

# TDSPTD Protocol Trigger and Decode Application Online Help



077-0025-02

**Tektronix**



**TDSPTD  
Protocol Trigger and Decode Application  
Online Help**

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Protocol Trigger and Decode Application Online Help, 076-0063-02

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

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

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# General Safety Summary

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

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

*Only qualified personnel should perform service procedures.*

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

## To Avoid Fire or Personal Injury

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

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

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

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

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

## Terms in this Manual

These terms may appear in this manual:



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

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

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## Product Description

The Protocol Trigger and Decode (PTD) application enables you to decode and simultaneously display protocol-level information and physical layer signaling.

The PTD application includes the following features:

- Simultaneously view signal, characters, and protocol
- Decode 8b/10b encoded serial data
- Correlate events across physical and link layers
- Synchronize your oscilloscope and protocol views
- Synchronize user specific pattern with the waveform
- Adjust threshold values for bit detection

## Related Documentation

Refer to the Optional Applications Software on a Windows-Based Oscilloscope Installation Manual for the following information.

- Software warranty
- List of all available applications, compatible oscilloscopes, and relevant software and firmware version numbers
- Applying a new label
- Installing an application
- Enabling an application
- Downloading updates from the Tektronix Web site

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**NOTE.** You can view PDF files of the reference guide and the installation manual from the CD Installation Browser and from the Documents directory on the Optional Applications Software on a Windows-Based Oscilloscope CD-ROM.

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## Application CD Contents

The Optional Applications Software on a Windows-Based Oscilloscope CD-ROM includes files for the following types of documentation:

- Printable file of the RT-Eye Serial Data Compliance and Analysis online help

- Printable file of the Protocol Trigger and Decode Tool online help
- PDF files of the Methods of Implementation (MOI) for the InfiniBand, PCI Express, and FB-DIMM serial data standards as they apply to the corresponding compliance modules
- Reference guides
- Optional Applications Installation manual

## Access to PDF Files

You can use any of the following methods to view the various PDF files associated with this application:

- Access a file in the Documents directory on the Applications CD from any PC
- Select a file from the **Start** menu in the oscilloscope task bar; you may need to first minimize the application
- Access a file from the **Help** drop-down list in the PTD application

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**NOTE.** If you do not have an Acrobat reader to view a PDF file, you can get a free copy of the reader from the [www.adobe.com/products/acrobat](http://www.adobe.com/products/acrobat) Web page.

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## Conventions

Online help topics use the following conventions:

- The term “click” is used to indicate choosing an option either with a mouse or by tapping as you would with a touch screen
- The term “Compliance Module” refers to optional “plug-in applications” from Tektronix used for compliance testing to specific serial data standards
- The term “channel” is context dependent. It can refer to the transmit channel of the device under test or to an oscilloscope channel
- The term “DUT” is an abbreviation for Device Under Test
- When steps require a sequence of selections using the application interface, the ">" delimiter marks each transition between a menu and an option. For example, one of the steps to recall a setup file would appear as **File > Recall**

## Feedback

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

You can email your feedback to [techsupport@tektronix.com](mailto:techsupport@tektronix.com), FAX it to (503) 627-5695, or call 1-800-833-9200 (select option 3). Please be as specific as possible and include the following information:

### General Information

- Oscilloscope model number and hardware options, if any
- Probes used
- Serial data standard
- Signaling rate
- Your name, company, mailing address, phone number, FAX number

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**NOTE.** Please indicate if you would like to be contacted by Tektronix regarding your suggestion or comments.

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### Application-Specific Information

- Software version number
- Description of the problem such that technical support can duplicate the problem
- If possible, save the oscilloscope waveform file as a .wfm file
- If possible, save the oscilloscope and application setup files from the application to obtain both the oscilloscope .set file and the application .ini 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 "PTD Problem," and attach the .set, .ini, and .wfm files.

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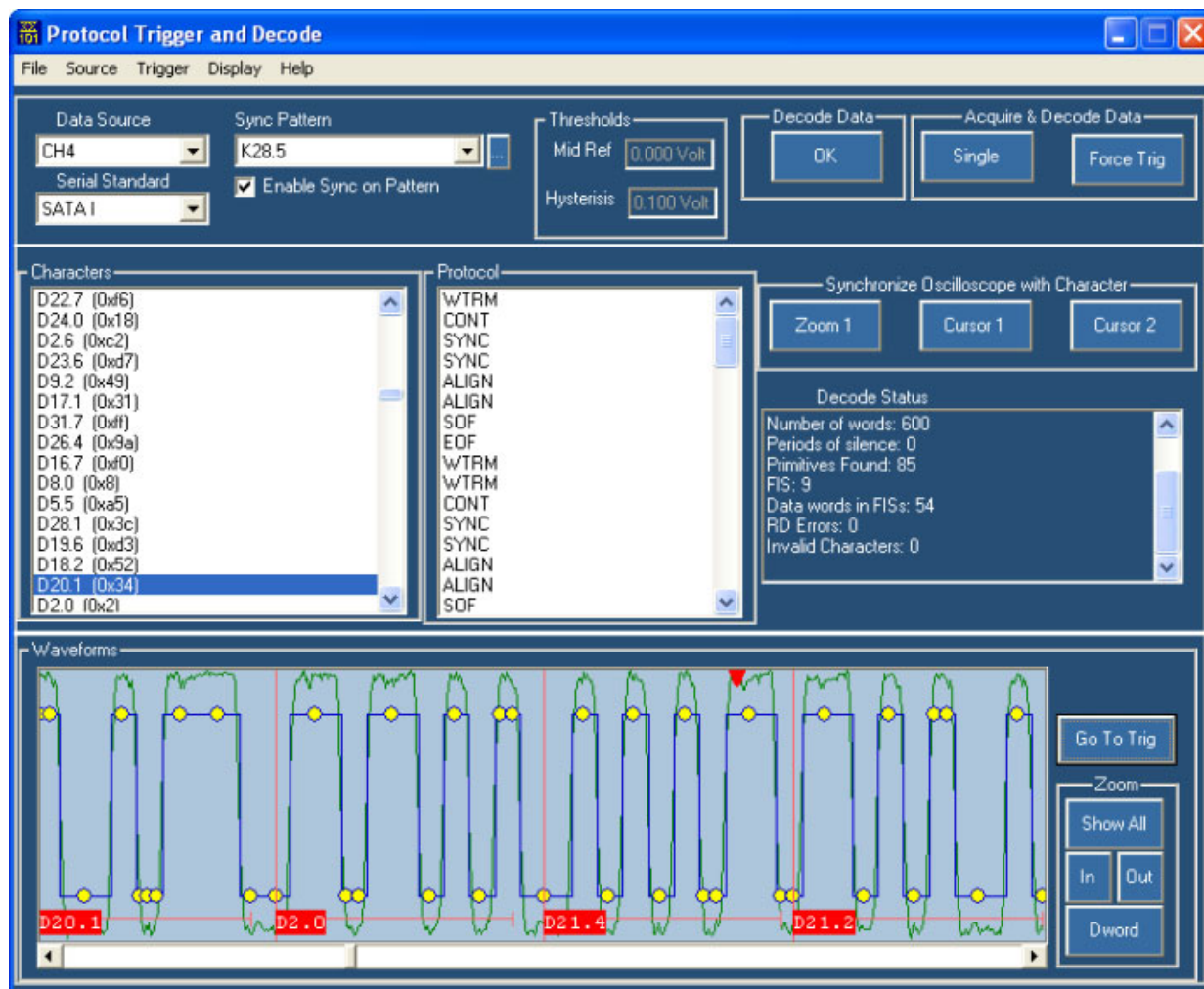
**NOTE.** To include screen shots, from the oscilloscope menu bar, select File > Export. In the Export dialog box, enter a file name with a .bmp extension and select Save. The file is saved in the C:\TekScope\Images directory. You can then attach the file to your e-mail (depending on the capabilities of your e-mail editor).

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## Protocol Trigger and Decode Control Window

The Protocol Trigger and Decode control window consists of three windows, which you can show or hide from view. Use the Display > Views menu to select which windows to show and which ones to hide from view.



The application window includes:

- Controls for selecting data sources and serial standards
- Controls for the type of information displayed
- Controls for oscilloscope acquisitions
- Control for selecting/entering user patterns
- Read out threshold values for bit detection

The symbolic window includes:

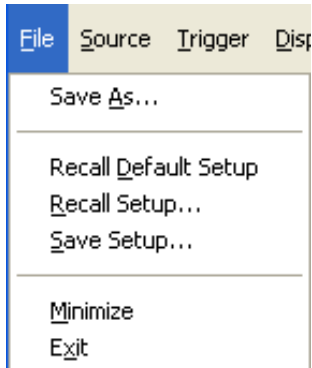
- Character and protocol displays
- Controls for configuring information display
- Controls for synchronization
- Status readout of the decode process

The waveform window includes:

- Waveform display
- Horizontal zoom controls
- TriggerT display control

## File Menu

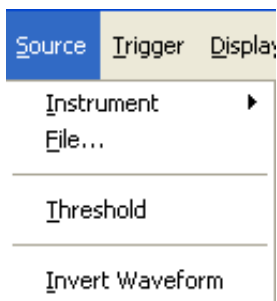
The File menu has the following options:



Menu Selection	Function
Save As...	Saves the decoded information.
Recall Default Setup	Recalls the default settings of the application.
Recall Setup...	Recalls the settings from the selected file.
Save Setup...	Saves the settings in the selected file.
Minimize	Minimizes the application window.
Exit	Closes the application.

## Source Menu

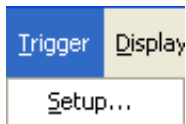
The Source menu has the following options:



Menu Selection	Function
Instrument	<ul style="list-style-type: none"> <li>■ Displays a list of data sources: Channels 1–4, Ref 1–4, and Math 1–4.</li> <li>■ Files allows you to browse for waveforms stored in .wfm format.</li> </ul>
File...	Opens a waveform file for decoding.
Threshold	Opens the <a href="#">Threshold entry dialog box (see page 16)</a> to enter threshold values.
Invert Waveform	Inverts the waveform.

## Trigger Menu

The Trigger menu has the following options:



Menu Selection	Function
Setup...	Opens the <a href="#">Trigger Setup Control dialog (see page 12)</a> .

## Display Menu

The Display menu has the following options:

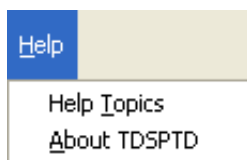




Menu Selection	Function
Views	Displays the following options: <ul style="list-style-type: none"> <li>■ All – Displays the entire application window.</li> <li>■ Protocol – Displays the Symbolic window and hides the waveform window.</li> <li>■ Waveform – Displays the Waveform window and hides the Symbolic window.</li> <li>■ None – Displays only Application Controls window.</li> </ul>
Word Names	Displays Dwords in the Waveform window.
Sample Points	Displays Sample points on the waveform.
Recovered Signal	Displays the Recovered Signal in the Waveform window.
Original Signal	Displays the Original Signal in the Waveform window.
Grid and Levels	Displays grids and levels in the waveform.
SATA Decoding	Displays the following options: <ul style="list-style-type: none"> <li>■ Primitives – Displays Dwords (four-character sequences) beginning with a control character in the Protocol display.</li> <li>■ FIS – Displays Frame Information Structure, disassembly includes frame header information.</li> <li>■ ATAPI – Displays AT attachment Packet interface.</li> </ul>
Always on Top	Keeps the Protocol Trigger and Decode application window always on top.

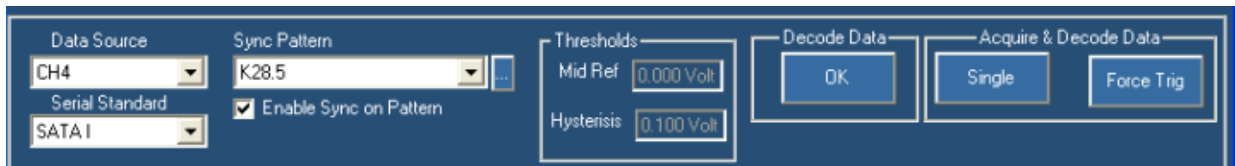
## Help Menu

The Help menu has the following options:



Menu Selection	Function
Help Topics	Displays TDSPTD help file (.chm).
About TDSPTD	Displays a dialog box with the version number and the copyright information of the application.

## Application Controls




The application window includes controls for selecting data sources and serial standards, the type of information displayed, and oscilloscope acquisitions and synchronization.

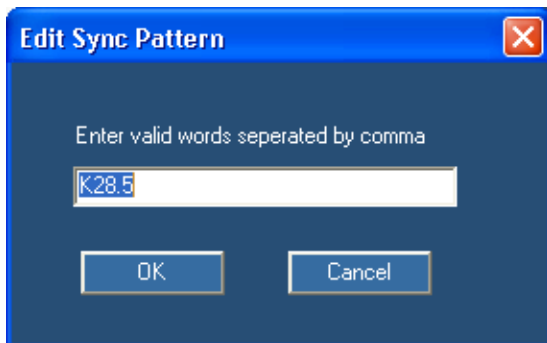
Use the **Data Source** drop-down list to select your data source. Data sources can be Channels 1-4, Ref 1-4, or Math 1-4. Selecting File allows you to browse for waveforms stored in .wfm format.

Use the **Serial Standard** drop-down list to select the serial standard that you want to use in your analysis. You can select PCI Express, SATA, or a user-defined standard. The standard that you select will also determine what appears in the Character and Protocol displays.

**Enable Sync on Pattern** option will allow you to enable/disable synchronization on the pattern.

If you need to synchronise a specific pattern for the waveform, select a serial standard from the drop-down list, and use **Sync Pattern: Enable** drop-down box to choose from a list of user patterns populated from the User Pattern folder (C:\TekApplications\TDSPTD\UserPattern). The files in this folder are editable and are in the “standard”.csv format, for example, SATA 1.csv.

You can enter a specific sequence of the pattern ranging from 1 character upto 4 characters separated by commas. For example, K28.5, D10.5, D25.4, D24.4. Click  next to the **Sync Pattern** drop-down list to enter a user pattern range in the Sync Pattern field, the following dialog box appears. If you enter an invalid text and click OK, the message “Invalid entry” is displayed.



The Mid Ref and Hysterisis values entered in [Threshold entry dialog box \(see page 16\)](#) is displayed under **Thresholds**.

Click **Decode Data** to analyze the data that is currently selected in the Data source drop-down list.

If you need to acquire data, click **Single**. This button works similarly to Single button on the front panel of an oscilloscope. Clicking the Single button in the application starts an acquisition, analyzes the acquired data, and then updates the display windows. Use the Force Trig button if you need to simulate a trigger event to complete the acquisition. After the acquisition is complete, the application analyzes the acquired data and updates the display windows.

## Symbolic Area Controls

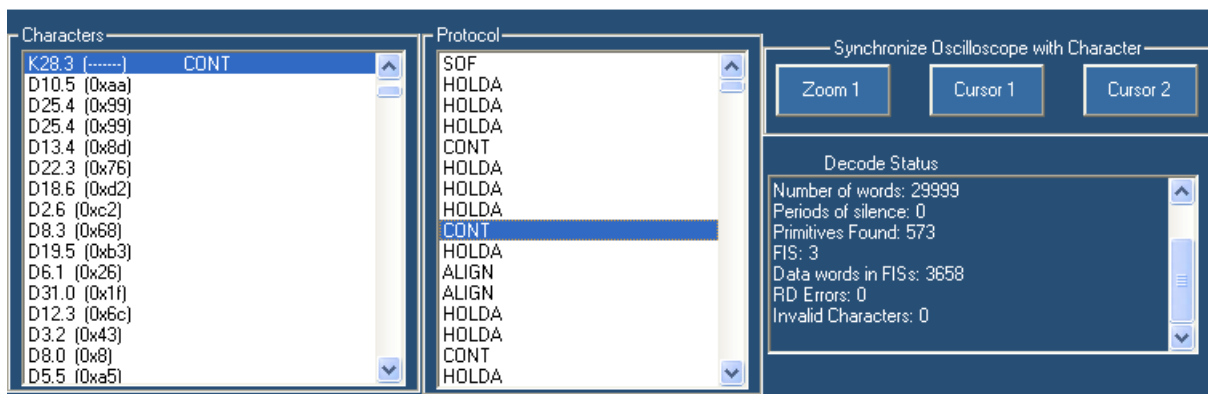
The symbolic window controls character and word displays as well as configuring information displays.

Click **Display > Sata Decoding** to select the level of abstraction that you want in the Protocol display.

To synchronize the host oscilloscope with the data that is displayed by the application, use the buttons under Synchronize Oscilloscope with Character. If you want to see the same area on your oscilloscope that is displayed in the Waveform window of the PTD application, click **Zoom 1**. The oscilloscope will zoom in on the portion of the waveform that you have displayed in the PTD application.

To synchronize the host oscilloscope using cursors, be sure that you have cursors turned on and set to V-bars on the host instrument. Select a line in either the Character or Protocol display, and click **Cursor 1**. The position of Cursor 1 on the oscilloscope will be updated to match the selection in the PTD application.

The **Decode Status** is a scrolling area that displays information about the decoding process.



The **Display > Sata Decoding** menu has the following choices:

- Primitives-Dwords (four-character sequences) beginning with a control character
- FIS-Frame Information Structure, disassembly includes frame header information
- ATAPI-AT Attachment Packet Interface

**NOTE.** The Protocol window will be blank if you select FIS or ATAPI with standards other than SATA. Only SATA contains FIS and ATAPI structures.

## Waveform Area Controls

The waveform window displays the waveform and annotations and allows you to zoom a displayed waveform.

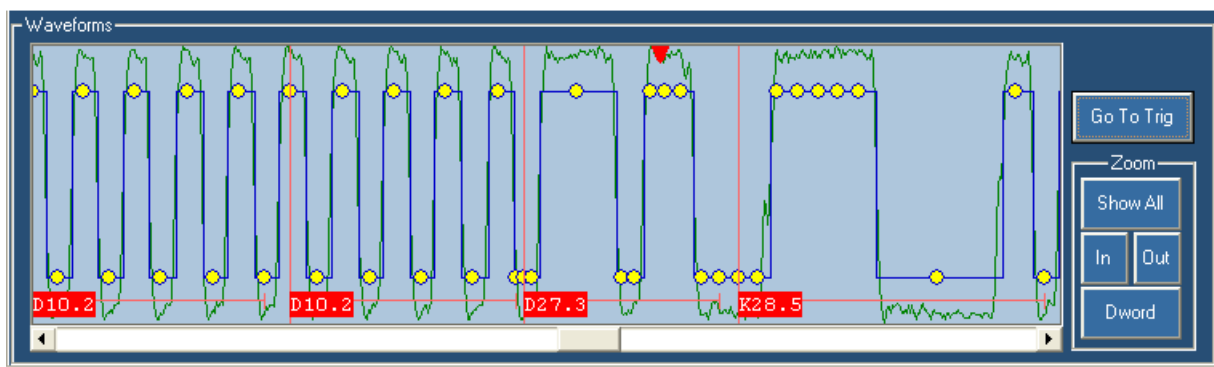
To display the entire waveform without the sample points or the word names, click **Show All**.

To magnify the waveform horizontally, click **In**.

To reduce the waveform, click **Out**. If the waveform is too congested, the sample points and Dwords are not visible.

Click **Dword** to set the waveform window to contain four 10b symbols of data.

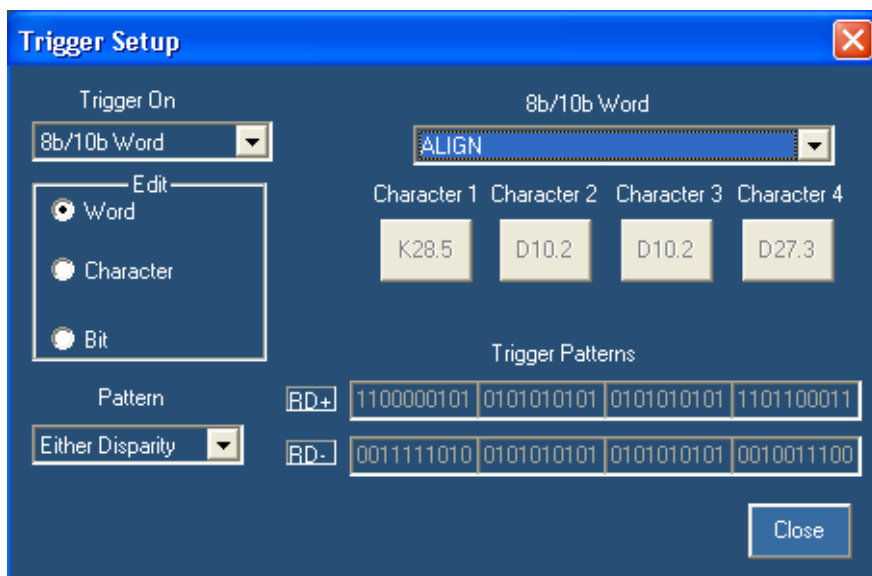
Click **Go To Trig** to display the trigger 'T' position in the waveform view (in the software) corresponding to the position on the oscilloscope display.



## Trigger Setup Controls

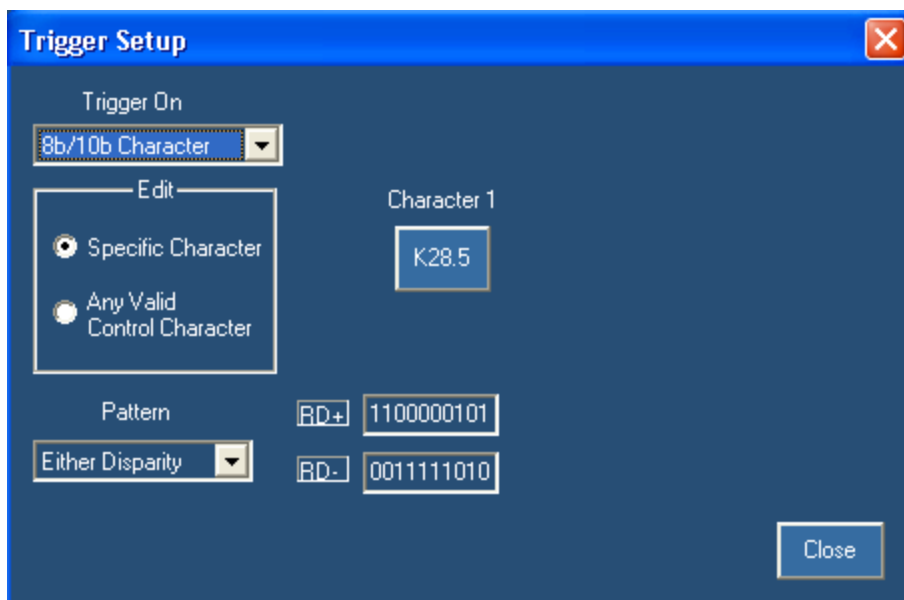
Use the Trigger Setup control window to set up direct hardware triggering on 8b/10b characters and words. This enables you to fill the memory of the instrument with an event of interest rather than taking a random snapshot. Serial protocol triggering allows you to isolate a variety of link layer control sequences, or faults. To open this control window, go to the PTD Trigger menu and select **Setup**.

Use the **Trigger On** drop-down list to select different serial trigger types: 8b/10b Word, 8b/10b Character, 8b/10b Code Error, or Bit Pattern. Selecting **8b/10b Word** allows you to specify a four-character sequence of 8b/10b-coded characters to trigger on. This can be either from a list of predefined words or as individual characters. To select predefined primitives, select Word from the Edit group box, and then use the 8b/10b Word drop-down list to select the word. The standard determines the predefined words that are available in the list.



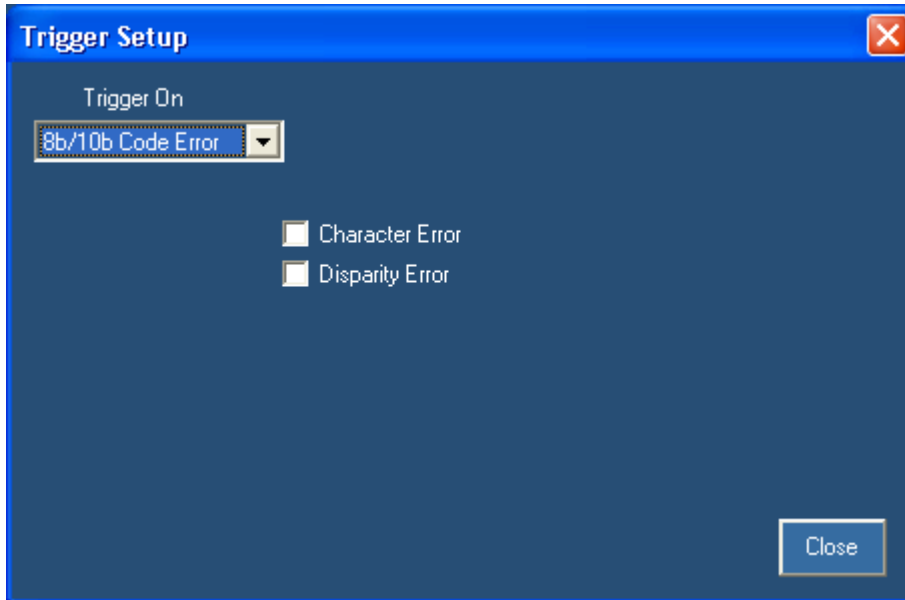
To select individual characters, you must choose Character from the Trigger group box. The Character 1-4 buttons display the value for the currently selected word. You can change the character values by clicking a Character button.

Select **8b/10b Character** from the **Trigger On** drop-down list to trigger on only one character. Selecting Specific Character from the Edit group box allows you to trigger on one specific character. Click **Character** to change the character value that you want to trigger on. Selecting Any Valid Control Character allows you to trigger on the first valid control character found.

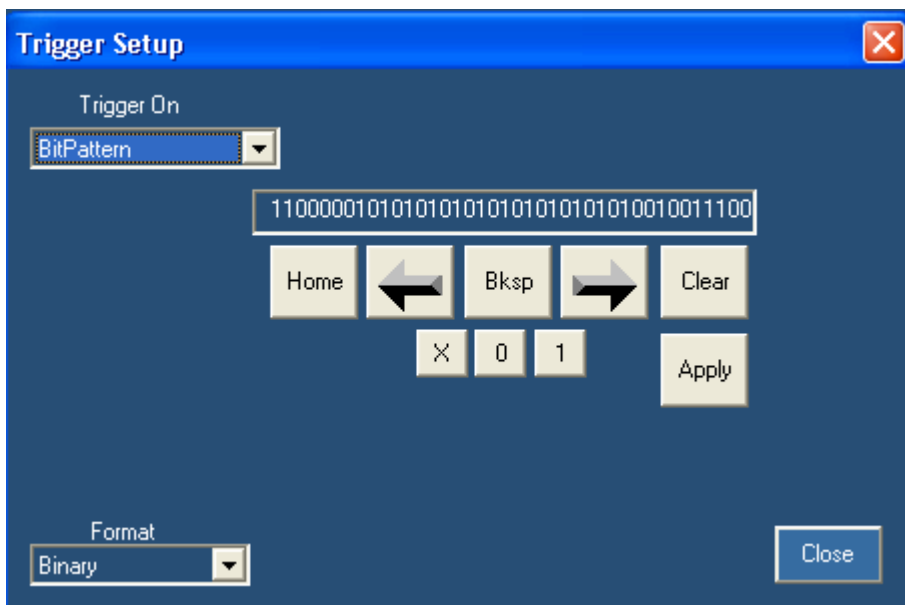


By default, the trigger system is loaded with patterns for both positive and negative running disparity. You can use the **Pattern** drop-down list to select only characters that arrive after a positive or a negative running disparity. Note that the Trigger Patterns reflect your selection in the Pattern drop-down list.

To trigger on a code error select **8b/10b Code Error** from the **Trigger On** drop-down-list, and then select the type of errors that you want to trigger on. You can select one of the error options from the list.



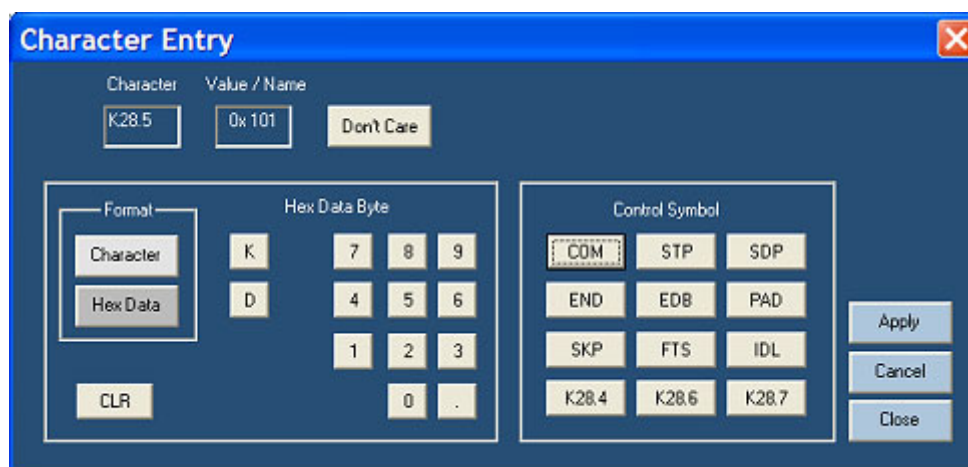
To trigger on a specific bit pattern, select **Bit Pattern** from the **Trigger On** drop-down list, and then select either Binary or Hex from the **Format** drop-down list. Enter the bit pattern, and then click **Apply**.



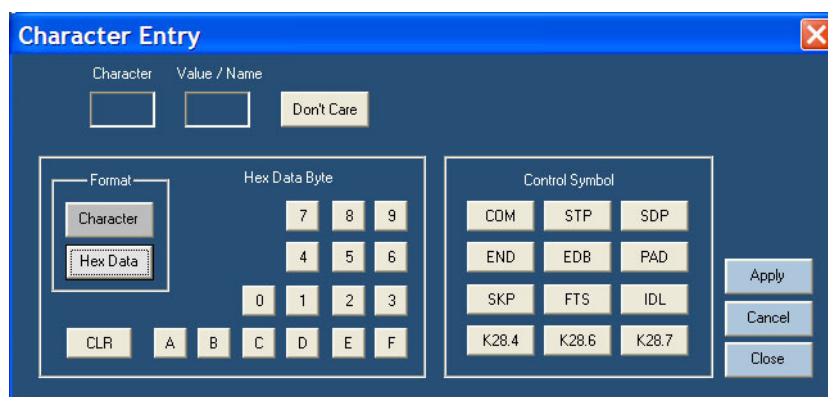
## Character Entry Dialog Box

Use the Character Entry dialog box to modify or change the characters that you want to trigger on. To access this dialog box, click **Character** in the Trigger Setup control window.

Select either Character or Hex Data Format. In Character format, click either **K** or **D**, and then enter the decimal values for the character. If you entered a K-character, its symbolic name is shown in the Value/Name field. If you entered a D-character, its hexadecimal value is shown in the Value/Name field. You can also click **Control Symbol**, and the Character field will show the value of that control symbol.

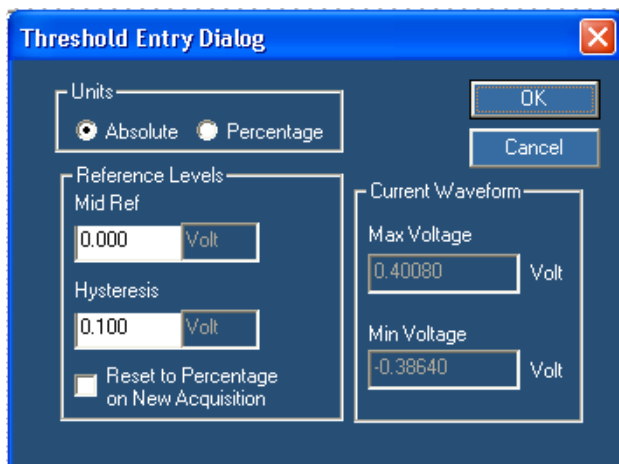


In Hex Data format, enter the Hex Data Byte using the keypad. The corresponding code value is shown in the Character field. You can also click **Control Symbol**, and the Character field will show the value of that control symbol. The Value/Name field displays the 8b/10b character equivalent.



## Threshold Entry Dialog Box

Use the Threshold Entry dialog box to modify or change the thresholds for bit detection to potentially improve performance in low SNR situations.



To enter the threshold values, do the following:

1. Select the type of units for the values you want to enter. If **Absolute** is selected, the reference levels will be in Volts. If **Percentage** is selected, values will be in percentage.
2. Enter the desired mid reference value in **Ref Level** field. The default value is 50 percent (average DC of the waveform).
3. Enter the desired hysteresis percent value in the **Hysteresis** field. The default value is 20 percent.
4. The default Maximum and Minimum voltages for the current waveform is displayed in the **Current Waveform** area.
5. Select **Reset to Percentage on New Acquisition** to set the units to percentage when a new acquisition occurs.



## Synchronize Data

When you click any word in the Protocol field, the corresponding character in the Character field is highlighted and the Waveform displays the beginning of that sequence, starting at the left.

When you click any character in the character field, the Waveform displays the beginning of that sequence, starting at the left.

The screenshot displays a software interface for protocol synchronization. It is divided into several sections:

- Characters:** A list of characters with their hexadecimal values. 'K28.3 (-----) CONT' is selected.
- Protocol:** A list of protocol primitives. 'CONT' is selected.
- Synchronize Oscilloscope with Character:** A control panel with 'Zoom 1', 'Cursor 1', and 'Cursor 2' buttons.
- Decode Status:** A panel showing statistics: Number of words: 29999, Periods of silence: 0, Primitives Found: 573, FIS: 3, Data words in FIS: 3658, RD Errors: 0, Invalid Characters: 0.
- Waveforms:** A signal waveform with red brackets and labels indicating synchronization points: 'K28.3', 'D10.5', 'D25.4', 'D25.4', and 'D13.4'. A 'Go To Trig' button and a 'Zoom' panel (with 'Show All', 'In', 'Out', and 'Dword' buttons) are also visible.

## Synchronize Data with the Host Instrument

To synchronize a zoom window on the host oscilloscope with the data that is displayed by the PTD application, do the following:

Click **Zoom 1** under **Synchronize Oscilloscope with Character**. The oscilloscope **Zoom 1** display changes to match the area of the waveform that you have displayed in the PTD application.

To synchronize cursors in the host oscilloscope with the data that is displayed by the PTD application, do the following:

1. From the protocol window in PTD, click a character or primitive.
2. From the protocol window in PTD, click Cursor 1 or Cursor 2. The corresponding cursor in the host oscilloscope moves to the same location.

## Define Your Own Standard

To define your own standard, do the following:

1. Open the User file located in `C:\TekApplications\TSDPTD\Macros`.
2. Use Excel or a similar application to edit the file. The file is in .csv format.
3. Select **Save As** from the **File** menu. and type in a unique name in the File name text box.
4. Select .csv format from the **Save as** type drop-down list.

Your file will appear in the **Standard** drop-down list in the PTD application.

## Show and Hide Windows

To show or hide windows, do the following:

1. Click the **Display > Views** menu.
2. Select the window(s) that you want to show.
  - All displays both the Symbolic and Waveform windows
  - Symbolic displays the Symbolic window but hides the Waveform window
  - Waveform displays the Waveform window but hides the Symbolic window
  - None hides both the Symbolic and Waveform windows

## Change the Window Size

To change the size of the symbolic window or the waveform window, do the following:

- Click the white line that separates the window from other windows. The white line will change color.
- Drag the line either up or down.

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