Tektronix®

TekExpress® DDR Tx Software

Printable Application Help

077-1648-00

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www.tek.com
077-1648-00

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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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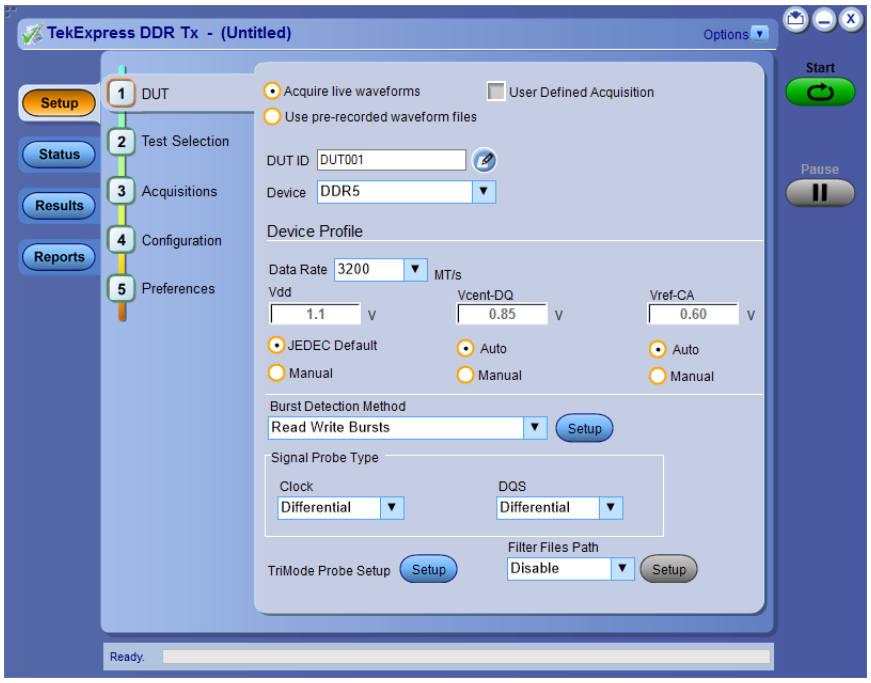
Welcome



DDR (Dual Data Rate) is a dominant and fast-growing memory technology. It offers high data transfer rates required for virtually all computing applications, from consumer products to the most powerful servers. The high speeds of these signals require high performance measurement tools.

The Tektronix TekExpress DDR Tx is an automated test application to validate and debug DDR5 design of the DUT as per the latest JEDEC specification. The solution enables you to achieve new levels of productivity, efficiency, and measurement reliability.

Key features

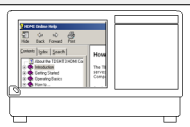
1. Total 52 Measurements of DDR5 System Transmitter Tests as per DDR5 JEDEC Specification
   a. 21 Clock Measurements
   b. 9 Write Burst Measurements
   c. 1 Write Data Eye Measurement
   d. 13 Read Burst Measurements
   e. 8 Command and Address Measurements
2. User defined acquisition mode for Clock, Command Address, Data Strobe, and Data for both Write and Read traffic (or bursts)
3. De-embedding support for Clock, Command Address, Data Strobe, and Data for both Write and Read traffic (or bursts)
4. Number of UIs support for Clock and Read/Write Data measurements
5. Deploys 'DDR DFE' Standalone application, that can be launched from TekScope > Analyze > DDR DFE
6. Support DFE for Write Data Eye measurements
7. User friendly measurement configurations
8. Test Report to reflect all the statistics of the measurement
9. User can select the source and channel in acquisition panel
10. Multiple Burst Detection Method supported - Read and Write, Write Only, Read Only, Visual Search
11. Diamond shape mask and margin analysis for Write Data Eye measurement

Getting help and support

Related documents

The following manuals are available as part of the TekExpress DDR Tx Automated Solution documentation set.

Table 1: Product documentation

Item	Purpose	Location
Online Help	In-depth operation and UI help.	
PDF of the Online Help (077-1648-XX)	In-depth operation and UI help.	

Conventions

Help uses the following conventions:

- The term "Application," and "Software" refers to the TekExpress DDR Tx application.
- The term “DUT” is an abbreviation for Device Under Test.
- The term “select” is a generic term that applies to the two methods of choosing a screen item (button control, list item): using a mouse or using the touch screen.
- A Note identifies important information.

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 Web site. See *www.tek.com* at the front of this document for contact 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
- Modules 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

Supported oscilloscope models

- DPO71604SX, DPO72304SX, DPO73304SX
- MSO72304DX, MSO72504DX, MSO73304DX, DPO72304DX, DPO72504DX, DPO73304DX

Recommended probes

Active probes:

- **P7720** 20 GHz Trimode Probe with TekFlex connector technology
- **P7716** 16 GHz Trimode Probe with TekFlex connector technology

Probe tips:

- **P77STFLXA / P77STCABL** : Active, Solder-in Tip with TekFlex connector technology; probe tips to probe directly on the motherboard or vias.
- **P77STFLXB / P77STCABL**: Active, Solder-in Tip with TekFlex connector technology; probe tips to probe CLK, DQS, DQ, and CA/CKE/CS on the Nexus XH Series SI Interposer.
- **Edge interposer NEX-DDR5MCI78XHEPTD** : Order from Nexus. Please also request the s-par files for all individual signals on the interposer instead of getting a generic nominal s-par model.
- **SI Interposer** : Edge Probe, Direct Attach, Socketed interposer available from Nexus. Please order directly from Nexus. Please request the s-par files for all individual signals on the interposer instead of getting a generic nominal s-par model.

  Refer the Nexus's page for more information: *http://www.nexustechnology.com/products/memory-interposers/ddr5-main-memory-interposers/*.

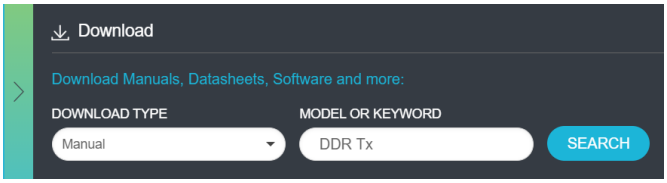
Required software

- **DDR5SYS**: DDR5 Memory Bus Electrical Validation and Analysis Oscilloscope Software.
- **SDLA64**: Serial Data Link Analysis for Win 64-bit Scopes.
- **DJA**: DPOJET Jitter Analysis.
- **VET**: VET – Visual Trigger.

Downloading and installing the software

Complete the following steps to download and install the latest DDR Tx application.

1. Go to *www.tek.com*.
2. Click **Downloads**. In the Downloads menu, select DOWNLOAD TYPE as Software and enter *DDR Tx* 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\TekExpress DDR Tx*.
5. Select **Application** > **TekExpress DDR Tx** from the Oscilloscope menu to launch the application.

Activate the license

Activate the license using the Option Installation wizard in the TekScope application:

1. In the TekScope application menu bar, click Utilities > Option Installation.

   The TekScope Option Installation wizard opens.

2. Push the F1 key on the oscilloscope keyboard to open the Option Installation help topic.

3. Follow the directions in the help topic to activate the license.

View software version

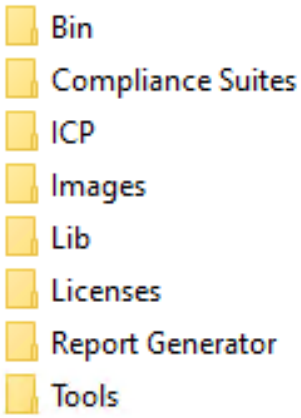
To view version information for DDR Tx, click **Options** > **About TekExpress**.

Application directories

The TekExpress DDR Tx application files are installed at the following location:

C:\Program Files\Tektronix\TekExpress\TekExpress DDR Tx

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
Bin	Contains application libraries
Compliance Suites	Contains test suite specific files
ICP	Contains instrument and application specific interface libraries
Licenses	
Images	Contains images of the application
Lib	Contains utility files specific to the application
Report Generator	Contains style sheets for report generation
Tools	Contains instrument and application specific files

File name extensions

The TekExpress DDR Tx software uses the following file name extensions:

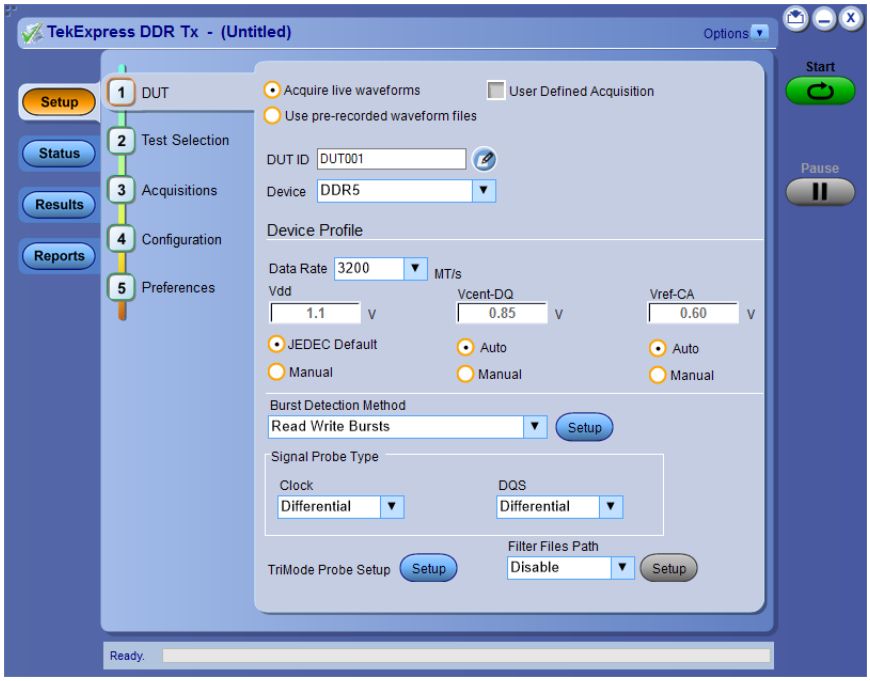
Table 4: File name extension

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
.png	Captured images

Operating basics

Launch the application

To launch the TekExpress DDR Tx application, select **Analyze** > **TekExpress DDR Tx** from the oscilloscope menu.



After first launch of Tekexpress DDR Tx application following changes take place on the oscilloscope.

During launch, "My TekExpress" folder is created in the Documents folder of the current user and gets mapped to "X" drive. When the application is closed properly, the "X" drive will get unmapped.

NOTE. *If a user with new login ID launches "TekExpress DDR Tx.exe", "My TekExpress" folder is created in the Documents folder of the new user.*

When you first run the application after installation, the application checks for Resources.xml located in the X:\ folder. The Resources.xml file gets created into X: drive, if the file is not found, then the application creates file with equipment details. Session files are then stored inside the X:\DDR Tx folder. If this file is not found, the application runs an instrument discovery program to detect connected instruments before launching TekExpress DDR Tx.

To keep the TekExpress DDR Tx application window on top, select Keep On Top from the *Options menu overview* on page 13. If the application goes behind the oscilloscope application, click Application > TekExpress DDR Tx to move the application to be in front.

NOTE. *When* ***Keep on Top*** *is selected, you cannot access the combo boxes in the application panels.*

See also

Exit the application on page 10

Exit the application

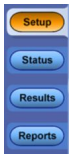
To exit the application, click  on the application title bar. Follow on-screen prompts to save any unsaved session, save test setup files, or exit the application.

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

Application controls

This section describes the application controls.

Table 5: Application control description

Item	Description
Options menu overview on page 13 	Menu to display global application controls.
Test panel 	Controls that open tabs for configuring test settings and options.
Start / Stop button  	Use the **Start** button to start the test run of the measurements in the selected order. If prior acquired measurements are not cleared, then 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.
Pause / Continue button 	Use the **Pause** button to pause the acquisition. When a test is paused, this button changes as **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 *Results panel* on page 42. ***NOTE.*** *This button is visible only when there are results data on the panel.*

Item	Description
Application window move icon 	Place the cursor over the top of the application window to move the application window to the desired location
Minimize icon 	Minimizes the application.
Close icon 	Close the application.
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. 

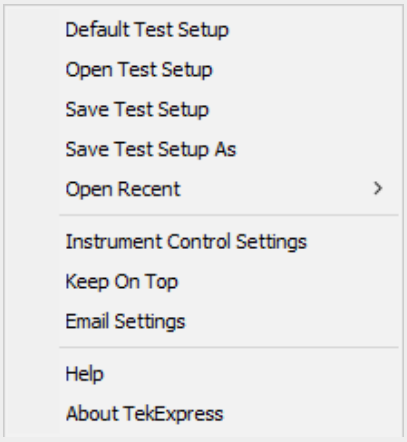
Global application controls

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

Options menu overview

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

Options menu



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
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
TekExpress instrument control settings on page 14	Detects, lists, and refreshes the connected instruments found on specified connections (LAN, GPIB, USB, and so on)
Keep On Top	Keeps the TekExpress DDR Tx application on top of all the application ***NOTE.*** *When* ***Keep on Top*** *is selected, you cannot access the combo boxes in the application panels.*
Email Settings	Use to configure email options for test run and results notifications

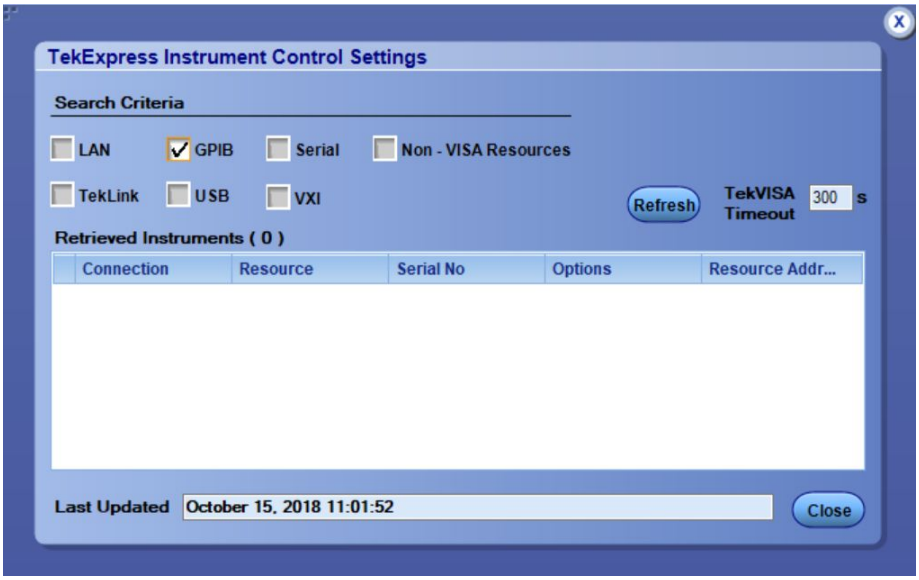
Menu	Function
Help	Displays the TekExpress DDR Tx help
About TekExpress	■ Displays application details such as software name, version number, and copyright ■ Provides a link to the end-user license agreement ■ Provides a link to the Tektronix Web site

See also. *Application controls* on page 11

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.

To access, click **Options** > **Instrument Control Settings**.



The connected instruments displayed here can be selected for use under Global Settings in the test configuration section.

See also. *Options menu overview* on page 13

View connected instruments

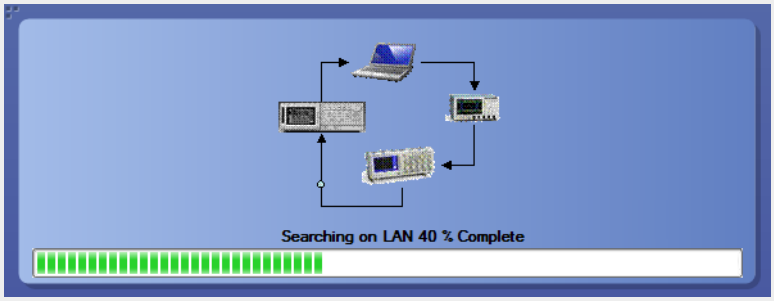
Use TekExpress Instrument Control Settings dialog box to search the instruments (resources) connected to the application. The application uses TekVISA to discover the connected instruments.

NOTE. *The instruments required for the test setup must be connected and it must be recognized by the application before running the test.*

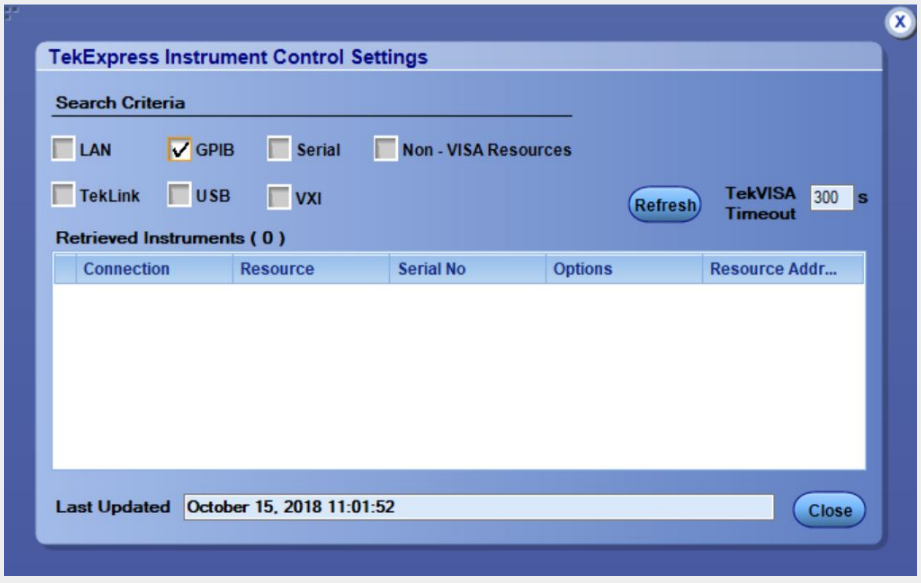
To refresh the list of connected instruments:

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.

   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.
3. Click **Refresh**. TekExpress searches for connected instruments.



4. After searching, the dialog box lists the instrument-related details based on the search criteria. For example, for the Search Criteria as LAN and GPIB, the application displays all LAN and GPIB instruments connected to the application.

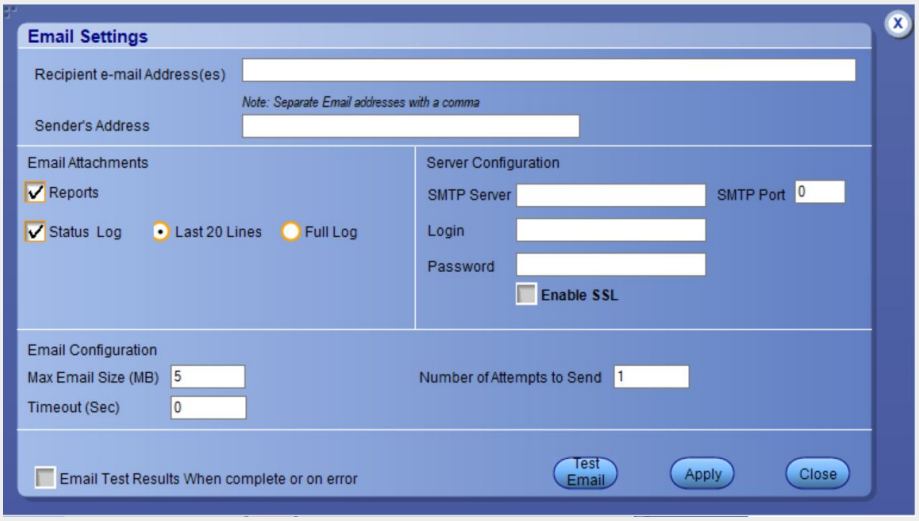


The details of the instruments are displayed in the Retrieved Instruments table. The time and date of instrument refresh is displayed in the Last Updated field.

Configure email settings

Use the Email Settings utility to get notified by email when a measurement completes, or produces any error condition. Follow the steps to configure email settings:

Email Settings



1. Select **Options > Email Settings** to open the Email Settings dialog box.
2. (Required) For **Recipient email Address(es)**, enter one or more recipient email addresses. 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 ID. For example: user@yourcompany.com.
4. (Required) In the **Server Configuration** section, type the SMTP Server address of the Mail server configured at the client location, and the SMTP Port number, in the corresponding fields.

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

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

---

5. In the **Email Attachments** section, select from the following options:
   - **Reports**: Select to receive the test report with the notification email.
   - **Status Log**: Select to receive the test status log with the notification email. If you select this option, then also select whether you want to receive the full log or just the last 20 lines.
6. In the **Email Configuration** section:
   - 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.

Application panels overview

TekExpress DDR Tx solution uses panels to group Test Setup 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.

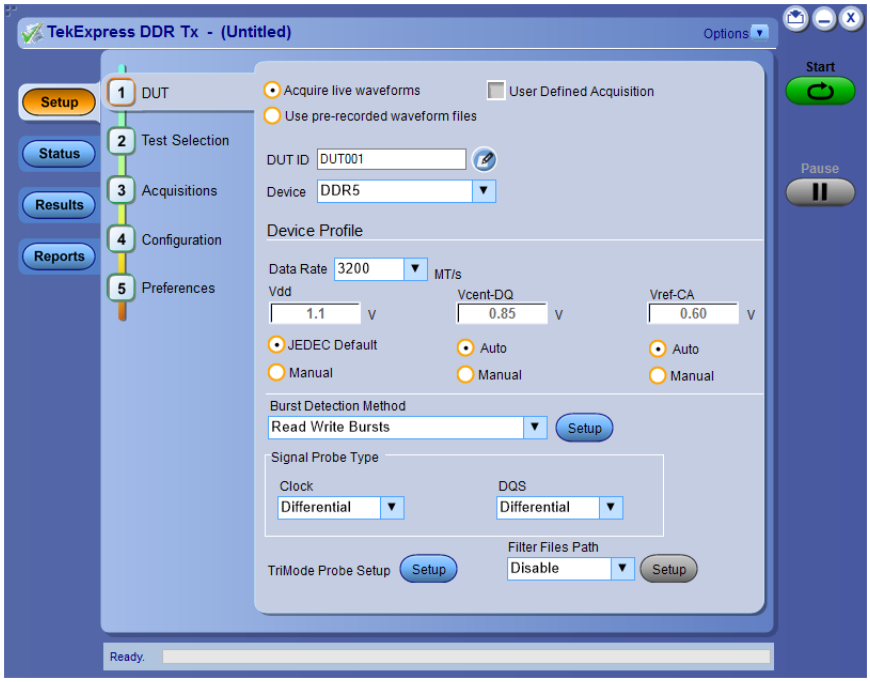


Table 6: Application panels overview

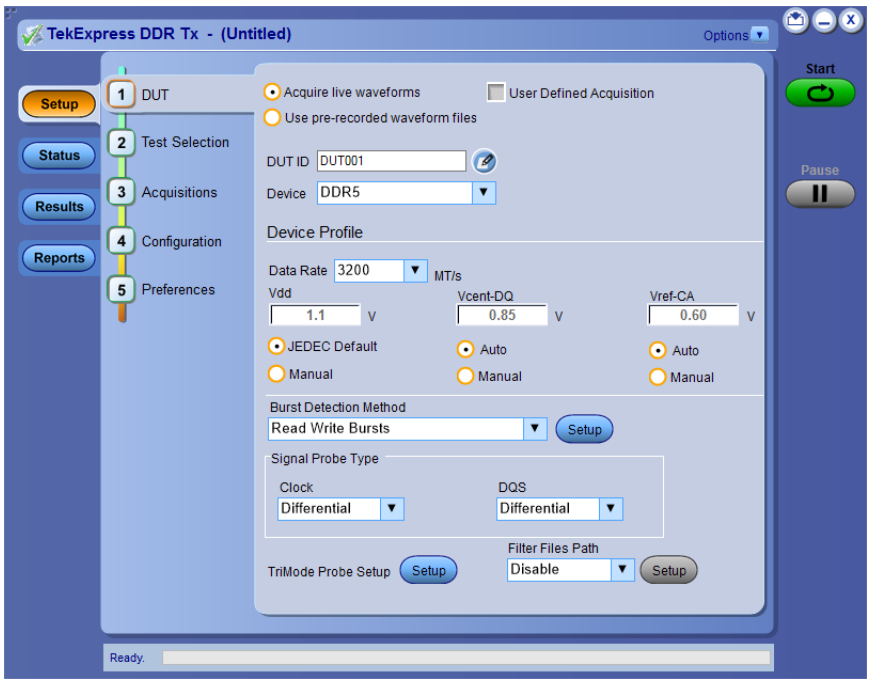
Panel Name	Purpose
Setup panel on page 19	The Setup panel shows the test setup controls. Click the **Setup** button to open this panel. Use this panel to: ■ *Set DUT parameters* on page 19 ■ *Select tests* on page 28 ■ *Set acquisition tab parameters* on page 29 ■ *Set configuration tab parameters* on page 30 ■ *Set preferences tab parameters* on page 38
Status panel on page 40	View the progress and analysis status of the selected tests, and view test logs.
Results panel on page 42	View the summary of test results and select result viewing preferences.
Reports panel on page 45	Browse for reports, save reports as specific file types, specify report naming conventions, select report content to include (summary information, detailed information, user comments, setup configuration, application configuration, etc.), and select report viewing options.

See also *Application controls* on page 11

Setup panel

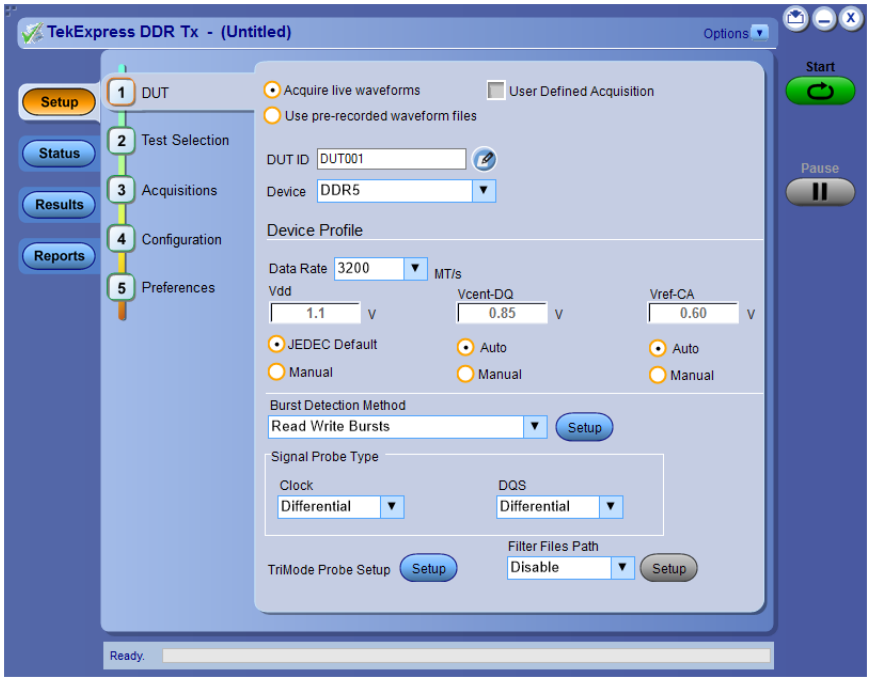
Setup panel overview

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



Set DUT parameters

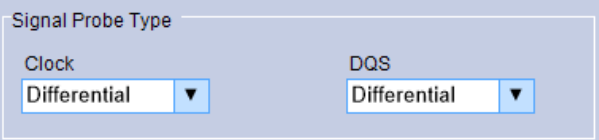
Use the DUT tab to select parameters for the device under test. These settings are global and apply to all tests of current session. DUT settings also affect the list of available tests in the Test Selection tab.

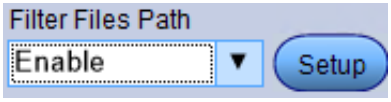
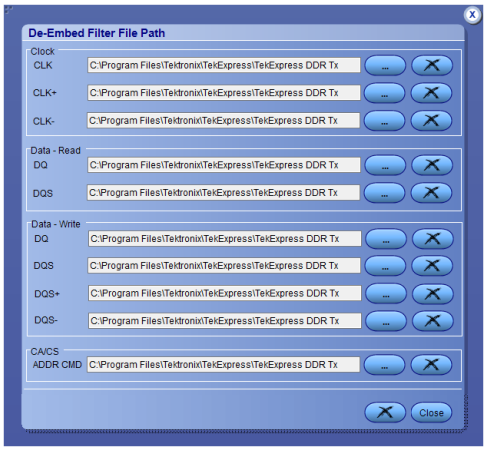


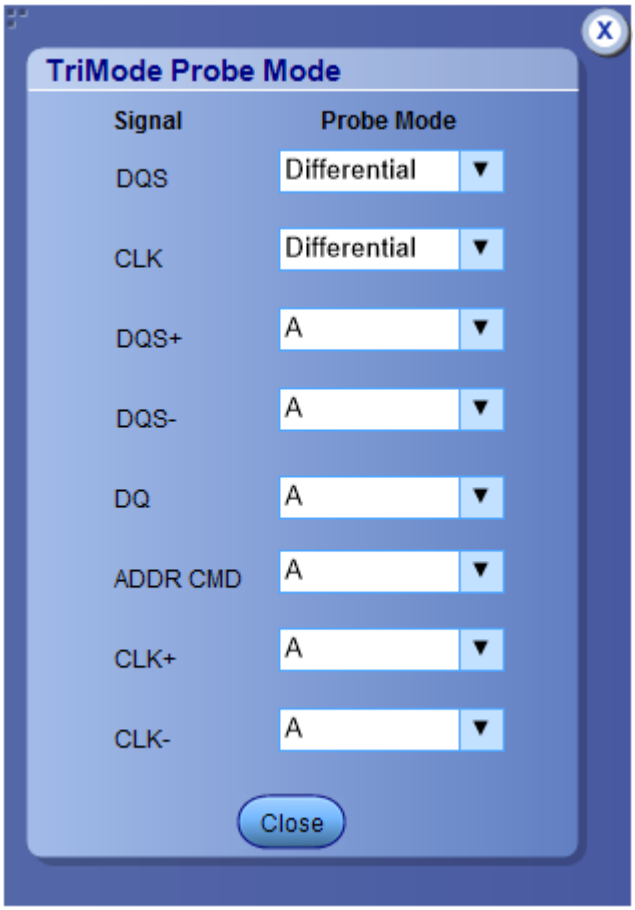
Click **Setup > DUT** to access the DUT parameters:

Table 7: DUT tab settings

Setting	Description
Acquire live waveforms	Acquire active signals from the DUT for measurement and analysis.
Use pre-recorded waveform files	Run tests on a saved waveform. *Open load a saved test setup* on page 54 **Click here** for details about the file names for pre-recorded waveform.
User Defined Acquisition	When selected, enables user to define the acquisition settings of their choice. Gives additional source option [MATH] for signals in acquisition panel.
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* on page 46.
Device	Select Device name as DDR5 from drop-down
Device Profile	
Data Rate (MT/s)	Select the data rate from drop down.
Vdd (V)	Vdd is the supply voltage for each DDR standard. For DDR5, it is 1.1 V. ■ Displays **JEDEC** value by default ■ Select **Manual** to change the Vdd value.

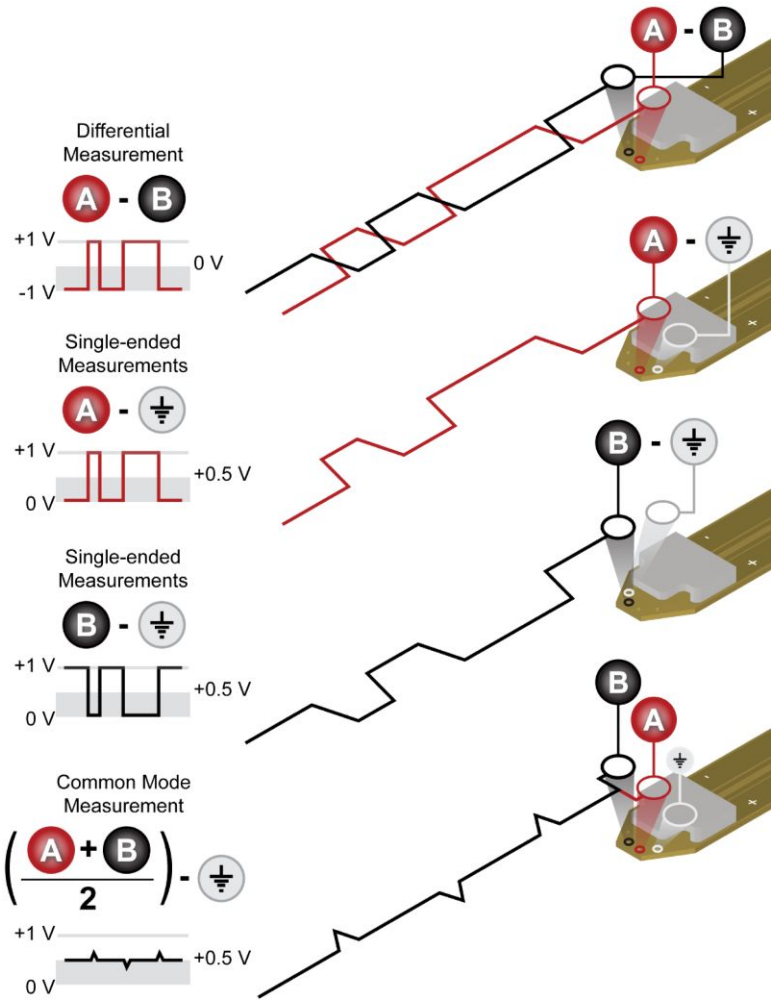
Setting	Description
Vcent-DQ (V)	Vcent_DQ is the voltage at which the cumulative eye of the pin DQx is widest. ■ Displays **Auto** value by default. ■ Select **Manual** to change the Vcent-DQ value from -2 V to 2 V.
Vref-CA (V)	Vref_CA is voltage at widest part of the eye. ■ Displays **Auto** value by default. ■ Select **Manual** to change the Vref-CA value from -2 V to 2 V.
Burst detection method on page 25	Selects the burst detection method from drop-down. ■ Read Write Bursts ■ Write Only Bursts ■ Read Only Bursts ■ Visual search
Signal Probe Type	Selects the probe type **Clock** and **DQS** to execute the tests. ■ **Clock** - Differential or Single Ended ■ **DQS** - Differential or Single Ended  You can configure the signal as per the probes you are planning to use to run the tests. For Clock: If probes are connected in a single-ended fashion, then internally a differential signal is created to perform clock jitter measurements. Based on the probe type selected for Clock or DQS, the test selection panel refreshes the measurements in clock and data group.

Setting	Description
Filter Files path	Select Enable or Disable from the drop-down list.   Click **Setup** ( ). Browse and select the filter files from the De-Embed Filter File Path menu for Differential and Single-Ended signals. Click **Close** to close the menu. 

Setting	Description
Trimode Probe Setup	With TriMode probing, one probe setup makes differential, single-ended, and common mode measurements accurately. Click **Setup**. In TriMode Probe Mode window, select A, B, or Differential from the drop-down list. ■ A represents that probe is configured to point A and ground. ■ B represents that probe is configured to point B and ground. ■ Differential represents that the probe is configured to point A and B respectively.  **Figure 1: TriMode Probe Mode window**

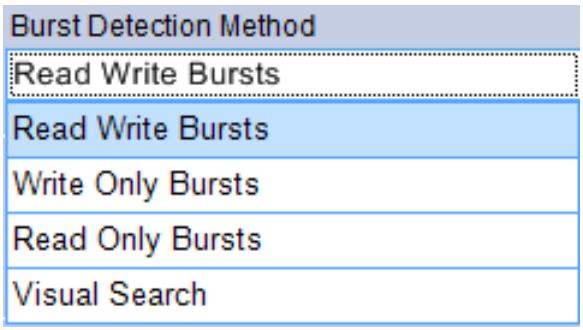
NOTE. *P7700 Series TriMode Probes*

With TriMode probing, one probe setup makes differential, single-ended, and common mode measurements accurately. This unique capability allows you to work more effectively and efficiently, switching between differential, single-ended and common mode measurements without moving the probe's connection points.



See also. *Select tests* on page 28

Burst detection method. Burst detection is applicable only for Write Bursts and Read Bursts of the DATA group measurements. The Burst Detection Setup controls the identification of data burst within a waveform which includes tri-state levels. For appropriately-probed signals with good signal fidelity, adjustment to the default values are not required. For signals with poor fidelity or unusual properties, burst detection can be improved by switching to Manual control and adjusting the detection levels.



The application supports the following burst detection methods:

1. **Read Write Bursts**: This method identifies READ and WRITE measurements that are available in the data group. Select this method when there is a voltage difference between READ and WRITE burst peak-to-peak level.

   NOTE.

   a. *When the DUT traffic is transmitting both Read + Write bursts and the Read burst amplitude is greater than the Write burst amplitude, follow the steps for burst detection:*

   a. *Measure the Pk2PK for Read burst using TekScope > Measure > Amplitude > Peak to Peak.*

   b. *Measure the Pk-Pk for Write burst using TekScope > Measure > Amplitude > Peak to Peak.*

   c. *In the Read tab of Burst Detection Setup window, set the Read Burst(pk-pk) value to be 5% lower than the value obtained from step 1.a.i.*

   d. *In the Write tab of Burst Detection Setup window, set the Write Burst(pk-pk) value to be 5% greater than the value obtained from step 1.a.ii.*

   b. *When the DUT traffic is transmitting both Read + Write bursts and the Read burst amplitude is lower than the Write burst amplitude, follow the steps for burst detection:*

   a. *Measure the Pk2PK for Read burst using TekScope > Measure > Amplitude > Peak to Peak.*

   b. *Measure the Pk-Pk for Write burst using TekScope > Measure > Amplitude > Peak to Peak.*

   c. *In the Read tab of Burst Detection Setup window, set the Read Burst(pk-pk) value to be 5% greater than the value obtained from step 1.b.i.*

   d. *In the Write tab of Burst Detection Setup window, set the Write Burst(pk-pk) value to be 5% lower than the value obtained from step 1.b.ii.*

2. **Write Only Bursts**: The method identifies only write measurements that are available in the data group.

   NOTE. *Configure the DUT data traffic to ALL WRITE BURSTS mode.*

3. **Read Only Bursts**: The method identifies only read measurements that are available in the data group.

NOTE. *Configure the DUT data traffic to ALL READ BURSTS mode.*

Table 8: Burst detection parameter description

Pre-amble Length (tCK)	Specify the Read / Write burst pre-amble length of your device here.
Post-amble Length (tCK)	Specify the Read / Write burst pre-amble length of your device here.
Burst Length (UI)	Specify the burst length of your device here. Used in case of Write Only Bursts or Read Only Bursts as Burst Detection Method.
Write Burst(pk-pk) (V)	Specify the DQS (pk-pk) voltage level of WRITE bursts. Used in case of Read Write Bursts as Burst Detection Method
Read Burst(pk-pk)(V)	Specify the DQS (pk-pk) voltage level of READ bursts. Used in case of Read Write Bursts as Burst Detection Method
Margin(%)	Specifies the voltage variance allowed in terms of percentage of peak-peak voltage. Used in case of Read Write Bursts as Burst Detection Method.
tDQS2DQ (ps) – Auto	tDQS2DQ value is automatically set by the application. Used in case of Read Write Bursts or Write Only Bursts for 'Write' as Burst Detection Method.
tDQS2DQ (ps) – Manual	tDQS2DQ value can be edited. Used in case of Read Write Bursts or Write Only Bursts for 'Write' as Burst Detection Method.

NOTE. *The High/Mid/Low levels used for burst detection have no relationship to the reference levels used for measurement points.*

a. Select the type of burst detection level for the search.

- If you select Auto, the application calculates these levels for you. It is recommended unless you find that manual levels are necessary for reliable detection.
- If you select Manual, enter both the Strobe and Data reference levels for the signal (High, Mid, and Low). As you adjust the detection levels, observe the search-and-mark sprites that appear above the waveform. These sprites are dynamically updated as you adjust the levels, helping you to identify levels that properly delimit the selected burst type.

b. These settings need not be changed in most cases:

- Edge Detection Hysteresis: This control configures the internal edge finder's hysteresis band which is used to detect read or write bursts. In the event of noisy inputs, it can be increased to correct marks which may be larger than appropriate.

- Termination Logic Margin: This value can be increased to help in terminating marks on back-to-back writes in cases where otherwise a continuous strobe would cause a write-mark to merge two back-to-back writes.

4. **Visual search**: Capturing and analyzing the right part of the waveform can require hours of collecting and sorting through the many acquisitions. The Visual Trigger feature in the oscilloscope makes the identification of the desired waveform events quick and easy by scanning through acquired analog waveforms and graphically comparing them to geometric shapes on the display. By discarding acquired waveforms which do not meet the graphical definition, Visual Triggering extends the trigger capabilities of the oscilloscope beyond the traditional hardware trigger system.

   Visual Trigger can be used to separate Read Bursts from Write Bursts and mark them. By selecting the Visual Search option in 'Burst Detection Method', these marked bursts can be used for further debugging and analysis.

Select tests

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

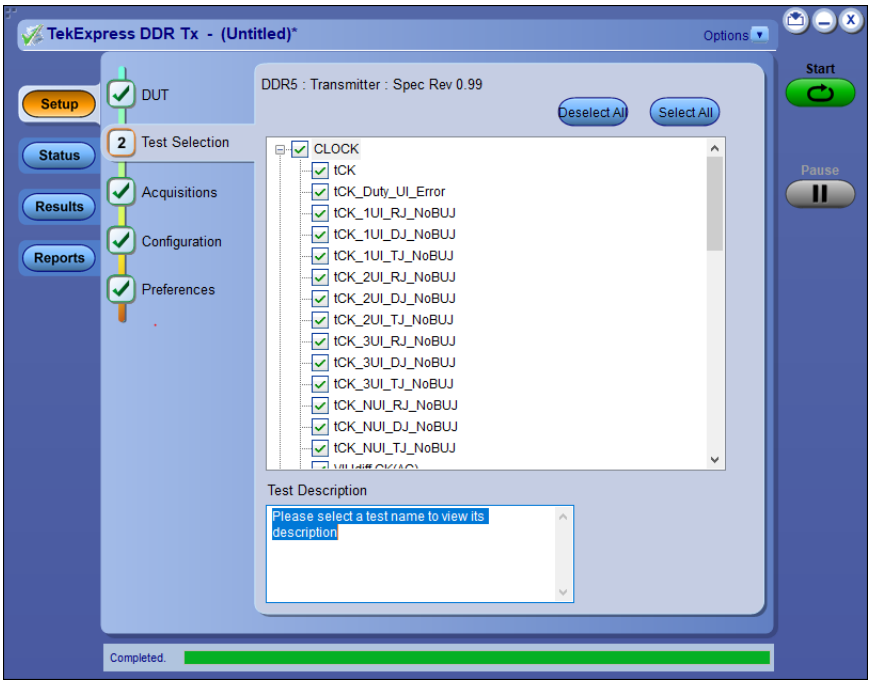


Figure 2: TekExpress DDR Tx measurements

Table 9: Test Selection tab settings

Setting	Description
Deselect All Select All	Deselect or select all tests in the list.
Tests	Click on a test to select or unselect. Highlight a test to show details in the Test Description pane. The application automatically selects all required tests when in Compliance mode.
Test Description	Shows brief description of the highlighted test in the test tree.

See also. *Set acquisition tab parameters* on page 29

Set acquisition tab parameters

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

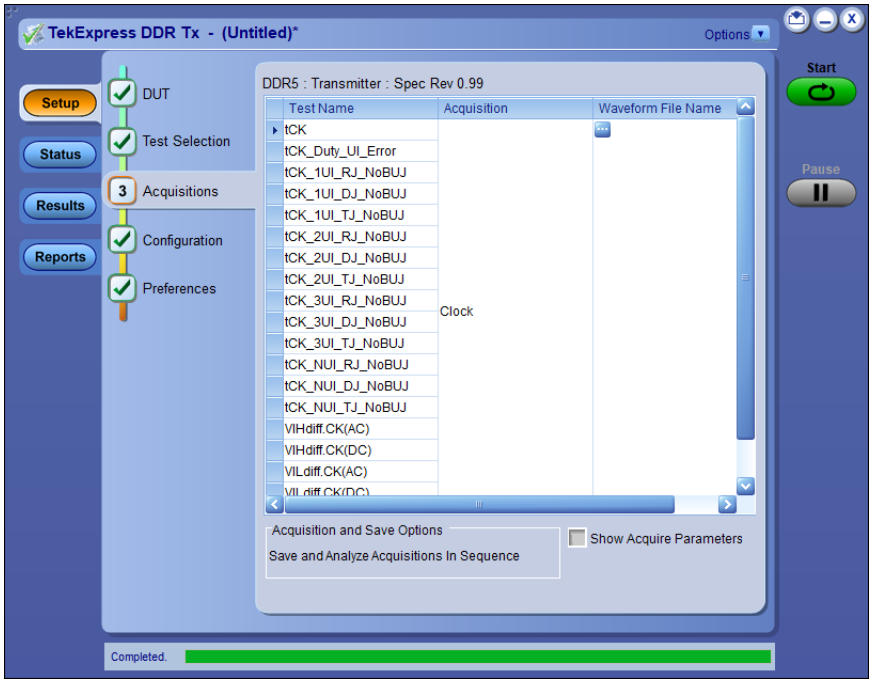
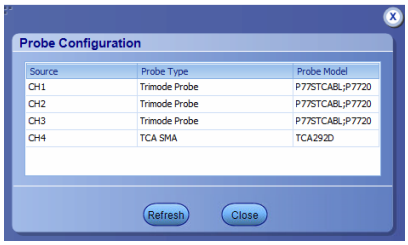


Figure 3: Acquisition tab

Table 10: Acquisitions tab settings

Settings	Description
View Probes	View the detected probe configuration. Use the View Probes dialog box to view the connected probes. 
Acquisition and Save options	
Save and Analyze Acquisition In Sequence	Saves and then analyses the acquisition in sequence.
Show Acquire Parameters	Select to view the acquisition parameters.

TekExpress DDR Tx saves all acquisition waveforms to files by default. 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:\TekExpress DDR Tx \Untitled Session\<dutid>\<date>_<time>. Images created for each analysis, XML files with result values, reports, and other information specific to that particular execution are also saved in this folder.

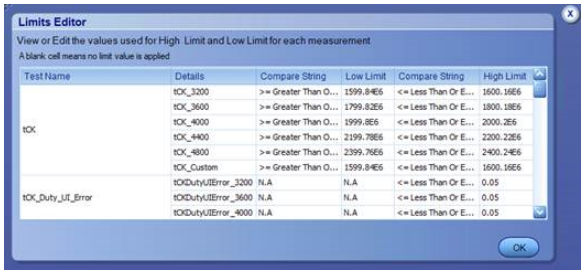
Saving a session moves the session file contents from the Untitled Session folder to the specified folder name, and changes the session name to the specified name.

See also. use prerecorded wavwform files

Set configuration tab parameters

Use Configuration tab to view and configure the Global Settings and the measurement configurations. The measurement specific configurations available in this tab depends on the selections made in the DUT panel and Test Selection panel.

Table 11: Configuration tab: Common parameters

Setting	Description
Limits Editor	Displays the upper and lower limits for the applicable measurement using different types of comparisons. 

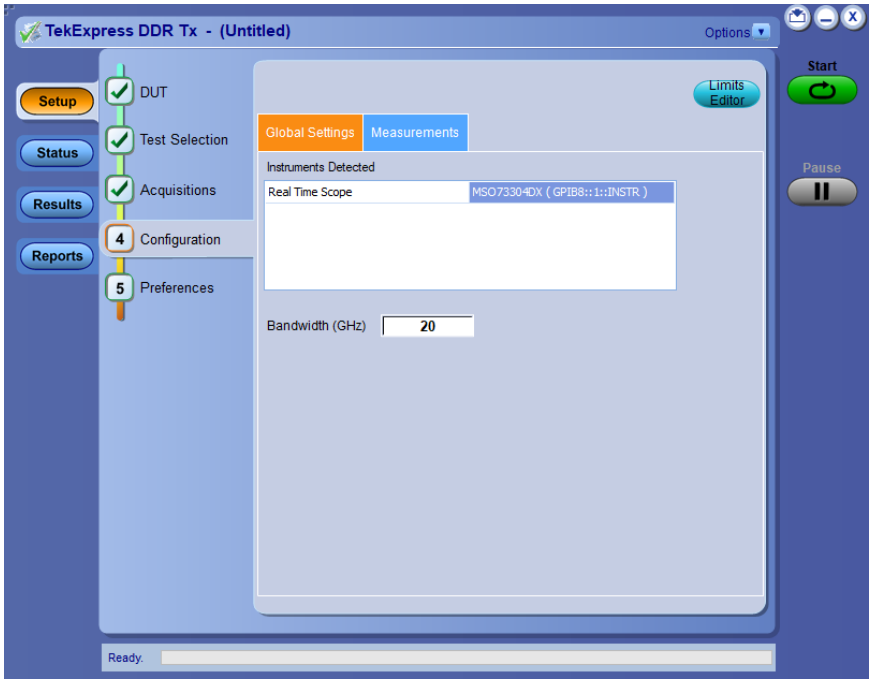


Figure 4: Configuration tab: Global Settings

Table 12: Configuration tab: Global settings

Setting	Description
Global Settings	
Instruments Detected	Displays the instruments connected to this application. Click on 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* ***LAN and GPIB*** *search criteria (default setting) in the Instrument Control Settings is selected when using TekExpress DDR Tx application.*
Bandwidth	Select the oscilloscope bandwidth. This value will be used for all tests.

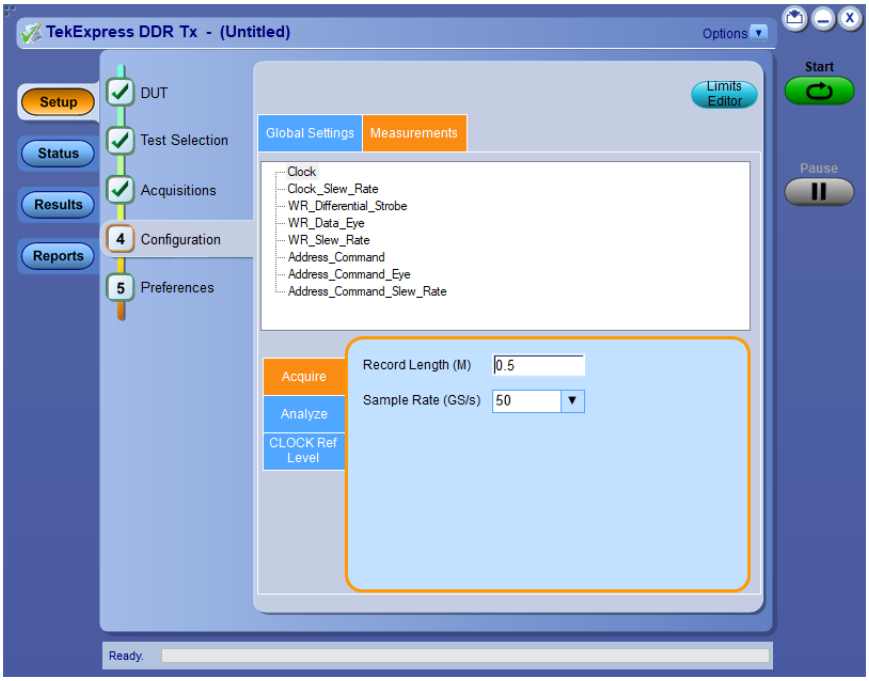


Figure 5: Configuration tab: Measurements

Table 13: Configuration tab: Measurements settings

Configuration			Range	
Measurements			Displays the measurements which are selected in the Test Selection tab. The tests are grouped with unique acquisition type names.	
Clock	Acquire	Record length (M)	0.001 to 100	
		Sample Rate (GS/s)	50	
	Analyze	Number of UI (M)	0.001 to 2000	
		Save worst case measurement snapshot	Select, Unselect	
		N start	2 to 30	
		N stop	2 to 30	
		BER	3 to 22	
WR_Differential_Strobe / RD_Differential_Strobe /	Acquire	Record length (M)	0.001 to 100	
		Sample Rate (GS/s)	50	
	Analyze	Number of UI (M)	0.001 to 2000	
		Save worst case measurement snapshot	Select, Unselect	
		tCK (ns)	0.2 to 10	
	DQS Ref Level / DQ Ref Level / Clock Ref Level	Absolute	High level (V)	-10 to 10
			Mid level (V)	-10 to 10
			Low level (V)	-10 to 10
			Hysteresis(V)	0 to 10
		Percentage	High level (V)	1 to 99
			Mid level (V)	1 to 99
			Low level (V)	1 to 99
			Hysteresis(V)	0 to 50
			Auto set basetop method	Minmax
				Auto

Configuration				Range	
RD_Output_level	Acquire		Record length (M)	0.001 to 100	
			Sample Rate (GS/s)	50	
	Analyze		Number of UI (M)	0.001 to 2000	
			Save worst case measurement snapshot	Select, Unselect	
	Analyze	DQS Ref Level / DQ Ref Level	Absolute	High level (V)	-10 to 10
				Mid level (V)	-10 to 10
				Low level (V)	-10 to 10
				Hysteresis(V)	0 to 10
			Percentage	High level (V)	1 to 99
				Mid level (V)	1 to 99
				Low level (V)	1 to 99
				Hysteresis(V)	1 to 99
				Auto set basetop method	Minmax
					Auto

Configuration			Range	
WR_Data_Eye	Acquire	Record length (M)	0.001 to 100	
		Sample Rate (GS/s)	50	
	Analyze	tCK (ns)	0.2 to 10	
		Mask Definition	Eye Width (UI)	0 to 2
			Eye Height (mV)	0 to 1000
		Superimpose DQS	Select, Unselect	
		Apply DFE	Select, Unselect	
		Gain(dB)	-6 to 6	
		Threshold(mV)	0 to 2000	
		Tap1(mV)	-200 to 50	
		Tap2(mV)	-75 to 75	
		Tap3(mV)	-60 to 60	
		Tap4(mV)	-45 to 45	
		Stop on Mask Hit	Select, Unselect	
	DQS Ref Level / DQ Ref Level / Clock Ref Level	Absolute	High level (V)	-10 to 10
			Mid level (V)	-10 to 10
			Low level (V)	-10 to 10
			Hysteresis(V)	0 to 10
		Percentage	High level (V)	1 to 99
			Mid level (V)	1 to 99
			Low level (V)	1 to 99
			Hysteresis(V)	0 to 50
			Auto set basetop method	Minmax
				Auto

Configuration			Range	
WR_Slew_Rate	Acquire	Record length (M)	0.001 to 100	
		Sample Rate (GS/s)	50	
	Analyze	Number of UI (M)	0.001 to 2000	
		Save worst case measurement snapshot	Select, Unselect	
	DQS Ref Level	Absolute	High level (V)	-10 to 10
			Mid level (V)	-10 to 10
			Low level (V)	-10 to 10
			Hysteresis(V)	0 to 10
		Percentage	High level (V)	1 to 99
			Mid level (V)	1 to 99
			Low level (V)	1 to 99
			Hysteresis(V)	0 to 50
			Auto set basetop method	Minmax
				Auto
Address_Command	Acquire	Record length (M)	0.001 to 100	
		Sample Rate (GS/s)	50	
	Clock/CA Reference Level	Ref levels Clock/CA	■ Absolute ■ Percentage	
		High level Percentage Clock/CA	1 to 99	
		Mid level Percentage Clock/CA		
		Low level Percentage Clock/CA		
		Hysteresis Percentage Clock/CA	0 to 50	
		High level Absolute Clock/CA (V)	-10 to 10	
		Mid level Absolute Clock/CA (V)		
		Low level Absolute Clock/CA (V)		
		Hysteresis Absolute Clock/CA (V)	0 to 10	
		Ref Levels Autoset Basetop Method Clock/CA	■ MINMAX ■ AUTO	

Configuration			Range
Address_Command_Eye	Acquire	Record length (M)	0.001 to 100
		Sample Rate (GS/s)	50
	Analyze	tCK (ns)	0.2 to 10
		tcivw (UI)	0 to 2
		vcivw (V)	0 to 10
	Clock/CA Reference Level	Ref levels Clock/CA	■ Absolute ■ Percentage
		High level Percentage Clock/CA	1 to 99
		Mid level Percentage Clock/CA	
		Low level Percentage Clock/CA	
		Hysteresis Percentage Clock/CA	0 to 50
		High level Absolute Clock/CA (V)	-10 to 10
		Mid level Absolute Clock/CA (V)	
		Low level Absolute Clock/CA (V)	
		Hysteresis Absolute Clock/CA (V)	0 to 10
		Ref Levels Autoset Basetop Method Clock/CA	■ MINMAX ■ AUTO

Configuration				Range	
Address_Command_Slew_Rate	Acquire		Record length (M)	0.001 to 100	
			Sample Rate (GS/s)	50	
	Slew rate ref level	Auto			
		Manual	CA Reference Level	Ref levels CA	■ Absolute ■ Percentage
				High level Percentage CA	1 to 99
				Mid level Percentage CA	
				Low level Percentage CA	
				Hysteresis Percentage CA	0 to 50
				High level Absolute CA (V)	-10 to 10
				Mid level Absolute CA (V)	
				Low level Absolute CA (V)	
				Hysteresis Absolute CA (V)	0 to 10
				Ref Levels Autoset Basetop Method CA	■ MINMAX ■ AUTO

Set preferences tab parameters

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

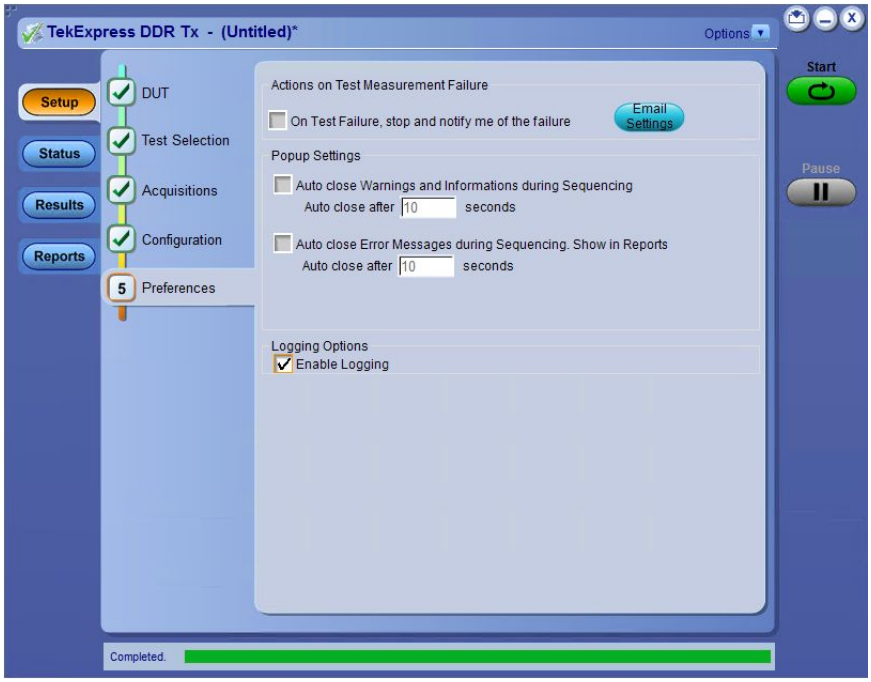


Figure 6: Preferences tab

Table 14: Preferences tab settings

Setting	Description
Actions on Test Measurement Failure	
On Test Failure, stop and notify me of the failure	Select to stop the test run on Test Failure, and to get notified via email. By default, it is unselected. Click *Configure email settings* on page 16 to configure. ***NOTE.*** *Ensure that the email settings are configured correctly. If the settings are not done correctly, the test will be stopped and no other notifications will be sent.*
Popup Settings	
Auto close Warnings and Informations during Sequencing Auto close after <no> Seconds	Select to auto close warnings/informations during sequencing. Set the Auto close time. By default it is unselected. ***NOTE.*** *You must enter non-zero only for seconds.*

Setting	Description
Auto close Error Messages during Sequencing. Show in Reports Auto close after <no> Seconds	Select to auto close Error Messages during Sequencing. Set the Auto close time. By default it is unselected. ***NOTE.*** *You must enter non-zero only for seconds.*
Logging Options	
Enable Logging	Select to enable/disable the logging feature. When enabled the application records the actions of the user. By default, it is 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) 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 tests are running.

Test Status: The tests are grouped and displayed based on the Clock and Data lane. It displays the tests along with the Acquisition type, Acquire, and Analysis status of the tests. In pre-recorded mode, Acquire status is not valid.

Log View: It displays the detailed execution status of the tests.

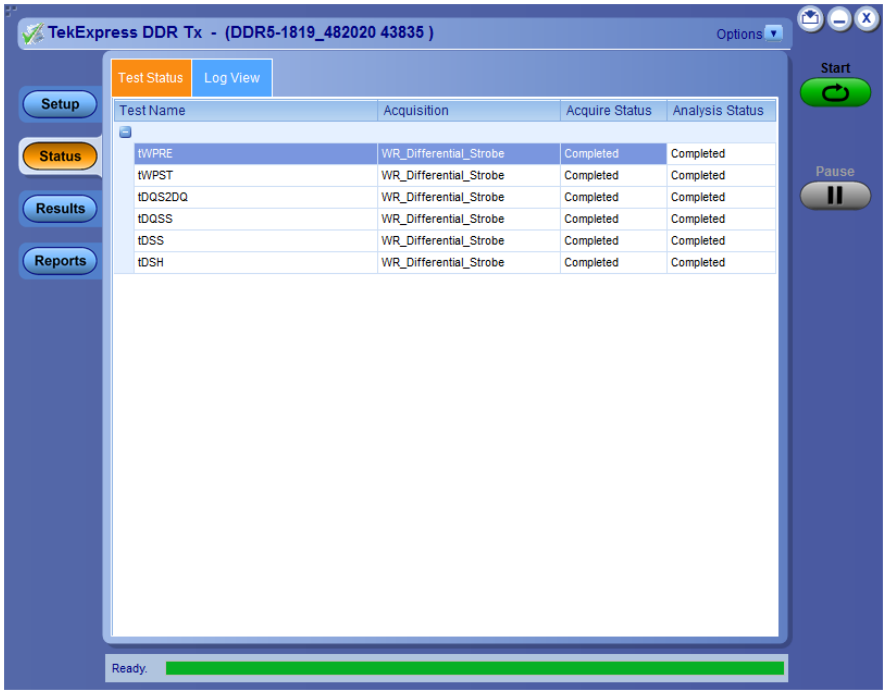


Figure 7: Test status view in Status panel

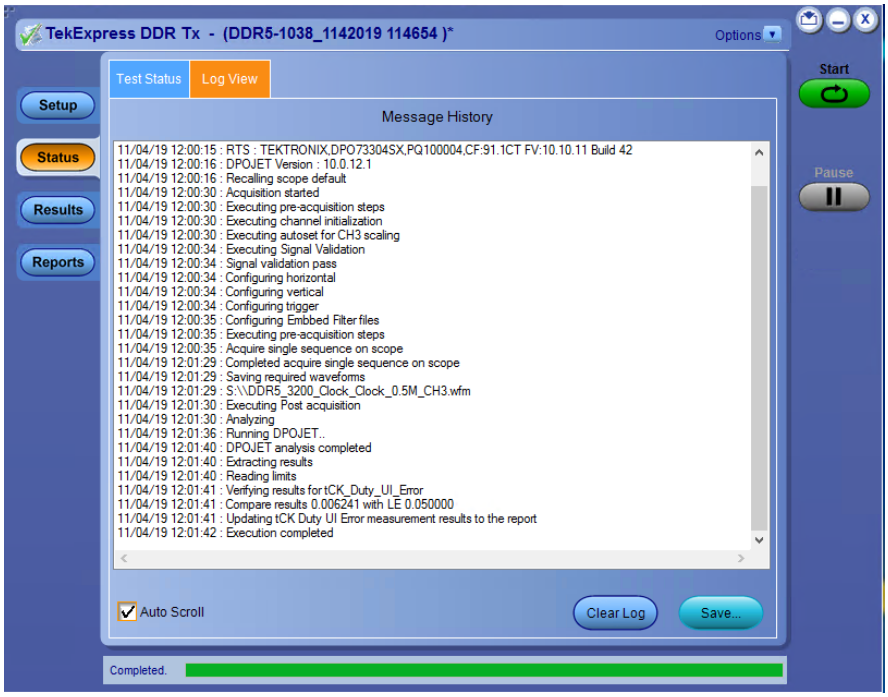


Figure 8: Log view in Status panel

Table 15: Status panel settings

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 execution.
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 panels overview* on page 17

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.

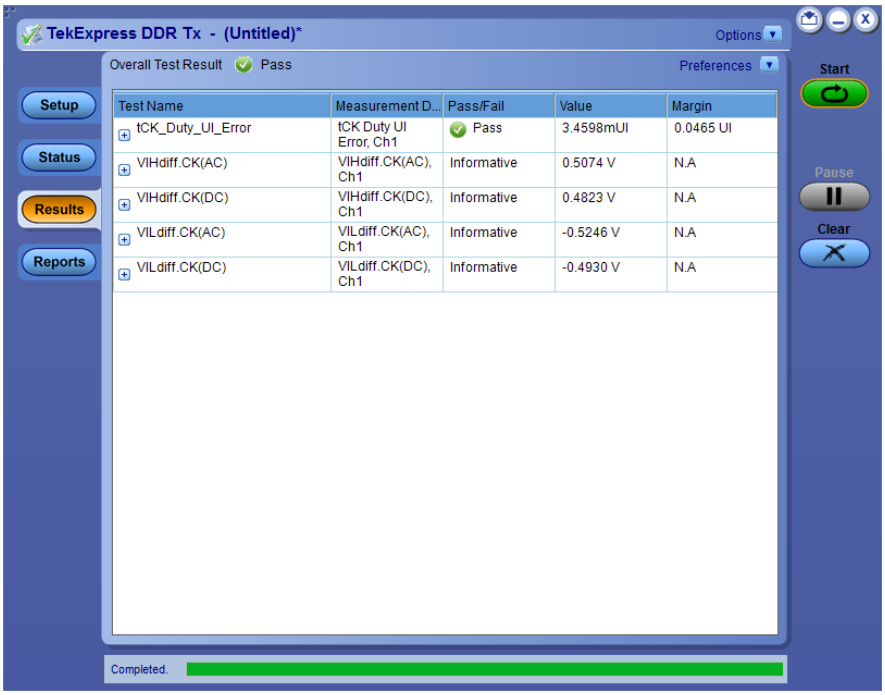


Figure 9: Results panel

When a test finishes, the application switches to the Results panel, which displays a summary of test results.

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 remove or restore the Pass/Fail column, select Preferences > **Show Pass/ Fail**.
- To collapse all expanded tests, select Preferences > **View Results Summary**.
- To expand all tests listed, select **View Results Details** from the **Preferences menu** in the upper right corner.
- To enable or disable the wordwrap feature, select Preferences > **Enable Wordwrap**.
- To view the results grouped by lane or test, select the corresponding item from the Preferences menu.
- 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 clear all test results displayed, click **Clear**.

See also. *View a report* on page 47

Application panels overview on page 17

Preferences menu

The Preferences menu is part of the Results panel display. Use the Preferences menu to change how some items display in the Results panel.

- To include pass/fail details info in the details table, select **Show Pass/Fail**.
- To view the results summary, select **View Results Summary**.
- To expand all tests listed, select **View Results Details**
- To enable or disable the wordwrap feature, select **Enable Wordwrap**.
- To group the tests by lane, select **Group by Lane**.
- To group the tests, select **Group by Test**.

See also. *Results panel overview* on page 42

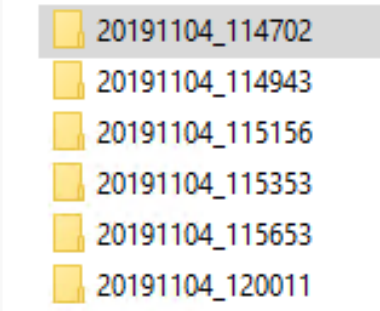
View test-related files

Files related to tests are stored in My TekExpress\DDR Tx\Untitled session folder . Each test setup in this folder has both 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 X:\DDR Tx. 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 DDR Tx application.

See also. *File name extensions* on page 7

Reports panel

Reports panel overview

Use Reports panel to configure report generation settings parameters, view the report, generate the report, browse for reports, name and save reports, select test content to include in reports, and select report viewing options.

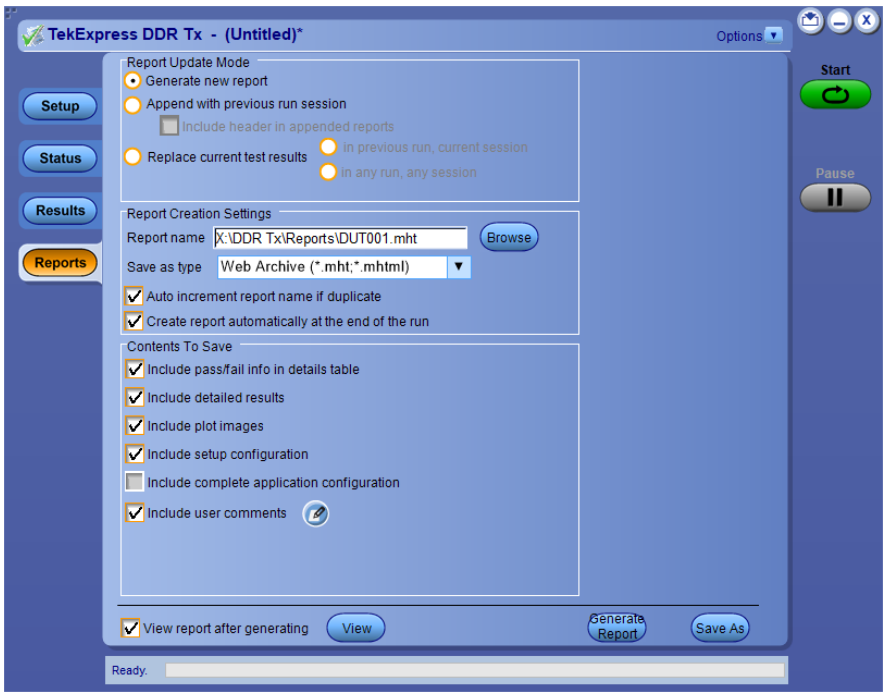


Figure 10: Reports panel

For information on setting up reports, see *Select report options* on page 46. For information on viewing reports, see *View a report* on page 47.

See also. *View a report* on page 47

Application panels overview on page 17

Select report options

Click Reports panel and use the Reports panel controls to select which test result 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.

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 16: Report options

Setting	Description
Report Update Mode	
Generate new report	Creates a new report. The report can be in either .mht or .pdf file formats.
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
Replace current test in previous run session	Replaces the previous test results with the latest test results. Results from newly added tests are appended to the end of the report.
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 test result of any other run session.
Report Creation Settings	
Report name	Displays the name and location from which to open a D-PHY report. The default location is at *\My TekExpress\DDR Tx\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 popup keyboard and click the **Enter** button. 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\DDR Tx \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.

Setting	Description
Save as type	Saves a report in the specified file type, selected from the drop-down list. The report are saved in .csv, .pdf or .mht. ***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.
Contents To Save	
Include pass/fail info in details table	Includes pass/fail info in the details table of the report.
Include plot images	Includes the plot images in the report.
Include detailed results	Includes detailed results in the report.
Include setup configuration	Sets the application to include hardware and software information in the summary box at the top of the report. Information includes: the oscilloscope model and serial number, the oscilloscope firmware version, and software versions for applications used in the measurements.
Include complete application configuration	Select to complete application configurtion.
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.
View report after generating	Automatically opens the report in a Web browser when the test completes. 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:

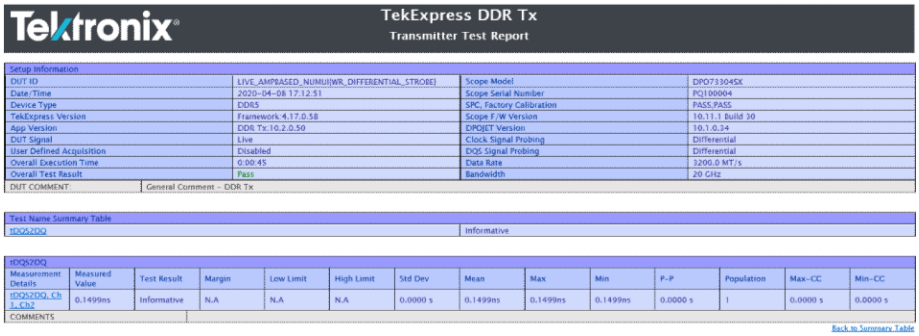
1. Click the **Reports** button.
2. Click the **Browse** button and locate and select the report file to view.
3. In the Reports panel, click **View**.

NOTE. *Iteration column will be displayed only when more than one test run is selected.*

For information on changing the file type, file name, and other report options, see *Select report options* on page 46.

Report content

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



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, optical module model and serial number, 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* on page 42

View test-related files on page 43

Running tests

Compensate the signal path (Prerequisite)

Use the following procedure to compensate the internal signal acquisition path. Perform this procedure if the ambient temperature has changed more than 5 °C (9 °F) since you performed the last signal path compensation. Perform the signal path compensation once a week. Failure to do so may result in the instrument not meeting warranted performance levels.

1. Power on and wait for the instrument to complete its warm up period before continuing with this procedure.
2. Disconnect any probes you have connected to the input channels.
3. Set the instrument to Menu mode.
4. Select Instrument Calibration from the Utilities menu.
5. Note any instructions that appear in the resulting control window.
6. Click Run SPC to begin the procedure. The procedure may take several minutes to complete.
7. Verify that the Status changes to Compensated after the procedure is complete. If the Calibration Status field indicates anything other than Compensated, see Signal Path Compensation Status for information on the readout and recommended action.

NOTE. *When making measurements at vertical scale settings less than or equal to 5 mV, you should perform the signal path compensation at least once a week. Failure to do so may result in the instrument not meeting warranted performance levels at those volts/div settings.*

Running tests

Set DUT parameters on page 19, *Select tests* on page 28, *Set acquisition tab parameters* on page 29, *Set configuration tab parameters* on page 30, *Set preferences tab parameters* on page 38, 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 tests are running, the other applications will be displayed at the background. If you want the TekExpress DDR Tx application to run in the foreground select **Keep On Top** from the TekExpress Options menu.

The application displays report when the tests execution is complete.

Pre-run checklist

1. Make sure that the instruments are warmed up (approximately 20 minutes) and stabilized.
2. Perform compensation: In the oscilloscope main menu, select **Utilities** > **Instrument Compensation**. Click **Help** in the compensation window for steps to perform instrument compensation.

View test results

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

Each test result occupies a row in the Results table. By default, results are displayed in summary format, with the measurement details collapsed. You can change the view in the following ways:

- To view the results grouped by lane, test, or data rate, select the corresponding item from the Preferences menu.
- To expand all tests listed, select **View Results Details** from the Preferences menu.
- To expand and collapse tests, use the plus and minus buttons to the left of the test rows.
- To collapse all expanded tests, select **Preferences > View Results Summary**.
- 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 one 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** (

).

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:\DDR Tx**.

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.
- Run a saved test using saved waveforms.

See also *Save a test setup*

Open (load) a saved test setup

Save a test setup

You can save a test setup before or after running a test. You can create a test setup from *already created test setup*, or using *default test setup*. When you select the default test setup, the parameters are set to the application's default value.

Select **Options > Save Test Setup** to save the opened setup.

Select **Options > Save Test Setup As** to save the setup with different name.

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**. Setup files are located at **X:\DDR Tx**.

See also *About test setups*

Create a test setup using an existing one

Create a test setup from default settings

Create a test setup using an existing one

To create a test setup using an existing one, follow the steps:

1. Select **Options > Open Test Setup**
2. Select a setup from the list and then click **Open**
3. Click application setup and modify the parameters
4. Click application reports and modify the report options
5. Select **Options > Save Test Setup As**
6. Enter test setup name, and click **Save**.

Create a test setup from default settings

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

1. Select **Options > Default Test Setup**. For default test setup, the parameters are set to the application's default value.
2. Click application *Setup* and set the parameters
3. Click application *Reports* and set the report options
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:\DDR Tx\<*session_name*>

SCPI commands

About SCPI command

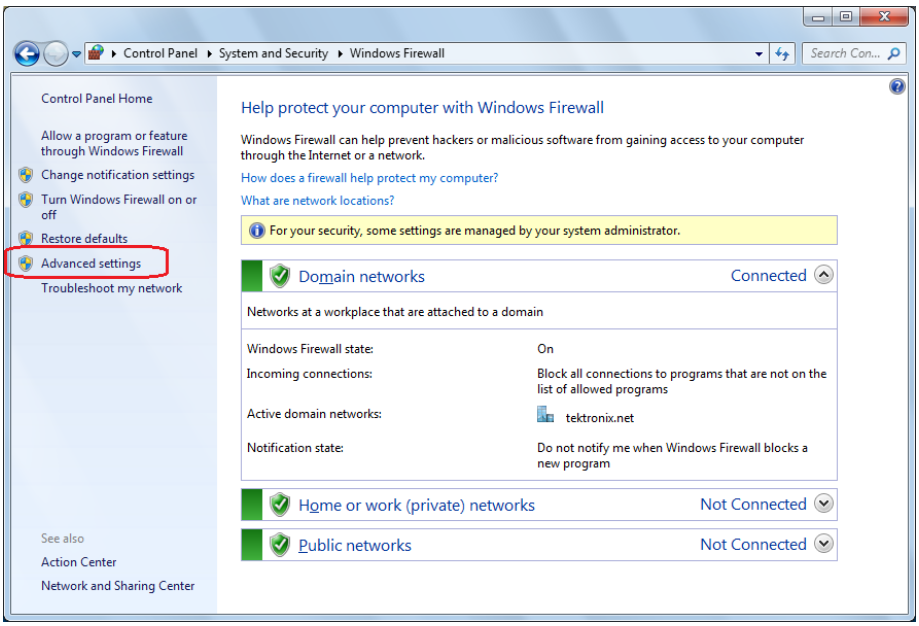
You can use Standard Commands for Programmable Instruments (SCPI) to communicate with the TekExpress application.

Socket configuration for SCPI commands

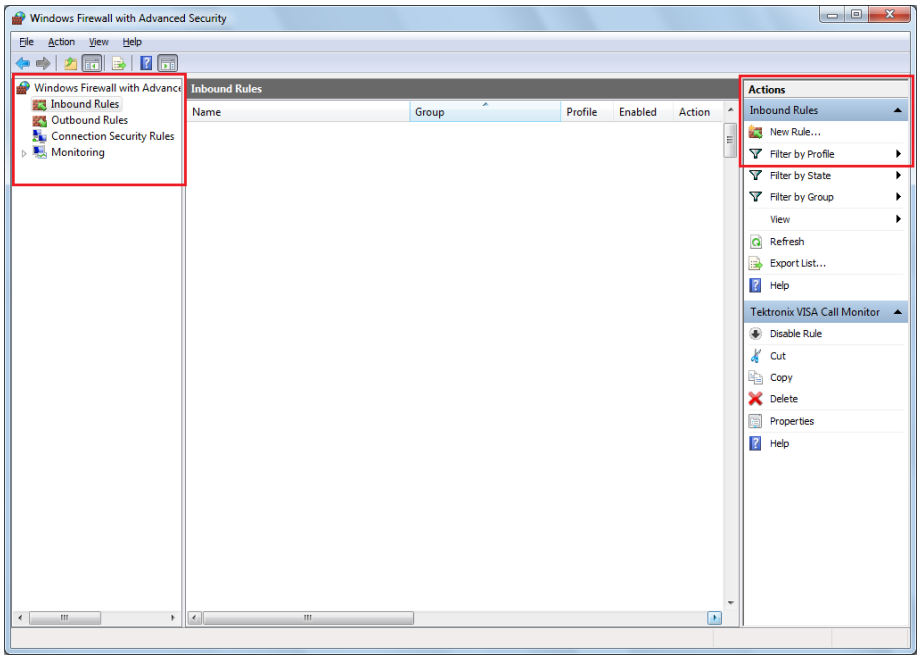
This section describes the steps for TCPIP socket configuration and TekVISA configuration to execute the SCPI commands.

TCPIP socket configuration

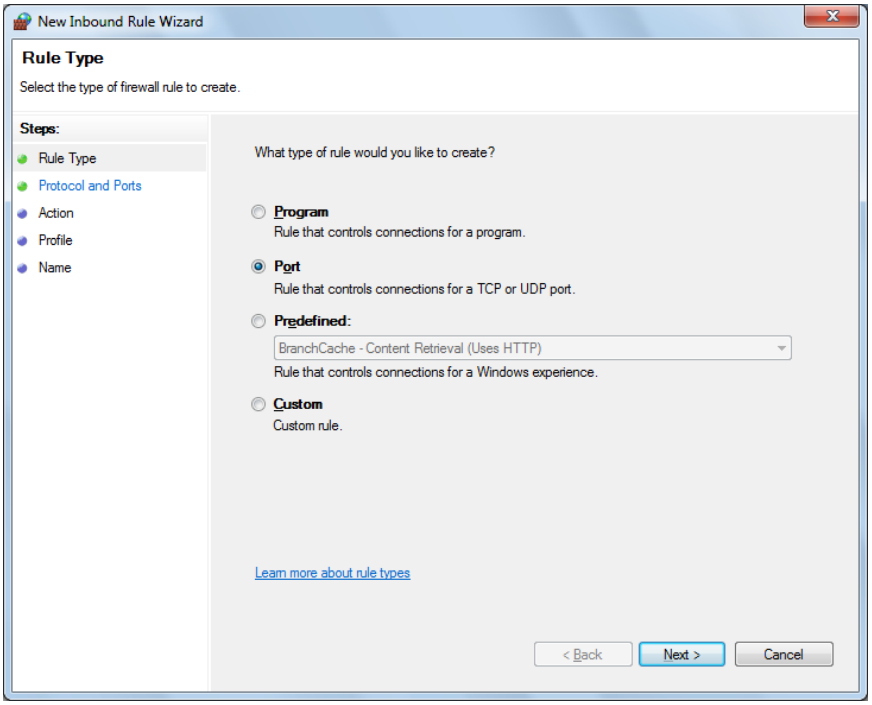
1. Click **Start** > **Control Panel** > **System and Security** > **Windows Firewall** > **Advanced settings**.



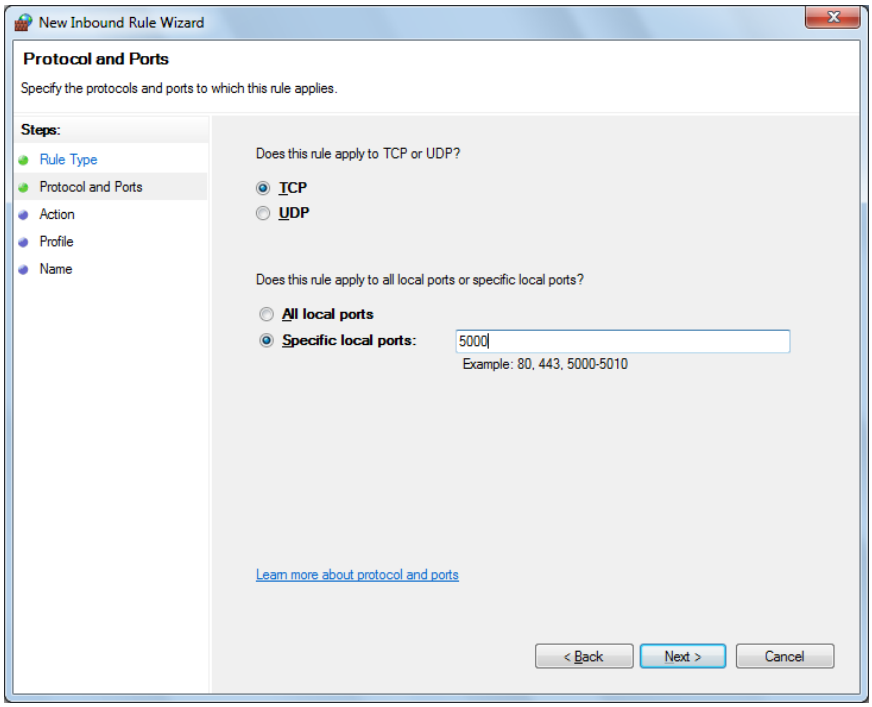
2. In Windows Firewall with Advanced Security menu, select **Windows Firewall with Advanced Security on Local Computer** > **Inbound Rules** and click New Rule…



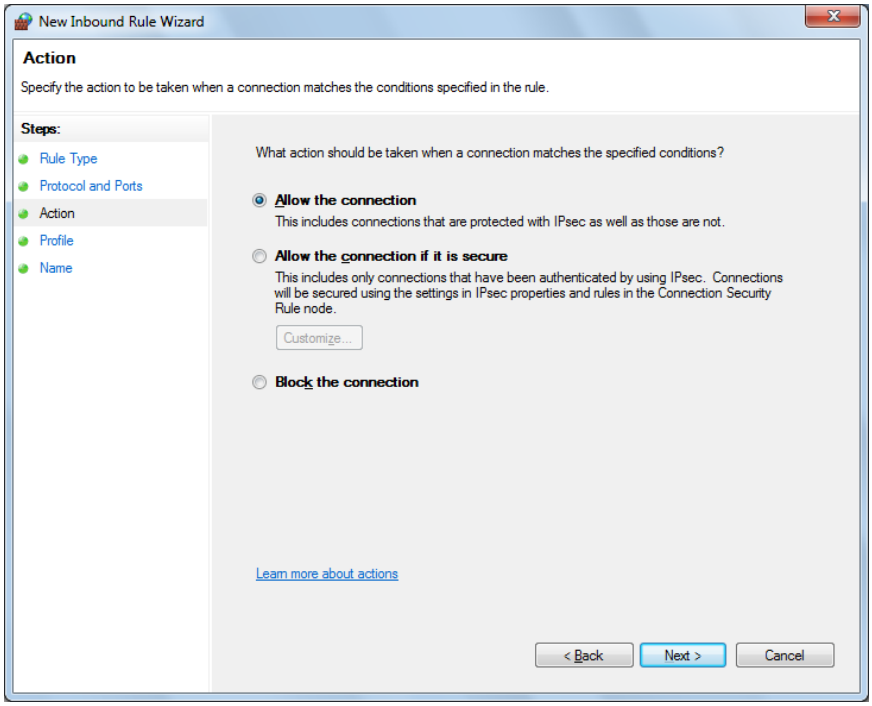
3. In New Inbound Rule Wizard menu
   a. Select **Port** and click **Next**.



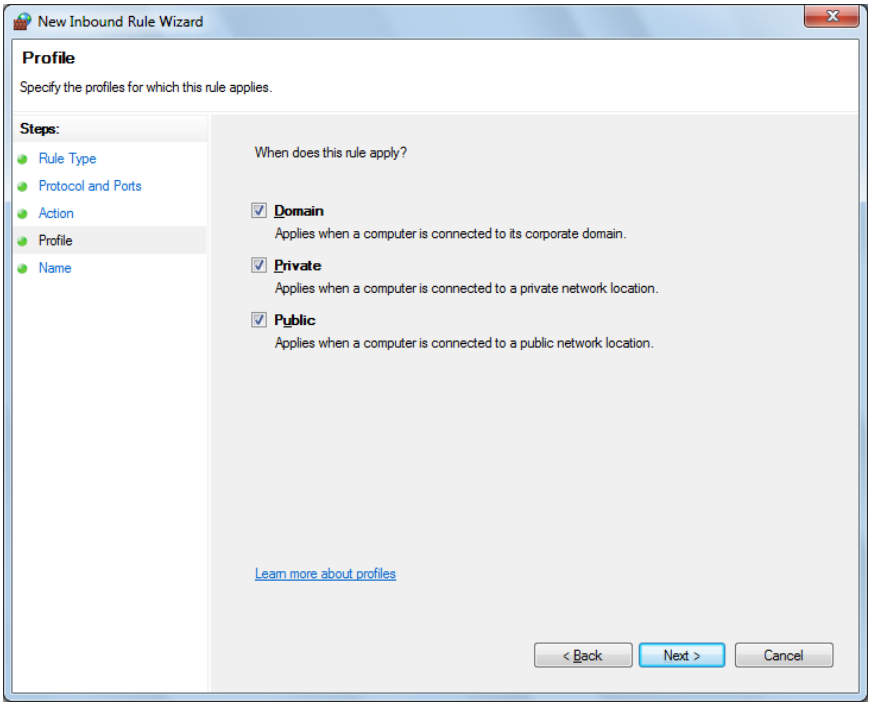
b. Select **TCP** as rule apply and enter 5000 for **Specific local ports** and click **Next**.



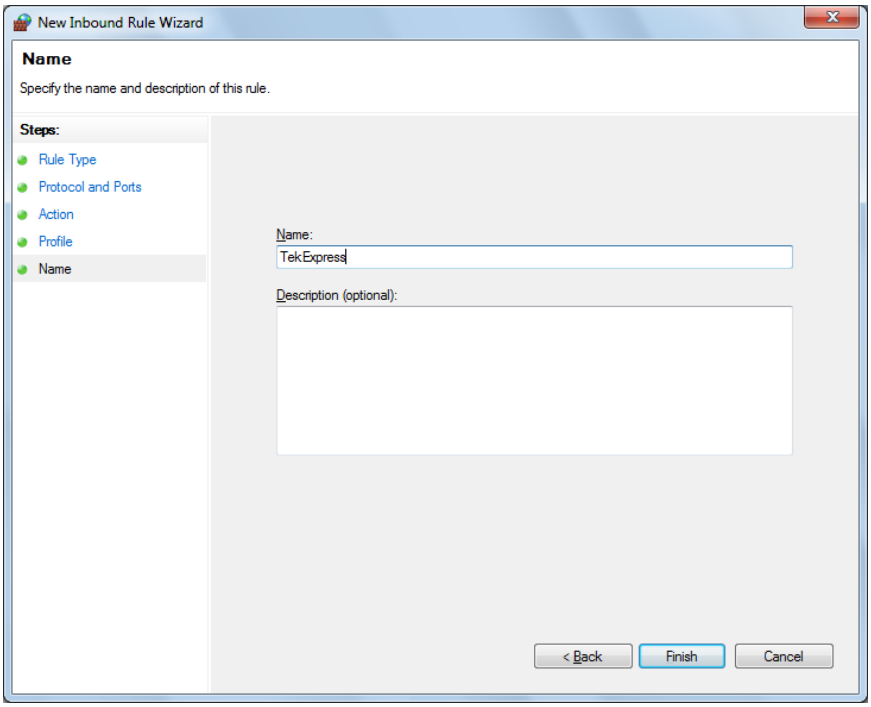
c. Select **Allow the connection** and click **Next**.



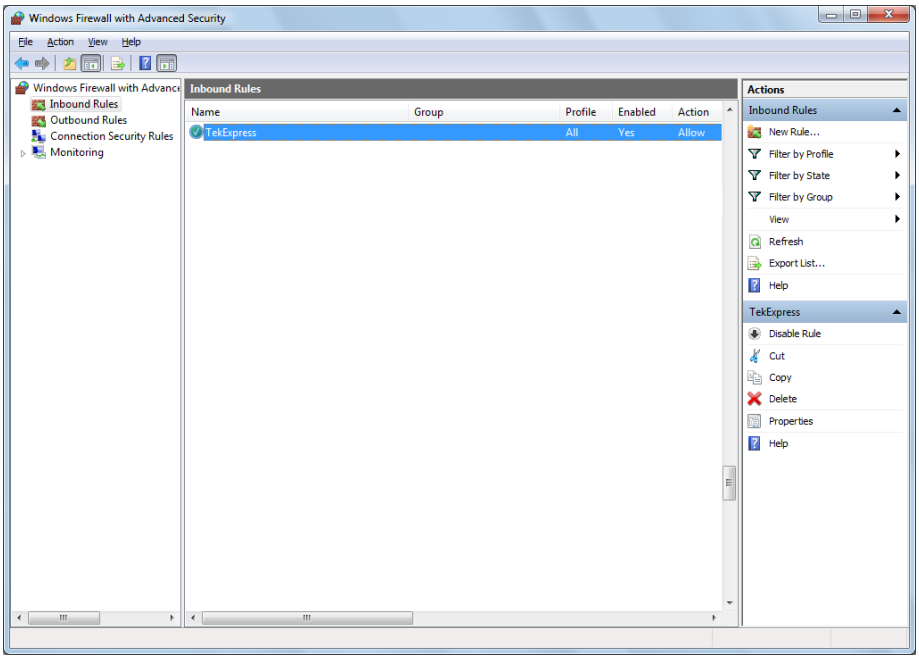
d. Select **Domain, Private, Public** and click **Next**.



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

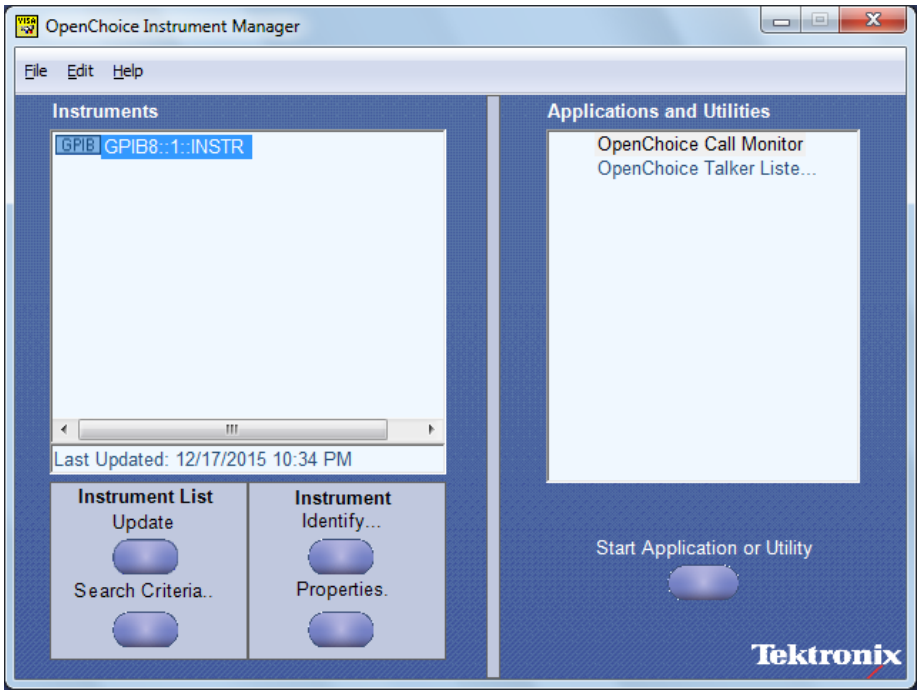


4. Check whether the Rule name is displayed in **Windows Firewall with Advanced Security menu** > **Inbound Rules**.



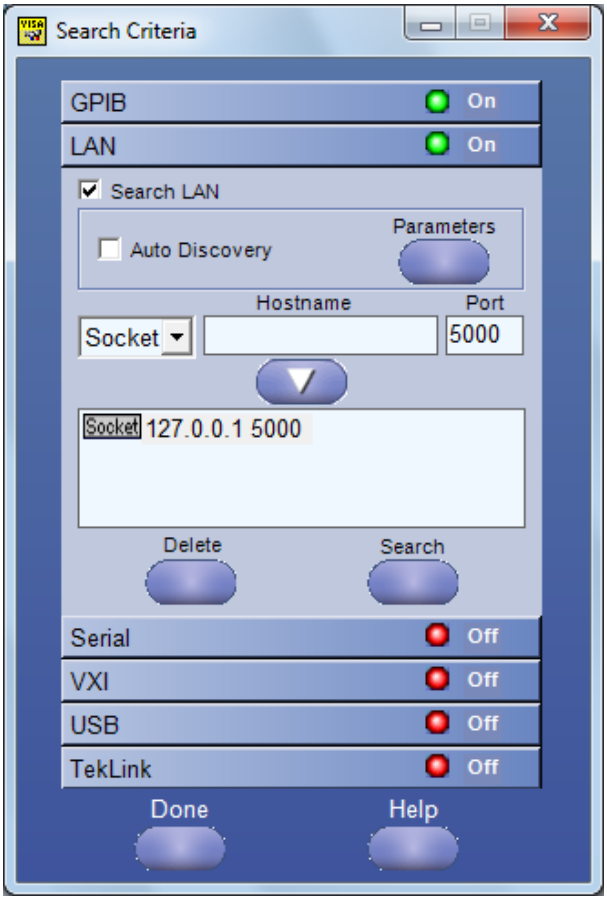
TekVISA configuration

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

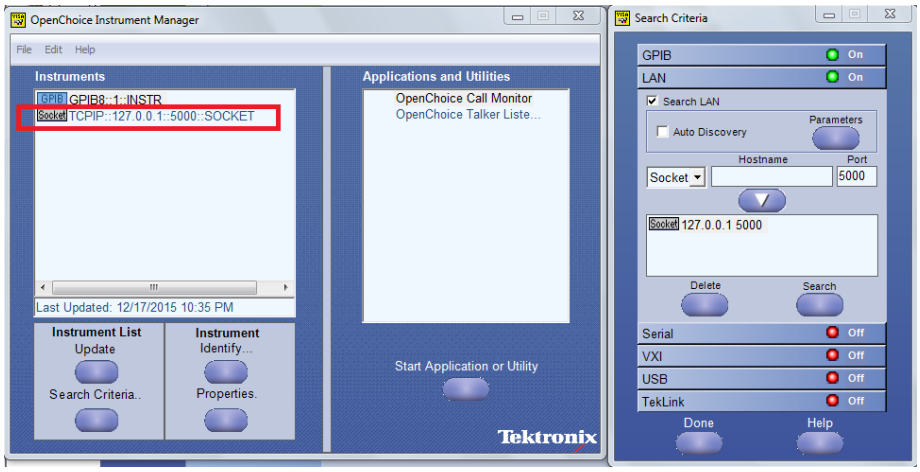


2. Click **Search Criteria**. In Search Criteria menu, click **LAN** to Turn-on. Select **Socket** from the drop-down list, enter the IP address of the TekExpress device in **Hostname** and type **Port** as 5000. Click  to configure the IP address with Port.

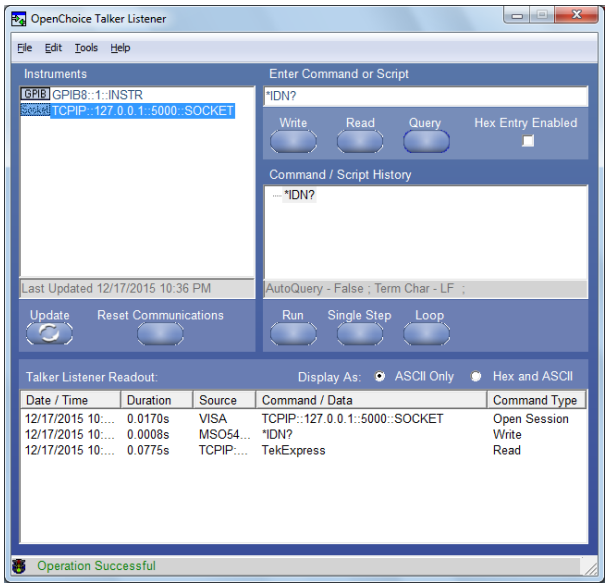
   Enter the Hostname as 127.0.0.1 if the TekVISA and TekExpress application are in the same system, else enter the IP address of the TekExpress application system.



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 Talker 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 oscilloscope.

Syntax TEKEXP:*IDN?\n

Inputs NA

Outputs Returns active TekExpress application name running on the oscilloscope.

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

TEKEXP:ACQUIRE_MODE

This command sets the acquire mode as live or pre-recorded.

Syntax TEKEXP:ACQUIRE_MODE {LIVE | PRE-RECORDED}\n

Inputs {LIVE | PRE-RECORDED}

Outputs NA

TEKEXP:ACQUIRE_MODE?

This command queries the acquire mode type.

Syntax TEKEXP:ACQUIRE_MODE?\n

Inputs NA

Outputs {LIVE | PRE-RECORDED}

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 WFM,"<FileName>"\n	Returns the specified waveform file in bytes
TEKEXP:EXPORT IMAGE,"<FileName>"\n	Returns the specified image file in bytes

Inputs FileName - Specifies the file name

TEKEXP:INFO?

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

Syntax	Outputs
TEKEXP:INFO? REPORT\n	<ReportFileSize>,"<ReportFileName.mht>"
TEKEXP:INFO? WFM \n	<WfmFile1Size>,"<WfmFileName1.wfm>";<WfmFile2Size>,"<WfmFileName2.wfm>";...
TEKEXP:INFO? IMAGE\n	<Image1FileSize>,"<Image1FileName>";<Image2FileSize>,"<Image2FileName>" ;...

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 section for InstrumentType and Value parameters.*

Outputs NA

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 section for InstrumentType parameters.*

Outputs Returns the instrument selected for the specified instrument type

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>

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 section for InstrumentType parameters.*

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

TEKEXP:MODE?

This command queries the execution mode type.

Syntax TEKEXP:MODE?\n

Inputs NA

Outputs {COMPLIANCE | USER-DEFINED}

TEKEXP:POPUP

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

Syntax TEKEXP:POPUP “<PopupResponse>”\n

Inputs PopupResponse

Outputs NA

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.

TEKEXP:REPORT

This command generates the report for the current session.

Syntax TEKEXP:REPORT GENERATE\n

Inputs GENERATE

Outputs NA

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

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]

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.*

[1] Row number starts from zero.

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 section for DeviceName, SuiteName, VersionName, and TestName parameters.*

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.

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	Saves the already existing modified session
TEKEXP:SETUP SAVE,"<SessionName>"\n	Save the session

Inputs SessionName - The name of the session

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

TEKEXP:STATE?

This command queries the current setup state.

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

TEKEXP:VALUE

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

Syntax

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

TEKEXP:VALUE ACQUIRE,“<TestName>","<AcquireType>", "<ParameterName>",“<Value>”\n

TEKEXP:VALUE ANALYZE,“<TestName>","<ParameterName>".“<Value>” \n

TEKEXP:VALUE DUTID,“<Value>”\n

TEKEXP:VALUE VERBOSE,{TRUE | FALSE}\n

TEKEXP:VALUE WFMFILE,<Test_Name>,<Aquire_Type>,<FilesName1$FileName2>\n

Inputs

ParameterName - Specifies the parameter name

TestName - Specifies the test name

AcquireType - Specifies the acquire type

Value - Specifes the value to set

FilesName1$FileName2 - Specifies the waveform file name

TRUE - Pop-ups are enabled

FALSE - Pop-ups are disabled

TIP. *Check Command parameters list section for ParameterName, AcquireType, and Value parameters.*

Outputs NA

TEKEXP:VALUE?

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

Syntax	Outputs
TEKEXP:VALUE? GENERAL,"<ParameterName>"\n	Returns the value of Parameter for type GENERAL
TEKEXP:VALUE? ACQUIRE,“<TestName>", "<AcquireType>","<ParameterName>"\n	Returns the value of Parameter for type ACQUIRE
TEKEXP:VALUE? ANALYZE, “<TestName>","<ParameterName>"\n	Returns the value of Parameter for type ANALYZE
TEKEXP:VALUE? DUTID\n	Returns the DUTID value
TEKEXP:VALUE? WFMFILE,<Test_Name>,<Aquire_Type>\n	Returns the waveform file name
TEKEXP:VALUE? VERBOSE	Returns the verbose mode type

Inputs ParameterName - Specifies the parameter name

TestName - Specifies the test name

AcquireType - Specifies the acquire type

TRUE - Pop-ups are enabled

FALSE - Pop-ups are disabled

TIP. *Check Command parameters list section for ParameterName and AcquireType parameters.*

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

Command parameters list

This section provides the parameters list for the SCPI commands.

Specifies the Parameter Name and Value for DUT, Test selection, Acquisition, Configuration and Preferences tabs.

Table 17: ParameterName and Value for DUT tab

Parameters	Description
DUT ID	Specifies the value parameters For DUTID, valid value is: Comment
Acquiremode	Specifies the acquire mode parameter: Acquire live waveforms
Use pre-recorded mode	Specifies the pre-recorded parameter: Use pre-recorded waveform files
Device	DDR5
User Defined Acquisition	Enables user to define the acquisition settings of their choice.
TriMode Probe Setup	With TriMode probing, one probe setup makes differential, single-ended, and common mode measurements accurately.
Device Profile	
Data Rate	Specifies the different data rates supported(3200>=DR<=8400). Valid values are: ■ 3200 ■ 3600 ■ 4000 ■ 4400 ■ 4800 ■ Custom
Vdd	Specifies the Vdd mode. Valid values are: ■ JEDEC Default ■ Manual
Vdd Display	Displays the Vdd value in Volts. To set the Vdd a valid Double value can be specified. ***NOTE.*** *Set Vdd to Manual Mode before setting its value.*
Vcent-DQ	Modes supported for setting Vcent_DQ value. Valid values are: ■ Auto ■ Manual
Vcent_DQ Display	Specifies the Vcent_DQ value in Volts. To set the Vcent_DQ a valid Double value can be specified. ***NOTE.*** *Set Vcent_DQ to Manual Mode before setting its value.*

Parameters	Description
Vref-CA	Modes supported for setting Vref_CA value. Valid values are: ■ Auto ■ Manual
Vref-CA Display	Specifies the Vref-CA value in Volts. To set the Vref-CA a valid Double value can be specified. ***NOTE.*** *Set Vref-CA to Manual Mode before setting its value.*
Burst Detection Method	Specifies the modes of burst detection for Data signals. Valid values are: ■ Read Write Bursts ■ Write Only Bursts ■ Read Only Bursts ■ Visual Search
Clock Signal Probe Type	Specifies the signal type for clock and Data. Valid values are: ■ Differential ■ Single Ended
Data Signal Probe Type	Specifies the type of Data signals. Valid values are: ■ Differential ■ Single Ended
DeEmbed Filter Files	Specifies the DeEmbed Filter file settings. Valid values are: ■ Enabled ■ Disabled
DQS Probe Mode	Specifies the Trimode Probe Settings for DQS signal. Valid values are: ■ A ■ B ■ Differential
Clock Probe Mode	Specifies the Trimode Probe Settings for Clock signal. Valid values are: ■ A ■ B ■ Differential

Parameters	Description
DQSPositive Probe Mode	Specifies the Trimode Probe Settings for DQS (+) signal. Valid values are: ■ A ■ B ■ Differential
DQ Probe Mode	Specifies the Trimode Probe Settings for DQ signal. Valid values are: ■ A ■ B ■ Differential
ADDR CMD Probe Mode	Specifies the Trimode Probe Settings for Command and Address signal. Valid values are: ■ A ■ B ■ Differential
Clock Positive Probe Mode	Specifies the Trimode Probe Settings for Clock (+) signal. Valid values are: ■ A ■ B ■ Differential
Clock Negative Probe Mode	Specifies the Trimode Probe Settings for Clock (-) signal. Valid values are: ■ A ■ B ■ Differential
DQSNegative Probe Mode	Specifies the Trimode Probe Settings for DQS (-) signal. Valid values are: ■ A ■ B ■ Differential
DQS_Write Connected to Filter File	Mention the path for filter file for DQS Write signal
Clock Connected to Filter File	Mention the path for filter file for Clock signal
DQS(+)_Write Connected to Filter File	Mention the path for filter file for Strobe Positive for Data signal
DQS(-)_Write Connected to Filter File	Mention the path for filter file for Strobe Negative for Data signal
DQ_Read Connected to Filter File	Mention the filter file path for Data Read Signal
DQ_Write Connected to Filter File	Mention the filter file path for Data Write Signal

Parameters	Description
CA Connected to Filter File	Mention the filter file path for Command and Address Signal
Clock(+) Connected to Filter File	Mention the filter file path for Clock Positive Signal
Clock(-) Connected to Filter File	Mention the filter file path for Clock Positive Signal
RB:DQ/DQS Phase Alignment:Pre-amble Length (tCK)	Specifies the Read Data signal's preamble-length, for Read Write Burst Detection Method. Valid Values are 1, 2, 3, 4.
RB:DQ/DQS Phase Alignment:Post-amble Length (tCK)	Specifies the Read Data signal's postamble-length, for Read Write Burst Detection Method. Valid Values are 0.5 and 1.5.
RB:DQ/DQS Phase Alignment:Burst(pk-pk)	Specifies the Pk-Pk amplitude value of the Read traffic, in Read Write Burst detection method. Valid Range is 0-5.
RB:DQ/DQS Phase Alignment:Margin(%)	Specifies the Margin for Read traffic in Read Write Burst Detection method. Valid Range is 0-100.
RB:DQ/DQS Phase Alignment:IsReadWriteGreater	Specifies if the Read Data's amplitude is greater than the Write Data's amplitude. Valid values are Yes and No.
RB:DQ/DQS Phase Alignment:Strobe High	Specifies the High Reference level for Strobe signal for Read traffic, in Read Write Burst Detection method. Valid range is -5 to 5.
RB:DQ/DQS Phase Alignment:Strobe Mid	Specifies the Mid Reference level for Strobe signal for Read traffic, in Read Write Burst Detection method. Valid range is -5 to 5.
RB:DQ/DQS Phase Alignment:Strobe Low	Specifies the Mid Reference level for Strobe signal for Read traffic, in Read Write Burst Detection method. Valid range is -5 to 5.
RB:DQ/DQS Phase Alignment:Data High	Specifies the High Reference level for Data Read signal, in Read Write Burst Detection method. Valid range is -5 to 5.
RB:DQ/DQS Phase Alignment:Data Mid	Specifies the Mid Reference level for Data Read signal, in Read Write Burst Detection method. Valid range is -5 to 5.
RB:DQ/DQS Phase Alignment:Data Low	Specifies the Low Reference level for Data Read signal, in Read Write Burst Detection method. Valid range is -5 to 5.
RB:DQ/DQS Phase Alignment:Hysteresis	Specifies Hysteresis value for Data Read signal, in Read Write Burst Detection method. Valid range is 0 to 50.
RB:DQ/DQS Phase Alignment:Margin	Specifies Margin value for Data Read signal, in Read Write Burst Detection method. Valid range is 0 to 100.
WB:DQ/DQS Phase Alignment:tDQS2DQ Type	Specifies the tDQS2DQ type, in Read Write Burst Detection Method. Valid Values are Auto and Manual.
WB:DQ/DQS Phase Alignment:tDQS2DQ Value (ps)	Specifies the tDQS2DQ value, in Read Write Burst Detection Method. Valid Range is 0 to 1875ps.
WB:DQ/DQS Phase Alignment:Pre-amble Length (tCK)	Specifies the Write Data signal's preamble-length, for Read Write Burst Detection Method. Valid Values are 2, 3, and 4.
WB:DQ/DQS Phase Alignment:Post-amble Length (tCK)	Specifies the Write Data signal's postamble-length, for Read Write Burst Detection Method. Valid Values are 0.5 and 1.5.
WB:DQ/DQS Phase Alignment:Burst(pk-pk)	Specifies the Pk-Pk amplitude value of the Write traffic, in Read Write Burst detection method. Valid Range is 0-5.
WB:DQ/DQS Phase Alignment:Margin(%)	Specifies the Margin for Write traffic in Read Write Burst Detection method. Valid Range is 0-100.

Parameters	Description
WB:DQ/DQS Phase Alignment:IsReadWriteGreater	Specifies if the Read Data's amplitude is greater than the Write Data's amplitude. Valid values: ■ Yes ■ No
WB:DQ/DQS Phase Alignment:Strobe High	Specifies the High Reference level for Strobe signal for Write traffic, in Read Write Burst Detection method. Valid range is -5 to 5.
WB:DQ/DQS Phase Alignment:Strobe Mid	Specifies the Mid Reference level for Strobe signal for Write traffic, in Read Write Burst Detection method. Valid range is -5 to 5.
WB:DQ/DQS Phase Alignment:Strobe Low	Specifies the Mid Reference level for Strobe signal for Write traffic, in Read Write Burst Detection method. Valid range is -5 to 5.
WB:DQ/DQS Phase Alignment:Data High	Specifies the High Reference level for Data Write signal, in Read Write Burst Detection method. Valid range is -5 to 5.
WB:DQ/DQS Phase Alignment:Data Mid	Specifies the Mid Reference level for Data Write signal, in Read Write Burst Detection method. Valid range is -5 to 5.
WB:DQ/DQS Phase Alignment:Data Low	Specifies the Low Reference level for Data Write signal, in Read Write Burst Detection method. Valid range is -5 to 5.
WB:DQ/DQS Phase Alignment:Hysteresis	Specifies Hysteresis value for Data Write signal, in Read Write Burst Detection method. Valid range is 0 to 50.
WB:DQ/DQS Phase Alignment:Margin	Specifies Margin value for Data Write signal, in Read Write Burst Detection method. Valid range is 0 to 100.
Read Burst:Pre-amble Length (tCK)	Specifies the Read Data signal's preamble-length, for Read Only Burst Detection Method. Valid Values are 1, 2, 3, and 4.
Read Burst:Post-amble Length (tCK)	Specifies the Read Data signal's postamble-length, for Read Only Burst Detection Method. Valid Values are 0.5 and 1.5.
Read Burst:Burst Length	Specifies the length of the Read burst, in Read Only Burst Detection method. Valid values are 16 and 32.
Read Burst:Strobe High	Specifies the High Reference level for Strobe signal for Read traffic, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Read Burst:Strobe Mid	Specifies the Mid Reference level for Strobe signal for Read traffic, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Read Burst:Strobe Low	Specifies the Low Reference level for Strobe signal for Read traffic, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Read Burst:Data High	Specifies the High Reference level for Data Read signal, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Read Burst:Data Mid	Specifies the Mid Reference level for Data Read signal, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Read Burst:Data Low	Specifies the Low Reference level for Data Read signal, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Read Burst:Hysteresis	Specifies the Hysteresis value for Read Data signal, in Read Only burst detection method. Valid range is 0 to 20.
Read Burst:Margin	Specifies the Margin value for Read Data signal, in Read Only burst detection method. Valid range is 0 to 100.

Parameters	Description
Write Burst:tDQS2DQ Type	Specifies the tDQS2DQ type, in Write Only Burst Detection Method. Valid Values are Auto and Manual.
Write Burst:tDQS2DQ Value (ps)	Specifies the tDQS2DQ value, in Write Only Burst Detection Method. Valid Range is 0 to 1875ps.
Write Burst:Pre-amble Length (tCK)	Specifies the Write Data signal's preamble-length, for Write Only Burst Detection Method. Valid Values are 2, 3, and 4.
Write Burst:Post-amble Length (tCK)	Specifies the Write Data signal's postamble-length, for Write Only Burst Detection Method. Valid Values are 0.5 and 1.5.
Write Burst:Burst Length	Specifies the length of the Write burst, in Write Only Burst Detection method. Valid values are 16 and 32.
Write Burst:Strobe High	Specifies the High Reference level for Strobe signal for Write traffic, in Write Only Burst Detection method. Valid range is -1.1 to 1.1.
Write Burst:Strobe Mid	Specifies the Mid Reference level for Strobe signal for Write traffic, in Write Only Burst Detection method. Valid range is -1.1 to 1.1.
Write Burst:Strobe Low	Specifies the Low Reference level for Strobe signal for Write traffic, in Write Only Burst Detection method. Valid range is -1.1 to 1.1.
Write Burst:Data High	Specifies the High Reference level for Data Write signal, in Write Only Burst Detection method. Valid range is -1.1 to 1.1.
Write Burst:Data Mid	Specifies the Mid Reference level for Data Read signal, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Write Burst:Data Low	Specifies the Low Reference level for Data Read signal, in Read Only Burst Detection method. Valid range is -1.1 to 1.1.
Write Burst:Hysteresis	Specifies the Hysteresis value for Write Data signal, in Write Only burst detection method. Valid range is 0 to 20.
Write Burst:Margin	Specifies the Margin value for Write Data signal, in Write Only burst detection method. Valid range is 0 to 100.

Table 18: ParameterName and Value for Test Selection tab

Parameters	Description
Test Name	Specifies the test measurement name. **Clock Group measurements** ■ tCK ■ tCK_Duty_UI_Error ■ tCK_1UI_Rj_NoBUJ ■ tCK_1UI_Dj_NoBUJ ■ tCK_1UI_Tj_NoBUJ ■ tCK_2UI_Rj_NoBUJ ■ tCK_2UI_Dj_NoBUJ ■ tCK_2UI_Tj_NoBUJ ■ tCK_3UI_Rj_NoBUJ ■ tCK_3UI_Dj_NoBUJ ■ tCK_3UI_Tj_NoBUJ ■ tCK_nUI_Rj_NoBUJ ■ tCK_nUI_Dj_NoBUJ ■ tCK_nUI_Tj_NoBUJ ■ VIHdiff.CK(AC) ■ VIHdiff.CK(DC) ■ VILdiff.CK(AC) ■ VILdiff.CK(DC) ■ SRIdiff-Rise ■ SRIdiff-Fall ■ VIX_CK_Ratio **Write Burst measurements** ■ tWPRE ■ tWPST ■ tDQS2DQ ■ tDQSS ■ tDSS ■ tDSH ■ RxMask ■ InputSlew-Diff-Rise(DQS) ■ InputSlew-Diff-Fall(DQS)

Parameters	Description
	■ VIX_DQS_Ratio **Read Burst measurements** ■ tRPRE ■ tRPST ■ tDQSCK ■ VOHdiff(AC) ■ VOLdiff(AC) ■ VOH(AC) ■ VOH(DC) ■ VOL(AC) ■ VOL(DC) ■ SRQdiff-Rise(DQS) ■ SRQdiff-Fall(DQS) ■ SRQse-Rise(DQ) ■ SRQse-Fall(DQ) **Address Command measurements** ■ VIHL_AC ■ RxMask_CA ■ VciVW ■ TciVW ■ TciPW_Positive ■ TciPW_Negative ■ SRIN_clVW_Rise ■ SRIN_clVW_Fall

Table 19: ParameterName and Value for Acquisition tab

Parameters	Description
DQ Connected to : Signal Selected	Enables/ disables the DQ source channel. Valid values are: ■ True ■ False
DQ Connected to	Specifies the source channel to which the Data signal is connected. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4
DQS Connected to : Signal Selected	Enables/ disables the DQS source channel. Valid values are: ■ True ■ False
DQS Connected to	Specifies the source channel to which the Data Strobe signal is connected. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4
CA Connected to : Signal Selected	Enables/ disables the CA source channel. Valid values are: ■ True ■ False
CA Connected to	Specifies the source channel to which the Address command signal is connected. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4
Clock Connected to : Signal Selected	Enables/ disables the Clock signal source when clock signal probe type is set to "Differential". Valid values are: ■ True ■ False

Parameters	Description
Clock Connected to	Specifies the source channel to which the Clock signal is connected. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4
Clock(+) Connected to : Signal Selected	Enables/ disables the Clock signal source when clock signal probe type is set to "Single-Ended". Valid values are: ■ True ■ False
Clock(+) Connected to	Specifies the source channel to which the clock signal (Positive) is connected to, when the Clock Signal Probe Type is selected as single ended. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4
Clock(-) Connected to : Signal Selected	Enables/ disables the Clock signal source when clock signal probe type is set to "Single-Ended". Valid values are: ■ True ■ False
Clock(-) Connected to	Specifies the source channel to which the clock signal (Negative) is connected to, when the Clock Signal Probe Type is selected as single ended. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4
Show Acquire Parameters	■ True ■ False
DQS(+) Connected to : Signal Selected	Specifies if the Strobe Positive signal is selected in the acquisition panel. Valid Values are: ■ True ■ False

Parameters	Description
DQS(-) Connected to : Signal Selected	Specifies if the Strobe Negative signal is selected in the acquisition panel. Valid Values are: ■ True ■ False
DQS(+) Connected to	Specifies the source channel to which the Data strobe positive is connected. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4
DQS(-) Connected to	Specifies the source channel to which the Data strobe negative is connected. Valid Values are: ■ CH1 ■ CH2 ■ CH3 ■ CH4

Table 20: ParameterName and Value for Configuration tab

Parameters	Description
Bandwidth20GHz	Specifies the bandwidth to be set on the oscilloscope. Valid Range is 8 to 20.
Bandwidth16GHz	Specifies the bandwidth to be set on the oscilloscope. Valid Range is 8 to 16.

Table 21: ParameterName and Value for Preferences tab

Parameters	Description
On Test Failure, stop and notify me of the failure	■ True ■ False
Email Settings	■ Recipient e-mail Address ■ Sender's Address
Timer Warning Info Message Popup	Specifies the behavior of Warning message pop-ups. Valid Values are: ■ True ■ False

Parameters	Description
Timer Warning Info Message Popup Duration	Sets the time duration for which the Warning message pop up is displayed. Valid Values are: ■ -2 ■ 2
Timer Error Message Popup	Specifies the behavior of Error message pop-ups. Valid Values are: ■ True ■ False
Timer Error Message Popup Duration	Sets the time duration for which the Error message pop up is displayed. Valid Values are: ■ -2 ■ 2
Enable Logging	Specifies if additional logs are to be captured. Valid values are: ■ True ■ False

Table 22: ParameterName and Value for Acquire

Acquire Type	Parameter name	Value
Clock Clock_Slew_Rate WR_Differential_Strobe WR_Data_Eye WR_Slew_Rate RD_Differential_Strobe RD_Output_Level RD_Slew_Rate Address_Command Address_Command_Eye Address_Command_Slew_Rate	Sample Rate (GS/s)	50
	Record Length (M)	0.001 to 100

Table 23: ParameterName and Value for Analyze

Acquire Type	Parameter name	Value
Clock	Target BER	3 to 22
	N value Start	4 to 30
	N value Stop	4 to 30
	Number of UI state	■ TRUE ■ FALSE
	Number of UI value	0.001 to 2000

Acquire Type	Parameter name		Value
	Worst Case Logging		■ TRUE ■ FALSE
WR_Data_Eye	tCK Value		0.2 to 10
	Eye Width (UI)		0 to 2
	Eye Height (mV)		0 to 1000
	DQS/DQ/Clock Reference Level	Ref levels DQS/DQ/Clock	■ Absolute ■ Percentage
		High level Percentage DQS/DQ/Clock	1 to 99
		Mid level Percentage DQS/DQ/Clock	
		Low level Percentage DQS/DQ/Clock	
		Hysteresis Percentage DQS/DQ/Clock	0 to 50
		High level Absolute DQS/DQ/Clock	-10 to 10
		Mid level Absolute DQS/DQ/Clock	
		Low level Absolute DQS/DQ/Clock	
		Hysteresis Absolute DQS/DQ/Clock	0 to 10
		Ref Levels Autoset Basetop Method DQ/Clock	■ MINMAX ■ AUTO
	Apply DFE		■ TRUE ■ FALSE
	Superimpose DQS		■ TRUE ■ FALSE
	Gain(dB)		-6 to 6
	Threshold(mV)		0 to 2000
	Tap1(mV)		-200 to 50
	Tap2(mV)		-75 to 75
	Tap3(mV)		-60 to 60
	Tap4(mV)		-45 to 45

Acquire Type	Parameter name		Value
	Stop on Mask Hit		■ TRUE ■ FALSE
Clock_Slew_Rate	Slew Rate ref level		■ AUTO ■ Manual
	Number of UI state		■ TRUE ■ FALSE
	Number of UI value		0.001 to 2000
	Worst Case Logging		■ TRUE ■ FALSE
	Clock Reference Level	Ref levels Clock	■ Absolute ■ Percentage
		High level Percentage Clock	1 to 99
		Mid level Percentage Clock	
		Low level Percentage Clock	
		Hysteresis Percentage Clock	0 to 50
		High level Absolute Clock	-10 to 10
		Mid level Absolute Clock	
		Low level Absolute Clock	
		Hysteresis Absolute Clock	0 to 10
		Ref Levels Autoset Basetop Method Clock	■ MINMAX ■ AUTO
WR_Slew_Rate Address_Command_Slew_Rate RD_Slew_Rate	Slew Rate ref level		■ AUTO ■ Manual
	DQS/DQ/CA/Clock Reference Level	Ref levels DQS/DQ/CA/Clock	■ Absolute ■ Percentage
		High level Percentage DQS/DQ/CA/Clock	1 to 99
		Mid level Percentage DQS/DQ/CA/Clock	
		Low level Percentage DQS/DQ/CA/Clock	
		Hysteresis Percentage DQS/DQ/CA/Clock	0 to 50

Acquire Type	Parameter name		Value
		High level Absolute DQS/DQ/CA/Clock	-10 to 10
		Mid level Absolute DQS/DQ/CA/Clock	
		Low level Absolute DQS/DQ/CA/Clock	
		Hysteresis Absolute DQS/DQ/CA/Clock	0 to 10
		Ref Levels Autoset Basetop Method DQ/CA/Clock	■ MINMAX ■ AUTO
Address_Command	Clock/CA Reference Level	Ref levels Clock/CA	■ Absolute ■ Percentage
		High level Percentage Clock/CA	1 to 99
		Mid level Percentage Clock/CA	
		Low level Percentage Clock/CA	
		Hysteresis Percentage Clock/CA	0 to 50
		High level Absolute Clock/CA	-10 to 10
		Mid level Absolute Clock/CA	
		Low level Absolute Clock/CA	
		Hysteresis Absolute Clock/CA	0 to 10
		Ref Levels Autoset Basetop Method Clock/CA	■ MINMAX ■ AUTO
Address_Command_Eye	tCK Value CA		0.2 to 10
	tcivw Value		0 to 2
	vcivw Value		0 to 10
	Clock/CA Reference Level	Ref levels Clock/CA	■ Absolute ■ Percentage
		High level Percentage Clock/CA	1 to 99
		Mid level Percentage Clock/CA	
		Low level Percentage Clock/CA	
		Hysteresis Percentage Clock/CA	0 to 50
		High level Absolute Clock/CA	-10 to 10
		Mid level Absolute Clock/CA	
		Low level Absolute Clock/CA	
		Hysteresis Absolute Clock/CA	0 to 10

Acquire Type	Parameter name		Value
		Ref Levels Autoset Basetop Method Clock/CA	■ MINMAX ■ AUTO
WR_Differential_Strobe RD_Differential_Strobe RD_Output_Level	DQS/DQ/Clock Reference Level	Ref levels DQS/DQ/Clock	■ Absolute ■ Percentage
		High level Percentage DQS/DQ/ Clock	1 to 99
		Mid level Percentage DQS/DQ/ Clock	
		Low level Percentage DQS/DQ/ Clock	
		Hysteresis Percentage DQS/DQ/ Clock	0 to 50
		High level Absolute DQS/DQ/ Clock	-10 to 10
		Mid level Absolute DQS/DQ/ Clock	
		Low level Absolute DQS/DQ/ Clock	
		Hysteresis Absolute DQS/DQ/ Clock	0 to 10
		Ref Levels Autoset Basetop Method DQ/Clock	■ MINMAX ■ AUTO

Table 24: ParameterName and Value for Reports tab

ParameterName	Value
Report Update Mode	■ New ■ Append ■ Replace
Report Path	Mention the path where the report shall be saved.
Save As Type	■ Web Archive (*.mht;*.mhtml) ■ PDF (*.pdf;) ■ CSV (*.csv;)
Auto increment report name if duplicate	TRUE or FALSE
Create report at the end	■ Included ■ Excluded

ParameterName	Value
Include Pass/Fail Results Summary	TRUE or FALSE
Include Detailed Results	TRUE or FALSE
Include Plot Images	TRUE or FALSE
Include Setup Configuration	TRUE or FALSE
Include Complete Application Configuration	TRUE or FALSE
Include User Comments	TRUE or FALSE
Report Settings:Include Header In Appended Reports	TRUE or FALSE
View Report After Generating	TRUE or FALSE
Report Group Mode	■ Test Name ■ Test Result ■ Measurement Group
Append Report	TRUE or FALSE

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:ACQUIRE_MODE PRE-RECORDED\n	It sets the acquire mode as pre-recorded.
TEKEXP:ACQUIRE_MODE?\n	It returns LIVE when acquire mode is set to live.
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 file size in bytes for the filename ReportFileName.
TEKEXP:INFO? WFM\n	It returns “100,“WfmFileName1.wfm””;“200, “WfmFileName2.wfm”" when 100 is the filesize in bytes for the filename WfmFileName1.wfm and 200 is the file size in bytes for the filename WfmFileName2.wfm.
TEKEXP:VALUE ANALYZE,"RxMask","Superimpose DQS","True"	It enables Superimpose DQS.
TEKEXP:VALUE GENERAL,"Bandwidth20GHz",19	It sets the bandwidth to 19 GHz.

Example	Description
TEKEXP:VALUE? GENERAL,"Bandwidth20GHz"	It queries the Bandwidth set and returns the value in GHz.
TEKEXP:INSTRUMENT "Real Time Scope",MSO58 (GPIB8::1::INSTR)\n	It sets the instrument value as MSO58 (GPIB8::1::INSTR) for the selected instrument type Real Time Scope.
TEKEXP:INSTRUMENT? “Real Time Scope”\n	It returns "MSO56 (GPIB8::1::INSTR), when MSO56 (GPIB8::1::INSTR)" is the selected instrument for the instrument type Real Time Scope.
TEKEXP:LASTERROR?\n	It returns ERROR: INSTRUMENT_NOT_FOUND, when no instrument is found.
TEKEXP:LIST? DEVICE\n	It returns "TX-Device,RX-Device" when TX-Device, RX-Device are the available device.
TEKEXP:LIST? INSTRUMENT,"Real Time Scope"\n	It returns "MSO58 (GPIB8::1::INSTR),MSO56 (TCPIP:: 134.64.248.91::INSTR)" when MSO58 (GPIB8::1::INSTR), MSO56 (TCPIP:: 134.64.248.91::INSTR) are the list of 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 Model”\n	It returns "MSO54" when MSO54 is the scope model.
TEKEXP:REPORT? “DUT ID”\n	It returns "DUT001" when DNI_DUT001 is the DUT ID.
TEKEXP:RESULT? "tCK_NUI_RJ_NoBUJ"\n	It returns Pass when the test result is Pass.
TEKEXP:SELECT DEVICE, TX_Device, TRUE\n	It selects TX_Device
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," Test Mode", "Escape"\n	It sets the Test Mode parameter value to Escape

Example	Description
TEKEXP:VALUE? GENERAL,"Test Mode"\n	It returns "Escape" when Escape is the Test Mode value.
TEKEXP:VALUE GENERAL,"DataRate", 3600	It sets the data rate to 3600.
TEKEXP:VALUE? GENERAL,"DataRate"	It returns the data rate that is currently set.
TEKEXP:VALUE GENERAL, "Clock Signal Probe Type", "Single Ended"	It sets the clock signal probe type to single ended.
TEKEXP:VALUE? GENERAL, "Clock Signal Probe Type"	It returns the clock signal probe type as Differential or Single Ended.
TEKEXP:VALUE ANALYZE, "tCK_NUI_RJ_NoBUJ", "N value Start", 2	It sets the analyze parameter's low range for N value to 2 for the specified measurement.
TEKEXP:VALUE? ANALYZE, "tCK_NUI_RJ_NoBUJ", "N value Start"	It returns the value of the analyze parameter Start N Value for the specified measurement.
TEKEXP:SELECT TEST ,"tck",True	It selects the measurement "tCK".
TEKEXP:VALUE? ACQUIRE, "tRPRE", "RD_Differential_Strobe", "Record Length (mpts)"	It returns the record length set for the Acquisition Type RD_Differential_strobe.
TEKEXP:VALUE ACQUIRE, "tRPRE", "RD_Differential_Strobe", "Record Length (mpts)", 0.5	It sets the Record length for the Acquisition type RD_Differential_Strobe to 0.5 mpts.
TEKEXP:VALUE? ANALYZE, "tCK_NUI_RJ_NoBUJ", "N value Start"	It returns the value of the analyze parameter Start N Value for the specified measurement.
TEKEXP:VALUE ANALYZE, "tCK_NUI_RJ_NoBUJ", "N value Start", 2	It sets the Analyze parameter's low range for N value to 2 for the specified measurement.
TEKEXP:VALUE GENERAL,"DQS Probe Mode","A"	It sets the Trimode probe type for DQS signal.
TEKEXP:VALUE? GENERAL,"DQS Probe Mode"	It queries the Trimode probe type set.
TEKEXP:VALUE GENERAL "DQ_Write Connected to Filter File","C:\Users\Public \Automation\FilterFiles\Clock_50GSs.flt"	It sets the filter file for DQ Write signal.
TEKEXP:VALUE? GENERAL "DQ_Write Connected to Filter File"	It queries the filter file used for Write DQ signal.
TEKEXP:USER_DEF_ACQ?	It queries the User Defined Acquisition status.
TEKEXP:USER_DEF_ACQ TRUE	It enables User Defined Acquisition.

References

DDR DFE standalone application

DDR5 DFE Overview

DDR5 supports data rates from 3200 MT/s to 6400 MT/s. This increase in the data rate is realized without the need for differential signaling at the DQ pins i.e. the DQ bus is single-ended – same as DDR3/4.

However, due to the many impedance mismatched points that exist along the memory subsystem, ISI due to reflections are expected to increase. At data rates >= 4800MT/s, the data eye at the DRAM ball is expected to be closed. A 4-tap DFE is implemented in the DDR5 DRAM Rx to help equalize the DQ signals and open the data eyes after the data is latched by the receiver.

DDR DFE Introduction

The DDR DFE is a standalone software application in Tektronix's performance scopes. It is used to perform 4 tap DFE operation on the DDR5 write burst signals coming from the DDR5 DUTs.

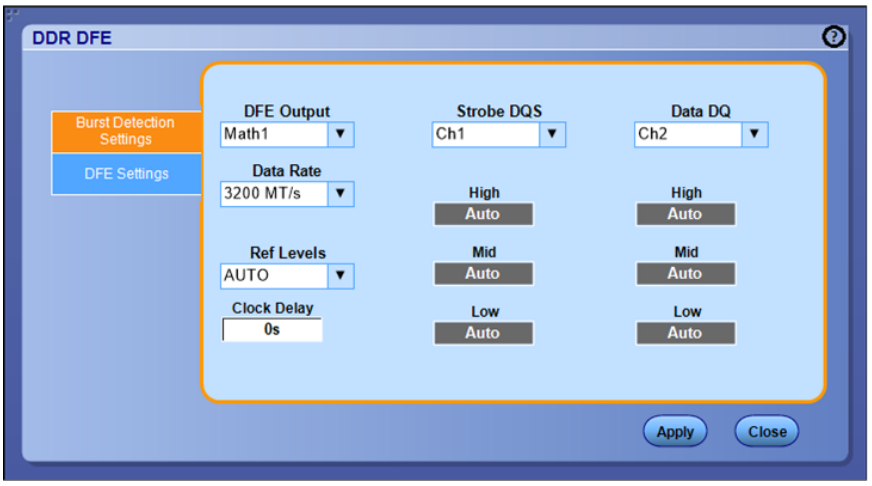
How to launch

Install TekExpress DDR Tx on the oscilloscope. Click **TekScope** > **Analyze Menu** > **DDR DFE**.

DDR DFE Application

Burst Detection Settings

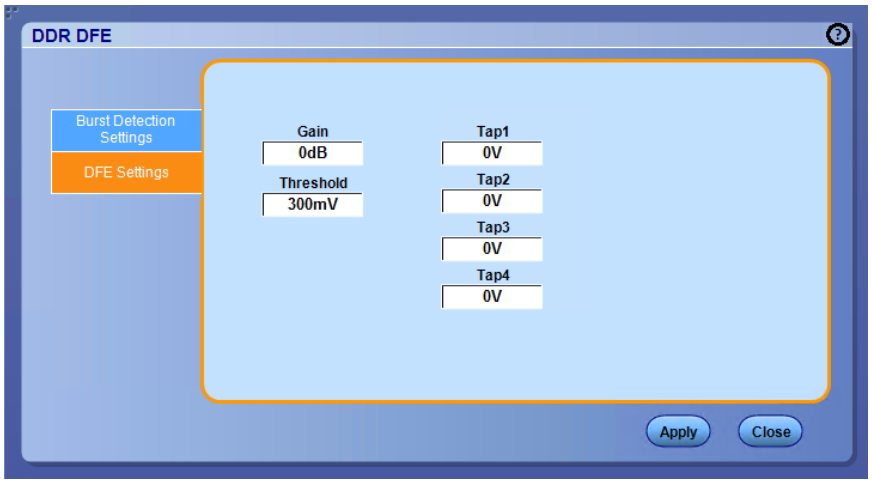
Once the "DDR DFE" is launched, in the 'Burst Detection Settings' tab, user must select 'Strobe DQS' and 'Data DQ' signals coming from the DUT connected to the oscilloscope channels. The user must configure the 'DFE Output' to the required Math channel. The user must set the 'Data Rate' of the DDR5 of the DUT. The waveform edges are selected based on 'Ref Levels' [High, Mid, and Low]. The application will calculate the reference level automatically when ref levels are set to "Auto". The application will calculate separate High, Mid, Low values for 'Data DQ' and 'Strobe DQS'.



When the 'Ref Levels' are modified from Auto to Custom, they can be modified as per user choice. The application will use the reference level set by the user when input levels are set to "Custom". Similarly, 'Clock Delay' can be modified as per user choice. The clock delay is timing delay between DQS to DQ, the delay is used in clock recovery.

DFE Settings tab

The DFE Setting tab will allow the user to define the Gain and Tap values for Tap1, Tap2, Tap3, and Tap4. The gain control of the front end is used to ensure that the cursor or the current bit is in a congruent relationship with the ISI correction required for the channel. The taps T1, T2, T3, T4 coefficients provide the corrections needed to the current bit by adding or subtracting the effects of ISI of the previous bits.



The Gain is applied to the waveform along the 4 tap DFE tap values. The limits of the Gain and tap values are shown below. Note: Initial Gain and DFE taps are each individually limited to the below range. Exact values (TBD) as will be determined upon release of JEDEC specification.

Threshold is the middle voltage level of the signal, which may be the transition between logic levels. For biased signals, enter the mid-level value.

Description	Min	Max	Unit
DFE Gain	-6	6	dB
DFE Tap 1	-200	50	mV
DFE Tap 2	-75	76	mV
DFE Tap 3	-60	60	mV
DFE Tap 4	-45	45	mV

Description	Typical	Unit
DFE Gain Avg Step Size	2	dB
DFE Tap Avg Step Size	5	mV

Apply the DFE Settings to Math

Click **Apply** to configure the Gain and Tap values configured in the Burst Detections Settings tab to the DFE Output. You can find the Math output generating the DFE applied DQ waveform, which you can use with Strobe DQS for any of the measurements of your choice.

NOTE. *Do not use DDR DFE while executing the Write Eye measurements in the TekExpress DDR Tx application.*

SDLA DDR5 Tutorial

This tutorial provides details on how to setup SDLA to model a DDR5 memory system test configuration. The DQS and DQ signals are acquired through the oscilloscope probes that are soldered onto an interposer that fits between the memory chip and the circuit board. The user can then setup S-parameter models for the probe, and interposer, and the memory system loading and transmission lines. The goal is to create filters, that when applied to the acquired waveforms, de-embeds the effects of interposer and probe. Thus, accounting for impedance mis-match and reflections.

SDLA overview

The overall purpose of SDLA is to allow the user to setup S-parameter models for the measurement system used to acquire signals on an oscilloscope and for the simulation system. It will compute filters to apply to the input waveforms of the oscilloscope and provide waveforms that would be represented by the various test points in the SDLA system model. SDLA also provides an Rx block model that allows for simulation of CTLE, clock recovery, and FFE and DFE equalization filters.

Steps to install and launch SDLA application

1. Install the latest SDLA version on the oscilloscope.
2. To launch the application, select **TekScope** > **Analyze** > **Serial Data Link Analysis**

Follow the steps to launch the **SDLA DDR5 Modeling Tutorial** document.

1. To launch the application, select **TekScope** > **Analyze** > **Serial Data Link Analysis**
2. Click **Rx** in the SDLA menu.

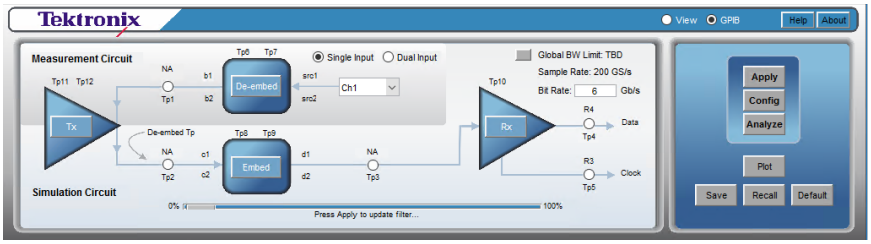


Figure 11: SDLA Visualizer

3. In the SDLA Visualizer - Rx Configuration, select **User** and click the **Config** tab.

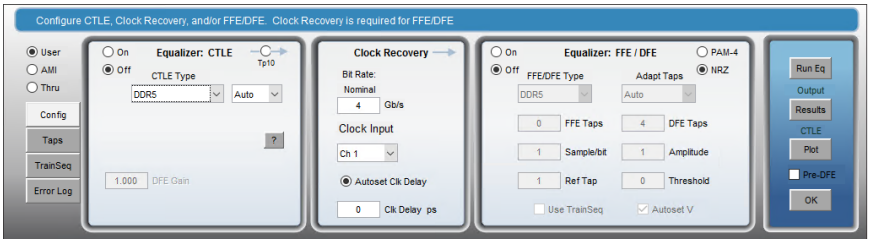


Figure 12: SDLA Visualizer - Rx Configuration

4. Select **DDR5** from the CTLE Type drop-down menu.
5. Click **?** button to open the SDLA help file.

Pre-recorded waveform file names for test measurements

The following table specifies the waveforms to load for the selected Acquire Type.

Acquire Type	Waveforms to be loaded
Clock	■ For differential signal probe type DDR5_<DataRate>_Clock_Clock_<RecordLength>_<SourceChannel>.wfm ■ For Single Ended Probe Type DDR5_<DataRate>_Clock_Clock-_<RecordLength>_<SourceChannel>.wfm DDR5_<DataRate>_Clock_Clock+_<RecordLength>_<SourceChannel>.wfm
Clock_Slew_Rate	■ DDR5_<DataRate>_Clock_Slew_Rate_Clock_<RecordLength>_<SourceChannel>.wfm
WR_Differential_Strobe	For differential signal probe type: ■ DDR5_<DataRate>_WR_Differential_Strobe_Clock_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_WR_Differential_Strobe_DQ_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_WR_Differential_Strobe_DQS_<RecordLength>_<SourceChannel>.wfm For single-ended probe type: ■ DDR5_<DataRate>_WR_Differential_Strobe_DQS+_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_WR_Differential_Strobe_DQS-_<RecordLength>_<SourceChannel>.wfm
WR_Data_Eye	■ DDR5_<DataRate>_WR_Data_Eye_DQS_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_WR_Data_Eye_DQ_<RecordLength>_<SourceChannel>.wfm
WR_Slew_Rate	■ DDR5_3200_WR_Slew_Rate_DQ_<RecordLength>_<SourceChannel>.wfm ■ DDR5_3200_WR_Slew_Rate_DQS_<RecordLength>_<SourceChannel>.wfm

Acquire Type	Waveforms to be loaded
RD_Differential_Strobe	■ DDR5_<DataRate>_RD_Differential_Strobe_Clock_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_RD_Differential_Strobe_DQ_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_RD_Differential_Strobe_DQS_<RecordLength>_<SourceChannel>.wfm
RD_Output_Level	■ DDR5_3200_RD_Output_Level_DQ_<RecordLength>_<SourceChannel>.wfm ■ DDR5_3200_RD_Output_Level_DQS_<RecordLength>_<SourceChannel>.wfm
RD_Slew_Rate	■ DDR5_3200_RD_Slew_Rate_DQ_<RecordLength>_<SourceChannel>.wfm ■ DDR5_3200_RD_Slew_Rate_DQS_<RecordLength>_<SourceChannel>.wfm
Address_Command	■ DDR5_<DataRate>_Address_Command_CA_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_Address_Command_Clock_<RecordLength>_<SourceChannel>.wfm
Address_Command_Eye	■ DDR5_<DataRate>_Address_Command_Eye_CA_<RecordLength>_<SourceChannel>.wfm ■ DDR5_<DataRate>_Address_Command_Eye_Clock_<RecordLength>_<SourceChannel>.wfm
Address_Command_Slew_Rate	■ DDR5_<DataRate>_Address_Command_Slew_Rate_CA_<RecordLength>_<SourceChannel>.wfm

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