# TekExpress® D-PHY
## Automated Solution

## Printable Application Help

*077-0514-04*

077-0514-04

**Tektronix**

**TekExpress® D-PHY
Automated Solution**

**Printable Application Help**

**Tektronix**

TekExpress D-PHY Automated Solution Online Help, 076-0227-03.

## 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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# Introduction to the application

## 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:
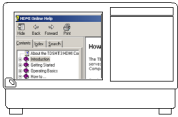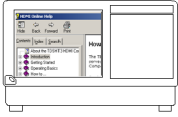
- Allows conformance testing to the latest Compliance Test Specification (Base Spec 1.2)
- Comprehensive test coverage performing all conformance tests to the latest CTS. (100% test coverage)
- Fully-automated Multi-lane testing using an external RF switch
- Automated testing:
    - Eliminates user intervention 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 Device 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

## 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. |  |

## 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

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# Getting started

## Compatibility

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

- MSO70404C, MSO70604C, MSO70804C, MSO71254C, MSO71604C, and MSO72004C Series Mixed Signal Oscilloscopes

  DPO/DSA70404C, DPO/DSA70604C, DPO/DSA70804C, 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

- DPO7254C [1] and DPO7354C Digital Oscilloscope

- DPO7254[1] and DPO7354 Digital Oscilloscope

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)

- P7313 (used for 33G models)

- TDP3500

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

# Minimum system requirements

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

| Item | Requirement |
|---|---|
| Processor | Pentium 4/M or equivalent processor. |
| Operating System | Windows XP Service Pack 2, Windows 7. |
| 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 [2]. |
| Software | ■ Microsoft Excel 2002 or above.<br><br>■ Microsoft Internet Explorer 6.0 SP1 or later.<br><br>■ Microsoft Photo Editor 3.0 or equivalent software for viewing image files.<br><br>■ Adobe Reader 6.0 or equivalent software for viewing portable document format (PDF) files. |
| Other Devices | ■ Microsoft compatible mouse or compatible pointing device.<br><br>■ Four USB ports (two USB ports minimum).<br><br>■ PCI-GPIB or equivalent interface for instrument connectivity [3]. |

[2]  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.

[3]  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.

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## 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 (x86)\Tektronix \TekExpress\TekExpress D-PHY.

## Application directories and usage

The application directory and associated files are organized as follows:

ACP
Bin
Compliance Suites
Data Manager
Data Storage
Documents
Examples
ICP
Lib
Report Generator
SCP
Tools
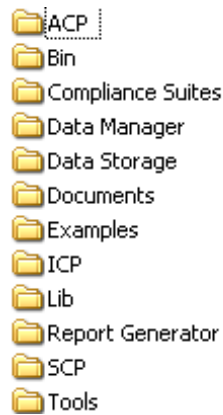
The following table lists the default directory names and their usage:

| 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. |

| Directory names | Usage |
|---|---|
| TekExpress D-PHY\Data Manager<br>TekExpress D-PHY\Data Storage<br>TekExpress D-PHY\Report Generator | Includes the result management specific libraries of the D-PHY application are present in these folders.<br>Includes Excel Active X interface Library for Report Generation. |
| TekExpress D-PHY \Filter_Files_for_Temperature_ Chamber | 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 (x86)\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.<br>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** > **License Info** to view the license information and activate the application.

2. Click **Help**> **About Tekexpress** > **View Version Details** link to view the Version Details.
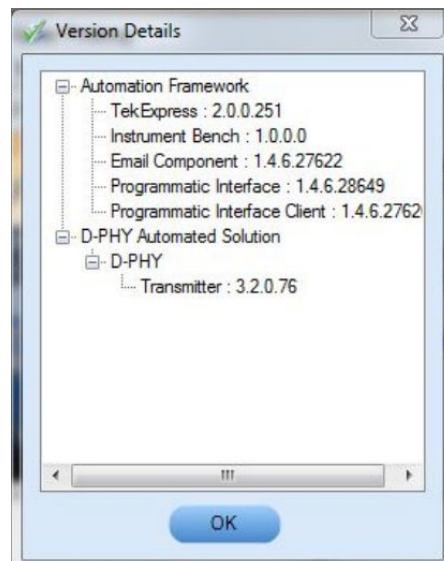
3. Click the **View End-User License Agreement** link to open the following Tektronix Software License Agreement window. Click **Print** to print the License Agreement.
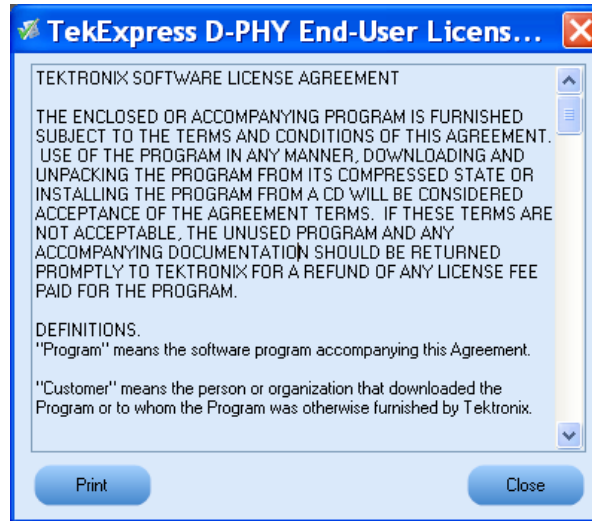
4. Click **License Info** to view the available software options. This window shows the license key and supported options with their status (active or inactive) with the current license key.
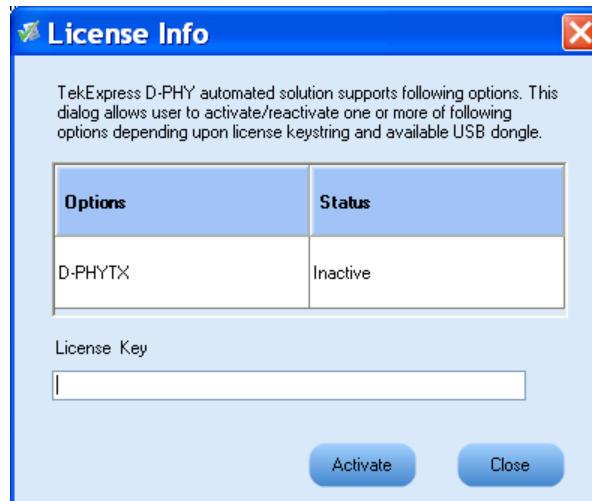
5. If you are activating the license for the first time, the license key field will be empty. To activate the license, connect the USB dongle to your computer, enter the license key provided in the license key certificate, and click **Activate**. If the activation is successful, a sign is displayed next 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:

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

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1. Map 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.

**Mapping My TekExpress Folder**

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

a. Open Windows Explorer.

b. From the Windows Explorer menu, select **Tools > Map Network** drive.

c. 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).

d. In the Folder field, enter the remote My TekExpress folder path (for example, \\192.158.97.65\ John's My TekExpress)

e. 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.

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 to view the picture.
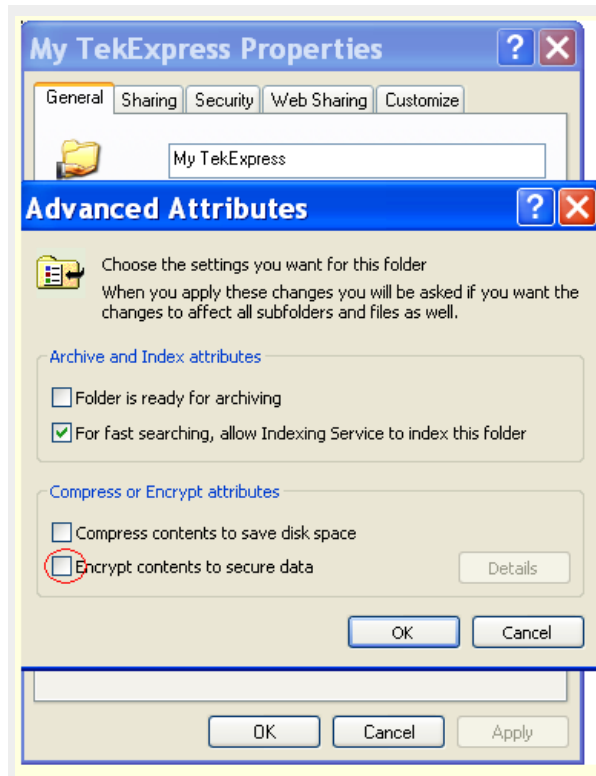
**3.** Ensure that all the required instruments are properly warmed up, Signal Path Compensation (SPC) performed, followed by cable deskew.

To find SPC, do the following:

**a.** On the oscilloscope main menu, select the **Utilities** menu.

**b.** Click the **Instrument Calibration** option.

# Operating basics

## 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.



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

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# 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.

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

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# 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.
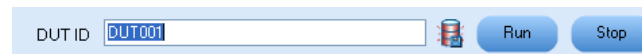
**Table 2: Global controls**

| 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.
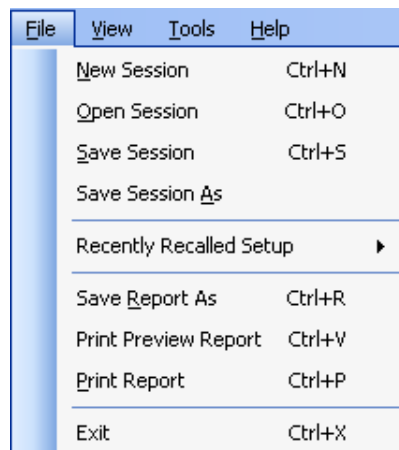


The File menu has the following selections:

| 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. |

| Menu | Function |
|------|----------|
| 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.
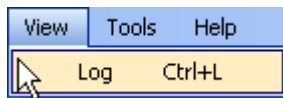


The View menu has the following selections:

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

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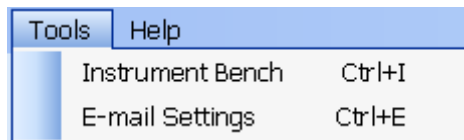


The Tools menu has the following selections:

| Menu | Function |
|------|----------|
| Instrument Bench | Shows the list of instruments connected to the test setup. |
| E-mail Setting | 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:
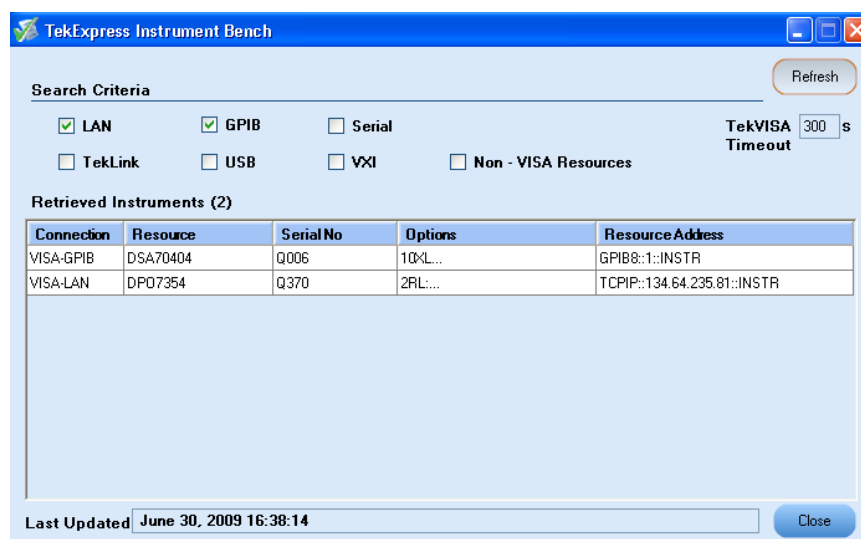


**E-mail Settings**
The E-mail Settings utility allows you to configure and set the e-mail options. The following fields are mandatory for receiving e-mail notification from TekExpress:

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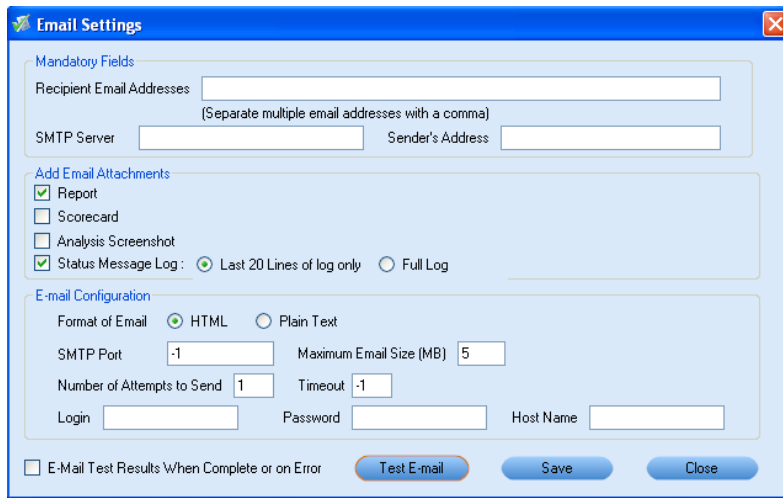
Check the option "E-mail Test Results When Complete or on Error" to receive the e-mail. The attachment list depends on the choice which is made while configuring the email setup.

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

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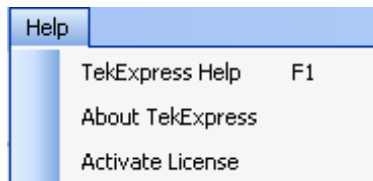


The Help menu has the following selections:

| 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* | Displays the details of activating the application. |

# How to

## 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) (Single-ended only)

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

  1.1.3 Data Lane Rise Time (Single-ended only)

  1.1.4. Data Lane Fall Time (Single-ended only)

  1.1.5. Data Lane LP-TX Slew Rate versus CLOAD (ōVō/tSR) (Single-ended only)

  1.1.6. Data Lane LP-TX Pulse Width of Exclusive-OR Clock (TLP-PULSE-TX) (Single-ended only)

  1.1.7. Data Lane LP-TX Period of Exclusive-OR Clock (TLP-PER-TX) (Single-ended only)

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  **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)

  1.2.5. Clock Lane LP-TX Slew Rate versus CLOAD (ōV/ōtSR) (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 (Single-ended only)

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*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.*

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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)) (Single-ended only)

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)

1.3.15. Data Lane HS Exit: TEOT Value

1.3.16. DATA Lane HS Exit: THS-EXIT Value

■ 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 ($\Delta$VCMTX(1,0)) (Single-ended only)

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

1.4.10 Clock Lane HS-TX Dynamic Common-Level Variations Above 450MHz ($\Delta$VCMTX(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 (Single-ended only)

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

1.4.15. Clock Lane HS Exit: TEOT Value (Single-ended only)

1.4.16. Clock Lane HS Exit: THS-EXIT Value (Single-ended only)

1.4.17 Clock Lane HS Clock Instantaneous (UIINST)

1.4.18 Clock Lane HS Clock Delta UI ($\Delta$UI)

- 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 Exit: TCLK POST Value

  1.5.3 HS Clock Rising Edge Alignment to First Payload Bit

  1.5.4. Data-to-Clock Skew (TSKEW[TX])

  1.5.5. Initial HS Skew Calibration Burst (TSKEWCAL-SYNC, TSKEWCAL)

  1.5.6. Periodic HS Skew Calibration Burst (TSKEWCAL-SYNC, TSKEWCAL)

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

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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.<br>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, 1.3.15, 1.3.16.<br>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, 1.4.15, 1.4.16, 1.4.17, 1.4.18.<br>Test ids: 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.5, 1.5.6. |
| | | Differential tests: Group 3, Group 4, and Group 5.<br>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, 1.3.15, 1.3.16.<br>Test ids: 1.4.4, 1.4.5, 1.4.11, 1.4.12, 1.4.17,1.4.18.<br>Test ids: 1.5.1, 1.5.2, 1.5.4. |
| Normal | Escape | Single-ended tests: Group 1, Group 2, and Group 3.<br>Test ids: 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7 Test ids: 1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.2.5.<br>Test id: 1.3.1 |
| Continuous | Normal | Single-ended tests: Group 3 and Group 4.<br>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, 1.3.15, 1.3.16.<br>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, 1.4.18. |
| | | Differential tests: Group 3 and Group 4.<br>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, 1.3.15, 1.3.16.<br>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.
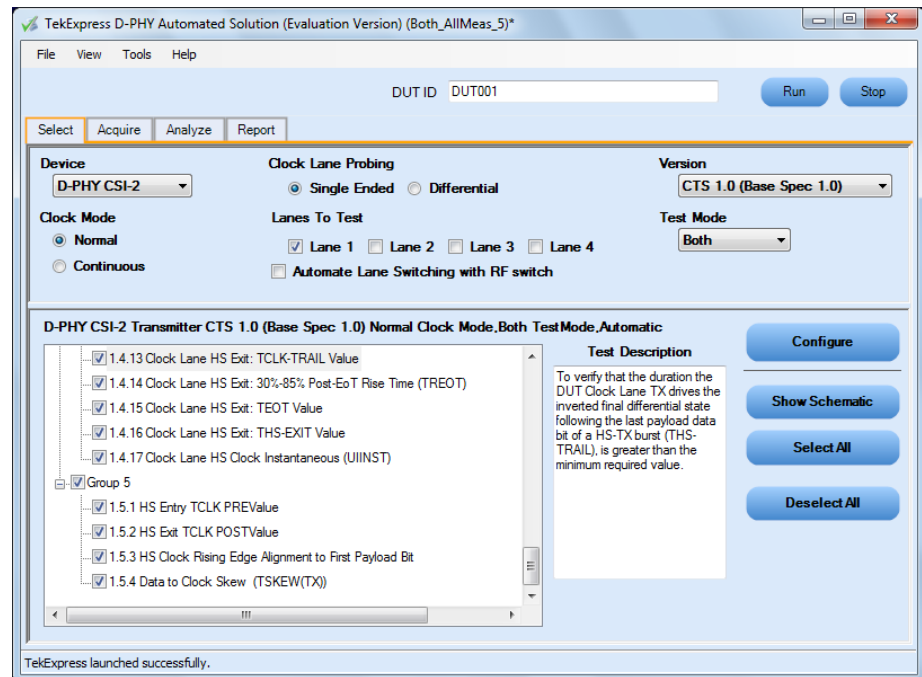


**Select Device.** Select the device type from the list: D-PHY CSI-2 or D-PHY DSI. The default value is D-PHY-CSI-2. Enter the DUT ID for the device.

**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 Lanes to Test.** Select the lane to test. You can manually select the lanes to test, or you can select Automate Lane Switching with RF switch. If you select multiple lanes without automation, a control window is displayed when you need to switch the probing to the next lane. If you select automated lane switching, the system automatically switches to the next lanes for you.

**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 Base Spec 1.2. 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.



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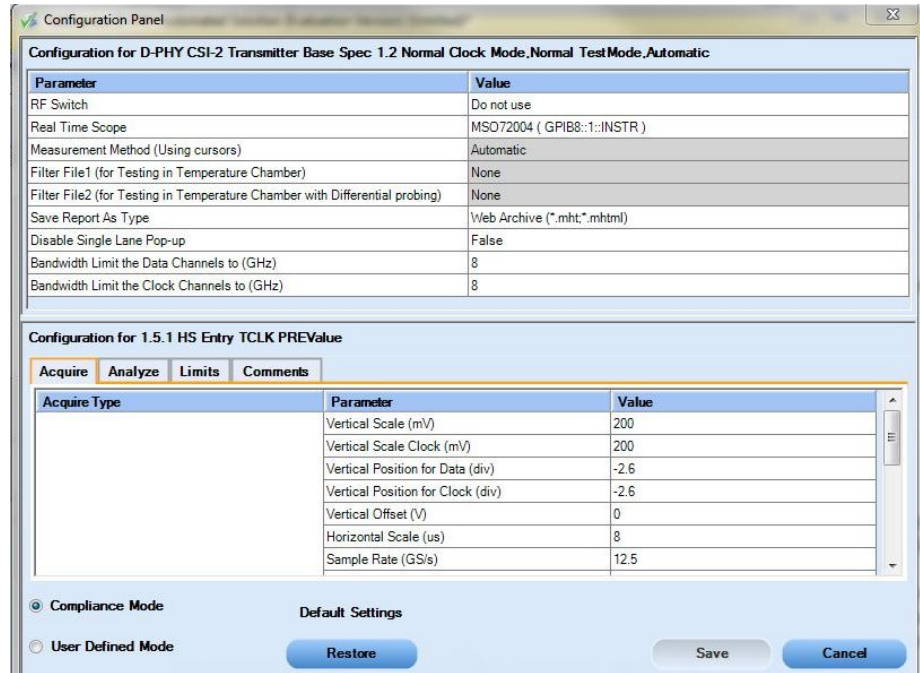
**NOTE.** *If any of the test parameters are grayed, it means that these parameters are not editable.*

---

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.<br><br>**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).<br><br>**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).<br><br>**NOTE.** *Filter file selection is available only in the User Defined mode.* |
| Save Report As Type | Value "Web Archive (*.mht;*.mhtml, *html, *xls)" |
| Disable Single Lane Pop-up | Value "True/False" (If "true" is selected, it disables the first lane popup and If "false" is selected, popup appears "Please connect lane" when the test execution is started) |
| Bandwidth Limit the Data Channels to (GHz) | Select the BW limit if the data channel in GHz. Default it is set to 8 GHz. |
| Bandwidth Limit the DClock Channels to (GHz) | Select the BW limit if the Clock channel in GHz. Default it is set to 8 GHz. |

**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 | Shows the various parameters related to acquisition of a selected test. |
| Analyze | 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. |
| Limits | 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. |

## Configure Acquire panel



## Configure Limits panel

**Configure Analyze panel**

| Parameter | Value |
|---|---|
| **Configuration for D-PHY - Transmitter CTS 1.0 (Base Spec 1.0)** | |
| RF Switch | Do not use |
| Real Time Scope | MSO70604 ( GPIB8::1::INSTR ) |
| Measurement Method (Using cursors) | Automatic |
| Filter File1 (for Testing in Temperature Chamber) | None |
| Filter File2 (for Testing in Temperature Chamber with Differential probing) | None |

**Configuration for 1.4.12 Clock Lane HS-TX 80%-20% Fall Time (tF)**

Acquire | **Analyze** | Limits | Comments

| Parameter | Value |
|---|---|
| Trigger Type | Edge |
| Trigger Source | Ch3 |
| Trigger Upper Level (V) | 1 |
| Trigger Lower Level (V) | 0.05 |
| Trigger Upper Level For Differential(V) | -0.3 |
| Trigger Lower Level For Differential(V) | -0.9 |
| Trigger Level for Clock Continuous Mode(V) | 0.2 |

● Compliance Mode     **Default Settings**
○ User Defined Mode     Restore     Save     Cancel
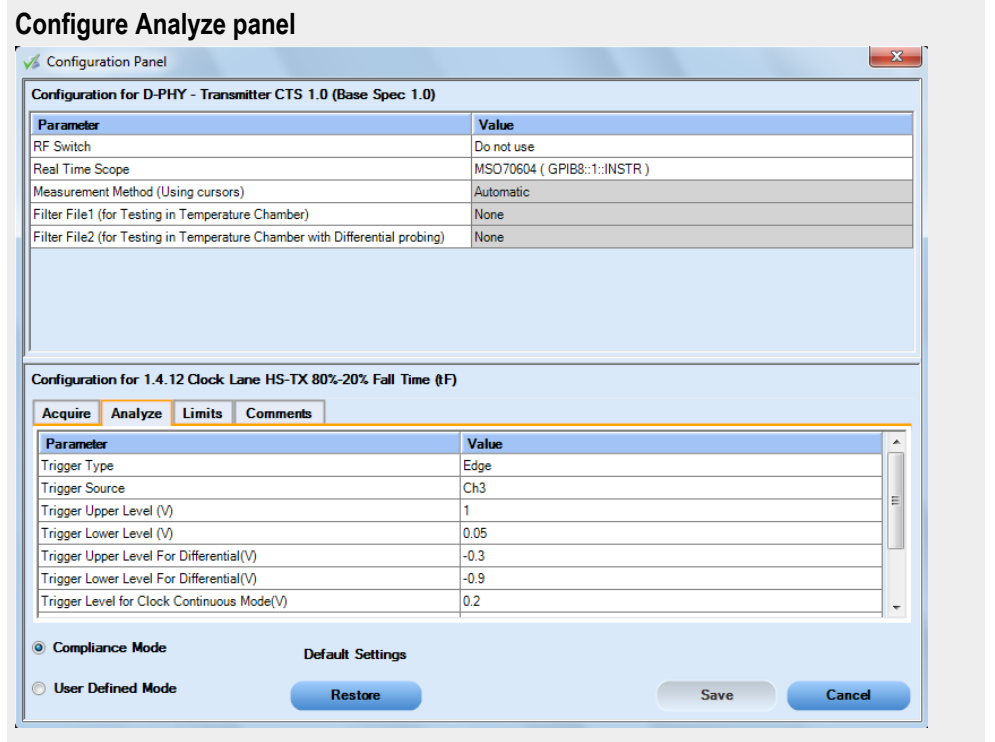
Click **Run** in the Select panel to run the selected tests.

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 |

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.

## 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 | Transition | Transition | Transition | Edge | Transition | Transition | Transition | 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 |

| 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 |
| 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.

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

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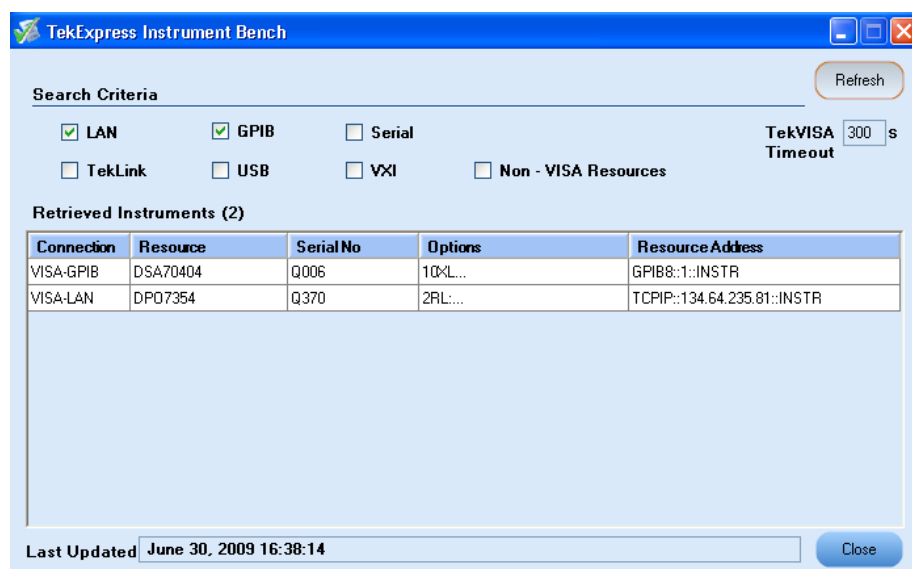
Provide the time in the TekVISA Refresh Timeout (Seconds) field, within which if the TekVISA Instrument Manager does not find the instruments, the TekExpress application resumes the operation. If you choose Non-VISA resources, all the instruments supported by TekExpress but not communicating over the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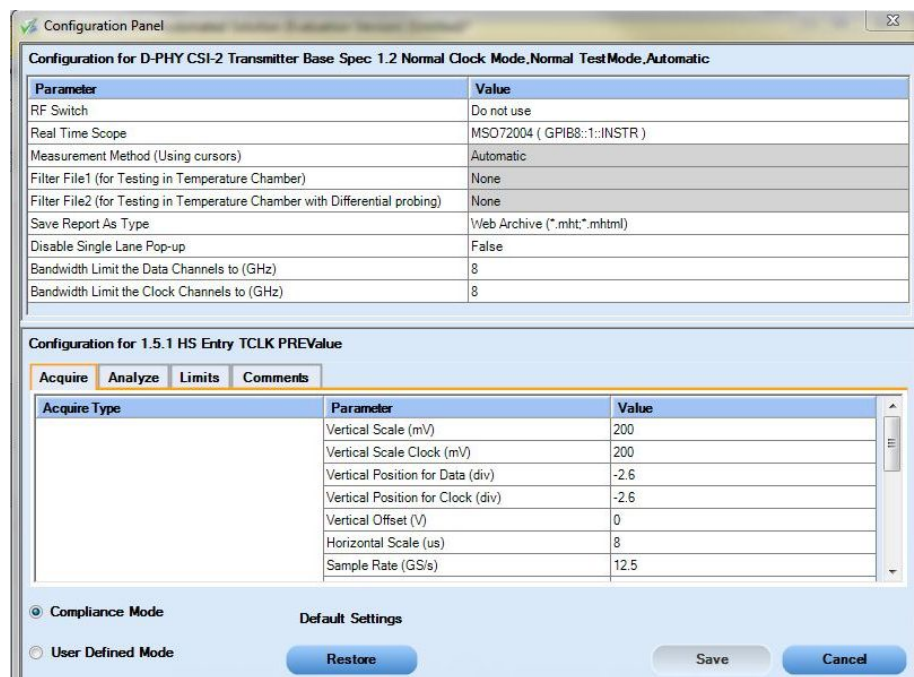


*NOTE. The list of instruments displayed is specific to the selected test suite. It does not show all the connected instruments.*

# 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.
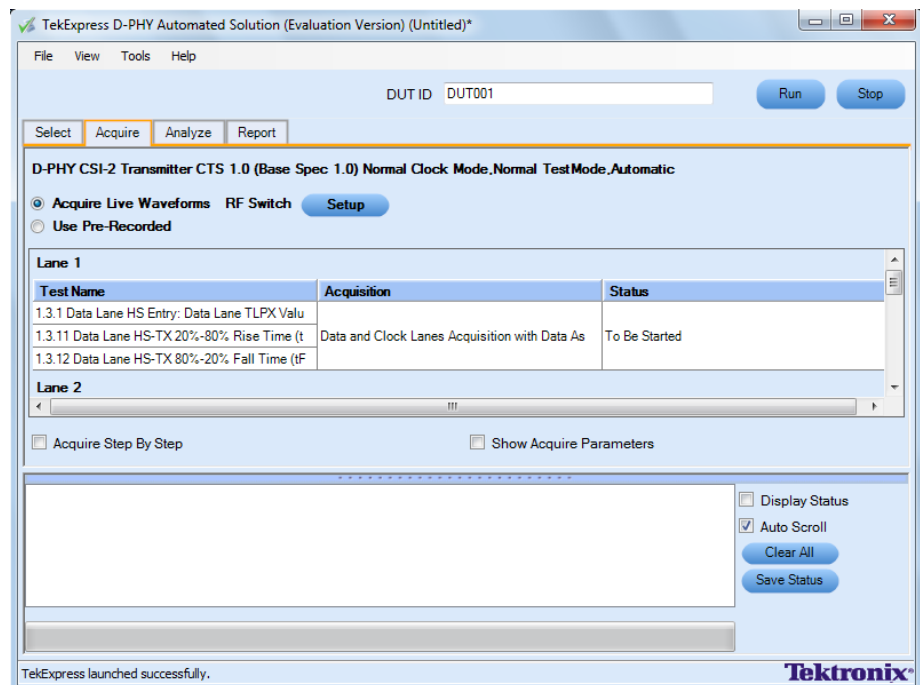


This example shows the acquire panel with channel selections.
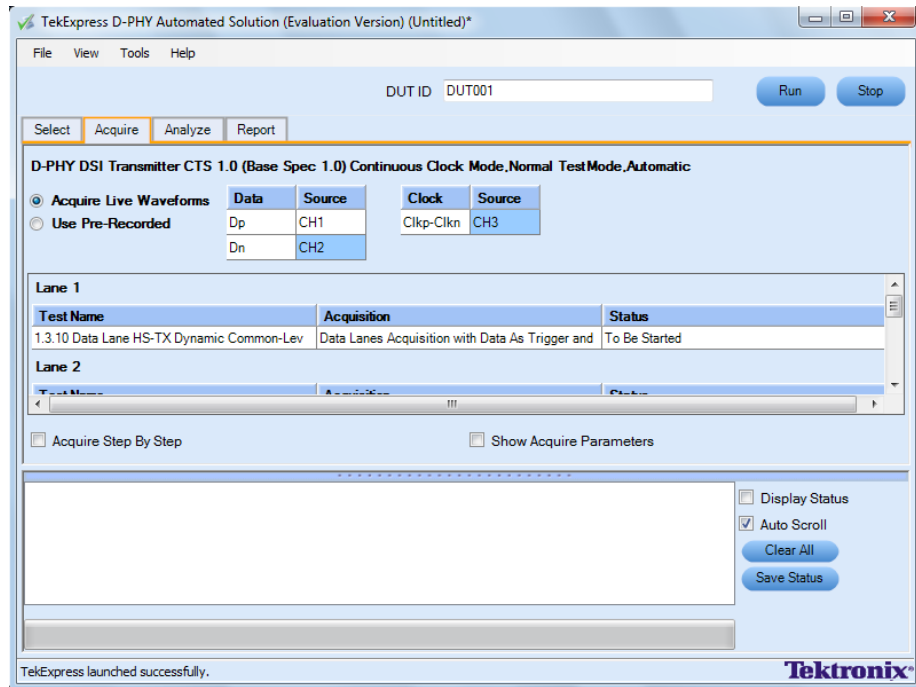
**Table 7: Controls on the Acquire panel**

| 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. |
| **Acquire Options** | |

| Selection | Function |
|---|---|
| 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.*
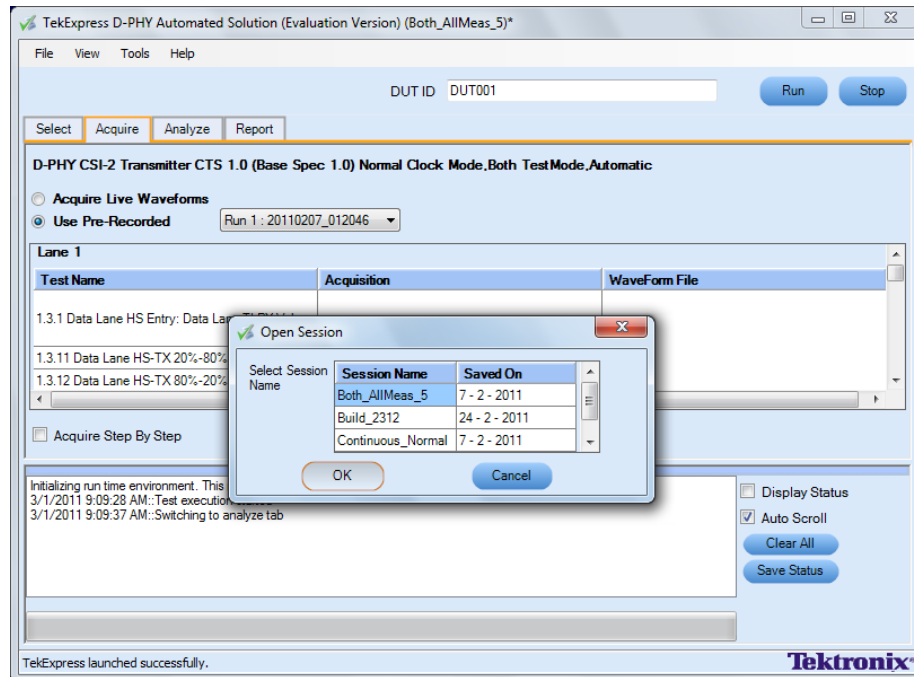
| Column name | Function |
|---|---|
| Test Name | Name of the tests performing acquisitions. One or more tests can perform the same acquisitions. |
| Acquisition | Test acquisition status of the running test passed at intervals. |
| Waveform File | Prerecorded waveform files of unique acquisitions. 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:
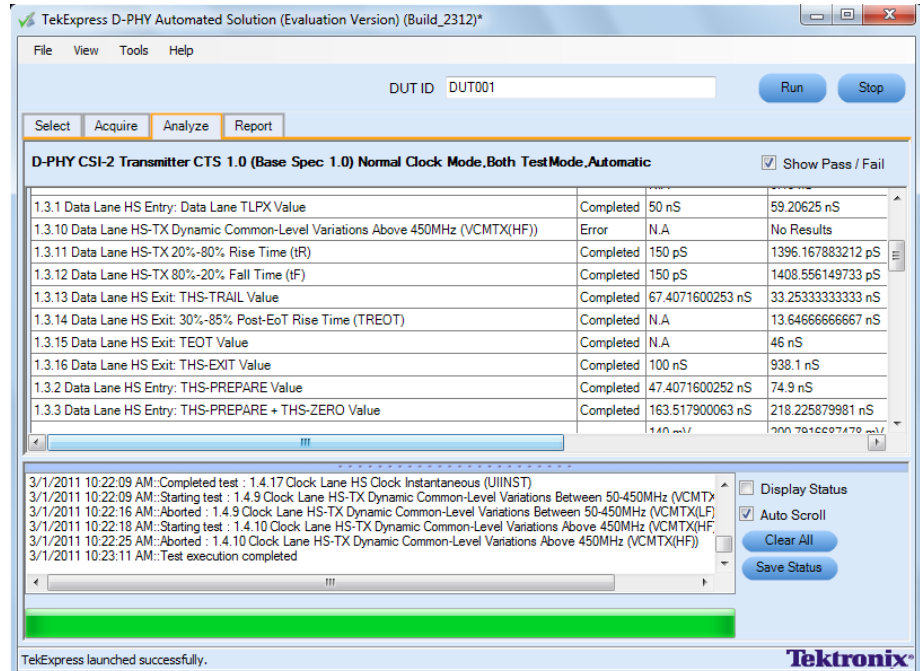
  1. Open a new session.

  2. Select the tests.

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

4.  Save the session.

5.  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 Report As** option.

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**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.*

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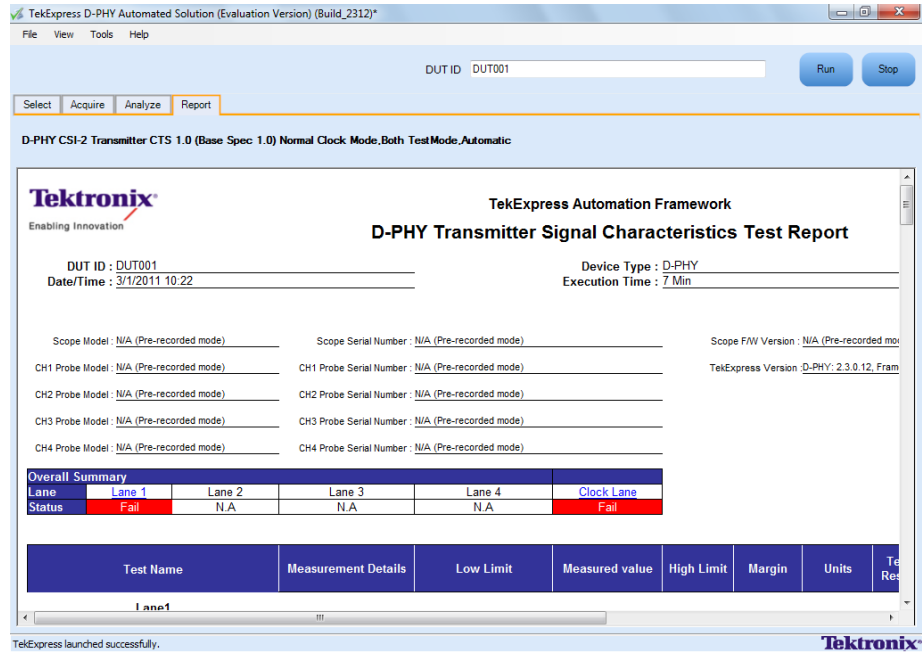
# View test related files

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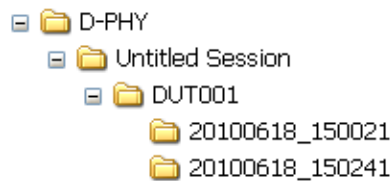
**Case 2.** An example image of data when the session is still not saved and is in the My TekExpress/D-PHY path as "Untitled Session", the DUT001 folder already present (tests are performed twice), and the DUT ID is now set to DUT002 (here the tests are performed once).

```
☐ 📁 D-PHY
   ☐ 📁 Untitled Session
      ☐ 📁 DUT001
            📁 20100618_150021
            📁 20100618_150241
      ☐ 📁 DUT002
            📁 20100618_150607
            📁 20100618_150750
```
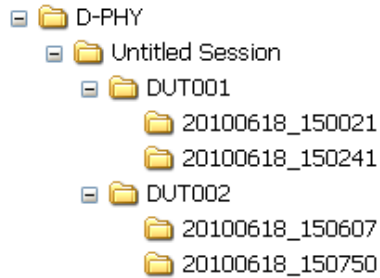
**Case 3.** An example image of data when the session is saved and is in the My TekExpress/D-PHY path as "Test".

```
☐ 📁 My TekExpress
   ☐ 📁 D-PHY
      ☐ 📁 Test
         ☐ 📁 DUT001
               📁 20100621_102242
               📁 20100621_103932
               📁 20100621_104124
         ☐ 📁 DUT002
               📁 20100621_103740
```
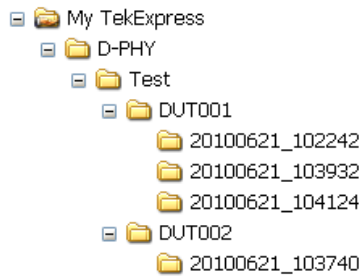
# Application examples

## Connection setup

You need the following equipment (see *Compatibility*):
- A supported Tektronix DPO oscilloscope
- Single-ended probe
- Differential probe
- Device under test
- Probing board
- For multilane testing, RF switch:

Make connections as follows for single-ended tests:

**Single-ended Test**
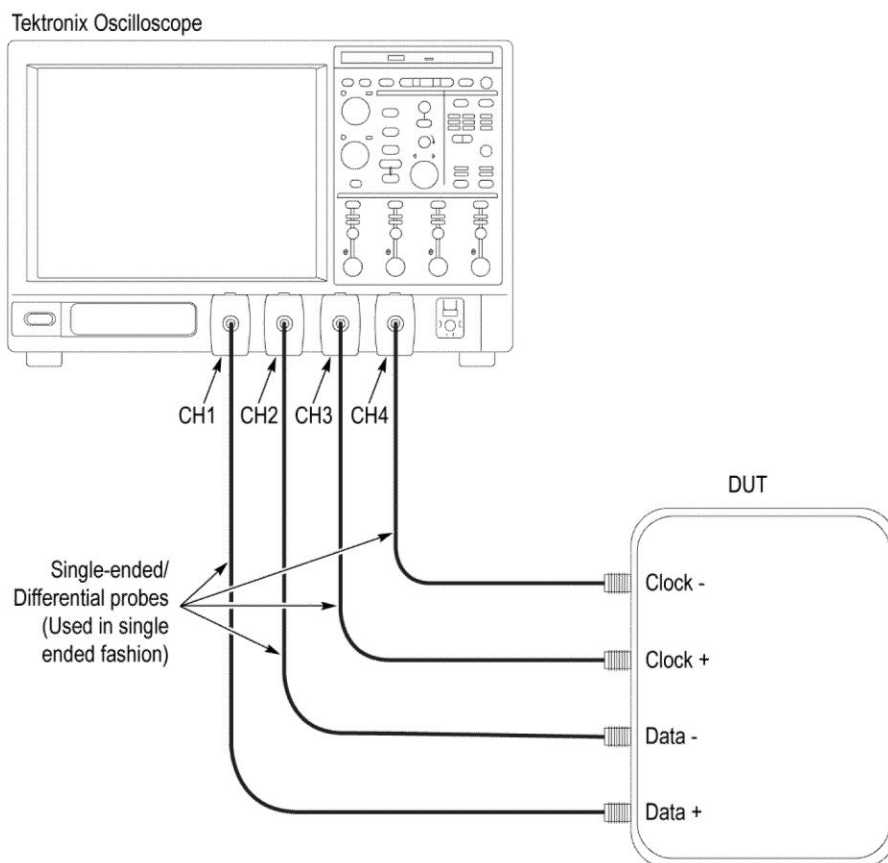


Note: If you have a partial setup, such as only Tx and no Rx, then the probing board should be connected to the termination board, which provides proper termination for the LP and HS signals. If you have a full setup, then there is no need for the termination board.

0514-006

Make connections as follows for differential tests:

**Differential Test**
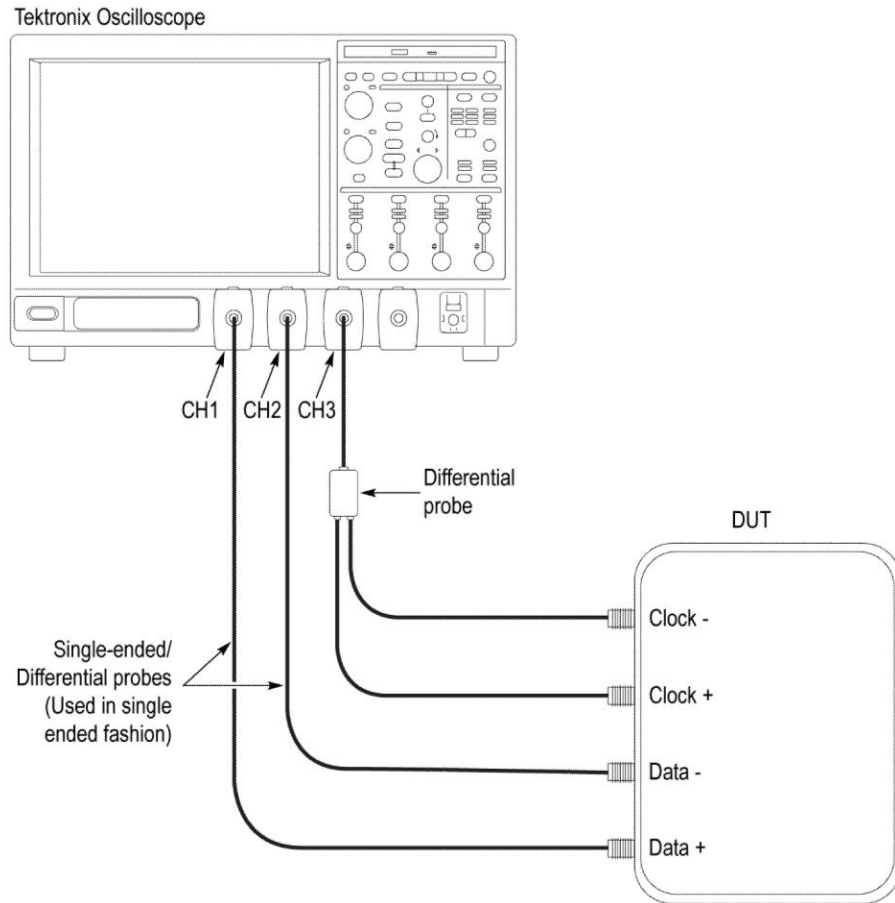
Tektronix Oscilloscope

CH1  CH2  CH3

Differential probe

DUT

Clock -

Clock +

Data -

Data +

Single-ended/
Differential probes
(Used in single
ended fashion)

Note: If you have a partial setup, such as only Tx and no Rx, then the probing board should
be connected to the termination board, which provides proper termination for the LP and
HS signals. If you have a full setup, then there is no need for the termination board.

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Make connections as follows when you are using an RF switch and probing
board:
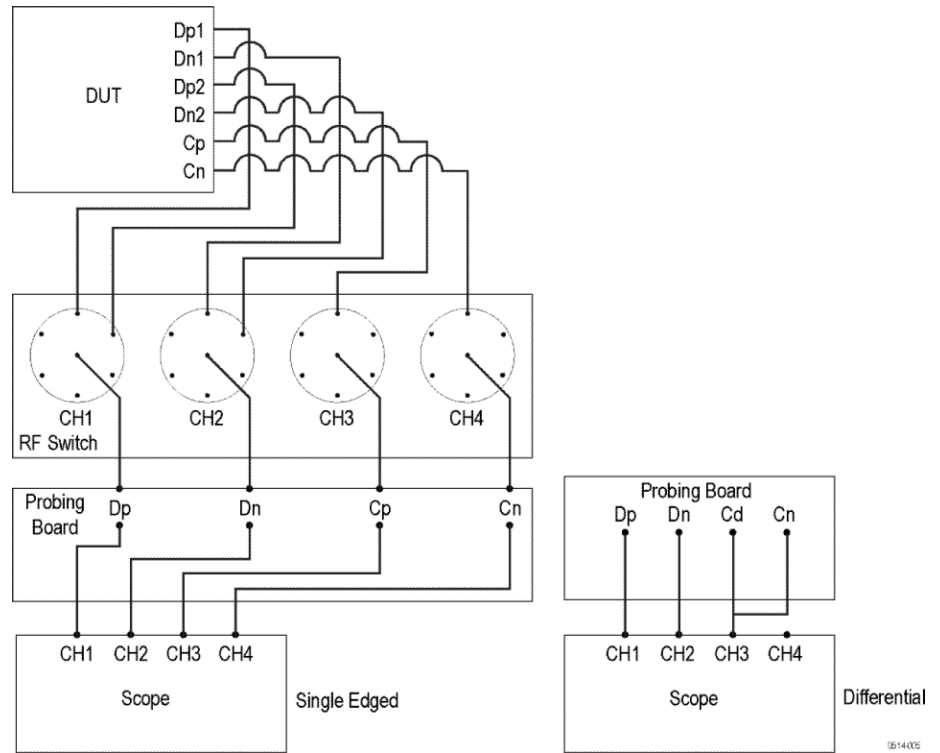
# Configuring parameter values

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. <br><br> *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). <br><br> *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). <br><br> *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.

Tektronix Oscilloscope

Ch1 Ch2 Ch3 Ch4

Tektronix P75xx
Trimode Probes

Temperature Oven

DUT

Clock -

Clock +

Data -

Data +

Socket Cable XL (020-2960-00)
with High-Temperature Tip (020-2958-00)

0514-01
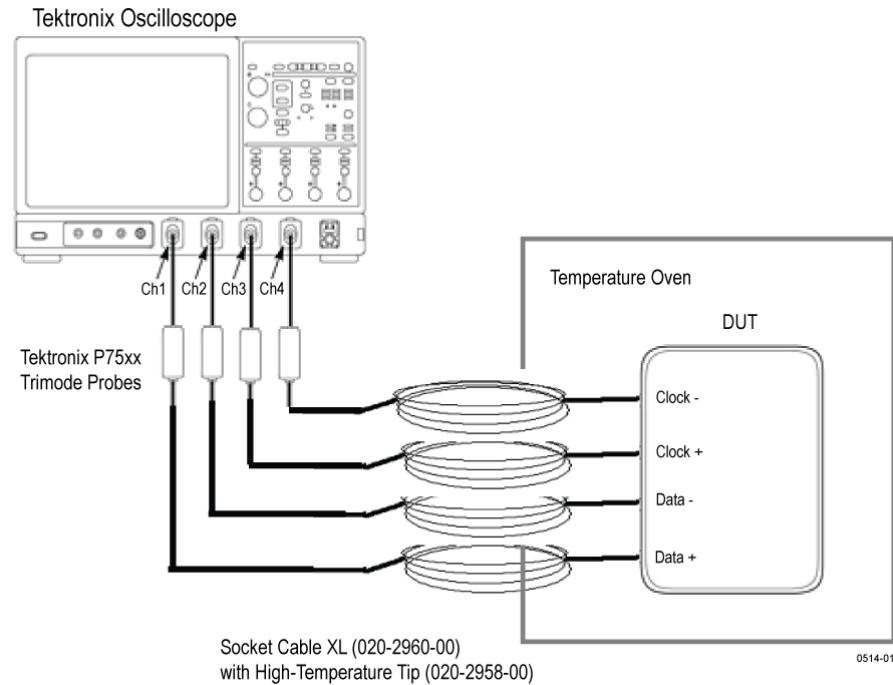
**Steps for performing temperature chamber testing**

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**

Measurement
begin

Measurement sequence calls the Acquire sequence to
get the desired number of waveforms

Acquire Setting Read from Model and Applied on Scope On Require Channels based on Acquisition type

Is Filter file specified for
Temperature chamber
testing?

No

Yes

Single Ended?

No

Apply separate Filter on data
and Clock as specified on UI

Acquire the waveforms on the channels and return
to the calling sequence

Yes

Apply same filter on all channels and
put waveform on Math channels

Acquire the waveforms on the Math Channels
and return it to the calling sequence

Is the test 1.3.9,
1.3.10, 1.4.9, or
1.4.10

No

Yes

Apply the BandPass Filter for 13.9.1.4.9 measurement or apply
HighPass Filter for 1.3.10, 1.4.10 measurement on the respective
Math channels and load the second level filtered waveforms onto
the Math1 and Math2 channel

Complete analysis on the
capture waveforms

Acquire the filtered waveforms from the math channel

0514-02

Measurement
Ends

# Multilane testing with RF switch

Multilane testing with an RF switch takes measurements on four lanes. The system can automatically receive signals from all four lanes without user intervention, save the acquisitions, and then take measurements on one lane, and then the signals from next lane are automatically selected and the measurements are performed.

Without automation you can select which lane (s) to test, and based on the selection, the application acquires the desired signals and takes the selected measurements on those acquired waveforms. When done with a lane, the software prompts you to change the connection over to the next lane.

After each acquisition the waveforms are saved, with proper naming convention for specific lanes, analyzed, and the results for each lane updated in the analyze panel and the report panel.

**Table 9: Required Equipment**

| Item | Description |
|------|-------------|
| RF switch | Keithley S46 series Microwave Switch System |
| Reference Termination Board (otpional) | D-PHY Reference Termination Board (RTB) available from University of New Hampshire (UNH-IOL). This UNH RTB is orderable from, http://www.iol.unh.edu/services/testing/mipi/MIPI_Test_Fixture_Order_Form.doc |
| GPIB cable | A GPIB cable is required when using an RF switch for multi-lane automation. |

**Setting up Multilane Testing**

*Click here* for information on connections for multilane testing. Perform the following steps to set up the equipment for multilane testing:

1. Connect a GPIB cable between the oscilloscope and the RF switch.

2. Connect the input channels of the oscilloscope to the outputs of the Probing board.

3. Connect the inputs of the Probing board to the outputs of the RF switch.

4. Connect the Dp signals form each lane of the DUT to the inputs of channel 1 of the RF switch.

5. Connect the Dn signals from each lane of the DUT to the corresponding inputs of channel 2 of the RF switch.

6. Connect the Cp signal to the input of channel 3 of the RF switch. The clock lane is connected through the RF switch to ensure that there is no skew between the data and clock signals.

7. Connect the Cn signal to the input of channel 4 of the RF switch.

8. In the Select tab, select the Automate Lane switching with RF switch check box

9. In the Acquire tab, select Acquire Live Waveforms.

10. Select RF Switch setup.

11. Map the lanes and input types to the location on the RF switch.
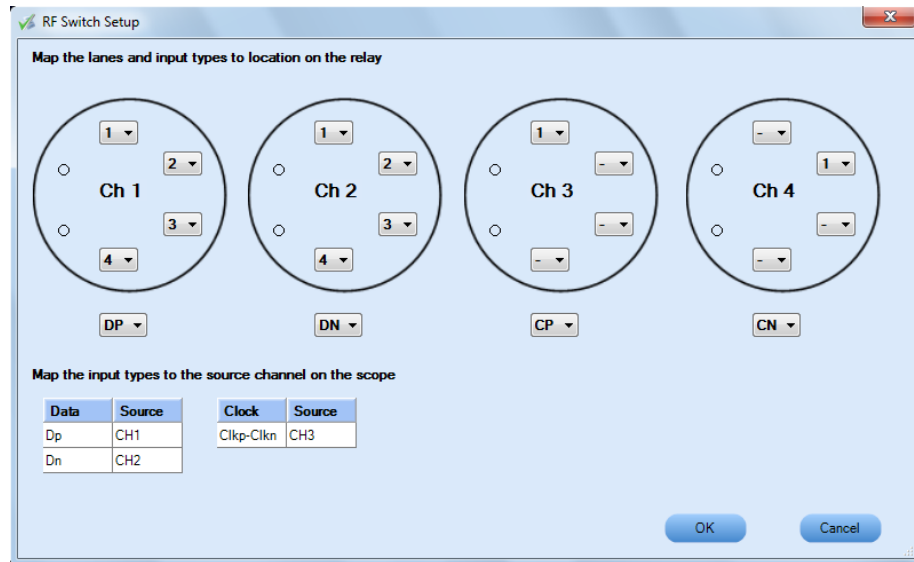


# Group 1 tests

**Testing data lane LP-TX thevenin output high level voltage (VOH)**

**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.

TekExpress D-PHY Printable Application Help

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type (Data Lanes Acquisition in Escape Mode with Data as Trigger). The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 10: 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 |
| 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 11: Analysis parameters for Data Lane LP-TX Thevenin Output High Level Voltage (VOH)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| 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.

**Testing data lane LP-TX thevenin output low level voltage (VOL)**

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Data Lanes Acquisition in Escape Mode with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 12: 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 13: Analysis parameters for Data Lane LP-TX Thevenin Output Low Level Voltage (VOL)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 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.

**Testing data lane rise time**

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Data Lanes Acquisition in Escape Mode with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 14: 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 |
| 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 15: Analysis parameters for Data Lane Rise Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane fall time**

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Data Lanes Acquisition in Escape Mode with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 16: 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 17: Analysis parameters for Data Lane Fall Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane slew rate versus CLOAD**

**Connections for data lane LP-TX slew rate versus CLOAD (V-tSR).** *Click here* for information on connections for the Data Lane LP-TX Slew Rate Versus CLOAD (ōVō/tSR) test.

**Configure and run data lane LP-TX slew rate versus CLOAD (V-tSR).**

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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Data Lanes Acquisition in Escape Mode with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 18: 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 19: Analysis parameters for Data Lane Fall Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane pulse width of Exclusive-OR clock**

**Connections for data lane LP-TX pulse width of Exclusive-OR clock.** *Click here* for information on connections for the Data Lane LP-TX Pulse Width of Exclusive-OR Clock test.

**Configure and run data lane LP-TX pulse width of Exclusive-OR clock.**

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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Data Lanes Acquisition in Escape Mode with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 20: 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 21: Analysis parameters for Data Lane Fall Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane LP-TX period of Exclusive-OR clock**

**Connections for data lane LP-TX period of Exclusive-OR clock.** *Click here* for information on connections for the Data Lane LP-TX Period of Exclusive-OR Clock test.

**Configure and run data lane LP-TX period of Exclusive-OR clock.**

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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Data Lanes Acquisition in Escape Mode with Data as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 22: 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 23: Analysis parameters for Data Lane Fall Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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 Report As** option. The following screen shows the results for Group 1 tests.

## Group 2 tests

**Testing clock lane LP-TX thevenin output high level voltage (VOH)**

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Clock Lanes Acquisition in Escape Mode with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 24: 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 |
| 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 25: Analysis parameters for Clock Lane LP-TX Thevenin Output High Level Voltage (VOH)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing clock lane LP-TX thevenin output low level voltage (VOL)**

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Clock Lanes Acquisition in Escape Mode with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 26: 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 27: Analysis parameters for Clock Lane LP-TX Thevenin Output Low Level Voltage (VOL)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger If Violation | Occurs | Occurs, Logic |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing clock lane rise time**

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Clock Lanes Acquisition in Escape Mode with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 28: 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 29: Analysis parameters for Clock Lane Rise Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing clock lane fall time**

**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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Clock Lanes Acquisition in Escape Mode with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 30: 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 31: Analysis parameters for Clock Lane Fall Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing clock lane LP-TX slew rate versus CLOAD (V-tSR)**

**Connections for clock lane LP-TX slew rate versus CLOAD (V-tSR).** *Click here* for information on connections for the Clock Lane LP-TX Slew Rate Versus CLOAD test.

**Configure and run clock lane LP-TX slew rate versus CLOAD (V-tSR).**

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 **Base Spec 1.2**.

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

6. In the Configuration Panel, set the following parameters for the acquire type Clock Lanes Acquisition in Escape Mode with Clock as Trigger. The following table lists the compliance mode values and the permitted range of values for the user-defined mode:

**Table 32: 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 33: Analysis parameters for Clock Lane Fall Time**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

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| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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 Report As** option. The following screen shows the results for Group 2 tests.

## Group 3 tests

**Testing data lane HS entry: Data lane TLPX value**

**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.

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**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 **Base Spec 1.2**.

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

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

**Table 34: 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 35: Analysis parameters for Data Lane HS Entry: Data Lane TLPX Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| Trigger Upper Level (V) | 1 | Enter a value based on the test |

| 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 | Negative | Positive, Negative, Either |
| Trigger If Violation | Occurs | Occurs, Logic |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS entry: THS-PREPARE value**

**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 **Base Spec 1.2**.

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

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

**Table 36: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | –3 to +3<br>+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 37: Analysis parameters for Data Lane HS Entry: THS-PREPARE Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS entry: THS-PREPARE + THS-ZERO value**

**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 **Base Spec 1.2**.

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

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

**Table 38: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | –3 to +3<br>–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 39: Analysis parameters for Data Lane HS Entry: THS-PREPARE + THS-ZERO**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX differential voltages (VOD(0), VOD(1))**

**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 **Base Spec 1.2**.

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

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

**Table 40: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 41: Analysis parameters for Data Lane HS-TX Differential Voltages (VOD(0), VOD(1))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX differential voltage mismatch (VOD)**

**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 **Base Spec 1.2**.

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

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

**Table 42: Configuration parameters for Data Lane HS-TX Differential Voltage Mismatch (VOD)**

| 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 | –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 43: Analysis parameters for Data Lane HS-TX Differential Voltage Mismatch (VOD)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|-----------|---------|-------------------|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX Single-Ended output high voltages (VOHHS(DP), VOHHS(DN))**

**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 **Base Spec 1.2**.

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

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

**Table 44: 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 45: 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 |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 | Polarity | Positive, Negative, Either |
| Trigger If Violation | Occurs | Occurs, Logic |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX static Common-Mode voltages (VCMTX(1), VCMTX(0))**

**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 **Base Spec 1.2**.

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

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

**Table 46: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 47: 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 | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX static Common-Mode voltage mismatch (VCMTX(1,0))**

**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 **Base Spec 1.2**.

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

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

**Table 48: 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 49: Analysis parameters for Data Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX dynamic Common-Level variations between 50-450 MHz (VCMTX(LF))**

**Connections for data lane HS-TX dynamic Common-Level variations between 50-450 MHz (VCMTX(LF)).** *Click here* for information on connections for the Data Lane HS-TX Dynamic Common-Level Variations Between 50-450 MHz (VCMTX(LF)) test

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**Configure and run data lane HS-TX dynamic Common-Level variations between 50-450 MHz (VCMTX(LF)).** The Data Lane HS-TX Dynamic Common-Level Variations Between 50-450 MHz (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 waveform names are like **Acq1_Data Lanes Acquisition with Data As Trigger and BandPass Filter_Lane1_DN.wfm**and Acq1_Data Lanes Acquisition with Data As Trigger and BandPass Filter_Lane1_DP.wfm.

2. Applies a band pass filter on live channels and stores them on the Math channel. Typical filtered waveform file name are like Lane1_FilteredTwoChannelwithDataasTriggerAndBandPassFilter_DN.WFM and Lane1_FilteredTwoChannelwithDataasTriggerAndBandPassFilter_DP.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 **Base Spec 1.2**.

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

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

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

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Scale (mV) | 200 | 100, 200, 300 |
| Vertical Position for Data (div) | –2.6 | +3 to –3 |

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Position for Clock (div)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 51: Analysis parameters for Data Lane HS-TX Dynamic Common-Level Variations Between 50-450 MHz (VCMTX(LF))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX dynamic Common-Level variations above 450 MHz (VCMTX(HF))**

**Connections for data lane HS-TX dynamic Common-Level variations above 450 MHz (VCMTX(HF)).** *Click here* for information on connections for the Data Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (VCMTX(HF)) test

**Configure and run data lane HS-TX dynamic Common-Level variations above 450 MHz (VCMTX(HF)).** The Data Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (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 waveform names are like Acq2_Data Lanes Acquisition with Data As Trigger and HighPass Filter_Lane1_DN.wfmand Acq2_Data Lanes Acquisition with Data As Trigger and HighPass Filter_Lane1_DP.wfm.

2. Applies a high pass filter on live channels and stores them on the Math channel. Typical filtered waveform file names are like Lane1_FilteredTwoChannelwithDataasTriggerAndHighPassFilter_DN.WFM and Lane1_FilteredTwoChannelwithDataasTriggerAndHighPassFilter_DP.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 **Base Spec 1.2**.

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

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

**Table 52: Configuration parameters for Data Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (VCMTX(HF))**

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Scale (mV) | 200 | 100, 200, 300 |
| Vertical Position for Data (div) | −2.6 | +3 to −3 |

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Position for Clock (div) <br> Single-ended probing <br> Differential probing | –2.6 <br> +2.6 | +3 to –3 <br> –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 53: Analysis parameters for Data Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (VCMTX(HF))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

**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.

**Testing data lane HS-TX 20%-80% rise time (tR)**

**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 **Base Spec 1.2**.

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

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

**Table 54: Configuration parameters for Data Lane HS-TX 20%-80% Rise time (tR)**

| 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 55: Analysis parameters for Data Lane HS-TX 20%-80% Rise time (tR)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS-TX 80%-20% fall time (tF)**

**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 **Base Spec 1.2**.

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

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

**Table 56: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 57: Analysis parameters for Data Lane HS-TX 80%-20% Fall time (tF)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS exit: THS-TRAIL value**

**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 **Base Spec 1.2**.

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

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

**Table 58: 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 |
| 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 59: Analysis parameters for Data Lane HS Exit: THS-TRAIL Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS exit: 30%-80% Post-EOT rise test (TREOT)**

**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 **Base Spec 1.2**.

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

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

**Table 60: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 61: Analysis parameters for Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT)**

| Parameter | Default | User defined mode |
| --- | --- | --- |
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS exit: $T_{EOT}$ value**

**Connections for data lane HS exit: TEOT value.** *Click here* for information on connections for the Data Lane HS Exit: $T_{EOT}$ Value test.

**Configure and run data lane HS exit: TEOT 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 **Base Spec 1.2**.

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

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

**Table 62: 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)<br>Single-ended probing<br>Differential probing | −2.6<br>+2.6 | +3 to −3<br>−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 63: Analysis parameters for Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing data lane HS exit: THS-EXIT value**

**Connections for data lane HS exit: THS-EXIT value.** *Click here* for information on connections for the Data Lane HS Exit: $T_{HS\text{-}Exit}$ Value test.

**Configure and run data lane HS exit: THS-EXIT 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 **Base Spec 1.2**.

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

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

**Table 64: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 65: Analysis parameters for Data Lane HS Exit: 30%-80% Post-EOT Rise Test (TREOT)**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 |

...

| Parameter | Default | User defined mode |
|-----------|---------|-------------------|
| Trigger Polarity | Positive | Positive, Negative |

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 Report As** option. The following screen shows the results for Group 3 tests.



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## Group 4 tests

**Testing clock lane HS entry TLPX value**

**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 **Base Spec 1.2**.

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

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

**Table 66: 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 67: Analysis parameters for Clock Lane HS Entry TLPX Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing clock lane HS entry TCLK-PREPARE value**

**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 **Base Spec 1.2**.

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

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

**Table 68: 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 69: Analysis parameters for Clock Lane HS Entry TCLK-PREPARE Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|-----------|---------|-------------------|
| Trigger Polarity | Positive | Positive, Negative |

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.

**Testing clock lane HS entry TCLK-PREPARE +TCLK-ZERO value**

**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 **Base Spec 1.2**.

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

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

**Table 70: 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 71: Analysis parameters for Clock Lane HS Entry TCLK-PREPARE +TCLK–ZERO Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Cklp | Dp, Dn, Clkp, Clkn |
| 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 |

| 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 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.

**Testing clock lane HS-TX differential voltages (VOD(0), VOD(1))**

**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 **Base Spec 1.2**.

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

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

**Table 72: 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 73: 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 | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Level for Clock Continuous Mode (V) | 0.2 | 0.2, 0.05, 0.1 |
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Normal Clock<br>Continuous Clock | Greater Than<br>Not Applicable | Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | Occurs<br>Not Applicable | Occurs, Logic<br>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.

**Testing clock lane HS-TX differential voltage mismatch**

**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 **Base Spec 1.2**.

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

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

**Table 74: 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 75: 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 | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Level for Clock Continuous Mode (V) | 0.2 | 0.2, 0.05, 0.1 |
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Normal Clock<br>Continuous Clock | <br>Greater Than<br>Not Applicable | <br>Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | <br>Occurs<br>Not Applicable | <br>Occurs, Logic<br>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.

**Testing clock lane HS-TX Single-Ended output high voltages (VOHHS(DP), VOHHS(DN))**

**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 **Base Spec 1.2**.

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

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

**Table 76: 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 77: Analysis parameters for Clock Lane HS-TX Single-Ended Output High Voltages (VOHHS(DP), VOHHS(DN))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type<br>Normal Clock<br>Continuous Clock | Transition<br>Edge | Transition<br>Edge |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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<br>Normal Clock<br>Continuous Clock | Greater Than<br>Not Applicable | Greater Than, Less Than<br>Not Applicable |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | Occurs<br>Not Applicable | Occurs, Logic<br>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.

**Testing clock lane HS-TX static Common-Mode voltages (VCMTX(1), VCMTX(0))**

**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 **Base Spec 1.2**.

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

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

**Table 78: 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 79: Analysis parameters for Clock Lane HS-TX Static Common-Mode Voltages (VCMTX(1), VCMTX(0))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type<br>Normal Clock<br>Continuous Clock | Transition<br>Edge | Transition<br>Edge |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

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| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Normal Clock<br>Continuous Clock | Greater Than<br>Not Applicable | Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | Occurs<br>Not Applicable | Occurs, Logic<br>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.

**Testing clock lane HS-TX static Common-Mode voltage mismatch (VCMTX(1,0))**

**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 **Base Spec 1.2**.

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

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

**Table 80: 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 |
| 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 81: Analysis parameters for Clock Lane HS-TX Static Common-Mode Voltage Mismatch (VCMTX(1,0))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type<br>Normal Clock<br>Continuous Clock | Transition<br>Edge | Transition<br>Edge |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Normal Clock<br>Continuous Clock | Greater Than<br>Not Applicable | Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | Occurs<br>Not Applicable | Occurs, Logic<br>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.

**Testing clock lane HS-TX dynamic Common-Level variations between 50-450 MHz (VCMTX(LF))**

**Connections for clock lane HS-TX dynamic Common-Level variations between 50-450 MHz (VCMTX(LF)).** *Click here* for information on connections for the Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450 MHz (VCMTX(LF)) test

**Configure and run clock lane HS-TX dynamic Common-Level variations between 50-450 MHz (VCMTX(LF)).** The Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450 MHz (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 waveform names are like Acq4_Clock Lanes Acquisition with Clock As Trigger and BandPass Filter_ClockLane_CN.wfmand Acq4_Clock Lanes Acquisition with Clock As Trigger and BandPass Filter_ClockLane_CP.wfm.

2. Applies a band pass filter on live channels and stores them on the Math channel. Typical filtered waveform file names are like ClockLane_FilteredTwoChannelWithClockasTriggerAndBandPassFilter_CN .WFM and ClockLane_FilteredTwoChannelWithClockasTriggerAndBandPassFilter_CP. 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 50-450 MHz (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 **Base Spec 1.2**.

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

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

**Table 82: Configuration parameters for Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450 MHz (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 83: Analysis parameters for Clock Lane HS-TX Dynamic Common-Level Variations Between 50-450 MHz (VCMTX(LF))**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type<br>Normal Clock<br>Continuous Clock | Transition<br>Edge | Transition<br>Edge |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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<br>Normal Clock<br>Continuous Clock | Greater Than<br>Not Applicable | Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | Occurs<br>Not Applicable | Occurs, Logic<br>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.

**Testing clock lane HS-TX dynamic Common-Level variations above 450 MHz (VCMTX(HF))**

**Connections for clock lane HS-TX dynamic Common-Level variations above 450 MHz (VCMTX(HF)).** *Click here* for information on connections for the Clock Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (VCMTX(HF)) test

**Configure and run clock lane HS-TX dynamic Common-Level variations above 450 MHz (VCMTX(HF)).** The Clock Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (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 waveform names are like Acq5_Clock Lanes Acquisition with Clock As Trigger and HighPass Filter_ClockLane_CN.wfmand Acq5_Clock Lanes Acquisition with Clock As Trigger and HighPass Filter_ClockLane_CP.wfm.

2. Applies a high pass filter on live channels and stores them on the Math channel. Typical filtered waveform file names are like ClockLane_FilteredTwoChannelWithClockasTriggerAndHighPassFilter_CN.WFM and ClockLane_FilteredTwoChannelWithClockasTriggerAndHighPassFilter_CP.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 450 MHz (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 **Base Spec 1.2**.

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

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

Table 84: Configuration parameters for Clock Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (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 85: Analysis parameters for Clock Lane HS-TX Dynamic Common-Level Variations Above 450 MHz (VCMTX(HF))

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type<br>Normal Clock<br>Continuous Clock | <br>Transition<br>Edge | <br>Transition<br>Edge |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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<br>Normal Clock<br>Continuous Clock | <br>Greater Than<br>Not Applicable | <br>Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | <br>Occurs<br>Not Applicable | <br>Occurs, Logic<br>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.

**Testing clock lane HS-TX 20%-80% rise time (tR)**

**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 **Base Spec 1.2**.

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

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

**Table 86: 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 87: 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 |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Normal Clock<br>Continuous Clock | Greater Than<br>Not Applicable | Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | Occurs<br>Not Applicable | Occurs, Logic<br>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.

**Testing clock lane HS-TX 80%-20% fall time (tF)**

**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 **Base Spec 1.2**.

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

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

**Table 88: 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 89: 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 | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|-----------|---------|-------------------|
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Normal Clock<br>Continuous Clock | <br>Greater Than<br>Not Applicable | <br>Greater Than, Less Than<br>Not Applicable |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Normal Clock<br>Continuous Clock | <br>Occurs<br>Not Applicable | <br>Occurs, Logic<br>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.

**Testing clock lane HS exit: TCLK-TRAIL value**

**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 **Base Spec 1.2**.

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

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

**Table 90: 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 91: Analysis parameters for Clock Lane HS Exit: TCLK-TRAIL Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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.

**Testing clock lane HS exit: 30%-85% Post-EoT rise time (TREOT)**

**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 **Base Spec 1.2**.

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

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

**Table 92: 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 93: 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 | Clkp | Dp, Dn, Clkp, Clkn |
| 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.

**Testing clock lane HS exit: TEOT value**

**Connections for clock lane HS exit: TEOT value.** *Click here* for information on connections for the Clock Lane HS Exit: $T_{EOT}$ Value test.

**Configure and run clock lane HS exit: TEOT 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 **Base Spec 1.2**.

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

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

**Table 94: 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 95: 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 | Clkp | Dp, Dn, Clkp, Clkn |
| 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.

**Testing clock lane HS exit: THS-EXIT value**

**Connections for clock lane HS exit: THS-EXIT value.** *Click here* for information on connections for the Clock Lane HS Exit: $T_{HS-Exit}$ Value test.

**Configure and run clock lane HS exit: THS-EXIT 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 **Base Spec 1.2**.

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

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

**Table 96: 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 97: 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 | Clkp | Dp, Dn, Clkp, Clkn |
| 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.

**Testing clock lane HS clock instantaneous (UIINST)**

**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 **Base Spec 1.2**.

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

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

**Table 98: 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 99: 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<br>Single-ended probing<br>Differential probing | Transition<br>Edge | Transition<br>Edge |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Level for Clock Continuous Mode (V) | 0.2 | 0.2, 0.05, 0.1 |
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Single-ended probing<br>Differential probing | Greater Than<br>NA | Greater Than, Less Than<br>NA |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Single-ended probing<br>Differential probing | Occurs<br>NA | Occurs, Logic<br>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.

**Testing clock lane HS clock delta UI (ΔUI)**

**Connections for clock lane HS clock delta UI (ΔUI).** *Click here* for information on connections for the Clock Lane HS Clock Delta UI (ΔUI) test.

**Configure and run clock lane HS clock delta UI (ΔUI).**

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 **Base Spec 1.2**.

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

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

Table 100: Configuration parameters for Clock Lane HS Clock Delta UI(ΔUI)

| 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 101: Analysis parameters for Clock Lane HS Clock Delta UI(ΔUI)

| 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<br>Single-ended probing<br>Differential probing | Transition<br>Edge | Transition<br>Edge |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|-----------|---------|-------------------|
| Trigger Time (pS) | 500 | 250, 500 |
| Trigger Transition<br>Single-ended probing<br>Differential probing | Greater Than<br>NA | Greater Than, Less Than<br>NA |
| Trigger Slope | Negative | Positive, Negative, Either |
| Trigger If Violation<br>Single-ended probing<br>Differential probing | Occurs<br>NA | Occurs, Logic<br>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 Report As** option. The following screen shows the results for Group 4 tests.

# Group 5 tests

**Testing HS entry TCLK PREValue**  **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 **Base Spec 1.2**.

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

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

**Table 102: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 103: Analysis parameters for HS Entry TCLK PREValue**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|---|---|---|
| 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.

**Testing HS exit TCLK POSTValue**

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

**Configure and run HS exit TCLK POSTValue.**

1. In the Select panel, select the Device.

2. Select the Clock Mode as **Normal** .

---

**NOTE.** *The HS Exit 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 **Base Spec 1.2**.

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

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

**Table 104: 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)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | +3 to –3<br>–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 105: Analysis parameters for HS Exit: TCLK-POST Value**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

| Parameter | Default | User defined mode |
|-----------|---------|-------------------|
| 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.

**Testing clock rising edge alignment to first payload bit**

**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 **Base Spec 1.2**.

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

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

**Table 106: 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 107: Analysis parameters for Clock Rising Edge Alignment to First Payload Bit**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Clkp | Dp, Dn, Clkp, Clkn |
| 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 |

*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.

**Testing Data-to-Clock skew (TSKEW[TX])**

**Connections for Data-to-Clock skew (TSKEW[TX]).** *Click here* for information on connections for the Data-to-Clock Skew (TSKEW[TX]) test.

**Configure and run Data-to-Clock skew (TSKEW[TX]).**

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 **Base Spec 1.2**.

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

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

**Table 108: 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 109: Analysis parameters for Clock Rising Edge Alignment to First Payload Bit**

| Parameter | Default | User defined mode |
|---|---|---|
| Trigger Type | Transition | Transition |
| Trigger Source | Dp | Dp, Dn, Clkp, Clkn |
| 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 Report As** option. The following screen shows the results for Group 5 tests.

# Group 6 tests

**Connections for Group 6 tests**

*Click here* for information on connections for Group 6 Tests.

**Configure and run Group 6 tests**

1.  In the Select panel, select the Device.

2.  Select the Clock Mode as **Normal**.

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

    **NOTE.** *ULPS Entry, Clock Lane Probing as Single-ended is needed.*

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

5.  The Version default value is Base Spec 1.2.

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

7.  Acquire tab in the Configuration Panel, lists the following parameters. The following table lists the compliance mode values (default), while in user-defined mode, these are under user control for configuration:

**Table 110: Acquire parameters for INIT: LP-TX test initialization period**

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Scale (mV) | 200 | Range: 100, 200, 300 |
| Vertical Position for Data (div) | –2.6 | |
| Vertical Position for Clock (div)<br>Single-ended probing<br>Differential probing | –2.6<br>+2.6 | |
| Vertical Offset (V) | 0 | |
| Horizontal Scale (us) | 32 | Range: 8, 10, 12,16, 32 |
| Sample Rate (GS/s) | 3.125 | Range: 3.125, 7.5 ,10 , 12.5 |
| Record length | 1 M | |

**Table 111: Acquire parameters for ULPS Entry test**

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Scale (mV) | 200 | Range: 100, 200, 300 |
| Vertical Position for Data (div) | –2.6 | |
| Vertical Position for Clock (div) (Single-ended probing ) | –2.6 | |
| Vertical Offset (V) | 0 | |
| Horizontal Scale (us) | 8 | Range: 8, 10, 12 |
| Sample Rate (GS/s) | 12.5 | Range: 7.5 ,10 , 12.5 |
| Record length | 1 M | |

**Table 112: Acquire parameters for ULPS Exit test**

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Scale (mV) | 200 | Range: 100, 200, 300 |
| Vertical Position for Data (div) | –2.6 | |
| Vertical Position for Clock (div) (Single-ended probing ) | –2.6 | |
| Vertical Offset (V) | 0 | |
| Horizontal Scale (us) | 200 | Range: 8, 10, 12, 200 |
| Sample Rate (GS/s) | 3.125 | Range: 3.125, 7.5 ,10 , 12.5 |
| Record length | 6.25 | |

**Table 113: Acquire parameters for Bus Turn Around (BTA) tests**

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Scale (mV) | 200 | Range: 100, 200, 300 |
| Vertical Position for Data (div) | –2.6 | |

| Parameter | Default | User defined mode |
|---|---|---|
| Vertical Position for Clock (div) (Single-ended probing ) | –2.6 | |
| Vertical Offset (V) | 0 | |
| Horizontal Scale (us) | 1.6 | Range: 1.6, 4, 8, 10, 12, 200 |
| Sample Rate (GS/s) | 12.5 | Range: 7.5 ,10 , 12.5 |
| Record length | 200 K | |

8. Click Analyze. View and change the following analysis parameters:

**Table 114: Analyze parameters INIT: LP-TX initialization period**

| Parameter | Default |
| --- | --- |
| Trigger type | Width |
| Trigger Source | Dp |
| Trigger Level (V) | 50% |
| Trigger Polarity | Positive |
| Upper Limit (µs) | 300 |
| Lower Limit (µs) | 25 |
| Trigger Slope | Positive |

**Table 115: Analyze parameters ULPS Entry**

| Parameter | Default |
| --- | --- |
| Trigger type | Edge |
| Trigger Source | Dp |
| Level | 50% |
| Slope | Negative |
| Horizontal Delay Mode | On |
| Ref Point | 50% |
| A Trigger Level | 500 mV |
| Acquisition Delay | 20 ms |

**Table 116: Analyze parameters ULPS Exit**

| Parameter | Default |
| --- | --- |
| Trigger Type | Edge |
| Trigger Source | Dp |
| Level | 50% |
| Slope | Positive |
| Horizontal Trigger Position | 20% |

**Table 117: Analyze parameters Bus Turn Around (BTA) tests**

| Parameter | Default |
| --- | --- |
| Trigger type | Edge |
| Trigger Source | Dp |
| Level | 50% |
| Slope | Negative |

> **NOTE.** *Edge, Width and Transition triggers are available for all tests in user-defined mode.*

9. Click **Limits** to view and change limit parameters and the compare string.

10. Use the Comments section to enter comments, which are added to the Test report.

11. Click **Save** to keep the changes, or click Cancel.

12. Click the Acquire tab to view the acquisition parameters.

13. Select the Data (Dp and Dn) and Clock (Clkp and Clkn) sources.

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

# TekExpress programmatic interface

## About the programmatic interface

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

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.
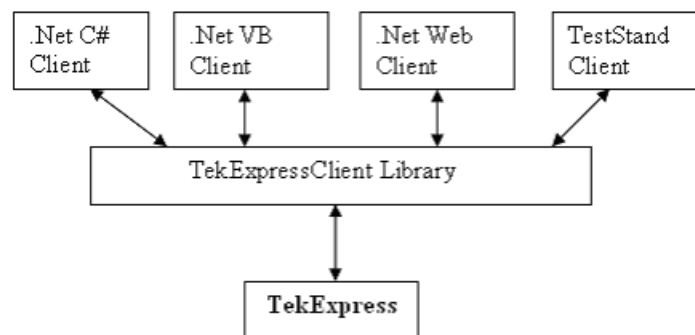


Click the following links to get details on them:

**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.
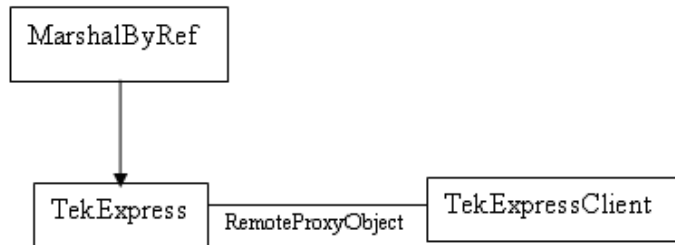


The following is an example:

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

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

For example,

//Get a reference to the remote object

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

**Client proxy object**     Client exposes a proxy object to receive certain information.
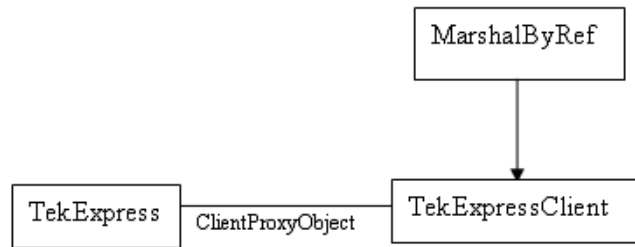


For example,

//Register the client proxy object

WellKnownServiceTypeEntry[] e =
RemotingConfiguration.GetRegisteredWellKnownServiceTypes();

clientInterface = new ClientInterface();

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

//Expose the client proxy object through marshalling

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

The client proxy object is used for the following:

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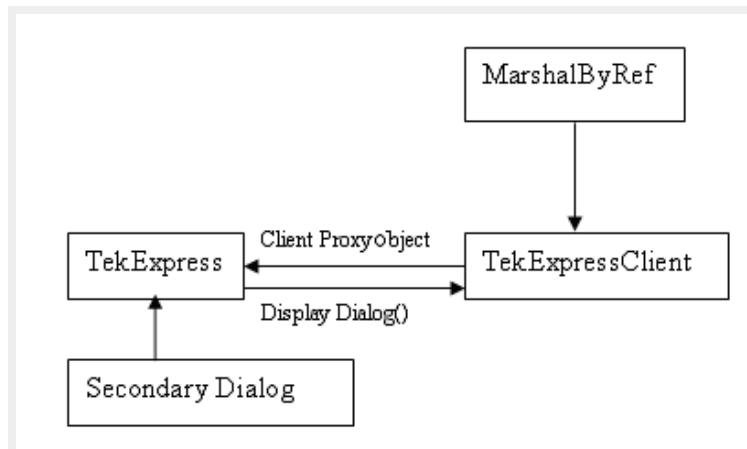
The secondary dialog messages from the Secondary Dialog library are redirected to the client-end when a client is performing the automations at the remote end.

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:
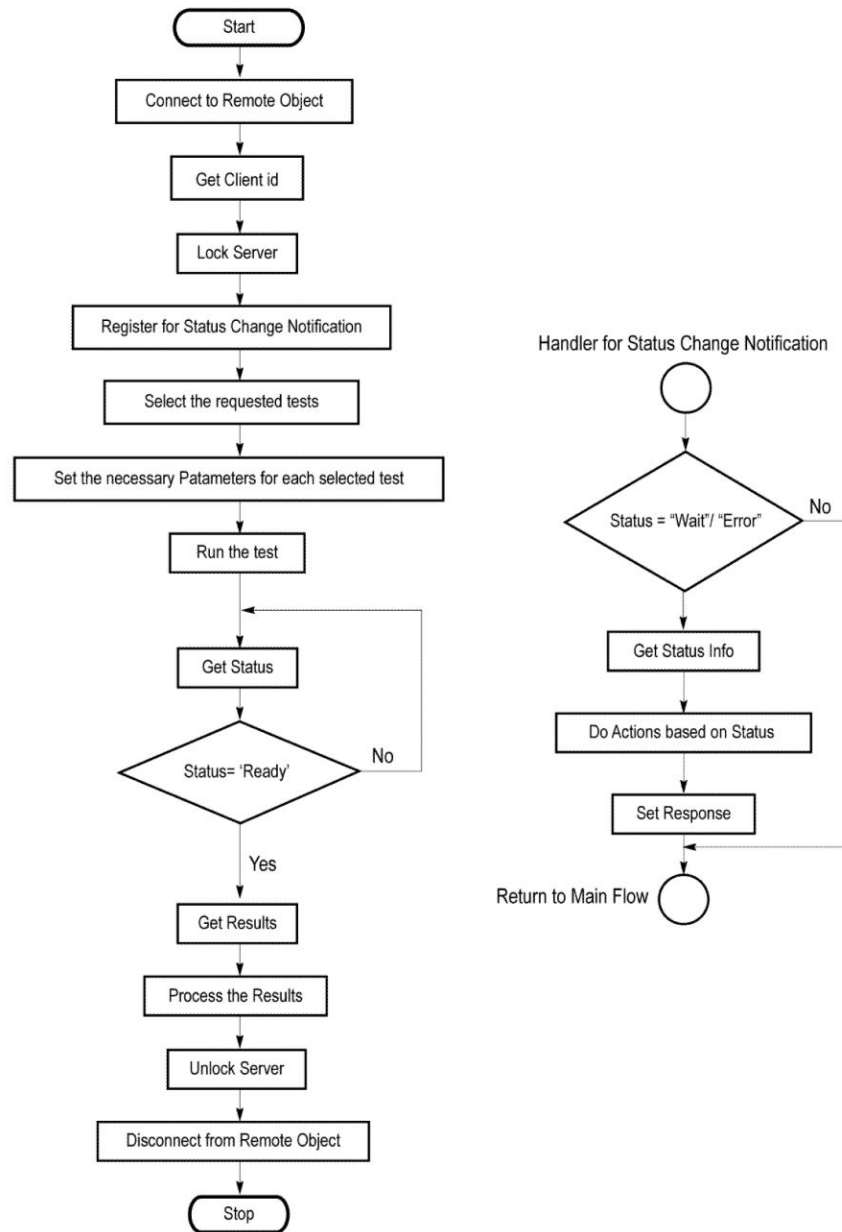
1. Connect to a server or remote object using the programmatic interface provided.

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

*Connect through an IP address*

*Lock the server*

*Disable the popups*

*Set or get the DUT ID*

*Set the configuration parameters for a suite or measurement*

*Query the configuration parameters for a suite or measurement*

*Select a measurement*

*Select a suite*

*Select a channel*

*Configure the selected measurement*

*Run with set configurations or stop the run operation*

*Get or set the timeout value*

*Wait for the measurement to complete*

*After the measurement is complete*

*Save, recall, or check if a session is saved*

*Unlock the server*

*Disconnect from the server*

*Select a lane*

*Assign input signals to scope channels*

*Assign each lane input signal to RF switch ports*

*Enable disable automation of the lane switching with RF switch*

*Handle error codes*

**Connect through an IP address**

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

**string ipAddress**

| Name | Type | Direction | Description |
|---|---|---|---|
| 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.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

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

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

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

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

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

**Lock the server**

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

**out string clientID**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

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

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

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

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

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

**Disable the popups**

| Command name | Parameters | Description | Return Value | Example |
|--------------|-----------|-------------|--------------|---------|
| SetVerboseMode() | string clientID bool _verbose | This method sets the verbose mode to either true or false. When the value is set to true, 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.SetVerboseMode(clientID, true) **Verbose mode is turned off** returnval=m_Client.SetVerboseMode(clientID, false) |

**out string clientID**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**bool_verbose**

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

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

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

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

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

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

**Set or get the DUT ID**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetDutId() | string clientID<br>string dutName | 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<br><br>**NOTE.** *If the dutName parameter is null, the client is prompted to provide a valid DUT ID.* |
| GetDutId() | string clientID<br>string dutId | 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) |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string dutName**

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

**string dutId**

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

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

---

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

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

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

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

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

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TekExpress D-PHY Printable Application Help

**Set the configuration parameters for a suite or measurement**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetGeneralParameter | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | This method sets the number of video lanes for the selected measurement.<br><br>*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.<br>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<br><br>**Select Channel Example**<br><br>returnval=mClient. SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Lane5 Connected to:Data:Dn$CH1")<br><br>Select Measurement Method<br><br>**Select Measurement Method Example**<br><br>returnval=mClient. SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measurement Method $Automatic") |
| SetAnalyzeParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | 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 |

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetAcquireParameter() | string clientID string device string suite string test string parameterString | This method sets the configuration parameters in the Acquire panel of the Configuration Panel dialog box for a given suite or measurement. | returnVal = remoteObject.Set AcquireParameter( id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUC CESS) return CommandFailed(r eturnVal) | Configure Acquire Parameters for Data Lane Rise Time |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

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

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

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

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

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

**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") |

| Parameter | Example |
|---|---|
| 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 |
|---|---|---|---|---|
| GetGeneralParameter() | string clientID string device string suite string test string parameterString | 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 |
| | | | | **Query Channel Example** |
| | | | | returnval=mClient. GetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Lane5 Connected to:Data:Dn") |
| | | | | Query Measurement Method |
| | | | | **Query Measurement Method Example** |
| | | | | returnval=mClient. GetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measurement Method") |
| GetAnalyzeParameter() | string clientID string device string suite string test string parameterString | This method gets the configuration parameters set in the Analyze panel of the Configuration Panel dialog box for a 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 |
| GetAcquireParameter() | string clientID string device string suite string test string parameterString | 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 |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

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

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

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

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

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

**Query 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)") |

| Parameter | Example |
|---|---|
| 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 string device string suite string test bool isSelected | 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) |

**out string clientID**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| device | string | IN | Specifies the name of the device. |

**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. |

**bool isSelected**

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

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

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

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

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

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

**Select a suite**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SelectSuitet() | string clientID<br>string device<br>string suite<br>bool isSelected | This method selects or deselects a given suite.<br>Setting parameter isSelected to true, you can select a suite.<br>Setting parameter isSelected to false, you can deselect a suite. | String that gives the status of the operation after it has been performed.<br>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<br>**Select Suite (Default):**<br>returnval=m_Client.SelectTest(clientID, "D-PHY", "Transmitter", true) |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**string suite**

| Name | Type | Direction | Description |
|---|---|---|---|
| suite | string | IN | Specifies the name of the suite. |

**bool isSelected**

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

---

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

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

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

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

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

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**Select a channel**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetGeneralParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | This method sets the parameters that are not specific to any given test.<br><br>*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 Select Measurement Method |
| SetAnalyzeParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | 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 |
| SetAcquireParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | This method sets the configuration parameters in the Acquire panel of the Configuration Panel dialog box for a given suite or measurement. | returnVal = remoteObject.Set AcquireParameter( id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUC CESS) return CommandFailed(r eturnVal) | Configure Acquire Parameters for Data Lane Rise Time |

**out string clientID**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| device | string | IN | Specifies the name of the device. |

**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. |

**Select Channel Example**

returnval=mClient.SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Lane5 Connected to:Data:Dn$CH1")

**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") |

| Parameter | Example |
|---|---|
| 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") |

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

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

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

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

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

**Configure the selected measurement**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetAnalyzeParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | 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 |
| SetAcquireParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | 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 |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

**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") |

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

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

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

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

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

**Run with set configurations or stop the run operation**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| Run() | string clientID | Runs the selected tests. Note<br><br>***NOTE.*** *When the run is performed, the status of the run is updated periodically using a timer.*<br><br>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 | Stops the currently running tests. Note<br><br>***NOTE.*** *When the session is stopped, the client is prompted to stop the session and is stopped at the consent.* | String that gives the status of the operation after it has been performed. The return value is "Stopped..." on success. | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Stop(clientID) |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

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

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

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

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

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

**Get or set the timeout value**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| GetTimeOut() | string clientID | Returns the current timeout period set by the client. | String that gives the status of the operation after it has been performed. The default return value is 1800000. | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.GetTimeOut() |
| SetTimeOut() | string clientID string time | Sets a timeout period specified by 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.SetTimeOut(clientID, desiredTimeOut) |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string 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.

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

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

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

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

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

**Wait for the test to complete**

The commands in this group 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 | This method gets the status of the server application. The states at a given time are Ready, Running, Paused, Wait, or Error.<br><br>Ready: Test configured and ready to start.<br><br>Running: Test running.<br><br>Paused: Test paused.<br><br>Wait: A popup that needs your inputs.<br><br>Error: An error is occurred. | String value that gives the status of the server application. | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.ApplicationStatus(clientID) |
| QueryStatus() | string clientID<br>out string[] status | 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.<br>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) |

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| GetCurrentStateInfo()<br><br>*NOTE. This command is used when the application is running and is in the wait or error state.* | string clientID<br>out string caption<br>out string message<br>out string[] buttonTexts | 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.<br>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()<br><br>*NOTE. This command is used when the application is running and is in the wait or error state.* | string clientID<br>out string caption<br>out string message<br>string response | 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) |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**out string[] status**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| status | string array | OUT | The list of status messages generated during run. |

**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). |

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

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

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

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

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

**After the test is complete**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| GetPassFailStatus() | string clientID<br>string device<br>string suite<br>string test | This method gets the pass or fail status of the measurement after test completion.<br><br>*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<br>string device<br>string suite<br>string test<br>string parameterString | This method gets the result values of the measurement after the run. | String that gives the status of the operation after it has been performed. Returns the result value in the form of a string. | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as srting returnval=m_Client.GetResultsValue(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measured Value") |

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| GetResultsValueForSubMeasurements() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString<br>int rowNr | This method gets the result values for individual sub-measurements, after the run. | String that gives the status of the operation after it has been performed. Returns the result value in the form of a string. | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string **Data Lane Rise Time DP (nS)** returnval=m_Client.GetResultsValueForSubMeasurements(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.GetResultsValueForSubMeasurements(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "Measured Value", 1) //For DN wfm |

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| GetReportParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | 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<br>**Oscilloscope Model**<br>returnval=m_Client.GetReportParameter(clientID,"Scope Model")<br>**TekExpress Version**<br>returnval=m_Client.GetReportParameter(clientID,"TekExpress Version")<br>**D-PHY Version**<br>returnval=m_Client.GetReportParameter(clientID,"Application Version") |
| TransferReport() | string clientID<br>string filePath | This method transfers the report generated after the run. The report contains the summary of the run. The client must provide the location where the report is to be saved at the client-end. | String that gives the status of the operation after it has been performed. Transfers all the result values in the form of a string. | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.TransferReport(clientID,"C:\Report") |

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| TransferWaveforms() | string clientID string filePath | This method transfers all the waveforms from the folder for the current run.<br><br>*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 string filePath | This method transfers all the images (screenshots) from the folder for the current run (for a given suite or measurement).<br><br>*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") |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

**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.*

**string parameterString**

| Name | Type | Direction | Description |
|------|------|-----------|-------------|
| parameterString | string | IN | Specifies the oscilloscope model, TekExpress version, and D-PHY version. |

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

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

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

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

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

**Save, recall, or check if a session is saved**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| CheckSessionSaved() | string clientID<br>out bool saved | 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.CheckSessionSaved(m_clientID, out savedStatus) |
| RecallSession() | string clientID<br>string name | 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.<br>The return value is "Session Recalled...". | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.RecallSession(clientID, savedSessionName) |
| SaveSession() | string clientID<br>string name | 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.<br>The return value is "Session Saved..."/"Failed...". | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.SaveSession(clientID, desiredSessionName) |
| SaveSessionAs() | string clientID<br>string name | 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.<br>The return value is "Session Saved...". | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.SaveSessionAs(clientID, desiredSessionName) |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string name**

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

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

**out bool saved**

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

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

---

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

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

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

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

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

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**Unlock the server**

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

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

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

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

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

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

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

**Disconnect from the server**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| Disconnect() | string clientID | This method disconnects the client from the server it is connected to. Note<br><br>*NOTE. When the client is disconnected, it is unlocked from the server and then disconnected. The id is reused.* | Integer value that gives the status of the operation after it has been performed.<br>1 for Success<br>−1 for Failure | m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string returnval=m_Client.Disconnect(m_clientID) |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

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

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

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

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

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

**Select a lane**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetGeneralParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | This method sets the parameters that are not specific to any given test.<br>Note. Using this command you can select a lane, channel, or source type. | String that gives the status of the operation after it has been performed.<br>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/Deselect a Lane<br>Deselect a Lane |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

*NOTE. To select Lane 1, the parameterString is "Lane1:Lane 1$Included", To deselect it – "Lane1:Lane 1$Excluded"*

*To select Lane 2, the parameterString is "Lane2:Lane 1$Included", To deselect it – "Lane2:Lane 1$Excluded"*

*To select Lane 3, the parameterString is "Lane3:Lane 1$Included", To deselect it – "Lane3:Lane 1$Excluded"*

*To select Lane 4, the parameterString is "Lane4:Lane 1$Included", To deselect it – "Lane4:Lane 1$Excluded"*

*Example:returnval=mClient.SetGeneralParameter(clientID,"D-PHY","Transmitter", "1.1.3 Data Lane Rise Time", "Lane1:Lane 1$Included")*

**Assign input signals to scope channels**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetGeneralParameter() | string clientID string device string suite string test string parameterString | This method sets the parameters that are not specific to any given test. Note. Using this command you 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 Assign input signals to scope channels |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

*NOTE. To assign the Dp signal to Channel 1, the parameterString is "Lane5 Connected to:Data:Dn$CH1"*

*To assign the Dp signal to Channel 1, the parameterString is "Lane6 Connected to:Data:Dn$CH1"*

*To assign the Clkpp signal to Channel 1, the parameterString is "Lane7 Connected to:Clock:Clkp$CH1"*

*To assign the Clknn signal to Channel 1, the parameterString is "Lane8 Connected to:Clock:Clkn$CH1"*

*To assign the Clkp-Clkn signal to channel 1 if a differential probe is used for the clock signals, the parameterStrign is "Lane9 Connected to:Clkp-clkn$CH1"*

*You can assign the signal to CH1, CH2, CH3, or CH4. These values must replace the text after the '$' symbol in parameterString.*

*Example:returnval=mClient.SetGeneralParameter(clientID,"D-PHY","Transmitter", "1.1.3 Data Lane Rise Time", "Lane5 Connected to:Data:Dn$CH1")*

**Assign each lane input signal to RF switch ports**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetGeneralParameter() | string clientID<br>string device<br>string suite<br>string test<br>string parameterString | This method sets the parameters that are not specific to any given test. Note. Using this command you 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 Assign data lane input signals to RF switch ports Assign clock lane input signals to RF switch ports |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server.<br>clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

---

**NOTE.** *To assign the data lane input signals to RF switch ports*

*To assign each lane's DP/DN signals to ports, parameterString format is "<LaneName> <DataSignalName> Connected to$<PortName>"*

*<LaneName> can have one of the following values — Lane1, Lane2, Lane3, or Lane4*

*DataSignalName> can have one of the following values — DP or DN*

*PortName> can have one of the following vallues — Port 1, Port 2, Port 3, or Port 4*

*For example,;*

*To assign Lane 1 DP signal to Port 1, the parameterString is "Lane1 DP Connected to$Port 1"*

*Example:returnval=mClient.SetGeneralParameter(clientID,"D-PHY","Transmitter", "1.1.3 Data Lane Rise Time", "Lane1 DP Connected to $Port 1")*

*To assign clock lane input signals to RF switch ports*

*To Assign CP/CN signal to ports, parameterString format is "<ClockSignalName> Connected to$<PortName>"*

*<ClockSignalName> can have one of the following values — CP or CN*

*<PortName> can have one of the following values — Port 1, Port 2, Port3, or Port 4*

*For example:*

*To assign CP signal to Port 1, the parameterString is "CP Connected to$Port1"*

*Example:*

*retrunval=mClient.SetGeneralParameter(clientID, "D-PHY", "Transmitter", "1.1.3 Data Lane Rise Time", "CP Connected to$Port 1")*

---

TekExpress D-PHY Printable Application Help

**Enable-Disable automation of the lane switching with RF switch**

| Command name | Parameters | Description | Return Value | Example |
|---|---|---|---|---|
| SetGeneralParameter() | string clientID string device string suite string test string parameterString | This method sets the parameters that are not specific to any given test. Note. Using this command you 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 Enable/Disable automation of htte lane switching with an RF switch |

**out string clientID**

| Name | Type | Direction | Description |
|---|---|---|---|
| clientid | String | OUT | Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065–192.157.98.70 |

**string device**

| Name | Type | Direction | Description |
|---|---|---|---|
| device | string | IN | Specifies the name of the device. |

**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. |

---

**NOTE.** *To enable the automation of lane switching, the parameterString is "Automate with RF Switch$True"*

*To disable the automation of lane switching, the parameterString is "Automate with RF Switch$False"*

*Example:returnval=mClient.SetGeneralParameter(clientID,"D-PHY","Transmitter", "1.1.3 Data Lane Rise Time", "Automate with RF Switch $True")*

---

**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
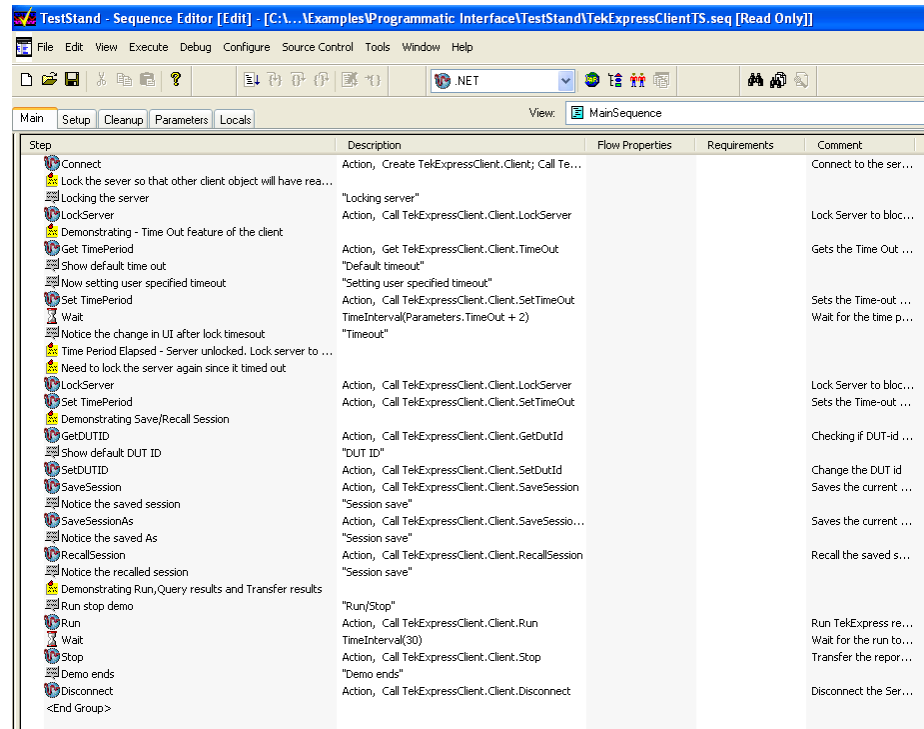
# Reference

## Algorithms

**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:

  - To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

  - 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
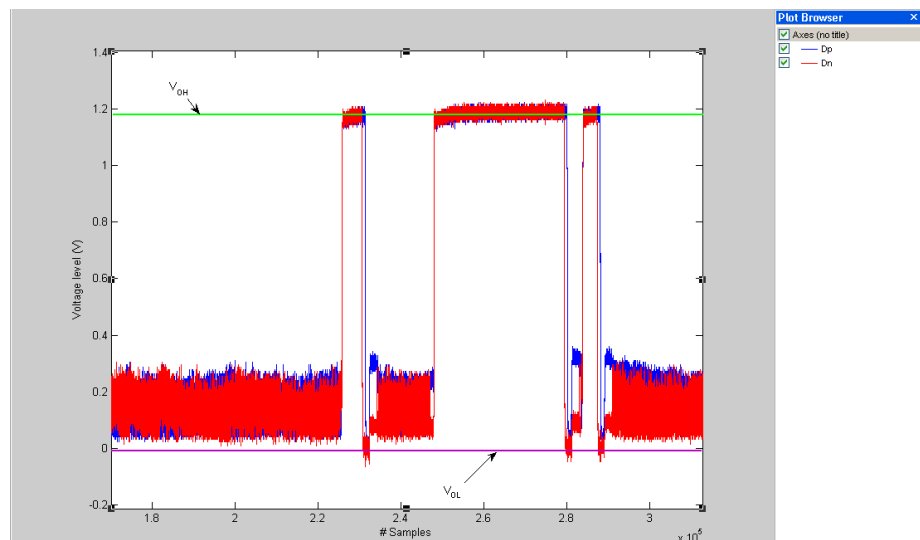
**Test 1.1.2 Data Lane LP-TX Thevenin Output Low Level Voltage (VOL).** Data Lane LP-TX Thevenin Output Low Level Voltage is calculated using the following algorithm:

- Acquire the Dp and Dn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on the oscilloscope.

- Using post processing:

  - To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

  - Traverse the Dp waveform and find the LP signaling sequence.

  - In the LP sequence region, find the absolute peak-to-peak value. $V_{OL}$ 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:

■   To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

■   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
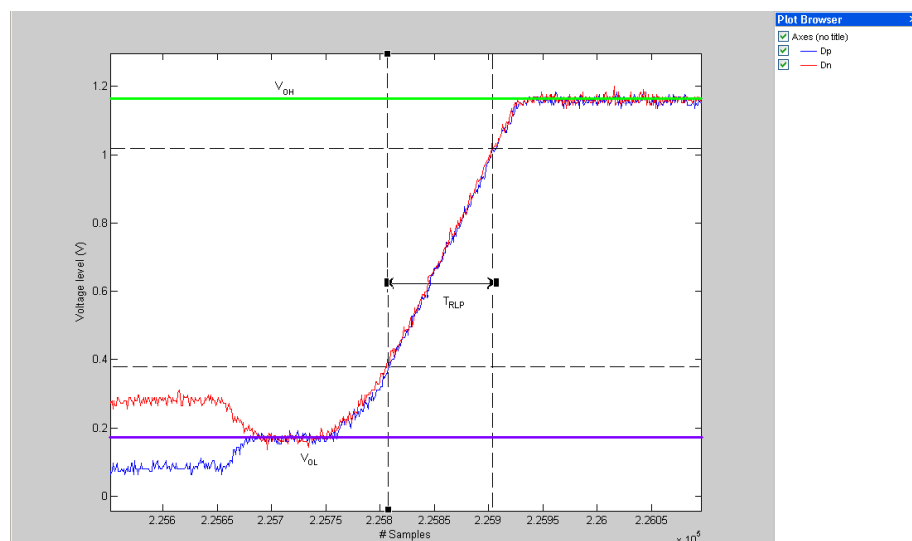
**Test 1.1.4 Data Lane Fall Time.** Data Lane Fall Time is calculated using the following algorithm:

■   Acquire the Dp and Dn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on oscilloscope.

■   Using post processing:

   ■   To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

   ■   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
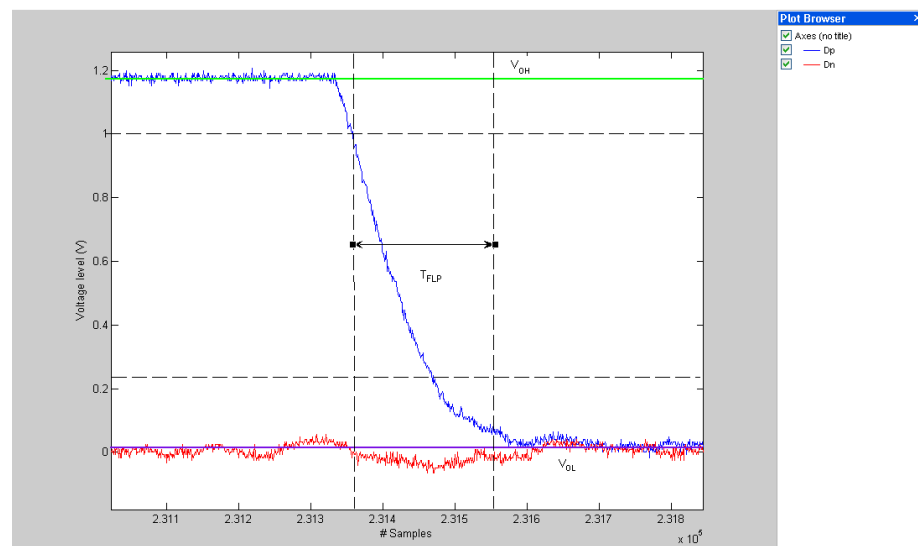
**Test 1.1.5 Data Lane LP-TX Slew Rate Versus CLOAD (ōV/ōtSR).** Data Lane LP-TX Slew Rate Versus CLOAD is calculated using the following algorithm:

- Acquire the Dp and Dn waveforms by setting the transition trigger from LP to HS mode (LP11-10) on oscilloscope.

- Using post processing:

  - To reduce measurement noise, a 400-MHz, 4th-order Butterworth lowpass test filter is applied to the source waveform.

  - Determine the max and min for the Dp and Dn waveforms.

  - Find all the falling edges in the Dp waveform.

  - Find the slew rate for each falling edge of Dp from maxDp to minDp with a vertical window of 50 mV.

  - Find the maximum slew rate, maxSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Dp.

  - Find the mean of maxSR(i), where maxFallSRDp=mean(maxSR(i)).

  - Find all the falling edges in the Dn waveform.

  - Find the slew rate for each falling edge of Dn from maxDn to minDn with a vertical window of 50 mV.

  - Find the maximum slew rate, maxSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Dn.

  - Find the mean of maxSR(i), where maxFallSRDn = mean(maxSR(i)).

  - Find all the falling edges in the Dp waveform.

  - Find the slew rate for each falling edge of Dp from 0.93 V to 0.4 V with a vertical window of 50 mV.

  - Find the minimum slew rate, minSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Dp.

  - Find the mean of minSR(i), where minFallSRDp = mean(minSR(i)).

  - Find all the falling edges in the Dn waveform.

  - Find the slew rate for each falling edge of Dn from 0.93 V to 0.4 V with a vertical window of 50 mV.

  - Find the minimum slew rate, minSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Dn.

  - Find the mean of minSR(i), where minFallSRDn = mean(minSR(i)).

  - Find the rising edges of Dp.

  - Find the slew rate for each rising edge of Dp from minDp to maxDp with a vertical window of 50 mV.

  - Find the maximum slew rate, maxSR(i), where i represents the rising edge number. Repeat this step for each rising edge of Dp.

  - Find the mean of maxSR(i), where maxRiseSRDp = mean(maxSR(i)).

  - Find all the rising edges in the Dn waveform.

  - Find the slew rate for each rising edge of Dn from minDn to maxDn with a vertical window of 50 mV.

- Find the maximum slew rate, maxSR(i), where i represents the rising edge number. Repeat this step for each rising edge of Dn.

- Find the mean of maxSR(i), where maxRiseSRDn = mean(maxSR(i)).

- Find all the rising edges in the Dp waveform.

- Find the slew rate for each rising edge of Dp from 0.4 V to 0.7 V with a vertical window of 50 mV.

- Find the minimum slew rate, minSR(i), where i represents the rising edge number. Repeat this step for each rising edge of Dp.

- Find the mean of minSR(i), where minRiseSRDp = mean(minSR(i)).

- Find all the rising edges in the Dn waveform.

- Find the slew rate for each rising edge of Dn from 0.4 V to 0.7 V with a vertical window of 50 mV.

- Find the minimum slew rate, minSR(i), where i represents the rising edge number. Repeat this step for each falling edge of Dn.

- Find the mean of minSR(i), where minRiseSRDn = mean(minSR(i)).

- Find all the rising edges in the Dp waveform.

- Find the slew rate for each rising edge of Dp from 0.7 V to 0.93 V with a vertical window of 50 mV.

- Find the minimum slew rate margin, minSRMargin(i), where i represents the rising edge number. Repeat this step for each rising edge of Dp.

- Find the mean of minSRMargin(i), where minRiseSRMarginDp = mean(minSRMargin(i)).

- Find all the rising edges in the Dn waveform.

- Find the slew rate for each rising edge of Dn from 0.7 V to 0.93 V with a vertical window of 50 mV.

- Find the minimum slew rate margin, minSRMargin(i), where i represents the rising edge number. Repeat this step for each rising edge of Dn.

- Find the mean of minSRMargin(i), where minRiseSRMarginDn = mean(minSRMargin(i)).

where,

Dp – Data positive waveform

Dn – Data negative waveform

**Test 1.1.6 Data Lane LP-TX Pulse Width of Exclusive-OR Clock (TLP-PULSE-TX).**
Data Lane LP-TX Pulse Width of Exclusive-OR Clock 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:

  - To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

  - Find edges (edge positions) of Dp and Dn(MREF = 0.93/0.5 V and HYSTREF = 0.05 V).

  - Quantize (2-level, 1 and 0) Dp and Dn with all points between a rising edge and a falling edge set to 1 and all points between a falling edge and rising edge set to 0. Bit XOR the quantized Dp and Dn to get the low power clock.

  - Find edges (edge positions) of the low power clock (MPCT = 50%, HYSTPCT = 0%). Filter out transients (due to noise) in the set of computed edge positions.

  - Find the positive pulse width (between rising and falling edges).

  - Find the minimum of all pulse widths excluding first and last pulse with.

  where,

  Dp – Data positive waveform

  Dn – Data negative waveform

**Test 1.1.7 Data Lane LP-TX Period of Exclusive-OR Clock (TLP-PER-TX).** Data Lane LP-TX Period of Exclusive-OR Clock 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:

   ■ To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

   ■ Find the edges (edge positions) of Dp and Dn (MREF = 0.93/0.5 V and HYSTREF = 0.05 V).

   ■ Quantize (2-level, 1 and 0) Dp and Dn with all points between a rising edge and a falling edge set to 1 and all points between a falling edge and rising edge set to 0. Bit XOR the quantized Dp and Dn to get the low power clock.

   ■ Find edges (edge positions) of the low power clock. Filter out transients (due to noise) in the set of computed edge positions.

   ■ Find the rise to rise period (between two rising edges).

   ■ Find the minimum of all pulse widths excluding first and last pulse with.

   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:

   ■ To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

   ■ 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:

   ■ To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

   ■ 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:

   ■ To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

   ■ 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:

    - To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

    - 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

**Test 1.2.5 Clock Lane LP-TX Slew Rate Versus CLOAD (ōV/ōtSR).** Clock Lane LP-TX Slew Rate Versus CLOAD 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:

  - To reduce measurement noise, a 400 MHz, 4th order Butterworth lowpass test filter is applied to the source waveform.

  - Find the maximum and minimum of the Cp and Cn waveforms.

  - Find the falling edges of Cp.

  - Find the slew rate for each falling edge of Cp from maxCp to MinCp with the vertical window at 50 mV.

  - Find the maximum slew rate, maxSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Cp.

  - Find the mean of maxSR(i), where maxFallSRCp = mean(maxSR(i)).

  - Find the falling edges of Cn.

  - Find the slew rate for each falling edge of Cn from maxCn to MinCn with the vertical window at 50 mV.

  - Find the maximum slew rate, maxSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Cn.

  - Find the mean of maxSR(i), where maxFallSRCn = mean(maxSR(i)).

  - Find the falling edges of Cp.

  - Find the slew rate for each falling edge of Cp from 0.93 V to 0.4 V with the vertical window at 50 mV.

  - Find the minimum slew rate, minSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Cp.

  - Find the mean of minSR(i), where maxFallSRCp = mean(minSR(i)).

  - Find the falling edges of Cn.

  - Find the slew rate for each falling edge of Cn from 0.93 V to 0.4 V with the vertical window at 50 mV.

  - Find the minimum slew rate, minSR(i), where i represents the falling edge number. Repeat this step for each falling edge of Cn.

  - Find the mean of minSR(i), where minFallSRCn = mean(minSR(i)).

  - Find the rising edges of Cp.

  - Find the slew rate for each rising edge of Cp from minCp to MaxCp with the vertical window at 50 mV.

  - Find the maximum slew rate, maxSR(i), where i represents the rising edge number. Repeat this step for each rising edge of Cp.

  - Find the mean of maxSR(i), where maxRiseSRCp = mean(maxSR(i)).

  - Find the rising edges of Cn.

  - Find the slew rate for each rising edge of Cn from minCn to MaxCn with the vertical window at 50 mV.

- Find the maximum slew rate, maxSR(i), where i represents the rising edge number. Repeat this step for each rising edge of Cn.

- Find the mean of maxSR(i), where maxRiseSRCn = mean(maxSR(i)).

- Find the rising edges of Cp.

- Find the slew rate for each rising edge of Cp from 0.4 V to 0.7 V with the vertical window at 50 mV.

- Find the minimum slew rate, minSR(i), where i represents the rising edge number. Repeat this step for each rising edge of Cp.

- Find the mean of minSR(i), where minRiseSRCp = mean(minSR(i)).

- Find the rising edges of Cn.

- Find the slew rate for each rising edge of Cn from 0.4 V to 0.7 V with the vertical window at 50 mV.

- Find the minimum slew rate, minSR(i), where i represents the rising edge number. Repeat this step for each rising edge of Cn.

- Find the mean of minSR(i), where minRiseSRCn = mean(minSR(i)).

- Find the rising edges of Cp.

- Find the slew rate for each rising edge of Cp from 0.7 V to 0.93 V with the vertical window at 50 mV.

- Find the minimum slew rate margin, minSRMargin(i), where i represents the rising edge number. Repeat this step for each rising edge of Cp.

- Find the mean of minSRMargin(i), where minRiseSRMarginCp = mean(minSR(i)).

- Find the rising edges of Cn.

- Find the slew rate for each rising edge of Cn from 0.7 V to 0.93 V with the vertical window at 50 mV.

- Find the minimum slew rate margin, minSRMargin(i), where i represents the rising edge number. Repeat this step for each rising edge of Cn.

- Find the mean of minSRMargin(i), where minRiseSRMarginCn = mean(minSR(i)).

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
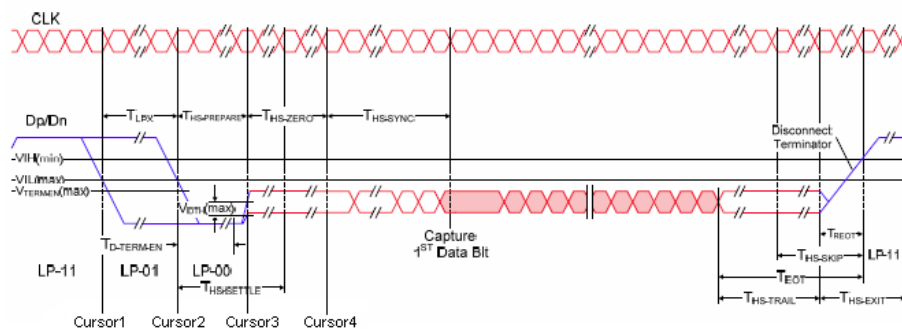
**Test 1.3.2 Data Lane HS Entry: THS-PREPARE Value.** Data Lane THS-PREPARE Value is calculated using the following algorithm:

■ 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 $T_{HS-PREPARE}$.

where,

Dp – Data positive waveform

Dn – Data negative waveform

Cp – Clock positive waveform

Cn – Clock negative waveform
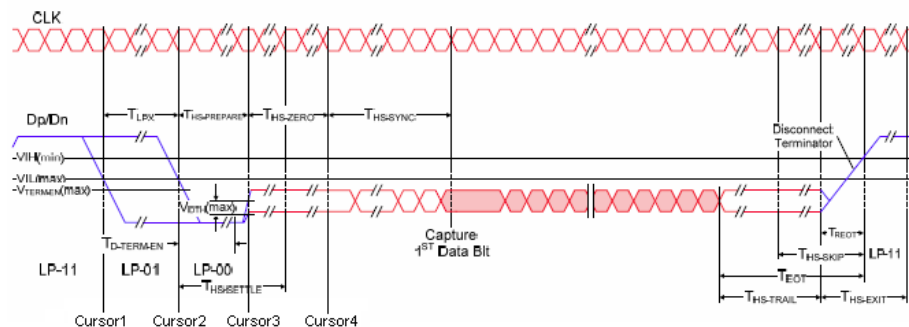
**Test 1.3.3 Data Lane HS Entry: THS-PREPARE + THS-ZERO Value.** Data Lane THS-PREPARE + THS-ZERO Value is calculated using the following algorithm:

- 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
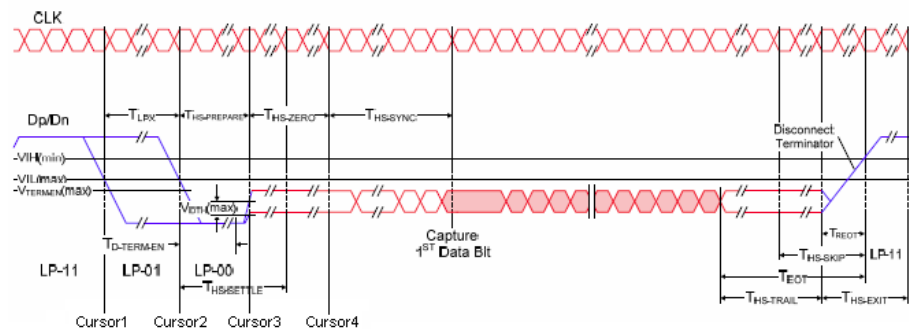
**Test 1.3.4 Data Lane HS-TX Differential Voltages (VOD(0), VOD(1)).** Data Lane HS-TX Differential Voltages (VOD(0), VOD(1)) is calculated using the following algorithm:

---

**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, Clock Lane signals Cp and Cn, and the sampling rate of the waveform.
- Identify all the HS regions in the input clock waveforms 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 011111 pattern on Dp and Dn to measure VOHHS(Dp) and VOHHS(Dn) respectively (11111 is a region with about 5 UI interval length).
- Calculate VOHHS(Dp) and VOHHS(Dn) as the measured mean of all voltage samples between the centers of the 4th and 5th 1 bit respectively.
- Average VOHHS(Dp) and VOHHS(Dn) across all instances of the pattern.

where,

Dp – Data positive waveform

Dn – Data negative waveform

Cp – Clock positive waveform

Cn – Clock negative waveform

**Test 1.3.7 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 ($\Delta VCMTX(1,0)$) 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, $V_{peak} = \max (V_{max}, abs(V_{min}))$

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.

**Test 1.3.15 Data Lane HS Exit: TEOT Value.** Data Lane HS Exit: TEOT Value is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn.
- Acquire Clock Lane signals Cp and Cn.
- Identify the HS regions in the input clock waveform and estimate the UI.
- Find the Ths-Trail as in Test 1.3.13.
- Find Treot as in Test 1.3.14.
- Compute Treot as $T_{EOT}$ = Ths-Trail + Treot..

**Test 1.3.16 Data Lane HS Exit: THS-EXIT Value.** Data Lane HS Exit: THS-EXIT Value is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Dn.
- Identify the LP regions using input data waveform.
- Mark the beginning of every LP region (corresponds to the end of Ths-Trail) as the Start cursor.
- Mark the End cursor at the point where the Dp or Dn (whichever is first) falling edge goes below 550 mV.
- Compute Ths-Exit as, $T_{HS-EXIT}$ = End cursor – Start cursor.

**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.

■ $T_{CLK-PREPARE}$ = 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.

■ $T_{CLK-PREPARE}$ + $TC_{LK-ZERO}$ = (Cursor2 – 3*UI – $T_{CLK-PREPARE}$ 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

- $\Delta V_{OD}$ 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 sampling rate.

- Identify all the HS regions in the input clock waveform and estimate the UI.

- In the HS regions of the input clock waveforms, identify a 011111 pattern on Cp and Cn to measure VOHHSs(Cp) and VOHHS(Cn) respectively (11111 is a region with about 5 UI interval length).

- Calculate VOHHS(Cp) and VOHHS(Cn) as the measured mean of all voltage samples between the centers of the 4th and 5th 1 bit respectively.

- Averaage VOHHS(Cp) and VOHHS(Cn) across all instances of the pattern.

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 ($\Delta$VCMTX(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 ($\Delta$VCMTX(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 1.4.15 Clock Lane HS Exit: TEOT Value.** Clock Lane HS Exit: TEOT Value is calculated using the following algorithm:

■ Acquire Clock Lane signals Cp and Cn.

■ Estimate the clock UI.

■ Compute Ths-Trail as in Test 1.4.13.

■ Compute Treot as in Test 1.4.14.

■ Compute Teot as, $T_{EOT}$ = Ths-Trail + Treot..

**Test 1.4.16 Clock Lane HS Exit: THS-EXIT Value.** Clock Lane HS Exit: THS-EXIT Value is calculated using the following algorithm:

■ Acquire Clock Lane signals Cp and Cn.

■ Identify the LP regions using input clock waveform.

■ Mark the beginning of every LP region (corresponds to the end of Ths-Trail) as the Start cursor.

■ Mark the End cursor at the point where the Cp or Cn (whichever is first) falling edge goes below 550 mV.

■ Compute Ths-Exit as, $T_{HS-EXIT}$ = End cursor – Start cursor.

**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

**Test 1.4.18 Clock Lane HS Clock Delta UI (ΔUI).** Clock Lane HS Clock Delta UI(ΔUI) 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. Compute 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)

- Take the inverse of all the UI values computed which is nothing but the array of frequencies.

- Now apply a double-pole (second order) Butterworth lowpass filter with a -3dB cutoff frequency of 2.0 MHz to filter the UI data to remove the high frequency noise/error components.

- The resulting waveform that is produced at the output of the test filter will then be converted to units of percent, to produce the ΔUI values.

- The peak maximum and peak minimum values will be observed, and the one with the greater absolute value will be reported as the result for that burst.

- If multiple bursts are observed, the peak value across all bursts will be reported as the final result.

**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
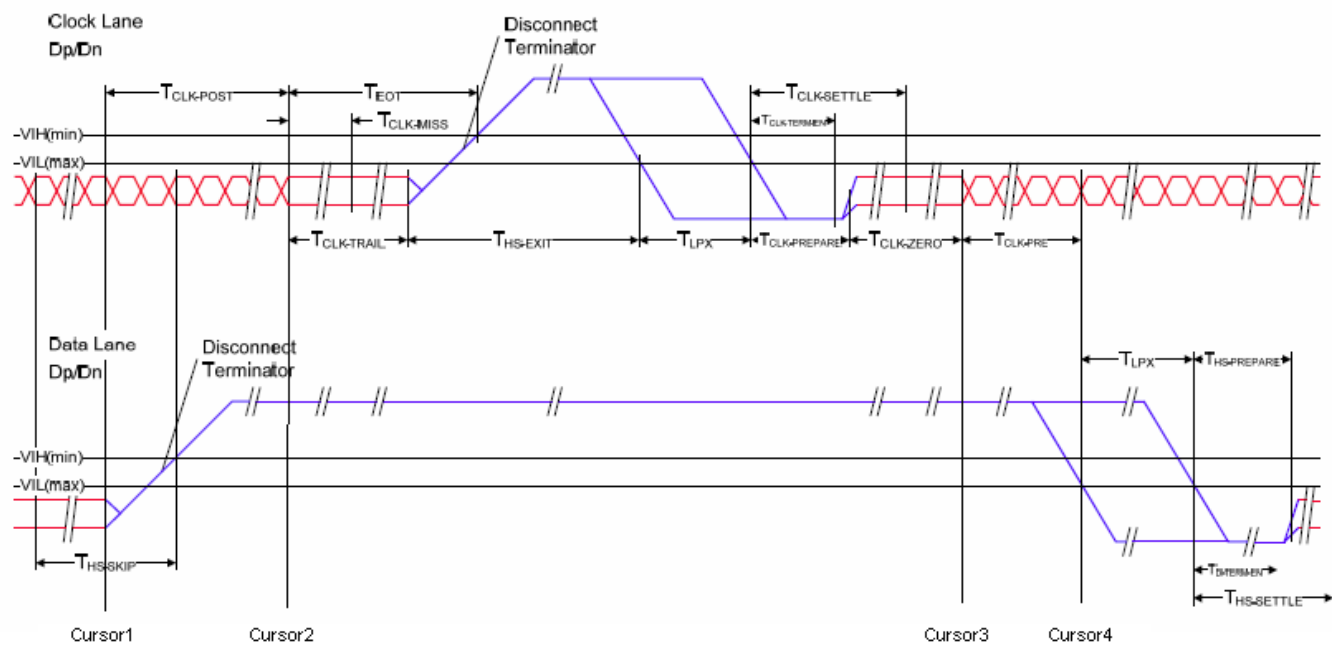
**Test 1.5.2 HS Exit TCLK POSTValue.** HS Exit TCLK POSTValue is calculated using the following algorithm:

- 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 $T_{CLK\text{-}POST}$ as shown in the following figure.

  where,

  Dp – Data positive waveform

  Dn – Data negative waveform

  Cp – Clock positive waveform

  Cn – Clock negative waveform
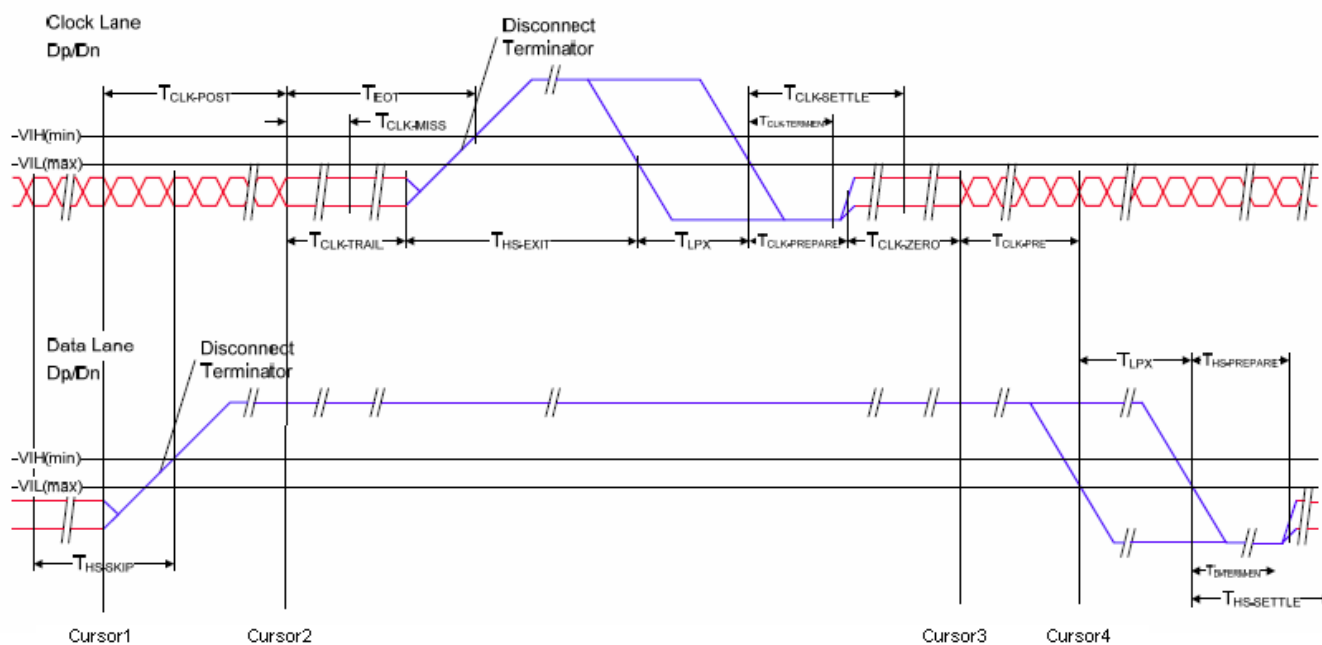
**Test 1.5.3 HS Clock Rising Edge Alignment to First Payload Bit .** HS Clock Rising Edge Alignment to First Payload Bit is determined by visual verification.

**Test 1.5.4 Data-to-Clock Skew (TSKEW[TX}).** Data-to-Clock Skew is calculated using the following algorithm:

- Acquire Data Lane signals Dp and Cn.

- Acquire Clock Lane signals Cp and Cn (if single ended) or CDiff(differential).

- Compute differential data (Dp-Dn) and differential clock (CDiff = Cp-Cn) signal. Determine HS regions of differential data waveform (Dp-Dn).

- Using the HS regions, filter out the HS part in the differential data (Diffdata_HS) and differential clock signal (Diffclk_HS). Determine HS edges present in Diffdata_HS and Diffclk_HS.

- Mark the data edge position as t1. Determine the clock edge which occurs immediately after the data edge. Let the clock edge position be t2. Data to clock skew(i) = (t2 — t1), where I represents the data edge. Do this for each data edge.

- Compute the maximum, minimum, and mean of the data to clock skew.

**Test 1.5.5 Initial HS Skew Calibration Burst (TSKEWCAL-SYNC, TSKEWCAL).** Initial HS Skew Calibration Burst is calculated using the following algorithm:
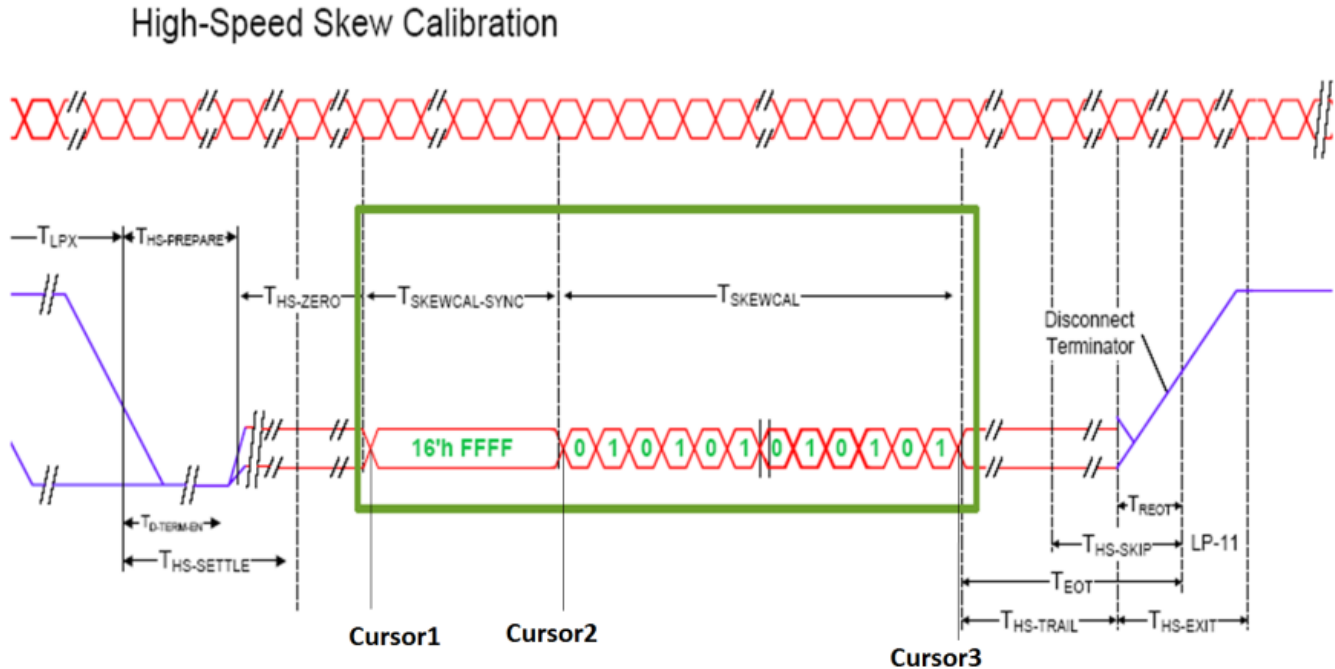


Figure 26 Normal Mode vs Skew Calibration (Zoom-In)

- Acquire Dp and Dn waveform by setting the Transition trigger from LP to HS mode on the oscilloscope.
- Using post processing, traverse the Dp waveform and find the Cursor1, Cursor2 and Cursor3 positions.
- From the HS Signaling subtract the Dp and Dn waveforms to obtain Dp-Dn.
- Take the zero-crossing points of the differential waveform.
- Compute the mean UI value across the entire burst.
- The differential waveform which takes the pattern of 16UI (16 1's pattern) which comes after HS_Exit is measured as the deskew sync pattern (0xFFFF, TSKEWCAL-SYNC)
- Start of 16UI pattern or End of HS Exit is marked as Cursor1.
- End of 16UI pattern is marked as Cursor2.
- After the 16UI pattern ends, compute the clock pattern(01010101….) of minimum duration $2^{15}$ UI(32768 UI)
- End of the $2^{15}$ UI pattern is marked as Cursor3.
- Cursor2 – Cursor1 gives the length of TSKEWCAL-SYNC
- Cursor3 – Cursor2 gives the length of TSKEWCAL
- For all Data Lanes, the value of TSKEWCAL-SYNC will be 16*UI +/- 0.25UI (where UI is the mean UI value from the burst) in order to be

considered conformant. Also, TSKEWCAL will be greater than or equal to 2^15 UI (32768 UI) in order to be considered conformant.

- Compute the TSKEWCAL-SYNC and TSKEWCAL values, as described above.

- Repeat the previous steps for Data Lanes 1, 2, and 3 (if DUT implements multiple Data Lanes).

**Test 1.5.6 Periodic HS Skew Calibration Burst (TSKEWCAL-SYNC, TSKEWCAL).**
Periodic HS Skew Calibration Burst is calculated using the following algorithm:

- Acquire Dp and Dn waveform by setting the Transition trigger from LP to HS mode on the oscilloscope.

- Using post processing, traverse the Dp waveform and find the Cursor1,Cursor2 and Cursor3 positions.

- From the HS Signaling subtract the Dp and Dn waveforms to obtain Dp-Dn.

- Take the zero-crossing points of the differential waveform.

- Compute the mean UI value across the entire burst.

- The differential waveform which takes the pattern of 16UI (16 1's pattern) which comes after HS_Exit is measured as the deskew sync pattern (0xFFFF, TSKEWCAL-SYNC)

- Start of 16UI pattern or End of HS Exit is marked as Cursor1.

- End of 16UI pattern is marked as Cursor2.

- After the 16UI pattern ends, compute the clock pattern(01010101….) of minimum duration 2^12 UI(4096 UI)

- End of the 2^12 UI pattern is marked as Cursor3.

- Cursor2 – Cursor1 gives the length of TSKEWCAL-SYNC

- Cursor3 – Cursor2 gives the length of TSKEWCAL

- For all Data Lanes, the value of TSKEWCAL-SYNC will be 16*UI +/- 0.25UI (where UI is the mean UI value from the burst) in order to be considered conformant. Also, TSKEWCAL will be greater than or equal to 2^12 UI (4096 UI) in order to be considered conformant.

- Compute the TSKEWCAL-SYNC and TSKEWCAL values, as described above.

- Repeat the previous steps for Data Lanes 1, 2, and 3 (if DUT implements multiple Data Lanes).

**Group 6 tests**     **Test 1-6-1 INIT: LP-TX initialization period (TINIT,MASTER).** The Conformance Test Suite (CTS) mentions that TINIT can be a protocol dependent parameter, and generation and controlling it can be implemented in the protocol layer. Therefore this test may not be applicable for all DUTs.

**Test 1-6-2 ULPS entry: Verification of clock lane LP-TX ULPS support.** This test is applicable for clock lane of Master DUTs only. Sometimes it is difficult to capture the ULPS entry sequence, as measuring intervals can be longer than the Scope memory depth. For this reason, 'Horizontal Delay' is used in Trigger.

You may need to use this value in 'User Defined mode' to perform this test after determining the amount of delay need for the trigger for a particular DUT.

**Test 1-6-3 ULPS exit: Transmitted TWAKEUP interval.** Same as in Test 1.6.1.

**Test 1-6-4 BTA: TX-Side TTA-GO interval value.** These tests are semi-automatic as the drive overlap period cannot be reliably determined algorithmically. These tests are informative only.

After the test is complete, the user is prompted to place the cursors appropriately. The application adds the time difference between the cursors to the report.

**Test 1-6-5 BTA: RX-Side TTA-SURE interval value.** Same as in Test 1.6.4.

**Test 1-6-6 BTA: RX-Side TTA-GET interval value.** Same as in Test 1.6.4.

# 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<br>Ctrl + R |
| Print Preview Report | Alt + F + V<br>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 |
| 50009 | Could not find HS Trail |
| 50010 | Could not find TREOT |
| 50011 | Rising edges not found |
| 50012 | Falling edges not found |
| 50013 | TLPX region not found |
| 50014 | THS-Prepare region not found |
| 50015 | THS-Prepare-Zero region not found |
| 50016 | HS-Exit not found |
| 50017 | Proper LP Edges not found |
| 50018 | Clock-Pre region not found |
| 50019 | Clock-Post region not found |
| 50020 | LP-00 region not found |
| 50021 | Skew Cal Sync of Length 16 UI not Found |
| 50022 | Initial Skew Cal Sync of Length 32768 UI not Found |
| 50023 | Period Skew Cal Sync of Length 4096 UI not found |

# 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)<br>Single Ended<br>Differential | <br>–2.6<br>+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 (Dp/Dn) |
| 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)<br>Single Ended<br>Differential | <br>–2.6<br>+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 (Clkp/Clkn) |
| Trigger Upper Level (V)<br>Single Ended<br>Differential | <br>1<br>–0.05 |
| Trigger Lower Level (V)<br>Single Ended<br>Differential | <br>0.05\1<br>–1 |

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| Parameter | Value |
|---|---|
| Trigger Time (pS) | 500 |
| Trigger Transition | Greater Than |
| Trigger Slope<br>Single Ended<br>Differential | Positive<br>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 (Dp/Dn) |
| 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 |
| Vertical Position for Clock (div)<br>Single Ended<br>Differential | –2.6<br>+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 (Clkp/Clkn) |
| Trigger Upper Level (V)<br>Single-Ended<br>Differential | 1<br>–0.05 |

| Parameter | Value |
|---|---|
| Trigger Lower Level (V)<br>Single-Ended<br>Differential | 0.05\1<br>−1 |
| Trigger Time (pS) | 500 |
| Trigger Transition | Greater Than |
| Trigger Slope<br>Single-Ended<br>Differential | Positive<br>Negative |
| Trigger If Violation | Occurs |

Setup for Clock Continuous Mode

| Parameter | Value |
|---|---|
| Vertical Scale (mV) | 200 |
| Vertical Position for Data/Clock (div)<br>Single Ended<br>Differential | −2.6<br>+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 Source (Dp/Dn)/Clock Source (Clkp/Clkn) |
| Trigger Level (V)<br>Single Ended<br>Differential | 200 mV<br>0 V |

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