

SDA-HDMI

Software Option

Rev 1.2a

New Compliance Framework



Featuring LeCroy's



Operator's Manual

May 2006

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INTRODUCTION TO HDMI

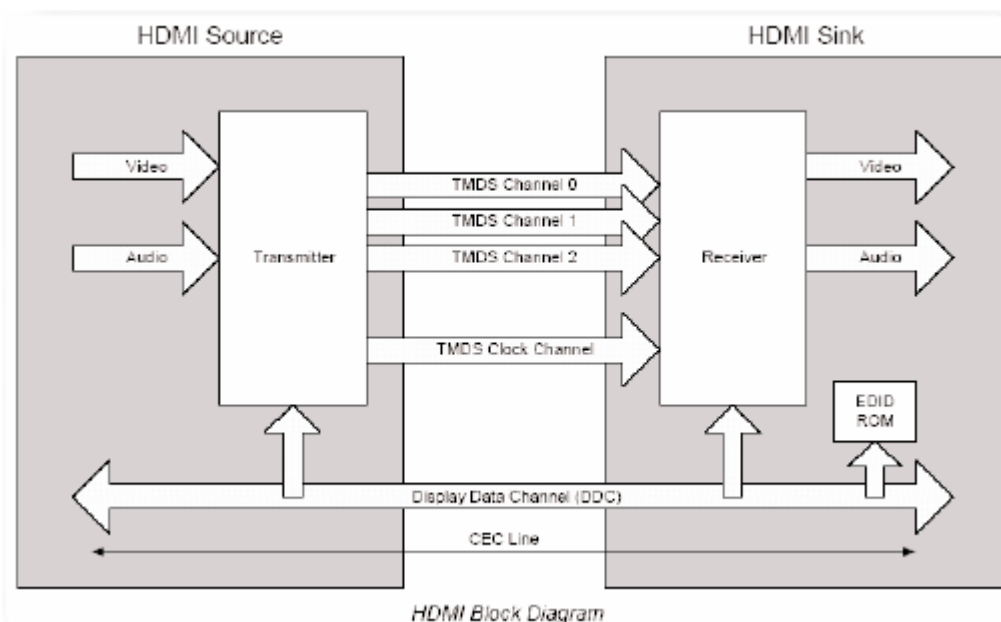
Developed by Sony, Hitachi, Thomson (RCA), Philips, Matsushita (Panasonic), Toshiba, and Silicon Image, the High-Definition Multimedia Interface (HDMI) has emerged as the connection standard for HDTV and the consumer electronics market. HDMI is the first and only digital interface to combine uncompressed high-definition video, multi-channel audio and intelligent format and command data in a single digital interface. For end-users, use of a single cable for audio and video dramatically simplifies home theater system installation by eliminating the tangle of cables typically associated with home theater system components.

Most importantly, HDMI offers significant advantages over analog A/V connections, including the ability to transmit uncompressed digital video and audio content. And INTEL allows use of its proprietary High Definition Content Protection (HDCP) scheme for DVI and HDMI, perhaps the best solution for the digital video interface, which transfers high definition video content and is easy to implement.

Since the Digital Display Working Group (DDWG), the standards body that specifies DVI, decided to focus on the computing market, the HDMI working group has taken over the role in consumer electronics. In addition to numerous device and display manufacturers, Hollywood studios and cable and satellite operators also support HDMI.

Key Specifications and Product Features

HDMI system architecture is defined as consisting of Sources, Sinks, Repeaters, and Cable Assemblies. A given device may have one or more HDMI inputs, and one or more HDMI outputs.



Each HDMI input on a device follows all of the rules for an HDMI Sink, and each HDMI output follows all of the rules for an HDMI Source. Consequently, each HDMI input is fully tested for compliance using the tests specified for Sink devices, and each HDMI output is fully tested against the full set of tests specified for Source devices.

Engineering Tasks

Required Test Equipment Capabilities

- The Jitter/Eye Analyzer must be capable of accurately indicating the amount of jitter, or the actual eye diagram, on the tested transition minimized differential signal (TMDS).
- The transfer function for an ideal recovery clock is given by Equation 4-1 from HDMI Specification 1.2a, shown below. An ideal clock recovery unit (CRU) would perfectly match this function.
- Across the tested clock frequency range, the Jitter/Eye Analyzer's CRU shall have a jitter transfer amplitude that differs from the ideal transfer function by no more than ± 0.2 dB from DC to 10 MHz. At

20 MHz the difference must be less than ± 1 dB, and at 50 MHz, less than $\pm 2/-6$ dB. From DC to 20 MHz, the jitter transfer phase response must be within ± 1.8 degrees of the phase response of the ideal recovery clock.

$$H(j\omega) = 1/(1 + j\omega/\omega_0) \quad (\text{Eq. 4-1})$$

where $\omega_0 = 2\pi f_0$, $f_0 = 4.0$ MHz

INTRODUCTION TO SDA-HDMI

The LeCroy HDMI Compliance Test Software for the SDA4000A, SDA4020A, SDA5000A, SDA6000A, SDA6020 and SDA11000 serial data analyzers is designed with the following major objective in mind:

SDA-HDMI provides the necessary tools to develop HDMI compliant source devices in a systematic, step-by-step fashion, in accordance with the latest standards and specification documents published by HDMI founders.

The standard features of the SDA also provide a broad tool set for advanced debugging of these interfaces, including jitter, eye pattern, and bit error rate.

The LeCroy HDMI Compliance Software (SDA-HDMI) can work with version 4.6.3 or later of X-Stream DSO firmware.

Required Equipment

- SDA 4000A, SDA 4020A, SDA 5000A, SDA 6000A, SDA 6020 or SDA 11000
- HDMI Compliance Test software option (LeCroy SDA-HDMI)
- 2 differential probes (D350 type)
- 1 set of compliance test fixtures (TF-HDMI: TPA-P-DI and TPA-P-SE)
- A host computer, though not required, is highly recommended to execute X-Replay, the compliance & development software engine.

HDMI Compliance Test Fixtures

The HDMI standard describes a set of two fixtures that are used to connect to the signal under test. The fixtures are known as the TPA-P-DI and the TPA-P-SE. The TPA-P-DI is used to test the signal as differential, and the TPA-P-SE is used to test the signal as single-ended. TPA-P-DI and TPA-P-SE are available from LeCroy as a set, under product code TF-HDMI.

Both fixtures terminate all differential lines with a 50 ohm resistor to V_{cc} (3.3 V) on board, and provide probing points for an active probe to pick up the signal.

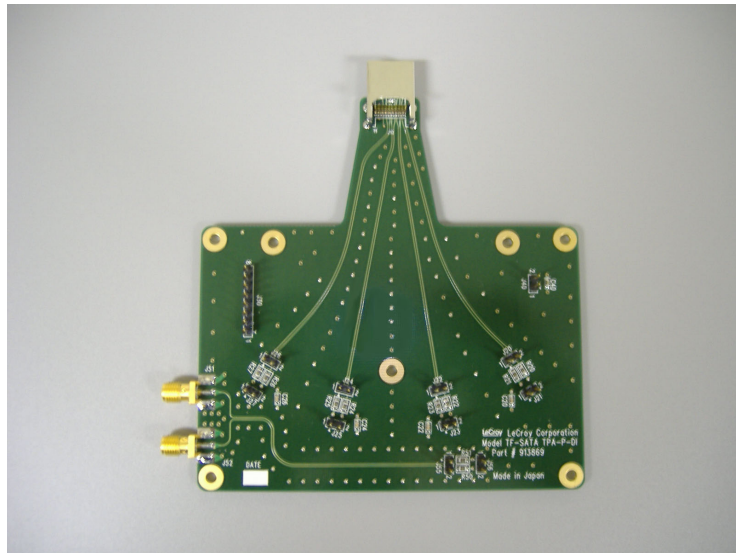


Figure 1. HDMI test fixture TF-HDMI TPA-P-DI provides an HDMI plug connector to connect an HDMI source device. The 3.3 V power supply connection is at the square pin header. All TMDS differential signals, D0, D1, D2, and CLK are picked up from corresponding square pin headers. The EDID emulator is connected to an 8-pin square pin header to communicate with the source device under the test.

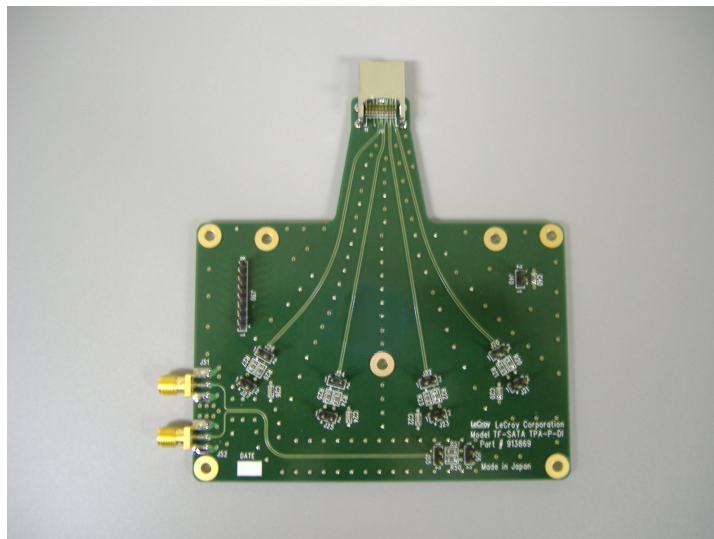


Figure 2. HDMI test fixture TF-HDMI TPA-P-SE is similar to TPA-P-DI but TMDS differential lines are separated as two single-ended lines for the corresponding test.

What Is X-Replay?

The HDMI Compliance Test software application incorporates X-Replay, a unique application framework. X-Replay is an MS Windows-based application that contains all the commands and instructions necessary to configure, acquire, display, and report measurement results. For instance, the X-Replay environment enables you to:

- Create or change test criteria in order to make context-sensitive parametric measurements.
- Export all test results as XML for import into a database program, such as Microsoft Access, for further manipulation.
- Generate reports from within X-Replay, showing the latest test results. Reports are html and are meant to be viewed with Microsoft Internet Explorer.

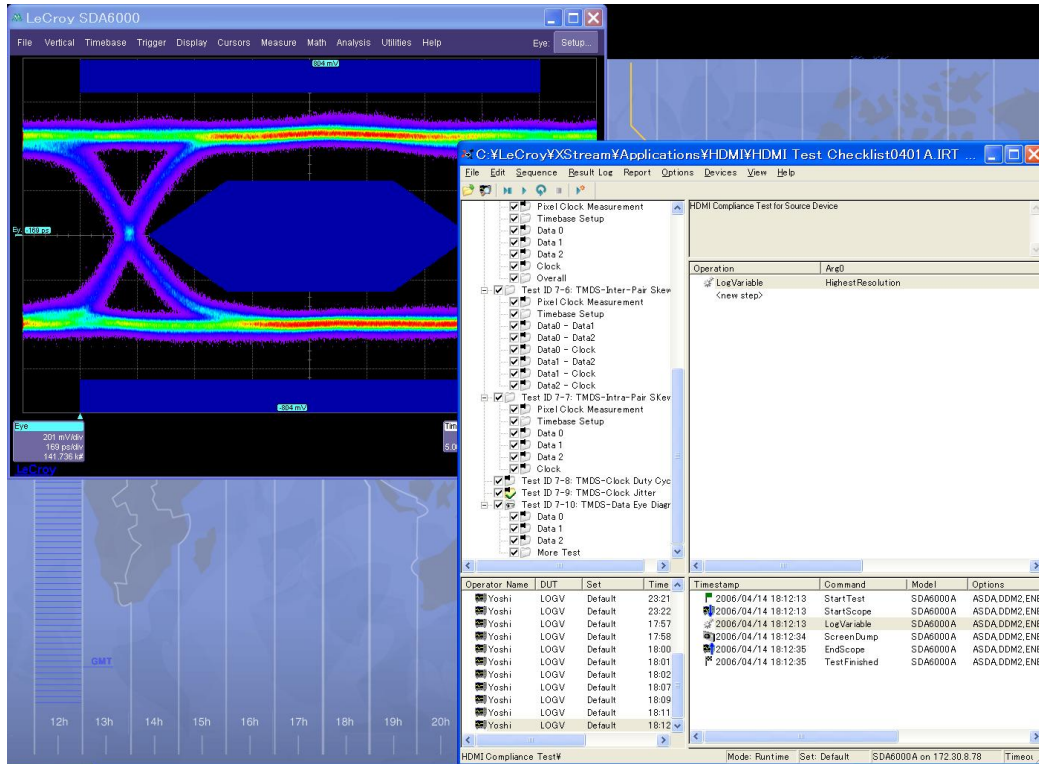


Figure 3. X-Replay Window

The HDMI Compliance Test software resides in X-Stream DSO software in the scope, and it is activated through the use of an alphanumeric code matched to the scope's serial number. Unique to each scope serial number, this code is activated when you order SDA-HDMI software.

While the software key enables the scope to perform the measurements, X-Replay contains the HDMI script, the test results database, and the report generation engine. For ultimate flexibility, X-Replay can be executed from a host computer at a remote location, provided that there is a Windows-compatible network connection.

SOFTWARE INSTALLATION AND SYSTEM CONFIGURATION

Option Key Installation

When ordered as an option for a new instrument, no installation of SDA-HDMI is necessary. Installation is required, however, when the option is ordered after the oscilloscope is purchased. An option key will be issued at the time the option is purchased.

To enter the option key code,

1. Touch **Utilities** in the menu bar, then **Utilities Setup...** in the drop-down menu.
2. Select the “Options” tab from the utilities dialog.
3. In the Options dialog, touch the **Add Key** button and enter the option key in the dialog box, using the on-screen keyboard.

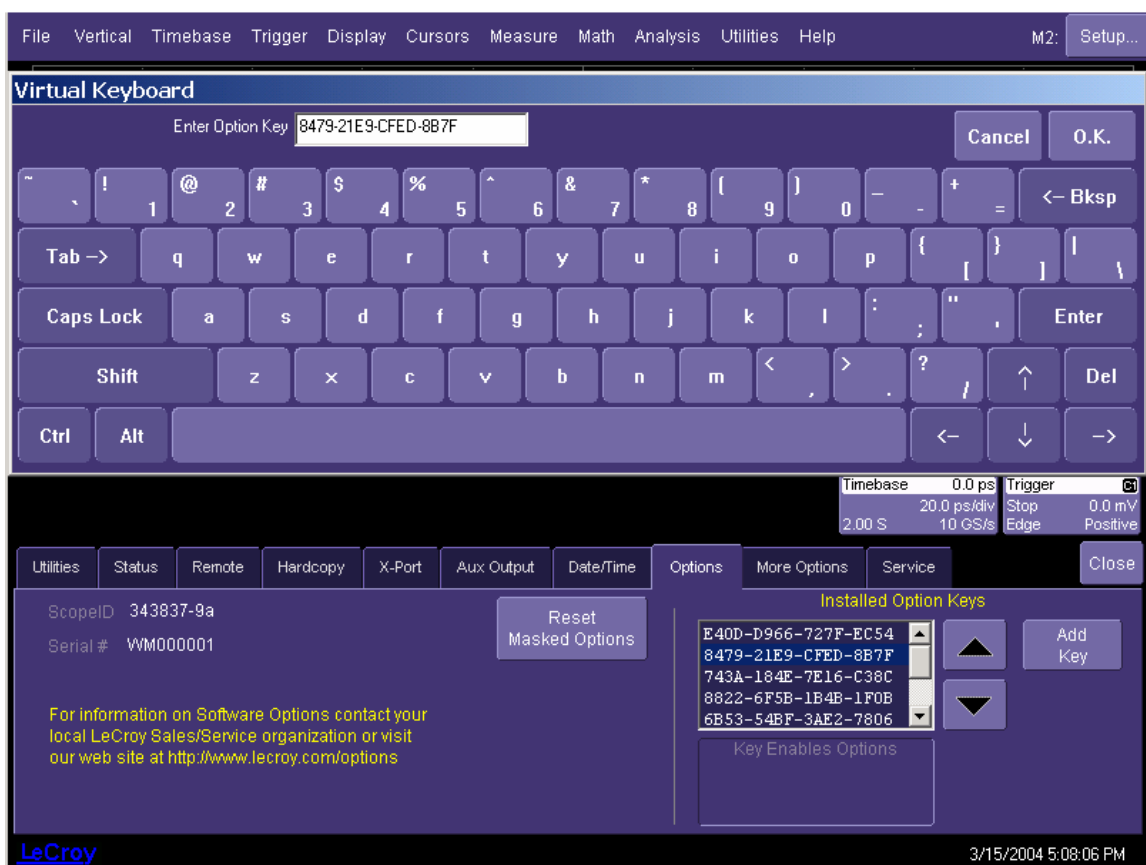


Figure 4. Entering the option key code for the SDA-HDMI software option

CD-ROM Installation

When ordered as an upgrade to an existing X-Stream instrument, an Application Software CD-ROM is supplied containing X-Replay and other software installation files. Follow the specific instructions in the Installer application. When necessary, the installation process will prompt you for storage locations for data files and test results, reports, scripts, etc.

X-Replay Configuration

Typical Configuration (Recommended)

SDA-HDMI software can be executed from the scope PC or from a Host PC. By default, a new scope will come equipped with X-Replay installed in the scope. LeCroy recommends running SDA-HDMI in a scope equipped with Dual Monitor Display capability (Option DMD-1), such that the waveform and measurements are displayed on the scope LCD display, whereas the X-Replay application and test results are displayed on a second monitor. When X-Replay is executed in the scope, the scope will appear as a local host (IP address is 127.0.0.1). To verify its correct operation, the following steps must be taken once the scope is turned on:

1. Minimize the X-Stream scope window.
2. Run X-Replay.
3. Select **Scope Manager**. The Scope Selector window will display the ID of the scope attached:

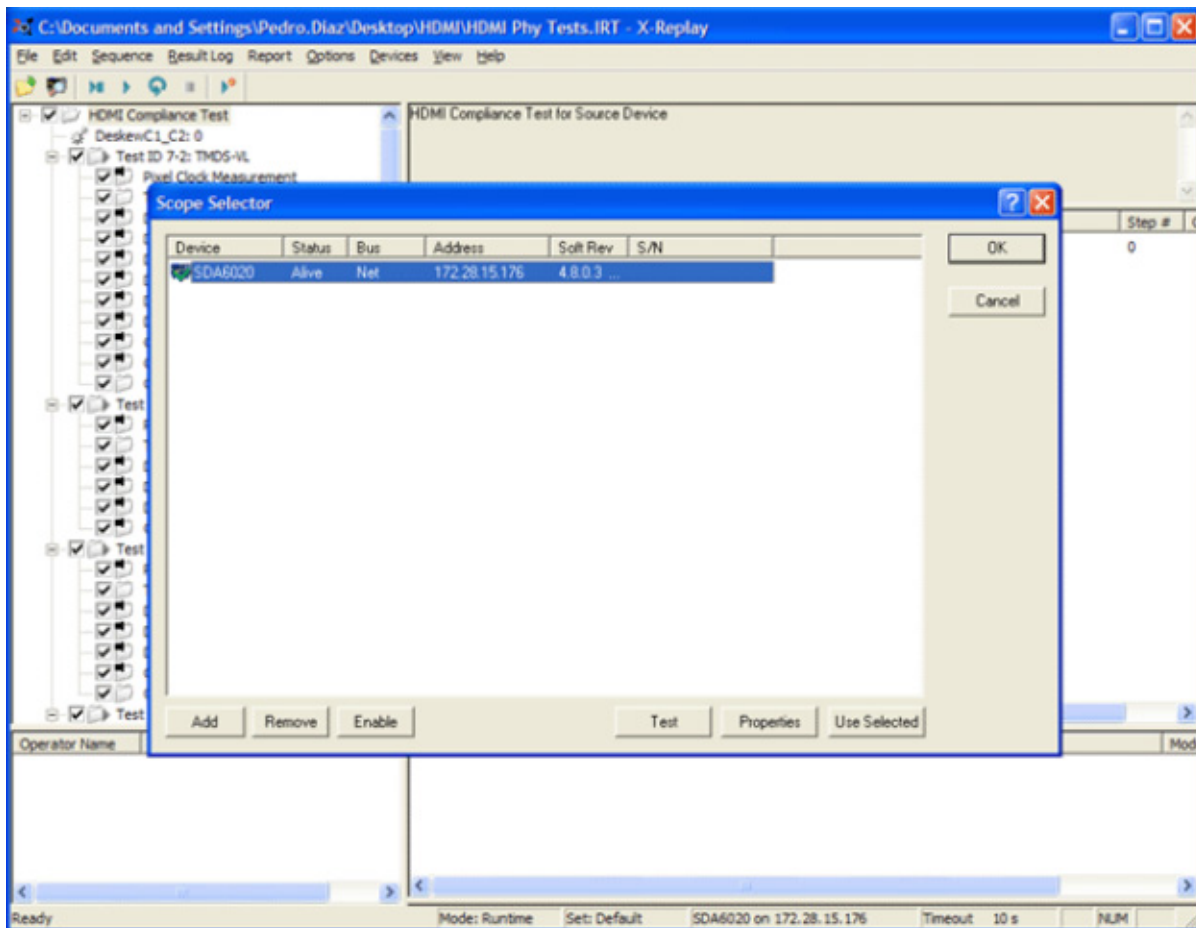


Figure 5. Selecting a scope

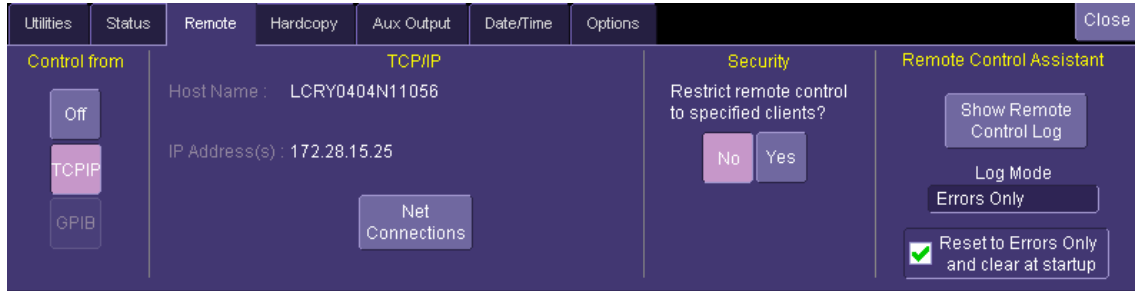
4. Press the **Test** button. If the scope is detected, a message box will indicate that the test is OK. X-Replay is now ready for use.

Remote (Networked) Configuration

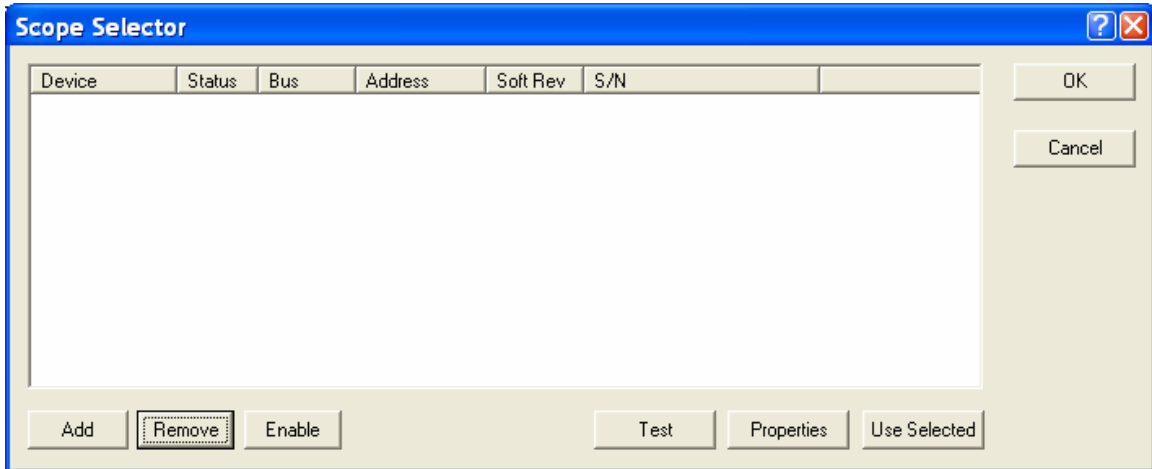
Of course, it is also possible to run SDA-HDMI by installing X-Replay in a host PC and controlling the scope through a Windows Network/LAN connection, which allows you to control other instruments or run applications from the host PC (for example, setting up and configuring the LeCroy PE Protocol and Host Emulator instruments). The scope must already be configured, and an IP address (fixed or network-assigned) must already be established.

As an example of how to set up the scope using X-Replay over a LAN, follow these steps:

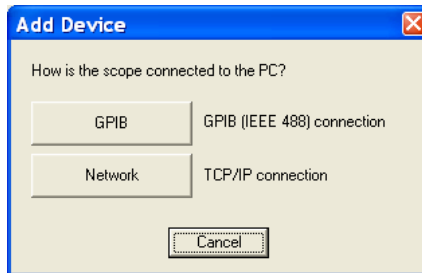
1. Verify in the **Utilities, Remote** dialog that the scope has an assigned IP address, and control is set to TCP/IP as shown below.



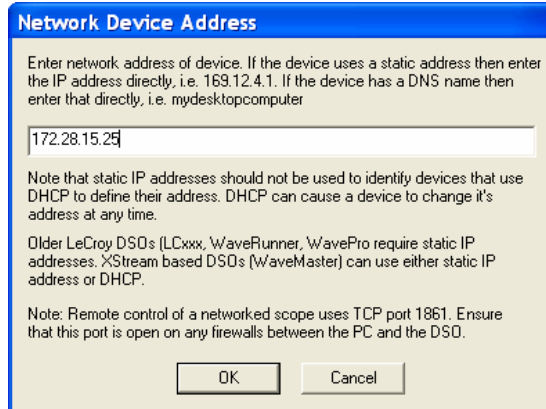
2. Make sure that the host PC is connected to the same LAN as the scope. If unsure, contact your system administrator.
3. Open **X-Replay** in the host PC and select **Devices, Scope Manager**; the Scope Selector window opens. There should be no devices enabled at this time:



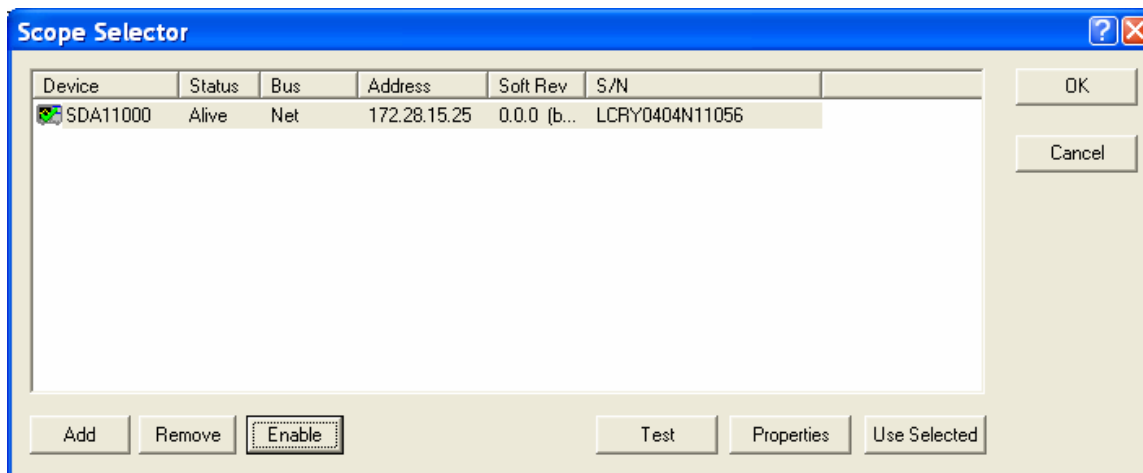
4. Click the **Add** button. Select the connection method (**GPIB** or **Network**):



5. In this example, we select **Network**, then enter the **IP address** from step #1:



6. Click **OK**. The Scope Selector window will display the correct information about the scope connected to the LAN. In this example, an SDA 11000 is connected as shown below:



PREPARING TO MAKE HDMI MEASUREMENTS

Channel Deskew (SMA Cables)

HDMI signals are properly probed using two separate channels on the oscilloscope connected to the appropriate SMA jacks on the test fixture. The highest measurement accuracy is achieved when the timing skew between the two channels is calibrated. This is performed using the “Deskew” control on one of the two channels to which the differential signal is connected, as follows:

1. Attach the calibrator signal to both input channels using a “T” connector to rout the calibrator signal on the SDA front panel through the same cables that will be connected to the fixture.

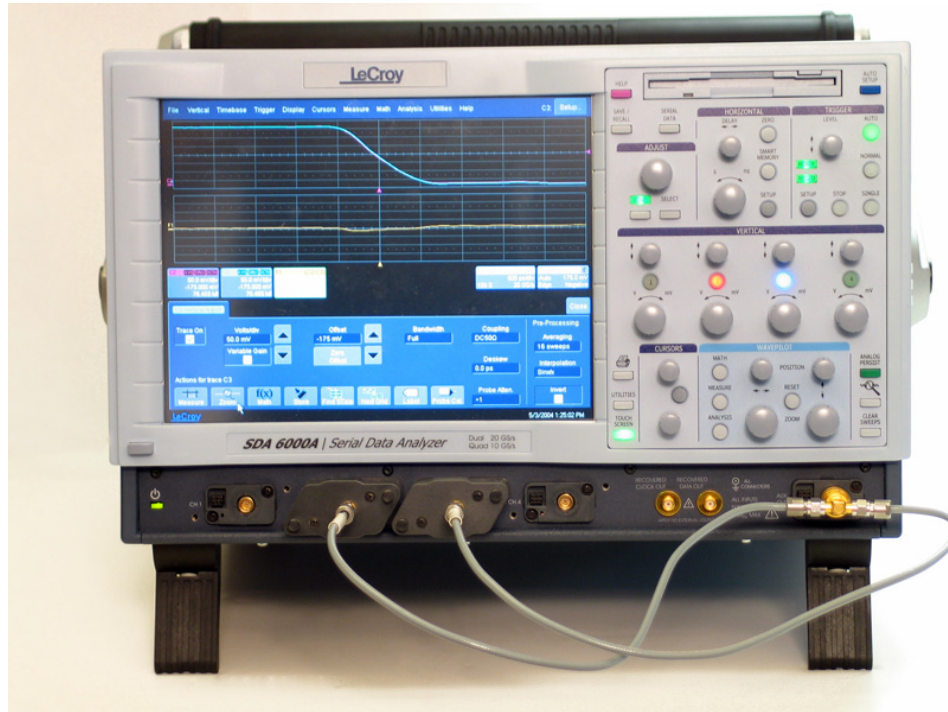


Figure 6. Deskew cable setup. The calibrator signal is connected to the cables using a “T” connector or resistive divider. The calibrator peak voltage should be set to the same value as the nominal voltage of D+ and D-.

2. Set interpolation of both channels to **Sinx/x**, using the “Interpolation” control in the “Vertical Adjust” dialog for each channel.
3. Check the **Invert** checkbox on one channel.

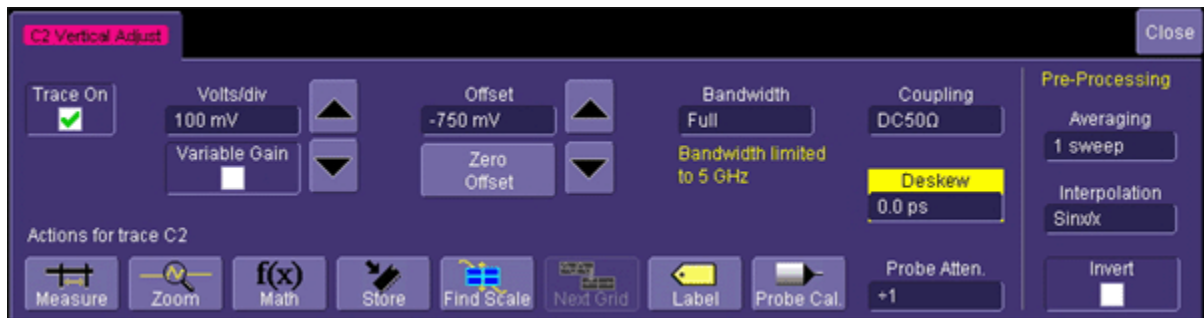


Figure 7. Deskew control in channel menu. Adjust this value to achieve minimum skew.

4. Create a Difference math waveform by selecting **Math** in the menu bar, then **Math Setup...** in the drop-down menu. Enter the channels to which your signal is connected in the **Source1** and **Source2** fields, and select **Difference** from the **Operator1** menu. The math function is thus defined as the difference between the 2 channels probing the D⁺ and D⁻ signals.

- While viewing the math trace, adjust the **Deskew** control in one of the channels until the math trace is as flat as possible.

Note: With the “Deskew” control highlighted, you can use the front panel **ADJUST** knob to make the adjustment.

The best accuracy is achieved by setting the level of the calibrator signal to match the expected levels of the signal under test, and with the calibrator set to its maximum frequency (5 MHz). The calibrator settings can be found in the “Utilities” dialog under the **Aux Output** tab.

Table 1. Parameter List – Transmitter Compliance Tests (measured at the Tx package pins)

Test ID	Test Name
7-2	TMDS-VL
7-4	TDMS Trise/Tfall
7-5	TMDS Over/Undershoot
7-6	TMDS-InterPair Skew
7-7	TMDS IntraPair Skew
7-8	TMDS Clock Duty Cycle
7-9	TMDS Clock Jitter
7-10	TMDS Data Eye Diagram

CHECKLIST TEST MODE OF OPERATION

All the tests described in this manual refer to the HDMI Source Device, Rev 1.0, dated April 26, 2006. This section covers use of X-Replay and the supplied “HDMI Compliance Test.irt” script to perform tests described in the PHY Electrical Test Considerations, and generating a report from X-Replay using the supplied style sheet “XReplayHDMI_Report.xslt”

X-Replay allows you to test HDMI functionality in several ways:

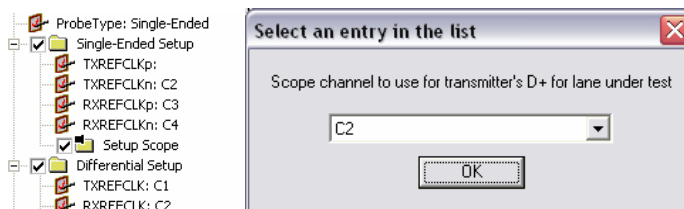
- Select, repeat, and skip tests as required to demonstrate or develop different PHY functions.
- Establish Test Limits for each of the versions of the HDMI specification and modify, import, or delete entire test limit sets.
- Generate Test Reports based on the tests actually run.
- Query the database for test results from prior test sessions or experimental runs.

The X-Replay application window is divided into several panes (clockwise, from upper left hand):

- Test Sequence pane
- Test Description pane
- Commands pane
- Activity Log pane
- Session pane

Use of Configuration Variables in Test Sequences

Configuration Variables allow you to define system inputs such as signal sources, probe types, specification parameter set to be used for testing, form factors, and other global conditions. These variables can be set prior to beginning tests, or changed between test runs.



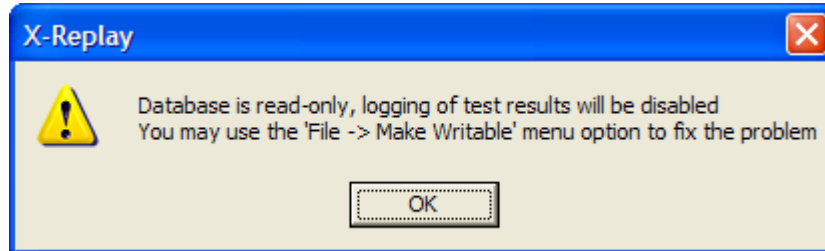
Right-clicking on any variable and selecting **Change value** allows you to reset the variable to its default setting, or to change the value to be used for subsequent tests.

Menu Structure

File

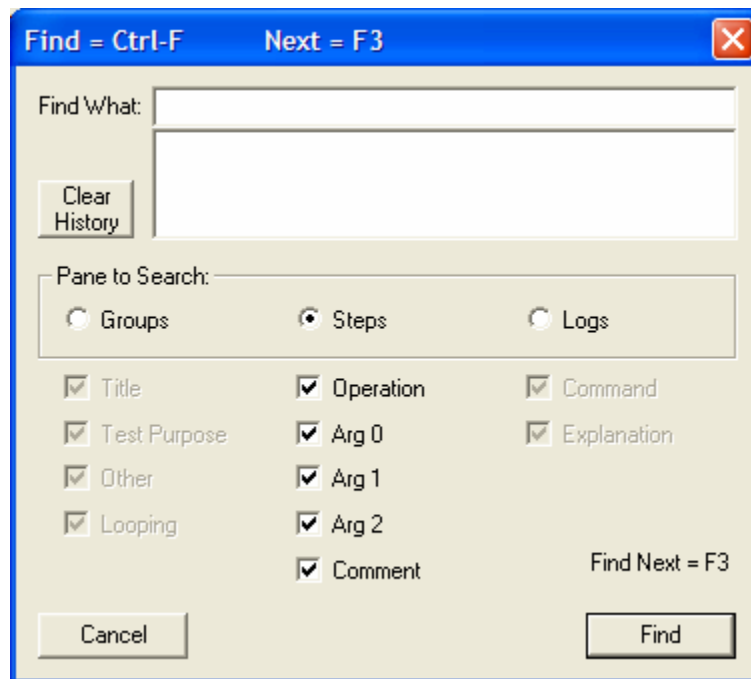
Open Test Database. The file extension is *.irt

Make Read Only disables writing of test results into session log. *Make Writable* reverses the action.



Edit

Performs the find function to locate specific measurements or actions in the program sequence.



Sequence

Execute program items starting at the designated point. The toolbar displays the available choices, from left to right:



Open

Search Attached Devices performs a scope search.

Single Step [F10] executes one instruction at a time.

Play Selected Group and Children [F5] executes all the checked items in the selected group.

Play Selected Group Continuously executes all checked items in the selected group until *Stop* is selected.

Stop stops execution (active when *Play* has been pressed).

Start a New Test Session

Result Log

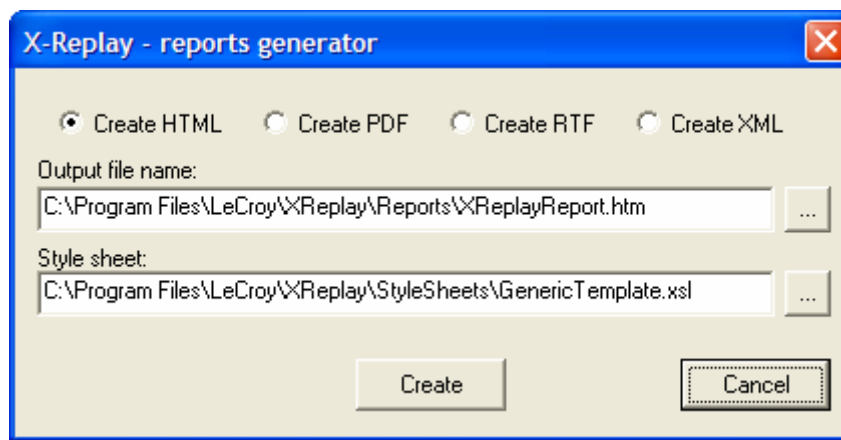
Clear Log removes all the previously recorded activity.

Export to File (ASCII) creates a comma-separated-values set of activity records.

Export to File (ASCII) Standard creates a text file phy tests checklist.logdump.txt

Report

Creates a report in one of three formats (html, pdf, or rtf) based on the specified report template Style Sheet (*.xsl or *.xslt). For Style Sheet, please select the supplied "XReplayReport.xsl". The "... " button to the right of the text entry field can be used to locate the file. On an SDA, it can be found in D:\Applications\HDMI.



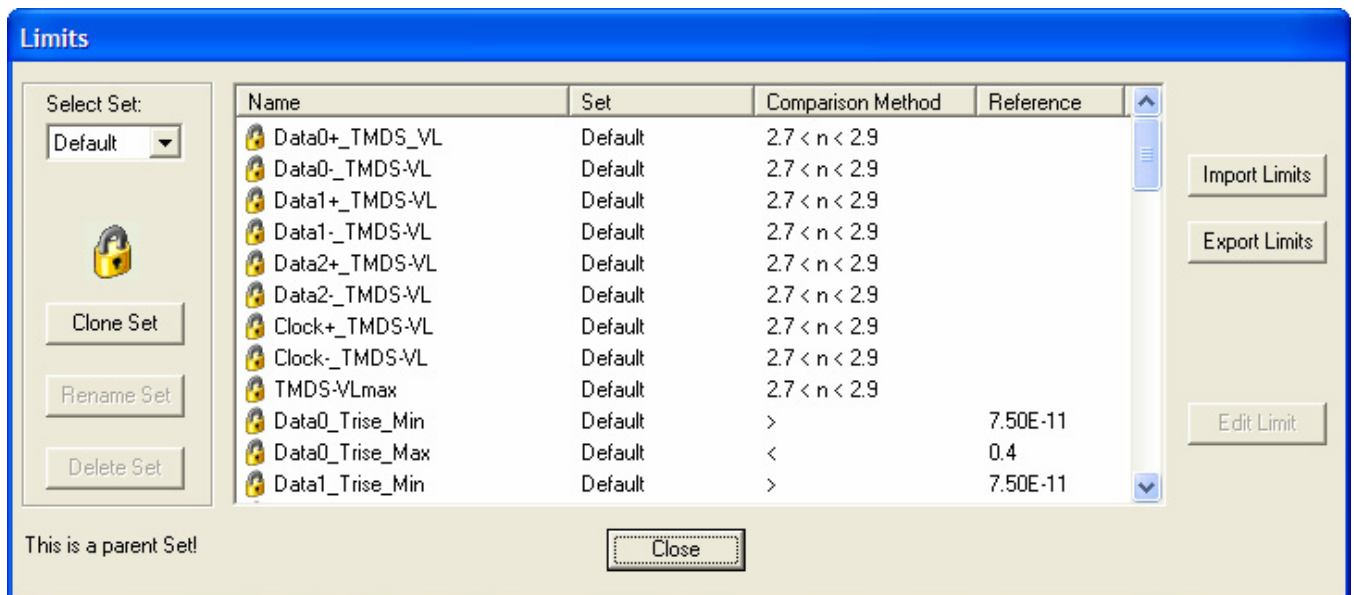
Options

Select the **Limits** option to allow the configuration of individual parameters pass/fail criteria, or to edit, rename, and save complete parameter sets.

Clone Set : You can create a new, named set of limits . Initially, the new set is the same as the set selected when selecting "Create Set".

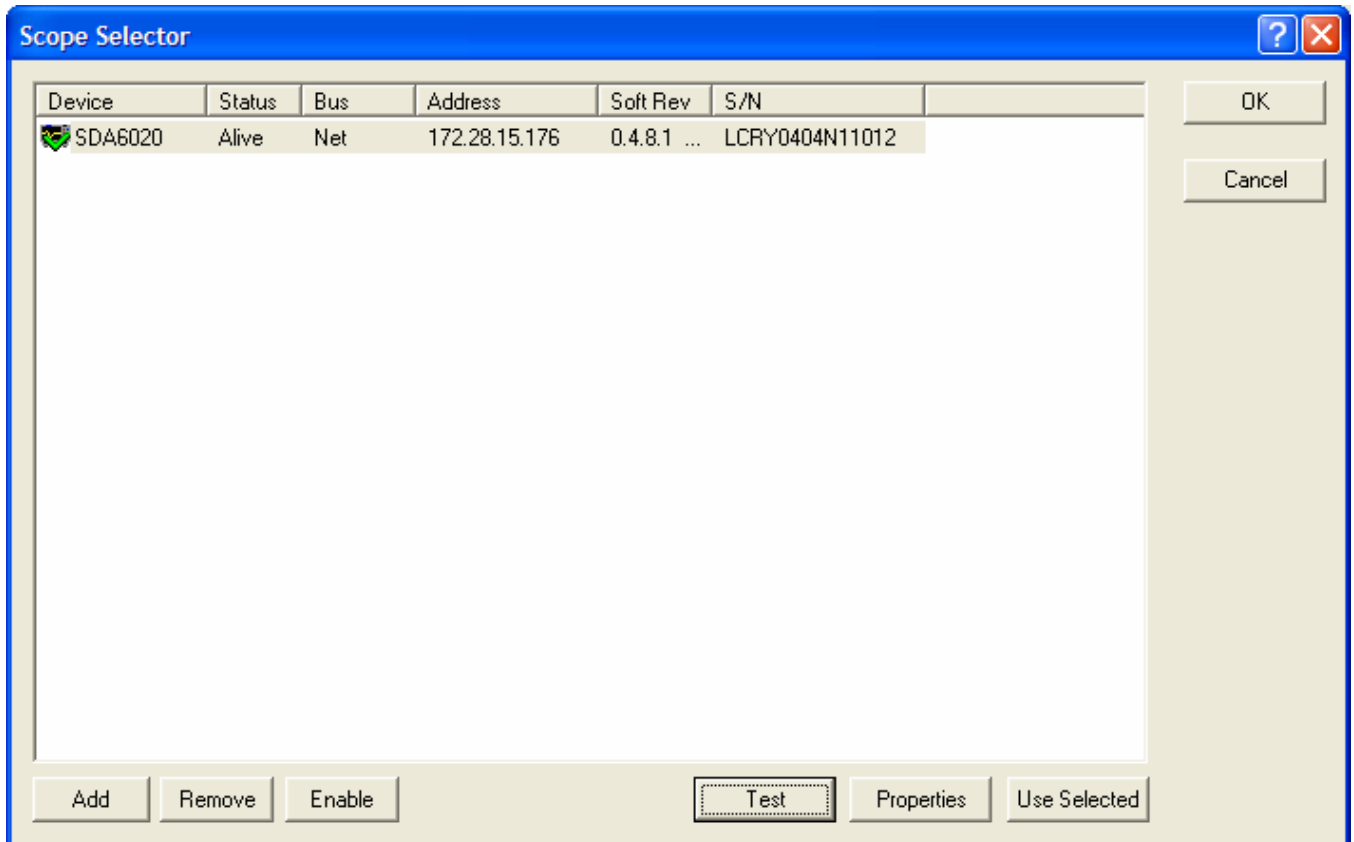
Edit Limit: Using Edit Limit allows limits to be changed to meet specific pass/fail criteria.

Import/Export Limits allows you to transfer entire parameter sets to csv-formatted (MS Excel) files

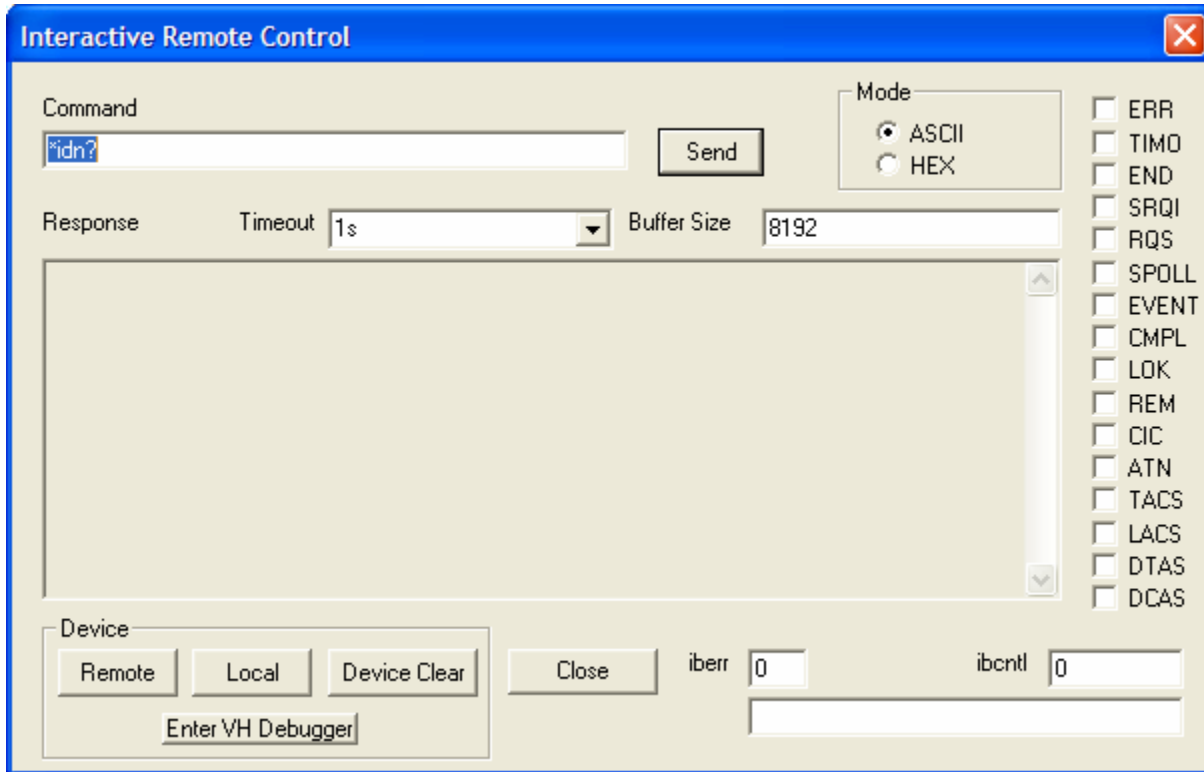


Devices

Scope Manager displays the devices connected to the host computer. There are two supported modes of attaching a device: GPIB or LAN.



Interactive Dialog supports sending and receiving of single line commands to the devices in the list.




View

Shows/hides toolbar and status bars.

Help

Help Topics

Running HDMI Tests

1. Verify proper signal input and perform all deskew and calibration procedures.
2. Run X-Replay application.
3. Select **File, Open Test Database**, and open the HDMI PHY Tests database.
4. Select the test groups to be executed. By default, all test groups and individual tests within each group are selected. However, you can uncheck any tests you do not want to run.
5. Set up configuration variables as required for the selected tests by right-clicking the variable and selecting **Change value**.
6. Select **Start a new test session**  and follow script prompts, as required.

Export to *.XML file – Database Access

X-Replay allows you to export entire test sessions in XML file format for subsequent access by database programs such as Microsoft Access. Most database programs have built-in XML import data capability. Please note that test sessions appear at the lower left portion of the X-Replay screen.

In order to create an XML record of the session data, right-click on the desired test session and select **Dump Log into XML**.

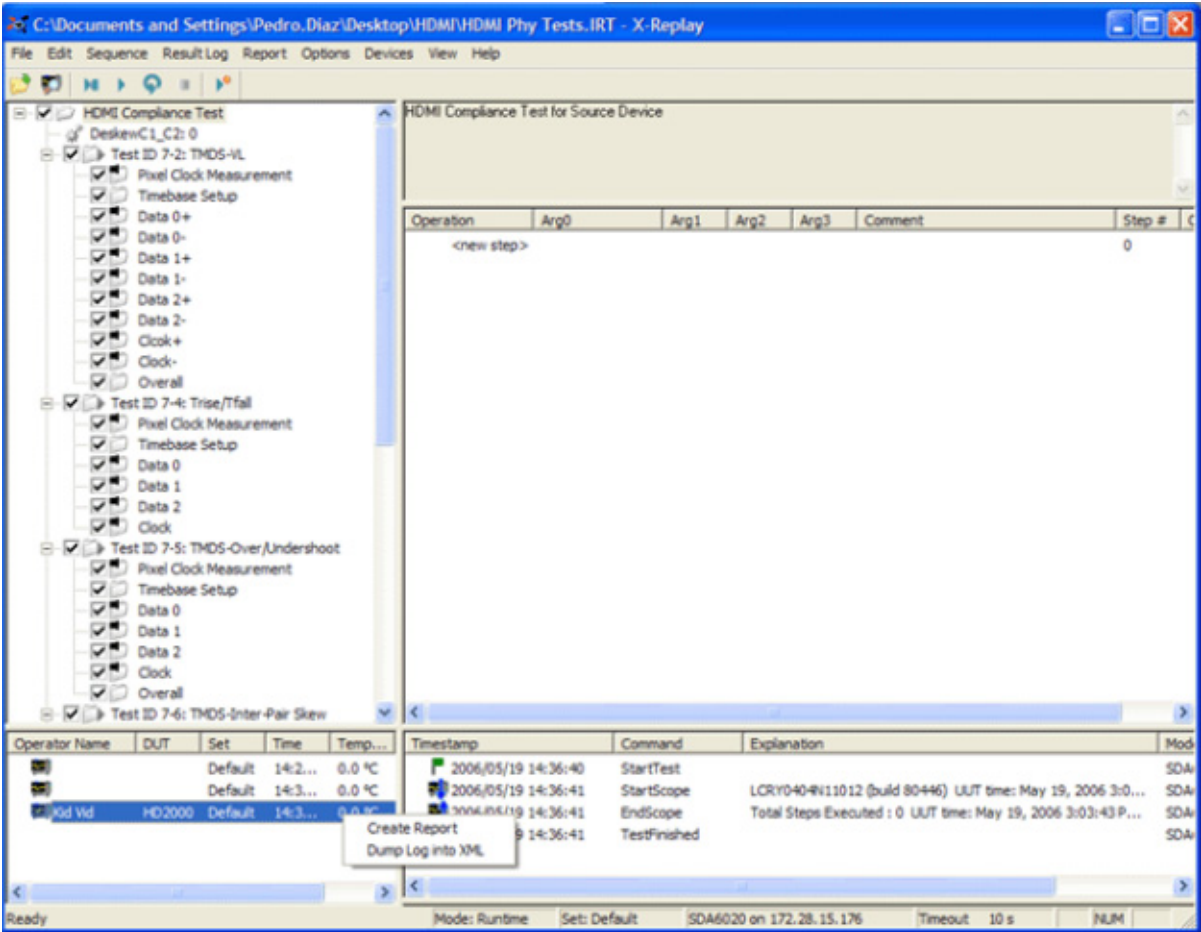
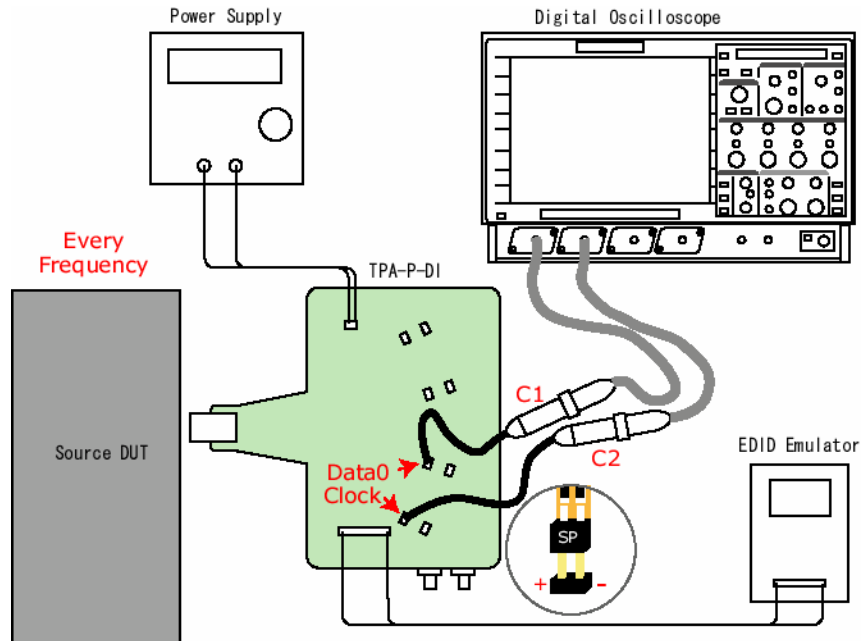


Figure 6. Saving test results in xml format

TEST SEQUENCE REFERENCE

General Information (Batch/Device Info)



Device Info

Purpose: Space provided to enter device-specific information (alphanumeric)

Available Entries:

Enter first Lane ID

Enter second Lane ID

HDMI Tests

Source Device Tests

Test ID 7-2: TMDS- V_L

Reference:

[HDMI: 4.2.4] HDMI Source TMDS Characteristics

“The Source shall meet the DC specification in Table 4-12 for all operating conditions specified in Table 4-11 when driving clock and data signals.”

[HDMI: Table 4-12] Source DC Characteristics at TP1

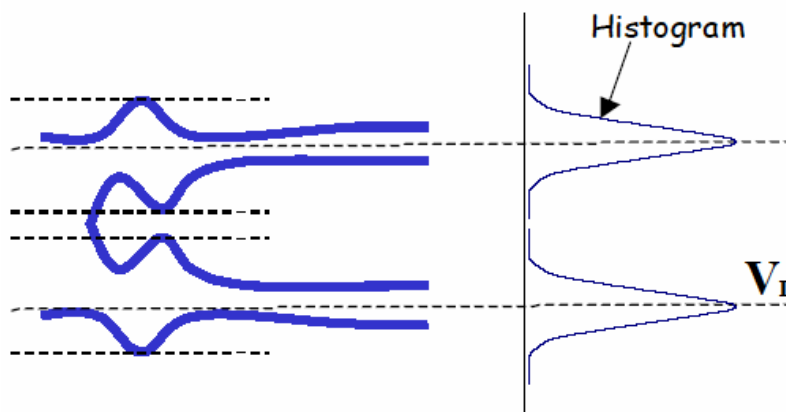
Single-ended low level output voltage, V_L

$(Avcc-600mV) \leq V_L \leq (Avcc-400mV)$

Test Objective:

Confirm that DC voltage levels on the HDMI link are within specified limits for each TMDS signal.

Required Test Method



Test Conditions:

Test Fixture	TF-HDMI TPA-P-SE
Probe	D350-ST/SP on Channel 1
Display Resolution	Lowest supported pixel clock frequency

Test procedure:

1. Connect TPA-P-SE adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with lowest supported pixel clock frequency.
3. Connect probe to TMDS_DATA0+.
4. Capture waveform more than $2T_{BIT}$ duration 10,000 times as segments in sequence trigger mode.
5. Calculate V_L using histogram method
If ($V_L > 2.900\text{ V}$) OR ($V_L < 2.700\text{ V}$) then FAIL
6. Repeat same procedure on all HDMI signal links.

Test ID 7-4: TMDS- T_{RISE} , T_{FALL}

Reference:

[HDMI: 4.2.4] HDMI Source TMDS Characteristics

“The Source shall meet the AC specification in Table 4-13 across all operating conditions specified in Table 4-11.”

[HDMI: Table 4-13] Source AC Characteristics at TP1

$$75\text{ ps} \leq \text{Rise Time or Fall Time} \leq 0.4 * T_{BIT}$$

Test Objective:

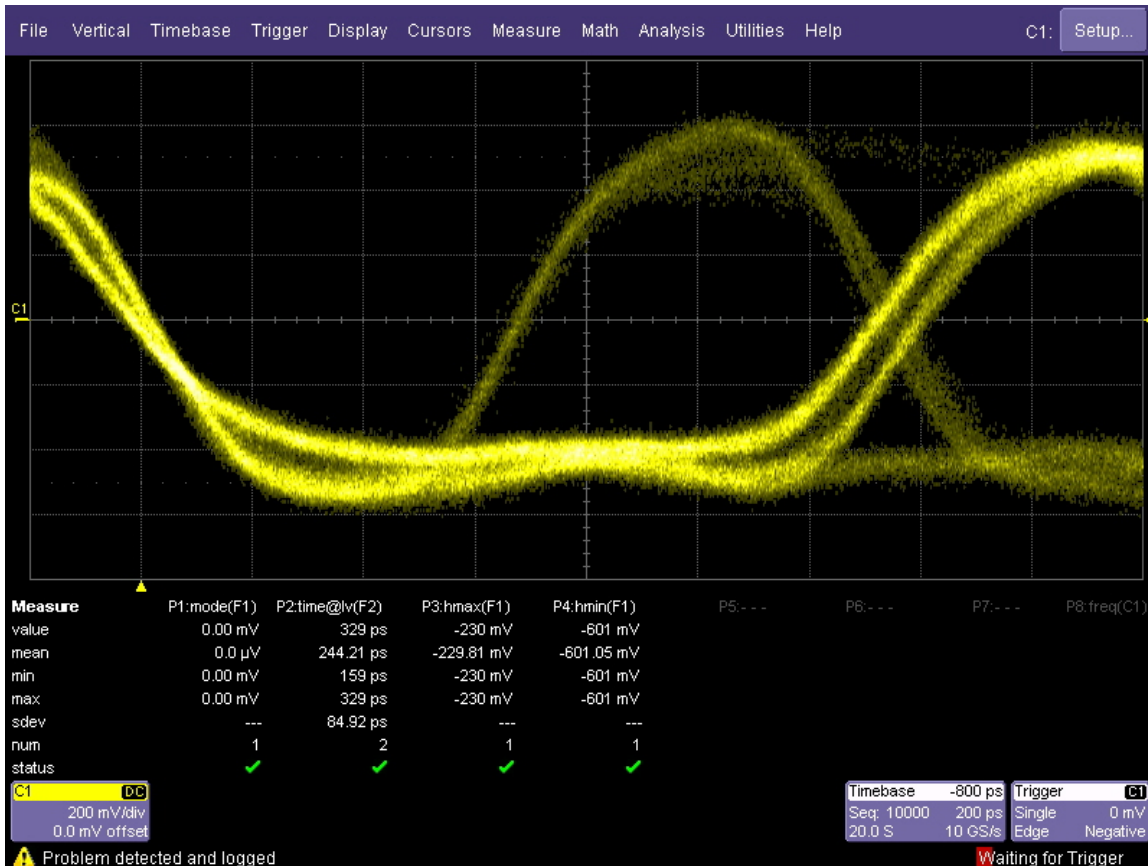
Confirm that the rise time and fall time on the TMDS differential signals fall within the limit of the specification.

Test Conditions:

Test Fixture	TF-HDMI TPA-P-DI
Probe	D350-ST/SP on Channel 1
Display Resolution	Highest supported pixel clock frequency

Test procedure:

1. Connect TPA-P-DI adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with highest supported pixel clock frequency
3. Connect probe to TMDS_DATA0.
4. Capture waveform more than 2TBIT duration 10,000 times as segments in sequence trigger mode.
If ($T_{RISE} < 75 \text{ ps}$) OR ($T_{RISE} > 0.4 * T_{BIT}$) then FAIL
If ($T_{FALL} < 75 \text{ ps}$) OR ($T_{FALL} > 0.4 * T_{BIT}$) then FAIL
5. Repeat same procedure on all HDMI differential signal links.



Test ID 7-5: TMDS Over/Undershoot

Reference:

[HDMI: 4.2.4] HDMI Source TMDS Characteristics

“The Source shall meet the AC specification in Table 4-13 across all operating conditions specified in Table 4-11.”

[HDMI: Table 4-13] Source AC Characteristics at TP1

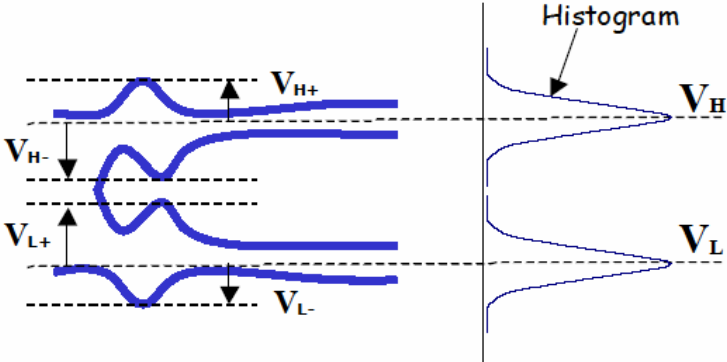
TMDS overshoot must be $\leq 15\%$ of $2 * V_{SWING}$

TMDS undershoot must be $\leq 25\%$ of $2 * V_{SWING}$

Test Objective:

Confirm that the differential TMDS signals do not have overshoot and undershoot beyond that allowed by the specification.

Required Test Method



Test Conditions:

Test Fixture	TF-HDMI TPA-P-DI
Probe	D350-ST/SP on Channel 1
Display Resolution	Lowest supported pixel clock frequency

Test Procedure:

1. Connect TPA-P-DI adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with lowest supported pixel clock frequency.
3. Connect probe to TMDS_DATA0.
4. Capture waveform more than 2TBIT duration 10,000 times as segments in sequence trigger mode.
 If Overshoot > 15% of $2 \cdot V_{SWING}$ then FAIL
 If Undershoot > 25% of $2 \cdot V_{SWING}$ then FAIL
5. Repeat same procedure on all HDMI differential signal links.

Test ID 7-6: TMDS Inter-Pair Skew

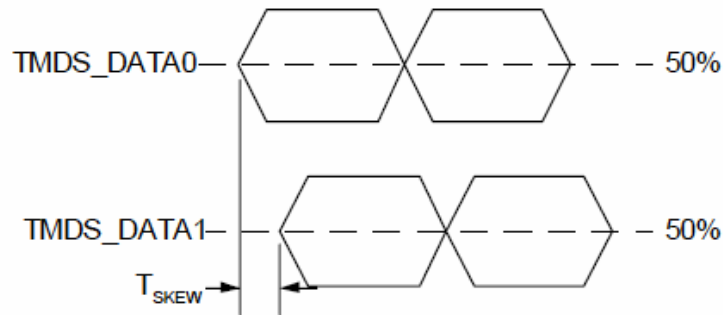
Reference:

- [HDMI: 4.2.4] HDMI Source TMDS Characteristics
 “The Source shall meet the AC specification in Table 4-13 across all operating conditions specified in Table 4-11.”
- [HDMI: Table 4-13] Source AC Characteristics at TP1
 Inter-Pair skew must be exceed $0.20 \cdot T_{PIXEL}$.

Test Objective:

Confirm that any skew between the differential pairs in the TMDS portion of the HDMI link does not exceed the limits in the specification.

Required Test Method



Test Conditions:

Test Fixture	TF-HDMI TPA-P-DI
Probe	Two of D350-ST/SPs on Channel 1 and Channel 2
Display Resolution	Highest supported pixel clock frequency

Test Procedure:

1. Connect TPA-P-DI adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with highest supported pixel clock frequency.
3. Connect probe to TMDS_DATA0 and TMDS_DATA1.
4. Capture waveform more 1M waveform as singleshot
If (skew > 0.15*TBIT) then FAIL
5. Repeat same procedure on all combination of HDMI differential signal links.

Test ID 7-7: TMDS Intra-Pair Skew

Reference:

[HDMI: 4.2.4] HDMI Source TMDS Characteristics

“The Source shall meet the AC specification in Table 4-13 across all operating conditions specified in Table 4-11.”

[HDMI: Table 4-13] Source AC Characteristics at TP1

Intra-Pair skew must be exceed $0.15 * T_{PIXEL}$.

Test Objective:

Confirm that any skew within any one differential pair in the TMDS portion of the HDMI link does not exceed the limits in the specification.

Test Conditions:

Test Fixture	TF-HDMI TPA-P-SE
Probe	Two of D350-ST/SPs on Channel 1 and Channel 2
Display Resolution	Highest supported pixel clock frequency

Test procedure:

1. Connect TPA-P-SE adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with highest supported pixel clock frequency.
3. Connect probe to TMDS_DATA0+ and TMDS_DATA0-.

4. Capture waveform more 1M waveform as single shot.
If (skew > 0.15*TBIT) then FAIL
5. Repeat same procedure on all HDMI differential signal links.

Test ID 7-8: TMDS Clock Duty Cycle

Reference:

[HDMI: 4.2.4] HDMI Source TMDS Characteristics

“The Source shall meet the AC specification in Table 4-13 across all operating conditions specified in Table 4-11.”

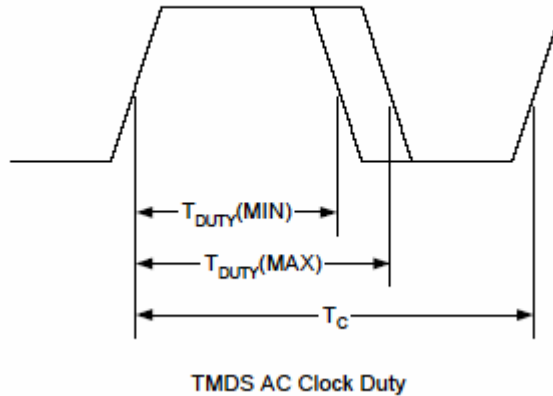
[HDMI: Table 4-13] Source AC Characteristics at TP1

Clock duty cycle must be at least 40% and not more than 60%.

Test Objective:

Confirm that the duty cycle of the differential TMDS clock does not exceed the limits in the specification.

Required Test Method



Test Conditions:

Test Fixture	TF-HDMI TPA-P-DI
Probe	Two of D350-ST/SP on Channel 1
Display Resolution	Highest supported pixel clock frequency

Test procedure:

1. Connect TPA-P-DI adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with highest supported pixel clock frequency.
3. Connect probe to TMDS_Clock.
4. Capture waveform 2M points as single shot.
If ($T_{DUTY(MIN)} < 40%$) OR ($T_{DUTY(MAX)} > 60%$) then FAIL

Test ID 7-9: TMDS Clock Jitter

Reference:

[HDMI: 4.2.4] HDMI Source TMDS Characteristics

“The Source shall meet the AC specification in Table 4-13 across all operating conditions specified in Table 4-11.”

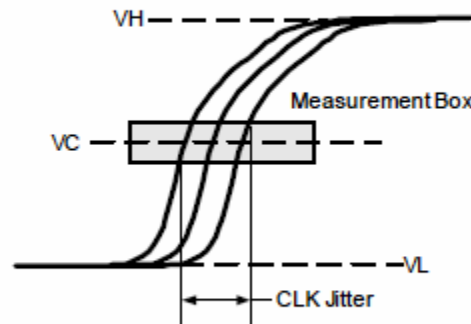
[HDMI: Table 4-13] Source AC Characteristics at TP1

TMDS differential clock jitter must not exceed $0.25 * T_{BIT}$, relative to the ideal Recovery Clock.

Test Objective:

Confirm that the TMDS Clock does not carry excessive jitter.

Required Test Method



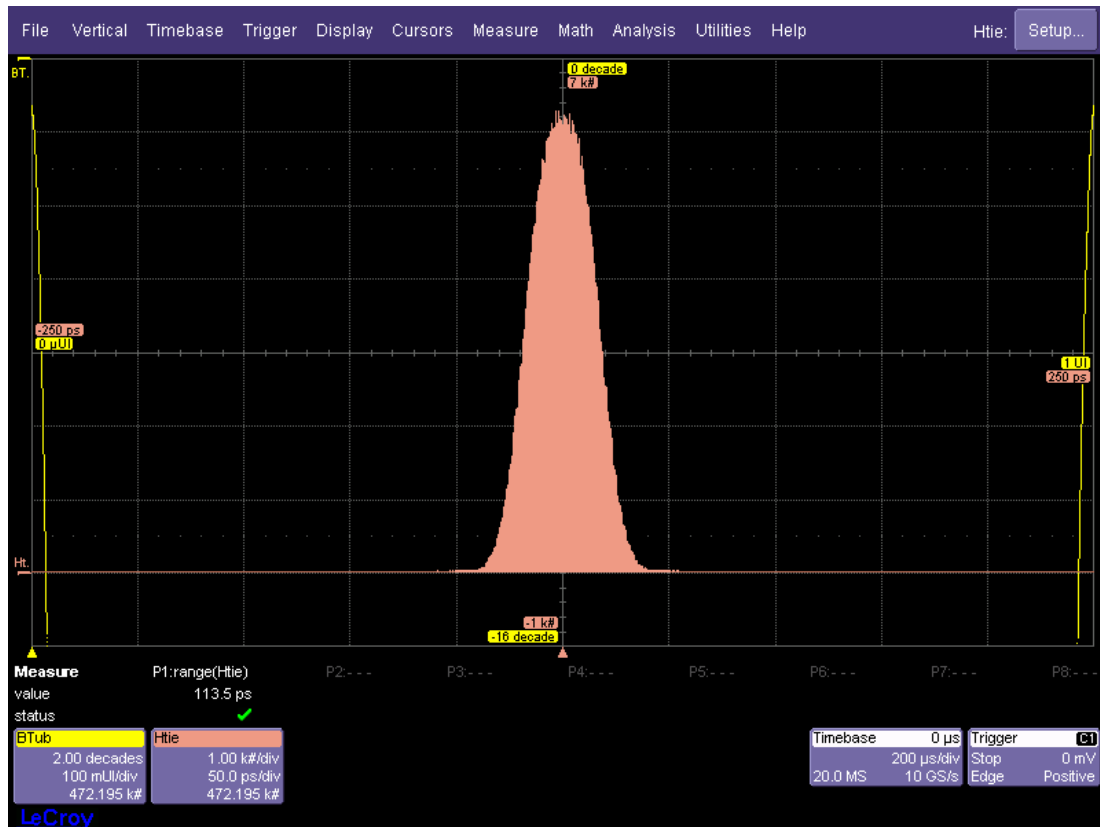
TMDS AC Clock Jitter

Test Conditions:

Test Fixture	TF-HDMI TPA-P-DI
Probe	Two of D350-ST/SP on Channel 1
Display Resolution	Highest supported pixel clock frequency

Test procedure:

1. Connect TPA-P-DI adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with highest supported pixel clock frequency.
3. Connect probe to TMDS_Clock.
4. Capture waveform 16M points as single shot.
If Clock jitter exceeds $0.25 * T_{BIT}$ -> then FAIL.



Test ID 7-10: TMDS Data Eye Diagram

Reference:

[HDMI: 4.2.4] HDMI Source TMDS Characteristics

“For all channel under all operating conditions specified in Table 4-11...the Source shall have output level at TP1, which meet the normalized eye diagram requirements of Figure 4-12.”

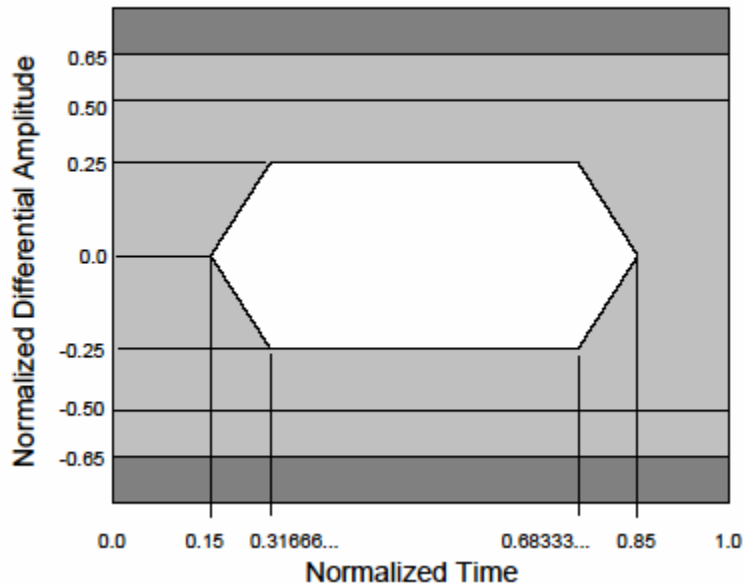
[HDMI: Figure 4-12] Normalized Eye Diagram Mask at TP1

Refer to the [HDMI: Figure 4-12] “Normalized Eye Diagram Mask at TP1 for Source Requirements”.

Test Objective:

Confirm that the differential signal on each TMDS differential data pair has an “eye opening” (region of valid data) that meets or exceeds the limits of eye opening in the specification.

Required Test Method

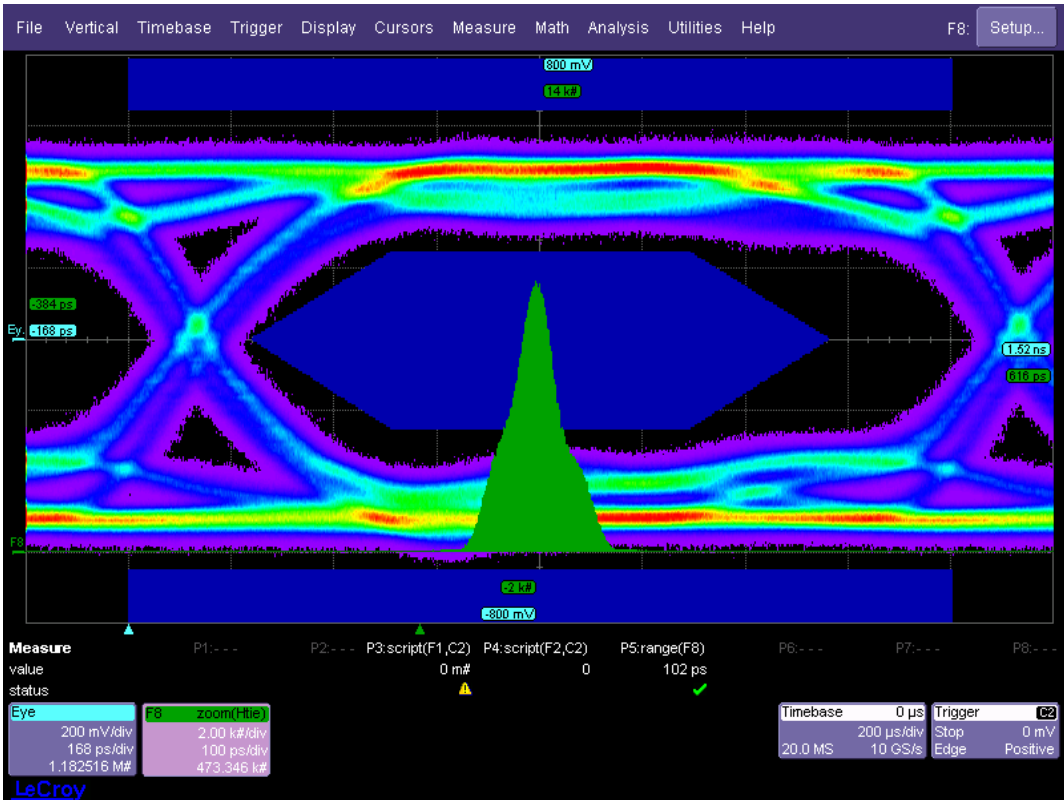


Test Conditions:

Test Fixture	TF-HDMI TPA-P-DI
Probe	Two of D350-ST/SPs on Channel 1 and Channel 2
Display Resolution	All supported pixel clock frequency

Test Procedure:

1. Connect TPA-P-DI adapter to Source DUT HDMI output connector.
2. Set the Source DUT to output a video format with Lowest supported pixel clock frequency.
3. Connect probe from C1 to TMDS_DATA0 and from C2 to TMDS_Clock.
4. Capture waveform 16M points as single shot.
5. Compare the data eye to the TP1 Eye Diagram Mask.
6. Shift the mask left until one of the left-side corners touches the waveform.
If any other part of the waveform touches or crosses into the data eye then FAIL
If data jitter > 0.3*TBIT then FAIL
7. Repeat all HDMI differential signal links with all supported pixel clock frequency.



§ § §



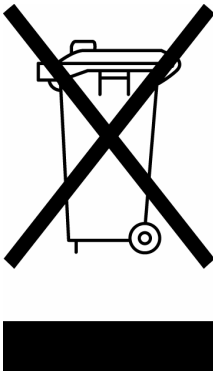
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