

**TekExpress® USB**  
**Automated Solutions**  
**Printable Online Help**



077-0350-03

**Tektronix**



**TekExpress® USB**  
**Automated Solutions**  
**Printable Online Help**

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TekExpress USB Automated Solutions Online help, 076-0196-03.

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

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# 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 TekExpress USB Online Help, the following documentation is included with the software:




- *DPOJET SuperSpeed (USB 3.0) Setup Library Methods of Implementation (MOI) for Verification, Debug and Characterization*, Tektronix part number 077-0266-xx.
- TekExpress USB Online Help (PDF version), Tektronix part number 077-0350-XX.

## Conventions

The online help uses the following conventions:

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

**Table 1: Icon descriptions**

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

## Technical Support

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

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

### General Information

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

### Application Specific Information

- Software version number.
- Description of the problem such that technical support can duplicate the problem.
- If possible, save the setup files for all the instruments used and the application.
- If possible, save the application 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](mailto:techsupport@tektronix.com)
- FAX – (503) 627-5695



## What is new in this release

This version of TekExpress USB provides the following feature enhancements:

- LFPS Tburst & Trepeat tests.
- Windows 7 Support.
- New UI for toggle options using AWG/AFG/Scope.

## Accessories

### About the Test Fixture

**For Host Testing.** TF-USB3-A-P (for best signal quality) or for more mechanical flexibility use TF-USB-B-R (with included 13 cm USB 3.0 Cable - Part number 174-5772-00). For precision De-Embed of TF-USB3-A plug fixture, order TF-USB3-AB-KIT (includes Cal Kit).

**For Device Testing.** TF-USB3-A-R (includes short USB 3.0 Cable).

### Supported Probes

The following probes support TekExpress USB application:

- P7313 SMA differential probe
- P7500 Tri-Mode probe

## Minimum System Requirements

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

**Table 2: System requirements**

<b>Processor</b>	Pentium 4/M or equivalent processor.
<b>Operating System</b>	Windows XP Service Pack 2.
<b>Memory</b>	512 MB of memory.
<b>Hard Disk</b>	Approximately 2 GB of available hard-disk space for the recommended installation, which includes full TekExpress installation and distributed components.
<b>Drive</b>	DVD drive
<b>Display</b>	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 at 96 dpi display settings <sup>1</sup> .
<b>Software</b>	<ul style="list-style-type: none"> <li>■ TekExpress Framework (v1.4.6 or later) installed.</li> <li>■ SigTest 3.1.30 or later installed.</li> <li>■ DPOJET Jitter and Eye Analysis Tool (v3.4.0 or later) with Advanced Jitter and Eye analysis (DJA option) installed.</li> <li>■ SDLA software for Channel De-Embed for custom filter development (optional).</li> <li>■ Microsoft Internet Explorer 7.0 or later.</li> <li>■ Adobe Reader 6.0 or equivalent software for viewing portable document format (PDF) files.</li> </ul>
<b>Other Devices</b>	<ul style="list-style-type: none"> <li>■ Microsoft compatible mouse or compatible pointing device.</li> <li>■ Four USB ports (2 USB ports minimum).</li> <li>■ PCI-GPIB or equivalent interface for instrument connectivity <sup>2</sup>.</li> </ul>

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

<sup>2</sup> If TekExpress is installed on a Tektronix oscilloscope, the virtual GPIB port cannot be used by TekExpress for communicating with oscilloscope applications. If external devices like USB-GPIB or equivalent are used for instrument connectivity, ensure that the Talker Listener utility is enabled in the MSO/DPO/DSA oscilloscope's GPIB menu.



## Application Directories and Usage

TekExpress USB is installed the following directory path, depending on the Windows operating system.

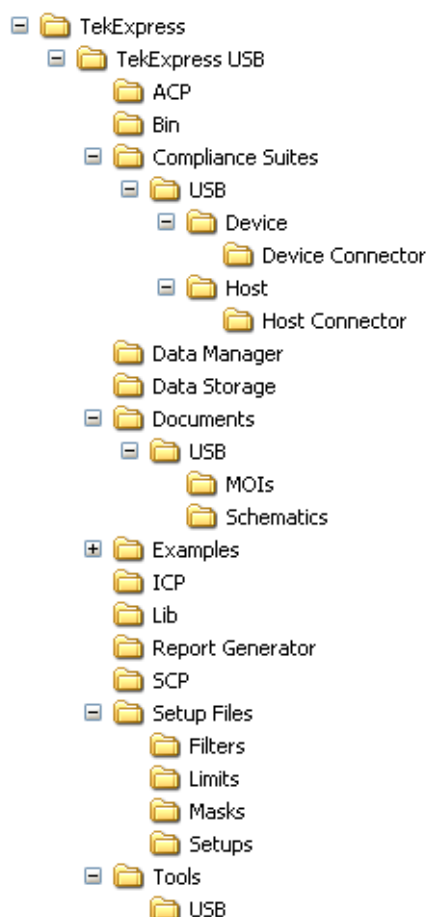
- For Windows 7:

C:\Program Files (x86)\Tektronix\TekExpress\TekExpress USB

- For Windows XP and Windows XP-Embedded:

C:\Program Files\Tektronix\TekExpress\TekExpress USB

The application directory and associated files are organized as follows:



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

**Table 3: Default directory names and their usage**

Directory names	Usage
InstallDir\TekExpress	Contains the TekExpress application and associated files.
\TekExpress\TekExpress USB	Contains files specific to TekExpress USB.
\TekExpress USB\Compliance Suites	Contains compliance specific sequence files. The folders under this directory represent the devices to be tested.
\TekExpress USB\Compliance Suites\USB	Includes the Device and Host Transmitter folders.
\TekExpress USB\Compliance Suites\USB\Device	Includes the “Device Connector” folder.
\TekExpress USB\Compliance Suites\USB\Device\Device Connector	Contains application specific files for Device.
\TekExpress USB\Compliance Suites\USB\Host	Includes the “Host Connector” folder.
\TekExpress USB\Compliance Suites\USB\Host\Host Connector	Contains application specific files for Host.
\TekExpress USB\ACP	Includes instrument and application specific interface libraries of TekExpress.
\TekExpress USB\SCP	
\TekExpress USB\ICP	
\TekExpress USB\Data Manager	Includes the result management specific libraries of TekExpress are present in these folders.
\TekExpress USB\Data Storage	
\TekExpress USB\Report Generator	
\TekExpress USB\Documents	Includes the Method of Implementation documents and technical documentation for the application.
\TekExpress USB\Bin	Includes the miscellaneous libraries of TekExpress.
\TekExpress USB\Lib	
\TekExpress USB\Tools	

## File Name Extensions

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	The encrypted XML file that contains the test specific configuration information. The log file extension is also xml.
.mht	This file details the test report.
.PDF	The PDF file that details the method of implementation for the test.
.msk	The mask file.
.flt	The filter file.
.html	The html file.

## How To Activate the License

Follow the steps below to activate the license:

---

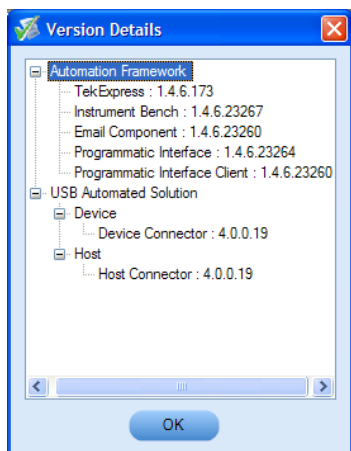
**NOTE.** *Ensure that your TekExpress USB dongle is installed on your host system.*

---

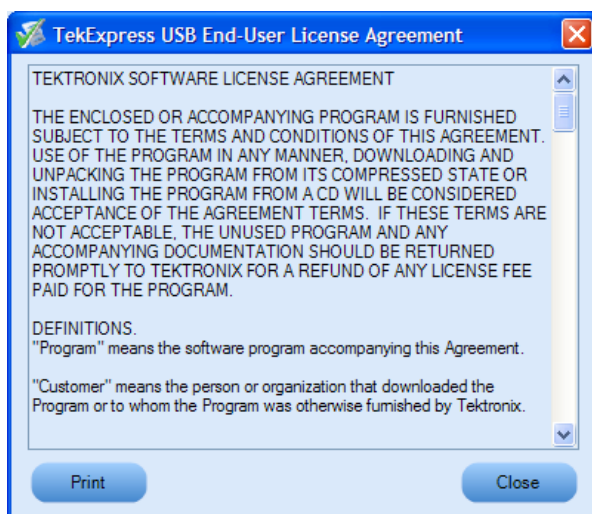
1. Click **Help > About** to view the license information.




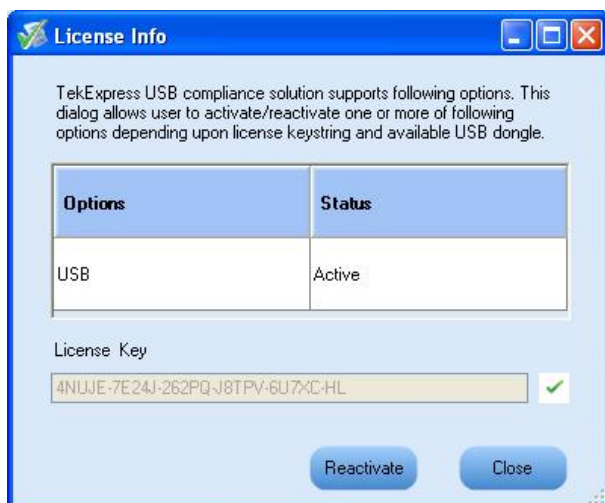
2. Click the **View Version Details** link to check the version numbers of the installed test suites.



3. Click the **View End-User License Agreement** link to open the following Tektronix Software License Agreement window. Click **Print** to print the License Agreement.



4. Click **License Info** to view the available software options. This window shows the license key and the various options with their status (active or inactive) with the current license key.
5. If you are activating the license for the first time, the license key field will be empty. To activate the license, connect the USB dongle to your computer, 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.



6. If you are reactivating the license, click **Reactivate**, enter the new license key and click **Activate**.

## Before You Click Run

After you first launch TekExpress, it creates the following folders on your computer:

- \My Documents\My TekExpress

---

**NOTE.** Ensure that the “My TekExpress” folder has read and write access.

---



---

**NOTE.** If a user with a different Windows login ID launches TekExpress, a new My TekExpress folder is created under that user's My Documents folder.

---

- \My Documents\My TekExpress\USB.
- \My Documents\My TekExpress\USB\Untitled Session. Every time the USB.exe is launched an Untitled Session folder is created under USB folder. The Untitled Session folder is deleted when you exit TekExpress.




---

**CAUTION.** 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.

---

- The My TekExpress folder is created as a shared folder with share name as <domain><user ID> My TekExpress (or if the PC is not connected to domain then share name is <Computer name><user ID> My TekExpress).

---

**NOTE.** If the X: drive is mapped as a Local Disk and you want to map X: to a shared network location on a PC on which TekExpress is running, you need to manually unmap the Local Disk X: using the command (`subst x: /d`) from the command prompt and then manually map X: on the oscilloscope to desired network location.

---

- The above shared folder is mapped as X: (X drive) on the PC where TekExpress is running.

---

**NOTE.** If X drive is mapped to any other shared folder, TekExpress will display a warning message window asking you to disconnect the X: drive manually.

---

Do the following before you click Run:

---

**NOTE.** Ensure that the network connectivity is enabled on the PC running TekExpress.

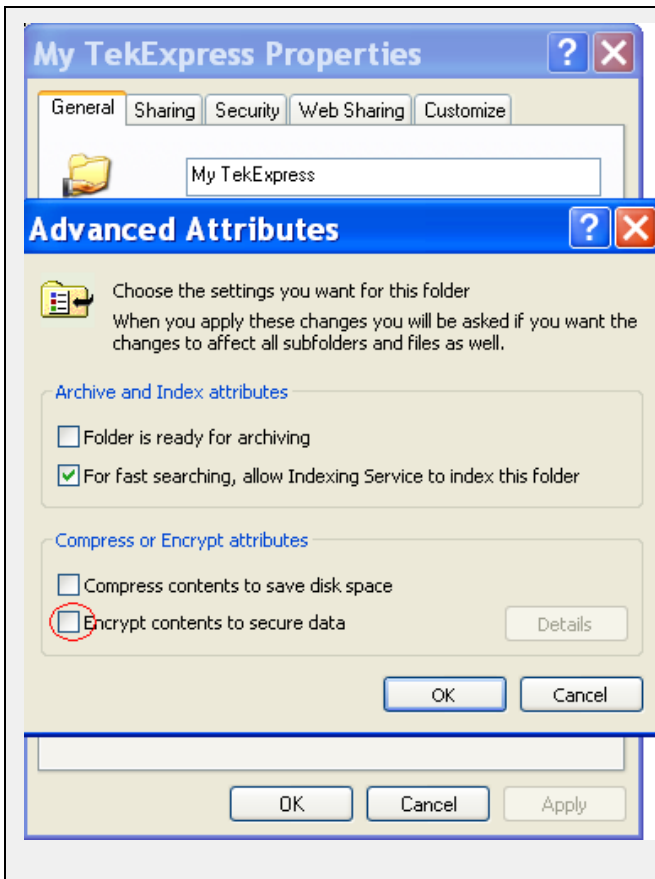
---

1. [Map](#) the shared My TekExpress folder as X: (X drive) on all the instruments used in the test setup running Microsoft Windows Operating System. This share folder is used to save the waveform files or any other file transfer operations.
2. Right click on the My TekExpress folder and open the **Properties** dialog box. Select the **General** tab and then **Advanced**. In the **Advanced Attributes** window, ensure that the option **Encrypt contents to secure data** is NOT selected. Click [here](#) to view the picture.
3. Ensure that all the required instruments are properly warmed up, and that [Signal Path Compensation \(SPC\)](#) is performed.

### Mapping My TekExpress folder

To map the My TekExpress folder on the instruments, follow the steps below:

1. Open Windows Explorer.
2. From the Windows Explorer menu, select **Tools > Map Network drive**.
3. Select the Drive letter as X: (if there is any previous connection on X:, disconnect it first through **Tools > Disconnect Network drive** menu of Windows Explorer).
4. In the Folder field, enter remote My TekExpress folder path (for example, \\192.158.97.65\\My TekExpress).
5. You can determine the IP address of the PC where “My TekExpress” folder exists by doing the following:
  - Select **Start > Run** menu on the PC where My TekExpress folder exists.
  - Enter `cmd` and click **Enter**.
  - At command prompt, type `ipconfig`.



You can find SPC by following the steps below:

1. On the oscilloscope main menu, click **Utilities** menu.
2. Click **Instrument Calibration** option.





## TekExpress Application Overview

TekExpress is the Tektronix Compliance Test Automation Framework, developed to support current and future test automation needs of customers. It is a highly modular architecture that enables deploying automated test solutions for various serial standards in a relatively short time.

The TekExpress USB application (Opt. USB-TX) is the automated version of USB3.0 measurements from DPOJET Timing and Analysis tool. With TekExpress USB, Tektronix provides Fully-Automated Tx solution for verification, characterization, and debug.


### Key Features

The following are the key features of TekExpress USB application:

- Comprehensive test coverage
- Precise debugging and troubleshooting
- Accurate and reliable results
- Integrated Signal Test Tool (Sigtest Tool software installation is required — available from the USB-IF.)

## Starting the Application

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

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

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 prompts to recall the previously unsaved session.


---

## Resizing the Application Window

- 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.

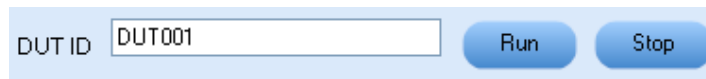
## Exiting the Application

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.

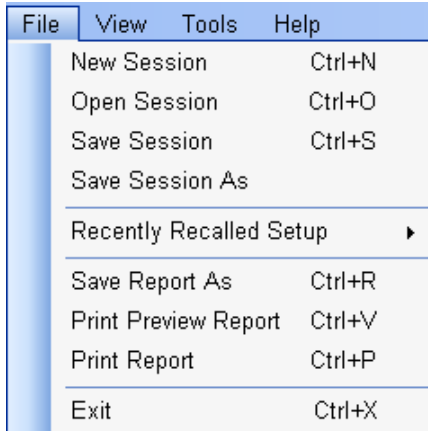


**Table 4: Controls and Functions**

Control name	Function
DUT ID	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, pause, resume and stop the tests.

## File Menu

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

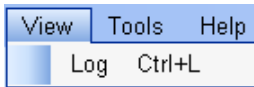


The File menu has the following selections:

Menu	Function
New Session	Starts a default session of TekExpress.
Open Session	Opens a saved session.
Save Session	Saves the session.
Save Session As	Saves a session in a different name.
Recently Recalled Setup	Lists all the recent and previously recalled setup files.
Save Report As	Saves the report in user specified location.
Print Preview Report	Previews the report before printing.
Print Report	Opens the Windows "Print" dialog box.
Exit	Closes the application.

## View Menu

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

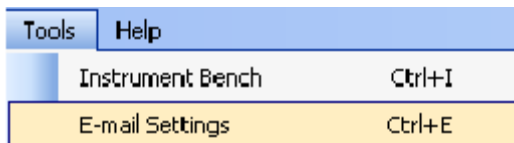


The View menu has the following selections:

Menu	Function
Log	Opens the log (log.xml) file in the default viewer.

## Tools Menu

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



The Tools menu has the following selections:

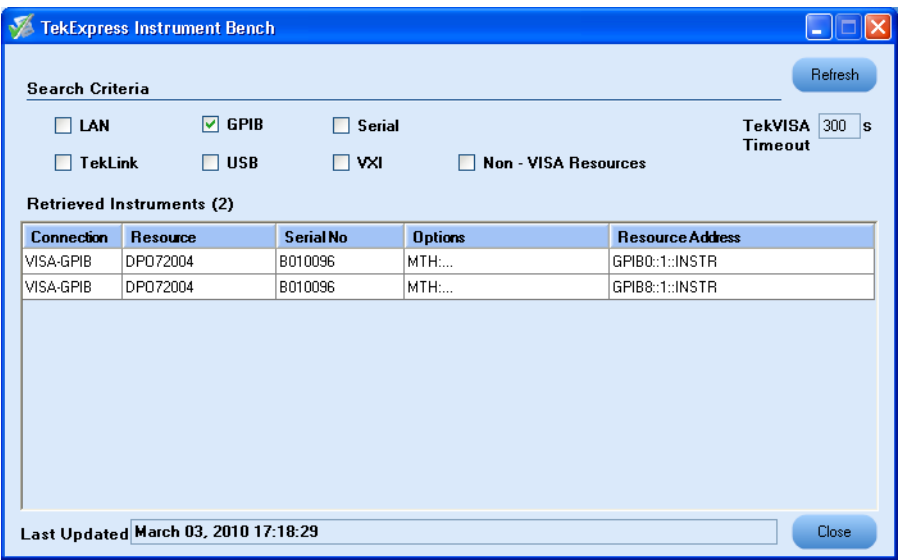
Menu	Function
<a href="#">Instrument Bench</a>	Opens a dialog box showing the list of instruments attached to the test setup.
<a href="#">Email Settings (see page 21)</a>	Opens a dialog box showing e-mail setting details.

### Tools > Instrument Bench

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.

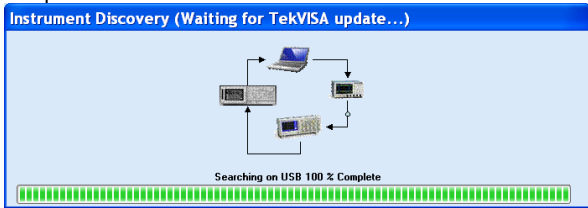
**NOTE.** TekExpress uses TekVISA for instrument search. Ensure that TekVISA is running on your system before you refresh the instrument bench window.

**Table 5: Retrieved Resources properties in the Instrument Bench window**

Title	Description
Connection	Shows the type of connection with the instrument.
Resource	Shows the name of the resource.
Serial Number	Shows the serial number of the resource.
Options	Shows the options available on the instrument. <sup>1</sup>
Resource Address	Shows IP Address/Port number of the resource.

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

**Table 6: Button controls on Instrument Bench dialog box**

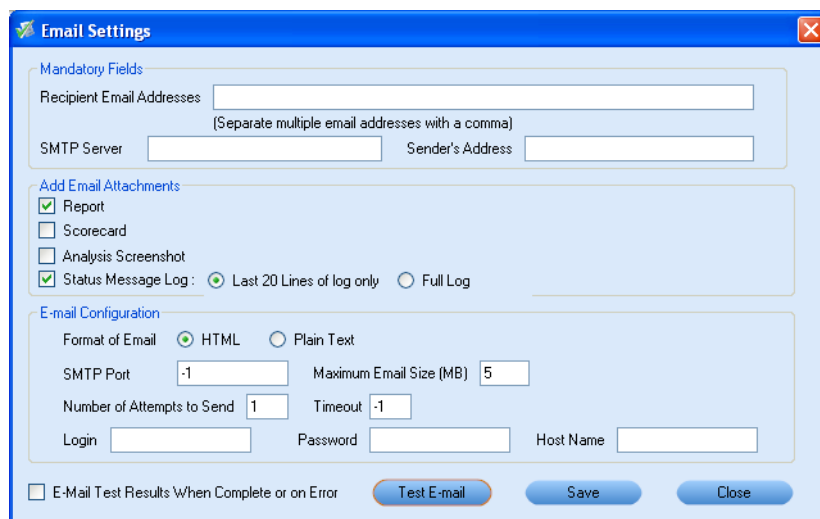
Button	Function
Refresh	The application searches on the selected connection for resources. While searching resources it shows the Instrument Bench discovery window. The Instrument Discovery window shows the connection currently being scanned and the percentage of task completed.
	
Close	Closes the dialog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

## Tools > E-mail Settings

Use the E-mail Settings utility to configure and set the e-mail options. The following fields are mandatory for receiving e-mail notification from TekExpress:

1. Recipient Email Addresses. For example, User@domain.com.
2. Sender's Address.
3. SMTP Server address of the Mail server configured at client location.

If any of these fields are left blank, the settings are not saved and e-mail notification will not be sent.



**Email Settings**

**Mandatory Fields**

Recipient Email Addresses:   
(Separate multiple email addresses with a comma)

SMTP Server:  Sender's Address:

**Add Email Attachments**

☒ Report  
☐ Scorecard  
☐ Analysis Screenshot  
☒ Status Message Log : ☒ Last 20 Lines of log only ☐ Full Log

**E-mail Configuration**

Format of Email: ☒ HTML ☐ Plain Text

SMTP Port:  Maximum Email Size (MB):

Number of Attempts to Send:  Timeout:

Login:  Password:  Host Name:

☐ E-Mail Test Results When Complete or on Error

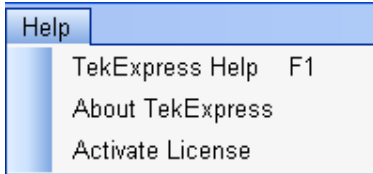
**Test E-mail** **Save** **Close**

Select the option “E-mail Test Results When Complete or on Error” has to be checked to receive the e-mail. The attachment list depends on what you have selected while configuring the e-mail setup.

**NOTE.** Among the e-mail attachments, the Analysis Screenshot is not yet functional.

## Help Menu

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



The Help menu has the following selections:

Selection	Function
TekExpress Help	Displays TekExpress Help (F1).
<a href="#">About TekExpress</a>	Displays application details such as software name, version number and copyright.
<a href="#">Activate License</a>	Displays available software options and also about license activation.



## Deskew Real Time Oscilloscopes

The following procedure is used for deskewing direct input SMA channels on a real time oscilloscope.

---

**NOTE.** *If you are using DPOJET, it has an automatic deskew option under **Analyze > Jitter And Eye Analysis > Deskew**. Refer to your DPOJET online help on how to deskew the channels.*

---

1. Run Signal Path Compensation (SPC) on the oscilloscope.
2. Connect a SMA Power Splitter (preferred) or SMA 50 ohm coaxial “T” connector to the Fast Edge output of the oscilloscope.
3. Connect SMA cables from each of the two channels to be deskewed to the power splitter (or SMA coaxial “T” connector). It is best to use matched cables when making high speed serial measurements. **It is important to use the same cables that will be used for subsequent measurements.**
4. Select **Default Setup**, and then select **Autoset** on the oscilloscope front panel.
5. Set the oscilloscope for 70% to 90% full screen amplitude on both channels. Center both traces so that they overlap.
6. Make sure that volts/div, position, and offset are identical for the two channels being deskewed.
7. Set the time/div to approximately 100 ps/div or less, with sample rate at 1 ps/pt. These settings are not critical, but should be close.
8. Set the horizontal acquisition mode to average, which provides a more stable display.
9. Select **Deskew** from the **Vertical** menu.
10. Verify that the reference channel (typically CH1 or CH2) is set to 0 ps deskew.
11. In the deskew control window, select the channel to deskew (typically CH3 or CH4). Adjust the deskew to overlay the rising edge as best as possible.

---

**NOTE.** *Typical values are in the 10's of ps or less with cables connected directly from Fast Edge to SMA inputs. If you are using a switch box (for example, Keithley), deskew the complete path from where the test fixture connects, through the switch, and into the oscilloscope. Deskew values in these cases may be as much as 30 ps or more.*

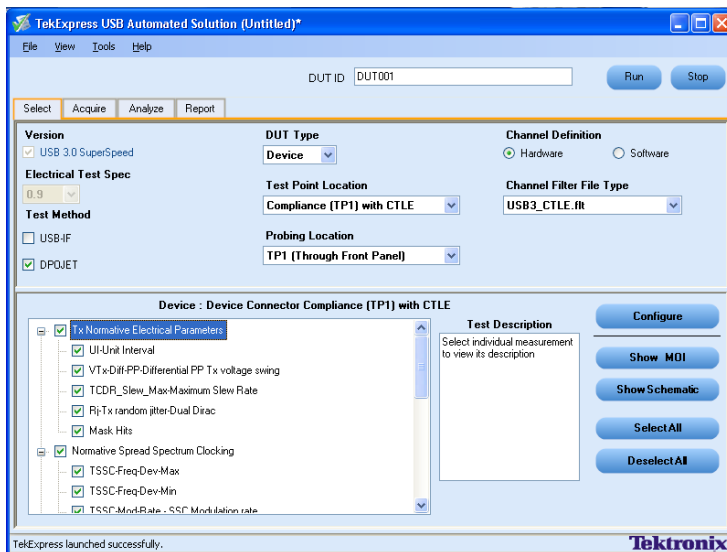
---

There are sometimes significant differences in the skew between two TCA-SMA adapters. If you find that a system requires a very large correction, it might be better to find a pair of TCA-SMA adapters that match each other better.

## Select the Test(s)

The application tests USB transmitter devices for compliance. The Select panel allows you to select tests to configure and run.

This panel provides the following functions:



### Version

USB 3.0 SuperSpeed is the default version selected.

### Electrical Test Spec

0.9 is the default value for electrical test specification.

### Test Method

Select DPOJET or USB-IF as appropriate for the measurement you want to run. If you select the USB-IF option, a drop-down list appears showing the SigTest Tool software version installed currently on your computer.

### Select DUT type

Select the Device or Host as the device to be tested.

## Test Point Selection

Select the appropriate test point location. For example, Compliance[TP1] with CTLE, Connector and so on.

## Probing Location

Select the appropriate probing location from where the DUT is tested. In the example screen shown, the DUT is being tested with a test fixture at the Device Connector (Near End connection) and the Channel Configuration being emulated is the Host's Back Panel or Front Panel.

## Channel Definition

Select Hardware or Software option.

## Channel Filter File Type

Select the filter file from the drop-down menu.

The Custom Filter File selection allows you to choose your own filter file.

Measurements are grouped under different categories according to standard specifications such as [Tx Informative Electrical Parameters \(see page 26\)](#), [Normative Speed Spectrum Clocking \(see page 26\)](#), [Tx Normative Eye Mask \(see page 26\)](#), and [LFPS measurement \(see page 26\)](#).


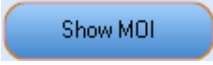




---

**NOTE.** *If any of the measurements are grayed, you cannot make any changes.*

---

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

**Table 7: Button controls on the Select panel**

Button	Description
	Opens the configuration panel for the selected test.
	Opens the PDF file for the method of implementation (MOI) for the selected test.
	Opens the schematic for the selected test. This is useful if you want to verify the test setup before running the test.
	Selects all tests in the table.
	Deselects all tests in the table.
	Indicates system on low disk space.

**Tx Informative Electrical Parameters**

Includes measurements such as UI-Unit Interval, VTx-Diff-PP-Differential PP Tx voltage swing, TCDR\_Slew\_Max-Maximum Slew Rate, Rj-Tx-random jitter-Dual Dirac, and Mask Hits.

**Normative Speed Spectrum Clocking**

Includes measurements such as TSSC-Freq-Dev-Max, TSSC-Freq-Dev-Min, TSSC-Mod-Rate-SSC Modulation rate, and TSSC USB Profile.

**Tx-Normative Eye Mask**

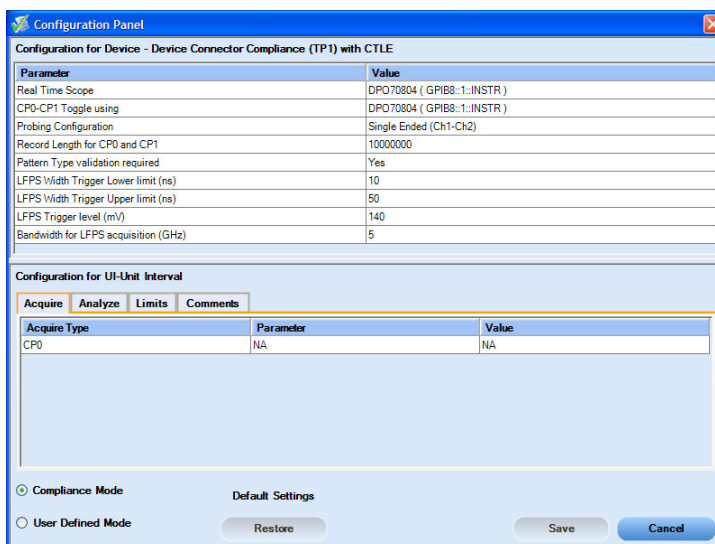
Includes measurements such as TJ-Tx total jitter-Dual Dirac at 10E-12 BER, DJ-Tx-deterministic Jitter-Dual Dirac, Eye Height- Transmitter Eye Mask, and Width@BER.

**LFPS Measurement**

Includes measurements such as LFPS Duty Cycle, LFPS Fall Time, LFPS Rise Time, LFPS TPeriod, LFPS TBurst, LFPS TRepeat, LFPS Vcm-AC, and LFPS VTx-DIFF-PP.

## Configure and Run the Test(s)

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



In the Configure panel, you have the following options:

- To change the parameters associated with the configuration of acquisition.
- To change the parameters associated with analysis configuration.

---

**NOTE.** You can select different filter files under Filter Selection option for different test suites.

---

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

- Select the appropriate instrument.
- Select the [Probing Configuration \(see page 29\)](#).
- Select an appropriate parameter for “CP0–CP1 Toggle using” (AWG/AFG/Scope/Do Not Use).
- Select to enable Pattern type validation. Selecting Yes enables the process of validating that each test pattern is correct. Selecting No skips the test pattern validation.

The lower part 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 the compliance mode. When you switch to the user defined mode, these parameters are editable.

---

**Table 8: Test parameters**

#### Parameters to configure

##### Acquire

Acquire	Analyze	Limits	Comments
Acquire Type	Parameter	Value	
CP0	NA	NA	

#### Description

Shows the various parameters related to acquisition of a selected test. These parameters can vary from one test to another.

##### Analyze

Acquire	Analyze	Limits	Comments
Parameter	Value		
MaskFile path	USB_3_0_Rx_Normative.msk		

Shows the various parameters related to analysis of a selected test. The Analyze parameters shows the default analysis parameters for the selected test.

Refer to:

[Using NonStandard Waveform Mask](#)

**Table 8: Test parameters (cont.)****Parameters to configure****Description****Limits**

Applies to a specific test. It shows the measurement limits using different types of comparisons.

Acquire	Analyze	Limits	Comments
Details	Value1	Compare String	Value2
DJ	86e-12	Less Than Or Equal To (<=)	0

**Comments**

You can specify a comment up to 256 characters long for the selected test.

Acquire	Analyze	Limits	Comments

**Compliance settings**

**Restore**

Restores the default settings.

**Save**

Saves all changes made in the Configuration Panel and closes the dialog box.

**Cancel**

Closes the dialog box and without apply changes.

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

Refer to the following table for different test limit comparisons:

**Table 9: Different test limit comparisons**

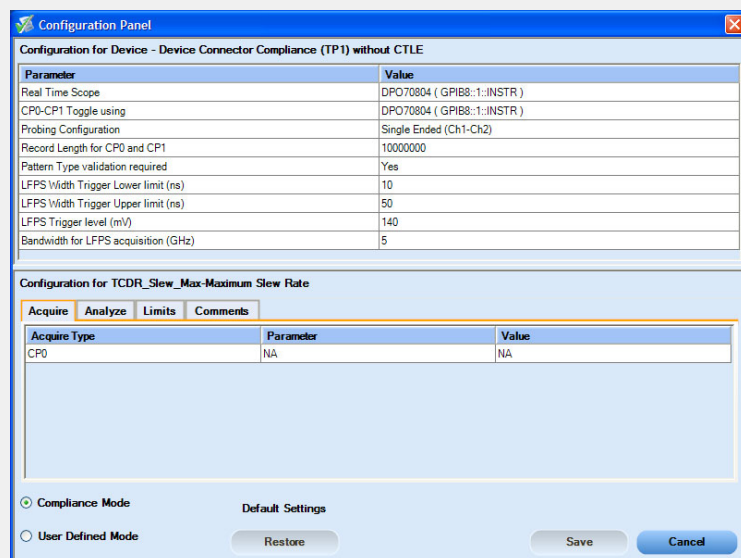
Comparison string	Description
EQ(==)	Equal to
NE(!=)	Not equal to
GT(>)	Greater than
LT(<)	Less than
GE(>=)	Greater than or Equal to
LE(<=)	Less than or Equal to
GTLT(> <)	Greater than and Less than
GELE(>= <=)	Greater than or equal to and Less than or equal to
GELT(>= <)	Greater than or equal to and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

Table 9: Different test limit comparisons (cont.)

Comparison string	Description
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

### Using Reference Waveforms

If you want to use an existing reference waveform from your storage location for analysis and run, click Probing Configuration field to select the different waveforms for example, ref1, or ref1-ref2 and so on from the drop-down list.



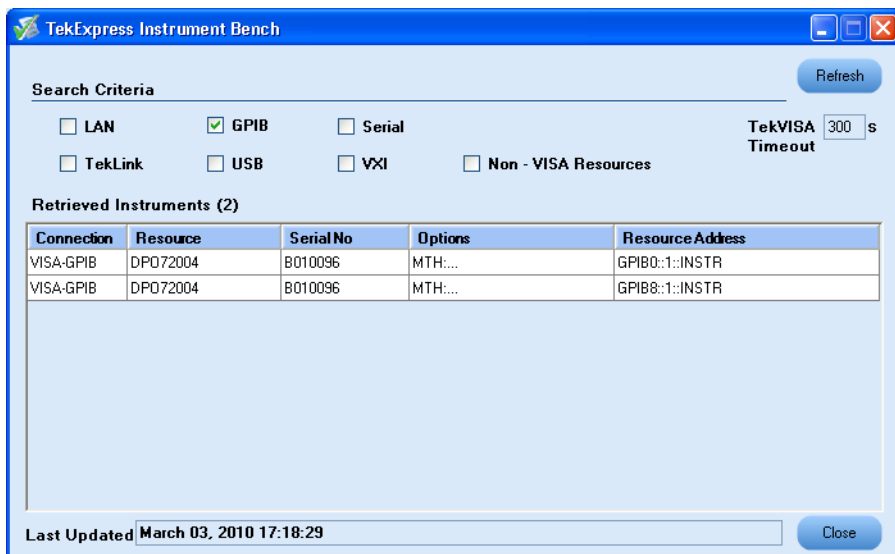
## View and Select Connected Instruments

### 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 search 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 and GPIB as the search criteria in the Instrument Bench dialog box and click Refresh, the TekVISA Instrument Manager checks for the instruments available over LAN and GPIB and the details of the instrument are displayed in the **Retrieved Instruments** table.



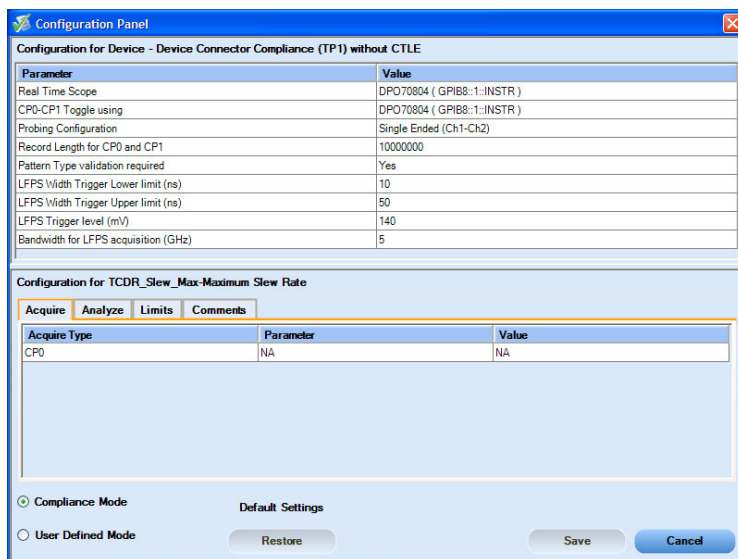
You can provide the time in the **TekVISA Timeout (Seconds)** field, within which if the TekVISA Instrument Manager does not find the instruments, the TekExpress application resumes operation.

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 part of the panel displays the general parameters for the tests under the selected test suite.



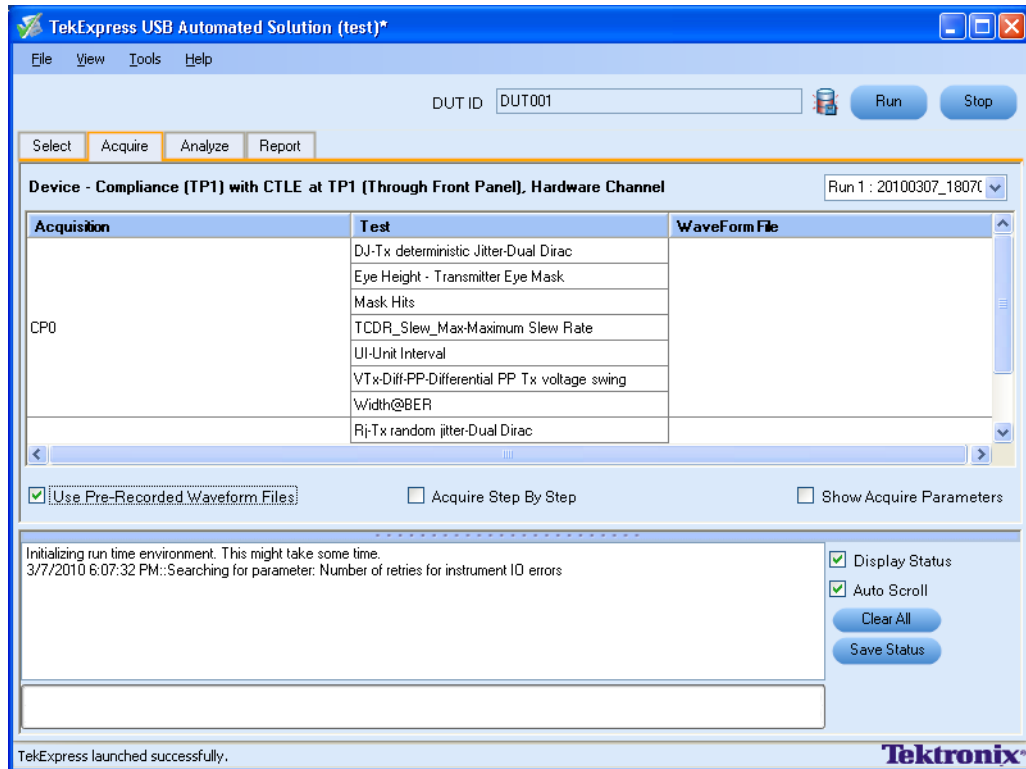


**NOTE.** The list of instruments displayed is specific to the selected test suite. It does not show all the connected instruments.

## Use the Prerecorded Waveform for Analysis

From the Acquire tab, you can see unique acquisitions, acquisition parameters, acquisition status, and prerecorded waveform files of the selected test suite. The Acquire panel is specific to a suite and is updated every time the selected test suite is changed. This panel shows the acquisition details for the tests in the currently selected suite. The tests with the common acquisition parameters are grouped together and shown as a single acquisition.

Column name	Function
Status	Test acquisition status of the running test passed at intervals.
Test	Name of the tests performing acquisitions. One or more tests can perform the same acquisitions.
Acquisition	Acquisition name
Waveform File(s)	Prerecorded waveform files of unique acquisitions. You can select waveform files by selecting browse on individual cells. This allows you to select any waveform file using the standard file open window.



The following Acquire source options are available:

- **Use Pre-Recorded Waveform files:** Enabling or disabling the option shows or hides the waveform file column in the acquisition table. When you save a session and then select this option, the DUT ID text box changes to a drop-down list, in which you can select the DUT ID up to the point where the session was saved. A drop-down box appears above the Waveform file column, showing the run details, including the date and time of each run. If you select a run, corresponding data for that run will be populated (such as the selected test, the test configuration settings, and the test summary status).

---

**NOTE.** If you want to select the waveform files manually, you need to select all the waveform (.wfm) files required for the measurement. To select multiple files, hold down the Ctrl key to enable selecting multiple files in the File Open dialog screen. If any required files are not selected, the measurement may not run properly.

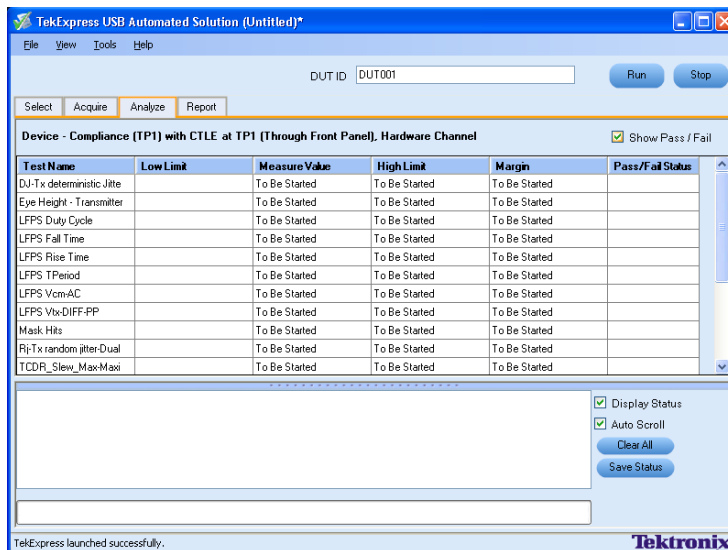
---

- **Acquire Step by Step:** Selecting this option prompts you at the end of each acquisition before proceeding to the next one.
- **Show Acquire Parameters:** On enabling this option, the acquisition parameters for each unique acquisition are displayed in the acquisition table.

When you select “Use Pre-Recorded Waveform Files”, the first column shows the waveform type and the second column shows the tests that use that waveform type for analysis.

## View the Progress of Analysis

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



### Analysis Table

The table contains the following:

- The test name.
- The status of the tests that are being run.
- The measured, limit and margin values of the tests.

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 Messages panel.

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

- **Display Status:** Enable/Disable status messages.
- **Auto Scroll:** Scrolls status messages 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

After the 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 following screen is an example report of a test run using only DPOJET software.

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

The screenshot displays the TekExpress USB Automated Solution (Untitled) software interface. The main window shows a USB 3.0 Test Report for DUT ID: DUT001. The report includes test results for various USB 3.0 parameters, such as Eye Height, Mask Hrs, Rx-Tx random jitter, and TSSC-Freq-Dev-Max. The overall test result is Pass.

**Tektronix® Automation Framework**  
**USB 3.0 Test Report**

DUT ID : DUT001    Device Type : Device    CTS Version : 0.9  
 Date/Time : 7/8/2010 15:11    Execution Time : 13 Min    Overall Compliance Mode : Yes  
 Overall Test Result : **Pass**

Scope Model : DPO71604    Scope Serial Number : B031020    Scope FW Version : 5.2.1 DEVBUILD 5    SPC Factory Calibration : Pass  
 TekExpress Version : USB: 3.0.0.3, Framework: 1.3.5.143  
 DPOJET Version : 3.0.0 Build 4

Test Name	Measurement Details		Low Limit	Measured Value	High Limit	Margin
	Sampling Rate	Record Length				
DJ-Tx deterministic jitter-Dual Dirac	50.000G(S/s)	10.000M	NA	24.588ps	86.000ps	61.412ps NA
Eye Height - Transmitter Eye Mask	50.000G(S/s)	10.000M	100.000mV	320.179mV	1.200V	879.821mV 220.179V
Mask Hrs	50.000G(S/s)	10.000M	NA	0	NA	NA NA
Rx-Tx random jitter-Dual Dirac	50.000G(S/s)	10.000M	NA	1.059ps	3.290ps	2.240ps NA
TSSC-Freq-Dev-Max	50.000G(S/s)	10.000M	-300.000ppm	2.238kppm	300.000ppm	-1.938kppm 2.538kppm
TSSC-Freq-Dev-Min	50.000G(S/s)	10.000M	-5.300kppm	-2.304kppm	-3.700kppm	-1.396kppm 2.996kppm
TCDR_Slew_Max-Maximum Slew Rate	50.000G(S/s)	10.000M	NA	4.640ms/s	10.000ms/s	5.360ms/s NA
IJ-Tx total jitter-Dual Dirac at 10E-12 BER	50.000G(S/s)	10.000M	NA	39.365ps	132.000ps	92.635ps NA
TSSC-Mod-Rate - SSC Modulation rate	50.000G(S/s)	10.000M	30.000kHz	32.476kHz	33.000kHz	523.511Hz 2.476kHz

TekExpress launched successfully.

## View Test Related Files

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

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

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



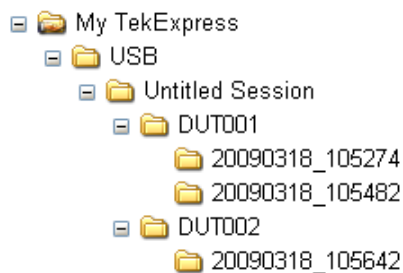
---

**WARNING.** Do not save a session named “Untitled Session” or “Backup” because there are application-specific files and are deleted when you exit the application.

---

A session folder can contain results for more than one DUT, and a DUT folder can contain more than one run data folder marked by date-time stamp as folder name.

Here is an example image of data storage:



## Select and Run a Test Using SigTest Software

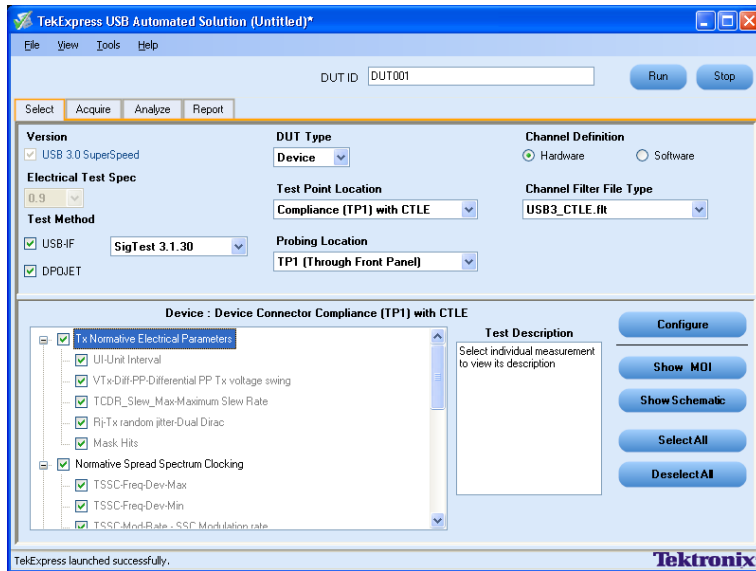
Select and run a test using the USB-IF software. The steps are same as running a test using the DPOJET software. Refer to [How To Select the Tests \(see page 24\)](#).

1. Select the **USB-IF** option in the Select Panel. Under **Test Method**, browse to the latest version of USB-IF installed on your machine. Click **Run**.

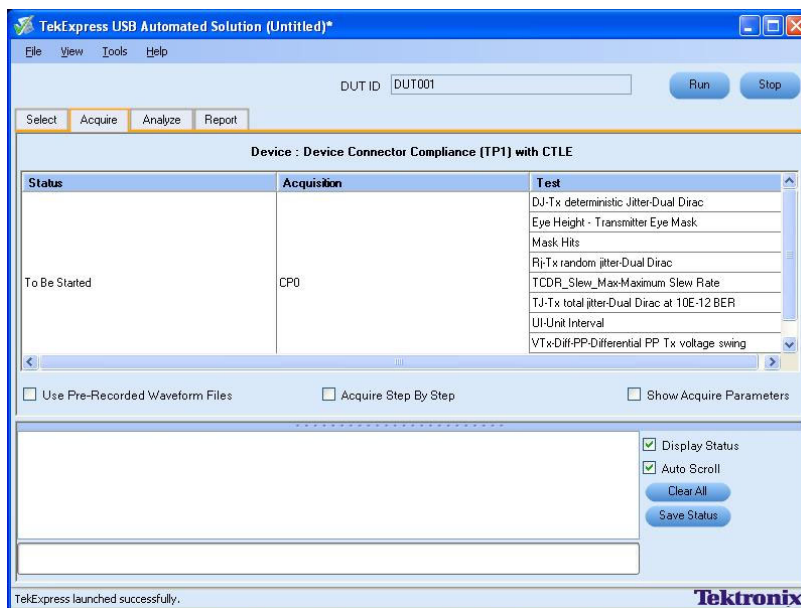
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**NOTE.** If you have not installed USB-IF software (SigTest) on your instrument/PC, the Test method option is disabled.

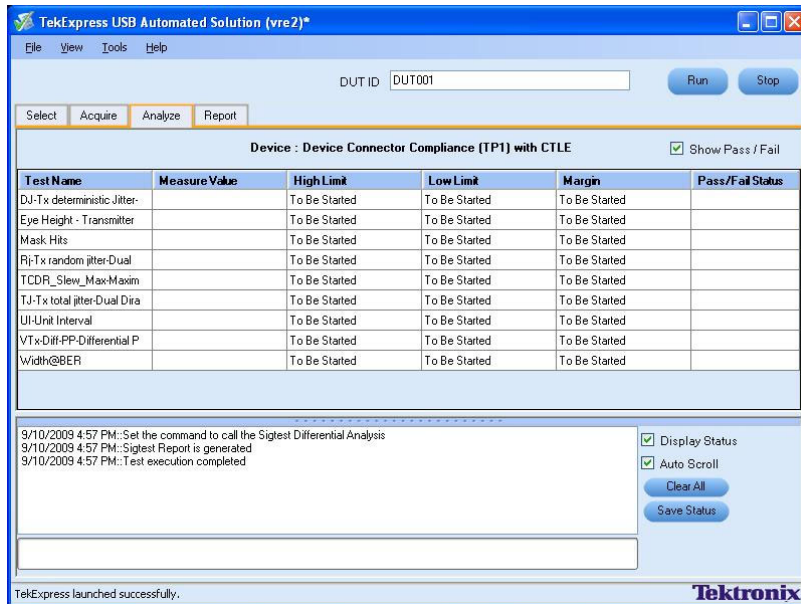
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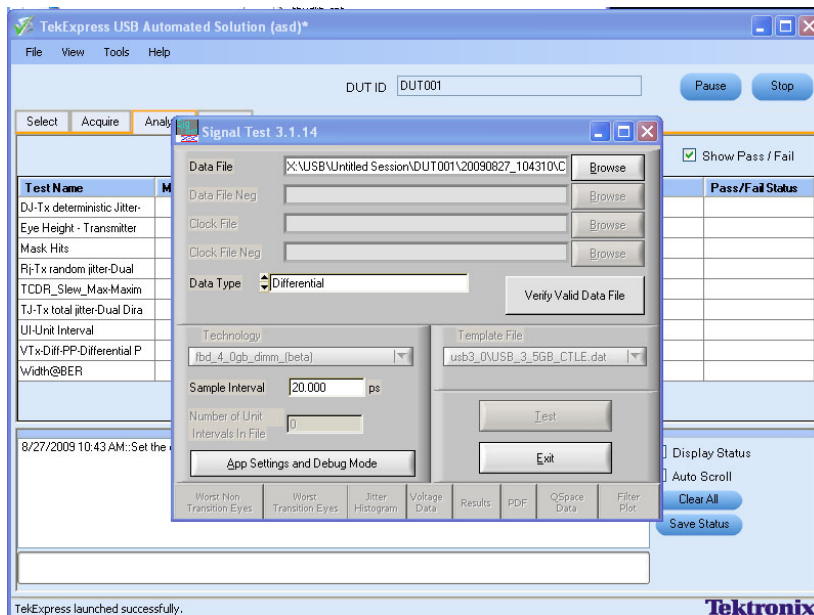
- While running, the application automatically switches to the Acquire tab and displays the status of acquisition.



- The Analyze tab displays the Measured, High and Low limit values.

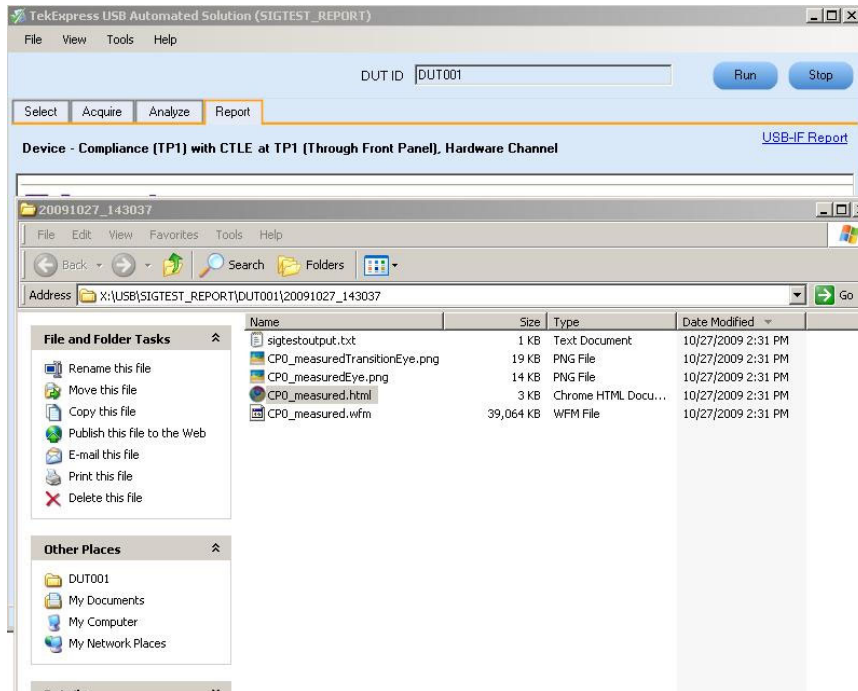


4. A SigTest tool pop-up appears which shows that the application is using SigTest as the test method to perform the analysis.



5. During test execution, once the analysis is completed, SigTest application automatically closes and generates a report with the details. Click **USB-IF Report** link on the TekExpress Report tab to view the report location. Double-click the .html file to view the test report.

**NOTE.** Results shown in the TekExpress report tab are results from DPOJET.

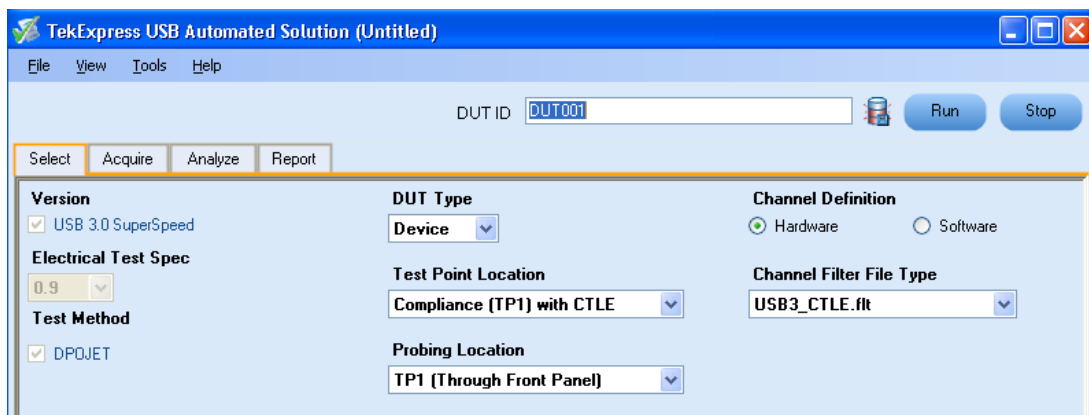


## Use Filters

### Using the Nonstandard Filter

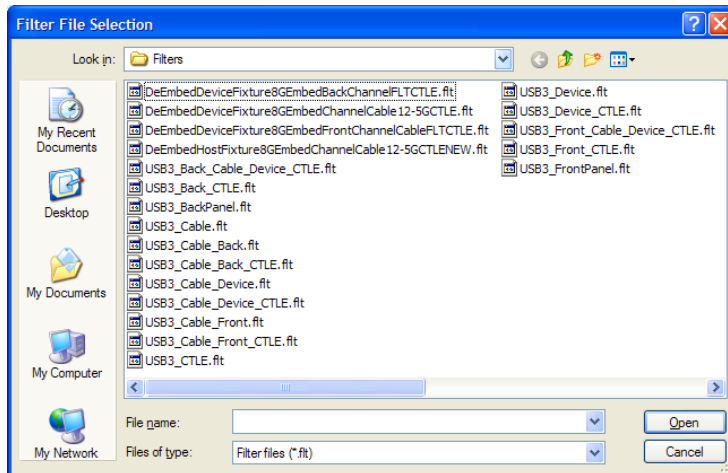
The following procedure explains how to select and enter any filter file in the configuration panel.

1. Click the **Channel Filter File Type** option in the Select panel and select **Custom Filter File** option from the drop-down menu.



2. Click **Browse** to view the location of filter files from where you can choose from. Select the file and click **Open**.





Filter files to be used for de-embedding the fixture are:

- DeEmbedDeviceFixture8GEmbedBackChannelFLTCTLE.flt
- DeEmbedDeviceFixture8GEmbedChannelCable12-5GCTLE.flt
- DeEmbedDeviceFixture8GEmbedFrontChannelCableFLTCTLE.flt
- DeEmbedHostFixture8GEmbedChannelCable12-5GCTLENEW.flt

The remaining filter files are for embedding the fixture.

---

**NOTE.** The filter files are located in the TekExpress Filters folder.

For Microsoft Windows 7, the Filters folder file path is:

*C:\Program Files (x86)\Tektronix\TekExpress\TekExpress USB\Setupfiles\Filters*

For Microsoft Windows XP or Windows XP Embedded, the Filters folder file path is:

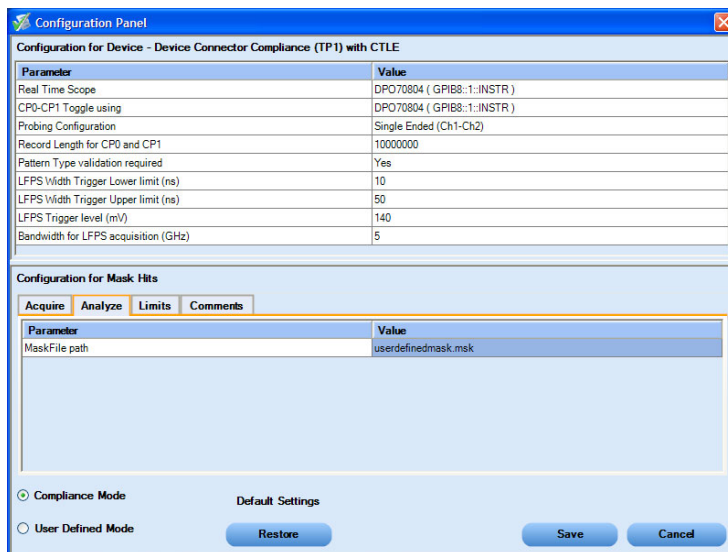
*C:\Program Files\Tektronix\TekExpress\TekExpress USB\Setupfiles\Filters*

---

## Using the Nonstandard Waveform Mask

If you want to use a nonstandard mask file, follow this procedure:

1. Select the Mask Hits test in the Select panel and click Configure.
2. Click the Analyze tab in the Configure panel.
3. Enter the mask file name in the Analyze tab of the Configuration panel as shown. Click **Save**.



**NOTE.** The mask files are located in the TekExpress Masks folder.

For Microsoft Windows 7, the Masks folder file path is:

*C:\Program Files (x86)\Tektronix\TekExpress\TekExpress USB\Setupfiles\Masks*

For Microsoft Windows XP or Windows XP Embedded, the Masks folder file path is:

*C:\Program Files\Tektronix\TekExpress\TekExpress USB\Setupfiles\Masks*

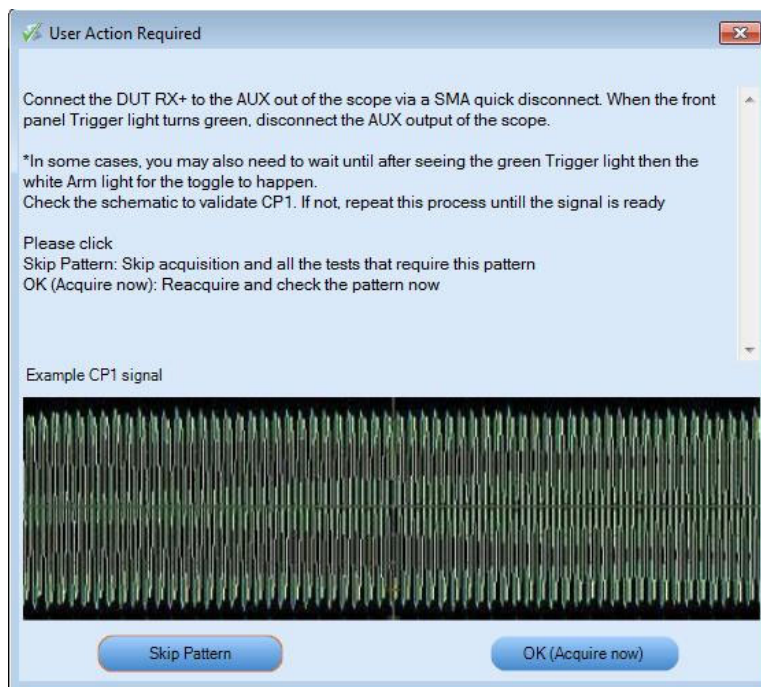
## CP0-CP1 Toggle Using Mechanisms

### Scope Based Toggle

To use the oscilloscope based toggle, follow this procedure.

**NOTE.** Scope based toggle is not guaranteed to work for all DUTs.

1. In the configuration panel, for the parameter CP0-CP1 Toggle using, select an oscilloscope (E.g. DPO72004 (TCPIP::192.158.96.152::INSTR)).
2. Connect the AUX OUT from the oscilloscope to the USB 3.0 Device Fixture 2 RX+ and connect a USB cable from USB 3.0 Device Fixture 2 to Device fixture 1.
3. Click the Run button. If the CP1 measurements are selected, then when the CP1 pattern is being acquired, a pop up displays to prompt you to make the necessary connections. Select to either skip the pattern or make a new acquisition after the DUT is transmitting CP1.

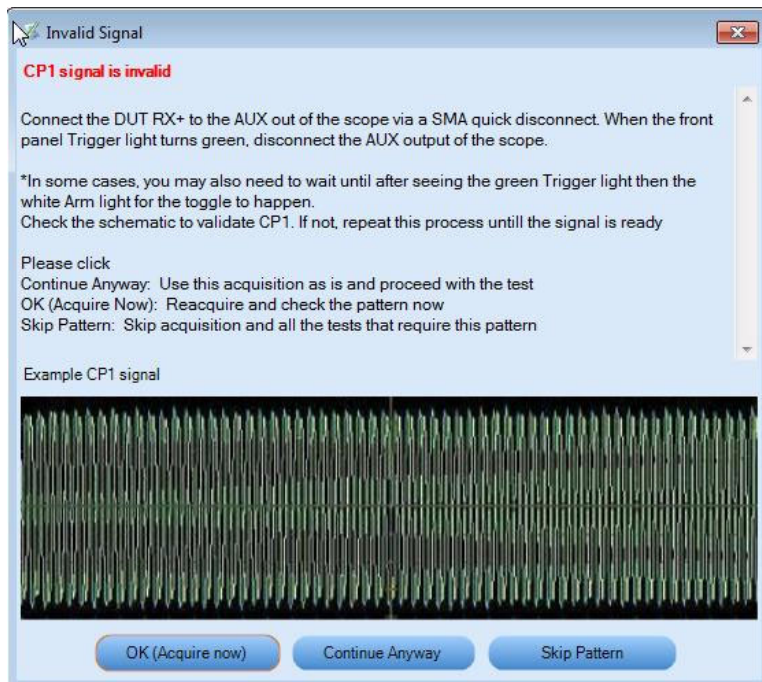


4. If you select OK (Acquire Now), a new acquisition is done. If Pattern Type validation is set to Yes, a Pattern Type validation is done on the acquired signal to check if it is a CP1 signal. If it is a CP1 signal, the measurements proceed normally. If not, the following pop up displays.

---

**NOTE.** *If Pattern type validation is set to No, then the measurement proceeds with the acquired waveform.*

---

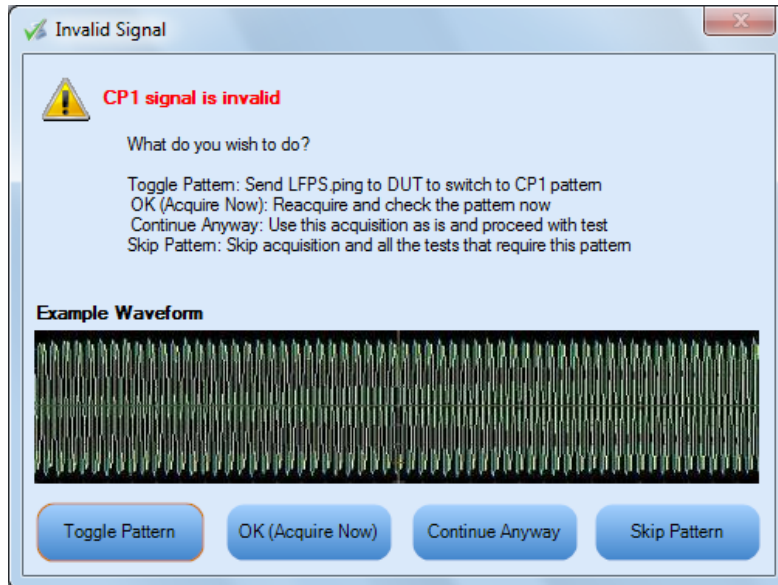


5. Choose how to proceed.
  - Select OK (Acquire now) to start the acquisition again.
  - Select Continue Anyway to cause the measurements to proceed with acquired waveform.
  - Select Skip Pattern to skip all CP1 tests. The rest of the selected measurements proceed. If CP1 is skipped and CP0 is acquired, TJ and RJ will be computed on CP0 for informational purposes.

## AWG Based Toggle

To use the arbitrary waveform generator (AWG) based toggle, follow this procedure.

1. In the configuration panel, for the parameter CP0-CP1 Toggle using, select an AWG (E.g. AWG7122C (TCPIP::192.158.96.152::INSTR)).
2. Connect the interleave (analog and  $\overline{\text{analog}}$ ) output of Ch1 of the AWG to the USB 3.0 Device Fixture 2 (RX+ and RX-) and connect a USB cable from the USB 3.0 Device Fixture 2 to USB 3.0 Device fixture 1.
3. Click the Run button. If the CP1 measurements are selected, then when the CP1 pattern is being acquired, a command is sent to the AWG to send a trigger to toggle the DUT from CP0 to CP1. Next, the waveform is acquired. If Pattern type validation is set to Yes, then the validation is done. If the pattern is valid, the measurement proceeds normally. If the pattern is not valid, the following pop up displays.



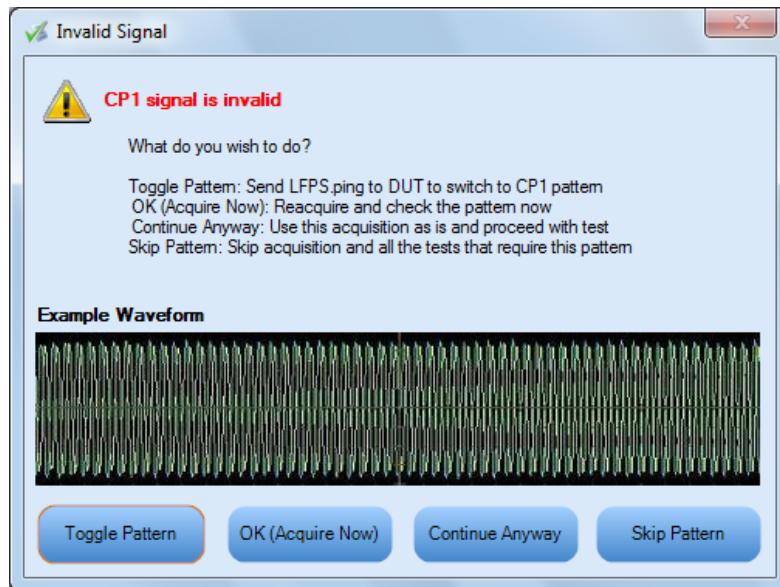
**NOTE.** *If Pattern type validation is set to No, then the measurement proceeds with the acquired waveform.*

4. If you select Toggle Pattern, then the toggle sequence is initiated again to toggle the DUT. (The pop up remains displayed during this toggle process.) You can visually verify whether the acquired pattern is correct. If not, keep clicking the Toggle Pattern button until the desired pattern is acquired. Once the desired pattern is acquired, select OK (Acquire now) to save the waveform and proceed with the measurement.
5. At any time, you can select Continue Anyway to proceed with current acquired waveform. You can also select Skip pattern to skip the CP1 acquisition and proceed with rest of selected measurements.

## AFG Based Toggle

To use the arbitrary function generator (AFG) based toggle, follow this procedure.

1. In the configuration panel, for the parameter CP0-CP1 Toggle using, select an AFG (E.g. AFG3102 (TCPIP::192.158.96.152::INSTR)).
2. Connect Ch1 of the AFG to the Device fixture 2 (RX+) and connect a 3 meter USB cable from Device fixture 2 to Device fixture 1.
3. Click the Run button. If the CP1 measurements are selected, then when the CP1 pattern is being acquired, a command is sent to AFG to send a trigger to toggle the DUT from CP0 to CP1. Next, the pattern is acquired. If Pattern type validation is set to Yes, then the validation is done. If the pattern is valid, the measurement proceeds normally. If the pattern is not valid, the following pop up displays.



---

**NOTE.** *If Pattern type validation is set to No, then the measurement proceeds with the acquired waveform.*

---

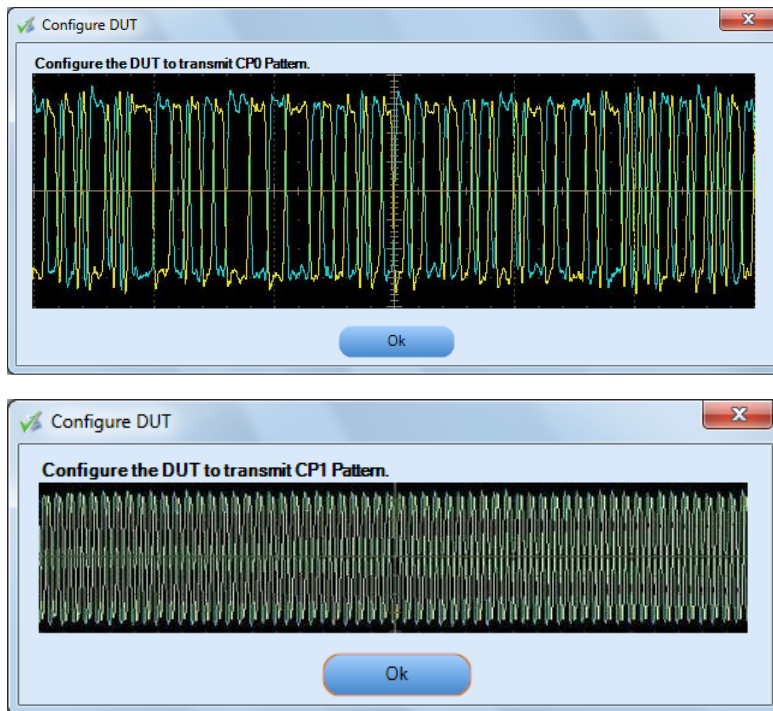
4. If you select Toggle Pattern, then the toggle sequence is initiated again to toggle the DUT. (The pop up remains displayed during this toggle process.) You can visually verify whether the acquired pattern is proper. If not, keep clicking the Toggle Pattern button until the desired pattern is acquired. Once the desired pattern is acquired, select OK (Acquire now) to save the waveform and proceed with the measurement.
5. At any time, you can select Continue Anyway to proceed with current acquired waveform. You can also click Skip pattern to skip the CP1 acquisition and proceed with rest of selected measurements.

## No Toggle

To not use the toggle tool, follow this procedure.

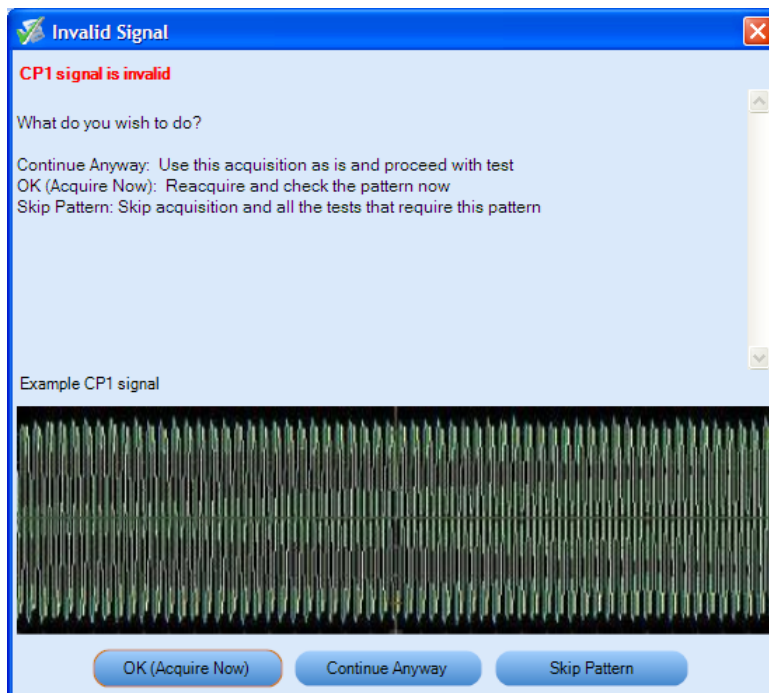
1. In the configuration panel, for the parameter CP0-CP1 Toggle using, set to Do not use.
2. The following pop up is displayed just before acquiring the CP0/CP1 pattern to allow you to manually transmit the desired pattern and acquire the waveform.



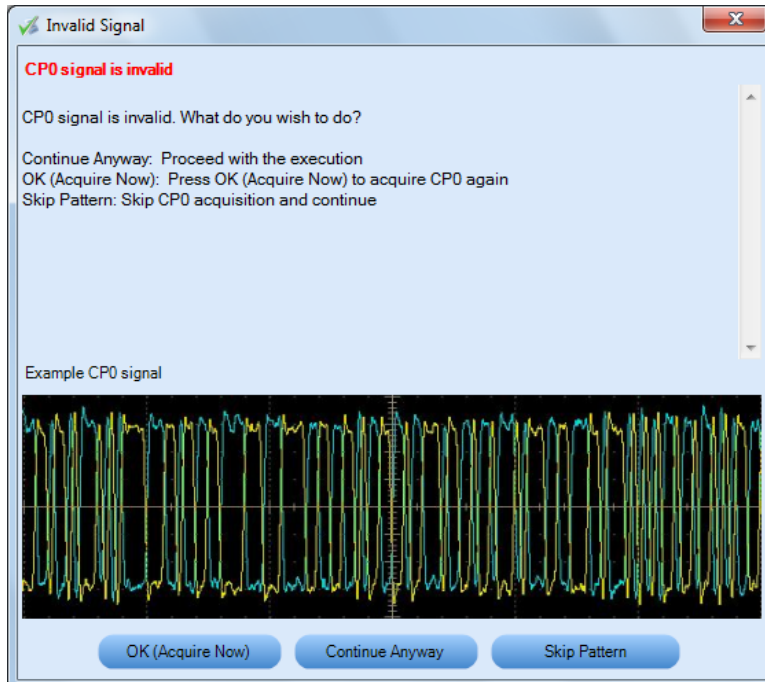


3. Click OK to acquire the waveform. If Pattern type validation is set to Yes, a pattern type validation is done on the acquired signal. If it is a valid pattern, the measurement proceeds normally.

If it is not a valid CP1 pattern, the following pop up displays.



If it is not a valid CP0 pattern, the following pop up displays.



---

**NOTE.** *If Pattern type validation is set to No, then the measurement proceeds with the acquired waveform.*

---

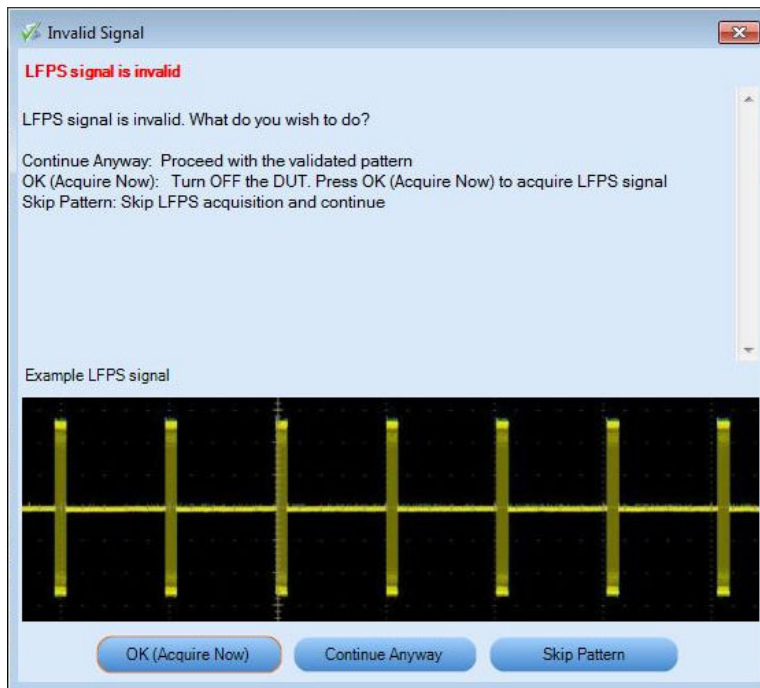
4. Choose how to proceed.

- Select OK (Acquire now) to start the acquisition again.
- Select Continue Anyway to cause the measurements to proceed with acquired waveform.
- Select Skip Pattern to skip all CP0-CP1 tests. The rest of the selected measurements proceed.



## LFPS Pattern Type Validation

When the Pattern type validation is set to Yes, during the acquisition of LFPS pattern, a validation is done. If the pattern is valid, the measurement proceeds normally. If the pattern is invalid, the following pop up displays.



---

**NOTE.** If Pattern type validation is selected as “No”, then the measurement proceeds with the acquired waveform.

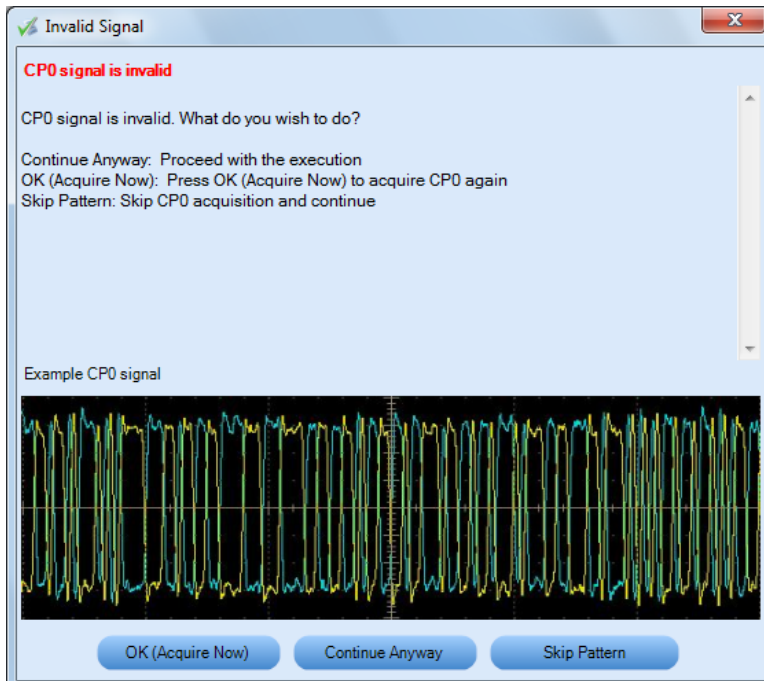
---

Choose how to proceed.

- Select OK (Acquire now) to start the acquisition again.
- Select Continue Anyway to cause the measurements to proceed with acquired waveform.
- Select Skip Pattern to skip all LFPS tests. The rest of the selected measurements proceed.

## CP0 Pattern Type Validation

When the Pattern type validation is set to Yes, during the acquisition of a CP0 pattern, a validation is done. If the pattern is valid, the measurement proceeds normally. If the pattern is invalid, the following pop up displays.



---

**NOTE.** If Pattern type validation is selected as “No”, then the measurement proceeds with the acquired waveform.

---

Choose how to proceed.

- Select OK (Acquire now) to start the acquisition again.
- Select Continue Anyway to cause the measurements to proceed with acquired waveform.
- Select Skip Pattern to skip all CP0 tests. The rest of the selected measurements proceed.

## CP1 Pattern Type Validation

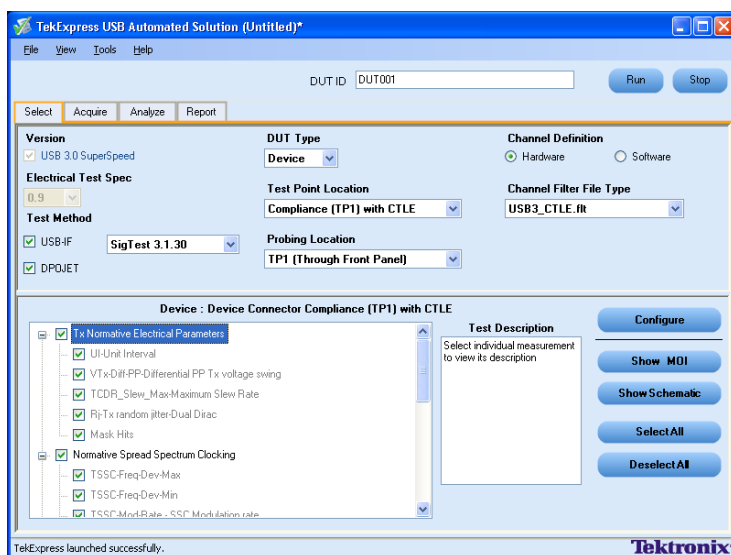
Refer to the section [CP0-CP1 Toggle Mechanisms \(see page 40\)](#).

## Mask Testing on a Device with a Hardware Channel

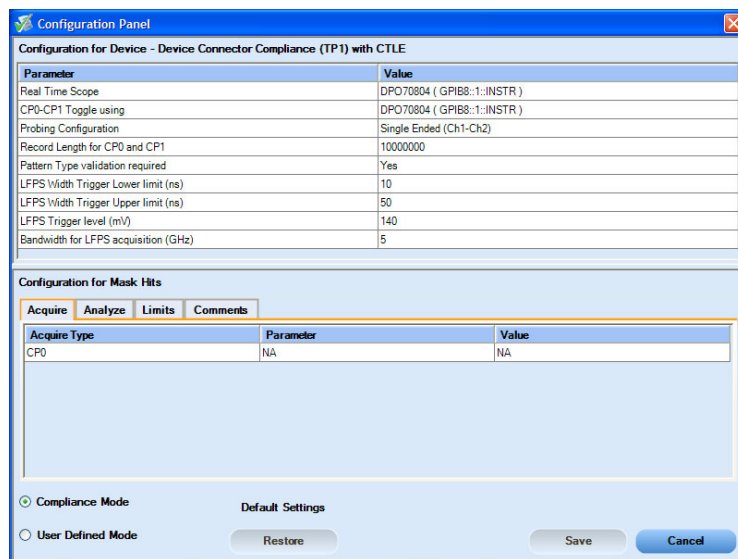
The following procedure discusses how to use TekExpress to test a Device with a hardware channel using USB-IF as the test method. For the required equipment and setup diagram click [here](#).

**NOTE.** USB compliance testing is done by using software to emulate the channel and cable when Channel Definition is set to Software mode. When Hardware mode is selected, the same testing is performed with a physical channel.

1. Select **Device** as the DUT type.
2. Choose **Compliance[TP1] with CTLE** as your test point location.
3. Select the **USB3\_CTLE.flt** as the required channel filter file type. This applies the USB-IF compliant file to open the eye before the measurements are taken.
4. Select **TX Normative Electrical Parameters** as the test to be run.

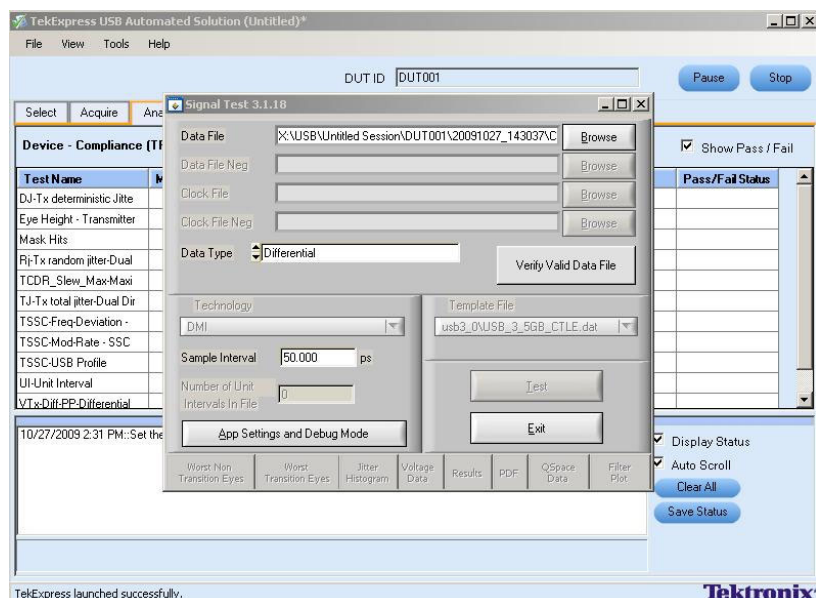


5. Click **Configure** to configure the test parameters. Note that Configure panel will be Compliance Mode only.
6. You can configure any test to help you analyze measurement results. To refer to the *DPOJET SuperSpeed (USB 3.0) Setup Library Methods of Implementation (MOI)* document for information on how to configure the Deterministic Jitter test, click **Show MOI** in the Select panel.
7. Click **Close** to close the dialog box.

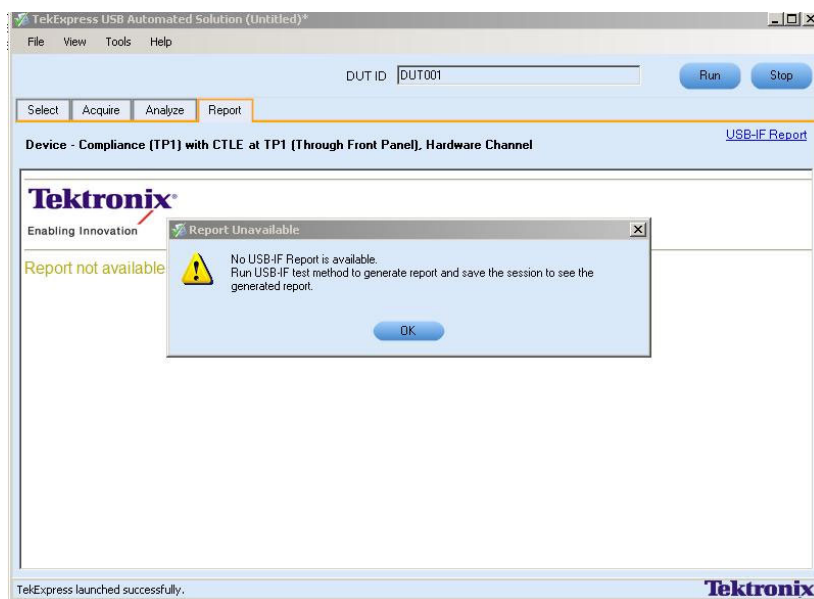


8. Click **Run** in the Select panel to run the selected test.
9. The Acquire panel shows the status of the waveform acquisition. To know more about the Acquire panel, click [here](#).
10. The Analyze tab displays the Measured, High and Low limit values and a SigTest tool pop-up appears. The Analyze tab shows the DPOJET results, not the SigTest results.

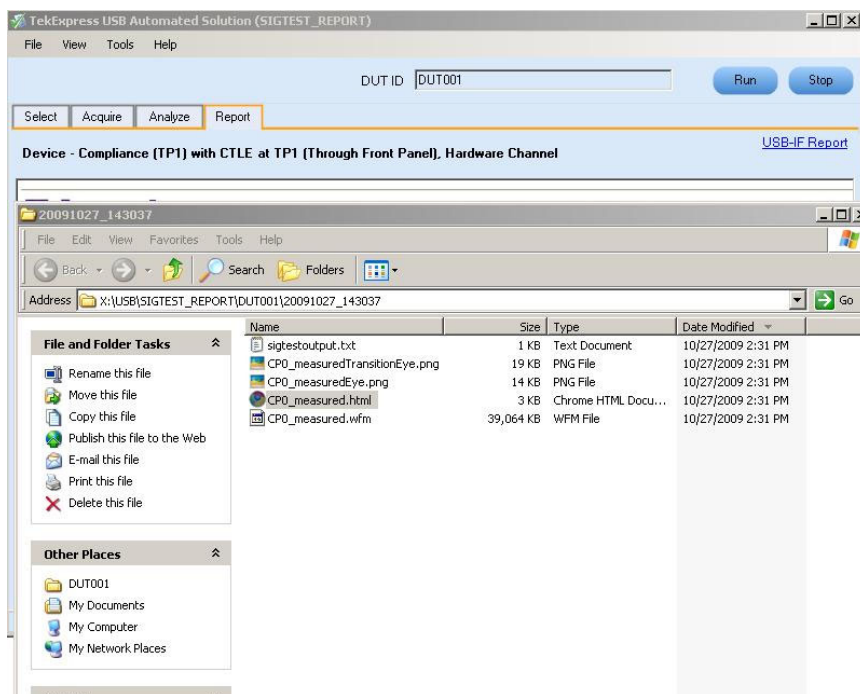
**NOTE.** For toggling from CP0 to CP1, refer to section [CP0-CP1 Toggle Using Mechanisms](#) (see page 40).



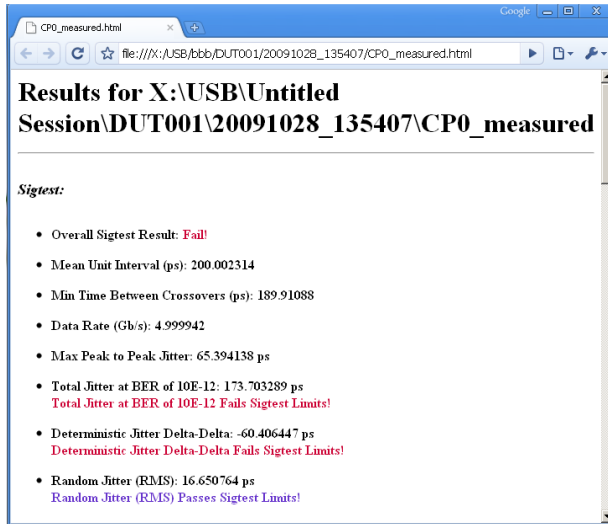
11. After the tests complete, the application prompts you to save the session. Unless the session is saved, the report is not generated.



12. Once the session is saved, click **USB-IF Report** link on the TekExpress report tab to view the report location. Double-click the .html file to view the test report.



The html report looks like the screen below.



## Set Up the Equipment

You need the following equipment:

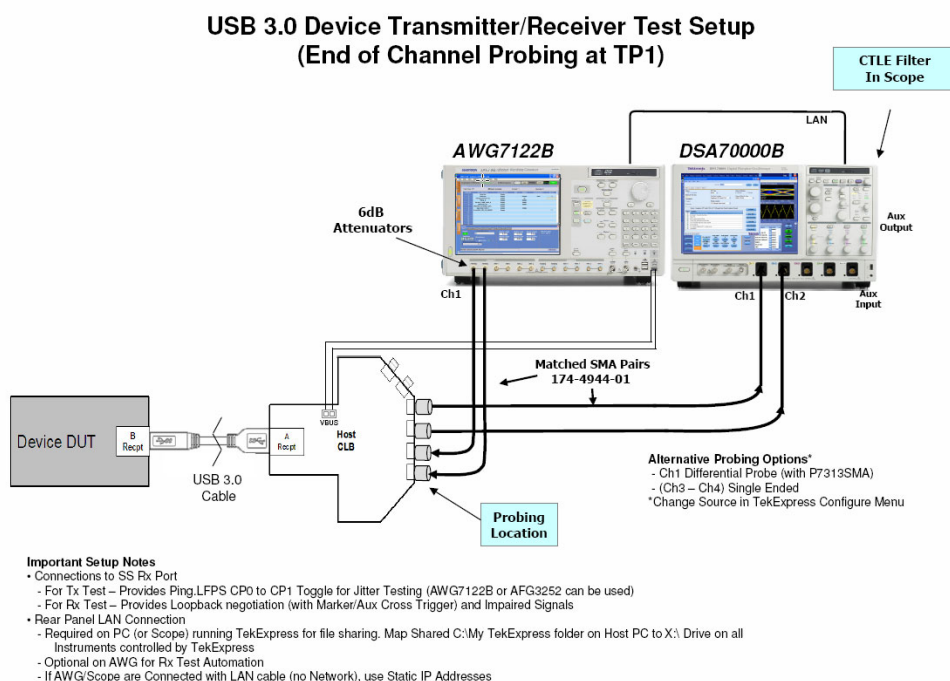
**Table 10: Required equipment**

Resource	Model supported
Real-time oscilloscope	Tektronix MSO/DPO/DSA71254 Series. Also MSO/DPO/DSA70804 Series is suitable for Normative measurements. A minimum of 12 GHz bandwidth is required for compliance testing.
Probes	Two TCS-SMA or one P7300SMA/P7500 differential probe.
Test Fixture	TF-USB3-KIT (includes short USB 3.0 cable) or USB-IF fixtures <sup>1</sup> .
AWG/AFG (optional)	AWG7102 (v3.3), AWG7122 Series (v4.1.1.5), with options 6,8. AFG3252, AFG3251, AFG3102, AFG3101.

<sup>1</sup> Available through USB-IF.

Connect the equipment as shown in the following diagram:

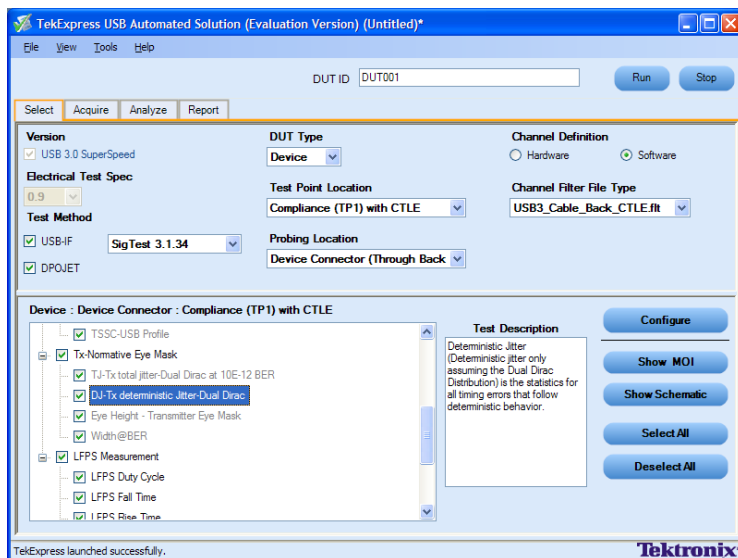
**NOTE.** The VBUS on the device fixture is typically powered from an external power supply, not from the AWG.



## Testing Deterministic Jitter on a Device Back Panel

The following procedure discusses how to use TekExpress to test the Device back panel.

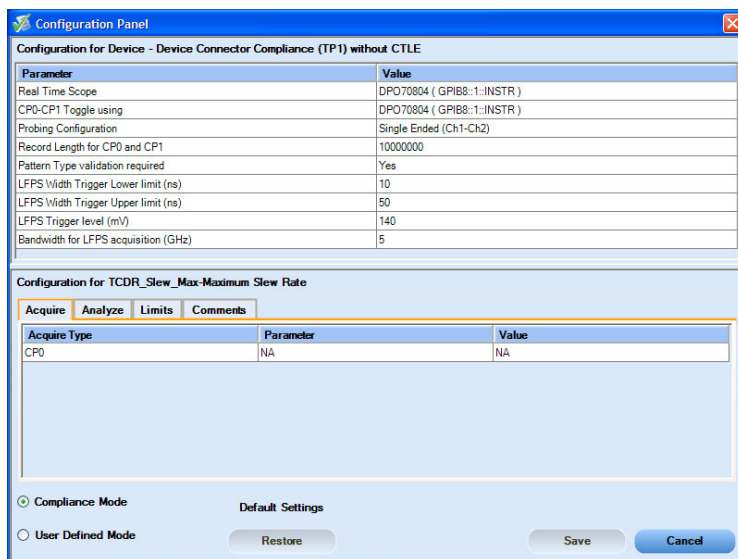
1. Select **Device** as the DUT type.
2. Select **Device Connector (Through Back Panel)** as the probing location.
3. Select **Compliance[TP1] with CTLE** as the test point.
4. Select **DJ-Tx deterministic Jitter-Dual Dirac** as the test to be run.



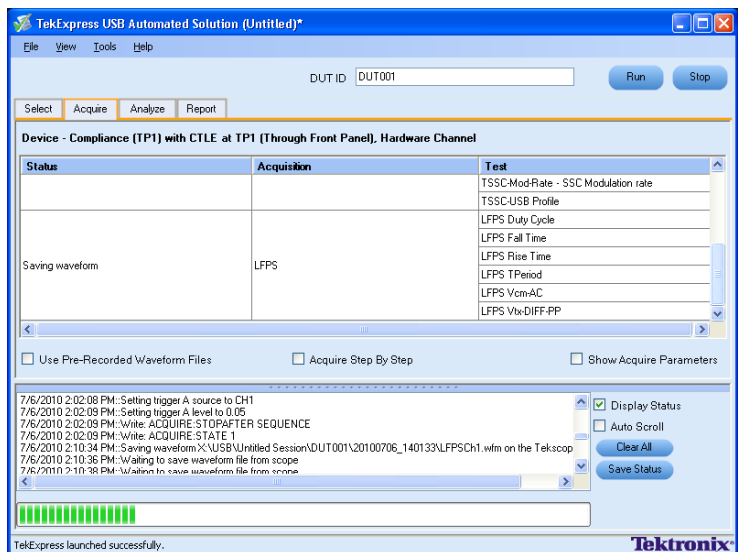
5. Click **Configure** to configure the test parameters.
6. You can configure any test to help you analyze measurement results. To refer to the *DPOJET SuperSpeed (USB 3.0) Setup Library Methods of Implementation (MOI)* document for information on how to configure the Deterministic Jitter test, click **Show MOI** in the Select panel.
7. Once you change the parameters, click **Apply** to apply the new settings for the selected test. If you want to restore the default settings, click **Restore**.

Click **Close** to close the dialog box.

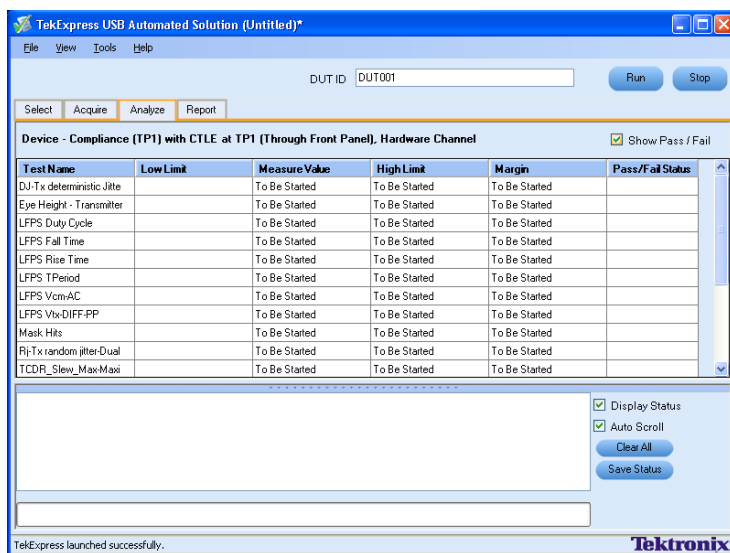




8. Click **Run** in the Select panel to run the selected test.
9. The Acquire panel shows the status of the waveform acquisition. To know more about the Acquire panel, click [here](#).

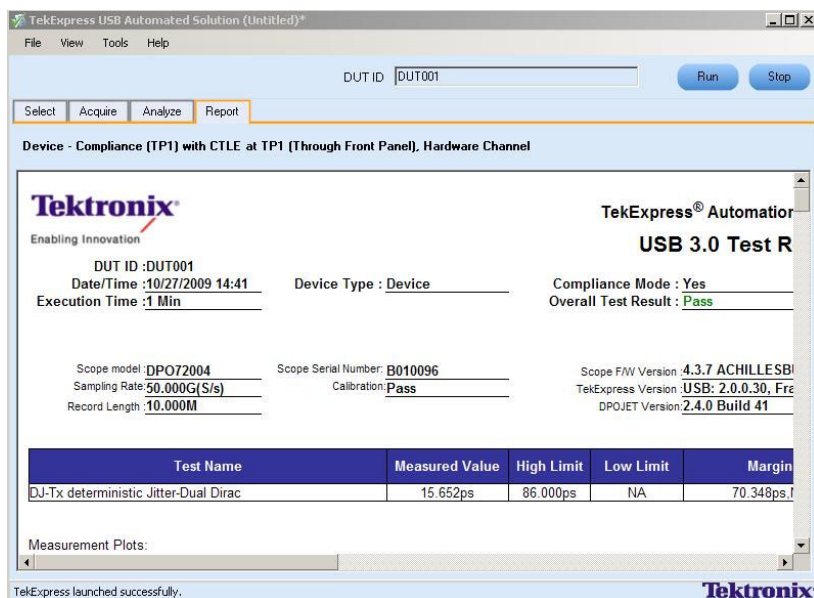


10. The Analyze tab displays the Measured, High, and Low limit values.

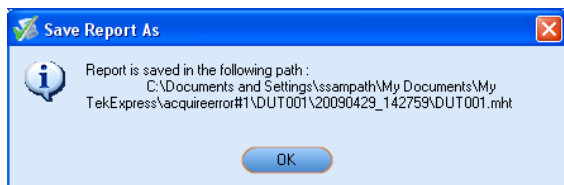


11. After the tests complete, a report is generated and displayed in the Report panel.

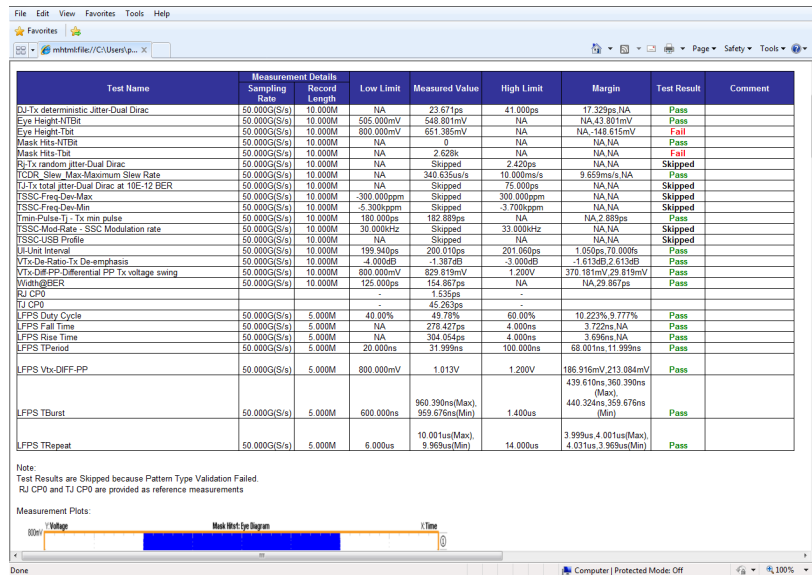
**NOTE.** For toggling from CP0 to CPI, refer to section [CP0-CPI Toggle Using Mechanisms \(see page 40\)](#).



You can save the report using the **File > Save Report As** option. The following dialog box is displayed.



If CP1 is skipped, then the measurements RJ and TJ are done on CP0 for information only.





## About the Programmatic Interface

The Programmatic interface allows you to seamlessly integrate the TekExpress test automation application with the high-level automation layer. This also allows you to control the state of TekExpress application running on a local or a remote PC. The following operations can be performed using the programmatic interface exposed by TekExpress:

- [\(see page 68\)](#) Query DUT ID
- [\(see page 69\)](#) Set DUT ID
- [\(see page 70\)](#) SaveSession
- [\(see page 72\)](#) RecallSession
- [\(see page 73\)](#) Run the TekExpress execution
- [\(see page 74\)](#) Stop the TekExpress execution
- [\(see page 76\)](#) Transfer result files
- [\(see page 77\)](#) Check the application status

---

**NOTE.** *The programmatic interface is not available for the following pop-up screens:*

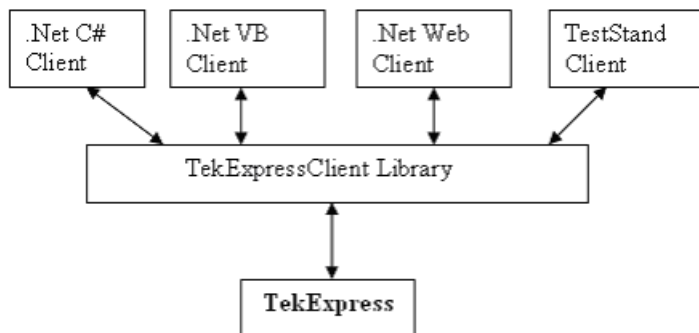
- *Scope as Toggle Tool (User Action Required, two button pop-up for CPI)*
  - *AWG as Toggle Tool (Invalid Signal, four button pop-up)*
  - *AWG as Toggle Tool (Invalid Signal, four button pop-up)*
- 

For simplifying the descriptions, the following terminologies are used in this section:

- **TekExpress Client:** A high level automation application that communicates with TekExpress using TekExpress Programmatic Interface.
- **TekExpress Server:** The TekExpress application when being controlled by TekExpress Client.

TekExpress leverages .Net Marshalling to enable the Programmatic Interface for TekExpress Client. TekExpress provides a client library for TekExpress clients to use the programmatic interface. The TekExpress client library is inherited from .Net MarshalByRef class to provide the proxy object for the

clients. The TekExpress client library maintains a reference to the TekExpress Server and this reference allows the client to control the server state.



Click the following links to get details on them:

### What does one need to have to develop TekExpress Client ?

While developing TekExpress Client one needs to use the TekExpressClient.dll. The client can be a VB .Net, C# .Net, TestStand, or a web application. The examples for interfaces in each of these applications are in `Samples` folder.

### References required

*TekExpressClient.dll* has internal reference to *IIdlglib.dll* and *IRemoteInterface.dll*. *IIdlglib.dll* has a reference to *TekDotNetLib.dll*. *IRemoteInterface.dll* provides the interfaces required to perform the remote automations. It is an interface that forms the communication line between the server and the client. *IIdlglib.dll* provides the methods to generate and direct the secondary dialog messages at the client-end.

---

**NOTE.** The end-user client application does not need any reference to above mentioned DLL files. It is essential to have these DLLs (*IRemoteInterface.dll*, *IIdlglib.dll* and *TekDotNetLib.dll*) in same folder location as that of *TekExpressClient.dll*.

---

### What steps does a client need to follow ?

The following are the steps that a client needs to follow to use the TekExpressClient.dll to programmatically control the server:

A client UI has to be developed to access the interfaces exposed through the server. This client needs to load `TekExpressClient.dll` to access the interfaces. Once the `TekExpressClient.dll` is loaded, the client UI can call the specific functions to run the operations requested by the client. Once the client is up and running, it has to do the following to run a remote operation:

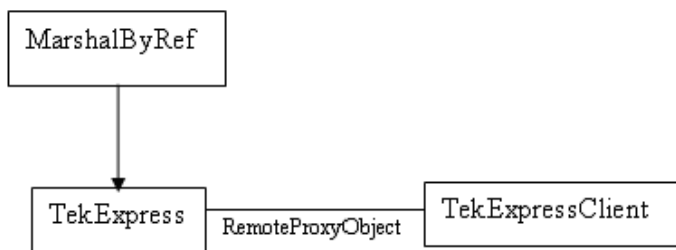
1. The client needs to provide the IP address of the PC at which the server is running in order to connect to the server.

2. The client needs to lock the server application to avoid conflict with any other Client that may try to control the server simultaneously. “Lock” would also disable all user controls on server so that server state cannot be changed by manual operation.
3. If any other client tries to access a server which is locked, it will get a notification that the server is locked by another client.
4. When the client has connected to and locked the server, the client can access any of the programmatic controls to run the remote automations.
5. Once the client operations are completed, the server needs to be “unlocked” by the client.

## Server and Client Proxy Objects

### Remote Proxy Object

The server exposes a remote object to let the remote client access and perform the server side operations remotely. The proxy object is instantiated and exposed at the server-end through marshalling.



The following is an example:

```
RemotingConfiguration.RegisterWellKnownServiceType (typeof (TekExpressRemoteInterface), "TekExpress Remote interface", WellKnownObjectMode.Singleton);
```

This object lets the remote client access the interfaces exposed at the server side. The client gets the reference to this object when the client gets connected to the server.

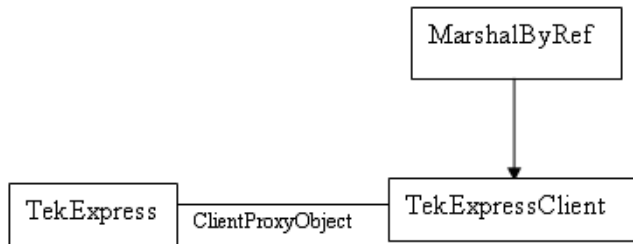
For example,

```
//Get a reference to the remote object
```

```
remoteObject = (IRemoteInterface)Activator.GetObject(typeof(IRemoteInterface), URL.ToString());
```

## Client Proxy Object

Client exposes a proxy object to receive certain information.



For example,

```
//Register the client proxy object
```

```
wellKnownServiceTypeEntry[] e = RemotingConfiguration.GetRegisteredWellKnownServiceTypes();
```

```
clientInterface = new ClientInterface();
```

```
RemotingConfiguration.RegisterWellKnownServiceType(typeof(ClientInterface),  
"Remote Client Interface", wellKnownObjectMode.Singleton);
```

```
//Expose the client proxy object through marshalling
```

```
RemotingServices.Marshal(clientInterface, "Remote Client Interface");
```

The client proxy object is used for the following:

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

[Click here to see examples.](#)

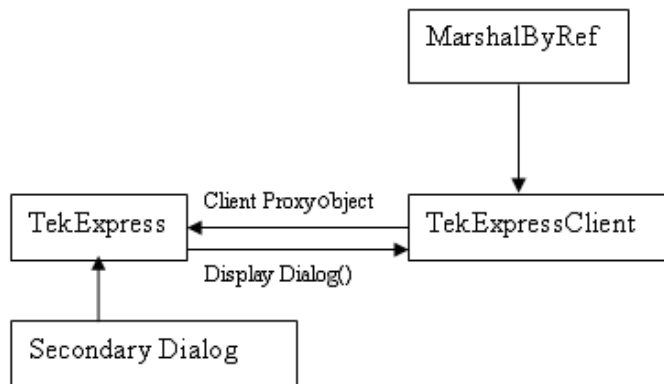
```
clientObject.clientIntf.DisplayDialog(caption, msg, iconType, btnType);
```

```
clientObject.clientIntf.TransferBytes(buffer, read, fileLength);
```



To know more on the topics below, click the links.

### Secondary Dialog Message Handling



The secondary dialog messages from the Secondary Dialog library are redirected to the client-end when a client is performing the automations at the remote end.

In the secondary dialog library, the assembly that is calling for the dialog box to be displayed is checked and if a remote connection is detected, the messages are directed to the remote end.

### File Transfer Events

When the client requests the transfer of the report, the server reads the report and transfers the file by calling the file transfer methods at the client-end.

## Connect()

**Connect(*string* ipAddress, *IRemoteClientInterface* clientIntf, out *string* clientId)**

This method connects the client to the server. The client provides the ip address of the server to connect to the server. The server provides a unique clientId when the client is connected to it.

## Parameters

Name	Type	Direction	Description
ipAddress	String	IN	The ip address of the server to which the client is trying to connect to. This is required to establish the connection between the server and the client.
clientIntf	String	IN	Is the handle of the remote object interface
clientId	String	OUT	Identifier of the client that is connected to the server. clientId = unique number + ipaddress of the client. For example, 1065-192.157.98.70

## Return Value

Value that suggests the status if the connection was established or an error occurred. The return value is an object that can be a boolean value, returning true or a string, returning the error message.

## Example

```
try {
    IPAddress[] hostIPAddr = Dns.GetHostAddresses(Dns.GetHostName());
    // Connect to the remoter Server
    remoteObject.Connect(hostIPAddr, clientInterface, out clientId);
    return true;
}
catch (Exception error)
{
    return error;
}
```

## Comments

The server has to be active and running for the client to connect to the server. Any number of clients can be connected to the server at a time. Each client will get a unique id.

## Disconnect()

### Disconnect(*string* id)

This method disconnects the client from the server it is connected to.

#### Parameters

Name	Type	Direction	Description
id	String	IN	Identifier of the client that is performing the remote function.

#### Return Value

Integer value that suggests the status of the operation after it has been performed.

1 – Success

-1 – Failure

#### Example

```
try
{
    string returnUrl = UnlockServer (clientId);
    remoteObject.Disconnect (clientId);
    return 1;
}
```

#### Comments

When the client is disconnected, it is unlocked from the server and then disconnected. The id is reused.

## LockSession()

### LockSession(*string* id)

This method locks the server. The client has to call this method before running any of the remote automations. The server can be locked by only one client.

### Parameters

Name	Type	Direction	Description
id	String	IN	Identifier of the client that is performing the remote function.

### Return Value

String value that suggests the status of the operation after it has been performed.

### Example

```
if (locked)
    return "Session has already been locked!";
returnVal = remoteObject.LockSession(clientId);
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)
{
    locked = true;
    return "Session Locked...";
}
```

### Comments

When the client tries to lock a server that is locked by another client, the client gets a notification that the server is already locked and it has to wait until the server is unlocked.

If the client locks the server and is idle for a certain amount of time then the server is unlocked automatically from that client.

## UnlockSession()

### UnlockSession(*string* id)

This method unlocks the server from the client. The client id of the client to be unlocked has to be provided.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.UnlockSession(clientId);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
{  
    locked = false;  
    return "Session Un-Locked...";  
}
```

#### Comments

When the client is disconnected, it is automatically unlocked.

## GetDutId()

### GetDutId(*string* id, *string* dutId)

This method gives the DUT id of the current set-up.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.
dutId	string	OUT	The DUT id of the set-up.

#### Return Value

String that gives the timeout period (in seconds) of the client.

#### Example

```
returnVal = remoteObject.GetDutId(clientId, out id);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
{  
    return id;  
}  
else  
    return CommandFailed(returnVal);
```

#### Comments

The dutId is an OUT parameter whose value is set after the server processes the request.

## ChangeDutId()

### ChangeDutId(*string* id, *string* dutName)

This method changes the DUT id of the set-up. The client has to provide a valid DUT id.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.
dutName	string	IN	The new DUT id of the set-up.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
If (dut Id.Length <=0 && locked == true)
    return "Enter a valid DUT-ID";
returnVal = remoteObject.ChangeDutId(clientId, dutId);
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)
    return "DUT Id Changed...";
else
    return CommandFailed(returnVal);
```

#### Comments

If the dutName parameter is null, the client is prompted to provide a valid DUT id.

## SaveSession()

### SaveSession(*string* id, *string* name)

Saves the current session. The name of the session is provided by the client.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.
name	string	IN	The name of the session being saved.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.SaveSession(clientId,sessionName);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
    return "Session Saved...";  
else  
    return CommandFailed(returnVal);
```

#### Comments

The name parameter cannot be empty. If it is empty, the client is prompted to provide a valid name.

Once the session is saved under 'name' you cannot use this method to save the session in a different name. Instead SaveSessionAs can be used.



## SaveSessionAs()

### SaveSessionAs(*string* id, *string* name)

Saves the current session in a different name every time this method is called. The name of the session is provided by the client.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.
name	string	IN	The name of the session being saved.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.SaveSessionAs(clientId,sessionName);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
    return "Session Saved...";  
else  
    return CommandFailed(returnVal);
```

#### Comments

The same session is saved under different names using this method. The name parameter cannot be empty. If it is empty, the client is prompted to provide a valid name.

## RecallSession()

### RecallSession(*string* id, *string* name)

Recalls a saved session. The name of the session is provided by the client.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.
name	string	IN	The name of the session being recalled.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.RecallSession(clientId,sessionName);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
    return "Session Recalled...";  
else  
    return CommandFailed(returnVal);
```

#### Comments

The name parameter cannot be empty. If it is empty, the client is prompted to provide a valid name.

## Run()

### Run(*string* id)

Runs the setup. Once the server is set up and is configured, it can be run remotely using this function.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.Run(clientId);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
    return "Run started...";  
else  
    return CommandFailed(returnVal);
```

#### Comments

When the run is performed the status of the run is updated periodically using a timer.

## Stop()

### Stop(*string* id)

Stops the run operation.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.Stop(clientId);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
    return "Stopped...";  
else  
    return CommandFailed(returnVal);
```

#### Comments

When the session is stopped the client is prompted to stop the session and is stopped at the consent.

## Status()

### Status(string id, out string[] status)

This method gives the status of the run as messages. The status messages are generated once the run is started.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.
status	string array	OUT	The list of status messages generated during run.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.QueryStatus(clientId, out statusMessages);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
    return "Status updated...";  
else  
    return CommandFailed(returnVal);
```

#### Comments

The status messages are updated periodically after the run begins. The status is an out parameter which is set when the server processes the request.

## TransferReport()

### TransferReport(*string* id)

This method transfers the report generated after the run. The report contains the summary of the run. The client has to provide the location where the report is to be saved at the client-end.

#### Parameters

Name	Type	Direction	Description
id	string	IN	Identifier of the client that is performing the remote function.

#### Return Value

String that suggests the status of the operation after it has been performed.

#### Example

```
returnVal = remoteObject.TransferReport(clientId);  
if ((OP_STATUS)returnVal == OP_STATUS.SUCCESS)  
    return "Transferred...";  
else  
    return CommandFailed(returnVal);
```

#### Comments

If the client does not provide the location to save the report, the report is saved at C:\ProgramFiles.

## ApplicationStatus()

### ApplicationStatus(string id)

This method gets the status (ready, running, paused) of the server application.

#### Parameters

Name	Type	Direction	Description
Id	string	IN	Identifier of the client that is performing the remote function.

#### Return Value

String value that gives the status of the server application.

#### Example

```
returnVal = remoteObject.ApplicationStatus(clientId);  
return returnVal;
```

#### Comments

The application can be in one of the following states at a given time:

- Ready – Test configured and ready to start
- Running – Test running
- Paused – Test paused

## Select Panel Parameters

	Parameters	Default Value	Options/Range	Example
Select DUT Type			Device, Host	SelectDevice(clientId, device, true);
Select Test				SelectTest(clientId, device, devicesuite, "UI-Unit Interval", boolSelect);
Select parameters from Select Panel	Version		List from available versions	SetGeneralParameter(clientId, device, devicesuite, "", "Version\$Compliance (TP1) without CTLE")
	Probing Location		List from available probing locations	SetGeneralParameter(clientId, device, devicesuite, "", "Probing Location\$TP1 (Through Back Panel)")
	Channel Definition		Software, Hardware	SetGeneralParameter(clientId, device, devicesuite, "", "Channel Definition\$Software")
	Test Tool		DPOJET, USB-IF, Both	SetGeneralParameter(clientId, device, devicesuite, "", "Test Tool\$USB-IF")
	Channel Filter File Type		List from the filter files available with the software	SetGeneralParameter(clientId, device, devicesuite, "", "Channel Filter File Type\$Custom Filter File")
	Custom Filter File		List from available user defined filter files	SetGeneralParameter(clientId, device, devicesuite, "", " Custom Filter File\$USB4_Cable.fit ")
Instrument Configuration	Real Time Scope	<Instrument Address>	List from Instrument discovery	SetInstrument(clientId, device, devicesuite, "UI-Unit Interval", "AnalyzeInstrument\$Real Time Scope\$ DPO71254C (GPIB0::1::INSTR)")
	Signal Generator	<Instrument Address>	List from Instrument discovery	SetInstrument(clientId, device, devicesuite, "UI-Unit Interval", "AnalyzeInstrument\$Signal Generator\$AWG7122B (GPIB0::2::INSTR)");
Selecting general parameters from Configuration panel	Probing Configuration		List from available probing locations	SetGeneralParameter(clientId, device, devicesuite, "", "Probing Configuration\$Differential (Ch1)")
	Record Length		500 – 10000000	SetGeneralParameter(clientId, device, devicesuite, "", "Record Length\$7000");
	CP0			SetAcquireParameter(clientId, device, devicesuite, "UI-Unit Interval", "CP0\$NA\$7")



## Error Codes

The return value of the remote automations at the server-end is OP\_STATUS which is changed to a string value depending on its code and returned to the client.

The values of OP\_STATUS are as follows:

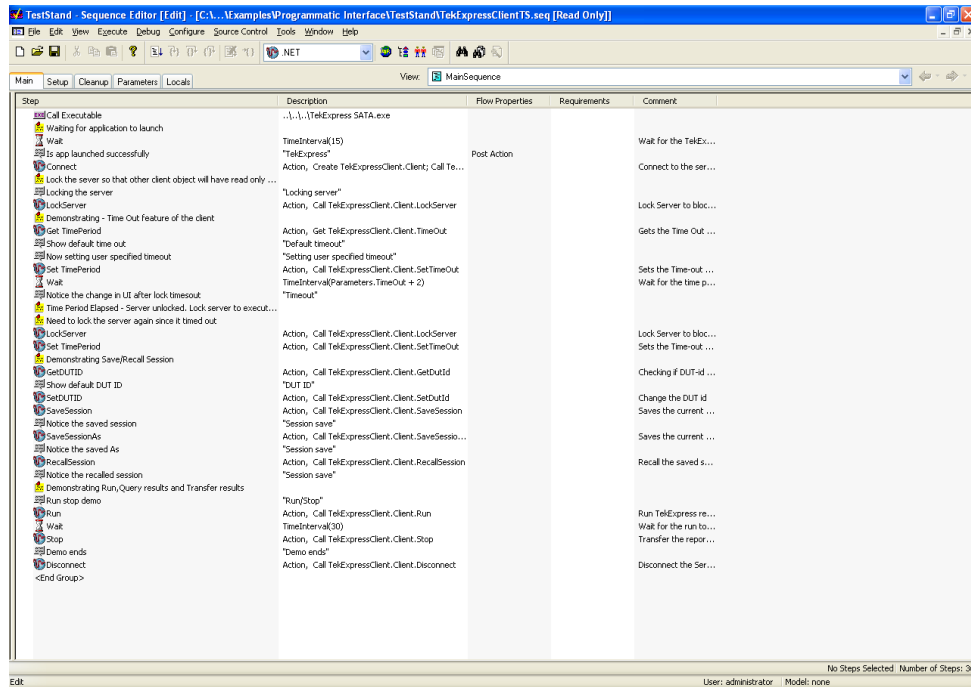
Value	Code	Description
FAIL	-1	The operation failed.
SUCCESS	1	The operation succeeded.
NOTFOUND	2	Server not found
LOCKED	3	The server is locked by another client, so operation cannot be performed.
UNLOCK	4	The server is not locked. Lock the server before performing the operation.
NULL	0	Nothing

## Example

The following is an example for NI TestStand Client available in the following path.

For Windows 7 — C:\Program Files (x86)\Tektronix\TekExpress\TekExpress USB\Examples\Programmatic Interface\TestStand.

For Windows XP and XP Embedded — C:\Program Files\Tektronix\TekExpress\TekExpress USB\Examples\Programmatic Interface\TestStand



## Instrument Connectivity

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.

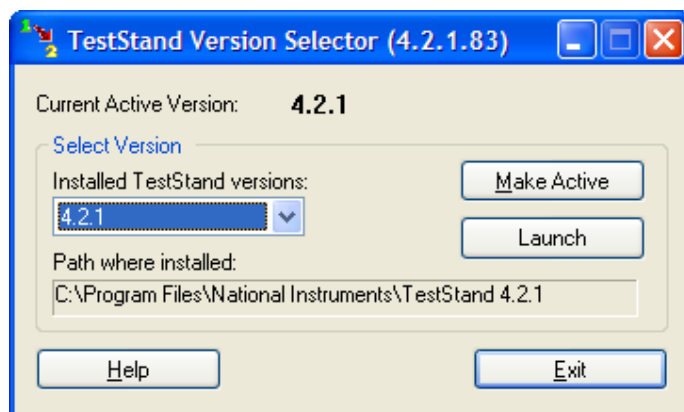
If Instrument initialization fails during test sequence execution, do the following:

It is observed that GPIB communication with instrument over Tek-VISA layer is not initialized if in TekVISA Instrument manager the search criteria is turned-off, even if a valid instrument is connected in the network. It is necessary to turn ON the respective search criteria by opening the TekVISA Instrument manager.

## TestStand Run time Engine Installation

Managing multiple versions of TestStand installed on the system.

TekExpress installs TestStand version 4.2.1 runtime engine. If you have other versions, ensure that the version shipped with TekExpress is active while working with TekExpress. You can do so by clicking **Start > Programs > National Instruments > TestStand 4.2.1 > TestStand Version Selector**.





## Shortcut Keys

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

**Table 11: Keyboard shortcut keys**

Menu	Shortcut keys
<b>File</b>	Alt + F
New Session	Ctrl + N
Open Session...	Ctrl + O
Save Session...	Ctrl + S
Save Session As	Alt + F + A
Save Report As...	Alt + F + R
Print Preview Report	Alt + F + V
Print Report...	Ctrl + P
Exit	Ctrl + X
<b>View</b>	Alt + V
Log	Ctrl + L
<b>Tools</b>	Alt + T
Instrument Bench	Ctrl + I
E-mail settings	Ctrl + E
<b>Help</b>	Alt + H
TekExpress Help (F1)	Alt + H + H
About TekExpress	Alt + H + A
Activate License	Alt + H + L



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