Source differential tests

Test number and characteristic tested	Setup diagram
HF1-2: Source TMDS Electrical – 6G – TRISE, TFALL	Source differential diagram
HF1-3: Source TMDS Electrical – 6G – Inter-Pair Skew	Source differential diagram
HF1-5: Source TMDS Electrical – 6G – Differential Voltage	Source differential diagram
HF1-6: Source TMDS Electrical – 6G – Clock Duty Cycle	Clock diagram
HF1-7: Source TMDS Electrical – 6G – Clock Jitter	Clock diagram

Schematic for Source differential diagram

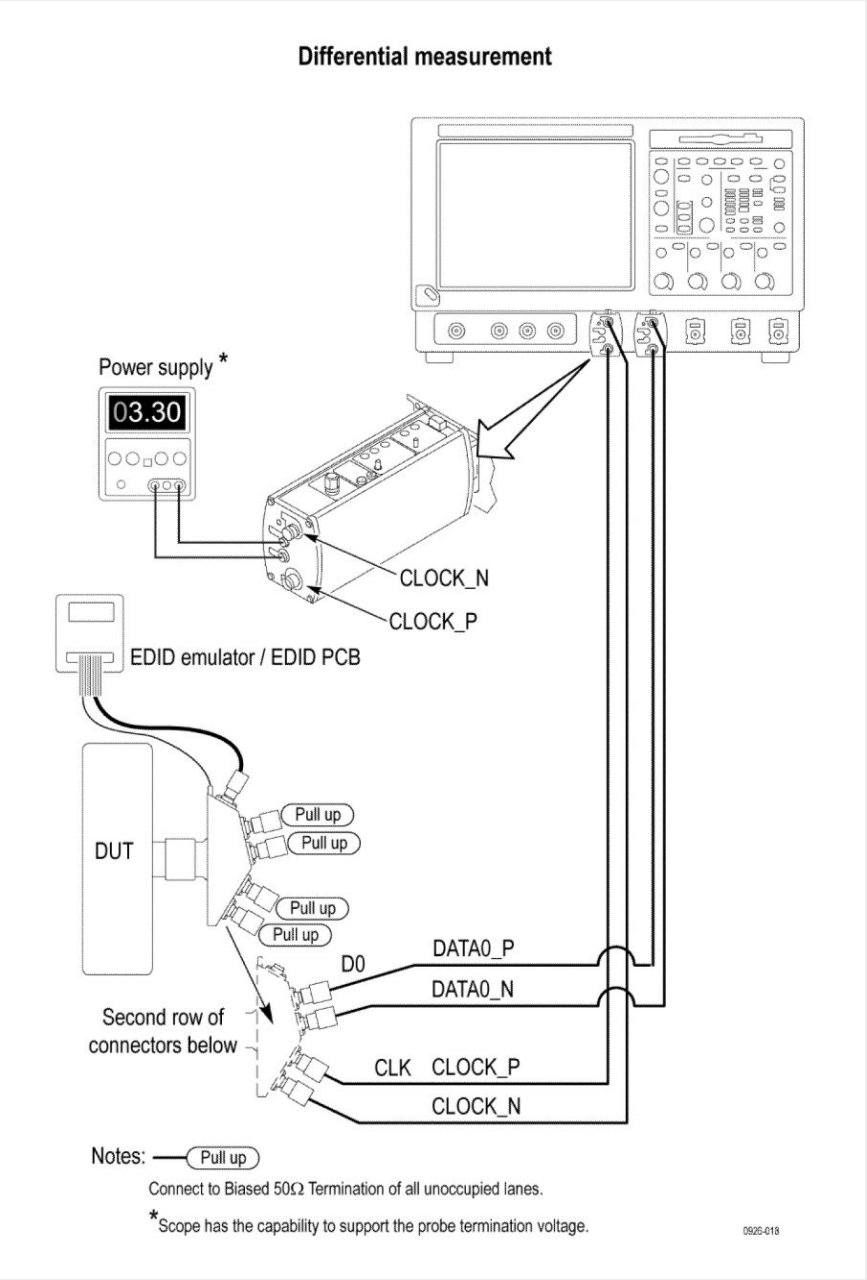
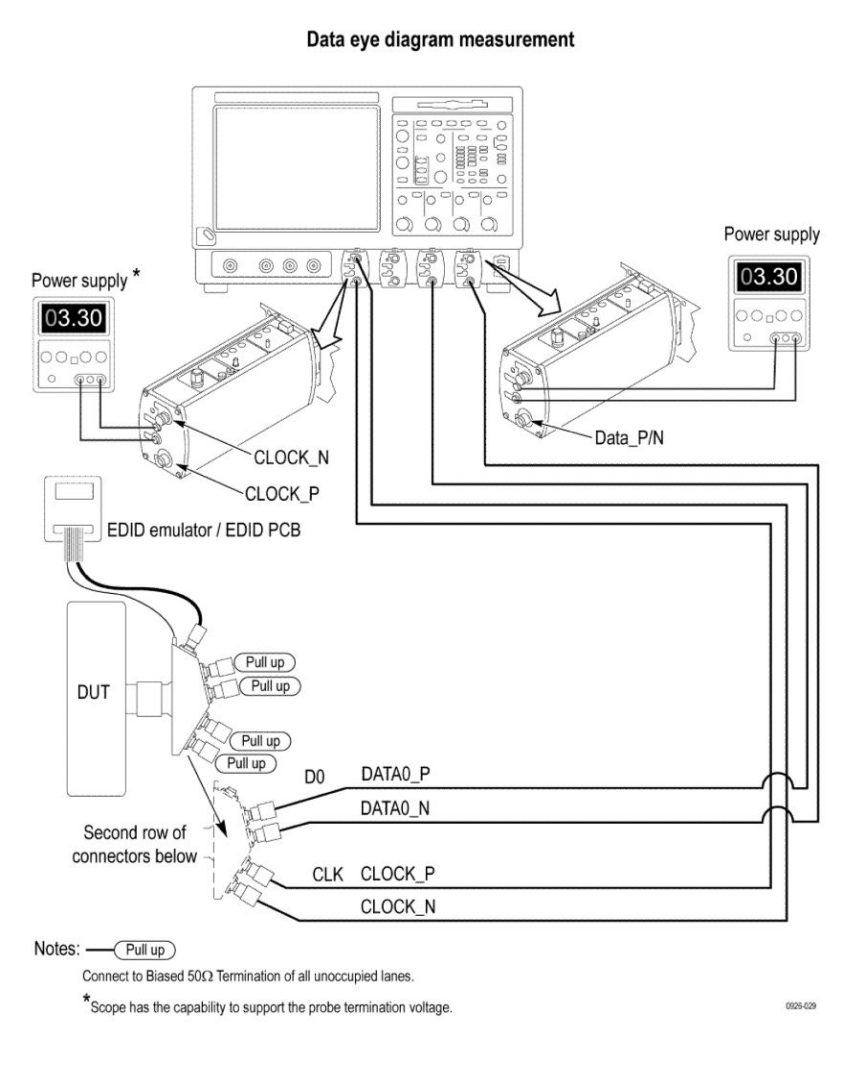


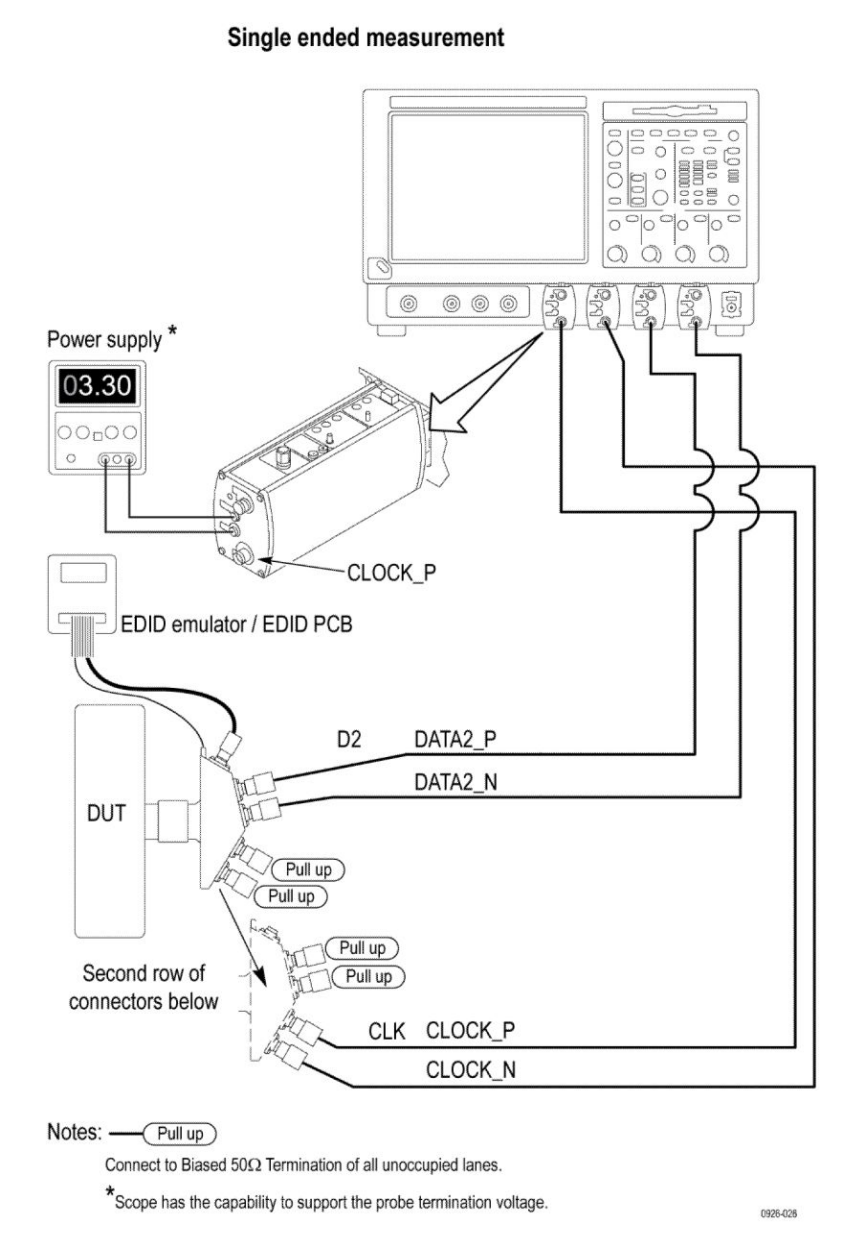
Table 3: Source single ended tests

Test number and characteristic tested	Setup diagram
HF1-8: Source TMDS Electrical – 6G – Data Eye Diagram	Source data eye diagram
HF1-1: Source TMDS Electrical – 6G – VL and VSwing	Source single ended diagram
HF1-4: Source TMDS Electrical – 6G – Intra-Pair Skew	Source single ended diagram

Schematic for Source data eye diagram



Schematic for Source single ended diagram



See Also *Equipment connection setup (HDM Sink)*

About algorithms

Equipment connection setup (HDM Sink for CTS 2.0)

You need the following equipment (for details, see *Minimum system requirements*):

- A *supported Tektronix oscilloscope*
- Device under test (DUT)
- Two TCA-SMA connectors
- An AFG3102, AFG3102C, AFG3252, or an AFG3252C
- Eight 12 GHz Bias T (mini circuit bias T model number zx85-12G-s+)
- Two 120 psec Rise time filters (5115110-120)
- A Power supply external (PWS4721, PWS4602, PWS4323, PWS4305, or PWS4205)
- Two AWG70002A instruments with option 01, 03 and 225, or two AWG7122C instruments with option 1, 2/6, 8
- TF-HDM-TPA-S
- 10 SMA cables (174-1428-00)
- Four BNC to SMA converters
- A BNC T connector
- Four BNC cables of similar length

Connection diagrams and the tests they apply to are listed below.

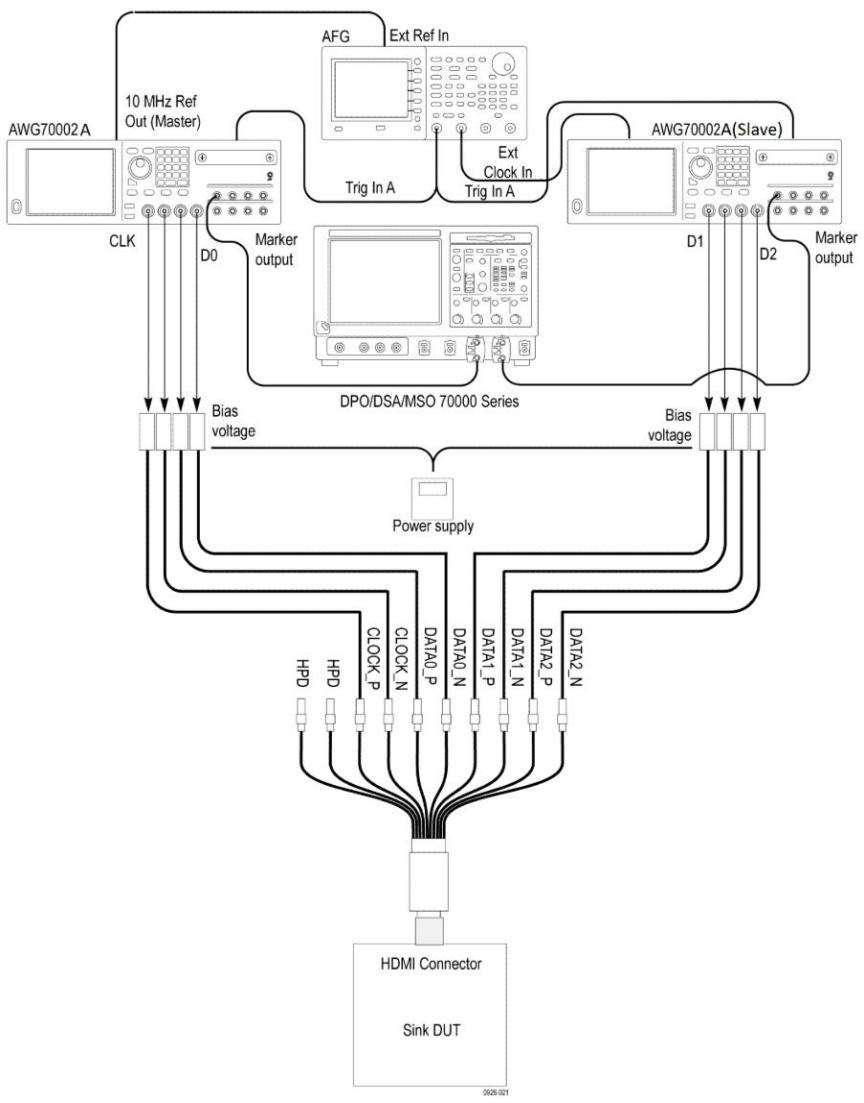
NOTE. *GPIB connection is supported only for AWG7122C. If using AWG7122C and GPIB connections, three NI-GPIB cables are needed.*

Sink tests

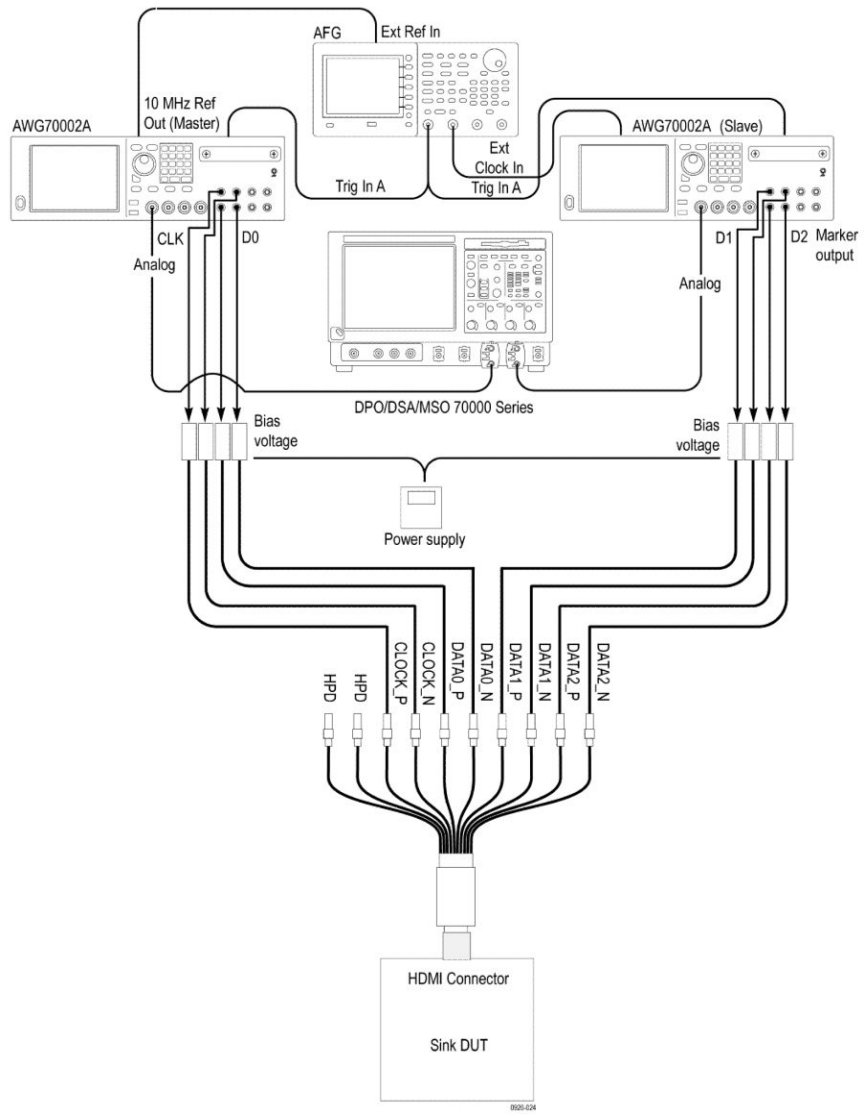
Table 4: Sink Electrical tests for 2.0

Test number and characteristic tested	Setup diagram
*HF 2-1: Min/Max Differential Swing Tolerance	Sink Electrical min diagram for AWG70002A Sink Electrical max diagram for AWG70002A Sink min/max diagram for AWG7122C
*HF 2-2: Intra-Pair Skew	Sink Electrical intra-pair skew diagram for AWG70002A Sink intra-pair skew diagram for AWG7122C
*HF 2-3: Jitter Tolerance	Sink Electrical jitter tolerance diagram for AWG70002A Sink jitter tolerance diagram for AWG7122C

Schematic for Sink Protocol, Electrical (min, intra-pair skew, jitter tolerance) tests for AWG70002A

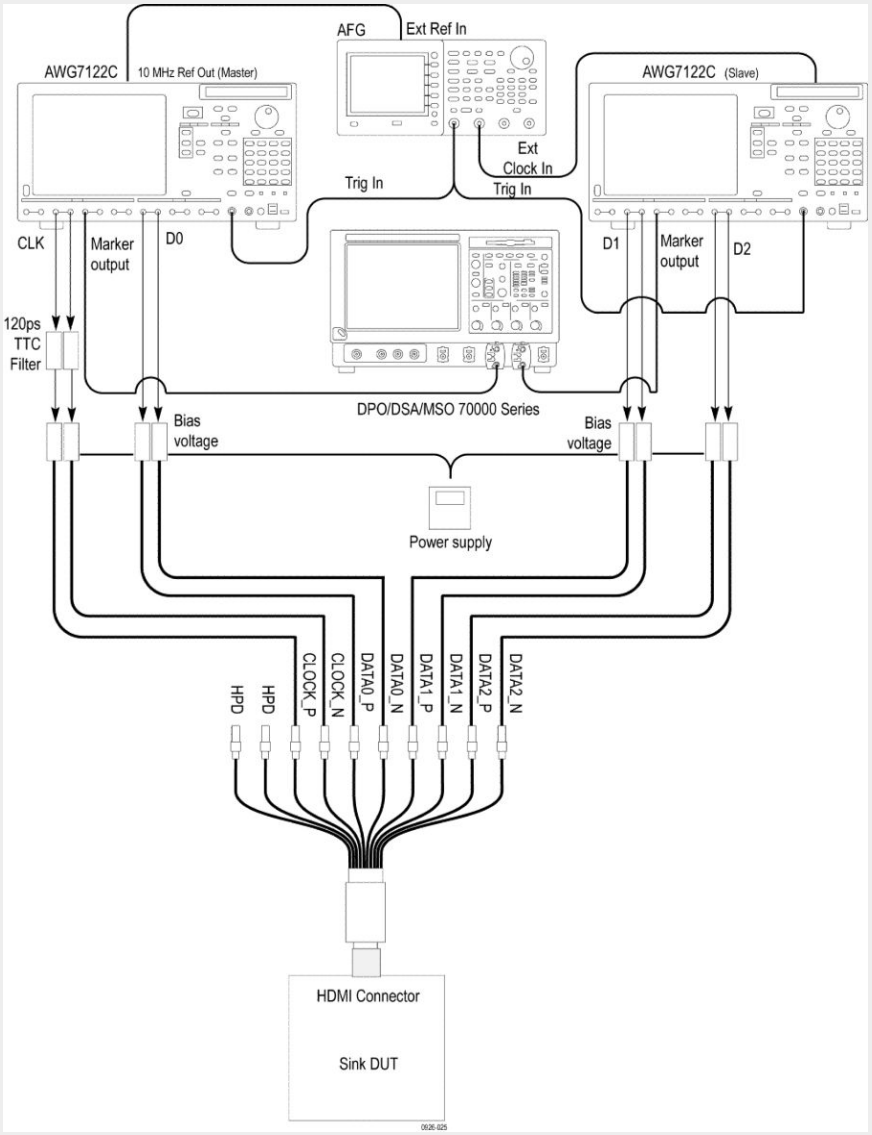


Schematic for Sink Electrical max test for AWG70002A



NOTE. *For AWG7122C, the connection remains the same as the nominal pattern.*

Schematic for Sink Electrical (jitter tolerance, intra-pair skew, and min/max) tests for AWG7122C



Schematic for Sink Protocol test for AWG7122C

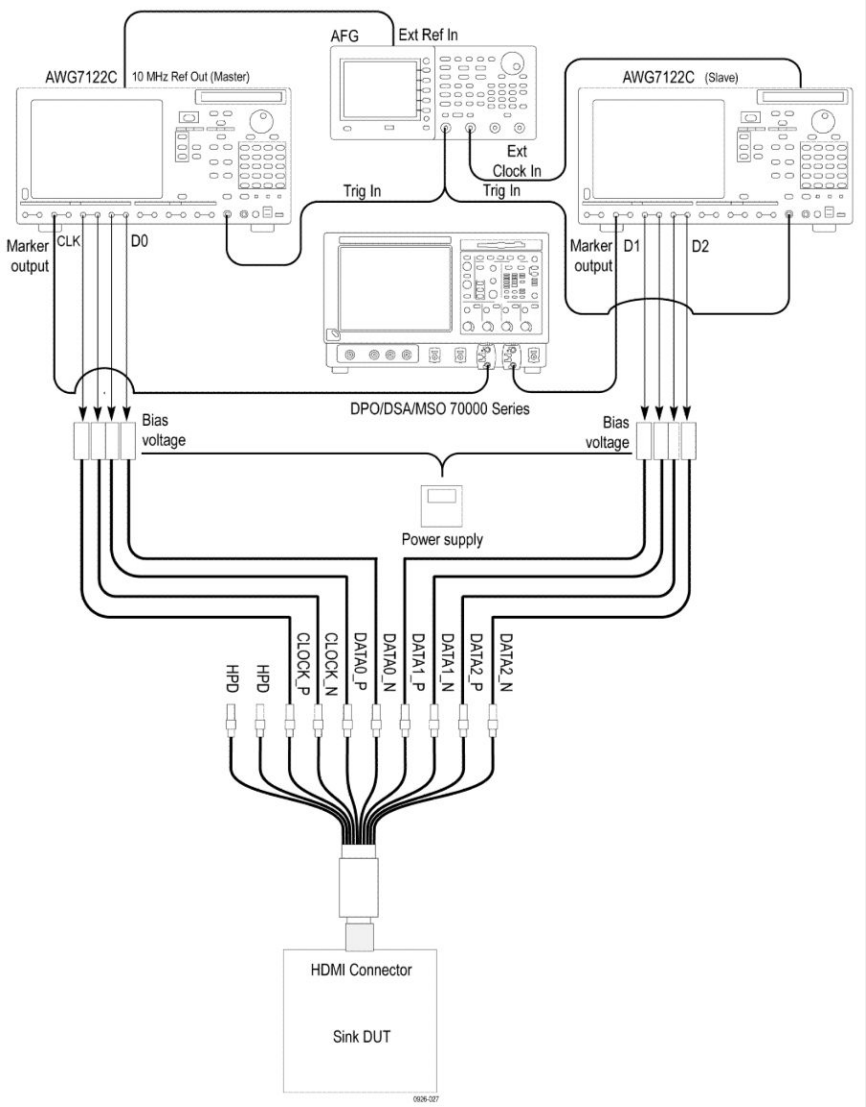


Table 5: Sink Protocol tests for CTS 2.0

Test number and characteristic tested	Setup diagram
HF2-6 Sink Video Timing - 6G - 2160p 24 bit Color Depth	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C
HF2-7 Sink Video Timing - 6G - 2160p Deep Color	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C
HF2-8 Sink Video Timing - 6G - 2160p 3D	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C
*HF2-23: Sink Pixel Decoding YCBCR 4:2:0	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C
HF2-24 Sink Pixel Decoding YCBCR 4:2:0 Deep Color	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C

Test number and characteristic tested	Setup diagram
HF2-25 Sink Video Timing - 21:9 (64:27)	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C
HF2-36 Sink Video Timing - 6G - Non-2160p 24 bit Color Depth	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C
HF2-37 Sink Video Timing - 6G - Non-2160p Deep Color	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C
HF2-38 Sink Video Timing - 6G - Non-2160p 3D	Sink Protocol diagram for AWG70002A Sink Protocol diagram for AWG7122C

Equipment connection setup (HDM Sink for CTS 1.4)

You need the following equipment (for details, see *Minimum system requirements*):

- A *supported Tektronix oscilloscope*
- Device under test (DUT)
- Two TCA-SMA connectors
- An AFG3102,AFG3102C,AFG3252, or an AFG3252C
- Eight 12 GHz Bias T (mini circuit bias T model number zx85-12G-s+)
- Eight 6.4 GHz filter (5115110-120)
- A Power supply external (PWS4721, PWS4602, PWS4323, PWS4305, or an PWS4205)
- Two AWG70002A instruments with option 01, 03 and 225, or two AWG7122C instruments with option 1, 2/6, 8

  NOTE. *The AWG7122C should not be used for CTS 1.4.*

- TF-HDM-TPA-S
- 10 SMA cables (174-1428-00)
- Four BNC to SMA converters
- One BNC T connector
- Three BNC cables
- One BNC T connector
- Four BNC cables of similar length

Connection diagrams and the tests they apply to are listed below.

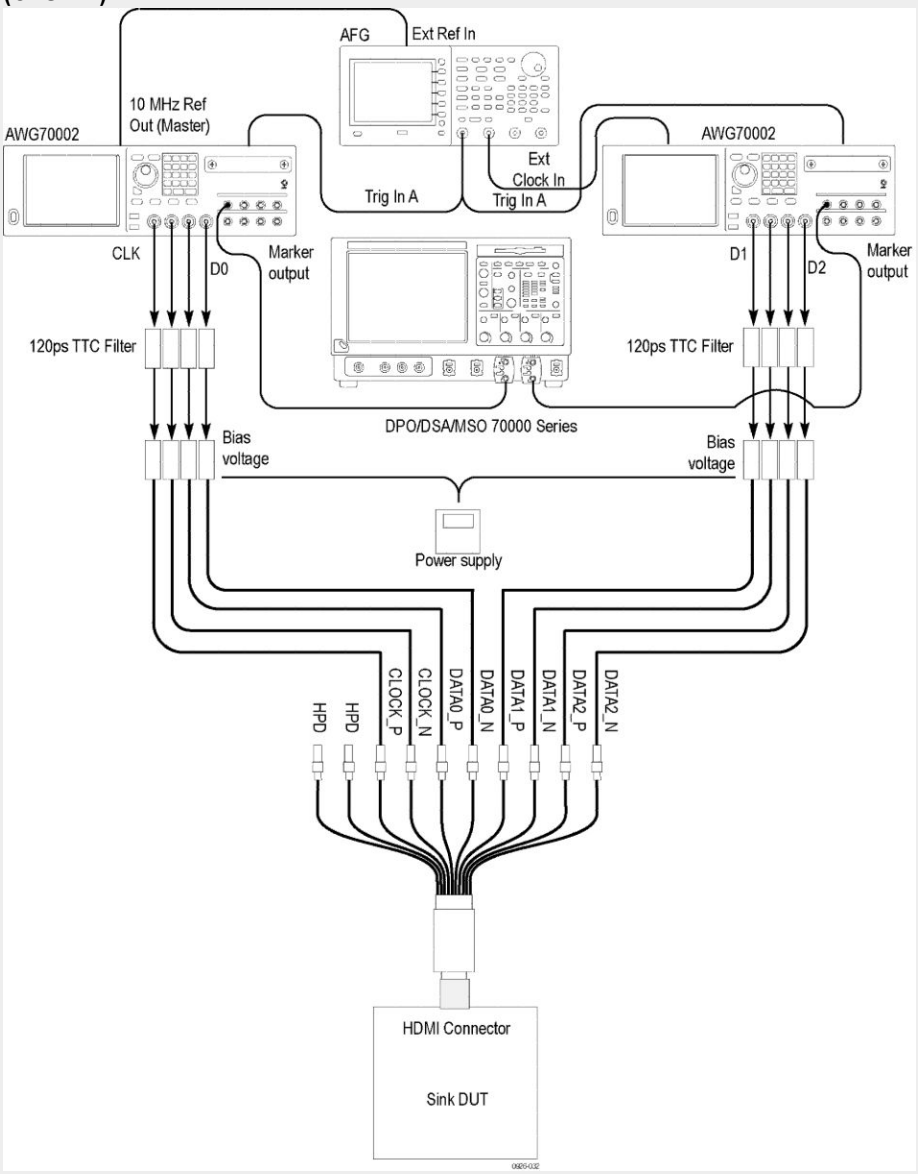
NOTE. *GPIB connection is supported only for AWG7122C. If using AWG7122C and GPIB connections, three NI-GPIB cables are needed.*

Sink tests

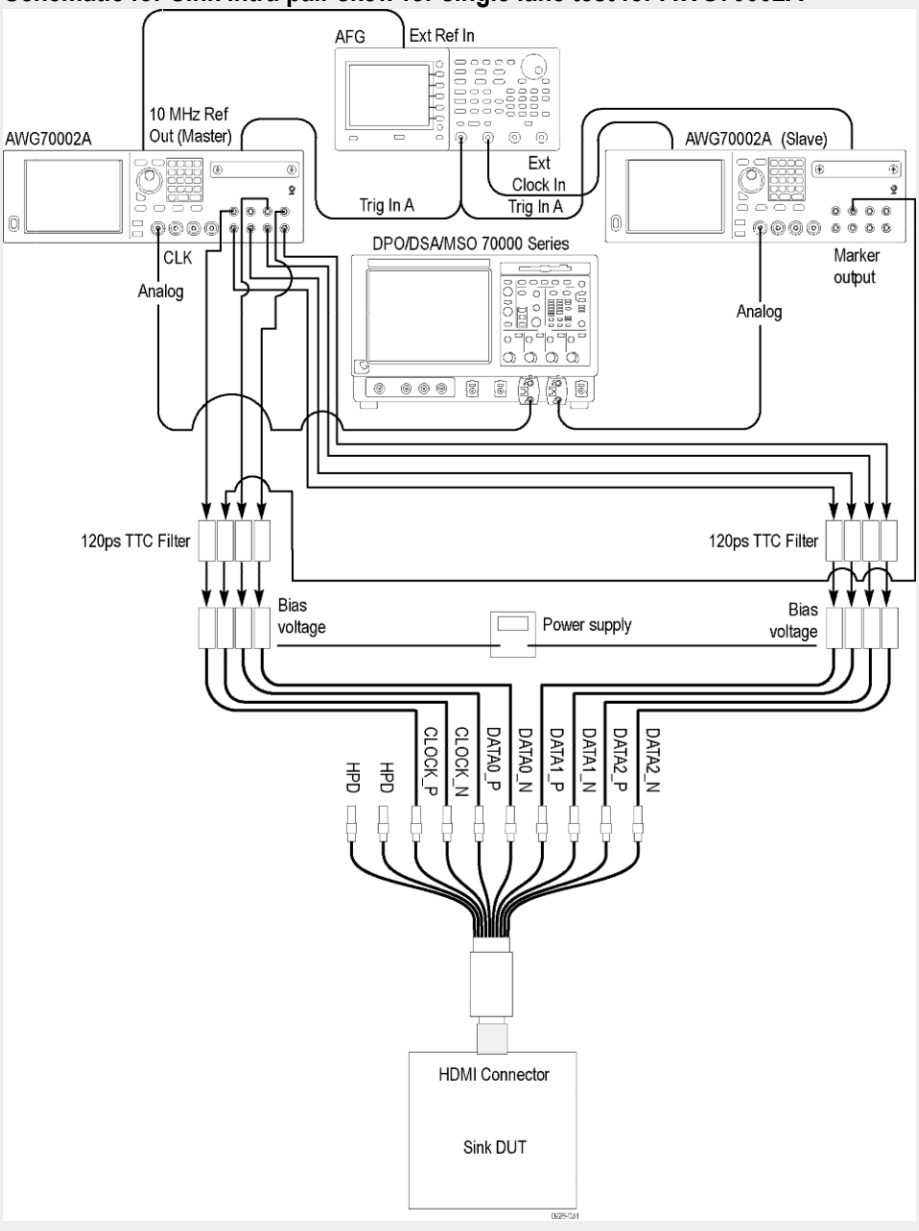
Table 6: Sink Electrical tests for 1.4

Test number and characteristic tested	Setup diagram
Test ID 8-5: TMDS-Min/Max Differential Swing Tolerance	Sink electrical min diagram for AWG70002A Sink Max diagram for AWG70002A
Test ID 8-6: TMDS-Intra-Pair Skew	Sink Intra pair skew diagram- single lane for AWG70002A Sink Intra pair skew diagram - all lanes for AWG70002A
Test ID 8-7: TMDS-Jitter Tolerance	Sink jitter tolerance diagram for AWG70002A

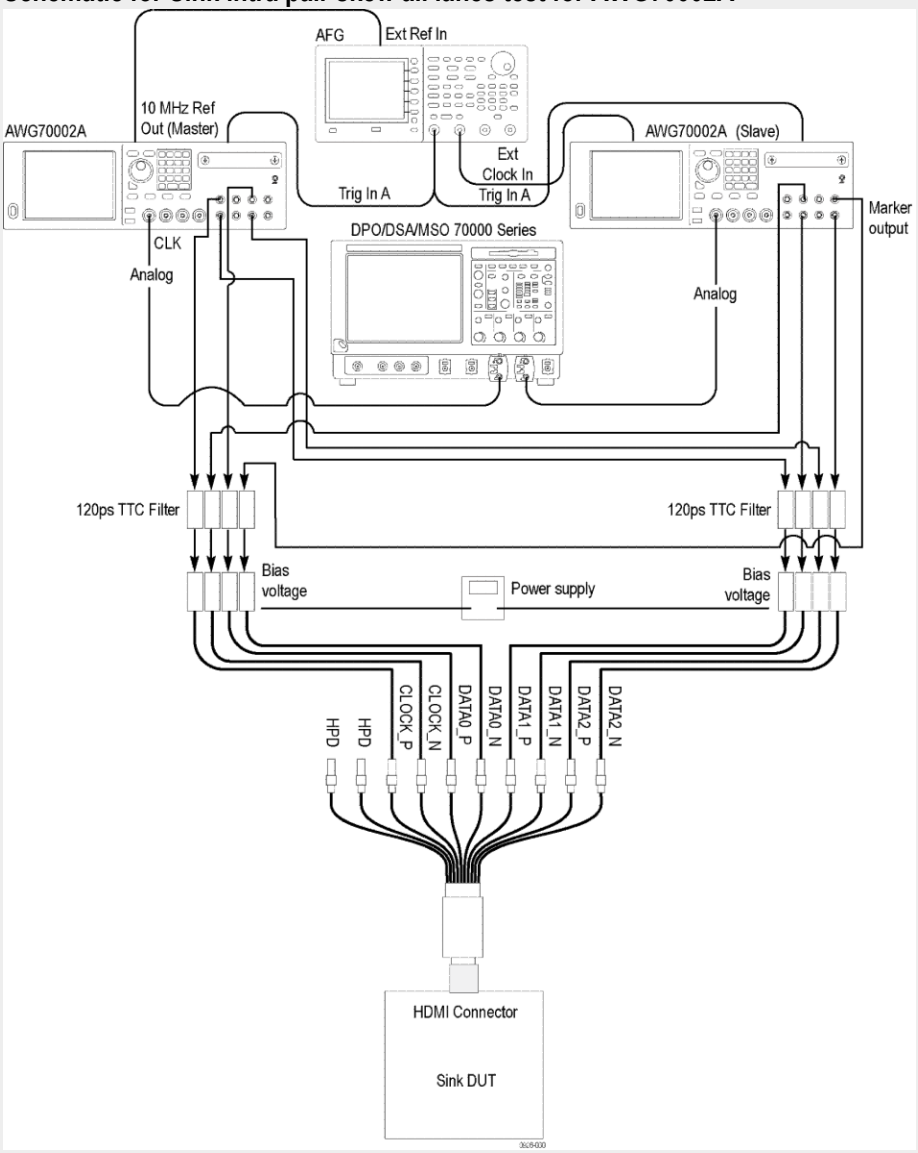
Schematic for Sink protocol, sink jitter tolerance, sink min test for AWG70002A (CTS 1.4)



Schematic for Sink Intra pair skew for single lane test for AWG70002A



Schematic for Sink intra pair skew all lanes test for AWG70002A



Schematic for Sink Max for AWG70002A

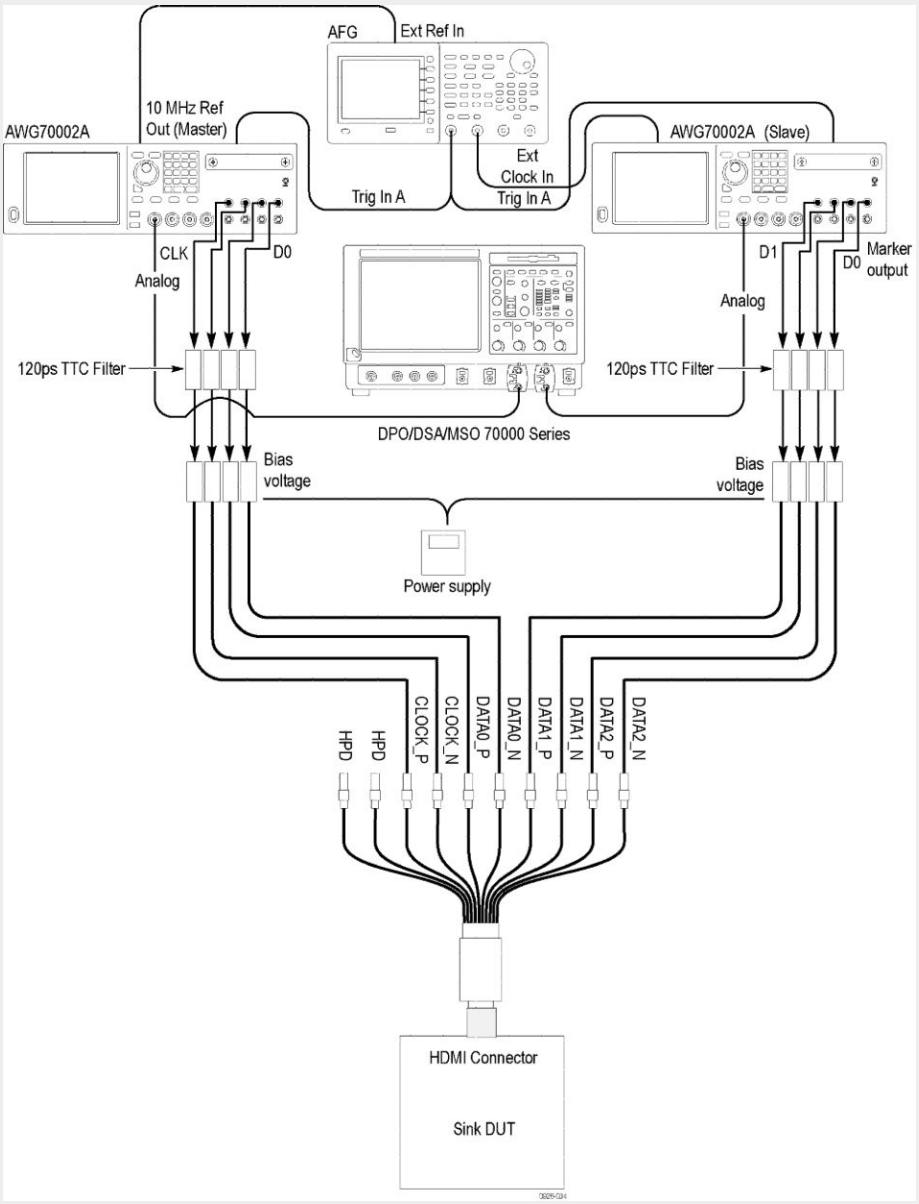


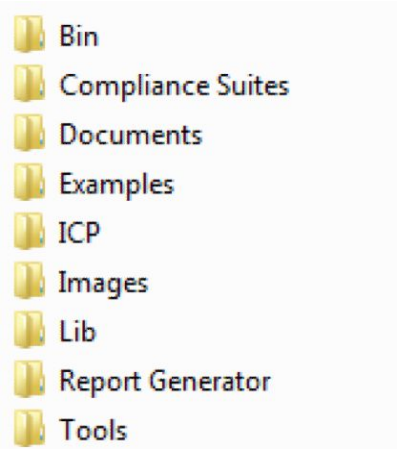
Table 7: Sink Protocol tests for CTS 1.4

Test number and characteristic tested	Setup diagram
Test ID 8-15: Character Synchronization	Sink Protocol diagram for AWG70002A
Test ID 8-16: Acceptance of All Valid Packet Types	Sink Protocol diagram for AWG70002A
Test ID 8-19: Pixel Encoding Requirements	Sink Protocol diagram for AWG70002A
Test ID 8-20: Video Format Timing	Sink Protocol diagram for AWG70002A
Test ID 8-21: Audio Clock Regeneration	Sink Protocol diagram for AWG70002A
Test ID 8-22: Audio Sample Packet Jitter	Sink Protocol diagram for AWG70002A

Test number and characteristic tested	Setup diagram
Test ID 8-23: Audio Formats	Sink Protocol diagram for AWG70002A
Test ID 8-24: Interoperability with DVI	Sink Protocol diagram for AWG70002A
Test ID 8-25: Deep Color	Sink Protocol diagram for AWG70002A
Test ID 8-28: One Bit Audio	Sink Protocol diagram for AWG70002A
Test ID 8-29: 3D Video Format Timing	Sink Protocol diagram for AWG70002A
Test ID 8-30: 4K 2K Video Format Timing	Sink Protocol diagram for AWG70002A
Test ID 8-31: Extended Colors and Contents	Sink Protocol diagram for AWG70002A

Application directories and usage

The application directory and associated files are organized as follows:



The following table lists the default directory names and their usage.

Table 8: Application directories and usage

Directory names	Usage
InstallDir\TekExpress\TekExpress HDM	Contains the application and associated files
TekExpress HDM\Bin	Contains miscellaneous HDM application libraries
TekExpress HDM\Compliance Suites	Contains compliance-specific files and filter files
TekExpress HDM\Documents	Contains the technical documentation for the HDM application
TekExpress HDM\Examples	Contains various support files
TekExpress HDM\ICP	Contains instrument and HDM application-specific interface libraries

Directory names	Usage
TekExpress HDM\Lib	Contains utility files specific to the HDM application
TekExpress HDM\Report Generator	Contains style sheets for report generation
TekExpress HDM\Tools	Contains instrument and HDM application-specific files

See Also *View test-related files*

File name extensions

The TekExpress HDM software uses the following file name extensions:

File name extension	Description
.TekX	Session files are saved in this format but the extensions may not be displayed
.py	The test sequence file
.xml	The encrypted XML file that contains the test-specific configuration information The log file extension is also xml
.wfm	The test waveform file
.mht	Test result reports are saved in this format by default. Test reports can also be *saved in MHTML or PDF formats*.
.pdf	Test report can also be saved in pdf format.
.flt	Filter file used with transmitter tests

See Also *Application directories and usage*

Getting started

Installing the software

Compatibility

The TekExpress HDM application runs on the following Tektronix oscilloscopes:

For CTS 2.0

- DPO/DSA/MSO72004/C, DPO/DSA/MSO71604/C Digital Oscilloscopes with Option DJA
- DPO/DSA73304D and DPO/DSA72504D Digital Oscilloscopes with Option DJA
- DPO/MSO72304DX, DPO/MSO72504DX, DPO/MSO73304DX with Option DJA

NOTE. *You can also use a 12.5 GHz bandwidth oscilloscope, but there may be a 10% variation in the measurement result.*

For CTS 1.4

- DPO/DSA/MSO72004/C and/or DPO/DSA/MSO71604/C Digital Oscilloscopes
- DPO/DSA73304D and DPO/DSA72504D Digital Oscilloscopes
- DPO/MSO72304DX and/or DPO/MSO72504DX, DPO/MSO73304DX
- Supports oscilloscopes > = 4 GHz (Win 7)

See Also. *Minimum system requirements*

Minimum system requirements

The following table shows the minimum system requirements for an oscilloscope to run TekExpress.

Table 9: System requirements

Component	Description
Oscilloscope	For CTS 2.0 BW ≥ 16 GHz, 16 M Record Length/Ch - Opt. 4M/2XL or more (for Eye Diagram and Jitter tests), and 20XL for Inter Pair Skew tests. For CTS 1.4 BW ≥ 4 GHz, 1 ***NOTE.*** *CTS 1.4 supports BW >= 4 GHz oscilloscope.* For a list of compatible oscilloscopes, see *Compatibility*.
Processor	Same as the oscilloscope
Operating system	Same as the oscilloscope
Memory	Same as the oscilloscope
Hard disk	Same as the oscilloscope
Display	Same as the oscilloscope [1]
Software	■ TekExpress HDM Advanced analysis and Compliance software ■ DPOJET, Jitter and Eye Diagram Analysis Tool Ver 6.2.1 and above for Win 7 oscilloscopes ■ Microsoft Internet Explorer 6.0 SP1 or later ■ Microsoft Photo Editor 3.0 or equivalent software for viewing image files ■ Adobe Reader 8.0 or equivalent software for viewing portable document format (PDF) files
Probes	■ Four differential probes – P7313SMA for Single-Ended and Differential tests
HDM sources	■ HDM Tx DUTs ■ HDM Ref waveforms
TDR tests	■ Oscilloscope – DSA8200 or equivalent with 80E03 and 80E04 modules and I-Connect software

[1] If TekExpress is running on an instrument having a video resolution lower than 800 x 600 (for example, a sampling oscilloscope), it is recommended that you connect a secondary monitor, which must be enabled before launching the application.

Component	Description
HDM Generator for Sink	■ Two AWG70002A with option 01, 03 and 225 or two AWG7122C with option 1, 2/6, 8 ***NOTE.*** *AWG 7122C does not support CTS 1.4.* ■ One AFG3102/AFG3102C/AFG3252/ AFG3252C
HDM fixtures	For CTS 2.0 HDM fixture kits from Tektronix ■ TF-HDM-TPA-S ■ TF-HDMI-TPA-T (Termination fixture) ■ TF-HDM-TPA-STX ■ TF-HDMD-TPA-STX For CTS 1.4 HDM fixture kits from Tektronix ■ HDMI 1.4B TYPE A ■ HDMI 1.4B TYPE C ■ HDMI 1.4B TYPE D ■ HDMI 1.4B TYPE E

Component	Description
HDM accessory kit (to be used with AWG)	TF-HDM-DS-Acc kit from Tektronix contains the following: ■ Eight Bias Tees from Mini-Circuits – ZX85-12G-S+ ■ For CTS 2.0: Two 120 ps TTC filters from Picosecond Pulse Labs (5915-100-1200) ■ For CTS 1.4: Eight 120 ps TTC filters(PSPL5915)
Other devices	■ Microsoft compatible mouse or compatible pointing device ■ Four USB ports (two USB ports minimum) ■ PCI-GPIB or equivalent interface for instrument connectivity [2] ■ 10 SMA cables, 174-1428-xx ■ Four BNC cables ■ One BNC T connector ■ Four BNC-to-SMA adapter ■ External power supply PWS4721/ PWS4602/PWS4323/PWS4305/PWS4205 ■ Any approved DDC Master ■ Any approved EDID analyzer

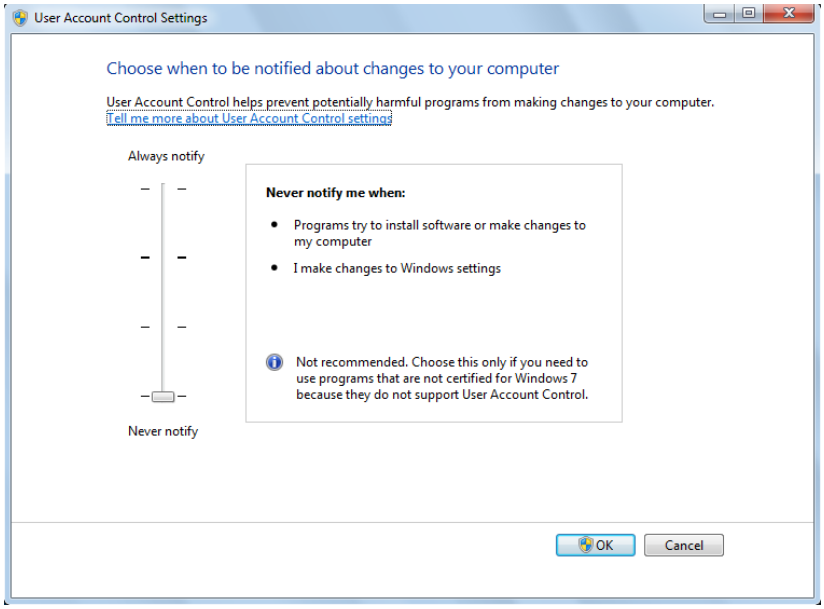
See Also. *Compatibility*

[2] If TekExpress is installed on a Tektronix oscilloscope, the virtual GPIB port will be used by TekExpress for communicating with oscilloscope applications. If external GPIB communication devices such as USB-GPIB-HS or equivalent are used for instrument connectivity, ensure that the Talker Listener utility is enabled in the DPO/DSA oscilloscope's GPIB menu. For ease of use, connect to an external (secondary) monitor.

Windows 7 user accounts

Windows 7 instruments need to have the User Account Control Settings set to **Never Notify**. To set User Account Control Settings:

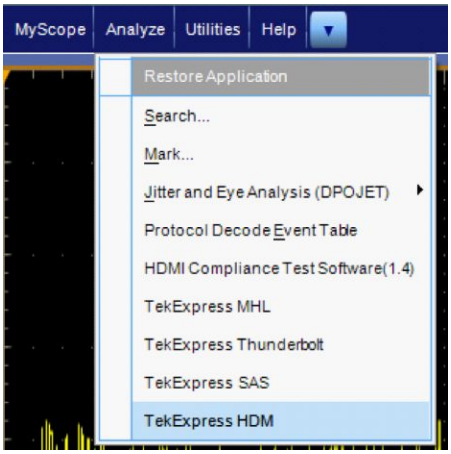
1. Go to **Control Panel > User Accounts > Change User Account Control settings**.
2. Set it to **Never Notify** as shown in the image.



Install the software

The software can be installed on any compatible instrument running Windows 7.

1. Close all applications (including the TekScope application).
2. Go to the www.tek.com Web site and search for HDMI to locate the installation file. Download the file HDM WebInstaller.exe.
3. Double-click the executable file to extract the installation files. After extraction, the installer launches and displays the InstallShield Wizard.
4. The software automatically installs in the following location:
   - C:\Program Files\Tektronix\TekExpress\TekExpress HDM
5. The installer updates the TekScope Analyze menu to include TekExpress HDM:



See Also. *Minimum system requirements*

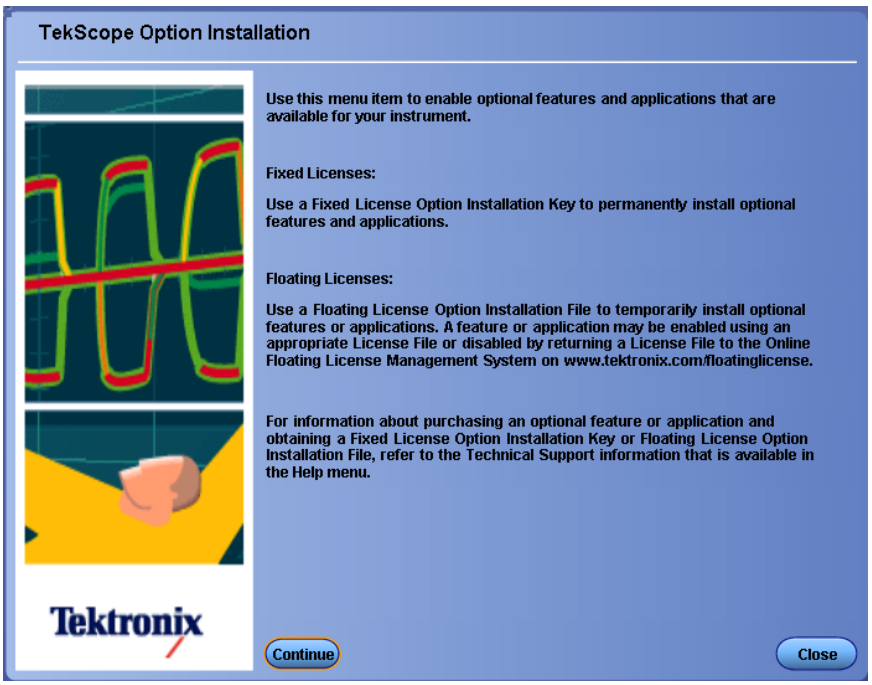
Compatibility

Activate the license

Activate the license using the option installation wizard on the oscilloscope. Follow these steps to activate the TekExpress HDM license:

1. From the oscilloscope menu bar, click **Utilities** > **Option Installation**.

   The TekScope Option Installation wizard opens.



2. Instructions for using the Options Installation window to activate licenses for installed applications is provided in the oscilloscope online help. Press the **F1** key on the oscilloscope keyboard to open the Option Installation help topic. Follow the directions in the topic to activate the license.

See Also. *View version and license information*

View version and license information

Use the following instructions to view application version information and version information for the application modules such as the Programmatic interface and the Programmatic interface client.

To view version information:

From the Options menu, select **About TekExpress**.

To view license information:

1. From the oscilloscope Help menu, select **About TekScope**.

   The Options section in the dialog box displays a list of installed options, including TekExpress HDM.

2. To view the Option key, look in the Option Installation Key section. When finished, click **OK** to close the dialog box.

See Also. *Activate the license*

Options menu

Application basics

Run the application

To run the HDM application, do either of the following:

- Select **Analyze > TekExpress HDM** from the TekScope menu.
- Double-click any saved HDMI session file.

When you open the application after installation, the application checks for a file called Resources.xml located in the C:\Users\<username>\My Documents folder. The Resources.xml file gets mapped to the X: drive when the application launches. Session files are then stored inside the X:\HDM folder. The Resources.xml file contains information about available network-connected instruments. If this file is not found, the application runs an instrument discovery program before launching HDM to locate available instruments.

If the application license was not installed using the TekScope menu **Utilities > Option Installation** selection, you can open the application up to 10 times in evaluation mode. Each time you open the application without supplying a valid license key, one of the free trials is used.

Exit the application

Use the following method to exit the application:

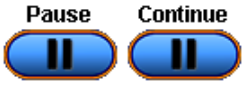
1. Click  on the application title bar.
2. Do one of the following:
   - If you have an unsaved session or test setup open, you are asked to save it before exiting. To save it, click **Yes**. Otherwise click **No**. The application closes.
   - A message box appears asking if you really want to exit TekExpress. To exit, click **Yes**.

NOTE. *Using other methods to exit the application results in abnormal termination of the application.*

Application controls and menus

Application controls

Table 10: Application control descriptions

Item	Description
Options menu	Opens the Options menu for access to global controls
Panels	Visual frames with sets of related options
Command buttons	Buttons that initiate an immediate action such as the Start, Stop, Pause, Continue, and Clear command buttons
Start button	 Starts continuous measurement acquisition and analysis. If prior acquired measurements have not been cleared, the new measurements are added to the existing set.
Stop button	 Stops (aborts) the current measurement acquisition.
Pause \ Continue button	 Use the Pause button to temporarily interrupt the current acquisition. When a test is paused, the button name changes to Continue.

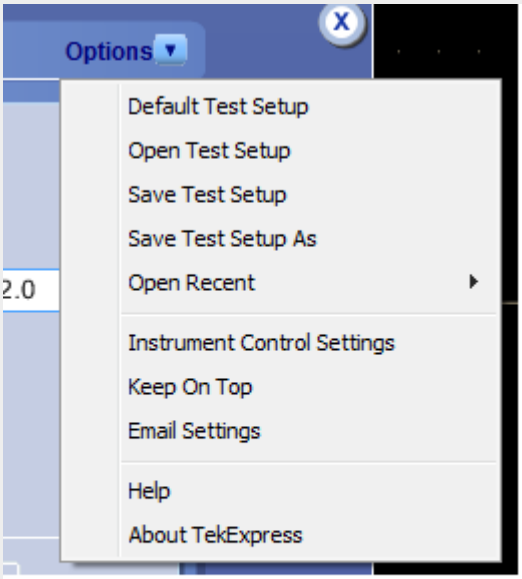
Item	Description
Clear button	 Clears all existing measurement results. Adding or deleting a measurement, or changing a configuration parameter of an existing measurement, also clears measurements. This prevents the accumulation of measurement statistics or sets of statistics that are not coherent. This button is available only on the *Results panel*.
Clear Log	 This button is available only on the *Status panel*.
Save	 This button is available only on the *Status panel*.
Application window move icon	 Place the cursor over the three-dot pattern in the upper left corner of the application window. When the cursor changes to a hand, drag the window to the desired location.

Options menu

Options menu overview. The Options menu is located in the upper right corner of the application.

The *Options menu* has the following selections:

Options menu

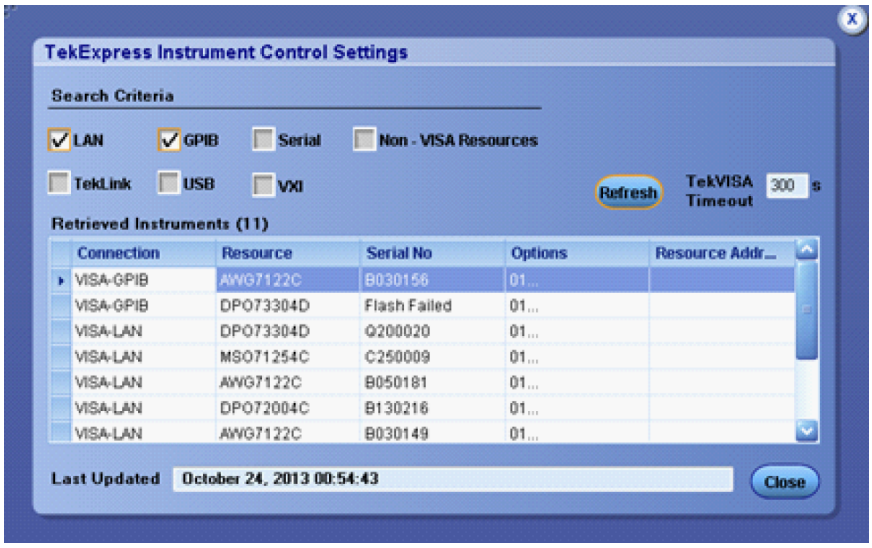


Menu	Function
Default Test Setup	Opens an untitled test setup with defaults selected
Open Test Setup	Opens a saved test setup
Save Test Setup	Saves the current test setup selections
Save Test Setup As	Creates a new test setup based on an existing one
Open Recent	Displays a menu of recently opened test setups from which to select
Instrument control settings	Shows the list of instruments connected to the test setup and allows you to locate and refresh connections to connected instruments
Keep On Top	Keeps the TekExpress HDM utility on top of other open windows on the desktop
Email settings dialog box	Use to configure email options for test run and results notifications
Help	Displays TekExpress Help

Menu	Function
About TekExpress	■ Displays application details such as software name, version number, and copyright ■ Provides access to *software version and license information* for your HDM installation ■ Provides a link to the Tektronix Web site

See also. *Application controls*

Instrument control settings. Use the TekExpress Instrument Control Settings dialog box to search for and list the connected resources (instruments) found on specified connections (LAN, GPIB, USB, and so on) and each instruments connection information. You access this dialog box from the Options menu.



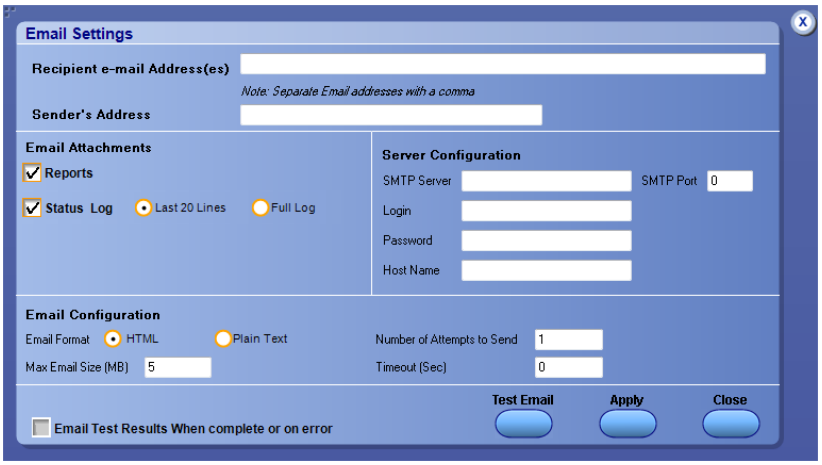
Use the Instrument Control Settings feature to and view instrument connection details. Connected instruments displayed here can be selected for use in the Global Settings tab in the configuration section. See step 1 of *Configure Tests* for details.

See also. *Options menu overview*

Email settings dialog box overview. Use the Email Settings dialog box to enable TekExpress to send an email message when a test completes, produces an error, or fails. Select the type of test run information to attach to the email (such as test reports and test logs), the email message format, and the email message size limit.

Open the Email Settings dialog box from the **Options** menu.

NOTE. *Recipient email address, sender's address, and SMTP Server are mandatory fields.*



See also. *Configure email settings*

Options menu

Select test notification preferences

Configure email settings. To be notified by email when a test completes, fails, or produces an error, configure the email settings.

1. Select **Options > Email Settings** to open the Email settings dialog box.
2. (Required) For Recipient email Address(es), enter one or more email addresses to which to send the test notification. To include multiple addresses, separate the addresses with commas.
3. (Required) For Sender's Address, enter the email address used by the instrument. This address consists of the instrument name, followed by an underscore, followed by the instrument serial number, the @ symbol and then the email server used. For example: DPO72004C_B130099@yourcompany.com.
4. (Required) In the Server Configuration section, type the SMTP Server address of the Mail server configured at the client location, and the SMTP Port number, in the corresponding fields.

   If this server requires password authentication, enter a valid login name, password, and host name in the corresponding fields.

   NOTE. *If any of the above required fields are left blank, the settings will not be saved and email notifications will not be sent.*

5. In the Email Attachments section, select from the following options:
   - **Reports**: Attach the test report to the notification email.
   - **Status Log**: Attach the test status log to the notification email. If you select this option, then also select whether you want to receive the full log or just the last 20 lines.
6. In the Email Configuration section:
   - Select the message file format to send: HTML (default) or plain text.
   - Enter a maximum file size for the email message (message plus attachment files). Messages with attachments larger than this limit will be truncated. The default is 5 MB.
   - Enter the number in the Number of Attempts to Send field, to limit the number of attempts that the system makes to send a notification. The default is 1. You can also specify a timeout period.
7. Select the **Email Test Results When complete or on error** check box. Use this check box to quickly enable or disable email notifications.
8. To test your email settings, click **Test Email**.
9. To save your settings, click **Apply**.
10. Click **Close** when finished.

Setup panel

Setup panel overview

Source

The Setup panel contains sequentially ordered tabs that help guide you through a typical test setup process.

Set the DUT parameters.

Select test(s).

Set lane acquisition source.

Configure the selected tests.

Select test notification preferences.

Items selected in a preceding Setup tab may change options available in the following tabs. You can switch between the tabs in any order to modify your test parameters.

Sink

The Setup panel contains sequentially ordered tabs that help guide you through a typical test setup process.

Set the DUT parameters.

Select test(s).

Configure the selected tests.

Select test notification preferences.

Items selected in a preceding Setup tab may change options available in the following tabs. You can switch between the tabs in any order to modify your test parameters.

Set DUT parameters

Use the *Setup panel DUT tab* to select parameters for the device under test. The settings are global and apply to all tests for the current session. DUT settings also affect the list of available tests in the Test Selection tab.

Source.

1. Click **Setup > DUT**.

a. Suite > Source

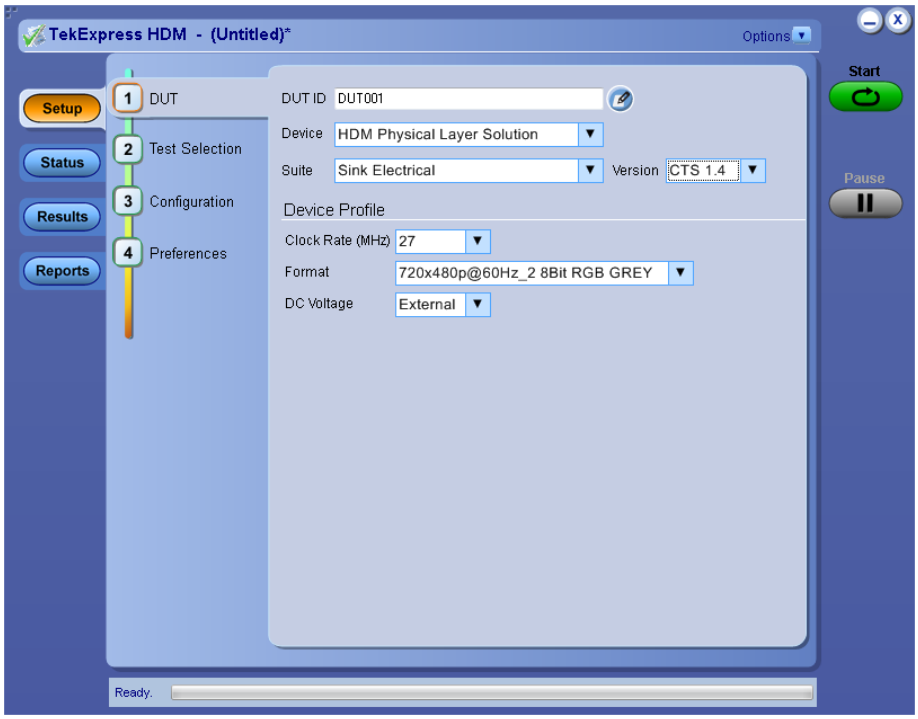
Table 11: DUT tab settings (Source)

Setting	Description
Acquire live waveforms	Acquire active signals from the oscilloscope for testing.
Use pre-recorded waveform files	Run tests on a saved run session file. Select a run session file from the list.
View	Determines where to access the test configuration settings: ■ **Compliance**: View configuration settings by clicking **Setup > Test Selection > Configure** ■ **Advanced**: Enables the **Setup > Configuration** tab in which to view configuration settings.
DC Voltage	Internal\External Other\Tek Power Supply
Data Rates (Gbps)	Highest: Select the Highest data rate to include in the tests. Lowest: Select the Lowest data rate to include in the tests
TBit For High Data Rate (ps)	Sets the TBit calculated for highest data rate
TBit For Low Data Rate (ps)	Set the TBit calculated for lowest data rate
Probe Attenuation (X)	Differential: 12.5/2.5 Single-Ended: 12.5/2.5
Recalc TBit	Check or Uncheck Recalc TBit. TBit Should be calculated for at least once.

Setting	Description
Number of Lanes to Test	Select the number of lanes to be tested: 1 Lane / 2 Lanes / 3 Lanes / 4 Lanes

b. Suite > Sink Electrical

Sink Electrical for CTS 1.4



Sink Electrical for CTS 2.0

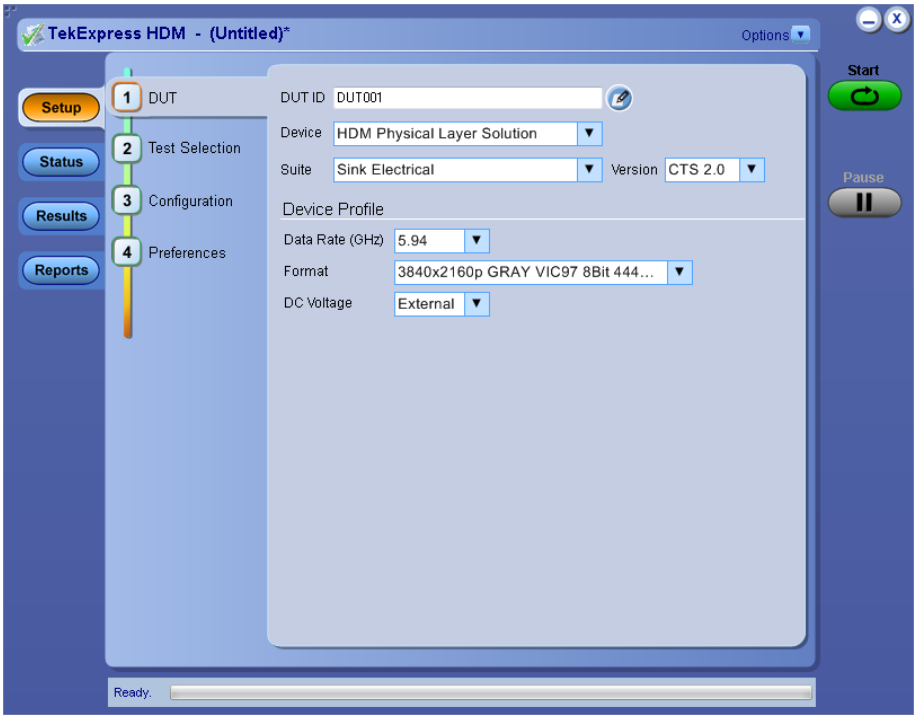
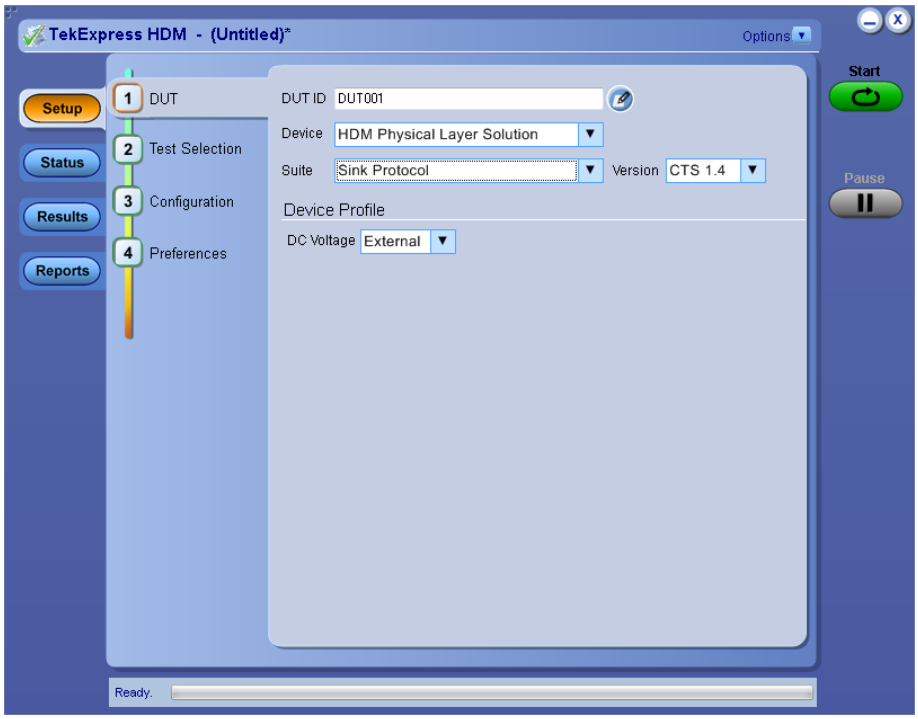


Table 12: DUT tab settings (Sink Electrical CTS 1.4 and 2.0)

Setting	Description
For CTS 1.4b: Clock Rate (Gps) For CTS 2.0: Data Rate (Gbps)	Select data rate or clock rate from Device Profile
Format	Select format from Device Profile
DC Voltage	Select DC Voltage from the Device Profile

c. Suite > Sink Protocol

Sink Protocol for CTS 1.4



Sink Protocol for CTS 2.0

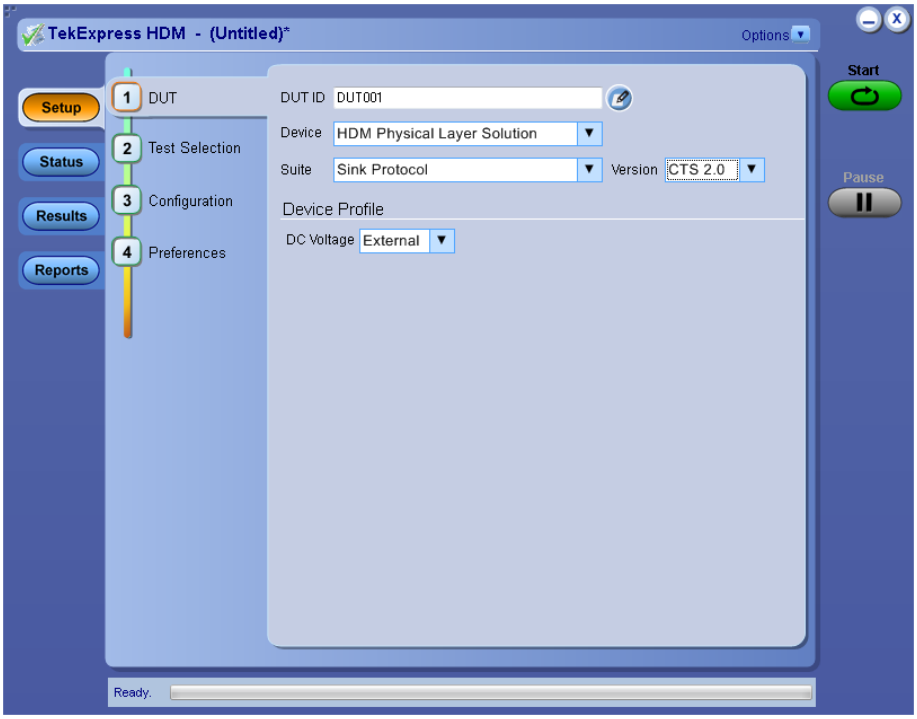


Table 13: DUT tab settings (Sink Protocol for CTS 1.4 and 2.0)

Setting	Description
DC Voltage	If Tek Power Supply is connected, select DC voltage as "Tek Power Supply' or "External".

2. (Optional) Enter the ID for the device. The default value is DUT001. The DUT ID parameter is added to reports.
3. (Optional) To add comments to the test report, click the note pad icon ( ) to the right of the DUT ID field. Enter comment text up to 256 characters. To enable or disable displaying comments in the test report, see *Select report options*.
4. Settings that do not apply to compliance testing cannot be changed and are grayed out.

Select tests Use the *Test Selection tab* to select the tests to run on the connected DUT.

1. Click **Setup > Test Selection**.

   Source Test Selection

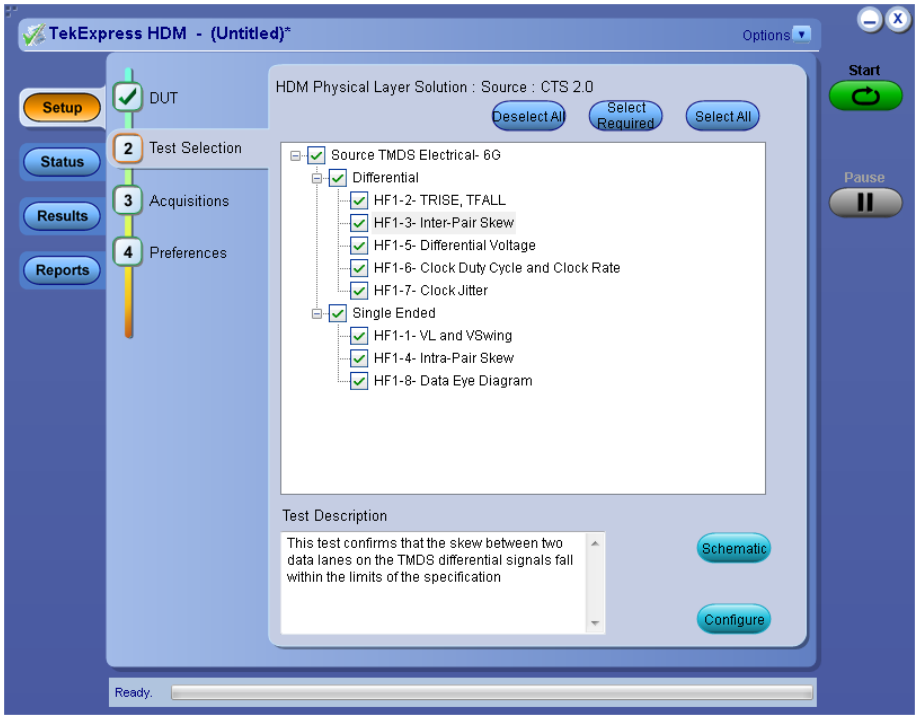
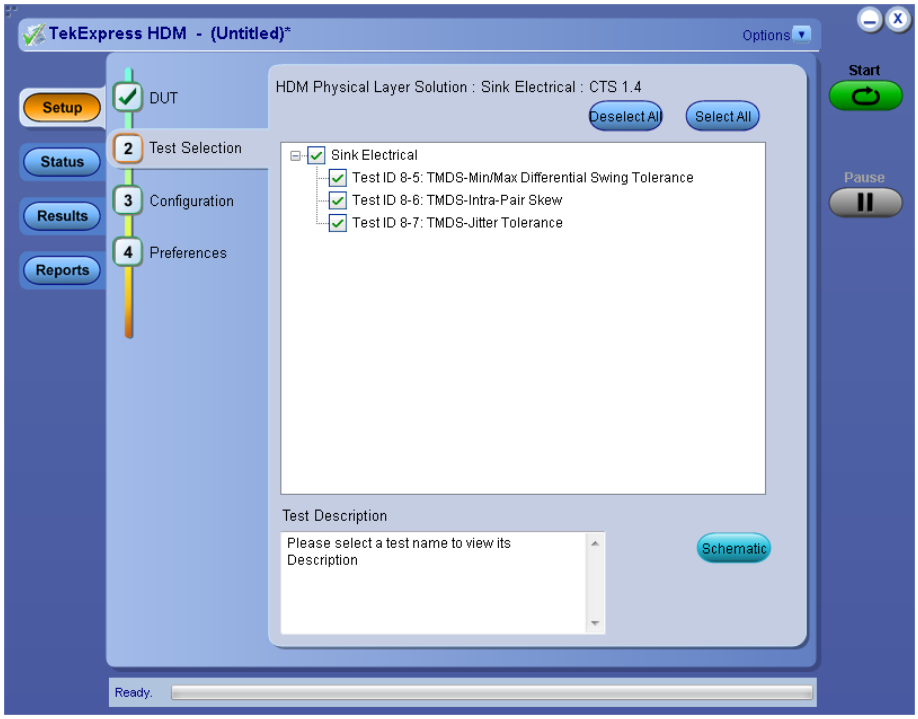
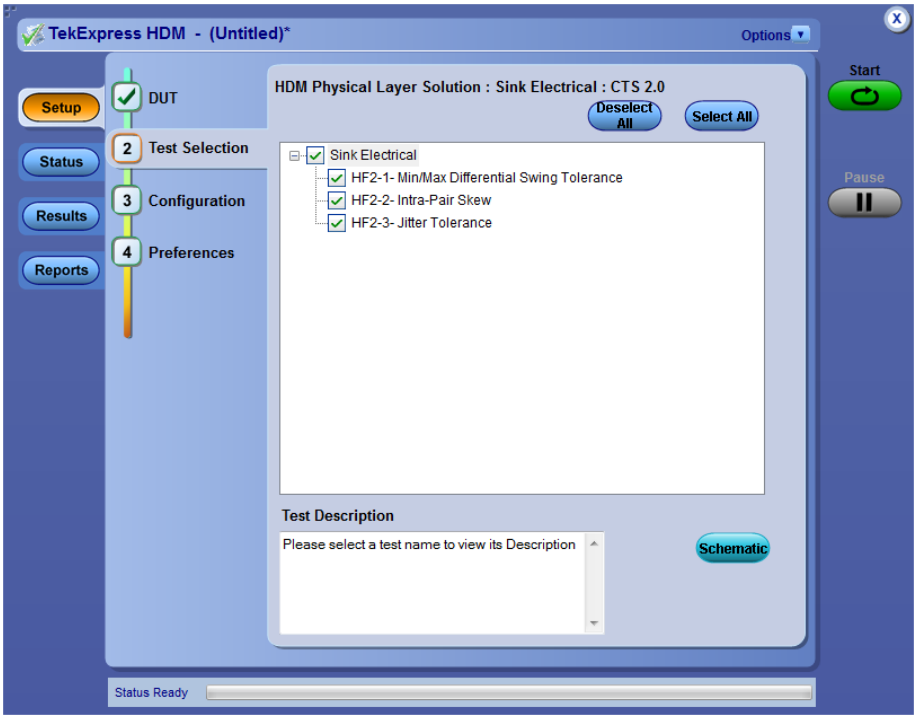


Figure 1: Source

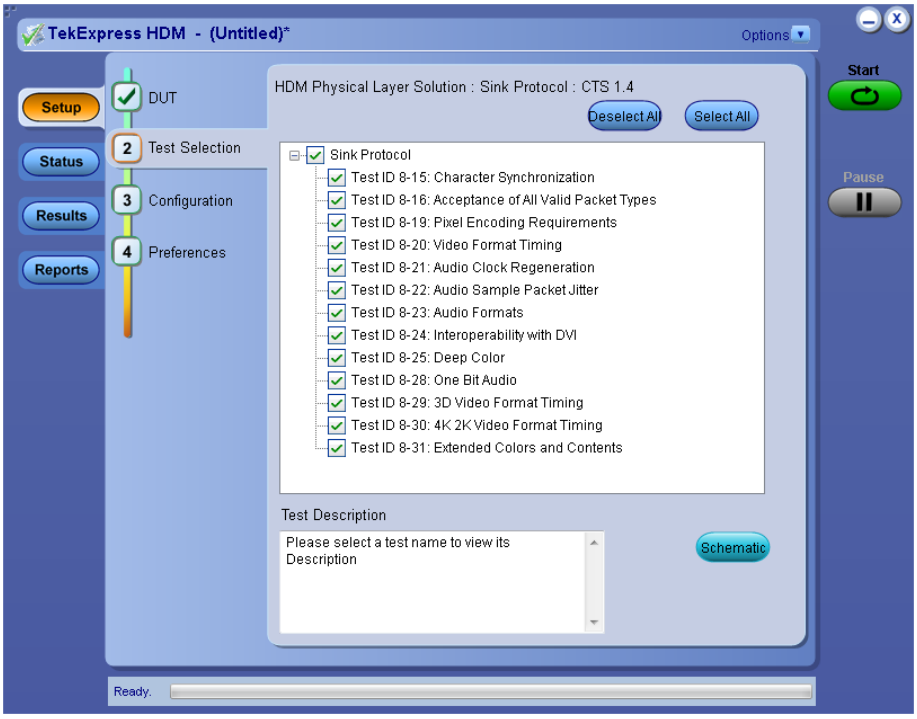
Sink Electrical for CTS 1.4

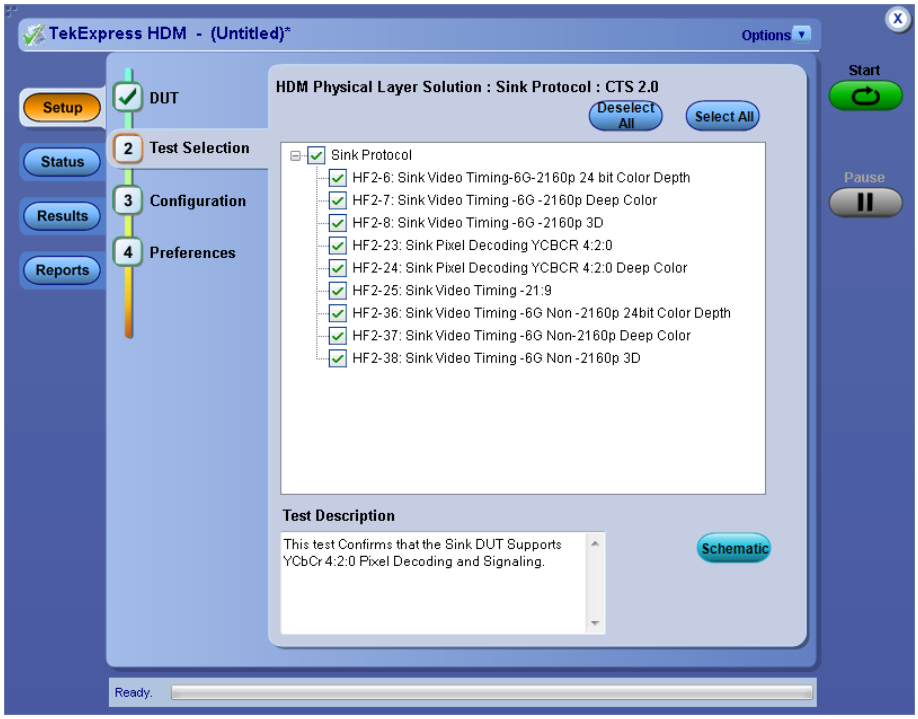


Sink Electrical for CTS 2.0



Sink Protocol for CTS 1.4



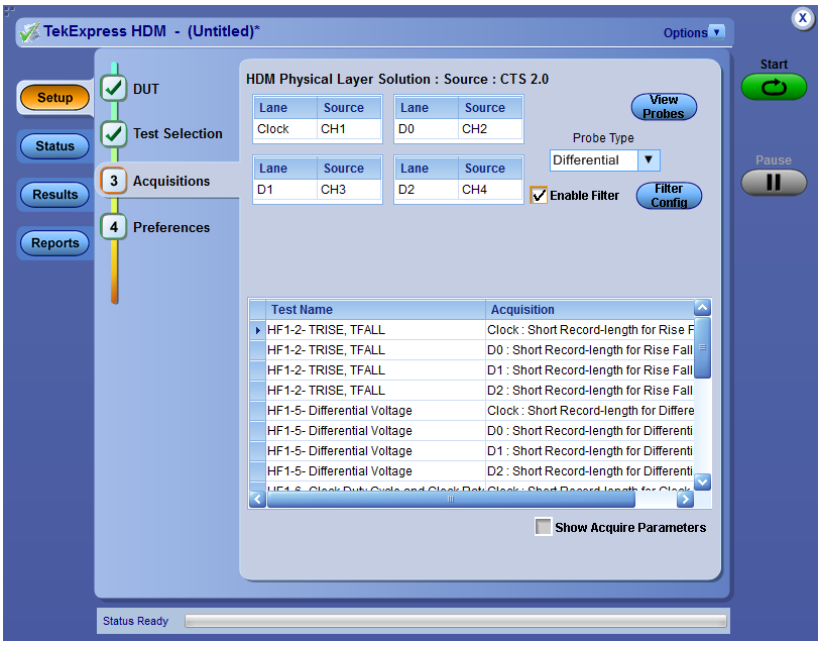


2. Select the test(s) to run:
   - Click one or more check boxes adjacent to each test.
   - Click **Deselect All** to deselect all tests. All tests are selected by default.
   - Click **Select All** to select all tests.
3. Click **Schematic** to display a schematic diagram that shows the DUT test setup. Use the diagram to verify the test setup before running the test.

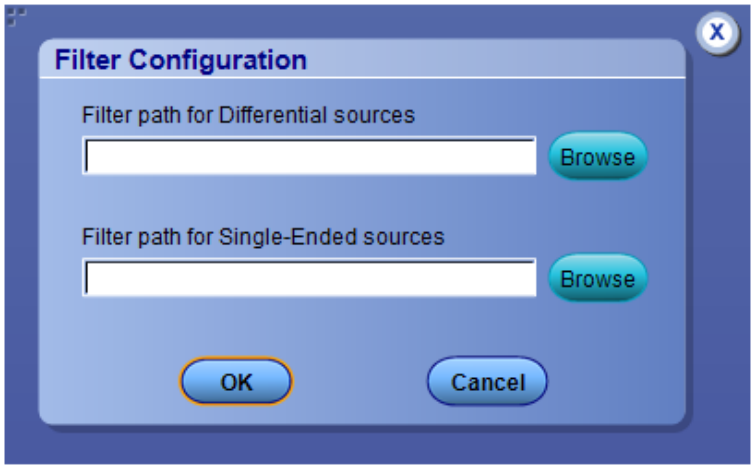
Set acquisition parameters (source only)

Use the Acquisitions tab to set the signal source (channel) used to acquire data. Acquisition options are available only when acquiring a live waveform.

1. Click **Setup > Acquisitions**.



2. Select **Source** field to select the oscilloscope channels to use for those lanes.
3. Select probe type from **Probe Type** field as Differential, Single-Ended, or Eye-Diagram.
4. Check or uncheck the **Enable Filter** check box and configure the Filter Configuration by clicking the **Filter Config** button and choose from the displayed field.



Set test notification preferences

Use the Preferences tab to set the application to send an email when a test measurement completes:

1. Click **Setup > Preferences**.
2. Select the **Email Test Results when complete** check box in the Email Settings dialog box. Click **Email Settings** to *configure the email settings*.

See also. *Select report options*

Configure test parameters

About configuring test parameters (source only). Use the configuration settings to view the measurement parameters for selected tests. How the test configurations are accessed depend on the View selected in the DUT tab.

- If you selected Compliance View in the DUT tab, then in the Test Selection tab, select the desired test in the list and then click the Configure button.
- If you selected Advanced View in the DUT tab, click the Configuration tab in the Setup panel.

See also. *Configure tests parameters*

Configure test parameters. The Configuration parameters let you set global and individual test parameters. To return to test selection from the Configuration tab or panel, click the **Test Selection** button.

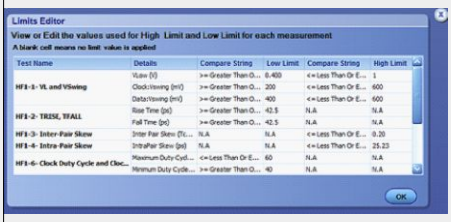
NOTE. *You cannot change test parameters that are grayed out.*

Source and Sink.

1. Modify *Global settings* as desired:
   - To select the instruments for testing, click **Global Settings**. In the Instruments Detected section, click in the shaded areas to activate the drop-down lists and select an instrument. If you do not see the desired instrument in the list, see *Instrument control settings*.
2. To modify any individual test measurement settings, click **Measurements**, select the test in the tree view, and change the settings.

Common test parameters. The following table lists the settings and parameters common to all tests.

Table 14: Common parameters and values

Parameter type	Parameter
Mode	Determines whether test parameters are in compliance mode or can be edited (User Defined Mode). ■ Compliance: Most test parameter values cannot be edited. ■ User Defined: Most test parameter values can be edited.
Global Settings	These settings apply to all tests selected for the current session. You can change only some of these settings. ■ Scope Settings: Specifies the instrument channel to use as the source for the trigger. This can be changed.
Measurements	These settings apply to the test selected in the tree view of the configuration section.
Limits Editor (Source only)	Shows the upper and lower limits for the applicable measurement using different types of comparisons. In Compliance Mode, you are able to view the measurement high and low limits used for the test selected in the tree view of the Measurements tab. When running tests in User Defined Mode, you can edit the limit settings in the Limits Editor. When running tests in User Defined Mode, the cells in the Limits Editor table are active for editing so you can change parameters.  When running tests in User Defined Mode, the cells in the Limits Editor table are active for editing so you can change parameters.

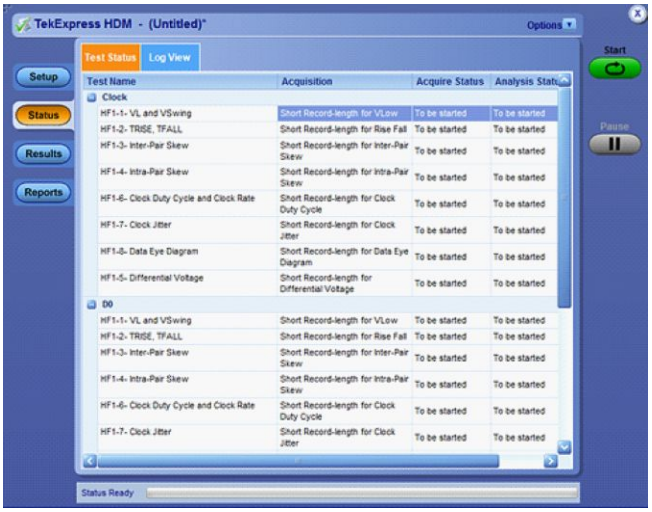
Status panel overview

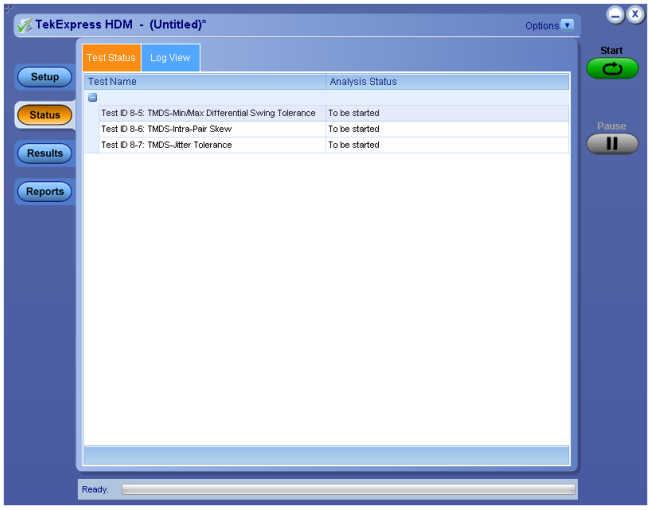
The Status panel provides status on test acquisition and analysis (Test Status tab) and a listing of test tasks performed (Log View tab). The application opens the Test Status tab when you start a test run. You can select the Test Status or the Log View tab to view these items while tests are running.

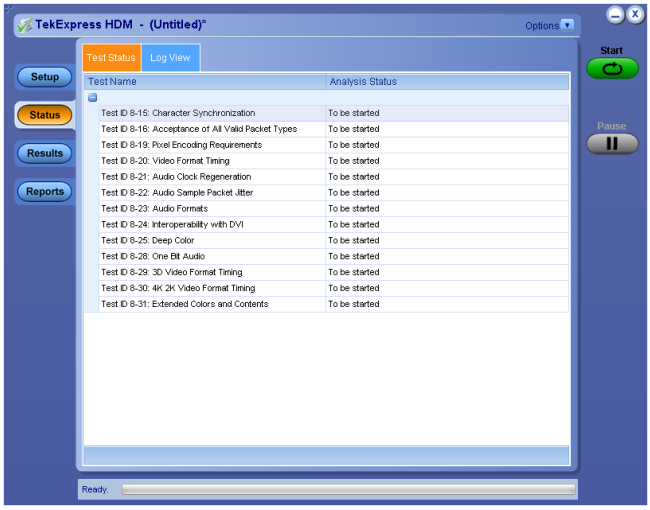
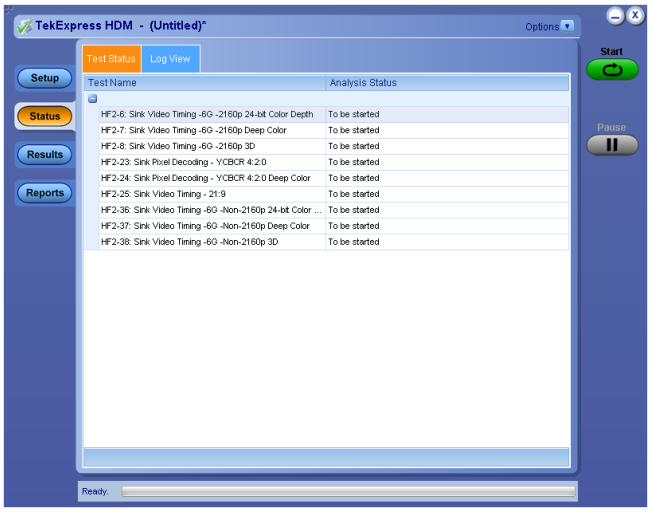
The Test Status tab lists a high level status for each test.

Table 15: Test Status tab

Column	Description
Test Name	Name of the test
Acquire Status, Analysis Status	Status of the signal acquisition or test analysis ■ To be started ■ In progress ■ Completed ■ Aborted ***NOTE.*** *Sink tests have a minimal set of status indicators.*



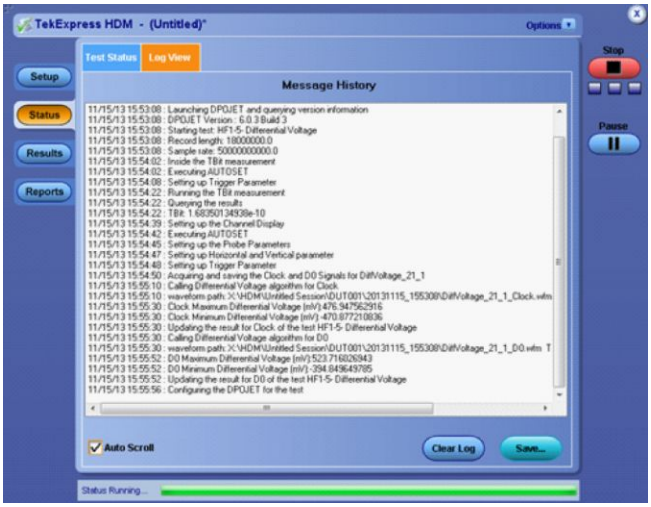
Column	Description
	

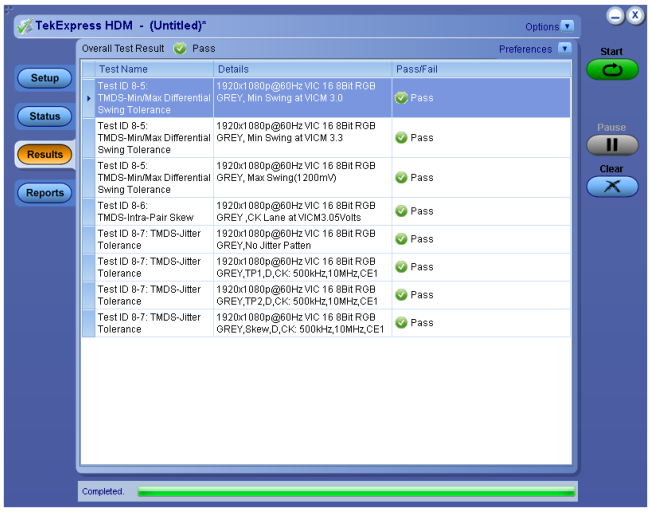
Column	Description
	
	

The Log View tab provides a list of the actions executed during the test. Use this information to review or troubleshoot tests.

Table 16: Log View fields

Item	Description
Auto Scroll	Sets the program to automatically scroll down the Message History window as information is added to the log during the test.
Clear Log	Clears all messages in the Message History window.
Save	Saves the log file as a text file for examination. Displays a standard Save As File window and saves the status messages in the file that you specify.





See also *View test results*

Results panel

Results panel overview

When a test finishes, the application switches to the Results panel to display a summary of test results. Set viewing preferences for this panel from the Preferences menu in the upper right corner. Viewing preferences include showing whether a test passed or failed, summary results or detailed results, and enabling wordwrap. For information on using this panel, see *View test results*.

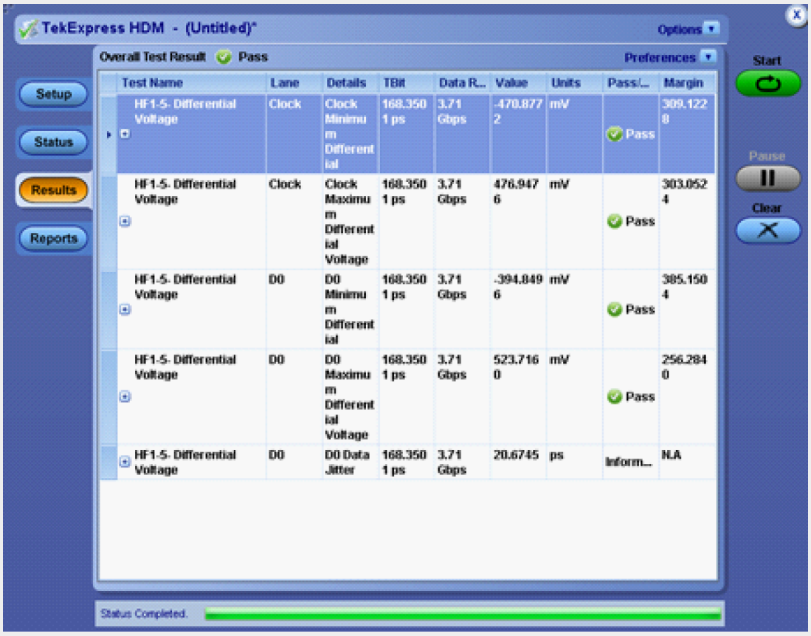


Figure 2: Results panel - Source results

Figure 3: Results panel - Sink results for CTS 1.4

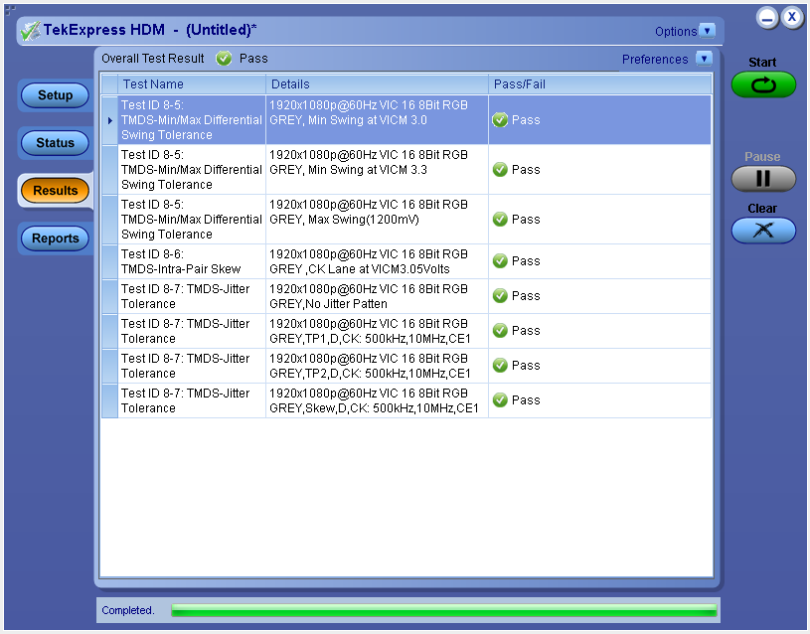
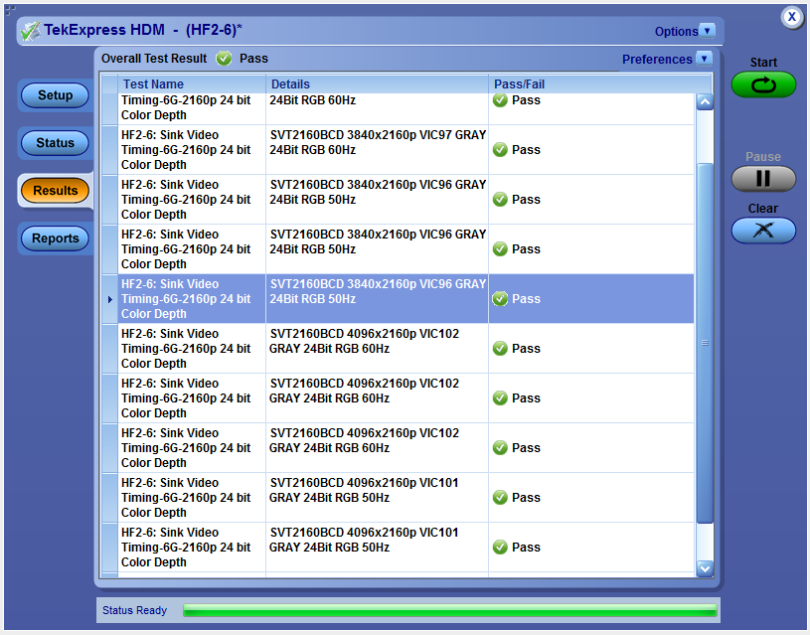


Figure 4: Results panel - Sink results for CTS 2.0



View test results

When a test finishes, the application switches to the *Results panel*, which displays a summary of test results. The overall test result is displayed at the top left of the Results table. If all of the tests for the session pass, the overall test result will be Pass. If one or more tests fail, the overall test result will show Fail.

Each test result occupies a row in the Results table. By default, results are displayed in summary format with the measurement details collapsed and with the Pass/Fail column visible. Change the view in the following ways:

- To expand all tests listed, select **View Results Details** from the Preferences menu in the upper right corner.
- To expand and collapse tests, click the plus and minus buttons.
- To collapse all expanded tests, select **Preferences > View Results Summary**.
- To remove or restore the Pass/Fail column, select **Preferences > Show Pass/Fail**.
- To enable or disable the wordwrap feature, select **Preferences > Enable Wordwrap**.
- To expand the width of a column, place the cursor over the vertical line that separates the column from the column to the right. When the cursor changes to a double-ended arrow, hold down the mouse button and drag the column to the desired width.
- To sort the test information by column, click the column head. When sorted in ascending order, a small up arrow is displayed. When sorted in descending order, a small down arrow is displayed.
- To clear all test results displayed, click **Clear**.

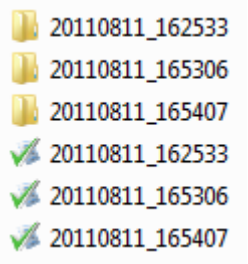
See also. *View a report*

View test-related files

Files related to tests are stored in the My TekExpress\HDM folder. In the HDM folder, each test setup has a test setup file and a test setup folder, both with the test setup name. The test setup file is preceded by the HDM icon and usually has no visible file extension.

Inside the test setup folder is another folder named for the DUT ID used in the test sessions. The default is DUT001.

Inside the DUT001 folder are the session folders and files. Each session has a folder and file pair, both named for the test session using the naming convention (date)_(time). Each session file is stored outside its matching session folder.



The first time you run a new, unsaved session, the session files are stored in the Untitled Session folder located at ..\My TekExpress\HDM. When you name and save the session, the files are placed in a folder with the name that you specify.

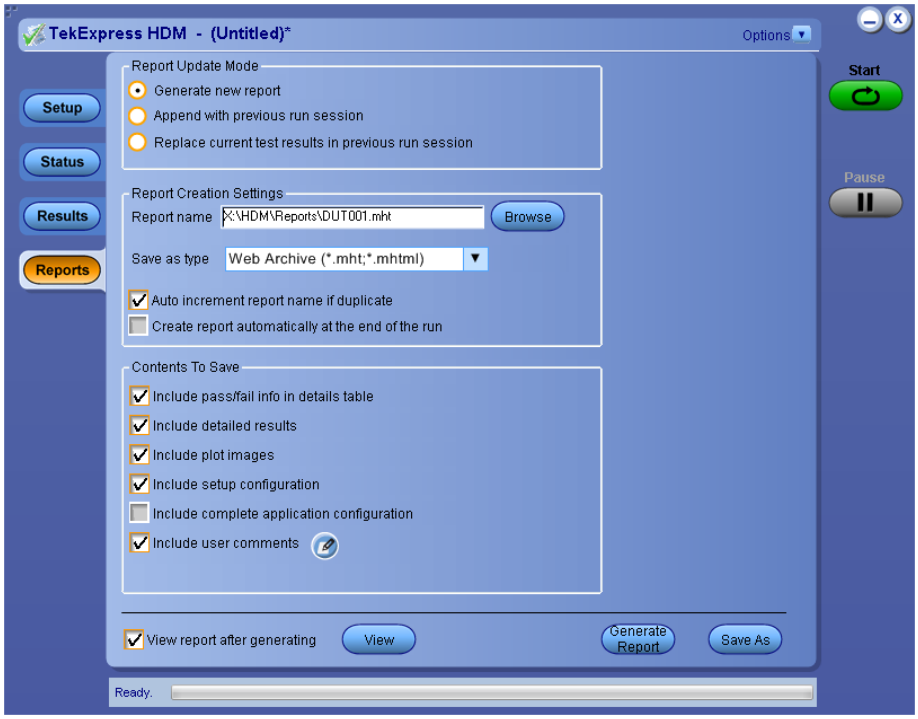
See also. *File name extensions*

Reports panel

Reports panel overview

Use the Reports panel to open reports, name and save reports, select report content to include, and select report viewing options.

For information on setting up reports, see *Select report options*. For information on viewing reports, see *View the report*.



Select report options

Use the *Reports panel* to select which test information to include in the report, and the naming conventions to use for the report. For example, always give the report a unique name or select to have the same name increment each time you run a particular test. Generally, you would select report options before running a test or when creating and saving test setups. Report settings are included in saved test setups.

In the Reports panel, select from the following options:

Table 17: Report options

Setting	Description
Generate new report	Creates a new report.
Append with previous run session	Appends the last run session and the previous run session.
Replace current test results in previous run session	Replaces the current test results in the previous run session. Newly added tests results are appended to the end of the report.
Report name	Displays the name and location from which to open a report. The default location is at X:\ HDM \Reports. The report file in this folder gets overwritten each time you run a test unless you specify a unique name or select to auto increment the report name. To change the report name or location. Do one of the following: ■ In the Report Name field, type over the current folder path and name. ■ Click inside Report Name field and Click on <image> or Double click inside the field to launch Tek keyboard. Provide Report path in the Tek keyboard and Click **Enter** key. Be sure to include the entire folder path, the file name, and the file type. For example: C:\Users \UnserName\Documents\My TekExpress\HDM \DUT001_Test_85.mht. ***NOTE.*** *You cannot change the file location using the Browse button.* Open an existing report. Click **Browse**, locate and select the report file and then click **View** at the bottom of the panel.
Save as type	Lists the available report formats for user to generate. Supported formats are MHT and PDF. ***NOTE.*** *If you select a file type different from the default, be sure to change the report file name extension in the Report Name field to match.*

Setting	Description
Auto increment report name if duplicate	Sets the application to automatically increment the name of the report file if the application finds a file with the same name as the one being generated. For example: DUT001, DUT002, DUT003. This option is enabled by default.
Include pass/fail results summary	Sets the application to include the color block labeled Test Result (indicating whether the test passed or failed) in the report. For details, see Report Contents in *View a report*.
Include detailed results	Sets the application to include parameter limits, execution time, and test-specific comments generated during the test.
Include plot images	Sets the application to include plotted diagrams.
Include setup configuration	Sets the application to include information about hardware and software used in the test in the summary box at the top of the report. Information includes: the oscilloscope model and serial number, probe model and serial number, the oscilloscope firmware version, SPC and factory calibration status, and software versions for applications used in the measurements.
Include Complete Application Configuration	Sets the application to include a table listing general, common, and acquired parameters used in the test. This option is disabled by default.
Include user comments	Select to include any comments about the test that you or another user added in the DUT tab of the Setup panel. Comments appear in the Comments section under the summary box at the beginning of each report.
View report after generating	Automatically opens the report in your Web browser when the test completes. This option is selected by default.

See also. *View a report*

View a report

The application automatically generates a report when test analysis is completed and displays the report in your default Web browser (unless you cleared the **View Report After Generating** check box in the Reports panel before running the test). If you cleared this check box, or if you want to view a different test report, do the following:

1. Click the **Reports > Browse** button and locate and select the report file to view.

   NOTE. *If you did not save the test setup after running the test and you either closed the application or you ran another test, the report file was not saved.*

2. At the bottom of the Reports panel, click **View**.

For information on changing the file type, file name, and other report options, see *Select report options*.

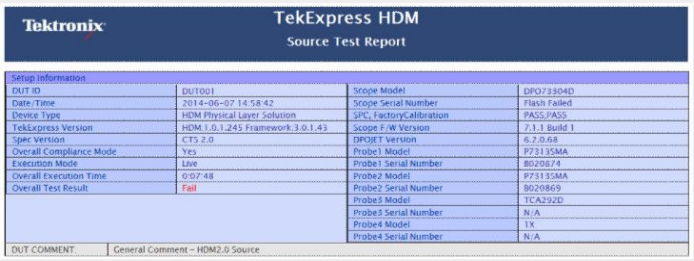
Report contents

A report shows specified test details, as defined in the Reports panel.

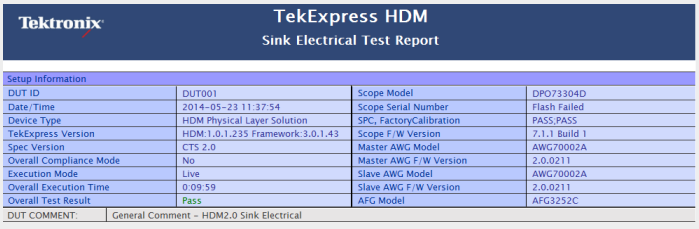
Setup configuration information

Setup configuration information is listed in the summary box at the top of the report. This information includes the oscilloscope model and serial number, probe model and serial number, and software versions. To exclude this information from the report, clear the **Include setup configuration** check box in the Reports panel before running the test.

Source

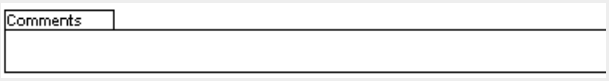


Sink



User comments

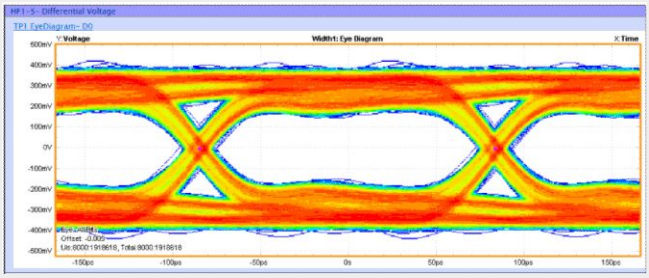
If you selected to include comments in the test report, any comments you added in the DUT tab of the Setup panel appear in the Comments section directly below the summary box.



Test results

This table lists the tests results. The contents of this table depend on the selections made in the Reports panel before running the test (Include pass/fail results summary, Include user comments, Include detailed results, Include setup configuration, and Include user comments).

If Include plots images is selected, then measurement waveform plots are shown below the test results table.



See also. *View test results*

View test-related files

TekExpress programmatic interface

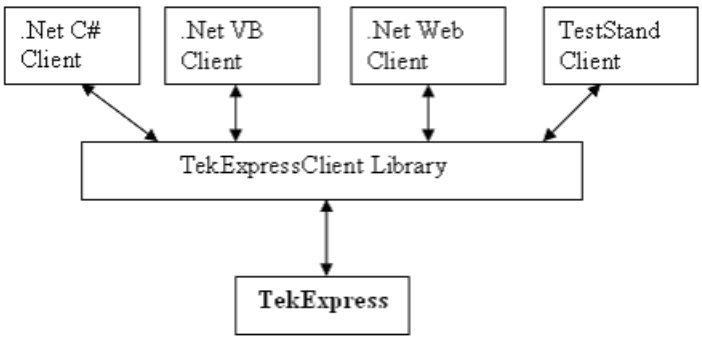
About the programmatic interface

The Programmatic interface allows you to seamlessly integrate the TekExpress test automation application with the high-level automation layer. This also allows you to control the state of the TekExpress application running on a local or a remote computer.

For simplifying the descriptions, the following terminologies are used in this section:

- **TekExpress Client:** A high-level automation application that communicates with TekExpress using TekExpress Programmatic Interface.
- **TekExpress Server:** The TekExpress application when being controlled by TekExpress Client.

TekExpress leverages .Net Marshalling to enable the Programmatic Interface for TekExpress Client. TekExpress provides a client library for TekExpress clients to use the programmatic interface. The TekExpress client library is inherited from .Net MarshalByRef class to provide the proxy object for the clients. The TekExpress client library maintains a reference to the TekExpress Server and this reference allows the client to control the server state.



See also *Requirements for developing TekExpress client*

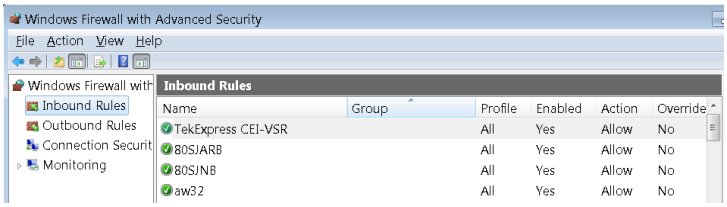
Remote proxy object

Client proxy object

To enable remote access

To access and remotely control an instrument using the TekExpress programmatic interface, you need to change specific firewall settings as follows:

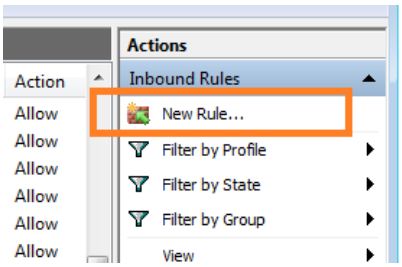
1. Access the Windows Control Panel and open the Windows Firewall tool (**Start > Control Panel > All Control Panel Items > Windows Firewall**).
2. Click **Advance Settings > Inbound Rules**.
3. Scroll through the **Inbound Rules** list to see if the following items (or with a similar name) are shown:
   - TekExpress HDM
   - TekExpress



4. If both items are shown, you do not need to set up any rules. Exit the Windows Firewall tool.
5. If one or both are missing, use the following procedure to run the **New Inbound Rule Wizard** and add these executables to the rules to enable remote access to the TekExpress application.
6. On the client side include Client application.exe through which TekExpress application is remotely controlled. For example if the application is controlled using python scripts then "ipy64.exe" should be included as part of Inbound rules.

Run the New Inbound Rule Wizard

1. Click on **New Rule** (in Actions column) to start the **New Inbound Rule Wizard**.

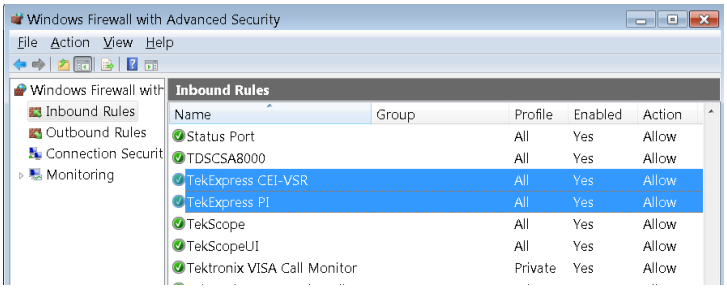


2. Verify that **Program** is selected in the Rule Type panel and click **Next**.
3. Click **Browse** in the Program panel and navigate to and select one of the following TekExpress applications (depending on the one for which you need to create a rule):
4. TekExpress HDM.exe
5. TekExpress.exe

NOTE. *See for the path to the application files.*

---

6. Click **Next**.
7. Verify that **Allow the connection** is selected in the Action panel and click **Next**.
8. Verify that all fields are selected (**Domain**, **Private**, and **Public**) in the Profile panel and click **Next**.
9. Use the fields in the Name panel to enter a name and optional description for the rule. For example, a name for the TekExpress HDM application could be **TekExpress HDM Application**. Add description text to further identify the rule.
10. Click **Finish** to return to the main Windows Firewall screen.
11. Scroll through the Inbound Rules list and verify that the list shows the rule that you just entered.



12. Repeat steps *1* through 11 to enter the other TekExpress executable if it is missing from the list. Enter **TekExpress PI** as the name.

13. Scroll through the Inbound Rules list and verify that the list shows the rule that you just entered.
14. Exit the Windows Firewall tool.

To use the remote access:

1. Obtain the IP address of the instrument on which you are running TekExpress HDM. For example, 134.64.235.198.
2. On the PC from which you are accessing the remote instrument, use the instrument IP address as part of the TekExpress HDM PI code to access that instrument. For example:

   object obj = piClient.Connect("134.64.235.198",out clientid);

Requirements for developing TekExpress client

While developing the TekExpress Client, use the TekExpressClient.dll. The client can be a VB .Net, C# .Net, TestStand or Web application. The examples for interfaces in each of these applications are in the Samples folder.

References required

- *TekExpressClient.dll* has an internal reference to *IIdlglib.dll* and *IRemoteInterface.dll*.
- *IIdlglib.dll* has a reference to *TekDotNetLib.dll*.
- *IRemoteInterface.dll* provides the interfaces required to perform the remote automations. It is an interface that forms the communication line between the server and the client.
- *IIdlglib.dll* provides the methods to generate and direct the secondary dialog messages at the client-end.

NOTE. *The end-user client application does not need any reference to the above mentioned DLL files. It is essential to have these DLLs (IRemoteInterface.dll, IIdlglib.dll and TekDotNetLib.dll) in the same folder as that of TekExpressClient.dll.*

Required steps for a client

The following steps are used by the client to programmatically control the server using TekExpressClient.dll:

Develop a client UI to access the interfaces exposed through the server. This client loads TekExpressClient.dll to access the interfaces. After TekExpressClient.dll is loaded, the client UI can call the specific functions to run the operations requested by the client. When the client is up and running, it does the following to run a remote operation:

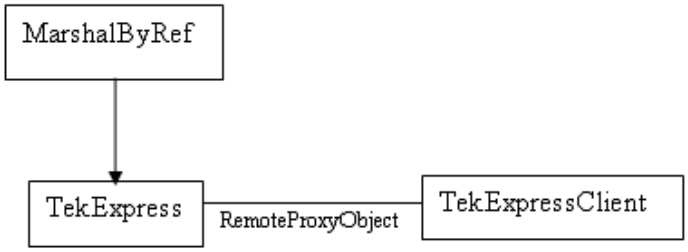
1. To connect to the server, the client provides the IP address of the PC where the server is running.
2. The client locks the server application to avoid conflict with any other Client that may try to control the server simultaneously. “Lock” would also disable all user controls on the server so that server state cannot be changed by manual operation.

   If any other client tries to access a server that is locked, it will receive a notification that the server is locked by another client.
3. When the client has connected to and locked the server, the client can access any of the programmatic controls needed to run the remote automations.
4. After the client operations finish, the client unlocks the server.

See also *HDM application commands flow*

Remote proxy object

The server exposes a remote object to let the remote client access and perform the server-side operations remotely. The proxy object is instantiated and exposed at the server-end through marshalling.



The following is an example:

RemotingConfiguration.RegisterWellKnownServiceType (typeof (TekExpressRemoteInterface), “TekExpress Remote interface”, WellKnownObjectMode.Singleton);

This object lets the remote client access the interfaces exposed at the server side. The client gets the reference to this object when the client gets connected to the server.

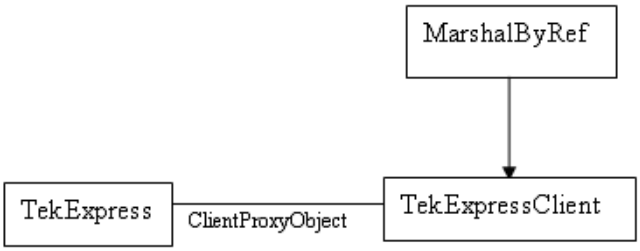
For example,

//Get a reference to the remote object

remoteObject = (IRemoteInterface)Activator.GetObject(typeof(IRemoteInterface), URL.ToString());

Client proxy object

Client exposes a proxy object to receive certain information.



For example,

//Register the client proxy object

WellKnownServiceTypeEntry[] e = RemotingConfiguration.GetRegisteredWellKnownServiceTypes();

clientInterface = new ClientInterface();

RemotingConfiguration.RegisterWellKnownServiceType(typeof(ClientInterface), “Remote Client Interface”, WellKnownObjectMode.Singleton);

//Expose the client proxy object through marshalling

RemotingServices.Marshal(clientInterface, "Remote Client Inteface");

The client proxy object is used for the following:

- To get the secondary dialog messages from the server.
- To get the file transfer commands from the server while transferring the report.

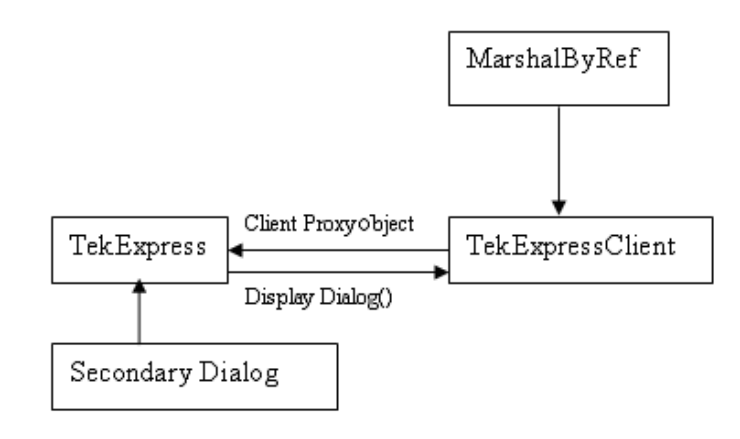
Examples

```
clientObject.clientIntf.DisplayDialog(caption, msg,iconType, btnType);
```

```
clientObject.clientIntf.TransferBytes(buffer, read, fileLength);
```

For more information, click the following links:

Secondary dialog message handling



The secondary dialog messages from the Secondary Dialog library are redirected to the client-end when a client is performing the automations at the remote end.

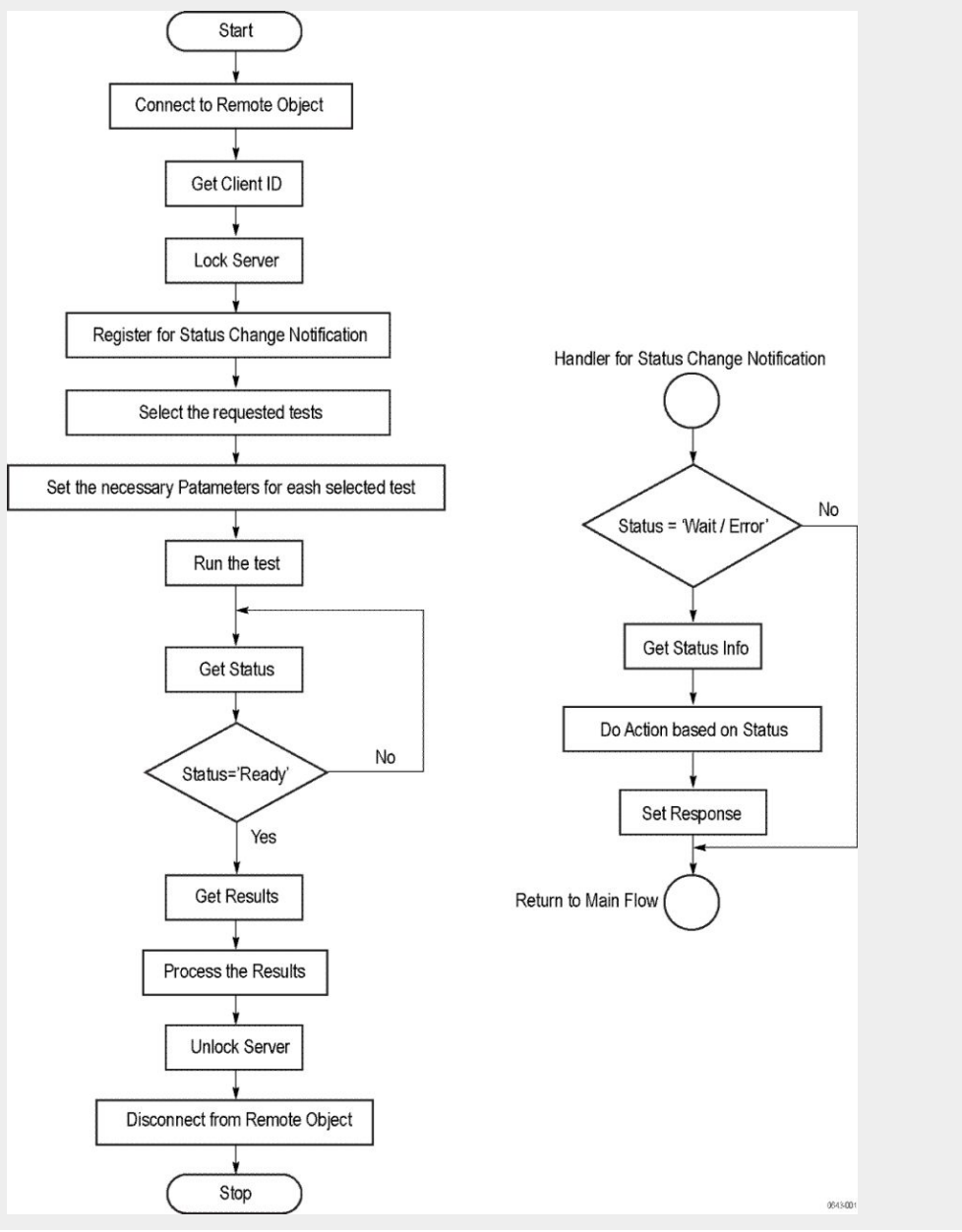
In the secondary dialog library, the assembly that is calling for the dialog box to be displayed is checked and if a remote connection is detected, the messages are directed to the remote end.

File Transfer Events

When the client requests the transfer of the report, the server reads the report and transfers the file by calling the file transfer methods at the client-end.

Client programmatic interface overview

The following is an overview of the client programmatic interface:



1. Connect to a server or remote object using a programmatic interface.
2. Get the client ID that is created when connecting to the remote object. This client ID is one of the required parameters to communicate with the server.

NOTE. *The server identifies the client with this ID only and rejects any request if the ID is invalid.*

---

3. Lock the server for further operations. This disables the application interface.

   NOTE. *You can get values from the server or set values from the server to the client only if the application is locked.*

4. Register for receiving notifications on status change events on the server. To register you need to give a handler as a parameter. For details, see *Handler of status change notification*.

   NOTE. *Whenever there is a change in the status of the server, all the clients registered with the server receive a notification from the server.*

5. Select the tests to run through the programmatic interface.
6. Set the necessary parameters for each test.
7. Run the tests.
8. Poll for the status of the application.

   NOTE. *Skip this step if you are registered for the status change notification and the status is Ready.*

9. After completing the tests, get the results.
10. Create a report or display the results and verify or process the results.
11. Unlock the server after completing all the tasks.
12. Disconnect from the remote object.

Handler of status change notification

1. Get the status. If the status is Wait or Error, get the information that contains the title, message description, and the expected responses for the status.
2. Perform the actions based on the status information.
3. Set the response as expected.

See also

HDM application commands flow

Program remote access code example

Program remote access code example

This code example shows how to communicate between a remote PC and TekExpress HDM.

Table 18: Remote access code example

Task	Code
Start the application	
Connect through an IP address.	m_Client.Connect("localhost") 'True or False clientID = m_Client.getClientID
Lock the server	m_Client.LockServer(clientID)
Disable the Popups	m_Client.SetVerboseMode(clientID, false)
Set the DUT ID	m_Client.SetDutId(clientID, "DUT_Name")
Select a test	For Source: SelectTest(clientId, device, Suite, test name, true) m_Client.SelectTest(clientID, "HDM Physical Layer Solution", "Source", "HF1-2- TRISE, TFALL", true);
Run with set configurations	m_Client.Run(clientID)
Wait for the test to complete.	Do Thread.Sleep(500) m_Client.Application_Status(clientID) Select Case status Case "Wait"
Get the current state information	mClient.GetCurrentStateInfo(clientID, WaitingMsbBxCaption, WaitingMsbBxMessage, WaitingMsbBxButtontexts)
Send the response	mClient.SendResponse(clientID, WaitingMsbBxCaption, WaitingMsbBxMessage, WaitingMsbBxResponse) End Select Loop Until status = "Ready"
Save results	'Save all results values from folder for current run m_Client.TransferResult(clientID, logDirname)
Unlock the server	m_Client.UnlockServer(clientID)
Disconnect from server	m_Client.Disconnect()
Exit the application	

HDM application commands

HDM application commands flow

Click a client action link to see the associated command name, description, parameters, return value, and an example.

Connect through an IP address

Lock the server

Disable the popups

Set or get the DUT ID

Set the configuration parameters for a suite or measurement

Query the configuration parameters for a suite or measurement

Select a test

Select a suite

Run with set configurations or stop the run operation

Handle error codes

Get or set the timeout value

Wait for the test to complete

After the test is complete

Save, recall, or query a saved session

Unlock the server

Disconnect from the server

Connect through an IP address

Command name	Parameters	Description	Return value	Example
Connect()	string ipAddress out string clientID	This method connects the client to the server. Note The client provides the IP address to connect to the server. The server provides a unique client identification number when connected to it.	Return value is either True or False	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as boolean returnval = m_Client.Connect(ipaddress,m_client ID)

string ipAddress

Name	Type	Direction	Description
ipAddress	string	IN	The ip address of the server to which the client is trying to connect. This is required to establish the connection between the server and the client.

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

NOTE. *The server must be active and running for the client to connect to the server. Any number of clients can be connected to the server at a time*

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Lock the server

Command name	Parameters	Description	Return value	Example
LockSession()	string clientID	This method locks the server. Note The client must call this method before running any of the remote automations. The server can be locked by only one client.	String value that gives the status of the operation after it has been performed The return value is "Session Locked..." on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval = m_Client.LockServer(clientID)

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

NOTE. *When the client tries to lock a server that is locked by another client, the client gets a notification that the server is already locked and it must wait until the server is unlocked. If the client locks the server and is idle for a certain amount of time then the server is unlocked automatically from that client.*

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Disable the popups

Use these commands to disable popup messages that require user intervention.

Command name	Parameters	Description	Return value	Example
SetVerboseMode()	string clientID bool -verbose	This method sets the verbose mode to either true or false. When the value is set to true, any message boxes that appear during the application will be routed to the client machine that is controlling TekExpress. When the value is set to false, all the message boxes are shown on the server machine.	String that gives the status of the operation after it has been performed When Verbose mode is set to true, the return value is "Verbose mode turned on. All dialog boxes will be shown to client". When Verbose mode is set to false, the return value is "Verbose mode turned off. All dialog boxes will be shown to server".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string **Verbose mode is turned on** return=m_Client.SetVerboseMode(clientID, true) **Verbose mode is turned off** returnval=m_Client.SetVerboseMode(clientID, false)

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

bool-verbose

Name	Type	Direction	Description
-verbose	bool	IN	Specifies whether the verbose mode should be turned ON or OFF

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Set or get the DUT ID

Command name	Parameters	Description	Return value	Example
SetDutId()	string clientID string dutName	This method changes the DUT ID of the setup. The client must provide a valid DUT ID.	String that gives the status of the operation after it has been performed Return value is “DUT Id Changed” on success	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string return=m_Client.SetDutId(clientID,desiredDutId) Note
GetDutId()	string clientID string dutId	This method gets the DUT ID of the current setup.	String that gives the status of the operation after it has been performed	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string return=m_Client.GetDutid(clientID, out DutId)

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

string dutName

Name	Type	Direction	Description
dutName	string	IN	The new DUT ID of the setup

string dutId

Name	Type	Direction	Description
dutId	string	OUT	The DUT ID of the setup

The dutId parameter is set after the server processes the request.

NOTE. *If the dutName parameter is null, the client is prompted to provide a valid DIT ID.*

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Set the configuration parameters for a suite or measurement

Command name	Parameters	Description	Return value	Example
SetGeneralParameter	string clientID string device string suite string test string parameterString	This method sets the general parameter values. ***NOTE.*** *Use this command to select a lane, channel, or source type.*	String that gives the status of the operation after it has been performed The return value is "" (an empty String) on success.	Sets the value for the general Parameter. mClient.SetGeneralParameter(clientID, "HDM Physical Layer Solution", "Source", "HF1-2-TRISE, TFALL", "Voltage termination $Internal"
SetAnalyzeParameter()	string clientID string device string suite string test string parameterString	This method sets the configuration parameters in the Analyze panel of the Configuration Panel dialog box for a suite or measurement.	String that gives the status of the operation after it has been performed The return value is "" (an empty String) on success.	Sets the value for the Analyze Parameter. mClient.SetAnalyzeParameter(clientID, "HDM Physical Layer Solution", "Source", "HF1-2-TRISE, TFALL", "Signal Type $DATA")
SetAcquireParameter()	string clientID string device string suite string test string parameterString	This method sets the configuration parameters in the Acquire panel of the Configuration Panel dialog box for a suite or measurement.	String that gives the status of the operation after it has been performed The return value is "" (an empty String) on success.	Sets the value for the Acquire Parameter. mClient.SetAcquireParameter(clientID, "HDM Physical Layer Solution", "Source", "HF1-2-TRISE, TFALL", "Short Record-length for VLow $Record Length (M)$4"

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite For Example "Source"; "Sink Electrical"; "Sink Protocol"

string test

Name	Type	Direction	Description
test	string	IN	Specifies the name of the test to obtain the pass or fail status. Test Names for Source: "HF1-1- VL and VSwing"; "HF1-2- TRISE, TFALL"; "HF1-3- Inter-Pair Skew"; "HF1-4- Intra-Pair Skew"; "HF1-5- Differential Voltage"; "HF1-6- Clock Duty Cycle and Clock Rate"; "HF1-7- Clock Jitter"; "HF1-8- Data Eye Diagram"

string parameterString

Name	Type	Direction	Description
parameterString	string	IN	Selects or deselects a test

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Query the configuration parameters for a suite or measurement

Command name	Parameters	Description	Return value	Example
GetGeneralParameter()	string clientID string device string suite string test string parameterString	This method gets the general configuration parameters for a suite or measurement.	The return value is the general configuration parameter for a specified suite or measurement that is set.	Gets the value for the general Parameter. mClient.GetGeneralParameter(clientID, "HDM Physical Layer Solution", "Source", "HF1-2-TRISE, TFALL", "Voltage termination")
GetAnalyzeParameter()	string clientID string device string suite string test string parameterString	This method gets the configuration parameters set in the Analyze panel of the Configuration Panel dialog box for a specified suite or measurement.	The return value is the configuration parameter set in the Analyze panel of the Configuration Panel dialog box for a specified suite or measurement.	Gets the value for the Analyze Parameter. mClient.GetAnalyzeParameter(clientID, "HDM Physical Layer Solution", "Source", "HF1-2-TRISE, TFALL", "Signal Type")
GetAcquireParameter()	string clientID string device string suite string test string parameterString	This method gets the configuration parameters set in the Acquire panel for a specified suite or measurement.	The return value is the configuration parameter set in the Acquire panel for a specified suite or measurement.	Gets the value for the Acquire Parameter. mClient.GetAcquireParameter(clientID, "HDM Physical Layer Solution", "Source", "HF1-2-TRISE, TFALL", "Short Record-length for VLow $Record Length (M)")

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite For Example "Source"; "Sink Electrical"; "Sink Protocol"

string test

Name	Type	Direction	Description
test	string	IN	Specifies the name of the test to obtain the pass or fail status. Test Names for Source: "HF1-1- VL and VSwing"; "HF1-2- TRISE, TFALL"; "HF1-3- Inter-Pair Skew"; "HF1-4- Intra-Pair Skew"; "HF1-5- Differential Voltage"; "HF1-6- Clock Duty Cycle and Clock Rate"; "HF1-7- Clock Jitter"; "HF1-8- Data Eye Diagram"

string parameterString

Name	Type	Direction	Description
parameterString	string	IN	Selects or deselects a test

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Query parameter example

returnval=mClient.GetAnalyzeParameter(clientID, "Transmitter", "Drive", "5.3.9 - Random Jitter (RJ)", "Clock Edge")

Select a test

Command name	Parameters	Description	Return value	Example
SelectTest()	string clientID string device string suite string test bool isSelected	This method selects or deselects a specified test. If this Setting parameter is set to true, you can select a measurement. If this Setting parameter is set to false, you can deselect a measurement.	String that displays the status of the operation after it has been performed The return value is "" (an empty String) on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string For Source: SelectTest(clientId, device, Suite, test name, true) m_Client.SelectTest(clientID, "HDM Physical Layer Solution", "Source", "HF1-2-TRISE, TFALL", true);

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite For Example "Source"; "Sink Electrical"; "Sink Protocol"

string test

Name	Type	Direction	Description
test	string	IN	Specifies the name of the test to obtain the pass or fail status. Test Names for Source: "HF1-1- VL and VSwing"; "HF1-2- TRISE, TFALL"; "HF1-3- Inter-Pair Skew"; "HF1-4- Intra-Pair Skew"; "HF1-5- Differential Voltage"; "HF1-6- Clock Duty Cycle and Clock Rate"; "HF1-7- Clock Jitter"; "HF1-8- Data Eye Diagram" Test Names for Sink: Electrical for CTS 1.4 "8-5: TMDS-Min/ Max Differential Swing Tolerance"; "8-6: TMDS-Intra-Pair Skew"; "8-7: TMDS-Jitter Tolerance". Test Names for Sink: Electrical for CTS 2.0 "HF2-1 Min-Max Differential Swing Tolerance"; "HF2-2 Intra-Pair skew test"; "HF2-3-Jitter Tolerance test". Test Names for Sink protocol: For CTS 1.4 "HF2-3-Jitter Tolerance test"; "HF8-16: Acceptance of All Valid Packet Types"; "HF8-19: Pixel Encoding Requirement"; "HF8-20: Video Format Timing"; "HF8-21: Audio Clock Regeneration"; "HF8-22: Audio Sample Packet Jitter"; "HF8-23: Audio Formats"; "HF8-24: Interoperability with DVI"; "HF8-25: Deep Color"; "HF8-28: One Bit Audio", "HF8-29: 3D Video Format Timing"; "HF8-30: 4K 2K Video

bool isSelected

Name	Type	Direction	Description
isSelected	bool	IN	Selects or deselects a test

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Select a device

Command name	Parameters	Description	Return value	Example
SelectDevice()	string clientID value	This method selects device	The return value is "" (an empty String) on success.	m_Client.SelctDevice(Client_ID,"HDM Physical Layer Solution")

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

value

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

Select a suite

Command name	Parameters	Description	Return value	Example
SelectSuite()	string clientID string device string suite bool isSelected	This method selects or deselects a specified suite. When this parameter is set to true, you can select a suite. When this parameter is set to false, you can deselect a suite.	String that gives the status of the operation after it has been performed The return value is "" (an empty String) on success.	m_Client.SelectSuite(clientID, "HDM Physical Layer Solution", "Source", true)

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite For Example "Source"; "Sink Electrical"; "Sink Protocol"

bool isSelected

Name	Type	Direction	Description
isSelected	bool	IN	Selects or deselects a test

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Select a version

Command name	Parameters	Description	Return value	Example
SelectVersions()	string clientID string device string suite value	This method selects version	The return value is "" (an empty String) on success.	m_Client.SelectVersions(Client_ID," HDM Physical Layer Solution", "Sink Electrical", ["CTS2.0"])

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

value

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite For Example "Source"; "Sink Electrical"; "Sink Protocol"

Run with set configurations or stop the run operation

Command name	Parameters	Description	Return value	Example
Run()	string clientID	Runs the selected tests Note After the server is set up and configured, run it remotely using this function.	String that gives the status of the operation after it has been performed. The return value is "Run started..." on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.Run(clientID)
Stop()	string clientID	Stops the currently running tests Note	String that gives the status of the operation after it has been performed The return value is "Stopped..." on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.Stop(clientID)

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

NOTE. *When the run is performed, the status of the run is updated periodically using a timer.*

NOTE. *When the session is stopped, the client is prompted to stop the session and is stopped at the consent.*

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Handle error codes

The return value of the remote automations at the server-end is OP_STATUS, which changes to a string value depending on its code, and returned to the client. The values of OP_STATUS are as follows:

Code	Value	Description
-1	FAIL	The operation failed
1	SUCCESS	The operation succeeded
2	NOT FOUND	Server not found
3	LOCKED	The server is locked by another client, so the operation cannot be performed
4	UNLOCK	The server is not locked; lock the server before performing the operation
0	NULL	Nothing

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Get or set the timeout value

Command name	Parameters	Description	Return value	Example
GetTimeOut()	string clientID	Returns the current timeout period set by the client	String that gives the status of the operation after it has been performed The default return value is 1800000.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.GetTimeOut()
SetTimeOut()	string clientID string time	Sets a timeout period specified by the client. After this timeout period expires, the server is unlocked automatically.	String that gives the status of the operation after it has been performed On success the return value is “TimeOut Period Changed”.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.SetTimeOut(clientID, desiredTimeOut)

string time

Name	Type	Direction	Description
time	string	IN	The time in seconds that refers to the timeout period

The time parameter gives the timeout period, which is the time the client is allowed to be locked and idle. After the timeout period if the client is still idle, it gets unlocked.

The time parameter should be a positive integer; otherwise, the client is prompted to provide a valid timeout period.

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Wait for the test to complete

The commands in this group execute while tests are running. The GetCurrentStateInfo() and SendResponse() commands are executed when the application is running and in the wait state.

Command name	Parameters	Description	Return value	Example
ApplicationStatus()	string clientID	This method gets the status of the server application. The states are Ready, Running, Paused, Wait, or Error.	String value that gives the status of the server application	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.ApplicationStatus(clientID)
QueryStatus()	string clientID out string[] status	An interface for the user to transfer Analyze panel status messages from the server to the client	String that gives the status of the operation after it has been performed On success the return value is “Transferred...”.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string Query status example
GetCurrentStateInfo() ***NOTE.*** *This command is used when the application is running and is in the wait or error state.*	string clientID out string WaitingMsbBxCaption out string WaitingMsbBxMessage out string[] WaitingMsbBxButtontexts	This method gets the additional information of the states when the application is in Wait or Error state. Except client ID, all the others are Out parameters.	This command does not return any value. This function populates the Out parameters that are passed when invoking this function.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL mClient.GetCurrentStateInfo(clientID, WaitingMsbBxCaption, WaitingMsbBxMessage, WaitingMsbBxButtontexts)

Command name	Parameters	Description	Return value	Example
SendResponse() ***NOTE.*** *This command is used when the application is running and is in the wait or error state.*	string clientID out string WaitingMsbBxCaption out string WaitingMsbBxMessage string WaitingMsbBxResponse	After receiving the additional information using the method GetCurrentStateInfo(), the client can decide which response to send and then send the response to the application using this function. The response should be one of the strings that was received earlier as a string array in the GetCurrentStateInfo function. The _caption and _message should match the information received earlier in the GetCurrentStateInfo function.	This command does not return any value.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL mClient.SendResponse(clientID, WaitingMsbBxCaption, WaitingMsbBxMessage, WaitingMsbBxResponse)

Ready: Test configured and ready to start

Running: Test running

Paused: Test paused

Wait: A popup that needs your inputs

Error: An error is occurred

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

out string[] status

Name	Type	Direction	Description
status	string array	OUT	The list of status messages generated during the run

out string WaitingMsbBxCaption

Name	Type	Direction	Description
caption	string	OUT	The wait state or error state message sent to you

out string WaitingMsbBxMessage

Name	Type	Direction	Description
message	string	OUT	The wait state/error state message sent to you

out string[] WaitingMsbBxButtontexts

Name	Type	Direction	Description
buttonTexts	string array	OUT	An array of strings containing the possible response types that you can send

string WaitingMsbBxResponse

Name	Type	Direction	Description
response	string	IN	A string containing the response type that you can select (it must be one of the strings in the string array buttonTexts)

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Query status example

```
returnVal=m_Client.QueryStatus(clientID, out statusMessages)
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)
return “Status updated...”
else
return CommandFailed(returnVal)
```

After the test is complete

Command name	Parameters	Description	Return value	Example
GetPassFailStatus()	string clientID string device string suite string test	This method gets the pass or fail status of the measurement after test completion. ***NOTE.*** *Execute this command after completing the measurement.*	String that gives the status of the operation after it has been performed Returns the pass or fail status in the form of a string	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.GetPass-FailStatus(clientID, device,suite, "HF1-1- VL and VSwing”)
GetResultsValue()	string clientID string device string suite string test string parameterString	This method gets the result values of the measurement after the run.	String that gives the status of the operation after it has been performed Returns the result value in the form of a string	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as srting returnval=m_Client.GetResultsValue(clientID,device,suite, "HF1-1- VL and VSwing")

Command name	Parameters	Description	Return value	Example
GetResultsValueForSubMeasurements()	string clientID string device string suite string test Results Panel Column Name int rowNr	This method gets the result values for individual sub-measurements after the run.	String that gives the status of the operation after it has been performed Returns the result value in the form of a string	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string Get results for a submeasurement example
GetReportParameter()	string clientID string device string suite string test string parameterString	This method gets the general report details such as oscilloscope model, TekExpress version, and HDM version.	The return value is the oscilloscope model, TekExpress version, and HDM version.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string **Oscilloscope Model** returnval=m_Client.GetReportParameter(clientID,"Scope Model") **TekExpress Version** returnval=m_Client.GetReportParameter(clientID,"TekExpress Version") **HDM Version** returnval=m_Client.GetReportParameter(clientID,"Application Version")

Command name	Parameters	Description	Return value	Example
TransferResult()	string clientID string filePath	This method transfers the report generated after the run. The report contains the summary of the run. The client must provide the location where the report is to be saved at the client-end.	String that gives the status of the operation after it has been performed Transfers all the result values in the form of a string	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.TransferResult(clientID,"C:\Report")
TransferImages()	string clientID string filePath	This method transfers all the images (screen shots) from the specified client and folder for the current run (for a suite or measurement). ***NOTE.*** *Every time you click Start, a folder is created in the X: drive. Transfer the waveforms before clicking Start.*	String that gives the status of the operation after it has been performed Transfers all the images in the form of a string	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.TransferImages(clientID, "C:\Waveforms")

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device For example "HDM Physical Layer Solution"

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite For Example "Source"; "Sink Electrical"; "Sink Protocol"

string test

Name	Type	Direction	Description
test	string	IN	Specifies the name of the test to obtain the pass or fail status. Test Names for Source: "HF1-1- VL and VSwing"; "HF1-2- TRISE, TFALL"; "HF1-3- Inter-Pair Skew"; "HF1-4- Intra-Pair Skew"; "HF1-5- Differential Voltage"; "HF1-6- Clock Duty Cycle and Clock Rate"; "HF1-7- Clock Jitter"; "HF1-8- Data Eye Diagram"

int rowNr

Name	Type	Direction	Description
rowNr	int	IN	Specifies the zero based row index of the sub-measurement for obtaining the result value

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

string parameterString

Name	Type	Direction	Description
parameterString	string	IN	Specifies the oscilloscope model, TekExpress version, and HDM version

string filePath

Name	Type	Direction	Description
filePath	string	IN	The location where the report must be saved in the client

NOTE. *If the client does not provide the location to save the report, the report is saved at C:\ProgramFiles.*

Get results for a submeasurement example

This example returns the specified submeasurement results for test HF1-2- TRISE, TFALL.

returnval=m_Client.GetResultsValue(clientID," "HDM Physical Layer Solution", "Source", "HF1-2- TRISE, TFALL","Value",0)

returnval=m_Client.GetResultsValue(clientID," "HDM Physical Layer Solution", "Source", "HF1-2- TRISE, TFALL","Value",1)

Save recall or query a saved session

Command name	Parameters	Description	Return value	Example
CheckSessionSaved()	string clientID out bool saved	This method checks whether the current session is saved.	Return value is either True or False	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.CheckSessionSaved(m_clientID, out savedStatus)
RecallSession()	string clientID string name	Recalls a saved session. The client provides the session name.	String that gives the status of the operation after it has been performed The return value is “Session Recalled...”	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.RecallSession(clientID, savedSessionName)
SaveSession()	string clientID string name	Saves the current session. The client provides the session name.	String that gives the status of the operation after it has been performed The return value is "Session Saved..."/"Failed..."	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.SaveSession(clientID, desiredSessionName)
SaveSessionAs()	string clientID string name	Saves the current session under a different name every time this method is called. The client provides the session name.	String that gives the status of the operation after it has been performed The return value is "Session Saved..."	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.SaveSessionAs(clientID, desiredSessionName)

string name

Name	Type	Direction	Description
name	string	IN	The name of the session being recalled

The name parameter cannot be empty. If it is empty, the client is prompted to provide a valid name.

out bool saved

Name	Type	Direction	Description
saved	bool	OUT	Boolean representing whether the current session is saved

This parameter is used as a check in SaveSession() and SaveSessionAs() functions.

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Unlock the server

Command name	Parameters	Description	Return value	Example
UnlockSession()	string clientID	This method unlocks the server from the client. The ID of the client to be unlocked must be provided. Note	String that gives the status of the operation after it has been performed The return value is "Session Un-Locked..."	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.UnlockServer(clientID)

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

NOTE. *When the client is disconnected, the client is unlocked automatically.*

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Disconnect from the server

Command name	Parameters	Description	Return value	Example
Disconnect()	string clientID	This method disconnects the client from the server. Note	Integer value that gives the status of the operation after it has been performed 1 for Success –1 for Failure	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.Disconnect(m_clientID)

out string clientID

Name	Type	Direction	Description
clientID	string	OUT	Identifier of the client that is connected to the server clientID = unique number + ipaddress of the client. For example, 1065–192.157.98.70

NOTE. *When the client is disconnected, it is unlocked from the server and then disconnected. The id is reused.*

NOTE. *The Fail condition for this command occurs in the following conditions:*

If the server is LOCKED the command returns "Server is locked by another client".

If the session is UNLOCKED the command returns "Lock Session to execute the command".

If the server is NOTFOUND the command returns "Server not found...Disconnect!".

If none of these fail conditions occur the command returns "Failed...".

Algorithms

About algorithms

For all measurements, use the following guidelines to set up the oscilloscope.

Oscilloscope Setup Guidelines

The following guidelines are generalized.

- The signal is any channel, reference, or math waveform.
- The vertical scale for the waveform must be set so that the waveform does not exceed the vertical range of the oscilloscope.
- The sample rate must be set to capture sufficient waveform detail and avoid aliasing.
- Longer record lengths increase measurement accuracy but the oscilloscope takes longer to measure each waveform.

HDM Source tests

HF1- 2 - Source TMDS electrical - 6G -T_{RISE}, T_{FALL}

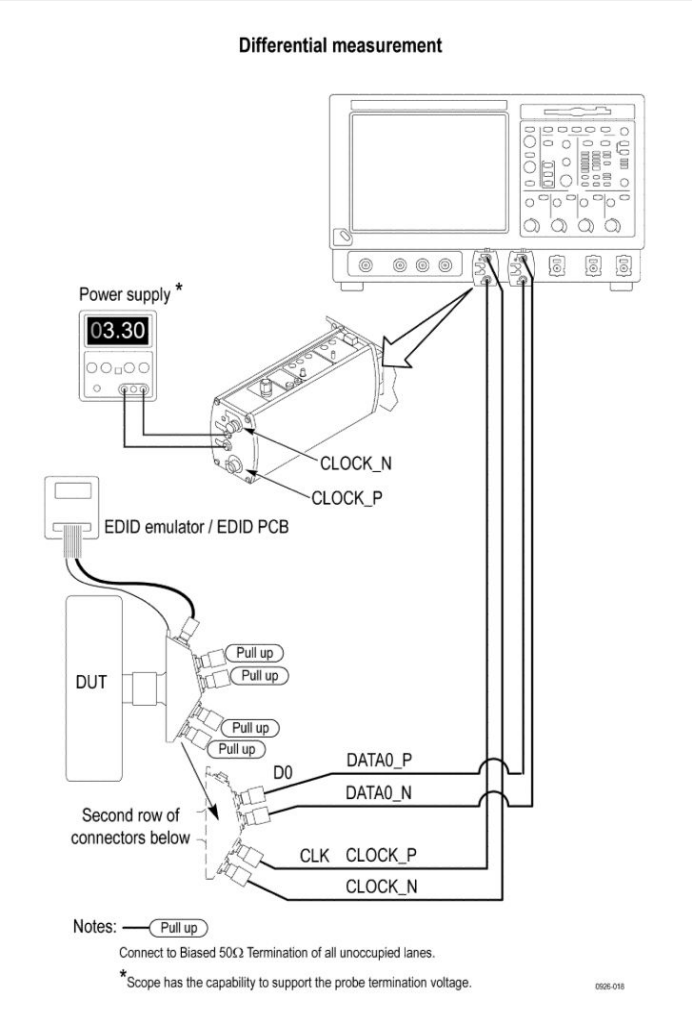
This test confirms that the rise times and fall times on the TMDS differential signals fall within the limits of the specification.

Required test equipment

In addition to the DUT, you will need the following:

- Digital storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for single ended and differential tests
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external power supply option)

Connect the equipment as shown in the Source differential diagram.



Set the DUT to operate in normal mode.

Measurement algorithm

The algorithm calculates the rise and fall time of the waveform as per the following steps:

1. Given a waveform, find the V_{High} and V_{Low}:
2. Measure the V_{Low}
   a. Capture 1000 or more repetitions, triggered at the vertical mid-point of the High-to-Low transition of a H-L-L-L bit sequence. Each capture must be of duration 3 times TBIT.
   b. Display the voltage (vertical) histogram on the scope, with the histogram data accumulated only from the last 2-bits of the H-L-L-L sequence.
   c. Read the V_{Low} value as the most common low-level (mode) voltage shown on the histogram.

3. Measure the V_{High}
   a. Capture the 1000 or more repetitions, triggered at the vertical mid-point of the High-to-Low transition of a L-H-H-H bit sequence. Each capture must be of duration 3 times TBIT.
   b. Display the voltage (vertical) histogram on the scope, with the histogram data accumulated only from the last 2-bits of the L-H-H-H sequence.
   c. Read the V_{High} value as the most common low-level (mode) voltage shown on the histogram.
4. Measure T_{RISE} as the mode of the sampled edge times from 20% to 80% of the differential swing voltage (V_{High}) rising edge.
5. Measure T_{FALL} as the mode of the sampled edge times from 80% to 20% of the differential swing voltage (V_{Low}) on the falling edge.

HF1- 3 - Source TMDS Electrical - 6G - Inter-Pair Skew

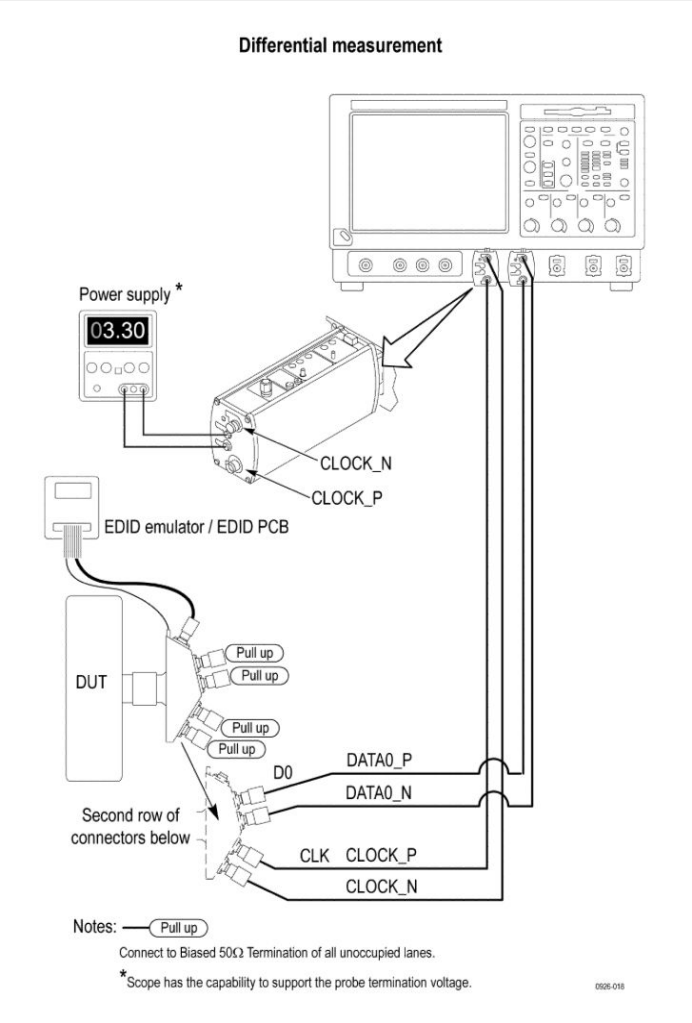
This test confirms that the skew between two data lanes on the TMDS differential signals fall within the limits of the specification.

Required test equipment

In addition to the DUT, you will need the following:

- Digital Storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for single ended and differential tests
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external power supply option)

Connect the equipment as shown in the Source differential diagram.



Measurement algorithm

The algorithm calculates the skew between the differential pairs in the TMDS portion as per the below steps. Inter pair skew test is a differential test and is only for data signals. Clock signal is excluded for this test, but is used for calculating the Tbit.

1. Connect and acquire the Data 0 and Data 1 signals.
2. Set the Digital Oscilloscope horizontal setting: sampling rate >= 25 Gs/sec and Record Length set to 100 M.
3. Decode the bit stream of Data 0 and Data 1.
4. Search for the 20 bit unscrambled control code (SSCP) on Data 0 and Data 1. SSCP might have one of the following 10 bit values:
   - 1101010100
   - 0010101011
   - 0101010100
   - 1010101011

5. Stop the acquisition and measure the TSKEW between channels.
6. Repeat the test for the remaining combinations of TMDS_DATAx pairs.

HF1- 6 - Source TMDS Electrical - 6G - Clock Duty Cycle and Clock Rate

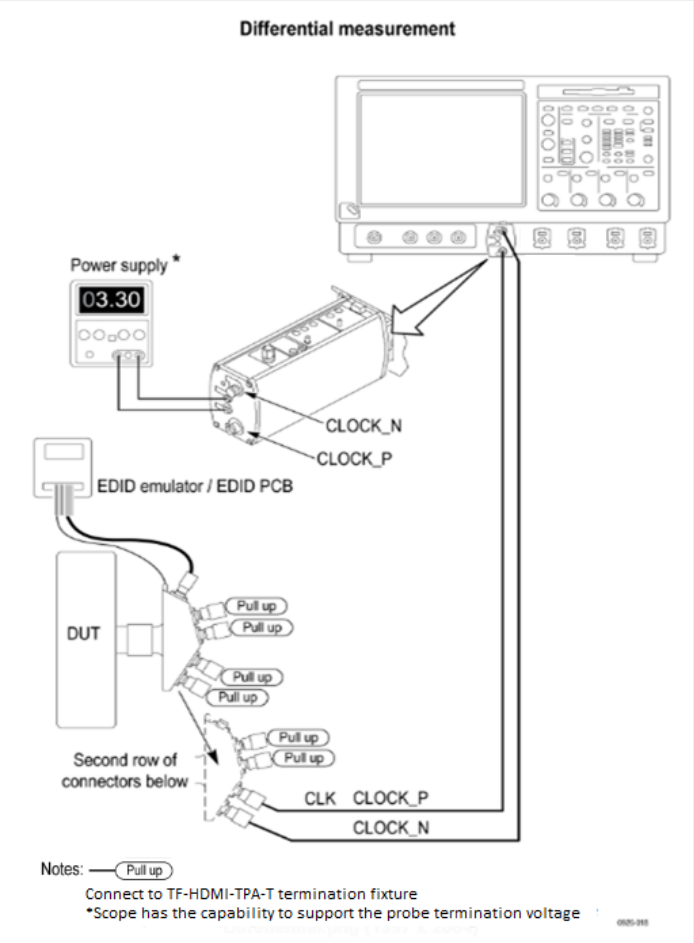
This test confirms that the duty cycle and clock rate of the TMDS differential clock complies with the limits mentioned in specification.

Required test equipment

In addition to the DUT, you will need the following:

- Digital Storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for Single Ended and Differential tests
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external Power Supply option)

Connect the equipment as shown in the Source differential diagram.



Set the DUT to operate in normal mode.

Measurement algorithm

The algorithm calculates the Clock Duty Cycle of the waveform as per the following steps:

1. DPOJET measurement is used to perform this test.
2. The Duty Cycle (Max) and Duty Cycle (Min) measurements calculate the difference in positive (or negative) pulse widths from one cycle to the next.

3. The application calculates these measurements using the following equations:

$$\Delta W_n^+ = \Delta W_n^+ - \Delta W_{n-1}^+$$

$$\Delta W_n^- = \Delta W_n^- - \Delta W_{n-1}^-$$

Where:

- ΔW+ is the difference between positive pulse widths of adjacent clock cycles.
- ΔW– is the difference between negative pulse widths of adjacent clock cycles.
- W+ is the positive pulse width measurement.
- W– is the negative pulse width measurement.

HF1- 7- Source TMDS Electrical - 6G - Clock jitter

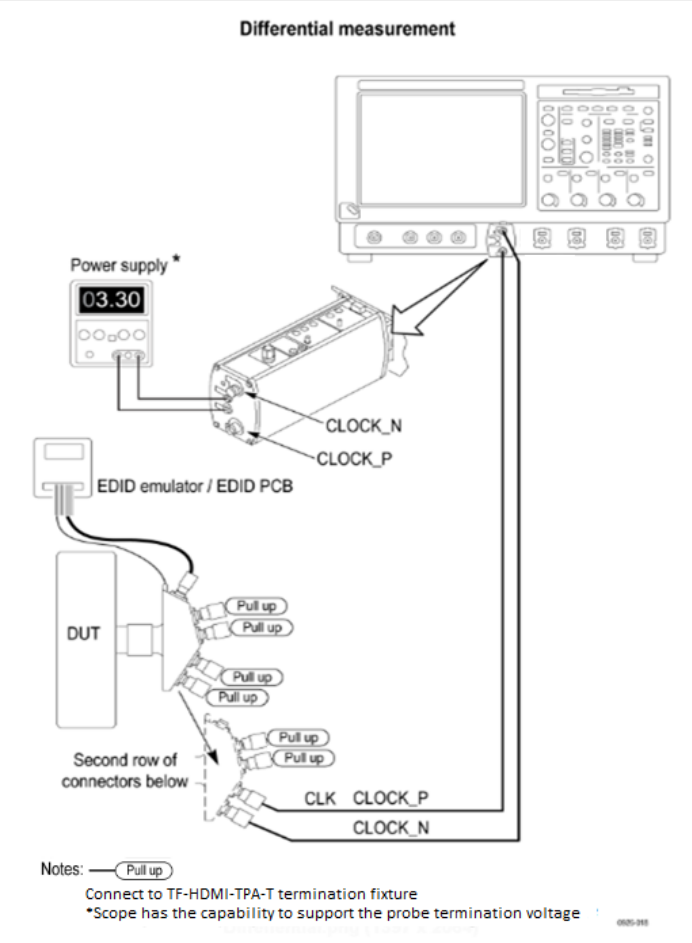
This test confirms that the clock jitter of the TMDS differential clock complies with the limits mentioned in specification.

Required test equipment

In addition to the DUT, you will need the following:

- Digital Storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for single ended and differential tests
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external power supply option)

Connect the equipment as shown in the Source differential diagram.



Set the DUT to operate in normal mode.

Measurement algorithm

TekExpress HDM automatically executes the following calculations:

1. Acquire the differential clock signal with same settings as before: Compliance Mode: 50 GS/sec Compliance Mode: 18M.
2. Apply 12.5x BW enhancement filter and save the wfm: - C:\TekScope\Math Arbitrary Filters\Probe-Filters\P7313_SMA_12.5x_16GHz_50GSs.flt and save this wfm as Clk_BWE.wfm.
3. Pass Clk_BWE.wfm from step 2 to algorithm for swing calculation.
4. Swing limits: If (Vs > 1200 mV) OR (Vs < 400 mV) then FAIL.
5. Apply the Cable effect on Clk_BWE.wfm from step 2, that is apply sdlaTp2clk.flt filter. Save this wfm as Clock_CableEffect.wfm.
   - Recall Clk_BWE.wfm on Ref1
   - Load Arbfilt1 = sdlaTp2clk.flt
   - Math1 = Arbfilt1(Ref1)
   - Save Math1 as Clock_CableEffect.wfm
6. Recall Clock_CableEffect.wfm on Ref1

7. Load load arbfilt1 = HDMI2_EQ_50G.flt
8. Math1 = arbfilt1(Ref1)
9. Pass Math1 from step 8 to DPOJET for jitter calculation. DPOJET settings are same as before:
   - Edge->Rising->50% TIE CH1
   - Signal Type: Clock
   - Clock Edge: Rise
   - Clock Recovery => Method: PLL Custom BW
   - PLL Model: Type I
   - Loop BW :4 MHz
   - Filter Spec : I st Order
   - Freq (F1) : 4 MHz
10. If Clock jitter exceeds 0.3 times TBIT then FAIL.

HF1- 8 - Source TMDS Electrical - 6G - Data Eye Diagram

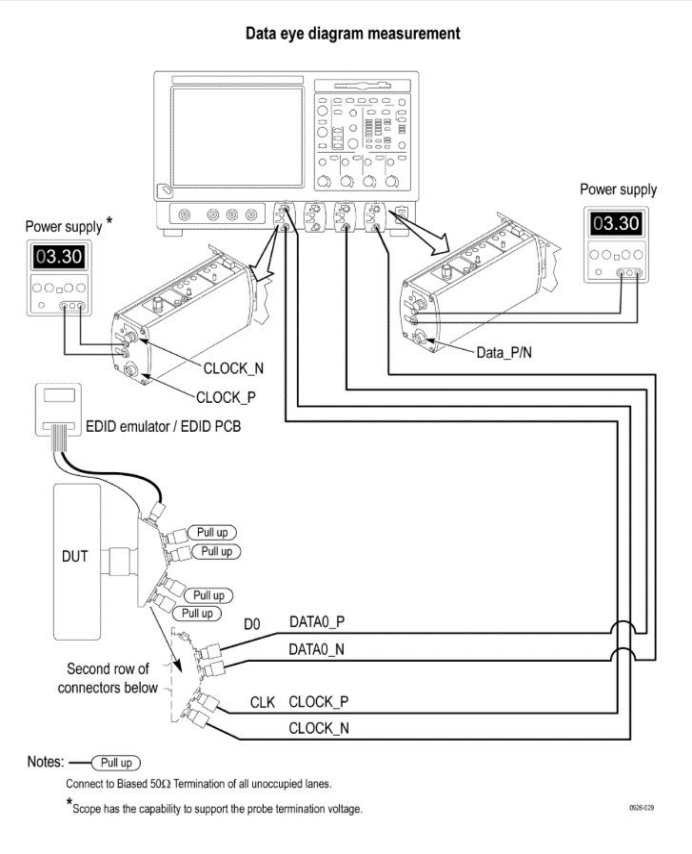
This test confirms that the HDMI Data output has signal quality that meets the eye opening required by the specification.

Required test equipment

In addition to the DUT, you will need the following:

- Digital Storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for single ended and differential tests
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external power supply option)

Connect the equipment as shown in the Source data eye diagram.



Set the DUT to operate in normal mode.

Measurement algorithm

TekExpress HDM automatically executes the following calculations:

This is a DPOJET based measurement.

CTS Procedure

- Source Eye Diagram test is measured at TP2_EQ.
- TP2 is the signal after passing along a worst cable.
- Worst cable has worst attenuation and skew of 112 ps.

Measurement procedure

1. Connect the Clock of the HDMI 2.0 source DUT to Ch1 of the oscilloscope. (Adding Type 4 Cable Emulator and inserting 112 ps delay on all TMDS data positive lanes.)
2. Connect Data0 (0/1/2/) +ve of the HDMI 2.0 Source to Ch3 of the oscilloscope.
3. Connect Data0 (0/1/2/) -ve of the HDMI 2.0 Source to Ch4 of the oscilloscope.

4. On Clock signal :
   - Load Arbfilt1 = sdlaTp3DIFFSrc1.flt – sdlaTp2clk.flt
   - Math1 = Arbfilt1 (Ch1)
   - Save Math1 as 1-7 TMDS Data Eye Diagram_Clock.wfm
5. On Data signal, load below filter files:
   - ArbFilt1 = sdlaTp2ADp.flt
   - ArbFilt2 = sdlaTp2ADn.flt
   - ArbFilt3 = sdlaTp2BDp.flt
   - Arbfilt4 = sdlaTp2BDn.flt
6. Define Math waveforms
   - Math2 = Arbfilt1 (Ch3) + Arbfilt2 (Ch4)
   - Math3 = ArbFilt3 (Ch3) + Arbfilt4 (Ch4)
   - Save Math4 = Math 2 – Math3 as 1-7 TMDS Data Eye Diagram_Data.wfm
7. Clear all Maths and filter file definitions.
8. Recall 1-7 TMDS Data Eye Diagram_Clock.wfm on Ref1.
9. Recall 1-7 TMDS Data Eye Diagram_Data.wfm on Ref2.
10. Load arbfilt1 = HDMI2_EQ_50G.flt.

    Math1 = arbfilt1 (Ref1)

    Math2 = arbfilt1 (Ref2)
11. Perform DPOJET ->Mask Hits measurements with below settings:
    - Clock Recovery => Method: Explicit Clock – PLL,
    - Clock Source: Math1
    - Clock Edge: Rise
    - Clock Multiplier: 40
    - PLL Model: Type I
    - Damping: 700 m
    - Loop BW: 4 MHz
    - Mask File = Data Rate_5.92 Gbps.msk
    - Clock offset = Auto
    - BitType = All
    - Plot = Eye Diagram
12. Perform DPOJET ->Eye width measurements with below settings:
    - Clock Recovery => Method: Explicit Clock – PLL,
    - Clock Source: Math1
    - Clock Edge: Rise

- Clock Multiplier: 40
- PLL Model: Type I
- Damping: 700 m
- Loop BW: 4 MHz
- Clock offset = Auto
- Bit Type = All
- Measurement setting ->Cursor gating ON

13. Enable the measurement with vertical cursors on at 5% and 95% of the oscilloscope acquisition.
14. Perform the above measurement on Data1 and Data2 by repeating the steps from (2) to (13).

(Adding Type4 Cable Emulator and inserting 112 psec delay on all TMDS data negative lanes.)

1. Connect the Clock of the HDMI 2.0 source DUT to Ch1 of the oscilloscope.
2. Connect Data0 (0/1/2/) +ve of the HDMI 2.0 Source to Ch3 of the oscilloscope.
3. Connect Data0 (0/1/2/) -ve of the HDMI 2.0 Source to Ch4 of the oscilloscope.
4. On Clock signal:
   - Load Arbfilt1 = sdlaTp3DIFFSrc1.flt – sdlaTp2clk.flt
   - Math1 = Arbfilt1 (Ch1)
   - Save Math1 as 1-7 TMDS Data Eye Diagram_Clock.wfm
5. On Data signal, load these filter files:
   - ArbFIlt1 = sdlaTp2ADp.flt
   - ArbFilt2 = sdlaTp2ADn.flt
   - Arbfilt3 = sdlaTp2BDp.flt
   - Arbfilt4 = sdlaTp2BDn.flt
6. Define Math waveforms:
   - Math2 = Arbfilt1 (Ch4) + Arbfilt2 (Ch3)
   - Math3 = ArbFilt3 (Ch4) + Arbfilt4 (Ch3)
   - Save Math4 = Math 3 – Math2 as 1-7 TMDS Data Eye Diagram_Data.wfm
7. Clear all Maths and filter file definitions.
8. Recall 1-7 TMDS Data Eye Diagram_Clock.wfm on Ref1
9. Recall 1-7 TMDS Data Eye Diagram_Data.wfm on Ref2
10. Load arbfilt1 = HDMI2_EQ_50G.flt

    Math1 = arbfilt1(Ref1)

    Math2 = arbfilt1(Ref2).

11. Perform DPOJET ->Auto Fit Mask Hits with below settings:
    - Clock Recovery => Method: Explicit Clock – PLL,
    - Clock Source: Math1
    - Clock Edge: Rise
    - Clock Multiplier: 40
    - PLL Model: Type I
    - Damping: 700 m
    - Loop BW: 4 MHz
    - Mask File = Data Rate_5.92 Gbps.msk
    - Clock offset = Auto
    - BitType = All
    - Plot = Eye Diagram
12. Perform DPOJET ->Eye width measurements with below settings:
    - Clock Recovery => Method: Explicit Clock – PLL,
    - Clock Source: Math1
    - Clock Edge: Rise
    - Clock Multiplier: 40
    - PLL Model: Type I
    - Damping: 700 m
    - Loop BW: 4 MHz
    - Clock offset = Auto
    - Bit Type = All
    - Measurement setting ->Cursor gating ON
13. Enable the measurement with vertical cursors on at 5% and 95% of the scope acquisition. Perform the above measurement on Data 1 and Data 2 by repeating the steps from (2) to (13). Repeat the test for remaining supported test character rates. Only one video format/pixel-size combination is required per TMDS character rate.

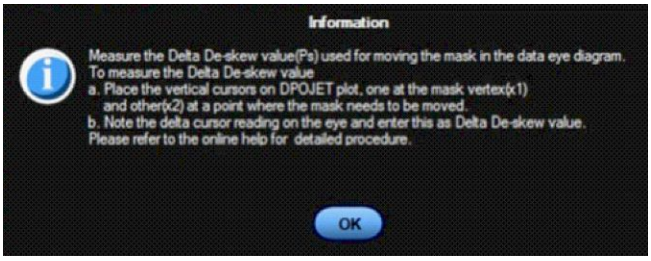
TP2 mask

Table 19: Mask coordinates at different data rates

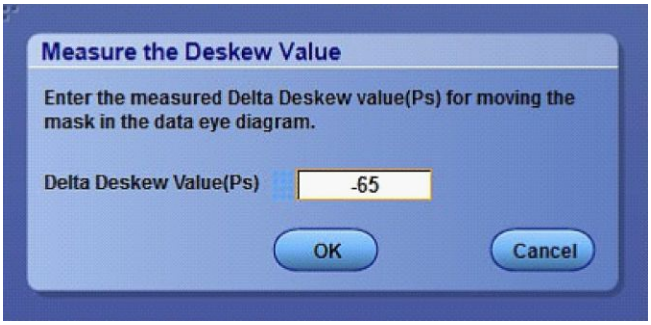
TMDS Bit Rate (Gbps)	H (Tbit)	V (mV)
3.71	0.6	335
4.46	0.56	295
5.94	0.4	150

HDM Data Eye Diagram Test - Mask Movement

When performing the HDM Data Eye Diagram test (Source), if the test fails due to mask hits, you are presented with a dialog box to enter a timing value that will be used to shift the Mask horizontally, thus allowing the test to pass. You will have up to three opportunities to adjust the mask position. If, after three attempts, the test still fails due to any mask hits, the test will stop and report the test as failed. The first message you see when the Eye Diagram test fails due to mask hits provides a short description of what you need to adjust the mask position.



After you select OK, the Measure the Deskew Value dialog box displays. Once you determine the amount of time (in picoseconds) to shift the mask horizontally, enter the value here.



HF1-1- Source TMDS Electrical - 6G -V_L and V_{Swing}

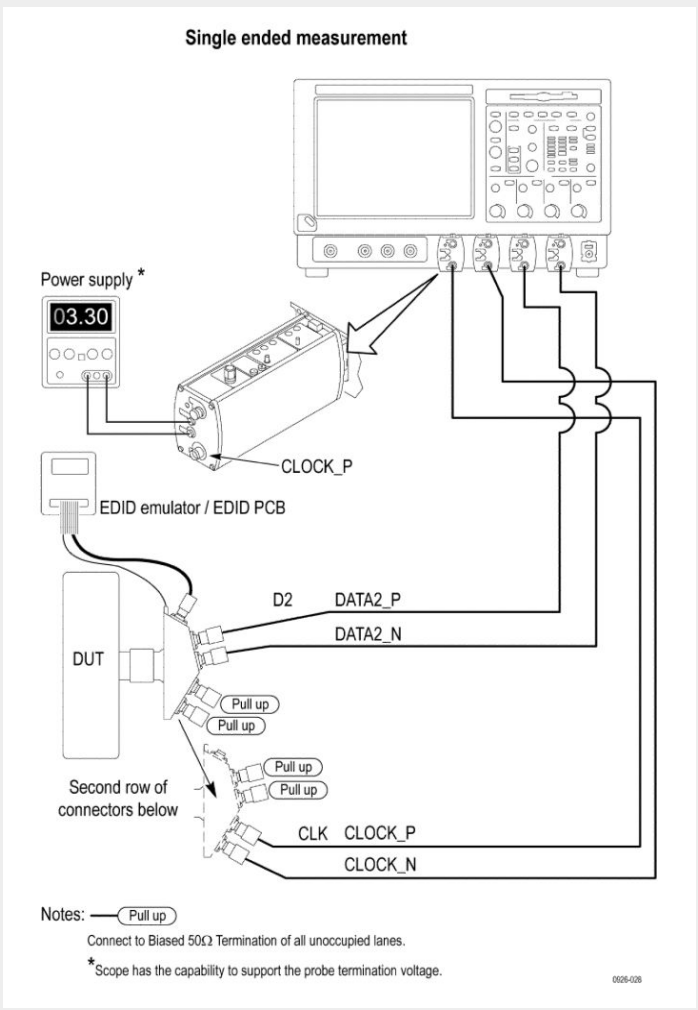
This test confirms that the low voltage level of the TMDS single-ended signals and the Swing of the single-ended signals complies with the limits listed in the specification.

Required test equipment

In addition to the DUT, you will need the following:

- Digital Storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for single ended and differential tests
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external power supply option)

Connect the equipment as shown in the Source single ended diagram.



Set the DUT to operate in normal mode.

Measurement algorithm

The algorithm calculates the rise and fall time of the waveform as per the following steps:

Given a waveform, find the V_{High} and V_{Low}

1. Measure V_{Low}:
   a. Capture 1000 or more repetitions, triggered at the vertical mid-point of the High-to-Low transition of a H-L-L-L bit sequence. Each capture must be of duration 3 times TBIT.
   b. Display the voltage (vertical) histogram on the scope, with the histogram data accumulated only from the last 2-bits of the H-L-L-L sequence.
   c. Read the V_{Low} value as the most common low-level (mode) voltage shown on the histogram
   d. Capture the 1,000 or more repetitions, triggered at the vertical mid-point of the Low-to-High transition of a L-H-H-H bit sequence. Each capture should be of duration 3 times Tbit.
   e. Display the voltage (vertical) histogram on the oscilloscope, with the histogram data accumulated only from the last 2-bits of the L-H-H-H sequence.
   f. Read the V_{High} value as the most common high-level voltage shown on the histogram.
   g. Calculate the $V_{Swing} = V_{High} - V_{Low}$.
2. In the case of Data Signals:
   - If the (V_{Low} < 2.30 V) or (2.90 V < V_{Low}), then FAIL.
   - If the (V_{Swing} < 400 mV) or (600 mV < V_{Swing}), then FAIL.
3. In the case of Clock Signals:
   - If (VL_{Low} < 2.30 V) or (3.10 V < V_{Low}), then FAIL.
   - If (V_{Swing} < 200 mV) or (600 mV < V_{Swing}), then FAIL.
4. Repeat the test for all eight TMDS signals.

HF1- 4 - Source TMDS Electrical - 6G - Intra-Pair Skew

This test confirms that the skew between the positive and negative lane of the TMDS single ended signals complies with the limits mentioned in specification.

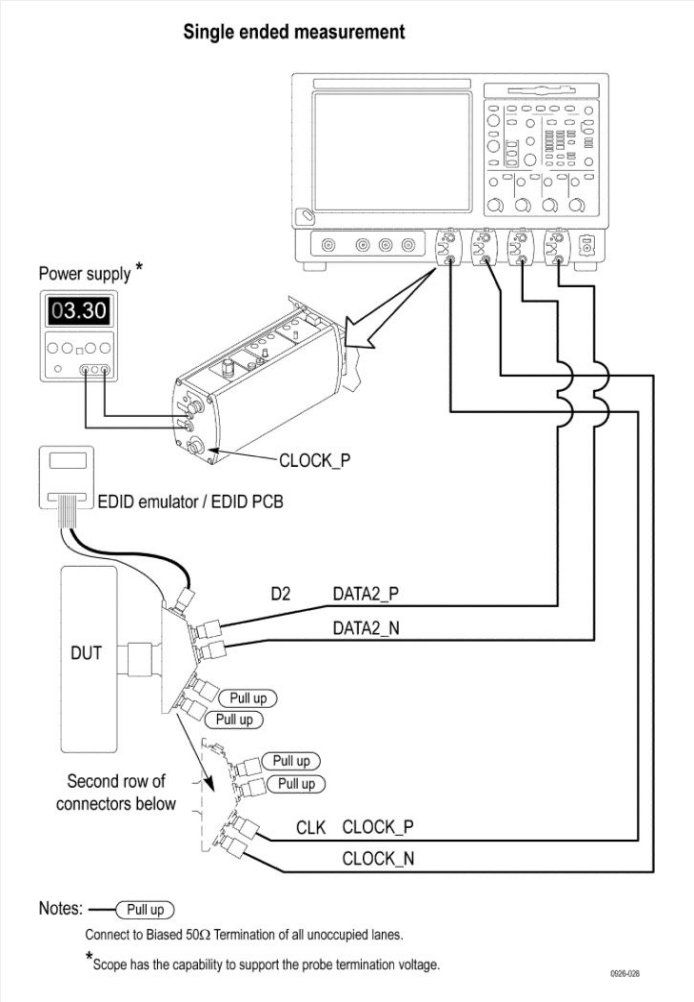
Required test equipment

In addition to the DUT, you will need the following:

- Digital Storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for single ended and differential tests)
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external power supply option)

Connect the equipment as shown in the Source single ended diagram.

Set the DUT to operate in normal mode.



Measurement algorithm

TekExpress HDM automatically executes the following described calculations described:

The algorithm calculates the skew within any Differential pair in the TMDS portion as per below steps. Intra-pair skew test is a single-ended measurement.

1. Capture D0+, D0- single-ended signals.
2. Search for at least 1000 occurrences of HLLL pattern on D0+ and LLLH on D0-. Capture these as qualified region for the measurement.
3. Measure the average skew between the corresponding rising edges of D0+ and falling edges of D0- of the qualified region.
4. Repeat the test for all remaining TMDS differential pairs.

HF1- 5 - Source TMDS Electrical - 6G - Differential Voltage

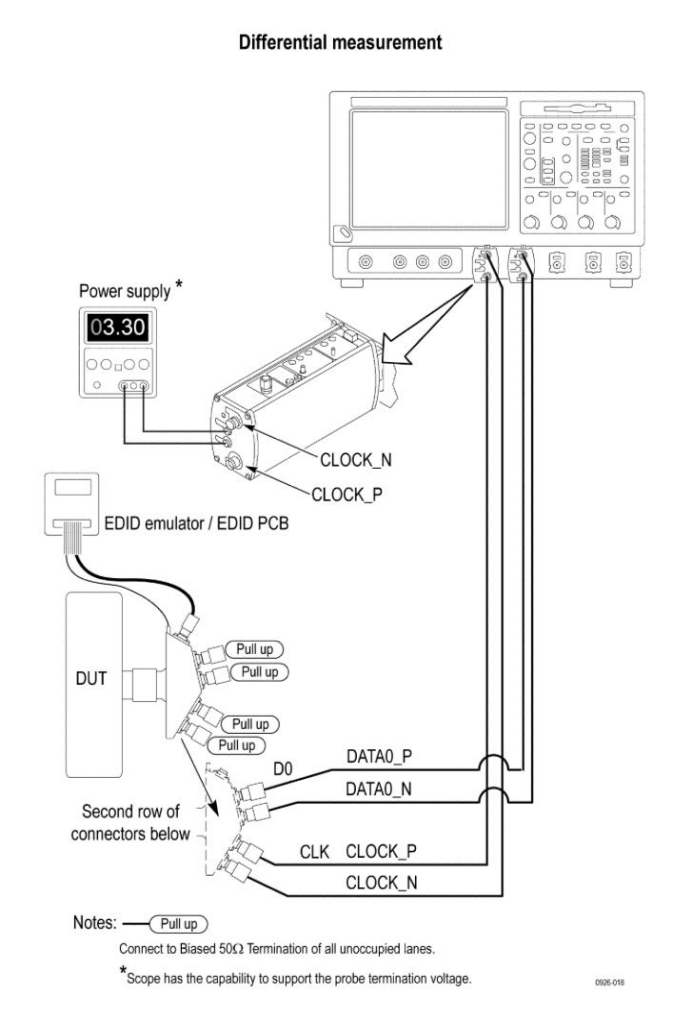
This test confirms that the voltage level of the TMDS differential signals complies with the limits in the specification.

Required test equipment

In addition to the DUT, you will need the following:

- Digital Storage oscilloscope: DPO/DSA/MSO series oscilloscope with BW greater than or equal to 16 GHz
- Four Differential probes – P7313SMA, for single ended and differential tests
- Test fixture: TF-HDM-TPA-S fixture for Source to be used for source testing
- Power supply: PWS4205 or PWS2185 (if using external power supply option)

Connect the equipment as shown in the Source differential diagram.



Set the DUT to operate in normal mode.

Measurement algorithm

The algorithm calculates the Differential voltage on Differential TMDS lanes clock, D0, D1, D2 as per following steps:

Given a waveform, find the Maximum Differential Voltage and Minimum Differential Voltage.

Measure the Minimum Differential voltage:

1. Capture 1000 or more repetitions, triggered at the vertical mid-point of the High-to-Low transition of a H-L-L-L bit sequence. Each capture must be of duration 3 times TBIT.
2. Display the voltage (vertical) histogram on the scope, with the histogram data accumulated only from the last 2-bits of the H-L-L-L sequence.
3. Read the Minimum Differential Voltage value as the most common low-level (mode) voltage shown on the histogram.

Measure the Maximum Differential voltage:

1. Capture 1000 or more repetitions, triggered at the vertical mid-point of the High-to-Low transition of a L-H-H-H bit sequence. Each capture must be of duration 3 times TBIT.
2. Display the voltage (vertical) histogram on the scope, with the histogram data accumulated only from the last 2-bits of the L-H-H-H sequence.
3. Read the Maximum Differential Voltage value as the most common low-level (mode) voltage shown on the histogram.

HDM - Sink Electrical tests for CTS 2.0

HF2-1 Min-max Differential Swing Tolerance

This HDMI Receiver test confirms that the Sink properly supports TMDS differential voltages at minimum and maximum levels.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

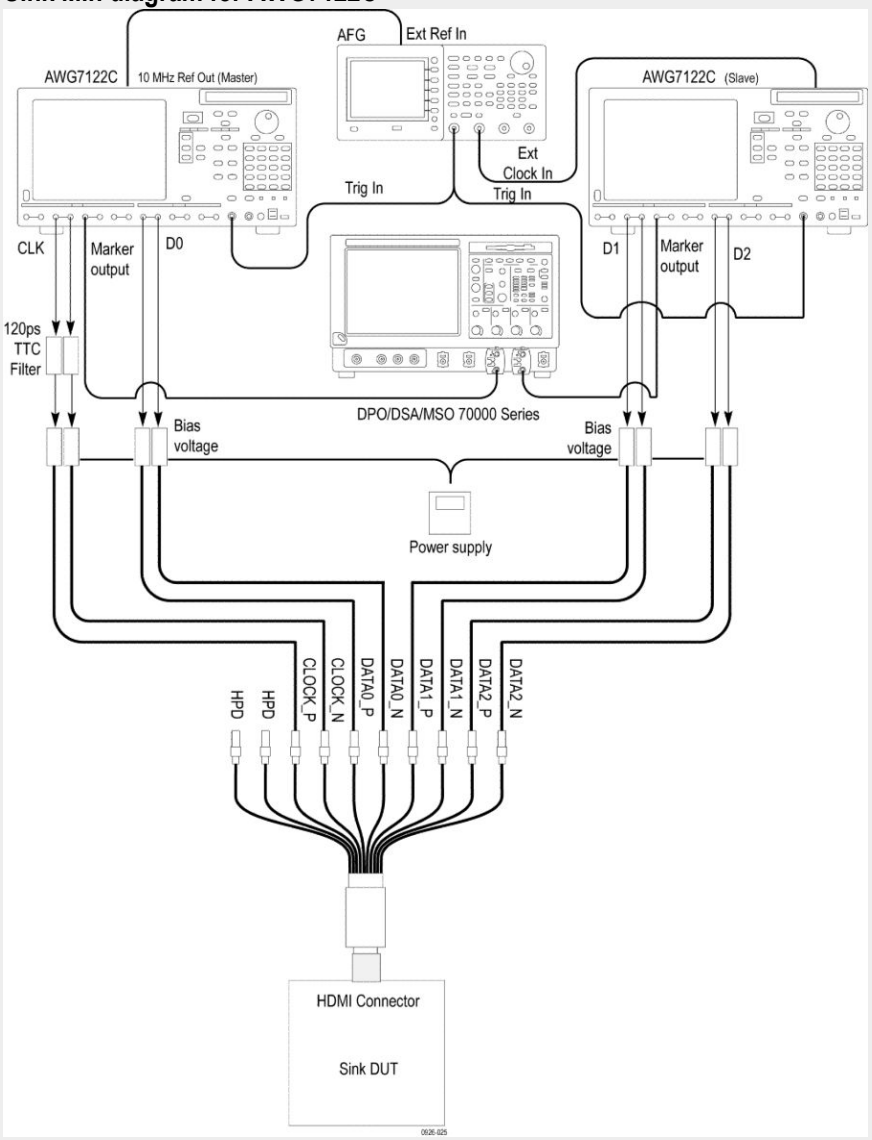
- HDMI signal generator: Two AWG70002A with options 01, 03 and 225, or two AWG7122C with options 1, 2/6, 8, and Option SDX with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Two 120 ps TTC filters (PSPL5915)
- Test fixture: A set of TF-HDM-TPA-S fixtures
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/Video display

Measurement algorithm

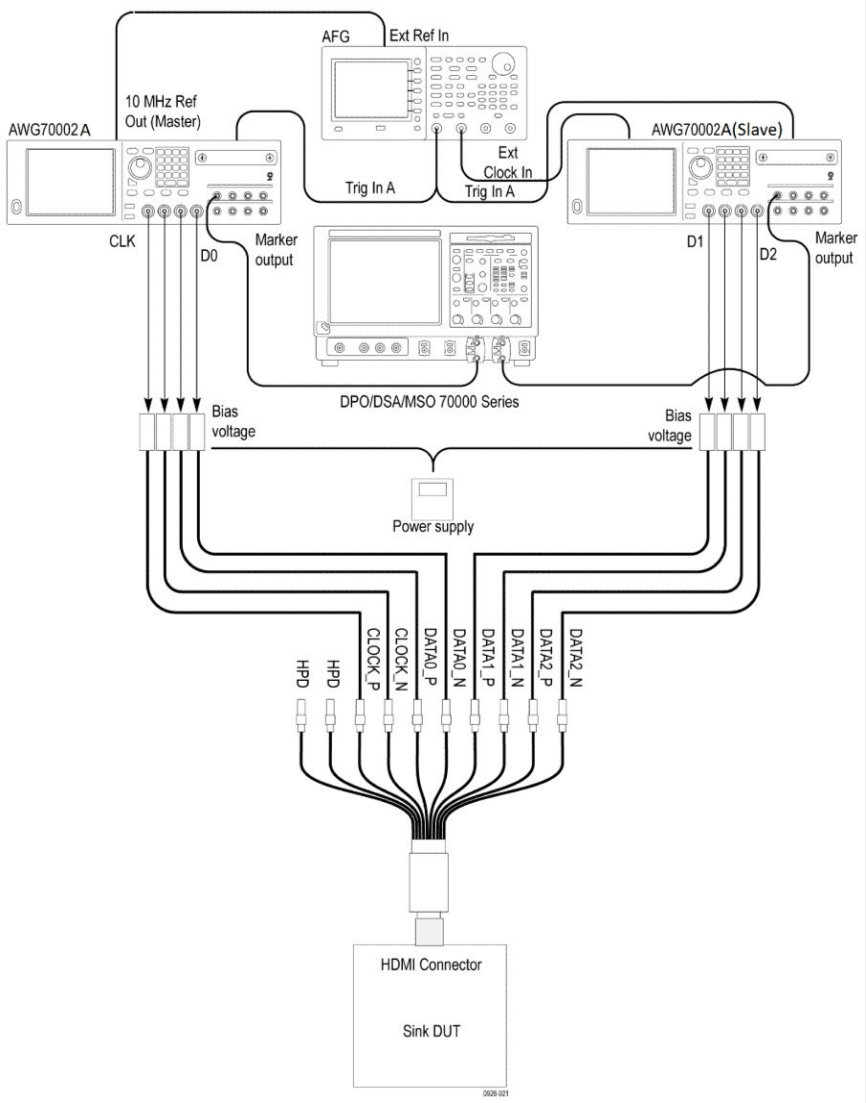
The following procedure is fully automated by Tektronix HDM Compliance Software (Option HDM-DS):

1. Connect the equipment as shown in the Sink Min diagram for AWG7122C or Sink Min diagram for AWG70002A.

Sink Min diagram for AWG7122C



Sink Min diagram for AWG70002A



2. Calibrate the HDM Signal Generator AWG7K/70K output for the following settings.
   a. Frequency: Highest frequency supported by the Sink DUT
   b. Pattern: HDMI Gray Ramp data streams
   c. Rise/fall times:

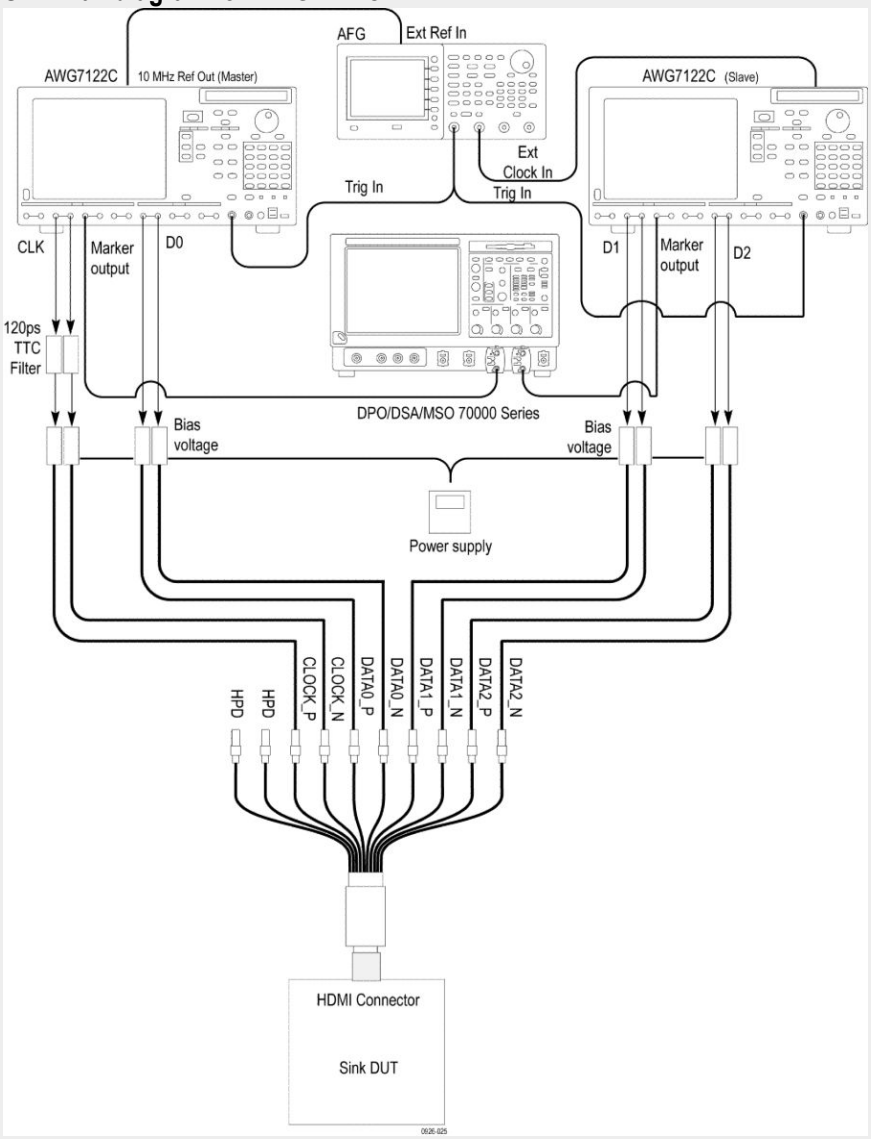
      Set the rise/fall time of the TMDS CLOCK to between 75 ps and 110 ps.

      Set the rise/fall time of the TMDS DATA between 42.5 ps and 65 ps.
   d. Set the common mode voltage (VICM) to 3.1 V.
   e. Set the differential swing voltage to 150 mV. Confirm the Sink DUT support. If the Sink DUT does not support the transmitted resolution, then FAIL: “Min diff swing unsupported at VICM1 range”.

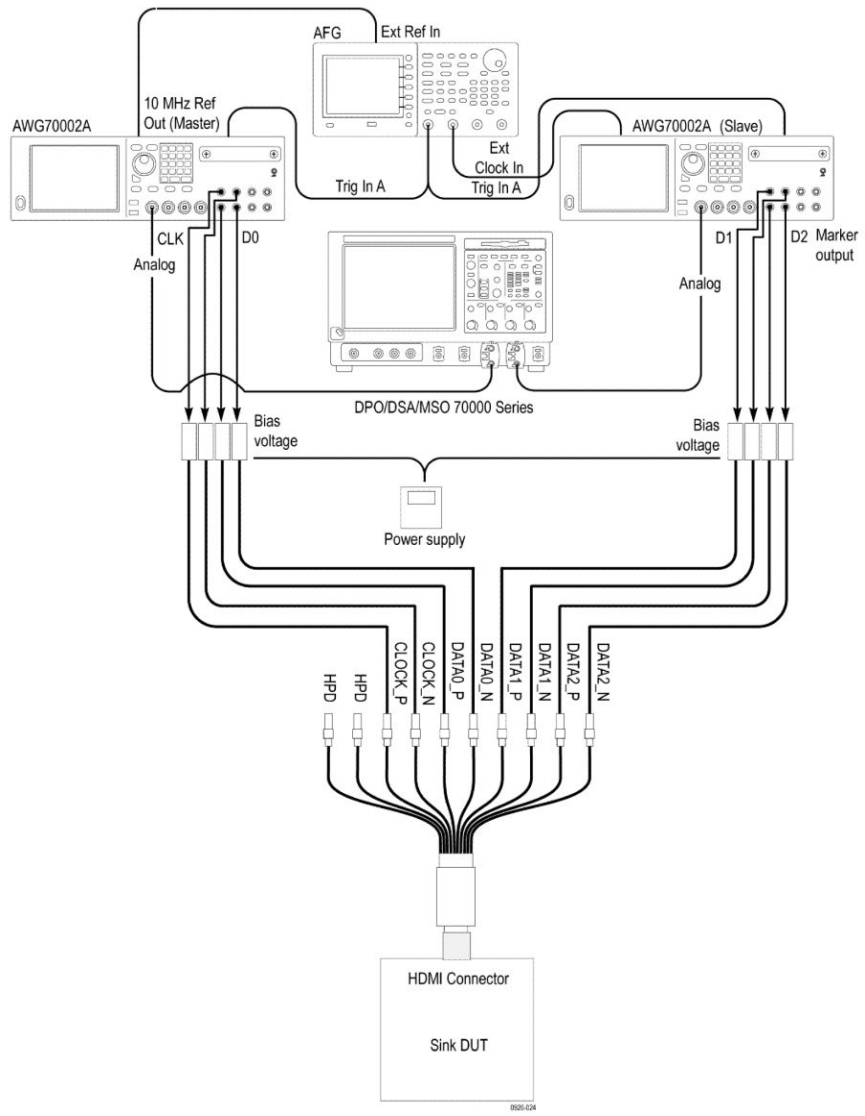
f. Change the VICM to 3.3 V. Confirm that the Sink DUT continues to support the transmitted image without errors. If the Sink DUT does not support the transmitted resolution, then FAIL: “Min diff swing unsupported at VICM2 range”.

g. Connect the equipment as shown in the Sink Max diagram for AWG7122C or Sink Max diagram for AWG70002A.

Sink Max diagram for AWG7122C



Sink Max diagram for AWG70002A



Note: For AWG7122C, the connection remains the same as the nominal pattern.

h. Set the common mode voltage (VICM) to 2.6 V.

i. Change the differential voltage to 1200 mV (600 mV/single-ended signal = max swing).

j. Verify that the Sink DUT continues to support the transmitted image without errors.

k. If the Sink DUT does not support the transmitted image, then FAIL: “Max diff swing unsupported at VICM1 range”.

l. Change the VICM to 3.3 V. Verify that the Sink DUT continues to support the transmitted image without errors.

m. If the Sink DUT fails to support the transmitted image, then FAIL: “Max diff swing unsupported at VICM2 range”.

HF2-2 Intra-pair skew test

This HDMI Receiver test confirms that the maximum allowed timing skew within each TMDS pair is supported by the Sink DUT.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

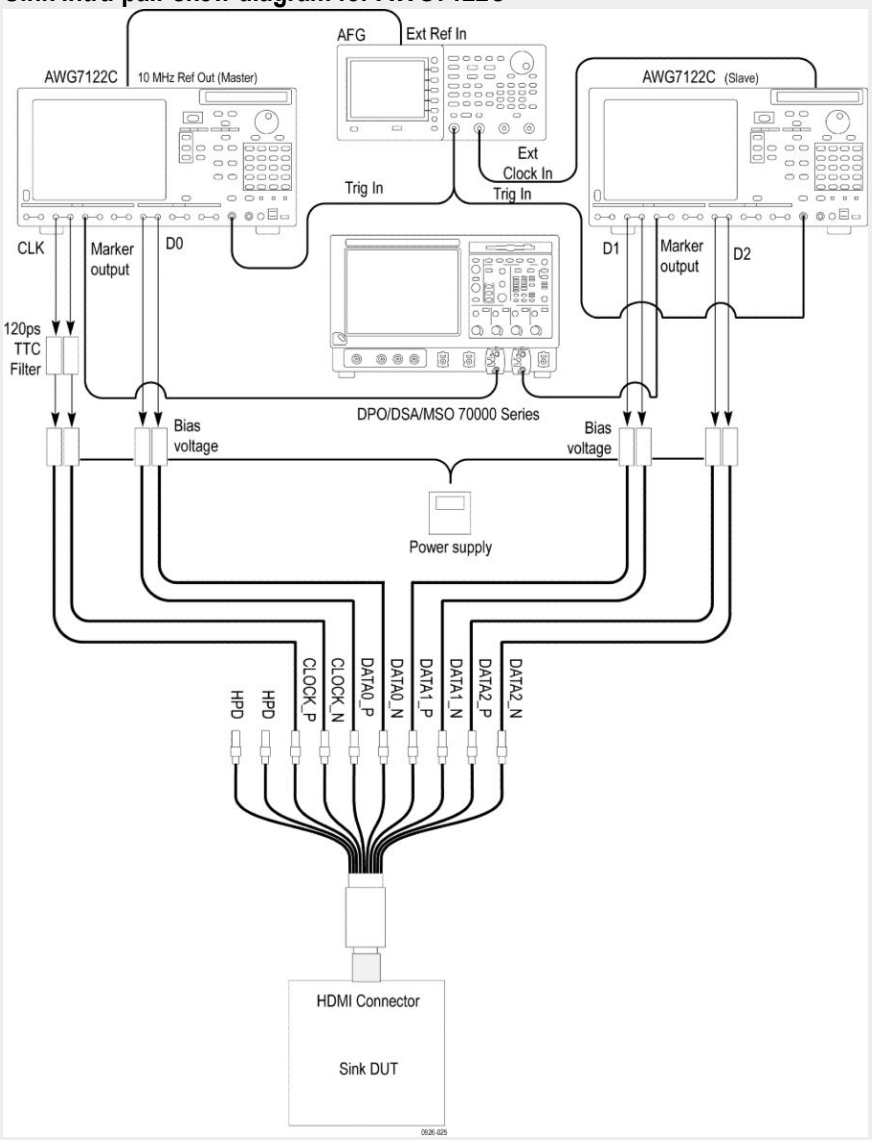
- HDMI signal generator: Two AWG70002A with options 01, 03 and 225, or two AWG7122C with options 1, 2/6, 8, and option SDX with direct synthesis capability to simulate cable emulator effect and Rise time filter effect.
- Rise time Filter: Two 120 ps TTC filters (PSPL5915)
- Test Fixture: A set of TF-HDM-TPA-S fixtures
- DC Power Suppl
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/Video display

Measurement algorithm

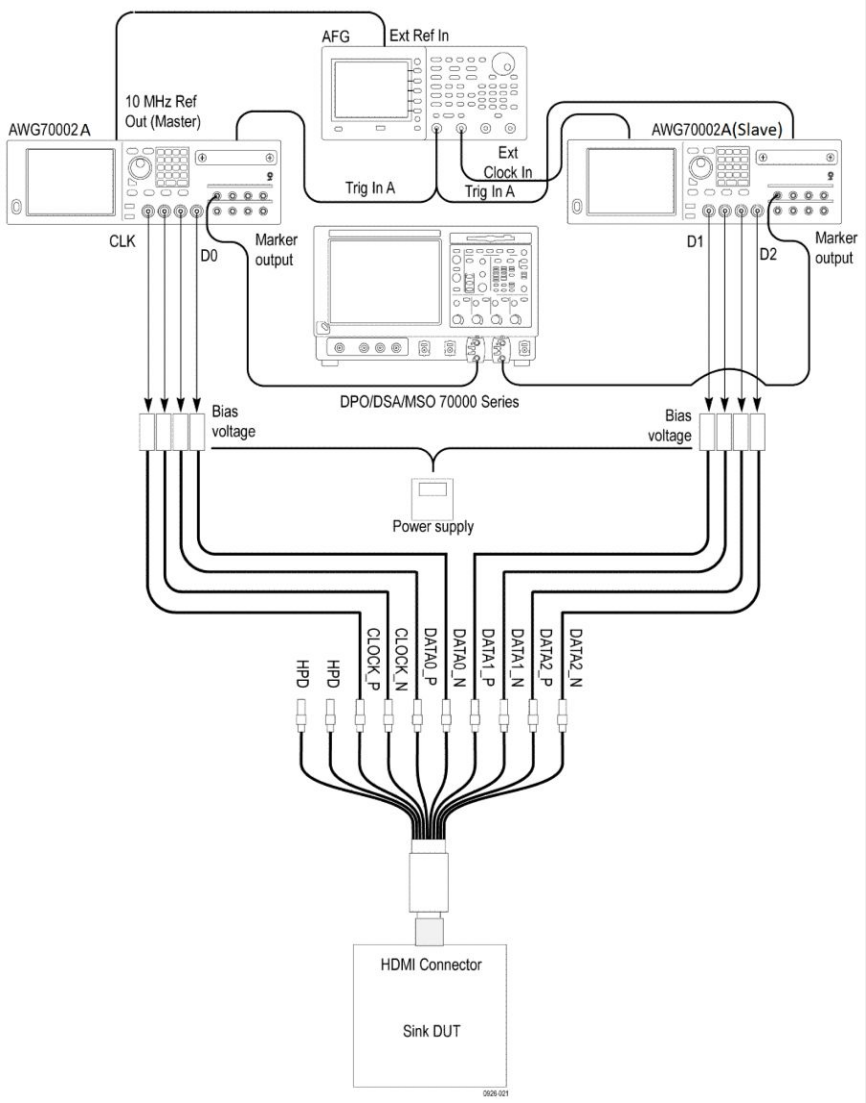
The following procedure is fully automated by Tektronix HDM Compliance Software (Option HDM-DS):

1. Connect the equipment as shown in the Sink Intra-pair skew diagram for AWG7122C or Sink Intra-pair skew diagram for AWG70002A.

Sink Intra-pair skew diagram for AWG7122C



Sink Intra-pair skew diagram for AWG70002A



2. Calibrate the HDM Signal Generator AWG7K/70K output for the following settings.
   - Frequency: Highest frequency supported by the Sink DUT
   - Pattern: HDMI Gray Ramp data streams
   - Rise/fall times:

     Set the rise/fall time of the TMDS CLOCK to between 75 ps and 110 ps.

     Set the rise/fall time of the TMDS DATA between 42.5 ps and 65 ps.
   - Set the Single Ended Swing to 500 mV.
   - Set the VICM to 2.8 V.
3. Do the following for each TMDS differential pair Clock and Data:
   a. Apply the worst skew at TP2 to the pair being tested:

      Set skew of .15*Tbit on one line against the other line.

Apply the Worst Cable Emulator after the TMDS Signal Generator to cause 112 ps signal delay on the line of the TMDS differential pair against the other line.

b. Enable the Scrambling mode on DUT.

c. Operate the TMDS Signal Generator to output the tested Video Format.

d. If the Sink DUT fails to adequately support the transmitted image, then FAIL.

e. Switch the setting of the signal delay on the other line for the tested TMDS differential pair.

f. If the Sink DUT fails to adequately support the transmitted image, then FAIL

g. Repeat the test for the remaining untested pairs.

h. For all TMDS signals, set (VICM) to 3.3 V and repeat the procedure.

HF2-3-Jitter Tolerance test

This HDMI Receiver test confirms that the maximum allowed clock jitter on TMDS signal is supported by the Sink DUT.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

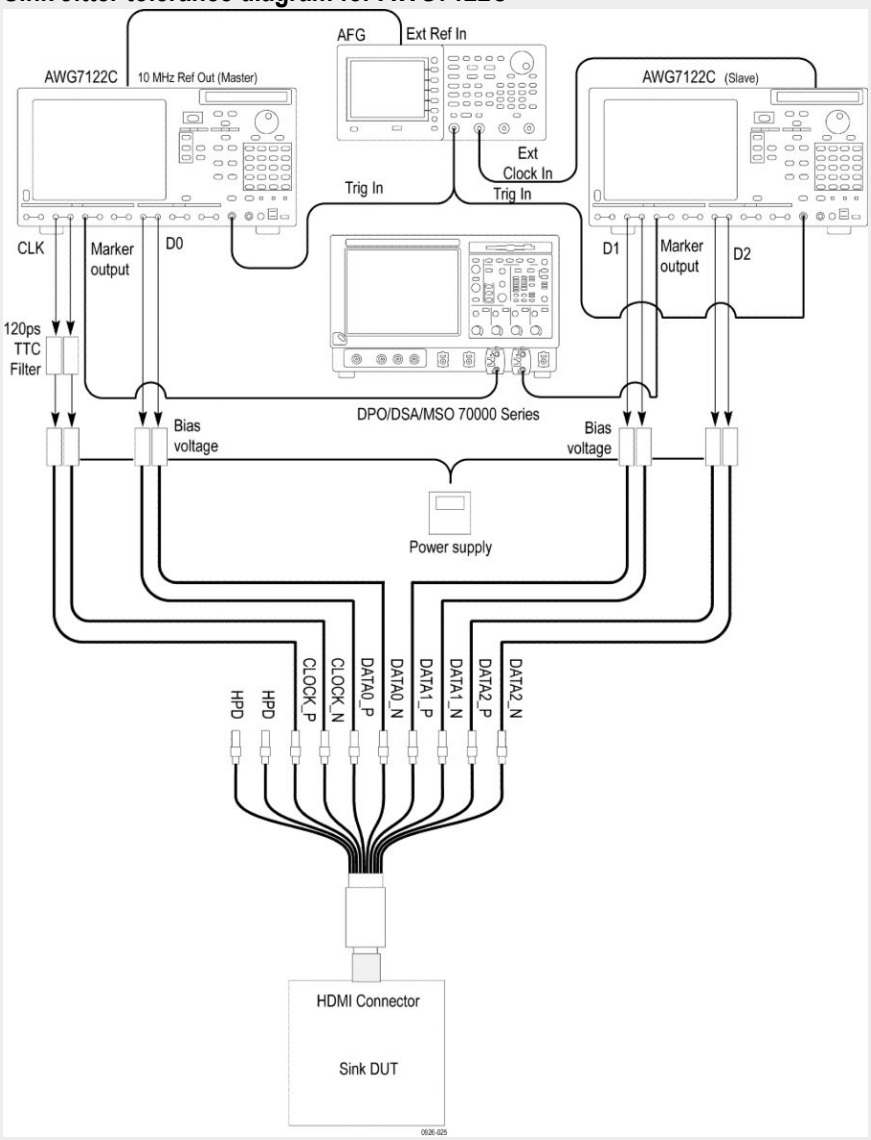
- HDMI signal generator: Two AWG70002A with options 01, 03 and 225, or two AWG7122C with options 1, 2/6, 8, and option SDX with direct synthesis capability to simulate cable emulator effect and Rise time filter effect.
- Rise time filter: Two 120 ps TTC filters (PSPL5915)
- Test fixture: A set of TF-HDM-TPA-S fixtures
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

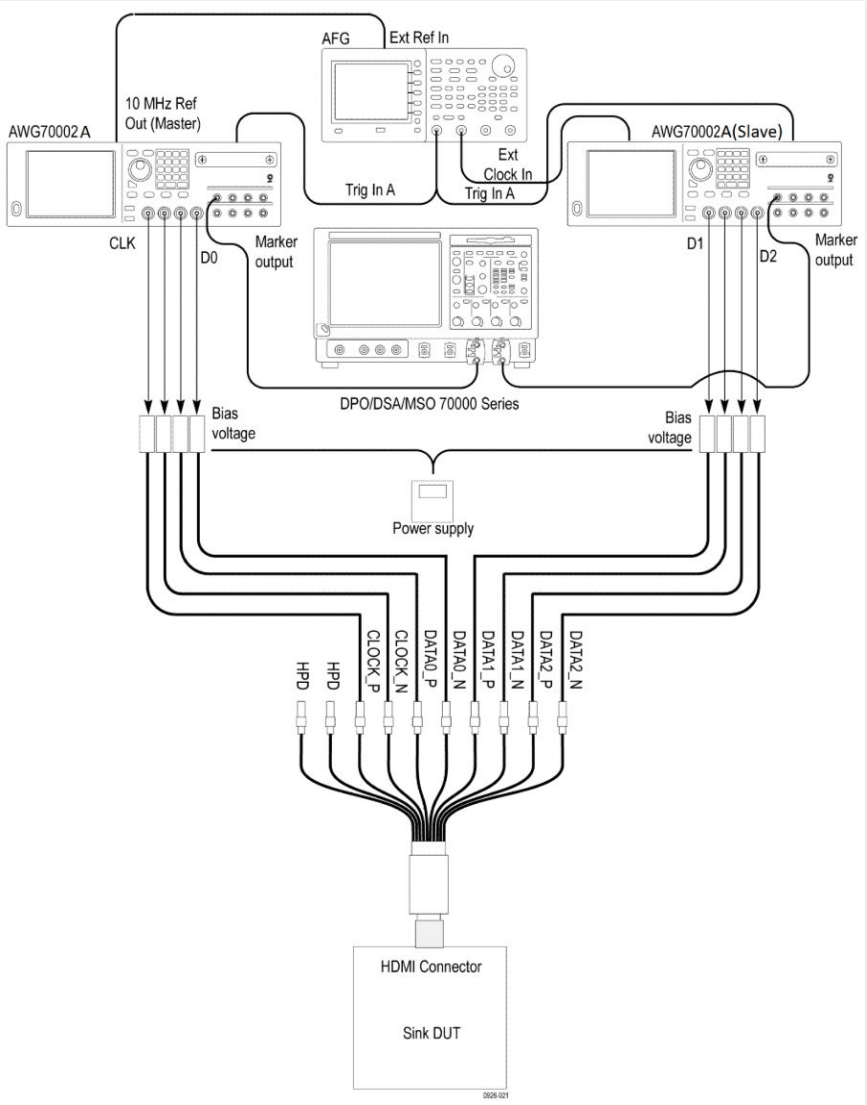
The following procedure is fully automated by Tektronix HDM Compliance Software (Option HDM-DS):

1. Connect the equipment as shown in the Sink Jitter tolerance diagram for AWG7122C or Sink Jitter tolerance diagram for AWG70002A.

Sink Jitter tolerance diagram for AWG7122C



Sink Jitter tolerance diagram for AWG70002A



2. Calibrate the HDM Signal Generator AWG7K/70K output for the following settings.
   a. Frequency: Highest frequency supported by the Sink DUT
   b. Pattern: HDMI Gray Ramp data streams
   c. Rise/fall times:

      Set the rise/fall time of the TMDS CLOCK to between 75 ps and 110 ps.

      Set the rise/fall time of the TMDS DATA between 42.5 ps and 65 ps.
   d. Set VICM to 2.9 V.
   e. Set Single Ended Swing to 400 mV.

f. Below are the jitter frequencies inserted on the signal:

D_JITTER = 500 kHz (on TMDS_CLOCK), C_JITTER = 10 MHz.

D_JITTER = 1 MHz (on TMDS_CLOCK), C_JITTER = 7 MHz.

NOTE. *All jitter amounts described below are relative to a recovered clock as measured with a Clock Recovery Unit).All four jitter frequencies define sinusoidal jitter). [Make TP2 worst condition]*

---

g. Apply the Worst Cable Emulator under the condition that the Worst Cable Emulator causes delay on all TMDS DATA positive (+) lines against negative (–) lines.

h. Generate TP2 signal and adjust the jitter amplitude as follows:

C_JITTER to be 0.3*Tbit at TP2 after processing with the CRU and applying the Reference Cable Equalizer for 3.4 Gbps–6 Gbps.

Data waveform (eye diagram) to nearly touch the 2 corners (right and left) points of the TP2_EQ eye mask, but without causing a TP2_EQ eye mask violation after processing with the CRU and applying the Reference Cable Equalizer for 3.4 Gbps–6 Gbps.

i. Connect the TMDS Signal Generator to the Sink DUT.

a. Use the I2C Analyzer to write 1 to the Scrambling_Enable bit of the Sink DUT.

b. Operate the TMDS Signal Generator to output the tested Video Format.

c. If the CDF field Sink_Error_Counter is “Y” and the DUT passed all tests in Section 8.2.3 (Test ID HF2-18, HF2-19, HF2-20), then measure the error rate using the Error Counter. If the Error rate is more than 10-9, then FAIL.

HDM Sink Electrical tests for CTS version 1.4

Test ID 8-7 TMDS Jitter tolerance test

This HDMI Receiver test confirms that the maximum allowed clock jitter on TMDS signal is supported by the Sink DUT.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

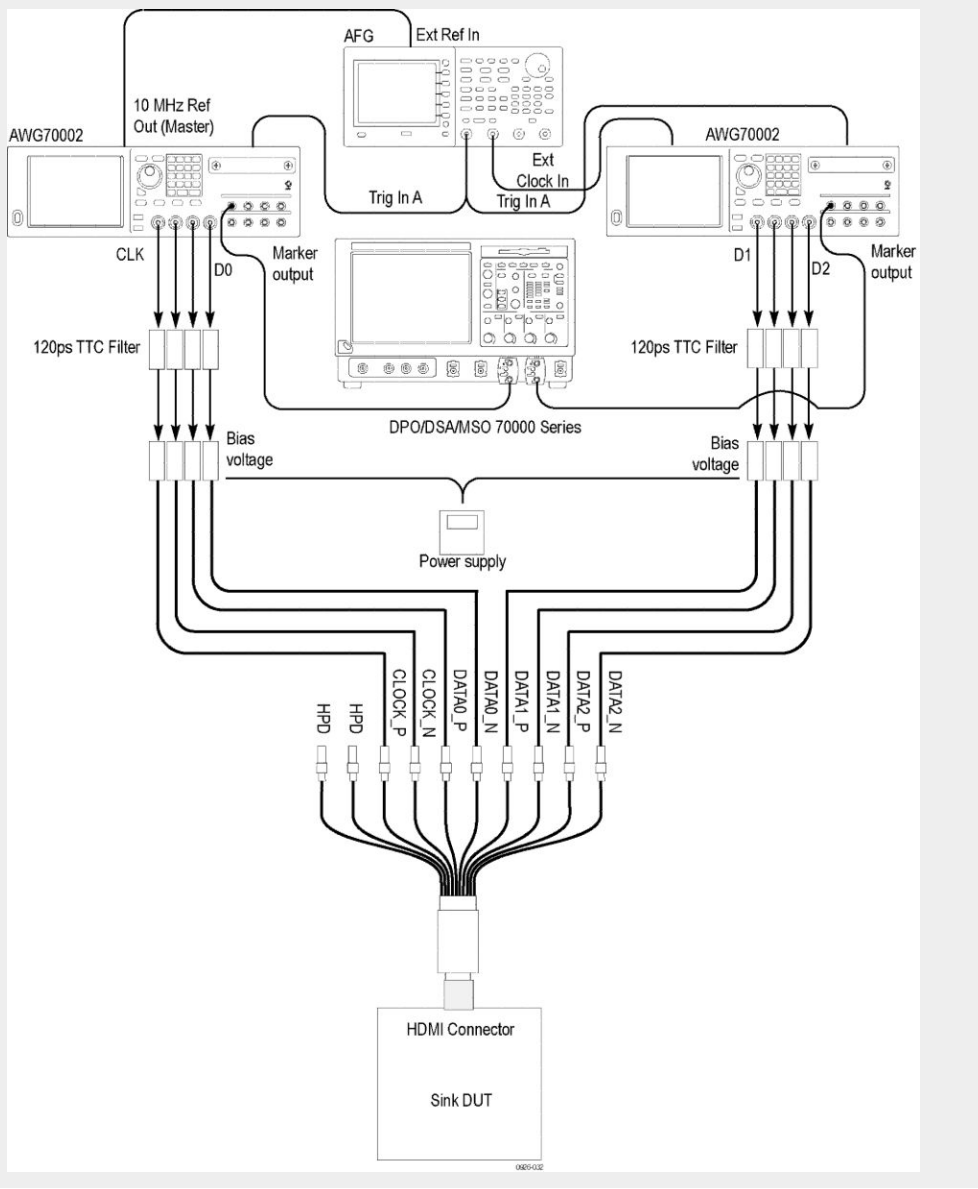
- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Eight SMA cables
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test Fixture: A set of ET-HDM-TPA-S or TF-HDMIE-TPA-KIT fixtures
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by Tektronix HDM Compliance Software (Option HT3-DS):

1. Connect the equipment as shown in the Sink Jitter tolerance diagram for AWG70002A.

   NOTE. *Rise time filters are not required for testing 297MHz patterns*



2. The Application generates the pattern with these settings.
   - Frequency: Highest frequency supported by the Sink DUT
   - Pattern: HDMI Gray Ramp data streams
   - VCIM is set to 3.1 V.
   - Single Ended Swing of each TMDS signal is set to 400 mV.
   - Below are the jitter frequencies inserted on the signal:

     D_JITTER=500 kHz (on TMDS_CLOCK), C_JITTER=10 MHz.

D_JITTER=1 MHz (on TMDS_CLOCK), C_JITTER=7 MHz.

NOTE. *All jitter amounts described below are relative to a recovered clock as measured with a Clock Recovery Unit). All four jitter frequencies define sinusoidal jitter). [Make TP2 worst condition]*

- Selected cable emulator is applied
- TP2 signal is generated and the jitter amplitude us adjusted as follows:

  C_JITTER to be 0.3*Tbit at TP2 after processing with the CRU and applying the Reference Cable Equalizer.

3. Connect the TMDS Signal Generator to the Sink DUT and follow the on screen instructions to complete the test.

Test ID 8-6 TMDS Intra-pair skew test

This HDMI Receiver test confirms that Sink DUT supports the maximum allowed timing skew within each TMDS pair.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, or two AWG7122C instruments with options 1, 2/6, 8, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Eight SMA cables
- Test fixture: A set of TF-HDM-TPA-S fixtures
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/Video display
- Eight 6400 MHz filters are needed

Measurement algorithm

The following procedure is fully automated by Tektronix HDM Compliance Software (Option HT3-DS):

1. Connect the equipment as shown in the Sink Intra-pair skew diagram for AWG70002A for single lane and Sink Intra-pair skew diagram for AWG70002A for all lanes.

NOTE. *Based on the Lane you are testing, do these connection changes*

- *Clock: Connect CLOCK_N from Slave AWG CH1-Marker 1 -ve channel*
- *DO: Connect DATA0_N from Slave AWG CH1-Marker 2 -ve channel*
- *D1: Connect DATA1_N from Slave AWG CH2-Marker 1 -ve channel*
- *D2: Connect DATA2_N from Slave AWG CH2-Marker 2 -ve channel*

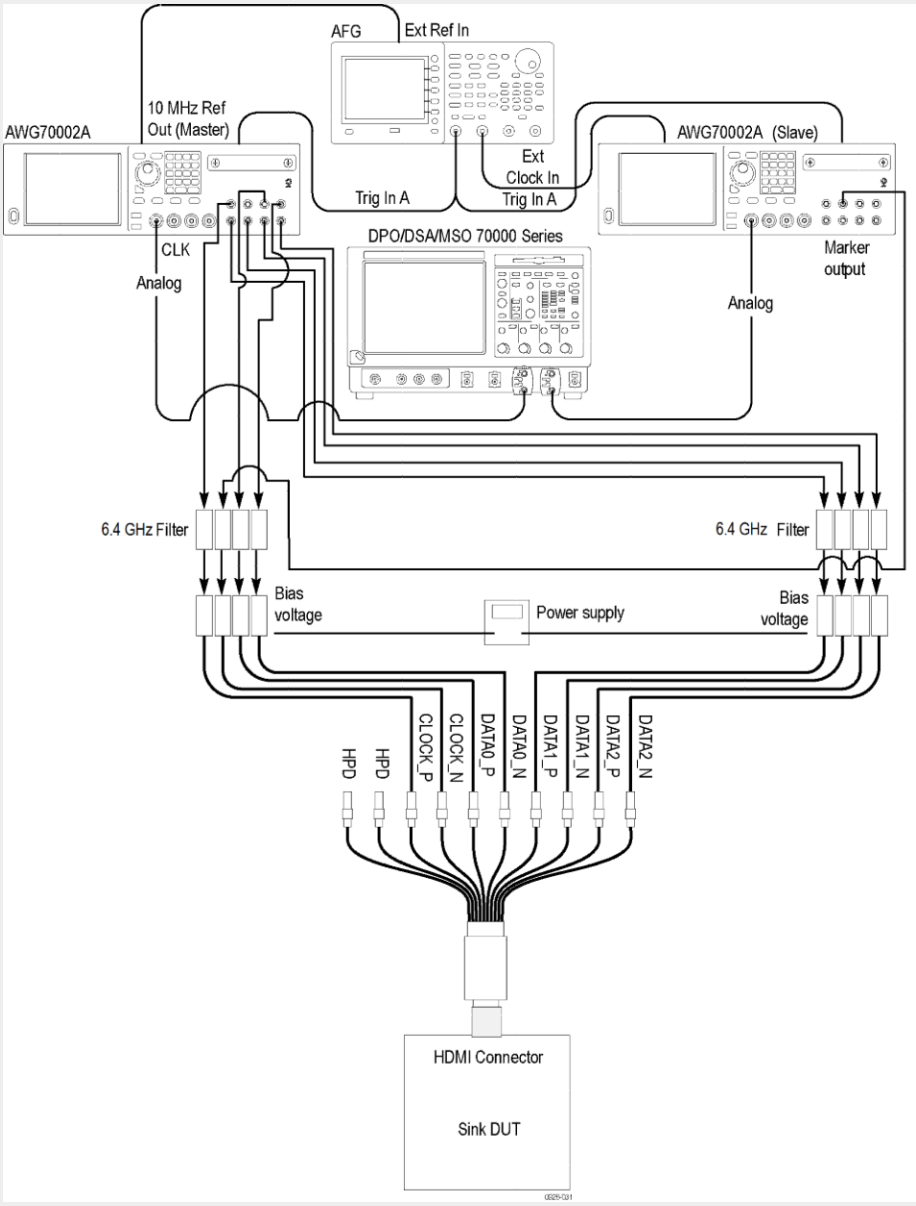


Figure 5: Sink Intra-pair skew diagram for AWG70002A for single lane

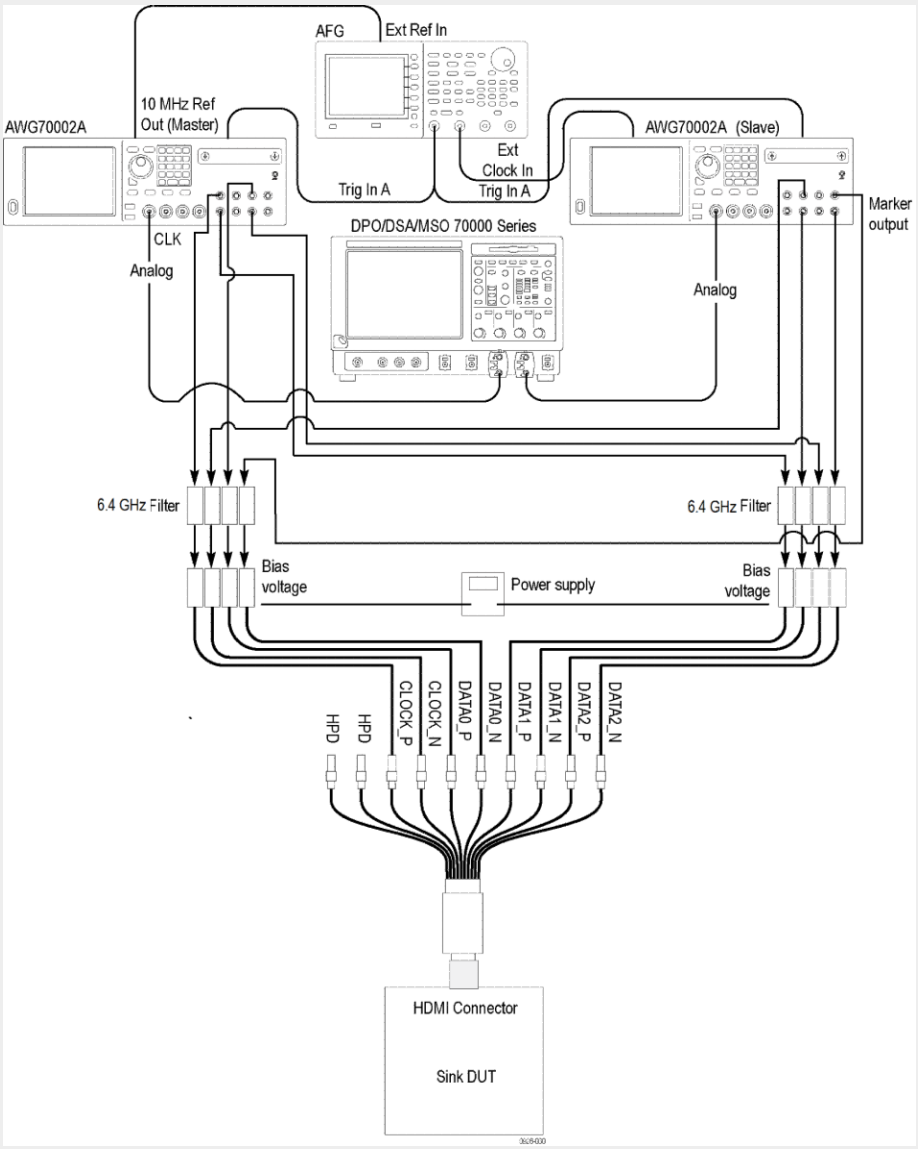


Figure 6: Sink Intra-pair skew diagram for AWG70002A for all lanes

2. Calibrate the HDM Signal Generator AWG7K/70K output for the following settings:
   - Frequency: High frequency supported by the Sink DUT
   - Pattern: HDMI Gray Ramp data streams
   - Set VICM to 3.05 V.
   - Set Single Ended Swing to 500 mV.
   - Rise/Fall time should be between 75pS and 110pS.
3. Do the following for each TMDS differential pair Clock and Data:

   Configure the Signal generator to add skew between + and -signal fo the tested pair.

Increase the skew by steps of less than or equal to 0.1*Tbit, until the Sink DUT outputs errors or until reaching 0.6*Tbit or 1nSec.

If the DUT errors

a. Reduce the skew one step, so that the DUT outputs no errors

b. If the TMDS clock frequency is <=222.75 MHz

- If the skew <0.4*Tbit, then FAIL

c. If TMDS clock frequency > 222.75 MHz

- If skew <112psec+0.15.*TBit, then FAIL

4. Repeat the test but add the skew in the opposite direction.
5. Repeat the test for untested pairs.

Test ID 8-5 TMDS Min-max differential swing tolerance

This HDMI Receiver test confirms that The sink DUT supports the maximum allowed clock jitter on TMDS signal.

Required Test Equipment

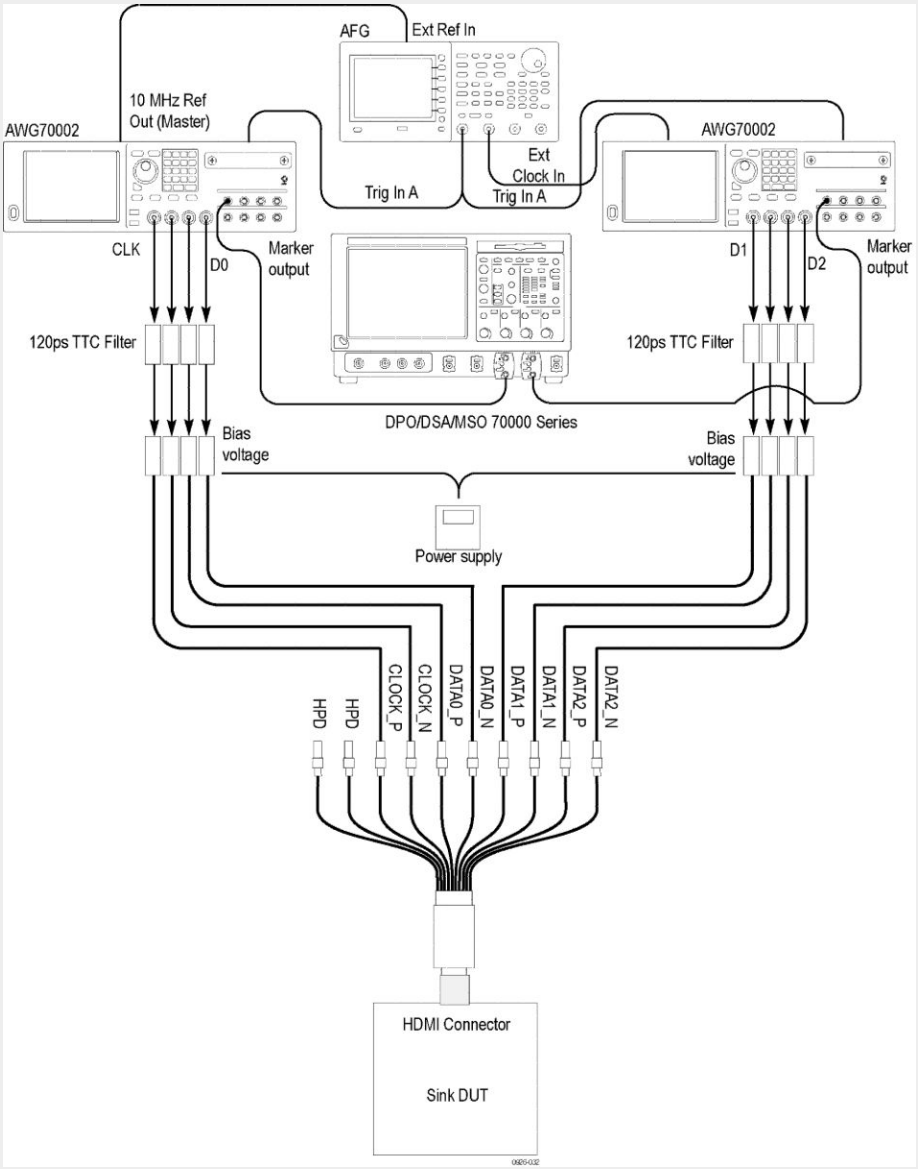
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

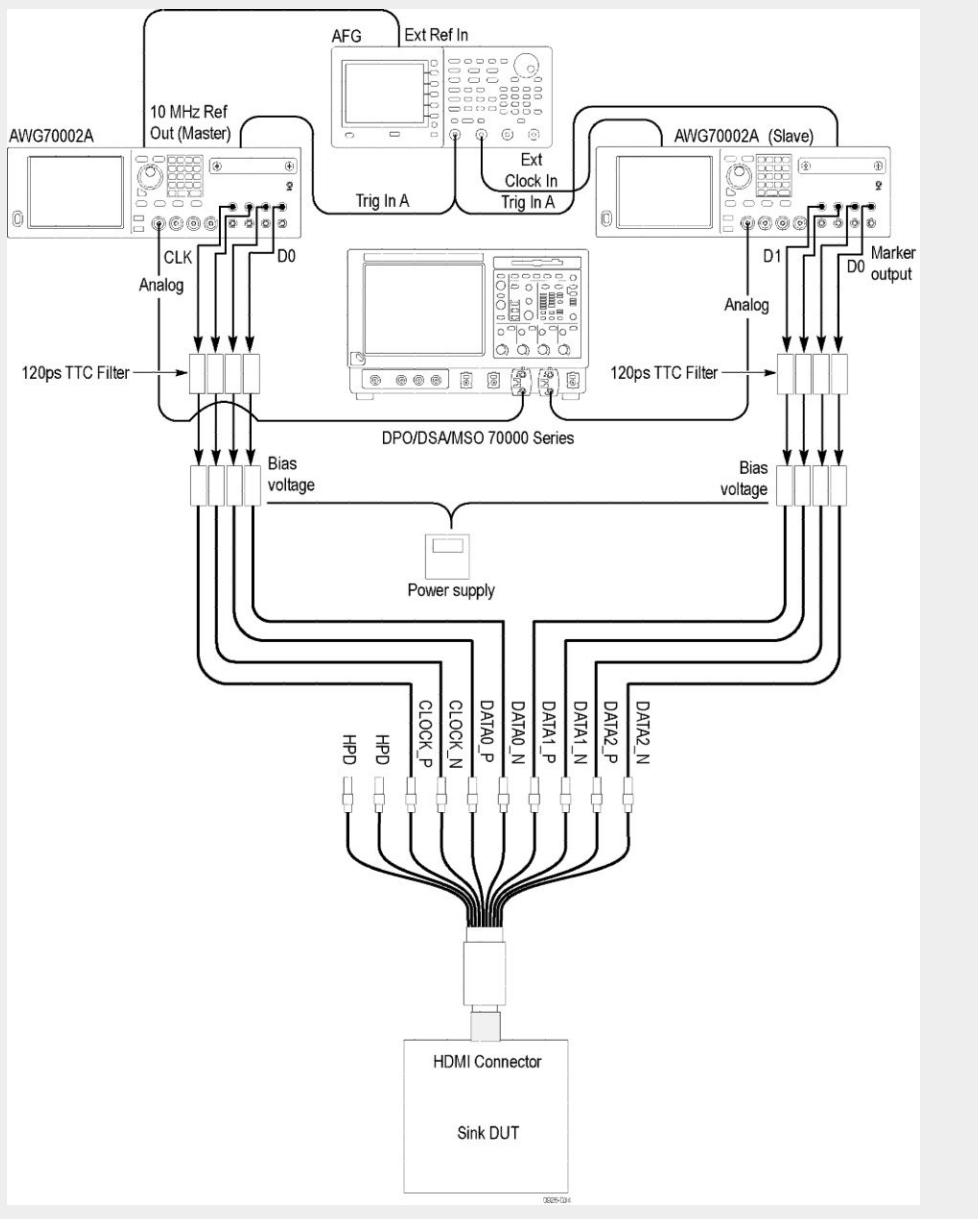
- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225 with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Eight SMA cables
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: A set of ET-HDM-TPA-S or TF-HDMIE-TPA-KIT fixtures
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/Video display

Measurement algorithm

The following procedure is fully automated by Tektronix HDM Compliance Software (Option HT3-DS):

1. Connect the equipment as shown in Sink min differential swing tolerance diagram for AWG70002A and Sink max differential swing tolerance diagram for AWG70002A .


AFG
Ext Ref In
10 MHz Ref
Out (Master)
AWG70002
AWG70002
Ext
Clock In
Trig In A
Trig In A
CLK
D0
Marker
output
D1
D2
Marker
output
120ps TTC Filter
120ps TTC Filter
DPO/DSA/MSO 70000 Series
Bias
voltage
Bias
voltage
Power supply
HPD
HPD
CLOCK_P
CLOCK_N
DATA0_P
DATA0_N
DATA1_P
DATA1_N
DATA2_P
DATA2_N
HDMI Connector
Sink DUT



2. Calibrate the HDM Signal Generator AWG70K output for these settings:
   - Frequency: Highest frequency supported by the Sink DUT
   - Pattern: HDMI Gray Ramp data streams
   - Set the common mode voltage (VICM) as the following:
     - 2.9V- if the Sink supports TMDS clock rates > 165MHz
     - 3.0V -if the Sink supports only TMDS clock rates <= 165MHz
   - Set the differential swing voltage to 170 mV. Search the min supported differential swing. If this value is greater than or equal to 150mV then FAIL, 'Min diff swing unsupported at Vicm1 range'

- Set the swing to 170mV and set the Vicm to 3.3V. Search the min supported differential swing. If this value is greater than or equal to 150mV then FAIL, 'Min diff swing unsupported at Vicm2 range'
- Change the differential swing to 1.2V (Vicm =3.3V) and if the DUT does not support this voltage then FAIL, 'Max diff swing unsupported at Vicm2 range'

HDM - Sink Protocol tests for CTS 2.0

HF2-6 Sink video timing - 6G - 2160p 24 bit color depth

This test confirms that the Sink DUT supports 24-bit color depth 2160p video format for TMDS Character rate above 340 Mcsc up to 600 Mcsc.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

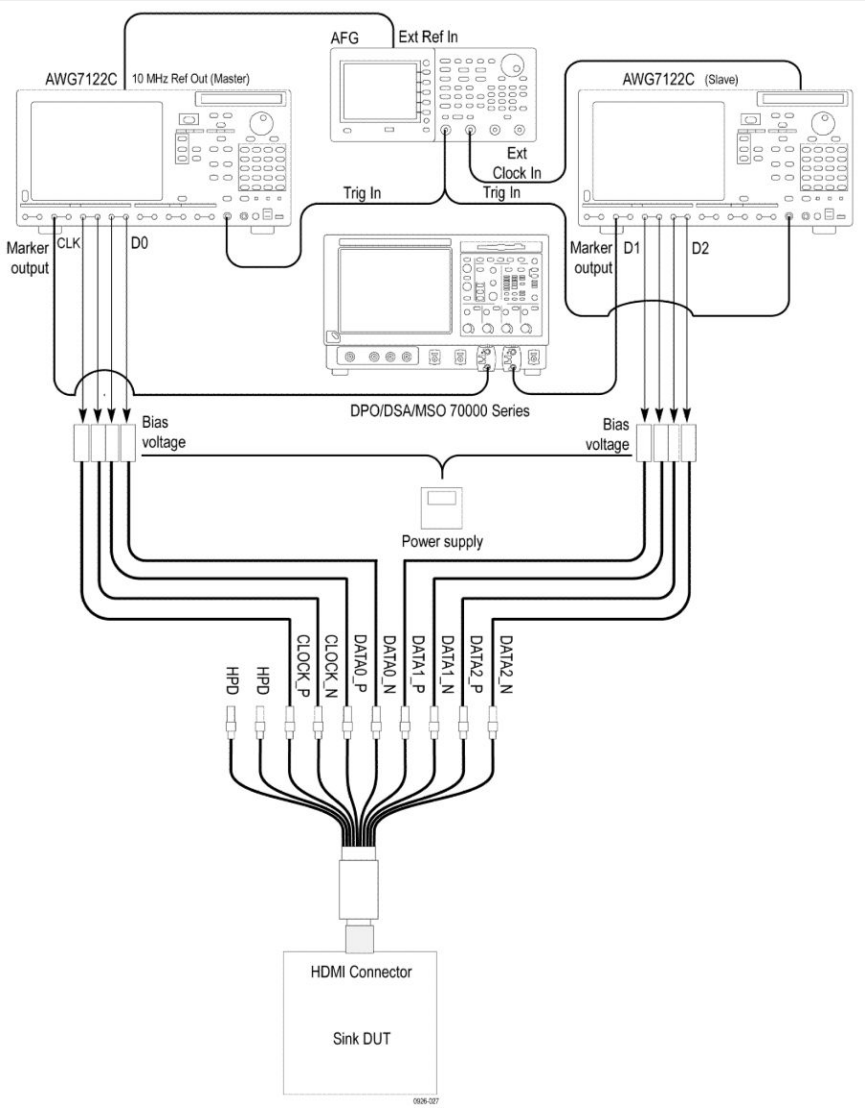
- HDMI Signal generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8, and Option SDX with Direct Synthesis capability to simulate Cable emulator effect and Rise time filter effect.
- Rise time Filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test Fixture: One set of TF-HDM-TPA-S fixture
- DC Power Supply: Tektronix Power Supply or any other
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- Audio/Video Display

Measurement algorithm

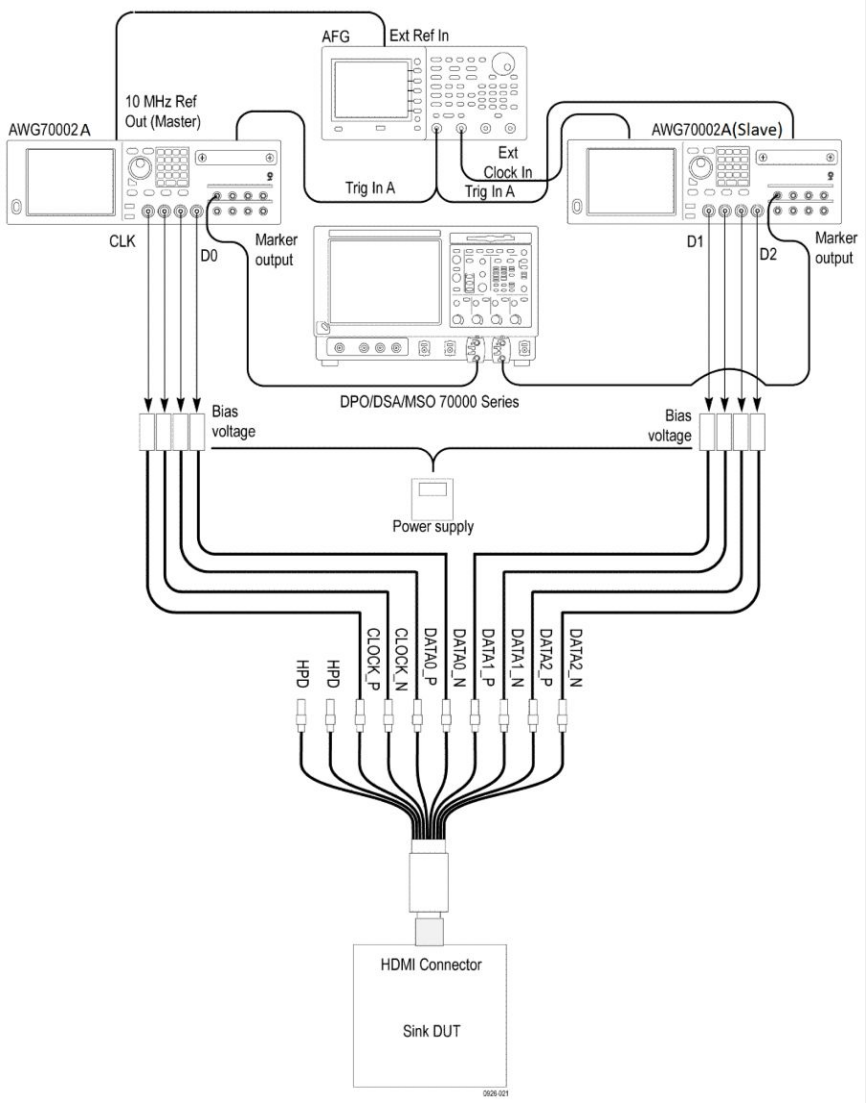
The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



2. Select the required video formats supported by the sink.
3. Perform the following test for each of the video formats listed in the EDID:
   a. In the case of 60 Hz formats, the TMDS Clock frequency minimum and maximum values are +0.5%/-0.6% of 148.5 MHz.
   b. In the case of 50Hz formats, the TMDS Clock frequency minimum and maximum values are +0.5%/-0.5% of 148.5 MHz.

   Check that the TMDS clock frequency accuracy is +/- 0.5%.
4. Output each one of the video format timing listed in step 3, at a minimum allowable TMDS clock frequency and maximum allowable TDMS clock frequency. Perform steps 3 through 6 for each frequency.

5. If you use an auxiliary power supply, set the DC voltage in the pop-up field. If you use a Tektronix power supply, automatically the Vicml would be set to 2.6 V.
6. Recall the pattern on the AWG, synchronize the master and the slave AWGS. Verify the Display is working, if not the result is FAIL.
   a. If the Sink DUT does not adequately support this video format, then FAIL.
   b. If this step fails for any video format listed in step 2, then FAIL.

HF2-7 Sink video timing - 6G - 2160p deep color

This test confirms that the Sink DUT supports deep color 2160p video formats for TMDS Character rate 340 Mcsc upto 600 Mcsc.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

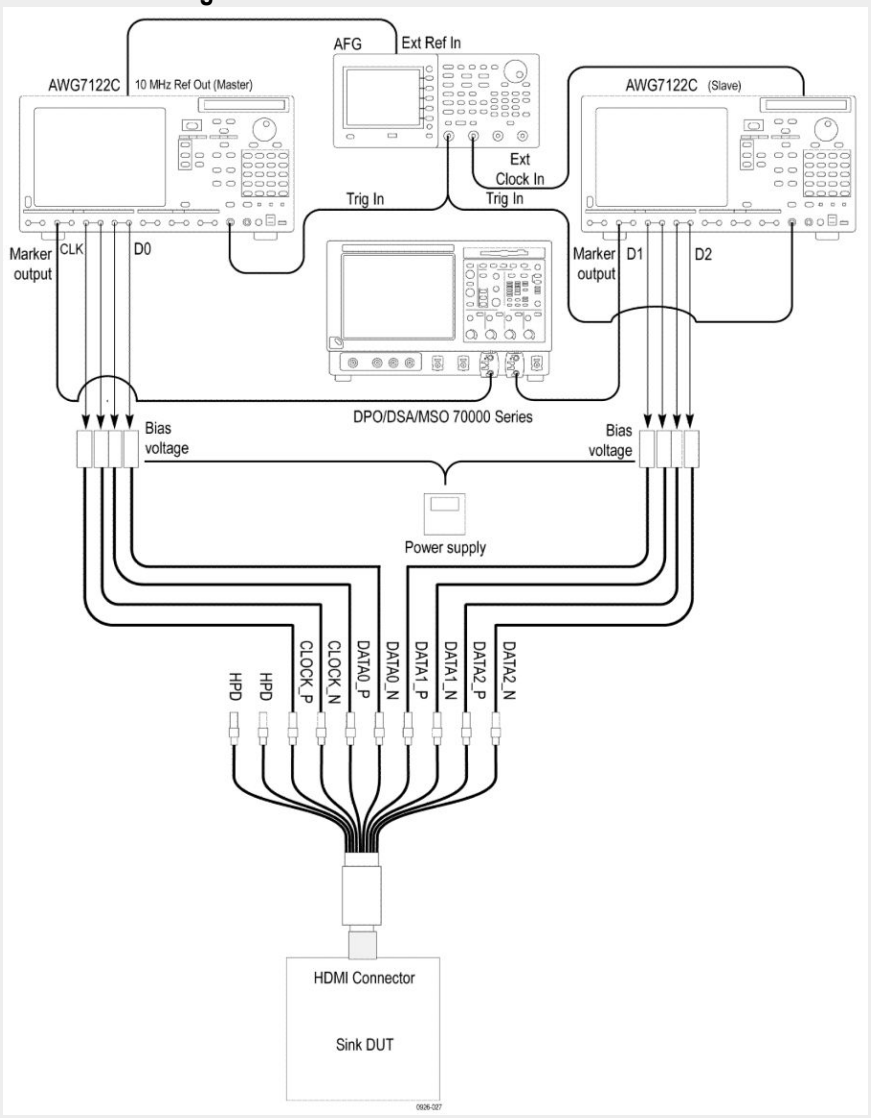
- HDMI Signal generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8
- AFG: AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test fixture: HDMI 2-0 compatible fixture
- Cables: One TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

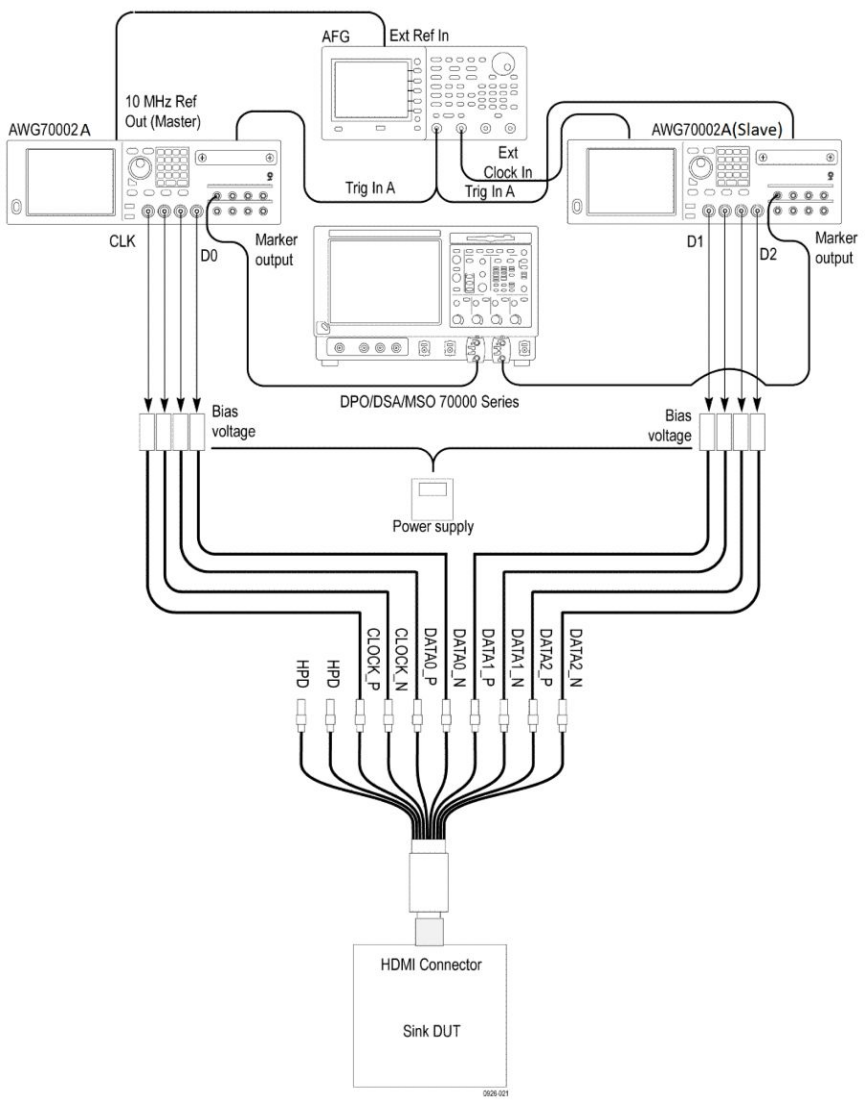
The following procedure is fully automated by Tektronix HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



2. Select the required video format and color depth.
3. Perform the following tests for each of the video formats in the EDID:
   a. In the case of 24/30 Hz formats, the TMDS clock frequency minimum and maximum values are +0.5%/-0.6% of 92.8125 MHz, 111.375 MHz or 148.5 MH.
   b. In the case of 25Hz formats, the TMDS clock frequency minimum and maximum values are +0.5%/-0.5% of 92.8125 MHz, 111.375 MHz or 148.5 MHz.

   Check that the TMDS clock frequency accuracy is +/- 0.5%.
4. Then if DC_36bit of H14b-VSDB is equal to 1 in the EDID:

If the value of Max_TMDS_Character_Rate of HF-VSDB in the EDID x 5 is greater than 445.5 then:

a. Configure the TMDS Signal generator to transmit that video format to the Sink DUT using 36-bit Pixel depth and RGB Pixel encoding at the minimum allowable TMDS clock frequency.

b. If the Sink DUT does not adequately support this video format, then FAIL.

c. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

d. If the Sink DUT does not adequately support this video format, then FAIL.

e. If DC_Y444 of H14b-VSDB is equal to 1 in the EDID, then configure the TMDS Signal generator to transmit that video format to the Sink DUT using 36-bit Pixel depth and YCBCR 4:4:4 Pixel encoding at the minimum allowable TMDS clock frequency.

f. If the Sink DUT does not adequately support this video format, then FAIL.

g. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

h. If the Sink DUT does not adequately support this video format, then FAIL.

5. Then if DC_30bit of H14b-VSDB is equal to 1 in the EDID:

If the value of Max_TMDS_Character_Rate of HF-VSDB in the EDID x 5 is greater than 371.25 then:

a. Configure the TMDS Signal generator to transmit that video format to the Sink DUT using 30-bit Pixel depth and RGB Pixel encoding at the minimum allowable TMDS clock frequency.

b. If the Sink DUT does not adequately support this video format, then FAIL.

c. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

d. If the Sink DUT does not adequately support this video format, then FAIL.

e. If DC_Y444 of H14b-VSDB is equal to 1 in the EDID, then configure the TMDS Signal generator to transmit that video format to the Sink DUT using 30-bit Pixel depth and YCBCR 4:4:4 Pixel encoding at the minimum allowable TMDS clock frequency.

f. If the Sink DUT does not adequately support this video format, then FAIL.

g. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

h. If the Sink DUT does not adequately support this video format, then FAIL.

6. Then if DC_48bit of H14b-VSDB is equal to 1 in the EDID:

If the value of Max_TMDS_Character_Rate of HF-VSDB in the EDID x 5 is greater than 594 then:

a. Configure the TMDS Signal generator to transmit that video format to the Sink DUT using 48-bit Pixel depth and RGB Pixel encoding at the minimum allowable TMDS clock frequency.

b. If the Sink DUT does not adequately support this video format, then FAIL.

c. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

d. If the Sink DUT does not adequately support this video format, then FAIL.

e. If DC_Y444 of H14b-VSDB is equal to 1 in the EDID, then configure the TMDS Signal generator to transmit that video format to the Sink DUT using 48-bit Pixel depth and YCBCR 4:4:4 Pixel encoding at the minimum allowable TMDS clock frequency.

f. If the Sink DUT does not adequately support this video format, then FAIL.

g. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

h. If the Sink DUT does not adequately support this video format, then FAIL.

HF2-8 Sink video timing - 6G - 2160p 3D

This test confirms that the Sink DUT supports 2160p 3D 2160p video formats for TMDS Character rate above 340 Mcsc up to 600 Mcsc.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

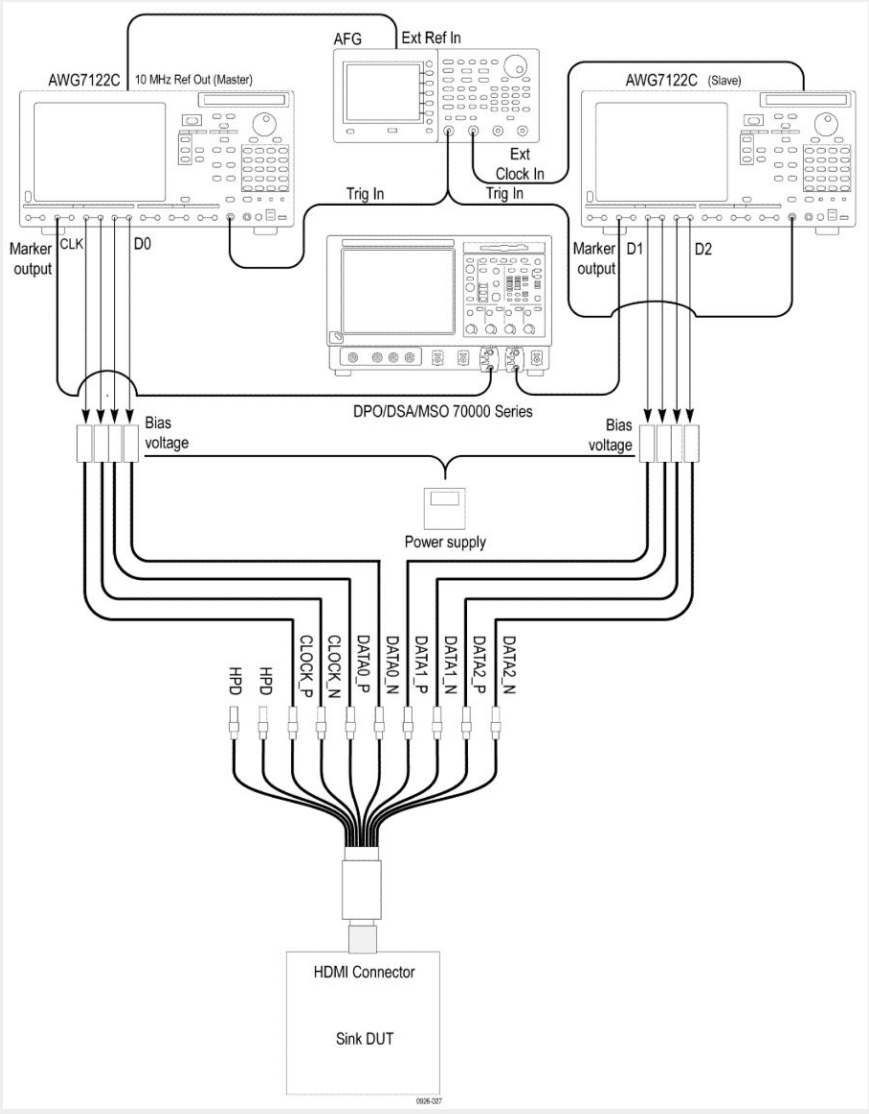
- HDMI Signal generator: AWG70002A instrument with options 01, 03 and 225 (quantity 2) OR AWG7122C instrument with options 1, 2/6, 8 (quantity 2)
- AFG: AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time Filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test Fixture: HDMI 2-0 compatible Fixture
- Cables: One TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

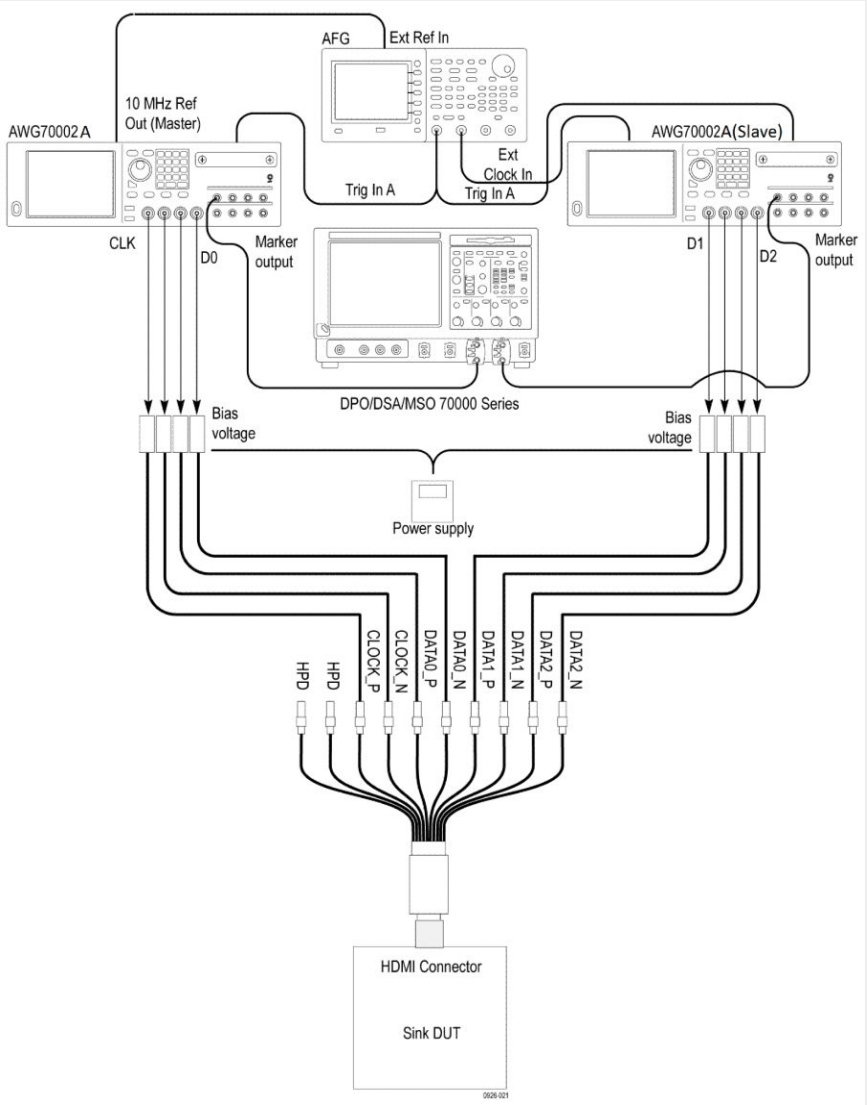
The following procedure is fully automated by Tektronix HDM Compliance Software (Option HDM-DS):

1. CDF field Sink_Above_340 is “N”, then Skip this test and go to the next test.
2. Connect the equipment as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



3. Perform the following test for each of the video formats listed in the EDID:
   a. In the case of 24/30/60Hz formats, the TMDS clock frequency minimum and maximum values are +0.5%/-0.6% of 148.5 MH.
   b. In the case of 25/50 Hz formats, the TMDS clock frequency minimum and maximum values are +0.5%/-0.5% of 148.5 MHz.

      Check that the TMDS clock frequency accuracy is +/- 0.5%.
4. Output each of the video format timing listed in step 3, to a minimum allowable TMDS clock frequency and maximum allowable TMDS clock frequency. Perform steps 3 through 6 for each frequency.
5. If you use an auxiliary power supply, set the DC voltage in the pop-up field. If you use a Tektronix power supply, automatcally the Vicml would be set to 2.6 V.
6. Recall the pattern on the AWG, then synchronize the master and slave AWGS. Verify the Display is working, if not the result is FAIL.

7. If the Sink DUT does not adequately support this video format, then FAIL.
8. If this step fails for any video format listed in step 2, then FAIL.

HF2-23- Sink pixel decoding YCBCR 4:2:0

This test confirms that the Sink DUT supports YCBCR 4:2:0 Pixel decoding and signaling.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

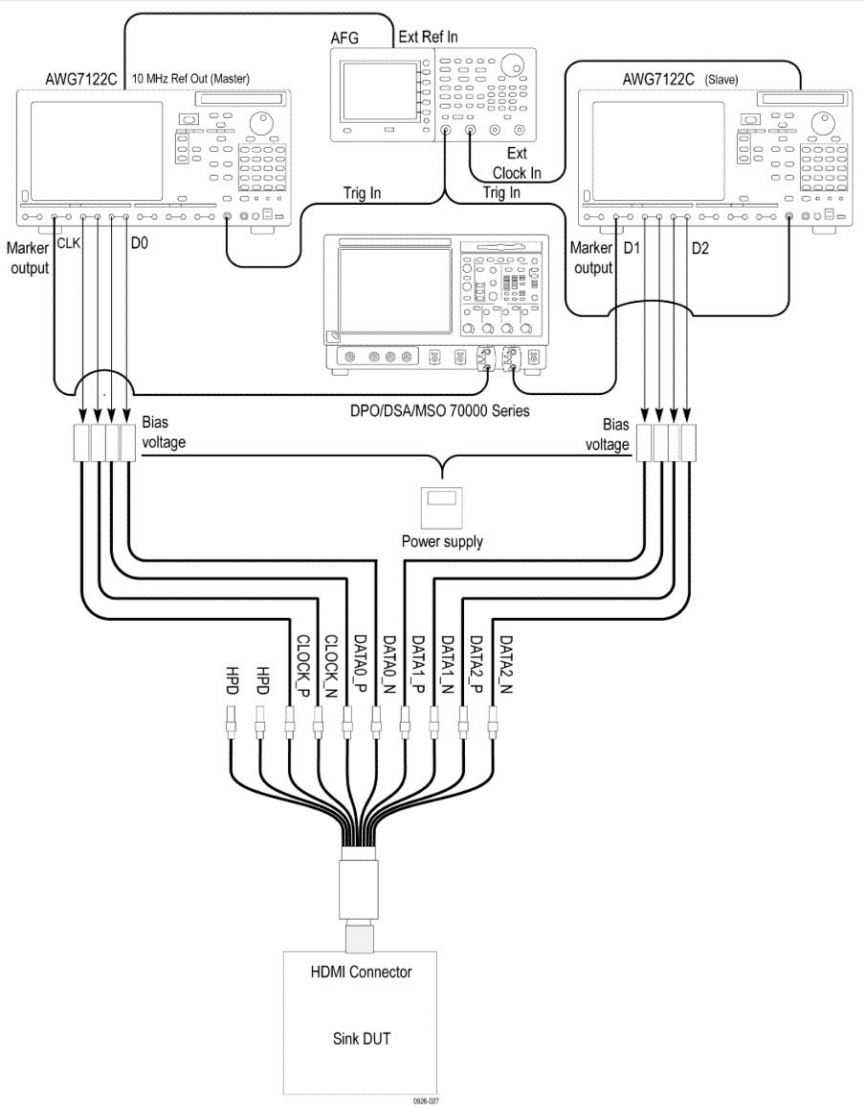
- HDMI Signal generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8
- AFG: One AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test fixture: HDMI 2-0 compatible fixture
- Cables: one TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: 1– PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

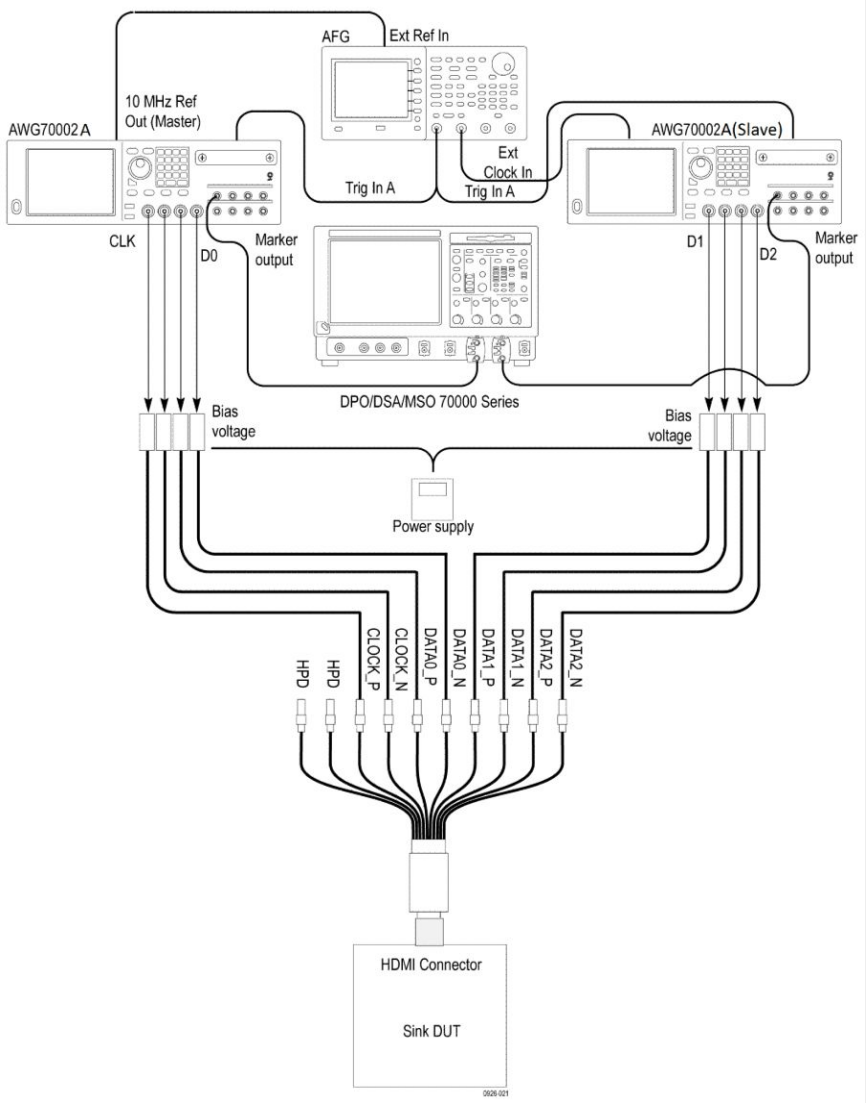
The following procedure is fully automated by TekExpress HDM Software:

1. If the CDF field Sink_HDMI_YCBCR_420 is “N”, then Skip this test and go to the next test.
2. Connect the Sink DUT to any approved DDC master and EDID analyzer.
3. Turn on the Sink DUT, have the DDC Master output +5 V power and read the sink DUT’s EDID in response to a hotplug.
4. If hotplug detect signal is not received or EDID is unreadable, then FAIL.
5. Connect the Sink DUT to the 297 MHz video generator.
6. Make the connection as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

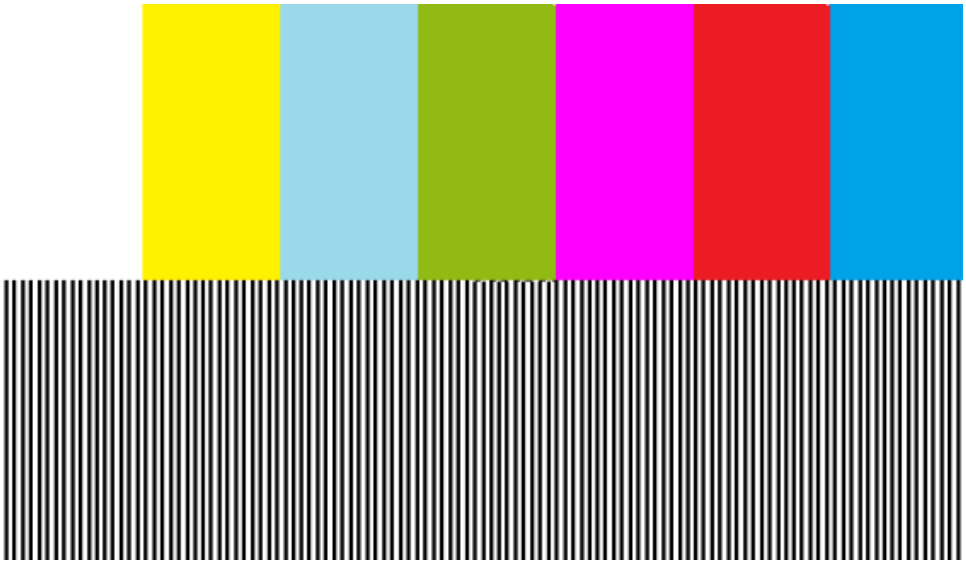
Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



7. Recall nominal pattern YCBCR 420 8 Bit Pattern with pixel clock frequency 297 MHz -0.5 % (or -0.6% when the frame rate is 60 Hz) with test image as shown in following Figure, AVI Infoframe with Y2, Y1, Y0 = 011 and appropriate VIC, synchronize AWG's.
8. If the Image /Video appear to be distorted or incorrect, then FAIL.
9. If color bars in the upper half of the active video are not in the order shown in the Figure, then FAIL.
10. If black and white bars in the lower half of the active video are not evenly spaced, then FAIL.
11. If black and white bars in the lower half of the active video contain a strong blue or red tint when examined at close range, then FAIL.
12. Change Pixel clock frequency to 297 MHz +0.5%, synchronize AWG's and repeat steps 5 through 8.
13. If steps 5 through 8 pass then the test results are Pass; for all other conditions it is Fail.



HF2-24 Sink pixel decoding YCBCR 4:2:0 deep color

This test confirms that a YCBCR 4:2:0 Pixel encoding-capable Sink DUT supports YCBCR 4:2:0 deep color pixel decoding and signaling.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

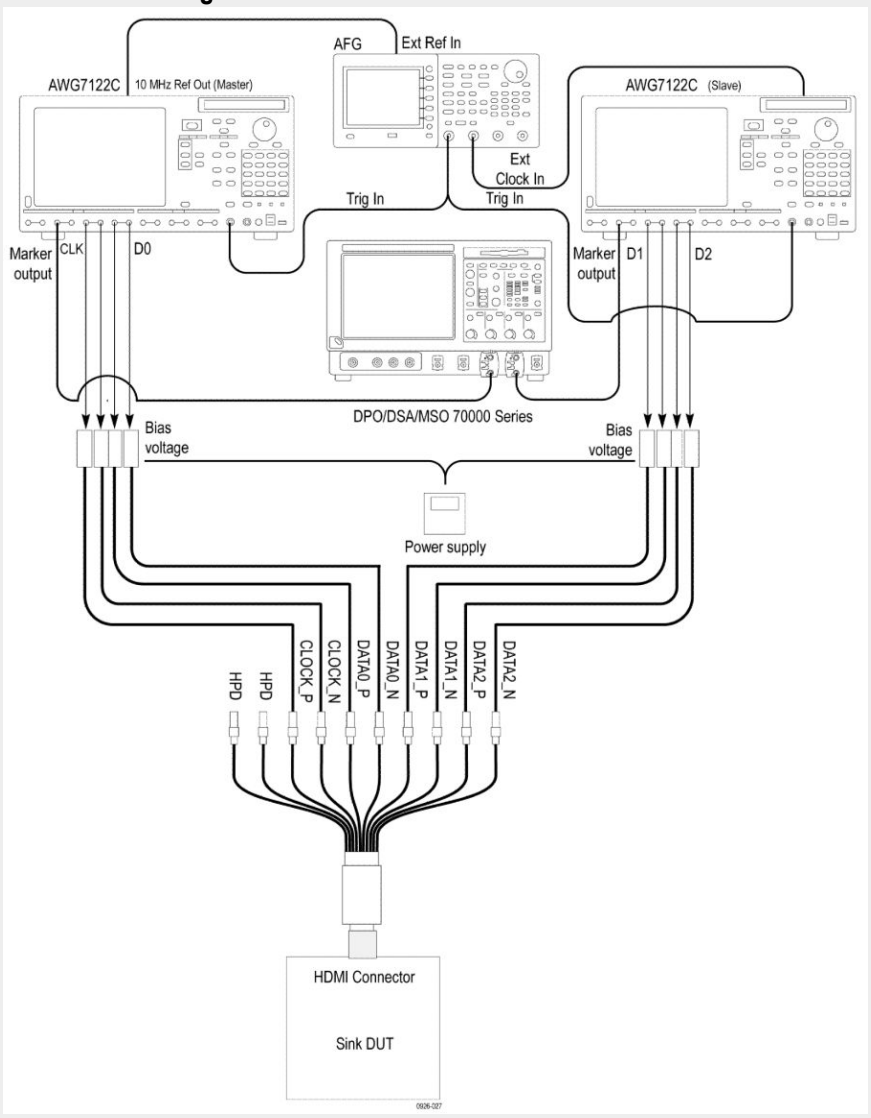
- HDMI Signal generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8
- AFG: One AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test fixture: HDMI 2-0 compatible fixture
- Cables: one TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: One PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

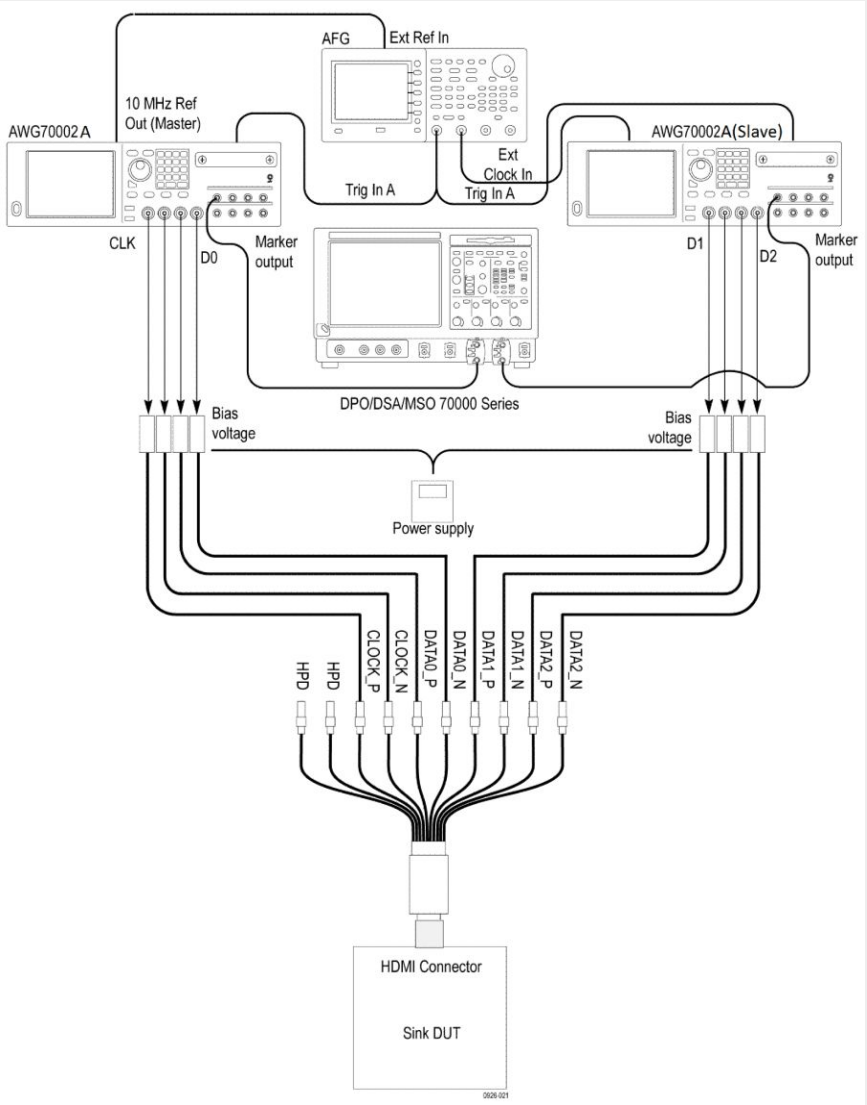
The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the connection diagram for Sink pixel decoding – YCBCR 4:2:0. Recall the Nominal signal for the selected data rate, synchronize the AWGS, and verify that the display is working fine; if not, it will give result as fail. For nominal operation the connection diagram should be same as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



2. Output a YCBCR 4:2:0 Pixel encoded signal with a specified Pixel clock frequency.
3. If you use an auxiliary power supply, set the DC voltage in the pop-up field. If you use a Tektronix power supply, automatically the Vicml would be set to 2.6 V.
4. Recall the pattern on the AWG, then synchronize AWGS. Verify that the Display continues to work, if not the result is FAIL.
5. If the image/video appears to be distorted or incorrect, then FAIL.
6. If the color bars in the upper half of the active video are not in the order described in appendix A, then FAIL.
7. If the black and white bars in the lower half of the active video are not evenly spaced, then FAIL.

8. If the black and white bars in the lower half of the active video contain a strong blue or red tint when examined at close range, then FAIL.
9. If all of the steps 4 through 8 pass, then the test passes, for all other conditions, the test has failed.

HF2-25 Sink video timing - 21:9 (64:27)

This test confirms that a "21:9" (64:27)-capable Sink DUT, when it receives a supported "21:9" (64:27) video format, it correctly decodes and displays it.

Required test Equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

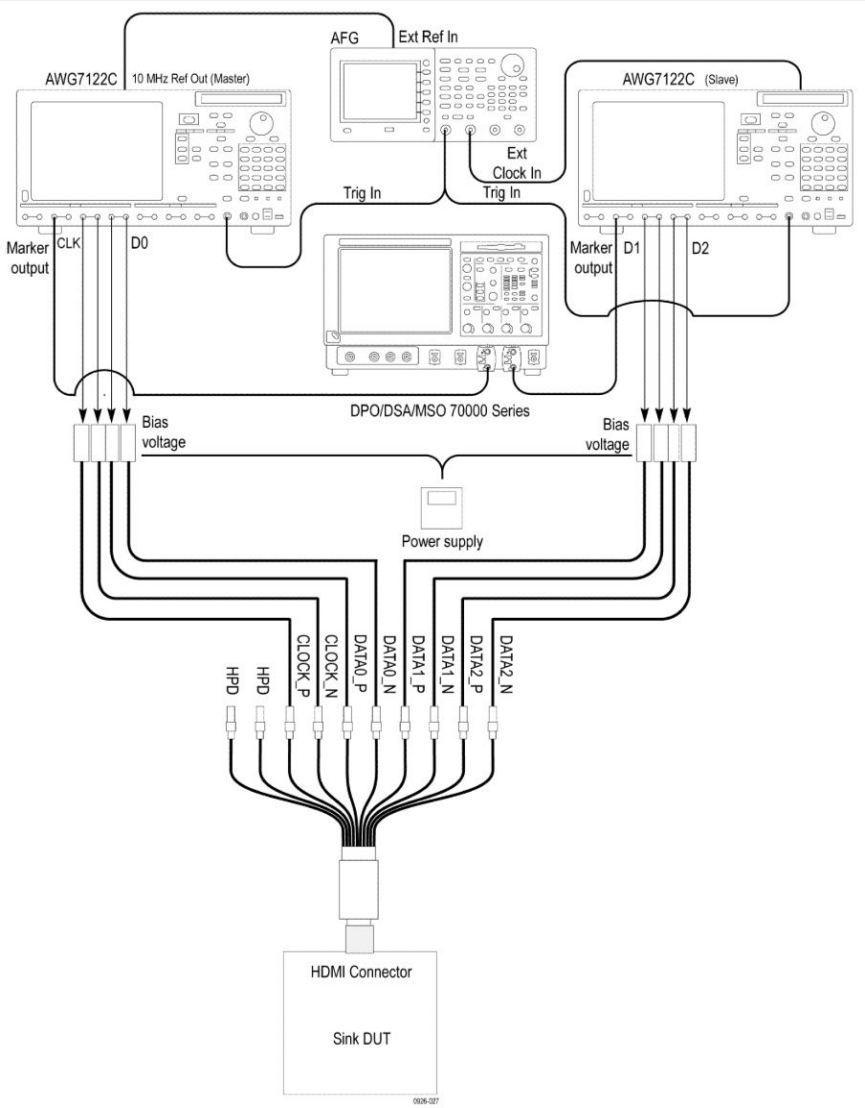
- HDMI Signal generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8
- AFG: 1 AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test fixture: HDMI 2-0 compatible fixture
- Cables: One TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: 1– PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits (ZX85-12G-S+)
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

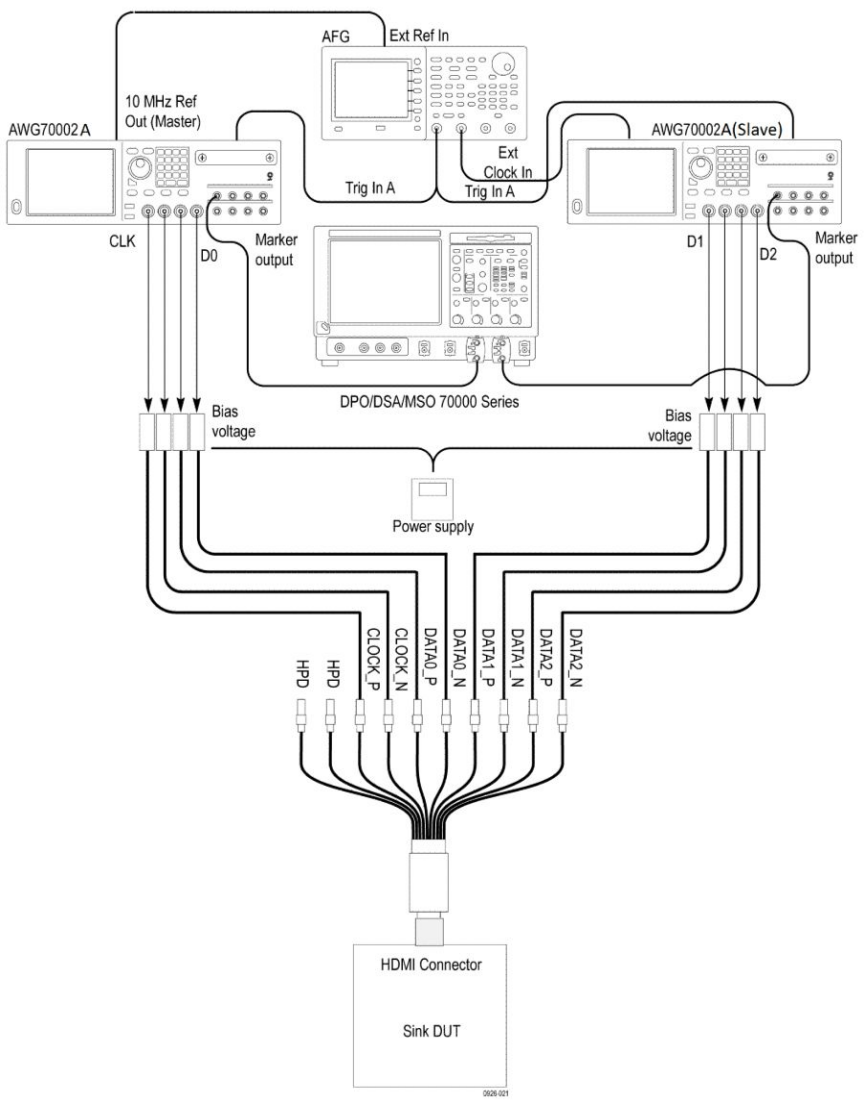
The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



2. If the CDF field SINK_Video_Formats_21by9 is all “N”, then Skip this test and go the next test.
3. Read the EDID of the Sink DUT.
4. For each of the VIC codes in the ranges 65..92 and 103..107, check the Short video descriptors and the CDF field.
   a. If support for this video format is listed in the EDID, but it is not declared in the CDF field, then FAIL.
   b. If support for this video format is not listed in the EDID, but it is declared in the CDF field, then FAIL.
5. If aux power is used, give the popup to set the DC voltage. If Tektronix power supply is used, then set the Vicm1 = 2.6 V, automatically.
6. Connect the Test signal generator to the Sink DUT.
7. For each of the VIC codes listed in CDF field SINK_Video_Formats_21by9, configure the Test signal generator to generate the video timing specified by

the VIC code. The Test signal generator should have a Pixel clock frequency accuracy of ±0.05% or better. Also configure the Test signal generator to output a test image that will allow the tester to observe if the Sink DUT displays the image properly (for example., No distortions such as spurious dots, jitter, wrong colors; correct aspect ratio and position).

a. If the Sink supports both VIC codes of a dual aspect ratio pair that share a common video timing (see the rows in CEA-861-F Table 1 that have two values in the "VIC" column), then test these VIC codes together by doing the following:

  a. If necessary, put the Sink is in an automatic mode using CDF field. Sink_AutoZoomStretch_procedure, where the user has not forced a certain zoom or stretch.

  b. Configure the Test signal generator to send the video timing associated with the dual aspect ratio pair.

  c. Configure the Test signal generator to output an AVI InfoFrame containing the first VIC of the dual aspect ratio pair along with a test image matching the aspect ratio of the VIC being sent in the AVI. This allows the correct aspect ratio to be determined.

  d. Observe the displayed aspect ratio #1. If the displayed picture is not geometrically correct, then FAIL.

  e. Reconfigure the Test signal generator to output an AVI InfoFrame containing the other VIC of the dual aspect ratio pair along with a test image matching the aspect ratio of the VIC being sent in the AVI. This allows the correct aspect ratio to be determined.

  f. Observe the displayed aspect ratio #2. If the displayed picture is not geometrically correct, then FAIL.

b. For each unique video timing, test both the minimum and maximum permitted Pixel clock frequencies as follows:

  a. For video formats with a 25 Hz frame rate (or multiples thereof), these values are the nominal rate -0.5% and the nominal rate +0.5%.

  b. For video formats with a 24 or 30 Hz frame rate (or multiples thereof), these values are the nominal rate -0.6% and the nominal rate +0.5%.

HF2-36 Sink video timing - 6G - non-2160p 24 bit color depth

This test confirms that the Sink DUT supports 24-bit color depth non-2160p video timings with a TMDS Character rate that is greater than 340 Mcsc indicated in the EDID.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

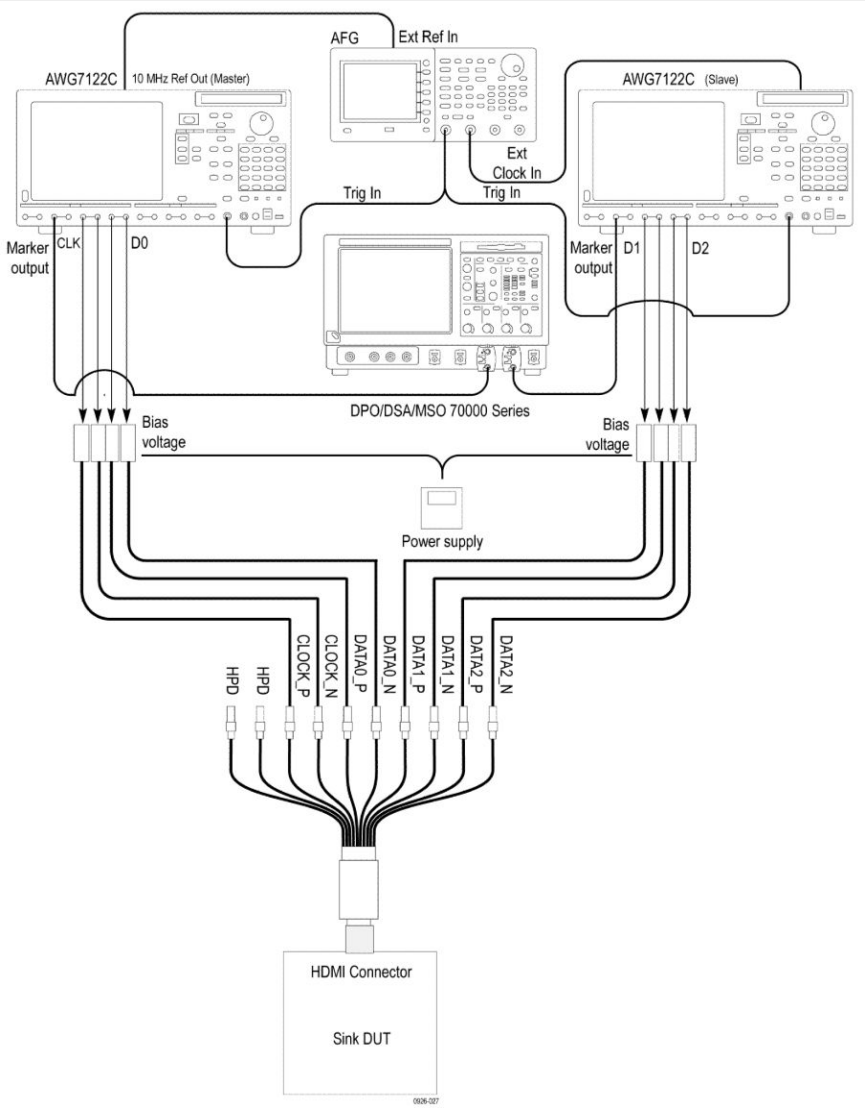
- HDMI Signal generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8
- AFG: One AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test fixture: HDMI 2-0 compatible fixture and
- Cables: One TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: One PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

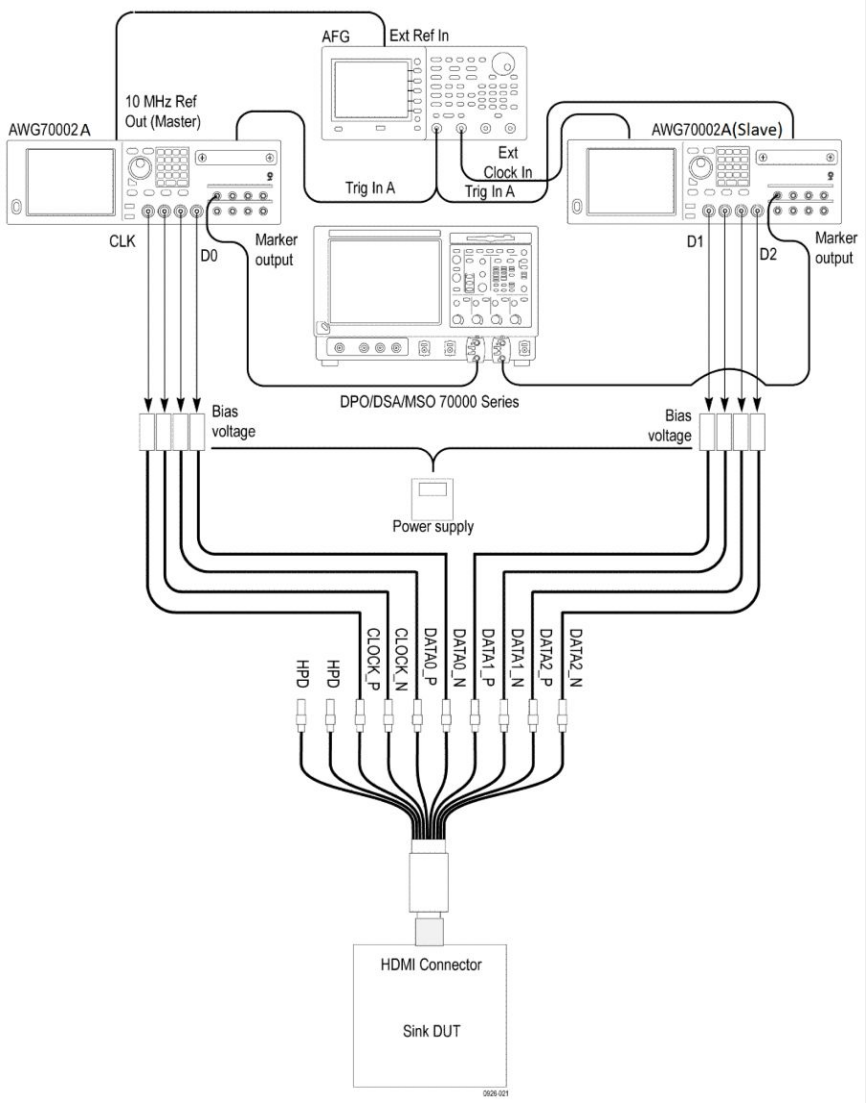
The following procedure is fully automated by TekExpress HDM Software:

1. If the CDF field Sink_Above_340 is “N”, then Skip this test and go to the next test.
2. Connect the equipment as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



3. Perform the following test for each of the video formats listed in the EDID:
   a. In the case of 24/30/60 Hz formats (or multiples thereof), the TDMS clock frequency the minimum and maximum values permitted are +0.5%/-0.6%.
   b. In the case of 25/50 Hz formats, the TDMS clock frequency minimum and maximum values permitted are +0.5%/-0.5%.

      Check that the TMDS clock frequency accuracy is +/- 0.5%.
4. Output each of the non -2160p 24 bit color depth signal with minimum allowable TMDS clock frequency and maximum allowable TMDS clock frequency. Perform the steps 3 through 6 for each frequency.
5. If you use an auxiliary power supply, set the DC voltage in the pop-up field. If you use a Tektronix power supply, automatically the Vicml would be set to 2.6 V.
6. Recall the pattern on the AWG, synchronize the master and the slave AWGS. Verify the Display is working, if not the result is FAIL.

7. If the Sink DUT does not adequately support this video format, then FAIL.
8. If this step fails for any video format listed in step 2 then FAIL.

HF2-37 Sink video timing - 6G - non-2160p deep color

This test confirms that the Sink DUT supports deep color non-2160p video formats for TMDS Character rate greater than 340 Mcsc indicated in the EDID.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

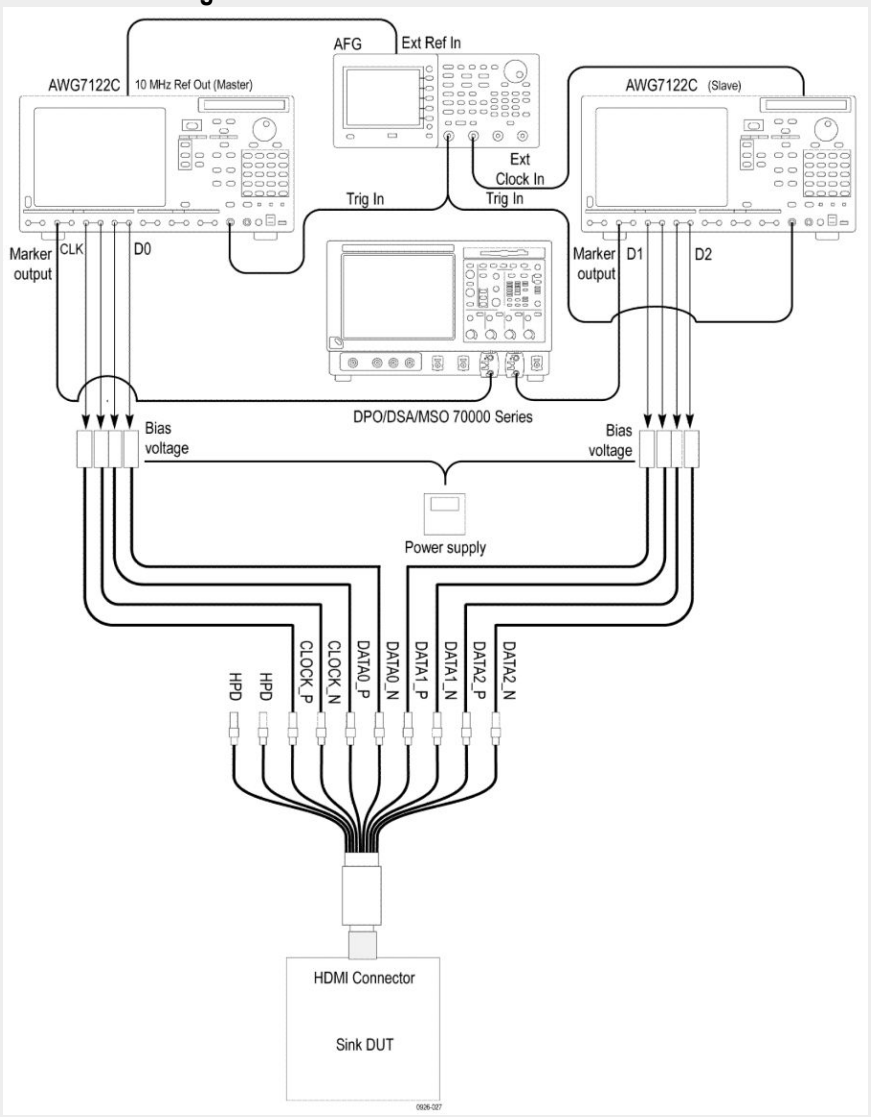
- HDMI Signal Generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8
- AFG: One AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time Filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test Fixture: HDMI 2-0 compatible fixture
- Cables: One TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: One PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

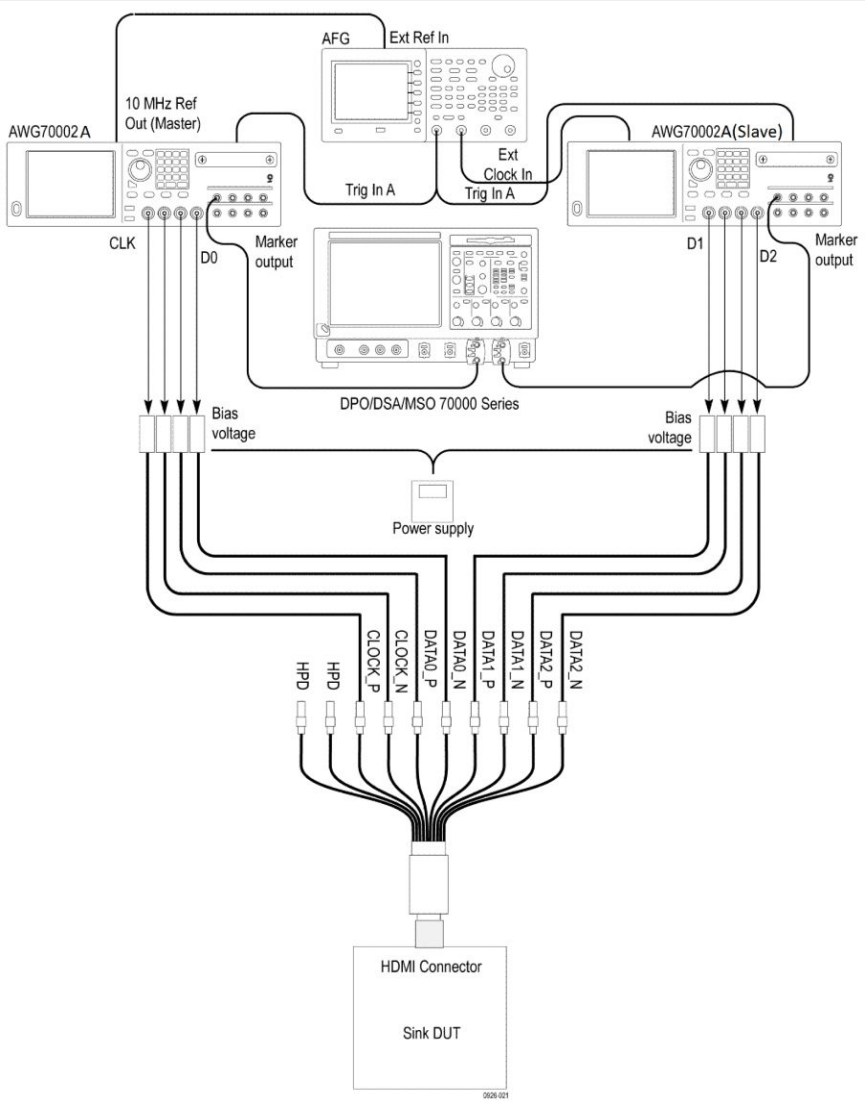
The following procedure is fully automated by TekExpress HDM Software:

1. If the CDF field Sink_Above_340 is “N”, then Skip this test and go to the next test.
2. Connect the equipment as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



3. Select the required color depths supported by the sink DUT.
4. Perform the following test for each of the video formats listed in the EDID:
   a. In the case of 24/30 Hz formats, the TMDS clock frequency minimum and maximum values are +0.5%/-0.6% of 92.8125 MHz, 111.375 MHz or 148.5 MHz.
   b. In the case of 25 Hz formats, the TMDS clock frequency minimum and maximum values are +0.5%/-0.5% of 92.8125 MHz, 111.375 MHz or 148.5 MHz.

      Check that the TMDS clock frequency accuracy is +/- 0.5%.
5. Then if DC_36bit of H14b-VSDB is equal to 1 in the EDID:

If the value of Max_TMDS_Character_Rate of the HF-VSDB in the EDID x 5 is greater than or equal to 1.5 times the TMDS Character rate corresponding to the video timing (when using 24 bit per Pixel) then:

a. Configure the TMDS Signal generator to transmit that video format to the Sink DUT using 36-bit Pixel depth and RGB Pixel encoding at the minimum allowable TMDS clock frequency.

b. If the Sink DUT does not adequately support this video format, then FAIL.

c. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

d. If the Sink DUT does not adequately support this video format, then FAIL.

e. **a.** a. If DC_Y444 of H14b-VSDB is equal to 1 in the EDID, then configure the TMDS Signal generator to transmit that video format to the Sink DUT using 36-bit Pixel depth and YCBCR 4:4:4 Pixel encoding at the minimum allowable TMDS clock frequency.

f. If the Sink DUT does not adequately support this video format, then FAIL.

g. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

h. If the Sink DUT does not adequately support this video format, then FAIL.

6. Then if DC_30bit of H14b-VSDB is equal to 1 in the EDID:

If the value of Max_TMDS_Character_Rate of the HF-VSDB in the EDID x 5 is greater than or equal to 1.25 times the TMDS Character rate corresponding to the video timing (when using 24 bit per Pixel) then:

a. Configure the TMDS Signal generator to transmit that video format to the Sink DUT using 30-bit Pixel depth and RGB Pixel encoding at the minimum allowable TMDS clock frequency.

b. If the Sink DUT does not adequately support this video format, then FAIL

c. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

d. If the Sink DUT does not adequately support this video Format, then FAIL.

e. If DC_Y444 of H14b-VSDB is equal to 1 in the EDID, then configure the TMDS Signal generator to transmit that video format to the Sink DUT using 30-bit Pixel depth and YCBCR 4:4:4 Pixel encoding at the minimum allowable TMDS clock frequency.

f. If the Sink DUT does not adequately support this video format, then FAIL.

g. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

h. If the Sink DUT does not adequately support this video format, then FAIL.

7. Then if DC_48bit of H14b-VSDB is equal to 1 in the EDID:

If the value of Max_TMDS_Character_Rate of HF-VSDB in the EDID x 5 is greater than or equal to 2 times the TMDS Character rate corresponding to the video timing (when using 24 bit per Pixel) then:

a. Configure the TMDS Signal generator to transmit that video format to the Sink DUT using 48-bit Pixel depth and RGB Pixel encoding at the minimum allowable TMDS clock frequency.

b. If the Sink DUT does not adequately support this video format, then FAIL.

c. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

d. If the Sink DUT does not adequately support this video format, then FAIL.

e. If DC_Y444 of H14b-VSDB is equal to 1 in the EDID, then configure the TMDS Signal generator to transmit that video format to the Sink DUT using 48-bit Pixel depth and YCBCR 4:4:4 Pixel encoding at the minimum allowable TMDS clock frequency.

f. If the Sink DUT does not adequately support this video format, then FAIL.

g. Configure the TMDS Signal generator to transmit the tested video format to the Sink DUT at the maximum allowable TMDS clock frequency.

h. If the Sink DUT does not adequately support this video format, then FAIL.

HF2-38 Sink video timing - 6G - non-2160p 3D

This test confirms that the Sink supports 3D and non-2160p video timings with a TMDS Character rate that is greater than 340 Mcsc.

Required test equipment

In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

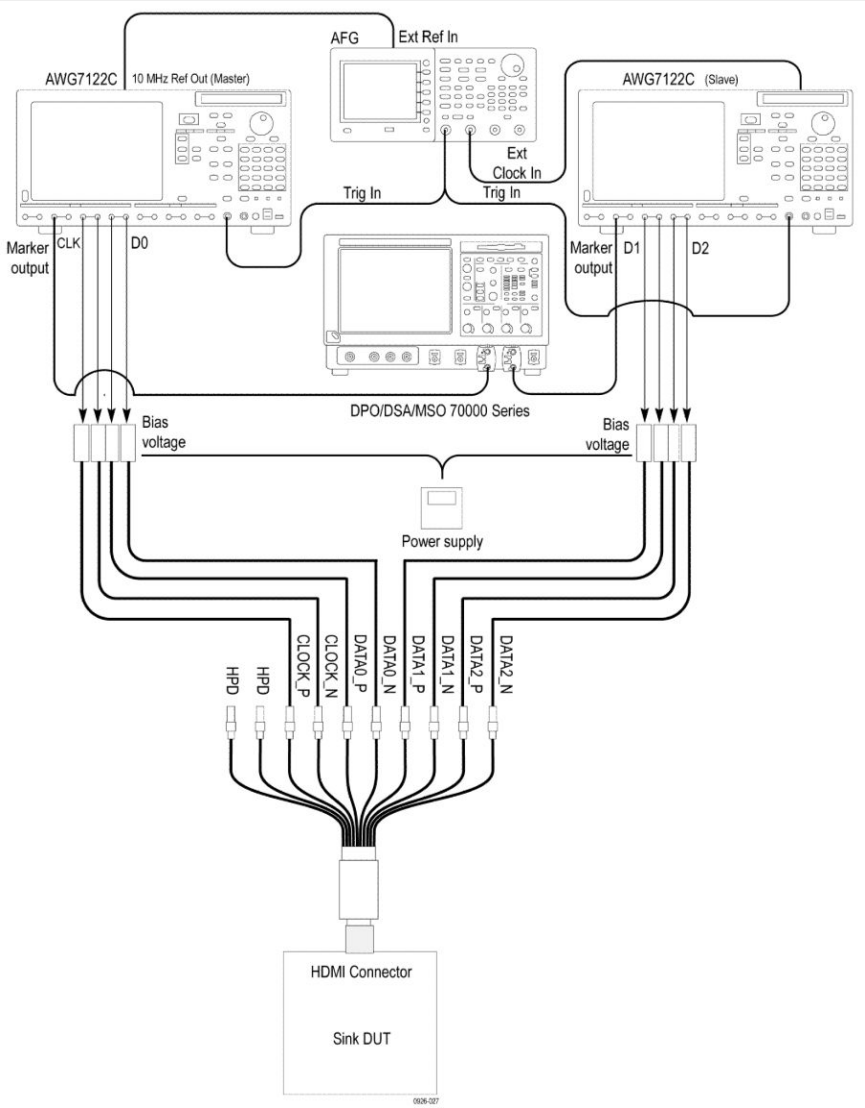
- HDMI Signal generator: Two AWG70002A instruments with options 01, 03 and 225 or two AWG7122C instruments with options 1, 2/6, 8
- AFG: 1 AFG3102/AFG3102C/AFG3252/AFG3252C
- Rise time filter: Two 120 ps TTC filter from Pico Second Pulse Labs (5915-100-1200)
- Test fixture: HDMI 2-0 compatible fixture
- Cables: One TF-HDM-TPA-S, one BNC T connector, three BNC cables
- External power supply: One PWS4721 / PWS4602 / PWS4323 / PWS4305 / PWS4205
- Bias Tees: Eight Bias Tees from Mini-Circuits – ZX85-12G-S+
- DDC Master: Any approved DDC Master
- EDID Analyzer: Any approved EDID analyzer

Measurement algorithm

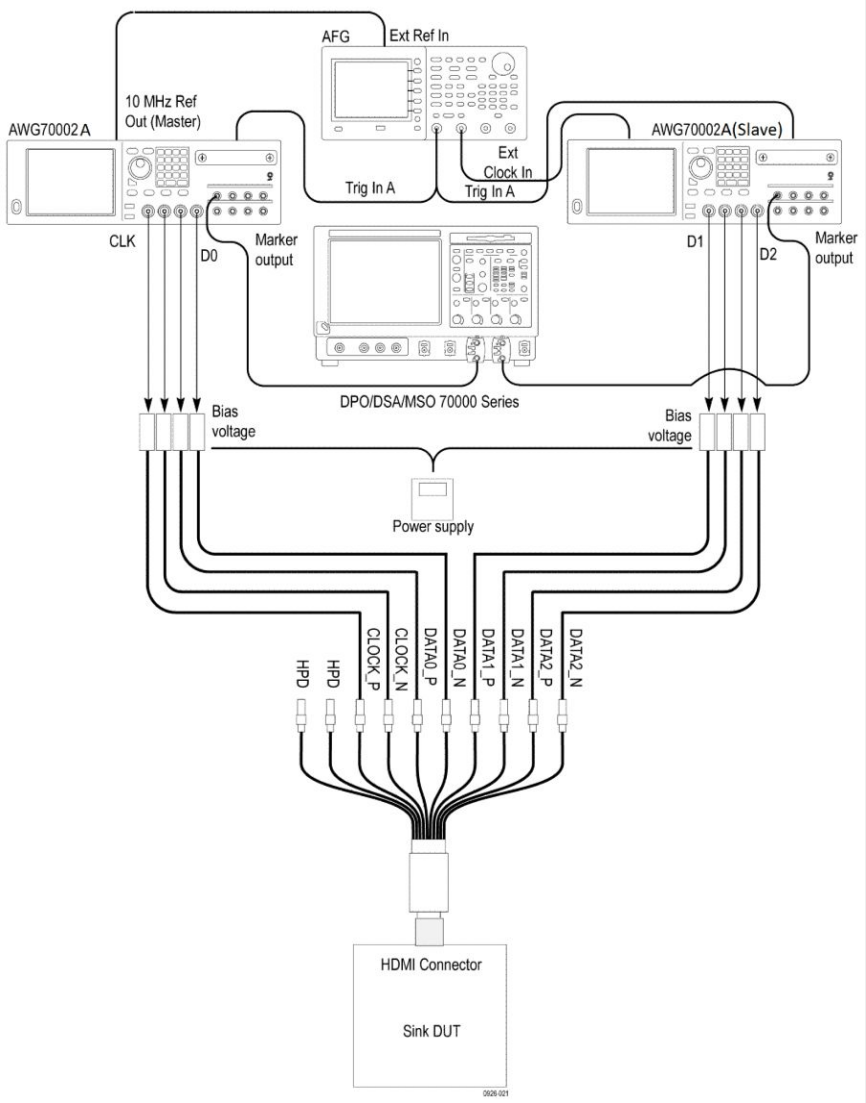
The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG7122C or Sink Protocol diagram for AWG70002A.

Sink Protocol diagram for AWG7122C



Sink Protocol diagram for AWG70002A



2. Perform the following test for each of the video formats listed in the EDID:
   a. In the case of 24/30/60 Hz formats (or multiples thereof), the TDMS clock frequency minimum and maximum values permitted are +0.5%/-0.6%.
   b. In the case of 25/50 Hz formats, the TDMS clock frequency minimum and maximum values permitted are +0.5%/-0.5%.

      Check that the TMDS clock frequency accuracy is +/- 0.5%.
3. Output non -2160p 3D signal with minimum allowable TMDS clock frequency and maximum allowable TMDS clock frequency and perform steps 4 through 6 for each frequency.
4. If you use an auxiliary power supply, set the DC voltage in the pop-up field. If you use a Tektronix power supply, automatically the Vicml would be set to 2.6 V.
5. Recall the pattern on the AWG, synchronize the master and slave AWGS. Verify the Display is working, if not the result is FAIL.

6. If the Sink DUT does not adequately support this video format, then FAIL.
7. If this step fails for any video format listed in step 2, then FAIL.

HDM - Sink Protocol tests for 1.4

Test ID 8-15 Character synchronization test

This test confirms that sink establishes synchronization with the data when it receives only minimum length control periods.

Required test equipment

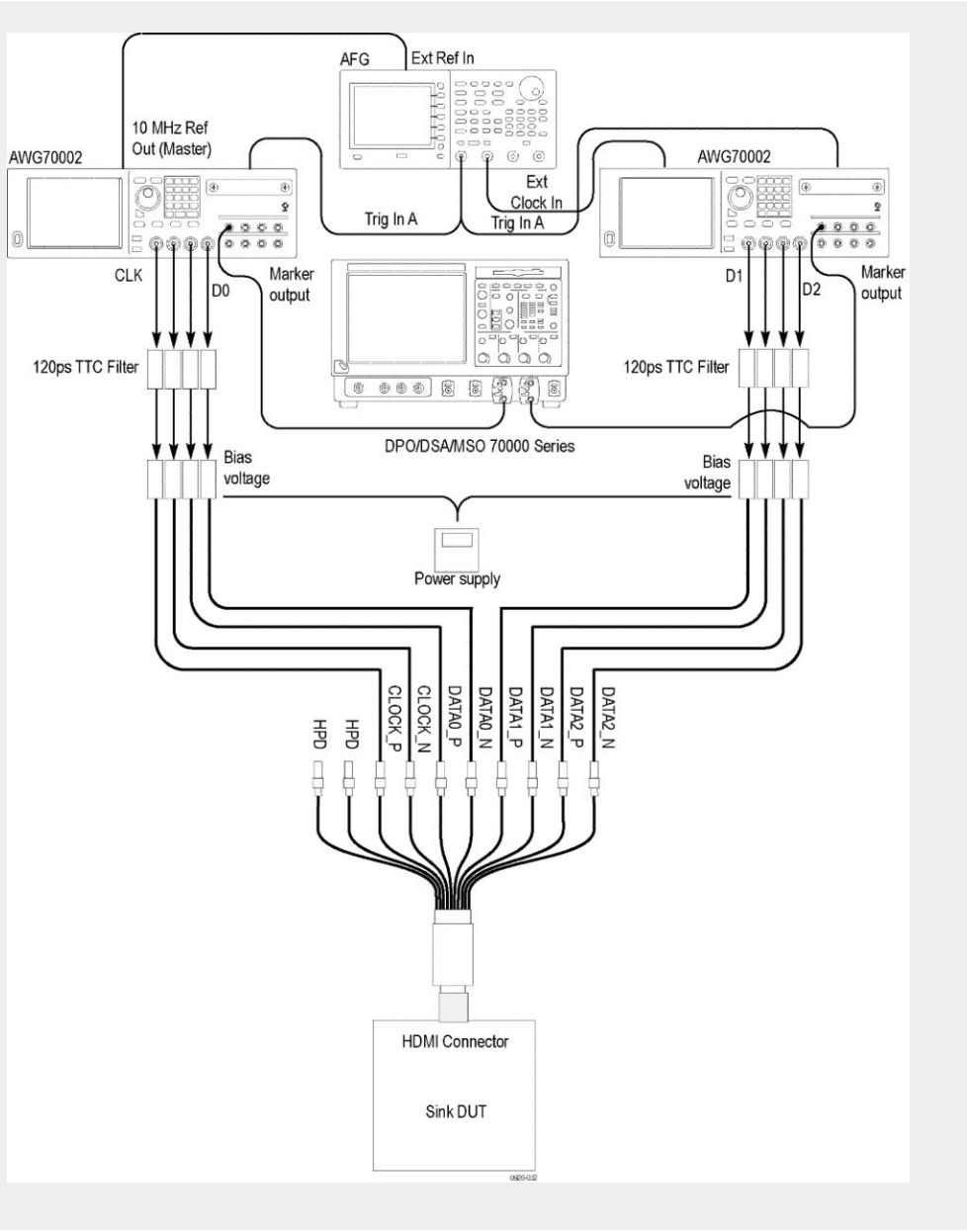
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Eight SMA cables
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: HDMI 1.4B Type A fixtures
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by TekExpress HDM software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Start the transmission of valid 640X480p video frame with every horizontal and vertical blanking interval completely filled with one or more Data island periods and all Control periods either 12 or 13 characters in length.
3. If the sink DUT does not support the transmitted signal then FAIL.

Test ID 8-16 Acceptance of all valid packet types test

This test confirms the reception of all valid packet types.

Required test equipment

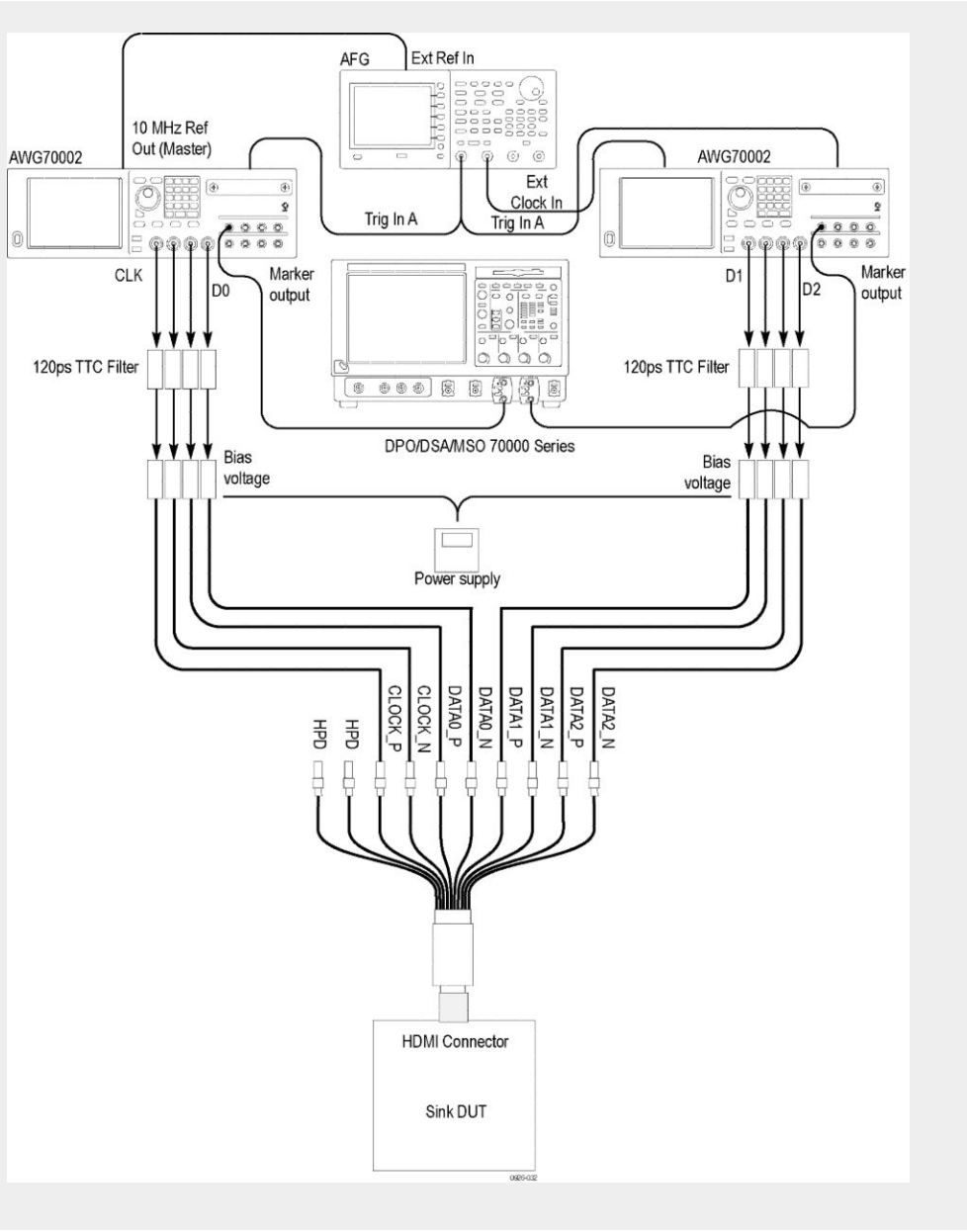
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test Fixture: HDMI 1.4B Type A fixtures
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by TekExpress HDM software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Start the transmission of valid 720X480p (if Sink_60Hz ="Y") or 720X576p (if Sink_60Hz="N", 2 channel 48 KHz audio_HDMI signal_with following characteristics.
   - Duringthe VBLANK, one or more Data Islands contain a valid
     - Null Packet (0x03)
     - General Control Packet (0x03)
       - with Set_AVMUTE and Clear_AVMUTE clear (0).
     - Vendor-specific InfoFrame Packet (0x81)
       - with a length of 3 and a 24-bit IEEE registration identifier belonging to the HDMI Licensing, LLC (0x000C03)
     - AVI InfoFrame Packet (0x82)

- Source Product Description Packet (0x83)
- Audio InfoFrame Packet (ox84)
- MPEG Source InfoFrame Packet (0x85)

- If the sink DUT does not adequately suport the signal then FAIL.
- If the CDF filed Sink_Supports_AI is Y:
  - Configure protocol generator to also transmit, during VBLANK, one or more Data Islands containing a valid
    - ACP Packet (0x04)
    - ISRC1 Packet (0x05)
    - ISRC2 Packet (0x06)
  - If the sink DUT does not adequately support the signal then FAIL
- If the CDF field Sink_xvYCC is Y:
  - Configure protocol generator to also transmit valid xvYCC-encoded video and, during VBLANK, one or more Data Islands containing a valid
    - Gamut Metadata Packet (0x0A) with P0 transmission profile

3. If the sink DUT does not support the transmitted signal then FAIL.

Test ID 8-19 Pixel encoding requirements test

This test confirms that Sink supports YC_BC_R pixel encoding when required.

Required test equipment

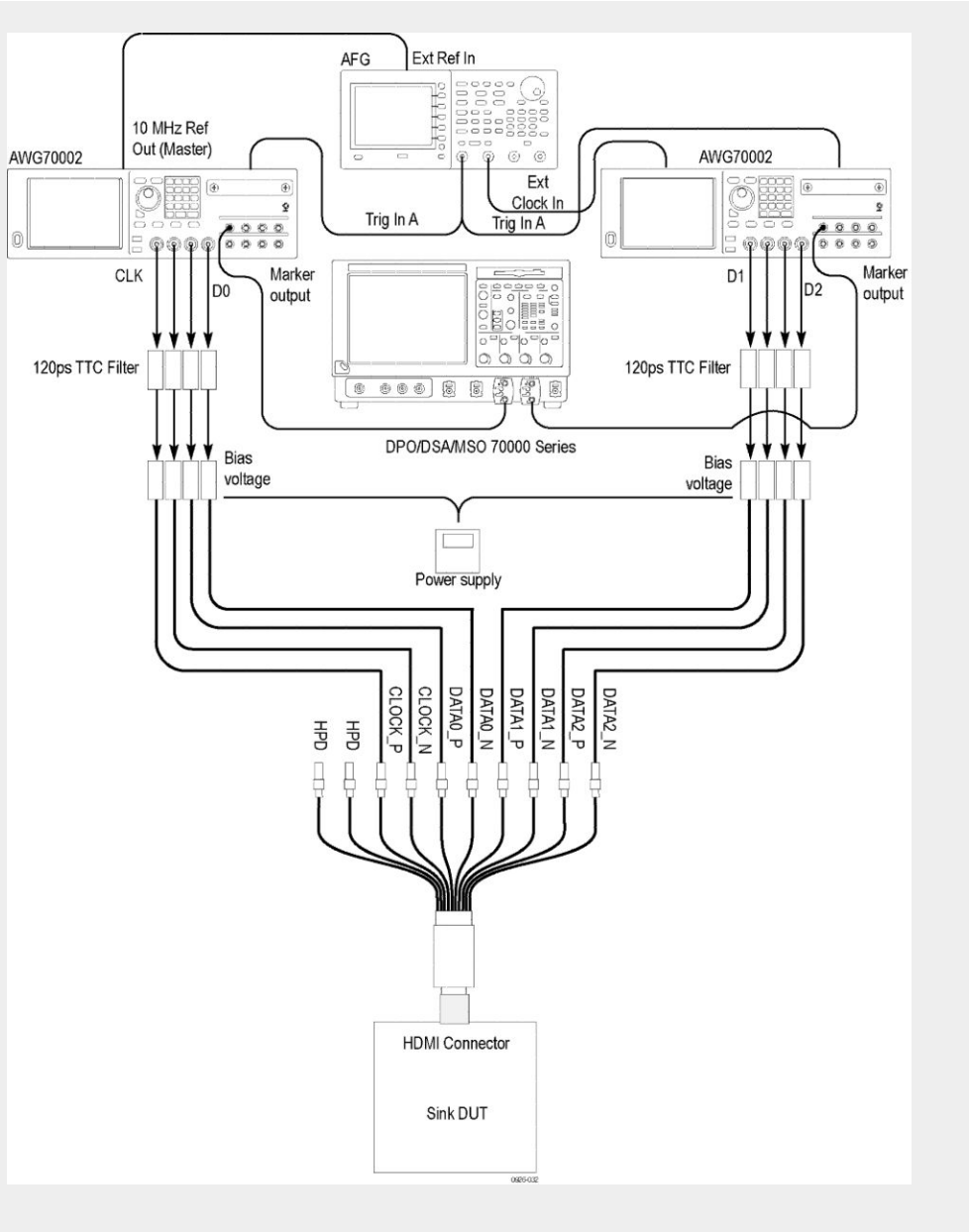
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test Fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by the TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Check if the Sink supports either YC_BC_R 4:2:2 or YC_BC_R 4:4:4 then both should be supported.
   - Check bits #4 and #5 of byte #3 of the CEA EDID Timing Extension. [861-D: Table 27]
   - If bit # 4 ==1 and bit #5 ==1 then FAIL
   - If bit # 4 ==0 and bit #5 ==1 then FAIL
3. All HDMI Sinks shall be capable of supporting both the YC_BC_R 4:4:4 and YC_BC_R 4:2:2 pixel encoding when that device is capable of supporting a

color-difference color space from any other component analog or digital video input.

- If the CDF field Sink_YUV_On_Other =='Y':
  - Check bits #4 and #5 of byte #3 of the EDID Timing Extension
  - If either bit is clear (0) then FAIL

4. All HDMI sink should support RGB 4:4:4 pixel encoding. Transmit 720X480p (if Sink_60Hz =”Y”) or 720X576p (if Sink_60Hz =”N”) Video signal with RGB signal encoding to sink DUT.
   - If the sink DUT does not adequately support the transmitted signal then FAIL.
5. All HDMI sink should support RGB 4:4:4 pixel encoding. Transmit 720X480p (if Sink_60Hz =”Y”) or 720X576p (if Sink_60Hz =”N”) Video signal with YC_BC_R 4:2:2 signal encoding to sink DUT.
   - If the sink DUT does not adequately support the transmitted signal then FAIL.
6. All the HDMI sink should support RGB 4:4:4 pixel encoding. Transmit 720X480p (if Sink_60Hz =”Y”) or 720X576p (if Sink_60Hz =”N”) Video signal with YC_BC_R 4:4:4 signal encoding to sink DUT.
   - If the sink DUT does not adequately support the transmitted signal then FAIL.

Test ID 8-20 Video format timing test

This test confirms that Sink supports the required variations on mandatory video formats and CEA video formats indicated in EDID.

Required test equipment

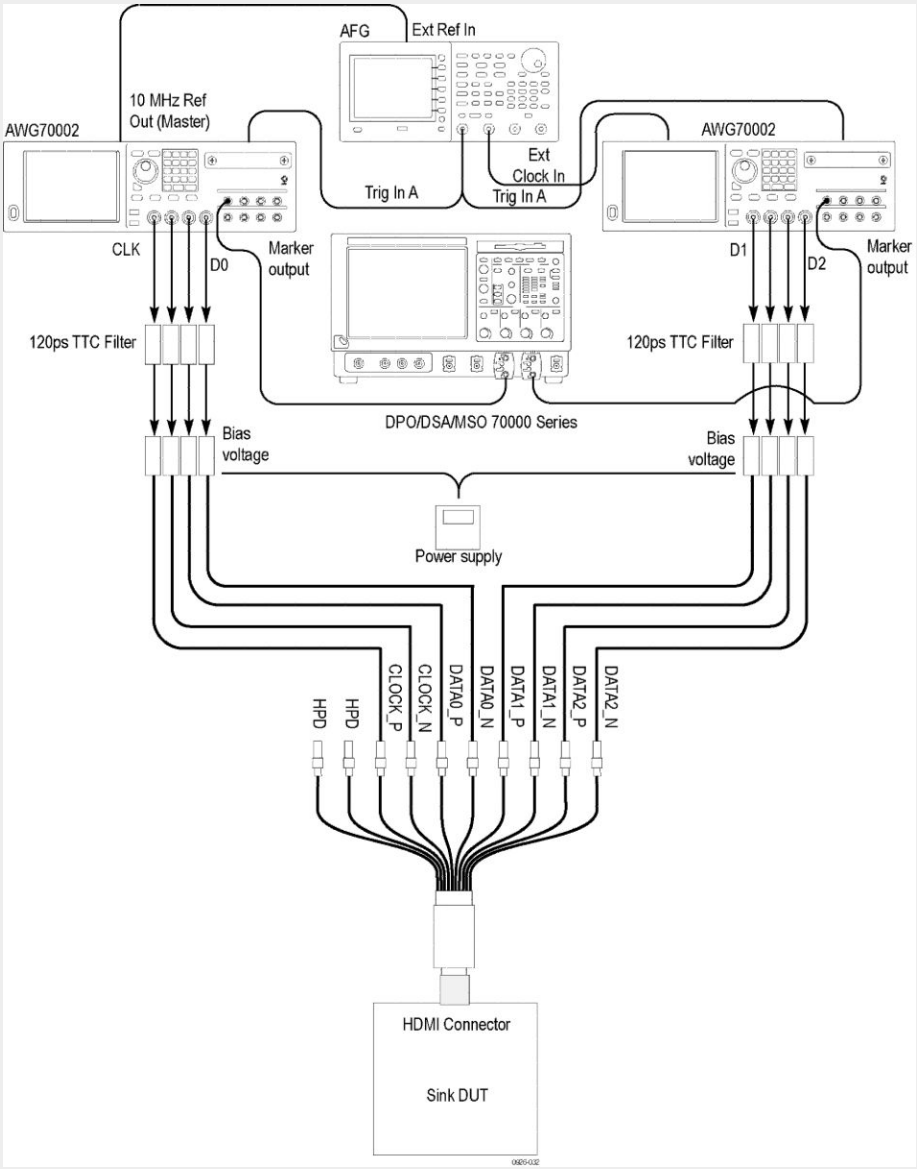
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time rilter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by the TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Perform the following test for each of the video formats listed in the EDID. This test should be performed at two different frequencies, the minimum and maximum permitted for a source. These values are minimum (frame rate -0.5%) and Maximum (frame rate +0.5%).
3. Verify the Sink DUT supports 640X480p.
   - Configure the TMDS Signal Generator to transmit 640x480p @ 60 Hz to the Sink DUT at the minimum allowable pixel clock frequency.
   - If the Sink DUT does not adequately support format then FAIL, "640x480p, Min".

- Configure TMDS Signal Generator to transmit 640x480p @ 60 Hz to Sink DUT at the maximum allowable pixel clock frequency.
- If the Sink DUT does not adequately support format then FAIL, "640x480p, Max".

4. Transmit each of the video formats supported by EDID and perform the steps below.
5. Configure TMDS generator to transmit selected video format at the minimum allowable clock frequency.
6. If the sink DUT does not adequately support then FAIL.
7. Configure TMDS generator to transmit selected video format at the maximum allowable clock frequency.
8. If the sink DUT does not adequately support then FAIL.

Test ID 8-21 Audio clock regeneration test

This test confirms that proper sink operation with respect to Audio Clock Regeneration.

Required test equipment

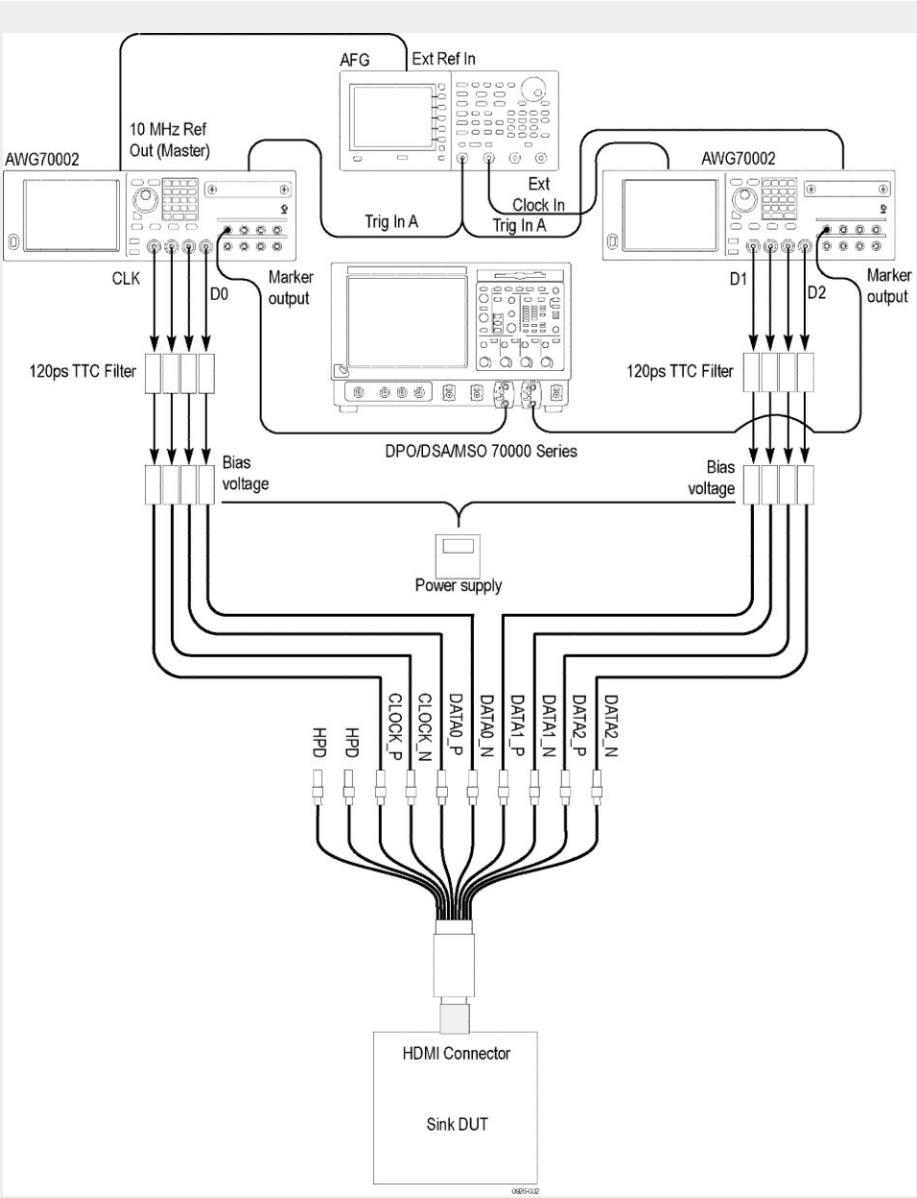
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: HDMI 1.4B Type A fixturs
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by the TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. If the CDF field Sink_Basic_Audio ==”N” then
   - Examine the DUT for any other analog or digital audio input (e.g. analog RCA jacks,S/PDIF, etc).
   - If any other audio input is present on DUT, then FAIL
   - Else, PASS (end test)
3. Configure the TMDS protocol generate to transmit 480p video format with a 48 kHz audio sample rate and ACR packets with maximum N parameter with minimum integer value not less than 128*Fs/1500 and audio sample data with audio tone frequency of 1 khz with amplitude -20dB.
4. Perform the listening test.
5. If no sound, extraneous sound or unnecessary mute then FAIL.

6. Configure TMDS protocol generate to transmit 480p video format with a 48 kHz audio sample rate and ACR packets with maximum N parameter which maximum integer value no more than 128*Fs/300 and audio sample data with audio tone frequency of 1khz with amplitude -20dB.
7. Perform thelistening test.
8. If no sound, extraneous sound or unnecessary mute then FAIL.

Test ID 8-22 Audio sample packet jitter test

This test confirms that Sink supports Audio sample packets with minimum jitter.

Required test equipment

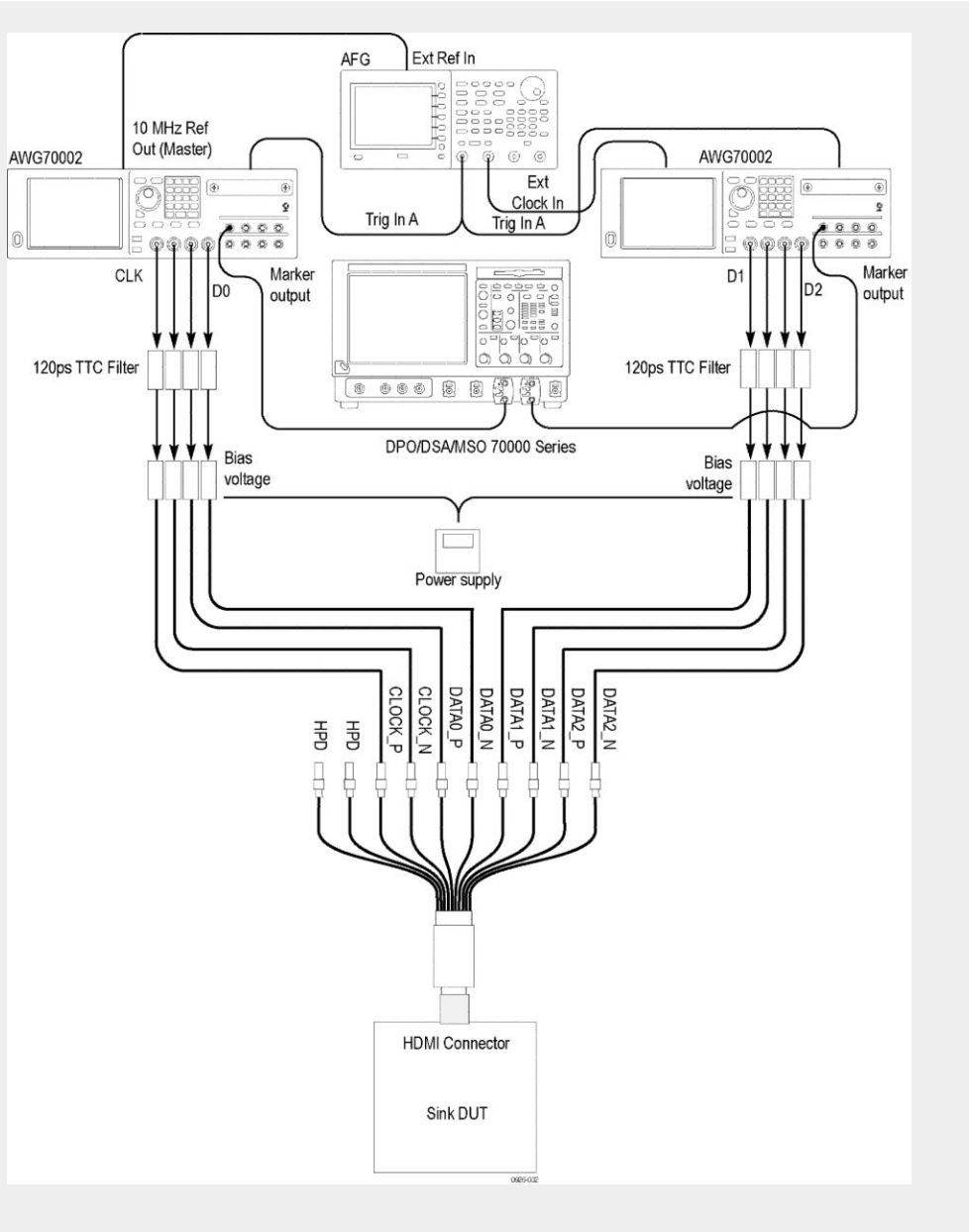
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test Fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. If CDF field Sink_Basic_Audio ==”N” then PASS.
3. Transmit the HDMI audio/video stream containing the following:
   - Either 480p, 576p, or VGA (640x480p @ 60 Hz) with a 48 kHz audio sample rate.
   - ACR packets contain the recommended N and CTS values per [HDMI: 7.2.3].
   - Audio Sample packet transmission timing has jitter of one horizontal video (total) line time plus the period of 1 audio sample (i.e. 1/Fs).
4. Perform the listening test.
5. If no sound, extraneous sound or unnecessary mute then FAIL.

Test ID 8-23 Audio formats test

This test confirms that Sink supports every audio packet specified in EDID.

Required test equipment

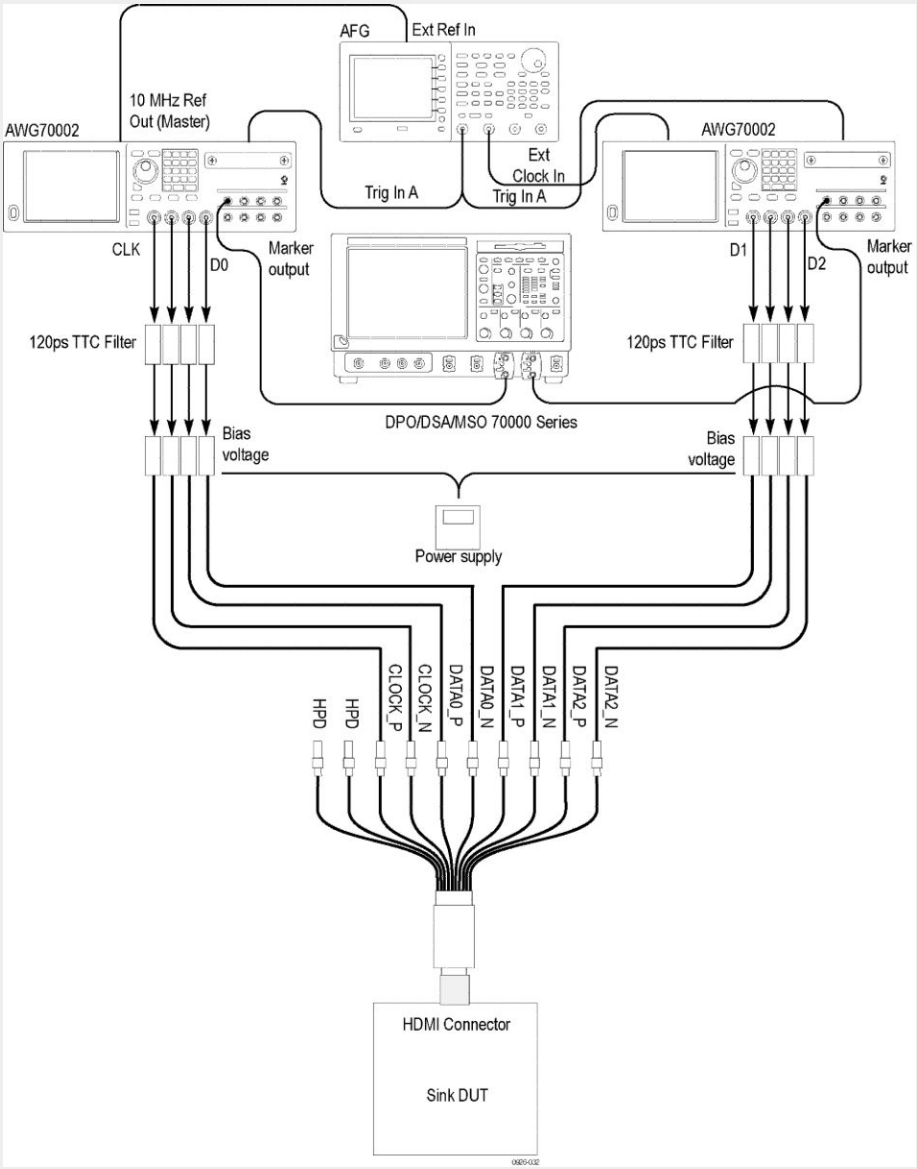
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test Fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. If the CDF field Sink_Basic_Audio ==”N” then PASS.
3. Transmit the HDMI signal with any DUT supported video format and 2-channel 32 kHz PCM signal to sink DUT.
4. If the Sink DUT does not adequately support audio format then FAIL.
5. Transmit the HDMI signal with any DUT supported video format and 2-channel 44.1 kHz PCM signal to sink DUT
6. If the Sink DUT does not adequately support audio format then FAIL.
7. Transmit the HDMI signal with any DUT supported video format and 2-channel 48 kHz PCM signal to sink DUT.
8. If the Sink DUT does not adequately support audio format then FAIL.

Test ID 8-24 Interoperability with DVI test

This test confirms that Sink DUT handles required transmission from DVI to HDMI mode.

Required test equipment

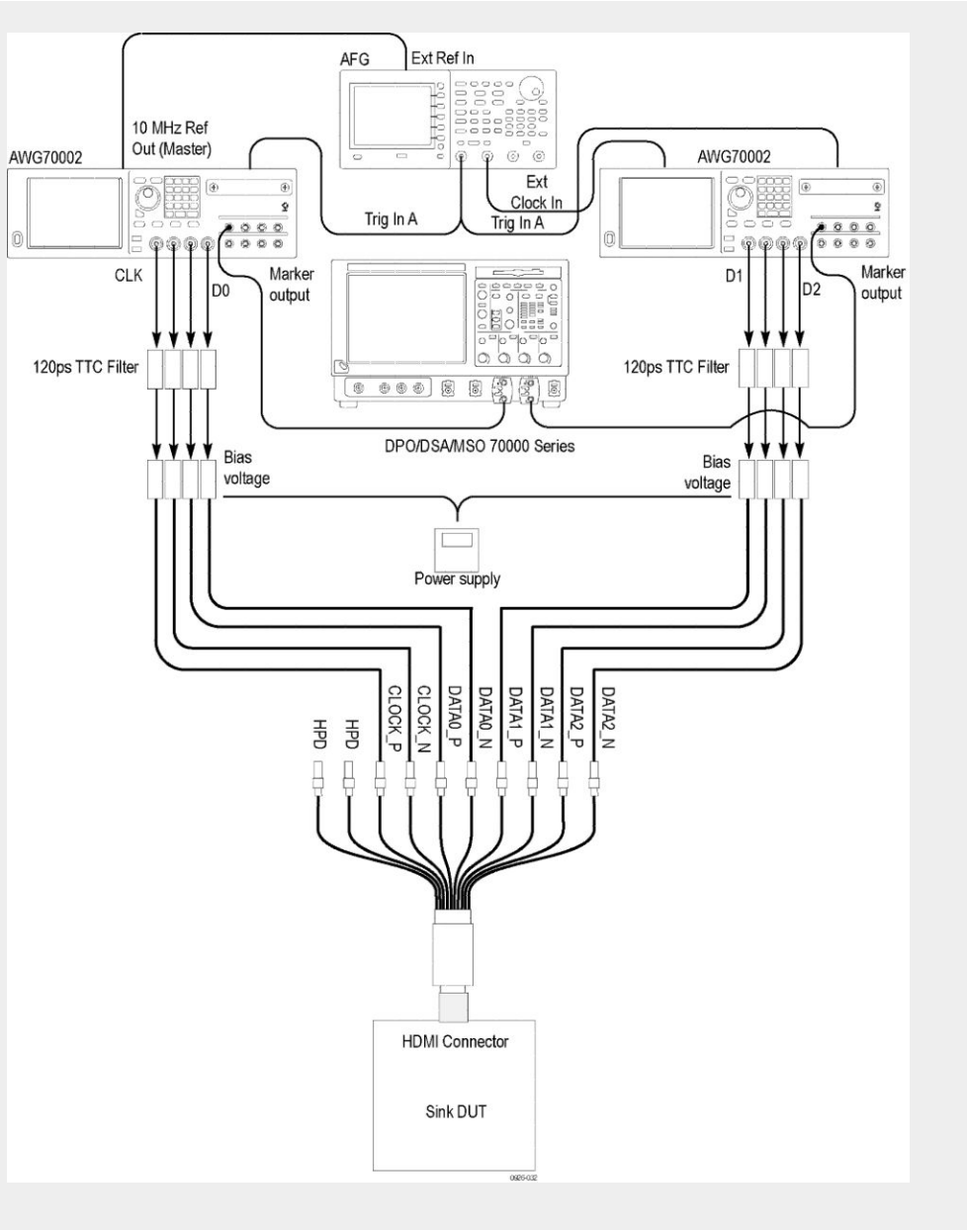
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test Fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Transmit the 720X480p (if Sink_60 Hz =”Y”) or 720X576p (if Sink_60 Hz =”N”), RGB pixel encoding, no guard bands, no Data Islands.
3. Turn on the Sink DUT and verify that the HDMI port is active.
4. Verify that the Sink DUT supports signal with correct pixel encoding and no audio.
5. If the Sink does not adequately support signal then FAIL.

Test ID 8-25 Deep color test

This test confirms that a Deep color-capable sink DUT supports deep color packing and signaling.

Required test equipment

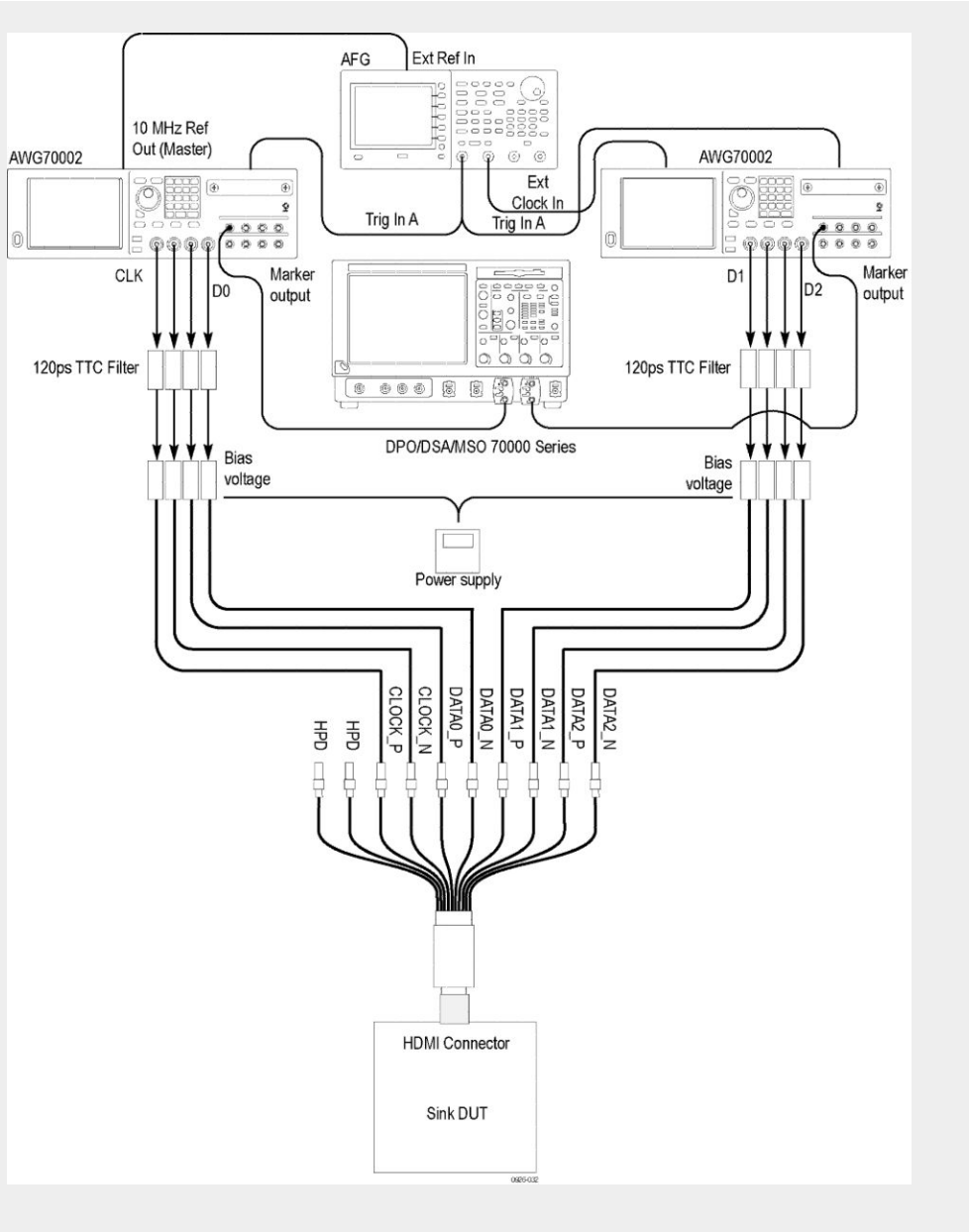
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test Fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. If the CDF field Sink_Deep_Color ==”N” then Skip.
3. If the CDF field Sink_Max_TMDS_CLOCk if Zero then FAIL.
4. For each video formats indicated in the CDF filed Sink_Video_Formats
   - If the CDF field Sink_DC_36 bit is “N” then FAIL, else
     - Output 36 bit depth video format and RGB pixel encoding from TMDS signal generator.
     - If the sink DUT does not adequately support format then FAIL.
     - If the CDF filed Sink_DC_Y444 is “Y” then Output 36 bit depth video format and YC_BC_R 4:4:4 pixel encoding from TMDS signal generator.

If the sink DUT does not adequately support format then FAIL.

- If the CDF field Sink_DC_30 bit is “N” then FAIL, else
  - Output the 30 bit depth video format and RGB pixel encoding from TMDS signal generator.
  - If the sink DUT does not adequately support format then FAIL.
  - If the CDF filed Sink_DC_Y444 is “Y” then Output 30 bit depth video format and YC_BC_R 4:4:4 pixel encoding from TMDS signal generator.
  - If the sink DUT does not adequately support format then FAIL.
- If the CDF field Sink_DC_48bit is “N” then FAIL, else
  - Output the 48bit depth video format and RGB pixel encoding from TMDS signal generator.
  - If the sink DUT does not adequately support format then FAIL.
  - If the CDF filed Sink_DC_Y444 is “Y” then Output 48 bit depth video format and YC_BC_R 4:4:4 pixel encoding from TMDS signal generator.
  - If the sink DUT does not adequately support format then FAIL.

Test ID 8-28 One bit audio test

This test confirms that a One bit audio-capable sink supports One bit audio sample packets and signaling.

Required test equipment

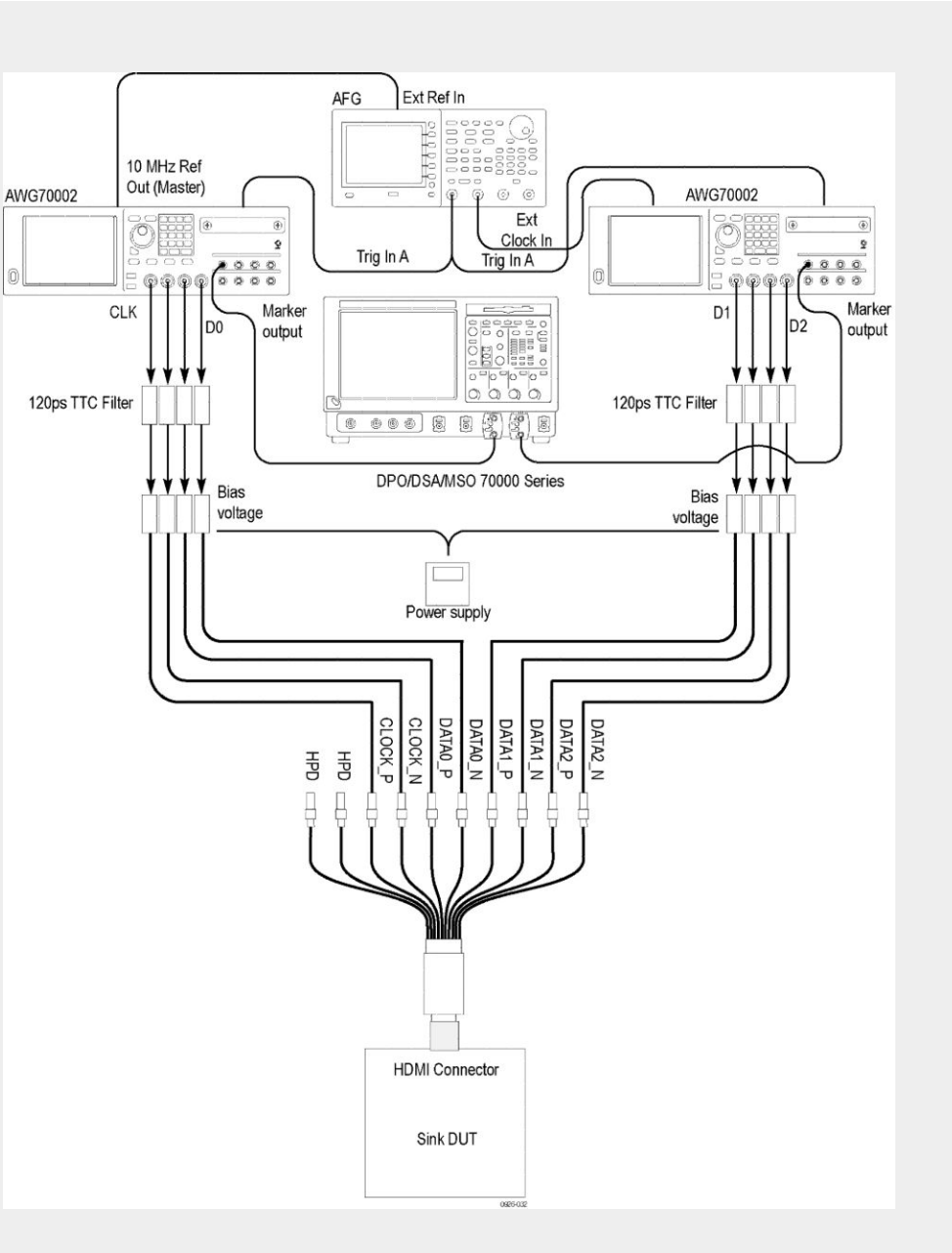
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by the TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Transmit the HDMI Signal with 480p or 576p with 2X pixel repetition (1140X480p or 1140X576p) video format or DUT-supported video format, and a Bit Audio Sample packet to Sink DUT.
3. Perform teh listening test.
4. If no sound, extraneous sound or unnecessary mute then FAIL.

Test ID 8-29 3D video format timing test

This test confirms that a 3D-Capable Sink DUT supports required variation on mandatory 3D video formats and other primary formats listed in the EDID.

Required test equipment

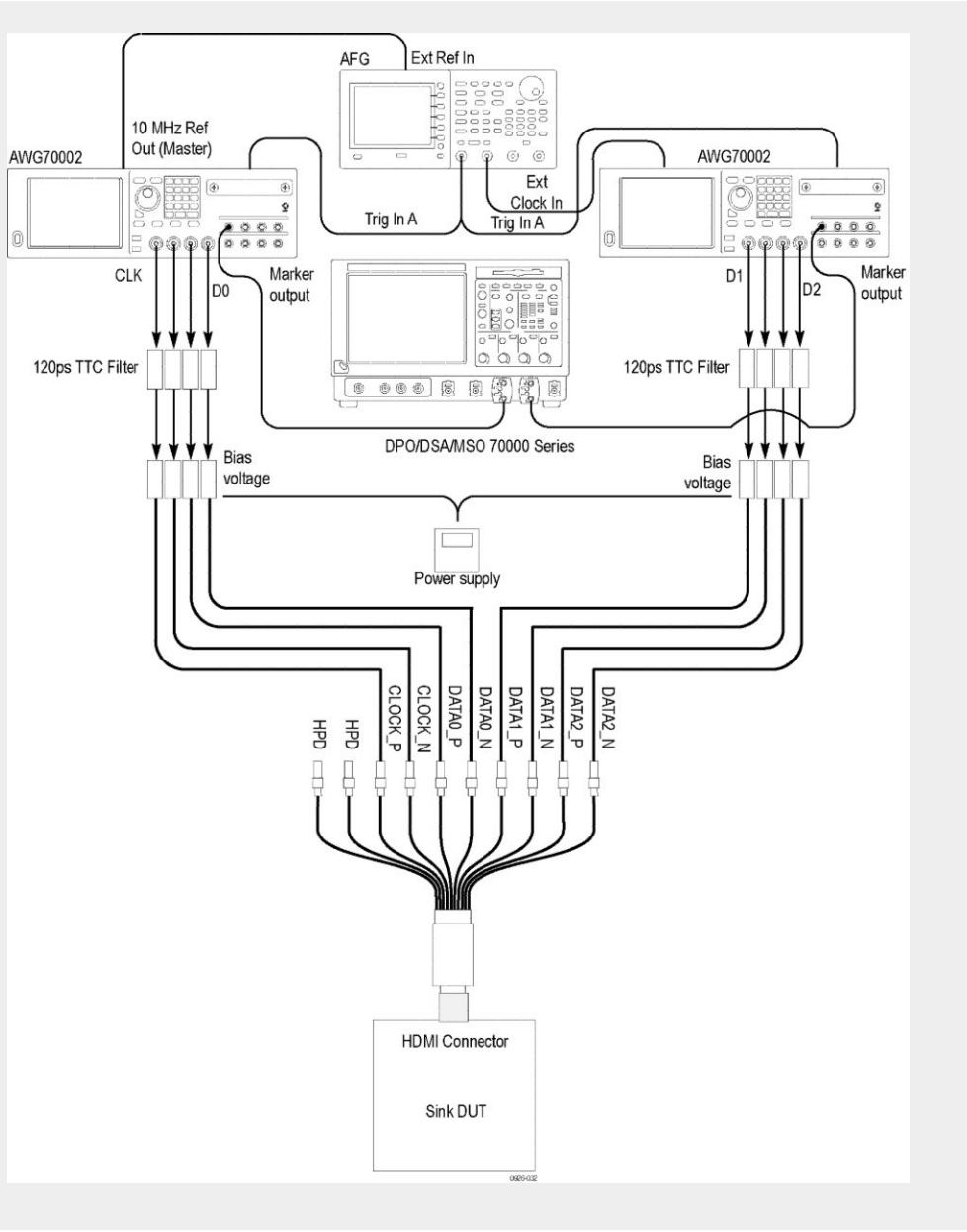
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by the TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Perform the following test for each of the video formats listed in the EDID. This test should performed at two different frequencies, minimum and maximum permitted for a source. These values are minimum (frame rate -0.5%) and maximum (frame rate +0.5%).
3. Transmit each of the video formats supported by EDID and perform the below steps:
4. Configure the TMDS generator to transmit selected video format at the minimum allowable clock frequency.
5. If the sink DUT does not adequately support then FAIL.
6. Configure the TMDS generator to transmit selected video format at the maximum allowable clock frequency.
7. If the sink DUT does not adequately support then FAIL.

Test ID 8-30 4Kx2K video format timing test

This test confirms that a 4K-2K Sink DUT supports 4K2K video formats and other primary formats listed in the EDID.

Required test equipment

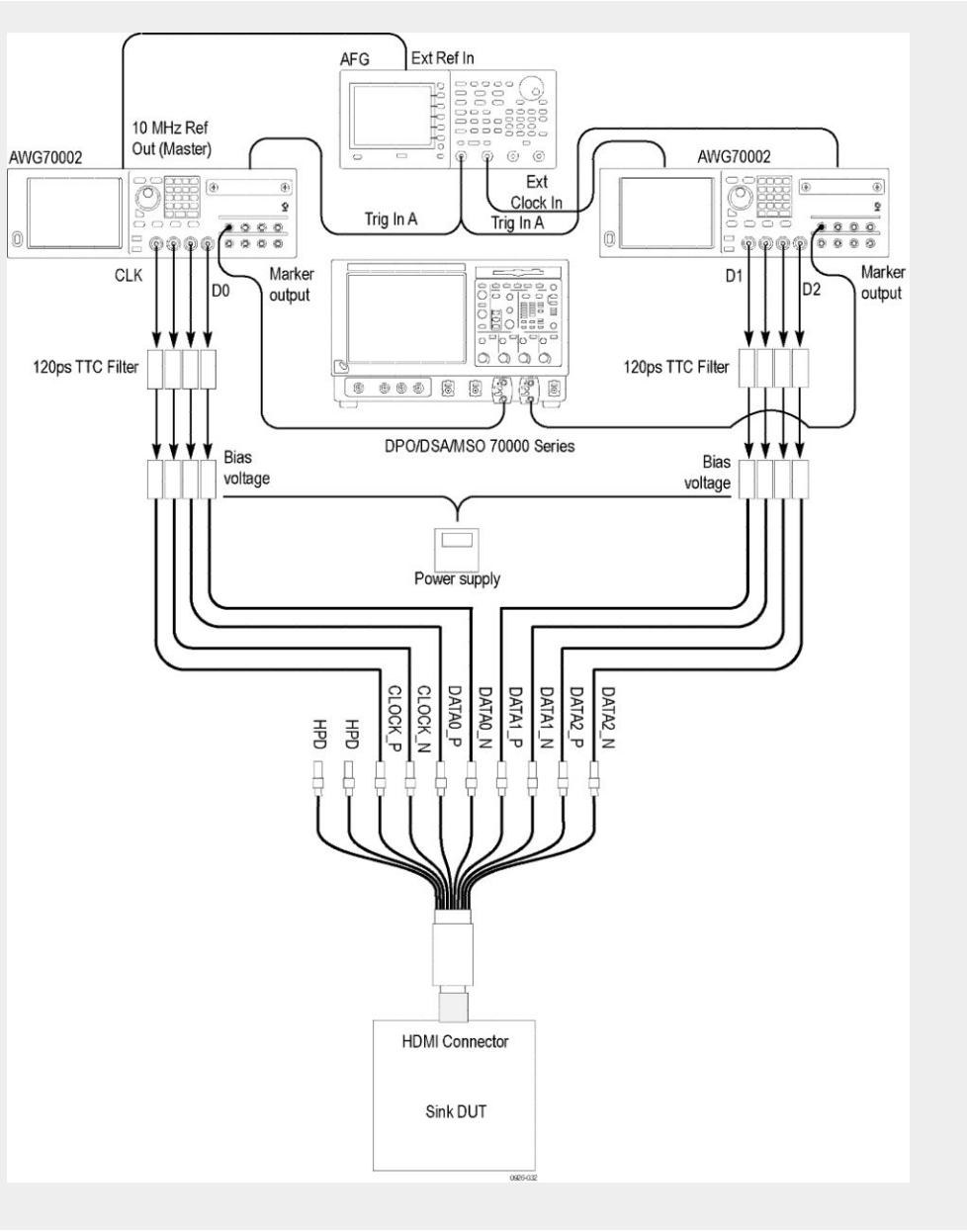
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by the TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A.



2. Perform the following test for each of the video formats listed in the EDID. This test should performed at two different frequencies, minimum and maximum permitted for a source. These values are minimum (frame rate -0.5%) and Maximum (frame rate +0.5%).
3. Transmit each of the video formats supported by the HDMI_VIC_X in the EDID and perform the below steps :
4. Configure the TMDS generator to transmit selected video format at the minimum allowable clock frequency.
5. If the sink DUT does not adequately support then FAIL.
6. Configure the TMDS generator to transmit selected video format at the maximum allowable clock frequency.
7. If the sink DUT does not adequately support then FAIL.

Test ID 8-31 Extended colors and contents test

This test confirms that Sink supports reception of particular AVI info frame packets supporting Extended Colorimetry, Content Type and Selectable YCC Quantization Range Settings, and the sink displays the image with significant distortions.

Required test equipment

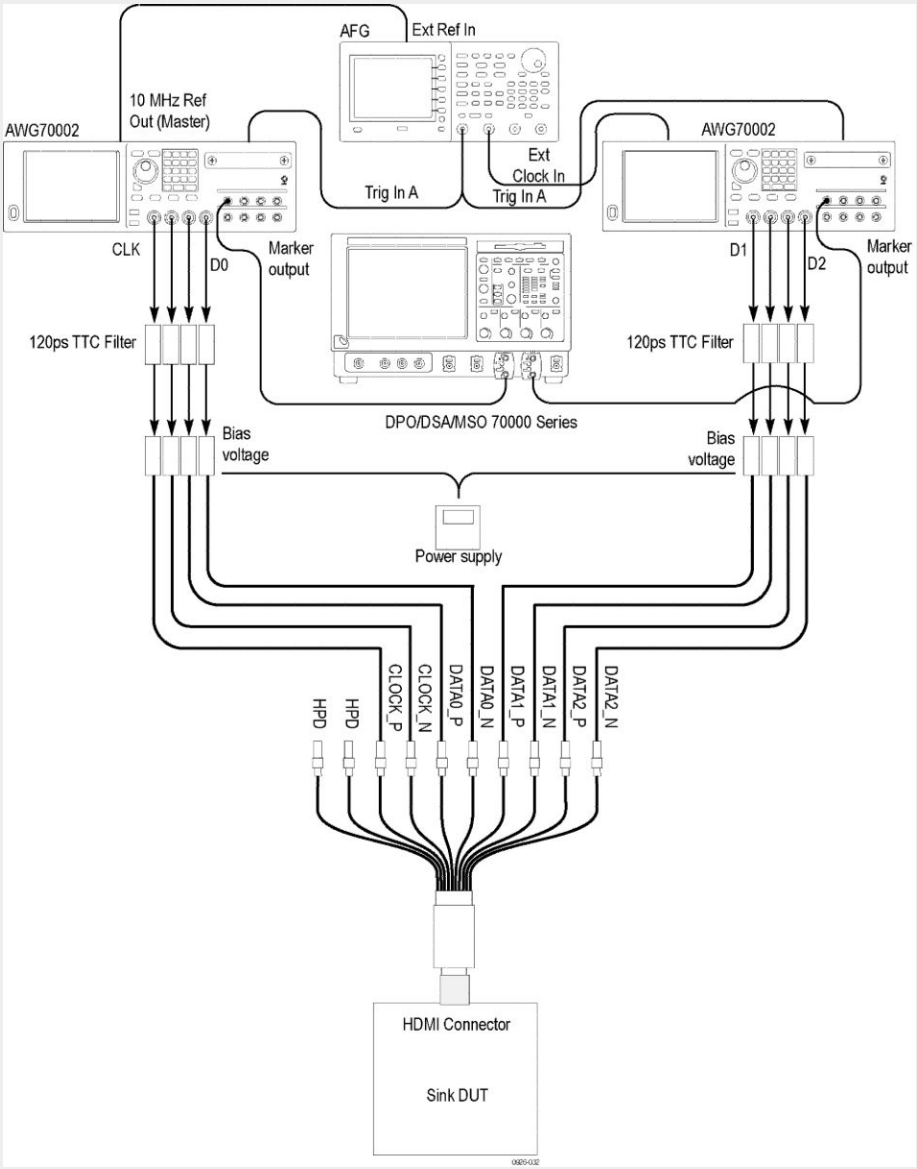
In addition to the DUT and high-bandwidth digital oscilloscope, you will need the following:

- HDMI signal generator: Two AWG70002A instruments with options 01, 03 and 225, with direct synthesis capability to simulate cable emulator effect and rise time filter effect.
- Rise time filter: Eight 120 ps TTC filters (PSPL5915)
- Test fixture: HDMI 1.4B Type A fixture
- DC Power Supply
- Bias Tees: Eight bias tees from Mini-Circuits – ZX85-12G-S+
- Audio/ Video display

Measurement algorithm

The following procedure is fully automated by the TekExpress HDM Software:

1. Connect the equipment as shown in the Sink Protocol diagram for AWG70002A .



2. Configure the TMDS signal generator to Transmit 720X480p (if Sink_60 Hz =”Y”) or 720X576p (if Sink_60 Hz =”N”).
3. If bit #3 of byte#3 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
   - Configurethe TMDS generator to transmit video signal with following AVI Info Frame which has sYCC601 =1.
   - If Sink DUT does not adequately support the signal then FAIL.
4. If bit #4 of byte#3 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
   - Configure the TMDS generator to transmit video signal with following AVI Info Frame which has AdobeYCC601 =1.
   - If Sink DUT does not adequately support the signal then FAIL.

5. If bit #5 of byte#3 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
   - Configure the TMDS generator to transmit video signal with following AVI Info Frame which has AdobeRGB =1.
   - If the Sink DUT does not adequately support the signal then FAIL.
6. If bit #7 of byte#3 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
   - Configure the TMDS generator to transmit video signal with following AVI Info Frame which has YQ1,YQ0 = 0,1 (Full range).
   - If the Sink DUT does not adequately support the signal then FAIL.
7. If bit #0 of byte#8 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
   - Configure the TMDS generator to transmit video signal with following AVI Info Frame which has ITC=1 and CN0, CN1 = 0, 0 (Graphics).
   - If the Sink DUT does not adequately support the signal then FAIL.
8. If bit #1 of byte#8 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
   - Configure the TMDS generator to transmit video signal with following AVI Info Frame which CN0, CN1 = 0, 1 (Photo).
   - If the Sink DUT does not adequately support the signal then FAIL.
9. If bit #2 of byte#8 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
   - Configure the TMDS generator to transmit video signal with following AVI Info Frame which CN0, CN1 = 1, 0 (Cinema).
   - If the Sink DUT does not adequately support the signal then FAIL.
10. If bit #3 of byte#8 the Colorimetry Data Block in the EDID of Sink DUT is set to one.
    - Configure the TMDS generator to transmit video signal with following AVI Info Frame which CN0, CN1 = 1, 1 (Game).
    - If the Sink DUT does not adequately support the signal then FAIL.

Reference

Map the My TekExpress folder

Map the shared My TekExpress folder as X: (X drive) on all instruments used in test setup running Microsoft Windows Operating System. The My TekExpress folder has the shared name format <domain><user ID>My TekExpress. Or, if the instrument is not connected to a domain, then the share name format is <instrument name><user ID> My TekExpress. This shared folder is used to save the waveform files and is used during any other file transfer operations.

To map the My TekExpress folder on the instruments, follow these steps:

1. Open Windows Explorer.
2. From the Windows Explorer menu, click **Computer**.
3. In the menu bar, click **Map network drive**.
4. Select the Drive letter as **X:** (if there is any previous connection on X:, disconnect it first through **Tools > Disconnect Network drive** menu of Windows Explorer. Windows 7 users: if you do not see the Tools menu, press the **Alt** key).
5. In the Folder field, enter the remote My TekExpress folder path (for example, \\192.158.97.65\My TekExpress)
6. Click **Finish**.

To determine the IP address of the instrument where the My TekExpress folder exists, do the following:

1. On the instrument where the My TekExpress folder exists, click **Start** and select **Run**.
2. Type “cmd” and then press **Enter**.
3. At the command prompt, type “ipconfig” and then press **Enter**.

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