

TekExpress® SFP+ QSFP+ Tx
Compliance and Debug Solution Software
Printable Online Help



077-0590-04

Tektronix

TekExpress® SFP+ QSFP+ Tx
Compliance and Debug Solution Software
Printable Online Help

Copyright © Tektronix. All rights reserved. Licensed software products are owned by Tektronix or its subsidiaries or suppliers, and are protected by national copyright laws and international treaty provisions.

Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specifications and price change privileges reserved.

TEKTRONIX and TEK are registered trademarks of Tektronix, Inc.

TekExpress is a registered trademark of Tektronix, Inc.

TekExpress SFP+ QSFP+ Tx Compliance and Debug Solution Online Help, 076-0252-04.

Contacting Tektronix

Tektronix, Inc.
14150 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

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

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

Table of Contents

Getting help and support

Related documentation	1
Conventions used in help	1
Technical support	2

Getting started

Installing the software	
Tektronix oscilloscope compatibility	3
Minimum system requirements	4
Install the software	6
Activate the license	6
View version and license information	7
Introduction to the application	
SFP+ QSFP+ Tx application overview	8
Application directories and usage	10
File name extensions	11

Operating basics

Start the application	13
Exit the application	14
Application controls and menus	
Application controls	15
Options menu	15
Email settings	17
Instrument control settings	18
Panels	
About panels	19
Setup panel	19
Status panel	27
Results panel	29
Reports panel	30

Saving and recalling test setups

About test setups	31
Save a test setup	31
Recall a saved test setup	32
Create a new test setup based on an existing one	32

Setting up and configuring tests

About setting up tests	33
Equipment connection setup	36
View connected instruments.....	40
Test setup overview	42
Select device parameters.....	42
Select a test	44
Selecting acquisitions	
About acquisitions	45
Select acquisitions	46
Acquisition parameters.....	46
Use prerecorded waveforms for analysis.....	48
Acquire live waveforms for analysis	49
Configuring tests	
About configuring tests.....	50
Configure tests	52
Common test parameters and values.....	53
Configure email notification	55
Select test notification preferences.....	56
Select report options.....	56

Running tests and viewing results

About running tests.....	59
Before you click start.....	59
Pre-Run checklist.....	61
Run a saved test in prerecorded mode.....	62
View the progress of analysis	63
View test results	64
View a report.....	65
View test-related files	68

TekExpress programmatic interface

About the programmatic interface	69
Requirements for developing TekExpress client	70
To enable remote access	71
Remote proxy object	73
Client proxy object	74
Client programmatic interface example.....	75
Program example	78
SFP+ QSFP+ Tx application commands	
About SFP+ QSFP+ Tx application commands.....	80
Connect through an IP address	86

Lock the server	87
Disable the popups.....	88
Set or get the DUT ID	89
Set the configuration parameters for a suite or measurement	90
Query the configuration parameters for a suite or measurement	92
Select a measurement	93
Select a suite.....	94
Select a channel	95
Configure the selected measurement	97
Run with set configurations or stop the run operation	98
Handle error codes.....	99
Get or set the timeout value.....	100
Wait for the test to complete.....	100
After the test is complete.....	103
Save, recall, or check if a session is saved	106
Unlock the server	107
Disconnect from the server	107

SFP+ QSFP+ Tx tests

Testing procedures and examples

Signal types used by tests	109
Oscilloscope setup	111
Signal validation procedure.....	111

Host tests

SFF-8431 table 11 tests

Single-ended output voltage range	113
Output AC Common-Mode voltage (RMS) (Host)	114

SFF-8431 table 12 tests

Crosstalk source Rise/Fall time (20% - 80%) (Host)	115
Crosstalk source amplitude (p-p differential) (Host).....	116
Signal Rise/Fall time (20% - 80%).....	117
Total jitter (Host).....	119
Data dependent jitter (Host)	121
Data dependent pulse width shrinkage (Host)	123
Uncorrelated jitter (Host)	125
Transmitter Qsq	126
Eye mask hit ratio (Host).....	128

SFF-8431 table 33 tests

Voltage modulation amplitude (p-p)	130
Transmitter Qsq (for Cu)	131
Output AC Common-Mode voltage (RMS) (for Cu)	133
Host output TWDPC	134

Module tests

SFF-8431 table 16 tests

AC Common-Mode voltage tolerance (Module)	135
Single-Ended input voltage tolerance (Module).....	136

SFF-8431 table 17 tests

Crosstalk source Rise/Fall time (20% - 80%) (Module).....	137
Crosstalk source amplitude (p-p differential) (Module)	138
Output AC Common-Mode voltage (RMS) (Module).....	140
Total jitter (Module)	141
Data dependent jitter (Module).....	143
Data dependent pulse width shrinkage (Module).....	145
Uncorrelated jitter (Module).....	147
Eye mask hit ratio (Module)	148

Reference




De-embed using filter files.....	151
Deskew channels	152
Map the My TekExpress folder	153

Index

Related documentation

The following manuals are available as part of the TekExpress SFP+ QSFP+ Tx Compliance and Debug Solution documentation set.

Table 1: Product documentation

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

See also

- [Technical Support \(see page 2\)](#)

Conventions used in help

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.

Technical support

Tektronix values your feedback on our products. To help us serve you better, please send us your suggestions, ideas, or comments on your application or oscilloscope. Contact Tektronix through mail, telephone, or the Web site. See [Contacting Tektronix](#) for more information.

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

Tektronix oscilloscope compatibility

The TekExpress SFP+ QSFP+ Tx application runs on the following Tektronix oscilloscopes:

- DPO/DSA/MSO71604C and DPO/DSA/MSO72004C Series Digital Oscilloscopes
- DPO/DSA72504D and DPO/DSA73304D Series Digital Oscilloscopes
- DPO/MSO72304DX, DPO/MSO72504DX, and DPO/MSO73304DX Series Digital Oscilloscopes

See also

- [Minimum System Requirements \(see page 4\)](#)

Minimum system requirements

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

Table 2: System requirements

Processor	Same as the oscilloscope
Operating System	Same as the oscilloscope (Windows 7, 64-bit only)
Memory	Same as the oscilloscope
Hard Disk	Same as the oscilloscope
Display	Same as the oscilloscope ¹
Firmware	TekScope 7.0.2.4 and later (Windows 7)
Software	<ul style="list-style-type: none"> ■ DPOJET, Jitter and Eye Diagram Analysis Tool, version 6.1.0 or later (64-bit) ■ MathWorks MATLAB Runtime 8.0 ² (Windows 7) ■ IronPython 2.7.3 ■ PyVisa 1.0.0.25 ■ Microsoft .NET 4.0 Framework ■ Microsoft Internet Explorer 6.0 SP1 or later ■ Microsoft Photo Editor 3.0 or equivalent software for viewing image files ■ Adobe Reader 7.0 or equivalent software for viewing portable document format (PDF) files
Other Devices	<ul style="list-style-type: none"> ■ Microsoft compatible mouse or compatible pointing device ■ Four USB ports (two USB ports minimum) ■ PCI-GPIB or equivalent interface for instrument connectivity ³

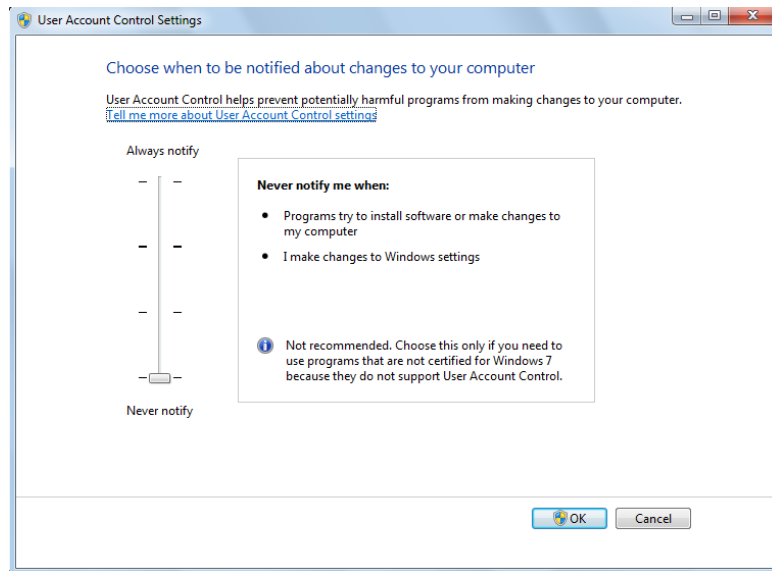
¹ If TekExpress is running on an instrument having a video resolution lower than 800x600 (for example, a sampling oscilloscope), it is recommended that you connect a secondary monitor, which must be enabled before launching the application.

² MatLab Runtime Compiler is required for performing the Host Output TWDPc test. This test is purchase option SFP-WDP.

³ If TekExpress is installed on a Tektronix oscilloscope, TekExpress will use the virtual GPIB port for communicating with oscilloscope applications. If external GPIB communication devices such as USB-GPIB-HS or equivalent are used for instrument connectivity, make sure that the Talker Listener utility is enabled in the GPIB menu of the DPO/DSA oscilloscope. For ease of use, connect to an external (secondary) monitor.

User access control

On Windows 7 instruments set User Access Control settings to Never Notify. To set User Access Control Settings, go to Control Panel > User Accounts > Change User Access control Settings and set it to Never Notify as shown in the image.



See also

- [Compatibility \(see page 3\)](#)

Install the software

The software can be installed on any compatible instrument running Windows 7 (64-bit). See [Minimum System Requirements \(see page 4\)](#) for details.

1. Close all applications.
2. Go to the www.tek.com Web site and search for SFP+ QSFP+ Tx to locate the installation file. Download the file `SFP+QSFP+TxWebinstaller.exe`.
3. Double-click the executable file to extract the installation files.

After extraction, the installer launches and the software automatically installs in the following location:

- Windows 7 location: `C:\Program Files\Tektronix\TekExpress\TekExpress SFP+ QSFP+ Tx`

See also

- [Minimum System Requirements \(see page 4\)](#)
- [Compatibility \(see page 3\)](#)

Activate the license

The SFP+ QSFP+ Tx application runs in Evaluation mode if you do not provide a valid license key. You are allowed 10 free trials in Evaluation mode. Each time you open the application without supplying a valid license key, one of the free trials is used.

An evaluation version of the [Host Output TWDPc test \(see page 134\)](#) is included in the SFP+ QSFP+ Tx installation. You are allowed 10 free trials of this test. Each time you run the test, one of the free trials is used, regardless of how often you open the application. To use this test after the evaluation period, purchase the SFP-WDP option license key.

Activate the license using the Option Installation wizard on the oscilloscope. Instructions for using the Options Installation window to activate licenses for installed applications is provided in the oscilloscope online Help:

1. From the oscilloscope menu bar, click **Utilities > Option Installation**.
The TekScope Option Installation wizard opens.
2. Press the **F1** key on the oscilloscope keyboard to open the Option Installation help topic. Follow the directions in the topic to activate the license.

See also

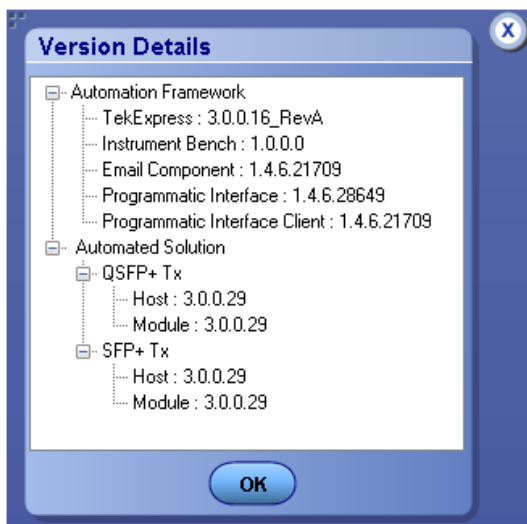
- [View Version and License Information \(see page 7\)](#)

View version and license information

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

To view version information:

1. From the Options menu, select **About TekExpress**.
2. Click the **View Version Details** link to check the version numbers of the installed test suites.



To view license information:

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

The Options section in the dialog box displays a list of installed options, including SFP+ QSFP+ Tx.

2. To view the Option key, look in the Option installation key section.

See also

- [Activate the License \(see page 6\)](#)
- [Options Menu \(see page 15\)](#)

SFP+ QSFP+ Tx application overview

NOTE. *The skew between Data+ and Data- in the signal path from the DUT to the oscilloscope will be computed and compensated before running the measurements.*

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

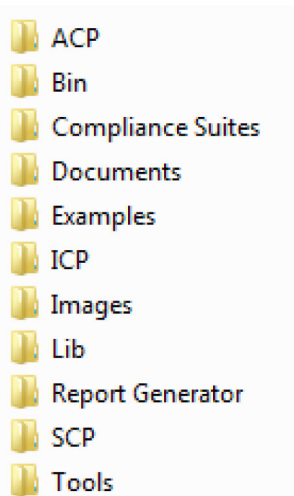
TekExpress SFP+ QSFP+ Tx has the following key features:

- Allows conformance testing to the latest Compliance Test Specification (CTS)
- Reliable Testing:
 - Conformance to SFP+ and QSFP+ interconnect module electrical testing ensures reliable results
 - SFP+ QSFP+ Tx is SFP+ and QSFP+ compliance software
 - Enables execution of the physical-layer (PHY), electrical tests, and SFP+/QSFP+ based electrical measurements
- Automated testing:
 - Minimizes user intervention when conducting time-consuming testing
 - Reduces the time required to conduct testing
- 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
- Quick testing:
 - One-button selection of multiple tests ensures faster testing
 - Test margins and statistical information aid analysis to find answers quickly
 - One-button .mht report saves time

- Complete Solution:
 - Wide range of tests for SFP+/QSFP+ Host devices and SFP+/QSFP+ Module devices enables complete validation
 - Complete compliance solution with an elaborate test fixture and signal sources support for SMA cable-based solution provides cost-effective way to perform compliance testing
 - User defined mode supports PRBS7, PRBS11, PRBS15, PRBS20 & PRBS23 in addition to patterns supported in Compliance mode including PRBS9, PRBS31 and 8180
- Customize the setup:
 - Modify the test setup according to the DUT configuration.
 - Run test measurements with different record lengths.
 - Run test measurements with more than one signal.
- Detailed test reporting:
 - Provides a Pass/Fail summary table
 - Provides margin details on each test
 - Provides a consolidated report for all tests
 - Provides additional information such as skew, and signal type selected for each measurement

Application directories and usage

The application directory and associated files are organized as follows:



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

Table 3: Application directories and usage

Directory names	Usage
InstallDir\TekExpress\TekExpress SFP-Tx	Contains the application and associated files
TekExpress SFP+ QSFP+ Tx\ACP	Contains instrument and SFP+ QSFP+ Tx application-specific interface libraries
TekExpress SFP+ QSFP+ Tx\Bin	Contains miscellaneous SFP+ QSFP+ Tx application libraries
TekExpress SFP+ QSFP+ Tx\Compliance Suites	Contains compliance-specific files
TekExpress SFP+ QSFP+ Tx\Documents	Contains the technical documentation for the SFP+ QSFP+ Tx application
TekExpress SFP+ QSFP+ Tx\Examples	Contains various support files
TekExpress SFP+ QSFP+ Tx\ICP	Contains instrument and SFP+ QSFP+ Tx application-specific interface libraries
TekExpress SFP+ QSFP+ Tx\Images	Contains various Image files
TekExpress SFP+ QSFP+ Tx\Lib	Contains utility files specific to the SFP+ QSFP+ Tx application
TekExpress SFP+ QSFP+ Tx\Report Generator	Contains style sheets for report generation
TekExpress SFP+ QSFP+ Tx\SCP	Contains instrument and SFP+ QSFP+ Tx application-specific interface libraries
TekExpress SFP+ QSFP+ Tx\Tools	Contains instrument and SFP+ QSFP+ Tx application-specific files

See also

- [View Test-Related Files \(see page 68\)](#)

File name extensions

The TekExpress SFP+ QSFP+ Tx application uses the following file name extensions:

File name extension	Description
.TekX	Session files are saved in this format but the extensions may not be displayed.
.py	The test sequence file
.xml	The encrypted XML file that contains the test-specific configuration information The log file extension is also xml.
.wfm	The test waveform file
.mht	Test result reports are saved in this format by default. Test reports can also be saved in HTML format (see page 56) .

See also

- [View Test-Related Files \(see page 68\)](#)
- [Application Directories and Usage \(see page 10\)](#)
- [Before You Click Start \(see page 59\)](#)

Start the application

The first time you open the application after installation, you are required to enter a license key. The application also checks for a file called **Resources.xml** located in the **My TekExpress** folder. If this file is not found, the application performs instrument discovery before launching. The **Resources.xml** file contains information regarding instruments that are available on your network.

NOTE. *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 key, it continues to run in Evaluation mode. You are allowed 10 free trials in Evaluation mode. Each time you open the application without supplying a valid license key, one of the free trials is used.*

To run the SFP+ QSFP+ Tx application, do one of the following:

- From the TekScope Analyze menu, select **Analyze > TekExpress SFP+ QSFP+ Tx**.
- Double-click any saved session file.

While running the application, switch between the oscilloscope screen and SFP+ QSFP+ Tx by clicking the desired window or by using the Alt+Tab key combination. To keep the application window on top, select **Keep On Top** from the [Options menu \(see page 15\)](#).

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


See also

- [Activate the License \(see page 6\)](#)

Exit the application





Use the following method to exit the application:

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

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

Application controls

Table 4: Application controls descriptions

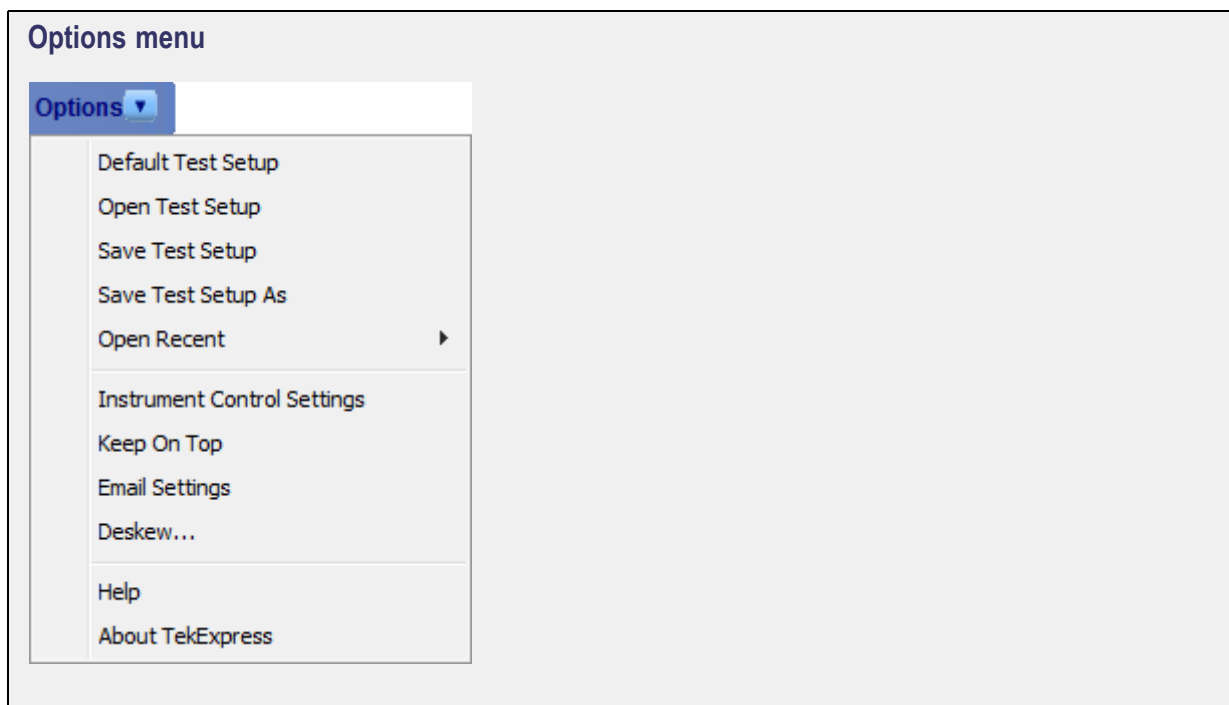
Item	Description
Options menu (see page 15)	Opens the Options menu for access to global controls
Panels (see page 19)	Visual frames with sets of related options
Command buttons	Buttons that initiate an immediate action such as the Start, Stop, Pause, Continue, and Clear command buttons
Start button	Use the Start button to continuously acquire and accumulate measurements. If prior acquired measurements have not been cleared, the new measurements are added to the existing set.
Stop button	 <p>Use the Stop button to abort the test.</p>
Pause \ Continue button	 <p>Use the Pause button to temporarily interrupt the current acquisition. When a test is paused, the button name changes to "Continue."</p>
Clear button	 <p>Use the Clear button to clear all existing measurement results. Adding or deleting a measurement, or changing a configuration parameter of an existing measurement, also clears measurements. This is to prevent the accumulation of measurement statistics or sets of statistics that are not coherent. This button is available only on the Results panel (see page 29).</p>
Application window move icon	 <p>Place the cursor over the three-dot pattern in the upper left corner of the application window. When the cursor changes to a hand, drag the window to the desired location.</p>

Options menu

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

The [Options menu \(see page 16\)](#) has the following selections:

Menu	Function
Default Test Setup	Opens an untitled test setup with defaults selected
Open Test Setup	Opens a saved test setup
Save Test Setup	Saves the current test setup selections
Save Test Setup As	Creates a new test setup based on an existing one
Open Recent	Displays a menu of recently opened test setups to select from
Instrument Control Settings (see page 18)	Shows the list of instruments connected to the test setup and allows you to locate and refresh connections to those instruments
Keep On Top	Keeps the TekExpress SFP+ QSFP+ Tx application on top of other open windows on the desktop
Email Settings (see page 17)	Use to configure email options for test run and results notifications
Deskew (see page 152)	Use to deskew channels
Help	Displays TekExpress Help
About TekExpress	<ul style="list-style-type: none"> ■ Displays application details such as software name, version number, and copyright ■ Provides access to license information (see page 7) for your SFP+ QSFP+ Tx installation ■ Provides a link to the Tektronix Web site



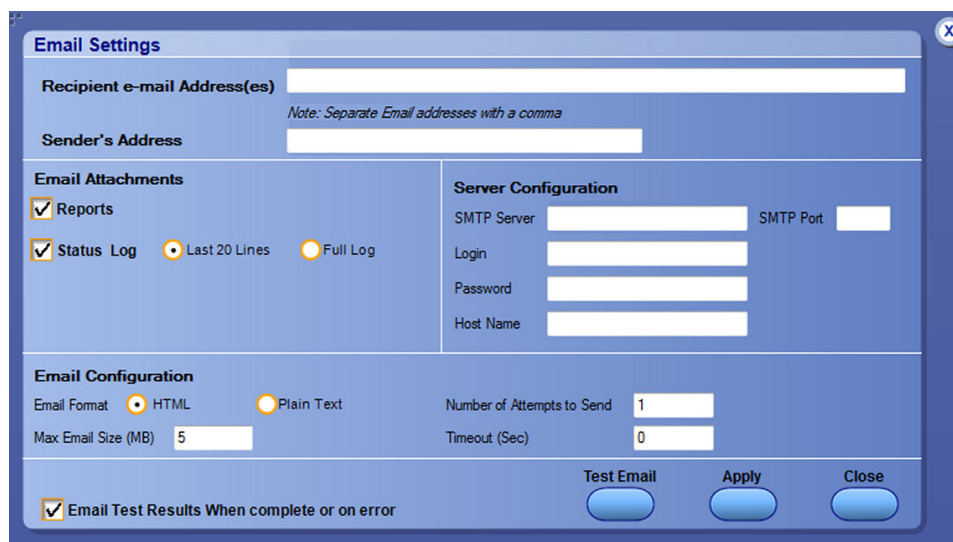
See also

- [Application Controls \(see page 15\)](#)

Email settings

Use the Email Settings utility to [configure email notifications \(see page 55\)](#) if you want to receive notifications when a test completes, produces an error, or fails. Select the type of test session information to include in the notification, such as test reports and test logs, the email message format, and the email message size limit.

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



The screenshot shows the 'Email Settings' dialog box with the following fields and options:

- Recipient e-mail Address(es):** A text input field with a note: 'Note: Separate Email addresses with a comma'.
- Sender's Address:** A text input field.
- Email Attachments:** A section with three checked checkboxes: ☒ Reports, ☒ Status Log, and ☒ Last 20 Lines. There is also an unchecked checkbox for ☐ Full Log.
- Server Configuration:** A section with four text input fields: SMTP Server, SMTP Port, Login, Password, and Host Name.
- Email Configuration:** A section with two radio buttons: ☒ HTML and ☐ Plain Text. It also has two text input fields: Number of Attempts to Send (set to 1) and Timeout (Sec) (set to 0).
- Max Email Size (MB):** A text input field set to 5.
- Email Test Results When complete or on error:** A checked checkbox ☒.
- Buttons:** Test Email, Apply, and Close.

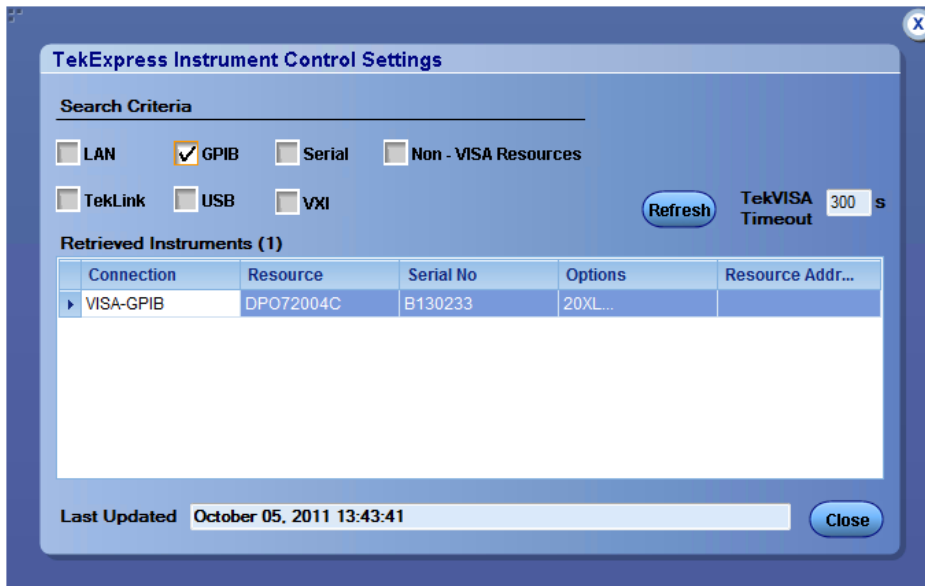
See also

- [Options Menu \(see page 15\)](#)
- [Select Test Notification Preferences \(see page 56\)](#)

Instrument control settings

The Instrument Control Settings dialog box shows the list of resources found on different connections. It serves two purposes:

- Discovers the connected instruments
- Confirms the instrument connection setup



Use the Instrument Control Settings feature to [search for connected instruments \(see page 40\)](#) and view instrument connection details. Connected instruments displayed here can be selected for use under Global Settings in the test configuration section. See step 2 of [Configure Tests \(see page 52\)](#) for details.

See also

- [Options Menu \(see page 15\)](#)

About panels

TekExpress SFP+ QSFP+ Tx has the following main panels:

Table 5: Application panels

Panel Name	Purpose
Setup (see page 19)	The Setup panel allows you to configure the test setup. Use this panel to: <ul style="list-style-type: none"> ■ Select device parameters (see page 42). ■ Select the test(s) (see page 44). ■ Select acquisitions parameters (see page 46) for selected tests. ■ Configure the selected tests (see page 52). ■ Select test notification preferences (see page 56).
Status (see page 27)	View the acquisition and analysis status of the selected tests, and view test logs.
Results (see page 29)	View a summary of test results and select result viewing preferences.
Reports (see page 30)	Browse for reports, save reports, specify report naming conventions, select content to include (such as summary information, detailed information, user comments, plot images, setup configuration), and select other report viewing options.

See also

- [Application Controls \(see page 15\)](#)

Setup panel

The Setup panel has numbered tabs to guide you through the test setup process:

- 1 – [DUT \(see page 20\)](#)
- 2 – [Test Selection \(see page 23\)](#)
- 3 – [Acquisitions \(see page 24\)](#)
- 4 – [Configuration \(see page 25\)](#)
- 5 – [Preferences \(see page 26\)](#)

By default, only the DUT, Test Selection, Acquisitions, and Preferences tabs are displayed. The Configuration tab is only available if you select the [Advanced View \(see page 21\)](#) option in the DUT tab. Otherwise, configuration settings for tests are available from the Configure button on the Test Selection tab.

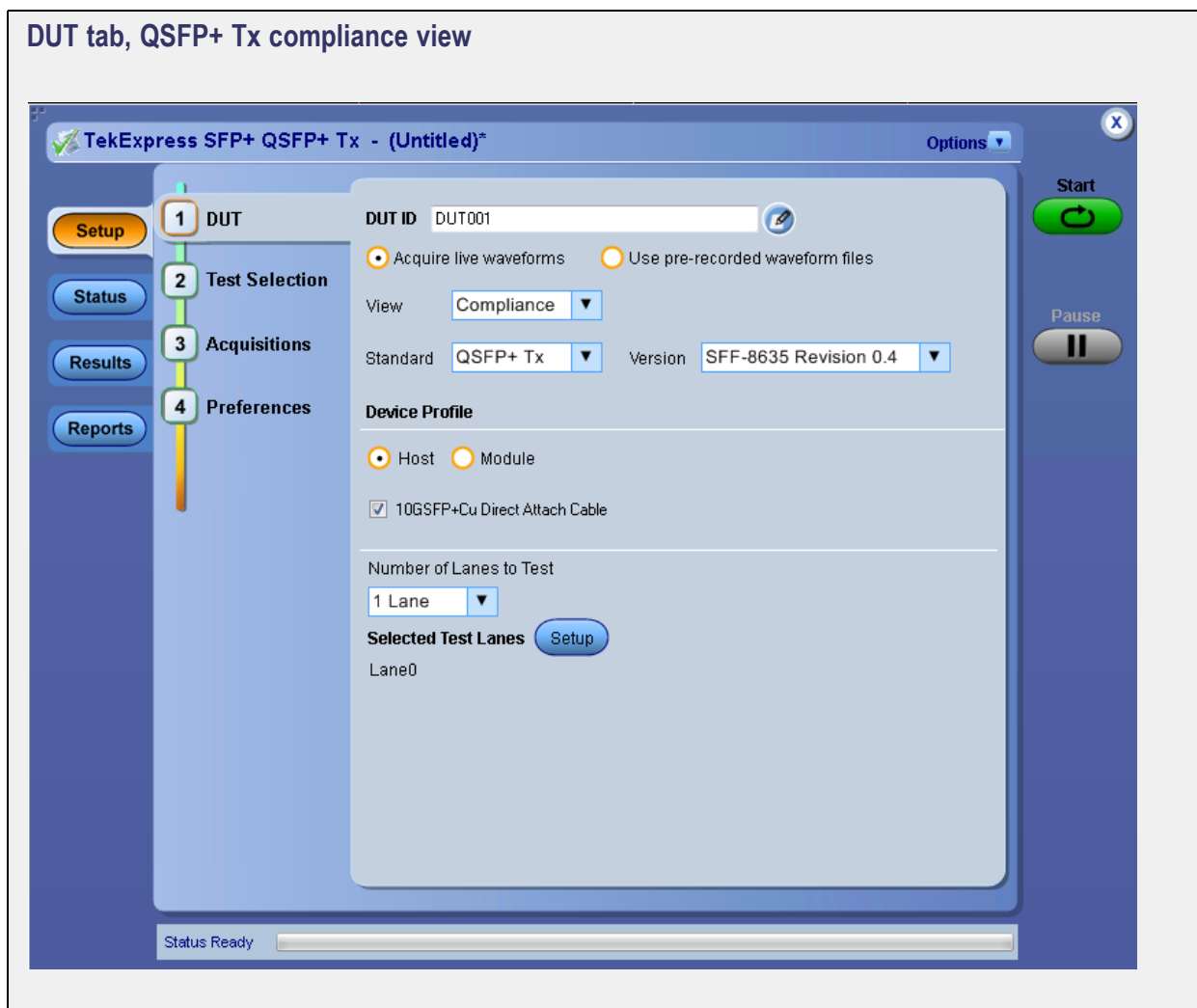
Options selected in a preceding tab affect options available in the next tab down. However, you can switch between the tabs in any order if you need to modify test parameters. For more information on using the Setup panel, see [Test Setup Overview \(see page 42\)](#).

By default, QSFP+ Tx is the selected standard in the DUT tab. Use the Standard drop-down box to select the [SFP+ Tx \(see page 22\)](#) standard.

When you finish making selections in a tab and move to the next tab, the number in the tab title changes to a check mark. If you make changes on a tab that significantly affect the settings set in a preceding tab, the check mark in the tab title of the affected tab is replaced with the number again to indicate that you should check the settings on that tab.

See also

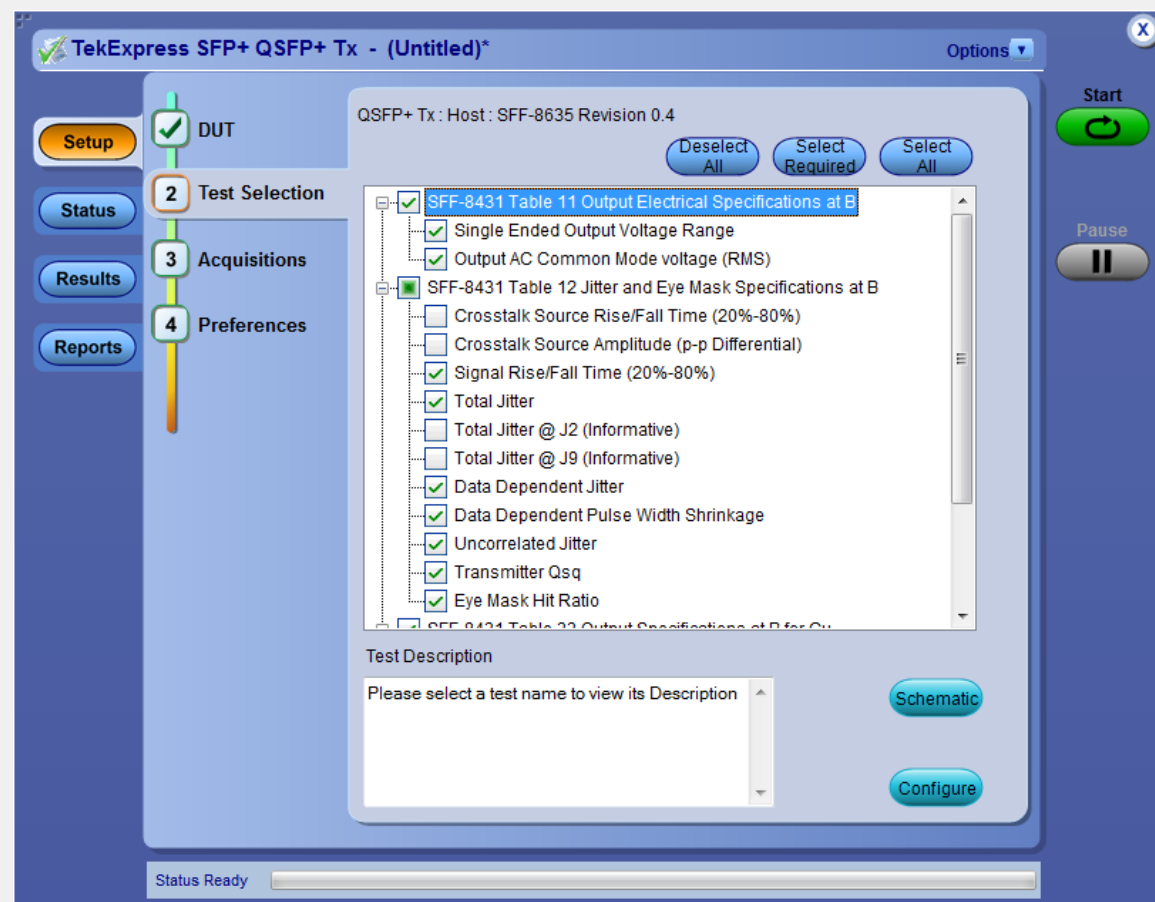
- [About Panels \(see page 19\)](#)
- [Select Device Parameters \(see page 42\)](#)
- [Select a Test \(see page 44\)](#)
- [Select Acquisitions \(see page 46\)](#)
- [Configure Tests \(see page 52\)](#)
- [Select Test Notification Preferences \(see page 56\)](#)

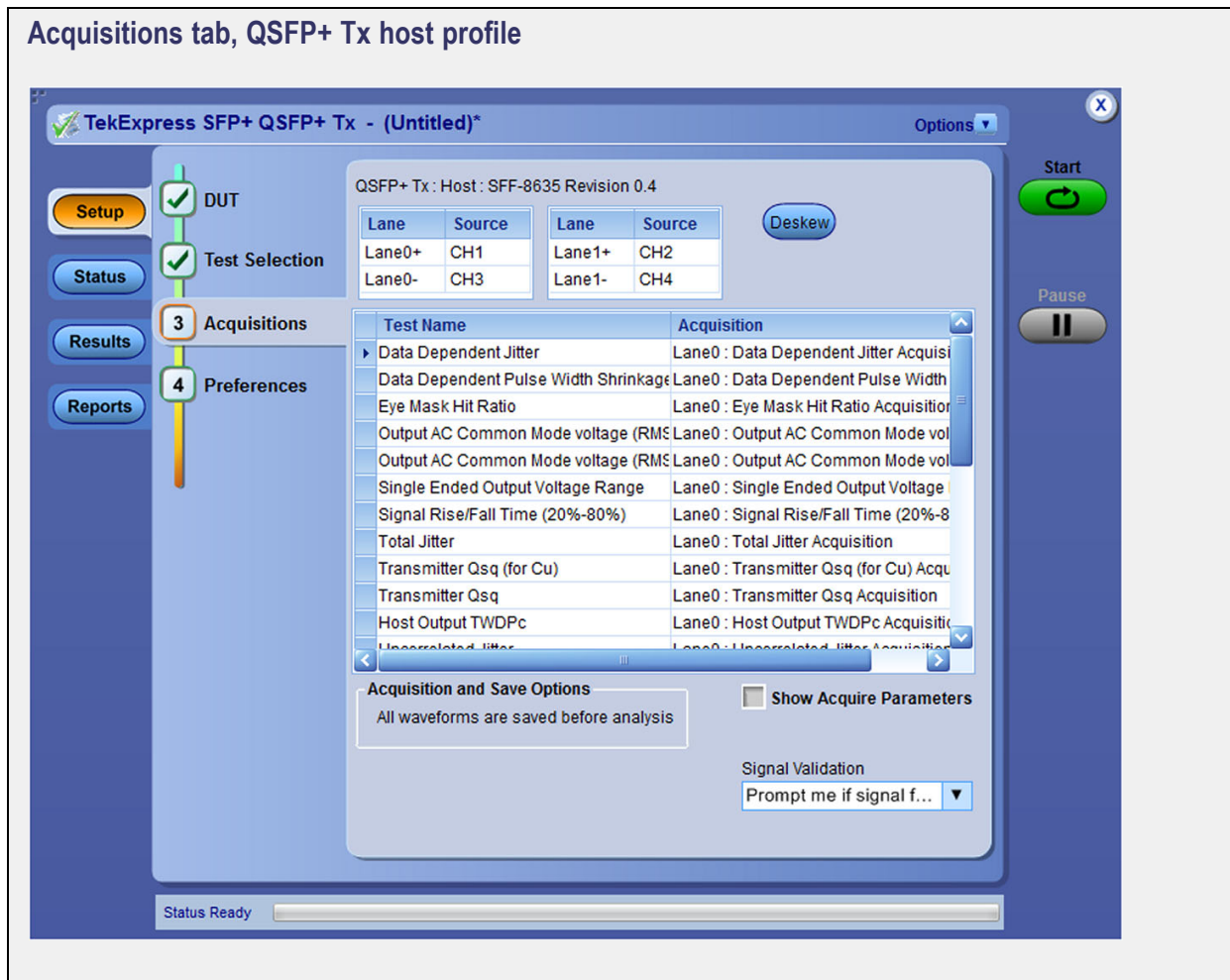


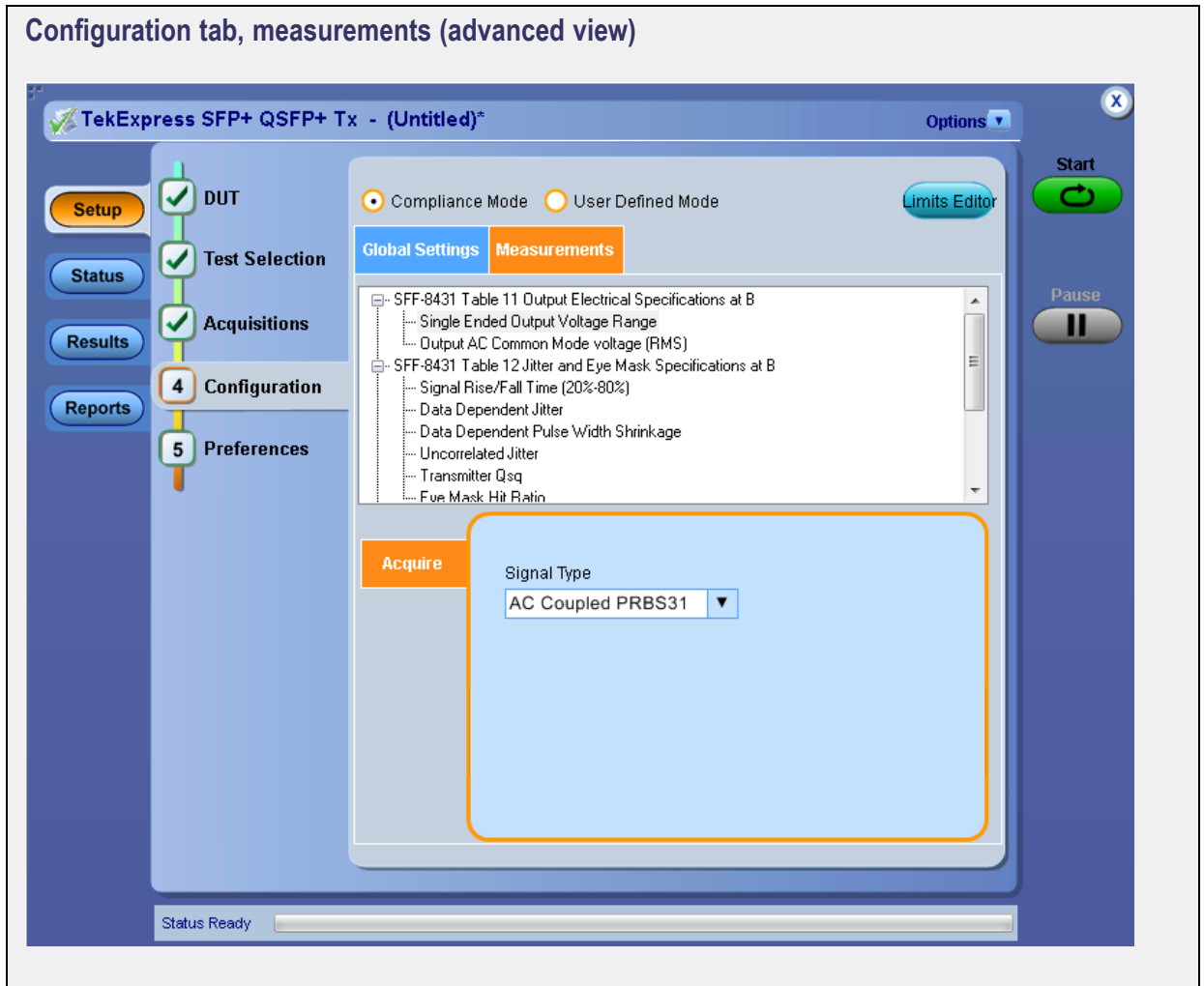


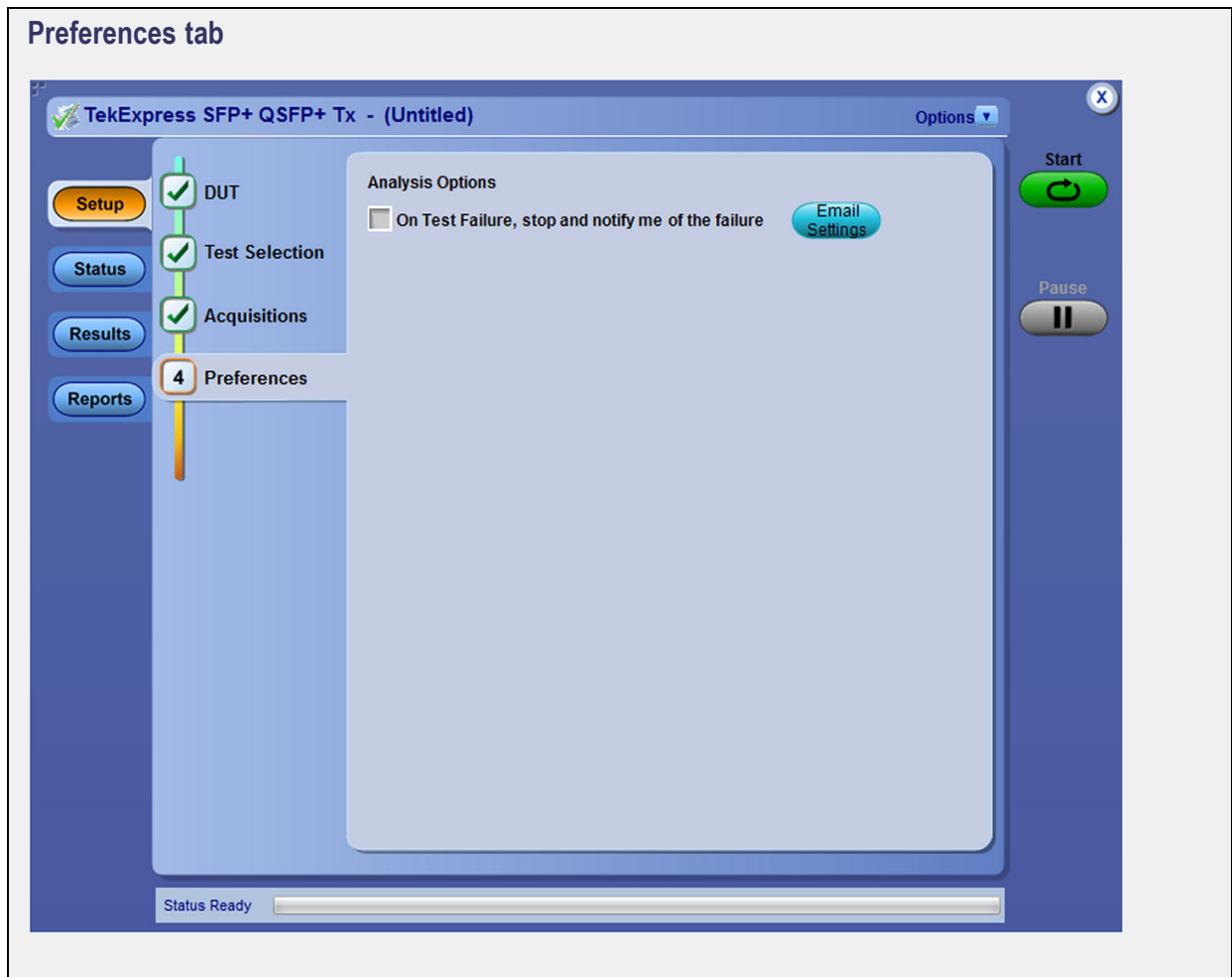


Test Selection tab, QSFP+ Tx host profile tests





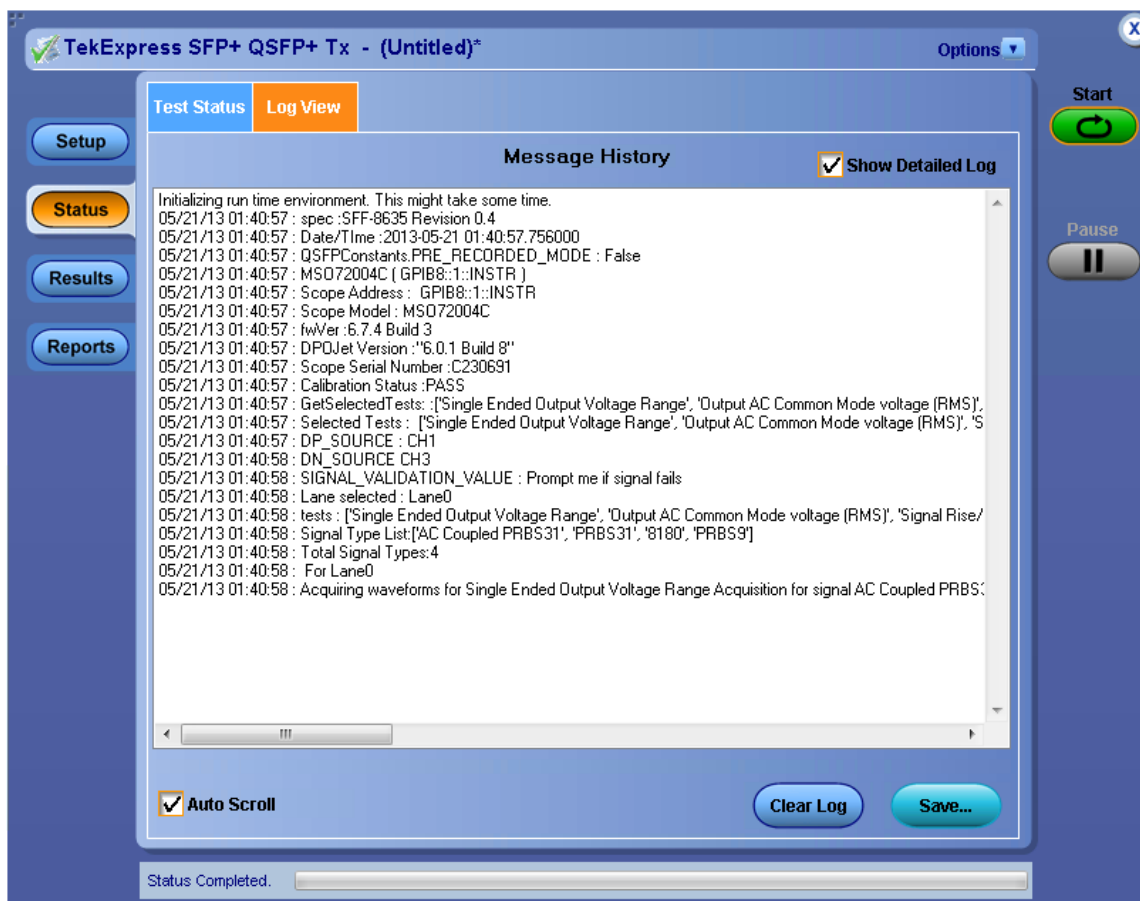




Status panel

Use the Status panel to track test measurement progress. The Status panel has two tabs: the [Test Status](#) (see page 28) tab displays the acquire status and the analysis status of the tests as they are being executed; the Log View tab (shown below) displays a view of the test log.

For more information on using the Status panel, see [View the Progress of Analysis](#) (see page 63).



See also

- [About Panels](#) (see page 19)

Test Status view

TekExpress SFP+ QSFP+ Tx - (Untitled)* Options

Test Status Log View

Setup Status Results Reports

Test Name	Acquisition	Acquire Status	Analysis Status
Lane0			
Single Ended Output Voltage Range	Single Ended Output Voltage Range Acquisition	To be started	To be started
Output AC Common Mode voltage (RMS)	Output AC Common Mode voltage (RMS) Acquisition	To be started	To be started
Signal Rise/Fall Time (20%-80%)	Signal Rise/Fall Time (20%-80%) Acquisition	To be started	To be started
Data Dependent Jitter	Data Dependent Jitter Acquisition	To be started	To be started
Data Dependent Pulse Width Shrinkage	Data Dependent Pulse Width Shrinkage Acquisition	To be started	To be started
Uncorrelated Jitter	Uncorrelated Jitter Acquisition	To be started	To be started
Transmitter Qsq	Transmitter Qsq Acquisition	To be started	To be started
Eye Mask Hit Ratio	Eye Mask Hit Ratio Acquisition	To be started	To be started
Voltage Modulation Amplitude (p-p)	Voltage Modulation Amplitude (p-p) Acquisition	To be started	To be started
Transmitter Qsq (for Cu)	Transmitter Qsq (for Cu) Acquisition	To be started	To be started
Output AC Common Mode voltage (RMS) (for Cu)	Output AC Common Mode voltage (RMS) (for Cu) Acquisition	To be started	To be started
Host Output TVDPC	Host Output TVDPC Acquisition	To be started	To be started

Start

Pause

Status Ready

Results panel

When a test completes, the application switches to the Results panel to display a summary of test results.

NOTE. Results of Crosstalk measurements, Total Jitter @ J2, and Total Jitter @ J9 are not included in the overall test results because these measurements are informative only.

Set viewing preferences for this panel from the Preferences menu in the upper right corner. Viewing preferences include showing whether a test passed or failed, summary results or detailed results, and enabling wordwrap. For information on using this panel, see [View Test Results \(see page 64\)](#).

TekExpress SFP+ QSFP+ Tx - (Untitled)*

Options ▾

Overall Test Result Live Preferences ▾

Description	Details	Pass/Fail	Value	Margin
<input checked="" type="checkbox"/> Signal Rise/Fall Time (20%-80%)	Signal Rise/Fall Time (20%-80%) RiseTime	✓ Pass	52.9379	18.9379
High Limit		N.A	N.A	
Low Limit		✓ Pass	34.0	
<input checked="" type="checkbox"/> Signal Rise/Fall Time (20%-80%)	Signal Rise/Fall Time (20%-80%) FallTime	✓ Pass	46.9951	12.9951
High Limit		N.A	N.A	
Low Limit		✓ Pass	34.0	
<input checked="" type="checkbox"/> Data Dependent Pulse Width Shrinkage	Data Dependent Pulse Width Shrinkage	✓ Pass	0.0156	0.0394
High Limit		✓ Pass	0.055	
Low Limit		N.A	N.A	
<input checked="" type="checkbox"/> Uncorrelated Jitter	Uncorrelated	✓ Pass	0.0041	0.0189
High Limit		✓ Pass	0.023	
Low Limit		N.A	N.A	
<input checked="" type="checkbox"/> Transmitter Qsq	Transmitter Qsq	✓ Pass	142.8168	92.8168
<input checked="" type="checkbox"/> Voltage Modulation	Voltage Modulation	✓ Pass	497.4027	197.4027
<input checked="" type="checkbox"/> Transmitter Qsq (for Cu)	Transmitter Qsq (for Cu)	✓ Pass	142.8168	79.7168
<input checked="" type="checkbox"/> Host Output TWDPc	Host Output TWDPc	✓ Pass	10.3854	0.3146

Status Completed.

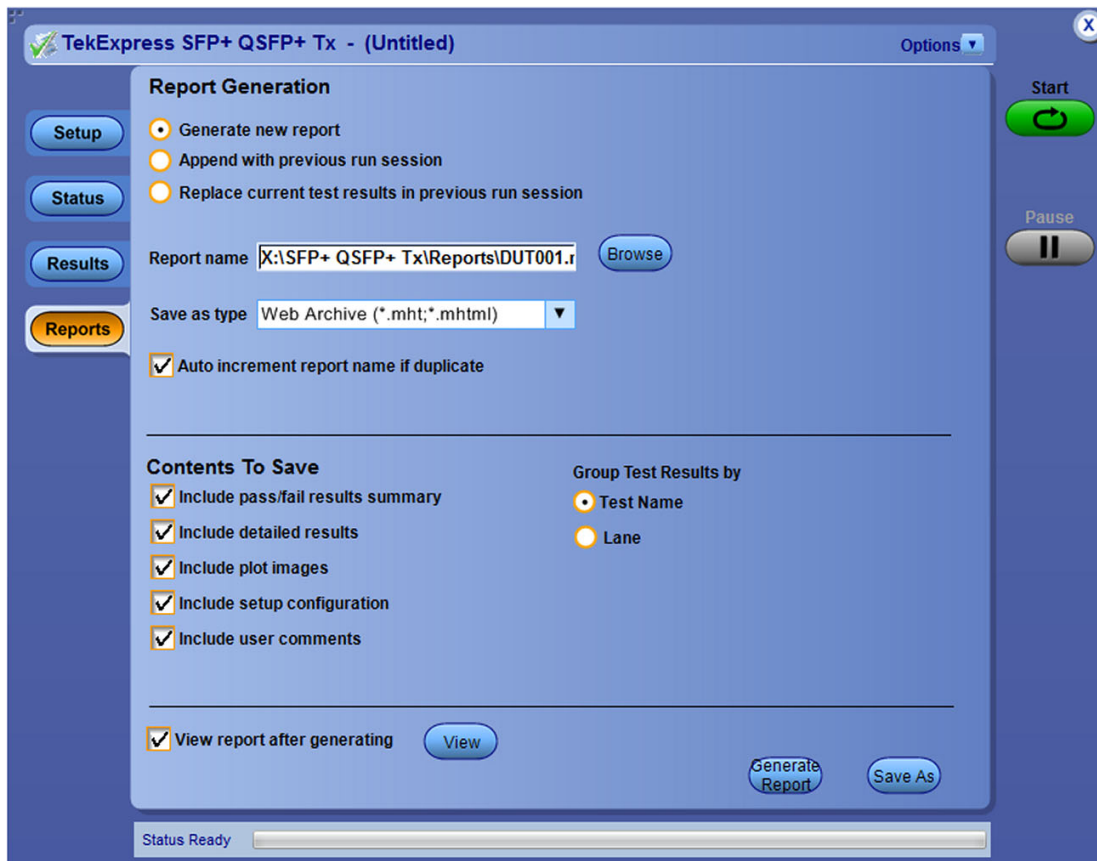
See also

- [About Panels \(see page 19\)](#)

Reports panel

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

For information on setting up reports, see [Select Report Options \(see page 56\)](#). For information on viewing reports, see [View the Report \(see page 65\)](#).



See also

- [About Panels \(see page 19\)](#)

About test setups

TekExpress SFP+ QSFP+ Tx opens with the default setup selected for the default standard (QSFP+). Run a test before or after saving a setup. When you save a setup, the test information, such as the selected oscilloscope, general parameters, acquisition parameters, measurement limits, waveforms (if applicable), and other configuration settings are all saved under the setup name. Use test setups to:

- [Run a saved test in prerecorded mode \(see page 62\).](#)
- View all the information associated with a saved test, including the log file, the history of the test status as it executed, and the results summary. For details, see [Recall a Saved Test Setup \(see page 32\).](#)
- [Create a new test setup based on an existing one \(see page 32\).](#)

See also

- [About Setting Up Tests \(see page 33\)](#)
- [Save a Test Setup \(see page 31\)](#)
- [Recall a Saved Test Setup \(see page 32\)](#)

Save a test setup

Save a test setup before or after running a test using the parameters you want saved. Create a new test setup from any open setup or from the default setup. When you select the default test setup, all parameters are returned to their defaults.

The following instructions start from the default test setup:

1. From the Options menu, select **Default Test Setup**.
2. Select the desired options in the Setup panel.
3. Select the desired [report options \(see page 56\)](#).
4. If desired, run the test to be sure that it captures the desired information. If it does not, edit the parameters.
5. From the Options menu, select **Save Test Setup**.

See also

- [About Setting Up Tests \(see page 33\)](#)
- [Test Setup Overview \(see page 42\)](#)
- [View Test-Related Files \(see page 68\)](#)

Recall a saved test setup

These instructions are for recalling saved test setups.

1. From the Options menu, select **Open Test Setup**.
2. In the File Open dialog box, select the desired setup from the list and then click **Open**.

See also

- [About Test Setups \(see page 31\)](#)
- [Create a New Test Setup Based on an Existing One \(see page 32\)](#)

Create a new test setup based on an existing one

Use this method to create a variation on a test setup without having to create the setup from the beginning.

1. From the Options menu, select **Open Test Setup**.
2. In the File Open dialog box, select the desired setup from the list and then click **Open**.
3. Modify the parameters as desired.
4. From the Options menu, select **Save Test Setup As**.
5. In the File Save As dialog box, enter a test setup name and then click **Save**.

See also

- [About Test Setups \(see page 31\)](#)
- [Select Device Parameters \(see page 42\)](#)
- [Configure Tests \(see page 52\)](#)
- [Select Acquisitions \(see page 46\)](#)

About setting up tests

Set up tests using the tabs in the [Setup panel \(see page 19\)](#). Settings in the DUT tab use a top-down, left-to-right logic flow, so that any parameter that affects or acts as a filter for other parameters appears either above or to the left of the affected parameters.

Test options: standards, views, and modes

Test options include two standards, QSFP+ Tx and SFP+ Tx (selected in the DUT tab of the Setup panel), two views, Compliance and Advanced (selected in the DUT tab of the Setup panel), and two modes, Compliance and User Defined (selected in the configuration settings of the Setup panel).

The selected standard determines which measurement standard will be used. The selected view determines where the test configuration settings are displayed. The selected mode determines whether you can change test configuration settings to include those that are noncompliant.

- **Compliance View** selected with **Compliance Mode**

View configuration options in the Test Selection tab of the Setup panel. Tests will run automatically with little or no user intervention. You will not be able to change test parameters to anything that deviates from the compliance standards. The only test configuration parameters that you can change in this mode are the Global Settings.

- **Compliance View** selected with **User-Defined Mode**

View configuration options in the Test Selection tab of the Setup panel. Tests will run automatically but you will be able to change the parameters before starting the tests.

- **Advanced View** selected with **Compliance Mode**

View configuration options in the Configuration tab of the Setup panel. Tests will run automatically with little or no user intervention. You will not be able to change test parameters to anything that deviates from the compliance standards. The only configuration parameters that you can change in this mode are the Global Settings.

- **Advanced View** selected with **User-Defined Mode**

View configuration options in the Configuration tab of the Setup panel. Tests will run automatically but you will be able to change test parameters before starting the tests.

Supported tests

The application supports the following tests, grouped by profile.

Host Profile Tests

- SFF-8431 Table 11 Output Electrical Specifications at B:
 - [Single Ended Output Voltage Range \(see page 113\)](#)
 - [Output AC Common Mode voltage \(RMS\) \(see page 114\)](#)

- SFF-8431 Table 12 Jitter and Eye Mask Specifications at B:
 - [Crosstalk Source Rise/Fall Time \(20%–80%\) \(see page 115\)](#)
 - [Crosstalk Source Amplitude \(p-p Differential\) \(see page 116\)](#)
 - [Signal Rise/Fall Time \(20%–80%\) \(see page 117\)](#)
 - [Total Jitter \(see page 119\)](#)
 - [Data Dependent Jitter \(see page 121\)](#)
 - [Data Dependent Pulse Width Shrinkage \(see page 123\)](#)
 - [Uncorrelated Jitter \(see page 125\)](#)
 - [Transmitter Qsq \(see page 126\)](#)
 - [Eye Mask Hit Ratio \(see page 128\)](#)
- SFF-8431 Table 33 Output Specifications at B for Cu:

NOTE. The group SFF-8431 Table 33 Output Specifications at B for Cu is associated with the 10GSFP+ Cu Direct Attach Cable device profile (the check box for this profile is located on the DUT tab of the Setup panel). This group of tests is available only when this check box is selected.

- [Voltage Modulation Amplitude \(p-p\) \(see page 130\)](#)
- [Transmitter Qsq \(for Cu\) \(see page 131\)](#)
- [Output AC Common Mode voltage \(RMS\) \(for Cu\) \(see page 133\)](#)
- [Host Output TWDPc \(see page 134\)](#)

NOTE. An evaluation version of the Host Output TWDPc test is included in the SFP+ QSFP+ Tx installation. You are allowed 10 free trials of this test. Each time you run the test, regardless of how often you open the application, one of the free trials is used. To use this test after the evaluation period, purchase the SFP-WDP option license key.

Module Profile Tests

- SFF-8431 Table 16 Transmitter Input Electrical Specifications at B:
 - [AC Common-Mode Voltage Tolerance \(see page 135\)](#)
 - [Single-Ended Input Voltage Tolerance \(see page 136\)](#)

- SFF-8431 Table 17 Transmitter Input Tolerance Signal Calibrated at B:
 - [Crosstalk Source Rise/Fall Time \(20%-80%\) \(see page 137\)](#)
 - [Crosstalk Source Amplitude \(p-p Differential\) \(see page 138\)](#)
 - [Output AC Common-Mode Voltage \(RMS\) \(see page 140\)](#)
 - [Total Jitter \(see page 141\)](#)
 - [Data Dependent Jitter \(see page 143\)](#)
 - [Data Dependent Pulse Width Shrinkage \(see page 145\)](#)
 - [Uncorrelated Jitter \(see page 147\)](#)
 - [Eye Mask Hit Ratio \(see page 148\)](#)
- Additional Supported Measurements for QSFP+ only
 - Total Jitter @ J2
 - Total Jitter @ J9

See also

- [Test Setup Overview \(see page 42\)](#)
- [Before You Click Start \(see page 59\)](#)
- [About Test Setups \(see page 31\)](#)

Equipment connection setup

To run tests, you need the following equipment (for details, see [Minimum System Requirements \(see page 4\)](#)):

- A [supported Tektronix oscilloscope \(see page 3\)](#)
- The device under test
- SFP+ or QSFP+ fixtures

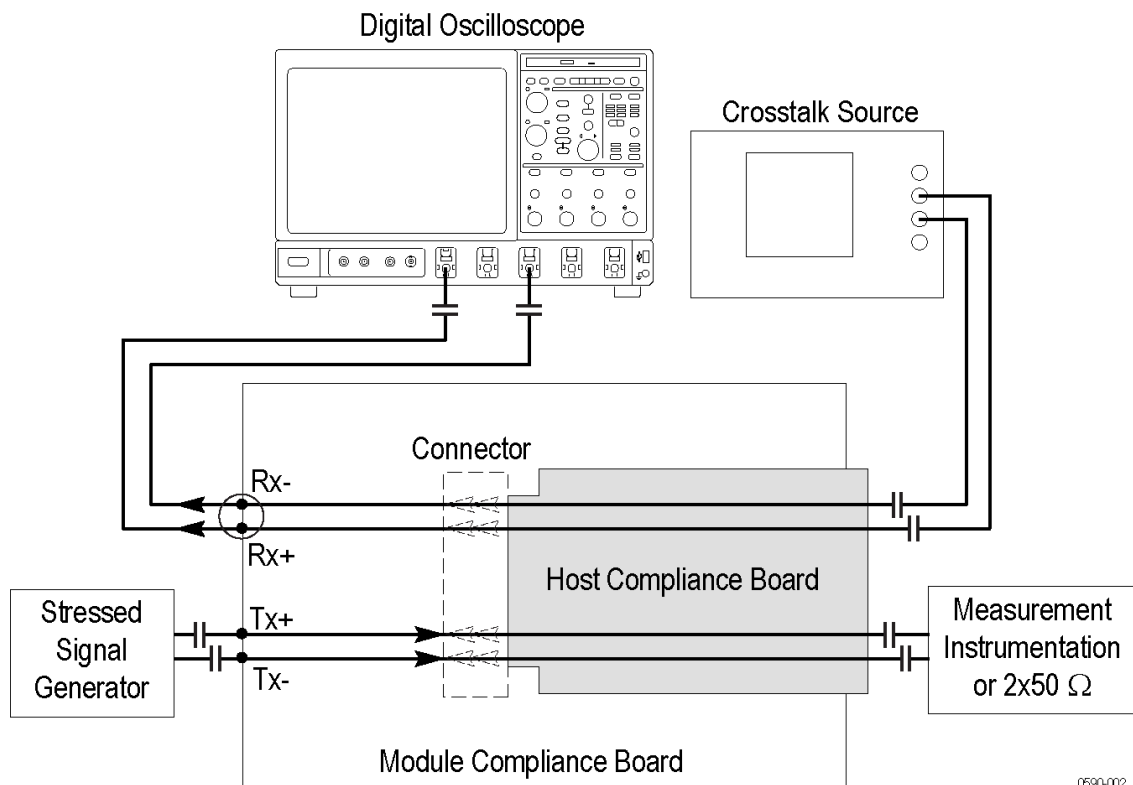
Table 6: SFP+ and QSFP+ fixtures

Tektronix nomenclature	Description
TF-SFP-TPA-HCB-P	SFP+ Host Compliance Board Plug
TF-SFP-TPA-MCB-R	SFP+ Module Compliance Board Receptacle
TF-SF-TPA-PR	SFP+ Host Compliance Board Plug and Module Compliance Board Receptacle
TF-SFP-TPA-HCB-PK	SFP+ Host Compliance Board Plug Kit with DC Blocks and Termination
TF-SFP-TPA-MCB-RK	SFP+ Module Compliance Board Receptacle Kit with DC Block and Termination
TF-SFP-TPA-PRK	SFP+ Host Module Compliance Board and Module Compliance Board with DC Blocks and Termination
TF-QSFP-TPA-HCB-P	QSFP+ Host Compliance Plug
TF-QSFP-TPA-MCB-R	QSFP+ Module Compliance Board Receptacle
TF-QSFP-TPA-PR	QSFP+ Host Compliance Board Plug and Module Compliance Board Receptacle
TF-DC-BLOCK-KIT	DC Block Kit

Equipment connections can vary by Device Profile (Host and Module) and by individual test. Refer to the following connection diagrams when setting up equipment for testing.

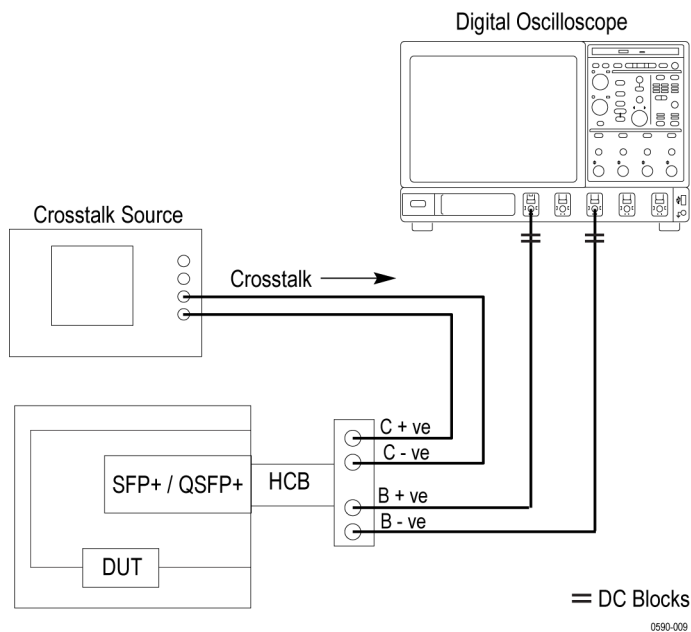
Connection setup for Host tests

- Table 12 Crosstalk Source tests

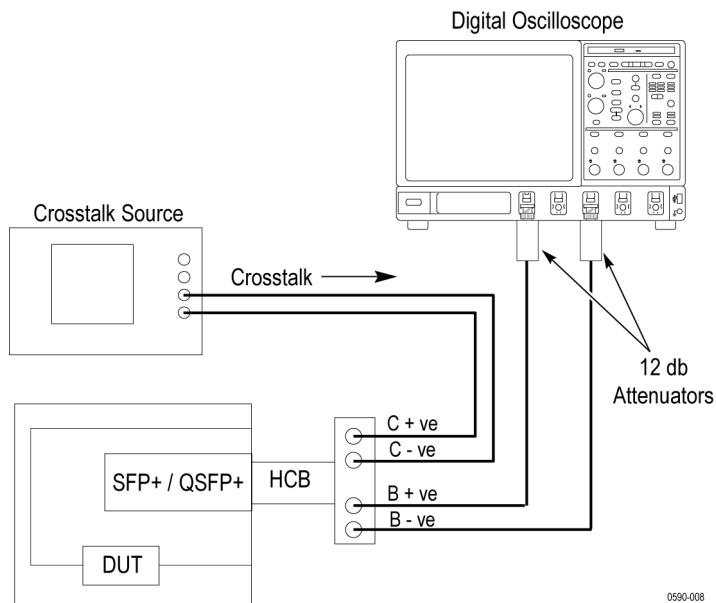


0590-002

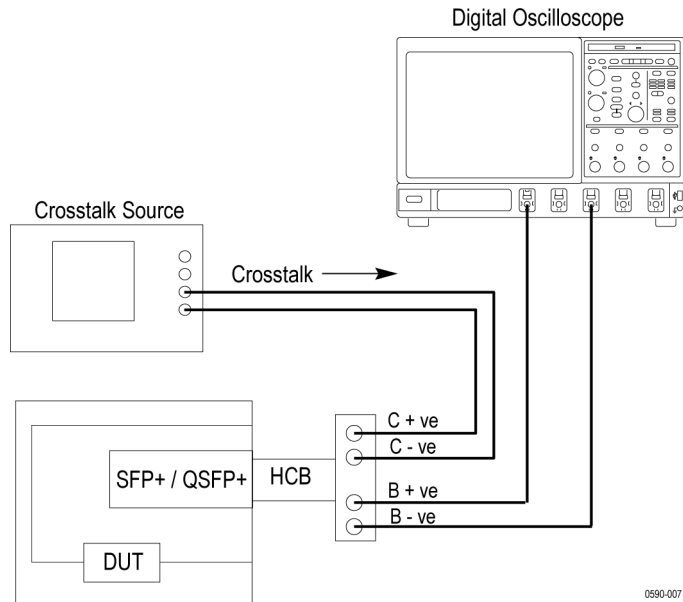
■ All other Host tests



Test setup for all measurements other than single-ended output voltage range



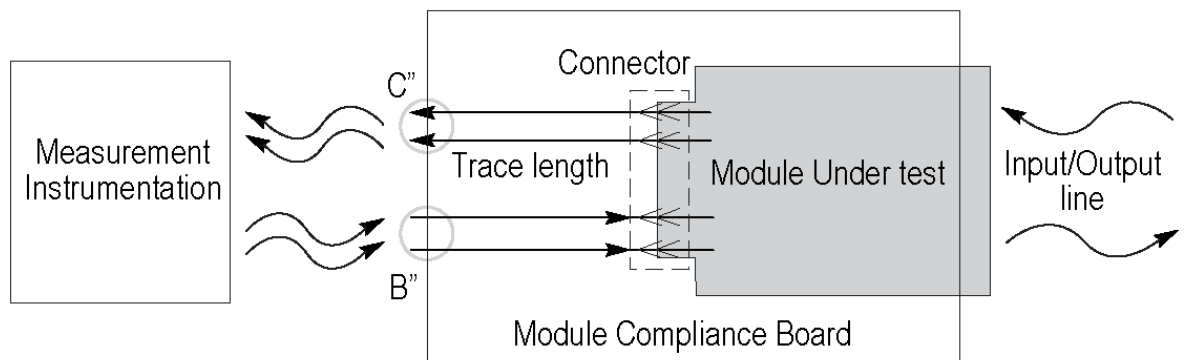
Test setup for single ended output voltage range measurement on DPO/DSA70000D series oscilloscopes



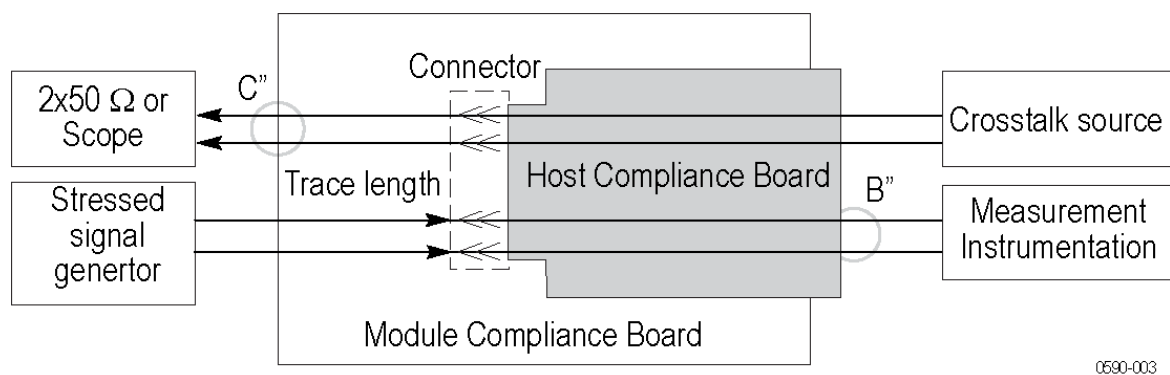
Test setup for single ended output voltage range measurement on all oscilloscopes other than DPO/DSA70000D series oscilloscopes

Connection setup for module tests

■ Single-Ended Input Voltage Tolerance Test



■ All other Module tests



0590-003

See also

- [View Connected Instruments \(see page 40\)](#)
- [About Setting Up Tests \(see page 33\)](#)
- [Oscilloscope Setup \(see page 111\)](#)

View connected instruments

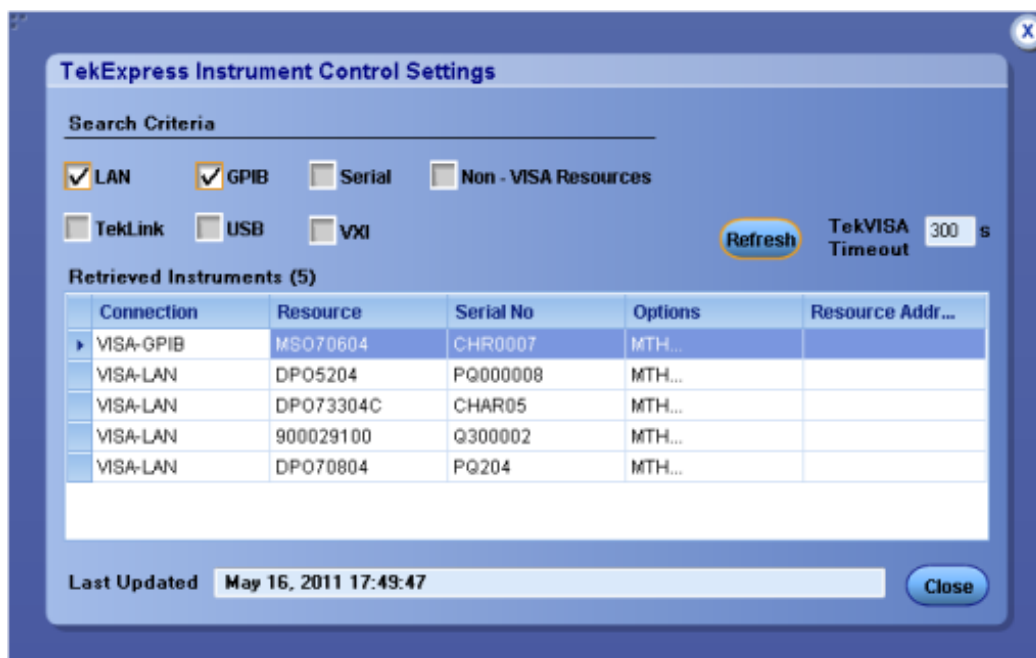
Use the Instrument Control Settings dialog box to view or search for connected instruments required for the tests. The application uses TekVISA to discover the connected instruments.

To refresh the list of connected instruments:

1. From the Options menu, select **Instrument Control Settings**.
2. In the Search Criteria section of the Instrument Control Settings dialog box, select the connection types of the instruments to search for. By default, only the GPIB resource type is selected but you can select as many types as your system and setup use.

Instrument search is based on the VISA layer but different connected cables determine the resource type, such as LAN, GPIB, USB. For example, if you choose LAN, the search will include all the instruments supported by TekExpress that are communicating over the LAN. If the search does not find any instruments that match a selected resource type, a message appears telling you that no such instruments were found. If you selected more than one resource type for the search, after you close the message window, the application will continue searching for the other selected types.

3. Click **Refresh**. TekExpress searches for connected instruments.
4. After discovery, the dialog box lists the instrument-related details based on the selected search criteria. For example, if you selected LAN and GPIB as the search criteria, the application checks for the availability of instruments over LAN, then GPIB.



The Retrieved Instruments table displays details about the instruments. The time and date of instrument refresh is displayed in the Last Updated field.

See also

- [Configure Tests \(see page 52\)](#)
- [Equipment Connection Setup \(see page 36\)](#)

Test setup overview

Test setup includes acquisition and configuration parameters, but you can also select report options when setting up tests. Use the options in the [Setup panel \(see page 19\)](#) and [Reports panel \(see page 30\)](#) to select and configure tests.


1. [Select device parameters \(see page 42\).](#)
2. [Select one or more tests \(see page 44\).](#)
3. [Select acquisitions \(see page 46\).](#)
4. [Configure tests \(see page 52\).](#)
5. [Set test measurement notification options \(see page 56\).](#)
6. [Select report options \(see page 56\).](#)

See also

- [Before You Click Start \(see page 59\)](#)
- [Pre-Run Checklist \(see page 61\)](#)
- [About Running Tests \(see page 59\)](#)

Select device parameters

Use the Setup panel DUT tab to select settings for the device under test. Options selected here affect which tests are available in the Test Selection tab.

1. In the Setup panel, click the **DUT** tab.
2. If needed, in the DUT ID field, enter the ID for the device. The default value is DUT001. The name in this field appears on reports.
3. (Optional) To add comments that will appear at the top of the test Report for the selected DUT, click the note pad icon () to the right of the DUT ID field and specify a comment up to 256 characters. (To enable or disable comments appearing on the test report, see [Select Report Options \(see page 56\)](#).)
4. Select whether to use a prerecorded waveform file or a live waveform for testing.

If you are rerunning a saved test and select to use a prerecorded waveform file, select the desired run session. For more information, see [Run a Saved Test in Prerecorded Mode \(see page 62\)](#).

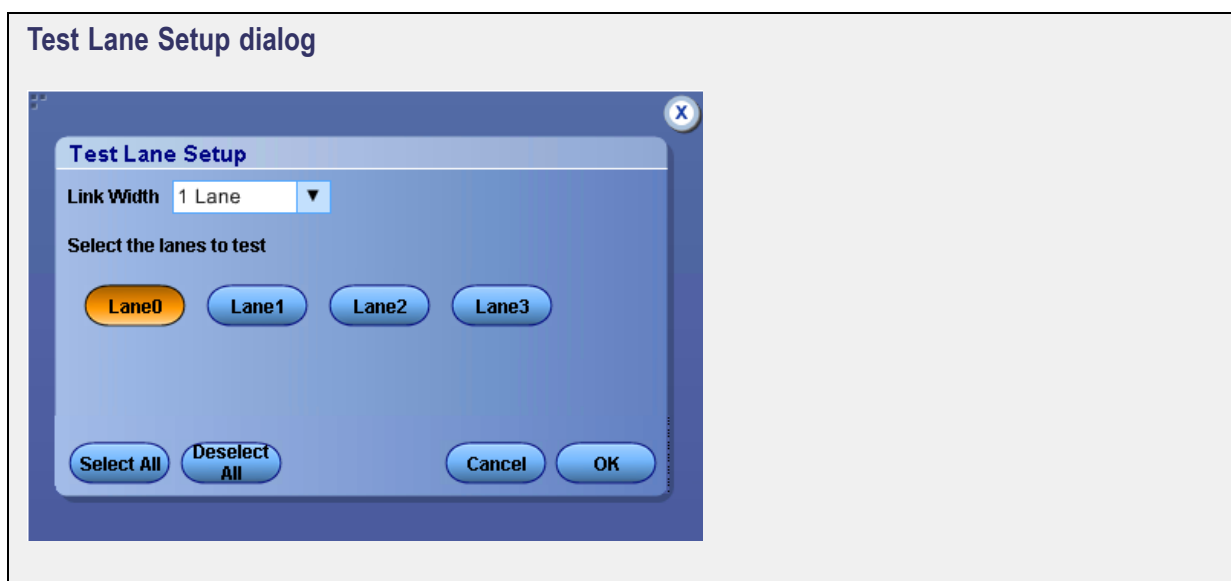
5. For View, select **Compliance** or **Advanced**.

NOTE. If you select *Advanced View*, the configuration settings are included in the Setup steps as step 4. If you select *Compliance View*, the configuration step is not included as a separate step. Access configuration parameters for selected tests from the *Configure* button in the *Test Selection* tab.

6. For Standard, select **QSFP+ Tx** or **SFP+ Tx**. If you select the QSFP+ Tx standard, you can configure which lanes to test as described in step 8.
7. For Device Profile, select one:
 - **Host** (default). Select this option to enable selecting Host tests listed in the Test Selection tab. To include measurements related to an attached copper cable, select the **10GSFP+Cu Direct Attach Cable** check box.
 - **Module**. Select this option to enable selecting Module tests listed in the Test Selection tab.
8. To configure the lane selection:
 - Use the **Number of Lanes to Test** drop-down box to select **1 Lane**, **2 Lanes**, or **4 Lanes**.
 - Click the **Selected Test Lanes Setup** button to open the [Test Lane Setup dialog \(see page 43\)](#). Use the dialog to configure which lanes to test.

See also

- [About Setting Up Tests \(see page 33\)](#)
- [Select a Test \(see page 44\)](#)
- [Use Prerecorded Waveforms for Analysis \(see page 48\)](#)
- [Acquire Live Waveforms for Analysis \(see page 49\)](#)








Select a test

Tests listed in the Test Selection tab depend on whether you selected Host or Module in the DUT tab. The available tests are the same for both standards (QSFP+ Tx and SFP+ Tx). Use these instructions to select the tests to run on the connected DUT. Select tests individually or by group. To see a short description of a test, select the test in the list.

1. In the Setup panel, click the **Test Selection** tab.
2. All required tests are selected by default. Click **Deselect All** if you do not want to run all required tests.
3. Select the desired test(s):
 - To select all required tests, click the **Select Required** button.
 - To select all tests in the list, click the **Select All** button.
 - To select an entire test group, select the check box for the test group; tests listed under the group are automatically selected.
 - To select one or more, but not all, tests in a test group, select only the check boxes for the desired tests.

Test Selection Controls

Table 7: Setup panel test controls

Button	Description
	When the View type selected in the DUT tab is Compliance, this button opens the configuration section for the selected test. If the View type is Advanced, this button is not displayed.
	Displays the schematic document for the selected test. Use to verify the test setup before running the test
	Deselects all tests in the table
	Selects tests required for compliance and deselects all other tests currently selected
	Selects all tests in the table

See also

- [Select Acquisitions \(see page 46\)](#)
- [About Setting Up Tests \(see page 33\)](#)

About acquisitions

Use the Acquisitions tab in the Setup panel to view and set [acquisition and save options \(see page 46\)](#) for the selected tests.

The information on the Acquisitions tab is specific to a test suite and gets updated when you change the selected test suite. This tab shows the acquisition details for the tests in the currently selected suite. Other options available depend on whether you selected the QSFP+ Tx or the SFP+ Tx standard, selected to [acquire live waveforms \(see page 49\)](#), or selected to [use prerecorded waveform files \(see page 48\)](#).

For example, the top part of the Acquisitions tab is the data source selection area. The information that appears here depends on the selected standard, the number of lanes to be tested (QSFP+ Tx only), whether you are using prerecorded waveforms or live waveforms, and whether you selected Host profile or Module profile in the DUT tab.

Below the data source selection area is the test acquisition and mapping table. The Acquisitions table shows the test name, acquisition, and signal type used for each test, and the waveform files used for tests run in prerecorded mode.

Table 8: Acquisitions table

Column Name	Function
Test Name	Displays the name of the selected test to which the acquisitions apply. One or more tests can perform the same acquisitions.
Acquisition	The acquisition of the waveform for the corresponding test
Signal Type	Shows the acquisition parameters of the signal. This column is displayed only if the Show Acquire Parameters check box is selected in the Acquisition and Save Options section.
Waveform File	Lists the name of the waveform files used for the test. Select waveform files by clicking the button in the row and selecting any waveform file using the standard File Open window. This option is available only when Use pre-recorded waveform files is selected in the Setup panel DUT tab.

See also

- [Select Acquisitions \(see page 46\)](#)
- [About Setting Up Tests \(see page 33\)](#)

Select acquisitions

Use the Acquisitions tab in the Setup panel to view and set acquisition parameters for selected tests. Options available depend on whether you are testing using live waveforms or prerecorded waveform files.

1. In the Setup panel, click the **Acquisitions** tab.
2. Do one of the following:
 - For prerecorded waveform files: in the Acquisitions table, locate the row for the desired test and then click the ellipsis button (⋮) in the Waveform FileName column. Select Data Positive (DP) and Data Negative (DN) waveforms for each test.
 - For capturing live waveforms, select the Data Source channels for positive and negative signals if needed.
3. [Deskew channels \(see page 152\)](#).
4. Select the [acquisition and save options \(see page 46\)](#).

See also

- [Configure Tests \(see page 52\)](#)
- [About Setting Up Tests \(see page 33\)](#)
- [Test Setup Overview \(see page 42\)](#)

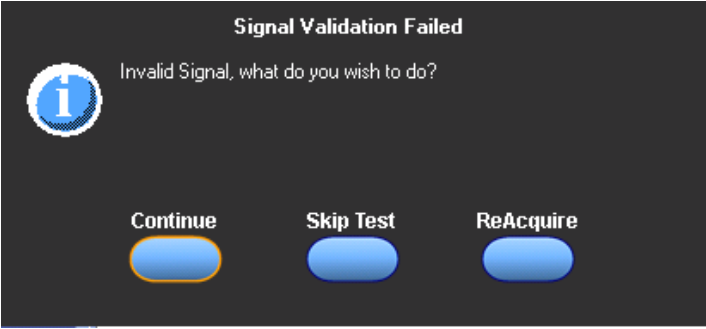
Acquisition parameters

Available acquisition options depend on the selected mode (Compliance or User Defined) and the type of waveform being used, live or prerecorded.

Table 9: Acquisition and save options

Option	Description
Show Acquire Parameters	When selected, the signal acquisition parameter for each test displays in the Signal Type column.
NOTE. The rest of the options in this table are available for live waveform acquisitions only.	
Data Source (+)	Sets the channels used for positive and negative data sources. When QSFP+ Tx is the selected standard, data sources for each lane to be tested can be configured.
Data Source (–)	
Signal Validation:	Determines how the application responds to the source signal

Table 9: Acquisition and save options (cont.)

Option	Description
<div>■ Prompt me if signal fails</div>	<div>If the signal fails, pauses the measurement operation and displays a dialog box with the following options:</div> <div></div> <div><div>■ Reacquire: Try acquiring the signal again.</div><div>■ Use Anyway: Use the signal even if it cannot be validated.</div><div>■ Skip Test: Abort the test if the signal cannot be validated.</div></div>
<div>■ Use signal as is—Don't Check</div>	<div>Skips the signal validation process. Does not test the signal for its characteristics</div>
<div>■ Skip test if signal fails</div>	<div>Moves to the next test (if applicable) if the signal fails</div>
<div>NOTE. The following Save options affect the order in which waveforms are acquired and analyzed.</div>	
<div>Save All Waveforms Before Analysis</div>	<div>Waveforms will be saved before being analyzed.</div>

See also


- [About Acquisitions \(see page 45\)](#)
- [Select Acquisitions \(see page 46\)](#)

Use prerecorded waveforms for analysis

Use prerecorded waveform files to run saved tests or to run a new test using a saved waveform from another test.

[Run a saved test in prerecorded mode \(see page 62\).](#)

Run a new test using a prerecorded waveform file.

1. [Create a new test \(see page 31\).](#)
2. In the DUT tab of the Setup panel, select **Use pre-recorded waveform files**.
3. [Change any other DUT parameters as desired \(see page 42\).](#)
4. In the Test Selection tab, [select the desired test\(s\) \(see page 44\).](#)
5. In the Acquisitions tab, locate the Waveform FileName column in the Acquisitions table. Click the ellipsis button () for each test and select Data Positive (DP) and Data Negative (DN) waveforms for each test.
6. Change or select other parameters as needed and then click **Start** to run the test.

See also

- [Test Setup Overview \(see page 42\)](#)
- [About Acquisitions \(see page 45\)](#)
- [Configure Tests \(see page 52\)](#)

Acquire live waveforms for analysis

Use these instructions to set up acquisition for a live waveform.

1. [Open a saved test setup \(see page 32\)](#) or [create a new one \(see page 31\)](#).
2. In the Setup panel DUT tab, enter the desired DUT in the corresponding field if needed and then select **Acquire live waveforms**.
3. [Select other DUT parameters \(see page 42\)](#) as desired.
4. In the Test Selection tab, [select the desired test\(s\) \(see page 44\)](#).
5. In the Acquisitions tab, select the channels for the positive and negative data sources if needed.
6. [Deskew channels \(see page 152\)](#) if needed.
7. Select other desired [acquisition and save options \(see page 46\)](#).
8. [Configure the tests \(see page 52\)](#) if needed and then click **Start** to run the test.

See also

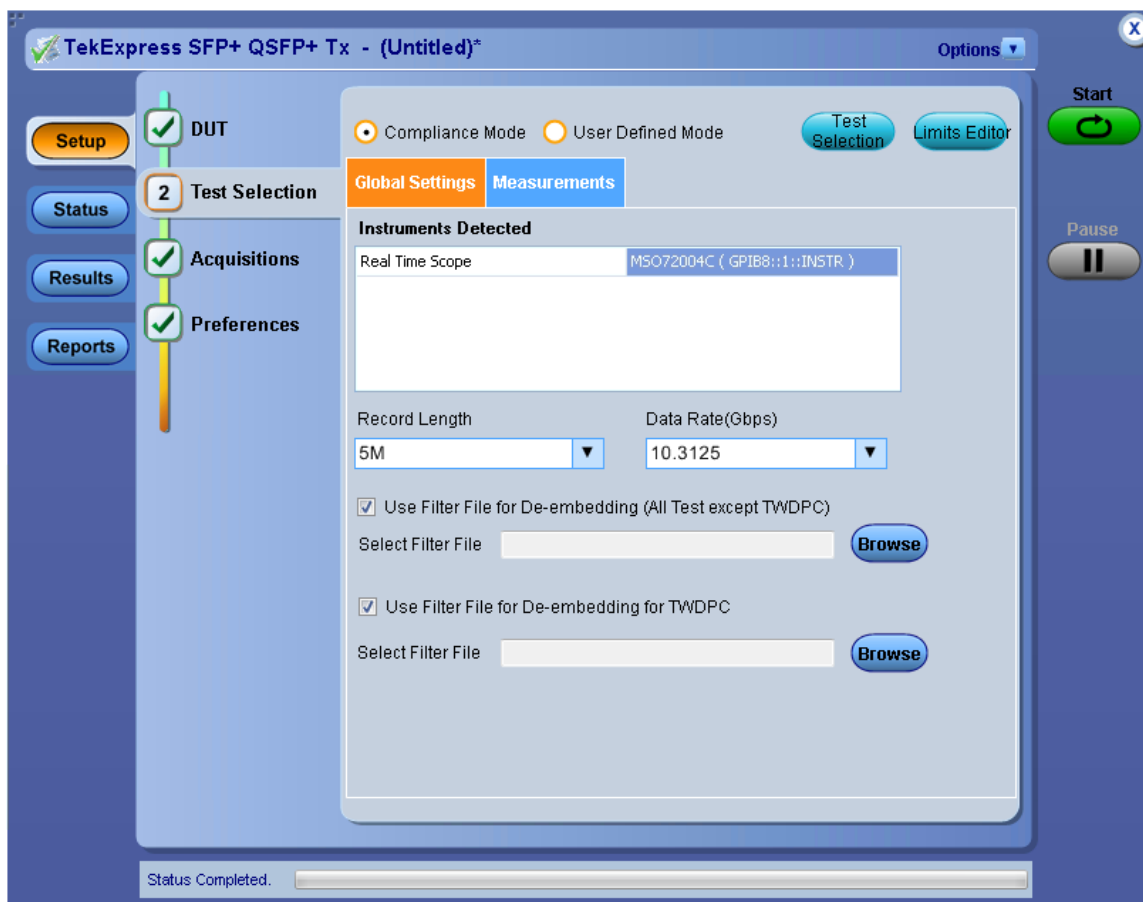
- [About Acquisitions \(see page 45\)](#)
- [Select Acquisitions \(see page 46\)](#)
- [Use Prerecorded Waveforms for Analysis \(see page 48\)](#)

About configuring tests

Use configuration settings to view and edit the analysis parameters for selected tests.

The Configuration tab shows Global Settings parameters and Measurement parameters.

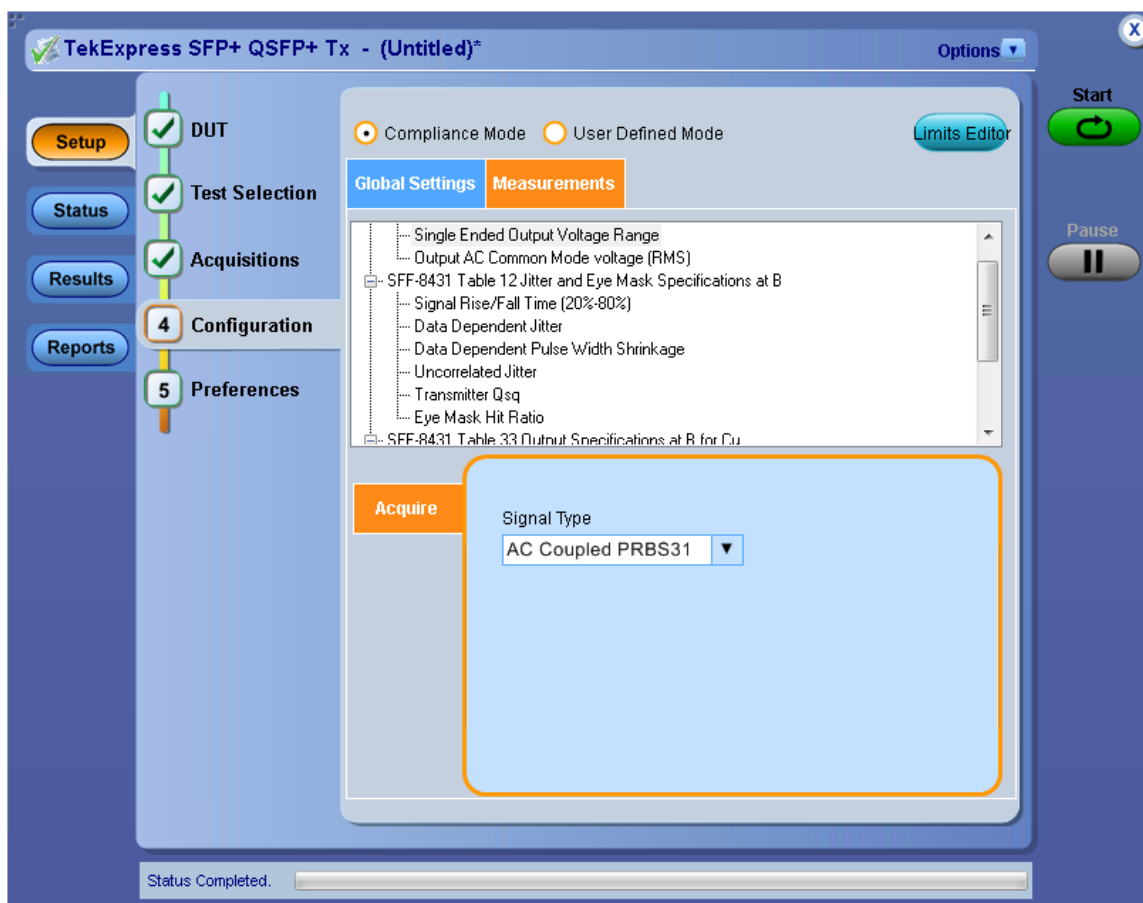
Global Settings parameters are common for all tests and are applied to all tests in the session until you change the settings or select a different test setup.



NOTE. The *Use Filter File for De-embedding (only for TWDPC)* check box is available only if the test Host Output TWDPC is selected in the Test Selection tab.

Measurement parameters are specific to the test selected in the tree view section of the configuration settings. Test-specific parameters can include acquisition, analysis, and limit parameters, and certain oscilloscope settings.

Whether you can configure settings depends on which mode you selected, Compliance or User Defined. For more information, see [About Setting Up Tests \(see page 33\)](#).



NOTE. If you selected Compliance View in the DUT tab, you will access test configuration settings using the Configure button in the Test Selection tab. If you selected Advanced View, access test configuration settings from the Configuration tab in the Setup panel.

See also

- [Configure Tests](#)
- [About Running Tests \(see page 59\)](#)

Configure tests

Use these instructions for configuring tests.

1. Do one of the following:

- If you selected Compliance View in the DUT tab, then in the Test Selection tab, select the desired test in the list and click **Configure**.

NOTE. To return to test selection from the Configuration section, click the **Test Selection** button.

- If you selected Advanced View, click the **Configuration** tab in the Setup panel.

2. Select the desired mode:

- **Compliance Mode:** Select to use Compliance Mode values. You cannot change most test parameters in Compliance mode but you can view the parameters.
- **User Defined Mode:** Select to run tests with custom parameters.

3. To select parameters that apply to all tests selected for the current session, click the **Global Settings** tab and do any of the following:

- To change the oscilloscope used for testing, in the Instruments Detected section, click in the shaded area opposite Real Time Scope and select the desired instrument from the drop-down list. If the oscilloscope you want is not listed, [refresh the list \(see page 40\)](#).
- To select a filter file for de-embedding the signal, select the **Use Filter File for De-embedding** check box. Click the **Browse** button that appears and select a filter file to use.
- To select a filter file for de-embedding the signal for Host Output TWDPC tests, select the **Use Filter File for De-embedding (only for TWDPC)** check box. (Available only if the Host Output TWDPC test is selected in the Test Selection tab.) Click **Browse** and select a filter file to use.

4. To change the signal for a specific test (in User Defined Mode), click the **Measurements** tab, select the test in the tree view section and then select the signal type in the Acquire section.

5. To view test limits (in Compliance Mode) or change test limits (in User Defined Mode), click the **Limits Editor** button to access the Limits Editor window.

See also

- [Common Test Parameters and Values \(see page 53\)](#)
- [De-embed Using Filter Files \(see page 151\)](#)
- [Select Report Options \(see page 56\)](#)
- [About Setting Up Tests \(see page 33\)](#)

Common test parameters and values

The following table lists the measurement parameters common to most tests.

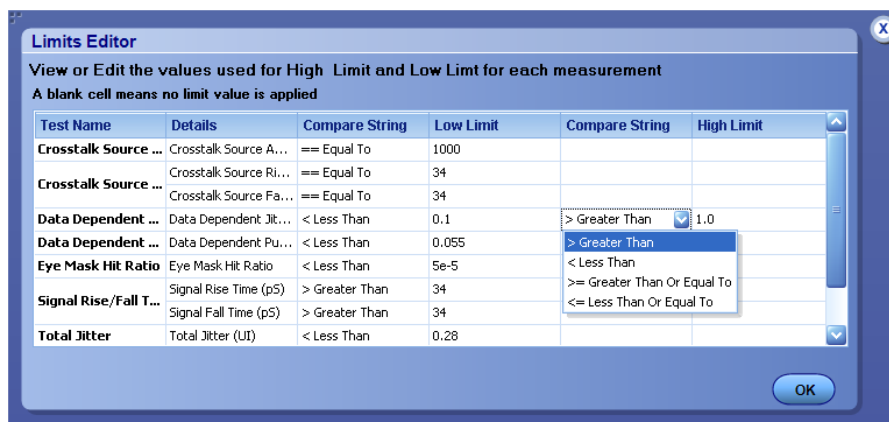
NOTE. *If you change the channel selection for Data+ (DP) and Data– (DN) signals, make sure that you change the corresponding trigger source in the Analyze tab for each of the measurements. If you do not do this, the waveform might not trigger and the measurements might not be completed.*

Table 10: Common parameters and values

Parameter Type	Parameter and Default Value
Mode	<p>Determines whether test parameters are in compliance or can be edited</p> <ul style="list-style-type: none"> ■ Compliance: Most test parameter values cannot be changed. ■ User Defined: Most test parameter values can be changed.
Global Settings	<p>These settings apply to all tests selected for the current session. You can change only some of these settings.</p> <ul style="list-style-type: none"> ■ Real Time Scope: Specifies the oscilloscope used for tests ■ Record Length: Specifies the length of the record (5M is the default) ■ Use Filter File for De-embedding: When selected, provides a browse button and field for selecting a filter to use to compensate for cable lengths. ■ Use Filter File for De-embedding (only for TWDPC): When selected, provides a browse button and field for selecting a filter to use to compensate for cable lengths. ■ Data Rate: Select the signal data rate as one of 9.95328 Gbps, 10.3125 Gbps (default), 10.51875 Gbps, or 11.10 Gbps.

Table 10: Common parameters and values (cont.)

Parameter Type	Parameter and Default Value
Measurements	<p>Acquire:</p> <ul style="list-style-type: none"> ■ Signal Type: Specifies the signal type of the acquisition for the test selected in the tree view of the Measurements tab. Running tests in User Defined Mode allows you to perform the tests on different types of signal. The default signal type varies by test. Not all tests support all the signal types. For each test, the application includes the signal type options that are best suited to the measurements (see page 109). ■ Window Size (%): Host test Transmitter Qsq only. Set at 10% for Compliance Mode. In User Defined Mode, you can change this to 5% or 20%.
Limits	Shows the upper and lower limits for the applicable measurement using different types of comparisons. In Compliance Mode, allows you to view the measurement high and low limits used for the test selected in the tree view of the Measurements tab. When running tests in User Defined Mode, you can edit the limit settings in the Limits Editor.



When running tests in User Defined Mode, the cells in the Limits Editor table are active for editing so you can change parameters.

See also

- [Configure Tests \(see page 52\)](#)
- [Select Acquisitions \(see page 46\)](#)
- [De-embed Using Filter Files \(see page 151\)](#)

Configure email notification

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

1. From the Options menu, select **Email Settings** to open the [Email Settings \(see page 56\)](#) dialog box.
2. (Required) For Recipient email Address(es), enter your email address. To include multiple addresses, separate the addresses with commas.
3. (Required) For Sender's Address, enter the email address used by the instrument. This address consists of the instrument name followed by an underscore followed by the instrument serial number, then the @ symbol and the email server used. For example: DPO72004C_B130099@yourcompany.com.
4. (Required) In the Server Configuration section, type the SMTP Server address of the Mail server configured at the client location, and the SMTP Port number, in the corresponding fields.

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

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

5. In the Email Attachments section, select from the following options:
 - **Reports:** Select to receive the test report with the notification email.
 - **Status Log:** Select to receive the test status log with the notification email. If you select this option, then also select whether you want to receive the full log or just the last 20 lines.
6. In the Email Configuration section, select as desired:
 - Select the message file format to send: HTML (the default) or plain text.
 - Enter a maximum file size for the email message. Messages with attachments larger than this limit will not be sent. The default is 5 MB.
 - To limit the number of attempts the system makes to send a notification, enter the number in the Number of Attempts to Send field. The default is 1. You can also specify a timeout.
7. Select the **Email Test Results When complete or on error** check box. Use this check box to quickly enable or disable email notifications.
8. To test your email settings, click **Test Email**.
9. To apply your settings, click **Apply**.
10. Click **Close** when finished.

Email settings

Email Settings

Recipient e-mail Address(es)

Note: Separate Email addresses with a comma

Sender's Address

Email Attachments

☒ Reports

☒ Status Log ☐ Last 20 Lines ☐ Full Log

Server Configuration

SMTP Server SMTP Port

Login

Password

Host Name

Email Configuration

Email Format ☒ HTML ☐ Plain Text

Max Email Size (MB)

Number of Attempts to Send

Timeout (Sec)

☒ Email Test Results When complete or on error

Test Email Apply Close

Select test notification preferences

Select how you want to be notified by the system when a test measurement fails:

1. In the Setup panel, click the **Preferences** tab.
2. Select the following option:
 - **On Test Failure, stop and notify me of the failure:** Select this option to have the test stop and notify you by email if the test fails. If you select this option, select the **Email Test Results when complete or on error** check box in the Email Settings dialog box. Click **Email Settings** and [configure the email settings \(see page 55\)](#) if you have not already done so.

See also

- [About Setting Up Tests \(see page 33\)](#)
- [Select Report Options \(see page 56\)](#)

Select report options

Use the [Reports panel \(see page 30\)](#) to select which test information to include in the report, and the naming conventions to use for the report. For example, always give the report a unique name or select to have the same name increment each time you run a particular test. Generally, you would select report options before running a test or when creating and saving test setups. Report settings are included in saved test setups.

In the Reports panel, select from the following report options:

Table 11: Report options

Setting	Description
Generate new report	Creates a new report.
Append with previous run session	Appends the latest test results to the end of the current test results report.
Replace current test values with the new results	Replaces the previous test results with the latest test results. Newly added tests results are appended to the end of the report.
Report name	<p>Displays the name and location where the report will be saved when generated. This field is blank by default. The report and related files are stored in the Untitled Session folder located at \My TekExpress\SFP+ QSFP+ Tx\Untitled Session by default. The report file in this folder gets overwritten each time you run a test, and gets deleted when you close the application. To preserve your test results, specify a unique name or select to auto increment the report name, then save the test before running another test or exiting the application.</p> <p>Change the report name or location.</p> <p>Do one of the following:</p> <ul style="list-style-type: none"> ■ In the Report Name field, type over the current folder path and name. ■ Double-click in the Report Name field and then make selections from the popup keyboard and click the Enter button. <p>Be sure to include the entire folder path, the file name, and the file extension. For example: C:\Documents and Settings\<your user name>\My Documents\My TekExpress\SFP+ QSFP+ Tx\DUT001_group1.mht.</p> <p>NOTE. You cannot set the file location using the Browse button.</p> <p>Open an existing report.</p> <p>Click Browse, select the report file and then click View at the bottom of the panel.</p>
Save as type	Saves a report in a file type different from the default. Lists supported file types .mht and .pdf.
Auto increment report name if duplicate	If the application finds a report with the same name as the one being generated, the application automatically increments the name of the report. For example: DUT001, DUT002, DUT003. This option is enabled by default. This option is not available if Append Reports is selected.
Include pass/fail results summary	The color block labeled Test Result indicating whether the test passed or failed will be included in the report. For details, see Report Contents in View a Report (see page 65) .
Include detailed results	The report will include parameters measured, such as Margin, Low Limit, High Limit, Compliance Mode Yes/No, Execution Time, and test-specific Comments generated by the software.
Include plot images	Screen shots captured from the oscilloscope during test execution that show the waveform and measurement data will be included.
Include setup configuration	Information about hardware and software used in the test will be included in the summary box at the beginning of the report. Information includes: the oscilloscope model and serial number, firmware version, SPC and factory calibration status, and software versions for applications used in the measurements.

Table 11: Report options (cont.)

Setting	Description
Include user comments	Select to include any comments about the test that you or another user added in the DUT tab of the Setup panel. Comments appear in the Comments section under the summary box at the beginning of each report.
Group test	The report can be grouped either by test name or by lane. This option is for QSFP+Tx standard only.
Append reports	This option adds new report data to the end of an existing report of the same name. This option is disabled by default. This option is not available if the Auto Increment Report Name if Duplicate option is selected.
View report after generating	Automatically opens the report in your Web browser when the test completes. This option is selected by default.

See also

- [View a Report \(see page 65\)](#)
- [About Setting Up Tests \(see page 33\)](#)

About running tests

After selecting and configuring tests, review the [pre-run checklist \(see page 61\)](#) and then click **Start** to perform the tests. The application acquires and analyzes the data, then displays a report when the tests are finished.

While the tests are running, other applications may display windows in the background. The TekScope application takes precedence over other applications, but you can switch to other applications by using the Alt+Tab key combination. To keep the TekExpress SFP+ QSFP+ Tx application on top, select **Keep On Top** from the SFP+ QSFP+ Tx Options menu.

See also

- [Before You Click Start \(see page 59\)](#)
- [About Configuring Tests \(see page 50\)](#)
- [About Setting Up Tests \(see page 33\)](#)

Before you click start

Before you run tests for the first time, do the following:

1. Understand where your test files are stored on the instrument.

After you install and launch TekExpress SFP+ QSFP+ Tx, it creates the following folders on the oscilloscope:

- \My Documents\My TekExpress\SFP+ QSFP+ Tx
- \My Documents\My TekExpress\SFP+ QSFP+ Tx\Untitled Session

Every time you launch TekExpress SFP+ QSFP+ Tx, an **Untitled Session** folder is created in the SFP+ Tx folder. The **Untitled Session** folder is automatically deleted when you exit the SFP+ QSFP+ Tx application. To preserve your test session files, save the test setup before exiting the TekExpress application.



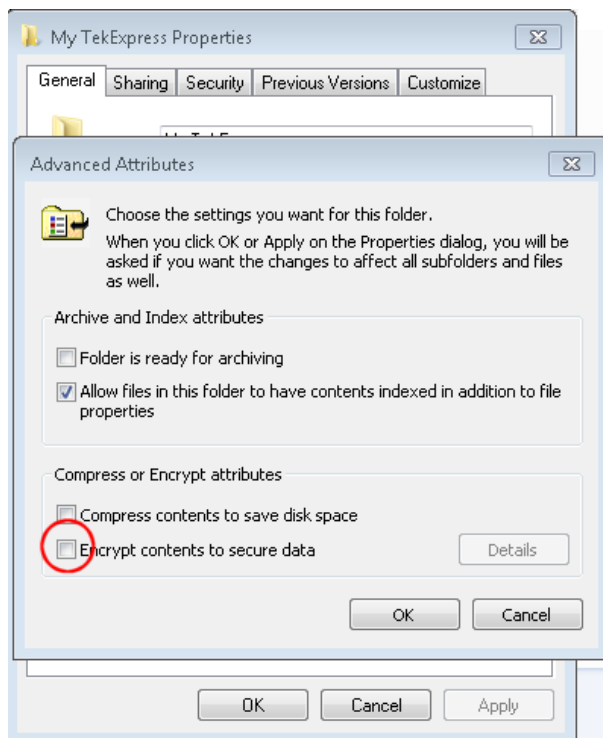
CAUTION. Do not modify any of the session files or folders because this may result in loss of data or corrupted session files. Each session has multiple files associated with it. When you save a session, a .TekX file, and a folder named for the session that contains associated files, is created on the oscilloscope X: drive.

2. [Map the shared My TekExpress folder \(see page 153\)](#) as **X:** (X drive) on the instruments used in test setups running Microsoft Windows Operating System.

The My TekExpress folder has the share name format <domain><user ID>My TekExpress. Or, if the instrument is not connected to a domain, the share name format is <instrument name><user ID>My TekExpress. This shared folder is used to save the waveform files and is used during other file transfer operations.

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

3. Make sure that the My TekExpress folder has read and write access, and that the contents are not set to be encrypted:
 - a. Right-click the folder and select **Properties**.
 - b. Select the **General** tab and then click **Advanced**.
 - c. In the Advanced Attributes dialog box, make sure that the option **Encrypt contents to secure data** is NOT selected. Example.



4. See the [pre-run checklist \(see page 61\)](#) before you run a test.

See also

- [Configure Tests \(see page 52\)](#)
- [View Test-Related Files \(see page 68\)](#)

- [Application Directories and Usage \(see page 10\)](#)
- [File Name Extensions \(see page 11\)](#)

Pre-Run checklist

Do the following before you click Start to run a test. If this is the first time you are running a test on a setup, refer to the information in [Before You Click Start \(see page 59\)](#).

1. Make sure that all the required instruments are properly warmed up (approximately 20 minutes).
2. Perform Signal Path Compensation (SPC).
 - a. On the oscilloscope main menu, select the **Utilities** menu.
 - b. Select **Instrument Calibration**.
3. [Deskew channels \(see page 152\)](#).
4. Verify that the application is able to find the DUT. If it cannot, [perform a search for connected instruments \(see page 40\)](#).
 - a. In SFP+ QSFP+ Tx, select the **Setup** panel and then click the **Test Selection** tab.
 - b. Select any test and then click **Configure**.
 - c. In the Configuration section, click **Global Settings**.
 - d. In the Instruments Detected section, click the drop-down arrow to the right of Real Time Scope and make sure that the oscilloscope with the (GPIB8::1::INSTR) designation is in the list.

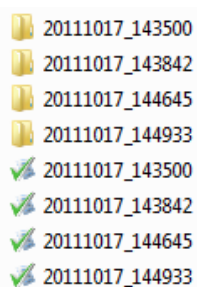
See also

- [Equipment Connection Setup \(see page 36\)](#)

Run a saved test in prerecorded mode

Use this option to rerun a complete test using just the oscilloscope and the saved test setup files, provided that you selected to save the captured waveforms when you originally ran the saved test.

NOTE. When you run a saved test in prerecorded mode and then save it under the same name, the test results are saved in a new session folder named for the date and time of the session. Any test settings that you changed for the session will be saved as a new test session file and be paired with a folder of the same name. Example. When you open a test setup that has multiple sessions and you select a session from the Run session list in the DUT tab, the settings associated with that test session are restored.



Each test session folder has a matching test session file that stores the individual test settings for that session.

1. [Open a saved test setup \(see page 32\).](#)
2. In the Setup panel, select the DUT tab and then select **Use pre-recorded waveform files**.
A Run session drop-down list appears that displays the previous saved sessions for this test.
3. From the Run session list, select the session to run.

NOTE. If you select a session for which no waveform files were saved, you will receive an error message. Either select another test session or select waveform files to use. For details, see Step 2 of [Select Acquisitions \(see page 46\)](#).

4. Click **Start**.
5. To save the test results, session settings, and related files, save the test setup before selecting another test setup or exiting TekExpress SFP+ QSFP+ Tx.

See also

- [Use Prerecorded Waveforms for Analysis \(see page 48\)](#)

View the progress of analysis

The [Status panel \(see page 27\)](#) displays a record of the test as it is executed. By default, the application switches to this panel after you click the Start button to run a test. Choose from the following two views by selecting the named tab, even while a test is in progress.

Test Status

The Test Status tab presents a collapsible table with information about each test as it is running. To collapse and expand the table, click the expand (+/-) collapse button.

Table 12: Status tab table

Column	Description
Test Name	Name of the test
Acquisition	Describes the type of data being acquired
Acquire Status	Progress of the acquisition: <ul style="list-style-type: none"> ■ To be started ■ Completed Acquisition ■ Prerecorded waveform
Analysis Status	Progress state of the analysis: <ul style="list-style-type: none"> ■ To be started ■ In progress ■ Completed ■ Aborted

Log View

The Log View tab provides a list of actions that happen as the test executes. Use this tab to review or troubleshoot tests.

Table 13: Log view options

Item	Description
Message History	This window timestamps and displays all run messages.
Show Detailed Log	Select this check box to record a detailed history of test execution.
Auto Scroll	Select this check box to have the program automatically scroll down as information is added to the log during the test.
Clear Log	Click this button to clear all messages in the Message History window.
Save	Use to save the log file as a text file for examination. Displays a standard Save File window and saves the status messages in the file that you specify.

See also

- [View Test Results \(see page 64\)](#)

View test results

When a test completes running, the application switches to the [Results panel \(see page 29\)](#), which shows a summary of test results. The Overall Test Result is displayed at the top left of the Results table. If all of the tests for the session pass, the overall test result will be Pass. If even one test out of multiple tests fails, the overall test result will show Fail, even if all the other tests passed.

NOTE. *Results of Crosstalk measurements, Total Jitter @ J2, and Total Jitter @ J9 are not included in the Overall Test Results because these measurements are informative only. If any of the Crosstalk tests or Total Jitter @ J2 and Total Jitter @ J9 fails, it will not cause the overall test results to fail.*

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

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

See also

- [View a Report \(see page 65\)](#)
- [View the Progress of Analysis \(see page 63\)](#)

View a report

After the analysis, a report is automatically generated. By default, the report is displayed in your Web browser unless you cleared the **View Report After Generating** check box in the Reports panel before running the test. If you cleared this check box, or to view a different test report, do the following:

1. In the Reports panel, click the **Browse** button and locate the desired report.

The path to the report displays in the Report Name field.

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

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


For information on changing the file type, file name, and other report options, see [Select Report Options \(see page 56\)](#).

Report contents

In the report, a table shows the test name, measurement details, test result (pass/fail), mode, and analysis time.

Setup Configuration Information

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

<div>  <div> TekExpress QSFP+ Host Test Report </div> </div>			
Setup Information			
DUT ID	DUT001	TekExpress Version SFP+/QSFP+	3.1.0.126
Spec Version	SFF-8635 Revision 0.4	Scope Model	DPO72004C
Date/Time	2013-10-16 05:30:53	FW Version	6.8.1 Build 3
Compliance Mode	True	DPOjet Version	6.1.0.509
Overall Execution Time	0:16:09	Scope Serial Number	B130233
Overall Test Result	Pass	Calibration Status	PASS
DUT COMMENT:	General Comment - QSFP + Transmitter Host DUT		

User Comments

These appear in the Comments section directly below the summary box at the beginning of the test report. To exclude these comments from a report, clear the **Include User Comments** check box in the Reports panel before running the test.

Pass/Fail Summary

The Pass/Fail Summary column indicates whether a test passed or failed. If the test passed, the column cell is green. If the test failed, it is red. To exclude this information from a report, clear the **Include Pass/Fail Results Summary** check box in the Reports panel before running the test.

Single Ended Output Voltage Range							
Measurement Details	Lane	Measured Value	Units	Test Result	Margin	High Limit	Low Limit
Single Ended Output Voltage Range Min(V)	Lane0	-0.1818	V	Pass	0.1182	N.A	-0.3
Single Ended Output Voltage Range Max(V)	Lane0	0.162	V	Pass	3.838	4.0	N.A
Single Ended Output Voltage Range Min(V)	Lane1	-0.1776	V	Pass	0.1224	N.A	-0.3
Single Ended Output Voltage Range Max(V)	Lane1	0.1584	V	Pass	3.8416	4.0	N.A
COMMENTS		Signal Type :AC Coupled PRBS31.					

[Back to Summary Table](#)

Detailed Results

Includes detailed measurement information, as shown outlined in red in the following example. The Comments column is for test-specific information that isn't covered elsewhere. To exclude this information from a report, clear the **Include Detailed Results** check box in the Reports panel before running the test.

Test Name Summary Table							
Single Ended Output Voltage Range				Pass			
Output AC Common Mode voltage (RMS)				Pass			
Transmitter Qsq				Pass			
Eye Mask Hit Ratio				Pass			
Voltage Modulation Amplitude (p-p)				Pass			
Transmitter Qsq (for Cu)				Pass			
Output AC Common Mode voltage (RMS) (for Cu)				Pass			
Host Output TWDPC				Pass			

Single Ended Output Voltage Range							
Measurement Details	Measured Value	Units	Test Result	Margin	High Limit	Low Limit	
Single Ended Output Voltage Range Min (V)	-0.1776	V	Pass	0.1224	N.A	-0.3	
Single Ended Output Voltage Range Max (V)	0.16	V	Pass	3.84	4.0	N.A	
COMMENTS		Signal Type :AC Coupled PRBS31.					

[Back to Summary Table](#)

Output AC Common Mode voltage (RMS)							
Measurement Details	Measured Value	Units	Test Result	Margin	High Limit	Low Limit	
Output AC Common Mode voltage (RMS)	8.1908	mV	Pass	6.8092	15.0	N.A	
COMMENTS		Signal Type :PRBS31					

[Back to Summary Table](#)

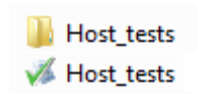
Plot Images

Plot images are screen shots captured from the oscilloscope during test execution. They show waveform and measurement data. To exclude these from a report, clear the **Include Plot Images** check box in the Reports panel before running the test.



View test-related files

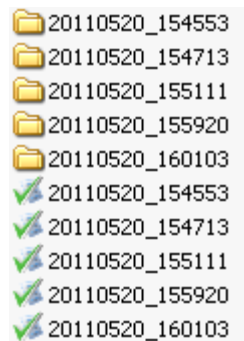
Files related to tests are stored in the **SFP+ QSFP+ Tx** folder under the **My TekExpress** shared folder. In the **SFP+ QSFP+ Tx** folder, each test setup has a test setup file and a test setup folder, both with the test setup name:



The test setup file is preceded by the SFP-TX icon and usually has no visible file extension.

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

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



Each session folder contains image files of any plots generated from running the test session. If you selected to save all waveforms or ran tests using prerecorded waveform files, these are included here.

The first time you run a new, unsaved session, the session files are stored in the **Untitled Session** folder located at **.. \My TekExpress \SFP+ QSFP+ Tx**. The session setup file is named **Untitled**. When you name and save the session, the test setup file is given the name you specify and the test-related files are placed in a folder with the same name. A copy of the test files stay in the **Untitled Session** folder until you run a new test or until you close the **SFP+ QSFP+ Tx** application.

See also

- [File Name Extensions \(see page 11\)](#)
- [Before You Click Start \(see page 59\)](#)

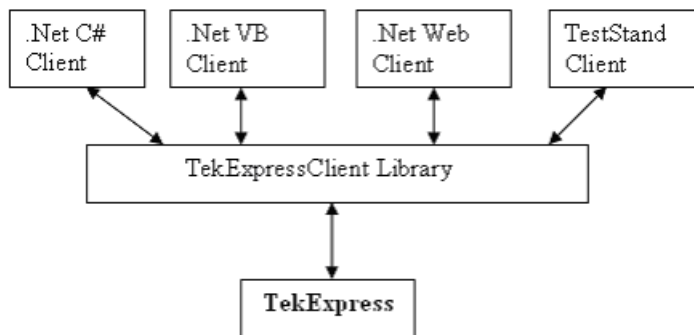
About the programmatic interface

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

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

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

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



See also

- [Requirements for Developing TekExpress Client \(see page 70\)](#)
- [Remote Proxy Object \(see page 73\)](#)
- [Client Proxy Object \(see page 74\)](#)

Requirements for developing TekExpress client

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

References required

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

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

Required steps for a client

The client uses the following steps to use TekExpressClient.dll to programmatically control the server:

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

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

If any other client tries to access a server that is locked, it will receive a notification that the server is locked by another client.

3. When the client has connected to and locked the server, the client can access any of the programmatic controls needed to run the remote automations.
4. After the client operations finish, the client unlocks the server.

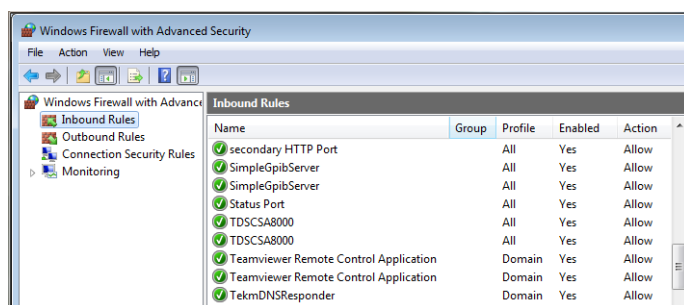
See also

- [About SFP+ QSFP+ Tx Application Commands \(see page 80\)](#)

To enable remote access

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

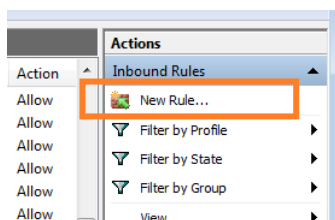
1. Access the Windows Control Panel and open the Windows Firewall tool (**Start > Control Panel > All Control Panel Items > Windows Firewall**).
2. Click **Advance Settings > Inbound Rules**.
3. Scroll through the **Inbound Rules** list to see if the following items (or with a similar name) are shown: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



4. If both items are shown, you do not need to set up any rules. Exit the Windows Firewall tool.
5. If one or both are missing, use the following procedure to run the **New Inbound Rule Wizard** and add these executables to the rules to enable remote access to the TekExpress application.

Run the New Inbound Rule Wizard

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

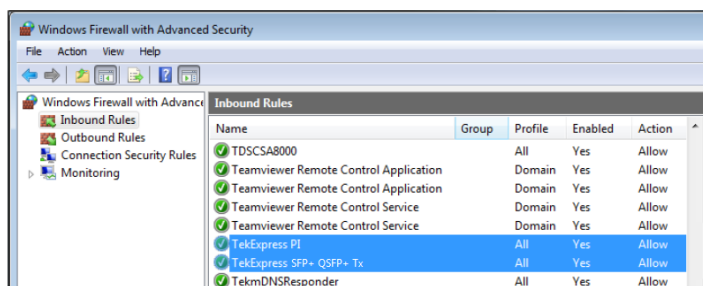


2. Verify that **Program** is selected in the Rule Type panel and click **Next**.
3. Click **Browse** in the Program panel and navigate to and select one of the following TekExpress applications (depending on the one for which you need to create a rule):

4. TekExpress SFP+ QSFP+ Tx.exe
5. TekExpress.exe

NOTE. See [Application directories and usage \(see page 10\)](#) for the path to the application files.

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



12. Repeat steps 1 through 11 to enter the other TekExpress executable if it is missing from the list. Enter **TekExpress PI** as the name.
13. Scroll through the Inbound Rules list and verify that the list shows the rule that you just entered.
14. Exit the Windows Firewall tool.

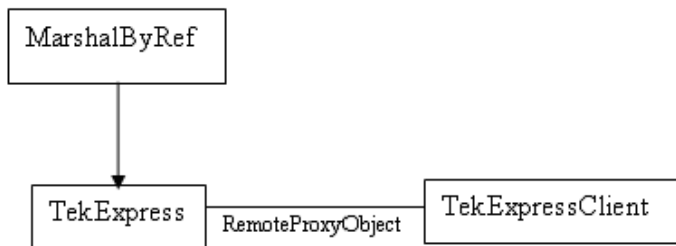
To use the remote access:

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

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


Remote proxy object

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



The following is an example:

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

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

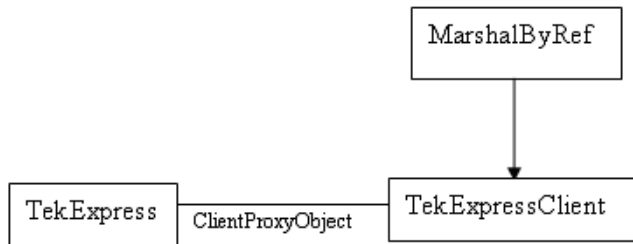
For example,

```
//Get a reference to the remote object
```

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

Client proxy object

Client exposes a proxy object to receive certain information.



For example,

```
//Register the client proxy object
```

```
wellKnownServiceTypeEntry[] e = RemotingConfiguration.GetRegisteredWellKnownServiceTypes();
```

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

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

```
//Expose the client proxy object through marshalling
```

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

The client proxy object is used for the following:

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

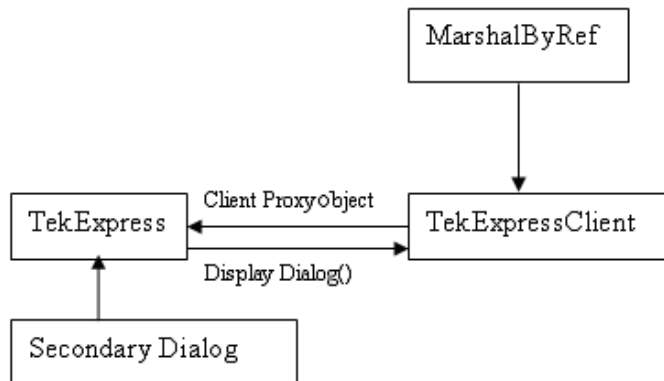
Examples

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

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

For more information, click the following topic 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.

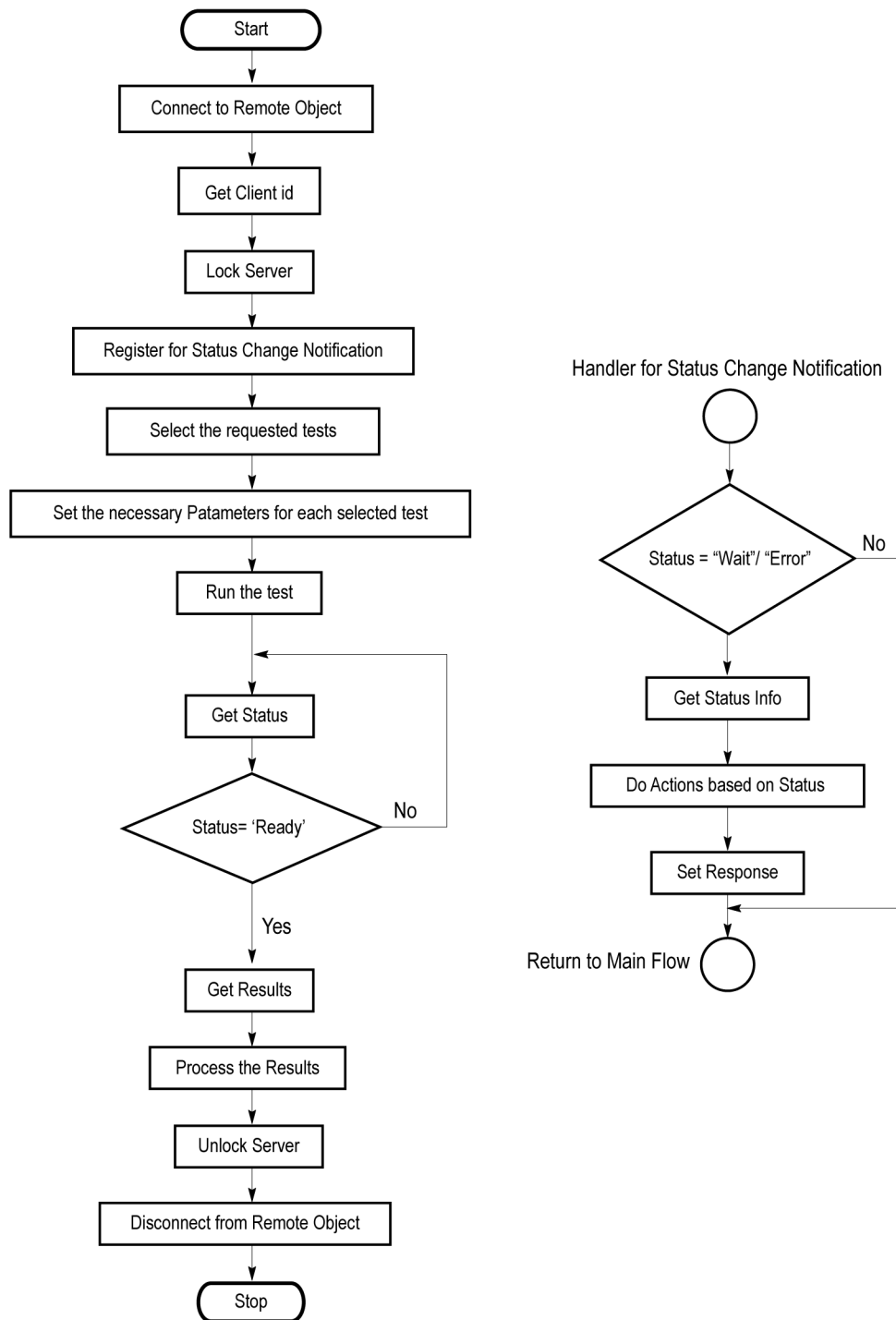
File Transfer Events

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 example

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

Process flowchart



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

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

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

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

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. *Skip step 8 if you are registered for the status change notification and the status is Ready.*

9. After completing the tests, get the results.
10. Create a report or display the results and verify or process the results.
11. Unlock the server after 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 that contains the title, message description, and the expected responses for the status.
2. Perform the actions based on the status information.
3. Set the response as expected.

See also

- [About SFP+ QSFP+ Tx Application Commands \(see page 80\)](#)
- [Program Example \(see page 78\)](#)

Program example

This program example shows how to communicate between a PC and TekExpress SFP+ QSFP+ Tx 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, "SFP+ Tx", "Host", "Single Ended Output  
Voltage Range", true)
```

7. Select a channel.

```
mClient.SetGeneralParameter(clientID, "SFP+ Tx", "Host", "Single Ended  
Output Voltage Range", "DP Connected To") 'Measurement selected
```

8. Configure the selected measurement.

```
mClient.SetGeneralParameter(clientID, "SFP+ Tx", "Host", "Single Ended  
Output Voltage Range", "DP Connected to") 'Single Ended Output Voltage Range  
measurement selected
```

```
mClient.SetGeneralParameter(clientID, "SFP+ Tx", "Host", "Single Ended  
Output Voltage Range", "DN Connected to") 'Single Ended Output Voltage Range  
measurement
```

```
mClient.SetGeneralParameter(clientID, "SFP+ Tx", "Host", "Single Ended  
Output Voltage Range", "Record Length$2M") 'Single Ended Output Voltage Range  
measurement
```

```
mClient.SetAcquireParameter(clientID, "SFP+ Tx", "Host", "Single Ended  
Output voltage Range", "Single Ended output Voltage Range Acquisition & "$  
& "Signal Type" & "$" & PRBS21") Signal type PRB21 is selected for 'Single Ended Output  
Voltage Range measurement test
```

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, waitingMsbBxMes-  
sage, 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.

About SFP+ QSFP+ Tx application commands

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

[Connect through an IP address \(see page 86\)](#)

[Lock the server \(see page 87\)](#)

[Disable the popups \(see page 88\)](#)

[Set or get the DUT ID \(see page 89\)](#)

[Set the configuration parameters for a suite or measurement \(see page 90\)](#)

[Query the configuration parameters for a suite or measurement \(see page 92\)](#)

[Select a measurement \(see page 93\)](#)

[Select a suite \(see page 94\)](#)

[Select a channel \(see page 95\)](#)

[Configure the selected measurement \(see page 97\)](#)

[Run with set configurations or stop the run operation \(see page 98\)](#)

[Handle Error Codes \(see page 99\)](#)

[Get or set the timeout value \(see page 100\)](#)

[Wait for the test to complete \(see page 100\)](#)

[After the test is complete \(see page 103\)](#)

[Save, recall, or check if a session is saved \(see page 106\)](#)

[Unlock the server \(see page 107\)](#)

[Disconnect from server \(see page 107\)](#)

string id

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

Ready: Test configured and ready to start

Running: Test running

Paused: Test paused

Wait: A popup that needs your inputs

Error: An error is occurred

string dutName

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

out bool saved

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

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

string ipAddress

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

out string clientID

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

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

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

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

string dutId

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

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

string device

Name	Type	Direction	Description
device	string	IN	Specifies the name of the device

string suite

Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite

string test

Name	Type	Direction	Description
test	string	IN	Specifies the name of the test to obtain the pass or fail status

string parameterString

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

int rowNr

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

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

out string[] status

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

string name

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

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

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

string name

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

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

Once the session is saved under 'name' you cannot use this method to save the session in a different name. Use SaveSessionAs instead.

string name

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

The same session is saved under different names using this method. The name parameter cannot be empty. If it is empty, the client is prompted to provide a valid name.

bool isSelected

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

string time

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

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

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

bool_verbose

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

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

string filePath

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

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

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

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 can be selected (it must be one of the strings in the string array buttonTexts)

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

Connect through an IP address

Command name	Parameters	Description	Return Value	Example
Connect()	string ipAddress (see page 81) out string clientID (see page 81)	This method connects the client to the server. Note (see page 82) The client provides the IP address to connect to the server. The server provides a unique client identification number when connected to it.	Return value is either True or False.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as boolean returnval = m_Client.Connect(ipaddress,m_clientID)

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Lock the server

Command name	Parameters	Description	Return Value	Example
LockSession()	string clientID (see page 86)	This method locks the server. Note (see page 83) 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 is performed. The return value is "Session Locked..." on success.	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval = m_Client.LockServer(clientID)

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is **LOCKED** and the message displayed is "Server is locked by another client".

The session is **UNLOCKED** and the message displayed is "Lock Session to execute the command".

The server is **NOTFOUND** and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Disable the popups

Command name	Parameters	Description	Return Value	Example
SetVerboseMode()	string clientID (see page 86) bool verbose (see page 84)	<p>This method sets the verbose mode to either true or false.</p> <p>When the value is set to true, any message boxes appearing during the application will be routed to the client machine that is controlling TekExpress.</p> <p>When the value is set to false, all the message boxes are shown on the server machine.</p>	<p>String that gives the status of the operation after it is performed</p> <p>When Verbose mode is set to true, the return value is "Verbose mode turned on. All dialog boxes will be shown to client".</p> <p>When Verbose mode is set to false, the return value is "Verbose mode turned off. All dialog boxes will be shown to server".</p>	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string Verbose mode is turned on return=m_Client.SetVerbose- Mode(clientID, true) Verbose mode is turned off returnval=m_Client.SetVer- boseMode(clientID, false)</pre>

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is **LOCKED** and the message displayed is "Server is locked by another client".

The session is **UNLOCKED** and the message displayed is "Lock Session to execute the command".

The server is **NOTFOUND** and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Set or get the DUT ID

Command name	Parameters	Description	Return Value	Example
SetDutId()	string clientID (see page 86) string dutName (see page 81)	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 is performed Return value is "DUT Id Changed" on success	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string return=m_Client.SetDutId(clientID,desiredDutId) Note (see page 82)
GetDutId()	string clientID (see page 86) string dutId (see page 82)	This method gets the DUT ID of the current set up.	String that gives the status of the operation after it is performed	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string return=m_Client.GetDutId(clientID, out DutId)

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is **LOCKED** and the message displayed is "Server is locked by another client".

The session is **UNLOCKED** and the message displayed is "Lock Session to execute the command".

The server is **NOTFOUND** and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Set the configuration parameters for a suite or measurement

Command name	Parameters	Description	Return Value	Example
SetGeneralParameter	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method sets the number of video lanes for the selected measurement. NOTE. Use this command to select a lane, channel, or source type.	String that gives the status of the operation after it is performed The return value is "" (an empty String) on success.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL.</pre> returnval as string Select Channel (see page 91) Select Measurement Method (see page 91)
SetAnalyzeParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	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.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL .</pre> returnval as string
SetAcquireParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method sets the configuration parameters in the Acquire panel of the Configuration Panel dialog box for a given suite or measurement.	<pre>returnVal = remoteObject.SetAcquireParameter(id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUCCESS) return CommandFailed(returnVal)</pre>	

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select channel example

```
returnval=mClient.SetGeneralParameter(clientID, "SFP-Tx", "Host", "Signal Rise/Fall Time  
(20%-80%)", "Data + Signal connected to Real Time Scope at$Channel 1")
```

Select measurement method example

```
returnval=mClient.SetGeneralParameter(clientID, "SFP-Tx", "Host", "Signal Rise/Fall Time  
(20%-80%)", "Measurement Method$Automatic")
```

Configure analyze parameters example

Parameter	Example
Record Length	<pre>returnval = mClient.SetAcquireParameter(clientID, "SFP-Tx", "Host", "Single Ended Output Voltage Range", "Signal Type\$PRBS31") returnval = mClient.SetAcquireParameter(clientID, "SFP-Tx", "Host", "Single Ended Output Voltage Range", "Record Length\$2M")</pre>

Query the configuration parameters for a suite or measurement

Command name	Parameters	Description	Return Value	Example
GetGeneralParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	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.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string</pre> Query Channel (see page 93) Query Measurement Method (see page 93)
GetAnalyzeParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method gets the configuration parameters set in the Analyze tab of the Configuration Panel dialog box for a given suite or measurement.	The return value is the configuration parameter set in the Analyze tab of the Configuration Panel dialog box for a given suite or measurement.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL . returnval as string</pre>
GetAcquireParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method gets the configuration parameters set in the Acquire tab for a given suite or measurement.	The return value is the configuration parameter set in the Acquire tab for a given suite or measurement.	Query Acquire Parameters example (see page 93)

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Query channel example

```
returnval=mClient.GetGeneralParameter(clientID, "SFP-Tx", "Host", "<Test/Measurement Name>",
"DP connected to")
```

Query measurement method example

```
returnval=mClient.GetGeneralParameter(clientID, "SFP-Tx", "Host", "<Test/Measurement Name>",
"Measurement Method")
```

Query acquire parameter examples

Parameter	Example
Record Length	returnval = mClient.GetAcquireParameter(clientID, "SFP+ TX", "Host", "Single Ended Output Voltage Range", "Record Length\$500K")

Select a measurement

Command name	Parameters	Description	Return Value	Example
SelectTest()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) bool isSelected (see page 84)	<p>This method selects or deselects a given test.</p> <p>When this parameter is set to true, you can select a measurement.</p> <p>When this parameter is set to false, you can deselect a measurement.</p>	<p>String that displays the status of the operation after it is performed</p> <p>The return value is "" (an empty String) on success.</p>	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL returnval as string Select Measurement (Signal Rise/Fall Time (20%-80%)): returnval=m_Client.Se- lectTest(clientID, "SFP-Tx", "Host", "Signal Rise/Fall Time (20%-80%)", true)</pre>

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select a suite

Command name	Parameters	Description	Return Value	Example
SelectSuitet()	string clientID (see page 86) string device (see page 82) string suite (see page 82) bool isSelected (see page 84)	<p>This method selects or deselects a given suite.</p> <p>When this parameter is set to true, you can select a suite.</p> <p>When this parameter is set to false, you can deselect a suite.</p>	<p>String that gives the status of the operation after it is performed</p> <p>The return value is "" (an empty String) on success.</p>	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string Select Suite (Default): returnval=m_Client.Se- lectTest(clientID, "SFP-Tx", "Host", true)</pre>

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select a channel

Command name	Parameters	Description	Return Value	Example
SetGeneralParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method sets the parameters that are not specific to any given test. NOTE. Use this command to select a lane, channel, or source type.	String that gives the status of the operation after it is performed The return value is "" (an empty String) on success.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string</pre> Select Channel (see page 96) Select Measurement Method (see page 96)
SetAnalyzeParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method sets the configuration parameters in the Analyze tab of the Configuration Panel dialog box for a given suite or measurement.	The return value is "" (an empty String) on success.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string</pre>
SetAcquireParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method sets the configuration parameters in the Acquire tab of the Configuration Panel dialog box for a given suite or measurement.	<pre>returnVal = remoteObject.SetAcquireParameter(id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUCCESS) return CommandFailed(returnVal)</pre>	

NOTE. *The Fail condition for PI commands occurs in any of the following cases:*

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Select channel example

```
returnval=mClient.SetGeneralParameter(clientID, "SFP+ TX", "Host", "Single Ended Output Voltage Range", "DP Connected to$CH1")
```

Select measurement method example

```
returnval=mClientSetGeneralParameter(clientID, "SFP+ TX", "Host", "Single Ended Output Voltage Range", "Measurement Method$Automatic")
```


Configure the selected measurement

Command name	Parameters	Description	Return Value	Example
SetAnalyzeParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method sets the Analyze parameters (Configuration parameters) for a given test.	The return value is "" (an empty String) on success.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string</pre>
SetAcquireParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method sets the Acquire parameters in the Acquire tab of the Configure Dialog box for a given test.	<pre>returnVal = remoteObject.SetAcquireParameter(id, device, suite, test, parameterString) if ((OP_STATUS) returnVal != OP_STATUS.SUCCESS) return CommandFailed(returnVal)</pre>	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string</pre> <p>Configure Acquire Parameters for Record Length (see page 98)</p>

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Configure parameter example

Parameter	Example
Record Length	<pre>returnval = mClient.SetAcquireParameter(clientID, "SFP-Tx", "Host", "Single Ended Output Voltage Range", "Signal Type\$PRBS31") returnval = mClient.SetAcquireParameter(clientID, "SFP-Tx", "Host", "Single Ended Output Voltage Range", "Record Length\$2M")</pre>

Run with set configurations or stop the run operation

Command name	Parameters	Description	Return Value	Example
Run()	string clientID (see page 86)	Runs the selected tests. Note (see page 83) After the server is set up and configured, run it remotely using this function.	String that gives the status of the operation after it is performed The return value is "Run started..." on success.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.Run(clientID)</pre>
Stop()	string clientID (see page 86)	Stops the currently running tests Note (see page 84)	String that gives the status of the operation after it is performed. The return value is "Stopped..." on success.	<pre>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)</pre>

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Handle error codes

The return value of the remote automations at the server-end is `OP_STATUS`, which changes 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 the operation cannot be performed.
UNLOCK	4	The server is not locked. Lock the server before performing the operation.
NULL	0	Nothing

Get or set the timeout value

Command name	Parameters	Description	Return Value	Example
GetTimeOut()	string clientID (see page 86)	Returns the current timeout period set by the client	String that gives the status of the operation after it is 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 return-val=m_Client.GetTimeOut()
SetTimeOut()	string clientID (see page 86) string time (see page 84)	Sets a timeout period specified by the client. After this timeout period expires, the server is unlocked automatically.	String that gives the status of the operation after it is 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 return-val=m_Client.SetTimeOut(clientID, desiredTimeOut)

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is *LOCKED* and the message displayed is "Server is locked by another client".

The session is *UNLOCKED* and the message displayed is "Lock Session to execute the command".

The server is *NOTFOUND* and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Wait for the test to complete

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

Command name	Parameters	Description	Return Value	Example
ApplicationStatus()	string clientID (see page 86)	This method gets the status of the server application. The states at a given time are Ready , Running , Paused , Wait , or Error . (see page 81)	String value that gives the status of the server application	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.Applica- tionStatus(clientID)</pre>
QueryStatus()	string clientID (see page 86) out string[] status (see page 83)	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 is performed On success the return value is "Transferred...".	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnVal=m_Client.QueryS- tatus(clientID, out statusMes- sages) if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS) return "Status updated..." else return CommandFailed(re- turnVal)</pre>

Command name	Parameters	Description	Return Value	Example
GetCurrentState-Info() NOTE. This command is used when the application is running and is in the wait or error state.	string clientID (see page 86) out string caption (see page 85) out string message (see page 85) out string[] buttonTexts (see page 85)	This method gets the additional information of the states when the application is in Wait or Error state. Except client ID, all the others are Out parameters.	This command does not return any value. This function populates the Out parameters that are passed when invoking this function.	<code>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. m_Client.GetCurrentState-Info(clientID, caption,message, buttonTexts)</code>
SendResponse() NOTE. This command is used when the application is running and is in the wait or error state.	string clientID (see page 86) out string caption (see page 85) out string message (see page 85) string response (see page 85)	After receiving the additional information using the method GetCurrentState-Info(), the client decides which response to send, and then sends the response to the application using this function. The response should be one of the strings that was received earlier as a string array in the GetCurrentStateInfo function. The _caption and _message should match the information received earlier in the GetCurrentStateInfo function.	This command does not return any value.	<code>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. m_Client.SendResponse(clientID, caption,message, response)</code>

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

After the test is complete

Command name	Parameters	Description	Return Value	Example
GetPassFailStatus()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82)	This method gets the pass or fail status of the measurement after test completion. NOTE. <i>Execute this command after completing the measurement.</i>	String that gives the status of the operation after it is performed Returns the pass or fail status in the form of a string	<pre>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, "Signal Rise/Fall Time (20%-80%)") //Pass or Fail</pre>
GetResultsValue()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82)	This method gets the result values of the measurement after the run.	String that gives the status of the operation after it is performed Returns the result value in the form of a string	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.GetResultsValue(clientID, "SFP-Tx", "Host", "Signal Rise/Fall Time (20%-80%)", "Measured Value")</pre>
GetResultsValueForSubMeasurements()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 82) int rowNr (see page 83)	This method gets the result values for individual sub-measurements after the run.	String that gives the status of the operation after it is performed Returns the result value in the form of a string	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string Signal Rise/Fall Time returnval=m_Client.GetResultsValueForSubMeasurements(clientID, "SFP-Tx", "Host", "Signal Rise/Fall Time (20%-80%)", "Measured Value",0) //For DP wfm returnval=m_Client.GetResultsValueForSubMeasurements(clientID, "SFP-Tx", "Host", "Signal Rise/Fall Time (20%-80%)", "Measured Value",1) //For DN wfm</pre>

Command name	Parameters	Description	Return Value	Example
GetReportParameter()	string clientID (see page 86) string device (see page 82) string suite (see page 82) string test (see page 82) string parameterString (see page 105)	This method gets the general report details such as oscilloscope model, TekExpress version, and SFP+ QSFP+ Tx version.	The return value is the oscilloscope model, TekExpress version, and SFP+ QSFP+ Tx version.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string</pre> <p>Oscilloscope Model</p> <pre>returnval=m_Client.GetReportParameter(clientID,"Scope Model")</pre> <p>TekExpress Version</p> <pre>returnval=m_Client.GetReportParameter(clientID,"TekExpress Version")</pre> <p>SFP+ QSFP+ Tx Version</p> <pre>returnval=m_Client.GetReportParameter(clientID,"Application Version")</pre>
TransferReport()	string clientID (see page 86) string filePath (see page 85)	<p>This method transfers the report generated after the run.</p> <p>The report contains the summary of the run.</p> <p>The client must provide the location where the report is to be saved at the client-end.</p>	<p>String that gives the status of the operation after it is performed</p> <p>Transfers all the result values in the form of a string</p>	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string</pre> <pre>returnval=m_Client.TransferReport(clientID,"C:\Report")</pre>

Command name	Parameters	Description	Return Value	Example
TransferWaveforms()	string clientID (see page 86) string filePath (see page 85)	This method transfers all the waveforms from the folder for the current run. NOTE. Each time you click Start, a folder is created on the X: drive. Transfer the waveforms before clicking Start..	String that gives the status of the operation after it is performed Transfers all the waveforms in the form of a string On success the return value is "Transferred..."	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.TransferWaveforms(clientID,"C:\Waveforms")
TransferImages()	string clientID (see page 86) od string filePath (see page 85)	This method transfers all the images (screen shots) from the folder for the current run (for a given suite or measurement). NOTE. Each time you click Start, a folder is created in the X: drive. Transfer the waveforms before clicking Start.	String that gives the status of the operation after it is performed Transfers all the images in the form of a string	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.TransferImages(clientID, "C:\Waveforms")

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is LOCKED and the message displayed is "Server is locked by another client".

The session is UNLOCKED and the message displayed is "Lock Session to execute the command".

The server is NOTFOUND and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

String parameterString

Name	Type	Direction	Description
parameterString	string	IN	Specifies the oscilloscope model, TekExpress version, and SFP+ QSFP+ Tx version.

Save, recall, or check if a session is saved

Command name	Parameters	Description	Return Value	Example
CheckSession-Saved()	string clientID (see page 86) out bool saved (see page 81)	This method checks whether the current session is saved.	Return value is either True or False	<code>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)</code>
RecallSession()	string clientID (see page 86) string name (see page 83)	Recalls a saved session. The client provides the session name.	String that gives the status of the operation after it is performed The return value is "Session Recalled..."	<code>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, savedSession-Name)</code>
SaveSession()	string clientID (see page 86) string name (see page 83)	Saves the current session. The client provides the session name.	String that gives the status of the operation after it is performed The return value is "Session Saved..."/"Failed..."	<code>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, desiredSession-Name)</code>
SaveSessionAs()	string clientID (see page 86) string name (see page 84)	Saves the current session under a different name every time this method is called. The client provides the session name.	String that gives the status of the operation after it is performed The return value is "Session Saved..."	<code>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)</code>

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is **LOCKED** and the message displayed is "Server is locked by another client".

The session is **UNLOCKED** and the message displayed is "Lock Session to execute the command".

The server is **NOTFOUND** and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed..."

Unlock the server

Command name	Parameters	Description	Return Value	Example
UnlockSession()	string clientID (see page 86)	This method unlocks the server from the client. The ID of the client to be unlocked must be provided. Note (see page 85)	String that gives the status of the operation after it is performed The return value is "Session Un-Locked...".	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.Unlock-Server(clientID)

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is **LOCKED** and the message displayed is "Server is locked by another client".

The session is **UNLOCKED** and the message displayed is "Lock Session to execute the command".

The server is **NOTFOUND** and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Disconnect from the server

Command name	Parameters	Description	Return Value	Example
Disconnect()	string clientID (see page 86)	This method disconnects the client from the server. Note (see page 82)	Integer value that gives the status of the operation after it is performed 1 for Success -1 for Failure	m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. returnval as string returnval=m_Client.Disconnect(m_clientID)

NOTE. The Fail condition for PI commands occurs in any of the following cases:

The server is **LOCKED** and the message displayed is "Server is locked by another client".

The session is **UNLOCKED** and the message displayed is "Lock Session to execute the command".

The server is **NOTFOUND** and the message displayed is "Server not found...Disconnect!".

When none of these fail conditions occur, then the message displayed is "Failed...".

Signal types used by tests

The following tables list the signal types used by each measurement for the two profiles.

Host profile

Table 14: Host profile measurement signal types

Measurement	Compliance mode support	User-Defined Mode support
Single Ended Output Voltage Range	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Output AC Common-Mode Voltage (RMS)	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Cross Talk Source Rise/Fall Time (20%-80%)	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180
Cross Talk Source Amplitude (p-p)	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180
Signal Rise/Fall Time (20%-80%)	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180
Total Jitter	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Total Jitter @ J2	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Total Jitter @ J9	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Data Dependent Jitter	PRBS9	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Data Dependent Pulse Width Shrinkage (DDPWS)	PRBS9	PRBS7, PRBS9, PRBS11, PRBS15
Uncorrelated Jitter	PRBS9	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Transmitter Qsq	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180
Eye Mask Hit Ratio	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Voltage Modulation Amplitude (p-p)	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180
Transmitter Qsq (for Cu)	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180

Measurement	Compliance mode support	User-Defined Mode support
Output AC Common Mode Voltage (RMS) (for Cu)	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Host Output TWDPc	PRBS9	PRBS9

Module profile

Table 15: Module profile measurement signal types

Measurement	Compliance mode support	User-defined mode support
AC Common Mode Voltage Tolerance	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Single Ended Input Voltage Tolerance	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Cross Talk Source Rise/Fall Time (20%-80%)	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180
Cross Talk Source Amplitude (p-p)	8180	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31, 8180
Output AC Common-Mode Voltage (RMS)	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Total Jitter	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Total Jitter @ J2	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Total Jitter @ J9	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Data Dependent Jitter	PRBS9	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Data Dependent Pulse Width Shrinkage (DDPWS)	PRBS9	PRBS7, PRBS9, PRBS11, PRBS15
Uncorrelated Jitter	PRBS9	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31
Eye Mask Hit Ratio	PRBS31	PRBS7, PRBS9, PRBS11, PRBS15, PRBS20, PRBS23, PRBS31

See also

- [Signal Validation Procedure \(see page 111\)](#)
- [Select Acquisitions \(see page 46\)](#)

Oscilloscope setup

The following tables show the generalized oscilloscope setup parameters for all tests, except where noted.

Table 16: Horizontal setup

Mode	Sample Rate	Record Length	Acquisition Mode
Manual	100 GS/s	5M, 10M	100 GS/s

Table 17: Vertical setup

Channel 1			Channel 2		
Position	Scale	Offset	Position	Scale	Offset
0	Vertical setup procedure	0	0	Vertical setup procedure	0

See also

- [Signal Validation Procedure \(see page 111\)](#)

Signal validation procedure

Each measurement goes through signal validation, signal acquisition, and measurement steps. Before running any measurement, check the signal for validity. To do this, set up the oscilloscope to acquire the signal and then test the signal for its characteristics such as voltage level and/or frequency. Once the characteristics of the signal are correct, the signal is valid and ready for use in compliance measurements. The signal validation procedure is the same for both Host and Module Profile measurements.

SFP+ solution supports three types of signals: PRBS9, PRBS31, and 8180.

NOTE. *PRBS20, PRBS23, PRBS31 pattern validation is not done. The signal is assumed to be PRBS20, PRBS23, or PRBS31 respectively.*

Acquire the signal according to the SFF-8431 specification. The oscilloscope setup differs for each measurement. For all measurements, use the following guidelines to set up the oscilloscope. For the oscilloscope setup for individual tests, see the individual test topics.

After the signal is acquired, the measurement is conducted using either the base oscilloscope, DPOJET, or the TekExpress algorithm library.

Oscilloscope setup guidelines

The following describes the oscilloscope setup and signal validation measurement for PRBS7, PRBS9, PRBS11, PRBS15, and 8180 signals.

1. Connect the input signal to the appropriate channels. (The channels are those selected as data sources in the Acquisitions tab of the Setup panel.)

The vertical setup routine runs automatically to find the best fitting vertical scale.

Horizontal setup uses these parameters:

- Mode: **Manual**
- Sample Rate: **100 GS/s**
- Record Length: **5M/10M**
- Acquisition Mode: **Sample**

2. On the oscilloscope, set Math1 = (**Ch1 – Ch3**).
3. Call the Signal Validation algorithm to verify the signal type.

The signal validation results are returned from the algorithm. If signal validation fails, display a signal validation message.

See also

- [Oscilloscope Setup \(see page 111\)](#)

Single-ended output voltage range

Single-ended output voltage range is measured as the single-ended peak-to-peak output voltage for the positive and negative data channels on a single acquisition. This test is one of the SFF-8431 Table 11 Output Electrical Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Single-ended output voltage range is measured using base DPOJET.

- Use DPOJET measurement name: **Ampl > Max and Ampl > Min** for Dp and Dn

Limits

For each of Dp and Dn: Minimum = -0.3 V; Maximum = 4 V

Snapshot and cursor placement details

There will be two snapshots:

- A snapshot of Dp with cursors placed at maximum and minimum voltages of single-ended Pk-Pk measurement value of Dp. Cursor values can be derived using DPOJET: **Ampl > Cycle Max** and **Ampl > Cycle Min** for +ve and -ve peak, respectively for Dp.
- A snapshot of Dn with cursors placed at maximum and minimum voltages of single-ended Pk-PK measurement value of Dn. Cursor values can be derived using DPOJET: **Ampl > Cycle Max** and **Ampl > Cycle Min** for +ve and -ve peak, respectively for Dn.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Output AC Common-Mode voltage (RMS) (Host)

Output AC common-mode voltage is measured as the AC RMS voltage of the common mode $((DP+DN) \div 2)$ signal. This test is one of the SFF-8431 Table 11 Output Electrical Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Output AC common-mode voltage is measured using the base oscilloscope.

1. $Math1 = (Dp + Dn) \div 2$. Switch off channels connected to Dp and Dn.
2. Draw a histogram bounding box from the top left of the oscilloscope to the bottom right, and choose **Histogram Vertical**.
3. Select **Math1** as the histogram source.
4. From the Measure menu, select **Histogram Measurements > Standard Deviation**.
5. Do a single step run and measure the mean value of the histogram standard deviation. This is the measurement result.

Limits

Maximum = 15 mV

Snapshot and cursor placement details

A snapshot where the histogram on math and the standard deviation value of the histogram is visible on the screen. The standard deviation value visible on the screen should be the value reported in the report. No cursors are required.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Crosstalk source Rise/Fall time (20% - 80%) (Host)

Crosstalk source rise/fall time is measured as the 20% – 80% (of VMA) Rise time and 80% – 20% (of VMA) Fall time of the differential Crosstalk Source introduced to the signal. This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): Table 12 Crosstalk Source Tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The crosstalk source rise/fall time measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Dp and Dn after deskewing and applying 12 GHz filter
- Signal Type ("SFPPlus.SignalType")

Algorithm

- Input the differential waveform.
- Obtain values of vHigh and vLow as done in the VMA measurement (averaged over all the patterns found in the waveform).
- Find the position of the rising and falling edges in the input waveform.
- On each rising edge, traverse forward until the first point crossing the upper limit (80%) is found (= End) and traverse backward until the first point crossing the lower limit (20%) is found (= Start).
- On each falling edge, traverse backward until the first point crossing the upper limit (80%) is found (= Start) and traverse forward until the first point crossing the lower limit (20%) is found (= End).
- Transition time is computed as $TT = (End - Start)$. This value is averaged across all edges.
- End

Limits

Target value = 34 ps

Snapshot and cursor placement details

This measurement has two snapshots: the first with cursors placed at the rise time, the second with cursors placed at the fall time.

- Rise time: Zoom to the cursor positions. Cursor1 = starting point of RT of first rising edge, cursor2 = ending point of RT of first rising edge.
- Fall time: Zoom to the cursor positions. Cursor1 = starting point of FT of first falling edge, cursor2 = ending point of FT of first falling edge.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Crosstalk source amplitude (p-p differential) (Host)

Crosstalk source amplitude is measured as the difference between the nominal one and zero levels, which are defined as voltages measured in the mid 20% of the high (eight 1s) and low (eight 0s) regions respectively, of the differential crosstalk source introduced to the signal. This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): Table 12 Crosstalk Source Tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The crosstalk source amplitude (p-p differential) measurement is performed using the algorithm library.

Inputs to algorithm

Differential waveform obtained on a Math channel using Dp and Dn after deskewing and applying 12 GHz filter

Algorithm

- Input the differential waveform.
- On the input waveform, identify the regions with the pattern 11111111 or 00000000.
- On each such pattern, measure the mean voltage in the middle 20% of the pattern.

- The mean voltages corresponding to the Signal High regions is taken as vHigh, and the mean voltages corresponding to the Signal Low is taken as vLow. The vHigh and vLow values are averaged across all regions.
- The required result Amplitude is given by, $\text{Amplitude} = \text{vHigh} - \text{vLow}$.
- End

Limits

Target value = 1000 mV

Snapshot and cursor placement details

This measurement has one snapshot with cursor1 = +ve high of VMA, cursor2 = -ve high of VMA.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Signal Rise/Fall time (20% - 80%)

Signal rise/fall time is measured as the 20% – 80% (of VMA) Rise time and 80% – 20% (of VMA) Fall time of the input signal. This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The signal rise/fall time (20% – 80%) measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Dp and Dn after deskewing and applying 12 GHz filter
- Signal Type ("SFPPlus.SignalType")

Algorithm

- Obtain values of vHigh and vLow as done in the “VMA” measurement. (Averaged over all the patterns found in the waveform.)
- Find the position of rising and falling edges in the input waveform.
- On each rising edge, traverse forward until the first point crossing the upper limit (80%) is found (=End) and traverse backward until the first point crossing the lower limit (20%) is found (=Start).
- On each falling edge, traverse backward until the first point crossing the upper limit (80%) is found (=Start) and traverse forward until the first point crossing the lower limit (20%) is found (=End).
- Compute Transition Time, $TT = (End - Start)$ This value is averaged across all edges.
- End

Limits

Minimum value = 34 ps

Snapshot and cursor placement details

This measurement has two snapshots: first with cursors placed at the rise time, second with cursors placed at the fall time.

- Rise time: Zoom to the cursor positions. Cursor1 = starting point of RT of first rising edge, cursor2 = ending point of RT of first rising edge.
- Fall time: Zoom to the cursor positions. Cursor1 = starting point of FT of first falling edge, cursor2 = ending point of FT of first falling edge.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Total jitter (Host)

TJ, as used here, is the Level 1 definition for Total Jitter as described in the FC-MJSQ, where TJ is the crossing width, defined as the late time at which the BER is 10^{-12} minus the early time at which the BER is 10^{-12} . This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Total jitter is measured using base DPOJET.

- Deskew the Data+ and Data- inputs. Compute the differential signal on Math1 = Dp – Dn.
- Use DPOJET TJ@BER measurement on the Math signal and Skew measurement on the single-ended input signals.

DPOJET settings

- Select Tab: Select **Jitter > TJ@BER**.
 - Configure the source:
 - Click the arrow button in the Source(s) column and configure Source 1 = **Math 1 (Dp – Dn)**
 - Select the **Advanced** check box and then set Reference Level % relative to Base Top as follows:

Setting	Rise	Fall
High	80%	80%
Mid	50%	50%
Low	20%	20%
Hysteresis	5%	

- Click **Close**.

- Configure Tab:
 - Edges: Signal Type = **Data**
 - Clock Recovery:
 - Method = **PLL Custom BW**
 - PLL Model = **Type II**
 - Damping = **700 m**
 - Loop BW = **4 MHz**
 - Click the **Advanced** Button:
 - Nominal Data Rate = **ON**. Bit Rate = **10.3125 Gb/s**
 - Known Data Pattern = **OFF**
 - Click **OK**.
 - RjDj:

For PRBS9 signal:

 - Pattern Type = **Repeating**
 - Pattern Length = **511 UI**
 - BER 1E- = **12** (for J2 BER 1E- = 2.6; for J9 BER 1E- = 9.6)

For PRBS31 signal:

 - Pattern Type = **Arbitrary**
 - Window length = **10 UI**
 - Population = **100**
 - BER 1E- = **12** (for J2 BER 1E- = 2.6; for J9 BER 1E- = 9.6)
 - Filters: **No filters**
 - General: **OFF**
 - Global:
 - Gating: **OFF**
 - Quality: **OFF**
 - Population: **OFF**
- Results Tab: In the Options menu, deselect **Display Units – Absolute**.
- Click **Single**.

Limits

Maximum value = 0.28 UI

Snapshot and cursor placement details

No cursors are required because total jitter cannot be shown using cursors or snapshots. Instead, zoom a part of the waveform to see the type of waveform used for the measurement. Zoom the waveform between time 0 and (Horizontal scale $\div 10^4$). If the record length is 2M, the number of points in the zoomed part will be 200.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Data dependent jitter (Host)

DDJ is the range (max – min) of the timing variations measured on the Differential Signal with a crossing level equal to the average value of the entire waveform being measured. The waveform is averaged sufficiently to remove the effects of random jitter and noise in the system. This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

For compliance, perform ■ [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

Data dependent jitter is measured using base DPOJET.

- Deskew the Data+ and Data- inputs. Compute the differential signal on Math1 = Dp – Dn
- Use DPOJET DDJ measurement on the Math signal and Skew measurement on the single ended input signals.

DPOJET settings

- Select Tab: select **Jitter**, click **DDJ**.
 - Source configuration:
 - Source = **Math 1 (Dp – Dn)**
 - Select the **Advanced** check box and then set Reference Level % relative to Base Top as follows:

Setting	Rise	Fall
High	80%	80%
Mid	50%	50%
Low	20%	20%
Hysteresis	5%	

- Click **Close**.
- Configure Tab:
 - Clock Recovery:
 - Method = **PLL-Custom BW**
 - PLL Model = **Type II**
 - Damping = **700 m**
 - Loop BW = **4 Mhz**
 - Click the **Advanced** button:
 - Nominal Data Rate = **ON**. Bit Rate = **10.3125 Gb/s**
 - Known Data Pattern = **OFF**
 - Click **OK**.
 - RjDj:

For PRBS9:

 - Pattern Type = **Repeating**
 - Pattern Length = **511 UI**
 - BER 1E– = **12**

For PRBS31:

- Pattern Type = **Arbitrary**
- Window Length = **10 UI**
- Population = **100**
- BER 1E- = **12**
- Filters: **No filters**
- General: **OFF**
- Global:
 - Gating: **OFF**
 - Quality: **OFF**
 - Population: **OFF**
- Results Tab: In the Options menu, deselect **Display Units – Absolute**.
- Click **Single**.

Limits

Maximum value = 0.10 UI

Snapshot and cursor placement details

No cursors are required because data dependent jitter cannot be shown using cursors or snapshots. Instead, zoom a part of the waveform to see the type of waveform used for the measurement. Zoom the waveform between time 0 and (horizontal scale ÷ 10⁴). If the record length is 2M, the number of points in the zoomed part will be 200.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Data dependent pulse width shrinkage (Host)

DDPWS is measured as the difference between one symbol period and the minimum of all the differences between pairs of adjacent edges on the differential signal with a crossing level equal to the average value of the entire waveform being measured. The waveform is averaged sufficiently to remove the effects of random jitter and noise in the system. This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The data dependent pulse width shrinkage measurement is performed using the algorithm library.

Inputs to algorithm

Differential waveform obtained on a Math channel using Data+ and Data– after deskewing.

Algorithm

- Input differential waveform.
- Estimate the UI of the waveform (UI = bit duration).
- Identify all the PRBS9 patterns found in the acquired signal.
- Overlap all the PRBS9 patterns found in the acquisition to get a single averaged PRBS9 pattern.
- Identify the minimum width between adjacent edges of the averaged PRBS9 pattern. [= minimum UI]
- Compute Data Dependent Pulse Width Shrinkage (DDPWS) as: $DDPWS = \text{Estimated UI} - \text{minimum UI}$.

Limits

Maximum value = 0.055 UI

Snapshot and cursor placement details

This measurement has one zoomed snapshot with cursor1 and cursor2 marking the smallest UI.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Uncorrelated jitter (Host)

Uncorrelated jitter refers to the component of jitter in the transmitted signal that is not correlated to the transmitter data. The uncorrelated jitter (rms) is given by the RMS value of the standard deviations of the two distributions, namely standard deviation of jitter on rising edge and standard deviation of jitter on falling edge. This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The uncorrelated jitter measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Data+ and Data– after deskewing
- Signal Type ("SFPPlus.SignalType")

Algorithm

- Input differential waveform.
- Identify the deviation of each rising and falling edge on the input signal from its ideal location (constructed using $UI = 1 \div \text{data rate}$) (Note: consider the rising and falling edges of a pattern with the longest run of 1s to maintain some uniformity on the edges to measure deviations. If the deviations were measured on all edges, then the deviations are inconsistent for different edges resulting in measurement errors.)
- Find the standard deviation of the deviations of the rising edges. Find the standard deviation of the deviation of the falling edges.
- Compute UJ as follows:

$$\text{Uncorrelated jitter (rms)} = \sqrt{(\sigma_r^2 + \sigma_f^2)/2}$$

where σ_r is the standard deviation of the jitter on the rising edge

where σ_f is the standard deviation of the jitter on the falling edge

- End

Output from algorithm

m_SFPPlusISDB.Result1Mean.Value = UJ.Mean

Limits

Maximum value = 0.023 UI

Snapshot and cursor placement details

No cursors are required. Uncorrelated jitter cannot be shown using cursors or snapshots. Zoom a part of the waveform to see the type of waveform used for the measurement. Zoom the waveform between time 0 and (horizontal scale $\div 10^4$). If the record length is 2M, the number of points in the zoomed part will be 200.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Transmitter Qsq

Transmitter Qsq is measured on the differential data signal as the inverse of Relative Noise (RN). This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The transmitter Qsq measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Data+ and Data– after deskewing
- Signal Type ("SFPPlus.SignalType");
- Window Width ("SFPPlus.QsqWidth");

Algorithm

- Input differential PRBS waveform
- Compute VMA as given by the VMA algorithm. On the input waveform, identify the regions with the pattern 11111111 or 00000000.
- On each such pattern, measure the AC RMS voltage in the 10% window where the waveform is the flattest.
- The AC RMS in the 11111111 regions is LevelONENoise, and that in 00000000 regions is LevelZERONoise. Noise (rms) is measured as: $\sqrt{(LevelONENoise^2 + LevelZERONoise^2)/2}$
- Measure Relative Noise as: $RN = \frac{2 * Noise(rms)}{VMA}$
The required result Tx Qsq is given by $Tx\ Qsq = 1 \div RN$
- End

Output from algorithm

m_SFPPlusISDB.Result1Mean.Value = TxQsq.Mean
 m_SFPPlusISDB.Hist1Left.Value = LevelONENoise window begin
 m_SFPPlusISDB.Hist1Right.Value = LevelONENoise window end
 m_SFPPlusISDB.HorizontalPos1.Value = position of the waveform where to zoom for LevelONENoise
 m_SFPPlusISDB.HorizontalScale1.Value = scale of Zoom that is to be set for LevelONENoise
 m_SFPPlusISDB.Hist2Left.Value = LevelZERONoise window begin
 m_SFPPlusISDB.Hist2Right.Value = LevelZERONoise window end
 m_SFPPlusISDB.HorizontalPos2.Value = position of the waveform where to zoom for LevelZERONoise
 m_SFPPlusISDB.HorizontalScale2.Value = scale of Zoom that is to be set for LevelZERONoise

Limits

Minimum value = 50

Snapshot and cursor placement details

This measurement has two snapshots with zoom showing one full period of the 8180 pattern. The first snapshot has cursor1 and cursor2 marking the flattest region of the high part of the period. The second snapshot has cursor1 and cursor2 marking the flattest region of the low part of the period.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Eye mask hit ratio (Host)

The required transmitter pulse shape characteristics are specified in the form of a mask of the transmitter eye diagram (used to measure the number of Mask Hits). Eye mask hit ratio is computed using eye mask hit ratio = (Number of Mask Hits × Signaling Speed) ÷ (Number of UIs × Sampling rate). This test is one of the SFF-8431 Table 12 Jitter and Eye Mask Specifications at B tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other tests.

Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Eye mask hit ratio is measured using base DPOJET.

- Deskew the Data+ and Data– inputs. Compute the differential signal on Math1 = Dp – Dn.
- Use DPOJET Mask Hits measurement on the Math signal and Skew measurement on the single-ended input signals.

DPOJET settings

- Select Tab: Select **Eye >Mask Hits**.
 - Configure the Source:
 - Click the arrow button in the Source(s) column and configure Source 1 = **Math 1 (Dp–Dn)**
 - Select the **Advanced** check box and then set Reference Level % relative to Base Top as follows:

Setting	Rise	Fall
High	80%	80%
Mid	50%	50%
Low	20%	20%
Hysteresis	5%	

- Click **Close**.

- Configure Tab:
 - Edges: Signal Type = **Data**
 - Clock Recovery:
 - Method = **PLL – Custom BW**
 - PLL Model = **Type II**
 - Damping = **700 m**
 - Loop BW = **4 MHz**
 - Click the **Advanced** button:
 - Nominal Data Rate = **ON**. Bit Rate = **10.3125 Gb/s**
 - Known Data Pattern = **OFF**
 - Click **OK**.
 - Click **Apply**.
 - RjDJ:

For PRBS9 signal:

 - Pattern Type = **Repeating**
 - Pattern Length = **511 UI**
 - BER 1E– = **12**

For PRBS31 signal:

 - Pattern Type = **Arbitrary**
 - Window length = **10 UI**
 - Population = **100**
 - BER 1E– = **12**
 - Filters: **No filters**
 - General: **OFF**
 - Global:
 - Gating = **OFF**
 - Quality = **OFF**
 - Population = **OFF**
- Click **Run**.

NOTE. Run until population crosses 2M.

The Mask Hits DPOJET measurement gives the number of Mask hits. Plug that value into the following formula to obtain the Mask Hit Ratio:

$$\text{Mask Hit Ratio} = \text{Number of Mask Hits} \times \text{Signaling Speed (10.3125 e}^9\text{)} \div \text{Number of UIs (Population from DPOJET)} \times \text{Sampling Rate (50 e}^9\text{)}$$

Limits

Mask hit ratio of 5×10^{-5}

Snapshot and cursor placement details

This measurement has one snapshot of the eye mask hit generated in DPOJET. No cursors are required.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Voltage modulation amplitude (p-p)

Voltage modulation amplitude is measured as the difference between the nominal one and zero levels, which are defined as voltages measured in the mid 20% of the high (eight 1s) and low (eight 0s) regions respectively, of the differential data signal. This test is one of the SFF-8431 Table 33 Output Specifications at B for Cu tests.

Connect the equipment as shown in the diagram [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The voltage modulation amplitude (p-p) measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Data+ and Data– after deskewing
- Signal Type ("SFPPlus.SignalType")

Algorithm

- Input differential PRBS waveform.
- On the input waveform identify the regions with the pattern 11111111 or 00000000.
- On each such pattern measure the mean voltage in the middle 20% of the pattern.
- The mean voltages corresponding to the Signal High regions is taken as vHigh and the mean voltages corresponding to the Signal Low is taken as vLow. The vHigh and vLow values are averaged across all regions.
- The required result VMA is given by, $VMA = vHigh - vLow$
- End

Limits

Minimum value = 300 mV

Snapshot and cursor placement details

This measurement has one snapshot with cursor1 = +ve high of VMA, cursor2 = -ve high of VMA.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Transmitter Qsq (for Cu)

Transmitter Qsq is measured on the differential data signal as the inverse of Relative Noise (RN). RN is measured as $RN = 2 \times \text{Noise (rms)} \div VMA$. And $\text{Noise(rms)} = \sqrt{(\text{LogicONENoise(rms)}^2 + \text{LogicZERONoise(rms)}^2) \div 2}$. This test is one of the SFF-8431 Table 33 Output Specifications at B for Cu tests.

Connect the equipment as shown in the diagram [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The transmitter Qsq (for Cu) measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Data+ and Data– after deskewing
- Signal Type ("SFPPlus.SignalType");

Algorithm

- Input differential PRBS waveform
- Compute VMA as given by the VMA algorithm. On the input waveform, identify the regions with the pattern 11111111 or 00000000.
- On each such pattern, measure the AC RMS voltage in the 10% window where the waveform is the flattest.
- The AC RMS in the 11111111 regions is LevelONENoise, and that in 00000000 regions is

LevelZERONoise. Measure Noise (rms) as: $\sqrt{(levelONENoise^2 + LevelZERONoise^2)/2}$

- Measure Relative Noise as: $RN = \frac{2 * Noise(rms)}{VMA}$

The required result TxQsq is given by $TxQsq = 1 \div RN$

- End

Output from algorithm

m_SFPPlusISDB.Result1Mean.Value = TxQsq.Mean

Limits

Minimum value = 63.1

Snapshot and cursor placement details

This measurement has two snapshots with zoom showing one full period of the 8180 pattern. The first snapshot has cursor1 and cursor2 marking the flattest region of the high part of the period. The second snapshot has cursor1 and cursor2 marking the flattest region of the low part of the period.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Output AC Common-Mode voltage (RMS) (for Cu)

Output AC common-mode voltage is measured as the AC RMS voltage of the common-mode ((DP + DN) ÷ 2) signal. This test is one of the SFF-8431 Table 33 Output Specifications at B for Cu tests.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

The output AC common-mode voltage (RMS) (for Cu) measurement is performed using the base oscilloscope.

1. $\text{Math1} = (\text{Dp} + \text{Dn}) \div 2$. Switch off channels connected to Dp and Dn.
2. Draw a histogram bounding box from top left of the oscilloscope to the bottom right and choose **Histogram Vertical**.
3. Select **Math1** as the histogram source.
4. From the Measurement menu, select **Histogram Measurements > Standard Deviation**.
5. Do a single step run and measure the mean value of the histogram standard deviation. This is the measurement result.

Limits

Maximum = 12 mV

Snapshot and cursor placement details

A screen shot where the histogram on math and the standard deviation value of the histogram is visible on the screen. The visible standard deviation value should be the value shown in the report. No cursors are required.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Host output TWDPc

NOTE. The Host Output TWDPc test is supported only on oscilloscopes that support 100 Gs/s. For details, see [Compatibility \(see page 3\)](#).

TWDP is a measure of the deterministic dispersion penalty due to a particular transmitter with reference emulated multi-mode fibers and receiver. TWDP is initially defined to characterize the performance of a transmitter in optical links. The same concept has been extended to quantify channel performance, especially in high-speed copper links.

This test is one of the SFF-8431 Revision 4.1 Table 33-Host Transmitter Output Specifications at B for Cu tests.

NOTE. The TWDPc measurement is supported only on a Ch1–Ch3 combination setup of a C or D series oscilloscope. 100 GS/s RT mode output on Ch2 and Ch4 is not available. Therefore, if Ch1 is not working, the test cannot be performed successfully.

Connect the equipment as shown in the diagram at [Connection Setup for Host Tests \(see page 37\)](#): All other Host tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The Host output TWDPc measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Data+ and Data– after deskewing. Sampled at 3.3 TS/s using IT mode.
- Signal Type (“SFPPlus.SignalType”);

Algorithm

- Input the differential waveform (sampled at 3.3 TS/s IT)
- Down sample the differential input waveform to 16 samples per UI (which is down sampling 20 times)
- Identify all the PRBS9 patterns in the waveform. For each PRBS9 pattern, write all points to a text file and call the SFF8431 x WDP algorithm.

- The required result TWDPc is the average value of the TWDP calculated for each PRBS9 pattern.
- End

Output from algorithm

m_SFFPlusISDB.Result1Mean.Value = Average TWDPc value

Limits

Maximum value = 10.7 dBe

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

AC Common-Mode voltage tolerance (Module)

Output AC common-mode voltage tolerance is measured as the AC RMS voltage of the common mode $((DP+DN)\div 2)$ signal. This is one of the SFF-8431 Revision 4.1 Table 16 Module Transmitter Input Electrical Specifications at B' tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

Automatic signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

AC common-mode voltage tolerance is measured using the base oscilloscope.

1. Generate the AC common-mode waveform on Math1 = $(Dp + Dn) \div 2$. Switch off the channels connected to Dp and Dn.
2. Add the base oscilloscope measurement Min and Max. Choose Math1 as the source in both cases.
3. Perform a single run and read the Min and Max values.

Limits

Min (Abs(Min), Abs(Max)) > 15 V (Table 16)

Snapshot and cursor placement details

A snapshot of the common-mode voltage is displayed on the oscilloscope.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Single-Ended input voltage tolerance (Module)

Single-ended input voltage tolerance is measured as the single-ended peak-to-peak input voltage for the positive and negative data channels on a single acquisition. This test is one of the SFF-8431 Revision 4.1 Table 16 Module Transmitter Input Electrical Specifications at B' tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): Single-Ended Input Voltage Tolerance Test.

Signal validation

Automatic signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Single-ended input voltage tolerance is measured using base DPOJET.

- Use DPOJET measurement name: **Ampl > Cycle Pk-Pk**
- Use DPOJET settings: All default settings

Limits

For each of Dp and Dn:

Minimum = -0.3 V

Maximum = 4 V

Snapshot and cursor placement details

There will be two snapshots:

- A snapshot of Dp with cursors placed at maximum and minimum voltages of single-ended Pk-Pk measurement value of Dp. Cursor values can be derived using DPOJET: **Ampl > Cycle Max** and **Ampl > Cycle Min** for +ve and -ve peak, respectively for Dp.
- A snapshot of Dn with cursors placed at maximum and minimum voltages of single-ended Pk-Pk measurement value of Dn. Cursor values can be derived using DPOJET: **Ampl > Cycle Max** and **Ampl > Cycle Min** for +ve and -ve peak, respectively for Dn.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Crosstalk source Rise/Fall time (20% - 80%) (Module)

Crosstalk source rise/fall time is measured as the 20% – 80% (of VMA) Rise time and 80% – 20% (of VMA) Fall time of the differential crosstalk source introduced to the signal. This test is one of the SFF-8431 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The crosstalk source rise/fall time (20% – 80%) measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Dp and Dn after deskewing and applying 12 GHz filter
- Signal Type ("SFPPlus.SignalType")

Algorithm

- Input differential waveform.
- Obtain values of vHigh and vLow as done in the VMA measurement (averaged over all the patterns found in the waveform).

- Find the position of rising and falling edges in the input waveform.
- On each rising edge, traverse forward until the first point crossing the upper limit (80%) is found (= End) and traverse backward until the first point crossing the lower limit (20%) is found (= Start).
- On each falling edge, traverse backward until the first point crossing the upper limit (80%) is found (= Start) and traverse forward until the first point crossing the lower limit (20%) is found (= End).
- Transition time is computed as $TT = (End - Start)$. This value is averaged across all edges.
- End

Limits

Target value = 34 ps

Snapshot and cursor placement details

This measurement has two snapshots: the first with cursors placed at the rise time, the second with cursors placed at the fall time.

- Rise time: Zoom to the cursor positions. Cursor1 = starting point of RT of first rising edge, cursor2 = ending point of RT of first rising edge.
- Fall time: Zoom to the cursor positions. Cursor1 = starting point of FT of first falling edge, cursor2 = ending point of FT of first falling edge.

Cursor values and zoom positions are provided by the Algorithm library.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Crosstalk source amplitude (p-p differential) (Module)

Crosstalk source amplitude is measured as the difference between the nominal one and zero levels, which are defined as voltages measured in the mid 20% of the high (eight 1s) and low (eight 0s) regions respectively, of the differential crosstalk source introduced to the signal. This is one of the SFF-8431 Revision 4.1 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The crosstalk source amplitude (p-p differential) measurement is performed using the algorithm library.

Inputs to algorithm

Differential waveform obtained on a Math channel using Dp and Dn after deskewing and applying 12 GHz filter

Algorithm

- Input differential PRBS waveform.
- On the input waveform, identify the regions with the pattern 11111111 or 00000000.
- On each such pattern, measure the mean voltage in the middle 20% of the pattern.
- The mean voltages corresponding to the Signal High regions is taken as vHigh, and the mean voltages corresponding to the Signal Low is taken as vLow. The vHigh and vLow values are averaged across all regions.
- The required result amplitude is given by, $\text{Amplitude} = v\text{High} - v\text{Low}$.
- End

Limits

Target value = 1000 mV

Snapshot and cursor placement details

This measurement has one snapshot with cursor1 = +ve high of VMA, cursor2 = -ve high of VMA.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Output AC Common-Mode voltage (RMS) (Module)

Output AC common-mode voltage is measured as the AC RMS voltage of the common-mode ((DP + DN)÷2) signal. This test is one of the SFF-8431 Revision 4.1 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Output AC common-mode voltage (RMS) is measured using the base oscilloscope.

1. $\text{Math1} = (\text{Dp} + \text{Dn}) \div 2$. Switch off channels connected to Dp and Dn.
2. Draw a histogram bounding box from the top left of the oscilloscope to the bottom right, and choose **Histogram Vertical**.
3. Select **Math1** as the histogram source.
4. From the Measure menu, select **Histogram Measurements > Standard Deviation**.
5. Do a single step run and measure the mean value of the histogram standard deviation. This is the measurement result.

Limits

Maximum = 15 mV (Table 17)

Snapshot and cursor placement details

A snapshot where the histogram on math and the standard deviation value of the histogram is visible on the screen. The standard deviation value visible on the screen should be the value reported in the report. No cursors are required.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Total jitter (Module)

Total jitter, as used here, is the Level 1 definition for TJ as described in the FC-MJSQ, where TJ is the crossing width, defined as the late time at which the BER is 10^{-12} minus the early time at which the BER is 10^{-12} . This test is one of the SFF-8431 Revision 4.1 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Total jitter is measured using base DPOJET.

- Deskew the Data+ and Data- inputs. Compute the differential signal on Math1 = Dp – Dn.
- Use DPOJET TJ@BER measurement on the Math signal and Skew measurement on the single ended input signals.

DPOJET settings

- Select Tab: Select **Jitter**, click **TJ@BER**.
 - Configure the source:
 - Click the arrow button in the Source(s) column and configure Source 1 = **Math 1 (Dp – Dn)**
 - Select the **Advanced** check box and then set Reference Level % relative to Base Top as follows:

Setting	Rise	Fall
High	80%	80%
Mid	50%	50%
Low	20%	20%
Hysteresis	5%	

- Click **Close**.

- Configure Tab:
 - Edges: Signal Type = **Data**
 - Clock Recovery:
 - Method = **PLL-Custom BW**
 - PLL Model = **Type II**
 - Damping = **700 m**
 - Loop BW = **4 MHz**
 - Click the **Advanced** Button:
 - Nominal Data Rate = **ON** Bit Rate = **10.3125 Gb/s**
 - Known Data Pattern = **OFF**
 - Click **OK**.
 - RjDj:

For PRBS9 signal:

 - Pattern Type = **Repeating**
 - Window length = **511 UI**
 - BER 1E- = **12** (for J2 BER 1E- = 2.6; for J9 BER 1E- = 9.6)

For PRBS31 signal:

 - Pattern Type = **Arbitrary**
 - Window length = **10 UI**
 - Population = **100**
 - BER 1E- = **12** (for J2 BER 1E- = 2.6; for J9 BER 1E- = 9.6)
 - Filters: **No filters**
 - General: **OFF**
 - Global:
 - Gating: **OFF**
 - Quality: **OFF**
 - Population: **OFF**
- Results Tab: In the Options menu, deselect **Display Units – Absolute**.
- Click **Single**.

Limits

Maximum value = 0.28 UI

Snapshot and cursor placement details

No cursors are required because total jitter cannot be shown using cursors or snapshots. Instead, zoom a part of the waveform to see the type of waveform used for the measurement. Zoom the waveform between time 0 and (Horizontal scale $\div 10^4$). If the record length is 2M, the number of points in the zoomed part will be 200.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Data dependent jitter (Module)

DDJ is the range (max – min) of the timing variations measured on the differential signal with a crossing level equal to the average value of the entire waveform being measured. The waveform is averaged sufficiently to remove the effects of random jitter and noise in the system. This test is one of the SFF-8431 Revision 4.1 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

For compliance, perform ■ [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

Data dependent jitter is measured using base DPOJET.

- Deskew the Data+ and Data- inputs. Compute the differential signal on Math1 = Dp – Dn
- Use DPOJET DDJ measurement on the Math signal and Skew measurement on the single ended input signals.

DPOJET settings

- Select Tab: select **Jitter**, click **DDJ**.
 - Source configuration:
 - Source = **Math 1 (Ch1 – Ch1)**
 - Select the **Advanced** check box and then set Reference Level % relative to Base Top as follows:

Setting	Rise	Fall
High	80%	80%
Mid	50%	50%
Low	20%	20%
Hysteresis	5%	

- Click **Close**.
- Configure Tab:
 - Clock Recovery:
 - Method = **PLL-Custom BW**
 - PLL Model = **Type II**
 - Damping = **700 m**
 - Loop BW = **4 MHz**
 - Click the **Advanced** button:
 - Nominal Data Rate = **ON**. Bit Rate = **10.3125 Gb/s**
 - Known Data Pattern = **OFF**
 - Click **OK**.
 - RjDj:

For PRBS9:

 - Pattern Type = **Repeating**
 - Pattern Length = **511 UI**
 - BER 1E– = **12**

For PRBS31:

- Pattern Type = **Arbitrary**
- Window Length = **10 UI**
- Population = **100**
- BER 1E- = **12**
- Filters: **No filters**
- General: **OFF**
- Global:
 - Gating: **OFF**
 - Quality: **OFF**
 - Population: **OFF**
- Results Tab: In the Options menu, uncheck **Display Units – Absolute**.
- Click **Single**.

Limits

Target value = 0.10 UI

Snapshot and cursor placement details

No cursors are required because Data Dependent Jitter cannot be shown using cursors or snapshots. Instead, zoom a part of the waveform to see the type of waveform used for the measurement. Zoom the waveform between time 0 and (Horizontal scale $\div 10^4$). If the record length is 2M, the number of points in the zoomed part will be 200.

Data dependent pulse width shrinkage (Module)

DDPWS is measured as the difference between one symbol period and the minimum of all the differences between pairs of adjacent edges on the Differential Signal with a crossing level equal to the average value of the entire waveform being measured. The waveform is averaged sufficiently to remove the effects of random jitter and noise in the system. This is a SFF-8431 Revision 4.1 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” test.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

For compliance, perform ■ [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The data dependent pulse width shrinkage measurement is performed using the algorithm library.

Inputs to algorithm

Differential waveform obtained on a Math channel using Data+ and Data– after deskewing.

Algorithm

- Input differential waveform.
- Estimate the UI of the waveform (UI = bit duration).
- Identify all the PRBS9 patterns found in the acquired signal.
- Overlap all the PRBS9 patterns found in the acquisition to get a single averaged PRBS9 pattern.
- Identify the minimum width between adjacent edges of the averaged PRBS9 pattern. [= minimum UI]
- Compute Data Dependent Pulse Width Shrinkage (DDPWS) as: $DDPWS = \text{Estimated UI} - \text{minimum UI}$.

Limits

Target value = 0.055 UI

Snapshot and cursor placement details

This measurement has one zoomed snapshot with cursor1 and cursor2 marking the smallest UI.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Uncorrelated jitter (Module)

Uncorrelated jitter refers to the component of jitter in the transmitted signal that is not correlated to the transmitter data. The uncorrelated jitter (rms) is given by the RMS value of the standard deviations of the two distributions, namely standard deviation of jitter on rising edge and standard deviation of jitter on falling edge. This test is one of the SFF-8431 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

For compliance, perform [Signal Validation Procedure \(see page 111\)](#).

Measurement procedure

The uncorrelated jitter measurement is performed using the algorithm library.

Inputs to algorithm

- Differential waveform obtained on a Math channel using Data+ and Data- after deskewing
- Signal Type ("SFPPlus.SignalType")

Algorithm

- Input differential waveform.
- Identify the deviation of each rising and falling edge on the input signal from its ideal location (constructed using $UI = 1 \div \text{data rate}$) (Note: consider the rising and falling edges of a pattern with the longest run of 1s to maintain some uniformity on the edges to measure deviations. If the deviations were measured on all edges, then the deviations are inconsistent for different edges resulting in measurement errors.)
- Find the standard deviation of the deviations of the rising edges. Find the standard deviation of the deviation of the falling edges.
- Compute UJ as follows:

$$\text{Uncorrelated jitter (rms)} = \sqrt{(\sigma_r^2 + \sigma_f^2)/2}$$

where σ_r is the standard deviation of the jitter on the rising edge

where σ_f is the standard deviation of the jitter on the falling edge

- End

Output from algorithm

m_SFPPlusISDB.Result1Mean.Value = UJ.Mean

Limits

Target value = 0.023 UI

Snapshot and cursor placement details

No cursors are required. Uncorrelated jitter cannot be shown using cursors or snapshots. Zoom a part of the waveform to see the type of waveform used for the measurement. Zoom the waveform between time 0 and $(H\text{-scale} \div 10^4)$. If the record length is 2M, the number of points in the zoomed part will be 200.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

Eye mask hit ratio (Module)

The required transmitter pulse shape characteristics are specified in the form of a mask of the transmitter eye diagram (used to measure the number of Mask Hits). Eye Mask hit ratio is computed using Eye Mask hit ratio = $(\text{Number of Mask Hits} \times \text{Signaling Speed}) \div (\text{Number of UIs} \times \text{Sampling rate})$. This test is one of the SFF-8431 Revision 4.1 Table 17 Module Transmitter Input Tolerance Signal Calibrated at B” tests.

Connect the equipment as shown in the diagram at [Connection Setup for Module Tests \(see page 39\)](#): All other Module tests.

Signal validation

Automatic signal validation for PRBS31 pattern signals is not done by the SFP+ QSFP+ Tx application. The software assumes that the PRBS31 pattern is valid.

Measurement procedure

Eye mask hit ratio is measured using base DPOJET.

- Deskew the Data+ and Data– inputs. Compute the differential signal on Math1 = Dp – Dn.
- Use DPOJET Mask Hits measurement on the Math signal and Skew measurement on the single-ended input signals.

DPOJET settings

- Select Tab: Select **Eye >Mask Hits**.
 - Configure the Source:
 - Click the arrow button in the Source(s) column and configure Source 1 = **Math 1 (Dp–Dn)**
 - Select the **Advanced** check box and then set Reference Level % relative to Base Top as follows:

Setting	Rise	Fall
High	80%	80%
Mid	50%	50%
Low	20%	20%
Hysteresis	5%	

- Click **Close**.
- Configure Tab:
 - Edges: Signal Type = **Data**
 - Clock Recovery:
 - Method = **PLL – Custom BW**
 - PLL Model = **Type II**
 - Damping = **700 m**
 - Loop BW = **4 MHz**
 - Click the **Advanced** button:
 - Nominal Data Rate = **ON**. Bit Rate = **10.3125 Gb/s**
 - Known Data Pattern = **OFF**
 - Click **OK**.
 - Click **Apply**.
 - RjDj:

For PRBS9 signal:

 - Pattern Type = **Repeating**
 - Pattern Length = **511 UI**
 - BER 1E– = **12**

For PRBS31 signal:

- Pattern Type = **Arbitrary**
- Window length = **10 UI**
- Population = **100**
- BER 1E- = **12**
- Filters: **No filters**
- General: **OFF**
- Global:
 - Gating = **OFF**
 - Quality = **OFF**
 - Population = **OFF**
- Click **Run**.

NOTE. *Run until population crosses 2M.*

The Mask Hits DPOJET measurement gives the number of Mask hits. Plug that value into the following formula to obtain the Mask hit ratio:

Mask Hit Ratio = Number of Mask Hits \times Signaling Speed (10.3125 e⁹) \div Number of UIs (Population from DPOJET) \times Sampling Rate (50 e⁹)

Limits

Mask hit ratio of 5×10^{-5}

Snapshot and cursor placement details

This measurement has one snapshot of the eye mask hit generated in DPOJET. No cursors are required.

See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Common Test Parameters and Values \(see page 53\)](#)

De-embed using filter files

TekExpress SFP+ QSFP+ Tx provides an option to de-embed the signal path using filter files. You create the filter files. The filter files are .flt files composed of de-embed filter coefficients for a particular sampling rate. A filter file created for one sampling rate might not work for other sampling rates, so it is important to understand at what sampling rate the measurements are being performed. The following table summarizes the sampling rates used for each measurement.

Table 18: Measurement sampling rates

Measurement	Oscilloscope model
	DPO/DSA/MSO C & D Series (>16 GHz BW)
	Input on Ch1 and Ch3
Single-Ended Output Voltage Range	100 GS/s
Output AC Common Mode Voltage (RMS)	
Host Transmitter Jitter and Eye Mask specifications	
Crosstalk Source Rise/Fall Time (20% – 80%)	100 GS/s
Crosstalk Source Amplitude (p-p differential)	
Signal Rise/Fall Time (20% – 80%)	
Total Jitter (p-p)	
Data Dependent Jitter (p-p)	
Data Dependent Pulse Width Shrinkage (p-p)	
Uncorrelated Jitter (RMS)	
Transmitter Qsa	
Eye Mask Hit Ratio	
Host Transmitter Output Specifications for CU (SFP+ Host supporting direct attached cables)	
Voltage Modulation Amplitude (p-p)	100 GS/s
Transmitter Qsa	
Output AC Common Mode Voltage	
Host Output TWDPc	3.3 TS/s

See also

- [Common Test Parameters and Values \(see page 53\)](#)
- [Configure Tests \(see page 52\)](#)

Deskew channels

If skew is present between positive and negative channels, then the channels need to be deskewed before being used for waveform measurements. TekExpress SFP+ QSFP+ Tx provides support for channel deskew using the following method:

1. Determine what the skew is for each channel.
2. From the TekScope menu, select **Vertical > Deskew**.
3. In the Deskew/Attenuation window, click the channel (1 – 4) button for the first channel to be deskewed.
4. Click in the Ch(x) Deskew Time entry field and enter the skew. The skew can be +ve or –ve.
5. Click the channel button for the next channel and repeat step 4.
6. After entering the skew for all the channels that require it, from the Options menu in TekExpress SFP+ QSFP+ Tx, select **Deskew**.
7. In the Deskew dialog box, select the desired level:
 - **Less than 100 mV signal amplitude:** Select this if the signal amplitude is such that the oscilloscope's vertical setting is less than 100 mV/division.
 - **100 mV or greater signal amplitude:** Select this if the signal amplitude is such that the oscilloscope's vertical setting is greater than 100 mV/division.
8. Click **Read Deskew/Attn**.
9. When the status in the dialog box indicates the deskew is finished, click **Close**.

Each input channel has its own deskew settings. Deskew compensates individual channels for probes or cables of different lengths. The instrument applies the delay values after each completed acquisition. The deskew values are saved as part of the instrument setup. The deskew values for the selected channel are retained until you change the probe, you restore a saved setup, or you recall the factory setup.

See also

- [Select Acquisitions \(see page 46\)](#)
- [PreRun Checklist \(see page 61\)](#)

Map the My TekExpress folder

Follow these steps to map the My TekExpress folder on the instrument:

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

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

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

See also

- [Before You Click Start \(see page 59\)](#)
- [Install the Software \(see page 6\)](#)

Index

Symbols and Numbers

8180 signal validation, 112

A

About TekExpress, 8
 Acquire parameters, 46
 including in test reports, 56
 showing, 45
 viewing in reports, 65
 Acquire Status, 63
 Acquiring live waveforms, 49
 Acquisition options, 46
 Acquisitions, 46
 Acquisitions table, 45
 Activating the license, 6
 Advanced View, 33
 Algorithms
 Host: Crosstalk Source
 Amplitude (p-p
 Differential), 116
 Host: Crosstalk Source
 Rise/Fall Time (20% -
 80%), 115
 Host: Data Dependent
 Jitter, 121
 Host: Data Dependent Pulse
 Width Shrinkage, 123
 Host: Mask Hit Ratio, 128
 Host: Output AC
 Common Mode Voltage
 (RMS), 114
 Host: Output AC Common
 Mode Voltage (RMS) (for
 Cu), 133
 Host: Output TWDPC, 134
 Host: Signal Rise/Fall Time
 (20% - 80%), 117
 Host: Single Ended Output
 Voltage Range, 113
 Host: Total Jitter, 119
 Host: Transmitter Qsq, 126
 Host: Transmitter Qsq (for
 Cu), 131

Host: Uncorrelated Jitter, 125
 Host: Voltage Modulation
 Amplitude (p-p), 130
 Module: AC Common-Mode
 Voltage Tolerance, 135
 Module: Crosstalk Source
 Amplitude (p-p
 Differential), 138
 Module: Crosstalk Source
 Rise/Fall Time (20% -
 80%), 137
 Module: Data Dependent
 Jitter, 143
 Module: Data Dependent
 Pulse Width
 Shrinkage, 145
 Module: Eye Mask Hit
 Ratio, 148
 Module: Output AC
 Common Mode Voltage
 (RMS), 140
 Module: Single Ended Input
 Voltage Tolerance, 136
 Module: Total Jitter, 141
 Module: Uncorrelated
 Jitter, 147
 Analysis Status, 63
 Analyzing live waveforms, 49
 Analyzing prerecorded
 waveforms, 48
 Appending reports, 58
 Application controls, 15
 Application version, 7
 Application window, 15
 ApplicationStatus(), 101
 Auto Scroll, 63

C

Channel selection commands, 95
 CheckSessionSaved(), 106
 Clear test log, 63
 Client Proxy Object, 74
 Command buttons, 15

Commands, 80
 Comments, 42
 Compliance Mode, 33
 Compliance View, 33
 Configuration Parameter
 query, 92
 Configure button, 44
 Configure Selected Measurement
 commands, 97
 Configuring email notifica-
 tions, 55
 Configuring tests, 52
 Connect(), 86
 Connected instruments
 searching for, 40
 selecting, 52
 Connection requirements, 36

D

Data source, 46
 De-embedding, 151
 Default directory, 10
 Deselect All button, 44
 Deskew channels, 152
 Device parameters, 42
 Device profile connections, 36
 Device profiles, 42
 Directories, 10
 Disable Popups command, 88
 Disconnect from Server
 command, 107
 Disconnect(), 107
 DUT ID, 42
 DUT ID commands, 89

E

Email Notifications, 55
 Email Settings, 17
 Enable remote access, 71
 Equipment setup, 36
 Error code commands, 99
 Evaluation mode, 13
 Exiting the application, 14

F

Features, 8
File name extensions, 11
Filter files, 151
Firewall (remote access), 71
Flowchart for Client
 Programmatic Interface, 75
Free trials, 13

G

GetAcquireParameter(), 92
GetAnalyzeParameter(), 92
GetCurrentStateInfo(), 102
GetDutId(), 89
GetGeneralParameter(), 92
GetPassFailStatus(), 103
GetReportParameter(), 104
GetResultsValue(), 103
GetResultsValueForSubMeasure-
 ments(), 103
GetTimeOut(), 100
Global settings, 52

H

Help conventions, 1
Host tests, 33
 Crosstalk Source Amplitude
 (p-p Differential), 116
 Crosstalk Source Rise/Fall
 Time (20% - 80%), 115
 Data Dependent Jitter, 121
 Data Dependent Pulse Width
 Shrinkage, 123
 Eye Mask Hit Ratio, 128
 Output AC Common Mode
 Voltage (RMS), 114
 Output AC Common Mode
 Voltage (RMS) (for
 Cu), 133
 Output TWDPC, 134
 Signal Rise/Fall Time (20% -
 80%), 117
 Single Ended Output Voltage
 Range, 113
 Total Jitter, 119
 Transmitter Qsq, 126
 Transmitter Qsq (for Cu), 131

Uncorrelated Jitter, 125
Voltage Modulation
 Amplitude (p-p), 130

I

Inbound Rule Wizard (remote
 access), 71
Installing the software, 6
Instruments
 discovering connected, 18
 viewing connected, 40
Interface, 69
Interface error codes, 99
IP address connection
 commands, 86

K

Keep On Top, 13

L

License activation, 6
License Agreement, 7
Limits Editor, 53
Live waveform parameters, 46
Live waveforms, 49
LockSession(), 87
Log files, 63
Log View tab, 27

M

Measurement limits, 53
Measurement parameters, 50
Measurement selection
 commands, 93
Measurements, 52
Menus, 15
Message History, 63
Module tests, 33
 AC Common-Mode Voltage
 Tolerance, 135
 Crosstalk Source Amplitude
 (p-p Differential), 138
 Crosstalk Source Rise/Fall
 Time (20% - 80%), 137
 Data Dependent Jitter, 143

Data Dependent Pulse Width
 Shrinkage, 145
Eye Mask Hit Ratio, 148
Output AC Common-Mode
 Voltage (RMS), 140
Single Ended Input Voltage
 Tolerance, 136
Total Jitter, 141
Uncorrelated Jitter, 147

Moving the application
 window, 15
My TekExpress folder
 files stored in, 68
 location of, 59
 mapping, 153

N

New Inbound Rule Wizard, 71

O

Options menu, 15
 Instrument Control
 Settings, 18
 Keep On Top, 13
Oscilloscope setup
 guidelines, 112
Oscilloscope setup
 parameters, 111
Oscilloscopes supported, 3
Overall test result, 64
Overview of SFP+ QSFP+ Tx, 8

P

Panels, 19
Pass/Fail Summary
 including in reports, 57
 viewing, 65
Plot images
 including in reports, 57
 viewing, 65
Popups, 88
PRBS11 signal validation, 112
PRBS15 signal validation, 112
PRBS7 signal validation, 112
PRBS9 signal validation, 112
Pre-run Checklist, 61
Preferences menu, 29

Preferences tab, 19
 Prerecorded mode
 running a new test in, 48
 running a saved test in, 62
 selecting run sessions for, 42
 selecting waveform files
 for, 46
 Prerecorded waveform files, 48
 Program example, 78
 Programmatic Interface, 69

Q

QueryStatus(), 101

R

Reactivating the license, 6
 Real Time Scope, 53
 RecallSession(), 106
 Record Length, 111
 Related Documentation, 1
 Remote access firewall
 settings, 71
 Remote Proxy Object, 73
 Report name, 57
 Report Options, 56
 Report sections, 65
 Reports, 65
 adding user comments to, 42
 receiving in email
 notifications, 55
 Reports panel, 30
 Results panel, 29
 Run commands, 98
 Run session, 62
 Run(), 98

S

SaveSession(), 106
 SaveSessionAs(), 106
 Saving test setups, 31
 Saving tests, 68
 Schematic button, 44
 Select All button, 44
 Select Required button, 44
 Selecting acquisitions, 46
 Selecting test report contents, 56

Selecting tests, 44
 SelectTest(), 94
 SendResponse(), 102
 Server, 70
 Server locking commands, 87
 Session files, 68
 Session folders, 68
 Session Status commands, 106
 Set Configuration Parameters
 commands, 90
 Set remote access, 71
 SetAcquireParameter(), 97
 SetAnalyzeParameter(), 97
 SetDutId(), 89
 SetGeneralParameter(), 90
 SetTimeOut(), 100
 Setting up equipment, 36
 Setting up tests, 33
 Setup panel, 19
 Setup panel views, 42
 SetVerboseMode(), 88
 SFP+ QSFP+ Tx Application
 Commands, 80
 SFP+ QSFP+ Tx features, 8
 Show Acquire Parameters, 45
 Show Detailed Log, 63
 Signal types, 109
 Signal validation, 111
 for PRBS7, PRBS9, PRBS11,
 PRBS15, 8180, 112
 Signal validation prompt, 46
 Software installation, 6
 Status panel, 63
 Stop commands, 98
 Stop(), 98
 Suite selection commands, 94
 System requirements, 4

T

Technical support, 2
 TekExpress Client, 69
 TekExpress Client require-
 ments, 70
 TekExpress Server, 69
 Test configuration, 50
 Test groups, 44
 Test limits, 52

Test notifications, 56
 Test parameters, 53
 Test progress, 63
 Test Reports, 65
 Test results
 emailing, 55
 saving, 62
 viewing, 64
 Test Results commands, 103
 Test selection controls, 44
 Test setup files, 68
 Test setup steps, 42
 Test setups, 31
 creating, 32
 recalling, 32
 saving, 31
 Test signal types, 109
 Test status, 63
 Test Status commands, 100
 Test Status tab, 27
 Test-related files, 68
 Tests, 50
 running, 59
 running saved, 62
 selecting, 44
 setting up, 33
 Timeout Value commands, 100
 TransferImages(), 105
 TransferReport(), 104
 TransferWaveforms(), 105

U

Unlock Server command, 107
 UnlockSession(), 107
 Untitled Session folder, 59
 User Comments
 including in reports, 58
 location in reports, 65
 User Defined Mode, 53

W

Waveform files
 locating and storing, 68
 saving, 46