Tektronix Logic Analyzer Family

Quick Start User Manual

This document supports TLA Application Software V6.0 and above.

www.tektronix.com

077-1575-05

Tektronix

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

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

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[W2 – 15AUG04]

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[W9b – 15AUG04]

Table of Contents

Preface

This manual describes the basic operation and concepts of the Tektronix Logic Analyzer series instruments. The TLA6000 Series Logic Analyzers are stand-alone products and the TLA7000 Series Logic Analyzers are configurable modular products. The TLA7000 Series Logic Analyzers can be configured with a variety of logic analyzer modules and serial analyzer modules. All logic analyzers have integrated operation capabilities with Tektronix oscilloscopes. This manual supports the following instruments:

- TLA6000 Series Logic Analyzers (TLA6202, TLA6203, TLA6204, TLA6401, TLA6402, TLA6403, TLA6404))
- TLA7000 Series Mainframes (TLA7012, TLA7016) and their associated modules

Key features

The Tektronix Logic Analyzers can help you verify and debug hardware designs, processor and bus designs, and embedded software and hardware integration. Key features include:

- 34/68/102/136 channel logic analyzers with up to 512 Mb record length
- Up to 156 ps (6.4 GHz)/512 Mb deep timing analysis
- Up to 20 ps (50 GHz) MagniVu high resolution timing acquisition simultaneous with deep timing or state acquisition to find difficult problems
- Up to 667 MHz state acquisition analysis of synchronous digital circuits (2 samples per clock), TLA6400 series.
- Up to 800 MHz state acquisition analysis of synchronous digital circuits, TLA7Axx and TLA6200 series
- Up to 1400 MHz state acquisition analysis of synchronous digital circuits, TLA7Bxx series
- Simultaneous state, high-speed timing and analog analysis through the same logic analyzer probe to allow you to pin-point elusive faults without double probing, TLA7ACx series, TLA7Bxx series, and TLA6000 series with Tektronix oscilloscopes
- Glitch and setup/hold violation triggering finds and displays elusive hardware problems
- Transitional storage extends the signal analysis capture time
- Connectorless probing system with 0.5 pF total capacitive loading eliminates the need for on-board connectors, minimizes intrusion on circuits, and is ideal for differential signal applications

Tektronix also offers the TLA7SA08 and TLA7SA16 serial analyzer modules for PCI Express validation of silicon, computer systems, and embedded systems. Key features include:

- 8- and 16-channel serial analyzer modules with 8 GB memory
- 2.5 Gb/s, 5 Gb/s, and 8 Gb/s acquisition speeds for PCI Express 1.0, 2.0, and 3.0
- Support for x1, x2, x4, x8, and x16 PCI Express links

Documentation

The following table lists related documentation, available as printed documents or as PDF documents on the TLA Documentation CD and on the Tektronix Web site (www.tektronix.com). Other documentation, such as online help, is available on the instrument.

Related documentation

Item	Purpose
TLA Quick Start User manuals	High-level operational overview
Online Help	In-depth operation and UI help
Installation Reference sheets	High-level installation information
Installation manuals	Detailed first-time installation information
XYZs of Logic Analyzers	Logic analyzer basics
Declassification and Securities instructions	Data security concerns specific to sanitizing or removing memory devices from Tektronix products
Application notes	Collection of logic analyzer application specific notes
Product Specifications & Performance Verification procedures	TLA Product specifications and performance verification procedures
Field upgrade kits	Upgrade information for your logic analyzer
Optional service manuals	Self-service documentation for modules and mainframes

Version differences

Some of the illustrations in this document may have different icons than your instrument due to differences in software versions. Refer to the online help for the menu features of your software version.

Basic setups

Installation documentation

For installation instructions and descriptions of controls and connectors on your instrument, refer to the installation manual that came with the instrument. (See page iii, *Documentation*.)

Connect to a network

The user interface operates under the Microsoft Windows® operating system. Before you connect to a network, Microsoft recommends the following to make sure your instrument is protected:

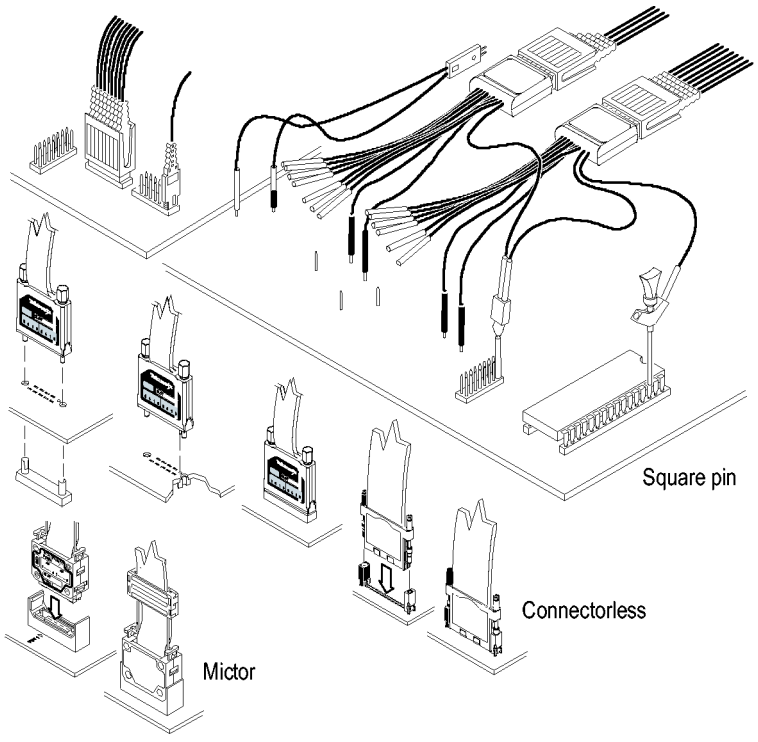
- Use an internet firewall
- Install operating system updates regularly
- Use up-to-date antivirus software

See the installation manual for detailed instructions on connecting to a network.

Connecting probes to the system under test

The logic analyzer has different methods of connecting probes to the system under test. Refer to the illustration and connect your probes to the system under test.

- **Square pin connectors.** Use general-purpose probes to connect to the system under test using square pin connectors or square-pin adapters.
- **Connectorless compression connectors.** Use land pattern probes for applications that connect many channels to connectorless compression contacts on the system under test.
- **Mictor® connectors.** Use Mictor connector probes for applications requiring many channels to be quickly connected using Mictor connectors or Mictor adapters. (For TLA6200 series instruments, Mictor connections are made with a P6860 probe using Mictor on board-to-compression adapters; TLA6400 series instruments use P5934 Mictor probes).



Connecting to your instrument

You can connect to your instrument as Remote Host, Remote Desktop, or Local.

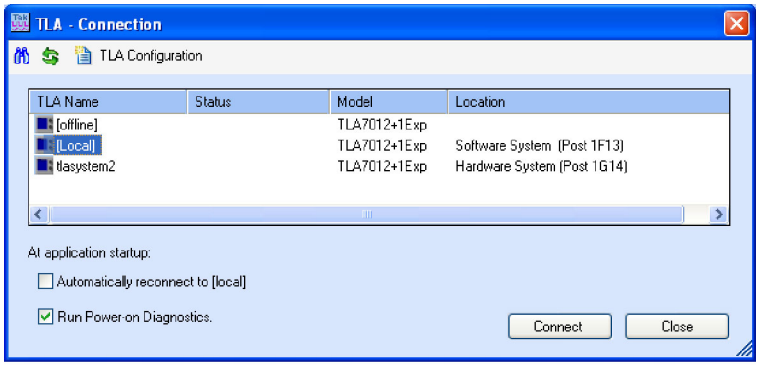
To access the TLA Connection dialog box, start the TLA Application software on the instrument or on your PC.

NOTE. *The TLA Connection dialog box appears when you start the instrument from a PC or when you restart the TLA application without shutting down the instrument.*

Local connection

Choose a Local connection when you want to work directly on the instrument.

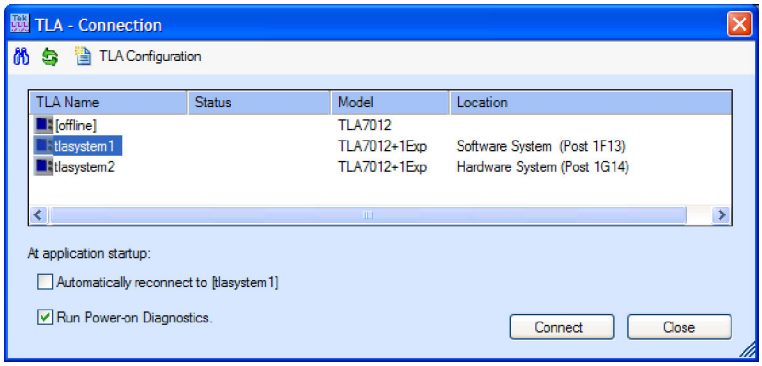
NOTE. *Make sure that you select* ***Local*** *instead of* ***Offline*** *when you want to connect to your local instrument. Selecting Offline does not connect you to an instrument.*



Remote host connection

Connect as Remote Host when you want to run the application on your PC to control the instrument remotely, and then store the data locally on your PC.

NOTE. *You must be connected to a LAN to use Remote Host and the TLA Server (TLA7012 and TLA6000) must be running.*

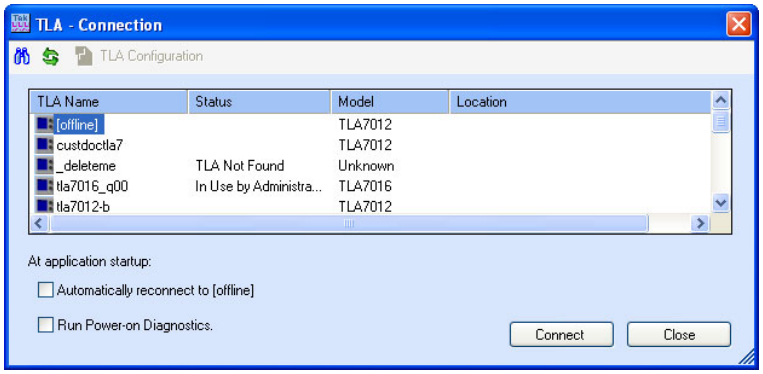


NOTE. *To start the TLA Server on TLA7012 and TLA6000 instruments, right-click the*  *(TLA Server) icon in the toolbar at the bottom right side of the screen and select* ***Start TLA Server****.*

Offline

You can work offline, without connecting to an instrument, to modify setups or view data files that you previously saved.

Click the TLA Application on the desktop and then select Offline.

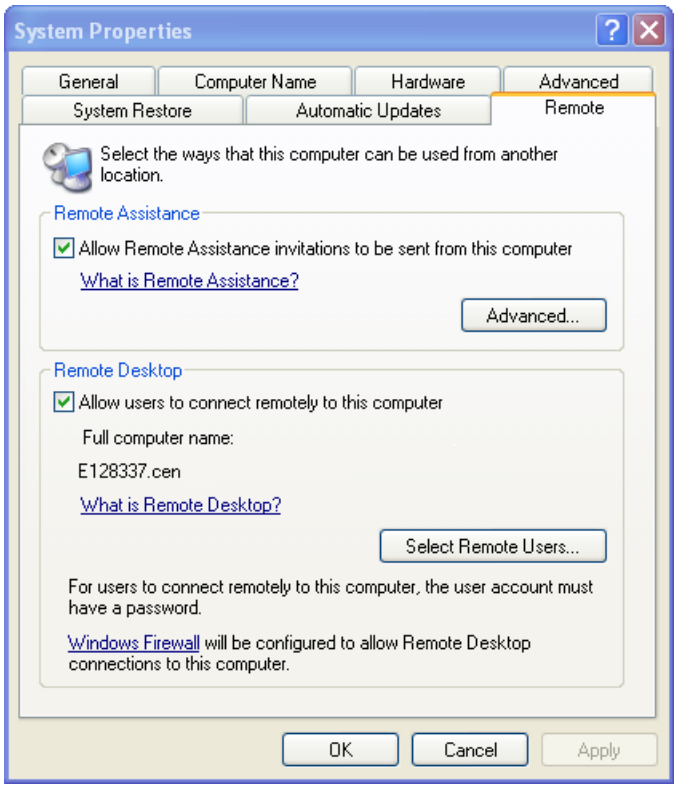


Remote Desktop

Connect as Remote Desktop when you want to run the application on the instrument from your PC and store the data on the instrument.

To enable the Remote Desktop, make sure that the Microsoft Windows System Properties dialog box on the instrument is setup as shown.

See the Microsoft Web site http://www.microsoft.com for more information on working remotely.



Navigating the logic analyzer windows

Tektronix provides several different ways of navigating the logic analyzer windows to accomplish your basic tasks. Choose the one that works best for you.

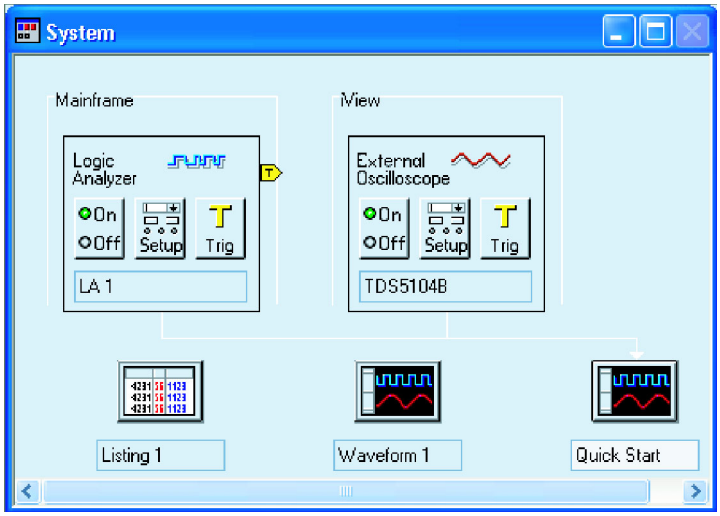
Toolbar buttons

Use the toolbar buttons to quickly navigate between key windows while making the best use of screen space.

Click one of the buttons to quickly access a Setup window, Trigger window, Waveform window, or Listing window.

System window

The System window shows a block diagram representation of the modules and data windows available with your logic analyzer. Click an icon to open the related window.



Quick tips

- To open the System window, select System from the Window menu or press function key F9.
- Use the front-panel buttons to navigate between windows on the TLA7012 Portable Mainframe and TLA6000 series instruments.

Basic steps for using the logic analyzer

The basic steps for using the logic analyzer are summarized below:

1. Use the Setup window to set up the logic analyzer signals, threshold voltages, clocking, and sampling, and samples per signal.
2. Specify triggering in the Trigger window.
3. Create and configure a Waveform or Listing data window.
4. Acquire data.
5. Analyze the data in the Waveform or Listing window.

Data window overview

Create data windows to display and analyze data acquired by your instrument. The default instrument set-up does not contain any data windows. Create data windows using the New Data Window wizard.

NOTE. *To start the New Data Window wizard click*  *in the toolbar or select New Data Window from the Window menu.*

Alternately when there are no data windows, click the Waveform or Listing toolbar buttons to launch the New Data Window wizard to create a new Waveform or Listing window.

Waveform window

Use Waveform windows to display waveform data from the logic analyzer or from an external oscilloscope. Waveform windows are best used for diagnosing timing problems, measuring hardware timing-related characteristics, and verifying correct hardware operation by comparing recorded results against data sheet timing diagrams.

Listing window

Use Listing windows to display acquired data in a state table display. Use Listing windows for state machine debug applications, tracing relative software execution, system optimization, and following data through a system design.

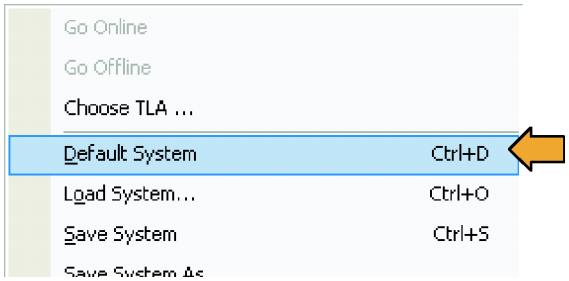
Get acquainted with your instrument

The following sections show how to set up the logic analyzer and to do timing analysis using data from a simple D-type flip-flop. Flip-flops serve as building blocks in digital systems. Although most flip-flops are buried inside complex ASICS and other devices, they are useful for showing hardware debugging techniques using a logic analyzer. The examples in this document use only a few channels to acquire data. However, you can use the same concepts with hundreds of channels.

Set the Default System

Use the Default System setup to load the factory default settings.

1. Power on the instrument and wait for the instrument to complete the power-on tests.
2. Select **Default System** from the File menu.
3. Click **OK**.



Configure the Setup window

Use the following procedures to define data signals, to set the clocking, to set the probe threshold voltages, and to use other features of the Setup window.

Specify the sampling method

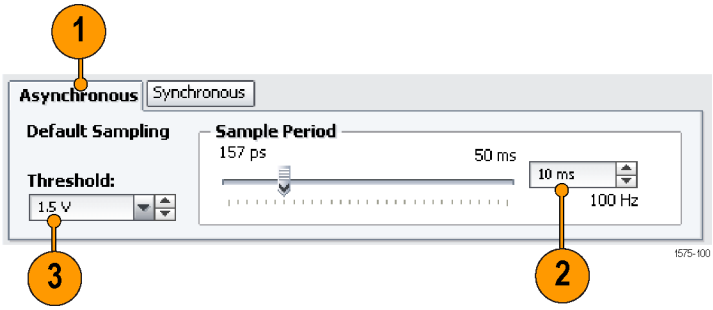
When you select asynchronous sampling, the logic analyzer selects when data is sampled (sample point). Asynchronous sampling is also known as timing acquisition.

When you use synchronous sampling, the system-under-test specifies the sample point by an external clock. Synchronous sampling is also known as state acquisition.

The following example uses asynchronous sampling.

1. Select **Asynchronous**.
2. Set sample period (or use default setting).
3. Select the threshold voltage.

   The threshold voltage is applied to all probe channels. You can set threshold voltages for individual channels in the bottom part of the Setup window.

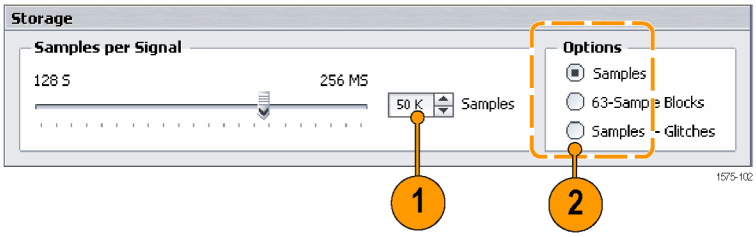


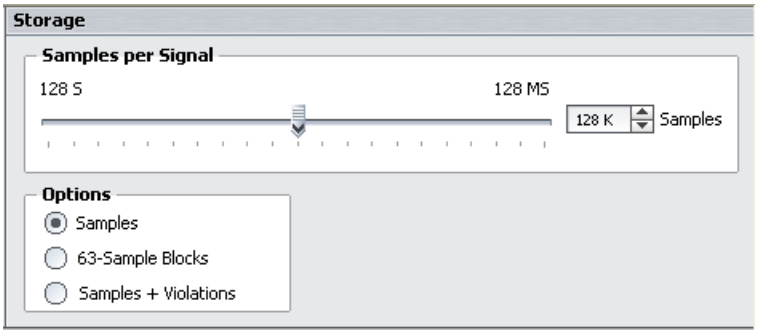
NOTE. If your logic analyzer has a support package installed, a custom clocking tab is available. The label on the tab is the same as the support package.

Set the storage options

Use Storage to specify the length of each data acquisition and how to store the acquisition.

1. Select the number of samples to store per signal. The selections vary depending on your logic analyzer.
2. Select how to store the acquisition.
   - Select **Samples** to store samples specified by the trigger actions.
   - Select **63-Sample Blocks** to store samples in blocks of 63 bits; this is often recommended for troubleshooting program flow.
   - Select **Samples + Glitches** to store glitch data (Asynchronous sampling only).
   - Select **Samples + Violations** (Setup and hold violations) to store setup and hold violations (Synchronous and Custom sampling only).



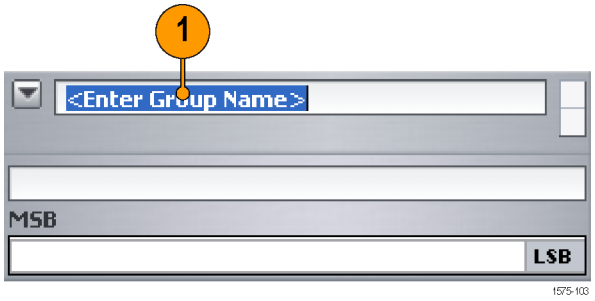


Create groups

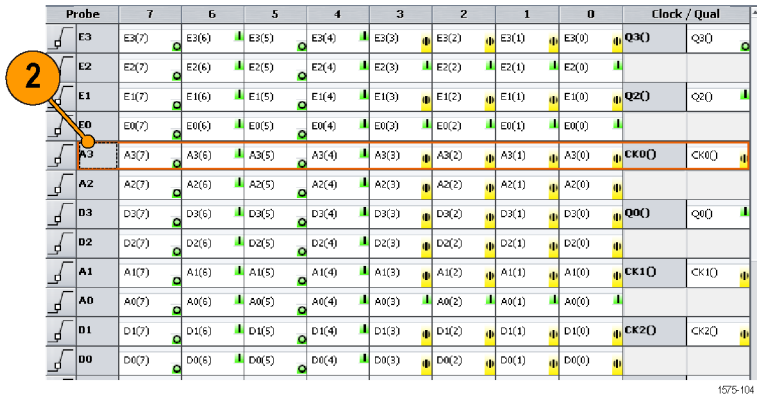
Groups are logical collections of probe signals often related to busses on your system-under-test.

When you enter the Setup window the first time, an empty group card appears on the right side of the Setup window.

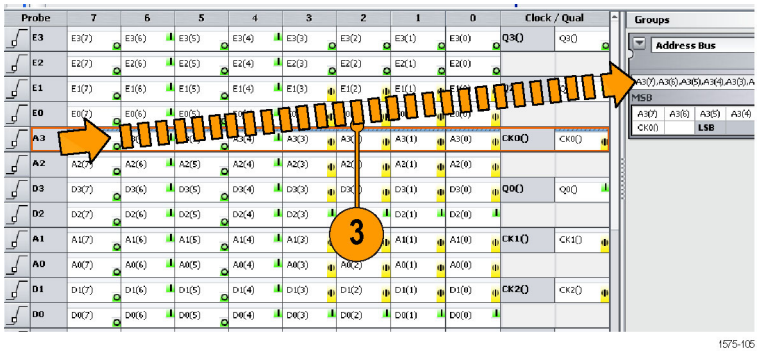
1. Enter a name for the group, for example, Address Bus.



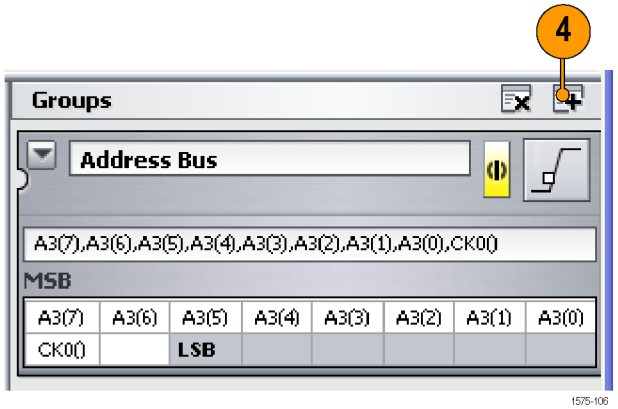
2. Determine the probe section that you want to use. For example, click A3 to select the signals for section A3.



3. Drag selected signals to the group card.



4. To create additional groups, click the plus sign at the right edge of the Groups column.



Check for signal activity

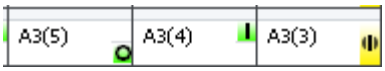
You can easily check for signal activity at the probe tips by looking at the Activity & Threshold indicators in the Setup window. When there is signal activity, the indicators change from a 1 to a 0 with yellow in between. Each data and clock signal has its own indicator.

Note the signals in the example:

The signal connected to A3(5) is low as indicated by the zero (o).

The signal connected to A3(4) is high as indicated by the one (1).

The signal connected to A3(3) is transitioning as indicated in yellow.



NOTE. *If the signals are inverted the zero (O) appears on top and the one (1) is on the bottom.*

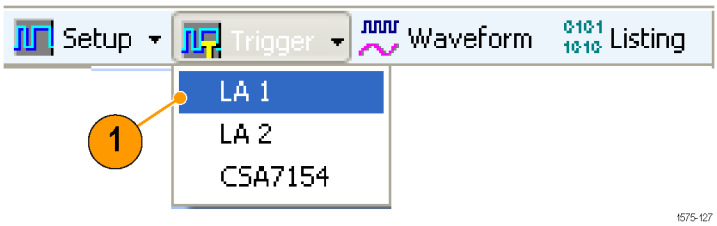
If there is no probe activity, check for the following:

- Check the probe connections.
- Verify that the target system is powered on
- Check the probe threshold voltages. (Click the Activity & Threshold indicators to open a dialog box to adjust the threshold voltages.)

Define the Trigger window

Use triggers to tell the logic analyzer when to acquire data and display the results in a data window.

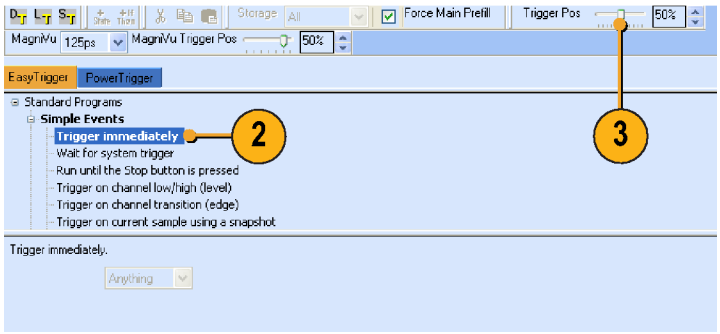
1. Click the Trigger button in the TLA toolbar and select the Trigger window for your instrument.



2. In the Easy Trigger tab, select a trigger program from the list. For example, select **Trigger immediately** to trigger the instrument on any data:

   Use the area below the trigger program list to enter more details for the trigger programs, if needed.

3. Click and drag the **Trigger Pos** indicator to the point in memory where you want the instrument to trigger. The default selection is 50%.



Quick tips

- After you have acquired data, use the Tabbed Trigger window to define simple trigger programs without having to close the Waveform or Listing window.
- Use EasyTrigger to define the trigger program for most applications; use PowerTrigger to customize the trigger program for specific needs.

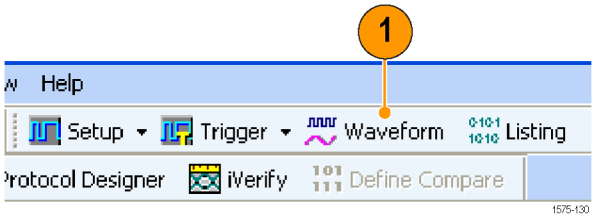
Create a data window

The default instrument setup does not include any data windows. Use the New Data Window wizard to create a new data window; click the NEW button in the toolbar to open the New Data Window wizard. Alternately, click either the Waveform or Listing toolbar buttons to open the wizard. For the following examples, you will create a Waveform window.

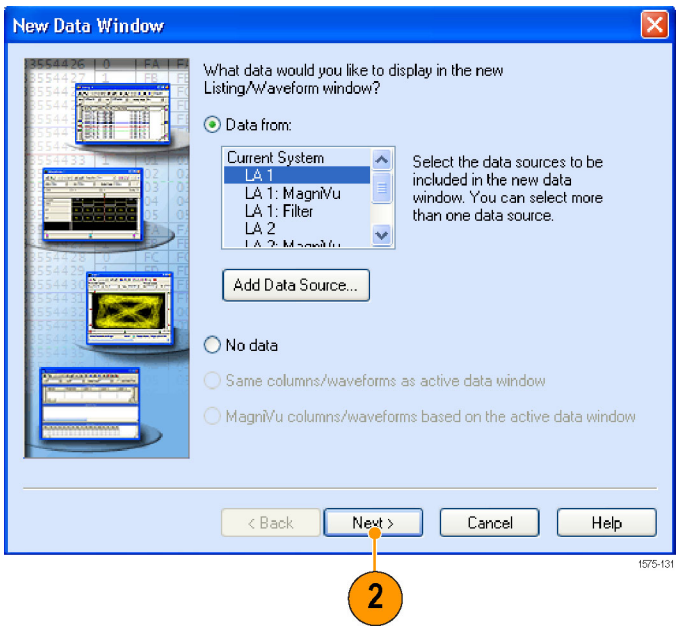
Create the Waveform window

1. Click the Waveform button to create a Waveform window.

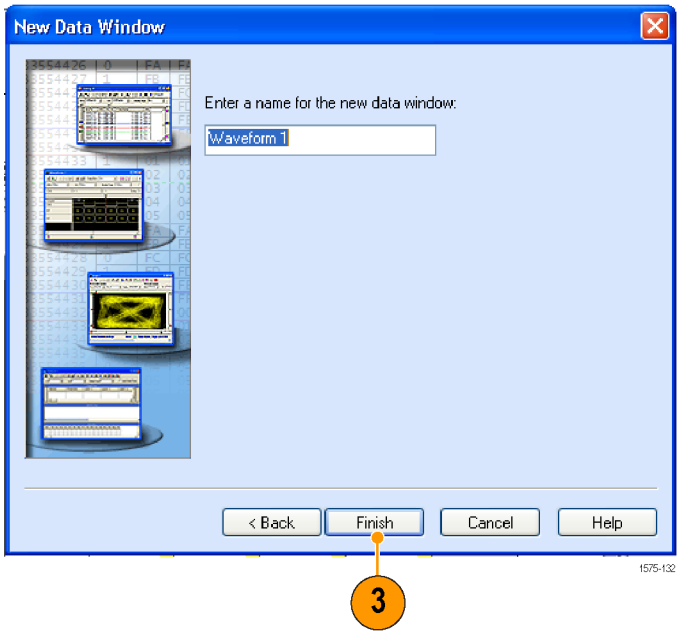
   The New Data Window Wizard opens.



2. Click the **Next >** button at the bottom of the wizard to use the default window settings.



3. Use the default window name and click the **Finish** button.

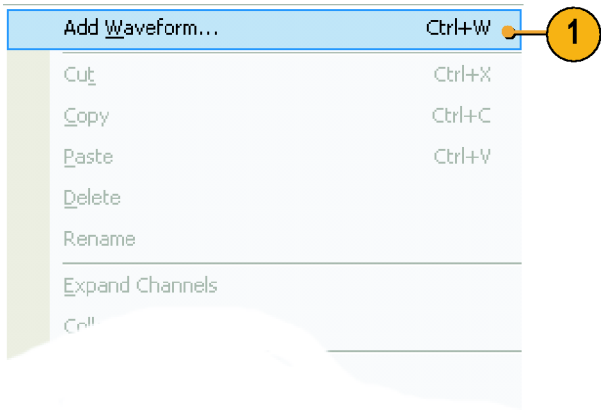


The new Waveform window displays and includes any group that you created in the Setup window.

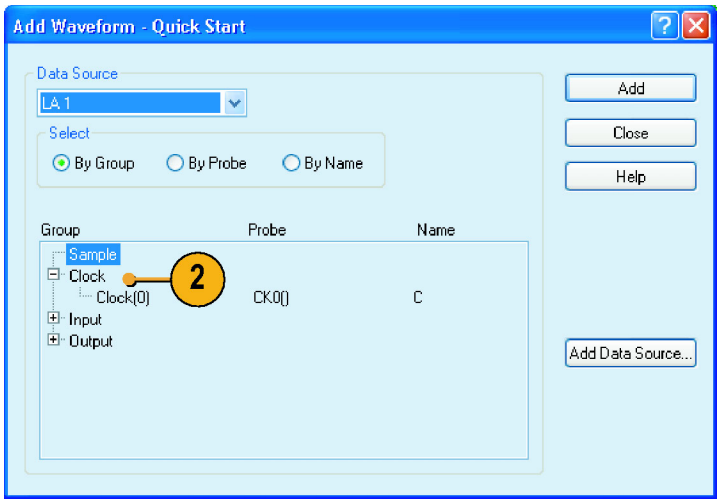
Add waveforms

Use the following steps to add other waveforms that you defined in the Setup window. (See page 8, *Create groups*.)

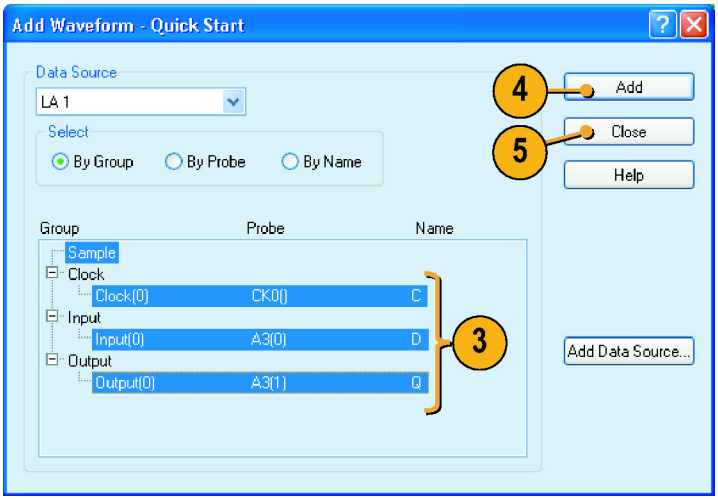
1. Right-click in the waveform label area and select **Add Waveform**.



2. Expand each group.



3. Press the **Ctrl** key while selecting each signal that you want to add to the Waveform window.
4. Click **Add**.
5. Click **Close**.



Quick tips

- Select **By Name** to add the probe signals to the Waveform window by their channel names. This is useful for groups that have only one channel.
- Use the delete key on the keyboard to delete any highlighted waveforms in the Waveform window.

Acquire data

After you have defined all of the setups and connected the probes to the target system, you are ready to acquire data. You can acquire a single sequence of data, or you can continuously acquire data.

Acquire a single acquisition

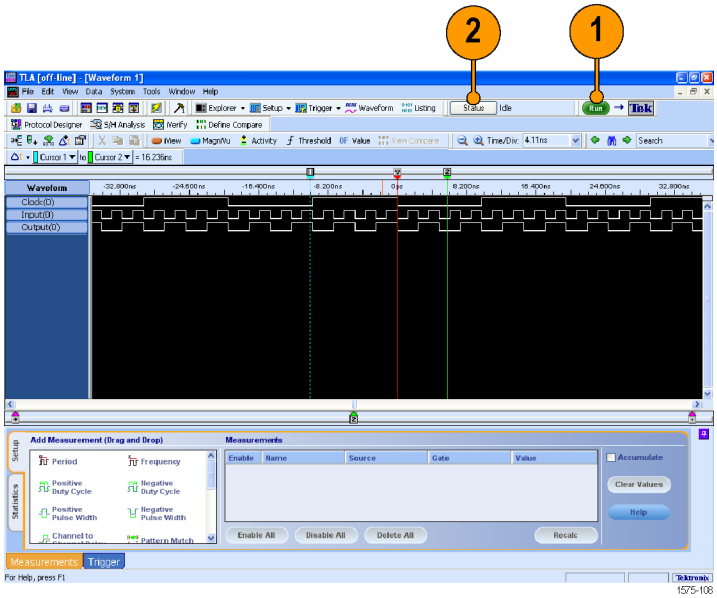
1. Click **Run**.

   The Run button changes to Stop until the instrument has met the trigger conditions and has acquired the data. The button changes back to Run after data is acquired.

2. If the instrument does not trigger, click **Status**.

   Use the information in the dialog box to see if the logic analyzer is waiting for the trigger or if it has triggered and is filling its acquisition memory.

   When a trigger occurs, the instrument displays the flip-flop Clock, Input, and Output data in the Waveform window. The trigger point is represented by the red trigger marker (T).



Quick tip

- To verify that the instrument is acquiring data during long periods of inactivity on the screen, check that the Tek icon in the upper right corner of the screen is animated.

Acquire repetitive acquisitions

1. Click the Repetitive Run button to acquire data repetitively. The icon changes from an arrow to a loop.

2. Click **Run**. The instrument will acquire data until you click Stop or until you click the Repetitive Run button again to change back to single run mode.

Use the Tabbed Trigger window to set up quick triggers

You can define a trigger program using the Tabbed Trigger window without closing the Waveform or Listing window. The following example shows how to set up the instrument to trigger on a channel edge.

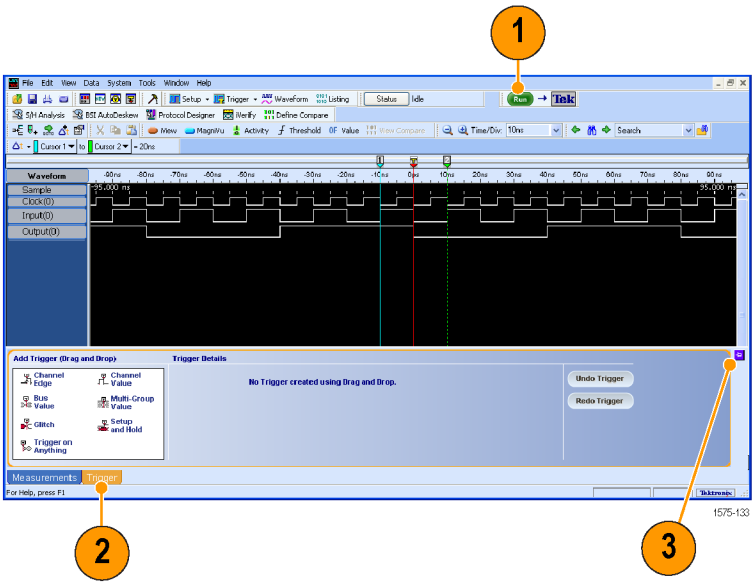
You can also use this procedure to quickly define other trigger programs. To acquire complex data, you can still use the Power Trigger window.

1. Click **Run**.

Data must be present before you can use the Tabbed Trigger window.

2. Click **Trigger** in the tabbed window.

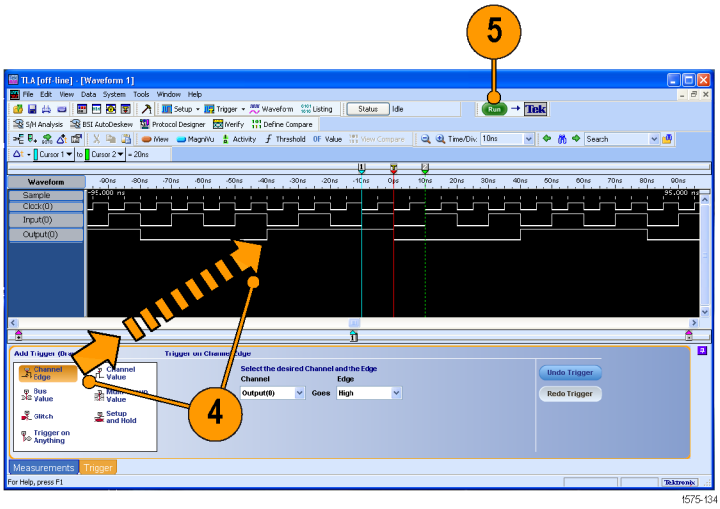
3. Click the button to pin the Tabbed Trigger window to the screen.



4. Click and drag the **Channel Edge** icon from the Tabbed Trigger window to the Output waveform.

   The instrument will display the details of the program in the Trigger Details area. The details are similar to those in the Power Trigger window. You can edit any of the details.

5. Click **Run** to acquire data and trigger the instrument based on the new trigger program.



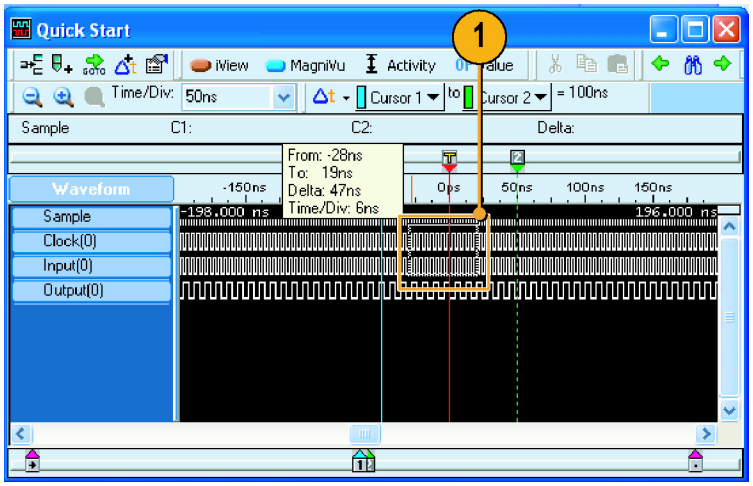
Analyzing data

Your instrument has several tools for analyzing data, such as zooming data, measuring data, and viewing data with MagniVu high-resolution timing. This section provides concepts and procedures for analyzing data in the Waveform window. Some of these features also apply to the Listing window; refer to the online help for more details.

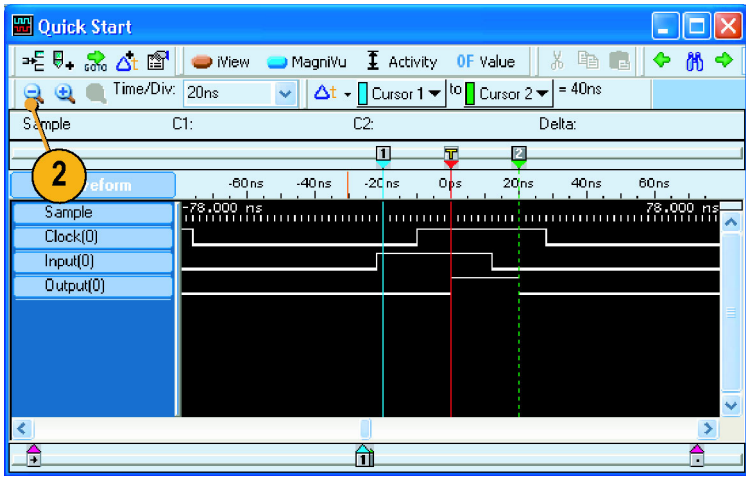
Zoom the data

To zoom data in the Waveform window:

1. Click and drag from left to right over the area you want to zoom.



2. Click the Zoom In button a few times to zoom the timing data samples.



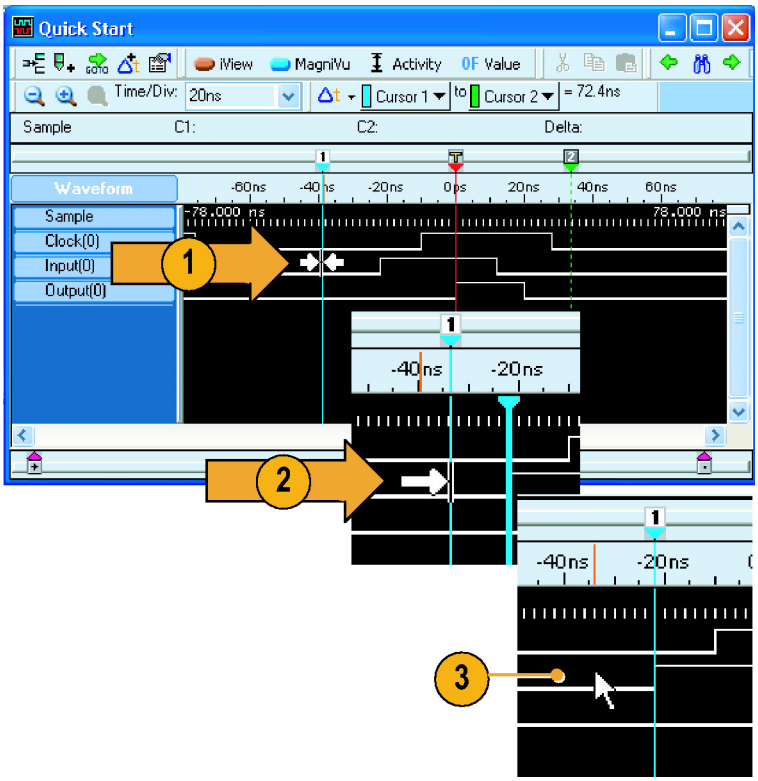
Quick tips

- Click and drag from the right to the left to zoom to the previous selection.
- Use the Zoom In and the Zoom Out buttons in the toolbar as an alternative method of zooming data.
- Rearrange the toolbars, as needed, to access command buttons, if the command buttons appear off-screen.

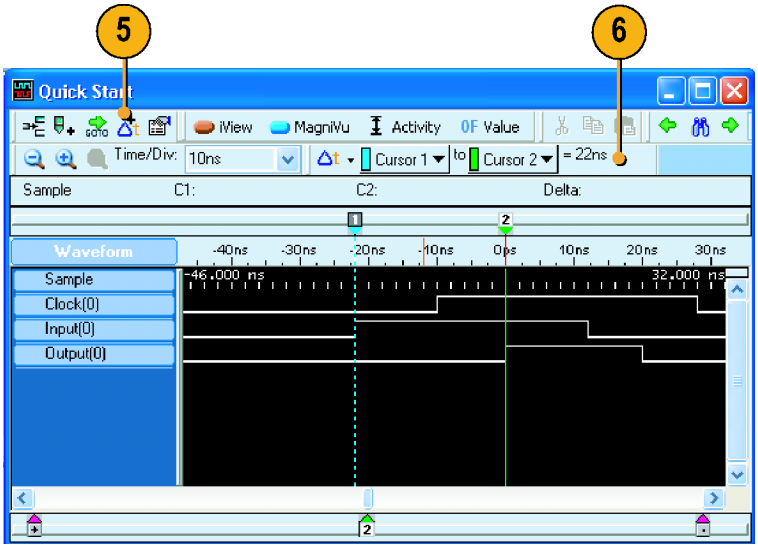
Measure waveform data using cursors

Use the Snap to Edge feature with cursors in the Waveform window to measure the time between waveforms.

1. Point the mouse at Cursor 1 over the waveform that you want to measure.
2. Click and drag Cursor 1 toward a leading or trailing edge of the waveform.
3. Release the mouse to snap the cursor to the next waveform edge.
4. Repeat for Cursor 2.



5. If the Delta-time toolbar is turned off, click Δt.
6. Read the time difference between the two cursors.



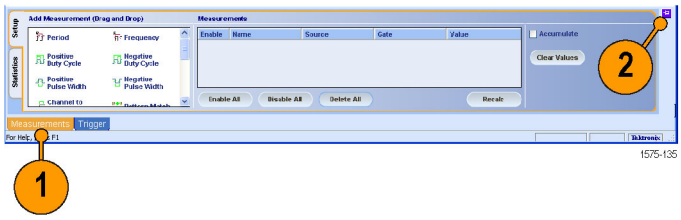
Quick tips

- If the cursors do not appear in the Waveform window, use the right-click menu to move the cursors on screen (select **Move Cursor 1 Here**).
- You can use the Snap to Edge feature with any of the user marks.
- You can click  to add multiple Delta-Time toolbars in the same Waveform window.
- You can use the Delta-Time toolbar to measure time between any two marks. Select the marks from the drop-down lists in the toolbar.

Use the Data Measurement window for quick measurements

Use the Data Measurement window to quickly take measurements in the Waveform or Listing window.

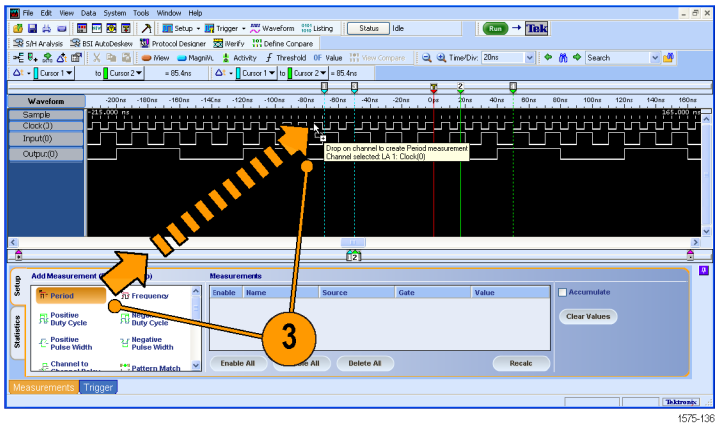
1. Click **Measurements**.
2. Click the  button to pin the Data Measurement window to the screen.



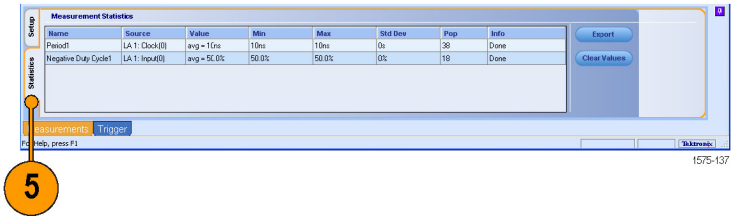
3. Click and drag the **Period** icon to the Clock waveform, and release.

   The selected measurement will be added to the Data Measurement window at the bottom of the display.

4. Repeat for any other measurements.



5. Click the **Statistics** tab in the Data Measurement window to display the results of the measurement along with other statistics. Measurements are taken on the existing data without having to acquire new data.



Quick tips

- To take a measurement on new data, click **Run**.
- To save the measurement data to a file, click the Export button in the Statistics tab of the Data Measurement window.
- To select a measurement in the Waveform window, select the waveform label, right-click the waveform, select **Add LA Data Measurement**, and then select a measurement from the list.

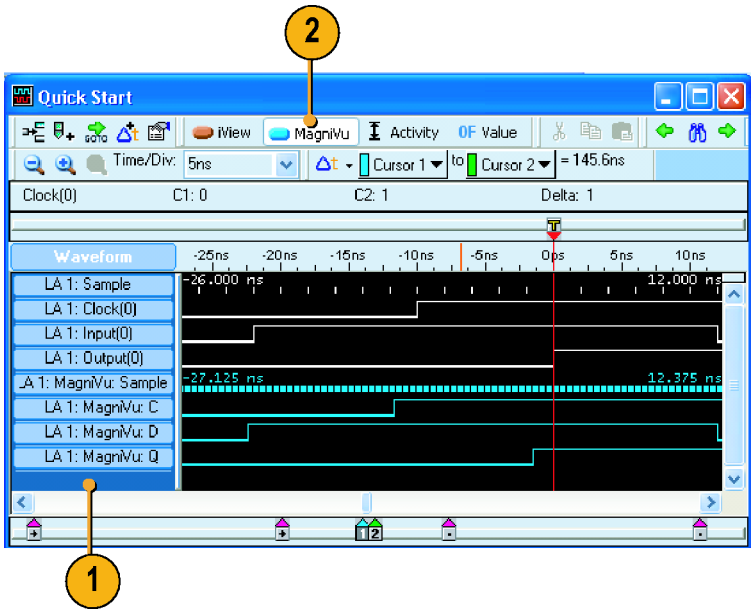
View acquired data with MagniVu high-resolution timing

MagniVu high-resolution timing provides fast sampling on all waveforms to analyze details that you may not see using Deep timing. It is like having two logic analyzers in one. Using a single probe you can view Deep timing data for long time spans and MagniVu high-resolution timing data for greater resolution at the area of interest.

The MagniVu high-resolution data is automatically acquired with each acquisition. However, the waveforms may not be visible. To add MagniVu timing waveforms:

1. Click below the waveform labels to deselect all waveforms.
2. Click **MagniVu** to add the MagniVu data to the Waveform window.

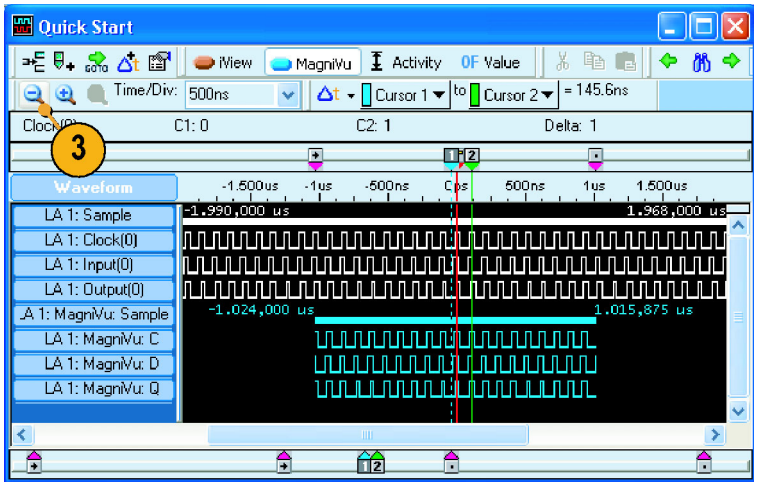
   The MagniVu timing waveforms are added to the window in a different color.



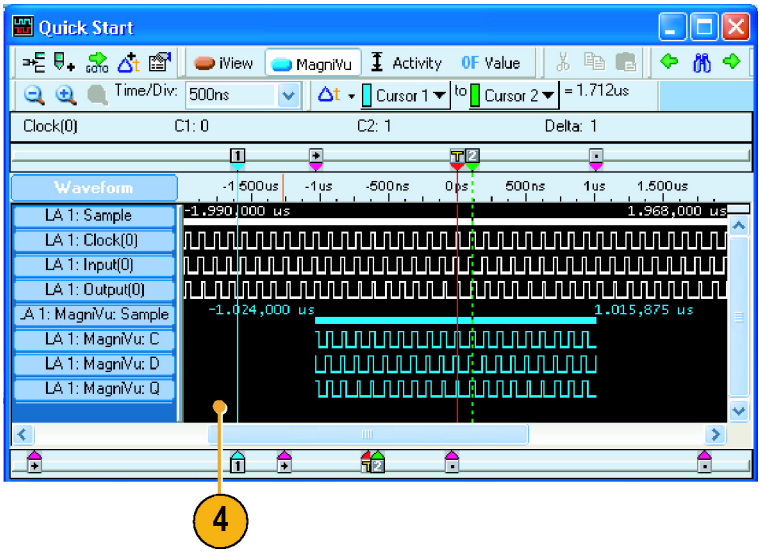
3. Click the Zoom Out button until you see the entire MagniVu timing waveforms.

   Note that the MagniVu timing data is 16 K bits long as compared to the Deep timing data. Deep timing lets you acquire a large amount of data; MagniVu timing lets you focus on the details of the data.

   MagniVu data can be up to 128 K bits long for TLA7Bxx and TLA6400 series instruments or 16 K bits long for TLA7ACx and TLA6200 series instruments.

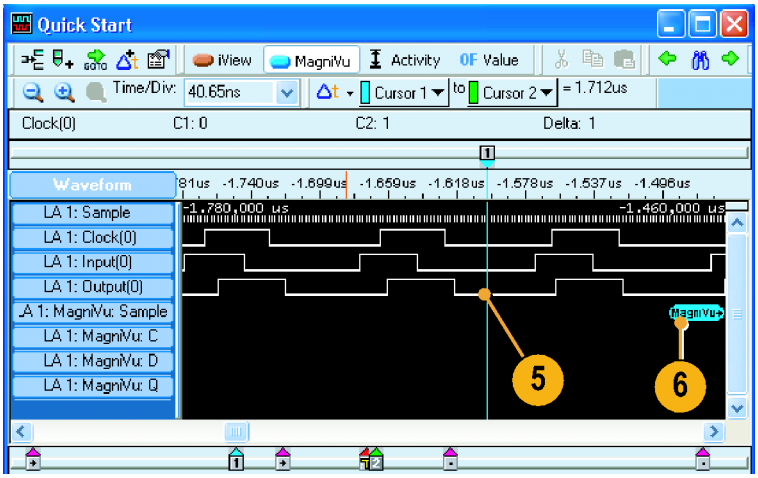


4. Move Cursor 1 to an area in the Waveform window outside the range of the MagniVu data.



5. Zoom on Cursor 1. The MagniVu button indicates the MagniVu waveforms are off screen.

6. Click the MagniVu button to center the MagniVu data on-screen.



Quick tip

- Click the MagniVu button in the Listing or Waveform window to turn the MagniVu display on and off.

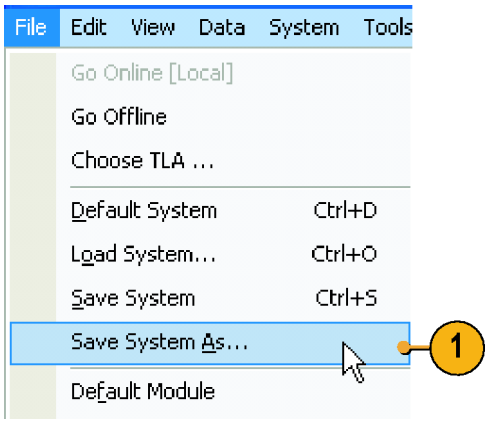
Managing data

This section contains procedures for managing data, such as saving setups and loading saved setups.

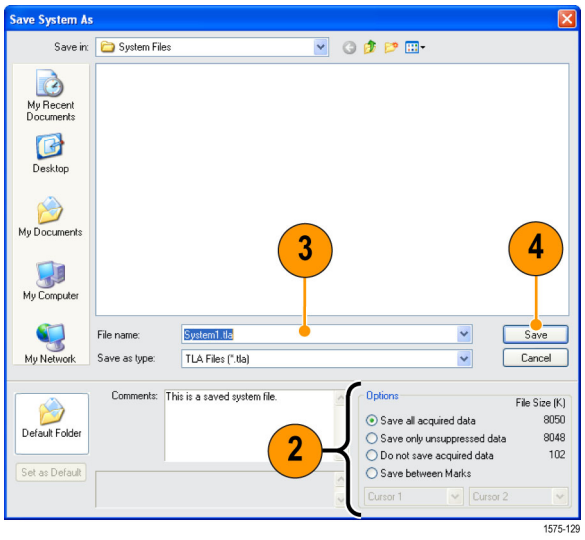
Save the setup

After defining your setup, you can save it for future use.

1. Select **Save System As**.



2. Select one of the following save options:
   - Save all acquired Data
   - Save only unsuppressed Data
   - Do not save acquired Data
   - Save between Marks
3. Enter a file name.
4. Click **Save**.



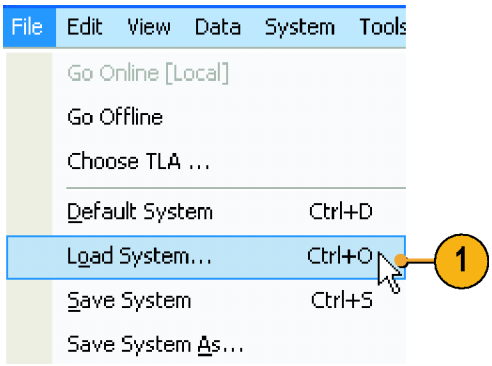
Quick tips

- Save often to avoid losing critical setups and data.
- See the online help for details on saving setups.

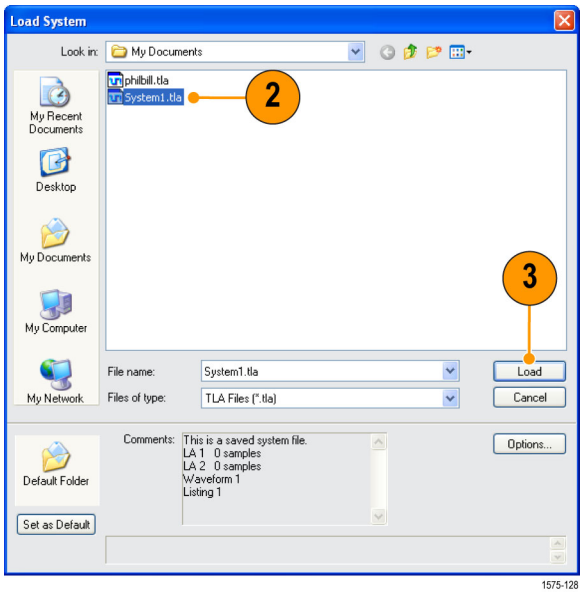
Load a saved setup

Use the following steps to load the setup that you saved under *Getting Acquainted with Your Instrument.* (See page 7.)

1. Select **Load System**.



2. Select the file name.
3. Click **Load**.



iView integrated measurements

You can use the iView feature to connect an external Tektronix oscilloscope to the logic analyzer, acquire data from both instruments, and display the results on the logic analyzer. This is useful for displaying the analog components of a signal in the same data window as the digital components.

In the following examples the logic analyzer and the oscilloscope will acquire the same data. The logic analyzer captures the digital components and the oscilloscope captures the analog components.

Use the following steps to set up the oscilloscope for these examples. Refer to the documentation that came with your oscilloscope for operating instructions.

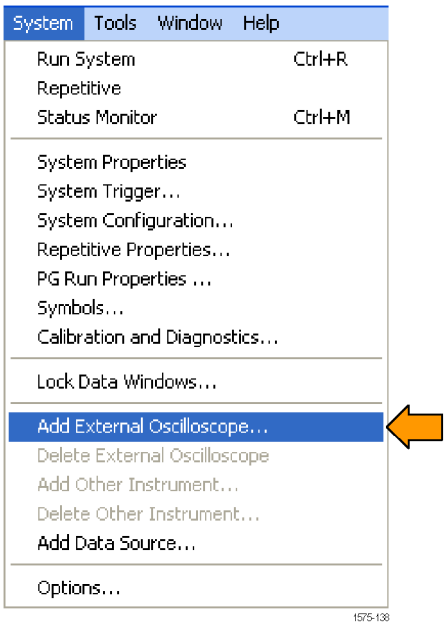
1. Connect the oscilloscope probe to the same signal source as the logic analyzer (for this example, connect to the Q output of the flip-flop).
2. Power on the oscilloscope.
3. Press the **Default Setup** button on the oscilloscope, and then press the **Autoset** button. You should have a signal on the oscilloscope screen.

Connect the logic analyzer and the oscilloscope

After completing the oscilloscope and logic analyzer setups, use the iView wizard to connect the two instruments together.

1. From the logic analyzer System menu, select **Add External Oscilloscope.** .
2. Follow the instructions on each page of the iView wizard to do the following steps:
   - Select the oscilloscope.
   - Connect the iView cable to the logic analyzer.
   - Connect the iView cable to the oscilloscope.
   - Verify the GPIB address of the oscilloscope.
   - Identify where to display the oscilloscope data.
   - Specify the triggering.
   - Verify the connections and setups.
3. Click **Finish** on the last page of the wizard.

The oscilloscope is added to the to the System window.



Quick tips

- Start the iView wizard by clicking the iView icon in the Listing window or Waveform window. If you have a TLA7012 Portable Mainframe or a TLA6000 series instrument, start the iView wizard by pressing the front-panel iView button.
- If the oscilloscope is properly connected to the logic analyzer when you start the iView wizard, the wizard will bypass the connection instructions. Follow the on-screen instructions to finish the installation or to return to the start page of the wizard.

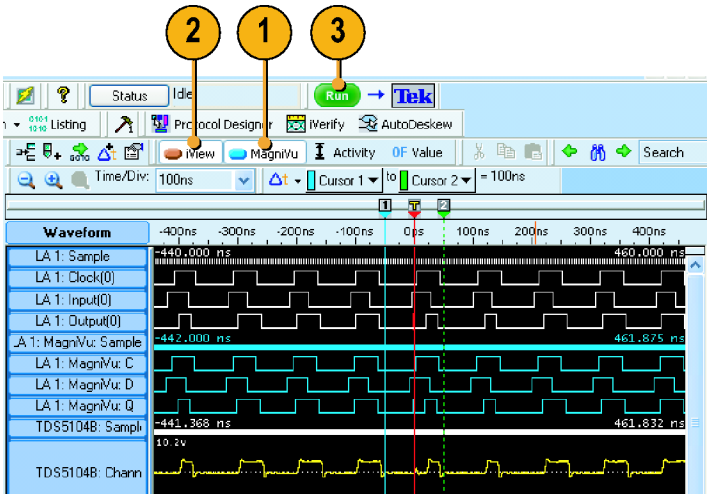
Acquire the iView data

The next steps consist of acquiring the initial data, and then adjusting the data to properly view and analyze the data.

1. Click **MagniView** to turn on the MagniVu waveforms.
2. Click **iView** to turn on the iView waveforms.

   If desired, delete any of the unused oscilloscope waveforms.
3. Click **Run** to acquire and display waveform data from both instruments.

   Depending on the oscilloscope and your Waveform window settings, you may not see any waveform data from the oscilloscope. If necessary, click the iView button in the Waveform window to bring the waveform on screen.

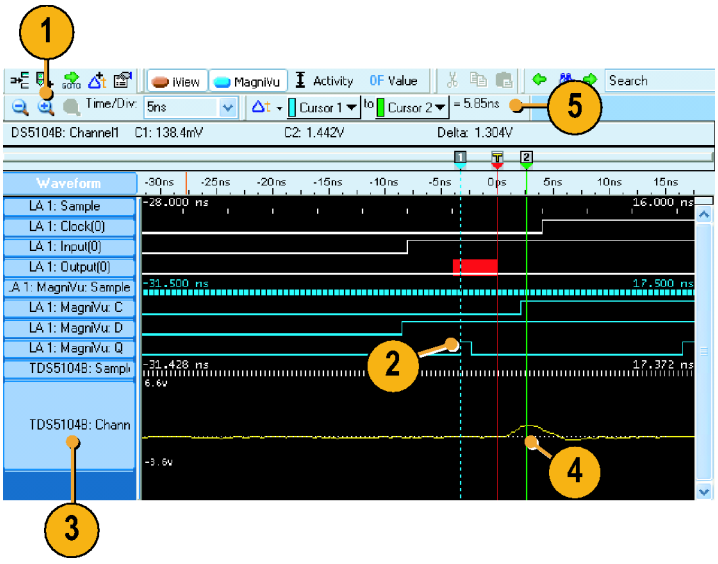


Align the oscilloscope data with the logic analyzer data

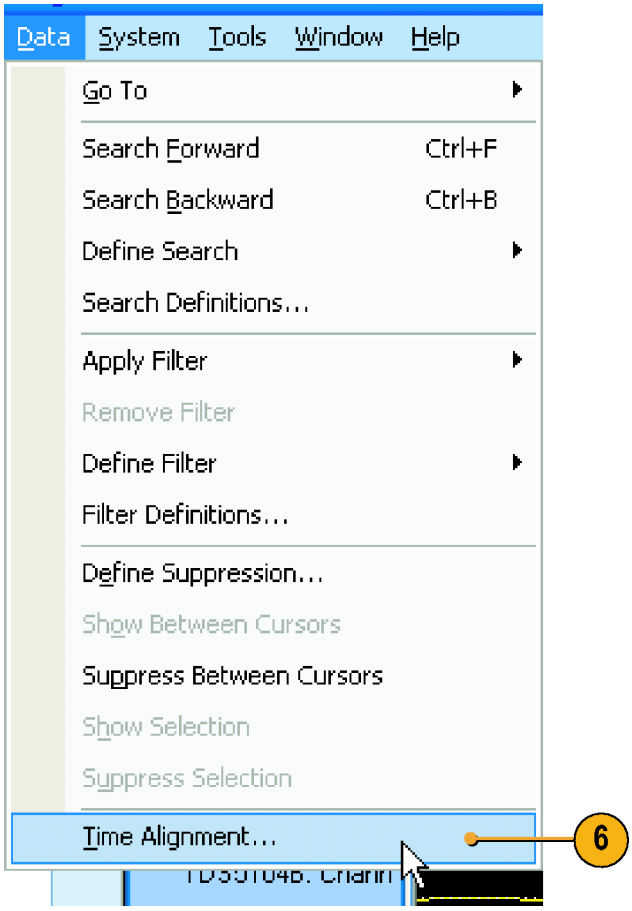
Complete the following steps to fine-tune the data alignment.

1. Zoom the display to measure the time difference between the glitch in the MagniVu waveform and in the oscilloscope waveform:
2. Move Cursor 1 to the leading edge of the glitch in the MagniVu waveform.
3. Click the oscilloscope waveform label to allow you to read the voltage measurements.

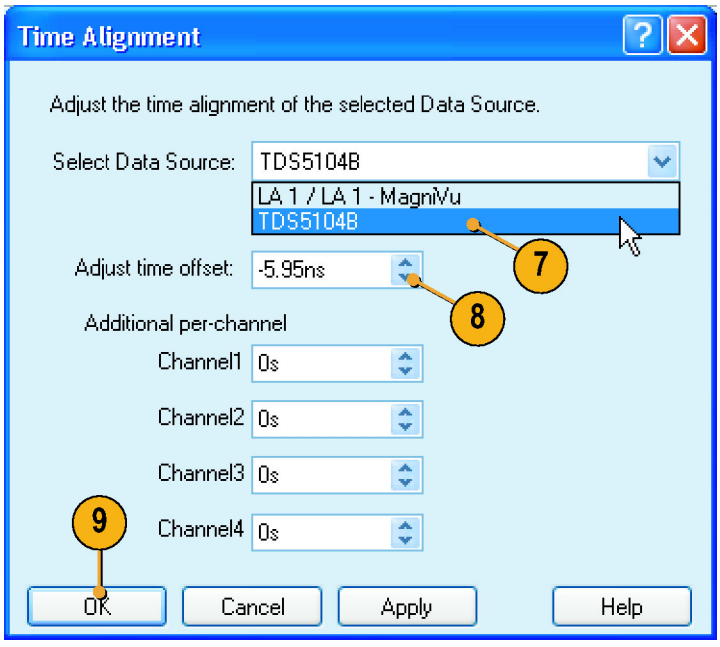
   If the highlighted waveform is too bright, click the area below the waveform labels to turn the highlighting off (you may need to resize the Waveform window to show the label area with no labels).
4. Move Cursor 2 to the point on the glitch where the waveform crosses the threshold voltage as indicated by the measurement readout.
5. Note the Delta Time value.



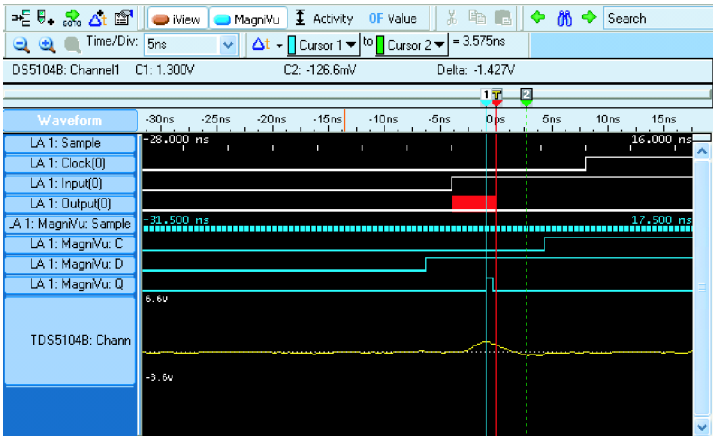
6. Select **Time Alignment.** from the Data menu.



7. Select the oscilloscope as the data source.
8. Enter the offset value (Delta Time value) into the Adjust time offset box.
9. Click **OK**.



The oscilloscope data is now time-aligned with the logic analyzer data.



Quick tips

- A positive Adjust Time offset value will move the oscilloscope waveform in the display to the right with respect to the logic analyzer data. A negative offset value will move the oscilloscope waveform to the left.
- Click the iView button in the Waveform window or press the iView button on the TLA7012 or TLA6000 front panel to turn the iView signals on and off.

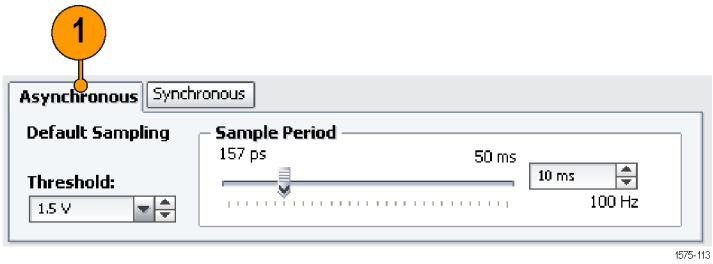
Application examples

The examples in this section show how to use your instrument to do common logic analyzer tasks. These examples use the basic setups with the flip-flop examples developed earlier in this document. (See page 7, *Get acquainted with your instrument*.) Refer to the setups as needed to step through the application examples.

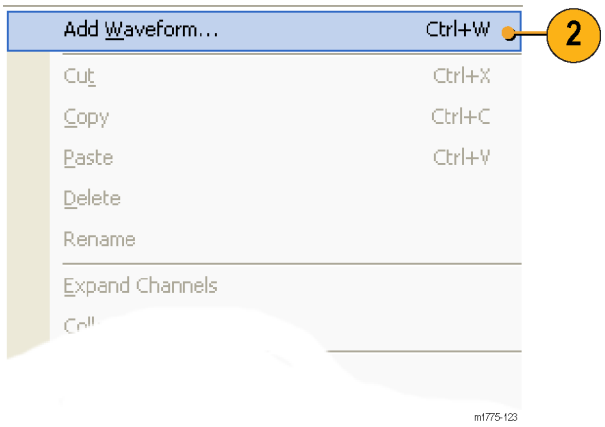
Trigger on a glitch

Logic analyzers are useful for debugging elusive, intermittent problems, such as glitches. Use the following procedures to set up the logic analyzer to trigger on a glitch.

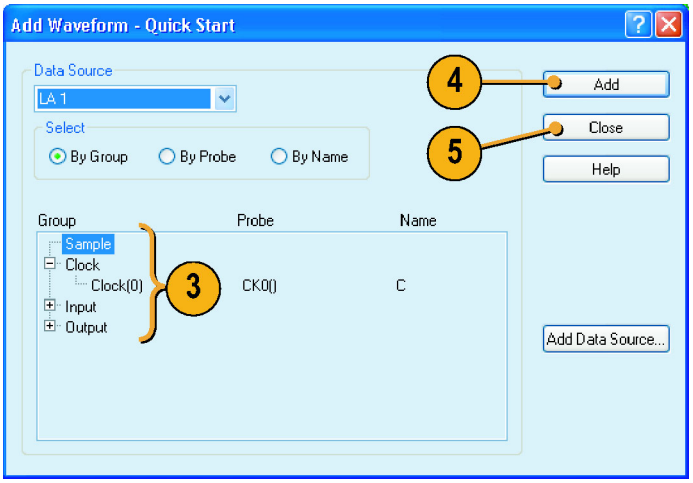
1. Configure the Setup window and make sure that **Asynchronous** is selected. (See page 7, *Configure the Setup window*.)



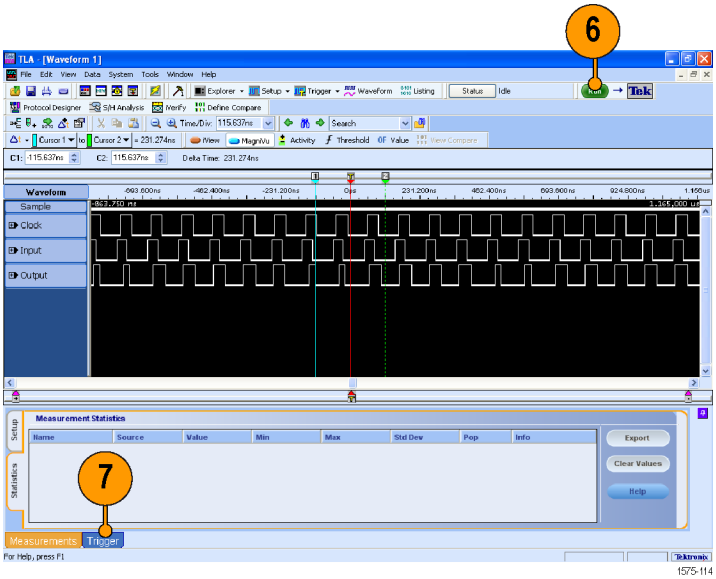
2. Open the Waveform window, right-click in the waveform label area, and select **Add Waveform**.



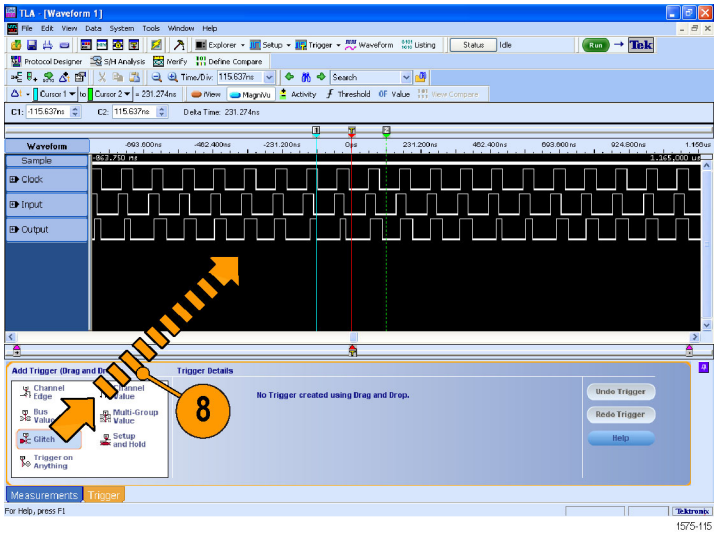
3. Select the groups (Clock, Input, and Output for this example).
4. Click **Add**.
5. Click **Close**.



6. Click **Run**.
7. Click **Trigger**.

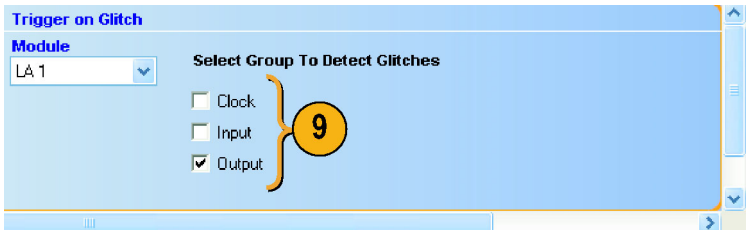


8. Click and drag the **Glitch** icon from the Tabbed Trigger window to the Output group waveform.



9. Select the groups that you want the logic analyzer to trigger on. Clear any other signals.

   The signal where you dropped the Glitch icon is selected by default. You can select the groups you want and avoid triggering on signals that may contain glitches that you do not care about.

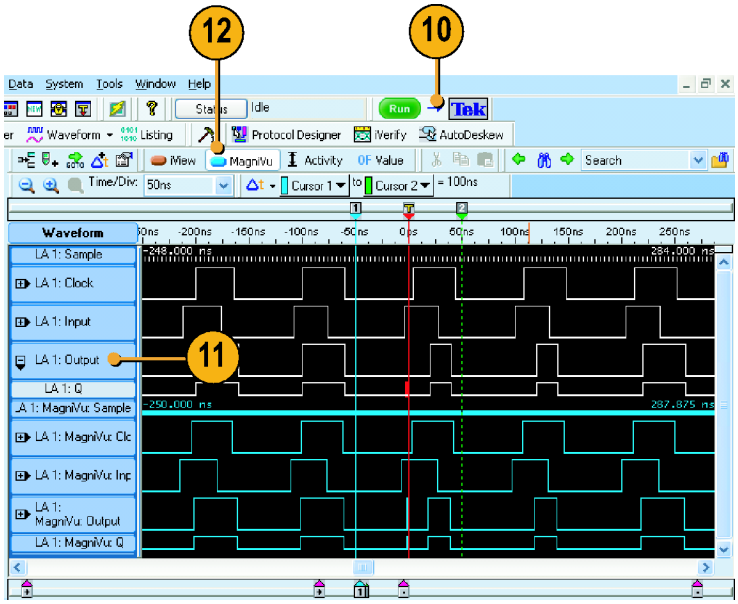


10. Click **Run**.

11. Expand the Output group to see the highlighted glitch on the Q waveform.

12. Click **MagniVu**.

    The glitch data is highlighted in red at every sample point for each signal in the Deep timing waveforms. The MagniVu timing waveforms show the high-resolution glitch data.



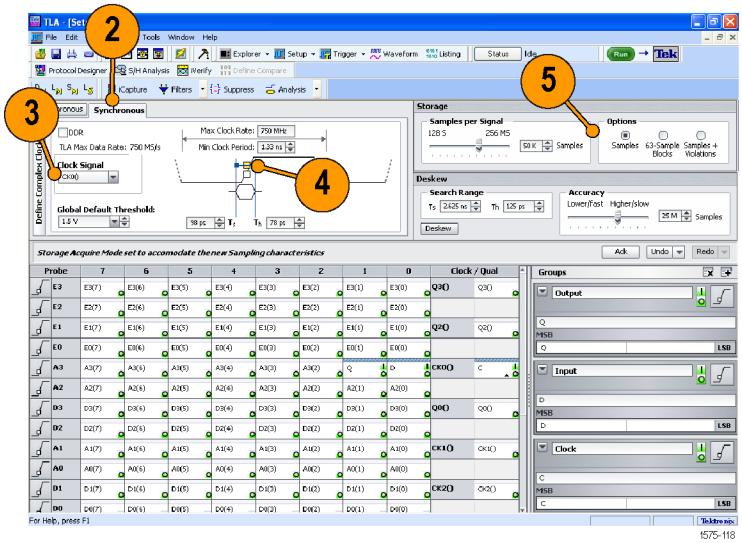
Analyze state data

You can use the logic analyzer for state data analysis; you can view the data in tabular form in the Listing window.

Define the Setup window

State acquisition uses an external clock from the target system to tell the logic analyzer when to sample data.

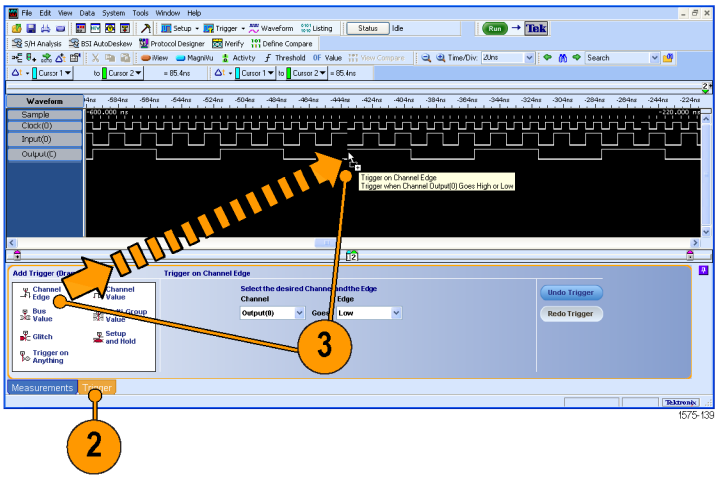
1. Configure the signals in the Setup window. (See page 7, *Configure the Setup window*.)
2. Select **Synchronous**.
3. Select the Single Clock source. For this example, select **CK0()**.
4. Select the rising edge of the clock.
5. Select **Samples**.



Configure the Trigger

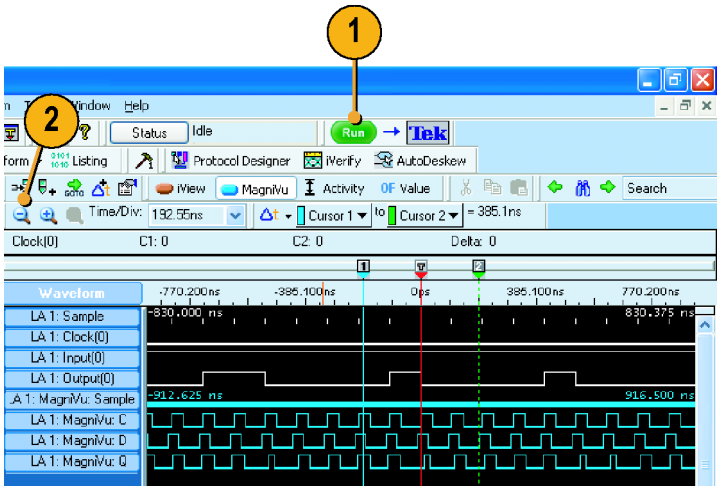
1. Define the setups for the Waveform window. (See page 11, *Create a data window*.)

   You will use the Waveform window setups to help define the trigger.
2. Click **Trigger** in the tabbed window.
3. Click and drag the **Channel Edge** icon from the Tabbed Trigger window to the Output waveform.



Acquire the data

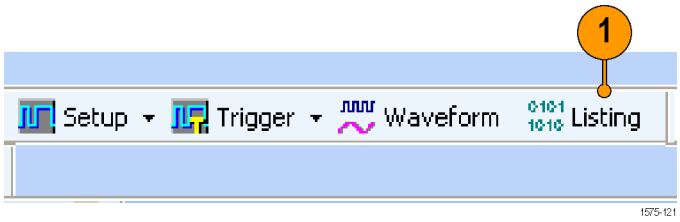
1. Click **Run**.
2. Zoom the data as necessary to view the acquired data.
   - The LA1: Clock(0) waveform data shows no changes because the data is sampled on each rising clock edge. Each tic mark of the Sample clock waveform represents a clock edge.
   - The MagniVu high-resolution data still displays timing data.



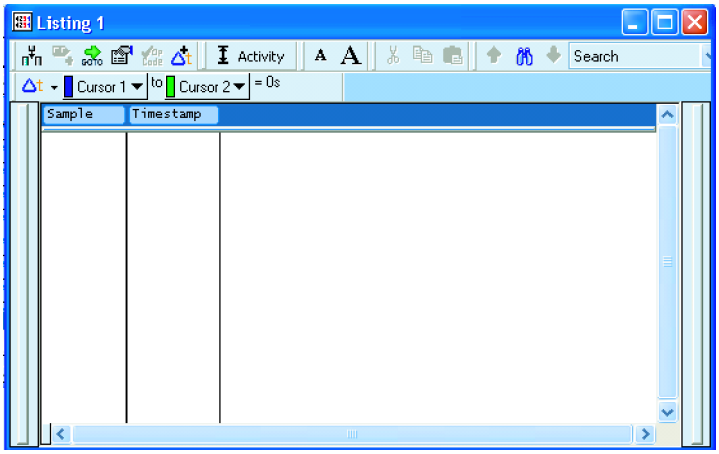
Create the Listing window

1. Click the Listing window button for your instrument in the TLA toolbar.

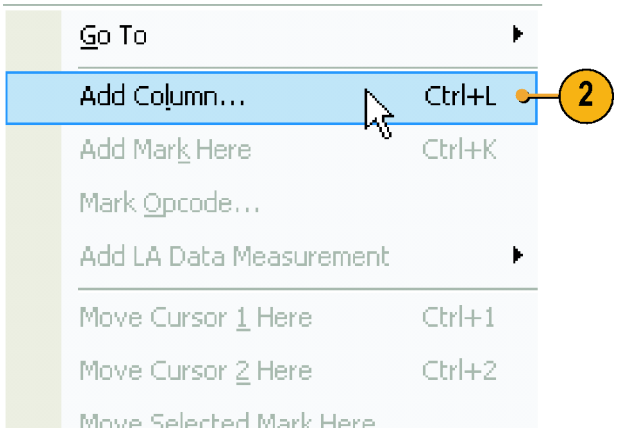
If the Listing window does not exist, use the New Data Window wizard to create a new Listing window.



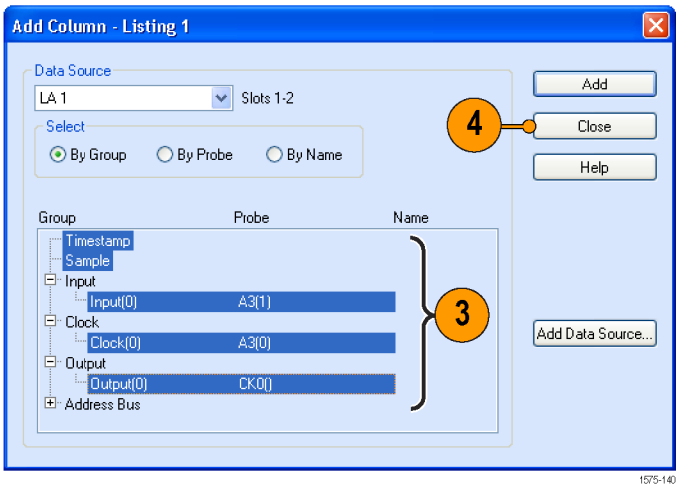
The listing window has no data in it. You need to add the data columns to the window to see the data.



2. Right-click in the data area and select **Add Column**.



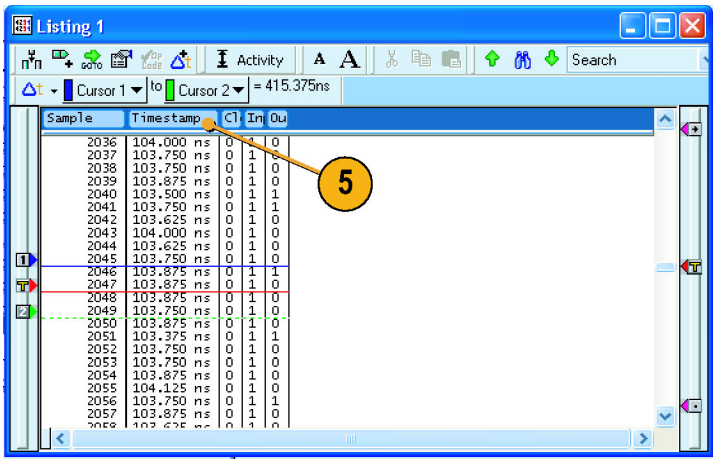
3. Expand the groups, press the **Ctrl** key while selecting each column, and click **Add** to add the columns to the Listing window.
4. Click **Close**.



5. Click and drag the Timestamp column to the right of the last column. Timestamps may be easier to read in this position.

Note the data in the Listing window.

- The clock data appears as zeros because the data is sampled on the rising edge of the clock.
- The Input and Output data appear as ones and zeros.
- The Timestamp column lists the time between data samples.
- The trigger point is halfway through the data because the Trigger position was set to 50%.

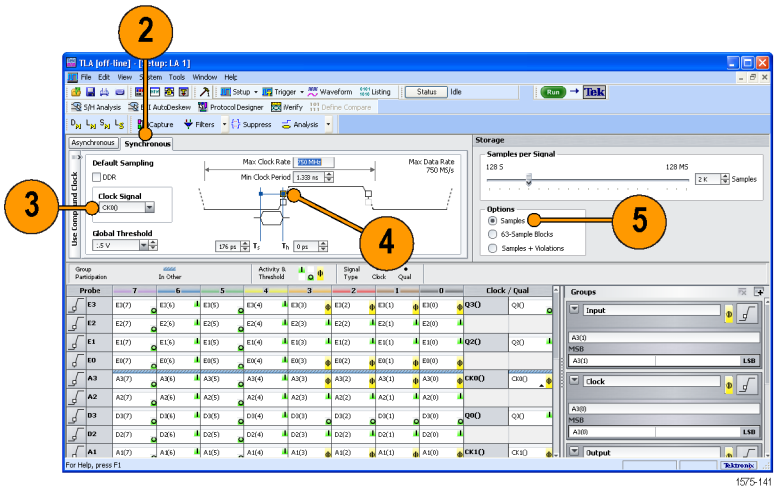


Trigger on a setup & hold violation

Use the Setup & Hold triggering to capture setup and hold violations. This example uses the same setups for the Setup window as the previous example. (See page 32, *Analyze state data*.)

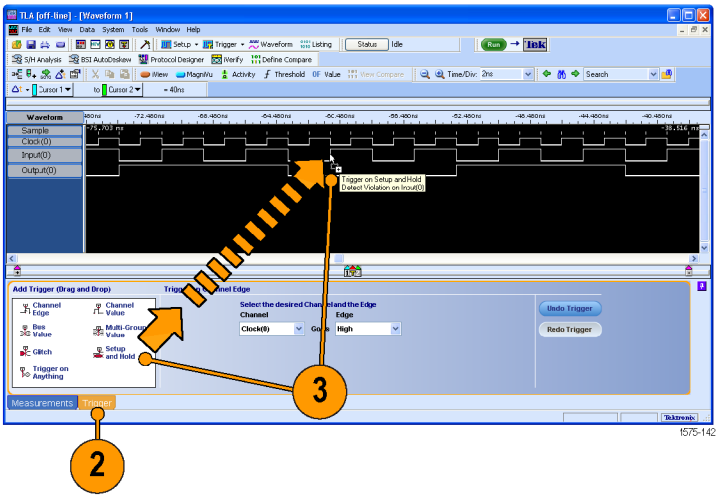
Define the Setup window

1. Configure the signals in the Setup window. (See page 7, *Configure the Setup window*.)
2. Select **Synchronous**.
3. Select the Single Clock source. For this example, select **CK0()**.
4. Select the rising edge of the clock.
5. Select **Samples**.

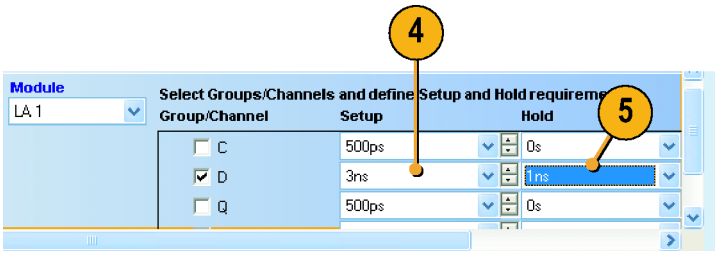


Configure the Trigger

1. Click **Run**.
2. Click **Trigger**.
3. Click and drag the **Setup and Hold** icon from the Tabbed Trigger window to the Input waveform.



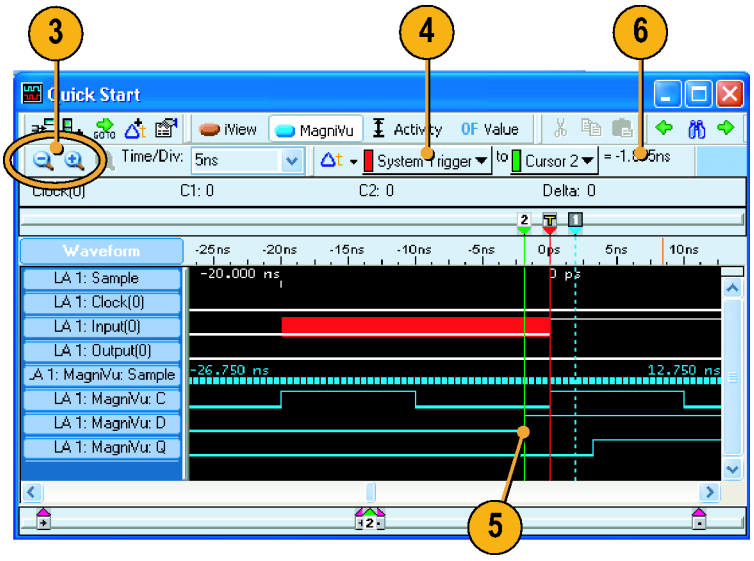
4. Select the desired value for the Input group/signal setup time.
5. Select the desired hold time.



Acquire and measure the MagniVu high-resolution timing data

1. Click **Run**.
2. View the data in the Waveform window.

   The instrument triggers on the rising edge of the clock signal at the violation. The setup and hold violation area is highlighted in red for each setup and hold violation on the Deep timing waveform. Use the MagniVu timing to view and measure the actual details.
3. Zoom the data as necessary to see the MagniVu waveforms.
4. Select System Trigger in the Measurement toolbar.
5. Move Cursor 2 to the data input transition.
6. Read the setup time from the Delta-Time readout.



Specifications

This section provides the warranted and mechanical specifications for the following Tektronix logic analyzers and modules:

- TLA6000 Series Logic Analyzers
- TLA7000 Series Logic Analyzers
- TLA7Bxx and TLA7ACx Series Logic Analyzer modules

All specifications (marked with the ✓ symbol) are guaranteed and can be checked directly or indirectly at your nearest Tektronix location or by following the procedures described in individual service manuals or performance verification documents. Typical specifications are provided for your convenience but are not guaranteed.

The performance limits in these specifications are valid under the following conditions:

- The instrument must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in these specifications.
- Logic analyzer modules must be installed in a logic analyzer mainframe.
- The instrument must have had a warm-up period of at least 30 minutes.
- The TLA7000 series instruments and TLA6200 series instruments must have been calibrated and adjusted at an ambient temperature between +20 °C and +30 °C.
- The TLA6400 series instruments must have been calibrated and adjusted at an ambient temperature between +18 °C and +28 °C.

Atmospheric characteristics

Characteristic	Description
Temperature: Operating and nonoperating	Operating (no media in floppy disk drive or DVD drive): +5 °C to +40 °C, 15 °C/hr maximum gradient, noncondensing (derated 1 °C per 300 m (984 ft) above 1500 m (4921 ft) altitude) [1] Nonoperating (no media in floppy disk drive or DVD drive): –20 °C to +60 °C, 15 °C/hr maximum gradient, noncondensing
Relative humidity: Operating and nonoperating	Operating (no media in floppy disk drive or DVD drive): 20% to 80% relative humidity, noncondensing. Maximum wet bulb temperature: +29 °C (derates relative humidity to approximately 22% at +50 °C) [2] [3] Nonoperating (no media in floppy disk drive or DVD drive): 8% to 80% relative humidity, noncondensing. Maximum wet bulb temperature: +29 °C (derates relative humidity to approximately 22% at +50 °C) [4]
Altitude: Operating and nonoperating	Operating: To 3000 m (9843 ft), (derated 1 °C per 300 m (984 ft) above 1500 m (4921 ft) altitude Nonoperating: To 12,000 m (39,370 ft)

1 TLA7012 and TLA6200 series instrument operating temperature is 45 °C maximum.

2 TLA7Bxx series module relative humidity derates to approximately 57% at +40 °C.

3 TLA7Bxx and TLA7ACx series modules and TLA6200 instrument operating humidity is 5% to 90% up to +30 °C, 75% from +30 to +40 °C, noncondensing. Maximum wet-bulb temperature is +29.4 °C.

4 TLA7Bxx and TLA7ACx series modules and TLA7000 instrument nonoperating humidity is 5% to 90% limited by a wet bulb temperature of +40 °C.

Product features

Characteristic	Description
✓ CLK10 Frequency (mainframes)	10 MHz ±100 PPM
TLA7012 mainframe slots	4
TLA7016 mainframe slots	13
MagniVu record length (samples per channel)	16 K for TLA7ACx modules and TLA6200 instruments 128 K for TLA7Bxx modules and TLA6400 instruments
MagniVu sampling period	125 ps for TLA7ACx modules and TLA6200 instruments 20 ps for TLA7Bxx modules 40 ps for TLA6400 instruments Data is asynchronously sampled and stored in a separate high-resolution memory. The storage speed may be changed (by software) to 250 ps, 500 ps, or 1000 ps, so that the MagniVu memory covers more time at a lower resolution.
Number of channels	
TLA6401	32 data and 2 clocks
TLA6202, TLA6402, TLA7AC2, TLA7BB2	64 data and 4 clock
TLA6203, TLA6403, TLA7AC3, TLA7BB3	96 data and 6 clock/qualifier
TLA6204, TLA6404, TLA7AC4, TLA7BB4, TLA7BC4	128 data and 8 clock/qualifier
Acquisition record length	
TLA7BBx, TLA6400 series	64 M samples per channel, maximum
TLA7ACx, TLA7BC4, TLA6200 series	128 M samples per channel, maximum

Warranted specifications

Characteristic	Description
Input parameters with probes	
✓ Threshold accuracy	
TLA6200 series, TLA7ACx, TLA7Bxx	±(35 mV + 1% of the threshold voltage setting)
TLA6400 series	±(50 mV + 1% of the threshold voltage setting)
✓ Channel-to-channel skew	
TLA6200 series, TLA7ACx	≤400 ps maximum
TLA7Bxx	±40 ps maximum, module only (for P6800 and P6900 series probes, add ±60 ps) ±20 ps (typical), module only
TLA6400 series	±40 ps maximum, instrument only, for P5900 series probes, add ±60 ps ±20 ps (typical), instrument only
Asynchronous sampling	
✓ Sampling period [1]	The fastest sampling rate for each logic analyzer goes to 50 ms in a 1–2–5 sequence
TLA6200 series, TLA7ACx	2 ns, 500 MS, all channels 1 ns, 1000 MS, half channels 500 ps 2000 MS, quarter channels
TLA7Bxx	1.25 ns, 800 MS, all channels 625 ps, 1600 MS, all channels 313 ps, 3200 MS, half channels 157 ps, 6400 MS, quarter channels
TLA6400 series	1.25 ns, 800 MS, all channels 625 ps, 1600 MS, all channels 313 ps, 3200 MS, half channels
✓ Minimum recognizable word [2] (across all channels)	Channel-to-channel skew + sample uncertainty Example for a P6860 Probe and a 1.25 ns sample period: 160 ps + 1.25 ns = 1.45 ns
Synchronous sampling	
✓ Setup and hold window size (data and qualifiers)	
TLA7ACx (single module), TLA6200 series	Maximum window size = Maximum channel-to-channel skew + (2 x sample uncertainty) + 100 ps Maximum setup time = User interface setup time + 75 ps Maximum hold time = User interface hold time + 50 ps
TLA7Bxx	220 ps maximum (180 ps Typical) single channel on single module 240 ps maximum (200 ps Typical) single channel on merged module
TLA6400 series	300 ps maximum (260 ps Typical) single-channel with P5910 and P5960 probes

Warranted specifications (cont.)

Characteristic	Description
✓ Maximum synchronous clock rate	
TLA6200 series, TLA7ACx	120 MHz in quarter-speed mode (8.3 ns minimum between active clock edges) [3] 235 MHz in half-speed mode (4.25 ns minimum between active clock edges) [3] 450 MHz in full-speed mode (2.2 ns minimum between active clock edges) 800 MHz on half channels [4] Software controls the selection between full-speed and half-speed modes.
TLA7Bxx	750 MHz, one sample point per clock, all channels 750 MHz, four samples points per clock, half channels 1400 MHz, one sample point per clock, all channels 1400 MHz, two sample points per clock, half channels
TLA6400 series	333 MHz, two sample points per clock, all channels 667 MHz, two sample points per clock, all channels
Trigger system	
✓ Trigger state machine (TSM) sequence rate	
TLA7ACx and TLA6200 series	DC to 500 MHz (2.00 ns) [5]
TLA7Bxx and TLA6400 series	DC to 800 MHz (1.25 ns) [6]

1 It is possible to use storage control and only store data when it has changed (transitional storage).

2 Applies to asynchronous sampling only. Setup and hold window specification applies to synchronous sampling only.

3 Software controls the selection between full-speed, half-speed, and quarter-speed modes.

4 This is a special mode and has some limitations such as the clocking state machine and trigger state machine only running at 500 MHz.

5 For data rates of 500 Mb/s or less, the TSM evaluates one data sample per TSM clock. For data rates greater than 500 Mb/s, the TSM evaluates multiple data samples per TSM clock up to the maximum acquired data rate.

6 For data rates of 800 Mb/s or less, the TSM evaluates one data sample per TSM clock. For data rates greater than 800 Mb/s, the TSM evaluates multiple data samples per TSM clock up to the maximum acquired data rate.

Mechanical characteristics

Characteristic	Description
TLA6200 dimensions	
Height (with feet)	29.46 cm (11.6 in)
Width	45.08 cm (17.75 in)
Depth	45.97 cm (18.1 in)
TLA6400 dimensions	
Height (with feet)	29.7 cm (11.7 in)
Width	43.7 cm (17.2 in)
Depth	38.7 cm (15.2 in)
TLA7012 dimensions	
Height (with feet)	29.46 cm (11.6 in)
Width	45.08 cm (17.75 in)
Depth	45.97 cm (18.1 in)

Mechanical characteristics (cont.)

Characteristic	Description
TLA7016 dimensions	
Height (with feet)	34.67 cm (13.7 in)
Width	42.42 cm (16.7 in)
Depth	67.31 cm (26.5 in)
TLA7Bxx and TLA7ACx dimensions	
Height	262 mm (10.32 in)
Width	61 mm (2.39 in) with merge connector in the recessed position Width increases by 10.41 mm (0.41 in) with merge connector in the extended position.
Length	373 mm (14.7 in)
Weight (TLA6000 series instruments and TLA7000 series mainframes include empty accessory pouch, slot covers, and front cover)	
TLA6202	20.73 kg (45 lbs 7 oz)
TLA6203	20.83 kg (45 lbs 15 oz)
TLA6204	20.89 kg (46 lbs 1 oz)
TLA6401	13.52 kg (29 lbs 13 oz)
TLA6402	13.88 kg (30 lbs 10 oz)
TLA6403	14.29 kg (31 lbs 8 oz)
TLA6404	14.65 kg (32 lbs 5 oz)
TLA7012	18.45 kg (40 lbs 12 oz)
TLA7016	24 kg (52 lbs 14 oz)
TLA7AC2, TLA7BB2	2.282 kg (5 lb 0.5 oz)
TLA7AC3, TLA7BB3	2.381 kg (5 lb 4 oz)
TLA7AC4, TLA7BB4, TLA7BC4	2.438 kg (5 lb 6 oz)

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