TekExpress®
D-PHY Automated Solution
Online Help

077-0514-01

Tektronix

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www.tektronix.com
077-0514-01

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TekExpress D-PHY Automated Solution Online Help, 076-0227-01.

Contacting Tektronix

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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.

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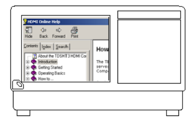
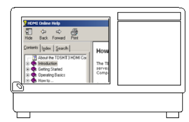
Related Documentation

The following manuals are available as part of the TekExpress D-PHY Automated Solution documentation set.

Table 1: Product documentation

Item	Purpose	Location
Online Help	In-depth operation and UI help.	
PDF of the Online Help (077-0514-XX)	In-depth operation and UI help.	 +  www.Tektronix.com

Conventions

Online Help uses the following conventions:

- The term “DUT” is an abbreviation for Device Under Test.
- The term “select” is a generic term that applies to the two mechanical methods of choosing an option: using a mouse or using the touch screen.
- A Note identifies important information.

Technical Support

Tektronix values your feedback on our products. To help us serve you better, please send us your suggestions, ideas, or comments on your application or oscilloscope.

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

General Information

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

Application Specific Information

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

Forward the information to technical support using one of these methods:

- E-mail – techsupport@tektronix.com
- FAX – (503) 627-5695

Compatibility

The TekExpress D-PHY application runs on the following Tektronix oscilloscopes:

- MSO71254C, MSO71604C, and MSO72004C Series Mixed Signal Oscilloscopes
- DPO/DSA71254C, DPO/DSA71604C, and DPO/DSA72004C Series Digital Oscilloscopes
- MSO70404, MSO70604, MSO70804, MSO71254, MSO71604, and MSO72004 Series Mixed Signal Oscilloscopes
- DPO/DSA70404B, DPO/DSA70604B, DPO/DSA70804B, DPO/DSA71254B, DPO/DSA71604B, and DPO/DSA72004B Series Digital Oscilloscopes
- DPO/DSA70404, DPO/DSA70604, DPO/DSA70804, DPO/DSA71254, DPO/DSA71604, and DPO/DSA72004 Series Digital Oscilloscopes
- DPO7254 [1] and DPO7354 Digital Oscilloscope

1 The DPO7254 oscilloscope may not meet the Rise/Fall time specifications of D-PHY standards. If that is not critical, then you can use the DPO7254 oscilloscope for the D-PHY measurement.

The TekExpress D-PHY application supports the following Tektronix probes:

- TAP1500
- P7240
- P6245
- P7380A
- P7508 (supports HS-tests only, with known limitations for DSI DUTs)
- TDP3500

Minimum System Requirements

The minimum system requirements for a PC to run TekExpress are as follows:

Processor	Pentium 4/M or equivalent processor.
Operating System	Windows XP Service Pack 2.
Memory	512 MB of memory.
Hard Disk	Approximately 2 GB of available hard-disk space for the recommended installation, which includes full TekExpress installation and distributed components.
Drive	DVD drive.
Display	Super VGA resolution or higher video adapter (800x600 minimum video resolution for small fonts or 1024x768 minimum video resolution for large fonts). The application is best viewed at 96 dpi display settings [1].

Software	■ Microsoft Excel 2002 or above. ■ Microsoft Internet Explorer 6.0 SP1 or later. ■ Microsoft Photo Editor 3.0 or equivalent software for viewing image files. ■ Adobe Reader 6.0 or equivalent software for viewing portable document format (PDF) files.
Other Devices	■ Microsoft compatible mouse or compatible pointing device. ■ Four USB ports (two USB ports minimum). ■ PCI-GPIB or equivalent interface for instrument connectivity [2].

1 If TekExpress is running on an instrument having a video resolution lower than 800x600 (for example, sampling oscilloscope), it is recommended to connect a secondary monitor and this must be enabled before launching the application.

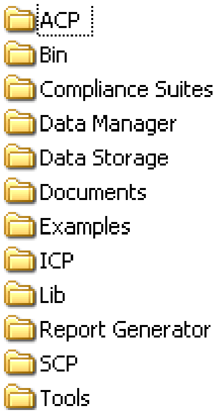
2 If TekExpress is installed on a Tektronix oscilloscope, the virtual GPIB port will be used by TekExpress for communicating with oscilloscope applications. If external GPIB communication devices like USB-GPIB-HS or equivalent are used for instrument connectivity, ensure that the Talker Listener utility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

Install the Software

1. Close all applications.
2. Download D-PHYWebinstaller_<version>.EXE.
3. Double-click the executable to extract the files. After extraction, the installer launches and the software is installed in `C:\Program Files\Tektronix\TekExpress\TekExpress D-PHY`.

Application Directories and Usage

The application directory and associated files are organized as follows:



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

Directory names	Usage
InstallDir\TekExpress\TekExpress D-PHY	Contains the application and associated files.
TekExpress D-PHY\Compliance Suites	Contains compliance specific files.
TekExpress D-PHY\Bin TekExpress D-PHY\Lib TekExpress D-PHY\Tools	Includes the Miscellaneous libraries of the D-PHY application. Includes utility files specific to the D-PHY application. Includes instrument application specific files for the D-PHY application.
TekExpress D-PHY\ACP TekExpress D-PHY\SCP TekExpress D-PHY\ICP	Includes instrument and application specific interface libraries of the D-PHY application.
TekExpress D-PHY\Documents	Includes the technical documentation for the application.
TekExpress D-PHY\Data Manager TekExpress D-PHY\Data Storage TekExpress D-PHY\Report Generator	Includes the result management specific libraries of the D-PHY application are present in these folders. Includes Excel Active X interface Library for Report Generation.
	Includes the filter files for the D-PHY application.

Folder Structure

After you install D-PHY, it creates the following folders on your computer:

- `\Program Files\Tektronix\TekExpress\TekExpress D-PHY`.

***NOTE.** Ensure that the "TekExpress" folder has read and write access.*

- `\My Documents\My TekExpress\D-PHY`.
- `\My Documents\My TekExpress\D-PHY\Untitled Session`.

  Every time the `TekExpress D-PHY.exe` is launched, an Untitled Session folder is created under `D-PHY` folder. The Untitled Session folder is deleted when you exit the `D-PHY` application.

***CAUTION.** Each session has multiple files associated with it. Do not modify any of the session files and/or folders as this may result in loss of data or corrupted session files.*

- The `My TekExpress` folder is created as a shared folder with share name as <domain><user ID>My TekExpress (or if the PC is not connected to domain, then share name is `<Computer name><user ID> My TekExpress`).
- The above shared folder is mapped as X: (X drive) on to the instrument where D-PHY is running.

***NOTE.** If X drive is mapped to any other shared folder, the application will display a warning message window asking you to disconnect the X: drive manually.*

File Name Extensions

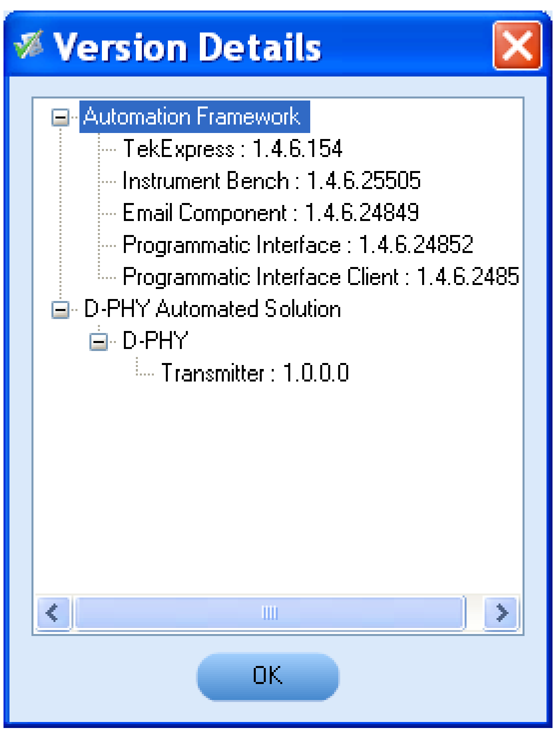
The software uses the following file name extensions:

File name extension	Description
.TekX	The session file will be saved in this format.
.seq	The test sequence file.
.xml	The encrypted XML file that contains the test specific configuration information. The log file extension is also xml.
.wfm	The test waveform file.
.mht	The test result report will be saved in this format.
.flt	The filter files are in this format.

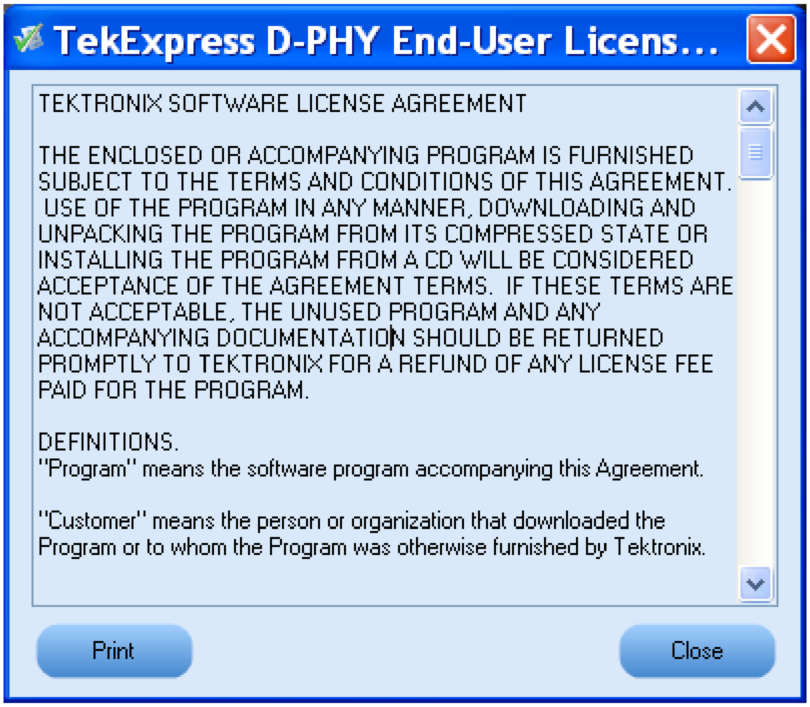
Activate the License

Follow the steps below to activate the license:

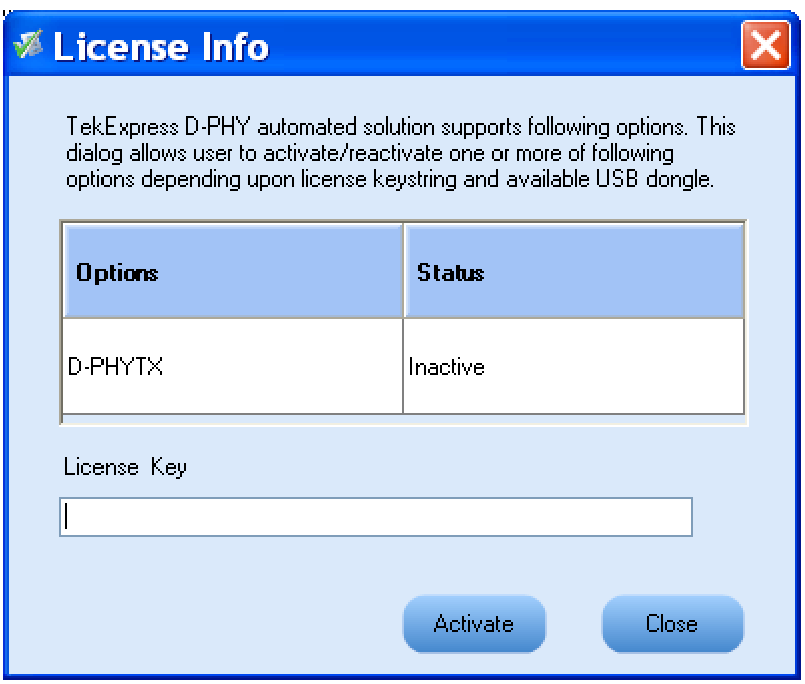
1. Click **Help** > **Activate License** or **Help** > **About TekExpress** > **License Info** to view the license information and activate the application.
2. Click the **View Version Details** link to check the version numbers of the installed test suites.



3. Click the **View End-User License Agreement** link to open the following Tektronix Software License Agreement window. Click **Print** to print the License Agreement.



4. Click **License Info** to view the available software options. This window shows the license key and supported options with their status (active or inactive) with the current license key.



5. If you are activating the license for the first time, the license key field will be empty. To activate the license, connect the USB dongle to your computer, enter the license key provided in the license key certificate, and click **Activate**. If the activation is successful, a sign is displayed next to the license key field.

6. If you are reactivating the license, click **Reactivate**, enter the new license key and click **Activate**.

Before You Click Run

Do the following before you click Run:

NOTE. *Ensure that the network connectivity is enabled on the instrument running the D-PHY application.*

1. Map (see page 9) the shared My TekExpress folder as X: (X drive) on all the instruments used in test setup running Microsoft Windows Operating System. This shared folder is used to save the waveform files or used during any other file transfer operations.

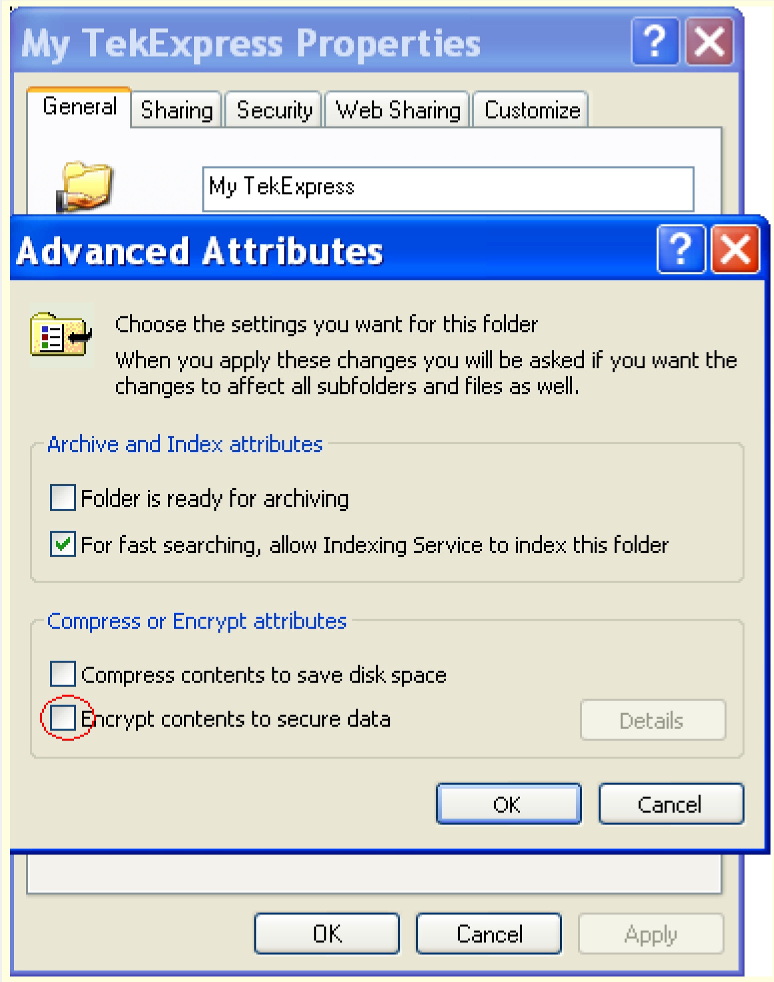
2. Right-click on the My TekExpress folder and open the **Properties** dialog box. Select the **General** tab and then **Advanced**. In the **Advanced Attributes** window, ensure that the option **Encrypt contents to secure data** is NOT selected. Click here (see page 10) to view the picture.

3. Ensure that all the required instruments are properly warmed up, Signal Path Compensation (SPC) (see page 10) performed, followed by cable deskew.

Mapping My TekExpress Folder

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

1. Open Windows Explorer.
2. From the Windows Explorer menu, select **Tools** > **Map Network** drive.
3. Select the Drive letter as X: (if there is any previous connection on X:, disconnect it first through **Tools** > **Disconnect Network drive** menu of Windows Explorer).
4. In the Folder field, enter the remote My TekExpress folder path (for example, \\192.158.97.65\John's My TekExpress)
5. To determine the IP address of the PC where "My TekExpress" folder exists, do the following:
   - Select **Start** > **Run** menu on the PC where the My TekExpress folder exists.
   - Enter cmd and press **Enter**.
   - At the command prompt, type ipconfig.



To find SPC, do the following:

1. On the oscilloscope main menu, select the **Utilities** menu.
2. Click the **Instrument Calibration** option.

D-PHY Application Overview

TekExpress is the Tektronix Test Automation Framework, developed to support your current and future test automation needs. TekExpress uses a highly modular architecture that lets you deploy automated test solutions for various standards in a relatively short time.

Key Features

The key features of the D-PHY application are:

- Allows conformance testing to the latest Compliance Test Specification (CTS)
- Comprehensive test coverage performing 40 out of 49 total conformance tests to the latest CTS. (81% tests coverage)
- Automated testing:
  - Eliminates user intervention to conduct time-consuming testing
  - Reduces the time required to conduct testing
  - Enables you to test devices faster
- Automated temperature chamber testing provides automated setup to validate all High Speed tests using XL cables, temperature tips and standard filter files
- Customizing the setup:
  - Allows you to modify the test setup as per the DUT configuration
  - Automatically calculates unit intervals based on the DUT data rates
- Margin testing and characterization:
  - Allows custom-limits or limits-editing to perform Margin testing
  - Performs characterization of your design
- Flexible probing allows you to probe your Design Under Test (DUT) using either Differential or Single-ended probes.
- Selective testing:
  - Performs fully-automated testing for transmitter measurements
  - Allows you to select individual tests or test groups in the tree-structure
  - Avoids repeated testing, through accurate and reliable results from a single run
- Escape mode support allows you to perform both Escape Mode (ULPS Mode) and the Normal Mode tests.

- Clock Continuous Mode support allows you to perform all tests in normal mode or selective tests in Clock Continuous mode
- Detailed test reporting:
  - Provides a Pass/Fail summary table
  - Provides margin details on each test
  - Provides a consolidated report for all tests

Starting the Application

The application uses a USB dongle that contains the license key. This dongle must be present on the instrument hosting the D-PHY application.

The application also checks for a file, called Resources.xml, located in My TekExpress folder. If this file is not found, instrument discovery is performed before launching D-PHY. The Resources.xml file contains information regarding instruments available on network.

When the application starts, it checks for the appropriate license key. If the valid license key is not present, the application switches to the “Evaluation” mode. If the application fails to detect the dongle, it continues to run in Evaluation mode.

Start the application in one of the following ways:

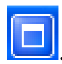
- Click **Start** > **Programs** > **Tektronix** > **TekExpress** > **TekExpress D-PHY**.
- Double click the icon  on the desktop.
- If you have previously saved a session, double-click the session file stored under My TekExpress\D-PHY.

NOTE. *If the application was not terminated properly during the last use, a dialog box asks to recall the previously unsaved session.*

Resizing the Application Window

To minimize the application, click  on the application title bar. To restore the application to its previous size, select 

in the Windows task bar.

To maximize the application, click . To restore the application to its previous size, click on the application title bar.

Exiting the Application

To exit the application, do one of the following:

- Click **File** > **Exit**.
- Click  on the application title bar.

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

Global Controls

The menus and controls that appear outside the individual tabs are called “Global Controls”. These are used to specify the devices to be tested.

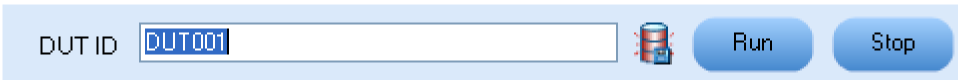


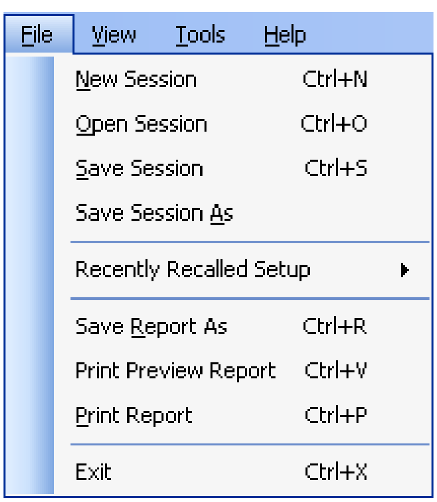
Table 2: Global controls

Control name	Function
DUT	The device ID is specified at the global level and the information is stored in the default location for all data files. This field cannot be empty and does not allow these special characters (.,..,...,\,/:?”<>|*). The maximum length of characters allowed is 32.
	Displays the status of the disk space. When the disk space is low, a warning dialog appears to perform the cleanup and continue working on the application.
	You will be able to run, pause, resume, and stop the tests.

Menus

File Menu

Click **File** on the application menu bar.

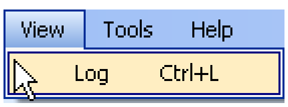


The File menu has the following selections:

Menu	Function
New Session	Starts a default session of D-PHY.
Open Session	Opens a saved session.
Save Session	Saves the session.
Save Session As	Saves a session in a different name.
Recently Recalled Setup	Recalls the recently saved setup.
Save Report As	Saves the report in user specified location.
Print Preview Report	Previews the report before printing.
Print Report	Opens the Windows “Print” dialog box.
Exit	Closes the application.

View Menu

Click **View** on the application menu bar.

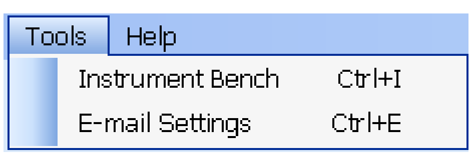


The View menu has the following selections:

Menu	Function
Log	Opens the log (log.xml) file in the default viewer.

Tools Menu

Click **Tools** on the application menu bar.



The Tools menu has the following selections:

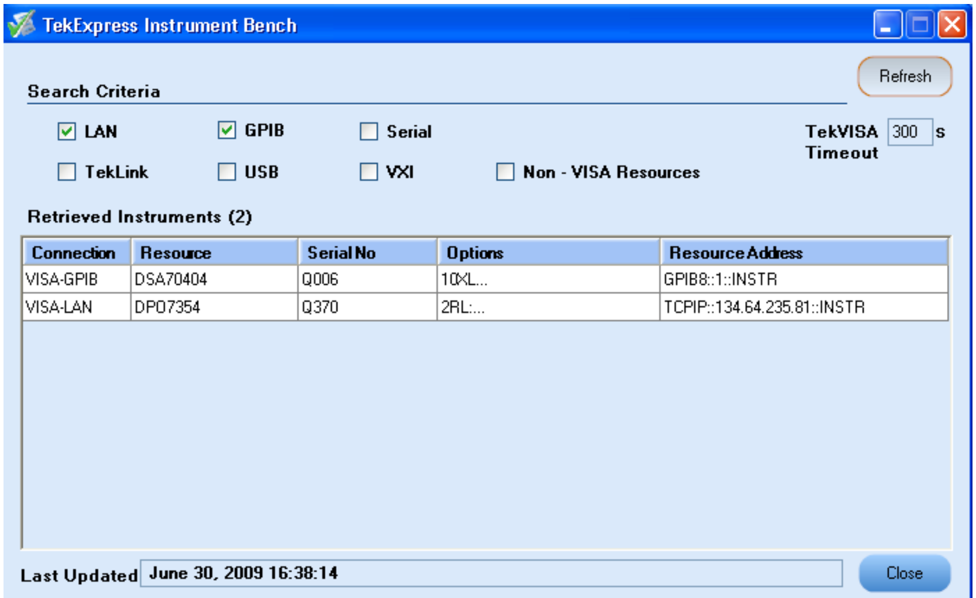
Menu	Function
Instrument Bench (see page 16)	Shows the list of instruments connected to the test setup.
E-mail Setting (see page 16)	Allows you to configure and set the e-mail options.

Instrument Bench

The Instrument Bench window shows the list of VISA and Non-VISA resources found on different interfaces/connections. It serves two purposes at the launch of TekExpress:

- Discovers the connected instruments.
- Confirms the instrument connection setup.

When you click **Tools** > **Instrument Bench**, the following dialog box is displayed:

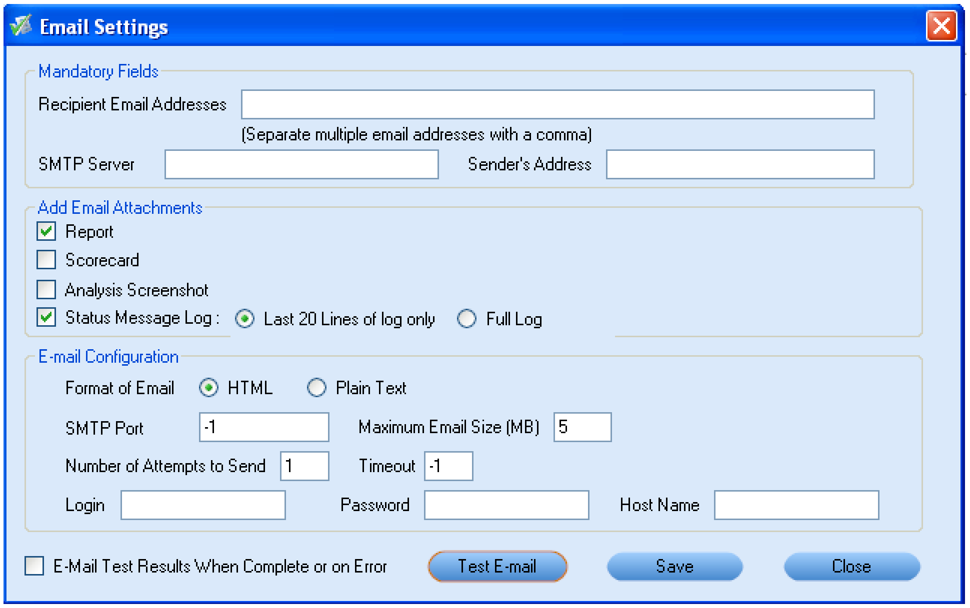


E-mail Settings

The E-mail Settings utility allows you to configure and set the e-mail options. The following fields are mandatory for receiving e-mail notification from TekExpress:

1. Recipient Email Addresses. For example, User@domain.com
2. Sender's Address
3. SMTP Server address of the Mail server configured at client location

If any of the above mentioned fields are left blank, the settings will not get saved and e-mail notification will not be sent.

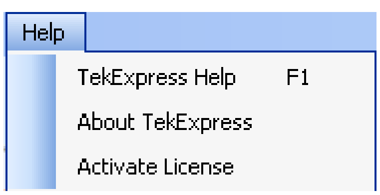


Check the option "E-mail Test Results When Complete or on Error" to receive the e-mail. The attachment list depends on the choice which is made while configuring the email setup.

NOTE. *The Analysis Screenshot option in the Add Email Attachments pane is not yet functional.*

Help Menu

Click **Help** on the application menu bar.



The Help menu has the following selections:

Menu	Function
TekExpress Help	Displays TekExpress Help (F1).
About TekExpress	Displays the TekExpress screen with the application title. Also displays the application details such as software name, version number, and copyright.
Activate License (see page 7)	Displays the details of activating the application.

Select Test(s)

The application supports the following D-PHY tests:

- Group 1 tests that are Single-ended tests and available only in the Escape mode:

  1.1.1 Data Lane LP-TX Thevenin Output High Level Voltage (VOH)

  1.1.2 Data Lane LP-TX Thevenin Output Low Level Voltage (VOL)

  1.1.3 Data Lane Rise Time

  1.1.4. Data Lane Fall Time

NOTE. *Group 1 tests are supported on LP-HS waveforms although it is not recommended to use LP-HS waveforms for these tests.*

- Group 2 tests that are Single-ended tests and available only in the Escape mode:

  1.2.1 Clock Lane LP-TX Thevenin Output High Level Voltage (VOH) (Single-ended only)

  1.2.2 Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL) (Single-ended only)

  1.2.3 Clock Lane Rise Time (Single-ended only)

  1.2.4. Clock Lane Fall Time (Single-ended only)

NOTE. *Group 2 tests are supported on LP-HS waveforms although it is not recommended to use LP-HS waveforms for these tests.*

- Group 3 tests:

  The following Group 3 tests are single-ended and differential tests, except where indicated:

  1.3.1 Data Lane HS Entry: Data Lane TLPX Value

NOTE. *The Data Lane HS Entry: Data Lane TLPX Value test is supported on LP-HS waveforms although it is not recommended to use LP-HS waveforms for this test.*

  1.3.2 Data Lane HS Entry: THS-PREPARE Value

  1.3.3 Data Lane HS Entry: THS-PREPARE+ THS-ZERO Value

  1.3.4 Data Lane HS-TX Differential Voltages (VOD(0), VOD(1))

  1.3.5 Data Lane HS-TX Differential Voltage Mismatch (ΔVOD)

  1.3.6 Data Lane HS-TX Single-ended Output High Voltages (VOHHS(DP)), VOHHS(DN))

1.3.7 Data Lane HS-TX Common Mode Voltages (VCMTX(1), VCMTX(0))

1.3.8 Data Lane HS-TX Common Mode Voltage Mismatch (ΔVCMTX(1,0))

1.3.9 Data Lane HS-TX Dynamic Common-Level Variations Between 50–450MHz (ΔVCMTX(HF))

1.3.10 Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (ΔVCMTX(HF))

1.3.11 Data Lane HS-TX 20%–80% Rise Time (tR)

1.3.12 Data Lane HS-TX 80%–20% Fall Time (tF)

1.3.13 Data Lane HS Exit: THS-TRAIL Value

1.3.14 Data Lane HS Exit 30%–80% POST-EoT Rise Time (TREOT)

- Group 4 tests:

  The following Group 4 tests are single-ended and differential tests, except where indicated:

  1.4.1 Clock Lane HS Entry: TLPX Value (Single-ended only)

  1.4.2 Clock Lane HS Entry: TCLK-PREPARE Value (Single-ended only)

  1.4.3 Clock Lane HS Entry: TCLK-PREPARE+ TZERO Value (Single-ended only)

  1.4.4 Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1))

  1.4.5 Clock Lane HS-TX Differential Voltage Mismatch (ΔVOD)

  1.4.6 Clock Lane HS-TX Single-ended Output High Voltages (VOHHS(DP)), VOHHS(DN)) (Single-ended only)

  1.4.7 Clock Lane HS-TX Common Mode Voltages (VCMTX(1), VCMTX(0)) (Single-ended only)

  1.4.8 Clock Lane HS-TX Common Mode Voltage Mismatch (ΔVCMTX(1,0)) (Single-ended only)

  1.4.9 Clock Lane HS-TX Dynamic Common-Level Variations Between 50–450MHz (ΔVCMTX(LF)) (Single-ended only)

  1.4.10 Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (ΔVCMTX(HF)) (Single-ended only)

  1.4.11 Clock Lane HS-TX 20%–80% Rise Time (tR)

  1.4.12 Clock Lane HS-TX 80%–20% Fall Time (tF)

  1.4.13 Clock Lane HS Exit: TCLK-TRAIL Value

  1.4.14 Clock Lane HS Exit 30%–80% POST-EoT Rise Time (TREOT) (Single-ended only)

  1.4.17 Clock Lane HS Clock Instantaneous (UIINST)

- Group 5 tests:

  The following Group 5 tests are single-ended and differential tests, except where indicated:

  1.5.1 HS Entry: TCLK PRE Value

  1.5.2 HS Entry: TCLK POST Value

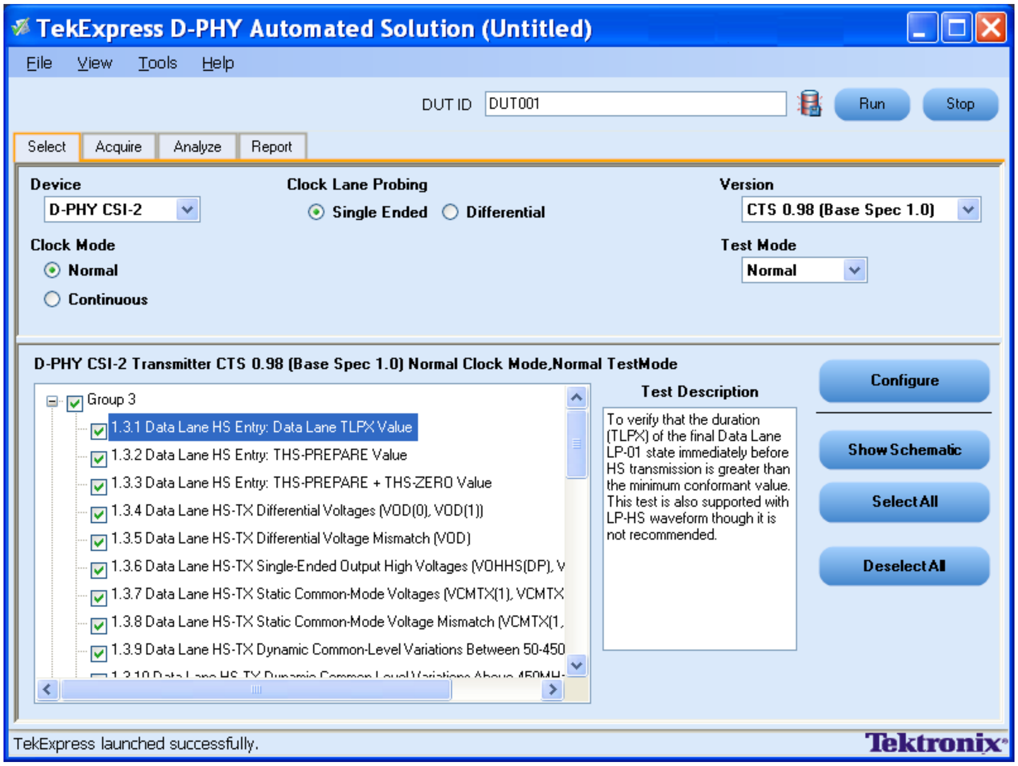
1.5.3 HS Clock Rising Edge Alignment to First Payload Bit

NOTE. *Group 5 tests are not available in the Clock Continuous mode.*

The following table lists the tests (ids) that are supported in the clock and test modes:

Clock mode	Test mode	Test ids
Normal	Normal	Single-ended tests: Group 3, Group 4, and Group 5. Test ids: 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.3.6, 1.3.7, 1.3.8, 1.3.9, 1.3.10, 1.3.11, 1.3.12, 1.3.13, 1.3.14. Test ids: 1.4.1, 1.4.2, 1.4.3, 1.4.4, 1.4.5, 1.4.6, 1.4.7, 1.4.8, 1.4.9, 1.4.10, 1.4.11, 1.4.12, 1.4.13, 1.4.14, 1.4.17. Test ids: 1.5.1, 1.5.2, 1.5.3.
		Differential tests: Group 3, Group 4, and Group 5. Test ids: 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.3.7, 1.3.8, 1.3.9, 1.3.10, 1.3.11, 1.3.12, 1.3.13, 1.3.14. Test ids: 1.4.4, 1.4.5, 1.4.11, 1.4.12, 1.4.17. Test ids: 1.5.1, 1.5.2.
Normal	Escape	Single-ended tests: Group 1, Group 2, and Group 3. Test ids: 1.1.1, 1.1.2, 1.1.3, 1.1.4 Test id: 1.2.1, 1.2.2, 1.2.3, 1.2.4. Test id: 1.3.1
Continuous	Normal	Single-ended tests: Group 3 and Group 4. Test ids: 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.3.6, 1.3.7, 1.3.8, 1.3.9, 1.3.10, 1.3.11, 1.3.12, 1.3.13, 1.3.14. Test ids: 1.4.4, 1.4.5, 1.4.6, 1.4.7, 1.4.8, 1.4.9, 1.4.10, 1.4.11, 1.4.12, 1.4.17.
		Differential tests: Group 3 and Group 4. Test ids: 1.3.2, 1.3.3, 1.3.4, 1.3.5, 1.3.7, 1.3.8, 1.3.9, 1.3.10, 1.3.11, 1.3.12, 1.3.13, 1.3.14. Test ids: 1.4.4, 1.4.5, 1.4.11, 1.4.12, 1.4.17.

Use the Select panel to select configure, and run one or more groups of tests.



Select Device. Select the device type from the list: D-PHY CSI-2 or D-PHY DSI. The default value is D-PHY-CSI-2. Enter the DUT ID for the device.

Select Clock Mode. Select the Clock Mode: Normal or Continuous. Select Continuous when the signal has only the high speed region. Select Normal when the signal has both, the high speed and the low power regions. The application uses Edge trigger for Continuous mode and Transition trigger for Normal mode. The default Sample rate is 12.5 Gs/s and the default Record Length is 1M.

Select Clock Lane Probing. Select the probing method: Differential or Single-Ended. Based on this selection, the application displays the single-ended and differential tests. If probing type is Single-ended then you will need four probes (Dp, Dn, Clkp, Clkn). If probing type is Differential, then you will need three probes (Dp, Dn, Clkp-Clkn). Group 1 and Group 2 tests are not available for the Differential probing method

Select Test Mode. Select the test mode from the list: Normal or Escape. The default value is Normal. Escape is available only when the Clock Mode is Normal. The application does not support Clock continuous mode for Escape mode tests. As a result, the trigger is Transition trigger. When you select Escape mode, you must connect a ULPS signal to the oscilloscope on which the measurements will be done. However, the application can still perform the measurements on the LP-HS signals. The default Sample rate is 12.5 Gs/s and the default Record Length is 1M.

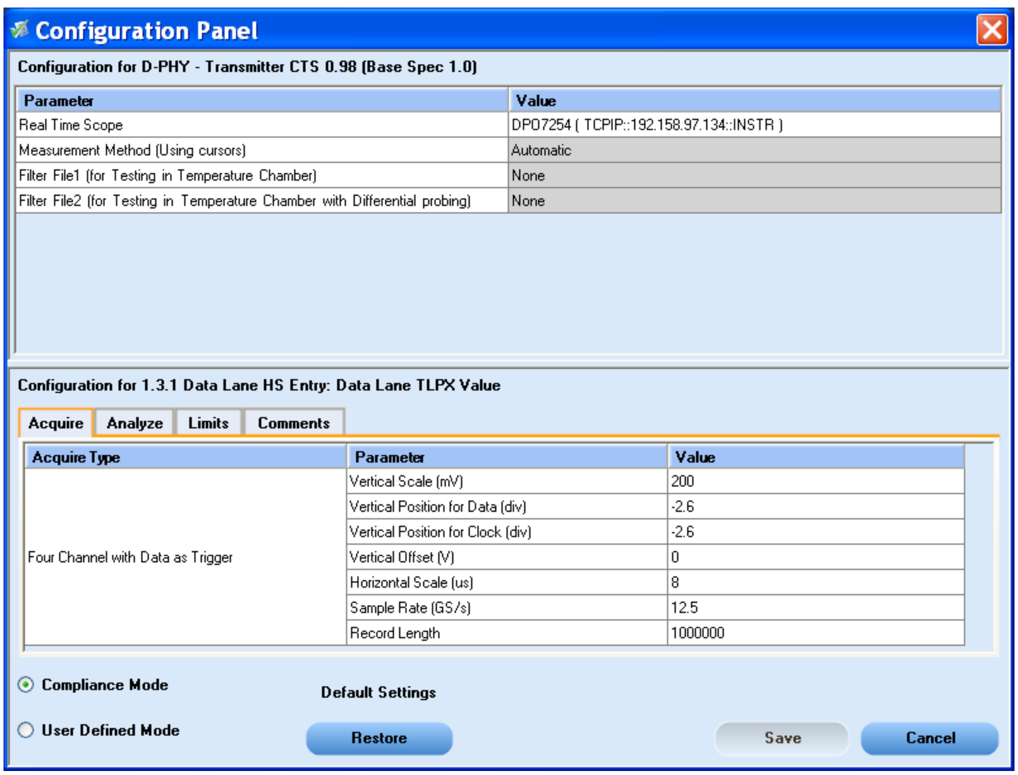
Version. Select the Compliance Test Specification version, the default value is CTS 0.98. For the selected CTS version, select any particular test, or one or more test groups.

Table 3: Select panel buttons

Button	Description
Configure	Opens the configuration panel for the selected test.
Show Schematic	Opens the schematic for the selected test. This is useful if you want to verify the test setup before running the test.
Select All	Selects all tests in the table.
Deselect All	Deselects all tests in the table.

Configure and Run the Test(s)

The configuration panel is used to view and edit the parameters associated with the acquisition and the analysis of the selected test. Click here for the options.



NOTE. *If any of the test parameters are grayed, it means that these parameters are not editable.*

The upper part of the Configuration Panel shows parameters and their values. These parameters are common for a group of tests. Parameters specific to a select test are shown in the lower part of the Configuration Panel. Test-specific parameters include acquisition, analysis, and limit parameters.

The following table lists the common parameters and their values:

Table 4: Common parameters and values

Parameter	Value
Real Time Scope	Select the oscilloscope to which to connect.
Measurement Method	Select the measurement method: Automatic or Manual. In the Automatic mode, you perform a test without any intervention. In the Manual mode, you will be prompted to place the cursors on the acquired waveform before the application proceeds with the analysis. ***NOTE.*** *The Manual method is available only in the User Defined mode.*
Filter File 1 (for testing in Temperature Chamber)	Select the filter file to use for temperature chamber testing. Click on the browse button in the field and select a file. If you select None, no filter file is used (testing in temperature chamber is not considered). ***NOTE.*** *Filter file selection is available only in the User Defined mode.*
Filter File 2 (for testing in Temperature Chamber with Differential Probing)	Select the filter file to use with differential probing for temperature chamber testing. Click on the browse button in the field and select a file. If you select None, no filter file is used (testing in temperature chamber is not considered). ***NOTE.*** *Filter file selection is available only in the User Defined mode.*

NOTE. *If you change the channel selection for Data+ (DP), Data– (DN), Clock+ (CP), and Clock– (CN) signals, make sure that you change the trigger source correspondingly in the Analyze tab for each of the measurements. If you do not do this, the waveform might not trigger and the measurements might not be completed.*

For temperature chamber testing, a filter file with S4 parameters is used to compensate the factors introduced due to length of the probe cable when testing the DUT in temperature chamber. You will need one or two filter files based on the selected clock probing. If you select Single-ended probing, you must specify only one filter file (Filter File 1). The application ignores the Filter File 2 even if you provide it. If you select Differential probing, then you must specify both the filter files (Filter File 1 and Filter File 2).

The following table lists the tabs and button controls for the tests:

Table 5: Configure panel buttons

Configure parameters	Description
Acquire (see page 26)	Shows the various parameters related to acquisition of a selected test.
Analyze (see page 28)	Shows the various parameters related to analysis of a selected test. These parameters can vary from one test to another test. For example, Vertical scale, Vertical offset, Horizontal scale, and others.

Table 5: Configure panel buttons (cont.)

Configure parameters	Description
Limits (see page 27)	Applies to a specific version. It shows the measurement lower and upper limits using different types of comparisons like EQ(==), NE(!=), GT(>), LT(<), GE(>=), LE(<=), GTLT(> <), GELT(>= <), GTLE(> <=), LTGT(< >), LEGE(<= >=), LEGT(<= >), LTGE(< G=), GELE(>= <=). Some use unary operands and some use binary operands. For unary operands, only value1 (on the left) is active.
Comments	Specify a comment up to 256 characters long for selected test.
Restore	Restores the default values.
Save	Saves and applies the configuration parameters that you have set.
Cancel	Dismisses the dialog box.

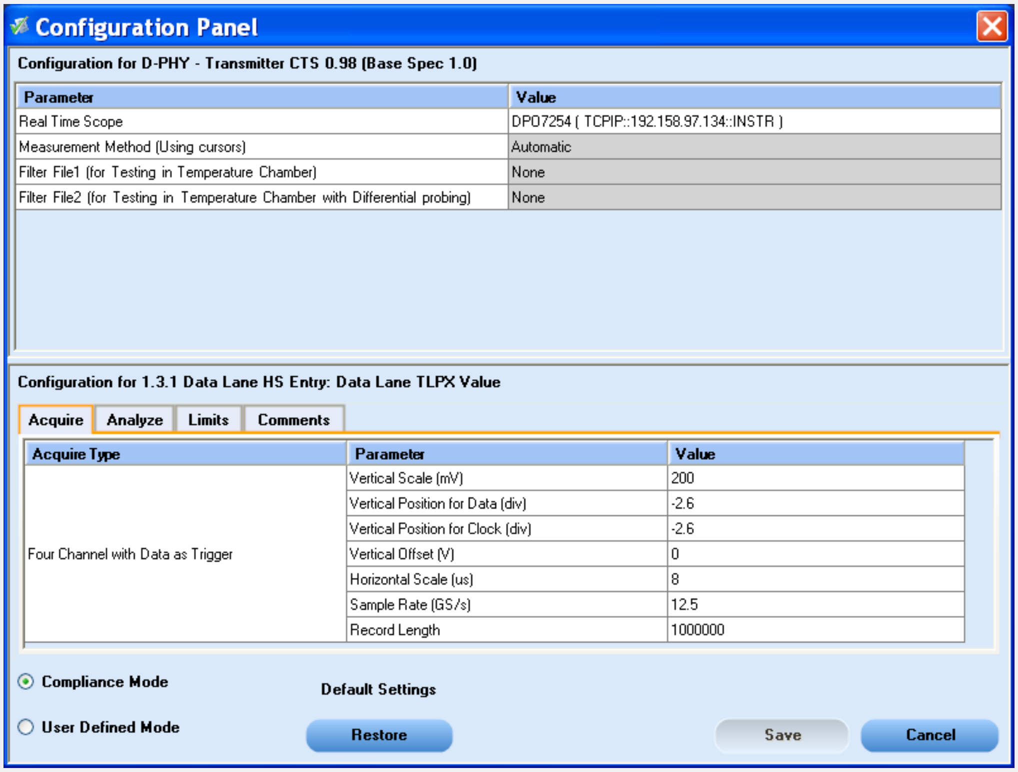
Click **Run** in the Select panel to run the selected tests.

Refer to the following table for various test limit comparisons:

Table 6: Test limit comparisons

Comparison string	Description
EQ(==)	Equal to
NE(!=)	Not equal to
GT(>)	Greater than
LT(<)	Less than
GE(>=)	Greater than or Equal to
LE(<=)	Less than or Equal to
GTLT(><)	Greater than and Less than
GELT(>=<)	Greater than or equal to and Less than
GTLE(><=)	Greater than and Less or equal to
LTGT(<>)	Less than and Greater than
LEGE(<= >=)	Less than or equal to and Greater than or equal to
LEGT(<= >)	Less than or equal to and Greater than
LTGE(< >=)	Less than and Greater than or equal to
GELE(>= =<)	Greater than or equal to and Less than or equal to

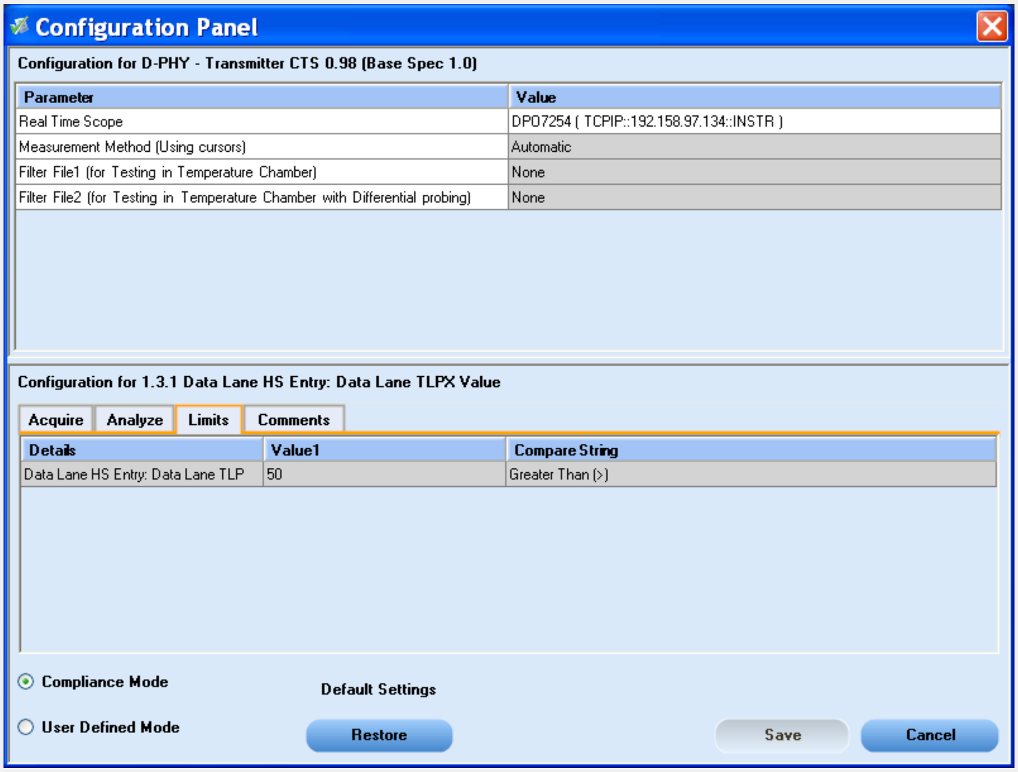
Configure Acquire Panel



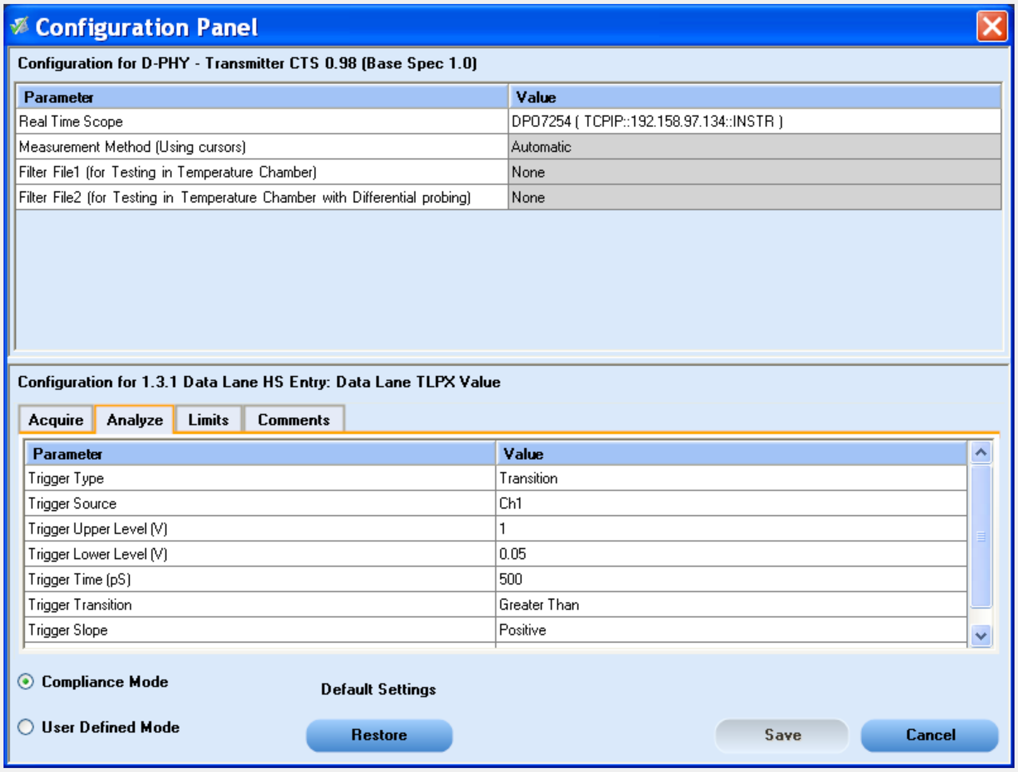
You have the following options:

- Restore compliance mode values.
- Change the parameters associated with analysis configuration.
- Change the test limits in the User Defined mode.
- Add comments for the selected test that would appear in the Report panel.

Configure Limits Panel



Configure Analyze Panel



Typical Configuration Parameters

The following table shows the typical or default configuration parameters for single-ended and differential tests in the clock normal and clock continuous modes.

Acquire parameters	Single-ended tests (Clock Mode Normal)		Single-ended tests (Clock Mode Continuous)		Differential tests (Clock Mode Normal)		Differential tests (Clock Mode Continuous)	
	Data lane tests	Clock lane tests	Data lane tests	Clock lane tests	Data lane tests	Clock lane tests	Data lane tests	Clock lane tests
Vertical Scale (mV)	200	200	200	200	200	200	200	200
Vertical Position for Data (div)	–2.6	NA	–2.6	NA	–2.6	NA	–2.6	NA
Vertical Position for Clock (div)	NA	–2.6	NA	–2.6	NA	2.6	NA	2.6
Vertical Position (div)	–2.6	–2.6	–2.6	–2.6	2.6	2.6	2.6	2.6
Vertical Offset (V)	0	0	0	0	0	0	0	0
Horizontal Scale (us)	8	8	8	8	8	8	8	8
Sample Rate (GS/s)	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Record Length	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Analyze parameters								
Trigger Type	Transi-tion	Transi-tion	Transi-tion	Edge	Transi-tion	Transi-tion	Transi-tion	Edge
Trigger Source	Ch1	Ch3	Ch1	Ch3	Ch1	Ch3	Ch1	Ch3
Trigger Upper Level (V)	1	1	1	NA	1	1	1	NA
Trigger Lower Level (V)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Trigger Level for Continuous Clock Mode (V)	NA	NA	NA	0.2	NA	NA	0.2	0.2
Trigger Time (ps)	500	500	500	500	500	500	500	500
Trigger Transition	Greater Than	Greater Than	Greater Than	NA	Greater Than	Greater Than	Greater Than	NA
Trigger Slope	Positive, Negative	Positive, Negative	Positive, Negative	Positive, Negative	Positive, Negative	Positive, Negative	Positive, Negative	Positive, Negative
Trigger If Violation	Occurs	Occurs	Occurs	NA	Occurs	Occurs	Occurs	NA

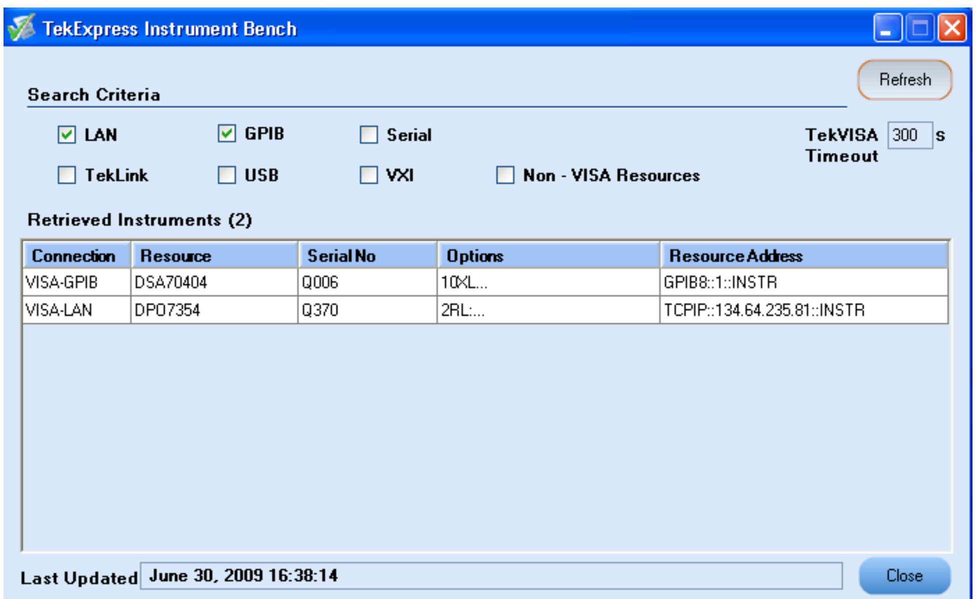
View and Select Connected Instruments

Viewing Connected Instruments

The **Tools > Instrument Bench** menu item is used to discover connected instruments required for the tests. The application uses TekVISA to discover the connected instruments. Once the operation is done, the Instrument Bench dialog box resumes operation and lists the instrument-related details based on the selected search criteria.

NOTE. *When the TekVISA Instrument Manager checks for connected Instruments, the Instrument Bench dialog box does not respond.*

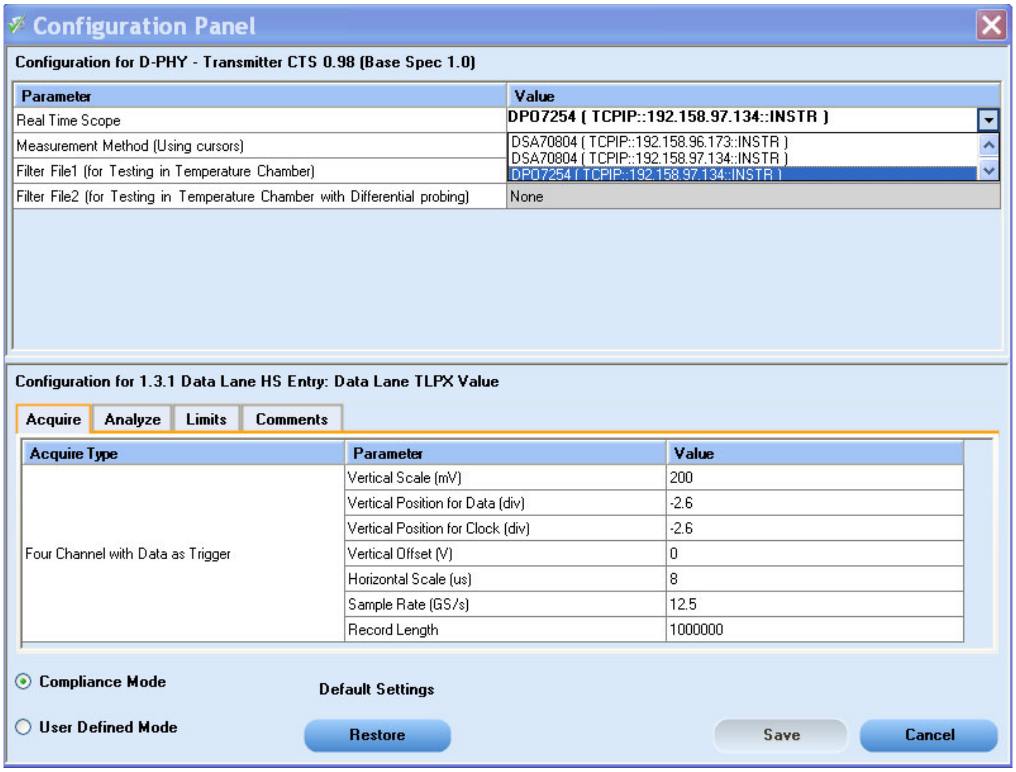
For example, if you select LAN and GPIB as the search criteria in the Instrument Bench dialog box and click Refresh, the TekVISA Instrument Manager checks for the availability of instruments over LAN and the details of the instruments are displayed under Retrieved Instruments table.



Provide the time in the TekVISA Refresh Timeout (Seconds) field, within which if the TekVISA Instrument Manager does not find the instruments, the TekExpress application resumes the operation. If you choose Non-VISA resources, all the instruments supported by TekExpress but not communicating over the VISA layer can be searched.

Selecting Connected Instruments

View the instruments connected in the Configuration panel. The upper half of the panel displays the general parameters for the tests under the selected test suite. Select the Real Time Scope to connect to from the drop-down list.



NOTE. *The list of instruments displayed is specific to the selected test suite. It does not show all the connected instruments.*

Acquire Live Waveform for Analysis

Select the Acquire tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources. When you click Run, by default the application acquires live signals from the source.

Click the Acquire tab to see acquisition parameters, and acquisition status of the selected test suite. The Acquire panel is specific to a suite and gets updated every time the selected test suite is changed. This panel shows the acquisition details for the tests in the currently selected suite. The tests with common acquisition parameters are grouped together and shown as a single acquisition.

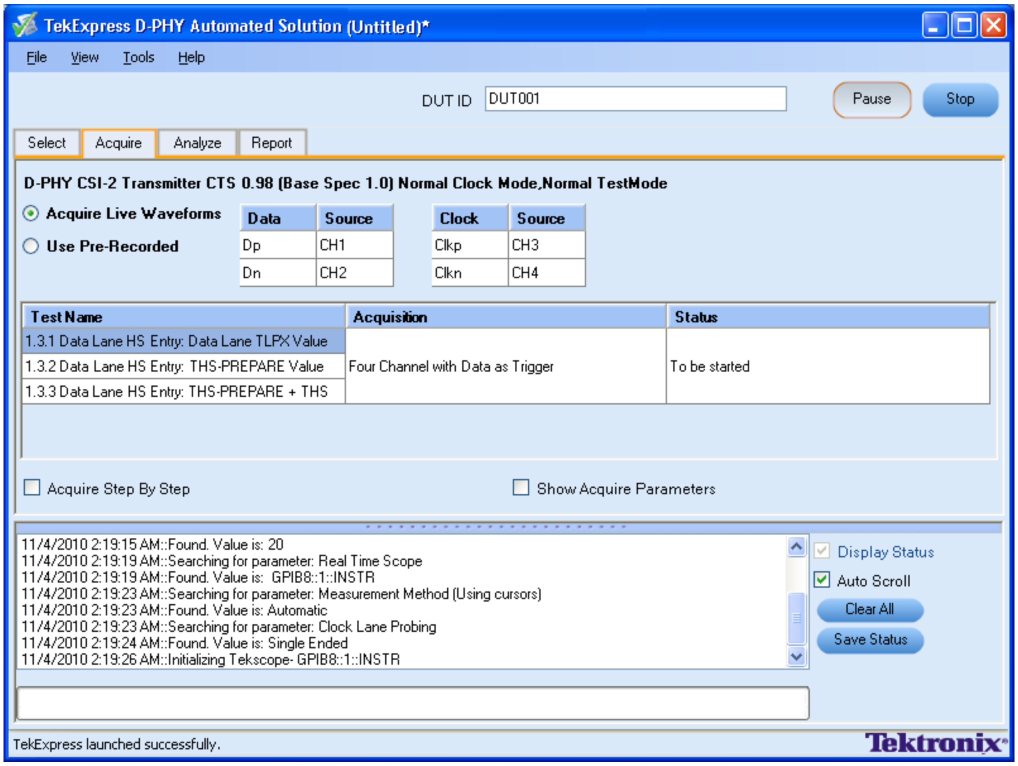


Table 7: Controls on the Acquire panel

Selection	Function
Data Source	Lists the sources assigned for each data line (Dp and Dn). Select the source (channel) for each data line (Dp and Dn). Once you select a channel for Dp, you cannot select the same channel for other lines (Dn, Clkp, and Clkn) and vice versa).
Clock Source	Lists the sources assigned for each clock line (Clkp and Clkn). Select the source (channel) for each clock line (Dp and Dn). Once you select a channel for Clkp, you cannot select the same channel for other lines (Dn, Dn, and Clkn) and vice versa). If you have selected Differential Clock Lane Probing in the Select panel, only one source selection is displayed (differential probe clock needs only one channel as source).
Column Name	
Test	Displays the name of the selected test for performing acquisitions. One or more tests can perform the same acquisitions.
Status	Acquisition status of the running test at intervals. The messages are passed only in live acquisition.
Acquisition	Updates the location of the acquisition name.

Table 7: Controls on the Acquire panel (cont.)

Selection	Function
Acquire Options	
Use Pre-recorded Waveform Files	When enabled, uses pre-recorded waveforms for the selected test.
Acquire Step By Step	When enabled, displays the reference input waveform of the selected test. This helps you to compare the input waveform with the reference waveform, allows you to change the setup before acquiring the waveforms, and then proceeds with the next selected test.

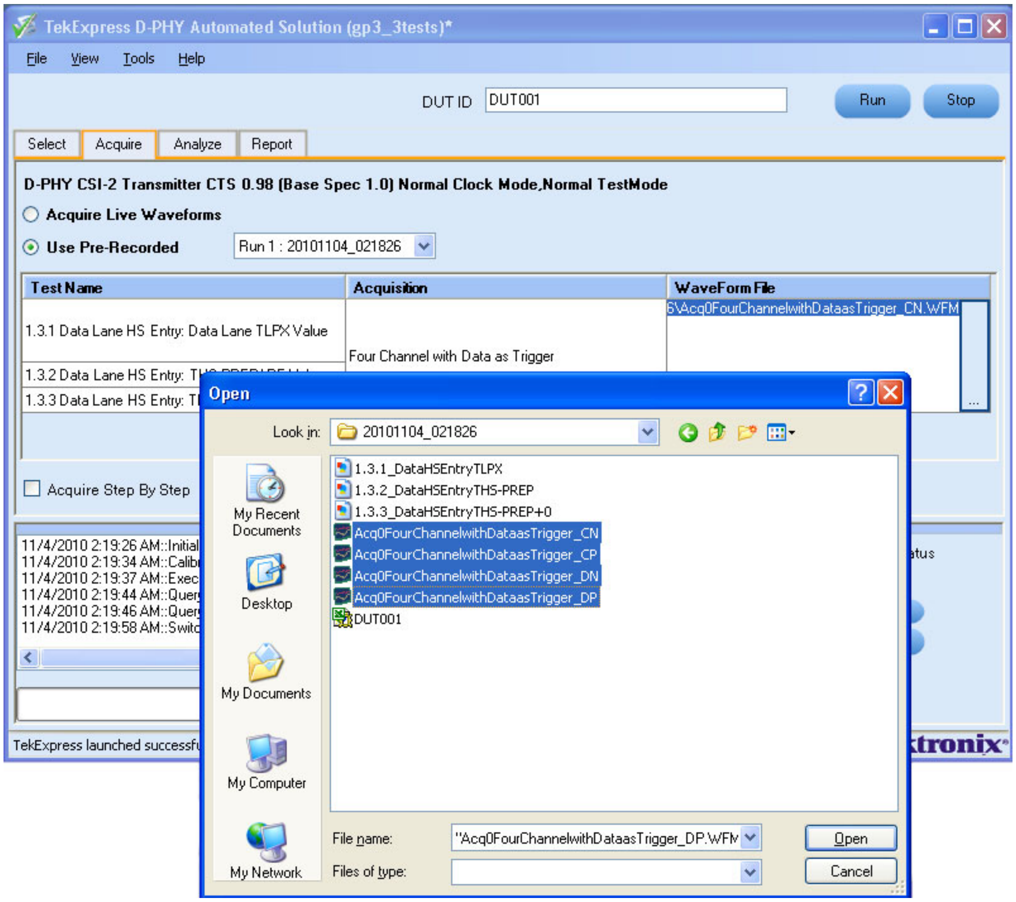
Use Prerecorded Waveforms for Analysis

Select the Acquire tab to see unique acquisitions, acquisition parameters, acquisition status, and prerecorded waveform files of the selected test suite. The Acquire panel is specific to a group and gets updated every time the selected test group is changed. This panel shows the acquisition details for the tests in the currently selected group. The tests with the common acquisition parameters are grouped together and shown as a single acquisition.

For pre-recorded testing, it is recommended that you capture the waveforms at 12.5 Gs/s sample rate. However, if you capture the waveforms at a different sample rate, ensure that you change the Sample Rate parameter in the Configure Panel appropriately for each of the selected tests.

NOTE. *You can only use saved sessions in which the tests have been run in Automatic mode for prerecorded testing. You cannot use the sessions in which tests have been run in Manual mode for prerecorded testing.*

NOTE. *You cannot use the prerecorded waveform option for the 1.5.3 HS Clock Rising Edge Alignment to First Payload Bit test.*



Column name	Function
Test Name	Name of the tests performing acquisitions. One or more tests can perform the same acquisitions.
Acquisition	Test acquisition status of the running test passed at intervals.
Waveform File	Prerecorded waveform files of unique acquisitions. You can select waveform files by clicking the hyperlink. This allows you to select any waveform file using the standard file open window.

NOTE. *To use the prerecorded option, it is recommended that you use a waveform file (.wfm) which has been captured from a Tektronix oscilloscope. This eliminates the need to use an oscilloscope. You can manually select waveforms and perform the tests with a click of the Run button.*

The following Acquire source options are available:

- **Use Pre-recorded Waveform Files**: Enabling or disabling the option shows or hides the waveform file column in the acquisition table.

Follow these steps to save a session and use the pre-recorded mode to run it:

a. Open a new session.

b. Select the tests.

c. Highlight a test and click Configure. Change the sample rate parameter to the desired value for each of the selected tests.

d. Save the session.

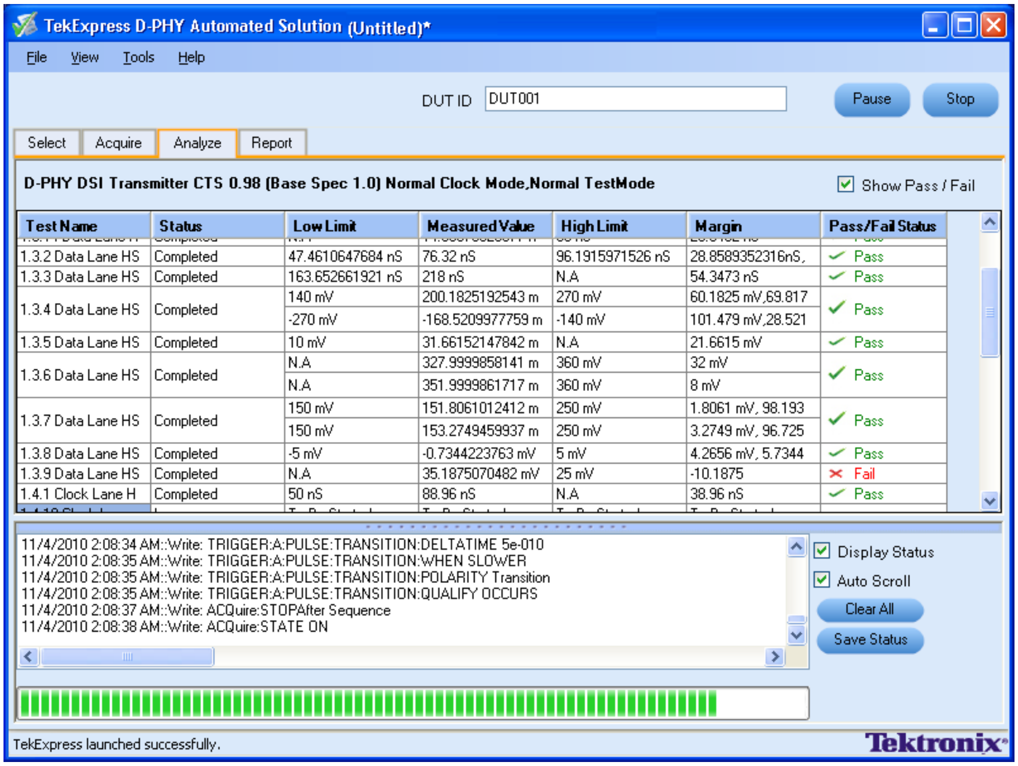
e. In the Acquire panel, select **Use Pre-recorded Waveform Files** and then select the waveforms for each of the tests. Make sure that the waveform names have a suffix DP, DN, CP, and CN indicating the data and clock waveforms. For example.....

- **Acquire Step by Step**: Selecting this prompts you at the end of each acquisition before proceeding to the next one.
- **Show Acquire Parameters**: Selecting this shows the acquisition parameters.

When you select “Use Pre-recorded”, the first column shows the Acquisition, the second column shows the Test, and the next column shows the Waveform File for analysis.

View the Progress of Analysis

Click the Analyze tab to view the progress of the analysis. As the analysis of each test is complete, the result value is updated.



Analyze Table

The Analyze table contains the following:

- The test name.
- The status of the tests that are being run.
- The low and high limit values, and margins, for the tests.
- The measured values for the tests.
- The pass/fail status of the tests.

The tests that are not yet started are shown with a "To be Started" status. A summarized status of the currently running test is shown in the Status Messages panel.

The **Status Messages** window time-stamps all run time messages and displays them. You can do the following:

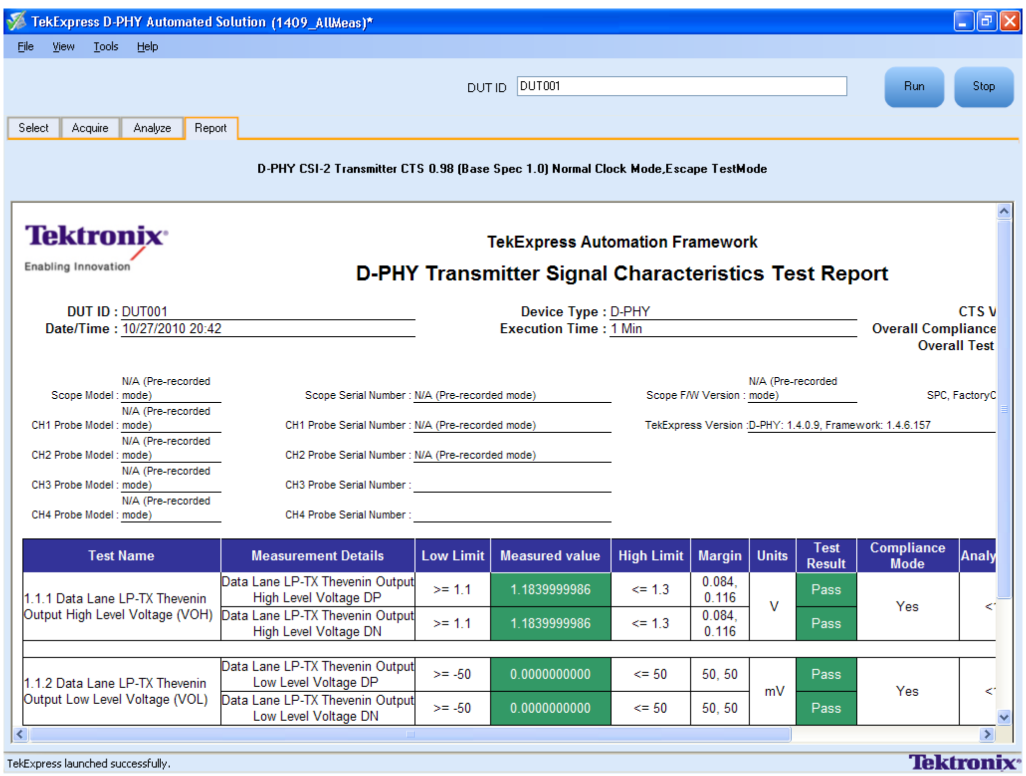
- **Display Status**: Enable/Disable status messages.
- **Auto Scroll**: Scroll the status messages automatically.
- **Clear All**: Clear all status messages in Status Window.
- **Save Status**: Save all status messages in text file. Displays a standard save file window and saves the status messages in the user specified file.

View the Report

After the analysis, a report is automatically generated and displayed in the report panel. The device information such as oscilloscope model, serial number, firmware version of the oscilloscope, version information of the TekExpress and the application, start time, and the execution time are displayed.

A table shows the test name, measurement details, test result (pass/fail), compliance mode, and analysis time. Save the report as an MHT file using the **File > Save As** option.

NOTE. *If you use a secondary monitor, verify that the screen resolution of the secondary monitor is the same as that of the primary display. This ensures that captured images in the reports are of the same size.*

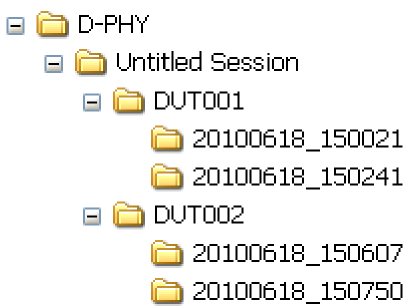


View Test Related Files

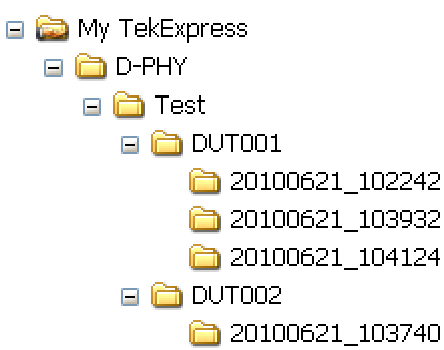
All the test related files for currently selected tests are always saved under: `My Documents\My TekExpress\D-PHY\SessionName`.

Case 1. An example image of data when the session is still not saved and is in the `My TekExpress/D-PHY` path as “`Untitled Session`”, the DUT ID is set to `DUT001`, and the tests are performed twice (two folders are created with the file naming convention `YYYYMMDD_HHMMSS` (Date_Time).

Case 2. An example image of data when the session is still not saved and is in the `My TekExpress/D-PHY` path as “`Untitled Session`”, the `DUT001` folder already present (tests are performed twice), and the DUT ID is now set to `DUT002` (here the tests are performed once).



Case 3. An example image of data when the session is saved and is in the `My TekExpress/D-PHY` path as “`Test`”.

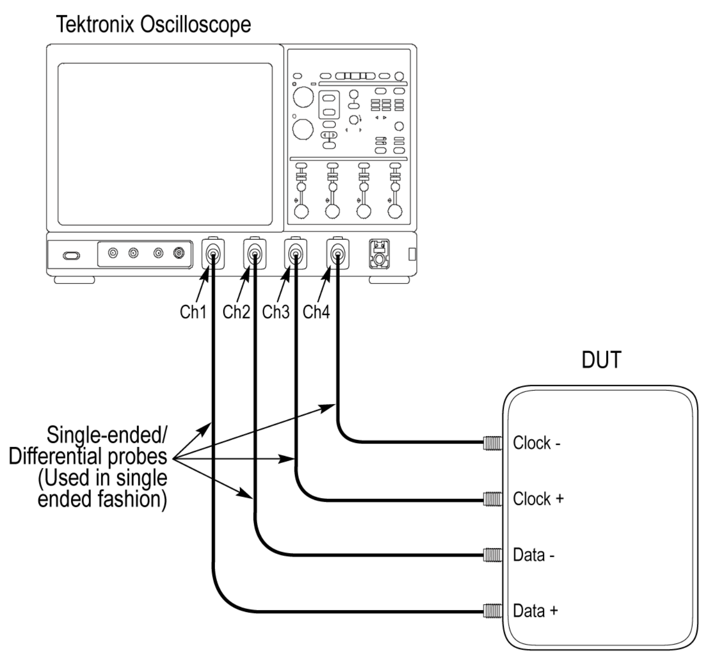


Connection Setup

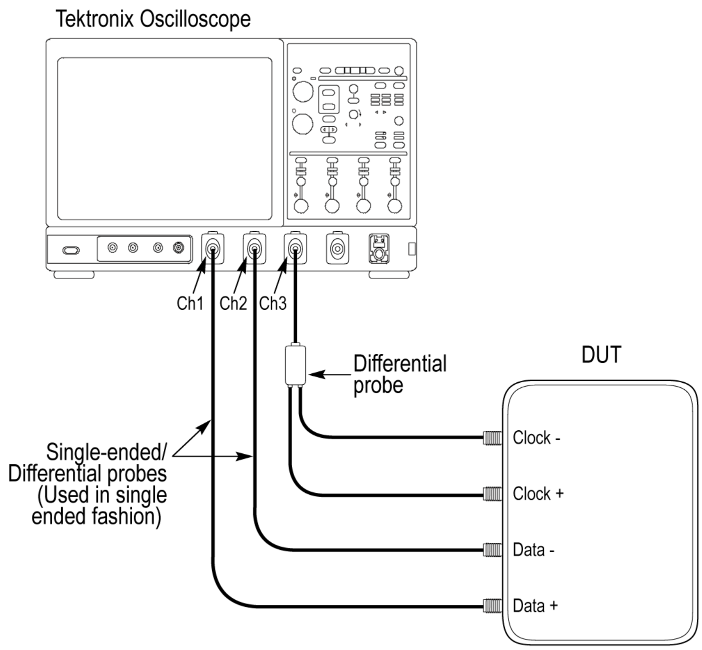
You need the following equipment (see Compatibility (see page 3)):

- A supported Tektronix DPO oscilloscope
- Single-ended probe
- Differential probe
- Device under test

Make connections as follows for single-ended tests:



Make connections as follows for differential tests:



Configuring Parameter Values

To configure a test, do the following:

1. In the Select panel click **Configure**.
2. In the Configure panel, set the following general parameters that are common for all tests:

Parameter	Value
Real Time Scope	Select the oscilloscope to which to connect.
Measurement Method	Select the measurement method: Automatic or Manual. ***NOTE.*** *The Manual method is available only when in the User Defined mode.*

Filter File 1 (for testing in temperature chamber)	Select the filter file to use for temperature chamber testing. Click on the browse button in the field and select a file. If you select None, no filter file is used (testing in temperature chamber is not considered). ***NOTE.*** *Filter file selection is available only in the User Defined mode.*
Filter File 2 (for testing in temperature chamber with Differential Probing)	Select the filter file to use with differential probing for temperature chamber testing. Click on the browse button in the field and select a file. If you select None, no filter file is used (testing in temperature chamber is not considered). ***NOTE.*** *Filter file selection is available only in the User Defined mode.*

The Automatic measurement method mode, lets you perform a test without any intervention. You must select one or more tests, configure the tests (or use the default values) and click Run to perform the test. The application acquires and analyzes the data, and displays a report when complete.

If you select the Manual mode, select one or more tests, configure the tests (or use the default values) and click Run to perform the test. The application begins to acquire data. A window opens where you are prompted to place the cursors on the acquired waveform and click **OK**. Go to the TekScope application and zoom the waveform around the trigger point. Place the cursors on the waveform to capture the values at those points and click **OK** in the window. The application completes the test and displays the report.

For temperature chamber testing, a filter file with S4 parameters is used to compensate the factors introduced due to length of the probe cable when testing the DUT in temperature chamber. You will need one or two filter files based on the selected clock probing. If you select Single-ended probing, you must specify only one filter file (Filter File 1). The application ignores the Filter File 2 even if you provide it. If you select Differential probing, then you must specify both the filter files (Filter File 1 and Filter File 2).

NOTE. *Other applications will display there windows in the background. The TekScope application takes precedence over other applications. Use Alt+Tab to view the other application windows.*

3. Select either **Compliance Mode** or **User Defined Mode**. In the User Defined Mode, you can modify the test parameters but you will no longer be testing against the compliance standards.

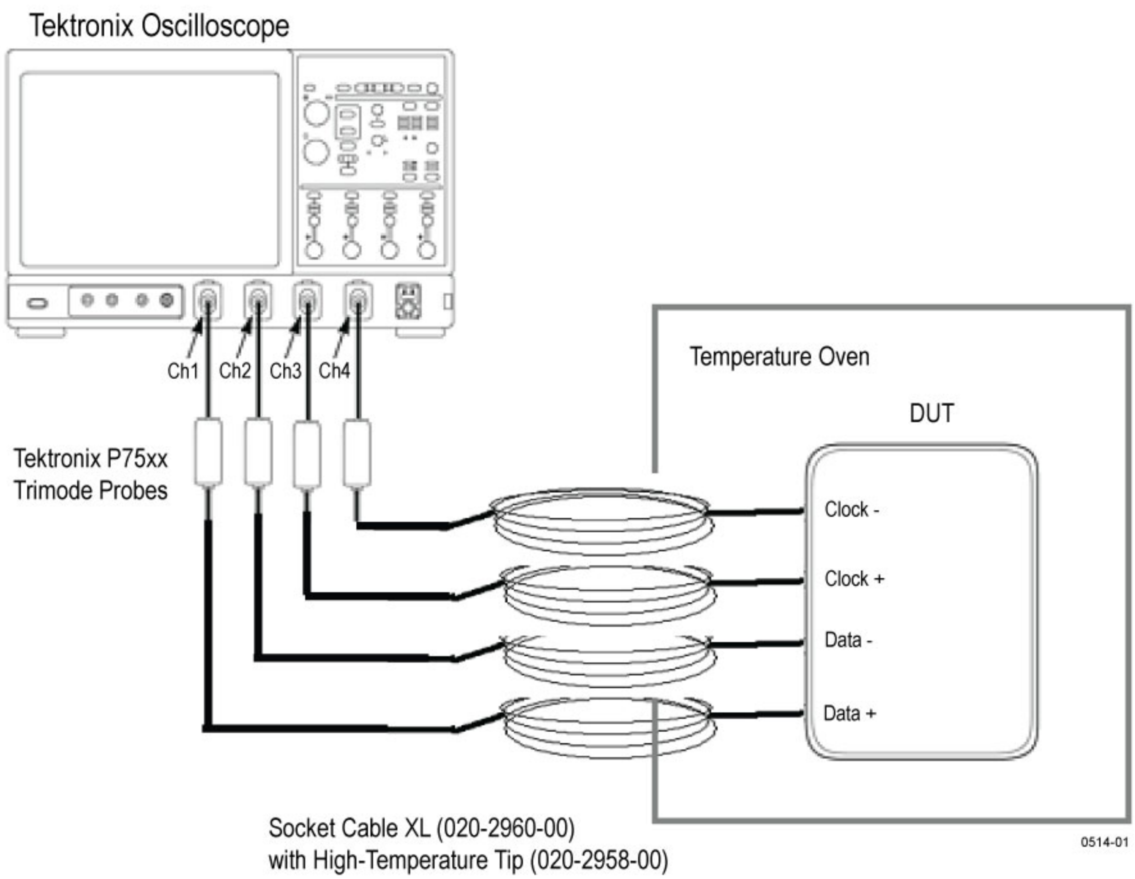
Temperature Chamber Testing

The TekExpress D-PHY offers the temperature chamber testing which is done at system level when the device is put in the oven and the connection points from the DUT are extended to the probe using a wire. This wire is 60” (5 ft) long and the signal must be de-embedded for the measurement. Filter files are needed to offset the cable effects that are introduced in temperature chamber testing.

The setup shown below is expected to be done by the user. The DUT is ideally placed in an environment in which the temperature can be externally controlled, which we call the Temperature Oven. The DUT is then connected to the setup using the above-mentioned long cables that come from within the oven to the Tektronix P7500 series probes that are then connected to the desired channels of the Tektronix real time scope.

However, the P7500 probe does not support LP measurement but can support all measurements in normal mode. All the measurements that can be performed using the LP-HS transition mode are supported in Temperature chamber mode.

The next specifies how to control this testing through the application once the setup is ready.



Steps for Performing Temperature Chamber Testing

The application provides a set of filter files. However, you have the option of selecting your own set of filter files.

Temperature chamber testing is available only in the User Defined mode.

1. Select the test and click Configure.

2. Select the User Defined mode.

3. Select Filter File1 by browsing to the folder.
4. Select Filter File 2 to use with differential probing for temperature chamber testing by browsing to the folder.

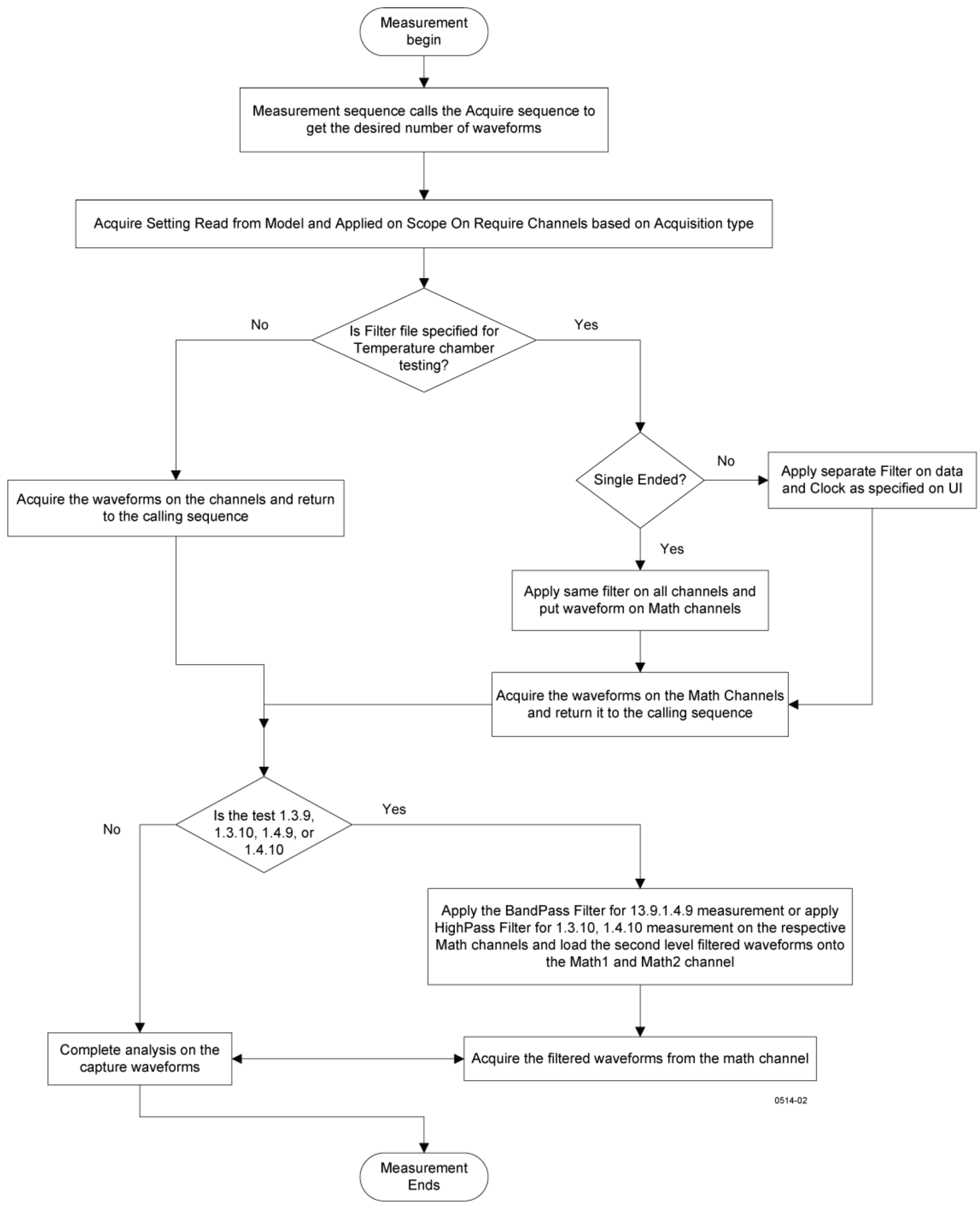
You will need one or two filter files based on the selected clock probing. If you select Single-ended probing, you must specify only one filter file (Filter File 1). If you select Differential probing, then you must specify both the filter files (Filter File 1 and Filter File 2).

The filter file for each of the combinations is listed in the table

Table 8: Filter file names

Selection	Affected channels/Lanes	File name
NORMAL CLOCK, SINGLE ENDED	Dp, Dn,Cp,Cn	Single ended filter for all lanes
NORMAL CLOCK, DIFFERENTIAL	Dp, Dn,Cp-n	Single ended for Data lane, Differential filter for clock lane
CONTINUOUS CLOCK, SINGLE ENDED	Dp, Dn,Cp, Cn	Single ended filter for all lanes
CONTINUOUS CLOCK, DIFFERENTIAL	Dp, Dn,Cp-n	Single ended for Data lane, Differential filter for clock lane

Logic Flow of Temperature Chamber Testing in TekExpress D-PHY



Connections for Data Lane LP-TX Thevenin Output High Level Voltage (VOH)

Click here for information on connections for the Data Lane LP-TX Thevenin Output High Level Voltage (VOH) test.

Configure and Run Data Lane LP-TX Thevenin Output High Level Voltage (VOH)

1. In the Select panel, select the Device.

NOTE. *The Data Lane LP-TX Thevenin Output High Level Voltage (VOH) test is not available when the selected clock lane probing is Differential.*

You can also perform Data Lane LP related measurements on a signal that has an LP-HS transition.

2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Escape**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type (Two Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 9: Configuration parameters for Data Lane LP-TX Thevenin Output High Level Voltage (VOH)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12

Table 9: Configuration parameters for Data Lane LP-TX Thevenin Output High Level Voltage (VOH) (cont.)

Parameter	Default	User defined mode
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 10: Analysis parameters for Data Lane LP-TX Thevenin Output High Level Voltage (VOH)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane LP-TX Thevenin Output High Voltage DP and Data Lane LP-TX Thevenin Output High Voltage DN values, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to accept the changes, or click **Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Click here for information on connections for the Data Lane LP-TX Thevenin Output Low Level Voltage (VOL) test.

Configure and Run Data Lane LP-TX Thevenin Output Low Level Voltage (VOL)

1. In the Select panel, select the Device.

NOTE. *The Data Lane LP-TX Thevenin Output Low Level Voltage (VOL) test is not available when the selected clock lane probing is Differential.*

2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Escape**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type Two Channel with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 11: Configuration parameters for Data Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 12: Analysis parameters for Data Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane LP-TX Thevenin Output Low Voltage DP and Data Lane LP-TX Thevenin Output Low Voltage DN values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click **Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane Rise Time

Click here for information on connections for the Data Lane Rise Time test.

Configure and Run Data Lane Rise Time

1. In the Select panel, select the Device.

NOTE. *The Data Lane Rise Time test is not available when the selected clock lane probing is Differential.*

2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Escape**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type Two Channel with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 13: Configuration parameters for Data Lane Rise Time

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change

Table 13: Configuration parameters for Data Lane Rise Time (cont.)

Parameter	Default	User defined mode
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 14: Analysis parameters for Data Lane Rise Time

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane Rise Time DP and Data Lane Rise Time DN values in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane Fall Time

Click here for information on connections for the Data Lane Fall Time test.

Configure and Run Data Lane Fall Time

1. In the Select panel, select the Device.

NOTE. *The Data Lane Fall Time test is not available when the selected clock lane probing is Differential.*

2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Escape**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type Two Channel with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 15: Configuration parameters for Data Lane Fall Time

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 16: Analysis parameters for Data Lane Fall Time

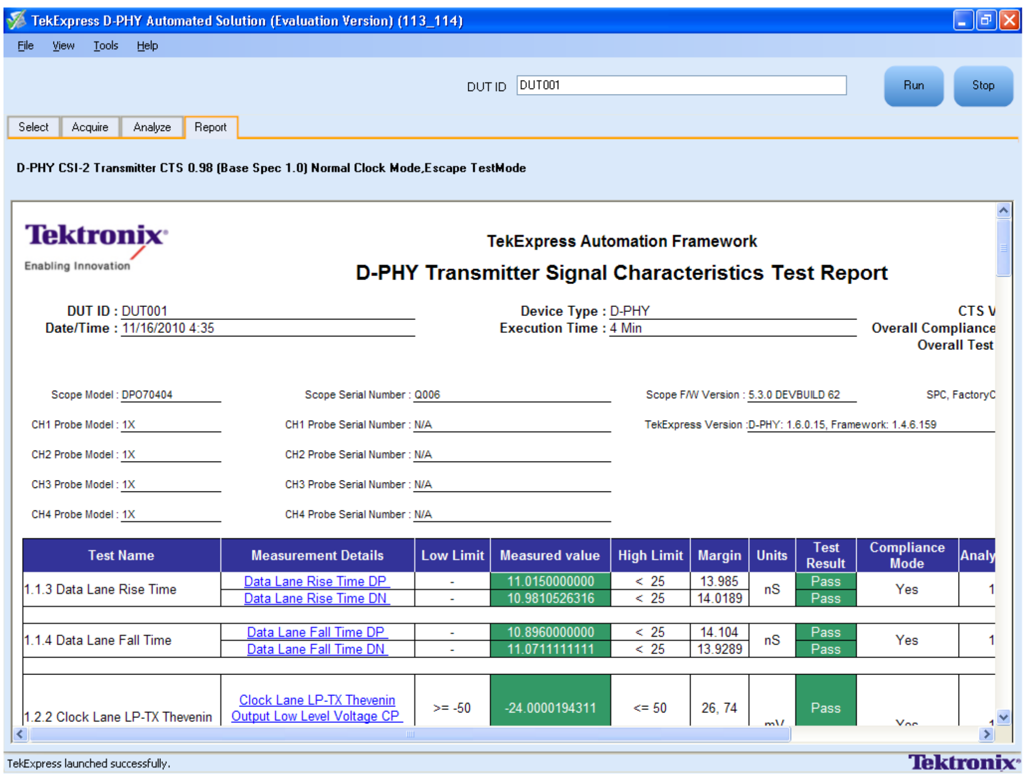
Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane Fall Time DP and Data Lane Fall Time DN values in nS, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

View Report for Group 1 Tests

The application automatically displays a report in the Report panel once the test is successfully completed. A table shows the test name, measurement details, test result (pass/fail), compliance mode, and analysis time. Save the report as an MHT file using the **File > Save As** option. The following screen shows the results for Group 1 tests.



Connections for Clock Lane LP-TX Thevenin Output High Level Voltage (VOH)

Click here for information on connections for the Clock Lane LP-TX Thevenin Output High Level Voltage (VOH) test.

Configure and Run Clock Lane LP-TX Thevenin Output High Level Voltage (VOH)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane LP-TX Thevenin Output High Level Voltage (VOH) test is not available when the selected clock lane probing is Differential.*

You can also perform Clock LP mode measurements using LP-HS transition.

4. Select the Test Mode as **Escape**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type Two Channel with Clock/Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 17: Configuration parameters for Clock Lane LP-TX Thevenin Output High Level Voltage (VOH)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12

Table 17: Configuration parameters for Clock Lane LP-TX Thevenin Output High Level Voltage (VOH) (cont.)

Parameter	Default	User defined mode
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 18: Analysis parameters for Clock Lane LP-TX Thevenin Output High Level Voltage (VOH)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0,05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane LP-TX Thevenin Output High Voltage CP and Clock Lane LP-TX Thevenin Output High Voltage CN values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Click here for information on connections for the Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL) test.

Configure and Run Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL) test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Escape**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type Two Channel with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 19: Configuration parameters for Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 20: Analysis parameters for Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane LP-TX Thevenin Output Low Voltage CP and Clock Lane LP-TX Thevenin Output Low Voltage CN values, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane Rise Time

Click here for information on connections for the Clock Lane Rise Time test.

Configure and Run Clock Lane Rise Time

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane Rise Time test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Escape**.

The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type Two Channel with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 21: Configuration parameters for Clock Lane Rise Time

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 22: Analysis parameters for Clock Lane Rise Time

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane Rise Time CP and Clock Lane Rise Time CN values in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. In the Select panel, click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane Fall Time

Click here for information on connections for the Clock Lane Rise Time test.

Configure and Run Clock Lane Fall Time

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane Fall Time test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Escape**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the acquire type Two Channel with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 23: Configuration parameters for Clock Lane Fall Time

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 24: Analysis parameters for Clock Lane Fall Time

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane Fall Time CP and Clock Lane Fall Time CN values in nS, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.

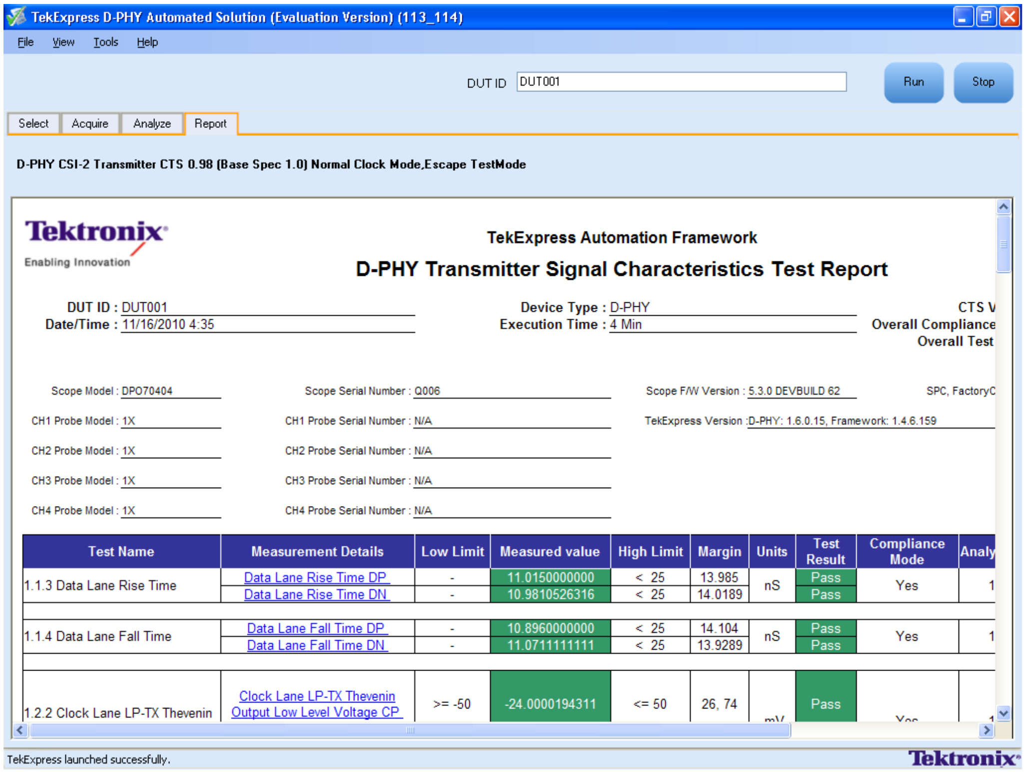
10. Click **Save** to effect the changes, or click**Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.

12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

View Report for Group 2 Tests

The application automatically displays a report in the Report panel once the test is successfully completed. A table shows the test name, measurement details, test result (pass/fail), compliance mode, and analysis time. Save the report as an MHT file using the **File > Save As** option. The following screen shows the results for Group 2 tests.



Connections for Data Lane HS Entry: Data Lane TLPX Value

Click here for information on connections for the Data Lane HS Entry: Data Lane TLPX Value test.

Configure and Run Data Lane HS Entry: Data Lane TLPX Value

The Data Lane HS Entry: Data Lane TLPX Value test is supported on LP-HS waveforms although it is not recommended to use LP-HS waveforms for this test.

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.

NOTE. *The Clock mode Continuous is available only when the test mode is Normal.*

3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Data Lane HS Entry: Data Lane TLPX Value test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Escape** or **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 25: Configuration parameters for Data Lane HS Entry: Data Lane TLPX Value

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 26: Analysis parameters for Data Lane HS Entry: Data Lane TLPX Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane HS Entry DATA Lane TLP value and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.

10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS Entry: THS-PREPARE Value

Click here for information on connections for the Data Lane HS Entry: THS-PREPARE Value test.

Configure and Run Data Lane HS Entry: THS-PREPARE Value

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel wit Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 27: Configuration parameters for Data Lane HS Entry: THS-PREPARE Value

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 –3 to +3 +3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 28: Analysis parameters for Data Lane HS Entry: THS-PREPARE Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane HS Entry: THS-PREPARE values in ns, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS Entry: THS-PREPARE + THS-ZERO Value

Click here for information on connections for the Data Lane HS Entry: THS-PREPARE + THS-ZERO Value test.

Configure and Run Data Lane HS Entry: THS-PREPARE + THS-ZERO Value

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Four Channel wit Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

***NOTE.** The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 29: Configuration parameters for Data Lane HS Entry: THS-PREPARE + THS-ZERO

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div)		
Single-ended probing	–2.6	–3 to +3
Differential probing	+2.6	–3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 30: Analysis parameters for Data Lane HS Entry: THS-PREPARE + THS-ZERO

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane HS Entry: THS-PREPARE + THS-ZERO values in ns, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.

10. Click **Save** to effect the changes, or click**Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.

12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Click here for information on connections for the Data Lane HS-TX Differential Voltages (VOD(0), VOD(1)) Value test.

Configure and Run Data Lane HS-TX Differential Voltages (VOD(0), VOD(1))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 31: Configuration parameters for Data Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 32: Analysis parameters for Data Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test

Table 32: Analysis parameters for Data Lane HS-TX Differential Voltages (VOD(0), VOD(1)) (cont.)

Parameter	Default	User defined mode
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the VOD(1) and VOD(0) values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX Differential Voltage Mismatch (VOD)

Click here for information on connections for the Data Lane HS-TX Differential Voltage Mismatch (VOD) Value test.

Configure and Run Data Lane HS-TX Differential Voltage Mismatch (VOD)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 33: Configuration parameters for Data Lane HS-TX Differential Voltage Mismatch (VOD)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200

Table 33: Configuration parameters for Data Lane HS-TX Differential Voltage Mismatch (VOD) (cont.)

Parameter	Default	User defined mode
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	+2.6	–3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 34: Analysis parameters for Data Lane HS-TX Differential Voltage Mismatch (VOD)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the VOD values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX Single-Ended Output High Voltages ((VOHHS(DP), VOHHS(DN))

Click here for information on connections for the Data Lane HS-TX Single-Ended Output High Voltages ((VOHHS(DP), VOHHS(DN)) test.

Configure and Run Data Lane HS-TX Single-Ended Output High Voltages ((VOHHS(DP), VOHHS(DN))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 35: Configuration parameters for Data Lane HS-TX Single-Ended Output High Voltages ((VOHHS(DP), VOHHS(DN))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 36: Analysis parameters for Data Lane HS-TX Single-Ended Output High Voltages ((VOHHS(DP), VOHHS(DN))

Parameter	Default	User defined mode
Trigger Type	Transition	Transition

Table 36: Analysis parameters for Data Lane HS-TX Single-Ended Output High Voltages ((VOHHS(DP), VOHHS(DN)) (cont.)

Parameter	Default	User defined mode
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane HS-TX Single-Ended Output High Voltages DP and DN values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

Click here for information on connections for the Data Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0)) test.

Configure and Run Data Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 37: Configuration parameters for Data Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 38: Analysis parameters for Data Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Common Mode Voltages VTX(0) and VTX(1) values in mV, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.

10. Click **Save** to effect the changes, or click**Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.

12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

Click here for information on connections for the Data Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0)) test

Configure and Run Data Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 39: Configuration parameters for Data Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 40: Analysis parameters for Data Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

Parameter	Default	User defined mode
Trigger Type	Transition	Transition

Table 40: Analysis parameters for Data Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0)) (cont.)

Parameter	Default	User defined mode
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Common Mode Voltage Mismatch values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

Click here for information on connections for the Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF)) test

Configure and Run Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

The Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF)) test uses a band pass filter. To perform the measurement, the application uses both the original waveform (unfiltered) and the filtered waveform as follows:

1. Acquires unfiltered waveforms from the oscilloscope channels. Typical unfiltered waveform names are like `Acq4TwoChannelwithClockasTrigger_CN.WFM` and `Acq4TwoChannelwithClockasTrigger_CP.WFM`.
2. Applies a band pass filter on live channels and stores them on the Math channel. The band pass filter files that the application uses are `TwoChannelwithDataasTriggerAndBandPassFilter_DP.WFM` and `TwoChannelwithDataasTriggerAndBandPassFilter_DN.WFM`. Typical filtered waveform

file name are like `TwoChannelwithClockasTriggerAndBandPassFilter_CP.WFM` and `TwoChannelwithClockasTriggerAndBandPassFilter_CN.WFM`.

3. Saves both Live and Math waveforms to the disk.
4. Performs the measurement using both the Live and Math waveforms.

In the pre-recorded mode, it is enough if you to select the unfiltered waveforms. However, make sure that the filtered waveforms are in the same folder as the unfiltered waveforms for these measurements to run correctly in pre-recorded mode. The filtered waveforms for the measurements must be the ones saved by the TekExpress application. The measurements will not work as expected if any other filtered waveforms are used. .

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger and BandPass). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 41: Configuration parameters for Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 42: Analysis parameters for Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4

Table 42: Analysis parameters for Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF)) (cont.)

Parameter	Default	User defined mode
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane HS-TX Dynamic Common-Level Variations value in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

Click here for information on connections for the Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF)) test

Configure and Run Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

The Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(LF)) test uses a high pass filter. To perform the measurement, the application uses both the original waveform (unfiltered) and the filtered waveform as follows:

1. Acquires unfiltered waveforms from the oscilloscope channels. Typical unfiltered waveform names are like `Acq4TwoChannelwithClockasTrigger_CN.WFM` and `Acq4TwoChannelwithClockasTrigger_CP.WFM`.
2. Applies a high pass filter on live channels and stores them on the Math channel. The high pass filter files that the application uses are `TwoChannelwithDataasTriggerAndHighPassFilter_DP.WFM` and `TwoChannelwithDataasTriggerAndHighPassFilter_DN.WFM`.

3. Saves both Live and Math waveforms to the disk.
4. Performs the measurement using both the Live and Math waveforms.

In the pre-recorded mode, it is enough if you to select the unfiltered waveforms. However, make sure that the filtered waveforms are in the same folder as the unfiltered waveforms for these measurements to run correctly in pre-recorded mode. The filtered waveforms for the measurements must be the ones saved by the TekExpress application. The measurements will not work as expected if any other filtered waveforms are used. .

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger and HighPass). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 43: Configuration parameters for Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 44: Analysis parameters for Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1

Table 44: Analysis parameters for Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF)) (cont.)

Parameter	Default	User defined mode
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Negative	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane HS-TX Dynamic Common-Level Variations value in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX 20%-80% Rise time (tR)

Click here for information on connections for the Data Lane HS-TX 20%-80% Rise time (tR) test.

Configure and Run Data Lane HS-TX 20%-80% Rise time (tR)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 45: Configuration parameters for Data Lane HS-TX 20%-80% Rise time (tR)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200

Table 45: Configuration parameters for Data Lane HS-TX 20%-80% Rise time (tR) (cont.)

Parameter	Default	User defined mode
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 46: Analysis parameters for Data Lane HS-TX 20%-80% Rise time (tR)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the tR value in pS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS-TX 80%-20% Fall time (tF)

Click here for information on connections for the Data Lane HS-TX 80%-20% Fall time (tF) test.

Configure and Run Data Lane HS-TX 80%-20% Fall time (tF)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 47: Configuration parameters for Data Lane HS-TX 80%-20% Fall time (tF)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 48: Analysis parameters for Data Lane HS-TX 80%-20% Fall time (tF)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500

Table 48: Analysis parameters for Data Lane HS-TX 80%-20% Fall time (tF) (cont.)

Parameter	Default	User defined mode
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the tF values in pS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS Exit: THS-TRAIL Value

Click here for information on connections for the Data Lane HS Exit: THS-TRAIL Value test.

Configure and Run Data Lane HS Exit: THS-TRAIL Value

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 49: Configuration parameters for Data Lane HS Exit: THS-TRAIL Value

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3

Table 49: Configuration parameters for Data Lane HS Exit: THS-TRAIL Value (cont.)

Parameter	Default	User defined mode
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 50: Analysis parameters for Data Lane HS Exit: THS-TRAIL Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane THS-TRAIL values in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT)

Click here for information on connections for the Data Lane HS Exit: 30%–80% Post-EOT Rise Test (TREOT) test.

Configure and Run Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 51: Configuration parameters for Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 52: Analysis parameters for Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT)

Parameter	Default	User defined mode
Trigger Type	Transition	Transition

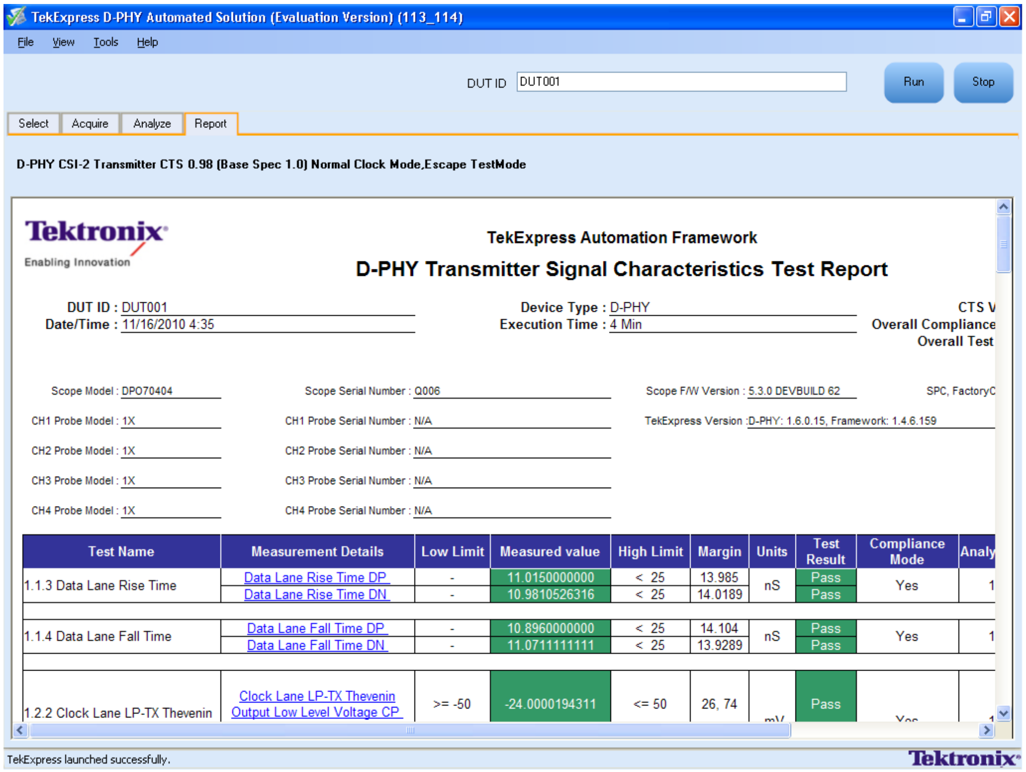
Table 52: Analysis parameters for Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT) (cont.)

Parameter	Default	User defined mode
Trigger Source	Ch1	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Data Lane TREOT value in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

View Report for Group 3 Tests

The application automatically displays a report in the Report panel once the test is successfully completed. A table shows the test name, measurement details, test result (pass/fail), compliance mode, and analysis time. Save the report as an MHT file using the **File > Save As** option. The following screen shows the results for Group 3 tests.



Connections for Clock Lane HS Entry TLPX Value

Single-ended clock signal only

Click here for information on connections for the Clock Lane HS Entry TLPX Value test.

Configure and Run Clock Lane HS Entry TLPX Value

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.

NOTE. *This test is not available in the Continuous Clock mode.*

3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Normal**.

The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 53: Configuration parameters for Clock Lane HS Entry TLPX Value

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 54: Analysis parameters for Clock Lane HS Entry TLPX Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane HS Entry TLPX Value in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS Entry TCLK-PREPARE Value

test id 1.4.2.

Single-ended clock signal only

Click here for information on connections for the Clock Lane HS Entry TCLK-PREPARE Value test.

Configure and Run Clock Lane HS Entry TCLK-PREPARE Value

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.

NOTE. *This test is not available in the Continuous Clock mode.*

3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 55: Configuration parameters for Clock Lane HS Entry TCLK-PREPARE Value

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (ns)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 56: Analysis parameters for Clock Lane HS Entry TCLK-PREPARE Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane HS Entry TCLK-PREPARE Value in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS Entry TCLK-PREPARE+TCLK–ZERO Value

Click here for information on connections for the Clock Lane HS Entry TCLK-PREPARE Value test.

Configure and Run Clock Lane HS Entry TCLK-PREPARE+TCLK–ZERO Value

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.

NOTE. *This test is not available in the Continuous Clock mode.*

3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane HS Entry TCLK-PREPARE+TCLK–ZERO Value is not available in the Differential Mode.*

4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 57: Configuration parameters for Clock Lane HS Entry TCLK-PREPARE+TCLK–ZERO Value

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (ns)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 58: Analysis parameters for Clock Lane HS Entry TCLK-PREPARE+TCLK–ZERO Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane HS Entry TCLK-PREPARE Value in nS, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Click here for information on connections for the Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1)) test.

Configure and Run Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 59: Configuration parameters for Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 60: Analysis parameters for Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Upper Level for Differential (V)	-0.3	+1 to -1
Trigger Lower Level for Differential (V)	-0.9	+1 to -1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the Clock Lane VOD(1) and VOD(2) values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX Differential Voltage Mismatch

Click here for information on connections for the Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1)) test.

Configure and Run Clock Lane HS-TX Differential Voltage Mismatch

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 61: Configuration parameters for Clock Lane HS-TX Differential Voltage Mismatch

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 62: Analysis parameters for Clock Lane HS-TX Differential Voltage Mismatch

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4

Table 62: Analysis parameters for Clock Lane HS-TX Differential Voltage Mismatch (cont.)

Parameter	Default	User defined mode
Trigger Upper Level (V) Single-ended probing Differential probing	 1 0.15	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Upper Level for Differential (V)	-0.3	+1 to -1
Trigger Lower Level for Differential (V)	-0.9	+1 to -1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the Clock Lane VOD value in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN))

Click here for information on connections for the Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN)) test.

Configure and Run Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 63: Configuration parameters for Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 64: Analysis parameters for Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN))

Parameter	Default	User defined mode
Trigger Type		
Normal Clock	Transition	Transition
Continuous Clock	Edge	Edge

Table 64: Analysis parameters for Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN)) (cont.)

Parameter	Default	User defined mode
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the Clock Lane HS-TX Single-Ended Output High Voltages DP and DN values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

Click here for information on connections for the Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0)) test.

Configure and Run Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0)) test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 65: Configuration parameters for Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 66: Analysis parameters for Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the Common Mode Voltages VTX(0) and VTX(1) values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

Click here for information on connections for the Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0)) test

Configure and Run Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1, 0)) test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 67: Configuration parameters for Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300

Table 67: Configuration parameters for Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0)) (cont.)

Parameter	Default	User defined mode
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 68: Analysis parameters for Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the Common Mode Voltage Mismatch values in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

Click here for information on connections for the Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF)) test

Configure and Run Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

The Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF)) test uses a band pass filter. To perform the measurement, the application uses both the original waveform (unfiltered) and the filtered waveform as follows:

1. Acquires unfiltered waveforms from the oscilloscope channels. Typical unfiltered waveform names are like `Acq4TwoChannelwithClockasTrigger_CN.WFM` and `Acq4TwoChannelwithClockasTrigger_CP.WFM`.
2. Applies a band pass filter on live channels and stores them on the Math channel. The band pass filter files that the application uses are `TwoChannelwithClockasTriggerAndBandPassFilter_CP.WFM` and `TwoChannelwithClockasTriggerAndBandPassFilter_CN.WFM`. Typical filtered waveform file name are like `TwoChannelwithClockasTriggerAndBandPassFilter_CP.WFM` and `TwoChannelwithClockasTriggerAndBandPassFilter_CN.WFM`.
3. Saves both Live and Math waveforms to the disk.
4. Performs the measurement using both the Live and Math waveforms.

In the pre-recorded mode, it is enough if you to select the unfiltered waveforms. However, make sure that the filtered waveforms are in the same folder as the unfiltered waveforms for these measurements to run correctly in pre-recorded mode. The filtered waveforms for the measurements must be the ones saved by the TekExpress application. The measurements will not work as expected if any other filtered waveforms are used. .

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF)) test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger and BandPass). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 69: Configuration parameters for Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 70: Analysis parameters for Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (VCMTX(LF))

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the Clock Lane HS-TX Dynamic Common-Level Variations value in mV, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.

10. Click **Save** to effect the changes, or click**Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

Click here for information on connections for the Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF)) test

Configure and Run Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

The Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF)) test uses a high pass filter. To perform the measurement, the application uses both the original waveform (unfiltered) and the filtered waveform as follows:

1. Acquires unfiltered waveforms from the oscilloscope channels. Typical unfiltered waveform names are like `Acq4TwoChannelwithClockasTrigger_CN.WFM` and `Acq4TwoChannelwithClockasTrigger_CP.WFM`.
2. Applies a high pass filter on live channels and stores them on the Math channel. The high pass filter files that the application uses are `TwoChannelwithClockasTriggerAndHighPassFilter_CP.WFM` and `TwoChannelwithClockasTriggerAndHighPassFilter_CN.WFM`.
3. Saves both Live and Math waveforms to the disk.
4. Performs the measurement using both the Live and Math waveforms.

In the pre-recorded mode, it is enough if you to select the unfiltered waveforms. However, make sure that the filtered waveforms are in the same folder as the unfiltered waveforms for these measurements to run correctly in pre-recorded mode. The filtered waveforms for the measurements must be the ones saved by the TekExpress application. The measurements will not work as expected if any other filtered waveforms are used. .

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended**.

NOTE. *The Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF)) test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Normal**.

The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger and HighPass). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 71: Configuration parameters for Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 72: Analysis parameters for Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (VCMTX(HF))

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the Clock Lane HS-TX Dynamic Common-Level Variations value in mV, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click **Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX 20%-80% Rise time (tR)

Click here for information on connections for the Clock Lane HS-TX 20%-80% Rise time (tR) test.

Configure and Run Clock Lane HS-TX 20%-80% Rise time (tR)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 73: Configuration parameters for Clock Lane HS-TX 20%-80% Rise time (tR)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 74: Analysis parameters for Clock Lane HS-TX 20%-80% Rise time (tR)

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge

Table 74: Analysis parameters for Clock Lane HS-TX 20%-80% Rise time (tR) (cont.)

Parameter	Default	User defined mode
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Upper Level for Differential (V)	-0.3	+1 to -1
Trigger Lower Level for Differential (V)	-0.9	+1 to -1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the tR value in pS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click **Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS-TX 80%-20% Fall time (tF)

Click here for information on connections for the Clock Lane HS-TX 80%-20% Fall time (tF) test.

Configure and Run Clock Lane HS-TX 80%-20% Fall time (tF)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 75: Configuration parameters for Clock Lane HS-TX 80%-20% Fall time (tF)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 76: Analysis parameters for Clock Lane HS-TX 80%-20% Fall time (tF)

Parameter	Default	User defined mode
Trigger Type Normal Clock Continuous Clock	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Upper Level for Differential (V)	-0.3	+1 to -1
Trigger Lower Level for Differential (V)	-0.9	+1 to -1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Normal Clock Continuous Clock	 Greater Than Not Applicable	 Greater Than, Less Than Not Applicable
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Normal Clock Continuous Clock	 Occurs Not Applicable	 Occurs, Logic Not Applicable

8. Click **Limits** to view and change the tF values in pS, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click **Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS Exit: TCLK-TRAIL Value

Click here for information on connections for the Clock Lane HS Exit: TCLK-TRAIL Value test.

Configure and Run Clock Lane HS Exit: TCLK-TRAIL Value

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** .
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 77: Configuration parameters for Clock Lane HS Exit: TCLK-TRAIL Value

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 78: Analysis parameters for Clock Lane HS Exit: TCLK-TRAIL Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition

Table 78: Analysis parameters for Clock Lane HS Exit: TCLK-TRAIL Value (cont.)

Parameter	Default	User defined mode
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs

8. Click **Limits** to view and change the Clock Lane THS-TRAIL values in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click **Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS Exit: 30%-85% Post-EoT Rise Time (TREOT)

Click here for information on connections for the Clock Lane HS Exit: 30%–85% Post-EoT Rise Time (TREOT) test.

Configure and Run Clock Lane HS Exit: 30%-85% Post-EoT Rise Time (TREOT)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal**.
3. Select Clock Lane Probing as **Single-ended**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 79: Configuration parameters for Clock Lane HS Exit: 30%-85% Post-EoT Rise Time (TREOT)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 80: Analysis parameters for Clock Lane HS Exit: 30%-85% Post-EoT Rise Time (TREOT)

Parameter	Default	User defined mode
Trigger Type	Transition, Edge	Transition, Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the Clock Lane TREOT value in nS, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.

10. Click **Save** to effect the changes, or click**Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.

12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Lane HS Clock Instantaneous (UIINST)

Click here for information on connections for the Clock Lane HS Clock Instantaneous (UIINST) test.

Configure and Run Clock Lane HS Clock Instantaneous (UIINST)

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** or **Continuous**.
3. Select Clock Lane Probing as **Single-ended** .
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Two Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 81: Configuration parameters for Clock Lane HS Clock Instantaneous (UIINST)

Parameter	Default	User defined mode
Vertical Scale (mV)	200	100, 200, 300
Vertical Position (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 82: Analysis parameters for Clock Lane HS Clock Instantaneous (UIINST)

Parameter	Default	User defined mode
UI INST MIN (nS)	1.25	Greater than or equal to 1.25 and less than or equal to 12.5
Trigger Type Single-ended probing Differential probing	 Transition Edge	 Transition Edge
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1

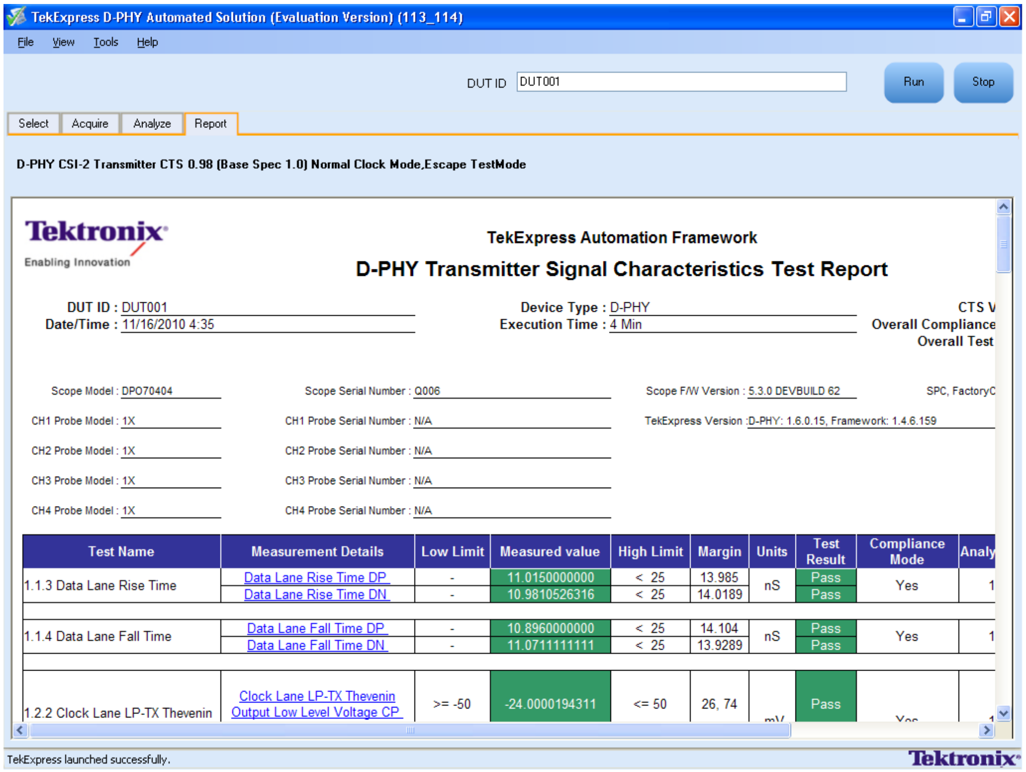
Table 82: Analysis parameters for Clock Lane HS Clock Instantaneous (UIINST) (cont.)

Parameter	Default	User defined mode
Trigger Upper Level for Differential (V)	-0.3	+1 to -1
Trigger Lower Level for Differential (V)	-0.9	+1 to -1
Trigger Level for Clock Continuous Mode (V)	0.2	0.2, 0.05, 0.1
Trigger Time (pS)	500	250, 500
Trigger Transition Single-ended probing Differential probing	 Greater Than NA	 Greater Than, Less Than NA
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation Single-ended probing Differential probing	 Occurs NA	 Occurs, Logic NA

8. Click **Limits** to view and change the Maximum (UIINST) values in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click**Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

View Report for Group 4 Tests

The application automatically displays a report in the Report panel once the test is successfully completed. A table shows the test name, measurement details, test result (pass/fail), compliance mode, and analysis time. Save the report as an MHT file using the **File > Save As** option. The following screen shows the results for Group 4 tests.



Connections for HS Entry TCLK PREValue

Click here for information on connections for the HS Entry TCLK PREValue test.

Configure and Run HS Entry TCLK PREValue

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** .

NOTE. *The HS Entry TCLK PREValue test is not available in the Clock Continuous Mode.*

3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Four Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 83: Configuration parameters for HS Entry TCLK PREValue

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 84: Analysis parameters for HS Entry TCLK PREValue

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the HS Entry TCLK PREValue in nS, and the compare string.

9. Click **Comments** to enter comments. The comments are shown in the test report.

10. Click **Save** to effect the changes, or click **Cancel**.

11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.

12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for HS Exit TCLK POSTValue

Click here for information on connections for the HS Exit TCLK POSTValue test.

Configure and Run HS Entry TCLK POSTValue

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** .

NOTE. *The HS Entry TCLK POSTValue test is not available in the Clock Continuous Mode.*

3. Select Clock Lane Probing as **Single-ended** or **Differential**.
4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.
5. Select the test and click **Configure**.
6. In the Configuration Panel, set the following parameters for the test (Four Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

NOTE. *The record length for this measurement can be a maximum of 5,000,000. The measurement may not work properly with longer record lengths.*

Table 85: Configuration parameters for HS Exit TCLK POSTValue

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div) Single-ended probing Differential probing	 –2.6 +2.6	 +3 to –3 –3 to +3
Vertical Offset (V)	0	Do not change
Horizontal Scale (ns)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 86: Analysis parameters for HS Exit: TCLK-POST Value

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

8. Click **Limits** to view and change the HS Exit TCLK POSTValue in nS, and the compare string.
9. Click **Comments** to enter comments. The comments are shown in the test report.
10. Click **Save** to effect the changes, or click **Cancel**.
11. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.
12. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

Connections for Clock Rising Edge Alignment to First Payload Bit

Click here for information on connections for the Clock Rising Edge Alignment to First Payload Bit test.

Configure and Run Clock Rising Edge Alignment to First Payload Bit

1. In the Select panel, select the Device.
2. Select the Clock Mode as **Normal** .
3. Select Clock Lane Probing as **Single-ended** .

NOTE. *The Clock Rising Edge Alignment to First Payload Bit test is not available when the selected clock lane probing is Differential.*

4. Select the Test Mode as **Normal**.

   The Version default value is **CTS 0.98 (Base Spec 1.0)**.

5. Select the test and click **Configure**.

6. In the Configuration Panel, set the following parameters for the test (Four Channel with Clock as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

Table 87: Configuration parameters for Clock Rising Edge Alignment to First Payload Bit

Parameter	Default	User defined mode
Vertical Scale (mV)	200	50, 100, 200
Vertical Position for Data (div)	–2.6	+3 to –3
Vertical Position for Clock (div)	–2.6	+3 to –3
Vertical Offset (V)	0	Do not change
Horizontal Scale (us)	8	8, 10, 12
Sample Rate (GS/s)	12.5	7.5, 10, 12.5
Record Length	1000000	100000 to 10000000

7. Click **Analyze**. View and change the following analysis parameters:

Table 88: Analysis parameters for Clock Rising Edge Alignment to First Payload Bit

Parameter	Default	User defined mode
Trigger Type	Transition	Transition
Trigger Source	Ch3	Ch1, Ch2, Ch3, Ch4
Trigger Upper Level (V)	1	Enter a value based on the test
Trigger Lower Level (V)	0.05	0.05, 0.1, 1
Trigger Time (pS)	500	250, 500
Trigger Transition	Greater Than	Greater Than, Less Than
Trigger Slope	Positive	Positive, Negative, Either
Trigger If Violation	Occurs	Occurs, Logic

NOTE. *The Limits tab has no configurable parameters.*

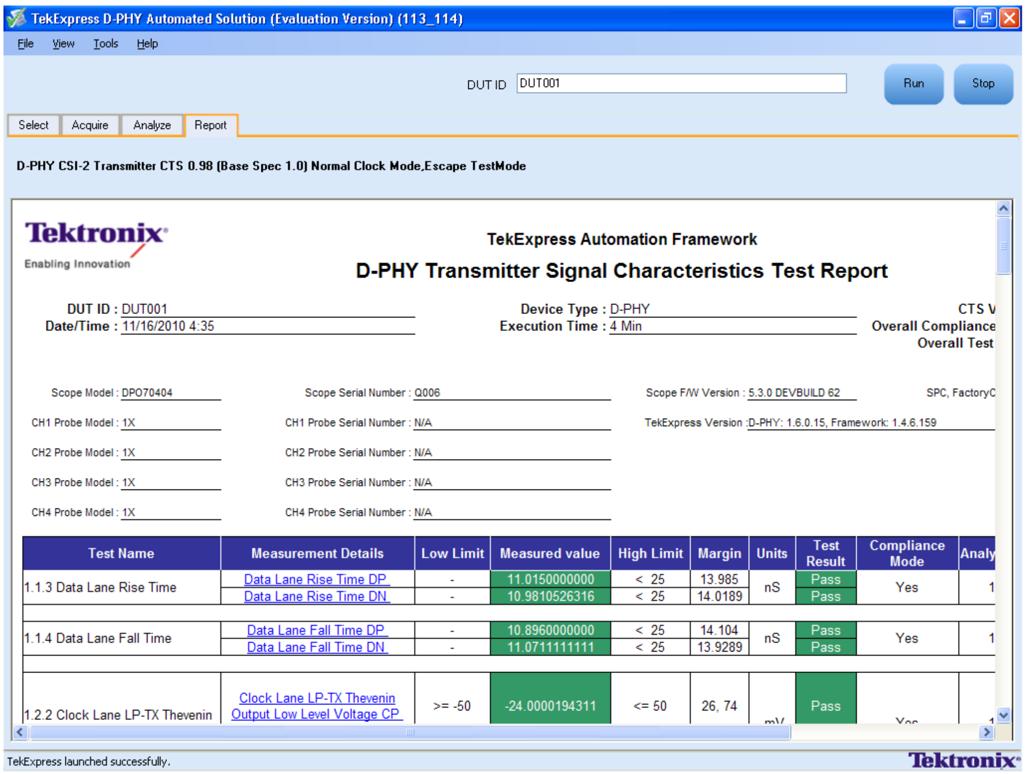
8. Click **Comments** to enter comments. The comments are shown in the test report.
9. Click **Save** to effect the changes, or click **Cancel**.
10. Click the **Acquire** tab to view the acquisition parameters. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.

11. Click **Run** to start the test. The Acquire panel shows the progress and status of the test as it runs.

12. Follow the on-screen prompt and complete the test.

View Report for Group 5 Tests

The application automatically displays a report in the Report panel once the test is successfully completed. A table shows the test name, measurement details, test result (pass/fail), compliance mode, and analysis time. Save the report as an MHT file using the **File > Save As** option. The following screen shows the results for Group 5 tests.



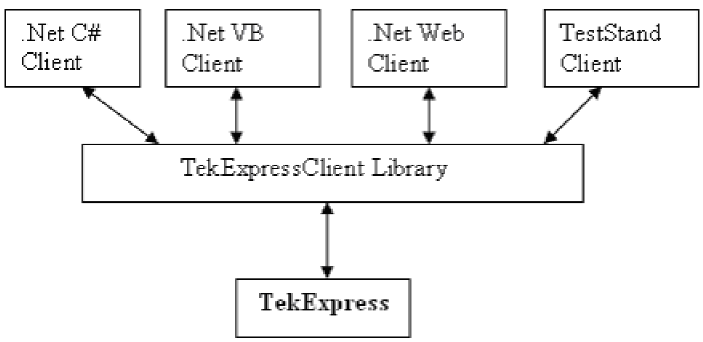
About the Programmatic Interface

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

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

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

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



Click the following links to get details on them:

What does one need to have to develop TekExpress Client?

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

References required

TekExpressClient.dll has internal reference to *IIdlglib.dll* and *IRemoteInterface.dll*.

IIdlglib.dll has a reference to *TekDotNetLib.dll*.

IRemoteInterface.dll provides the interfaces required to perform the remote automations. It is an interface that forms the communication line between the server and the client.

IIdlglib.dll provides the methods to generate and direct the secondary dialog messages at the client-end.

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

What steps does a client need to follow?

The following are the steps that a client needs to follow to use the TekExpressClient.dll to programmatically control the server:

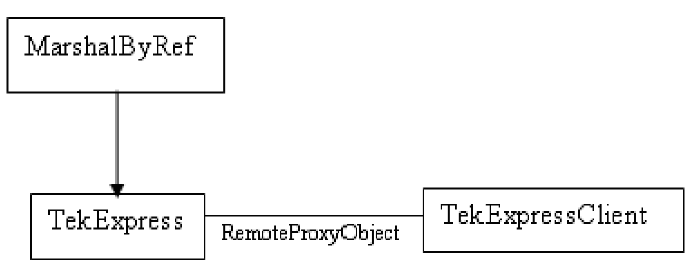
A client UI must be developed to access the interfaces exposed through the server. This client needs to load `TekExpressClient.dll` to access the interfaces. Once the TekExpressClient.dll is loaded, the client UI can call the specific functions to run the operations requested by the client. Once the client is up and running, it must do the following to run a remote operation:

1. The client needs to provide the IP address of the PC at which the server is running in order to connect to the server.
2. The client needs to lock the server application to avoid conflict with any other Client that may try to control the server simultaneously. “Lock” would also disable all user controls on server so that server state cannot be changed by manual operation.
3. If any other client tries to access a server which is locked, it will get a notification that the server is locked by another client.
4. When the client has connected to and locked the server, the client can access any of the programmatic controls to run the remote automations.
5. Once the client operations are completed, the server needs to be “unlocked” by the client.

Server and Client Proxy Objects

Remote Proxy Object

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



The following is an example:

```
RemotingConfiguration.RegisterWellKnownServiceType (typeof (TekExpressRe-
moteInterface), "TekExpress Remote interface", WellKnownObjectMode.Singleton);
```

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

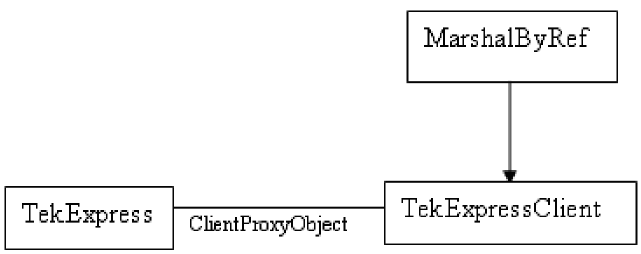
For example,

//Get a reference to the remote object

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

Client Proxy Object

Client exposes a proxy object to receive certain information.



For example,

//Register the client proxy object

```
WellKnownServiceTypeEntry[] e = RemotingConfiguration.GetRegisteredWell-
KnownServiceTypes();
```

```
clientInterface = new ClientInterface();
```

```
RemotingConfiguration.RegisterWellKnownServiceType(typeof(ClientInterface),
"Remote Client Interface", WellKnownObjectMode.Singleton);
```

//Expose the client proxy object through marshalling

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

The client proxy object is used for the following:

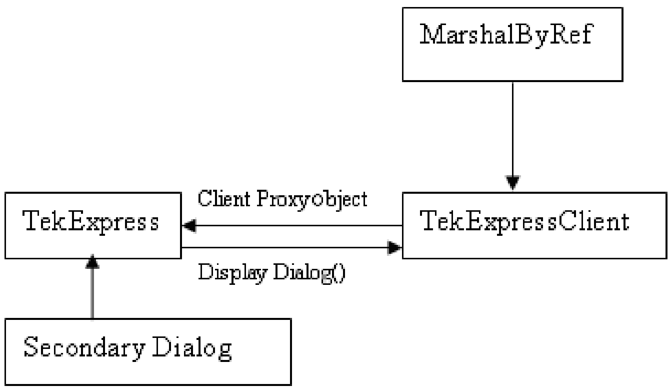
1. To get the secondary dialog messages from the server.
2. To get the file transfer commands from the server while transferring the report.

Click here to see examples.

```
clientObject.clientIntf.DisplayDialog(caption, msg,iconType, btnType);
clientObject.clientIntf.TransferBytes(buffer, read, fileLength);
```

To know more on the topics below, click the links.

Secondary Dialog Message Handling



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

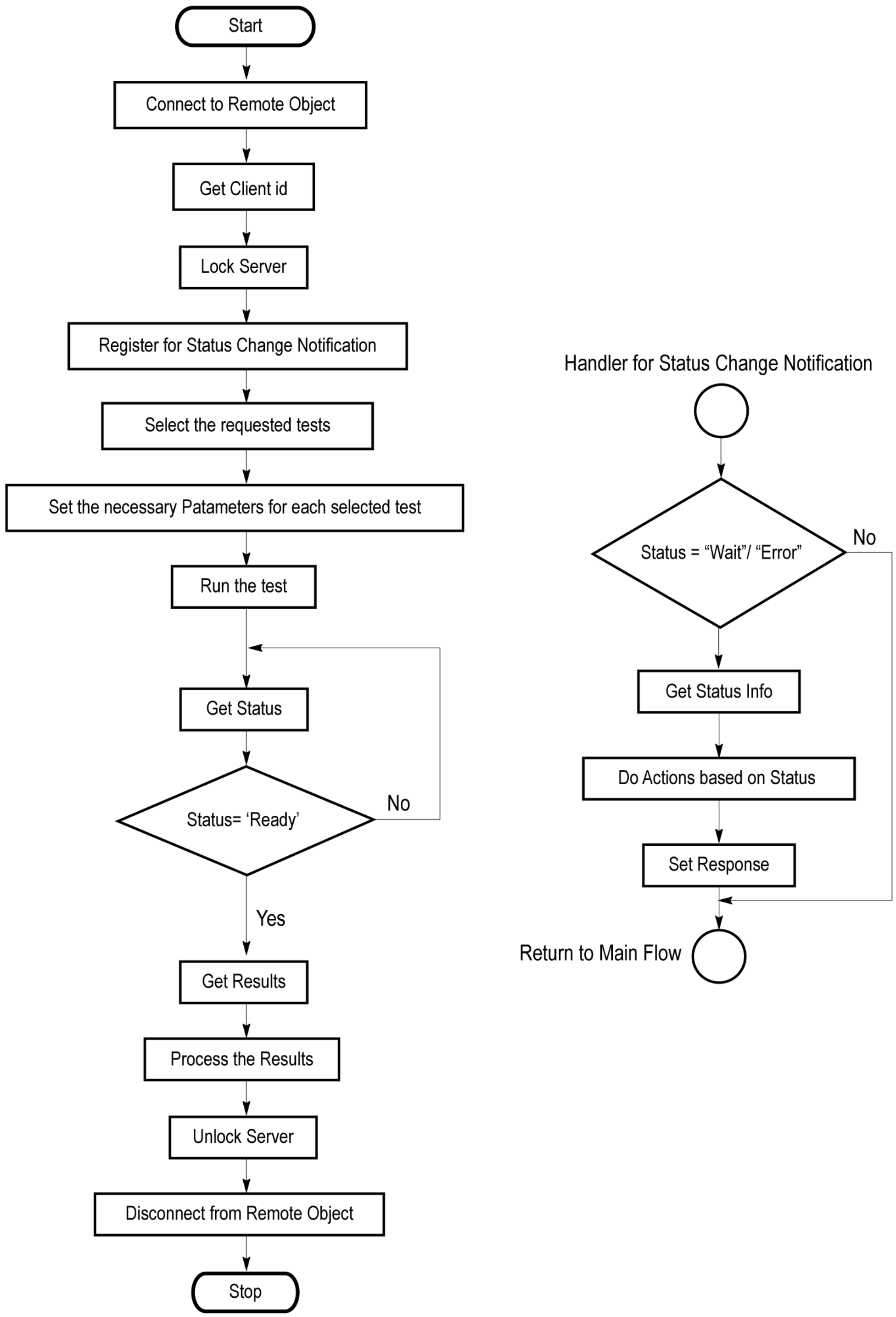
In the secondary dialog library, the assembly that is calling for the dialog box to be displayed is checked and if a remote connection is detected, the messages are directed to the remote end.

File Transfer Events

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

Client Programmatic Interface: An Example

An example of the client programmatic interface is described and shown as follows:


Start
Connect to Remote Object
Get Client id
Lock Server
Register for Status Change Notification
Select the requested tests
Set the necessary Patameters for each selected test
Run the test
Get Status
Status= 'Ready'
No
Yes
Get Results
Process the Results
Unlock Server
Disconnect from Remote Object
Stop
Handler for Status Change Notification
Status = "Wait"/ "Error"
No
Get Status Info
Do Actions based on Status
Set Response
Return to Main Flow

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

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

---

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

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

---

4. Register for receiving notifications on status change events on the server. To register you need to give a handler as a parameter.

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

---

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

NOTE. *You can skip this step if you are registered for the status change notification and when the status is Ready.*

---

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

Handler of Status Change Notification

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

D-PHY Application Command Arguments and Queries

string id

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.

Ready: Test configured and ready to start.

Running: Test running.

Paused: Test paused.

Wait: A popup that needs your inputs.

Error: An error is occurred.

string dutName

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

out bool saved

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

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

string ipAddress

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

out string clientID

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

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

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

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

string dutId

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

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

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device.

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite.

string test

Name	Type	Direction	Description
test	string	IN	Specifies the name of the test to obtain the pass or fail status.

string parameterString

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

int rowNr

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

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

out string[] status

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

string name

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

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

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

string name

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

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

Once the session is saved under ‘name’ you cannot use this method to save the session in a different name. Use SaveSessionAs instead.

string name

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

The same session is saved under different names using this method. The name parameter cannot be empty. If it is empty, the client is prompted to provide a valid name.

bool isSelected

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

string time

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

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

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

bool_verbose

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

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

string filePath

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

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

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

out string caption

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

out string message

Name	Type	Direction	Description
message	String	OUT	The wait state/error state message to you.

out string[] buttonTexts

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

string response

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

out string clientID

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

Connect Through an IP Address

Command name	Parameters	Description	Return Value	Example
Connect()	string ipAddress (see page 122) out string clientID (see page 122)	This method connects the client to the server. Note (see page 122) The client provides the IP address to connect to the server. The server provides a unique client identification number when connected to it.	Return value is either True or False.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as boolean returnval = m_Client.Connect(ipaddress,m_clientID)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Lock the Server

Command name	Parameters	Description	Return Value	Example
LockSession()	string clientID (see page 126)	This method locks the server. Note (see page 123) The client must call this method before running any of the remote automations. The server can be locked by only one client.	String value that gives the status of the operation after it has been performed. The return value is "Session Locked..." on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval = m_Client.LockServer(clientID)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Disable the Popups

Command name	Parameters	Description	Return Value	Example
SetVerboseMode()	string clientID (see page 126) bool _verbose (see page 125)	This method sets the verbose mode to either true or false. When the value is set to true, then any of the message boxes appearing during the application will be routed to the client machine which is controlling TekExpress. When the value is set to false, then all the message boxes are shown on the server machine.	String that gives the status of the operation after it has been performed. When Verbose mode is set to true, the return value is "Verbose mode turned on. All dialog box will be shown to client ...". When Verbose mode is set to false, the return value is "Verbose mode turned off. All dialog box will be shown to server ...".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string **Verbose mode is turned on** return=m_Client.SetVerbose-Mode(clientID, true) **Verbose mode is turned off** returnval=m_Client.SetVerbose-Mode(clientID, false)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Set or Get the DUT ID

Command name	Parameters	Description	Return Value	Example
SetDutId()	string clientID (see page 126) string dutName (see page 122)	This method changes the DUT ID of the set up. The client must provide a valid DUT ID.	String that gives the status of the operation after it has been performed. Return value is "DUT Id Changed..." on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string return=m_Client.SetDutId(clientID,desiredDutId) Note (see page 122)
GetDutId()	string clientID (see page 126) string dutId (see page 123)	This method gets the DUT ID of the current set up.	String that gives the status of the operation after it has been performed.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string return=m_Client.GetDutid(clientID, out DutId)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Set the Configuration Parameters for a Suite or Measurement

Command name	Parameters	Description	Return Value	Example
SetGeneralParameter	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the number of video lanes for the selected measurement. ***NOTE.*** *Using this command we can select a lane, channel, or source type.*	String that gives the status of the operation after it has been performed. The return value is "" (an empty String) on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string Select Channel (see page 131) Select Measurement Method (see page 131)

Command name	Parameters	Description	Return Value	Example
SetAnalyzeParameter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the configuration parameters in the Analyze panel of the Configuration Panel dialog box for a given suite or measurement.	The return value is "" (an empty String) on success.	m_Client = new Client() //m_Clientis a reference to the Client class in the Client DLL returnval as string Configure Analyze parameters for Data Lane Rise Time (see page 132)
SetAcquireParameter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the configuration parameters in the Acquire panel of the Configuration Panel dialog box for a given suite or measurement.	returnVal = remoteObject.SetAcquireParameter(id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUCCESS) return CommandFailed(returnVal)	Configure Acquire Parameters for Data Lane Rise Time (see page 132)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select Channel Example

returnval=mClient.SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data + Signal connected to Real Time Scope at$Channel 1")

Select Measurement Method Example

returnval=mClient.SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measurement Method$Automatic")

Configure Analyze Parameters for Data Lane Rise Time Example

Parameter	Example
Trigger Type	returnval = mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Type$Transition")
Trigger Source	returnval = mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Source$Ch1")
Trigger Upper Level (V)	returnval = mClient.SetAnalyzeParameter(clientID,"D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Upper Level (V)$1")
Trigger Lower Level (V)	returnval = mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Lower Level (V)$0.05")
Trigger Time (ps)	returnval = mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Time (pS)$500")
Trigger Transition	returnval = mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Transition$Greater Than")
Trigger Slope	returnval = mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Slope$Positive)
Trigger If Violation	returnval = mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger If Violation$Occurs")

Data Lane Rise Time Configure Parameter Example

Parameter	Example
Vertical Scale (mV)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Scale (mV)$200")
Vertical Position (div)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Position (div)$–2.6")
Vertical Offset (V)	returnval = mClient.SetAcquireParameter(clientID,"D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Offset (V)$0")
Horizontal Scale (us)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Horizontal Scale (us)$8")
Sample Rate (GS/s)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Sample Rate (GS/s)$12.5")
Record Length	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Record Length$500000")

Query the Configuration Parameters for a Suite or Measurement

Command name	Parameters	Description	Return Value	Example
GetGeneralParam-eter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parame-terString (see page 123)	This method gets the general configuration parameters for a given suite or measurement.	The return value is the general configuration parameter for a given suite or measurement that is set.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string Query Channel (see page 134) Query Measurement Method (see page 134)
GetAnalyzeParam-eter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parame-terString (see page 123)	This method gets the configuration parameters set in the Analyze panel of the Configuration Panel dialog box for a given suite or measurement.	The return value is the configuration parameter set in the Analyze panel of the Configuration Panel dialog box for a given suite or measurement.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string Query Analyze Parameters for Data Lane Rise Time (see page 135)
GetAcquireParame-ter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parame-terString (see page 123)	This method gets the configuration parameters set in the Acquire panel for a given suite or measurement.	The return value is the configuration parameter set in the Acquire panel for a given suite or measurement.	Query Acquire Parameters for Data Lane Rise Time (see page 134)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Query Channel Example

returnval=mClient.GetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data + Signal connected to Real Time Scope at")

Query Measurement Method Example

returnval=mClient.GetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measurement Method")

Query Data Lane Rise Time Acquire Parameter Examples

Parameter	Example
Vertical Scale (mV)	returnval = mClient.GetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Scale (mV)")
Vertical Position (div)	returnval = mClient.GetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Position (div)")
Vertical Offset (V)	returnval = mClient.GetAcquireParameter(clientID,"D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Offset (V)")
Horizontal Scale (us)	returnval = mClient.GetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Horizontal Scale (us)")
Sample Rate (GS/s)	returnval = mClient.GetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Sample Rate (GS/s)")
Record Length	returnval = mClient.GetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Record Length")

Query Data Lane Rise Time Analyze Parameter Examples

Parameter	Example
Trigger Type	returnval = mClient.GetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Type")
Trigger Source	returnval = mClient.GetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Source")
Trigger Upper Level (V)	returnval = mClient.GetAnalyzeParameter(clientID,"D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Upper Level (V)")
Trigger Lower Level (V)	returnval = mClient.GetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Lower Level (V)")
Trigger Time (ps)	returnval = mClient.GetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Time (pS)")
Trigger Transition	returnval = mClient.GetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Transition")
Trigger Slope	returnval = mClient.GetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Slope)
Trigger If Violation	returnval = mClient.GetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger If Violation")

Select a Measurement

Command name	Parameters	Description	Return Value	Example
SelectTest()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) bool isSelected (see page 124)	This method selects or deselects a given test. Setting parameter isSelected to true, you can select a measurement. Setting parameter isSelected to false, you can deselect a measurement.	String that displays the status of the operation after it has been performed. The return value is "" (an empty String) on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string **Select Measurement (Data Lane Rise Time):** returnval=m_Client.SelectTest(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", true)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select a Suite

Command name	Parameters	Description	Return Value	Example
SelectSuitet()	string clientID (see page 126) string device (see page 123) string suite (see page 123) bool isSelected (see page 124)	This method selects or deselects a given suite. Setting parameter isSelected to true, you can select a suite. Setting parameter isSelected to false, you can deselect a suite.	String that gives the status of the operation after it has been performed. The return value is "" (an empty String) on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string **Select Suite (Default):** returnval=m_Client.SelectTest(clientID, "D-PHY", "Transmitter", true)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select a Channel

Command name	Parameters	Description	Return Value	Example
SetGeneralParameter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the parameters that are not specific to any given test. ***NOTE.*** *Using this command we can select a lane, channel, or source type.*	String that gives the status of the operation after it has been performed. The return value is "" (an empty String) on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string Select Channel (see page 137) Select Measurement Method (see page 137)

Command name	Parameters	Description	Return Value	Example
SetAnalyzeParameter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the configuration parameters in the Analyze panel of the Configuration Panel dialog box for a given suite or measurement.	The return value is "" (an empty String) on success.	m_Client = new Client() //m_Clientis a reference to the Client class in the Client DLL returnval as string Configure Analyze parameters for Data Lane Rise Time (see page 138)
SetAcquireParameter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the configuration parameters in the Acquire panel of the Configuration Panel dialog box for a given suite or measurement.	returnVal = remoteObject.SetAcquireParameter(id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUCCESS) return CommandFailed(returnVal)	Configure Acquire Parameters for Data Lane Rise Time (see page 138)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select Channel Example

returnval=mClient.SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data + Signal connected to Real Time Scope at$Channel 1")

Select Measurement Method Example

returnval=mClient.SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measurement Method$Automatic")

Configure Analyze parameters for Data Lane Rise Time Example

Parameter	Example
Trigger Type	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Type$Transition")
Trigger Source	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Source$Ch1")
Trigger Upper Level (V)	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Upper Level (V)$1")
Trigger Lower Level (V)	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Lower Level (V)$0.05")
Trigger Time (pS)	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "TriggerTime (pS)$500")
Trigger Transition	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Transition$Greater Than")
Trigger Slope	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Slope$Positive")
Trigger If Violation	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger If Violation$Occurs")

Configure Acquire Parameters

Parameter	Example
Vertical Scale (mV)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Scale (mV)$200")
Vertical Position (div)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Position (div)$–2.6")
Vertical Offset (V)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Offset (V)$0")
Horizontal Scale (us)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Horizontal Scale (us)$8")
Sample Rate (GS/s)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Sample Rate (GS/s)$12.5")
Record Length	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Record Length$500000")

Configure the Selected Measurement

Command name	Parameters	Description	Return Value	Example
SetAnalyzeParameter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the Analyze parameters (Configuration parameters) for a given test.	The return value is "" (an empty String) on success.	m_Client = new Client() //m_Clientis a reference to the Client class in the Client DLL returnval as string Configure Analyze Parameters for Data Lane Rise Time (see page 140)
SetAcquireParameter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method sets the Acquire parameters in the Acquire panel of the Configure Dialog box for a given test.	returnVal = remoteObject.SetAcquireParameter(id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUCCESS) return CommandFailed(returnVal)	m_Client = new Client() //m_Clientis a reference to the Client class in the Client DLL returnval as string Configure Acquire Parameters for Data Lane Rise Time (see page 140)

***NOTE.** The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Data Lane Rise Time Configure Parameter Example

Parameter	Example
Vertical Scale (mV)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Scale (mV)$200")
Vertical Position (div)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Position (div)$–2.6")
Vertical Offset (V)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Vertical Offset (V)$0")
Horizontal Scale (us)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Horizontal Scale (us)$8")
Sample Rate (GS/s)	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Sample Rate (GS/s)$12.5")
Record Length	returnval = mClient.SetAcquireParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data Lane Rise Time$Record Length$500000")

Data Lane Rise Time Analyze Parameter Example

Parameter	Example
Trigger Type	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Type$Transition")
Trigger Source	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Source$Ch1")
Trigger Upper Level (V)	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Upper Level (V)$1")
Trigger Lower Level (V)	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Lower Level (V)$0.05")
Trigger Time (pS)	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "TriggerTime (pS)$500")
Trigger Transition	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Transition$Greater Than")
Trigger Slope	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Slope$Positive")
Trigger If Violation	returnval=mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger If Violation$Occurs")

Run with Set Configurations or Stop the Run Operation

Command name	Parameters	Description	Return Value	Example
Run()	string clientID (see page 126)	Runs the selected tests. Note (see page 124) Once the server is set up and is configured, it can be run remotely using this function.	String that gives the status of the operation after it has been performed. The return value is "Run started..." on success.	m_Client = new Client() //m_Clientis a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Run(clientID)
Stop()	string clientID (see page 126)	Stops the currently running tests. Note (see page 125)	String that gives the status of the operation after it has been performed. The return value is "Stopped..." on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Stop(clientID)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Get or Set the Timeout Value

Command name	Parameters	Description	Return Value	Example
GetTimeOut()	string clientID (see page 126)	Returns the current timeout period set by the client.	String that gives the status of the operation after it has been performed. The default return value is 1800000.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.GetTime-Out()
SetTimeOut()	string clientID (see page 126) string time (see page 125)	Sets a timeout period specified by client. After expiry of this timeout period, the server is automatically unlocked.	String that gives the status of the operation after it has been performed. On success the return value is “TimeOut Period Changed”.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.SetTime-Out(clientID, desiredTimeOut)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Wait for the Test to Complete

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

Command name	Parameters	Description	Return Value	Example
ApplicationStatus()	string clientID (see page 126)	This method gets the status of the server application. The states at a given time are Ready, Running, Paused, Wait, or Error. (see page 121)	String value that gives the status of the server application.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Applica-tionStatus(clientID)

Command name	Parameters	Description	Return Value	Example
QueryStatus()	string clientID (see page 126) out string[] status (see page 124)	It is an interface for the user to transfer Analyze panel status messages from the server to the client.	String that gives the status of the operation after it has been performed. On success the return value is "Transferred...".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnVal=m_Client.QueryStatus(clientID, out statusMessages) if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS) return "Status updated..." else return CommandFailed(returnVal)
GetCurrentStateInfo() ***NOTE.*** *This command is used when the application is running and is in the wait or error state.*	string clientID (see page 126) out string caption (see page 125) out string message (see page 126) out string[] buttonTexts (see page 126)	This method gets the additional information of the states when the application is in Wait or Error state. Except client ID, all the others are out parameters.	This command does not return any value. This function fills up the out parameters that are passed when invoking this function.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL m_Client.GetCurrentStateInfo(clientID, caption,message, buttonTexts)
SendResponse() ***NOTE.*** *This command is used when the application is running and is in the wait or error state.*	string clientID (see page 126) out string caption (see page 125) out string message (see page 126) string response (see page 126)	After receiving the additional information using the method GetCurrentStateInfo(), the client can decide on the response to send and send the response to the application using this function. The response should be one of the strings that was earlier received as a string array in the GetCurrentStateInfo function.The _caption and _message should match the information received earlier in the GetCurrentStateInfo function.	This command does not return any value.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL m_Client.SendResponse(clientID, caption,message, response)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

After the Test is Complete

Command name	Parameters	Description	Return Value	Example
GetPassFailStatus()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123)	This method gets the pass or fail status of the measurement after test completion. ***NOTE.*** *Execute this command after completing the measurement.*	String that gives the status of the operation after it has been performed. Returns the pass or fail status in the form of a string.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.GetPassFailStatus(clientID, device, suite, "1.1.3 Data Lane Rise Time") //Pass or Fail
GetResultsValue()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parameterString (see page 123)	This method gets the result values of the measurement after the run.	String that gives the status of the operation after it has been performed. Returns the result value in the form of a string.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as srting returnval=m_Client.GetResultsValue(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measured Value")

Command name	Parameters	Description	Return Value	Example
GetResultsValue-ForSubMeasure-ments()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parame-terString (see page 123) int rowNr (see page 123)	This method gets the result values for individual sub-measurements, after the run.	String that gives the status of the operation after it has been performed. Returns the result value in the form of a string.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string **Data Lane Rise Time DP (nS)** returnval=m_Client.GetRe-sultsValueForSubMeasure-ments(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "1.1.3 Data Lane Rise Time”, "Measured Value",0) //For DP wfm returnval=m_Client.GetRe-sultsValueForSubMeasure-ments(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measured Value",1) //For DN wfm
GetReportParame-ter()	string clientID (see page 126) string device (see page 123) string suite (see page 123) string test (see page 123) string parame-terString (see page 147)	This method gets the general report details such as oscilloscope model, TekExpress version, and D-PHY version.	The return value is the oscilloscope model, TekExpress version, and D-PHY version.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string **Oscilloscope Model** returnval=m_Client.GetRe-portParameter(clientID,"Scope Model") **TekExpress Version** returnval=m_Client.GetReport-Parameter(clientID,"TekExpress Version") **D-PHY Version** returnval=m_Client.GetReport-Parameter(clientID,"Application Version")

Command name	Parameters	Description	Return Value	Example
TransferReport()	string clientID (see page 126) string filePath (see page 125)	This method transfers the report generated after the run. The report contains the summary of the run. The client must provide the location where the report is to be saved at the client-end.	String that gives the status of the operation after it has been performed. Transfers all the result values in the form of a string.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.TransferReport(clientID,"C:\Report")
TransferWaveforms()	string clientID (see page 126) string filePath (see page 125)	This method transfers all the waveforms from the folder for the current run. ***NOTE.*** *For each click of Run button, a folder is created in the X: drive. Transfer the waveforms before clicking the Run button.*	String that gives the status of the operation after it has been performed. Transfers all the waveforms in the form of a string. On success the return value is "Transferred...".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.TransferWaveforms(clientID,"C:\Waveforms")
TransferImages()	string clientID (see page 126) od string filePath (see page 125)	This method transfers all the images (screenshots) from the folder for the current run (for a given suite or measurement). ***NOTE.*** *For each click of Run button, a folder is created in the X: drive. Transfer the waveforms before clicking the Run button.*	String that gives the status of the operation after it has been performed. Transfers all the images in the form of a string.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.TransferImages(clientID, "C:\Waveforms")

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

string parameterString

Name	Type	Direction	Description
parameterString	string	IN	Specifies the oscilloscope model, TekExpress version, and D-PHY version.

Save, Recall, or Check if a Session is Saved

Command name	Parameters	Description	Return Value	Example
CheckSession-Saved()	string clientID (see page 126) out bool saved (see page 122)	This method is called when a check is to be made to know if the current session is saved.	Return value is either True or False.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Check-SessionSaved(m_clientID, out savedStatus)
RecallSession()	string clientID (see page 126) string name (see page 124)	Recalls a saved session. The name of the session is provided by the client.	String that gives the status of the operation after it has been performed. The return value is “Session Recalled...”.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.RecallSes-sion(clientID, savedSession-Name)
SaveSession()	string clientID (see page 126) string name (see page 124)	Saves the current session. The name of the session is provided by the client.	String that gives the status of the operation after it has been performed. The return value is "Session Saved..."/"Failed...".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.SaveSes-sion(clientID, desiredSession-Name)
SaveSessionAs()	string clientID (see page 126) string name (see page 124)	Saves the current session in a different name every time this method is called. The name of the session is provided by the client.	String that gives the status of the operation after it has been performed. The return value is "Session Saved...".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.SaveSes-sionAs(clientID, desiredSes-sionName)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Unlock the Server

Command name	Parameters	Description	Return Value	Example
UnlockSession()	string clientID (see page 126)	This method unlocks the server from the client. The ID of the client to be unlocked must be provided. Note (see page 125)	String that gives the status of the operation after it has been performed. The return value is "Session Un-Locked...".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Unlock-Server(clientID)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Disconnect from the Server

Command name	Parameters	Description	Return Value	Example
Disconnect()	string clientID (see page 126)	This method disconnects the client from the server it is connected to. Note (see page 122)	Integer value that gives the status of the operation after it has been performed. 1 for Success –1 for Failure	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Discon-nect(m_clientID)

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Handle Error Codes

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

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

Program Example

This program example shows how to communicate between a PC and TekExpress D-PHY remotely.

A typical application does the following:

1. Start the application.

2. Connect through an IP address.

`m_Client.Connect("localhost")` 'True or False

`clientID = m_Client.getClientID`

3. Lock the server.

`m_Client.LockServer(clientID)`

4. Disable the Popups.

`m_Client.SetVerboseMode(clientID, false)`

5. Set the Dut ID.

`m_Client.SetDutId(clientID, "DUT_Name")`

6. Select a measurement.

`mClient.SelectTest(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", true)` 'Data Lane Rise Time measurement selected

7. Select a channel.

`mClient.SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Data + Signal connected to Real Time Scope at$Channel 1")` Data Lane Rise Time measurement selected

8. Configure the selected measurement.

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Type$Transition")` ’Data Lane Rise Time measurement selected

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Source$Ch1")` ’Data Lane Rise Time measurement selected

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Upper Level(V)$1")` ’Data Lane Rise Time measurement selected

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Lower Level(V)$0")` ’Data Lane Rise Time measurement selected

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Time(pS)$500")` ’Data Lane Rise Time measurement selected

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Transition$Greater Than")` ’Data Lane Rise Time measurement selected

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger Slope$Positive")` ’Data Lane Rise Time measurement selected

   `mClient.SetAnalyzeParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Trigger If Violation$Occurs")` ’Data Lane Rise Time measurement selected

9. Run with set configurations.

   `m_Client.Run(clientID)`

10. Wait for the test to complete.

    `Do`

    `Thread.Sleep(500)`

    `m_Client.Application_Status(clientID)`

    `Select Case status`

    `Case "Wait"`

    ’Get the Current State Information

    `mClient.GetCurrentStateInfo(clientID, WaitingMsbBxCaption, WaitingMsbBxMessage, WaitingMsbBxButtontexts)`

    ’Send the Response

```
mClient.SendResponse(clientID, WaitingMsbBxCaption, WaitingMsbBxMessage,
WaitingMsbBxResponse)
```

```
End Select
```

```
Loop Until status = "Ready"
```

11. After the Test is Complete.

’Save all results values from folder for current run

```
m_Client.TransferResult(clientID, logDirname)
```

’Save all waveforms from folder for current run

```
m_Client.TransferWaveforms(clientID, logDirname)
```

’Save all images from folder for current run

```
m_Client.TransferImages(clientID, logDirname)
```

12. Unlock the server.

```
m_Client.UnlockServer(clientID)
```

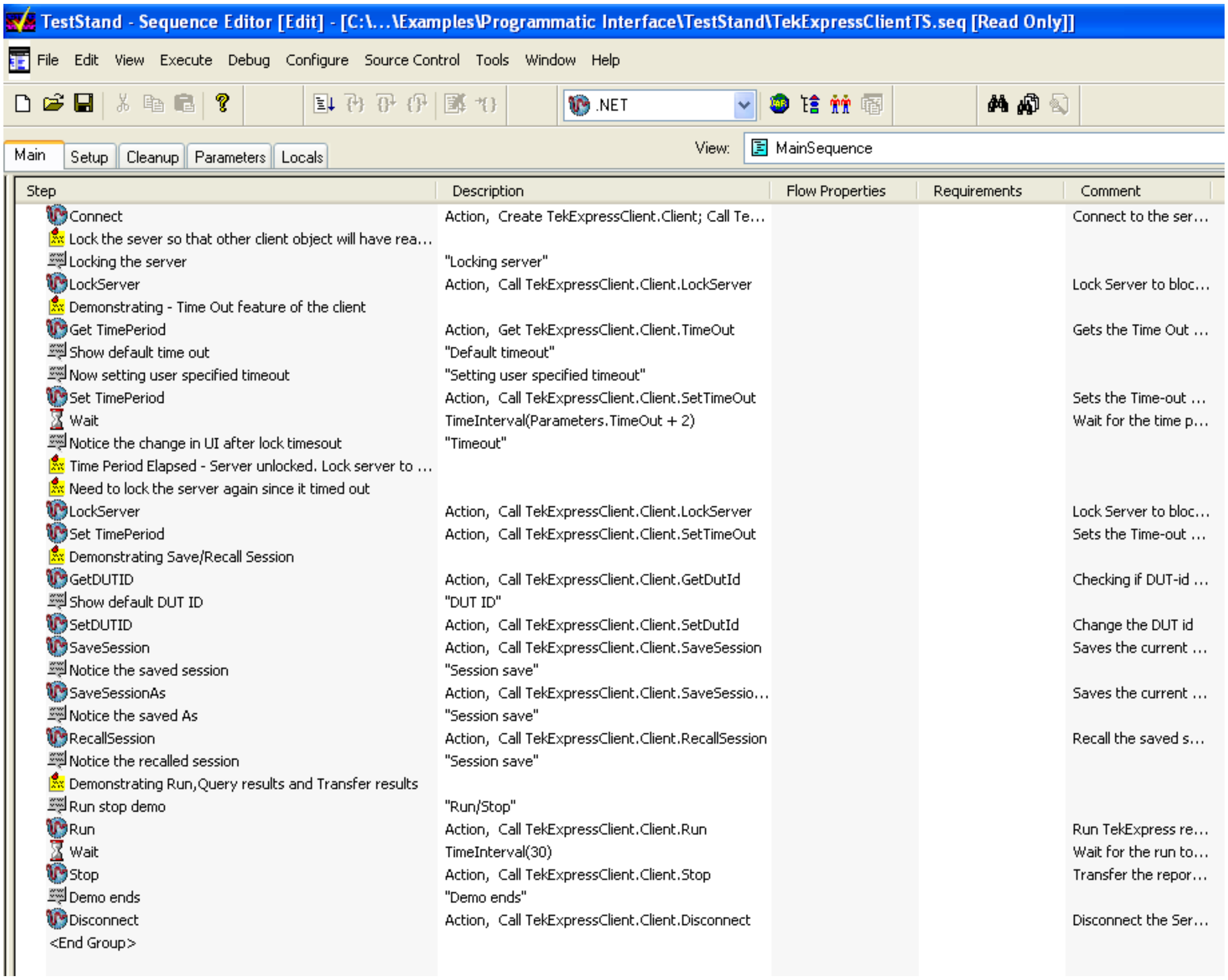
13. Disconnect from server.

```
m_Client.Disconnect()
```

14. Exit the application.

NI TestStand Client Example

The following is an example for NI TestStand Client available in the path, `C:\Program Files\Tektronix\TekExpress\TekExpress D-PHY\Examples\Programmatic Interface\TestStand`



Group 1 Tests

Test 1.1.1 Data Lane LP-TX Thevenin Output High Level Voltage (VOH)

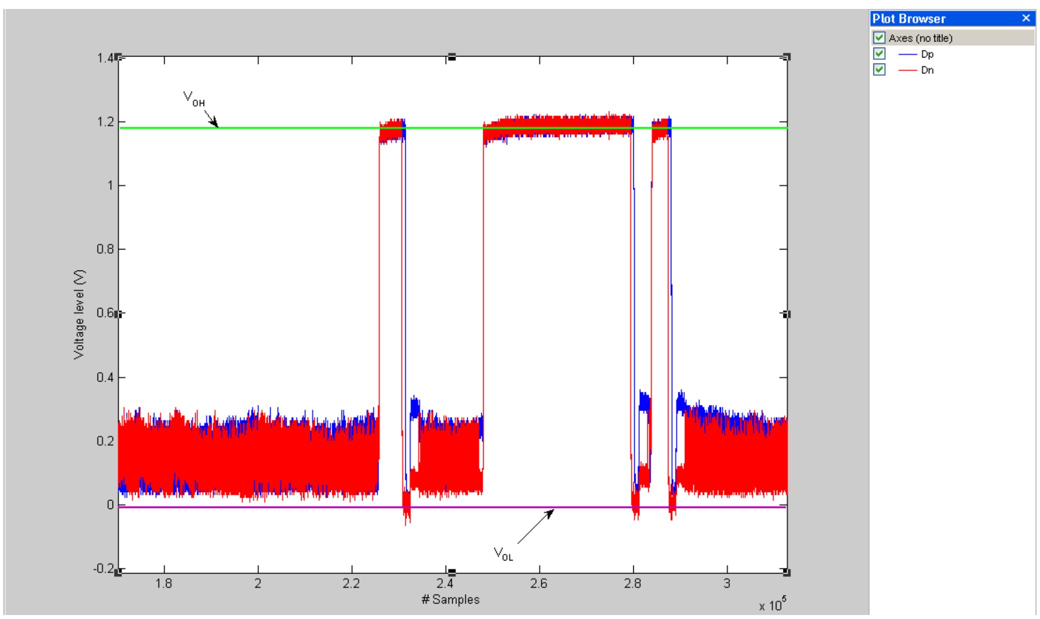
Data Lane LP-TX Thevenin Output High Level Voltage is calculated using the following algorithm:

- Acquire the Dp and Dn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on the oscilloscope.
- Using post processing:
  - Traverse the Dp waveform and find the LP signaling sequence.
  - In the LP sequence region, find the absolute peak-to-peak value. V_{OH} is measured as the mode of all the waveform samples greater than 50% of the absolute peak-to-peak.

where,

Dp – Data positive waveform

Dn – Data negative waveform



Test 1.1.2 Data Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Data Lane LP-TX Thevenin Output Low Level Voltage is calculated using the following algorithm:

- Acquire the Dp and Dn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on the oscilloscope.
- Using post processing:
  - Traverse the Dp waveform and find the LP signaling sequence.
  - In the LP sequence region, find the absolute peak-to-peak value. V_{OH} is measured as the mode of all the waveform samples lower than 50% of the absolute peak-to-peak.

where,

Dp – Data positive waveform

Dn – Data negative waveform

Test 1.1.3 Data Lane Rise Time

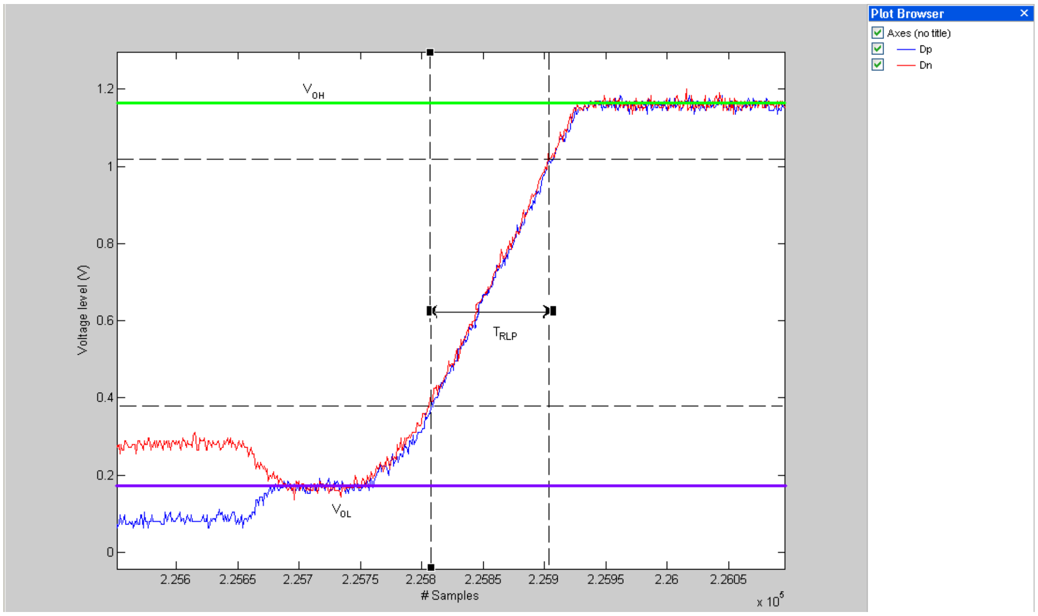
Data Lane Rise Time is calculated using the following algorithm:

- Acquire the Dp and Dn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing:
  - Traverse the Dp waveform and find the LP signaling sequence.
  - In the LP sequence region, find the absolute peak-to-peak. V_{OH} is measured as the mode of all the waveform samples greater than 50% of the absolute peak-to-peak and V_{OL} is measured as the mode of all the waveform samples lower than 50% of the absolute peak-to-peak.
  - Find all the rising edges in the Dp waveform and find the 15%-85% rise time with reference to V_{OL} and V_{OH} for each of the edges and average the results. This result is Rise Time (T_{RLP}).

where,

Dp – Data positive waveform

Dn – Data negative waveform



Test 1.1.4 Data Lane Fall Time

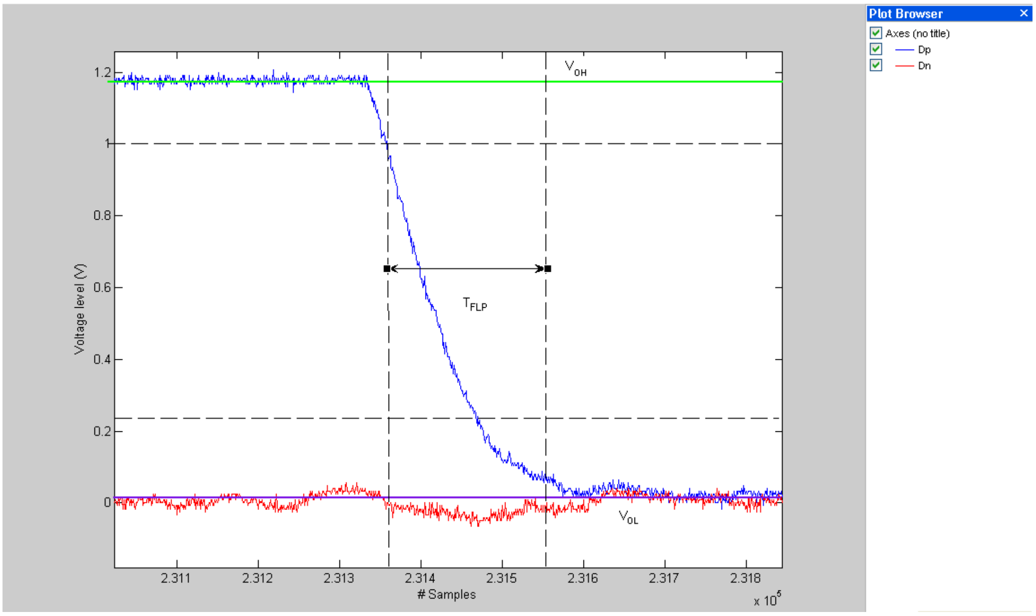
Data Lane Fall Time is calculated using the following algorithm:

- Acquire the Dp and Dn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing:
  - Traverse the Dp waveform and find the LP signaling sequence.
  - In the LP sequence region, find the absolute peak-to-peak. V_{OH} is measured as the mode of all the waveform samples greater than 50% of the absolute peak-to-peak and V_{OL} is measured as the mode of all the waveform samples lower than 50% of the absolute peak-to-peak..
  - Find all the falling edges in the Dp waveform and find the 15%-85% fall time with reference to V_{OL} and V_{OH} for each of the edges and average the results. This result is Fall Time (T_{FLP}).

where,

Dp – Data positive waveform

Dn – Data negative waveform



Group 2 Tests

Test 1.2.1 Clock Lane LP-TX Thevenin Output High Level Voltage (VOH)

Clock Lane LP-TX Thevenin Output High Level Voltage is calculated using the following algorithm:

- Acquire the Cp and Cn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing:
  - Traverse the Cp waveform and find the LP signaling sequence.
  - In the LP-11 sequence region, find the absolute peak-to-peak. V_{OH} is measured as the mode of all the waveform samples greater than 50% of the absolute peak-to-peak.

where,

Cp – Clock positive waveform

Cn – Clock negative waveform

Test 1.2.2 Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL)

Clock Lane LP-TX Thevenin Output Low Level Voltage is calculated using the following algorithm:

- Acquire the Cp and Cn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing:
  - Traverse the Cp waveform and find the LP signaling sequence.
  - In the LP-00 sequence region, find the absolute peak-to-peak. V_{OL} is measured as the mode of all the waveform samples lower than 50% of the absolute peak-to-peak.

where,

Cp – Clock positive waveform

Cn – Clock negative waveform

Test 1.2.3 Clock Lane Rise Time

Clock Lane Rise Time is calculated using the following algorithm:

- Acquire the Cp and Cn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing:
  - Traverse the Cp waveform and find the LP signaling sequence.
  - In the LP sequence region, find the absolute peak-to-peak and V_{OH} is measured as the mode of all the waveform samples greater than 50% of the absolute peak-to-peak and V_{OL} is measured as the mode of all the waveform samples lower than 50% of the absolute peak-to-peak.
  - Find all the rising edges in the Cp waveform and find the 15%-85% rise time with reference to V_{OL} and V_{OH} for each of the edges and average the results. This result is Rise Time (T_{RLP}).

where,

Cp – Clock positive waveform

Cn – Clock negative waveform

Test 1.2.4 Clock Lane Fall Time

Clock Lane Fall Time is calculated using the following algorithm:

- Acquire Cp and Cn waveform by setting the Transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing:
  - Traverse the Cp waveform and find the LP signaling sequence.
  - In the LP sequence region, find the absolute peak-to-peak and V_{OH} is measured as the mode of all the waveform samples greater than 50% of the absolute peak-to-peak and V_{OL} is measured as the mode of all the waveform samples lower than 50% of the absolute peak-to-peak.
  - Find all the falling edges in the Cp waveform and find the 15%-85% fall time with reference to V_{OL} and V_{OH} for each of the edges and average the results. This result is Fall Time (T_{FLP}).

where,

Cp – Clock positive waveform

Cn – Clock negative waveform

Group 3 Tests

Test 1.3.1 Data Lane HS Entry: Data Lane TLPX Value

Data Lane TLPX Value is calculated using the following algorithm:

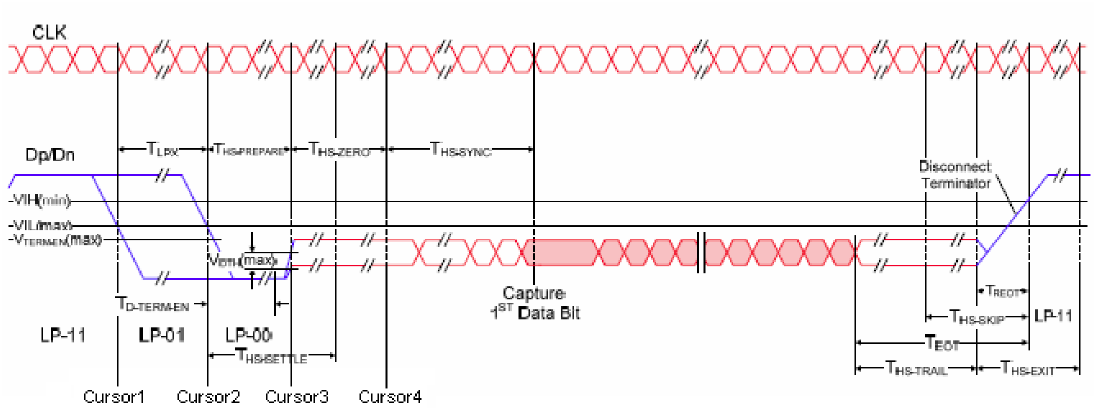
- Acquire Dp and Dn waveform by setting the Transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing, traverse the Dp waveform and find the Cursor 1 and Cursor 2 positions corresponding to LP-01 signaling sequence as given:
  - Compute Dp–Dn and look for points with voltage greater than 550 mV. If the number of points found is 0, then compute Dn–Dp and look for points with voltage greater than 550 mV. If the number of points found is 0, then the signal is not correct. If the signal is correct, proceed with the following steps on the difference signal (Diff):
    - In the Diff waveform, in the region corresponding to the LP signaling sequence region, find the first rising edge and successive falling edge.
    - The time difference between these two edges at voltage level of 550 mV is T_{LPX}.
    - where,

      Dp – Data positive waveform

      Dn – Data negative waveform

      Cp – Clock positive waveform

Cn – Clock negative waveform



Test 1.3.2 Data Lane HS Entry: THS-PREPARE Value

Data Lane THS-PREPARE Value is calculated using the following algorithm:

- Acquire Dp and Dn waveform by setting the Transition trigger from LP to HS mode (LP11-10) on the oscilloscope.
- Using post processing, traverse the Dp waveform and find the Cursor2 and Cursor3 positions corresponding to LP-00 signaling sequence as given below:
  - Subtract the Dp and Dn waveforms to obtain Dp-Dn.
  - In the LP signaling sequence, in Dp–Dn find the first rising edge and successive falling edge. Cursor 2 is the point where the falling edge touches 550 mV.
- Compute V_{OLHS}:
  - Find the high speed sequence in the input waveform.
  - Find the highest and the lowest voltage values in the high speed sequence. The mode of all the values greater than 50% of the peak-to-peak is the $V_{OHHS}$and the mode of all the values less than 50% of the peak-to peak is the V_{OLHS}.
- Find the Cursor 3 position:
  - From the point corresponding to Cursor 2 on Dn, traverse to the right of the Dn waveform and find a point that is less than or equal to the V_{OLHS}. Mark this point as Marker 1.
  - From Marker 1, traverse both the Dn and Dp waveforms and find the first point which is greater than or equal to V_{OHHS} on either of Dn or Dp waveforms. Mark this point as Marker 2.
  - On the waveform where the Marker 2 point was found, traverse to the left of the waveform until a point less than or equal to 70 mV is located. This is Cursor 3.
- The time between Cursor 3 and Cursor 2 is $T_{HS\text{-}PREPARE}$.

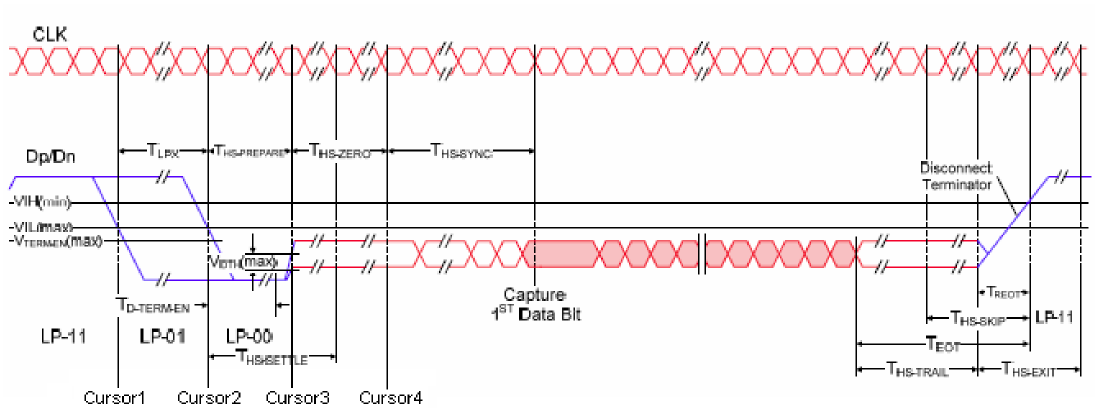
where,

Dp – Data positive waveform

Dn – Data negative waveform

Cp – Clock positive waveform

Cn – Clock negative waveform



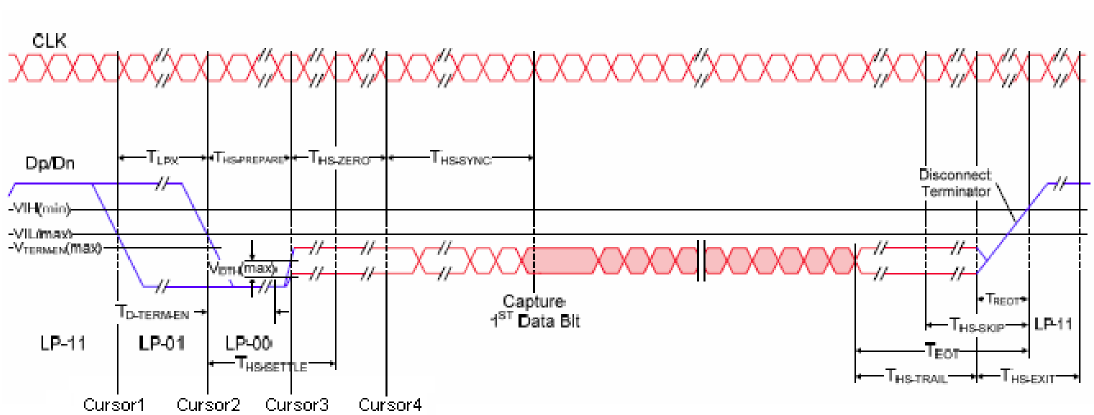
Test 1.3.3 Data Lane HS Entry: THS-PREPARE + THS-ZERO Value

Data Lane THS-PREPARE + THS-ZERO Value is calculated using the following algorithm:

- Acquire Dp and Dn waveform by setting the Transition trigger from LP to HS mode (LP11-10) on the oscilloscope.
- Using post processing, traverse the Dp waveform and find the Cursor 2 and Cursor 4 positions as below:
  - Subtract the Dp and Dn waveforms to obtain Dp–Dn.
  - In the LP signaling sequence, in Dp–Dn find the first rising edge and successive falling edge. Marker 1 is the point where the falling edge touches 550 mV. Cursor 2 = Marker 1.
- Compute V_{OLHS}:
  - Find the high speed sequence in the input data waveforms.
  - Find the highest and the lowest voltage values in the high speed sequence. The mode of all the values greater than 50% of the peak-to-peak is the V_{OHHS} and the mode of all the values less than 50% of the peak-to peak is the V_{OLHS}.

- Find the Cursor 4 position.
  - From the point corresponding to Marker 1 on Dn, traverse to the right of Dn waveform and find a point that is less than or equal to the V_{OLHS}. Mark this point as Marker 2.
  - From Marker 2, traverse both the Dn and Dp waveforms and find the first point which is greater than or equal to V_{OHHS} on either of Dn or Dp waveforms. Mark this point as Marker 3.
  - On the waveform where the Marker 3 point was found, traverse to the left of the waveform until a point less than or equal to 70 mV is located. This is Marker 4.
  - On the waveform where the point corresponding to Marker 3 was found, traverse to the right and find a point where the voltage is less than or equal to $(V_{OHHS} + V_{OLHS})/2$. This is Marker 5.
  - Starting from Marker 5, on the same waveform where the point corresponding to Marker 5 was found, traverse further and find a point where the voltage is greater than or equal to $(V_{OHHS} + V_{OLHS})/2$. This is Marker 6. Marker 5–Marker 6 is almost 1High speed UI. Hence Marker 5–3*(Marker 6–Marker 5) is the end point of $T_{HS-ZERO}$. Call this Marker 7.
  - $T_{HS-ZERO}$ is the time between Marker 7 and Marker 4.
  - Cursor 4 = Marker 7
- The time between Cursor 2 and Cursor 4 is $T_{HS-PREPARE} + T_{ZERO}$.

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform



Test 1.3.4 Data Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Data Lane HS-TX Differential Voltages (VOD(0), VOD(1)) is calculated using the following algorithm:

NOTE. *In the Manual Method, the measurement must be performed on a differential signal Instead of a single-ended signal.*

- Acquire Data Lane signals Dp and Dn, Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify all the HS regions in the input data waveforms.
- In the HS regions of the input data waveforms, identify a ‘100000’ pattern to measure VOD(0) and identify a ‘011111’ pattern to measure VOD(1) (00000 or 11111 is a region with about 5 UI interval length).
- Measure VOD(0) and VOD(1) values as the mean of all voltage samples between the centers of fourth and fifth 0/1 bit respectively.
- Average VOD(0) and VOD(1) across all instances of the pattern

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.3.5 Data Lane HS-TX Differential Voltage Mismatch (VOD)

Data Lane HS-TX Differential Voltage Mismatch (VOD) is calculated using the following algorithm:

NOTE. *In the Manual Method, the measurement must be performed on a differential signal Instead of a single-ended signal.*

- Acquire Data Lane signals Dp and Dn, Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify all the HS regions in the input data waveforms.
- In the HS regions of the input data waveforms, identify a ‘100000’ pattern to measure VOD(0) and identify a ‘011111’ pattern to measure VOD(1) (00000 or 11111 is a region with about 5 UI interval length).
- Measure VOD(0) and VOD(1) values as the mean of all voltage samples between the centers of fourth and fifth 0/1 bit respectively.
- Average VOD(0) and VOD(1) across all instances of the pattern
- Compute $\Delta VOD = |VOD(1)| - |VOD(0)|$

where,

Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.3.6 Data Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN))

Data Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN)) is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, and the sampling rate of the waveform.
- Identify all the HS regions in the input data waveforms.
- In the input data waveform Dp, find the highest voltage across all the HS regions. This is VOHHS(Dp). In the input data waveform Dn, find the highest voltage across all the HS regions. This is VOHHS(Dn).

where,
Dp – Data positive waveform
Dn – Data negative waveform

Test 1.3.7 Data Lane HS-TX Static Common Mode Voltages (VCMTX(0), VCVMTX(1))

Data Lane HS-TX Static Common Mode Voltages (VCMTX(0), VCVMTX(1)) is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Create an V_{CMTX} waveform as $V_{CMTX}X = (Dp + Dn)/2$.
- Identify all the HS regions in the input data and V_{CMTX} waveforms.
- At the Mid-point of each Clock UI, check if the data is at Differential-0 or Differential-1 state.
- Obtain the corresponding point on the $V_{CMTX}X$ waveform. If the data is Differential-0, the point is added to $V_{CMTX}(0)$, else if the data is Differential-1, the point added to $V_{CMTX}(1)$.
- Average all values of $V_{CMTX}(0)$ and $V_{CMTX}(1)$.

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.3.8 Data Lane HS-TX Static Common-Mode Voltage Mismatch (ΔVCMTX(1,0))

Data Lane HS-TX Static Common-Mode Voltage Mismatch (ΔVCMTX(1,0)) is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, Clock Lane signals Cp and Cn, and the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Create an V_{CMTX} waveform as V_{CMTX} = (Dp + Dn)/2.
- Identify all the HS regions in the input data and V_{CMTX} waveforms.
- At the mid-point of each Clock UI, check if the data is at Differential-0 or Differential-1 state.
- Obtain the corresponding point on the V_{CMTX} waveform. If the data is Differential-0, the point is added to $V_{CMTX}(0)$, else if the data is Differential-1, the point added to $V_{CMTX}(1)$.
- Average all values of $V_{CMTX}(0)$ and $V_{CMTX}(1)$ and calculate $\Delta_{CMTX(1,0)} = (V_{CMTX}(1) - V_{CMTX}(0))/2$.

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.3.9 Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz

Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, Bandpass Filtered Data Lane signals FilteredDp and FilteredDn, and the sampling rate.
- Identify all the HS regions in the Filtered input data waveforms using Unfiltered Dp and Dn.
- Find the minimum voltage in the filtered data HS region, V_{min}. Find the maximum voltage in the Filtered data HS region, V_{max}
- Compute V_{peak} as, $V_{peak} = \max(V_{max}, \text{abs}(V_{min}))$

where,
Dp – Data positive waveform
Dn – Data negative waveform
FilteredDp – Bandpass Filtered Data positive waveform
FilteredDn – Bandpass Filtered Data negative waveform

Test 1.3.10 Data Lane HS-TX Dynamic Common-Level Variations Above 450MHz

Data Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, Bandpass Filtered Data Lane signals FilteredDp and FilteredDn, and the sampling rate.
- Identify all the HS regions in the Filtered input data waveforms using Unfiltered Dp and Dn.
- Find the minimum voltage in the filtered data HS region, V_{min}. Find the maximum voltage in the Filtered data HS region, V_{max}
- Compute V_{rms} as:

$$Vrms = \sqrt{\frac{\sum_{i=0}^{n}(V_i^2)}{n}}$$

where,
Dp – Data positive waveform
Dn – Data negative waveform
FilteredDp – Bandpass Filtered Data positive waveform
FilteredDn – Bandpass Filtered Data negative waveform

Test 1.3.11 Data Lane HS-TX 20%-80% Rise Time (tR)

Data Lane HS-TX 20%-80% Rise Time (tR) is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify all the HS regions in the input data waveforms.
- Compute VOD(0) and VOD(1).
- In the HS regions of the input data waveforms identify a ‘000111’ pattern (000 or 111 is a region with about 3 UI interval length).
- Measure Rise-time, tR (as time between 20%-80% of the VOD), on the identified ‘000111’ pattern.
- Average all values of tR.

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.3.12 Data Lane HS-TX 80%-20% Fall Time (tF)

Data Lane HS-TX 80%-20% Fall Time (tF) is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify all the HS regions in the input data waveforms.
- Compute VOD(0) and VOD(1).
- In the HS regions of the input data waveforms identify a '111000' pattern (000 or 111 is a region with about 3 UI interval length).
- Measure Fall-time, tF (as time between 80%-20% of the VOD), on the identified '111000' pattern.
- Average all values of tF.

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.3.13 Data Lane HS Exit: THS-TRAIL Value

Data Lane HS Exit: THS-TRAIL Value is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn, Clock Lane signals Clkp and Clkn(single-ended) or Clkp(differential, Clkp – Clkn).
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify the LP regions using input data waveform. Let the number of LP regions be N.
- From the beginning of every LP region, move backward in the waveform until the absolute diff(Dp-Dn) is greater than 0.1v. Let these points be p(i), i=0 to (N-1).

  From p(i), move forward in waveform until the absolute value of the diff(Dp-Dn) is less than 0.07v. Let these points be q(i). q(i) marks the end of trail region.
- From p(i) move backward in waveform until the point where single-ended signals Dp and Dn cross each other. Let this point be r(i). r(i) marks the start of trail region.

  Trail_Duration(i) = [p(i) – r(i)]
- Compute the mean of trail durations observed at all HS to LP transitions.

  TrailMean = (1/N)*(Sum(Trail_Duration(i))

Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.3.14 Data Lane HS Exit: 30%-85% Post-EOT Rise Time (TREOT)

Data Lane HS Exit: 30%-85% Post-EOT Rise Time (TREOT) is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn.
- Identify the LP regions using input data waveform. Let the number of LP regions be N.
- From the beginning of every LP region, move backward in the waveform until the absolute diff(Dp-Dn) is greater than 0.1v. Let the point be p(i), i=0 to (N-1). From p(i), move forward in waveform until the absolute value of the diff(Dp-Dn) is less than 0.07v. Let this point be q(i). q(i) marks the start of TREOT region.
- From q(i), move forward in waveform until the point where amplitude of single-ended signal Dp goes greater than 0.88 volts. Let this point be r(i). r(i) marks the end of TREOT region.

  TREOT_Duration(i) = [r(i) – q(i)]
- Compute the mean of TREOT durations observed at all HS to LP transitions.

Group 4 Tests

Test 1.4.1 Clock Lane HS Entry: TLPX Value

Clock Lane HS Entry: TLPX Value is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Obtain a differential clock signal as CnMinCp = Cn - Cp
- Find the Low Speed UI, LS_UI (for Low Power region).
- Identify a rising edge in the CnMinCp waveform and its corresponding fall edge (the rising and falling edges are taken corresponding to 0.55 V limit)
- Identify a point on the Cp waveform corresponding to the rising edge on CnMinCp. Mark this as Cursor1.
- Identify a point on the Cn waveform corresponding to the falling edge on CnMinCp. Mark this as Cursor2.
- T_{LPX} = Cursor2 – Cursor1 is the required result.

Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.2 Clock Lane HS Entry: TCLK-PREPARE Value

Clock Lane HS Entry: TCLK-PREPARE Value is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Obtain a differential clock signal as CnMinCp = Cn - Cp

- Find the Low Speed UI, LS_UI (for Low Power region), V_{OL}, and V_{OH}.
- Identify a falling edge in the CnMinCp waveform (the falling edge is taken corresponding to 0.55 V limit). Identify a point on the Cn waveform corresponding to the falling edge on CnMinCp. Mark this as Cursor1.
- From Cursor1 move forward on Cn until you find a point lying below V_{OL}. From this point move forward on Cn until you find a point above V_{OH}.
- From this point traverse back until you find a point just above 0.070V. Mark this as Cursor 2.
- $T_{CLK\text{-}PREPARE}$ = Cursor2 – Cursor1 is the required result.

Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.3 Clock Lane HS Entry: TCLK-PREPARE+TCLK-ZERO Value

Clock Lane HS Entry: TCLK-PREPARE+TCLK-ZERO Value is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Obtain a differential clock signal as CnMinCp = Cn - Cp
- Find the Low Speed UI, LS_UI (for Low Power region), V_{OL}, and V_{OH}.
- Identify a falling edge in the CnMinCp waveform (the falling edge is taken corresponding to 0.55 V limit). Identify a point on the Cn waveform corresponding to the falling edge on CnMinCp. Mark the end of TCLK-PREPARE as Cursor1.
- Obtain V_{CMTX} as, V_{CMTX}= (Cp + Cn) / 2.
- Traverse forward from Cursor1 and identify a point on Cn where Cn crosses (or goes below) V_{CMTX}. Mark this point as Cursor2.
- $T_{CLK\text{-}PREPARE}$ + $TC_{LK\text{-}ZERO}$ = (Cursor2 – 3*UI – $T_{CLK\text{-}PREPARE}$ Begin) is the required result.

Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.4 Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1))

Clock Lane HS-TX Differential Voltages (VOD(0), VOD(1)) are calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify all the HS regions in the input clock waveforms.
- In the HS regions of the input clock waveforms identify a ‘10’ pattern to measure VOD(0) and identify a ‘01’ pattern to measure VOD(1) (0 or 1 is a region with about 1 UI interval length)

- Measure VOD(0) and VOD(1) as the mean of all voltage samples at the exact center of 0/1 bit respectively.
- Average VOD(0) and VOD(1) across all instances of the pattern

where,
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.5 Clock Lane HS-TX Differential Voltage Mismatch (VOD)

Clock Lane HS-TX Differential Voltage Mismatch (VOD) are calculated using the following algorithm:

- Accept the following inputs:
  - Clock Lane signals Cp and Cn
  - Sampling rate
- Identify the HS regions in the input clock waveform and estimate the UI.
- In the HS regions of the input clock waveforms, identify a 10 pattern to measure $V_{OD(0)}$ and identify an 01 pattern to measure $V_{OD(1)}$ (0 or 1 is a region with about 1UI interval length)
- $V_{OD(0)}$ and $V_{OD(1)}$ are measured as the mean of all voltage samples at the exact center of 0/1 bit respectively.
- $V_{OD(0)}$ and $V_{OD(1)}$ are averaged across all instances of the pattern
- ΔV_{OD} is calculated as, $\Delta V_{OD} = V_{OD(1)} - V_{OD(0)}$

Test 1.4.6 Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN))

Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN)) are calculated using the following algorithm:

where,

- Acquire Clock Lane signals Cp and Cn, and the waveform.
- Identify all the HS regions in the input data waveforms.
- In the input data clock waveform Cp, find the highest voltage across all the HS regions. This is VOHHS(Cp).

  In the input data clock waveform Cn, find the highest voltage across all the HS regions. This is VOHHS(Cn).

Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.7 Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))

Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0)) are calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Create an V_{CMTX} waveform as $V_{CMTX} = (Cp + Cn)/2$
- Identify all the HS regions in the input clock and V_{CMTX} waveforms.
- At the Mid-point of each Clock UI, check if the clock is at Differential-0 or Differential-1 state.
- Obtain the corresponding point on the V_{CMTX} waveform. If the clock is Differential-0, the point is added to $V_{CMTX}(0)$, else if the clock is Differential-1, the point added to V_{CMTX} (1).
- Average all values of $V_{CMTX}(0)$ and $V_{CMTX}(1)$.

where,
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.8 Clock Lane HS-TX Static Common-Mode Voltage Mismatch (ΔVCMTX(1,0))

Clock Lane HS-TX Static Common-Mode Voltage Mismatch (ΔVCMTX(1,0)) is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Create an V_{CMTX}waveform as $V_{CMTX} = (Cp + Cn)/2$
- Identify all the HS regions in the input clock and V_{CMTX} waveforms.
- At the Mid-point of each Clock UI, check if the clock is at Differential-0 or Differential-1 state.
- Obtain the corresponding point on the V_{CMTX} waveform. If the clock is Differential-0, the point is added to VCMTX(0), else if the clock is Differential-1, the point added to V_{CMTX} (1).
- Average all values of V_{CMTX} (0) and V_{CMTX} (1) and calculate $\Delta V_{CMTX(1,0)} = (V_{CMTX}(1) - V_{CMTX}(0))/2$.

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.9 Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (ΔVCMTX(LF))

Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450MHz (ΔVCMTX(LF)) is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, Bandpass Filtered Clock Lane signals FilteredCp and FilteredCn, and the sampling rate.
- Identify all the HS regions in the Filtered input data waveforms using Unfiltered Cp and Cn.
- Find the minimum voltage in the filtered clock HS region, V_{min}. Find the maximum voltage in the Filtered clock HS region, V_{max}
- Compute V_{peak} as, $V_{peak} = max(V_{max}, abs(V_{min}))$

where,
Cp – Clock positive waveform
Cn – Clock negative waveform
FilteredCp – Bandpass Filtered Clock positive waveform
FilteredCn – Bandpass Filtered Clock negative waveform

Test 1.4.10 Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (ΔVCMTX(HF))

Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz (ΔVCMTX(HF)) is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, Bandpass Filtered Clock Lane signals FilteredCp and FilteredCn, and the sampling rate.
- Identify all the HS regions in the Filtered input data waveforms using Unfiltered Cp and Cn.
- Find the minimum voltage in the filtered clock HS region, V_{min}. Find the maximum voltage in the Filtered clock HS region, V_{max}
- Compute V_{rms} as:

$$Vrms = \sqrt{\frac{\sum_{i=0}^{n}(V_i^2)}{n}}$$

where,
Cp – Clock positive waveform
Cn – Clock negative waveform
FilteredCp – Bandpass Filtered Clock positive waveform
FilteredCn – Bandpass Filtered Clock negative waveform

Test 1.4.11 Clock Lane HS-TX 20%-80% Rise Time (tR)

Clock Lane HS-TX 20%-80% Rise Time (tR) is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify all the HS regions in the input data waveforms.
- Compute VOD(0) and VOD(1).
- In the HS regions of the input data waveforms identify a ‘01’ pattern (is a region alternating (low-high) with about 1UI interval length).
- Measure Rise-time, tR (as time between 20%-80% of the VOD), on the identified ‘01’ pattern
- Average all values of tR.

where,
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.12 Clock Lane HS-TX 80%-20% Fall Time (tF)

Clock Lane HS-TX 80%-20% Fall Time (tF) is calculated using the following algorithm:

- Acquire Clock Lane signals Cp and Cn, and the waveform.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Identify all the HS regions in the input data waveforms.
- Compute VOD(0) and VOD(1).
- In the HS regions of the input data waveforms identify a ‘10’ pattern (is a region alternating (high-low) with about 1 UI interval length).
- Measure Fall-time, tF (as time between 80%-20% of the VOD), on the identified ‘10’ pattern.
- Average all values of tF.

where,
Cp – Clock positive waveform
Cn – Clock negative waveform

Test 1.4.13 Clock Lane HS Exit: THS-TRAIL Value

Clock Lane HS Exit: THS-TRAIL Value is calculated using the following algorithm:

- Acquire Clock Lane signals Clkp and Clkn(single-ended) or Clkp(differential, Clkp – Clkn).
- Identify the LP regions using input data waveform. Let the number of LP regions be N.
- From the beginning of every LP region, move backward in the waveform until the absolute diff(Clkp-Clkn) is greater than 0.1v. Let these points be p(i), i=0 to (N-1).

From p(i), move forward in waveform until the absolute value of the diff(Clkp-Clkn) is less than 0.07v. Let these points be q(i). q(i) marks the end of trail region.

- From p(i) move backward in waveform until the point where single-ended signals Clkp and Clkn cross each other. Let this point be r(i). r(i) marks the start of trail region.

  Trail_Duration(i) = [p(i) – r(i)]

- Compute the mean of trail durations observed at all HS to LP transitions.

  TrailMean = (1/N)*(Sum(Trail_Duration(i))

Test 1.4.14 Clock Lane HS Exit: 30%-85% Post-EOT Rise Time (TREOT)

Clock Lane HS Exit: 30%-85% Post-EOT Rise Time (TREOT) is calculated using the following algorithm:

- Acquire single-ended clock lane signals Clkp and Clkn.
- Identify the LP regions using input data waveform. Let the number of LP regions be N.
- From the beginning of every LP region, move backward in the waveform until the absolute diff(Clkp-Clkn) is greater than 0.1V. Let this point be p(i), i=0 to (N-1). From p(i), move forward in waveform until the absolute value of the diff(Clkp-Clkn) is less than 0.07V. Let this point be q(i). q(i) marks the start of TREOT region.
- From q(i) move forward in waveform until the point where amplitude of single-ended signal Clkp goes greater than 0.88 volts. Let this point be r(i). r(i) marks the end of TREOT region.

  TREOT_Duration(i) = [r(i) – q(i)]

- Compute the mean of TREOT durations observed at all HS to LP transitions.

Test 1.4.17 Clock Lane HS Clock Instantaneous (UIINST)

Clock Lane HS Clock Instantaneous (UIINST) is calculated using the following algorithm:

- Accept the following inputs:
  - Clock Lane signals Cp and Cn
  - Sampling rate
- Identify all the HS regions in the input clock waveforms
- In the HS regions of the input clock waveforms, identify all the edges. Comput the duration of each period as the edge-to -edge transition duration (that is the time between a rise and the subsequent fall or fall and the subsequent rise, taken with reference to 50% of peak)
- Compute the following as results:
  - HSUIMean = mean of all periods computed above
  - HSUIMinimum = minimum value of the periods computed above
  - HSUIMaximum = maximum value of the periods computed above

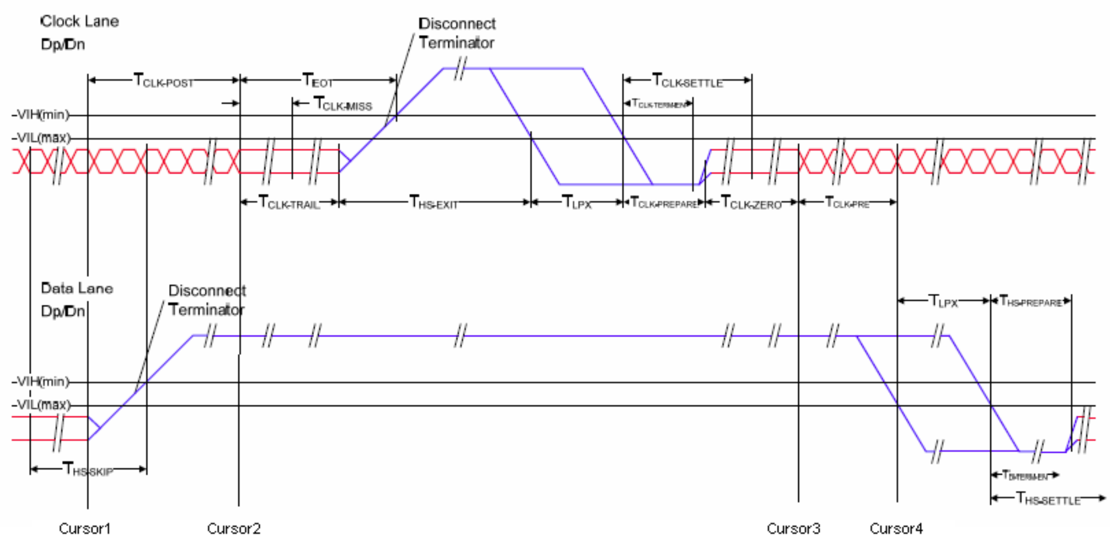
Group 5 Tests

Test 1.5.1 HS Entry TCLK PREValue

HS Entry TCLK PREPValue is calculated using the following algorithm:

- Acquire the Dp and Dn waveforms by setting the Transition trigger from LP to HS mode (LP11-10) on the oscilloscope.
- Using post processing, traverse the Cp and Cn waveforms and find the position corresponding to Cursor 3. Traverse the Dp and Dn waveforms and find the position corresponding to Cursor 4 as below:
  - Subtract the Cp and Cn waveforms to obtain Cp–Cn.
  - In the LP signaling sequence, find in Cp–Cn, the first rising edge and successive falling edge. Marker 1 is the point where the falling edge touches 550 mV.
- Compute V_{OLHS}:
  - Find the high speed sequence in the input clock waveforms.
  - Find the highest and the lowest voltage values in the high speed sequence. The mode of all the values greater than 50% of the peak-to-peak is the V_{OHHS} and the mode of all the values less than 50% of the peak-to peak is the V_{OLHS}.
- Find the Cursor 3 position.
  - From the point corresponding to Marker 1 on Cn, traverse to the right of Cn waveform and find a point that is less than or equal to the V_{OLHS}. Mark this point as Marker 2.
  - From Marker 2, traverse both the Cn and Cp waveforms and find the first point which is greater than or equal to V_{OHHS} on either of the Cn or Cp waveforms. Mark this point as Marker 3.
  - On the waveform where the Marker 3 point was found, traverse to the left of the waveform until a point less than or equal to 70 mV is located. This is Marker 4.
  - On the waveform where the point corresponding to Marker 3 was found, traverse to the right and find a point where the voltage is less than or equal to $(V_{OHHS}+V_{OLHS})/2$. This is Marker 5.
  - Starting from Marker 5, on the same waveform where the point corresponding to Marker 5 was found, traverse further and find a point where the voltage is greater than or equal to $(V_{OHHS}+V_{OLHS})/2$. This is Marker 6. Marker 5–Marker 6 and is almost 1 High speed UI. Hence Marker 5 – (Marker 6–Marker 5) is the end point of $T_{CLK-ZERO}$. Call this Marker 7.
  - Cursor 3 = Marker 7.
- On the Dn and Dp waveforms, find the point corresponding to Marker 7 and check if the value of that point is greater than 0.8 V. If yes, continue with the following steps, else, the signal is not correct.
- On the Data waveform, find a point corresponding to Marker 7. From this point, traverse to the right and find the first falling edge. The point at which this falling edge crosses 550 mV is Cursor 4.
- The time between Cursor 3 and Cursor 4 is $T_{CLK-PRE}$.

where,
Dp – Data positive waveform
Dn – Data negative waveform
Cp – Clock positive waveform
Cn – Clock negative waveform



Test 1.5.2 HS Exit TCLK POSTValue

HS Exit TCLK POSTValue is calculated using the following algorithm:

- Acquire Cp, Cn, Dp, and Dn waveforms by setting the Transition trigger from LP to HS mode (LP11-10) on oscilloscope.
- Using post processing, traverse the Dp and Dn waveforms and find the position corresponding to Cursor 1. Traverse the Cp and Cn waveforms and find the position corresponding to Cursor 2 as below:
  - Compute V_{OL} and V_{OH} for the clock and data waveform.
  - Find the rising edges on the clock waveform. From the point where the first rising edge is found, traverse backwards on that waveform and find the point where either of the Cp or Cn waveforms'

voltage level reaches V_{OL}. This point is Marker 1. At Marker 1 position, one of Cp and Cn voltages is greater than the other. Let us say Cn value is greater than Cp value at this point.

- Traverse backwards from Marker 1 and find on the clock waveforms where Cp value becomes greater than Cn. This point is Marker 2.
- Continue traversing backwards on the clock waveforms and find a point where Cn value becomes greater than Cp.
- Cursor 2 = Marker 2 + (Marker 2–Marker 3).
- At a point corresponding to Cursor 2, check if the data waveform value is greater than 0.8 V. If yes, then proceed, else the signal is not correct.
- From the point corresponding to Cursor 2 position on Data waveform, traverse backwards and find the point where a rising edge value becomes either equal to or just less than V_{OL}. This point is Cursor 1.
- The time between Cursor 1 and Cursor 2 is $T_{CLK-POST}$ as shown in the following figure.

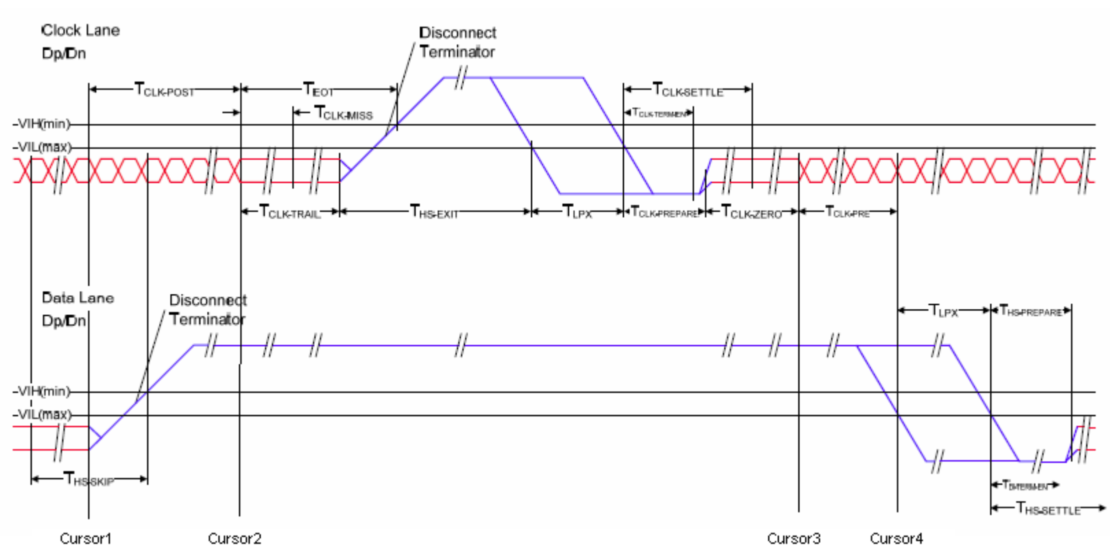
where,

Dp – Data positive waveform

Dn – Data negative waveform

Cp – Clock positive waveform

Cn – Clock negative waveform



Test 1.5.3 HS Clock Rising Edge Alignment to First Payload Bit

HS Clock Rising Edge Alignment to First Payload Bit is determined by visual verification.

Shortcut Keys

The following table lists the short cut keys to access the application:

Menu	Shortcut keys
File	Alt + F
New Session	Ctrl + N
Open Session	Ctrl + O
Save Session	Ctrl + S
Save Session As	Alt + F + A
Save Report As	Alt + F + R Ctrl + R
Print Preview Report	Alt + F + V Ctrl+ V
Print Report	Ctrl + P
Exit	Ctrl + X
View	Alt + V
Log	Ctrl + L
Tools	Alt + T
Instrument Bench	Ctrl + I
Help	Alt + H
TekExpress Help (F1)	Alt + H + H
About TekExpress	Alt + H + A

Error Codes

The following table lists the error codes used in the application:

Error code	Description
50111	Waveform file not found
50001	Could not find HS region
50002	Could not find LP region
50003	HS UI could not be computed
50004	Pattern 011111/100000 not found
50006	Pattern 111000 not found
50007	Pattern 000111 not found
50008	Possible improper clock

Error code	Description
50009	Could not find HS Trail
50010	Could not find TREOT
50011	Rising edges not found
50012	Falling edges not found
50013	Incorrect waveform
50014	Error running measurement

Oscilloscope Setup

Four channel with Data as Trigger

Parameter	Value
Vertical Scale (mV)	200
Vertical Position for Data (div)	–2.6
Vertical Position for Clock (div) Single Ended Differential	 –2.6 +2.6
Vertical Offset (V)	0
Horizontal Scale (us)	8
Sample Rate (GS/s)	12.5
Record Length	1000000
Trigger Type	Transition
Trigger Source	Data Source
Trigger Upper Level (V)	1
Trigger Lower Level (V)	0.05
Trigger Time (pS)	500
Trigger Transition	Greater Than
Trigger Slope	Positive
Trigger If Violation	Occurs

Four channel with Clock as Trigger

Parameter	Value
Vertical Scale (mV)	200
Vertical Position for Data (div)	–2.6
Vertical Position for Clock (div) Single Ended Differential	 –2.6 +2.6
Vertical Offset (V)	0

Parameter	Value
Horizontal Scale (us)	8
Sample Rate (GS/s)	12.5
Record Length	1000000
Trigger Type	Transition
Trigger Source	Clock Source
Trigger Upper Level (V) Single Ended Differential	 1 –0.05
Trigger Lower Level (V) Single Ended Differential	 0.05\1 –1
Trigger Time (pS)	500
Trigger Transition	Greater Than
Trigger Slope Single Ended Differential	 Positive Negative
Trigger If Violation	Occurs

Two channel with Data as Trigger

Parameter	Value
Vertical Scale (mV)	200
Vertical Position for Data (div)	–2.6
Vertical Offset (V)	0
Horizontal Scale (us)	8
Sample Rate (GS/s)	12.5
Record Length	1000000
Trigger Type	Transition
Trigger Source	Data Source
Trigger Upper Level (V)	1
Trigger Lower Level (V)	0.05
Trigger Time (pS)	500
Trigger Transition	Greater Than
Trigger Slope	Positive
Trigger If Violation	Occurs

Two channel with Clock as Trigger

Parameter	Value
Vertical Scale (mV)	200

Parameter	Value
Vertical Position for Clock (div) Single Ended Differential	 –2.6 +2.6
Vertical Offset (V)	0
Horizontal Scale (us)	8
Sample Rate (GS/s)	12.5
Record Length	1000000
Trigger Type	Transition
Trigger Source	Clock Source
Trigger Upper Level (V) Single-Ended Differential	 1 –0.05
Trigger Lower Level (V) Single-Ended Differential	 0.05\1 –1
Trigger Time (pS)	500
Trigger Transition	Greater Than
Trigger Slope Single-Ended Differential	 Positive Negative
Trigger If Violation	Occurs

Setup for Clock Continuous Mode

Parameter	Value
Vertical Scale (mV)	200
Vertical Position for Data/Clock (div) Single Ended Differential	 –2.6 +2.6
Vertical Offset (V)	0
Horizontal Scale (us)	8
Sample Rate (GS/s)	12.5
Record Length	1000000
Trigger Type	Edge
Trigger Source	Data/Clock Source
Trigger Level (V) Single Ended Differential	 200 mV 0 V

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