Tektronix®

TekExpress® 400G-TXO
Optical Compliance Solution for Sampling Scopes
Printable Application Help

077-1363-00

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TekExpress® 400G-TXO
Optical Compliance Solution for Sampling Scopes
Printable Application Help

TekScope v6.5.1.0 or greater

www.tek.com
077-1363-00

Contacting Tektronix

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

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

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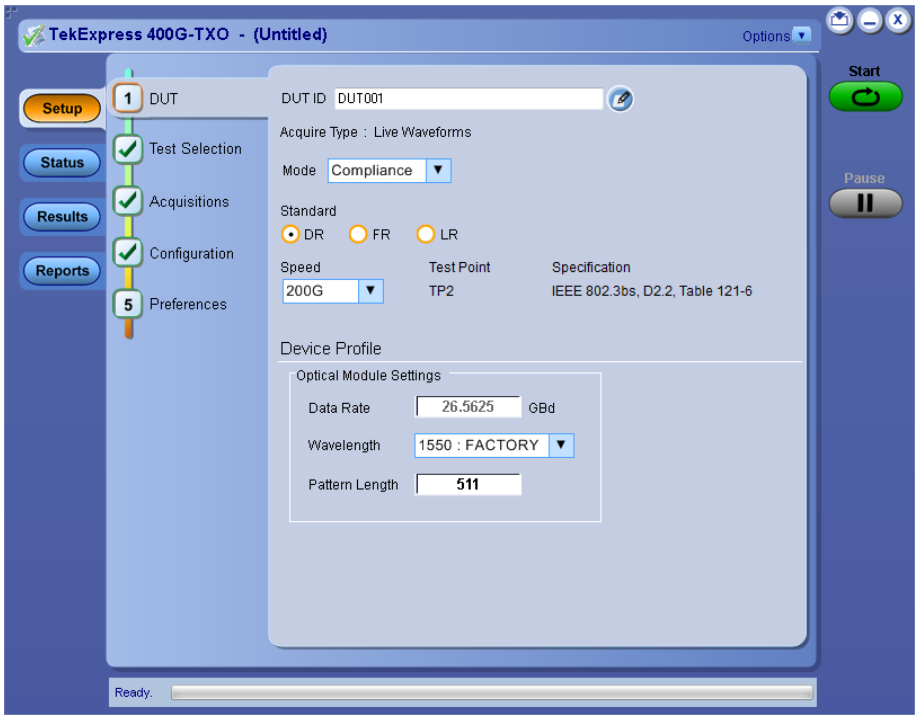
Welcome



Welcome to the Tektronix 400G-TXO, a Tektronix sampling oscilloscope application software solution that addresses 50GBASE-FR / 50GBASE-LR / 100GBASE-DR / 200GBASE-DR4 / 200GBASE-FR4 / 200GBASE-LR4 / 400GBASE-FR8 / 400GBASE-LR8 / 400GBASE-DR4 standards of IEEE. These standards are the backbone of the current 400G Ethernet industry, and the TekExpress 400G TXO automation test solution facilitates turnkey optical transmitter validation of 400G Ethernet systems.

The 400G-TXO solution specifically targets sections D1.0 of IEEE802.3cd and D2.2 of IEEE802.3bs specifications. These tools allow verification to these IEEE optical standards, while offering comprehensive test automation, results margining, data logging, and result reporting in an advanced testing framework.

Key features of TekExpress 400G-TXO include:

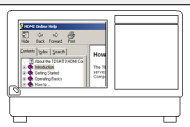
- 400G-TXO offers transmitter based 50GBASE-FR and 50GBASE-LR optical transmitter characterization testing at TP2, as per IEEE 802.3cd, section D1.0, table 139-6 specification.
- 400G-TXO incorporates 100GBASE-DR optical transmitter standards at TP2, as per IEEE 802.3cd, section D1.0, table 140-6 specification.
- 400G-TXO incorporates 200GBASE-DR4 optical transmitter standards at TP2, as per IEEE 802.3bs, section D2.2, table 121-6 specification and 200GBASE-LR4 and 200GBASE-FR4 optical transmitter at TP2, as per IEEE 802.3bs, section D2.2, table 122-9 specification.
- 400G-TXO incorporates 400GBASE-FR8 and 400GBASE-LR8 optical transmitter standards at TP2, as per IEEE 802.3bs, section D2.2, table 122-10 specification and 400GBASE-DR4 optical transmitter standards at TP2, as per IEEE 802.3bs, section D2.2, table 124-6 specification.

Getting help and support

Related documentation

The following documentation is available as part of the TekExpress® 400G-TXO Solution application.

Table 1: Product documentation

Item	Purpose	Location
Help	Application operation and User Interface help	
PDF of the help	Printable version of the compiled help	 PDF file that ships with 400G-TXO Solution software distribution (*TekExpress 400G-TXO-Automated-Test-Solution-Software-Printable-Help-EN-US.pdf*). You can download the PDF version of the manual from the Tektronix website. Part number: 077-1363-00 *www.tek.com*

See also: *Technical support*

Conventions

Help uses the following conventions:

- The term "Application" and "Software" refers to the TekExpress 400G-TXO Solution application.
- The term “DUT” is an abbreviation for Device Under Test.
- The term “select” is a generic term that applies to the different methods of choosing a screen item (button, control, list item): using a mouse or using the touch screen.

Table 2: Icon descriptions

Icon	Meaning
	This icon identifies important information.
	This icon identifies conditions or practices that could result in loss of data.
	This icon identifies additional information that will help you use the application more efficiently.

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 website. 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

Getting started

Minimum system requirements

The following table shows the minimum system requirements to install and run the TekExpress 400G-TXO solution.

Table 3: System requirements

Component	Description
Oscilloscope	■ Tektronix DSA8300 Digital Sampling Oscilloscope ■ Firmware Version: 6.5.1.0 or greater ■ 80SJNB Software Version: 4.2.6.0 or greater ■ Opt ADVTRIG ■ Opt JNB02 ■ Opt PAM4
Software	■ IronPython 2.7.3 installed ■ PyVisa 1.0.0.25 installed ■ Microsoft .NET 4.0 Framework ■ Microsoft Internet Explorer 7.0 SP1 or greater, or other Web browser for viewing reports ■ Adobe Reader software 7.0 or greater for viewing portable document format (PDF) files
Other Devices	■ Microsoft compatible mouse or compatible pointing device. ■ Two USB ports (four USB ports recommended).

Instruments and accessories required

The 400G-TXO application is launched on DSA8300 sampling oscilloscope. The following table lists the instruments and accessories required for this application.

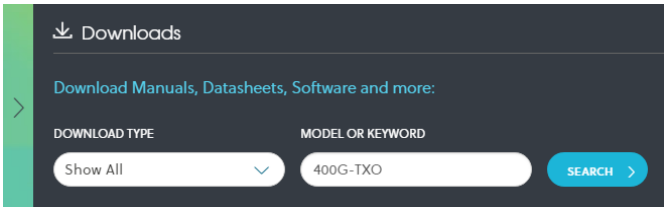
Table 4: Instruments and accessories required for 400G-TXO application

Instrument/Accessory	Model number	Quantity
Sampling Oscilloscope	Tektronix DSA8300 Digital Serial Analyzer	1
Clock Recovery Unit	CR286A (optional)	1
Optical Modules for 200G-DR4/ FR4/LR4 and 400G-FR8/LR8	80C10C, 80C15, 80C17, 80C18	1
Optical Modules for 400G-DR4	80C10C	1
Optical Power Meter supporting DR4, FR4, LR4 wavelength range	No recommendation	1
Phase Reference	82A04B (optional) [1]	1
Module extender cables	80X01 (1 meter)	1

Downloading and installing the software

Complete the following steps to download and install the latest 400G-TXO application. See *Minimum system requirements* for compatibility.

1. Go to *www.tek.com*.
2. Click **Downloads**. In the Downloads menu, select DOWNLOAD TYPE as Software and enter *400G-TXO* in the MODEL OR KEYWORD field and click **SEARCH**.



3. Select the latest version of software and follow the instructions to download. Copy the executable file to the oscilloscope.
4. Double-click the executable and follow the on-screen instructions. The software is installed at *C:\Program Files\Tektronix\TekExpress\400G-TXO*.
5. Select **Application** > **400G-TXO** from the TekScope menu to *launch the application*.

[1] Required to reach jitter noise floors below 100fsec

View software 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.

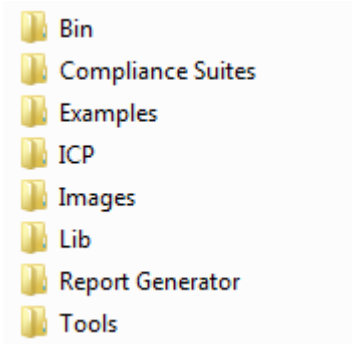
To view the version information, click **Options** > **TekExpress**.

A dialog box similar to the following figure appears.

Application directories

The TekExpress 400G-TXO application files are installed at the following location:

C:\Program Files\Tektronix\TekExpress\TekExpress 400G-TXO



The following table lists the application directory names and their purpose.

Table 5: Application directories and usage

Directory names	Usage
Bin	Contains TekExpress 400G-TXO application libraries
Compliance Suites	Contains compliance-specific files
Examples	Contains various support files
ICP	Contains instrument and TekExpress 400G-TXO application-specific interface libraries
Images	Contains images of the TekExpress 400G-TXO application
Lib	Contains utility files specific to the TekExpress 400G-TXO application
Report Generator	Contains style sheets for report generation
Tools	Contains instrument and TekExpress 400G-TXO application-specific files

See also: *View test-related files*

File name extensions

File name extensions

The TekExpress 400G-TXO application uses the following file name extensions:

File name extension	Description
.TekX	Application session files (the extensions may not be displayed)
.py	Python sequence file
.xml	Test-specific configuration information (encrypted) files Application log files
.csv	Test result reports Plot data
.mht	Test result reports (default) Test reports can also be saved in HTML format
.pdf	Test result reports Application help document
.xslt	Style sheet used to generate reports

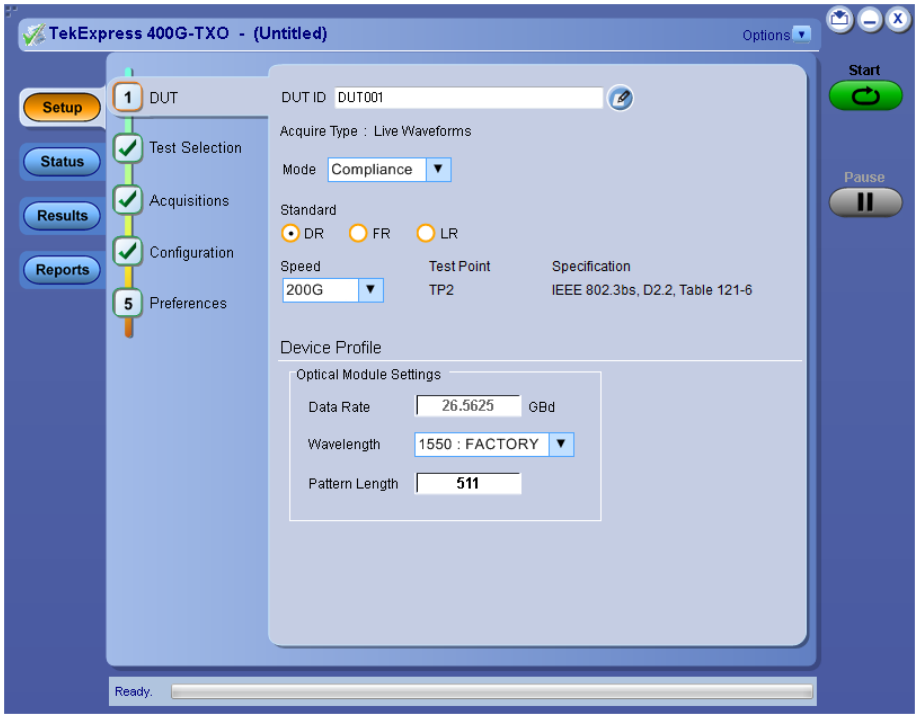
See also: *View test-related files*

Application directories

Operating basics

Launch the application

To launch the TekExpress 400G-TXO solution, select **Application > 400G-TXO** from the TekScope menu.



When you launch the application for the first time, the file C:\Users\<username>\Documents\My TekExpress\400G-TXO\Resources.xml is mapped to drive X:. This file contains information about available network-connected instruments. The session files are stored in X:\400G-TXO\. If this file is not found, then the application runs Instrument Discovery Program to detect the network-connected instruments before launching 400G-TXO solution.

If the application is behind the oscilloscope application, click **Application > 400G-TXO** to bring it to the front. To keep the 400G-TXO application window on top, select **Keep On Top** from the 400G-TXO *Options menu*.

See also: *Application controls*

Application panel overview

Application panels overview

TekExpress 400G-TXO solution uses panels to group Configuration, Results, and Reports settings. Click any button to open the associated panel. A panel may have one or more tabs that list the selections available in that panel. Controls in a tab can change depending on settings made in the same tab or another tab.

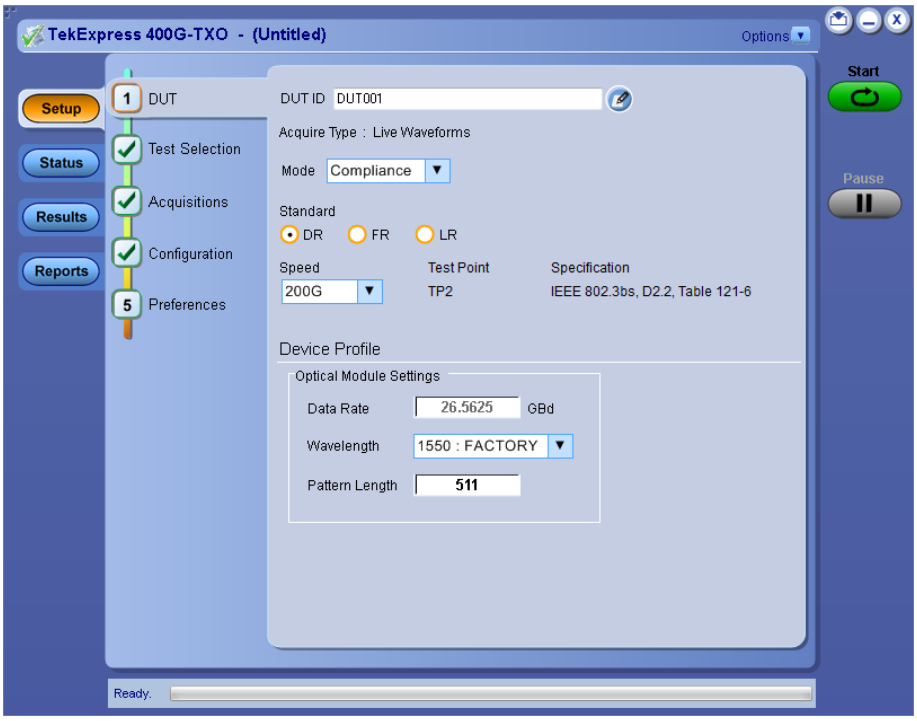


Table 6: Application panels overview

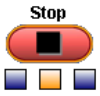
Panel Name	Purpose
Setup panel	To select the test setup controls which are grouped in tabs. The controls in a tab can change depending on settings made in the same tab or another tab. Click the **Setup** button to open this panel. Use this panel to: ■ *Set the DUT parameters* ■ *Select the tests* ■ *Set the acquisition parameters* ■ *Set the configuration parameters* ■ *Set the preferences parameters*
Status panel	This panel displays the acquisition status and analysis status for the selected tests in Test Status and logs in Log View.
Results panel	This tab displays the summary of test results and select result viewing preferences.
Reports panel	Browse for reports, save reports as specific file types, specify report naming conventions, replace current test results in the report with the test result(s) of previous run in current session, select report content to include (summary information, detailed information, user comments, setup configuration, application configuration), and select report viewing options.

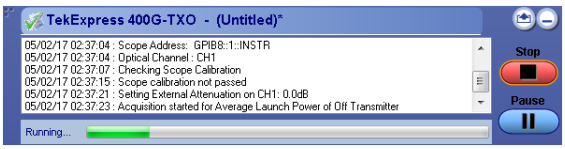
See also: *Application controls*

Global application controls

Application controls

Table 7: Application controls descriptions

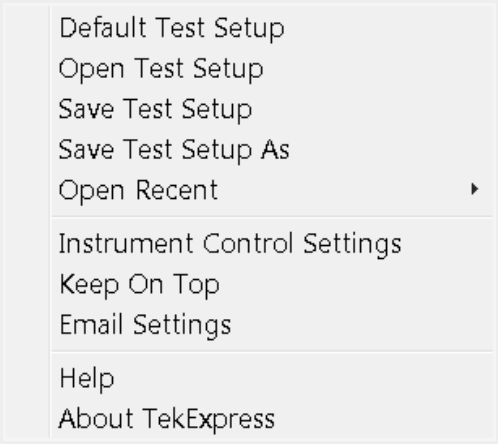
Item	Description
Options menu overview on page 14*Options menu* 	Menu to display global application controls
Application controls on page 12*Panel buttons* 	Controls that open panels for configuring test settings and options.
Start/Stop button  	Click the Start button to run the measurements in the selected order. If prior acquired measurements have not been cleared, the new measurements are added to the existing set. The button toggles to the Stop mode while tests are running. Use the Stop button to abort the test.

Item	Description
Pause \ Continue button  	Use the Pause button to temporarily interrupt the current acquisition. When a test is paused, the button name changes to “Continue.”
Clear button 	Use the Clear button to clear all existing measurement results. Adding or deleting a measurement, or changing a configuration parameter of an existing measurement also clears measurements. This is to prevent the accumulation of measurement statistics or sets of statistics that are not coherent. This button is available only on the *Results panel*.
Minimize button 	Minimizes the application.
Close button 	Exits the application.
Application window move	Place the cursor over the application window and drag it to the desired location.
Mini view / Normal view  	Toggles the application between mini view and normal view. Mini view displays the run messages with the time stamp, progress bar, Start / Stop button, and Pause / Continue button. The application moves to mini view when you click the Start button. 

Options menu overview

To access Options menu, click in the upper-right corner of the application. It has the following:

Options menu



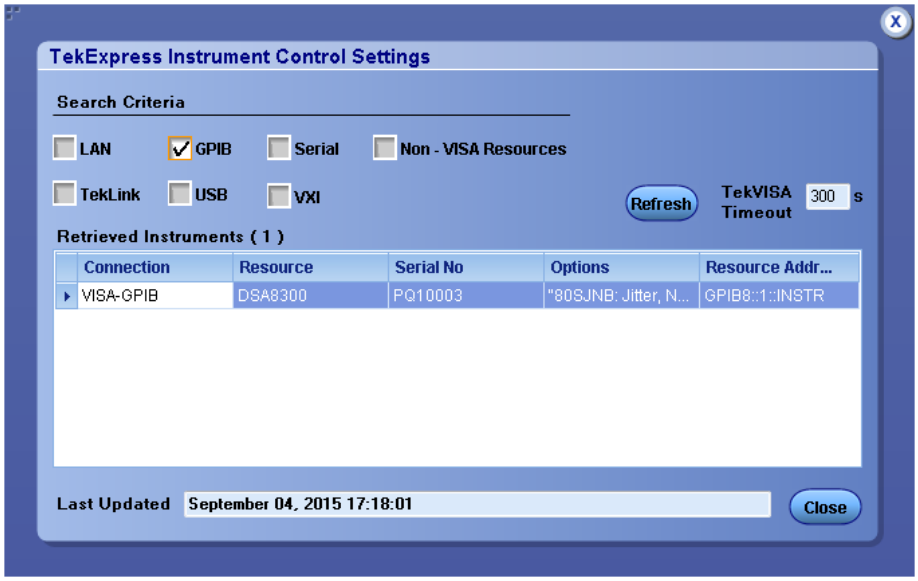
Menu	Function
Default Test Setup	Opens an untitled test setup with defaults selected Acquire Live Waveforms **Mode**: Compliance **Standard**: DR **Speed**: 200G **Test Point**: TP2 **Specification**: IEEE802.3bs, D2.2, Table 121-6 **Data rate**: 26.5625 GBd **Wavelength**: None **Pattern Length**: 511
Open Test Setup	Opens a saved test setup
Save Test Setup	Saves the current test setup
Save Test Setup As	Saves the current test setup with a different file name or file type
Open Recent	Displays the recently opened test setups to open
Instrument Control Settings	Detects, lists, and refreshes the connected instruments found on specified connections (LAN, GPIB, USB, and so on)
Keep On Top	Keeps the TekExpress 400G-TXO application on top of all the application
Email Settings	Use to configure email options for test run and results notifications
Help	Displays the TekExpress 400G-TXO help
About TekExpress	■ Displays application details such as software name, version number, and copyright ■ Provides a link to the end-user license agreement ■ Provides a link to the Tektronix Web site

See also:. *Application controls*

TekExpress instrument control settings

Use TekExpress Instrument Control Settings dialog box to search the instruments (resources) connected to the application. You can use the Search Criteria to search the connected instruments depending on the connection type. The details of the connected instrument is displayed in the Retrieved Instruments window.

You can access this dialog box from the **Options** menu.



The connected instruments displayed here can be selected under global settings in the configuration tab.

NOTE. *Select GPIB (Default) when using TekExpress 400G-TXO application.*

See also:. *Options menu overview*

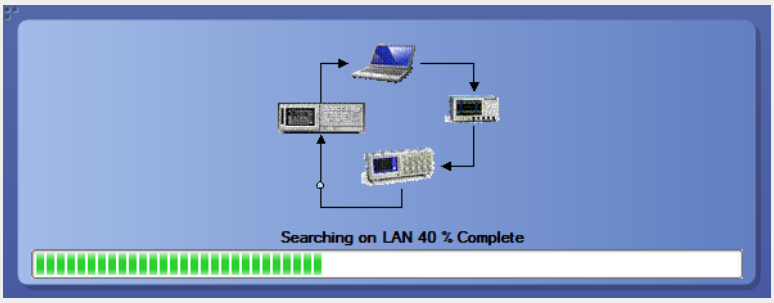
View connected instruments

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

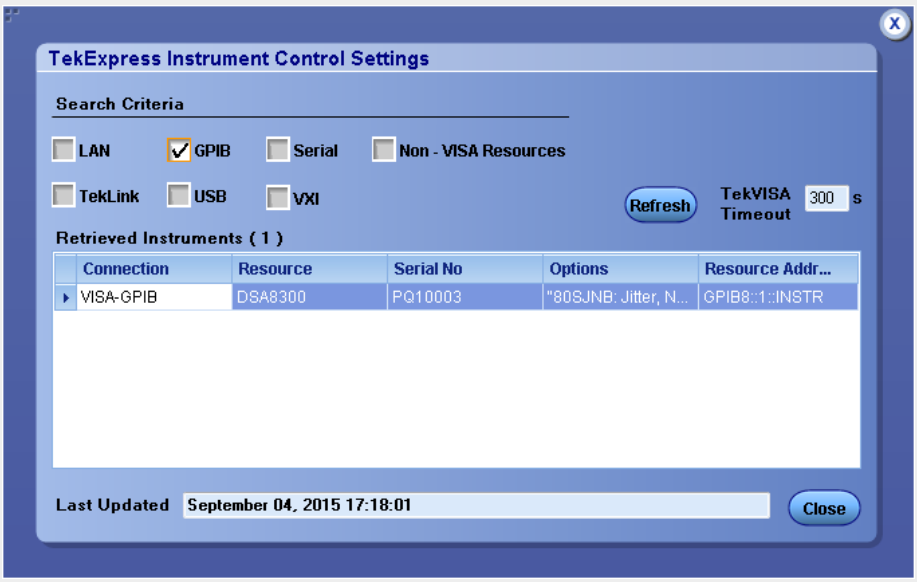
To refresh the list of connected instruments:

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 for which to search.

   Instrument search is based on the VISA layer, but different connections determine the resource type, such as LAN, GPIB, and 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.
3. Click **Refresh**. *TekExpress searches for connected instruments.*



4. After discovery, the dialog box lists the instrument-related details based on the search criteria you selected. 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 details of the instruments are displayed in the Retrieved Instruments table. The time and date of instrument refresh is displayed in the Last Updated field.

See also:. *Configuration test parameters*

Equipment connection diagram

Configure email settings

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

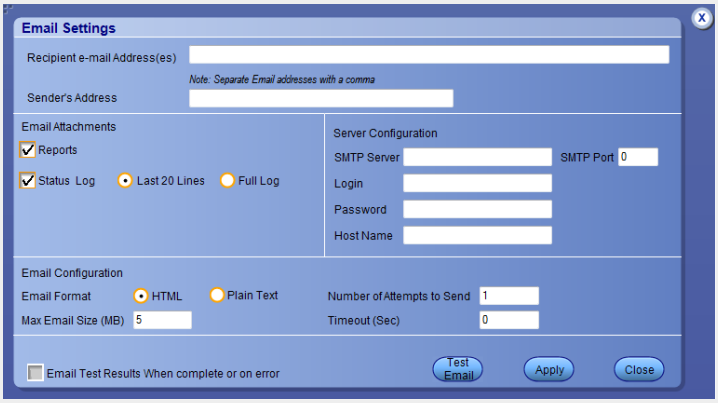
1. Click **Options > Email Settings** to open the Email Settings dialog box.
2. (Required) For Recipient email Address(es), enter one or more email addresses to which to send the test notification. To include multiple addresses, separate the addresses with commas.
3. (Required) For Sender's Address, 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: DPO72016C_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.

   Enter a valid login name and password in the corresponding fields. Select **Enable SSL**, if the server requires SSL/TLS technology.

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

5. In the Email Attachments section, select from the following options:
   - **Reports**: Select to receive the test report with the notification email.
   - **Status Log**: Select to receive the test status log with the notification email. If you select this option, then also select whether you want to receive the full log or just the last 20 lines.
6. In the Email Configuration section:
   - Select 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.
   - Enter the number in the Number of Attempts to Send field, to limit the number of attempts that the system makes to send a notification. The default is 1. You can also specify a timeout period.
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.

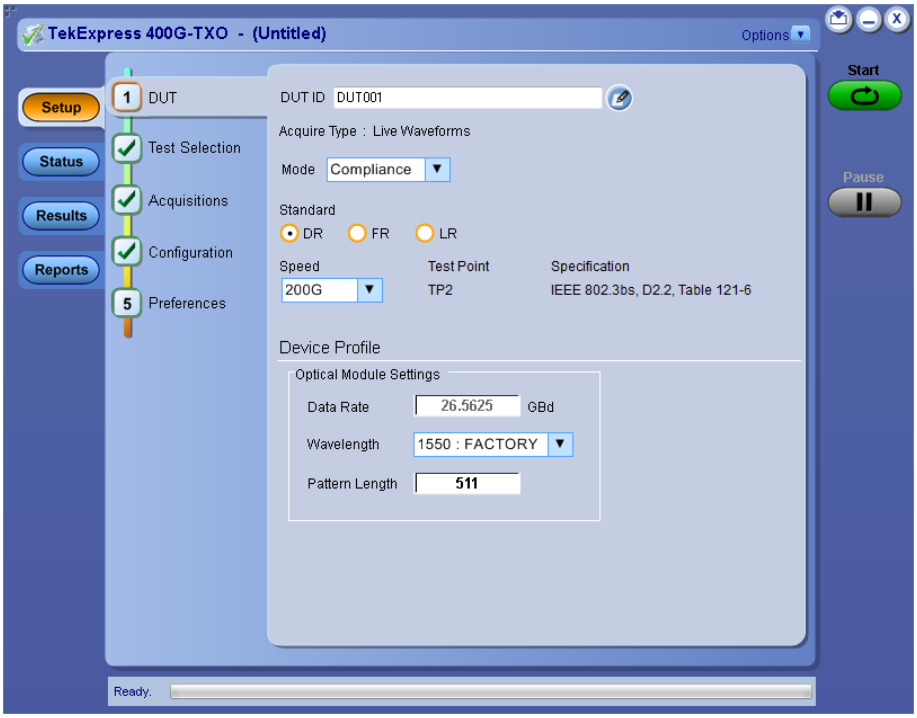
Email settings



Setup panel

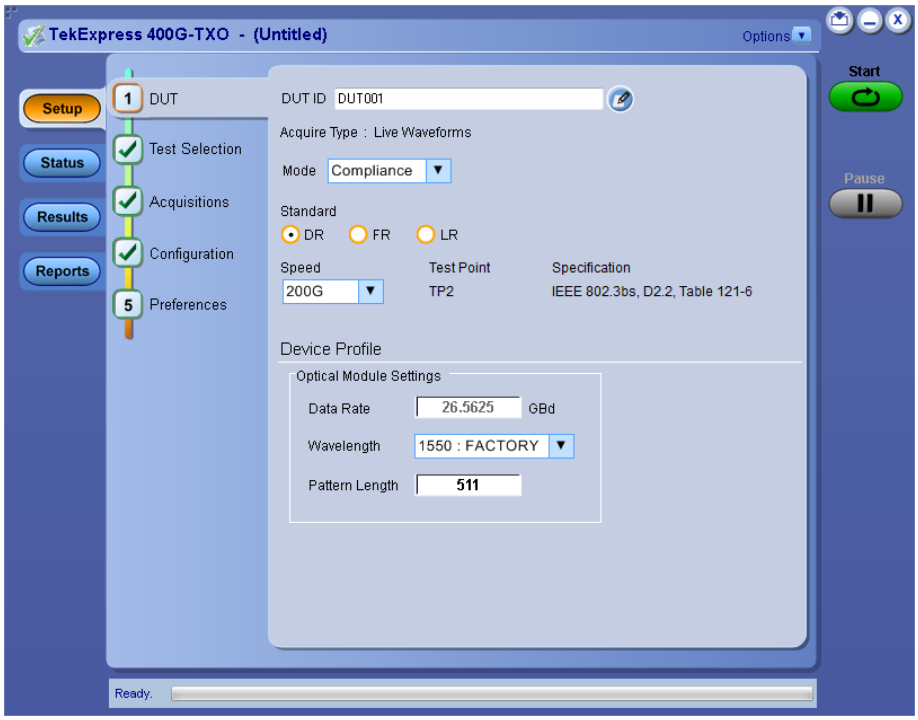
Setup panel overview

The Setup panel contains sequentially ordered tabs that help you guide through the test setup and execution process.



Set DUT parameters

Use the DUT tab to select parameters for the device under test. These settings are global and apply to all tests of current session. DUT settings also affect the list of available tests in the Test Selection tab.



Click **Setup > DUT** to access the DUT parameters:

Table 8: DUT tab settings

Setting	Description
DUT ID	Adds an optional text label for the DUT to reports. The default value is DUT001. The maximum number of characters is 32. You cannot use the following characters in an ID name: (.,..,..., \,/:?"<>|*)
Comments icon (to the right of the DUT ID field)	Opens Comments dialog box to enter text to add to the report. Maximum size is 256 characters. To enable or disable comments appearing on the test report, see *Select report options*.
Acquire Type	Live waveforms. The application performs analysis on live waveforms only.
Mode	■ Compliance ■ User Defined
Standard	■ DR ■ FR ■ LR

Setting	Description
Speed	Select the speed from the drop-down list. The options available depends on the Standard selected. ■ 50G ■ 100G ■ 200G ■ 400G
Test Point	TP2.
Specification	Displays the specification for the selected Standard and Speed.
Device Profile	
Optical Module Settings	
Data Rate	Set the data rate to be tested.
Wavelength	Select the wavelength from the drop-down list. The drop-down lists the wavelength supported by the connected optical module.
Pattern Length	Configure the repetitive pattern length to validate.

See also:. *Select tests*

Select tests

Use the Test Selection tab to select the tests. The test measurements available depend on the standards selected in the DUT tab.

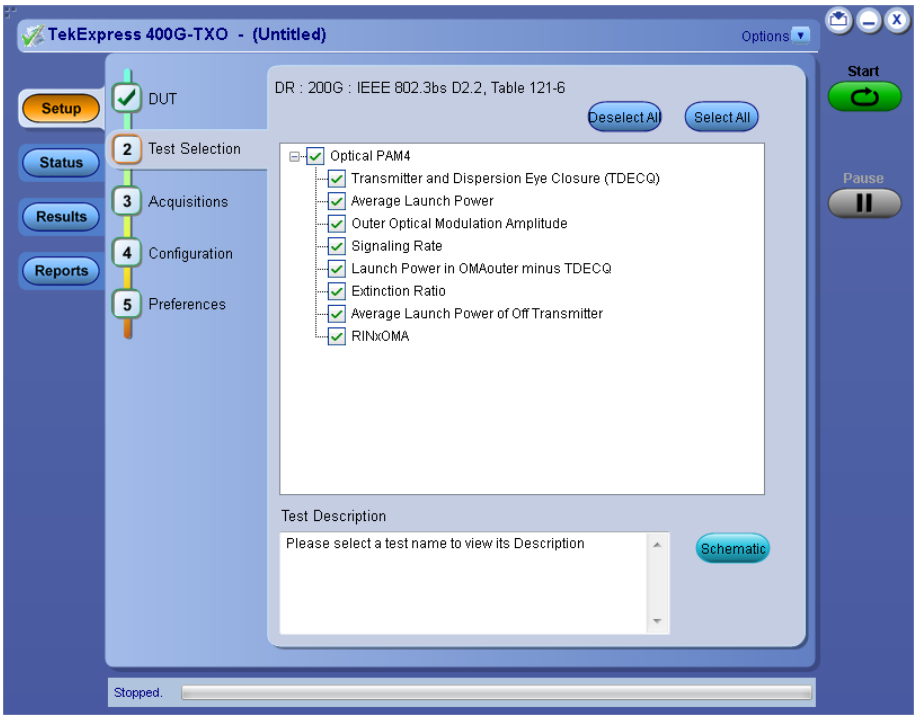


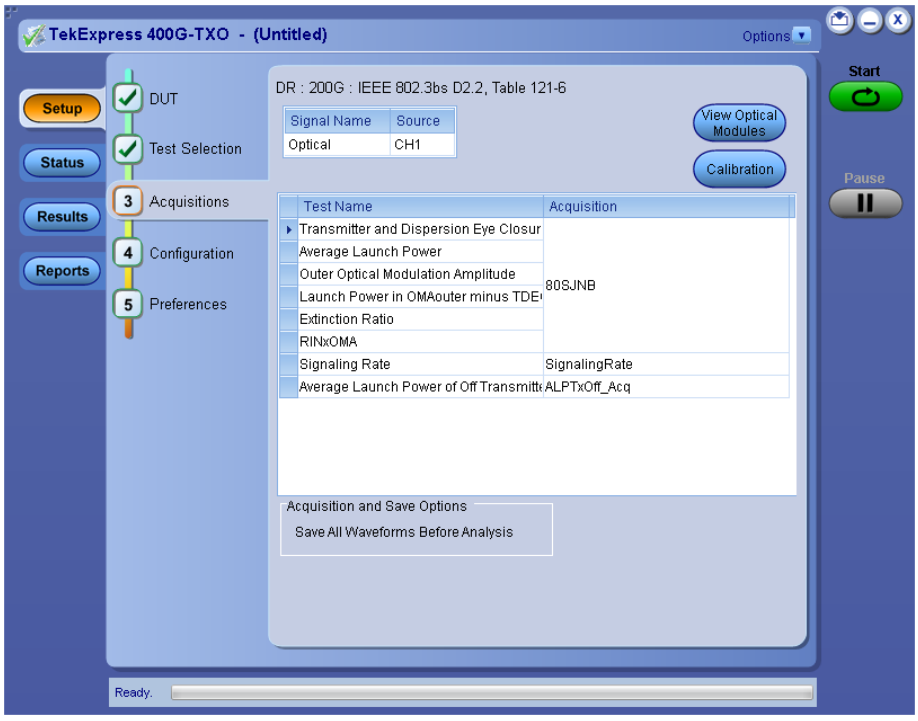
Table 9: Test Selection tab settings

Setting	Description
Tests	Select or clear a test. Highlight a test to show details in the Test Description pane.
Test Description	Shows brief description of the highlighted test in the Test field.
Deselect All	Click to clear all tests.
Select All	Click to select all tests. All tests are selected by default.
Schematic	Click to display the schematic diagram of the DUT test setup for the selected test. Use the diagram to verify the test setup before running the test.

See also:. *Set acquisition tab parameters*

Set acquisition tab parameters

Use the Acquisitions tab to view the test acquisition parameters. The contents displayed on this tab depends on the DUT type and tests selected.



NOTE. *400G-TXO application acquires all waveforms needed by each test before performing the analysis.*

Table 10: Acquisitions tab settings

Setting	Description
View Optical Modules	Shows the detected optical modules that are installed in the instrument.
Calibration	Shows the results of the most recent instrument calibration. Use the Calibrations dialog box to view the status of oscilloscope calibration, external attenuation and instrumentation noise. Update these parameters by clicking the associated Refresh or Measure button.

TekExpress 400G-TXO saves all acquisition waveforms to files by default. The waveforms are saved in a unique folder for each session (a session is started when you click the Start button). The folder path is X:\400G-TXO\Untitled Session\<dutid>\<date>_<time>. The images created for each analysis, CSV files with result values, reports, and other information specific to that particular execution are also saved in this folder.

Saving a session moves the session file contents from the Untitled Session folder to the specified folder name, and changes the session name to the specified name.

Set configuration tab parameters

Use Configuration tab to configure the Global Settings and test measurement configurations. The Global Settings and the measurements with configurations available in this tab depend on the Standards selected in the DUT tab.

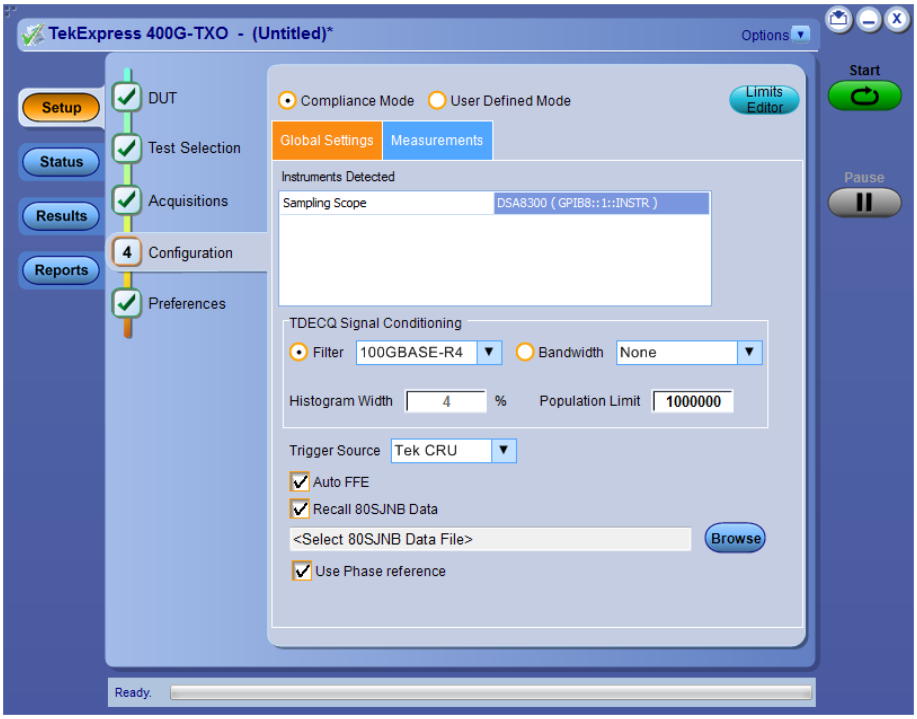


Table 11: Configuration tab settings

Setting	Description
Compliance Mode	Select compliance mode. By default, Compliance Mode is selected.
User Defined Mode	Select user defined mode
Limits Editor	Shows the upper and lower limits for the applicable measurement using different types of comparisons. In Compliance Mode, use the Limits Editor to view the measurement high and low limits used for selected tests. In User Defined Mode, use the Limits Editor to edit the limit settings.  To edit a value, click that field and either select from the displayed list or enter a new value. Use the bottom scroll bar to view all available fields.
Global Settings	
Instruments Detected	Displays the instruments connected to this application. Click the instrument name to open a list of available (detected) instruments. Select **Options** > **Instrument Control Settings** and click Refresh to update the instrument list. ***NOTE.*** *Verify that the* ***GPIB*** *search criteria (default) is selected in the Instrument Control Settings.*
TDECQ Signal Conditioning	
Filter	Select the filter from the drop-down list. The drop-down lists the filters supported by the connected optical module.
Bandwidth	Select the bandwidth value from the drop-down list. The drop-down lists the bandwidth supported by the connected optical module.
Histogram Width	Select the histogram width in percentage for TDECQ computation.
Population Limit	Select to set the total number of samples to be acquired by the 80SJNB, before processing the data.
Trigger Source	■ Tek CRU ■ Others

Setting	Description
Auto FFE	When selected, the application will perform signal path computation, query and report the results. Unselect to manually configure the FFE settings, perform the required computation. The application will then query and report the results.
Recall 80SJNB Data	Select to execute the measurements using 80SJNB pre-computed data (.mat).
Use Phase reference	Select to use phase reference. For more details on phase reference characterization, *click here*.

Set preferences tab parameters

Use the Preferences tab to set the application action on completion of a measurement.

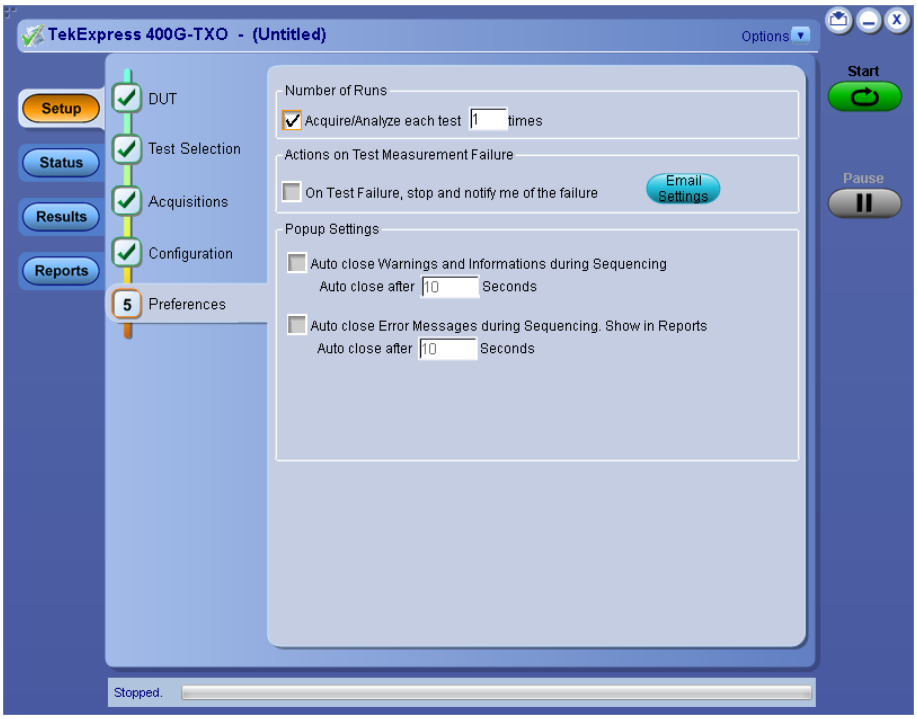


Table 12: Preferences tab settings

Setting	Description
Number of Runs	
Acquire/Analyze each test <n> times (not applicable to Custom Tests)	Select to repeat the test run by setting the number of times. By default, it is selected with 1 run.
Actions on Test Measurement Failure	

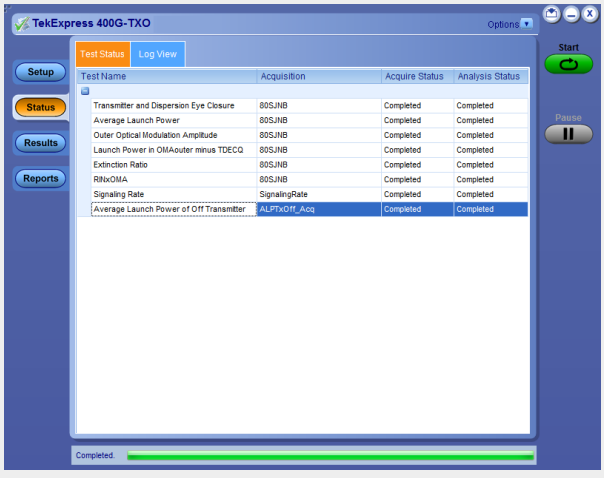
Setting	Description
On Test Failure, stop and notify me of the failure	Select to stop the test run on Test Failure, and get notified via email. By default, it is not selected. Click Email Settings to configure.
Popup Settings	
Auto close Warnings and Informations during Sequencing Auto close after <n> Seconds	Select to auto close warnings/informations during sequencing. Set the Auto close time. By default it is not selected.
Auto close Error Messages during Sequencing. Show in Reports Auto close after <n> Seconds	Select to auto close Error Messages during Sequencing. Set the Auto close time. By default it is not selected.

Status panel

Status panel overview

The Status panel accesses the Test Status and Log View tabs, which provide status on test acquisition and analysis (Test Status tab) and a listing of test tasks performed (Log View tab). The application opens the Test Status tab when you start a test run. You can select the Test Status or the Log View tab to view these items while the tests are running.

Test status view



Log view

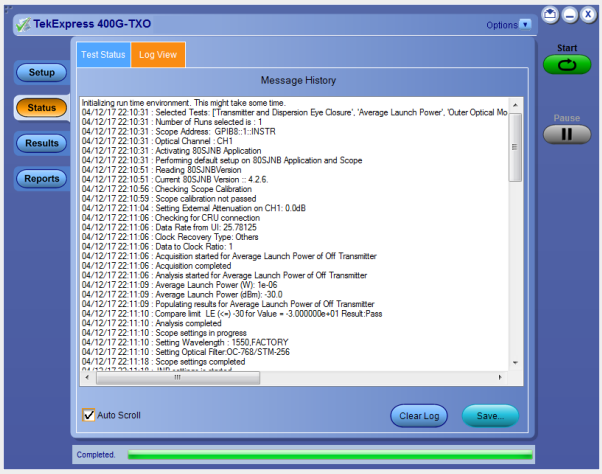


Table 13: Status panel Log View controls

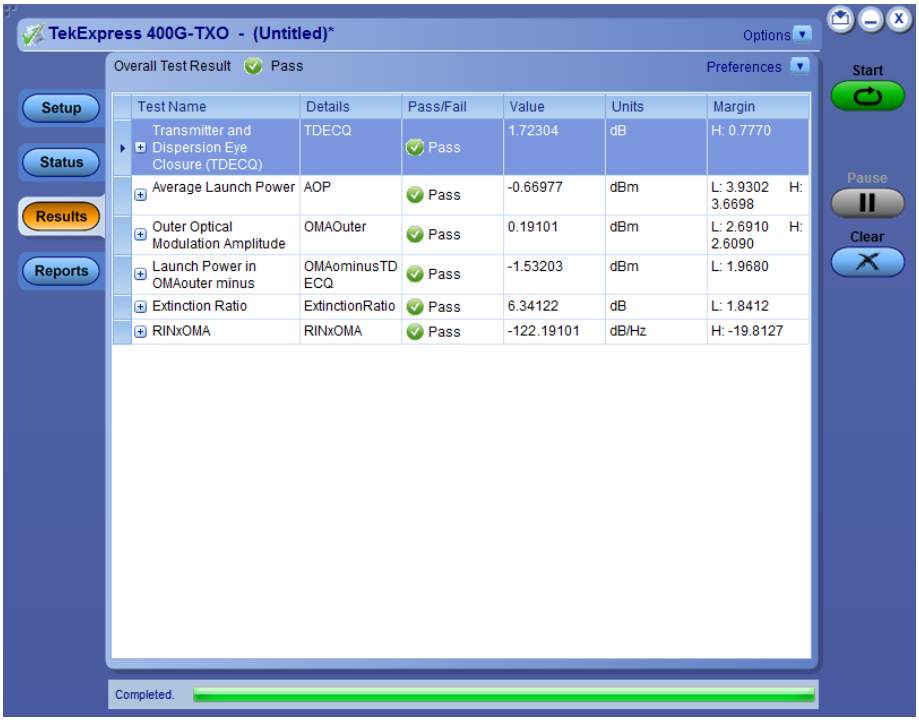
Control	Description
Message History	Lists all executed test operations and timestamp information.
Auto Scroll	Enables automatic scrolling of the log view as information is added to the log during the test.
Clear Log	Clears all messages from the log view.
Save	Saves the log file to a text file. Use the standard Save File window to navigate to and specify the folder and file name to which to save the log text.

See also:. *Application panel overview*

Results panel

Results panel overview

When a test execution is complete, the application automatically opens the **Results** panel to display a summary of test results.



See also:. *View a report*

Application panels overview

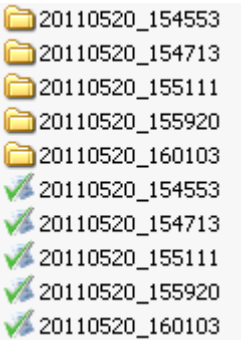
View test-related files

Files related to tests are stored in C:\Users\<username>\Documents\My TekExpress\400G-TXO\. Each test setup in this folder has a test setup *file* and a test setup *folder*, both with the test setup name.

The test setup file is preceded by the TekExpress icon and usually has no visible file name 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.

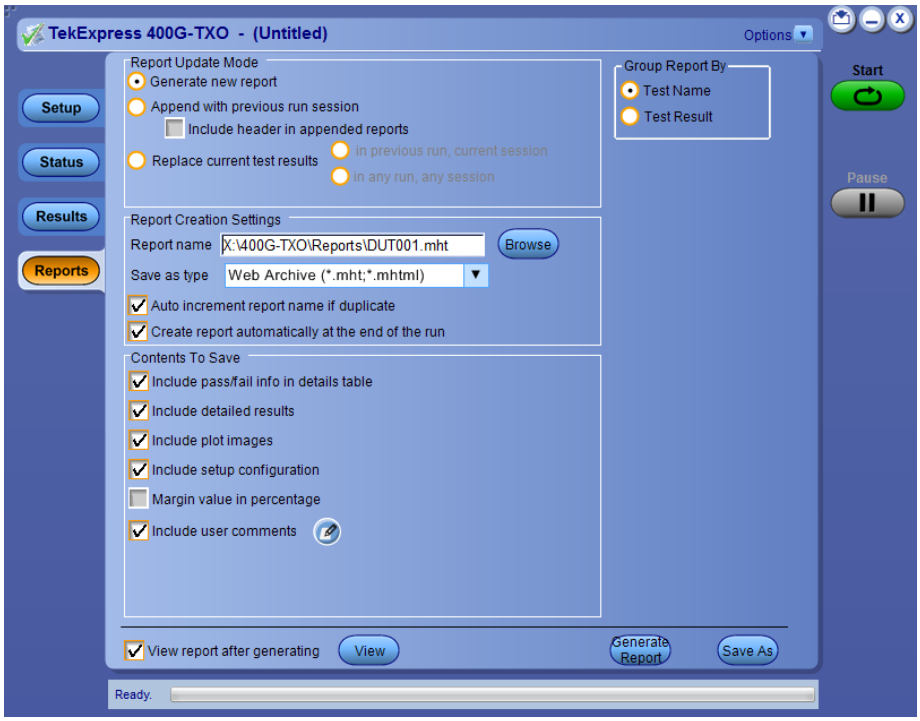
The first time you run a new, unsaved session, the session files are stored in the Untitled Session folder located at ..\My TekExpress\400G-TXO\. When you name and save the session, the files are placed in a folder with the name that you specify. A copy of the test files stay in the Untitled Session folder until you run a new test or until you close the 400G-TXO application.

See also:. *File name extensions*

Reports panel

Reports panel overview

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



For information on setting up reports, see *Select report options*. For information on viewing reports, see *View a report*.

See also:. *Applications panel overview*

Select report options

Click the Reports panel to select the test result information to be included 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 incremented each time you run a particular test.

Select the 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 14: Report options

Setting	Description
Report Update Mode	
Generate new report	Creates a new report. The report can be in either .mht, .pdf, or .csv file format.
Append with previous run session	Appends the latest test results to the end of the current test results report.
Include header in appended reports	Select to include header in appended reports

Setting		Description
Replace current test results	In previous run, current session	Select to replace current test results in the report with the test result(s) of previous run in current session.
	In any run, any session	Select to replace current test results in the report with the test result(s) in selected run session's report. Click  and select the test result of any other run session from another setup.
Report Creation Settings		
Report name		Displays the name and location from which to open a 400G-TXO report. The default location is at *\My TekExpress\400G-TXO\Untitled Session*. The report file in this folder gets overwritten each time you run a test unless you specify a unique name or select to auto increment the report name. Change the report name or location. Do one of the following: ■ In the Report Path field, type over the current folder path and name. ■ Double-click in the Report Path field and then make selections from the pop-up keyboard and click the **Enter** button. Be sure to include the entire folder path, the file name, and the file extension. For example: C:\Users\<username>\Documents\My TekExpress\400G-TXO\DUT001.mht. ***NOTE.*** *You cannot set the file location using the Browse button.* Open an existing report. Click **Browse**, locate and select the report file, and then click **View** at the bottom of the panel.
Save as type		Saves a report in the specified file type, selected from the drop-down list. ***NOTE.*** *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.*
Auto increment report name if duplicate		Sets the application to automatically increment the name of the report file if the application finds a file with the same name as the one being generated. For example: DUT001, DUT002, DUT003. This option is enabled by default.
Create report automatically at the end of the run		Creates report at the end of the run.

Setting	Description
Contents To Save	
Include pass/fail info in details table	Includes pass/fail info in the details table of the report.
Include detailed results	Includes detailed results in the report.
Include plot images	Includes plot images in the report.
Include setup configuration	Select to include hardware and software information in the summary box, at the top of the report. Information includes oscilloscope model and serial number, oscilloscope firmware version, and software versions for the applications used in the measurements.
Margin value in percentage	Select to view the margin value in percentage.
Include user comments	Select to include any comments about the test that you or another user added in the DUT tab of the Setup panel. Comments appear in the Comments section, under the summary box at the beginning of each report.
Group Report By	
Test Name	Select to group the tests in the report by test name.
Test Result	Select to group the tests in the report by test results.
View report after generating	Automatically opens the report in default Web browser, when the test execution is complete. This option is selected by default.
View	Click to view the most current report.
Generate Report	Generates a new report based on the current analysis results.
Save As	Specify a name for the report.

View a report

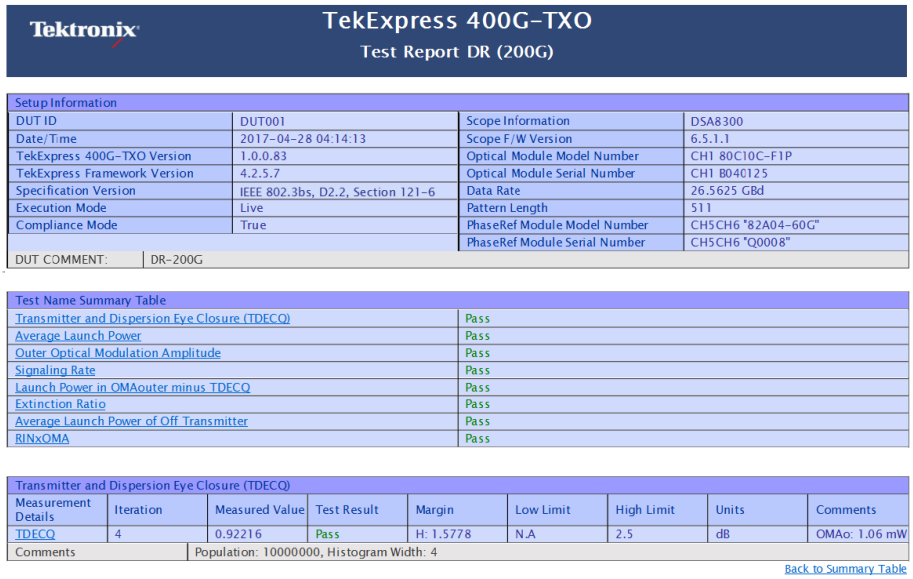
The application automatically generates a report when test execution is complete and displays the report in your default Web browser (unless you cleared the **View Report After Generating** check box in the Reports panel before running the test). If you cleared this check box, or to view a different test report, do the following:

1. Click the **Reports** button.
2. Click the **Browse** button and locate and select the report file to view.
3. In the Reports panel, click **View**.

For information on changing the file type, file name, and other report options, see *Select report options*.

Report contents

A report shows detailed results and plots, as set in the Reports panel.



Tektronix

TekExpress 400G-TXO

Test Report DR (200G)

Setup Information			
DUT ID	DUT001	Scope Information	DSA8300
Date/Time	2017-04-28 04:14:13	Scope F/W Version	6.5.1.1
TekExpress 400G-TXO Version	1.0.0.83	Optical Module Model Number	CH1 80C10C-F1P
TekExpress Framework Version	4.2.5.7	Optical Module Serial Number	CH1 B040125
Specification Version	IEEE 802.3bs, D2.2, Section 121-6	Data Rate	26.5625 GBd
Execution Mode	Live	Pattern Length	511
Compliance Mode	True	PhaseRef Module Model Number	CH5CH6 "82A04-60G"
		PhaseRef Module Serial Number	CH5CH6 "Q0008"
DUT COMMENT:	DR-200G		

Test Name Summary Table	
Transmitter and Dispersion Eye Closure (TDECQ)	Pass
Average Launch Power	Pass
Outer Optical Modulation Amplitude	Pass
Signaling Rate	Pass
Launch Power in OMAouter minus TDECQ	Pass
Extinction Ratio	Pass
Average Launch Power of Off Transmitter	Pass
RINxOMA	Pass

Transmitter and Dispersion Eye Closure (TDECQ)

Measurement Details	Iteration	Measured Value	Test Result	Margin	Low Limit	High Limit	Units	Comments
TDECQ	4	0.92216	Pass	H: 1.5778	N.A	2.5	dB	OMAo: 1.06 mW
Comments	Population: 10000000, Histogram Width: 4							

Back to Summary Table

Setup configuration information

The summary box at the beginning of the report lists setup configuration information. This information includes the oscilloscope model and serial number, electrical module model, and software version numbers of all associated applications.

To exclude this information from a report, clear the **Include Setup Configuration** check box in the Reports panel before running the test.

User comments

If you selected to include comments in the test report, any comments you added in the DUT tab are shown at the top of the report.

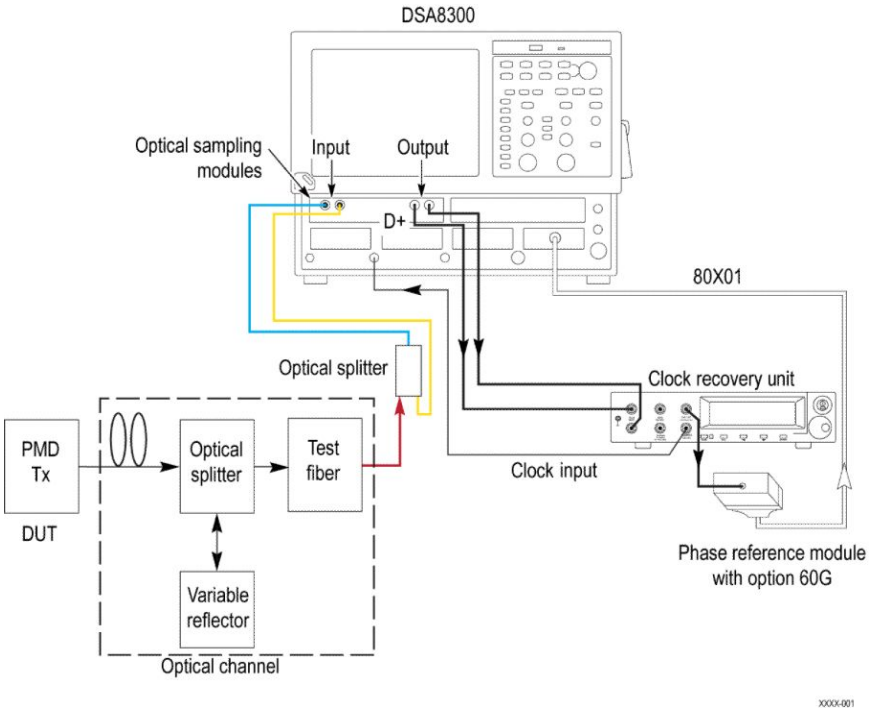
See also:. *Results panel overview*

View test-related files

Running tests

Equipment connection diagram

Click **Setup** > **Test Selection** > **Schematic** to view the equipment setup diagram(s).



NOTE.

- *Use CR286A (supports up to 28 GBd) output or clock output from the DUT as the clock input signal.*
- *The optical splitter is internal to 80C10C CRTP.*

Figure 1: Connection diagram with Tek CR286A

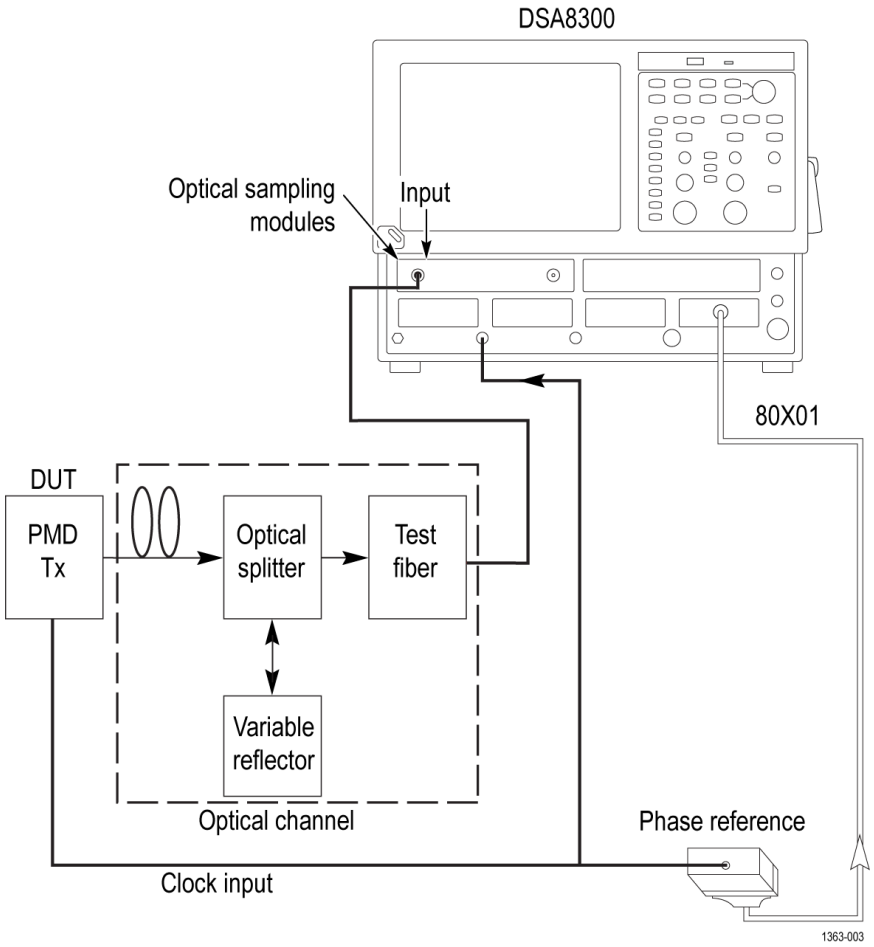


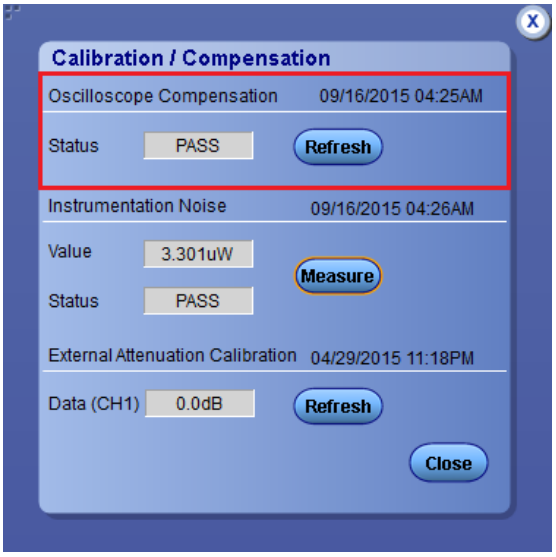
Figure 2: Connection diagram with clock synchronized to DUT signal

See also: *Minimum system requirement*

Oscilloscope compensation

Use the following procedure to check the oscilloscope calibration status:

1. Select **TekExpress 400G-TXO** > **Setup** > **Acquisition panel** > **Calibration** to open the calibration dialog box.
2. Click **Refresh** (in the Oscilloscope Calibration area).

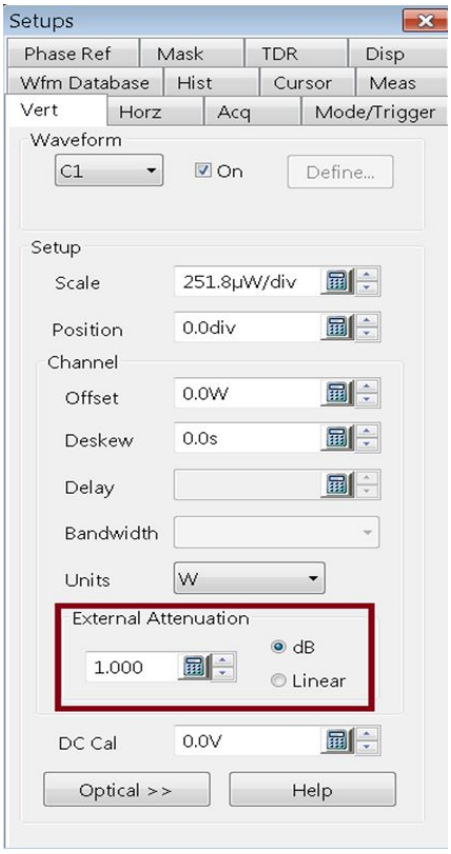


NOTE. *It is recommended to perform Oscilloscope Compensation in addition after 20 minutes of warm up. Oscilloscope compensation can be accessed from the Oscilloscope main menu,* ***Utilities > Instrument Compensation****. Click Help in the compensation window for further details.*

External attenuation calibration

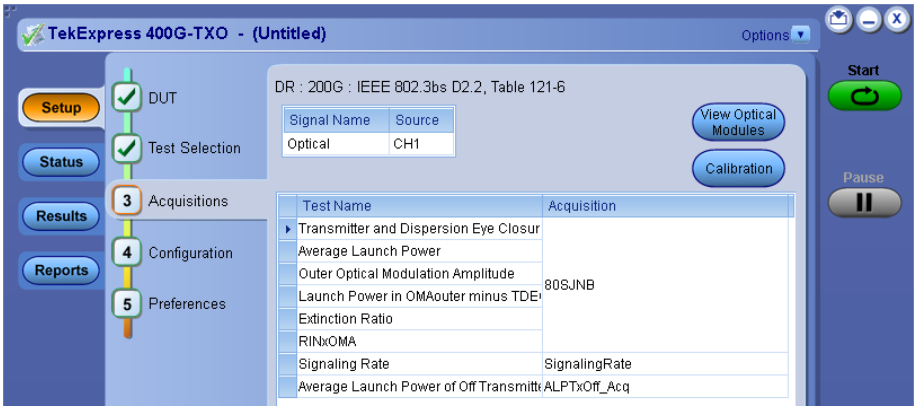
Complete the following the steps to set the external attenuation:

1. In DSA8300, set the optical source as **Ch1**.
2. Enter the External Attenuation value for the oscilloscope as shown in the following image.

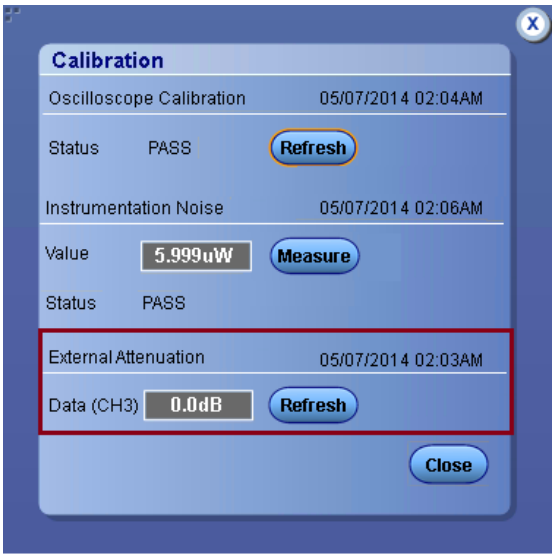


3. Select **Ch1** from the **TekExpress 400G-TXO** > **Setup** > **DUT** > **Source**.

4. Click **TekExpress 400G-TXO** > **Setup** > **Acquisition** > **Calibration** to open the calibration dialog box.



5. Click Refresh (in the External Attenuation area) and check the value.



6. Repeat steps 1 to 5 by selecting **Ch3** and check the value.

Instrument noise

The following procedure is used by the 400G-TXO application to measure the Instrument noise calibration:

1. Disconnect all signals connected to the sampling oscilloscope.
2. Select **Setup > Vert > waveform C1** to **On**.
3. Define **MATH1** as Ch1, and switch on MATH1.
4. Set the Trigger Source to **Free Run**.
5. Select measurement **Setup > Meas > Meas 1 > Pulse Amplitude: AC RMS**.
6. Set **Setup > Meas > Source: MATH1**.
7. Set WaveformdB source as MATH1.
8. Enable and switch on the display of WaveformdB.
9. Query the result of measurement1 (AC RMS).

NOTE. *Measured noise limit is a function of optical settings (Bandwidth and Filter).*

If the noise level measurement is not within the limits, perform an oscilloscope compensation and then perform the instrument noise measurement again. If the measured noise level is still outside of the above limits, please contact *Tektronix customer support*.

Running tests

Select tests , *set acquisition parameters*, *set configuration parameters*, *set preferences parameters*, and click **Start** to run the tests. While tests are running, you cannot access the Setup or Reports panels. To monitor the test progress, switch between the Status panel and the Results panel.

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 **Alt + Tab** key combination. To keep the TekExpress 400G-TXO application on top, select **Keep On Top** from the TekExpress Options menu.

The application displays the report when the tests execution is complete.

Prerun checklist

1. Make sure that the instruments have had a 20-minute warm-up .
2. Perform compensation: In the oscilloscope main menu, select **Utilities** > **Instrument Compensation**. Click **Help** in the compensation window for steps to perform instrument compensation.

Saving and recalling test setup

Test setup files overview

Saved test setup information (such as the selected oscilloscope, general parameters, acquisition parameters, measurement limits, waveforms (if applicable), and other configuration settings) are saved under the setup name at **X:\400G-TXO**.

Use test setups to:

- Run a new session, acquiring live waveforms, using a saved test configuration.
- Create a new test setup using an existing one.
- 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.

Save a test setup

Save a test setup before or after running a test to save the test configuration. 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 the default values of the application.

To save the current setup session to the same setup name, select **Options > Save Test Setup**.

To save the current setup session to a new setup name, select **Options > Save Test Setup As**.

Open (load) a saved test setup

To Open (load) a saved test setup, do the following:

1. Select **Options > Open Test Setup**.
2. Select the setup from the list and click **Open**. The setup files are located at **X:\400G-TXO**.

Create a test setup from default settings

To create a test setup using default settings, complete the following steps:

1. Select **Options > Default Test Setup**. For default test setup, the parameters are set to the default values.
2. Click *Setup* and set the test setup controls.
3. Click *Reports* and select the test result information to be included in the report and naming conventions to use for the report.
4. Optional: Click **Start** to run the test and verify that it runs correctly and captures the specified test information and reports. If it does not, then edit the parameters and repeat this step until the test runs to your satisfaction.
5. Select **Options > Save Test Setup**. Enter the file name and click Save. The application saves the file to X:\400G-TXO\<*session_name*>.

Create a new test setup using an existing one

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

1. Select **Options > Open Test Setup**.
2. Select a setup from the list and then click **Open**.
3. Use the **Setup** and **Reports** panels to modify the parameters to meet your testing requirements.
4. Select **Options > Save Test Setup As**.
5. Enter a test setup name and click **Save**.

400G-TXO compliance measurements

Transmitter and dispersion eye closure (TDECQ)

This measurement verifies that the transmitter and dispersion eye closure of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

- PAM4 equalized (FFE) optical signal
- Histogram width in percentage
- Pattern length as input to the DUT panel

Patterns supported

- Any repeating pattern

Measurement procedure

Transmitter and Dispersion Eye Closure for PAM4 (TDECQ) is a penalty given by the ratio of the noise a receiver could add to an ideal transmitter and ideal channel and get a certain symbol error rate (SER) to the noise a receiver could add to the DUT and worst case channel and get the same SER. These noise terms are given by R1 and R2 respectively. The SER used in IEEE standard for TDECQ is 4.8e-4. TDECQ is calculated by the following formula:

$$TDECQ\ (dB) = 10 * \log_{10}(\frac{R1}{R2})$$

R1 = R2 is the best case. If, R2 < R1, and TDECQ is > 0 dB. This measurement is done using 80SJNB with coding as “PAM4”.

The equalized signal is used as input for the TDECQ measurement. Feed Forward Equalizer with Number of FFE taps as 5 and FFE taps per symbol as 2 is used to equalize the PAM4 signal.

You can configure the histogram width in percentage from 2 to 10. While executing the TDECQ measurement, the TekExpress application configures the 80SJNB in free-run mode with the total number of samples specified by the Population Limit.

Limits

Standards	Lower limit	Higher limit
50GBASE-FR	NA	2.3 dB
50GBASE-LR	NA	2.5 dB
100GBASE-DR	NA	2.5 dB
200GBASE-DR4	NA	2.5 dB
200GBASE-FR4	NA	2.4 dB
200GBASE-LR4	NA	2.5 dB
400GBASE-FR8	NA	2.2 dB
400GBASE-LR8	NA	2.4 dB
400GBASE-DR4	NA	2.5 dB

Average launch power

This measurement verifies that the average launch power of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

- PAM4 equalized (FFE) optical signal
- Pattern length as input to the DUT panel

Patterns supported

- Any repeating pattern

Measurement procedure

Average launch power is the power that the optical signal is launched at the transmitter end. It is the function of the brightness of the optical source. Average launch power is expressed in dBm with 1 mW acting as the reference level.

This measurement is done using 80SJNB with coding as “PAM4”. The equalized signal is used as the input for the TDECQ measurement. The Feed Forward Equalizer with the Number of FFE taps set to 5 and FFE taps-per-symbol set to 2 is used to equalize the PAM4 signal.

Limits

Standards	Lower limit	Higher limit
50GBASE-FR	NA	NA
50GBASE-LR	NA	NA
100GBASE-DR	-2.4 dBm	4 dBm
200GBASE-DR4	-4.6 dBm	3 dBm
200GBASE-FR4	-3.7 dBm	4.7 dBm
200GBASE-LR4	-2.9 dBm	5.3 dBm
400GBASE-FR8	-3 dBm	5.3 dBm
400GBASE-LR8	-2.3 dBm	5.3 dBm
400GBASE-DR4	-2.4 dBm	4 dBm

Outer optical modulation amplitude

This measurement verifies that the outer optical modulation amplitude of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

- PAM4 equalized (FFE) optical signal
- Pattern length as input to the DUT panel

Patterns supported

- Any repeating pattern

Measurement procedure

The outer optical modulation amplitude is the difference between the average optical launch power level P3, measured over the central 2 UI of the run of 7 threes and the average optical launch power level P0 measured over the central 2 UI of the run of 6 zeros.

This measurement is done using 80SJNB with coding as “PAM4”. Equalized signal is used as input for the TDECQ measurement. The Feed Forward Equalizer with the Number of FFE taps set to 5 and FFE taps-per-symbol set to 2 is used to equalize the PAM4 signal.

Limits

Standards	Lower limit	Higher limit
50GBASE-FR	-2.0 dBm	2.8 dBm
50GBASE-LR	-1.0 dBm	4.0 dBm
100GBASE-DR	-0.3 dBm	4.2 dBm
200GBASE-DR4	-2.5 dBm	2.8 dBm
200GBASE-FR4	-0.7 dBm	4.5 dBm
200GBASE-LR4	0.1 dBm	5.1 dBm
400GBASE-FR8	0 dBm	5.5 dBm

Standards	Lower limit	Higher limit
400GBASE-LR8	0.7 dBm	5.7 dBm
400GBASE-DR4	-0.3 dBm	4.2 dBm

Signaling rate

This measurement verifies that the signaling speed of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

- PAM4 equalized (FFE) optical signal
- Pattern length as input to the DUT panel

Patterns supported

- Any repeating pattern

Measurement procedure

As per the specification, the DUT will transmit the PAM4 signal with the symbol rate of ±100 ppm from the nominal symbol rate.

The Nominal symbol rate for standards is given in the following table.

Standard	Nominal symbol rate (GBd)
100GBASE-DR	53.125
50GBASE-FR and 50GBASE-LR	26.5625
200GBASE-DR4, 200GBASE-LR4 200GBASE-FR4, 400GBASE-FR8 and 400GBASE-LR8	26.5625
400GBASE-DR4	53.125

There are two cases to be considered while executing this measurement.

Case1: With a Tektronix external clock recovery unit

- Connect the data signal to the external Tektronix clock recovery unit; configure and lock the clock recovery unit.
- Launch the 400G-TXO application and connect the external clock recovery unit to the sampling oscilloscope through the USB interface.
- The data rate of the locked clock recovery unit is used as the result for this measurement.

This measurement will report an error, If clock recovery unit is not locked.

Case1: Without Tektronix external Clock Recovery Unit

If an external Tektronix Clock Recovery Unit is not available, then the value configured by the user in the DUT panel is used as result for this measurement.

Limits

- Low Limit : Nominal Data rate – 100 ppm
- High Limit : Nominal Data rate + 100 ppm

Standards	Nominal data rate
50GBASE-FR	26.5625
50GBASE-LR	26.5625
100GBASE-DR	53.125
200GBASE-DR4	26.5625
200GBASE-FR4	26.5625
200GBASE-LR4	26.5625
400GBASE-FR8	26.5625
400GBASE-LR8	26.5625
400GBASE-DR4	53.125

Launch power in OMAouter minus TDECQ

This measurement verifies that the launch power in OMAouter minus TDECQ of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

- PAM4 equalized (FFE) optical signal
- Pattern length as input to the DUT panel

Patterns supported

- Any repeating pattern

Measurement procedure

This measurement is a function of two 80SJNB measurements. Launch power in OMAouter minus TDECQ = OMAouter in dBm – TDECQ in dB.

This measurement is done using 80SJNB with coding as “PAM4”. The Equalized signal is used as input for the TDECQ measurement. The Feed Forward Equalizer with the Number of FFE taps set to 5 and FFE taps-per-symbol set to 2 is used to equalize the PAM4 signal.

Limits

Standards	Lower limit	Higher limit
50GBASE-FR	-2 dBm	NA
50GBASE-LR	-2 dBm	NA
100GBASE-DR	-1.3 dBm	NA
200GBASE-DR4	-3.5 dBm	NA
200GBASE-FR4	-1.7 dBm	NA
200GBASE-LR4	-0.9 dBm	NA
400GBASE-FR8	-1 dBm	NA
400GBASE-LR8	-0.3 dBm	NA
400GBASE-DR4	-1.3 dBm	NA

Extinction ratio

This measurement verifies that the extinction ratio of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

- PAM4 equalized (FFE) optical signal
- Pattern length as input to the DUT panel

Patterns supported

- Any repeating pattern

Measurement procedure

The Extinction Ratio (ER) of a PAM4 optical signal is the ratio of average optical launch power level P3 measured over the central 2 UI of the run of 7 threes and the average optical launch power level P0 measured over the central 2 UI of the run of 6 zeros.

The Extinction Ratio measurement accuracy will be increased if dark level compensation is done as pre-requisite.

This measurement is done using 80SJNB with coding as “PAM4”. The equalized signal is used as input for the TDECQ measurement. The Feed Forward Equalizer with the Number of FFE taps set to 5 and FFE taps-per-symbol set to 2 is used to equalize the PAM4 signal.

Limits

Standards	Lower limit	Higher limit
50GBASE-FR	4.5 dB	NA
50GBASE-LR	4.5 dB	NA
100GBASE-DR	5 dB	NA
200GBASE-DR4	4.5 dB	NA
200GBASE-FR4	4.5 dB	NA

Standards	Lower limit	Higher limit
200GBASE-LR4	4.5 dB	NA
400GBASE-FR8	4.5 dB	NA
400GBASE-LR8	4.5 dB	NA
400GBASE-DR4	5 dB	NA

Average launch power of off-transmitter

This measurement verifies that the average launch power of off-transmitter of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

NA

Patterns supported

NA

Measurement procedure

The average Launch Power with optical transmitter off can be measured only using an external optical power meter. Measure the result from power meter, convert the result to the dBm scale, and dial in the result in the pop-up displayed by the application. This result is used to compare with the limits and report pass/fail of the test.

Limits

Standards	Lower limit	Higher limit
50GBASE-FR	NA	-30 dBm
50GBASE-LR	NA	-30 dBm
100GBASE-DR	NA	-20 dBm
200GBASE-DR4	NA	-30 dBm

Standards	Lower limit	Higher limit
200GBASE-FR4	NA	-30 dBm
200GBASE-LR4	NA	-30 dBm
400GBASE-FR8	NA	-30 dBm
400GBASE-LR8	NA	-30 dBm
400GBASE-DR4	NA	-30 dBm

RINxOMA

This measurement verifies that the extinction ratio of the DUT is within the conformable limits according to the specification.

Required test equipment

Minimum system requirements

Equipment connection diagram

Standards	Specification
50GBASE-FR and 50GBASE-LR	IEEE 802.3cd, Table 139-6
100GBASE-DR	IEEE 802.3cd, Table 140-6
200GBASE-DR4	IEEE 802.3bs, Table 121-6
200GBASE-FR4 and 200GBASE-LR4	IEEE 802.3bs, Table 121-9
400GBASE-FR8 and 400GBASE-LR8	IEEE 802.3bs, Table 122-10
400GBASE-DR4	IEEE 802.3bs, Table 124-6

Inputs

- PAM4 equalized (FFE) optical signal
- Pattern length as input to the DUT panel

Patterns supported

- Any repeating pattern

Measurement procedure

RINxOMA represents Relative Intensity Noise (RIN) of an optical signal measured using a setup with x dB of optical return loss. Mathematically, RINxOMA is defined as:

$$RIN_xOMA = 10 * \log_{10}\left(\frac{P_N}{BW * P_M}\right) dB/Hz$$

Where:

RIN_xOMA = Relative intensity noise referred to optical modulation amplitude measured with x dB reflection

BW = Low pass bandwidth of filter – high pass bandwidth of DC blocking capacitor (noise bandwidth of the measuring system in Hz)

P_N = Electrical noise power in watts with modulation turned off

P_M = Electrical power in watts with modulation turned on

The PAM4 optical signal will have three eyes. RINxOMA will be computed for each eye and the worst RINxOMA is displayed as the measurement result. The worst RINxOMA is compared with the limits and either pass or fail is reported for the test.

The RINxOMA of the other two eyes are reported in specific comments for each measurement run.

The RINxOMA computation for three eyes of PAM4 signal depends on:

- OMA, OMA1, and OMA2 reported by JNB. OMA, OMA1, and OMA2 are optical modulation amplitudes for PAM eyes 0, 1, and 2 respectively.
- NoiseRMSHigh, NoiseRMSHigh1, and NoiseRMSHigh2 reported by JNB NoiseRMSHigh, NoiseRMSHigh1, and NoiseRMSHigh2 are random noise measurements on level high for PAM4 lower eye, middle eye, and upper eye respectively.
- NoiseRMSLow, NoiseRMSLow1, and NoiseRMSLow2 reported by JNB NoiseRMSLow, NoiseRMSLow1, and NoiseRMSLow2 are random noise measurements on level low for PAM4 lower eye, middle eye, and upper eye respectively.

Mathematically, RINxOMA for each eye is computed using the formula given below.

$$\mathrm{RINxOMA} = 10 * \log_{10}\left(\frac{\left(\sqrt{(\mathrm{RandomNoiseHighLevel}^2 - \mathrm{ScopeNoise}^2)} + \sqrt{(\mathrm{RandomNoiseLowLevel}^2 - \mathrm{ScopeNoise}^2)}\right)^2}{(\mathrm{BW} * (\mathrm{OMA})^2)}\right)$$

Where:

RandomNoiseHighLevel = random noise measurement result on level high

RandomNoiseLowLevel = random noise measurement result on level low

ScopeNoise = scope noise computed as part of calibration

BW = optical bandwidth

OMA = Optical modulation amplitude

Limits

Standards	Optical return loss (dB)	Lower limit	Higher limit
50GBASE-FR	16.5	NA	-136 dB/Hz
50GBASE-LR	15.1	NA	-136 dB/Hz
100GBASE-DR	21.4	NA	-142 dB/Hz
200GBASE-DR4	22.8	NA	-142 dB/Hz
200GBASE-FR4	17.8	NA	-136 dB/Hz
200GBASE-LR4	15.7	NA	-136 dB/Hz
400GBASE-FR8	17.8	NA	-136 dB/Hz
400GBASE-LR8	15.7	NA	-136 dB/Hz
400GBASE-DR4	22.8	NA	-142 dB/Hz

SCPI commands

About SCPI command

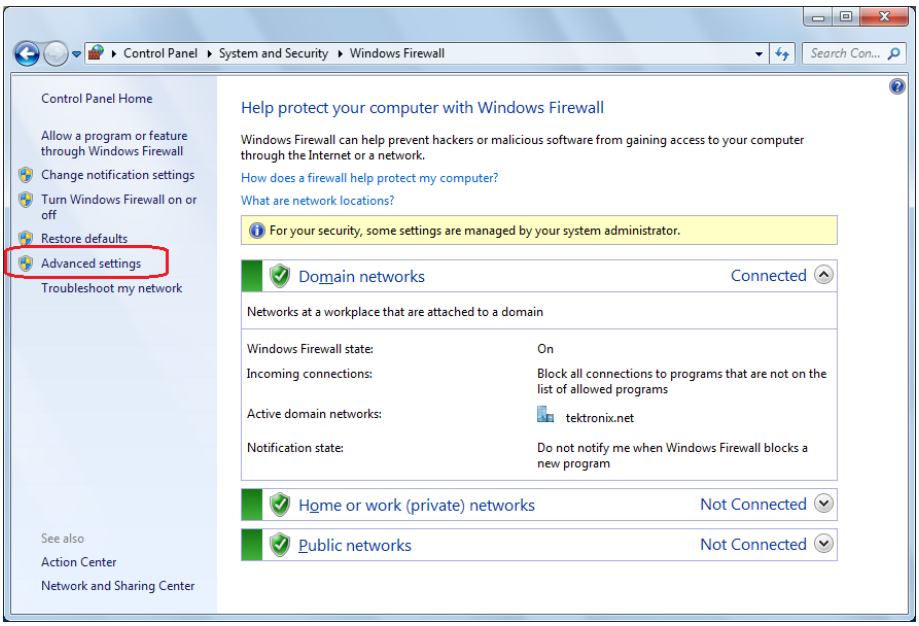
You can use Standard Commands for Programmable Instruments (SCPI) to communicate with the TekExpress application.

Socket configuration for SCPI commands

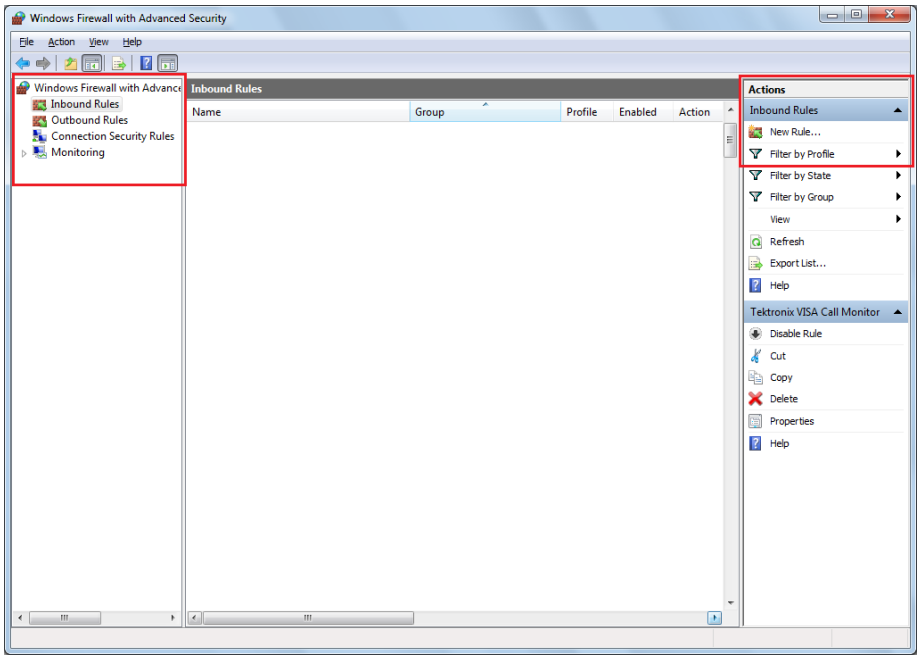
This section describes the steps for TCPIP socket configuration and TekVISA configuration to execute the SCPI commands.

TCPIP socket configuration

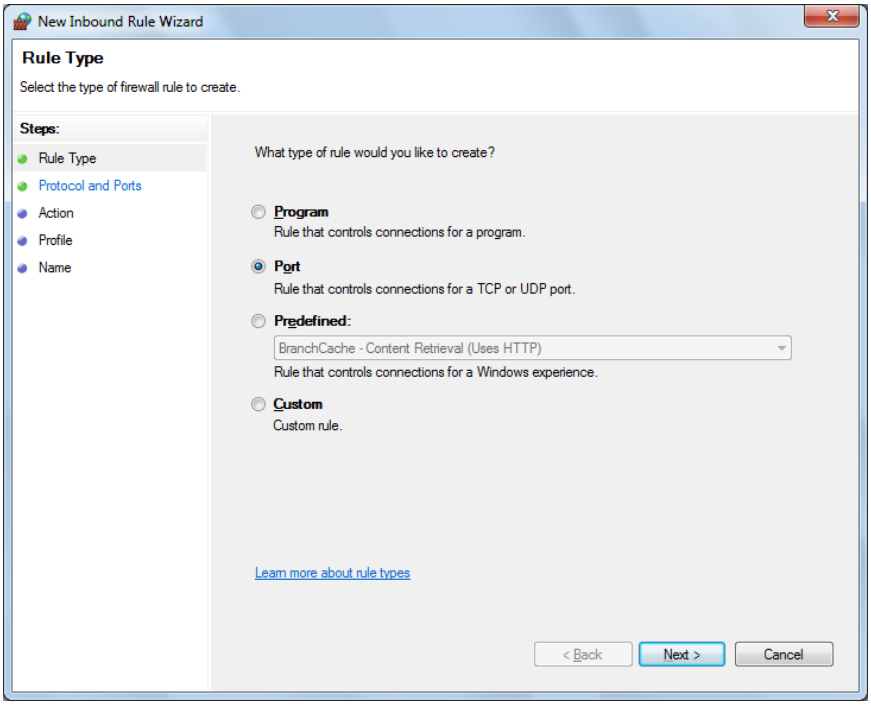
1. Click **Start** > **Control Panel** > **System and Security** > **Windows Firewall** > **Advanced settings**



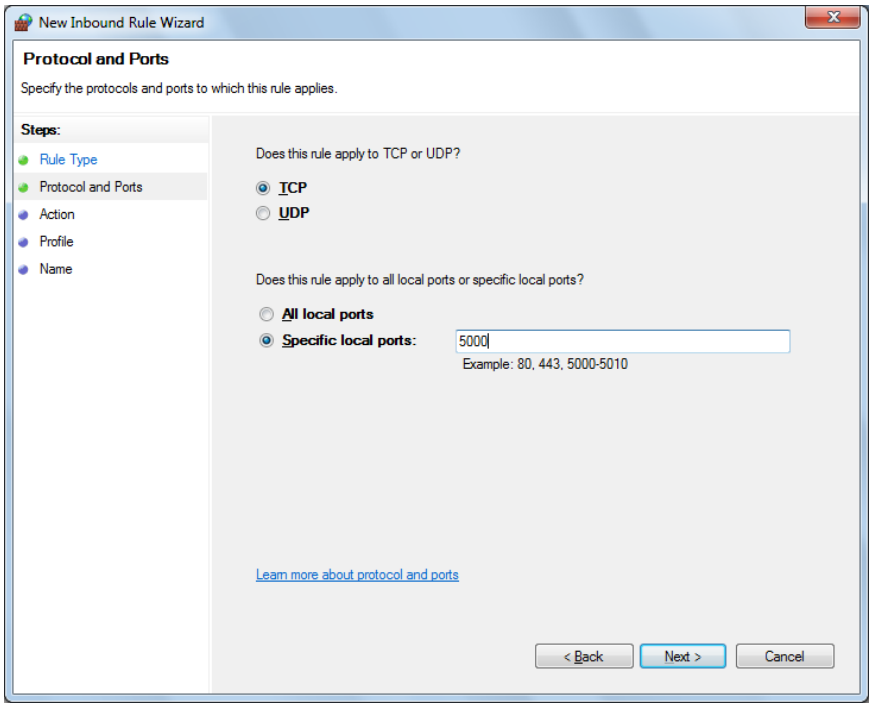
2. In Windows Firewall with Advanced Security menu, select **Windows Firewall with Advanced Security on Local Computer** > **Inbound Rules** and click New Rule…



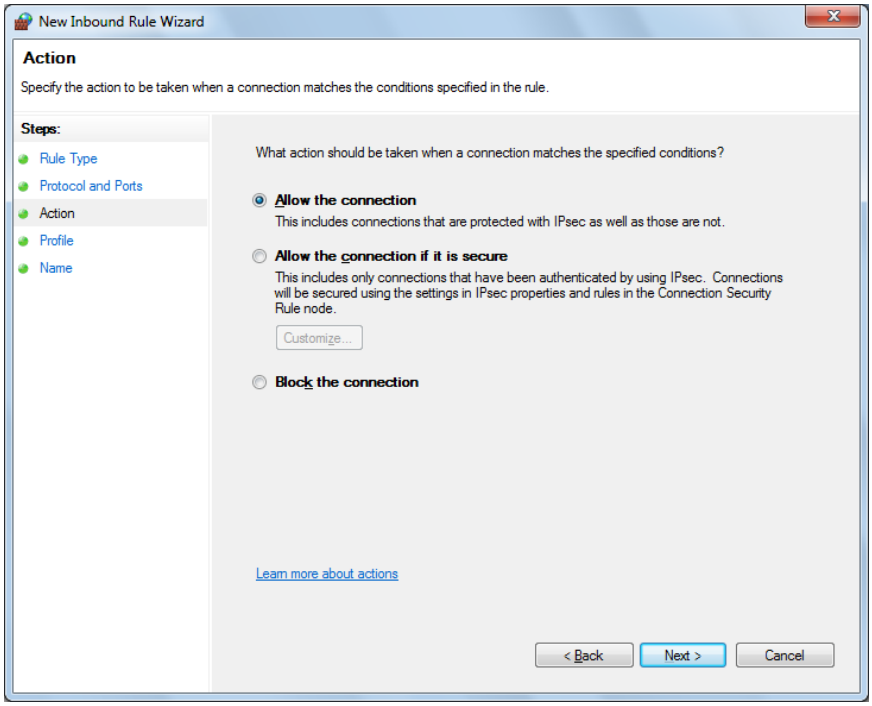
3. In New Inbound Rule Wizard menu
   a. Select **Port** and click **Next**



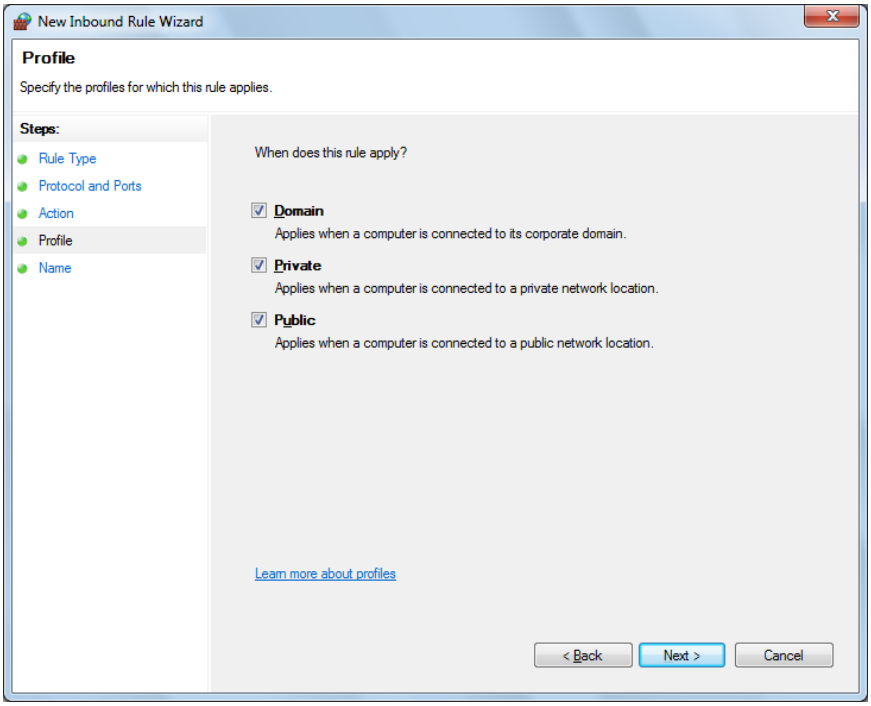
b. Select **TCP** as rule apply and enter 5000 for **Specific local ports** and click **Next**



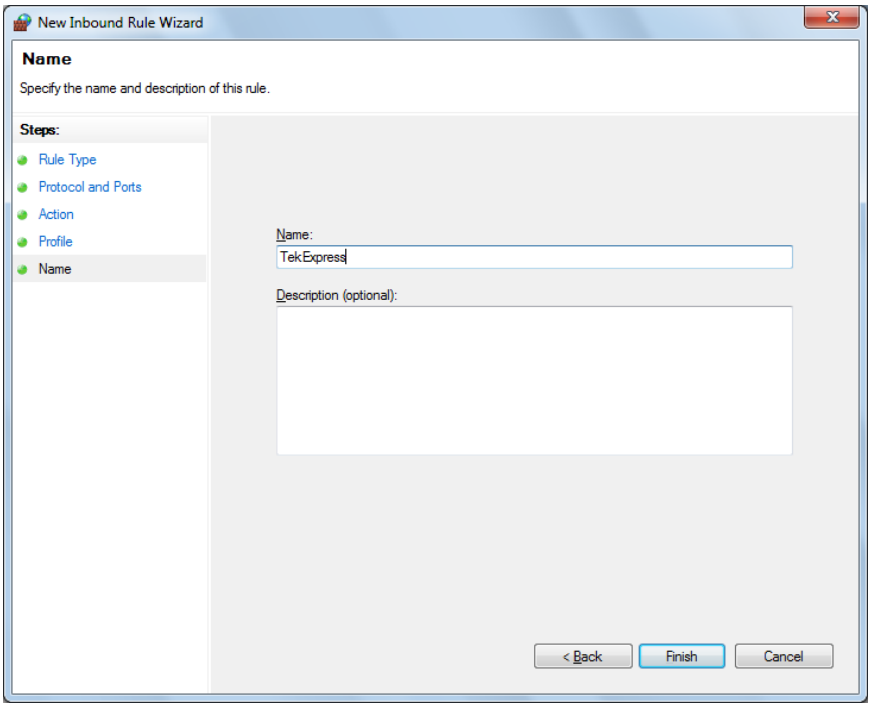
c. Select **Allow the connection** and click **Next**



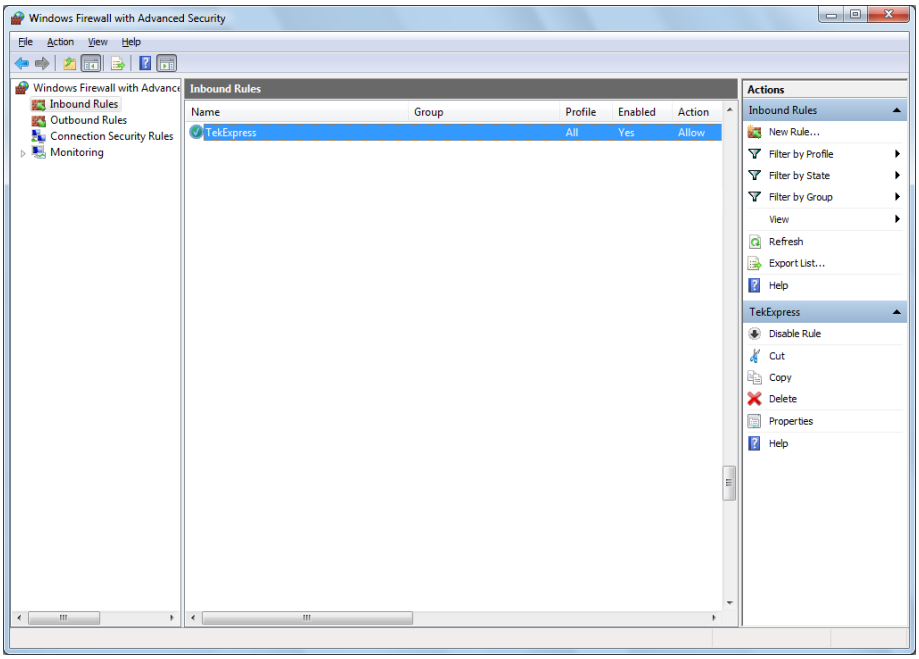
d. Select **Domain, Private, Public** and click **Next**



e. Enter **Name**, Description (optional), and click **Finish**

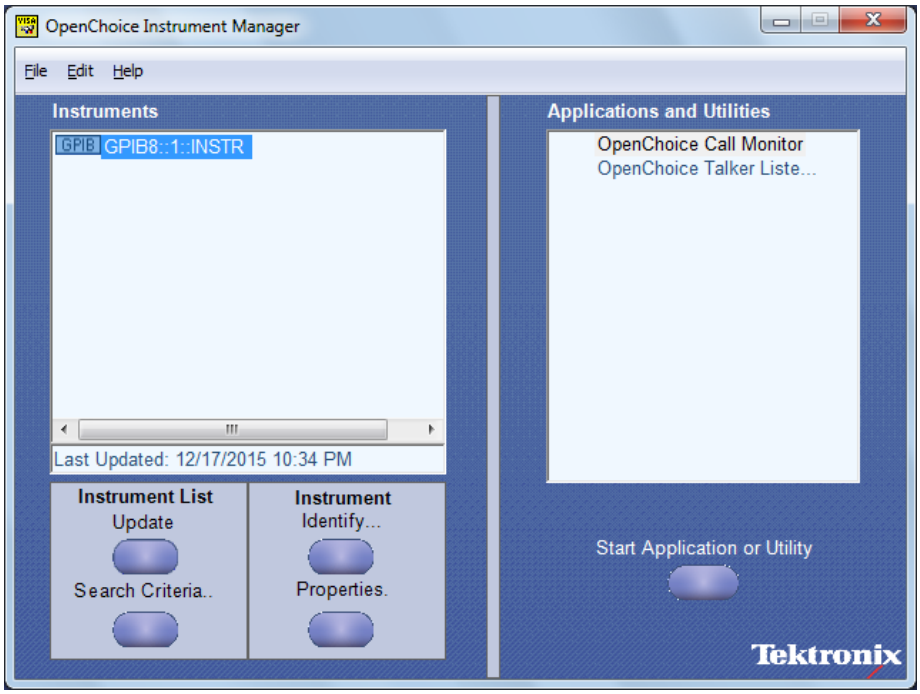


4. Check whether the Rule name is displayed in **Windows Firewall with Advanced Security menu** > **Inbound Rules**



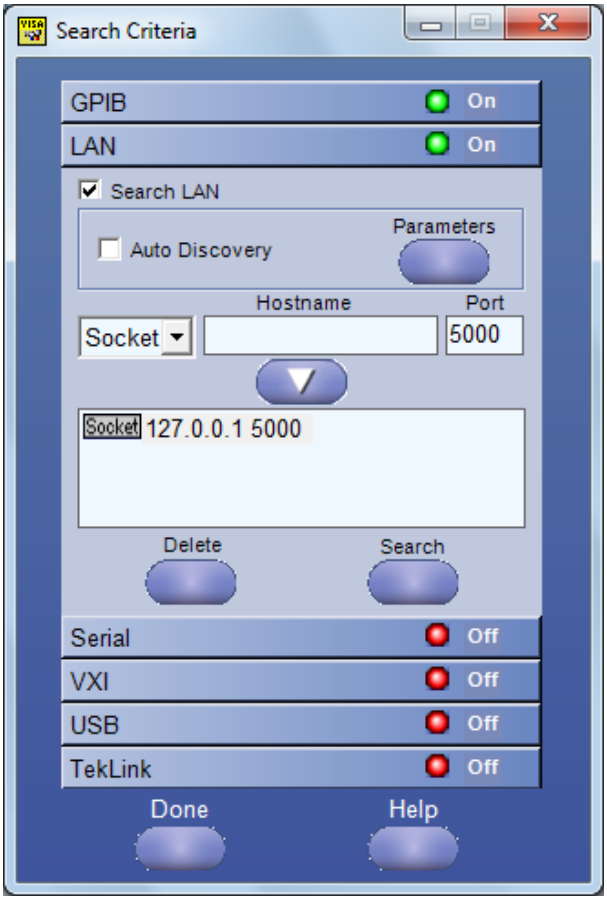
TekVISA configuration

1. Click **Start** > **All Programs** > **TekVISA** > **OpenChoice Instrument Manager**

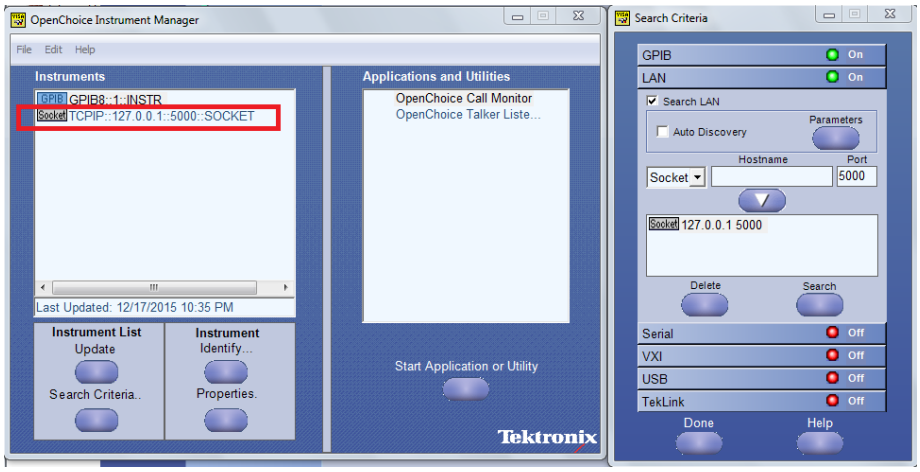


2. Click **Search Criteria**. In Search Criteria menu, click **LAN** to Turn-on. Select **Socket** from the drop-down list, enter the IP address of the TekExpress device in **Hostname** and type **Port** as 5000. Click  to configure the IP address with Port.

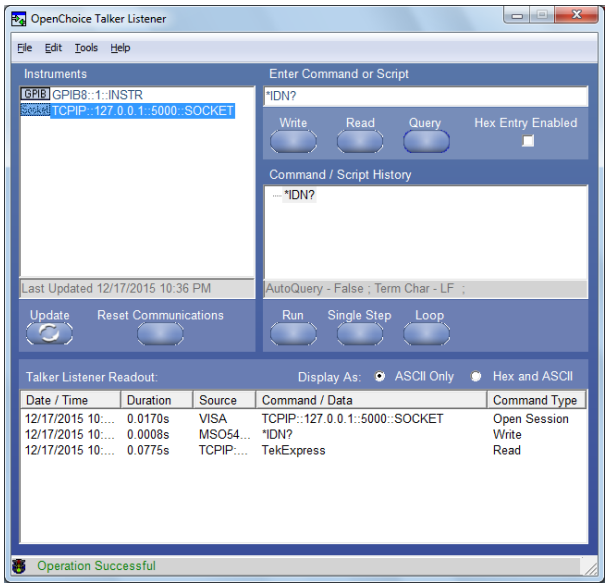
   Enter the Hostname as 127.0.0.1 if the TekVISA and TekExpress application are in the same system, else enter the IP address of the TekExpress application system.



3. Click **Search** to setup the TCPIP connection with the host. Check whether the TCPIP host name is displayed in **OpenChoice Instrument Manager** > **Instruments**



4. Double-click **OpenChoice Takler Listener** and enter the Command *IDN? in command entry field and click **Query**. Check that the Operation is successful and Talker Listener Readout displays the Command / Data.



TEKEXP:*IDN?

This command queries the active TekExpress application name running on the scope.

Syntax TEKEXP:*IDN?\n

Inputs NA

Outputs Returns active TekExpress application name running on the scope

TIP. *Click here for examples.*

TEKEXP:*OPC?

This command queries the execution status of the last executed command.

Syntax TEKEXP:*OPC?\n

Inputs NA

Outputs 0 - last command execution is not complete

1 - last command execution is complete

TIP. *Click here for examples.*

TEKEXP:EXPORT

This command returns all the bytes of data to the specified file.

Syntax	Outputs
TEKEXP:EXPORT REPORT\n	Returns the report file in bytes
TEKEXP:EXPORT IMAGE,"<FileName>"\n	Returns the specified image file in bytes

Inputs FileName - Specifies the file name

TIP. *Click here for examples.*

TEKEXP:INFO?

This command queries the information about the file(s).

Syntax	Outputs
TEKEXP:INFO? REPORT\n	<ReportFileSize>,"<ReportFileName.mht>"
TEKEXP:INFO? IMAGE\n	<Image1FileSize>,"<Image1FileName>";<Image2FileSize>,"<Image2FileName>" ;...

TIP. *Click here for examples.*

TEKEXP:INSTRUMENT

This command sets the value for the selected instrument type.

Syntax TEKEXP:INSTRUMENT "<InstrumentType>",<Value>"\n

Inputs InstrumentType

Value

TIP. *Check Command parameters list for InstrumentType and Value parameters.*

Outputs NA

TIP. *Click here for examples.*

TEKEXP:INSTRUMENT?

This command queries the instrument selected for the specified instrument type.

Syntax TEKEXP:INSTRUMENT? "<InstrumentType>"\n

Inputs InstrumentType

TIP. *Check Command parameters list for InstrumentType parameters.*

Outputs Returns the instrument selected for the specified instrument type

TIP. *Click here for examples.*

TEKEXP:LASTERROR?

This command queries the last error string occurred for the current TCP session. If there are no errors since startup, or since the last call to TEKEXP:LASTERROR?\n, this command returns an empty string.

Syntax TEKEXP:LASTERROR?\n

Inputs NA

Outputs <string>

TIP. *Click here for examples.*

TEKEXP:LIST?

This command queries the list of available device, suite, test, version or instrument.

Syntax	Outputs
TEKEXP:LIST? DEVICE\n	Returns the list of available device(s) as comma separated values.
TEKEXP:LIST? SUITE\n	Returns the list of available suite(s) as comma separated values.
TEKEXP:LIST? TEST\n	Returns the list of available test(s) as comma separated values.
TEKEXP:LIST? VERSION\n	Returns the list of available version(s) as comma separated values.
TEKEXP:LIST? INSTRUMENT,"<InstrumentType>"\n	Returns the list of available instruments' for the given Instrument type as comma separated values.

NOTE. *This command returns the list of items within double quotes (""). Iterate the receive procedure until the list ends with double quotes otherwise the next query commands won't work as expected.*

Inputs InstrumentType

TIP. *Check Command parameters list for InstrumentType parameters.*

TIP. *Click here for examples.*

TEKEXP:MODE

This command sets the execution mode as compliance or user defined.

Syntax TEKEXP:MODE {COMPLIANCE | USER-DEFINED}\n

Inputs {COMPLIANCE | USER-DEFINED}

Outputs NA

TIP. *Click here for examples.*

TEKEXP:MODE?

This command queries the execution mode type.

Syntax TEKEXP:MODE?\n

Inputs NA

Outputs {COMPLIANCE | USER-DEFINED}

TIP. *Click here for examples.*

TEKEXP:POPUP

This command sets the response to the active popup shown in the application.

Syntax TEKEXP:POPUP “<PopupResponse>”\n

Inputs PopupResponse

Outputs NA

TIP. *Click here for examples.*

TEKEXP:POPUP?

This command queries the active popup information shown in the application.

Syntax TEKEXP:POPUP?\n

Inputs NA

Outputs Returns the active popup information in the application.

TIP. *Click here for examples.*

TEKEXP:REPORT

This command generates the report for the current session.

Syntax TEKEXP:REPORT GENERATE\n

Inputs GENERATE

Outputs NA

TIP. *Click here for examples.*

TEKEXP:REPORT?

This command queries the queried header field value in the report.

Syntax TEKEXP:REPORT? “<HeaderField>”\n

Inputs HeaderField - Specifies to return the measured value for the indicated test.

TIP. *Check* ***Report*** *for HeaderField parameters.*

Outputs Returns the queried header field value in the report

TIP. *Click here for examples.*

TEKEXP:RESULT?

This command queries the result available in report summary/details table.

Syntax	Outputs
TEKEXP:RESULT? "<TestName>"\n	Return Pass/Fail status of the test.
TEKEXP:RESULT? "<TestName>","<ColumnName>"\n	Returns all the row values of the specified column for the test.
TEKEXP:RESULT? "<TestName>","<ColumnName>",<RowNumber>\n	Returns the column value for the specified row number [1]

[1] Row number starts from zero.

Inputs

TestName - Specifies the name of the test for which to obtain the test result value.

ColumnName - Specifies the column name for the measurement

RowNumber - Specifies the row number of the measurement

TIP. *Check* ***Results*** *panel for TestName, ColumnName, and RowNumber parameters.*

TIP. *Click here for examples.*

TEKEXP:SELECT

This command selects the device, suite, version, or test.

Syntax

TEKEXP:SELECT <string1>,<string2>,<string4>\n

TEKEXP:SELECT TEST,<string3>,<string4>\n

Inputs

<string1> = {DEVICE | SUITE | VERSION}

<string2> = {DeviceName | SuiteName | VersionName}

<string3> = {“<TestName>"| ALL| REQUIRED }

<string4> = {TRUE | FALSE}

TIP. *Check Command parameters list for DeviceName, SuiteName, VersionName, and TestName parameters.*

TIP. *Click here for examples.*

Outputs NA

TEKEXP:SELECT?

This command queries the name of the selected device, suite, version, or test.

Syntax TEKEXP:SELECT? {DEVICE | SUITE | TEST | VERSION}\n

Inputs {DEVICE | SUITE | TEST | VERSION}

Outputs Returns the name of the selected device, suite, version, or test.

TIP. *Click here for examples.*

TEKEXP:SETUP

This command sets the value of the current setup.

Syntax	Outputs
TEKEXP:SETUP DEFAULT\n	Restore to default Setup
TEKEXP:SETUP OPEN,"<SessionName>"\n	Open the session
TEKEXP:SETUP SAVE\n	Save the session
TEKEXP:SETUP SAVE,"<SessionName>"\n	Save the session

Inputs SessionName - The name of the session

TIP. *Click here for examples.*

TEKEXP:STATE

This command sets the execution state of the application.

Syntax TEKEXP:STATE {RUN | STOP | PAUSE | RESUME}\n

Inputs {RUN | STOP | PAUSE | RESUME}

Outputs NA

TIP. *Click here for examples.*

TEKEXP:STATE?

This command queries the current setup state.

Syntax	Outputs
TEKEXP:STATE?	RUNNING | PAUSED | WAIT | ERROR | READY | STOPPED
TEKEXP:STATE? SETUP	SAVED | NOT_SAVED

TIP. *Click here for examples.*

TEKEXP:VALUE

This command sets the value of parameters of type General or DUTID.

Syntax TEKEXP:VALUE GENERAL,"<ParameterName>",“<Value>”\n
TEKEXP:VALUE DUTID,“<Value>”\n

Inputs ParameterName - Specifies the parameter name
Value - Specifes the value to set

TIP. *Check Command parameters list for ParameterName and Value parameters.*

Outputs NA

TIP. *Click here for examples.*

TEKEXP:VALUE?

This command queries the value of the parameter for type General or DUTID.

Syntax	Outputs
TEKEXP:VALUE? GENERAL,"<ParameterName>"\n	Returns the value of Parameter for type GENERAL
TEKEXP:VALUE? DUTID\n	Returns the DUTID value

Inputs ParameterName - Specifies the parameter name

TIP. *Check Command parameters list for ParameterName parameters.*

Outputs Returns the value of Parameter for type GENERAL | DUTID.

TIP. *Click here for examples.*

Command parameters list

This section provides the parameters list for the SCPI commands.

Parameters	Description
InstrumentType	Specifies the instrument type. Valid values are: ■ Sampling Scope
Value	Specifies the value parameters. ■ For InstrumentType, valid values are: ■ Do not use ■ GPIB8::1::INSTR ■ For DUTID, valid value is: ■ Comment
DeviceName	Specifies the device name. Valid values are: ■ DR ■ FR ■ LR
SuiteName	Specifies the suite name. Valid values are 50G, 100G, 200G, 400G
TestName	■ Transmitter and Dispersion Eye Closure ■ Average Launch Power ■ Outer Optical Modulation Amplitude ■ Signaling Rate ■ Launch Power in OMAouter minus TDECQ ■ Extinction Ratio ■ Average Launch Power of Off Transmitter ■ RINxOMA

ParameterName and Value for General

Specifies the ParameterName and Value for General, Acquire and Analyze. The configuration parameters available are not same for measurements.

Table 15: ParameterName and Value for General

ParameterName	Value
Report Update Mode	■ New ■ Append ■ Replace ■ ReplaceAny
Replace Runsession Path	Session file path. Example: X:\400G-TXO\Session1\DUT001\20170421_121534
Include Header In Appended Reports	■ "True" ■ "False"
Auto increment report name if duplicate	■ "True" ■ "False"
Include Pass/Fail Results Summary	■ "True" ■ "False"
Include Detailed Results	■ "True" ■ "False"
Include Plot Images	■ "True" ■ "False"
Include Setup Configuration	■ "True" ■ "False"
Report margin value in percentage	■ "True" ■ "False"
Include User Comments	■ "True" ■ "False"
Save As Type	■ Web Archive (*.mht;*.mhtml) ■ PDF (*.pdf;) ■ CSV (*.csv;)
View Report After Generating	■ "True" ■ "False"

ParameterName	Value
Report Group Mode	■ Test Name ■ Test Result
Create report at the end	■ "True" ■ "False"
DUTID Comment	User comment
Run Test More than Once	TRUE or FALSE
Number of Runs	1 to 100
Timer Warning Info Message Popup	■ "True" ■ "False"
Timer Warning Info Message Popup Duration	1 to 100
Timer Error Message Popup	■ "True" ■ "False"
Timer Error Message Popup Duration	1 to 100
Pattern Length	2 to 100000
Data Rate	Valid values are: ■ 25 to 28.5 for 200G DR and all speeds of FR/LR ■ 50 to 56 for 100G and 400G DR
Wavelength	Wavelength supported by the connected optical module. For example: ■ 1310 : FACTORY ■ 1550 : FACTORY
MODE	■ COMPLIANCE ■ USER-DEFINED
Signal Conditioning Mode	■ BandWidth ■ Filter
Filter	Filter supported by the connected optical module. For example: ■ 40GBASE-LR ■ OTU-4

ParameterName	Value
BandWidth	Bandwidth supported by the connected optical module. For example: ■ "70.000GHz" ■ "55.000GHz"
Histogram Width	2 to 10
Population Limit	431100 to 10000000
PhaseRefCheck	■ "True" ■ "False"
Trigger Source	■ Tek CRU ■ Others
Data to Clock ratio	1, 2, 4, 8
Auto FFE	■ "True" ■ "False"
Recall 80SJNB Data	■ "True" ■ "False"
80SJNB Data File	File path. Example: C:\DataFile\PRBS15.mat
Optical Source	CH1, CH2, CH3, CH4

Examples

This section provides the examples for the SCPI commands.

Example	Description
TEKEXP:*IDN?\n	It returns the active TekExpress application name running on the scope.
TEKEXP:*OPC?\n	It returns the last command execution status.
TEKEXP:EXPORT REPORT\n	It returns the report file in bytes. This can be written into another file for further analysis.
TEKEXP:INFO? REPORT\n	It returns “100,”ReportFileName.mht”", when 100 is the filesize in bytes for the filename ReportFileName.
TEKEXP:INSTRUMENT? “Sampling Scope”\n	It returns "DSA8300 (GPIB8::1::INSTR), when DSA8300 (GPIB8::1::INSTR)" is the connected.
TEKEXP:LASTERROR?\n	It returns ERROR: INSTRUMENT_NOT_FOUND, when no instrument is found.
TEKEXP:LIST? DEVICE\n	It returns "DR,FR,LR" when DR, FR, and LR are the available device.
TEKEXP:LIST? INSTRUMENT,"Sampling Scope"\n	It returns "DSA8300 (GPIB8::1::INSTR)" when DSA8300 is the available instruments.
TEKEXP:MODE COMPLIANCE\n	It sets the execution mode as compliance.
TEKEXP:MODE?\n	It returns COMPLIANCE when the execution mode is compliance.
TEKEXP:POPUP “OK”\n	It sets OK as the response to active popup in the application.
TEKEXP:POPUP?\n	It returns "OK", when OK is the active popup information shown in the application.
TEKEXP:REPORT GENERATE\n	It generates report for the current session.
TEKEXP:REPORT? “Scope Information”\n	It returns "DSA8300" when DSA8300 is the scope model.
TEKEXP:REPORT? “DUT ID”\n	It returns "DUT001" when DNI_DUT001 is the DUT ID.
TEKEXP:SELECT DEVICE, DR, TRUE\n	It selects DR
TEKEXP:SELECT? DEVICE\n	It returns "TX-Device" when TX-Device is the selected device type.
TEKEXP:SETUP DEFAULT\n	It restores the application to default setup.
TEKEXP:STATE STOP\n	It stops the test execution.
TEKEXP:STATE?\n	It returns as READY when the application is ready to run next measurement.
TEKEXP:STATE? SETUP\n	It returns as NOT_SAVED when the current setup is not saved.
TEKEXP:VALUE GENERAL,"Pattern Length", "511"\n	It sets the pattern length to 511.
TEKEXP:VALUE? GENERAL,"Pattern Length"\n	It returns "511", when 511 is the pattern length.
TEKEXP:VALUE GENERAL,"Report Update Mode","Replace"	It sets to replace current test results in the report with the test result(s) of previous run in current session.
TEKEXP:VALUE GENERAL,"Report Update Mode","ReplaceAny"	It sets to replace current test results in the report with the test result(s) from the selected session.
TEKEXP:VALUE GENERAL,"Replace Runsession Path","X:\400G-TXO\Session1\DUT001\20170421_121534"	It sets the session from which to replace the result(s).

References

Technology overview

The 400G-TXO application provides measurements for characterization of 50G, 100G, 200G, and 400G PAM4 (pulse amplitude modulation) optical signal at TP2. All measurements will be done on a sampling oscilloscope using either base oscilloscope, 80SJNB, or measurements.

Table 16: 400G-TXO optical standards

Standards	Data rate / Symbol rate (GBd)	Bit rate (Gbps)	Number of lanes	Operating range	Optical reference receiver filter
50GBASE-FR	26.5625	53.125	1	2 m to 2 km	19.34 GHz
50GBASE-LR	26.5625	53.125	1	2 m to 10 km	19.34 GHz
100GBASE-DR	53.125	106.25	1	2 m to 500 m	38.68 GHz
200GBASE-FR4	26.5625	53.125	4	2 m to 2 km	19.34 GHz
200GBASE-LR4	26.5625	53.125	4	2 m to 10 km	19.34 GHz
200GBASE-DR4	26.5625	53.125	4	2 m to 500 m	19.34 GHz
400GBASE-FR4	26.5625	53.125	8	2 m to 2 km	19.34 GHz
400GBASE-LR4	26.5625	53.125	8	2 m to 10 km	19.34 GHz
400GBASE-DR4	53.125	106.25	4	2 m to 500 m	38.68 GHz

Table 17: 400G-TXO measurements and the standards they support

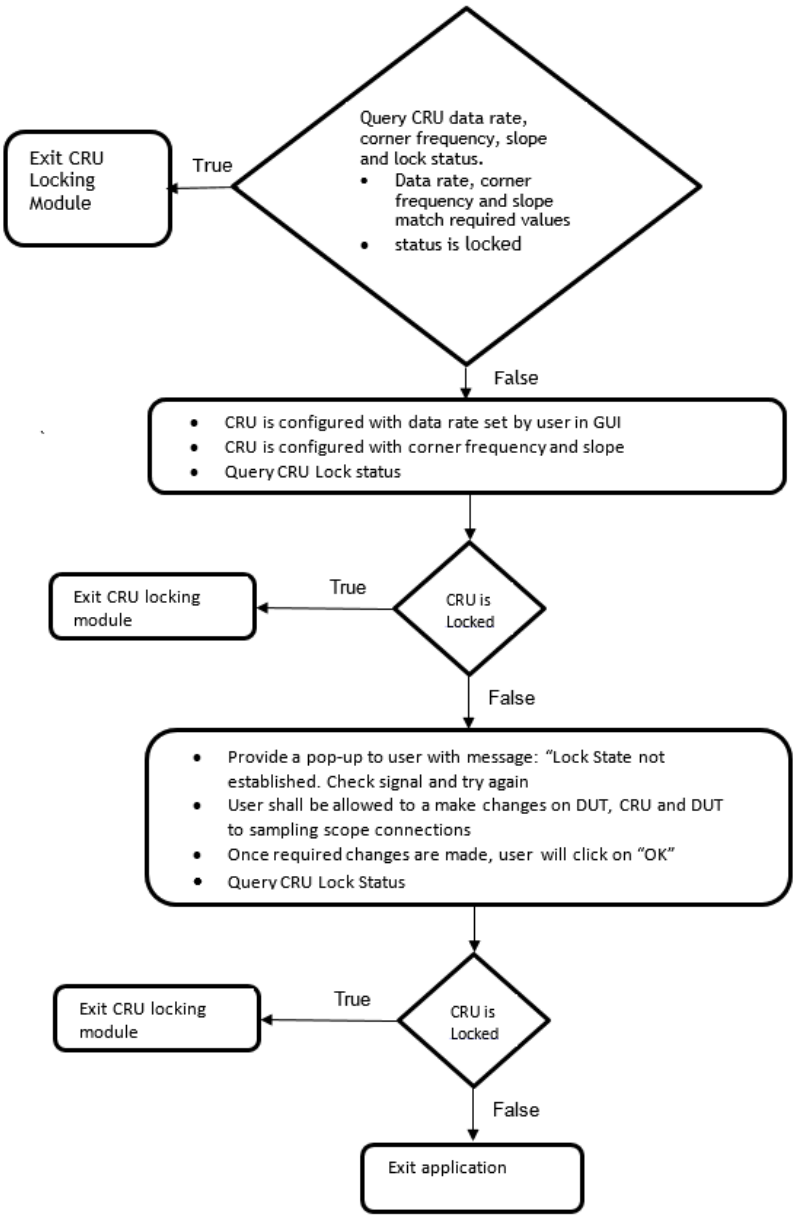
Measurements	50GBASE-FR	50GBASE-LR	100GBASE-DR	200GBASE-FR4	200GBASE-LR4	200GBASE-DR4	400GBASE-FR4	400GBASE-LR4	400GBASE-DR4
Signaling Rate	✓	✓	✓	✓	✓	✓	✓	✓	✓
Average launch power	NA	NA	✓	✓	✓	✓	✓	✓	✓
Outer Optical Modulation Amplitude	✓	✓	✓	✓	✓	✓	✓	✓	✓
Launch power in OMA outer minus TDECQ	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transmitter and dispersion eye closure for PAM4	✓	✓	✓	✓	✓	✓	✓	✓	✓

Measurements	50GBASE-FR	50GBASE-LR	100GBASE-DR	200GBASE-FR4	200GBASE-LR4	200GBASE-DR4	400GBASE-FR4	400GBASE-LR4	400GBASE-DR4
Average launch power of OFF transmitter	✓	✓	✓	✓	✓	✓	✓	✓	✓
Extinction ratio	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total average launch power	✓	✓	NA	✓	✓	✓	✓	✓	NA
Difference in launch power between any two lanes	NA	NA	NA	NA	✓	✓	✓	✓	NA
RINxOMA	✓	✓	✓	✓	✓	✓	✓	✓	✓

Tektronix clock recovery unit (CRU)

The Tektronix clock recovery unit is configured with the Nominal Data rate (set by the user in GUI), Corner frequency of 10 MHz, Slope of 20 dB/decade, for example, 0 dB peaking, and Lock range of 10 MHz.

The CRU locked data rate value is used as the result for the Signaling Rate measurement. The following flow diagram shows the detailed flow used by the CRU locking mechanism in the 400G-TXO application.



The SUBRATE CLOCK output of the CRU is given to Clock input / Pre-scale of the sampling oscilloscope. The CLK OUTPUT of the CRU is sent to the phase reference module.

NOTE.

- *The 400G-TXO application only supports an external clock recovery unit (optional).*
- *Tektronix clock recovery unit supports up to 28 GBd.*

Clock / Pre-scalar

The clock signal (synchronous to data) can be provided using either the Tektronix external CRU, or other source having clock signal in synchronous with data and perform similar to the Tektronix external CRU. If you use another trigger source, then you can configure the clock divider parameter.

The clock divider is the ratio of the data rate to the frequency of the clock signal, fed as an input to the phase reference. It is used to determine the frequency of phase characterization (used only if phase reference module is present in one of the slots in the main frame).

Phase characterization frequency = Data rate / Clock divider

Phase reference characterization

The phase reference module is not a mandatory requirement for 400G-TXO measurements. If a phase reference module is present in any of the sampling oscilloscope slots, then the setup provides a clock signal synchronous with data as input to the phase reference module (can use the recovered clock from the CRU). Phase reference characterization is done with the phase correction mode as “triggered” and the input frequency equal to frequency of the input clock signal.

NOTE. *The recovered clock frequency from CR286A is half of the data rate, when the data rate is greater than 14.3 Gb/s.*

The 400G-TXO application uses only one phase reference module; if the system has multiple modules, then the lower numbered slot is used and others are ignored. This slot/channel information is obtained from the phase reference source query, using the instrument programmatic interface internally.

If there is no phase reference module, then the query results in C1C2 (default), and performs an additional query of model number. If the model number is 82A04B, then proceed with phase reference characterization, otherwise skip the phase reference characterization.

Parameters

About application parameters

This section describes the 400G-TXO application parameters, and includes the default menu settings.

The parameters for the menus, and options list the selections available for each and include the default values.

Setup panel configuration parameters

DUT tab parameters.

Parameters	Selection	Default Setting
DUTID	-	DUT001
Mode	Compliance, User defined	Compliance
Standard	DR, FR, LR	DR
Speed	50G, 100G, 200G, 400G	200G
Device Profile		
Optical Module Settings		
Data Rate		
50GBASE-FR, 50GBASE-LR, 200GBASE-DR4, 200GBASE-FR4, 200GBASE-LR4, 400GBASE-FR8, and 400GBASE-LR8	25 GBd to 28.05 GBd	26.5625 GBd
100GBASE-DR and 400GBASE-DR4	50 GBd to 56 GBd	53.125 GBd
Wavelength	None	None
Pattern Type	2 to 100000	511

Test Selection tab parameters.

Parameters	Selection	Default Setting
400G-TXO Measurements	■ Tramsnitter and Dispersion Eye Closure (TDECQ) ■ Average Launch Power ■ Outer Optical Modulation Amplitude ■ Signaling Rate ■ Launch Power in OMAOuter minus TDECQ ■ Extinction Ratio ■ Average Launch Power of Off Transmitter ■ RINxOMA	All measurements selected

Configuration tab parameters.

Table 18: Global settings parameters

Parameters	Selection	Default Setting
TDECQ Signal Conditioning		
Filter	None	None
Bandwidth	None	None
Histogram WIdth	2 to 10	4
Population Limit	431100 to 10000000	1000000
Trigger Source		
50GBASE-FR, 50GBASE-LR, 200GBASE-DR4, 200GBASE-FR4, 200GBASE-LR4, 400GBASE-FR8, and 400GBASE-LR8	Tek CRU, Others	Tek CRU
100GBASE-DR and 400GBASE-DR4	Others	Others
Auto FFE	Select, De-select	Select
Recall 8SJNB Data	Select, De-select	De-select

Preferences tab parameters.

Parameters	Selection	Default Setting
Acquire/Analyze each test X times	1 to 200	1
Auto close Warnings and Information during Sequencing Auto close after X Seconds	1 to 300	10
Auto close Error Messages during Sequencing, Show in Reports Auto close after X Seconds	1 to 300	10

Reports panel parameters

Parameters	Selection	Default Setting
Report name	-	x:\400G-TXO\Reports \DUT001.mht
Save as Type	PDF (*.pdf;), Web Archive (*.mht; *.mhtml), CSV (*.csv;)	Web Archive (*.mht; *.mhtml)

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