Tektronix

TDSDVD
Optical Storage
Analysis Application

Copyright and Version

Tektronix, Inc. P.O. Box 500, Beaverton, OR 97077

TDSDVD Optical Storage Analysis Online Help, OLH0200, Version 01.00

General Safety


WARNING: To avoid injury to eyes, wear eye protection if the possibility of exposure to high-intensity rays or laser radiation exists.


WARNING: To avoid electric shock, remove power from the system under test (SUT) before attaching a probe to it. Do not touch exposed conductors except with the properly rated probe tips. Refer to the probe manual for proper use.

Table of Contents

Introduction

Welcome to the TDSDVD Optical Storage Analysis Application

The TDSDVD Optical Storage Analysis & Measurement Application is a Java–based application that lets you quickly and easily measure and analyze CD/DVD/MO optical storage device signals.

What do you want to do?

Read the Product Description on page 11
Learn About Online Help on page 7
Go to Installation on page 13

Using Online Help

Select Help on the right side of the application's Menu bar to open the Help window. The main (opening) Help window has three tabs:

- **Table of Contents (TOC) tab:** Displays the help information organized into book-like sections. Click a book icon to open a section; select any of the topics listed under the book.
- **Index tab:** Displays a list of alphabetical keywords. Click the topic of interest to bring up the appropriate help page.
- **Find tab:** Displays a box in which you can enter a word or words for which to search. a text-based search.

To print a topic, select the Print button from the help topics menu bar. If you are printing to a monochrome printer, see Color Printing on page 10.

Select the Back button to return to the previous help window. Sometimes you can jump from one topic to another through a hyperlink. If the Back button is "grayed out" or a jump is not available, choose the "Help Topics" button to select the originating help topic.

Browse buttons (Next >> and Previous <<) allow you to move forward and backward through topics in the order of the Table of Contents.

A Green text (with dotted underline) indicates a Popup window. Click the green text to display a brief help message. Click to return to the topic.

Green-underlined text indicates a Jump (link) to another topic. Select the green text to jump to the related topic.

To return to the Online Help Table of Contents, select Help Topics from the Help Top Menu.

Related Documentation

In addition to the Online Help, you can access other information on how to operate the application or oscilloscope through the following related documents:

- Installation Instructions; the installation instructions provide information on how to install software.
- Oscilloscope Information; the oscilloscope user manual provides information on how to operate the oscilloscope.
- Programmer Information; the online help for your oscilloscope provides details on how to use GPIB commands to control the oscilloscope.

You can also download files with programmer information and examples from the Tektronix web site. Refer to the installation manual for information on how to download the file. Refer to the Optional Applications Software on a Windows-Based Oscilloscope 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
- How to apply a new label
- Installation procedures
- How to enable an application
- How to download 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 a Windows-Based Oscilloscope CD*. The CD booklet only contains information on installing the application from the CD and on how to apply a new label.

See Also

Using Online Help on page 7

Accessing Online Documents

To view a PDF file of the TDSDVD online help from a PC with the application installed, select Start > Programs > TekApplications > TDSDVD, and select the PDF file from the list. The corresponding PDF file displays.

To run the TDSDVD online help without starting the application, select Start > Programs > TekApplications > Help. The TDSDVD help program displays.

Contacting Tektronix

Phone	1-800-833-9200*
Address	Tektronix, Inc. Department or name (if known) 14200 SW Karl Braun Drive P.O. Box 500 Beaverton, OR 97077 USA
Web site	www.tektronix.com
Sales support	1–800–833–9200, select option 1*
Service support	1–800–833–9200, select option 2*
Technical support	Email: techsupport@tektronix.com 1–800–833–9200, select option 3* 1–503–627–2400 * This Telephone number is toll free in North America. After office hours, please leave a voice mail message. Outside North America, contact a Tektronix sales office or distributor; See the Tektronix web site for a list of offices.

Product Feedback

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

Send your feedback to us by email to techsupport@tektronix.com or FAX us at (503) 627-5695. Please provide as much of the following information as possible:

- Your name, company, mailing address, phone number, and FAX number
- Oscilloscope model number and hardware options, if any
- Probes used
- Software version number
- Description of the problem such that technical support can duplicate the problem

- If possible, save the oscilloscope and application setup and information .set and .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 "TDSDVD Problem," and attach the .set, .ini, and .wfm files. Please indicate if you would like to be contacted by Tektronix regarding your suggestion or comments.

To create oscilloscope screen shots to include with your email or FAX, follow these steps:

1. In the oscilloscope menu bar, select File > Export to display the Export dialog box.
2. Enter a file name. The default file type is bitmap (.bmp).
3. Select Save. The file is saved in the C:\TekScope\Images directory. You can then attach the file to your email (depending on the capabilities of your email editor).

Color Printing

Many of the online help topics include color examples of application screens. Printing these color topics on a monochrome printer can result in loss of image information due to how different monochrome printers interpret and print color information.

If you do not have access to a color printer, you should print the topic from the application Online Help PDF (portable document format) file. You can find the file in the Documents directory on the *Optional Applications Software on a Windows-Based Oscilloscope* CD.

Getting Started

Product Description

The TDSDVD Optical Storage Analysis and Measurement Application is a Java-based application for measuring and analyzing the amplitude, modulation, and timing characteristics of CD/DVD/MO optical storage device encoded signals. The application features include:

- Supports, but is not restricted to, common CD/DVD/MO optical storage standards
- Displays measurement results as numeric values, linear plots, or histogram plots
- Supports adding external MATLAB (version 6.1 or later) and .DLL signal analysis/processing software.
- Supports Time Interval Analysis (TIA) display
- Displays a count of Track Error pulses
- Ability to install and run TDSDVD on a PC to take advantage of greater processing power; the PC must be connected to the oscilloscope on which the TDSDVD applicationis installed and enabled
- Saves measurement setups and results to a file

What do you want to do?

Check Compatibility, see page 12
Look Over Requirements and Restrictions, see page 12
Go to Installation, see page 13
Connecting to a System Under Test, see page 16
Start Running the Application, see page 19

Accessories

There are no standard accessories for this product.

Compatibility

This table lists the oscilloscopes that support the TDSDVD application.

Application	Oscilloscope Model	Oscilloscope Software Version
TDSDVD* Optical Storage Analysis and Measurements V 1.0.0* and above	TDS7054, TDS7104	V 2.1.0 and above
	TDS7154, TDS7254, TDS7404	V 2.0.0 and above
	CSA7154, CSA7404	V 2.0.0 and above
	TDS5052, TDS5054, TDS5104	V 1.0.7 and above
* For a current list of supported models, see the Software and Drivers category on www.tektronix.com.		

Requirements and Restrictions

To operate the TDSDVD application, the Sun Microsystems Java Run-Time Environment (JRE) version 1.4 (or greater) must be installed on the oscilloscope. The TDSDVD installation program automatically installs the proper version of JRE. If you accidentally delete the JRE on your oscilloscope, you will need to reinstall the TDSDVD application.

This application assumes that the following conditions are met to obtain measurements:

- The data source signal is a continuous physical data disk recording of nT pulses with no gaps or non-nT type data.
- The clock period (T) of the data source signal is constant.

The following table lists memory requirements for taking six measurements at one time on long record length data samples.

Record Length	Windows RAM	
	Required	Recommended
Up to 4 M samples	256 MB	256 MB
4 M samples and above*	256 MB	512 MB
* Taking measurements on 4 M (or greater) data records can take significant time to process. Running the application on a PC with a 1 GHz or greater processor can reduce processing time.		

Installation

To install the TDSDVD application software on an oscilloscope, refer to the *Optional Applications Software on a Windows-Based Oscilloscope Installation Manual,* which is part of the optional applications CD and documentation kit. The installation manual contains the following information:

- A list of applications, compatible oscilloscopes, and relevant software and firmware version numbers
- How to apply the option label
- Installation procedures
- How to enable an application
- How to install the application on a PC
- How to configure the PC-installed application to communicate with an oscilloscope using a GPIB or LAN connection
- How to download updates from the Tektronix web site

You can find the corresponding Portable Document Format (PDF) file for the installation manual in the Documents directory of the *Optional Applications Software on a Windows-Based Oscilloscope* CD at C\Program Files\Tek Applications\tdsdvd.

Note.
The CD booklet in the CD case only contains information on installing the application from the CD and on how to apply a new label.

PC Installation

You can install the TDSDVD application on a PC with Windows 98 or Windows 2000 operating systems. Operating the application from a PC allows the application to use the additional processing power of the PC.

Note.
Ensure that the PC has access to the oscilloscope with the enabled application, either over a local area network (LAN) or through a GPIB cable.

To set up a PC to control the application over a LAN or GPIB cable, you need to do the following tasks:

- Setting Up the Oscilloscope for Remote Access, located on page 14
- Installing the Application Software on the PC, located on page 14
- Installing TekVISA Communications Software on the PC, located on page 14
- Configuring TekVISA , located on page 15

Setting Up the Oscilloscope for Remote Access

To set up the oscilloscope for remote LAN access, follow these steps:

1. From the menu bar of the oscilloscope, select Utilities > LAN Server Status. The VXI-11 Server Control menu appears.
2. Select the Start command button to start the server. A VXI-11 Server Control icon appears on the Windows status bar.

To set up the oscilloscope for remote GPIB access, follow these steps:

1. Install a GPIB card in your PC. For information on GPIB cards, you can access the National Instrument web site.
2. Follow the instructions from the manufacturer and connect a GPIB cable between your PC and oscilloscope.
3. From the oscilloscope menu bar, select Utilities> GPIB Configuration.
4. Select the Talk/Listen button and the On option.
5. Select address 1.

Installing Application Software on the PC

To install the TDSDVD application on a PC, follow these steps:

1. Insert the *Optional Applications Software for Windows-Based Oscilloscopes* CD-ROM in the CD drive on your PC. The PC may automatically start the Installation Browser program. If the PC does not start the Installation Browser program, follow these steps:
2. Select the My Computer icon.
3. In the Exploring - My Computer window, select the D: (CD-ROM) drive and select the Launch.exe file.
4. Follow the on-screen instructions given by the InstallShield Wizard. Select the OK button if prompted to install the JRE (Java Run-time Environment).
5. Reboot the PC to complete the application software installation process.

Installing TekVISA Communications Software on the PC

This application requires TekVISA API drivers to communicate with an oscilloscope over a network. The TekVISA software is the Tektronix version of the PC VISA API drivers.

To install TekVISA software on your PC, follow these steps:

1. Insert the oscilloscope product software CD-ROM disc into your PC CD-ROM drive.
2. Navigate to the TekVISA directory on the CD-ROM.

3. In the TekVISA directory, double-click Setup.exe to open the TekVISA Install Wizard.
4. Follow the instructions in the Install Wizard. Select Complete when prompted for the installation type.

You can also download the latest TekVISA software from the Tektronix web site: To do so, follow these steps:

1. Access the www.tektronix.com web site.
2. Select Software & Drivers (in the Resources column) to display the Software and Firmware Finder page.
3. Enter tekvisa in the Find by model number or keyword field.
4. Select Go. The search returns a list of the available TekVISA software to download.
5. Select the TekVISA software appropriate for your oscilloscope. View the web page for instructions on how to download TekVISA to your oscilloscope or PC.

Configuring TekVISA

To configure TekVISA software, you must first determine the hostname of the oscilloscope with the TDSDVD application enabled. To do so, follow these steps:

1. Minimize the oscilloscope (select File> Minimize from the menu bar).
2. Right click the Network Neighborhood icon.
3. Select Properties.
4. Select the Identification tab.
5. Write down (take mental note) the oscilloscope name, also referred to as the host name.

To configure TekVISA software to communicate with an oscilloscope, follow these steps:

1. On the PC, select Start > Programs > TekVISA > TekVISA Configuration to display the TekVISA configuration menu.
2. Verify that the host name of the oscilloscope matches the name of the instrument with the GPIB8 designator in the list of TekVISA Remote Hosts.

If the names do not match, you must remove the incorrect instrument name from the list of remote hosts. To remove a name from the list and add a correct name, follow these steps:

1. In the list of Remote Hosts, select the host name with the GPIB8 VISA designator.

2. Select Remove.
3. Select OK. The PC removes the item.
4. In the Remote Hosts menu, select the Add button to display the Add Remote Host menu.
5. Enter the host name of the oscilloscope with the TDSDVD application enabled in the Host Name field.
6. Enter GPIB8 in the Visa Name field. The application communicates with the oscilloscope only on GPIB8.
7. Select OK.
8. Select the Find button in the TekVISA Resources window. The PC adds the GPIB8::1::INSTR to the list; it may take a few moments for the list to update.

   If GPIB8::1::INSTR does not appear in the list, check that your network cable is properly connected and that you have the correct host name. You might also need to work with your system administrator to resolve connectivity problems.
9. Select Quit to exit the TekVISA Configuration window.

Connecting to a System Under Test

Connecting to a System Under Test (SUT)

 **WARNING:** To avoid injury to eyes, wear eye protection if the possibility of exposure to high-intensity rays or laser radiation exists.

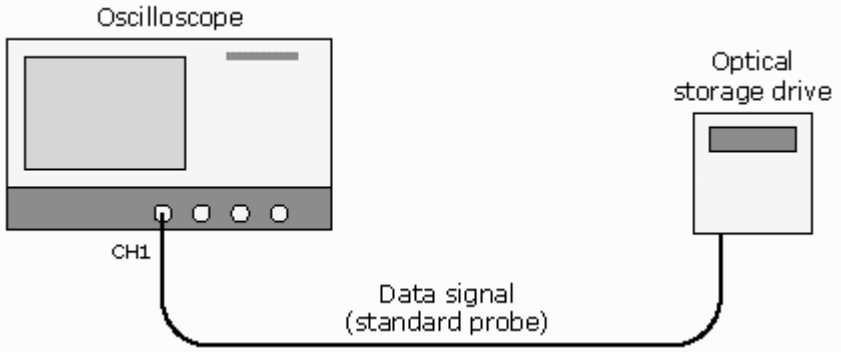
 **WARNING:** To avoid electric shock, remove power from the SUT before attaching a probe to it. Do not touch exposed conductors except with the properly rated probe tips. Refer to the probe manual for proper use.

See Also

Primary Setup: Measuring Data Using Extracted Clock on page 17
Secondary Setup: Measuring Data Using Actual Clock on page 17

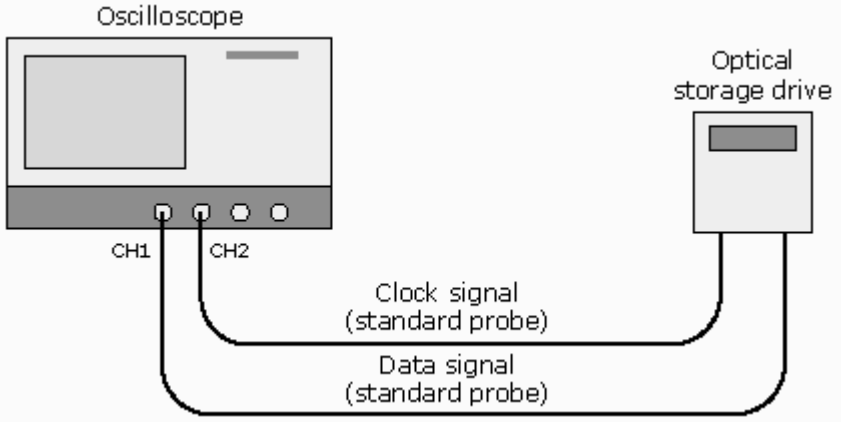
Primary Setup: Measuring Data Using an Extracted Clock

Use the primary setup to measure the optical drive data signal using an extracted or ideal (synthesized) clock signal. Connect the optical storage drive to the oscilloscope as shown below.



Secondary Setup: Measuring Data Using the Actual Clock

Use the secondary setup to measure optical data signal using the actual acquired clock signal. Connect the optical storage drive to the oscilloscope as shown below.



Operating Basics

Running the Application

To run the application on an oscilloscope, select File > Run Application > Optical Storage Analysis from the oscilloscope menu bar.

The application uses a Windows interface. When you run the application, the oscilloscope display shrinks to half size and appears in the top half of the screen, and then Windows loads the application.

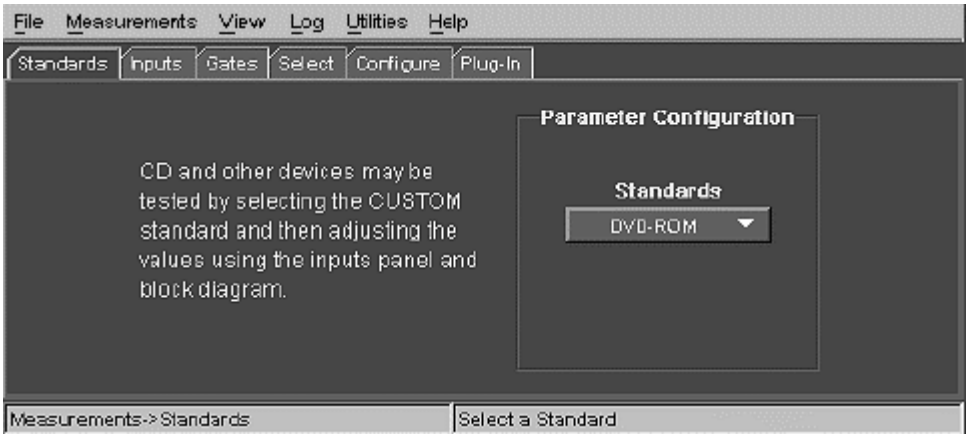
Note.
If you get the error message "Exit the currently running application before starting another, it may mean that the application is already running on the PC. You cannot run the application on the PC and an oscilloscope connected to that PC at the same time. Exit the application on the PC, and then start the application again on the oscilloscope.

To run the application on a PC, select Start > Programs > TekApplications > TDSDVD > Optical Storage Analysis.

Note.
If you get the error message "Attempting to run too many applications concurrently., it may mean that the application is already running on the oscilloscope. You cannot run the application on the PC and the oscilloscope at the same time. Exit the application on the oscilloscope, and then start the application again on the PC.

This message can also mean that you have not enabled the LAN or GPIB servers on the oscilloscope, which the TekVISA software is not correctly configured, or the PC has lost communication with the oscilloscope. Refer to Setting Up the Oscilloscope for Remote Access on page 14 for more information.

It takes a few moments to display the TDSDVD application, which is shown next.

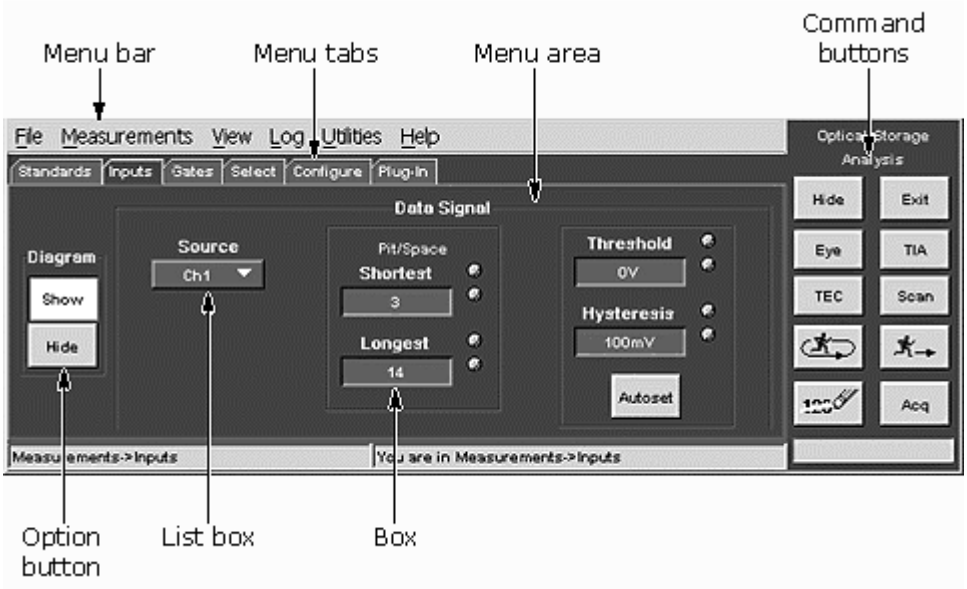


See Also

The Application Interface on page 20
Exiting the Application on page 25
Taking Measurements Guidelines on page 27

The Application Interface

The following figure shows the TDSDVD application interface, with labels for the key features, and a table listing the UI functions.



Application User Interface Controls

Item	Description
Menu bar	Located at the top of the application display and contains application menus. Selecting a menu item updates the menu area to show applicable menu tabs, parameters, or information
Area	Visual frame that encloses a set of related options
Command buttons	Buttons in the Control area that initiate an immediate action
Menu tabs	Menu functions grouped by category. The tabs displayed depend on which Menu Bar item is selected. Select a tab to display the associated functions
Option button	Button that defines a particular command or task
List box	Box that contains a list of items from which you can select one item
Box	Box in which you can enter text or numeric values, using the keypad or a Multipurpose knob
Scroll bar	Vertical or horizontal bar at the side or bottom of a display area used to move the display area for better viewing of information
Browse	Button that displays a window where you can look through a list of directories and files
Keyboard button	Icon that displays a virtual keyboard that you can use to enter data into a box

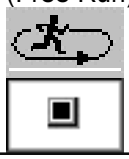
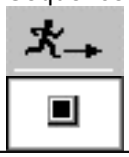
See Also

Command Buttons on page 22
Application Menu Bar on page 24

Command Buttons

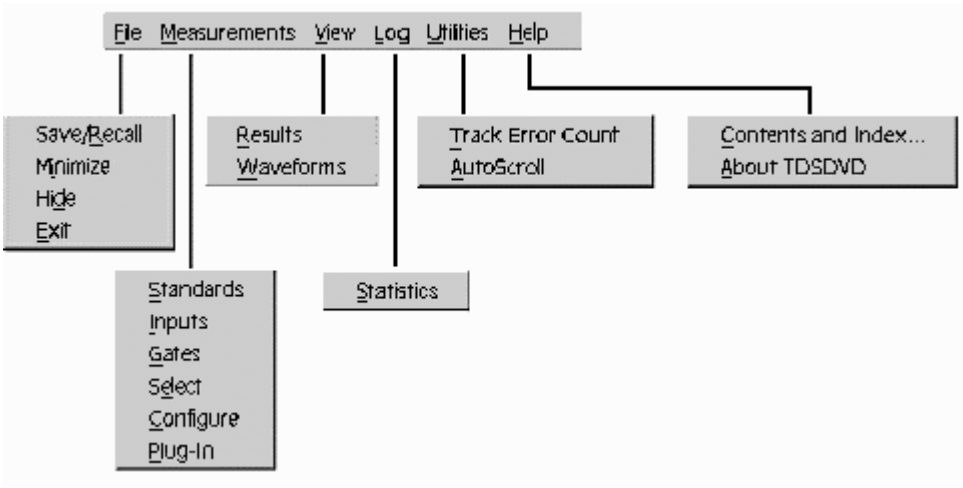
The Command buttons execute key application tasks, including exiting the application, acquiring data for measurements, and displaying key graphical information. The Command buttons are always available.

The Command Button Options

Button	Description
Hide	Returns the oscilloscope to full screen display. The application is still running but is behind the oscilloscope display
Exit	Exits (quits) the TDSDVD application. You have the option to restore the oscilloscope settings to those present prior to starting the application
Eye	Activates or deactivates the Eye display of the live HF signal. This mode requires an active signal. Deselecting returns the oscilloscope to the settings present prior to starting the Eye command
TIA	Activates or deactivates the Time Interval Analysis (TIA) display. You must take a Data Pulse Width measurement prior to selecting the TIA button
TEC	Activates the Track Error Count panel which displays the tracking error count
Scan	Activates the AutoScroll panel to zoom and scroll through the waveform data
Start/Stop (Free Run) 	Starts or stops the measurement in Free Run mode to make continuous acquisitions Stops measurement acquisition
Start Single Sequence 	Starts a single measurement acquisition Stops measurement acquisition
Reset All 	Clears all measurement results, including plot and histogram statistics
Acq/No Acq	Starts or stops any further acquistion of data. When No Acq is displayed, Start/Stop is disabled and measurements are taken on the last data acquisition

Application Menu Bar

The Menu bar contains the application functions, grouped by category. Selecting a menu item displays a drop-down menu list of functions.



You can also select menu items from the keyboard by pressing and holding the Alt key in combination with the letter underlined in the menu or submenu item. For example, to use the keyboard to display the Measurements > Configure panel, press and hold the Alt key, press the M key, and then press the C key.

See Also

The Application Menus on page 57

Minimizing and Maximizing the Application

To minimize the application, select Measurements > Minimize. This maximizes the oscilloscope and places the application behind the oscilloscope display. The application remains displayed when you minimize the oscilloscope.

To maximize the application from the Windows task bar, select TDSDVD in the Windows task bar.

To maximize the application from the oscilloscope, select the App button on the oscilloscope screen.

Accessing Oscilloscope Functions

When you access oscilloscope functions, the oscilloscope fills the display. You can access oscilloscope functions in the following ways:

- Select the Hide button in the application display to place the application window behind the oscilloscope display.

- Choose the Menu-bar or Toolbar mode on the oscilloscope and access menus.
- Press front-panel buttons.

To return to the application, select the App button on the oscilloscope screen.

Exiting the Application

To exit the application, select the Exit button. When you exit the application, you can select to keep the oscilloscope setup currently in use with the application or to restore the oscilloscope setup that was present before you started the application.

Application Directories

The application uses specific directories to save and recall setup files and uses specific file name extensions to identify the file type.

The following table lists default directory names.

Directory	Used for
C:\Program Files\ TekApplications\tdsdvd	Application executable files
C:\TekApplications\tdsdvd\data	Saved measurement results list files
C:\TekApplications\tdsdvd\log	Data log files
C:\TekApplications\tdsdvd\setup	Setup files
C:\TekApplications\tdsdvd\waveforms	Waveform files
C:\TekApplications\tdsdvd\example programs	Application plug-in example files

File Name Extensions

File name extension	Description
.csv	Comma-separated value file, used to store measurement data (individual measurement data or logged measurement data)
.ini	Application setup initialization file. The .ini file is saved on the instrument (oscilloscope or PC workstation) that is running the application
.set	Oscilloscope setup file that is saved and recalled at the same time as an .ini file; both files will have the same name. The .set file is always saved on the oscilloscope
.wfm	Waveform file that can be recalled into reference memory

Taking Measurements

About Taking Measurements

This section describes the steps to set up and take a measurement, how to replace the default signal process block functions with MATLAB or DLL user-developed software, and other common application tasks. You can also do the application Tutorial, located on page 49, which demonstrates most of the application functions.

These examples assume the following conventions:

- The TDSDVD application is installed and enabled on the oscilloscope.
- The oscilloscope is connected to the system under test (SUT) using the appropriate probes.

See Also

Installation on page 13
Taking Measurements Guidelines on page 27
Selecting a Measurement Standard on page 31

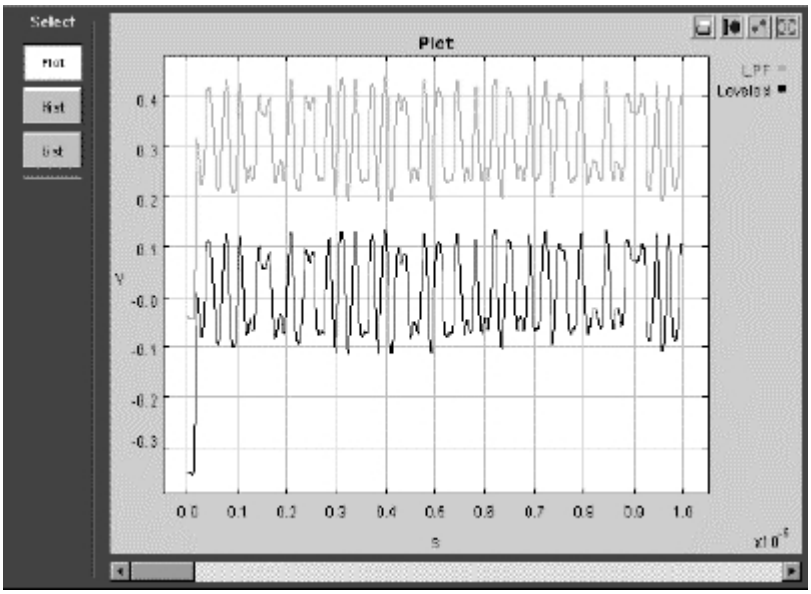
Taking Measurements Guidelines

Use the following guidelines when setting up and taking measurements with this application:

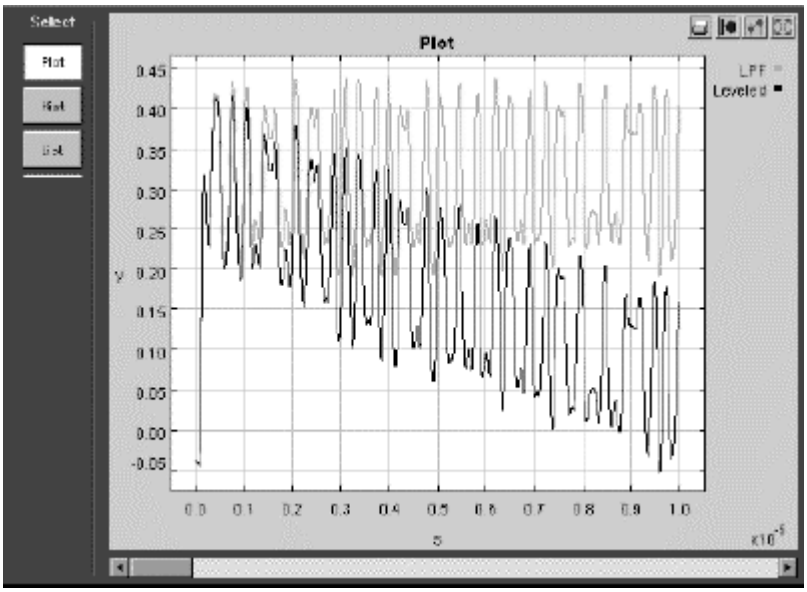
- The data source signal must be a continuous physical data disk recording of nT pulses with no gaps or non-nT type data.
- The clock period (T) of the data source signal must be constant, but not necessarily known.
- The application does not change the oscilloscope, acquisition record length, or sample rate settings in any of the operation modes, including data and clock Autoset. You must set the desired record length and sample rate for the application to correctly acquire, process, and measure the signal. In general, the sample rate should be at least 10 times the signal clock frequency, and the record length set to display at least 10 to 20 pulses.
- The DVD application measurement accuracy depends on the input parameter settings. The application is a collection of tools designed for general measurement and analysis of optical storage-specific signals without being restricted to a specific standard or signal. As a result, using the application to measure specific signals generally requires iterations between configuring the application parameters and analysis and validation of the measurement results (by viewing the resultant waveforms).

- The Extracted Clock and data/clock Autoset functions are meant to be a convenient way to obtain approximate values for the corresponding parameters, and produce roughly correct measurement results based on minimal user interaction. For more accurate results, use the Ideal (synthesized) clock mode and enter the known clock period. If the clock period is not known, a good starting point is to use the estimated clock period value calculated by the application using the Extracted clock.

  You can also enter data/clock threshold and hysteresis values to further refine measurement results. The hysteresis band should be set to a value that allows the application to discriminate between noise and the actual pulses in the signal. The Autoset function will select a sufficient value most of the time. However, the hysteresis of a signal will vary depending on conditions such as probes and test points. Therefore, the hysteresis may need slight adjustments based on these conditions. The threshold value selected by the Autoset function will also vary depending on the conditions described above, so the threshold value may also require minor changes.
- Using a synthesized clock speeds up the application considerably, as calculating the clock period is computationally time-consuming.
- The sampled input signal (live or stored) is not necessarily the signal being measured. If you route the input signal through the Equalizer or Low Pass Filter pre-processing blocks, the application measures the resultant signal from these blocks.
- The Data Source threshold and hysteresis settings apply to the data signal after signal pre-processing, and not to the sampled input source signal. The exception to this is when the signal processing path bypasses all signal process blocks and sends the input signal directly to the application.
- The data threshold and hysteresis parameters directly affect how accurately the application categorizes the nT data pulses (pits and spaces). If the clock is Extracted, then the accuracy of the clock period (T) estimation is another factor directly affecting the nT pulse categorization, and depends on its turn on the same data threshold and hysteresis.
- The Slicer Initial Threshold parameter is important. Because the Slicer bandwidth is usually small, an incorrect initial threshold setting can generate very long pulses categorized as having a very large nT (as they are offset heavily from the threshold). View the Leveled waveform signal (View > Waveforms > Leveled) and verify that the signal is centered on the zero volt line, as shown in the following figure.



If the Slicer Initial Threshold parameter is incorrect, the Leveled signal is not centered on zero volts, but slowly adjusts to the zero volt level depending on the Slicer bandwidth value, as shown in the below figure.



If you are measuring from the LPF output then a good initial value for the Slicer Initial Threshold parameter is the Autoset calculated data Threshold parameter value. Viewing the LPF signal (which is the Slicer input) also gives good basis for estimating an Initial Threshold value for the slicer.

Amplitude-related measurements depend on peak-to-peak and decision level measurements on specific nT pulse pairs (and adjacent pit and space with the same nT). A lack of results for these measurements can be because specified nT pairs were not found in the input signal. The fact that both pulses and spaces for a specified nT were found (for example, as indicated by getting results for High and Low measurements) does not mean that any pit or space with the specified nT was adjacent to another specified nT pit or space. If no results are returned for a measurement such as Asymmetry, the Divisor nT value in the Configure panel may need to be adjusted. In the Results panel, select the detailed results for a measurement that does have results and search for a row that has the same nT value for both the Subject and Adjacent columns. Enter this value in the Divisor nT field of the Configure panel.

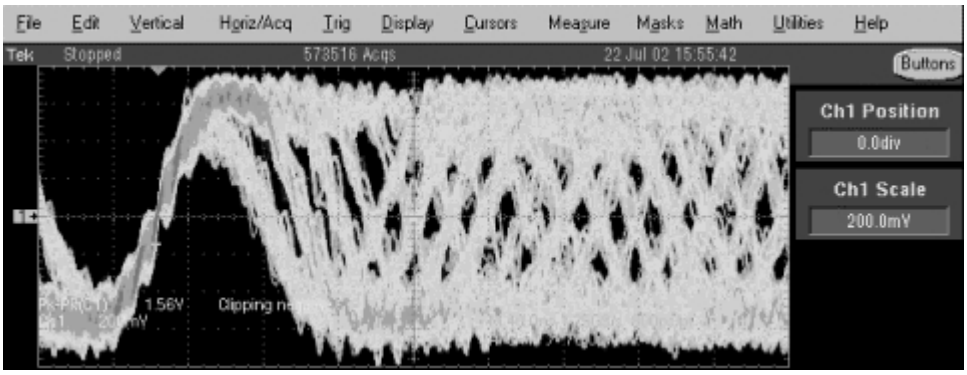
Acquiring the Data Signal

To acquire the optical storage drive signal, follow these steps:

1. Connect the oscilloscope to the SUT. The default application signal source input is Ch 1, and the default clock signal source input is Ch 2.
2. Push the oscilloscope AUTOSET button to acquire and display a signal.
3. Change the oscilloscope horizontal settings to adjust the sample rate. In general, the sample rate should be at least 10 times the signal clock frequency, and the record length set to display at least 10 to 20 pulses.

Displaying an Eye Waveform

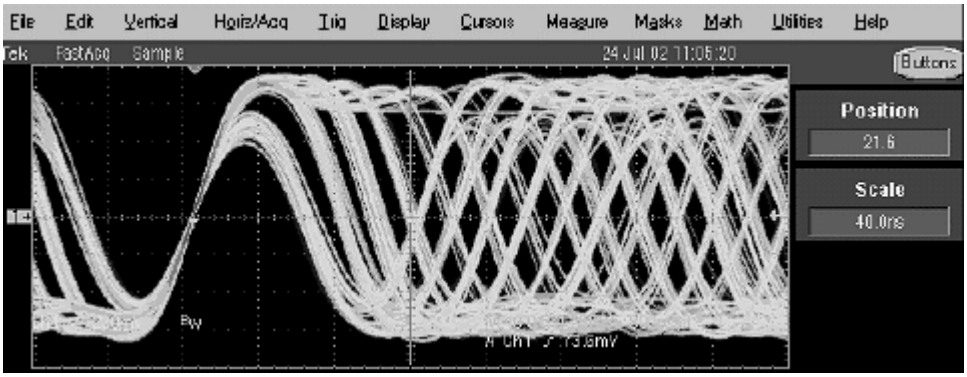
The Eye button displays an eye waveform of the active data signal. You can use this to validate the input data source signal.



To view the eye display, follow these steps:

1. Set up the oscilloscope to acquire an active data signal. You cannot display an eye waveform on a stored reference or math waveform.
2. Select the Eye command button.

Tip
To display a cleaner eye waveform, set the oscilloscope bandwidth to 20 MHz.



Selecting a Standard

Selecting a Measurement Standard

To select a measurement standard, follow these steps:

1. Select Measurements > Standards to display the Measurements Standards menu.
2. Select the Standards button to display a list of available standards.
3. Select a standard from the list. Choosing a standard presets most measurement parameters.

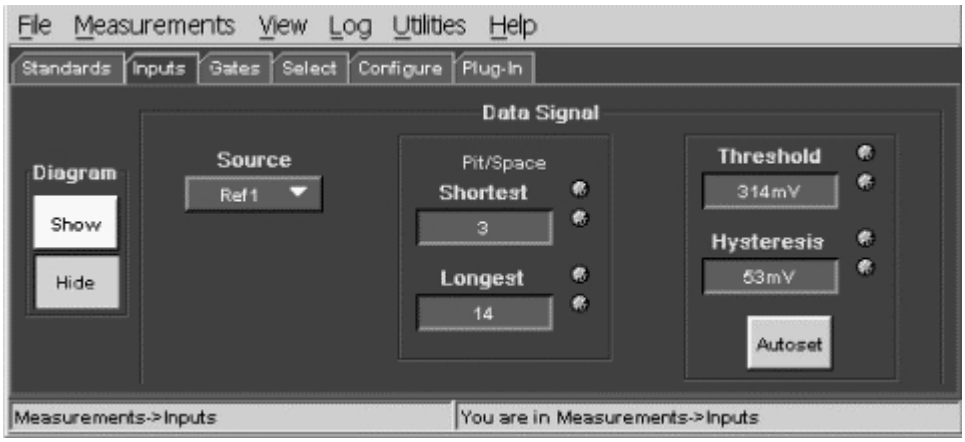
You can also select Custom and then configure the signal process path and measurement parameters to create your own custom measurement setups, and then use the File > Save/Recall menu functions to save and recall custom measurement setup files.

Setting Up the Input Options

Data Signal Input Options

To set the Data Signal options, follow these steps:

1. Select Measurements > Inputs to display the Inputs menu. The menu may be blank except for the Diagram Show/Hide buttons.
2. Select the Diagram Show button to display the Inputs Block Diagram (IBD).
3. Select the Data Signal button on the IBD diagram. The Inputs menu updates to show the data signal input parameter fields.



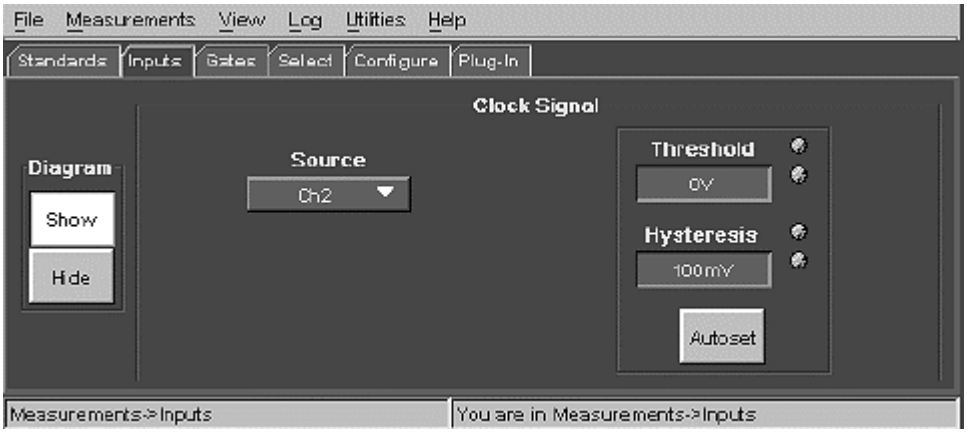
4. Select the Source button to display the source list.
5. Select the data signal source (Ch1-Ch4, Ref1-Ref4, Math1-Math4). The default value is Ch1.
6. If necessary for your measurement, change the Pit/Space Shortest and Longest parameter values.
7. Select the Autoset button to automatically set the data signal threshold and hysteresis parameter values based on the actual data waveform characteristics. You can also enter your own values for these parameters.

See Also

Using Cursors to Measure Part of a Waveform on page 38

Clock Signal Input Options

The Clock Signal menu sets the clock signal source, threshold, and hysteresis parameters. The actual clock signal is used for analyzing measurements when you select Clock Signal and Clock Source on the IBD.

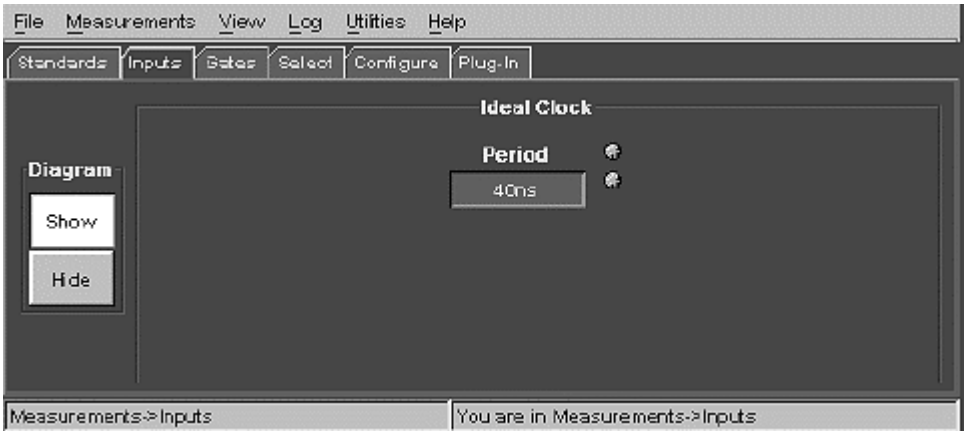


To set the Clock Signal parameters, follow these steps:

1. Select Measurements > Inputs to display the Inputs menu. The menu may be blank except for the Diagram Show/Hide buttons.
2. Select the Diagram Show button to display the Inputs Block Diagram (IBD) menu.
3. Select the Clock Signal button to display the Clock Signal parameter fields.
4. Select the Source button to display the source list.
5. Select the clock signal source (Ch1-Ch4, Ref1-Ref4, Math1-Math4). The default value is Ch2.
6. Select the Autoset button to automatically set the threshold and hysteresis values based on the clock waveform characteristics. You can also enter your own values for these parameters. Refer to Input Signal Parameters on page 87 for information on the Clock Signal input parameters.

Ideal Clock Period Option

The Ideal Clock menu sets the synthesized clock signal period. The synthesized clock signal is used for analyzing measurements when you select Ideal Clock and Synth Clock on the IBD.



To set the Ideal Clock Period, follow these steps:

1. Select Measurements > Inputs to display the Inputs menu.
2. Select the Diagram Show button to display the Inputs Block Diagram (IBD) menu.
3. Select the Ideal Clock button to display the Period option.
4. Use the general purpose knob or keyboard to change the value. Refer to Input Signal Parameters on page 89 for information on the Ideal Clock values.

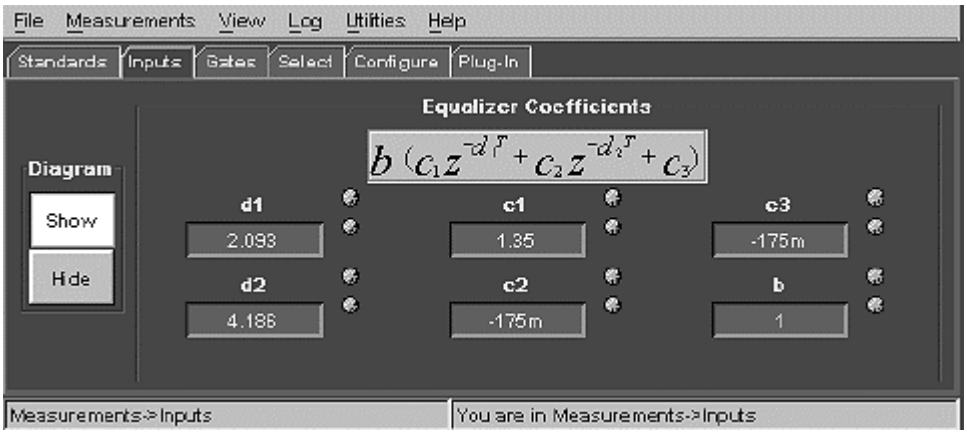
Equalizer Options

The Equalizer Coefficients menu lets you view and set the equalizer coefficient options.

Note.
The default values are based on the selected standard. Changing any equalizer option causes the application to change the standard type to Custom.

To set equalizer options, follow these steps:

1. Select Measurements > Inputs to display the Inputs menu.
2. Select the Diagram Show button to display the Inputs Block Diagram (IBD) menu.
3. Select the Equalizer button to display the Equalizer Coefficients options menu.



4. Use the general purpose knob or keyboard to change a value. Refer to Equalizer Coefficient Parameters on page 90 for information on the equalizer parameter values and ranges.

See Also

Default Standards Parameters Table 1 on page 87
Low Pass Filter Options on page 35
Slicer Options on page 36
Phase-Locked Loop Options on page 37

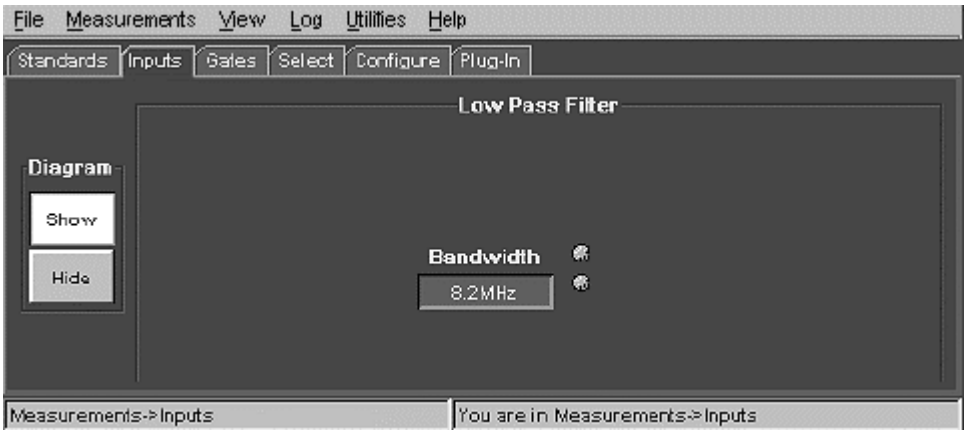
Low Pass Filter Options

The Low Pass Filter menu lets you view and set the low pass filter bandwidth corner frequency.

Note.
Default parameter values are based on the selected standard. Changing the Low Pass Filter option causes the application to change the standard type to Custom.

To set low pass filter options, follow these steps:

1. Select Measurements > Inputs to display the Inputs menu.
2. Select the Diagram Show button to display the Inputs Block Diagram (IBD) menu.
3. Select the Low Pass Filter button to display the Low Pass Filter menu.



4. Use the general purpose knob or keyboard to change the value. Refer to Low Pass Filter Parameters on page 90 for information on the Bandwidth parameter values and ranges.

See Also

Default Standards Parameters Table 1 on page 87
Equalizer Options on page 34
Slicer Options on page 36
Phase-Locked Loop Options on page 37

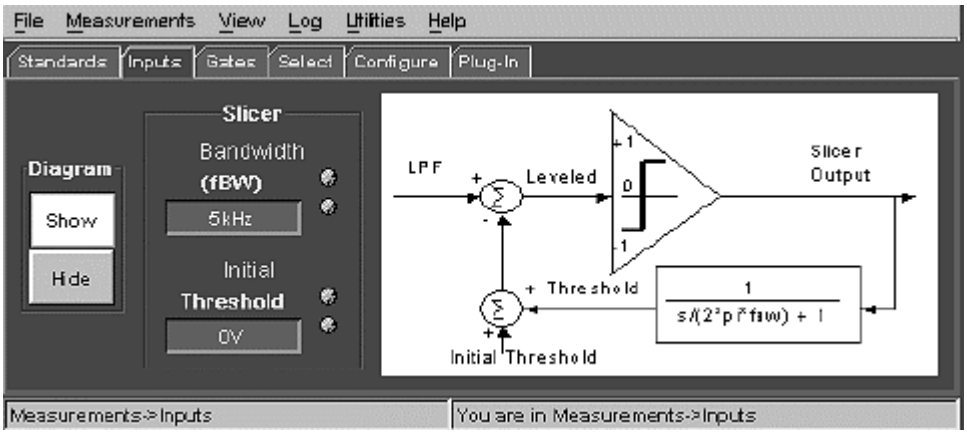
Slicer Options

The Slicer menu lets you view and set the Slicer bandwidth corner frequency and feedback loop initial threshold voltage.

Note.
Default parameter values are based on the selected standard. Changing the Slicer options causes the application to change the standard type to Custom.

To set Slicer options, follow these steps:

1. Select Measurements > Inputs to display the Inputs menu.
2. Select the Diagram Show button to display the Inputs Block Diagram (IBD) menu.
3. Select the Slicer button to display the Slicer menu.



4. Use the general purpose knob or keyboard to change a value. Refer to Slicer Parameters on page 90 for information on the Bandwidth and Initial Threshold parameter values and ranges.

See Also

Default Standards Parameters Table 1 on page 87
Equalizer Options on page 34
Low Pass Filter Options on page 35
Phase-Locked Loop Options on page 37

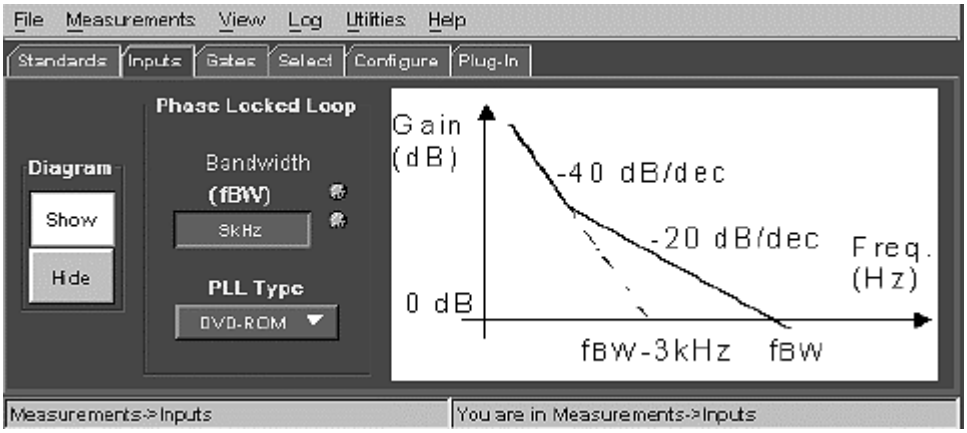
Phase-Locked Loop Options

The Phase-Locked Loop (PLL) menu lets you view and set the open loop bandwidth (BW) and PLL type based on the measurement standard. The filter transfer function characteristics chart changes depending on which PLL type you select.

Note.
Default parameter values are based on the selected standard. Changing the PLL parameters causes the application to change the standard type to Custom.

To set PLL options, follow these steps:

1. Select Measurements > Inputs to display the Inputs menu.
2. Select the Diagram Show button to display the Inputs Block Diagram (IBD) menu.
3. Select the PLL button to display the Phase-Locked Loop menu.



Use the general purpose knob or keyboard to change a value. Refer to Phase-Locked Loop Parameters on page 91 for information on the Bandwidth and PLL Type parameter values and ranges.

See Also

Default Standards Parameters Table 1 on page 87
Equalizer Options on page 34
Low Pass Filter Options on page 35
Slicer Options on page 36

Using Cursors to Measure Part of a Waveform

To use cursor gating to mark your measurements, follow these steps:

1. Select Measurements > Gates to display the Gated By menu.
2. Select the Cursors button. Vertical cursors appear on the oscilloscope screen.
3. Use the general purpose knobs, mouse, or touch screen to move the cursors to select the portion of the waveform to analyze.
4. Select and configure your measurements.
5. Select the Start/Stop Free Run or Start a Single Sequence Control button to start the signal acquisition. The application displays the Results Summary area with a table listing a summary of the statistical measurement values for all selected measurements, for the area within the cursors.
6. If you selected the Start/Stop Free Run command button, select that button again to stop signal acquisition.
7. To turn off cursor gating, select Measurements > Gates and select the None button. Selecting None sets the application to evaluate the entire signal.

See Also

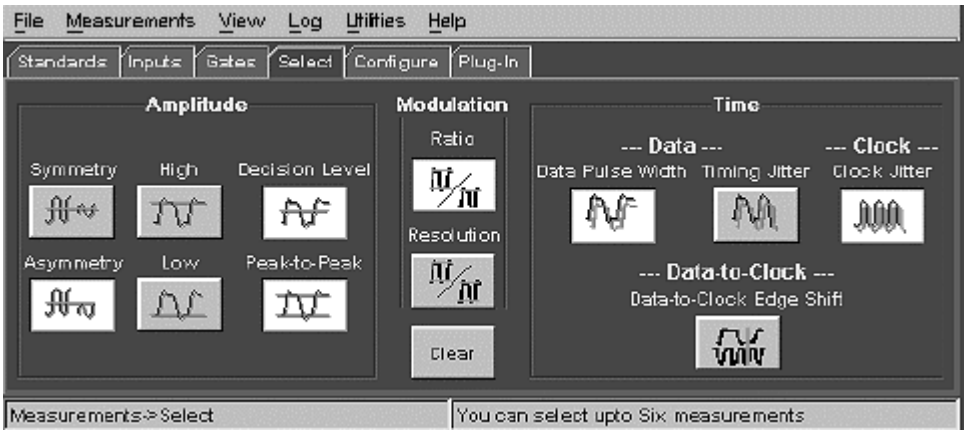
Measurements Gates Menu on page 69

Selecting and Configuring Measurements

Selecting Measurements

To select one or more measurements, follow these steps:

1. Select Measurements > Select to display the Measurement Select menu. There are three measurement type groups: Amplitude, Modulation, and Time.



2. Select the measurements you want to take. You can select up to six measurements, in any combination, from any of the measurement type groups.

Note.
To display a Time Interval Analysis (TIA) plot, you must select Data Pulse Width as one of your measurements.

Configuring Measurements

To configure one or more measurements, follow these steps:

1. Select Measurements > Configure to display the Configure menu. Available measurements (that were selected in the Measurement Select menu) are listed on the button icons at the top of the menu, in the order they were selected.
2. Select a measurement button. The menu highlights the available parameter fields for that measurement, and grays-out any fields that do not apply to the selected measurement.
3. Enter any changes to these fields as necessary for your measurement.

Note.
All measurements use the same set of parameters: you cannot set different parameter values for each measurement. For example, you cannot set the Adj Pos value to Leading for one measurement and then set it to Trailing for a different measurement.

See Also

Saving a Setup on page 42

Taking Measurements

Taking Measurements

To take a measurement, follow these steps:

1. Select the Start/Stop Free Run or Start a Single Sequence Control button to start the signal acquisition. The application displays the Results Summary area with a table listing a summary of the statistical measurement values for all selected measurements.
2. If you selected the Start/Stop Free Run command button, select that button again to stop signal acquisition.

Note.
Do not change oscilloscope settings while taking a measurement. Doing so stops the measurement acquisition.

Viewing Results

Viewing Measurement Results

To view measurement results, follow these steps:

1. If not already displayed, select View > Results to display the Results Summary area with a table listing a summary of the statistical measurement values for all selected measurements.
2. Select a measurement tab in Results Summary to display the Results Measurement area that contains more information for that measurement, listed in order of nT subject/adjacent pairs.
3. In the Results Measurement area, select a button in the Details column to display the Measurement Details area and plot or save the selected nT subject/adjacent pair measurement values.

Using Track Error Count

Track Error Count (TEC) counts the number of pulses (pit and/or spaces) in the track error signal. To use the Track Error Count, follow these steps:

1. Only configure the settings for Data Source, Threshold and Hysteresis in the Measurement Inputs menu. The input threshold and hysteresis values, as

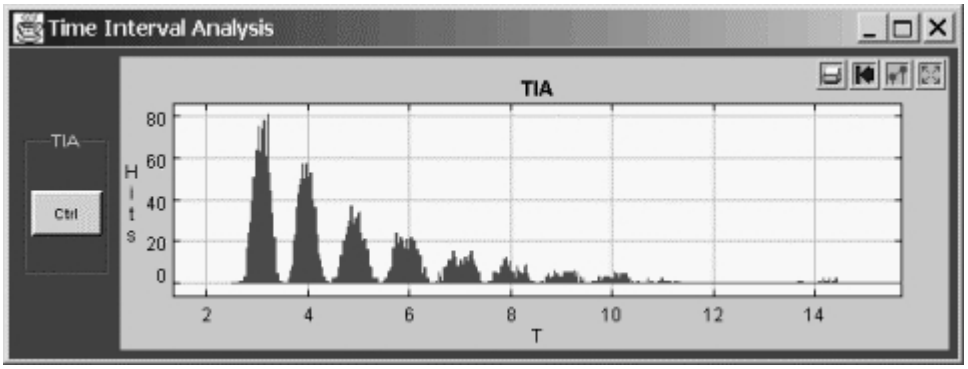
well as the outputs of the various signal-processing blocks, can affect the TEC value.

2. Select the TEC button on the Control panel, or select Utilities > Track Error Count, to display the Track Error Count panel.
3. Select the Single or Start/Stop Free Run button from the Control Panel. The track error count appears in the Track Error Count field.

Note.
No other measurements are executed, even if they are selected on the Measurement Select panel.

Displaying a Time Interval Analysis (TIA) Plot

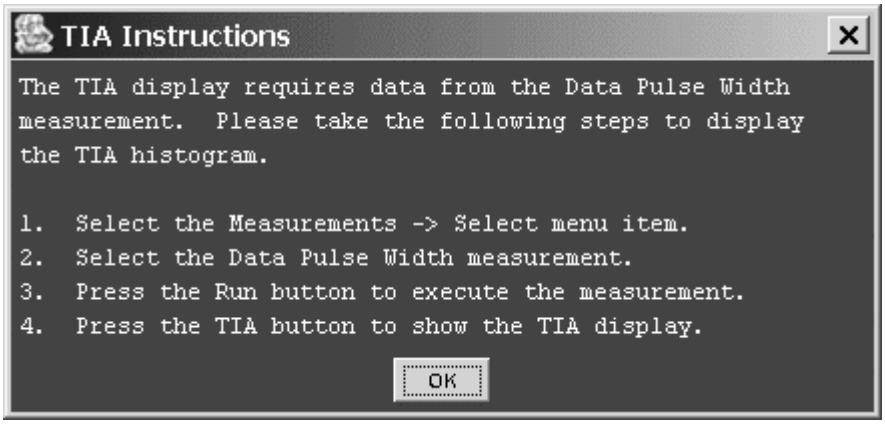
The TIA (Time Interval Analysis) command button displays time interval data from the Data Pulse Width measurement.



To display the TIA data, follow these steps:

1. Select Measurement > Select.
2. Select the Data Pulse Width measurement.
3. Select the Start/Stop Run Free or the Run One command button.
4. If you selected the Start/Stop button, select it again to stop data acquisition.
5. Select the TIA command button to display the Time Interval Analysis plot.
6. Select Ctrl on the TIA plot to display the Bin Resolution menu and change the Bin Resolution if needed.

If you do not take a Data Pulse width measurement prior to selecting the TIA button, or there is no Pulse Width measurement data, the application displays a TIA Instructions message (below). The message lists the process steps to do to display a TIA plot.



Using AutoScroll

To use AutoScroll, follow these steps:

1. Go to Utilities> Autoscroll. You can also select the Scan button on the Control Panel to go directly to the AutoScroll panel.
2. Select the Off (default) button to toggle AutoScroll to On.
3. Select Position to enter a percentage of position of the oscilloscope screen.
4. Select Step Size to enter the size of the step.
5. Select Scale to set the scaling.
6. Select the Start/Stop Free Run button on the Control Panel.
7. AutoScroll automatically scrolls the zoom window through the record.

See Also

AutoScroll Menu on page 85

Saving and Recalling Setups

Saving a Setup

To save a measurement configuration to a file, follow these steps:

1. Select File > Save/Recall to display the Save/Recall menu.
2. Select Save to display the Enter/Select File Name to Save dialog.
3. Select or enter a file name. The menu sets the folder location, which is C:\TekApplications\tdsdvd\setup.
4. Select the Save button. The application saves the oscilloscope setup information to a .set file, and the application setup information to a .ini file.

Note.
Setup and initialization files must both be located in the directory C:\TekApplications\tdsdvd\setup, for both oscilloscope and PC application operation.

Recalling a Saved Setup

To recall a measurement configuration from a saved setup file, follow these steps:

1. Select File > Save/Recall.
2. Select the Recall… button to display the Select File to Recall window.
3. Select the .ini setup file name to recall. The menu uses the folder location C:\TekApplications\tdsdvd\setup.
4. Select Open. The application loads the application initialization and oscilloscope setup files and reconfigures the application and oscilloscope.

Note.
Setup and initialization files must both be located in the directory C:\TekApplications\tdsdvd\setup, for both oscilloscope and PC application operation.

Restoring Default Settings

To restore the application default settings, follow these steps:

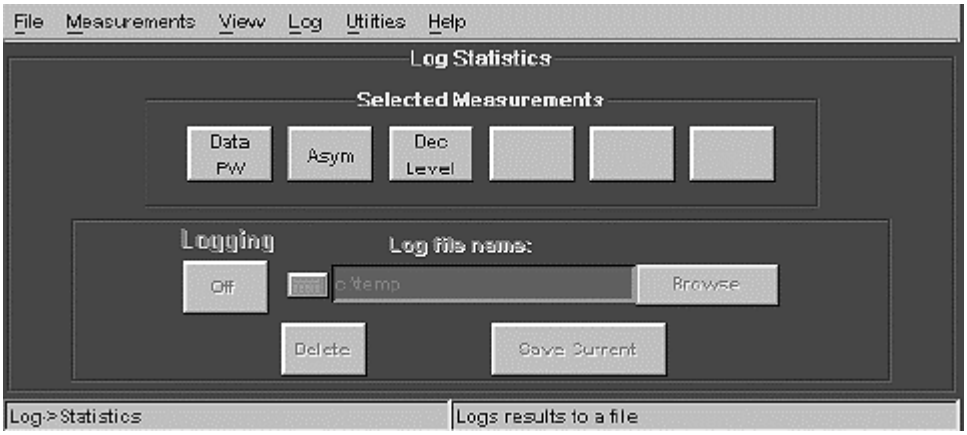
1. Select File > Save/Recall.
2. Select the Default button.

Saving Results to a File

Logging a Measurement to a File

To save a series of measurement results for one measurement to a data log file, follow these steps:

1. Select Log > Statistics to display the Data Logging menu.



2. Select the measurement button in the Selected Measurements area to select the measurement to log. You can log up to six measurements at a time, but you must select and enable each measurement for logging.
3. To save the log file to a file name or directory other than the default name and directory, select the Browse button to display the Open file dialog. Specify a new file name and/or directory. The default directory is *C:\TekApplications\tdsdvd\log*. The default file name is an abbreviation of the measurement name with a .csv extension.
4. Select the Logging button to On.
5. Repeat steps 2-4 for each measurement you want to log.
6. Select the Start/Stop command button to start acquiring multiple measurements.
7. Select the Start/Stop command button to stop acquiring measurements after a period of time.
8. Select Log > Statistics to display the Data Logging menu.
9. Select the Logging button to Off to close the data log file. You can now open and view the log file.

See Also

Viewing a Data Log File on page 44
Data Log File Format on page 45
Data Log File Example on page 45

Viewing a Data Log File

You can open the .csv data log file in a spreadsheet, database, text editor or data analysis program for further analysis.

Tip
You can use Notepad or Wordpad to quickly view the results in the data log file.

See Also

Data Log File Format

The data log file consists of one header row and rows of logged information. The header row contains the application name, the version number of the application, and the date and time on which the file was created. The remaining rows contain information for the measurements. The information will vary with the measurements being logged.

Note.
If you are using a GPIB program to execute the application, you can add your own annotation to the data log file by using the logAnnotate GPIB command. You can add information consisting of up to 20 characters; the custom information will appear after the date and time in the rows of logged data.

See Also

Logging a Measurement to a File on page 43
Viewing a Data Log File on page 44

Data Log File Example

The following is an example of a Decision Level measurement log file, as viewed with Notepad:

```
TDSDVD,1.0 (7/20/02),Wed Jul 24 15:28:54 PDT 2002,

Measurement,Dec Level
Data Source,Ch1
Clock Source,Ch2
Gated By,None
Standard,CUSTOM
Input Signal Type,HF
Output Signal Type,LPF
Output Clock Type,Extracted
Data Hysteresis,0.3
Clock Hysteresis,0.1
Data Threshold,-0.053
Clock Threshold,0.0

Acq#, Mean, Min, Max, Std Dev, Population
0, -0.0366, -0.0750, 0.02622, 0.01906, 811.0
1, -0.0369, -0.0739, 0.02548, 0.01897, 816.0
```

```
2, -0.0363, -0.0750, 0.02574, 0.01918, 824.0
3, -0.0371, -0.0750, 0.02503, 0.01894, 820.0
4, -0.0366, -0.0755, 0.02535, 0.01899, 816.0
5, -0.0361, -0.0749, 0.02590, 0.01938, 808.0
6, -0.0364, -0.0743, 0.02572, 0.01903, 806.0
7, -0.0370, -0.0748, 0.02518, 0.01905, 812.0
8, -0.0368, -0.0748, 0.02500, 0.01904, 810.0
9, -0.0370, -0.0746, 0.02514, 0.01909, 814.0
10, -0.0363, -0.0750, 0.02577, 0.01902, 816.0
11, -0.0363, -0.0830, 0.02550, 0.01907, 811.0
12, -0.0361, -0.0741, 0.02591, 0.01896, 816.0
13, -0.0364, -0.0747, 0.02545, 0.01891, 818.0
14, -0.0366, -0.0745, 0.02532, 0.01905, 811.0
```

Using Custom Plug-In Processes

Using the Plug-In Feature

To select a user-defined plug-in process, follow these steps:

1. Select Measurements > Plug-In to display the Plug-in Setup menu.
2. Select the Custom button.
3. Select the Plug-in Type drop-down list button for the block type you are replacing.
4. Select your own custom .dll or MATLAB file. If you selected MATLAB, use the Browse button to select a filename of the plug-in.

During the next measurement acquisition, the application passes waveform data to the specified plug-in file, which processes the data and returns the results to the application.

See Also

MATLAB Plug-in Usage Conventions on page 74
DLL Plug-in Usage Conventions on page 74
Replacing the Built-In Low Pass Filter with a MATLAB Process on page 46
Replacing the Built-in Equalizer with a DLL process on page 47

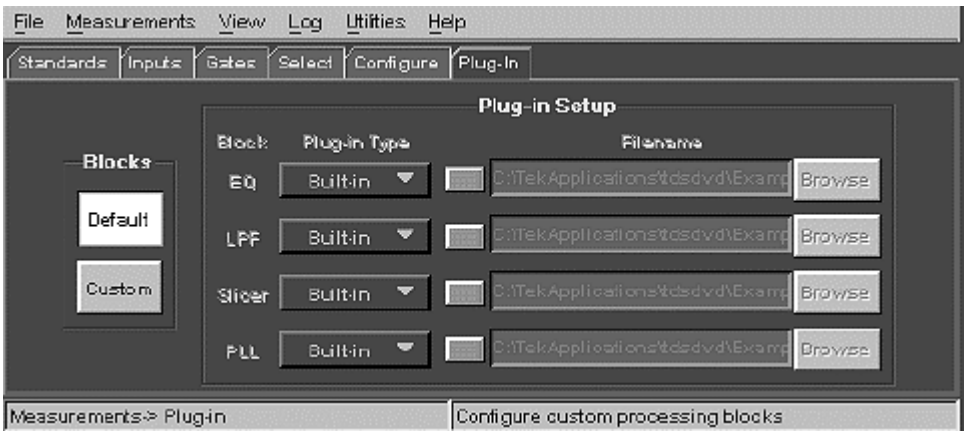
Replacing the Built-In Low Pass Filter with a MATLAB Process

The following steps describe how to substitute a MATLAB-based (.M file) 4^{th}-order Butterworth Low Pass Filter for the built-in 6^{th}-order Bessel Low Pass Filter.

Note.
MATLAB version 6.1 (or later) must be installed on the oscilloscope or PC that is running the application.

---

1. Make sure you can run the Tektronix-provided file tekLPF.m in MATLAB.
2. Copy the file *tekLPF.m* (located at C:\TekApplications\tdsdvd\Example Programs) under another file name in the same directory. Make sure to include the .m extension.
3. Edit the newly created file and replace the line
   `runExampleJavaorMATLAB = 1;` with
   `runExampleJavaorMATLAB = 0;`
4. Save the file.
5. In the application, select the Measurements > Plug-in to display the Plug-in menu.



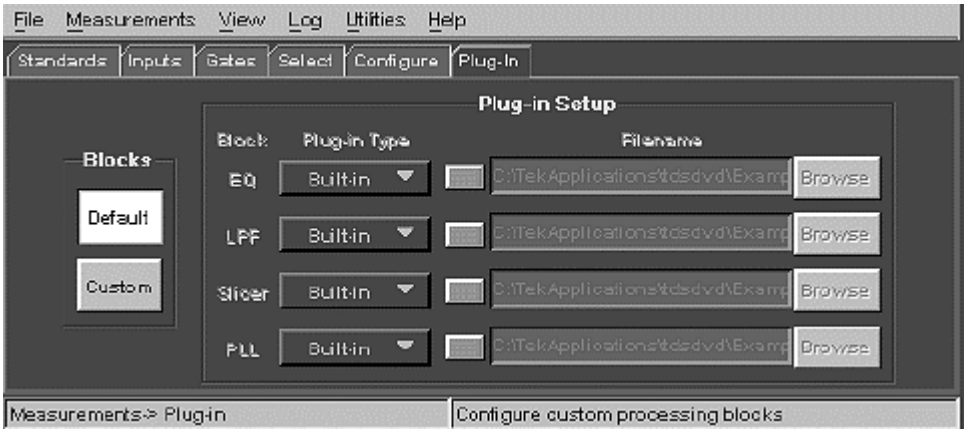
6. Select the Custom button.
7. Select the LPF list box and select MATLAB from the list.
8. Select the Browse button associated with the LPF field to display a file open menu.
9. Select the file name of the .m file you just created.
10. Select Open. The application closes the file menu and sets the Low Pass Filter process block to use the Plug-in MATLAB file instead of the built-in process.

Replacing the Built-in Equalizer with a DLL process

The following steps describe how to substitute a custom .dll equalizer process for the built-in equalizer process.

1. Create a new .dll file for your custom equalizer process.
2. Save the file. You must use a specific name for the file, and save the file to a particular directory. Refer to DLL Plug-in Usage Conventions on page 74 for information on custom .dll file naming and location conventions.

3. In the application, select the Measurements > Plug-in tab to display the Plug-in menu.



4. Select the Custom button.
5. Select the EQ button and select DLL from the list. The application sets the Equalizer process block to use the custom .dll process file instead of the built-in process.

See Also

Replacing the Built-In Low Pass Filter with a MATLAB Process on page 46

Tutorial

Introduction to the Tutorial

This tutorial teaches you how to set up the application, take a measurement, view the results, and save the results.

Tutorial Conventions

- This tutorial assumes that you have correctly installed the application onto an oscilloscope. If you have not done so, go to Installation on page 13 for information on installing the application.
- Run this tutorial from an application that is running on an oscilloscope.
- Perform the tutorial steps in the order listed in order to obtain the results shown in the tutorial.

See Also

Stopping the Tutorial on page 55
Returning to the Tutorial on page 56

Setting up the Oscilloscope

To set up the oscilloscope, follow these steps:

1. In the oscilloscope menu bar, select File > Recall Default Setup to set the oscilloscope to the default factory settings.
2. Push the individual CH 1, CH 2, CH 3, and CH 4 buttons as needed to remove active waveforms from the display.

Recalling a Waveform

The application includes a waveform file that you can use with this tutorial.

To recall the tutorial waveform file to Ref1 on to the oscilloscope, follow these steps:

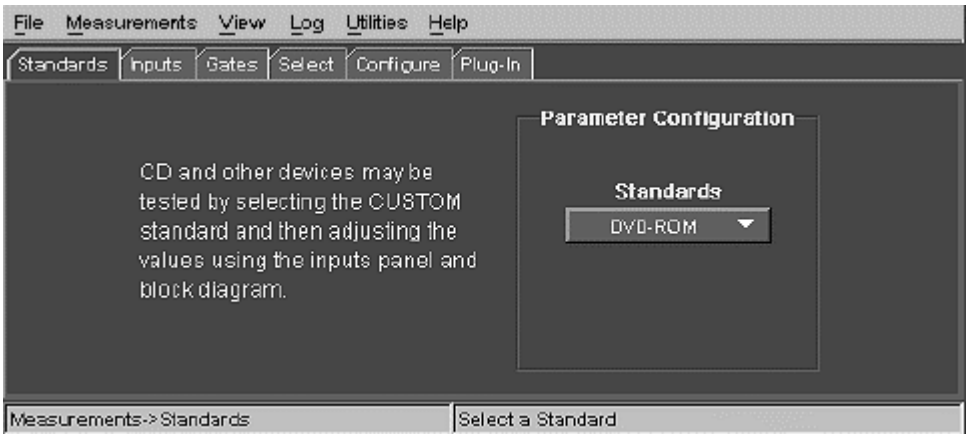
1. In the oscilloscope menu bar, select File > Reference Waveforms > Reference Setup.
2. Select the Ref 1 tab.
3. Select the Recall button. Navigate to the *C:\TekApplications\tdsdvd\waveforms* directory.

4. Select the *50k-DVD-ROM.wfm* file.
5. Select the Recall button.

Starting the Application

Note.
The application must be installed and enabled on the oscilloscope.

To start the application, go to the oscilloscope menu bar and select File > Run Application > Optical Storage Analysis. The application takes a few moments to start up.



For this tutorial you will use the DVD-ROM standard, which is the default standard.

Setting Up the Signal Source

Before you can take a measurement, you must select the signal standard, source type, and then define the signal options.

To set up the signal standard and source, follow these steps:

1. In the application menu bar, select Measurements > Inputs.
2. Select the Diagram Show button to display the Inputs Block Diagram window.
3. Select the Data Signal button in the diagram. The Inputs menu updates to show the data signal input parameter fields.
4. Select Ref1 from the Source drop-down list.
5. Select the Autoset button to set the signal threshold and hysteresis values based on the actual waveform.

Selecting the Measurement

For this tutorial you will take a Data Pulse Width measurement. To take a Data Pulse Width measurement, follow these steps:

1. Select Measurements > Select to display the Select Measurement menu.
2. Select the Data Pulse Width button.

Configuring the Measurement

Each measurement has a number of options you can adjust. Selecting a standard pre-defines many of these options. For this tutorial, you will change the Subject From n and the Adjacent Position parameters for the Data Pulse Width measurement.

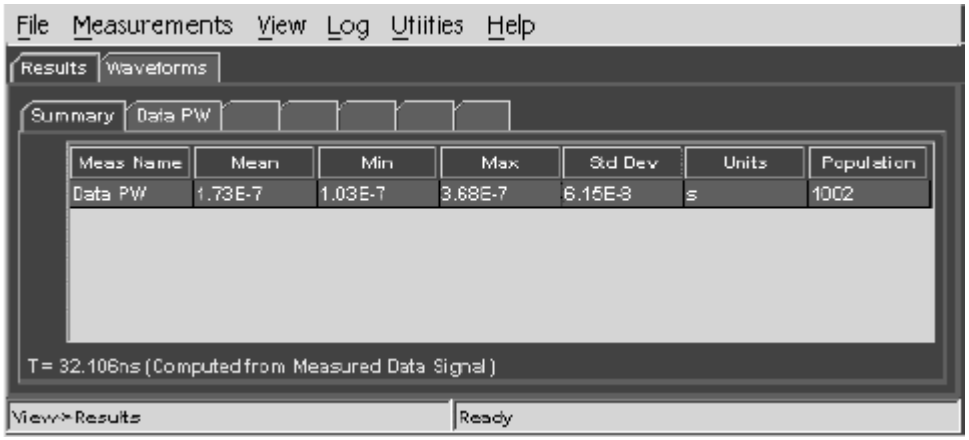
To change the measurement configuration parameters, follow these steps:

1. Select Measurements > Configure to display the Measurement Configure menu.
2. Select the Data PW button. The menu highlights the options associated with the Data Pulse Width measurement.
3. In the Subject nT area, change the From n = value to one (1)
4. In the Adj Pos area, select Leading OR Trailing from the list box.
5. Leave all other options at their default values.

Taking the Measurement

You are now ready to take the Data Pulse Width measurement.

To take the measurement, select the Start Single Sequence command button. The application analyzes the signal and then displays the View Results menu to display the measurement results summary data, as shown below. The View Summary menu shows overall statistical information for the measurement.

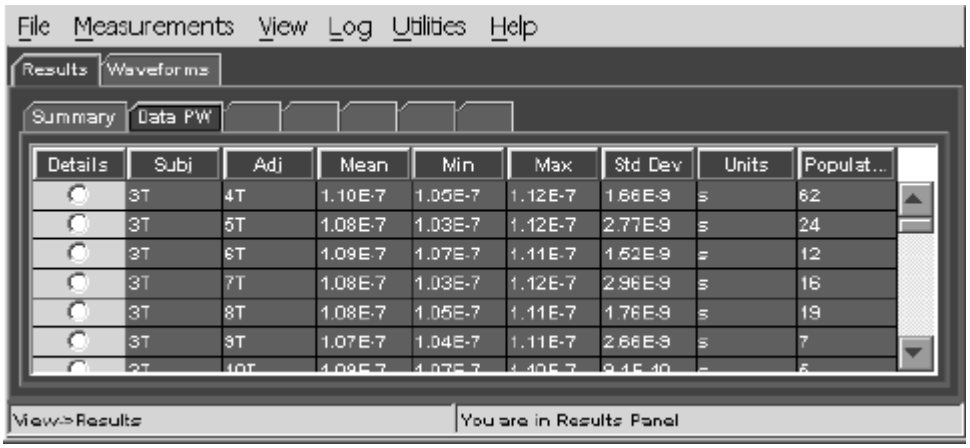


Note also that the summary results include the clock period value (T) in the lower left corner. This is the clock period that was extracted (recovered) from the data signal.

Viewing the Results

You can view more detailed information about the Data Pulse Width measurement, including measurements listed by nT, and graphical plots of listed nT values.

To view more detailed information, select the Data PW tab. The application displays the View Results Measurement panel, as shown below. The measurement panel lists the statistics for each subject and adjacent nT measurement, listed in ascending order, subtotals for each group of subject measurements, and a measurement total (at the bottom of the list).

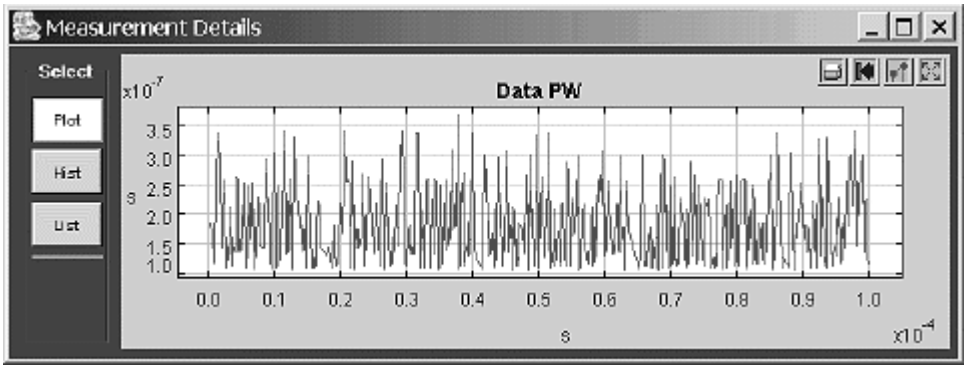


The Details column lets you select a particular subject/adjacent nT measurement and display the measurement values as a linear plot, a histogram, or as a list of values.

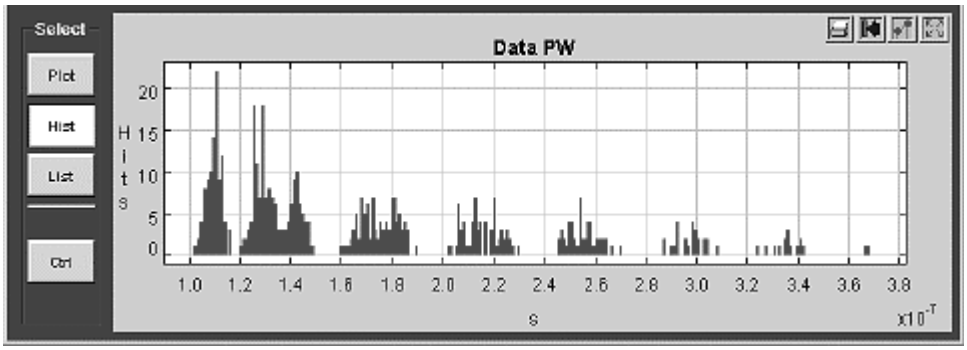
Displaying a Measurement Histogram

To display a histogram plot of the total Data Pulse Width measurement value, follow these steps:

1. Scroll to the bottom of the measurement list
2. Select the button in the Details column adjacent to the Total label in the Subj column. This displays the Measurement Details area and plots the selected measurement data as a linear graph.

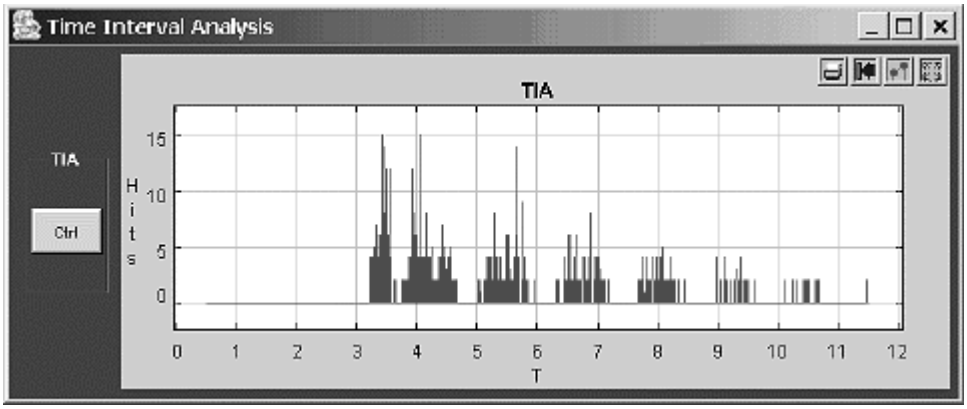


3. In the Measurement Details area, select the Hist button. The area redraws the data as a histogram, as shown below.



Displaying a Time Interval Analysis (TIA) plot

To display a Time Interval Analysis plot (which uses the Data Pulse Width measurement values), select the TIA command button. The application displays the TIA plot, as shown below.



Saving the Measurement Data

To save the measurement results to a data log file, follow these steps:

1. From the application menu bar, select Log > Statistics. The application displays the Data Logging menu.
2. Select the measurement to log. For this tutorial, only the Data Pulse Width measurement is available, so select the Data PW button.
3. Select the Save Current button to save the Data Pulse Width measurement. The application saves each measurement in a different file, with the measurement type as the default name. For this tutorial, the application saved the data in file *Data PW.csv*, in the *C:\TekApplications\TDSDVD\log* directory.

Note.
The format of the log file contents depends on the measurement.

You have completed the TDSDVD application tutorial.

Stopping the Tutorial

If you need more than one session to complete the tutorial lessons, you can stop the tutorial and return to it another time.

To save the application setup and stop your session, refer to Saving a Setup on page 42.

Returning to the Tutorial

To return to the tutorial setup, you can start the application and then recall the saved setup. To recall the application setup, refer to Recalling a Saved Setup on page 43.

Reference

Menus

The following sections provide information on specific application menu functions.

The File Menu
The Measurements Menu
The View Menu
The Log Menu
The Utilities Menu
The Help Menu

The File Menu

The File menu provides the following functions:

- Save/Recall saves and recalls application setup information. Use this to save and restore standard and custom measurement configurations.
- Minimize minimizes the application window onto the Windows task bar.
- Hide hides the application window.
- Exit closes (quits) the application. You have the option to restore the oscilloscope settings that were present prior to starting the application.

Save/Recall Menu

The Save/Recall menu lets you save and recall application measurement configuration settings to a file. You also use this menu to recall the default application settings.

Save/Recall Menu Options

Option	Description
Save…	Specify a file in which to save the application setup
Recall…	Select a file from which to recall the application setup
Default	Restores the default application setup values
File name for Save/Recall	Displays the name of the last file used to save or recall a setup

See Also

Saving a Setup on page 42
Recalling a Saved Setup on page 43
Restoring Default Settings on page 43

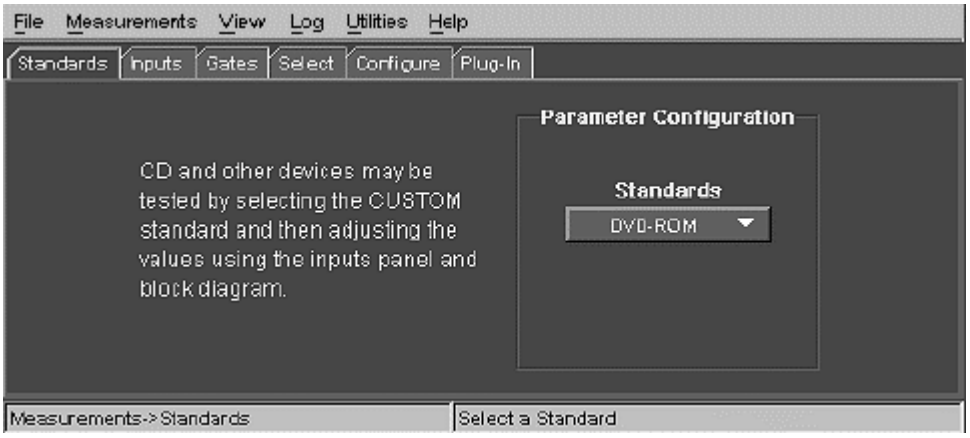
The Measurements Menu

The Measurements menu contains measurement-related menus. Use the Measurements menu for the following operations:

- Measurements > *Standards* selects the standard for which you are taking measurements, or selects Custom to let you define your own measurement setups and save them using the File > Save/Recall function.
- Measurements >*Inputs* sets the signal input and processing path parameters.
- Measurements >*Gates* enables using cursors to do measurements on a specified portion of the input waveform.
- Measurements >*Select* selects the measurement to take on the input signal. You can select up to six measurements at one time, in any combination of measurement type.
- Measurements >*Configure* sets the subject and adjacent nT ranges, as well as adjacent position, data/clock edge, data polarity, and other parameters for the measurements. The selected measurement enables the applicable parameters for that measurement.
- Measurements >*Plug-In* enables using of MATLAB or .dll plug-in extensions to replace the built-in Equalizer, Low Pass Filter, Slicer, and Phase-Locked Loop signal processing functions.

The Standards Menu

The Standards menu consists of a drop-down list containing supported measurement standards. Select the Standards button to display the Standards drop-down list, and then select a standard. Selecting a standard sets many of the default measurement options.



If you are testing for a standard that is not in the list, select Custom from the list. Then use the Inputs, Gates, Select, and Configure menus to set your custom measurement parameters. You can then save the custom measurement settings by selecting File > Save/Recall and specifying a file name and directory in which to store the settings.

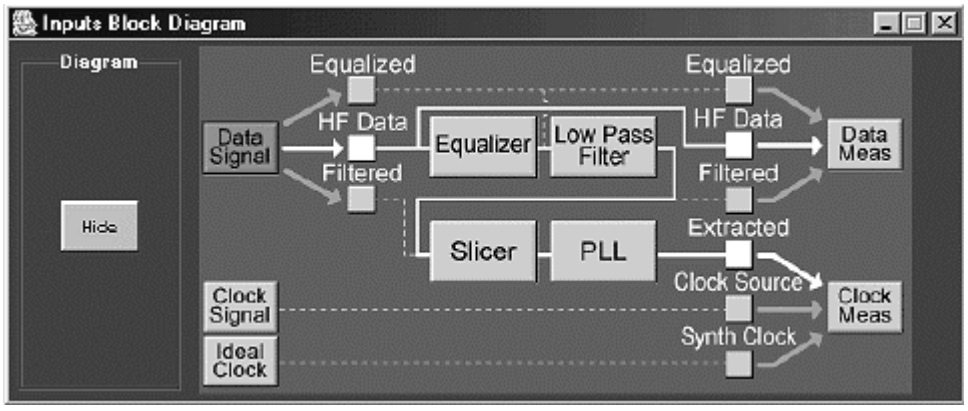
See Also

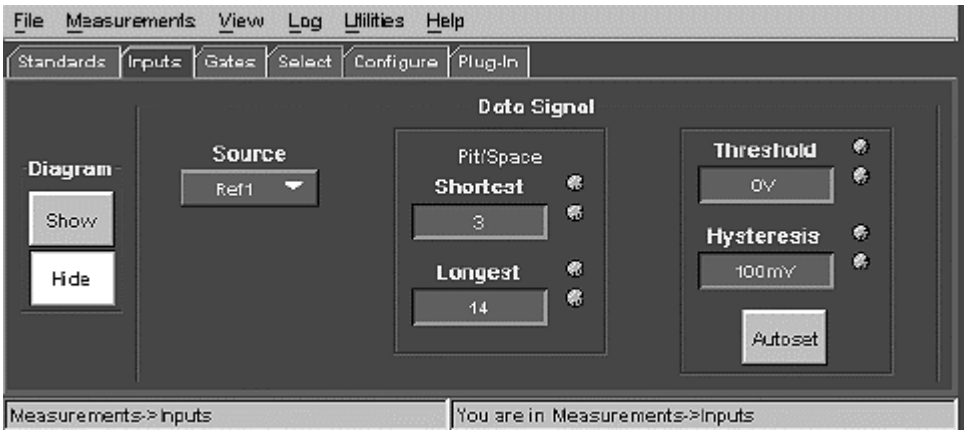
Default Standards Parameters, Table 1 on page 87

The Inputs Menu

The Measurement Inputs menu provides controls for setting input signal type and processing path parameters. Some parameters are automatically filled in with values based on the selected standard. The default screen does not list any parameter fields.

To display input parameter fields, select the Diagram Show button to display the Inputs Block Diagram (IBD) and then select a button. The Measurements Input menu then updates to display the parameter fields associated with the selected IBD button. For example, the following figure shows the Data Signal input parameters, which are displayed after selecting Data Signal on the IBD.

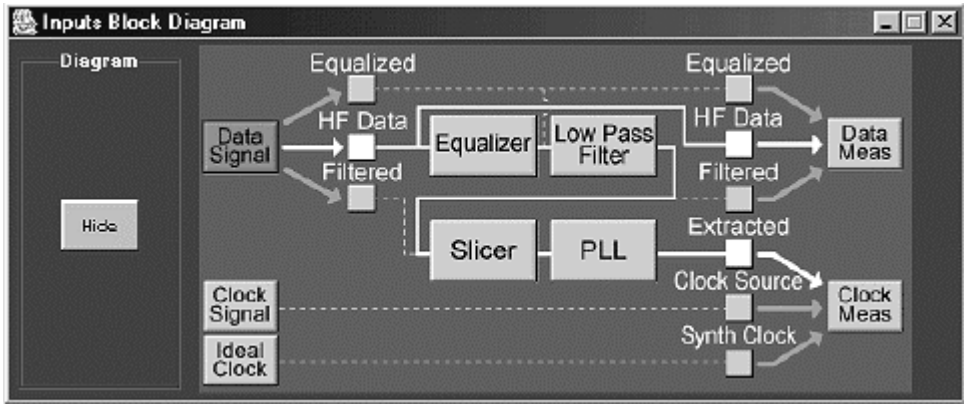




The Inputs Block Diagram (IBD)

You can define, the signal input sources, the signal processing to apply to the input data, and the signal output to measure with the application from the Inputs Block Diagram, which is opened from the Measurements > Inputs menu.

The default IBD input and output signal type is HF Data (data that is from the optical drive mechanism and has not been preprocessed). The default value for the clock signal source is Extracted (recovered from the data signal).



You configure the signal path by selecting the buttons. Selecting a button either changes the signal path route or displays fields in which to enter signal input and processor parameters. To close the IBD, select Hide.

There are three groups of Inputs Block Diagram options:

- Signal Input Options
- Signal Process Options
- Signal Output Options

Signal Input Options

Selecting Signal Input menu options updates the Inputs menu to show the data and clock signal parameters, as well as select the data signal input type (Equalized, HF Data, or Filtered).

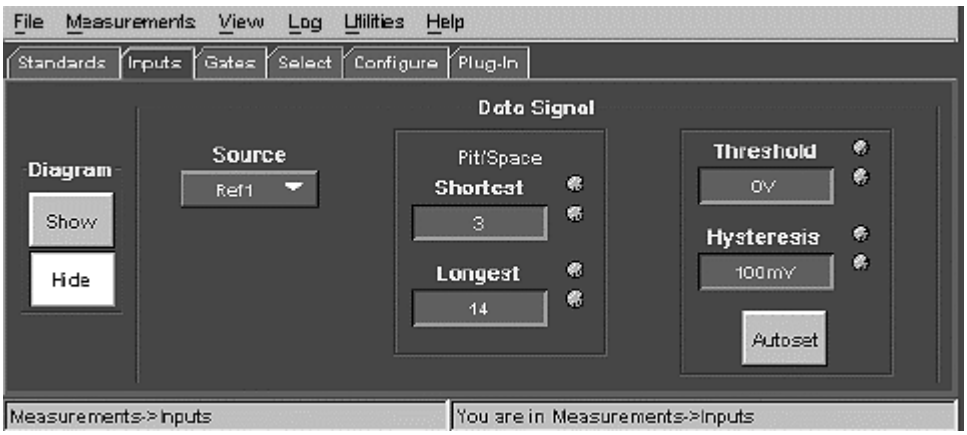
Option/button	Description
Data Signal	Displays data signal fields for setting the data input source, threshold, and hysteresis parameters
Input Signal Type Equalized * HF Data * Filtered *	Sets the input signal type applied to the signal processing block. Selecting an input type routes the signal as appropriate for that type of signal. For example, selecting HF Data routes the input signal to the Equalizer process, whereas selecting Filtered routes the input signal to the Slicer process. Only one input type is active at a time.
Clock Signal	Displays clock signal fields for setting the clock input source, threshold, and hysteresis parameters
Ideal Clock	Displays a clock period field for setting the clock period of the ideal (synthesized) clock signal generated by the application.
* Selecting a button can change the current process flow path. For example, if the selected Input type is Filtered, and you select the Output Signal Type as Equalized, the application changes the Input Signal Type to Equalized	

See Also

Data Signal Menu on page 62
Clock Signal Menu on page 63
Ideal Clock Menu on page 64

Data Signal Menu

The Data Signal menu sets the data signal source, threshold, and hysteresis parameters.



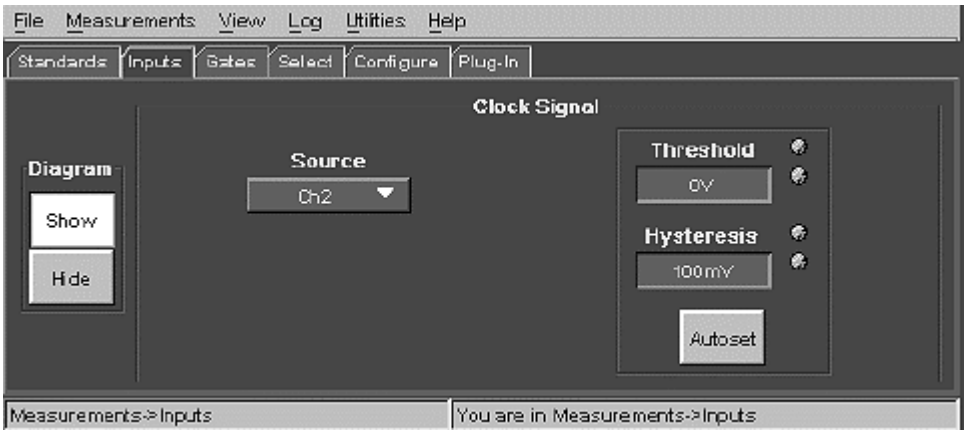
Data Signal Menu Options

Option/button	Description
Diagram Hide/Show	Displays or hides (closes) the Inputs Block Diagram (IBD), which you use to set data and clock signal input and processing path parameters
Source	Sets the input source for the data signal. Available sources are CH1 to Ch4, Math1 to Math4, and Ref1 to Ref4
Pit/Space Shortest Longest	Sets the range (Shortest to Longest) of nT pulses (pit or space) to analyze in the application. The value range is 0 to 24
Treshold *	Sets the data threshold voltage used to calculate the signal pulse width
Hysteresis *	Sets the hysteresis voltage, centered on the threshold voltage, used to determine a false (glitch) data pulse from a valid pulse
Autoset **	Analyzes the post-processing signals and automatically sets the threshold and hysteresis values based on the signal characteristics
* The threshold and hysteresis settings apply to the signal (data or clock) at the output of the signal processing blocks that are then measured by the application ** Autoset adjusts threshold and hysteresis to the best values it can determine. You may need to manually adjust these values to obtain optimum measurement results	

Refer to Input Signal Parameters on page 89 for information on the Clock Signal input parameters.

Clock Signal Menu

The Clock Signal menu sets the clock signal source threshold, and hysteresis parameters. Use this menu if you are using an actual clock signal from the SUT. The actual clock signal is used for analyzing measurements when you select the Clock Signal and Clock Source buttons on the IBD.



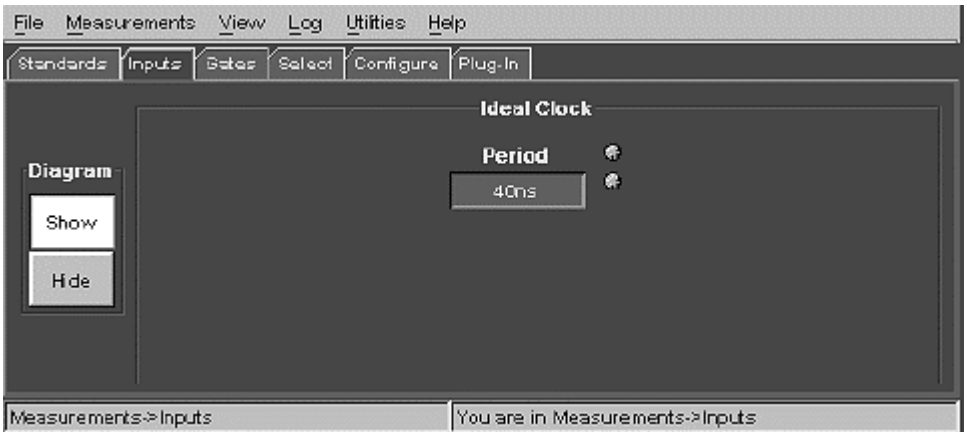
Clock Signal Menu Options

Option/button	Description
Diagram Hide/Show	Displays or hides (closes) the Inputs Block Diagram (IBD), which you use to set data and clock signal input and processing path parameters
Source	Sets the input source for the clock signal. Available sources are CH1 to Ch4, Math1 to Math4, and Ref1 to Ref4
Threshold*	Sets the clock threshold voltage
Hysteresis *	Sets the hysteresis voltage, centered on the threshold voltage, used to determine a false (glitch) clock pulse from a valid pulse
Autoset **	Analyzes the post-processing signals and automatically sets the clock threshold and hysteresis values based on the clock signal characteristics
* The threshold and hysteresis settings apply to the signal (data or clock) at the output of the signal processing blocks that are then measured by the application ** Autoset adjusts threshold and hysteresis to the best values it can determine. You may need to manually adjust these values to obtain optimum measurement results	

Refer to Input Signal Parameters on page 89 for information on the Clock Signal input parameters.

Ideal Clock Configuration Menu

The Ideal Clock menu sets the synthesized clock signal period. The synthesized clock signal is used for analyzing measurements when you select the Ideal Clock and Synth Clock buttons on the IBD panel.



Option/button	Description
Diagram Hide/Show	Displays or hides (closes) the Inputs Block Diagram (IBD), which you use to set data and clock signal input and processing path parameters
Period	Sets the ideal (synthesized) clock period value used by the application for measurements

Refer to Input Signal Parameters on page 89 for information on the Ideal Clock parameters.

Signal Process Options

Selecting the Signal Process menu options updates the Inputs menu to show the Equalizer, Low Pass Filter, Slicer, and Phase-Locked Loop signal processing parameter fields.

Option/button	Description
Equalizer *	Displays the Equalizer Coefficients menu where you can set the equalizer coefficient equation parameters
Low Pass Filter *	Displays the Low Pass Filter menu where you can set the low pass filter bandwidth parameter
Slicer *	Displays the Slicer menu where you can set the slicer bandwidth and initial threshold voltage parameters
PLL *	Displays the Phase-Locked Loop menu where you can set the phase-locked loop corner bandwidth and PLL data type
* The default process block parameters are set by the selected measurement standard. Changing any of these values resets the measurement standard to Custom	

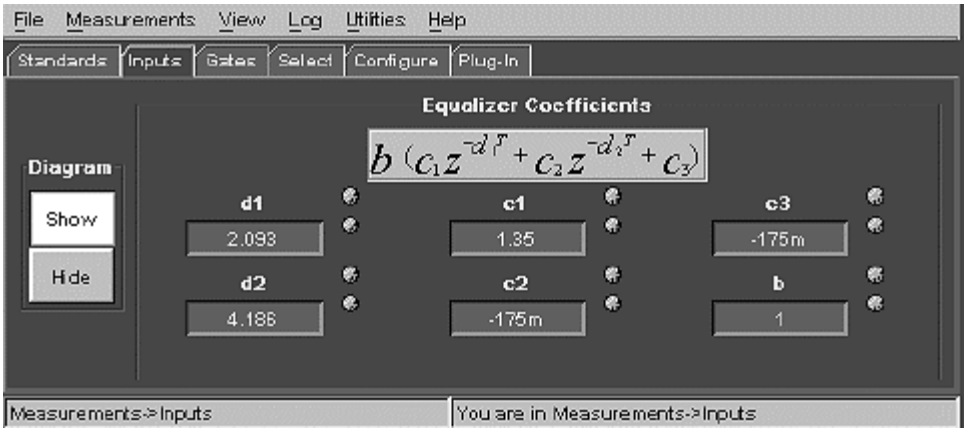
See Also

Equalizer Coefficients Menu on page 66
Low Pass Filter Menu on page 66
Slicer Menu on page 67
Phase-Locked Loop Menu on page 68
Signal Output Options on page 68
Equalizer Coefficient Parameters on page 90
Low Pass Filter Parameters on page 90
Slicer Parameters on page 90
Phase-Locked Loop Parameters on page 91

Equalizer Coefficients Menu

The Equalizer Coefficients menu lets you view and set the equalizer coefficient parameters. To set equalizer coefficients, select the Equalizer block in the Inputs Block Diagram (IBD). Use the general purpose knob or keyboard to change the default value of a coefficient. Refer to Equalizer Coefficient Parameters on page 90 for information on the equalizer parameter values and ranges.

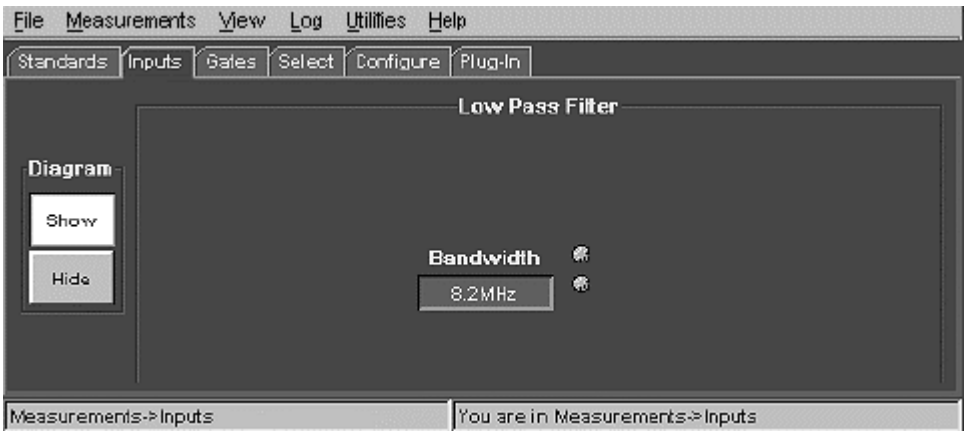
Note.
Default parameter values are based on the selected standard. Changing any of the Equalizer parameters changes the input standard type to Custom.



Low Pass Filter Menu

The Low Pass Filter menu lets you view and set the low pass filter bandwidth corner frequency.

Note.
Default parameter values are based on the selected standard. Changing the Low Pass Filter parameter causes the application to change the standard type to Custom.

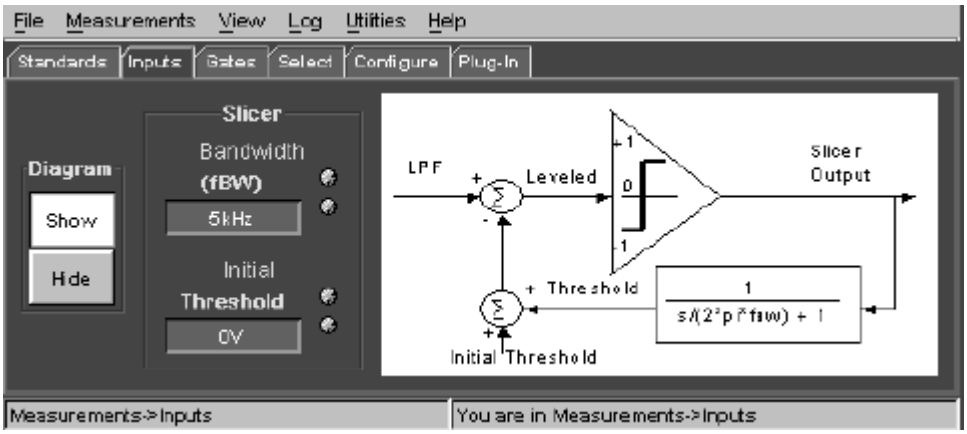


Refer to Low Pass Filter Parameters on page 90 for information on the Bandwidth parameter.

Slicer Configuration Menu

The Slicer menu lets you view and set the Slicer bandwidth corner frequency and feedback loop initial threshold voltage.

Note.
Default parameter values are based on the selected standard. Changing the Slicer bandwidth parameter changes the input standard type to Custom. Changing the initial threshold value does not change the input standard to Custom.

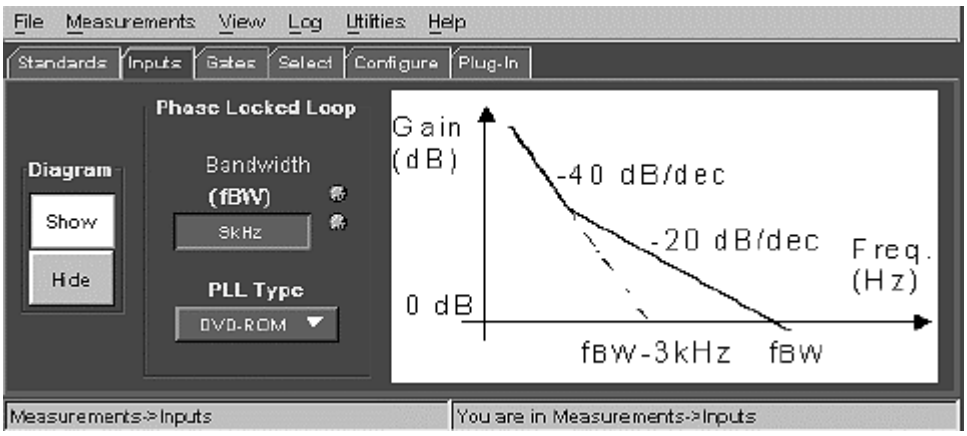


Refer to Slicer Parameters on page 90 for information on the Bandwidth and Initial Threshold parameters.

Phase-Locked Loop Configuration Menu

The Phase-Locked Loop (PLL) menu lets you view and set the open loop bandwidth (fBW) and PLL type based on the measurement standard. The filter transfer function characteristics chart changes depending on which PLL type you select.

Note.
Default parameter values are based on the selected standard. Changing the PLL parameters causes the application to change the standard type to Custom.



Refer to Phase-Locked Loop Parameters on page 91 for information on the Bandwidth and PLL Type parameters.

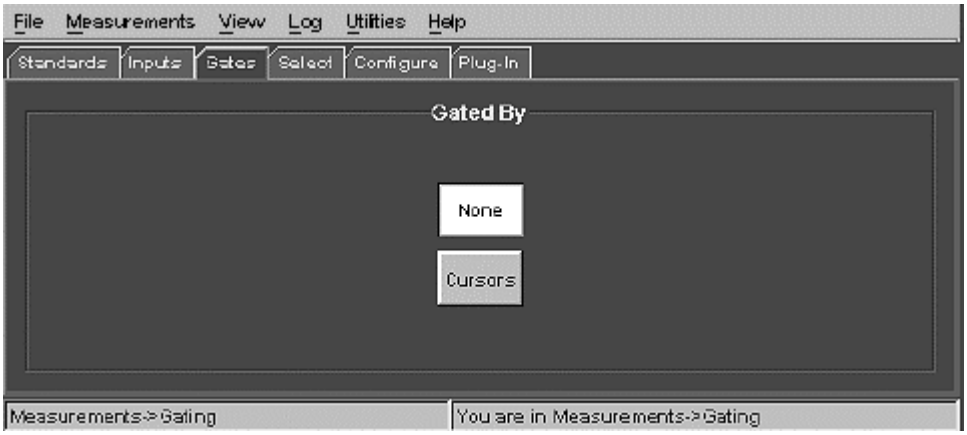
Signal Output Options

Selecting the Signal Output menu options sets which data and clock signals to route into the application for measurement.

Option/button	Description
Output Signal Type Equalized * HF Data * Filtered *	Sets the signal type to be measured by the application. Only one output (measured) signal type can be active at a time.
Output Clock Type Extracted Clock Source Synth Clock	Sets the clock signal type used by the application for taking measurements. Only one measured clock type can be active at a time.
* Selecting a button can change the current process flow path. For example, if the selected Input type is Filtered, and you select the Output Signal Type as Equalized, the application changes the Input Signal Type to Equalized	

The Measurements Gates Menu

The Measurements Gates menu lets you use the oscilloscope vertical cursors to select portions of the signal on which to take measurements. Only the signal data between the cursors is evaluated.



Measurements Gates Options

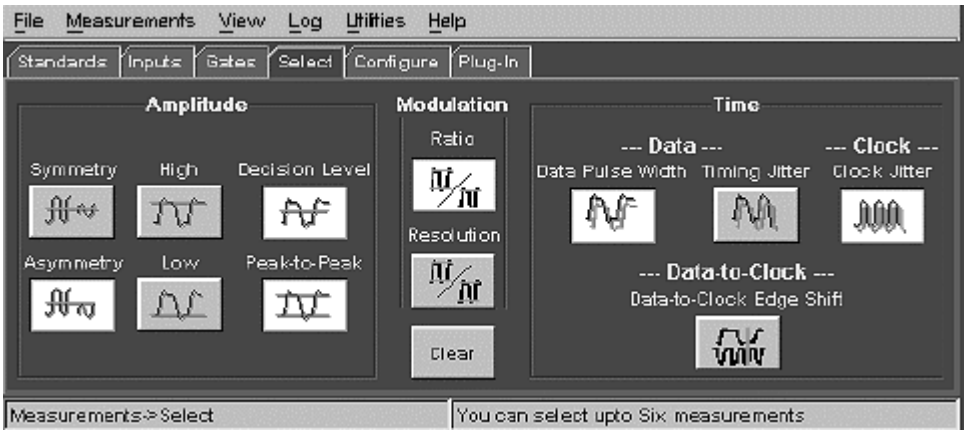
Option	Description
None button *	Turns off measurement gating
Cursors button	Turns on measurement gating
* Selecting None means that the oscilloscope evaluates the entire signal instead of the section between the cursors. None is the default setting.	

See Also

Using Cursors to Measure Part of a Waveform on page 38

The Measurements Select Menu

The Measurements Select menu lets you select which measurements to take on the optical signal. You can take up to six measurements at the same time.



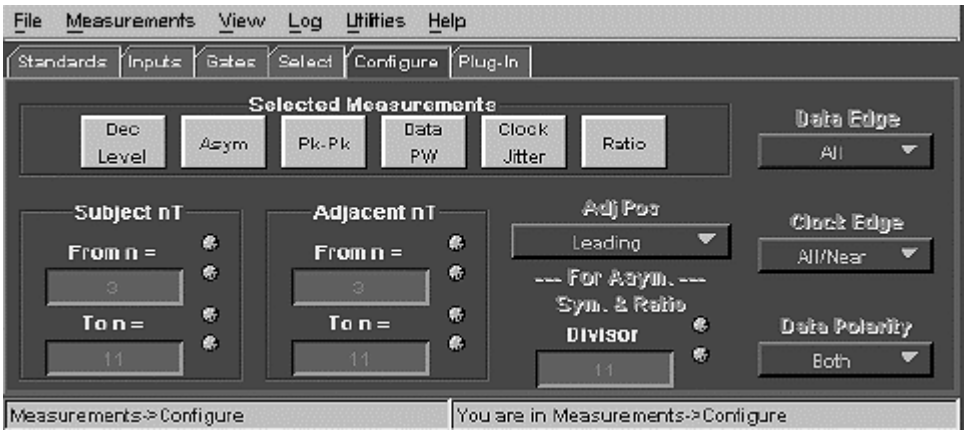
To select a measurement, click the button below the measurement label. You can select any combination of measurements, in any order.

Use the Clear button to deselect all selected measurements.

To configure selected measurement parameters, use the Measurement Configuration menu.

The Measurements Configuration Menu

You use the Measurements Configuration menu to configure measurement parameters for measurements selected in the Measurement Select menu.



To configure a selected measurement, select the button corresponding to a selected Measurement, and adjust the parameter values. Note that you cannot set different parameter values for each measurement. For example, you cannot set the Adj Pos value to Leading for one measurement and then set it to Trailing for a different measurement. All measurements will use the last values entered in the parameter fields.

Measurement Configuration Options

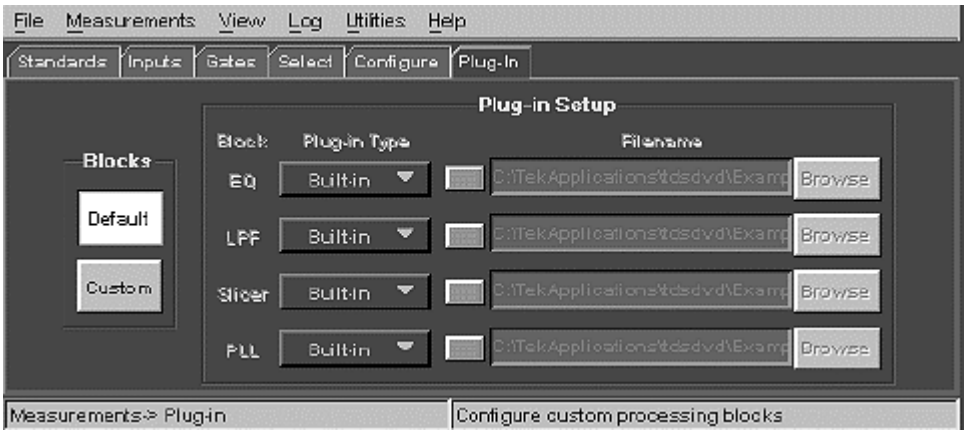
Option	Description
Selected Measurements buttons	Select a button to configure the associated measurement
Subject nT From n= To n=	Sets the range of subject nT pulses to measure
Adjacent nT From n= To n=	Sets the application to report results for only those subject nT that have adjacent nT pulse widths within the specified range
Adj Pos	Sets the application to report results for only those subject nT that have adjacent nT pulses in the specified position. The adjacent position can be Leading, Trailing, Leading AND Trailing, or Leading OR Trailing
For Asym, Sym and Ratio Divisor nT	Sets the nT pulse value to use in the denominator of symmetry, asymmetry, modulation amplitude ratio, and modulation amplitude resolution measurements
Data Edge	Set the data signal edge for measurements. Values are All,Rising, and Falling
Clock Edge	Set the clock signal edge for measurements. Values are All/Near, Rising, and Falling
Data Polarity	Set the data signal polarity type for measurements. Values are Positive, Negative, and Both
Note: All measurements use the same set of parameters: you cannot set different parameter values for each measurement. For example, you cannot set the Adj Pos value to Leading for one measurement and then set it to Trailing for a different measurement	

See Also

Measurement Configure Parameters on page 89

The Measurements Plug-In Menu

The Plug-in menu lets you replace the built-in (default) Equalizer, Low Pass Filter, Slicer, and Phase-Locked Loop signal processes with your own custom .dll or MATLAB-based .m files.



Plug-In Options

Option	Description
Built-In	Default Tektronix signal processing implementation
MATLAB™	User-created MATLAB .m file
DLL	User-created .dll file

See Also

Using the Plug-In Feature on page 46
DLL Plug-in Usage Conventions on page 74

MATLAB Plug-in Usage Conventions

Observe the following conventions when creating and using MATLAB .m plug-in files:

- To use MATLAB .m file plug-in processes, install MATLAB version 6.1 (or later) on the oscilloscope, or optionally on a PC if you are running the application on a PC, prior to using the plug-in with the application,
- To use MATLAB .m file plug-in processes, add the path to the *matlab.exe* file to the oscilloscope operating system path.
- The application comes with example .m files, one for each signal process block. These files are located at C:\TekApplications\tdsdvd\Example Programs\MATLAB. The file names are *tekEqualizer.m*, *tekLPF.m*, *tekSlicer.m*, and *tekPLL.m*.
- User-created MATLAB files must adhere to the interface requirements defined for each signal process type. You can view the example .m files to see the content and organization for each signal process type.
- You should copy the existing .m files, rename them, and then edit the copies to create new .M files with your process definitions.
- You should make a backup copy of the example .m files and place them in a different directory for safekeeping.

DLL Plug-in Usage Conventions

Observe the following conventions when creating and using .dll plug-in files:

- User-created .dll files must use the following file names for each signal process block type:

Signal processor block	.DLL file name
Equalizer	CustomEqualizerLibrary.dll
Low Pass Filter (LPF)	CustomLPFLibrary.dll
Slicer	CustomSlicerLibrary.dll
Phase-Locked Loop (PLL)	CustomPllLibrary.dll

- Place user-created .dll files in the *C:\Program files\TekApplications\tdsdvd* directory prior to starting the application. If you are running the application on a PC, you must place the .dll files in the same directory on both the PC and the oscilloscope.
- User-created .dll files must adhere to the interface requirements defined for each signal process type.

See Also

MATLAB Plug-in Usage Conventions on page 74

The View Menu

The View menu provides the following functions:

- Results displays measurement results. The View Results Summary Tab shows a table containing a summary of Mean, Min, Max, Standard Deviation, and Population values for each measurement. There are also tabs for displaying the results of each individual measurement.
- Waveforms opens a menu containing buttons for displaying selected waveforms at specific stages in the signal processing chain. Select one or more of the buttons to display the waveform data in the Plot window. Buttons available are HF, Clock, LPF, EQ, Levl'd, and Sliced. These buttons correspond to the signal processing stages as shown in the Measurements > Inputs Block Diagram window.

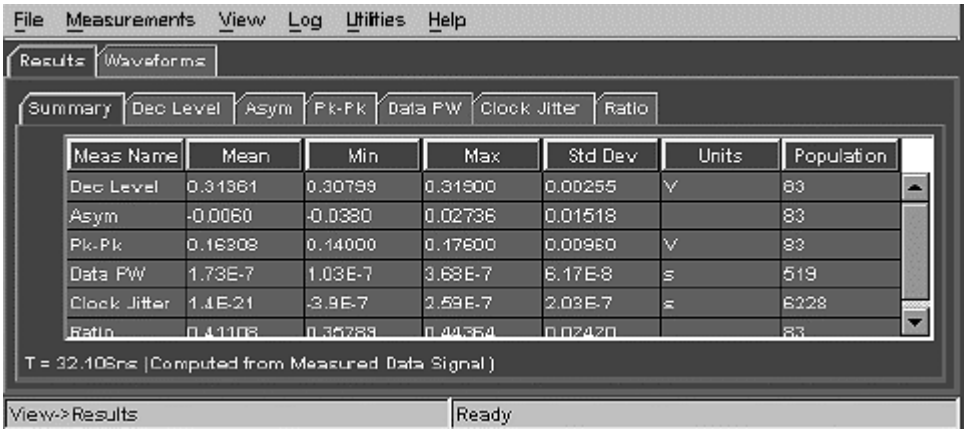
There are two areas of the View menu, the Results Summary menu and the Results Measurement menu.

See Also

The View Results Measurement Menu on page 76
The View Waveforms Menu on page 81
The Log Menu on page 82

The View Results Summary Menu

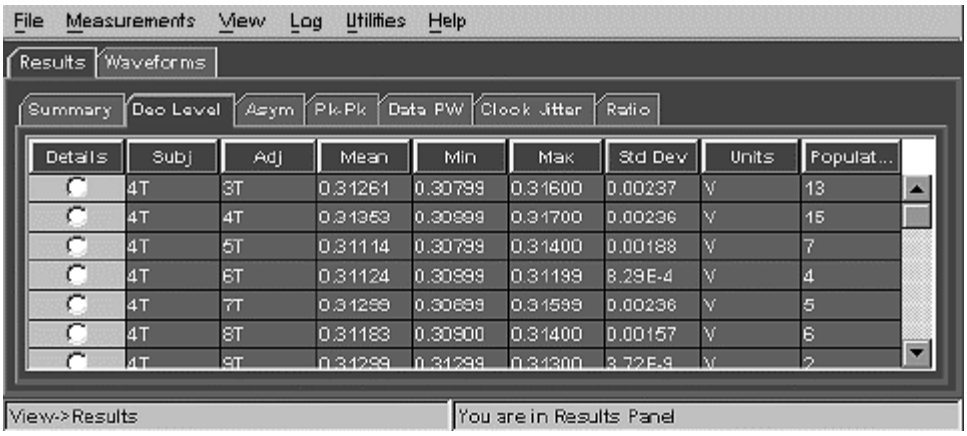
The Results Summary menu displays a table listing a summary of the measurement results, with each row listing the Mean, Min, Max, Standard Deviation, Units, and Population for a measurement.



Selecting any of the measurement tabs in this menu displays the View Results Measurement Menu, which displays statistical results for each subject/adjacent nT for the selected measurement.

The View Results Measurement Menu

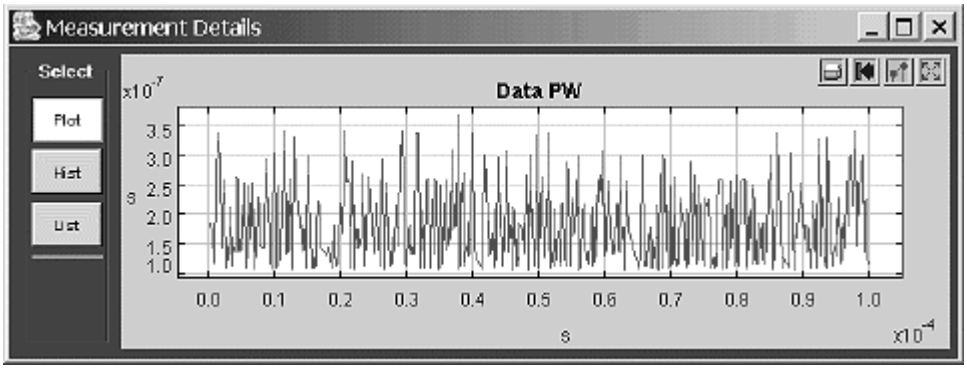
The View Results Measurement menu displays statistical results for the selected subject/adjacent nT.



The Details column lets you display a specific subject/adjacent nT measurement as a linear graph, a histogram, or as a list of values. Selecting a button under the Details column displays the Measurement Details menu.

The Measurement Details Menu

The Measurement Details menu displays measurement values either graphically or as a list of values. To activate the Measurement Details menu, select the button in the Details column of the Results menu adjacent to the measurement for which you want more detail. The default display is a linear plot of the selected measurement, as shown.

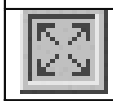


The available measurement display formats are Plot, Hist (histogram), and List Other functions within this frame let you save measurements to a file, set the histogram bin value, autofit or format the plot X and Y values, and print the measurement information.

You can resize the menu by selecting an edge or corner and dragging it to a new position. You can also use the mouse or touch screen to select a region of the plot and zoom in on that region.

Measurement Details Menu Options

This table describes the functions of the Measurement Details menu buttons and icons.

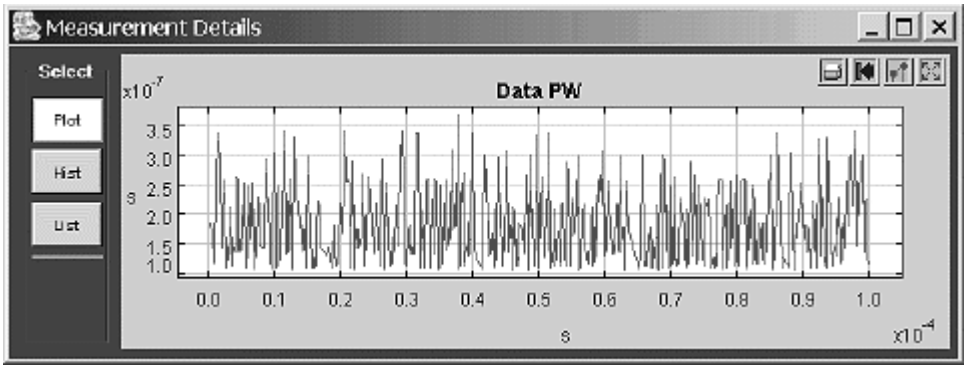
Option	Description
Plot button	Analyzes the variations of measured parameter values along time (or measurements) and displays the results as a linear plot
Hist button	Analyzes the statistical distribution (or density) of measurements and displays the results as a bar graph of accumulated hits (or cycles) vs. the measurement value
Ctrl button	Sets the histogram bin resolution value. This button is only available when displaying a histogram
List button	Displays the data points from which the statistics were derived as a list of numerical values
Save button	Displays the Save window which lets you write the measurement list values to a specified file name and directory. This button is only available when listing measurements
Control icons	Located in the upper right of the Measurement Details Frame
 Print icon	Prints the displayed plot or histogram to the oscilloscope default printer
 Reset icon	Resets X and Y axis ranges to their original values
 Format icon	Displays the Set Plot Format menu to set the plot parameters such as X and Y axis range and plot labels
 Rescale icon	Rescales the plot to fit the data

See Also

Histogram Display Example on page 78
List Display Example on page 79
Set Plot Format Menu on page 80

Plot Display Example

This is an example of a Data Pulse Width measurement graph plot.

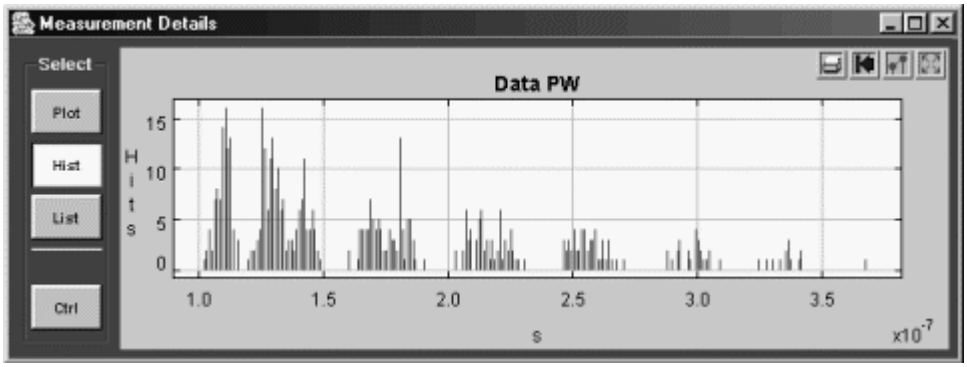


See Also

List Display Example on page 79

Histogram Display Example

This is an example of a Data Pulse Width measurement histogram plot.



See Also

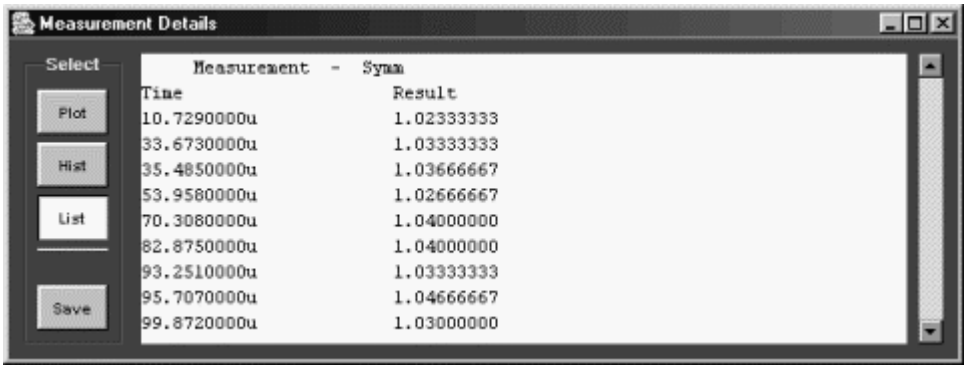
Histogram Ctrl button on page 79
Plot Display Example on page 78
List Display Example on page 79

Histogram Ctrl button

The Histogram Ctrl button displays a menu that lets you set the histogram bin resolution value. The bin values range from 5 to 500 in pre-defined increments.

List Display Example

This is an example of a measurement listing. You can use the Save button to save the results list to a file.

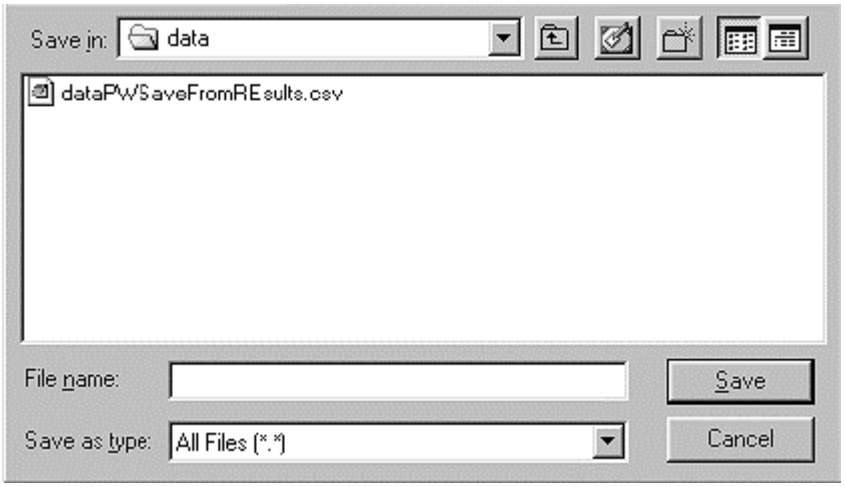


See Also

List Save Button on page 80
Plot Display Example on page 78
Histogram Display Example on page 78

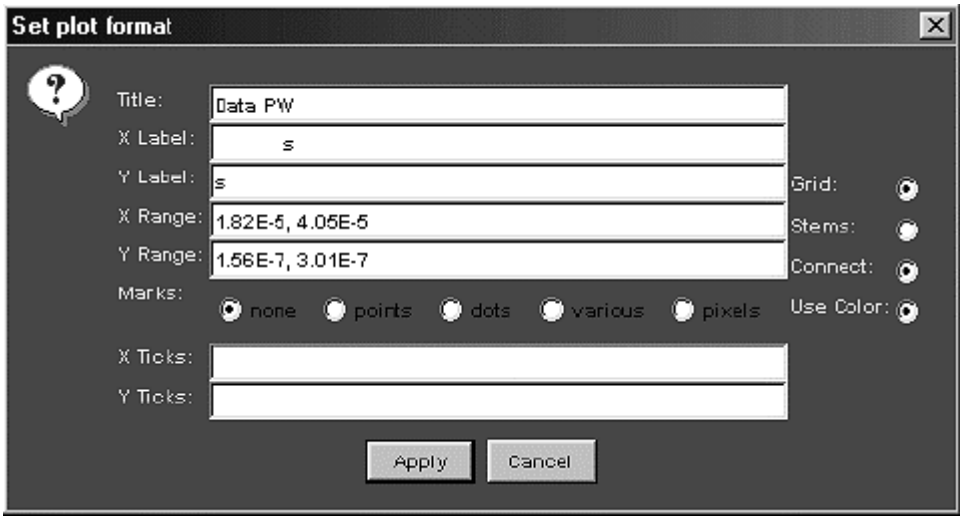
List Save button

The Measurement Details Save button displays a standard Windows dialog box that lets you save the measurement list values to a file in .csv format. Enter the file name and select the folder where you want to store the file.



Set Plot Format Menu

The Set Plot Format menu lets you change or add plot parameters such as the plot title, X and Y axis labels and data range, and plot tick marks.



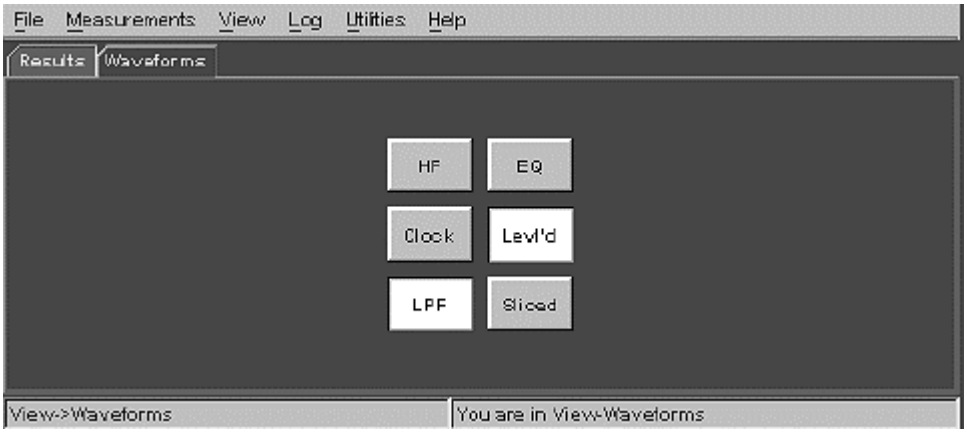
Set Plot Format Options

Item	Description
Title	Sets the plot title text displayed above the plot
X Label, Y Label	Sets the X and Y-axis label text
X Range, Y Range	Sets and displays the range of the displayed plot for the X-axis and Y-axis. The first value is the lower end of the range, followed by a comma, a space, and then the second value, which is the upper end of the range. You can use these fields to magnify areas of the plot by specifying a range of values that is less than the default axis range
Marks:	Sets how the data points are drawn
X Ticks, Y Ticks	Specifies the number of tick marks to display on the X-axis and Y-axis
Grid	Enables or disables displaying a grid on the plot
Stems	Draws a vertical line to each data point
Connect	Connects each data point with a line
Use Color:	Enables or disables using colors on the plot

You can resize the Measurement Details menu by selecting an edge or corner and dragging it to a new position. You can also use the mouse or touch screen to select a region of the plot and zoom in on that region.

The View Waveforms Menu

The View Waveforms menu lets you display waveform data at various stages of the signal processing path, in plot, histogram, or list format. You can select from one to six waveforms to plot at one time. Selecting a button opens the Measurement Details frame and displays the selected waveform as a linear plot. Each plot is shown in a different color.



View Waveforms Options

Option/button	Description
HF	The high frequency (HF) waveform
Clock	The clock waveform at the Clock Meas point selected in the Inputs Block Diagram (IBD)
LPF	The waveform at the output of the Low Pass Filter signal process block
EQ	The waveform at the output of the Equalizer signal process block
Levl'd	The leveled waveform data (the input to the Slicer comparator block)
Sliced	The waveform at the output of the Slicer signal process block

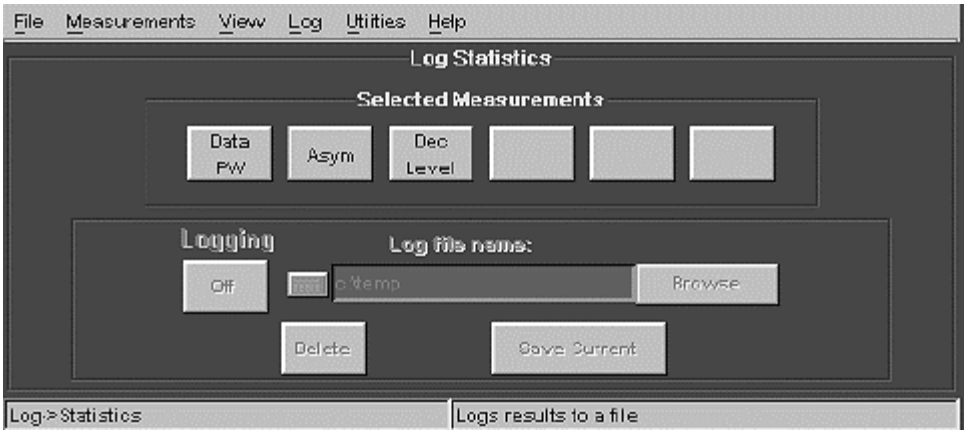
Note.
You can only view waveforms from active process blocks. For example, if you select Filtered as an input signal type and as a measurement output type, the Equalizer and Low Pass Filter waveforms cannot be viewed, as those process blocks are not active.

See Also

The Measurement Details Menu on page 76

The Log Menu

The Log menu lets you save measurement values for either a single measurement acquisition or a number of acquisitions into a .csv file. You can log up to six measurements at a time, but you must select and enable each measurement for logging. Each measurement is saved to a unique file name.



Data Logging Options

Option/button	Description
Selected Measurements Buttons	Select measurement for logging
Logging On/Off	Enables or disables logging. You must select a measurement before using this button
Log File Name Browse	Displays an Open dialog box where you can specify a file name and directory path where you want to save the selected measurement log file
Clear	Deletes the on-disk file (.csv) of the selected measurement. The path and file name are displayed in the Log file name field
Save Current	Saves the current selected measurement results in the .csv file displayed in the Log File Name field. You do not need to have Logging On to save the current measurement

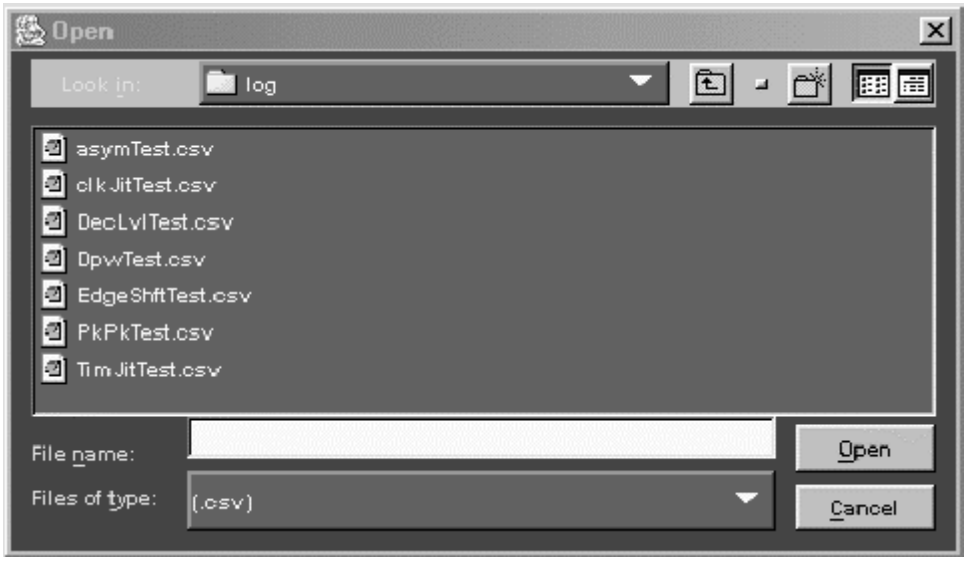
Note.
When the number of acquisitions in a log file reaches 10,000, that log file is renamed to <measurement_filename>old.csv, and a new log file named <measurement_filename>.csv is started.

See Also

Logging a Measurement to a File on page 43
Viewing a Data Log File on page 44
Data Log File Example on page 45
The Utilities Menu on page 84

Open File Menu (Browse Button)

You use the Open File menu to specify a new file name and/or directory for saving a measurement log file.



The Utilities Menu

The Utilities menu provides the following functions:

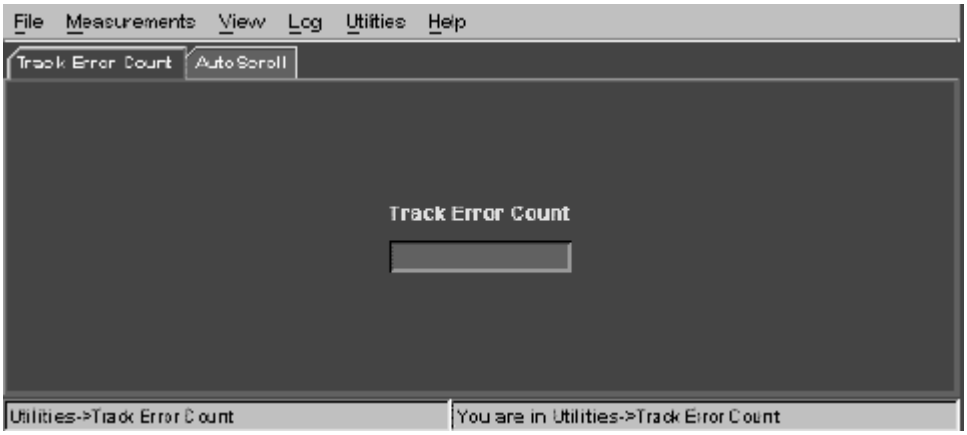
- Track Error Count displays the number of tracking errors.
- AutoScroll displays a zoomed image of the waveform and scroll back and forth through the waveform.

See Also

The Track Error Count Menu on page 85
The AutoScroll Menu on page 85

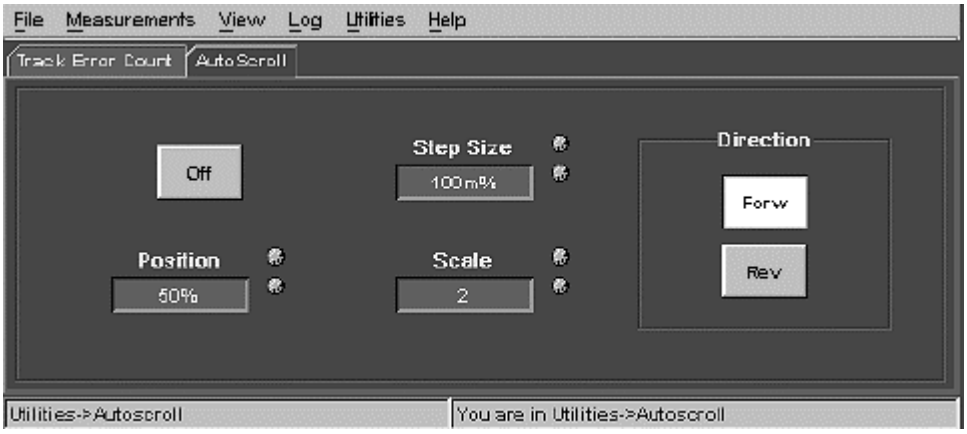
The Track Error Count Menu

The Track Error Count menu displays the number of tracking errors in the data signal, or the number of tracking errors between two cursors if gating is on.



The AutoScroll Menu

The AutoScroll menu (Utilities > AutoScroll) provides dynamic control of the zoom feature of the oscilloscope and duplicates the zoom controls.



AutoScroll Options

Option	Description
Off	Turns the instrument zoom window on or off
Position	Sets the horizontal position of the instrument zoom window, as a percentage of the total record length
Step Size	Sets the rate the instrument zoom window will automatically scroll horizontally, as a percentage of the total record length
Scale	Sets the horizontal magnification scale of the zoom window
Direction	Sets AutoScroll to scroll Forward (default) or Reverse (back) through the zoom window

See Also

Using AutoScroll on page 42

The Help Menu

The Help menu provides the following functions:

- Contents and Index displays the TDSDVD online help window.
- About TDSDVD displays the application version information.

See Also

Using Online Help on page 7

Parameters

Default Standards Parameters Table 1

The following table lists the first half of each standard's default parameter settings. Refer to Default Standards Parameters, Table 2 on page 88 for the rest of the default standards parameters.

Parameter	DVD-ROM	DVD-R	DVD-RAM	DVD+RW	Custom
Data Signal					
Type	HF-Data	HF-Data	HF-Data	HF-Data	HF-Data
Source	Ch1	Ch1	Ch1	Ch1	Ch1
Threshold	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V
Hysteresis	0.1 V	0.1 V	0.1 V	0.1 V	0.1 V
Clock Signal *					
Source	Ch2	Ch2	Ch2	Ch2	Ch2
Threshold	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V
Hysteresis	0.1 V	0.1 V	0.1 V	0.1 V	0.1 V
Ideal Clock **					
Period	40 ns	40 ns	40 ns	40 ns	40 ns
Equalizer					
b	1	1	1	1	1
c1	1.35	1.35	1.3	1.3	1.35
c2	-0.175	-0.175	-0.15	-0.16	-0.175
c3	-0.175	-0.175	-0.15	-0.16	-0.175
d1	2.093	2.093	2	2	2.093
d2	4.186	4.186	4	4	4.186
* Values only applied if measurement clock type is set to Clock Source ** Values only applied if measurement clock type is set to Synth Clock					

Default Standards Parameters Table 2

The following table lists the second half of each standard's default parameter settings. Refer to Default Standards Parameters, Table 1 for the first half of the default standards parameters.

Parameter	DVD-ROM	DVD-R	DVD-RAM	DVD+RW	Custom
Low Pass Filter					
Bandwidth	8.2 MHz	8.2 MHz	10 MHz	15 MHz	8.2 MHz
Slicer					
Bandwidth (-3dB closed-loop)	5 kHz	5 kHz	10 kHz	5 kHz	5 kHz
Init. Threshold	0 V	0 V	0 V	0 V	0 V
PLL					
Bandwidth (open loop bandwidth)	9 kHz	9 kHz	4.7746 kHz	12 kHz	9 kHz
PLL Type	DVD-ROM	DVD-R	DVD-RAM	DVD+RW	DVD-ROM
Measurement Configuration					
Subject nT					
From n=	3	3	3	3	3
To n=	11	11	11	11	11
Adjacent nT					
From n=	3	3	3	3	3
To n=	11	11	11	11	11
Adj. Position	Leading	Leading	Leading	Leading	Leading
Divisor nT	11	11	11	11	11
Data Edge	All	All	All	All	All
Clock Edge	All/Near	All/Near	All/Near	All/Near	All/Near
Data Polarity	Both	Both	Both	Both	Both

Measurement Configure Parameters

The following parameters are for the Measurements > Configure menu. Selecting a measurement button in this menu enables the appropriate parameter fields for that measurement.

Parameters	Value range	Default Settings
Subject nT		
From n =	1 to 25 in units of T	3
To n =	1 to 25 in units of T	11
Adjacent nT		
From nT =	1 to 25 in units of T	3
To nT =	1 to 25 in units of T	11
Adj Pos (Adjacent Position)	Leading Trailing Leading AND Trailing Leading OR Trailing	Leading
For Asym, Sym & Ratio Divisor	1 to 25 in units of T	11
Data Edge (Data-to-Clock Edge Shift measurement only)	Rising Falling All	All
Clock Edge	Rising Falling All/Near	All/Near
Data Polarity	Positive Negative Both	Both

Input Signal Parameters

The following parameters are for the Measurements > Inputs menu. The fields depend on which input source button was last selected in the Inputs Block Diagram panel.

Parameters	Selections	Default Settings
Source	Ch1-Ch4 Ref1-Ref4 Math1-Math4	Ch1
Pit/Space Shortest Longest	 0 to 24 in units of T 0 to 24 in units of T	 3 14
Threshold *	-10 to 10 in Volts	0
Hysteresis *	0 to 1 in Volts	0
Ideal Clock Period	0 to 1 s in units of 1 ps	200 ps
* Autoset affects the these settings		

Equalizer Coefficient Parameters

The following parameters are for the Equalizer process block.

Parameters	Value Range	Description
b	-10 to 10	The 3-tap analog equalizer boost value
c1	-10 to 10	The coefficient for the first tap of the 3-tap analog equalizer
c2	-10 to 10	The coefficient for the second tap of the 3-tap analog equalizer
c3	-10 to 10	The coefficient for the third tap of the 3-tap analog equalizer
d1	0 to 10	The first delay coefficient for the 3-tap analog equalizer
d2	0 to 10	The second delay coefficient for the 3-tap analog equalizer

Low Pass Filter Parameters

The following parameters are for the Low Pass Filter process block.

Parameter	Value Range	Description
Bandwidth	1 MHz to 500 MHz	The low pass filter corner frequency

Slicer Parameters

The following parameters are for the Slicer process block.

Parameter	Value Range	Default Setting	Description
Bandwidth	1 kHz to 500 kHz	Depends on selected standard	The Slicer corner frequency
Threshold	-3 to 3, in Volts	0 V	The low pass filter corner frequency

Phase-Locked Loop Parameters

The following parameters are for the Phase-Locked Loop process block.

Parameter	Value Range	Description
Bandwidth	1 kHz to 500 kHz	The Phase-Locked Loop first corner frequency
PLL Type	DVD-ROM DVD-R DVD-RAM DVD-RW	The source data type

Algorithms

About Measurements

Measurement Background

Measurement background provides information on signal terminology and characterization. Algorithm Equation Notation on page 96 describes the algorithms of the key application measurements.

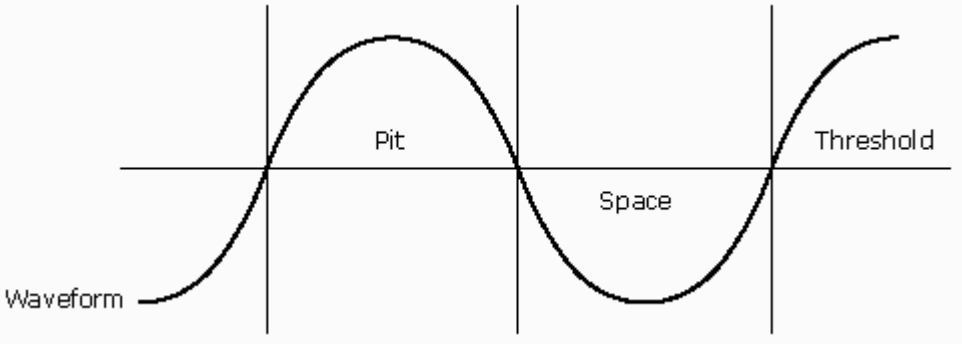
This application assumes that the following conditions are met in order to obtain measurements:

- The data source signal is a continuous physical data disk recording of nT pulses with no gaps or non-nT type data.
- The clock period (T) of the data source signal is constant.

See Also

Taking Measurements Guidelines on page 27

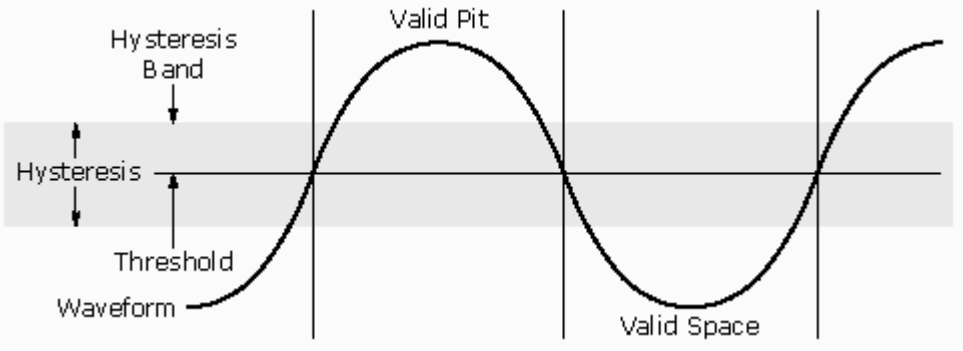
The Data Signal



The data signal waveform is first processed to identify the pits and spaces, the parts of the processed read-back waveform corresponding to the physical pits and spaces embossed on the media. Each waveform segment, delimited by threshold crossings, is a data pulse. The waveform segments are categorized as pits or spaces, depending on the polarity of the voltage corresponding to this data pulses (with respect to the threshold level).

Hysteresis

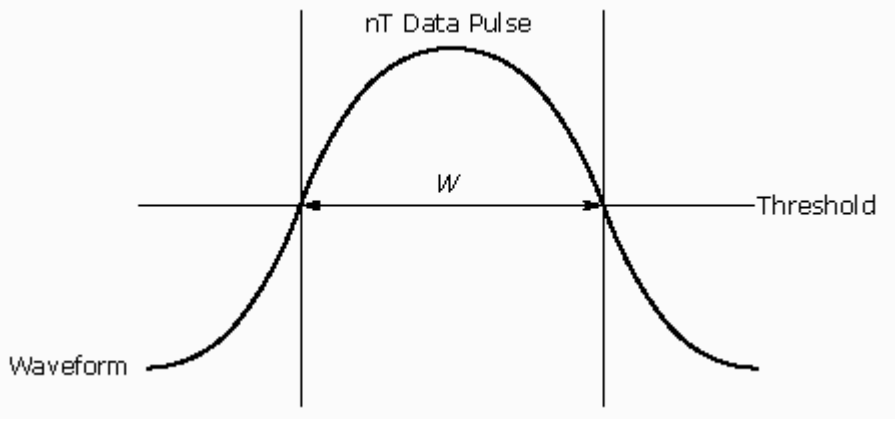
To prevent false reading of pits and spaces a hysteresis is used, as shown in the figure. To qualify as a valid pulse (pit or space) the voltage of the pulse must cross outside the hysteresis band to be recognized as a change to a second pulse (pit or space). Full crosses of the hysteresis band are necessary at each end of a pulse for that pulse to be identified as such.



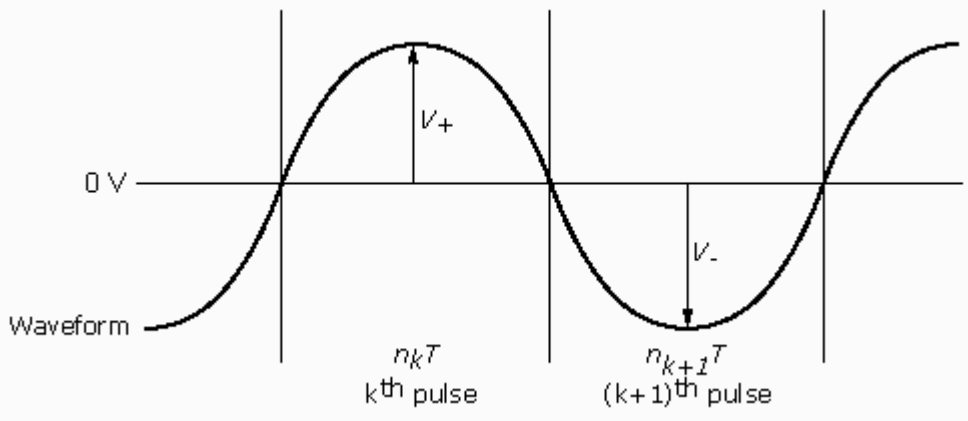
Data Pulse Categorization

Each pulse is the data-to-measure waveform is categorized as an nT pulse, where n is an integer, T is the clock period (average clock period if the clock is extracted or measured), and the following relation is true for the pulse width:

$$(n-0.5)T \le w < (n+0.5)T$$



High and Low Amplitude



Where

V_+ is the high amplitude (of the pit).

V_- is the low amplitude (of the space).

V_+ and V_- are referenced from zero volts.

k is an index that measures the number of pulses from the beginning of the analyzed waveform.

A pulse width W that satisfies the equation in Data Pulse Categorization is an nT pulse.

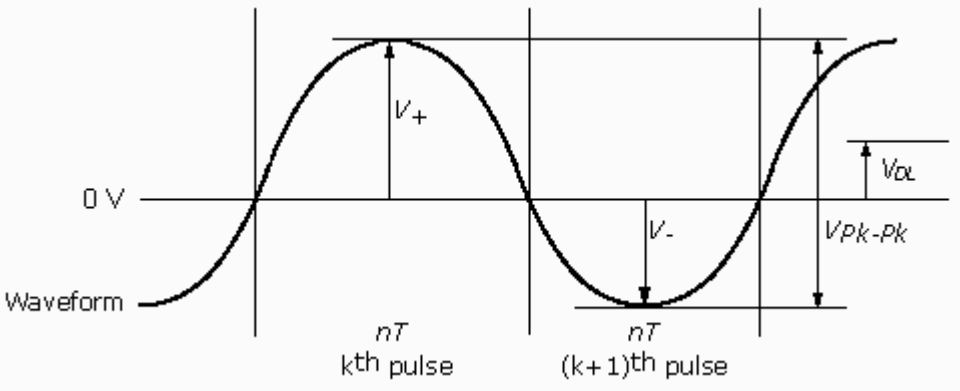
The individual pulse that is being measured algorithm is called the subject pulse. The neighboring pulses, the first to the left and to the right, are called adjacent pulses.

See Also

Peak-to-Peak and Decision Level on page 94
Data Pulse Categorization on page 92

Peak-to-Peak and Decision Level

If two adjacent pulses have the same nT categorization then two additional parameters of the pulse pair are defined.



Where

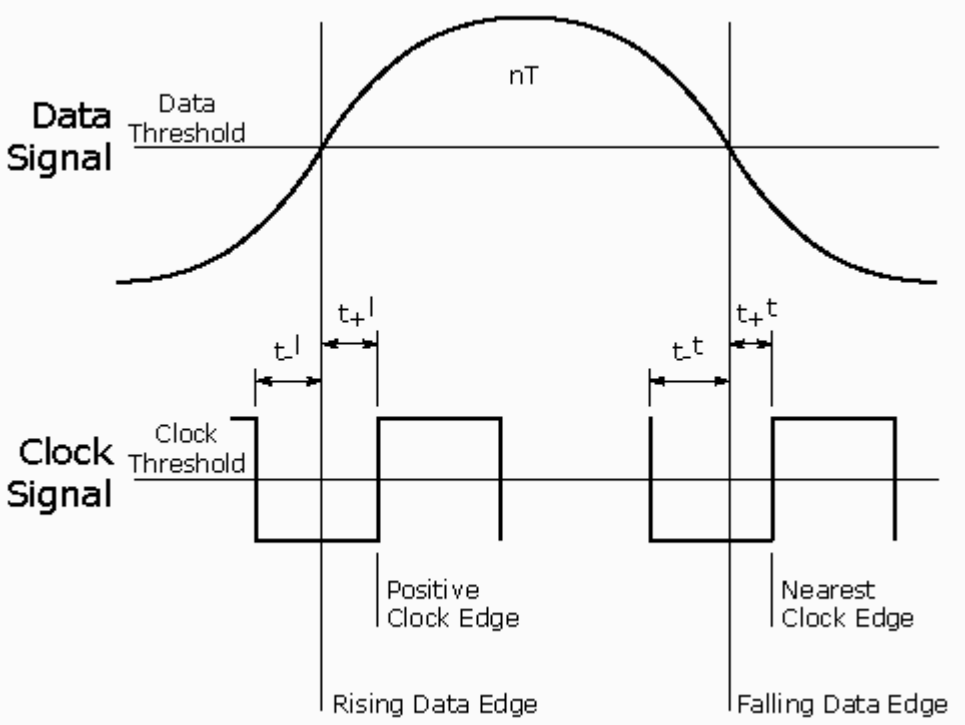
V_{Pk-Pk} is the peak-to-peak amplitude of the waveform

V_{DL} is the Decision Level, and is calculated by

(V+ + V-)/2, where *V* is measured with reference to zero volts

Data and Clock Time Parameters

The following are some basic data and clock waveform time parameters.



Measurement Algorithms

Algorithm Equation Notation

The algorithms in this document use the following notation:

Notation	Description
V_{+}^{n}	The high amplitude of a nT pit.
V_{-}^{n}	The low amplitude of a nT space.
V_{Pk-Pk}^{n}	The peak-to-peak amplitude of a nT pulse pair.
V_{DL}^{n}	The decision level of a nT pulse pair.
$\overline{V^{n}}$	The average of the corresponding measurement for all the nT pulses or nT pulse pairs.
w^{n}	The pulse width of a nT pulse pit or space.
$\overline{w^{n}}$	The average of the corresponding measurement for all the nT pulses.
t_{+}^{l}	The time difference between the leading edge of a data pulse and the following clock edge
t_{+}^{t}	The time difference between the trailing edge of a data pulse and the following clock edge
t_{-}^{l}	The time difference between the leading edge of a data pulse and the preceding clock edge.
t_{-}^{t}	The time difference between the trailing edge of a data pulse and the preceding clock edge.

High Amplitude

The High Amplitude measurement calculates the high amplitude, V_{+}^{n}, for each *nT* pit/pulse in the specified *nT* subject range.

Low Amplitude

The Low Amplitude measurement calculates the low amplitude, V_{-}^{n}, for each *nT* space/pulse in the specified *nT* subject range.

Decision Level Measurement

The Decision Level measurement calculates the decision level, V_{DL}^{n}, for each *nT* pit/space pulse pair in the specified *nT* subject range.

Peak-to-Peak Amplitude Measurement

The Peak-to-Peak Amplitude measurement calculates the peak-to-peak, V^{n}_{Pk-Pk}, for each *nT* pit/space pulse pair in the specified *nT* subject range.

Modulation Amplitude Ratio

The Modulation Amplitude Ratio measurement calculates the ratio, $V^{n1}_{Pk-Pk} \Big/ \overline{V^{n2}_{+}}$, for each n_1T pit/space pulse pair in the subject range, and for a specified divisor $n_2\ T$

Modulation Amplitude Resolution

The Modulation Amplitude Resolution measurement calculates the ratio, $V^{n1}_{Pk-Pk} \Big/ \overline{V^{n2}_{Pk-Pk}}$, for each n_1T pit/space pulse pair in the n_1T subject range and for a specified n_2T.

Symmetry Measurement

Symmetry calculates the ratio, $0.5\,V^{n1}_{DL} \Big/ \overline{V^{n2}_{Pk-Pk}}$, for each n_1T pit/space pulse pair in the subject range, and for a specified n_2T.

Asymmetry Measurement

Asymmetry calculates the ratio $(\overline{V^{n2}_{DL}} - V^{n1}_{DL}) \Big/ \overline{V^{n2}_{Pk-Pk}}$, for each n_1T pit/space pulse pair in the subject range and for a specified divisor n_2T.

Clock Jitter Measurement

The Clock Jitter measurement calculates a vector of time skews between the real and the ideal clock signals.

The clock signal can be measured from the system under test (SUT), extracted from the data, or synthesized by the application. The Clock Jitter measurement yields zero jitter when using an ideal (synthesized) clock.

Data Pulse Width Measurement

The Data Pulse Width measurement calculates the width of the data pulse, w^{n}, for each *nT* pulse in the *nT* subject range.

Timing Jitter Measurement

Timing Jitter calculates the difference between data pulse width and the average data pulse width, $w^n - \overline{w^n}$, for each active edge of an *nT* pulse in the subject range. The result is displayed normalized to the clock period (T) as a percentage based on the formula $100 * (w^n - \overline{w^n}) / T$.

Active data edges occur when an edge traverses the data threshold point in the specified direction.

Data-to-Clock Edge Shift Measurement

The Data-to-Clock Edge Shift measurement calculates the time difference between active data edges and active clock edges, t_+^l and/or t_-^l and/or t_+^t and/or t_-^t, for each active edge of a *nT* pulse in the *nT* subject range. Select the edge type (clock or data) in the Measurements > Configuration menu.

Mean

The Mean measurement calculates an unbiased estimate of the expected value of a finite set (*n*) of numerical data elements (grouped in a vector *x*). The measurement returns a scalar value.

$$\mu(x) = \frac{\sum_{i=1}^{n} x_i}{n}$$

Where *i* is the i-th element of vector *x*.

Standard Deviation Measurement

The Standard Deviation measurement calculates an unbiased estimate of the standard deviation of a finite set (*n*) of numerical data elements (grouped in a vector *x*), and returns a scalar $\sigma(x)$. The standard deviation is computed as the square root of the variance, as defined in the following formula:

$$\sigma^2(x) = \frac{\sum_{i=1}^{n} \left(x_i - \mu(x)\right)^2}{n}$$

where *i* is the i-th element of the vector *x*.

Equalizer

The Equalizer is a three-tap analogue equalizer specified by the three numerical values of the coefficients of its discrete transfer function, and two numerical

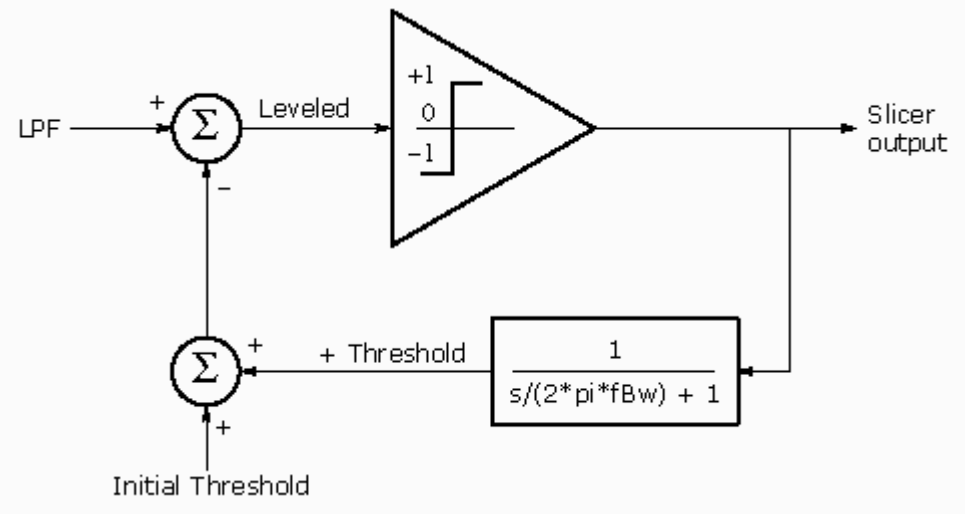
values for the corresponding tap delays. It provides an equalized signal based on a sampled input signal.

Low Pass Filter

The Low Pass Filter (LPF) is a 6th-order Bessel filter specified by the corner frequency. It provides a low-pass filtered signal based on a sampled input signal.

Slicer

The Slicer is a feed-back auto-slicer, 1st order of integration, and is specified by the frequency of the –3 dB closed-loop bandwidth. The Slicer produces two waveforms available for display: the Leveled waveform and the Slicer output waveform.

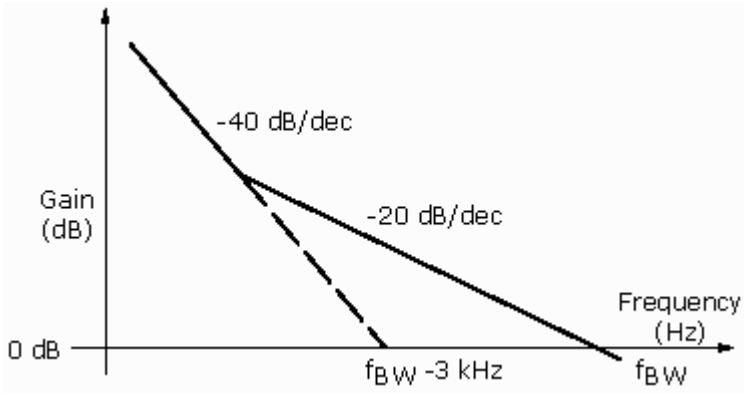


Phase-Locked Loop Type

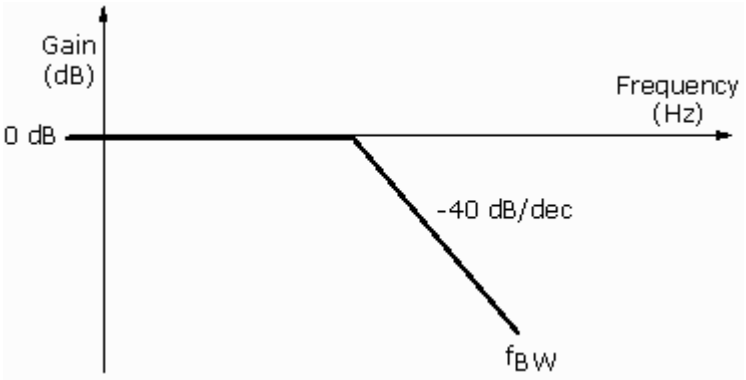
The Phase-Locked Loop (PLL) uses a PLL process to provide a recovered clock signal based on a NRZ data signal. The PLL open-loop bandwidth (f_{BW}) is a user-adjustable parameter.

There are three types of PLL available in the application, with the following filter transfer function characteristics, which cover various ECMA standard PLL requirements.

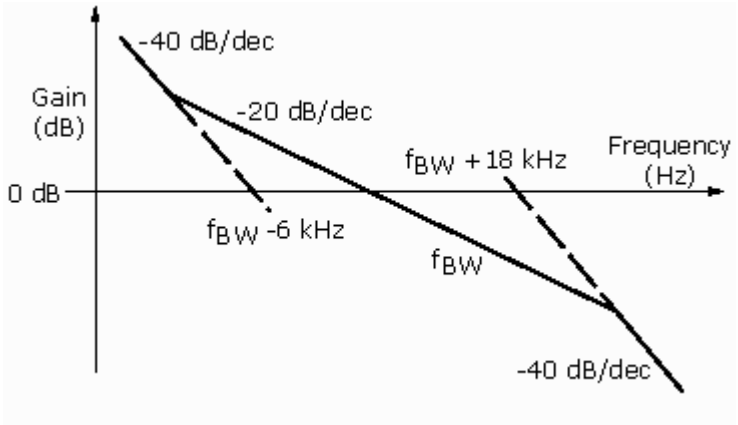
DVD-ROM and DVD-R



DVD-RAM



DVD-RW



GPIB Programming

Introduction to GPIB Command Usage

You can use the GPIB command syntax in your GPIB program to do the following tasks:

- Start the TDSDVD application.
- Recognize an active (running) application with GPIB protocol.
- Program and read application setup parameters.
- Sequence measurements.
- Read measurement results.

To use GPIB commands with your oscilloscope, you can use the following reference materials:

- The example GPIB program (TDSDVDctrl.c) file located in the C:\TekApplications\tdsdvd\Example Program directory, and also on the optional applications CD.
- The GPIB Program Example section on page 107 for guidelines to use while designing a GPIB program
- The Parameters section on page 87 for default values and value ranges of TDSDVD parameters
- The programmer information in the online help of your oscilloscope

GPIB Command Syntax

You should be familiar with the following terms when using GPIB command syntax:

Description: Gives the purpose of the command, conditions of its use, and its interactions with other commands.
Syntax: Gives the valid select and query command forms. The required arguments are listed in their proper order.
For example, in the syntax definition:
`PATH= <Ad><Ars>`
The arguments `<Ad>` and `<Ars>` are required in the order indicated.
Arguments: The arguments to a command are defined along with their range of values.
Returns: Defines the data returned in response to a command query.

See Also

Variable: Value TDS Command on page 103

Starting the Application Using GPIB

To start the TDSDVD2 application, you must send the oscilloscope the following GPIB commands:

Application:activate "{applicationName}"

Example: `Application:activate "Optical Storage Analysis"`

See Also

Variable: Value TDS Command on page 103
GPIB Application Command Arguments and Queries on page 104

Quitting the Application Using GPIB

To exit the TDSDVD2 application, send the oscilloscope the following GPIB command:

```
Variable:value "application", "exit"
```

See Also

Variable: Value TDS Command on page 103
GPIB Application Command Arguments and Queries on page 104

Controlling the Application Using GPIB

Application control is done using the VARIABLE:VALUE TDS GPIB command. This command has two forms, a command form accepting string arguments for the control or data variable and the value to set it to, and a query form with an argument designating the variable for which to return a value.

Example:

Variable:value "sequencerMode", "Single" sets the Sequencer mode to "Single"

Variable:value? "sequencerMode" returns the current sequencer setting string "Single"

Synchronization issues include:

- Determining when an application is running after an **Application:activate** command so that additional commands can be sent to the application
- Determining when measurement data is available after starting a measurement sequence.

To determine when an application is running, use the **Variable:value? "application"** query and check for the application name that you started.

Note.
The application may return the application name before the application is fully running. To ensure that the application is fully initialized, allow 30 to 60 seconds after starting the application before querying for the application run status.

To take a measurement, place the sequencer into Single mode using **Variable:value "sequencerMode"**, **"Single"** . Then send **Variable:value "sequencerState"**, **"Sequencing"** to start the measurement and **Variable:value? "sequencerState"** query checking for a "Ready" response

indicating the measurement has completed. At this time the measurement results can be queried.

Note.
*To prevent buffer overflows, send an *ESR? query frequently. The result should be examined to determine if there are events in the queue that should be processed before continuing. Refer to the instrument GPIB programming guide for more information.*

Variable: Value TDS Command

VARIABLE:VALUE TDS 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>" returns the current value of the specified variable name.

Note.
Commands are case and space sensitive. Your program will not operate correctly if you do not follow the capitalization and spacing precisely.

See Also

GPIB Application Command Arguments and Queries on page 104
Required GPIB Command Sequence on page 106
Results Returned by Measurements on page 106

GPIB Application Command Arguments and Queries Part 1

Variable name	Value	Function	Query return
application	{exit}	Quit (exit) a running application	Returns the name of the currently running application
sequencerMode	{Single_NoAcq, Free Run, Single}	Sets the sequencer mode	Returns the sequencer mode
sequencerState	{Ready, Paused, Sequencing}	Sets the state of the sequencer: Sequencing, Ready, Paused	Returns the state of the sequencer
reset	{results}	Clears the active measurement results	No query form
setup	{Default, Recall, Save}	Sets the recalled setup file name	Returns the saved setup file name
recallName	A string from one to eight characters long, containing A to Z and/or zero to nine	Sets the recalled setup file name	Returns the saved setup file name
saveName	A string from one to eight characters long, containing A to Z and/or zero to nine	Sets the setup file name	Returns the setup file name

See Also

GPIB Application Command Arguments and Queries Part 2 on page 105

GPIB Application Command Arguments and Queries Part 2

Variable name	Value	Function	Query return
<meas*> logAnnotate	Any string from 1 to 20 characters long, containing A to Z and/or zero to nine	Provides custom annotation to the statistics log file	Returns the logAnnotate string when set
<meas*> loggerDestination	A string containing characters from A to Z and/or zero to nine	Sets the statistics log file name for the specified measurement	Returns the statistics log file name
<meas*> LogDirectory	{Default}	Sets the directory to the default directory for logging the specified measurement	No query form
<meas*>logger	{Reset}	Deletes the current statistics log file	No query form
<meas*>loggerState	{On, Off}	Sets the state of the statistics log; when on, the statistics from the current acquisition are logged; see measurement in this table for <meas> choices	Returns the state of the data log
resultFor	{ High, Low, Dec Level, Pk-Pk, Symm, Asym, Ratio, Resoln, Data PW, Timing Jitter, Clock Jitter, D2CEdge Shift }	Sets the measurement for which results are requested	Returns the selected measurement; see Table B-2 for the queries associated with resultFor
* Values for <meas> can be one of the following: High, Low, Dec Level, Pk-Pk, Symm, Asym, Ratio, Resoln, Data PW, Timing Jitter, Clock Jitter, D2CEdge Shift			

See Also

GPIB Application Command Arguments and Queries Part 1 on page 104
Required GPIB Command Sequence on page 106

Required GPIB Command Sequence

Before you can request result queries, be sure that your program contains the following sequence of commands:

```
measurement
sequencerMode
sequencerState
resultFor
```

After this sequence, you can query the results. If you have subsequent sequencing for the same measurement, you must send another `resultFor` command.

Results Returned by Measurements

You need to use the VARIABLE:VALUE? form to enter measurement results queries in your GPIB program.

Measurement Results Queries Variable Names	Function
Mean	Returns the mean value of the result for the measurement selected in the resultFor variable
Min	Returns the minimum value of the result for the measurement selected in the resultFor variable
Max	Returns the maximum value of the result for the measurement selected in the resultFor variable
StdDev	Returns the standard deviation value of the result for the measurement selected in the resultFor variable
Population	Returns the population for the result for the measurement selected in the resultFor variable

GPIB Program Example

About the GPIB Program Example

The example GPIB program is a simple C program that starts the application, sets the application to take a Low Amplitude measurement, and then prints the mean value of the measurement results.

See Also

Guidelines to GPIB Programming on page 107
Display the GPIB Program Example on page 107
Introduction to GPIB Command Usage on page 101

Guidelines to GPIB Programming

Your GPIB program should comply with the following guidelines:

The application startup must complete before sending additional GPIB commands to the application (see example).

The measurements cycle must complete before data is queried (see example).

The error variable should be checked to ensure that an error has not occurred because of a measurement command problem.

You need to monitor the GPIB event queue to make sure the queue is clear before sending the next GPIB command. This is to prevent an event queue overflow error.

GPIB Program Example

```
/*  C Program Example:   TDSDVD GPIB control
*/

/*
================================================
================
 *  This sample program is for Tektronix Java
application TDSDVD --
 *  Optical Storage Analysis
 *
 *  Note1: In order to build the .exe correctly,
copy gpib-32.obj from
 *  "C:\Program Files\National
Instruments\GPIB\NI488\LangInt\C\" or
 *  "C:\Program Files\GPIB-NT\LangInt\C\ to
 *  the workspace.
 *
 */

#include <string.h>
#include <stdio.h>
#include <sys/timeb.h>
#include <windows.h>
#include "C:\GPIB-NT\LangInt\C\decl-32.h"

int start_application(/* in */ int scope);
int do_single_test(/* in */ int scope);
void check_status_register(/* in */ int scope);
```

```
void main (void)
{
   char  read_buffer           [100] = "";
   char  write_buffer    [100] = "";
   int        scope;
   int        status;

   /*
    * Open session for IBIC
     */
   scope  = ibfind ("DEV2");
   status = ibpad (scope, 1);
   status = ibtmo (scope, T10s);

   /*
    * In order for this program to work correctly,
the instrument should be in the "Header Off" state
     */
   sprintf (write_buffer, "%s", "Header Off");
   status = ibwrt (scope, write_buffer, strlen
(write_buffer));


   /*
    * Start Application
    */
   if (start_application(scope)){
        printf ("Application is started up!\n");

        // Load a ref waveform
        printf ("Loading reference waveform.\n");
        sprintf (write_buffer, "%s", "recall:wave
\"TekApplications/tdsdvd/Waveforms/50k_DVD-
ROM.wfm\", REF4");
        status = ibwrt (scope, write_buffer, strlen
(write_buffer));
       Sleep(2000);


        // Recall a setup
        printf ("Recalling gpibset1.\n");
```

```
         sprintf (write_buffer, "%s",
"Variable:value \"recallName\",\"gpibset1\"");
         status = ibwrt (scope, write_buffer, strlen
(write_buffer));
        Sleep(2000);
         sprintf (write_buffer, "%s",
"Variable:value \"setup\",\"Recall\"");
         status = ibwrt (scope, write_buffer, strlen
(write_buffer));
        Sleep(5000);
         check_status_register(scope);
        Sleep(500);

         /*
          * Turn on Log Statistics for Low
measurement
          */
         printf ("Activating logging.\n");
         sprintf (write_buffer, "%s",
"Variable:value \"Lowlogger\",\"Reset\"");
         status = ibwrt (scope, write_buffer, strlen
(write_buffer));
         sprintf (write_buffer, "%s",
"Variable:value \"LowloggerState\",\"On\"");
         status = ibwrt (scope, write_buffer, strlen
(write_buffer));
         sprintf (write_buffer, "%s",
"Variable:value \"LowloggerAnnotate\",\"Low
Annotation\"");
         status = ibwrt (scope, write_buffer, strlen
(write_buffer));
         /*A Timer is needed after setting the
loggerState on*/
        Sleep(2000);
         check_status_register(scope);
        Sleep(500);

         // trigger results for Low measurement
         // get the measurement values



         /*
          * Do a single test
```

```
          */
         printf ("Executing measurement
sequence.\n");

          if (do_single_test(scope)){

               /*
                * Set Measurement for which you want
to query test result -- TAA
                */
               sprintf (write_buffer, "%s",
"Variable:value \"resultFor\", \"Low\"");
               status = ibwrt (scope, write_buffer,
strlen (write_buffer));
               check_status_register(scope);


               /*A Timer is needed after setting the
measurement to be queried*/
               Sleep(500);


               /*
                * Query mean result
                */
               sprintf (write_buffer, "%s",
"Variable:value? \"mean\"");
               status = ibwrt (scope, write_buffer,
strlen (write_buffer));
               status = ibrd  (scope, read_buffer,
sizeof (read_buffer));


               if (ibcnt != 3) {
   /* It's not an empty string */
                    read_buffer [ibcnt] = 0;    /*
Get rid of extra characters */
                    printf ("Mean Low = ");
                    printf ("%s", read_buffer);
                    }
               }
          else
                    printf ("*** Fail to query
result ***\n");
```

```
   }
   else{
        printf ("*** Fail to start Application
***\n");
        return;
   }

   /*
    * Display Off for Ref4 before exiting
    */
   sprintf (write_buffer, "%s", "select:ref4 off");
   status = ibwrt (scope, write_buffer, strlen
(write_buffer));


   /*
    * Exit application
    */
   printf ("Exit application!\n");
   sprintf (write_buffer, "%s", "Variable:value
\"application\",\"exit\"");
   status = ibwrt (scope, write_buffer, strlen
(write_buffer));


   /*
    * Program Ending
    */
   printf ("Program Terminating Normally\n\n");

   return;

}



/*-------------------------------------------------
-----------------------------
 * Function: start_application
```

```
 * Argument: scope
 * Return:   1 if success, 0 otherwise
 *
 * This function starts the application and comfirms
the completion of startup
 */
int start_application(/* in */ int scope)
{
   char  read_buffer           [100];
   char  write_buffer    [100];
   char  app_name[30]    = "\"TDSDVD\"\n";
   int        status;
   int        timer = 0;
   int        i = 0;

    /*
     * Has application already been 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;    /* Get rid of extra
characters */

   if (strcmp(app_name, read_buffer) == 0){
        check_status_register(scope);
        Sleep(500);
        return 1;                   /* Application
is running, don't need to do anything */
   }

   /*
    * If application is not started up, start it and
wait for application to completely
    * start up
    */

   sprintf (write_buffer, "%s",
"Application:activate \"Optical Storage
Analysis\"");
```

```
   status = ibwrt (scope, write_buffer, strlen
(write_buffer));
    printf ("Starting application, please
wait...\n");
   Sleep(20000);

   while (strcmp(app_name, read_buffer) != 0){
         timer = timer + 2;
         if (timer > 45) {          /* The
application normally take 24 seconds to start up */
              printf ("***Application start up time
out***\n");
              return 0;             /* Something is
wrong if application does not start up in 30s */
         }
         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;/* Get rid of extra
characters */
       Sleep(2000);

   }
   /* Application start up! */
   check_status_register(scope);
    Sleep(500);

   return 1;
}


/*-------------------------------------------------
--------------
 * Function: do_single_test
 * Argument: scope
 * Return:   1 if success, 0 otherwise
 *
 * This function does a single measurement
 */
int do_single_test(/* in */ int scope)
```

```
{
   char  read_buffer           [100];
   char  write_buffer     [100];
   char  state[10]        = "\"Ready\"\n";
   int         status;
   int         timer = 0;
   int         i = 0;

   /*
    *  Start measurement
    */
    printf ("Do a single test...\n");
   sprintf (write_buffer, "%s", "Variable:value
\"sequencerState\",\"Sequencing\"");
   status = ibwrt (scope, write_buffer, strlen
(write_buffer));
    Sleep(2000);

    do{
         timer = timer + 2;
         if (timer > 60) {     /* Assuming a single
test takes less than 60 seconds */
              printf ("***Test time out***\n");
              return 0;        /* Something is wrong
if sequencerState does not come back
                                       * to Ready */
         }
         sprintf (write_buffer, "%s",
"Variable:value? \"sequencerState\"");
         status = ibwrt (scope, write_buffer, strlen
(write_buffer));
         status = ibrd  (scope, read_buffer, sizeof
(read_buffer));
         read_buffer [ibcnt] = 0;/* Get rid of extra
characters */
       Sleep(2000);
   }while (strcmp(state, read_buffer) != 0);

   check_status_register(scope);
    Sleep(500);

   return 1;
}
```

```
/*-------------------------------------------------
--------------
 * Function: check_status_register
 * Argument: scope
 * Return:   nothing
 *
 * This function checks the status register and
reads the all events
 * buffer, if needed, to purge it.
 */
void check_status_register(/* in */ int scope)
{
   int        status;
   char  write_buffer    [100];
   char  read_buffer          [1000];
   sprintf (write_buffer, "%s", "*ESR?");
   status = ibwrt (scope, write_buffer, strlen
(write_buffer));
   status = ibrd  (scope, read_buffer, sizeof
(read_buffer));
   if (0 != status)
   {
         sprintf (write_buffer, "%s", "ALLEV?");
         status = ibwrt (scope, write_buffer, strlen
(write_buffer));
         status = ibrd  (scope, read_buffer, sizeof
(read_buffer));
   }
}
```