Tektronix®

TekExpress® DDR Tx Software

Printable Application Help

077-1648-01

TekExpress® DDR Tx Software

Printable Application Help

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- Worldwide, visit *www.tek.com* to find contacts in your area.

Table of Contents

Welcome....vii
Getting help and support....9
Product documents....9
Conventions....9
Technical support....10
Getting started....11
Hardware requirements....11
Supported oscilloscope models....11
Recommended probes....11
Recommended SI Interposers....11
Software requirements....11
Required software....11
Downloading and installing the software....11
Activate the license....12
View software version and license key details....12
Setting up the test environment....13
Search instruments connected to the application....13
Compensate the signal path (Prerequisite)....14
Running tests....14
View test results....14
Launching the application....16
Application controls....16
Options menu functions....17
Configure email settings....18
Setup panel: Configure the test setup....20
DUT: Set DUT settings....21
Burst detection method....28
Test Selection: Select the tests....32
Acquisitions: Set waveform acquisition settings....33
Configuration: Set measurement limits for tests....35
Preferences: Set the test run preferences....41
Status panel: View the test execution status....43
View test execution status....43
View test execution logs....44
Results panel: View summary of test results....47
Filter the test results....48
Reports panel: Configure report generation settings....49
Select report generation options....49
View a generated report....52
Saving and recalling test setup....54
Test setup files overview....54
Save the configured test setup....54
Load a saved test setup....54
Select a pre-run session from the loaded test setup....54

Save the test setup with a different name....55
SCPI Commands....56
About SCPI command....56
Socket configuration for SCPI commands....56
Set or query the device name of application....62
Set or query the test name of the application....62
Set or query the general parameter values....66
Set or query the analyze parameter values....82
Query the available devices in the DUT panel of the application....95
Query the list of available tests of the application....95
Query the list of available instruments based on the specified instrument type....99
Set or query the IP address of the instrument based on the specified instrument type....99
Query the information of the generated report file....100
Query the information of the generated waveform files....100
Query the information of the generated image files....101
Query the active TekExpress application name....101
Sets or query the acquire mode status....101
Set or query the execution mode status....102
Generate the report for the current session....102
Query the value of specified report header field in the report....103
Query the value of specified result detail available in report summary/details table....103
Restore the setup to default settings....104
Save the settings to a specified session....104
Save the setup....105
Open the setup from a specified session....105
Query the current setup file name....105
Run/stop/pause/resume the selected measurements execution in the application....105
Query the current measurement execution status....106
Query whether the current setup is saved or not saved....106
Query the status of the previous command execution....106
Query the last error occurred....107
Set or query the popup details....107
Query the enable or disable status of Continuous run function....108
Set or query the continuous run duration time value....108
Set or query the session create option in the continuous run function....108
Set or query the View report after generating option status....109
Examples....110
References....114
Application directories....114
File name extensions....114
View test-related files....115
DDR DFE standalone application....116
SDLA DDR5 Tutorial....117
Pre-recorded waveform file names for test measurements....118
Index....122

Welcome

Figure 1: DDR5

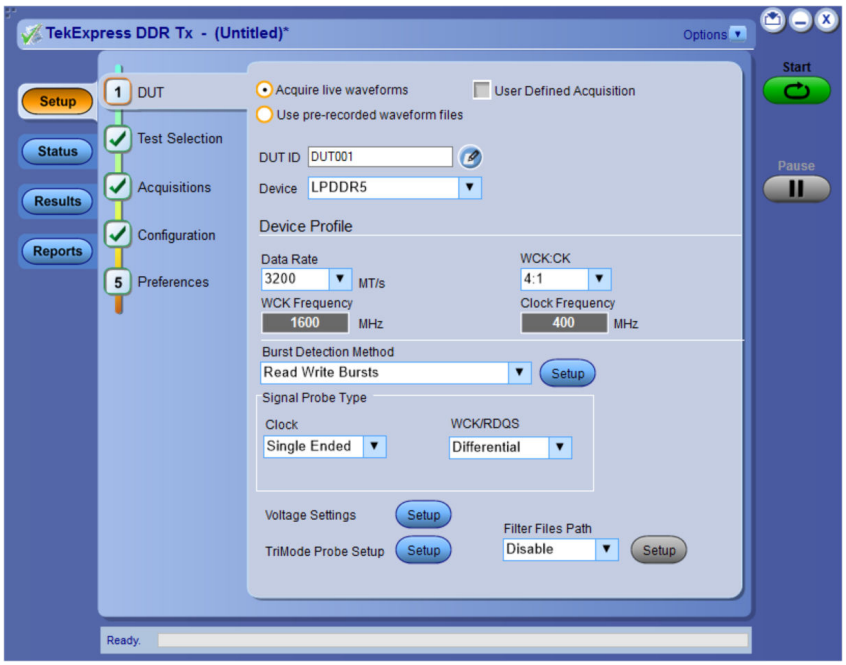


Figure 2: LPDDR5

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 speed of these signals require high performance measurement tools.

The Tektronix TekExpress DDR Tx is an automated test application that supports DDR5 and LPDDR5 to validate and debug design of the respective DUT as per the latest JEDEC specification. The solution enables you to achieve new levels of productivity, efficiency, and measurement reliability.

Key features for LPDDR5

1. Supports 52 measurements of LPDDR5 System Transmitter Tests as per LPDDR5 JEDEC specifications:
   a. 09 Clock measurements
   b. 11 Write Clock measurements
   c. 11 Write Data measurements
   d. 07 Read Data measurements
   e. 07 CA Rx Specification measurements
   f. 07 CS Rx Specification measurements
2. Number of UIs support for Clock, Write Clock, Write Data and Read Data measurements.
3. Hexagonal shape mask and margin analysis.

Key features for DDR5

1. Performance improvement in overall test execution time when all tests are selected.
2. Single Acquire Type for CLOCK, DATA [Write], DATA [READ], CA measurements; group wise and Analyze.
3. Automatic calculation of amplitude for Read Write Burst detection.
4. 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
5. Number of UIs support for Clock and Read/Write Data measurements.
6. Diamond shape mask and margin analysis for Write Data Eye measurement
7. DDR DFE: Deploys 'DDR DFE' Standalone application, that can be launched from TekScope > Analyze > DDR DFE
8. Support DFE for Write Data Eye measurements
9. DDR DFE: Added Threshold "Auto" option selection.
10. DDR DFE: Increased the record length capability for continuous signal.

Key features applicable for both DDR5 and LPDDR5

1. De-embedding support applicable as per respective signal type in both Devices.
2. User Defined Acquisition support for all signal types respectively in both Devices.
3. Multi-Run feature is applicable for all tests in both Devices.
4. All tests are De-selected by default in Test Selection tab.
5. All acquisition sources are De-selected by default in Acquisition panel.
6. Enabled de-embedding and TriMode probe support in User Defined Acquisition (UDA).
7. Acquire parameters like Record Length and Sample Rate are moved to Global Configurations.
8. Save worst case waveform in known / TekExpress sessions.
9. Retain Vertical Scale support during acquisition.
10. Visual trigger setup file support in Visual Search.
11. User friendly measurement configurations.
12. Test Report to reflect all the statistics of the measurement.
13. User can select the source and channel in acquisition panel.
14. Voltage settings moved into common location for easy access.
15. Multiple Burst Detection Method supported - Read and Write, Write Only, Read Only, Visual Search.

Getting help and support

Product documents

Use the product documents for more information on the application functions, understand the theory of operation, how to remotely program or operate the application, and do other tasks.

Table 1: TekExpress Application documents

To learn about	Use this document
How to use the application How to remotely control the instrument	TekExpress <Application Name> Help PDF version of this document can be downloaded from *www.tek.com/downloads* Compiled HTML (CHM) version is integrated with the application. Press **F1** key from the keyboard to launch the help. Tektronix Part Number: 077-xxxx-xx

Conventions

This application help uses the following conventions:

- The term "Application," and "Software" refers to the TekExpress 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: Icons used in the help

Icon	Description
	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 *Contacting Tektronix* 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

Getting started

Hardware requirements

Supported oscilloscope models

- DPO71604SX, DPO72304SX, DPO73304SX
- MSO72304DX, MSO72504DX, MSO73304DX, DPO72304DX, DPO72504DX, DPO73304DX
- Non-ATI channels of DPS75004SX, DPS75904SX, DPS77004SX.

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 / P77STLRCB**: Active, Solder-in Tip with TekFlex connector technology:
  - DDR5: Probe tips to probe CLK, DQS, DQ, and CA on the Nexus XH Series SI Interposer.
  - LPDDR5: Probe tips to probe CLK, WCK, RDQS, DQ, CA, and CS on the Nexus XH Series SI Interposer.

Recommended SI Interposers

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, *www.nexustechnology.com/products/memory-interposers/ddr5-main-memory-interposers/* for DDR5 and *www.nexustechnology.com/products/memory-interposers/lpddr5-mobile-memory-interposers/* for LPDDR5.

Software requirements

Required software

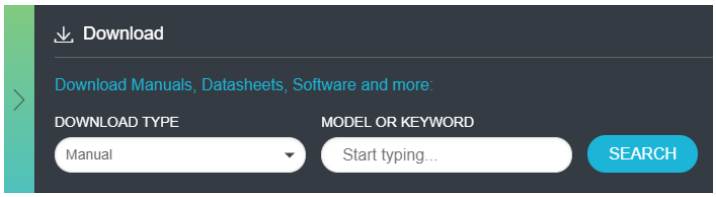
- **LPDDR5SYS**: LPDDR5 Memory Bus Electrical Validation and Analysis Oscilloscope Software.
- **DDR5SYS**: DDR5 Memory Bus Electrical Validation and Analysis Oscilloscope Software.
- **SDLA64**: Serial Data Link Analysis for Win 64-bit Scopes.
- **DJA**: DPOJET Jitter Analysis.
- **VET**: VET – Visual Trigger.

Downloading and installing the software

Complete the following steps to download and install the latest TekExpress <Application Name> application.

1. Go to *www.tek.com*.

2. Click **Downloads**. In the Downloads menu, select DOWNLOAD TYPE as Software and enter the application name in the MODEL OR KEYWORD field and click **SEARCH**.



3. Select the latest version of software and follow the instructions to download the software. Copy the executable file into the oscilloscope.
4. Double-click the executable and follow the on-screen instructions.

   The software is installed at `C:\Program Files\Tektronix\TekExpress\TekExpress <Application Name>`.
5. Select **Application > TekExpress <Application Name>** from the Oscilloscope menu, to open 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 and license key details

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

Setting up the test environment

Search instruments connected to the application

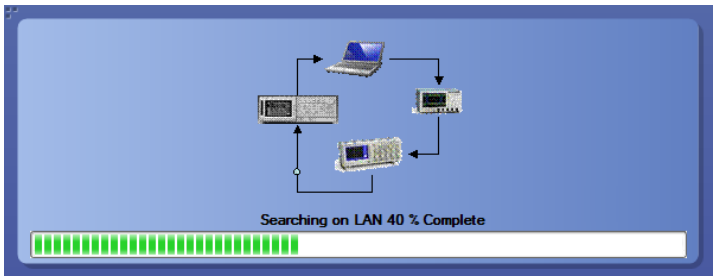
Use the TekExpress Instrument Control Settings dialog box to search the instruments (resources) connected to the application. The application uses TekVISA to discover the connected instruments.

Note: The instruments required for the test setup must be connected and detected by the application, before running the test.

To refresh the list of connected instruments:

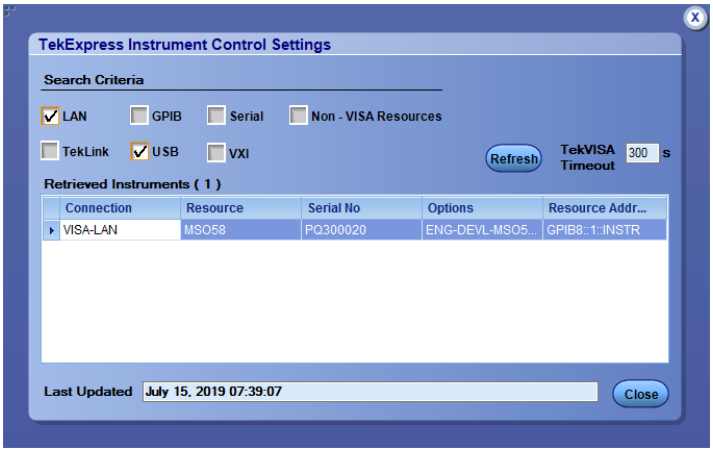
1. Select **Options > Instrument Control Settings**.
2. In the **Search Criteria** section of the **Instrument Control Settings** dialog box, select the connection types of the instruments to search. Instrument search is based on the VISA layer, but different connections determine the resource type, such as LAN, GPIB, and USB. For example, if you choose LAN, the search will include all the instruments supported by the TekExpress that are communicating over the LAN.
3. Click **Refresh**. The TekExpress application searches for the connected instruments.

   Search status of the instruments connected to LAN



4. When the search is complete, a 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 the LAN and GPIB instruments connected to the application.

   TekExpress Instrument Control Settings window.



   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.

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

DUT: Set DUT settings on page 21 , *Select tests*, *Acquisitions: Set waveform acquisition settings* on page 33, *Configuration: Set measurement limits for tests* on page 35, *Preferences: Set the test run preferences* on page 41, 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** (

).

Launching the application

To launch the TekExpress <application name>, select **Applications > TekExpress <application name>** from the oscilloscope menu bar.

During launch, a "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 gets unmapped. Session files are then stored inside the `X:\<Application name>` folder. If this file is not found, the application runs an instrument discovery program to detect connected instruments before launching TekExpress <application name>.

To keep the TekExpress <Application name> application on top of any application, select **Keep On Top** from the *options menu*. If the application goes behind the oscilloscope application, select **Applications > TekExpress <application name>** to bring the application to the front.

Application controls

This section describes the application controls.

Table 3: Application control description

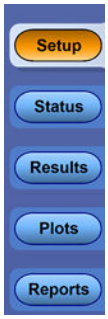
Item	Description
Options menu	Menu to display global application controls.
Test panel 	Controls that open tabs for configuring test settings and options.
Start / Stop button	Use the **Start** button to start the test run of the measurements in the selected order. If prior acquired measurements are not 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**.

Table continued…

Item	Description
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*. **Note:** This button is visible only when there are results data on the panel.
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.

Options menu functions

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

Options menu

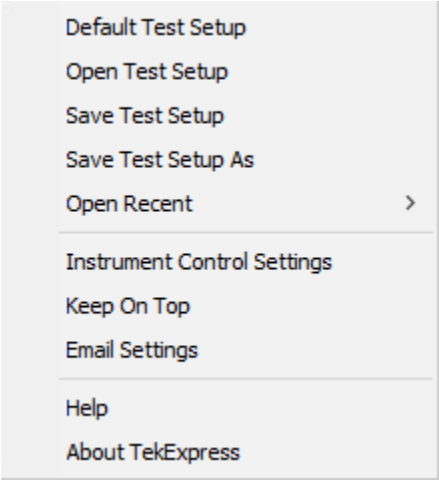


Table 4: Options menu settings

Menu	Function
Default Test Setup	Opens a new test setup with default configurations.
Open Test Setup	Opens a previously saved test setup. Displays the list of previously saved test setup file names. Make the selection and click **OK** to open the test setup.
Save Test Setup	Saves the current test configurations with the specified file name.
Save Test Setup As	Saves the current test setup with a different file name or file type.
Open Recent	Displays the recently opened test setup file names. Make the selection and click **OK** to open the test setup.
Instrument Control Settings	Detects, lists, and refreshes the connected instruments found on the specified connections (LAN, GPIB, USB, Serial, Non-VISA Resources, TekLink, and VXI).
Keep On Top	Always keeps the TekExpress <application name> application on top of all the applications.
Email Settings	Configures email options for test run and result notifications.
Help	Displays the TekExpress <Applicaiton Name> help.
About TekExpress	Displays the application name, version, and hyperlink to end the user license agreement.

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:

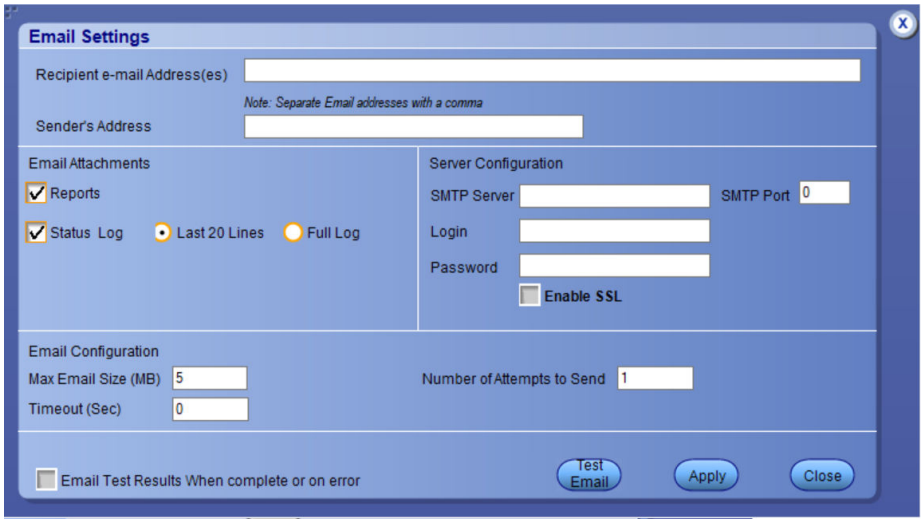


Figure 3: Email settings window

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.

Setup panel: Configure the test setup

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

Figure 4: DDR5

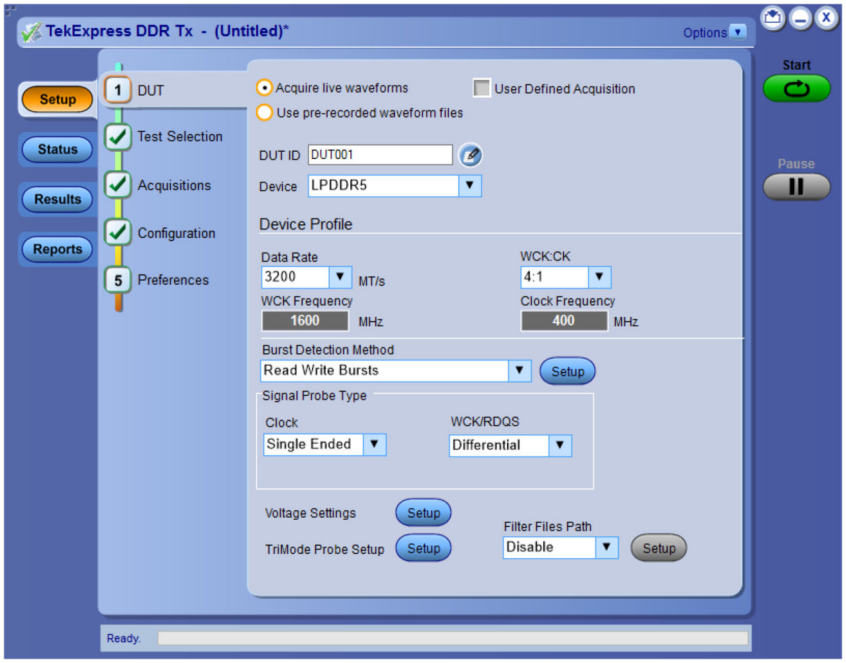


Figure 5: LPDDR5

DUT: Set DUT settings

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.

Figure 6: DDR5

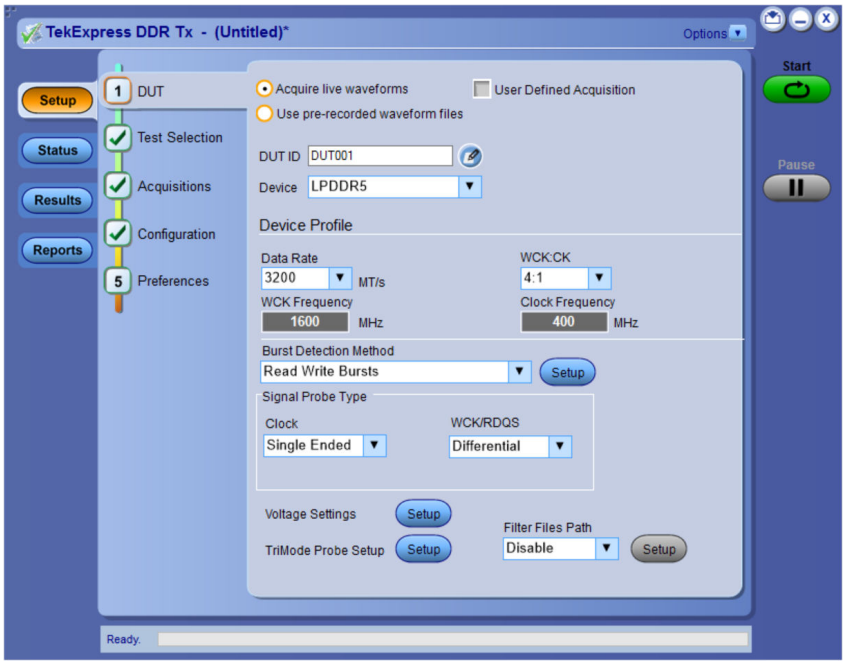


Figure 7: LPDDR5

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

Table 5: 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* **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*.
Device	Select Device name as DDR5/LPDDR5 from drop-down.
Device Profile	
Data Rate (MT/s)	Select the data rate from drop down.
WCK:CK	(Available only when **Device** = **LPDDR5**) WCK:CK is the WCK:CK ratio and is user selectable as either 2:1 or 4:1. By default it is set to 4:1.
WCK Frequency (MHz)	(Available only when **Device** = **LPDDR5**) Displays the write clock frequency of the DUT, based on the selected **Data Rate** and **WCK:CK** Ratio.
Clock Frequency (MHz)	(Available only when **Device** = **LPDDR5**) Displays the clock frequency of the DUT, based on the selected **Data Rate** and **WCK:CK** Ratio.
Burst detection method	Selects the burst detection method from drop-down. • Read Write Bursts • Write Only Bursts • Read Only Bursts • Visual search

Table continued…

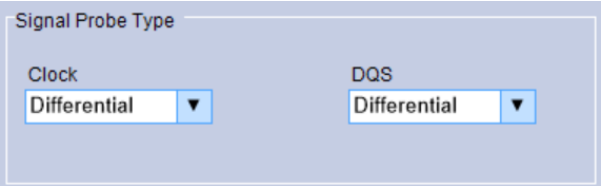
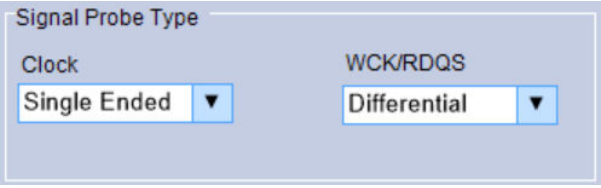
Setting	Description
Signal Probe Type	Selects the probe type **Clock**, **DQS**, and **and WCK/RDQS** to execute the tests. • **Clock** - Differential or Single Ended • **DQS** - Differential or Single Ended • **WCK/RDQS** - Differential or Single Ended **(Only available when Device = LPDDR5)**  *Figure 8: DDR5*  *Figure 9: LPDDR5* You can configure the signal as per the probes you are planning to use to run the tests. For **Device**=**DDR5** and **Signal type**=**Clock**: If probes are connected in a single-ended fashion, then internally a differential signal is created to perform clock jitter measurements. For **Device**=**LPDDR5** and **Signal type**=**Clock** or **WCK**: If probes are connected in a single-ended fashion, then internally a differential signal is created to perform clock or write clock measurements respectively. Based on the probe type selected for Clock or DQS, the test selection panel refreshes the measurements in clock and data group.

Table continued…

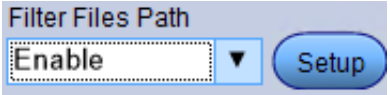
Setting	Description
Filter Files path	Select Enable or Disable from the drop-down list.  Click **Setup** ( ). Browse and select the filter files from the De-Embed Filter File Path menu for respective signals as per the probing type you use for Differential and Single-Ended signals. Click **Close** to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

Table continued…

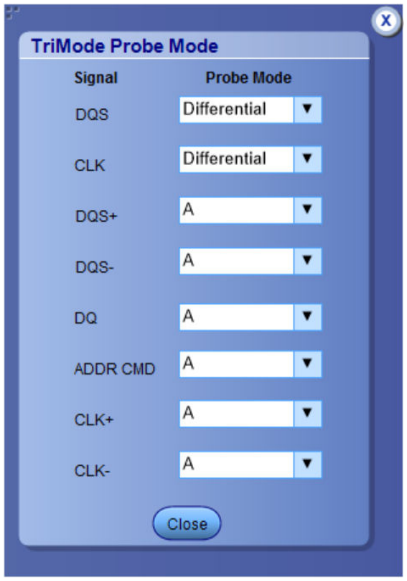
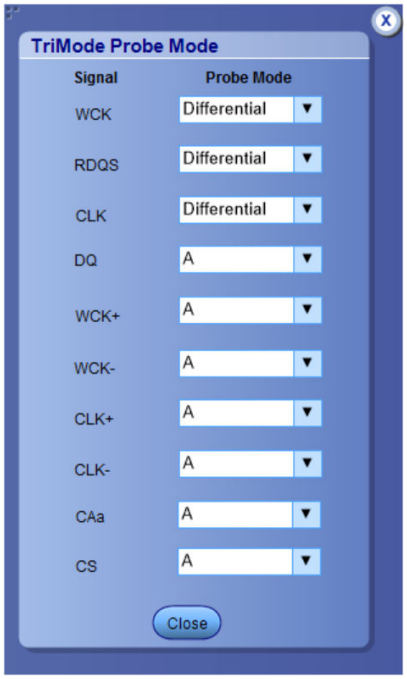
Setting	Description
TriMode Probe Setup	With TriMode probing, one probe setup makes differential, single-ended, and common mode measurements accurately. Click **Setup**. In TriMode Probe Mode window, select A, B, or Differential from the drop-down list. • A represents that probe is configured to point 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 10: TriMode Probe Mode window for DDR5*  *Figure 11: TriMode Probe Mode window for LPDDR5*

Table continued…

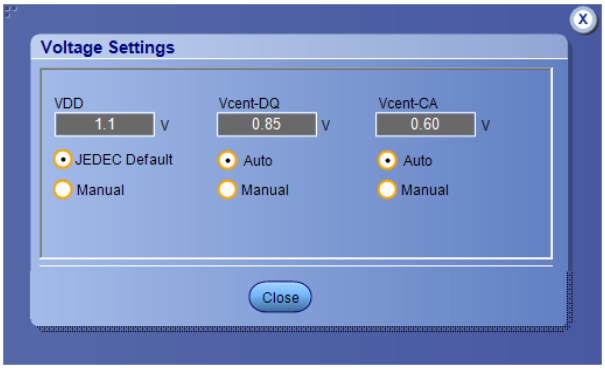
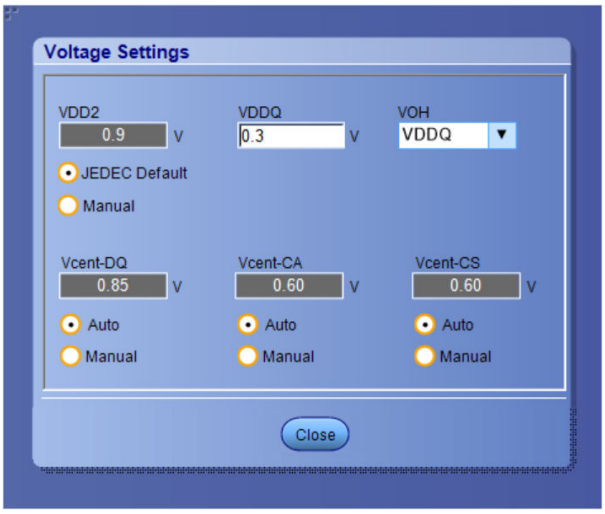
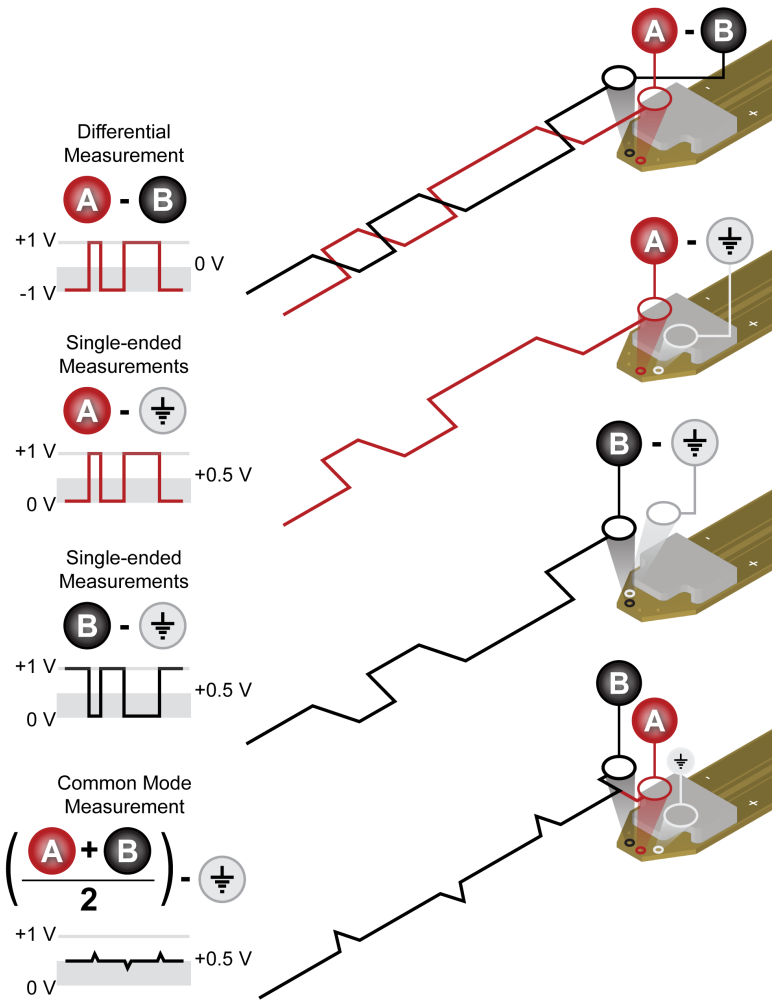
Setting	Description
Voltage Settings	Open the voltage Settings setup to observe and to modify the voltage levels respectively.  *Figure 12: Voltage Settings window for DDR5*  *Figure 13: Voltage Settings window for LPDDR5*
VDD (V)	VDD is the supply voltage for each DDR standard. For DDR5, it is 1.1 V. • Displays **JEDEC** value by default. • Select **Manual** to change the VDD value.
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.
Vcent-CA (V)	Vcent_CA is the voltage at widest part of the eye. • Displays **Auto** value by default. • Select **Manual** to change the Vcent_CA value from -2 V to 2 V.

Table continued…

Setting	Description
Vcent-CS (V)	(Available only when **Device** = **LPDDR5**) Vcent_CS is voltage at widest part of the eye. • Displays **Auto** value by default. • Select **Manual** to change the Vcent-CS value from -2 V to 2 V.
VDD2 (V)	(Available only when **Device** = **LPDDR5**) VDD2 is the supply voltage for each DDR standard. • Displays **JEDEC** value by default. • Select **Manual** to change the VDD2 value from 1.05 V to 0.9 V as per **Data Rate**.
VDDQ (V)	(Available only when **Device** = **LPDDR5**) VDDQ is the voltage internally applied to the I/O buffer, varies from 0.5 V to 0.3 V as per Data Rate. It is user configurable to change the value from 0 V to 5 V.
VOH (V)	(Only available when **Device** = **LPDDR5**) VOH is the output voltage swing, it can be set as VDDQ or VDDQ/2.

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

Test Selection: Select the tests on page 32

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.

Burst Detection Method
Read Write Bursts
Read Write Bursts
Write Only Bursts
Read Only Bursts
Visual Search

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: When the DUT traffic is transmitting both Read + Write bursts and if the Read burst amplitude is greater than the Write burst amplitude, follow the below steps for burst detection by setting the 'Burst Amplitude Levels' as 'Manual'.

   a. Measure the Peak to Peak voltage level between the Higher burst's and the lower burst's using the "Cursors > Cursors On > Cursor Type > H Bars". Note down the middle voltage level of the two peak-peak voltages.
   b. In the "TekExpress DDR Tx > DDR5 > Burst Detection Method > Read Write Bursts > Setup", set the measured voltage value in the Read Burst (pk-pk) (V) and Write Burst (pk-pk) (V) fields present under the Read and Write tabs respectively.
   c. Select "Yes" for 'Is Read burst (pk-pk) amplitude greater than Write burst (pk-pk) amplitude' and "No" for 'Is Write burst (pk-pk) amplitude greater than Read burst (pk-pk) amplitude' fields present under the Read and Write tabs respectively.
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 6: Burst detection parameter description for DDR5

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.
Burst Amplitude Levels	Specify the burst amplitude level. • **Auto**: when selected, the amplitude calculation is done automatically. • Select **Manual** to enter the user defined values. Used in case of Read Write Bursts as Burst Detection Method and must be specified in Read and Write tabs.
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.

Table continued…

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.
DQ/DQS Levels	Select the type of burst detection level for the search. • **Auto**: The application calculates these levels for you. It is recommended unless you find that manual levels are necessary for reliable detection. • **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. **Note:** The High/Mid/Low levels used for burst detection have no relationship to the reference levels used for measurement points.
Edge Detection Hysteresis	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.

Table 7: Burst detection parameter description for LPDDR5

Pre-amble static (tCK) [Write]	The write burst pre-amble static length is automatically set by the application, based on the selection of **Data Rate** and **WCK:CK** ratio.
Pre-amble toggle (tCK) [Write]	The write burst pre-amble toggle length is automatically set by the application, based on the selection of **Data Rate** and **WCK:CK** ratio.
tWCK2DQI [Write]	The Write burst tWCK2DQI value is automatically set by the application. Used in case of Write Only Bursts or Read Write Bursts (For Write) as Burst Detection Method. To set user defined value, select **Manual** option and specify the tWCK2DQI value as per your device.
Pre-amble static (tWCK) [Read]	Specify the Read burst pre-amble static length of your device here.
Pre-amble toggle (tWCK) [Read]	The Read burst pre-amble toggle length is set by the application automatically as per the Read burst pre-amble static length specified by you, are as per your Device.
tDQSQ [Read]	tDQSQ value is automatically set by the application. Used in case of Read Only Bursts or Read Write Bursts (For Read) as Burst Detection Method. To set user defined value select **Manual** option and specify the tDQSQ value as per your device.
Post-amble Mode [Read]	Specify the Read burst Post-amble Mode either Static / Toggle of your device here.

Table continued…

Burst Length (UI)	Specify the Read / Write burst length of your device here. Used in case of Write Only Bursts or Read Only Bursts or Read Write Bursts as Burst Detection Method.
Post-amble Length (tWCK)	Specify the Read / Write burst post-amble length of your device here.
DQ/RDQS Levels [Read] **DQ/WCK Levels** [Write]	Select the type of burst detection level for the search. • **Auto**: The application calculates these levels for you. It is recommended unless you find that manual levels are necessary for reliable detection. • **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. **Note:** The High/Mid/Low levels used for burst detection have no relationship to the reference levels used for measurement points.
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 can 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.

Test Selection: Select the tests

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

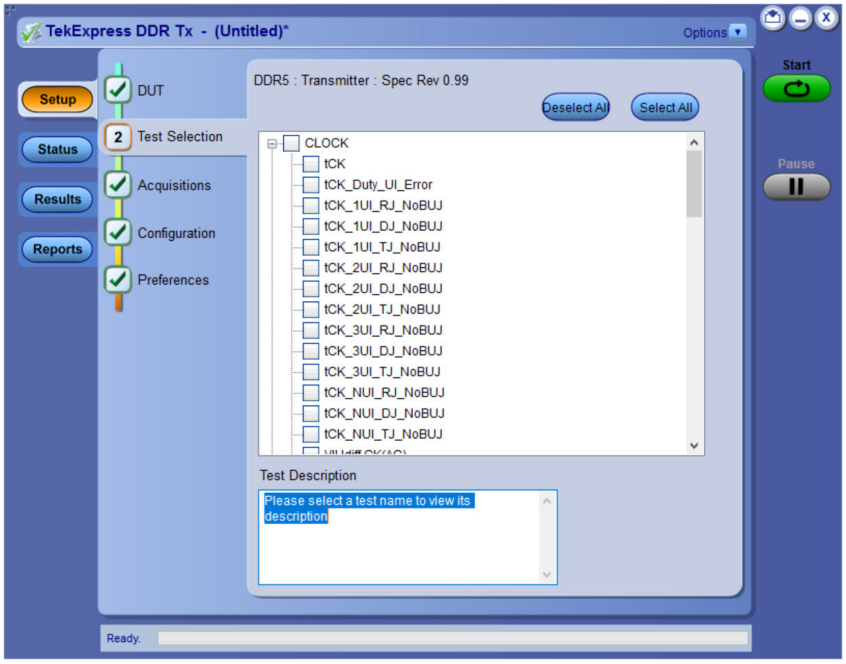


Figure 14: TekExpress DDR Tx (DDR5) measurements

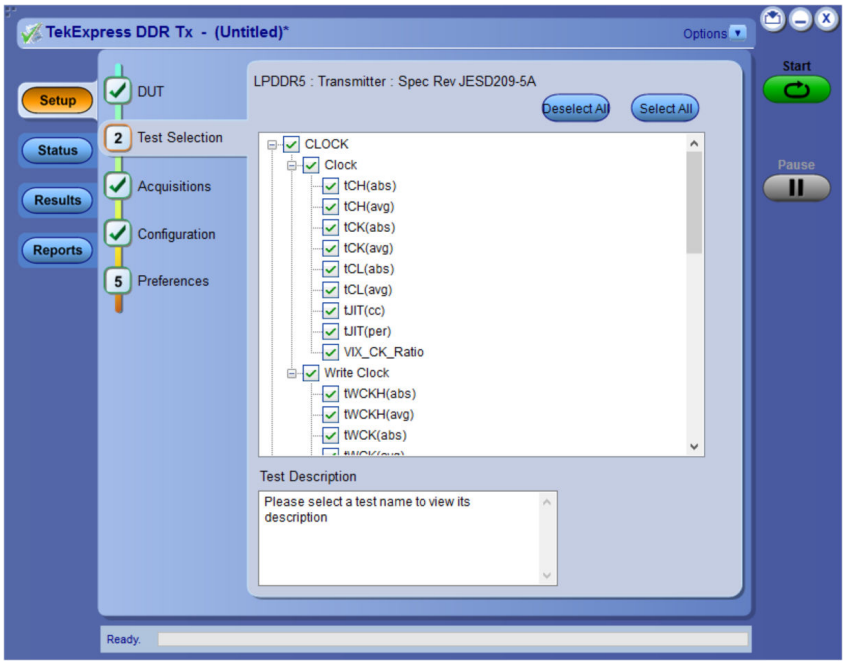


Figure 15: TekExpress DDR Tx (LPDDR5) measurements

Table 8: 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

Acquisitions: Set waveform acquisition settings on page 33

Acquisitions: Set waveform acquisition settings

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

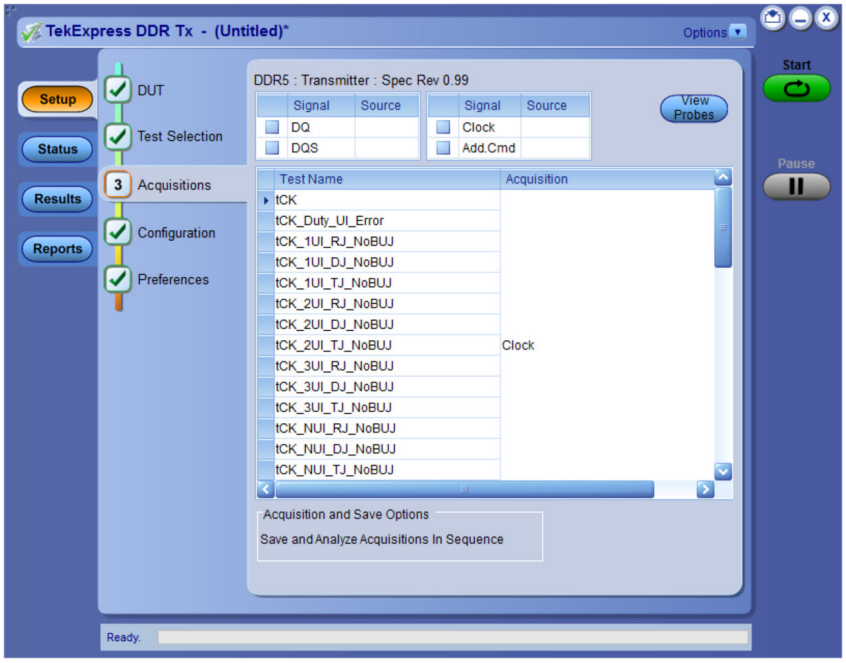


Figure 16: Acquisition tab for DDR5

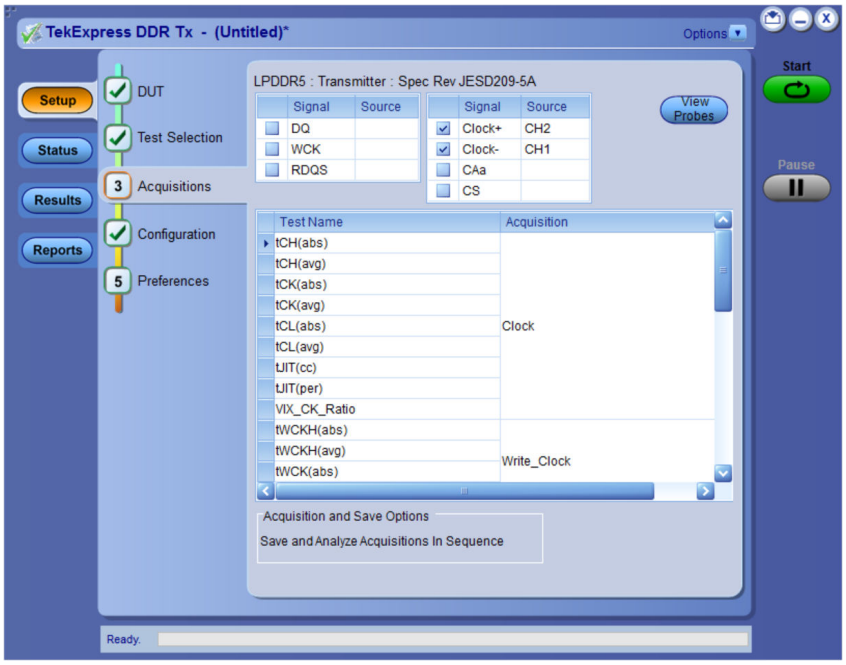
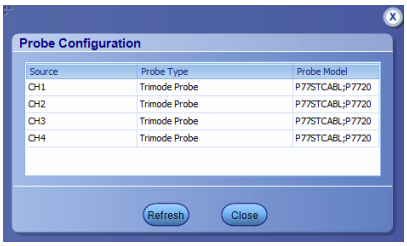


Figure 17: Acquisition tab for LPDDR5

Table 9: Acquisitions tab settings

Settings	Description
View Probes	View the detected probe configuration. Use the View Probes dialog box to view the connected probes. 
Signal	Select the type of signal on which the measurements need to be run.
Source	Select the channels with the respective signal type, on which the measurements have to be run.
Acquisition and Save options	
Save and Analyze Acquisition In Sequence	Saves and then analyses the acquisition in sequence.

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.

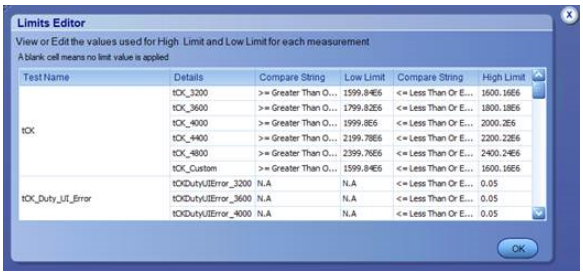
See also

Pre-recorded waveform file names for test measurements on page 118

Configuration: Set measurement limits for tests

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 10: Configuration tab: Common parameters

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

Configuration tab: Global settings

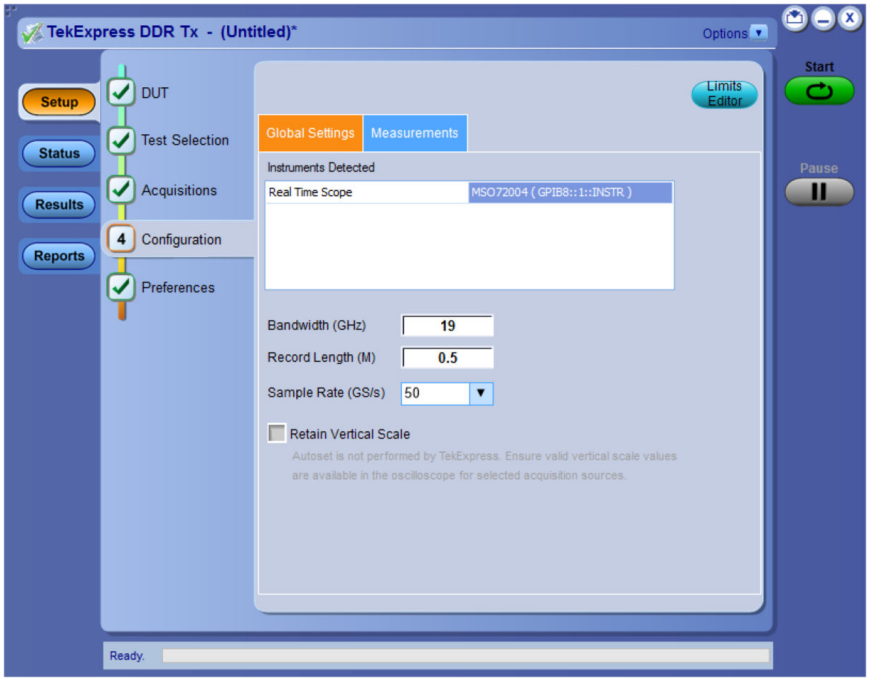


Figure 18: Configuration tab: Global Settings

Settings	Description
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 is used for all tests.
Record Length	Specifies the waveform record length.
Sampling Rate	Specifies the oscilloscope's sample rate for all tests.
Retain Vertical Scale	When enabled, retains vertical scale, offset and position values for the channels as specified by user prior to start of run.

DDR5 Configuration tab: Measurements settings

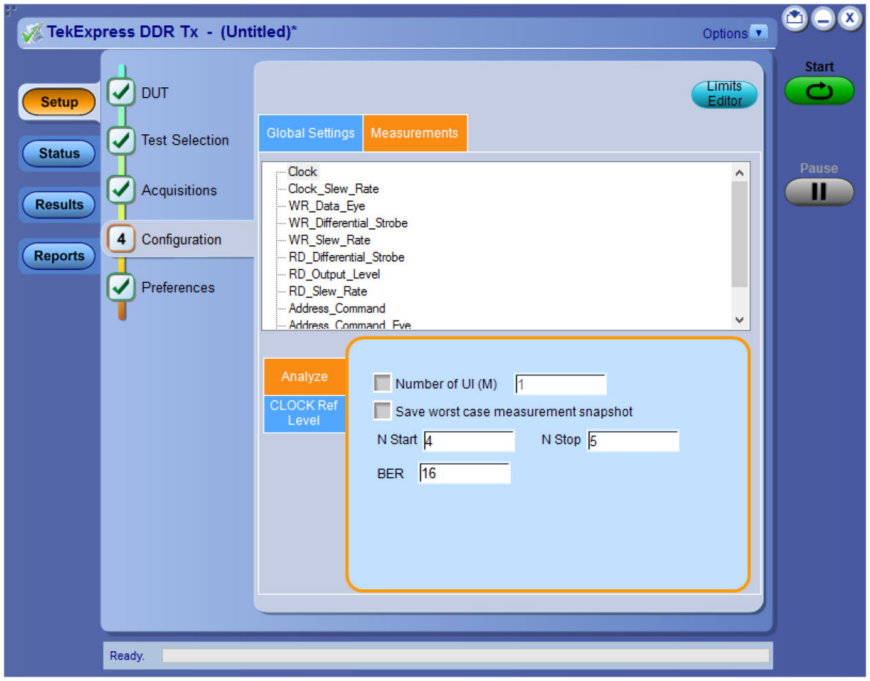


Figure 19: Configuration tab settings for DDR5

Table 11: Configuration tab settings for DDR5

Settings		Description
Measurements		Displays the measurement groups, that are selected in the Test Selection tab. Select the respective test group to view or modify the measurement configuration.
Number of UI		Enable to execute the selected measurement/s for specified number of unit intervals.
Save worst case measurement snapshot		Enable to save the worst case measurement snapshot for the selected measurement.
N start\N stop		Specifies the start and stop values for NUI jitter measurements. where N = 4, 5, 6,….30
BER		Specifies the Bit Error Rate.
tCK (ns)		Unit interval in seconds.
Superimpose DQS		Select to add DQS eye on the data eye diagram.
Stop on Mask Hit		Select to stop the test execution as soon as mask hit is observed.
Vertical Scale (Scale to DQ / Scale to DQS)		Scales the waveform which is larger among the superimposed eye, When **Superimpose DQS** option is checked. Auto scales to the vertical height of the data signal without considering the reference clock (DQS) signal amplitude.
Include Margins in the plot		Select to display mask margins in the eye diagram plot.
Mask Definition	Write Data Eye	• **Eye Width (UI)**: It is the Eye Width of stressed eye, based on the selected **Data Rate**. • **Eye Height (mV)**: It is the Eye height of stressed eye based on the selected **Data Rate**.
	Address Command Eye	• **TciVW (UI)**: It is the Rx Timing Window. • **VciVW (V)**: It is the Rx Mask voltage $_{p\text{-}p}$
Apply DFE		When checked, applies the DFE on the Write Data (DQ) and the output waveform of DQ is used for Write Data Eye measurement.
Gain		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.
Threshold		It is the middle voltage level of the signal, which may be the transition between logic levels. For biased signals, enter the mid-level value.
Tap (1 to 4)		The taps T1, T2, T3, T4 coefficients provide the corrections to the current bit by adding or subtracting the effects of ISI of the previous bits.

Table continued…

Settings	Description	
Ref Levels Clock / DQS / DQ / CA	Timing measurements are based on the state transition times. Edges occur when a waveform crosses specified reference voltage levels. Reference voltage levels must be set so that the application can identify state transitions on a waveform. By default, the application automatically chooses reference voltage levels when necessary.	
	Base top method	Specifies the Base-Top method, used for all reference voltage levels when auto set occurs.
	Absolute	Select to manually configure the reference level settings.
	Percentage	Select to manually configure the reference level settings in percentage.
	High Level	Sets the high threshold level for the rising and falling edge of the source.
	Mid Level	Sets the middle threshold level for the rising and falling edge of the source.
	Low Level	Sets the low threshold level for the rising and falling edge of the source.
	Hysteresis	Sets the threshold margin to the reference level, in which the voltage must cross to be recognized as changing; the margin is the relative reference level plus or minus hysteresis; use to filter out spurious events.

LPDDR5 Configuration tab: Measurements settings

Figure 20: Configuration tab settings for LPDDR5

Table 12: Configuration tab settings for LPDDR5

Settings	Description
Measurements	Displays the measurement groups that are selected in the Test Selection tab. Select the respective test group to view or modify the measurement configuration.
Window Size	Measurement analysis is done on a window of size 200 cycles with a step increment of 1 cycle. As per the standard, the default window size is 200. You can set window size up to 1M.
Number of UI (M)	Select to execute the selected measurement/s for the specified number of intervals.
Save worst case measurement snapshot	Enable to save the worst-case measurement snapshot for the selected measurement.
Superimpose WCK\Superimpose RDQS	Select to add WCK/RDQS eye on the data eye diagram.
Stop On Mask Hit	Select to stop the test execution as soon as mask hit is observed.
Vertical Scale [Scale to DQ / Scale to WCK / Scale to RDQS]	Scales the waveform which is larger among the superimposed eye, When **Superimpose WCK / RDQS** option is checked. Auto scales the vertical height of the data signal without considering the reference clock (WCK / RDQS) signal amplitude.
Include Margins in the plot	Select to display mask margins in the eye diagram plot.

Table continued…

Settings		Description	
Mask Defnition	Write Data Eye	• **TDIVW1 (UI)**: It is the DQ Rx mask width. • **TDIVW2 (UI)**: It is the DQ Rx mask width at VDIVW. • **VDIVW (V)**: It is the DQ Rx mask height.	
	Address Command Eye	• **TCIVW1 (UI)**: It is CA Rx mask width. • **TCIVW2 (UI)**: It is the CA Rx mask width at VCIVW. • **VCIVW (V)**: It is the CA Rx mask height.	
	Chip Select Eye	• **TCSIVW1 (UI)**: It is CS Rx mask width. • **TCSIVW2 (UI)**: It is the CS Rx mask width at VCSIVW. • **VCSIVW (V)**: It is the CS Rx mask height.	
Ref Levels Clock / WCK / RDQS / DQ / CA /CS		Timing measurements are based on the state transition times. Edges occur when a waveform crosses specified reference voltage levels. Reference voltage levels must be set so that the application can identify state transitions on a waveform. By default, the application automatically chooses reference voltage levels when necessary.	
		Base top method	Specifies the Base-Top method, used for all reference voltage levels when auto set occurs.
		Absolute	Select to manually configure the reference level settings.
		Percentage	Select to manually configure the reference level settings in percentage.
		High Level	Sets the high threshold level for the rising and falling edge of the source.
		Mid Level	Sets the middle threshold level for the rising and falling edge of the source.
		Low Level	Sets the low threshold level for the rising and falling edge of the source.
		Hysteresis	Sets the threshold margin to the reference level, in which the voltage must cross to be recognized as changing; the margin is the relative reference level plus or minus hysteresis; use to filter out spurious events.

Preferences: Set the test run preferences

Use **Preferences** tab to set the application action on completion of a measurement. The **Preferences** tab has the feature to enable or disable certain options related to the measurement execution.

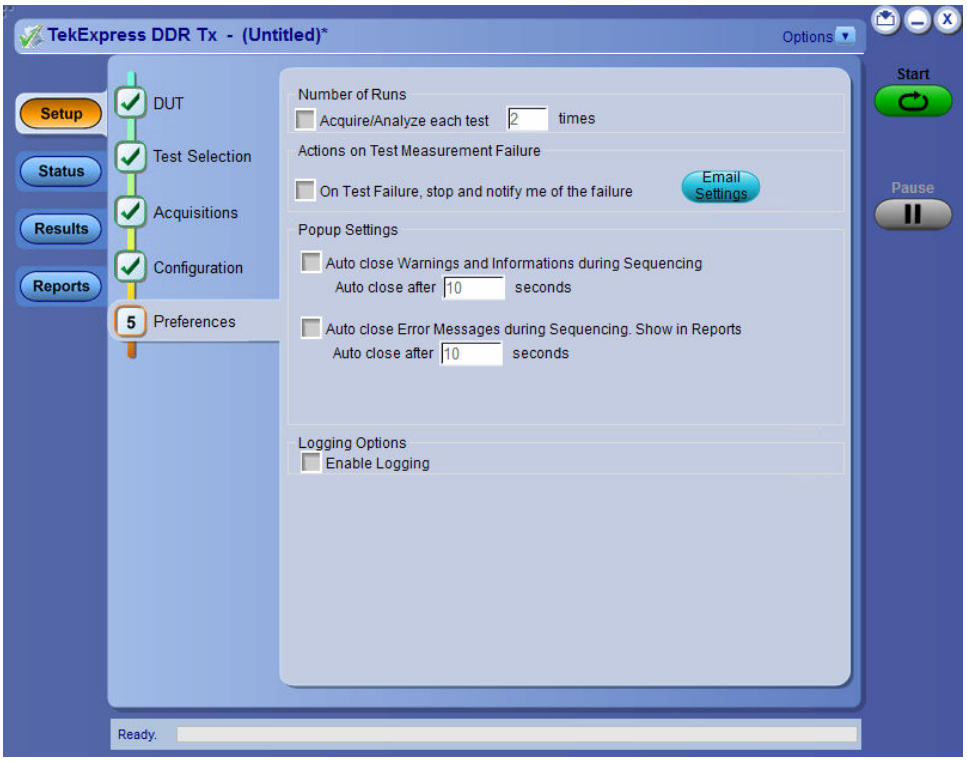


Figure 21: Preferences tab

Refer the below table for the options available in the **Preferences** tab:

Table 13: Preferences tab settings

Setting	Description
Number of Runs	
Acquire/Analyze each test <no> times (not applicable to Custom Tests)	Select to repeat the test run by setting the number of times. By default, checkbox is disabled. Upon enabling, the default value is 10.
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 **Email Settings** to configure the email settings to receive notifications.
Popup Settings	
Auto close Warnings and informations during Sequencing Auto close after <no> seconds	Select to close the warnings and information window automatically after the specified amount of tme. Specify the time in seconds using the edit box.

Table continued…

Setting	Description
Auto close Error Messages during Sequencing. Show in Reports Auto close after <no> seconds	Select to close the error message window automatically after the specified amount of time. Specify the time in seconds using the edit box.
Logging Options	
Enable Logging	Select to record the actions of the user by the application. By default, it is selected.

Status panel: View the test execution status

The Status panel contains the **Test Status** and **Log View** tabs, which provides status on the test acquisition and analysis (Test Status) and listing of test tasks performed (Log View tab). The application opens the **Test Status** tab when you start to execute the test. Select the **Test Status** or the **Log View** tab to view these items while the test execution is in progress.

View test execution 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.

The **Test Status** tab presents a collapsible table with information about each test as it is running. Use the symbols to expand (+) and collapse (−) the table rows.

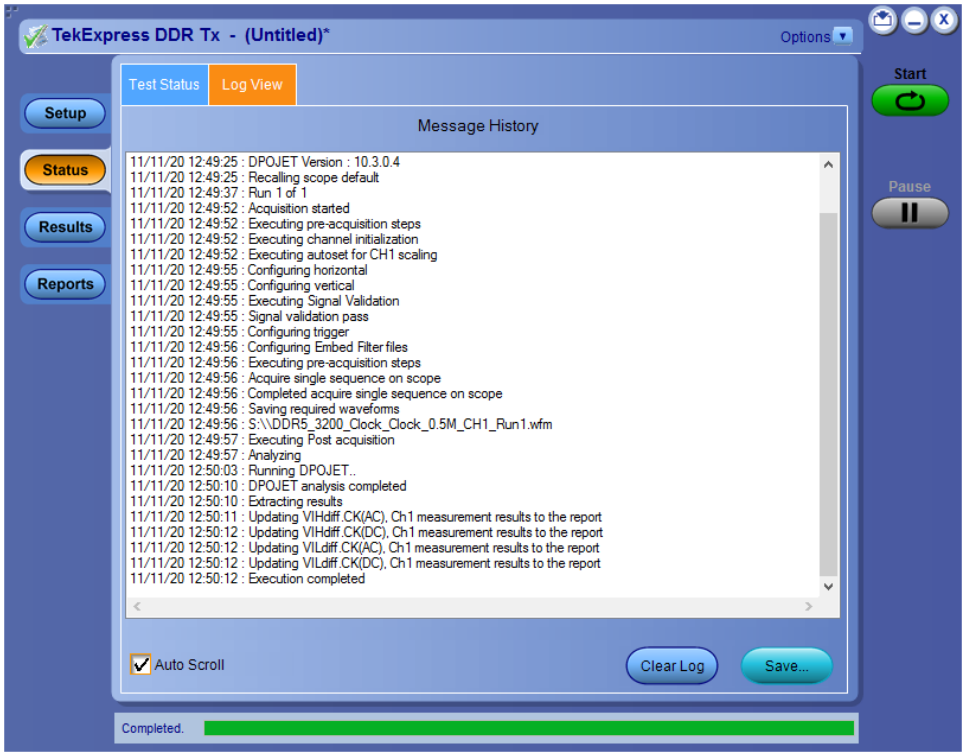


Figure 22: Test execution status view in DDR5 Status panel

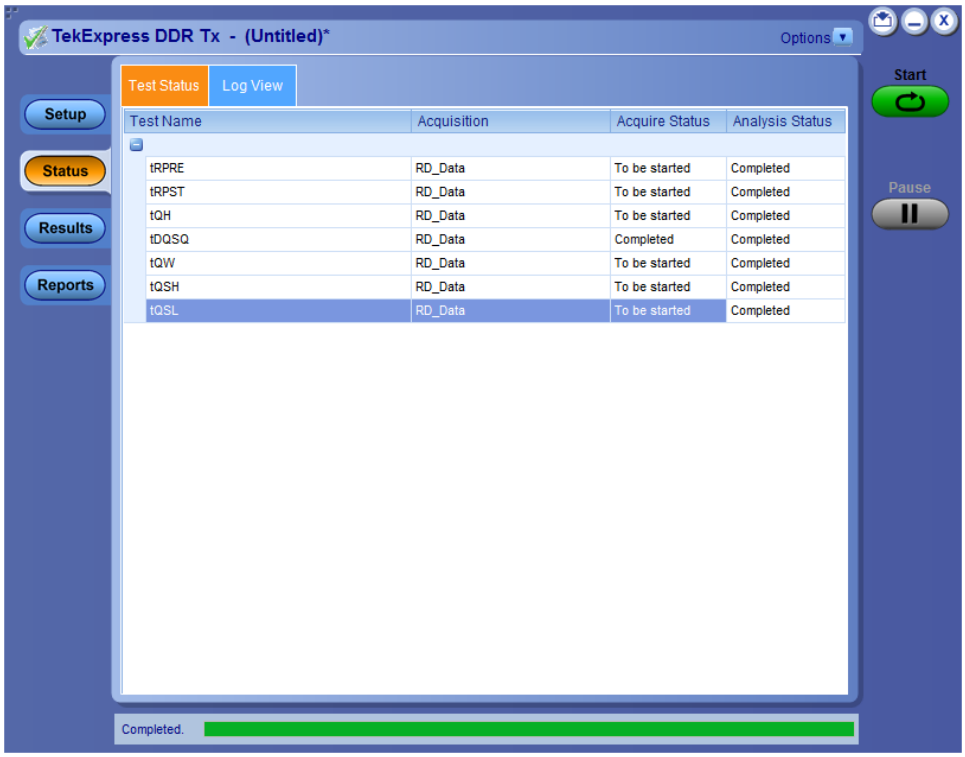


Figure 23: Test execution status view in LPDDR5 Status panel

Table 14: Test execution status table headers

Table Header	Description
Test Name	Displays the measurement name.
Acquisition	Describes the type of data being acquired.
Acquire Status	Displays the progress state of the acquisition: • To be started • Started Acquisition • Completed Acquisition
Analysis Status	Displays the progress state of the analysis: • To be started • In Progress • Completed • Aborted

View test execution logs

The Test Status tab displays the detailed execution status of the tests. Also, displays each and every execution step in detail with its timestamp information. The log details can be used to troubleshoot and resolve any issue/bug which is blocking the test execution process.

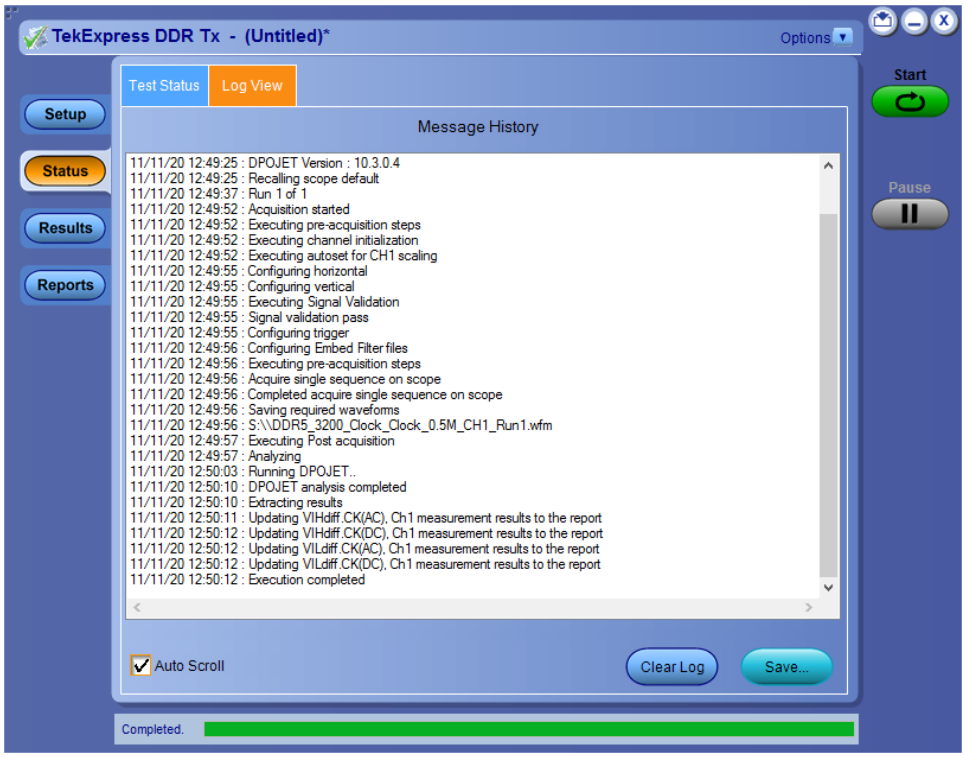


Figure 24: Log view in DDR5 Status panel

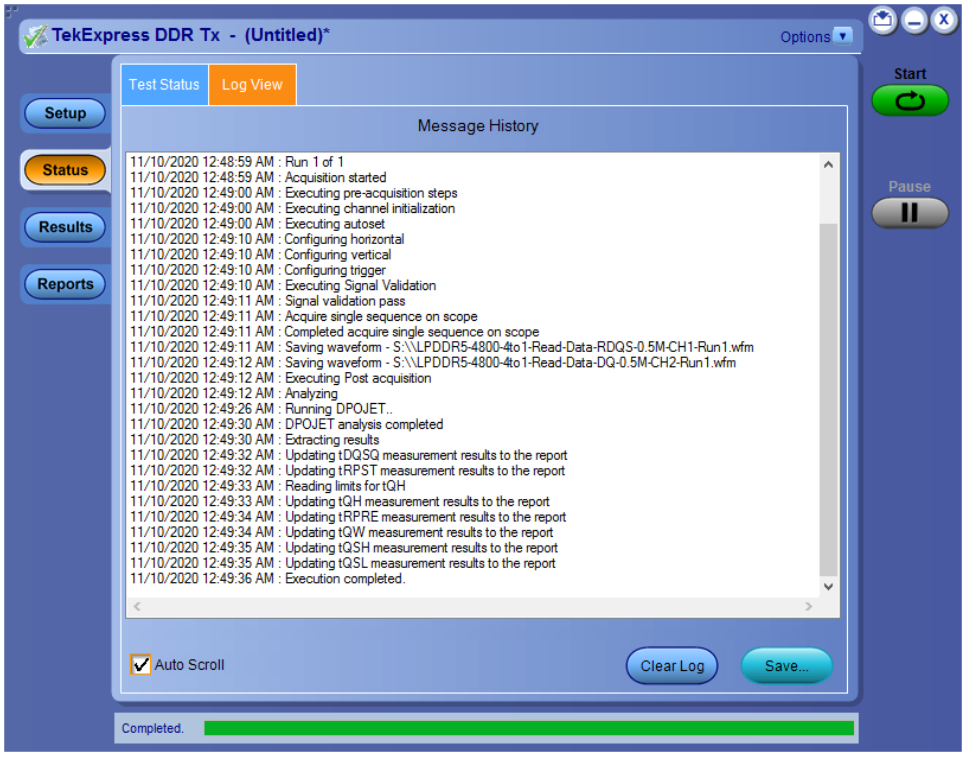


Figure 25: Log view in LPDDR5 Status panel

Table 15: Status panel settings

Control	Description
Message History	Lists all the 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 the messages from the log view.
Save	Saves the log file into a text file format. Use the standard Save File window to navigate to and specify the folder and file name to save the log text.

Results panel: View summary of test results

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

In the Results table, each test result occupies a row. By default, results are displayed in summary format with the measurement details collapsed and with the Pass/Fail column visible.

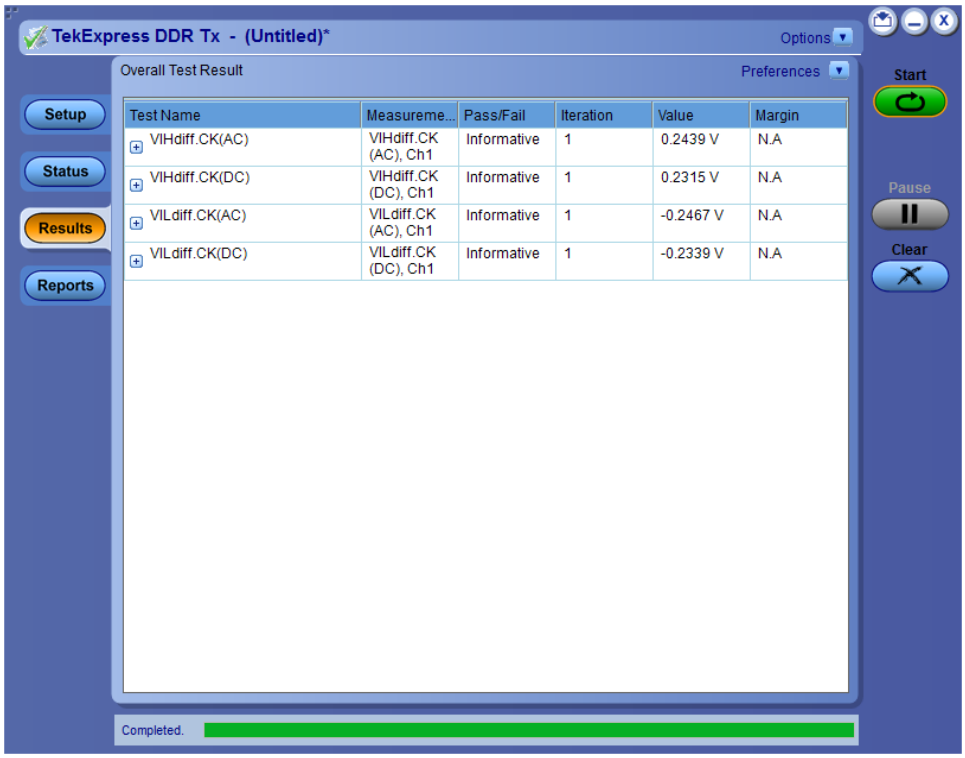


Figure 26: DDR5 Results panel with measurement results

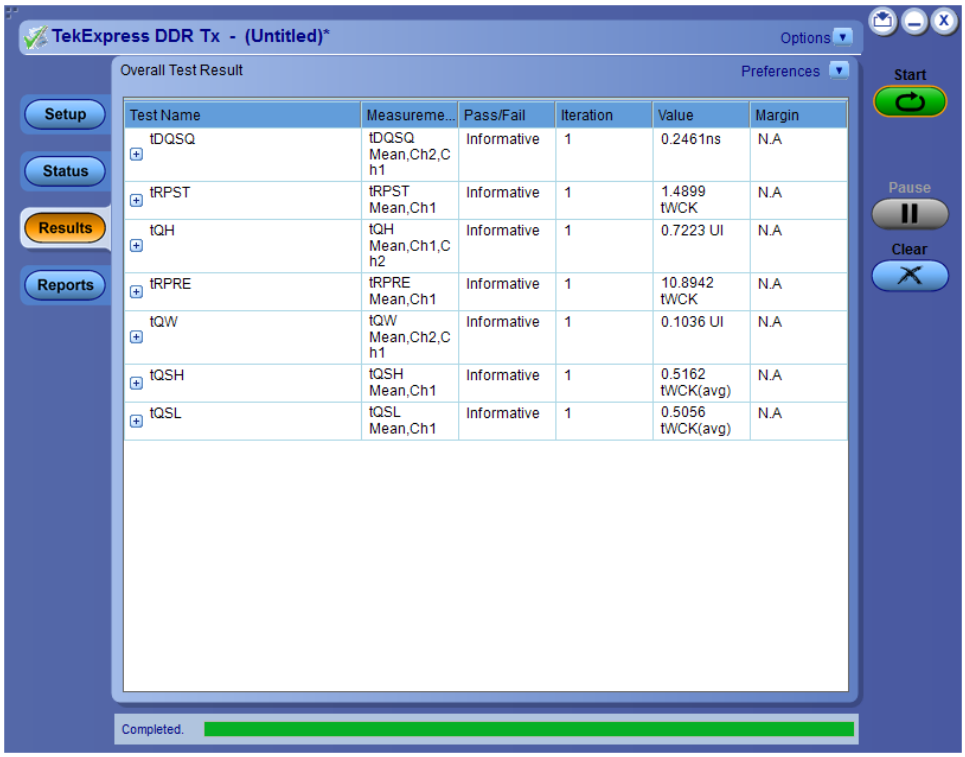


Figure 27: LPDDR5 Results panel with measurement results

Click icon on each measurement in the row to expand and to display the minimum and maximum parameter values of the measurement.

Filter the test results

Each column in the result table can be customized and displayed by enabling or disabling any column as per your requirement. You can 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 the listed tests, 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**.

Reports panel: Configure report generation settings

Click **Reports** panel to configure the report generation settings and select the test result information to include in the report. You can use the Reports panel to configure report generation settings, select test content to include in reports, generate the report, view the report, browse for reports, name and save reports, and select report viewing options.

Select report generation options

This section describes the report generation settings you can configure in the Reports panel. Select report settings before running a test or when creating and saving test setups. Report settings configured are included in saved test setups.

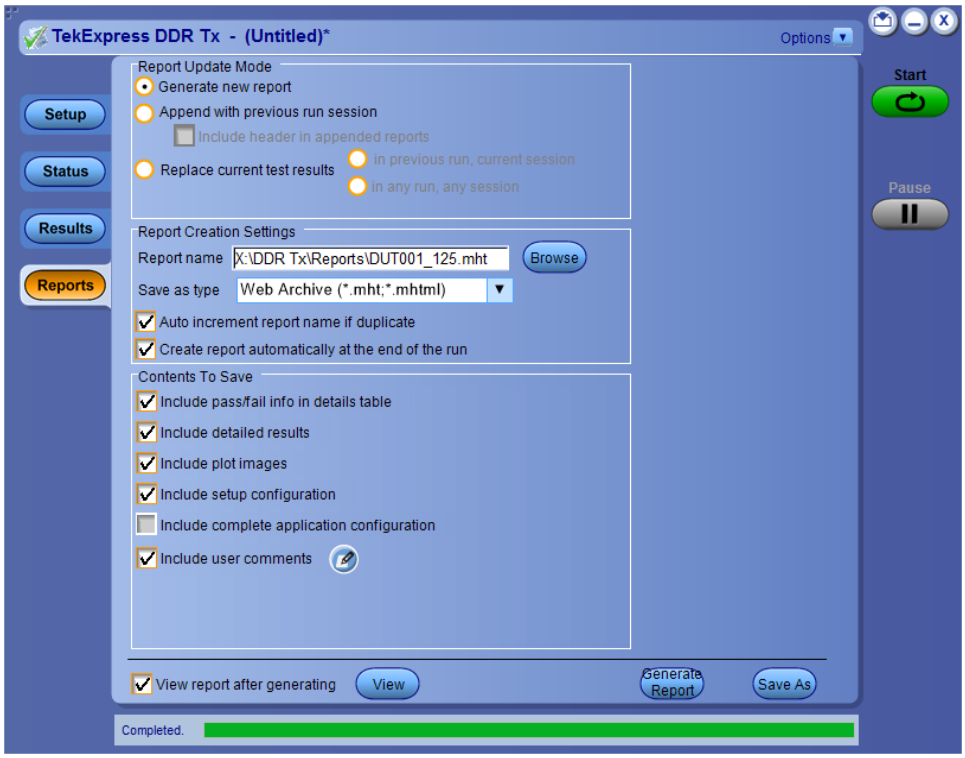


Figure 28: Reports panel

Report Update Mode Settings

Table 16: Report Update Mode Settings

Control	Description
Generate new report	Each time when you click **Run** and when the test execution is complete, it will create a new report. The report can be in either .mht, .pdf, or .csv file formats.
Append with previous run session	Appends the latest test results to the end of the current test results report. Each time when you click this option and run the tests, it will run the previously failed tests and replace the failed test result with the new pass test result in the same report.

Table continued…

Control	Description
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 the current session.
In any run, any session	Select to replace current test results in the report with the test result(s) in the selected run session's report. Click and select test result of any other run session.
Report Creation Settings	
Report name	Displays the name and path of the <Application Name> report. The default location is at `\My Documents>\My TekExpress\<Application Name> \Reports`. 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. **To change the report name or location, do one of the following:** • In the Report Path field, type the current folder path and name. • Double-click in the Report Path field and then make selections from the popup keyboard and click **Enter**. 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\<Application Name> \DUT001.mht`. **Note:** You cannot set the file location using the Browse button. **Open an existing report** Click **Browse**, locate and select the report file and then click **View** at the bottom of the panel.
Save as type	Saves a report in the specified file type, selected from the drop-down list. The report is 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.

Table continued…

Control	Description
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	Select to create the report with the settings configured, at the end of run.
Contents To Save Settings	
Include pass/fail info in details table	Select to include pass/fail information in the details table of the report.
Include detailed results	Select to include detailed results in the report.
Include plot images	Select to include the plot images 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 include the complete application configuration in the report.
Margin value in percentage	
Include user comments	Select to include any comments about the test that you or another user have added in the DUT tab of the Setup panel. Comments appear in the Comments section, below the summary box at the beginning of each report.
Include worst case screenshot	Select to include screenshot of the worst case test execution failure.
Include statics table	Select to include test run statistics in the report. This is enabled when you run any test for more than once. Set **Acquire/Analyze each test** in the Preferences tab to more than one, to run any test for multiple times.
Other settings in report panel	
View report after generating	Automatically opens the report in a Web browser when the test execution is complete. This option is selected by default.
View	Click to view the most current report.
Generate Report	Generates a new report based on the current analysis results.
Save As	Specify a name for the report.
Group Report By	
Test Name	Select to group the test results based on the test name in the report.

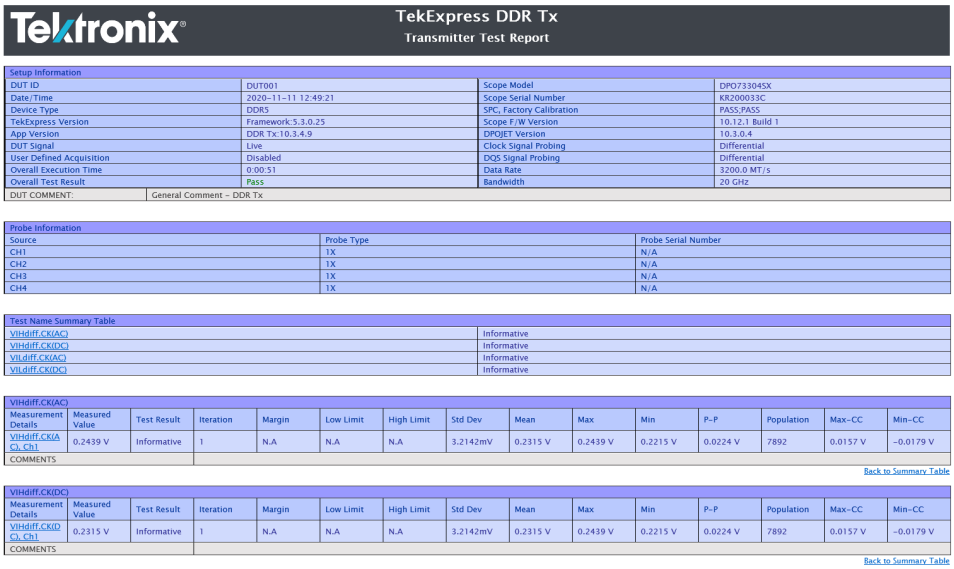
Table continued…

Control	Description
Test Result	Select to group the test results based on the test result in the report.
User logo	Adds user logo into the generated report.
Include user logo	Select to add your logo in the generated report. When selected, specify the logo file path in the Image file path option. Click **browse** and select the logo image.

View a generated report

Sample report and its contents

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



Tektronix

TekExpress DDR Tx
Transmitter Test Report

Setup Information			
DUT ID	DUT001	Scope Model	DPO73304SX
Date/Time	2020-11-11 12:49:21	Scope Serial Number	KR200033C
Device Type	DDR5	SPC, Factory Calibration	PASS;PASS
TekExpress Version	Framework:5.3.0.25	Scope F/W Version	10.12.1 Build 1
App Version	DDR Tx:10.3.4.9	DPOJET Version	10.3.0.4
DUT Signal	Live	Clock Signal Probing	Differential
User Defined Acquisition	Disabled	DQS Signal Probing	Differential
Overall Execution Time	0:00:51	Data Rate	3200.0 MT/s
Overall Test Result	Pass	Bandwidth	20 GHz
DUT COMMENT:	General Comment - DDR Tx		

Probe Information		
Source	Probe Type	Probe Serial Number
CH1	1X	N/A
CH2	1X	N/A
CH3	1X	N/A
CH4	1X	N/A

Test Name Summary Table	
VIHdiff.CK(AC)	Informative
VIHdiff.CK(DC)	Informative
VILdiff.CK(AC)	Informative
VILdiff.CK(DC)	Informative

VIHdiff.CK(AC)

Measurement Details	Measured Value	Test Result	Iteration	Margin	Low Limit	High Limit	Std Dev	Mean	Max	Min	P-P	Population	Max-CC	Min-CC
VIHdiff.CK(AC), Ch1	0.2439 V	Informative	1	N.A	N.A	N.A	3.2142mV	0.2315 V	0.2439 V	0.2215 V	0.0224 V	7892	0.0157 V	-0.0179 V
COMMENTS														

Back to Summary Table

VIHdiff.CK(DC)

Measurement Details	Measured Value	Test Result	Iteration	Margin	Low Limit	High Limit	Std Dev	Mean	Max	Min	P-P	Population	Max-CC	Min-CC
VIHdiff.CK(DC), Ch1	0.2315 V	Informative	1	N.A	N.A	N.A	3.2142mV	0.2315 V	0.2439 V	0.2215 V	0.0224 V	7892	0.0157 V	-0.0179 V
COMMENTS														

Back to Summary Table

Figure 29: Report for DDR5

TekExpress DDR Tx
Transmitter Test Report

Setup Information			
DUT ID	DUT001	Scope Model	DPO77002SX
Date/Time	11/10/2020 12:48:49 AM	Scope Serial Number	PQ100011
Device Type	LPDDR5	SPC, Factory Calibration	PASS;PASS
TekExpress Version	Framework: 5.3.0.25	Scope F/W Version	CF:91.1CT FV:10.12.0 Build 1
App Version	DDR Tx: 10.3.4.7	DPOJET Version	10.3.0.4
DUT Signal	Live	Clock Signal Probing	Differential
User Defined Acquisition	Disabled	WCK/RDQS Signal Probing	Differential
Overall Execution Time	00:00:46	Data Rate	4800 MT/s
Overall Test Result	Pass	Clock Frequency	600 MHz
		WCK Frequency	2400 MHz
		WCK:Clock	4:1
		Bandwidth	20 GHz
DUT COMMENT:	General Comment - DDR Tx		

Probe Information		
Source	Probe Type	Probe Serial Number
CH1	"TCA292D"	"N/A"
CH2	"TCA292D"	"N/A"
CH3	"TCA292D"	"N/A"
CH4	"TCA292D"	"N/A"

Test Name Summary Table	
tRPRE	Informative
tRPST	Informative
tQH	Informative
tDQSQ	Informative
tQW	Informative
tQSH	Informative
tQSL	Informative

tRPRE

Measurement Details	Measured Value	Test Result	Iteration	Margin	Low Limit	High Limit	Std Dev	Mean	Max	Min	P-P	Population	Max-CC	Min-CC
tRPRE Mean,Ch1	10.8942 tWCK	Informative	1	N.A	N.A	N.A	5.9018 tWCK	10.8942 tWCK	14.6868 tWCK	1.6319 tWCK	13.055 tWCK	104	0 tWCK	0 tWCK
COMMENTS														

Back to Summary Table

tRPST

Measurement Details	Measured Value	Test Result	Iteration	Margin	Low Limit	High Limit	Std Dev	Mean	Max	Min	P-P	Population	Max-CC	Min-CC
tRPST Mean,Ch1	1.4899 tWCK	Informative	1	N.A	N.A	N.A	4.4296mtWCK	1.4899 tWCK	1.5042 tWCK	1.4817 tWCK	0.0226 tWCK	104	0 tWCK	0 tWCK

Figure 30: Report for LPDDR5

Setup 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.

Test Name Summary Table

The test summary table lists all the tests which are executed with its result status.

Measurement

The measurement table displays the measurement related details with its parameter value.

User comments

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

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:\<Application Name>.

Use test setups to:

- Run a new session, acquire 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.

Save the configured 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 a default test setup. When you save a setup, all the parameters, measurement limits, waveform files (if applicable), test selections, and other configuration settings are saved under the setup name. 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.

Load a saved test setup

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

- Select **Options** > **Open Test Setup**.
- Select the setup from the list and click **Open**. Setup files are located at X:\<Application Name>.

Select a pre-run session from the loaded test setup

Complete the following steps to load a test setup from a pre-run session:

1. Select **Options > Open Test Setup**.
2. Select a setup from the list and then click **Open**. Setup files are located at `X:\<Application Name>\`.
3. Switch the mode to **Pre-recorded waveform files** in the DUT panel.
4. Select the required waveforms from the selected setup in the Acquisition tab and **Run** the required test.

Save the test setup with a different name

To create a test setup with a different name, 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 the test setup name and click **Save**.

SCPI Commands

About SCPI command

You can use the Standard Commands for Programmable Instruments (SCPI) to communicate remotely with the TekExpress application. Complete the TCPIP socket configuration and the TekVISA configuration in the oscilloscope or in the device where you are executing the script.

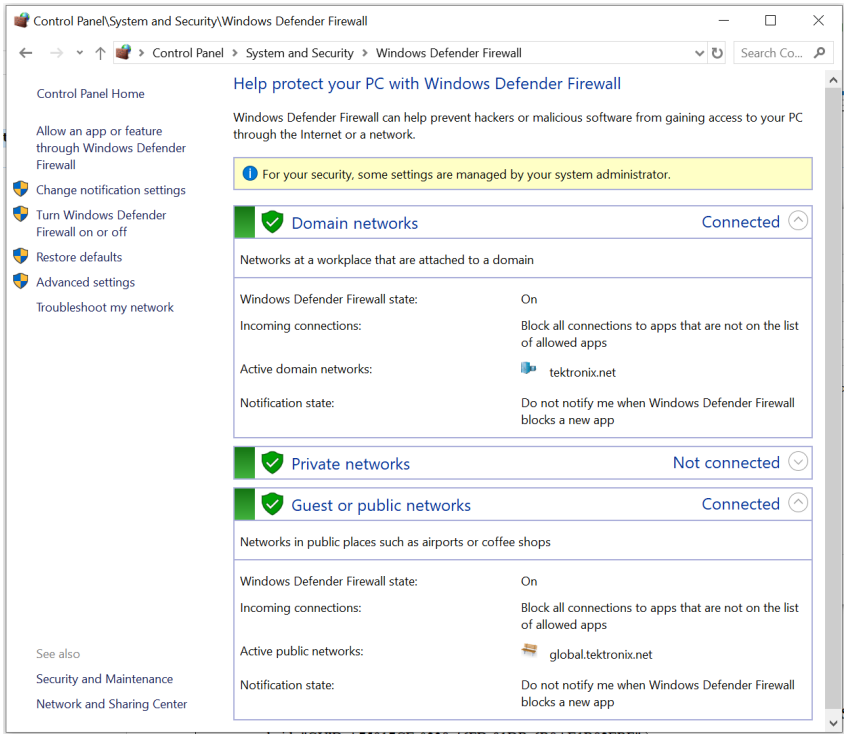
Note: If you are using an external PC to execute the remote interface commands, then install TekVISA in the PC to make the configurations.

Socket configuration for SCPI commands

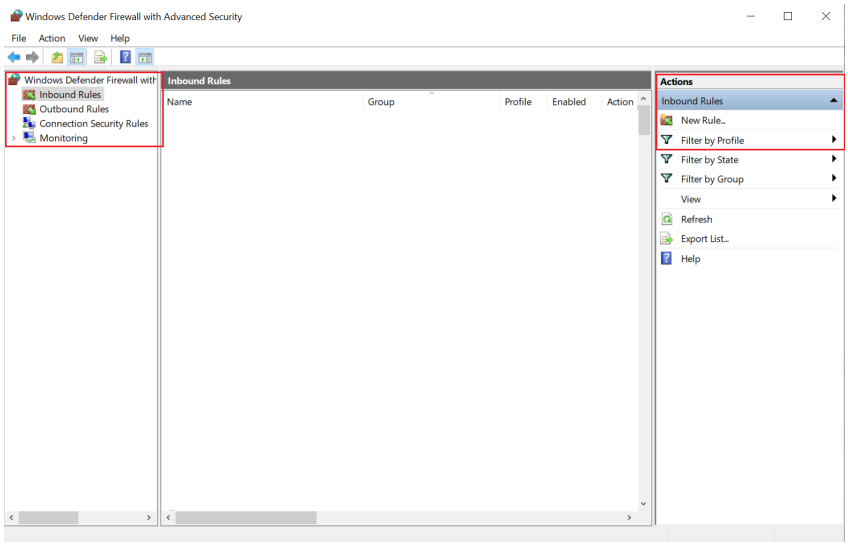
This section describes the steps to configure the TCPIP socket configuration in your script execution device and the steps to configure the TekVISA configuration in the oscilloscope to execute the SCPI commands.

TCPIP socket configuration

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

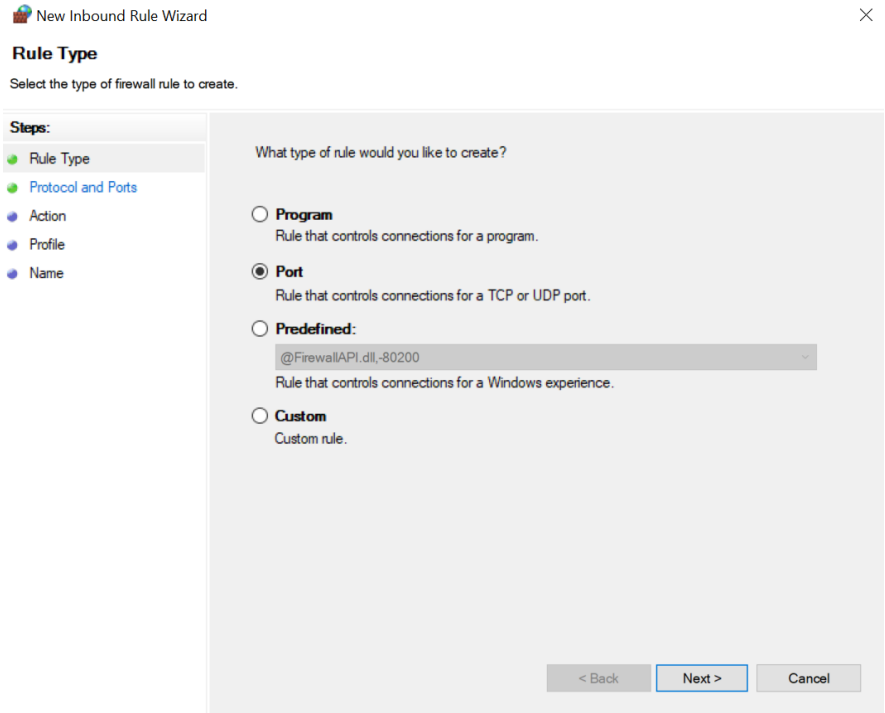


2. In Windows Firewall with Advanced Security menu, select **Windows Firewall with Advanced Security on Local Computer** > **Inbound Rules** and click **New Rule…**

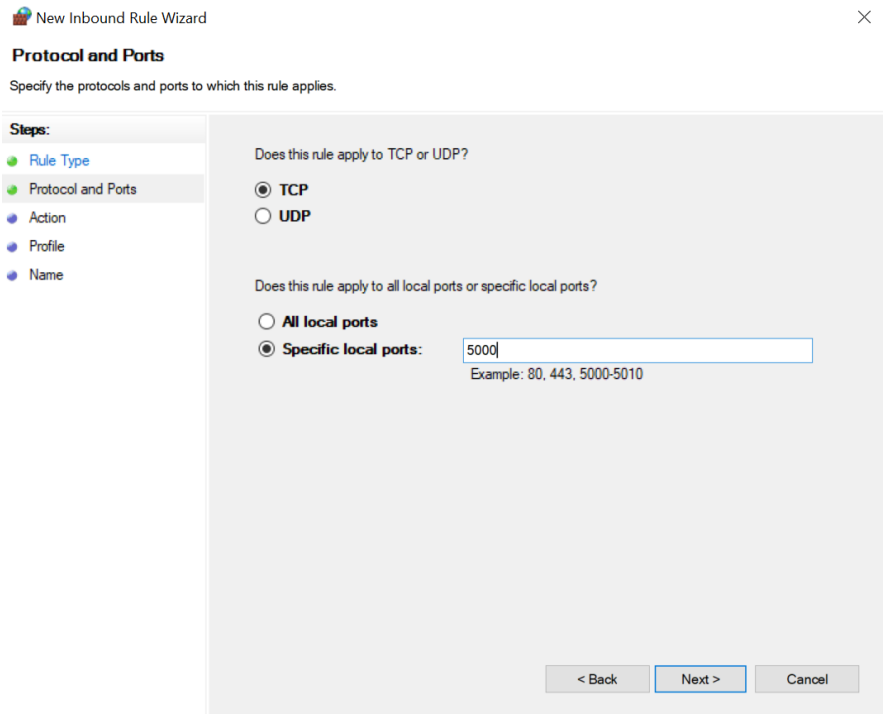


3. In **New Inbound Rule Wizard** menu

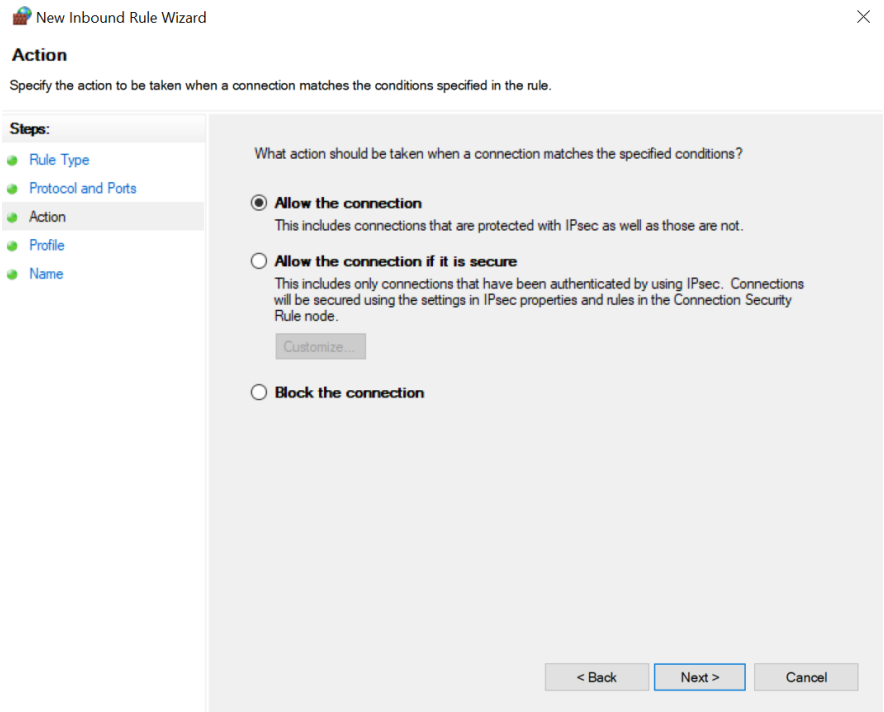
   a. Select **Port** and click **Next**.



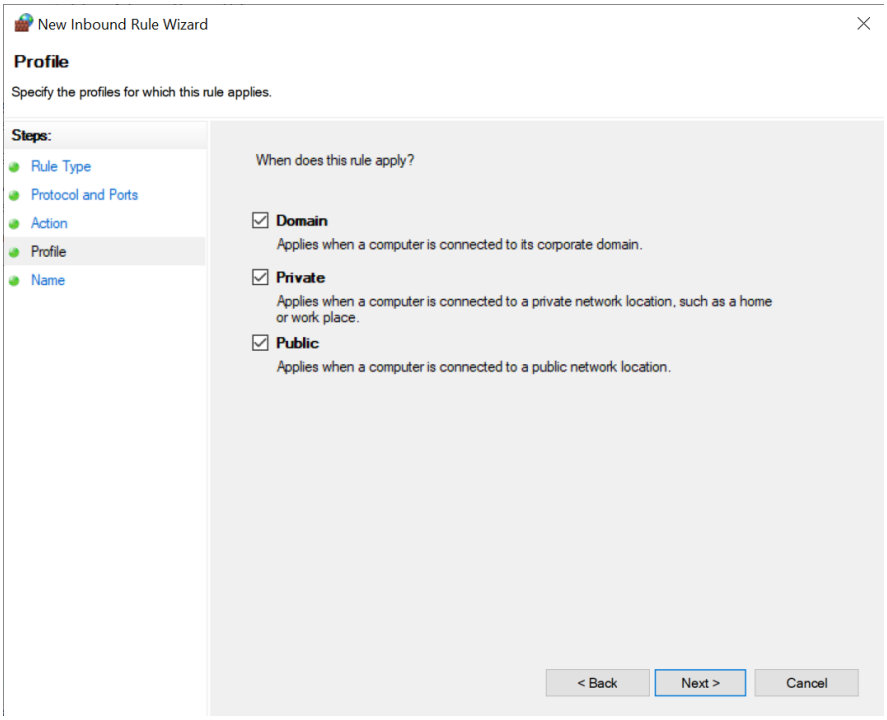
   b. Select **TCP** as rule apply, enter 5000 for **Specific local ports** and click **Next**.



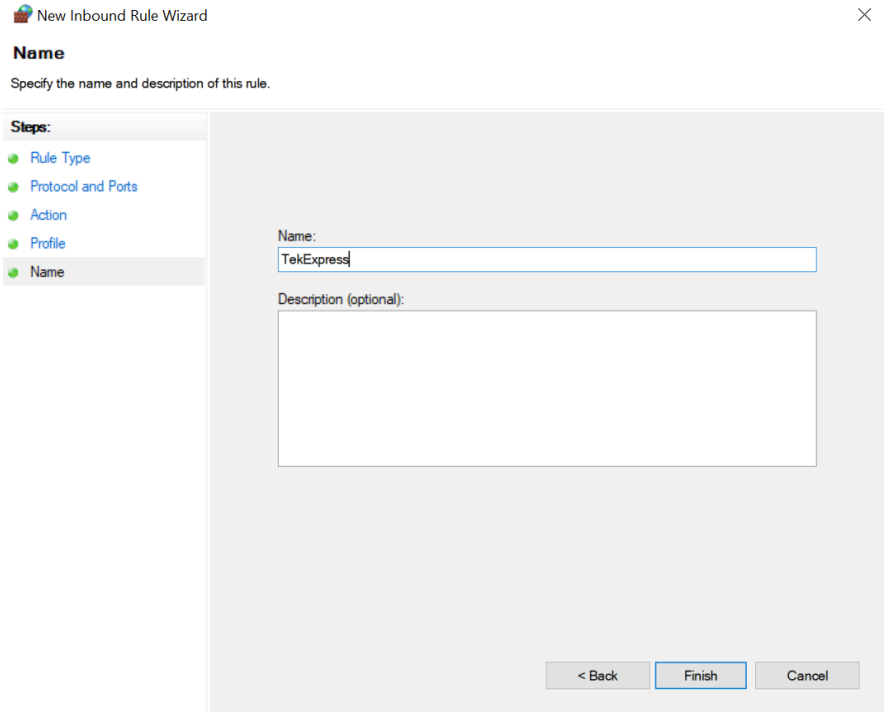
c. Select **Allow the connection** and click **Next**.



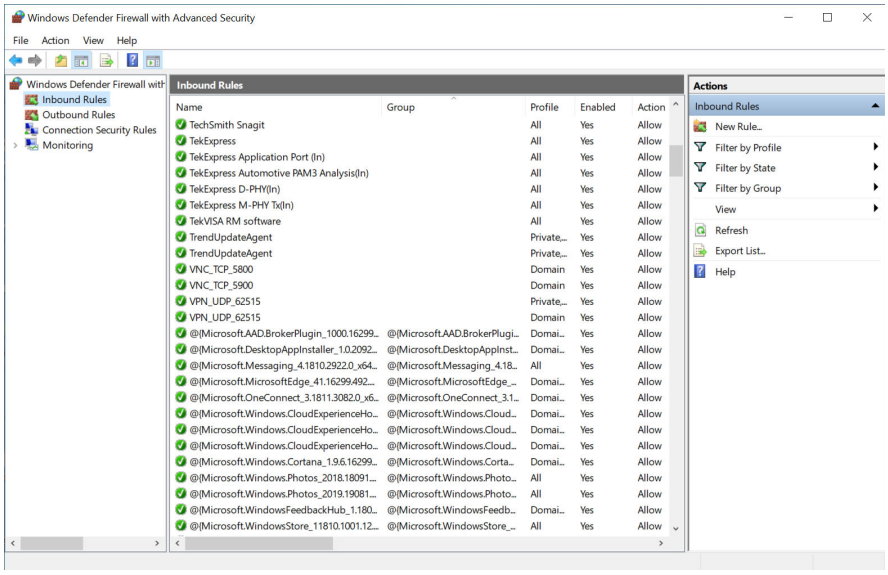
d. Select **Domain, Private, Public** checkbox and click **Next**.



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

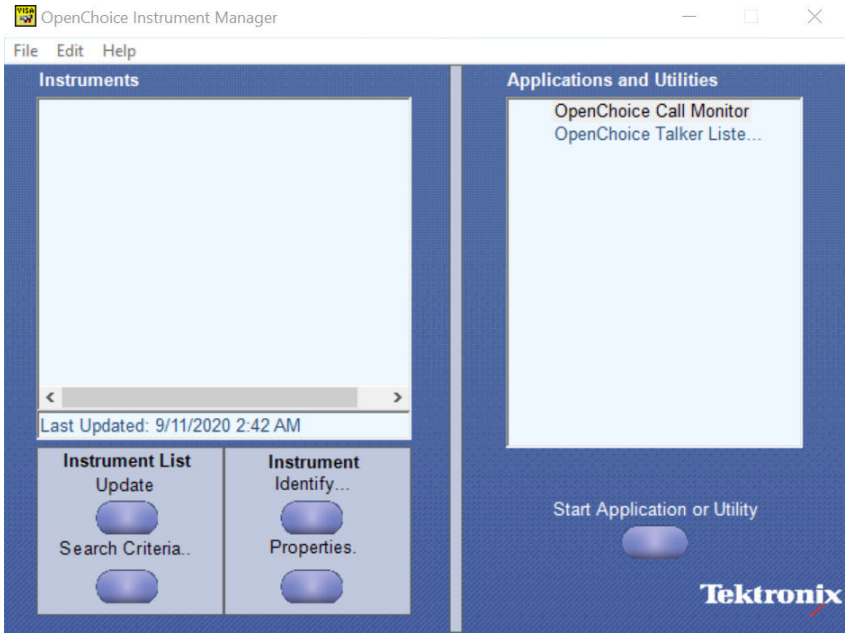


4. Check whether the Rule name is displayed in **Windows Firewall with Advanced Security menu** > **Inbound Rules**.



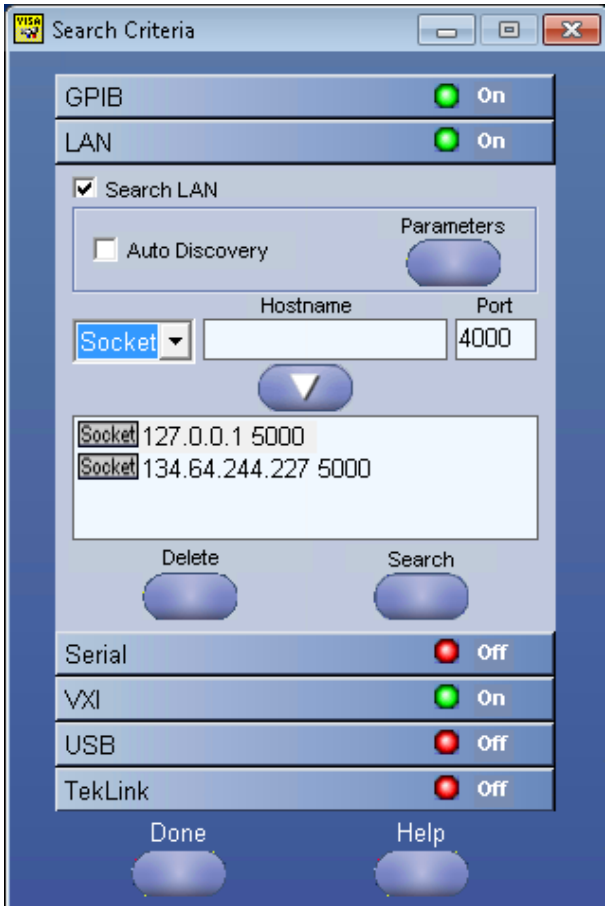
TekVISA configuration

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

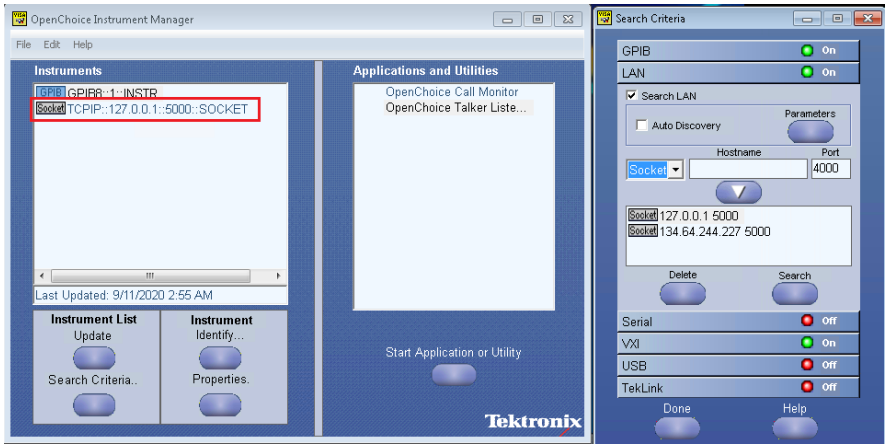


2. Click **Search Criteria**. In **Search Criteria** menu, click **LAN** to Turn-on. Select **Socket** from the drop-down list, enter the IP address of the TekExpress device in **Hostname** and type **Port** as 5000. Click to configure the IP address with Port.

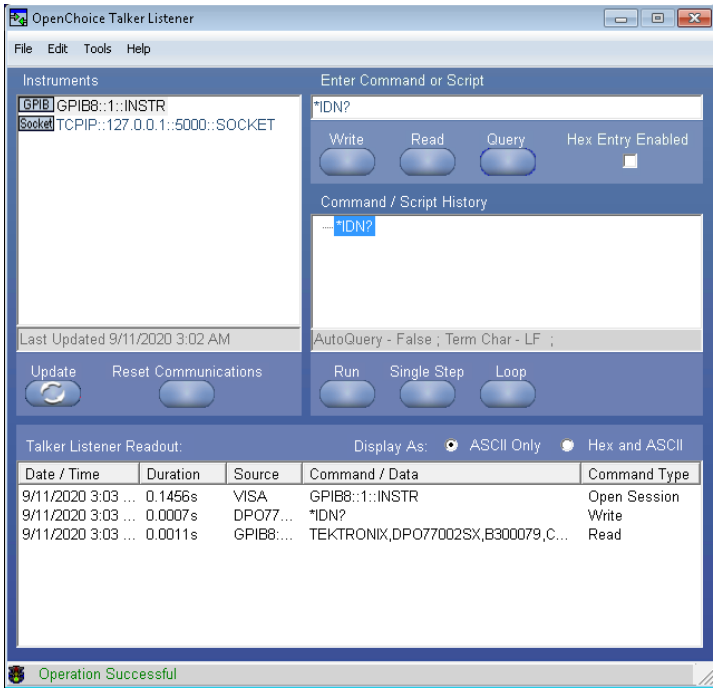
   Enter the Hostname as 127.0.0.1 if the TekVISA and TekExpress application are in the same system, else enter the IP address of the oscilloscope where the TekExpress application is running.



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.



Set or query the device name of application

This command sets or queries the device name (DUT ID) of the application.

Syntax

`TEKEXP:SELECT DEVICE,"<DeviceName>"` (Set)

`TEKEXP:SELECT? DEVICE` (Query)

Command arguments

Argument Name	Argument Type
<DeviceName>	<String>

Returns

<String>

Examples

`TEKEXP:SELECT DEVICE,"DUT001"` command sets the device name of the application to DUT001.

`TEKEXP:SELECT? DEVICE` command returns the selected device name of the application.

Set or query the test name of the application

This command selects or deselects the specified test name of the application.

Syntax

`TEKEXP:SELECT TEST,"<TestName>",<Value>` (Set)

`TEKEXP:SELECT TEST,"<ALL>"` (Set)

`TEKEXP:SELECT? TEST` (Query)

Command arguments

Table 17: For DDR5

<TestName>	<Value>
• 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) • VIX_DQS_Ratio	{True | False} or {1 | 0} It represents selected or unselected. Where, True or 1 - Selected False or 0 - Unselected

<TestName>	<Value>

• 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_cIVW_Rise
  • SRIN_cIVW_Fall
	{True | False} or {1 | 0}
	It represents selected or unselected.
	Where,
	True or 1 - Selected
	False or 0 - Unselected

Table 18: For LPDDR5

<TestName>	<Value>

• Clock
  • tCH(abs)
  • tCH(avg)
  • tCK(avg)
  • tCK(abs)
  • tCL(avg)
  • tCL(abs)
  • tJIT(cc)
  • tJIT(per)
  • VIX_CK_Ratio
• Write Clock
  • tWCKH(avg)
  • tWCKH(abs)
  • tWCKL(avg)
  • tWCKL(abs)
  • tWCK(avg)
  • tWCK(abs)
  • tJIT(cc)_WCK
  • tJIT(per)_WCK
  • tERR(2per)
  • tERR(3per)
  • tERR(4per)
• Read Burst Measurements
  • tRPRE
  • tRPST
  • tQH
  • tDQSQ
  • tQW
  • tQSH
  • tQSL
• Write Burst Measurements
  • RxMask_Write
  • tDIVW1
  • tDIVW2
  • vDIVW
  • tDIPW
  • tDIHL_Above
  • tDIHL_Below
  • vDIHL_AC
  • tWCK2DQI
  • VIX_WCK_Ratio
  • tWCK2CK
	{True | False} or {1 | 0}
	It represents selected or unselected.
	Where,
	True or 1 - Selected
	False or 0 - Unselected

<TestName>	<Value>

• CA Measurements
  • RXMask_CA
  • tCIVW1
  • tCIVW2
  • vCIVW
  • tCIPW_Positive
  • tCIPW_Negative
  • vCIHL_AC
• CS Measurements
  • RxMask_CS
  • tCSIPW_Negative
  • tCSIPW_Positive
  • vCSIHL_AC
  • tCSIVW1
  • tCSIVW2
  • vCSIVW
	{True | False} or {1 | 0}
	It represents selected or unselected.
	Where,
	True or 1 - Selected
	False or 0 - Unselected

Returns

{True | False} or {1 | 0}

Examples

`TEKEXP:SELECT TEST,"<TestName>",1` command selects the specified test in the Test Panel.

`TEKEXP:SELECT TEST,"<ALL>"` command select all the tests in the Test Panel.

`TEKEXP:SELECT? TEST` command returns the list of selected tests.

Set or query the general parameter values

This command sets or queries the general parameter values of the application.

Syntax

`TEKEXP:VALUE GENERAL,"<ParameterName>","<Value>"` (Set)

`TEKEXP:VALUE? GENERAL,"<ParameterName>"` (Query)

Command arguments

Table 19: Report panel command parameters

<ParameterName>	<Value>
Report Update Mode	• New • Append • Replace

Table continued…

<ParameterName>	<Value>
Report name	X:\<application name>\Reports\DUT001.mht
Save As Type	• Web Archive (*.mht;*.mhtml) • PDF (*.pdf;) • CSV (*.csv;)
Auto increment report name if duplicate	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Create report at the end	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Include Pass/Fail Results Summary	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Include Detailed Results	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Include Plot Images	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Include Setup Configuration	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected

Table continued…

<ParameterName>	<Value>
Include Complete Application Configuration	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Include User Comments	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Report Settings:Include Header In Appended Reports	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
View Report After Generating	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected
Report Group Mode	• Test Name • Test Result • Measurement Group
Append Report	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected

Table 20: General command parameters for DDR5

ParameterName	Value
Data Rate	Specifies the different data rates supported (3200>=DR<=8400). Valid values are: • 3200 • 3600 • 4000 • 4400 • 4800 • Custom
Vdd	• 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	• 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.
Vcent-CA	• Auto • Manual
Vcent-CA Display	Specifies the Vcent-CA value in Volts. To set the Vcent-CA a valid Double value can be specified. **Note:** Set Vcent-CA to Manual Mode before setting its value.
Burst Detection Method	• Read Write Bursts • Write Only Bursts • Read Only Bursts • Visual Search
Clock Signal Probe Type	• Differential • Single Ended
Data Signal Probe Type	• Differential • Single Ended

Table continued…

ParameterName	Value
DeEmbed Filter Files	Valid values are: • Enabled • Disabled
DQS Probe Mode	• A • B • Differential
Clock Probe Mode	• A • B • Differential
DQSPositive Probe Mode	• A • B • Differential
DQ Probe Mode	• A • B • Differential
ADDR CMD Probe Mode	• A • B • Differential
Clock(+) Probe Mode	• A • B • Differential
Clock(-) Probe Mode	• A • B • Differential
DQSNegative Probe Mode	• 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

Table continued…

ParameterName	Value
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
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:BurstDetectionMode	• Auto • Manual
RB:DQ/DQS Phase Alignment:Pre-amble Length (tCK)	1 to 4
RB:DQ/DQS Phase Alignment:Post-amble Length (tCK)	• 0.5 • 1.5
RB:DQ/DQS Phase Alignment:Burst(pk-pk)	0 to 5
RB:DQ/DQS Phase Alignment:Margin(%)	0 to 100
RB:DQ/DQS Phase Alignment:IsReadWriteGreater	• Yes • No
RB:DQ/DQS Phase Alignment:Strobe High	-5 to 5
RB:DQ/DQS Phase Alignment:Strobe Mid	-5 to 5
RB:DQ/DQS Phase Alignment:Strobe Low	-5 to 5
RB:DQ/DQS Phase Alignment:Data High	-5 to 5
RB:DQ/DQS Phase Alignment:Data Mid	-5 to 5
RB:DQ/DQS Phase Alignment:Data Low	-5 to 5

Table continued…

ParameterName	Value
RB:DQ/DQS Phase Alignment:Hysteresis	0 to 50
RB:DQ/DQS Phase Alignment:Margin	0 to 100
WB:DQ/DQS Phase Alignment:BurstDetectionMode	• Auto • Manual
WB:DQ/DQS Phase Alignment:tDQS2DQ Type	• Auto • Manual
WB:DQ/DQS Phase Alignment:tDQS2DQ Value (ps)	0 to 1875 ps
WB:DQ/DQS Phase Alignment:Pre-amble Length (tCK)	2 to 4
WB:DQ/DQS Phase Alignment:Post-amble Length (tCK)	• 0.5 • 1.5
WB:DQ/DQS Phase Alignment:Burst(pk-pk)	0 to 5
WB:DQ/DQS Phase Alignment:Margin(%)	0 to 100
WB:DQ/DQS Phase Alignment:IsReadWriteGreater	• Yes • No
WB:DQ/DQS Phase Alignment:Strobe High	-5 to 5
WB:DQ/DQS Phase Alignment:Strobe Mid	-5 to 5
WB:DQ/DQS Phase Alignment:Strobe Low	-5 to 5
WB:DQ/DQS Phase Alignment:Data High	-5 to 5
WB:DQ/DQS Phase Alignment:Data Mid	-5 to 5
WB:DQ/DQS Phase Alignment:Data Low	-5 to 5

Table continued…

ParameterName	Value
WB:DQ/DQS Phase Alignment:Hysteresis	0 to 50
WB:DQ/DQS Phase Alignment:Margin	0 to 100
Read Burst:Pre-amble Length (tCK)	• 1 • 2 • 3 • 4
Read Burst:Post-amble Length (tCK)	• 0.5 • 1.5
Read Burst:Burst Length	• 16 • 32
Read Burst:Strobe High	-1.1 to 1.1
Read Burst:Strobe Mid	-1.1 to 1.1
Read Burst:Strobe Low	-1.1 to 1.1
Read Burst:Data High	-1.1 to 1.1
Read Burst:Data Mid	-1.1 to 1.1
Read Burst:Data Low	-1.1 to 1.1
Read Burst:Hysteresis	0 to 20
Read Burst:Margin	0 to 100
Write Burst:tDQS2DQ Type	• Auto • Manual
Write Burst:tDQS2DQ Value (ps)	0 to 1875 ps
Write Burst:Pre-amble Length (tCK)	• 2 • 3 • 4
Write Burst:Post-amble Length (tCK)	• 0.5 • 1.5
Write Burst:Burst Length	• 16 • 32

Table continued…

ParameterName	Value
Write Burst:Strobe High	-1.1 to 1.1
Write Burst:Strobe Mid	-1.1 to 1.1
Write Burst:Strobe Low	-1.1 to 1.1
Write Burst:Data High	-1.1 to 1.1
Write Burst:Data Mid	-1.1 to 1.1
Write Burst:Data Low	-1.1 to 1.1
Write Burst:Hysteresis	0 to 20
Write Burst:Margin	0 to 100
DQ Connected to : Signal Selected	• True • False
DQ Connected to	• CH1 • CH2 • CH3 • CH4
DQS Connected to : Signal Selected	• True • False
DQS Connected to	• CH1 • CH2 • CH3 • CH4
CA Connected to : Signal Selected	• True • False
CA Connected to	• CH1 • CH2 • CH3 • CH4
Clock Connected to : Signal Selected	• True • False
Clock Connected to	• CH1 • CH2 • CH3 • CH4

Table continued…

ParameterName	Value
Clock(+) Connected to : Signal Selected	• True • False
Clock(+) Connected to	• CH1 • CH2 • CH3 • CH4
Clock(-) Connected to : Signal Selected	• True • False
Clock(-) Connected to	• CH1 • CH2 • CH3 • CH4
DQS(+) Connected to : Signal Selected	• True • False
DQS(-) Connected to : Signal Selected	• True • False
DQS(+) Connected to	• CH1 • CH2 • CH3 • CH4
DQS(-) Connected to	• CH1 • CH2 • CH3 • CH4
Bandwidth16GHz	8 to 16
Bandwidth20GHz	8 to 20
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	• True • False
Timer Warning Info Message Popup Duration	• -2 • 2

Table continued…

ParameterName	Value
Timer Error Message Popup	• True • False
Timer Error Message Popup Duration	• -2 • 2
Enable Logging	• True • False

Table 21: General command parameters for LPDDR5

ParameterName	Value
Data Rate	When **WCK:CK=4:1** • 40 • 533 • 1067 • 1600 • 2133 • 2750 • 3200 • 3733 • 4267 • 4800 • 5500 • 6000 • 6400 • Custom
	When **WCK:CK=2:1** • 40 • 533 • 1067 • 1600 • 2133 • 2750 • 3200 • Custom
WCK:CK	• 2:1 • 4:1
Burst Detection Method	• Read Write Bursts • Write Only Bursts • Read Only Bursts • Visual Search

Table continued…

ParameterName	Value
Clock Signal Probe Type	• Differential • Single Ended
WCK/RDQS Signal Probe Type	• Differential • Single Ended
VDD2	• JEDEC Default • Manual
VDDQ	0 to 5 V
VOH	• VDDQ • VDDQ/2
Vcent-DQ	• Auto • Manual
Vcent-CA	• Auto • Manual
Vcent-CS	• Auto • Manual
WCK Probe Mode	• A • B • Differential
RDQS Probe Mode	• A • B • Differential
CLK Probe Mode	• A • B • Differential
DQ Probe Mode	• A • B • Differential
WCK(+) Probe Mode	• A • B • Differential
WCK(-) Probe Mode	• A • B • Differential

Table continued…

ParameterName	Value
CLK(+) Probe Mode	• A • B • Differential
CLK(-) Probe Mode	• A • B • Differential
CA#a Probe Mode	• A • B • Differential
CS Probe Mode	• A • B • Differential
Filter Files Path	• Enable • Disable
RB:DQ/DQS Phase Alignment:Burst Detection Level Type	• Auto • Manual
RB:DQ/DQS Phase Alignment:tDQSQ	• Auto • Manual
RB:DQ/DQS Phase Alignment:tDQSQ Value	0 to 65000
RB:DQ/DQS Phase Alignment:Pre-amble Static (tWCK)	• 0 • 2 • 4 • tRDS_PRE
RB:DQ/DQS Phase Alignment:PreAmble Static Value	2 to 4 (Applicable when **Pre-amble Static=tRDS_PRE**)
RB:DQ/DQS Phase Alignment:Pre-amble Toggle (tWCK)	0 to 4
RB:DQ/DQS Phase Alignment:Post-amble Length (tCK)	• 0.5 • 2.5 • 4.5
RB:DQ/DQS Phase Alignment:Postamble Mode	• Static • Toggle
RB:DQ/DQS Phase Alignment:Preamble Type	• 16 • 32
RB:DQ/DQS Phase Alignment:BurstDetectionMode	• Auto • Manual
RB:DQ/DQS Phase Alignment:Strobe High	-5 to 5

Table continued…

ParameterName	Value
RB:DQ/DQS Phase Alignment:Strobe Mid	-5 to 5
RB:DQ/DQS Phase Alignment:Strobe Low	-5 to 5
RB:DQ/DQS Phase Alignment:Data High	-5 to 5
RB:DQ/DQS Phase Alignment:Data Mid	-5 to 5
RB:DQ/DQS Phase Alignment:Data Low	-5 to 5
RB:DQ/DQS Phase Alignment:Hysteresis	0 to 50
RB:DQ/DQS Phase Alignment:Margin	0 to 100
WB:DQ/DQS Phase Alignment:tWCK2DQI Type	• Auto • Manual
WB:DQ/DQS Phase Alignment:tWCK2DQI Value (ps)	0 to 1875
WB:DQ/DQS Phase Alignment:Burst Detection Level Type	• Auto • Manual
WB:DQ/DQS Phase Alignment:Pre-amble Static (tCK)	1 to 4
WB:DQ/DQS Phase Alignment:Pre-amble Toggle (tCK)	1 to 4
WB:DQ/DQS Phase Alignment:Post-amble Length (tCK)	• 2.5 • 4.5 • 6.5
WB:DQ/DQS Phase Alignment:Burst Length	• 16 • 32
WB:DQ/DQS Phase Alignment:BurstDetectionMode	• Auto • Manual
WB:DQ/DQS Phase Alignment:Strobe High	-5 to 5
WB:DQ/DQS Phase Alignment:Strobe Mid	-5 to 5
WB:DQ/DQS Phase Alignment:Strobe Low	-5 to 5
WB:DQ/DQS Phase Alignment:Data High	-5 to 5
WB:DQ/DQS Phase Alignment:Data Mid	-5 to 5
WB:DQ/DQS Phase Alignment:Data Low	-5 to 5
WB:DQ/DQS Phase Alignment:Hysteresis	0 to 50
WB:DQ/DQS Phase Alignment:Margin	0 to 100
Read Burst:Burst Detection Level Type	• Auto • Manual
Read Burst:tDQSQ	• Auto • Manual
Read Burst:tDQSQ Value	0 to 65000

Table continued…

ParameterName	Value
Read Burst:Pre-amble Static (tWCK)	• 0 • 2 • 4 • tRDS_PRE
Read Burst:PreAmble Static Value	2 to 4 (Applicable when **Pre-amble Static=tRDS_PRE**)
Read Burst:Pre-amble Toggle (tWCK)	0 to 4
Read Burst:Post-amble Length (tCK)	• 0.5 • 2.5 • 4.5
Read Burst:Postamble Mode	• Dynamic • Toggle
Read Burst:Burst Length	• 16 • 32
Read Burst:Strobe High	-1.1 to 1.1
Read Burst:Strobe Mid	-1.1 to 1.1
Read Burst:Strobe Low	-1.1 to 1.1
Read Burst:Data High	-1.1 to 1.1
Read Burst:Data Mid	-1.1 to 1.1
Read Burst:Data Low	-1.1 to 1.1
Read Burst:Hysteresis	0 to 20
Read Burst:Margin	0 to 100
Write Burst:Burst Detection Level Type	• Auto • Manual
Write Burst:Pre-amble Static (tCK)	1 to 4
Write Burst:Pre-amble Toggle (tCK)	1 to 4
Write Burst:Post-amble Length (tCK)	• 2.5 • 4.5 • 6.5
Write Burst:Burst Length	• 16 • 32
Write Burst:tWCK2DQI Type	• Auto • Manual
Write Burst:tWCK2DQI Value (ps)	0 to 1875
Write Burst:Strobe High	-1.1 to 1.1
Write Burst:Strobe Mid	-1.1 to 1.1

Table continued…

ParameterName	Value
Write Burst:Strobe Low	-1.1 to 1.1
Write Burst:Data High	-1.1 to 1.1
Write Burst:Data Mid	-1.1 to 1.1
Write Burst:Data Low	-1.1 to 1.1
Write Burst:Hysteresis	0 to 20
Write Burst:Margin	0 to 100
Record Length (mpts)	0.001 to 100 M
Sample Rate (GS/s)	50
Bandwidth20GHz	8 to 20 GHz
Retain Vertical Scale	• TRUE • FALSE
Clock(+) Connected to : Signal Selected	• TRUE • FALSE
Clock(+) Connected to	• CH1 • CH2 • CH3 • CH4
Clock(-) Connected to : Signal Selected	• TRUE • FALSE
Clock(-) Connected to	• CH1 • CH2 • CH3 • CH4
WCK(+) Connected to : Signal Selected	• TRUE • FALSE
WCK(+) Connected to	• CH1 • CH2 • CH3 • CH4
WCK(-) Connected to : Signal Selected	• TRUE • FALSE
WCK(-) Connected to	• CH1 • CH2 • CH3 • CH4

Table continued…

ParameterName	Value
RDQS(+) Connected to : Signal Selected	• TRUE • FALSE
RDQS(+) Connected to	• CH1 • CH2 • CH3 • CH4
RDQS(-) Connected to : Signal Selected	• TRUE • FALSE
RDQS(-) Connected to	• CH1 • CH2 • CH3 • CH4

Returns

<NRf> or <String>

Examples

`TEKEXP:VALUE GENERAL,"<ParameterName>","<Value>"` command set the value for the specified general parameter.

`TEKEXP:VALUE? GENERAL,"<ParameterName>"` command returns the value for the specified general parameter.

Set or query the analyze parameter values

This command sets or queries the analyze parameter values of the application.

Syntax

`TEKEXP:VALUE ANALYZE,”<TestName>","<ParameterName>","<ParameterValue>"` (Set)

`TEKEXP:VALUE? ANALYZE,”<TestName>","<ParameterName>"` (Query)

Command arguments

Table 22: For DDR5

<TestName>	<ParameterName>	<ParameterValue>
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
	Worst Case Logging	• TRUE • FALSE

Table continued…

<TestName>	<ParameterName>		<ParameterValue>
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

<TestName>	<ParameterName>		<ParameterValue>
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
		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

Table continued…

<TestName>	<ParameterName>		<ParameterValue>
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
	Tap1(mV)		-200 to 50
	Tap2(mV)		-75 to 75
	Tap3(mV)		-60 to 60
	Tap4(mV)		-45 to 45
	Stop on Mask Hit		• TRUE • FALSE

<TestName>	<ParameterName>		<ParameterValue>
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

<TestName>	<ParameterName>		<ParameterValue>
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
		Ref Levels Autoset Basetop Method Clock/CA	• MINMAX • AUTO

Table continued…

<TestName>	<ParameterName>		<ParameterValue>
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 23: For LPDDR5

<TestName>	<ParameterName>		<ParameterValue>
Clock/Write Clock	Window Size		200 to 1000000
	Number of UI state		• TRUE • FALSE
	Number of UI value		0.001 to 2000
	Worst Case Logging		• TRUE • FALSE
	Clock/Write Clock Reference Level	Ref levels Clock/WCK	• Absolute • Percentage
		High level Absolute Clock/WCK	-10 to 10
		Mid level Absolute Clock/WCK	
		Low level Absolute Clock/WCK	
		Hysteresis Absolute Clock/WCK	0 to 10
		High level Percentage Clock/WCK	1 to 99
		Mid level Percentage Clock/WCK	
		Low level Percentage Clock/WCK	
		Hysteresis Percentage Clock/WCK	0 to 50
		Ref Levels Autoset Basetop Method Clock/WCK	• MINMAX • AUTO

Table continued…

<TestName>	<ParameterName>		<ParameterValue>
WR_Data	Superimpose WCK		• TRUE • FALSE
	Vertical Scale		• Scale to DQ • Scale to WCK
	Stop On Mask Hit		• TRUE • FALSE
	Number of UI state		• TRUE • FALSE
	Number of UI value		0.001 to 2000
	tdivw1 value		0 to 2
	tdivw2 value		0 to 2
	vdivw Value		0 to 10
	Reference Level WCK	Ref levels WCK	• Absolute • Percentage
		High level Absolute WCK	-10 to 10
		Mid level Absolute WCK	
		Low level Absolute WCK	
		Hysteresis Absolute WCK	0 to 10
		High level Percentage WCK	1 to 99
		Mid level Percentage WCK	
		Low level Percentage WCK	
		Hysteresis Percentage WCK	0 to 50
		Ref Levels Autoset Basetop Method WCK	• MINMAX • AUTO
	Reference Level DQ **Note:** Set **Vcent-DQ=Manual** if, you want to modify the reference level values of DQ	Ref levels DQ	• Absolute • Percentage
		High level Absolute DQ	-10 to 10
		Mid level Absolute DQ	
		Low level Absolute DQ	
		Hysteresis Absolute DQ	0 to 10
		High level Percentage DQ	1 to 99
		Mid level Percentage DQ	
		Low level Percentage DQ	
		Hysteresis Percentage DQ	0 to 50
		Ref Levels Autoset Basetop Method DQ	• MINMAX • AUTO

Table continued…

<TestName>	<ParameterName>		<ParameterValue>
RD_Data	Superimpose RDQS		• TRUE • FALSE
	Vertical Scale		• Scale to DQ • Scale to RDQS
	Number of UI state		• TRUE • FALSE
	Number of UI value		0.001 to 2000
	Reference Level RDQS	Ref levels RDQS	• Absolute • Percentage
		High level Absolute RDQS	-10 to 10
		Mid level Absolute RDQS	
		Low level Absolute RDQS	
		Hysteresis Absolute RDQS	0 to 10
		High level Percentage RDQS	1 to 99
		Mid level Percentage RDQS	
		Low level Percentage RDQS	
		Hysteresis Percentage RDQS	0 to 50
		Ref Levels Autoset Basetop Method RDQS	• MINMAX • AUTO
	Reference Level DQ **Note:** Set **Vcent-DQ**=**Manual** if, you want to modify the reference level values of DQ	Ref levels DQ	• Absolute • Percentage
		High level Absolute DQ	-10 to 10
		Mid level Absolute DQ	
		Low level Absolute DQ	
		Hysteresis Absolute DQ	0 to 10
		High level Percentage DQ	1 to 99
		Mid level Percentage DQ	
		Low level Percentage DQ	
		Hysteresis Percentage DQ	0 to 50
		Ref Levels Autoset Basetop Method DQ	• MINMAX • AUTO

Table continued…

<TestName>	<ParameterName>		<ParameterValue>
CA	tdivw1 value		0 to 2
	tdivw2 value		0 to 2
	vdivw value		0 to 10
	Reference Level Clock	Ref levels Clock	• Absolute • Percentage
		High level Absolute Clock	-10 to 10
		Mid level Absolute Clock	
		Low level Absolute Clock	
		Hysteresis Absolute Clock	0 to 10
		High level Percentage Clock	1 to 99
		Mid level Percentage Clock	
		Low level Percentage Clock	
		Hysteresis Percentage Clock	0 to 50
		Ref Levels Autoset Basetop Method Clock	• MINMAX • AUTO
	Reference Level CA **Note:** Set **Vcent-CA**=**Manual** if, you want to modify the reference level values of CA	Ref levels CA	• Absolute • Percentage
		High level Absolute CA	-10 to 10
		Mid level Absolute CA	
		Low level Absolute CA	
		Hysteresis Absolute CA	0 to 10
		High level Percentage CA	1 to 99
		Mid level Percentage CA	
		Low level Percentage CA	
		Hysteresis Percentage CA	0 to 50
		Ref Levels Autoset Basetop Method CA	• MINMAX • AUTO

Table continued…

<TestName>	<ParameterName>		<ParameterValue>
CS	tdivw1 value		0 to 2
	tdivw2 value		0 to 2
	vdivw value		0 to 10
	Reference Level Clock	Ref levels Clock	• Absolute • Percentage
		High level Absolute Clock	-10 to 10
		Mid level Absolute Clock	
		Low level Absolute Clock	
		Hysteresis Absolute Clock	0 to 10
		High level Percentage Clock	1 to 99
		Mid level Percentage Clock	
		Low level Percentage Clock	
		Hysteresis Percentage Clock	0 to 50
		Ref Levels Autoset Basetop Method Clock	• MINMAX • AUTO
	Reference Level CS **Note:** Set **Vcent-CS=Manual** if, you want to modify the reference level values of CS	Ref levels CS	• Absolute • Percentage
		High level Absolute CS	-10 to 10
		Mid level Absolute CS	
		Low level Absolute CS	
		Hysteresis Absolute CS	0 to 10
		High level Percentage CS	1 to 99
		Mid level Percentage CS	
		Low level Percentage CS	
		Hysteresis Percentage CS	0 to 50
		Ref Levels Autoset Basetop Method CS	• MINMAX • AUTO

Returns

<Nrf>

Examples

`TEKEXP:VALUE ANALYZE,”<TestName>","<ParameterName>","<ParameterValue>"` command set the value for the specified test and its analyze parameter.

`TEKEXP:VALUE? ANALYZE,”<TestName>","<ParameterName>"` command returns the value for the specified test and its analyze parameter.

Query the available devices in the DUT panel of the application

This command queries the list of available devices on the DUT panel as comma separated values.

Syntax

`TEKEXP:LIST? DEVICE` (Query)

Command arguments

Device	Device Type and value	Description
<Device>	<String> • DDR5 • LPDDR5	It is the name of the device on the DUT panel of the application.

Returns

<String>

Examples

`TEKEXP:LIST? DEVICE` command returns the list of available devices.

Query the list of available tests of the application

This command queries the list of available tests of the application for the selected device as comma separated values.

Syntax

`TEKEXP:LIST? TEST` (Query)

Command arguments

Table 24: For DDR5

<TestName>	<String>
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) • VIX_DQS_Ratio

Table continued…

<TestName>	<String>
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_cIVW_Rise • SRIN_cIVW_Fall

Table 25: For LPDDR5

<TestName>	<String>
Clock	• tCH(abs) • tCH(avg) • tCK(avg) • tCK(abs) • tCL(avg) • tCL(abs) • tJIT(cc) • tJIT(per) • VIX_CK_Ratio

Table continued…

<TestName>	<String>
Write Clock	• tWCKH(avg) • tWCKH(abs) • tWCKL(avg) • tWCKL(abs) • tWCK(avg) • tWCK(abs) • tJIT(cc)_WCK • tJIT(per)_WCK • tERR(2per) • tERR(3per) • tERR(4per)
Read Burst Measurements	• tRPRE • tRPST • tQH • tDQSQ • tQW • tQSH • tQSL
Write Burst Measurements	• RxMask_Write • tDIVW1 • tDIVW2 • vDIVW • tDIPW • tDIHL_Above • tDIHL_Below • vDIHL_AC • tWCK2DQI • VIX_WCK_Ratio • tWCK2CK
CA Measurements	• RXMask_CA • tCIVW1 • tCIVW2 • vCIVW • tCIPW_Positive • tCIPW_Negative • vCIHL_AC

Table continued…

<TestName>	<String>
CS Measurements	• RxMask_CS • tCSIPW_Negative • tCSIPW_Positive • vCSIHL_AC • tCSIVW1 • tCSIVW2 • vCSIVW

Returns

<String>

Examples

`TEKEXP:LIST? TEST` command returns the list of available tests for the selected device.

Query the list of available instruments based on the specified instrument type.

This command queries the list of available instruments based on the specified instrument type.

Syntax

`TEKEXP:LIST? INSTRUMENT,"<InstrumentType>"` (Query)

Command argument

Argument Name	Argument value
<InstrumentType>	<String>

Returns

<String>

Examples

`TEKEXP:LIST? INSTRUMENT,"Real Time Scope"` command returns the list of available instruments based on the real time scope type.

Set or query the IP address of the instrument based on the specified instrument type.

This command sets or queries the IP address of the instrument based on the specified instrument type.

Syntax

`TEKEXP:INSTRUMENT? "<InstrumentType>"` (Query)

`TEKEXP:INSTRUMENT, "<InstrumentType>","<Value>"` (Set)

Command argument

Argument Name	Argument Type
<InstrumentType>	<String>

Table continued…

Argument Name	Argument Type
<Value>	<String> TCPIP::XXX.XX.XXX.XXX::INSTR

Returns

<String>

Examples

`TEKEXP:INSTRUMENT? "<InstrumentType>"` command returns the IP address of the oscilloscope.

`TEKEXP:INSTRUMENT, "<InstrumentType>","<value>"` command sets the oscilloscope to the specified IP address.

Query the information of the generated report file

This command queries the information of the generated report file in the format "<FileSize>","<FileName>".

Pre-requisite

A session should be run earlier and the report should be generated to get the information of the report.

Syntax

`TEKEXP:INFO? REPORT` (Query)

Returns

<FileSize>:: <String>

<FileName>:: <String>

Examples

`TEKEXP:INFO? REPORT` command returns the information of the generated report in the format ("1215","DUT001.mht").

Query the information of the generated waveform files

This command queries the information of the generated waveform files in the format.

<File1Size,"File1Name">.

If there are more than one waveform, the waveform file names are displayed with the comma separated values in the format

<File1Size,"File1Name">,<File2Size,"File2Name">.

Syntax

`TEKEXP:INFO? WFM` (Query)

Returns

<FileSize>:: <String>

<FileName>:: <String>

Examples

`TEKEXP:INFO? WFM` command returns the information of the generated waveform in the format (20000858,"X:\<Application Name>\Untitled Session\DUT001\20200916_041609\Iter1_Short Record-length for SCOPE Period_NoSSC_DIFF.wfm").

Query the information of the generated image files

This command queries the information of the generated image files in the format.

<File1Size,"File1Name">.

If there are more than one image, the image file names are displayed with the comma separated values in the format

<File1Size,"File1Name">,<File2Size,"File2Name">.

Syntax

`TEKEXP:INFO? IMAGE` (Query)

Returns

<FileSize>:: <String>

<FileName>:: <String>

Examples

`TEKEXP:INFO? IMAGE` command returns the information of the generated image in the format (109058, "X:\<Application Name>\Untitled Session\DUT001\20200916_041609\Iter1_Short Record-length for SCOPE Period_NoSSC_DIFF.png";22794,"X:\<Application Name>\UntitledSession\DUT001\20 200916_041609\ScopePeriodPlot_Iteration1WithCursor.png").

Query the active TekExpress application name

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

Syntax

`TEKEXP:*IDN?` (Query)

Returns

<String>

Examples

`TEKEXP:*IDN?` command returns the active TekExpress application name running on the oscilloscope.

Sets or query the acquire mode status

This command sets or queries the acquire mode status.

Syntax

`TEKEXP:ACQUIRE_MODE <Mode>` (Set)

`TEKEXP:ACQUIRE_MODE?` (Query)

Command arguments

Argument Name	Argument value
<Mode>	• LIVE • PRE-RECORDED

Returns

LIVE | PRE-RECORDED

Examples

`TEKEXP:ACQUIRE_MODE LIVE` command sets the acquire mode to the Live mode.

`TEKEXP:ACQUIRE_MODE?` command returns the current acquire mode.

Set or query the execution mode status

This command sets or queries the execution mode status.

Syntax

`TEKEXP:MODE <Mode>` (Set)

`TEKEXP:MODE?` (Query)

Command arguments

Argument Name	Argument value
<Mode>	• COMPLIANCE • USER-DEFINED

Returns

COMPLIANCE | USER-DEFINED

Examples

`TEKEXP:MODE COMPLIANCE` command sets the execution mode to the compliance mode.

`TEKEXP:MODE?` command returns the current execution mode.

Generate the report for the current session

This command generates the report for the current session.

Syntax

`TEKEXP:REPORT GENERATE`

Arguments

N/A

Examples

`TEKEXP:REPORT GENERATE` command generates the report for the current session.

Query the value of specified report header field in the report

This command queries the value of specified report header field in the report.

Syntax

`TEKEXP:REPORT? ”<Device Field>”` (Query)

Command arguments

Argument Name	Argument Type
<Device Field> Device field is the header name of each field in the setup information section of the report. Setup Information DUT ID: DUT001 Date/Time: 2020-10-22 11:24:39 Device Type: TX-Device TekExpress AppEmulator Version: 5.2.999.17 (DAILY) TekExpress Framework Version: 5.2.999.17_INTERNAL Spec Version: Spec 1.0 Overall Compliance Mode: Yes Overall Test Result: Pass Probe1 Model: "1X" Probe1 Serial Number: "N/A" Probe2 Model: "1X" Probe2 Serial Number: "N/A" Probe3 Model: "1X" Probe3 Serial Number: "N/A" Probe4 Model: "1X" Probe4 Serial Number: "N/A" Scope Model: DPO5104 Scope Serial Number: Not-Set SPC, FactoryCalibration: INIT:UNCAL Scope F/W Version: 10.8.1 Build 25 DPOJET Version: 10.1.0.64	<String>

Returns

<String>

Examples

`TEKEXP:REPORT? "DUT ID"` command returns the value of DUT ID field in the report.

Query the value of specified result detail available in report summary/details table.

This command queries the value of specified result detail available in report summary/details table.

Syntax

`TEKEXP:RESULT? "<TestName>"` (Query)

`TEKEXP:RESULT? "<TestName>","<ColumnName>"` (Query)

`TEKEXP:RESULT? "<TestName>","<ColumnName>",<RowNumber>` (Query)

Command arguments

Argument Name	Argument Type
<TestName> It is the test name of which the details are required in the report.	<String>
<ColumnName> It is the column header name of which the details are required in the report.	<String>

Table continued…

Argument Name	Argument Type
<RowNumber> It is the row number of which the details are required in the report.	<String>

Returns

<String>

Examples

`TEKEXP:RESULT? "<TestName>"` will return the pass fail status of test.

`TEKEXP:RESULT? "<TestName>","<ColumnName>"` will return all the row values of specific column for the test with comma separated values.

`TEKEXP:RESULT? "<TestName>","<ColumnName>",<RowNumber>` will return the column value of specified row number.

Restore the setup to default settings

This command restores the setup to default settings.

Syntax

`TEKEP:SETUP Default`

Arguments

N/A

Examples

`TEKEP:SETUP Default` command restores the setup to default settings.

Save the settings to a specified session

This command saves the settings to a specified session.

Syntax

`TEKEXP:SETUP Save,"<SessionName>"`

Command arguments

Argument Name	Argument value
<SessionName>	<String>

Examples

`TEKEXP:SETUP Save,"<SessionName>"` command saves the settings to a specified session.

Save the setup

This command saves the setup.

Syntax

`TEKEXP:SETUP Save`

Examples

`TEKEXP:SETUP Save` command saves the setup.

Open the setup from a specified session

This command opens the setup from a specified session.

Syntax

`TEKEXP:SETUP Open,"<SessionName>"`

Command arguments

Argument Name	Argument value
<SessionName>	<String>

Examples

`TEKEXP:SETUP Open,"<SessionName>"` command opens the setup from a specified session.

Query the current setup file name.

This command queries the current setup file name.

Syntax

`TEKEXP:SETUP? CURRENT` (Query)

Returns

<String>

Examples

`TEKEXP:SETUP? CURRENT` command returns the current setup file name.

Run/stop/pause/resume the selected measurements execution in the application

This command run/stop/pause/resume the selected measurements execution in the application.

Syntax

`TEKEXP:STATE <operation mode>` (Set)

Command arguments

Argument Name	Argument value
<operation mode>	• RUN • STOP • PAUSE • RESUME

Returns

RUN | STOP | PAUSE | RESUME

Examples

`TEKEXP:STATE RUN` command runs the execution for the selected measurements.

Query the current measurement execution status

This command queries the current measurement execution status.

Syntax

`TEKEXP:STATE?` (Query)

Returns

RUNNING | PAUSED | WAIT | ERROR | READY

Examples

`TEKEXP:STATE?` command returns the current measurement execution status.

Query whether the current setup is saved or not saved

This command queries whether the current setup is saved or not saved.

Syntax

`TEKEXP:STATE? SETUP` (Query)

Returns

Saved or Not-Saved

Examples

`TEKEXP:STATE? SETUP` command returns whether the current setup is saved or not saved.

Query the status of the previous command execution

This command queries whether the previous command execution is completed successfully.

Syntax

`TEKEXP:*OPC?` (Query)

Returns

{0 | 1} or {True | False}

1 or True indicates that command execution is successful.

0 or False indicates that command execution is failed.

Examples

`TEKEXP:*OPC?` command returns whether the previous command operation is completed successfully.

Query the last error occurred

This command queries the last error occurred.

Syntax

`TEKEXP:LASTERROR?` (Query)

Returns

<String>

Examples

`TEKEXP:LASTERROR?` command returns the last error occurred.

Set or query the popup details

This command sets or queries the popup details.

Syntax

`TEKEXP:POPUP?` (Query)

`TEKEXP:POPUP "<PopupResponse>"` (Set)

Command arguments

Argument Name	Argument value
<PopupResponse>	• Yes • No

Returns

The pop-up details return in the following format:

"<Tittle>","<message>","<response1>,<response2>".

Where,

<Tittle> :: <String>

<message> :: <String>

<response1>,<response2> :: <String>

Examples

`TEKEXP:POPUP?` command returns the popup details in following format ": "Do you really want to exit TekExpress?";Responses: "Yes, No".

`TEKEXP:POPUP "Yes"` command sets the popup response to Yes.

Query the enable or disable status of Continuous run function.

This command queries the enable or disable status of Continuous run function.

Syntax

`TEKEXP:VALUE? GENERAL,"Enable Continuous Run"` (Query)

Returns

{True | False} or {0 | 1}

Where,

1 or True indicates that the continuous run function is enabled.

0 or False indicates that the continuous run function is disabled.

Examples

`TEKEXP:VALUE? GENERAL,"Enable Continuous Run"` command returns the enable or disable status of continuous run function.

Set or query the continuous run duration time value

This command sets or queries the continuous run duration time value.

Syntax

`TEKEXP:VALUE? ContinuousRun_Duration` (Query)

`TEKEXP:VALUE ContinuousRun_Duration,"<Value>"` (Set)

Arguments

Argument Name	Argument value
<Value>	Infinite | hh:mm Infinite sets the radion button to infinite. hh:mm sets the continuous run duration to the specified time in hours and minutes. The minimum time duration you can set is 00:30.

Returns

Infinite | hh:mm

Examples

`TEKEXP:VALUE? ContinuousRun_Duration` command returns the continuous run duration time value.

`TEKEXP:VALUE ContinuousRun_Duration,"<Value>"` command sets the continuous run duration time value.

Set or query the session create option in the continuous run function

This command sets or queries the option for session creation in the continuous run function.

Syntax

`TEKEXP:VALUE? ContinuousRun_RunSessionOptions` (Query)

`TEKEXP:VALUE ContinuousRun_RunSessionOptions,"Value"` (Set)

Arguments

Argument Name	Argument value
<Value>	NewSession | SameSession_ClearResults NewSession - creates new session for each run. SameSession_ClearResults - Clears the test results of the current session and starts the test execution. The session results will be added in the same session, by erasing the previous run results.

Returns

NewSession | SameSession_ClearResults

Examples

`TEKEXP:VALUE? ContinuousRun_RunSessionOptions` command returns the option for session creation in the continuous run function.

`TEKEXP:VALUE ContinuousRun_RunSessionOptions,"Value"` command sets the option for session creation in the continuous run function.

Set or query the View report after generating option status

This command sets or queries the status of the View report after generating option.

Syntax

`TEKEXP:VALUE? GENERAL,"View Report After Generating"` (Query)

`TEKEXP:VALUE GENERAL,"View Report After Generating",<value>` (Set)

Arguments

Argument Name	Argument value
<Value>	{True | False} or {1 | 0} It represents selected or unselected. Where, • True or 1 - Selected • False or 0 - Unselected

Returns

{True | False} or {0 | 1}

Examples

`TEKEXP:VALUE? GENERAL,"View Report After Generating"` command returns the enable or disable status of view report after generating option.

`TEKEXP:VALUE GENERAL,"View Report After Generating",<value>` command enable or disable the view report after generating option.

Examples

This section provides the examples for the SCPI commands.

Table 26: Applicable for both DDR5 and LPDDR5

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 GENERAL,"Bandwidth20GHz",19`	It sets the bandwidth to 19 GHz.
`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.

Table continued…

Example	Description
`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?\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: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,"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:SELECT TEST ,"tck",True`	It selects the measurement "tCK".
`TEKEXP:VALUE? GENERAL "Record Length (mpts)"`	It returns the record length set.
`TEKEXP:VALUE GENERAL "Record Length (mpts)",0.5`	It sets the global configuration parameter value of Record Length to 0.5mpts.

Table continued…

Example	Description
`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", 4`	It sets the Analyze parameter's low range for N value to 4 for the specified measurement.
`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.
`TEKEXP:VALUE GENERAL,"Run Test More than Once","True"`	This enables the multi-run option.
`TEKEXP:VALUE? GENERAL,"Run Test More than Once"`	It returns the enable and disable status of multi-run option.
`TEKEXP:VALUE GENERAL,"Number of Runs",5`	It sets the number of iterations that the measurement has to run.
`TEKEXP:VALUE? GENERAL,"Number of Runs"`	It returns the number of iterations that the measurements will run.
`EKEXP:VALUE GENERAL,"Sample Rate (GS/s)",50`	Set the Sample Rate to 50 GS/s.
`TEKEXP:VALUE? GENERAL,"Sample Rate (GS/s)"`	It returns the value for Sample Rate.

Table 27: For DDR5

Example	Description
`TEKEXP:VALUE ANALYZE,"RxMask","Superimpose DQS","True"`	It enables Superimpose DQS.
`TEKEXP:RESULT? "tCK_NUI_RJ_NoBUJ"\n`	It returns Pass when the test result is Pass.
`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: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.

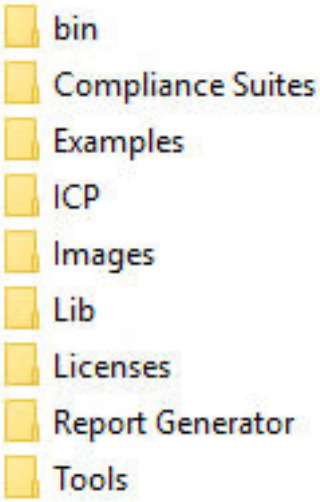
Table 28: For LPDDR5

Example	Description
`TEKEXP:VALUE ANALYZE,"RxMask_Write","Superimpose WCK","True"`	It enables Superimpose WCK.
`TEKEXP:RESULT? "tWCK2DQI"\n`	It returns Pass when the test result is Pass.
`TEKEXP:VALUE ANALYZE,"tCH(abs)",200`	Sets the Window Size to 200.
`TEKEXP:VALUE? ANALYZE,"tCH(abs)"`	It returns the value for Window Size.
`TEKEXP:VALUE GENERAL,"WCK Probe Mode","A"`	It sets the Trimode probe type for WCK signal.
`TEKEXP:VALUE? GENERAL,"WCK Probe Mode"`	It queries the Trimode probe type set.

References

Application directories

You can find the application files at *C:\Program Files\Tektronix\<Application Name>*. The application directory and associated files are organized as follows:



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

Table 29: Application directories and usage

Directory names	Usage
Bin	Contains application libraries
Compliance Suites	Contains test suite specific files
Examples	Contains various support files
ICP	Contains instrument and application specific interface libraries
Images	Contains images of the application
Lib	Contains utility files specific to the application
Licenses	Contains all the license files
Report Generator	Contains style sheets for report generation
Tools	Contains instrument and application specific files

File name extensions

The TekExpress <Application Name> software uses the following file name extensions:

Table 30: File name extension

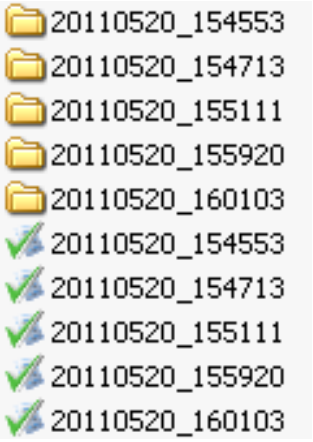
File name extension	Description
*.TekX	Application session files (the extensions may not be displayed)
*.py	Python sequence file.
*.xml	Test-specific configuration information (encrypted) files. Application log files
*.csv	Test result reports Plot data
*.mht	Test result reports (default) Test reports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

View test-related files

Files related to tests are stored in My Documents\<Application Name>\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.

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:\<Application Name>. 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 application.

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.

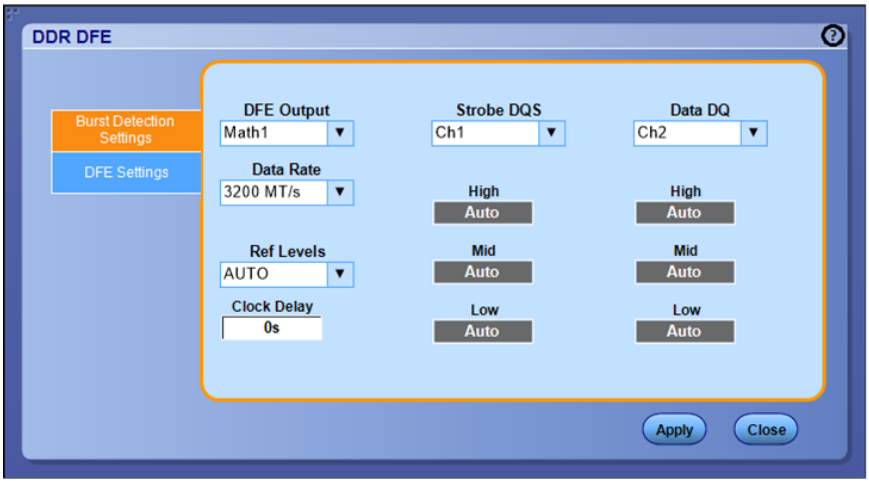
How to launch

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

DDR DFE Application

Burst Detection Settings

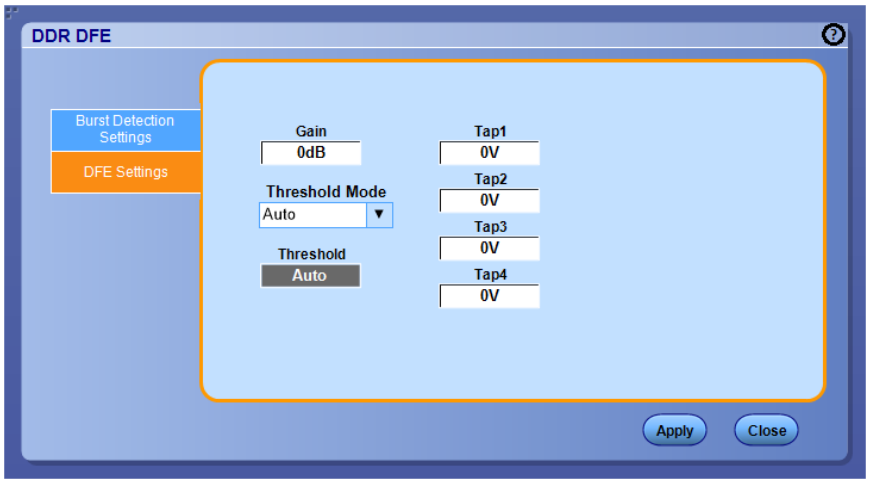
Once the "DDR DFE" is launched, in the 'Burst Detection Settings' tab, user must select 'Strobe DQS' and 'Data DQ' signals coming from the DUT connected to the oscilloscope channels. The user must configure the 'DFE Output' to the required Math channel. The user must set the 'Data Rate' of the DDR5 of 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.

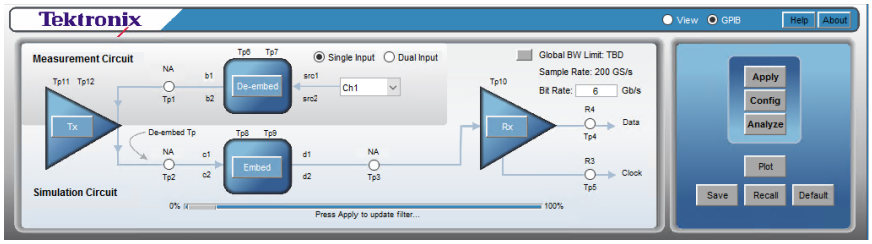


Figure 31: SDLA Visualizer

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

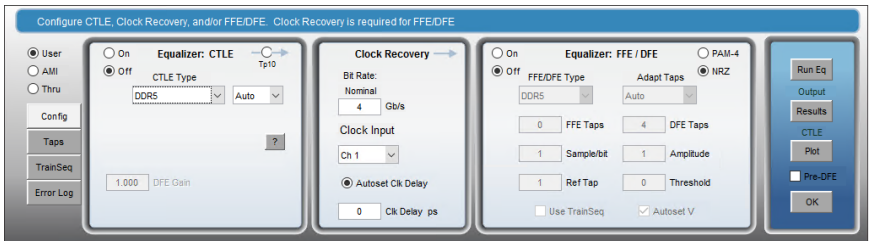


Figure 32: SDLA Visualizer - Rx Configuration

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.

Table 31: For DDR5

Acquire Type	Waveforms to be loaded
Clock	• For differential signal probe type DDR5_<DataRate>_Clock_Clock_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • For Single Ended Probe Type DDR5_<DataRate>_Clock_Clock-_<RecordLength>_<SourceChannel>>_<RunIteration>.wfm DDR5_<DataRate>_Clock_Clock+_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
Clock_Slew_Rate	DDR5_<DataRate>_Clock_Slew_Rate_Clock_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
WR_Differential_Strobe	For differential signal probe type: • DR5_<DataRate>_WR_Differential_Strobe_Clock_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_<DataRate>_WR_Differential_Strobe_DQ_<RecordLength>_<SourceChannel>_<RunIteration>.wfm For single-ended probe type: • DDR5_<DataRate>_WR_Differential_Strobe_DQS+_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_<DataRate>_WR_Differential_Strobe_DQS-_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
WR_Data_Eye	• DDR5_<DataRate>_WR_Data_Eye_DQS_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_<DataRate>_WR_Data_Eye_DQ_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
WR_Slew_Rate	• DDR5_3200_WR_Slew_Rate_DQ_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_3200_WR_Slew_Rate_DQS_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
RD_Differential_Strobe	• DDR5_<DataRate>_RD_Differential_Strobe_Clock_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_<DataRate>_RD_Differential_Strobe_DQ_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_<DataRate>_RD_Differential_Strobe_DQS_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
RD_Output_Level	• DDR5_3200_RD_Output_Level_DQ_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_3200_RD_Output_Level_DQS_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
RD_Slew_Rate	• DDR5_3200_RD_Slew_Rate_DQ_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_3200_RD_Slew_Rate_DQS_<RecordLength>_<SourceChannel>_<RunIteration>.wfm

Table continued…

Acquire Type	Waveforms to be loaded
Address_Command	• DDR5_<DataRate>_Address_Command_CA_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_<DataRate>_Address_Command_Clock_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
Address_Command_Eye	• DDR5_<DataRate>_Address_Command_Eye_CA_<RecordLength>_<SourceChannel>_<RunIteration>.wfm • DDR5_<DataRate>_Address_Command_Eye_Clock_<RecordLength>_<SourceChannel>_<RunIteration>.wfm
Address_Command_Slew_Rate	DDR5_<DataRate>_Address_Command_Slew_Rate_CA_<RecordLength>_<SourceChannel>_<RunIteration>.wfm

Table 32: For LPDDR5

Acquire Type	Waveforms to be loaded
Clock	• For differential signal probe type LPDDR5-<DataRate>-<WCKtoCK>-Clock-Clock-<RecordLength>-<SourceChannel>-<RunIteration>.wfm • For Single Ended Probe Type LPDDR5-<DataRate>-<WCKtoCK>-Clock-Clockt-<RecordLength>-<SourceChannel>-<RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-Clock-Clockc-<RecordLength>-<SourceChannel>-<RunIteration>.wfm
Write_Clock	• For differential signal probe type LPDDR5-<DataRate>-<WCKtoCK>-Clock-WCK-<RecordLength>-<SourceChannel>-<RunIteration>.wfm • For Single Ended Probe Type LPDDR5-<DataRate>-<WCKtoCK>-Clock-WCKt-<RecordLength>-<SourceChannel>-<RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-Clock-WCKc-<RecordLength>-<SourceChannel>-<RunIteration>.wfm

Table continued…

Acquire Type	Waveforms to be loaded
WR_Data	• For differential signal probe type LPDDR5-<DataRate>-<WCKtoCK>-WR_Data-DQ-<RecordLength>-<SourceChannel>-< RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-WR_Data-WCK-<RecordLength>-<SourceChannel>-< RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-WR_Data-RDQS-<RecordLength>-<SourceChannel>-< RunIteration>.wfm • For single-ended probe type LPDDR5-<DataRate>-<WCKtoCK>-WR_Data-WCKt-<RecordLength>-<SourceChannel>-< RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-WR_Data-WCKc-<RecordLength>-<SourceChannel>-< RunIteration>.wfm
RD_Data	LPDDR5-<DataRate>-<WCKtoCK>-RD_Data-DQ-<RecordLength>-<SourceChannel>-< RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-RD_Data-WCK-<RecordLength>-<SourceChannel>-< RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-RD_Data-RDQS-<RecordLength>-<SourceChannel>-< RunIteration>.wfm
CA	LPDDR5-<DataRate>-<WCKtoCK>-CA-Clock-<RecordLength>-<SourceChannel>-< RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-CA-CAa-<RecordLength>-<SourceChannel>-< RunIteration>.wfm
CS	LPDDR5-<DataRate>-<WCKtoCK>-CS-Clock-<RecordLength>-<SourceChannel>-< RunIteration>.wfm LPDDR5-<DataRate>-<WCKtoCK>-CS-CS-<RecordLength>-<SourceChannel>-< RunIteration>.wfm

Index

A

About SCPI command *56*
Acquire Step by Step *33*
Acquisition tab *33*
Activate the license
    license *12*

B

Bandwidth Limit
    clock channels *21*
    data channels *21*
Burst detection method *28*

C

Clearing test results *14*
Compensate the signal path *14*
Configuration tab parameter *35*
Configuration tab parameters *35*
Contacting Tektronix *10*
Conventions *9*

D

Downloading and installing the software
    Download the software
        Install the software *12*
DUT ID *21*
DUT parameter
    device *21*
    device profile *21*
DUT type
    device *21*

E

Email notification and setup *18*

F

Filter the test results *48*

G

Getting help and support *9*
Getting started *11*
global settings *35*

H

Hardware requirements
    Hardware *11*

I

Icons used
    symbols *9*
Instrument Control Settings *13*
instruments detected *35*
Instruments detected *35*

L

Launch the application *16*
license key *12*
Live waveforms *21*
load the saved test setup
    load the test setup *54*
Log view *46*
Log View *43*

M

Menus
    Preferences *14*

O

Options menu
    Options menu functions *18*
Oscilloscope compensation *14*

P

Pattern *21*
Pattern type *21*
Pre-recorded waveform file names for test measurements *118*
Preferences menu *48*
Preferences tab
    Preferences *42*
Product documents
    TekExpress Application documents *9*

R

recalling test setup *54*
Recommended SI Interposers *11*
Remote commands *56*
report generation *52*

report generation options 52
report generation settings
    Configure report generation settings 49
Reports
    receiving in email notifications 18
Reports panel 49
Results panel 48
Results Panel 14
Running tests 14

S

Save the configured test setup
    Save the test setup 54
Save the test setup 55
Save the test setup with a different name 55
Saving test setup 54
SCPI command 56
SCPI Commands
    SCPI 56
Search instruments connected
    instruments connected to the application 13
Select a loaded test setup 54
Select a pre-run session loaded test setup 54
Selecting tests 32
Setting up the test environment
    test environment 13
Setup Acquisition tab 33
Show acquire parameters 33
Socket configuration for SCPI commands
    Socket configuration 62
Software requirements
    Softwares 11
software version 12
Source 21
Start the application 16
Status panel 43
Support 10

T

Technical support
    support 10
TEKEP:SETUP Default 104
TEKEXP:*IDN? 101
TEKEXP:*OPC? 107
TEKEXP:ACQUIRE_MODE LIVE 102
TEKEXP:ACQUIRE_MODE? 102
TEKEXP:INFO? IMAGE 101
TEKEXP:INFO? REPORT 100
TEKEXP:INFO? WFM 101
TEKEXP:INSTRUMENT, "<InstrumentType>","<value>" 100
TEKEXP:INSTRUMENT? "<InstrumentType>" 100
TEKEXP:LASTERROR? 107
TEKEXP:LIST? DEVICE 95
TEKEXP:LIST? INSTRUMENT,"<Real Time Scope>" 99
TEKEXP:LIST? TEST 99
TEKEXP:MODE COMPLIANCE 102
TEKEXP:MODE? 102
TEKEXP:POPUP "Yes" 108
TEKEXP:POPUP? 108
TEKEXP:REPORT GENERATE 103
TEKEXP:REPORT? "<Device Field>" 103
TEKEXP:RESULT? "<TestName>" 104
TEKEXP:RESULT? "<TestName>","<ColumnName>" 104
TEKEXP:RESULT? "<TestName>","<ColumnName>",<RowNumber> 104
TEKEXP:SELECT DEVICE,"DeviceName" 62
TEKEXP:SELECT TEST,"<ALL>" 66
TEKEXP:SELECT TEST,"<TestName>",1 66
TEKEXP:SELECT? DEVICE 62
TEKEXP:SELECT? TEST 66
TEKEXP:SETUP Open,"<SessionName>" 105
TEKEXP:SETUP Save 105
TEKEXP:SETUP Save,"<SessionName>" 104
TEKEXP:SETUP? CURRENT 105
TEKEXP:STATE RUN 106
TEKEXP:STATE? 106
TEKEXP:STATE? SETUP 106
TEKEXP:VALUE ANALYZE,”<TestName>","<ParameterName>","<ParameterValue>" 94
TEKEXP:VALUE ContinuousRun_Duration,"<Value>" 108
TEKEXP:VALUE ContinuousRun_RunSessionOptions,"Value" 109
TEKEXP:VALUE GENERAL,"<ParameterName>","<Value>" 82
TEKEXP:VALUE GENERAL,"View Report After Generating",<value> 110
TEKEXP:VALUE? ANALYZE,”<TestName>","<ParameterName>" 94
TEKEXP:VALUE? ContinuousRun_Duration 108
TEKEXP:VALUE? ContinuousRun_RunSessionOptions 109
TEKEXP:VALUE? GENERAL,"<ParameterName>" 82
TEKEXP:VALUE? GENERAL,"Enable Continuous Run" 108
TEKEXP:VALUE? GENERAL,"View Report After Generating" 110
test execution status 43
Test Name 33
Test results
    send by email 18
Test Results
    clearing displayed 14
test run preferences 42
Test selection
    TekExpress DDR Tx 32
    test description 32
Test selection controls 32
Test setup files overview
    Test setup files 54
Test Status 43, 44
Tests
    running 14
    selecting 32

V

View a report *53*
View summary of test results
    summary of test results *48*
View test execution logs *46*
View the test execution status *44*

W

Wavelength *21*