

**TekExpress® SFP-TX**  
**Compliance and Debug Solution Software**  
**Printable Online Help**



077-0590-02

**Tektronix**



**TekExpress® SFP-TX**  
**Compliance and Debug Solution Software**  
**Printable Online Help**

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TekExpress SFP-Tx Compliance and Debug Solution Online Help, 076-0252-02.

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- In North America, call 1-800-833-9200.
- Worldwide, visit [www.tektronix.com](http://www.tektronix.com) to find contacts in your area.

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## Related documentation

The following manuals are available as part of the TekExpress SFP-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	 +  <a href="http://www.Tektronix.com">www.Tektronix.com</a>

### 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-TX application runs on the following Tektronix oscilloscopes:

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**NOTE.** *The Host Output TWDPC Measurement is supported only on oscilloscopes that support 100 Gs/s. For example, DPO/DSA/MSO71604C and DPO/DSA/MSO72004C Series Digital Oscilloscopes.*

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- DPO/DSA71604 and DPO/DSA72004 Series Digital Oscilloscopes
- DPO/DSA71604B and DPO/DSA72004B Series Digital Oscilloscopes
- DPO/DSA/MSO71604C and DPO/DSA/MSO72004C Series Digital Oscilloscopes
- MSO71604 and MSO72004 Series Mixed Signal Oscilloscopes
- DPO/DSA72504D and DPO/DSA73304D Series Digital Oscilloscopes

### See also

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

## Minimum system requirements

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

**Table 2: System requirements**

<b>Processor</b>	Same as the oscilloscope
<b>Operating System</b>	Same as the oscilloscope (Windows XP (32-bit) SP2 and higher; Windows 7 (64-bit only))
<b>Memory</b>	Same as the oscilloscope
<b>Hard Disk</b>	Same as the oscilloscope
<b>Display</b>	Same as the oscilloscope <sup>1</sup>
<b>Firmware</b>	<ul style="list-style-type: none"> <li>■ TekScope 5.3.4 (Windows XP)</li> <li>■ TekScope 6.4 and later (Windows 7)</li> </ul>

**Table 2: System requirements (cont.)**

<b>Software</b>	<ul style="list-style-type: none"> <li>■ DPOJET, Jitter and Eye Diagram Analysis Tool, version 5.0.0 or later (for 32-bit) or version 6.0.0 or later (for 64-bit)</li> <li>■ National Instruments LabVIEW Run-time Engine 9.0.1 or later</li> <li>■ National Instruments TestStand Engine 4.2.1</li> <li>■ MathWorks MATLAB Runtime 7.14 <sup>2</sup>(Windows 7), MATLAB Runtime 7.5 (Windows XP 32-bit)</li> <li>■ Microsoft .NET 4.0 Framework</li> <li>■ Microsoft Excel 2002 or above</li> <li>■ Microsoft Internet Explorer 6.0 SP1 or later</li> <li>■ Microsoft Photo Editor 3.0 or equivalent software for viewing image files</li> <li>■ Adobe Reader 7.0 or equivalent software for viewing portable document format (PDF) files</li> </ul>
<b>Other Devices</b>	<ul style="list-style-type: none"> <li>■ Microsoft compatible mouse or compatible pointing device</li> <li>■ Four USB ports (two USB ports minimum)</li> <li>■ PCI-GPIB or equivalent interface for instrument connectivity <sup>3</sup></li> </ul>

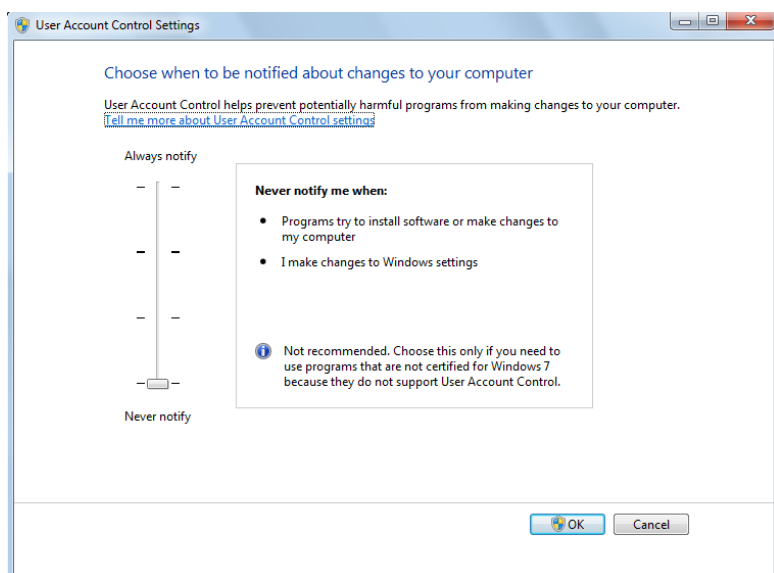
<sup>1</sup> If TekExpress is running on an instrument having a video resolution lower than 800x600 (for example, a sampling oscilloscope), it is recommended that you connect a secondary monitor, which must be enabled before launching the application.

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

<sup>3</sup> 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 XP or Windows 7 (64-bit). See [Minimum System Requirements \(see page 3\)](#) for details.

1. Close all applications.
2. Go to the [www.tek.com](http://www.tek.com) Web site and search for SFP-TX to locate the installation file. Download the file `SFP-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 XP location: `C:\Program Files\Tektronix\TekExpress\TekExpress SFP-Tx`
- Windows 7 location: `C:\Program Files (x86)\Tektronix\TekExpress\TekExpress SFP-Tx`

### See also

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

## Activate the license

The SFP-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 \(see page 138\)](#) is included in the SFP-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

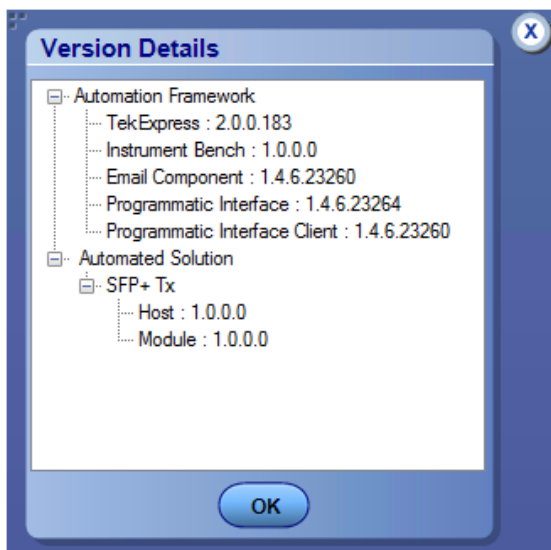
- [View Version and License Information \(see page 7\)](#)

## 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-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-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

SFP-TX has the following key features:

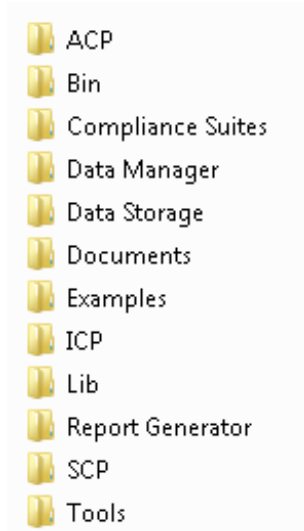
- Allows conformance testing to the latest Compliance Test Specification (CTS)
- Reliable Testing:
  - Conformance to SFP+ interconnect module electrical testing ensures reliable results
  - SFP-TX is SFP+ compliance software.
  - Enables execution of the physical-layer (PHY), electrical tests, and SFP+ 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 csv-format summary and HTML report saves time.
- Complete Solution:
  - Wide range of tests for SFP+ Host devices and SFP+ 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
- 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-Tx\ACP	Contains instrument and SFP-Tx application-specific interface libraries
TekExpress SFP-Tx\Bin	Contains miscellaneous SFP-Tx application libraries
TekExpress SFP-Tx\Compliance Suites	Contains compliance-specific files
TekExpress SFP-Tx\Data Manager	Contains result management-specific libraries of the SFP-Tx application
TekExpress SFP-Tx\Data Storage	Contains libraries needed for storing data
TekExpress SFP-Tx\Documents	Contains the technical documentation for the SFP-Tx application
TekExpress SFP-Tx\Examples	Contains various support files
TekExpress SFP-Tx\ICP	Contains instrument and SFP-Tx application-specific interface libraries
TekExpress SFP-Tx\Lib	Contains utility files specific to the SFP-Tx application
TekExpress SFP-Tx\Report Generator	Contains Excel Active X interface Library for Report Generation
TekExpress SFP-Tx\SCP	Contains instrument and SFP-Tx application-specific interface libraries
TekExpress SFP-Tx\Tools	Contains instrument and SFP-Tx application-specific files

### See also

- [View Test-Related Files \(see page 69\)](#)

## File name extensions

The TekExpress SFP-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.
.seq	The test sequence file
.xml	The encrypted XML file that contains the test-specific configuration information The log file extension is also xml.
.wfm	The test waveform file
.mht	Test result reports are saved in this format by default. Test reports can also be <a href="#">saved in HTML format (see page 56)</a> .

### See also

- [View Test-Related Files \(see page 69\)](#)
- [Application Directories and Usage \(see page 9\)](#)
- [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-TX application, do one of the following:

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

While running the application, switch between the oscilloscope screen and SFP-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
<a href="#">Options menu (see page 15)</a>	Opens the Options menu for access to global controls
<a href="#">Panels (see page 19)</a>	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>

**Table 4: Application controls descriptions (cont.)**

Item	Description
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 <a href="#">Results panel (see page 28)</a>.</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>

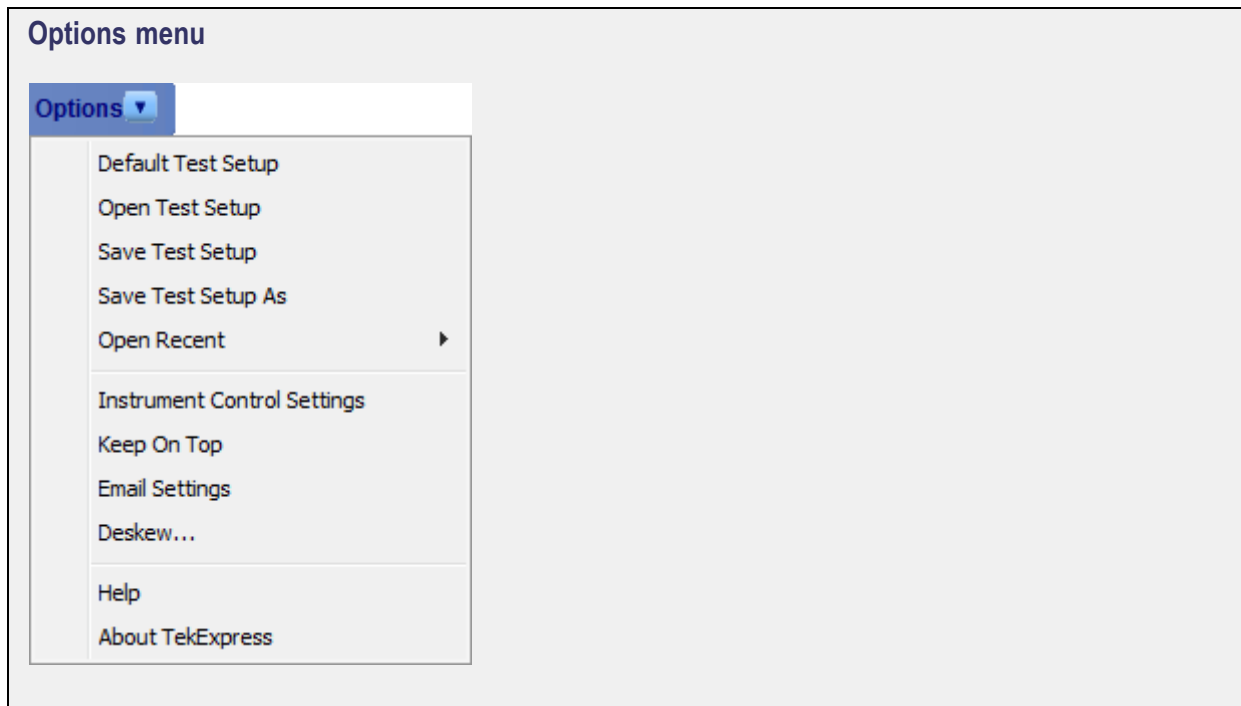
## Options menu

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
<a href="#">Instrument Control Settings (see page 18)</a>	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-TX utility on top of other open windows on the desktop
<a href="#">Email Settings (see page 17)</a>	Use to configure email options for test run and results notifications
<a href="#">Deskew (see page 158)</a>	Use to deskew channels

Menu	Function
Help	Displays TekExpress Help
About TekExpress	<ul style="list-style-type: none"> <li>■ Displays application details such as software name, version number, and copyright</li> <li>■ Provides access to <a href="#">license information (see page 7)</a> for your SFP-TX installation</li> <li>■ Provides a link to the Tektronix Web site</li> </ul>



### See also

- [Application Controls \(see page 14\)](#)



## 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 ScoreCard and Analysis Screenshot options are not available in SFP-TX.*

---

**Email Settings**

Recipient e-mail Address(es)

*Note: Separate Email addresses with a comma*

Sender's Address

**Email Attachments**

☒ Reports

☐ ScoreCard

☐ Analysis Screenshot

☒ 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

☐ Email Test Results When complete or on error

Test Email Apply Close

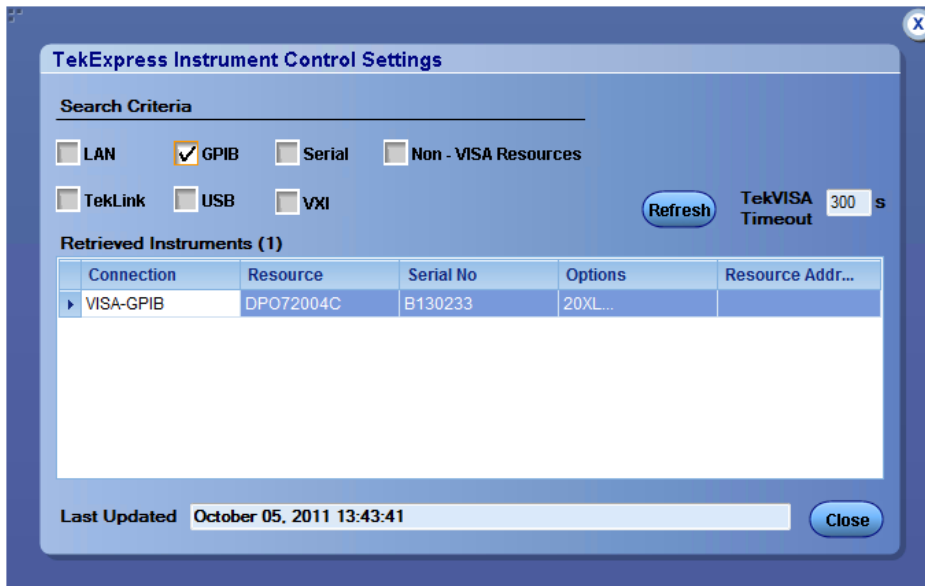
### See also

- [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 \(see page 51\)](#) for details.

### See also

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

## About panels

TekExpress SFP-TX has the following main panels:

**Table 5: Application panels**

Panel Name	Purpose
<a href="#">Setup (see page 19)</a>	The Setup panel allows you to configure the test setup. Use this panel to: <ul style="list-style-type: none"> <li>■ <a href="#">Select device parameters (see page 43)</a>.</li> <li>■ <a href="#">Select the test(s) (see page 44)</a>.</li> <li>■ <a href="#">Select acquisitions parameters (see page 46)</a> for selected tests.</li> <li>■ <a href="#">Configure the selected tests (see page 51)</a>.</li> <li>■ <a href="#">Select test notification preferences (see page 56)</a>.</li> </ul>
<a href="#">Status (see page 26)</a>	View the acquisition and analysis status of the selected tests, and view test logs.
<a href="#">Results (see page 28)</a>	View a summary of test results and select result viewing preferences.
<a href="#">Reports (see page 29)</a>	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 \(see page 14\)](#)

## Setup panel

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

1 – [DUT \(see page 21\)](#), 2 – [Test Selection \(see page 22\)](#), 3 – [Acquisitions \(see page 23\)](#), 4 – [Configuration \(see page 24\)](#), and 5 – [Preferences \(see page 25\)](#)

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 \(see page 20\)](#) option in the DUT tab. Otherwise, configuration settings for tests are available from the Configure button on the Test Selection tab.

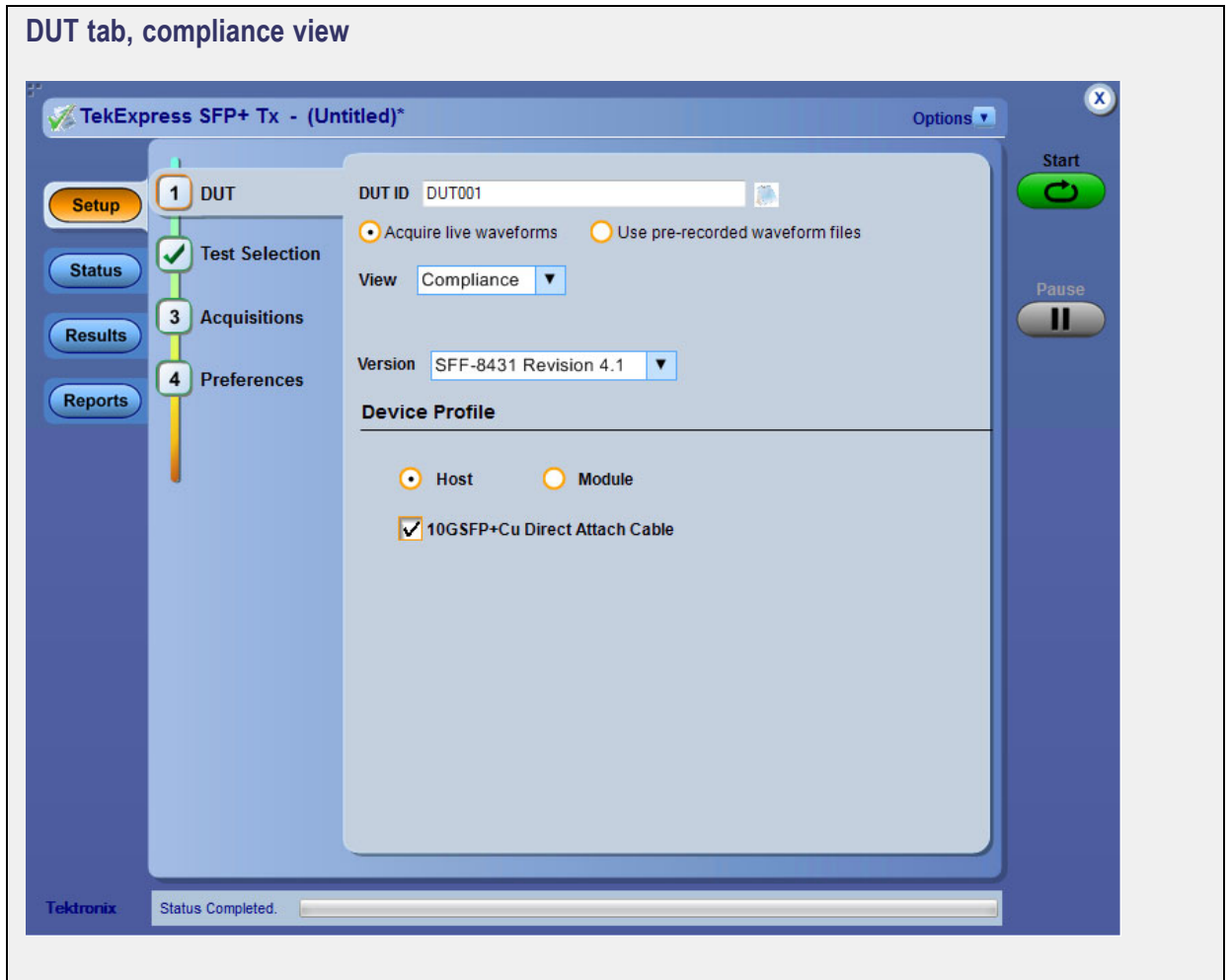
Options selected in a preceding tab affect options available in the next tab down. However, you can switch between the tabs in any order if you need to modify test parameters. For more information on using the Setup panel, see [Test Setup Overview \(see page 42\)](#).

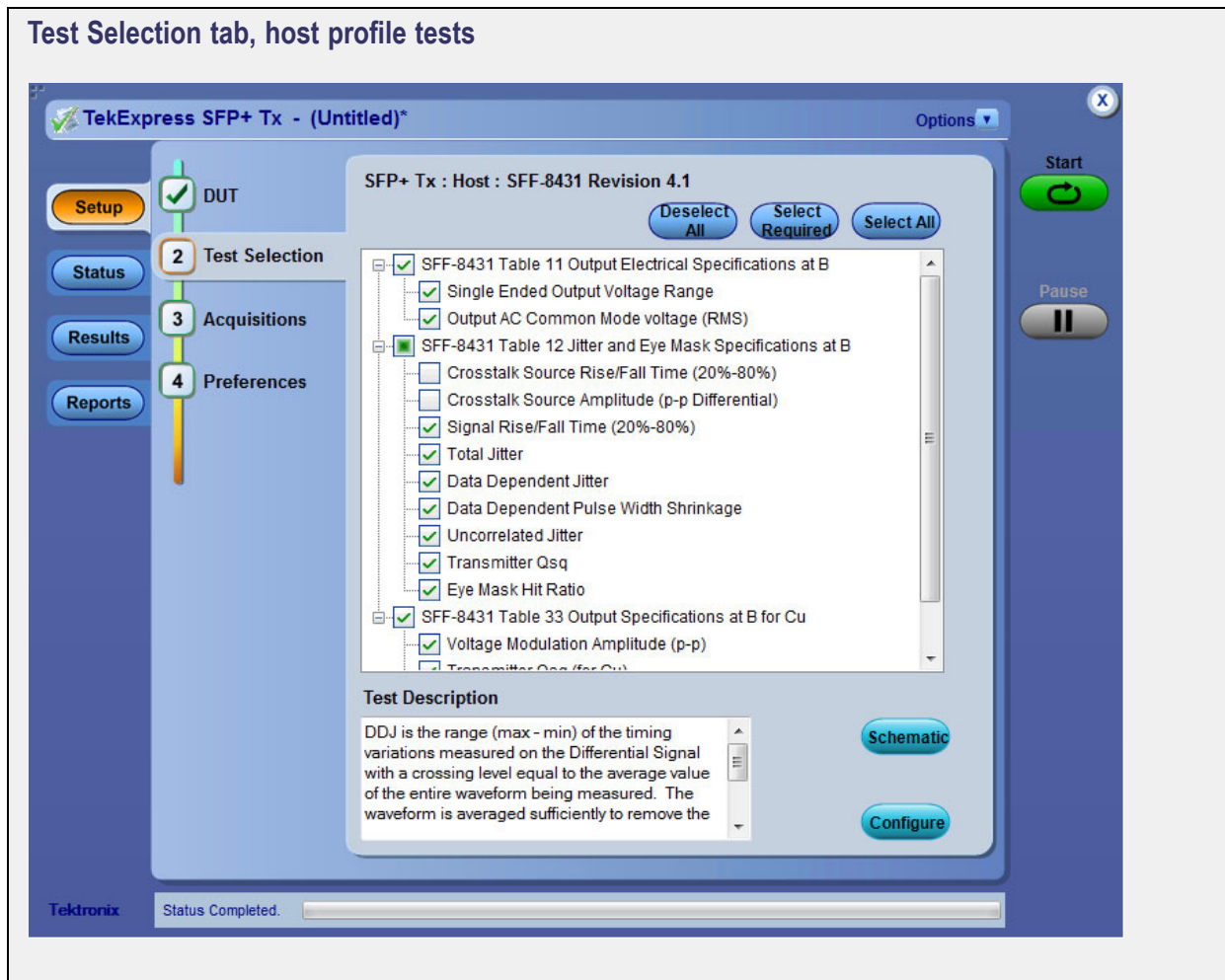
When you finish making selections in a tab and move to the next tab, the number in the tab title changes to a check mark. If you make changes on a tab that significantly affect the settings set in a preceding tab, the check mark in the tab title of the affected tab is replaced with the number again to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

## See also

- [About Panels \(see page 19\)](#)
- [Select Device Parameters \(see page 43\)](#)
- [Select a Test \(see page 44\)](#)
- [Select Acquisitions \(see page 46\)](#)
- [Configure Tests \(see page 51\)](#)
- [Select Test Notification Preferences \(see page 56\)](#)







## Acquisitions tab, host profile

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

**Setup** **Status** **Results** **Reports**

**3 Acquisitions**

**SFP+ Tx : Host : SFF-8431 Revision 4.1**

**Data Source (+)** CH1 **Data Source (-)** CH3 **Deskew**

Test Name	Acquisition
Data Dependent Jitter	Data Dependent Jitter Acquisition
Data Dependent Pulse Width Shrinkage	Data Dependent Pulse Width Shrinkage Acquisition
Eye Mask Hit Ratio	Eye Mask Hit Ratio Acquisition
Output AC Common Mode voltage (RMS)	Output AC Common Mode voltage (RMS) Acquisition
Output AC Common Mode voltage (RMS)	Output AC Common Mode voltage (RMS) Acquisition
Signal Rise/Fall Time (20%-80%)	Signal Rise/Fall Time (20%-80%) Acquisition
Single Ended Output Voltage Range	Single Ended Output Voltage Range Acquisition
Total Jitter	Total Jitter Acquisition
Transmitter Qsq (for Cu)	Transmitter Qsq (for Cu) Acquisition
Transmitter Qsq	Transmitter Qsq Acquisition
Uncorrelated Jitter	Uncorrelated Jitter Acquisition

**Acquisition and Save Options**

☐ Show Acquire Parameters

☐ Save All Waveforms Before Analysis

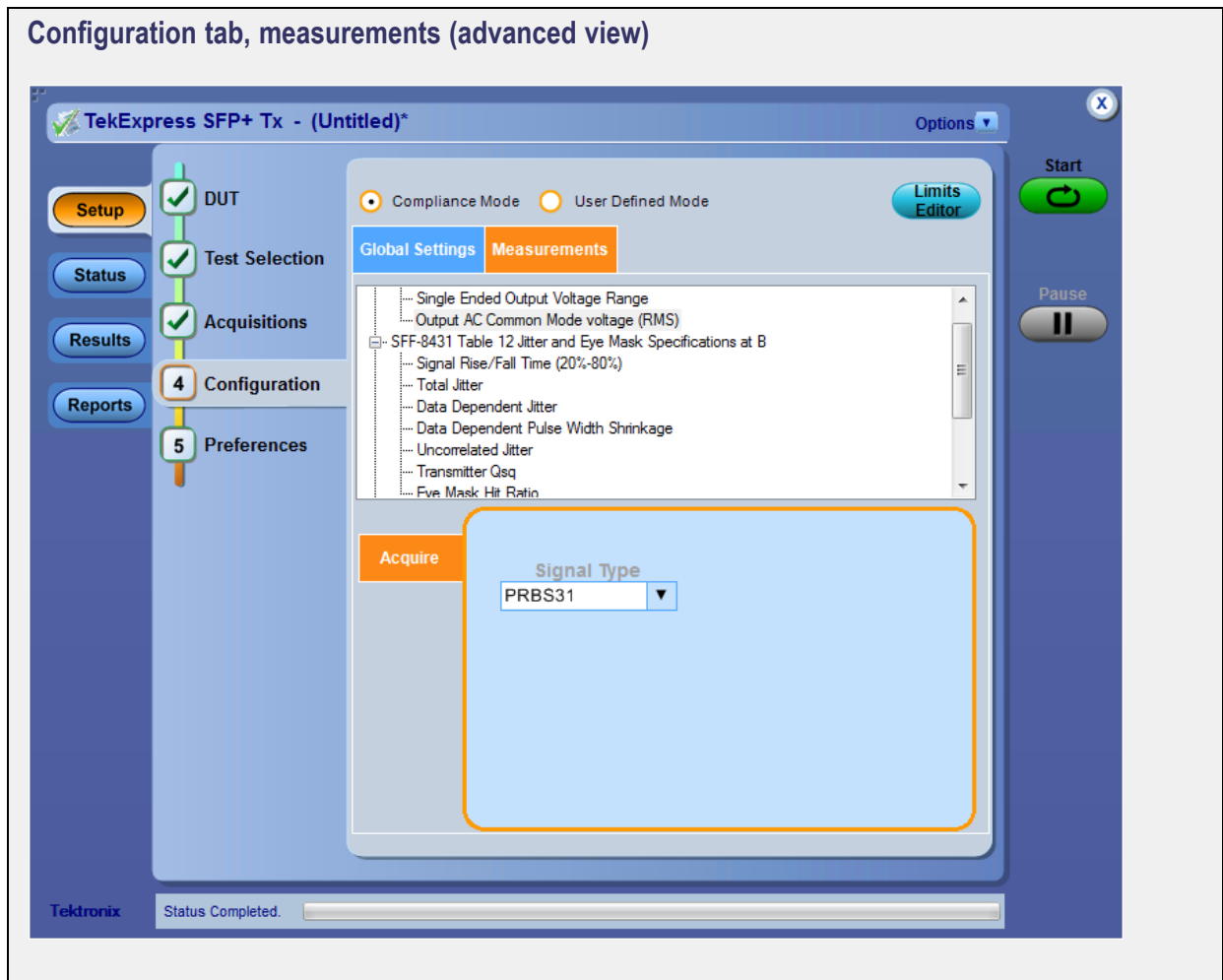
☐ Analyze Immediately - No Waveforms Saved

☒ Save and Analyze Acquisition In Sequence

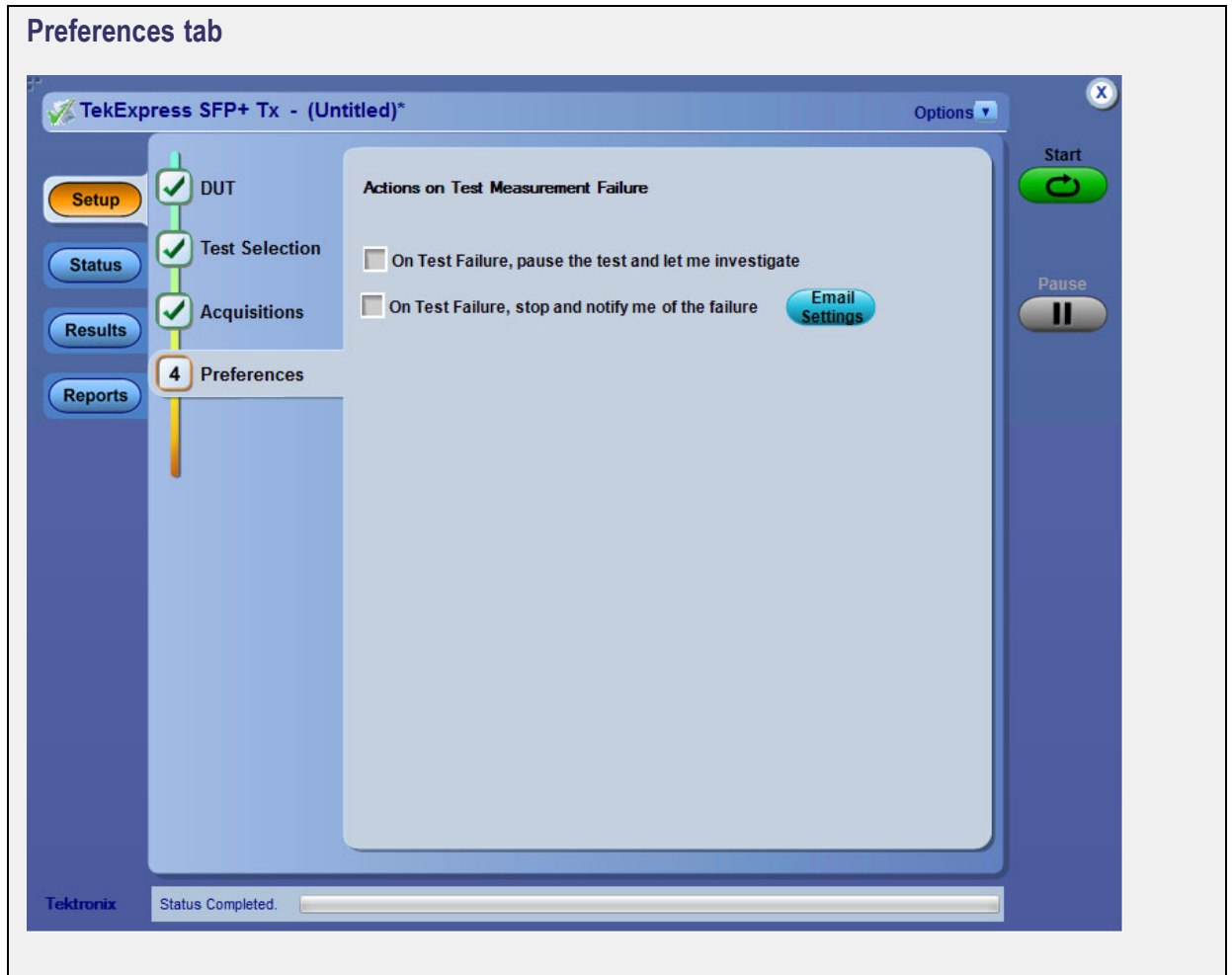
**Signal Validation**

Prompt me if signal f... ▼

**Tektronix** Status Completed.



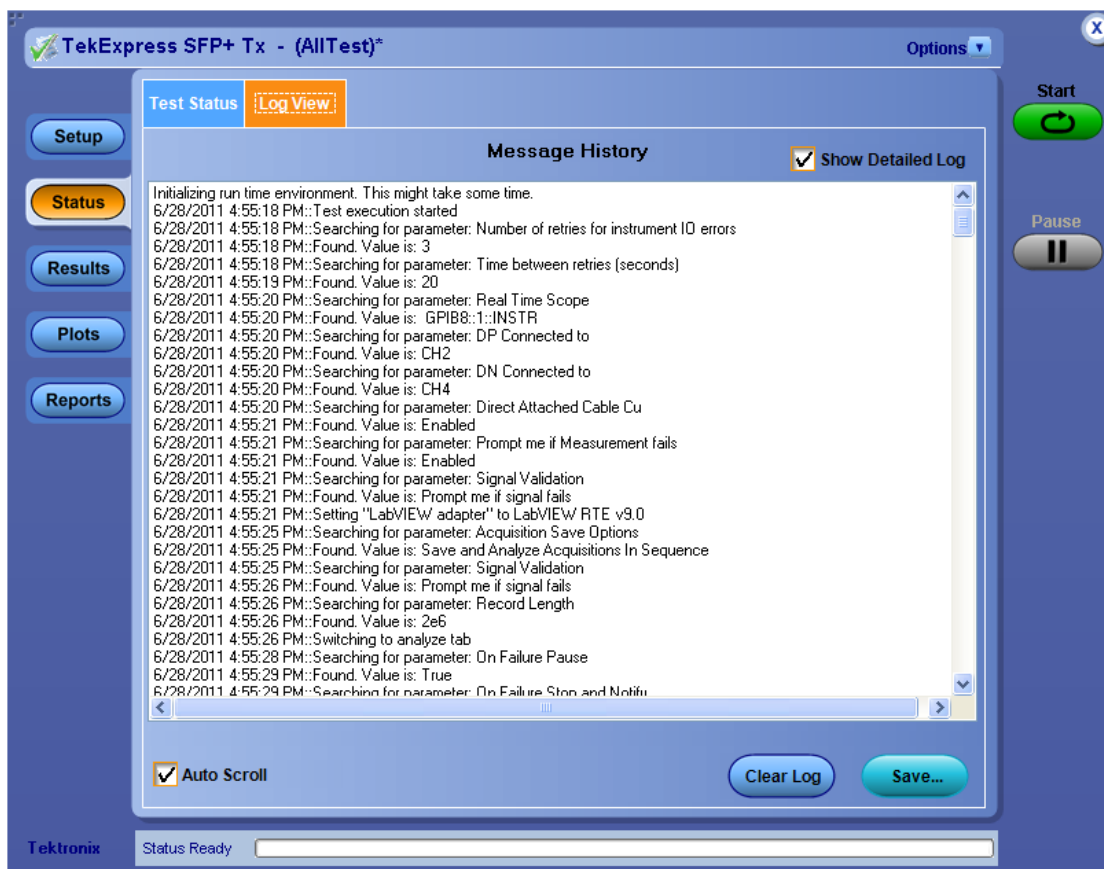




## Status panel

Use the Status panel to track test measurement progress. The Status panel has two tabs: the [Test Status](#) (see page 27) 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+ Tx - (AllTest)\*** Options

Test Status Log View

Setup Status Results Plots Reports

Test Name	Acquisition	Acquire Status	Analysis Status
Crosstalk Source Amplit...	Crosstalk Source Amplitude ...	Completed Acquisition	Completed
Crosstalk Source Rise/F...	Crosstalk Source Rise/Fall Ti...	Completed Acquisition	Completed
Data Dependent Jitter	Data Dependent Jitter Acqui...	Completed Acquisition	Completed
Data Dependent Pulse ...	Data Dependent Pulse Width...	Completed Acquisition	Completed
Eye Mask Hit Ratio	Eye Mask Hit Ratio Acquisition	Completed Acquisition	Completed
Output AC Common Mod...	Output AC Common Mode v...	Completed Acquisition	Completed
Output AC Common Mod...	Output AC Common Mode v...	Completed Acquisition	Completed
Signal Rise/Fall Time (20...	Signal Rise/Fall Time (20%-8...	Completed Acquisition	Completed
Single Ended Output Vol...	Single Ended Output Voltage...	Completed Acquisition	Completed
Total Jitter	Total Jitter Acquisition	Completed Acquisition	Completed
Transmitter Qsq (for Cu)	Transmitter Qsq (for Cu) Ac...	Completed Acquisition	Completed
Transmitter Qsq	Transmitter Qsq Acquisition	Completed Acquisition	Completed
Uncorrelated Jitter	Uncorrelated Jitter Acquisition	Completed Acquisition	Completed
Voltage Modulation Ampl...	Voltage Modulation Amplitud...	Completed Acquisition	Completed

Tektronix Status Ready

Start Pause

## 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 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+ Tx - (AllMeas)\***

Overall Test Result: ✔ Pass

Description	Details	Pass/Fail	Value	Margin
Data Dependent Jitter	Data Dependent Jitter (UI) Signal - PRBS9	<span style="color: green;">✔</span> Pass	0.0768	0.0232
High Limit		<span style="color: green;">✔</span> Pass	0.1UI	
Low Limit		N/A	N/A	
Data Dependent Pulse Width Shrinkage	Data Dependent Pulse Width Shrinkage (UI)	<span style="color: green;">✔</span> Pass	0.0489 UI	0.0061
High Limit		<span style="color: green;">✔</span> Pass	0.055UI	
Low Limit		N/A	N/A	
Eye Mask Hit Ratio	Eye Mask Hit Ratio Signal - PRBS31	<span style="color: green;">✔</span> Pass	0	0.0000496
Output AC Common Mode voltage (RMS)	Output AC Commonmode voltage (mV) Signal - PRBS31	<span style="color: green;">✔</span> Pass	8.8329 mV	6.1671
Output AC Common Mode voltage (RMS) (for Cu)	Output AC Commonmode voltage Cu (mV) Signal - PRBS31	<span style="color: green;">✔</span> Pass	8.8329 mV	3.1671
Signal Rise/Fall Time (20%-80%)	Signal Rise Time (pS) , Signal Fall	<span style="color: green;">✔</span> Pass	52.1088 pS , 49.5017 pS	18.1088 , 15.5017

Tektronix 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-TX opens with the default setup selected. 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 \(see page 69\)](#)

## 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 \(see page 43\)](#)
- [Configure Tests \(see page 51\)](#)
- [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: views and modes

Test options include 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 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 \(see page 115\)](#)
  - [Output AC Common Mode voltage \(RMS\) \(see page 116\)](#)

- SFF-8431 Table 12 Jitter and Eye Mask Specifications at B:
  - [Crosstalk Source Rise/Fall Time \(20%–80%\) \(see page 117\)](#)
  - [Crosstalk Source Amplitude \(p-p Differential\) \(see page 118\)](#)
  - [Signal Rise/Fall Time \(20%–80%\) \(see page 120\)](#)
  - [Total Jitter \(see page 121\)](#)
  - [Data Dependent Jitter \(see page 124\)](#)
  - [Data Dependent Pulse Width Shrinkage \(see page 126\)](#)
  - [Uncorrelated Jitter \(see page 128\)](#)
  - [Transmitter Qsq \(see page 129\)](#)
  - [Eye Mask Hit Ratio \(see page 131\)](#)
- SFF-8431 Table 33 Output Specifications at B for Cu:

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**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.

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- [Voltage Modulation Amplitude \(p-p\) \(see page 134\)](#)
- [Transmitter Qsq \(for Cu\) \(see page 135\)](#)
- [Output AC Common Mode voltage \(RMS\) \(for Cu\) \(see page 137\)](#)
- [Host Output TWDPC \(see page 138\)](#)

---

**NOTE.** An evaluation version of the Host Output TWDPC test is included in the SFP-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 \(see page 139\)](#)
  - [Single-Ended Input Voltage Tolerance \(see page 140\)](#)

- SFF-8431 Table 17 Transmitter Input Tolerance Signal Calibrated at B:
  - [Crosstalk Source Rise/Fall Time \(20%-80%\) \(see page 141\)](#)
  - [Crosstalk Source Amplitude \(p-p Differential\) \(see page 143\)](#)
  - [Output AC Common-Mode Voltage \(RMS\) \(see page 145\)](#)
  - [Total Jitter \(see page 146\)](#)
  - [Data Dependent Jitter \(see page 148\)](#)
  - [Data Dependent Pulse Width Shrinkage \(see page 150\)](#)
  - [Uncorrelated Jitter \(see page 152\)](#)
  - [Eye Mask Hit Ratio \(see page 153\)](#)

**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 \(see page 3\)](#)):

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

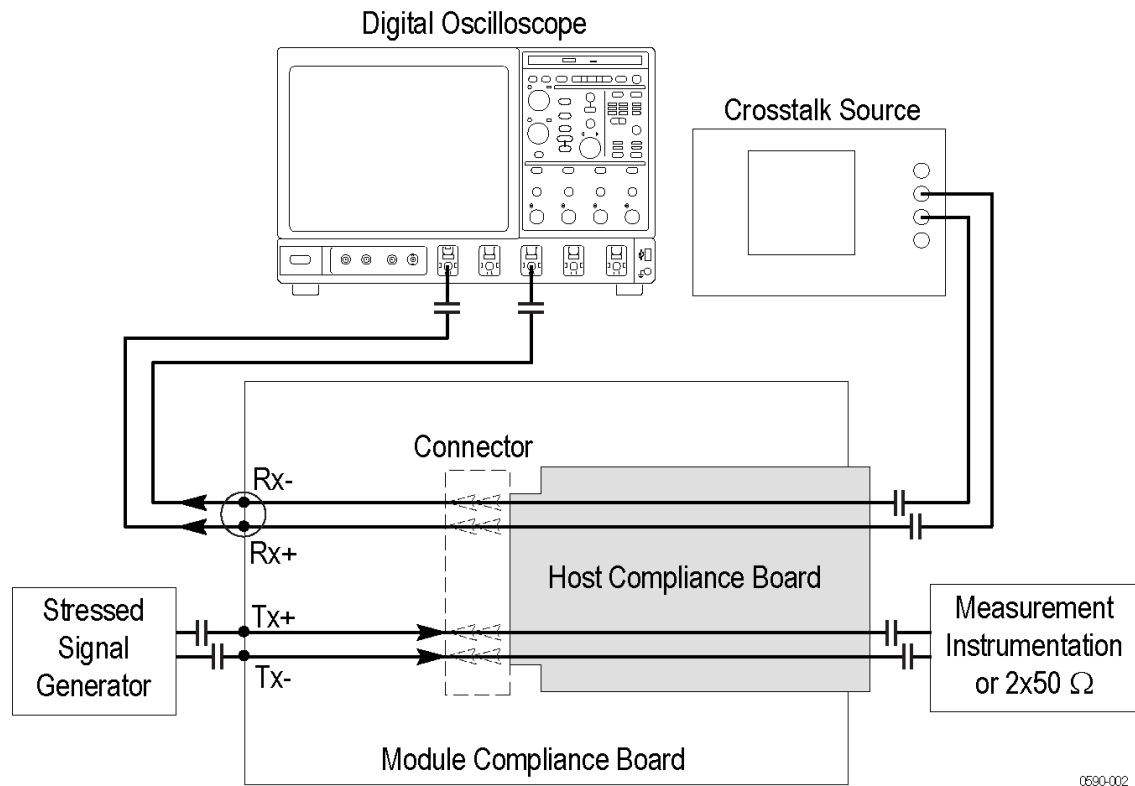
**Table 6: SFP+ fixtures**

<b>Tektronix nomenclature</b>	<b>Description</b>
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

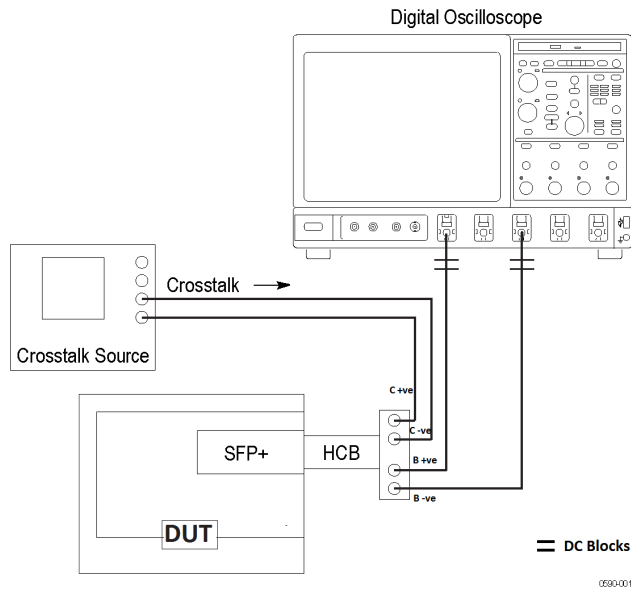
Equipment connections can vary by Device Profile (Host and Module) and by individual test. Refer to the following connection diagrams when setting up equipment for testing.

### Connection setup for Host tests

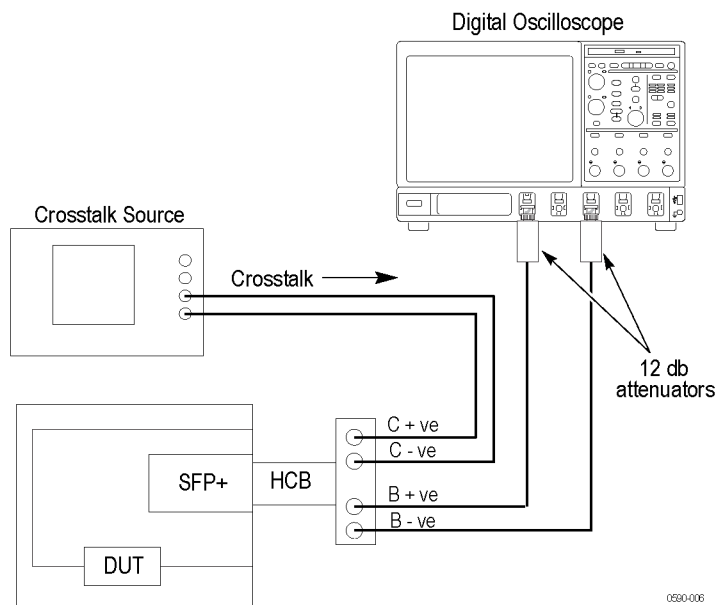
- Table 12 Crosstalk Source tests



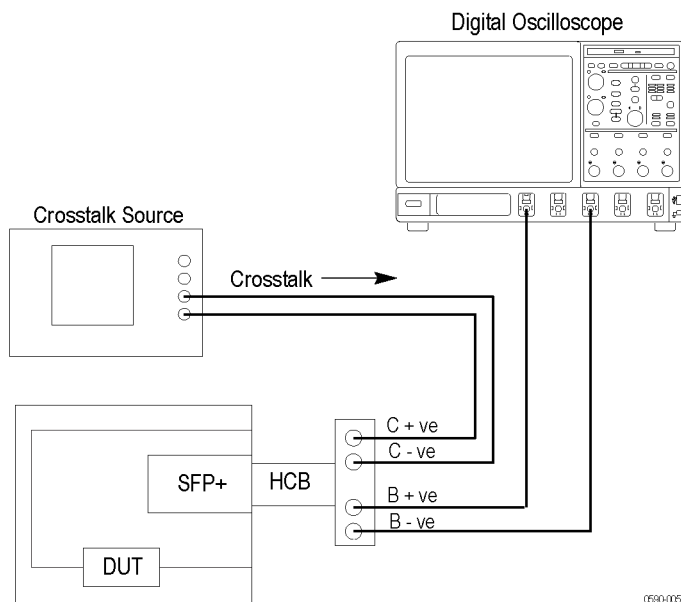
- All other Host tests



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



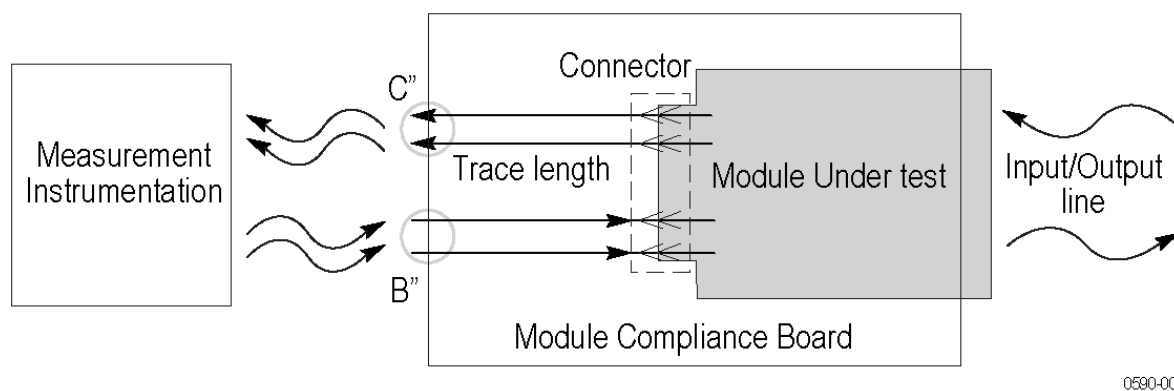
Test setup for single ended output voltage range measurement on DPO/DSA70000D series oscilloscopes



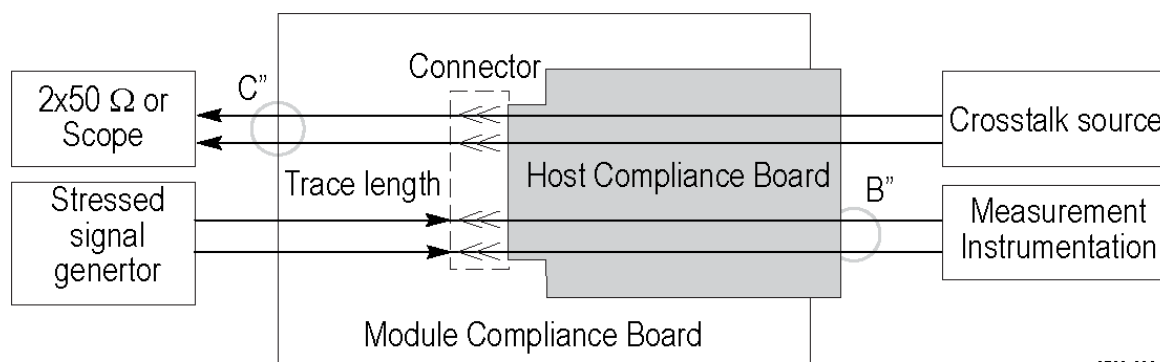
Test setup for single ended output voltage range measurement on all oscilloscopes other than DPO/DSA70000D series oscilloscopes

### Connection setup for module tests

- Single-Ended Input Voltage Tolerance Test



- All other Module tests



### 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.

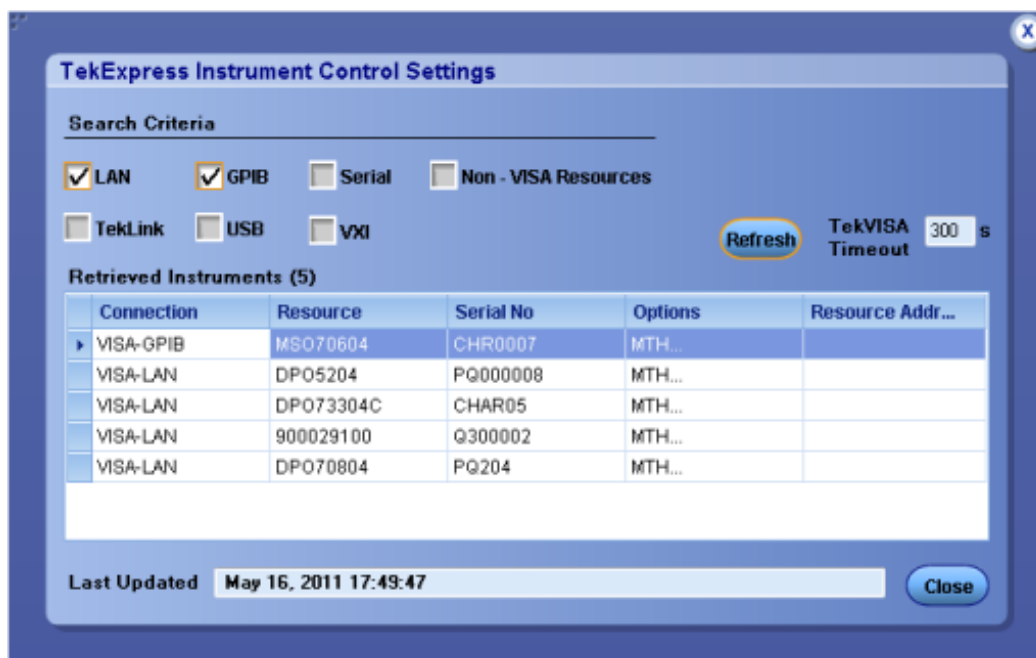
To refresh the list of connected instruments:

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 \(see page 51\)](#)
- [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 \(see page 29\)](#) to select and configure tests.


1. [Select device parameters \(see page 43\).](#)
2. [Select one or more tests \(see page 44\).](#)
3. [Select acquisitions \(see page 46\).](#)
4. [Configure tests \(see page 51\).](#)
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 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.

### 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 \(see page 49\)](#)





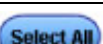
## Select a test

Tests listed in the Test Selection tab depend on whether you selected Host or Module in the DUT tab. 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 to [acquire live waveforms \(see page 49\)](#) or [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 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 <b>Show Acquire Parameters</b> 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 <b>Use pre-recorded waveform files</b> 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 one or more desired waveforms for each test.
  - For capturing live waveforms, select the Data Source channels for positive and negative signals if needed.
3. [Deskew channels \(see page 158\)](#).
4. Select the [acquisition and save options \(see page 46\)](#).

### See also

- [Configure Tests \(see page 51\)](#)
- [About Setting Up Tests \(see page 33\)](#)
- [Test Setup Overview \(see page 42\)](#)

## Acquisition parameters

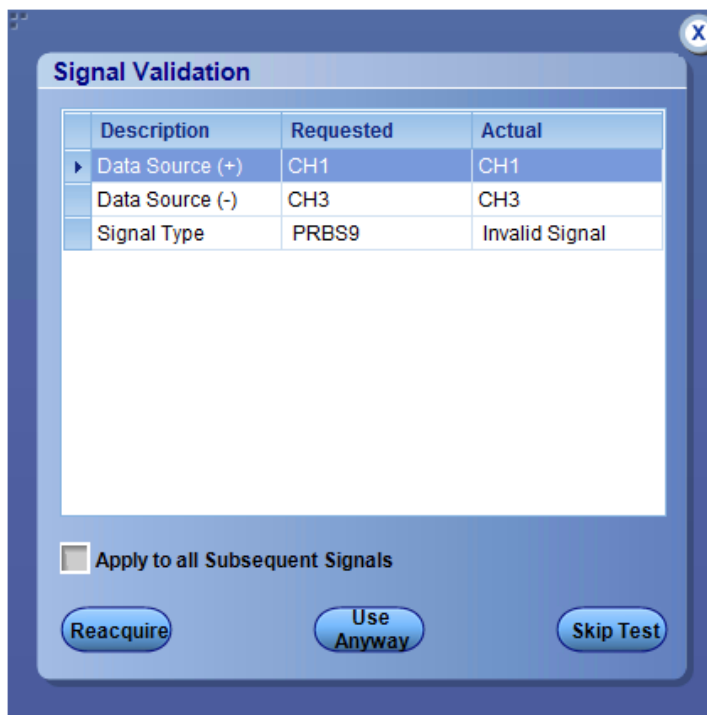
Available acquisition options depend on the selected mode (Compliance or User Defined) and the type of waveform being used, live or prerecorded.

**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.
<b>NOTE.</b> 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.
Data Source (–)	
Signal Validation:	Determines how the application responds to the source signal

**Table 9: Acquisition and save options (cont.)**

Option	Description
■ Prompt me if signal fails	If the signal fails, pauses the measurement operation and displays a dialog box with the following options:



- Reacquire: Try acquiring the signal again.
- Use Anyway: Use the signal even if it cannot be validated.
- Skip Test: Abort the test if the signal cannot be validated.

To apply your selection to all future signal acquisitions in this test session only, select **Apply to all Subsequent Signals**.

■ Use signal as is—Don't Check	Skips the signal validation process. Does not test the signal for its characteristics
■ Skip test if signal fails	Moves to the next test (if applicable) if the signal fails

**NOTE.** The following Save options affect the order in which waveforms are acquired and analyzed.

Save All Waveforms Before Analysis	Waveforms will be saved before being analyzed.
Analyze Immediately—No Waveform Saved	Waveforms will be analyzed without being saved.
Save and Analyze Acquisition in Sequence	Determines the order of acquisition and analysis during test execution

### 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 \(see page 43\).](#)
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 one or more waveform files.
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 \(see page 51\)](#)



## 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 \(see page 43\)](#) 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 \(see page 158\)](#) if needed.
7. Select other desired [acquisition and save options \(see page 46\)](#).
8. [Configure the tests \(see page 51\)](#) if needed and then click **Start** to run the test.

### See also

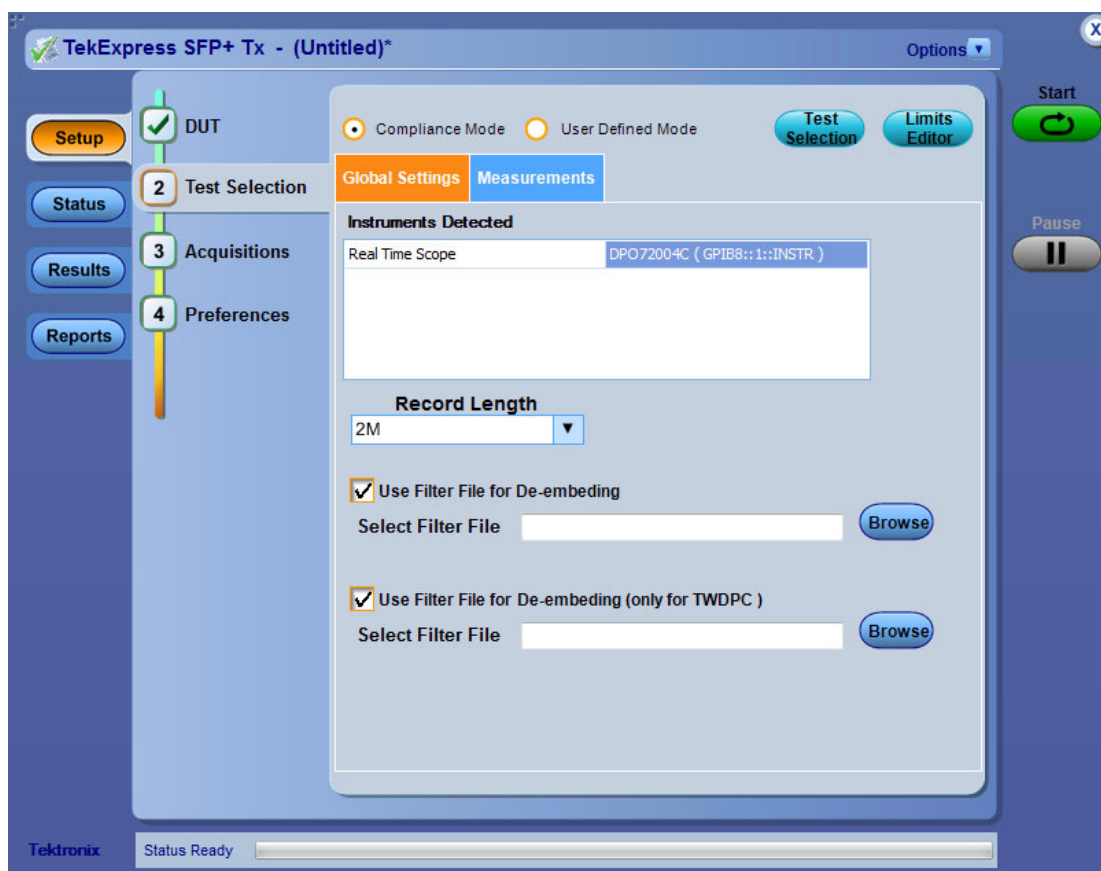
- [About Acquisitions \(see page 45\)](#)
- [Select Acquisitions \(see page 46\)](#)
- [Use Prerecorded Waveforms for Analysis \(see page 48\)](#)

## About configuring tests

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

The Configuration tab shows Global parameters and Measurement parameters.

Global 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.



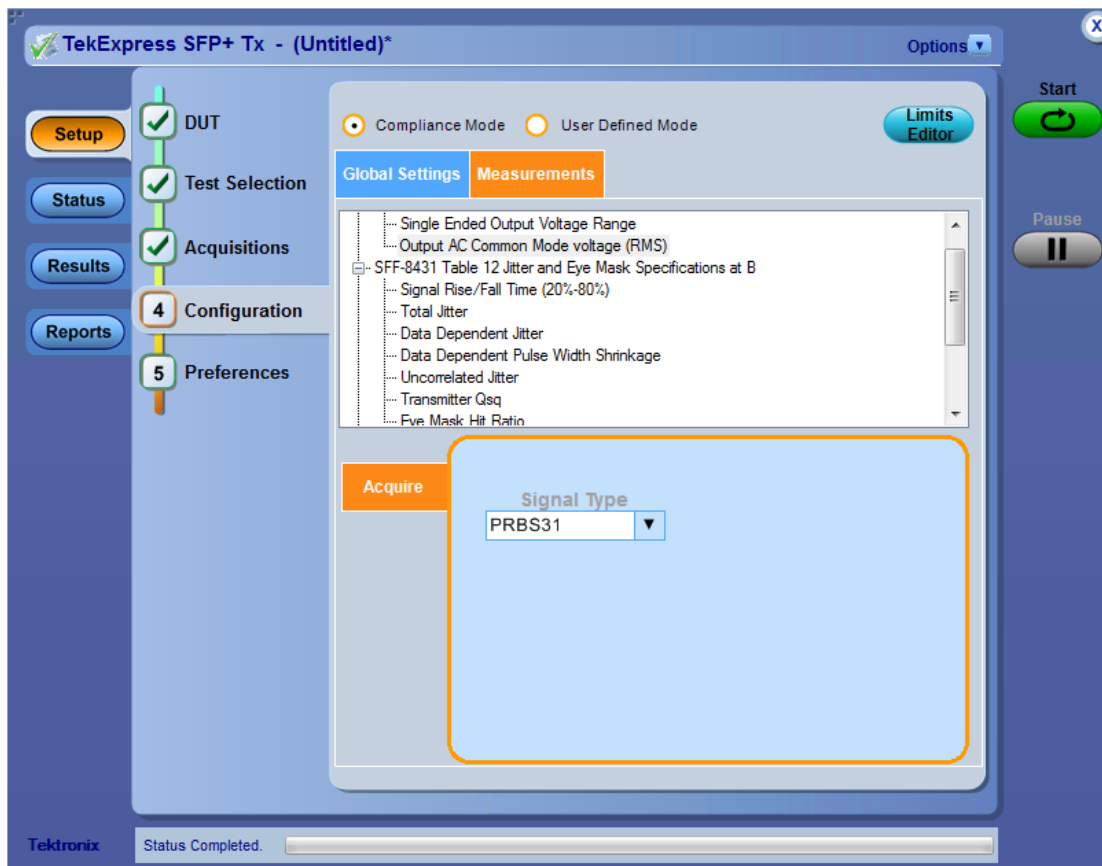

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**NOTE.** The *Use Filter File for De-embedding (only for TWDPC)* check box is available only if the test Host Output TWDPC is selected in the Test Selection tab.

---

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 \(see page 52\)](#)
- [De-embed Using Filter Files \(see page 157\)](#)
- [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.

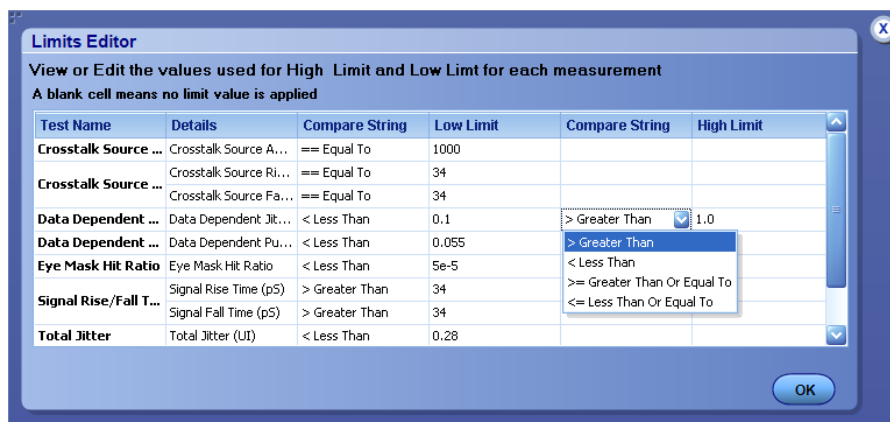
---

**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"> <li>■ Compliance: Most test parameter values cannot be changed.</li> <li>■ User Defined: Most test parameter values can be changed.</li> </ul>
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"> <li>■ Real Time Scope: Specifies the oscilloscope used for tests</li> <li>■ Record Length: Specifies the length of the record (5M is the default)</li> <li>■ 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.</li> <li>■ 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.</li> <li>■ Data Rate: Select the signal data rate as one of 9.95328 Gbps, 10.3125 Gbps (default), 10.51875 Gbps, or 11.10 Gbps.</li> </ul>

Table 10: Common parameters and values (cont.)

Parameter Type	Parameter and Default Value
Measurements	<p>Acquire:</p> <ul style="list-style-type: none"> <li>■ 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 <a href="#">signal type options that are best suited to the measurements (see page 109)</a>.</li> <li>■ 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%.</li> </ul>
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 \(see page 51\)](#)
- [Select Acquisitions \(see page 46\)](#)
- [De-embed Using Filter Files \(see page 157\)](#)

## 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.

---

**NOTE.** *The ScoreCard and Analysis Screenshot options are not available in SFP-TX.*

---

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

## 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 one or both of the following options:
  - **On Test Failure, pause the test and let me investigate:** Select this option to have the test pause on a failure so that you can investigate and change test parameters if necessary.
  - **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 \(see page 29\)](#) 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
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-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"> <li>■ In the Report Name field, type over the current folder path and name.</li> <li>■ Double-click in the Report Name field and then make selections from the popup keyboard and click the <b>Enter</b> button.</li> </ul> <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-Tx\DUT001_group1.mht.</p> <p><b>NOTE.</b> You cannot set the file location using the Browse button.</p> <p>Open an existing report.</p> <p>Click <b>Browse</b>, select the report file and then click <b>View</b> at the bottom of the panel.</p>
Save As Type	<p>Saves a report in a file type different from the default. Lists supported file types to choose from.</p> <p><b>NOTE.</b> If you select a file type different from the default, be sure to change the report file name extension in the Report Name field to match.</p>
Auto increment report name if duplicate	<p>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.</p>
Include Pass/Fail Results Summary	<p>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 <a href="#">View a Report (see page 65)</a>.</p>
Include Detailed Results	<p>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.</p>
Include Plot Images	<p>Screen shots captured from the oscilloscope during test execution that show the waveform and measurement data will be included.</p>
Include Setup Configuration	<p>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.</p>
Include Complete Application Configuration	<p>A table listing general, common, and acquired parameters used in the test will be included in the report. This option is disabled by default.</p>
Include User Comments	<p>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.</p>

**Table 11: Report options (cont.)**

Setting	Description
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-TX application on top, select **Keep On Top** from the SFP-TX Options menu.

### See also

- [Before You Click Start \(see page 59\)](#)
- [About Configuring Tests \(see page 49\)](#)
- [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-TX, it creates the following folders on the oscilloscope:

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

Every time you launch TekExpress SFP-TX, an **Untitled Session** folder is created in the SFP-Tx folder. The **Untitled Session** folder is automatically deleted when you exit the SFP-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 \(see page 159\)](#) 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

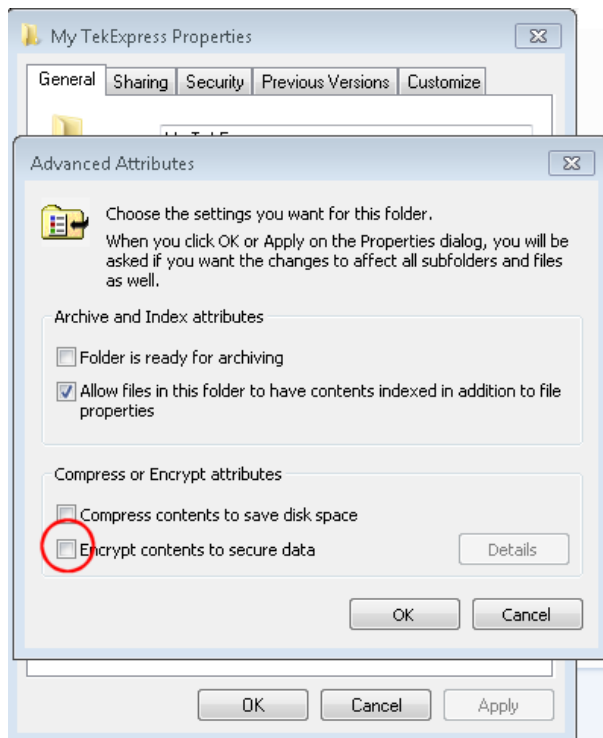
ID>My TekExpress. This shared folder is used to save the waveform files and is used during other file transfer operations.

---

**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 \(see page 51\)](#)
- [View Test-Related Files \(see page 69\)](#)
- [Application Directories and Usage \(see page 9\)](#)

- [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 \(see page 158\)](#).
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-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 \(see page 36\)](#)

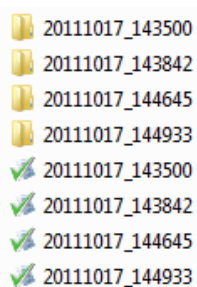
## Run a saved test in prerecorded mode

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-TX.

### See also

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

## View the progress of analysis

The [Status panel \(see page 26\)](#) 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"> <li>■ To be started</li> <li>■ Completed Acquisition</li> <li>■ Prerecorded waveform</li> </ul>
Analysis Status	Progress state of the analysis: <ul style="list-style-type: none"> <li>■ To be started</li> <li>■ In progress</li> <li>■ Completed</li> <li>■ Aborted</li> </ul>

### 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 \(see page 28\)](#), 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 are not included in the Overall Test Results because these measurements are informative only, so if any of the Crosstalk tests 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.



Enabling Innovation

**TekExpress SFP+ Transmitter**

**Host Test Report**

<p>DUT ID : DUT001</p> <p>Date/Time : 10/5/2011 17:18</p> <p>MOI/CTS/UTD/Spec Version : 4.1</p> <p>Overall Compliance Mode : Yes</p> <p>Overall Test Result : <span style="color: green;">Pass</span></p> <p>Scope Model : DPO72004C</p> <p>Scope Serial Number: B130233</p>	<p>Device Type : SFP+ Tx Host</p> <p>Execution Time : 1 Min</p> <p>Scope F/W Version : 6.2.0 Build 26</p> <p>SPC, Factory Calibration : PASS;PASS</p> <p>SFP+ Tx: 1.0.0.31,</p> <p>TekExpress Version Framework:</p> <p>DPOJET Version "3.5.0 Build 14"</p>
---	--

**Comments**

**General Comment - SFP + 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.

Test Name	Measurement Details	Measured value	Units	Test Result	Margin
Crosstalk Source Amplitude (p-p)	<a href="#">Crosstalk Source</a>	495.4227834	mV	Fail	504.5772
Crosstalk Source Rise/Fall Time (20%-80%)	<a href="#">Crosstalk Source Rise Time</a>	49.94849267	pS	Fail	-15.9485
	<a href="#">Crosstalk Source Fall Time</a>	51.548428			-17.5484
Signal Rise/Fall Time (20%-80%)	<a href="#">Signal Rise Time</a>	49.6687116	pS	Pass	15.6687
	<a href="#">Signal Fall Time</a>	51.36250587			17.3625
Transmitter Qsq	<a href="#">Transmitter Qsq</a>	191.1797186		Pass	141.1797
Transmitter Qsq (for Cu)	<a href="#">Transmitter Qsq Cu</a>	186.6447972		Pass	123.5448
Voltage Modulation Amplitude (p-p)	<a href="#">VMA</a>	497.9369639	mV	Pass	197.937

### 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.

Units	Test Result	Margin	Low Limit	High Limit	Compliance Mode	Execution Time	Comments
UI	Pass	0.1305	-	< 0.28	Yes	1 Min	Signal Type used = PRBS31 Skew Value = N.A

### 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.



## Application Configuration

This table lists general, common, and acquired parameters used in the test. General parameters are those selected to be included in all tests (where applicable). General parameters are set in the DUT tab. Acquire parameters are those that were actually used for the acquired signal during the test. By default, this information is not included in test reports. To include this information in a report, select the **Include Complete Application Configuration** check box before running a test.

General Parameters	
Common Parameters	
Parameter Name	Parameter Value
DP Connected to	CH1
DN Connected to	CH3
Direct Attached Cable Cu	Enabled
Prompt me if Measurement fails	Disabled
Signal Validation	Prompt me if signal fails
Number of retries for instrument IO errors	3
Time between retries (seconds)	20
Append Report	FALSE
Auto increment report name if duplicate	TRUE
Include Pass/Fail Results Summary	TRUE
Include Detailed Results	TRUE
Include Plot Images	TRUE
Include Setup Configuration	TRUE
Include Complete Application Configuration	TRUE
Include User Comments	TRUE
Save As Type	Web Archive (*.mht;*.mhtml)
View Report After Generating	TRUE
Report Path	
DUTID Comment	General Comment - SFP + Transmitter
Acquisition Save Options	Save and Analyze Acquisitions In
Record Length	2.00E+06
On Failure Pause	FALSE
On Failure Stop and Notify	FALSE
Filter File Path (.flt file)	
Apply Filter	No

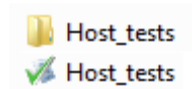
Acquire Instrumentation		
Parameter Name	Parameter Value	
Real Time Scope	GPIB8::1::INSTR	
No Acquire Utilities		
No Analyze Instrumentation		
No Analyze Utilities		
Transmitter Qsq		
Acquire Parameters		
Acquire Type	Parameter Name	Parameter Value
Transmitter Qsq Acquisition	Signal Type	8180
Analyze Parameters		
Parameter Name	Parameter Value	
Window Width (%)	10	

### See also

- [View Test Results \(see page 64\)](#)
- [View Test-Related Files \(see page 69\)](#)

## View test-related files

Files related to tests are stored in the SFP-TX folder under the My TekExpress shared folder. In the SFP-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-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-TX application.

### See also

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



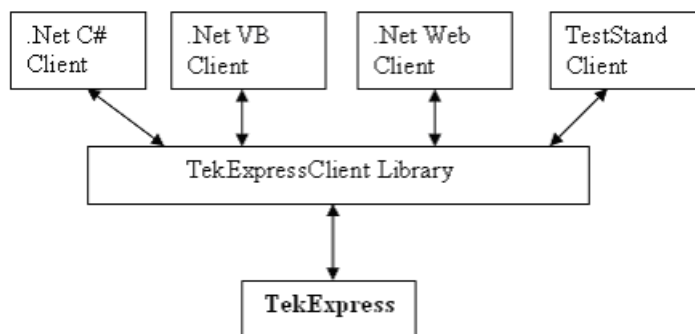
## About the programmatic interface

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 \(see page 71\)](#)
- [Remote Proxy Object \(see page 73\)](#)
- [Client Proxy Object \(see page 73\)](#)

## 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.

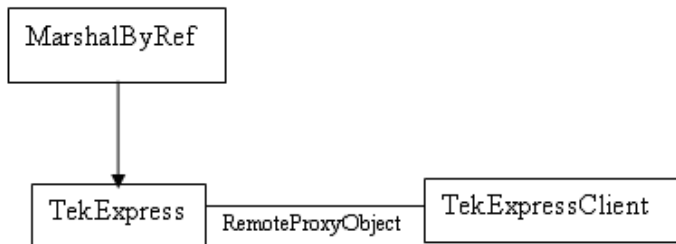
## See also

- [About SFP-TX Application Commands \(see page 80\)](#)



## 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.

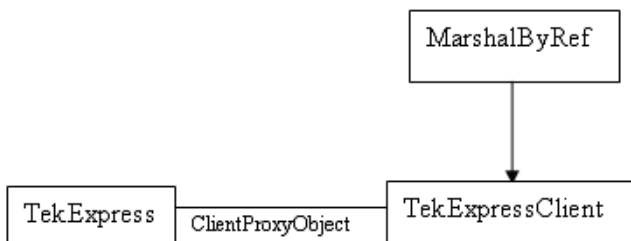
For example,

```
//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:

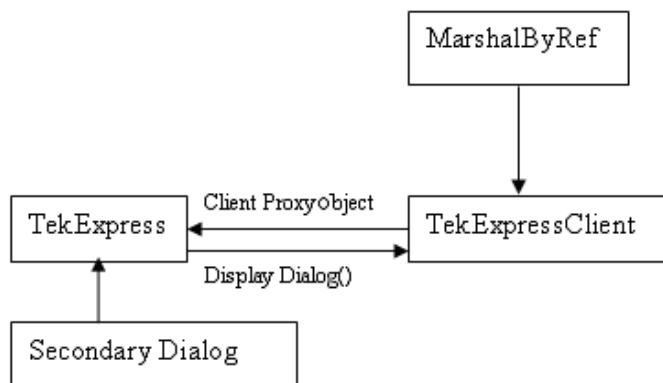
- To get the secondary dialog messages from the server.
- To get the file transfer commands from the server while transferring the report.

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.

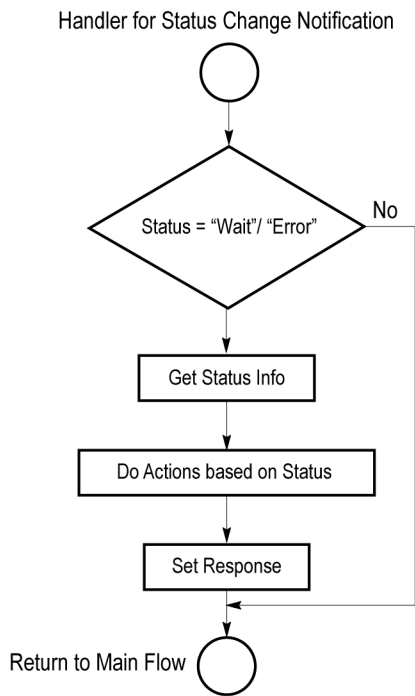
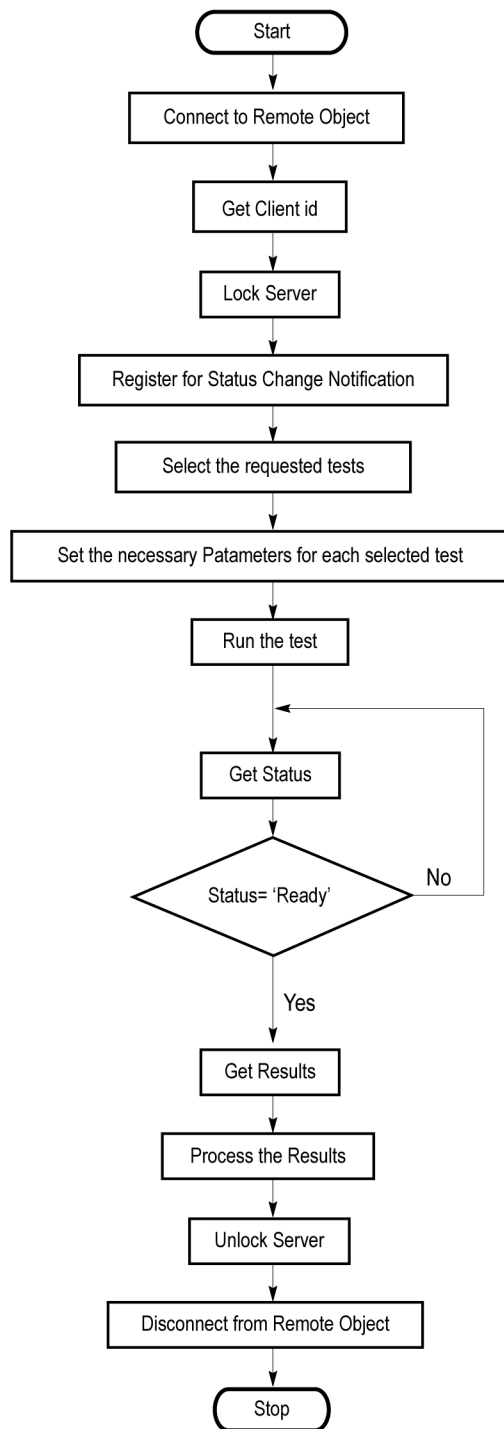
### File Transfer Events

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-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-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", "Signal Type") 'Single Ended Output Voltage Range measurement  
selected
```

9. Run with set configurations.

```
m_Client.Run(clientID)
```

10. Wait for the test to complete.

```
Do
```

```
Thread.Sleep(500)
```

```
m_Client.Application_Status(clientID)
```

```
Select Case status
```

```
Case "wait"
```

```
'Get the Current State Information
```

```
mClient.GetCurrentStateInfo(clientID, waitingMsbBxCaption, 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)
```

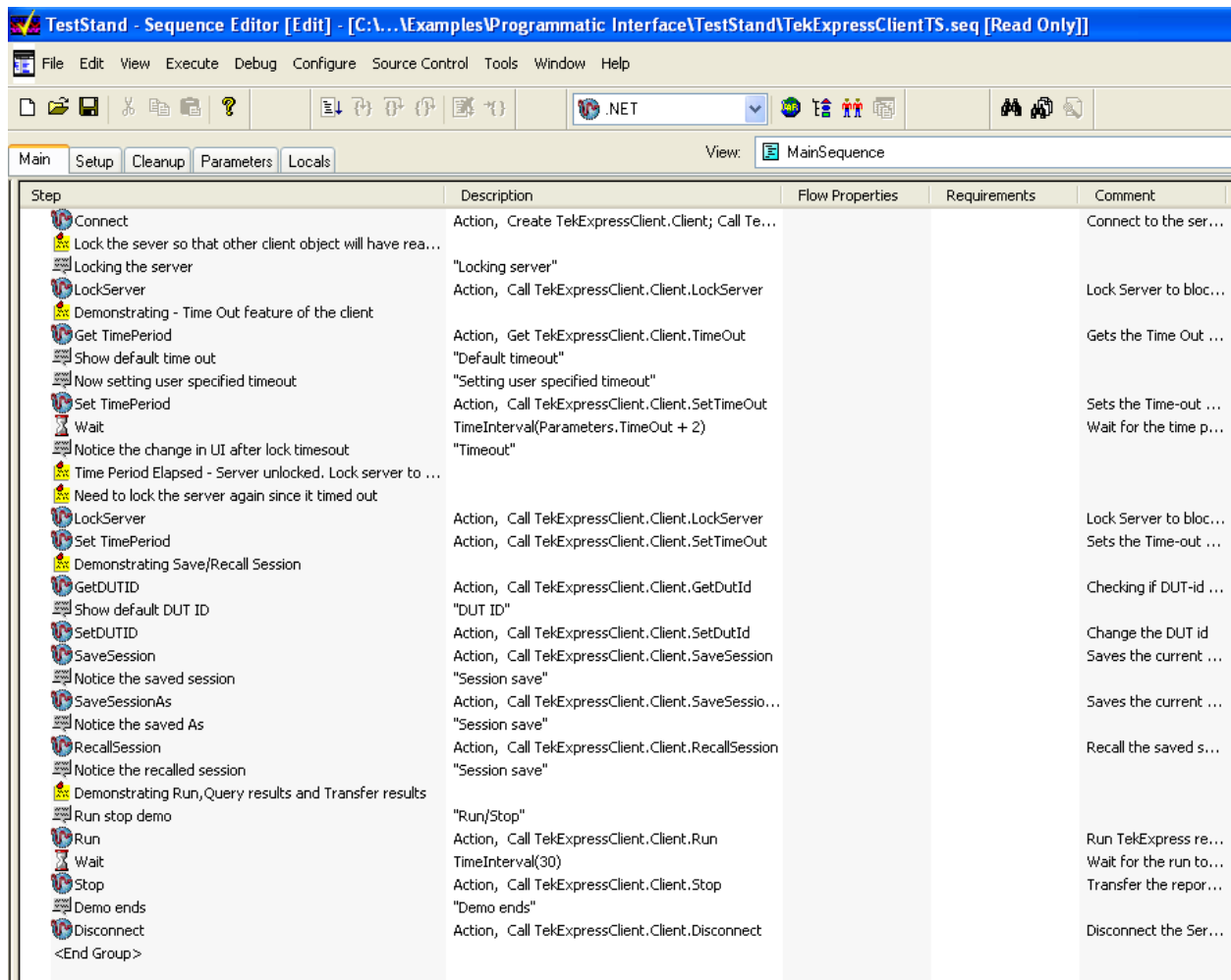
13. Disconnect from server.

```
m_Client.Disconnect()
```

14. Exit the application.

## NI TestStand client example

The following is an example for NI TestStand Client available in the path: C:\Program Files\Tektronix\TekExpress\TekExpress SFP-Tx\Examples\Programmatic Interface\TestStand



## About SFP-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.

<b>string device</b>			
Name	Type	Direction	Description
device	string	IN	Specifies the name of the device
<b>string suite</b>			
Name	Type	Direction	Description
suite	string	IN	Specifies the name of the suite
<b>string test</b>			
Name	Type	Direction	Description
test	string	IN	Specifies the name of the test to obtain the pass or fail status
<b>string parameterString</b>			
Name	Type	Direction	Description
parameterString	string	IN	Selects or deselects a test
<b>int rowNr</b>			
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.

<b>out string[ ] status</b>			
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()	<a href="#">string ipAddress (see page 82)</a> <a href="#">out_string clientID (see page 82)</a>	This method connects the client to the server. <a href="#">Note (see page 82)</a> 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.	<pre>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)</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...".

---

## Lock the server

Command name	Parameters	Description	Return Value	Example
LockSession()	<a href="#">string clientID</a> (see page 86)	This method locks the server. <a href="#">Note (see page 83)</a> 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()	<a href="#">string clientID</a> (see page 86) <a href="#">bool verbose</a> (see page 85)	<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  <b>Verbose mode is turned on</b> return=m_Client.SetVerbose- Mode(clientID, true)  <b>Verbose mode is turned off</b> 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()	<a href="#">string clientID (see page 86)</a> <a href="#">string dutName (see page 81)</a>	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) <a href="#">Note (see page 82)</a>
GetDutId()	<a href="#">string clientID (see page 86)</a> <a href="#">string dutId (see page 82)</a>	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	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	This method sets the number of video lanes for the selected measurement.  <b>NOTE.</b> 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 <a href="#">Select Channel (see page 91)</a> <a href="#">Select Measurement Method (see page 91)</a>
SetAnalyzeParameter()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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> <a href="#">Query Channel (see page 93)</a> <a href="#">Query Measurement Method (see page 93)</a>
GetAnalyzeParameter()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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.	<a href="#">Query Acquire Parameters example (see page 93)</a>

---

**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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">bool isSelected (see page 84)</a>	<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 <b>Select Measurement (Signal Rise/Fall Time (20%-80%)):</b> 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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">bool isSelected (see page 84)</a>	<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  <b>Select Suite (Default):</b> 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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	This method sets the parameters that are not specific to any given test.  <b>NOTE.</b> 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> <a href="#">Select Channel (see page 96)</a> <a href="#">Select Measurement Method (see page 96)</a>
SetAnalyzeParameter()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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><a href="#">Configure Acquire Parameters for Record Length (see page 98)</a></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()	<a href="#">string clientID</a> (see page 86)	Runs the selected tests. <a href="#">Note (see page 84)</a> 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()	<a href="#">string clientID</a> (see page 86)	Stops the currently running tests <a href="#">Note (see page 85)</a>	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()	<a href="#">string clientID (see page 86)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string time (see page 85)</a>	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()	<a href="#">string clientID</a> (see page 86)	This method gets the status of the server application. The states at a given time are <a href="#">Ready</a> , <a href="#">Running</a> , <a href="#">Paused</a> , <a href="#">Wait</a> , or <a href="#">Error</a> . (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()	<a href="#">string clientID</a> (see page 86) <a href="#">out string[]</a> <a href="#">status</a> (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()  <b>NOTE.</b> This command is used when the application is running and is in the wait or error state.	<a href="#">string clientID (see page 86)</a> <a href="#">out string caption (see page 85)</a> <a href="#">out string message (see page 86)</a> <a href="#">out string[] buttonTexts (see page 86)</a>	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.	<pre>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)</pre>
SendResponse()  <b>NOTE.</b> This command is used when the application is running and is in the wait or error state.	<a href="#">string clientID (see page 86)</a> <a href="#">out string caption (see page 85)</a> <a href="#">out string message (see page 86)</a> <a href="#">string response (see page 86)</a>	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.	<pre>m_Client = new Client() //m_Client is a reference to the Client class in the Client DLL. m_Client.SendResponse(clientID, caption,message, response)</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...".

---

## After the test is complete

Command name	Parameters	Description	Return Value	Example
GetPassFailStatus()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a>	This method gets the pass or fail status of the measurement after test completion.  <b>NOTE.</b> <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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a>	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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 83)</a> <a href="#">int rowNr (see page 83)</a>	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 <b>Signal Rise/Fall Time</b> 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()	<a href="#">string clientID (see page 86)</a> <a href="#">string device (see page 83)</a> <a href="#">string suite (see page 83)</a> <a href="#">string test (see page 83)</a> <a href="#">string parameterString (see page 105)</a>	This method gets the general report details such as oscilloscope model, TekExpress version, and SFP-TX version.	The return value is the oscilloscope model, TekExpress version, and SFP-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><b>Oscilloscope Model</b></p> <pre>returnval=m_Client.GetReportParameter(clientID,"Scope Model")</pre> <p><b>TekExpress Version</b></p> <pre>returnval=m_Client.GetReportParameter(clientID,"TekExpress Version")</pre> <p><b>SFP-TX Version</b></p> <pre>returnval=m_Client.GetReportParameter(clientID,"Application Version")</pre>
TransferReport()	<a href="#">string clientID (see page 86)</a> <a href="#">string filePath (see page 85)</a>	<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()	<a href="#">string clientID (see page 86)</a> <a href="#">string filePath (see page 85)</a>	This method transfers all the waveforms from the folder for the current run.  <b>NOTE.</b> 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()	<a href="#">string clientID (see page 86)</a> od <a href="#">string filePath (see page 85)</a>	This method transfers all the images (screen shots) from the folder for the current run (for a given suite or measurement).  <b>NOTE.</b> 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-Tx version.

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

Command name	Parameters	Description	Return Value	Example
CheckSession-Saved()	<a href="#">string clientID</a> (see page 86)  <a href="#">out bool saved</a> (see page 82)	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()	<a href="#">string clientID</a> (see page 86)  <a href="#">string name</a> (see page 84)	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()	<a href="#">string clientID</a> (see page 86)  <a href="#">string name</a> (see page 84)	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()	<a href="#">string clientID</a> (see page 86)  <a href="#">string name</a> (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()	<a href="#">string clientID</a> (see page 86)	This method unlocks the server from the client. The ID of the client to be unlocked must be provided. <a href="#">Note (see page 85)</a>	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()	<a href="#">string clientID</a> (see page 86)	This method disconnects the client from the server. <a href="#">Note (see page 82)</a>	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	PRBS9
Output AC Common-Mode Voltage (RMS)	PRBS31	PRBS9
Cross Talk Source Rise/Fall Time (20%-80%)	8180	—
Cross Talk Source Amplitude (p-p)	8180	—
Signal Rise/Fall Time (20%-80%)	8180	—
Total Jitter	PRBS31	PRBS9
Data Dependent Jitter	PRBS9	PRBS31
Data dependent Pulse Width Shrinkage (DDPWS)	PRBS9	PRBS31
Uncorrelated Jitter	PRBS9	PRBS31
Transmitter Qsq	8180	—
Eye Mask Hit Ratio	PRBS31	PRBS9
Voltage Modulation Amplitude (p-p)	8180	—
Transmitter Qsq (for Cu)	8180	—
Output AC Common Mode Voltage (RMS) (for Cu)	PRBS31	PRBS9
Host Output TWDPc	PRBS9	—

### Module profile

**Table 15: Module profile measurement signal types**

Measurement	Compliance mode support	User-defined mode support
AC Common Mode Voltage Tolerance	PRBS31	PRBS9
Single Ended Input Voltage Tolerance	PRBS31	PRBS9
Cross Talk Source Rise/Fall Time (20%-80%)	8180	—
Cross Talk Source Amplitude (p-p)	8180	—
Output AC Common-Mode Voltage (RMS)	PRBS31	PRBS9

Measurement	Compliance mode support	User-defined mode support
Total Jitter	PRBS31	PRBS9
Data Dependent Jitter	PRBS9	PRBS31
Data dependent Pulse Width Shrinkage (DDPWS)	PRBS9	PRBS31
Uncorrelated Jitter	PRBS9	PRBS31
Eye Mask Hit Ratio	PRBS31	PRBS9

**See also**

- [Signal Validation Procedure \(see page 112\)](#)
- [Select Acquisitions \(see page 46\)](#)
- [Signal Validation for 8180 \(see page 114\)](#)
- [Signal Validation for PRBS9 \(see page 113\)](#)

## 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 (C series oscilloscopes) 50 GS/s (B series oscilloscopes)	5M, 10M	100 GS/s (C series oscilloscopes) and 50 GS/s (B series oscilloscopes)

**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 \(see page 112\)](#)

## 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.** *PRBS31 pattern validation is not done. The signal is assumed to be PRBS31.*

---

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

For all measurements, use the following guidelines to set up the oscilloscope:

- The signal is any channel, reference, or math waveform.
- Set the vertical scale for the waveform so that the waveform does not exceed the vertical range of the oscilloscope.
- Set the sample rate to capture enough waveform detail and avoid aliasing.
- Longer record lengths increase measurement accuracy but the oscilloscope takes longer to measure each waveform.

### See also

- [Oscilloscope Setup \(see page 111\)](#)
- [Signal Validation for PRBS9 \(see page 113\)](#)
- [Signal Validation for 8180 \(see page 114\)](#)



## Signal validation for PRBS9

The following describes the oscilloscope setup and signal validation measurement for PRBS9 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** – C series, **50 GS/s** – B series
  - Record Length: **100 k**
  - 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

- [Signal Validation Procedure \(see page 112\)](#)
- [Oscilloscope Setup \(see page 111\)](#)

## Signal validation for 8180

The following describes the oscilloscope setup and signal validation measurement for 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** – C series, **50 GS/s** – B series
  - Record Length: **1000**
  - Acquisition Mode: **Average (# = 128)**
2. Perform trigger setup for 8180:
    - Trigger Type = **Edge**
    - Trigger Source = **Ch3**
    - Level = Set to **50%**
    - Slope = **Rising**
  3. Set the following measurements on the oscilloscope:
    - Meas 1 = **Vpk-pk (Ch1)**
    - Meas 2 = **Vpk-pk (Ch3)**
    - Meas 3 = **Pos Width (Ch1)** ( this measurement is located under the Time tab)
    - Meas 4 = **Neg Width (Ch1)**
    - Meas 5 = **Pos Width (Ch3)**
    - Meas 6 = **Neg Width (Ch3)**
  4. Wait for 128 acquisitions.

Meas 1 and Meas 2 should have a mean value of > 100 mV. Meas 3, Meas 4, Meas 5, and Meas 6 should have mean values between 620 ps and 930 ps for the signal to be valid. If these values are out of range, the signal is invalid.

### See also

- [Signal Validation Procedure \(see page 112\)](#)
- [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 \(see page 36\)](#): All other Host tests.

### Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP-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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other Host tests.

### Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP-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 \(see page 52\)](#)

## 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 \(see page 36\)](#): Table 12 Crosstalk Source Tests.

### Signal validation

For compliance, perform [signal validation for 8180 \(see page 114\)](#).

### 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
- 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

### Outputs from algorithm

#### Rise time.

- m\_SFPPlusISDB.Result1Mean.Value = Tr.Mean
- m\_SFPPlusISDB.CursorPos1Ver.Value = Risetime begin

- `m_SFPPPlusISDB.CursorPos2Ver.Value` = Risetime end
- `m_SFPPPlusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPPlusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

#### Fall time.

- `m_SFPPPlusISDB.Result2Mean.Value` = Tf.Mean
- `m_SFPPPlusISDB.CursorPos1Ver.Value` = Falltime begin
- `m_SFPPPlusISDB.CursorPos2Ver.Value` = Falltime end
- `m_SFPPPlusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPPlusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

#### 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): Table 12 Crosstalk Source Tests.

## Signal validation

For compliance, perform [signal validation for 8180 \(see page 114\)](#).

## 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

## 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

## Outputs from algorithm

- m\_SFPPPlusISDB.Result1Max.Value = Amplitude.Maximum
- m\_SFPPPlusISDB.CursorPos1Ver.Value = vHigh
- m\_SFPPPlusISDB.CursorPos2Ver.Value = vLow

## 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other Host tests.

### Signal validation

For compliance, perform [signal validation for 8180 \(see page 114\)](#).

### 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
- Signal Type ("SFPPPlus.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

### Outputs from algorithm

#### Rise time.

- m\_SFPPPlusISDB.Result1Mean.Value = Tr.Mean
- m\_SFPPPlusISDB.CursorPos1Ver.Value = Risetime begin
- m\_SFPPPlusISDB.CursorPos2Ver.Value = Risetime end



- `m_SFPPPlusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPPlusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

#### Fall time.

- `m_SFPPPlusISDB.Result1Mean.Value` = `Tf.Mean`
- `m_SFPPPlusISDB.CursorPos1Ver.Value` = Falltime begin
- `m_SFPPPlusISDB.CursorPos2Ver.Value` = Falltime end
- `m_SFPPPlusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPPlusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

#### 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: 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other Host tests.

## Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP-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 =  $D_p - D_n$ .
- 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 ( $D_p - D_n$ )**
    - 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 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**
- 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 \(see page 52\)](#)

# 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 \(see page 36\)](#): All other Host tests.

## Signal validation

For compliance, perform [signal validation for PRBS9 \(see page 113\)](#).

## Measurement procedure

Data dependent jitter is measured using base DPOJET.

- Deskew the Data+ and Data- inputs. Compute the differential signal on Math1 =  $D_p - D_n$
- 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  $\div 10^4$ ). 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other Host tests.

### Signal validation

For compliance, perform [signal validation for PRBS9 \(see page 113\)](#).

### 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 the Edges on the input waveform.
- Consider a cycle of PRBS 9 pattern. (A cycle contains 511 bits or 256 edges). Identify the lowest UI in the cycle (for example, the lowest time duration between adjacent edges in a cycle). Average this minimum value across multiple cycles of PRBS9 present in the input waveform. (In the case of a non PRBS 9 waveform being used, consider all the edges and UIs in the waveform as a single cycle.)
- Compute Data Dependent Pulse Width Shrinkage (DDPWS) as:  $DDPWS = \text{Estimated UI} - \text{minimum UI}$ .
- End

### Outputs from algorithm

- `m_SFPPplusISDB.Result1Mean.Value` = DDPWS.Mean
- `m_SFPPplusISDB.CursorPos1Ver.Value` = beginning of smallest UI
- `m_SFPPplusISDB.CursorPos2Ver.Value` = end of smallest UI
- `m_SFPPplusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPplusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

### Limits

Minimum 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other Host tests.

### Signal validation

For compliance, perform [signal validation for PRBS9 \(see page 113\)](#).

### 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  $\sigma_r$  is the standard deviation of the jitter on the rising edge

where  $\sigma_f$  is the standard deviation of the jitter on the falling edge

- End

### Output from algorithm

m\_SFPPlusISDB.Result1Mean.Value = UJ.Mean

### Limits

Minimum 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other tests.

### Signal validation

For compliance, perform [signal validation for 8180 \(see page 114\)](#).

### 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other tests.

### Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP-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  $5 \times 10^{-5}$

## 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 \(see page 52\)](#)

## 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 \(see page 36\)](#): All other Host tests.

### Signal validation

For compliance, perform [signal validation for 8180 \(see page 114\)](#).

### 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

### Outputs from algorithm

- m\_SFPPlusISDB.Result1Max.Value = VMA.Maximum
- m\_SFPPlusISDB.CursorPos1Ver.Value = vHigh
- m\_SFPPlusISDB.CursorPos2Ver.Value = vLow

### 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 \(see page 52\)](#)

## Transmitter Qsq (for Cu)

Transmitter Qsq is measured on the differential data signal as the inverse of Relative Noise (RN). RN is measured as  $RN = 2 \times \text{Noise (rms)} \div \text{VMA}$ . 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 \(see page 36\)](#): All other Host tests.

### Signal validation

For compliance, perform [signal validation for 8180 \(see page 114\)](#).

### 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\_SFPlusISDB.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 \(see page 52\)](#)



## 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 \(see page 36\)](#): All other Host tests.

### Signal validation

Signal validation for PRBS31 pattern signals is not done by the SFP-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 \(see page 52\)](#)

## Host output TWDPc

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**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 \(see page 36\)](#): All other Host tests.

### Signal validation

For compliance, perform [signal validation for PRBS9 \(see page 113\)](#).

### 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 \(see page 52\)](#)

## 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)÷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 ModuleTests \(see page 39\)](#): All other Module tests.

### Signal validation

Automatic signal validation for PRBS31 pattern signals is not done by the SFP-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) ÷ 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 \(see page 52\)](#)

## 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-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 =  $-0.3\text{ V}$

Maximum =  $4\text{ V}$

### 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 \(see page 52\)](#)

## 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 for 8180 \(see page 114\)](#).

### 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
- 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

## Outputs from algorithm

### Rise time.

- `m_SFPPPlusISDB.Result1Mean.Value` = `Tr.Mean`
- `m_SFPPPlusISDB.CursorPos1Ver.Value` = Risetime begin
- `m_SFPPPlusISDB.CursorPos2Ver.Value` = Risetime end
- `m_SFPPPlusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPPlusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

### Fall time.

- `m_SFPPPlusISDB.Result2Mean.Value` = `Tf.Mean`
- `m_SFPPPlusISDB.CursorPos1Ver.Value` = Falltime begin
- `m_SFPPPlusISDB.CursorPos2Ver.Value` = Falltime end
- `m_SFPPPlusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPPlusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

## 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 \(see page 52\)](#)

## 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 for 8180 \(see page 114\)](#).

### 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

### 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,  $\text{Amplitude} = \text{vHigh} - \text{vLow}$ .
- End

### Outputs from algorithm

- `m_SFPPPlusISDB.Result1Max.Value = Amplitude.Maximum`
- `m_SFPPPlusISDB.CursorPos1Ver.Value = vHigh`
- `m_SFPPPlusISDB.CursorPos2Ver.Value = vLow`

**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 \(see page 52\)](#)



## 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-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 \(see page 52\)](#)

## 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-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 =  $D_p - D_n$ .
- 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 ( $D_p - D_n$ )**
    - 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 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**
- 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 \(see page 52\)](#)

# 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 for PRBS9 \(see page 113\)](#).

## 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 for PRBS9 \(see page 113\)](#).

## 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 the Edges on the input waveform.
- Consider a Cycle of PRBS 9 pattern. (A cycle contains 511 bits or 256 edges). Identify the lowest UI in the cycle (for example, the lowest time duration between adjacent edges in a cycle). Average this minimum value across multiple cycles of PRBS9 present in the input waveform. (In the case of a non PRBS 9 waveform being used, consider all the edges and UIs in the waveform as a single cycle.)
- Compute Data Dependent Pulse Width Shrinkage (DDPWS) as:  $DDPWS = \text{Estimated UI} - \text{minimum UI}$ .
- End

## Outputs from algorithm

- `m_SFPPplusISDB.Result1Mean.Value` = DDPWS.Mean
- `m_SFPPplusISDB.CursorPos1Ver.Value` = beginning of smallest UI
- `m_SFPPplusISDB.CursorPos2Ver.Value` = end of smallest UI
- `m_SFPPplusISDB.HorizontalPos1.Value` = position of the waveform where to zoom
- `m_SFPPplusISDB.HorizontalScale1.Value` = scale of Zoom that is to be set

## 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 \(see page 52\)](#)

## 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 for PRBS9 \(see page 113\)](#).

### 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  $\sigma_r$  is the standard deviation of the jitter on the rising edge

where  $\sigma_f$  is the standard deviation of the jitter on the falling edge

- End



### Output from algorithm

m\_SFPlusISDB.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 \(see page 52\)](#)

## 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-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 =  $D_p - D_n$ .
- 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 e<sup>9</sup>)  $\div$  Number of UIs (Population from DPOJET)  $\times$  Sampling Rate (50 e<sup>9</sup>)

### Limits

Mask hit ratio of  $5 \times 10^{-5}$

### 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 \(see page 52\)](#)



## De-embed using filter files

TekExpress SFP-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 A & B Series	DPO/DSA/MSO C Series	
	Input on any channel combination	Input on Ch1 and Ch3	Input on Ch2 and Ch4
Single-Ended Output Voltage Range	50 GS/s	100 GS/s	50 GS/s
Output AC Common Mode Voltage (RMS)			
<b>Host Transmitter Jitter and Eye Mask specifications</b>			
Crosstalk Source Rise/Fall Time (20% – 80%)	50 GS/s	100 GS/s	50 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			
<b>Host Transmitter Output Specifications for CU (SFP+ Host supporting direct attached cables)</b>			
Voltage Modulation Amplitude (p-p)	50 GS/s	100 GS/s	50 GS/s
Transmitter Qsa			
Output AC Common Mode Voltage			
Host Output TWDPc	Not applicable	3.3 TS/s	Not applicable

### See also

- [Common Test Parameters and Values \(see page 52\)](#)
- [Configure Tests \(see page 51\)](#)

## 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-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-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 \(see page 5\)](#)





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