Tektronix

Online Help

TDSDVI
DVI Compliance Test Solution

077-0022-03

Adapted from TDSDVI Compliance Test Solution Online Help

www.tektronix.com

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 the measurement instrument or any products connected to it. To avoid potential hazards, use the software and measurement instrument only as specified.

While using this software, you may need to access other parts of the system. Read the General Safety Summary and specification sections in other equipment manuals for warnings, cautions, and ratings related to operating the system with this software.

To avoid Fire and Personal Injury:

Connect and Disconnect Properly. Connect the probe output to the measurement instrument before connecting the probe to the circuit under test. Disconnect the probe input and the probe ground 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 measurement instrument and other equipment used with this software. Consult the individual product manuals for further ratings information before making connections to the circuit under test.

Do Not Operate With Suspected Failures. If you suspect there is damage to the measurement instrument or other equipment being used with this software, have it inspected by qualified service personnel.

Symbols and Terms: The following terms and symbol(s) may appear in the manual.

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

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

Introduction

The TDSDVI is a Digital Visual Interface Compliance Test Solution that helps test, validation, and design engineers perform DVI physical layer validation and compliance testing. TDSDVI Test Solution is the first test solution to provide credible test results in conformance with the DVI specifications and the DVI Test and Measurement Guide.
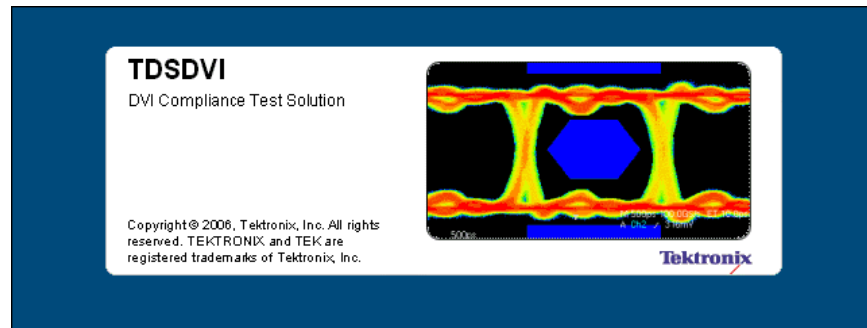
Figure 1: TDSDVI Application

TDSDVI provides fully automatic testing with automatic oscilloscope setups, eye mask generation, and parametric testing for DVI compliance.

The TDSDVI complies with the DVI specifications and:

- Enables the DVI developers to test designs according to the test procedures in the DVI Test and Measurement Guide.

- Offers automated tests for:

    - Transmitter: Eye Diagram, Pk-Pk Jitter, Intra-Pair Skew, Inter-Pair Skew, and Rise and Fall Time

    - Cable: High-Amplitude Eye Diagram, Low-Amplitude Eye Diagram, Pk-Pk Jitter, Intra-Pair Skew, and Inter-Pair Skew

    - Receiver: High-Amplitude Eye Diagram and Low-Amplitude Eye Diagram

- Automatic "one-button" testing ensures faster validation with higher reliability.

- Supports all resolutions up to UXGA.

- Half Clock and Pseudo Random Patterns for various resolutions allow testing according to DDWG procedures.

Online Help and Related Documentation

You can access the information on how to operate the application along with the oscilloscope through the following related documents and online help.

Using Online Help

Select Help on the right side of the oscilloscope menu bar to bring up the help file.

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.

Find tab — allows a text-based search. Follow these steps:

1. Type the word or phrase you want to find in the search box.

2. Select some matching words in the next box to narrow your search.

3. Choose a topic in the lower box, and then select the Display button.

To print a topic, select the Print button from the Help Topics menu bar.

Select Options from the menu bar for other commands, such as Refresh.

Select the Back button to return to the previous help window. Use the Hyperlink 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.

Sometimes you will see the word **Note** in the topic text. This indicates important information.

Note: Certain aspects of the online help are unique to applications that run on the oscilloscope.

Blue or green underlined text indicates a jump (hyperlink) to another topic. Select the underlined text to jump to the related topic. Select the underlined text to jump to the related topic. For example, select the blue text to jump to the topic on Online Help and Related Documentation and the Back button to return to the topics page.

Tip You can tell when the cursor is over an active hyperlink (button, jump, or pop-up), because the cursor arrow changes to a small hand.

Note: This graphic **Tip** *identifies additional information that will help you use the application more efficiently.*

Printing from Online Help

While using the TDSDVI online help, you can print topics and information from the Help viewer. Some online help topics have color in the examples of the displayed application. If you want to print this type of topic on a monochrome printer, some information may not print because of certain colors. Instead, you should print the topic from the PDF (portable document format) file that corresponds to the Online Help. You can find the file in the Documents directory on the *Optional applications Software on Windows-Based Oscilloscopes* DVD. The figures of application menus in the PDF file are gray scale so the relevant information will appear on the printed page.

To print a single topic:

1. Find the topic in the Contents pane.

2. Click Print.

3. Click Print the selected topic and click OK.

To print all topics in a selected TOC book:

1. Find the TOC book in the Contents pane.

2. Click Print.

3. Click Print the selected heading and all subtopics and click OK.

Related Documentation

■ Oscilloscope Information: The user manual and user online help for your oscilloscope provides general information on how to operate the oscilloscope.

■ You can download PDF versions of many user manuals from the Tektronix Web site.

■ Programmer Information: The online programmer guide for your oscilloscope provides details on how to use GPIB commands to control the oscilloscope.

You can download programmer information and examples from the Tektronix Web site.

Refer to the *Optional Applications Software on Windows-Based Oscilloscopes Installation Manual* for the following information:

- Software warranty

- Software license agreement

- List of all available applications, compatible oscilloscopes, and relevant software and firmware version numbers

- Applying a new label

- Installing procedures

- Enabling an application

- Downloading updates from the Tektronix Web site

You can find a PDF (portable document format) file for this document in the Documents directory on the *Optional Applications Software on Windows-Based Oscilloscopes* DVD. The CD booklet only contains information on installing the application from the CD and on how to apply a new label.

Conventions

This online help uses the following conventions:

- Refers to the TDSDVI Compliance Test Solution as the TDSDVI or as the application or the software.

- ESB refers to the Equivalent Source Board, HCP to Half Clock Pattern and PRP to Pseudo Random Pattern.

- When steps require a sequence of selections using the application interface, the ">" symbol marks each transition between a menu and an option. For example, File> Minimize.

- GP knob refers to the General Purpose Knob.

- DUT refers to the device under test. This can be a Transmitter, Cable, or a Receiver device.

- CRU is the Clock Recovery Unit.

- In the application fields, you can use either the calculator keypad or the GP knob to enter the values.

- PLL Clk or PLL Clock refers to the Phase Locked Loop Clock.

Feedback

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

Direct your feedback via e-mail to techsupport@tektronix.com or dvifeedback@tek.com or FAX at (503) 627-5695 and include the following information. Please be as specific as possible.

General information:

- Oscilloscope model number and 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

- Firmware version of the oscilloscope

- Description of the problem such that technical support can duplicate the problem

- If possible, save the oscilloscope and application setup files as .set or .ini files

- If possible, save the waveform on which you are performing the measurement as a .wfm file

Once you have gathered this information, you can contact technical support by phone or through e-mail. If using e-mail, be sure to enter in the subject line "TDSDVI Problem", and attach the .set, .ini and .wfm files.

TDSDVI-DVI Compliance Test Solution

Getting Started

Compatibility

For information on oscilloscope Compatibility, refer to the *Optional Applications Software on Windows-Based Oscilloscopes Installation Manual*, Tektronix part number 077-0067-XX. The manual is also available as a PDF file.

Requirements and Restrictions

Do not change the oscilloscope settings when a test is running. If you change the settings, the application may give incorrect test results.

Prerequisites

- Read the Readme.txt file before you install the application.

- TekVisa must be installed on the oscilloscope. If you do not have TekVisa, you can download it from www.tektronix.com.

- The Sun Java Run-Time Environment V1.4.2 must be installed on the oscilloscope to operate the application. If Java Run-Time Environment is not installed, it will be automatically installed when you install the application. If you remove JRE v1.4.2, you can reinstall it by reinstalling the application.

- If the signal is not connected and the noise level is below 50 mV, the application detects this and displays the message: "Improper Waveform".

- To get appropriate results in Pk-Pk Jitter measurements, from the oscilloscope menu bar, select Measure> Waveform Histograms> Adjust Histogram Box Limits.

For better and reliable results

To calibrate (Signal Path Compensation) an oscilloscope, select Utilities> Instrument Calibration in the oscilloscope menu bar and select the Calibrate button.

Accessories

The application supports the following differential probes:

- P7350

- P7330

- P6330

The application supports the following single-ended probes for skew testing:

- P7240

- P6249

Other accessories

- SMA Cable to connect recovered (PLL) clock from the TPA-R and TPA-P fixture

- TCA-BNC adapter to use a P6330 probe

- TCA-SMA adapter to use the SMA cables

Updates from the Web site

You can find information about this and other applications at the Tektronix Web site, www.tektronix.com. Check this site for application updates and other free applications.

To install an application update, you will need to download it from the Tektronix Web site to the oscilloscope hard disk.

Note: More information about changes to the application or installation is in a Readme.txt file on the Web site. You should read it before you continue.

Installation and Uninstallation Procedures

Installing the Application

Refer to the *Optional Applications Software on Windows-Based Oscilloscopes Installation Manual* for the following information:

- Installing procedures

- Applying a new label

- Enabling an application

- Downloading updates from the Tektronix Web site

You can find a PDF (portable document format) file for this document in the Documents directory on the *Optional Applications Software on Windows-Based Oscilloscopes* DVD. The CD booklet contains information on how to install the application from the CD and on how to apply a new label.

Uninstalling the Application

To uninstall the application:

1. On the Windows task bar, select Start> Settings.

2. Select Control Panel> Add/Remove Programs.

3. Select DVI Compliance Test Solution from the programs list. Select Add/Remove and the Installshield will take you through the uninstallation procedures.

Basic Application Functions

Starting the Application

Follow these steps to start the application:

1. Depending on the type of oscilloscope, you can start the application in one of the following ways:

   ▪ Select File> Run Application> DVI Compliance Test Solution from the oscilloscope menu bar.

   ▪ Select Analyze> DVI Compliance Test Solution.

2. A splash screen indicates that the software loading is in progress.

3. The oscilloscope display resizes to fit the upper half of the screen and the lower half of the oscilloscope screen displays the TDSDVI application user interface. If you access the oscilloscope functions, the oscilloscope display appears in full screen and the TDSDVI application interface recedes to the background.

Maximizing and Minimizing the Application Window

The application appears even when you minimize the oscilloscope display.

1. To minimize the application, select File> Minimize.

2. To maximize the application, select TDSDVI application in the Windows toolbar.

3. To hide the application, select the Hide button .

Note: If you select Hide button, the TDSDVI application window minimizes to the Windows taskbar and the oscilloscope display resizes to the full screen.

If you select File> Minimize, the application window minimizes to the Windows taskbar. The upper half of the screen shows the oscilloscope display and the lower half of the screen shows the Windows desktop.

Returning to the Application

To return to the application, do one of the following:

▪ Select the App button on the top right side of the oscilloscope.

▪ Select Analyze> Restore Application.

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Exiting the Application

To exit the application select File> Exit or select ✖ from the right corner of the application.

Application Directories and File Names

The application uses specific directories to save and recall files. The following table lists the default directory names:

Table 1: Application directories

Directory	Function
C:\TekApplications\TDSDVI\Setup	Stores the application setup files
C:\TekApplications\TDSDVI\Reports	Stores the generated report
C:\TekApplications\TDSDVI\Images	Stores the zoomed eye images with the statistics
C:\TekApplications\TDSDVI\Patterns	Stores the Pseudo Random and the Half Clock Patterns

File Name Extensions

The application uses these file name extensions to identify the file type. The following table lists the file name extensions:

Table 2: File name extensions

File name extensions	Description
.ini	Application setup file
.set	Oscilloscope setup file saved and recalled with a .ini file; both the files will have the same file name
.html	Report file or a compared result file
.bmp	Format of the HCP and PRP pattern files
.jpg	Eye mask image file
.gif	Tektronix logo image

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Operating Basics

The TDSDVI application is a Windows-based application. The application window contains a Menu Bar, Device Selection Tab, Measurement Selection Pane and the Status Bar.

You can select Transmitter, Cable, or Receiver from the Device Selection Tab. Select any of the device to display its measurement selection pane.

Application Interface Controls

The application uses a Window interface.

Note: The oscilloscope application shrinks to half size and appears in the top half of the display when the application is running.

The following table lists the application interface controls:

Table 3: Application interface controls

Control	Description
Menu bar	Located at the top of the application window and provides access to the application menus
Area/Tab	Enclosed visual frame with a set of related options
Option button	Selects a command or task
Drop-down List box	Lists items from which you can select one item
Field	Box that you can use to type in text or to enter a value with the keypad or a multipurpose knob
Check Boxes	Box that you use to select or clear preferences
Scroll bar	Vertical or horizontal bar at the side or bottom of a display area used to move around that area
Browse	Displays a window where you can look through a list of directories and files
Command button	Initiates an immediate action
Keypad	Used to enter numeric values
MP/GP knob	Displays a line between the knob and the box. You can turn the knob on the oscilloscope to select a value

Measurement Selection

The measurement area, displayed in the center of the application window, displays the measurements you can select. These measurements vary depending on the selected tab.

The application has three tabs: the Transmitter, the Cable, and the Receiver, based on the device to be tested.

Transmitter Tab

If you select any measurement in the Transmitter Tab and click Configure, the configuration parameters for the selected measurement appears.

Figure 2: Transmitter Tab

The following figure shows the parameters you can configure for Transmitter measurements:

	Data	Trigger	Pair	Pair1	Pair2	Number of Eyes	Vswing	Tx Clock	Source1	Source2	Hysteresis
Eye Diagram	✔	✔	✔			✔	✔				
Rise and Fall Time	✔	✔	✔				✔				✔
Pk-Pk Jitter		✔						✔			
Intra-Pair Skew			✔						✔	✔	✔
Inter-Pair Skew				✔	✔				✔	✔	✔

Figure 3: Transmitter Measurements Matrix

Cable Tab

If you select any measurement in the Cable Tab and click Configure, the configuration parameters for the selected measurement appear.

TDSDVI-DVI Compliance Test Solution
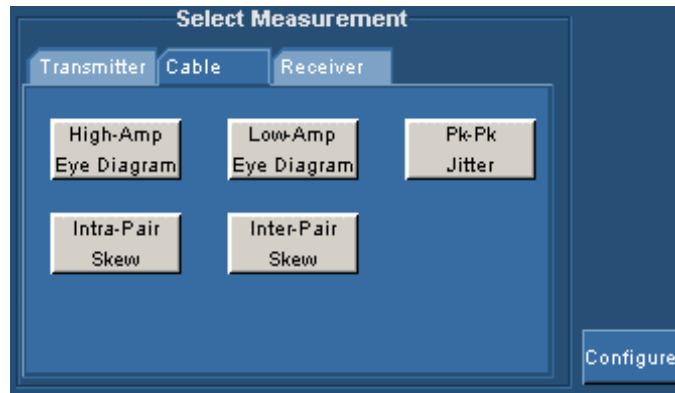
Figure 4: Cable Tab

The following figure shows the parameters you can configure for Cable measurement:

	Data	Trigger	Pair	Pair1	Pair2	Number of Eyes	Vswing	Tx Clock	Source1	Source2	Hysteresis
Hi-Amp Eye Diagram	✔	✔	✔			✔					
Low-Amp Eye Diagram	✔	✔	✔			✔					
Pk-Pk Jitter		✔						✔			
Intra-Pair Skew			✔						✔	✔	✔
Inter-Pair Skew				✔	✔				✔	✔	✔

Figure 5: Cable measurements matrix

Receiver Tab

If you select any measurement in the Receiver Tab and click Configure, the configuration parameters for the selected measurement appear.
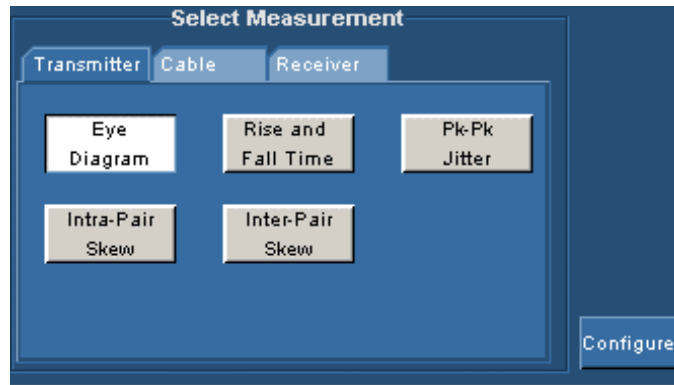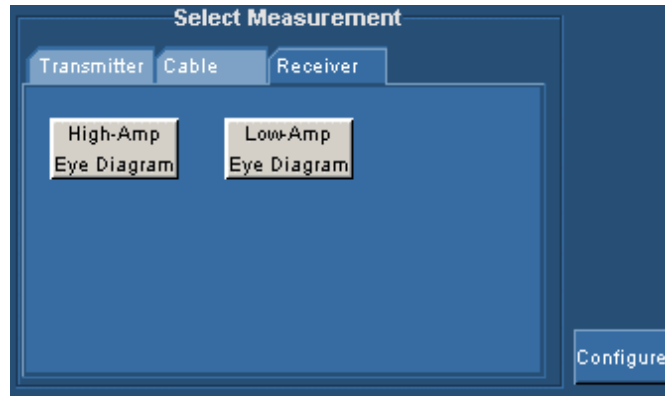

Figure 6: Receiver tab

The following figure shows the parameters you can configure for Receiver measurement:

	Data	Trigger	Pair	Pair1	Pair2	Number of Eyes	Vswing	Tx Clock	Source1	Source2	Hysteresis
High-Amplitude Eye Diagram	✓	✓	✓			✓					
Low-Amplitude Eye Diagram	✓	✓	✓			✓					

Figure 7: Receiver measurements matrix

Device Selection Tab

The device selection area is displayed above the measurement selection area of the application. You select the device based on your test. Click on any of the tabs to display the measurements associated with it.

Figure 8: Transmitter, Cable, and Receiver tabs

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Define Tbit Selection Area

The Define Tbit Selection Area displayed next to the Measurement Selection Area, helps you to define the Tbit parameters for all the measurements. You can select the Calculated option to assign a channel for the Tx Clock and calculate Tbit or select the User option to set a custom value. The application displays the calculated value in the Tbit Value field.
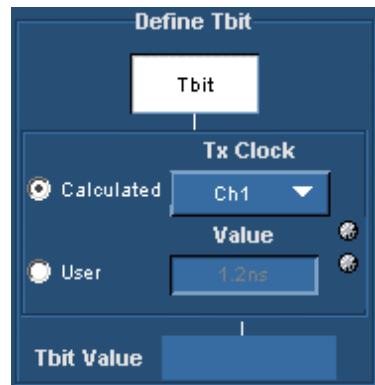
Figure 9: Define Tbit selection area

Control Panel

The control panel on the right of the application displays the dual-purpose

Run/Stop button. The Run is a toggle button, which changes to Stop when you run any measurement.
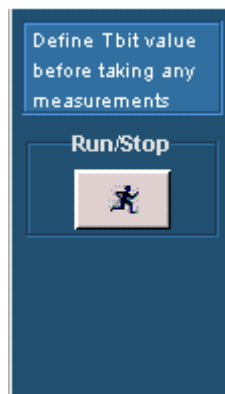
Figure 10: Control panel

The following table lists the control panel options:

Table 4: Control panel

Button	Button Name	Description
![run icon] ![stop icon]	Run/Stop	Executes the selected measurement or stops the application when the application is running

Status Bar

The status bar is displayed at the bottom of the application window. It displays the selected menu, related hint, and the status of the application.

| Menu: Measurements > Select | Hint: Define Tbit,then select a measurement to configure | Status: Ready |

Figure 11: Status Bar

Menus

The menu bar of the TDSDVI application provides access to the menus.

File   Measurements   Results   Utilities   Help
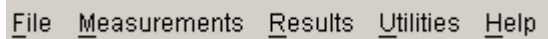
Figure 12: Application menus

File Menu

File   Measurements   F
Recall Default
Save...
Recall...
Recently Saved   ▶
Recently Recalled   ▶
Preferences...
Minimize
Exit

Figure 13: File menu

The following table describes the file menu items:

Table 5: File menu items and their descriptions

Menu Selection	Description
Recall Default	Recalls the default settings of the application
Save	Saves the application settings to a .ini file and the oscilloscope settings in a .set file
Recall	Recalls the previously saved settings of the application from an .ini file and the oscilloscope settings from a .set file
Recently Saved	Displays the recently saved setup
Recently Recalled	Displays the recently recalled setup
Preferences	Displays user preferences in two tabs In the General tab: ▪ Use Cursors for Eye, RT & FT Testing ▪ Prompt for signal connection ▪ Ref Wfm deletion prompt for Eye Diagram Test ▪ Show report after generation ▪ Use zoomed eye mask in report In the Advanced tab: ▪ Prompt for result reset ▪ Prompt for Tbit validity ▪ Select the test points for Cable Eye Diagram ▪ Specifies the number of acquisitions to create Eye Diagram in the Value field. This input is common for the General and Advanced tab
Minimize	Minimizes the application window
Exit	Exits the application window

Measurements Menu

Figure 14: Measurements menu

The following table describes the measurement menu items:

Table 6: Measurement menu items and their descriptions

Menu Selection	Description
Select	Allows you to select the measurements to be performed
Configure	Allows you to configure the parameters for the selected measurement

Results Menu
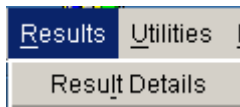
Figure 15: Results menu

The following table describes the results menu items:

Table 7: Results menu items and their descriptions

Menu Selection	Description
Result Details	Displays the detailed results of the selected measurement

Utilities Menu
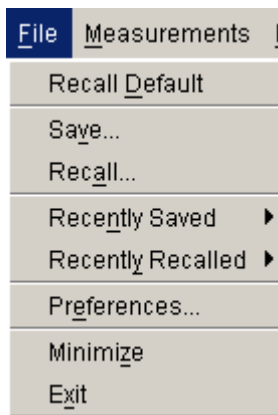

Figure 16: Utilities menu

The following table describes the utilities menu items:

Table 8: Utilities menu items and their descriptions

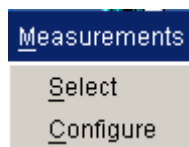| Menu Selection	Description
Report Generator	Displays the tabs— Report Setup and Report Name— to set the parameters for generating the reports
Compare Results	Allows you to compare the current displayed result with a previous result from a file or two previous results from two files

Help Menu

Figure 17: Help menu

The following table describes the help menu items:

Table 9: Help menu items and their descriptions

Menu Selection	Description
Topics	Displays the help for TDSDVI application
About TDSDVI	Displays a dialog box with the version number and the copyright information about the current version of the application
Contact Tektronix	Displays a dialog box with the contact email information

Dialog Boxes

Preferences

Click File> Preferences to set the user preferences in two tabs: General and Advanced**.**

In the General tab as shown in Figure 18, you can:

- Use cursors for Eye, RT & FT testing

- Prompt for signal connection

- Ref Wfm deletion prompt for Eye tests

- Show report after generation

- Use zoomed eye mask in report
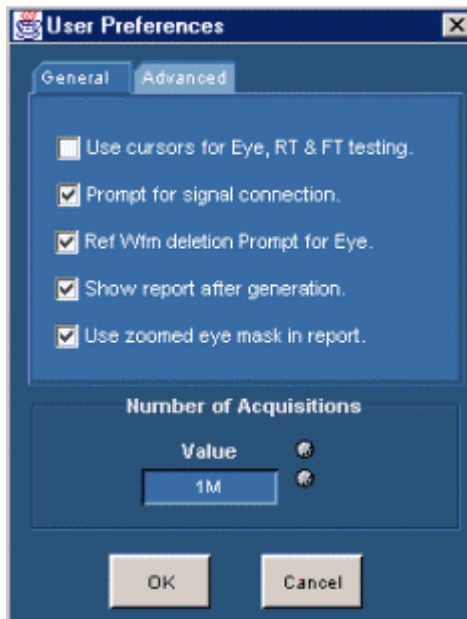
Figure 18: General tab

In the Advanced tab as shown in Figure 19, you can:

- Prompt for result reset

- Prompt for Tbit validity

- Select Cable Eye Diagram Test Point

Figure 19: Advanced tab

Number of Acquisitions field is common to the General and Advanced tabs.

The following table lists the options in the General and Advanced tab:

Table 10: Preferences options and their descriptions

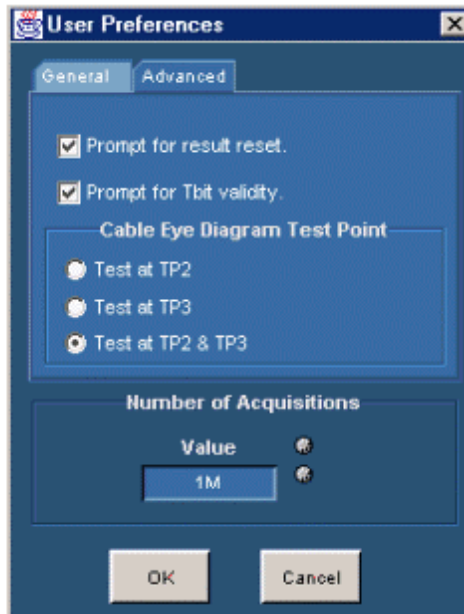| Option	Action
Use Cursors for Eye, RT & FT testing	Automatically enables the oscilloscope cursors to calculate the Vswing and the worst eye opening.
	The application enables the horizontal cursors to find the Vswing value. To calculate the Vswing value:
	▪ For the Eye Diagram and Rise and Fall Time measurements, place the cursors on the Vswing high and Vswing low of the eye diagram.
	The application enables the vertical cursors to select the worst eye opening. To select the worst eye opening:
	▪ Place the cursors at the crossover points of the worst eye opening for the Eye Diagram measurement.
	By default, the cursor option is not selected in the application.
Prompt for signal connection	Displays a message box prompting you to set up the connections and signal patterns when you run any measurement.
Ref Wfm deletion prompt for Eye	Displays a message box prompting you to save the Ref1 waveform with previous settings in another location because TDSDVI uses Ref1 for eye mask test and erases all the previous contents of Ref1. This happens when you run the Eye Diagram measurement.
Show report after generation	Automatically displays the report after the report is generated.
Use zoomed eye mask in report	In the generated report, the application uses the zoomed eye diagram with the mask. This is created using the Eye Zoom feature in Results> Result Detail> Eye zoom.
	If this checkbox is not selected, the application uses the oscilloscope screen shot of the eye diagram in the generated report.
Prompt for result reset	Displays a message box informing you that the previous results will be reset when you select the next measurement. This happens when you select successive measurements.
Prompt for Tbit validity	Displays a message box informing you to check the validity of Tbit calculation when you select any measurement and press the Run button.
Select Cable Eye Diagram test point	Specifies the different test points you can select to measure Cable Eye Diagram, such as TP2, TP3, or TP2 and TP3.
	Note: If you have a standard signal that passes a low or high amplitude mask, advanced users do not have to test the cable at TP2 with low or high amplitude mask every time they run the cable measurement. For this purpose, we recommend that you select the options in File> Preferences> Advanced> Cable Eye Diagram Test Point.

Table 10: Preferences options and their descriptions (Cont.)

Option	Action
Number of Acquisitions— Value	Specifies the number of acquisitions to create an Eye mask. You can use the calculator keypad ▦ or the GP knob next to the value field to enter the number of acquisitions.
	The DVI Test and Measurement Guide recommends one million acquisitions to perform an Eye Diagram measurement.
	For the CSA/TDS7404/B, TDS7254/TDS7254B, TDS7704B, DPO7354, and DPO/DSA70000 series oscilloscopes, you can set a maximum of five million and a minimum of five hundred thousand acquisitions.
	For theTDS6604, TDS6604B, TDS6404, and TDS6804 oscilloscopes, you can set a maximum of one million and a minimum of ten thousand acquisitions.

Recall Default

Click File> Recall Default to replace the existing settings with the default settings. Select Yes to confirm the action and No to cancel the action. If you select Yes, the application displays the message box as shown in Figure 21.
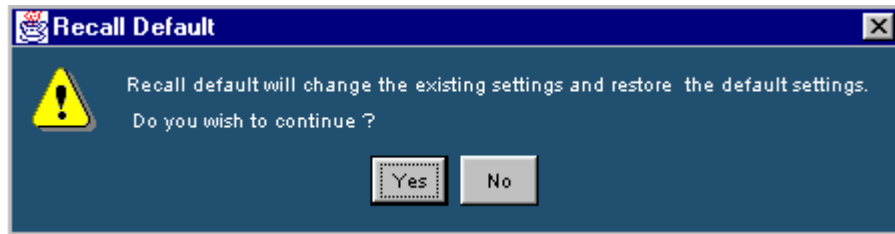
Figure 20: Recall Default message box

Figure 21: Recall message box

If you select No, the Recall Default dialog box disappears, and the application does not recall the default settings.

Calculator Keypad

You can display the Calculator Keypad in the following ways:

- File> Preferences> Value

- Measurements> Select> Define Tbit> User>Value

- Measurements> Select> Transmitter-Eye Diagram> Configure> User

- Measurements> Select> Transmitter- Eye Diagram, Cable-High-Amplitude/Low-Amp Eye Diagram, Receiver-High-Amplitude/Low-Amp Eye Diagram> Configure> Number of Eyes

Figure 22: Calculator keypad

The following table describes the calculator keypad options:

Table 11: Calculator keypad keys and their descriptions

Button	Description
Min	Automatically displays the minimum value of the selected field
Max	Automatically displays the maximum value of the selected field
CLR	Clears the value for the field selected and returns to zero value
BKSP	Defines a backspace for the selected value
Enter	Enters the value for the selected field
Esc	Exits the calculator screen
pHz-MHz	Defines the frequency magnitude of the selected value

To enter the values:

1. Select the Min button to display the minimum value for the selected option.

2. Select the Max button to display the maximum value for the selected option.

3. Select the CLR button to erase the previous values.

4. Select the numeric buttons to define the numeric values.

5. Select the Unit buttons to define the unit of the selected value.

6. Select the Enter button to enter the numeric values.

Virtual Keyboard

You can display the Virtual Keyboard in the following ways:

▪ Utilities> Report Generator> Report Setup> ID, Description, Prefix

▪ Utilities> Report Generator> Report Name> File Name

▪ Utilities> Compare Results> Select Files to Compare, Select Destination File

Figure 23: Virtual Keyboard

Use this dialog box to enter:

▪ Device ID

▪ Prefix

▪ Description

▪ File Name

Use the keyboard to enter the data in the fields and then select the Enter button to complete your entry.

Exit

Click File> Exit to exit the DVI application. When you exit the application, you can:

- Restore the oscilloscope settings to their state prior to starting the application

- Exit without changing the present oscilloscope settings
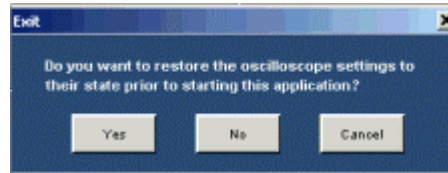
Figure 24: Exit dialog box

The following table describes the exit dialog box options:

Table 12: Exit options and their descriptions

Option	Action
Yes	Restores the oscilloscope settings to their original state values prior to starting the application and exits
No	Exits the application without changing the present oscilloscope settings
Cancel	Cancels exiting the application

Result Detail

Click Results> Result Detail to display the result Details and Statistics for the selected measurement. The Statistics information is available only for the following measurements:

- Transmitter Rise and Fall Time

- Transmitter/Cable Intra-Pair Skew

- Transmitter/Cable Inter-Pair Skew
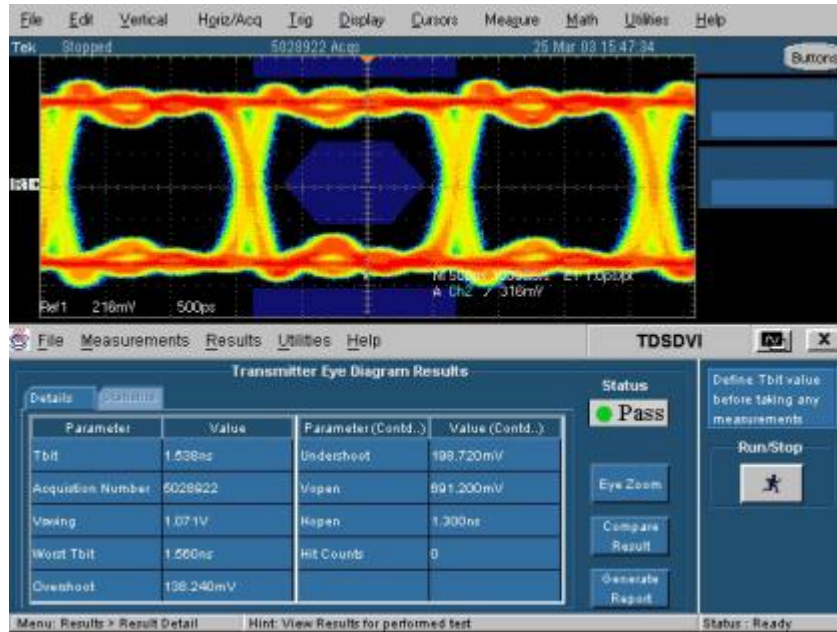
Figure 25: Result Details for Transmitter Eye Diagram

The following table describes the sample result details for Transmitter Eye Diagram:

Table 13: Result details options and their descriptions

Option	Description
Details tab	
Status	The status of the measurement: Pass or Fail.
Parameter	The calculated parameters for the measurement.
Value	The result parameters with the values.
Compare Result	The option to compare results from two different results.
Eye Zoom	The option to view a zoomed eye mask only for Eye diagram measurement.
Generate Report	The option to generate a report.

Report Generator

Click Utilities> Report Generator to specify the report setup and report name information, and to generate reports.

Figure 26: Report Setup tab

Figure 27: Report Name tab

The following table describes the report generator options:

Table 14: Report generator options and their descriptions

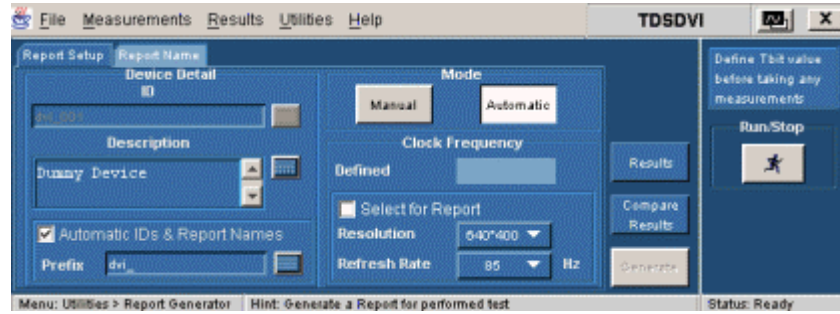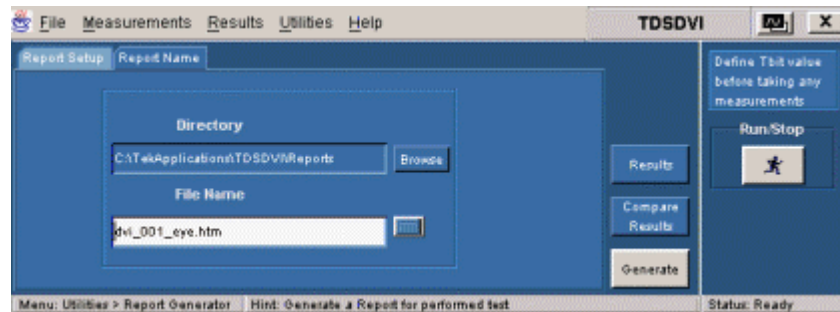| Option	Description
Report Setup tab	
ID	Specifies the device ID. You can use the virtual keyboard and enter the device ID or type the data in the field and press Enter.
Description	Specifies the test device description for which the report is to be generated. You can use the virtual keyboard next to the description field to enter the device description.
Automatic IDs and Report Names	Generates and specifies the device ID and the report names automatically, if the check box is selected. The ID field is disabled if you select this option. Select the check box before you run the measurement.
Prefix	Displays the specified prefix of the device. This field is enabled, only if you select the Automatic mode of report generation. You can use the virtual keyboard to enter the device prefix or key in the data in the field and press Enter.
Mode	Displays the Manual or the Automatic mode of report generation. If you select the Manual mode, the Prefix field is disabled and you have to enter the device ID and description. If you select the Automatic mode, the Device ID field is disabled and the Automatic ID's and Report Names check box is selected. The application then generates a report with its naming conventions without user intervention. You can also check or uncheck the Automatic Device ID's and Report Names for the Manual and the Automatic modes.
Defined	Specifies the clock frequency values automatically when you define and calculate Tbit.
Select for Report	Displays the selected resolution and refresh rate in the generated report.
Resolution Refresh Rate	Displays the Resolution and Refresh Rate values as per the VESA standard. Use the drop-down arrow in the Resolution and Refresh Rate fields to set the values. Refer the topic, Reference> Resolutions for more information on the available resolutions.
Generate	Generates an .html report for the selected measurement. If you select the Automatic mode, this button is disabled.

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Table 14: Report generator options and their descriptions (Cont.)

Option	Description
Report Name Tab	
Directory	Displays the directory location of the generated report.
Browse	Browses to the directory location.
File Name	Displays the file name of the report generated. Use the virtual keyboard to enter the file name or type the data in the field. If you select the Automatic mode, this field is disabled.
Generate	Generates an .html report for the selected measurement. If you select the Automatic mode, this button is disabled.

To generate a report:

1. Select Utilities> Report Generator.

2. In the ID field, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. Select Automatic IDs and Report Names box, if you want the application to generate a device ID and report names automatically.

Note: Select the Automatic IDs and Report Names box before you run the measurement.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Manual mode to generate report manually and the Automatic mode if you want the application to generate the report automatically.

7. The Defined field automatically displays the predefined clock frequency values when you define and calculate Tbit.

8. Select the Select for Report box, if you want the resolution and refresh rate values to generate the report.

9. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values according to the VESA standard.

10. In the Report Name tab, select the Browse button to browse the directory location.

11. In the File Name field, use the virtual keypad to enter the file name. Select the Generate button display an .html report.

Note: From this screen, you can use the Results button to view the results and the Compare Results option to compare results of two different devices.

Eye Zoom

Click Results> Result Detail> Eye Zoom to:

- Display the zoomed worst eye opening with the mask

- Use the cross haired cursors to find specific failed points and display their respective voltage and time values

- Mark the failed data points in the eye mask to find specific failed points with markers. Markers are small red boxes that surround the failed points

- Identify the failed points in red and the pass points in yellow

- Save the eye mask for future reference to the default directory C:\TekApplications\TDSDVI\Images or any other directory of your choice

- Identify the Hit Counts, Test Status, and Statistical information of the eye diagram
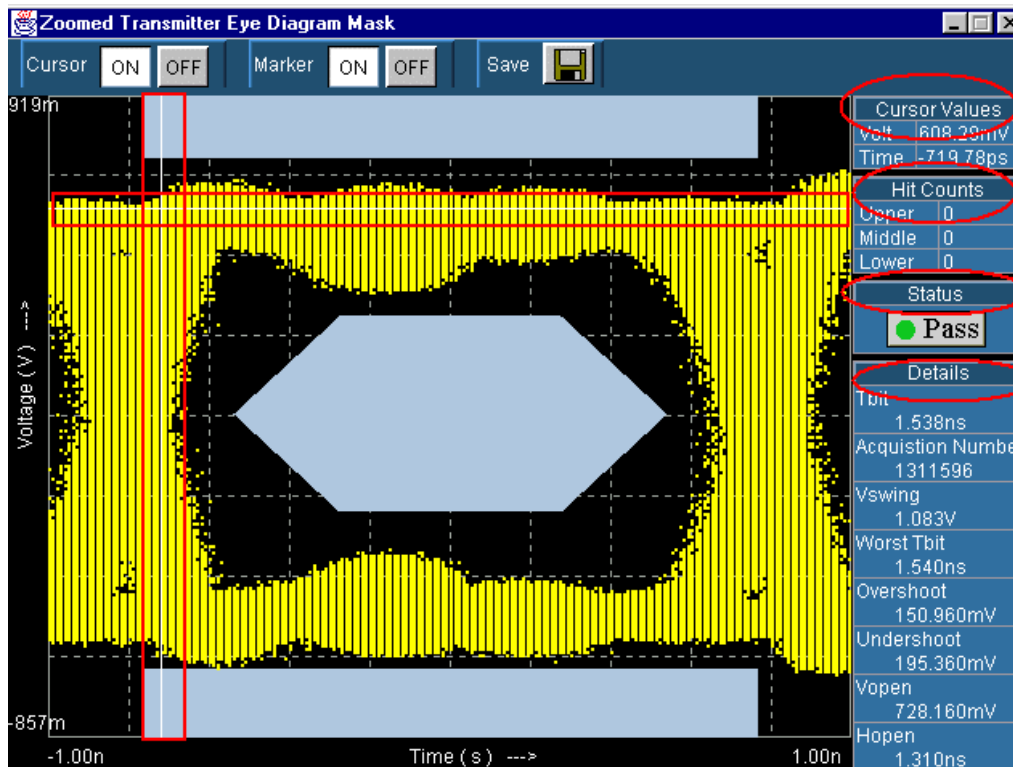

Figure 28: Zoomed eye

To enable the Cursor or the Marker option:

1. Select the ON button next to the cursor or marker option to enable cursors or markers. The X-axis of the cursor represents Time and the Y-axis represents Voltage. You can drag the cursor and position them anywhere on the eye mask.

2. Select the OFF button next to the cursor or the marker option to disable the cursors or the markers.

To save the zoomed eye mask:

▪ Select the Save button to save the mask in .jpg format to the default directory C:\TekApplications\TDSDVI\Images or any other directory of your choice. You cannot save the image when the measurement is running.

The following table describes the eye zoom options:

Table 15: Eye zoom options and their descriptions

Option	Description
Cursor Values	Displays the cursor positions with reference to Voltage in volts and Time in seconds.
Hit Counts	Displays the number of data points in the fail zone. With reference to Figure 28, they are: • Upper: upper eye mask • Middle: middle eye mask • Lower: lower eye mask
Status	Displays the status of the test: Pass or Fail.
Details	Displays the result details for the zoomed eye mask.

Compare Results

Click Results> Compare Results to compare either:

▪ The current results with results that are stored in a html file

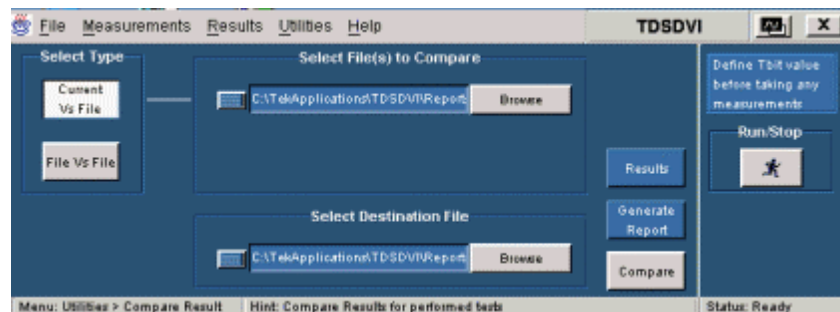▪ Results that are stored in two different html files

Figure 29: Compare results pane

The Current Vs File option displays two fields where you can enter:

- The file name to be compared with the currently displayed results

- The file name in which the compared results will be stored

The File Vs File option displays three fields where you can enter:

- The names of the html files to be compared

- The name of the html file where the compared results will be stored

The following figure lists the result combinations you can compare:

	Transmitter Eye Diagram	Transmitter Rise and Fall Time	Transmitter Pk-Pk Jitter	Transmitter Intra-Pair Skew	Transmitter Inter-Pair Skew	Cable High/Low Amplitude Eye Diagram (With TP2)	Cable High/Low -Amplitude Eye Diagram (with TP3)	Cable High/Low-Amplitude Eye Diagram (with TP2 and TP3)	Cable Pk-Pk Jitter	Cable Intra-Pair Skew	Receiver High-Amplitude/Low Amplitude Eye Diagram	Cable Inter-Pair Skew
Transmitter Eye Diagram	✔					✔	✔				✔	
Transmitter Rise and Fall Time		✔										
Transmitter Pk-Pk Jitter			✔						✔			
Transmitter Intra-Pair Skew				✔						✔		
Transmitter Inter-Pair Skew					✔							✔
Cable High/Low - Amplitude Eye Diagram (with TP2)	✔					✔	✔				✔	
Cable High/Low - Amplitude Eye Diagram (with TP3)	✔					✔	✔				✔	
Cable High/Low-Amplitude Eye Diagram (with TP2 and TP3)								✔				
Cable Pk-Pk Jitter			✔						✔			
Cable Intra-Pair Skew				✔						✔		
Cable Inter-Pair Skew					✔							✔
Receiver High/Low- Amplitude Eye Diagram	✔					✔	✔				✔	

Figure 30: Result comparison matrix

To compare the current result with a stored result:

1. In the Select File(s) to compare Result field, select the Current Vs File option, and use the pop-up keyboard to enter the file name or use the browse button to browse for the file. You can also enter the file name directly in the field and press Enter.

2. In the Select Destination File field, use the pop-up keyboard to enter the compared result file name or use the browse button to browse the file.

3. Select the Compare button to complete the process.

To compare results stored in two different files:

1. In the Select File(s) to compare Result fields, select File Vs File option, and use the pop-up keyboard to enter the file names or use the browse button to browse the file. You can also enter the file name directly in the field and press Enter.

2. In the Select Destination File field, use the pop-up keyboard to enter the name of the destination where you want to store the compared results or use the browse button to browse the file. You can also enter the file name directly in the field and press Enter.

3. Select the Compare button to complete the process and display the compared report as shown in Figure 31.

Comparison Report of Transmitter Eye Diagram and Transmitter Eye Diagram

Parameter	Transmitter Eye Diagram	Transmitter Eye Diagram
Device ID	dvi_001	dvi_001
Device Description	Dummy Device	Dummy Device
Date	Mon Mar 31 14:09:43 GMT+05:30 2003	Mon Mar 31 14:11:22 GMT+05:30 2003
Status	Fail	Pass
Clock Frequency	44.504MHz	44.504MHz
Resolution	-	-
Refresh Rate	-	-
Number of Eyes Tested	2	2
Data Pair Used	RX0	RX0
Tbit	2.247ns	2.247ns
Acquistion Number	1290257	1300701
Vswing	654.000mV	602.800mV
Worst Tbit	4.000ns	2.251ns
Overshoot	8.720mV	35.200mV
Undershoot	322.640mV	30.800mV
Vopen	8.720mV	545.600mV
Hopen	1.540ns	2.190ns
Hit Counts	959	0
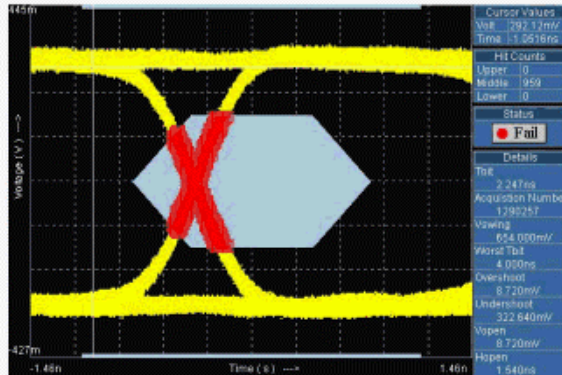
Eye Diagram
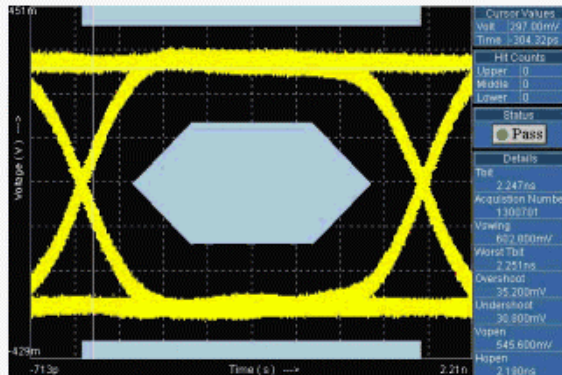
Eye Diagram

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Figure 31: Compared results

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The following table describes the compare result options:

Table 16: Compare results options and their descriptions

Option	Description
Current Vs File	Compares the current results with the results already stored in a file.
File Vs File	Compares the results stored in two different files.
Results	Displays the results panel for the selected measurement.
Generate Report	Displays the generate report panel for the selected measurement.
Compare	Compares the results based on the selected type.

Eye Trends in TDS6604, TDS6404, TDS6604B, and TDS6804B Oscilloscopes

Click Results> Result Detail> Eye Trend to:

- Display the eye progression.

- Display the Vertical and Horizontal trends of the eye diagram parameters such as Mask, Vswing, Overshoot, Undershoot, Tbit, Worst Tbit, Hopen, and Vopen.
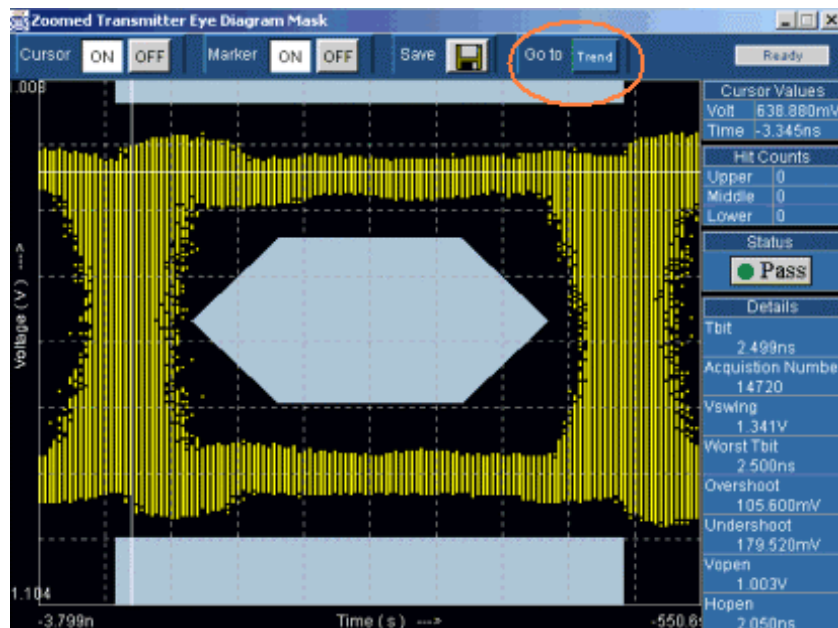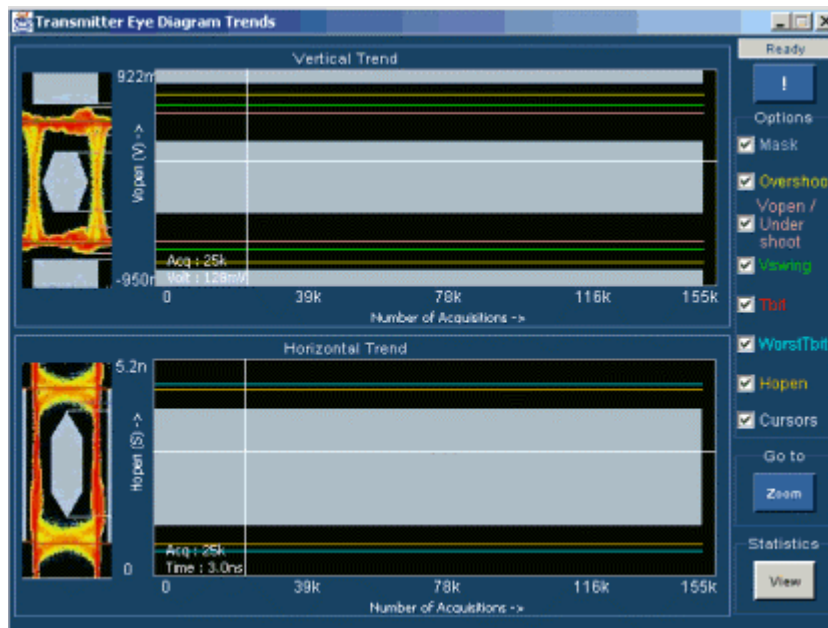
Figure 32: Eye trends in TDS6000 series oscilloscopes

To view the Eye Diagram Trends:

1. Select the Eye Zoom button to display the zoomed eye mask or press the Eye Trend button in the results panel.

2. Select the Go to Trend button to display the Vertical and Horizontal trends as shown in Figure 33.

The TDS6604, TDS6404, TDS6604B, and TDS6804B oscilloscopes do not support FastAcq mode for gathering one million acquisitions, which is recommended for DVI compliance. The Eye-Trends feature on the TDS6604, TDS6404, TDS6604B, and TDS6804B oscilloscopes helps you to monitor eye formation and also look at the trends for important parameters, such as, Tbit, Hopen, Vopen, Worst Tbit, Overshoot and Undershoot. You can effectively test for DVI compliance by selecting a lower number of acquisitions. The Eye Trend begins with a minimum of 10K acquisitions to display the progression of the eye mask test in two trends, Vertical and Horizontal, in intervals of 30 seconds.

In Vertical Trend, the X-axis represents the Number of Acquisitions and the Y-axis represents Vopen in Volts. The Vertical Trend also displays Vopen, Overshoot, Undershoot and Vswing statistical results.

In Horizontal Trend, the X-axis represents the Number of Acquisitions and the Y-axis represents Hopen in seconds. The Horizontal Trend also displays the Horizontal Opening, Crossover points, Worst Tbit and Tbit.

Select the Zoom button to view the zoomed eye mask. Figure 33 shows the eye diagram parameters.
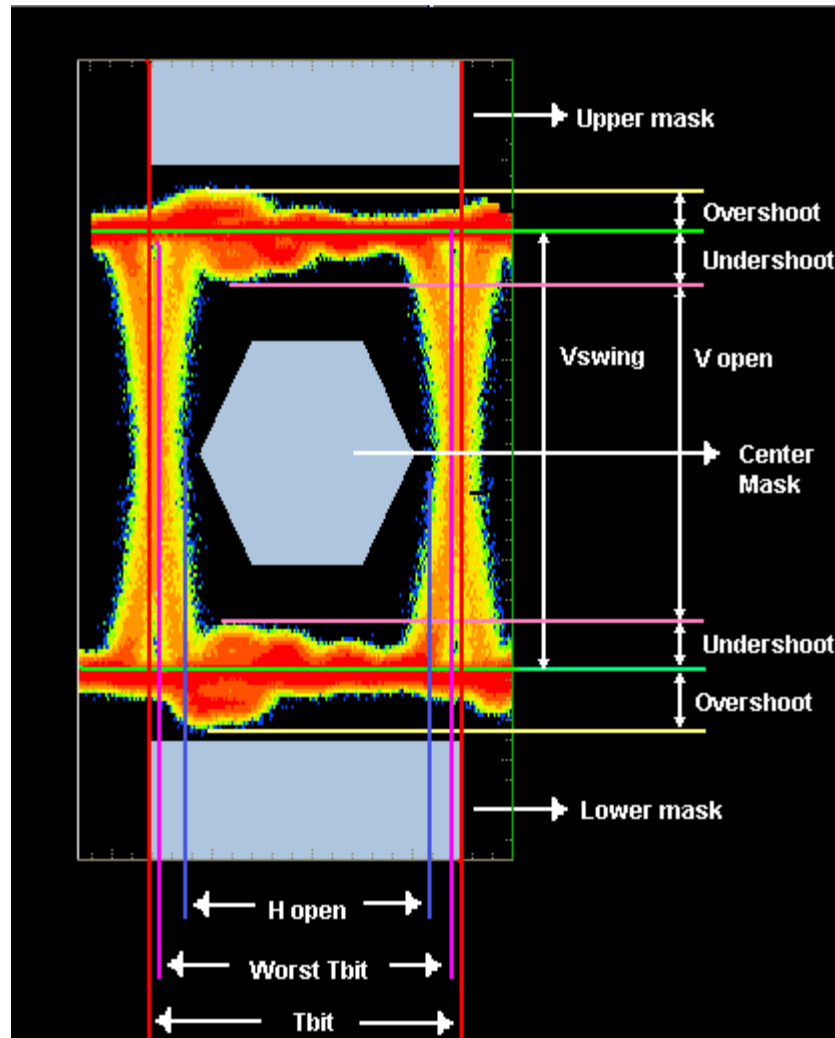
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Figure 33: Eye definitions

The following table describes the eye trend options:

Table 17: Eye trend options and their descriptions

Option	Description
Mask	Is a set of polygons called mask segments that appears on the oscilloscope screen. If the waveform violates any one of the mask segments, the measurement fails the test; if the waveform does not violate any one of the mask segments, the measurement passes the test.
Overshoot	The voltage difference between the peak (positive or negative) and the normalized level (Vswing Low or Vswing High) in the eye mask.
Undershoot	The voltage difference between the minimum high level voltage or the maximum low-level voltage after the transition and the normalized voltage level (Vswing Low or Vswing High) in the eye mask.
Vswing	The voltage difference between the normalized high and low levels of the eye diagram.

Table 17: Eye trend options and their descriptions (Cont.)

Option	Description
Tbit	The time taken to transmit one bit of data.
Worst Tbit	The minimum distance between two consecutive crossover points in the eye diagram.
Crossover	The intersection or the overlapping of the rising and falling edges in an eye diagram.

Select the View button to display the Statistics table.
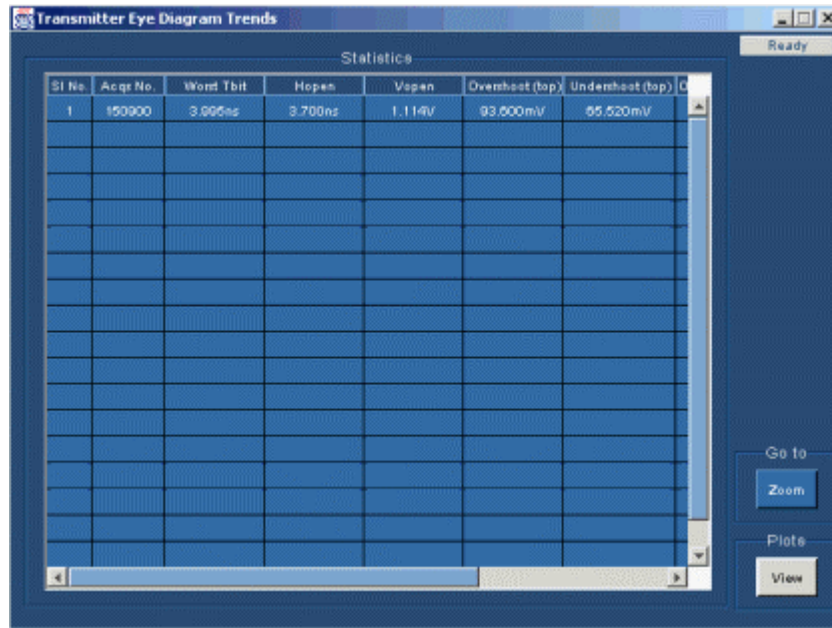
Figure 34: Eye trends statistical table

The following table describes the statistical table:

Table 18: Eye Trend-Statistics options and their descriptions

Option	Description
Acqs No	The number of acquisitions.
Worst Tbit	The minimum distance between two consecutive crossover points.
Hopen	The maximum horizontal opening between the closest hit points.
Vopen	The maximum vertical opening between the closest hit points.
Overshoot (Top and Bottom)	The voltage difference between the peak (positive or negative) and the normalized level (Vswing Low or Vswing High) in the eye mask.

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Table 18: Eye Trend-Statistics options and their descriptions (Cont.)

Option	Description
Undershoot (Top and Bottom)	The voltage difference between the minimum high level voltage or the maximum low-level voltage after the transition and the normalized voltage level (Vswing Low or Vswing High) in the eye mask.
Status	The results of the selected measurement as Pass or Fail.

Transmitter, Cable, and Receiver

The application tests the signals for three types of devices:

- Transmitter: Is a device that transmits DVI signals

- Cable: Is a medium that transmits DVI signals from a transmitter to a receiver

- Receiver: Is a device that receives DVI signals

These devices are grouped into three tabs and have different measurements associated with them.

Transmitter Eye Diagram

Before using the application, set up the DUT as given in Application Examples> Transmitter-Eye Diagram> Equipment setup on page 141.

Select the Transmitter tab and click the Eye Diagram measurement to display the following screen.
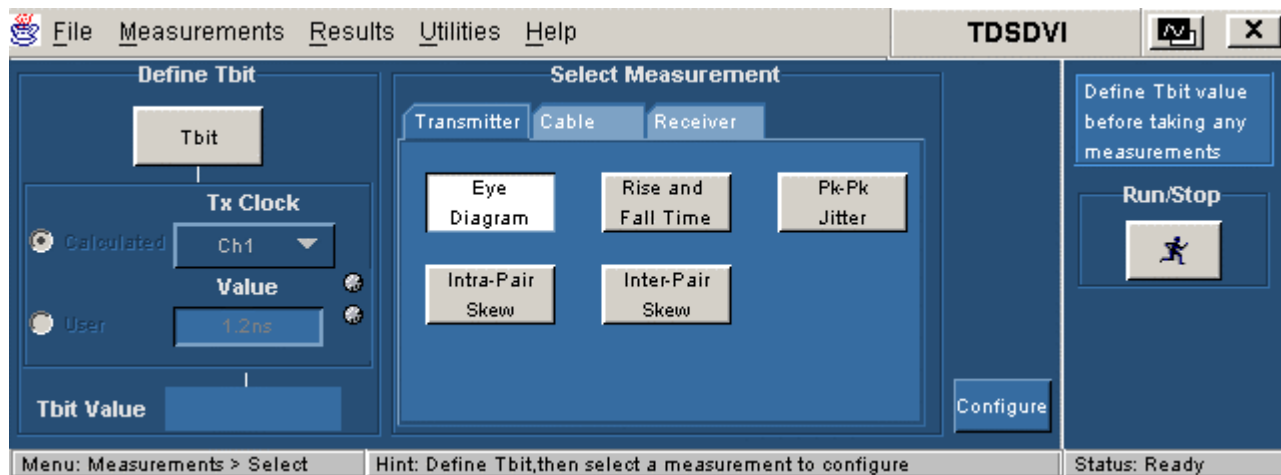

Figure 35: Eye Diagram pane

Select the Eye Diagram measurement and click the Configure button to display the configuration parameters for the Transmitter Eye Diagram measurement.
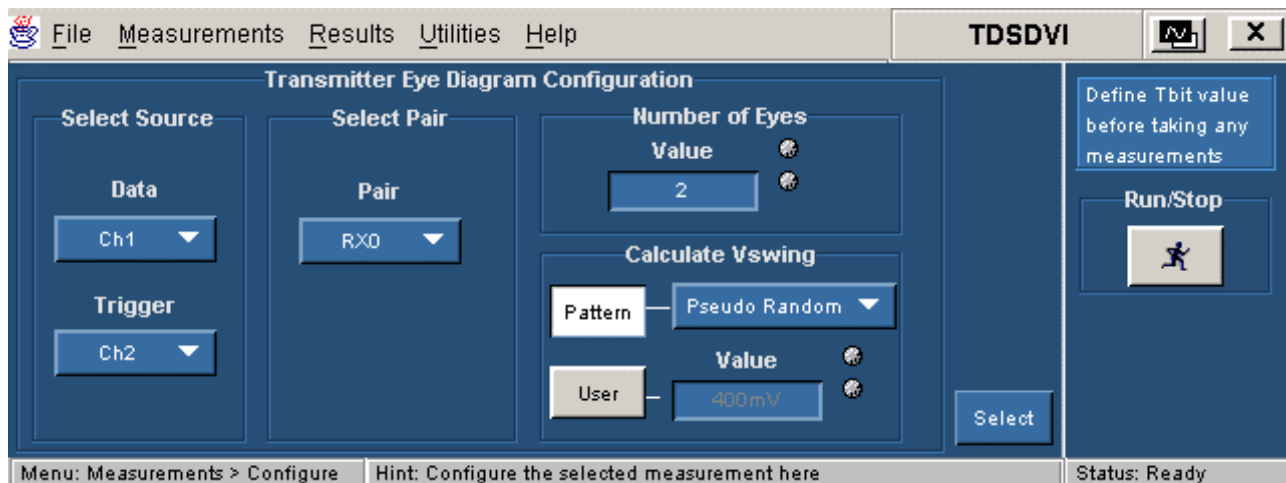

Figure 36: Eye Diagram Configuration

Select Source

Use the drop-down arrow in the Data box to select the data source channel. The available selections are: CH1 through CH4. The application requires a recovered clock as an external trigger source to the oscilloscope. Use the drop-down arrow in the Trigger box to set the trigger source channel. The Data and Trigger sources are mutually exclusive. The Data and Trigger fields identify the data source and the external clock source.

Figure 37: Select source

Note: You cannot select the same channel for Data and Trigger.

Select Pair

Use the drop-down arrow in the Select Pair box to set the data pair. The available data pairs are:

- RX0

- RX1

- RX2

Select the data pair from which you have probed the TPA-P fixture.
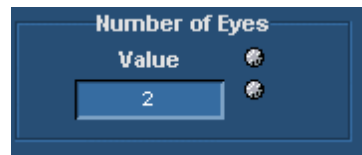

Figure 38: Select pair

Number of Eyes

Figure 39: Number of eyes

Use the GP knob or the calculator keypad ▦ next to the Value field, to set the minimum number of eyes considered to find the worst eye opening in Transmitter, Cable, or Receiver Eye measurements. The application then positions the eye mask on the worst opening eye.

You can set a minimum of two eyes to place the mask on the worst eye opening because the DVI specifications recommends at least two eyes to conduct the eye diagram test.

To analyze the pixels, you can set a maximum of ten eyes because each data pixel has 10 bits. The application analyzes these eyes and places the mask at the worst eye opening.
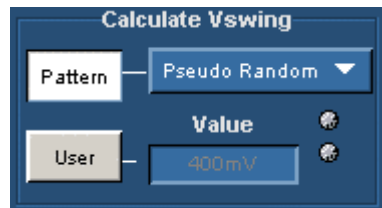
Calculate Vswing

Figure 40: Calculate Vswing

Select the Pattern button to indicate the pattern you are using to calculate Vswing. The available patterns are: Pseudo Random Pattern (PRP) and Half Clock Pattern (HCP). If you select the User option, use the pop-up keypad in the Value field to enter the Vswing values. The range of the Vswing value is 200 millivolts to 2 volts. The application uses the Vswing value to calculate the eye mask coordinates in Eye diagram measurement and the reference level in Rise Time and Fall Time measurement.

To calculate Vswing:

Select Pseudo Random Pattern or Half Clock from the drop-down list. To calculate Vswing accurately, use only the Half Clock Pattern because the HCP signal has less ringing than the PRP signal.

If you select the Half Clock option, the application prompts you to connect the HCP and calculate the Vswing using the HCP signal.

Select User option. In the Value field, use the calculator keypad to enter the Vswing values. The minimum value is 200 millivolts and the maximum is 2 volts. The default value is 400 mV. If you are using this option, the application will not use a signal to calculate the Vswing.

Transmitter Rise and Fall Time

Before using the application, set up the DUT as given in Application Examples> Transmitter-Rise and Fall Time> Equipment Set up on page 144.

According to the DVI specifications, Rise and Fall Time is defined as the time interval between the normalized 20% and 80% amplitude level of the TMDS (Transition Minimized Differential Signal) signal.

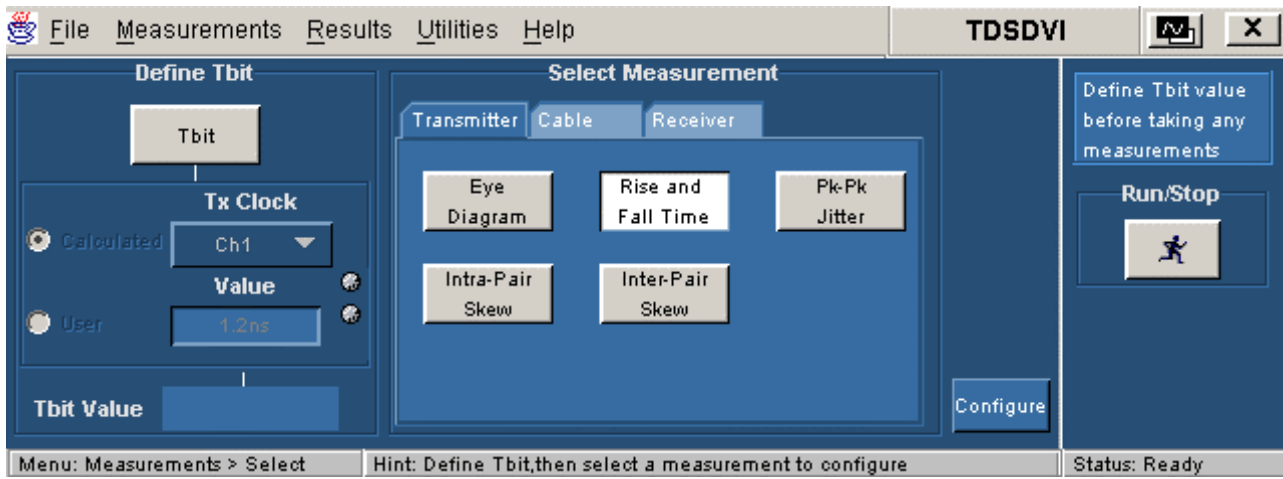Select the Transmitter tab and click the Rise and Fall Time measurement to display the following screen:

Figure 41: Rise and Fall Time pane

Select Rise and Fall Time measurement and select the Configure button to display the configuration parameters for Rise and Fall Time measurement.
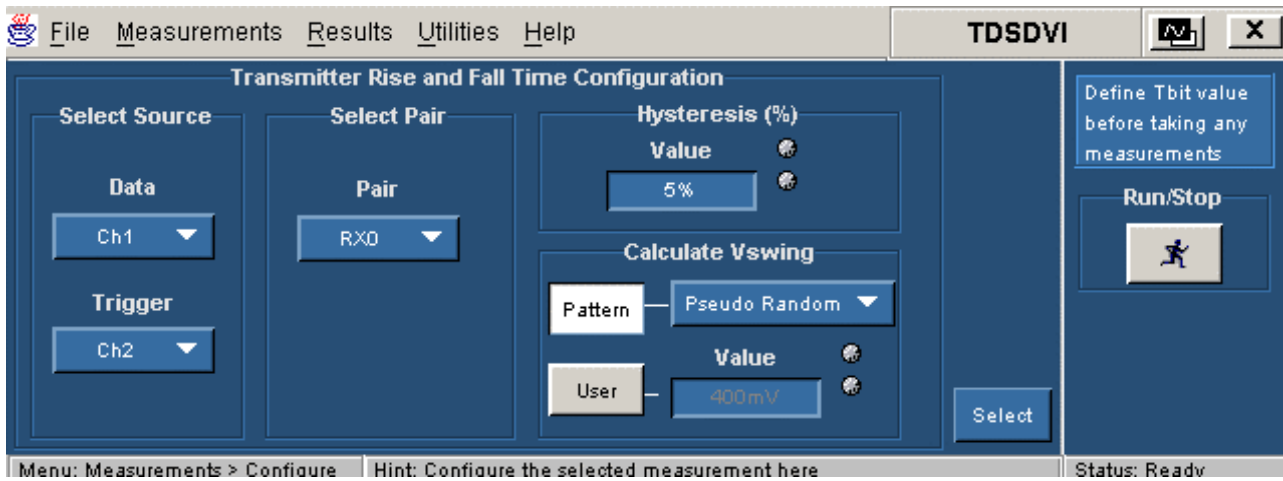

Figure 42: Rise and Fall Time configuration

Select Source

Figure 43: Select Source

Use the drop-down arrow in the Data box to select the data source channel. The available selections are: Ch1 through Ch4. The application requires a recovered clock as an external trigger source to the oscilloscope. Use the drop-down arrow in the Trigger box to set the trigger source channel. The Data and Trigger sources are mutually exclusive.

The Data and Trigger fields identify the data source and the external clock source.

Note: You cannot select the same channel for Data and Trigger.

Select Pair

Figure 44: Select Pair

Use the drop-down arrow in the Select Pair box to set the data pair. The available data pairs are:

- RX0

- RX1

- RX2

Select the data pair from which you have probed the TPA-P fixture.

Hysteresis

Use the GP knob or the calculator keypad ⊞ next to the Value field to enter the hysteresis percentage value. The hysteresis range is 2% to 10%.
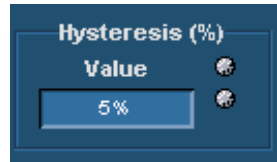

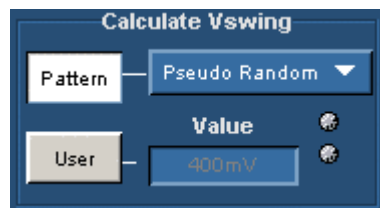**Figure 45: Hysteresis**

Calculate Vswing

Figure 46: Calculate Vswing

Select the Pattern button to indicate the pattern you are using to calculate Vswing. The available patterns are: Pseudo Random Pattern (PRP) and Half Clock Pattern (HCP). If you select the User option, use the pop-up keypad in the Value field to enter the Vswing values. The range of the Vswing value is 200 millivolts to 2 volts. The application uses the Vswing value to calculate the eye mask coordinates in Eye diagram measurement and the reference level in Rise Time and Fall Time measurement.

To calculate Vswing:

Select Pseudo Random Pattern or Half Clock from the drop-down list. To calculate Vswing accurately, we recommend that you use only the Half Clock Pattern because the HCP signal has less ringing than the PRP signal.

If you select the Half Clock option, the application prompts you to connect the HCP and calculate the Vswing using the HCP signal.

Select User option. In the Value field, use the calculator keypad to enter the Vswing values. The minimum value is 200 millivolts and the maximum is 2 volts. The default value is 400 mV. If you are using this option, the application will not use a signal to calculate the Vswing.

Transmitter Pk-Pk Jitter

Before using the application, set up the DUT as given in Application Examples> Transmitter-Pk-Pk Jitter> Equipment Setup on page 147.

Select the Transmitter tab and click the Pk-Pk Jitter measurement to display the following screen:
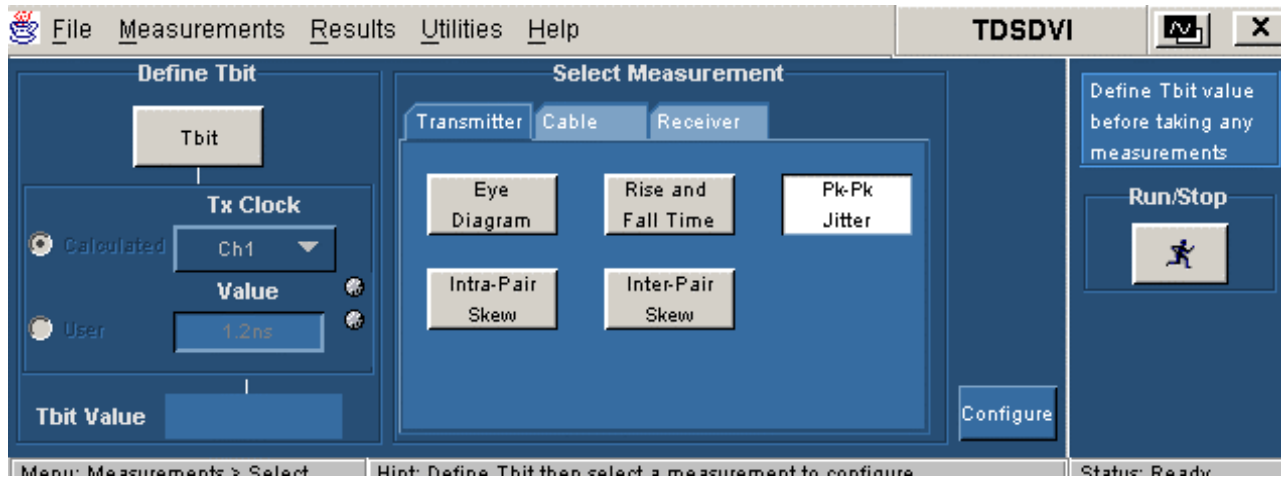

Figure 47: Pk-Pk Jitter pane

Select the Pk-Pk Jitter measurement and press the Configure button to display the configuration parameters for the Pk-Pk Jitter measurement.
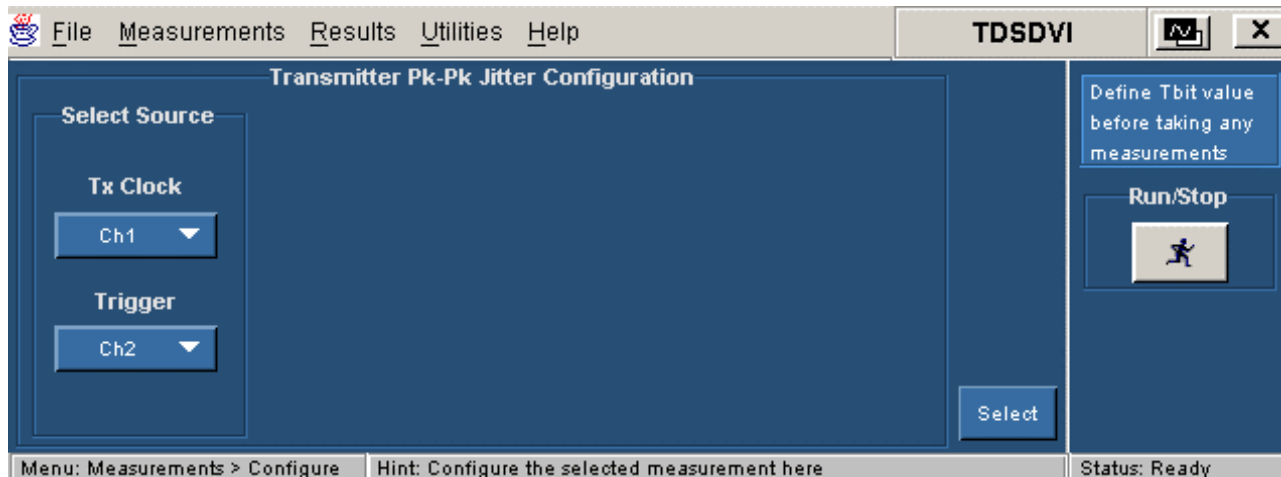

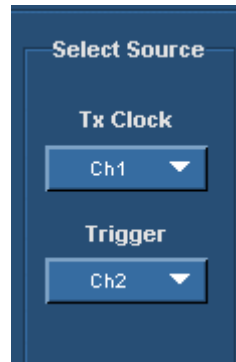Figure 48: Pk-Pk Jitter configuration

Select Source

Figure 49: Select Source

Use the drop-down arrow in the Tx Clock box to select the transmitted differential clock source channel. The available selections are: CH1 through CH4. The application requires a CRU (Clock Recovery Unit) to trigger the oscilloscope. Use the drop-down arrow in the Trigger box to set the trigger source channel. Data and Trigger source are mutually exclusive.

The Tx Clock and Trigger fields identify the Tx clock source and the Clock Recovery Unit source.

Note: You cannot select the same channel for Tx clock and Trigger.

Transmitter Intra-Pair Skew

Before using the application, set up the DUT as given in Application Examples> Transmitter-Intra-Pair Skew> Equipment Setup on page 150.

Intra-Pair skew is the Skew between the signal that constitutes from the same pair (Example Rx0+ and Rx0−) at TP2.

Select the Transmitter tab and click the Intra-Pair Skew measurement to display the following screen:
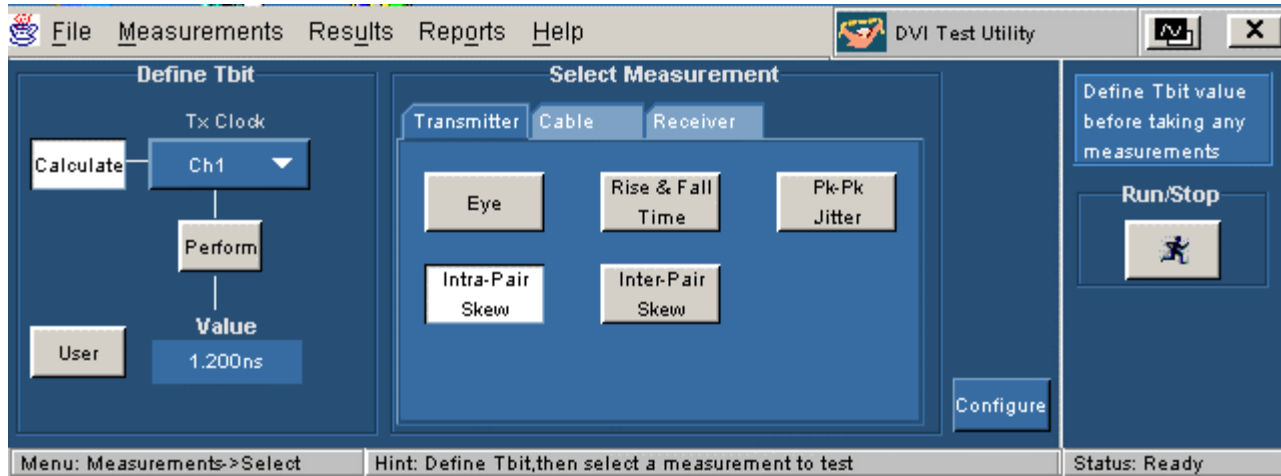

Figure 50: Intra-Pair Skew pane

Select the Intra-Pair Skew measurement and press the Configure button to display the configuration parameters for the Intra-Pair Skew measurement.
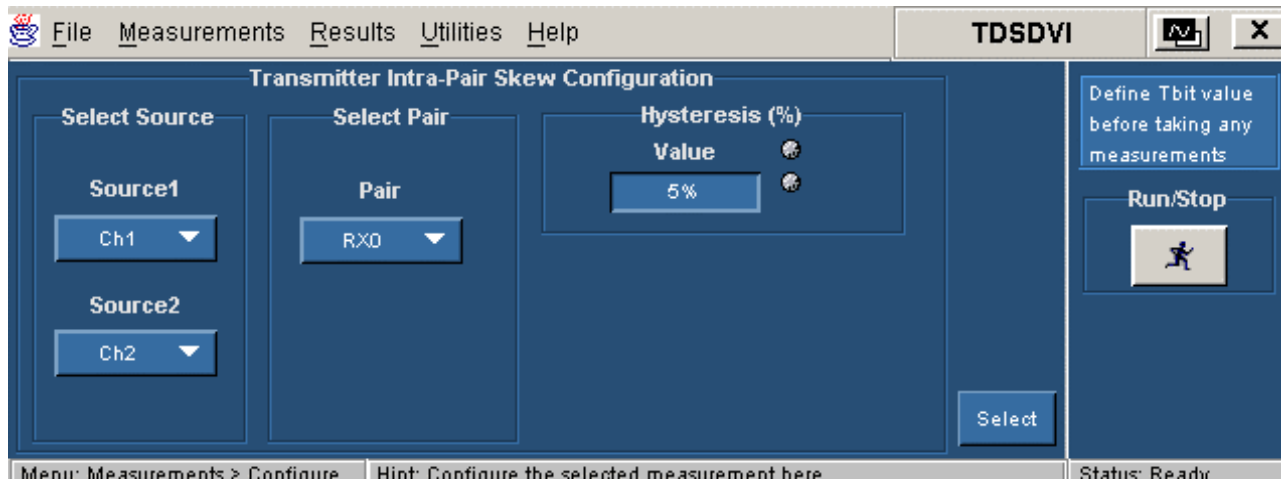

Figure 51: Intra-Pair Skew configuration

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Select Source

Figure 52: Select Source

Use the drop-down arrow in the Source1 box to set the data line (+) of the data pair. The available selections are: CH1 through CH4. Use the drop-down arrow in the Source2 box to set the data line (−) of the data pair. The Source channels are mutually exclusive. Use two single-ended probes to connect the data pair (for example: Rx0+ or Rx0−) to Source1 and Source2.

The Source field identifies a data line.

Note: You cannot select the same channel for Source1 and Source2.

Select Pair

Figure 53: Select Pair

Use the drop-down arrow in the Select Pair box to set the data pair. The available data pairs are:

- RX0

- RX1

- RX2

Select the data pair to which you have probed the TPA-P fixture for Transmitter device and TPA-R fixture for a Cable and Receiver device.
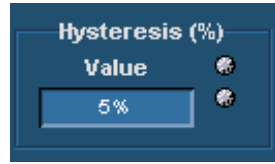
Hysteresis

Figure 54: Hysteresis

Use the GP knob or the calculator keypad next to the Value field to enter the hysteresis percentage value.

The hysteresis range is 2% to 10%.

Transmitter Inter-Pair Skew

Before using the application, set up the DUT as given in Application Examples> Transmitter-Inter-Pair Skew> Equipment Setup on page 153.

Inter-pair skew is the time delay between the different data pairs (Example Rx0+ of one pair and Rx1− of the other pair).

Select the Transmitter tab and click the Inter-Pair Skew measurement to display the following screen:
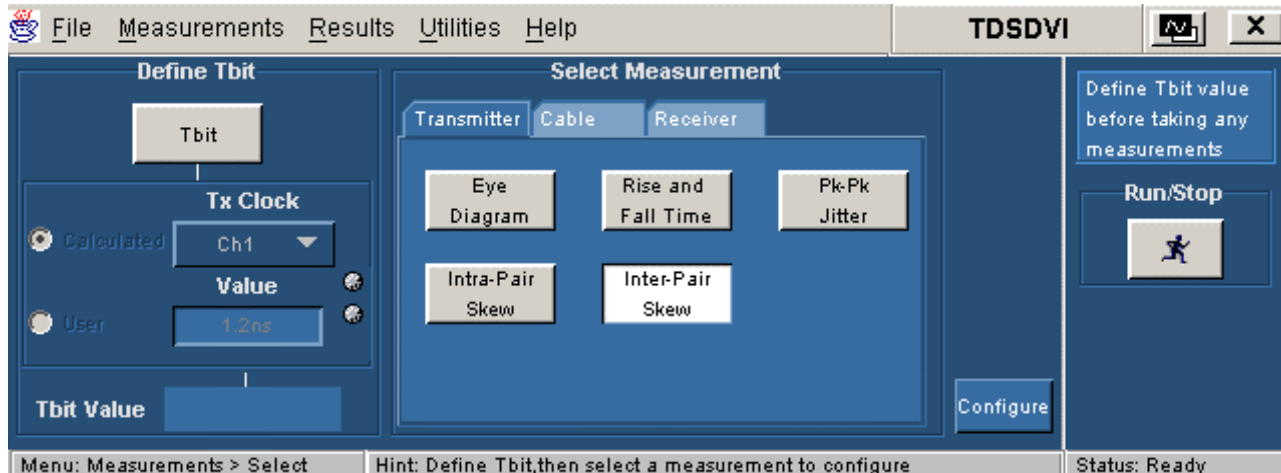
Figure 55: Inter-Pair Skew pane

Select the Inter-Pair Skew measurement and press the Configure button to display the configuration parameters for the Inter-Pair Skew measurement.
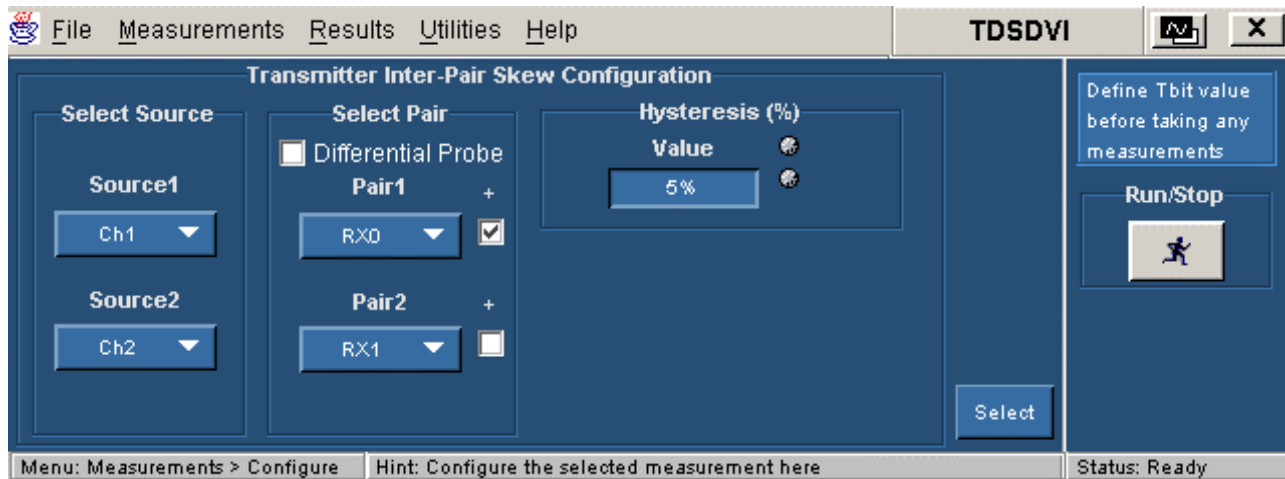
Figure 56: Inter-Pair Skew configuration

Select Source

Figure 57: Select Source

Use the drop-down arrow in the Source1 box to set the data line (+) of the data pair. The available selections are: CH1 through CH4. Use the drop-down arrow in the Source2 box to set the data line (−) of the data pair. The Source channels are mutually exclusive. Use two single-ended probes to connect the data pair (for example: Rx0+ or Rx0−) to Source1 and Source2.

The Source field identifies a data line.

Note: You cannot select the same channel for Source1 and Source2.
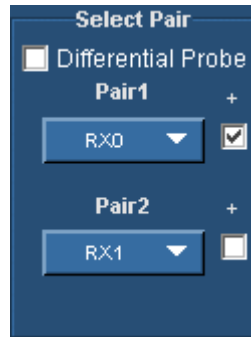
Select Pair

Figure 58: Select Pair

Use the drop-down arrow in the Pair1 and Pair2 box to set the differential data pair. The available data pairs are:

- RX0

- RX1

- RX2

If the data line is positive, select the check box next to the Pair fields. If you select the Differential Probe box, the positive check boxes next to the pair fields are disabled and the application calculates the time delay between the two data pairs. If you used a single-ended probe, the application calculates the skew between the data lines.

Select the data pair from which you have probed the TPA-P fixture. You cannot select the same data pair in the Pair1 and Pair2 boxes irrespective of the polarity (+ or −).
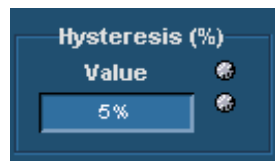
Hysteresis

Figure 59: Hysteresis

Use the GP knob or the calculator keypad ▦ next to the Value field to enter the hysteresis percentage value.

The hysteresis range is 2% to 10%.

Cable High-Amplitude/Low Amplitude Eye Diagram

Before using the application, set up the DUT as given in Application Examples> Cable-High-Amplitude/Low Amplitude Eye Diagram> Equipment Setup on page 162.

Select the Cable tab and click the High-Amp Eye Diagram measurement to display the following screen:

Figure 60: High-Amplitude Eye Diagram pane

Select the High-Amplitude Eye Diagram measurement and press the Configure button to display the configuration parameters for High-Amplitude Eye Diagram measurement.

Figure 61: High-Amplitude Eye Diagram configuration

Before using the application, set up the DUT as given in Application Examples> Transmitter-Eye Diagram> Equipment Setup on page 162.

Select the Cable tab and click the Low-Amp Eye Diagram measurement to display the following screen:

Figure 62: Low-Amplitude Eye Diagram pane

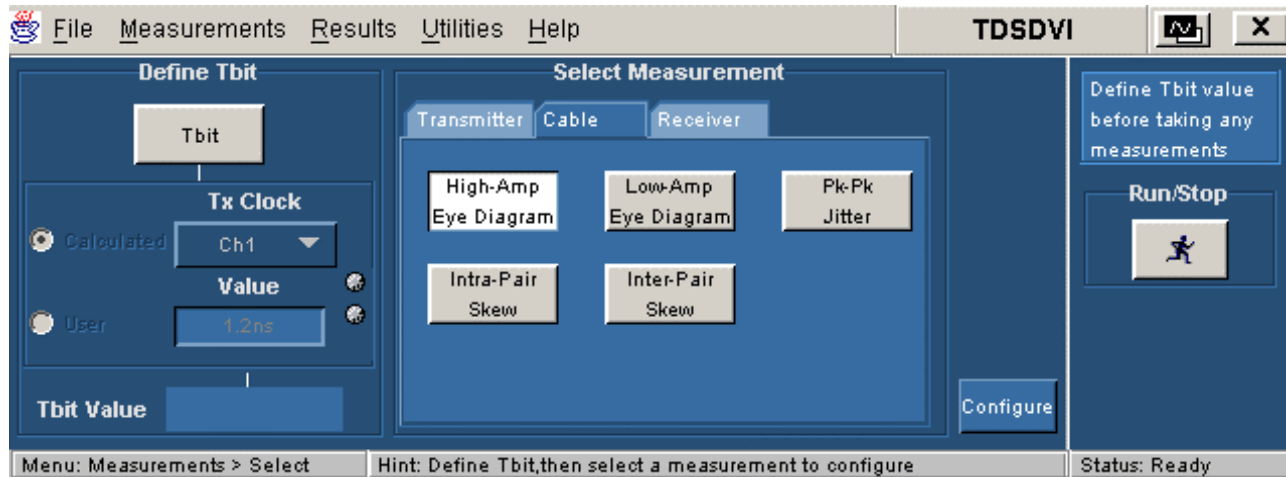Select the Low-Amplitude Eye Diagram measurement and press the Configure button to display the configuration parameters for Low-Amplitude Eye Diagram measurement.
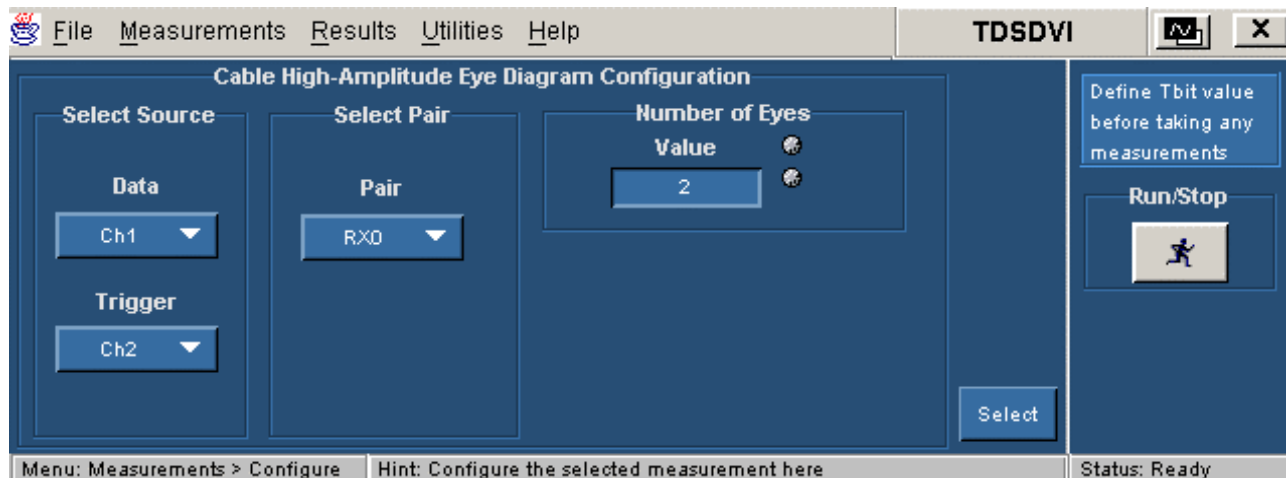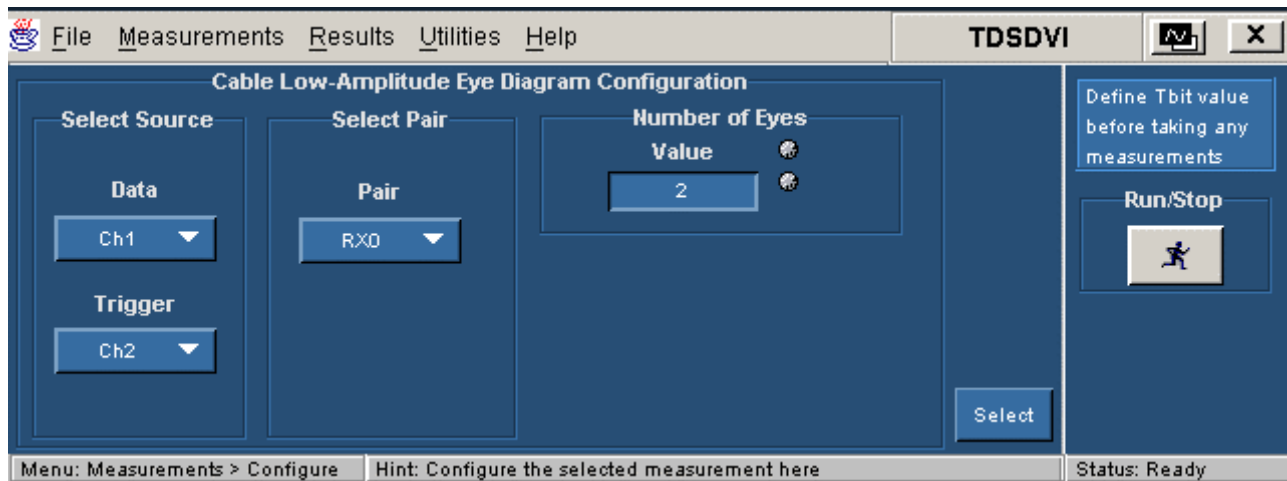

Figure 63: Low-Amplitude Eye Diagram configuration
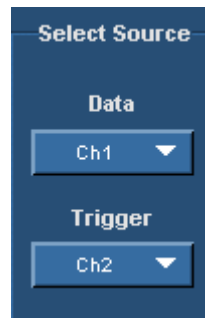
Select Source

Figure 64: Select Source

Use the drop-down arrow in the Data box to select the data source channel. The available selections are: CH1 through CH4.The application requires a recovered clock as an external trigger source to the oscilloscope. Use the drop-down arrow in the Trigger box to set the trigger source channel. The Data and Trigger sources are mutually exclusive.

The Data and Trigger fields identify the data source and the external clock source.

Note: You cannot select the same channel for Data and Trigger.

Select Pair

Figure 65: Select Pair

Use the drop-down arrow in the Select Pair box to set the data pair. The available data pairs are:

- RX0

- RX1

- RX2

Select the data pair to which you have probed the TPA-P fixture for Transmitter device and TPA-R fixture for a Cable and Receiver device.
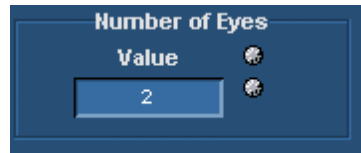
Number of Eyes

Figure 66: Number of Eyes

Use the GP knob or the calculator keypad next to the Value field to set the minimum number of eyes considered to find the worst eye opening in Transmitter, Cable, or Receiver Eye measurements. The application then positions the eye mask on the worst opening eye.

You can set a minimum of two eyes to place the mask on the worst eye opening because the DVI specifications recommend at least two eyes to conduct the eye diagram test.

To analyze the pixels, you can set a maximum of ten eyes because each data pixel has 10 bits. The application analyzes these eyes and places the mask at the worst eye opening.

Cable Pk-Pk Jitter

Before using the application, set up the DUT as given in Application Examples> Cable-Pk-Pk Jitter> Equipment Setup on page 156.

Select the Cable tab and click the Pk-Pk Jitter measurement to display the following screen:
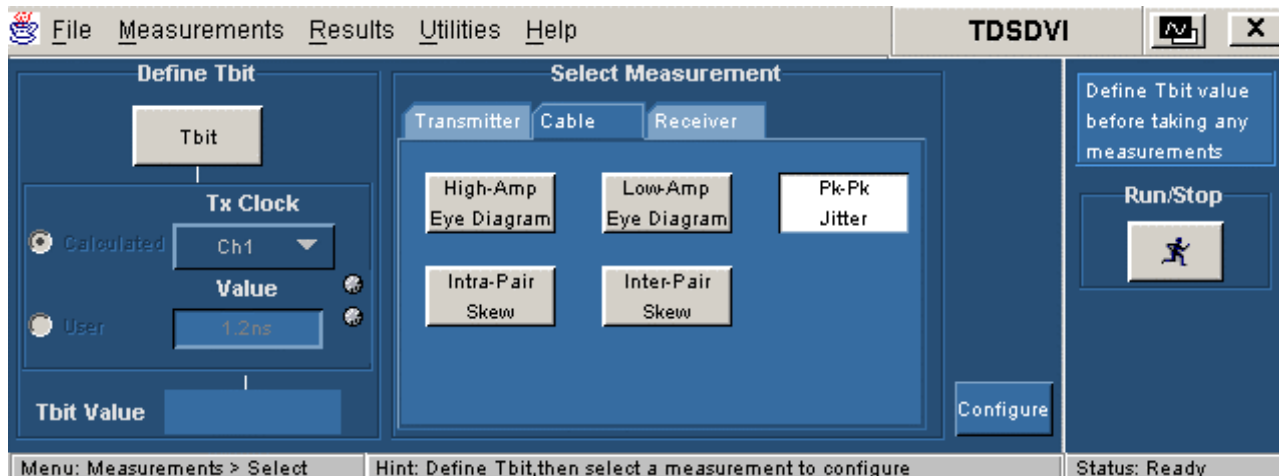
Figure 67: Pk-Pk Jitter pane
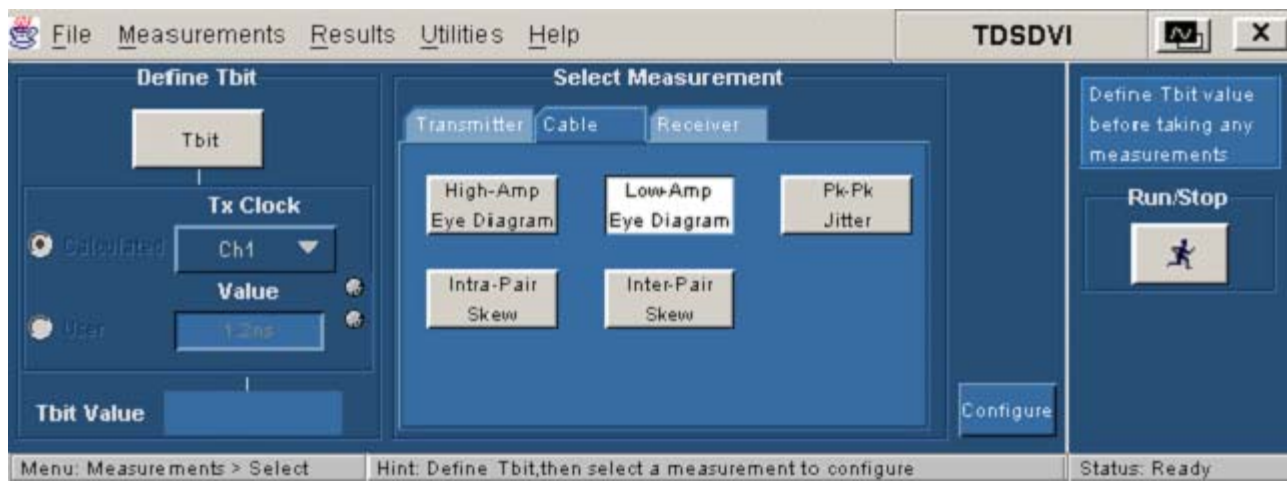
Select the Pk-Pk Jitter measurement and press the Configure button to display the configuration parameters for the Pk-Pk Jitter measurement.
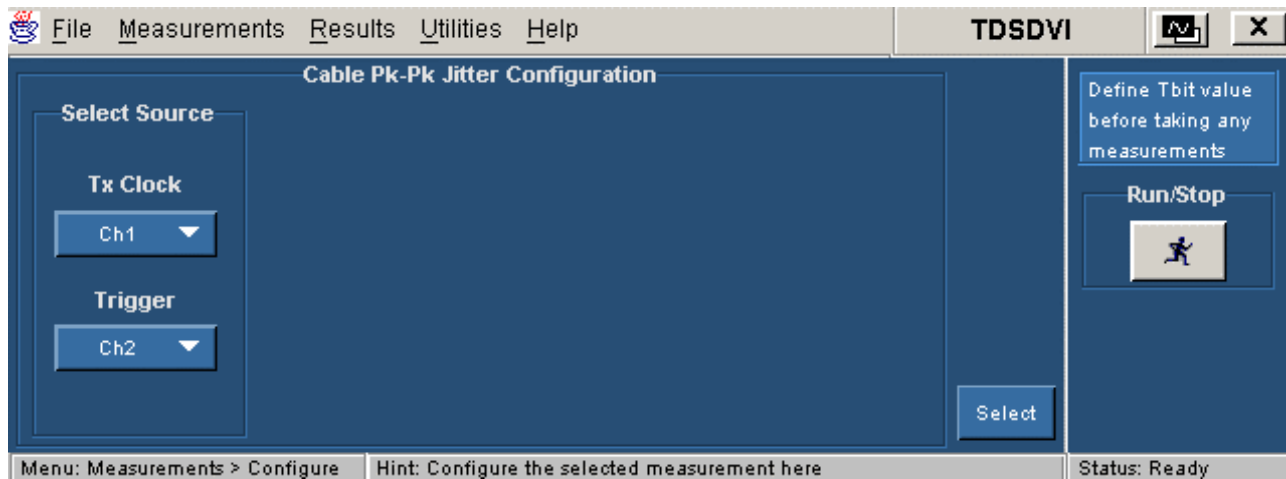
Figure 68: Pk-Pk Jitter configuration
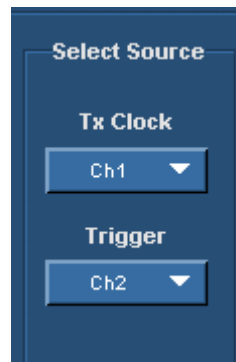
Select Source

Figure 69: Select Source

Use the drop-down arrow in the Tx Clock box to select the transmitted differential clock source channel. The available selections are: CH1 through CH4. The application requires a CRU (Clock Recovery Unit) to trigger the oscilloscope. Use the drop-down arrow in the Trigger box to set the trigger source channel. Data and Trigger source are mutually exclusive.

The Tx Clock and Trigger fields identify the Tx clock source and the Clock Recovery Unit source.

Note: You cannot select the same channel for Tx clock and Trigger.

Cable Intra-Pair Skew

Before using the application, set up the DUT as given in Application Examples> Cable-Intra-Pair Skew> Equipment Setup on page 157.

Cable Intra-Pair skew is the skew between the signal that constitutes from the same pair (Example Rx0+ and Rx0−) at TP3.

Select the Cable tab and click the Intra-Pair Skew measurement to display the following screen measurement:

Figure 70: Intra-Pair Skew pane

Select the Intra-Pair Skew measurement and press the Configure button to display the configuration parameters for the Intra-Pair Skew measurement.
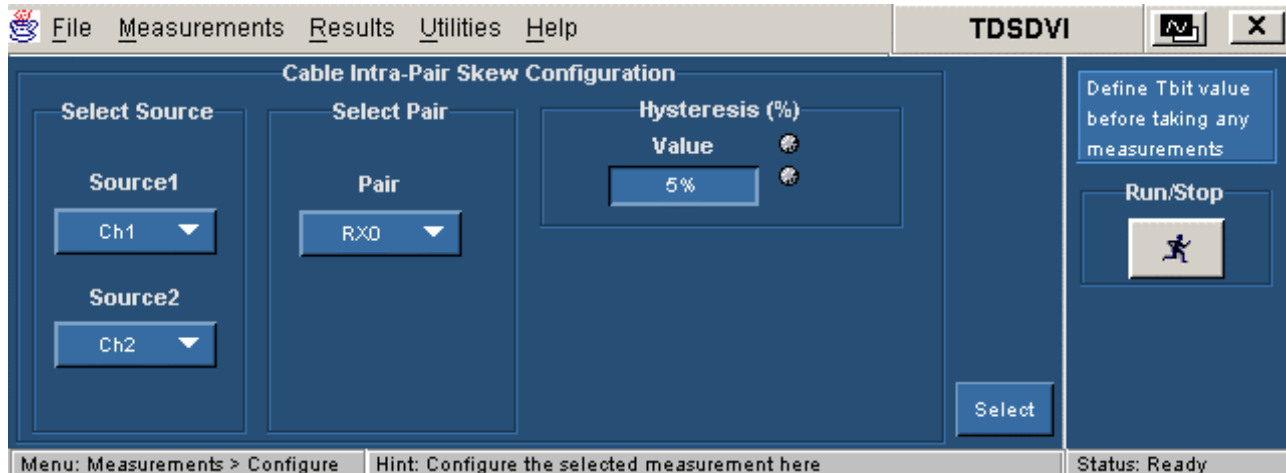

Figure 71: Intra-Pair Skew Configuration

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Select Source

Figure 72: Select Source

Use the drop-down arrow in the Source1 box to set the data line (+) of the data pair. The available selections are: CH1 through CH4. Use the drop-down arrow in the Source2 box to set the data line (−) of the data pair. The Source channels are mutually exclusive. Use two single-ended probes to connect the data pair (for example: Rx0+ or Rx0−) to Source1 and Source2.

The Source field identifies a data line.

Note: You cannot select the same channel for Source1 and Source2.

Select Pair

Figure 73: Select Pair

Use the drop-down arrow in the Select Pair box to set the data pair. The available data pairs are:

- RX0

- RX1

- RX2

Select the data pair to which you have probed the TPA-P fixture for Transmitter device and TPA-R fixture for a Cable and Receiver device.
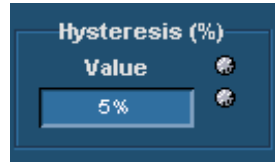
Hysteresis

Figure 74: Hysteresis

Use the GP knob or the calculator keypad ▦ next to the Value field to enter the hysteresis percentage value.

The hysteresis range is 2% to 10%.

Cable Inter-Pair Skew

Before using the application, set up the DUT as given in Application Examples> Cable-Inter-Pair Skew> Equipment Setup on page 160.

Inter-Pair skew is the skew between the signal that constitutes from the different pair (Example Rx0+ of one pair and Rx0− of the other pair).

Select the Cable tab and click the Inter-Pair Skew measurement to display the following screen:
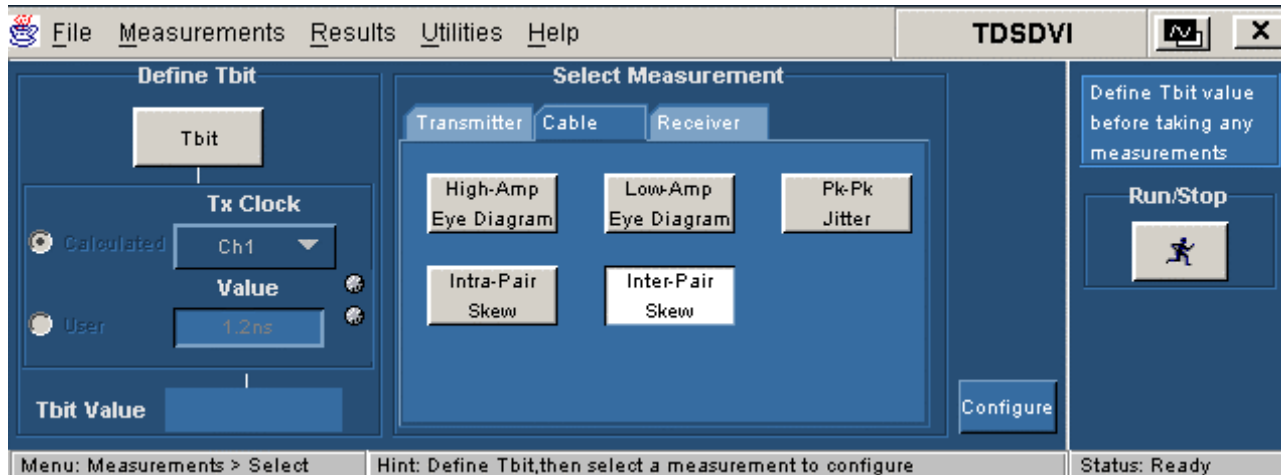
Figure 75: Inter-Pair Skew pane

Select the Inter-Pair Skew measurement and press the Configure button to display the configuration parameters for the Inter-Pair Skew measurement.
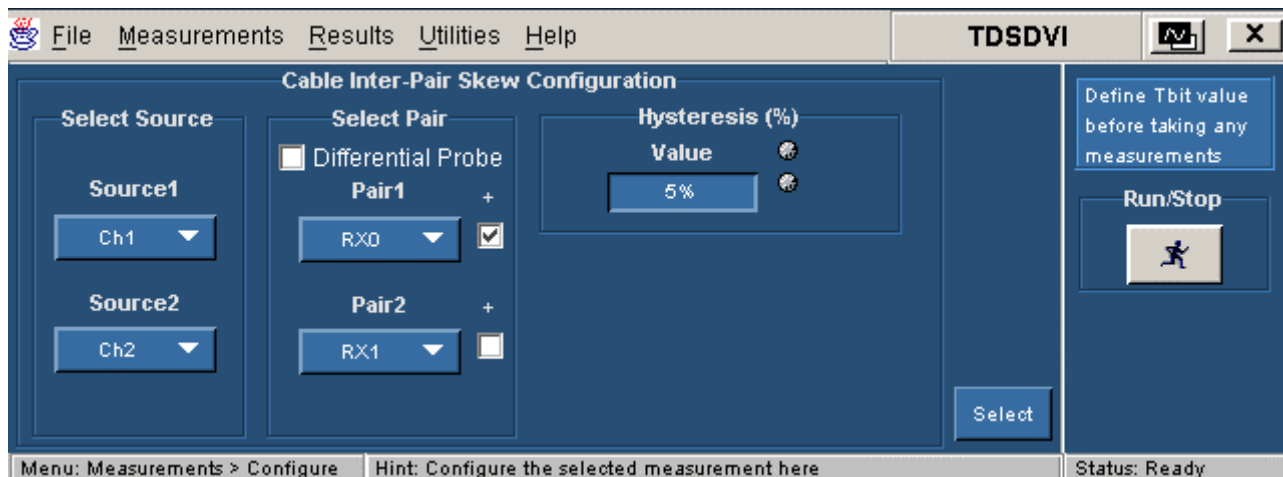
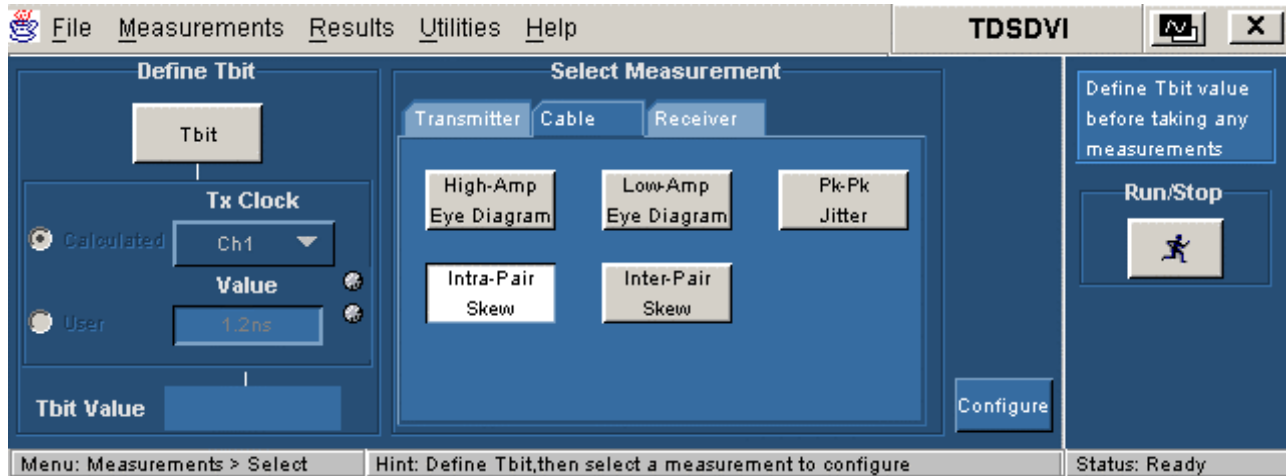Figure 76: Inter-Pair Skew configuration

Select Source

Figure 77: Select Source

Use the drop-down arrow in the Source1 box to set the data line (+) of the data pair. The available selections are: CH1 through CH4. Use the drop-down arrow in the Source2 box to set the data line (−) of the data pair. The Source channels are mutually exclusive. Use two single-ended probes to connect the data pair (for example: Rx0+ or Rx0−) to Source1 and Source2.

The Source field identifies a data line.

Note: You cannot select the same channel for Source1 and Source2.

Select Pair

Figure 78: Select Pair

Use the drop-down arrow in the Pair1 and Pair2 box to set the differential data pair. The available data pairs are:

- RX0

- RX1

- RX2

If the data line is positive, select the check box next to the Pair fields. If you select the Differential Probe box, the positive check boxes next to the pair fields are disabled and the application calculates the time delay between the two data pairs. If you used a single-ended probe, the application calculates the skew between the data lines.

Select the data pair from which you have probed the TPA-P fixture. You cannot select the same data pair in the Pair1 and Pair2 boxes, irrespective of the polarity (+ or −).
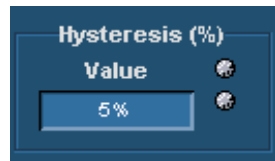
Hysteresis

Figure 79: Hysteresis

Use the GP knob or the calculator keypad next to the Value field to enter the hysteresis percentage value.

The hysteresis range is 2% to 10%.

Receiver High-Amplitude/Low Amplitude Eye Diagram

Before using the application, set up the DUT as given in Application Examples> Receiver-High Amplitude/Low Amplitude Eye Diagram> Equipment Setup on page 167.

Select the Receiver tab and click the High-Amp Eye Diagram measurement to display the following screen:
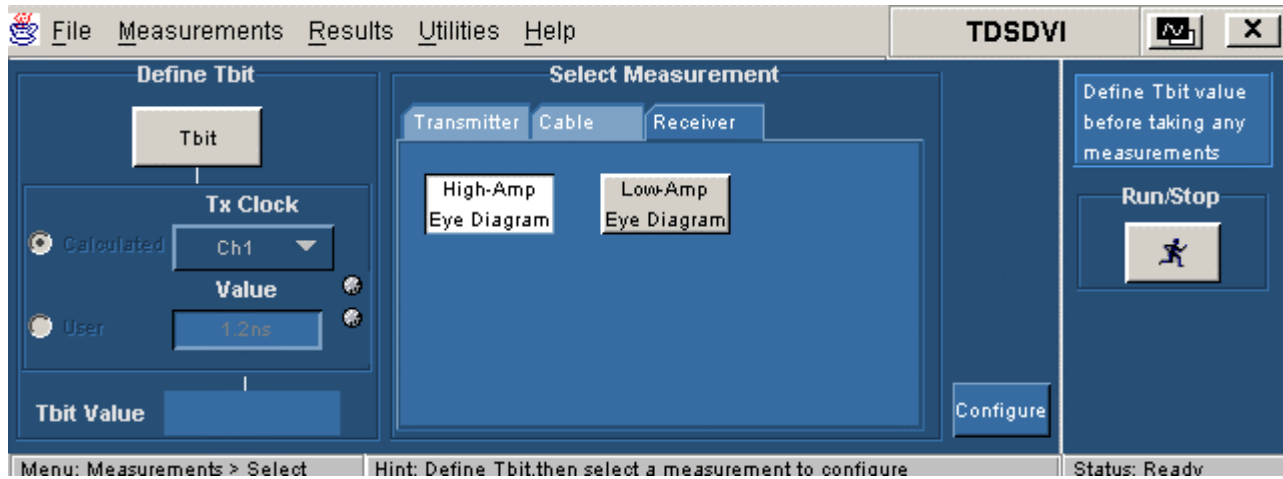
Figure 80: High-Amplitude Eye Diagram pane

Select the High-Amplitude Eye Diagram and press the Configure button to display the configuration parameters for the High-Amplitude Eye Diagram measurement.
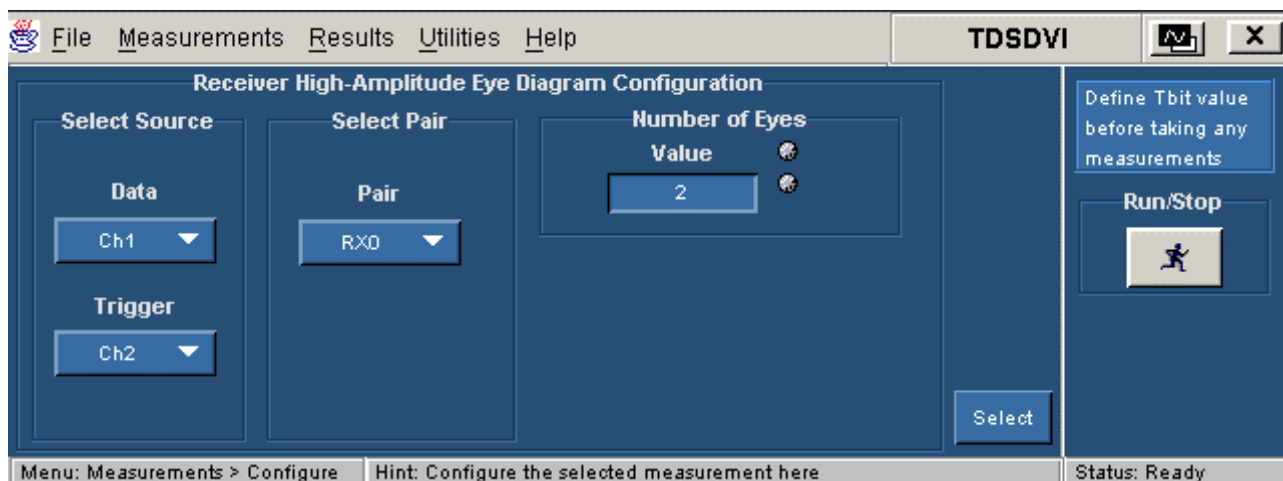
Figure 81: High-Amplitude Eye Diagram configuration

Select the Receiver tab and click the Low-Amp Eye Diagram measurement to display the following screen:
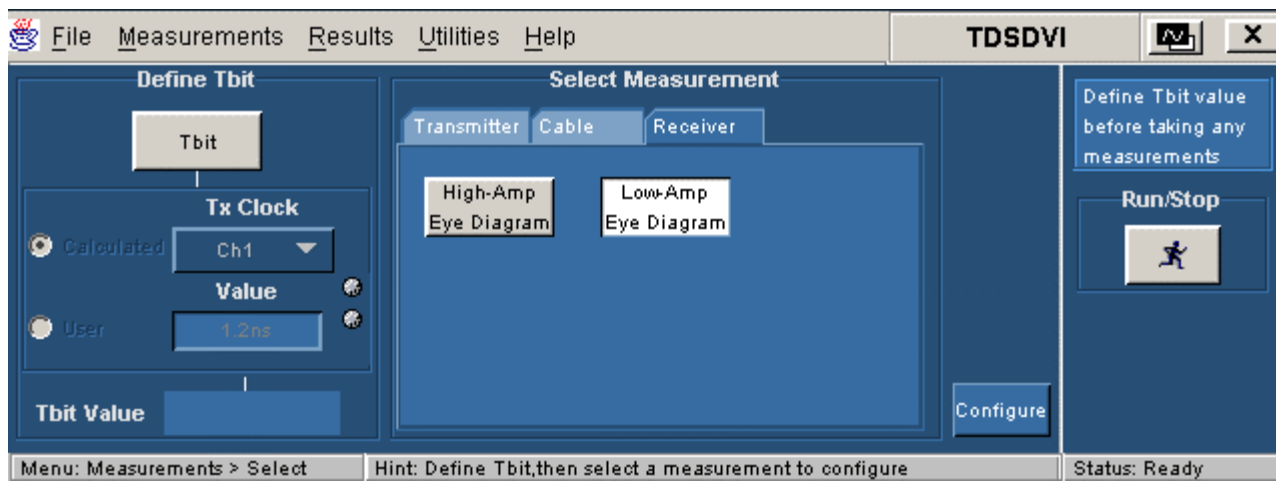
Figure 82: Low-Amplitude Eye Diagram pane

Select the Low-Amplitude Eye Diagram and press the Configure button to display the configuration parameters for the Low-Amplitude Eye Diagram measurement.
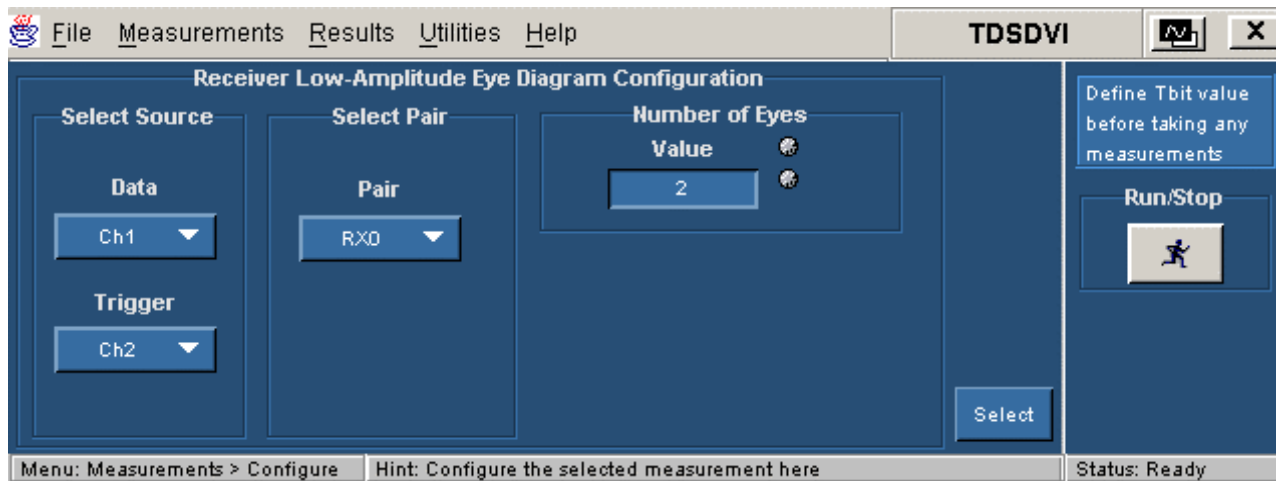
Figure 83: Low-Amplitude configuration

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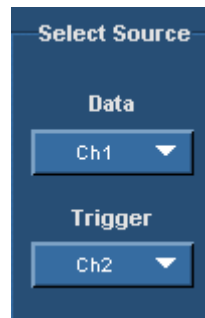
Select Source

Figure 84: Select Source

Use the drop-down arrow in the Data box to select the data source channel. The available selections are: Ch1 through Ch4. The application requires a recovered clock as an external trigger source to the oscilloscope. Use the drop-down arrow in the Trigger box to set the trigger source channel. The Data and Trigger sources are mutually exclusive.

The Data and Trigger fields identify the data source and the external clock source.

Note: You cannot select the same channel for Data and Trigger.

Select Pair
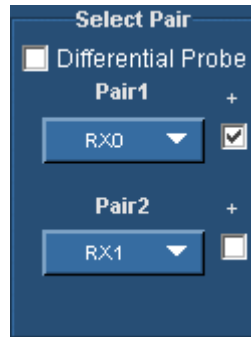

Figure 85: Select Pair

Use the drop-down arrow in the Select Pair box to set the data pair. The available data pairs are:

- RX0

- RX1

- RX2

Select the data pair to which you have probed the TPA-P fixture for Transmitter device and TPA-R fixture for a Cable and Receiver device.
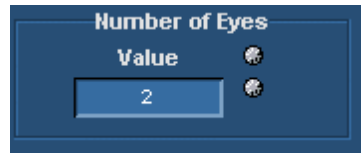
Number of Eyes

Figure 86: Number of Eyes

Use the GP knob or the calculator keypad ▦ next to the Value field to set the minimum number of eyes considered to find the worst eye opening in Transmitter, Cable, or Receiver Eye measurements. The application then positions the eye mask on the worst opening eye.

You should set a minimum of two eyes to place the mask on the worst eye opening because the DVI specifications recommend at least two eyes to conduct the eye diagram test.

To analyze the pixels, you can set a maximum of ten eyes because each data pixel has 10 bits. The application analyzes these eyes and places the mask at the worst eye opening.

Calculate Tbit
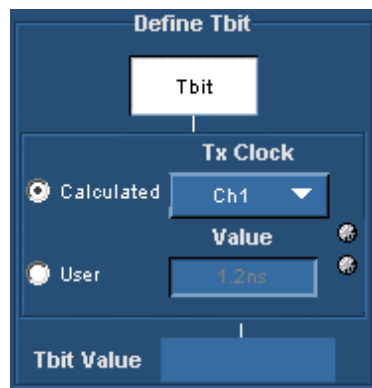
Figure 87: Define Tbit pane

Tbit is the time required to transmit one bit of data. The Define Tbit pane is independent of all the measurements. A valid Tbit value is required for all measurements. If the device, resolution, blanking rate, or the refresh rate changes, you have to recalculate Tbit. The Tx Clock field identifies the external clock source.

Note: We recommend that you calculate the Tbit with the differential transmitted clock rather than defining Tbit values yourself. You need to calculate Tbit only once for a device working at a particular resolution, refresh rate, or blanking rate. This value will be retained for further measurements. If the device, resolution, refresh rate, or blanking rate changes, you have to recalculate Tbit.

To calculate Tbit,

1. Select the Tbit button to enable the Define Tbit pane.

2. Select the Calculated radio button to use the differential transmitted clock and calculate Tbit.

3. Select the Tx Clock channel from the Tx Clock drop-down list. The available selections are: Ch1 through Ch4.

4. Click the Run button to calculate Tbit. The application displays the following message box. (This message box is not displayed if you have not selected the File> Preferences> Prompt for signal connection check box.)
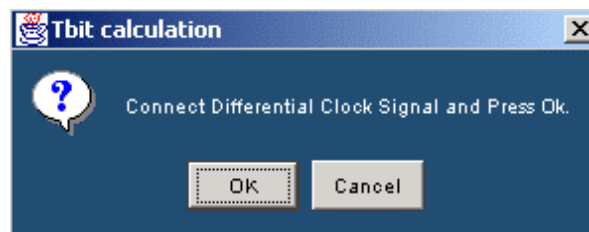
Figure 88: Connect differential clock message box

5. Select OK to confirm the connection. You can select the Cancel button to cancel the process.

6. After calculating Tbit, the application displays the following message box and the value in the Tbit Value field.
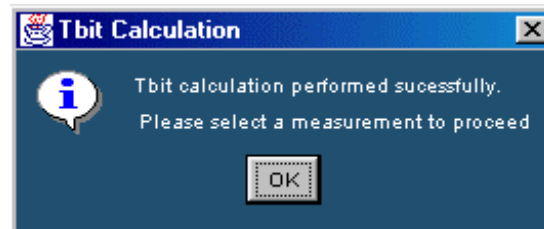
Figure 89: Successful Tbit calculation message box

Enter a User Defined Tbit Value

1. Select the Tbit button to enable the Define Tbit pane.

2. Select the User radio button if you want to define the Tbit values yourself.

3. Use the calculator keypad or the GP knob next to the Value field to set the Tbit value.

The acceptable ranges for Tbit Values are:

- TDS66604, TDS6404, TDS6604B, TDS6804B, TDS7404, TDS7404B, TDS7704B, CSA7404, CSA7404B, DPO7354, and DPO/DSA70000 series oscilloscopes—200 ps to 20 ns.

- TDS7254 and TDS7254B oscilloscopes—1ns to 20 ns.

Troubleshooting Tbit Calculation Error Messages

- The application displays the following message box if the Tbit value is not within the specified range. The acceptable ranges for Tbit Values are:

  - TDS66604, TDS6404, TDS6604B, TDS6804B, TDS7404, TDS7404B, TDS7704B, CSA7404, CSA7404B, DPO7354, and DPO/DSA70000 series oscilloscopes —200 ps to 20 ns.

  - TDS7254 and TDS7254B oscilloscopes—1ns to 20 ns.
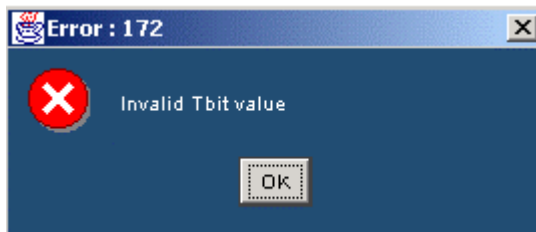
Figure 90: Invalid Tbit value message box

- The application displays the following message box if the Tbit calculation has failed. This happens if you have not used a clock signal.
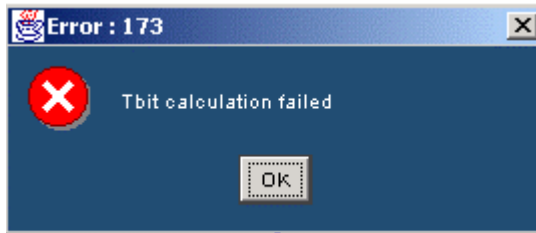
Figure 91: Tbit calculation failure message box

- If you select the Tbit option and press the Configure button, the application displays the following message box. To avoid this, configure the Tbit value in the Define Tbit pane and press the Run button.
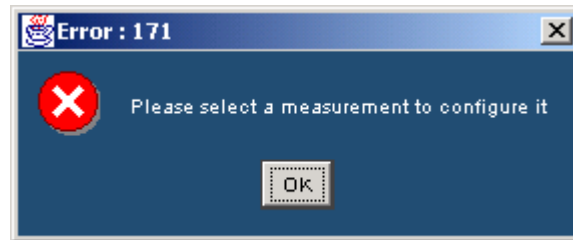
Figure 92: Select measurement message box

- If you select the User option and press the Configure button, the application displays the following message box:
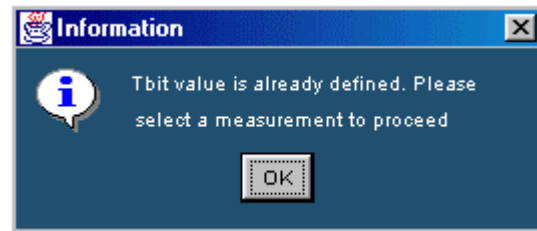
Figure 93: Tbit defined message box

Test Transmitter For Eye Diagram

Selecting and Configuring Eye Diagram

Follow these steps to select and configure the Eye Diagram:

Note: Refer to page 141 to set up the DUT before using the application.

1. Select Measurements> Select> Transmitter>Eye Diagram to display the Eye Diagram screen.
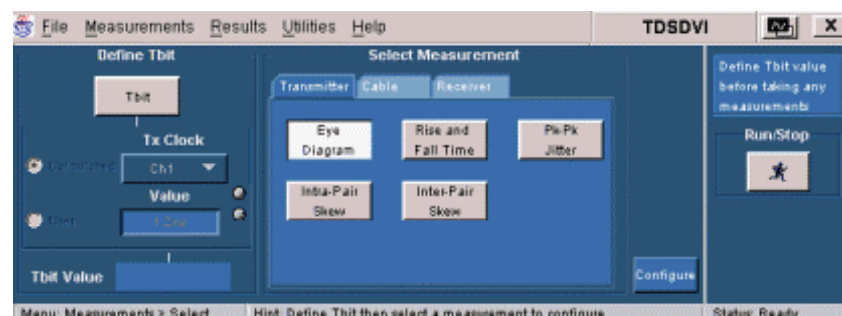
Figure 94: Eye Diagram pane

2. You have to define Tbit:

   ▪ If you have not calculated the Tbit value

   ▪ If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
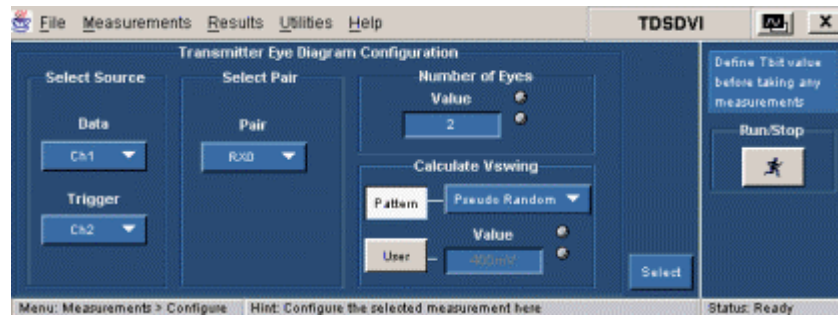
Figure 95: Eye Diagram configuration

4. In the Select Source pane, select the data source channel from the Data drop-down list. This indicates which channel is connected in the TPA-P fixture with a differential probe. The available selections are: CH1 through CH4. The application requires a recovered clock as an external trigger source to the oscilloscope. Use the drop-down arrow in the Trigger field to set the trigger source channel. The available selections are: CH1 through CH4. You cannot set the same channel for Data and Trigger source.

5. Use the drop-down arrow in the Pair field to set the data pair. The available data pairs are:

   ▪ RX0

   ▪ RX1

   ▪ RX2

Note: The data pair values appear only in the generated report and are not used for any calculations.

6. In the Number of Eyes field, use the GP knob or the calculator keypad ⊞ next to the Value field, to enter the minimum number of eyes to be considered to perform the test.

7. From the Calculate Vswing pane, you can calculate Vswing in two ways:

   ■ Select the Pattern button. Use the drop-down arrow to select the Pseudo Random or Half Clock to specify the pattern you want to use to calculate Vswing.

   ■ If you know the Vswing value, select the User button. In the Value field, use the pop-up keyboard to enter your user-defined Vswing values. The default pattern is PRP.

8. Press the Run button [icon] to perform the test. The application displays the Confirm Tbit Value message box.

9. If you have defined the Tbit value, the application displays the Eye Mask message box.

10. If you have selected Half Clock Pattern, the application displays the following message box. Transmit the HCP from the DUT, connect the signals to the oscilloscope, and select OK.
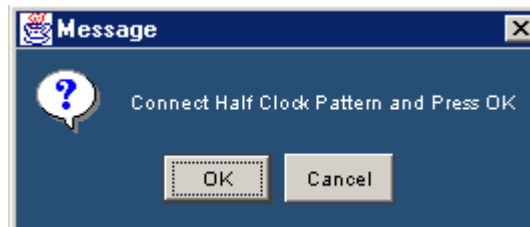
Figure 96: Half clock pattern message box

11. If you have selected PRP to calculate Vswing, the application displays the following message box. Transmit the PRP in the DUT, connect the signals to the oscilloscope and select OK.
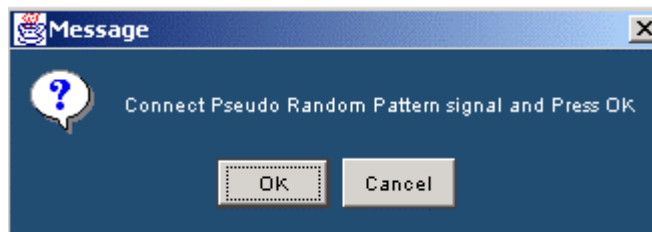
Figure 97: PRP message box

12. If you are using a TDS6000 series oscilloscopes:

- If you have selected Half Clock Pattern in TDS6000 series Oscilloscopes, the application displays the following message box. (You can select the Stop button to stop the process and the Skip button to measure the Vswing with the current number of available acquisitions.)
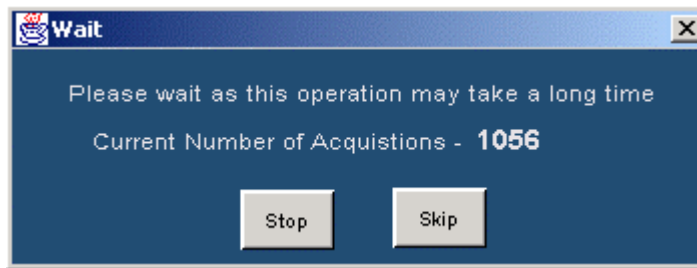
Figure 98: Wait message box

- If you have selected File> Preferences> Use Cursors for Eye, RT & FT Testing, the application enables the cursors on the oscilloscope to calculate the Vswing.

- After calculating Vswing using the Half Clock Pattern, the application displays the message box, "Connect the PRP pattern". Remove the TPA-P fixture from the DUT and connect the DVI monitor. Change the PRP pattern and remove the DVI monitor from the DUT. Connect the TPA-P fixture to the DUT and probe the selected data pair from the TPA-P and press OK to display the following message box.
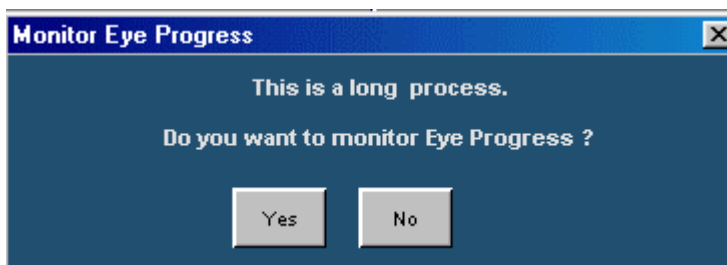
Figure 99: Monitor eye progress message box

- Select Yes to display the Eye Zoom screen. If you select No, the application continues to run the measurement.

    (If you have selected File> Preferences> Use Cursors for Eye, RT & FT Testing, the application displays only the Wait message box.)

The application tests the signal with the transmitter eye mask and displays the results.

Viewing Results for Eye Diagram

Follow these steps to view Eye Diagram results:

1. Select Results> Result Detail to display the detailed results for the Transmitter Eye Measurement.

You can also use the:

- Compare Result button to compare results

- Eye Zoom button to view the zoomed eye

- Generate Report button to generate reports
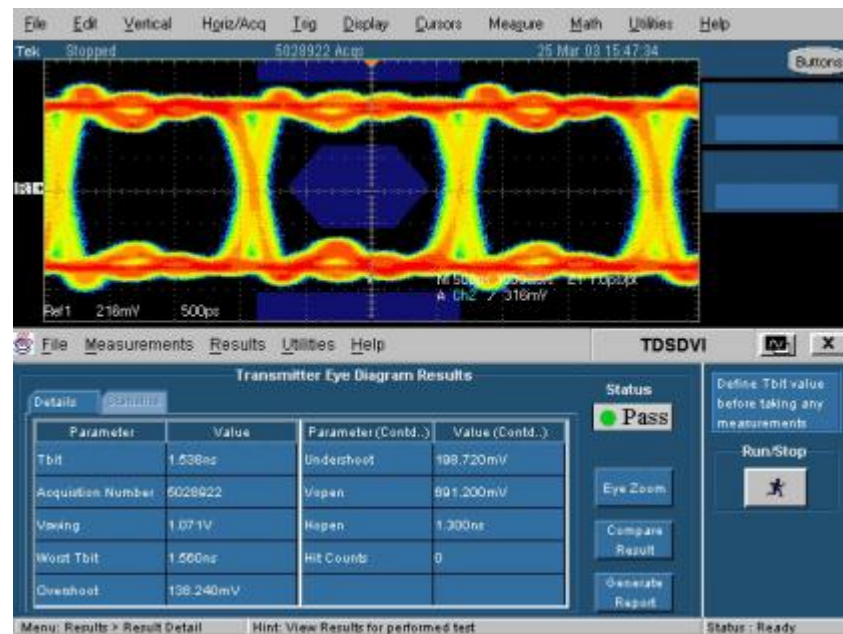
Figure 100: Eye Diagram results

The following table describes the eye diagram result options

Table 19: Results: Eye diagram options and their descriptions

Results	Description
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Acquisition Number, Vswing, Worst Tbit, Overshoot, Undershoot, Vopen, Hopen, and Hit Counts.
Value	Displays the values of: • Tbit used for calculating the coordinates of the eye mask • Calculated Worst Tbit • The number of acquisitions to create the eye diagram • Calculated Vswing in volts • Calculated Overshoot and Undershoot of the eye diagram • Vopen in volts and Hopen in seconds • The number of Hit counts on the eye mask
Status	Displays the result status: Pass or Fail.

Generating Reports for Eye Diagram

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

Follow these steps to generate a report for all the measurements:

1. Select Reports> Report Generation to display the following screen.
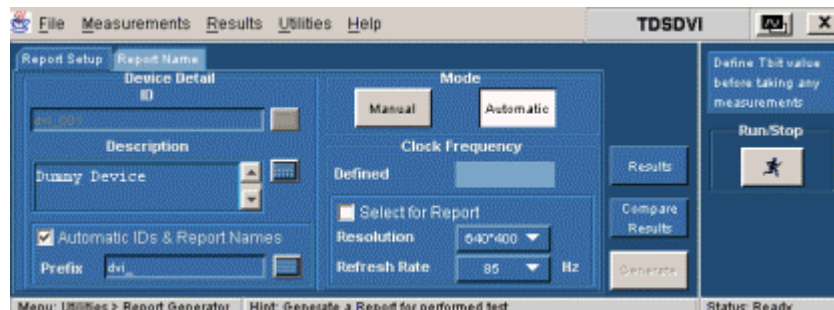
Figure 101: Generate report, report setup tab

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:

Figure 102: Generate Report, report name tab

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report. Figure 103 shows a sample Eye Diagram report.
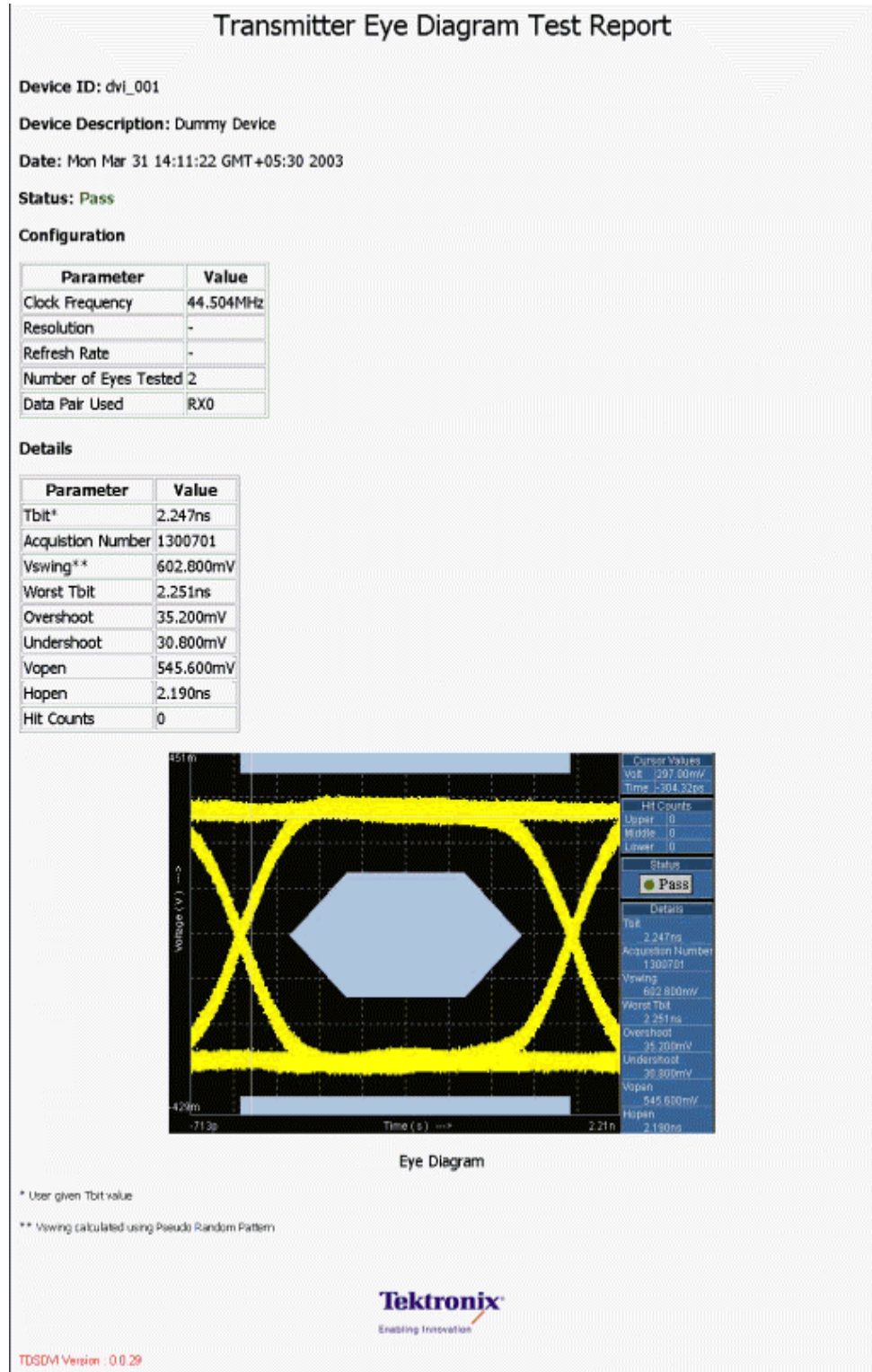
Figure 103: Eye Diagram report

Test Transmitter for Rise Time and Fall Time

Selecting and Configuring Measurements: Rise and Fall Time

Follow these steps to select and configure Rise and Fall Time:

Note: Refer to page 144 to set up the DUT before using the application.

1. Select Measurements> Select> Transmitter> Rise and Fall Time to display the following screen:
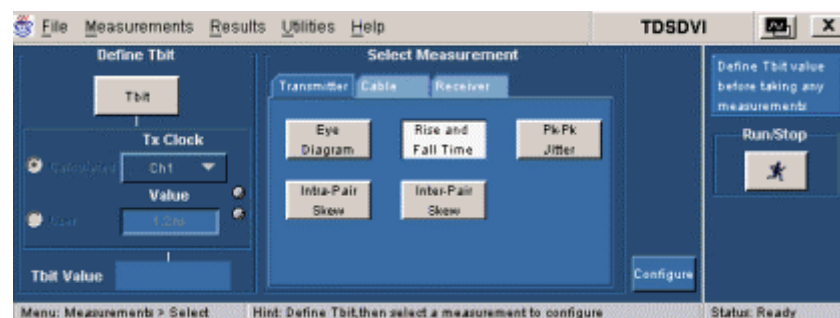
Figure 104: Rise and Fall Time pane

2. You have to define Tbit:

   - If you have not calculated the Tbit value

   - If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
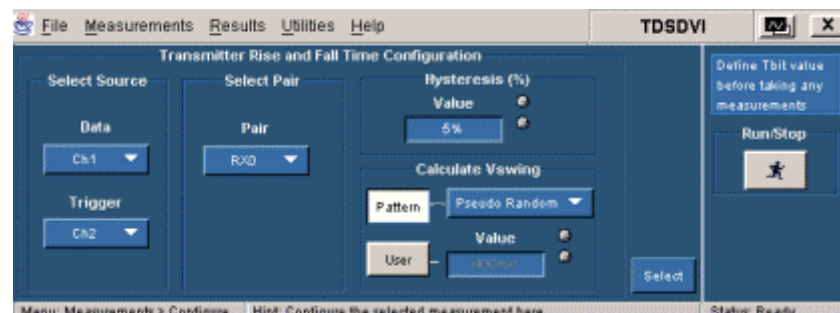
Figure 105: Rise and Fall Time configuration

4. Use the drop-down arrow in the Data field to select the data source channel. The available selections are: CH1 through CH4.The application requires a recovered clock as an external trigger source to the oscilloscope. Use the drop-down arrow in the Trigger field to set the trigger source channel.

5. Use the drop-down arrow in the Select Pair field to set the data pair. The available data pairs are:

   ▪ RX0

   ▪ RX1

   ▪ RX2

6. In the Hysteresis field, use the GP knob or the calculator keypad ⊞ to enter the hysteresis percentage value. The hysteresis range is 2% to 10%.

7. From the Calculate Vswing pane, you can calculate Vswing in two ways:

   ▪ Select the Pattern button. Use the drop-down arrow to select the Pseudo Random or Half Clock to specify the pattern you want to use to calculate Vswing.

   ▪ If you know the Vswing value, select the User button. In the Value field, use the calculator keypad ⊞ to enter the user defined Vswing values. The default pattern is PRP.

8. Press the Run button to perform the test. The application displays the Confirm Tbit Value message box.

9. If you have selected Half Clock Pattern, the application displays the following message box. Generate the HCP in the DUT and select OK. Refer to page 191 on how to generate the HCP in the DUT.
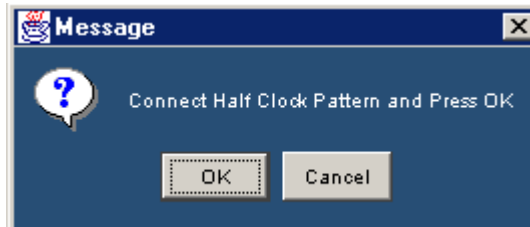
Figure 106: HCP message box

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10. If you have selected PRP to calculate the Vswing, the application displays the PRP message box. Generate the PRP in the DUT and select OK. Refer to page 191 on how to generate the PRP in the DUT.
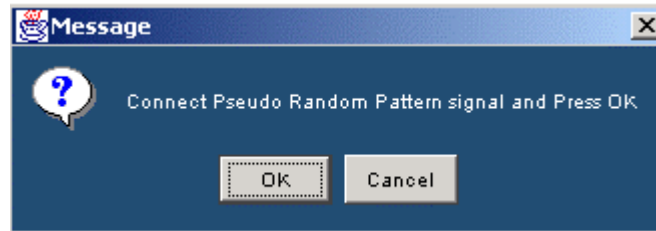
Figure 107: PRP message box

11. If you are using a TDS6604, TDS6404, TDS6604B, or TDS6804B oscilloscope.

- Select the Stop button to stop the process. If you select the Skip button, the application measures the Vswing with the current number of acquisitions.
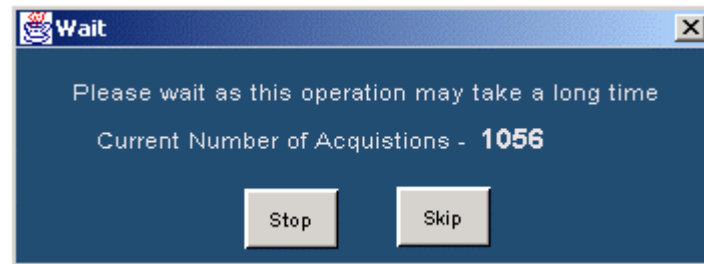
Figure 108: Wait message box

12. If you have selected File> Preferences> General> Use cursors for Eye, RT & FT Testing, refer to page 191 for information on what the application does to calculate Vswing. The application calculates the Rise and Fall time and displays the results.

Viewing Results for Rise and Fall Time

Follow these steps to view Rise and Fall Time results:

1. Select Results> Result Detail to display the detailed and statistical results for the Transmitter Rise and Fall Time Measurement.

You can use:

- Compare Result button to compare results

- Generate Report button to generate reports
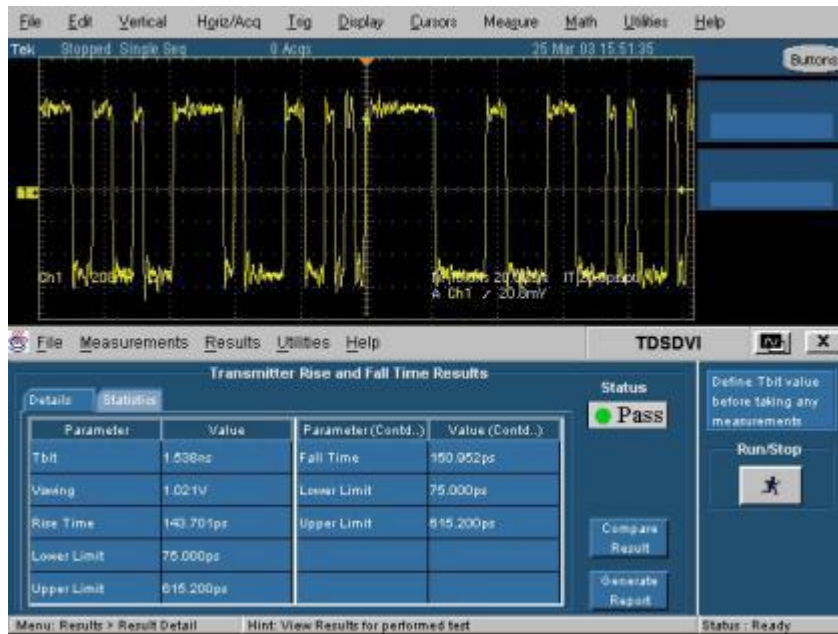
Figure 109: Rise and Fall Time results-Details
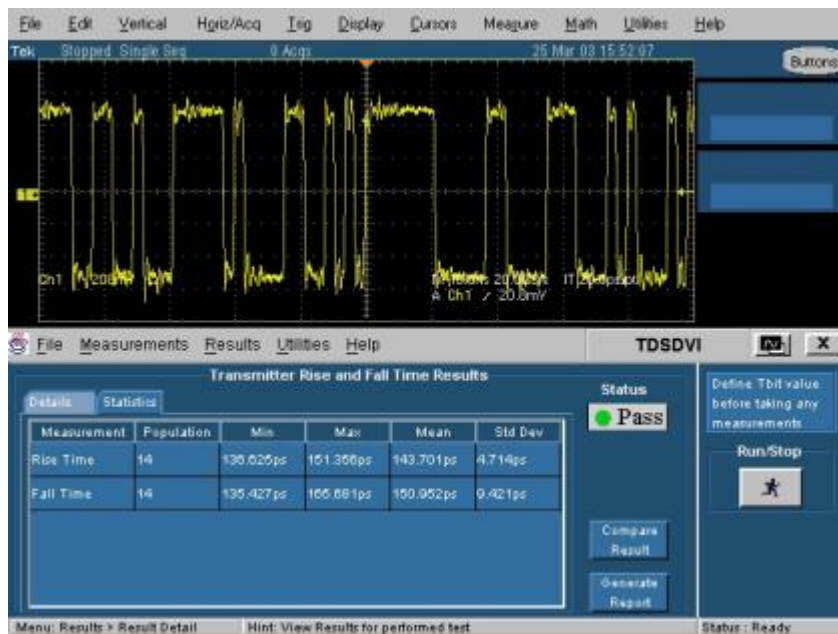
Figure 110: Rise and Fall Time results-Statistics

The following table describes the rise and fall time result options:

Table 20: Results: Rise and Fall time options and their descriptions

Results	Description
Details tab	
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Vswing, Worst Tbit, Lower Limits, and Upper Limits for Rise Time and Fall Time.
Value	Displays the values of: • Tbit used for calculating the limits of Rise and Fall Time • Calculated Vswing in volts • Calculated Overshoot, Undershoot of the eye diagram • Vopen in millivolts and Hopen in seconds • The measured Rise time and Fall time value in seconds • The lower limit for Rise time and Fall time. Values below this limit indicate a Fail • The upper limit for Rise time and Fall time. Values above this limit indicate a Fail
Statistics tab	
Measurement	Displays the selected measurement.
Population	The number of edges calculated in the acquired waveform.
Min	The minimum Rise and Fall Time value in the acquired waveform.
Max	The maximum Rise and Fall Time value in the acquired waveform.
Mean	The average of all the calculated Rise Time values.
Std Dev	The standard deviation of all the calculated Rise and Fall time values.
Status	Displays the result status: Pass or Fail. This is common to both the Details and Statistics tab.

Generating Reports for Rise Time and Fall Time

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

1. Select Reports> Report Generation to display the following screen.

Figure 111: Generate Report, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:

Figure 112: Generate Report, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Test Transmitter for Pk-Pk Jitter

Selecting and Configuring Measurements: Pk-Pk Jitter

You can select Pk-Pk Jitter in the following ways:

- Measurement> Select> Transmitter> Pk-Pk Jitter

- Measurement> Select> Cable> Pk-Pk Jitter

Note: Refer to page 147 to set up the DUT before using the application for Transmitter Pk-Pk Jitter.

Refer to page 156 to set up the DUT before using the application for Cable Pk-Pk Jitter

To get appropriate results in Pk-Pk Jitter measurements, from the oscilloscope menu bar, select Measure>Waveform Histograms>Adjust Histogram Box Limits.

Follow these steps to select and configure Pk-Pk Jitter:

1. Select Measurements> Select> Transmitter/Cable> Pk-Pk Jitter to display the screen:
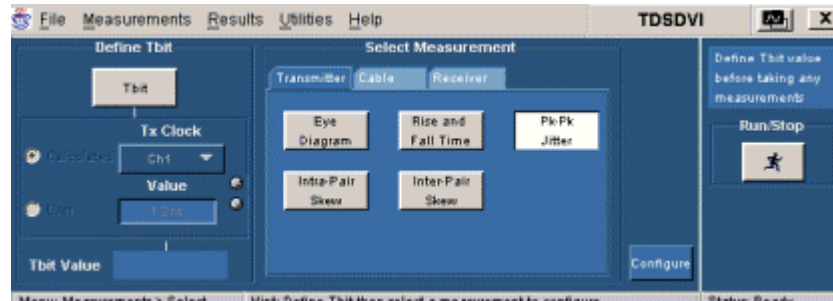
Figure 113: Transmitter Pk-Pk Jitter pane

Figure 114: Cable Pk-Pk Jitter pane

2. You have to define Tbit:

- If you have not calculated the Tbit value

- If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
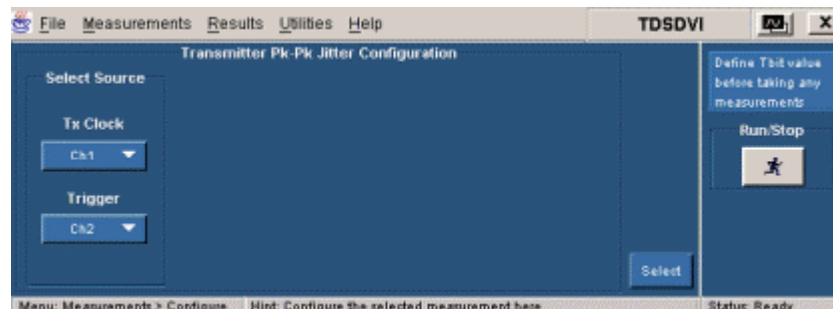
Figure 115: Transmitter Pk-Pk Jitter configuration

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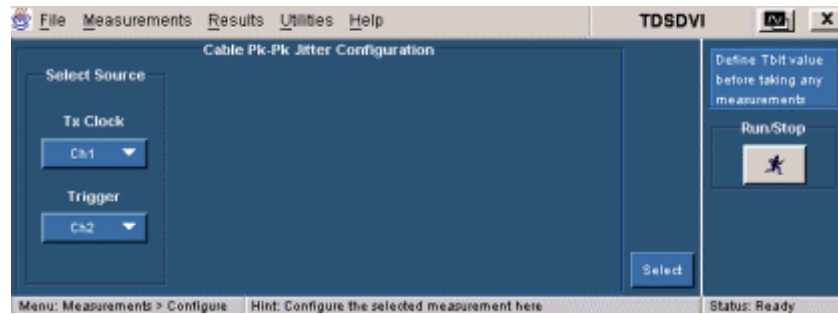
Figure 116: Cable Pk-Pk Jitter configuration

4. Select the transmitted differential clock source from the Tx Clock drop-down list. The available selections are: CH1 through CH4. The application requires a CRU (Clock Recovery Unit) to trigger the oscilloscope. Set the trigger source channel from the Trigger drop-down list. Data and Trigger source are mutually exclusive.

5. Press the Run button to perform the test. The application displays the Confirm Tbit Value message box.

6. Confirm the Tbit value to display the following message box. Connect the clock signals and press OK.

Figure 117: Clock signals message box

The application calculates the Pk-PK Jitter and displays the result: Pass or Fail.

Note: For more in-depth analysis on Jitter, use the TDSJIT3 Package.

If the signal is unstable, the application cannot place the histogram at the second rising edge of the clock signal, then the application displays the following message box.
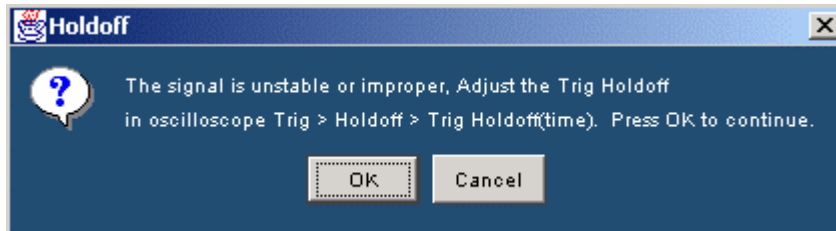
Figure 118: Holdoff message box

To adjust the Trigger Holdoff time:

1. Select Trig> Holdoff from the oscilloscope interface.

2. Use the GP knob on the oscilloscope panel to adjust the trigger hold off time.

3. After stabilizing the signal, press the APP button in the oscilloscope interface to display the application.

4. Press OK to continue the peak-to-peak jitter measurement and Cancel to stop running the measurement.

Figure 119: Oscilloscope interface

Viewing Results for Pk-Pk Jitter

Follow these steps to view Pk-Pk Jitter results:

1. Select Results> Result Detail to display the detailed results for the Transmitter or Cable Pk-Pk Jitter Measurement.

You can also use:

- Compare Result button to compare results

- Generate Report button to generate reports
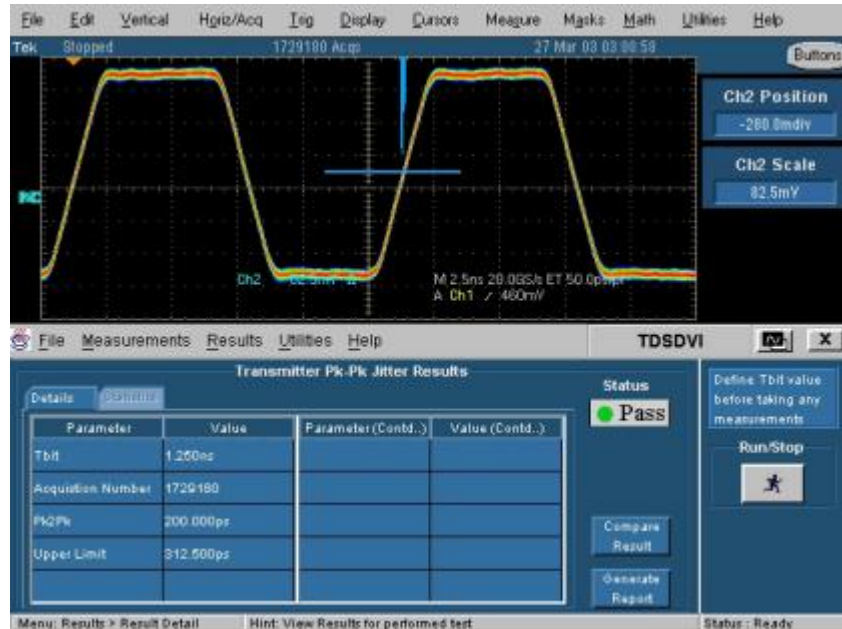
Figure 120: Pk-Pk Jitter results

The following table describes the peak-to-peak jitter result options:

Table 21: Results: Pk-Pk Jitter options and their descriptions

Results	Description
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Acquisition Number, Pk-to-Pk jitter, and Upper Limit.
Value	Displays the values of: • Tbit used for calculating the peak to peak jitter limits in seconds • The number of acquisitions to create the histogram • The measured peak to peak jitter values in seconds • The maximum limit values for Jitter. The peak to peak jitter values above this limit indicate a Fail
Status	Displays the result status: Pass or Fail.

Generating Reports for Pk-Pk Jitter

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

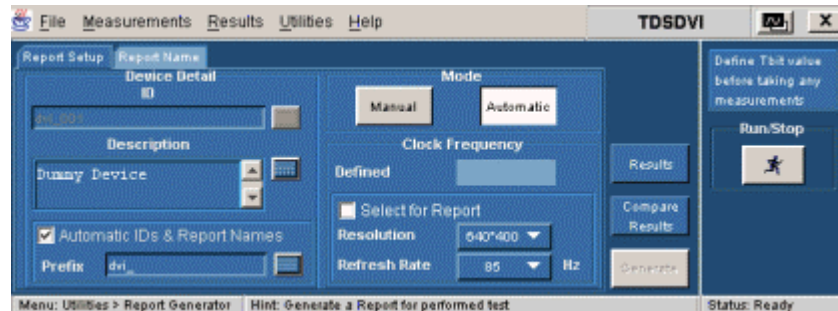1. Select Reports> Report Generation to display the following screen:

Figure 121: Generate report, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode the Prefix field is disabled. If you select the Automatic mode Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:
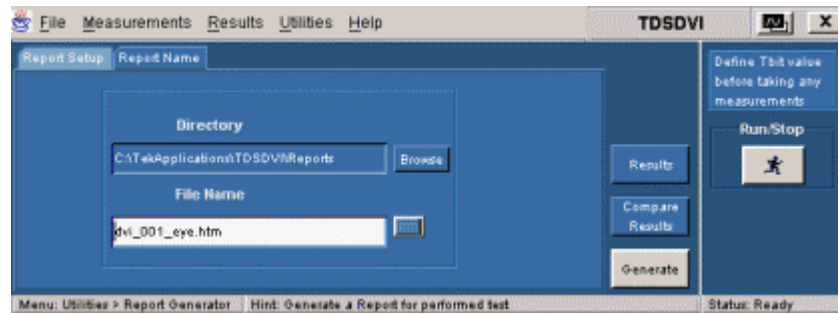

Figure 122: Generate report, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Test Transmitter for Intra-Pair Skew

Selecting and Configuring Measurements: Intra-Pair Skew

You can select Intra-Pair skew in the following ways:

- Measurement> Select> Transmitter>Intra-Pair Skew

- Measurement> Select> Cable> Intra-Pair Skew

Note: Refer to page 150 to set up the DUT before using the application for Transmitter Intra-Pair Skew.

Refer to page 157 to set up the DUT before using the application for Cable Intra-Pair Skew.

Follow these steps to select and configure Intra-Pair Skew:

1. Select Measurements> Select> Transmitter/Cable> Intra-Pair Skew to display the following screen:
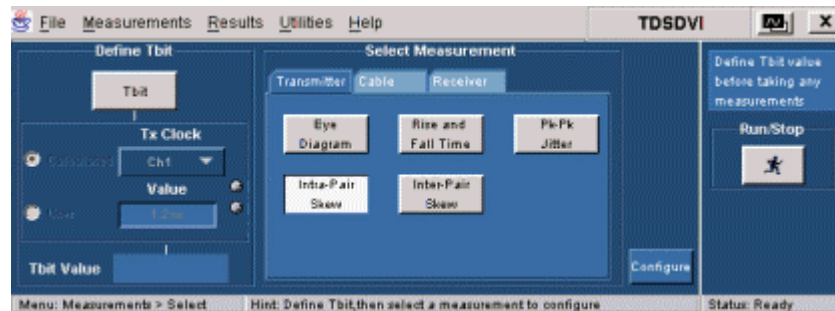
Figure 123: Transmitter Intra-Pair Skew pane
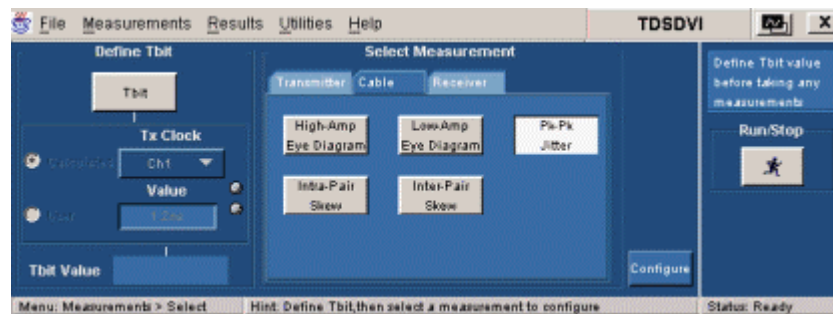

Figure 124: Cable Intra-Pair Skew pane

2. You have to define Tbit:

    ▪ If you have not calculated the Tbit value

    ▪ If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
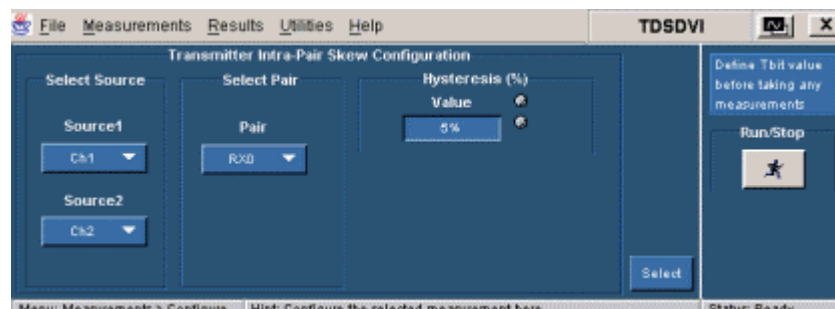
Figure 125: Transmitter Intra-Pair Skew configuration

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Figure 126: Cable Intra-Pair Skew configuration

4. Set the data line (+ or −) of a data pair in the Source drop-down list. The available selections are: CH1 through CH4. The Source channels are mutually exclusive. Use two single-ended probes to connect the data pair (for example: Rx0+ or Rx0−) to Source1 and Source2.

5. Set the data pair in the Pair drop down list. The available selections are:

    ▪ RX0

    ▪ RX1

    ▪ RX2

6. In the Hysteresis field, use the calculator keypad or the GP knob to enter the hysteresis percentage value. The range for the hysteresis is 2% to 10%.

7. Press the Run button to perform the test. The application displays the Confirm Tbit Value message box.

8. Select Yes to display the following message box. Connect the data signals and press OK.

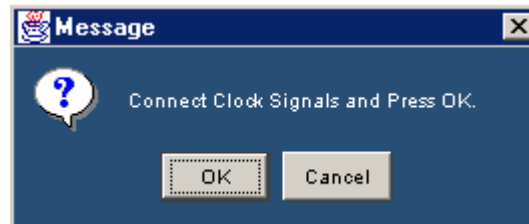Figure 127: Data signals message box

The application calculates the Intra-Pair Skew and displays the result: Pass or Fail.

Viewing Results for Intra-Pair Skew

Follow these steps to view Intra-Pair Skew results:

1. Select Results> Result Detail to display the detailed and statistical results for the Transmitter or Cable Intra-Pair Skew Measurement.

You can also use:

- Compare Result button to compare results

- Generate Report button to generate reports

Figure 128: Intra-Pair Skew results

The following table describes the intra-pair skew result options:

Table 22: Results: Intra-Pair Skew options and their descriptions

Results	Description
Details tab	
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Skew, and Upper Limit.
Value	Displays the values of:
	• Tbit used for calculating the intra-pair skew limits
	• The measured skew
	• The maximum limit for intra-pair skew. Values above this limit indicate a Fail

Table 22: Results: Intra-Pair Skew options and their descriptions (Cont.)

Results	Description
Statistics tab	
Measurement	Displays the selected measurement.
Population	The number of edges calculated in the acquired waveform.
Min	The minimum intra-pair skew value in the acquired waveform.
Max	The maximum intra-pair skew value in the acquired waveform.
Mean	The average of all the calculated intra-pair skew values.
Std Dev	The standard deviation of all the calculated intra-pair skew values.
Status	Displays the result status: Pass or Fail. This is common for the Details and the Statistics tab.

Generating Reports for Intra-Pair Skew

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

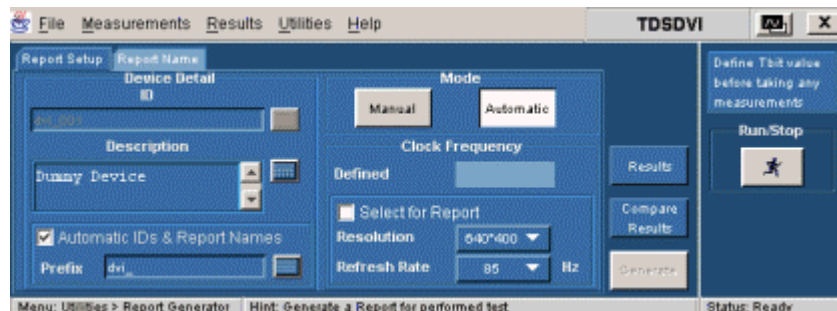**1.** Select Reports> Report Generation to display the following screen:

Figure 129: Generate reports, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:
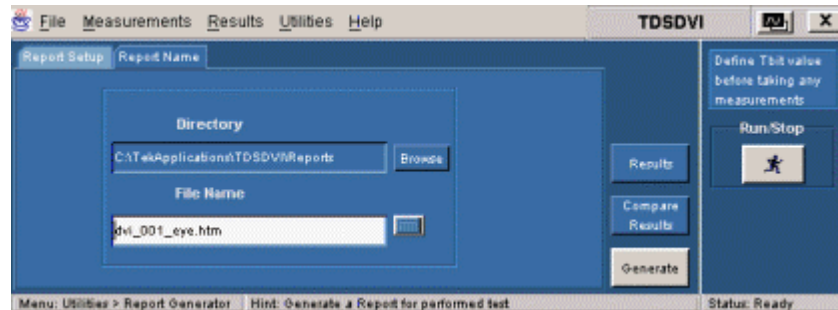

Figure 130: Generate reports, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Test Transmitter for Inter-Pair Skew

Selecting and Configuring Measurements: Inter Pair Skew

Follow these steps to select and configure Inter-Pair Skew:

Note: Refer to page 153 to set up the DUT before using the application.

1. Select Measurements> Select> Transmitter> Inter-Pair Skew to display the following screen.
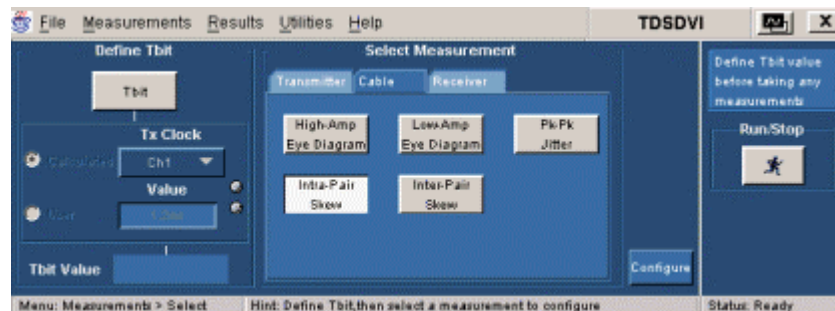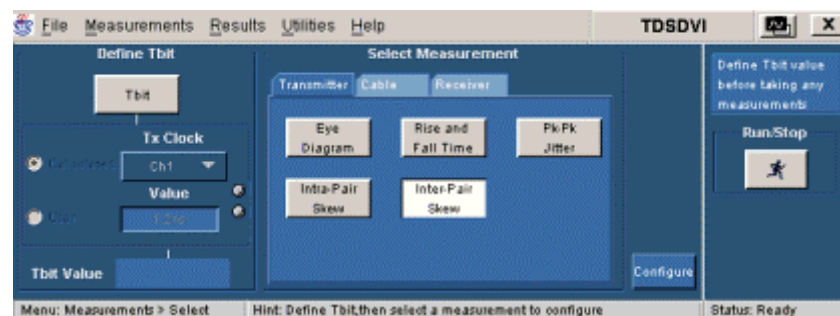

Figure 131: Inter-Pair Skew pane

2. You have to define Tbit:

- If you have not calculated the Tbit value

- If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

**3.** Select the Configure button to display the following screen:
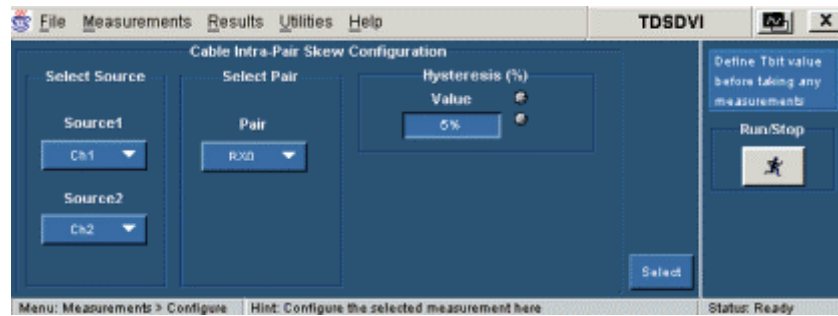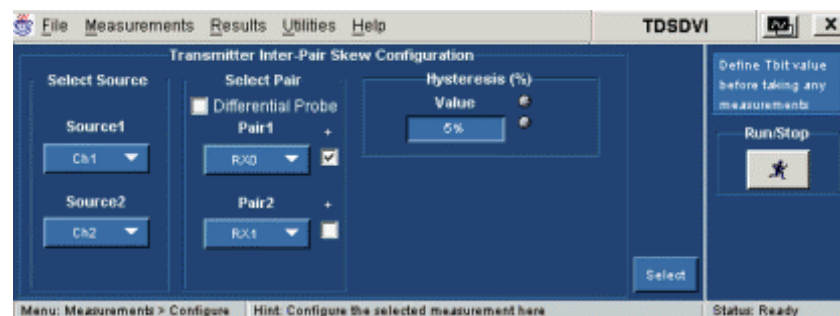

Figure 132: Inter-Pair Skew configuration

4. Set the data line (+ or −) of the data pair in the Source1 and Source2 drop-down list. The available selections are: CH1 through CH4. The Source channels are mutually exclusive. Use two single-ended probes to connect the data pair (for example: Rx0+ or Rx1−) to Source1 and Source2. If you have selected the Inter-Pair Skew option, use the drop-down arrow in the Pair1 and Pair2 field to set the data pairs. If you select the Differential Probe box, the positive check boxes next to the pair fields are disabled. If you use a differential probe, the application calculates the time delay between two data pairs. If you use a single-ended probe, the application calculates the skew between the data lines. The available selections are:

- RX0

- RX1

- RX2

If the data pairs are positive, select the check box next to the Pair fields. You cannot select the same data pair in the Pair1 and Pair2 fields irrespective of the selected polarity (+ or −). If you select the Differential Probe box, the positive check boxes next to the pair fields are disabled and the application calculates the time delay between the two data pairs.

5. Press the Run button [icon]. The application displays the Confirm Tbit Value message box.

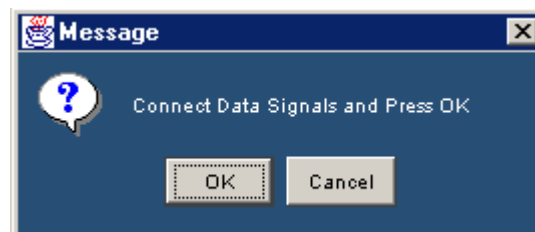**6.** Select Yes to display the following message box. Connect the data signals and press OK.
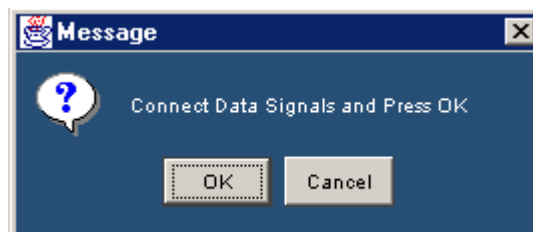
Figure 133: Data signals message box

The application calculates the Inter-Pair Skew and displays the result: Pass or Fail.

Viewing Results for Inter-Pair Skew

Follow these steps to view Inter-Pair Skew results.

1. Select Results> Result Detail to display the detailed results for the Transmitter Inter-Pair Skew Measurement.

You can also use the:

- Compare Result button to compare results

- Generate Report button to generate reports
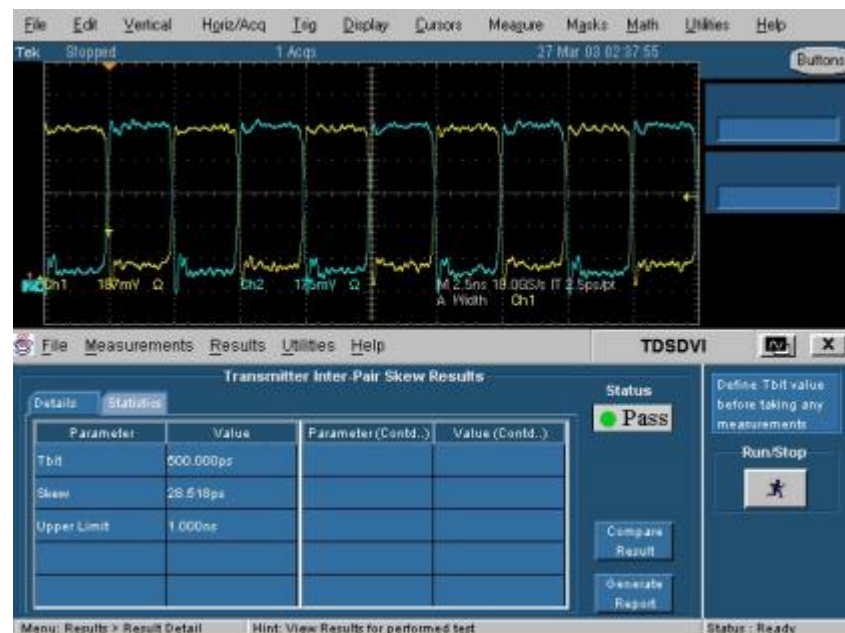
Figure 134: Inter-Pair Skew results

The following table describes the inter-pair skew result options:

Table 23: Results: Inter-Pair Skew options and their descriptions

Results	Description
Details tab	
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Skew, and Upper Limit.
Value	Displays the values of: • Tbit used for calculating inter-pair skew limits in seconds • The measured skew in seconds • The maximum limit for inter-pair skew. Values above this limit indicate a Fail

Table 23: Results: Inter-Pair Skew options and their descriptions (Cont.)

Results	Description
Statistics tab	
Measurement	Displays the selected measurement.
Population	The number of edges calculated in the acquired waveform.
Min	The minimum inter-pair skew value in the acquired waveform.
Max	The maximum inter-pair skew value in the acquired waveform.
Mean	The average of all the calculated inter-pair skew values.
Std Dev	The standard deviation of all the calculated inter-pair skew values.
Status	Displays the result status: Pass or Fail. This is common for the Details and the Statistics tab.

Generating Reports for Inter-Pair Skew

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

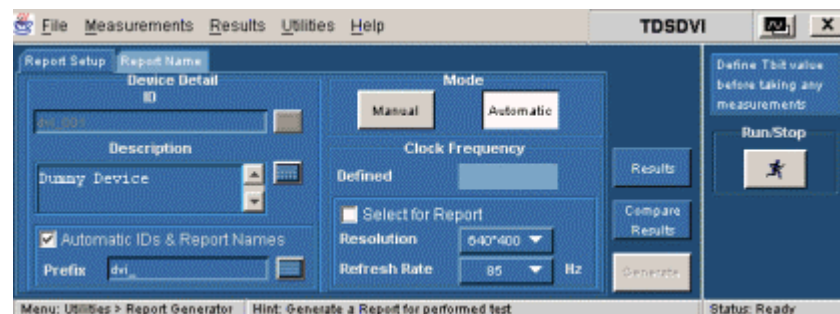**1.** Select Reports> Report Generation to display the following screen.

Figure 135: Generate report, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:
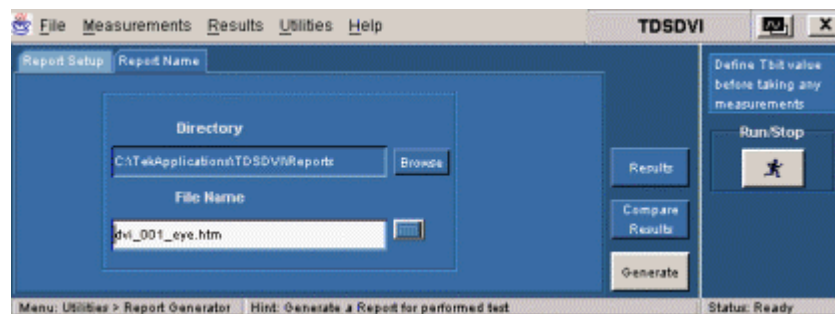

Figure 136: Generate report, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Test Cable for Hi-Amplitude/Low-Amplitude Eye

Select and Configure Measurements for High-Amplitude/Low-Amplitude Eye Diagram

Click Measurement> Select> Cable> High-Amplitude/Low-Amplitude Eye Diagram. Follow these steps to select and configure High-Amplitude/Low-Amplitude Eye Diagram:

Note: Refer to page 162 to set up the DUT before using the application.

1. Select the Measurements> Select> Cable tab to display the following screen. Select the High-Amplitude/Low-Amplitude Eye Diagram option.
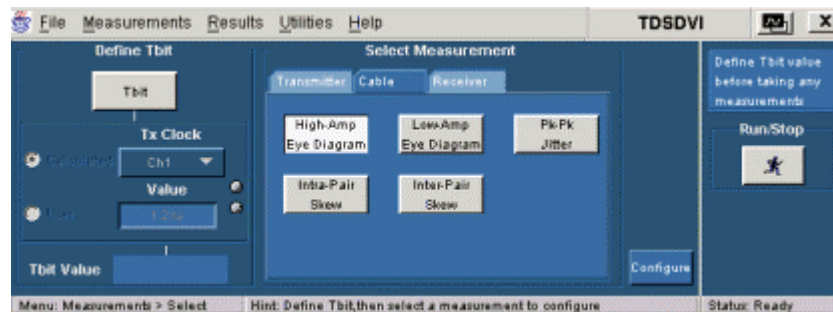
Figure 137: High-Amplitude Eye Diagram
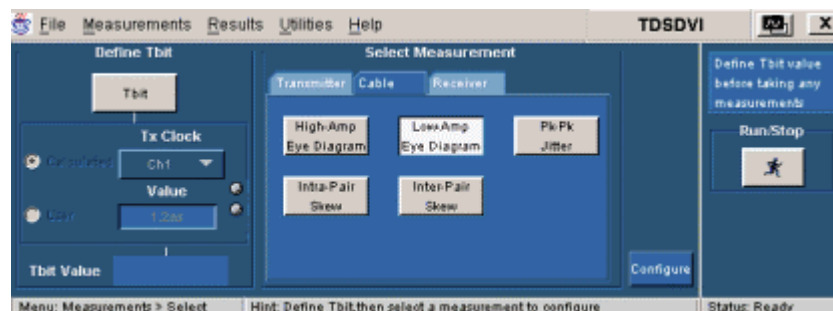
Figure 138: Low-Amplitude Eye Diagram

2. You have to define Tbit:

- If you have not calculated the Tbit value

- If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
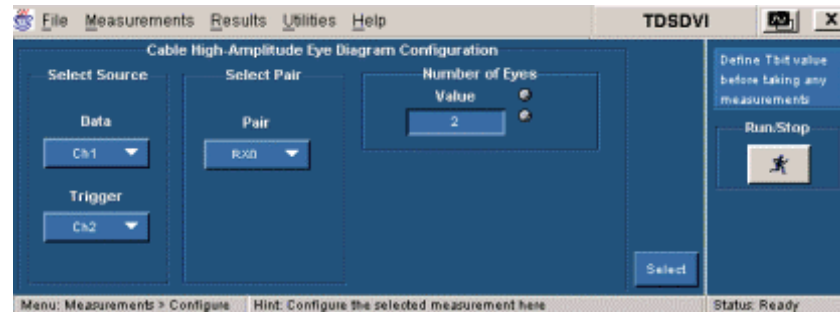
Figure 139: High-Amplitude Eye Diagram configuration
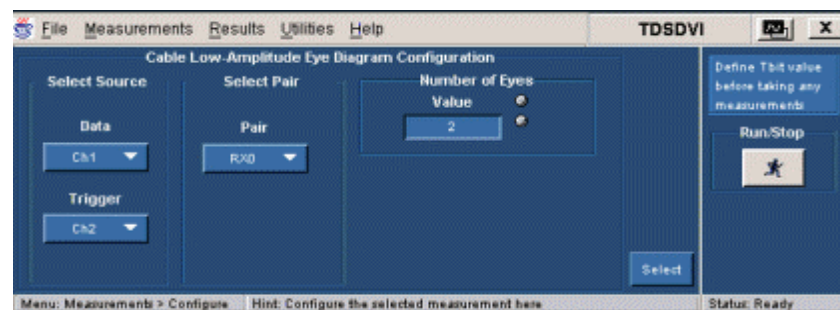
Figure 140: Low-Amplitude Eye Diagram configuration

4. In the Select Source area, from the Data drop-down list, indicate which channel is connected to the TPA-P fixture (at TP2) with a differential probe. See page 192 to learn about the TPA-P fixture at TP2 connections. The available selections are: Ch1 through Ch4. The application requires a recovered clock as an external trigger source to the oscilloscope. Set the trigger source in the Trigger drop-down list. The available selections are: Ch1 through Ch4. Data and Trigger sources are mutually exclusive.

5. Use the drop-down arrow in the Select Pair field to set the data pair. The available data pairs are:

   ▪ RX0

   ▪ RX1

   ▪ RX2

Note: The data pair values appear only in the generated report. They are not used for any calculations.

6. In the Min number of Eyes field, use the calculator keypad or the GP knob next to the Value field to enter the minimum number of eyes to be considered to place the mask.

7. Press the Run button to perform the test. The application displays the Confirm Tbit Value message box.

8. If the default option File> Preferences> Advanced> Cable Eye Diagram Test Point> Test at TP2 and TP3 is used the application does the following:

   ▪ The application displays the following message box. Select the PRP pattern in the Equivalent Source Board (ESB), connect the signal from the TPA-P fixture and press OK. See page 192 to learn about the TPA-P fixture connections.
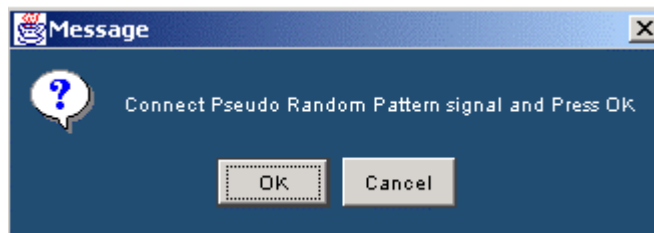
Figure 141: PRP message box

   ▪ The application tests the signal with Low/High Amplitude eye mask.

   ▪ If the signal fails, the application displays the TP2 test status and does not allow you to proceed further until the signal passes the test. To make the signal pass the test, increase or decrease the Vswing accordingly and run the test again. See page 193 for information on how to increase or decrease the Vswing. If the signal passes, you can view the TP2 test results and the application displays the following message box.
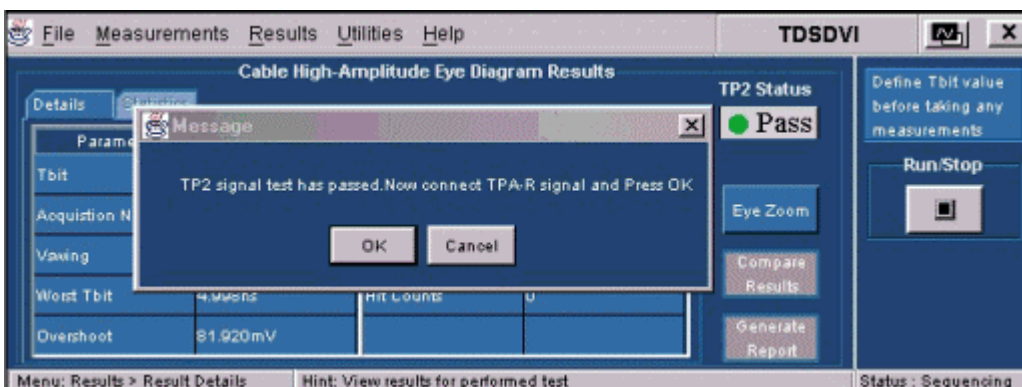
Figure 142: TPA-R message box

   ▪ Remove the TPA-P fixture at TP2 and connect the cable to the ESB board and the other end to TPA-R. See page 193 for information on the setup connections. Probe the correct data pairs from the TPA-R fixture and press OK.

   ▪ The application tests the signal with the cable limit eye mask.

TDSDVI-DVI Compliance Test Solution

- In the TDS66604, TDS6404, TDS6604B, and TDS6804B oscilloscopes, if you have selected Half Clock Pattern, the application displays the following message box. You can select the Stop button to stop the process.
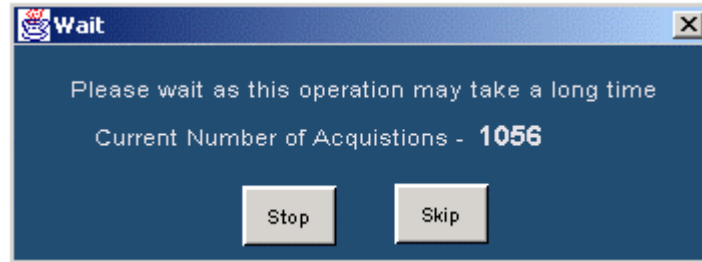
Figure 143: Wait message box

- The application completes the 10k acquisitions and displays the Monitor Eye Progress message box. Select Yes to display the Eye Zoom screen and No to stop running the measurement.
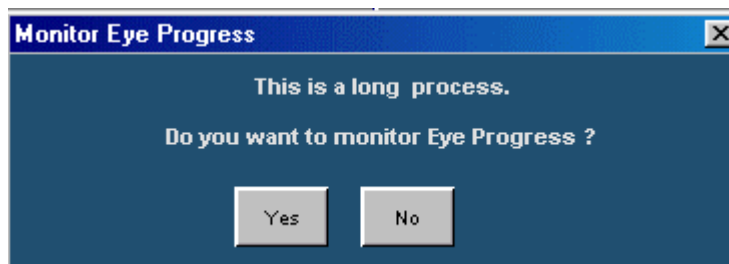
Figure 144: Monitor eye progress message box

Note: For expert users: If you have a standard signal that passes low or high amplitude mask, DVI application experts do not need to test cable at TP2 with low or high amplitude mask every time they run the cable measurement. For this purpose, we recommend that you select File> Preferences> Advanced> Cable Eye Diagram Test Point options.

If you have selected File> Preferences> Advanced> Cable Eye Diagram Test Point> Test at TP2, the application performs the following sequence of steps.

1. The application displays the message "Connect the Pseudo Random Pattern signal and press OK."

2. Select the PRP pattern in the Equivalent Source Board (ESB) and connect the signal from the TPA-P fixture and press OK.
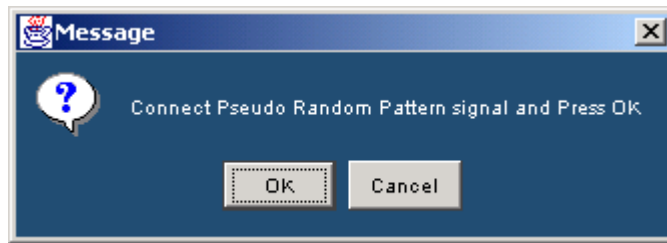
Figure 145: PRP message box

The application tests the signal with Low/High Amplitude eye mask and displays the results.

If you have selected File> Preferences> Advanced> Cable Eye Diagram Test Point> Test at TP3.

1. The application displays the message, "Connect TPA-R signal and press OK".

2. Connect the cable to the ESB board and the other end to TPA-R. Probe the correct data pairs from TPA-R and press OK.
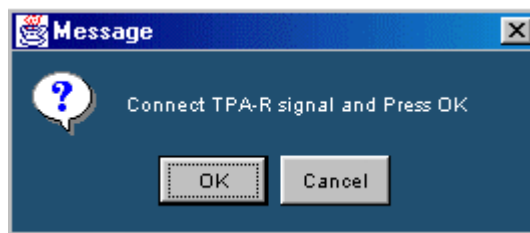
Figure 146: TPA-R signal message box

The application tests the signal with the cable limit eye mask and displays the results.

Note: If you have selected File> Preferences> Advanced> Cable Eye Diagram Test Point> Test at TP2 & TP3, you can generate reports only when the TP3 result is available (Pass or Fail). If you try to generate a report, the application displays the following error message box

Figure 147: Test not completed message box

Viewing Results for High-Amplitude/Low-Amplitude Eye Diagram

Follow these steps to view High-Amplitude/Low-Amplitude Eye Diagram results:

1. Select Results> Result Detail to display the detailed results for the Cable High/Low-Amplitude Measurement.

   You can also use the Compare Result button to compare results and Generate Report button to generate reports
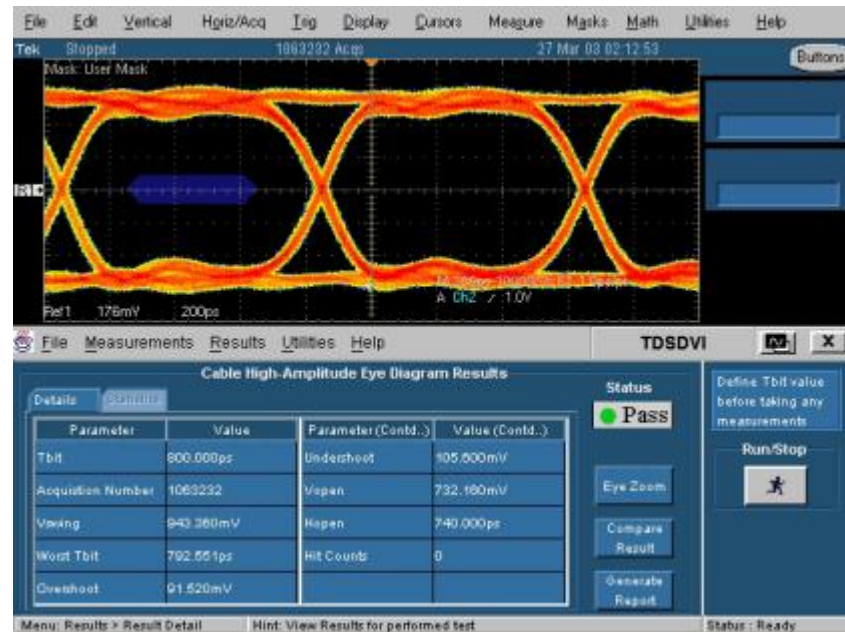
Figure 148: High-Amplitude Eye Diagram results
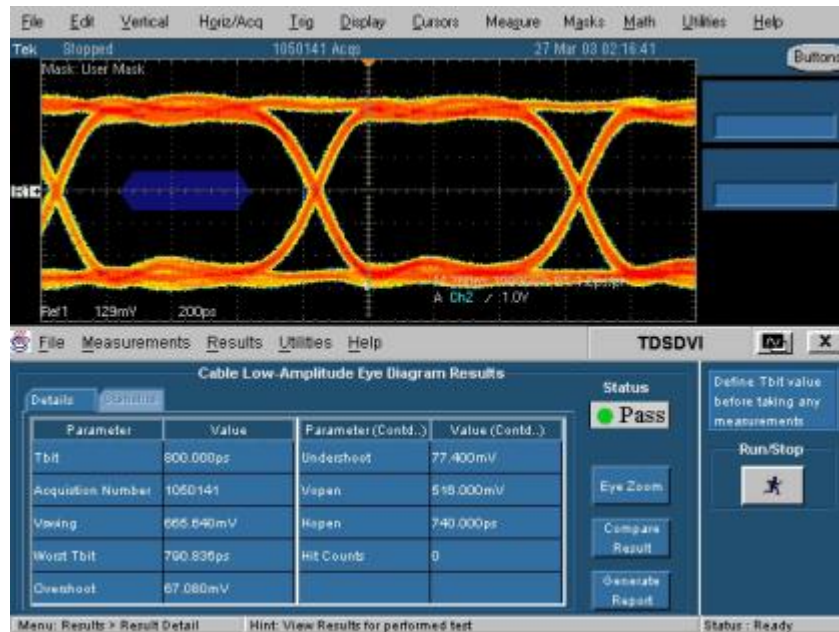
Figure 149: Low-Amplitude Eye Diagram results

The following table describes the high/low amplitude eye diagram result options:

Table 24: Results: High-Amplitude/Low-Amplitude Eye Diagram options and their descriptions

Results	Description
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Acquisition Number, Vswing, Worst Tbit, Overshoot, Undershoot, Vopen, Hopen, and number of Hit Counts.
Value	Displays the values of: • Tbit used to calculate the coordinates of the eye mask • The number of acquisitions to create the eye diagram • Calculated Vswing in volts • Calculated Worst Tbit which is the minimum horizontal opening or time in the displayed eye in seconds • Calculated Overshoot and Undershoot of the eye diagram • Vopen in volts and Hopen in seconds • The number of Hit counts on the eye mask
Status	Displays the result status: Pass or Fail.

Generating Reports for High-Amplitude/Low-Amplitude Eye Diagram

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

1. Select Reports> Report Generation to display the following screen.

Figure 150: Generate report, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:

Figure 151: Generate report, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Test Cable for Pk-Pk Jitter

Selecting and Configuring Measurements for Pk-Pk Jitter

You can select Pk-Pk Jitter in the following ways:

- Measurement> Select> Transmitter> Pk-Pk Jitter

- Measurement> Select> Cable> Pk-Pk Jitter

Note: Refer to page 147 to set up the DUT before using the application for Transmitter Pk-Pk Jitter.

Refer to page 156 to set up the DUT before using the application for Cable Pk-Pk Jitter.

To get appropriate results in Pk-Pk Jitter measurements, from the oscilloscope menu bar, select Measure> Waveform Histograms> Adjust Histogram Box Limits.

Follow these steps to select and configure Pk-Pk Jitter:

1. Select Measurements> Select> Transmitter/Cable> Pk-Pk Jitter to display the screen:
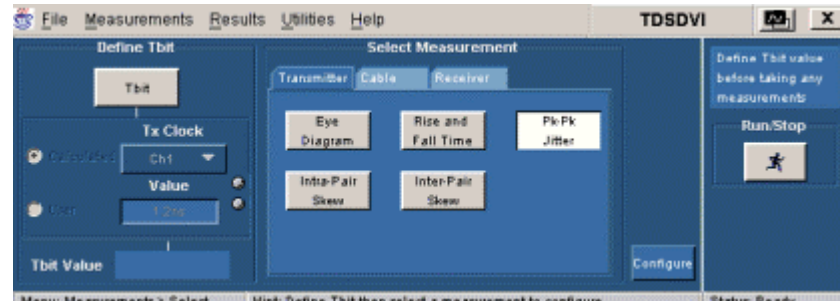
Figure 152: Transmitter Pk-Pk Jitter pane

Figure 153: Cable Pk-Pk Jitter pane

2. You have to define Tbit:

    ■   If you have not calculated the Tbit value

    ■   If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
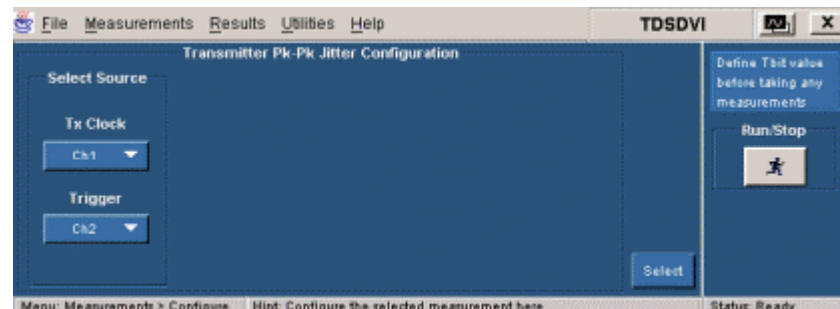
Figure 154: Transmitter Pk-Pk Jitter configuration
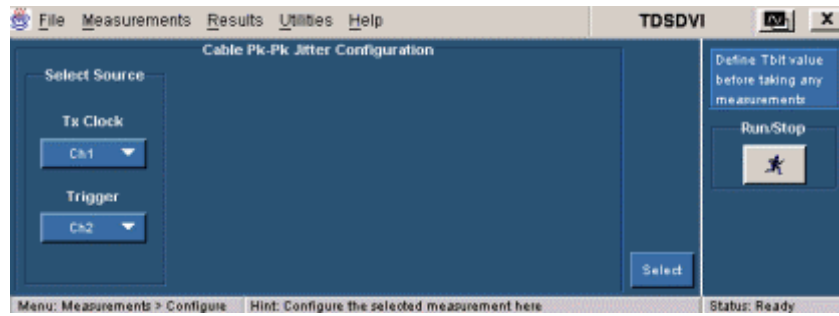
Figure 155: Cable Pk-Pk Jitter configuration

4. Select the transmitted differential clock source from the Tx Clock drop-down list. The available selections are: CH1 through CH4. The application requires a CRU (Clock Recovery Unit) to trigger the oscilloscope. Set the trigger source channel from the Trigger drop-down list. Data and Trigger source are mutually exclusive.

5. Press the Run button to perform the test. The application displays the Confirm Tbit Value message box.

6. Confirm the Tbit value to display the following message box. Connect the clock signals and press OK.
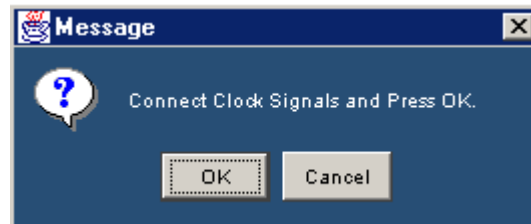
Figure 156: Clock signals message box

The application calculates the Pk-PK Jitter and displays the result: Pass or Fail.

Note: For more in-depth analysis on Jitter, use the TDSJIT3 Package.

If the signal is unstable, the application cannot place the histogram at the second rising edge of the clock signal, then the application displays the following message box:
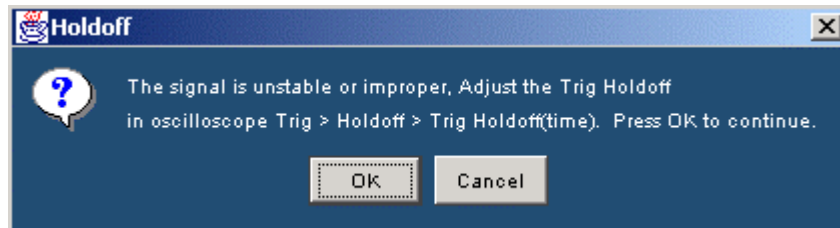
Figure 157: Holdoff message box

To adjust the Trigger Holdoff time,

1. Select Trig> Holdoff from the oscilloscope interface.

2. Use the GP knob on the oscilloscope panel to adjust the trigger hold off time.

3. After stabilizing the signal, press the APP button in the oscilloscope interface to display the application.

4. Press OK in Figure 157 Holdoff message box to continue the peak-to-peak jitter measurement and Cancel to stop running the measurement.
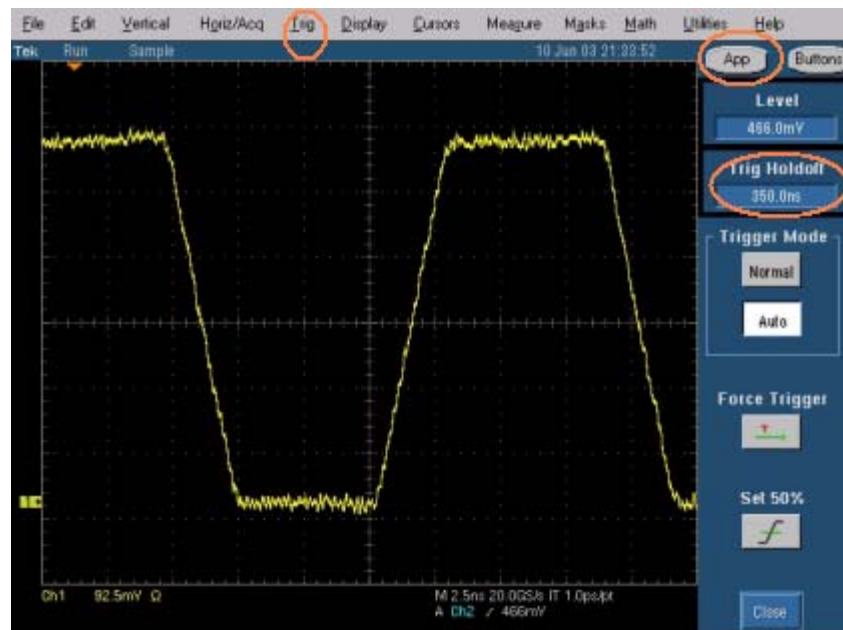
Figure 158: Oscilloscope interface

Viewing Results for Pk-Pk Jitter

Follow these steps to view Pk-Pk Jitter results:

1. Select Results> Result Detail to display the detailed results for the Cable Pk-Pk Jitter measurement.

You can also use the:

- Compare Result button to compare results

- Generate Report button to generate reports


Figure 159: Rise and Fall Time results-Details

The following table describes the pk-pk jitter result options:

Table 25: Results: Pk-Pk Jitter options and their descriptions

Results	Description
Parameters	Displays the calculated parameters for the measurement, such as Tbit, Acquisition Number, Pk-to-Pk, and Upper Limit.
Value	Displays the values of:
	• Tbit used for calculating the peak to peak jitter limit in seconds
	• The number of acquisitions to create the histogram
	• The measured peak to peak jitter in seconds
	• The maximum limit for Jitter. The values above this limit indicate a Fail
Status	Displays the result status: Pass or Fail.

Generating Reports for Pk-Pk Jitter

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

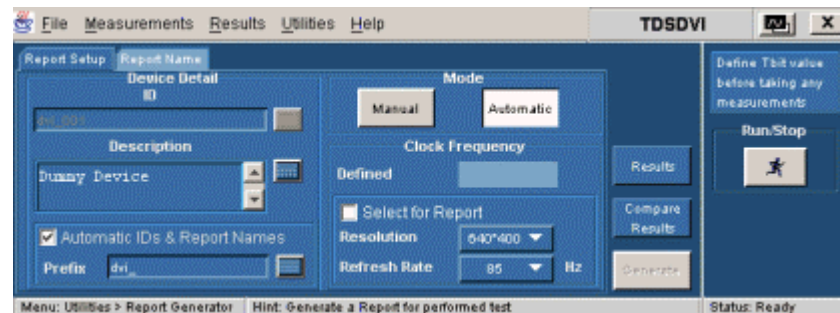1. Select Reports> Report Generation to display the following screen:

Figure 160: Generate report, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:
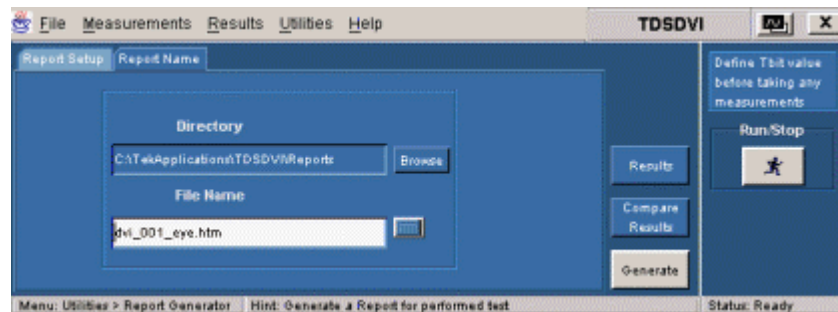

Figure 161: Generate report, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Test Cable for Intra-Pair Skew

Selecting and Configuring Measurements: Intra-Pair Skew

You can select the Intra-Pair skew in the following ways:

▪ Measurement> Select> Transmitter>Intra-Pair Skew

▪ Measurement> Select> Cable> Intra-Pair Skew

Note: Refer to page 150 to set up the DUT before using the application for Transmitter Intra-Pair Skew.
Refer to page 157 to set up the DUT before using the application for Cable Intra-Pair Skew.

Follow these steps to select and configure Intra-Pair Skew:

1.   Select Measurements> Select> Transmitter/Cable> Intra-Pair Skew to display the following screen.
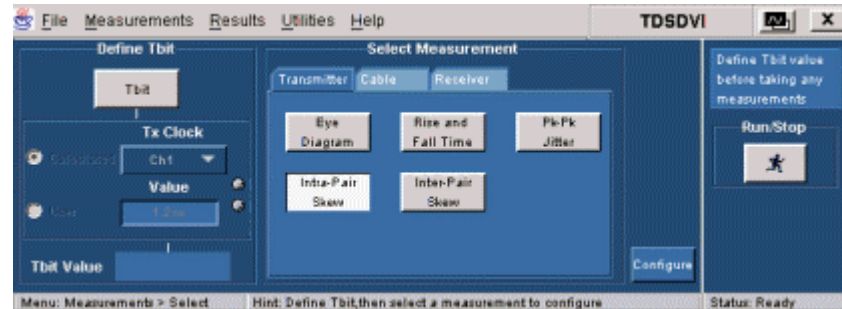
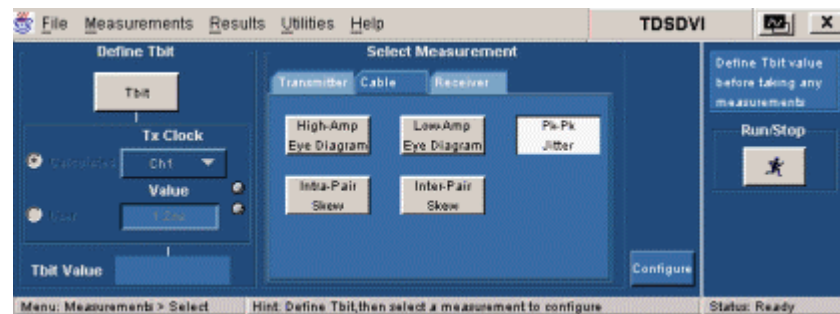Figure 162: Transmitter Intra-Pair Skew pane
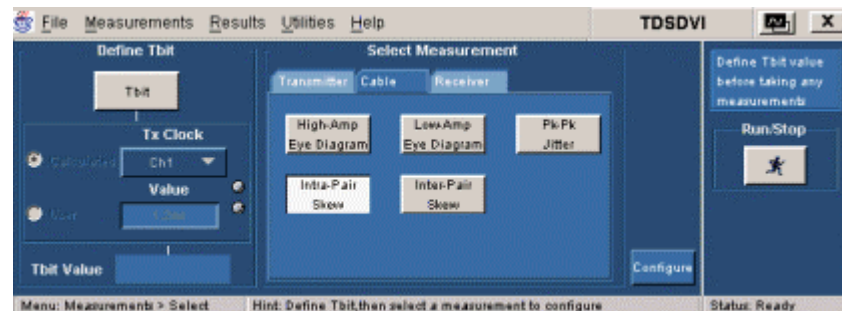
Figure 163: Cable Intra-Pair Skew pane

2.   You have to define Tbit:

  ▪   If you have not calculated the Tbit value

  ▪   If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3.   Select the Configure button to display the following screen:
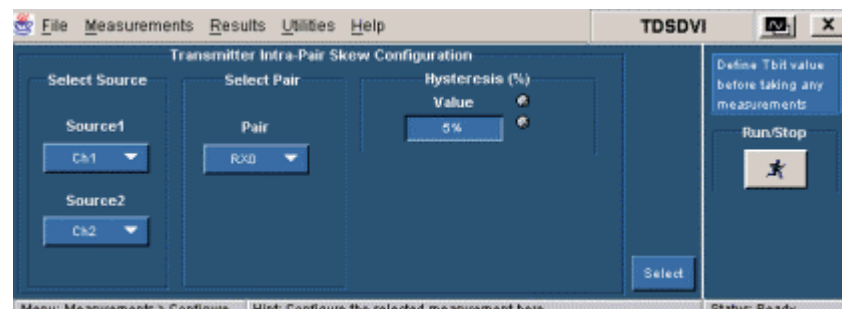
Figure 164: Transmitter Intra-Pair Skew configuration
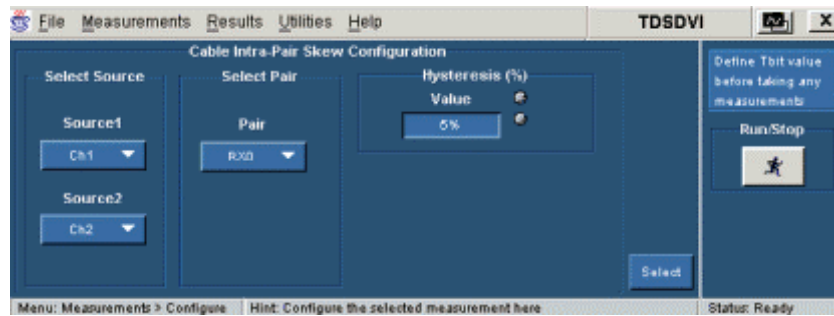
Figure 165: Cable Intra-Pair Skew configuration

4. Set the data line (+ or −) of a data pair in the Source drop-down list. The available selections are: CH1 through CH4. The Source channels are mutually exclusive. Use two single-ended probes to connect the data pair (for example: Rx0+ or Rx0−) to Source1 and Source2.

5. Set the data pair in the Pair drop down list. The available selections are:

    ▪ RX0

    ▪ RX1

    ▪ RX2

6. In the Hysteresis field, use the calculator keypad or the GP knob to enter the hysteresis percentage value. The range for the hysteresis is 2% to 10%.

7. Press the Run button to perform the test. The application displays the Confirm Tbit Value message box.

8. Select Yes to display the following message box. Connect the data signals and press OK.

Figure 166: Data signals message box

The application calculates the Intra-Pair Skew and displays the result: Pass or Fail.

Viewing Results for Intra-Pair Skew

Follow these steps to view Intra-Pair Skew results:

1. Select Results> Result Detail to display the detailed results for the Cable Intra-Pair Skew measurement.

You can also use the:

- Compare Result button to compare results

- Generate Report button to generate reports

Figure 167: Cable Intra-Pair Skew results

The following table describes the intra-pair skew result options:

Table 26: Results: Intra-Pair Skew options and their descriptions

Results	Description
Details tab	
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Skew, and Upper Limit.
Values	Displays the values of: • Tbit used for calculating the intra-pair skew limits in seconds • The measured skew in seconds • The maximum limit for Intra-Pair Skew. Values above this limit indicate a Fail

Table 26: Results: Intra-Pair Skew options and their descriptions (Cont.)

Results	Description
Statistics tab	
Measurement	Displays the selected measurement.
Population	The number of edges calculated in the acquired waveform.
Min	The minimum intra-pair skew value in the acquired waveform.
Max	The maximum intra-pair skew value in the acquired waveform.
Mean	The average of all the calculated intra-pair skew values.
Std Dev	The standard deviation of all the calculated intra-pair skew values.
Status	Displays the result status: Pass or Fail. This is common for the Details and the Statistics tab.

Generating Reports for Intra-Pair Skew

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

1. Select Reports> Report Generation to display the following screen:

Figure 168: Generate report, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:

Figure 169: Generate report, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report

Test Cable for Inter-Pair Skew

Selecting and Configuring Measurements for Inter-Pair Skew

Follow these steps to select and configure Inter-Pair Skew:

Note: Refer to page 160 to set up the DUT before using the application.

1. Select Measurements> Select> Cable> Inter-Pair Skew to display the following screen:
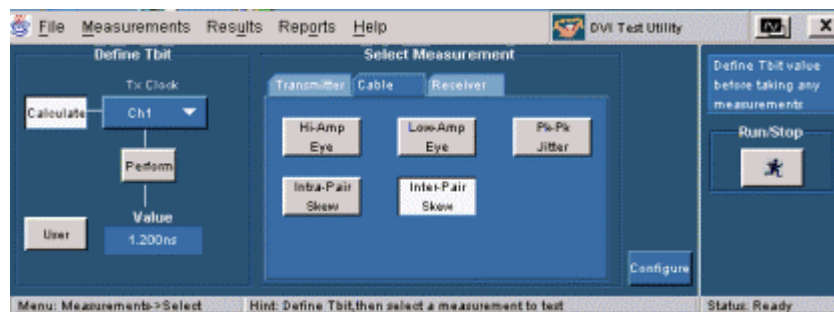
Figure 170: Inter-Pair Skew pane

2. You have to define Tbit:

    ■ If you have not calculated the Tbit value

    ■ If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
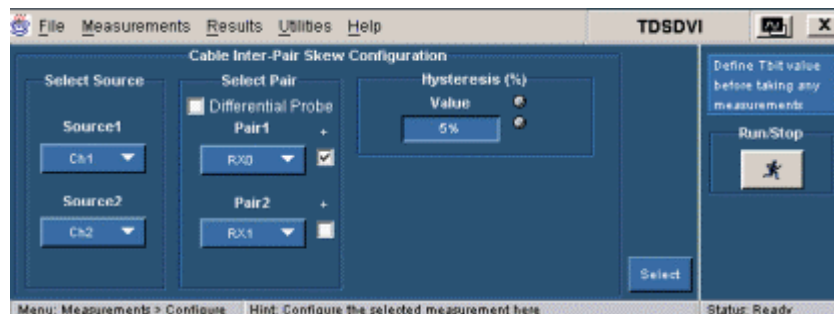
Figure 171: Inter-Pair Skew configuration

4. In the Select Source pane, select the channel connected in the TPA-P fixture with a differential probe from the Source1 and Source2 field drop down list. The available selections are: CH1 through CH4. The application requires a recovered clock as an external trigger source to the oscilloscope. If you select the Differential Probe box, the positive check boxes next to the pair fields are disabled. Set the data pair in the Select Pair drop down list to set the data pair. The available selections are:

- RX0

- RX1

- RX2

If the data line is positive, select the check box next to the Pair1 and Pair2 fields. You cannot select the same data pair in the Pair1 and Pair2 fields regardless of the polarity (+ or −).

5. Press the Run button ![run] to perform the test. The application displays the Confirm Tbit Value message box.

6. Select Yes to display the following message box. Connect the data signals and press OK.
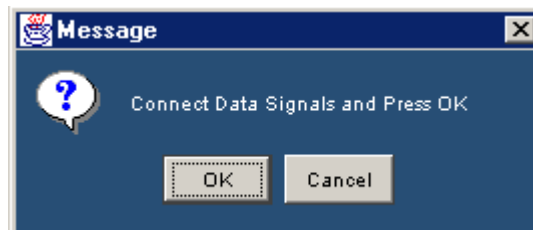
Figure 172: Data signals message box

The application calculates the Inter-Pair Skew and displays the result: Pass or Fail.

Viewing Results-Inter-Pair Skew

Follow these steps to view Inter-Pair Skew results:

1. Select Results> Result Detail to display the detailed results for the Cable Inter-Pair Skew measurement.

You can also use the:

- Compare Result button to compare results

- Generate Report button to generate reports

Figure 173: Inter-Pair Skew results

The following table describes the inter-pair skew result options:

Table 27: Results: Inter-Pair Skew options and their descriptions

Results	Description
Details tab	
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Skew, and Upper Limit.
Value	Displays the values of • Tbit used for calculating the inter-pair skew limits in seconds • The measured skew in seconds • The maximum limit for inter-pair skew. Values above this limit indicate a Fail
Statistics tab	
Measurement	Displays the selected measurement.
Population	The number of edges calculated in the acquired waveform.
Min	The minimum inter-pair skew values in the acquired waveform.
Max	The maximum inter-pair skew values in the acquired waveform.
Mean	The average of all the calculated inter-pair skew values.
Std Dev	The standard deviation of all the calculated inter-pair skew values.
Status	Displays the result status: Pass or Fail. This is common to the Details and the Statistics tab.

Generating Reports for Inter-Pair Skew

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

1. Select Reports> Report Generation to display the following screen.

Figure 174: Generating reports, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:

Figure 175: Generating reports, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Test Receiver for High-Amplitude/Low-Amplitude Eye Diagram

Selecting and Configuring Measurements: High-Amplitude/Low-Amplitude Eye Diagram

Note: Refer to page 167 to set up the DUT before using the application.

1. Select the Measurements> Select> Receiver tab to display the following screen. Select High-Amplitude/Low-Amplitude Eye Diagram.
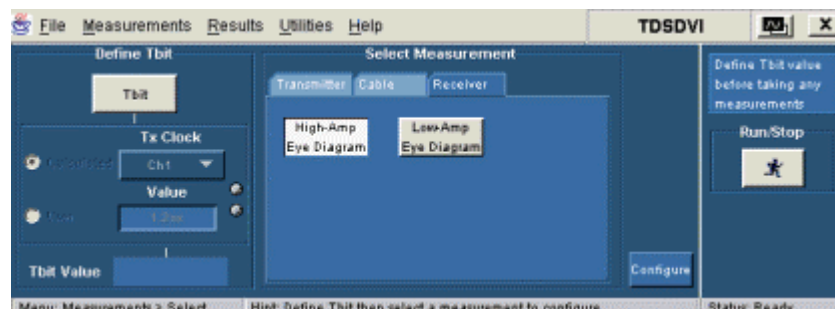
Figure 176: Receiver High-Amplitude Eye Diagram pane
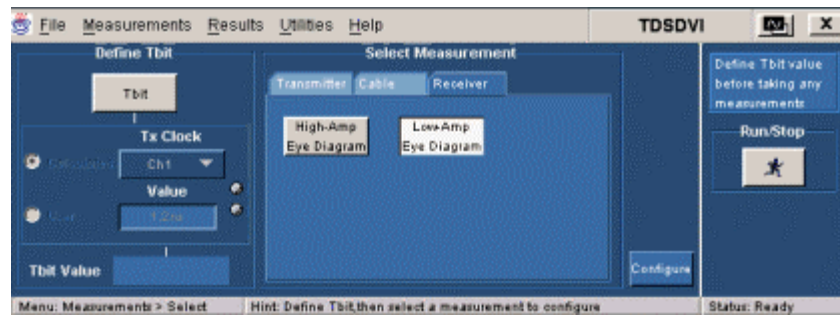
Figure 177: Receiver Low-Amplitude Eye Diagram pane

2. You have to define Tbit:

- If you have not calculated the Tbit value

- If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Configure button to display the following screen:
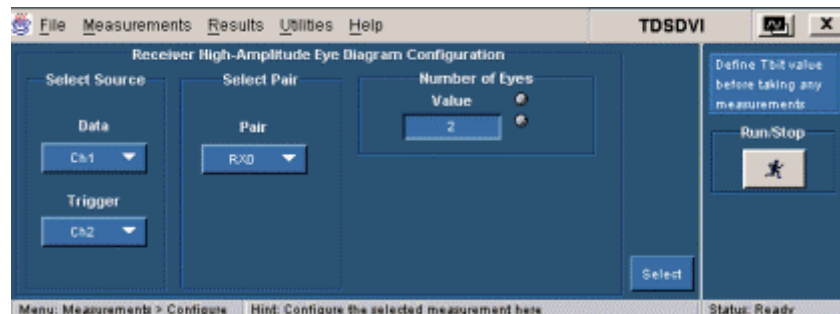
Figure 178: High-Amplitude configuration
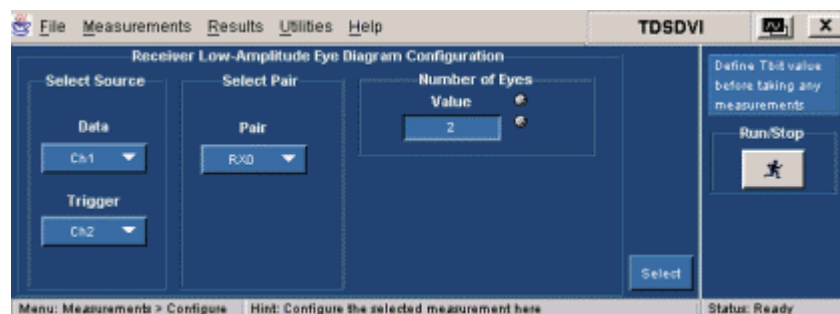
Figure 179: Low-Amplitude configuration

4. In the Select Source pane, select the data source channel from the Data drop-down list. The available selections are: CH1 through CH4. The application requires a recovered clock as an external trigger source to the oscilloscope. Use the drop-down arrow in the Trigger field to set the trigger source channel. The available selections are: CH1 through CH4. The Data and Trigger fields identify the data source and the external clock source. You cannot set the same channel for Data and Trigger source.

5. Use the drop-down arrow in the Select Pair field to set the data pair. The available data pairs are: Rx0, Rx1 and Rx2.

Note: The data pair values appear only in the generated report. They are not used for any calculations.

6. In the Number of Eyes field, use the calculator keypad ▦ or the GP knob next to the Value field to set the minimum number of eyes required to perform Receiver Eye measurement. After you set the minimum number of eyes, the worst eye is placed in the eye mask.

7. Press the Run button 🏃 to perform the test. The application displays the Confirm Tbit Value message box.

8. If you are sure you have defined the Tbit value, the application displays the following message box. If you select OK, the application deletes the previous Ref1 waveform and stores the current eye diagram results in the Ref1 waveform.
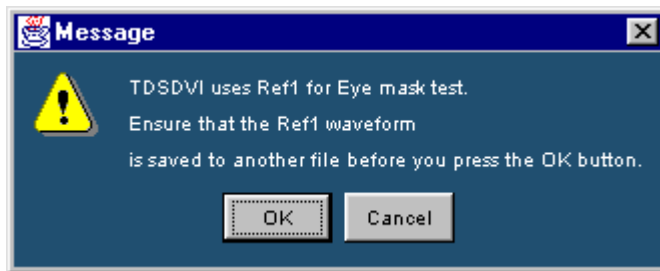
Figure 180: Ref1 message box

This message box will appear only if you have selected File> Preferences> General> Ref waveform deletion prompt for Eye box.

9. Select OK to display the following message box. Select the PRP pattern in the Equivalent Source Board (ESB) and connect the signal from the TPA-R fixture and press OK. See page 192 for information about TPA-P fixture connections.

Figure 181: PRP message box

10. If you are using a TDS6604, TDS6404, TDS6604B, or TDS6804B oscilloscope:

a. The application displays the Monitor Eye Progress message box.
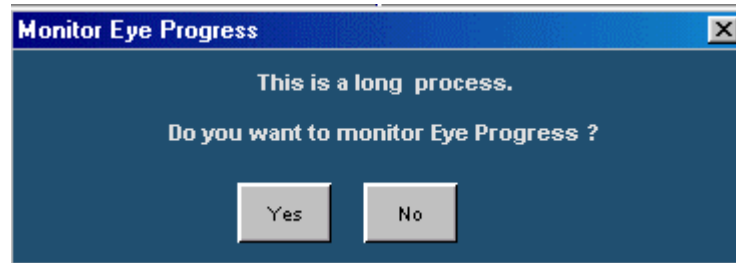
Figure 182: Monitor eye progress message box

b. Select Yes to display the Eye Zoom screen and No to display the results pane and wait until the application displays the results.

11. If you have selected File> Preferences> General> Use cursors for Eye, RT and FT Testing, see page 191 for further information on what the application does.

The application tests the signal with the receiver low/high amplitude eye mask and displays the results.

Viewing Results for High-Amplitude/Low-Amplitude Eye Diagram

Follow these steps to view High-Amplitude/Low-Amplitude Eye Diagram results:

1. Select Results> Result Detail to display the detailed results for the Receiver High-Amplitude/Low-Amplitude Eye Diagram measurement.

You can also use the:

- Compare Result button to compare results

- Eye Zoom button to view the zoomed eye

- Generate Report button to generate reports
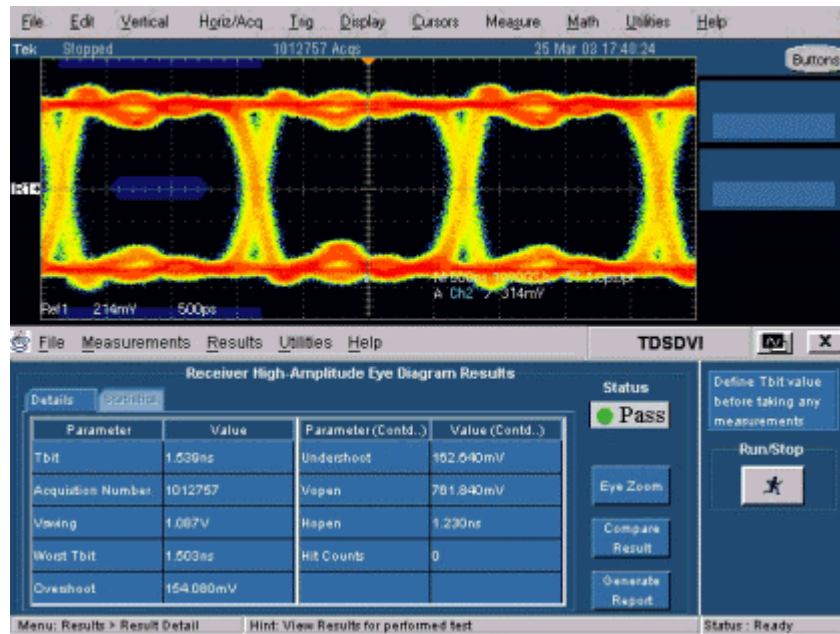
Figure 183: High-Amplitude Eye Diagram results
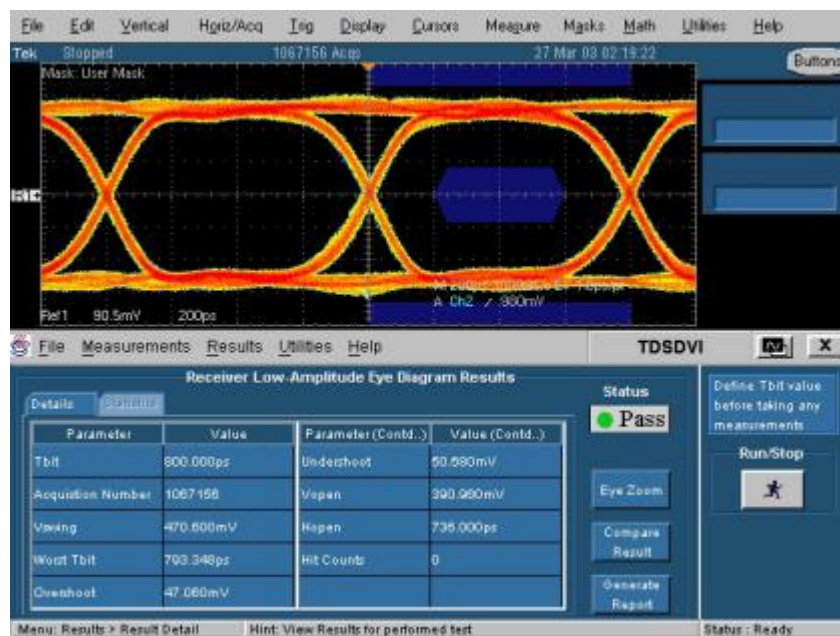
Figure 184: Low-Amplitude Eye diagram results

The following table describes the high/low amplitude eye diagram result options:

Table 28: Results: High-Amplitude/Low Amplitude Eye Diagram options and their descriptions

Results	Description
Parameter	Displays the calculated parameters for the measurement, such as Tbit, Acquisition Number, Vswing, Worst Tbit, Overshoot, Undershoot, Vopen, Hopen, and Hit Counts.
Value	Displays the values of: • Tbit used for calculating the coordinates of the eye mask • Calculated Worst Tbit in the displayed eyes in seconds • The number of acquisitions to create the eye diagram • Calculated Vswing in volts • Calculated Overshoot, Undershoot of the eye diagram • Vopen in volts and Hopen in seconds • The number of Hit counts on the eye mask
Status	Displays the result status: Pass or Fail.

Generating Reports for High-Amplitude/Low-Amplitude Eye Diagram

Follow these steps to generate a report for all the measurements:

Note: Select File> Export Setup> Images> Data Format from the oscilloscope menu. Set the data format option to .jpg before generating a report. The report format does not support any other image file. Before you run the measurement, select Automatic IDs & Report Names to automatically generate a report.

1. Select Reports> Report Generation to display the following screen:
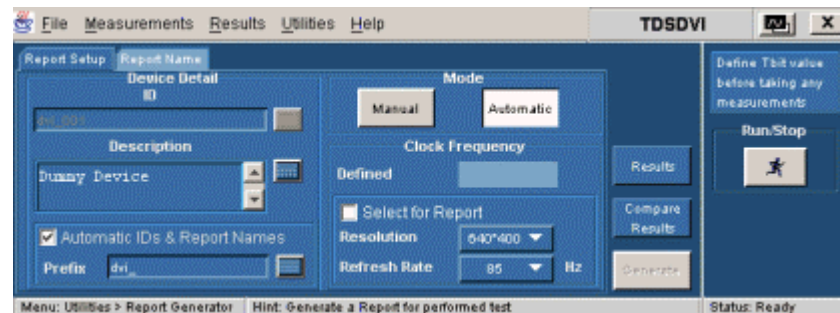

Figure 185: Generating reports, report setup

2. In the Report Setup tab, use the virtual keypad to enter the device ID.

3. In the Description field, use the virtual keypad to enter the device description.

4. If you have not yet run the measurement, and if you want the application to display the device ID and specify the report names automatically, select the Automatic IDs & Report Names box. The ID field is disabled if you select this option. The ID, File Name fields, and Generate button are disabled if this option is selected.

5. In the Prefix field, use the virtual keypad to enter the device prefix.

6. Select the Mode of generating the report: Manual or Automatic. If you select the Manual mode, the Prefix field is disabled. If you select the Automatic mode, Device ID field is disabled.

7. The Defined field displays the predefined clock frequency values automatically when you define and calculate Tbit.

8. Use the drop-down arrow in the Resolution and Refresh Rate field to set the values and calculate the clock frequency. The drop-down list provides the Resolution and Refresh Rate values according to the VESA standard. If you select the Select for Report box, the application displays the resolution and refresh rate in the generated report.

9. If you do not want to specify the report details, select the Generate button. You can do this only if you have selected the Manual mode of generating a report. If you want to specify the report details, perform the following steps:
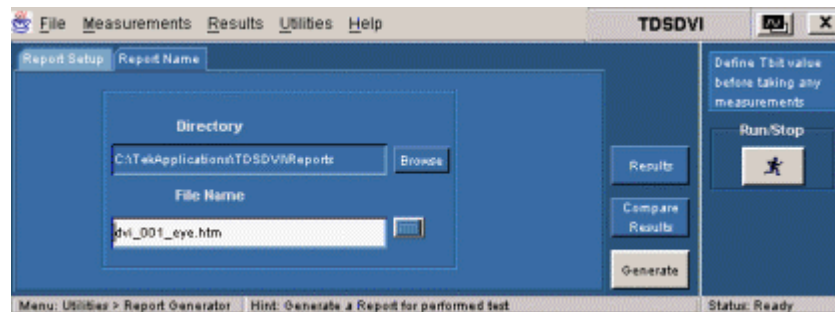

Figure 186: Generating reports, report name

a. In the Report Name tab, select the Browse button in the Directory field to browse to the directory location.

b. In the File Name field, use the virtual keypad to enter the file name.

c. You can use the Results option to view the results and the Compare Results option to compare results of two different devices.

d. Select the Generate button to generate report an HTML report.

Save and Recall Setups

Recall Default Setup

To recall the default application settings:

1. Select File> Recall default. You will see the message, "Recall default will change the existing settings and restore the default settings. Do you wish to continue?"

2. Select Yes to change the current settings to the default settings. Select No to retain the current settings.

Save a Setup

To save the application and oscilloscope settings to a setup file:

1. Select File> Save.

2. Select the directory.

3. Select or enter a file name with an .ini extension. If the file name does not have an ".ini" extension, the application adds an .ini extension. If you give an invalid extension, the application displays an error message "File name has an invalid extension".

4. Select Save.

Note: The application also saves the oscilloscope settings to a ".set" file when you save the settings. Both the application ".ini" file and oscilloscope ".set" file has the same file name. While saving the settings, the application checks for the disk space available.

Recall a Setup

To recall the application and oscilloscope settings from a saved setup file, follow these steps:

1. Select File> Recall.

2. Select the directory.

3. Select or enter a file name with an .ini extension. If the file name does not have an .ini extension, the application displays an error message "File does not exist."

4. Select Open to recall the specified settings.

5. If the settings are recalled successfully, the application displays a message "File recalled successfully". If the settings are not recalled successfully, the application displays an error message.

Note: The application also recalls the oscilloscope setup from a ".set" file when you recall its setup.

Recall a Recently Recalled Setup

To recall the recent file settings, follow these steps.

1. Select File> Recently Recalled to display the last four recalled files.

2. If you recall the settings from any file in the recently recalled file list and the file already exists, the application displays a message "Do you want to recall the settings?". If you select Yes, the application recalls the settings. If you select No, the oscilloscope settings or the existing settings are retained.

3. The application reorders the list of recently recalled files. For example, if the order is file1, file2, file3 and file4, then, on selecting file3, the display order changes to file3, file1, file2, and file4.

Recall a Recently Saved Setup

To overwrite the settings of a file from the recently saved list, follow these steps.

1. Select File> Recently Saved to display the last four saved files.

2. If you save the settings in any one file from the recently saved file list and the file already exists, the application prompts a message to overwrite the settings. If you select Yes, the application overwrites the settings. If you select No, the settings are retained.

3. The application reorders the list of recently recalled files. For example, if the order is file1, file2, file3 and file4, then, on selecting file3, the display order changes to file3, file1, file2, and file4.

Note: The application will not reorder the file list when the settings are saved to a file that appears as a first menu item in the recently saved file list.

Set Cursors for Eye, RT and FT Testing

The application automatically enables the oscilloscope's cursors relevant to each measurement. By default, the cursor option is not selected.

Note: Rise and Fall Time measurement uses cursors to calculate Vswing. In Eye Diagram measurement, you can use cursors to calculate Vswing and select the worst eye opening.

If you select File> Preferences> Use cursors for Eye, RT and FT testing:

▪ To calculate Vswing, the application enables the horizontal cursors in the oscilloscope and displays the following message box. Place the cursors on the Vswing high and Vswing low of the eye diagram for the Rise and Fall Time and Eye Diagram measurement. Select OK to calculate Vswing.
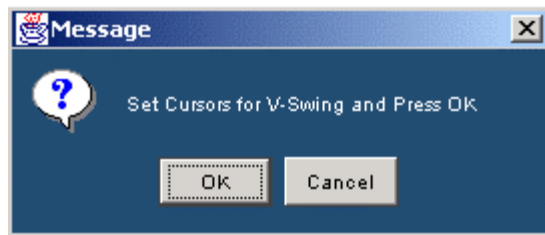
Figure 187: Message box

- To select the worst eye opening, the application enables the vertical cursors. Place the cursors at the crossover points of the worst eye opening for the Eye Diagram measurement. Select OK to set the worst eye. The application places the mask on the worst eye opening.
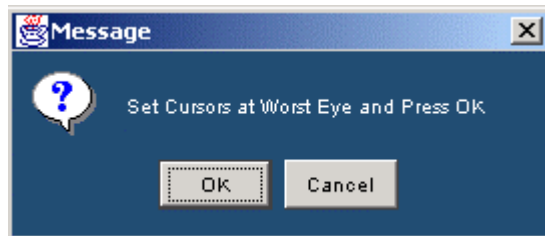
Figure 188: Message box

Application Examples

This section presents many application examples.

To run the application examples, install and enable the application on the oscilloscope, connect the probes to the device under test, and select and configure a measurement. To install the application, refer to Installation Procedures on page 141. For more information on compatible probes, refer to *Compatibility* on page 7 and *Accessories* on page 8.

Tbit

Specifying the Equipment: Define Tbit

You need the following equipment to set up the application and calculate Tbit:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7330, P7350 or P6330 (needs TCA-BNC adapter) differential probes

- TPA-P or TPA-R test fixture

- Device Under Test

Equipment Setup: Define Tbit

To set up a device to measure Tbit, follow these steps:

Figure 189: DVI monitor setup

1. Connect the DVI monitor to the DVI port of the AGP ADD Card in the PC. Set the required screen resolution and the refresh rate. Set the host computer to run with a Half Clock Pattern to conduct the test. For information on how to set the host computer to run with a Half Clock Pattern to conduct the test, see page 191.

2. Remove the DVI monitor and attach the TPA-P fixture to the DVI port of the DUT.

Connecting the TPA-P board to the DVI transmitter
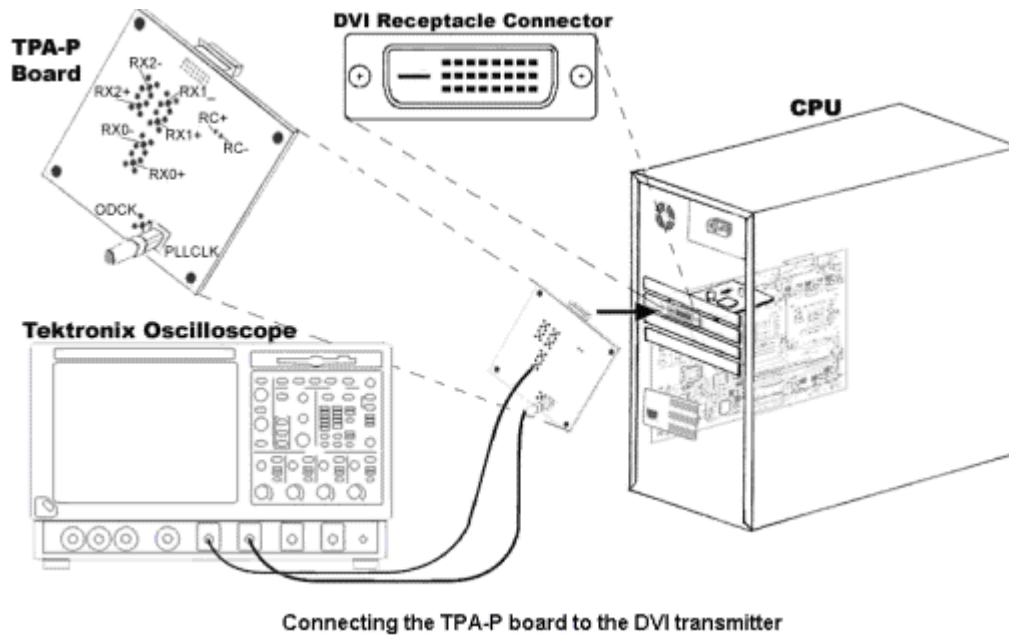
Figure 190: TPA-P fixture to the transmitter setup

3. Connect a P7350, P7330 or P6330 probe from any one of the four channels of the oscilloscope to the transmitted clock (Rxc+/−) on the TPA-P fixture. The following figure shows the test point for Rxc+/−.
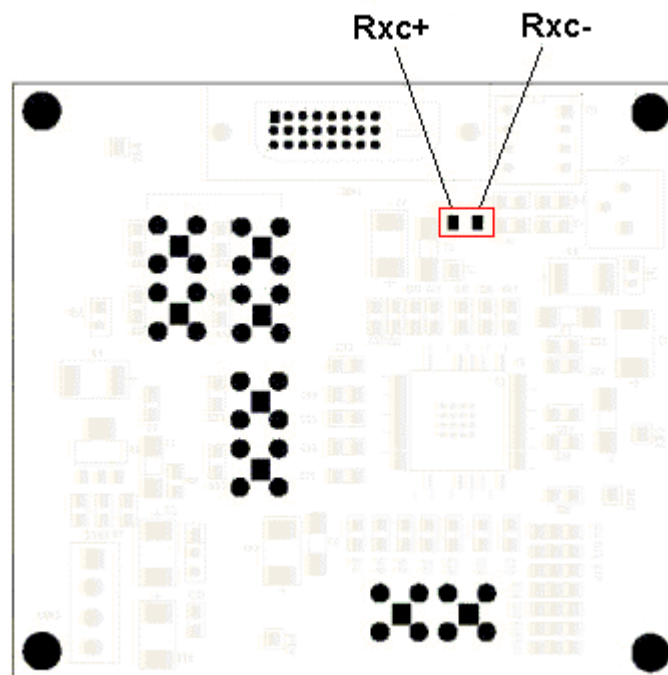
Setup for Tbit calculation

Figure 191: TPA-P test points

4. Configure the measurement and run the application.

Note: We recommend that you calculate the Tbit with the differential transmitted clock rather than defining Tbit values yourself. You need to calculate Tbit only once. This value will be retained for further measurements. If the device, resolution, blanking rate, or refresh rate changes, you have to recalculate Tbit.

Transmitter Eye Diagram

Specifying the Equipment: Transmitter Eye Diagram

You need the following equipment to set up the application and test Eye Diagram in a Transmitter:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7330, P7350 or P6330 (needs TCA-BNC adapter) differential probes

- SMA cable

- TPA-P test fixture

- Device Under Test

Equipment Setup-Transmitter: Eye Diagram

To set up a Transmitter to measure Eye Diagram, follow these steps:

Figure 192: DVI monitor setup

1. Connect the DVI monitor to the DVI port of the AGP ADD Card of the PC. Set the required screen resolution and the refresh rate. Set the host computer to run with the Half Clock Pattern to conduct the test. For information on how to set the host computer to run with a Half Clock Pattern to conduct the test, see page 191.

2. Remove the DVI monitor and attach the TPA-P fixture to the DVI port of the DUT.

Connecting the TPA-P board to the DVI transmitter
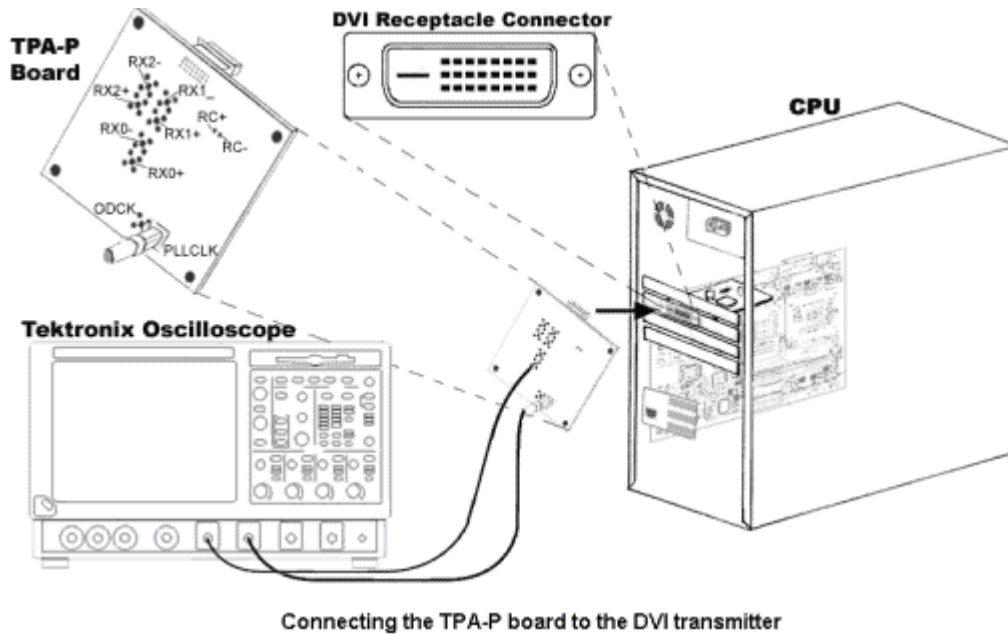
Figure 193: TPA-P fixture to the transmitter setup

3. Using the application define Tbit before selecting a measurement.

4. Connect a P7350, P7330 or P6330 probe from any one of the four channels of the oscilloscope to one of the data pairs (Rx0+/−, Rx1+/−, Rx2+/−) of the TPA-P fixture. Figure 194 displays the Rx0 test point. As specified by the DDWG specifications, perform the Transmitter Eye Diagram test in Rx1 and Rx2 test points shown in the Figure 194.

5. Connect the SMA cable to either one of the remaining three channels on the oscilloscope to the PLL Clock on the TPA-P fixture. Figure 194 shows the PLL Clock test point.

Note: You can refer the TPA-P test points for Rx1 and Rx2 data pairs on page 194.

TDSDVI-DVI Compliance Test Solution
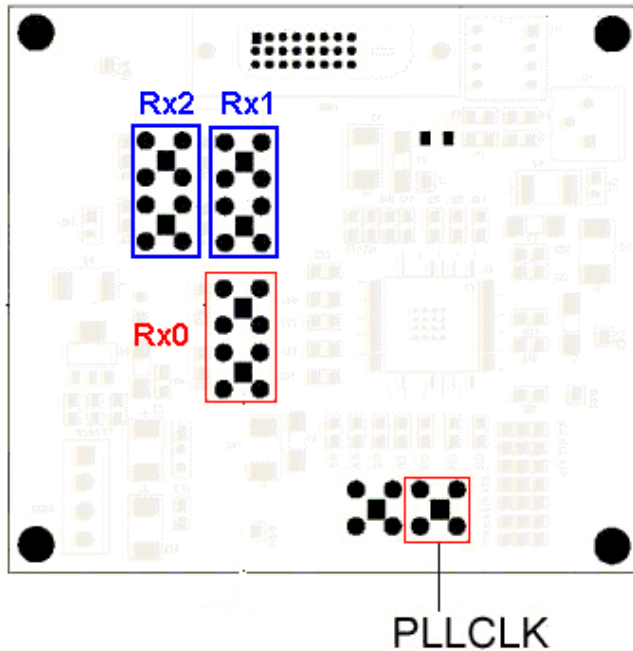
Sample test points in TPA-P for transmitter eye diagram test

Figure 194: TPA-P fixture test points

6. Configure the application and run the test in the application.

Transmitter Rise and Fall Time

Specifying the Equipment: Transmitter Rise and Fall Time

You need the following equipment to set up the application and test Rise and Fall Time in a Transmitter:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7350, P7330, P6330 (needs TCA-BNC adapter) differential probes

- SMA cable

- TPA-P test fixture

- Device Under Test

Equipment Setup: Transmitter- Rise and Fall Time

To set up a Transmitter to measure Rise Time/Fall Time follow these steps:
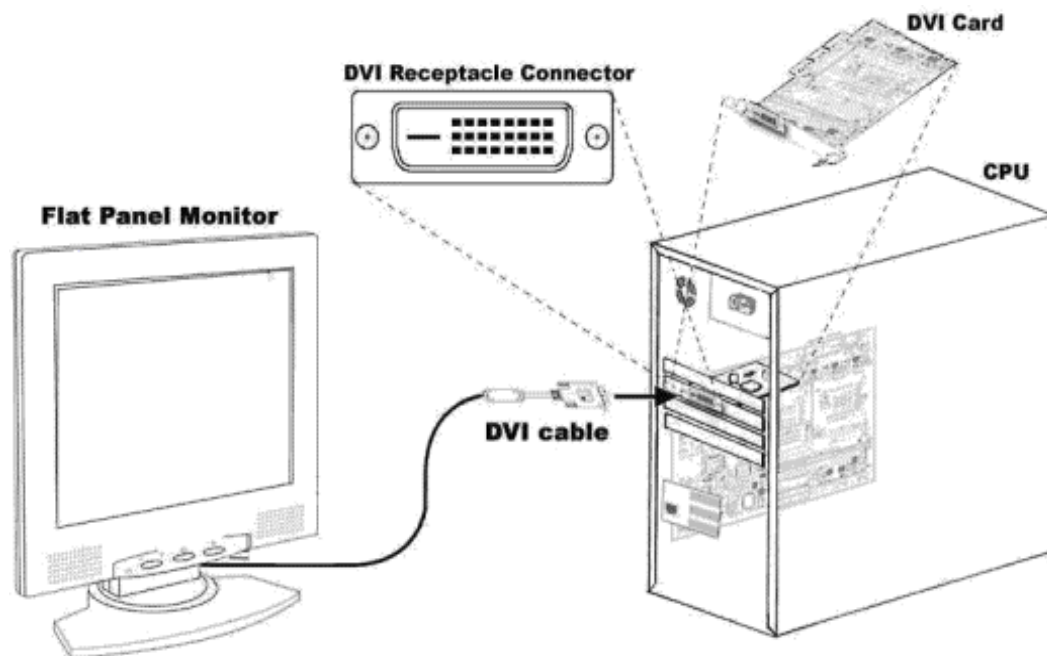
Figure 195: DVI monitor setup

1. Connect the DVI monitor to the DVI port of the AGP ADD Card in the PC. Set the host computer to run with the Half Clock Pattern to conduct the test. For information on how to set the host computer to run with a Half Clock Pattern to conduct the test, see page 191.

2. Remove the DVI monitor and attach the TPA-P fixture to the DVI port of the DUT (AGP ADD card with Tx chip).

Connecting the TPA-P board to the DVI transmitter
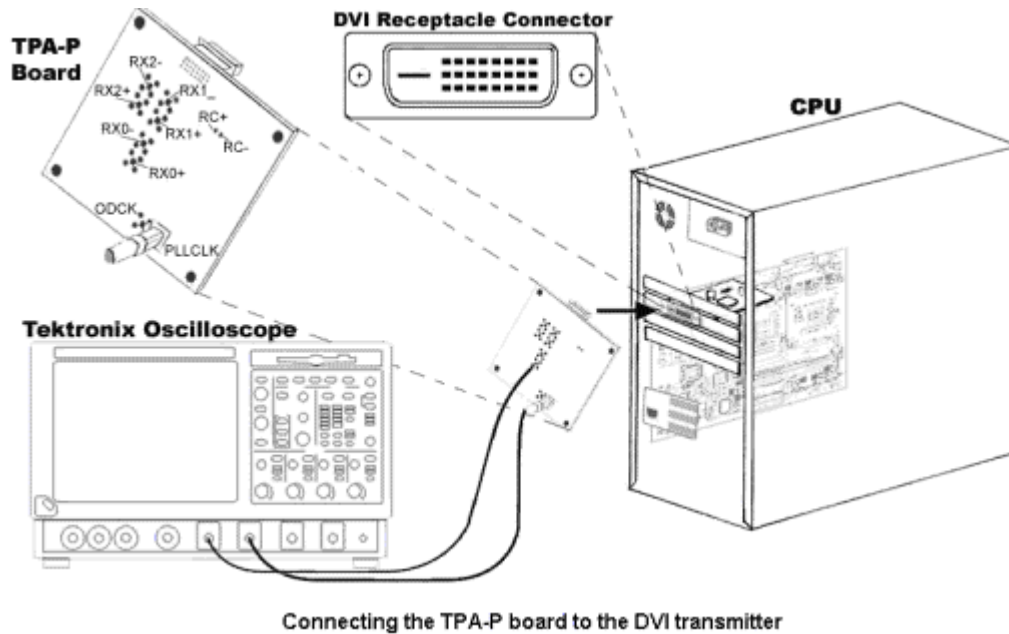
Figure 196: TPA-P fixture to the transmitter setup

3. Using the application, define Tbit before selecting a measurement.

4. Connect a P7350, P7330, or P6330 probe from any one of the four channels of the oscilloscope to either of the data pairs (Rx0+/−, Rx1+/−, Rx2+/−) on the TPA-P fixture. Figure 197 shows the Rx0 test point. Similarly, perform the tests in Rx1 and Rx2.

5. Connect the SMA cable from the remaining three channels on the oscilloscope to the SMA connector (PLL Clock) on the TPA-P fixture. Figure 197 shows the PLL Clock test point.

Note: You can refer to the TPA-P test points for Rx1 and Rx2 data pairs on page194.
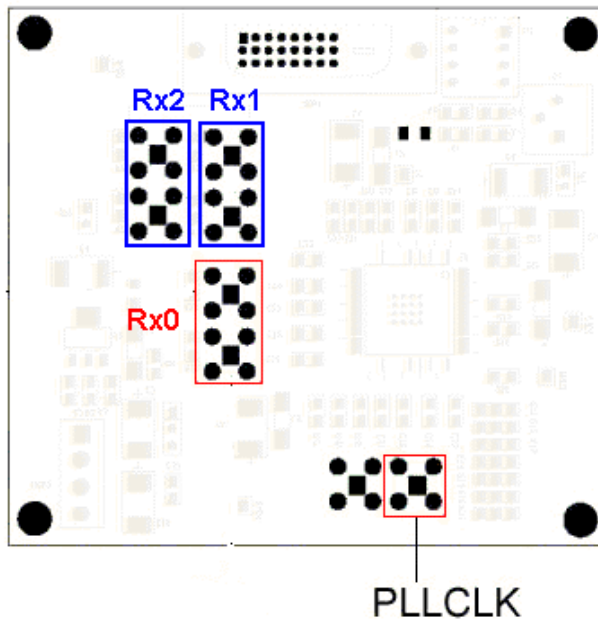
Sample test points in TPA-P for transmitter Rise and Fall time test

Figure 197: TPA-P test points

6. Configure the application and run the test in the application.

Transmitter Pk-Pk Jitter

Specifying the Equipment: Transmitter PK-Pk Jitter

You need the following equipment to set up the application and test Pk-Pk Jitter in a Transmitter:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7330, P7350 differential probe

- P6330 differential probe (needs TCA-BNC adapter)

- SMA cable

- TPA-P test fixture

- Device Under Test

Equipment Setup: Transmitter-Pk-Pk Jitter

To set up a Transmitter to measure Jitter follow these steps:
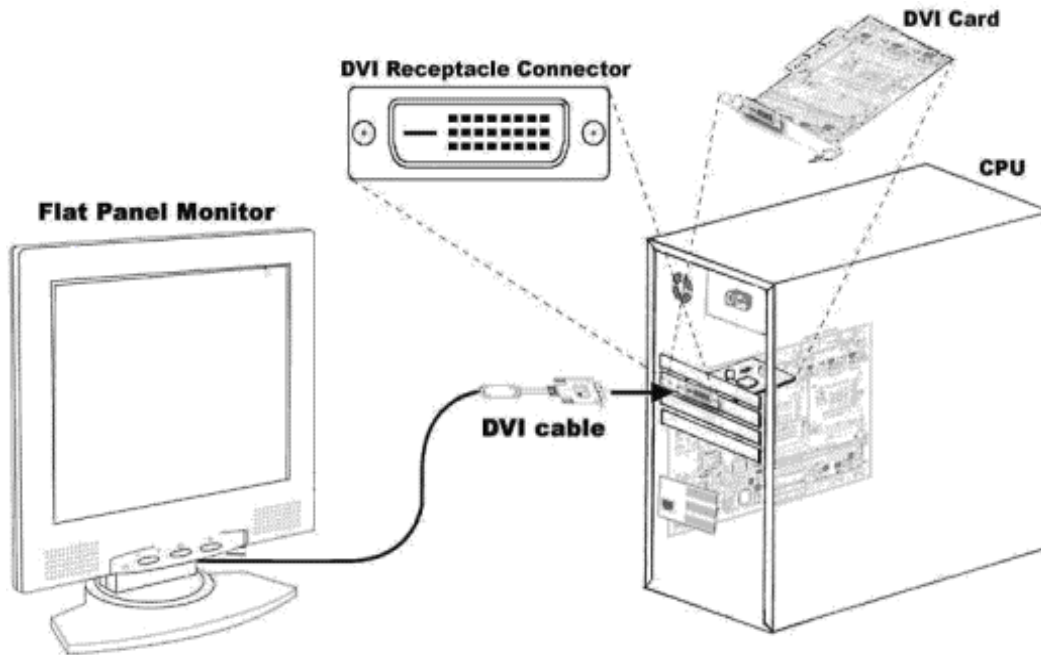
Figure 198: DVI monitor setup

1. Connect the DVI monitor to the DVI port of the AGP ADD Card of the PC. Set the required screen resolution and the refresh rate. Set the host computer to run with Half Clock pattern to conduct the test. For information on how to set the host computer to run with a Half Clock Pattern to conduct the test, see page 191.

2. Remove the DVI monitor and attach the TPA-P fixture to the DVI port of the DUT.

Connecting the TPA-P board to the DVI transmitter
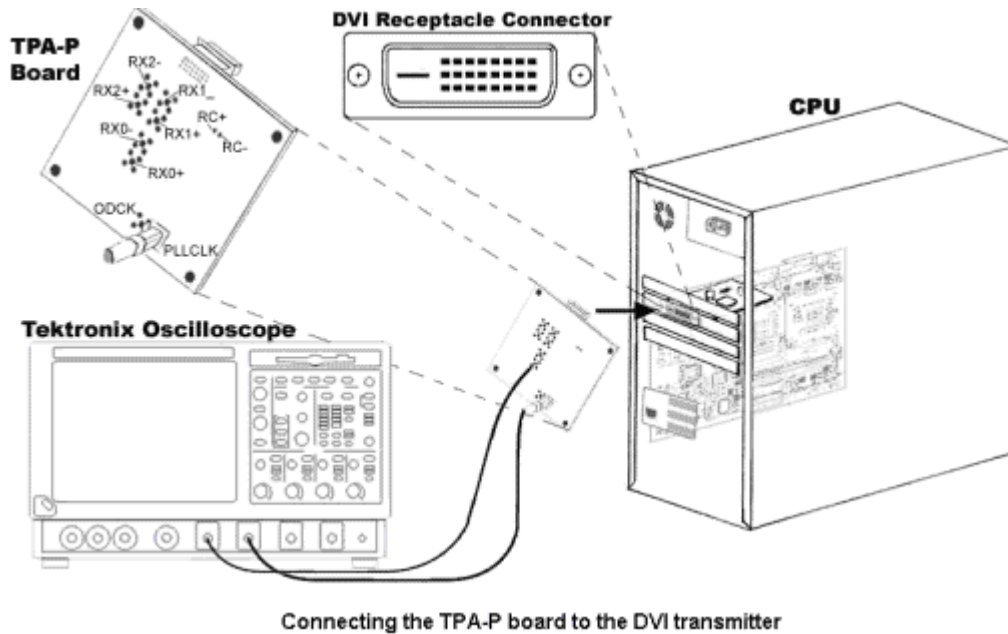
Figure 199: TPA-P fixture to the transmitter setup

3. Using the application, define Tbit before selecting a measurement.

4. Connect a P7350, P7330 or P6330 probe from any one of the four channels of the oscilloscope to the transmitted clock (Rxc+/−) on the TPA-P fixture. Figure 200 shows the Rxc+/− test point.

5. Connect the SMA cable from the remaining three channels on the oscilloscope to the SMA connector (PLL Clock) on the TPA-P fixture. Figure 200 shows the PLL Clock trigger source test point.

TDSDVI-DVI Compliance Test Solution
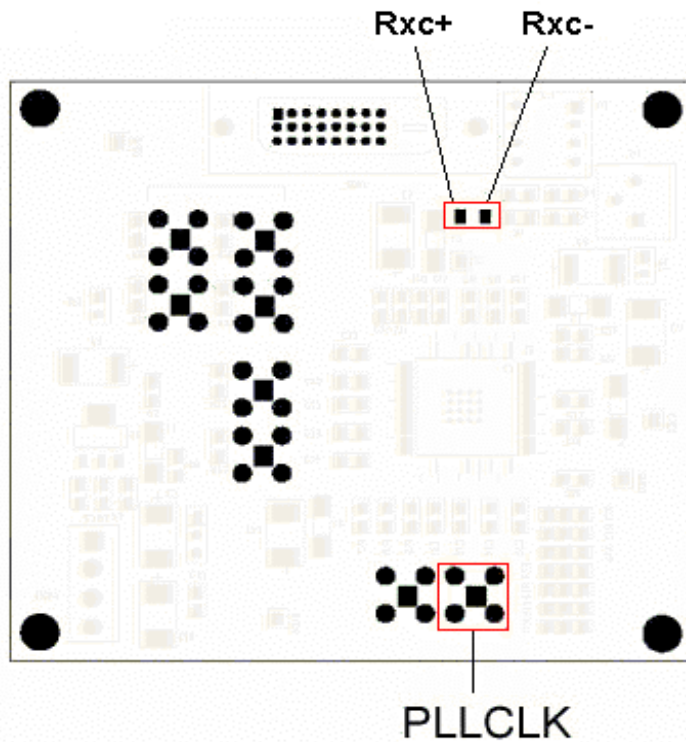
Sample test points in TPA-P for Transmitter Jitter

Figure 200: TPA-P test points

6. Configure the measurement and run the application.

Transmitter Intra-Pair Skew

Specifying the Equipment: Transmitter-Intra-Pair Skew

You need the following equipment to set up the application and test Intra-Pair Skew in a Transmitter:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7240 or P6249 single-ended probe (two numbers)

- SMA cable

- TPA-P fixture

- Device Under Test

Equipment Setup: Transmitter-Intra-Pair Skew

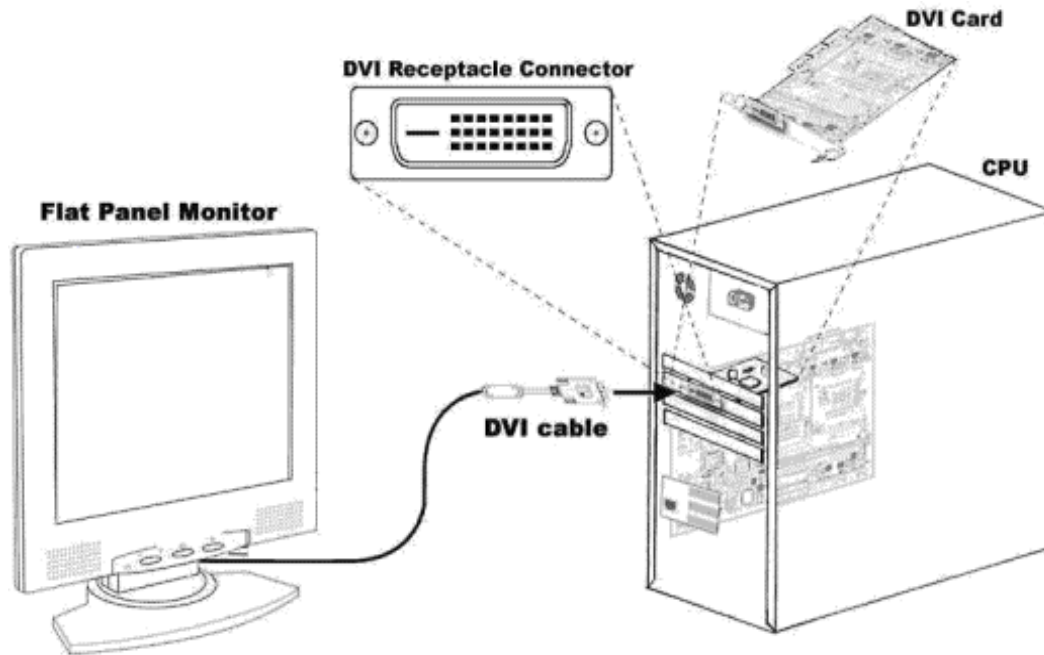To set up a Transmitter to measure Intra-Pair Skew, follow these steps:
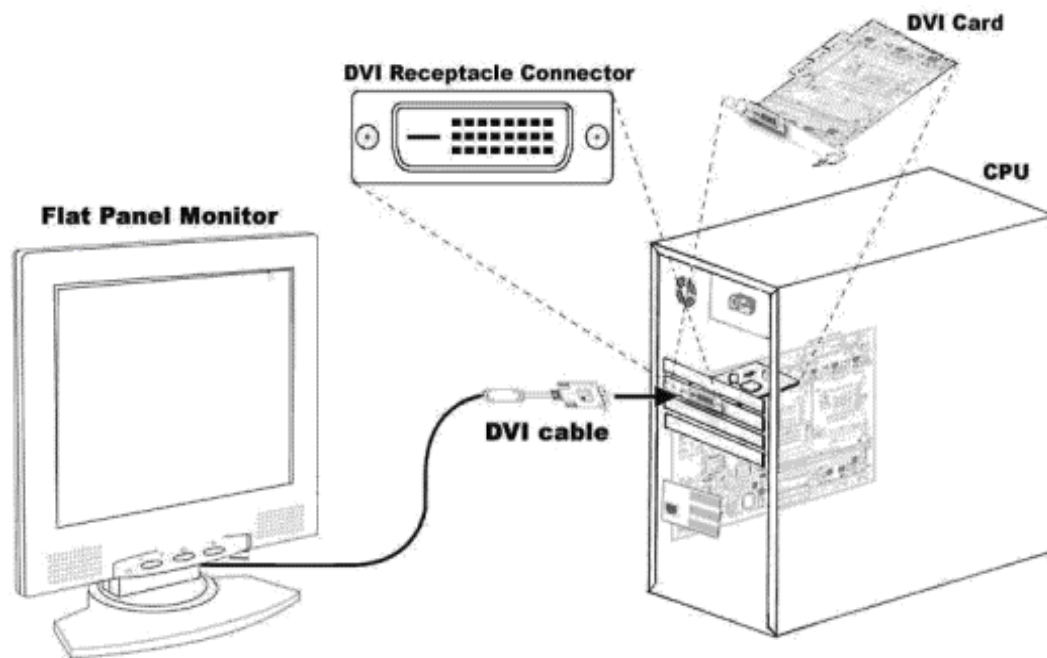
Figure 201: DVI monitor setup

1. Connect the DVI monitor to the DVI port of the AGP ADD Card of the PC. Set the required screen resolution and the refresh rate. Set the host computer to run with a Half Clock Pattern to conduct the test. For information on how to set the host computer to run with a Half Clock Pattern to conduct the test, see page 191.

2. Remove the DVI monitor and attach the TPA-P fixture to the DVI port of the DUT.

TDSDVI-DVI Compliance Test Solution

Connecting the TPA-P board to the DVI transmitter

Figure 202: TPA-P fixture to the transmitter setup

3. Use the application to define Tbit:

   ▪ If you have not calculated the Tbit value

   ▪ If you have changed the device, resolution, refresh or the blanking rate after calculating the Tbit

4. Connect two single-ended probes to the Rx0+ of one data pair and Rx0− of the same data pair as shown in the Figure 203.

Setup for Intra-pair Skew

RX0-

RX0+
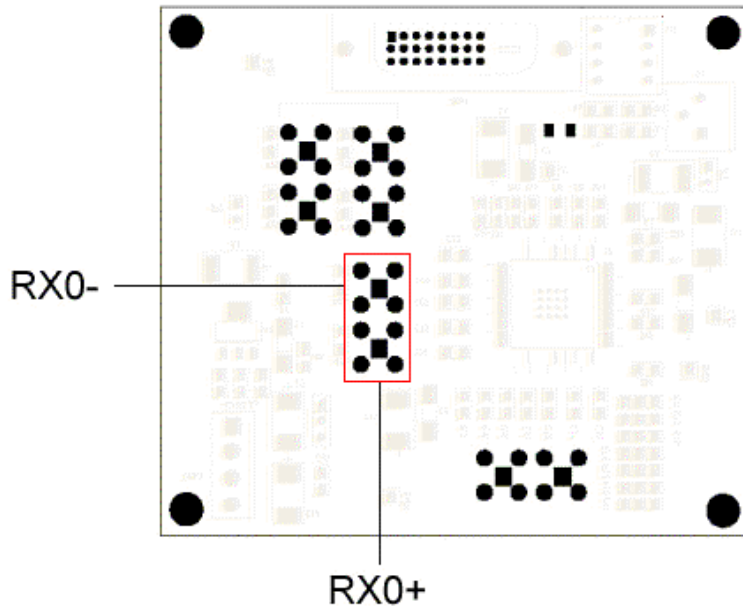
Figure 203: TPA-P test points

5. In the application measurement configuration screen, set the Pair option from the drop-down menu and press Run.

Transmitter Inter-Pair Skew

Specifying the Equipment: Transmitter-Inter-Pair Skew

You need the following equipment to set up the application and test Inter-Pair Skew in a Transmitter:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7240 or P6249 single-ended probe (two numbers)

- SMA cable

- TPA-P test fixture

- Device Under Test

Equipment Setup: Transmitter-Inter-Pair Skew

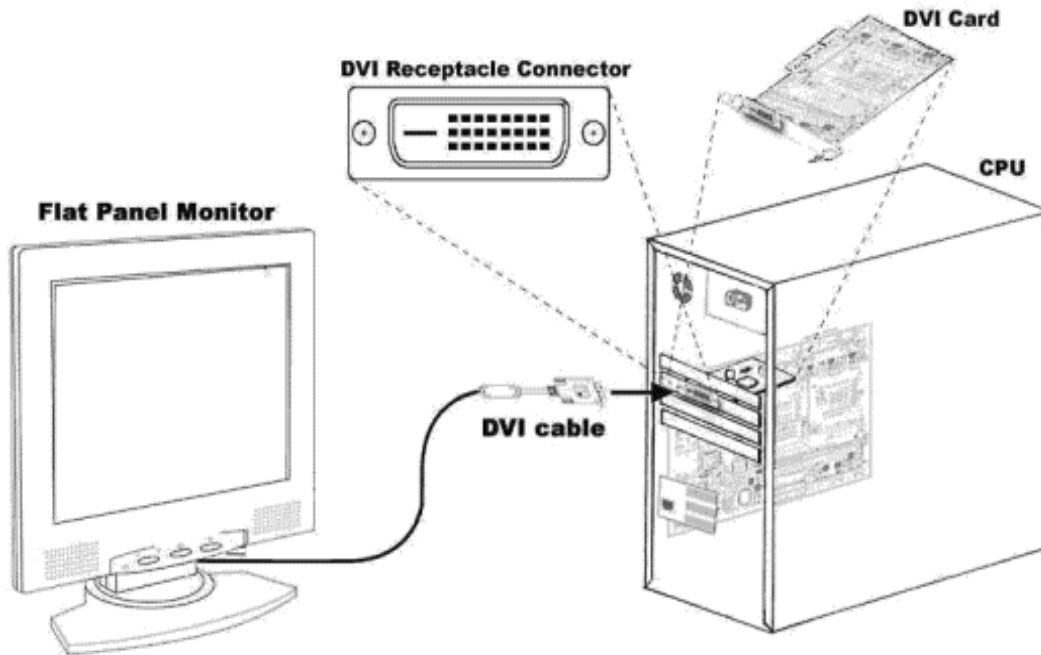To set up a Transmitter to measure Inter-Pair Skew, follow these steps:

:
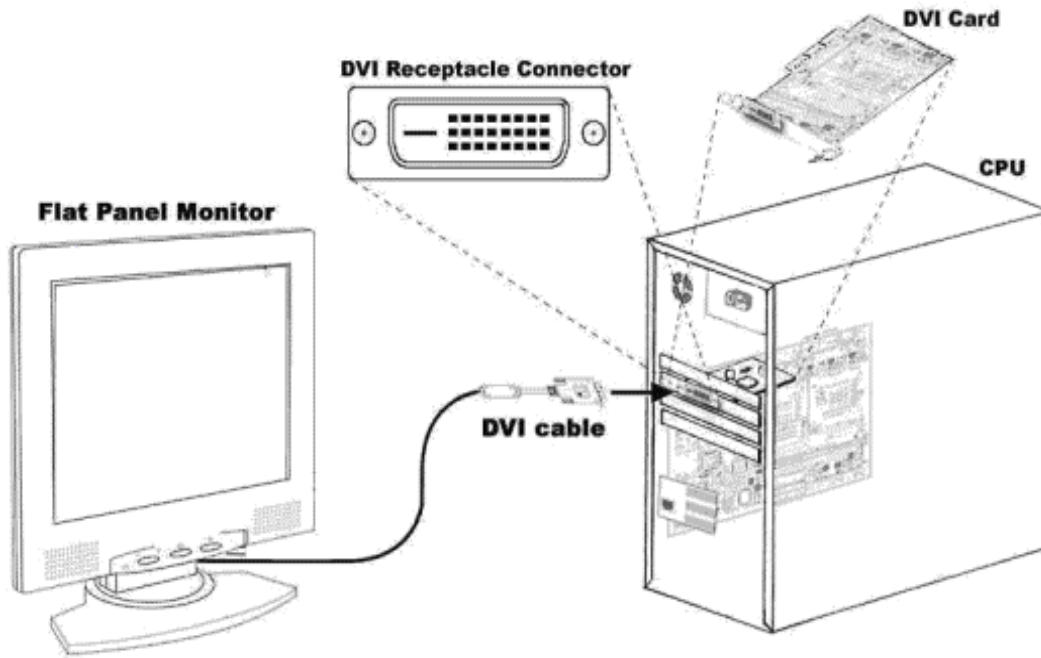
Figure 204: DVI monitor setup

1. Connect the DVI monitor to the DVI port of the AGP ADD Card of the PC. Set the required screen resolution and the refresh rate. Set the host computer to run with a Half Clock Pattern to conduct the test. For information on how to set the host computer to run with a Half Clock Pattern to conduct the test, see page 191.

2. Remove the DVI monitor and attach the TPA-P fixture to the DVI port of the DUT.
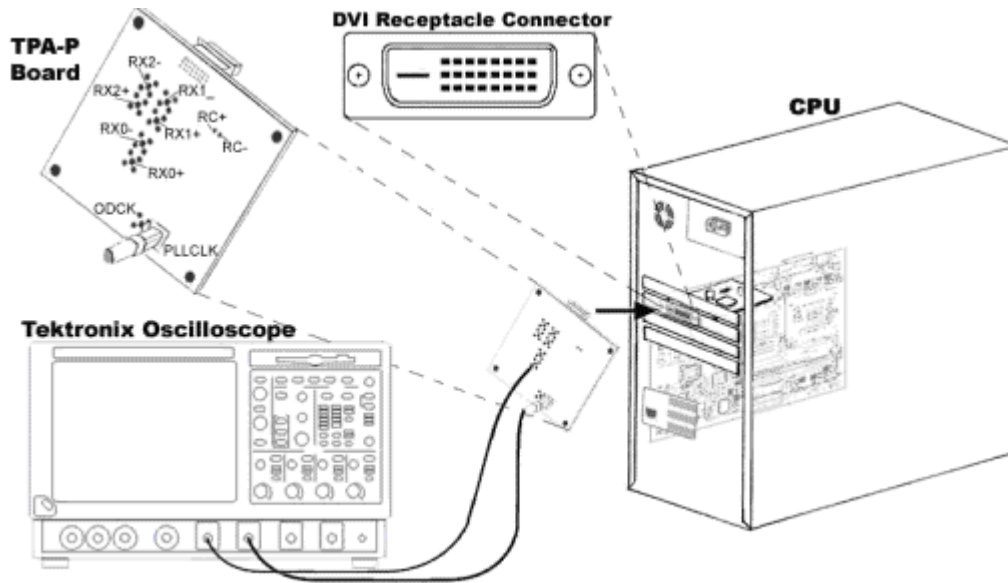
Connecting the TPA-P board to the DVI transmitter

Figure 205: TPA-P fixture to the transmitter setup

3. Use the application to define Tbit if:

- If you have not calculated the Tbit value

- If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

4. Connect two single-ended probes to the Rx0+ of one data pair and Rx1− of the same data pair as shown in Figure 206.

Setup for Inter-pair Skew
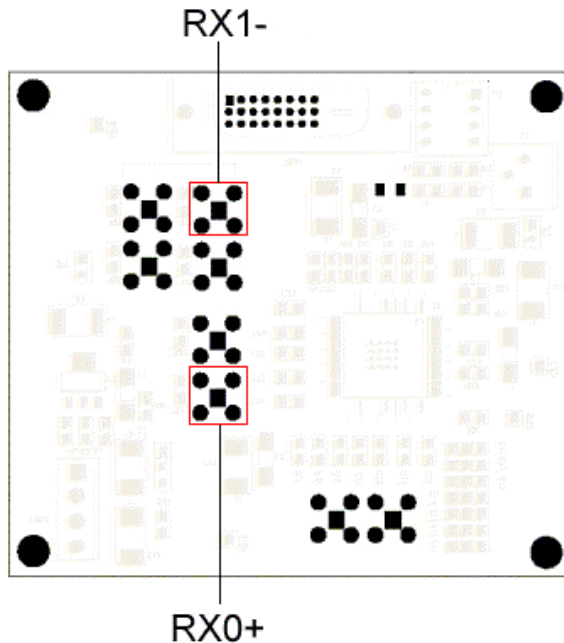
Figure 206: TPA-P test points

5. In the application measurement configuration screen, set the Pair option from the drop-down menu and press Run.

Cable Pk-Pk Jitter

Specifying the Equipment: Cable-Pk-Pk Jitter

You need the following equipment to set up the application and Pk-Pk Jitter in a Cable:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7350, P7330, P6330 (need TCA-BNC adapter) differential probe

- SMA cable

- TPA-R test fixture

- Device Under Test

Equipment Setup: Cable Pk-Pk Jitter

To set up a Cable to measure Jitter, follow these steps:

1. Connect the TPA-R board to the end of the cable.

Figure 207: Cable Jitter setup

2. Use the application to define Tbit if:

    ▪ If you have not calculated the Tbit value

    ▪ If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Connect a P7350, P7330 or P6330 probe from any one of the four channels of the oscilloscope to the transmitted clock (Rxc+/−) on the TPA-R board.

4. Connect the SMA cable from the remaining three channels on the oscilloscope to the SMA connector (PLL Clock) on the TPA-R board.

5. Configure the measurement and run the application.

Cable Intra-Pair Skew

Specifying the Equipment: Cable Intra-Pair Skew

You need the following equipment to set up the application and test Intra-Pair skew in a Cable:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7240 or P6249 single-ended probes (two numbers)

- SMA cable

- TPA-R test fixture

- ESB board

- DVI-compliant cable

- Device Under Test

Equipment Setup: Cable Intra-Pair Skew

To set up a Cable to measure Intra-Pair Skew follow these steps:

1. Select and transmit the half clock pattern from the ESB board.

2. Connect the TPA-R board to the end of the cable.
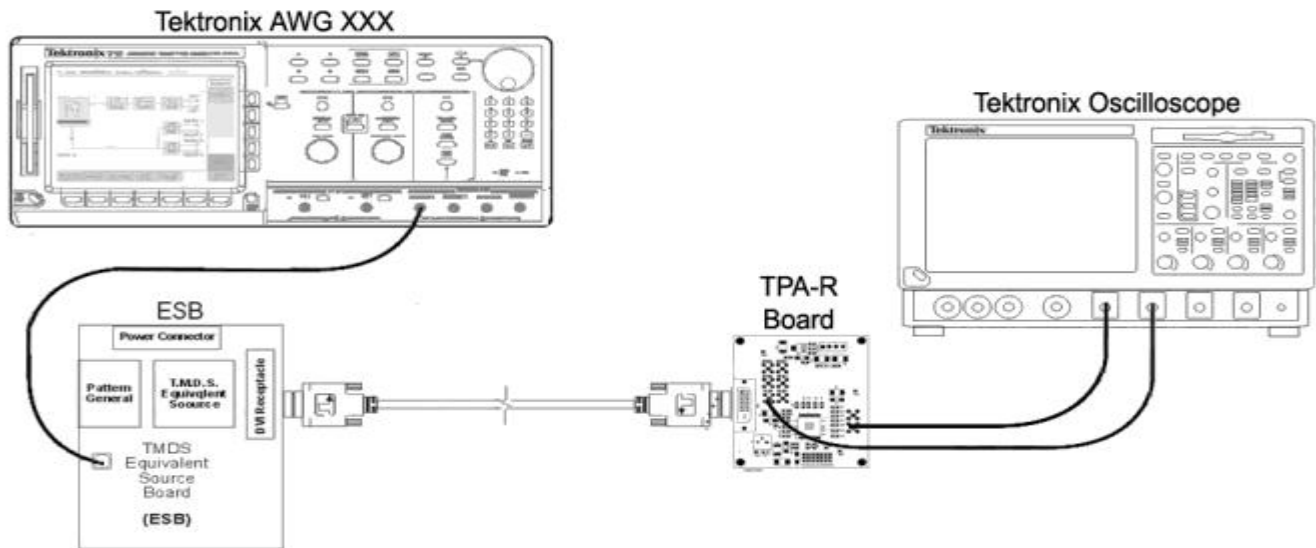
Figure 208: Cable Intra-Pair Skew setup

3. Use the application to define Tbit if:

- If you have not calculated the Tbit value

- If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

4. Connect two single-ended probes in TPA-R to the Rx0+ of one data pair and Rx0− of the same data pair.

TDSDVI-DVI Compliance Test Solution

Cable Intra-Pair Skew test points
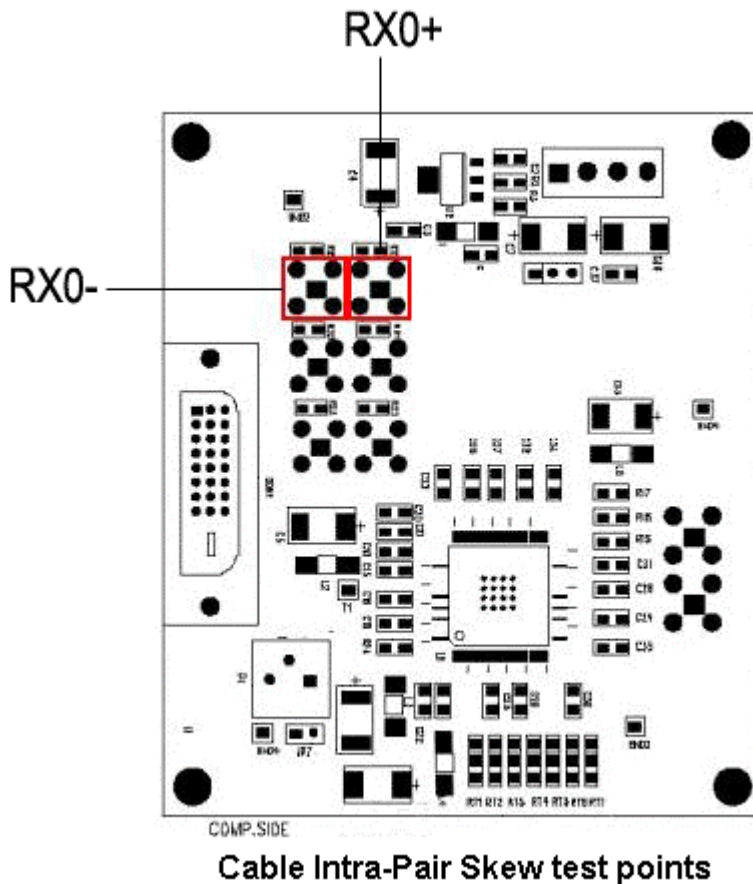
Figure 209: TPA-R test points

5. In the application measurement configuration screen, set the Pair option from the drop-down menu and press Run.

Cable Inter-Pair Skew

Specifying the Equipment: Cable Inter-Pair Skew

You need the following equipment to set up the application and test Inter-Pair Skew in a Cable:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7240 or P6249 single-ended probe (two numbers)

- SMA cable

- TPA-R test fixture

- ESB board

- DVI-compliant cable

Equipment Setup: Cable Inter-Pair Skew

To set up a Cable to measure Inter-Pair Skew follow these steps:

1. Select and transmit the half clock pattern from the ESB board.

2. Connect the TPA-R board end to the cable.
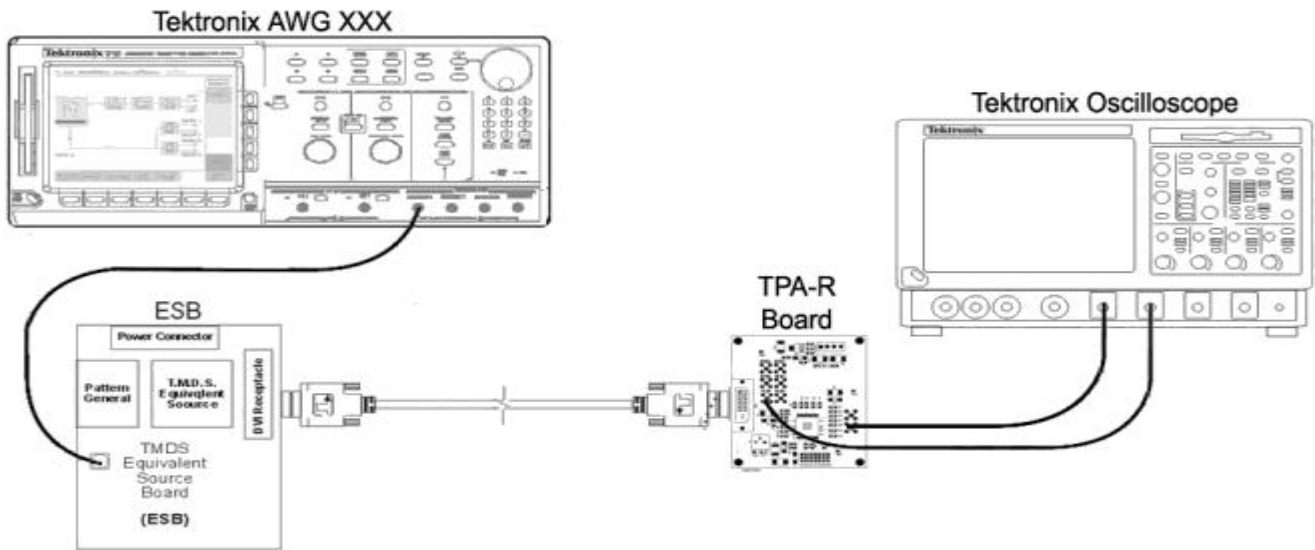
Figure 210: Cable Inter-Pair Skew setup

3. Use the application to define Tbit:

   - If you have not calculated the Tbit value

   - If you have changed the device, resolution, refresh rate, and blanking rate after calculating the Tbit

4. Connect two single-ended probes in TPA-R to the Rx0+ of one data pair and Rx1− of the same data pair. For a photographic representation of the TPA-R test points, see page 196.
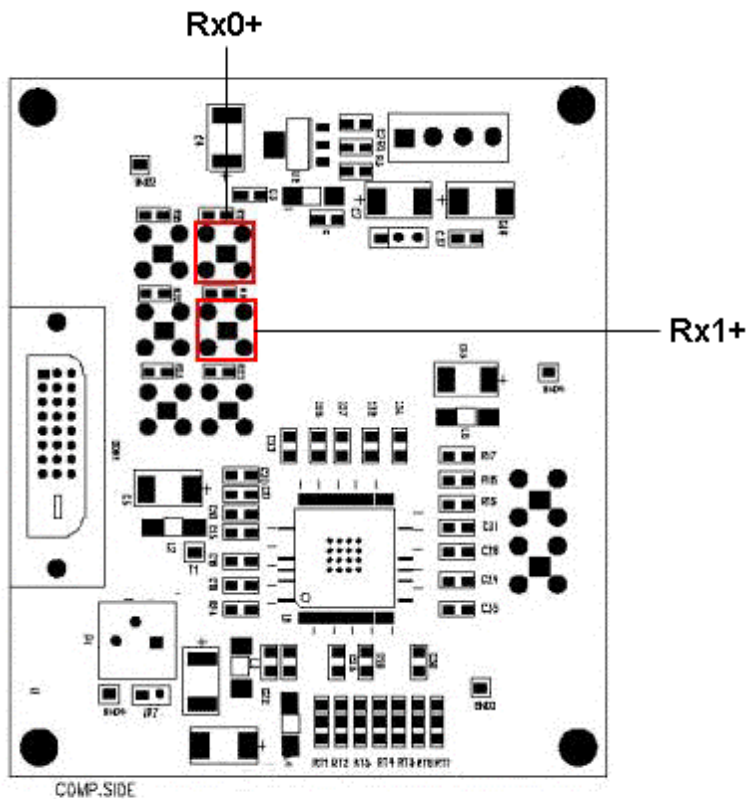
Cable Inter-Pair Skew test points

Figure 211: TPA-R test points

5. In the application measurement configuration screen, set the Pair option from the drop-down menu and press Run.

Cable Hi-Amplitude/Low-Amplitude Eye Diagram

Specifying the Equipment: Cable High-Amplitude/Low-Amplitude Eye Diagram

You need the following equipment to set up the application and test High-Amplitude/Low-Amplitude Eye Diagram in a Cable:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7350, P7330 or a P6330 (need TCA-BNC adapter) differential probes

- SMA cable

- TPA-P test fixture

- TPA-R test fixture

- ESB board

- DVI-compliant cable

- Device Under Test

Equipment Setup: Cable-High-Amplitude/Low-Amplitude Eye Diagram

The DVI Specifications version 1.0 specifies eye masks at TP2 (Low or High amplitude eye mask) and at TP3. The TP2 and TP3 test points are shown in the following figure.
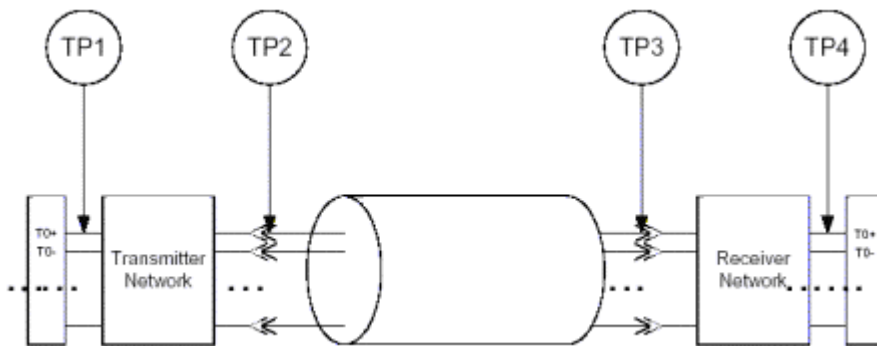
Figure 212: TP2 and TP3 test points

- Select File> Preferences> Advanced tab from the application menu bar.

Note: For expert users—If you have a standard signal that passes low or high amplitude mask, you may not opt to test cable at TP2 with low or high amplitude mask every time you run the cable measurement. For this purpose, we recommend that you select File> Preferences> Advanced> Cable Eye Diagram Test Point options. If you have selected File> Preferences> Advanced> Cable Eye Diagram Test Point> Test at TP2, follow step 1-7 in the procedure given below. If you have selected File> Preferences> Advanced> Cable Eye Diagram Test Point> Test at TP3, follow step 9- 12 in the procedure given below.

To set up a Cable to measure High-Amplitude/Low-Amplitude Eye Diagram, follow these steps:

1. Connect the TPA-P fixture to the Equivalent Source Board (ESB).
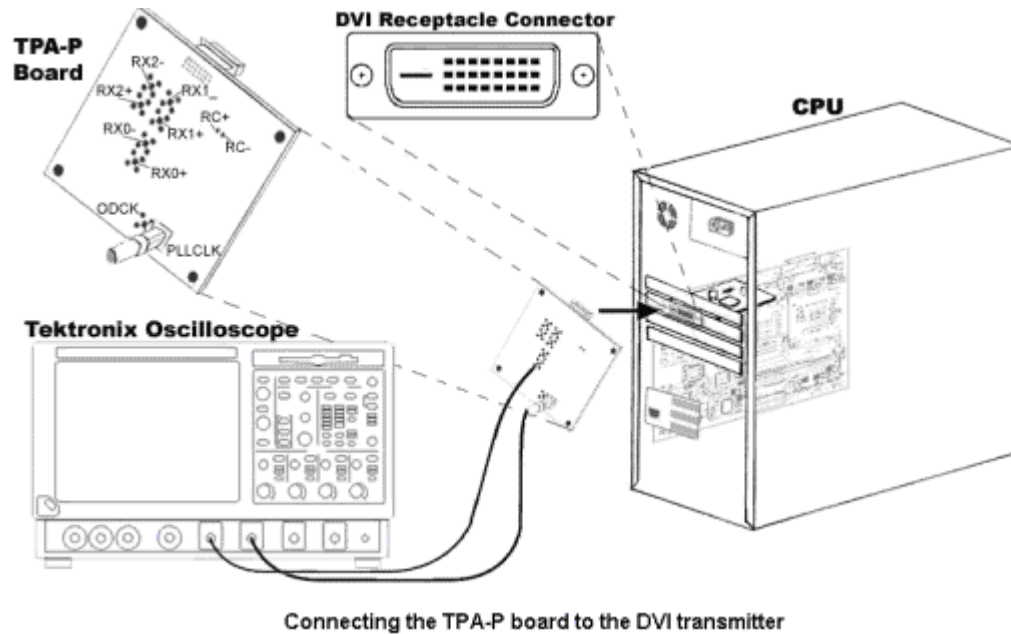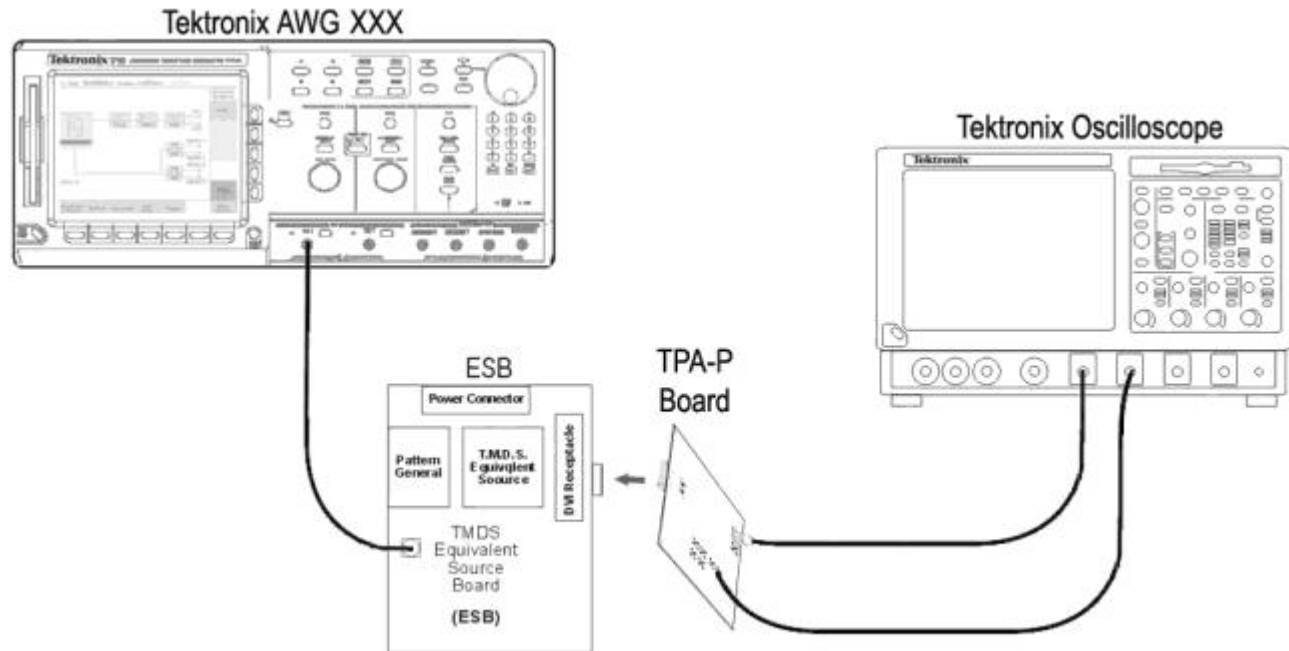

Figure 213: TPA-P to ESB setup

2. Use the application to define Tbit:

   ▪ If you have not calculated the Tbit value

   ▪ If you have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. Select the Cable> High-Amplitude/Low-Amplitude Eye Diagram measurement.

4. Connect a P7330, P7350 or P6330 probe from any one of the four channels of the oscilloscope to one of the data pairs (Rx0+/−, Rx1+/−, Rx2+/−) of the TPA-P fixture. Figure 214 shows the Rx0 test point. Similarly, perform the tests in Rx1 and Rx2 test points.

5. Connect the SMA cable to either one of the remaining three channels on the oscilloscope to the (PLL CLk) on the TPA-P fixture in Figure 214.

Note: You can refer to the TPA-P test points for Rx1 and Rx2 data pairs on page 194.
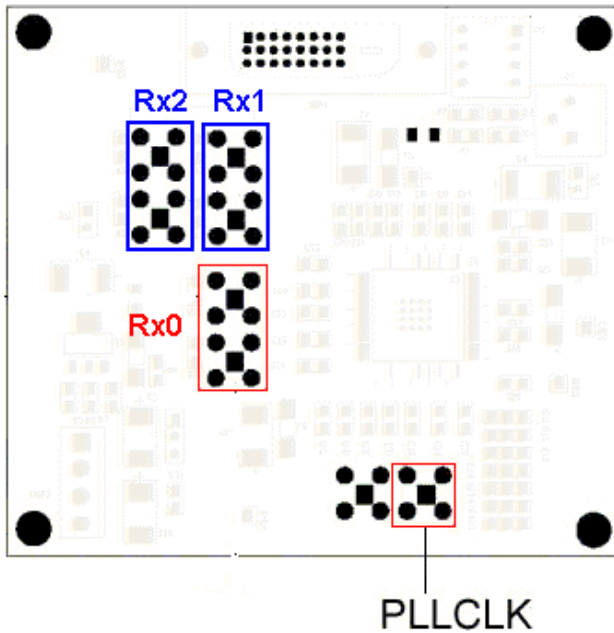
Sample test points in TPA-P for cable High/Low Amp Eye Diagram

Figure 214: TPA-P test points

6. Configure the application in the measurement configuration screen.

7. Press Run to run the Cable Low/ High Amplitude test. The application performs the test and displays the results. If the signal fails, adjust the amplitude in the ESB board and start from step one. See page 193.

8. If the signal passes the test, remove the TPA-P fixture.

9. Connect one end of the cable (DUT) to the ESB and the other end to the TPA-R fixture.

TDSDVI-DVI Compliance Test Solution
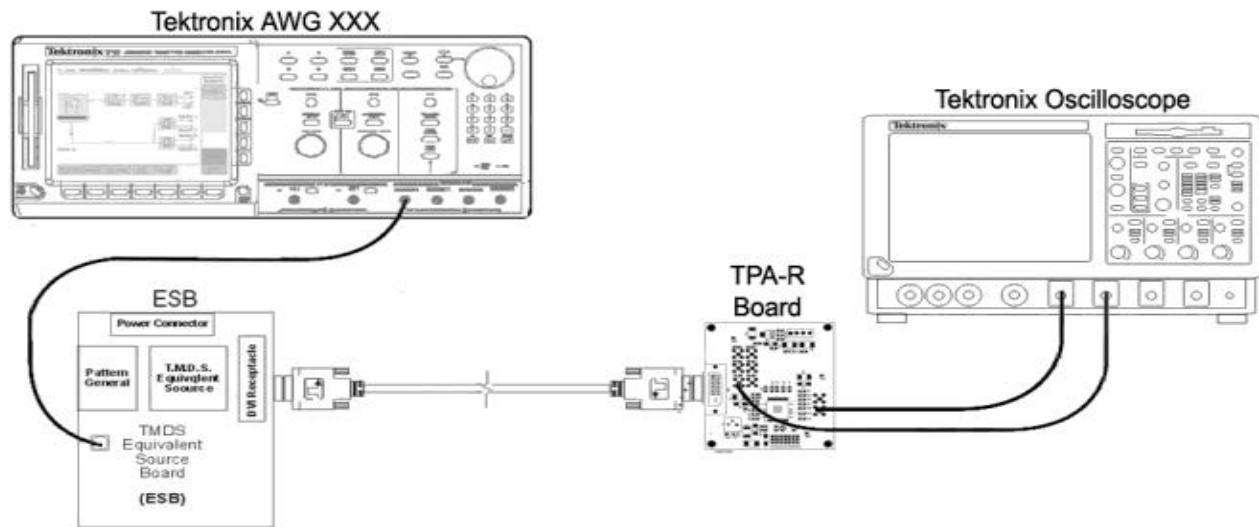
Figure 215: TPA-R to ESB setup

10. Connect a P7330, P7350 or P6330 probe from the selected data channel to one of the data pairs (Rx0+/−, Rx1+/−, Rx2+/−) of the TPA-R board. Figure 216 shows the Rx0 test point. Similarly, you can perform the tests in Rx1 and Rx2 test points shown in Figure 216.

11. Connect the SMA cable from the selected trigger channel to the (PLL Clk) on the TPA-R board.
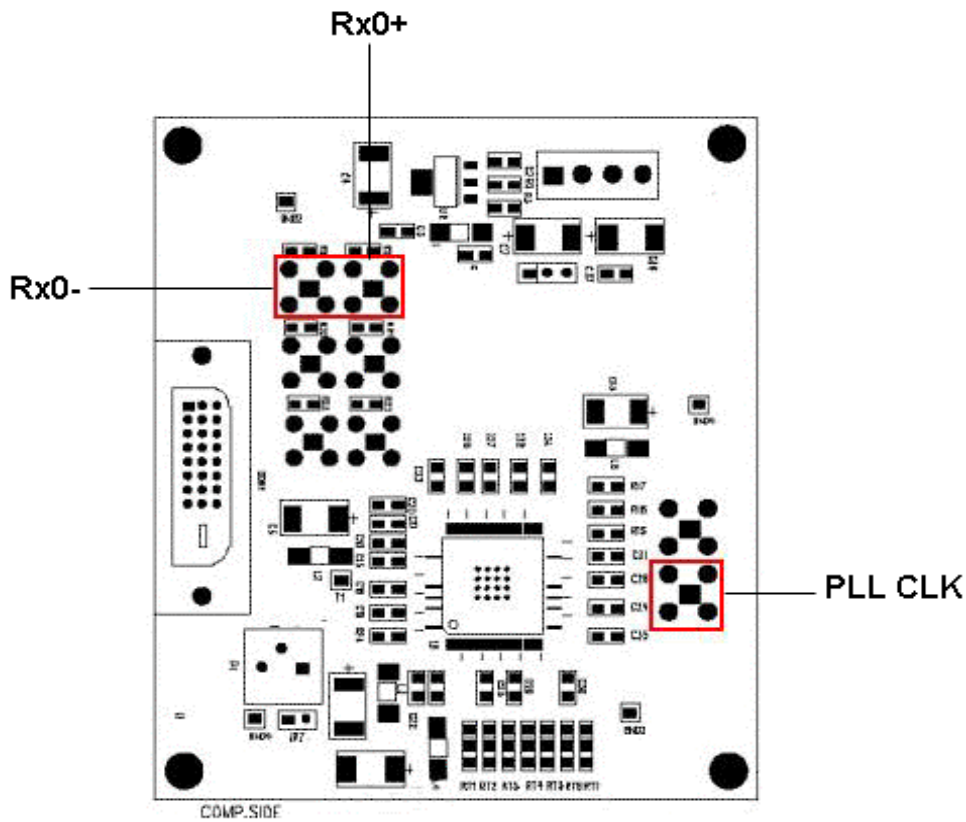
Cable High/Low Amp Eye Diagram test points

Figure 216: TPA-R test points

If you have selected the TP3 test point in File> Preferences> Advanced tab, configure the application and select the run button. If you have selected Test at TP2 & TP3 option, continue measuring the cable High/ Low Amplitude Eye diagram.

Receiver Hi-Amplitude/Low-Amplitude Eye Diagram

Specifying the Equipment: Receiver High-Amplitude/ Low-Amplitude Eye Diagram

You need the following equipment to set up the application and test High-Amplitude/Low-Amplitude Eye Diagram in a Receiver:

- CSA7404, CSA7404B, TDS7404, TDS7404B, TDS7254, TDS7524B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope with recommended firmware version

- P7350, P7330 or a P6330 (need TCA-BNC adapter) differential probe

- SMA cable

- TPA-R test fixture

- ESB board

- DVI-compliant cable

- Device under test

Equipment Setup Receiver: High-Amplitude/Low-Amplitude Eye Diagram

To set up a Receiver to measure High-Amplitude/Low-Amplitude Eye Diagram, follow these steps:

1. Connect the ESB, Cable and the TPA-R fixture.
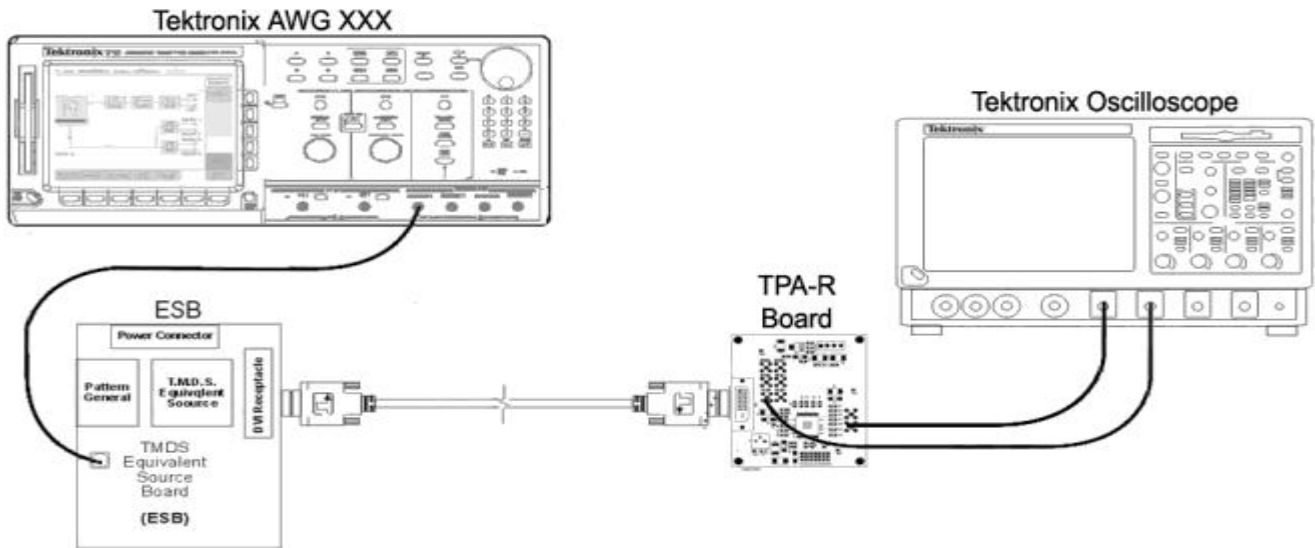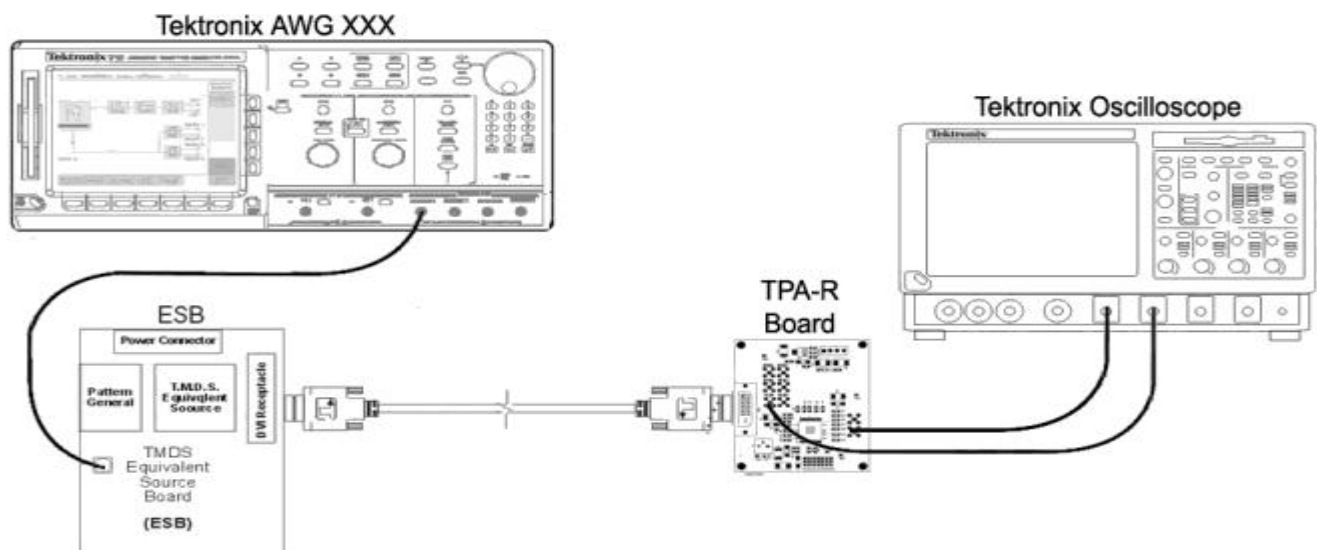

Figure 217: TPA-R to ESB setup

2. Use the application to define Tbit if:

- You have not calculated the Tbit value

- You have changed the device, resolution, refresh rate, or blanking rate after calculating the Tbit

3. From the application menu, select Receiver> High-Amplitude/Low-Amplitude Eye Diagram measurement.

4. Connect a P7330, P7350 or P6330 probe from any one of the four channels of the oscilloscope to one of the data pairs (Rx0+/−, Rx1+/−, Rx2+/−) of the TPA-R board. Figure 218 shows the Rx0 test points. Similarly, perform the tests in Rx1 and Rx2 test points shown in Figure 218.

5. Connect the SMA cable to either one of the remaining three channels of the oscilloscope and the PLL Clock of the TPA-R board.
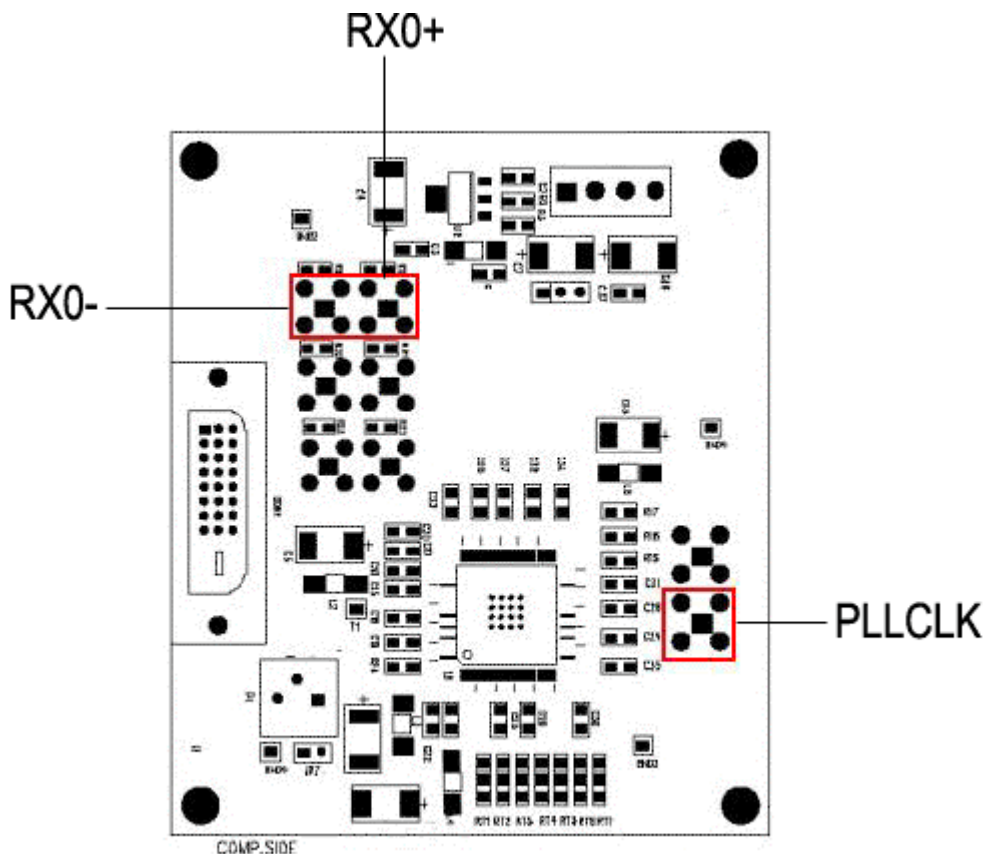
Receiver High/Low Amp Eye Diagram test points

Figure 218: TPA-R test points

6. Configure the application.

7. Press Run to perform the measurement.

8. The application displays the message "Connect the PRP signal and press OK." Select the PRP pattern on the ESB and press OK.

9. The application performs the Low/High Amplitude eye mask test. If the signal passes the test, continue with the next step. If the signal has failed, increase or decrease the Vswing and run the test again until it passes. See page 193 for information on how to adjust Vswing.

10. Remove the TPA-R and connect the display device (DUT) to the receiver as shown below.
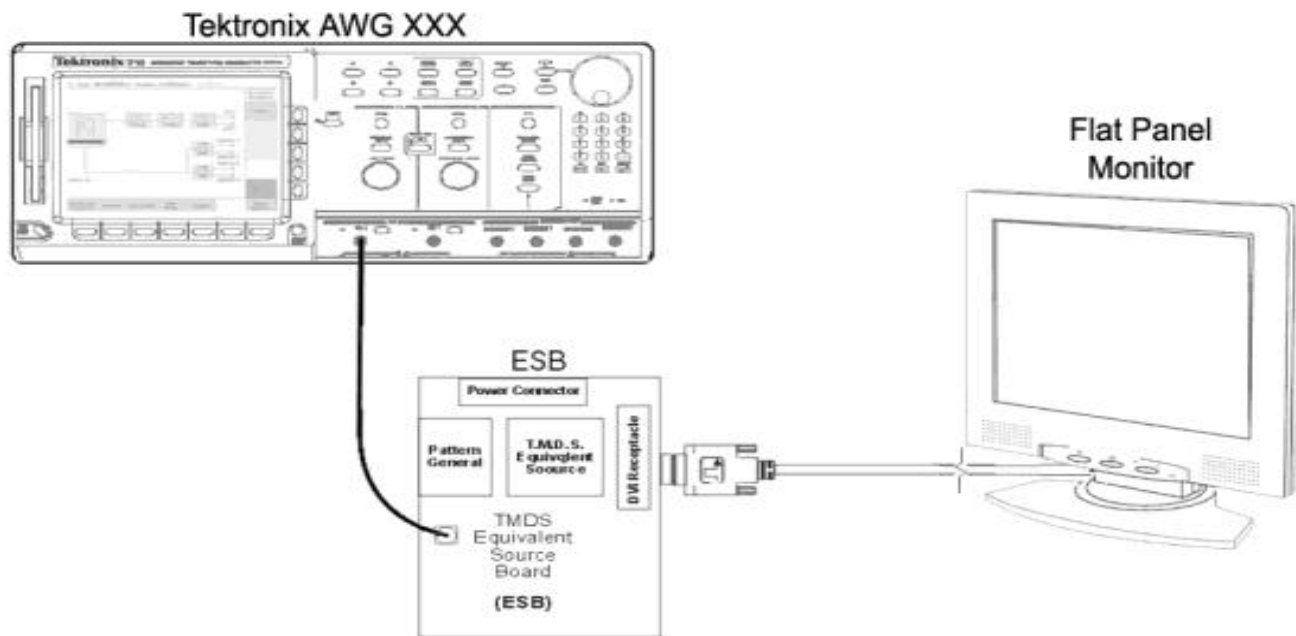
Figure 219: Receiver to the DUT setup

11. If the monitor displays the correct pattern on the screen, the display device passed the test.

Note: Unlike other measurements, the result status for the receiver measurement indicates that only the signal has passed and not the receiver device itself.

TDSDVI-DVI Compliance Test Solution

Measurement Algorithms

Eye

The application determines the mask geometry from Tbit and Vswing using a transmitted clock signal and a differential data signal, respectively. The application positions the mask at the center of the worst eye opening. The eye that has the least horizontal opening (worst eye opening) is calculated using the crossover detection algorithm. The six masks for the three types of devices are:

- Transmitter Eye mask

- Cable High Amplitude Eye mask

- Cable Low Amplitude Eye mask

- Cable TP3 Limit Eye mask

- Receiver High Amplitude Eye mask

- Receiver Low Amplitude Eye mask

Eye Openings

Vertical opening (Vopen)
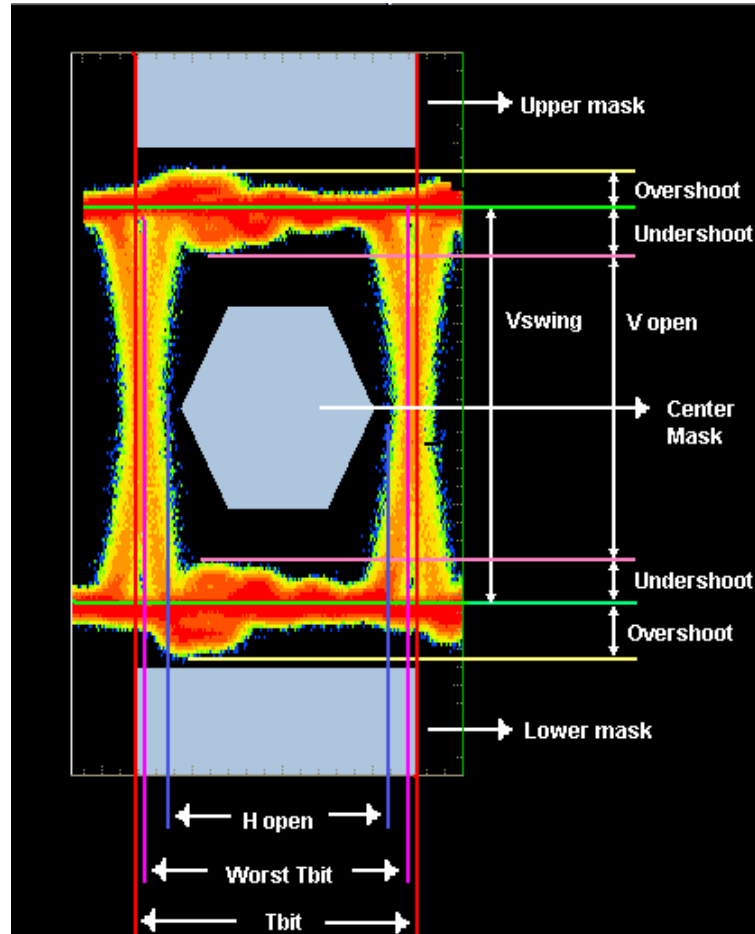
Figure 220: Eye definitions

The vertical eye opening is the minimum voltage difference between the high and low states after the transition. The application calculates the vertical opening at the worst eye opening and places the mask at the center of the worst eye opening. The center of the worst opening is calculated using the following equation:

Center of worst opening eye = (T1+T2)/2.0

Where:

T1 is the time at the least opening eye's left cross over

T2 is the time at the least opening eye's right cross over

Application considers the 18% before and after the center of the unit interval region as the after and before transition period and calculates the minimum voltage difference in this region. This voltage is called vertical opening.

Horizontal Opening

The minimum time difference between two crossovers of the eye diagram. This includes the effects of jitter.

Overshoot

Overshoot is voltage difference between the peak (+ve or −ve) and the normalized level (Vswing Low or Vswing High) in the previous eye diagram.

The application calculates Overshoot using the following method:

1. Find the minimum eye opening or the worst eye opening.

2. Find the positive peak and negative peak in the eye.

3. Find the normalized High (Vswing High) and Low (Vswing Low) using the histogram.

4. You can calculate:

   - Overshoot1 = Positive peak - normalized high

   - Overshoot2 = Normalized low - Negative Peak

5. The greater of Overshoot1 and Overshoot2 is used as Overshoot.

Undershoot

Undershoot is the voltage difference between the minimum high level voltage or the maximum low level voltage after the transition and the normalized voltage level (Vswing Low or Vswing High) in the eye diagram.

The application calculates Undershoot using the following method:

1. Find the minimum eye opening or the worst eye opening.

2. Find the minimum level high voltage and maximum level low voltage in the after transition region in the eye diagram.

3. Find the normalized High (Vswing High) and Low (Vswing Low) using the histogram.

4. You can calculate:

   - Undershoot1 = the minimum level high voltage - normalized high

   - Undershoot2 = maximum level low voltage - Negative Peak

5. The greater of Undershoot1 and Undershoot2 is used as Undershoot.

Inter-Pair Skew

Definition:

Inter-Pair Skew is the skew between the different data pairs that make up the TMDS signal. For example, the skew between Rx0+ of one pair and Rx1− is called Inter-Pair Skew. Use the single ended probe to run Inter-Pair Skew measurement.

Algorithm:
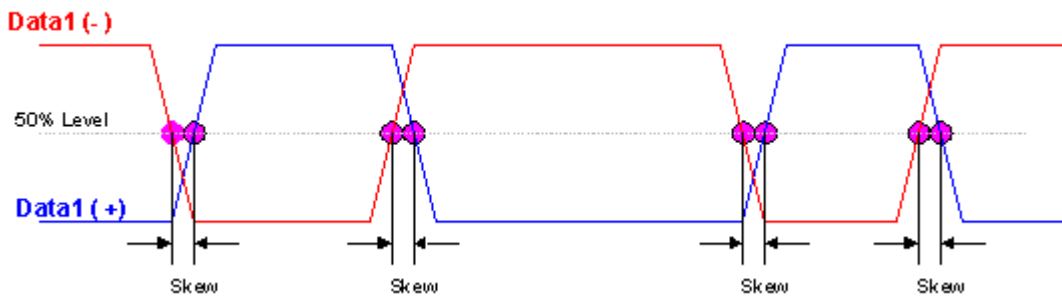
Figure 221: Calculation of Inter-Pair Skew

The application calculates the 50% of Pk-Pk voltage level in both signals and calculates the time difference between the two edges of the waveform.

The average of all the skew values over the acquisition period is compared with the Skew limits. The application calculates the Mean and Standard Deviation using the following equations:

If t_1, t_2, ...t_n are the skew values,

$$Mean = (\bar{x}) = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$SD = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{n})^2$$

Where:

n= number of skews

Intra-Pair Skew

Definition:

Intra-Pair Skew is the skew between the same data pairs that make up the TMDS signal. For example, the skew between Rx0+ of one pair and Rx0− of the same data pair is called Intra-Pair Skew measurement. Use the single ended probe to run Intra-Pair Skew measurement.

Algorithm:
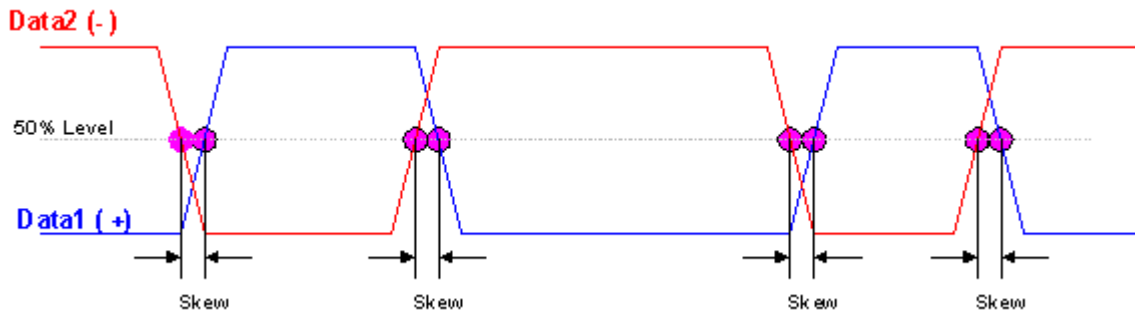
Figure 222: Calculation of Intra-Pair Skew

The application calculates the 50% of Pk-Pk voltage level in both signals and calculates the time difference between the two edges of the waveform.

The average of all the skew values over the acquisition period is compared with the Skew limits. The application calculates the Mean and Standard Deviation using the following equations:

If t_1, t_2, ...t_n are the skew values,

$$Mean = (\bar{x}) = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$SD = \frac{1}{n-1}\sum_{i=1}^{n} (x_i - \bar{n})^2$$

Where:

n= number of skews

Assumption

The application uses this algorithm with the assumption that both the data channels will transmit the same data content simultaneously.

Pk-Pk Jitter

Cable Jitter is calculated as the peak-to-peak histogram value. To calculate Pk-Pk Jitter:

1. Use the extracted clock to trigger the oscilloscope.

2. Place the histogram at the 50% level of the transmitted clock's second rising edge.

3. Measure the Pk-Pk histogram value as the Jitter value.

Rise and Fall Time

Rise Time:

Rise Time is the time interval between the 20% and 80% of normalized amplitude of the TMDS signal at Rising edge.

Fall Time:

Fall time is the time interval between the 80% and 20% of normalized amplitude of the TMDS signal at falling edge.
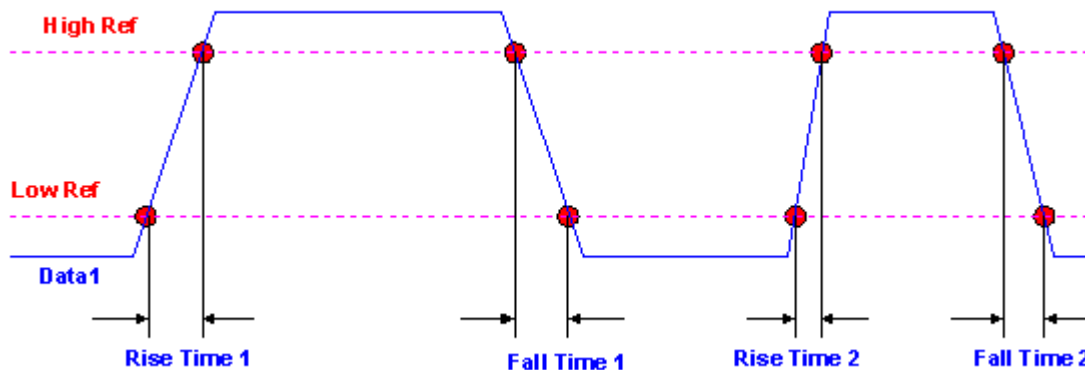
Figure 223: Calculation of Rise and Fall Time

Low Ref = Normalized Voltage Low + 0.2 *Vswing

High Ref = Normalized Voltage Low + 0.8 *Vswing

Vswing = Normalized Voltage High - Normalized Voltage Low calculated using the Eye diagram.

Each edge is defined by the slope, voltage reference level (threshold), and Hysteresis.

The application calculates this measurement using the following equation:

Rime Time = T HighRef – T LowRef (at Rising Edge)

Fall Time = T LowRef - ThighRef (at Falling Edge)

Application calculates all rise and fall times in the acquisition and finds Min, Max, Mean, and SD.

The mean value is compared with the limit value.

Assumption

For user Vswing value, the application needs a differential signal. The Absolute value of Vswing Low and Vswing high should be the same.

Generation of Cable High Amplitude Eye Mask
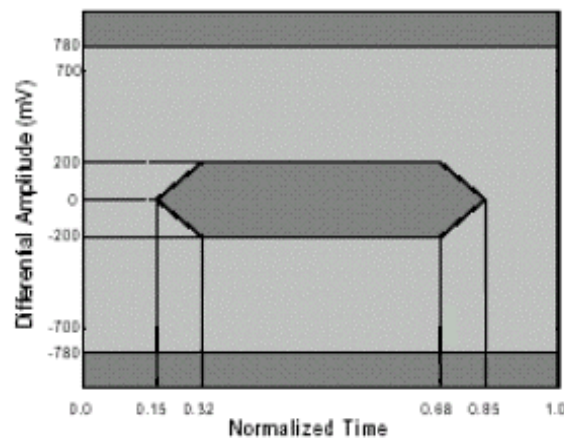
Figure 224: Cable High-Amplitude Eye mask

The application calculates the eye mask coordinates as a percentage of Tbit value with fixed voltage level.

Generation of Cable Limit Eye Mask
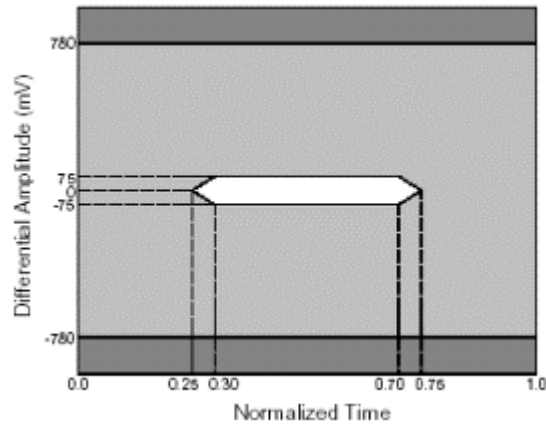
Figure 225: Cable Limit Eye mask

The application calculates the eye mask coordinates as a percentage of Tbit value with fixed voltage level.

Generation of Cable Low Amplitude Eye Mask
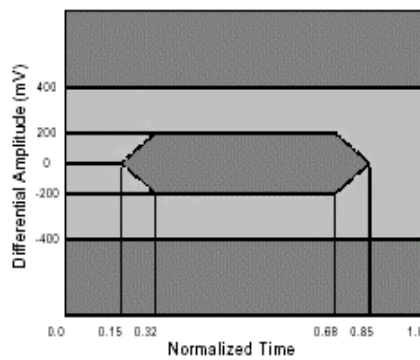
Figure 226: Cable Low-Amplitude Eye mask

The application calculates the eye mask coordinates as a percentage of Tbit value with fixed voltage level.

Generation of Receiver High Amplitude Eye Mask
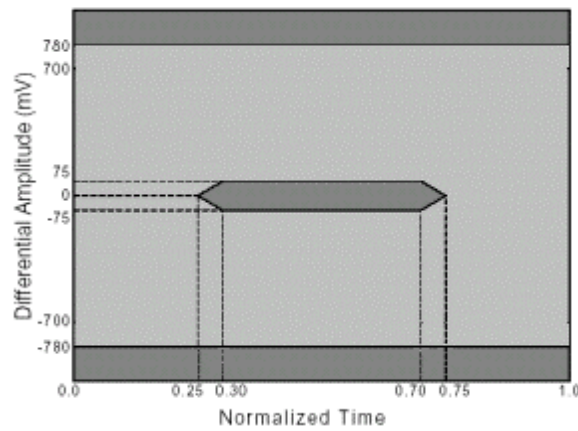
Figure 227: Receiver High-Amplitude Eye mask

The application calculates the eye mask coordinates as a percentage of Tbit value with fixed voltage level.

Generation of Receiver Low Amplitude Eye Mask
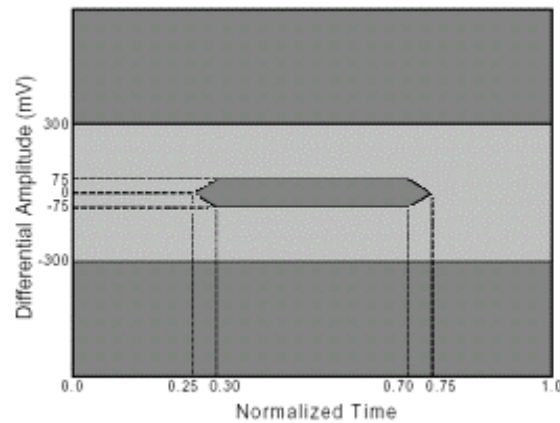
Figure 228: Receiver Low-Amplitude Eye mask

The application calculates the eye mask coordinates as a percentage of Tbit value with fixed voltage level.

Generation of Transmitter Eye Mask
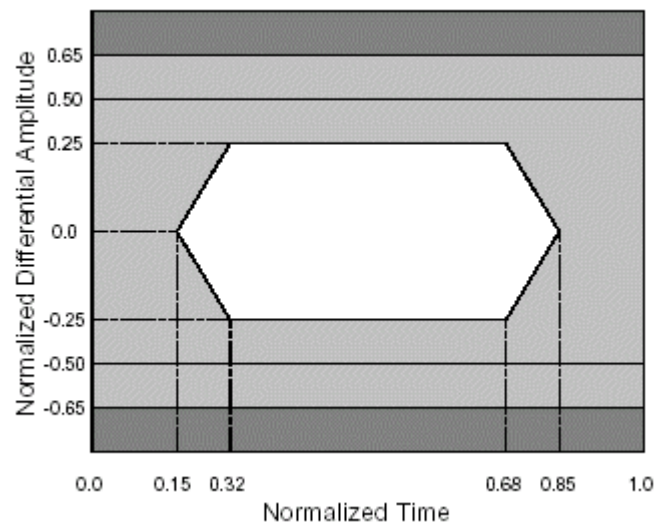
Figure 229: Transmitter Eye mask

The application calculates the eye mask coordinates as a normalized Tbit value with fixed voltage level.

Reference

Equivalent Source Board

Use the ESB to test the cable assembly and receiver devices. The board has a:

- Test pattern generator (HCP or PRP)

- TMDS transmitter

- DVI receptacle to connect the cable assembly or receiver under test.
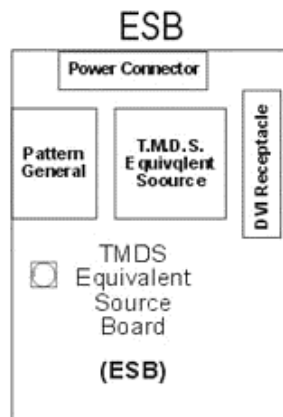
Figure 230: ESB board

ESB has a test pattern generator and a LCD module for a user interface to set the test modes (pattern choices and durations). To perform a test, select the appropriate resolution and pattern to be transmitted. ESB generates the required TMDS pattern along with the required DVI control signals for the Receiver test. You can also use the ESB to adjust the amplitude of a generated DVI signal.

The ESB requires a clock source to generate a pattern and introduce jitter in the TMDS clock. We recommend that you use a Tektronix AWGxxx as a clock source.

If you do not have the ESB setup, you can use the following setup to create a DVI signal:

ESB Setup using AWG and DG
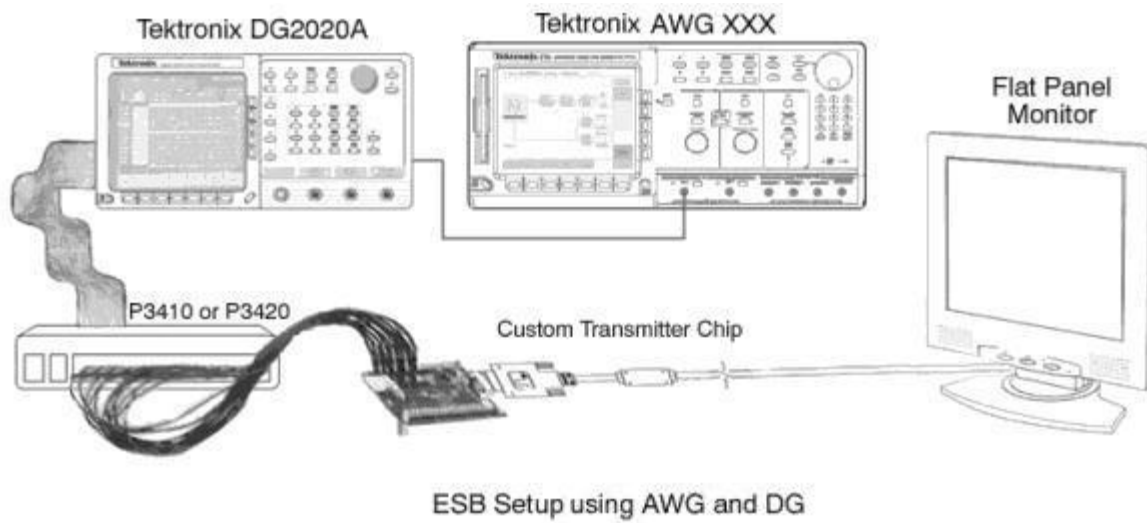
Figure 231: ESB board setup with AWG and DG

1. You can use the DG2020 to generate the required pattern with the DVI control signals.

2. AWGxxx serves as a clock source for the pattern generator (DG2020A).

3. By introducing jitter in the clock source, you can generate a jittery DVI signal for receiver testing.

4. A custom made Transmitter chip/board:

    ▪ Converts the parallel data from the pattern generator to a DVI signal.

    ▪ Provides an option to adjust the amplitude of the TMDS signals.

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Shortcut Keys

The following table lists the shortcut keys to access the application:

Table 29: Menu options and their shortcut keys

Menu	Shortcut Keys
File	
File	Alt+ F
Recall Default	Alt F+D
Save	Alt F+V
Recall	Alt F+A
Recently Saved	Alt F+N
Recently Recalled	Alt F+Y
Preferences	AltF+E
Minimize	Alt F+Z
Exit	Alt F+X
Measurements	
Measurements	Alt+M
Select	Alt M+S
Configure	Alt M+C
Results	
Results	Alt+R
Result Detail	Alt R+I
Utilities	
Utilities	Alt+U
Report Generator	AltU+G
Compare Results	AltU+P
Help	
Help	Alt+ H
Topics	AltH+O
About TDSDVI	AltH+B
Contact Tektronix	AltH+T

Default Settings

The following table lists the default parameter settings for the application:

Table 30: Default parameter settings

Parameter	Selection	Default Settings
Device type tab	Transmitter, Cable Receiver	Tbit
Define Tbit>Transmitter Clock	CH1 through CH4	Ch1
Define Tbit> User (T TDS66604, TDS6404, TDS6604B, TDS6804B, TDS7404, TDS7404B, TDS7704B, CSA7404, CSA7404B, DPO7354, and DPO/DSA70000 series oscilloscope)	Min-200ps, Max-20ns	1.2ns
Define Tbit> User (TDS7254/ TDS7524B)	Min-1ns, Max-20ns	1.2ns
Transmitter> Eye, Rise Time, Fall Time		
Transmitter> Eye Diagram> Configure> Select Source	Data-CH1 through CH4	Ch1
	Trigger-CH1 through CH4	Ch2
Transmitter> Eye Diagram> Configure> Select Pair	Rx0, Rx1, Rx2	Rx0
Transmitter> Eye Diagram> Configure> Eyes	Min-2, Max-10	2
Transmitter> Eye Diagram> Vswing> Pattern	Pseudo Random, Half Clock	Pseudo Random
Transmitter> Eye Diagram> Vswing> User	Min-200mV, Max-2 Volts	400mV
Transmitter, Cable> Pk-Pk Jitter		
Pk-Pk Jitter> Source> Transmitter Clock	CH1 through CH4	Ch1
Pk-Pk Jitter> Source> Trigger	CH1 through CH4	Ch2
Transmitter, Cable> Intra-Pair Skew, Inter-Pair Skew		
Intra-Pair Skew, Inter-Pair Skew> Source1	CH1 through CH4	Ch1
Intra-Pair Skew, Inter-Pair Skew> Source2	CH1 through CH4	Ch2
Intra-Pair Skew, Inter-Pair Skew> Pair	Rx0, Rx1, Rx2	Rx0
Inter-Pair Skew> Pair1	Rx0, Rx1, Rx2	Rx0
Intra-Pair Skew, Inter-Pair Skew> Hysteresis	Min-2%, Max-10%	5%
Intra-Pair Skew> Pair2	Rx0, Rx1, Rx2	Rx1
Transmitter> Rise Time, Fall Time		
Rise Time, Fall Time> Hysteresis	Min-2%, Max-10%	5%
Receiver, Cable> High-Amplitude Eye, Low-Amplitude Eye		
High-Amplitude Eye, Low-Amplitude Eye> Select Source> Data	CH1 through CH4	Ch1
High-Amplitude Eye, Low-Amplitude Eye> Select Source> Trigger	CH1 through CH4	Ch2
High-Amplitude Eye, Low-Amplitude Eye> Select Pair> Pair	Rx0, Rx1, Rx2	Rx0
High-Amplitude Eye, Low-Amplitude Eye> Eyes	Min-2, Max-10	2

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Table 30: Default parameter settings (Cont.)

Parameter	Selection	Default Settings
Utilities> Report Generator		
Report Setup> Clock Frequency> Resolution	For TDS/CSA7404/7404B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope see page 190 and for TDS7254/TDS7524B oscilloscopes see page 190	VGA
Report Setup> Clock Frequency> Refresh Rate	43, 56, 60, 70, 72, 75, 85 (These refresh rates vary and are available depending on the selected resolution)	60Hz
Preferences		
File> Preferences> User Preferences> Min number of Acquisitions	Min-500k, Max-5M (For TDS/CSA7404/7404B, TDS7704B and TDS7254/TDS7254B oscilloscopes) Min-10K, Max-1M (For TDS6604, TDS6404, TDS6604B, and TDS6804B oscilloscopes)	1M 20k

Error Codes

The following table lists the error codes for the application:

Table 31: Error codes, descriptions, and troubleshooting

Error Code	Display Information	Detailed Description	Probable Solution
101	There are no results to generate a report	If you try to generate a report without any results for the selected measurement, the application displays this error message.	Press the Run button and perform the measurement again.
111	Not enough acquisitions to perform measurement	The application expects to acquire a minimum number of acquisitions specified by you.	Make sure that the application configurations are proper. Check the probes and the test fixture connections.
113	Error in importing waveform from the instrument	The application could not import the waveform from the acquisition. This happens when there is no valid waveform in the acquisition memory.	Make sure that the probes and test fixture are properly connected and re-acquire the new waveform.
114	Improper waveform	Signal is not probed at the proper test points.	Follow the setup diagram and probe the proper signal for the particular measurement.

Table 31: Error codes, descriptions, and troubleshooting (Cont.)

Error Code	Display Information	Detailed Description	Probable Solution
115	Failed to find the required edges on the waveform	Number of edges found on the source waveform is lesser than the minimum number of edges required to run the measurement.	a) Decrease the horizontal scale to have more complete cycles of the waveform. b) Adjust the hysteresis level of the signal to find the edge at the required level.
122	Same source cannot be selected for data and trigger source	You cannot select the same source for Data and Trigger.	Select different channel sources for Data and Trigger.
123	Same source cannot be selected for both the data pairs	You cannot select the same source for both the data pairs.	Select Different data pair sources.
124	Same source cannot be selected for Tx clock and trigger source	You cannot select the same source for Tx Clock and trigger.	Select different channel sources for Tx clock and trigger.
125	Same source cannot be selected for source1 and source2	You cannot select the same source for source1 and source2.	Select different channel sources for source1 and source2.
131	Invalid file name	The file name should not have any of the following characters: |,:,//,\\,,,,<,>,*,\",/,?,@,^,~,$,#,%,&,(,),+,;,`,{,},[,],'	Make sure to use valid characters in file names.
132	Use valid .htm or .html extensions	The file extension for the report should be .htm or .html.	Check if the extensions of the report file(s) are .htm or .html.
133	Error while generating report	The error is generated if there is no waveform plot in C:\TekApplications\TDSDVI\Reports	Press the run button and perform the measurement again.
134	A valid device Id cannot contain special characters. |,:,//,\\,,,,<,>,*,\",/,?,@,^,~,$,#,%,&,(,),+,;,`,{,},[,],'	The device Id should not have any special characters mentioned in the error display.	Check whether the Device Id contains the special characters mentioned in the error display.
135	A valid device prefix cannot contain special characters. |,:,//,\\,,,,<,>,*,\",/,?,@,^,~,$,#,%,&,(,),+,;,`,{,},[,],'	The device prefix should not have any special characters as mentioned in error display.	Check whether the Device prefix contains the special characters as mentioned in the error display.
141	Unable to calculate Vswing. Connect the proper signal or select the cursor option from File> Preferences to obtain the Vswing value	If the signal(s) or the test fixture connections are not proper, the application is not able to calculate the Vswing.	Connect the proper signal or select the cursor option from File> Preferences menu to obtain Vswing value.
142	Unable to find the worst eye. Connect the proper signal or select the cursor option from File> Preferences to obtain worst eye opening	If the signal (s) or the test fixture connections are not proper, the application is unable to find the worst eye opening.	Connect the proper signal or select the cursor option from File> Preferences to obtain the Worst Eye value.
143	Improper Vswing or invalid signal	The application is unable to calculate the Vswing or when you enter an invalid Vswing. This happens if the signal(s) or the test fixture connections are not proper or cursor is not placed at the proper position.	Connect the proper signal or place the cursor at the proper position to obtain the Vswing value or enter a valid Vswing.

Table 31: Error codes, descriptions, and troubleshooting (Cont.)

Error Code	Display Information	Detailed Description	Probable Solution
144	The worst Tbit is greater than the calculated Tbit value	If the cursor is placed at the wrong position in the eye to find the Worst Eye or if the user Tbit value is invalid, this message appears.	Select File> Preferences> Use cursors for Eye, RT & FT testing box. Place the cursor in the worst Tbit crossover points to find the worst Tbit or Use the calculate option in Define Tbit pane to calculate the Tbit value.
145	The Vswing value does not meet the specification	The Vswing value should be with in the specified range of 800mV –1.2V.	Connect the proper signal or place the cursor at the proper position to obtain the Vswing value.
151	Error while deleting waveform from Ref1	The application failed to delete the Reference waveform.	Press the Run button and perform the measurement again.
161	Error in result comparison	The error is generated if there is no waveform plot in C:\TekApplications\TDSDVI\Reports (for Current Vs File option) or waveform plot not found for the selected files.	Press the run button and perform the measurement again to get the waveform plot.
162	Not a compatible result comparison	The error is generated if compared files are not compatible.	Select compatible files.
163	Not a valid path	The error is generated if the path/report given for report comparison is not valid. The path should not have any of the following characters: |,:,//,\\,,,<,>,*,\",/,?,@,^,~,$,#,%,&,(,),+,;,`,{,},[,],'	Select proper report and file path for comparison or check whether the path contains any special characters like |,:,//,\\,,,<,>,*,\",/,?,@,^,~,$,#,%,&,(,),+,;,`,{,},[,],'
164	Same path cannot be selected for input and output files	The result comparison input file and destination path cannot be the same.	Select different path for input and output file to compare results.
165	Same path cannot be selected for both the input files	The result comparison file vs file and the two input files cannot be the same.	Select different path for the two input files to compare results.
171	Please select a measurement to configure it	Tbit does not have a separate configuration panel. You have to select a measurement and configure.	The configure button can be used to configure measurements only.
172	Invalid Tbit value	If the Tbit value is not within the specified range of 200ps and 20ns in the TDS6604, TDS6404, TDS6604B, TDS6804B, TDS7404, TDS7404B, TDS7704B, DPO7354, and DPO/DSA70000 series oscilloscope and CSA7404, CSA7404B and between 1ns and 20ns in TDS7254 and TDS7254B oscilloscopes, the application displays this error message.	Make sure you have selected the proper Tx Clock channel for Tbit measurement or Check the test fixture connections or Change the resolution and/or the refresh rate and re-calculate Tbit.
173	Tbit calculation failed	The Tbit measurement has failed. If the Tx clock selected is not proper, the Tbit calculation can fail.	Make sure that the application has selected proper Tx Clock channel for Tbit measurement or check the test fixture connections.

Table 31: Error codes, descriptions, and troubleshooting (Cont.)

Error Code	Display Information	Detailed Description	Probable Solution
174	The device is not ready	If the destination location for saving zoomed eye is not valid, the application displays this error message.	Check if the specified drive and folder to save zoomed eye is valid and ready.
175	Tbit value is not defined	If you try running a measurement without defining the Tbit value, the application displays this error message.	Use the Calculated or the User option to define Tbit before running a measurement.
176	Test is not completed	If you have selected TP2 &TP3 as test point for Cable High/Low amplitude testing, and the test is completed only for the TP2 test point, the application displays this error message.	Analyze the possible reasons for the incomplete test at TP2 and run the test again.
181	Mask coordinates are out of view	The application is not able to calculate the mask coordinates. If the signal(s) or the test fixture connections are not proper or the cursor is not placed at proper position, this message appears.	Increase the number of eyes in the configuration panel and run the test again.
182	Error while saving the zoomed eye	If the destination drive does not have enough memory to save the zoomed eye, the application displays this error message.	Check if the destination drive is has enough memory to save the zoomed eye.
183	File name should not exceed 50 characters	The setup file name entered to save or recall should not be more than 50 characters.	Reduce the length of the file name.
184	Invalid extension. File name should have .ini extension	The setup file name entered to save to recall should have a valid ".ini" extension.	Check if the file name has a valid ".ini" extension.
185	The setup cannot be recalled. The file may be corrupted	The recall operation is not successful because the recalled setup file may be corrupt.	Replace the existing file if corrupt.
186	The setup cannot be recalled. The .ini file does not exist	The recall operation is not successful because the recalled setup file does not exist.	Check if the .ini file exists.
187	The setup is not saved successfully	The setup file cannot be saved because there is not enough space on the disk.	Check if there is enough space on the disk to save the setup file.

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Standard Resolutions

The following table lists the standard DVI resolutions:

Table 32: Standard resolutions

Resolution	Refresh Rate	Clock/Pixel Frequency
640 x 350	85 Hz	31.500MHz
640 x 400	85 Hz	31.500 MHz
720 x 400	85 Hz	35.500 MHz
640 x 480 (VGA)	60 Hz	25.175 MHz
	72 Hz	31.500 MHz
	75 Hz	31.500 MHz
	85 Hz	36.000 MHz
800 x 600 (SVGA)	56 Hz	36.000 MHz
	60 Hz	40.000 MHz
	72 Hz	50.000 MHz
	75 Hz	49.500 MHz
	85 Hz	56.250 MHz
1024 x 768 (XGA)	43 Hz	44.900 MHz
	60 Hz	65.000 MHz
	70 Hz	75.000 MHz
	75 Hz	78.750 MHz
	85 Hz	94.500 MHz
1152 x 864	75 Hz	108.000 MHz
1280 x 960	60 Hz	108.000 MHz
	85 Hz	148.500 MHz
1280 x 1024 (SXGA)	60 Hz	108.000 MHz
	75 Hz	135.000 MHz
	85 Hz	157.500 MHz
1600 x 1200 (UXGA)	60 Hz	162.000 MHz
	65 Hz	175.500 MHz
	70 Hz	189.000 MHz
	75 Hz	202.500 MHz
	85 Hz	229.500 MHz
1792 x 1344	60 Hz	204.750 MHz
	75 Hz	261.000 MHz
1856 x 1392	60 Hz	218.250 MHz
	75 Hz	288.000 MHz
1920 x 1440	60 Hz	234.000 MHz
	75 Hz	297.000 MHz
2048x1536(QXGA)	60 Hz	198.7 MHz

Resolutions on Supported Oscilloscopes

TDS/CSA7404/7404B, TDS7704B and TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope

The following table lists the DVI resolutions on TDS/CSA7404/7404B, TDS7704B, TDS6604, TDS6404, TDS6604B, TDS6804B, DPO7354, and DPO/DSA70000 series oscilloscope:

Table 33: Resolutions

Resolutions
640x350
640x400
720x400
640x480(VGA)
800x600(SVGA)
1024x768(XGA)
1152x864
1280x960
1280x1024(SXGA)
1600x1200(UXGA)
1792x1344
1856x1392
2048x1536(QXGA)

TDS7254/TDS7254B Oscilloscopes

The following table lists the DVI resolutions on TDS7254 and TDS7254B oscilloscopes:

Table 34: Resolutions

Resolutions
640x350
640x400
720x400
1600x1200(UXGA)
640x480(VGA)
800x600(SVGA)
1024x768(XGA)

Generate Patterns (in infinite loops) to Conduct a Test

With the host computer:

1. Copy the patterns from the oscilloscope directory
    C:\TekApplications\TDSDVI\Patterns to the host computer.

2. Open the specific resolution pattern with any image editor and maximize the
    pattern to full screen. For example, to transmit the XGA resolution PRP
    pattern infinitely, open the XGA resolution PRP pattern bit map in
    Microsoft Paint application. Select View> View Bitmap to maximize the
    pattern.

3. The device will transmit the selected pattern continually until you exit the
    image editor.

With the ESB board:

Please refer the ESB specifications and user guide to generate infinite loop
patterns.

Set Cursors for Eye and Rise and Fall Time Testing

The application automatically enables the oscilloscope's cursors relevant to each
measurement. By default, the cursor option is not selected.

*Note: The Rise and Fall Time measurement uses cursors to calculate Vswing. In
the Eye Diagram measurement, you can use cursors to calculate Vswing and
select the worst eye opening.*

If you select File> Preferences> Use cursors for Eye, RT & FT testing:

- To calculate Vswing, the application enables the horizontal cursors in the
  oscilloscope and displays the following message box. Place the cursors on
  the Vswing high and Vswing low of the eye diagram for the Rise and Fall
  Time and Eye Diagram measurement. Select OK to calculate Vswing.
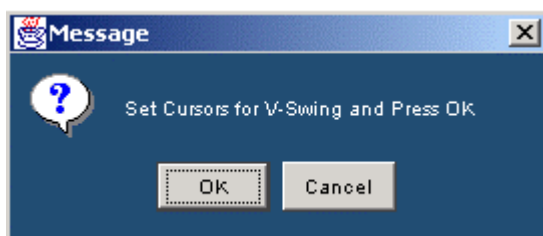
Figure 232: Cursors for Vswing message box

- To select the worst eye opening, the application enables the vertical cursors. Place the cursors at the crossover points of the worst eye opening for the Eye Diagram measurement. Select OK to set the worst eye. The application places the mask on the worst eye opening.
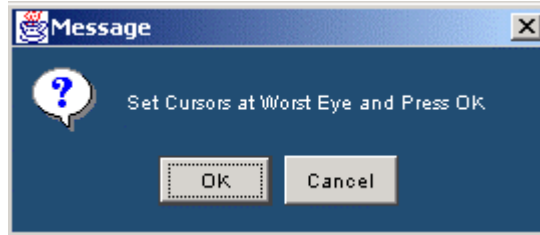
Figure 233: Cursors at worst eye message box

Cable Setup at TP2
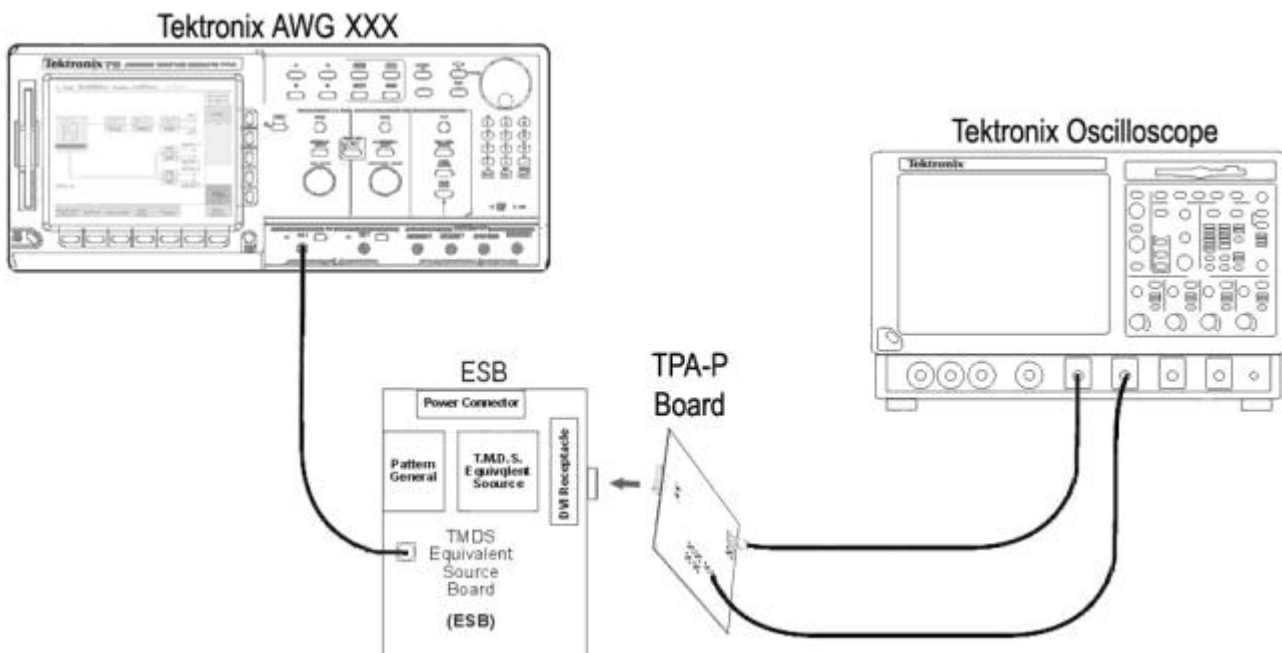
Figure 234: Cable setup at TP2

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Increase or Decrease the Vswing

If signal violates the mask at TP2, the test fails and you cannot proceed further for TP3 testing, use the following guidelines given below to pass the signal:

- If the ESB generated TMDS signal violates the upper and/or the lower mask segments, decrease the Vswing value in the ESB. Refer the ESB specifications and user guide for information on how to adjust the Vswing.

- If the ESB generated TMDS signal violates the middle mask, increase the Vswing value in the ESB.

- If the ESB generated TMDS signal violates the horizontal opening in the eye mask, adjust the clock jitter.

Cable Setup at TP3
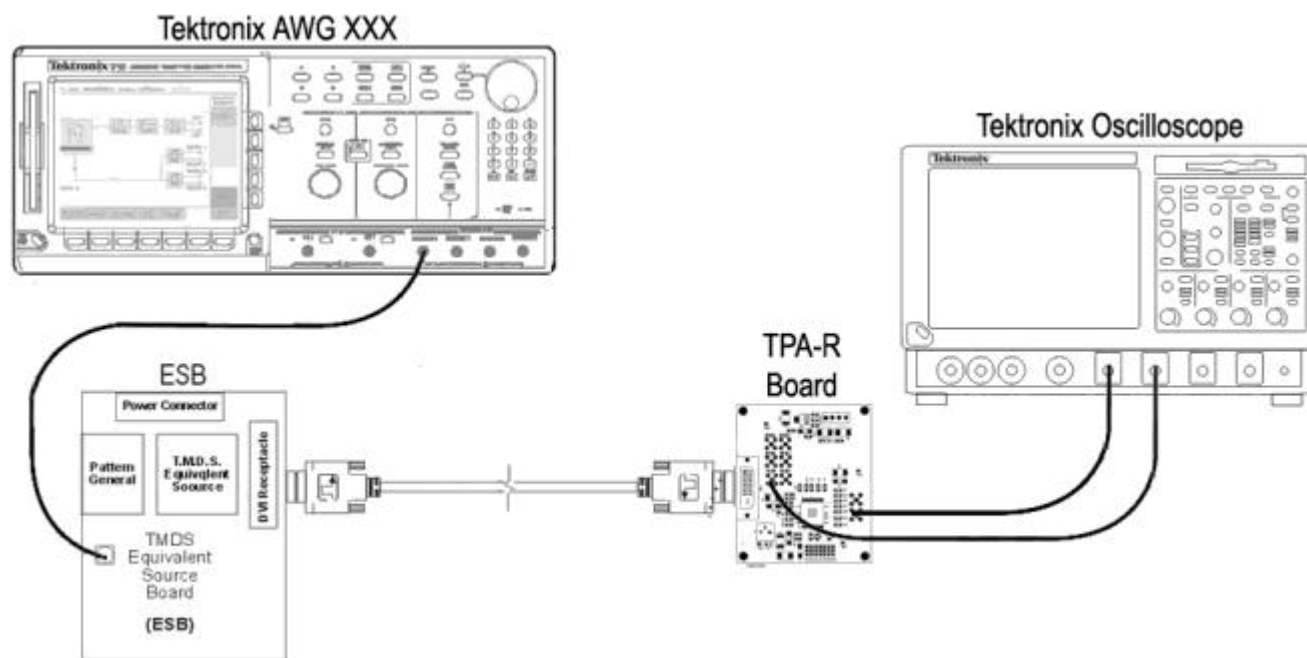
Figure 235: Cable setup at TP3

TPA-P Test Points
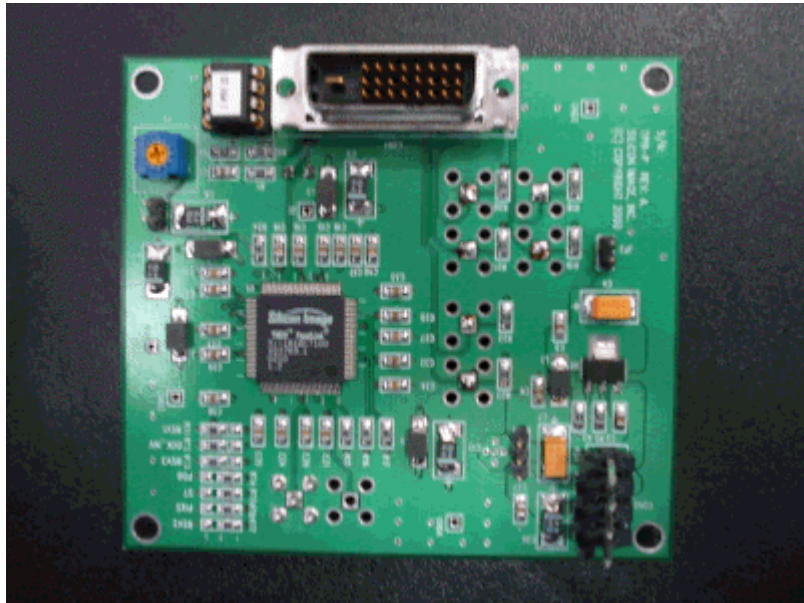
Figure 236: TPA-P fixture
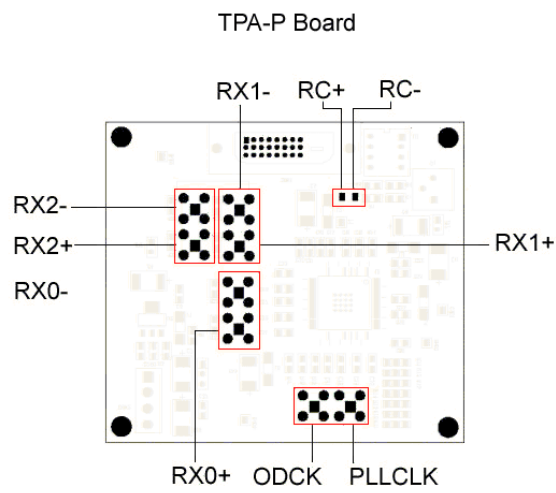
Figure 237: TPA-P test points

Figure 238 shows the component side view of the TPA-P fixture and the numbered list describes the corresponding components and the test points.

- DVI Input connector

- Power connector

- JP1 1-2 for 5V, 2-3 for 3.3 V

- PLL Clock output connector

- P1, adjustable output swing

- TMDS differential pair test points

- JP2, shorted if using DVI 5V
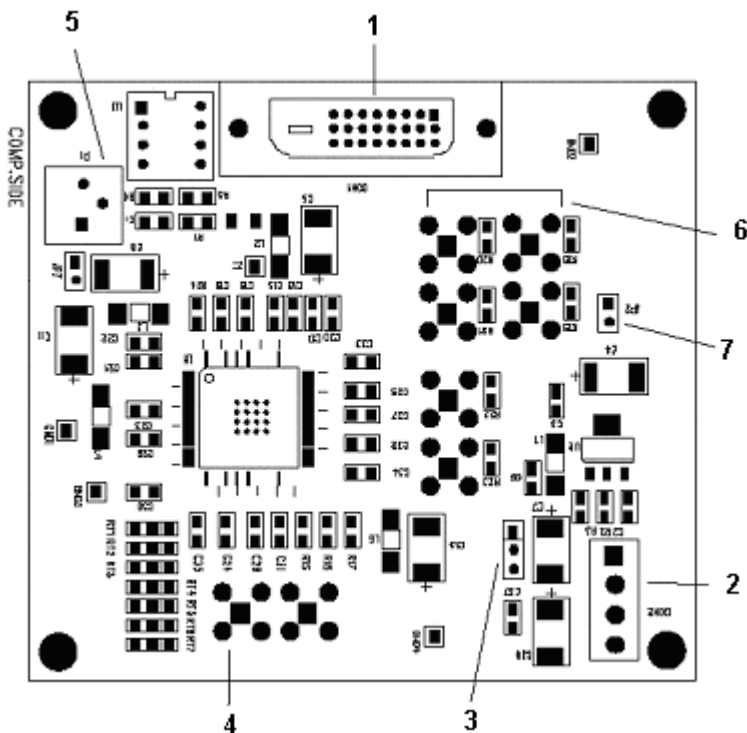
Figure 238: TPA-P fixture-component view

TPA-R Test Points
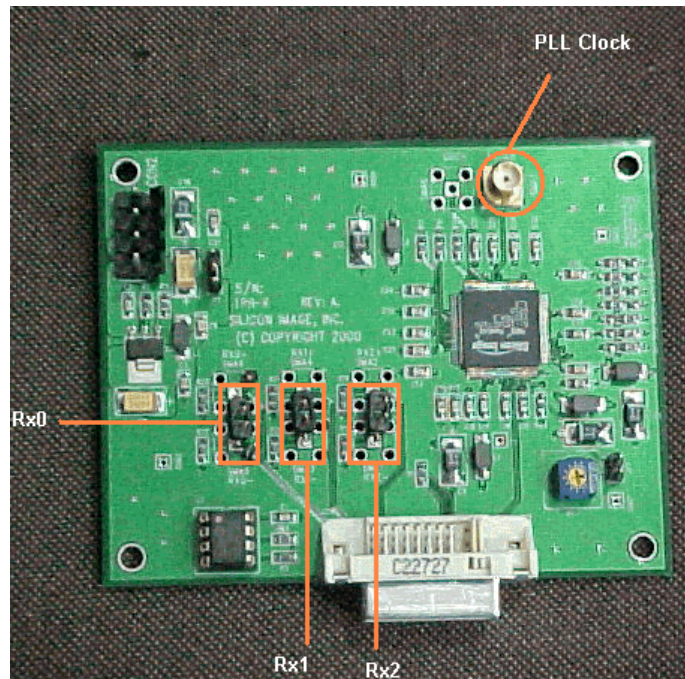
Figure 239: TPA-R test points

Remote GPIB

About the Remote GPIB program

The Remote GPIB feature provides a framework to remotely automate the TDSDVI application to perform DVI compliance testing. The Remote GPIB support can be used to select, configure and run all TDSDVI tests and supports the test report generation. An example of a Remote GPIB program that can execute the TDSDVI measurement is included with the application. The oscilloscope hard disk and optional applications disc both contain the file, TDSDVI_rgpib.c. On the hard drive, the file resides in the C:\Program Files\TekApplications\TDSDVI directory.

This example shows how a Remote GPIB program executes the application to do the following tasks:

1. Start up the application

2. Select a measurement and configure the parameters

3. Run the measurement

4. Generate a report

5. Exit the application

Remote GPIB Reference Materials

To use the Remote GPIB commands with your oscilloscope, refer to the following materials:

- The TDSDVI_rgpib.c file on the oscilloscope hard drive (located in the C:\Program Files\TekApplications\TDSDVI directory) and optional application disc for an example of a Remote GPIB command that can execute the application.

- The Remote GPIB Program Example section for guidelines to use while designing the Remote GPIB program.

- The programmer information is in the online help of your oscilloscope.

- The Guidelines to Remote GPIB Programming section in the Online Help.

Introduction to Remote GPIB commands

With the knowledge of Remote GPIB command syntax, you can design a Remote GPIB program to do the following tasks:

- Start the TDSDVI application

- Recognize an active application with Remote GPIB protocol

- Program and read the application setup parameters

- Sequence measurements

- Generate Report

Guidelines to Remote GPIB Programming

The TDSDVI application includes an example of a Remote GPIB program for your reference as a program example. Your Remote GPIB program should comply with the following guidelines:

- Launch the application before sending any remote GPIB commands to the application (See the program example).

- Before running the GPIB commands, you can use the *IDN? variable to identify the oscilloscope and ensure that the oscilloscope is responding.

- GPIB commands do not work through LAN.

- When the application processes remote GPIB commands, no messages are displayed.

- For save, recall, and report generation, the successive file names should be different.

- The application does not respond to commands that were sent before the application was activated.

- To generate reports, first check whether the sequencer state is "Ready".

- The status variable should be checked to ensure that an error has not occurred because of a measurement command problem.

- Remote GPIB event queue needs to be monitored. You can use the call monitor to monitor the RGPIB event queue. Make sure the event queue is clear before sending the next Remote GPIB command to prevent event queue overflow.

- Commands are case and space sensitive. Your program will not operate correctly if you do not follow the capitalization and spacing precisely.

- For information on error queries in Remote GPIB, refer to the Error Codes section in the Online Help.

- Ensure that the return value of the "commandStatus" is true before sending the next command and that there is a delay of 1.0 sec between the commands.

Note: Use TDSDVI in either the manual or Remote GPIB mode but not both the modes.

Launching the Application using Remote GPIB

You must manually set up the oscilloscope to launch the application.

The application uses the Remote GPIB VARIABLE: VALUE command with arguments to execute some features. The set of Remote GPIB commands includes the variable names and variable values necessary to select, configure, and run the measurements and to generate reports in the Remote GPIB program.

You can select and configure the measurements that you want to use with your Remote GPIB program.

Note:When the application is launched, the default directory for the report files is set to C:\TekApplications\TDSDVI\Reports.

Note:In Remote GPIB mode, the setup files are saved and recalled only from the directory C:\TekApplications\TDSDVI\Setup. The save and recall name should be appended with .ini extension.

GPIB Syntax

VARIABLE:VALUE COMMAND accepts string arguments for a control or data variable and a value to which to set the argument.

Syntax

VARIABLE:VALUE "<variable name>","<variable value>"

The arguments <variable name> and <variable value> are required in the order indicated.

VARIABLE: VALUE? "<Variable name>" for query

> *Note:Commands are case and space sensitive. Your program will not operate correctly if you do not follow the capitalization and spacing precisely.*

TDSDVI Application Command Arguments and Queries

Application Commands

To start the application, send the Remote GPIB command **application:activate "DVI Compliance Test Solution"** to the oscilloscope.

Table 35: Application

Variable Name	Valid Values	Set Form	Query Form
application	exit	Setting the value will terminate a running application.	Returns the name of the currently running application.

Sequencing Commands

Table 36: Sequencer

Variable Name	Valid Values	Set Form	Query Form
sequencer State	Sequencing {Ready, Sequencing}	This command is equivalent to running the measurement. Queries the state of the measurement - running or stopped.	Returns the sequencer state.

Save/Recall Commands

Table 37: Save/Recall

Variable Name	Valid Values	Set Form	Query Form
setup	{Default, Recall, Save}	Sets the Save/Recall/Default action.	The default value for this variable is an empty string. This variable is set to the selected value momentarily and returns to its default value after the task is complete.
recallName	Any string 1-50 characters from A-Z, 0-9	Sets the setup recall file name. The default path is C:\TekApplications\TDSDVI\Setup. You need to type in the .ini extension after entering the file name.	Returns the setup recall file name.
saveName	Any string 1-50 characters from A-Z, 0-9	Sets the setup save file name. The default path is C:\TekApplications\TDSDVI\Setup. You need to type in the .ini extension after entering the file name.	Returns the setup save file name.

Measurement Commands

Table 38: Measurement

Variable Name	Valid Values	Set Form	Query Form
measChanged	{transmitterEyeDiagram, transmitterRiseandFallTime, transmitterPkPkJitter, transmitterInterPairSkew, transmitterIntraPairSkew, cableHighAmplitudeEyeDiagram, cableLowAmplitudeEyeDiagram, cablePkPkJitter, cableInterPairSkew, cableIntraPairSkew, receiverHighAmplitudeEyeDiagram, receiverLowAmplitudeEyeDiagram, tbitMeasurement}	Sets the DVI Analysis measurement name.	Returns the set DVI Analysis measurement name.

Transmitter Eye-Diagram Configuration Commands

Table 39: Transmitter Eye-Diagram configuration

Variable Name	Valid Values	Set Form	Query Form
dataChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source data channel.	Returns the set source data channel.
triggerChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source trigger channel.	Returns the set source trigger channel.
dataPairChange	{RX0, RX1, RX2}	Sets the transmitter pair value.	Returns the set transmitter pair value.
numberOfEye	Any integer value between 2 to 10. Use the following example while entering the values. Example: 2, 4, 7, 10.	Sets the number of eyes required.	Returns the number of eyes.
vswingModeChange	{pattern, user}	Sets the Vswing mode required.	Returns the Vswing mode selected.
vswingPatternChange	{pseudoRandomPattern, halfClockPattern}	Sets the Vswing pattern required to calculate Vswing.	Returns the Vswing pattern selected.
vswingUserValue	Any double value between 200 mV to 2.0 V. Use the following example while entering the values. Example: 200e-3, 450e-3, 1.2.	Sets the user defined voltage value to calculate Vswing.	Returns the set user defined voltage value to calculate Vswing.

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Transmitter Rise-Time and Fall-Time Configurations Commands

Table 40: Transmitter Rise Time and Fall Time configuration

Variable Name	Valid Values	Set Form	Query Form
dataChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source data channel.	Returns the set source data channel.
triggerChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source trigger channel.	Returns the set source trigger channel.
dataPairChange	{RX0, RX1, RX2}	Sets the transmitter data pair value.	Returns the set transmitter pair value.
hysteresisChange	Any double value between 2 to 10 percent. Use the following example while entering the values. Example: 2.0, 4.5, 10.0.	Sets the rise time and fall time hysteresis value.	Returns the set rise time and fall time hysteresis value.
vswingModeChange	{pattern, user}	Sets the Vswing mode required.	Returns the Vswing mode selected.
vswingPatternChange	{pseudoRandomPattern, halfClockPattern}	Sets the Vswing pattern required to calculate Vswing.	Returns the Vswing pattern selected.
vswingUserValue	Any double value between 200 mV to 2.0 V. Use the following example while entering the values. Example: 200e-3, 450e-3, 1.2.	Sets the user defined voltage value to calculate Vswing.	Returns the set user defined voltage value to calculate Vswing.

Peak to Peak Jitter Configuration Commands

Table 41: Peak to Peak Jitter configuration (Transmitter and Cable)

Variable Name	Valid Values	Set Form	Query Form
clockChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source clock channel.	Returns the set source clock channel.
triggerChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source trigger channel.	Returns the set source trigger channel.

Intra-Pair Skew Configuration (Transmitter and Cable) Commands

Table 42: Intra-Pair Skew configuration (Transmitter and Cable)

Variable Name	Valid Values	Set Form	Query Form
source1Change	{Ch1, Ch2, Ch3, Ch4}	Sets the skew Source1 channel.	Returns the set skew Source1 channel.
source2Change	{Ch1, Ch2, Ch3, Ch4}	Sets the skew Source2 channel.	Returns the set skew Source2 channel.
skewHysteresisChange	Any double value between 2 to 10 percent. Use the following example while entering the values. Example: 2.0, 4.5, 10.0.	Sets the skew hysteresis value.	Returns the set skew hysteresis value.
dataPairChange	{RX0, RX1, RX2}	Sets the data pair value.	Returns the set data pair value.

Inter-Pair Skew Configuration (Transmitter and Cable) Commands

Table 43: Inter-Pair Skew configuration (Transmitter and Cable)

Variable Name	Valid Values	Set Form	Query Form
source1Change	{Ch1, Ch2, Ch3, Ch4}	Sets the skew Source1 channel.	Returns the set skew Source1 channel.
source2Change	{Ch1, Ch2, Ch3, Ch4}	Sets the skew Source2 channel.	Returns the set skew Source2 channel.
skewHysteresisChange	Any double value between 2 to 10 percent. Use the following example while entering the values. Example: 2.0, 4.5, 10.0.	Sets the skew hysteresis value.	Returns the set skew hysteresis value.
dataPairChange dataPair2Change	{RX0, RX1, RX2} {RX0, RX1, RX2}	Sets the data pair value. Sets the data Pair2 value.	Returns the set data pair value. Returns the set data Pair2 value.
dataPair1PositiveChange	true false	Selects the data Pair1+ box. Deselects the data Pair1+ box.	Returns true if data Pair1+ mode is selected or false if not selected.
dataPair2PositiveChange	true false	Selects the data Pair2+ box. Deselects the data Pair2+ box.	Returns true if data Pair2+ mode is selected or false if not selected.
selectDifferentialProbe	true false	Selects the Differential Probe box. Deselects the Differential Probe box.	Returns true if Differential Probe mode is selected or false if not selected.

High-Amplitude Eye Diagram (Cable and Receiver) Commands

Table 44: High-Amplitude Eye Diagram (Cable and Receiver)

Variable Name	Valid Values	Set Form	Query Form
dataChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source data channel.	Returns the set source data channel.
triggerChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source trigger channel.	Returns the set source trigger channel.
dataPairChange	{RX0, RX1, RX2}	Sets the cable data pair value.	Returns the set cable data pair value.
numberOfEye	Any integer value between 2 to 10	Sets the number of eyes required.	Returns the number of eyes.

Low-Amplitude Eye Diagram (Cable and Receiver) Commands

Table 45: Low-Amplitude Eye Diagram (Cable and Receiver)

Variable Name	Valid Values	Set Form	Query Form
dataChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source data channel.	Returns the set source data channel.
triggerChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the source trigger channel.	Returns the set source trigger channel.
dataPairChange	{RX0, RX1, RX2}	Sets the cable data pair value.	Returns the set cable data pair value.
numberOfEye	Any integer value between 2 to 10	Sets the number of eyes required.	Returns the number of eyes.

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Defining T-Bit Configurations Commands

Table 46: Defining T-Bit configuration

Variable Name	Valid Values	Set Form	Query Form
tbitModeChange	{user, calculated}	Selects the Tbit mode required to define Tbit.	Returns the set Tbit mode required to define Tbit.
tbitClkValueChange	Any double value between 200 ps to 20 ns. Use the following example while entering the values. Example: 300.0e-12, 20.0e-9.	Sets the user defined/calculated Tbit value.	Returns the set user defined/calculated Tbit value.
diffClockChannelChange	{Ch1, Ch2, Ch3, Ch4}	Sets the differential clock channel used to define Tbit.	Returns the set differential clock channel to define Tbit.

General Preferences Selection Commands

Table 47: General Preferences Selection

Variable Name	Valid Values	Set Form	Query Form
reportShowState	true false	Opens the report file after generation. Does not open the report file after generation.	Returns true if the Show report after generation box is selected or false if not selected.
zoomedEyeInReport	true false	Uses the zoomed eye mask in the report generated. Does not use the zoomed eye mask in the report generated.	Returns true if the Use zoomed eye mask in report box is selected or false if not selected.
minAcquisition	Any double value between 500k to 5M samples. Use the following example while entering the values. Example: 500e3, 5.0e6.	Sets the number of acquisitions required.	Returns the number of acquisitions set.

Advanced Preferences Selection Commands

Table 48: Advanced Preferences Selection

Variable Name	Valid Values	Set Form	Query Form
testPointChange	{Ch1, Ch2, Ch3, Ch4}	Selects the different test points.	Returns the selected test point.

Report Setup Commands

Table 49: Report Setup

Variable Name	Valid Values	Set Form	Query Form
deviceId	Any string 1-60 characters from A-Z, 0-9 without the use of special characters except the underscore	Sets the device ID of the device for report generation.	Returns the set device ID.
deviceDescription	Any string from A-Z, 0-9 without the use of special characters except the underscore	Sets the device description for the device during report generation.	Returns the set device description.
devicePrefix	Any string 1-60 characters from A-Z, 0-9 without the use of special characters except the underscore	Sets the device prefix for automatic device IDs and report names.	Returns the set device prefix.
deviceAutomaticIdandReport	true false	Automatically generates the device IDs and report names. Does not generate the device IDs and report names automatically.	Returns true if the Automatic ID's and Report Names box is selected or false if not selected.
reportGenerationMode	{manual, automatic}	Selects the automatic or manual report generation mode.	Returns the mode set for report generation.
selectForReport	true false	Shows the selected resolution and refresh rate in the report to be generated. Does not show the selected resolution and refresh rate in the report to be generated.	Returns true if the Select for Report box is selected or false if not selected.
resolutionChange	{VGA, SVGA, XGA, SXGA, UXGA, HDTV, QXGA, 640*350, 640*400, 720*400, 1152*864, 1280*960, 1792*1344, 1856*1392, 920*1440}	Sets the resolution in the report to be generated.	Returns the set resolution.
refreshRateChange	{43, 56, 60, 65, 70,72, 75, 85}	Sets the refresh rate for a particular resolution in the report to be generated.	Returns the set refresh rate.
reportDirNameChange	Absolute path name of the existing directory	Changes the path name of the existing directory.	Returns path name of the existing directory.
reportFileNameChange	Any string 1-60 characters from A-Z, 0-9	Changes the file name of the report. Supports only HTM and HTML format types for the report file name.	Returns the file name selected for the reports.
reportGenerate	generate	Generates the report only if report generation mode is set to manual.	The default value for this variable is an empty string. This variable is set to the selected value momentarily and returns to its default value after the task is complete.

Status/Error Commands

Table 50: Error

Variable Name	Valid Values	Set Form	Query Form
commandStatus	true false	Not applicable	Returns true if the command has completed execution. Returns false if the command is under execution or not executed. For more information, refer the note on commandStatus.
Status	Valid error code or error string	Not applicable	Returns an error code or error string

Note: After every set command, you have to wait until the "commandStatus" variable returns a true value. Keep polling for <variable:value? "commandStatus"> and then issue the next set or get command.
For the script to function correctly, ensure that the script follows this order:

The script recalls the default setup.
variable:value "setup","Default"

variable:value? "commandStatus"
"false"

…..keep polling until the return is true
"true"

When true, send the next command.

TDSDVI-DVI Compliance Test Solution

Program Example

/* TDSDVI

* This is a reference program to illustrate how to communicate to TDSDVI

* using Remote GPIB commands.

A typical application does following steps

1.   Start up the application

2.   Select a measurement and configure the parameters

3.   Run the measurement

4.   Generate a report

5.   Exit the application

For the current program, we will recall a setup file named as sqcsetup.

You can save setup files according to your own needs using the GUI based interface of the application.

```
*/
#include "stdafx.h"
#include <windows.h>
#include <stdio.h>
#include <stdlib.h>
#include "decl-32.h"
/* Forward Declarations */
int start_application(int scope);
int exit_application(int scope);
int do_single_test (int scope);
int recall_setup( int scope, char *filename);
```

```
/* parameters needed to access the device driver
handler */

#define BDINDEX 0     // Board Index

#define PRIMARY_ADDR_OF_DMM 1 // Primary address of
device

#define NO_SECONDARY_ADDR 0  // Secondary address of
device

#define TIMEOUT T10s   // Timeout value = 10 seconds

#define EOTMODE 1     // Enable the END message

#define EOSMODE 0     // Disable the EOS mode

char    ErrorMnemonic[21][5] = {"EDVR", "ECIC",
"ENOL", "EADR", "EARG", "ESAC", "EABO", "ENEB",
"EDMA", "","EOIP", "ECAP", "EFSO", "", "EBUS", "ESTB",
"ESRQ", "", "", "", "ETAB"};

/*

* After each GPIB call, the application checks whether
the call succeeded.

* If an NI-488.2 call fails, the GPIB driver sets the
corresponding bit in the global status variable.

* If the call failed, this procedure prints an error
message, takes the device offline and exits.

*/
```

```
void GPIBCleanup(int ud, char* ErrorMsg)

{
        printf("Error : %s\nibsta = 0x%x iberr = %d
        (%s)\n", ErrorMsg, ibsta, iberr,
        ErrorMnemonic[iberr]);

        if (ud != -1)

        {
                printf("Cleanup: Taking device offline\n");

                ibonl(ud, 0);

        }

        exit(0);

}

int start_application( int scope )

{
        char write_buffer[100];

        char read_buffer[100];

        char app_name[] = "\"TDSDVI\"\n";

        int status, timer;


        /* Start the TDSDVI application */

        sprintf(write_buffer, "%s", "Application:activate
        \"DVI Compliance Test Solution\"");

        status = ibwrt(scope, write_buffer,
        strlen(write_buffer));
```

```
if (ibsta & ERR)

{

    GPIBCleanup(scope, "Unable to start the
    application");

    return 0;

}

timer = 1;

while (1)

{

    /* Check whether application has started */

    sprintf(write_buffer, "%s",
    "Variable:value? \"application\"");

    status = ibwrt(scope, write_buffer,
    strlen(write_buffer));

    status = ibrd(scope, read_buffer,
    sizeof(read_buffer));

    read_buffer[ibcnt] = '\0';

    if (strcmp(app_name, read_buffer) == 0)

    {

        return 1;

    }

    timer++;

    if (timer > 60)

    {

        return 0;

    }

    Sleep(1000);

}

return 1;
```

```
        }


        /* Exit the application */

        int exit_application(int scope)

        {

            char write_buffer[100];

            printf("Exit Application ...\n");

            sprintf(write_buffer, "%s", "Variable:value
            \"application\",\"exit\"");

            ibwrt(scope, write_buffer, strlen(write_buffer));

            return 1;

        }


        /* Run the selected measurement */

        int run_test (int scope)

        {

            char write_buffer[100];

            char read_buffer[100];

            int timer;

            sprintf(write_buffer, "%s", "Variable:value
            \"sequencerState\",\"Sequencing\"");

            ibwrt(scope, write_buffer, strlen(write_buffer));

            printf("Executing Test...\n");

            Sleep(100);
```

```
/* Wait for application to come to Ready State */

timer = 1;

while (1)

{

    timer++;

    if (timer > 90)

    {

        printf("******Test Time Out
        ******\n");

        return 0;

    }

    sprintf(write_buffer, "%s",
    "Variable:value? \"sequencerState\"");

    ibwrt(scope, write_buffer,
    strlen(write_buffer));

    ibrd(scope, read_buffer, 99);

    if (ibsta & ERR)

    {

        GPIBCleanup(scope, "Unable to write to
        device");

    }

    read_buffer[ibcnt] = '\0';

    if (strcmp(read_buffer,"\"Ready\"\n") == 0)

    {

        printf("Test Complete ...\n");

        return 1;

    }

    Sleep(1000);

}

}
```

```
void report_generate(int scope,char* reportfilename)

{

        char write_buffer[100];

        char read_buffer[100];

        int status;


        /* Set report file name */

        sprintf(write_buffer, "Variable:value
        \"reportFileNameChange\",\"%s\"",reportfilename);

        printf("%s",write_buffer);

        status = ibwrt(scope, write_buffer,
        strlen(write_buffer));

        if (ibsta & ERR)

        {

                GPIBCleanup(scope, "Unable to communicate
                with Scope");

                return;

        }

        Sleep(1000);


        /*Generate the report*/

        sprintf(write_buffer, "variable:value
        \"reportGenerate\",\"generate\"");

        printf("%s",write_buffer);

        ibwrt(scope, write_buffer, strlen(write_buffer));
```

```
                if (ibsta & ERR)

                {

                        GPIBCleanup(scope, "Unable to start the
                        application");

                        return;

                }

                Sleep(2000);

        }


        void select_measurement(int scope)

        {

                char write_buffer[100];

                char read_buffer[100];

                int status;


                /*Select Measurement*/

                sprintf(write_buffer, "Variable:value
                \"measChanged\",\"Transmitter Eye Diagram\"");

                printf("%s\n",write_buffer);

                status = ibwrt(scope, write_buffer,
                strlen(write_buffer));

                if (ibsta & ERR)

                {

                        GPIBCleanup(scope, "Unable to communicate
                        with Scope");

                        return;

                }

                Sleep(1000);
```

```
/*Configure Data Channel*/

sprintf(write_buffer, "Variable:value
\"dataChannelChange\",\"Ch4\"");

printf("%s\n",write_buffer);

status = ibwrt(scope, write_buffer,
strlen(write_buffer));

if (ibsta & ERR)

{

    GPIBCleanup(scope, "Unable to communicate
    with Scope");

    return;

}

Sleep(1000);


/*Configure Trigger Channel*/

sprintf(write_buffer, "Variable:value
\"triggerChannelChange\",\"Ch4\"");

printf("%s\n",write_buffer);

status = ibwrt(scope, write_buffer,
strlen(write_buffer));

if (ibsta & ERR)

{

    GPIBCleanup(scope, "Unable to communicate
    with Scope");

    return;

}

Sleep(1000);
```

```
/*Configure Data Pair*/

sprintf(write_buffer, "Variable:value
\"dataPairChange\",\"RX2\"");

printf("%s\n",write_buffer);

status = ibwrt(scope, write_buffer,
strlen(write_buffer));

if (ibsta & ERR)

{

     GPIBCleanup(scope, "Unable to communicate
     with Scope");

     return;

}

Sleep(1000);


/*Setting the number of eye*/

sprintf(write_buffer, "Variable:value
\"numberOfEye\",\"10\"");

printf("%s\n",write_buffer);

status = ibwrt(scope, write_buffer,
strlen(write_buffer));

if (ibsta & ERR)

{

     GPIBCleanup(scope, "Unable to communicate
     with Scope");

     return;

}

Sleep(1000);

}
```

```
void main()

{

        int Dev;

        char write_buffer[100];

        int status;

        Dev = ibdev (BDINDEX, PRIMARY_ADDR_OF_DMM,
        NO_SECONDARY_ADDR, TIMEOUT, EOTMODE, EOSMODE);

        if (ibsta & ERR)

        {

             GPIBCleanup(Dev, "Unable to open device");

        }

        else

        {

             printf("My device id - %i", Dev);

        }

        Sleep(1000);

        sprintf(write_buffer, "%s", "header off");

        status = ibwrt(Dev, write_buffer,
        strlen(write_buffer));

        if (start_application(Dev))

        {

             printf("\nApplication started....\n");

        }

        Sleep(10000);

        select_measurement(Dev);

        Sleep(2000);

        run_test(Dev);

        Sleep(4000);

        report_generate(Dev,"fs_sqc");
```

```
                    Sleep(2000);

                    exit_application(Dev);


                    /* leave the device back elegantly */

                    printf("Cleanup: Taking device offline\n");

                    ibonl(Dev, 0);

          }
```

Glossary

DDWG

Digital Display Working Group

DVI

Digital Visual Interface

Hopen

The maximum horizontal opening between the closest hit points

Overshoot (Top and Bottom)

The voltage difference between the minimum high level voltage or the maximum low-level voltage after the transition and the normalized voltage level (Vswing Low or Vswing High) in the eye mask.

Undershoot (Top and Bottom)

The voltage difference between the minimum high level voltage or the maximum low-level voltage after the transition and the normalized voltage level (Vswing Low or Vswing High) in the eye mask.

VESA

Video Electronics Standard Association

Vopen

The maximum vertical opening between the closest hit points.

Worst Tbit

The minimum distance between two consecutive crossover points.

TDSDVI-DVI Compliance Test Solution