Online Help

Tektronix

TDSHT3
HDMI Compliance Test Software

077-0024-02

Adapted from TDSHT3 HDMI Compliance Test Software Online Help, Version 3.3.0

This document applies to TDSHT3 version 3.3.0 and above, which supports HDMI CTS 1.3 specifications.

www.tektronix.com

TDSHT3 HDMI Compliance Test Software Version 3.3.0, 077-0024-02.

Contacting Tektronix

Tektronix, Inc.
14200 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

For product information, sales, service, and technical support:

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

Warranty 9(b)

Tektronix warrants that the media on which this software product is furnished and the encoding of the programs on the media will be free from defects in materials and workmanship for a period of three (3) months from the date of shipment. If any such medium or encoding proves defective during the warranty period, Tektronix will provide a replacement in exchange for the defective medium. Except as to the media on which this software product is furnished, this software product is provided “as is” without warranty of any kind, either express or implied. Tektronix does not warrant that the functions contained in this software product will meet Customer’s requirements or that the operation of the programs will be uninterrupted or error-free.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period. If Tektronix is unable to provide a replacement that is free from defects in materials and workmanship within a reasonable time thereafter, Customer may terminate the license for this software product and return this software product and any associated materials for credit or refund.

THIS WARRANTY IS GIVEN BY TEKTRONIX IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TEKTRONIX AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TEKTRONIX’ RESPONSIBILITY TO REPLACE DEFECTIVE MEDIA OR REFUND CUSTOMER’S PAYMENT IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TEKTRONIX AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TEKTRONIX OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Table of Contents

About the TDSHT3 HDMI Compliance Test Software

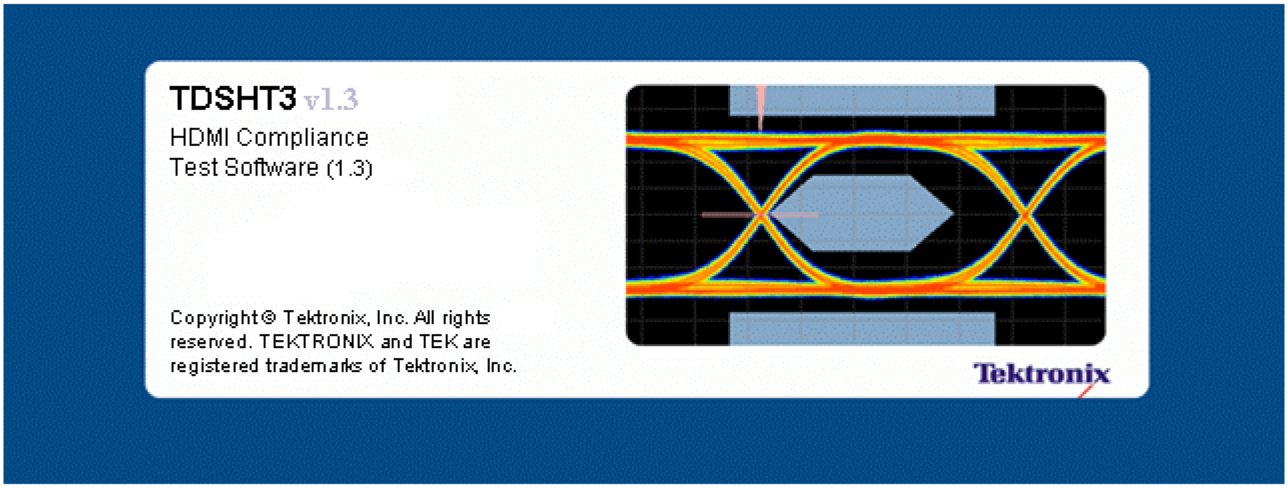


Figure 1: TDSHT3 HDMI Compliance Test Software

Note: *You will be provided with two TDSHT3 applications, one supporting CTS 1.2a specification, displayed as TDSHT3, and the other supporting CTS 1.3a specification, displayed as TDSHT3v1.3. Both applications can be loaded onto the oscilloscope but you can run only one application at a time.*

The TDSHT3 HDMI Compliance Test Software is a High Definition Multimedia Interface (HDMI) compliance test solution. This software helps the test, validation, and design engineers perform both HDMI physical layer validation and compliance testing. The TDSHT3 HDMI Compliance Test Software provides credible test results in conformance with the HDMI standards and test specifications.

The TDSHT3 HDMI Compliance Test Software offers automated tests for:

Source

- Clock-Data Tests: Eye Diagram (Test ID 7-10), Duty Cycle (Test ID 7-8), Rise Time (Test ID 7-4), Fall Time (Test ID 7-4), Clock Jitter (Test ID 7-9),
- Data-Data Tests: Inter-Pair Skew (Test ID 7-6)
- Single-Ended Tests: Intra-Pair Skew (Test ID 7-7), Low Amplitude + (Test ID 7-2), Low Amplitude - (Test ID 7-2)

Sink

- Differential Tests: Min/Max-Diff Swing Tolerance (Test ID 8-5), Jitter Tolerance (Test ID 8-7)
- Single-Ended Tests: Intra-Pair Skew (Test ID 8-6)

Cable

- Differential Tests: Eye Diagram (Test ID 5-3)

The software offers automatic one-button testing that ensures faster validation with higher reliability.

The software supports only single-link HDMI device resolutions.

Introduction

Conventions

This document uses the following conventions:

- When steps require a sequence of selections by using the software interface, the '>' delimiter marks each transition between a menu and an option, for example, File > Minimize.
- Device under Test (DUT) refers to the HDMI Source, Sink, or Cable being tested.
- Two or more adjacent hyperlinks are separated by '|.'

The software uses the following convention:

- Three dots '...' next to any command means that the command opens a dialog box, which requires input.

Feedback

Tektronix values your feedback on our products. To help us serve you better, please send us your suggestions, ideas, or comments on the TDSHT3 HDMI Compliance Test Software.

Direct your feedback via e-mail to HDMIFeedback@tek.com or FAX at (503) 627-5695 and include the following information. Please be as specific as possible.

General information

- Instrument model number and hardware options, if any
- Probes used
- Your name, company, mailing address, phone number, FAX number, e-mail id
- Please indicate if you would like to be contacted by Tektronix about your suggestions or comments

Program specific information

- Software version number
- Description of the problem such that technical support can duplicate the problem
- The instrument setup file of the oscilloscope and the application are also required to identify the problem
- If possible, save the waveform on which you are performing the test as a .wfm file

Note*: To know the software version number, click Help > About in the software.*

Once you have gathered this information, you can contact technical support by e-mail. When you use e-mail, be sure to type in the subject line 'TDSHT3 HDMI Compliance Test Software Problem,' and then attach the .wfm files. You can then attach the file to your e-mail (depending on the capabilities of your e-mail editor).

Updates through the Web Site

Periodic software upgrades may be available.

To check for upgrades:

1. Go to the Tektronix Web site (www.tektronix.com).
2. Click Software and Drivers to link to the Software and Firmware Finder Web page.
3. Enter the product name 'TDSHT3 HDMI Compliance Test Software' to find available software upgrades.

Getting Started

Compatibility

For information on oscilloscope compatibility, refer to the *Optional Applications Software on Windows-Based Oscilloscopes Installation Manual*, Tektronix part number 071-1888-XX. The manual is available as a PDF file.

Recommended Accessories

Supported Probes

- P7313SMA - 13 GHz recommended differential probe

The following probes can be used with old fixtures except for P7350SMA.

- P7350 - 5 GHz differential probe
- P7350SMA - 5 GHz differential probe
- P7330 - 4 GHz differential probe
- P6330 - 4 GHz differential probe
- P7380 - 8 GHz differential probe
- P7240 - 4 GHz single-ended probe

Supported Test Fixtures

- EFF-HDMI-TPA-R, available from Efficere Technologies
- EFF-HDMI-TPA-P, available from Efficere Technologies

The following test fixtures can only work for limited HDMI resolutions.

- HDMI TPA-P-DI
- HDMI TPA-P-SE
- HDMI TPA-P-TDR
- HDMI-TPA-R-DI
- HDMI-TPA-R-SE
- HDMI-TPA-R-TDR

Requirements and Restrictions

Do not change the oscilloscope settings when the test runs. If you change the settings when the test runs, the software may give abnormal test results.

Prerequisites

- TekVisa must be installed on the oscilloscope. If you do not have TekVisa, you can download it from http://www.tek.com/site/sw/search/1,1058,00.html
- If the signal is not connected and the noise level is less than 50 mV, then the software detects and displays a message such as Improper Waveform.

For better and reliable results

- Before you run any test, calibrate the probes and oscilloscope for Signal Path Compensation. On the oscilloscope menu bar, click Utilities > Instrument Calibration, and then click Calibrate to calibrate the oscilloscope.
- If the signal is not connected and the noise level is less than 50 mV, then the software detects and gives a message such as Invalid Signal.

Default Layouts and Templates

Templates under C:\TekApplications\TDSHT3v1-3\ReportGenerator\Templates

Source Clock-Data Tests

- Source_Clock_Data_Eye.rgt
- Source_Clock_Data_Jitter.rgt
- Source_Clock_Data_Max_Duty_Cycle.rgt
- Source_Clock_Data_Min_Duty_Cycle.rgt
- Source_Clock_Data_Clock_Rise_Time.rgt

- Source_Clock_Data_Data_Rise_Time.rgt
- Source_Clock_Data_Clock_Fall_Time.rgt
- Source_Clock_Data_Data_Fall_Time.rgt

Source Data-Data Tests

Source_Data_Data_Inter_Pair_Skew.rgt

Source Single-Ended Tests

- Source_SingleEnded_Intra_Pair_Skew.rgt
- Source_SingleEnded_Low_Amplitude+.rgt
- Source_SingleEnded_Low_Amplitude-.rgt

Cable

- Cable_EyeDiagram_Eye_TP1.rgt
- Cable_EyeDiagram_Jitter_TP1.rgt
- Cable_EyeDiagram_Eye_TP2.rgt
- Cable_EyeDiagram_Jitter_TP2.rgt

Sink Tests

- Sink_Min_Max_Diff_Swing.rgt
- Sink_Intra_Pair_Skew.rgt
- Sink_Jitter_Tol.rgt

Layouts under C:\TekApplications\TDSHT3v1-3\ReportGenerator\Layouts

- Sink.rpl
- Source.rpl
- Cable.rpl

Default Settings

Table 1: Default Settings

Parameter	Selection	Default Setting
Select	Flow Controls	Select
	Device Type Tab	Source (Clock-Data Tests)
	Source Test	Eye Diagram
	Sink Test	Min/Max-Diff Swing Tolerance (Differential)
	Cable Test	Eye Diagram
Source Configuration	Clock Input	Ch1
	Data Input	Ch2
CRU	Clock	PLL
Others	Ref Level Units	Percentage
Clock/Data Selection	Clock	Ch1
	Data	Ch2
Sink Configuration	DTG file path	C:\TekApplications\TDSHT3v1-3\ComplianceTestPatterns\PC\1920X1080i 50Hz 8 Bit Gray RGB PC V3-3.dtg
	Clock output from DTG	A1
	Data0 output from DTG	B1
	Data 1 output from DTG	B2
	Data 2 output from DTG	C1
Signal Sources	Signal Sources Tab	DTG AWG Unavailable AFG Unavailable
	Control Type	GPIB
	Board Type	GPIB0
	GPIB Address (Primary)	1
	GPIB Address (Secondary)	0
View Waveform	Clock/Data Waveforms	

Table 1: Default Settings (Cont.)

Parameter	Selection	Default Setting
Result Summary	View Jitter Plot	Unavailable
	View Eye Plot	Unavailable
Result Details	View Jitter Plot	Unavailable
	View Eye Plot	Unavailable
	Result Statistics	Unavailable
Deskew	External	From Input Setup - Input - Ch1
		From Input Setup - Hysteresis - 10%
		From Input Setup - Ref Level - 50%
		To Input Setup - Input - Ch2
		To Input Setup - Hysteresis - 10%
		To Input Setup - Ref Level - 50%
		Slope - Rise
		Slope - # of Slopes - 1
	Internal	From Input Setup - Input - Ch1
		To Input Setup - Input - Ch2
		Slope - Rise
Report Generator	Generate Report Tab	Select Report - C:\TekApplications\ TDSHT3v1-\ReportGenerator\ Layouts\Source.rpl
	Define Report Layout Tab	Edit Report Layout - C:\TekApplications\ TDSHT3v1-3\ReportGenerator\Layouts\ Source_Clock_Data_Eye_Diagram.rpl
	Define Test Template Tab	C:\TekApplications\ TDSHT3v1-3\ReportGenerator\Templates\ Source_Clock_Data_Eye.rgt
Report Configuration pane	Pair (CK, D)	Data 0
	Resolution	1920*1080i
	Refresh Rate	60Hz
	Report File	C:\TekApplications\ TDSHT3v1-3\ReportGenerator\Layouts
	Enable Preview	Selected
Report Configuration Advanced	Device ID	TDSHT3v1-3 - 001
	Device Details	HDMI Device
	Pair (Single-Ended)	Data 0
	Pair (D, D)	Data 0 - Data 1
	Use oscilloscope settings for image report	Selected

How to Use the Software

How to Start the Software

When you start the software, a warning message box may appear.

Figure 2: Warning Message box

This happens due to the following reasons:

1. **Oscilloscope bandwidth is less than 8 GHz**: For higher resolution HDMI signals, you need at least an 8 GHz oscilloscope. Your oscilloscope bandwidth is less than 8 GHz.

2. **Maximum available record length for two channels:** For HDMI compliance testing, you need at least 16 M record length in two channels. This 16 M record length is installed in the following oscilloscopes:

   - Option 4M and above in TDS series oscilloscopes
   - Option 2Xl and above in DPO series oscilloscopes

   If these options are not available (installed) in the oscilloscope, the software will run the Eye Diagram and Jitter measurements with the maximum available length.

Depending on the type of oscilloscope that you have, you can start the software in different ways.

1. For supported B-series oscilloscopes, select App > HDMI Compliance Test Software(1.3).

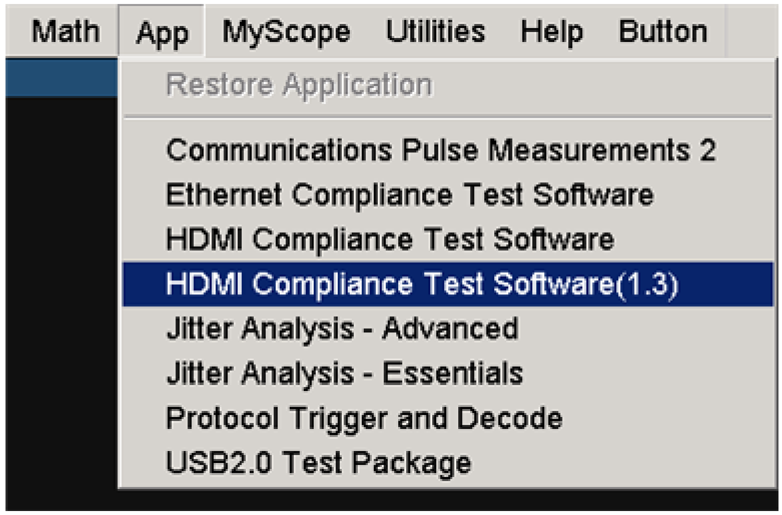


Figure 3: Run Application (for B-series oscilloscopes)

2. For TDS7000-series oscilloscopes, select File > Run Application > HDMI Compliance Test Software(1.3).

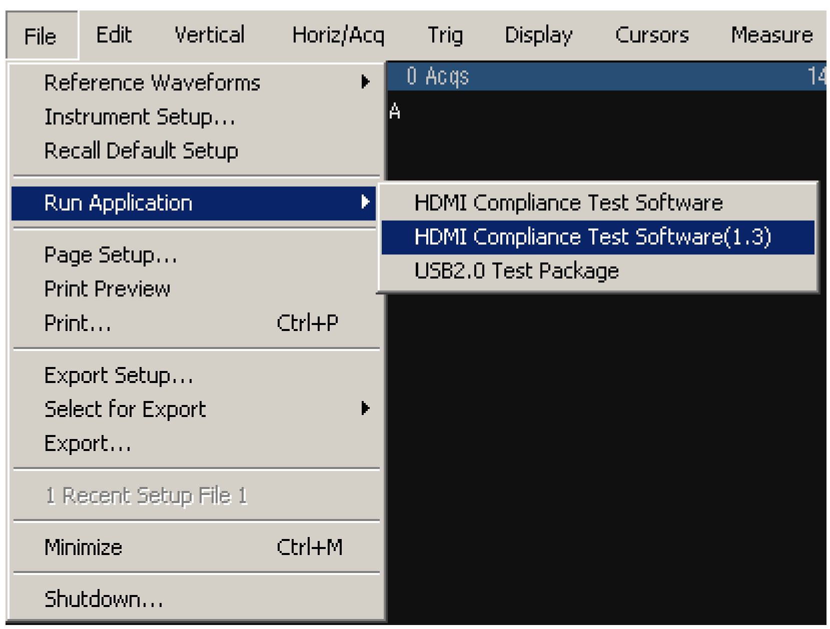


Figure 4: Run Application (for TDS7000-series oscilloscopes)

3. For DPO70000-series and DSA70000-series oscilloscopes, select Analyze > HDMI Compliance Test Software(1.3).

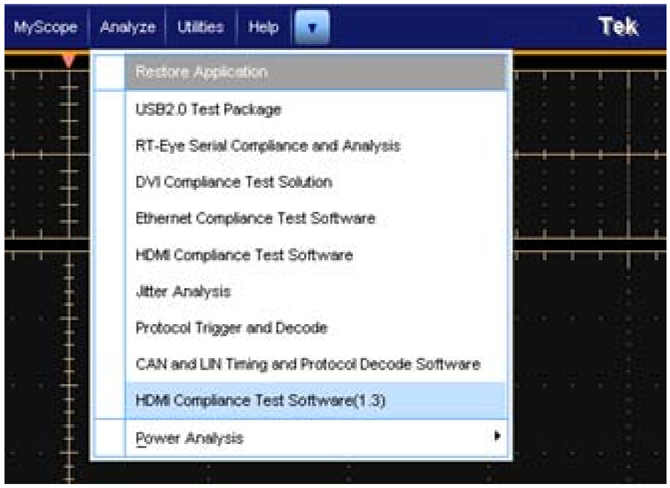


Figure 5: Run Application (for DPO70000/DSA70000 series oscilloscopes)

4. A splash screen indicates that the software loading is in progress.

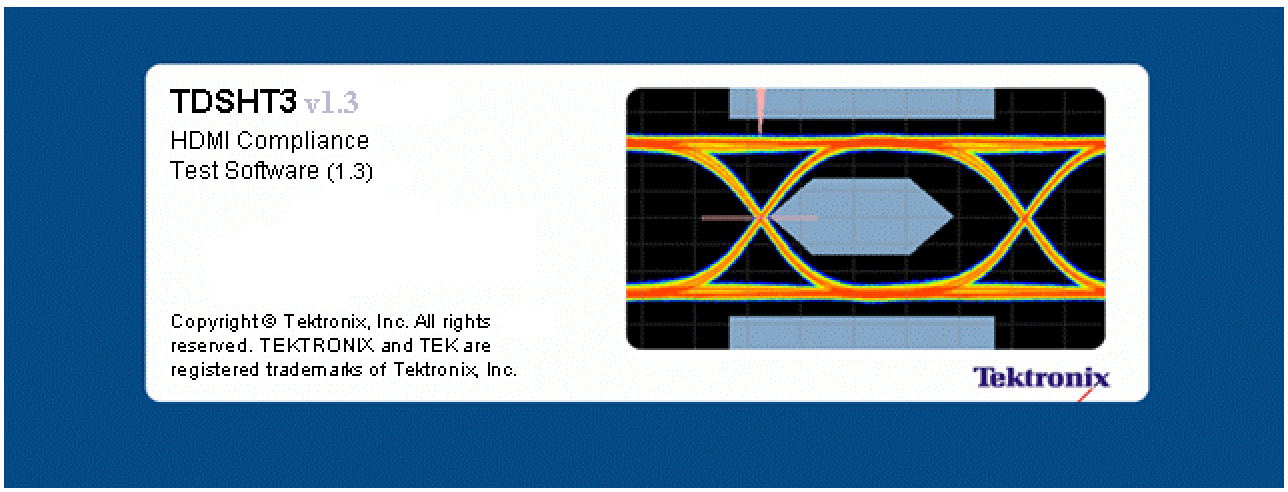


Figure 6: Splash screen indicating software loading in progress

5. The oscilloscope display resizes to fit in the upper part of the screen. The lower part of the oscilloscope screen displays the TDSHT3 HDMI Compliance Test Software.

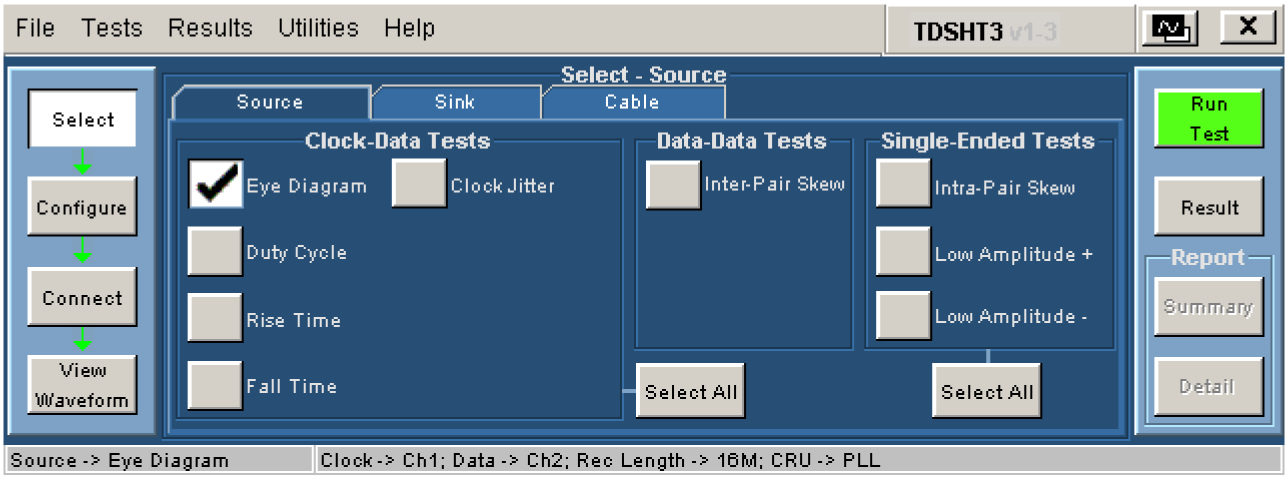


Figure 7: Application Interface

6. The software is automatically set to its default settings.

7. If you gain access to the oscilloscope functions, then the oscilloscope display appears full screen and the TDSHT3 HDMI Compliance Test Software recedes to the background.

How to Minimize and Maximize the Software

The software appears even when you minimize the oscilloscope display.

- To minimize the window, click File > Minimize. The TDSHT3 HDMI Compliance Test Software window minimizes to the Windows taskbar. The upper part of the screen has the oscilloscope display and the lower part of the screen has the desktop.
- To restore the minimized window to its previous size, click its taskbar button.
- To hide the window, click Hide on the top-right of the software window.

***Note**: If you click Hide, the TDSHT3 HDMI Compliance Test Software window goes to the background and the oscilloscope fills the display.*

How to Return to the Software

When you gain access to the oscilloscope functions, the oscilloscope fills the display. You can gain access to the oscilloscope functions in the following ways:

- Choose either the menu bar or the toolbar mode on the oscilloscope, and then gain access to the menus.
- Click App > Restore Application for B-series, click Analyze > Restore Application for DPO70000/DSA70000 series, or click APP on the top right of the TDS7000 series oscilloscope display to restore to the software.

How to Exit the Software

To quit the software:

- On the menu bar, click File > Exit.
- The Exit dialog box appears.

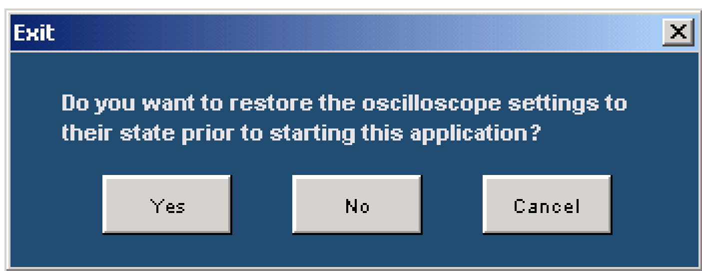


Figure 8: Exit dialog box

- Click either Yes, No, or Cancel. Yes is selected by default. When the software runs, it automatically changes some oscilloscope settings. When you quit the software, you can choose whether to retain these settings or restore the previous settings.

***Note**: Using other methods to quit the software may result in an abnormal termination of the software.*

Software Folders and File Names

The TDSHT3 HDMI Compliance Test Software uses file name extensions to identify the file type. The following table lists the default folder names and their purpose:

Table 2: Software Folders and File Names

Folder	Purpose
C:\TekApplications\TDSHT3v1-3	This is the software data folder.
C:\TekApplications\TDSHT3v1-3\Temp	This folder stores the software intermediate files.
C:\TekApplications\TDSHT3v1-3\Images	This folder stores all the images.
C:\TekApplications\TDSHT3v1-3\Data	This folder stores all the software data.
C:\TekApplications\TDSHT3v1-3\setup	This folder stores all the save and recall files.
C:\TekApplications\ TDSHT3v1-3\Demo Tools	This folder stores the demo waveforms.
C:\TekApplications\TDSHT3v1-3\Report Generator	This folder stores the report generator files, layouts, and templates.

Shortcut Keys

Table 3: Shortcut Keys

Menu	Shortcut Key
File	Alt+F
Tests	Alt+T
Results	Alt+R
Utilities	Alt+U
Help	Alt+H
File > Recall Compliance Default	Alt+F+D
File > Recall	Alt+F+R
File > Recall > First Recent	Alt+F+E+1
File > Recall > Second Recent	Alt+F+E+2
File > Recall > Third Recent	Alt+F+E+3
File > Recall > Fourth Recent	Alt+F+E+4
File > Save	Alt+F+S
File > Recall Recent	Alt+F+E
File > Preferences	Alt+F+P

Table 3: Shortcut Keys (Cont.)

Menu	Shortcut Key
File > Preferences > Position Eye Mask in Center	Alt+F+P+M
File > Preferences > Acquisition Alert Message	Alt+F+P+A
File > Preferences > Jitter Tolerance (No calibration)	Alt+F+P+J
File > Preferences > Single Ended (With 50ohm term)	Alt+F+P+S
File > Minimize	Alt+F+M
File > Exit	Alt+F+X
Tests > Select	Alt+T+S
Tests > Select > Source	Alt+T+S+S
Tests > Select > Sink	Alt+T+S+K
Tests > Select > Cable	Alt+T+S+C
Tests > Configure	Alt+T+C
Tests > Connect	Alt+T+N
Tests > View Waveform	Alt+T+V
Results > Summary	Alt+R+S
Results > Details	Alt+R+D
Utilities > Report Generator	Alt+U+R
Utilities > Deskew	Alt+U+D
Utilities > DTG Pattern List	Alt+U+P
Help > Help Topics	Alt+H+T
Help > About HDMI	Alt+H+A

Error Codes

The following table lists the error codes, their descriptions, and the possible solutions:

Table 4: Error Codes

Error Code	Error Message	Description	Possible Solution
101	Input is Not Conn.	Both the selected sources are not connected.	Select valid channels (Ch1-Ch2, Ref1-Ref2) for at least clock/data source/data source (differential tests) or for input1/input2 (single-ended tests).
102	Conflict in the selection of inputs.	The sources that are selected for the two inputs are the same. The inputs clock source and data source for differential tests, input 1 and input 2 for single-ended tests.	Select different channel sources for input 1 and input 2 for single-ended tests and different channel sources for clock source and data source for differential tests.
103	The combination of Ref and Live input signals is not valid.	The software supports both Ref or both Live combinations of channels.	Select both ref channels or both live channels for clock and data sources.
104	Ref Wfm is not valid.	The software cannot switch on ref waveforms. Ref waveforms could be empty.	Recall the required ref waveform from the appropriate file on the oscilloscope.
110	Unable to acquire waveform.	The oscilloscope is not able to acquire the signal and trigger.	Ensure that the software configurations are proper. Check the probes and test fixture connections. If the test uses serial trigger, ensure that the CTL pattern is present on the waveform.
111	Not enough acquisitions to perform the test.	The software expects to acquire a minimum number of acquisitions that are configured.	Ensure that the software configurations are proper. Check the probes and test fixture connections.
113	Error in importing the Wfm.	The software could not import the waveform from acquisition. This happens when there is no valid waveform in the acquisition memory.	Check the probes and test fixture connections. Run the test again.
114	Improper Wfm.	Signal is not probed at the proper test points.	Refer to the connections diagram and probe the proper signal.
115	Ref Wfms have different Record Lengths/Sample Rates.	The ref waveforms have different sample rates and/or record lengths.	Use waveforms that are acquired simultaneously for ref waveforms.

Table 4: Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
121	Ref Levels entered are outside the range of the Wfm.	Unable to locate the edges on the waveform at the transition because the levels configured do not fall within the transition of the waveform.	Enter the Ref Level voltage value where the transition occurs on the waveform. Enter 50 percent of the level of the peak-to-peak transition level for mid ref levels, 80 percent of the peak-to-peak for high ref levels, and 20 percent of the peak-to-peak for low ref levels.
122	((Hysteresis Level/2) + Ref Level) cannot be greater than 100 percent.	((Hysteresis Level/2) + Ref Level) has to be within 100 percent for edge finding.	Set both the ref and (Hysteresis Level/2) to be less than 100 percent.
123	High Level is less than or equal to Low Level.	The configured high-level value is less than the low level value.	Configure the high level to be greater than the low level.
131	Error in calculating Tbit.	Not a valid clock waveform.	Supply a valid clock waveform and run the test again.
132	Clock input is required to calculate Tbit.	The Tbit value has to be calculated before you run a test that uses only data source(s).	Select and run a test that uses clock source for Tbit value. Click Connect, select clock source, and then click Re-calculate Tbit before you run the test.
152	Select any test to continue.	Configure, Connect, View Waveform, and Run Test need at least one test to be selected.	Select at least one test before you click either Configure, Connect, View Waveform, or Run Test.
161	Unable to recover clock.	Improper waveform or the software components are missing.	Supply the proper waveform. Reinstall the software.
171	Unable to find edges.	The waveform may be noisy or the hysteresis level may be low.	Check the probes and test fixture connections. Increase the hysteresis band level.
172	Not enough edges.	Number of edges found on the waveform is less than the minimum number of edges that is required for the test.	Decrease the horizontal scale to have more complete cycles of the waveform. Adjust the hysteresis level of the signal to find the edge at the required level.
173	Unable to calculate skew.	Could not find the mid of the waveform.	Check the probes and test fixture connections.
174	CTL pattern not found.	The CTL pattern 0010101011 was not found on the waveform.	Ensure that the appropriate pattern is present on the source waveform. Change the polarity of the waveform.
178	Unable to calculate Vswing.	Signal is not probed at the proper test points.	Follow the instructions in the setup diagram and probe the proper signal.

Table 4: Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
181	Check the DTG connection.	DTG connection has failed. This could happen if: • The DTG is not switched on. • There is a mismatch in the GPIB-ENET configuration, software GPIB configuration, or DTG remote control configuration. • The GPIB cable is not connected properly.	• Switch on the DTG and wait for the DTG software to load. • Check GPIB connections. • Ensure that the primary and secondary addresses of DTG in the remote control match the GPIB-ENET configuration of the oscilloscope. • Ensure that the GPIB-ENET configuration on your oscilloscope matches the signal sources configuration in the software.
182	File not found in the DTG.	The configured file is not found in the DTG.	Ensure that the specified file in the software is present in the DTG. Specify a file name that is present in the DTG.
183	Invalid logical channel.	The logical channel is invalid.	Provide a proper logical channel.
184	Conflict in selection of outputs from the DTG.	The same physical channel (A1, A2, B1, B2, C1, C2, D1, D2) is selected for any two logical channels (Clock, Data 0, Data 1, Data 2).	Select different physical channels (A1, A2, B1, B2, C1, C2, D1, D2) for a given logical channel (Clock, Data 0, Data 1, Data 2).
191	Check the AWG connection.	AWG connection has failed. This could happen if: • The AWG is not switched on. • There is a mismatch in the GPIB-ENET configuration, application GPIB configuration, and AWG remote control configuration. • If the GPIB cable is not connected properly.	Switch on the AWG and wait for the AWG software to load. Check GPIB connections. Ensure that the primary address of AWG in the Utility > Network > Address matches with the GPIB-ENET configuration of the oscilloscope. Ensure that the GPIB-ENET configuration on your oscilloscope matches the signal sources configuration in the software.
192	File not found in the AWG.	File is not present in the AWG.	Ensure that the required file is present in the AWG.

Table 4: Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
193	Check the Signal Sources connection.	Signal sources connection has failed. It may be due to DTG or AWG connection failure. DTG connection has failed. This could happen if: • The DTG is not switched on. • There is a mismatch in the GPIB-ENET configuration, software GPIB configuration, and DTG remote control configuration. • If the GPIB cable is not connected properly. AWG connection has failed. This could happen if: • The AWG is not switched on. • There is a mismatch in the GPIB-ENET configuration, software GPIB configuration, and AWG remote control configuration. • If the GPIB cable is not connected properly. Primary addresses of DTG and AWG are same.	For DTG connection failure: • Switch on the DTG and wait for the DTG software to load. Check the GPIB connections. • Ensure that the primary address of DTG in the remote control matches the GPIB-ENET configuration of the oscilloscope. • Ensure that the GPIB-ENET configuration on your oscilloscope matches the signal sources configuration in the software. For AWG connection failure: • Switch on the AWG and wait for the AWG software to load. • Check the GPIB connections. Ensure that the primary address of AWG in the Utility > Network > Address matches with the GPIB-ENET configuration of the oscilloscope. • Ensure that the GPIB-ENET configuration on your oscilloscope and signal sources configuration in the software match. Select distinct primary addresses for DTG and AWG.
194	Jitter value is unavailable.	Signal is not probed at the proper test points.	Follow the instructions in the setup diagram and probe the proper signal.
196	Invalid DUT frequency.	The frequency of the DUT configured in Configure > Setup > DUT Freq (MHz) does not match with the frequency of the signal generated from the DTG.	Load the required pattern on the DTG and check the frequency of the signal. Ensure that the same frequency has been configured in the DUT Freq (MHz).
201	Edges on the Wfm are lesser than the configured number of edges.	Deskew number of edges set by the user to perform the deskew is not available on the waveform.	Ensure that the edges in the waveform and the display in the numeric input are the same. Adjust the horizontal scale to increase the number of transitions that is required to adjust the deskew.
202	Calculated skew is greater than the oscilloscope skew range.	The calculated skew value is greater than the oscilloscope deskew range.	The deskew will be done to the maximum deskew value that is applicable to the oscilloscope.
203	Cycle has less than 20 sample points.	Insufficient number of samples in a complete cycle. The number of data points in the identified cycle is less than 20.	Increase the sampling rate.
211	Select the test point(s) to continue.	No test points are selected.	Select any one or both of the test points in cable configuration.

Table 4: Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
221	Mask cannot be moved beyond this position.	Upper and lower masks have exceeded their boundary values. The mask co-ordinates are beyond the plottable area.	Change the Mask Movement mode from Coarse to Fine. After changing to Fine, you will be able to move a bit further. If you are already in Fine mode, and this message appears, then you are in the maximum/minimum possible position.
222	Unable to calculate mask margins.	An error occurred while calculating the mask margins.	The signal may be wrong (noise, invalid pattern). Connection to the probe tip may be loose. Recheck the connection and run the test again.
252	Four DTGM30 modules are required to run this measurement.	An error occurs when any of the four connected modules is not DTGM30.	Connect four DTGM30 modules to the DTG and run the test.

Operating Basics

Software View

The software window includes a menu bar, selection pane, test selection pane, execution pane, and status bar. The client pane changes between the configuration pane, parameter selection pane, connection pane, and view waveform pane depending on what you have selected in the selection pane. After you run the test, the client pane automatically changes to the result pane.

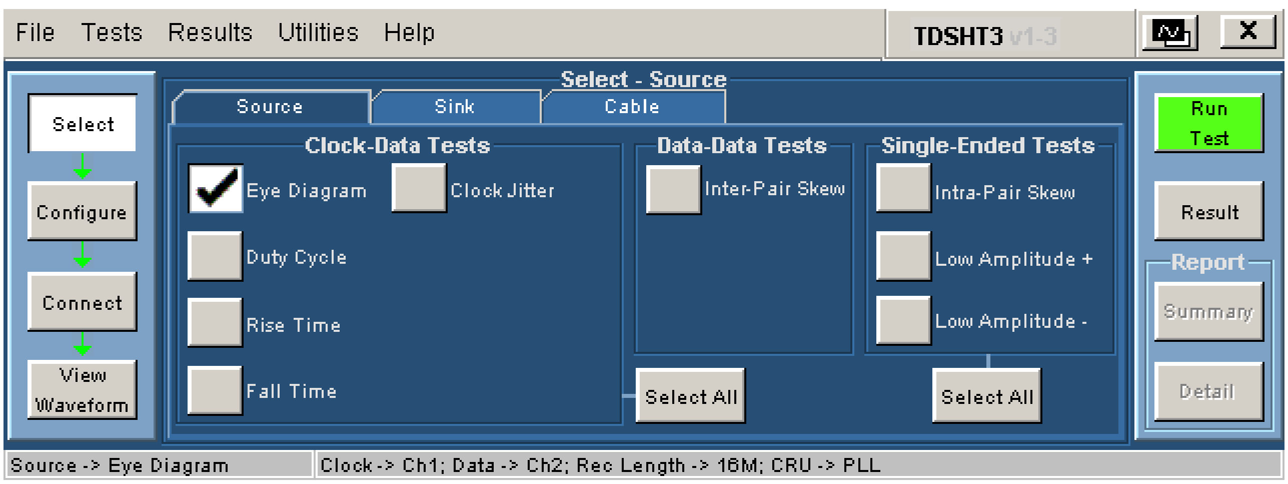


Figure 9: Application Window

TDSHT3 HDMI Compliance Test Software Interface Controls

The software uses a Microsoft Windows interface.

***Note**: The oscilloscope software shrinks to fit in the top part of the display when the TDSHT3 HDMI Compliance Test Software runs.*

The software interface uses the following controls:

Table 5: Application Interface Controls

Control	Description
Menu bar	The Menu bar provides access to the software menus. It is located at the top of the software window.
Area/Tab	An Area/Tab control encloses visual frame with a set of related options.
Option button	An Option button allows you to select either a command or a task.
Drop-down list box	A Drop-down list box lists items from which you can select one item.
Field	A Field is a box where you can enter text or values.
Check boxes	You can select or clear check boxes that you use to set preferences.
Scroll bar	A Scroll bar is a vertical or horizontal bar at the side or bottom of a display area that is used to move around that area.
Browse	Browse refers to the window where you can browse through a list of folders and files.
Command button	A Command button refers to the usually rectangular button that carries out a command and may initiate immediate action.
Numeric keypad	You can use a Numeric keypad to enter numeric values.
Text keypad	You can use a Text keypad to enter text.
MP/GP knob	A line between the knob icon and the field indicates which knob you can turn on the oscilloscope to select a value.
F1	F1 help opens help on a topic associated with the currently selected item in your software.

Menus

The menu bar of TDSHT3 HDMI Compliance Test Software consists of the following menus:

Figure 10: Menu bar

File menu

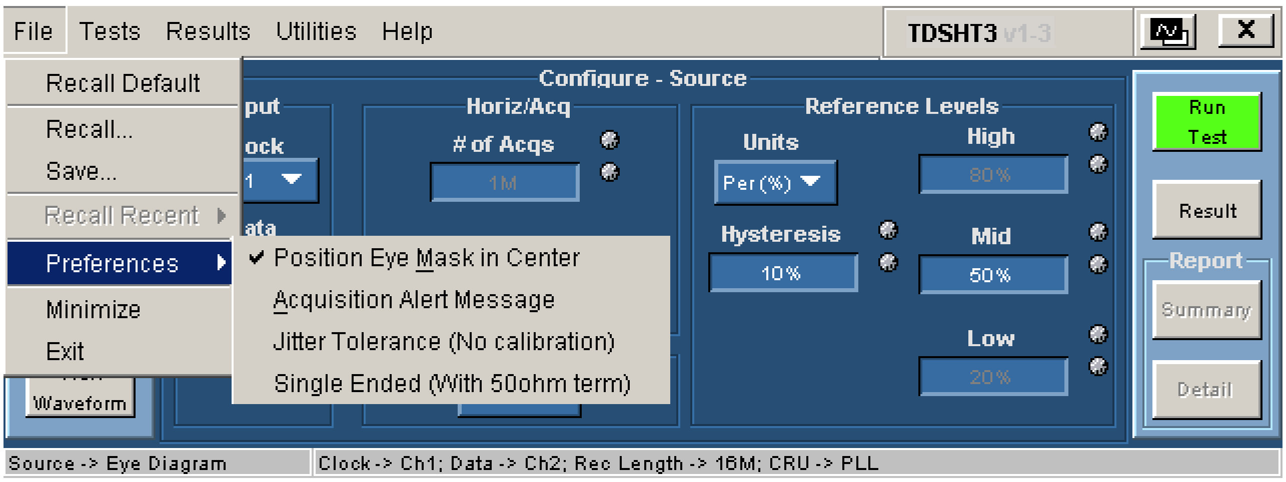


Figure 11: File menu

Table 6: File menu options

Menu Selection	Description
Recall Default	Click File > Recall Default to recall the default settings for both the software and the oscilloscope.
Recall	Click File > Recall to recall the previously saved settings for the software from an .ini file.
Save	Click File > Save to save the software settings to an .ini file.
Recall Recent	Click File > Recall Recent to select among the recently saved and recalled setups.
Preferences	Click File > Preferences to select one of the following options. Click an option again to clear the selection: • Position Eye Mask in Center • Acquisition Alert Message • Jitter Tolerance (No calibration) • Single Ended (With 50ohm term)
Minimize	Click File > Minimize to minimize the software window.
Exit	Click File > Exit to quit the software.

Tests menu

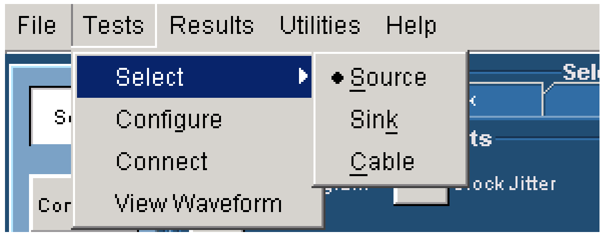


Figure 12: Tests menu

Table 7: Tests menu options

Menu Selection	Description
Select	Click Tests > Select to display or modify the test selection for Source, Cable, or Sink in the client pane.
Configure	Click Tests > Configure to display or modify the configuration parameters for the selected test(s).
Connect	Click Tests > Connect to display the connection instructions for the selected test(s).
View Waveform	Click Tests > View Waveform to display a sample waveform or waveforms based on the settings for the selected test(s).

Results menu

Figure 13: Results menu

Table 8: Results menu options

Menu Selection	Description
Summary	Click Results > Summary to display the result summary of the last test(s) that you conducted.
Details	Click Results > Details to display the detailed results of the last test that was conducted.

Utilities menu

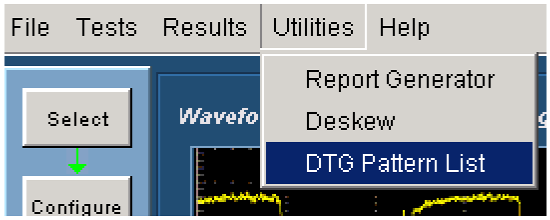


Figure 14: Utilities menu

Table 9: Utilities menu options

Menu Selection	Description
Report Generator	Click Utilities > Report Generator to open the report generator pane.
Deskew	Click Utilities > Deskew to open the deskew pane. The deskew pane allows you to compensate the skew between the oscilloscope channels.
DTG Pattern List	Click Utilities > DTG Pattern List to open the DTG pattern list pane. This pane allows you to add and delete DTG pattern files.

Help menu

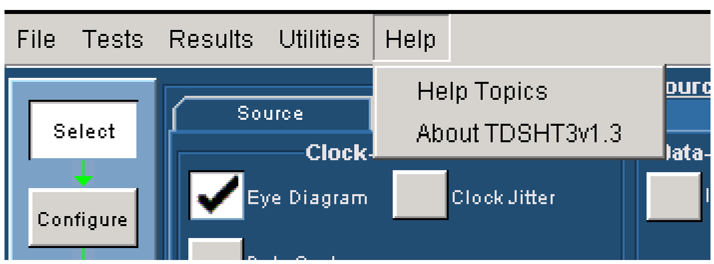


Figure 15: Help menu

Table 10: Help menu options

Menu Selection	Description
Help Topics	Click Help > Help Topics to display the help file for the TDSHT3 HDMI Compliance Test Software.
About TDSHT3	Click Help > About TDSHT3 to display a dialog box with information about the current TDSHT3 HDMI Compliance Test Software.

Preferences

On the menu bar, click File > Preferences to select any of the options described in the following table. Click an option again to clear the selection.

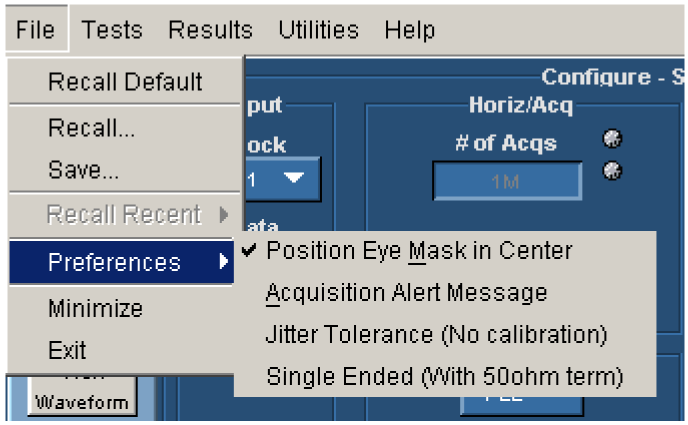


Figure 16: Preferences

Table 11: Preferences options

Option	Description
Position Eye Mask in Center	Select this option to position the mask at the center of the eye diagram. Clear this option to position the mask to the left of the eye diagram.
Acquisition Alert Message	Select this option to receive an alert message that allows the software to use the custom oscilloscope setup. Clear this option to stop receiving the alert message.
Jitter Tolerance (No calibration)	Select this option if you do not want to run the jitter calibration tests for sink jitter tolerance measurements.
Single Ended (With 50ohm term)	This option can be selected only when the negative input of the probe is terminated with the 50 ohm terminator. When this option is selected, the single ended measurements will be performed as though 50 ohm termination is connected.

Selection pane

The selection pane, which is located to the left of the software window, allows you to navigate through the software.

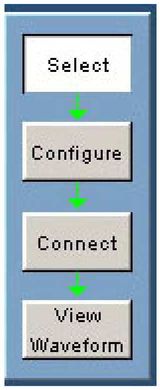


Figure 17: Selection pane

The following table lists the buttons and their task descriptions:

Table 12: Selection options

Button Name	Description
Select	Click Tests > Select to display or modify the test selection for Source, Cable, or Sink in the client pane.
Configure	Click Tests > Configure to display or modify the configuration parameters for the selected test(s).
Connect	Click Tests > Connect to display the connection instructions for the selected test(s).
View Waveform	Click Tests > View Waveform to display a sample waveform or waveforms based on the settings for the selected test(s).

Result pane

The result pane, which is located at the center of the software window, appears as shown in the following figure:

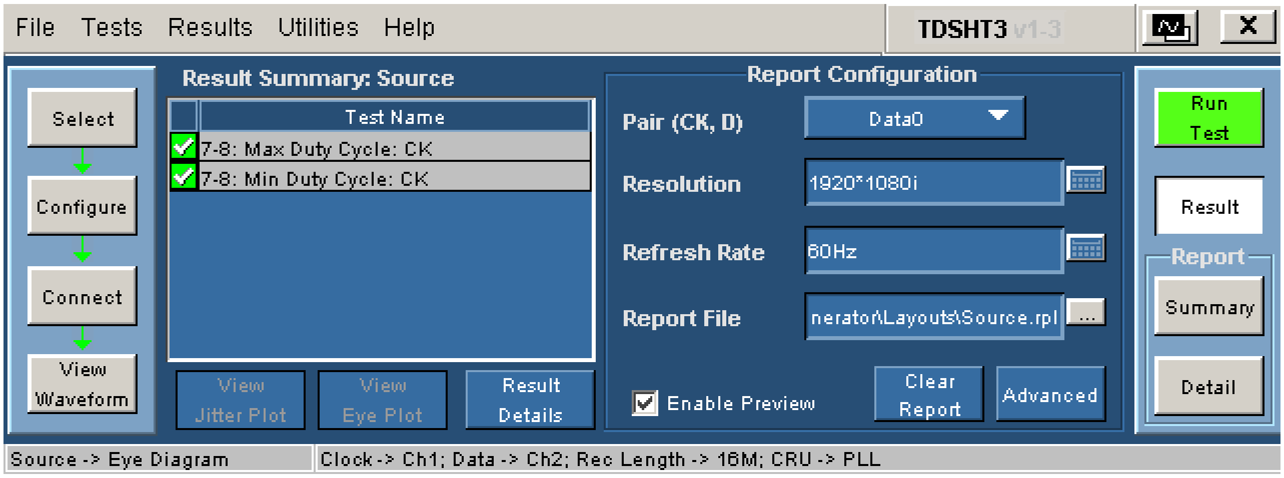


Figure 18: Result pane

The result pane includes the result summary pane and the report configuration pane.

Result Summary pane

The result summary pane displays the test results.

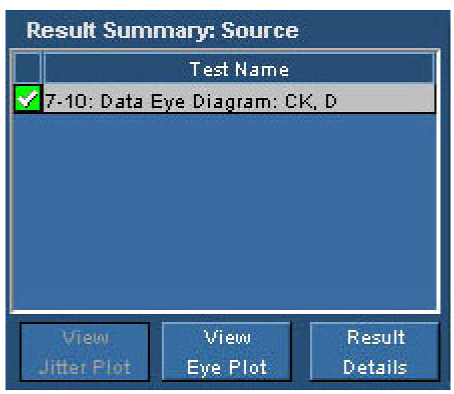


Figure 19: Result Summary pane

This icon indicates that the test has passed.

This icon indicates that the source eye diagram test has passed conditionally.

This icon indicates that the test has failed.

This icon indicates that the test could not be run due to an error.

Table 13: Result Summary options

Option	Description
Status	The status icons display the status of the test as Pass, Conditional Pass (for the source eye diagram test), Fail, or Error.
Test Name	The Test Name box displays the test id, test name, and signal names - CK (Clock), D (Data).
View Jitter Plot	Click View Jitter Plot to display the jitter plot. This command is available if you have successfully run the clock jitter test.
View Eye Plot	Click View Eye Plot to display the eye plot. This command is available if you have successfully run the eye diagram test.
Result Details	Click Result Details to display the Result Details dialog box that shows the details of the test results categorized as test name, specification range, measured value, result, and remarks.

Report Configuration pane

You can set the report details to identify and generate the report automatically. You can also set a default report file.

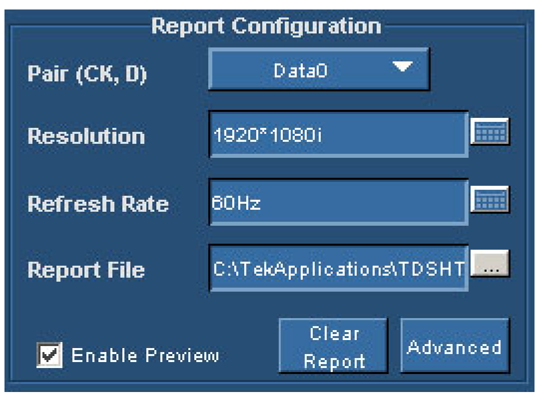


Figure 20: Report Configuration pane

In the report configuration pane, you can configure the following parameters:

Table 14: Report Configuration options

Category	Description
Pair	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	In the Resolution box, type the resolution at which you conducted the test. Some examples are VGA, SVGA, XGA, SXGA, and so on.
Refresh Rate	In the Refresh Rate box, type the refresh rate at which you conducted the test. Some examples are 40 Hz, 43 Hz, 57 Hz, 60 Hz, and so on.
Report File	The Report File box allows you to specify the path and the file where you want to save the generated report. However, for the selected test, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the previously generated reports.
Advanced	Click Advanced to open the Advanced Report Configuration dialog box.

Execution pane

The execution pane, which is located to the right of the software window, displays the Run Test and Result buttons. After you successfully run a test, the Summary and Detail buttons are available.

Figure 21: Execution pane

Click on each button to perform a particular task. The following table lists the buttons and their task descriptions:

Table 15: Execution options

Button name	Description
Run Test	Click Run Test to run the selected test or tests.
Result	Click Result to display the result pane that shows the test results.
Summary	Click Summary to generate a report summary as a .csv file.
Detail	Click Detail to generate a report. The Report Viewer utility appears and displays the test results. The test results are displayed only if you have selected Enable Preview in the report configuration pane. Otherwise, the test results are stored in a file and the folder path of the stored file is shown in a message box.

***Note**: The report details are real time. The results history is maintained as long as you do not change the device type. If you change the device type, then the history is cleared.*

Status bar

At the bottom of the software window is the status bar, which displays the selected test and the important configuration parameters.

Figure 22: Status bar

General Purpose Knob

To use the General Purpose knob, follow these steps:

1. Click any number box to display the connection to one of the general-purpose knobs.

2. Turn the corresponding knob on the oscilloscope front panel to adjust the value for the selected parameter.

3. For better resolution, press the Fine button.

Enable Remote Control of Test Equipment

There are two methods to connect to AWG/DTG/AFG. One is the GPIB-USB method and the other, is the GPIB-ENET method.

The following section will guide you through the process of connecting the AWG, DTG, AFG, and the digital oscilloscope used for Sink and Cable tests:

You will need Tektronix AWG710/B, AFG7000, Tektronix DTG5274, Tektronix supported oscilloscope, National Instruments GPIB-USB-B with the included software, NI-GPIB-HS cable with the included software, and NI-488.2 for Windows.

NI-488.2 Software configuration for TDS series

1. Ensure that NI-VISA is NOT installed.
2. Install NI-488.2 for Windows (version 2.1 or later).

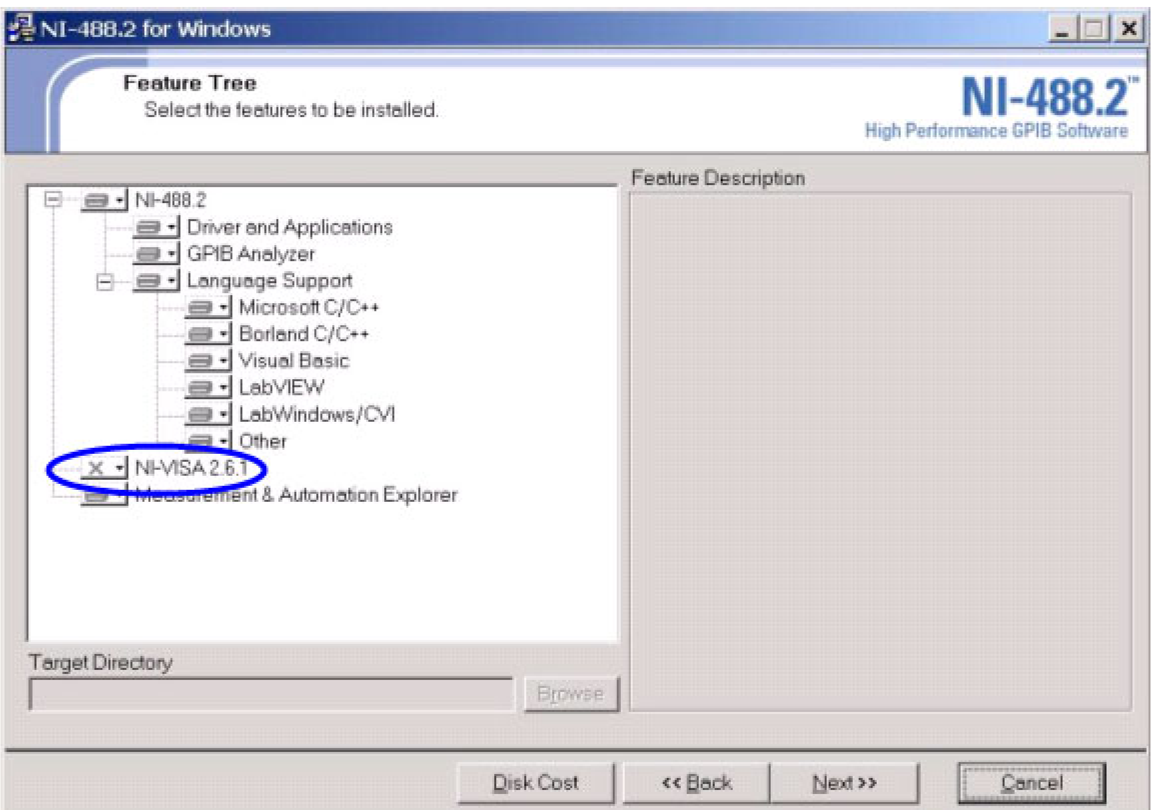


Figure 23: NI-488.2 for Windows

3. Install the Measurement & Automation Explorer software.
4. When prompted, enable the GPIB-USB interface.

Note: If you already have NI-488.2 installed on your oscilloscope, then ensure that you have the appropriate version and installation parameters. Otherwise, remove NI-488.2, and then reinstall the appropriate version.

5. Restart the oscilloscope.

NI-Software configuration for DPO70000 series

Note: *If you are using the NI-Drivers on the DPO70000 series for the first time perform steps1 through 9. If not perform steps 7 through 9.*

1. In the oscilloscope menu, click Utilities > GPIB Configuration.

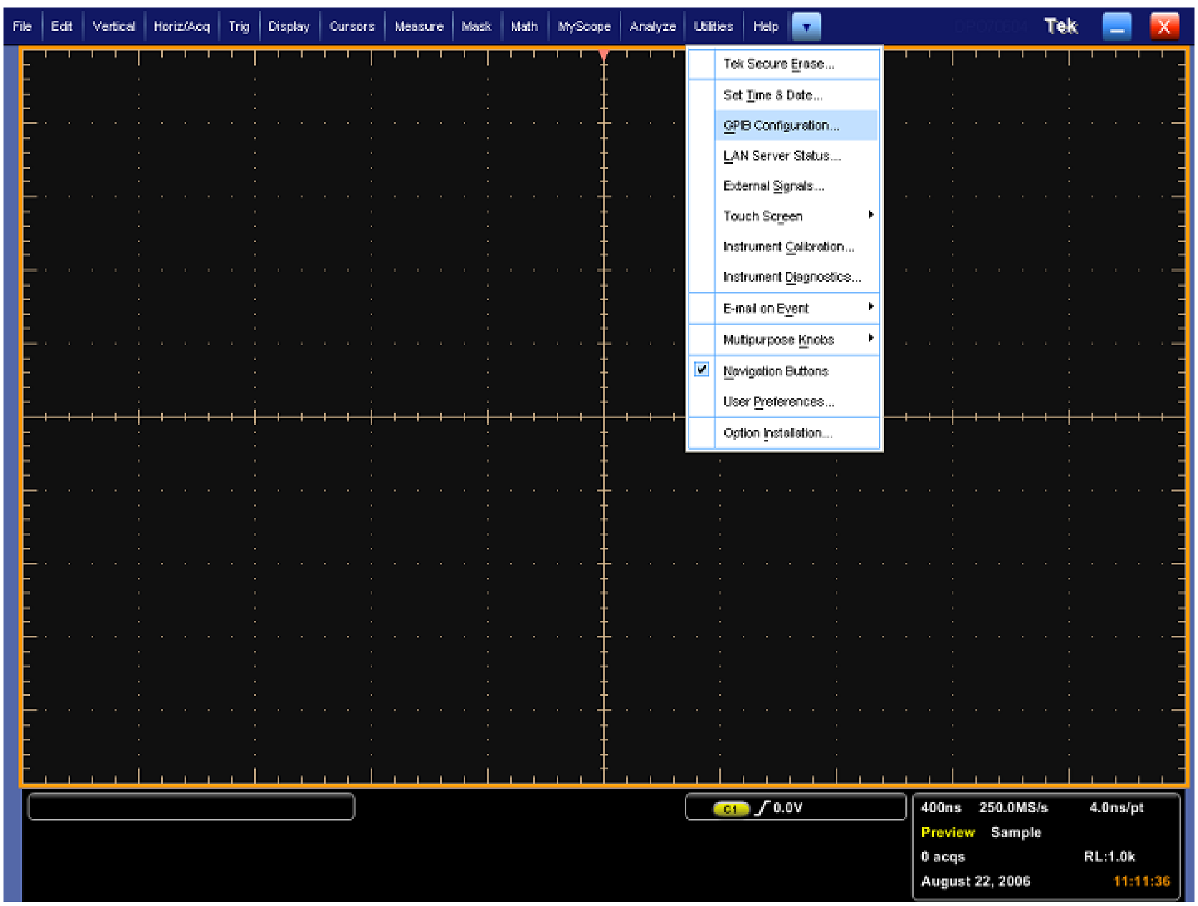


Figure 24: GPIB Configuration for DPO70000 Series

2. In the GPIB Configuration, select Controller. A GPIB Mode Switch dialog box is displayed.

3. Press OK to restart the oscilloscope.

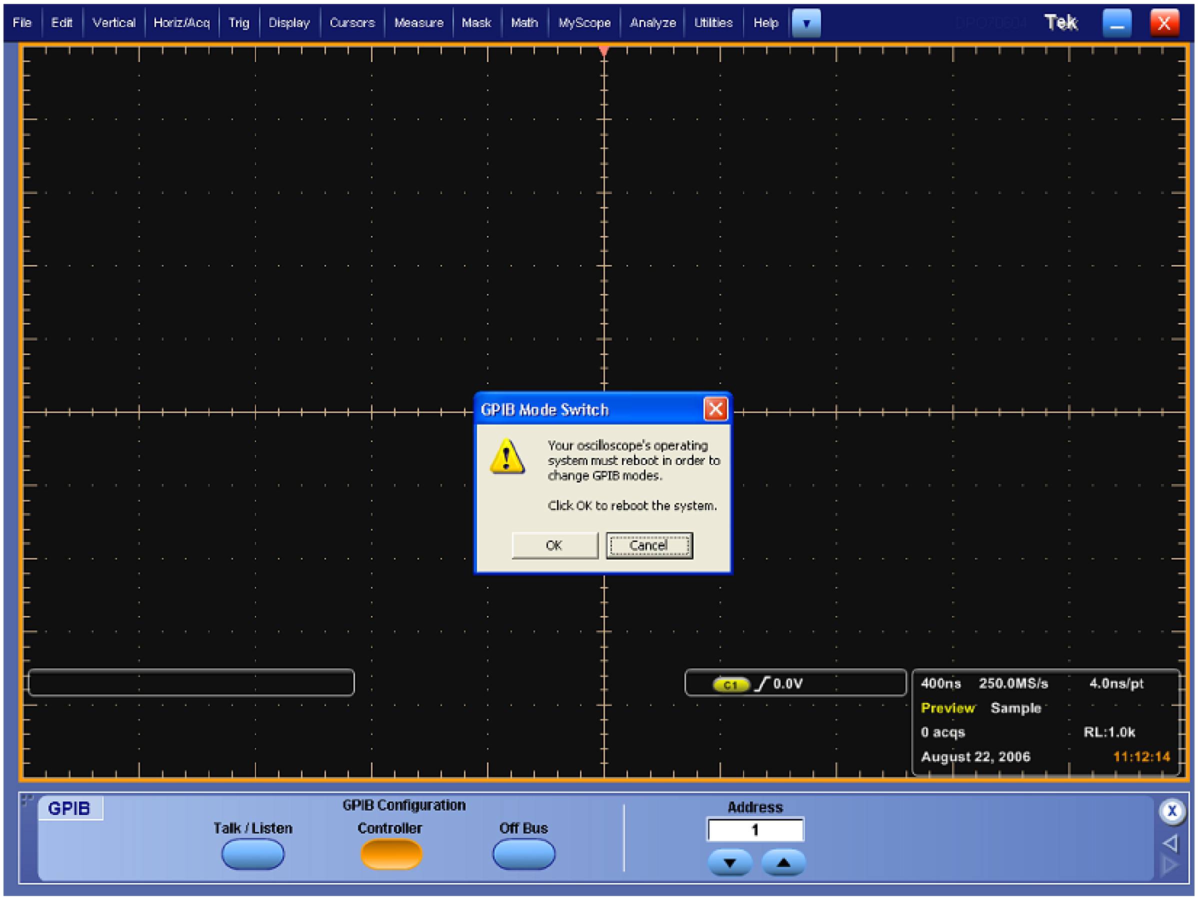


Figure 25: GPIB Controller for DPO70000 Series

4. In the oscilloscope menu, click Utilities > GPIB Configuration.

5. In the GPIB Configuration, select Talk/Listen. A GPIB mode switch dialog box is displayed.

6. Press OK to restart the oscilloscope.

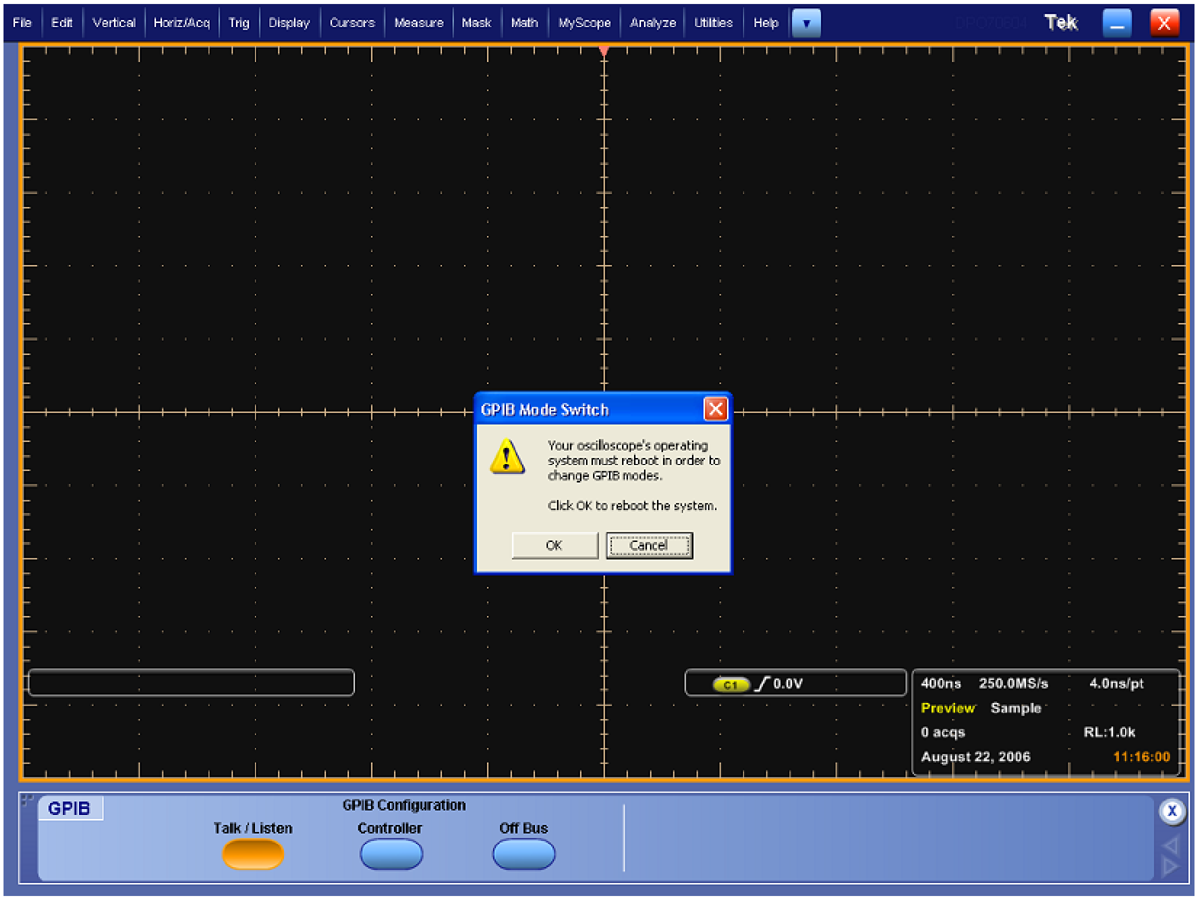


Figure 26: GPIB Talk/Listen for DPO70000 Series

You cannot access the NI software from the Start > Program menu and will have to go to C:\Program Files\National Instruments\NI-488.2\Bin location.

7. Double-click on the Add GPIB Hardware to display the Add GPIB Hardware Wizard.

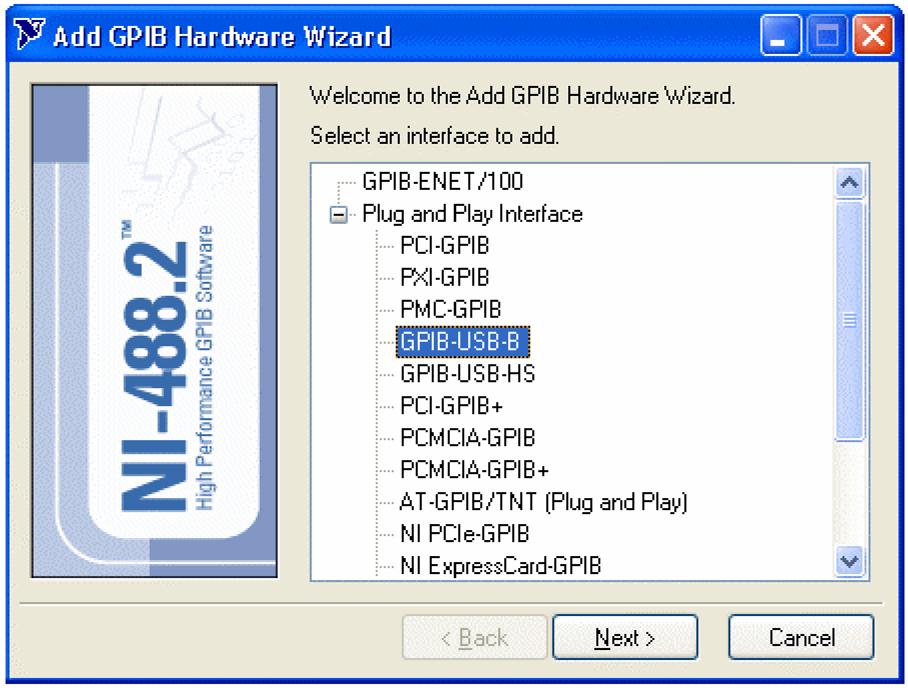


Figure 27: Add GPIB Hardware Wizard

8. Select the appropriate NI hardware from the list (select GPIB-USB-B from the list if it is connected).

9. Press Next and finish the installation.

Note: *Do not install any NI drivers on DPO70000 series oscilloscope because they are preinstalled.*

Connect the Equipment

To connect the equipment, follow these steps:

1. Configure the DTG GPIB primary address to 1 and AWG/AFG GPIB primary address to 2.
2. Connect the USB-GPIB controller to the USB port on the oscilloscope (the TDS7000B rear panel is shown here). The oscilloscope operating system will detect the USB-GPIB controller and install the appropriate driver for it.
3. Using GPIB cables, connect (stack) both the DTG and AWG/AFG GPIB ports to the GPIB port of the GPIB controller.

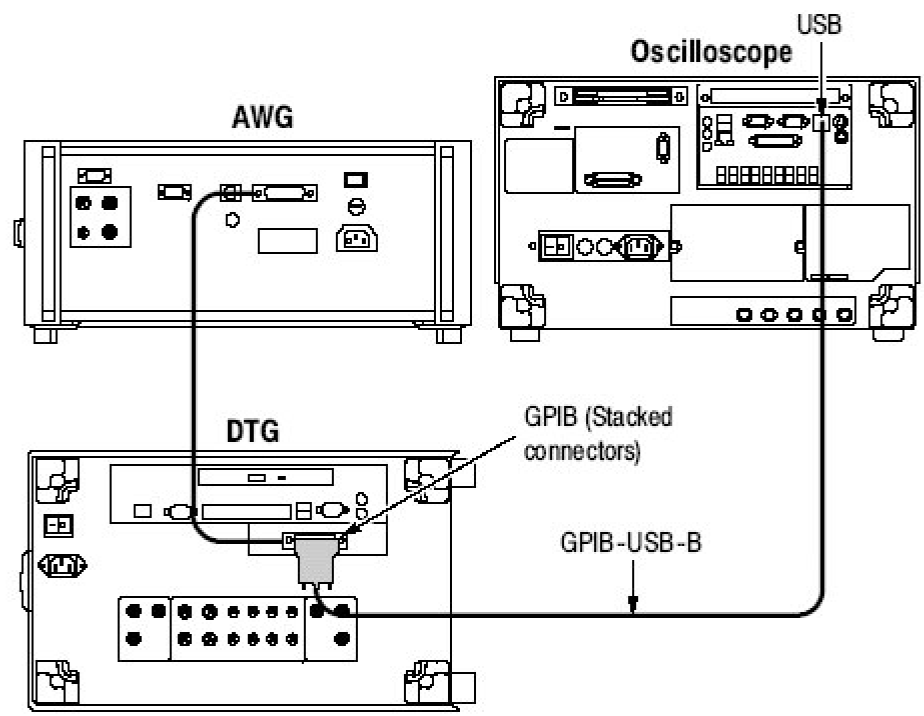


Figure 28: Connections for AWG/AFG and DTG (using GPIB-USB method)

Verify the Equipment Connections

To verify the equipment connections, follow these steps:

1. Open the Measurement & Automation Explorer software that was installed with the NI-488.2 software.

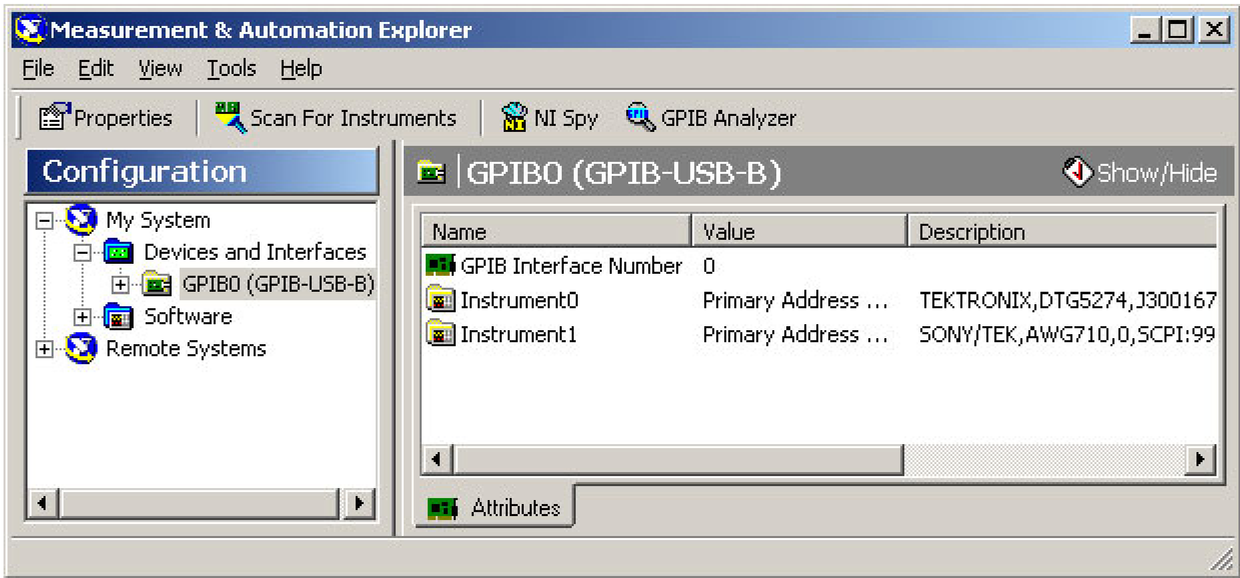


Figure 29: Measurement & Automation Explorer

2. In the configuration pane, look under Devices and Interfaces for the GPIB device.

3. Right-click the GPIB device and click Scan for Instruments.

4. Note the GPIB Instrument Number and the Primary Address to configure the instrument connection in the TDSHT3 HDMI Compliance Test Software.

5. Right-click the instrument, and then click Communicate with Instrument.

6. In the NI-488.2 Communicator dialog box, click Query and check that '*IDN?' displays a description of the correct equipment.

7. Start the TDSHT3 HDMI Compliance Test Software.

8. Click Select.

9. Click the Sink tab.

10. Select one of the differential tests, such as Jitter Tolerance.

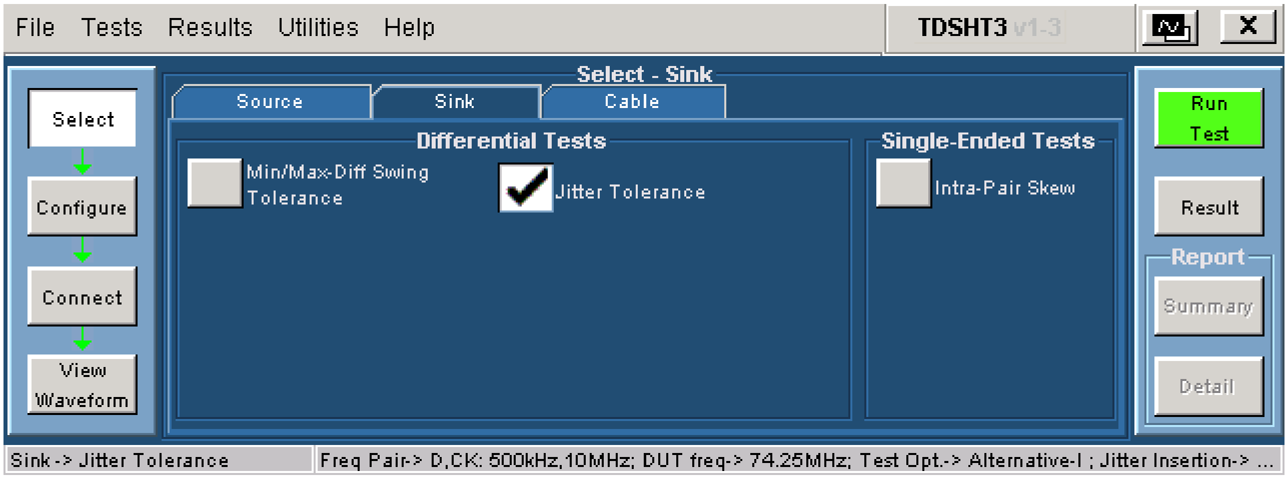


Figure 30: Jitter Tolerance (Sink test) Select pane

11. Click Connect.

12. Click Signal Sources. The Signal Sources Setup dialog box appears.

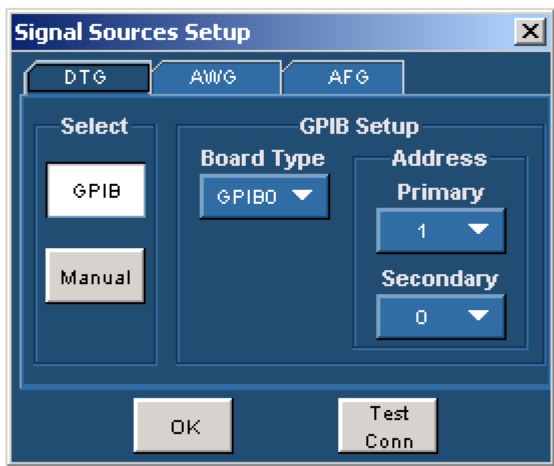


Figure 31: Signal Source Setup

13. In the Signal Sources Setup dialog box, click the DTG tab.

14. Configure the GPIB Board Type by using the GPIB Instrument Number that you noted in step 4.

15. Configure the Primary Address by using the address that you noted in step 4.

16. Leave the Secondary Address set to 0.

17. Click the AWG tab and repeat steps 14 through 16 for the AWG.

18. Click the AFG tab and repeat steps 14 through 16 for the AFG.

19. Click Test Conn and look for a message that the connection is successful.

Configure New IP Address for GPIB-ENET

There are two methods to connect to AWG/DTG. One is the GPIB-USB method and the other, the GPIB-ENET method.

GPIB-ENET and GPIB-ENET/100 for Windows 3.1/95/98/ME/NT/2000/XP

1. Confirm that you have installed the latest NI-488.2 driver software for your device.

2. Connect your GPIB-ENET or GPIB-ENET/100 to an Ethernet network by using a category 5 Ethernet cable to connect the RJ-45 port on your hardware to an Ethernet hub. You could also connect the external hardware directly to your oscilloscope by using an Ethernet crossover cable.

3. Connect the power to your GPIB-ENET or GPIB-ENET/100 and turn it on. When you power on your GPIB-ENET, the POWER LED comes on immediately. The READY LED flashes while it completes its power-on self-test. When the test completes successfully and the IP address is assigned, the READY LED remains steady, indicating that the unit is ready to operate. To assign your IP address, continue to step 4.

4. Run the Measurement & Automation Explorer software from Programs > National Instruments.

5. Some devices are not Windows Plug and Play compatible. Therefore, they do not automatically appear in the Devices and Interfaces list. Other devices may reside in another oscilloscope on your network. To add non Plug and Play or remote DAQ devices, right-click Devices and Interfaces in the configuration tree, and then click Create New. Follow the instructions in the wizard. Select GPIB-ENET/100 or GPIB-ENET interface according to the hardware.

How to Configure GPIB-ENET/100

1. Configure an existing device.

   To configure an existing National Instruments device, right-click the device name in Devices and Interfaces in the configuration tree, and then click Properties. You can also configure existing device properties by clicking Properties in the toolbar.

2. To configure the network parameters of your GPIB-ENET/100, right-click your GPIB interface in the configuration tree, and click Device Configuration.

3. Click Properties. Configure the IP address as shown in the following figure:

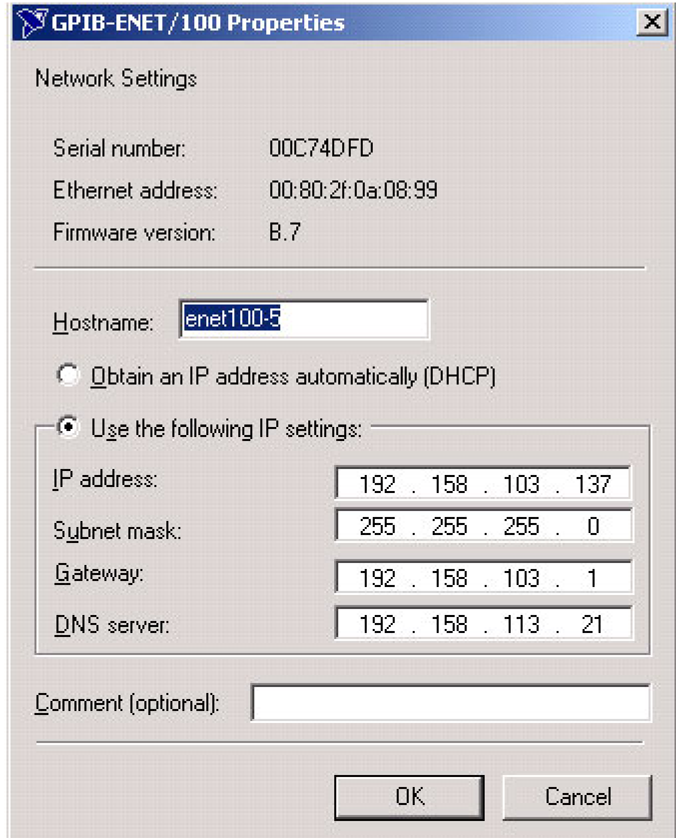


Figure 32: GPIB-ENET/100 Properties

4. After entering the IP settings, click OK. A message box appears as follows:

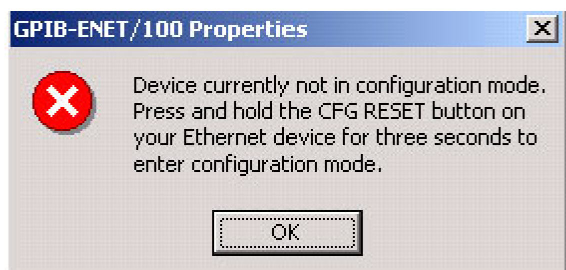


Figure 33: GPIB-ENET/100 Properties message box

5. After you reset the CFG in the ENET card, click OK in the GPIB-ENET/100 Properties message box. The software will configure and another message box appears.

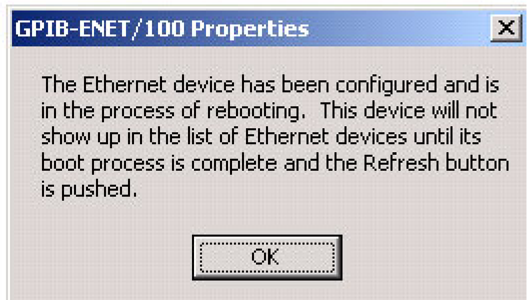


Figure 34: GPIB-ENET/100 Properties re-confirm message box

6. Click OK. The ENET card is configured.

7. Verify the configuration by pinging the IP address and through ICTA.

How to Configure GPIB-ENET (old card)

1. Right-click Devices and Interfaces. Click Assign IP Address. A message box appears.

Figure 35: IP Assign Address message box

Note*: The GPIB software installation is in the path C:\Program Files\National Instruments\NI-488.2\GPIB-ENET on the oscilloscope.*

2. Run the Measurement & Automation Explorer software. Click Assign IP Address. A message box appears.

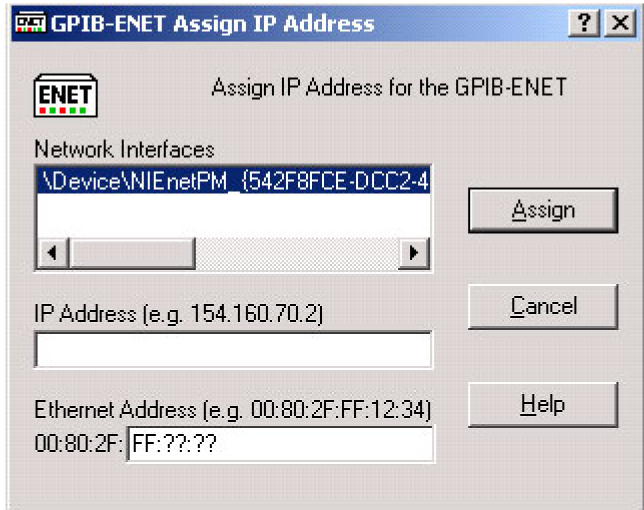


Figure 36: GPIB-ENET Assign IP Address message box

3. Enter the new IP Address and the Ethernet Address. Click Assign. A message box appears.

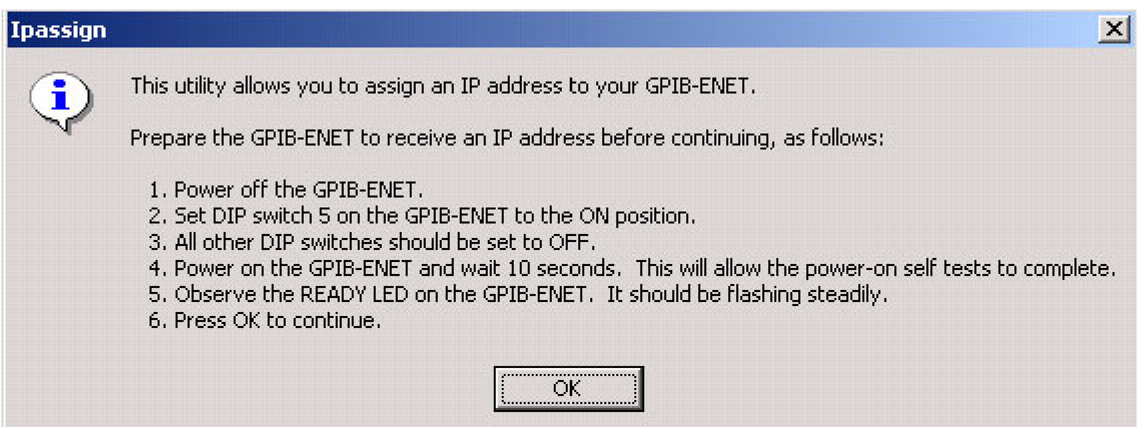


Figure 37: IPassign message box

4. Follow the instructions in the Ipassign message box. Click OK. Another message box appears.

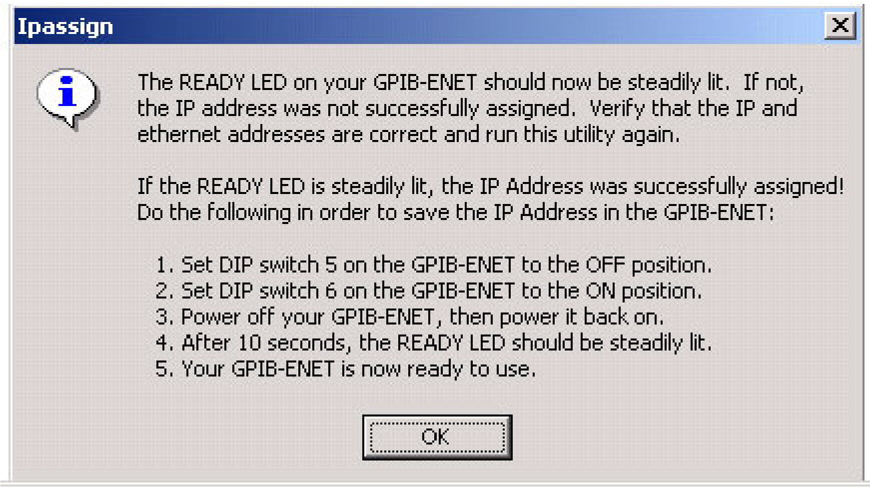


Figure 38: Ipassign re-confirm message box

5. Follow the instructions in the new Ipassign message box. Click OK.

Remote Control Caution

If you run the Sink or Cable tests, the GPIB Bus Timing dialog box appears.

Figure 39: GPIB Bus Timing dialog box

Click OK to continue if you are sure that the Bus Timing parameter is already set to 2 µsec. Otherwise, click Cancel and follow the procedure outlined later to change the Bus Timing parameter manually.

Once you have changed the parameter, select the check box if you do not want the dialog box to appear again in the current session. However, if you click File > Recall Default or you quit the software, then the dialog box appears again when you run the test.

When you install the remote control for the test equipment, the Measurement & Automation Explorer software will be installed on the oscilloscope. You can start the software by clicking Start > Program Files > National Instruments > Measurement & Automation.

To change the Bus Timing parameter, perform the following steps:

1. Start the Measurement & Automation Explorer software.
2. In the configuration pane, look under Devices and Interfaces for the GPIB device.
3. Right-click the GPIB device and click Properties. The GPIB Configuration dialog box appears.
4. In the GPIB Configuration dialog box, click the Advanced tab.
5. In the Bus Timing list, select 2µsec.

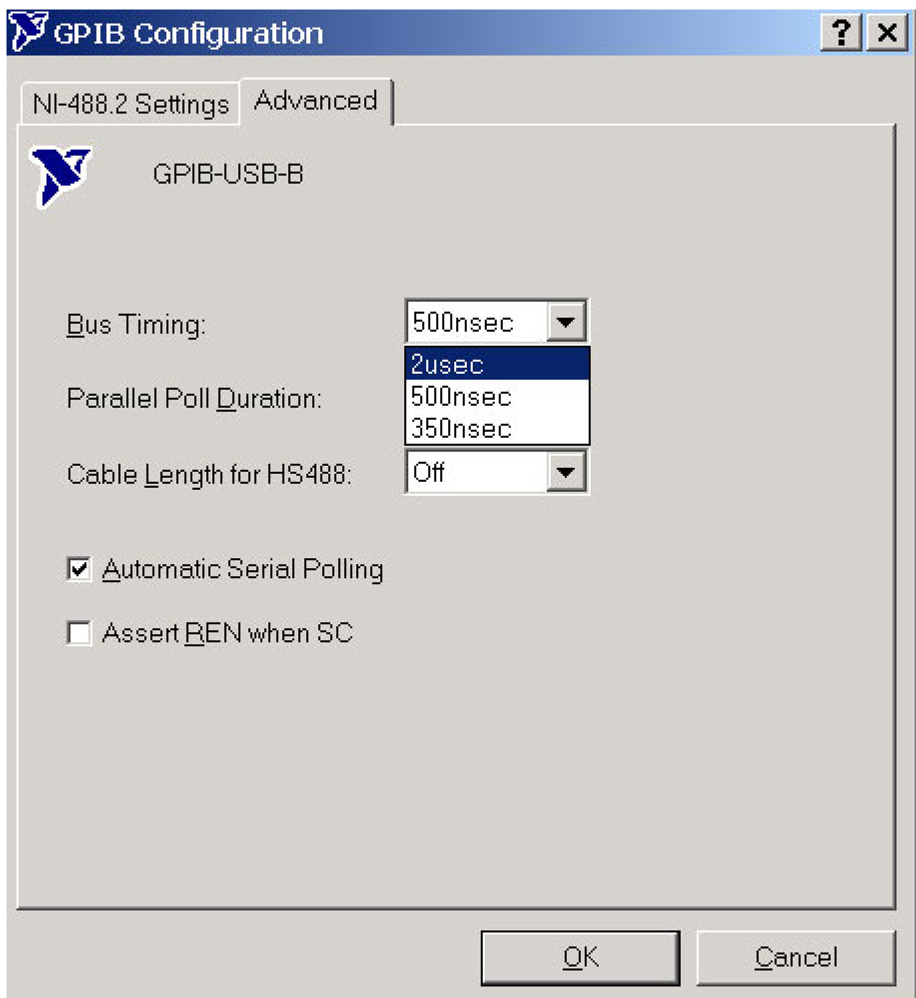


Figure 40: GPIB Configuration dialog box

6. Quit the TDSHT3 HDMI Compliance Test Software and restart the oscilloscope.

Remote GPIB Commands

The Remote General Purpose Interface Bus (RGPIB) is essentially another way of interfacing with the oscilloscope. It allows you to control much of the functionality of the oscilloscope as defined by the software, from a Remote GPIB controller.

You can use the following GPIB command to start the TDSHT3 HDMI Compliance Test Software:

```
application:activate “HDMI Compliance Test Software(1.3)”
```

How to Set and Query

1. The following command syntax sets the value to the variable:

```
VARIABLE:VALUE “<variable name>”,“<variable value>”
```

The arguments `<variable name>` and `<variable value>` are required in the order indicated.

2. The following command syntax queries the value of the variable:

```
VARIABLE:VALUE? “<variable name>”
```

3. The following command syntax runs the selected test:

```
variable:value "sequencerState", "Sequencing"
```

The TDSHT3 HDMI Compliance Test Software will be remotely controllable for the following set of commands for `(VARIABLE:VALUE)`:

Application

Table 16: Command Arguments and Queries (Application)

Variable Name	Valid Values	Function (Set)	Query Form
Application	Exit	Set the value to quit running the software.	Query to return the name of the currently running software.
Version	-	-	Query to return the version of the currently running software, for example, Version: 1.0.0.

Sequencer

Table 17: Command Arguments and Queries (Sequencer)

Variable Name	Valid Values	Function (Set)	Query Form
sequencerState	{Sequencing}: to set {Ready, Sequencing}: returned on query	Set the sequencer state.	Return the sequencer state.

Save/Recall

Table 18: Command Arguments and Queries (Save/Recall)

Variable Name	Valid Values	Function (Set)	Query Form
Setup	{Default, Recall, Save}	Set the Save/Recall/Default action.	Default value for this variable is an empty string. Thus, the variable is set to selected value momentarily and after the task is completed, it returns to its default value.
recallName	Any string 1-8 chars, comprised of A-Z, 0-9	Set the setup recall file name.	Return the setup recall file name.
saveName	Any string 1-8 chars, comprised of A-Z, 0-9	Set the setup save file name.	Return the setup save file name.

Report

Table 19: Command Arguments and Queries (Report)

Variable Name	Valid Values	Function (Set)	Query Form
reportSummary	Save	Save the report summary to a .csv file.	-
reportDetail	Save	Save the report details to an .rpt file.	-

Dialog Boxes

Result Details

After the test is complete, on the result pane, click Result Details to display the details of the result.

Figure 41: Result Details

Table 20: Result Details

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal names - CK (Clock), D (Data).
Spec Range	The Spec Range box describes the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the results of Tbit, Vswing, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.
View Jitter Plot	Click View Jitter Plot to display the jitter plot. This command is available if you have successfully run the clock jitter test.
View Eye Plot	Click View Eye Plot to display the eye plot. This command is available if you have successfully run the eye diagram test.
Result Statistics	Click Result Statistics to display statistics based on the tests.

__Note__: The parameters in the Result Details dialog box may change depending on the test that you run.

Virtual Keypad - Numeric

1. Click any number box to display the icon for the numeric keypad.

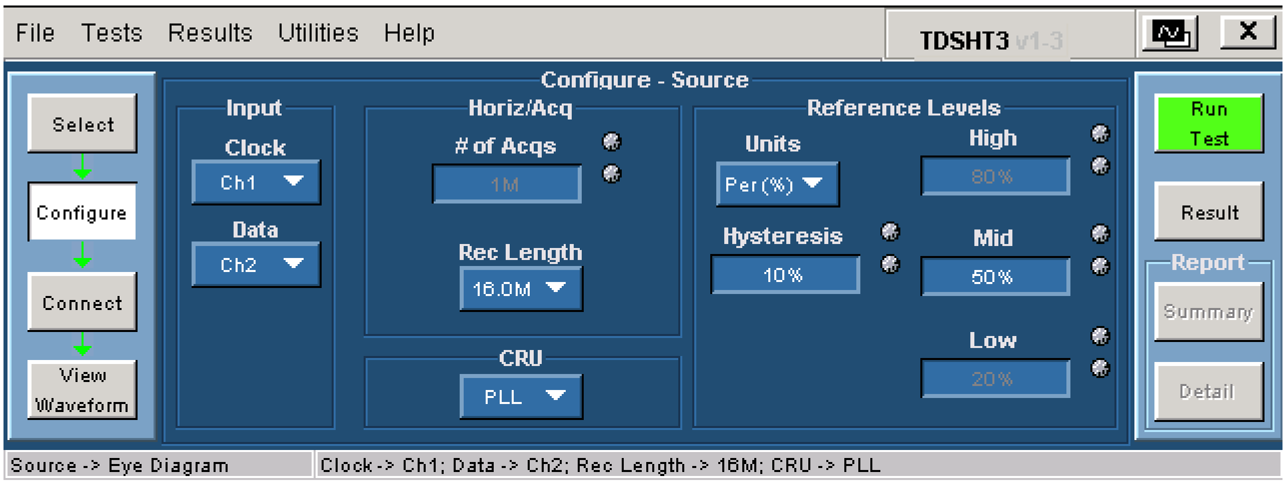


Figure 42: Configure Source

2. Click the icon to display the numeric keypad.

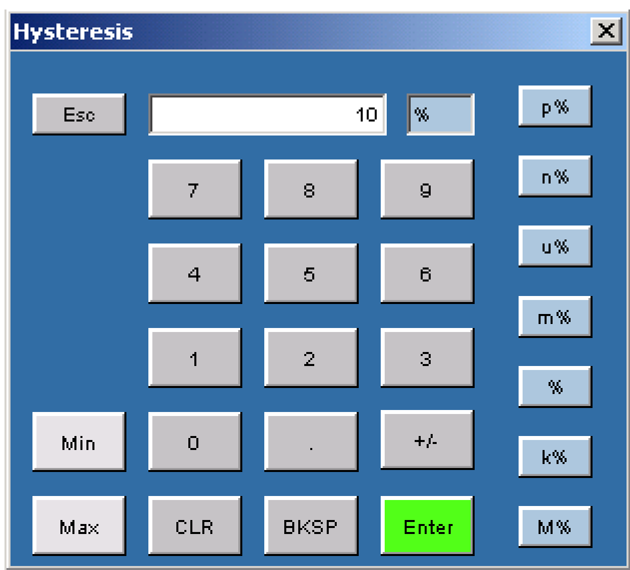


Figure 43: Numeric keyboard

3. Click the number keys to enter the desired value.

4. Select a unit measure.

5. Click Enter to confirm your entry. Selections are not effective until you click Enter.

Virtual Keyboard – Text

1. Click New to display the virtual keyboard.

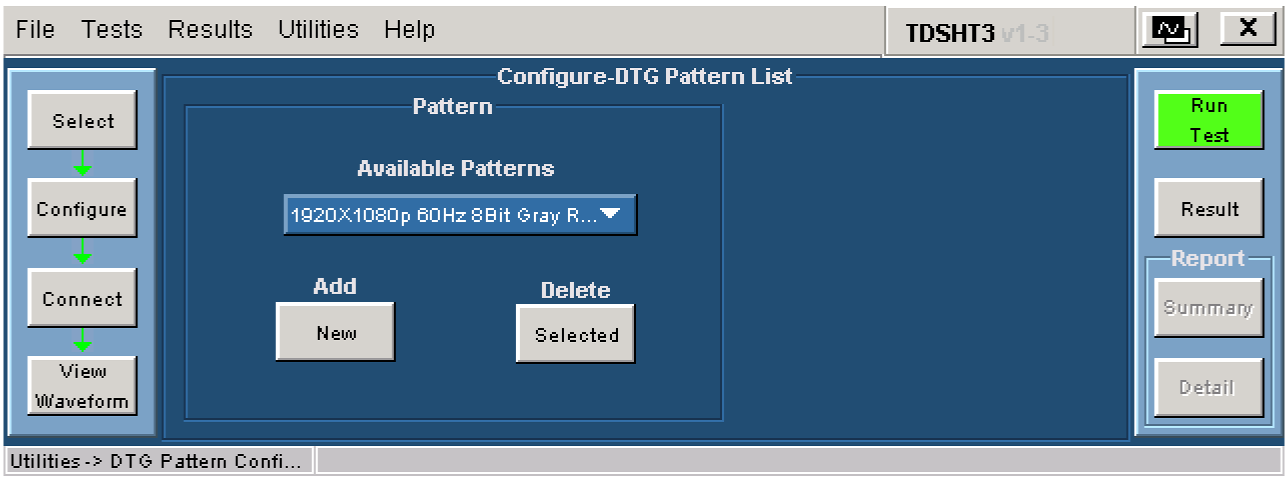


Figure 44: Configure Cable

2. Use the text keyboard to enter the required text (such as a file name).

Figure 45: DTG Pattern Path

3. Click Enter to confirm your entry. Selections are not effective until you click Enter.

Report Configuration Advanced

In the report configuration pane, click Advanced to open the Report Configuration Advanced dialog box.

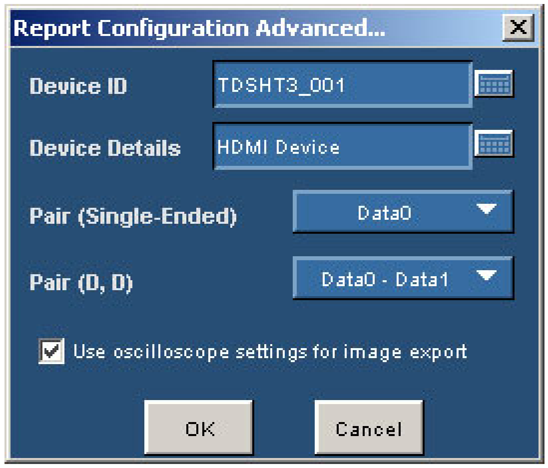


Figure 46: Advanced Report Configuration

In the Report Configuration Advanced dialog box, you can configure the following parameters:

Table 21: Report Configuration Advanced options

Category	Description
Device ID	The Device ID box allows you to specify the DUT on which you conducted the test by printing the device id on the generated report.
Device Details	The Device Details box allows you to specify the DUT on which you conducted the test by printing the device details on the generated report.
Pair (Single-Ended)	The Pair (Single-Ended) list allows you to select the pair on which you conducted the single-ended test.
Pair (D, D)	The Pair (D, D) list allows you to select the pair on which you conducted the data-data test.
Use oscilloscope settings for image report	Select the Use oscilloscope settings for image export check box to use the current settings of the oscilloscope for image export.

Exit

To quit the software:

1. On the menu bar, click File > Exit.

2. The Exit dialog box appears.

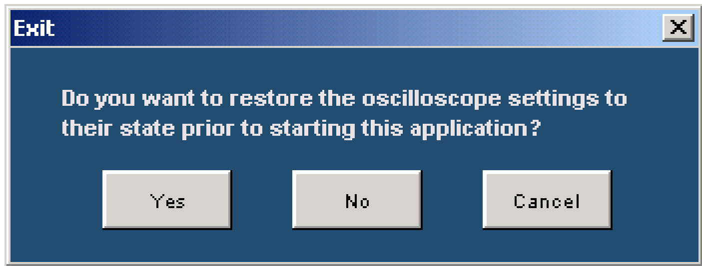


Figure 47: Exit

3. Click either Yes, No, or Cancel. Yes is selected by default. While the software is running, it automatically changes some oscilloscope settings. When you quit the software, you can choose whether to retain these settings or restore the previous settings.

Note*: Using other methods to quit the software may result in an abnormal termination of the software.*

How to…

Calculate Tbit

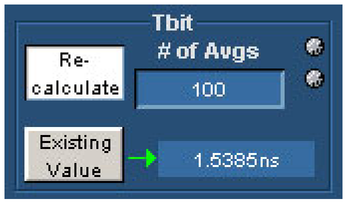


Figure 48: Tbit pane

Tbit is the time that is required to transmit one bit of data. Tbit is one bit time at the specified pixel clock frequency (= $T_{PIXEL}/10$).

For all the tests that require clock, the software calculates Tbit. For all the other tests, you have an option of either recalculating Tbit or use the previous Tbit value for the test.

If you click Re-calculate, the software computes the specified number of averages of T_{PIXEL} and then calculates Tbit. If you use the existing Tbit value, then the software uses the previously calculated Tbit value or you can also again recalculate Tbit by using the tbit pane.

To calculate Tbit for a measurement, use the Tbit pane. You can calculate Tbit for Duty Cycle, Rise Time, Fall Time, Inter-Pair Skew for Data-Data Tests, Intra-Pair Skew, Low Amplitude +, and Low Amplitude – measurement if the clock is not connected.

To calculate Tbit

1. Set up the connections as shown in the following diagram:

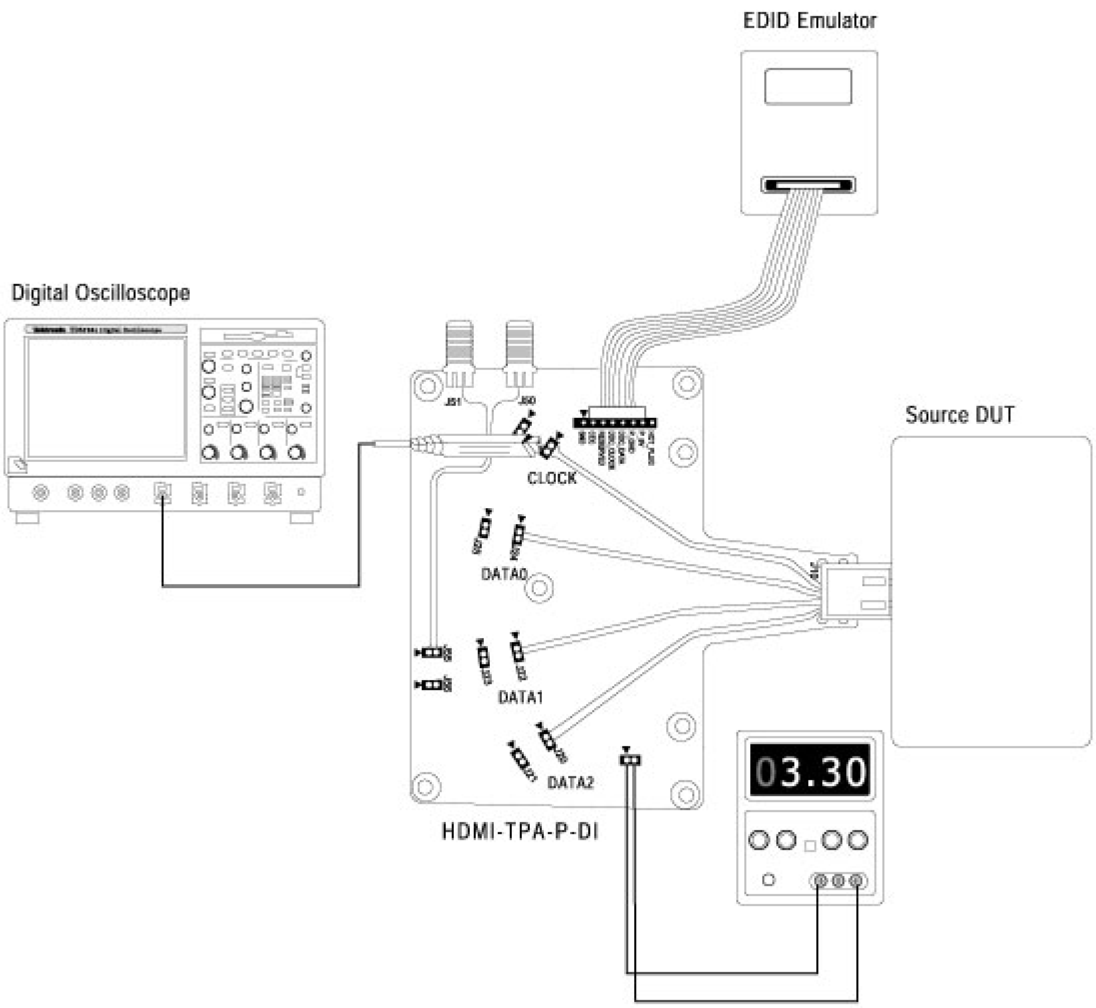


Figure 49: Connections to calculate Tbit

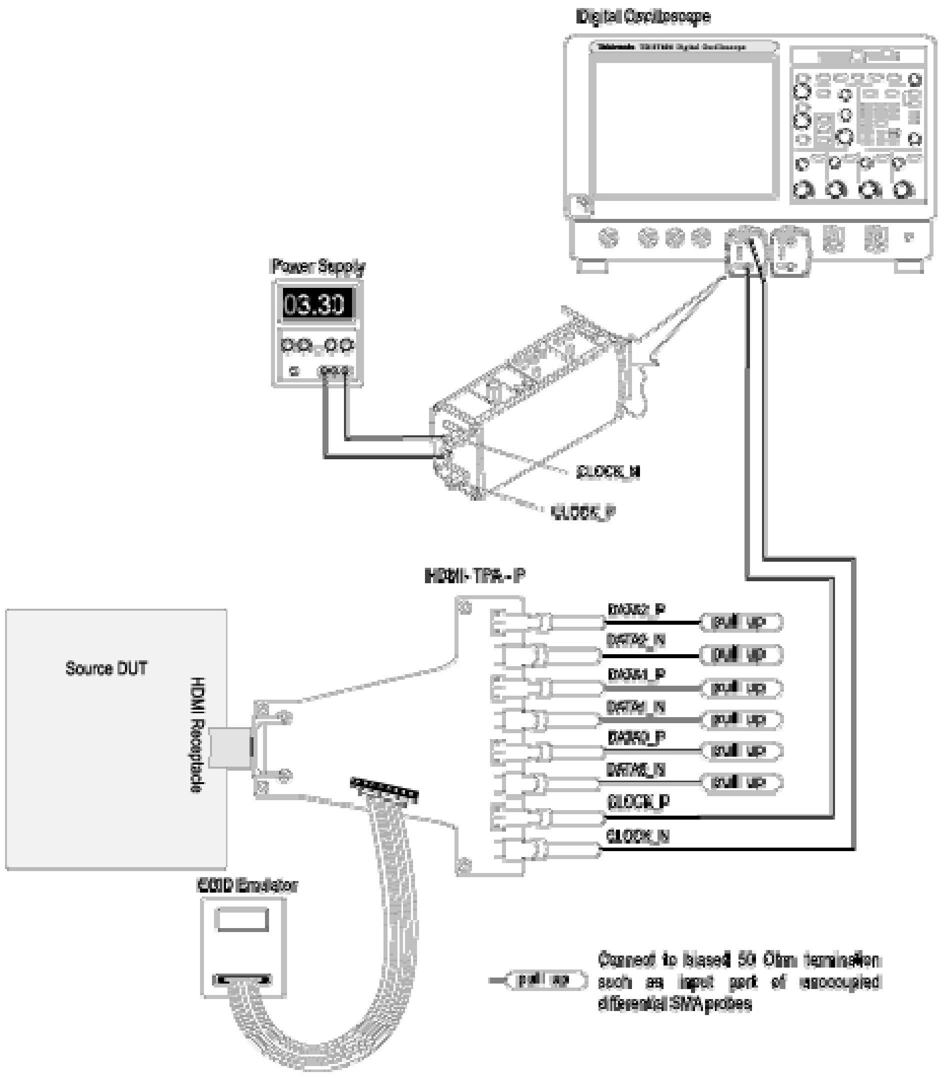


Figure 50: Connections to calculate Tbit with Efficere Technologies test fixture

- Connect a TPA-P-DI adapter to a Source DUT HDMI output connector.
- Connect a power supply to a TPA board.
- Configure the Source DUT to output a video format with the required supported pixel clock frequency.
- Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.

2. In the tbit pane, you have the following options:

Table 22: Tbit pane configure options

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

***Note**: Tbit value is used for oscilloscope setup and limit calculations. If the DUT's display resolution and the refresh rate changes, you have to recalculate Tbit.*

Deskew

Deskew is recommended before you conduct any skew test. To ensure accurate results, deskew the test setup before you conduct the tests from your device under test.

1. On the menu bar, click Utilities > Deskew.

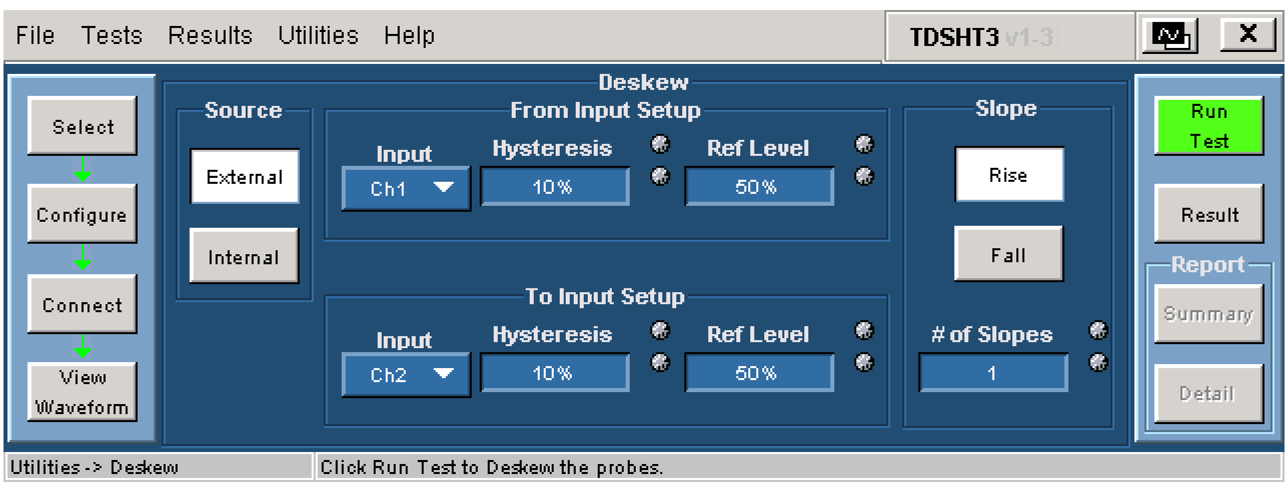


Figure 51: Utilities Deskew pane

2. In the source pane, you have the following options:

Table 23: Utilities Deskew Source options

Configure Parameter	Description
External	Click External if you will use an external deskew fixture (such as the clock signal of DUT).
Internal	Click Internal to probe the compensation signal on an oscilloscope.

3. Select the input channels between which you want to perform the deskew operation. Hysteresis and Ref Level are available only for an external source.

4. In the slope pane, you have the following options:

Table 24: Utilities Deskew Slope options

Configure Parameter	Description
Rise	Click Rise to calculate the average of the number of slopes and then set the skew for a rising pulse.
Fall	Click Fall to calculate the average of the number of slopes and then set the skew for a falling pulse. You do not have to calculate the average of the number of slopes for a falling pulse for an internal source.
# of Slopes	In the # of Slopes box, enter the required number of slopes to set the skew for either a rising pulse or a falling pulse. Ensure that the required number of slopes is present in the acquisition.

5. Click Run Test to deskew the probes.

Configure-DTG Pattern List

1. On the menu bar, click Utilities > DTG Pattern List.

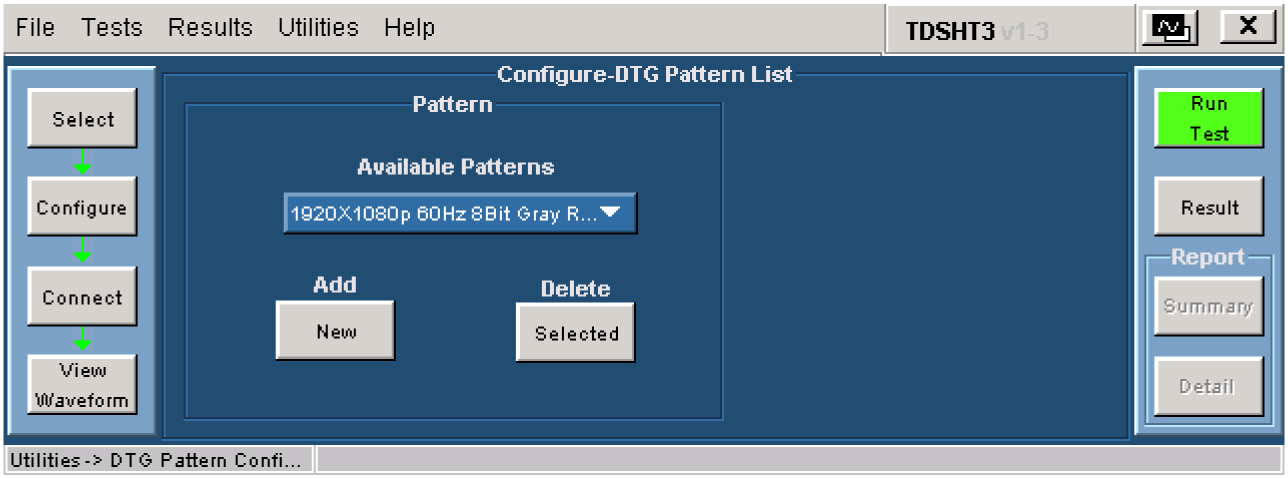


Figure 52: DTG Pattern List

2. In the Pattern pane, the Available Patterns drop-down list displays all the available patterns (including the newly added ones). The DTG pattern selected from the Configure screen is displayed as the default pattern in the Available Patterns list.

3. Click New to add a new DTG pattern. Type the name of the pattern and click Enter to save the pattern. All the newly added patterns will be available in the Cable Eye Diagram, Sink Min/Max Diff, and Sink Jitter Tolerance. The newly added pattern files should have a .dtg extension.

Figure 53: DTG Pattern Path

4. You can delete an added pattern by selecting the pattern from the Available Patterns list. Click Selected to delete the selected pattern. The default patterns installed by the application cannot be deleted.

Note: All the folders of the application should have unique DTG pattern names.

Select Which Tests to Run

Source

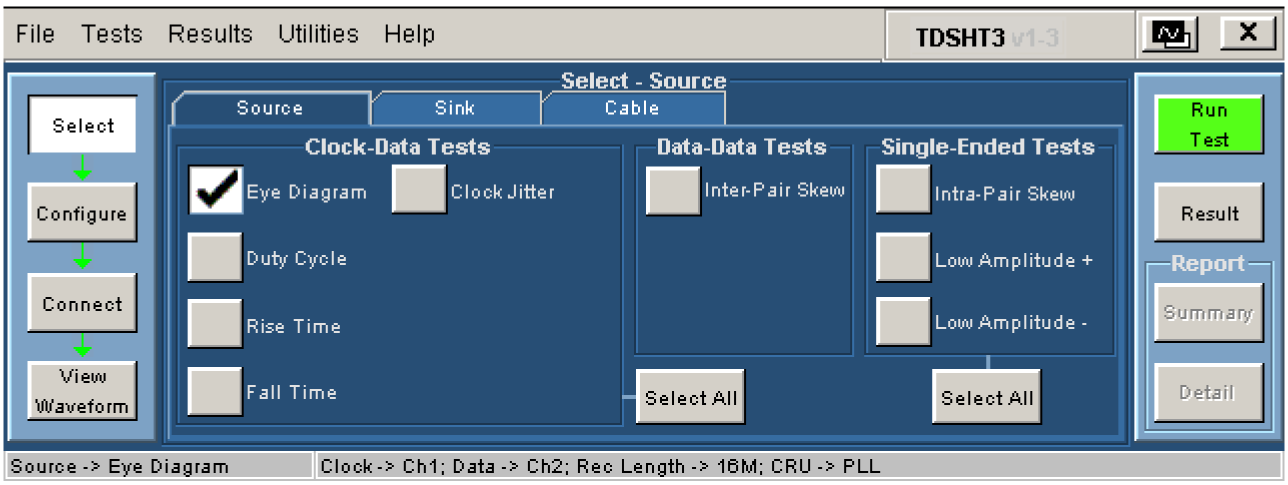


Figure 54: Select Source with Eye diagram test selected

The following table shows how to select the source test parameters:

Table 25: Select Source options

Test type	How to select
Source	Click Tests > Select > Source to select the source tab.
Eye Diagram	In the Source tab, select the Eye Diagram check box.
Duty Cycle	In the Source tab, select the Duty Cycle check box.
Rise Time	In the Source tab, select the Rise Time check box.
Fall Time	In the Source tab, select the Fall Time check box.
Clock Jitter	In the Source tab, select the Clock Jitter check box.
Inter-Pair Skew	In the Source tab, select the Inter-Pair Skew check box in the data-data tests pane.
Intra-Pair Skew	In the Source tab, select the Intra-Pair Skew check box.
Low Amplitude +	In the Source tab, select the Low Amplitude + check box.
Low Amplitude –	In the Source tab, select the Low Amplitude – check box.
Select All	In the Source tab, click Select All to select multiple tests either for Clock-Data Tests or Single-Ended Tests. When you select more than one test, Select All changes to Clear All.

Sink

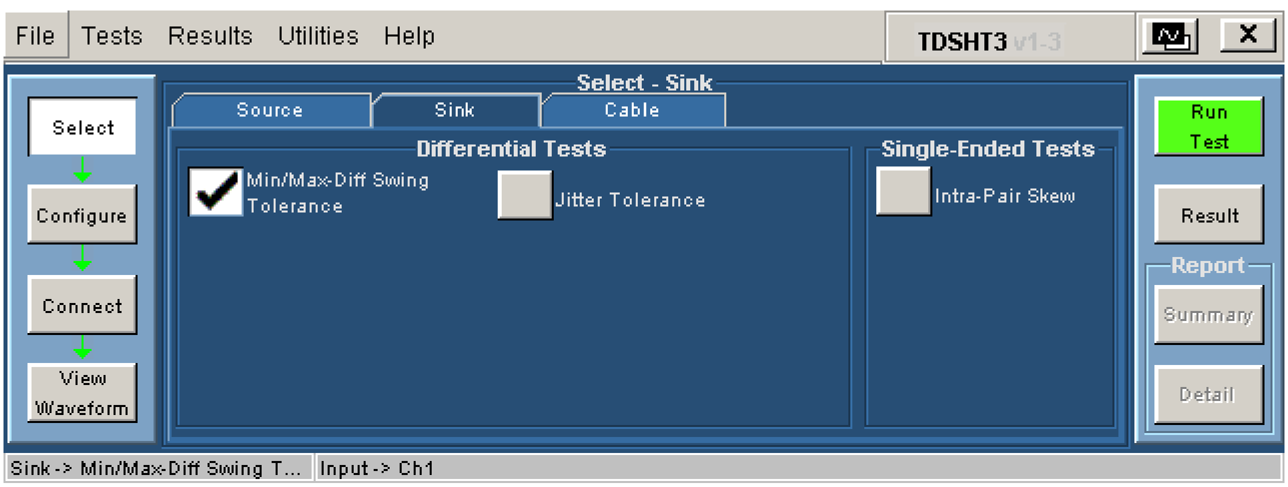


Figure 55: Select Sink with Min/Max-Diff Swing Tolerance test selected

The following table shows how to select the sink test parameters:

Table 26: Select Sink options

Test type	How to select
Sink	Click Tests > Select > Sink to select the sink tab.
Min/Max-Diff Swing Tolerance	In the Sink tab, select the Min/Max-Diff Swing Tolerance check box.
Jitter Tolerance	In the Sink tab, select the Jitter Tolerance check box.
Intra-Pair Skew	In the Sink tab, select the Intra-Pair Skew check box.

Cable

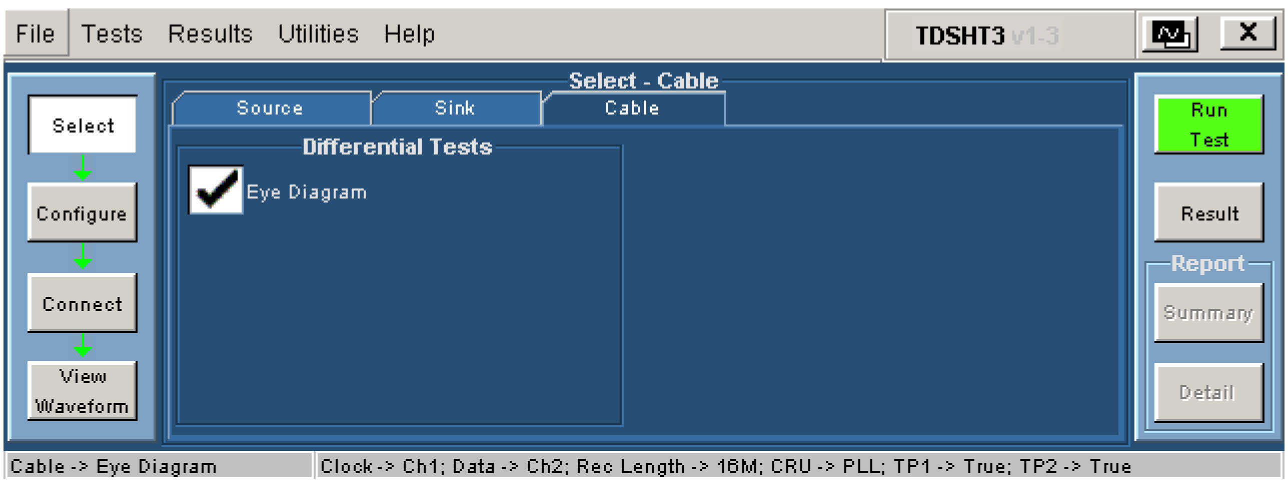


Figure 56: Select Cable with Eye Diagram test selected

The following table shows how to select the cable test parameters:

Table 27: Select Cable options

Test Type	How to Select
Cable	Click Tests > Select > Cable to select the cable tab.
Eye Diagram	In the Cable tab, select the Eye Diagram check box.

Configure

Source

On the menu bar, click Tests > Configure to configure the parameters for the selected test(s).

In the configure pane, you will see the factory default configuration for the test you selected. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

The following table shows the parameters that you can configure for source (clock-data tests):

			Source Input	Clock	Hysteresis	Mid Ref Level	Low Ref Level	High Ref Level	Record Length	Tbit	# of Acqs	Units
Source												
	Clock-Data											
		Eye Diagram	Clock and Data	Yes	Yes	Yes			Yes			Yes
		Duty Cycle	Clock			Yes				Yes	Yes	Yes
		Rise Time	Clock or Data				Yes	Yes		Yes	Yes	Yes
		Fall Time	Clock or Data				Yes	Yes		Yes	Yes	Yes
		Clock Jitter	Clock	Yes	Yes	Yes			Yes			Yes

Figure 57: Parameters for Source Clock-Data tests

The following table shows the parameters that you can configure for source (data-data tests):

				Source Input	Hysteresis	Mid Ref Level	Tbit	Units	Data Pair
Source									
	Data-Data								
		Inter-Pair Skew	Data+ and Data, Clock	Yes	Yes	Yes	Yes	Yes	

Figure 58: Parameters for Source Data-Data tests

The following table shows the parameters that you can configure for source (single-ended tests):

			Source Input	Avcc	Tbit	# of Acqs
Source						
	Single-Ended					
		Intra-Pair Skew	Data+ or Data-/Clock		Yes	Yes
		Low Amplitude +	Data+ or Data-/Clock	Yes	Yes	Yes
		Low Amplitude -	Data+ or Data-/Clock	Yes	Yes	Yes

Figure 59: Parameters for Source Single-Ended tests

Sink

On the menu bar, click Tests > Configure to configure the parameters for the selected test.

In the configure pane, you will see the factory default configuration for the test you selected. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

The following table shows the parameters that you can configure for sink (differential tests):

			Source Input	Clock	Hysteresis	Mid Ref Level	Record Length	Units	DTG Pattern Path	DTG Output	Frequency Pair	DUT Freq (MHz)	Jitter Insertion Type	Jitter Test Option	Jitter Amplitude
Sink															
	Differential														
		Min/Max-Diff Swing Tolerance	Data						Yes	Yes					
		Jitter Tolerance	Clock and Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 60: Parameters for Sink Differential test

The following table shows the parameters that you can configure for sink (single-ended tests):

			Source Input	Tbit	DTG Pattern Path	DTG Output	Skew on all Channels
Sink							
	Single-Ended						
		Intra-Pair Skew	Clock	Yes	Yes	Yes	Yes

Figure 61: Parameters for Sink Single-Ended tests

Cable

On the menu bar, click Tests > Configure to configure the parameters for the selected test.

In the configure pane, you will see the factory default configuration for the test you selected. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

The following table shows the parameters that you can configure for cable (differential tests):

			Source Input	Clock	Hysteresis	Mid Ref Level	Record Length	Units	TP1-TP2	DTG Pattern Path	DTG Output	Cable Equalizer	Rise Time Filter
Cable													
	Differential												
		Eye Diagram	Clock and Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 62: Parameters for Cable Differential tests

Connect

EDID Emulator for Source Tests

The EDID-PCB or EDID Emulator can be used in the following Source connection diagrams.

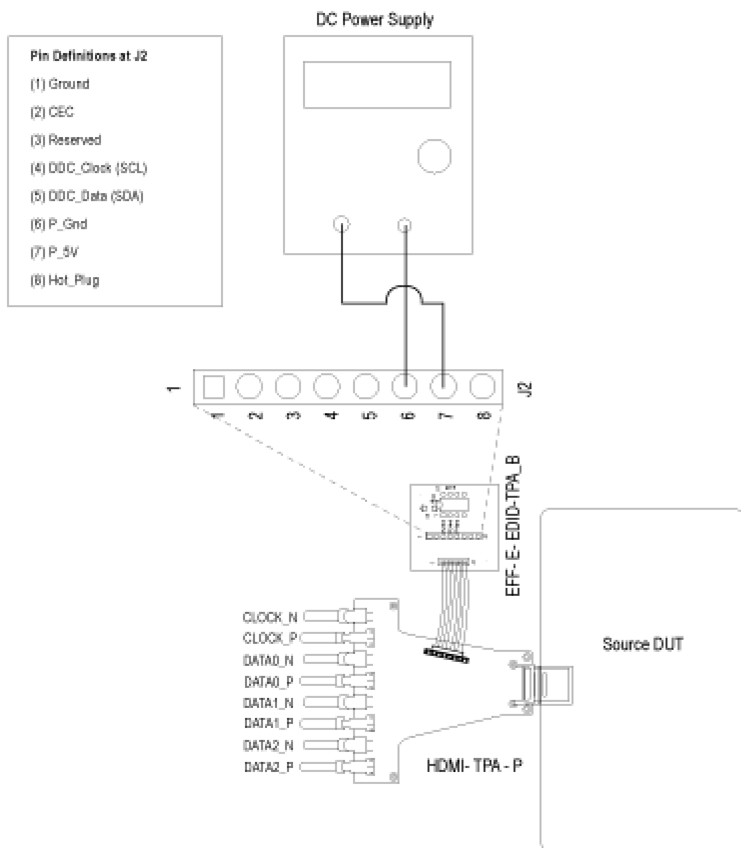


Figure 63: Connections for EDID Emulator for Source Tests

Source – Eye Diagram

On the menu bar, click Tests > Connect and make the connection as follows. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

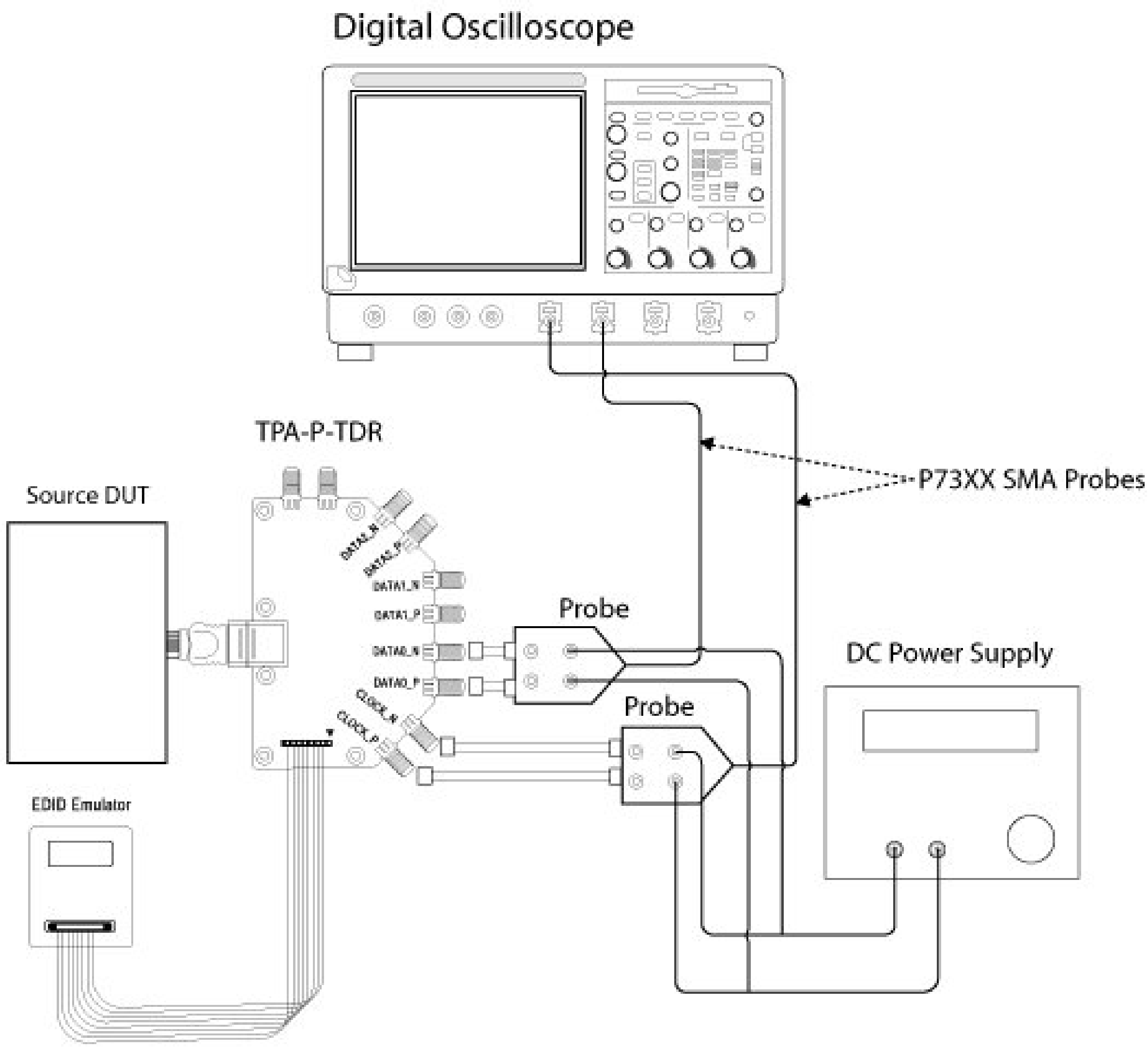


Figure 64: Connections for Source Eye Diagram

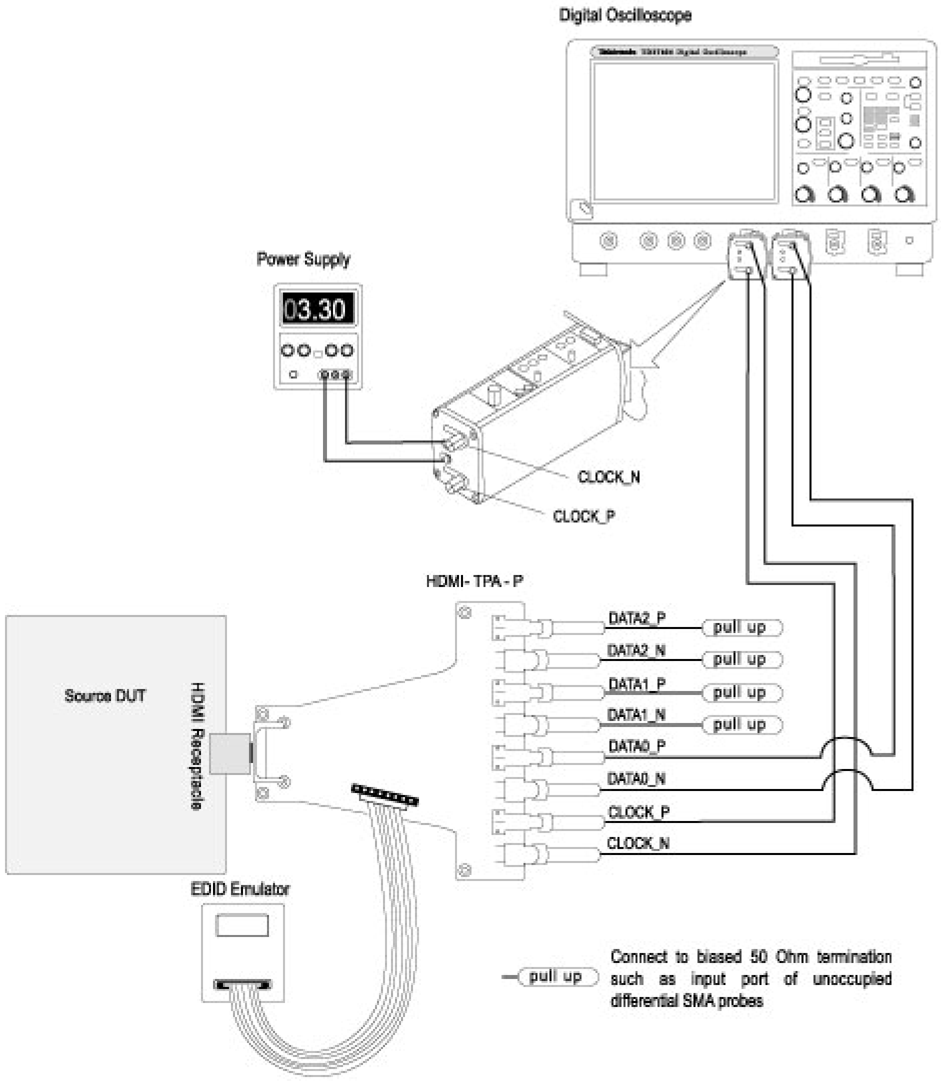


Figure 65: Connections for Source Eye Diagram with Efficere Technologies test fixture

1. Connect the HDMI output of the source DUT to the TPA-P-TDR/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Connect a TMDS Clock to the configured oscilloscope channel by using a SMA differential probe.
6. Connect the TMDS_DATA pair on which you will conduct the test to the configured oscilloscope channel by using a SMA differential probe.

.

Source – Duty Cycle

On the menu bar, click Tests > Connect and make the connection as follows. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

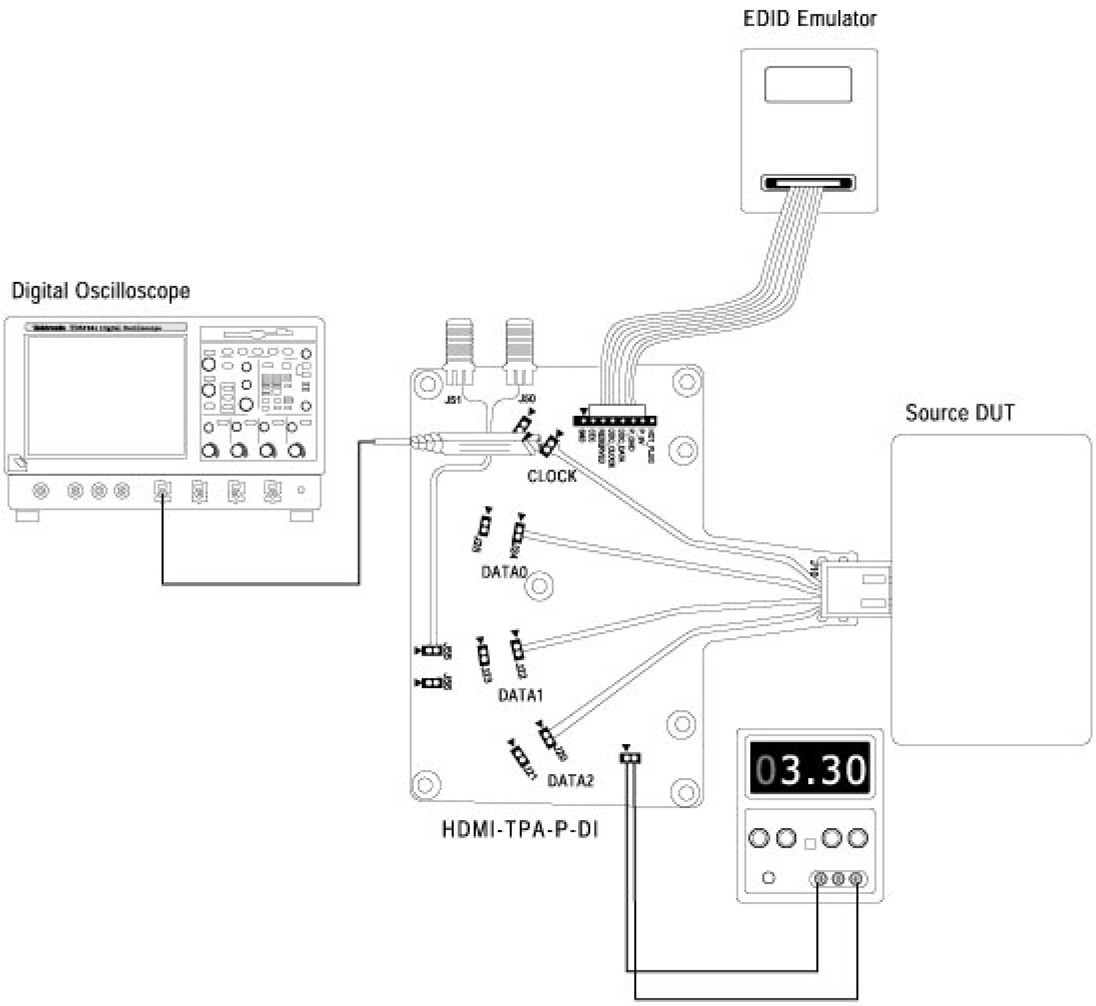


Figure 66: Connections for Source Duty Cycle

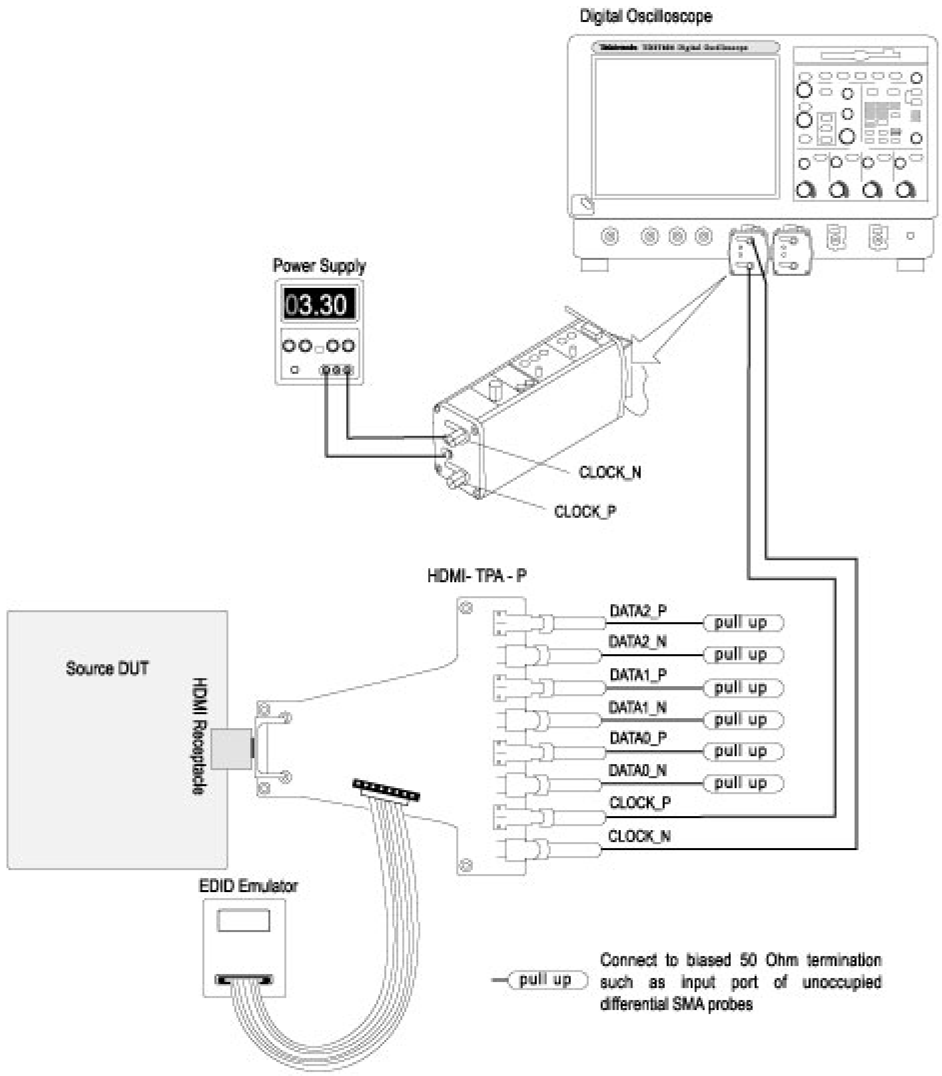


Figure 67: Connections for Source Duty Cycle with Efficere Technologies test fixture

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.

Source – Rise Time

On the menu bar, click Tests > Connect and make the connection as follows. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

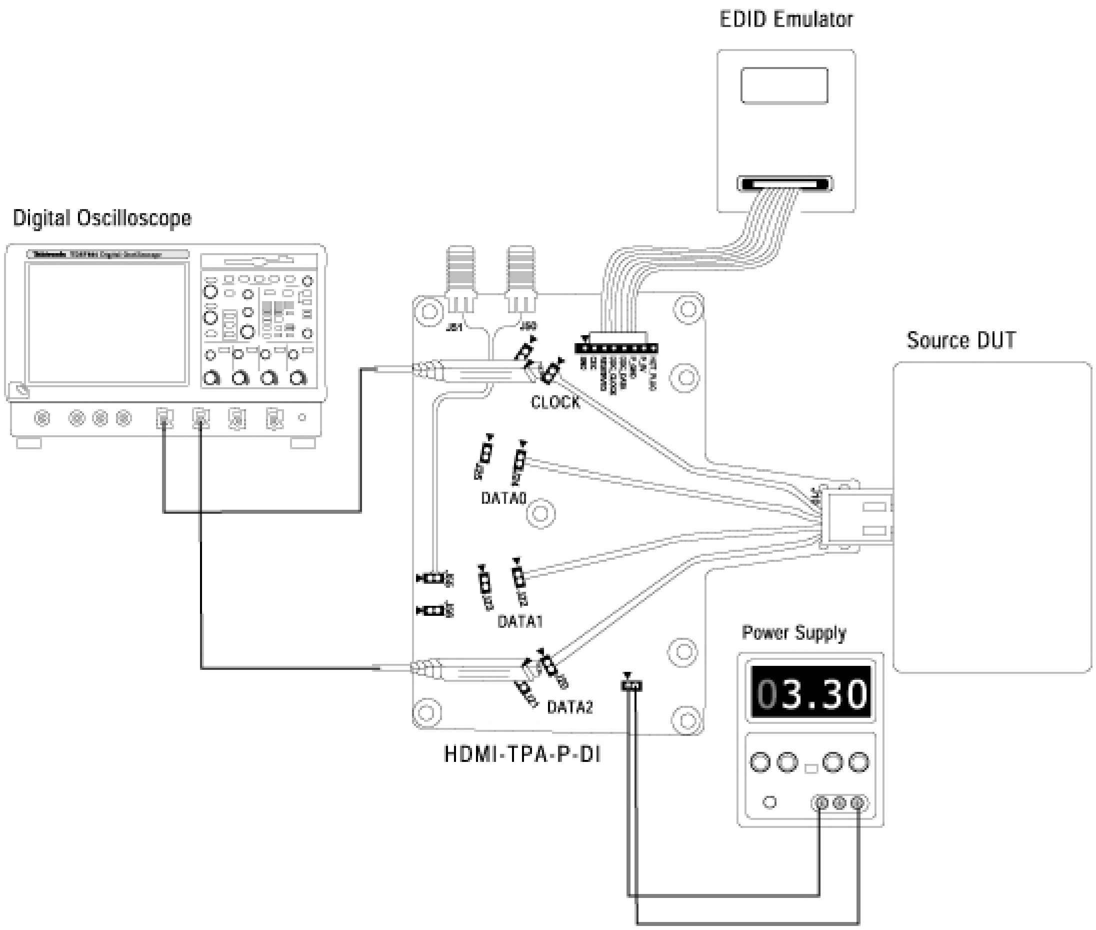


Figure 68: Connections for Source Rise Time

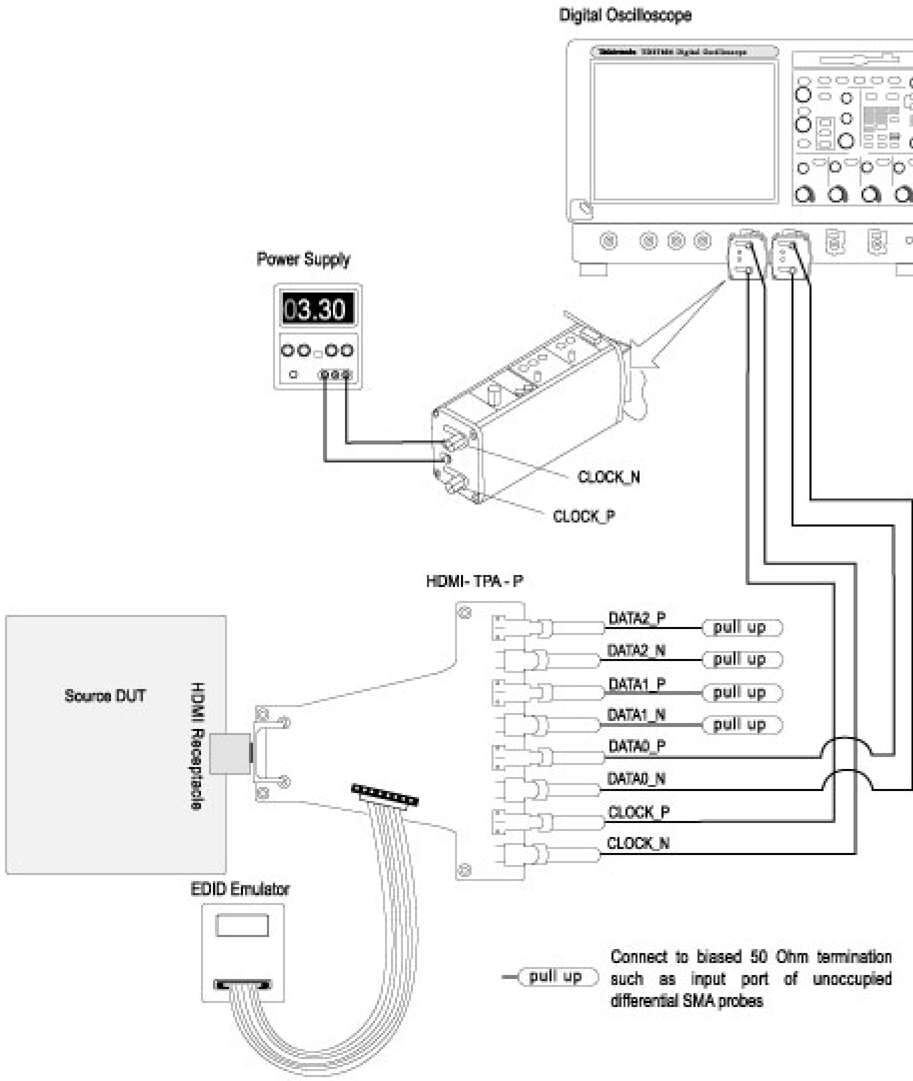


Figure 69: Connections for Source Rise Time with Efficere Technologies test fixture

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Connect a differential probe to a TMDS_DATA/CLOCK.

6. If you have selected Re-calculate Tbit in the configuration pane, then connect the clock channel to the configured oscilloscope channel by using a second differential probe.

Source – Fall Time

On the menu bar, click Tests > Connect and make the connection as follows. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

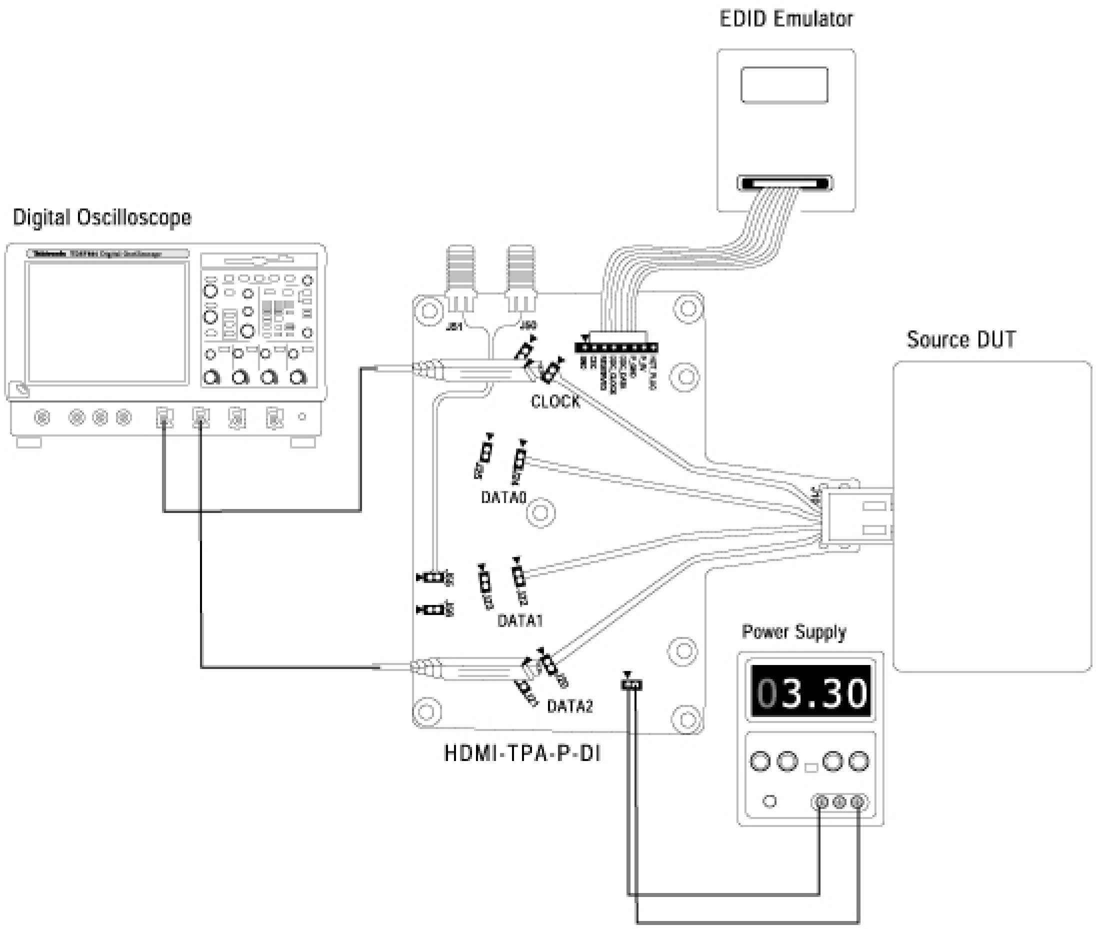


Figure 70: Connections for Source Fall Time

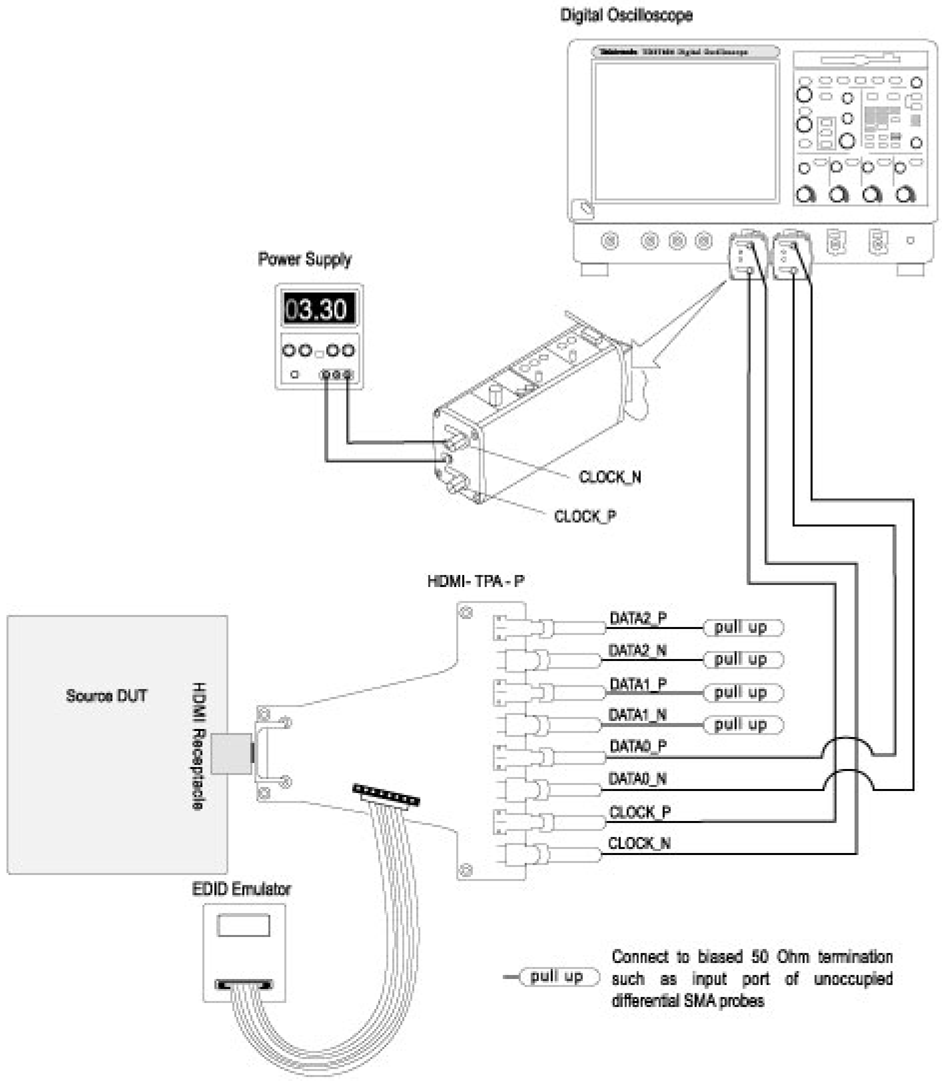


Figure 71: Connections for Source Fall Time with Efficere Technologies test fixture

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the highest supported pixel clock frequency.
5. Connect a differential probe to TMDS_DATA/CLOCK.
6. If you have selected Re-calculate Tbit in the configuration pane, then connect the clock channel to the configured oscilloscope channel by using a second differential probe.

Source – Clock Jitter

On the menu bar, click Tests > Connect and make the connection as follows. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

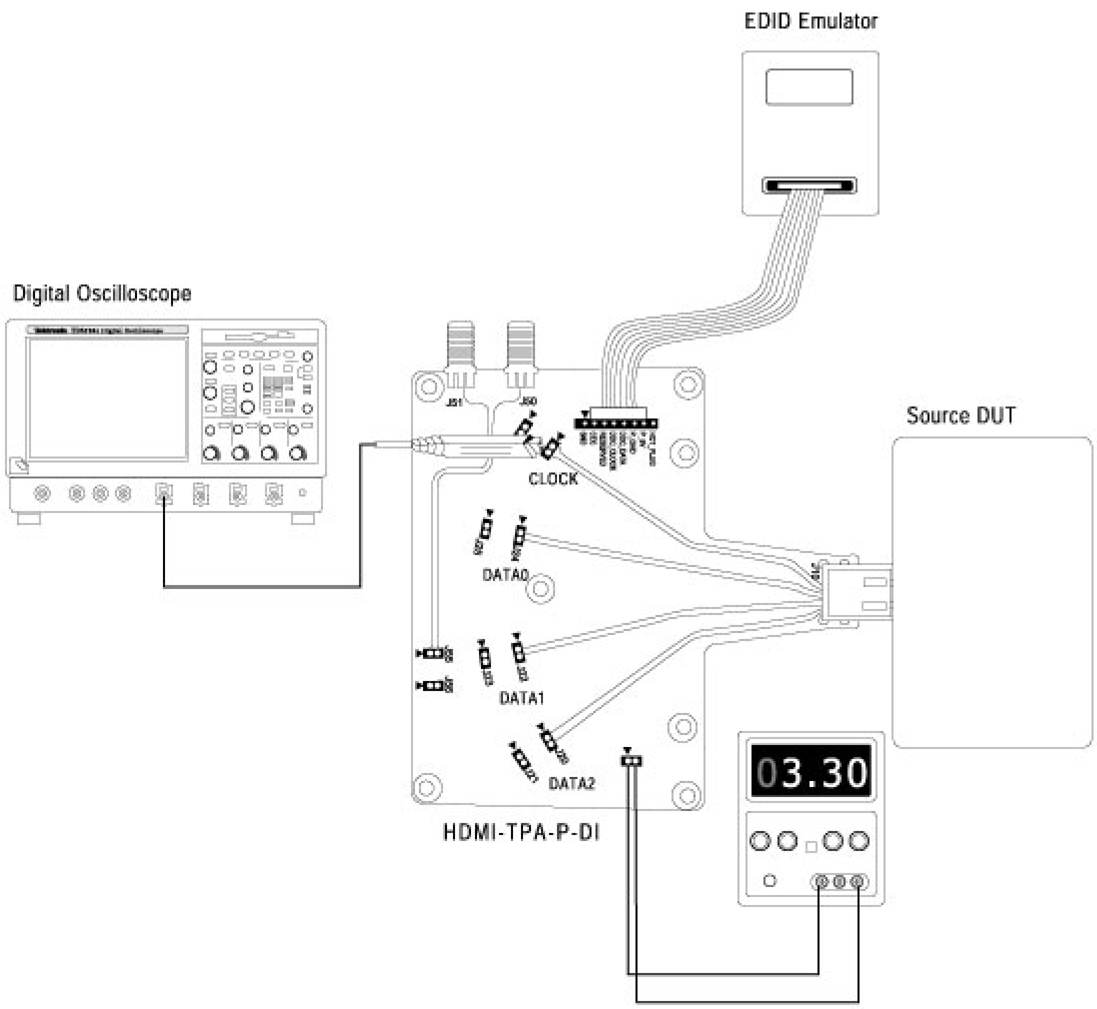


Figure 72: Connections for Source Clock Jitter

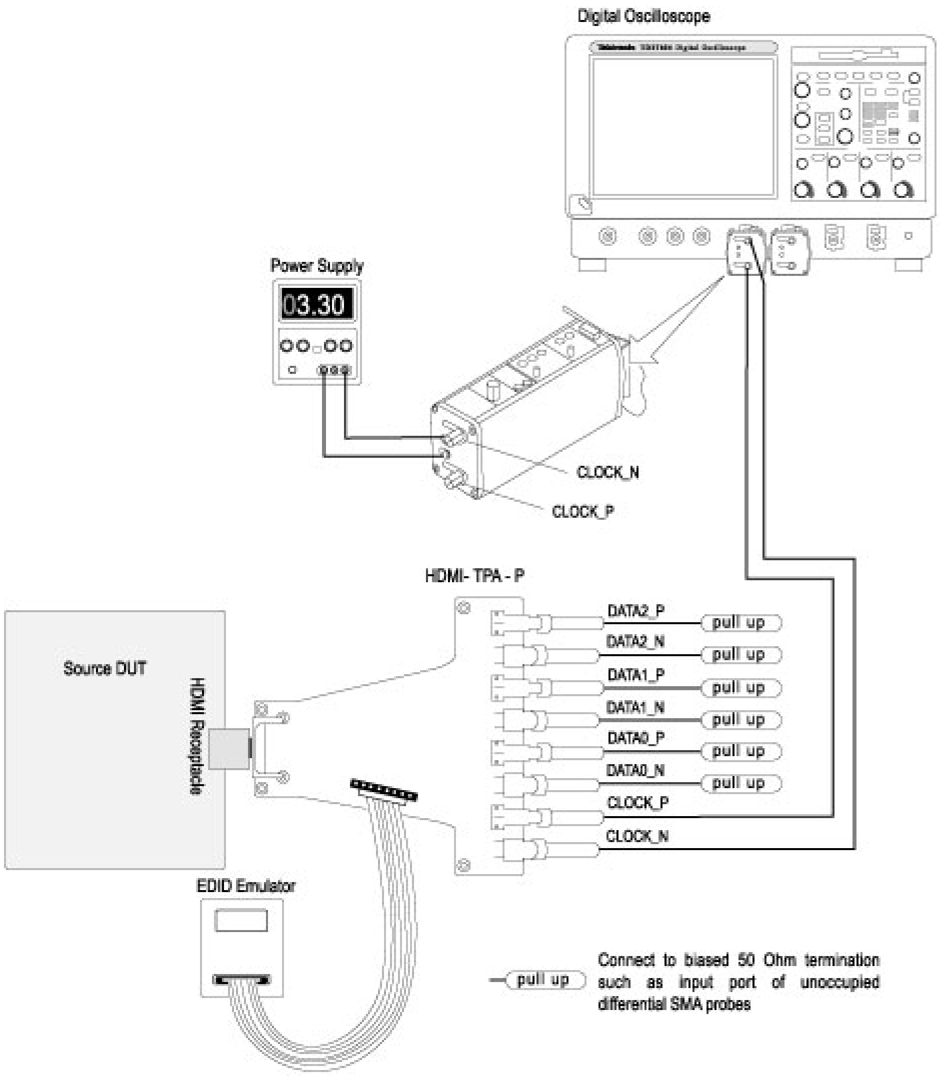


Figure 73: Connections for Source Clock Jitter with Efficere Technologies test fixture

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.

2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.

3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).

4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.

5. Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.

Source – Clock-Data Tests Select All

On the menu bar, click Tests > Connect and make the connection as follows. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

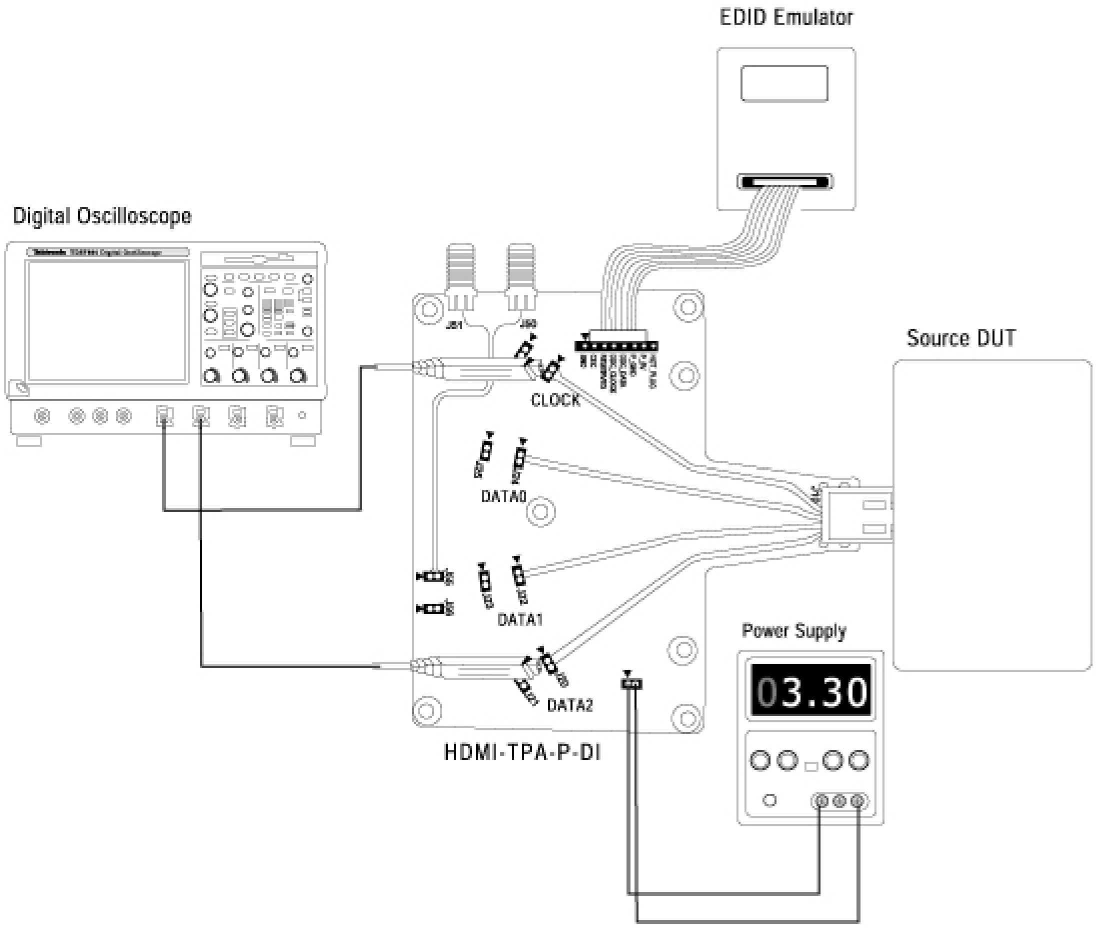


Figure 74: Connections for Source Clock-Data tests (with Select All option)

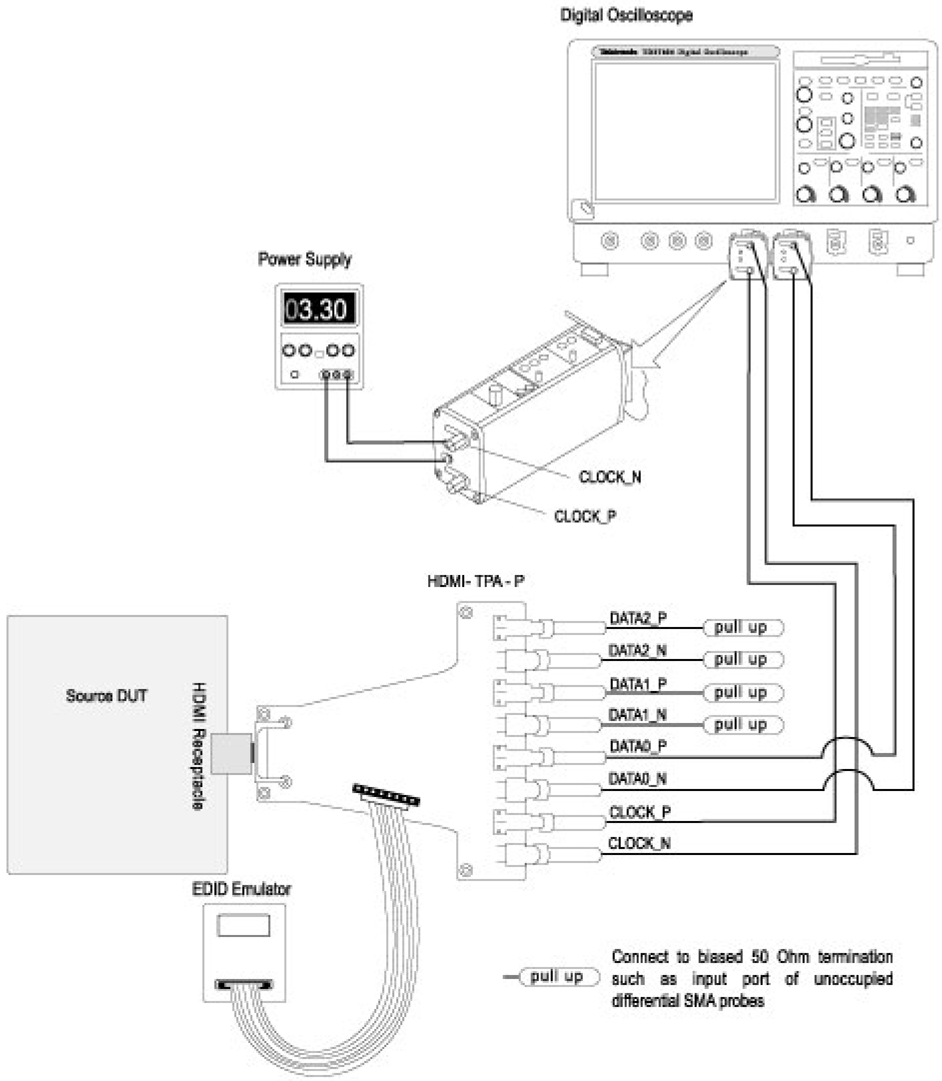


Figure 75: Connections for Source Clock-Data tests with Efficere Technologies test fixture (with Select All option)

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.
5. Connect the TMDS_DATA pair on which you will conduct the test to the configured oscilloscope channel by using a second differential probe.
6. Configure the Source DUT to output the required video format.

Source – Inter-Pair Skew for Data-Data Tests

On the menu bar, click Tests > Connect. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

Setup 1: If you have selected Re-calculate Tbit in the configuration pane

Make the connections as follows:

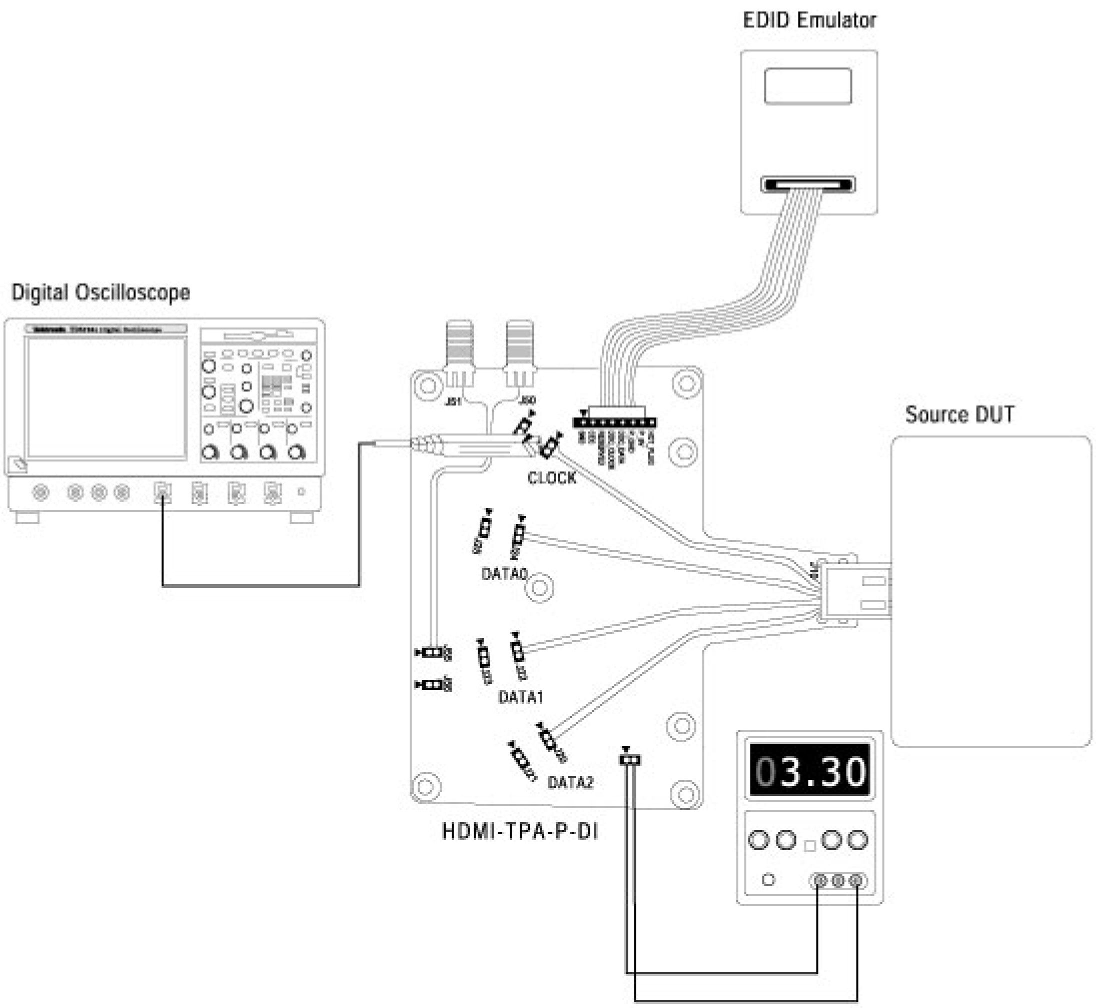


Figure 76: Connections for Inter-Pair Skew of Data-Data tests (Re-calculate Tbit option selected)

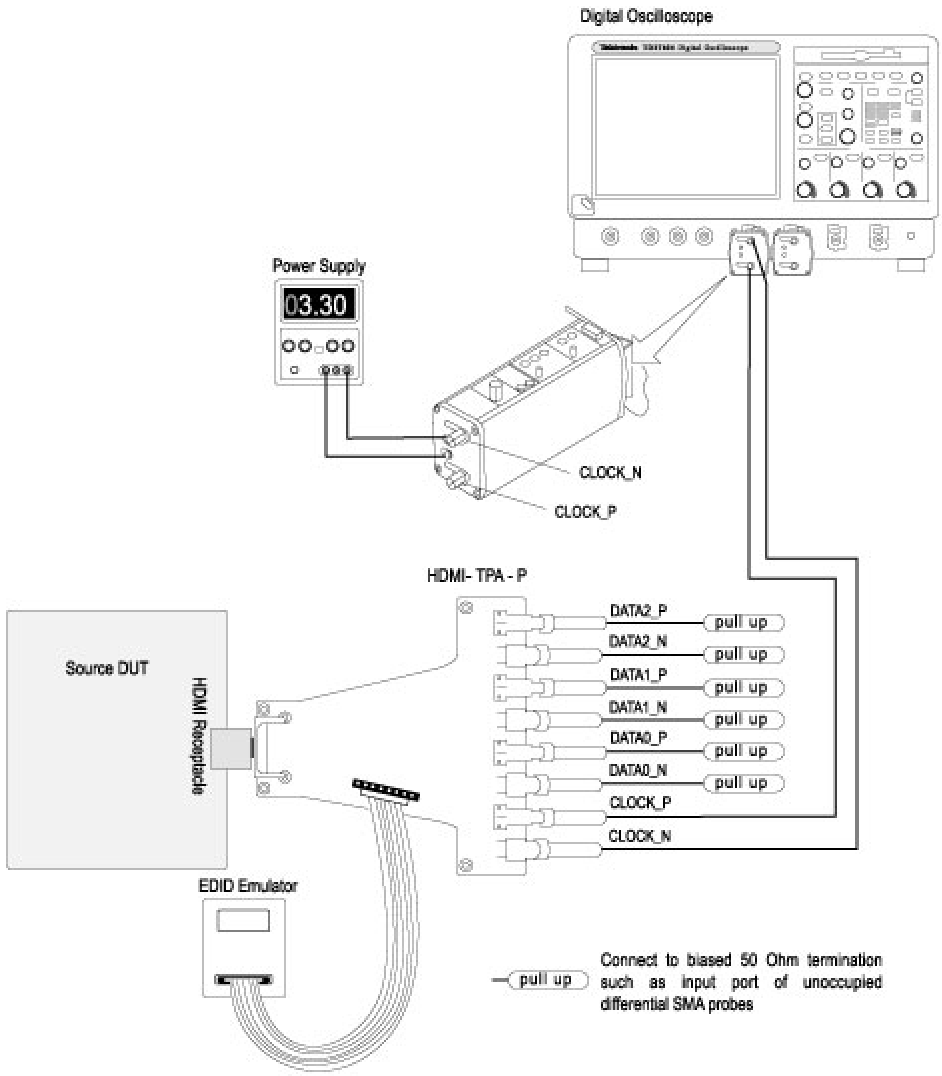


Figure 77: Connections for Inter-Pair Skew of Data-Data tests with Efficere Technologies test fixture (Re-calculate Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.

Setup 2: If you have selected Existing Tbit value or if you are calculating the inter-pair skew for data-data tests

Make the connections for Data-to-Data Skew as follows:

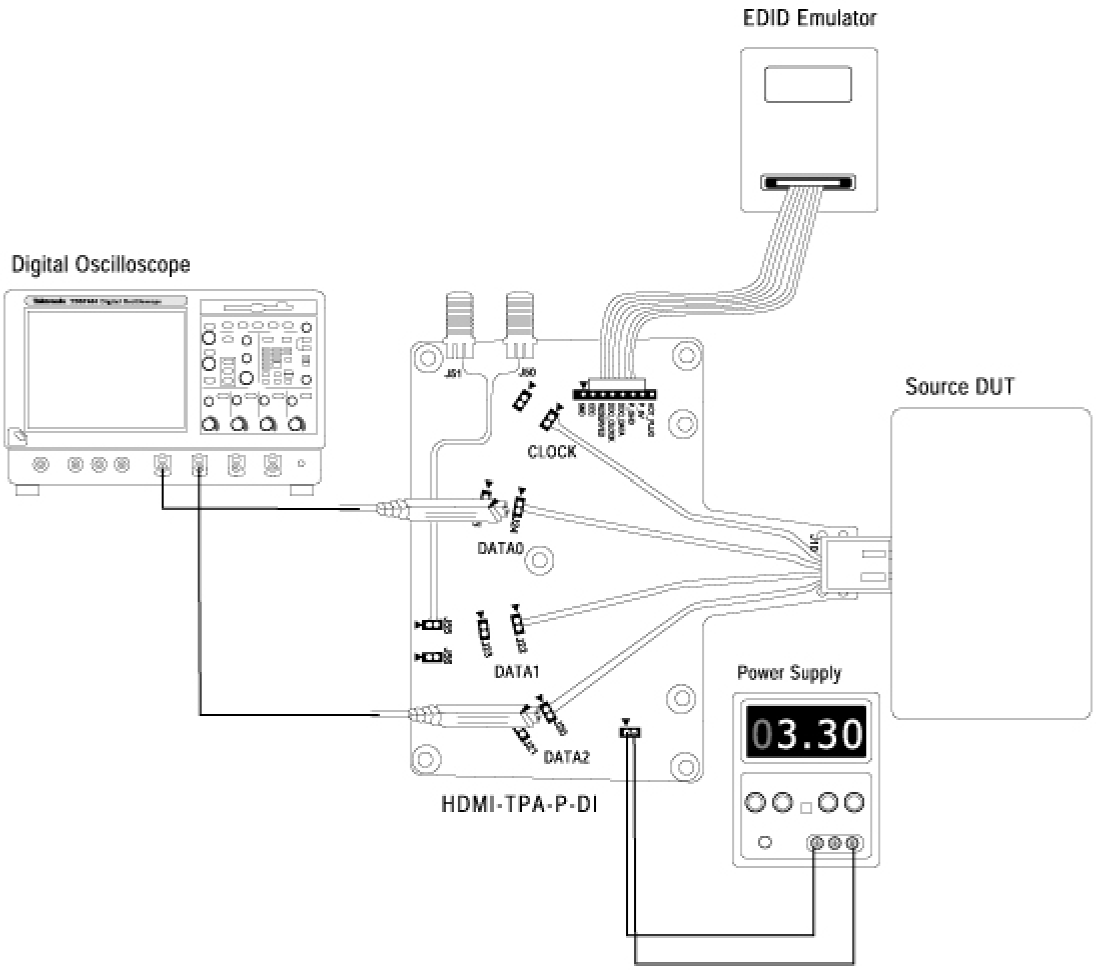


Figure 78: Connections for Source Inter-Pair Skew of Data-Data tests (Existing Tbit option selected)

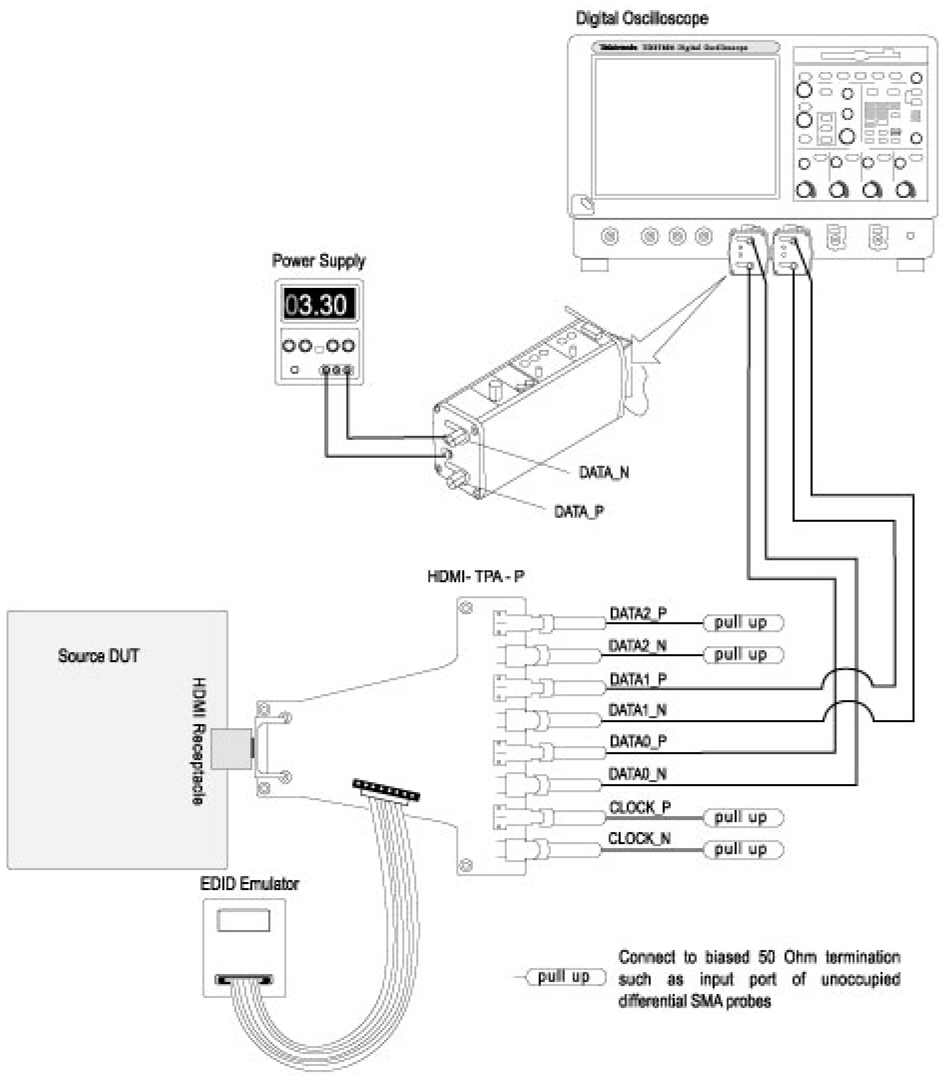


Figure 79: Connections for Source Inter-Pair Skew of Data-Data tests with Efficere Technologies test fixture (Existing Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.

2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.

3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).

4. Connect a TMDS_DATA<X> Clock to the configured oscilloscope channel by using a differential probe.

5. Connect the TMDS_DATA<Y> pair on which you will conduct the test to the configured oscilloscope channel by using a second differential probe.

6. Configure the Source DUT to output the required video format.

Source – Intra-Pair Skew

On the menu bar, click Tests > Connect. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

Setup 1: If you have selected Re-calculate Tbit in the configuration pane

Make the connections as follows:

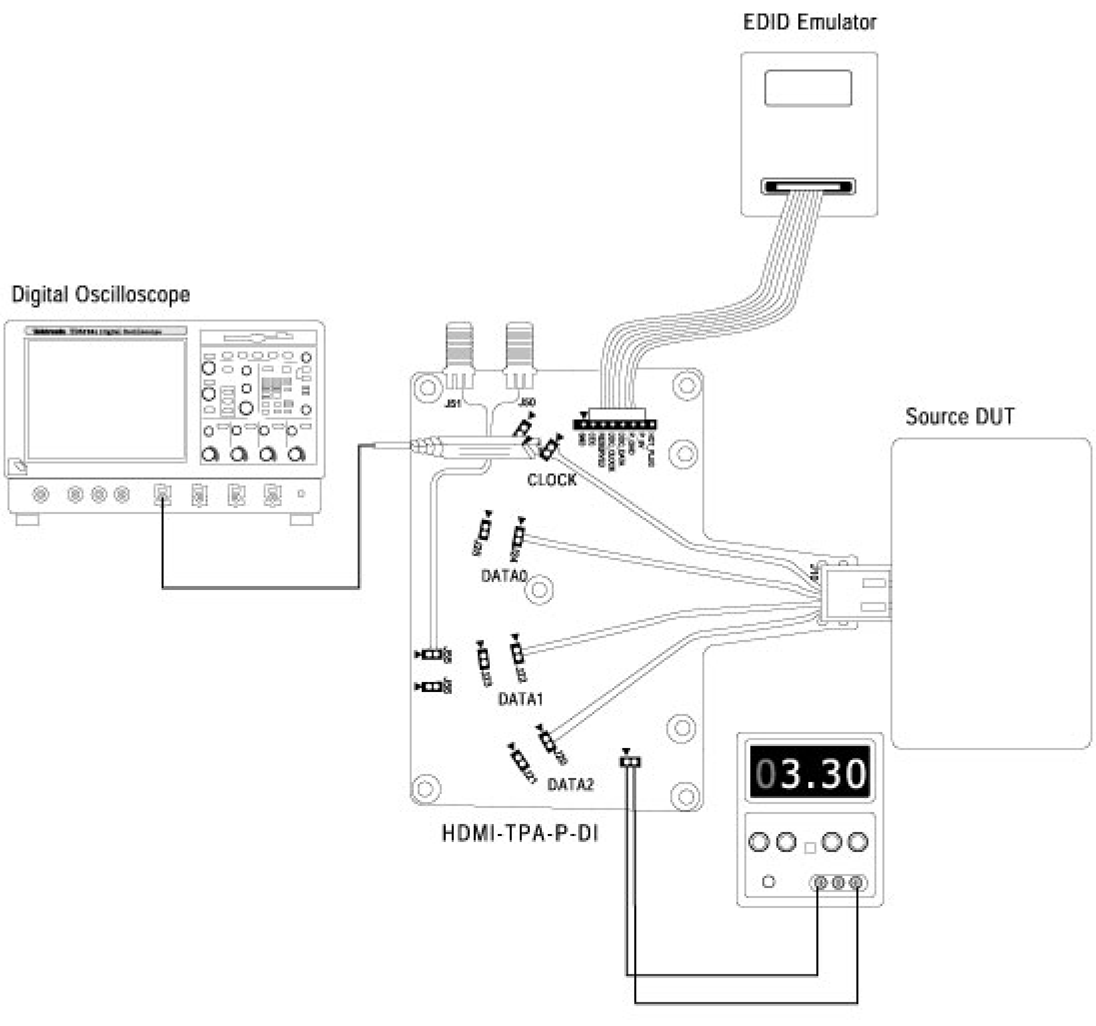


Figure 80: Connections for Source Intra-Pair Skew test (Re-calculate Tbit option selected)

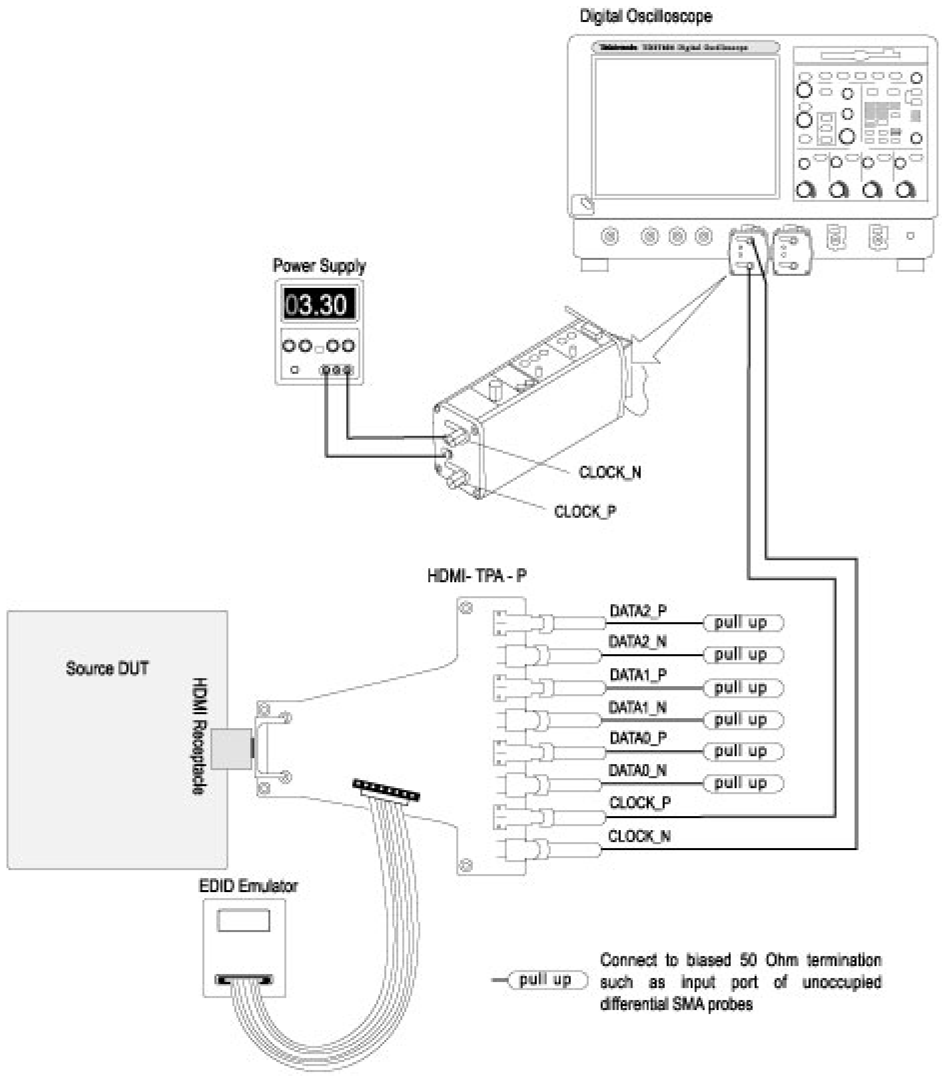


Figure 81: Connections for Source Intra-Pair Skew test with Efficere Technologies test fixture (Re-calculate Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.

Setup 2: If you have selected Existing Tbit value or if you are calculating the intra-pair skew

Make the connections as follows:

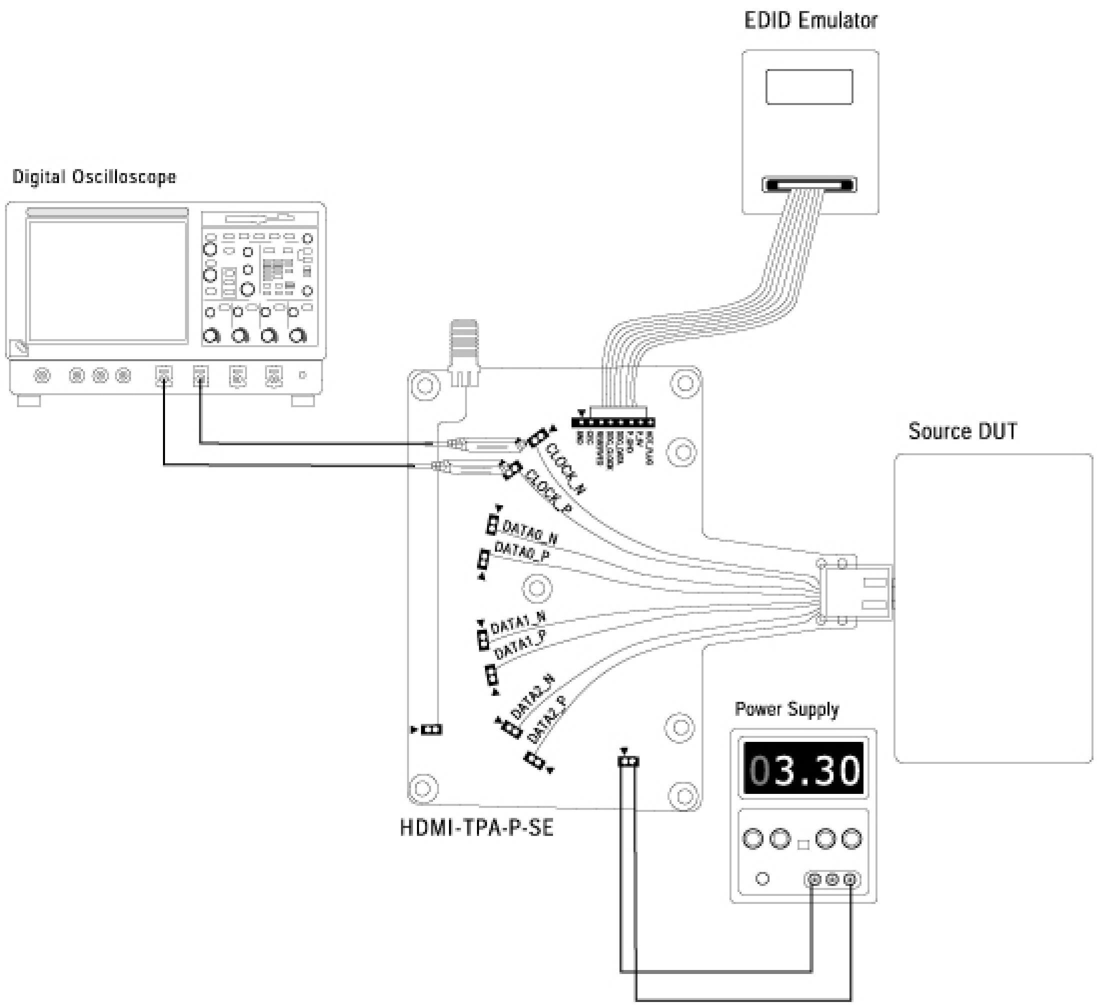


Figure 82: Connections for Source Intra-Pair Skew test (Existing Tbit option selected)

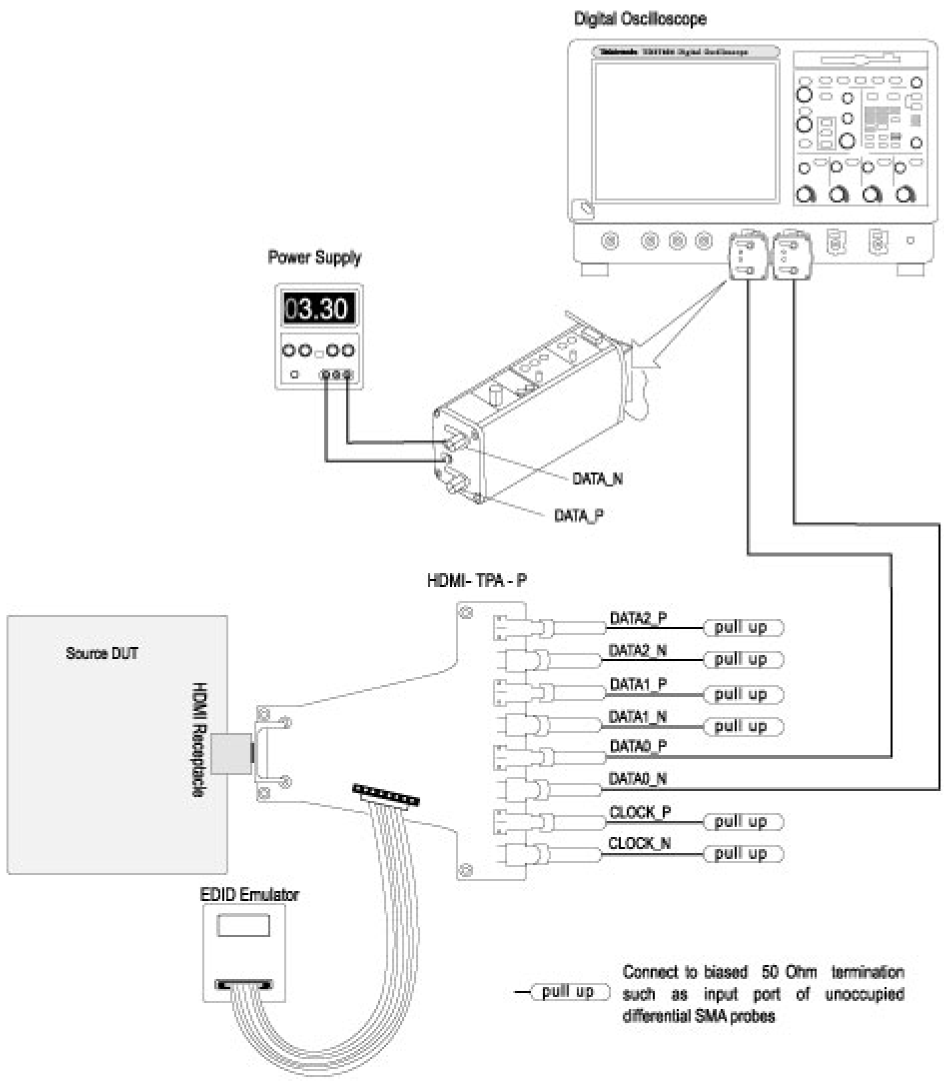


Figure 83: Connections for Source Intra-Pair Skew test with Efficere Technologies test fixture (Existing Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-SE/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Connect the first single-ended probe to TMDS_DATA<X>+/TMDS_CLOCK+.
5. Connect the second single-ended probe to TMDS_DATA<X>–/TMDS_CLOCK+.

6. Configure the Source DUT to output a video format with the required supported pixel clock frequency.

Source – Low Amplitude +

On the menu bar, click Tests > Connect. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

Setup 1: If you have selected Re-calculate Tbit in the configuration pane

Make the connections as follows:

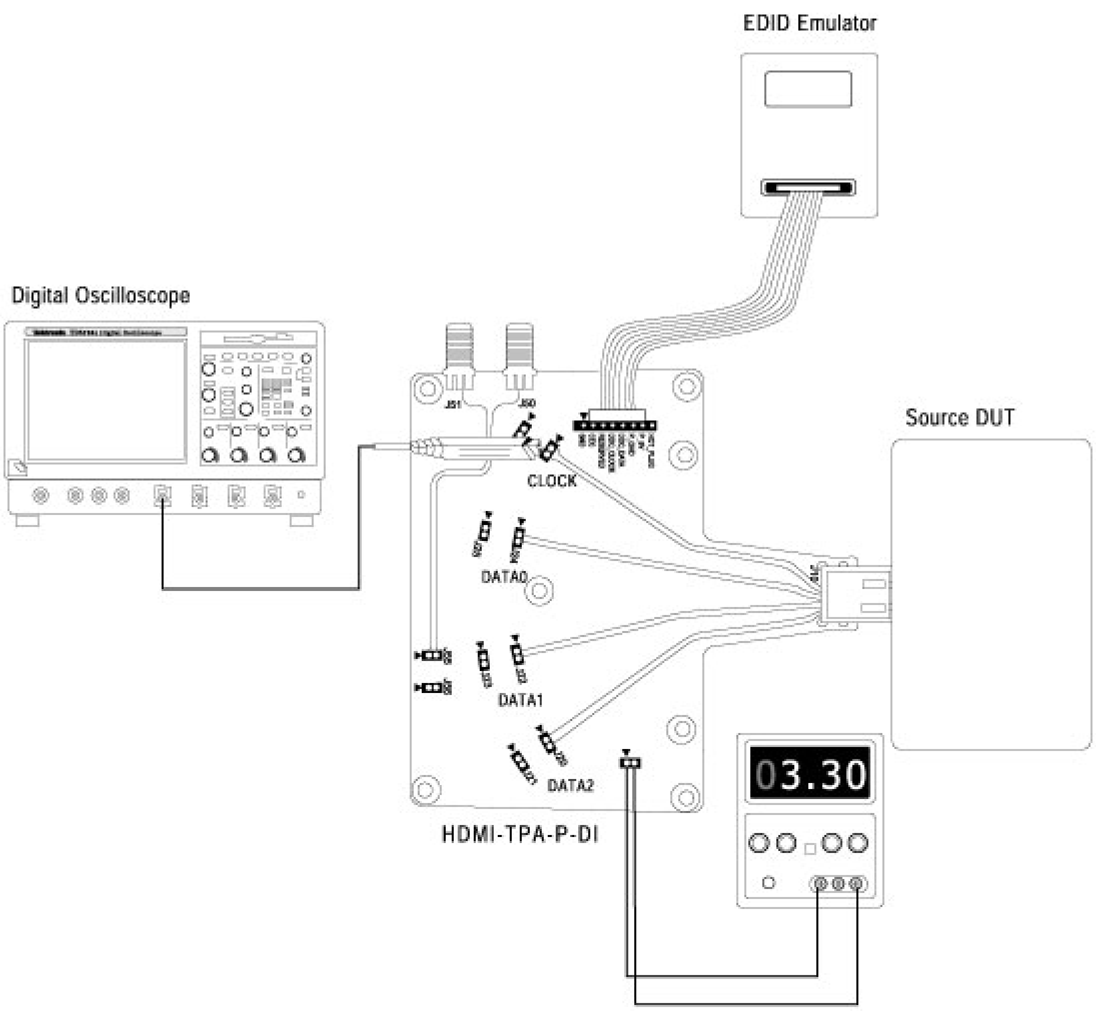


Figure 84: Connections for Low Amplitude + (Re-calculate Tbit option selected)

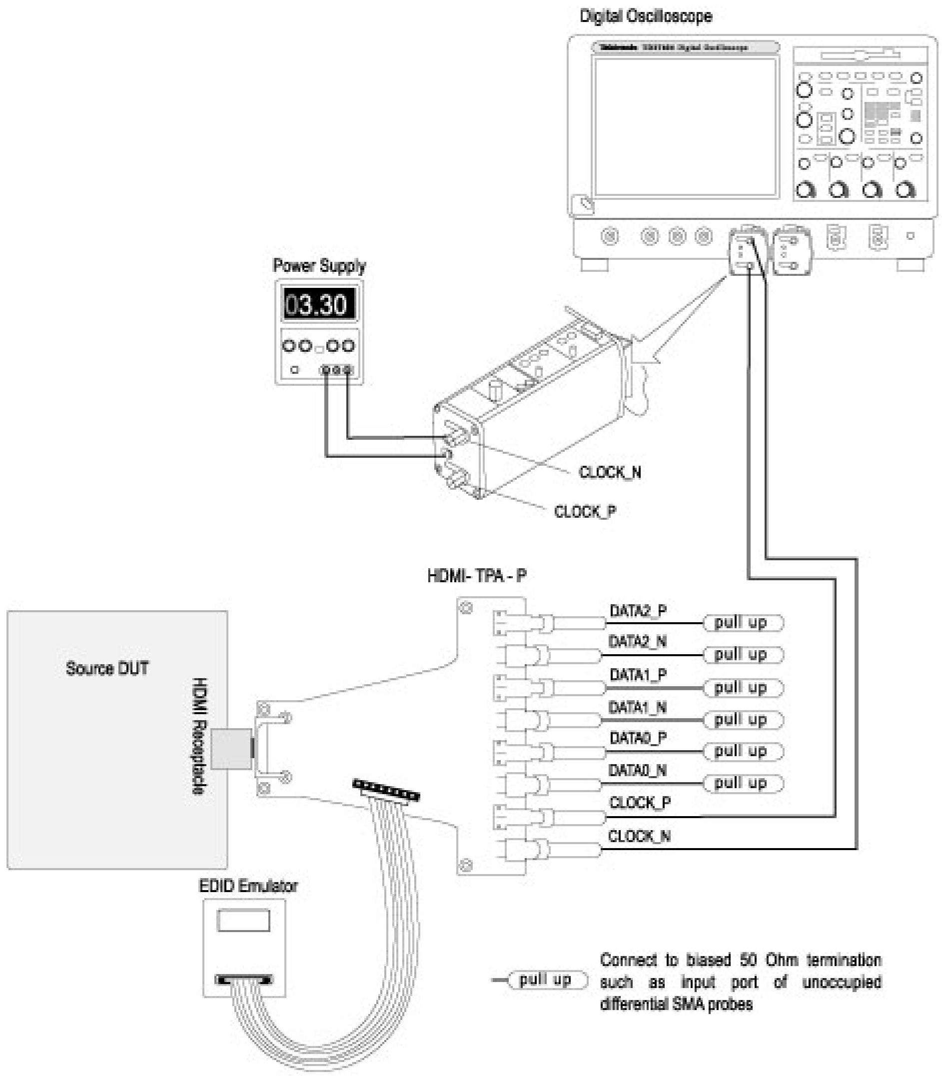


Figure 85: Connections for Low Amplitude + with Efficere Technologies test fixture (Re-calculate Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.

Setup 2: If you have selected Existing Tbit value or if you are calculating low amplitude

Make the connections as follows:

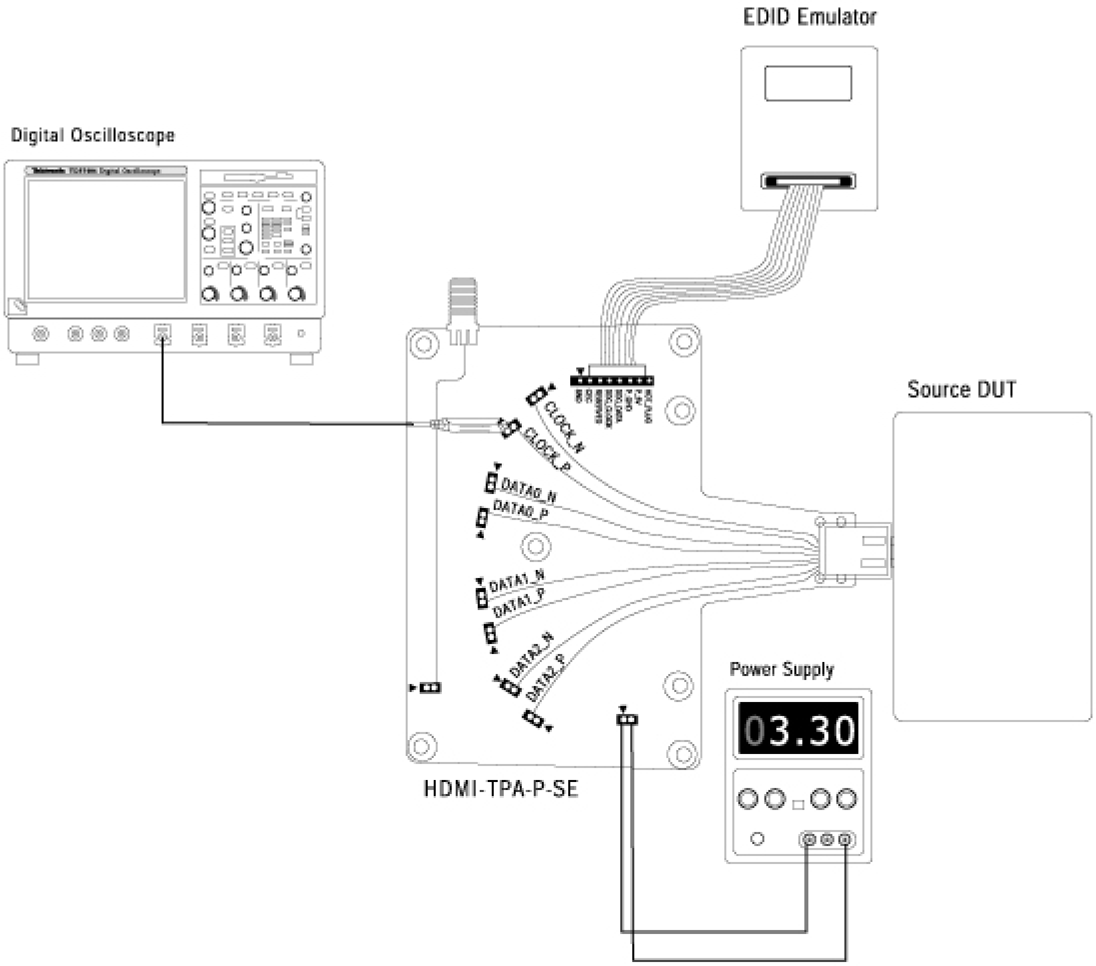


Figure 86: Connections for Low Amplitude + (Existing Tbit option selected)

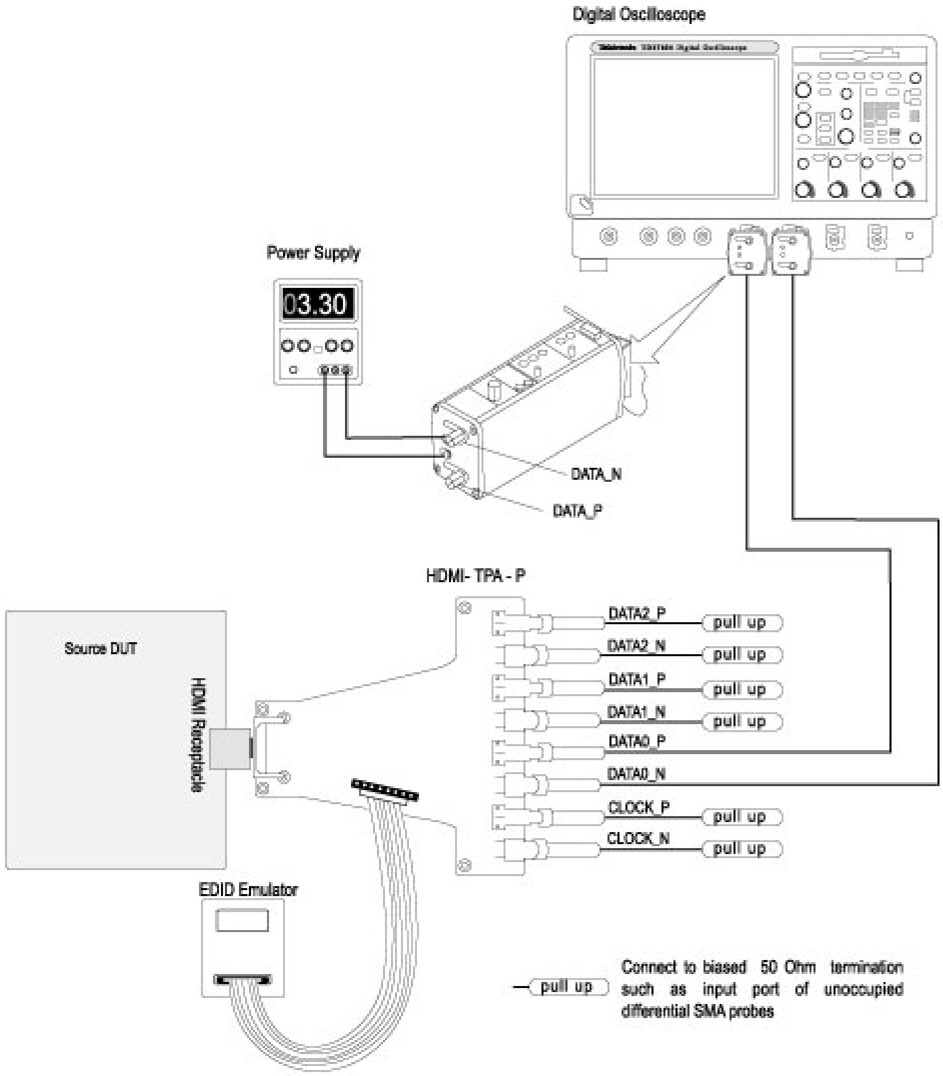


Figure 87: Connections for Low Amplitude + with Efficere Technologies test fixture (Existing Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-SE/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Connect the first single-ended probe to TMDS_DATA<X>+/ TMDS_CLOCK+.
5. Configure the Source DUT to output a video format with the required supported pixel clock frequency.

Source – Low Amplitude -

On the menu bar, click Tests > Connect. Refer to EDID Emulator for Source Tests on page 68 for EDID emulator connections.

Setup 1: If you have selected Re-calculate Tbit in the configuration pane

Make the connections as follows:

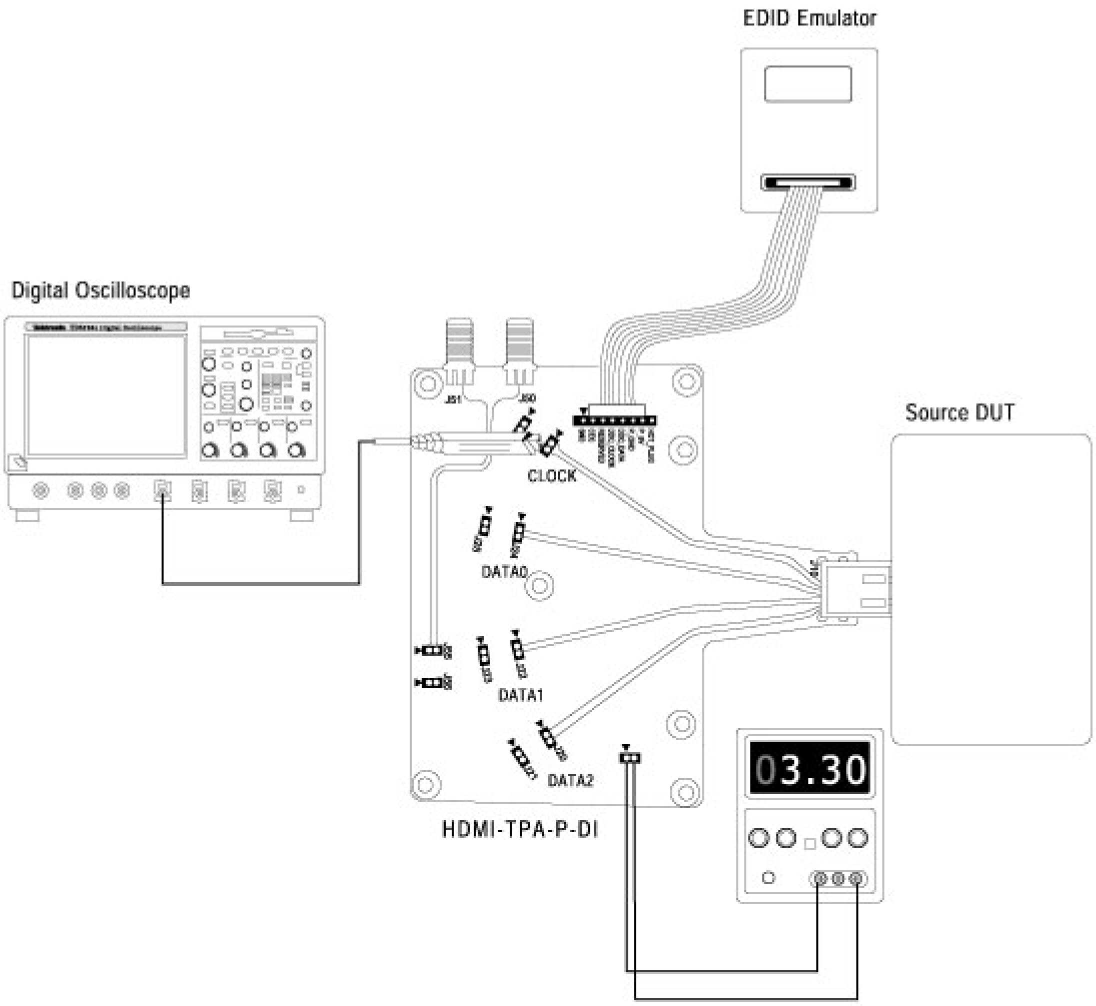


Figure 88: Connections for Low Amplitude – (Re-calculate Tbit option selected)

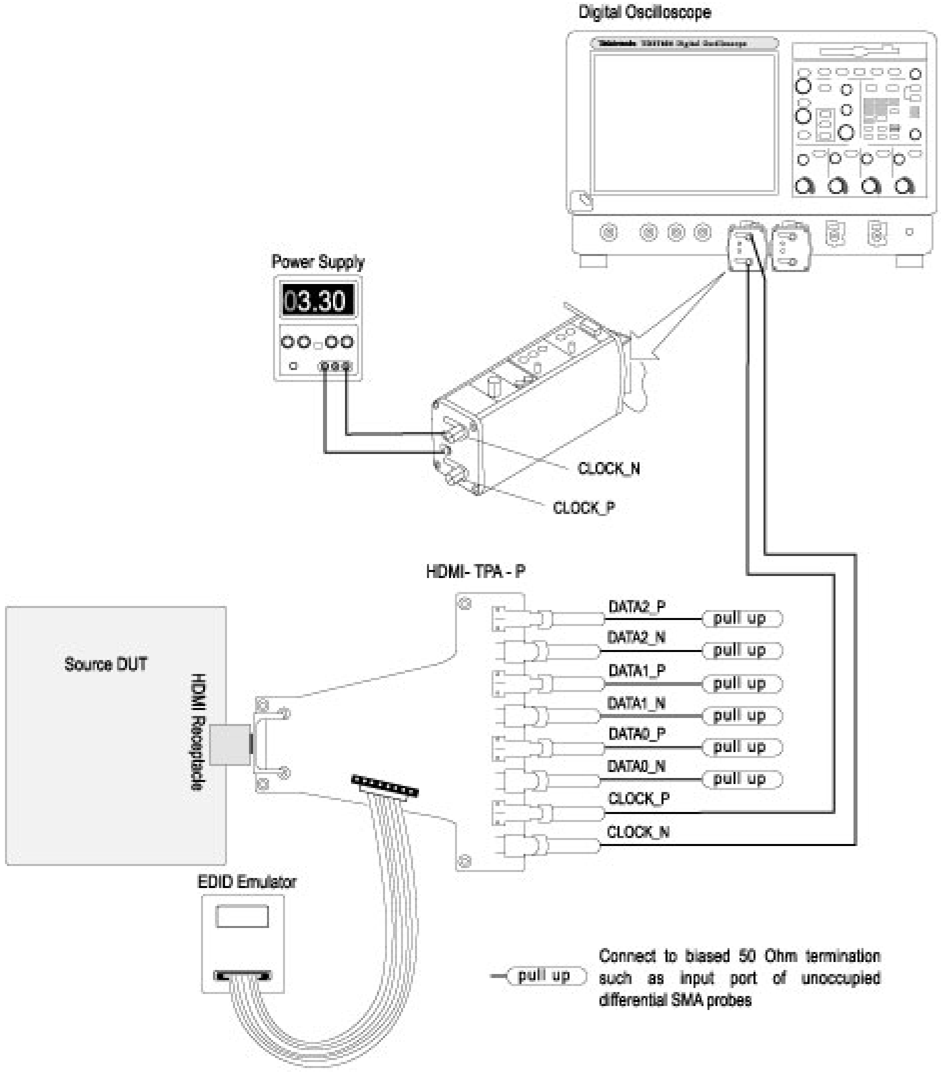


Figure 89: Connections for Low Amplitude – with Efficere Technologies test fixture (Re-calculate Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-DI/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Connect a TMDS Clock to the configured oscilloscope channel by using a differential probe.

Setup 2: If you have selected Existing Tbit value or if you are calculating low amplitude

Make the connections as follows:

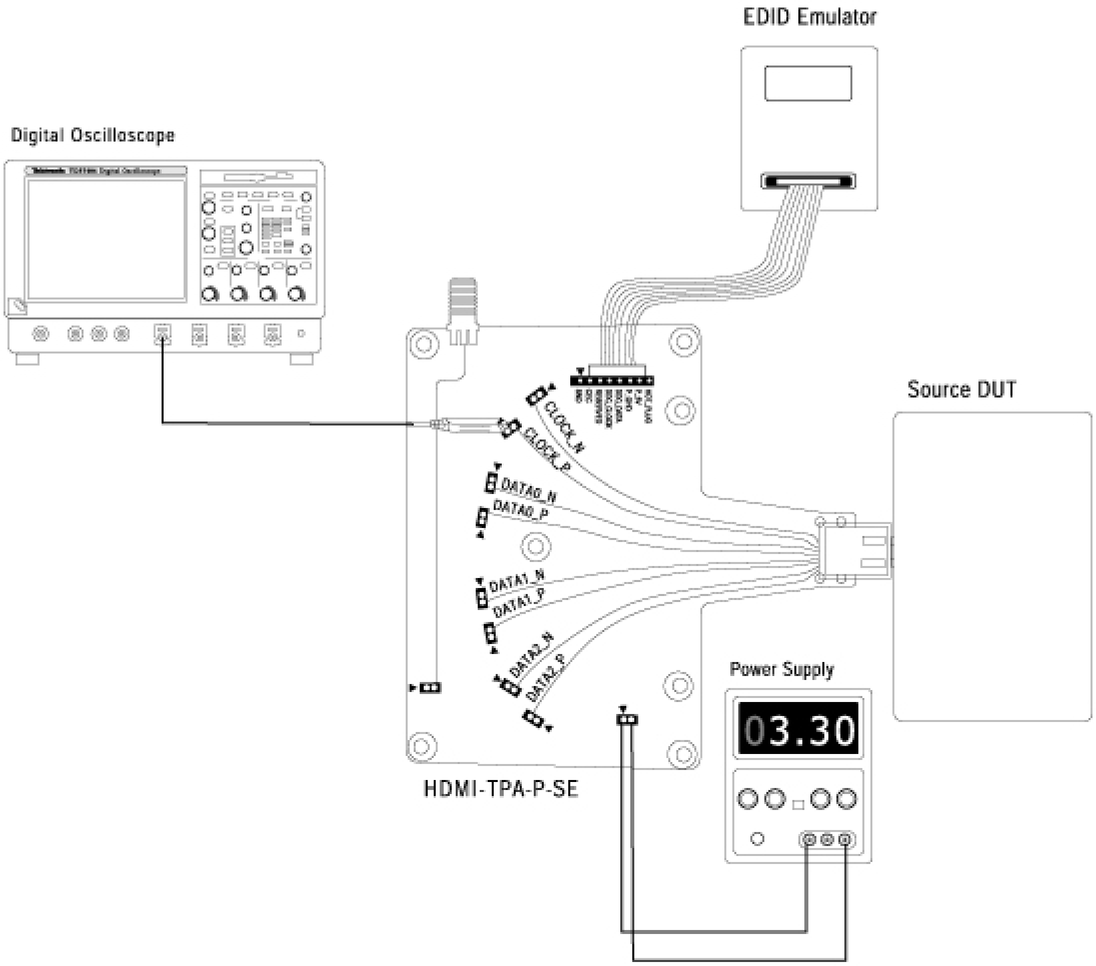


Figure 90: Connections for Low Amplitude - (Existing Tbit option selected)

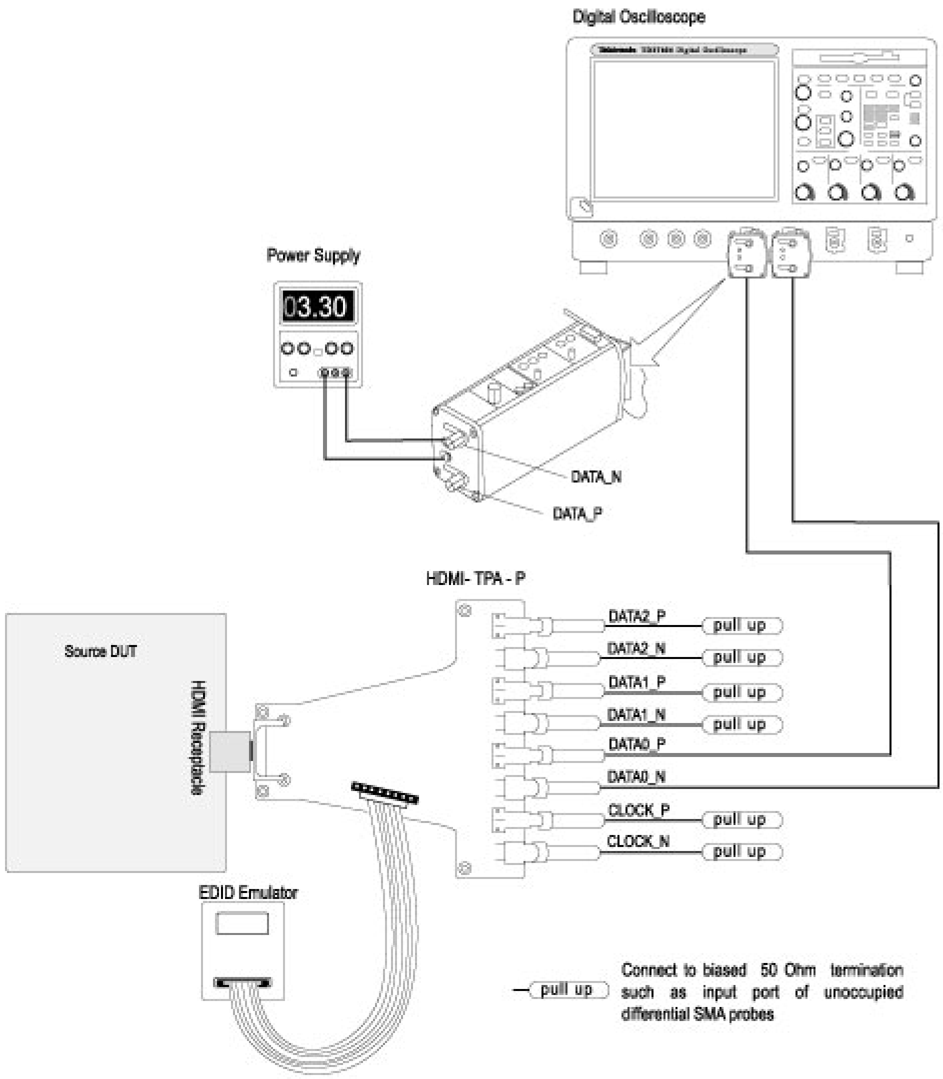


Figure 91: Connections for Low Amplitude - with Efficere Technologies test fixture (Existing Tbit option selected)

1. Connect the HDMI output of the source DUT to the TPA-P-SE/EFF-TPA-P adapter.
2. Connect a power supply to the TPA adapter and set the power supply to 3.30 V.
3. Connect the EDID emulator to the TPA adapter and set the emulator for the required resolution (refer to the EDID emulator user manual).
4. Connect the first single-ended probe to TMDS_DATA<X>+/ TMDS_CLOCK+.
5. Configure the Source DUT to output a video format with the required supported pixel clock frequency.

Sink – Min/Max-Diff Swing Tolerance

Note: For all the old test fixture connections, connect a TTC filter in between the DTG and the test fixture.

On the menu bar, click Tests > Connect.

Method 1: Using old test fixtures

Setup 1: To find the minimum swing voltage of the Sink DUT. Make the connections as follows:

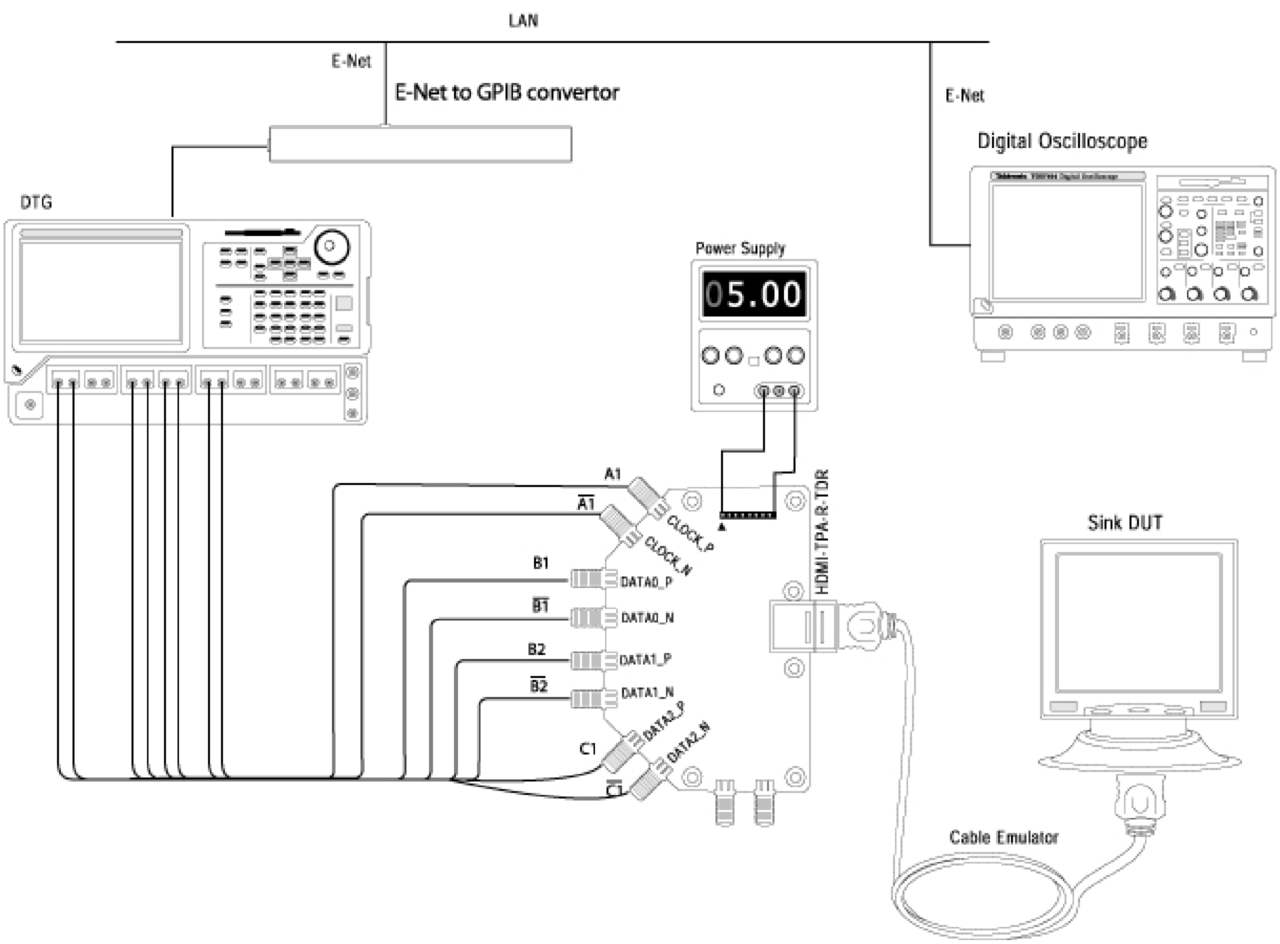


Figure 92: Connections for Min/Max-Diff Swing Tolerance (to find minimum swing voltage of the Sink DUT)

Note: Using the Cable Emulator/Cable is not mandatory. You can connect a TPA-P-TDR fixture directly to the DUT. If you find this inconvenient, then use the Cable Emulator/Cable to connect the DUT conveniently.

1. Connect the DTG to the TPA-R-TDR by using eight one meter or one and a half meter SMA cables:
   - Module A, Channel 1+, 1-: Connect to CLOCK_P, and CLOCK_N
   - Module A, Channel 2+, 2-: No Connection
   - Module B, Channel 1+, 1-: Connect to DATA0_P and DATA0_N
   - Module B, Channel 2+, 2-: Connect to DATA1_P and DATA1_N
   - Module C, Channel 1+, 1-: Connect to DATA2_P and DATA2_N
   - Module C, Channel 2+, 2-: No Connection
2. Connect the Cable Emulator from the TPA-R-TDR to the Sink DUT.
3. Connect and configure the DC Power Supply to drive +5 V between +5 V Power (P_5V) and DDC/CEC Ground (P_GND) on the TPA-R-TDR.

Setup 2: To measure the minimum differential swing voltage by using an oscilloscope. Make the connections as follows:

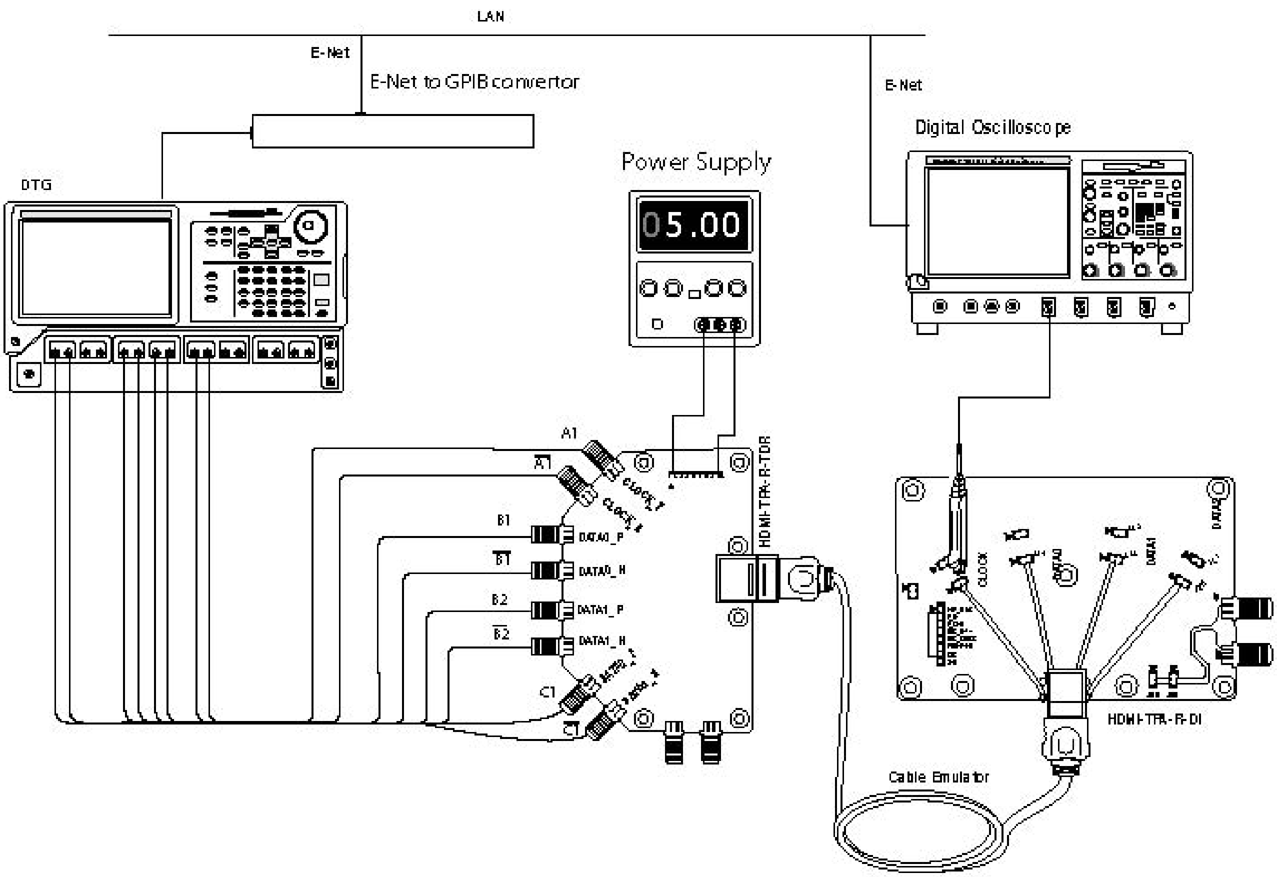


Figure 93: Connections for Min/Max-Diff Swing Tolerance (to measure the minimum differential swing voltage using an oscilloscope)

1. Remove the Sink DUT from the Cable Emulator.
2. Connect the TPA-R-DI test fixture at the end of the Cable Emulator.
3. Connect a TMDS Clock/Data channel to the configured oscilloscope channel by using a differential probe.

Setup 3: To find the maximum swing voltage of the Sink DUT

1. Remove the TPA-R-DI text fixture at the end of the Cable Emulator.

2. Connect the Sink DUT to the Cable Emulator.

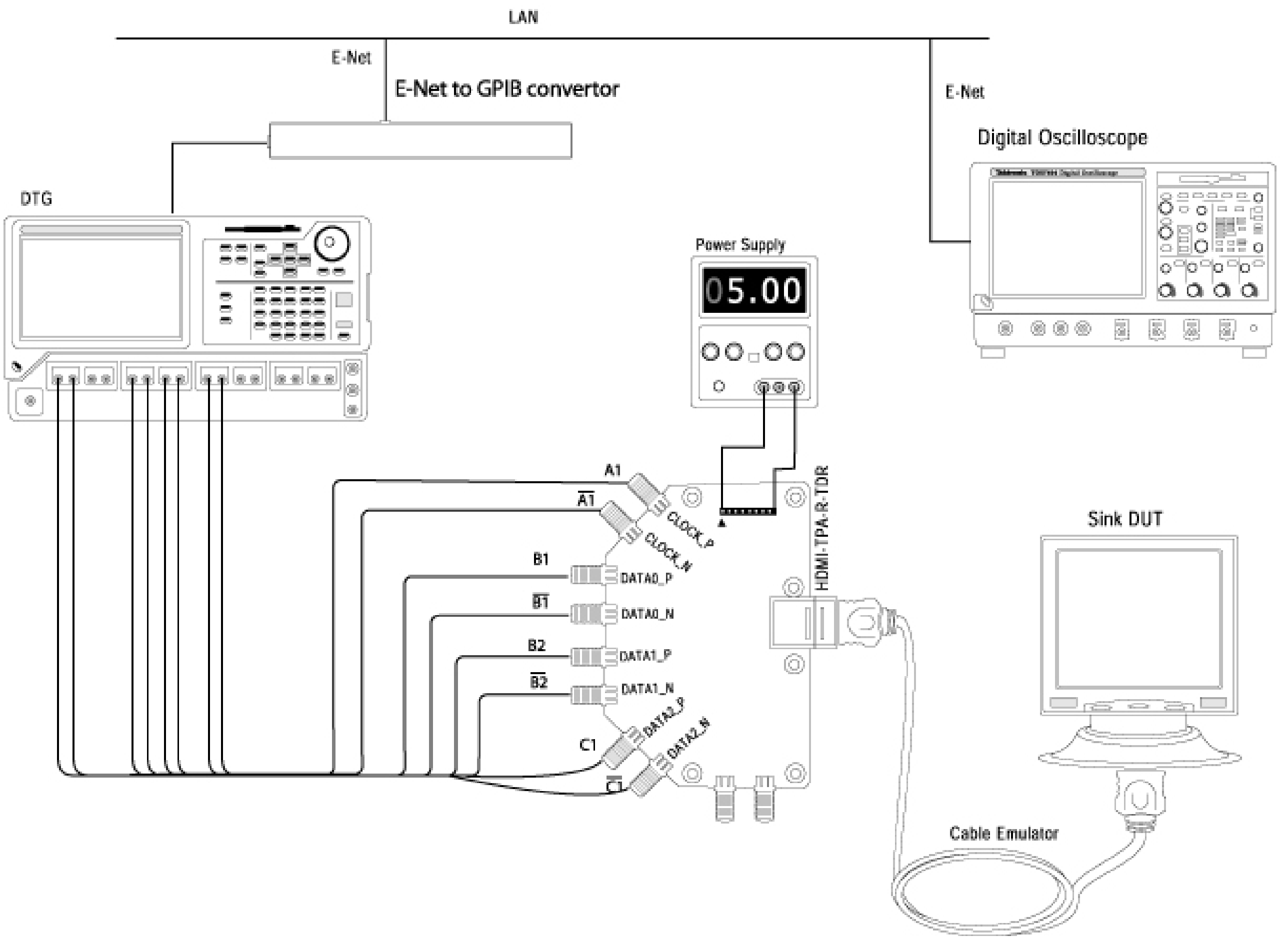


Figure 94: Connections for Min/Max-Diff Swing Tolerance (to find the maximum swing voltage of the Sink DUT)

Method 2: Using Efficere test fixtures

Setup 1: To find the Min/Max differential swing voltage of the Sink DUT with Efficere test fixture

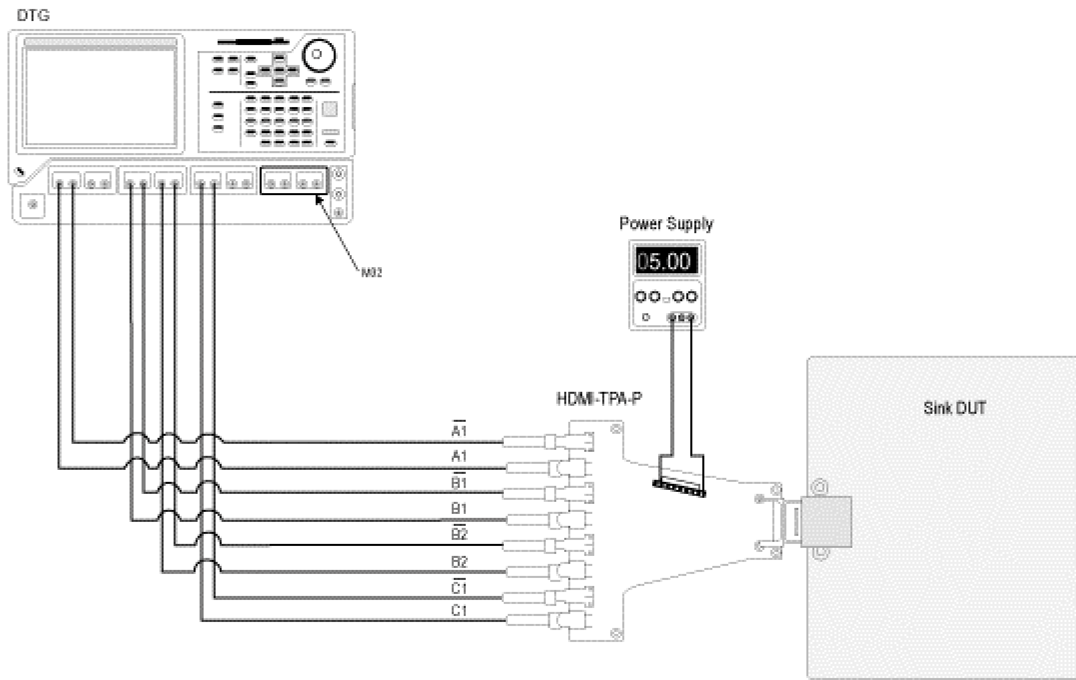


Figure 95: Connections to find Min/Max-Diff Swing Tolerance with Efficere Technologies test fixture

Setup 2: To measure the Min/Max differential swing voltage of the DUT with Efficere test fixture

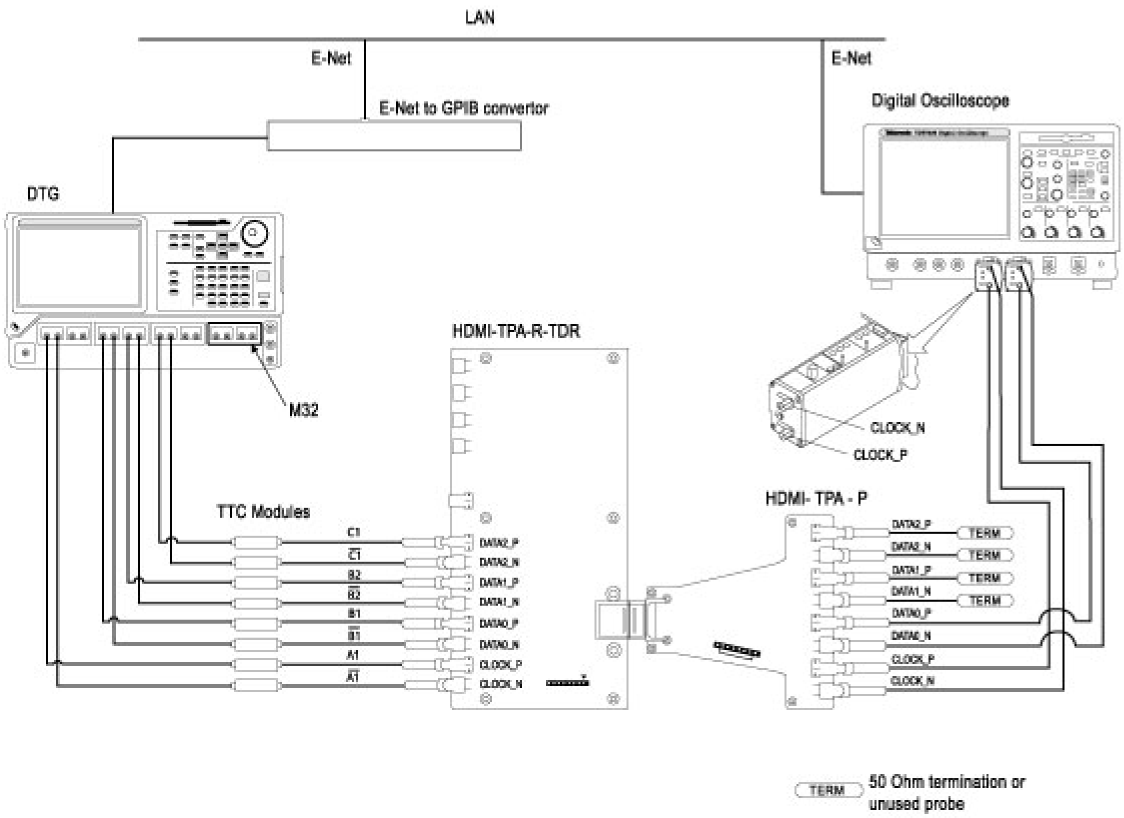


Figure 96: Connections to measure the Min/Max-Diff Swing Tolerance with Efficere Technologies test fixture

Sink – Jitter Tolerance

Note*: For all the old test fixture connections, connect a TTC filter in between the DTG and the test fixture.*

On the menu bar, click Tests > Connect.

Method 1: Using old test fixtures

Setup 1: To find the device tolerance limit for frequencies < 148.5 MHz make the connections as follows:

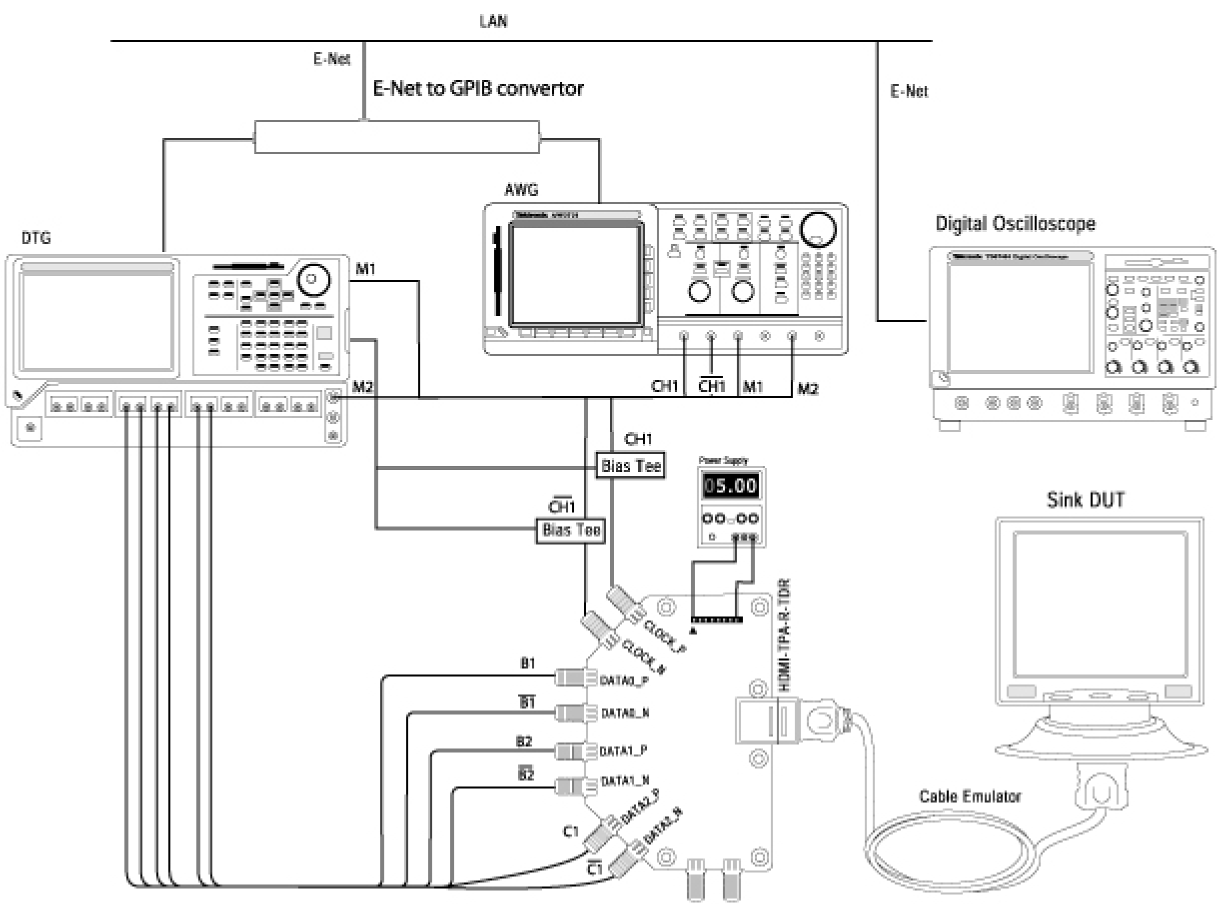


Figure 97: Connections for Jitter Tolerance (to find the device tolerance limit)

1. Connect the DTG, AWG, Bias-Tees, and the TPA-R-TDR.

- AWG Marker 1+ output to DTG External Clock input
- AWG Marker 2+ output to DTG Trigger In

- AWG Ch. 1+ output to Bias-Tee signal input (RF)
- Bias-Tee signal output (RF and DC) to CLOCK_P
- DTG DC_OUT (1) to Bias-Tee DC-level input (DC)
- AWG Ch. 1- output to Bias-Tee signal input (RF)
- Bias-Tee signal output (RF and DC) to CLOCK_N
- DTG DC_OUT (2) to Bias-Tee DC-level input (DC)
- DTG Module A, Channel 1+, 1–: No Connection
- DTG Module A, Channel 2+, 2–: No Connection
- DTG Module B, Channel 1+, 1–: Connect to DATA0_P and DATA0_N
- DTG Module B, Channel 2+, 2–: Connect to DATA1_P and DATA1_N
- DTG Module C, Channel 1+, 1–: Connect to DATA2_P and DATA2_N
- DTG Module C, Channel 2+, 2–: No Connection

2. Connect the TPA-R-TDR to the Sink DUT by using a Cable Emulator specified for tested pixel clock rate.

3. Connect and configure the DC Power Supply to drive +5 V between +5 V Power (P_5V) and DDC/CEC Ground (P_GND) on the TPA-R-TDR.

Setup 2: To measure the parameters for frequencies < 148.5 MHz make the connections as follows:

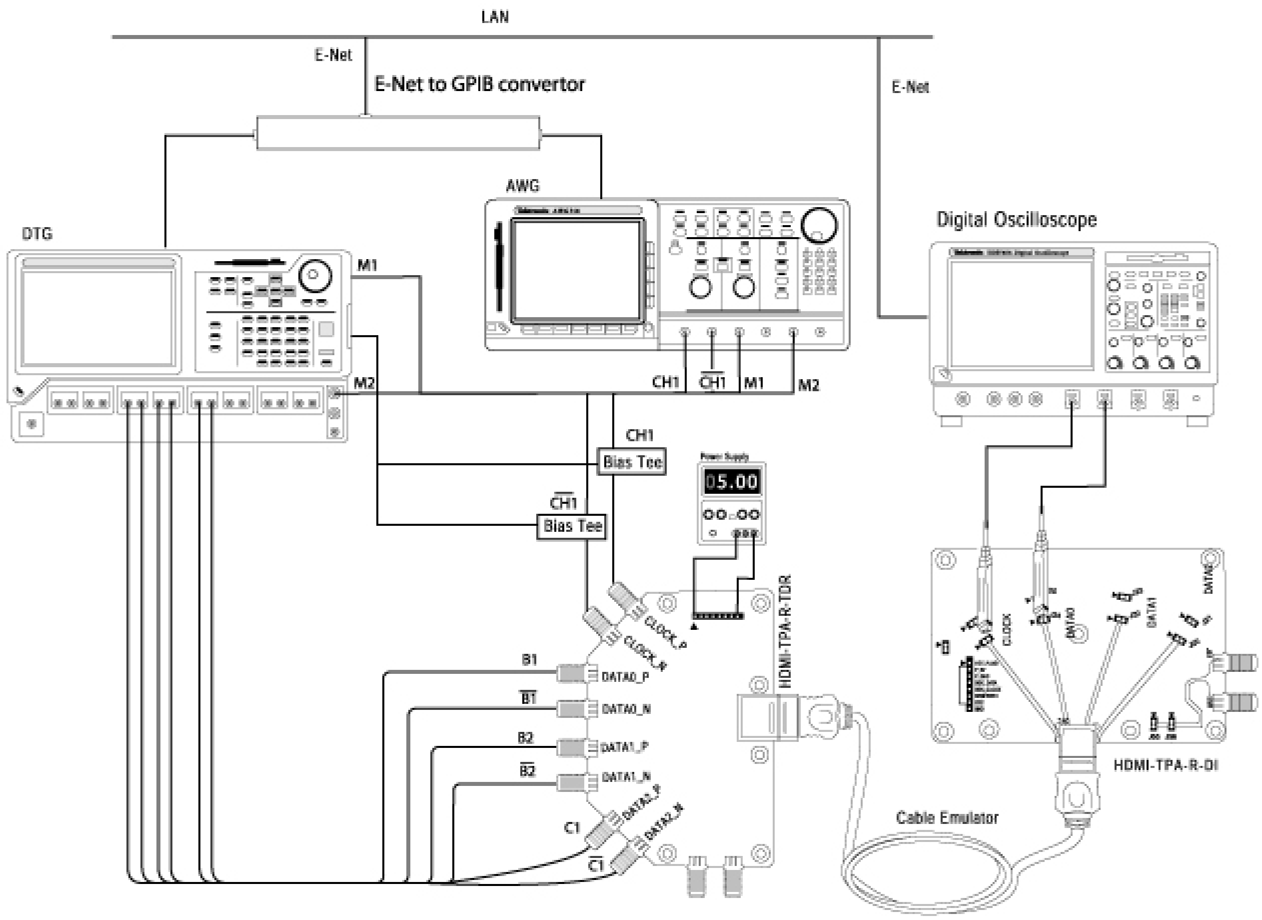


Figure 98: Connections for Jitter Tolerance (to measure the parameters)

1. Remove the Sink DUT.
2. Connect the TPA-R-DI test adaptor to a Cable Emulator.
3. Connect a Clock to the configured oscilloscope channel by using a differential probe.
4. Connect the DATA pair on which you will conduct the test to the configured oscilloscope channel by using a second differential probe.

Method 2: Using Efficere test fixtures

Setup 1: Connections for jitter calibration (common to all jitter insertion setups)

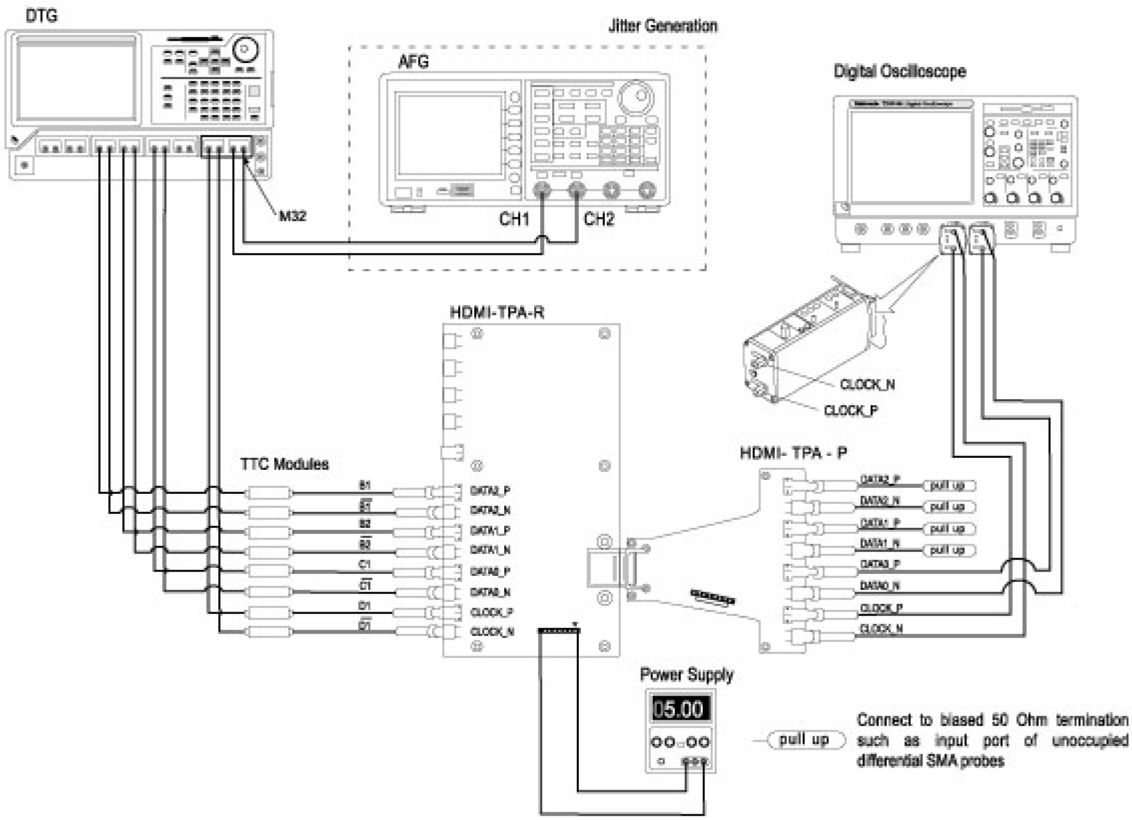


Figure 99: Connections for Jitter Calibration with Efficere Technologies test fixture

1. Use Jitter Generation block to generate a known amount of jitter (Clock jitter: 0.25 UI, Data jitter: 0.30 UI).
2. Connect the test fixture to the oscilloscope for calibration. The oscilloscope calculates data and clock jitter inserted due to the cables and the test fixtures along with the known amount of jitter.

Setup 2a: DTG-AWG710/AWG710B for testing resolutions ≤ 74.25 MHz

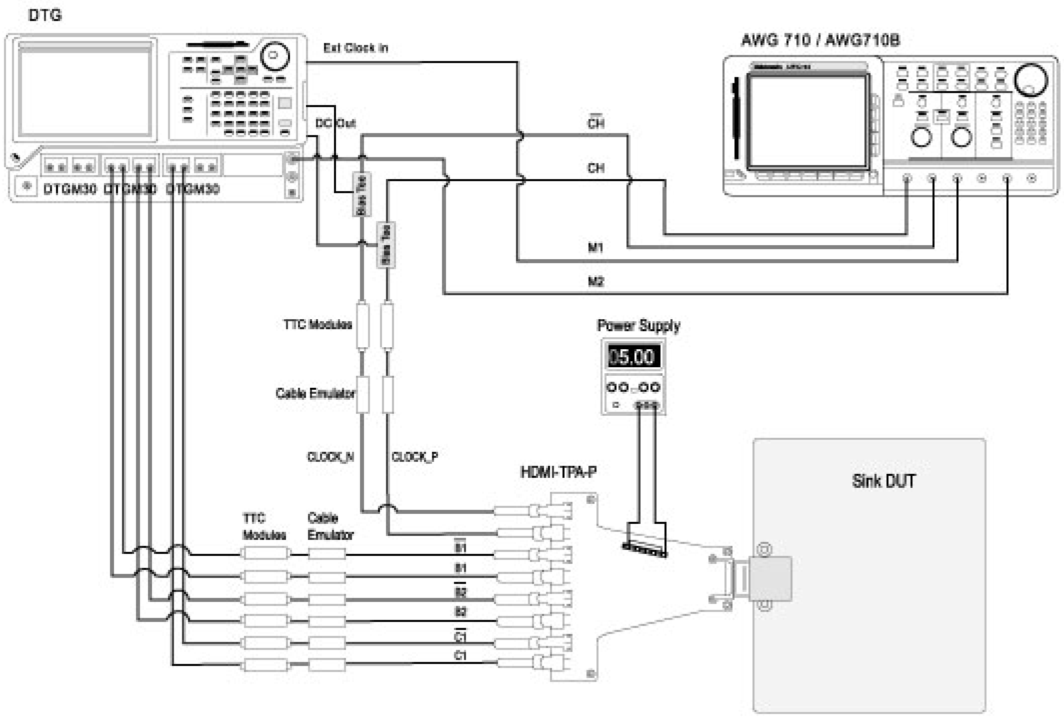


Figure 100: Connections for DTG-AWG710 to test resolutions ≤ 74.25MHz with Efficere Technologies test fixture

1. Connect the test equipment for DTG and AWG connection as shown in the setup diagram.

2. When connecting the test fixture to the DUT, use a cable emulator specified for the pixel clock rate being tested.

3. Connect the DTG, AWG, and the oscilloscope according to the Enable Remote Control of Test Equipment procedure on page 34.

4. Configure the DUT to receive the HDMI input signal.

Setup 2b: DTG-AWG710/AWG710B for testing resolutions > 74.25 MHz

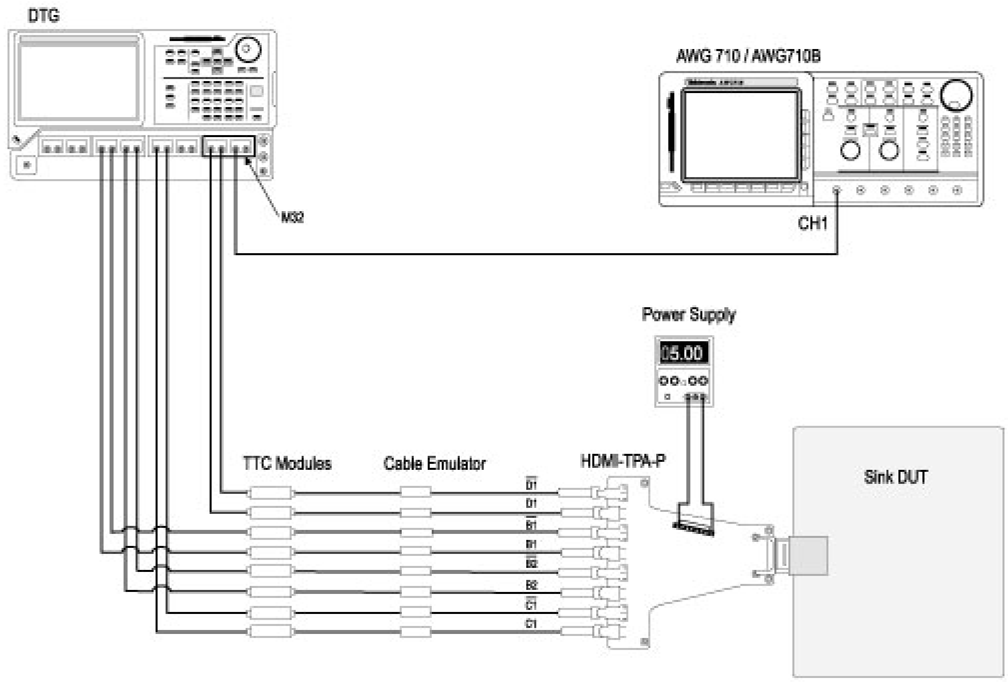


Figure 101: Connections for DTG-AWG710 to test resolutions > 74.25MHz with Efficere Technologies test fixture

1. Connect the test equipment for DTG and AWG connection as shown in the setup diagram.
2. Connect the DTG, AWG, and the oscilloscope according to the Enable Remote Control of Test Equipment procedure on page 34.
3. Configure the DUT to receive the HDMI input signal.

Note: *Some of the DUTs work with test fixtures that are not connected to a power supply.*

Setup 3: DTG-AFG3000 jitter tolerance

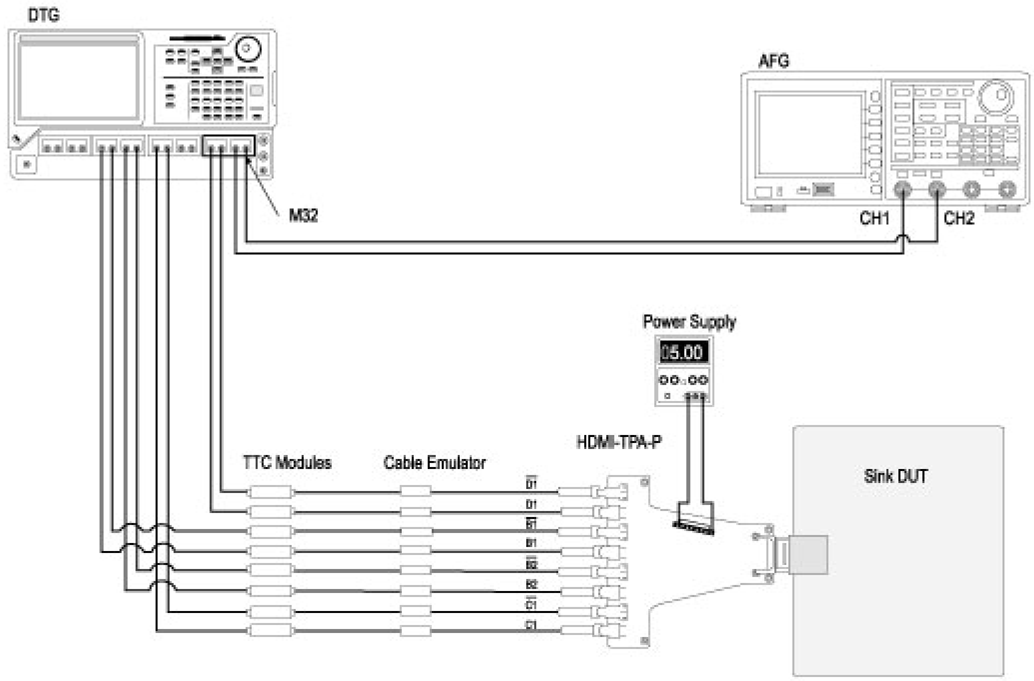


Figure 102: Connections for DTG-AFG3000 Jitter Tolerance with Efficere Technologies test fixture

1. Connect the test equipment for DTG and AFG connection as shown in the setup diagram.
2. When connecting the test fixture to the DUT, use a cable emulator specified for the pixel clock rate being tested.
3. Connect the DTG, AFG, and the oscilloscope according to the Enable Remote Control of Test Equipment procedure on page 34.
4. Configure the DUT to receive the HDMI input signal.

Setup 4: DTG-AWG7102 composite jitter tolerance for all frequencies

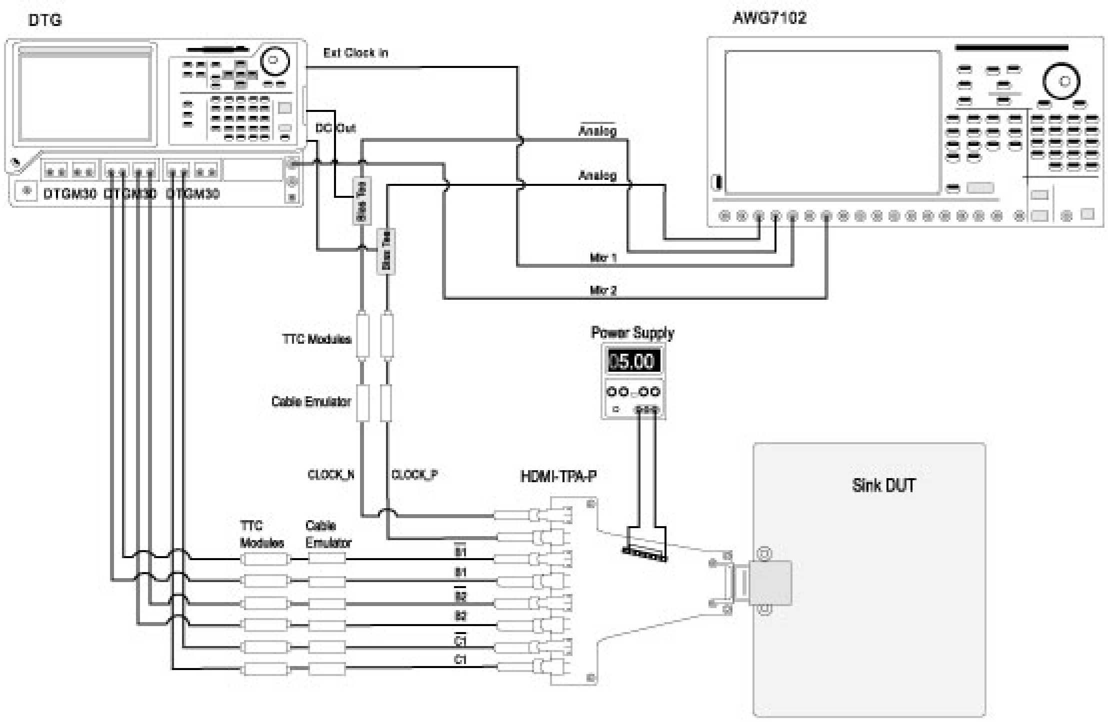


Figure 103: Connections for DTG-AWG7102 composite Jitter Tolerance with Efficere Technologies test fixture

1. Connect the test equipment for DTG and AWG7102 connection as shown in the setup diagram.

2. When connecting the test fixture to the DUT, use a cable emulator specified for the pixel clock rate being tested.

3. Connect the DTG, AWG7102, and the oscilloscope according to the Enable Remote Control of Test Equipment procedure on page 34.

4. Configure the DUT to receive the HDMI input signal.

Note: *Mkr2 need not be connected to the trigger input of the DTG.*

Setup 5: DTG-AWG7102 separate jitter tolerance for all frequencies

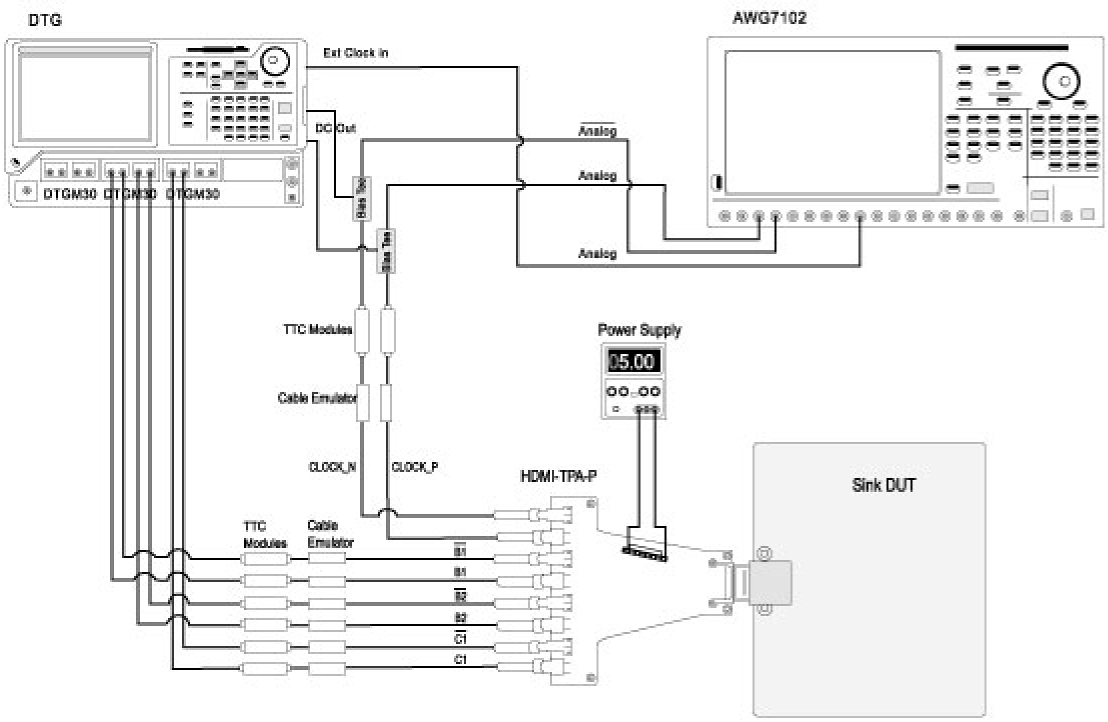


Figure 104: Connections for DTG-AWG7102 separate Jitter Tolerance with Efficere Technologies test fixture

1. Connect the test equipment for DTG and AWG7102 connection as shown in the setup diagram.
2. When connecting the test fixture to the DUT, use a cable emulator specified for the pixel clock rate being tested.
3. Connect the DTG, AWG7102, and the oscilloscope according to the Enable Remote Control of Test Equipment procedure on page 34.
4. Configure the DUT to receive the HDMI input signal.

Sink – Intra-Pair Skew

***Note**: For all the old test fixture connections, connect a TTC filter in between the DTG and the test fixture.*

On the menu bar, click Tests > Connect.

***Note**: The procedure mentioned next is for the clock intra-pair skew test. For other pairs, interchange the connection of DATA<X>_P with CLOCK_P and DATA<X>_N with CLOCK_N. Make the appropriate changes in the configuration of the DTG Outputs accordingly.*

For example, to calculate the intra-pair skew of Data0:

Connect DATA0_P to Module A1+, DATA0_N to DTG Module A2+, CLOCK_P to Module B1+, and CLOCK_N to module B1-.

Method 1: Using old test fixtures

Setup 1: To measure Tbit. Make the connections as follows:

***Note**: Use channel $\overline{A1}$ of the DTG instead of channel A2 (shown in figure) to make connections for Tbit measurements.*

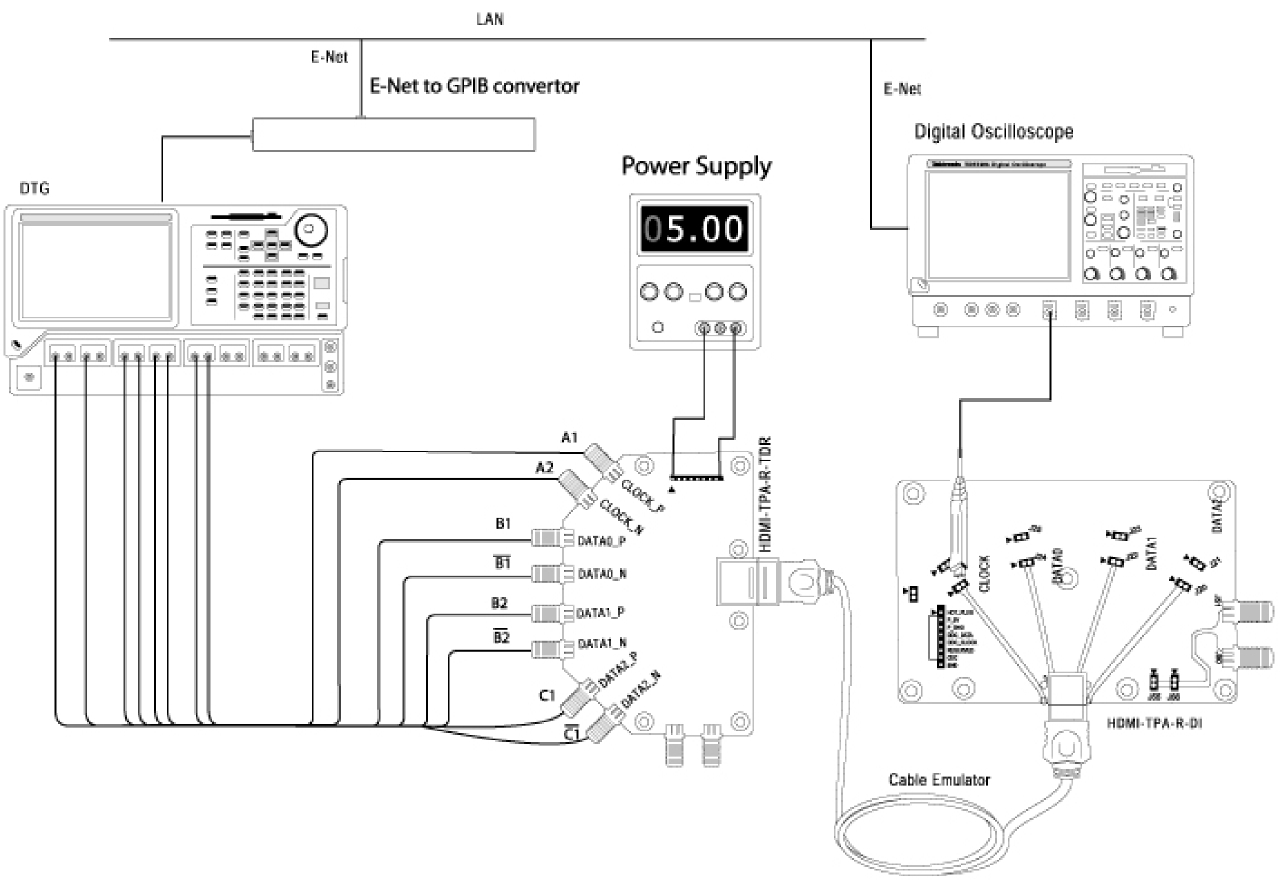


Figure 105: Connections for Sink Intra-Pair Skew (to measure Tbit)

***Note**: Using the Cable Emulator/Cable is not mandatory. You can connect a TPA-P-TDR fixture directly to the DUT. If you find this inconvenient, then use the Cable Emulator/Cable to connect the DUT conveniently.*

1. Connect the DTG to the TPA-R-TDR by using eight one meter (preferable) or one and a half meter SMA cables:
   - Module A, Channel 1+: Connect to CLOCK_P
   - Module A, Channel 1–: No Connection
   - Module A, Channel 2+: Connect to CLOCK_N
   - Module A, Channel 2–: No Connection
   - Module B, Channel 1+, 1–: Connect to DATA0_P and DATA0_N
   - Module B, Channel 2+, 2–: Connect to DATA1_P and DATA1_N
   - Module C, Channel 1+, 1–: Connect to DATA1_P and DATA1_N
   - Module C, Channel 2+, 2–: No Connection
2. Connect the TPA-R-TDR to the Cable Emulator.
3. Connect the TPA-R-DI to the Cable Emulator.
4. Connect a Clock to the configured oscilloscope channel by using a differential probe.

Setup 2: To find intra-pair skew of the Sink DUT. Make the connections as follows:

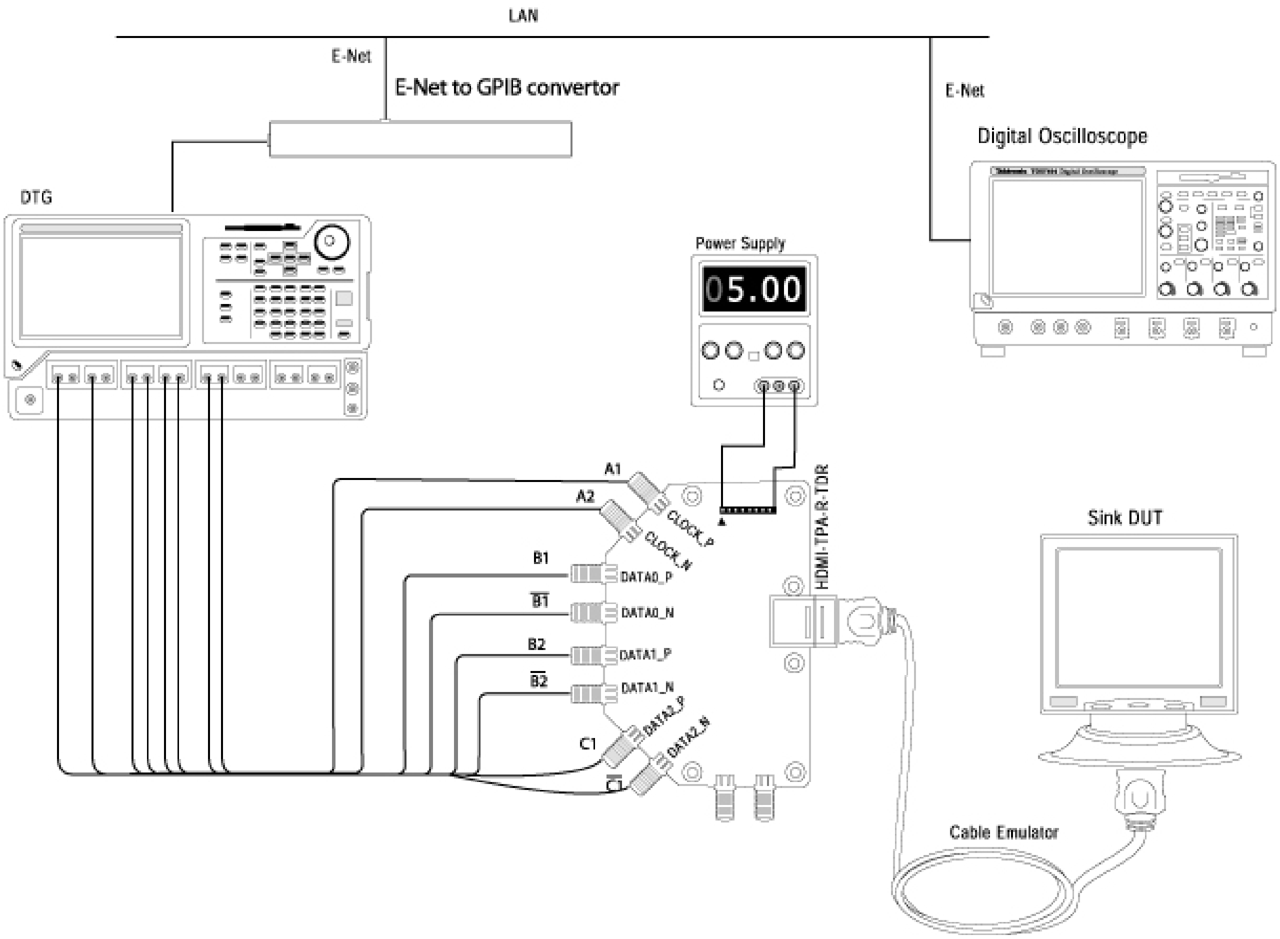


Figure 106: Connections for Sink Intra-Pair Skew (to find intra-pair skew of the Sink DUT)

***Note**: Using the Cable Emulator/Cable is not mandatory. You can connect a TPA-P-TDR fixture directly to the DUT. If you find this inconvenient, then use the Cable Emulator/Cable to connect the DUT conveniently.*

1. Remove the TPA-R-DI test fixture from the Cable Emulator.
2. Connect the Sink DUT to the Cable Emulator.
3. Connect and configure the DC Power Supply to drive +5 V between +5 V Power (P_5V) and DDC/CEC Ground (P_GND) on the TPA-R-TDR.

Method 2: Using Efficere test fixtures

Setup 1: To find intra-pair skew of the Sink DUT with Efficere Test Fixture

Make the connections as follows:

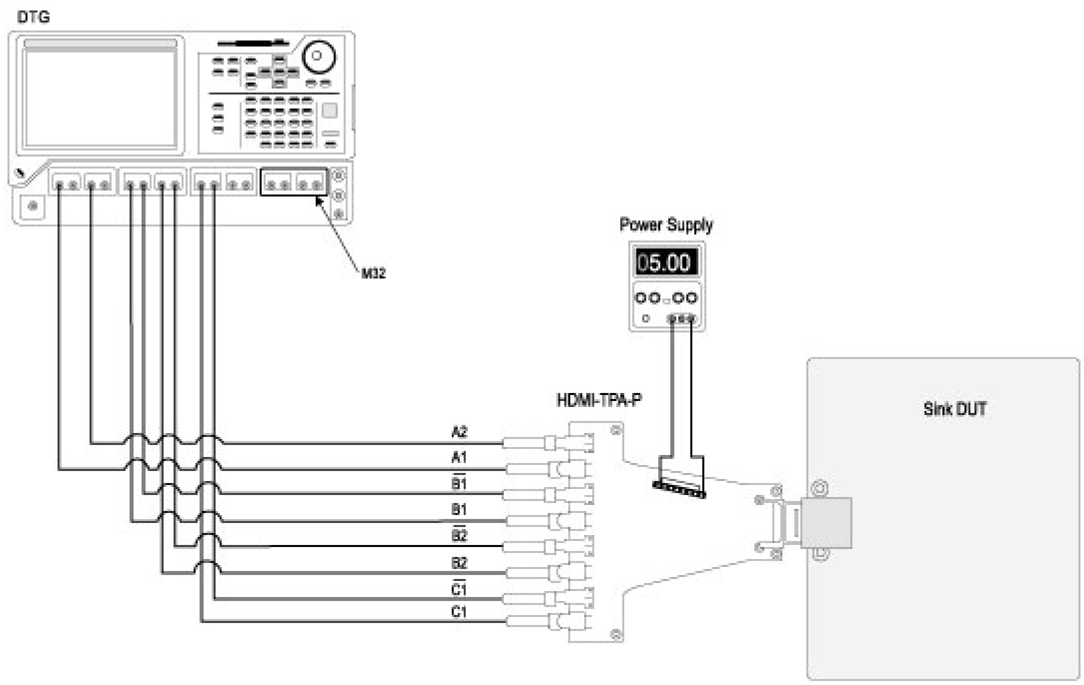


Figure 107: Connections for Sink Intra-Pair Skew with Efficere Technologies test fixture

Cable – Eye Diagram

On the menu bar, click Tests > Connect.

Setup diagram for TP1

Make the connections as follows:

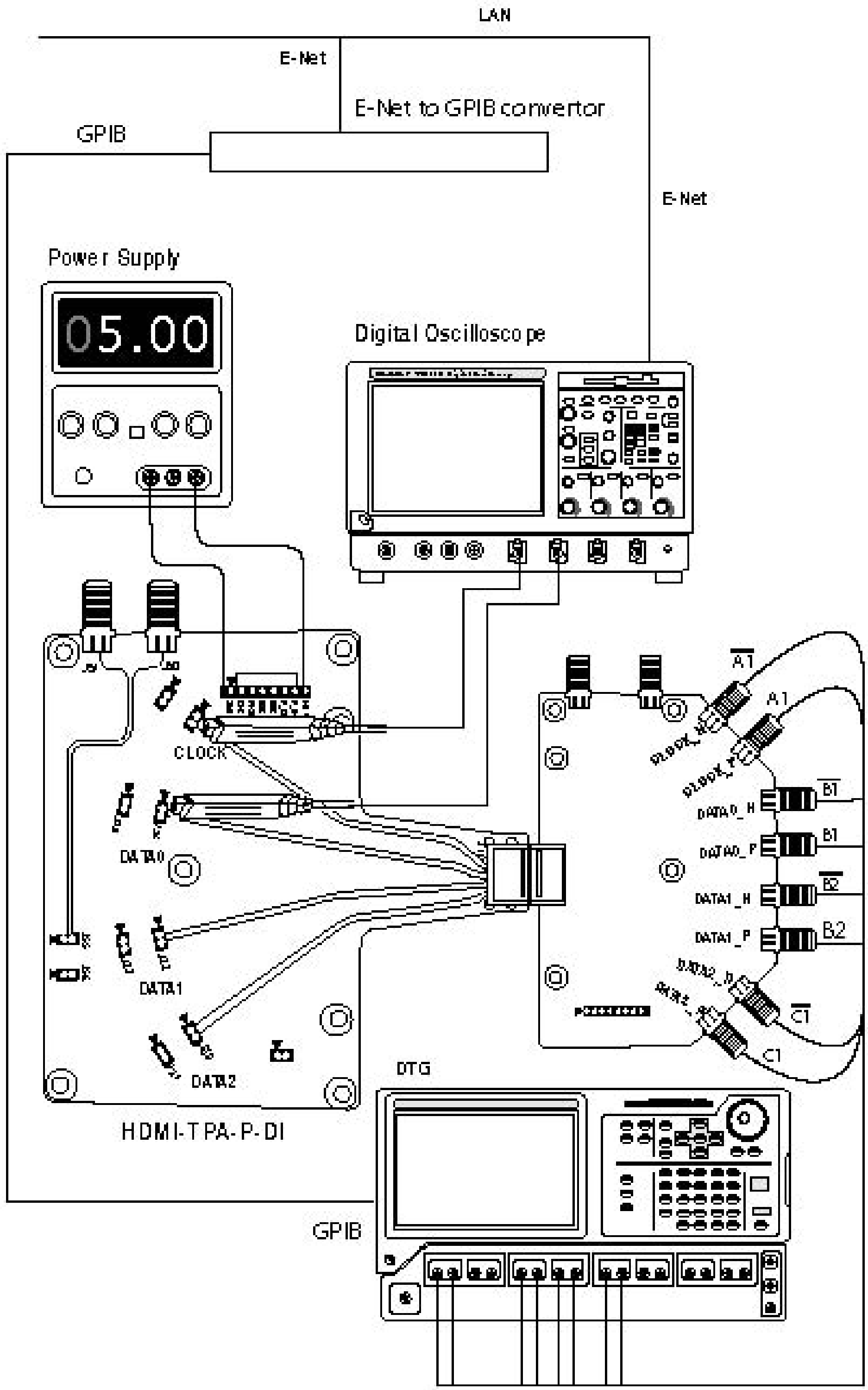


Figure 108: Connections for Cable Eye Diagram (Setup diagram for TP1)

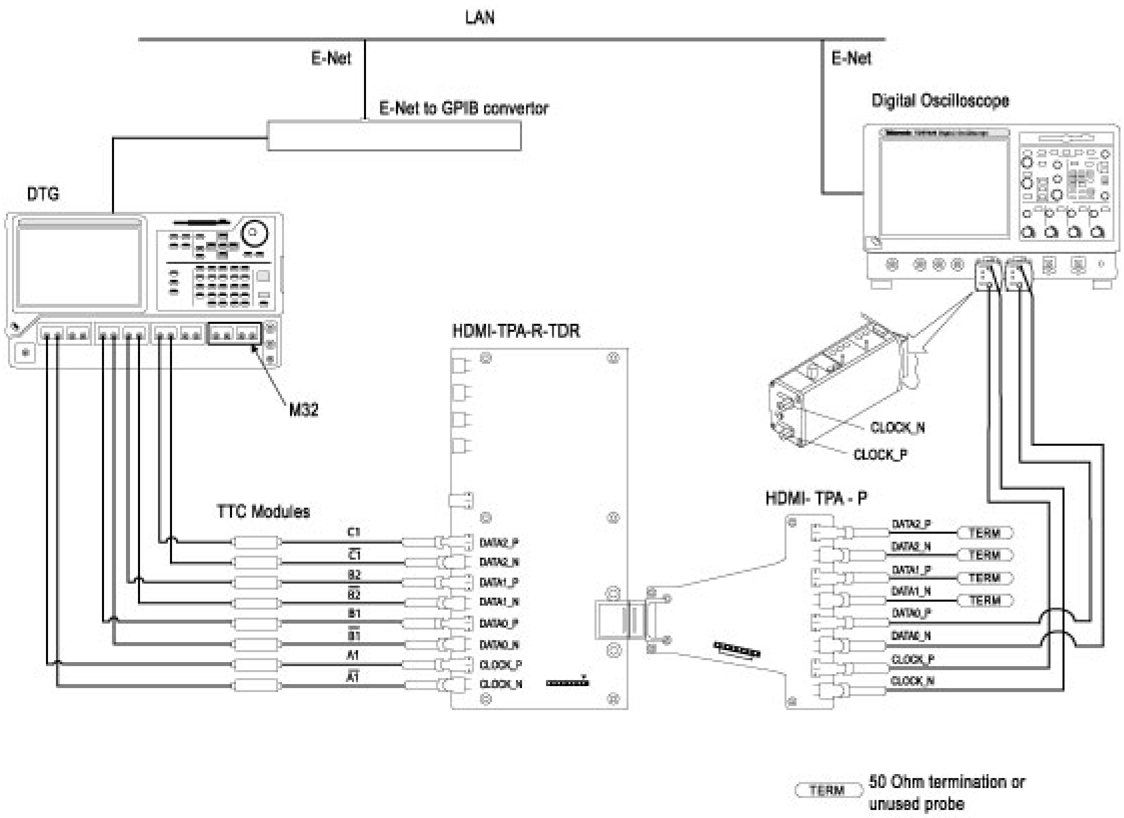


Figure 109: Connections for Cable Eye Diagram with Efficere Technologies test fixture (Setup diagram for TP1)

1. Connect the DTG to the input TPA-P-TDR/EFF-TPA-P adapter by using eight one meter (preferable) or one and a half meter SMA cables:

- Module A, Channel 1+, 1–: Connect to CLOCK_P and CLOCK_N
- Module A, Channel 2+, 2–: No Connection
- Module B, Channel 1+, 1–: Connect to DATA0_P and DATA0_N
- Module B, Channel 2+, 2–: Connect to DATA1_P and DATA1_N
- Module C, Channel 1+, 1–: Connect to DATA2_P and DATA2_N
- Module C, Channel 2+, 2–: No Connection

2. Connect the oscilloscope to the output TPA-R-DI/EFF-TPA-R adapter by using two differential probes, and supply 3.3 V power.

3. Connect a TMDS CLOCK to the configured oscilloscope channel by using a differential probe.

4. Connect the TMDS_DATA pair on which you will conduct the test to the configured oscilloscope channel by using a second differential probe.

Setup diagram for TP2

Make the connections as follows:

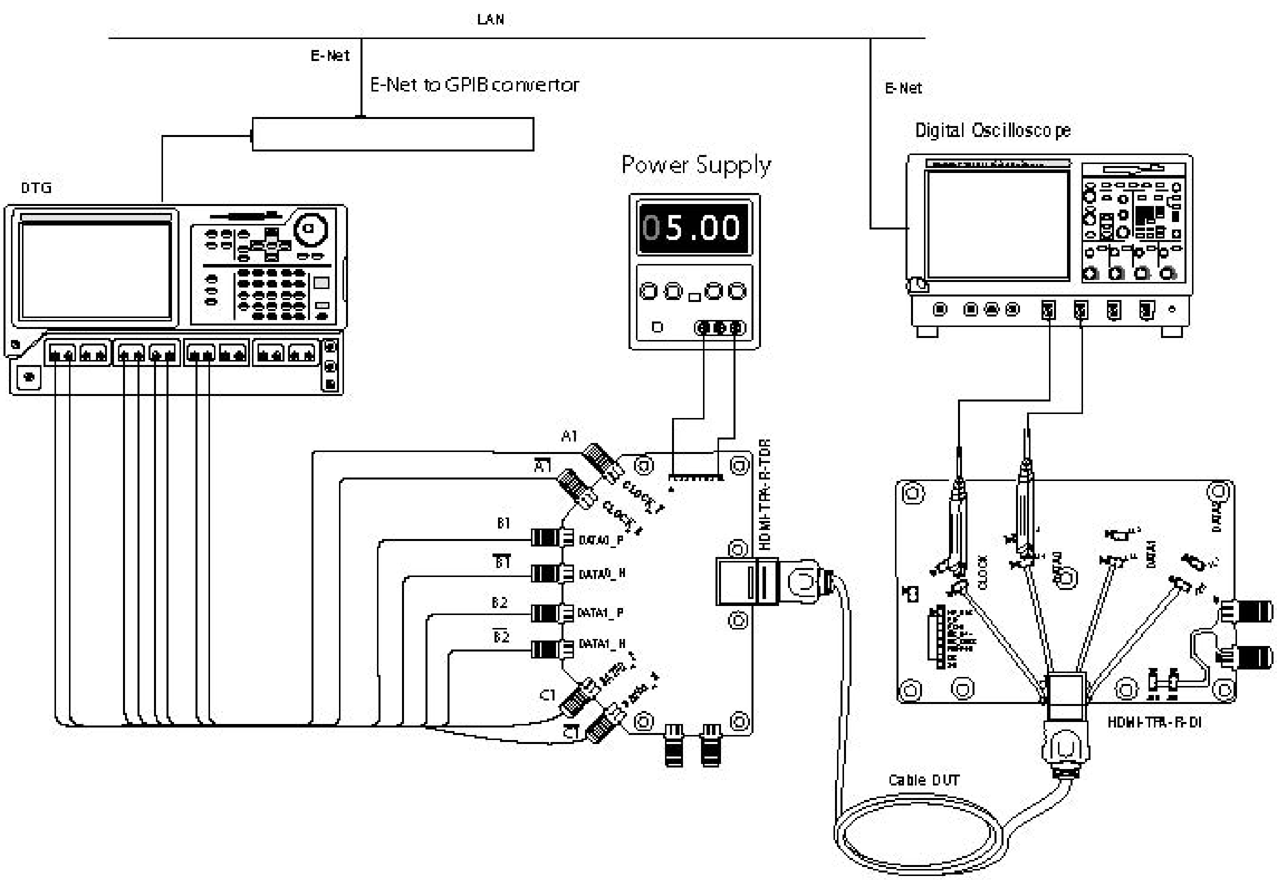


Figure 110: Connections for Cable Eye Diagram (Setup diagram for TP2)

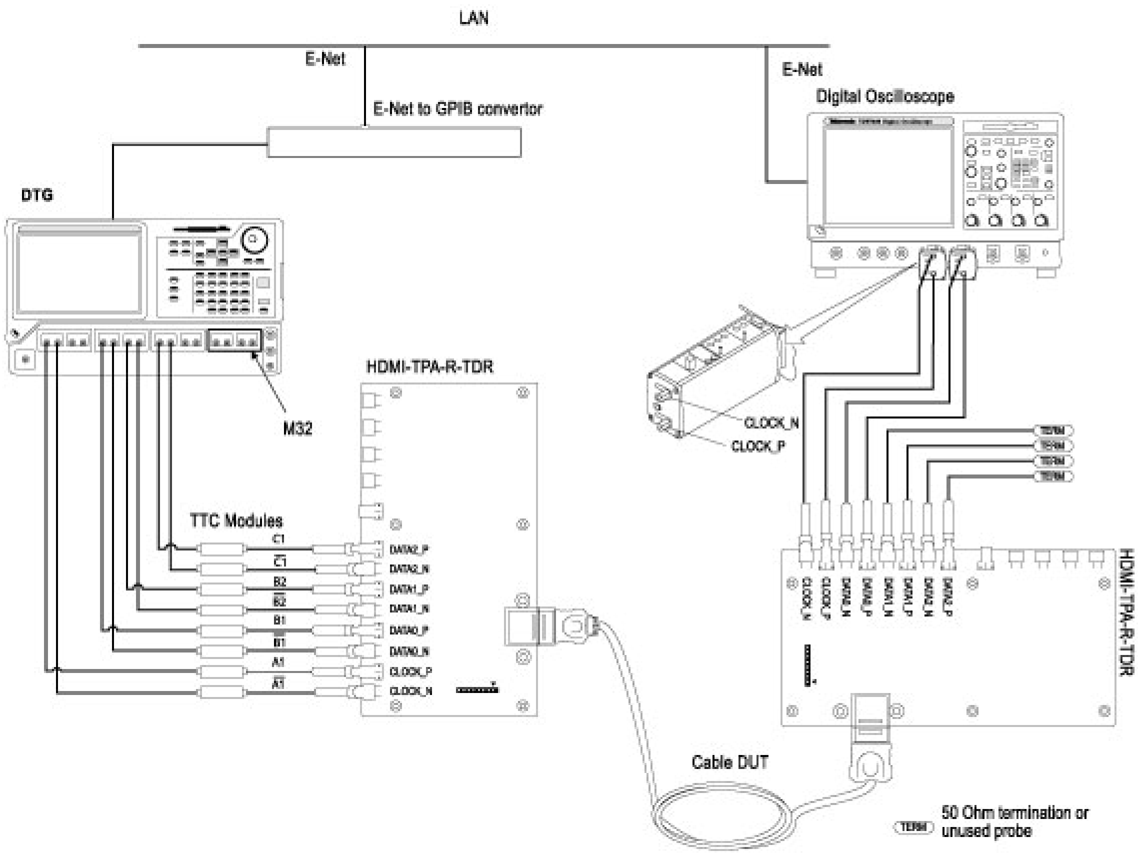


Figure 111: Connections for Cable Eye Diagram (Setup diagram for TP2) with Efficere Technologies test fixture

1. Remove the TPA-P-DI/EFF-TPA-P test adaptor.
2. Connect the Cable DUT.
3. Connect the TPA-R-DI/EFF-TPA-R adaptor for the required resolution (refer to the EDID emulator user manual).
4. Connect a TMDS CLOCK to the configured oscilloscope channel by using a SMA differential probe.
5. Connect the TMDS_DATA pair on which you will conduct the test to the configured oscilloscope channel by using a second differential probe.

View Waveform

Source – Eye Diagram

Click View Waveform to display the input signals Clock and Data as follows:

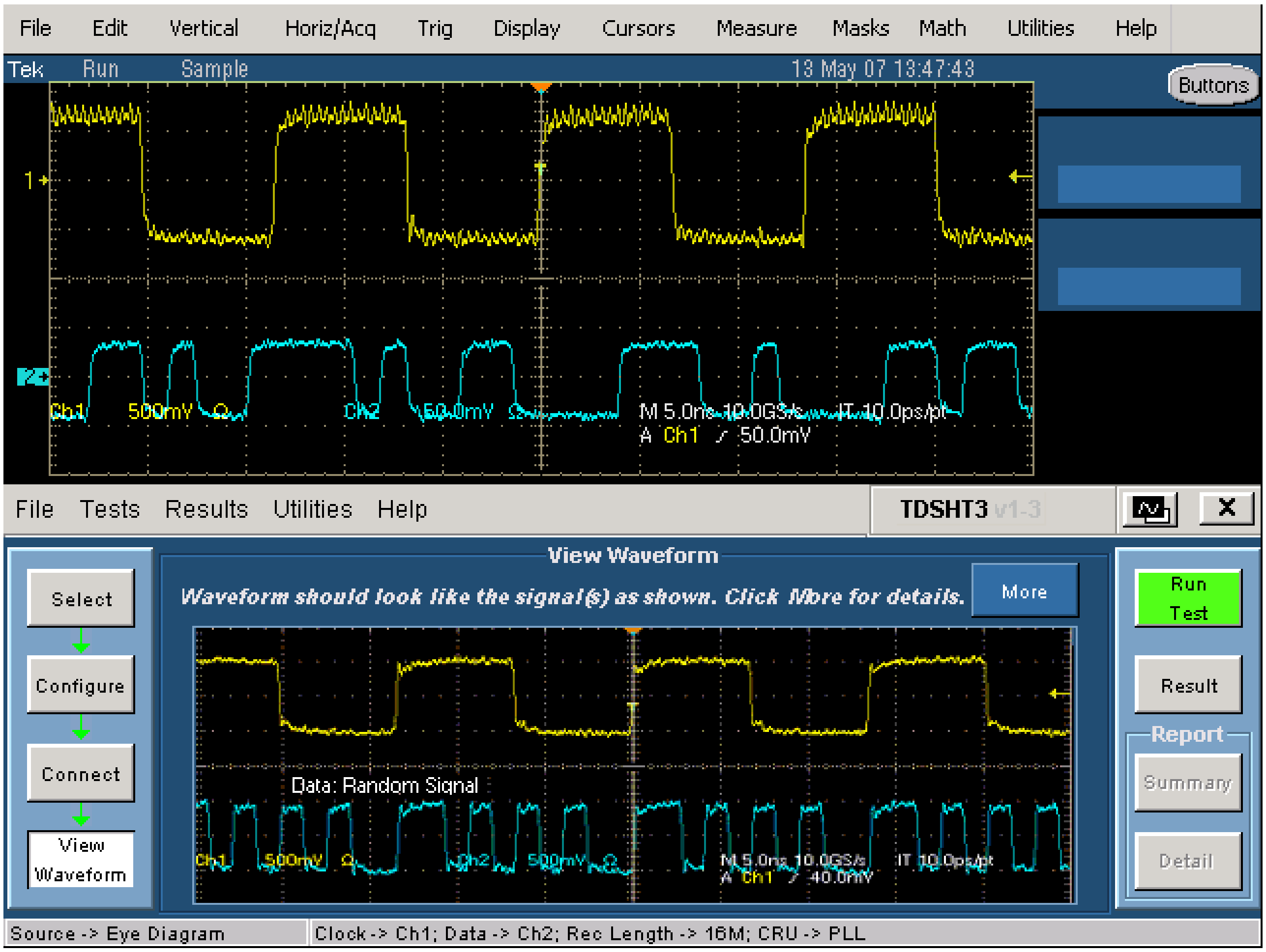


Figure 112: Waveform of Source Eye Diagram

Source – Duty Cycle

Click View Waveform to display the Clock signal as follows:

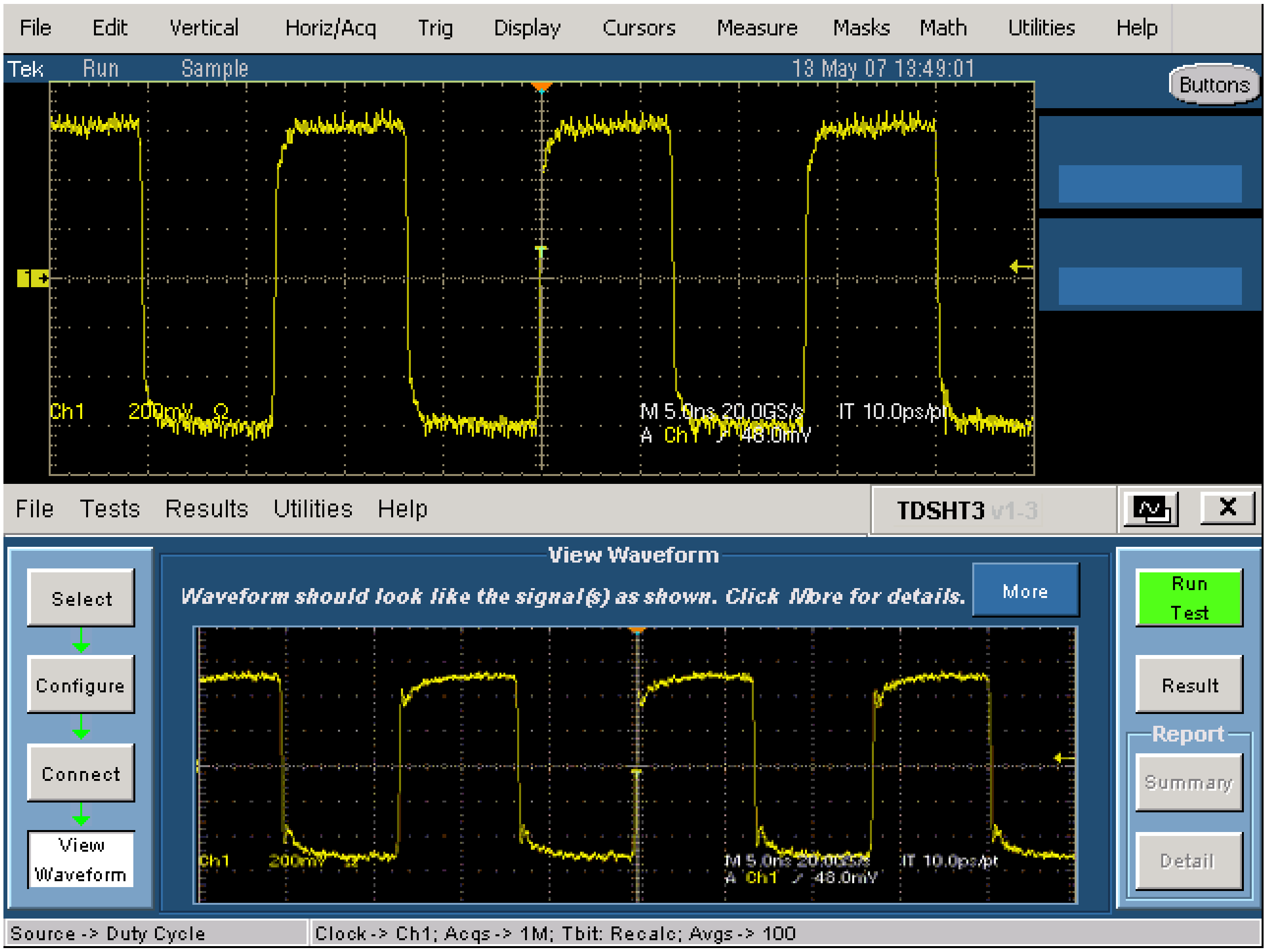


Figure 113: Waveform of Duty Cycle

Source – Rise Time

Click View Waveform to display the input signals Clock or Data as follows:

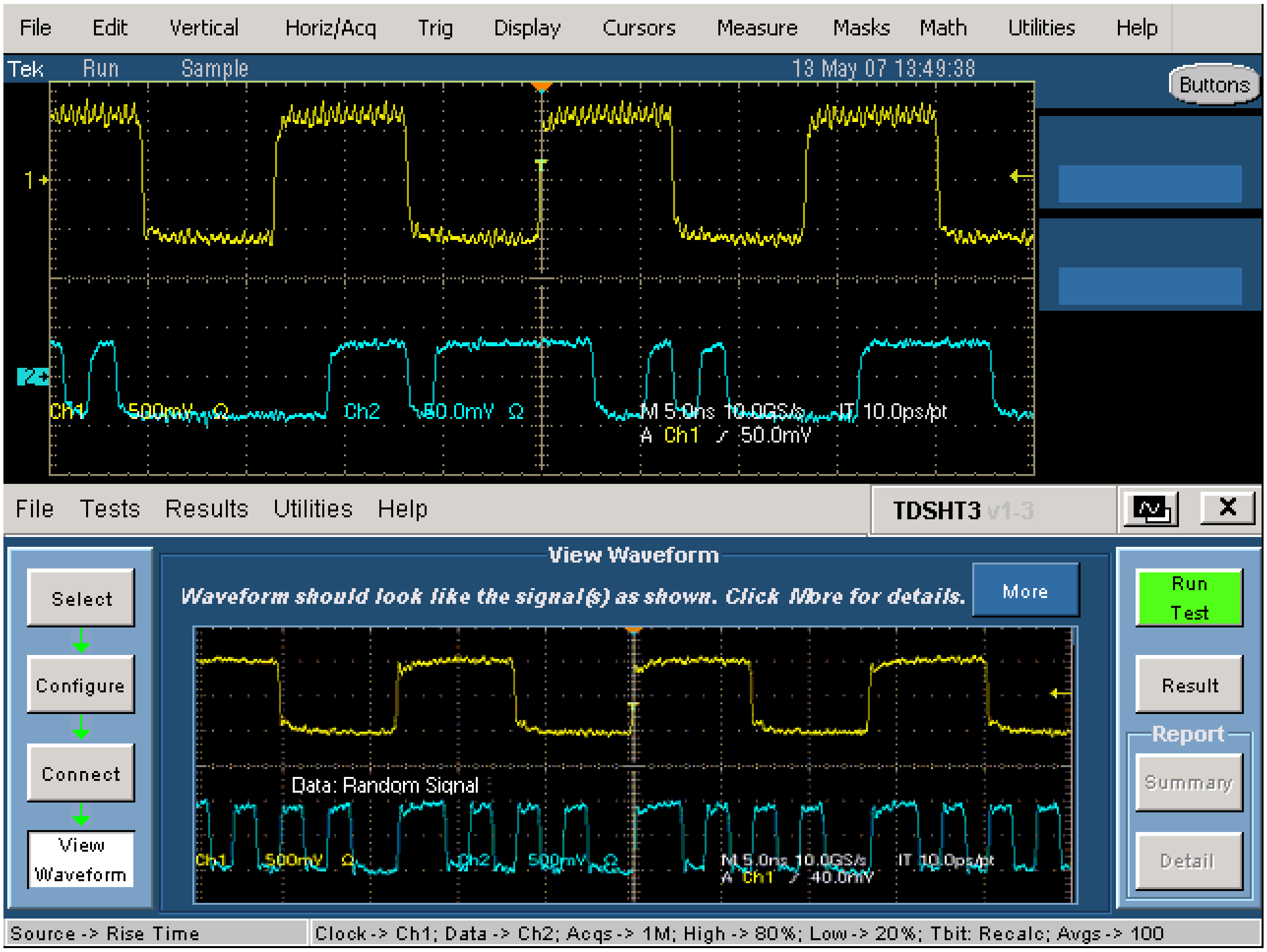


Figure 114: Waveform of Rise Time

Source – Fall Time

Click View Waveform to display the input signals Clock or Data as follows:

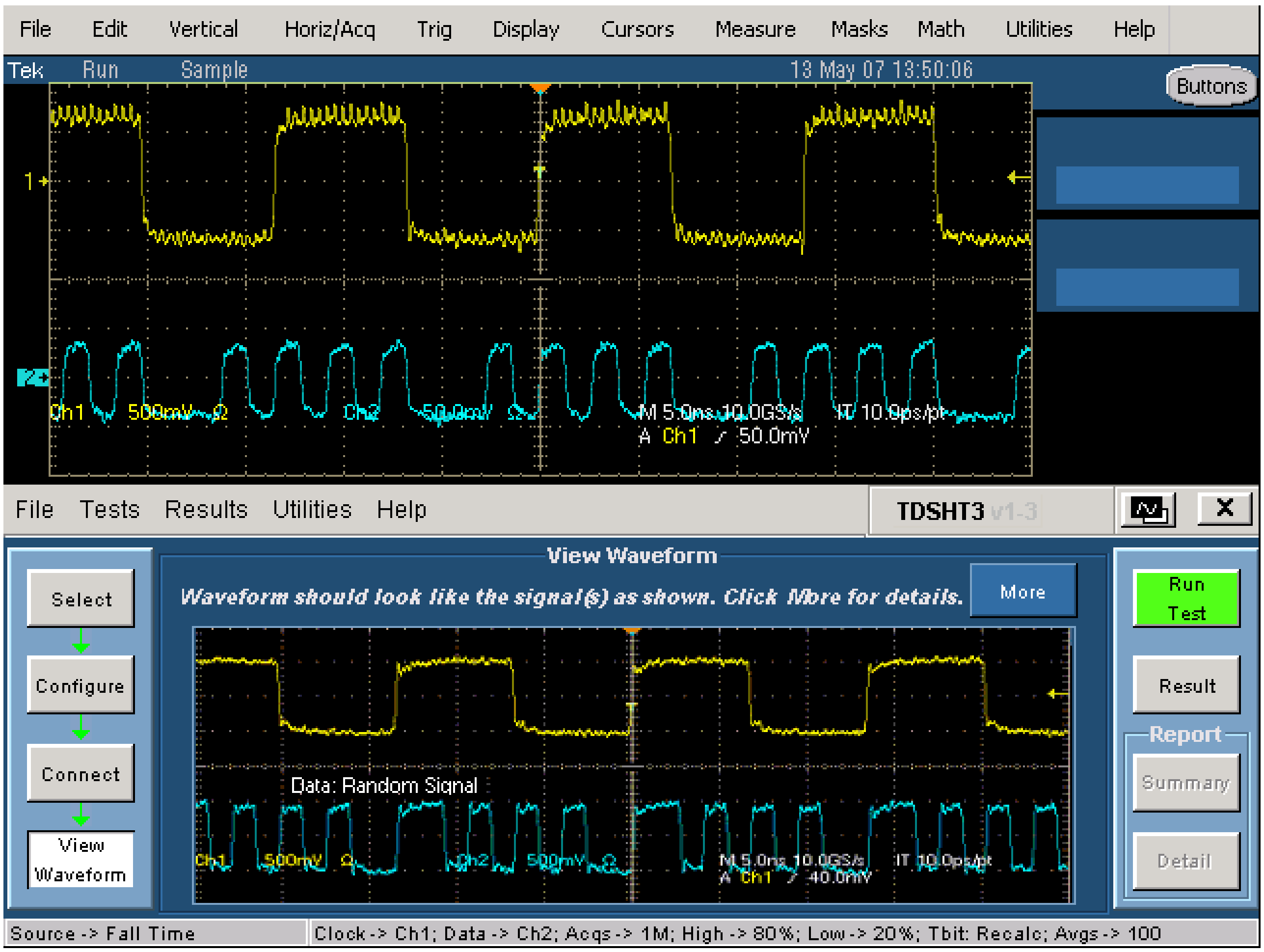


Figure 115: Waveform of Fall Time

Source – Clock Jitter

Click View Waveform to display the Clock signal as follows:

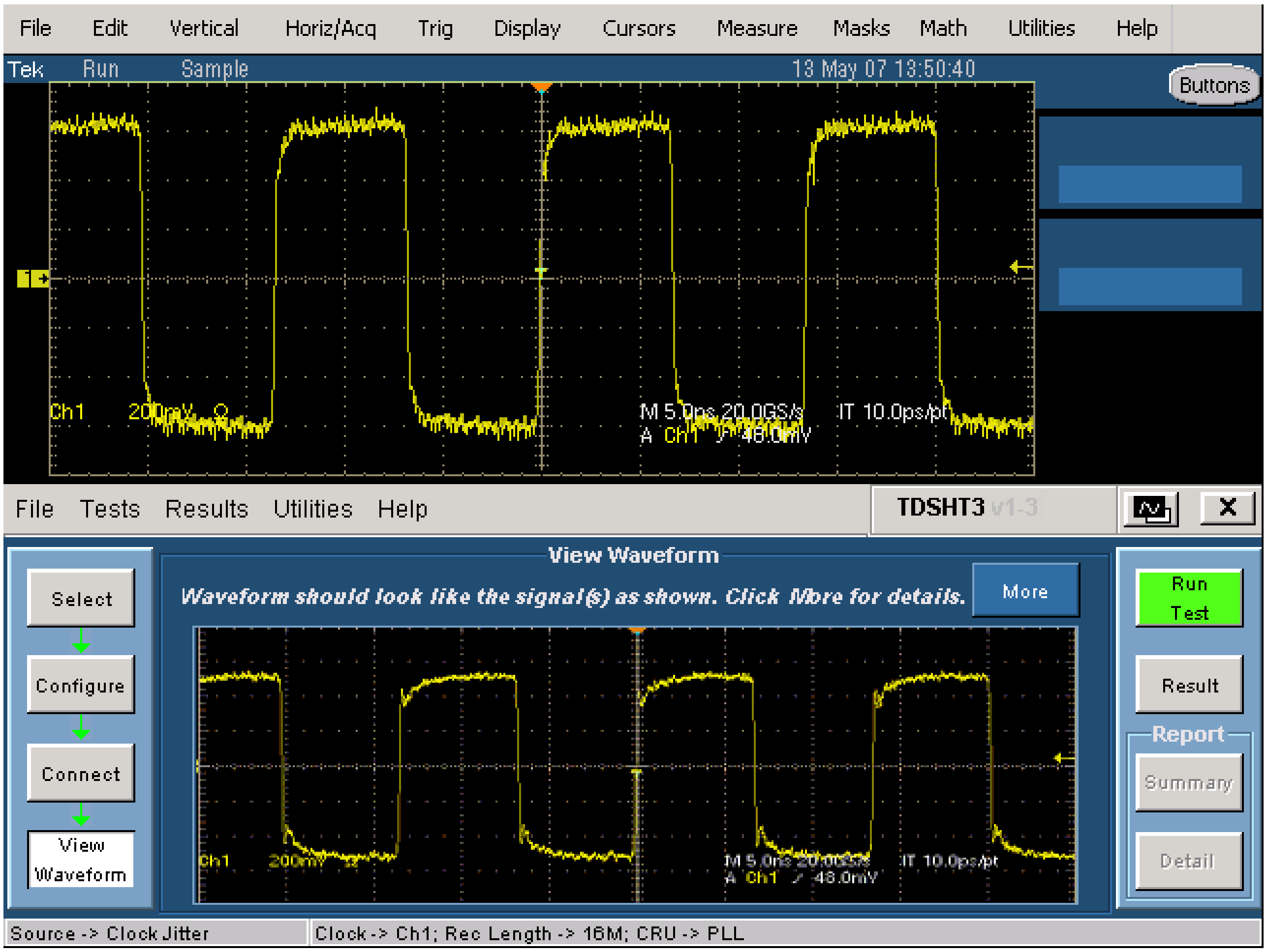


Figure 116: Waveform of Clock Jitter

Source – Clock-Data Tests Select All

Click View Waveform to display the input signals Clock and Data as follows:

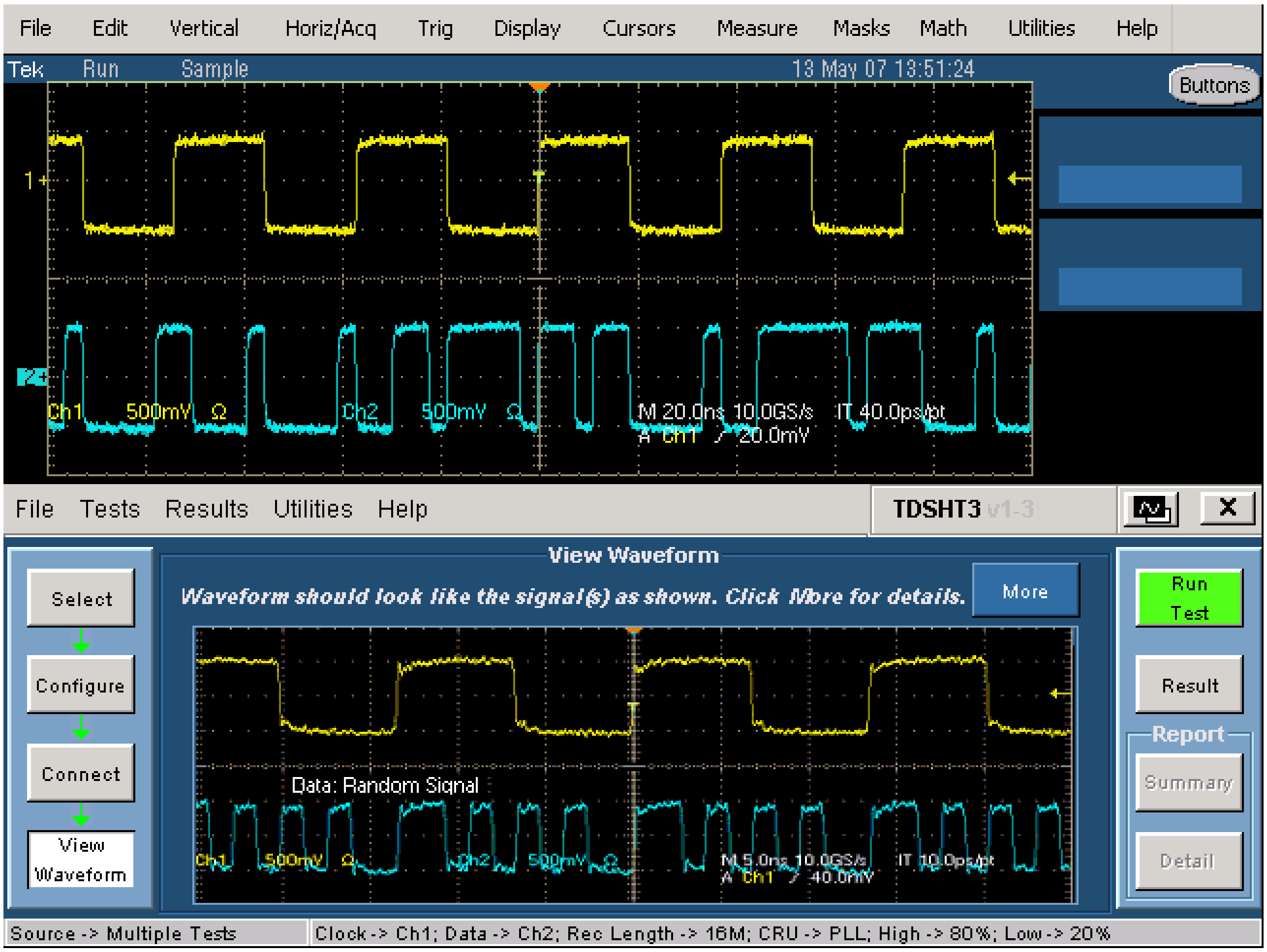


Figure 117: Waveform of Source Multiple Tests

Source – Inter-Pair Skew for Data-Data Tests

Click View Waveform to display the input signals Data+ and Data–, Clock as follows:

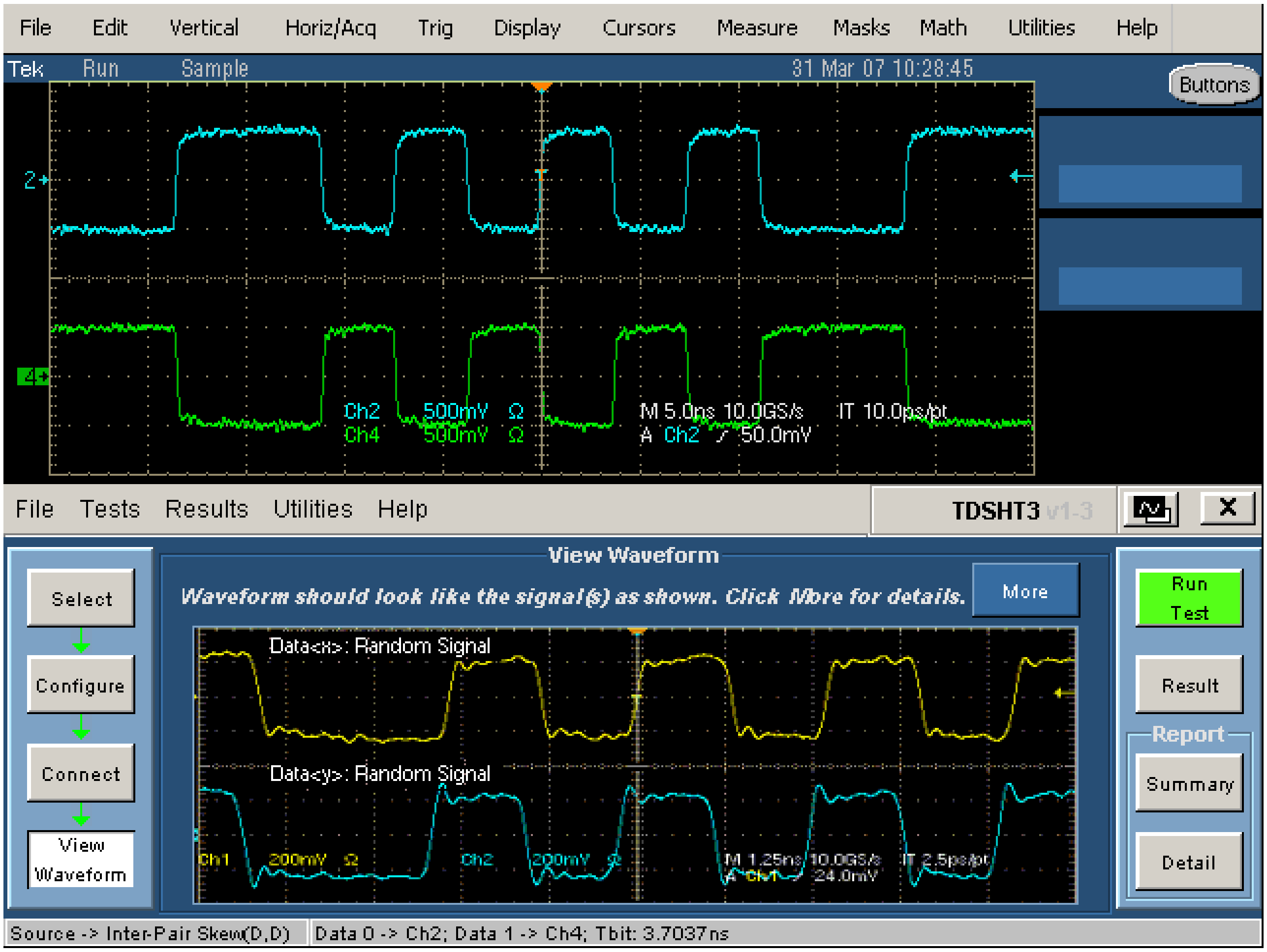


Figure 118: Waveform of Inter-Pair Skew (Data-Data)

Source – Intra-Pair Skew

Click View Waveform to display the input signals Data+ or Data–/Clock as follows:

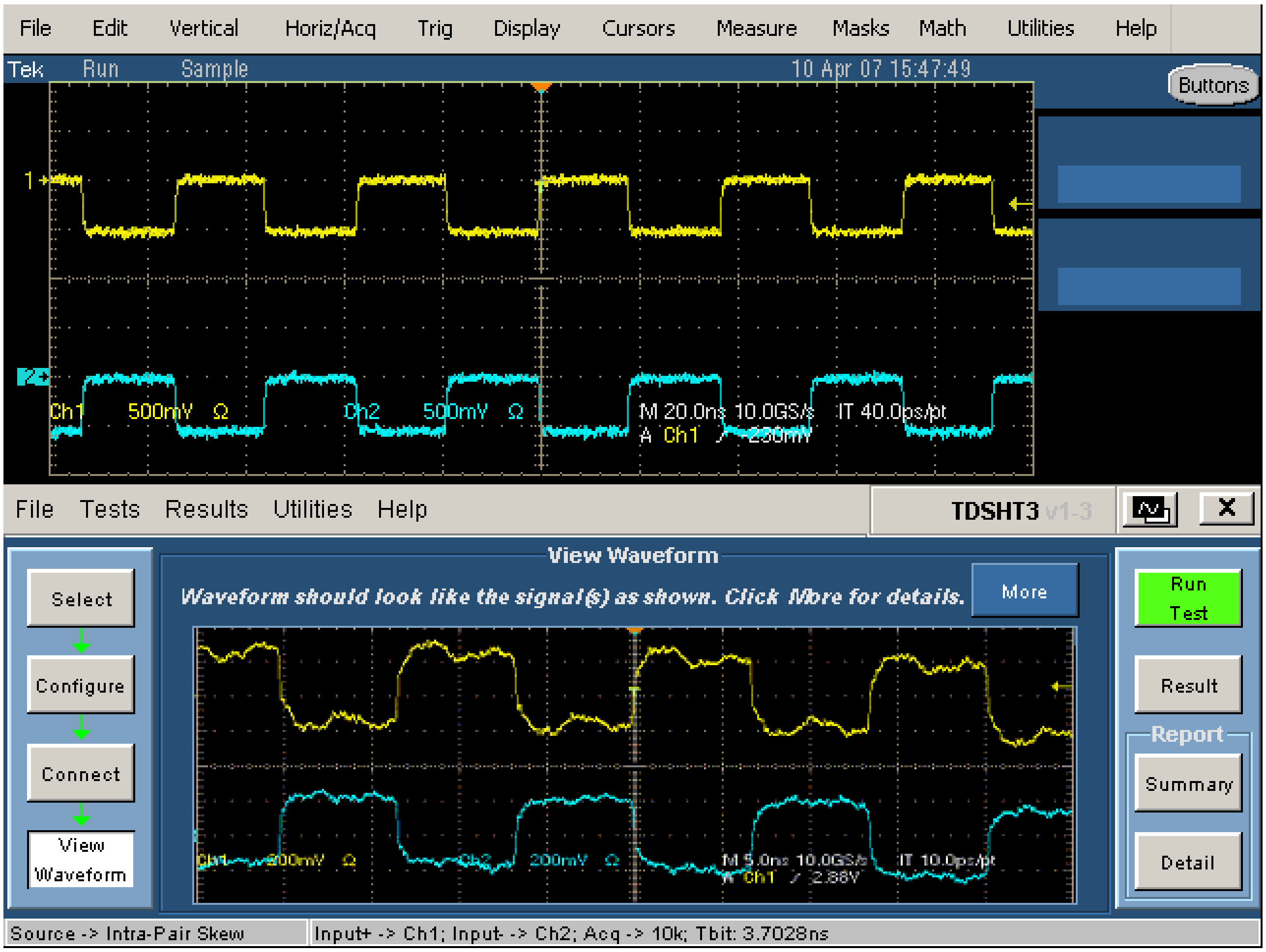


Figure 119: Waveform of Source Intra-Pair Skew

Source – Low Amplitude +

Click View Waveform to display the input signals Data+ or Data–/Clock as follows:

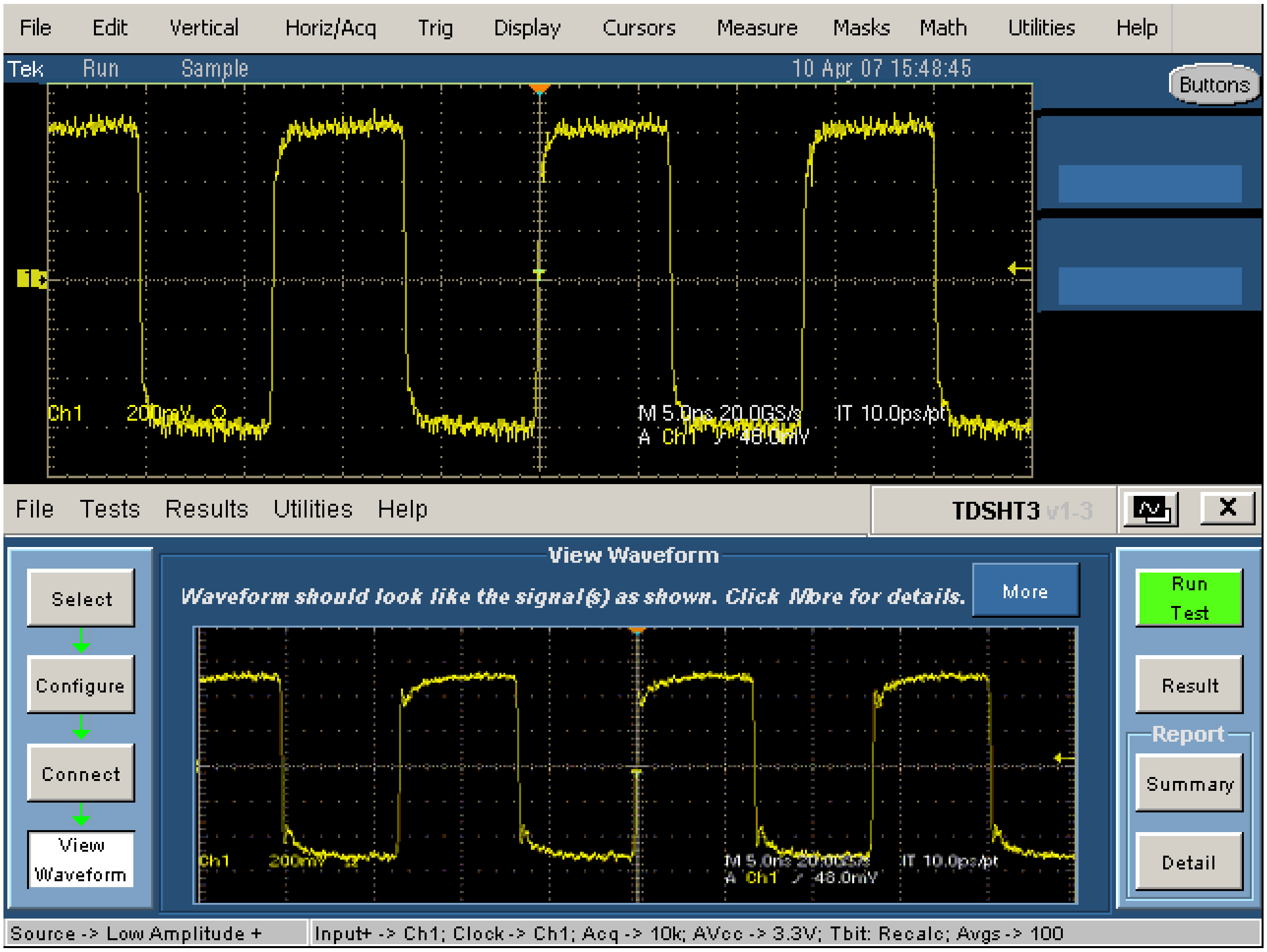


Figure 120: Waveform of Low Amplitude +

Source – Low Amplitude –

Click View Waveform to display the input signals Data+ or Data–/Clock as follows:

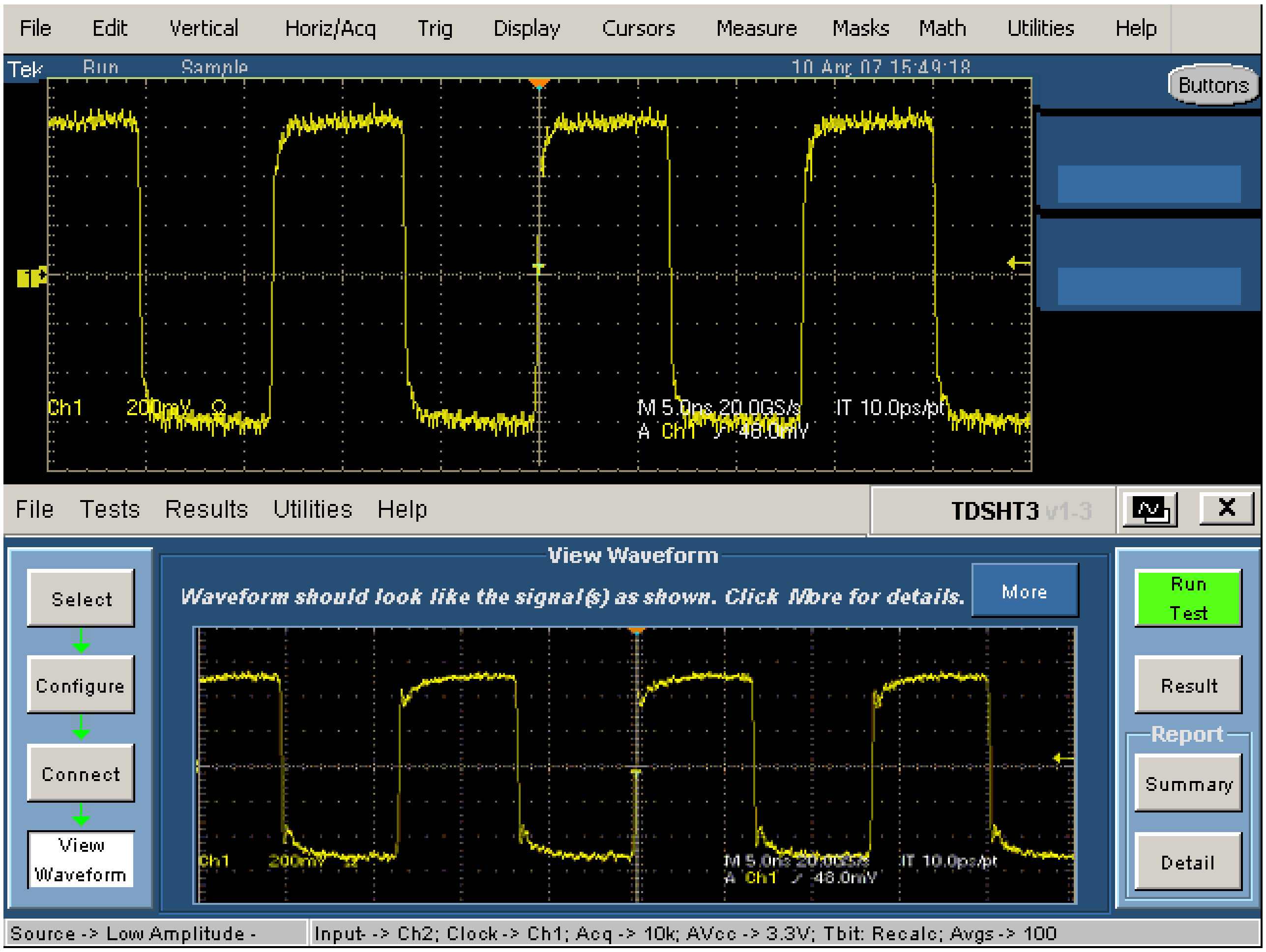


Figure 121: Waveform of Low Amplitude -

Sink – Min/Max-Diff Swing Tolerance

Because no signal is connected to the oscilloscope, you cannot view the waveform for the min/max-diff swing tolerance test.

Sink – Jitter Tolerance

Because no signal is connected to the oscilloscope, you cannot view the waveform for the jitter tolerance test.

Sink – Intra-Pair Skew

If you have selected re-calculate Tbit, then click View Waveform to display the Clock signal as follows:

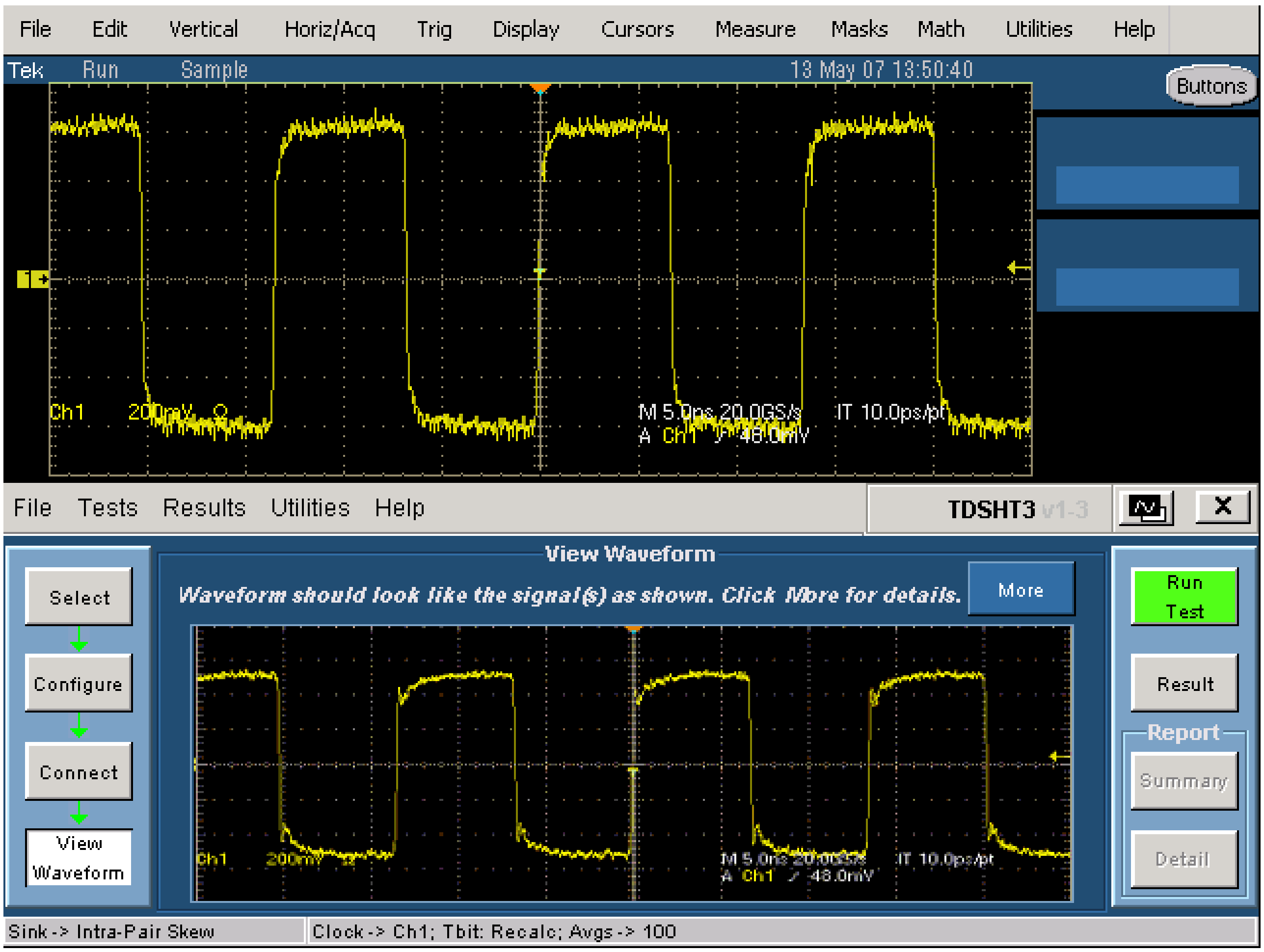


Figure 122: Waveform of Sink Intra-Pair Skew

Cable – Eye Diagram

Because no signal is connected to the oscilloscope, you cannot view the waveform for the eye diagram test.

Test

Source – Eye Diagram

This test allows you to confirm that the differential signal on each TMDS differential data pair has an eye opening (region of valid data), which meets or exceeds the limits on eye opening in the specification.

You will need one supported oscilloscope, two differential probes, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-DI fixture.

1. On the menu bar, click Tests > Select > Source.

2. In the clock-data tests pane, select the Eye Diagram check box.

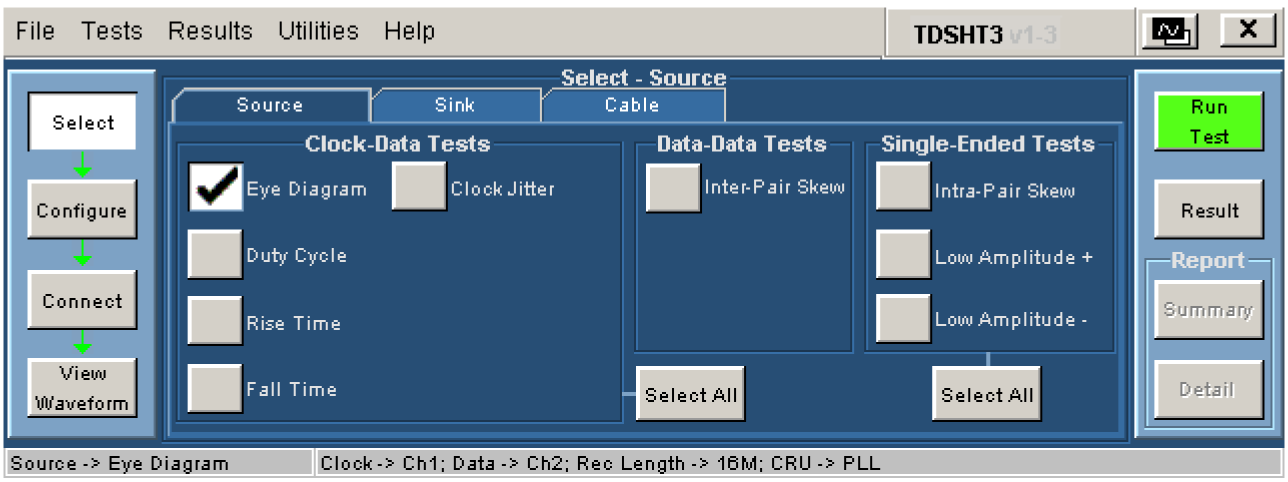


Figure 123: Select Source with Eye Diagram test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

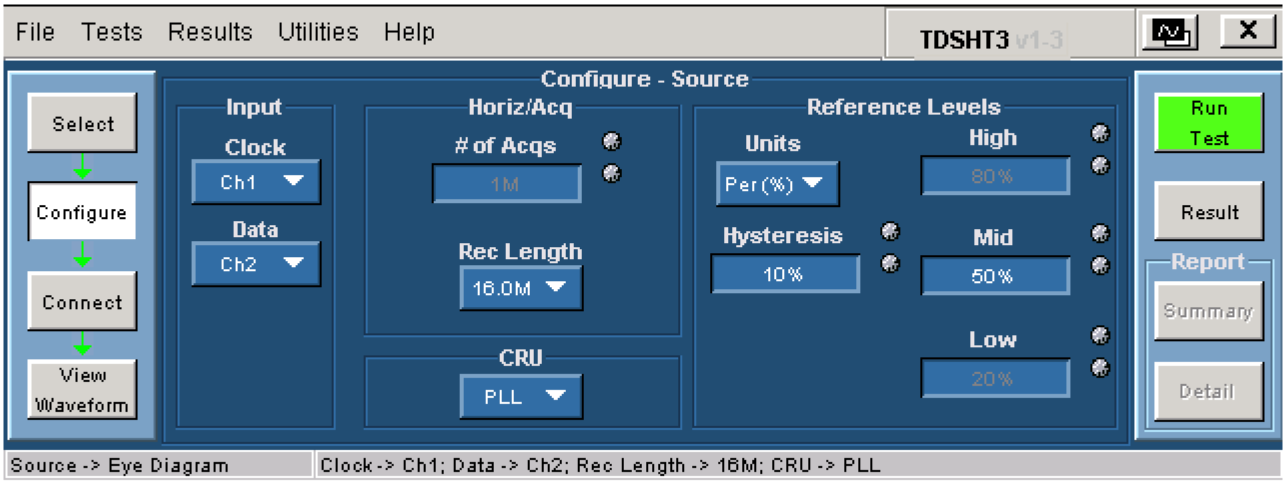


Figure 124: Configure Source for Eye Diagram

4. In the input pane, you have the following options:

Table 28: Input options for Eye Diagram

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, Ch4, Ref1, Ref2, Ref3, and Ref4.
Data	Data indicates the oscilloscope channel to which you will connect the data input. The available choices are Ch1, Ch2, Ch3, Ch4, Ref1, Ref2, Ref3, and Ref4.

5. In the horiz/acq pane, you have the following option:

Table 29: Horiz/Acq options for Eye Diagram

Configure Parameter	Description
Record Length	In the Rec Length box, enter the desired record length value for the eye tests.

6. In the CRU pane, you have the following option:

Table 30: CRU options for Eye Diagram

Configure Parameter	Description
CRU	The CRU list allows you to configure the CRU. The available choices are PLL, Raw, and Ideal. The default value is first order PLL and is used for compliance testing. Raw and Ideal are used for analysis.

7. In the reference levels pane, you have the following options:

Table 31: Reference Levels options for Eye Diagram

Configure Parameter	Description
Units	The Units list allows you to set the reference level units to either Per (%) or Abs. Per (%) indicates that the reference levels are a percentage of the Vswing value. Abs indicates that the reference levels are absolute voltage values.
Hysteresis	In the Hysteresis box, enter the desired hysteresis percent value. The default value is 10 percent. The hysteresis range is between 2 percent and 10 percent.
Mid	In the Mid box, enter the desired mid reference voltage value. The default value is 50 percent.

8. To connect the DUT, click Tests > Connect.

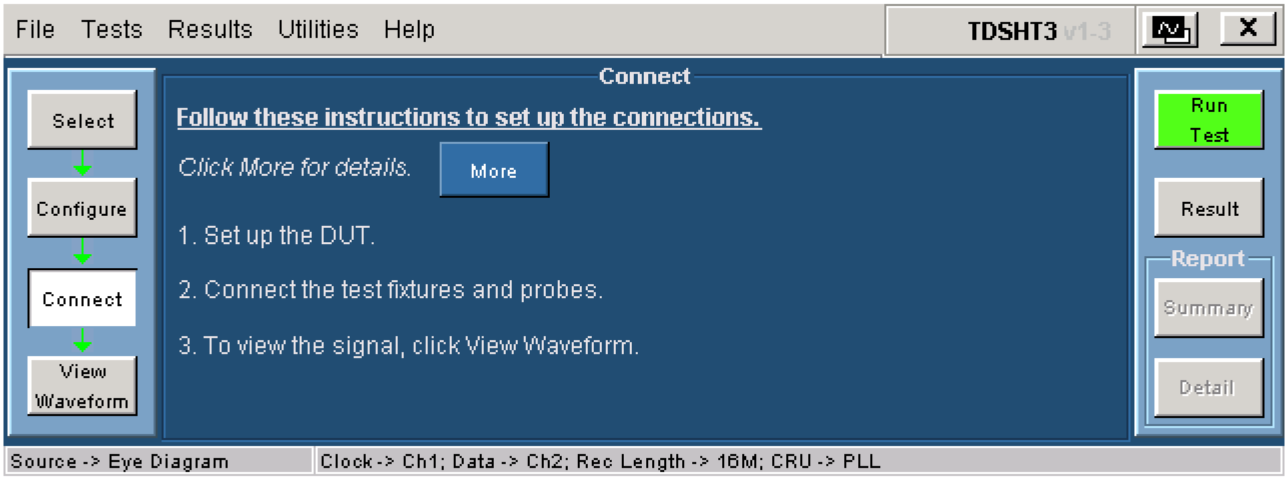


Figure 125: Connect pane for Source Eye Diagram

9. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections.

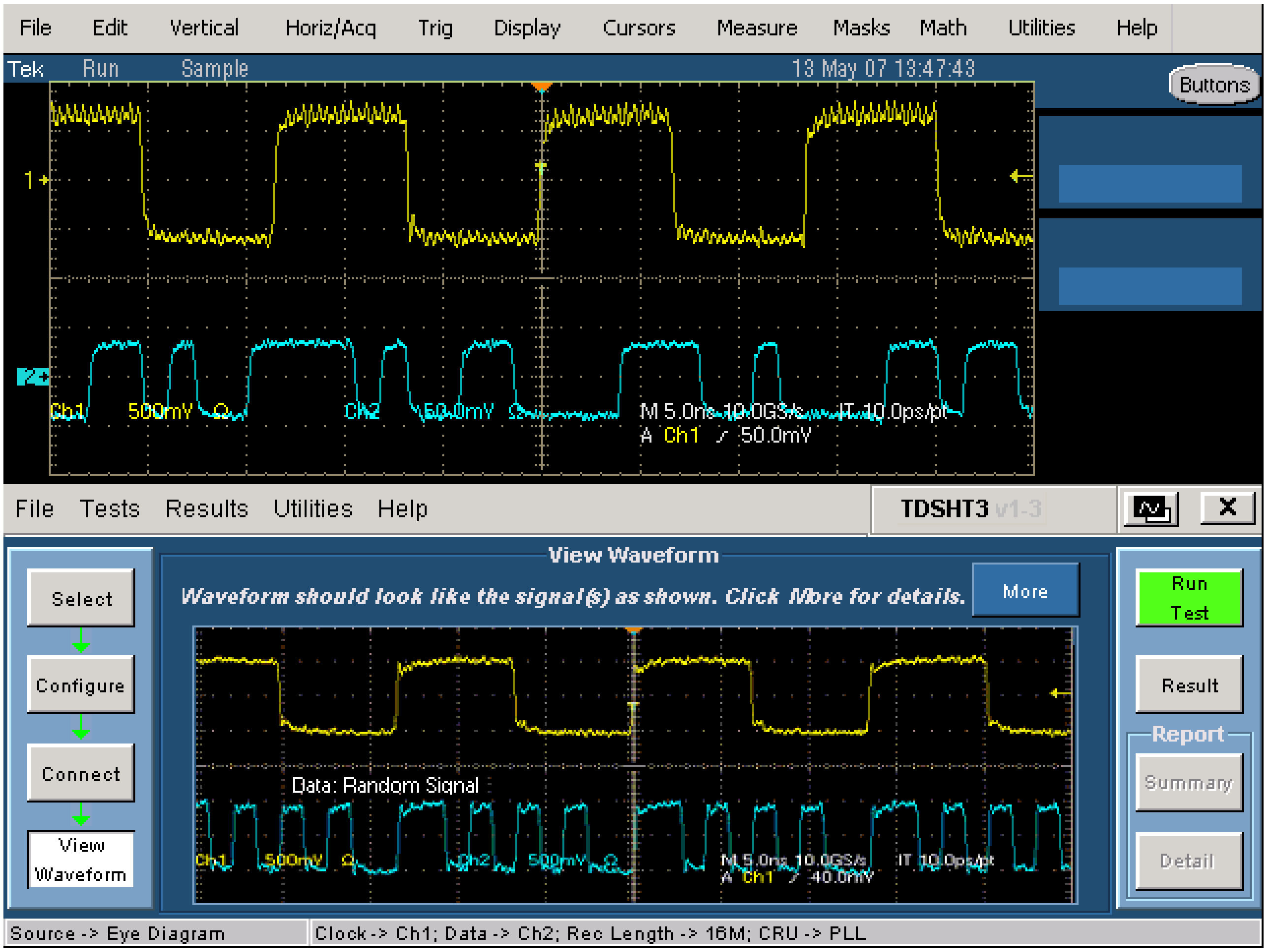


Figure 126: Waveform of Source Eye Diagram

10. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

11. If you have run the eye diagram test successfully, the software makes Result available automatically and displays the eye diagram plot. A warning message box may also appear. For more information on the Eye Diagram plot and the message box, refer to the online help.

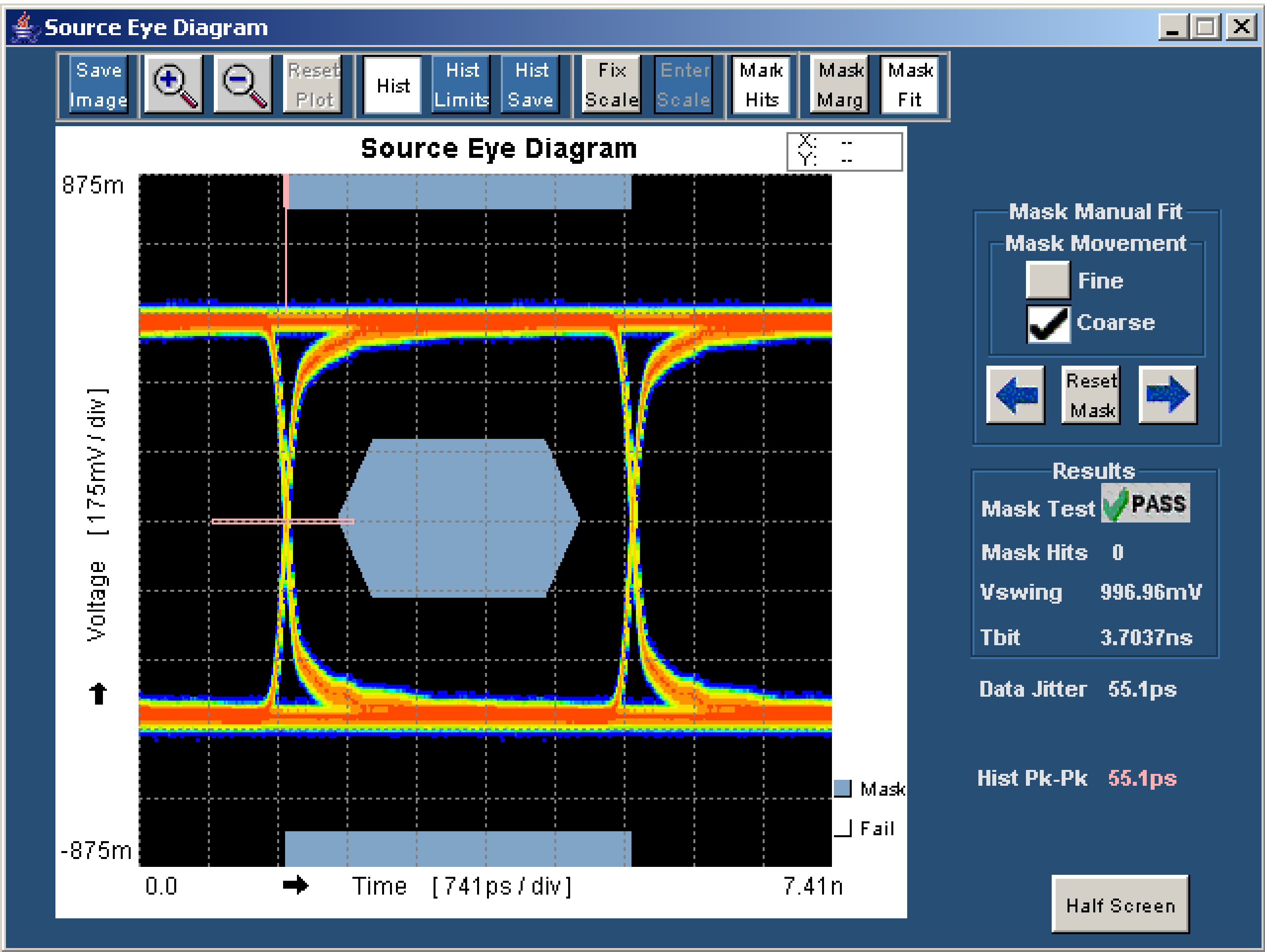


Figure 127: Source Eye Diagram plot

12. Click Half Screen to view the eye diagram plot in half screen. You can also view both the result summary of the test and the report configuration in the result pane as shown in the following diagram. For more information on Result Summary and Report Configuration, refer to online help.

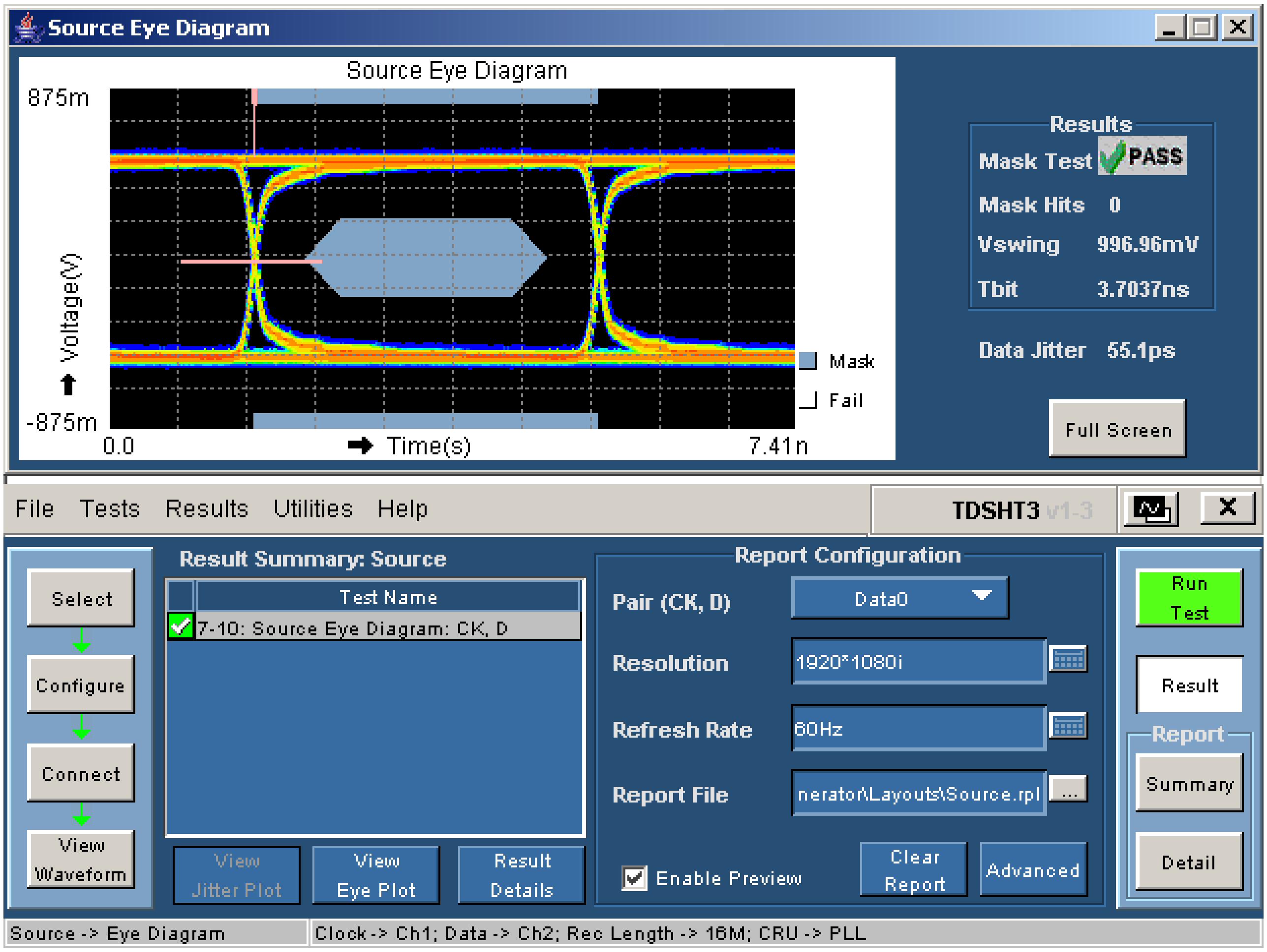


Figure 128: Waveform of Source Eye Diagram plot and Result

13. In the result summary pane, click Result Details to display the details of the result.

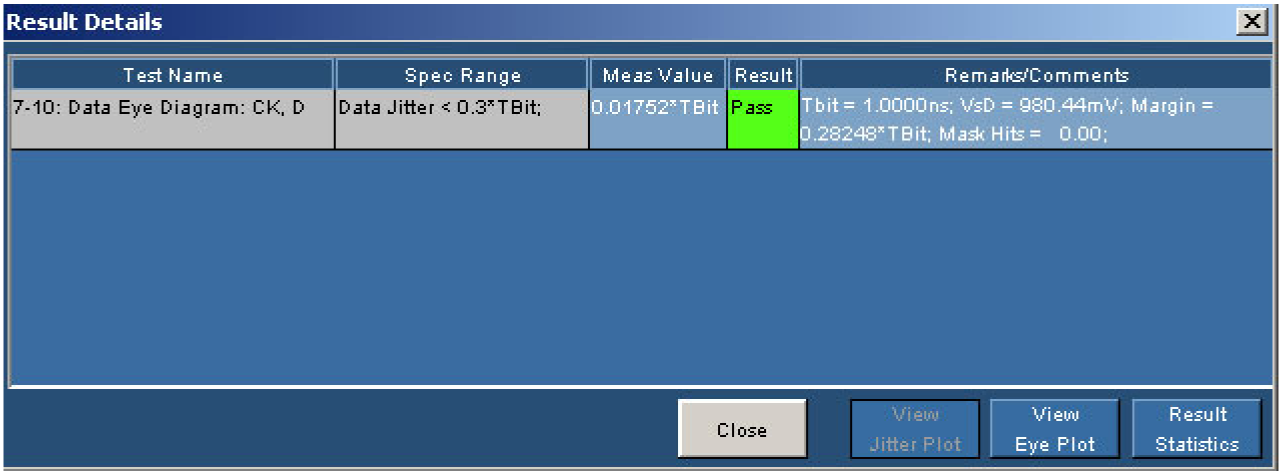


Figure 129: Result Details for Source Eye Diagram

14. In the Result Details dialog box, click Result Statistics to display statistics based on the tests. For more information on Result Statistics, refer to online help.

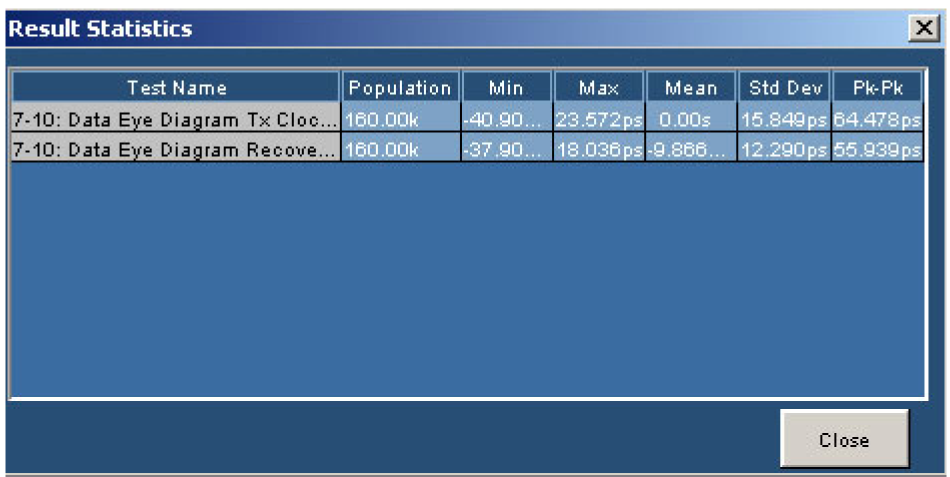


Figure 130: Result Statistics for Source Eye Diagram

Source – Duty Cycle

This test allows you to confirm that the duty cycle of the differential TMDS clock does not exceed the limits allowed by the specification.

You will need one supported oscilloscope, one differential probe, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-DI fixture.

1. On the menu bar, click Tests > Select > Source.

2. In the clock-data tests pane, select the Duty Cycle check box.

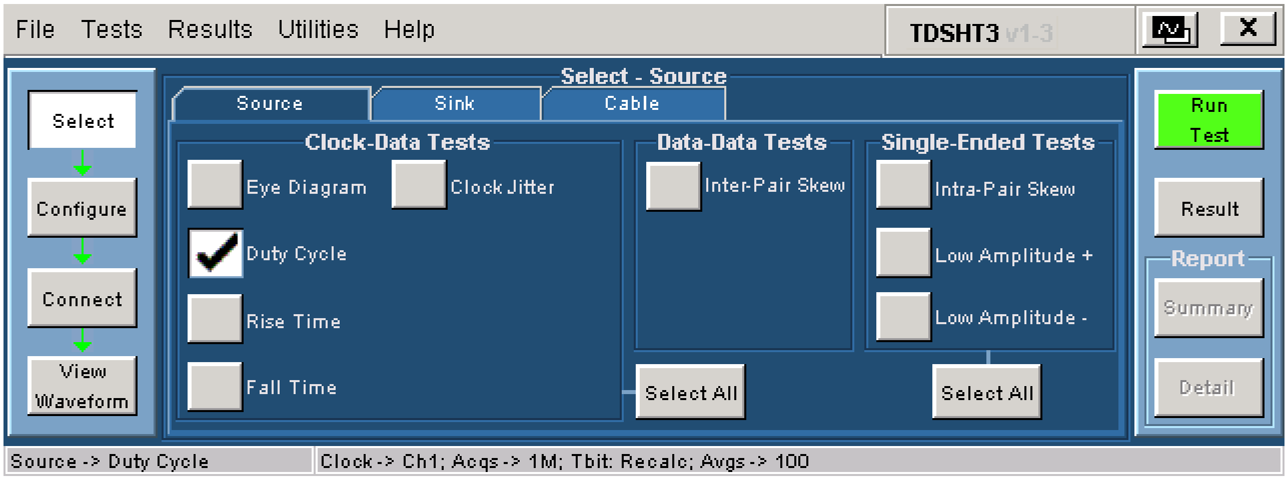


Figure 131: Select Source with Duty Cycle test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

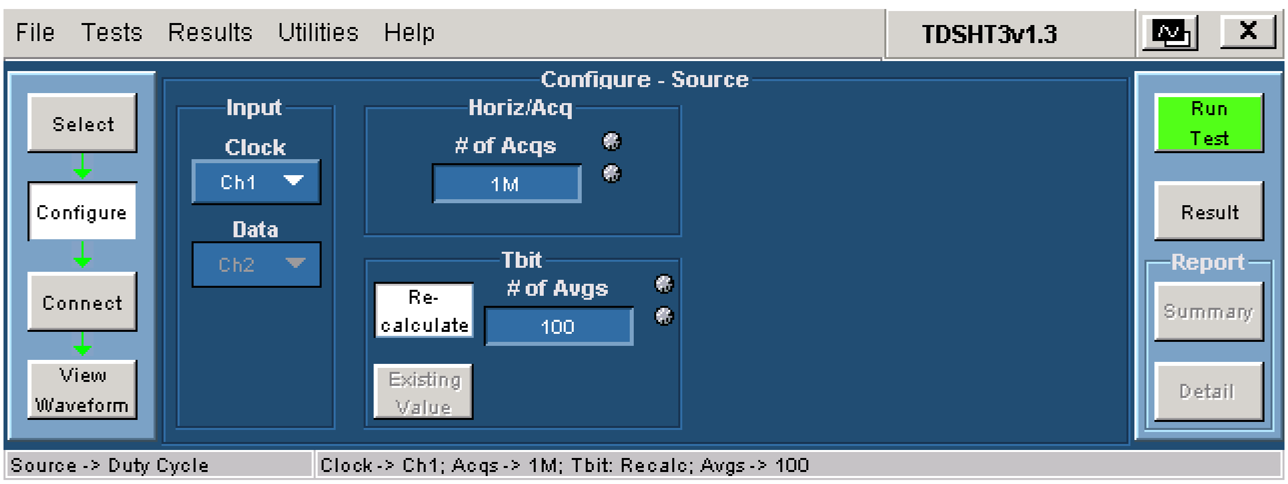


Figure 132: Configure Source for Duty Cycle

4. In the input pane, you have the following option:

Table 32: Input options for Duty Cycle

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. In the horiz/acq pane, you have the following option:

Table 33: Horiz/Acq options for Duty Cycle

Configure Parameter	Description
# of Acqs	In the # of Acqs box, enter the desired number of acquisitions that are required for the test. The default value is 10 K.

6. In the tbit pane, you have the following options:

Table 34: Tbit options for Duty Cycle

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

7. To connect the DUT, click Tests > Connect.

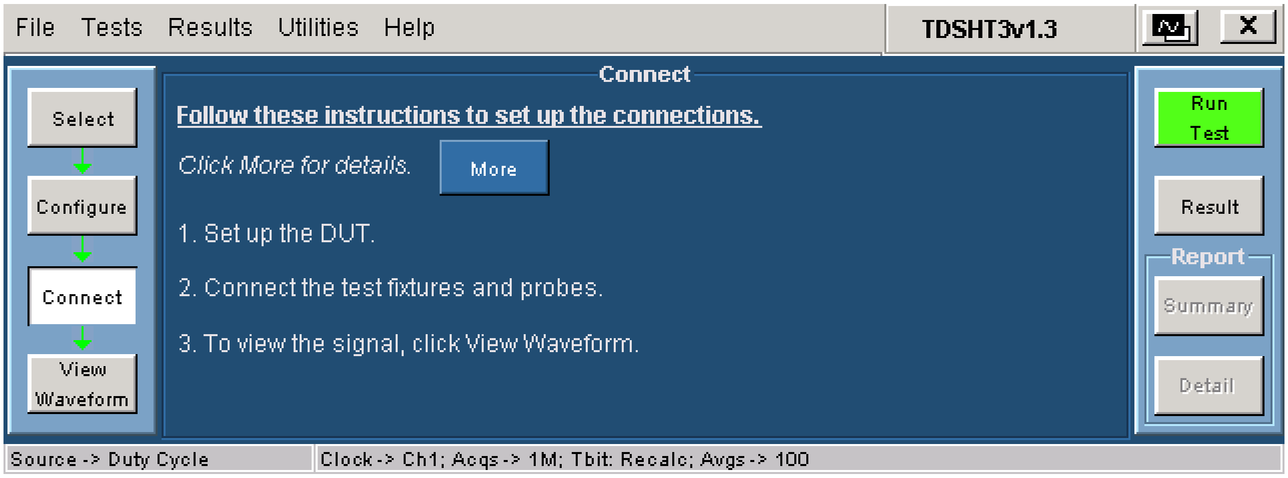


Figure 133: Connect pane for Duty Cycle

8. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections.

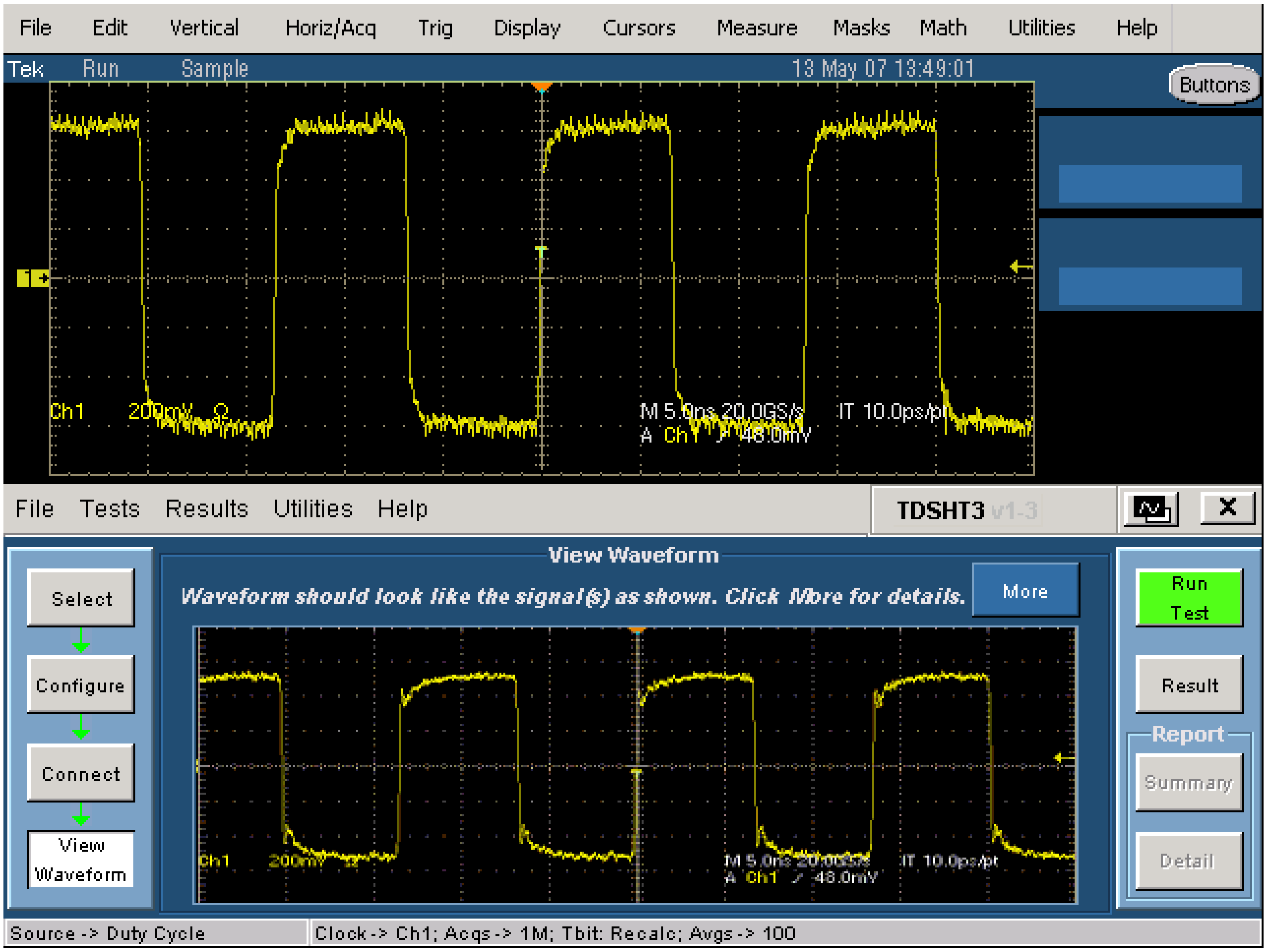


Figure 134: Waveform of Duty Cycle

9. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

10. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

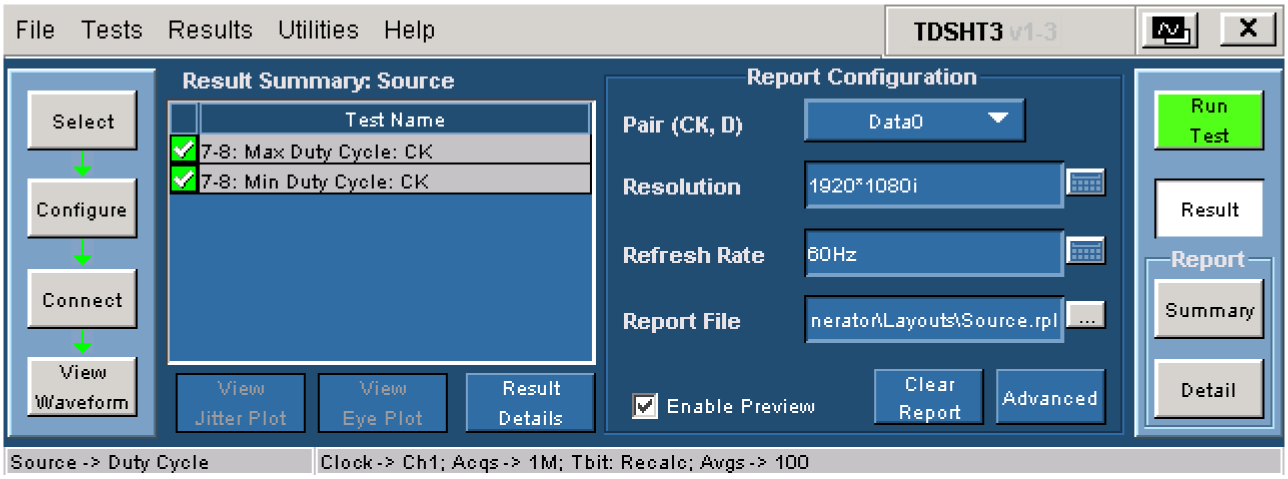


Figure 135: Result for Duty Cycle

Table 35: Result options for Duty Cycle

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

11. You can set the report details to identify and generate the report automatically. You can set a default report file.

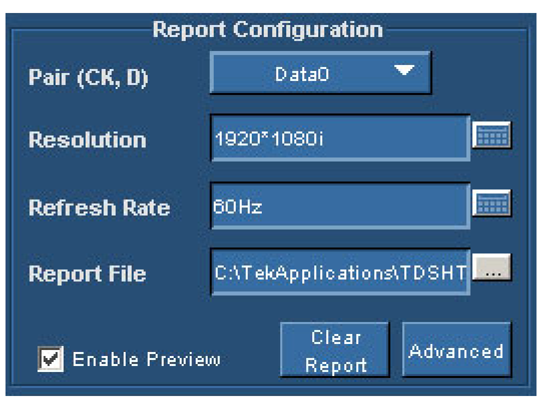


Figure 136: Report Configuration for Duty Cycle

In the report configuration pane, you can configure the following parameters:

Table 36: Report Configuration options for Duty Cycle

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

12. In the result summary pane, click Result Details to display the details of the result.

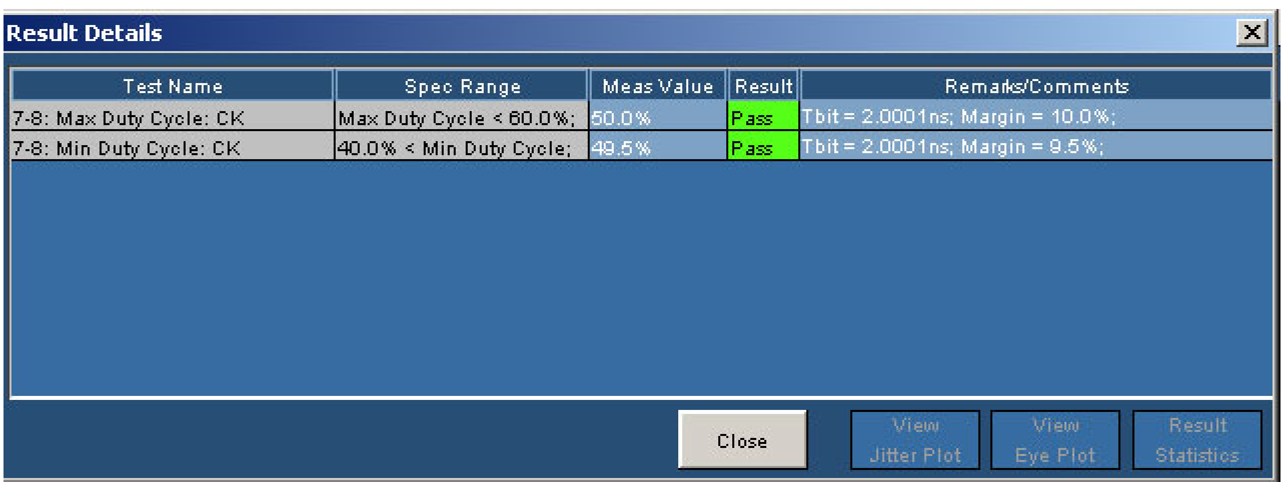


Figure 137: Result Details for Duty Cycle

Table 37: Result Details options for Duty Cycle

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Source – Rise Time

This test allows you to confirm that the rise times on the TMDS differential signals fall within the limits of the specification.

You will need one supported oscilloscope, one differential probe, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-DI fixture.

1. On the menu bar, click Tests > Select > Source.
2. In the clock-data tests pane, select the Rise Time check box.

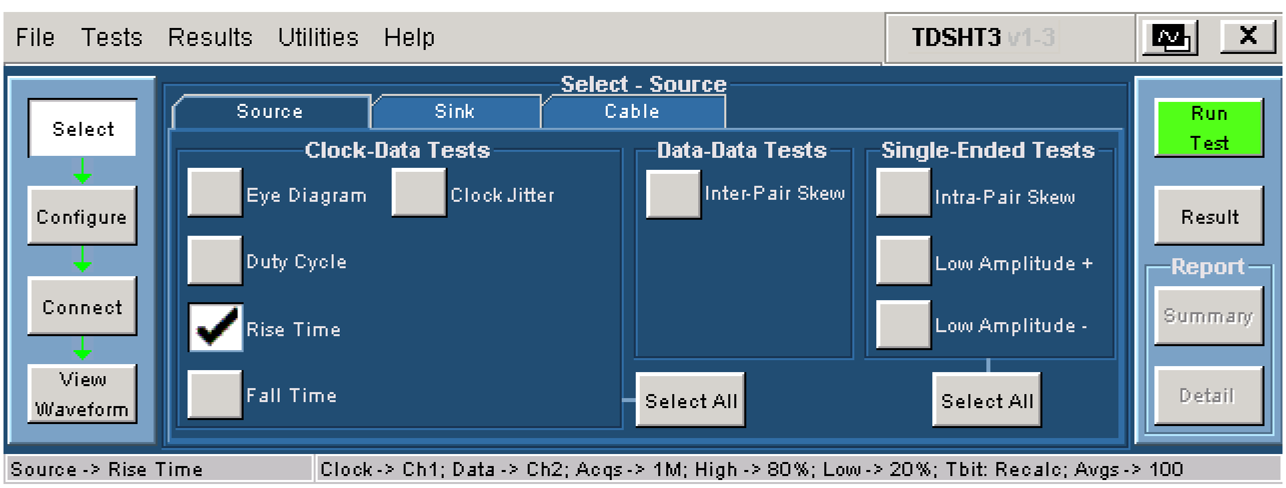


Figure 138: Select Source with Rise Time test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

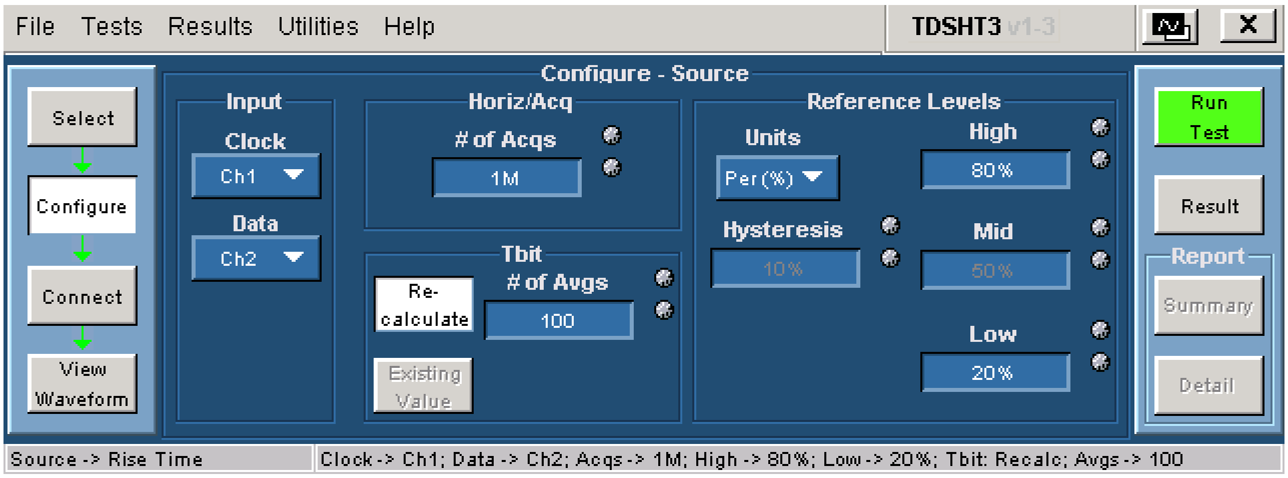


Figure 139: Configure Source for Rise Time

4. In the input pane, you have the following options:

Table 38: Input options for Rise Time

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, Ch4, and Not Conn.
Data	Data indicates the oscilloscope channel to which you will connect the data input. The available choices are Ch1, Ch2, Ch3, Ch4, and Not Conn.

5. In the horiz/acq pane, you have the following option:

Table 39: Horiz/Acq options for Rise Time

Configure Parameter	Description
# of Acqs	In the # of Acqs box, enter the desired number of acquisitions that are required for the test. The default value is 10 K.

6. In the tbit pane, you have the following options:

Table 40: Tbit options for Rise Time

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

7. In the reference levels pane, you have the following options:

Table 41: Reference Levels options for Rise Time

Configure Parameter	Description
Units	The Units list allows you to set the reference level units to either Per (%) or Abs. Per (%) indicates that the reference levels are a percentage of the Vswing value. Abs indicates that the reference levels are absolute voltage values.
Hysteresis	In the Hysteresis box, enter the desired hysteresis percent value. The default value is 10 percent.
High	In the High box, enter the desired high reference voltage value. The default value is 80 percent.
Mid	In the Mid box, enter the desired mid reference voltage value. The default value is 50 percent.
Low	In the Low box, enter the desired low reference voltage value. The default value is 20 percent.

8. To connect the DUT, click Tests > Connect.

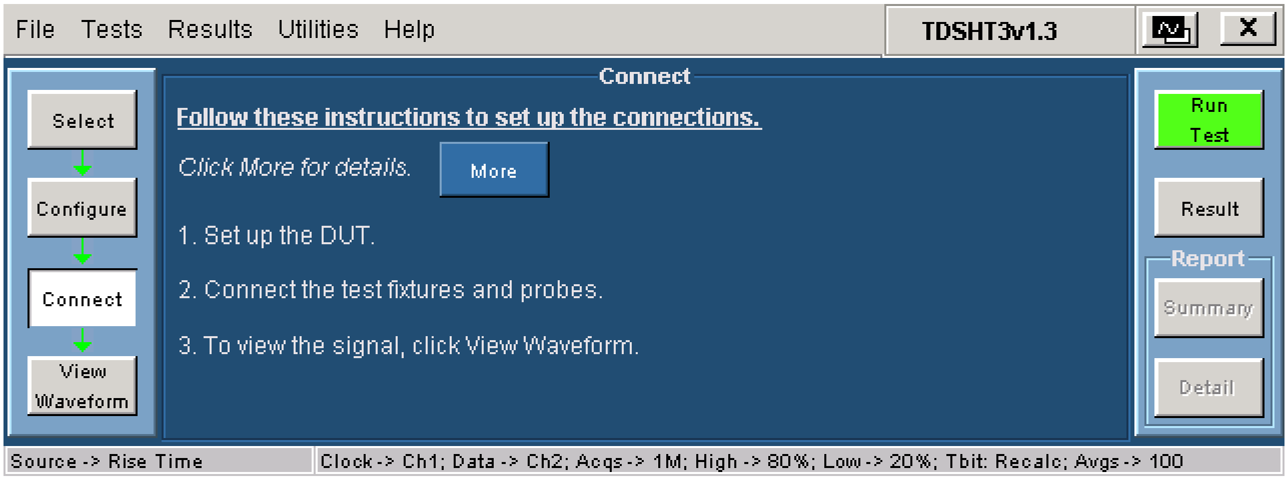


Figure 140: Connect pane for Rise Time

9. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections.

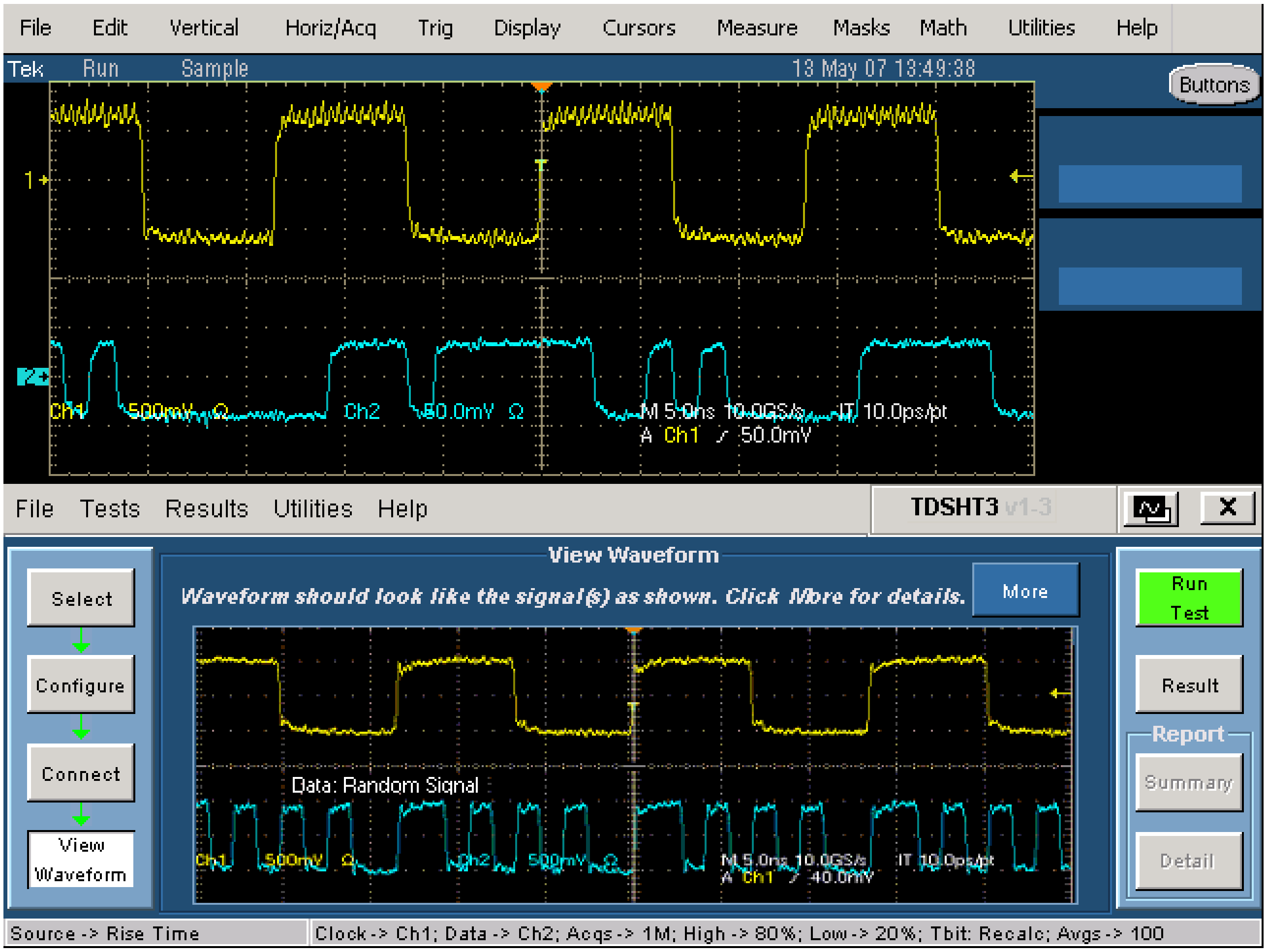


Figure 141: Waveform of Rise Time

10. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

11. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

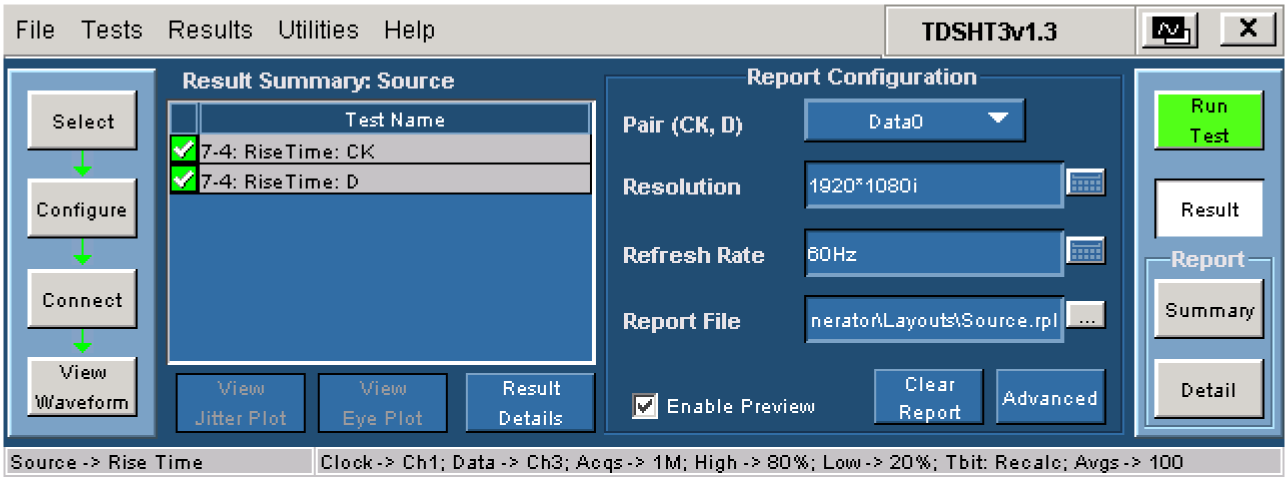


Figure 142: Result for Rise Time

Table 42: Result options for Rise Time

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

12. You can set the report details to identify and generate the report automatically. You can set a default report file.

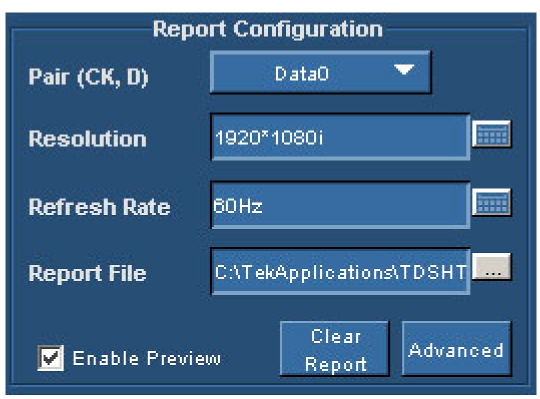


Figure 143: Report Configuration for Rise Time

In the report configuration pane, you can configure the following parameters:

Table 43: Report Configuration options for Rise Time

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

13. In the result summary pane, click Result Details to display the details of the result.

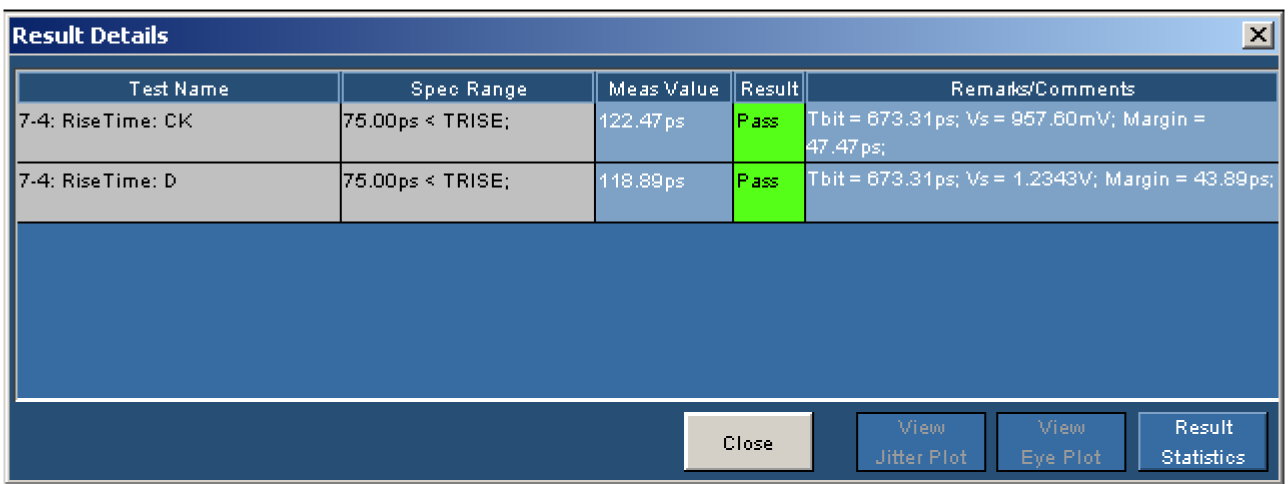


Figure 144: Result Details for Rise Time

Table 44: Result Details for Rise Time

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Spec Range	The Spec Range box displays the lower limit and upper limit of the rise time test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.
Result Statistics	Click Result Statistics to display statistics based on the tests.

14. In the Result Details dialog box, click Result Statistics to display statistics based on the tests.

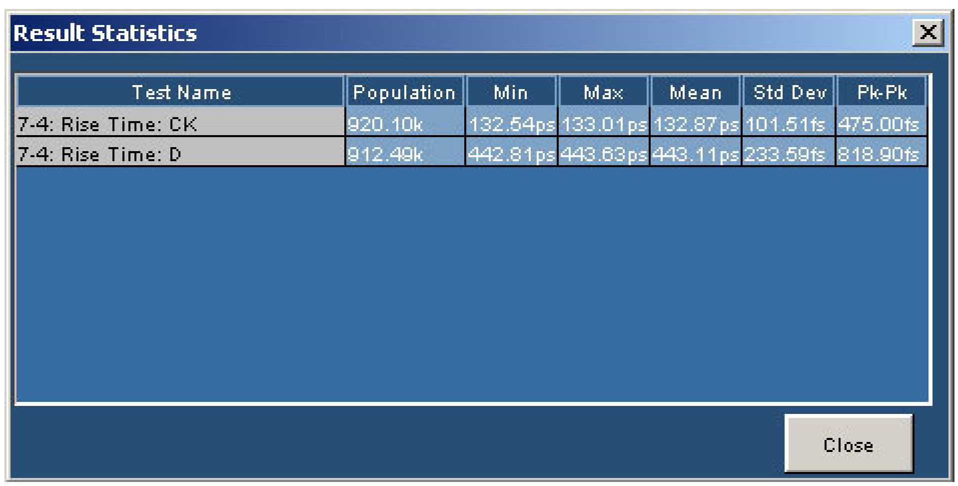


Figure 145: Result Statistics for Rise Time

The software calculates statistics for each selected test, and logs the statistics on a cycle-by-cycle basis in a large waveform. The standard statistics are for the Maximum, Minimum, Mean, Standard Deviation, and Population.

Table 45: Result Statistics for Rise Time test

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal names - CK (Clock), D (Data).
Population	The software calculates this statistic by using the following equation: Population (X) = N
Min	The software calculates this statistic by using the following equation: Min (X) = Lowest value of X
Max	The software calculates this statistic by using the following equation: Max (X) = Highest value of X
Mean	The software calculates this statistic by using the following equation: $Mean\ (X) = \overline{X} = \frac{1}{N} \sum_{n=1}^{N} X_n$
Std Dev	The software calculates this statistic by using the following equation: $Standard\ Deviation\ (X) = \sigma_x = \sqrt{\frac{1}{(N-1)} \sum_{n=1}^{N} (X_n - \overline{X})^2}$
Pk-Pk	The software calculates this statistic by using the following equation: Xppn = Max(X) - Min(X)
Close	Click Close to quit the Result Statistics dialog box.

Source – Fall Time

This test allows you to confirm that the fall times on the TMDS differential signals fall within the limits of the specification.

You will need one supported oscilloscope, one differential probe, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-DI fixture.

1. On the menu bar, click Tests > Select > Source.
2. In the clock-data tests pane, select the Fall Time check box.

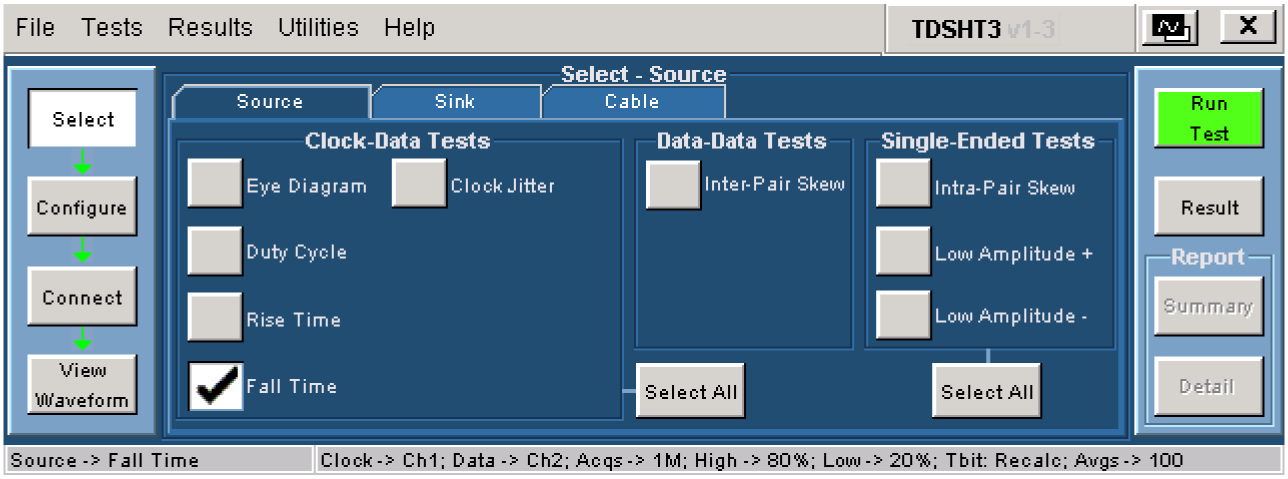


Figure 146: Select Source with Fall Time test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

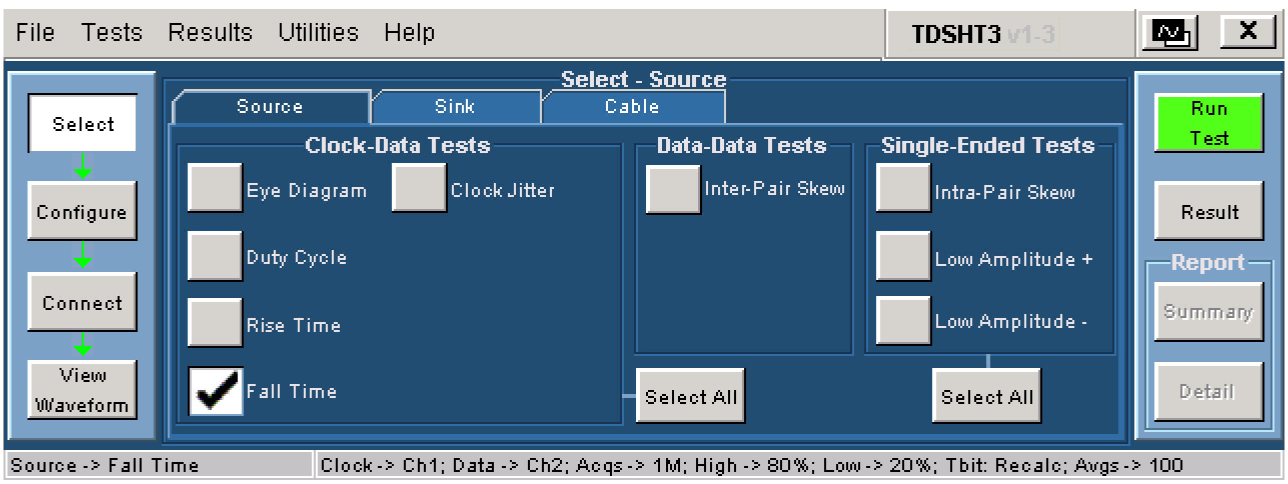


Figure 147: Configure Source for Fall Time

4. In the input pane, you have the following options:

Table 46: Input options for Fall Time

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, Ch4, and Not Conn.
Data	Data indicates the oscilloscope channel to which you will connect the data input. The available choices are Ch1, Ch2, Ch3, Ch4, and Not Conn.

5. In the horiz/acq pane, you have the following option:

Table 47: Horiz/Acq options for Fall Time

Configure Parameter	Description
# of Acqs	In the # of Acqs box, enter the desired number of acquisitions that are required for the test. The default value is 10 K.

6. In the tbit pane, you have the following options:

Table 48: Tbit options for Fall Time

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

7. In the reference levels pane, you have the following options:

Table 49: Reference Levels options for Fall Time

Configure Parameter	Description
Units	The Units list allows you to set the reference level units to either Per (%) or Abs. Per (%) indicates that the reference levels are a percentage of the Vswing value. Abs indicates that the reference levels are absolute voltage values.
Hysteresis	In the Hysteresis box, enter the desired hysteresis percent value. The default value is 10 percent.
High	In the High box, enter the desired high reference voltage value. The default value is 80 percent.
Mid	In the Mid box, enter the desired mid reference voltage value. The default value is 50 percent.
Low	In the Low box, enter the desired low reference voltage value. The default value is 20 percent.

8. To connect the DUT, click Tests > Connect.

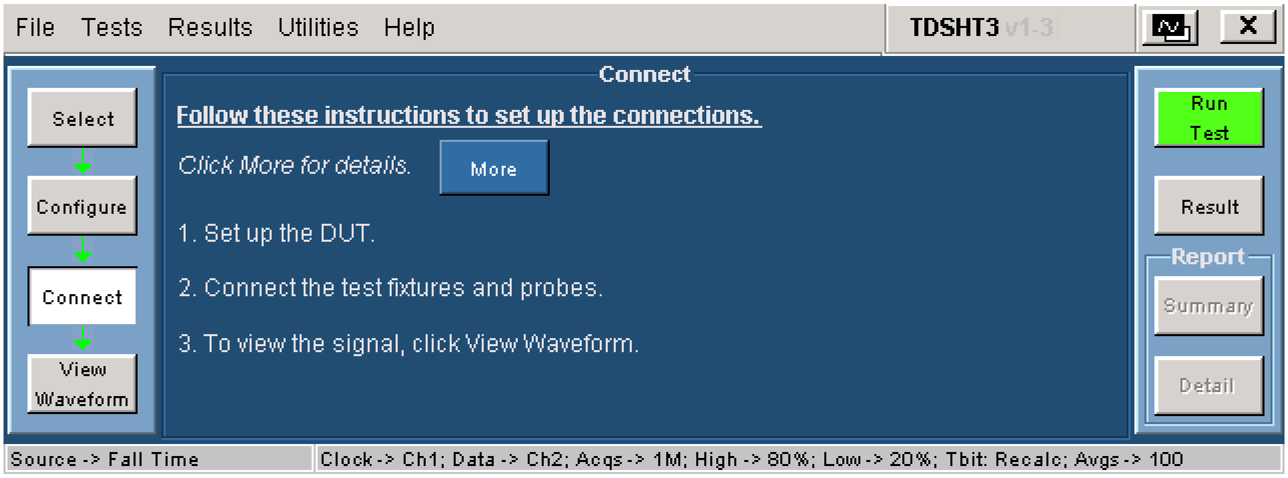


Figure 148: Connect pane for Fall Time

9. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections.

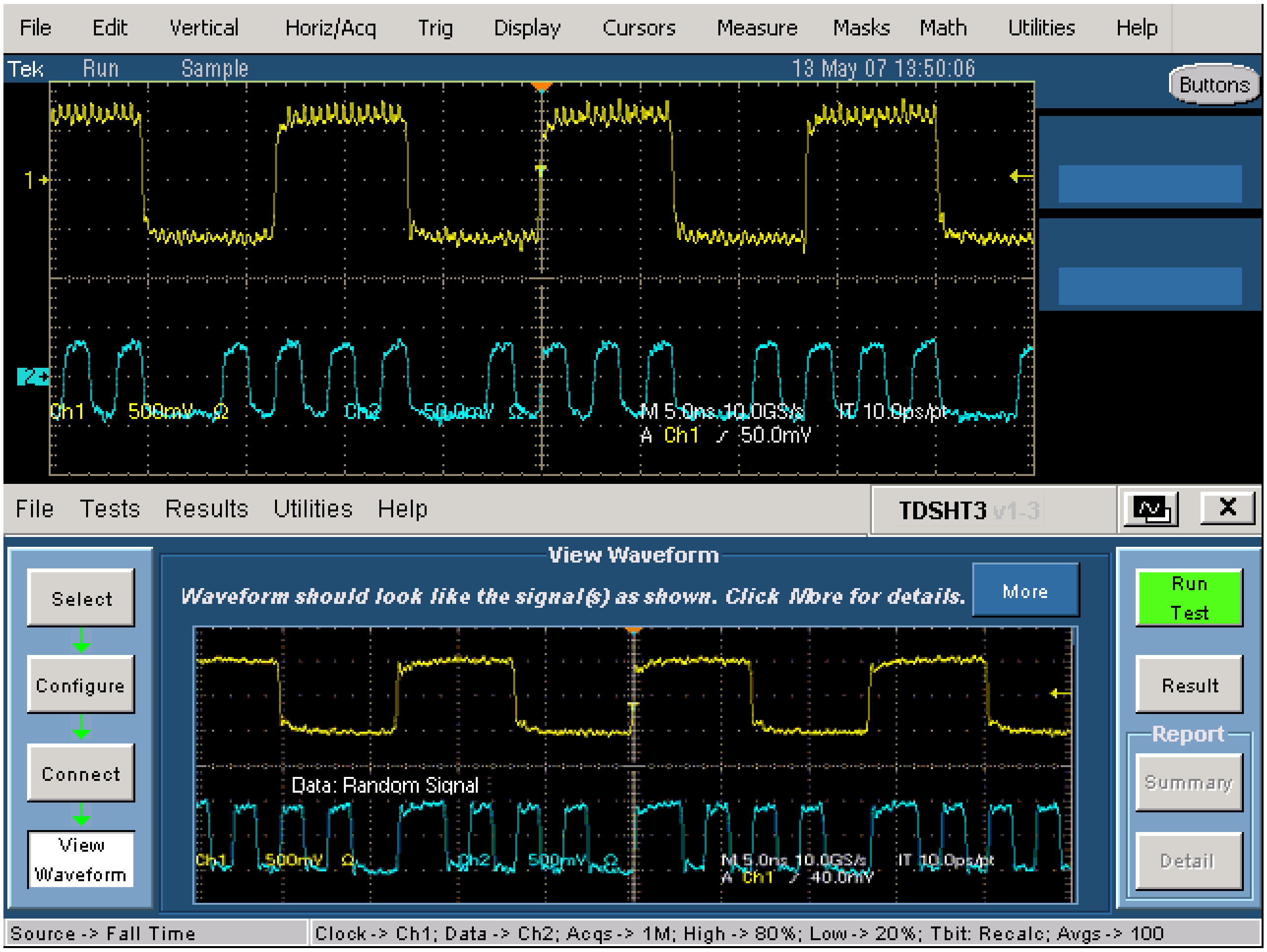


Figure 149: Waveform of Fall Time

10. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

11. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

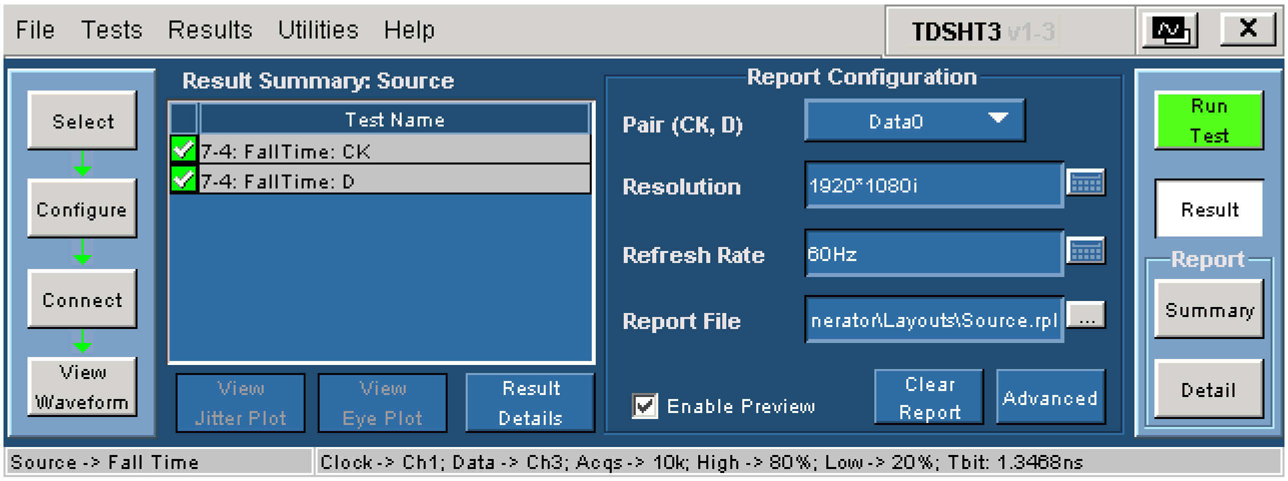


Figure 150: Result for Fall Time

Table 50: Results for Fall Time test

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

12. You can set the report details to identify and generate the report automatically. You can set a default report file.

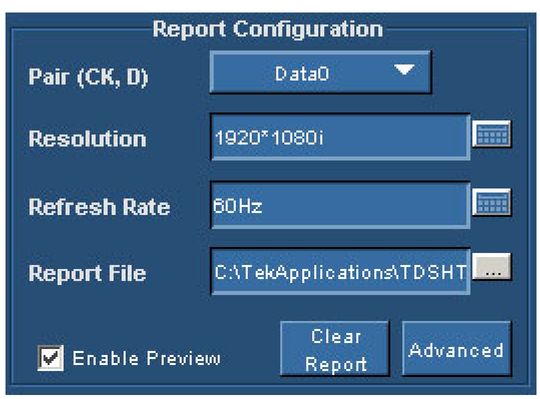


Figure 151: Report Configuration for Fall Time

In the report configuration pane, you can configure the following parameters:

Table 51: Report Configuration options for Fall Time

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

13. In the result summary pane, click Result Details to display the details of the result.

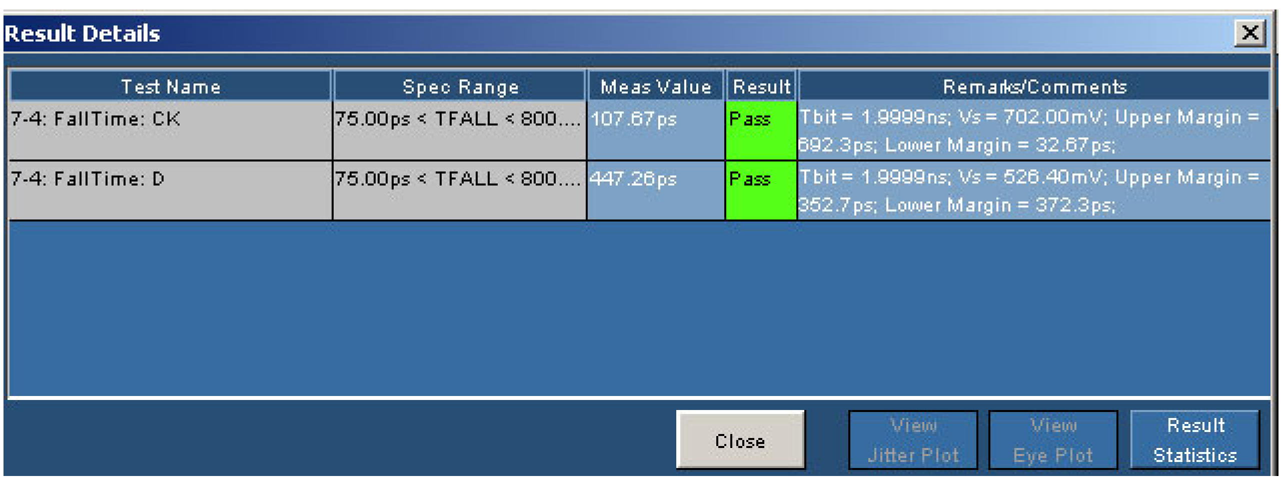


Figure 152: Result Details for Fall Time

Table 52: Result Details for Fall Time

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Spec Range	The Spec Range box displays the lower limit and upper limit of the fall time test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.
Result Statistics	Click Result Statistics to display statistics based on the tests.

14. In the Result Details dialog box, click Result Statistics to display statistics based on the tests.

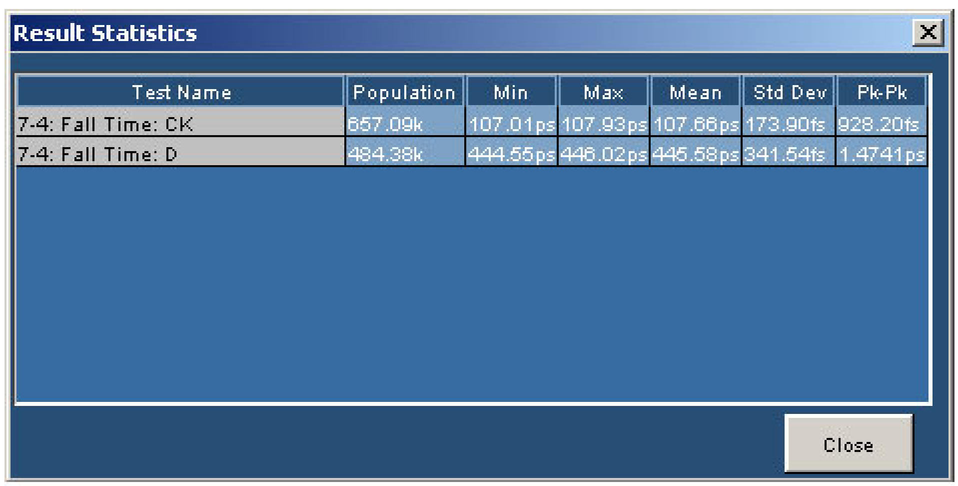


Figure 153: Result Statistics for Fall Time

The software calculates statistics for each selected test, and logs the statistics on a cycle-by-cycle basis in a large waveform. The standard statistics are for the Maximum, Minimum, Mean, Standard Deviation, and Population.

Table 53: Result Statistics for Fall Time

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal names - CK (Clock), D (Data).
Population	The software calculates this statistic by using the following equation: Population (X) = N
Min	The software calculates this statistic by using the following equation: Min (X) = Lowest value of X
Max	The software calculates this statistic by using the following equation: Max (X) = Highest value of X
Mean	The software calculates this statistic by using the following equation: $Mean\ (X) = \overline{X} = \frac{1}{N} \sum_{n=1}^{N} X_n$
Std Dev	The software calculates this statistic by using the following equation: $Standard\ Deviation\ (X) = \sigma_x = \sqrt{\frac{1}{(N-1)} \sum_{n=1}^{N} (X_n - \overline{X})^2}$

Table 53: Result Statistics for Fall Time (Contd.)

Option	Description
Pk-Pk	The software calculates this statistic by using the following equation: Xppn = Max(X) - Min(X)
Close	Click Close to quit the Result Statistics dialog box.

Source – Clock Jitter

This test allows you to confirm that the TMDS clock does not carry excessive jitter.

You will need one supported oscilloscope, one differential probe, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-DI fixture.

1. On the menu bar, click Tests > Select > Source.
2. In the clock-data tests pane, select the Clock Jitter check box.

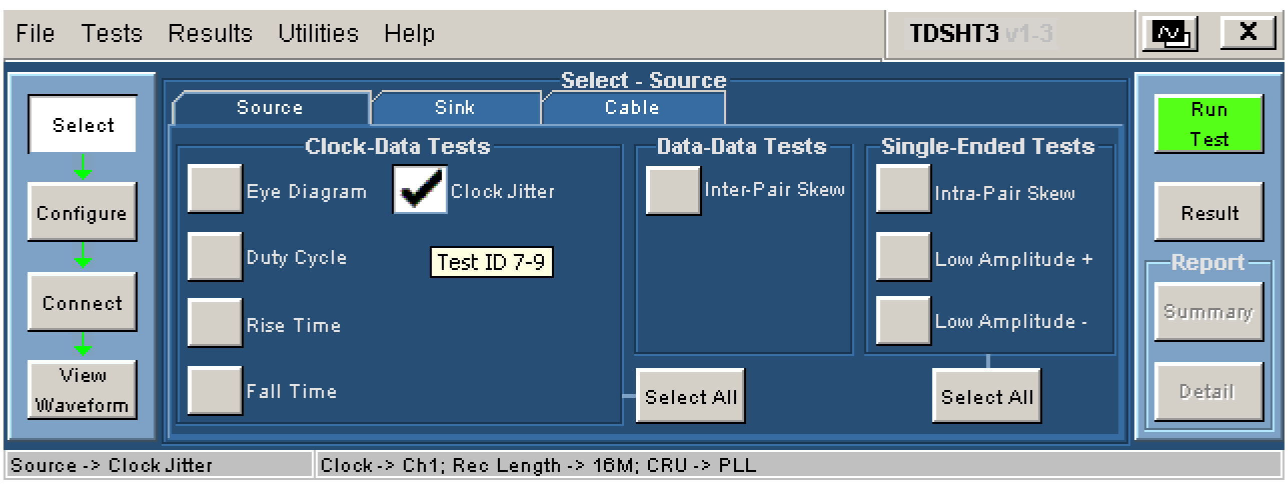


Figure 154: Select Source with Clock Jitter test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

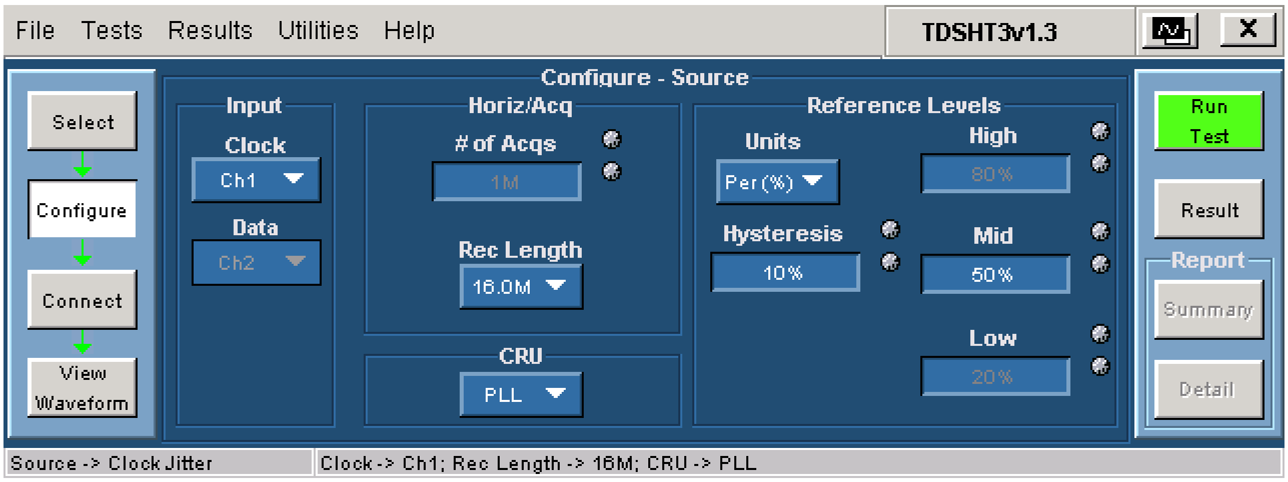


Figure 155: Configure Source for Clock Jitter

4. In the input pane, you have the following option:

Table 54: Input options for Clock Jitter

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, Ch4, Ref1, Ref2, Ref3, and Ref4.

5. In the horiz/acq pane, you have the following option:

Table 55: Horiz/options for Clock Jitter

Configure Parameter	Description
Record Length	In the Rec Length box, enter the desired record length value for the clock jitter tests.

6. In the CRU pane, you have the following option:

Table 56: CRU options for Clock Jitter

Configure Parameter	Description
CRU	The CRU list allows you to configure the CRU. The available choices are PLL, Raw, and Ideal. The default value is first order PLL and is used for compliance testing. Raw and Ideal are used for analysis.

7. In the reference levels pane, you have the following options:

Table 57: Reference Levels options for Clock Jitter

Configure Parameter	Description
Units	The Units list allows you to set the reference level units to either Per (%) or Abs. Per (%) indicates that the reference levels are a percentage of the Vswing value. Abs indicates that the reference levels are absolute voltage values.
Hysteresis	In the Hysteresis box, enter the desired hysteresis percent value. The default value is 10 percent. The hysteresis range is between 2 percent and 10 percent.
Mid	In the Mid box, enter the desired mid reference voltage value. The default value is 50 percent.

8. To connect the DUT, click Tests > Connect.

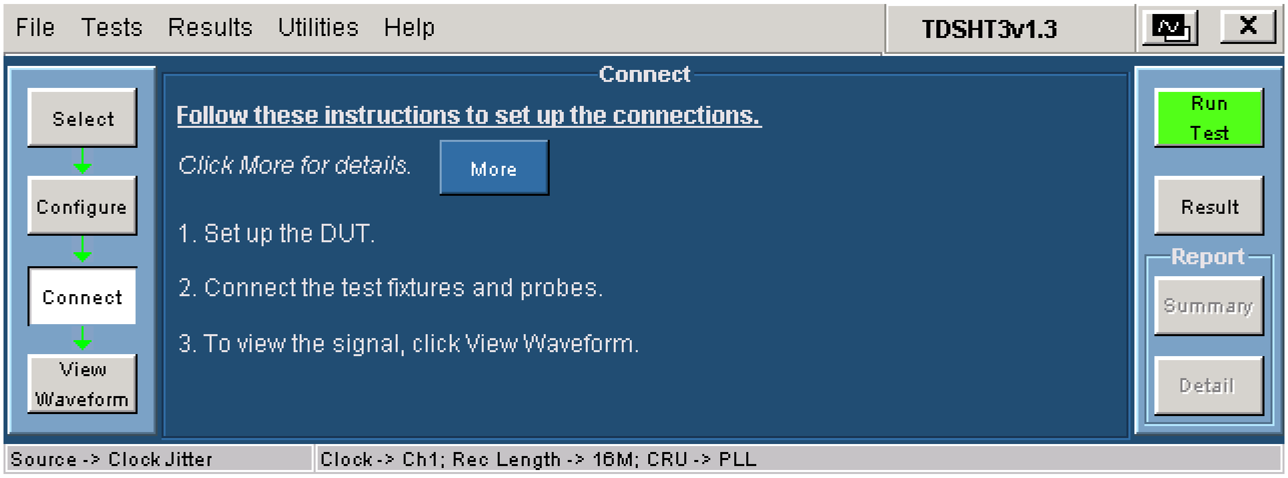


Figure 156: Connect pane for Clock Jitter

9. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections.

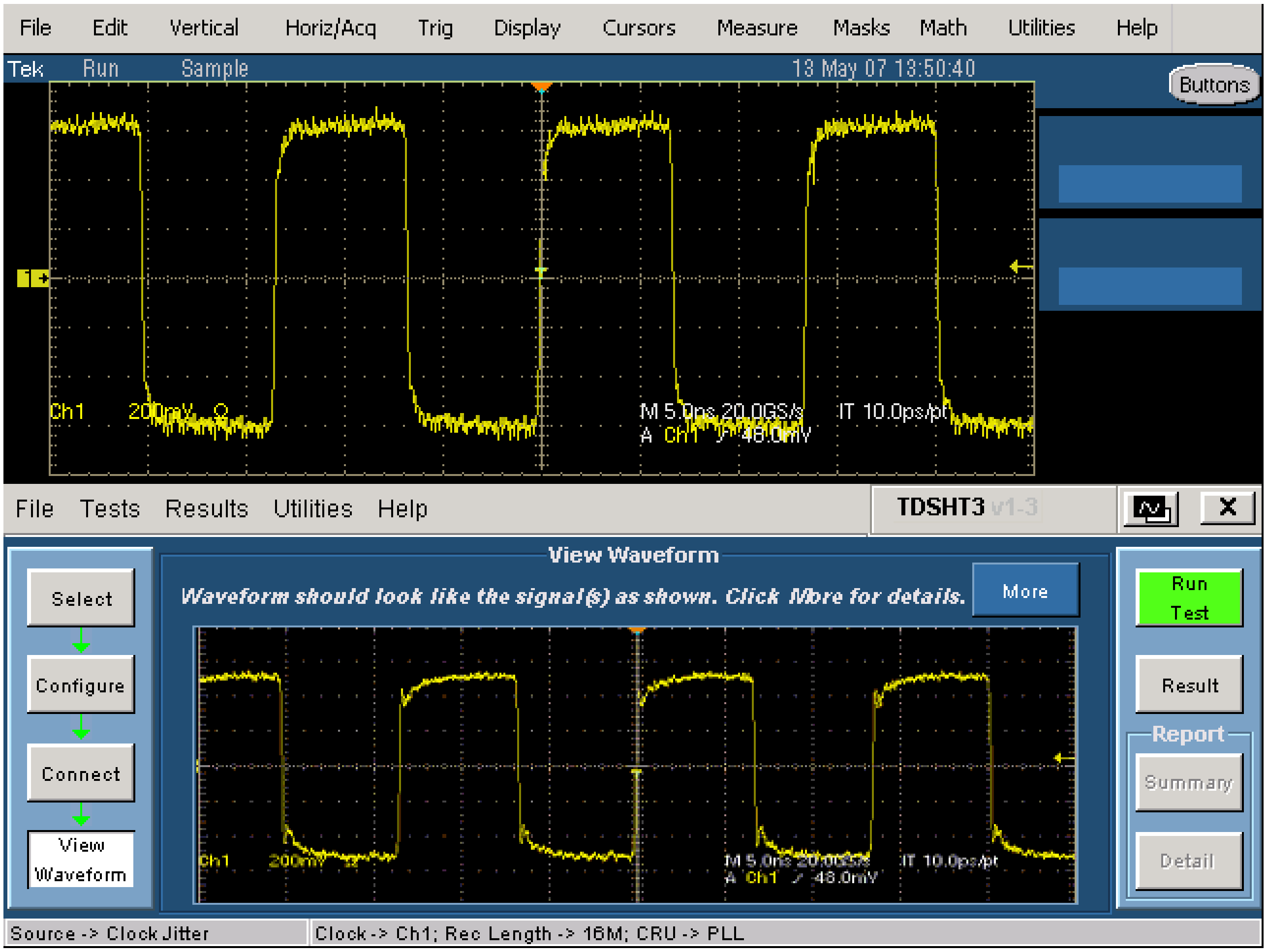


Figure 157: Waveform of Clock Jitter

10. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

11. If you have run the clock jitter test successfully, the software makes Result available automatically and displays the clock jitter plot.

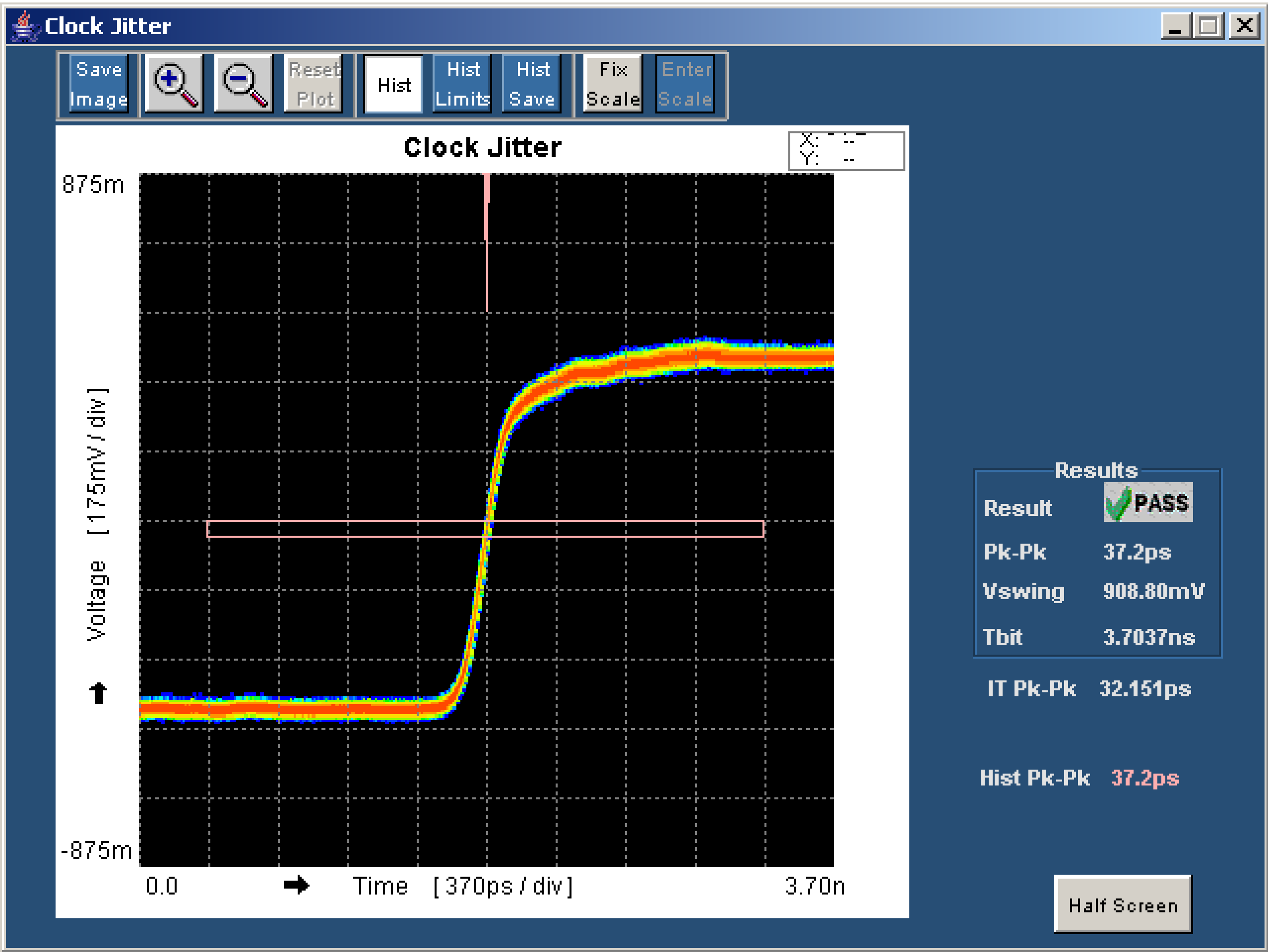


Figure 158: Clock Jitter plot

12. Click Half Screen to view the clock jitter plot in half screen. You can also view both the result summary of the test and the report configuration in the result pane as shown in the following diagram.

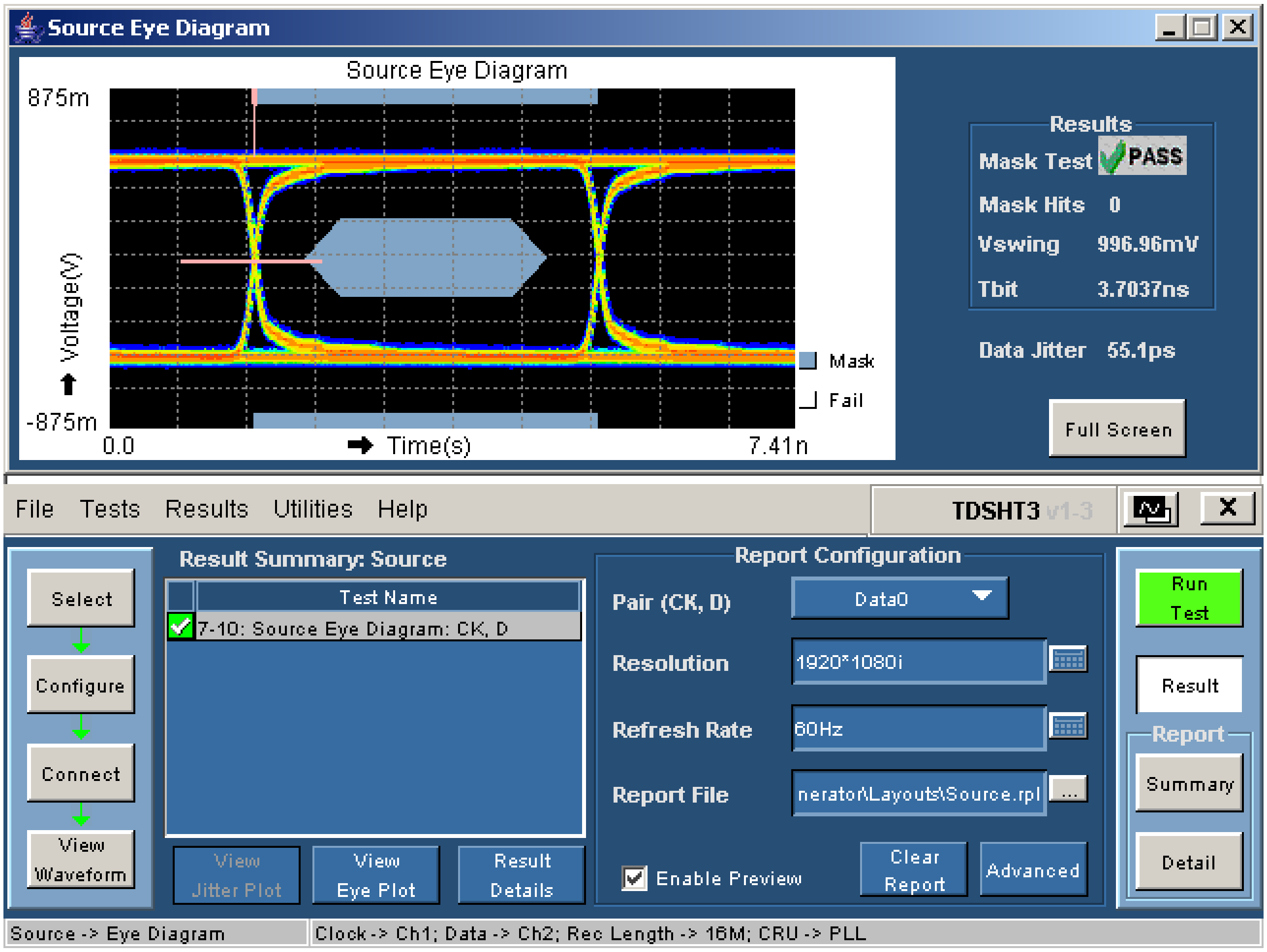


Figure 159: Source Clock Jitter plot and Result

13. In the result summary pane, click Result Details to display the details of the result.

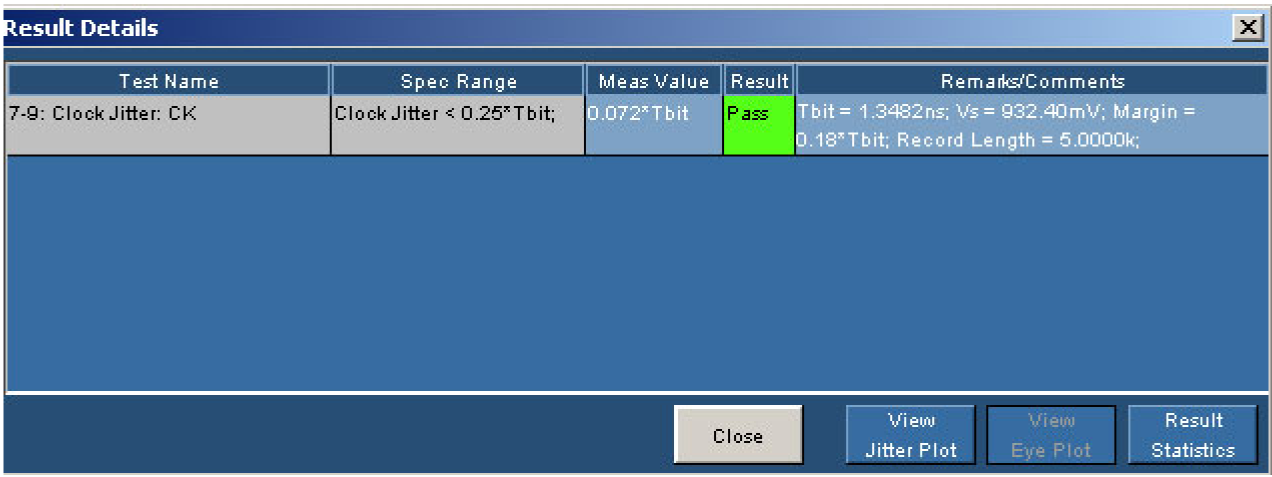


Figure 160: Result Details for Clock Jitter

14. In the Result Details dialog box, click Result Statistics to display statistics based on the tests.

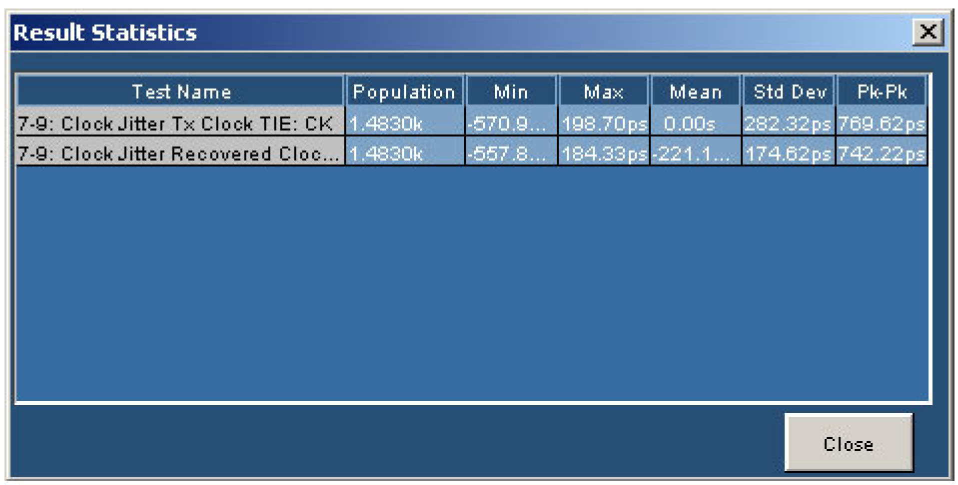


Figure 161: Result Statistics for Clock Jitter

Source – Clock-Data Tests Select All

This option enables you to run the eye diagram, duty cycle, rise time, fall time, and clock jitter.

You will need one supported oscilloscope, two differential probes, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-DI fixture.

1. On the menu bar, click Tests > Select > Source.

2. In the clock-data tests pane, click Select All.

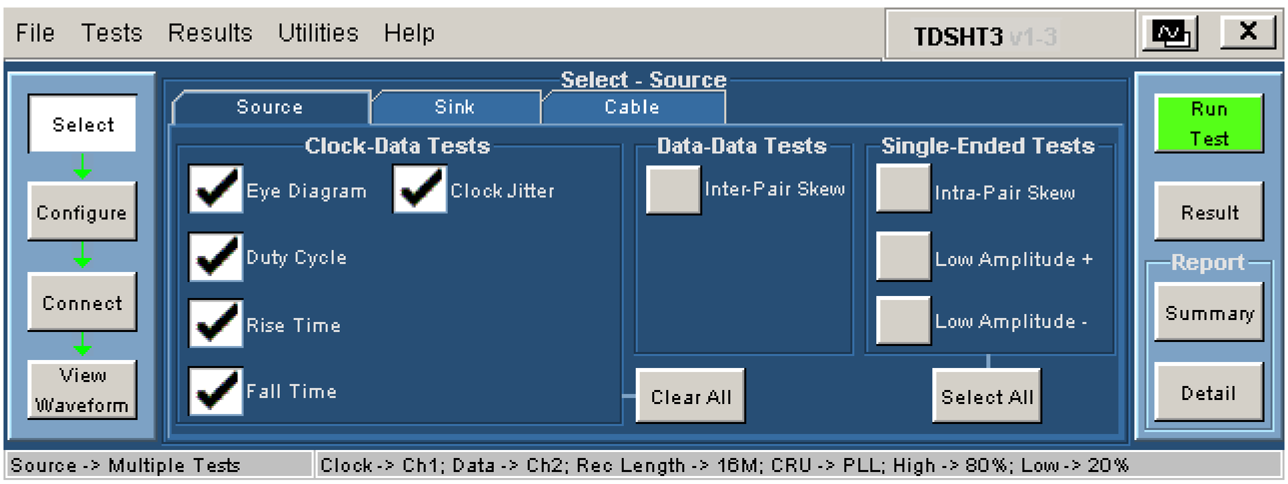


Figure 162: Select Source with Multiple tests selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

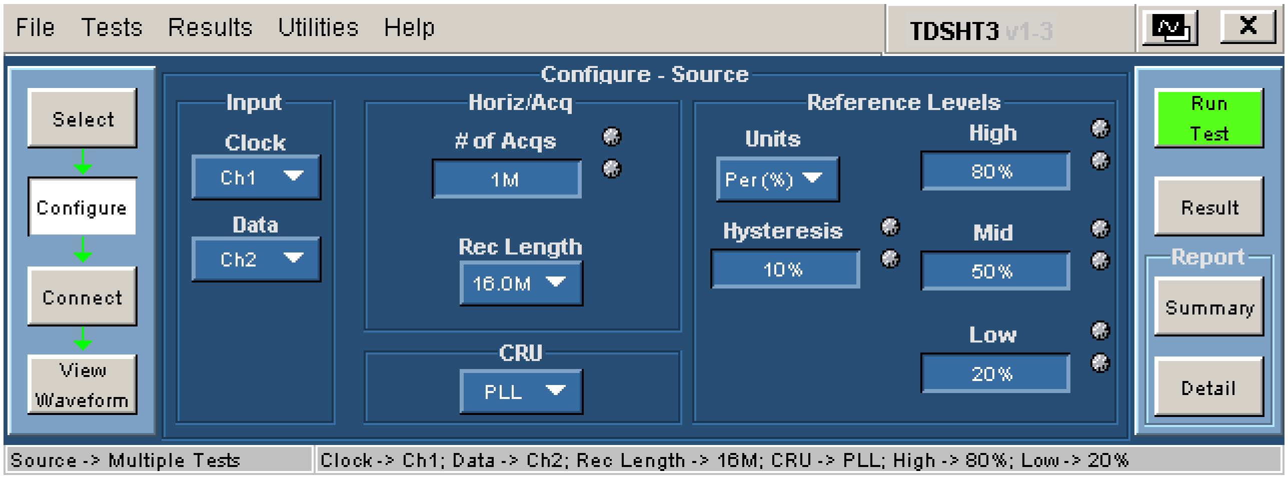


Figure 163: Configure Source for Source Multiple Tests selected

4. In the input pane, you have the following options:

Table 58: Input options for Source Multiple Tests

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Data	Data indicates the oscilloscope channel to which you will connect the data input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. In the horiz/acq pane, you have the following options:

Table 59: Horiz/acq options for Source Multiple Tests

Configure Parameter	Description
# of Acqs	The # of Acqs box displays the number of acquisitions that are required for the test. The default value is 10k.
Record Length	In the Rec Length box, enter the desired record length value for all the selected tests.

6. In the CRU pane, you have the following option:

Table 60: CRU options for Source Multiple Tests

Configure Parameter	Description
CRU	The CRU list allows you to configure the CRU. The available choices are PLL, Raw, and Ideal. The default value is first order PLL and is used for compliance testing. Raw and Ideal are used for analysis.
Define	The Define is available only when PLL is selected.

7. In the reference levels pane, you have the following options:

Table 61: Reference Levels options for Source Multiple Tests

Configure Parameter	Description
Units	The Units list allows you to set the reference level units to either Per (%) or Abs. Per (%) indicates that the reference levels are a percentage of the Vswing value. Abs indicates that the reference levels are absolute voltage values.
Hysteresis	In the Hysteresis box, enter the desired hysteresis percent value. The default value is 10 percent. The hysteresis range is between 2 percent and 10 percent.
High	The High box displays the high reference voltage value. The default value is 80 percent.
Mid	In the Mid box, enter the desired mid reference voltage value. The default value is 50 percent.
Low	The Low box displays the low reference voltage value. The default value is 20 percent.

8. To connect the DUT, click Tests > Connect.

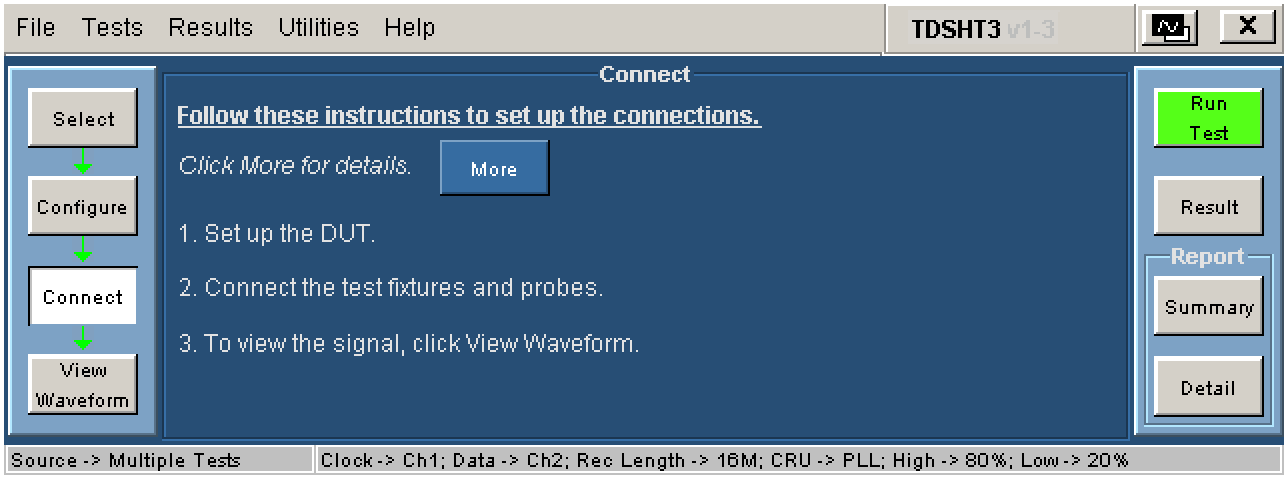


Figure 164: Connect pane for Source Multiple Tests selected

9. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections.

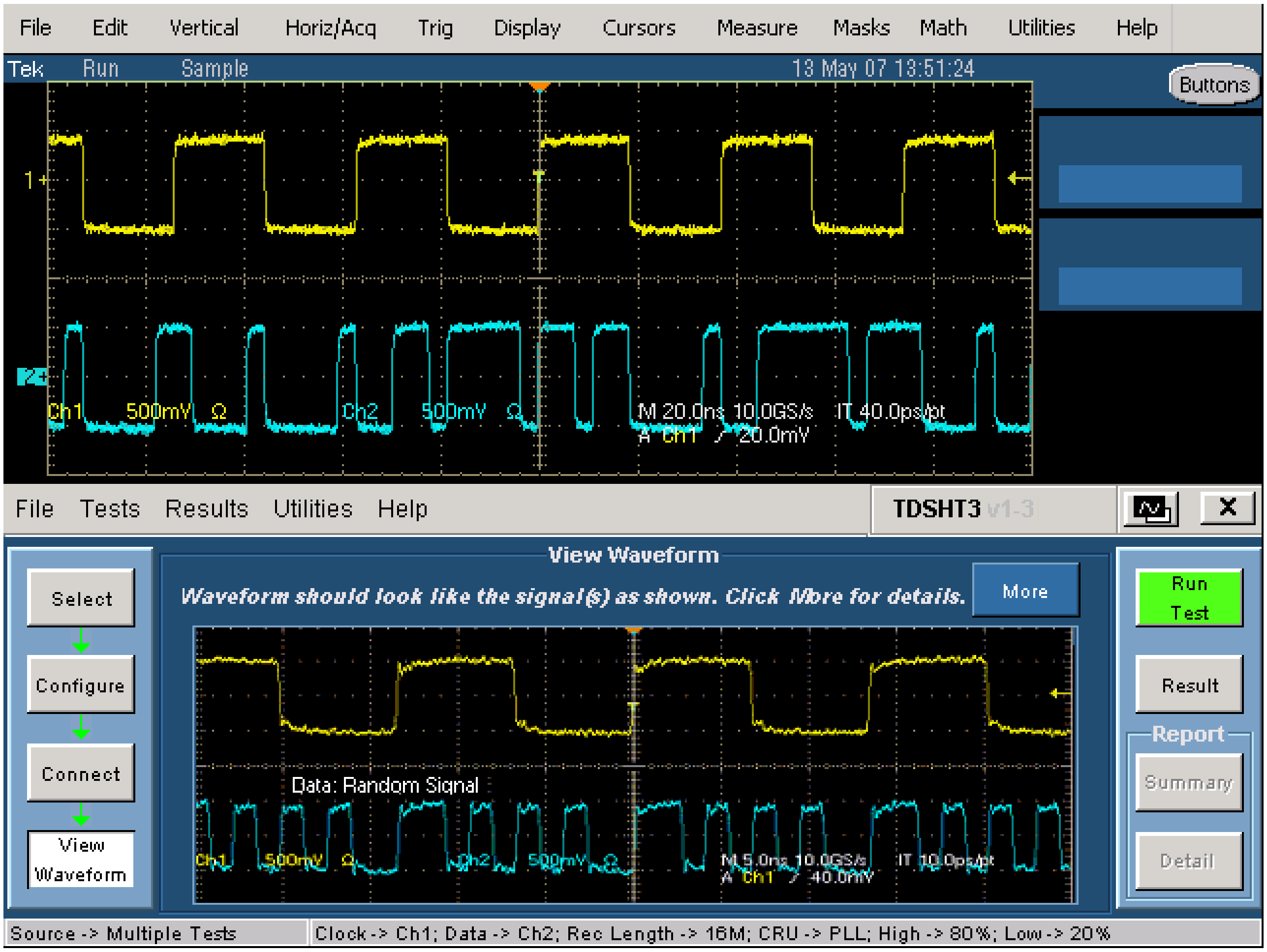


Figure 165: Waveform of Source Multiple Tests selected

10. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

11. If you have run the tests successfully, the software makes Result available automatically and displays the eye diagram plot and the clock jitter plot. You can also view both the result summary of the test and the report configuration in the result pane as shown in the following diagram:

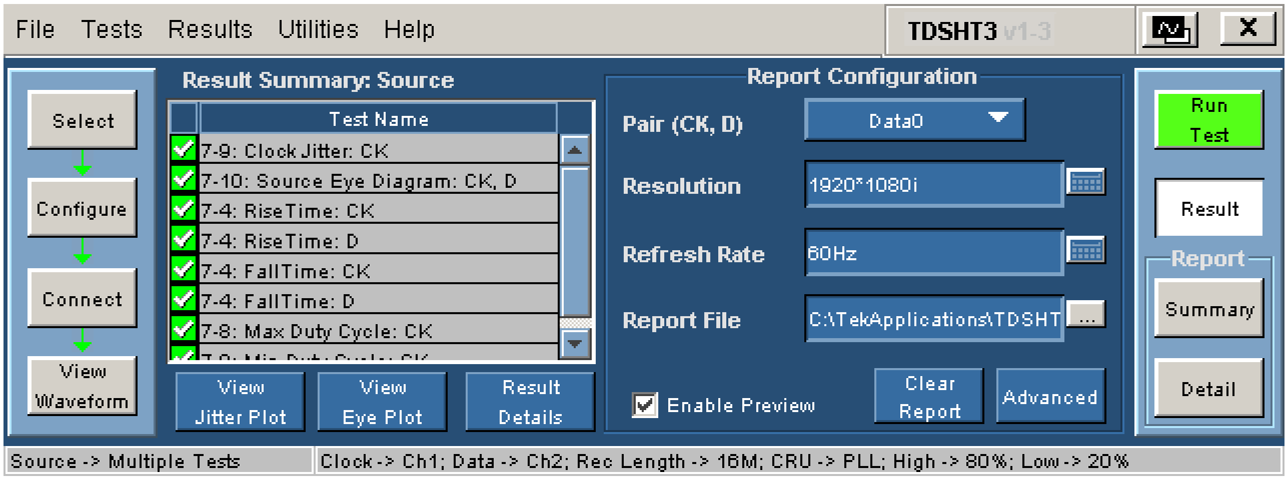


Figure 166: Result for Source Multiple Tests selected

Table 62: Result for Source Multiple Tests selected

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal names - CK (Clock), D (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
View Jitter Plot	Click View Jitter Plot to view the jitter plot for the clock jitter test.
View Eye Plot	Click View Eye Plot to view the eye plot for the eye diagram test.
Result Details	Click Result Details to display the details of the result.

Report Configuration pane

You can set the report details to identify and generate the report automatically. You can set a default report file.

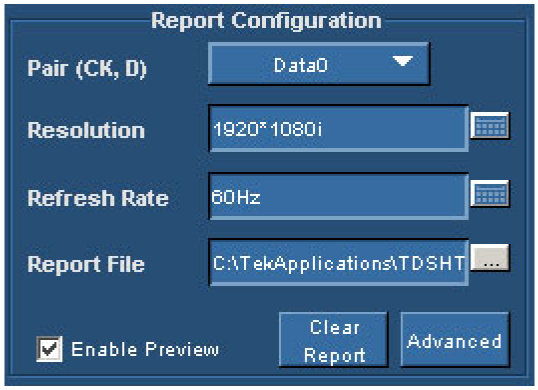


Figure 167: Report Configuration pane for Source Multiple Tests

In the report configuration pane, you can configure the following parameters:

Table 63: Report Configuration options for Source Multiple Tests

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

12. In the result summary pane, click Result Details to display the details of the result.

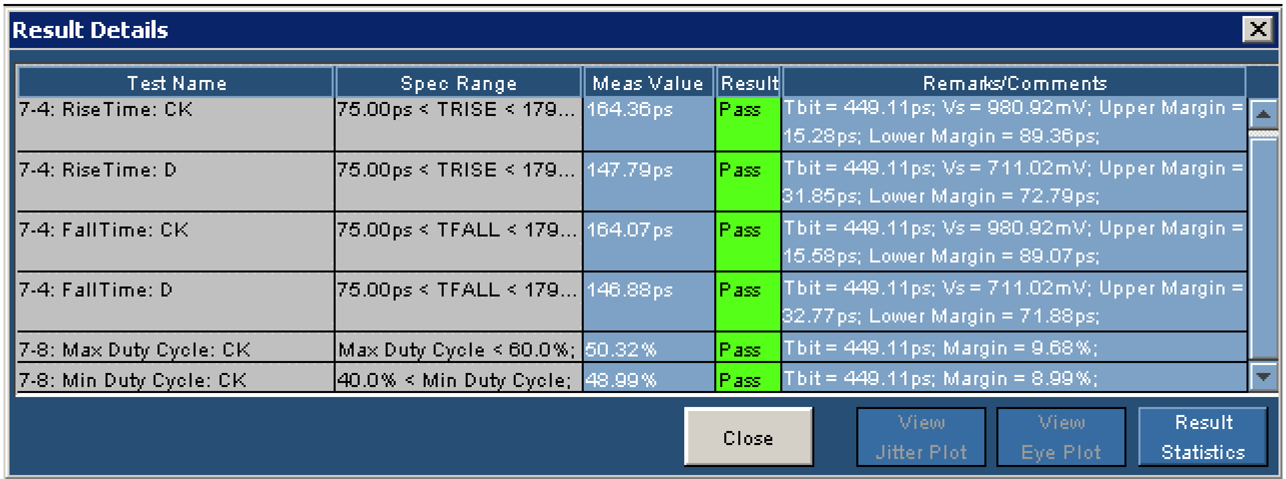


Figure 168: Result Details for Source Multiple Tests

Table 64: Result Details for Source Multiple Tests

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.
View Jitter Plot	Click View Jitter Plot to display the jitter plot for the clock jitter test.
View Eye Plot	Click View Eye Plot to display the eye plot for the eye diagram test.
Result Statistics	Click Result Statistics to display statistics based on the tests.

13. In the Result Details dialog box, click Result Statistics to display statistics based on the tests.

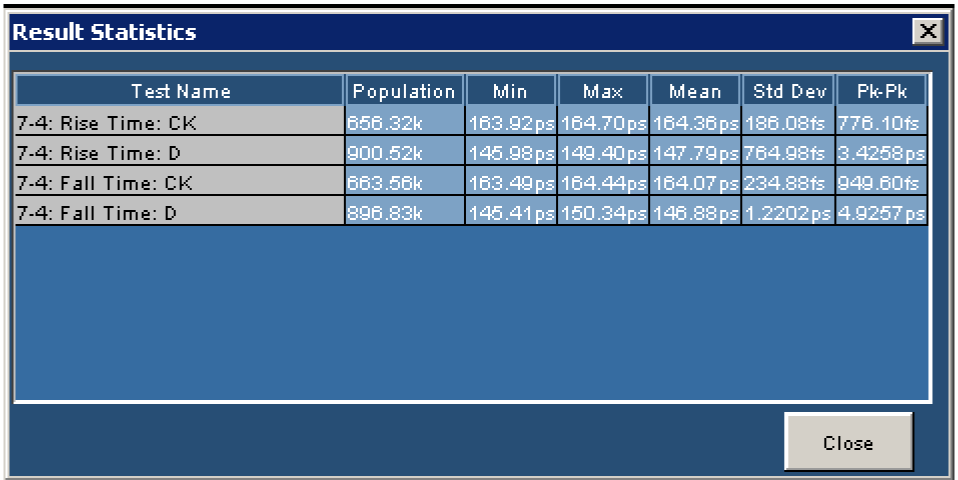


Figure 169: Result Statistics for Source Multiple Tests

The software calculates statistics for each selected test, and logs the statistics on a cycle-by-cycle basis in a large waveform. The standard statistics are for the Maximum, Minimum, Mean, Standard Deviation, and Population.

Table 65: Result Details for Source Multiple Tests

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal names - CK (Clock), D (Data).
Population	The software calculates this statistic by using the following equation: Population (X) = N
Min	The software calculates this statistic by using the following equation: Min (X) = Lowest value of X
Max	The software calculates this statistic by using the following equation: Max (X) = Highest value of X
Mean	The software calculates this statistic by using the following equation: $Mean\ (X) = \overline{X} = \frac{1}{N}\sum_{n=1}^{N} X_n$
Std Dev	The software calculates this statistic by using the following equation: $Standard\ Deviation\ (X) = \sigma_x = \sqrt{\frac{1}{(N-1)}\sum_{n=1}^{N}(X_n - \overline{X})^2}$

Table 65: Result Details for Source Multiple Tests (Contd.)

Option	Description
Pk-Pk	The software calculates this statistic by using the following equation: Xppn = Max(X) - Min(X)
Close	Click Close to quit the Result Statistics dialog box.

***Note**: Perform similar steps as mentioned in this procedure to test Single-Ended Select All.*

Source – Inter-Pair Skew for Data-Data Tests

This test allows you to confirm that any skew between the differential pairs in the TMDS portion of the HDMI link does not exceed the limits in the specification.

You will need one supported oscilloscope, two differential probes, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-DI fixture.

***Note**: Deskew is recommended before you conduct any skew test.*

1. On the menu bar, click Tests > Select > Source.
2. In the data-data tests pane, select the Inter-Pair Skew check box.

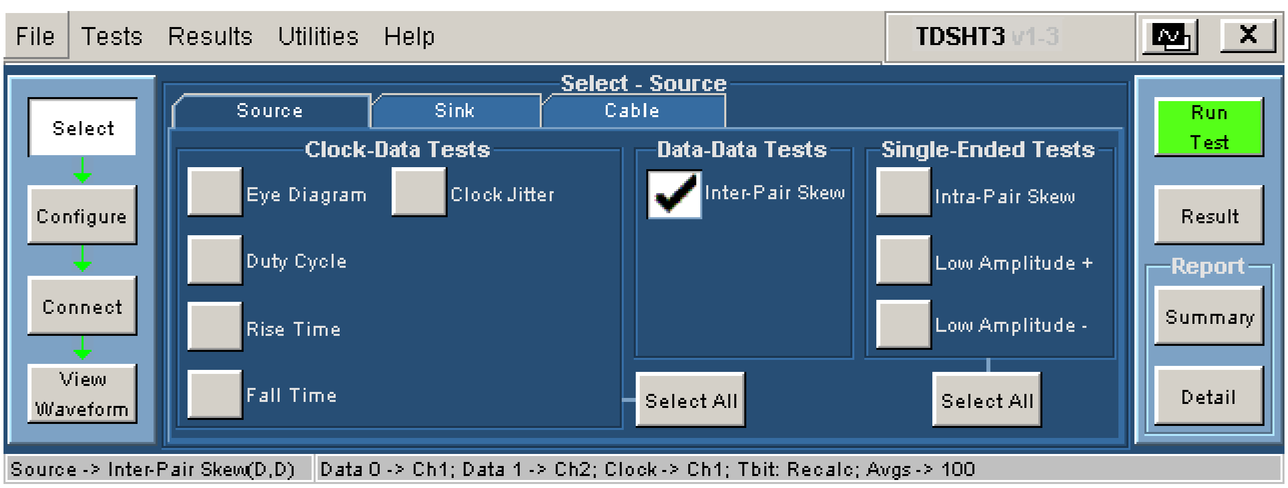


Figure 170: Select Source with Inter-Pair Skew (Data-Data) test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

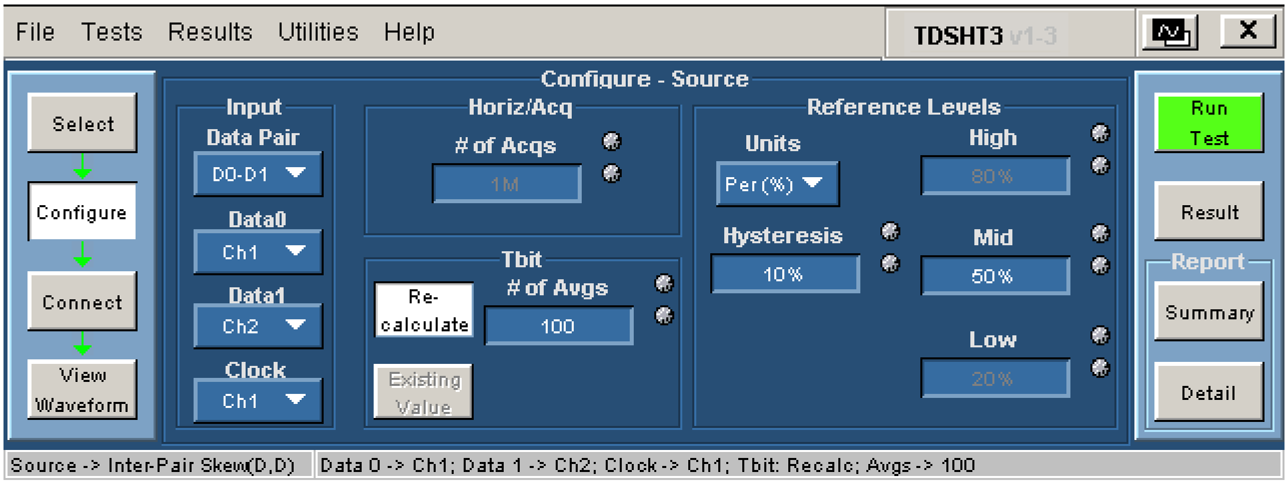


Figure 171: Configure Source for Inter-Pair Skew (Data-Data)

4. In the input pane, you have the following options:

Table 66: Input options for Inter-Pair Skew (Data-Data)

Configure Parameter	Description
Data Pair	Options available in Data Pair selection are: • DO-D1: To calculate inter pair skew between Data 0 and Data 1 input • D0-D2: To calculate inter pair skew between Data 0 and Data 2 input • D1-D2: To calculate inter pair skew between Data 1 and Data 2 input
Data 0	Data 0 indicates the oscilloscope channel to which you will connect the Data 0 input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Data 1	Data 1 indicates the oscilloscope channel to which you will connect the Data 1 input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Data 2	Data 2 indicates the oscilloscope channel to which you will connect the Data 2 input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. In the tbit pane, you have the following options:

Table 67: Tbit options for Inter-Pair Skew (Data-Data)

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

6. In the reference levels pane, you have the following options:

Table 68: Reference Levels options for Inter-Pair Skew (Data-Data)

Configure Parameter	Description
Units	The Units list allows you to set the reference level units to either Per (%) or Abs. Per (%) indicates that the reference levels are a percentage of the Vswing value. Abs indicates that the reference levels are absolute voltage values.
Hysteresis	In the Hysteresis box, enter the desired hysteresis percent value. The default value is 10 percent.
Mid	In the Mid box, enter the desired mid reference voltage value. The default value is 50 percent.

7. To connect the DUT, click Tests > Connect.

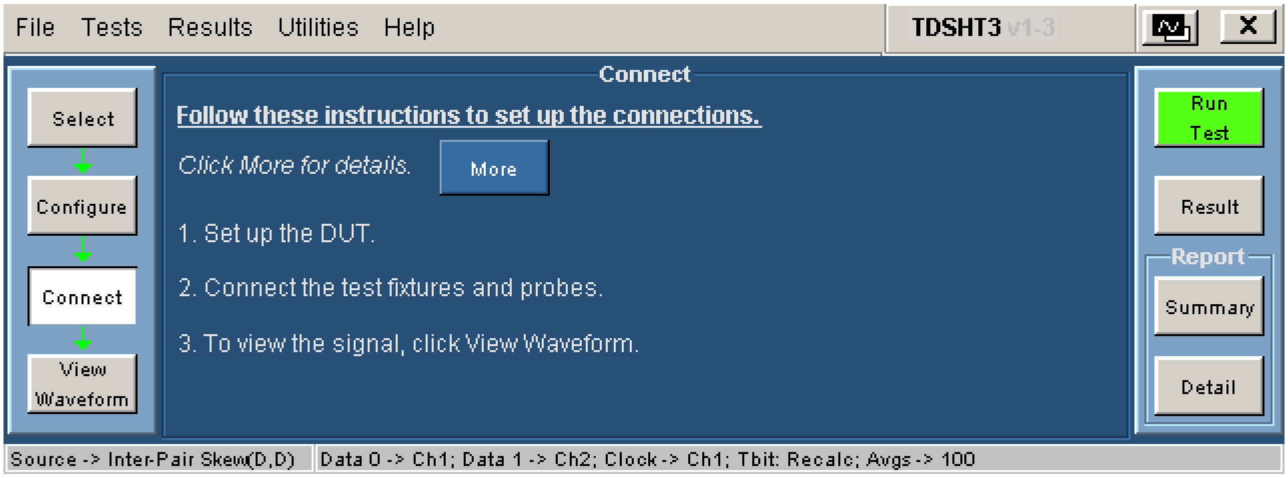


Figure 172: Connect pane for Inter-Pair Skew (Data-Data)

8. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections. The waveform shown here is for the re-calculate Tbit option. Click Run Test to run the test. The Confirm dialog box appears. Click Continue to continue to run the test. Go to step 10.

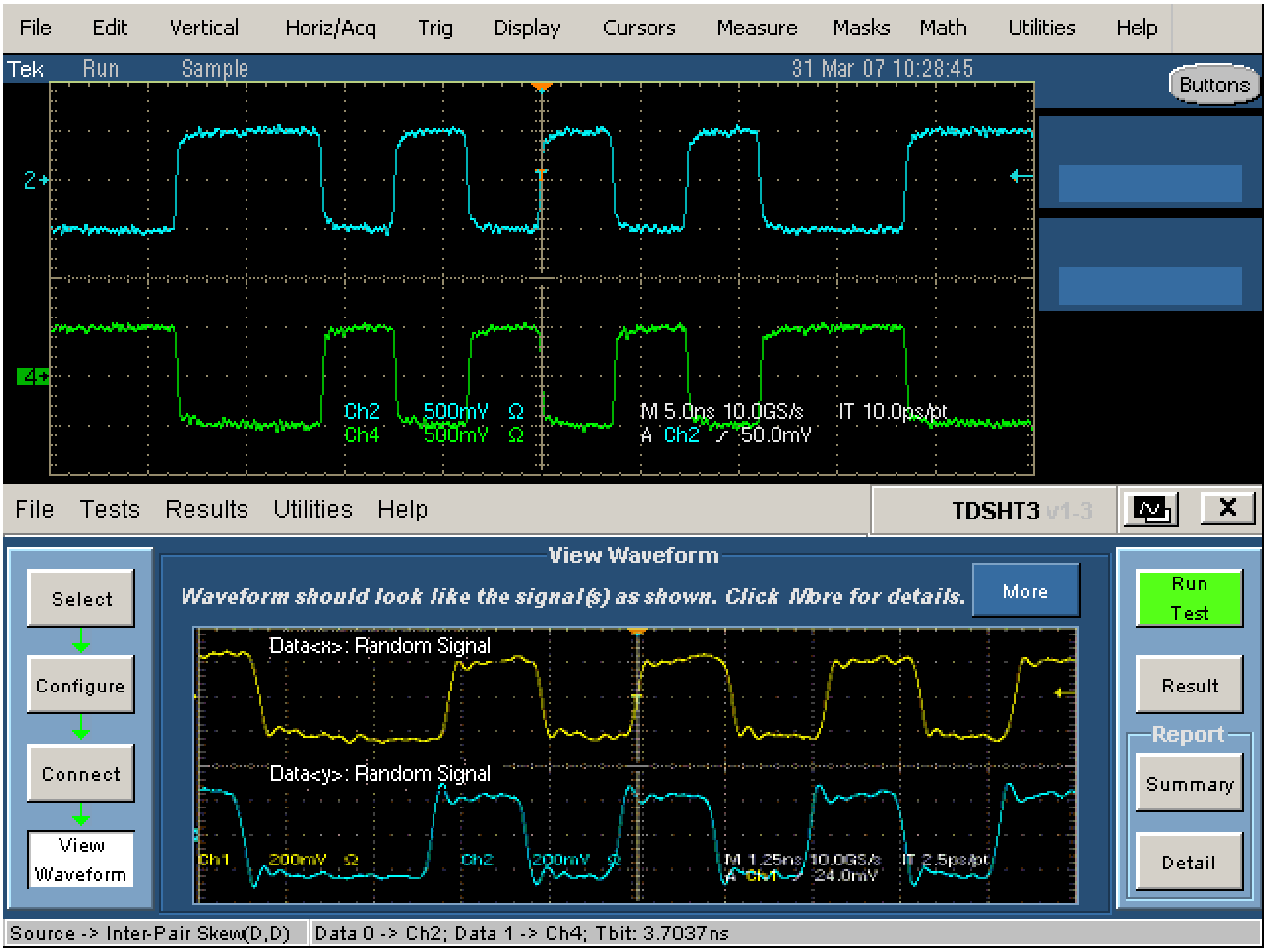


Figure 173: Waveform of Inter-Pair Skew (Data-Data)

9. If you have selected existing Tbit value, then click View Waveform to get a different waveform on your display. Ensure that your signal in the oscilloscope display is similar to the sample signal.

10. Click Run Test to run the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

11. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

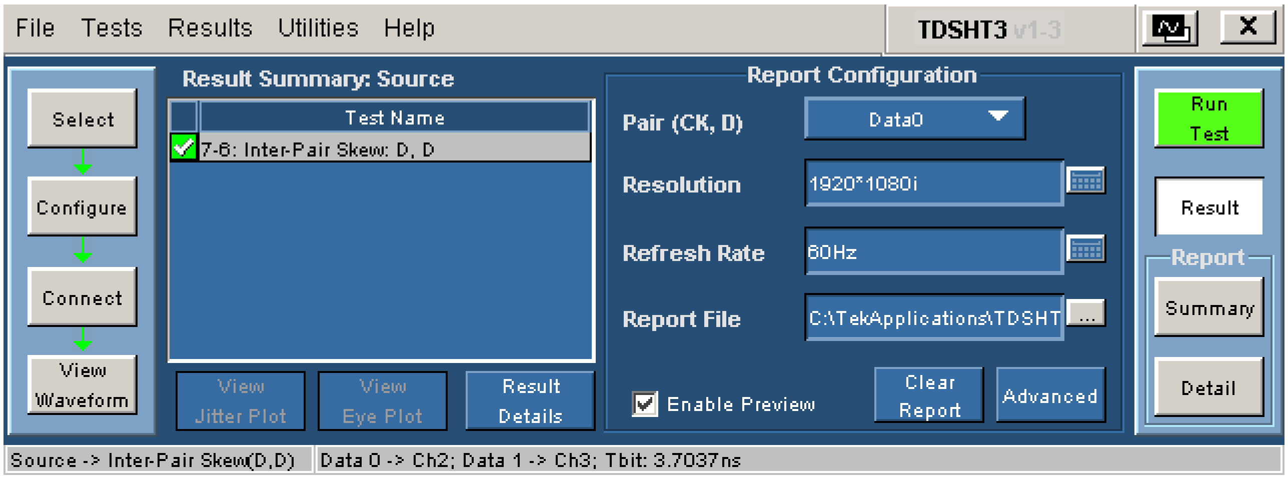


Figure 174: Result for Inter-Pair Skew (Data-Data)

Table 69: Result for Inter-Pair Skew (Data-Data Tests)

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D (Data), D (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

12. You can set the report details to identify and generate the report automatically. You can set a default report file.

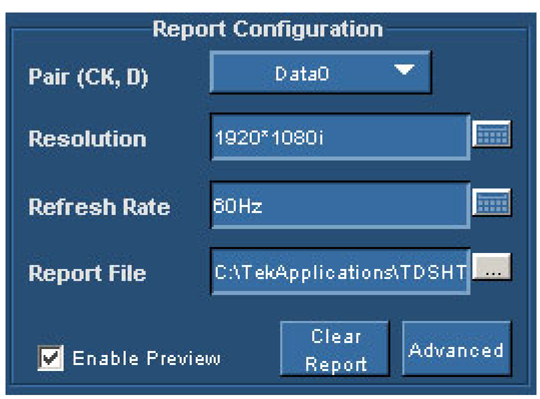


Figure 175: Report Configuration pane for Inter-Pair Skew (Data-Data)

In the report configuration pane, you can configure the following parameters:

Table 70: Report Configuration options for Inter-Pair Skew (Data-Data)

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

13. In the result summary pane, click Result Details to display the details of the result.

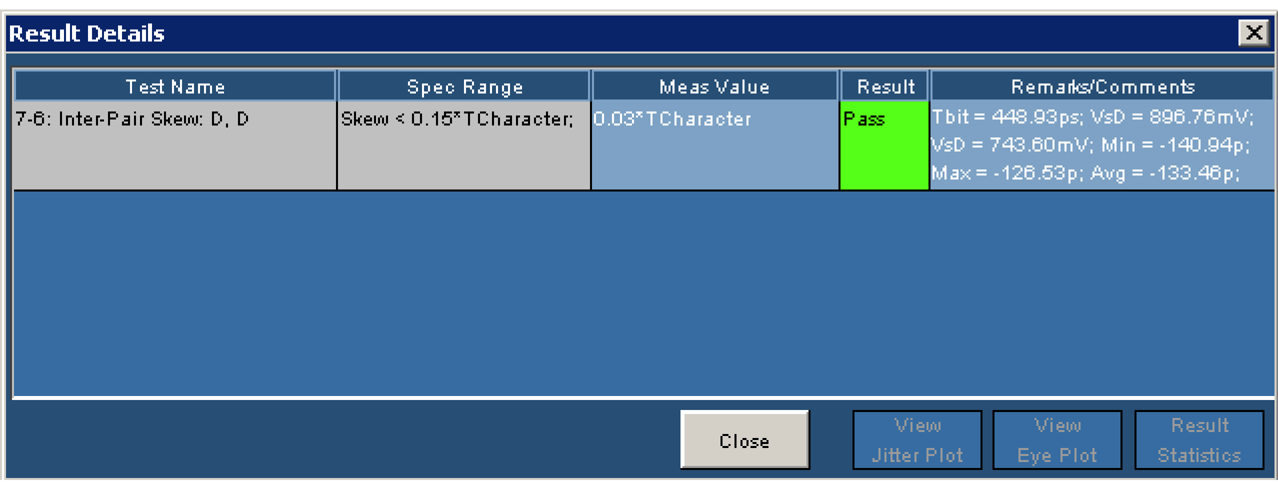


Figure 176: Result Details for Inter-Pair Skew (Data-Data)

Table 71: Result Details for Inter-Pair Skew (Data-Data)

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D (Data), D (Data).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Source – Intra-Pair Skew

This test allows you to 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.

You will need one supported oscilloscope, two single-ended probes, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-SE fixture.

***Note**: Deskew is recommended before you conduct any skew test.*

1. On the menu bar, click Tests > Select > Source.
2. In the single-ended tests pane, select the Intra-Pair Skew check box.

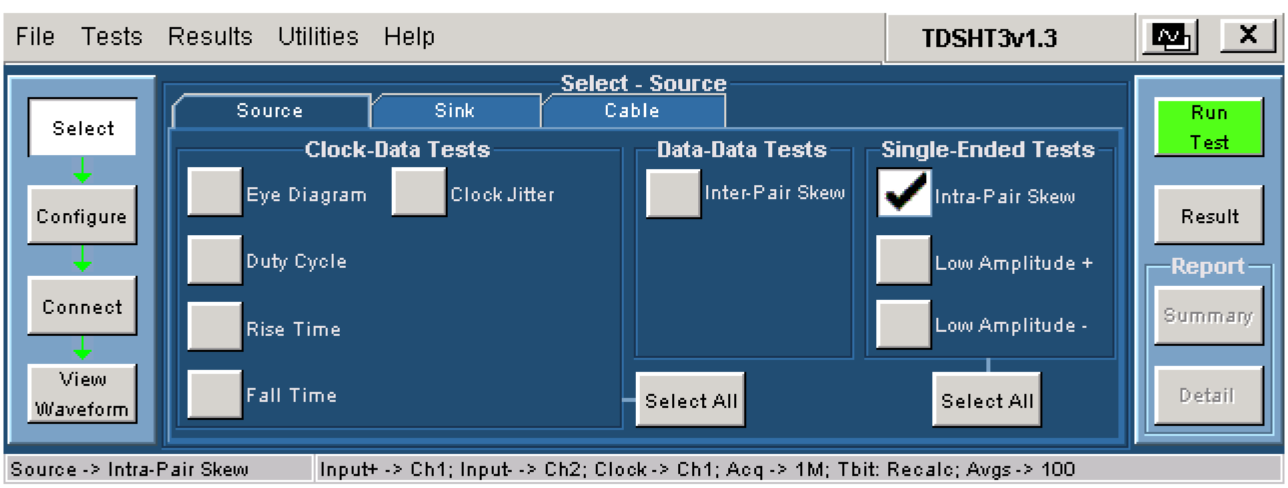


Figure 177: Select Source with Source Intra-Pair Skew test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

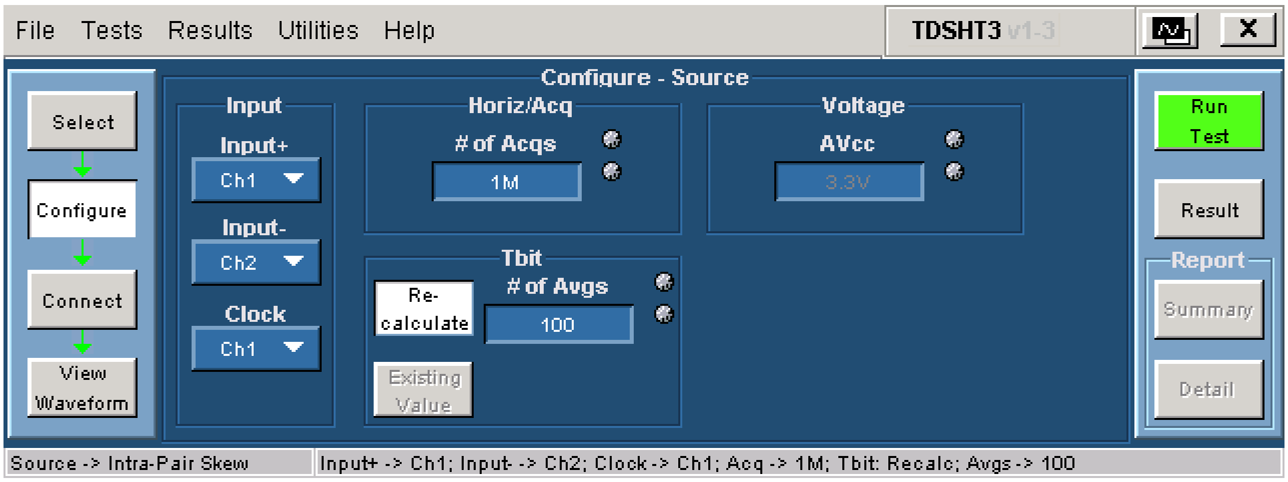


Figure 178: Configure Source for Intra-Pair Skew

4. In the input pane, you have the following options:

Table 72: Input options for Source Intra-Pair Skew

Configure Parameter	Description
Input+	Input+ indicates the oscilloscope channel to which you will connect the positive input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Input–	Input– indicates the oscilloscope channel to which you will connect the negative input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. In the horiz/acq pane, you have the following option:

Table 73: Horiz/Acq option for Source Intra-Pair Skew

Configure Parameter	Description
# of Acqs	In the # of Acqs box, enter the desired number of acquisitions that are required for the test. The default value is 10 K.

6. In the tbit pane, you have the following options:

Table 74: Tbit options for Source Intra-Pair Skew

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

7. To connect the DUT, click Tests > Connect.

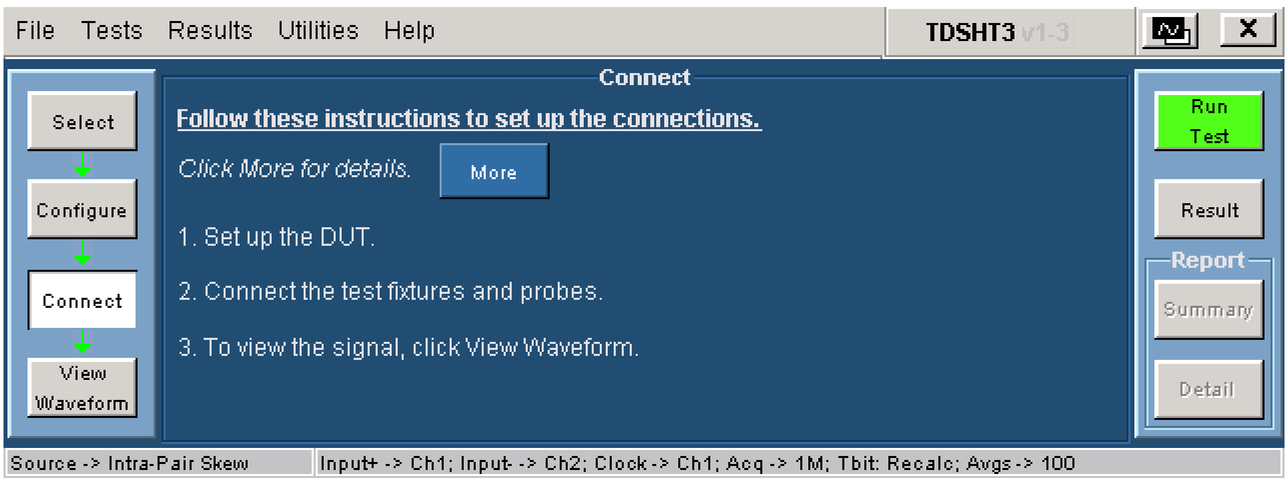


Figure 179: Connect pane for Source Intra-Pair Skew

8. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections. The waveform shown here is for the re-calculate Tbit option. Click Run Test to run the test. The Confirm dialog box appears. Click Continue to continue to run the test. Go to step 10.

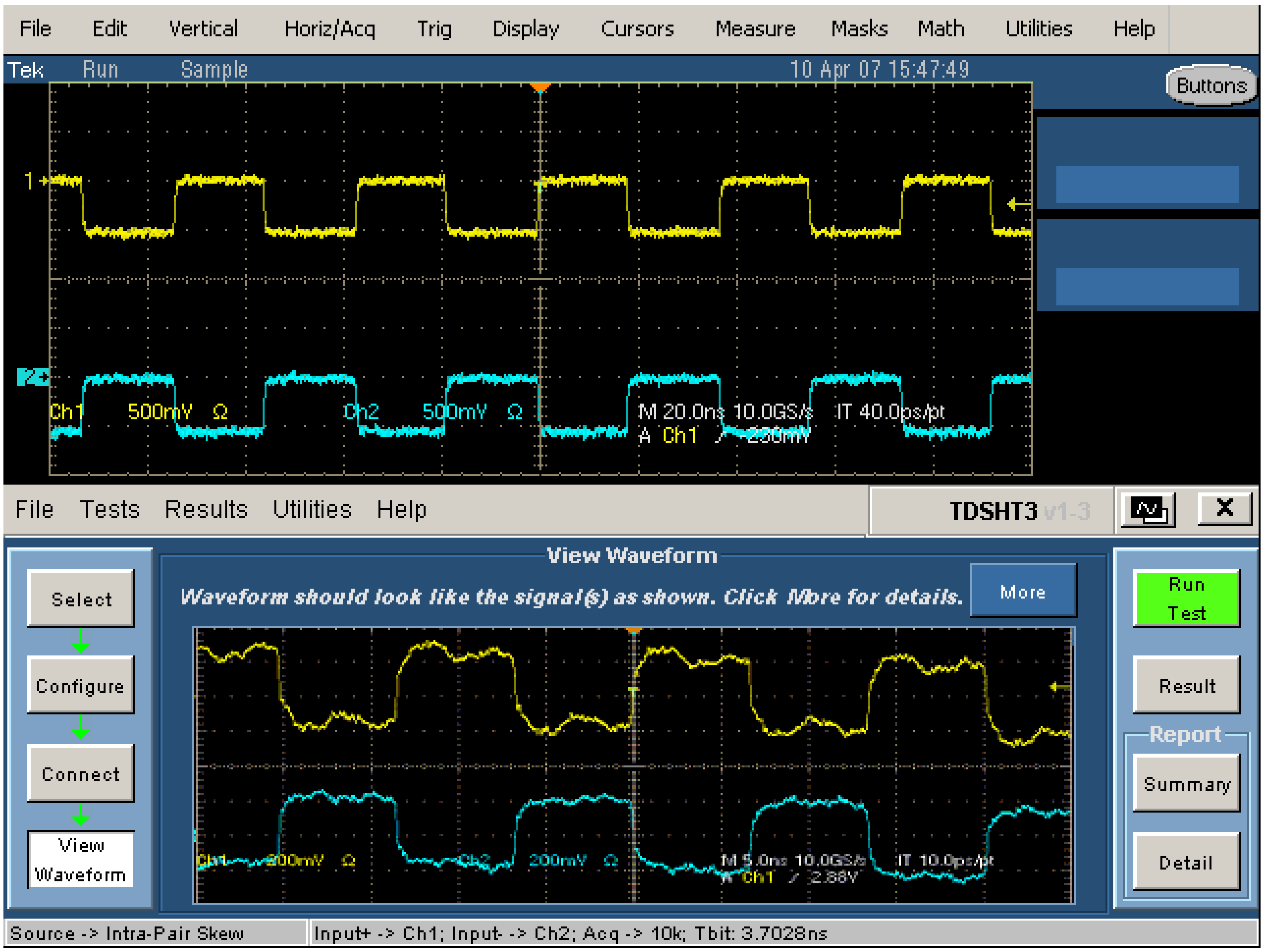


Figure 180: Waveform of Source Intra-Pair Skew

9. If you have selected existing Tbit value, then click View Waveform to get a different waveform on your display. Ensure that your signal in the oscilloscope display is similar to the sample signal.

10. Click Run Test to run the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

11. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

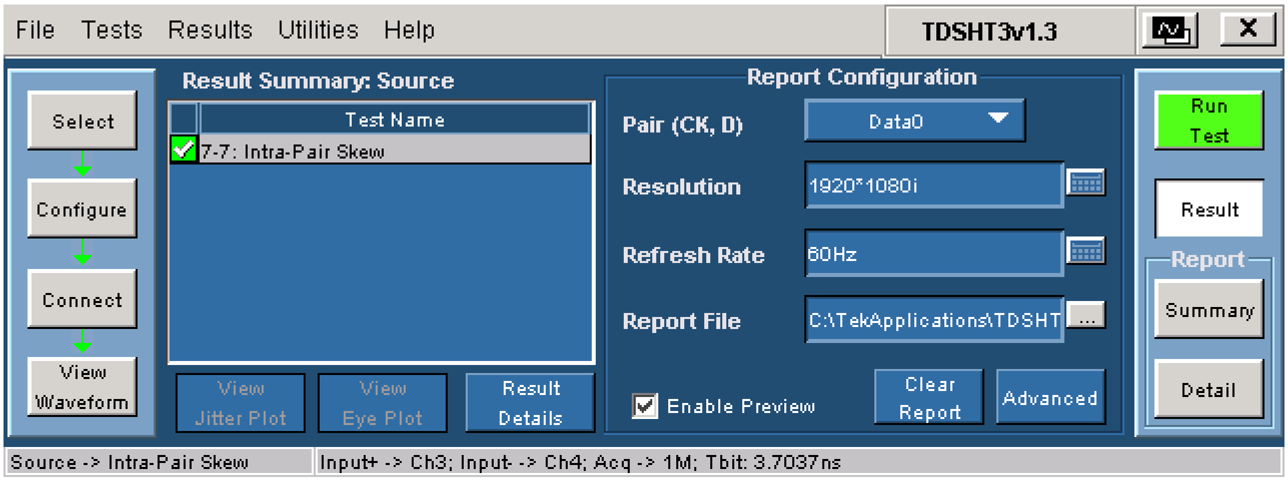


Figure 181: Result for Source Intra-Pair Skew

Table 75: Result for Source Intra-Pair Skew

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D0+ (Data), D0- (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

12. You can set the report details to identify and generate the report automatically. You can set a default report file.

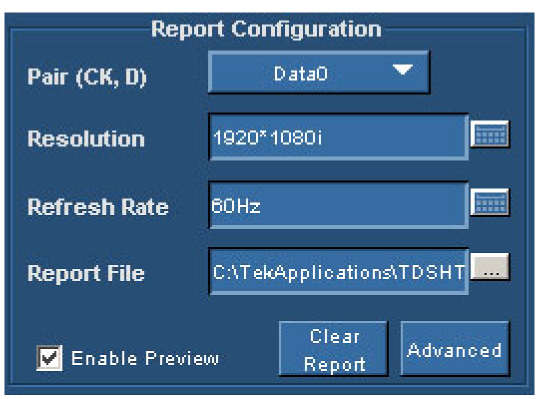


Figure 182: Report Configuration for Source Intra-Pair Skew

In the report configuration pane, you can configure the following parameters:

Table 76: Report Configuration options for Source Intra-Pair Skew

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

13. In the result summary pane, click Result Details to display the details of the result.

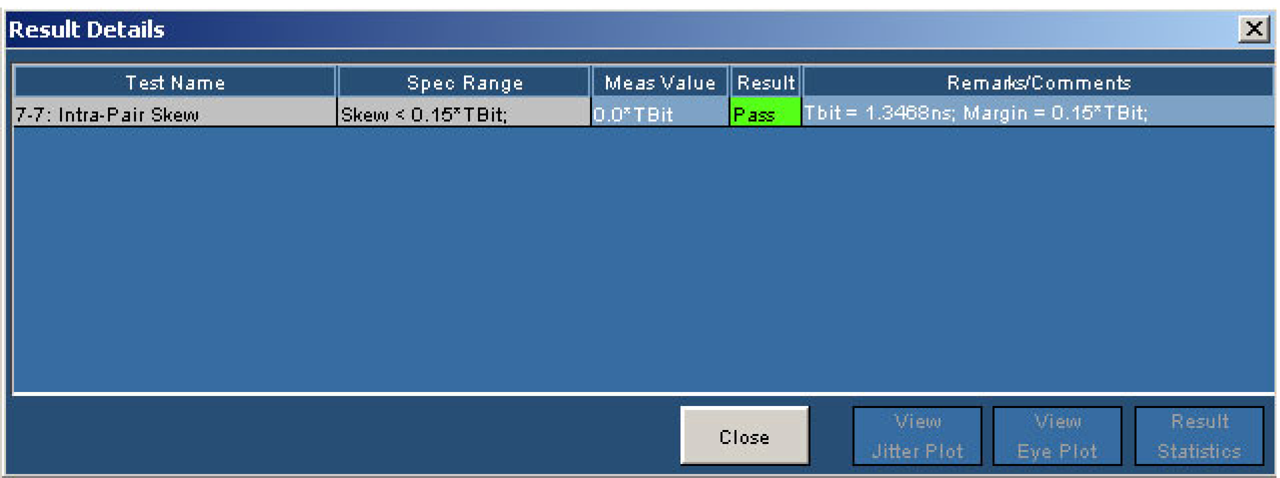


Figure 183: Result Details for Source Intra-Pair Skew

Table 77: Result Details for Source Intra-Pair Skew

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D0+ (Data), D0- (Data).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Source – Low Amplitude +

This test allows you to confirm that DC voltage levels on the HDMI link are within specified limits for each TMDS signal.

You will need one supported oscilloscope, one single-ended probe, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-SE fixture.

1. On the menu bar, click Tests > Select > Source.
2. In the single-ended tests pane, select the Low Amplitude + check box.

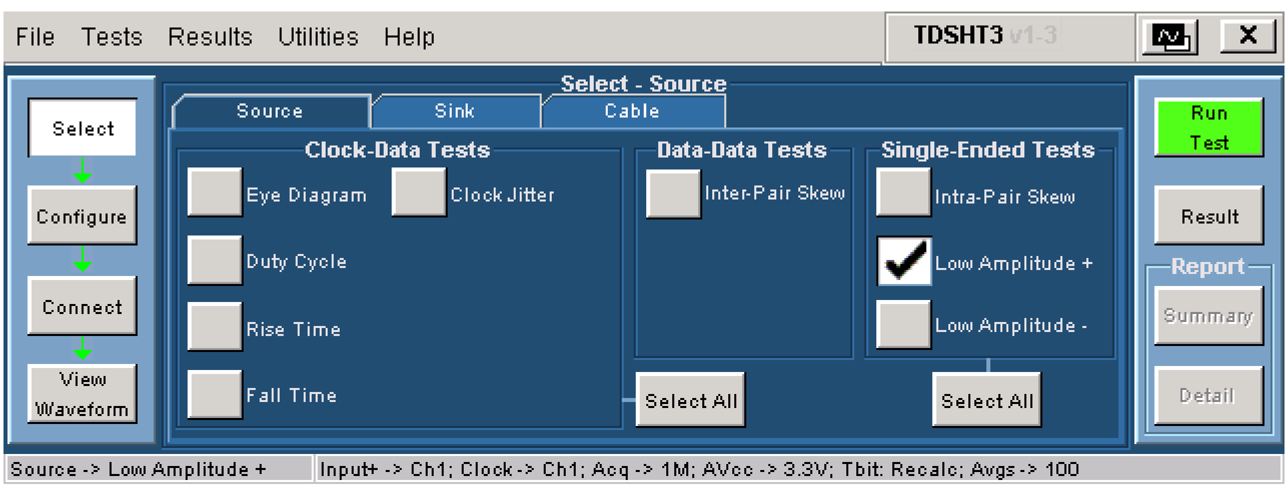


Figure 184: Select Source with Low Amplitude + test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

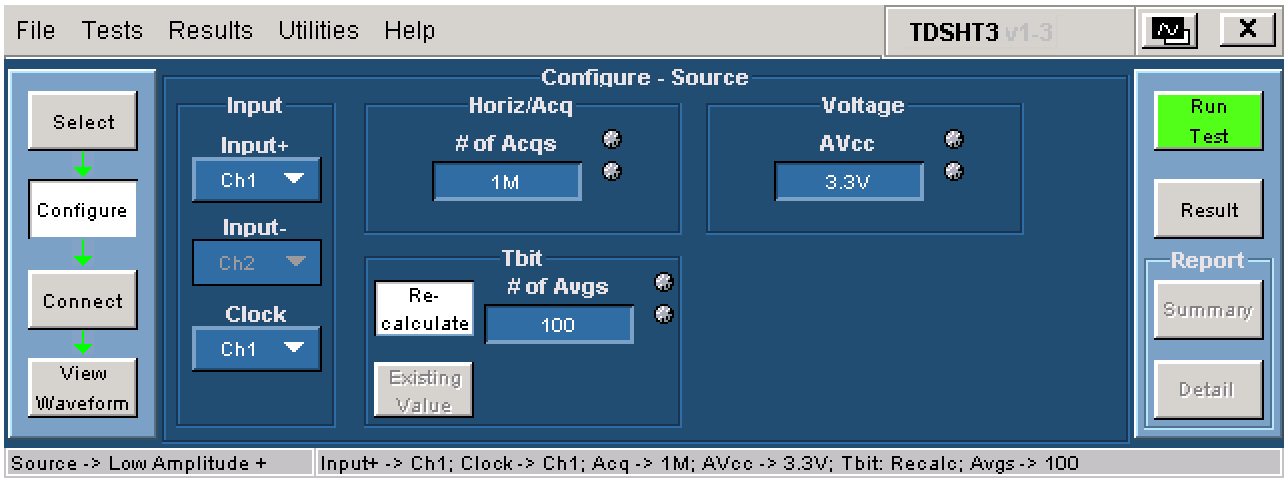


Figure 185: Configure Source for Low Amplitude +

4. In the input pane, you have the following options:

Table 78: Input options for Low Amplitude +

Configure Parameter	Description
Input+	Input+ indicates the oscilloscope channel to which you will connect the positive input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. In the horiz/acq pane, you have the following option:

Table 79: Horiz/Acq option for Low Amplitude +

Configure Parameter	Description
# of Acqs	In the # of Acqs box, enter the desired number of acquisitions that are required for the test. The default value is 10 K.

6. In the tbit pane, you have the following options:

Table 80: Tbit options for Low Amplitude +

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

7. In the voltage pane, you have the following option:

Table 81: Voltage option for Low Amplitude +

Configure Parameter	Description
AVcc	In the AVcc box, enter the desired voltage value. The default value is 3.3 V.

8. To connect the DUT, click Tests > Connect.

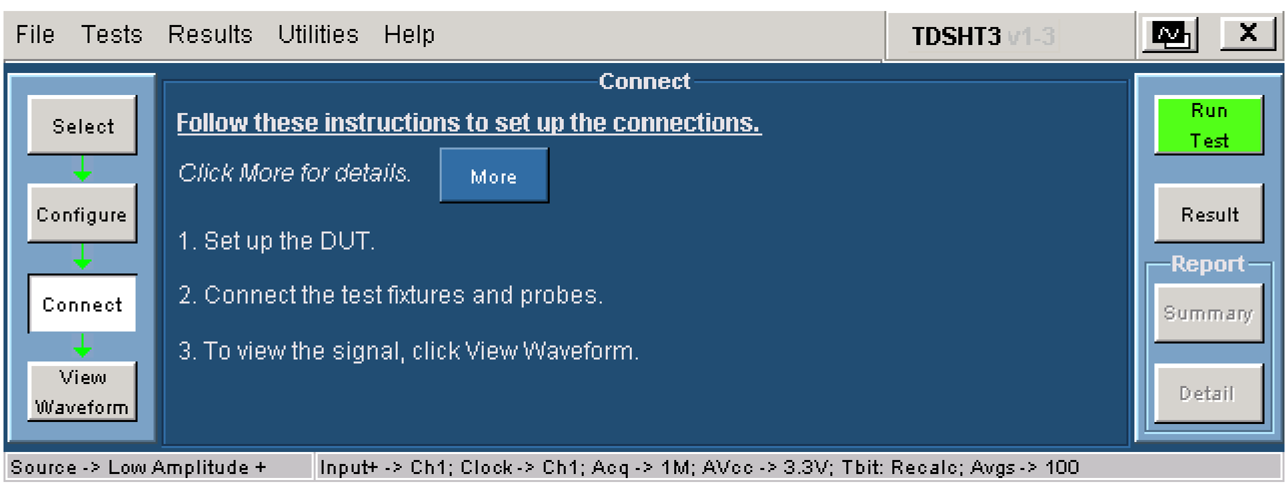


Figure 186: Connect pane for Low Amplitude +

9. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections. The waveform shown here is for the re-calculate Tbit option. Click Run Test to run the test. The Confirm dialog box appears. Click Continue to continue to run the test. Go to step 11.

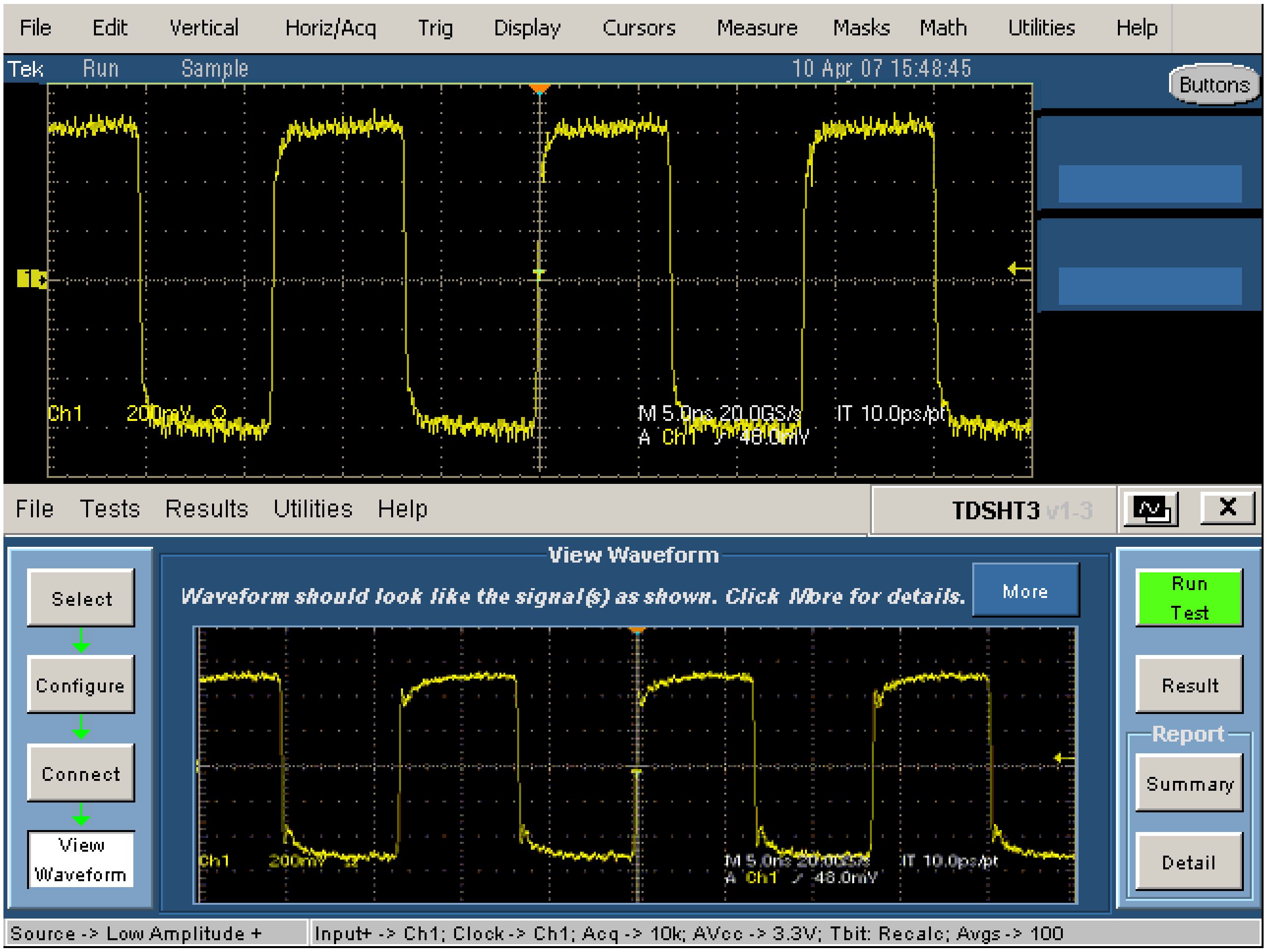


Figure 187: Waveform of Source – Low Amplitude + test

10. If you have selected existing Tbit value, then click View Waveform to get a different waveform on your display. Ensure that your signal in the oscilloscope display is similar to the sample signal.

11. Click Run Test to run the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

12. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

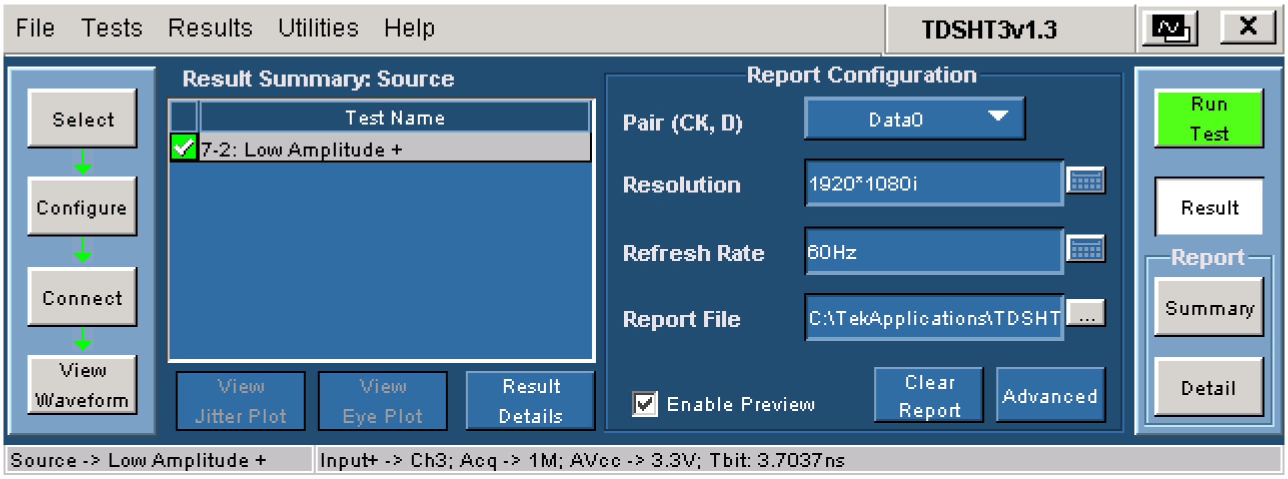


Figure 188: Result for Low Amplitude +

Table 82: Result for Low Amplitude +

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D0+ (Data), CK (Clock).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

13. You can set the report details to identify and generate the report automatically. You can set a default report file.

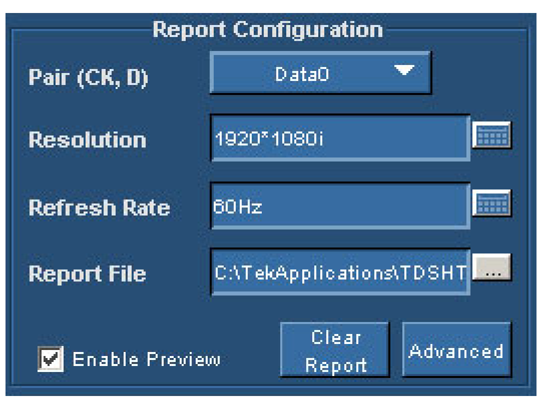


Figure 189: Report Configuration for Low Amplitude +

In the report configuration pane, you can configure the following parameters:

Table 83: Report Configuration options for Low Amplitude +

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

14. In the result summary pane, click Result Details to display the details of the result.

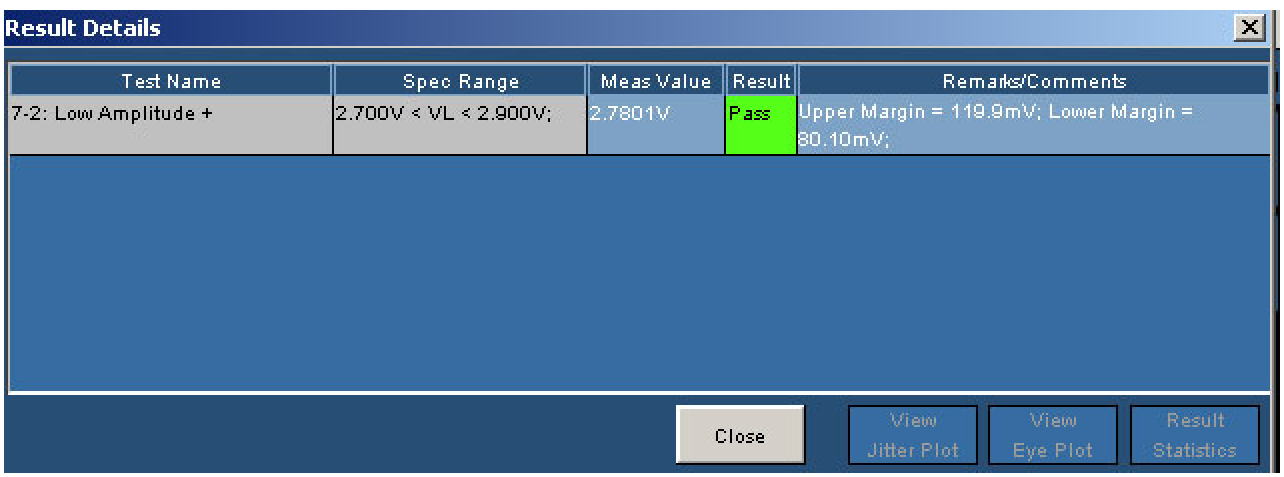


Figure 190: Results Details for Low Amplitude +

Table 84: Result Details for Low Amplitude +

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D0+ (Data), CK (Clock).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Source – Low Amplitude -

This test allows you to confirm that DC voltage levels on the HDMI link are within specified limits for each TMDS signal.

You will need one supported oscilloscope, one single-ended probe, one DC power supply 3.3 V, one EDID emulator, and one TPA-P-SE fixture.

1. On the menu bar, click Tests > Select > Source.

2. In the single-ended tests pane, select the Low Amplitude - check box.

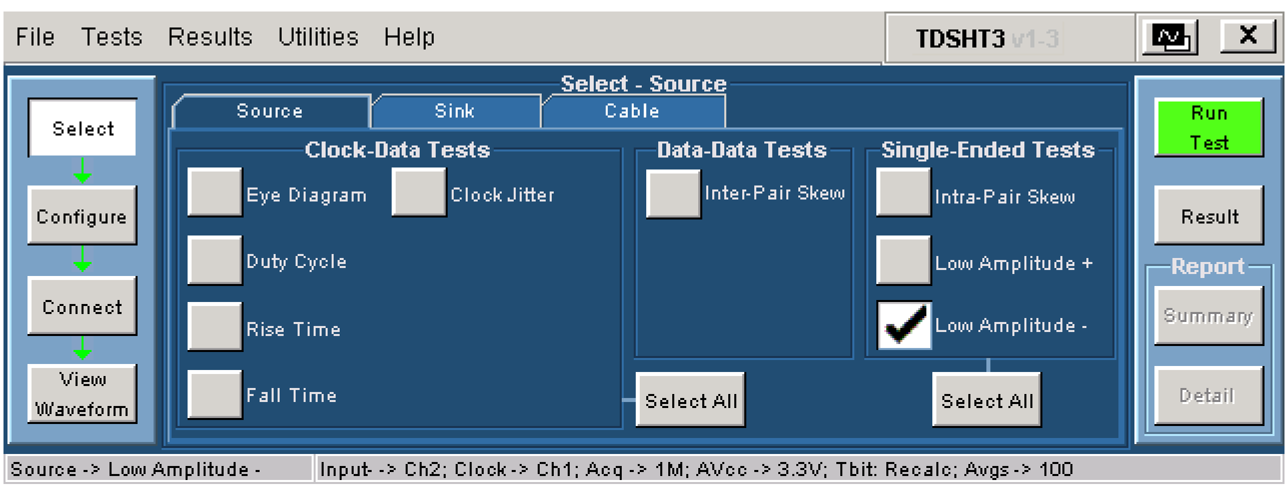


Figure 191: Select Source with Low Amplitude - test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

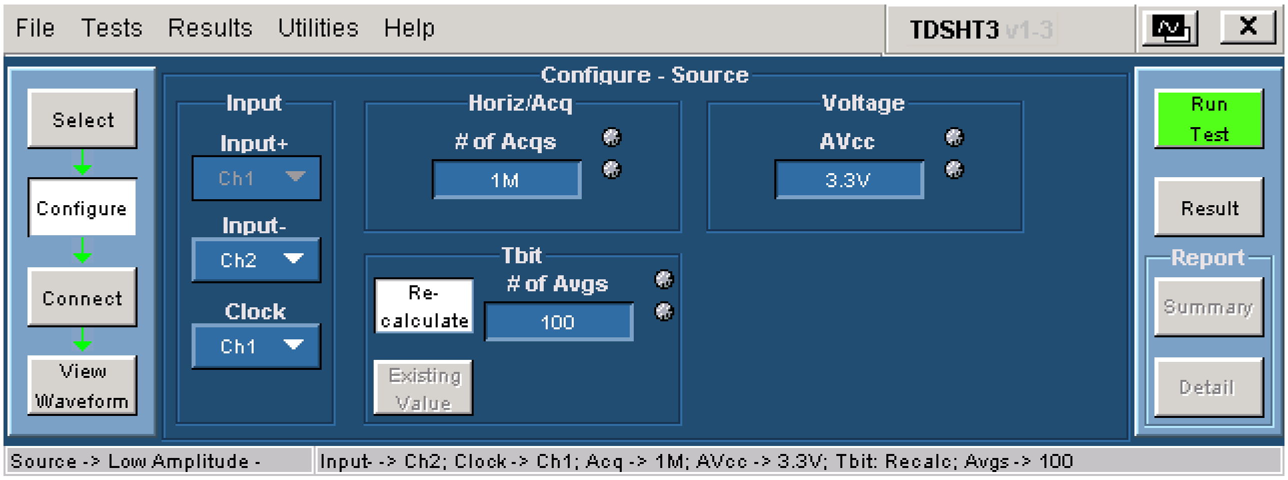


Figure 192: Configure Source for Low Amplitude -

4. In the input pane, you have the following options:

Table 85: Input options for Low Amplitude -

Configure Parameter	Description
Input–	Input- indicates the oscilloscope channel to which you will connect the positive input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. In the horiz/acq pane, you have the following option:

Table 86: Horiz/acq option for Low Amplitude -

Configure Parameter	Description
# of Acqs	In the # of Acqs box, enter the desired number of acquisitions that are required for the test. The default value is 10 K.

6. In the tbit pane, you have the following options:

Table 87: Tbit options for Low Amplitude -

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

7. In the voltage pane, you have the following option:

Table 88: Voltage option for Low Amplitude -

Configure Parameter	Description
AVcc	In the AVcc box, enter the desired voltage value. The default value is 3.3 V.

8. To connect the DUT, click Tests > Connect.

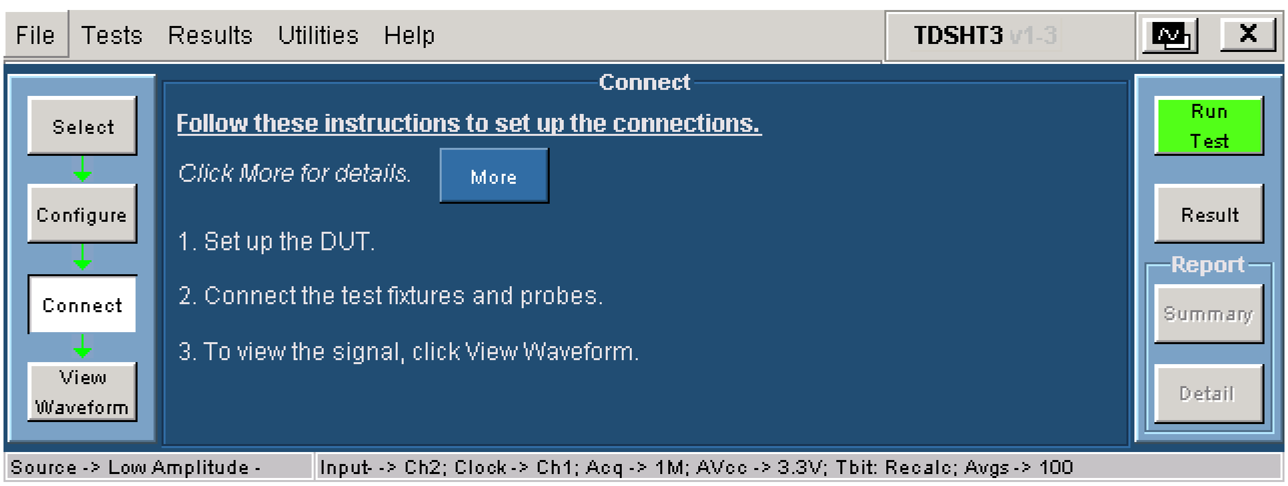


Figure 193: Connect pane for Low Amplitude -

9. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections. The waveform shown here is for the re-calculate Tbit option. Click Run Test to run the test. The Confirm dialog box appears. Click Continue to continue to run the test. Go to step 11.

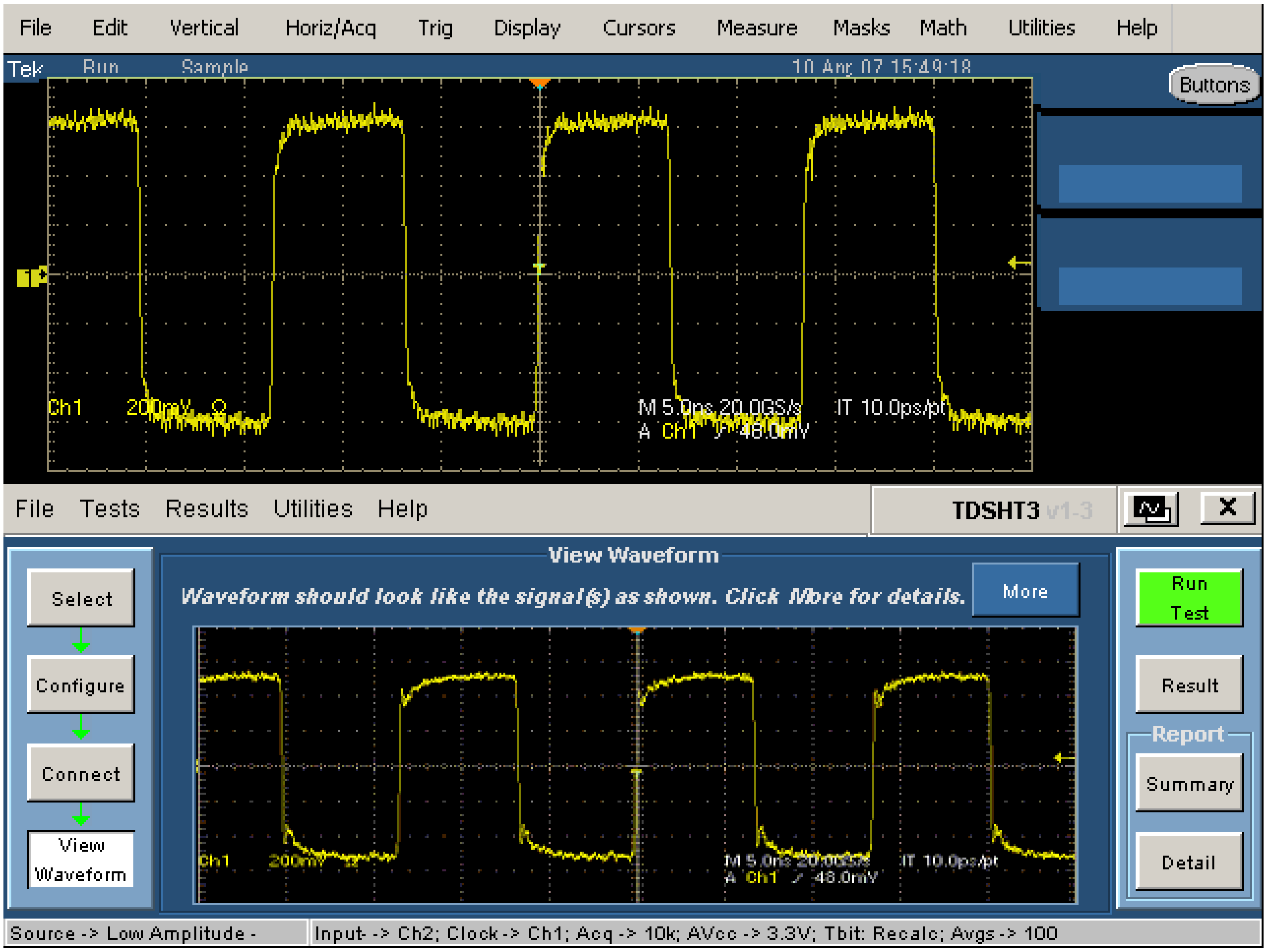


Figure 194: Waveform of Low Amplitude –

10. If you have selected existing Tbit value, then click View Waveform to get a different waveform on your display. Ensure that your signal in the oscilloscope display is similar to the sample signal.

11. Click Run Test to run the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

12. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

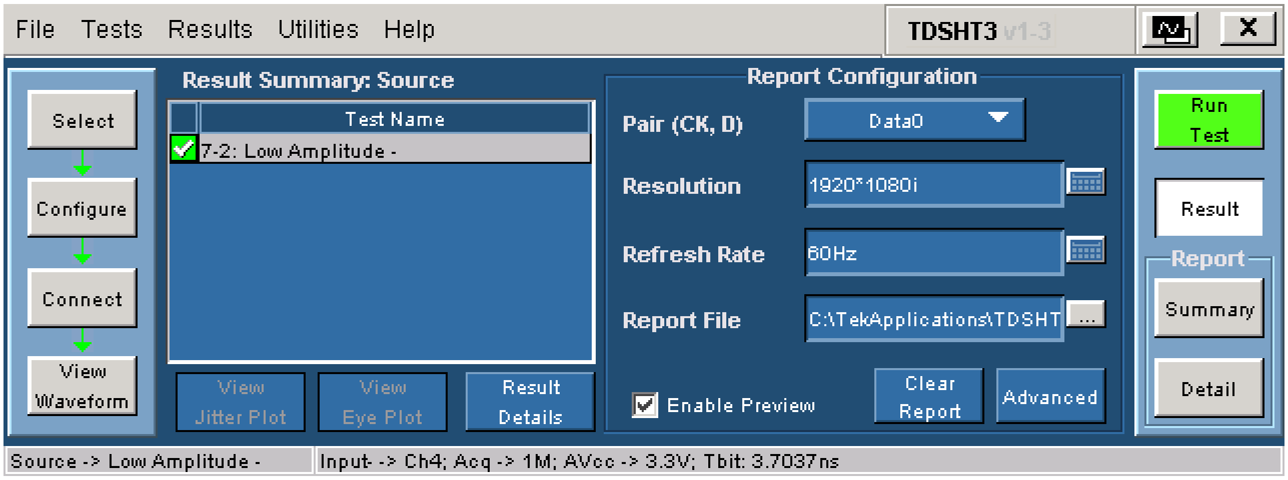


Figure 195: Result for Low Amplitude –

Table 89: Result for Low Amplitude –

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D0- (Data), CK (Clock).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

13. You can set the report details to identify and generate the report automatically. You can set a default report file.

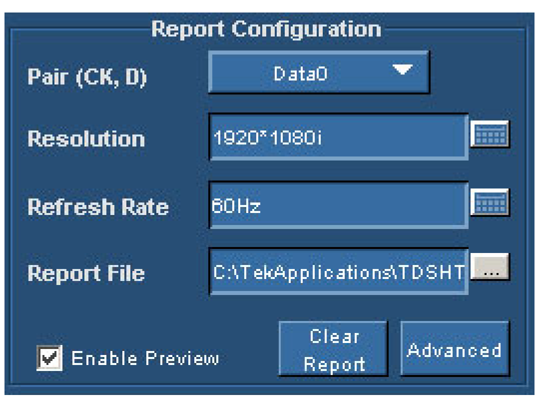


Figure 196: Report Configuration for Low Amplitude –

In the report configuration pane, you can configure the following parameters:

Table 90: Report Configuration options for Low Amplitude –

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

14. In the result summary pane, click Result Details to display the details of the result.

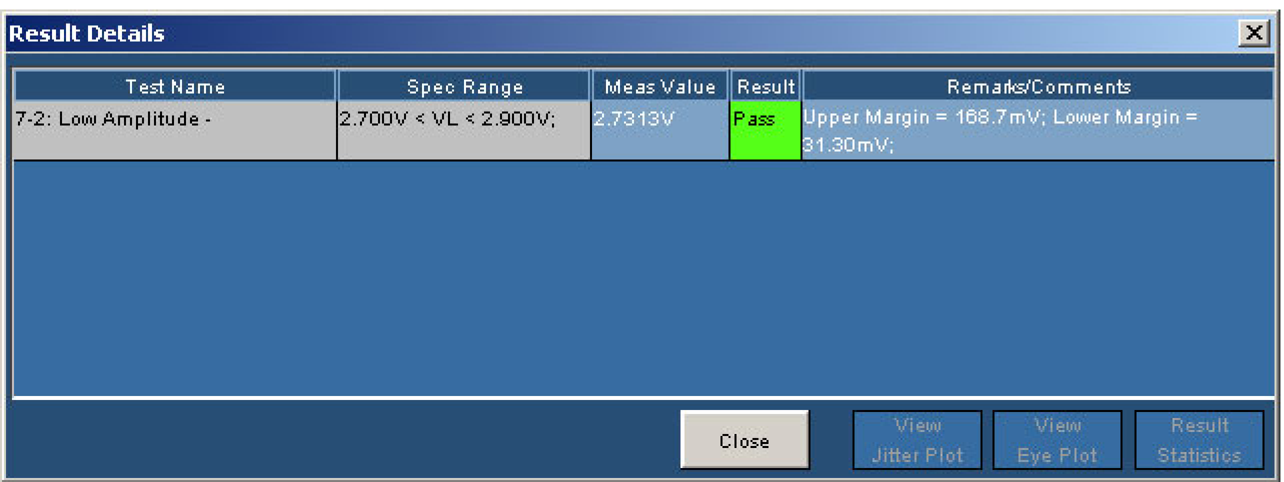


Figure 197: Result Details for Low Amplitude –

Table 91: Result Details for Low Amplitude –

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D0- (Data), CK (Clock).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Sink – Min/Max-Diff Swing Tolerance

This test allows you to confirm that the Sink correctly supports TMDS differential voltages at minimum levels.

You will need one supported oscilloscope, one digital timing generator (DTG), one differential probe, one DC power supply, eight SMA cables, one GPIB controller, and one TPA-P-TDR fixture.

1. On the menu bar, click Tests > Select > Sink.

2. In the differential tests pane, select the Min/Max-Diff Swing Tolerance check box.

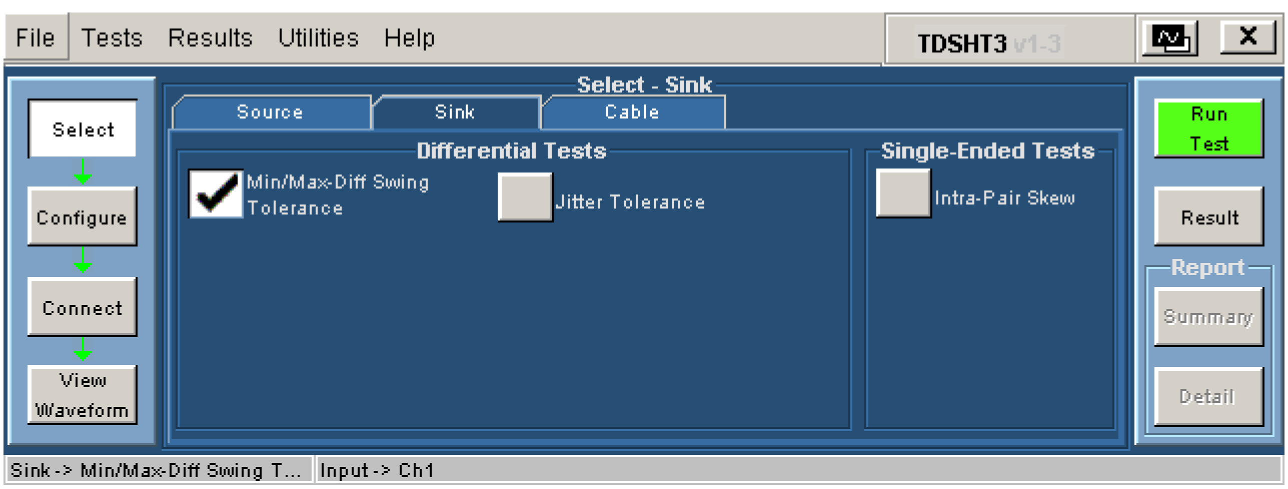


Figure 198: Select Sink with Min/Max-Diff Swing Tolerance test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

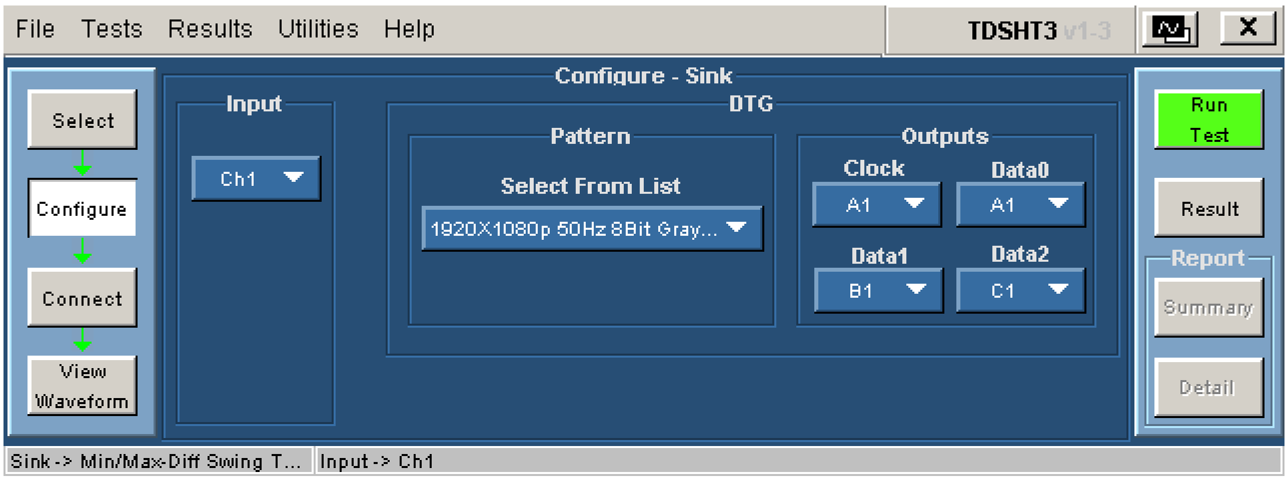


Figure 199: Configure Sink for Min/Max-Diff Swing Tolerance

4. In the input pane, you have the following option:

Table 92: Input option for Min/Max-Diff Swing Tolerance

Configure Parameter	Description
Input	Input indicates the oscilloscope channel to which you will connect the input. The available choices are Ch1, Ch2, Ch3, and Ch4.

V_{ICM} indicates common mode voltage, which is automatically configured by the TDSHT3 based on the following condition:

- V_{ICM1} is 2.9 V for frequency > 165 MHz
- V_{ICM1} is 3.0 V for frequency < 165 MHz
- V_{ICM2} is 3.3 V for all frequencies

5. In the DTG pane, you have the following option:

Table 93: DTG option for Min/Max-Diff Swing Tolerance

Configure Parameter	Description
Select From List	Select the DTG pattern file from the drop-down list.

6. In the outputs pane, you have the following options:

Table 94: Outputs options for Min/Max-Diff Swing Tolerance

Configure Parameter	Description
Clock	The Clock list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 0	The Data 0 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data1	The Data 1 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data2	The Data 2 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.

7. To connect the DUT, click Tests > Connect.

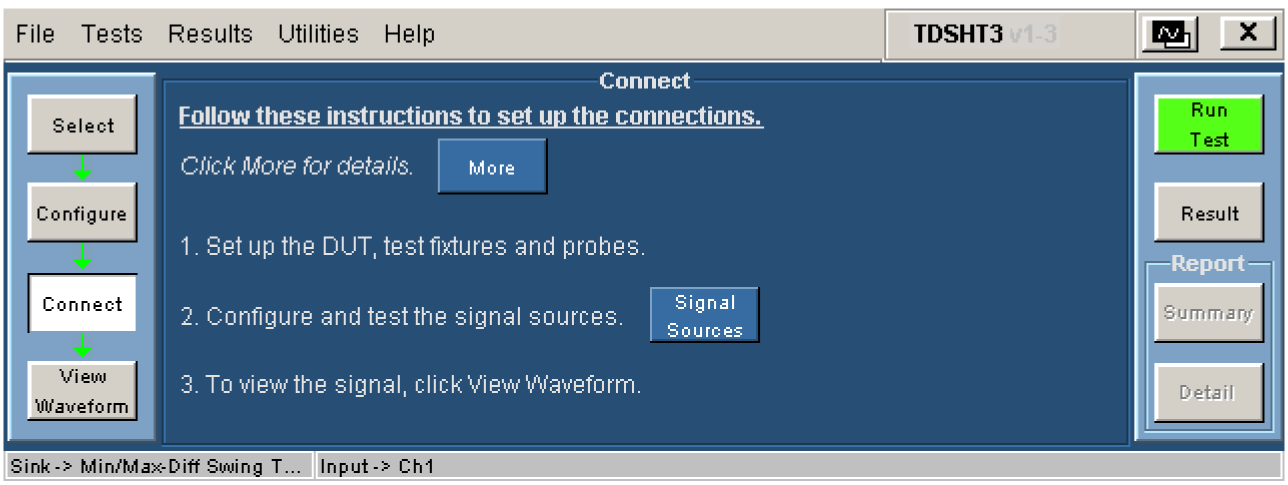


Figure 200: Connect pane for Min/Max-Diff Swing Tolerance

8. To configure and test the GPIB connection to the DTG, click Signal Sources. The Signal Sources Setup dialog box appears.

Figure 201: Signal Sources Setup for Min/Max-Diff Swing Tolerance

9. In the select pane, click GPIB. Configure the appropriate GPIB board number.

10. To test both the connection and the DTG GPIB configuration, click Test Conn.

11. Because no signal is connected to the oscilloscope, you cannot view the waveform for the min/max-diff swing tolerance test.

***Note**: To run the test successfully, ensure that the Bus Timing parameter is set to 2 µsec on your GPIB board configuration. For more details, refer to the section on Remote Control Caution.*

---

12. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and conducts the test. Follow the instructions in the dialog box. Depending on your answer, a series of dialog boxes may prompt you for your input.

13. If you successfully run the test, the software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

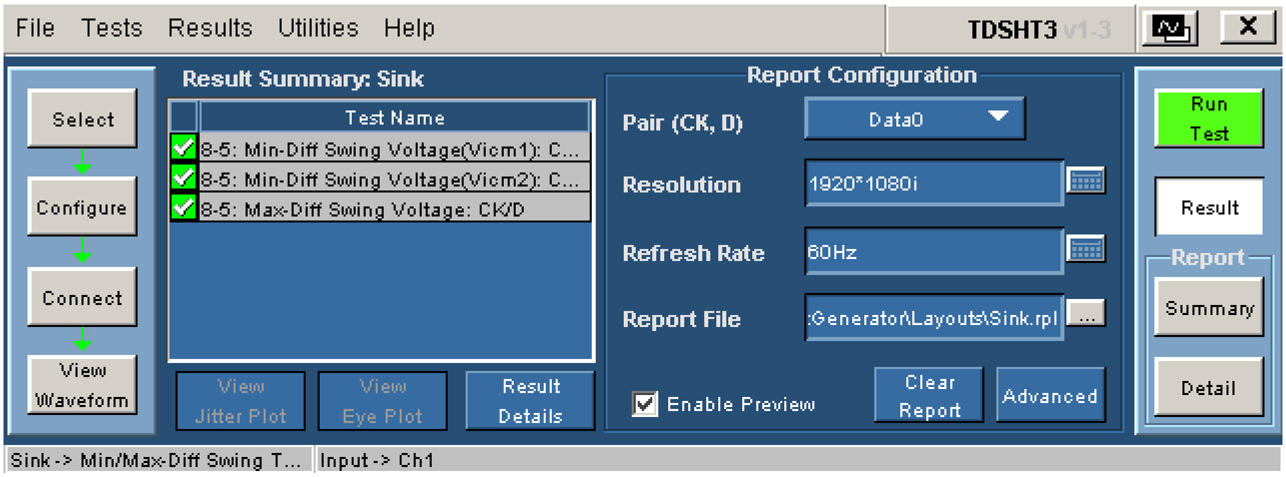


Figure 202: Result for Min/Max-Diff Swing Tolerance

Table 95: Result for Min/Max-Diff Swing Tolerance

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

14. You can set the report details to identify and generate the report automatically. You can set a default report file.

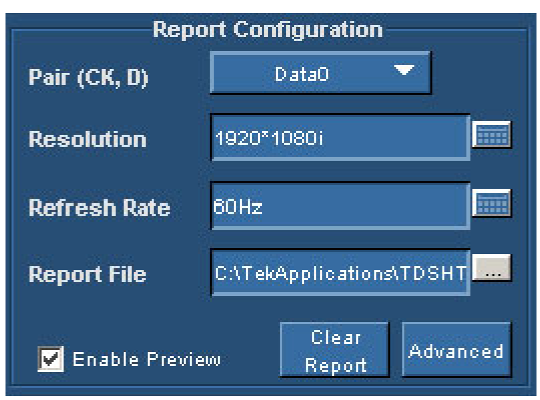


Figure 203: Report Configuration for Min/Max-Diff Swing Tolerance

In the report configuration pane, you can configure the following parameters:

Table 96: Report Configuration options for Min/Max-Diff Swing Tolerance

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

15. In the result summary pane, click Result Details to display the details of the result.

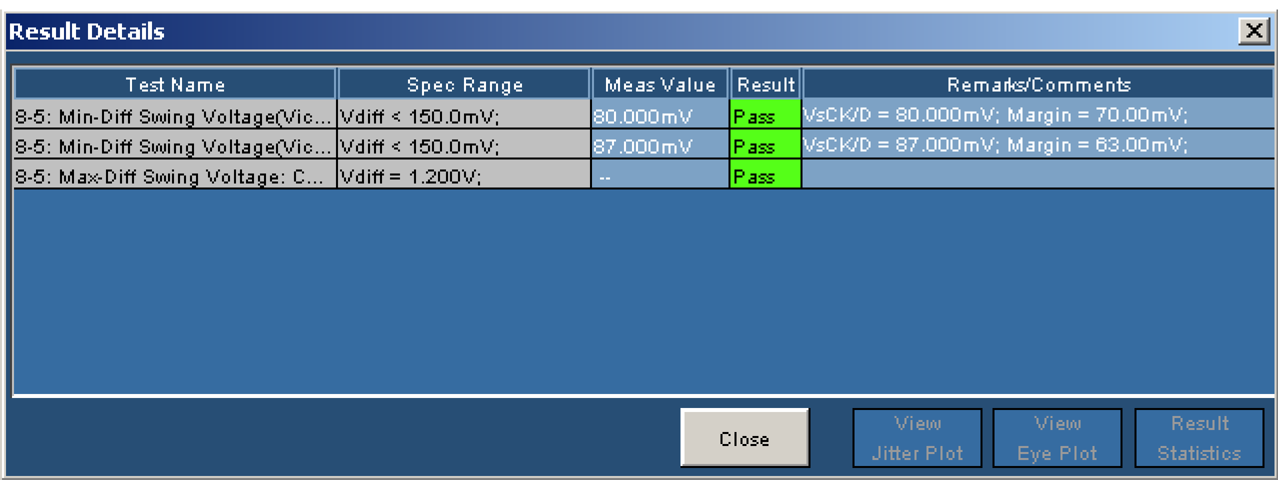


Figure 204: Result Details for Min/Max-Diff Swing Tolerance

Table 97: Result Details for Min/Max-Diff Swing Tolerance

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - D (Data).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Sink – Jitter Tolerance

This test allows you to confirm that the maximum allowed TMDS clock jitter is supported by the Sink DUT.

The signal degradation of typical passive copper cables increases with the frequency and the length of the cable. To recover data from such cables, TDSHT3 applies the reference cable equalizer (as specified in the HDMI specifications 1.3) automatically to the jitter tolerance measurement when the clock frequency is more than 165 MHz.

You will need one supported oscilloscope, two differential probes, one digital timing generator (DTG), one arbitrary waveform generator (AWG), one DC power supply, 12 SMA cables, two bias-tees, one cable emulator, one GPIB controller, one TPA-R-DI, one TPA-R-TDR and TTC modules.

1. On the menu bar, click Tests > Select > Sink.
2. In the differential tests pane, select the Jitter Tolerance check box.

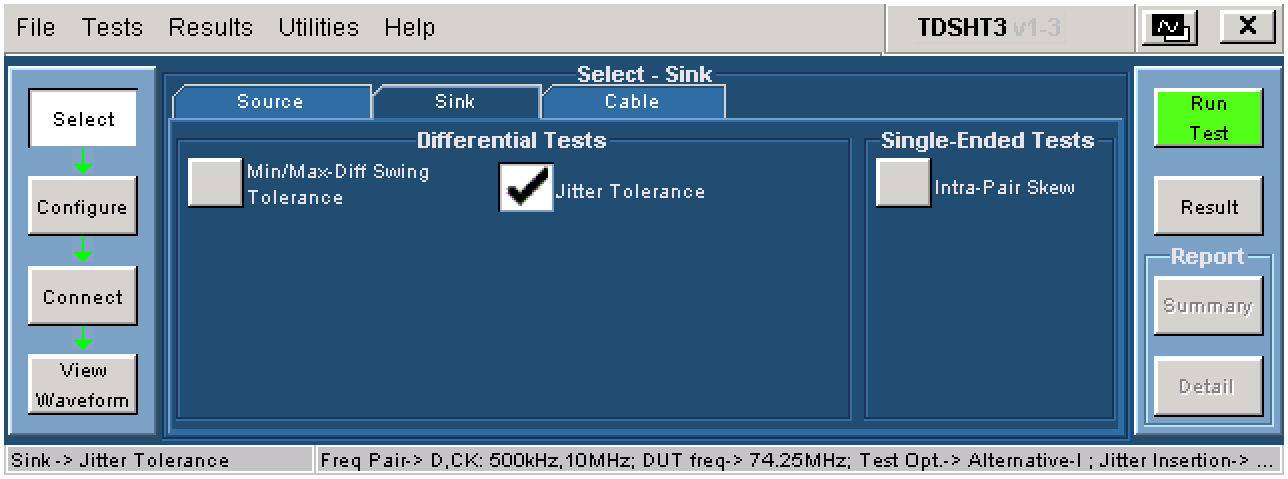


Figure 205: Select Sink with Jitter Tolerance test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

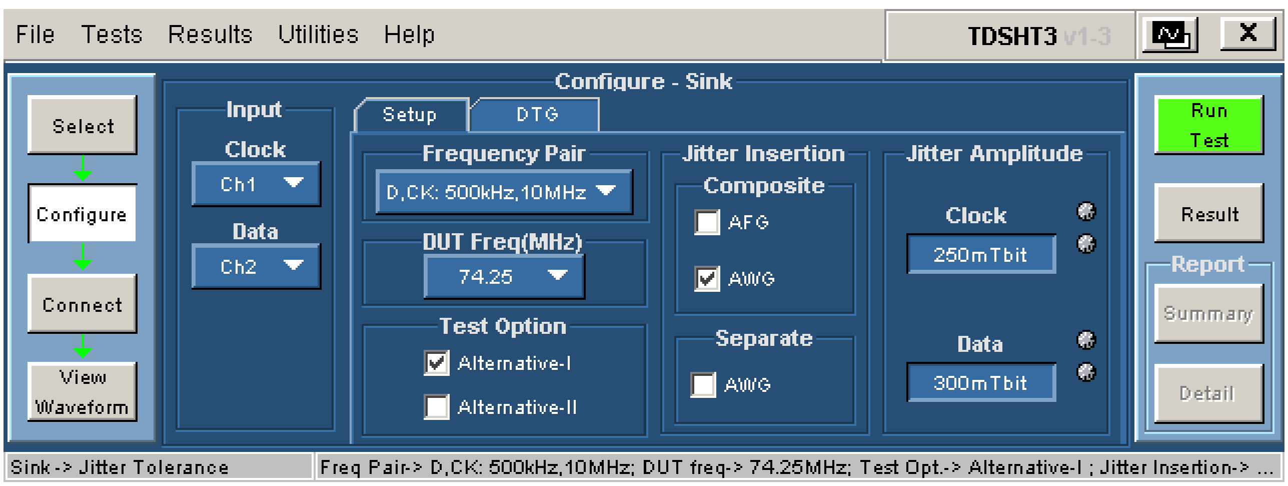


Figure 206: Configure Sink Setup for Jitter Tolerance

4. In the Input pane, you have the following options:

Table 98: Input options for Jitter Tolerance

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Data	Data indicates the oscilloscope channel to which you will connect the data input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. On the Setup tab, in the Frequency Pair pane, you have the following option:

Table 99: Frequency Pair option for Jitter Tolerance

Configure Parameter	Description
Frequency Pair	In the Frequency Pair list, click the desired value for the jitter tolerance tests. The available choices are D, Ck: 500 KHZ, 10 MHZ and D, Ck: 1 MHZ, 7 MHZ, and Both. If you select Both, the test is run for both the frequency pairs.

6. On the Setup tab, in the DUT Frequency pane, you have the following option:

Table 100: DUT Freq (MHz) option for Jitter Tolerance

Configure Parameter	Description
DUT FreqI(MHz)	In the DUT Freq (MHz), click the desired value for the DUT. The available choices are 25.175 MHz, 27 MHz, 74.25 MHz, 148.5 MHz, 225 MHz, 297 MHz.

7. On the Setup tab, in the Test Option pane, you have the following option:

Table 101: Test Option for Jitter Tolerance

Configure Parameter	Description
Alternative-I	Set the test option for jitter to Alternative-I. Alternative-I is the default test with 0.6 Vp-p.
Alternative-II	Set the test option for jitter to Alternative-II with 0.4 Vp-p.

8. On the Setup tab, in the Jitter Insertion pane, you have the following option:

Table 102: Jitter Insertion options for Jitter Tolerance

Configure Parameter	Description
Composite	You can select AFG or AWG for composite jitter insertion. AWG is the default insertion.
Separate	Select AWG for separate jitter insertion.

9. On the Setup tab, in the Jitter Amplitude pane, you have the following options:

Table 103: Jitter Amplitude options for Jitter Tolerance

Configure Parameter	Description
Clock	Set the amplitude of the clock jitter.
Data	Set the amplitude of the data jitter.

10. On the DTG tab, in the DTG pane, you have the following option:

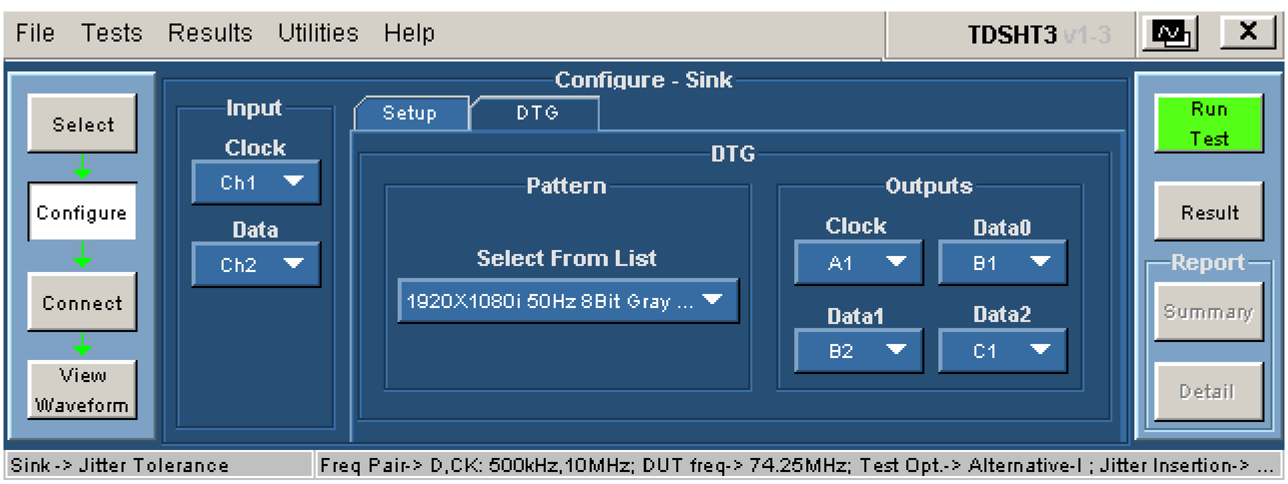


Figure 207: Configure Sink AWG/DTG for Jitter Tolerance

Table 104: AWG/DTG option for Jitter Tolerance

Configure Parameter	Description
Select From List	Select the DTG pattern file from the drop-down list.

11. On the AWG/DTG tab, in the Outputs pane, you have the following options:

Table 105: DTG Outputs options for Jitter Tolerance

Configure Parameter	Description
Clock	The Clock list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 0	The Data 0 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 1	The Data 1 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 2	The Data 2 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.

12. To connect the DUT, click Tests > Connect.

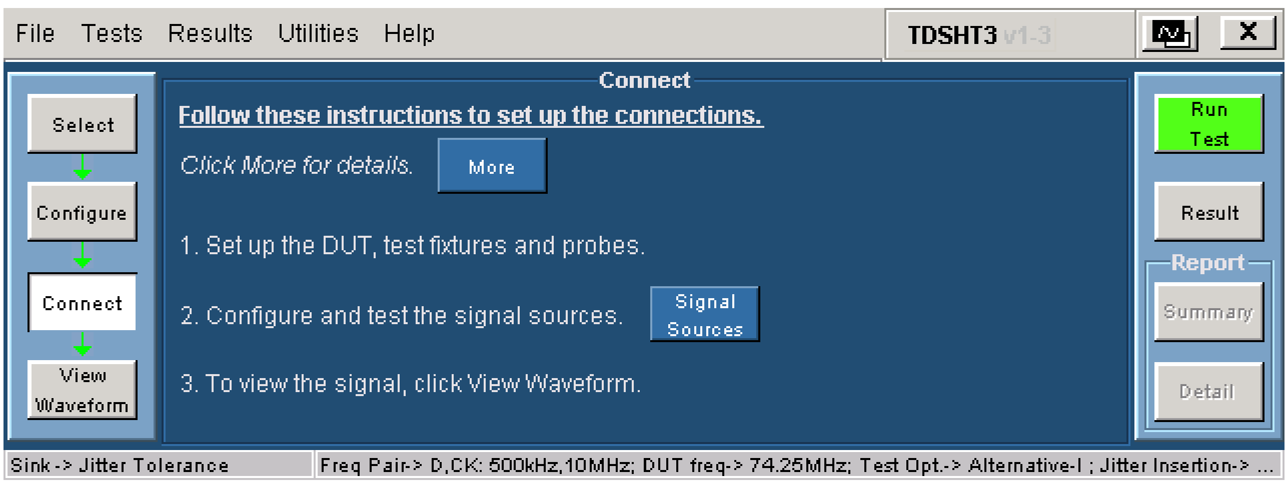


Figure 208: Connect pane for Jitter Tolerance

13. To configure and test the GPIB connection to the DTG and AWG/AFG, click Signal Sources. The Signal Sources Setup dialog box appears.

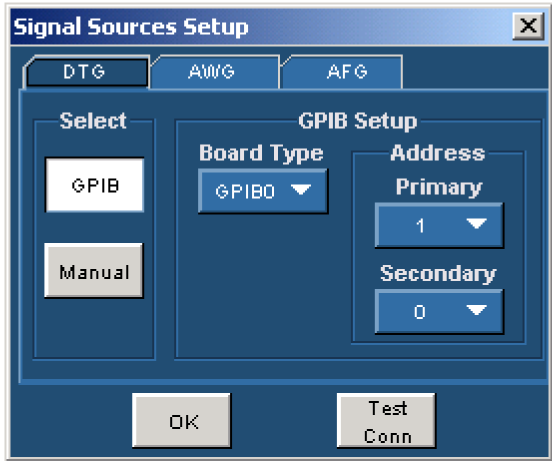


Figure 209: Signal Sources Setup for Jitter Tolerance

14. In the select pane, click GPIB. Configure the appropriate GPIB board number.

15. To test both the connection and the DTG GPIB configuration, click Test Conn.

16. Because no signal is connected to the oscilloscope, you cannot view the waveform for the jitter tolerance test.

Note*: To run the test successfully, ensure that the Bus Timing parameter is set to 2 µsec on your GPIB board configuration. For more details, refer to the section on Remote Control Caution.*

---

17. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and conducts the test.

18. Follow the instructions in the Sink Jitter Tolerance dialog box. Click OK. The Connect Sink Device dialog box appears.

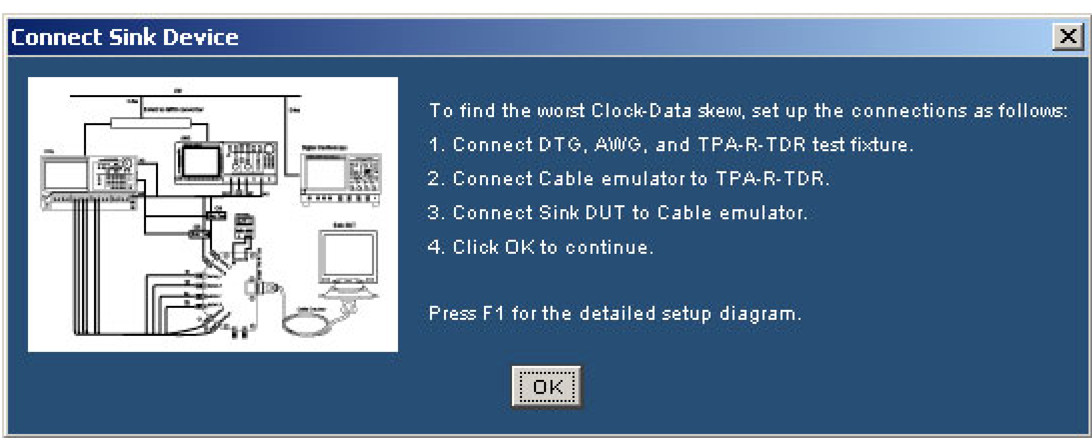


Figure 210: Connect Sink Device for Low Frequency

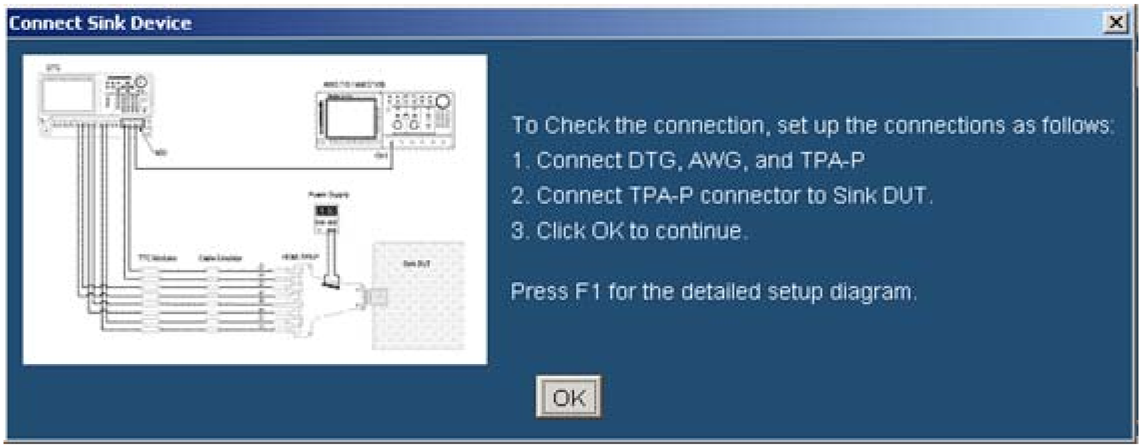


Figure 211: Connect Sink Device for High Frequency

19. Follow the instructions in the Connect Sink Device dialog box. Click OK. The test runs, displaying a progress indicator. The Confirm Sink Device Support dialog box appears.

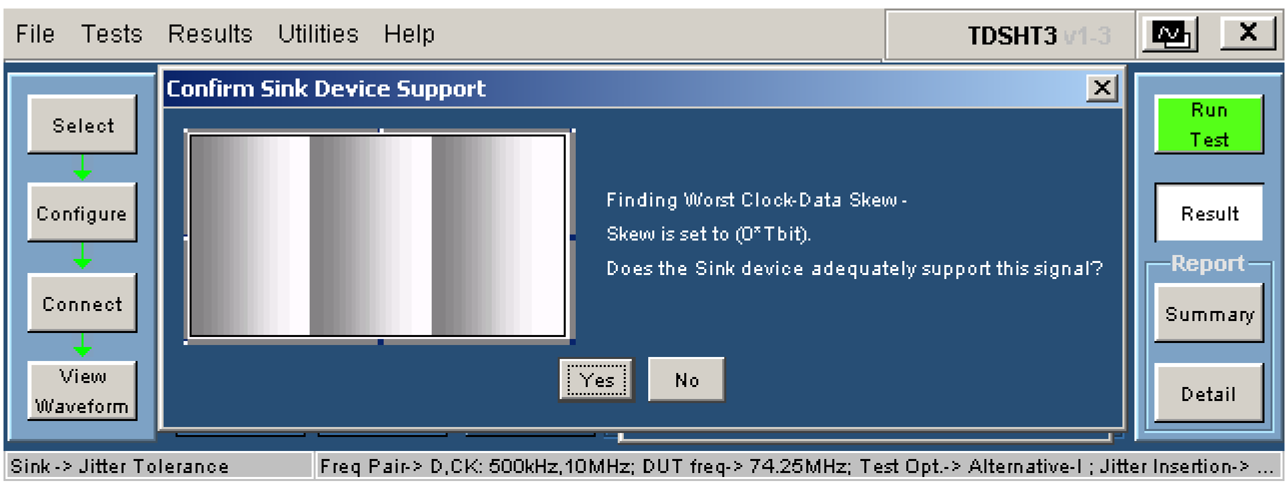


Figure 212: Confirm Sink Device Support

20. Follow the instructions in the dialog box. Depending on your answer, a series of dialog boxes may prompt you for your input.

21. If you successfully run the test, the software calculates the jitter values and displays the results. The software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

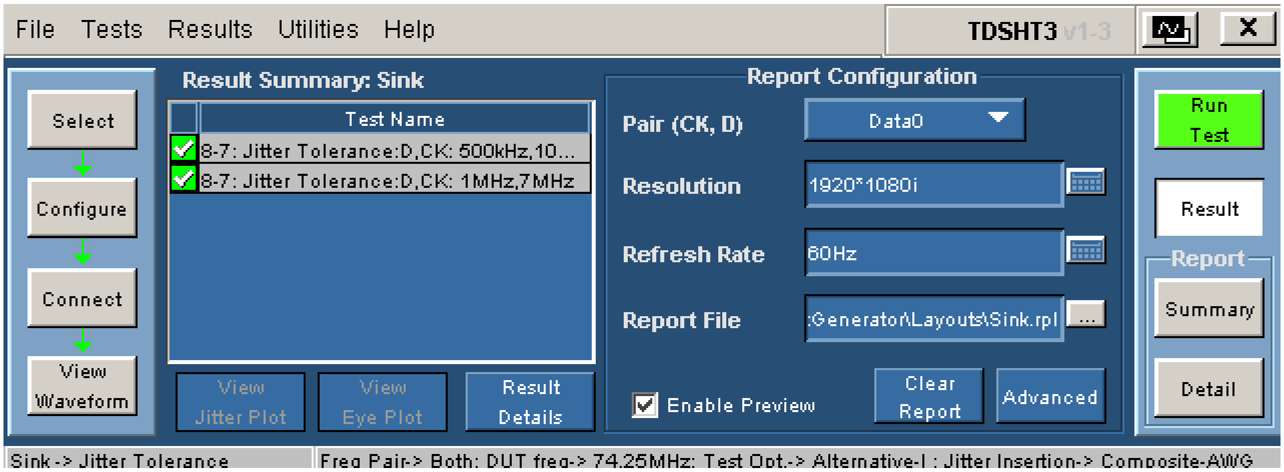


Figure 213: Result for Jitter Tolerance

Table 106: Result for Jitter Tolerance

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

22. You can set the report details to identify and generate the report automatically. You can set a default report file.

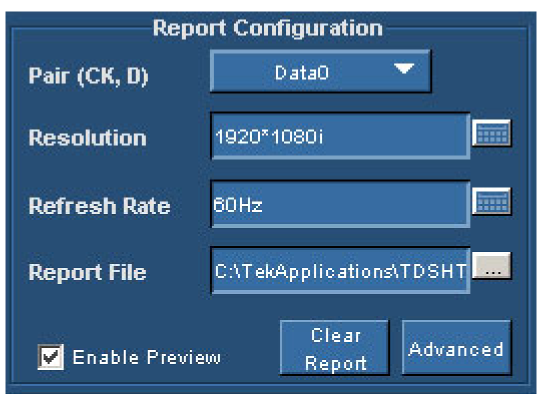


Figure 214: Report Configuration for Jitter Tolerance

In the report configuration pane, you can configure the following parameters:

Table 107: Report Configuration options for Jitter Tolerance

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

23. In the result summary pane, click Result Details to display the details of the result.

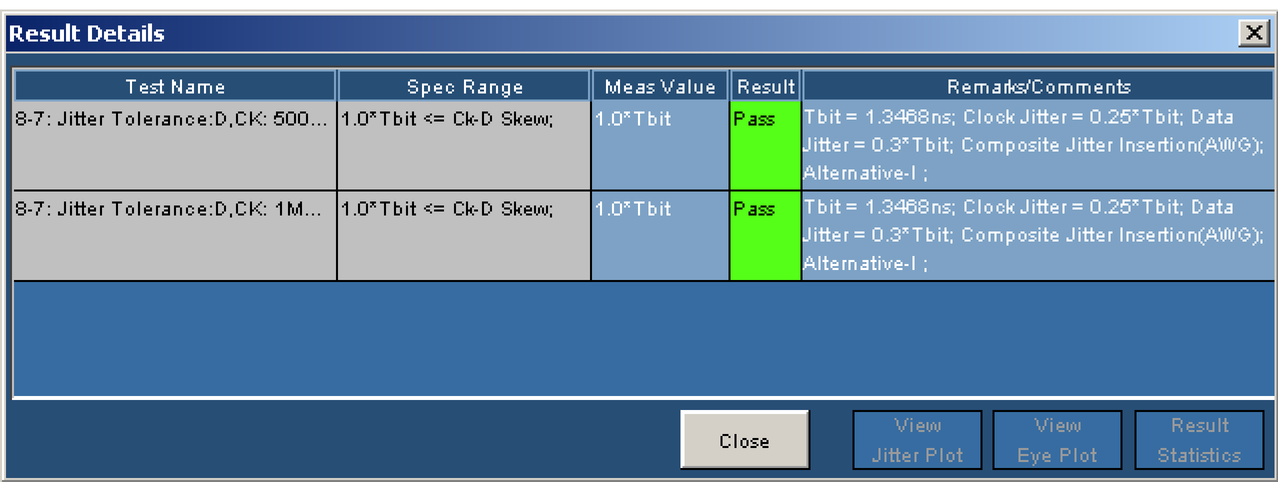


Figure 215: Result Details for Jitter Tolerance

Table 108: Result Details for Jitter Tolerance

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name – CK (Clock), D (Data).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Sink – Intra-Pair Skew

This test allows you to confirm that the maximum allowed timing skew within each TMDS pair is supported by the Sink DUT.

You will need one supported oscilloscope, one differential probe, one cable emulator, one TPA-P-DI fixture, one digital timing generator (DTG), one DC power supply, eight SMA cables, one GPIB controller, and one TPA-P-TDR fixture.

1. On the menu bar, click Tests > Select > Sink.

2. In the single-ended tests pane, select the Intra-Pair Skew check box.

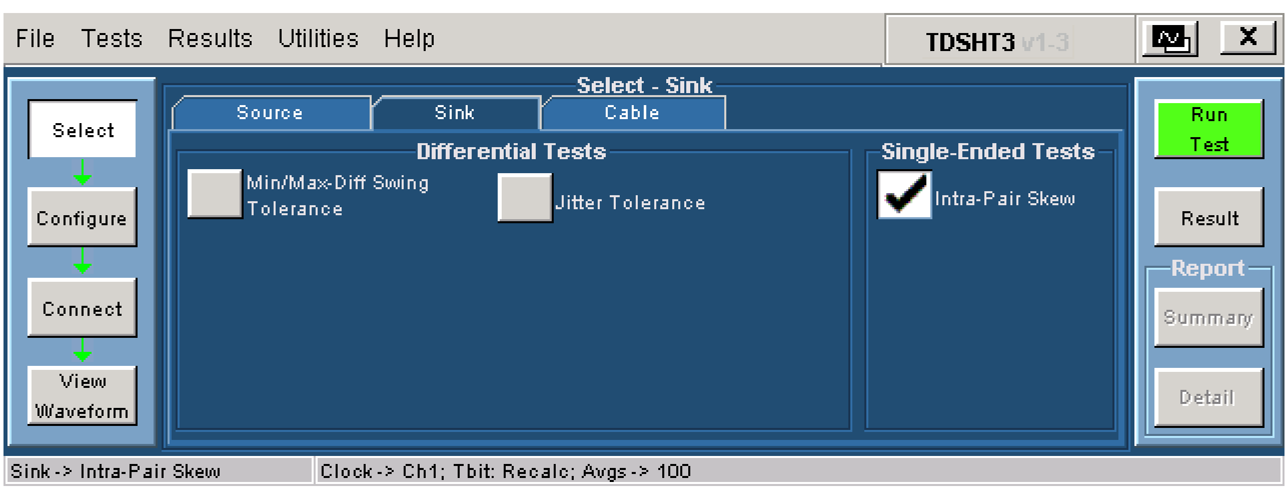


Figure 216: Select Sink with Intra-Pair Skew test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

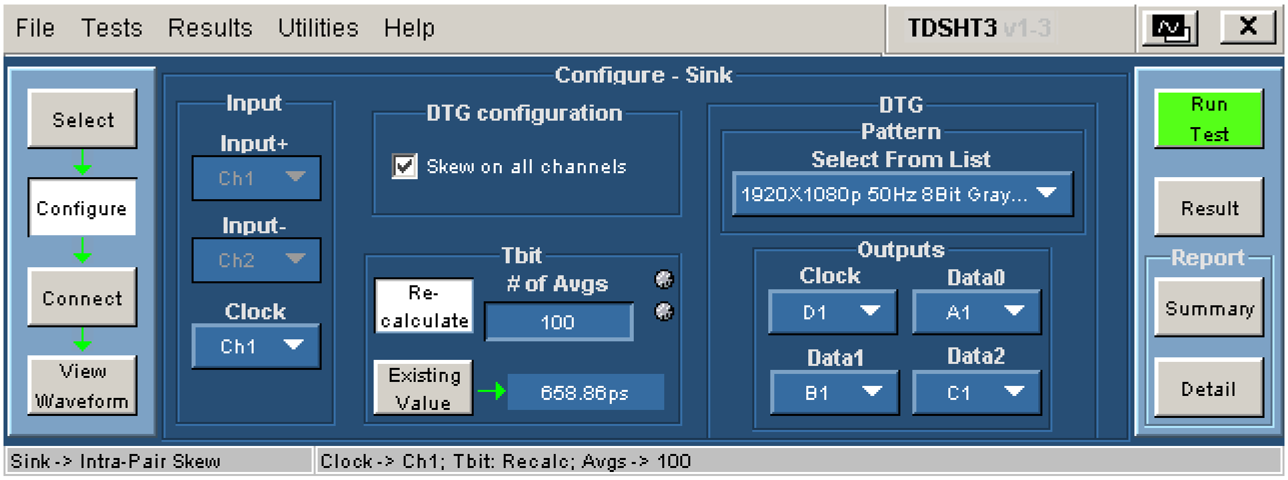


Figure 217: Configure for Sink Intra-Pair Skew

***Note**: The default configuration is to introduce skew on all the channels (Clock, DO, D1, D2). If you want to calculate the intra-pair skew for individual channels, then connect the desired channel to A1and A2. For example, to calculate the intra-pair skew of Data0, assign A1 to Data0 and B1 to Clock. Make the appropriate changes in the test connections.*

4. In the Input pane, you have the following option:

Table 109: Input option for Sink Intra-Pair Skew

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. In the tbit pane, you have the following options:

Table 110: Tbit options for Sink Intra-Pair Skew

Configure Parameter	Description
# of Avgs	In the # of Avgs box, enter the desired number of periods that are considered to calculate Tbit. The default value is 100.
Re-calculate	Click Re-calculate to recalculate the Tbit value.
Existing Value	Click Existing Value to use the previously calculated Tbit value.

6. In the DTG configuration pane, you have the following option:

Table 111: DTG configuration option for Sink Intra-Pair Skew

Configure Parameter	Description
Skew on all channels	Select the skew on all channels to set the skew on all the channels. This way skew will be introduced on Clock, D0, D1, and D2. All the four DTGM modules are required for this option.

Note: *The four DTGM modules can be connected as follows: Clock +ve to A1 and Clock –ve to A2, D0 +ve to B1 and D0 –ve to B2, D1 +ve to C1 and D1 -ve to C2, D2 +ve to D1 and D2 –ve to D2.*

7. In the DTG Pattern pane, you have the following option:

Table 112: DTG Pattern option for Sink Intra-Pair Skew

Configure Parameter	Description
Select From List	Select the DTG pattern file from the drop-down list.

8. In the outputs pane, you have the following options:

Table 113: Output options for Sink Intra-Pair Skew

Configure Parameter	Description
Clock	The Clock list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 0	The Data 0 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 1	The Data 1 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 2	The Data 2 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.

9. To connect the DUT, click Tests > Connect.

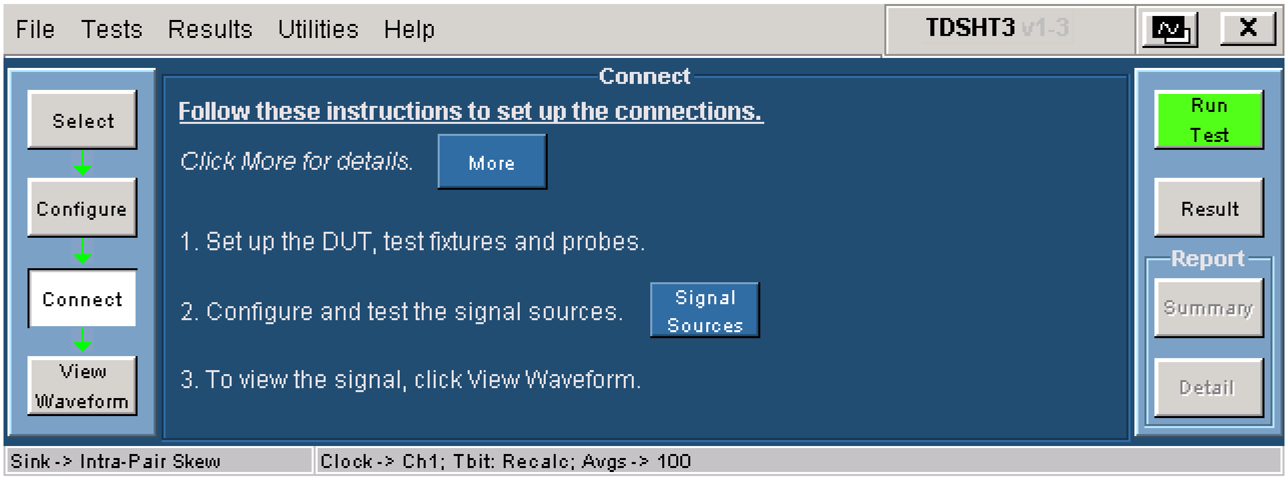


Figure 218: Connect pane for Sink Intra-Pair Skew

10. To configure and test the GPIB connection to the DTG, click Signal Sources. The Signal Sources Setup dialog box appears.

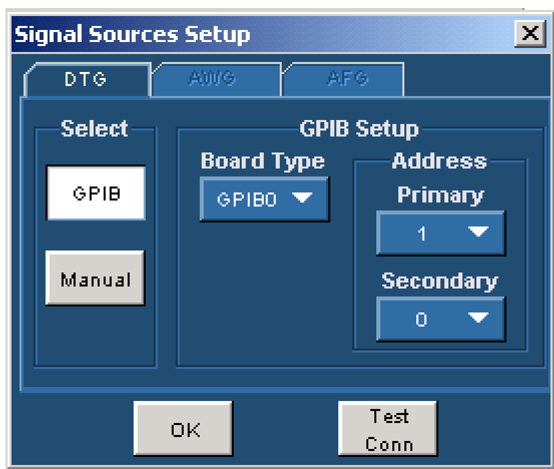


Figure 219: Signal Sources Setup for Sink Intra-Pair Skew

11. In the select pane, click GPIB. Configure the appropriate GPIB board number.

12. To test both the connection and the DTG GPIB configuration, click Test Conn.

13. Ensure that your signal in the oscilloscope display is similar to the sample signal. Click View Waveform to display a sample of the expected signal. If the displays are not similar, go back and check your configuration and connections. The sample signal appears if you have selected the re-calculate Tbit option.

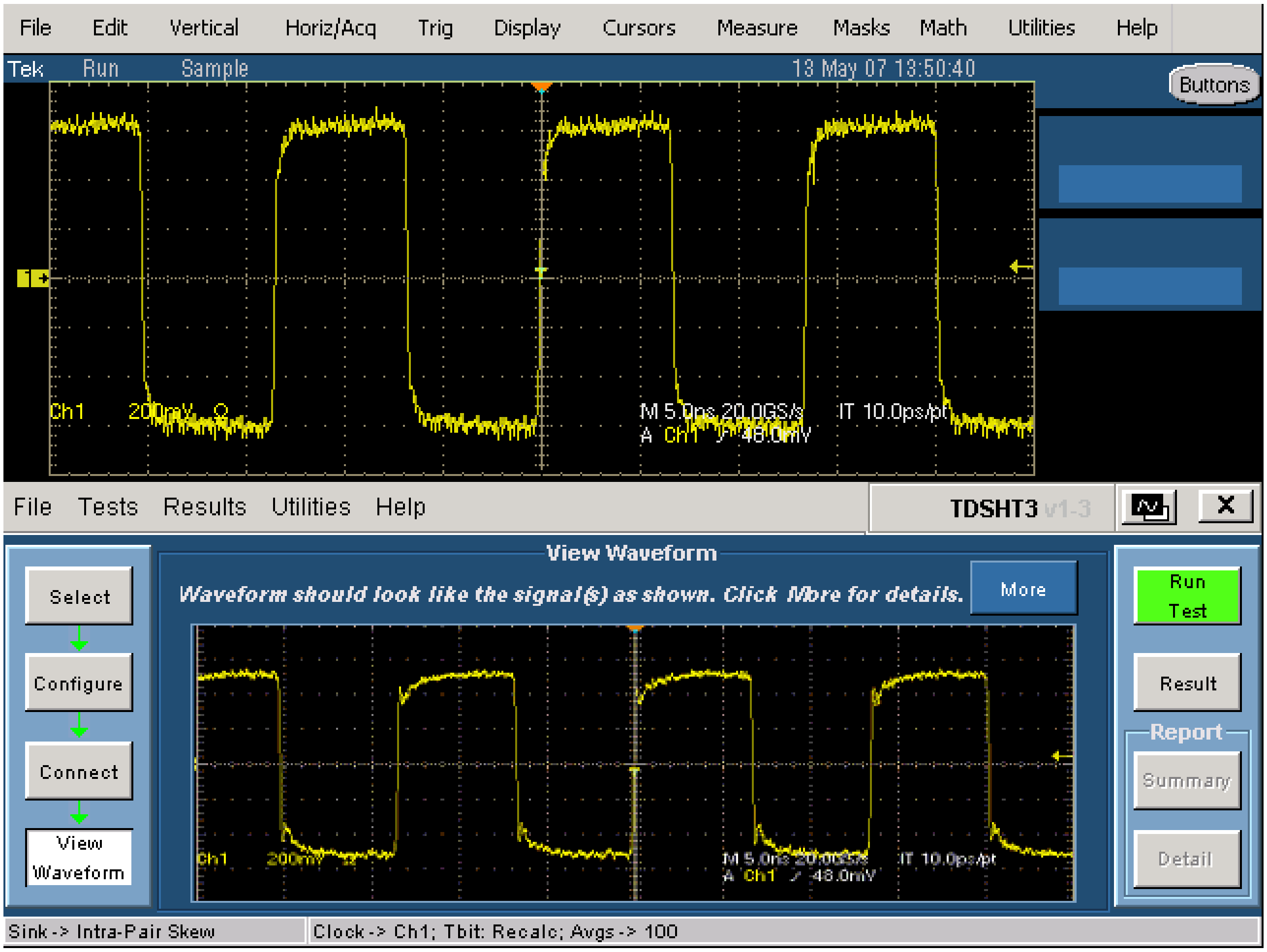


Figure 220: Waveform of Sink Intra-Pair Skew

Note: To run the test successfully, ensure that the Bus Timing parameter is set to 2 µsec on your GPIB board configuration. For more details, refer to the section on Remote Control Caution.

14. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and conducts the test. Follow the instructions in the dialog box. Depending on your answer, a series of dialog boxes may prompt you for your input.

15. If you successfully run the test, the software makes Result available automatically and displays the result summary. You can also view the report configuration details in the result pane.

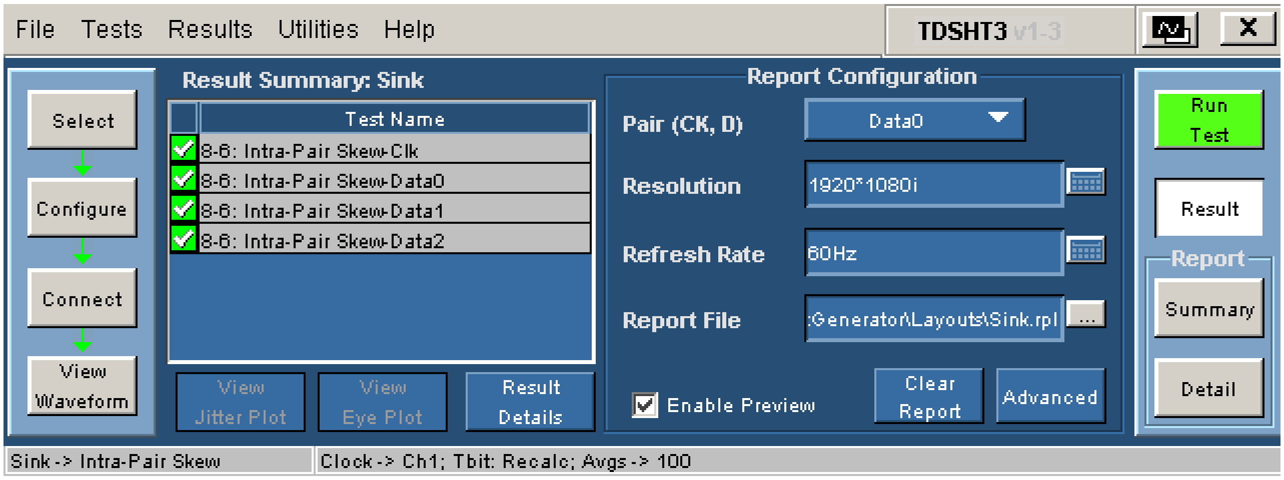


Figure 221: Result for Sink Intra-Pair Skew when Skew on all Channel is selected

Table 114: Result for Sink Intra-Pair Skew

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock).
Status	Status indicates the status of the test as Pass, Fail, or Error.
Result Details	Click Result Details to display the details of the result.

16. You can set the report details to identify and generate the report automatically. You can set a default report file.

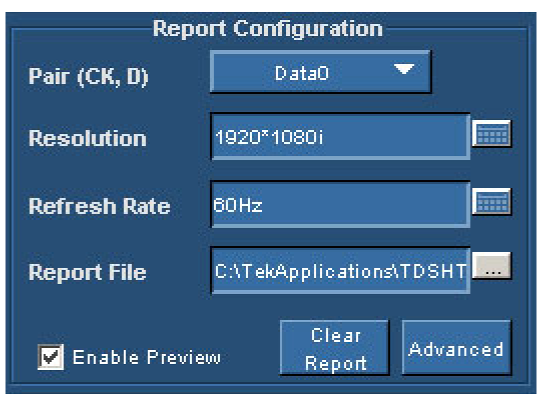


Figure 222: Report Configuration for Sink Intra-pair Skew

In the report configuration pane, you can configure the following parameters:

Table 115: Report Configuration options for Sink Intra-Pair Skew

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

17. In the result summary pane, click Result Details to display the details of the result.

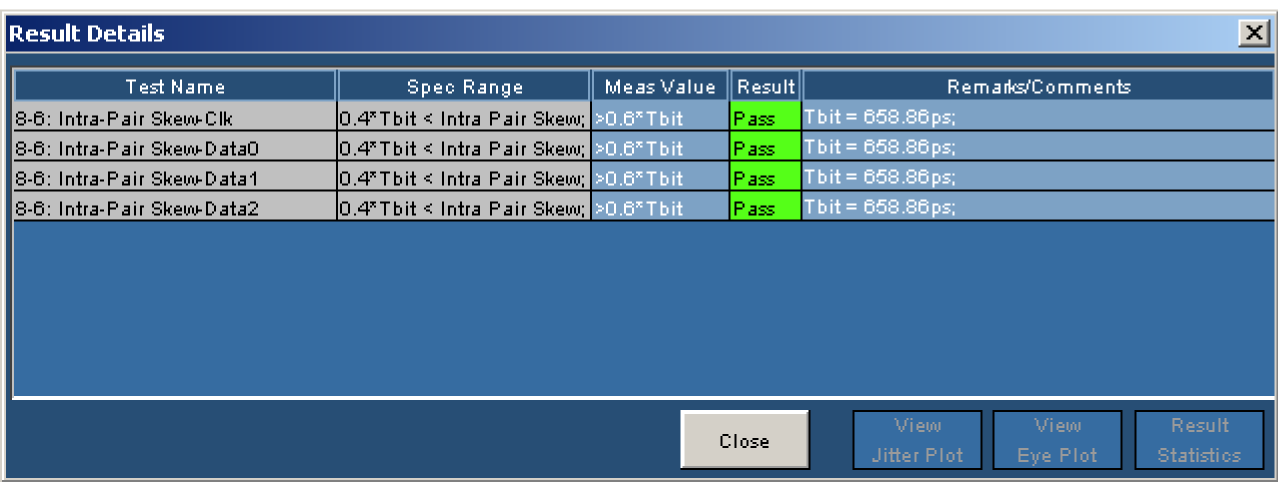


Figure 223: Result Details for Sink Intra-pair Skew when Skew on all Channel is selected

Table 116: Result Details for Sink Intra-Pair Skew

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.

Cable – Eye Diagram

This test allows you to confirm that the Cable assembly outputs a compliant data eye. You can check the input test signal at TP1, and verify the output of the cable, for compliance, at TP2.

The signal degradation of typical passive copper cables increases with the frequency and the length of the cable. To recover data from such cables, the TDSHT3 applies the reference cable equalizer (as specified in the HDMI specifications 1.3) automatically to the Cable eye diagram measurement when the clock frequency is more than 165 MHz.

You will need one supported oscilloscope, two differential probes, one digital timing generator (DTG), one GPIB controller, one DC power supply 3.3 V, eight SMA cables, one TPA-R-DI fixture, and one TPA-R-TDR fixture.

1. On the menu bar, click Tests > Select > Cable.

2. In the differential tests pane, select the Eye Diagram check box.

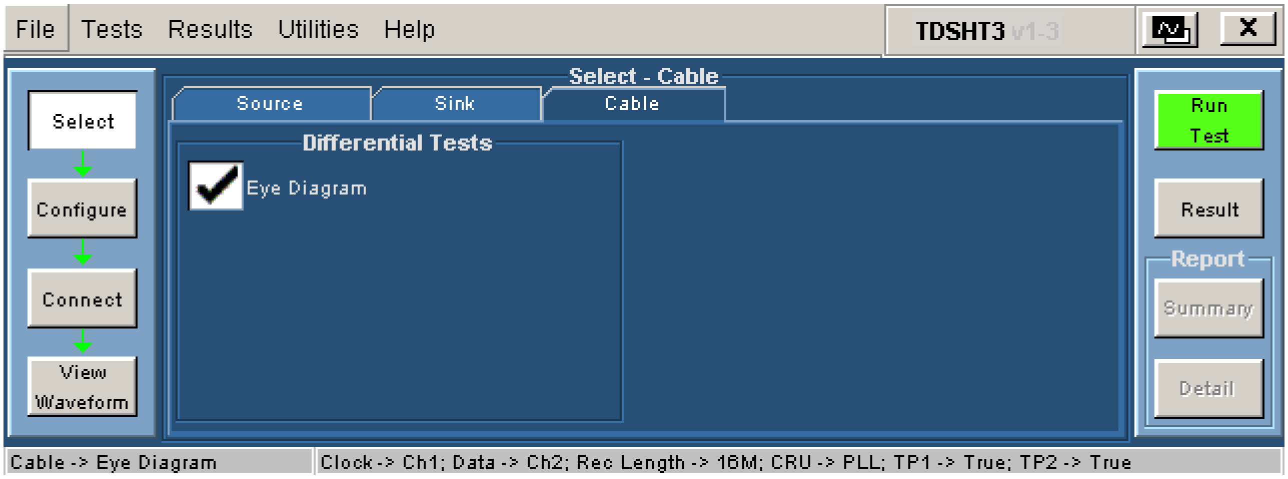


Figure 224: Select Cable with Eye Diagram test selected

3. To change the configuration settings, click Tests > Configure. For most tests, you can use the factory default configuration. However, you can change the values by using the virtual keyboard or the general-purpose knob on the oscilloscope front panel. Using the File menu, you can also restore the factory defaults or save and recall your own configuration settings.

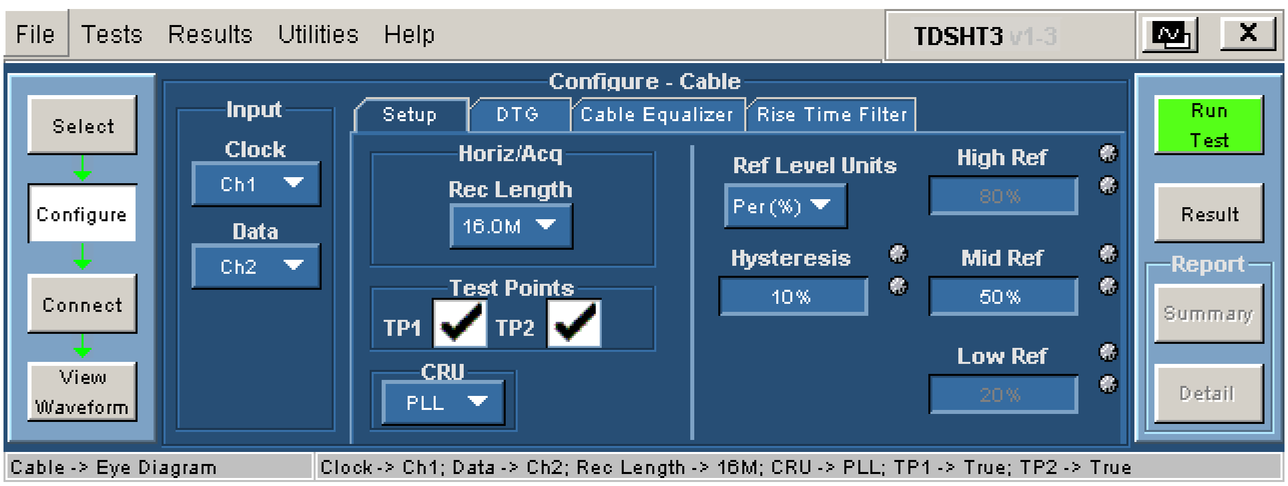


Figure 225: Configure Cable Setup for Eye Diagram

4. In the input pane, you have the following options:

Table 117: Input options for Cable Eye Diagram

Configure Parameter	Description
Clock	Clock indicates the oscilloscope channel to which you will connect the clock input. The available choices are Ch1, Ch2, Ch3, and Ch4.
Data	Data indicates the oscilloscope channel to which you will connect the data input. The available choices are Ch1, Ch2, Ch3, and Ch4.

5. On the Setup tab, in the horiz/acq pane, you have the following option:

Table 118: Horiz/Acq option for Cable Eye Diagram

Configure Parameter	Description
Record Length	In the Rec Length box, enter the desired record length value for the eye tests.

6. On the Setup tab, in the test points pane, you have the following options:

Table 119: Test Points options for Cable Eye Diagram

Configure Parameter	Description
TP1	TP1 represents the first test point. Feed the worst possible compliant signal at TP1. By default, the TP1 check box is selected.
TP2	TP2 represents the second test point. The worst possible compliant signal fed at TP1 is transmitted through the cable. The same signal is tested at TP2 with the TP2 specification. By default, the TP2 check box is selected.

7. On the Setup tab, in the CRU pane, you have the following option:

Table 120: CRU options for Cable Eye Diagram

Configure Parameter	Description
CRU	The CRU list allows you to configure the CRU. The available choices are PLL, Raw, and Ideal. The default value is first order PLL and is used for compliance testing. Raw and Ideal are used for analysis.

8. On the Setup tab, you also have the following options:

Table 121: Setup options for Cable Eye Diagram

Configure Parameter	Description
Ref Level Units	The Ref Level Units list allows you to set the reference level units to either Per (%) or Abs. Per (%) indicates that the reference levels are a percentage of the Vswing value. Abs indicates that the reference levels are absolute voltage values.
Hysteresis	In the Hysteresis box, enter the desired hysteresis percent value. The default value is 10 percent.
Mid Ref	In the Mid Ref box, enter the desired mid reference voltage value. The default value is 50 percent.

9. On the DTG tab, in the DTG pane, you have the following option:

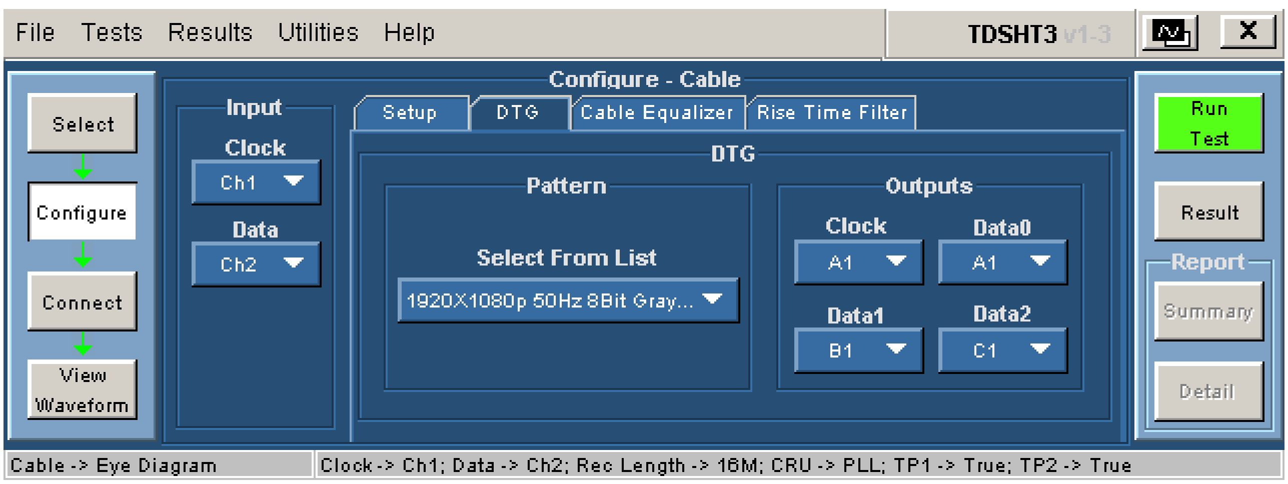


Figure 226: Configure Cable DTG for Eye Diagram

Table 122: DTG option for Cable Eye Diagram

Configure Parameter	Description
Select Pattern List	Select the DTG pattern file from the drop-down list.

10. On the DTG tab, in the outputs pane, you have the following options:

Table 123: DTG Outputs options for Cable Eye Diagram

Configure Parameter	Description
Clock	The Clock list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 0	The Data 0 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 1	The Data 1 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.
Data 2	The Data 2 list allows you to configure the output. The available choices are A1, A2, B1, B2, C1, C2, D1, and D2.

11. On the Cable Equalizer Configuration tab, you have the following options:

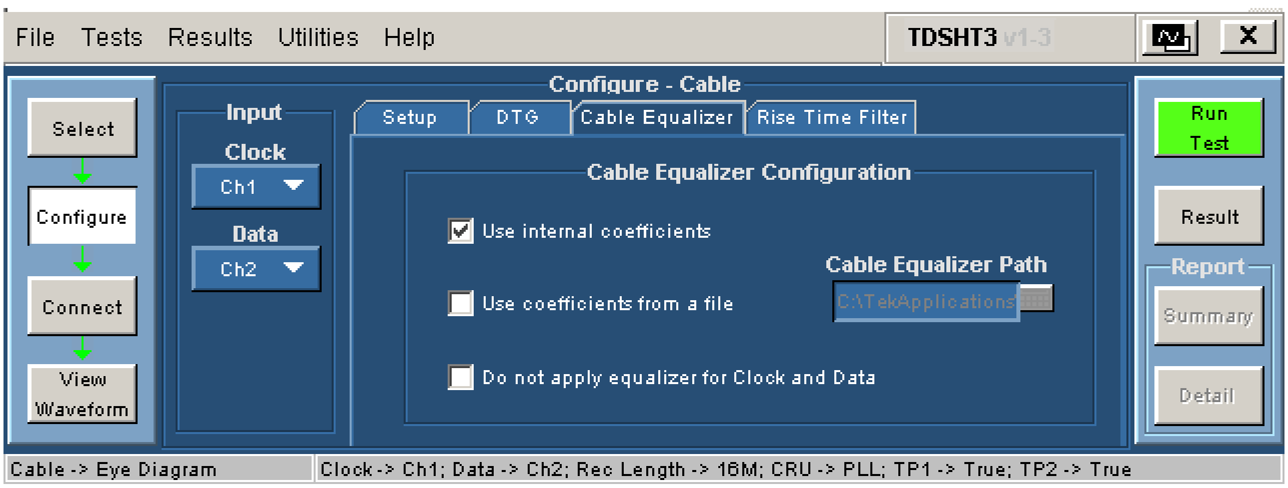


Figure 227: Configure Cable Equalizer for Eye Diagram

Table 124: Cable Equalizer Configuration options for Eye Diagram

Configure Options	Description
Use internal coefficients	Select the Use Internal coefficients check box to use the internal coefficients that are already available (these coefficients are in accordance with the CTS).
Use coefficients from a file	Select the Use coefficients from a file check box to use the coefficients from a file. You can browse to the cable equalizer file from the Cable Equalization Path option.
Do not apply equalizer for Clack and Data	Select Do not apply equalizer for Clock and Data if you do not want to apply cable equalization.

12. On the Rise Time Filter tab, you have the following options:

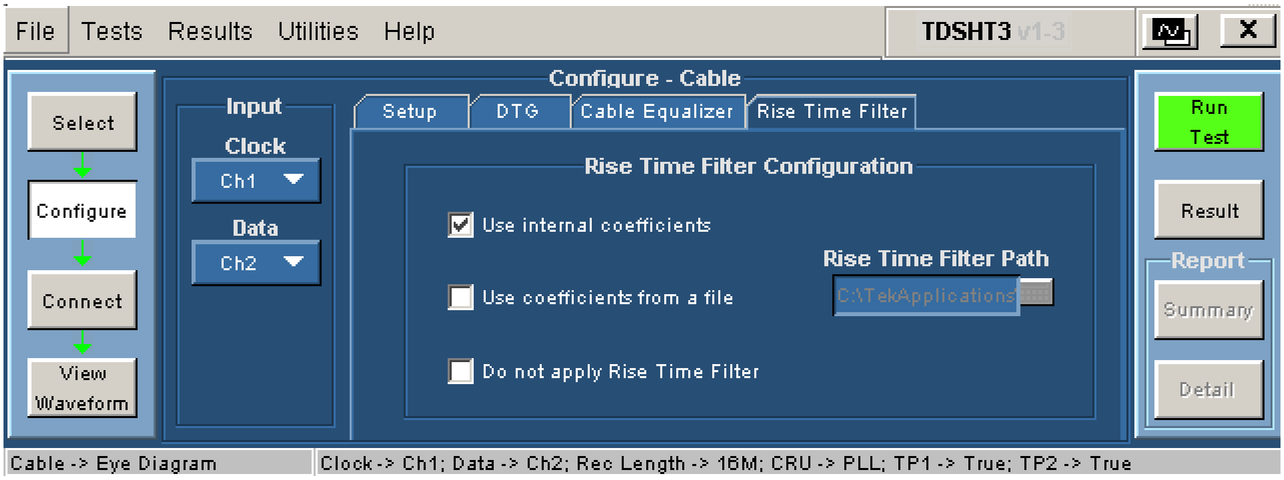


Figure 228: Configure Rise Time Filter for Eye Diagram

Table 125: Rise Time Filter Configuration options for Eye Diagram

Configure Options	Description
Use Internal coefficients	Select the Use Internal coefficients check box to use the internal coefficients that are already available (these coefficients are in accordance with the CTS).
Use coefficients from a file	Select the Use coefficients from a file check box to use the coefficients from a file. You can browse to the rise time filter file from the Rise Time Filter Path.
Do not apply rise time filter for Clock and Data	Select Do not apply rise time filter for Clock and Data if you do not want to filter.

13. To connect the DUT, click Tests > Connect.

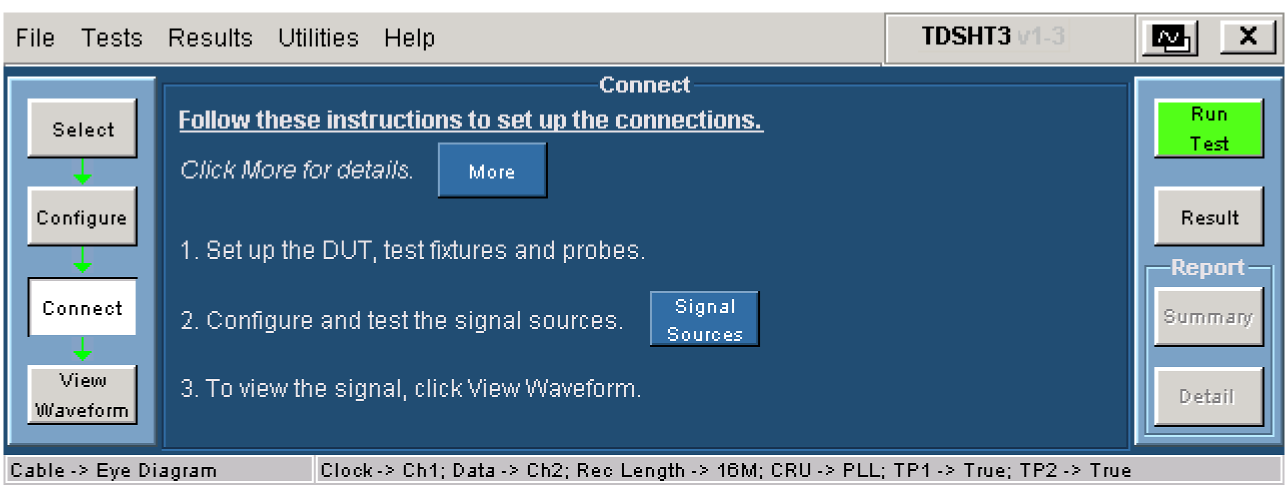


Figure 229: Connect pane for Cable Eye Diagram

14. To configure and test the GPIB connection to the DTG, click Signal Sources. The Signal Sources Setup dialog box appears.

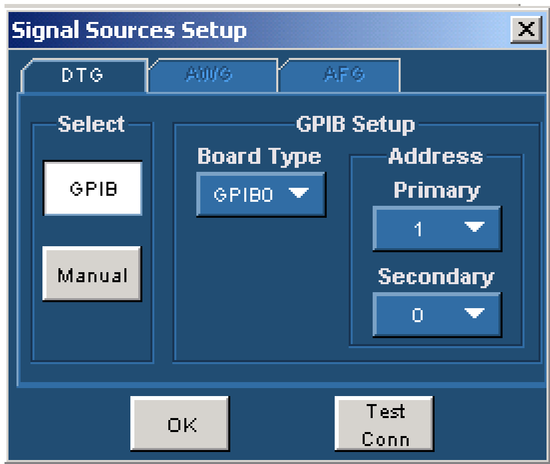


Figure 230: Signal Sources setup for Cable Eye Diagram

15. In the select pane, click GPIB. Configure the appropriate GPIB board number.

16. To test both the connection and the DTG GPIB configuration, click Test Conn.

17. Because no signal is connected to the oscilloscope, you cannot view the waveform for the eye diagram test.

Note*: To run the test successfully, ensure that the Bus Timing parameter is set to 2 µsec on your GPIB board configuration. For more details, refer to the section on Remote Control Caution.*

18. Click Run Test to perform the test. The TDSHT3 HDMI Compliance Test Software sets up the oscilloscope and the test runs, displaying a progress indicator.

19. In the GPIB mode, the application automatically adjusts the jitter amplitude on DTG and displays the measured jitter value. Follow the on-screen instructions to enable you to re-adjust the jitter value. The software creates a worst eye and asks you to verify the worst eye. Follow the on-screen instructions. Depending on your answer, a series of dialog boxes may prompt you for your input.

20. If you have run the test successfully, the software makes Result available automatically and displays the eye diagram plot and the clock jitter plot for both TP1 and TP2. You can also view both the result summary of the test and the report configuration in the result pane as shown in the following diagram:

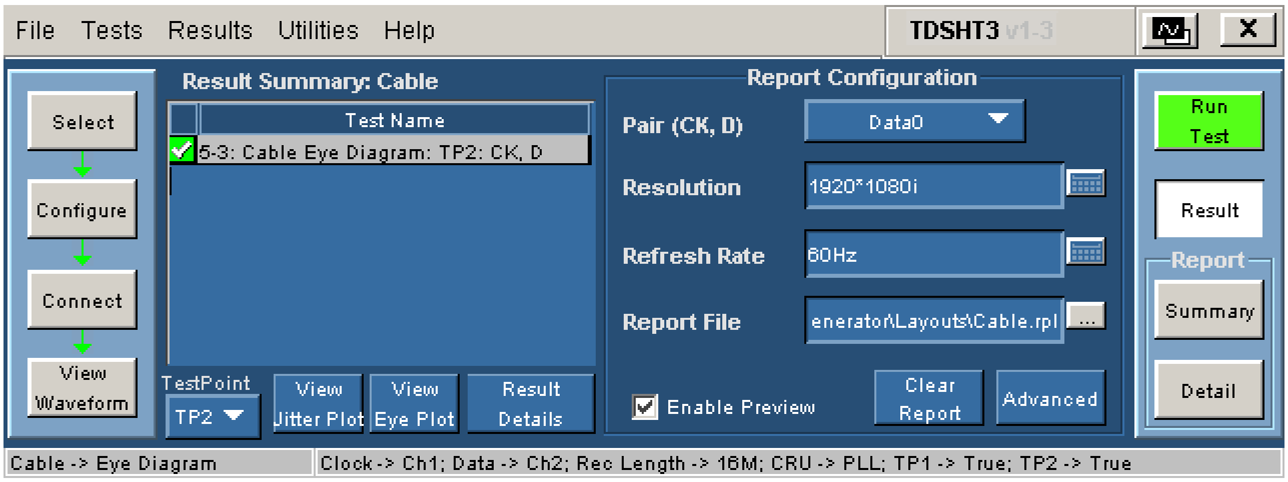


Figure 231: Result for Cable Eye Diagram

Table 126: Result for Cable Eye Diagram

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Status	Status indicates the status of the test as Pass, Fail, or Error.
TestPoint	You can check the input test signal at TP1, and verify the output of the cable, for compliance, at TP2. From the TestPoint list, select either TP1 or TP2 to view the respective details.
View Jitter Plot	Click View Jitter Plot to view the jitter plot for the selected test point for the eye diagram test.
View Eye Plot	Click View Eye Plot to view the eye plot for the selected test point for the eye diagram test.
Result Details	Click Result Details to display the details of the result.

21. You can set the report details to identify and generate the report automatically. You can set a default report file.

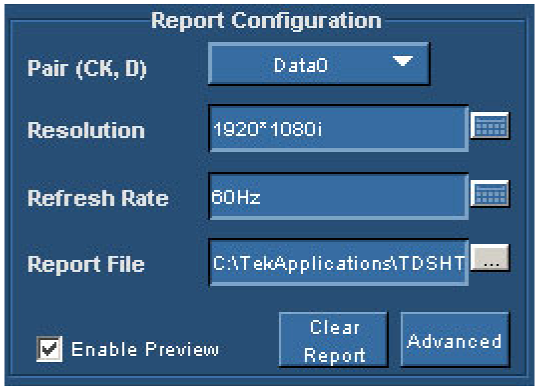


Figure 232: Report Configuration for Cable Eye Diagram

In the report configuration pane, you can configure the following parameters:

Table 127: Report Configuration options for Cable Eye Diagram

Category	Description
Pair (CK, D)	The Pair (CK, D) list allows you to specify the unique pairs on which the test is conducted.
Resolution	The Resolution box allows you to specify the resolution on which the test is conducted.
Refresh Rate	The Refresh Rate box allows you to specify the refresh rate at which the test is conducted.
Report File	The Report File box allows you to specify the path and the file where the generated report will be saved. However, for the selected speed, a default file name and path already exists.
Enable Preview	Select the Enable Preview check box to preview the report automatically after generation.
Clear Report	Click Clear Report to clear all the results and records of the earlier tests.
Advanced	Click Advanced to open the Report Configuration Advanced dialog box.

22. In the result summary pane, click Result Details to display the details of the result.

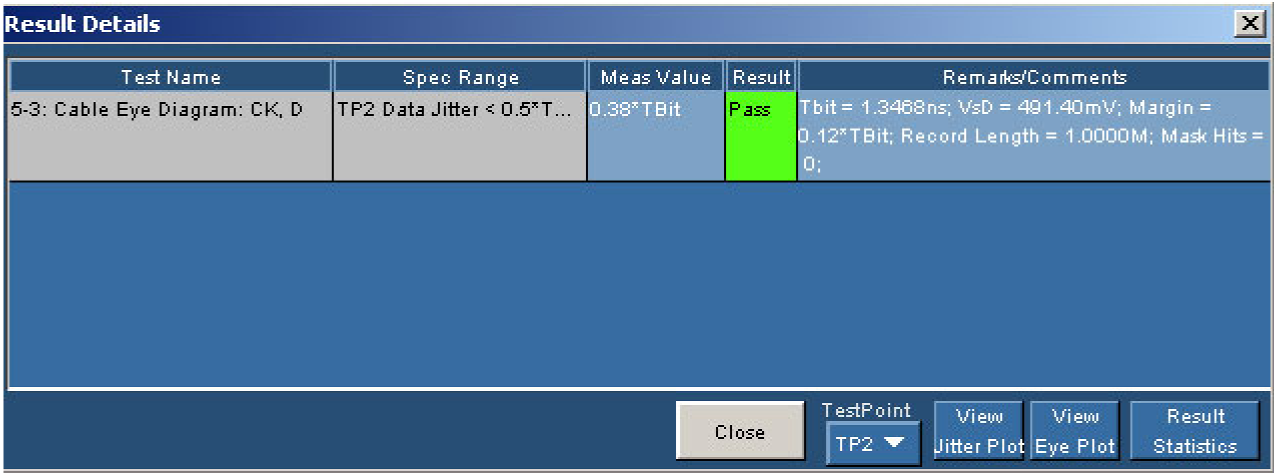


Figure 233: Result Details for Cable Eye Diagram

Table 128: Result Details for Cable Eye Diagram

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal name - CK (Clock), D (Data).
Spec Range	The Spec Range box displays the HDMI standards and test specifications limit for the test.
Meas Value	The Meas Value box displays the measured value.
Result	The Result box displays the status of the test as Pass, Fail, or Error.
Remarks/Comments	The Remarks/Comments box displays the relevant details, for example, Tbit, and Margin. If the test could not be run, then an error code appears.
Close	Click Close to quit the Result Details dialog box.
TestPoint	You can check the input test signal at TP1, and verify the output of the cable, for compliance, at TP2. From the TestPoint list, select either TP1 or TP2 to view the respective details.
View Jitter Plot	Click View Jitter Plot to view the jitter plot for the selected test point for the eye diagram test.
View Eye Plot	Click View Eye Plot to view the eye plot for the selected test point for the eye diagram test.
Result Statistics	Click Result Statistics to display statistics based on the tests.

23. In the Result Details dialog box, click Result Statistics to display statistics based on the tests.

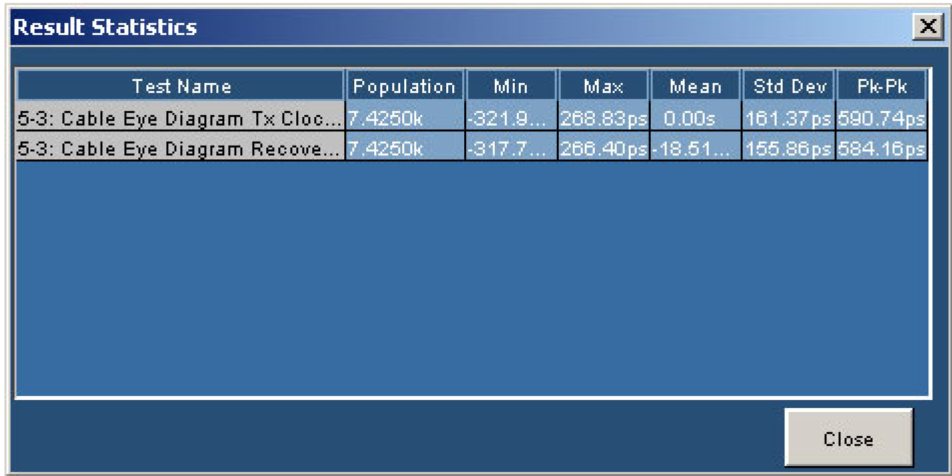


Figure 234: Result Statistics for Cable Eye Diagram

The software calculates statistics for each selected test, and logs the statistics on a cycle-by-cycle basis in a large waveform. The standard statistics are for the Maximum, Minimum, Mean, Standard Deviation, and Population.

Table 129: Result Statistics for Cable Eye Diagram

Option	Description
Test Name	The Test Name box displays the test id, test name, and signal names - CK (Clock), D (Data).
Population	The software calculates this statistic by using the following equation: Population (X) = N
Min	The software calculates this statistic by using the following equation: Min (X) = Lowest value of X
Max	The software calculates this statistic by using the following equation: Max (X) = Highest value of X
Mean	The software calculates this statistic by using the following equation: $Mean\ (X) = \overline{X} = \frac{1}{N}\sum_{n=1}^{N} X_n$

Table 129: Result Statistics for Cable Eye Diagram (Contd.)

Option	Description
Std Dev	The software calculates this statistic by using the following equation: $$Standard\ Deviation\ (X) = \sigma_x = \sqrt{\frac{1}{(N-1)}\sum_{n=1}^{N}(X_n - \overline{X})^2}$$
Pk-Pk	The software calculates this statistic by using the following equation: Xppn = Max(X) - Min(X)
Close	Click Close to quit the Result Statistics dialog box.

Measurement Algorithms

Software CRU Technology

The HDMI specification mandates the Clock Recovery Unit (CRU) by using a Phase Locked Loop (PLL) with first order transfer function characteristics, to test both the jitter and the eye diagram. A PLL-based CRU implemented in hardware makes correlation of test results difficult due to differences in vendor-specific implementations. There are software PLL techniques that exist to extract clock and timing data from a serial data stream. The following method shows a more practical and affordable way to satisfy the requirement:

PLL Characteristics

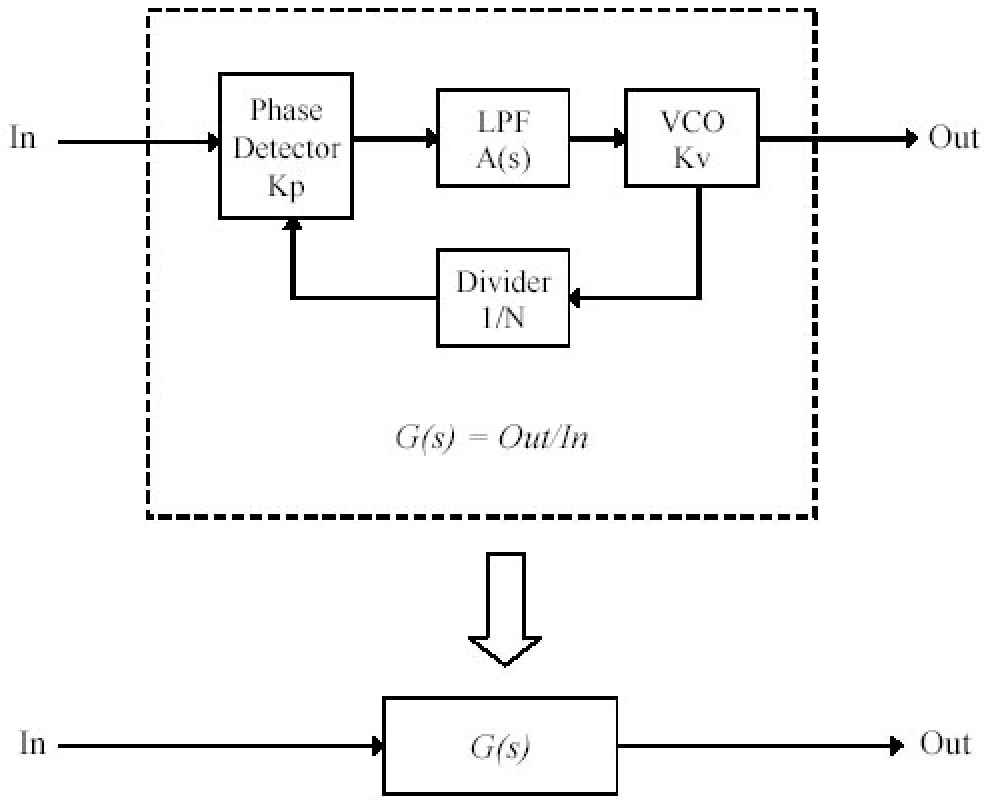


Figure 235: PLL design for CRU implementation

The diagram shows a simplified block diagram of generic phase-locked loop (PLL). A PLL consists of the Phase Detector (PD), Low-Pass Filter (LPF), Voltage Controlled Oscillator (VCO), and Frequency Divider (FD).

The phase of the input signal is compared to the phase of FD output. The input of the FD is the output of VCO, whose frequency is controlled by the LPF output.

The LPF output is a filtered form of the PD output. When the phase of FD output is leading compared to the input phase, the PD output changes to decrease the VCO frequency. Thus, the FD output will lag. Due to the effect of this feedback mechanism, the frequency of VCO is locked to N-times of the input frequency.

The LPF restricts the quick variation of the incoming signal, so that high frequency changes in the input phase are attenuated before they are transferred to consecutive functional blocks. Therefore, the VCO output represents the average phase of input signal even if the input signal does not have the constant phase rotation (frequency). Using this approach, the PLL circuitry recovers the clock information from the modulated input signal.

The transfer function from the input phase to the output phase is represented by following equation:

$$G(s) = \frac{\dfrac{Kp \cdot Kv \cdot H(s)}{s}}{1 + \dfrac{Kp \cdot Kv \cdot H(s)}{s \cdot N}} = \frac{N \cdot Kp \cdot Kv \cdot H(s)}{s \cdot N + Kp \cdot Kv \cdot H(s)}$$

where Kp and Kv are the sensitivity coefficients of PD and VCO respectively, and N is the division factor of FD. H(s) is the transfer function of LPF in the frequency domain.

Assuming that N, Kp, and Kv are constant, the function G(s) can be simplified as follows:

$$G(s) = \frac{K_2 \cdot H(s)}{s + K_1 \cdot H(s)}$$

Note that G(s) becomes the first order low-pass filter only when H(s) is constant, namely when H(s) is non-dependent on the frequency. This means that H(s) is not a low-pass filter in this case. On the contrary, it is well known that the PLL is not stable without a low-pass filter in place of H(s). Therefore, the first order transfer function that is required by CRU for HDMI may not be realized by the PLL circuitry as shown in the earlier PLL Functional Block diagram.

Conventional Method

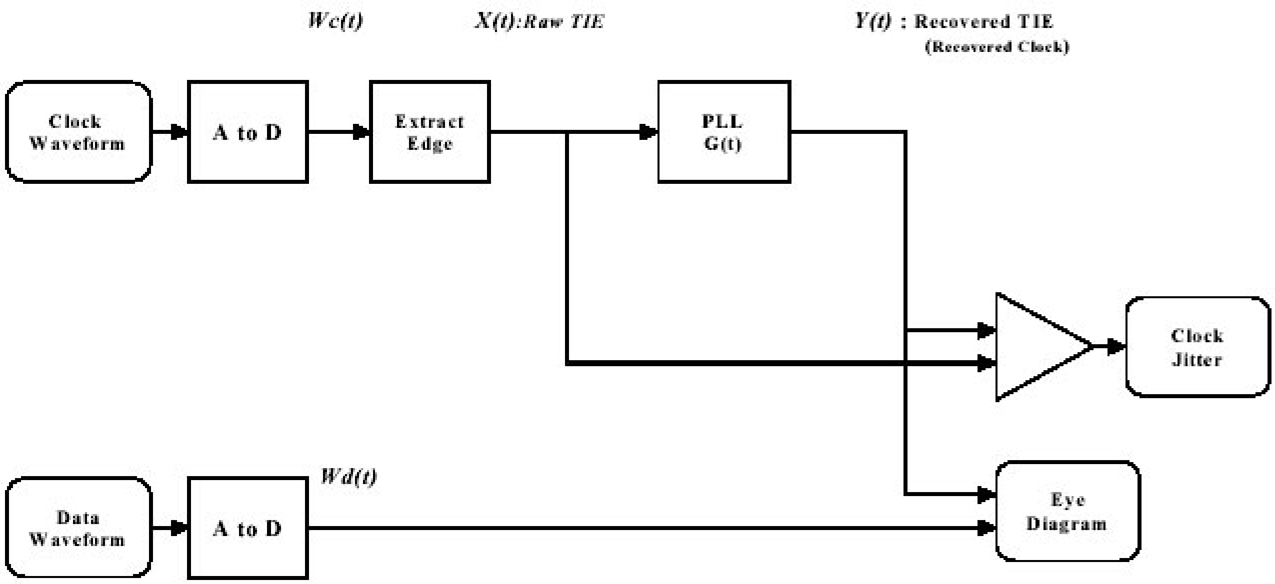


Figure 236: Conventional diagram of PLL design for CRU implementation

The diagram shows a simple PLL design for CRU, measuring both the clock jitter and eye diagram within a digital oscilloscope. The input signal is first converted to digital information with an A/D converter. The phase of the input signal is extracted by finding the rising (or falling) edges of the digitized signal. A digital simulation of an actual hardware PLL circuit may be realized because the input and output signals exist as just digital information. In this case, the voltage values at several points in the PLL circuit are expressed in the time domain, and are repetitively calculated to derive their time variation. The time interval of the calculation must be sufficiently small to retain the high precision of the simulation. Hence, it requires significant digital processing capability to simulate actual PLL within a reasonable amount of time.

In this method, the phase transfer function of the PLL is determined by the characteristics of the simulated components. As long as the simulation observes the laws of physics, the resultant transfer function does not differ from that of the actual hardware PLL circuit. Given the time to process the data in the simulation, using this method is not advisable. Hence, the first order transfer function to be realized by this method may not be useful either.

Another method to simulate a PLL in software is to use its time domain transfer function from the input phase error to output timing information. The impulse response is used as the time domain transfer function. In this case, given the input signal X(t), the integral operation shown next gives the output signal Y(t).

$$Y(t) = \int_{\tau=-\infty}^{\infty} X(t) \cdot G(\tau - t) d\tau$$

where G(t) is the time domain representation of G(s) mentioned in the previous section. This is called a convolution integral. In this case, the input signal is represented as discrete-time samples. The integration shown earlier should also be performed in discrete fashion as follows:

$$y(n) = \sum_{m=-\infty}^{\infty} g(m) \cdot x(n-m) = \sum_{m=-\infty}^{\infty} g(n-m) \cdot x(m)$$

There are two disadvantages in the time domain convolution method. One is that it still requires a huge number of multiplications and additions to calculate the values of all time points, as easily seen from the form of the equation above. Another is that it is not always practical to express the time domain transfer function as an explicit mathematical representation. In many cases, the human interpretation of the transfer function is made in frequency domain. Some means of conversion is required to derive the time domain response from the frequency domain characteristics. This requirement will complicate the design of the user interface.

It is important to mention that the first order transfer function characteristics can be realized by this convolution method, even though it has the difficulties described earlier. This method is inherently stable as far as an appropriate impulse response is adopted, because it does not include a feedback loop.

Proposed Method

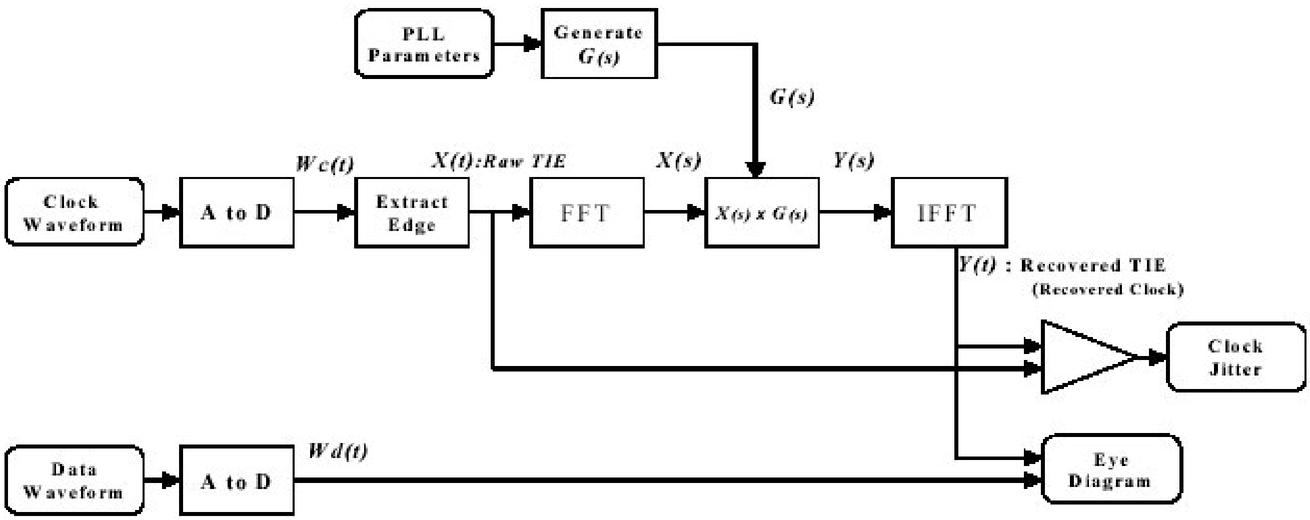


Figure 237: Proposed diagram of PLL design for CRU implementation

The PLL circuitry acts as a low-pass filter for incoming time information. In the frequency domain, the filter function is realized by multiplying the frequency response coefficients to the input spectrum. The convolution integral in the time domain is equivalent to simple multiplication between frequency-domain functions derived by the Fourier Transform. If the time information and the PLL characteristics are transformed to frequency domain, the PLL processing becomes much easier than in the time domain.

$$Y(s) = G(s) \cdot X(s)$$

As seen in this equation, the calculation becomes one per sample point multiplication (though between complex numbers). Hence, the demand for digital processing performance is low.

After the filter function is performed, the time information of the output signal may be derived with inverse transformation. Using an FFT algorithm, the forward and inverse transformation can be executed in relatively short time compared to simulation in time domain. Thus, the total time to calculate the recovered clock can be significantly reduced.

Jitter Test

The jitter of the incoming clock signal is measured by statistically analyzing the time difference between the incoming and recovered clocks. The timing information of both signals is already retained in digital form, so the jitter calculation is simple and straightforward. Usually, the peak-to-peak jitter value and the standard deviation (RMS) jitter value are used for evaluating the signal quality.

$$Jpp = \Delta T \max - \Delta T \min$$

$$J\sigma = \sqrt{\frac{\sum \left(\Delta T_n - \overline{\Delta T}\right)^2}{N}}$$

Appropriate sample points should be chosen to measure the jitter for specific cases such as the clock-to-data jitter at the first bit. Such a requirement is addressed by specifying a rectangular area with time range of [-T..+T] and voltage range of [-V..+V].

To obtain an accurate test, a large number of samples are required. As the earlier area restriction reduces the number of measured samples, the capability to process more and more samples is desired. Using the proposed method, it becomes realistic to gather a huge amount of statistical information for a more precise test.

Eye Diagram

An eye diagram is the incoming data waveform repeatedly drawn with the recovered clock used as the time reference. The recovered clock is represented as time information. Hence, it may be used to derive the position where the input data waveform should be drawn. The resulting diagram will precisely indicate the true marginal area with which the reliability of data transmission is determined.

The vertical coordinate to draw the incoming waveform is determined by using the data value itself. Determine the horizontal coordinate (x) by the following equation:

$$Xcoord = Tn - Tref$$

where Tn is the time of incoming waveform, and Tref is the time of the reference signal (the recovered clock signal).

Test Methods

Source

Eye Diagram

This sequence explains the actions that the software takes while it performs an eye diagram test. For the procedure on how to make this test, see eye diagram test procedure.

1. Connect TPA-P-TDR to the Source DUT HDMI output connector.
2. Connect the SMA differential probes to TMDS Clock and configure as trigger.
3. Connect the second differential probe to TMDS Data.
4. Configure the Source DUT to output the first supported video format.
5. Set up the oscilloscope as follows:
   - Memory length of at least 16 M points
   - Single-shot trigger at rising edge of TMDS Clock (50 percent)
   - Set the sample rate to ≥ 10 GS/s based on the oscilloscope
   - Adjust the vertical scale to accommodate the waveform in six vertical divisions
6. Capture the waveforms on the oscilloscope.

***Note**: Do not transfer the waveforms.*

7. Perform software clock recovery as follows:
   - Find V_H and V_L of both clock and data.
   - Find 50 percent reference level of the clock.
   - Pass the TIE values through the filter (FFT and IFFT) $H(s) = 1/(1+s\tau)$, where $\tau = 40$ nsec.
   - Reconstruct the clock, and then create a bit clock (x10 clock) by using even up sampling.

8. Draw the eye diagram.
   - x10 clock is used for slicing.
   - Draw the eye diagram with ½ UI+UI+½ UI method. This will ensure that all UIs are overlapped.
9. Create eye mask.
   - Calculate V_{SWING} by using V_H and V_L of the data.
   - Construct the mask co-ordinate by using T_{BIT} and V_{SWING}.
10. Position the mask in such a way that one of its left side corners just touches the waveform.
11. If any other part of the waveform either touches or crosses the data eye, then it implies FAIL.
12. Calculate the data jitter by using the histogram technique. The histogram co-ordinates are V_C+/-5 mV.
13. If data jitter is more than ($0.3*T_{BIT}$), then it implies FAIL.
14. Repeat the test for all the remaining TMDS_DATA pairs.
15. Repeat the test for all supported pixel clock rates. Only one video format is required per pixel clock rate.

Duty Cycle

This sequence explains the actions that the software takes while it performs a duty cycle test. For the procedure on how to make this test, see duty cycle test procedure.

1. Connect a TPA-P-DI adapter to the Source DUT HDMI output connector.
2. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
3. Connect a differential probe to the TMDS Clock.
4. Display the waveform of one clock period.

5. Set up the oscilloscope as follows:
   - Adjust the vertical scale to accommodate the waveform in six vertical divisions (Refer vertical setting).
   - Trigger: Edge trigger.
   - Acquire at least 10,000 waveforms in FastAcq.
6. Find the minimum and maximum duty cycle by using the following method:

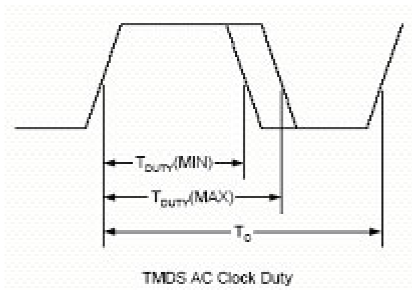


Figure 238: TMDS AC Clock waveform

7. Compare with the limit value.
   - If minimum duty cycle is more than 40 percent, then it implies PASS.
   - If maximum duty cycle is less than 60 percent, then it implies PASS.

Rise/Fall Time

This sequence explains the actions that the software takes while it performs a rise/fall time test. For the procedure on how to make this test, see rise time test procedure and fall time test procedure.

1. Connect a TPA-P-DI adapter to the Source DUT HDMI output connector.
2. Connect the Power Supply to the TPA board.
3. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
4. Connect a differential probe to TMDS_DATA0 and configure as trigger.
5. Set the trigger position at the center of the screen.

6. Set up the oscilloscope as follows:
   - Calculate T_{BIT} by using differential clock.
   - Set the vertical scale to accommodate the waveform in at least six divisions.
   - Set the horizontal scale to more than $2*T_{BIT}$.
   - If pulse width trigger is selected, Trigger with pulse width trigger with ($4*T_{BIT}$) pulse. or trigger with edge trigger.
7. Accumulate at least 10,000-triggered waveforms by acquiring the waveform in FastAcq mode of acquisition.
8. Calculate V_{SWING} of the signal ($V_{SWING} = V_H$-V_L), and then find the 20 percent and 80 percent of the level.
9. Measure the rise time and fall time.
   - Enable the oscilloscope rise time measurement. Set the reference level to 20 percent and 80 percent.
   - Acquire at least 10 K waveforms (RUN and STOP).
   - Calculate the rise time.
   - Set the trigger to negative pulse.
   - Enable the oscilloscope rise time measurement.
   - Acquire at least 10 K waveforms (RUN and STOP).
   - Calculate the fall time.
10. Compare with the limit.
    - If T_{RISE} is less than 75 ps or T_{RISE} is more than ($0.4*T_{BIT}$), then it implies FAIL.
    - If T_{FALL} is less than 75 ps or T_{FALL} is more than ($0.4*T_{BIT}$), then it implies FAIL.
11. Repeat the test for all the remaining TMDS clock and data pairs.

Clock Jitter

This sequence explains the actions that the software takes while it performs a clock jitter test. For the procedure on how to make this test, see clock jitter test procedure.

1. Connect TPA-P-DI to the Source DUT HDMI output connector.
2. Connect the differential probe to the TMDS Clock and configure as trigger.
3. Connect the second differential probe to TMDS_CLOCK.
4. Configure the Source DUT to output the required supported video format.
5. Set up the oscilloscope as follows:
   - Adjust the vertical scale to accommodate the waveform in six vertical divisions.
   - Set the record length to 16 M
   - Set the sample rate to ≥ 10 GS/s based on the oscilloscope
   - Trigger with the rising edge of the clock (50 percent level)
6. Capture the waveforms on the oscilloscope.
7. Do not transfer the waveforms.
8. Perform software clock recovery as follows:
   - Set the reference level to 50 percent of the clock and hysteresis to 10 percent of V_{SWING}.
   - Calculate the Software CRU filter as follows.
     - $H(s) = 1/(1+s\tau)$, where $\tau = 40$ nsec.
9. Draw the TMDS waveform with positive edge trigger.

10. Measure the clock jitter as follows:
    - Calculate V_{SWING} by using V_H and V_L of the clock.
    - Calculate the center voltage as follows:
        - $V_C = (V_H+V_L)/2$
    - Draw the histogram at V_C+/-20 mV.
    - Calculate Pk-Pk jitter and Interpolated Pk-Pk jitter.
11. If clock jitter exceeds ($0.25*T_{BIT}$), then it implies FAIL.

Inter-Pair Skew

This sequence explains the actions that the software takes while it performs an inter-pair skew test. For the procedure on how to make this test, see inter-pair skew test procedure for data-data tests.

1. Connect a TPA-P-DI adapter to the Source DUT HDMI output connector.
2. Connect the first differential probe to TMDS_DATA0.
3. Connect the second differential probe to TMDS_DATA1.
4. Configure the Source DUT to output a video format with the required supported pixel clock frequency.
5. Set up the oscilloscope and acquire the waveform.
    - Adjust the vertical scale to accommodate the waveform in six vertical divisions.
    - Calculate T_{BIT} by using differential clock.
    - Set the record length to 16 M
    - Set the sample rate to ≥ 10 GS/s based on the oscilloscope
    - Set the bit rate based on the T_{BIT} value.
    - Acquire the waveform in real-time single shot.
6. Calculate the data-data inter-pair skew as follows:
    - Find the CTL pattern in Data<X>.
    - Find the CTL pattern in Data<Y>.
    - Find the skew between the two channels in each transition.
    - Calculate the average skew.

7. If TSKEW is greater than (0.2*TPIXEL), then it implies FAIL.
8. Repeat the test for the remaining combinations of TMDS pairs.

Intra-Pair Skew

This sequence explains the actions that the software takes while it performs an intra-pair skew test. For the procedure on how to make this test, see intra-pair skew test procedure.

1. Connect a TPA-P-SE adapter to the Source DUT HDMI output connector.
2. Connect the first single-ended probe to TMDS_DATA0+.
3. Connect the second single-ended probe to TMDS_DATA0-.
4. Configure the Source DUT to output a video format with the highest supported pixel clock frequency.
5. Set up the oscilloscope as follows:
   - Calculate T_{BIT} by using differential clock.
   - Adjust the vertical scale to accommodate the waveform in six vertical divisions.
   - Set the horizontal scale to (2*T_{BIT}).
   - Trigger with edge trigger of Data+ (Rising edge with 50 percent level).
6. Display the waveform of TMDS_DATA0+ and DATA0-. Accumulate at least 10,000 triggers by acquiring the waveform in FastAcq mode.
7. Determine the most common TMDS_DATA0- 50 percent point by using the histogram method.
8. Measure skew from most common TMDS_DATA0+ point to 50 percent point of first edge of TMDS_DATA0-.
9. If skew is greater than (0.15*TBIT), then it implies FAIL.
10. Repeat the test for all the remaining TMDS differential pairs.

Sink

Min/Max-Diff Swing Tolerance

This sequence explains the actions that the software takes while it performs a min/max-differential swing tolerance test. For the procedure on how to make this test, see min/max-diff swing tolerance test procedure.

1. Configure the DTG to output any sink-supported video format.
   - Load the pattern that contains repeating RGB gray ramp 0, 1, 2…254, 255, 0, 1, 2… during each video period.
   - Map all the logical channels to physical channels.
   - Run the DTG.
   - Enable all the output channels.
2. Search and record the minimum differential swing voltage that the Sink DUT supports without error at V_{ICM} = 2.9 V (Frequency > 165 MHz) and 3.0 V (Frequency < 165 MHz).
   - Set V_{ICM1} = 3.0\2.9 V.
   - Set V_{DIFF} = 170 mV on all TMDS differential pairs. (Note that the Amplitude and Offset mode in the DTG Level window should be chosen. In this mode, Amplitude should be set to 0.085 Vp-p to correspond to a 170 mV differential swing.)
   - If the test passes at 170 mV reduce V_{DIFF} in 10 mV steps (corresponding to 0.01 Vp-p steps in the Amplitude setting), on all pairs until the Sink DUT outputs errors or V_{DIFF} of 90 mV is reached.
   - If the test fails at 170 mV, increase V_{DIFF} in 10 mV steps on all pairs until the Sink DUT outputs pass or V_{DIFF} of 250 mV is reached.
   - Record V_{DIFF} {minimum} at first voltage level where no error appears.
3. Repeat the test for V_{ICM2} = 3.3 V.

4. Verify the maximum differential voltage that the Sink DUT supports.
   - Set V_{DIFF} = 1.2 V on all TMDS differential pairs. (Note that the Amplitude and Offset mode in the DTG Level window should be chosen. In this mode, Amplitude should be set to 0.6 Vp-p to correspond to a 1.2 V differential swing.)
   - Verify that the DUT continues to support the signal without errors.
   - If DUT fails to support the signal, then it implies FAIL.

Intra-Pair Skew

This sequence explains the actions that the software takes while it performs an intra-pair skew test. For the procedure on how to make this test, see intra-pair skew test procedure.

1. Configure the DTG to output any sink-supported video format that uses the maximum sink-supported pixel clock frequency. If multiple formats are available, a native format is preferred.
2. Calculate Tbit by using the differential clock.
3. For each of the TMDS clock and data pairs that act as the tested pair:
   - Set the delay for all outputs to 0 ns. Disable Differential Timing Offset if it is previously enabled.
   - Move the TMDS +signal of the tested pair to DTG output module A, 1+.
   - Move the TMDS- signal of the tested pair to DTG output module A, 2+.
   - Change the DTG configuration to output the pattern for the tested TMDS channel on module A, 1.
4. When Skew on all four channels option is selected, the skew on all the four channels will be calculated based on the following conditions:
   - All four modules of the DTG must be DTGM30 modules. The test checks for the modules and throws an error if they are not from the DTGM30.
   - The configuration to run the test are A1-Clock, B1-Data 0, C1- Data 1, and D1- Data 2. If the test fails on any of the channels the skew will be inserted individually on the channels to find the channel that has failed the test.
5. In the DTG Timing, set the tested channel (connected to 1A1) and enable Differential Timing Offset.

6. Set the delay value in the differential timing offset to approximately ($0.1*T_{BIT}$). This corresponds to the initial intra-pair skew value.

7. Increase the skew (Differential Timing Offset) by steps of less than or equal to ($0.1*T_{BIT}$), until the Sink DUT outputs errors or until reaching either ($0.6*T_{BIT}$) or 1 nsec.

8. If errors are seen on the DUT, then:

   - Reduce the skew one step, so that the Sink DUT outputs no errors.
   - If intra-pair skew is less than ($0.4*T_{BIT}$), then it implies FAIL.

Jitter Tolerance

This sequence explains the actions that the software takes while it performs a jitter tolerance test.

For the procedure on how to make this test, see the jitter tolerance test procedure.

1. Operate the Sink DUT to support the HDMI input signal.

2. Configure the DTG as follows:

   - Load the appropriate pattern in the DTG
   - No jitter on any output
   - Set the signal outputs to 3.0 V average, 0.6 V_{P-P} for Alternative 1 and to 3.1 V average, 0.4 V_{P-P} for Alternative 2.

3. Configure the AWG as follows:

   - Under Vertical menu, set the following:
     - Filter-through
     - Amplitude

       Alternative 1: Amplitude = 0.6 V_{P-P}

       Alternative 2: Amplitude = 0.4 V_{P-P}
     - Offset = 0 V
     - Marker 1 = 0.00 V to 1.00 V
     - Marker 2 = 0.00 V to 2.00 V
   - No jitter on output initially, with the ability to add two simultaneous jitter components.

4. Connect the test fixture to the oscilloscope for jitter calibration. The oscilloscope calculates data and clock jitter inserted due to the cables and the test fixtures along with the known amount of jitter.

5. Use the appropriate TTC module based on the recommended resolution.

6. Measure jitter tolerance while verifying adequate support by sink.

   - For each of the two test cases:
   - D_JITTER = 500 kHz, C_JITTER = 10 MHz
   - D_JITTER = 1 MHz, C_JITTER = 7 MHz

7. Increase the skew (Differential timing offset) in steps of 0.1 Tbit from 0.0 Tbit to 1.0 Tbit. The test fails if the sink outputs errors at any point of time.

Cable

Eye Diagram

This sequence explains the actions that the software takes while it performs an eye diagram test.

Cable Equalizer: The signal degradation of typical passive copper cables increases with the frequency and the length of the cable. To recover data from such cables, TDSHT3 applies the reference cable equalizer (as specified in the HDMI specification 1.3) automatically to the Cable eye diagram measurement when the clock frequency is more than 165 MHz.

For the procedure on how to make this test, see eye diagram test procedure.

1. Configure the DTG to output a video format corresponding to the specified bandwidth of the cable. If no bandwidth is specified, then configure the DTG to output 1920 x 1080i @ 60 Hz (74.25 MHz pixel clock).

   - Load the appropriate pattern file.
   - Set the logical channel to physical channel mapping.
   - Run the pattern.
   - Enable all the DTG output.

2. Configure the DTG to output worst-case eye as follows:

   - Adjust the jitter on TMDS_CLOCK pair to output 0.4 ns at 500 KHz (worst jitter permitted at (TP1 = 0.3*T_{BIT}) at 75 MHz).
   - Adjust the output swing voltage to 500 mV for every TMDS single-ended signal.

- Using the jitter/eye analyzer, measure the TMDS_CLOCK jitter and eye diagram of all the three TMDS_DATA pairs.
- Repeat and readjust as necessary to create the input worst-case eye diagram.

3. Connect the cable DUT between the TPA-R-TDR and TPA-R-DI adapters.
4. Measure jitter at TPA-R-DI (procedure same as the source eye measurement).
   - If the data jitter is greater than 0.67 ns (= 0.5*T_{BIT} at 75 MHz), then it implies FAIL.
   - Calculate the measurement BOX vertical setting as follows:
   - $V_C = (V_H+V_L)/2 = \pm 5$ mV
   - Test the eye diagram with sink minimum eye mask. If any of the points violates, then it implies FAIL.
5. Adjust the DTG swing voltage to (V_H, V_L) = (3.3 V, 2.9 V) without jitter (clock jitter should remain at the worst case input condition).
6. Measure the eye mask on all the TMDS_DATA channels at CTP2.
7. If any measured eyes do not meet the sink minimum eye mask, then it implies FAIL.

Report Generator

About Report Generator

Report Generator allows you to generate and print reports directly from the oscilloscope. It enhances the TDSHT3 HDMI Compliance Test Software capabilities by simplifying the process of creating and maintaining reports.

Report Generator automates the process of compiling the test results and generating the reports. It allows you to set up the template layout by using either the factory default templates or the custom templates. Report Generator allows you to save files in custom file formats such as .rgt, .rpl, or .rpt. You can also save the generated reports as an .rtf file. Report Generator is integrated with the TDSHT3 HDMI Compliance Test Software. You can also convert rtf to pdf by using third-party software.

How to Start Report Generator

Utilities > **Report Generator**

You can generate and print reports directly from the oscilloscope.

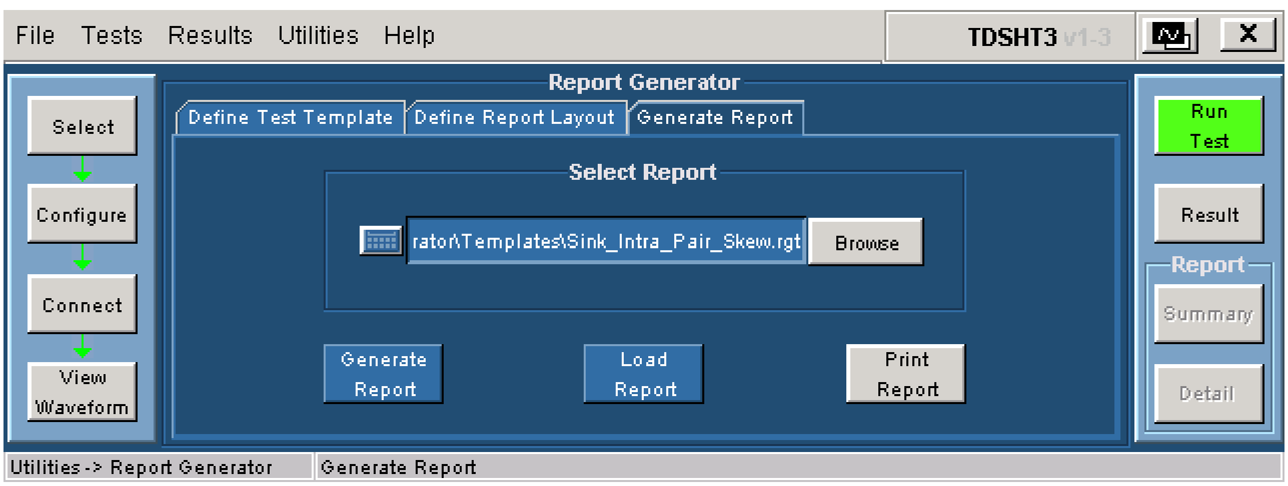


Figure 239: Generate Report pane

Perform the following steps to generate a report:

1. Create a new or edit an existing test template.
2. Define a new or edit an existing report layout.
3. Generate, print, or view a report.

***Note**: The report image settings are similar to the existing export settings of the oscilloscope. It is recommended that you use **Graticule(s) only** for Image view setting in export setup.*

Shortcut Keys

Table 130: Shortcut Keys

Action/Common Key	Shortcut Key
Open	Ctrl+O
Save	Ctrl+S
Template Editor	
New	Ctrl+N
Find	Ctrl+F
Replace	Ctrl+H
Print	Ctrl+P
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Delete	Del
Select All	Ctrl+A
Bring to Front	Ctrl+Plus
Send to Back	Ctrl+Minus
Edit Text	Alt+Enter
Report Layout	
New	Ctrlr+N
GoTo	Ctrl+G
Refresh Template List	F5

Table 130: Shortcut Keys (Contd.)

Action/Common Key	Shortcut Key
Report Viewer	
Find	Ctrl+F
Select All	Ctrl+A
Del	Del
GoTo	Ctrl+G
Bring to Front	Ctrl+Plus
Send to Back	Ctrl+Minus
Edit Text	Alt+Enter

How to Operate Report Generator

Template Editor

The report generator provides you with factory default templates. You can also create your own templates. Use Template Editor to create and edit templates in the .rgt format (report generator template). A template stores the fields and their positions. You can save the templates and reuse them in any number of reports or report layouts. You can cut, copy, and paste across templates. Once the report is generated, the software fills in the fields of the template by using the acquired data from the oscilloscope.

Template Editor has a palette list that displays the following groups of fields: the TDSHT3 Fields, Oscilloscope Fields, and Native Fields. Template Editor allows you to create custom groups; once created, these groups appear in the palette list. The fields are listed according to the group selected. You can use these fields to design and create a template.

You can place the fields in the template, and then move and size them appropriately. Multiple fields can be selected and placed in the template. You can select more than one field and make the following changes: cut, copy, paste, align, delete, size, edit font, and change caption of the fields.

Once a template is defined and saved, either click Done to close the Template Editor, or use the Layout icon to go directly to the Report Layout Editor.

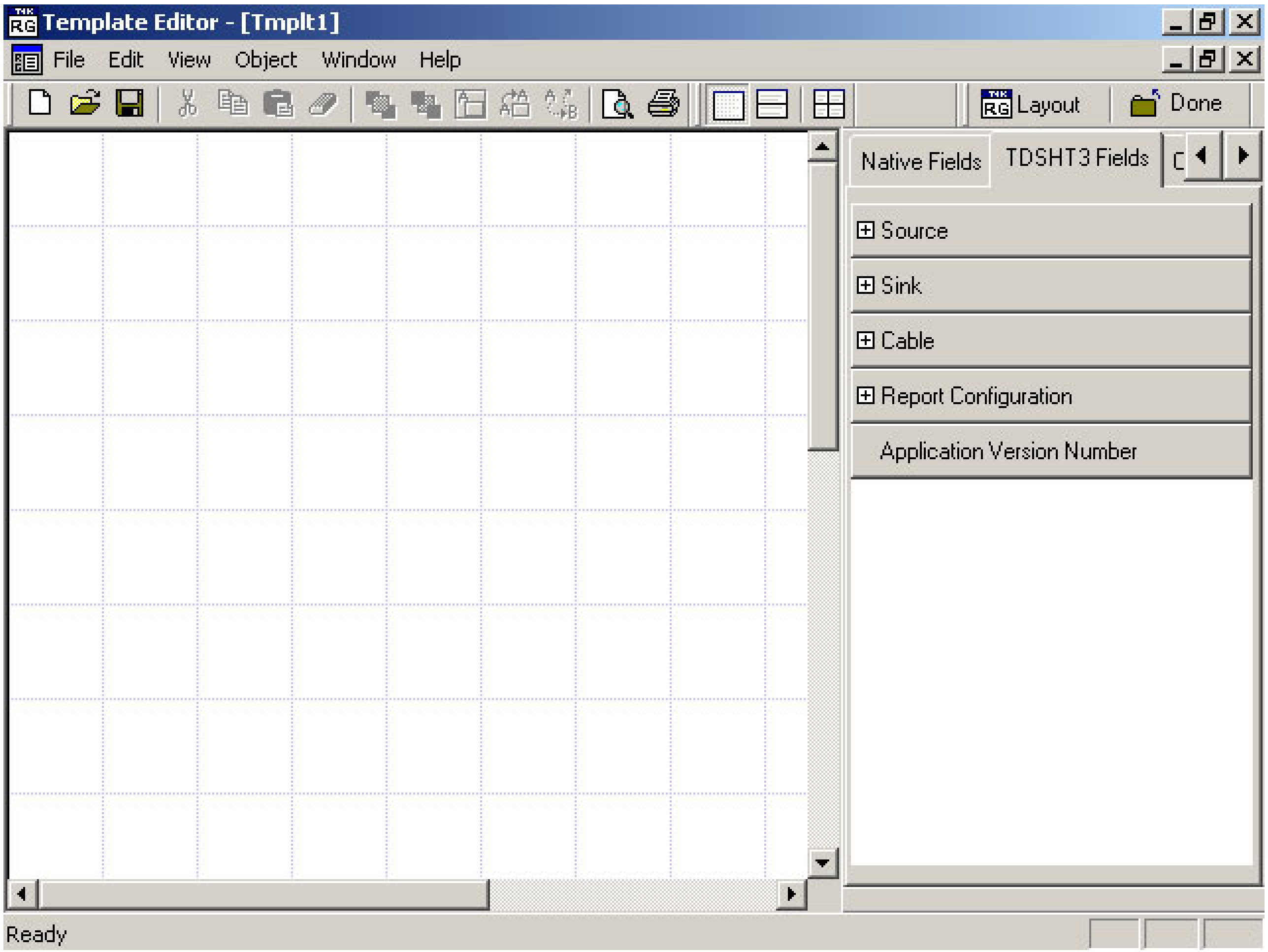


Figure 240: Report Layout Editor

Default Settings

Table 131: Template Editor Default Settings

Parameter	Selection	Default Setting
Page Size	Change Template Size	The default page size is 8.5 inches x 11 inches.
Palette List	None	The palette list displays TDSHT3 fields by default. If there are no TDSHT3 fields, then the oscilloscope fields are displayed.
Static Text	Static Text	The static text parameter inserts My Static Text.
Fields	None	The default size of the field dragged into the template is 200 pixels x 300 pixels.

Application View – Template Editor Window

The Template Editor window includes a menu bar, toolbar, client area, palette list, and status bar. When you click New Template in the software, the client area in the Template Editor window is empty. When you click Edit Template in the software, the client area displays the selected template.

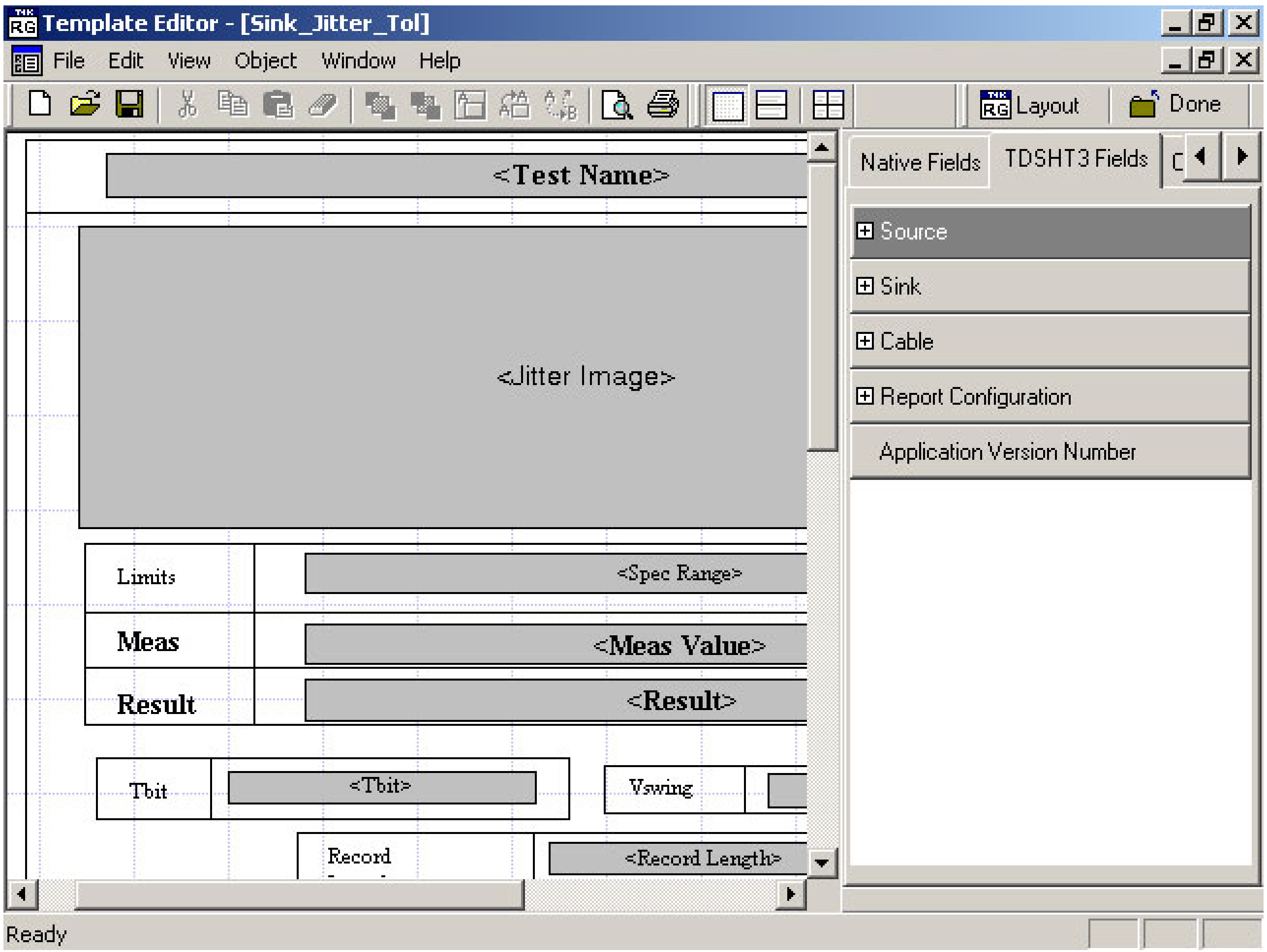


Figure 241: Template Editor Window

Application View – Palette List

View > Palette Toolbar

The palette list is a floating toolbar that has a list of Native Fields, TDSHT3 Fields, and Oscilloscope Fields grouped logically. You can drag and drop fields from the palette list into the template. The palette toolbar is displayed by default. Click View > Palette Toolbar to either show or hide the toolbar.

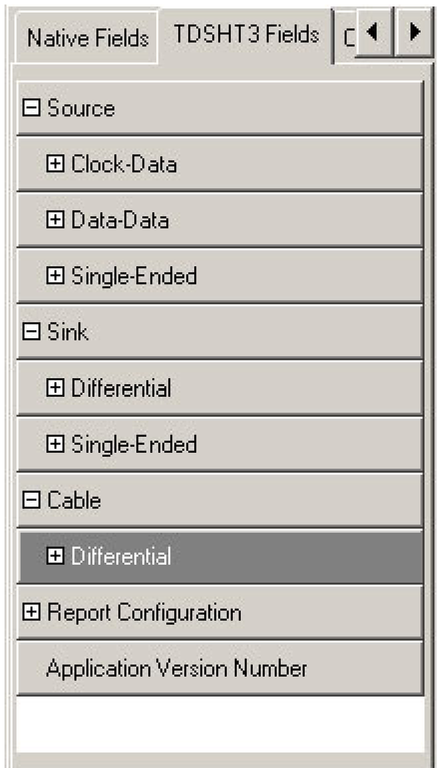


Figure 242: Palette list

The palette list groups the fields into the following categories:

- **Native Fields**: Native Fields are fields such as Static Text, Rectangle, Line, Logo, Table, Date, and Time.
- **TDSHT3 Fields**: TDSHT3 Fields are the fields that are related to the software.
- **Oscilloscope Fields**: Oscilloscope Fields are groups of fields that are related to the data acquired from the oscilloscope.
- **Custom Groups**: Custom Groups represent the custom groups created.

Application View – Palette List – Native Fields

You can enhance the report by using the following parameters from the Native Fields: Static Text, Rectangle, Line, Logo, Table, Date, and Time.

You can drag any field from the Native Field and drop it in the active template.

Static Text

1. From the Native Fields, drag and drop the static text.

Figure 243: Edit Text dialog box

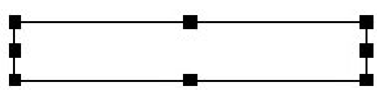
2. In the Edit Text dialog box,

   - Click the icon next to the **Text** box to open the Virtual Keyboard.
   - In the Virtual Keyboard, select the text, and then click **Enter**.

3. Click OK.

Rectangle

From the Native Fields, drag and drop the Rectangle into the active template.



The black squares that appear at the corners of the rectangle allow you to increase the size.

Line

From the Native Fields, drag and drop the Line into the active template.

The black squares that appear at the corners of the line allow you to increase the size.

Logo

1. From the Native Fields, drag and drop the Logo into the active template.

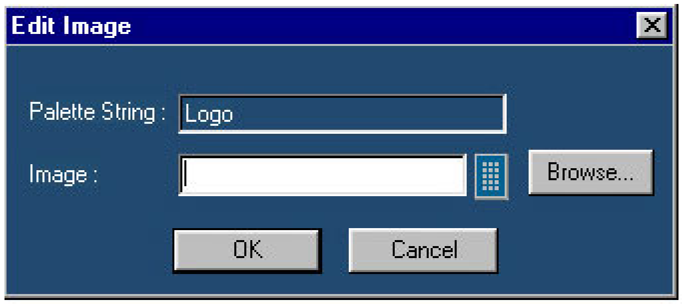


Figure 244: Edit Image dialog box

2. In the Edit Image dialog box,
   - Click the icon next to the **Image** box to open the Virtual Keyboard.
   - In the Virtual Keyboard, type the path and filename, and then click **Enter**; or, click **Browse** to navigate to the location where the image is available.
3. Click OK.

Table

1. From the Native Fields, drag and drop the Table into the active template.

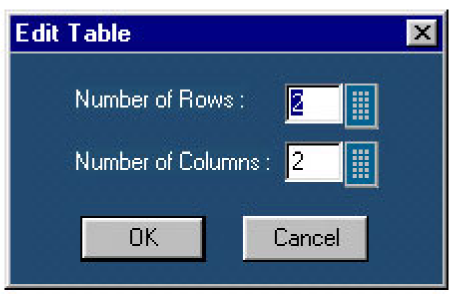


Figure 245: Edit Table dialog box

2. In the Edit Table dialog box, you can select the number of rows and columns.
   - Click the icon next to the **Number of Rows** box and the **Number of Columns** box to edit the number.
   - In the Virtual Keyboard, type the number, and then click **Enter**.
3. Click OK.

Date and Time

From the Native Fields, drag and drop the Date and Time.

Application View – Palette List – TDSHT3 Fields

Table 132: TDSHT3 Application Fields

TDSHT3 Fields		
Source		
- Clock-Data		
	- Configuration Parameters	
		- Clock Input
		- Data Input
		- Ref Level Units
		- Hysteresis
		- High Ref Level
		- Mid Ref Level
		- Low Ref Level
		- Number of Acquisitions
		- Record Length
		- Clock
		- Tbit # of Avgs

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
	- Eye Diagram Results	
		- Statistics - Clock TIE Population - Clock TIE Min - Clock TIE Max - Clock TIE Mean - Clock TIE Std Dev - Clock TIE Pk-Pk - Recovered Clock TIE Population - Recovered Clock TIE Min - Recovered Clock TIE Max - Recovered Clock TIE Mean - Recovered Clock TIE Std Dev - Recovered Clock TIE Pk-Pk
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Eye Diagram Image
		- Tbit
		- Vswing
		- Oscilloscope Image
		- Mask Hits
	- Clock Jitter Results	
		- Statistics - Clock TIE Population - Clock TIE Min - Clock TIE Max - Clock TIE Mean - Clock TIE Std Dev - Clock TIE Pk-Pk - Recovered Clock TIE Population - Recovered Clock TIE Min - Recovered Clock TIE Max - Recovered Clock TIE Mean - Recovered Clock TIE Std Dev - Recovered Clock TIE Pk-Pk

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Clock Jitter Image
		- Tbit
		- Vswing
		- Oscilloscope Image
	- Duty Cycle Results	

		- Max Duty Cycle
		  - Test Name
		  - Spec Range
		  - Meas Value
		  - Result
		  - Remarks/Comments
		  - Tbit
		  - Oscilloscope Image

		- Min Duty Cycle
		  - Test Name
		  - Spec Range
		  - Meas Value
		  - Result
		  - Remarks/Comments
		  - Tbit
		  - Oscilloscope Image

	- Rise Time Results	- Clock Rise Time
		  - Statistics
		    - Clock Rise Population
		    - Clock Rise Min
		    - Clock Rise Max
		    - Clock Rise Mean
		    - Clock Rise Std Dev
		    - Clock Rise Pk-Pk
		  - Test Name
		  - Spec Range
		  - Meas Value
		  - Result
		  - Remarks/Comments
		  - Tbit
		  - Vswing

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
		- Oscilloscope Image
		- Data Rise Time - Statistics - Data Rise Population - Data Rise Min - Data Rise Max - Data Rise Mean - Data Rise Std Dev - Data Rise Pk-Pk - Test Name - Spec Range - Meas Value - Result - Remarks/Comments - Tbit - Vswing - Oscilloscope Image
	- Fall Time Results	
		- Clock Fall Time - Statistics - Clock Fall Population - Clock Fall Min - Clock Fall Max - Clock Fall Mean - Clock Fall Std Dev - Clock Fall Pk-Pk - Test Name - Spec Range - Meas Value - Result - Remarks/Comments - Tbit - Vswing - Oscilloscope Image
		- Data Fall Time - Statistics - Data Fall Population - Data Fall Min - Data Fall Max - Data Fall Mean - Data Fall Std Dev - Data Fall Pk-Pk - Test Name - Spec Range

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
		- Meas Value - Result - Remarks/Comments - Tbit - Vswing - Oscilloscope Image
- Data-Data		
	- Configuration Parameters	
		- Data Input A
		- Data Input B
	- Inter-Pair Skew (Data-Data) Results	
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Tbit
		- Vswing
		- Oscilloscope Image
- Single-Ended		
	- Configuration Parameters	
		- Clock Input
		- Input +
		- Input -
		- Number of Acquisitions
		- Avcc
		- Tbit # of Avgs
	- Intra-Pair Skew Results	
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Tbit
		- Oscilloscope Image
	- Low Amplitude + Results	

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Oscilloscope Image
	- Low Amplitude - Results	
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Oscilloscope Image
Sink		
- Differential		
	- Configuration Parameters	
		- Clock Input
		- Data Input
		- Ref Level Units
		- Hysteresis
		- High Ref Level
		- Mid Ref Level
		- Low Ref Level
		- Record Length
		- Clock
		- Frequency Pair
		- DUT Freq, Jitter Test Option, Jitter Insertion Type, Jitter Amplitude
	- DTG Configuration Parameters	
		- DTG Filepath
		- Physical Clock Channel
		- Logical Clock Channel
		- Physical Data Channel 0
		- Logical Data Channel 0
		- Physical Data Channel 1
		- Logical Data Channel 1

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
		- Physical Data Channel 2
		- Logical Data Channel 2
	- Min/Max-Diff Swing Tolerance Results	
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Vswing
		- Oscilloscope Image
	- Jitter Tolerance Results	
		- Clock Jitter Results - Test Name - Spec Range - Meas Value - Result - Remarks/Comments - Tbit
		- Data Jitter Results - Test Name - Spec Range - Meas Value - Result - Remarks/Comments - Tbit
- Single-Ended		
	- Configuration Parameters	
		- Clock Input
	- DTG Configuration Parameters	
		- DTG Filepath
		- Physical Clock Channel
		- Logical Clock Channel
		- Physical Data Channel 0
		- Logical Data Channel 0
		- Physical Data Channel 1
		- Logical Data Channel 1
		- Physical Data Channel 2
		- Logical Data Channel 2

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
	- Intra-Pair Skew Results	
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- Tbit
		- Vswing
		- Oscilloscope Image
Cable		
- Differential		
	- Configuration Parameters	
		- Clock Input
		- Data Input
		- Ref Level Units
		- Hysteresis
		- High Ref Level
		- Mid Ref Level
		- Low Ref Level
		- Record Length
		- Test Points
		- Clock
	- DTG Configuration Parameters	
		- DTG Filepath
		- Physical Clock Channel
		- Logical Clock Channel
		- Physical Data Channel 0
		- Logical Data Channel 0
		- Physical Data Channel 1
		- Logical Data Channel 1
		- Physical Data Channel 2
		- Logical Data Channel 2
	- Eye Diagram Results	
		- Statistics - T x Clock TIE Population - T x Clock TIE Min - T x Clock TIE Max

Table 132: TDSHT3 Application Fields (Cont.)

TDSHT3 Fields		
		- T x Clock TIE Mean - T x Clock TIE Std Dev - T x Clock TIE Pk-Pk - Recovered Clock TIE Population - Recovered Clock TIE Min - Recovered Clock TIE Max - Recovered Clock TIE Mean - Recovered Clock TIE Std Dev - Recovered Clock TIE Pk-Pk
		- Test Name
		- Spec Range
		- Meas Value
		- Result
		- Remarks/Comments
		- TP1 Eye Diagram Image
		- TP1 Jitter Image
		- TP2 Eye Diagram Image
		- TP2 Jitter Image
		- Tbit
		- Vswing
		- Oscilloscope Image
		- Mask Hits (TP1)
		- Mask Hits (TP2)
Report Configuration		
- Pair (CK, D) - Resolution - Refresh Rate - Device ID - Device Details - Pair (Single-Ended) - Pair (D, D)		

Application View – Palette List – Oscilloscope Fields

The Oscilloscope Fields are grouped into ten different groups:

- **Waveform Group**: The Waveform Group has the entire active live channels and independent channels (only CH1 to CH4) waveforms in both jpeg and bmp. These waveforms are generated to smooth out the stair-step effect seen on the display.
- **Vertical Group**: The Vertical Group has all vertical related fields, such as the vertical scale, position, and offset.
- **Horizontal Group**: The Horizontal Group has all horizontal related fields, such as the horizontal divisions, scale, record length, position, and sample rate.
- **Math Group**: The Math Group has all the math related fields, such as the math definition for a specified math channel, magnitude, spectral gate, spectral phase, spectral window, and spectral frequencies of the math channel.
- **Trigger Group**: The Trigger Group has all trigger related fields, such as the trigger type, mode, level, and various fields related to different trigger types.
- **Measurement Group**: The Measurement Group has all the measurements, such as the eight automated measurements and the immediate measurements.
- **Acquisition Group**: The Acquisition Group has all acquisition related fields, such as the acquisition mode, acquisition state, repetitive mode, and fast acquisition mode.
- **Cursor Group**: The Cursor Group has all the cursor related fields, such as the cursor mode, source, state and type of the cursor, H Bars, and V Bars.
- **Zoom Group**: The Zoom Group has all zoom related fields, such as the zoom horizontal position and horizontal scale.
- **Histogram Group**: The Histogram Group has all histogram fields, such as the co-ordinates of histogram box, mode, size, and source.
- **Screen Snapshot Group**: The Screen Snapshot Group has two variations: one in color and the other in black-and-white. For these screenshots, the attributes are graticule, ink-saver, and jpeg.

Menus – File menu

Table 133: Template Editor | File menu

Menu Selection	Description
New	Click File > New to create a new template.
Open	Click File > Open to open a template file.
Close	Click File > Close to close the active template.
Save	Click File > Save to save changes to the file.
Save As	Click File > Save As to save the template to a different file by using the Save As dialog box.
Print	Click File > Print to either print all or part of the contents of the active template.
Print Preview	Click File > Print Preview to display a sample view of the active template as it would be printed.
List of recent templates	Click File > List of recent templates to open a previously (recently) opened template.
Exit	Click File > Exit to quit template editor.

Menus – Edit menu

The available edit menu selections depend on whether a template is active or not. In other words, the client area is either empty or has an open template.

Table 134: Template Editor | Edit menu

Menu Selection	Description
Cut	Click Edit > Cut to cut the selected fields.
Copy	Click Edit > Copy to copy the selected fields.
Paste	Click Edit > Paste to paste the clipboard content.
Delete	Click Edit > Delete to delete the selected fields.
Select All	Click Edit > Select All to select all the fields.
Create Custom Group	Click Edit > Create Custom Group to create a custom group.
Edit Custom Group	Click Edit > Edit Custom Group to edit the custom group.
Change Template Size	Click Edit > Change Template Size to change the template size.
Find	Click Edit > Find to find the data that matches the search criteria.
Replace	Click Edit > Replace to replace the data that matches the search criteria with the specified data.

Menus – View menu

A check mark appears next to the selected command.

Table 135: Template Editor | View menu

Menu Selection	Description
Toolbar	Click View > Toolbar to either display or hide the selected toolbars such as Standard, Align Size, Layout, and Action.
Status Bar	Click View > Status Bar to either display or hide the status bar.
Palette Bar	Click View > Palette Bar to either display or hide the palette bar.
Grid Lines	Click View > Grid Lines to either display or hide the grid lines in the client area.

Menus – Object menu

The available object menu selections depend on whether a parameter in the client area is selected or not.

Table 136: Template Editor | Object menu

Menu Selection	Description
Bring to Front	Click Object > Being to Front to bring the selected fields to the front.
Send to Back	Click Object > Send to Back to send the selected fields back.
Hide Text/Show Text	Click Object > Hide Text/Show Text to either hide or show the caption of the selected parameter.
Position Caption on Top/to the Left	Click Object > Position Caption on Top/to the Left to position the caption of the selected parameter either on top or to the left.
Edit Caption	Click Object > Edit Caption to edit the caption of the selected parameter.
Change Font	Click Object > Change Font to change the font of the selected parameter or the caption by using the Change Font dialog box.
Align Fields	Click Object > Align Fields to aligns fields to the top, bottom, left, or right.
Make Same Size	Click Object > Make Same Size to resize the selected objects to the same size by height, width, or both.

Menus – Windows menu

Table 137: Template Editor | Windows menu

Menu Selection	Description
New Window	Click Window > New Window to open a new window duplicating the current active window.
Cascade	Click Window > Cascade to arrange the open templates in the client area from the upper left side to lower right side so that they overlap one another.
Tile	Click Window > Tile to arrange the open templates horizontally and vertically in the application client area without overlapping.
Arrange Icons	Click Window > Arrange Icons to arrange the icons of any templates you have minimized to the bottom left of the window.
List of open templates	Click Window > List of open templates to jump to another open template.

Menus – Help menu

Table 138: Template Editor | Help menu

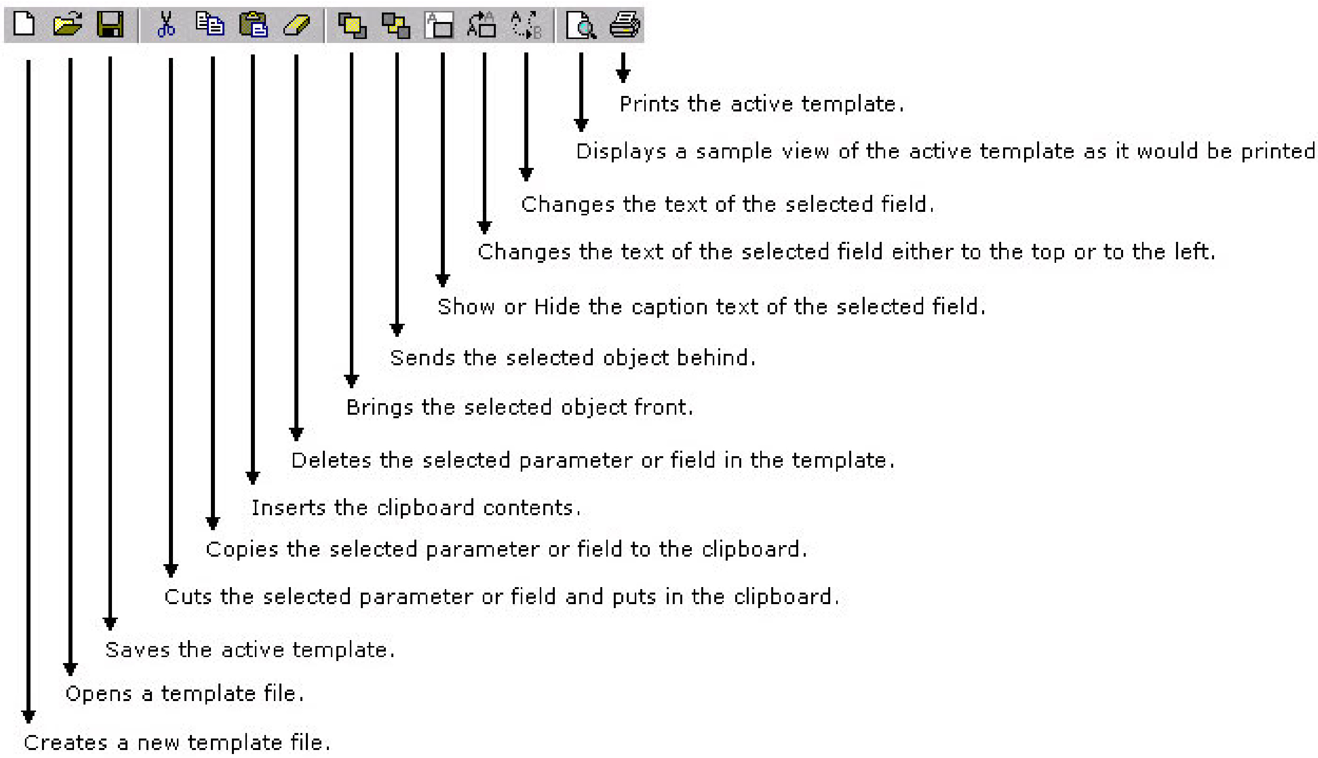
Menu Selection	Description
Help Topics	Click Help > Help Topics to display online help.
About Template Editor	Click Help > About Template Editor to display version and copyright information.

Toolbars

Click View > Toolbars to choose to either display or hide these toolbars.

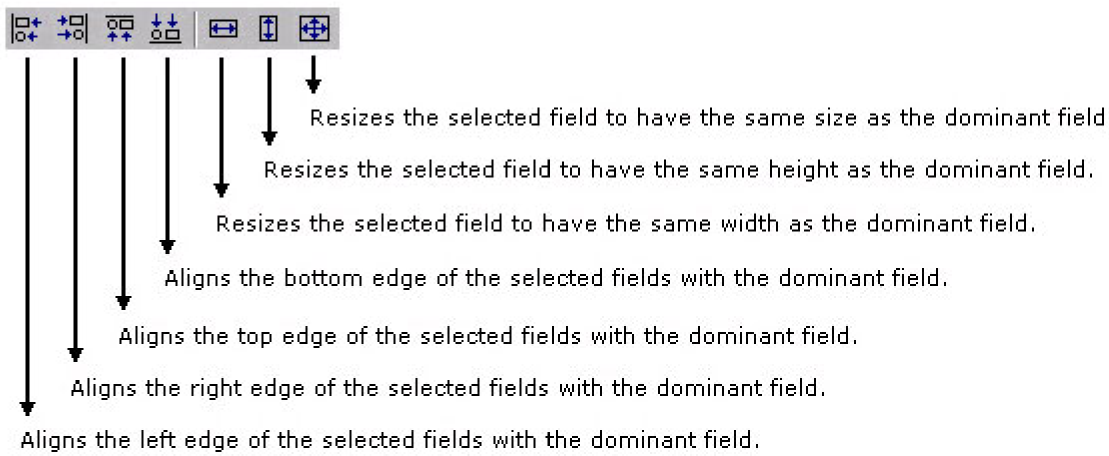
Toolbars – Standard toolbar

Click View > Toolbar > Standard to either display or hide the standard toolbar.



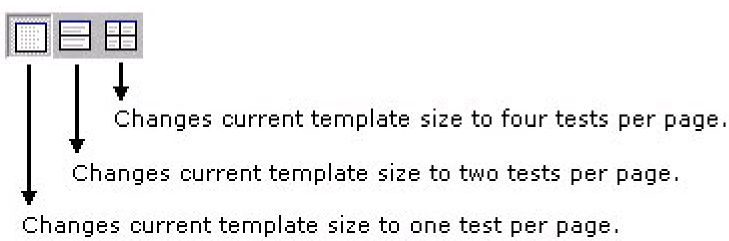
Toolbars – Align or Size toolbar

Click View > Toolbar > Align/Size to either display or hide the Align/Size toolbar.



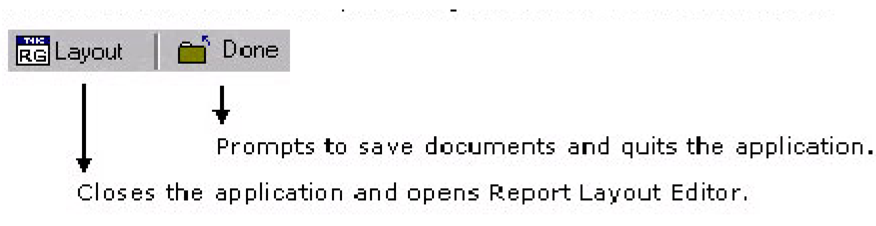
Toolbars – Layout toolbar

Click View > Toolbar > Layout to either display or hide the layout toolbar.



Toolbars – Action toolbar

Click View > Toolbar > Action to either display or hide the action toolbar.



Status bar

The status bar displays the status of the application and tool tips for selected options.

How to Use Template Editor

To create a new template

1. From the Palette List, drag and drop the fields that you want in the report.

Note: *If you drag and drop a group from the palette list, then all the fields within the group are placed in the active template.*

2. Organize the fields as you want them to appear in the report.
3. After you have finished creating the template, click File > Save.

To edit an existing template

1. Organize the fields as you want them to appear in the report.

Note: *From the Palette List, drag and drop the fields that you want in the report.*

2. If you drag and drop a group from the palette list, then all the fields within the group are placed in the active template.
3. Organize the fields as you want them to appear in the report.

4. After you have finished editing the template, click File > Save.

   - You can create a custom group, edit a custom group, and change the template size.
   - You can also edit the caption, change a font, align the fields, and make the selected fields of the same size.

Create Custom Groups

You can create custom groups by using any fields from the palette list.

1. Click Edit > Create Custom Group.

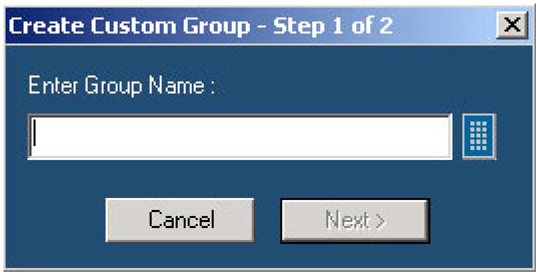


Figure 246: Create Custom Group - Step 1 of 2 dialog box

2. In the Create Custom Group - Step 1 of 2 dialog box, type the group name. You can type the group name by using the Virtual Keyboard.

3. Click Next. The Select Fields - Step 2 of 2 dialog box displays all the fields of the palette list.

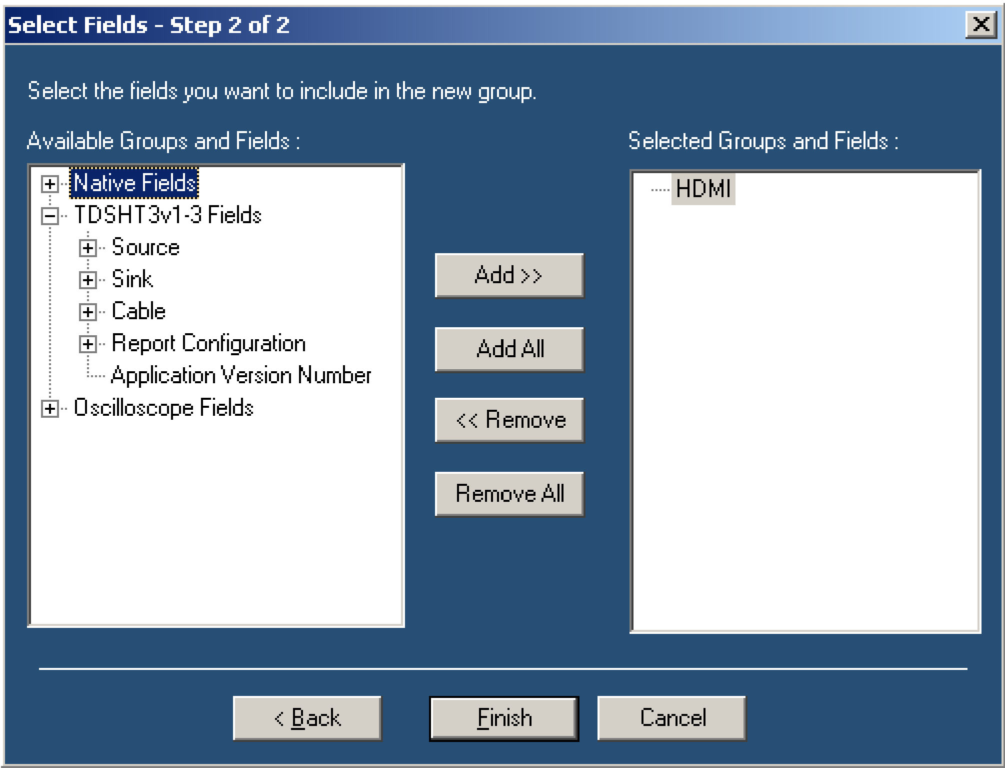


Figure 247: Select Fields - Step 2 of 2 dialog box

4. Using Add >>, Add All, << Remove, or Remove All, you can click the fields you want to include in the new group.

5. Click Finish.

Edit Custom Groups

You can edit custom groups.

1. Click Edit > Edit Custom Group.

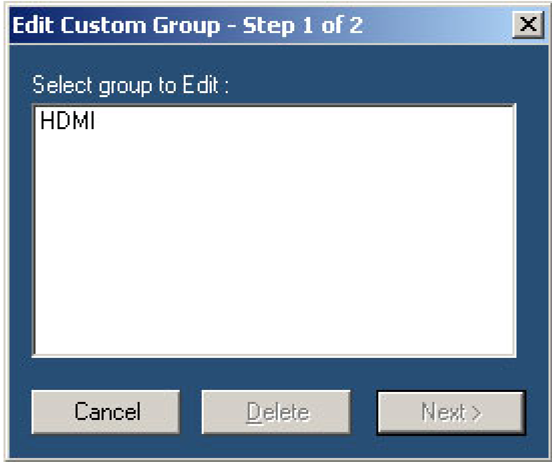


Figure 248: Edit Custom Group - Step 1 of 2 dialog box

2. In the Edit Custom Group - Step 1 of 2 dialog box, click a group to edit.

3. Click Next.

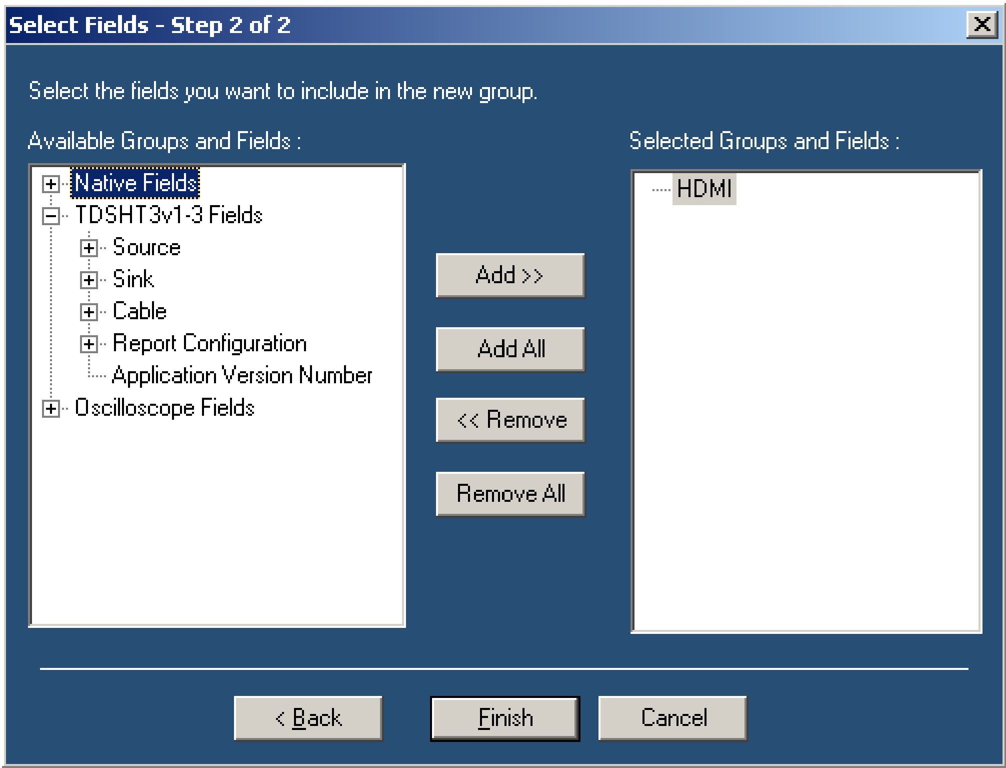


Figure 249: Select Fields - Step 2 of 2 dialog box

4. In the Select Fields - Step 2 of 2 dialog box, click the fields you want to add or remove from the group by using Add >>, Add All, << Remove, or Remove All.

5. Click Finish.

Delete Custom Groups

You can delete custom groups.

1. Click Edit > Edit Custom Group.

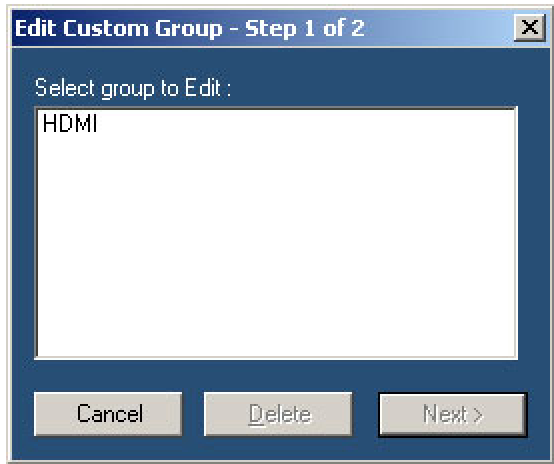


Figure 250: Edit Custom Group - Step 1 of 2 dialog box

2. In the Edit Custom Group - Step 1 of 2 dialog box, click a group to delete.

3. Click Delete. A message box appears asking for your confirmation.

4. Click Yes to delete.

Change Template Size

You can change the size and page setup for a template.

1. Click Edit > Change Template Size. The Change Template Size dialog box appears.

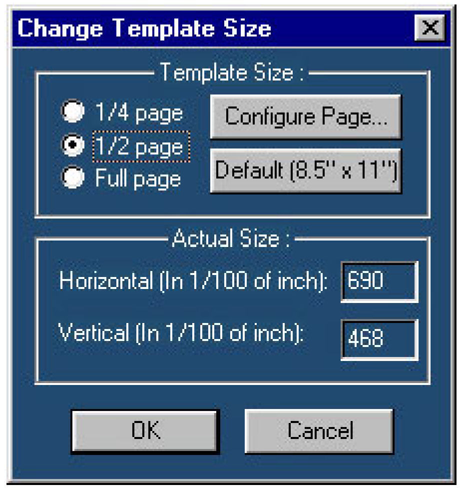


Figure 251: Change Template Size dialog box

2. In the Change Template Size dialog box,

- Select the Template Size as 1/4 page, 1/2 page, or Full page.
- If the printer is not available, select the Page Size as Default (8.5" x 11"); else, click Configure Page....

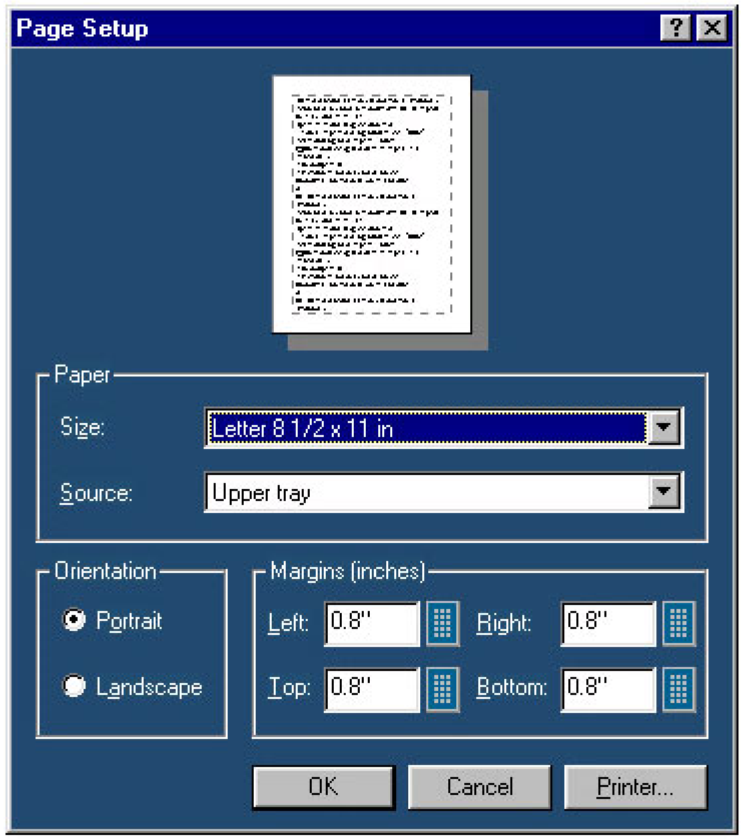


Figure 252: Page Setup dialog box

- In the Page Setup dialog box, select the paper size, source, orientation, and margins.
- Click OK to return to the Change Template Size dialog box.
- Click OK.

Note*: Do not reduce the template size beyond the content filled in the template. You may lose information.*

Select All

Click Edit > Select All. To cut, copy, or delete the fields from the active template, you need to select the fields. Click CTRL + selecting the fields to select the fields from the active template.

Find

You can search for text in the active template.

1. Click Edit > Find.

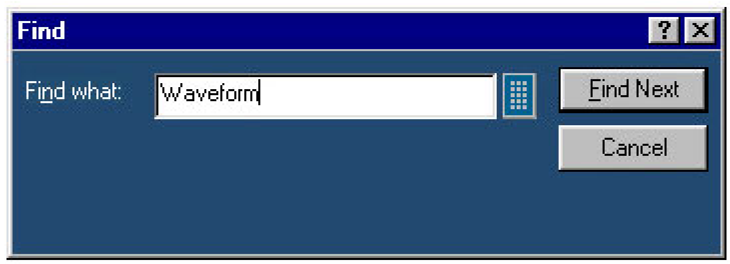


Figure 253: Find dialog box

2. In the Find dialog box, type the search string by using the Virtual Keyboard.

3. Click Find Next until you find the required search string.

Replace

You can both search and replace the text in the active template.

1. Click Edit > Replace.

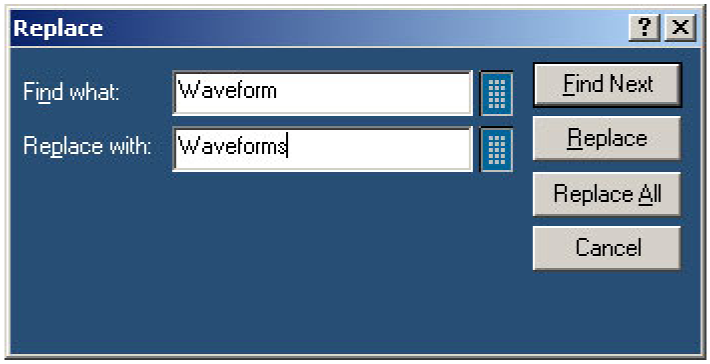


Figure 254: Replace dialog box

2. In the Replace dialog box, by using the Virtual Keyboard, type the search string in the Find what box.

3. In the Replace with box, by using the Virtual Keyboard, type the replacement string.

4. Click Find Next until you find the required search string.

5. Click Replace to replace one instance of the string, or click Replace All to replace all instances of the string.

6. Click Cancel after you have replaced the strings.

Bring To Front

Click Object > Bring To Front to bring the selected fields to the front.

Send To Back

Click Object > Send To Back to send the selected fields back.

Show/Hide Text

Click Object > Show/Hide Text to either show or hide the captions for the selected fields.

Position Caption

Click Object > Position Caption to the Left or on Top to position the caption of the selected fields either to the left or on the top.

Edit Caption

You can edit the caption of the selected parameter or object.

1. Click Object > Edit Caption. The Edit Caption dialog box appears.

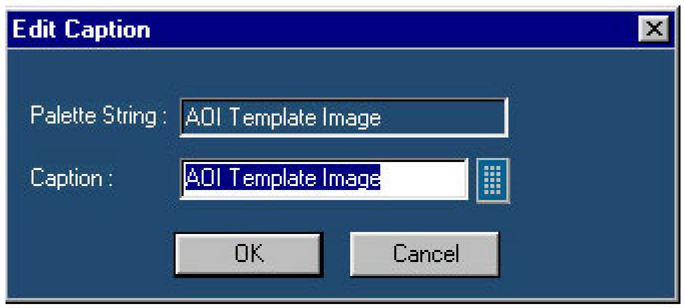


Figure 255: Edit Caption dialog box

2. In the Edit Caption dialog box, click the icon next to the Caption box to type the caption by using the Virtual Keyboard.

3. Click OK.

Change Font

You can change font for the selected field in the template.

1. Select the field or fields in the active template.

2. Click Object > Change Font or right-click the field to display the options.

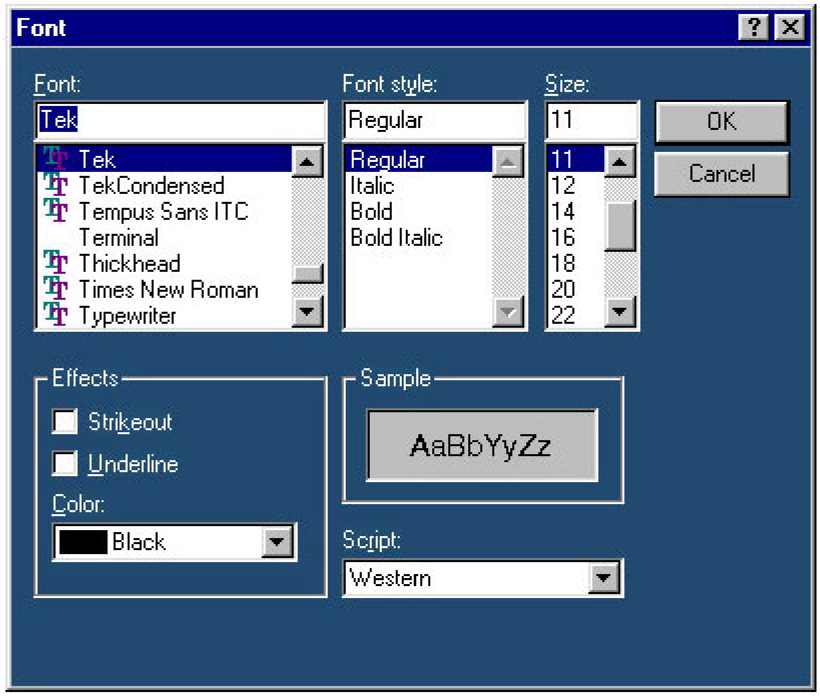


Figure 256: Font dialog box

3. In the Font dialog box, choose the font size, color, style, and effects.

4. Click OK.

Align Fields

You can align the fields to top, bottom, left, or right.

1. Select the fields in the active template.

2. Click Object > Align Fields > Top, Bottom, Left, or Right to align the fields accordingly.

Make Same Size

You can set the selected fields to the same height, width, or both.

1. Select the fields in the active template.

2. Click Object > Make Same Size > Height, Width, or Both to make the selected fields of the same size.

Report Layout Editor

About Report Layout Editor

Report Layout Editor helps you to define the report layout to generate reports. The report layout, once created, can be reused to generate multiple reports.

You can select the number of test templates per page and position the templates in the report. The report can have multiple pages with different template sizes. Each template is a sub report with a unique test title. This unique test title helps you select the required template when you generate a report. You can define headers and footers for the report layout.

To display Report Layout Editor, click Define Report Layout > New Layout.

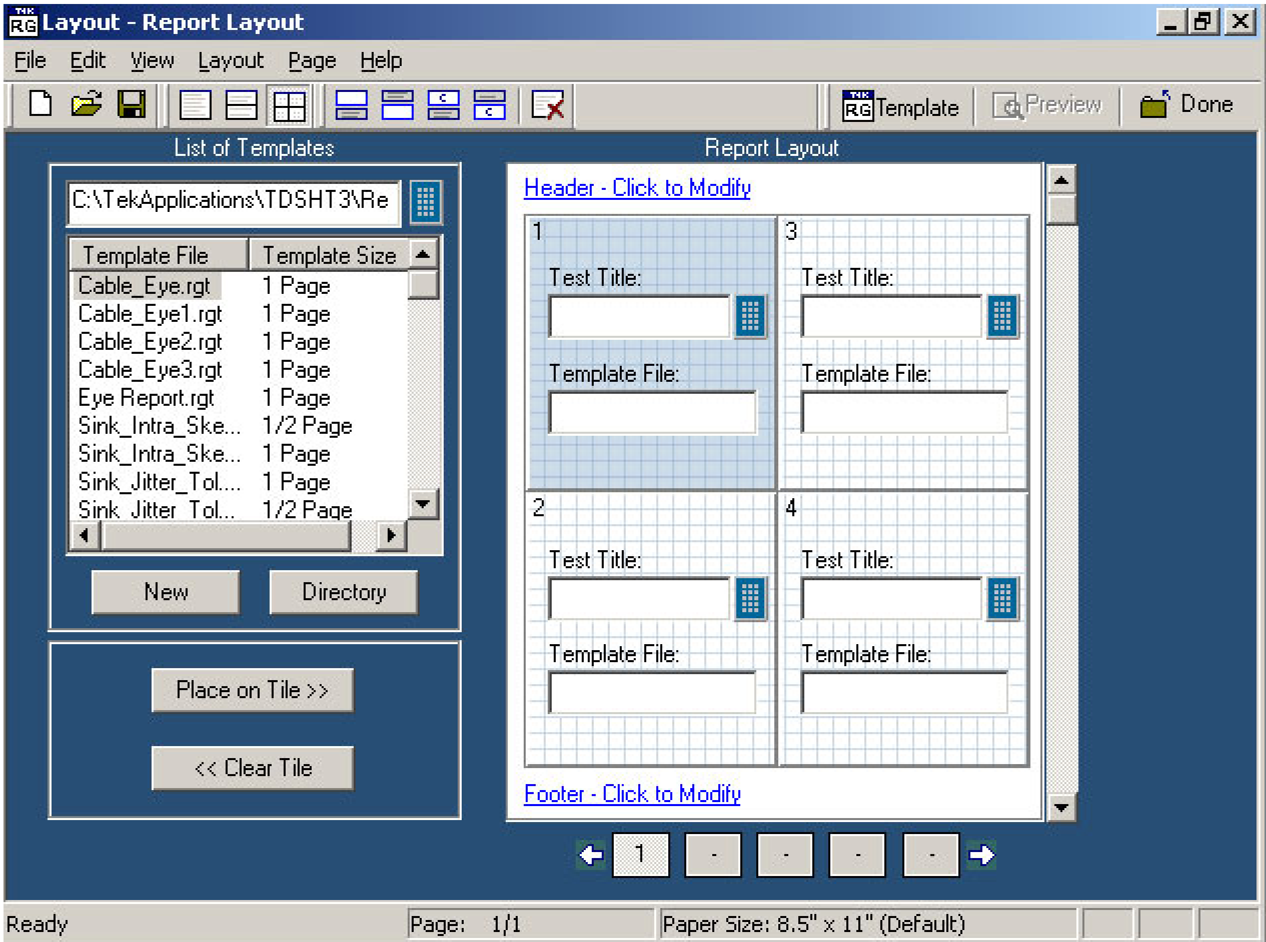


Figure 257: Report Layout window

The Report Layout Editor window has two panes.

- **List of Templates**: This pane displays a list of templates, template sizes, template folders, and buttons that allow you to clear or place a template in a report layout tile and to create new templates.
- **Report Layout**: This pane displays the selected report layout and the header, footer definition.

Default Settings

Table 139: Report Layout Default Settings

Parameter	Selection	Default Setting
Report Layout	Layout	Four tests per page
Page Size	Page Setup	8.5 inches x 11 inches
Layout Editor	None	One page
Go to	Edit	Displays the current page number in the page layout
Font	None	Arial > Regular 9
Default Margin Size	None	Margin size on all sides of the paper is 0.8 inch

Application View – Report Layout Editor Window

The Report Layout Editor window includes a menu bar, toolbar, list of templates pane, and a report layout pane.

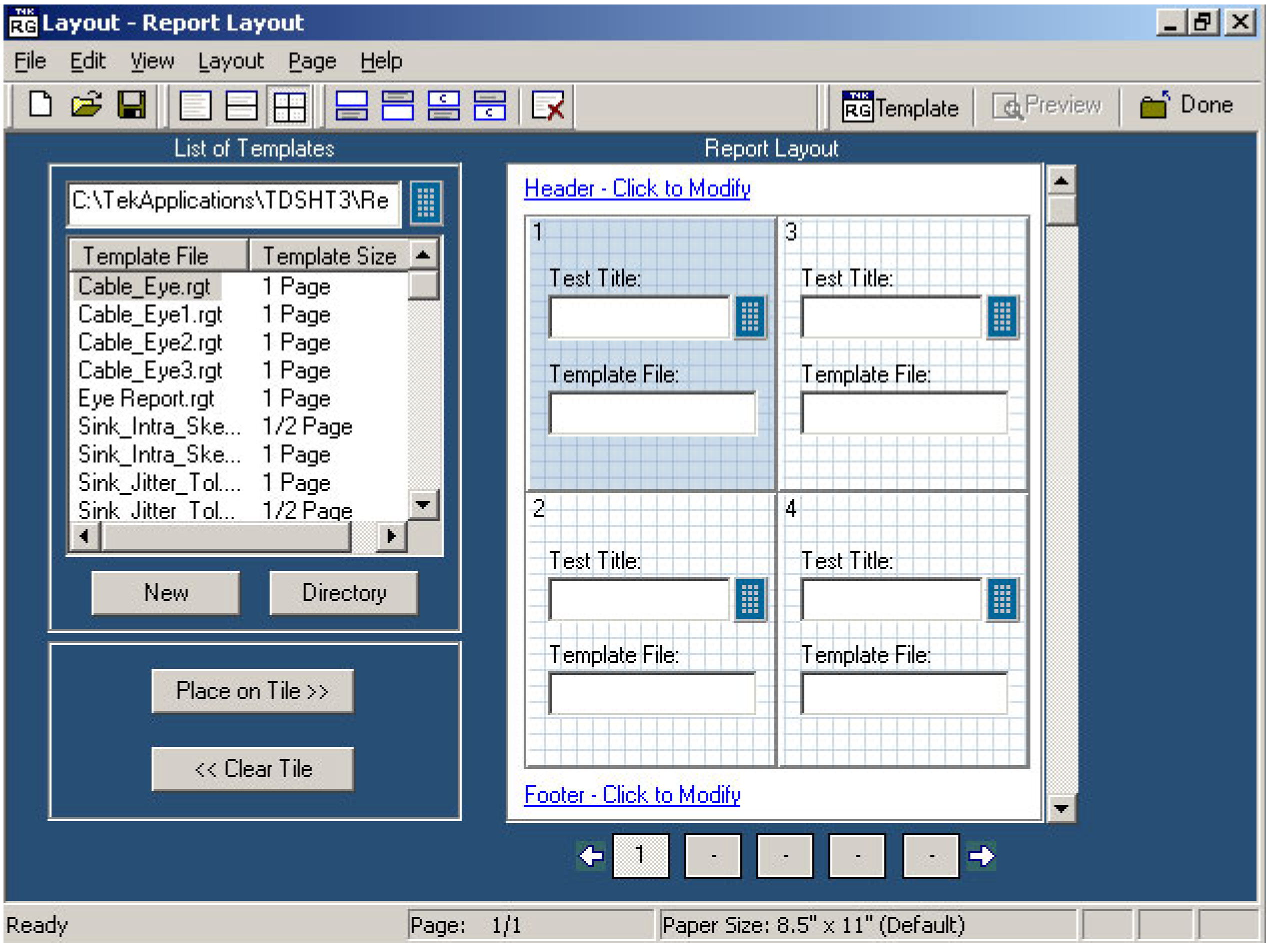


Figure 258: Report Layout Editor window

Application View – List of Templates pane

The list of templates pane displays the path of the template, templates in the folder, file names, and template sizes. You can select the template from this list and place it in the report layout pane.

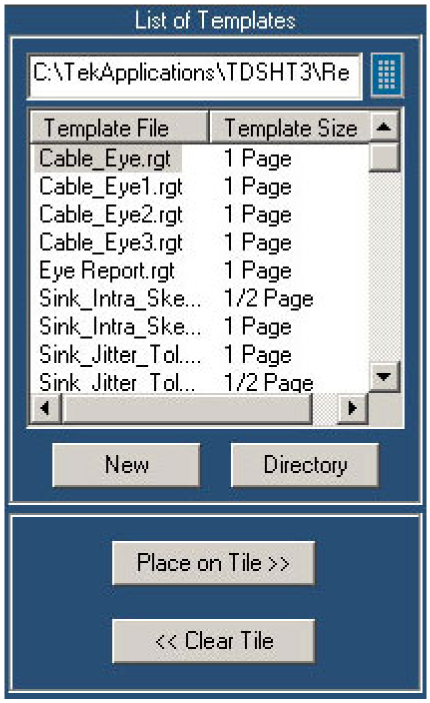


Figure 259: List of Templates pane

In the list of templates pane, you can:

- Select a different path where you have saved the customized templates either by using the Virtual Keyboard or clicking Directory that displays a Browse for Folder dialog box.
- Click New to create a new template. The Template Editor window appears, where you can create a new template.
- Drag and drop the template file to the report layout pane's tile, or select the template file and then click Place on Tile >>.
- Click << Clear Tile to clear the selected tile in the report layout pane.

Application View – Report Layout pane

Depending on the number of tests selected per page, the report layout pane appears as follows:

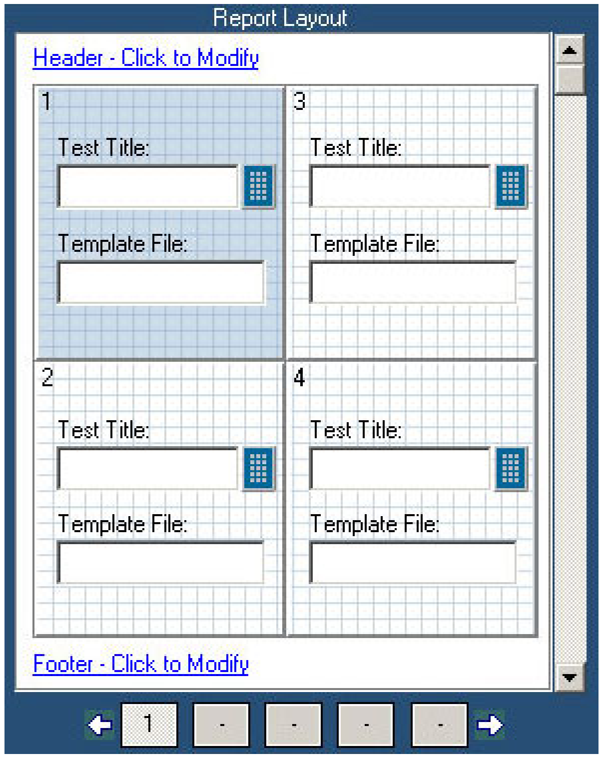


Figure 260: Report Layout pane

In the report layout pane, you can do the following:

- Specify a title for each test.
- Define or modify the header and footer.
- Navigate between pages of the report layout.

Menus – File menu

Table 140: File menu selection and Description

Menu Selection	Description
New	Click File > New to create a new report layout.
Open	Click File > Open to opens a report layout file.
Save	Click File > Save to save changes to the file.
Save As	Click File > Save As to save the report layout to a different file by using the Save As dialog box.
Page Setup	Click File > Page Setup to print either all or part of the contents of the active template.
Configure Page	Use the Page Setup dialog box to configure the paper size, source, orientation, and margins.
Default (8.5 inches X 11 inches)	Use the Page Setup dialog box to configure the page setup to default - 8.5 inches x 11 inches.
Layout Preview	Click File > Layout Preview to display a sample view of the active report layout as it would be printed.
List of recent report layouts	Click File > List of recent report layouts to open a previously (recently) opened report layout.
Exit	Click File > Exit to quit report layout editor.

Menus – Edit menu

Table 141: Edit menu selection and Description

Menu Selection	Description
Go To	Click Edit > Go To to go to the page that was typed in the Go To Page dialog box.

Menus – View menu

A check mark appears next to the selected command.

Table 142: View menu selection and Description

Menu Selection	Description
Toolbar	Click View > Toolbar to either display or hide the selected toolbars such as Standard, Page, Layout, and Action.
Status Bar	Click View > Status Bar to either display or hide the status bar.
Refresh Template List	Click View > Refresh Template List to update the template list in the list of templates pane.

Menus – Layout menu

A check mark appears next to the selected command.

Table 143: Layout menu selection and Description

Menu Selection	Description
One Test Per Page	Click Layout > One Test Per Page to change the report layout to fit one test per page.
Two Tests Per Page	Click Layout > Two Tests Per Page to change the report layout to fit two tests per page.
Four Tests Per Page	Click Layout > Four Tests Per Page to change the report layout to fit four tests per page.

Menus – Page menu

Table 144: Page menu selection and Description

Menu Selection	Description
Insert Blank	
Before Current Page	Click Page > Insert Blank > Before Current Page to insert a blank page before the current page.
After Current Page	Click Page > Insert Blank > After Current Page to insert a blank page after the current page.
Insert Copy	
Before Current Page	Click Page > Insert Copy > Before Current Page to insert a copy of the current page before the current page.
After Current Page	Click Page > Insert Copy > After Current Page to insert a copy of the current page after the current page.
Delete	Click Page > Delete to delete the current page.

Menus – Help menu

Table 145: Help menu selection and Description

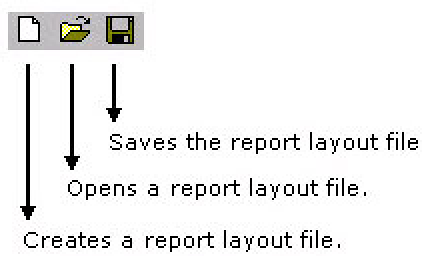
Menu Selection	Description
Help Topics	Click Help > Help Topics to display online help.
About Report Layout Editor	Click Help > About Report Layout Editor to display version and copyright information.

Toolbars

Click View > Toolbars to choose to either display or hide these toolbars.

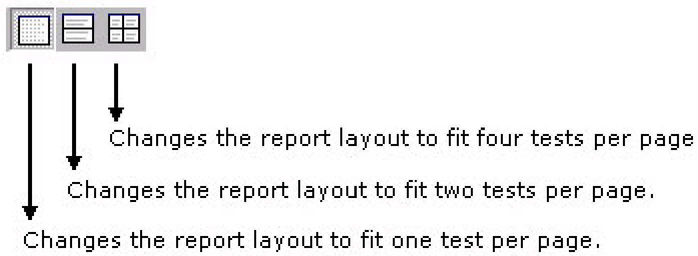
Toolbars – Standard toolbar

Click View > Toolbars > Standard to either display or hide the standard toolbar.



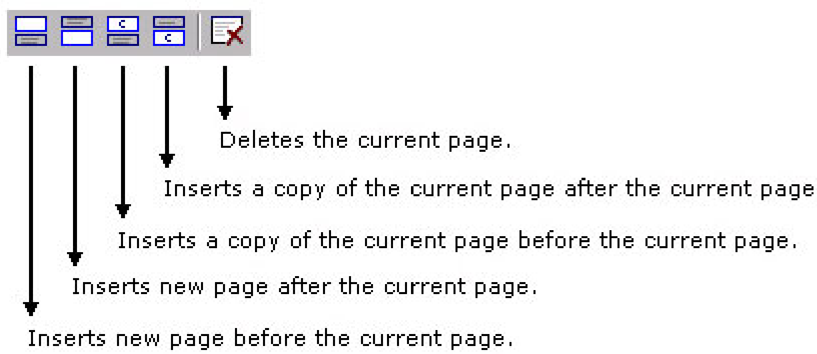
Toolbars – Layout toolbar

Click View > Toolbars > Layout to either display or hide the layout toolbar.



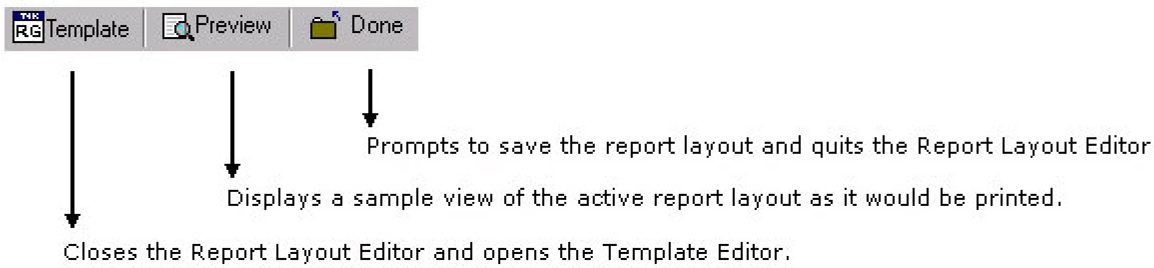
Toolbars – Page toolbar

Click View > Toolbars > Page to either display or hide the page toolbar.



Toolbars – Action toolbar

Click View > Toolbars > Action to either display or hide the action toolbar.



How to Use Report Layout Editor

To define a report layout, perform the following steps:

1. Set the report layout.

- Click Layout > One Test Per Page/Two Tests Per Page/Three Tests Per Page. The report layout pane displays tiles depending on the selected number of tests per page.

2. Add the templates.

- The list of templates pane displays the templates in the default directory - C:\TekApplications\TDSHT3v1-3\ReportGenerator\Templates.
- From the list of templates pane, drag and drop the templates to the tiles in the report layout pane. You can use Place on Tile and Clear Tile to move the templates to the tiles and to clear the tiles.
- If you want to define a new template, click New in the list of templates pane.
- To browse for a different folder other than the default templates, click Directory to display the Browse for Folder dialog box. Navigate to the folder where you have the templates stored and then click OK.

3. Define Header and Footer.

4. Save the report layout.

- Click File > Save to display the Save dialog box. Type the report layout name and then click Save.
- The report layout is saved in the .rpl format.

To edit an existing report layout, perform the following steps:

1. Change the report layout.

- Click Layout > One Test Per Page/Two Tests Per Page/Three Tests Per Page. The report layout pane displays tiles depending on the selected number of tests per page.
- An alert message appears.
- Click Yes to continue or click No to stop.

2. Add or remove the templates.

- In the report layout pane, click the tile to which you want to either add or remove the template.
- To remove a template from the report layout, complete the following steps:
  - In the list of templates pane, click Clear Tile.
  - An alert message appears.
  - Click Yes to continue or click No to stop.
- To add a template to the report layout, complete the following steps:
  - The list of templates pane displays the templates in the default directory - C:\TekApplications\TDSHT3v1-3\ReportGenerator\Templates.
  - From the list of templates pane, drag and drop the templates to the tiles in the report layout pane. Click Place on Tile to move the template to the selected tile.
  - If you want to define a new template, click New in the list of templates pane.
  - To browse for a different folder other than the default templates, click Directory to display the Browse for Folder dialog box. Navigate to the folder where you have the templates stored and then click OK.

3. Modify Header and Footer.

4. Save the report layout.

   - Click File > Save to display the Save dialog box. Type the report layout name and then click Save.
   - The report layout is saved in the .rpl format.

***Note**: Each report can have up to five pages.*

How to Add a Template

Using the Report Layout Editor, you can add a template to an existing report. Follow these steps to add a template to the report:

1. Click Define Report Layout to open a new layout.
2. Click File > Open and browse for generated reports. The report is displayed in the report layout pane.
3. From the standard toolbar, click Insert New Page before Current Page or Insert New Page after Current Page.
4. From the list of templates pane, select the template that you want to add to the current page layout. Drag and drop the template file on to the report or click Place on Tile to add the template.
5. Add test titles for this layout.
6. Click File > Save to save the modified report as an .rpl or .rpt file.
7. Click Generate Report to generate a report for the unfilled template from the .rpl or .rpt file.

Configure Page

1. Click File > Page Setup > Configure Page.
2. Configure the paper size, source, orientation, and margins.

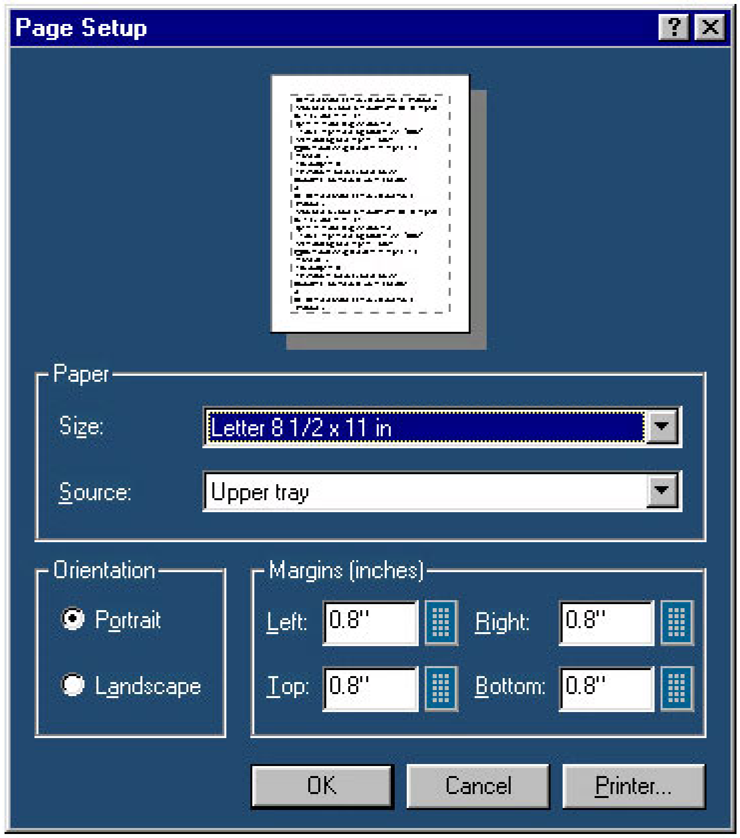


Figure 261: Page Setup window

3. Click OK.

Go To Page

1. Click Edit > Go To.

2. Use the Go To Page dialog box to go to different pages in the report layout.

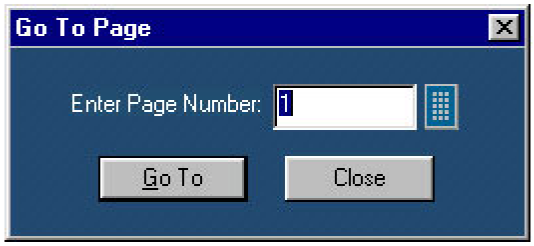


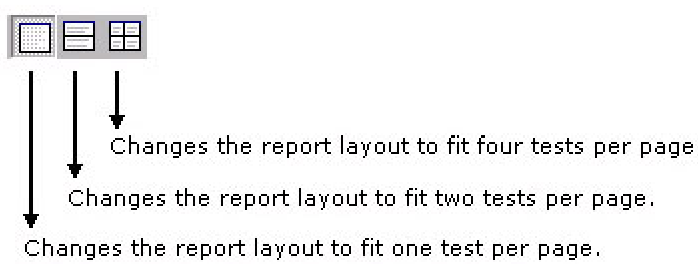
Figure 262: Go To Page dialog box

3. In the Enter Page Number box, either enter the page number or click the icon next the Enter Page Number box to display the Virtual Keyboard.

4. Click Go To. The report layout pane displays the relevant page.

Change Report Layout

Click Layout > One Test Per Page/Two Tests Per Page/Four Tests Per Page to change the report layout to fit one, two, or four tests per page.



Header/Footer Definition

To modify Header Definition, do the following:

1. In the report layout pane, click Header - Click to Modify.

Figure 263: Header/Footer Definition dialog box

2. In the Header/Footer Definition dialog box, select the header position - Header Left, Header Center, or Header Right.

3. Type the Header Definition in the text box.

   - Click the icon next to the text box to display the Virtual Keyboard. In the Virtual Keyboard, type the text, and then click Enter.

   - To insert special text, click Insert Special Text to display a submenu. Click Date, File Name, Author, Page X of Y, Page X, or Logo.

4. Click Set Font to change the font style, size, effects, color, and script for each field separately, and then click OK.

5. In the Header/Footer Definition dialog box, click OK.

To modify Footer Definition, do the following:

1. In the report layout pane, click Footer - Click to Modify.

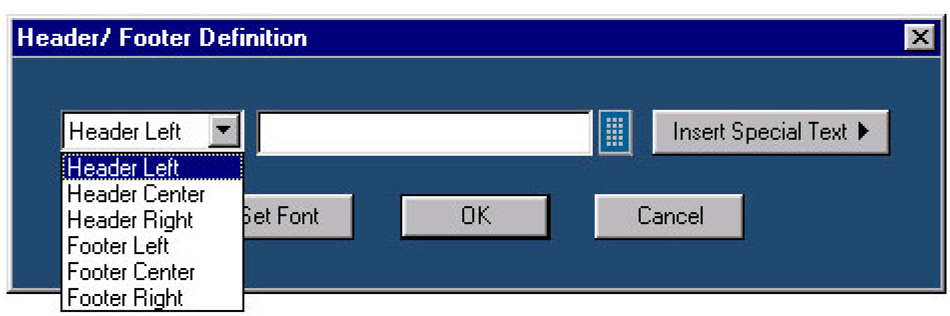


Figure 264: Header/Footer Definition dialog box

2. In the Header/Footer Definition dialog box, select the footer position - Footer Left, Footer Center, or Footer Right.

3. Type the Footer Definition in the text box.

   - Click the icon next to the text box to display the Virtual Keyboard. In the Virtual Keyboard, type the text, and then click Enter.

   - To insert special text, click Insert Special Text to display a submenu. Click Date, File Name, Author, Page X of Y, Page X, or Logo.

4. Click Set Font to change the font style, size, effects, color, and script for each field separately, and then click OK.

5. In the Header/Footer Definition dialog box, click OK.

Insert Pages

To insert pages, do the following:

- Click Page > Insert Blank > Before Current Page/After Current Page to insert a new page before the current page or after the current page.

- Click Page > Insert Copy > Before Current Page/After Current Page to insert copy of the current page before the current page or after the current page.

***Note**: When you insert a copy of a page before or after the current page, the current page layout is the same as the new page.*

Report Viewer

About Report Viewer

Report Viewer allows you to view the generated report.

On the Generate Report tab, either click Load Report or click Generate Report to display Report Viewer and browse for the report that you want to view or generate.

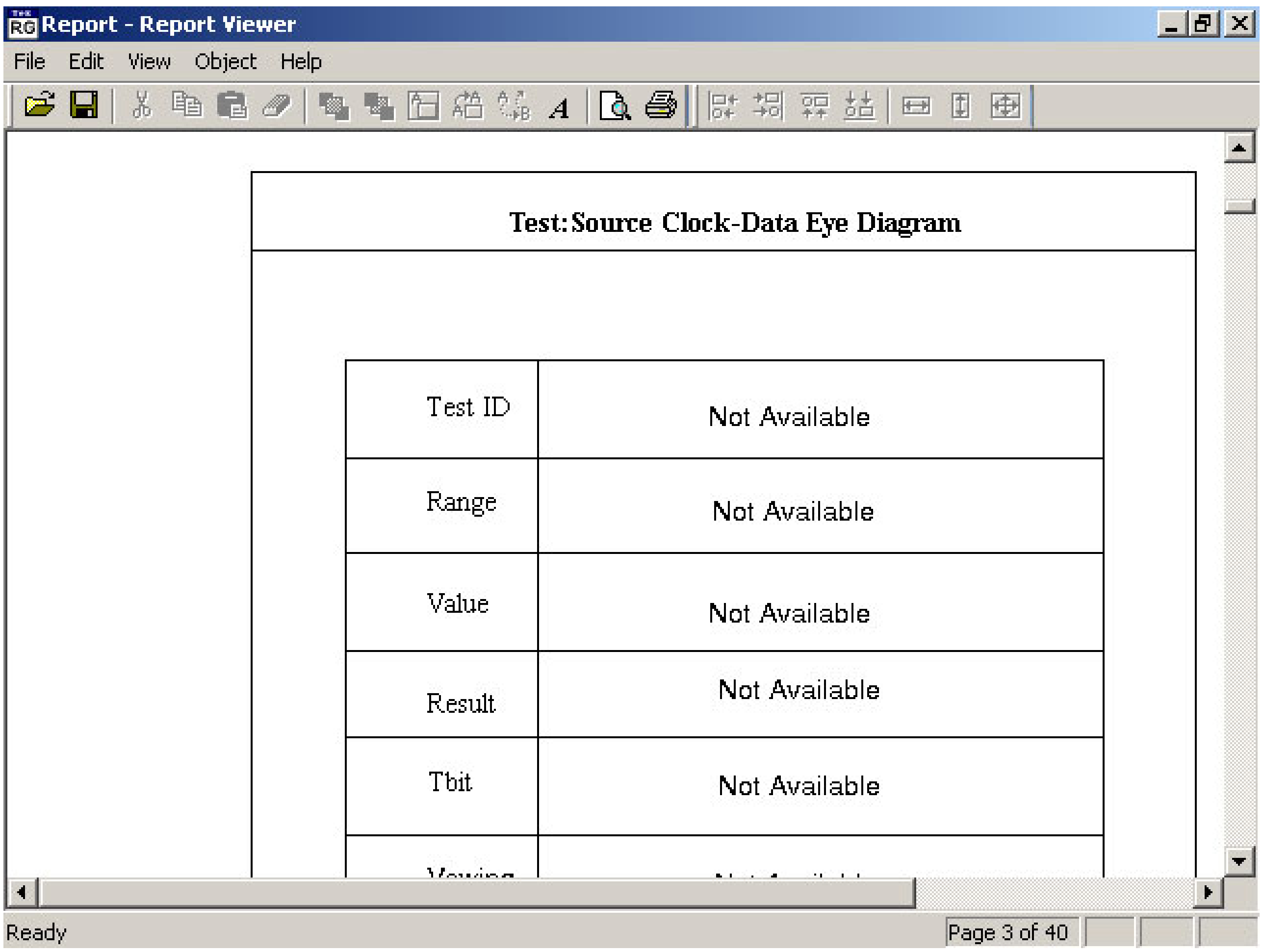


Figure 265: Application Report Viewer window

Application View – Report Viewer Window

The Report Viewer window includes a menu bar, toolbar, align/size bar, and client area.

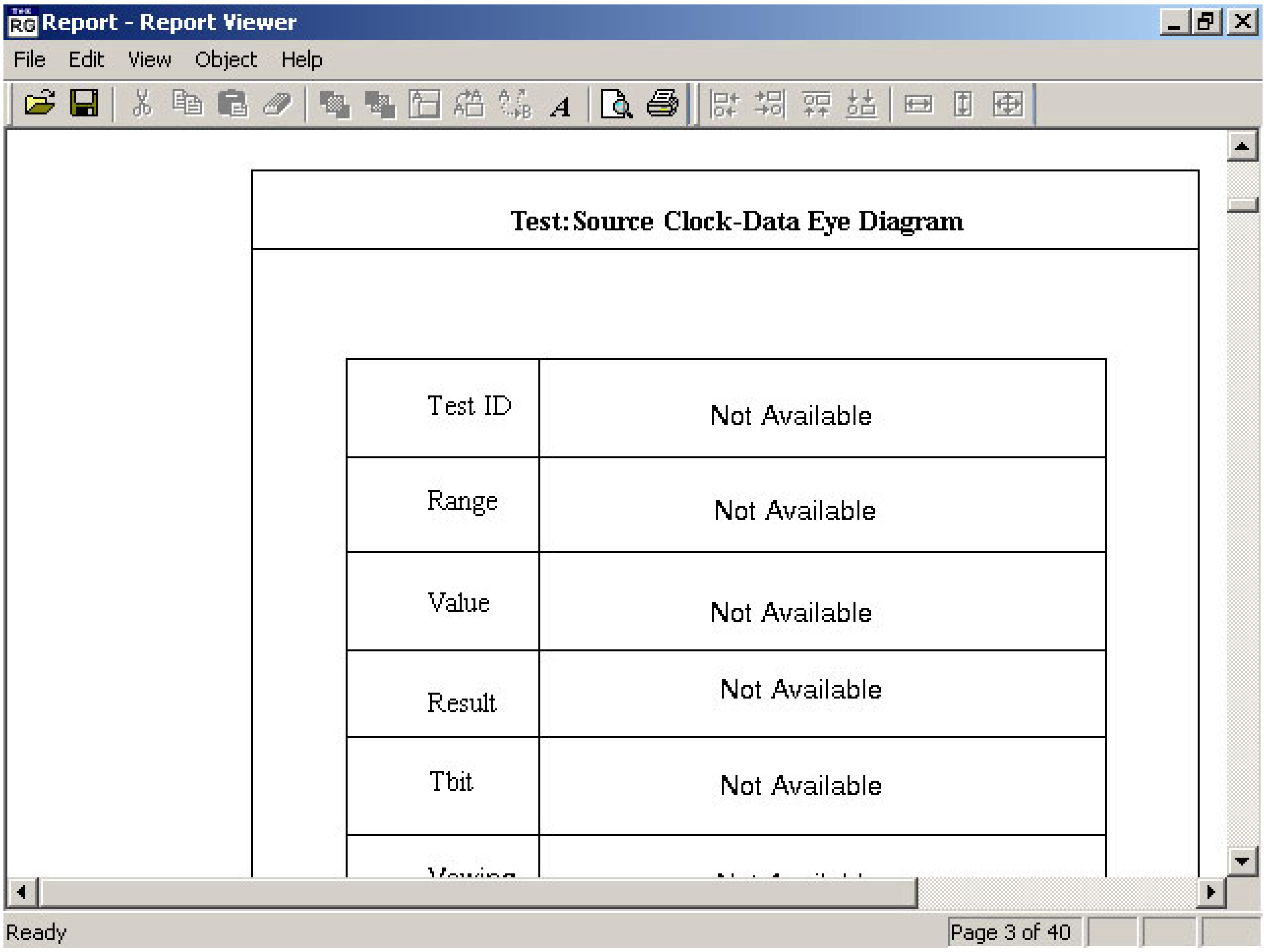


Figure 266: Report Viewer window

Menus – File menu

Table 146: File menu selection and Description

Menu Selection	Description
Open	Click File > Open to open a template file.
Save	Click File > Save to save changes to the file.
Save As	Click File > Save As to save the template to a different file by using the Save As dialog box.
Print	Click File > Print to either print all or part of the contents of the active template.
Print Preview	Click File > Print Preview to display a sample view of the active template as it would be printed.
Print Setup	Click File > Print Setup to set up the printer.
Export to RTF	Click File > Export to RTF to export the report in rich text format (.rtf).
List of recent templates	Click File > List of recent templates to open a previously (recently) opened template.
Exit	Click File > Exit to quit Report Viewer.

Menus – Edit menu

The available edit menu selections depend on whether a field is selected or not.

Table 147: Edit menu selection and Description

Menu Selection	Description
Cut	Click Edit > Cut to cut the selected fields and place it on the clipboard.
Copy	Click Edit > Copy to copy the selected fields to the clipboard.
Paste	Click Edit > Paste to paste the clipboard content.
Delete	Click Edit > Delete to delete the selected fields.
Select All	Click Edit > Select All to select all the fields.
Add Text Field	Click Edit > Add Text Field to add a text field to the report.
Find	Click Edit > Find to find the data that matches the search criteria.
Replace	Click Edit > Replace to replace the data that matches the search criteria with the specified data.
Go To	Click Edit > Go To to go to the page number specified in the Go To Page dialog box.

Menus – View menu

A check mark appears next to the selected command.

Table 148: View menu selection and Description

Menu Selection	Description
Toolbar	Click View > Toolbar to either display or hide the standard toolbar.
Align/Size Bar	Click View > Align/Size Bar to either display or hide the align/size toolbar.
Status Bar	Click View > Status Bar to either display or hide the status bar.
Separators	Click View > Separators to either display or hide the separators.

Menus – Object menu

The available object menu selections depend on whether a field in the client area is selected or not.

Table 149: Object menu selection and Description

Menu Selection	Description
Bring To Front	Click Object > Bring To Front to bring the selected field to front.
Send To Back	Click Object > Send To Back to send the selected field back.
Hide Text/Show Text	Click Object > Hide Text/Show Text to either show or hide the caption of the selected field.
Position Caption on Top/to the Left	Click Object > Position Caption on Top/to the Left to position the caption of the selected field either to the left or on top.
Edit Text	Click Object > Edit Text to edit the text in the selected field.
Change Font	Click Object > Change Font to change the font of the selected field or the caption by using the Change Font dialog box.
Align Fields	Click Object > Align Fields to align fields to the top, bottom, left, or right.
Make Same Size	Click Object > Make Same Size to resize the selected fields to the same size by height, width, or both.

Menus – Help menu

Table 150: Help menu selection and Description

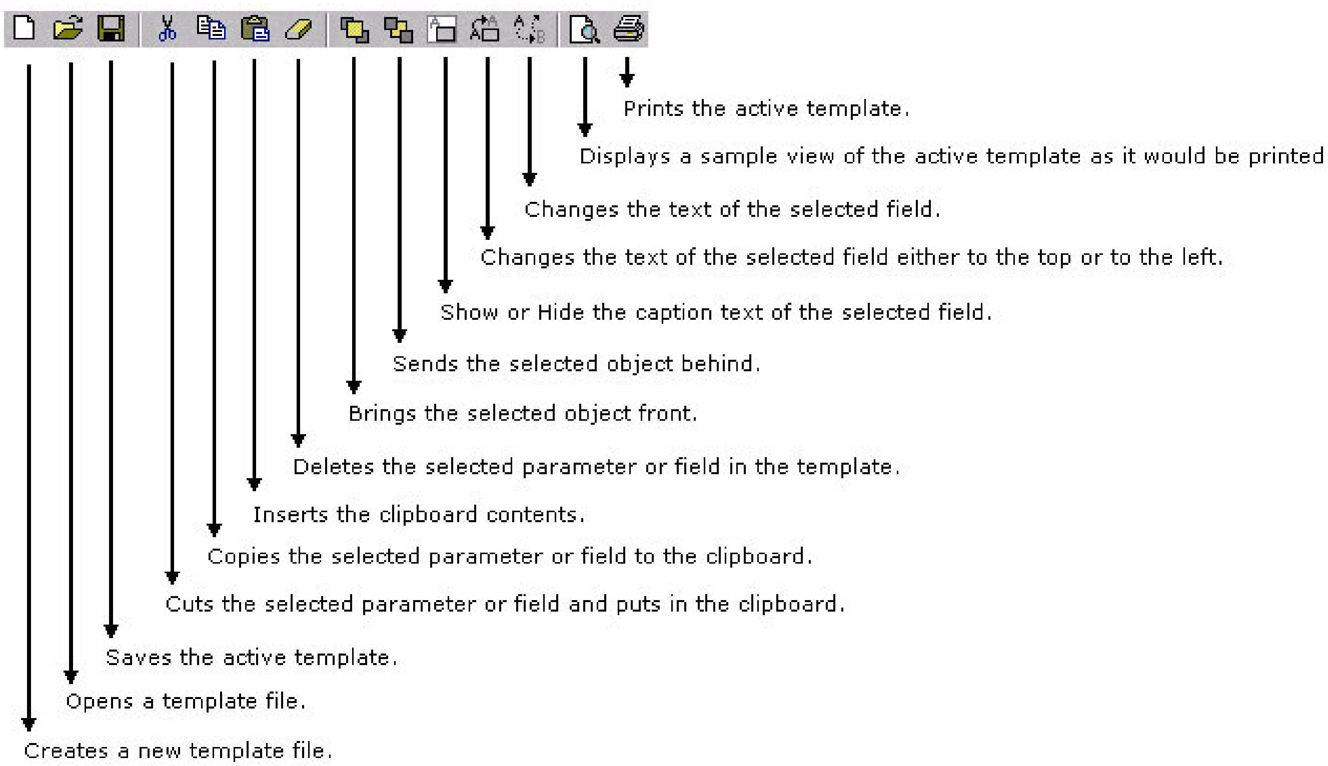
Menu Selection	Description
Help Topics	Click Help > Help Topics to display online help.
About Report Viewer	Click Help > About Report Viewer to display version and copyright information.

Toolbars

Click View > Toolbars to choose to either display or hide these toolbars.

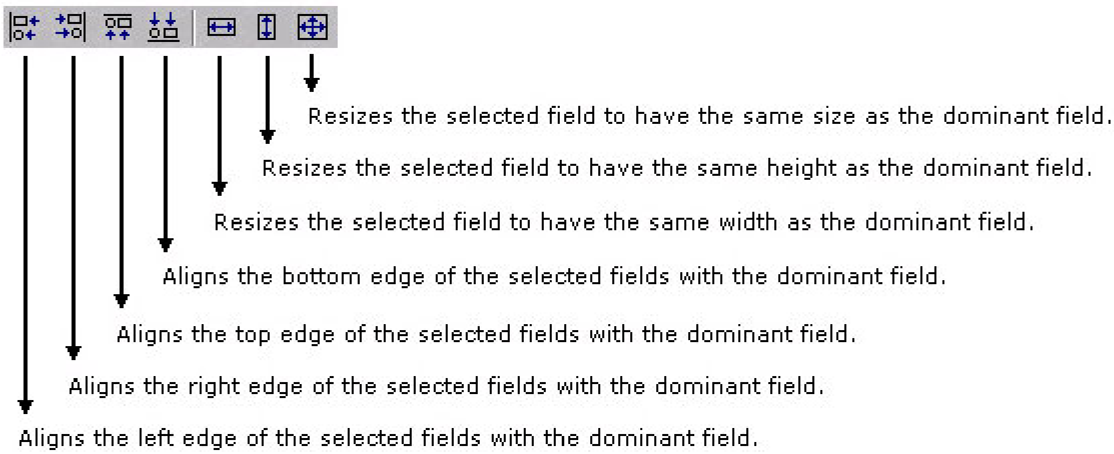
Toolbars – Standard toolbar

Click View > Toolbar > Standard to either display or hide the standard toolbar.



Toolbars – Align or Size toolbar

Click View > Toolbar > Align/Size to either display or hide the Align/Size toolbar.



Status bar

The status bar displays the status of the application and tool tips for selected options.

Separators

Click View > Separators to either display or hide the template separators.

How to Use Report Viewer

With the report viewer, you can:

- View a report
- Edit text
- Find text
- Replace text

You can select some objects and bring them front or send them back. You can show/hide text, position caption to the left, or on top. You can edit caption or change font. You can align selected fields or make the selected fields of the same size. You can export a report to an .rtf file.

Export to RTF

Click File > Export to RTF export a report to a rich text format (.rtf) file.

***Note**: Report Generator exports the report to an .rtf file in a compressed format to ensure that the file size is small. If you edit the .rtf file by using Microsoft Word, then the file size may increase.*

Find

You can search for text in the report.

1. Click Edit > Find. The Find dialog box appears.

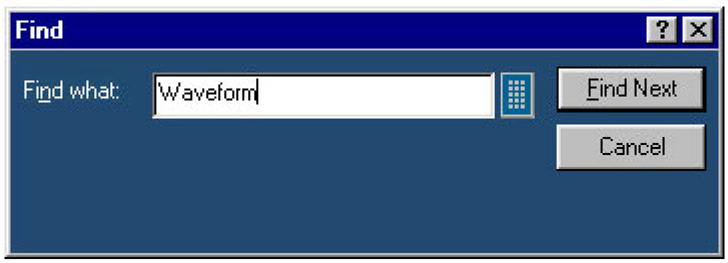


Figure 267: Find dialog box

2. In the Find dialog box, type the search string by using the Virtual Keyboard.

3. Click Find Next until you find the required search string.

Replace

You can search and replace the text in the report.

1. Select Edit > Replace.

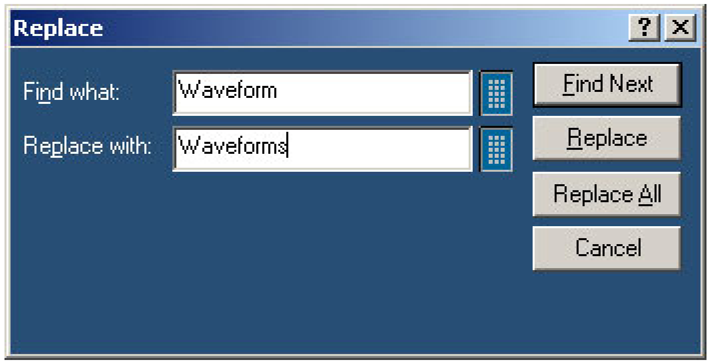


Figure 268: Replace dialog box

2. In the Replace dialog box, enter the search string by using the Virtual Keyboard in the Find what box.

3. In the Replace with box, by using the Virtual Keyboard, type the replacement string.

4. Click Find Next until you find the required search string.

5. Click Replace to replace one instance of the string, or click Replace All to replace all instances of the string.

6. Click Cancel after you have replaced the strings.

Bring To Front

Click Object > Bring To Front to bring the selected fields to the front.

Send To Back

Click Object > Send To Back to send the selected fields back.

Show/Hide Text

Click Object > Show/Hide Text to either show or hide the captions for the selected fields.

Position Caption

Click Object > Position Caption to the Left, or on Top to position the caption of the selected fields either to the left or on the top.

Edit Caption

You can edit the caption of the selected parameter or object.

1. Click Object > Edit Caption. The Edit Caption dialog box appears.

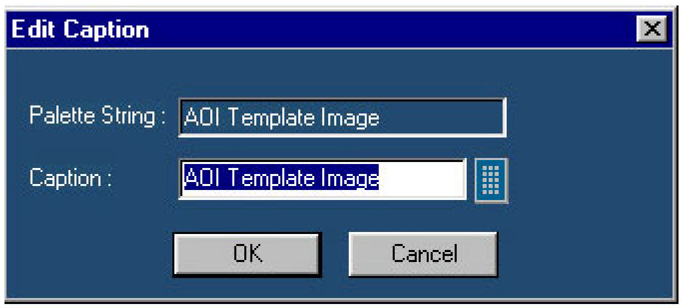


Figure 269: Edit Caption dialog box

2. In the Edit Caption dialog box, click the icon next to the Caption box to enter the caption by using the Virtual Keyboard.

3. Click OK.

Change Font

You can change font for the selected field in the template.

1. Select the field or fields in the active template.
2. Click Object > Change Font or right-click the field to display the options.

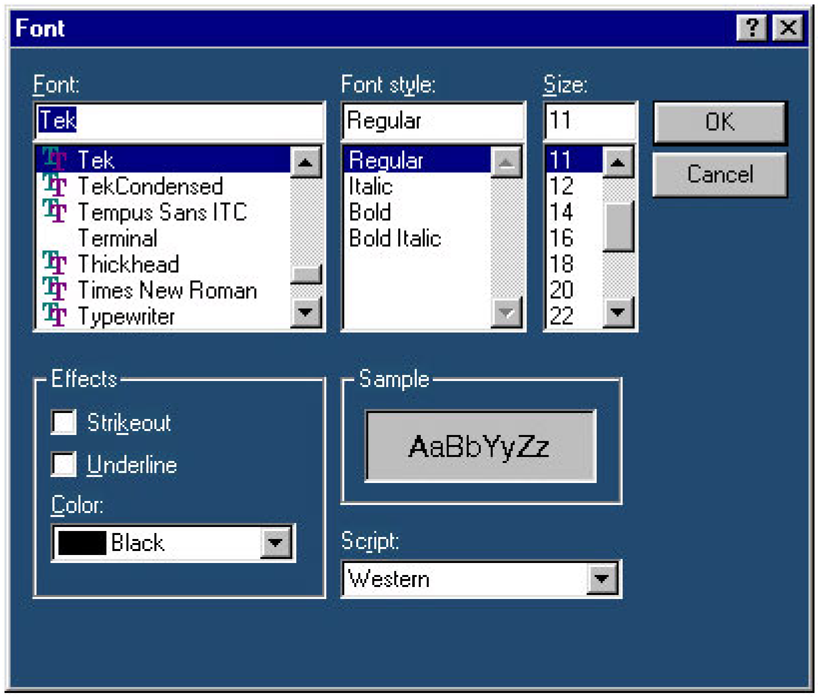


Figure 270: Font dialog box

3. In the Font dialog box, choose the font size, color, style, and effects.
4. Click OK.

Align Fields

You can align the fields to top, bottom, left, or right.

1. Select the fields in the active template.
2. Click Object > Align Fields > Top, Bottom, Left, or Right to align the fields accordingly.

Make Same Size

You can set the selected fields to the same height, width, or both.

1. Select the fields in the active template.
2. Click Object > Make Same Size > Height, Width, or Both to make the selected fields of the same size.

How to...

Create or Edit a Test Template

You can either create a new test template or edit an existing template.

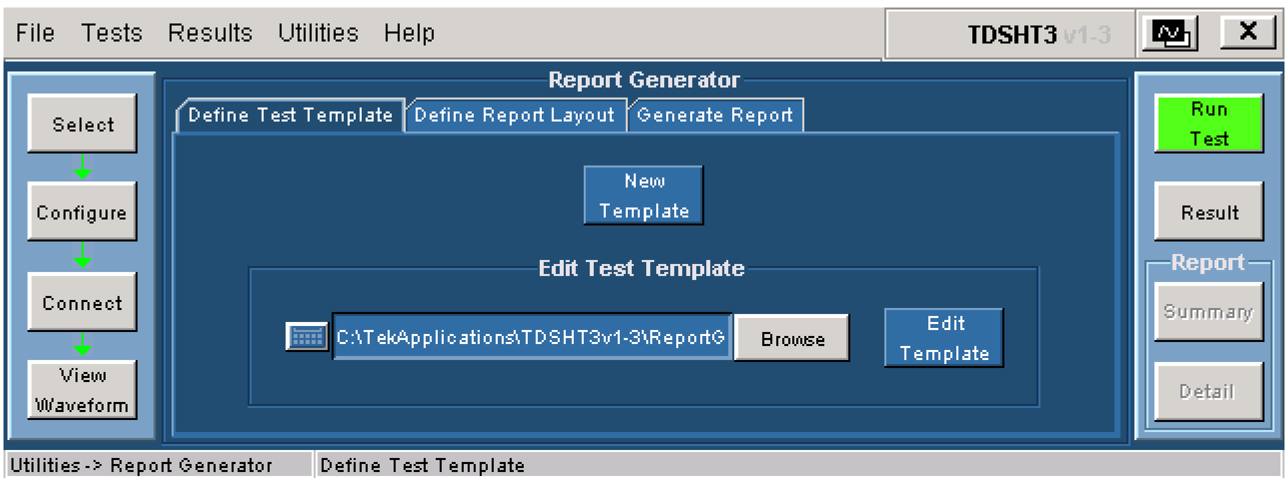


Figure 271: Define Test Template pane

To create a new test template:

1. Click Utilities > Report Generator > Define Test Template.
2. On the Define Test Template tab, click New Template.
3. The Template Editor window appears with an empty client area.
4. Create the template by using the palette list.
5. After you create a new test template, click Done.

To edit an existing test template

1. On the Define Test Template tab, click Browse. The Open dialog box appears.

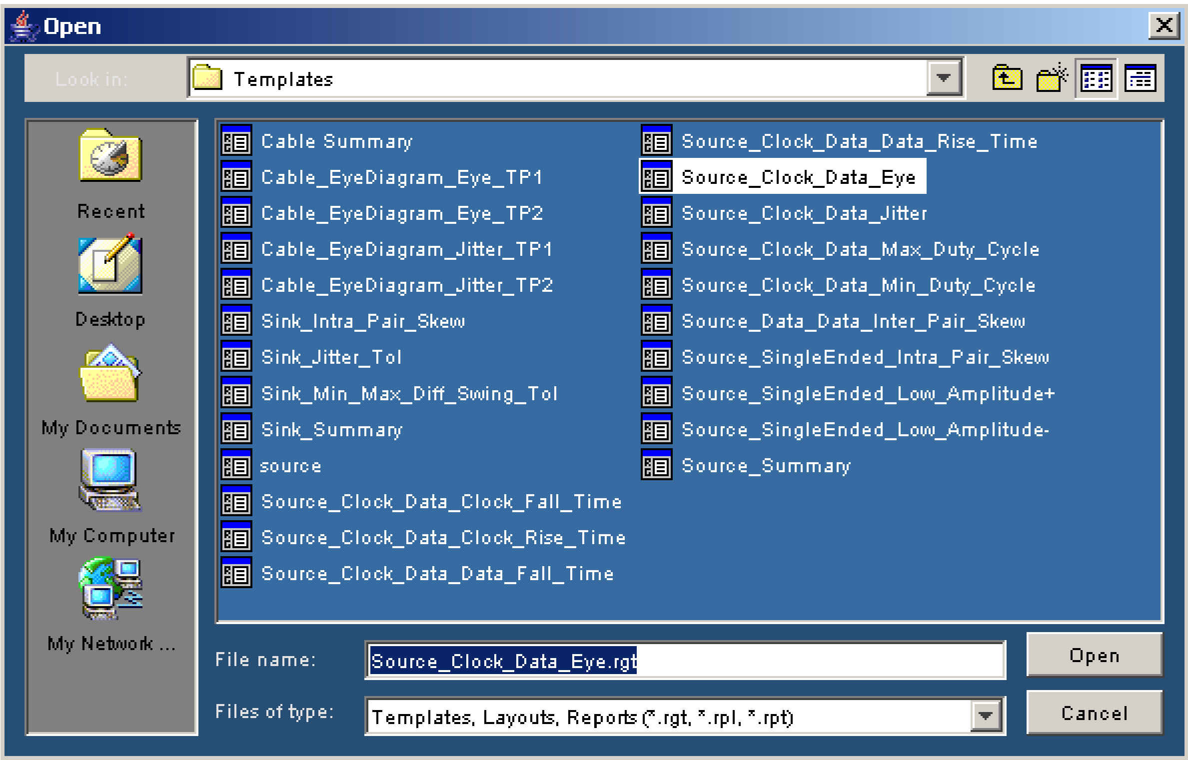


Figure 272: Open dialog box to edit an existing test template

2. The Open dialog box displays the existing factory default templates and customized templates in the path C:\TekApplications\TDSHT3v1-3\ReportGenerator\Templates.

3. Select the template that you want to use, and then click Open.

4. On the Define Test Template tab, click Edit Template.

5. The Template Editor window appears with the client area displaying the selected template.

6. Edit the template by using the palette list.

7. After you edit an existing test template, click Done.

Define or Edit a Report Layout

You can either create a new report layout or edit an existing report layout.

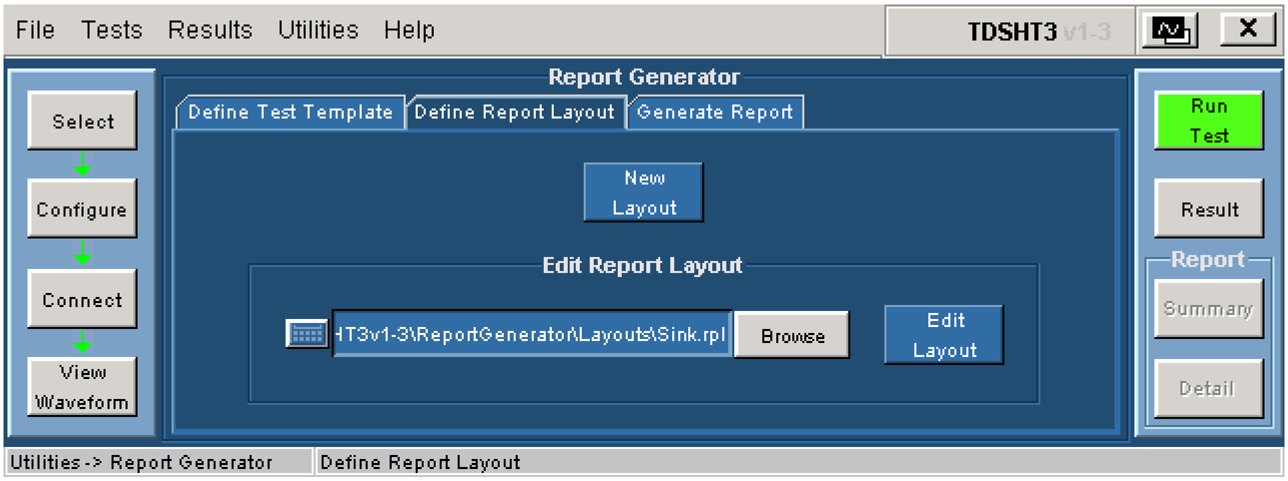


Figure 273: Define Report Layout pane

To create a new report layout:

1. Click Utilities > Report Generator > Define Report Layout.
2. On the Define Report Layout tab, click New Layout.
3. The Report Layout Editor window appears with an empty report layout area.
4. Create the report by defining the report layout and dragging and dropping the templates to the report layout area.
5. After you create a new report layout, click Done.

To edit an existing report layout:

1. On the Define Report Layout tab, click Browse. The Open dialog box appears.

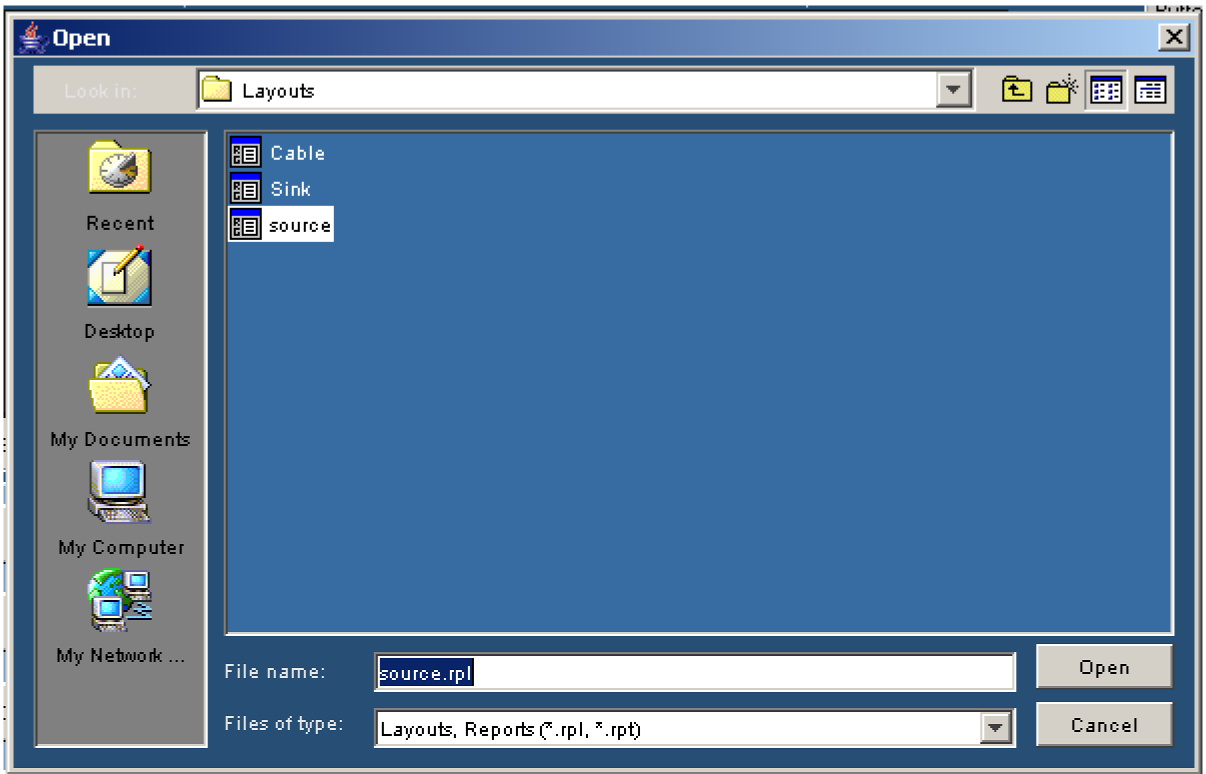


Figure 274: Open dialog box to edit an existing report layout

2. The Open dialog box displays the existing factory default report layout and customized report layouts in the path C:\TekApplications\TDSHT3v1-3\ReportGenerator\Layouts.

3. Select the report layout that you want to use, and then click Open.

4. On the Define Report Layout tab, click Edit Layout.

5. The Report Layout Editor window appears with the report layout area displaying the customized report layout and the selected template files.

6. Edit the report layout by using the list of templates and defining the report layout.

7. After you edit an existing report layout, click Done.

Generate, Print, or View a Report

Click Utilities > Report Generator > Generate Report to generate, print, or view a report.

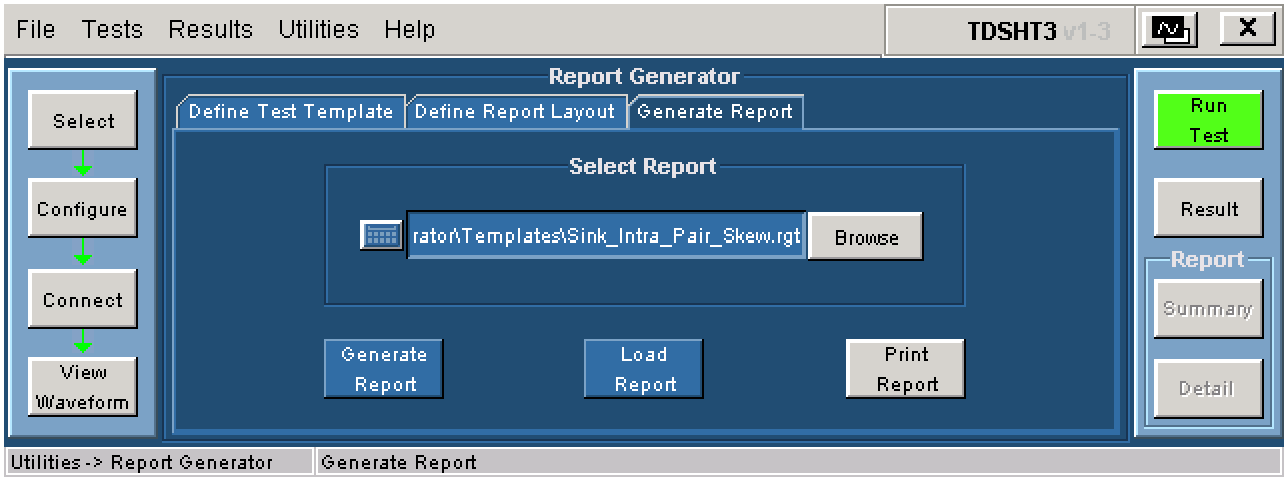


Figure 275: Generate Report pane

To generate a report:

1. On the Generate Report tab, click Browse. The Open dialog box appears.

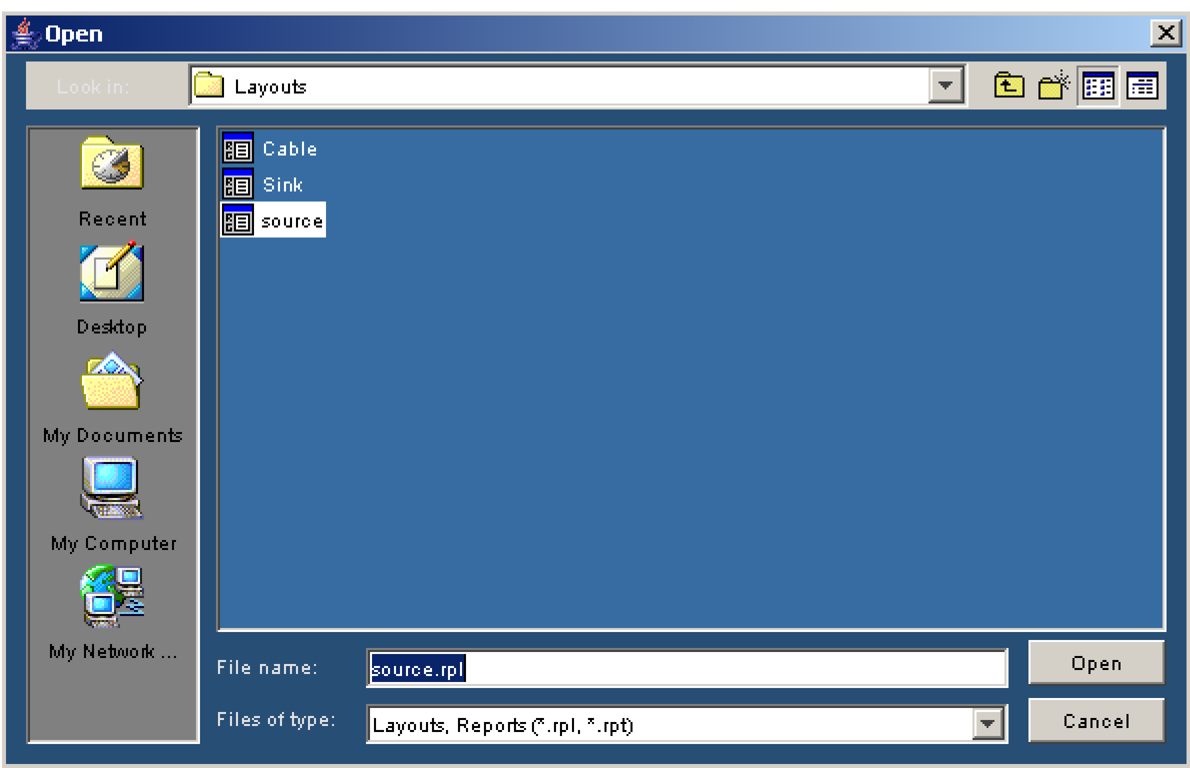


Figure 276: Open dialog box to generate a report

2. The Open dialog box displays the existing reports in the path C:\TekApplications\TDSHT3v1-3\ReportGenerator\Reports.

3. Select the report that you want to generate, and then click Open.

4. On the Generate Report tab, click Generate Report.

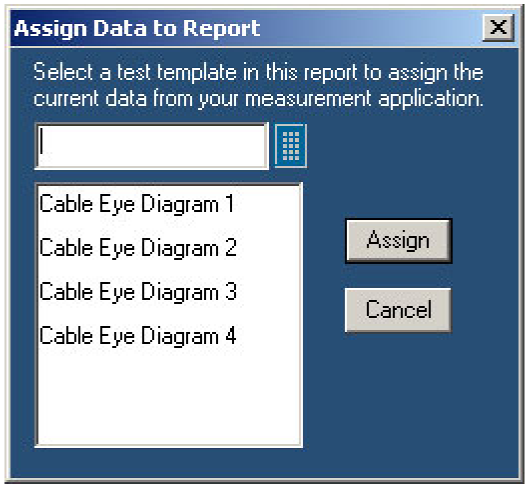


Figure 277: Assign Data to Report dialog box

5. In the Assign Data to Report dialog box, select a test template in this report to assign the current data from your test software.

6. Click Assign. Report Viewer displays the report with the current data from the software. You can choose to export the report to an .rtf format file.

To print a report:

1. On the Generate Report tab, click Browse. The Open dialog box appears.

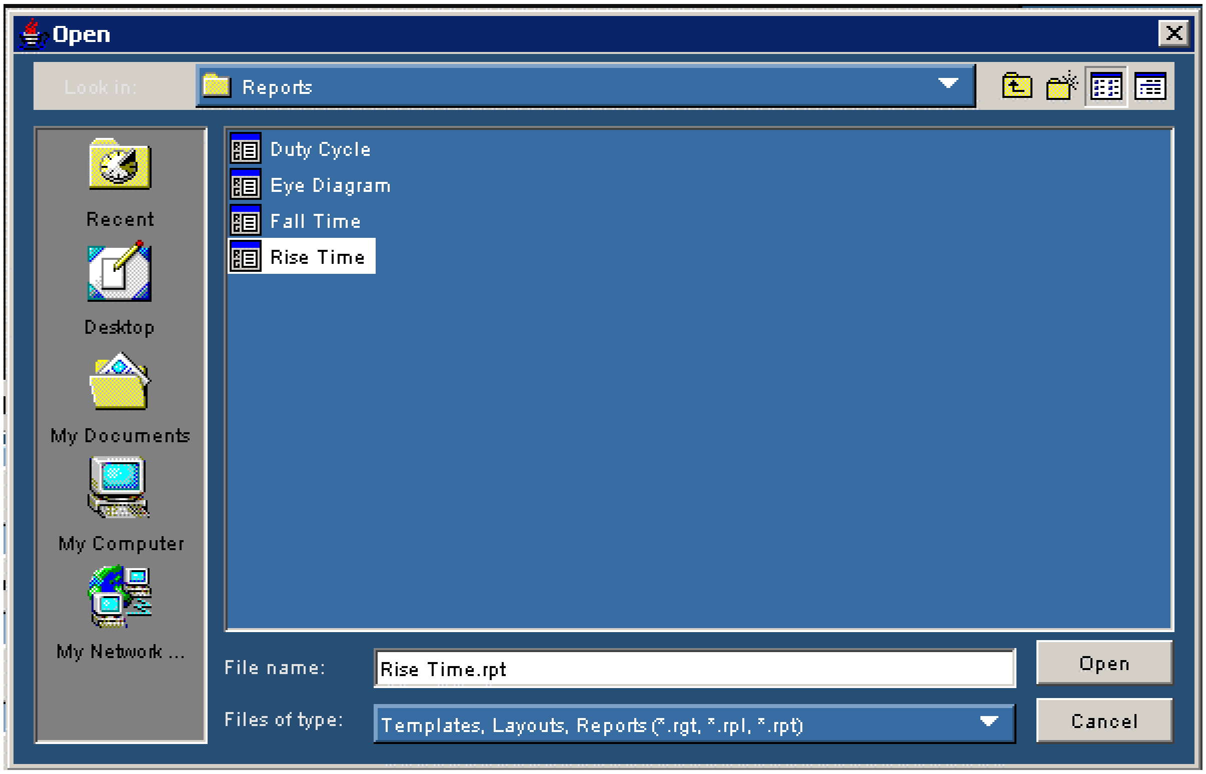


Figure 278: Open dialog box to print a report

2. The Open dialog box displays the existing reports in the path C:\TekApplications\TDSHT3v1-3\ReportGenerator\Reports.

3. Select the report that you want to print, and then click Open.

4. Click Load Report. Report Viewer displays the selected report with the current data from the software.

   - If the page settings do not match the page settings for the report, a **Page Size Mismatch** dialog box appears.
     - Click **Yes** to continue.
     - Click **No** to stop printing the report.
   - If the printer is available, the report is printed.

Report Generator Error Codes

Table 151: Report Generator Error Codes

Error Code	Error Message	Description	Possible Solution
Report Generator Interface Error Codes			
741	Some installation files are missing or corrupted, try reinstalling the application. The application will now exit.	The application FDB file path that is retrieved from the registry is either corrupted or the file path is invalid.	Remove the application and try reinstalling.
742	Some installation files are missing or corrupted, try reinstalling the application. The application will now exit.	Application id that is retrieved from the registry is invalid (< 0).	Remove the application and try reinstalling.
743	Some installation files are missing or corrupted, try reinstalling the application. The application will now exit.	The application version is invalid.	Remove the application and try reinstalling.
744	Some installation files are missing or corrupted, try reinstalling the application. The application will now exit.	The application is unable to spawn Report Viewer.	Report Viewer executable file is missing, or there might be a resource crunch if there are many applications currently running. Try closing some of the other applications. If this does not work, then remove and reinstall the application.
745	Internal initialization error. The application will exit now.	The memory map file or synchronization events for communication with RGScope are already open. The application was previously not shut down completely. Try closing RGScope.	The application was not closed completely last time. A module RGScope might be still running in the background. Try closing it.

Table 152: Report Generator Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
746	Some installation files are missing or corrupted, try reinstalling the application. The application will exit now.	The application is unable to spawn the oscilloscope interface.	RGScope file is missing, or there might be a resource crunch if there are many applications currently running. Try closing some of the other applications. If this does not work, then remove and reinstall the application.
747	Some installation files are missing or corrupted, try reinstalling the application. The application will exit now.	The application FDB file read failed. The file may be read only.	Remove and reinstall the application.
748	Some installation files are missing or corrupted, try reinstalling the application. The application will exit now.	The Acc application FDB file read failed. The file may be read only.	Remove and reinstall the application.
749	Some installation files are missing or corrupted, try reinstalling the application. The application will exit now.	Not invoked by the desired application. The application name passed by the invoking application is not found in the registry.	Remove and reinstall the application.
750	Some installation files are missing or corrupted, try reinstalling the application. The application will exit now.	The application is unable to spawn the Report Layout Editor.	The Report Layout Editor executable file is missing, or there might be a resource crunch if there are many applications running currently. Quit some of the other applications. If this does not work, then remove and reinstall the application.
751	Some installation files are missing or corrupted, try reinstalling the application. The application will exit now.	The application is unable to spawn the Template Editor.	The Template Editor executable file is missing, or there might be a resource crunch if there are many applications running currently. Quit some of the other applications. If this does not work, then remove and reinstall the application.
Report Layout Editor Error Codes			
721	Some installation files are missing or corrupted, try reinstalling the application.	Not invoked by the desired application. The application name passed by invoking the application is not found in the registry.	Remove and reinstall the application.
722	The Selected file is not a valid layout for this application.	The layout belongs to some other application.	The layout file being opened belongs to an older application, which may have been removed. It is not possible to open a file belonging to another application.

Table 152: Report Generator Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
723	Layout file is not valid for the current version of the Application.	The layout was created for some other version of the application.	The opened layout file belongs to a different version of the same application, which may have been removed. It is not 'possible to open a file belonging to another version.
Template Editor Error Codes			
761	Error in Initialization of Application.	The dlls and application executables are not properly installed.	Remove and reinstall the application.
762	Invalid Application Name.	The registry entries are not appropriate.	Remove and reinstall the application.
763	The Selected file is not a valid template for this application.	The template belongs to some other application.	The opened template file belongs to a different version of the same application, which may have been removed. It is not possible to open a file belonging to another version.
764	Template file is not valid for the current version of the Application.	The template was created for some other version of the application.	The opened template file belongs to a different version of the same application, which may have been removed. It is not possible to open a file belonging to another version.
765	A Group with the specified name already exists.	The user tried to create a custom group with the same name as an existing group.	Try to use a different name other than the existing groups.
Oscilloscope Interface Error Codes			
781	MFC initialization failed.	The MFC dlls are not properly installed.	Reinstall the application.
782	Error in creating or setting system resource.	The system resources that are required for communication are already open.	Quit all the application related executables and try again.
783	RGScope already running.	RGScope.exe is already running on the system.	Quit RGScope and restart the application.
784	Memory exception occurred + <context specific message>.	The application has performed an illegal memory access.	Quit the application and restart.
785	An exception occurred.	An unknown exception has occurred in the application.	Quit the application and restart.
786	File Exception occurred + <context specific message>.	An exception occurred while accessing a file.	Quit the application and restart.
787	Error in acquiring window resources + <context specific message>.	The application was not able to acquire windows resources such as GDI objects.	Quit the application and restart.
788	Failed to connect to the oscilloscope.	The application was not able to connect to the oscilloscope. Ensure that TekScope.exe is running.	If this does not solve the problem, then reinstall the application.
789	Error querying registry.	Either the required registry key	Quit the application and restart. If this does

Table 152: Report Generator Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
		does not exist or an error occurred while getting its value.	not solve the problem, then reinstall the application.
790	Error in reading FDB file.	Either the FDB file does not exist or it may be read-only.	Ensure that the FDB file is present and not read-only. If this does not solve the problem, then reinstall the application.
791	Invalid frame received.	Oscilloscope interface received an invalid message from RG interface.	Quit the application and restart.
792	Error in allocating memory.	There was an error in getting memory from the system.	Quit one or more applications running on the system, and then restart RGApp.
793	<context specific message>.	There was an error in creating the jpeg file.	Ensure that the temp folder exists and there is sufficient free space on the hard disk drive.
Message Boxes and Dialogs in the User Interface			
701	Error initializing Report Generator.	The system resources cannot be allocated. Try closing some of the other applications.	If this does not work, then remove and reinstall the application.
702	No valid file name was provided.	This happens when no filename is selected in the application for generating a report.	Select a valid file.
703	<Path of the file selected> The template file name is invalid.	The reading of the template file fails. This will happen if the application fails to read the .rgt file.	Select another valid template file.
704	<filename> is not a valid Report Layout.	An invalid report layout was provided. This happens if the application fails to read the layout file.	Select another valid layout file.
705	<filename> is not a valid Report Layout file for the application.	The layout is not valid for the application. This means that the file was read properly but the application name and version for the .rpl file do not match that of the application.	Select another valid layout file for the application.
706	Invalid report file specified.	A file other than the Report Generator file(s) is selected with the extension (.rpt, .rgt, .rpl) used by Report Generator files.	Select another valid file.
707	Invalid file format.	Other file types such as text are selected.	Select another valid file.
708	<filename> is not a valid report file for <AppName>.	The application name and version for the report file do not match that of the application.	Select another valid report file for that application.

Table 152: Report Generator Error Codes (Cont.)

Error Code	Error Message	Description	Possible Solution
709	Unable to read the report file.	An exception occurs for an rpt file. This happens if the application cannot read the report .rpt file.	Select another valid report file for that application.