TekExpress™ Serial ATA Automated Compliance Solutions Online Help

www.tektronix.com
077-0044-00

Tektronix

TekExpress Serial ATA Online help, 076-0096-00.

Contacting Tektronix

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

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

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Connect and Disconnect Properly. Connect the probe output to the measurement instrument before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement instrument.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Do Not Operate With Suspected Failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Terms in this Manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Using Online Help

Select Help from the menu to open the help file. You can also find an electronic copy of the help file in the Documents directory on the 063-4068-XX DVD.

Tables of Contents (TOC) tab — Organizes the Help into book-like sections. Select a book icon to open a section; select any of the topics listed under the book.

Index tab — Enables you to scroll a list of alphabetical keywords. Select the topic of interest to bring up the appropriate help page.

Search tab — Allows a text-based search.

Follow these steps:

1. Type the word or phrase you want to find in the search box. If the word or phrase is not found, try the Index tab.
2. Choose a topic in the lower box, and then select the Display button.

General Help Functions:

- Select the Print button from the Help topics menu bar to print a topic.
- To return to the previous window, select the Back button.
- Use hyperlinks to jump from one topic to another.
- If the back button is grayed out or a jump is not available, choose the Help Topics button to return to the originating help folder.

Related Documentation

In addition to this TekExpress Online Help, the following documentation is included with the software:

- *TekExpress Installation Manual*, Tektronix part number 071-2268-XX. The Installation Manual has information about installing and upgrading the software.
- *TekExpress Quick Start User Manual*, Tektronix part number 071-2298-XX. The Quick Start User Manual has information about how to use the software and includes application examples.

Technical Specification documents

http://www.tek.com/Measurement/applications/serial_data/sata.html

Conventions

Online Help uses the following conventions:

- The term “SATA” refers to Serial Advanced Technology Attachment.
- The term “DUT” is an abbreviation for Device Under Test.
- The term “UUT” is an abbreviation of Unit Under Test.
- The term “select” is a generic term that applies to the two mechanical methods of choosing an option: using a mouse or using the touch screen.

Technical Support

Tektronix values your feedback on our products. To help us serve you better, please send us your suggestions, ideas, or comments on your application or oscilloscope.

When you contact Tektronix Technical Support, please include the following information (be as specific as possible) :

General Information

- All instrument model numbers.
- Hardware options, if any.
- Probes used.
- Your name, company, mailing address, phone number, FAX number.
- Please indicate if you would like to be contacted by Tektronix about your suggestion or comments.

Application Specific Information

- Software version number
- Description of the problem such that technical support can duplicate the problem.
- If possible, save the setup files as .set files for all the instruments used and the application.
- If possible, save the TekExpress setup files, log.xml and status messages text file.
- If possible, save the waveform on which you are performing the measurement as a .wfm file.

Forward the information to technical support using one of these methods:

- E-mail – techsupport@tektronix.com
- FAX – (503) 627-5695

Accessories

About the Test Fixture

The TF-SATA-NE-XP and TF-SATA-FE-XP test fixtures that facilitate SATA Compliance testing are designed by Tektronix and manufactured and distributed by Crescent Heart Software. For more information, visit the Crescent Heart Software Web site www.c-h-s.com.

About Frame Error Analyzer

The Crescent Heart Software SATA II probe adapter facilitates Receiver Signalling Group test. Visit www.c-h-s.com for more information.

About Keithley Switch

The S46 Microwave Switch System is designed to simplify the automated switching needed to test a wide range of telecommunications products and devices. For more information, visit http://www.keithley.com/applications/aerospace/?mn=S46.

Minimum System Requirements

The minimum system requirements for a PC to run TekExpress are as follows:

Table 1: System requirements

Processor	Pentium 4/M or equivalent processor.
Operating System	Windows XP Service Pack 2.
Memory	1 GB of memory (512 MB minimum).
Hard Disk	Approximately 2 GB of available hard-disk space for the recommended installation, which includes full TekExpress installation and distributed components such as SQL Server Express, .NET 2.0 Framework and others.
Drive	DVD drive
Display	Super VGA resolution or higher video adapter (800x600 minimum video resolution for small fonts or 1024x768 minimum video resolution for large fonts). The application is best viewed in 96 dpi display settings.
Software	■ Microsoft Excel 2000 or above. ■ Microsoft Internet Explorer 6.0 SP1 or later. ■ Microsoft Photo Editor 3.0 or equivalent software for image files viewing. ■ Adobe Reader 6.0 or equivalent software for viewing portable document format (PDF) files.
Other Devices	■ Microsoft compatible mouse or compatible pointing device. ■ Four USB port (2 USB ports minimum). ■ PCI-GPIB or equivalent interface for instrument connectivity [1].

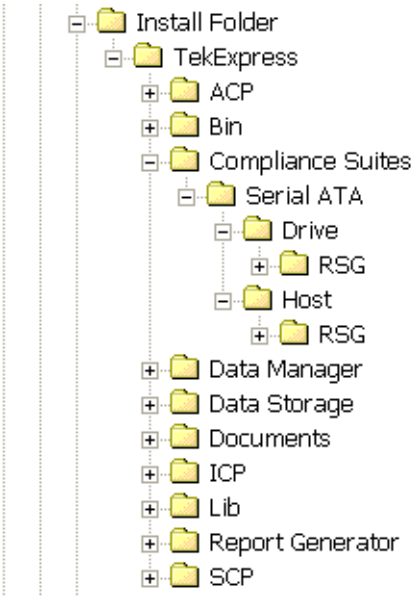
1 If the TekExpress is installed on a Tektronix oscilloscope, the virtual GPIB port cannot be used by TekExpress for communicating with oscilloscope applications.

Application Directories and Usage

Related Topics

- File Name Extensions
- How To Activate the License

The application directory and associated files are organized as follows:



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

Table 2: Default directory names and their usage

Directory names	Usage
InstallDir\TekExpress	Contains the application and associated files.
\TekExpress\Compliance Suites	Has compliance specific sequence files. The folders under this directory represent the devices to be tested.
\TekExpress\Compliance Suites\Serial ATA\	The folders under this are Drive and Host.
\TekExpress\Compliance Suites\Serial ATA\Drive\ \TekExpress\Compliance Suites\Serial ATA\Host\	Typically includes the RSG folder. This represents the suite of install tests for the drive and host devices.
\TekExpress\ACP \TekExpress\SCP \TekExpress\ICP	Includes instrument and application specific interface libraries of TekExpress.
\TekExpress\Data Manager \TekExpress\Data Storage \TekExpress\Report Generator	Includes the result management specific libraries of TekExpress are present in these folders.

Table 2: Default directory names and their usage (cont.)

Directory names	Usage
\TekExpress\Documents	Includes the Method of Implementation documents and technical documentation for the application.
\TekExpress\Bin \TekExpress\Lib	Includes the Miscellaneous libraries of TekExpress.

File Name Extensions

Related Topics

- Application Directories and Usage
- How To Activate the License

The software uses the following file name extensions:

File name extension	Description
.TekX	The session file will be saved in this format.
.seq	The test sequence file.
.xml [1]	The encrypted XML file that contains the test specific configuration information.
.PDF	The PDF file that details the method of implementation for the test.

1 The Log file extension is also xml.

How To Activate the License

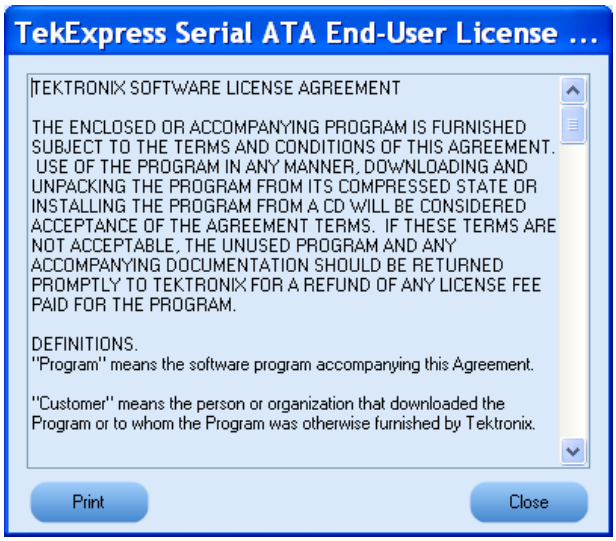
Related Topics

- Application Directories and Usage
- File Name Extensions

Follow the below steps to activate the license:

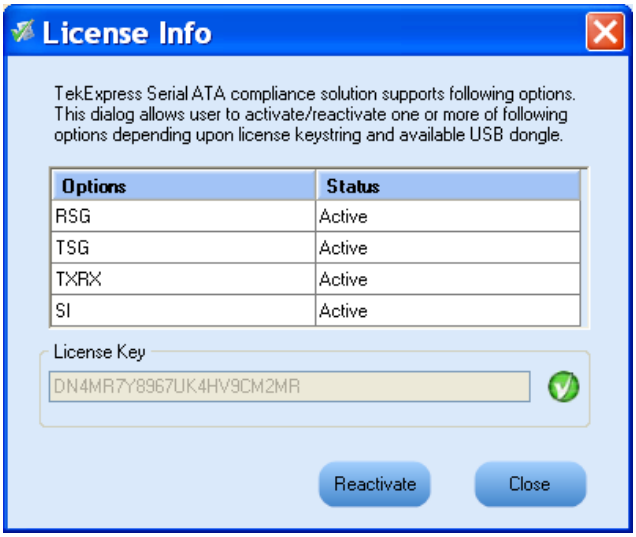
1. Click **Help > About** to view the license information.

2. Click the **View End-User License Agreement** link to open the following Tektronix Software License Agreement window. Click **Print** to take a hard copy of the License Agreement.



3. Click **License Info** to view the software options that are available for you to choose from. This window shows the license key and the various options with their status (active or inactive) with the current license key.

4. If you are activating for the first time, the license key field will be empty. To activate the license, connect the USB dongle to your computer and enter the license key provided in the license key certificate and click **Activate.** If the activation is successful, a sign is displayed next to the license key field.



5. If you are reactivating the license, click **Reactivate** and proceed to enter the new license key in the license key field. Click **Activate.**

Before You Click Run

After you first launch `TekExpress SATA.exe`, TekExpress creates the following folders on your computer:

- `\My Documents\My TekExpress`

NOTE. *If a user with a new login ID launches `TekExpress SATA.exe`, `My TekExpress` folder is created under `My Documents` of the new user.*

- `\My Documents\My TekExpress\Serial ATA`
- `\My Documents\My TekExpress\ Serial ATA\Untitled Session`. Note that everytime the `TekExpress SATA.exe` is launched `Untitled Session` folder is created under `Serial ATA` folder. The `Untitled Session` folder is deleted when you exit TekExpress.

NOTE. *Each session has multiple files associated with it. Do not modify any of the session files and/or folders as this may result in loss of data or corrupted session files.*

Before you click Run,

1. Ensure that you have shared the `My TekExpress` folder described above with full access settings.

How to share My TekExpress folder

To share the My TekExpress folder follow the steps below:

a. Open Windows Explorer.

b. Select `My TekExpress` folder located under `My Documents`.

c. From Windows Explorer menu, select **File > Properties.** This will show the properties of the `My TekExpress` folder.

d. Select **Sharing** tab and choose **Share this folder** option.

e. The default share name will be “My TekExpress”, however it is recommended to modify share name as your login ID followed by “My TekExpress” (For example, “John’s My TekExpress”).

f. Select **Permission** and view the permissions. Ensure that **Everyone** has full control access.

g. Click **Apply.**

h. Select **Security** tab and ensure that “Everyone” has full control access.

2. Map the `My TekExpress` folder as X: (X drive) on the PC where TekExpress SATA is installed.

Mapping My TekExpress folder

To map the My TekExpress folder on PC running TekExpress and on the instruments follow the steps below:

a. Open Windows Explorer.

b. From Windows Explorer menu, select **Tools > Map Network drive.**

c. Select Drive letter as X: (if there is any previous connection on X:, disconnect it first through **Tools > Disconnect Network drive** menu of Windows Explorer).

d. In the Folder field, enter remote `My TekExpress` folder path (for example, \\192.158.97.65\ John's My TekExpress)

e. You can determine IP address of PC where "My TekExpress" folder exists by doing the following:

- Select **Start > Run** menu on PC where My TekExpress folder exists.
- Enter `cmd` and click **Enter.**
- At command prompt, type `ipconfig`.

3. Map the `My TekExpress` folder as X: (X drive) on all the instruments used in test setup running Windows Operating System.
4. Ensure that the SATA setup files provided with install DVD are available on respective instruments. For more details, refer to the `ReadmeFirst.txt` located in the `SATA Setup Files` folder on the install DVD.

TekExpress Application Overview

TekExpress is the Tektronix Compliance Test Automation Framework, developed to support current and future test automation needs of customers. Developed using National Instruments' TestStand, TekExpress leverages on the capabilities of Microsoft .NET framework. It is a highly modular architecture that enables deploying automated test solutions for various serial standards in a relatively shorter time. TekExpress provides a compliance test automation solution for the Serial ATA Gen 1 and Gen 2 standard.

Options available with TekExpress Serial ATA are:

- TSG : PHY/TSG/OOB Test Suite
- RSG : Tests Suite
- TxRx : Tests Suite
- TekExpress SATA Bundle for the Host and Drive Test Suites
- SI : Cable Tests for TekExpress SATA

Starting the Application

Related Topics

Resizing the Application Window

Exiting the Application

The application, uses a USB dongle that contains the license key. This dongle must be present on the PC or the instrument hosting the TekExpress application.

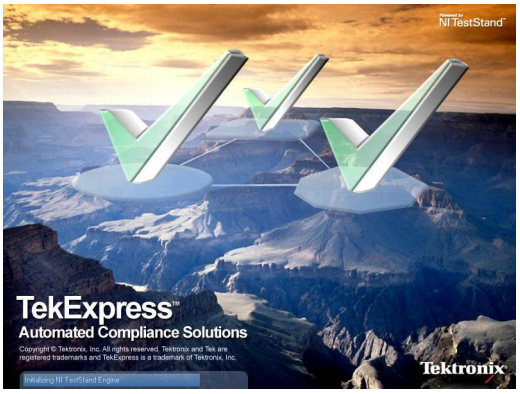
The application also checks for a file, called `Resources.xml`, located in My TekExpress folder. If this file is not found instrument discovery is performed before launching TekExpress. The `Resources.xml` file contains information regarding instruments available on network.

When the application starts, it checks for the appropriate license key. If the valid license key is not present, the application switches to the "Demo" mode. If the application fails to detect the dongle, it continues to run in Demo mode.

To start the application, you can do one of the following:

- Click **Start > Programs > Tektronix > TekExpress > TekExpress SATA.** Other applications follow similar pattern.
- Double click the icon  on the desktop.
- If you have previously saved the session, you can double-click the session file stored under `My TekExpress\Serial ATA.`

When the application is launched it displays the splash screen providing launch information. The application also checks for the presence and validity of the USB dongle.



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

Resizing the Application Window

Related Topics

Starting the Application

Exiting the Application

- To minimize the application, click  on the application title bar. To restore the application to its previous size, select 

in the Windows task bar.
- To maximize the application, click  . To restore it to previous size, click  on the application title bar.

Exiting the Application

Related Topics

Starting the Application

Resizing the Application Window

To exit the application, do one of the following:

- Click **File > Exit.**
- Click  on the application title bar.

Global Controls

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

Table 3: Controls and Functions

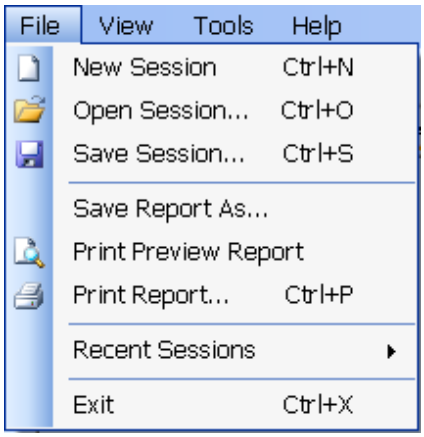
Control name	Function
DUT	The device ID is specified at the global level and the information is stored in the default location for all data files. This field cannot be empty and does not allow these special characters (.,..,...,\,/:?”<>|*). The maximum length of characters allowed is 32.
	You will be able to run or stop the test at any time. When a test is running, the button changes to **Stop.** When all tests are complete, the control changes to **Run** again.

File Menu

Related Topics

- View Menu
- Tools Menu
- Help Menu

Click **File** on the application menu bar.



The File menu has the following selections:

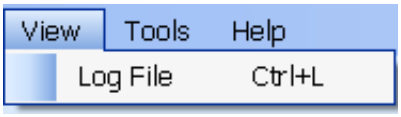
Menu	Function
New Session	Starts a default session of TekExpress.
Open Session	Opens a saved session.
Save Session	Saves the session.
Save Report As	Saves the report in user specified location.
Print Preview Report	Print preview the report.
Print Report	Brings up a Windows “Print” dialog box.
Recent Sessions	Lists recent sessions.
Exit	Closes the application.

View Menu

Related Topics

- File Menu
- Tools Menu
- Help Menu

Click **View** on the application menu bar.



The View menu has the following selections:

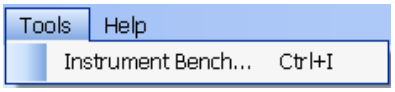
Menu	Function
Log File	This will open the log (log.xml) file in the default viewer.

Tools Menu

Related Topics

- File Menu
- View Menu
- Help Menu

Click **Tools** on the application menu bar.



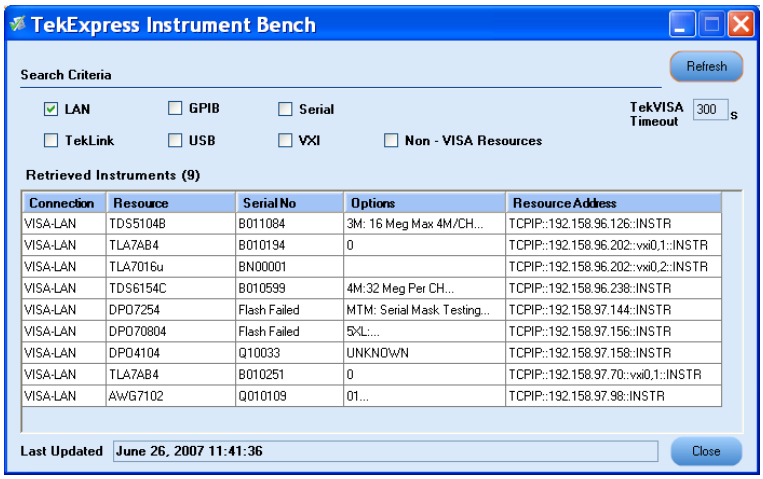
The Tools menu has the following selections:

Menu	Function
Instrument Bench	This will bring up a read-only dialog box of all the instruments attached to the test setup.

The Instrument Bench window shows the list of VISA and Non-VISA resources found on different interfaces/connections. It serves two purposes at the launch of TekExpress:

- Discovers the connected instruments.
- Confirms the instrument connection setup.

When you click **Tools > Instrument Bench,** the following dialog box is displayed:



- **Search Criteria :** The various connections on which you can search. **Non-Visa Resources** are the instruments that cannot be searched using TekVISA.
- **Retrieved Instruments:** Displays the count and details of instruments that were discovered.
- **Last Updated:** Displays the time when the last time search was performed.
- **TekVISA Refresh Timeout (Seconds):** This time out specifies the maximum time that TekExpress can wait for TekVISA update.

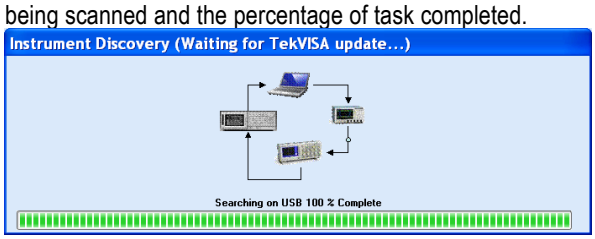
NOTE. *TekExpress uses TekVISA for instrument search. Ensure that TekVISA is running on your system before you refresh the instrument bench window.*

Table 4: Retrieved Resources properties in the Instrument Bench window

Title	Description
Connection	Shows the type of connection with the instrument.
Resource	Name of the resource.
Serial Number	Serial number of the resource.
Options	Shows the options available on the instrument. [1]
Resource Address	Shows IP Address/Port number of the resource.

1 The option column displays the options that fit in the field. To view complete options on the instrument, move the mouse cursor over the option.

Table 5: Button controls on Instrument Bench dialog box

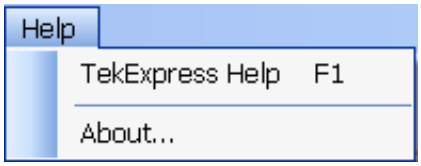
Button	Function
Refresh	The application searches on the selected connection for resources. While searching resources it shows the Instrument Bench discovery window. The Discovery window shows the connection currently being scanned and the percentage of task completed. 
Close	Closes the dialog box.

Help Menu

Related Topics

- File Menu
- View Menu
- Tools Menu

Click **Help** on the application menu bar.



The Help menu has the following selections:

Selection	Description or Function
TekExpress Help	Displays TekExpress Help (F1).
About..	Displays application details such as software name, version number and copyright.

Select the Test(s)

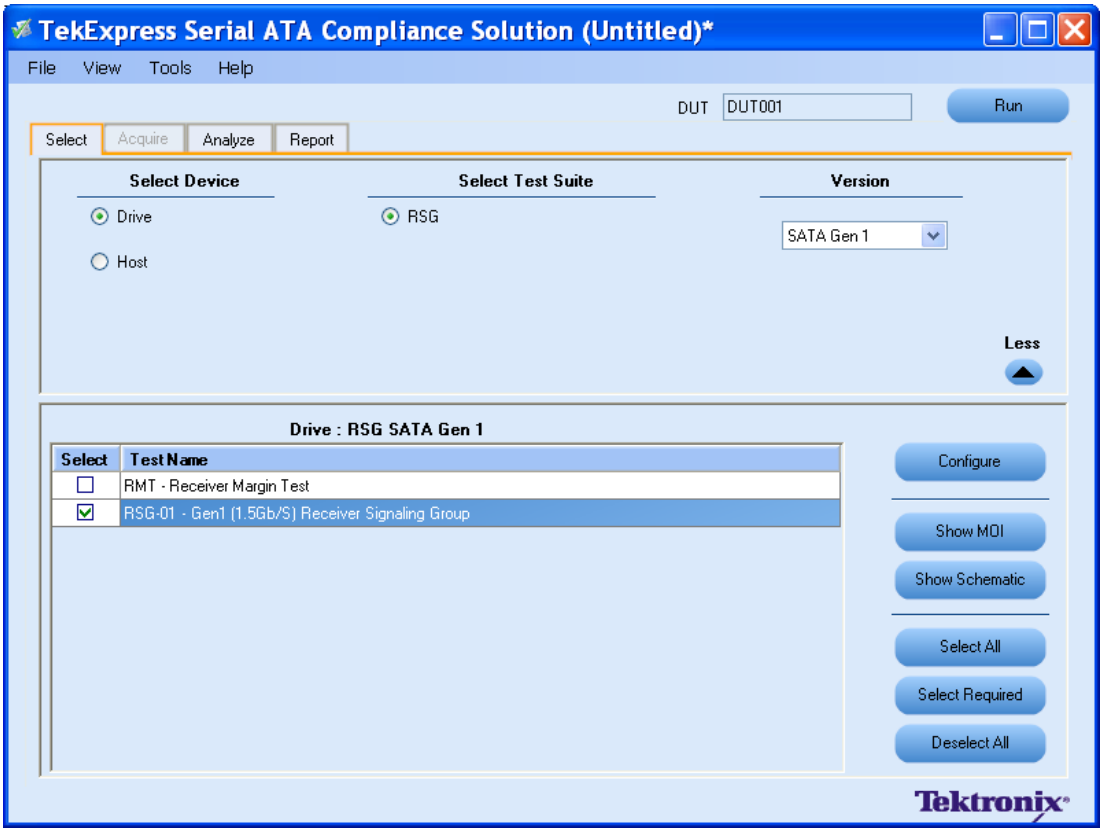
Related Topics

- View and Select Connected Instruments
- Configure and Run the Tests
- View the Progress of Analysis
- View the Report
- View Test Related Files

The application tests for two types of SATA devices for compliance.

- Drive
- Host

The Select panel allows you to select tests to configure and run.



This panel provides the following functions:

Select Device

Select the Device type, and the test suite options will be updated corresponding to the device selected.

Select Test Suite

The application allows you to select a subset of tests to execute. Based on the test suite selected, the Version drop-down list will be populated.

Version

You can select the appropriate version. For example, SATA Gen 1 or SATA Gen 2.

More/Less

The table has the following two columns:

- **Select:** You can include or exclude any test for analysis.
- **Test Name:** Displays the name of the test.

NOTE. *If any of the check box in the Select column is grayed, you cannot make any changes. It implies that the test is mandatory.*

Once you select a row, the following options are available:

Table 6: Button controls on the Select panel

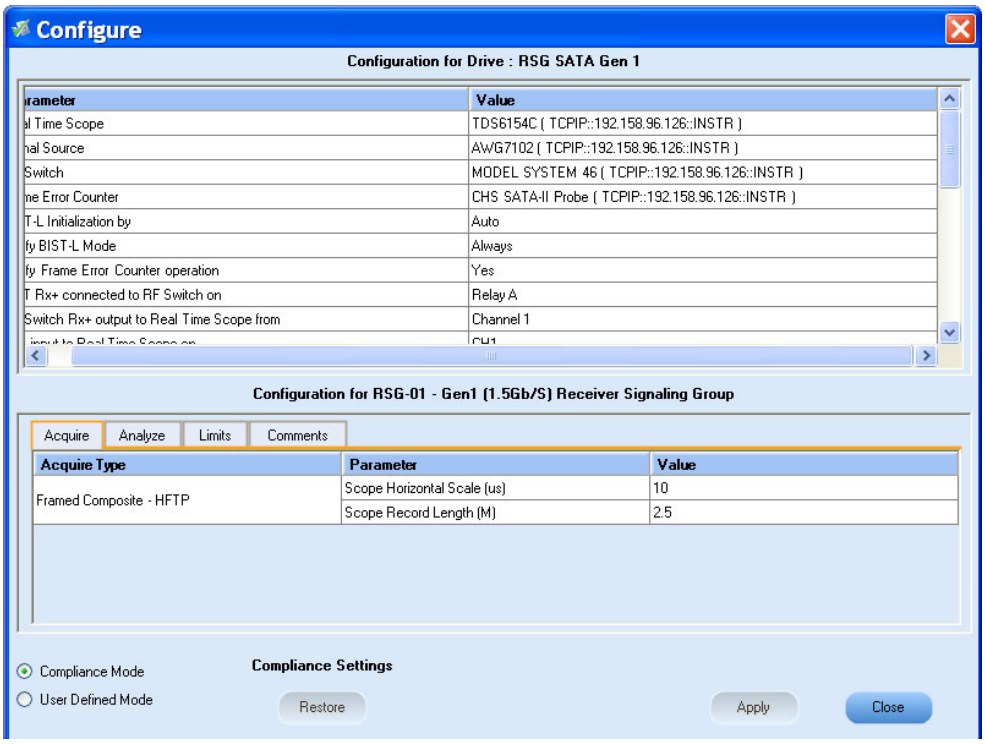
Button	Description
Configure	Opens the configuration panel for the selected test.
Show MOI	Opens the PDF of method of implementation (MOI) for the selected test.
Show Schematic	Opens the schematic for the selected test. This is useful if you want to verify the test setup before running the test.
Select All	Selects all tests in the table.
Select Required	Selects all required tests in the grid and deselects all informative tests in the table.
Deselect All	Deselects all tests in the table.

Configure and Run the Test(s)

Related Topics

- Select the Tests
- View and Select Connected Instruments
- View the Progress of Analysis
- View the Report
- View Test Related Files

The configuration panel is used to create, view, and edit the parameters associated with the acquisition and the analysis of the selected test.



You have the following options:

- To choose between running the tests in a Compliant or User Defined mode.
- To reload compliance mode values.
- To change the parameters associated with the configuration of acquisition.
- To change the parameters associated with analysis configuration.

The upper half of the Configure panel has general parameters that are common for all the tests under the selected test suite that are editable. The lower half of the Configure panel has test specific parameters.

NOTE. *If any of the test parameters are grayed, it means that these parameters cannot be modified in compliance mode. When you switch to user-defined mode, these parameters are editable.*

Table 7: Test parameters

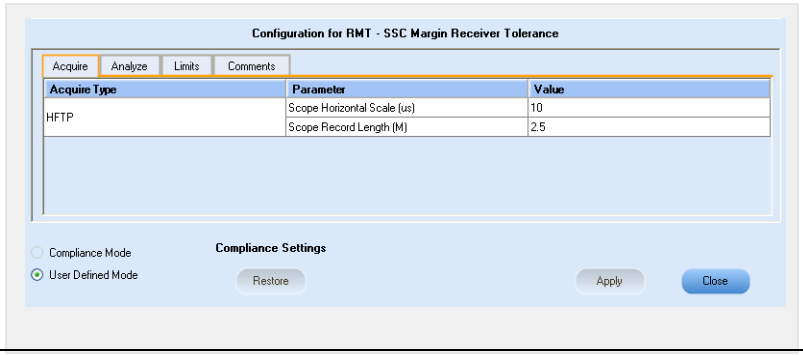
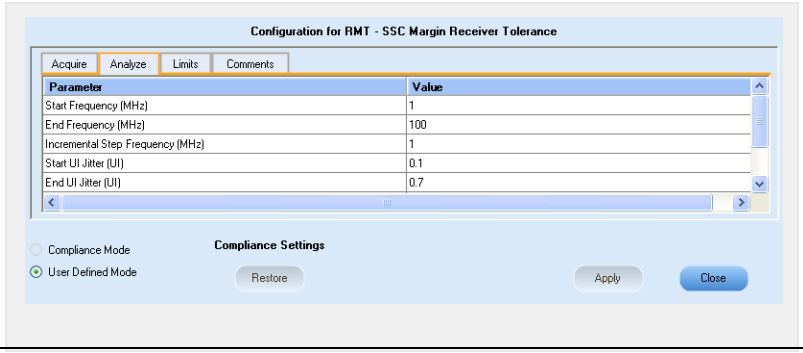
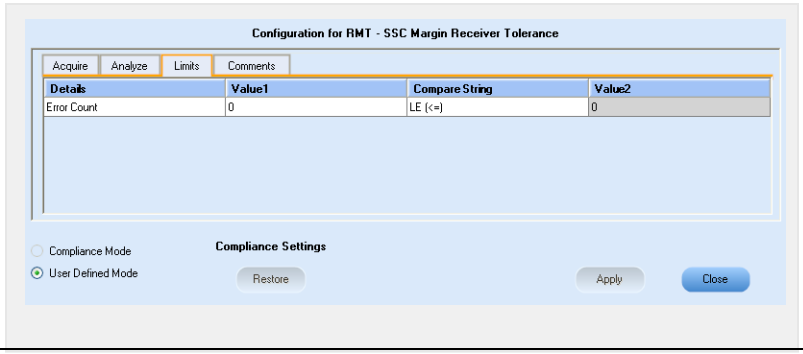
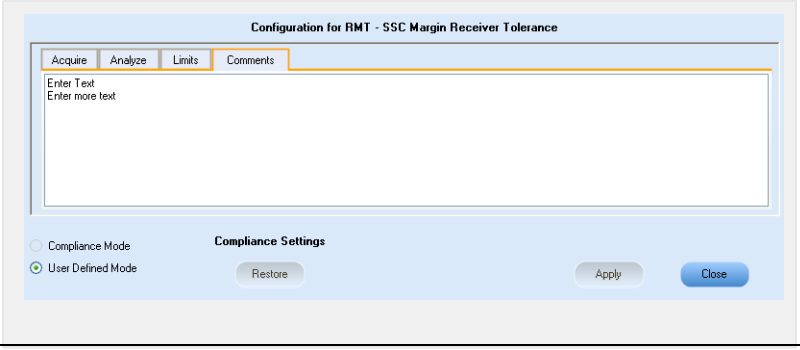
Parameters to configure	Description
Acquire Parameters 	Shows the various parameters related to acquisition of a selected test. These parameters can vary from one test to another such as, Number of Samples and Record Length.
Analyze parameters 	Shows the various parameters related to analysis of a selected test. These parameters can vary from one test to another such as, Jitter values.
Test Limits 	Applies to a specific test. It shows the measurement limits using different types of comparisons.

Table 7: Test parameters (cont.)

Parameters to configure	Description
Comments 	You can specify a comment up to 256 characters long for the selected test.
Compliance settings	
	The compliance settings will be restored.
	Accepts all changes that you made.
	Dismisses the dialog box and does not apply changes.

Click **Run** in the Select panel to run the selected tests.

Refer to the following table for different test limit comparisons:

Table 8: Different test limit comparisons

Comparison string	Description
EQ(==)	Equal to
NE(!=)	Not equal to
GT(>)	Greater than
LT(<)	Less than
GE(>=)	Greater than or Equal to
LE(<=)	Less than or Equal to
GTLT(><)	Greater than and Less than
GELT(>=<)	Greater than or equal to and Less than
GTLE(><=)	Greater than and Less or equal to
LTGT(<>)	Less than and Greater than
LEGE(<= >=)	Less than or equal to and Greater than or equal to
LEGT(<= >)	Less than or equal to and Greater than
LTGE(< >=)	Less than and Greater than or equal to
GELE(>= =<)	Greater than or equal to and Less than or equal to

View and Select Connected Instruments

Related Topics

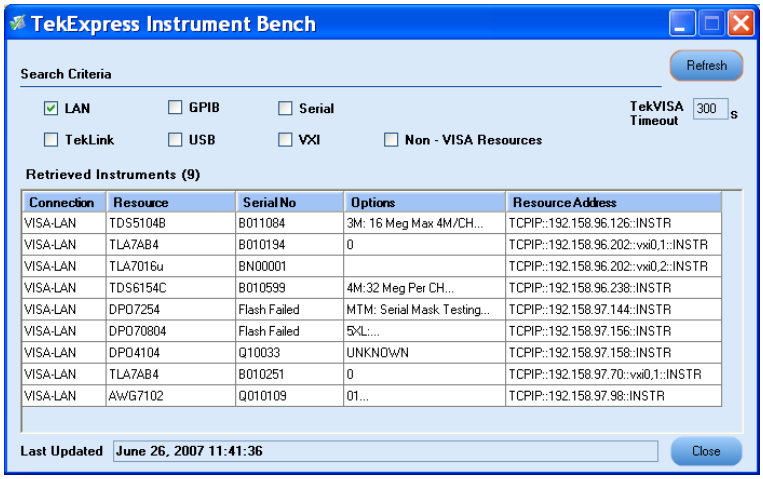
- Select the Tests
- Configure and Run the Tests
- View Test Related Files
- View the Progress of Analysis
- View the Report

Viewing Connected Instruments

The **Tools > Instrument Bench** menu item is used to discover connected instruments required for the tests. The application uses TekVISA to discover the connected instruments. Once the operation is done, the Instrument Bench dialog box resumes operation and lists the instrument-related details based on the selected search criteria.

NOTE. *When the TekVISA Instrument Manager checks for connected Instruments, the Instrument Bench dialog box does not respond.*

For example, if you select LAN as the search criteria in the Instrument Bench dialog and click Refresh, the TekVISA Instrument Manager checks for the instruments availability over LAN and the details of the instrument are displayed under **Retrieved Instruments** table.



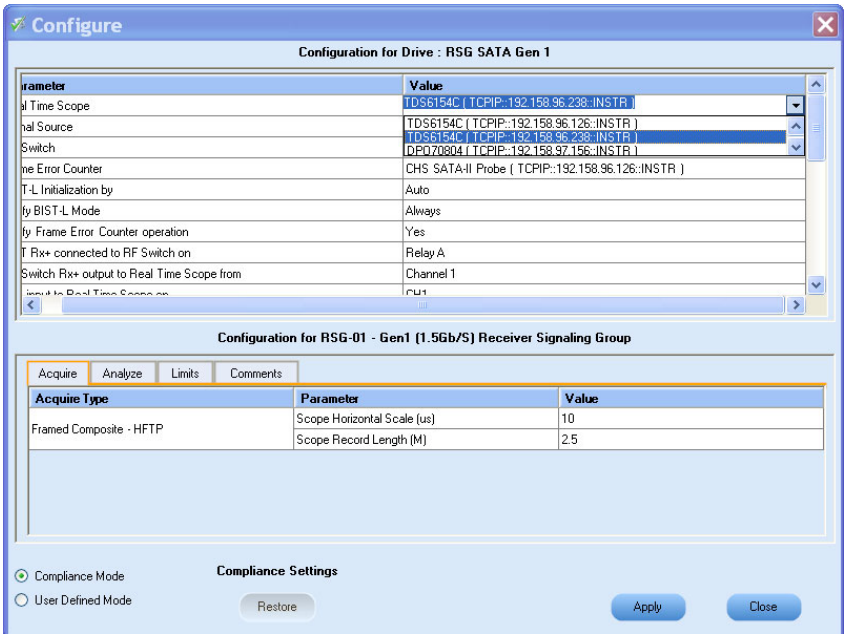
You can provide the time in the **TekVISA Refresh Timeout (Seconds)** field, within which if the TekVISA Instrument Manager does not find the instruments, the TekExpress application resumes the operation.

If you choose Non-VISA resources, all the instruments supported by TekExpress but not communicating over the VISA layer can be searched.

Selecting Connected Instruments

You can view the instruments connected in the Configuration panel. The upper half of the panel displays the general parameters for the tests under the selected test suite.

You can choose the instruments from the drop-down list as shown in the following figure:



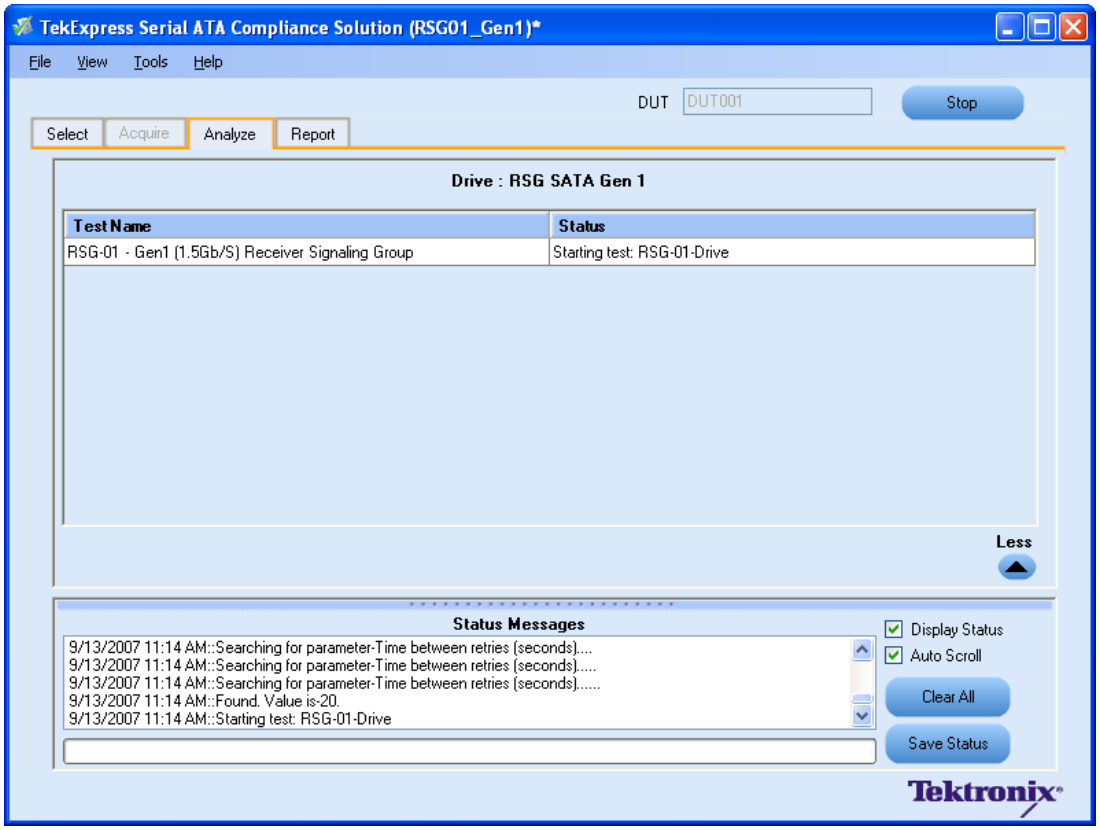
NOTE. *The list of instruments displayed is specific to the selected test suite. It does not show all the connected instruments.*

View the Progress of Analysis

Related Topics

- Select the Tests
- View and Select Connected Instruments
- Configure and Run the Tests
- View the Report
- View Test Related Files

You can view the progress of the analysis in the Analyze panel. When the analysis is complete, the result value of each test is updated.



Analysis Table

The table contains the following:

- The test name.
- The status of the tests that are being run.

The Tests that are not yet started are shown with a “To be Started” status. A summarized status of the currently running test is shown on the status.

More/Less

The **Status Messages** window timestamps all runtime messages and displays them. You can do the following:

- **Display Status :** Enable/Disable status messages.
- **Auto Scroll :** The status messages are scrolled automatically.
- **Clear All :** Clear all status messages in Status Window.
- **Save Status :** Save all status messages in text file. Displays a standard save file window and saves the status messages in the user specified file.

NOTE. *The Status Messages window is dockable and can be resized.*

View the Report

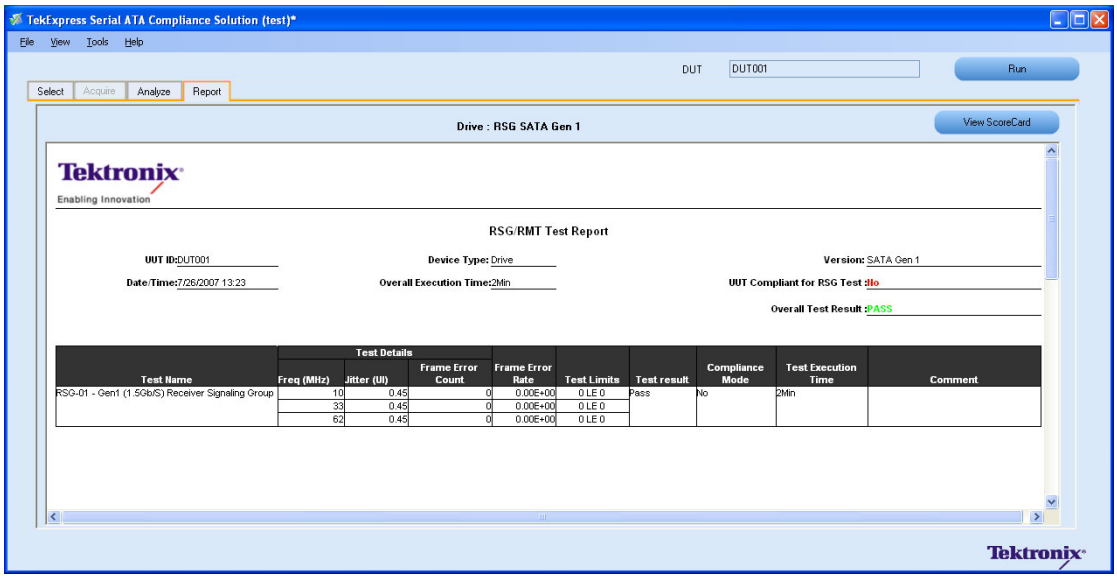
Related Topics

- Select the Tests
- View and Select Connected Instruments
- Configure and Run the Tests
- View the Progress of Analysis
- View Test Related Files

After analysis, a report is automatically generated and displayed in the report panel. The report shows the results of the tests, including device information and pass/fail status of each test.

The Report View Area contains an HTML version of the report template. You can select any area of the report and copy it to the clipboard to make it available to other application.

The **View Scorecard** option opens the report in Microsoft Excel.



View Test Related Files

All the test related files for currently selected tests are always saved under `My Documents\My TekExpress\Serial ATA\Untitled Session.`

When you save a session, it is saved with the session name under the path `My Documents\My TekExpress\Serial ATA\SessionName` for future references.

The session that is currently running will be stored in the same path as "Untitled" until you save it.

NOTE. *Sessions should not be saved in the name "Untitled" and "Backup" as they are application specific files and will be deleted when the application exits.*

Using the Pattern Generation Utility to Test Receivers

Related Topics

Calibration Procedure

The Pattern Generation is a utility that generates a controlled jittered waveform for performing the RSG (Receiver Signal Gain) and RMT (Receiver Margin Testing) testing for the DUT receiver. This utility uses a direct synthesis approach where required amounts of jitter components are added to the frame composite. These patterns are injected to DUT using the Arbitrary Waveform Generator 7000 series with option 2 and 6, Test fixture and matched pair cables.

Use the Calibration process (as mentioned in the MOI) to record the calibrated amplitude level, Random Jitter, Periodic Jitter (Optimal amplitude value of) jittered frequency (which is tuned to meet the nominal Total Jitter specified) are the inputs for the pattern generation utility.

It's recommended to do the calibration process for each pattern generation of interest.

For the RMT tests when the DUT fails there is a need to test the DUT for range of frequencies. The calibration has to be carried at least in the frequency resolution of 10 MHz for exact results.

Inputs to the Pattern Generation Utility

The Pattern Generation Utility is an Executable and requires you to input the following parameters (in this order). You need to provide below inputs and there are not default values.

1. The path of the Frame composite pattern IW4R8FCP.txt. This pattern is very specific for the utility and have known characteristics such as 10 characters per line.
2. The speed of the DUT such as usage model Gen1/Gen2.
3. Calibrated voltage swing for the utility. This is usually calculated using the 6 db attenuators at the end of the match cables. You can refer the amplitude calibration process to measure calibrated amplitude level.
4. The calibrated Random Jitter (Rj). You can refer to the calibration procedure for more details on how to calculate the Rj value for this setup. Rj has to specified in ps RMS.
5. Periodic Jitter (Pj) component as frequency in Hz. You can specify the frequency value between 0 to 300 MHz as 'Start'e6 and 'Stop'e6. The start should be less than the stop otherwise the utility shows an error.
6. The Pj increment is in steps of 1 MHz (step given as "xxe6") and the higher range is 300 MHz.
7. The Total jitter (Tj specified in Unit Interval (UI)) range is 0 to 1.2 UI. You have to specify the start and stop separately as 'Start' and 'Stop' without the 'UI' unit. The start should be less than the stop otherwise the utility will show an error.
8. The Tj values. These values increase in the following steps as per the Serial ATA standard. The predefined steps are 0.01, 0.02, 0.03, 0.05 and 0.1.
9. The Amplitude Periodic jitter. You have to make sure that the amplitude periodic jitter used in the utility to generate pattern of interest (for example 10 MHz 0.45 UI) has to result in nominal Tj value 0.45 UI. This is done by means of trial and error by recording the Tj at the output of the JIT3 Analysis – Advanced software. Please refer to the MOI calibration procedure for more details.

Output from the Pattern Generation Utility

The generated jittered waveform is available in the Frame composite pattern file path with file name as `<Jitter Frequency>-MHz-<TJ>UI.wfm`. <Example Pj from 100 MHz to 105 MHz and Tj= 0.45 UI: The sample file name output format is `100-MHz-0.45UI.wfm`. The five AWG patterns are generated from 100 MHz to 105 MHz.

Batch file usage

To get familiar with the usage of Serial ATA Pattern Generation Utility, an example `Example_01.bat` file is provided in the location `C:\SataPatternGenerationUtility` after the installation.

The following are the steps to use the batch file example:

1. Double-click the `Example_01.bat` file.
2. The batch file gets launched and you can observe the input parameters on DOS command prompt that is taken by the utility.
3. The jittered waveforms are generated and saved at location `C:\SataPatternGenerationUtility`.

Calibration Procedure

Related Topics

Using Pattern Generation Utility to Test Receivers

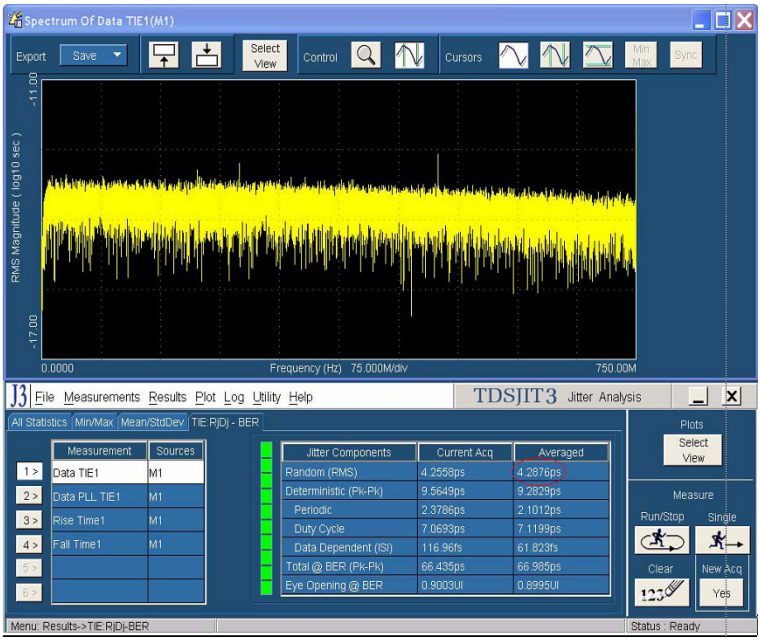
To generate jittered waveforms for RSG test, the complete calibration procedure has to be followed. Whereas, in case of generating jittered patterns for RMT test, only Random jitter calibration is required. Calibration can be carried out using the JIT3 Analysis - Advanced software.

Random Jitter Calibration

A reference Gen1 and Gen2 MFTP waveform with zero jitter (MFTP-Rj-Cal.wfm) is provided at `c:\SataPatternGenerationUtility\Gen1MFTP` folder to verify the calibration of Random jitter (Rj). Before verifying the Rj calibration, perform an SPC calibration on the Tektronix oscilloscope hosting the Advanced JIT3 Analysis software and perform a D/A channel calibration on the Arbitrary Waveform Generator (AWG) to compensate for the instrument's environmental conditions.

Rj is specified to be 0.18 UI PtP @ 7 Sigma or 4.285 ps RMS for Gen2 signaling rates and correspondingly 8.57 ps for Gen1 signaling rates.

NOTE. *The Rj found in the Tektronix AWG MFTP pattern has been synthesized and is a truncated Gaussian distribution with truncation occurring at 5 Sigma.*



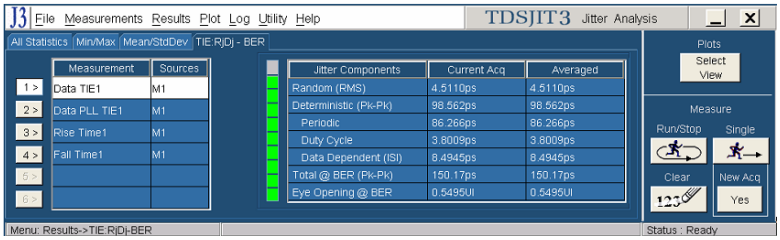
As illustrated in the red circled area of the preceding figure, ensure that the averaged RJ is nominally reading 4.285 ps RMS ± 4% allowable variation 4.11 ps < Nominal Value < 4.45 ps. Analyze 16E6 contiguous points per measurement, and 3 runs will typically converge on an averaged RJ close to 4.285 ps. For Gen1 rates the nominal variation of Rj would be within 8.22 < Nominal Tj Value < 8.9. Jitter magnitudes in excess of these values should result in recalibration of the AWG.

If the measured value in JIT3 results does not match with nominal Rj value 4.285 ps ±4% then random jitter component has to be varied as the input to the utility.

Perform this iteration till Rj value is close enough to nominal value specified.

Tj Calibration

Run the Pattern Generation utility using the IW4R8FCP.txt text patterns available at `c:\SataPatternGenerationUtility\IW4R8FCP.txt` with calibrated random jitter value and optimal value of the Amplitude of jittered frequency. Generate an XX-MHz -0.45UI.wfm waveform. Analyze this waveform using JIT3 Advanced software.



Observe the averaged Total @ BER (Pk-Pk) Jitter value after three acquisitions. Adjust the amplitude of jittered frequency value input so as to get the nominal value of Tj. The nominal accuracy of a calibrated system will provide 0.45 UI Tj conformance within 4% of nominal error. The observed jitter for Gen2 signaling Tj should nominally be 149.9 ps of Tj ± 4% allowable variation. 144 ps < Nominal Tj Value < 155.8 ps. Jitter magnitudes in excess of these values should result in recalibration of the AWG.

For Gen1 rates, the nominal variation of a nominal value of Tj would be within 288 < Nominal Tj Value < 312 ps.

If the measured value in the JIT3 results does not match with nominal Tj value 144 ps < Nominal Tj Value < 155.8 ps then vary the amplitude of the periodic jitter component as the input to the utility.

Perform this iteration till Tj value is close enough to the nominal specified.

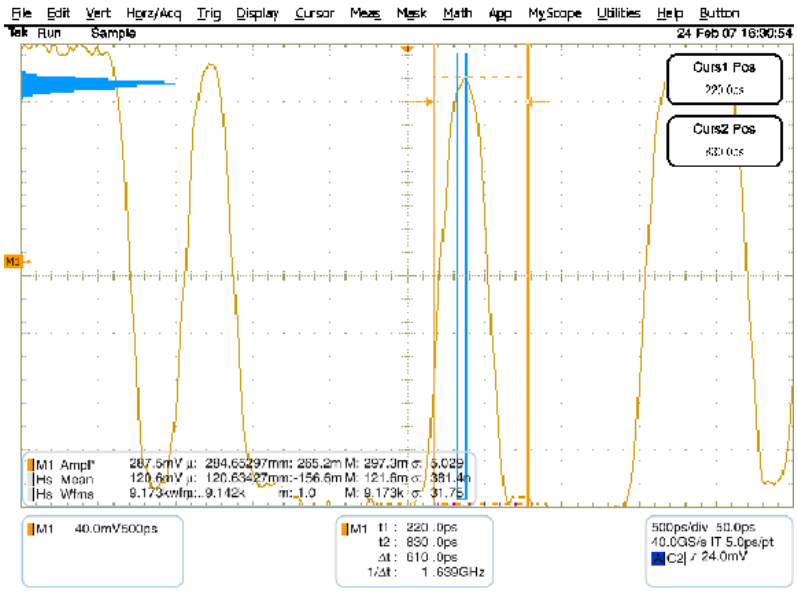
Amplitude Calibration

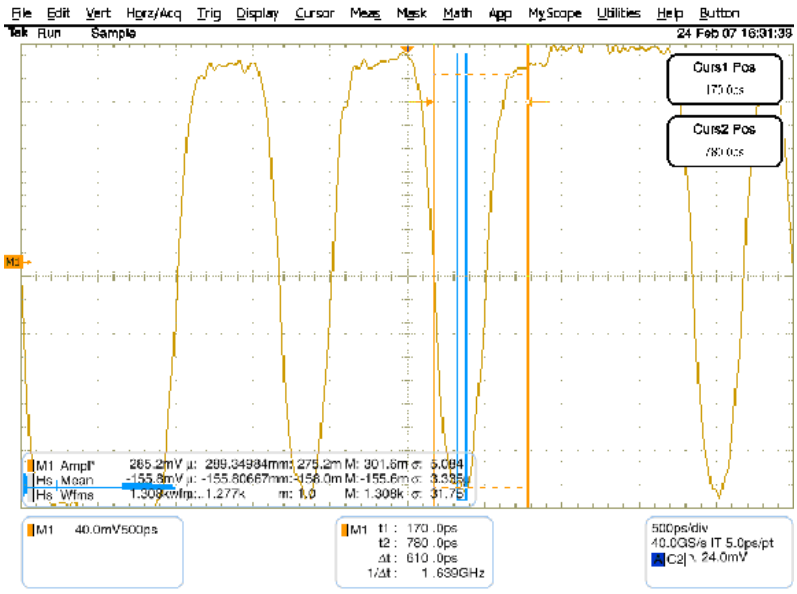
Signal amplitude conformance requires that Gen1 and Gen2 signaling not exceed 600 mV or 750 mV ptp and be within 5% of a target minimum amplitude of 325 mV and 275 mV respectively. Fine adjustment may be performed by adjusting the Vertical amplitude setting on the AWG's CH1 output. The minimum amplitude measurements are performed on both 212141 (negative pulse) and 413 (positive pulse) RL patterns.

Refer to the SATA specifications (Serial ATA Revision 2.5 27-October-2005) on LBP based amplitude measurements.

The minimum amplitude over a 1 UI epoch is the two consecutive bits at the string of a four or more consecutive bits, which is not a representative LBP pattern but is the minimum value in Framed Composite (Pre-ECN18) pattern.

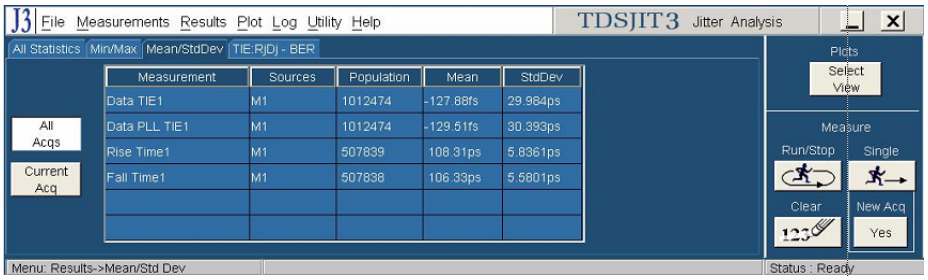
A 0.45 UI to 0.55 UI Histogram is setup on the two lone bits of interest from which the difference of the mean values is computed to obtain the lone pulse amplitudes.





Transition Time Validation

Make sure the Rise and Fall time is in the nominal range of < 100 ps. This can be verified using the JIT3 application with same setup files used for Jitter calibration/validation. Rise and Fall time measurements allow you to validate that the transition rate does not exceed 100 ps 20/80.



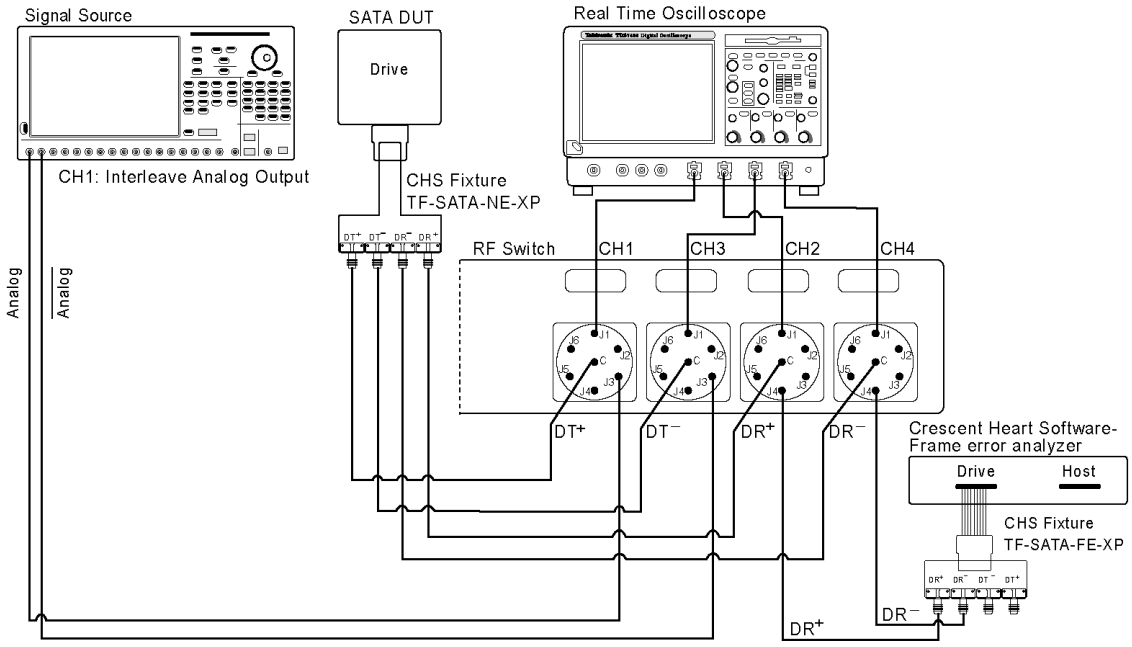
After the completion of calibration process, Calibrated Voltage swing required in the jittered waveform, Calibrated Random Jitter, Optimal value for Amplitude of jittered frequency are available and can be used for generating waveforms for RSG and RMT tests.

Equipment Setup: Drive

You need the following equipment to set up the application:

Resource	Model Supported
Signal Source	Tektronix AWG7102 (Option 6)
Real Time Oscilloscope	■ Tektronix DPO/DSA 72004, DPO/DSA 71604, DPO/DSA 71254, TDS6154C, TDS6124C ■ For Gen1-only testing, the following oscilloscopes are also acceptable: DPO/DSA 70804 or TDS6804B
RF Switch	Keithley S46
Frame Error Analyzer	Crescent Heart Software SATA II probe adapter
Test Fixture	Crescent Heart Software Fixture TF-SATA-NE-XP, TF-SATA-FE-XP
DUT	A SATA Drive to test

Connect the equipments as shown in the following diagram:



(A) If DUT Power Cycle Sequence is automated using DC output of Signal Source then
- Connect Channel-1 of DC output to pin #14 (and pin #15 to GND) in case of 20 pin Molex connector of AT/ATX power supply
- Connect Channel-1 of DC output to pin #16 (and pin #17 to GND) in case of 24 pin Molex connector of AT/ATX power supply

(B) On RF-Switch all unused switch points are recommended to close with 50 Ohm terminator.

(C) On CHS Test Fixtures all unused ports are recommended to close with 50 Ohm terminator.

Run RSG-01 - Gen1 (1.5Gb/s) Receiver Signalling Group

Related Topics

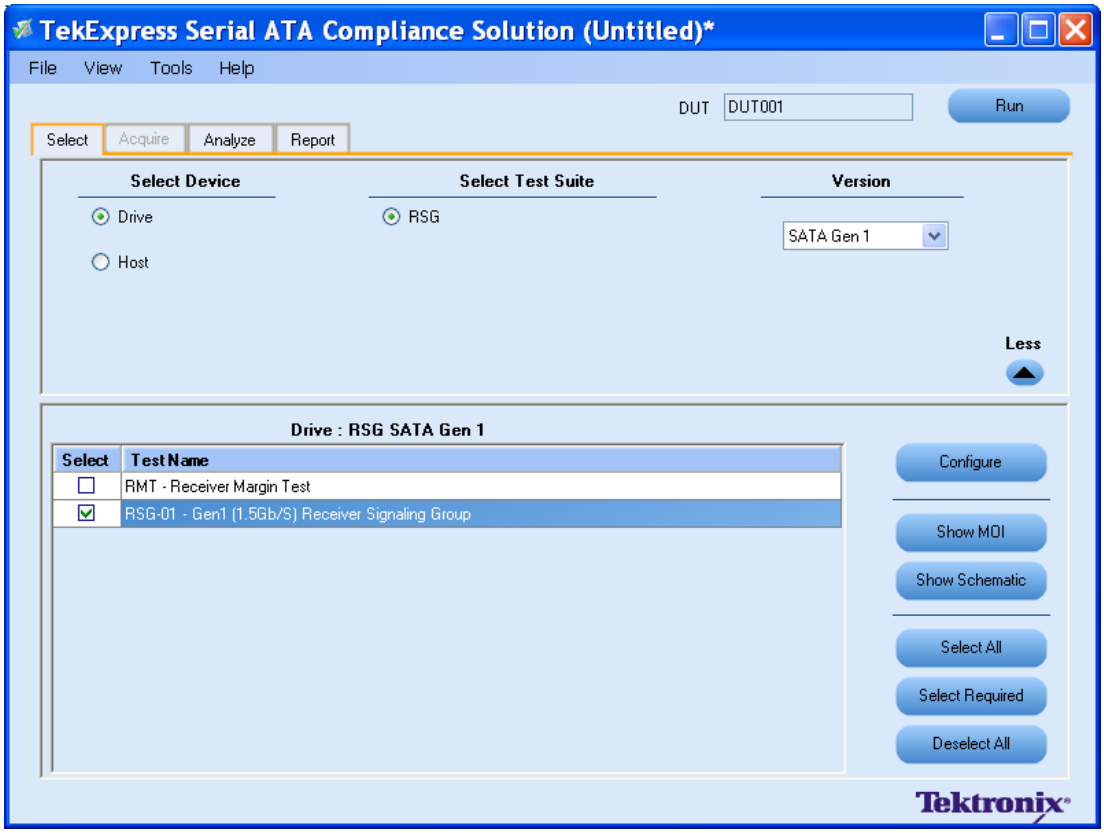
Equipment Setup Drive

Run RMT Receiver Margin Test1

To run an RSG test on a SATA Drive to conformance standards defined by SATA-IO Interoperability, follow these steps:

NOTE. *This test is applicable for both Drive and Host devices. The test procedure is identical for both drive and host except for a change in the connection diagram. Refer to Figure 2 for Host connection diagrams.*

1. Select **Drive** as the device type.
2. Select **RSG** as the Test Suite and SATA Gen 1 as the version.
3. Enter the DUT ID in the DUT field.
4. If you want to verify the test setup before running the test(s), click **Show Schematic.**
5. Select **RSG01-Gen1 (1.5Gb/s) Receiver Signalling Group** option.

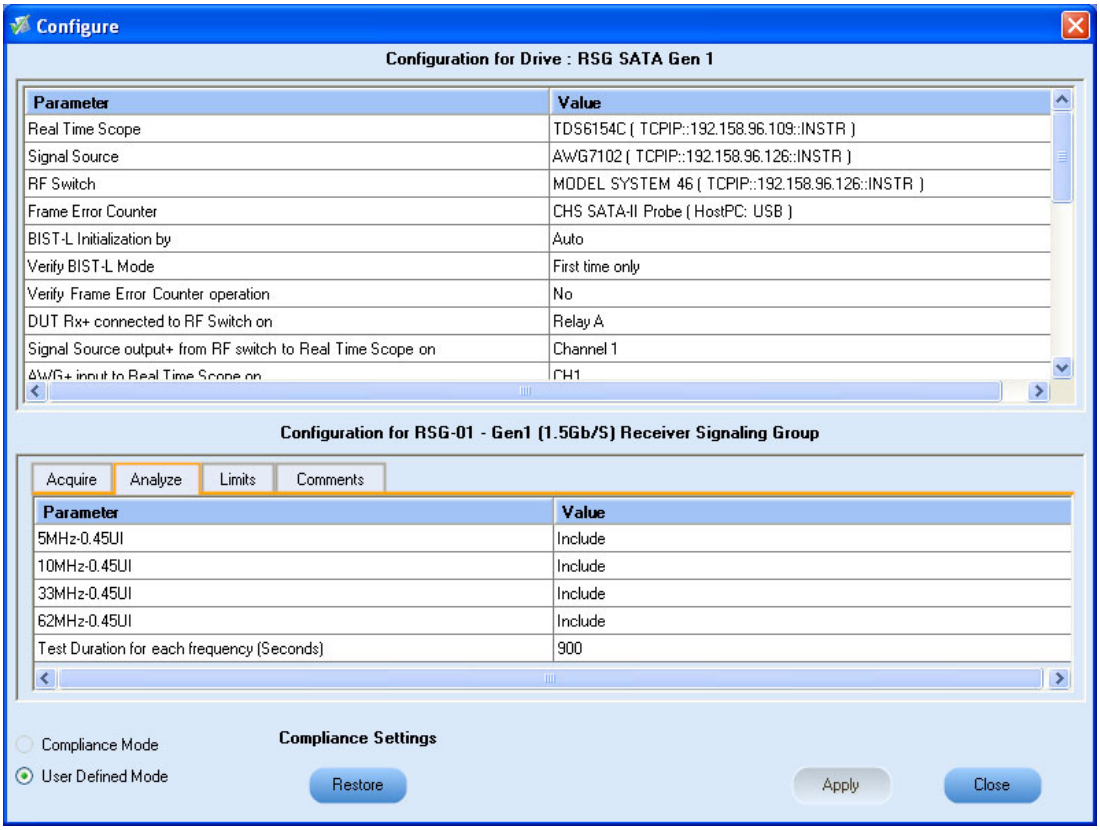


6. Click **Configure** to configure the test parameters. Observe that the default settings are in Compliance mode.

7. If you want to change the parameters, choose **User Defined Mode.** The message reports that the changes made to a test may no longer be compliant.

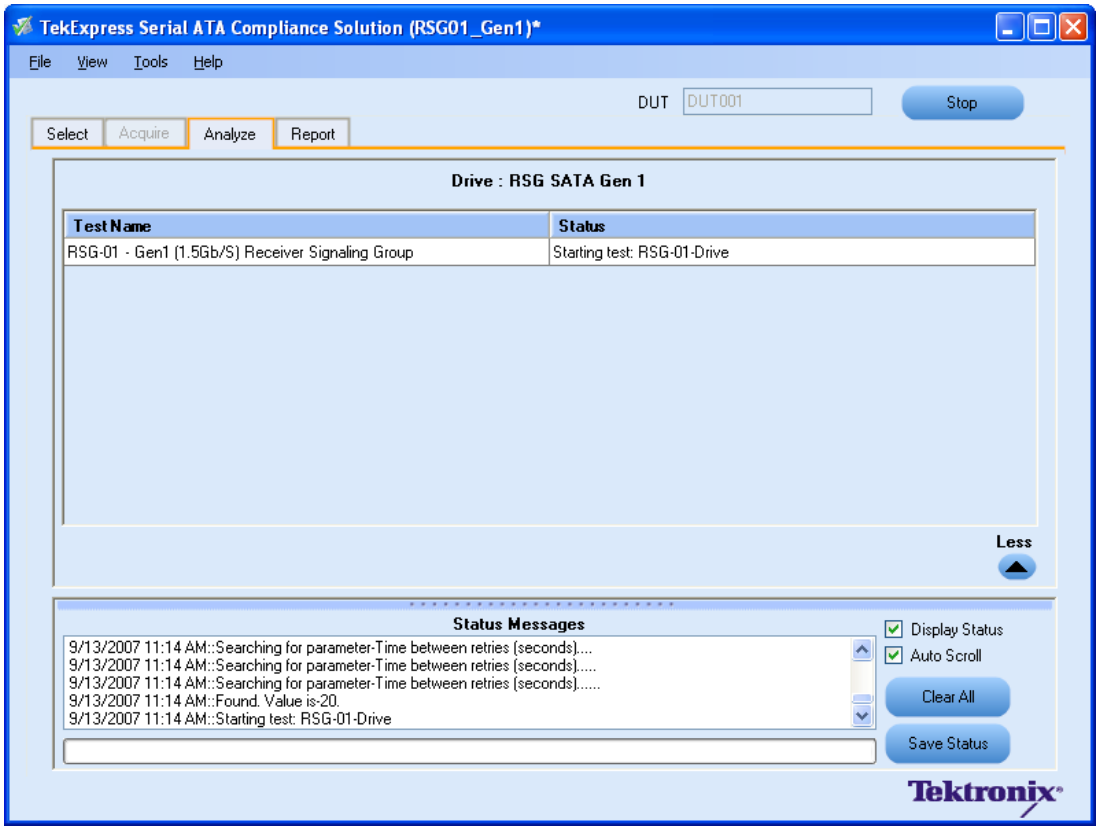
8. You can configure any test to help you analyze measurement results. To refer to the *Serial ATA Interoperability Program Revision 1.2 Tektronix* document for information on how to configure the drive receiver tests, click **Show MOI** in the Select panel.

9. Click **Apply** to apply the new settings for the test selected. If you want to restore the default settings, click **Restore.** To close the dialog box, click **Close.**

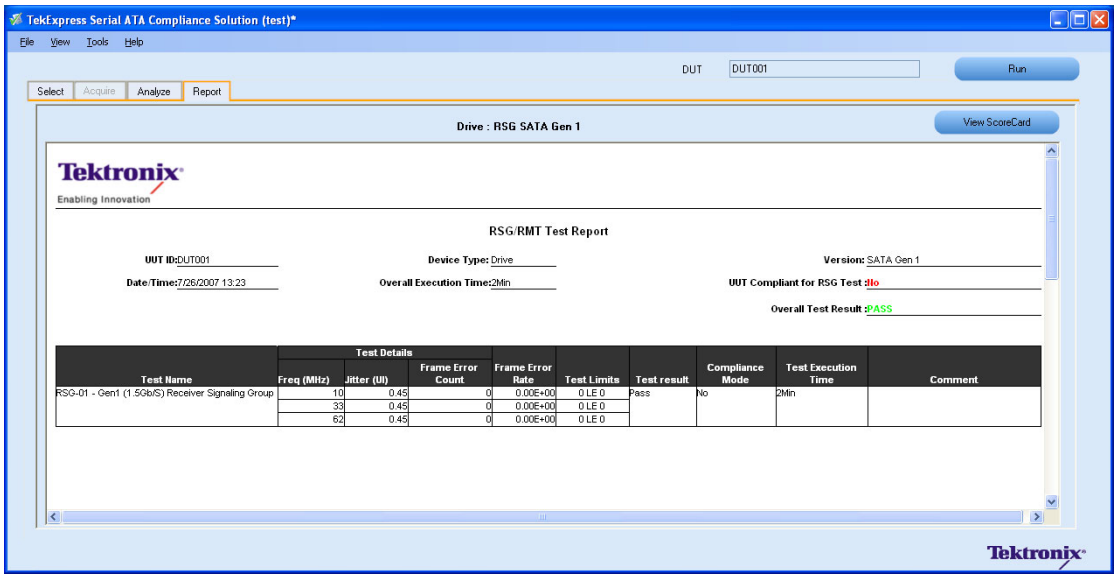


10. Click **Run** to run the selected tests.

The status of the tests is displayed in the Analyze panel.



11. After the tests run successfully, a report is generated and displayed in the Report panel.



You can save the report using **File > Save Report As** option.

Run RMT- Receiver Margin Test

Related Topics

Equipment Setup Drive

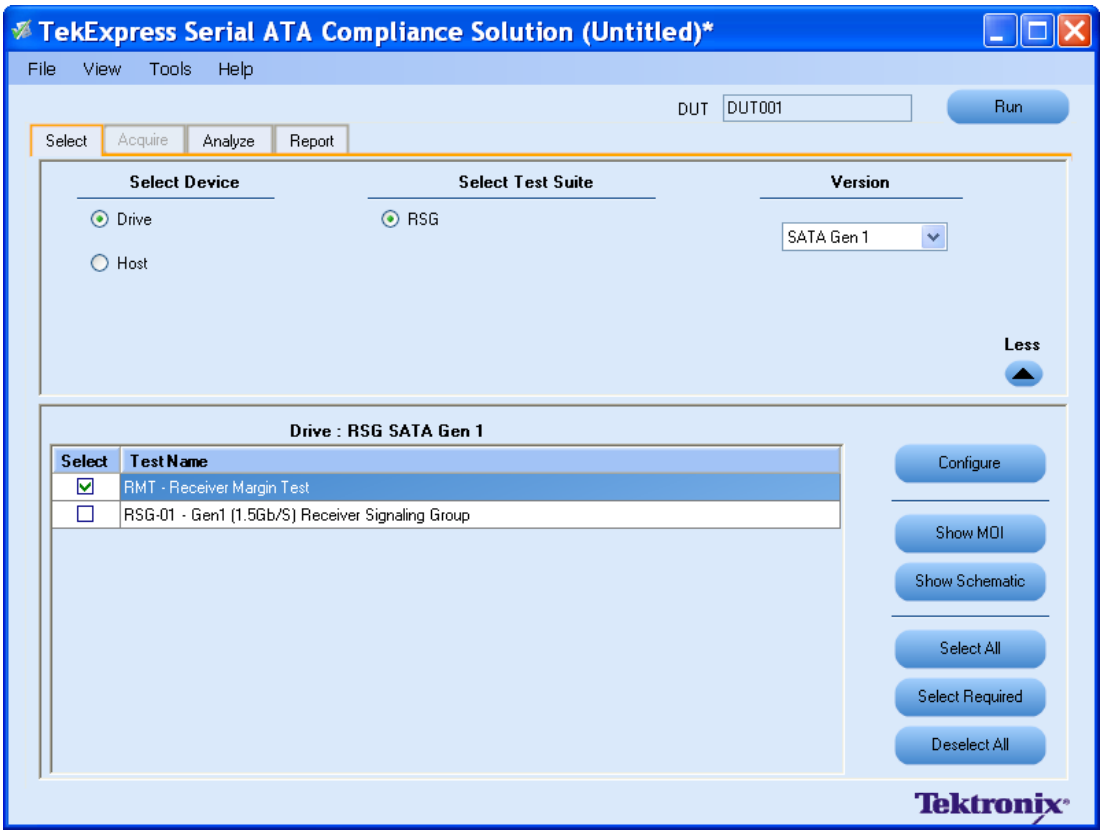
Run RSG01 Gen1 1 5Gbs Receiver Signalling Group

To run a RMT test on a Drive device, do the following:

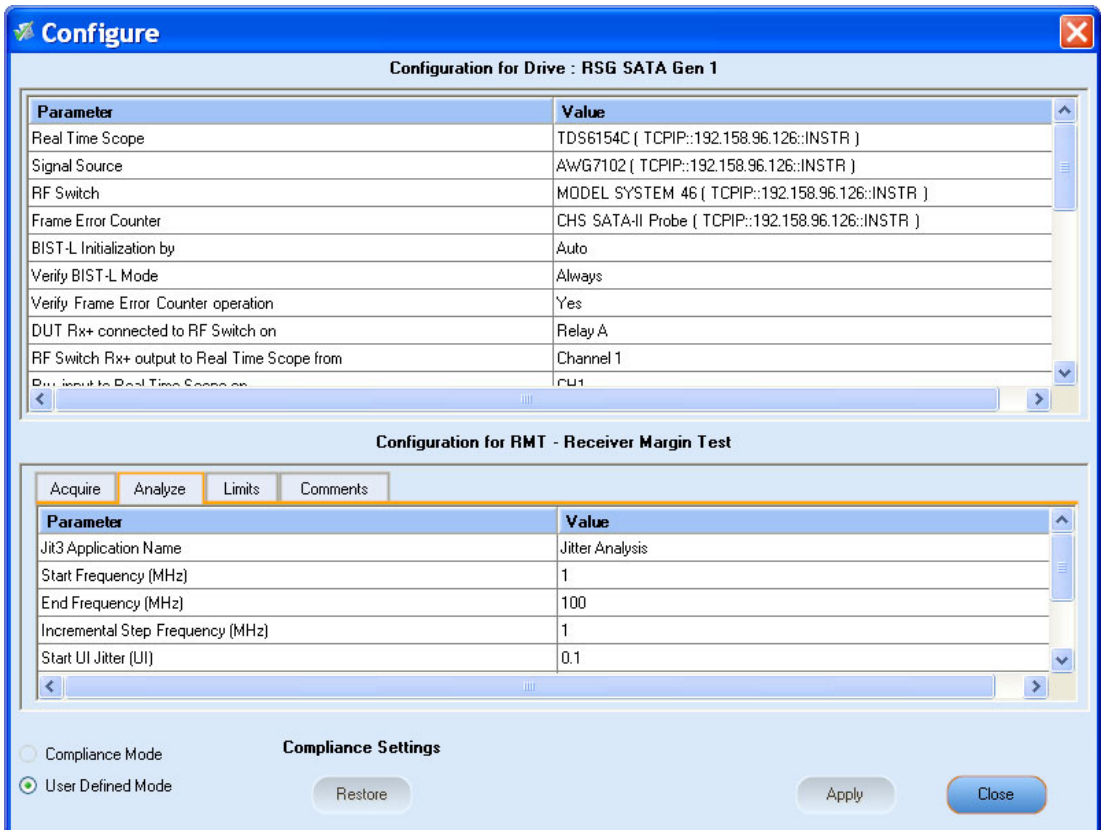
1. Select **Drive** as the Device type, select **RSG** test suite and **SATA Gen1** as the version.
2. Select **RMT - Receiver Margin Test** as the test to run.
3. Click **Show Schematic** to view the setup diagram for the application.

NOTE. *Refer to the* ***Equipment Setup: Drive*** *section for the setup diagram.*

4. For information on how to configure the RMT test parameters, refer to RSG - RMT Method of Implementation document by clicking **Show MOI.**
5. Click **Configure** to configure the test parameters.

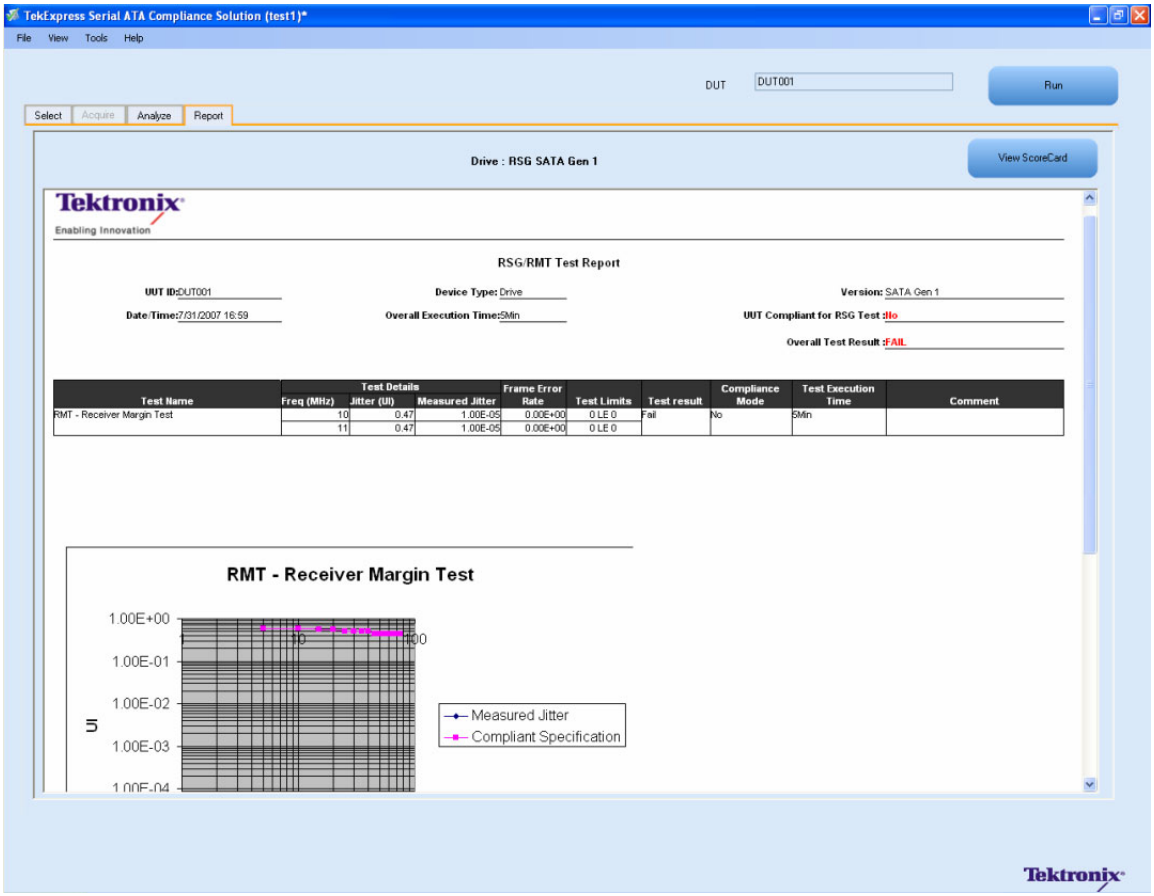


6. The default settings are in **User Defined Mode.** Configure the Analyze parameters such as, the Start Frequency and End Frequency. Click **Apply** to apply the new settings. Click **Close.**



7. Enter the DUT ID in the DUT field of Select panel, and click **Run.**
8. The progress of the Analysis is displayed in the **Analyze** tab.

9. The test result report is displayed in the **Report** panel.

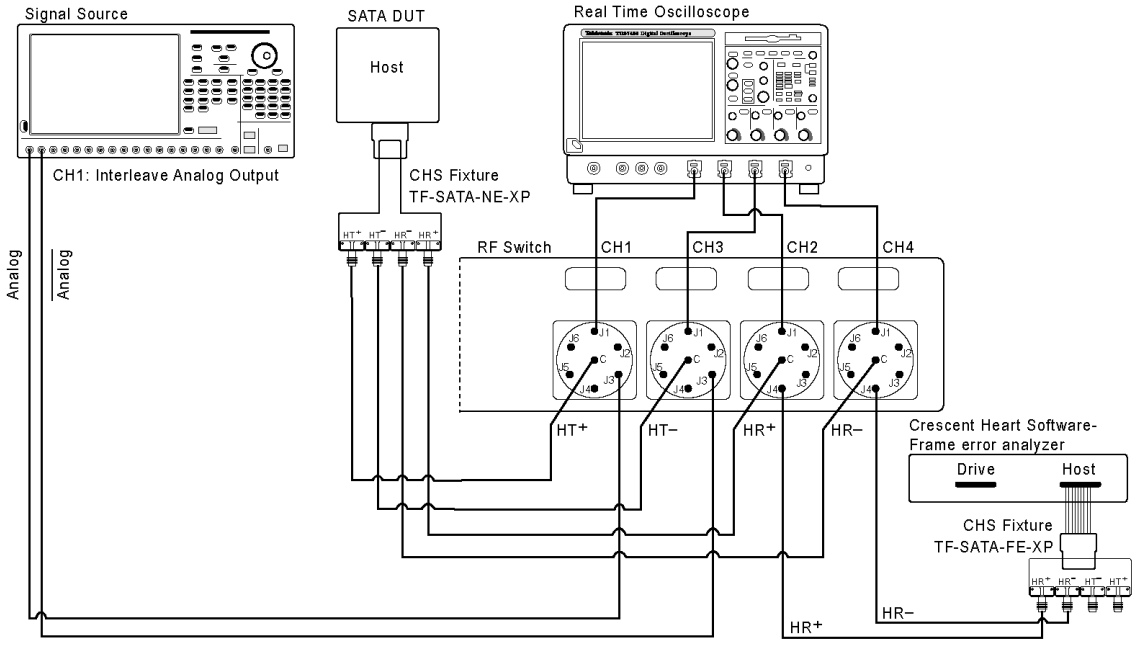


Equipment Setup: Host

You need the following equipment to setup the application:

Resource	Model Supported
Signal Source	Tektronix AWG7102 (Option 6)
Real Time Oscilloscope	■ Tektronix DPO/DSA 72004, DPO/DSA 71604, DPO/DSA 71254, TDS6154C, TDS6124C ■ For Gen1– only testing, the following osilloscopes are also acceptable: DPO/DSA 70804 or TDS6804B
RF Switch	Keithley S46
Frame Error Analyzer	Crescent Heart Software SATA II probe adapter
Test Fixture	Crescent Heart Software Fixture TF-SATA-NE-XP, TF-SATA-FE-XP
DUT	A SATA Host to test

Connect the equipment as shown in the following diagram:



(A) If DUT Power Cycle Sequence is automated using DC output of Signal Source then
- Connect Channel-1 of DC output to pin #14 (and pin #15 to GND) in case of 20 pin Molex connector of AT/ATX power supply
- Connect Channel-1 of DC output to pin #16 (and pin #17 to GND) in case of 24 pin Molex connector of AT/ATX power supply

(B) On RF-Switch all unused switch points are recommended to close with 50 Ohm terminator.

(C) On CHS Test Fixtures all unused ports are recommended to close with 50 Ohm terminator.

Run RSG-02 - Gen2 (3.0Gb/s) Receiver Signalling Group

Related Topics

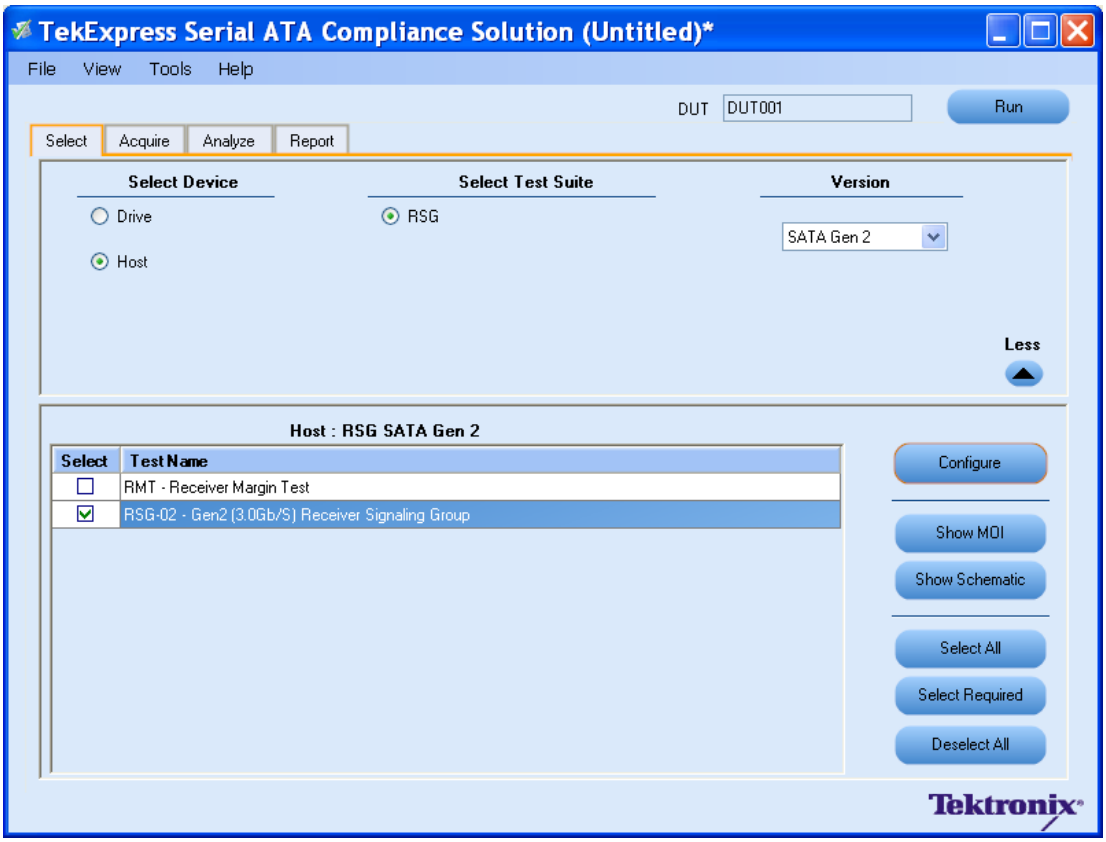
Equipment Setup Host

Run RMT Receiver Margin Test

To run a RSG test on a SATA Host to conformance standards defined by SATA-IO Interoperability, follow these steps:

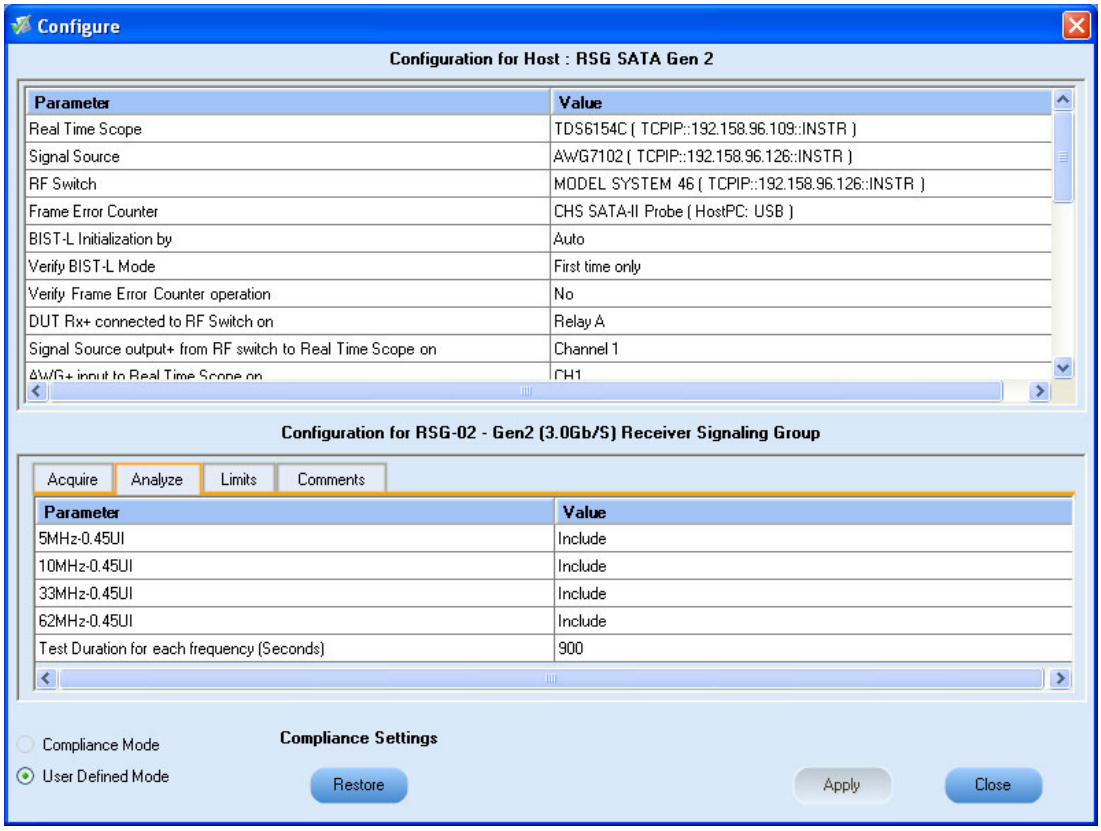
NOTE. *The test procedure is identical for both drive and host except for a change in the connection diagram. Refer Figure 1 for the Drive connection diagram.*

1. Select **Host** as the device type.
2. Select **RSG** test suite and SATA Gen 2 as the version.
3. Enter the DUT ID in the DUT field.
4. If you want to verify the test setup before running the test(s), click **Show Schematic.**
5. Select **RSG-02 Gen2 (3.0Gb/s) Receiver Signalling Group** option.

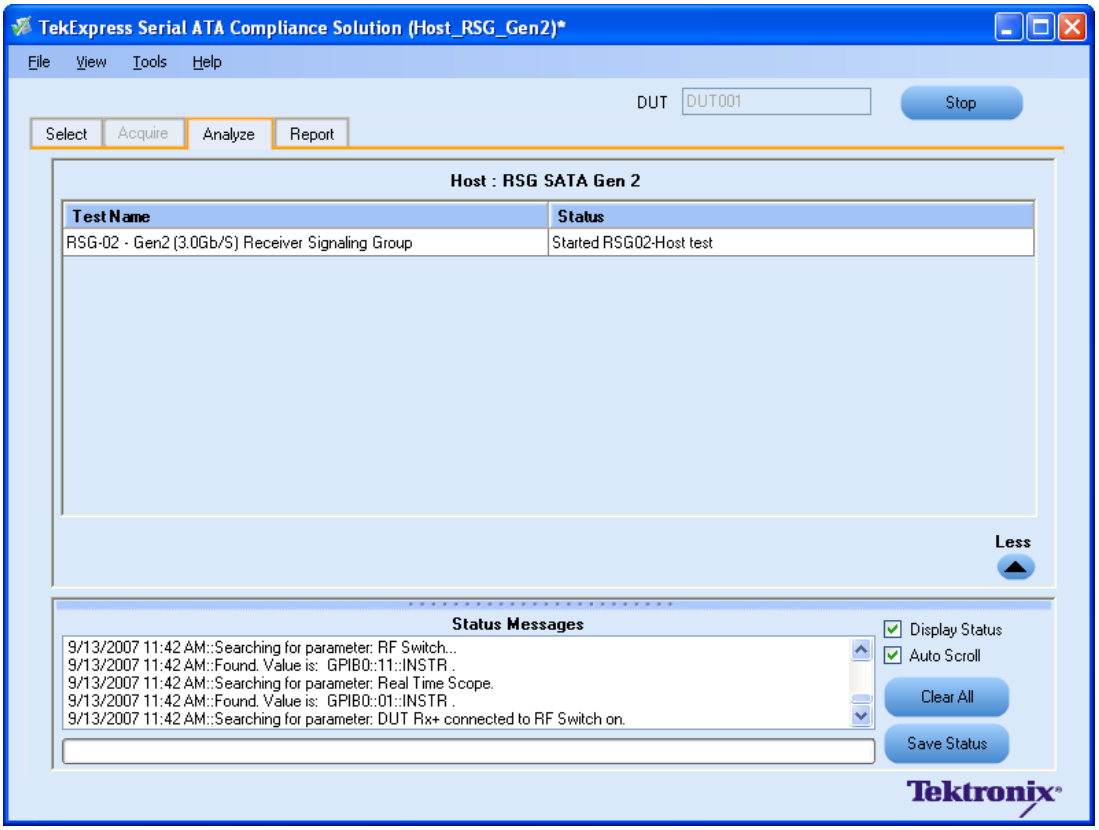


6. Click **Configure** if you want to configure the test parameters. Observe that the default settings are in Compliance mode.

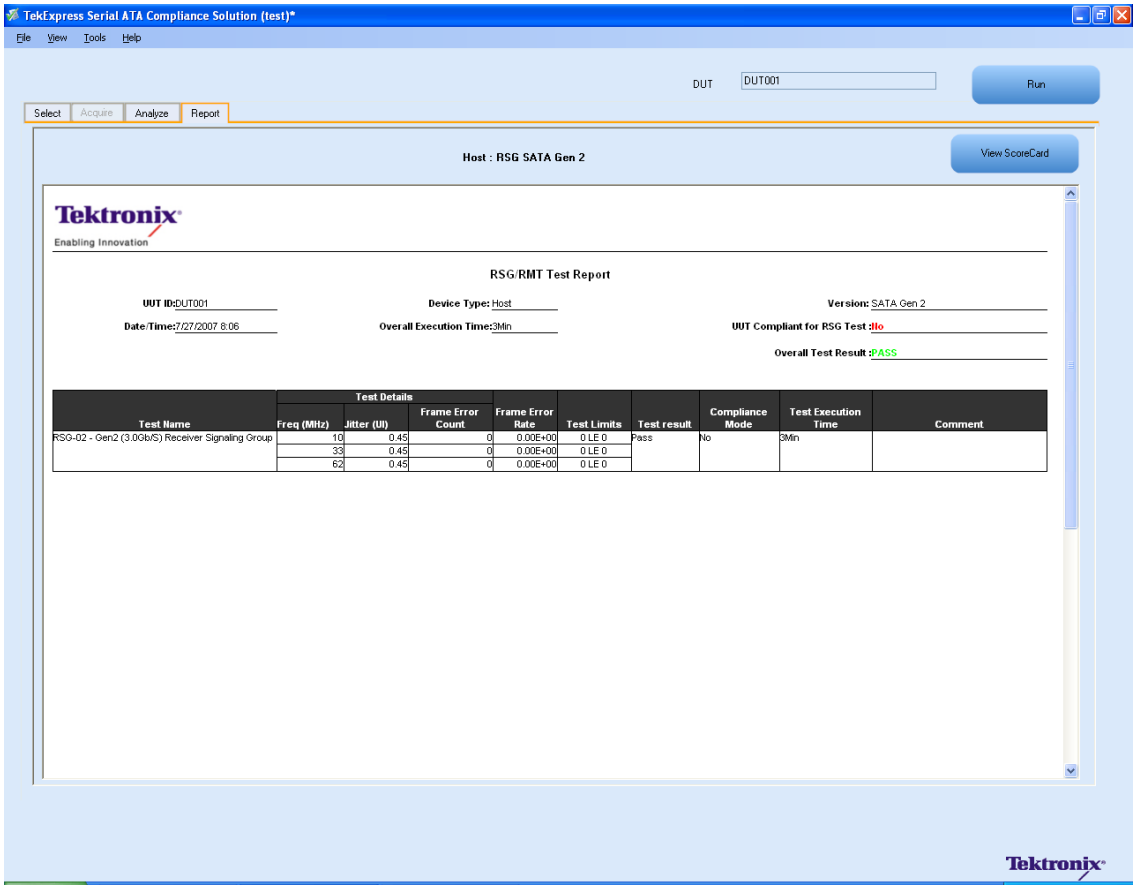
7. If you want to change the parameters, choose **User Defined Mode.**
8. You can configure any test to help you analyze measurement results. To refer to the *Serial ATA Interoperability Program Revision 1.2 Tektronix* MOI for information on how to configure the host receiver tests, click **Show MOI** in the Select panel.
9. Click **Apply** to apply the new settings for the selected test. If you want to restore the default settings, click **Restore.** To close the dialog box, click **Close.**



10. Click **Run** to run the selected tests. The status of the tests is displayed in the Analyze panel.



11. After the tests run successfully, a report is generated and displayed in the Report panel.



You can save the report using **File > Save Report As** menu option.

Run RMT- Receiver Margin Test

Related Topics

Equipment Setup Host

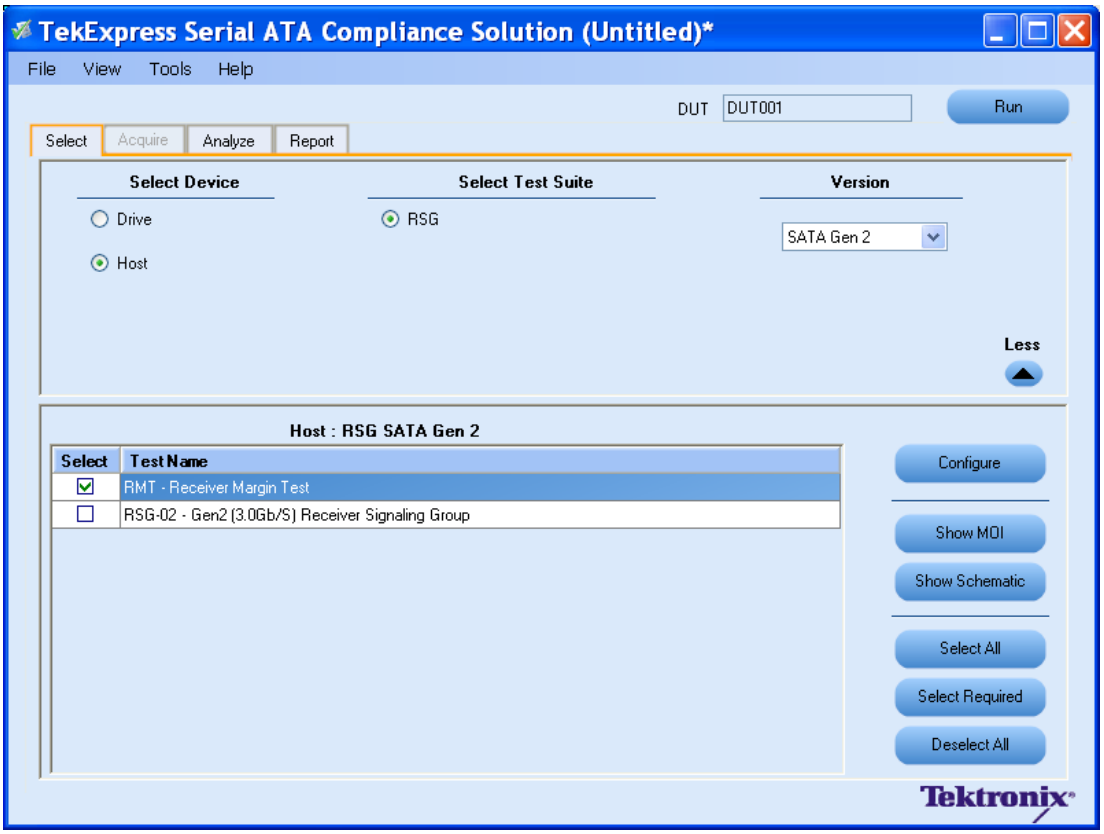
Run RSG02 Gen2 3 0Gbs Receiver Signalling Group

To run an RMT test on a Host device, do the following:

1. Select **Host** as the Device type.
2. Select **RSG** test suite and **SATA Gen2** as the version.
3. Select **RMT - Receiver Margin Test** as the test to run.
4. Click **Show Schematic** to view the setup diagram for the application.

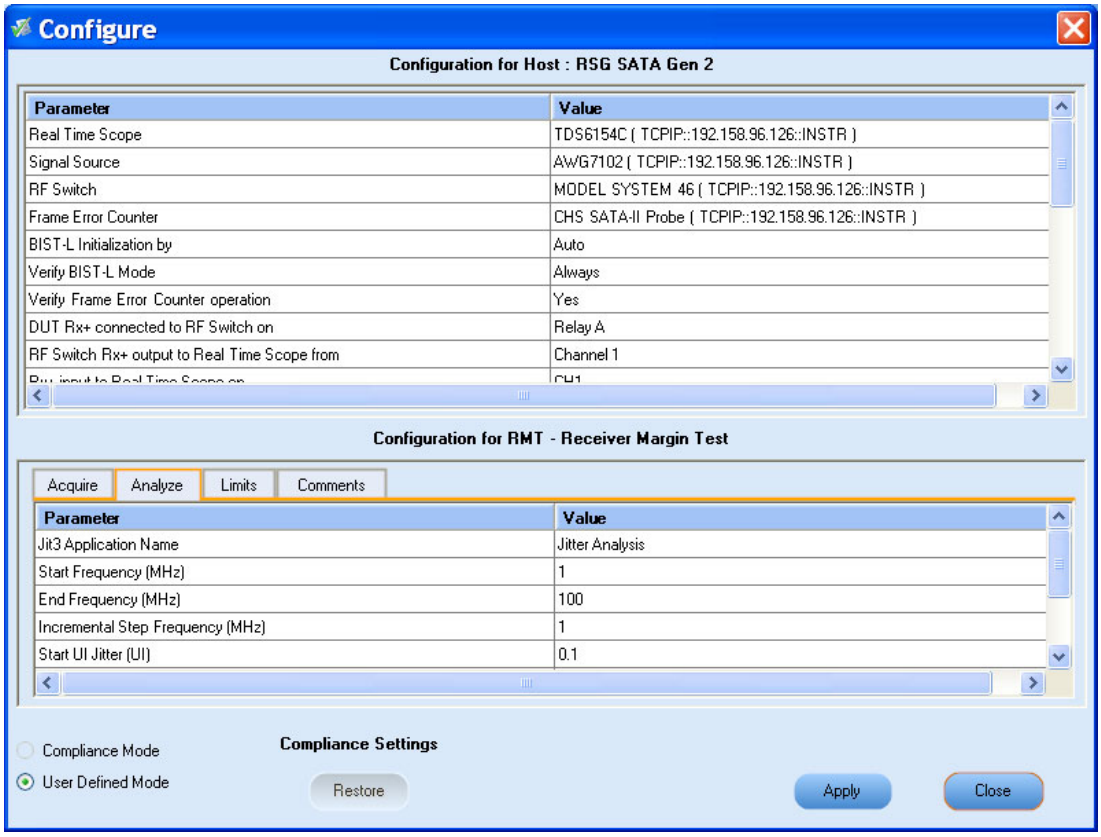
NOTE. *Refer to* ***Equipment Setup: Host*** *section, for the setup diagram.*

5. For information on how to configure the RMT test parameters, refer to RSG - RMT Method of Implementation document by clicking **Show MOI.**
6. Click **Configure** to configure the test parameters.



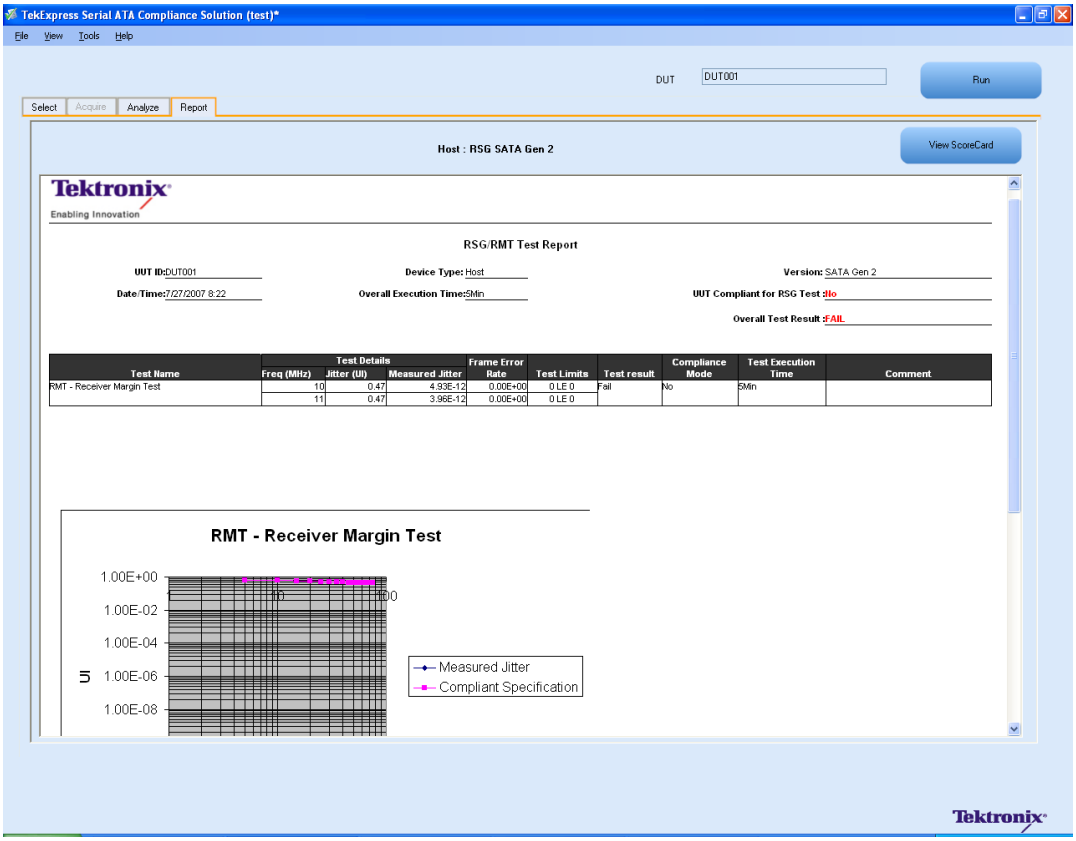
7. The default settings are in **User Defined Mode.** Configure the Analyze parameters such as, the Start Frequency and End Frequency.

8. Click **Apply** to apply the new settings. Click **Close.**



9. Enter the DUT ID in the **DUT** field. Click **Run.** The progress of the analysis is displayed in the **Analysis** tab.

10. The test results are displayed in the **Report** panel.



Setting Correct Acquire Parameters

Related Topics

- Instrument Connectivity
- User Interface
- TestStand Runtime Engine Installation

The TekExpress application supports various oscilloscope models for SATA compliance testing and not all the oscilloscope models can support the same acquire parameters (combination of record length and horizontal scale) for RSG test suite. The default settings of acquire parameters work on a majority of the oscilloscope models, however if an incorrect combination of record length and horizontal scale is specified then the test sequence is terminated, displaying incorrect parameter set status message.

An example for status message is as shown:

```
10/3/2007 10:29 AM::Writing command-HORIZONTAL:RECO 2500000

10/3/2007 10:29 AM::Set record length to-2000000
```

The following procedure describes how to manually identify a working combination of record length and horizontal scale for a given oscilloscope:

1. Open Talker Listener utility of TekVisa on the oscilloscope.
2. Apply default settings on the oscilloscope by clicking **Default setup** on oscilloscope panel.
3. Use the oscilloscope front panel to disable channel 1 and enable channel 2 and channel 4.
4. In the Talker Listener utility, enter `HORI:RECO <record length>` (for example, `HORI:RECO 2000000`) and click **Write.**
5. Verify if the oscilloscope applied the record length that you specified in step 4. If yes, continue with step 6 else repeat steps 2 through 4 with another record length.
6. In the Talker Listener utility, enter `HORI:SCALE <horizontal scale>` (for example, `HORI:SCALE 10E-06`) and click **Write.**
7. Verify if the oscilloscope applied the horizontal scale that you specified in step 6 **and also verify that the record length set in step 4 is not changed.** If this condition is met, then you have identified working combination of Acquire parameters. If this condition is not met, then repeat steps 2 through 6 with another combination of Acquire parameters.

Table 9: Acquire parameters for some of the oscilloscope models

	Acquire parameters for RSG test suite	
Oscilloscope model	**Record Length**	**Horizontal Scale**
TDS6154C	2000000	10E-06
TDS6804B	4000000	10E-06
DPO/DSA71254 (Firmware version 4.0.0 build 22)	5000000	10E-06
DPO/DSA72004 (Firmware version 4.0.0 build 22)	5000000	10E-06

Instrument Connectivity

Related Topics

- Setting Correct Acquire Parameters
- User Interface
- TestStand Runtime Engine Installation

If the instrument(s) are displayed in TekVISA Instrument Manager but not in the TekExpress Instrument Bench, check the following:

- Only those instruments that respond to `*idn?` and `*opt?` queries successfully, are displayed in Instrument Bench.
- Ensure that VXI-11 Server is running on the instruments.

User Interface

Related Topics

- Setting Correct Acquire Parameters
- Instrument Connectivity
- TestStand Runtime Engine Installation

The Acquire tab is disabled.

For a selected test suite, the test is performed on a live acquisition. If test(s) such as PHY-TSG-OOB can be performed on pre-acquired waveforms, this tab is active.

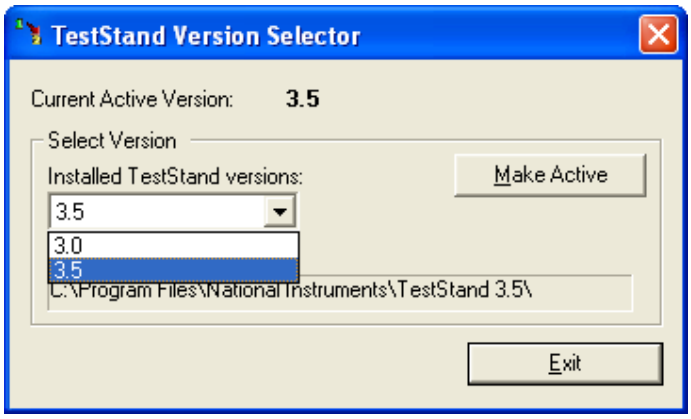
TestStand Run-time Engine Installation

Related Topics

- Setting Correct Acquire Parameters
- Instrument Connectivity
- User Interface

Managing multiple versions of TestStand installed on the system.

TekExpress installs TestStand version 3.5 runtime engine. If you have versions other than 3.5, while working with TekExpress, ensure that the version shipped with TekExpress is active. You can do so by clicking **Start > Programs > National Instruments > TestStand 3.5 > TestStand Version Selector.**



Shortcut Keys

The following table lists the short cut keys to access the application:

Table 10: Keyboard shortcut keys

Menu	Shortcut keys
File	
File	Alt + F
New Session	Ctrl + N
Open Session...	Ctrl + O
Save Session...	Ctrl + S
Save Report As...	Alt + F + A
Print Preview Report	Alt + F + V
Print Report...	Ctrl + P
Recent Sessions	Alt + F + R
Exit	Ctrl + X
View	
View	Alt + V
Log File	Ctrl + L
Tools	
Tools	Alt + T
Instrument Bench...	Ctrl + I
Help	
Help	Alt + H
TekExpress Help (F1)	Alt + H + H
About...	Alt + H + A

Error Codes for TekExpress

The following table lists the error codes for the application. Most of the errors require that you restart the system.

Table 11: Error codes and Description

Error Code	Description
<10000	TestStand generated error.
10001 - 11000 – Data Manager related errors	
10001	Insufficient Data. The Record could not be inserted. The following fields are empty or have insufficient data.
10002	Could not retrieve the record. The specified index is not valid.
11001 - 14000 – ICP related errors	
11001	Operation mode is not set as specified.
11002	SetUp file Error: Specified SetUp file is not set.
11003	Operation state is not set as specified.
11004	Specified waveform is not loaded into channel memory.
11005	Specified channel is not enabled.
11006	Interleave State could not be set to off.
12001	Operation State is not set to required value.
12002	Display state is not set to required value.
12003	Horizontal Scale is not set to required value.
12004	Vertical scale is not set to required value.
12005	Vertical Position is not set to required value.
12006	Deskew is not set to specified value.
12007	Out of Range Error-RunTime Error Message.
14001 - 18000 – SCP related errors	
14001	Timeout Error: Application could not be activated.
14002	JIT3 Application is already running.
14003	Cannot activate JIT3 application. Someother application is running on Scope.
14004	Error recalling the specified setup.
14005	Error setting the specified Sequencer State.
14006	Error in closing the Application.
14007	Error loading the default setup.

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