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Agilent LogicWave Help

Agilent LogicWave Help

Includes the following types of information:

- Getting Started - Quickly shows how to make basic measurements.
- Measurement Examples - How common measurements are performed with the logic analyzer.
- Task Guide - Shows how to perform logic analyzer tasks.
- Reference - Describes windows, commands, dialogs, and error messages.
- Concepts - Describes basic logic analysis concepts and answers frequently asked questions about LogicWave.
- Setup and Quick Reference - Shows how to connect the logic analyzer to your PC and install software.
- Glossary - Defines terms used in the LogicWave logic analyzer and its help.

See Also

- Technical Support
- LogicWave Home Page

Getting Started

Getting Started

Quickly shows how to make basic measurements.

Making a Basic Measurement

- Step 1. Start LogicWave
- Step 2. Connect the logic analyzer probes
- Step 3. Run a measurement

Performing Other Tasks and Measurements in Timing Mode

- Step 4. Set up the asynchronous sampling (timing) mode
- Step 5. Assign bus/signal names
- Step 6. Re-arrange buses and signals
- Step 7. Trigger on a signal edge
- Step 8. Trigger on sequential events
- Step 9. Trigger on a pulse
- Step 10. Measure time using markers
- Step 11. Trigger on a bus value in timing mode
- Step 12. Zoom in on data (change the time/division)

Performing Other Tasks and Measurements in State Mode

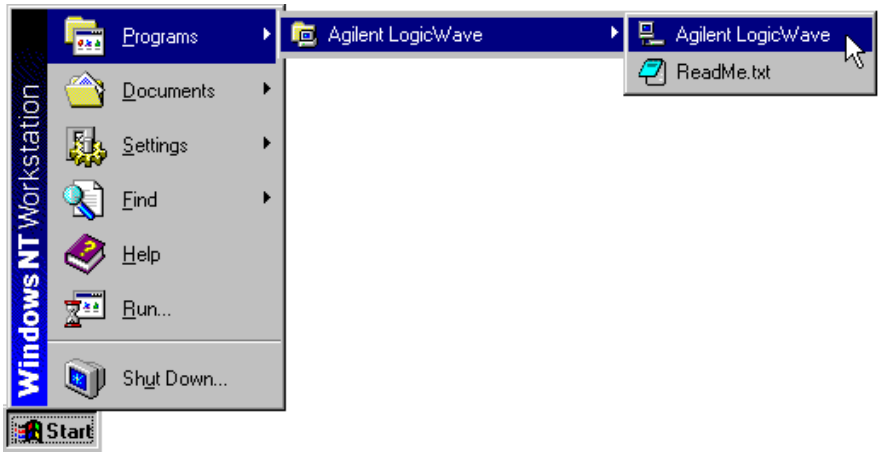
- Step 13. Set up the synchronous sampling (state) mode
- Step 14. Trigger on a bus value in state mode
- Step 15. Trigger on the Nth occurrence of a value
- Step 16. Trigger on sequential state events
- Step 17. Find a value in the captured data
- Step 18. Save the data file, and exit

submit

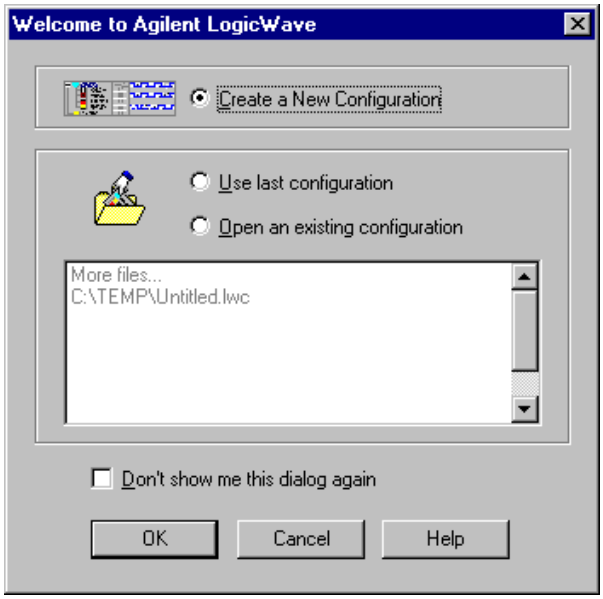
Making a Basic Measurement

Step 1. Start LogicWave

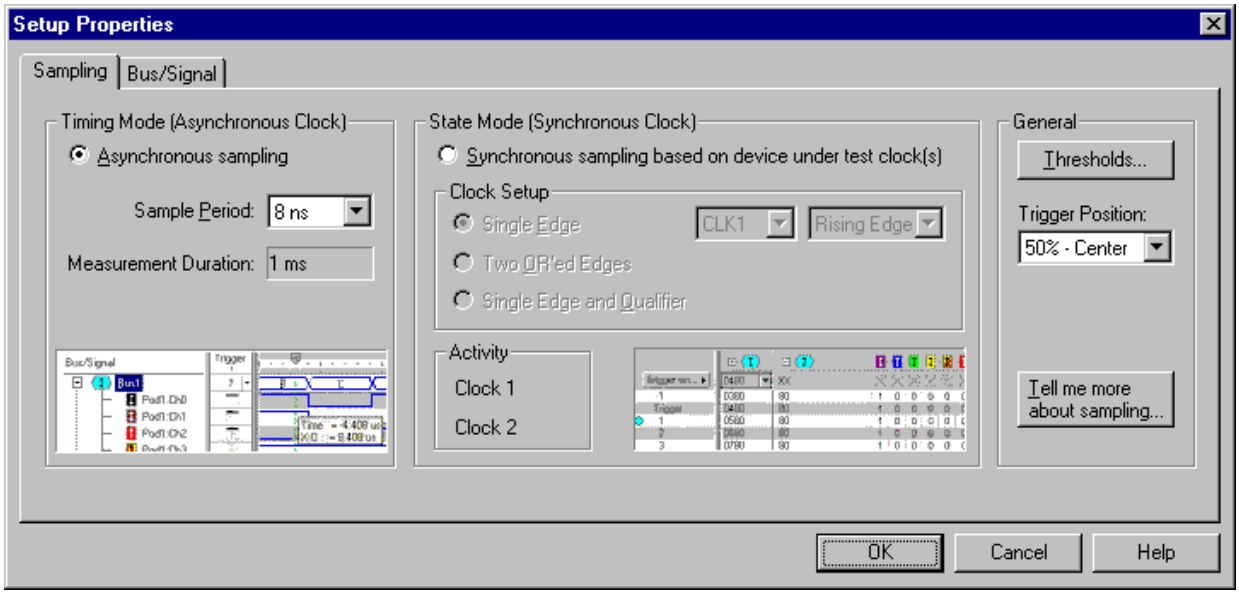
1. Choose Start->Programs->Agilent LogicWave->Agilent LogicWave.



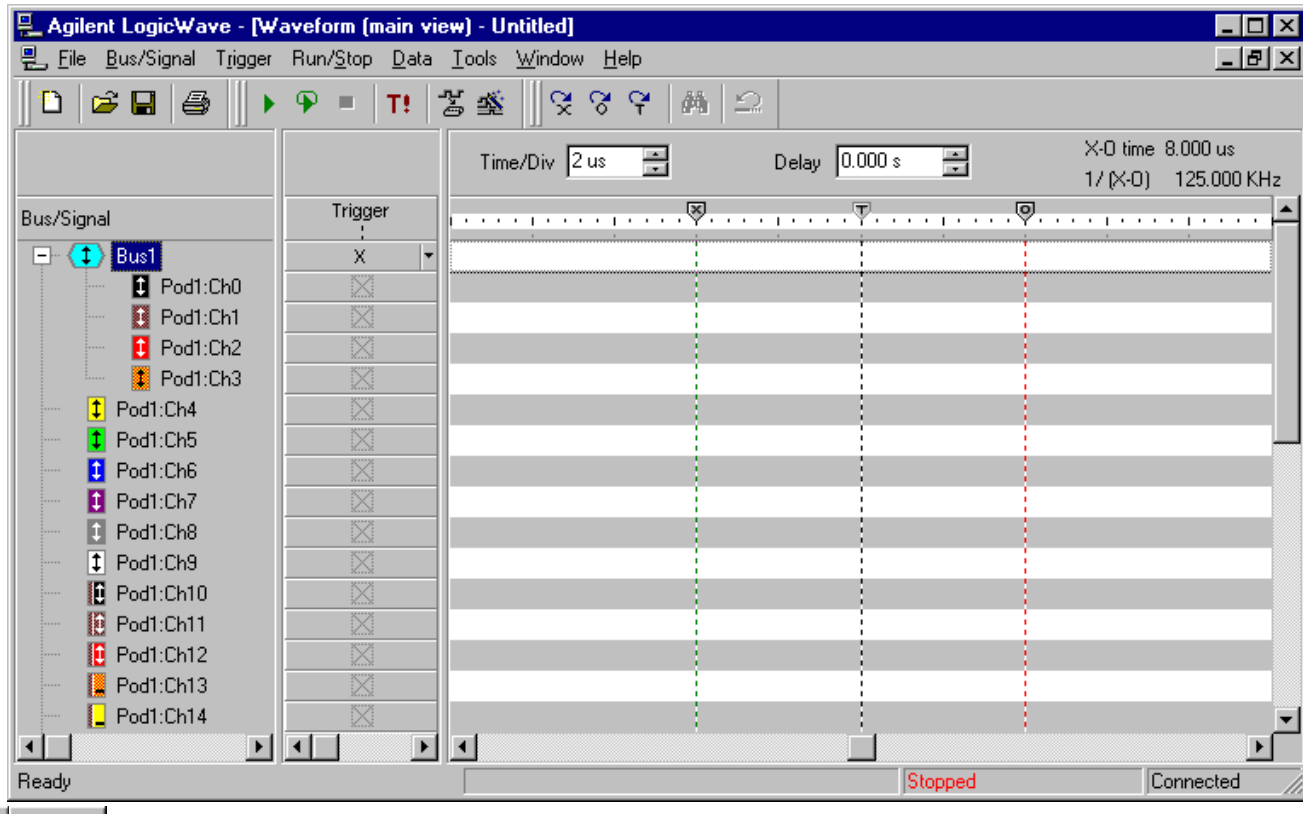
2. Create a new configuration.



3. Select the asynchronous sampling (timing) mode.



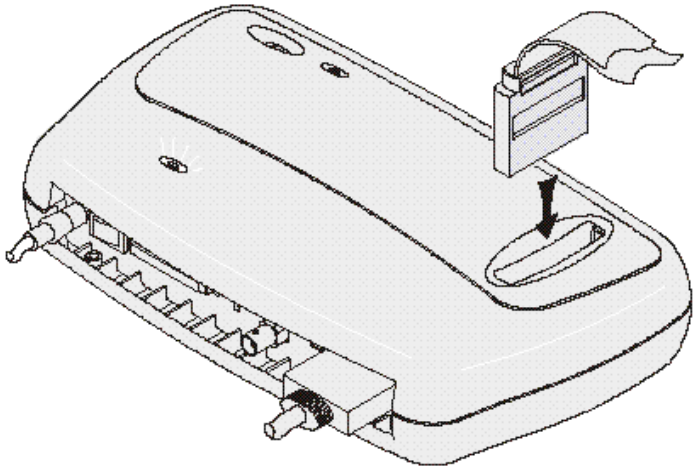
The Agilent LogicWave window opens.



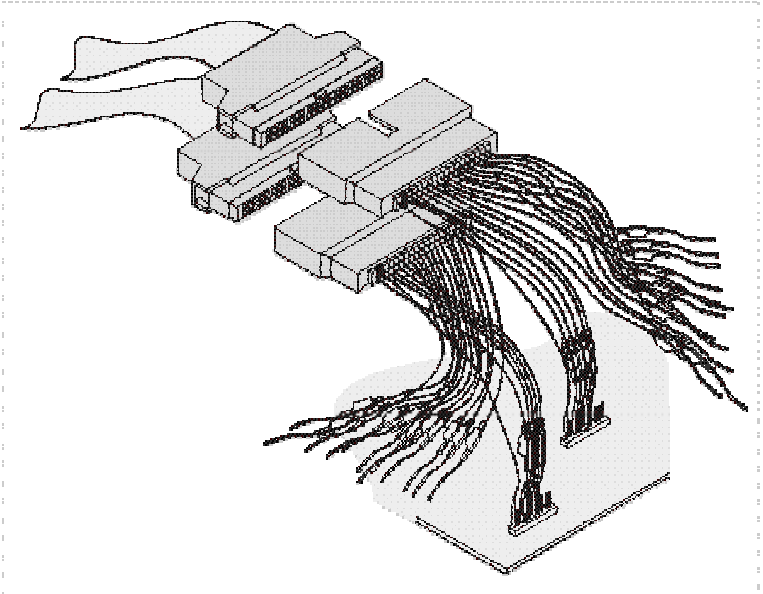
submit submit

Step 2. Connect the logic analyzer probes

1. Connect the probe cable to the logic analyzer.



2. Probe the device under test.



submit submit

Step 3. Run a measurement

submit submit

Performing Other Tasks and Measurements in Timing Mode

Step 4. Set up the asynchronous sampling (timing) mode

submit submit

Step 5. Assign bus/signal names

submit submit

Step 6. Re-arrange buses and signals

Back Next Step

Step 7. Trigger on a signal edge

Back Next Step

Step 8. Trigger on sequential events

submit submit

Step 9. Trigger on a pulse

submit submit

Step 10. Measure time using markers

submit submit

Step 11. Trigger on a bus value in timing mode

submit submit

Step 12. Zoom in on data (change the time/division)

submit submit

Performing Other Tasks and Measurements in State Mode

Step 13. Set up the synchonous sampling (state) mode

submit submit

Step 14. Trigger on a bus value in state mode

submit submit

Step 15. Trigger on the Nth occurrence of an event

submit submit

Step 16. Trigger on sequential state events

submit submit

Step 17. Find a value in the captured data

submit submit

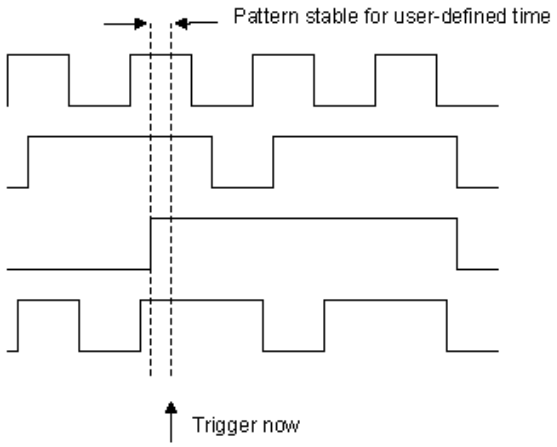
Measurement Examples

Measurement Examples

How common measurements are performed with the logic analyzer.

- To trigger on a stable pattern
- To trigger on an edge during a valid pattern
- To trigger on edges that are too close or too far
- To trigger when a signal or pattern stops
- To trigger if a pattern doesn't follow an edge
- To trigger on a pulse duration
- To trigger on the Nth occurrence of an event
- To trigger on a sequence of state events
- To capture execution up to a failure or halt

To trigger on a stable pattern

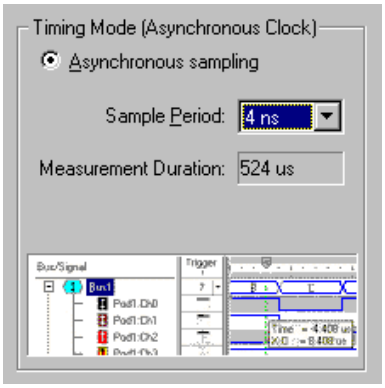


Possible Uses

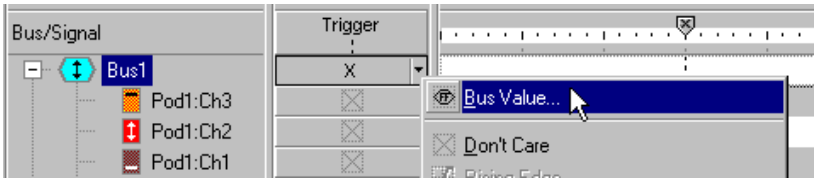
- To wait for all status lines to finish transitioning before triggering.
- To filter out spurious triggers because of transitions that occur when the device under test's state machine is indeterminate.

Procedure

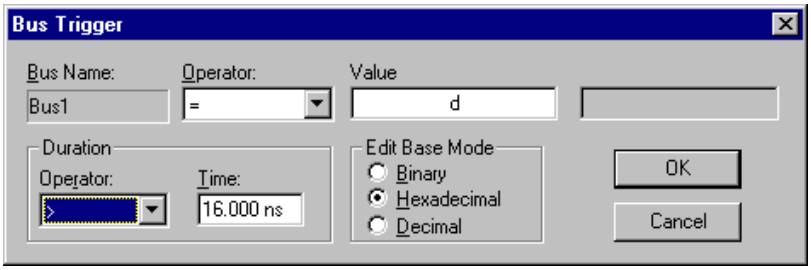
1. Click the sampling setup button and set up timing mode sampling.



2. Select the bus that you want to trigger on.
3. Choose the bus value trigger.



4. In the Bus Trigger dialog, enter the value to trigger on.
5. Select the ">" operator.
6. Enter the time that the pattern must be stable for.



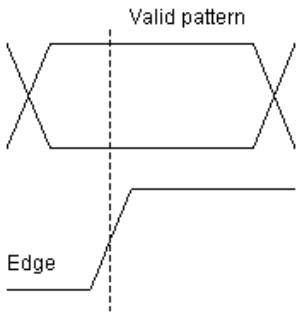
With the "<" operator, the minimum time is either twice the sample period or the absolute minimum of 16 ns. With the ">" operator, the minimum time is either equal to the sample period or the absolute minimum of 8 ns. The entered time will be rounded to a multiple of the sample period.

7. Click OK.
8. Click the run single measurement button.

See Also

- To select a timing or state analyzer
- To set up timing mode triggers

To trigger on an edge during a valid pattern

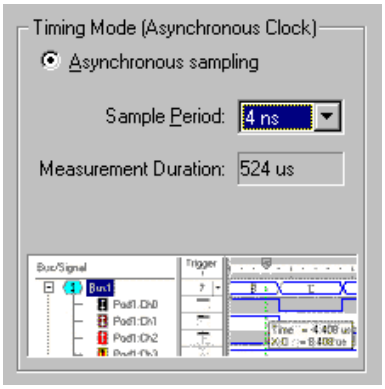


Possible Uses

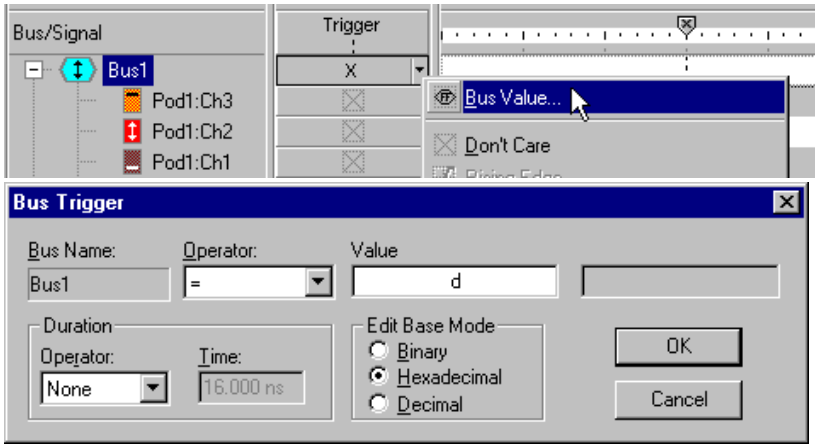
- To capture a memory chip's select line at a given address.
- To view the timing of a write signal to a peripheral.

Procedure

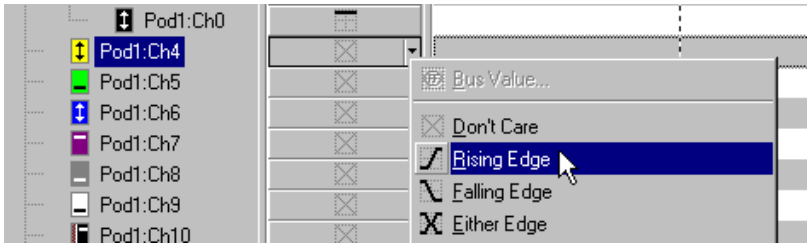
1. Click the sampling setup button and set up timing mode sampling.



2. Specify the valid bus pattern.



3. Specify the edge.

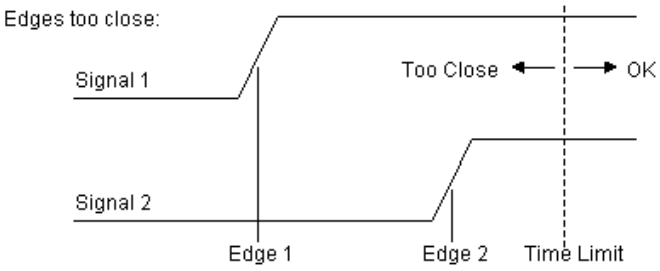


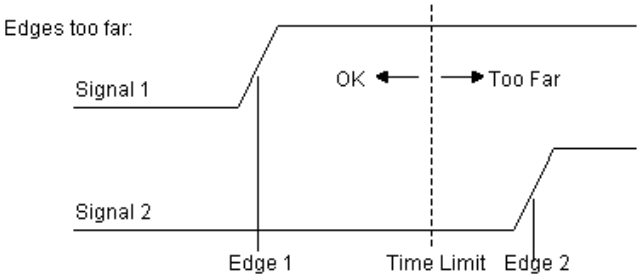
4. Click the run single measurement button.

See Also

- To select a timing or state analyzer
- To set up timing mode triggers

To trigger on edges that are too close or too far



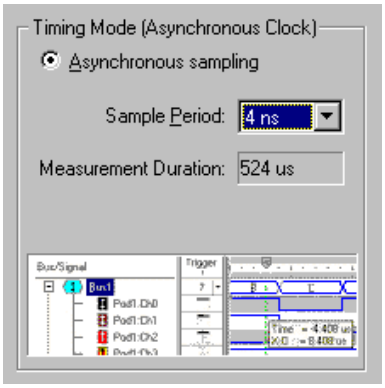


Possible Uses

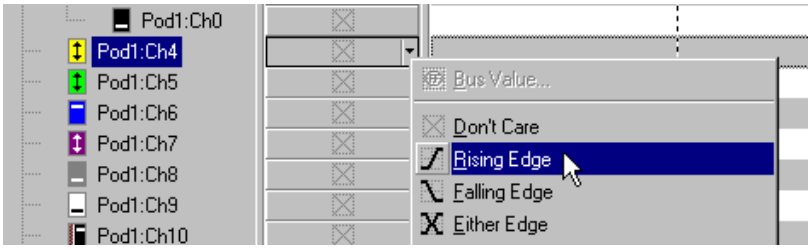
- To check DRAM row/column address strobe timing.
- To detect a handshake violation.
- To trigger on incorrect control signal generation from a Programmable Logic Device (PLD).

Procedure

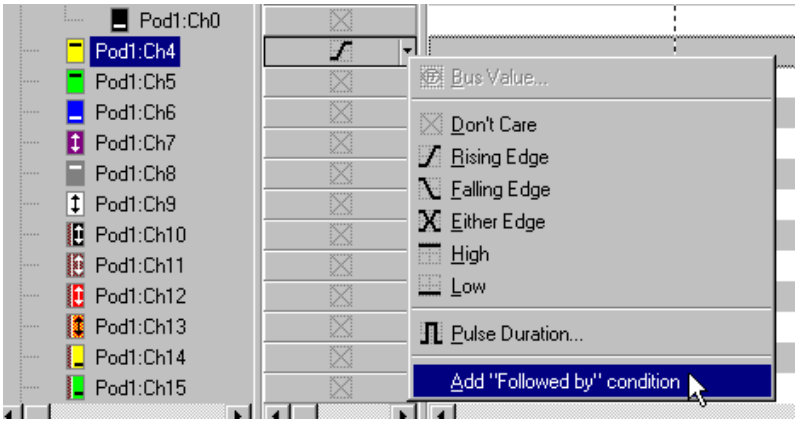
1. Click the sampling setup button and set up timing mode sampling.



2. Specify the first signal edge to look for.

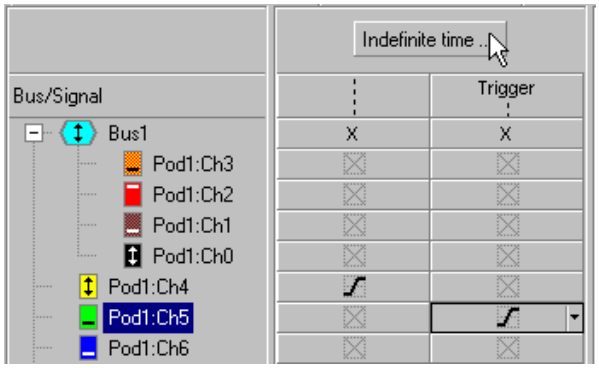


3. Choose the trigger "Add 'Followed by' condition" command.

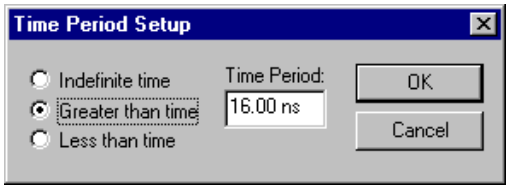


4. Specify the second signal edge to look for.

5. Click the time specification button at the top of the trigger column.



6. To trigger on edges too close, select "Less than time", or to trigger on edges too far select "Greater than time" in the Time Period Setup dialog; then, enter the time limit.

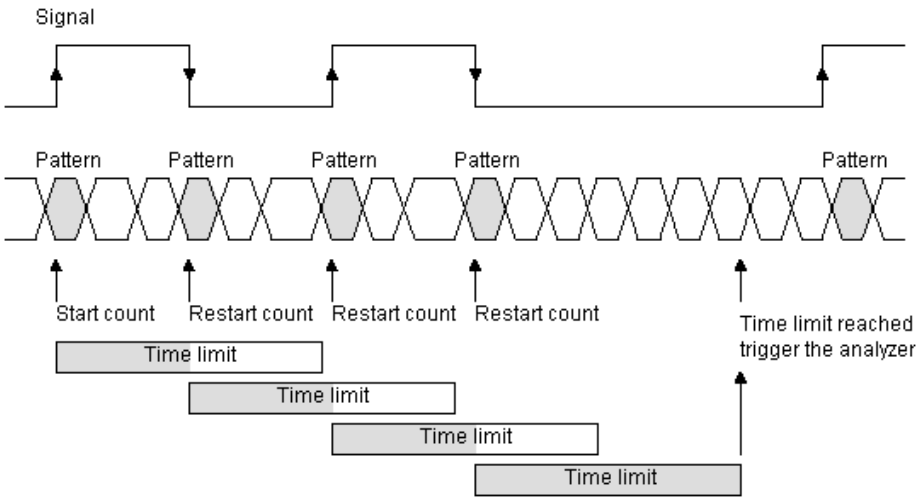


7. Click the run single measurement button.

See Also

- To select a timing or state analyzer
- To set up timing mode triggers

To trigger when a signal or pattern stops

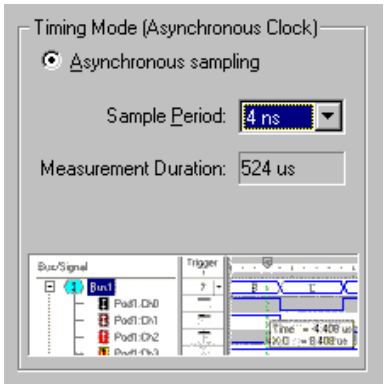


Possible Uses

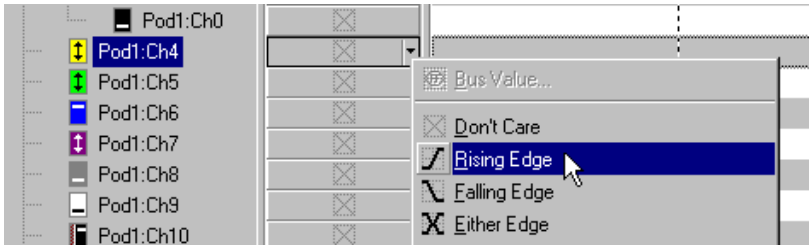
- To trigger when signals are inactive for too long a time.
- To check when execution leaves an address range.
- To check when expected variable values stop being written.
- To capture what leads up to an unexpected condition.

Procedure

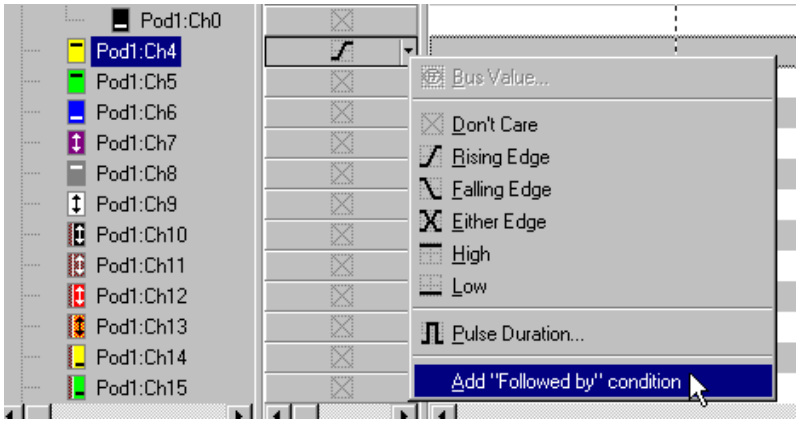
1. Click the sampling setup button and set up timing mode sampling.



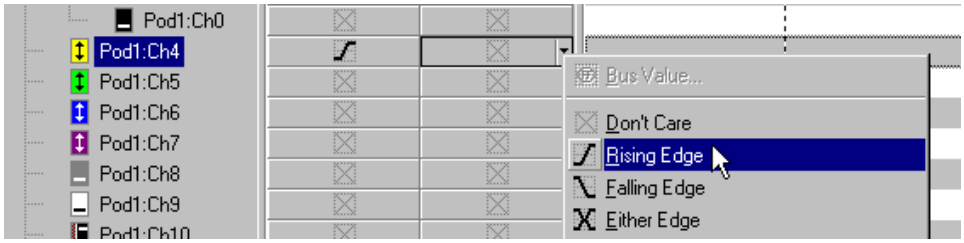
2. Specify the signal or bus pattern that you want to check.



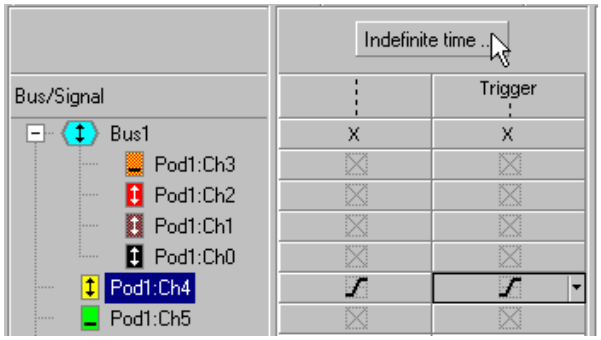
3. Choose the trigger "Add 'Followed by' condition" command.



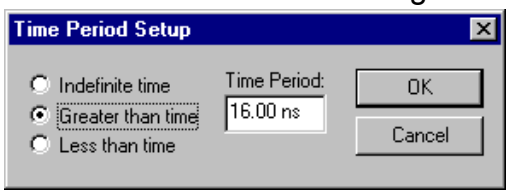
4. Specify the same signal or bus pattern in the second trigger column.



5. Click the time specification button at the top of the trigger column.



6. In the Time Period Setup dialog, select "Greater than time" and enter the time that indicates that the signal or pattern has stopped.

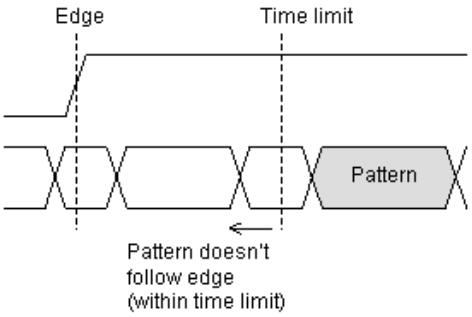


7. Click the run single measurement button.

See Also

- To select a timing or state analyzer
- To set up timing mode triggers

To trigger if a pattern doesn't follow an edge

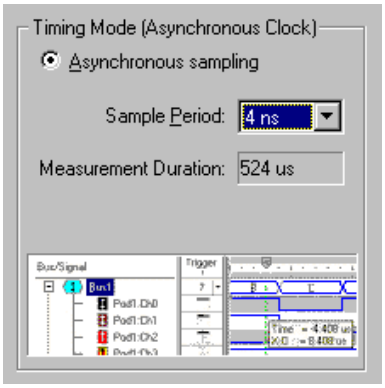


Possible Uses

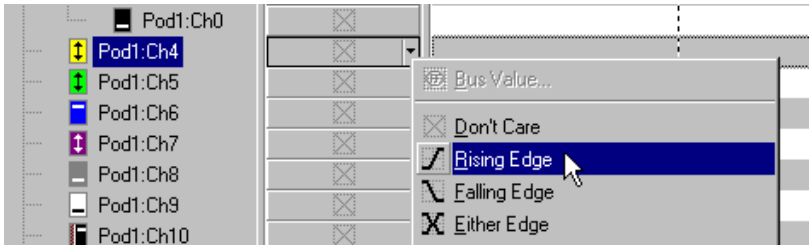
- To measure interrupt response time.
- To trigger when expected data does not appear on the data bus from a remote device when requested.

Procedure

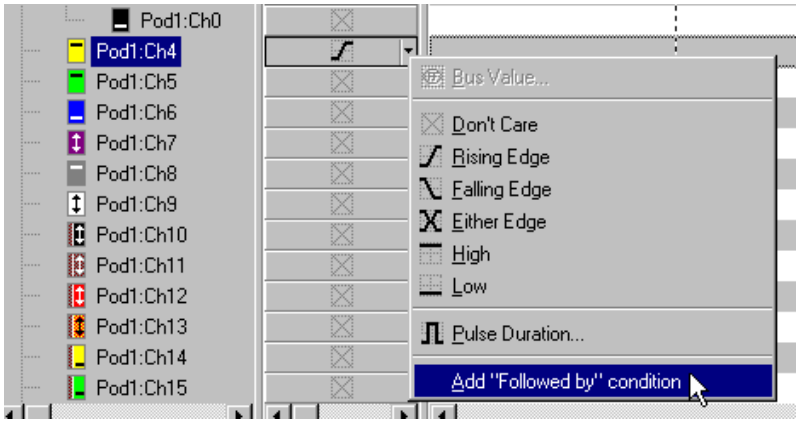
1. Click the sampling setup button and set up timing mode sampling.



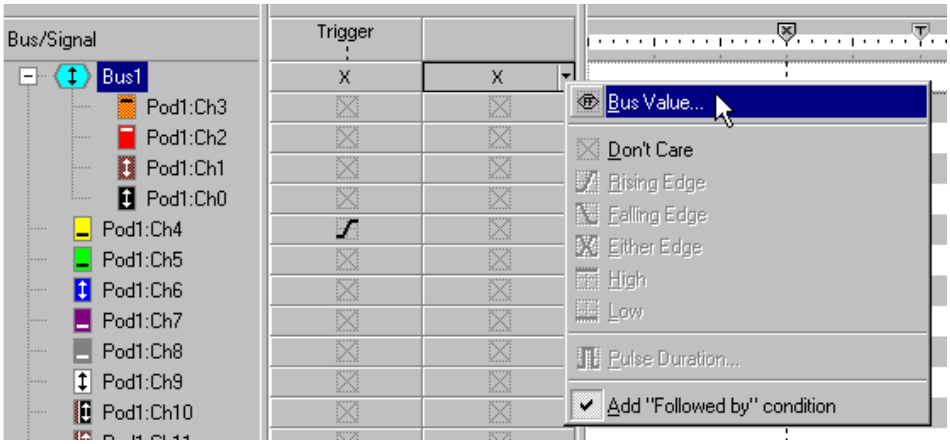
2. Specify the edge to look for.

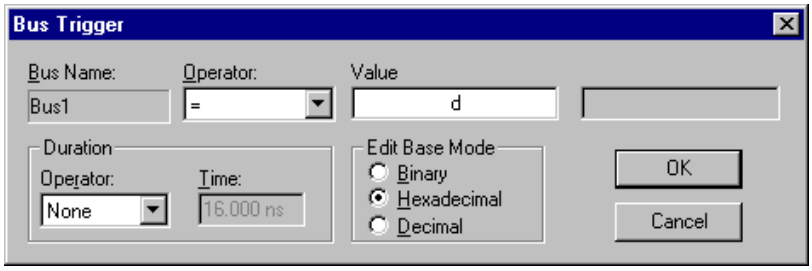


3. Choose the trigger "Add 'Followed by' condition" command.

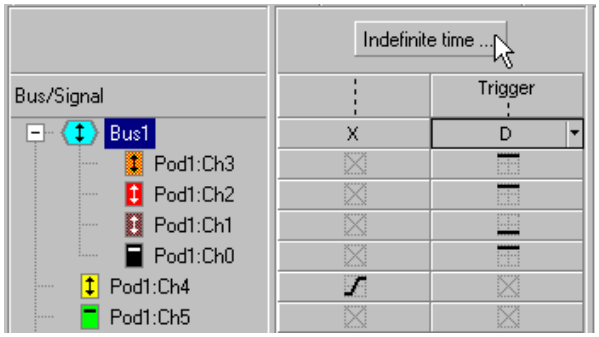


4. Specify the bus pattern that should follow the edge.

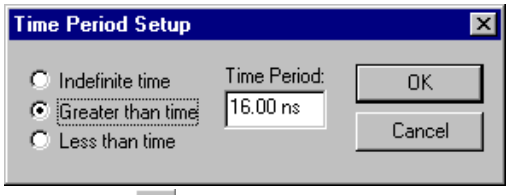




5. Click the time specification button at the top of the trigger column.



6. In the Time Period Setup dialog, select "Greater than time" and enter the time within which the pattern should occur.

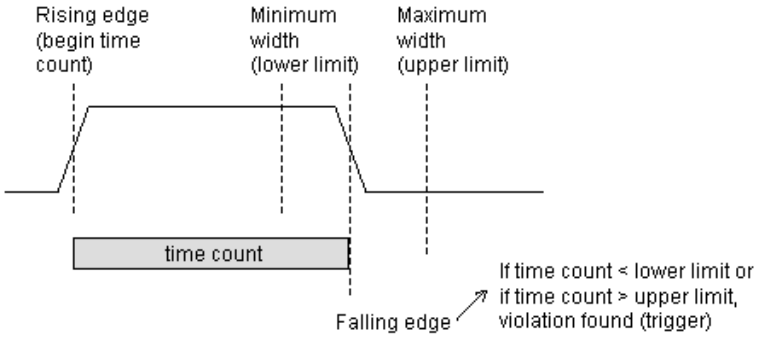


7. Click the run single measurement button.

See Also

- To select a timing or state analyzer
- To set up timing mode triggers

To trigger on a pulse duration

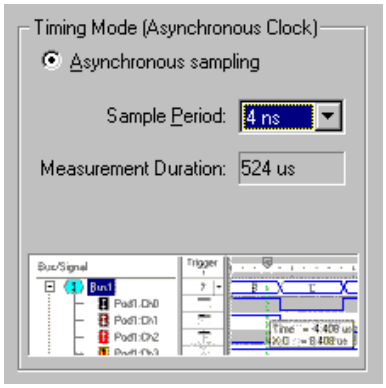


Possible Uses

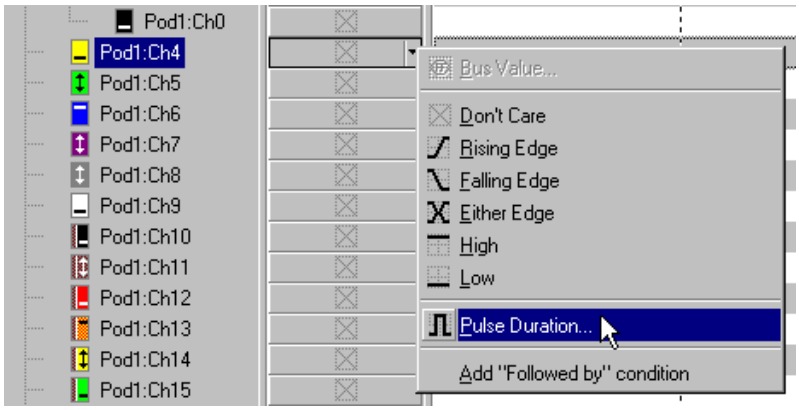
- To test minimum and maximum pulse limits.
- To verify that all pulses controlling a mechanical device fall within specifications.

Procedure

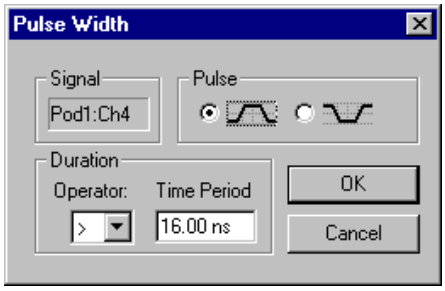
1. Click the sampling setup button and set up timing mode sampling.



2. Select the signal whose pulse you wish to check.
3. Choose the "Pulse Duration..." trigger.



4. In the Pulse Width dialog, select the type of pulse and enter the duration.



With the "<" operator, the minimum time period is either twice the sample period or the absolute minimum of 16 ns. With the ">" operator, the minimum time period is either equal to the sample period or the absolute minimum of 8 ns. The entered time period will be rounded to a multiple of the sample period.

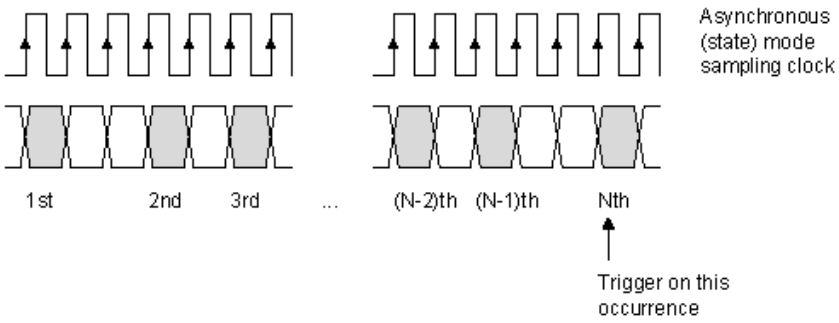
5. Click OK.
6. Click the run single measurement button.

See Also

- To select a timing or state analyzer
- To set up timing mode triggers

- To use the X and O markers

To trigger on the Nth occurrence of an event (in state mode)

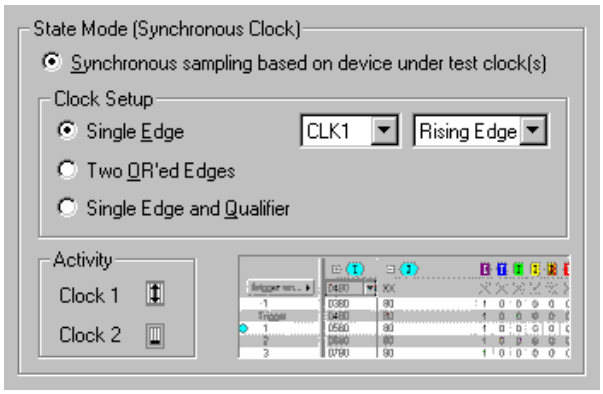


Possible Uses

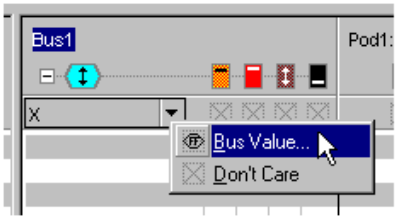
- To trigger on the 50th occurrence of a digital signal processing (DSP) subroutine.
- To trigger on the 3rd write to a specific memory address.

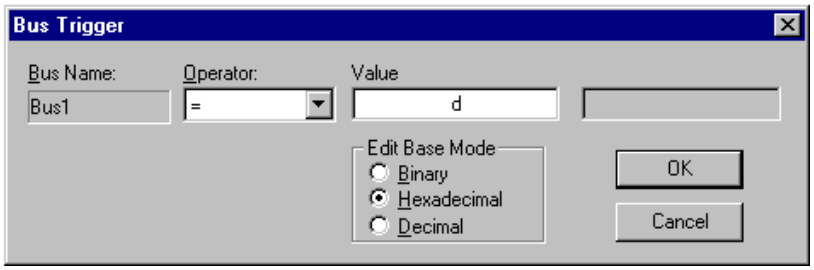
Procedure

1. Click the sampling setup button and set up state mode sampling.

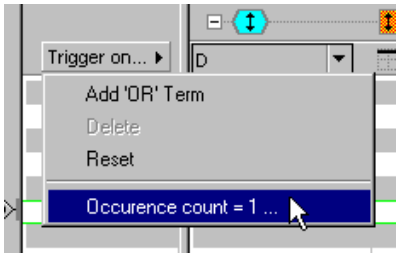


2. Set up the bus value or signal value trigger.

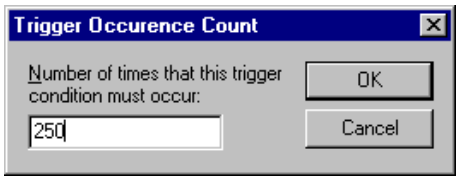




3. Click "Trigger on..." and select "Occurrence count = N ...".



4. In the Trigger Occurrence Count dialog, enter the number of times the event must occur before the logic analyzer triggers.

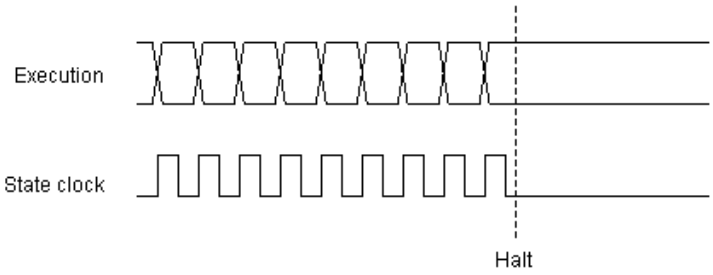


5. Click the run single measurement button.

See Also

- To select a timing or state analyzer
- To set up state mode triggers

To capture execution up to a failure or halt

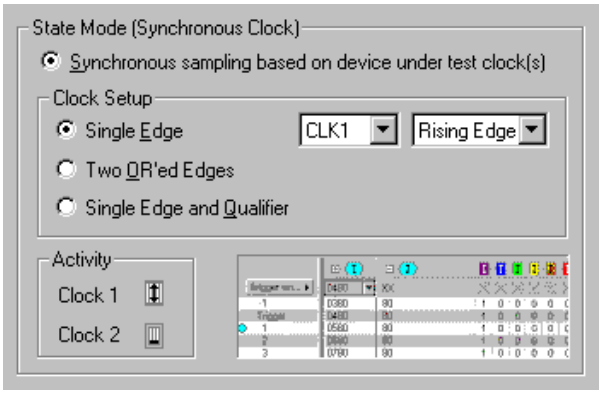


Possible Uses

- To store and display all activity leading up to a system crash.
- To run the logic analyzer indefinitely so that you can stop the measurement and observe system activity at your discretion.

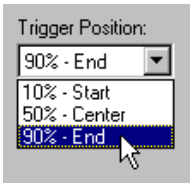
Procedure

1. Click the sampling setup button and set up state mode sampling.

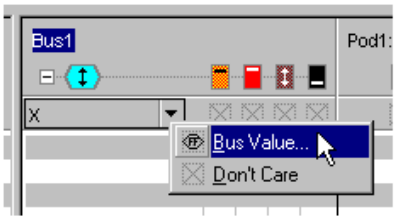


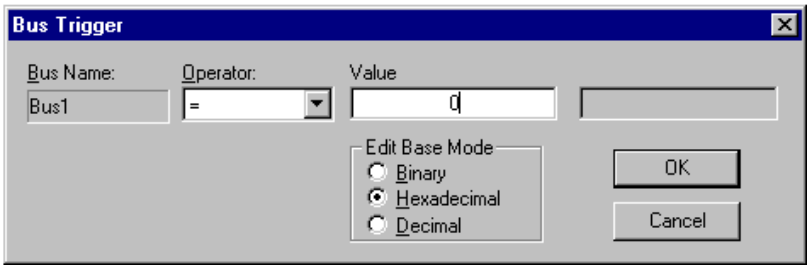
   Use a clock signal that will stop when the failure or halt occurs.

2. Also in the Setup Properties dialog, select "90% - End" so that when the sampling clock stops, you will have captured as many states as possible.



3. Set up to trigger on a bus or signal value that cannot occur.





4. Click the run single measurement button.
5. When the failure or halt occurs, click the stop acquisition button.

The data captured before the failure or halt will be displayed.

See Also

- To select a timing or state analyzer
- To set up state mode triggers
- To specify the trigger position

Task Guide

Task Guide

Shows how to perform logic analyzer tasks.

- Connecting Logic Analyzer Probes - Shows how to physically connect logic analyzer probes to your device under test.
- Capturing the Data - Shows how to select the type of logic analyzer and set up measurements.
- Displaying the Data - Shows different ways of displaying captured data.
- Printing/Exporting Data - Shows how to print captured data and export it in ASCII format.
- Triggering Other Instruments - Shows how to trigger oscilloscopes with the logic analyzer.

Connecting Logic Analyzer Probes

Connecting Logic Analyzer Probes

How to physically connect logic analyzer probes to your device under test.

- To physically connect logic analyzer probes
- To use the probe test contact
- To set the logic analyzer threshold voltage
- To assign bus/signal names to the logic analyzer probes
- To define symbols for particular bus/signal values

See Also

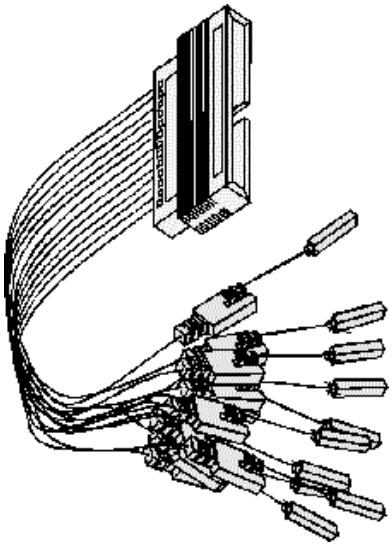
In addition to the general-purpose probes supplied with LogicWave, you can also plug logic analyzer probe cables (and perhaps termination adapters) directly into connectors that have been designed into a device under test. Refer to the Agilent logic analyzer probing accessories information on the World Wide Web at:

- Accessories

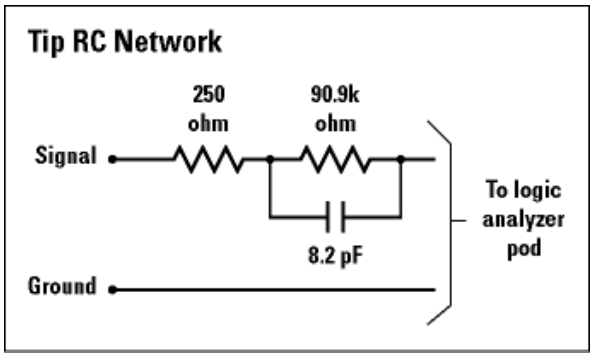
To physically connect logic analyzer probes

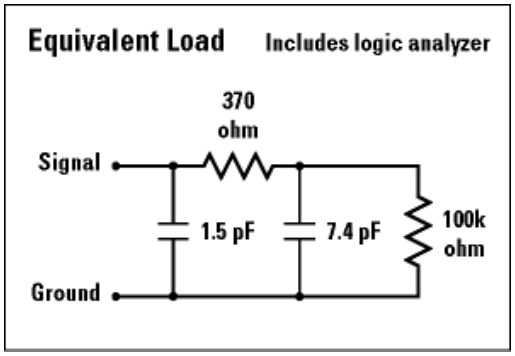
- Connecting to the Signal
- Grounding
- Assembling the Probing System

General-purpose probing requires connecting probe leads to individual signal lines. It is the most common method and is the most flexible. Because of the passive design of the probe, there are no active circuits at the outer end of the cable.



The probing system is similar to those of high-frequency oscilloscopes. It consists of a series RC network at the probe tip and a shielded resistive transmission line.





The advantages of this are:

- high input impedance
- signal ground at the probe tip to minimize reactive loading of high-speed timing signals
- inexpensive, removable probe tip assemblies

Connecting to the Signal

The signal and ground leads can be connected directly to the device under test. This requires installing 0.63 mm (0.025 inch) square pins, or round pins with a diameter between 0.66 and 0.84 mm (0.026 and 0.033 inch) directly on the

board. You can also use an IC test clip with pins with those dimensions.

You can also connect the leads using grabbers, which have small enough hooks to fit around adjacent IC pins, by using surface-mount grabbers designed for fine surface-mounted component leads, or by using wedge probe adapters. You can find more information on Agilent logic analyzer probing accessories on the World Wide Web at:

- Accessories

Grounding

Proper grounding will improve the signal quality and is essential for high-speed measurements. Each pod has a pod ground lead, which must be used. You can use only this ground, but the ground path will not be the same length as the signal path.

When probing signals with rise and fall times of 1 ns or less, ground each probe lead with a 2-inch ground lead as well as grounding the pod with the pod ground lead. This yields a grounding path equal to the signal path.

For good results with lower-speed measurements, ground not only the pod but every third or fourth lead.

Assembling the Probing System

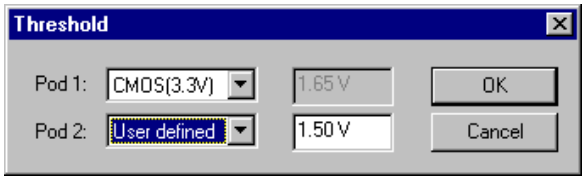
1. Connect the probing assembly to the probe cable.
2. If you have extra leads, disconnect individual probe leads by pushing on the latch at the lead base with a ballpoint pen.
3. Connect grabbers to the leads by slipping the end of the lead over the recessed pin located in the side of the grabber.

See Also

- Signal Requirements
- About the Probe Cable

To set the logic analyzer threshold voltage

1. Open the Sampling Setup dialog. (You can do this by clicking the sampling setup button, or you can choose the Data->Sampling Setup... command.)
2. Click the Thresholds... button.
3. In the Threshold dialog, select the type of signals that each logic analyzer pod is probing (TTL, CMOS(5V), CMOS(3.3V), or ECL) or "user defined" to specify a threshold voltage level.

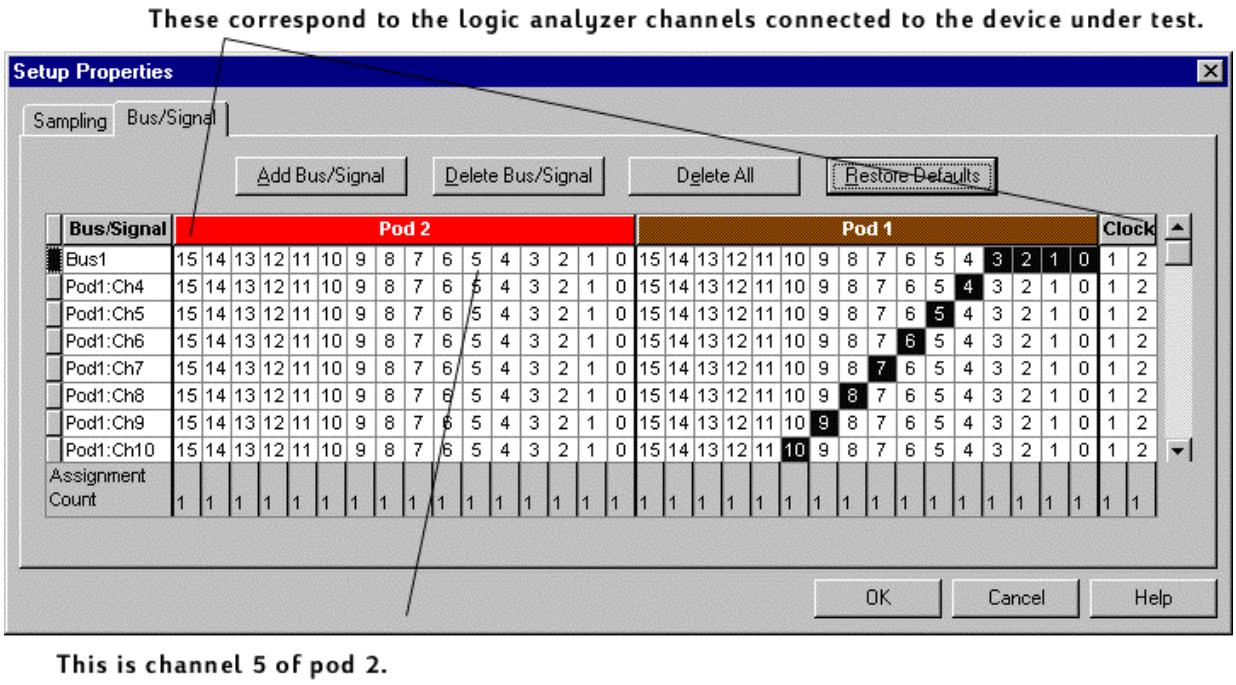


To assign bus/signal names to the logic analyzer probes

- To assign bus/signal names
- To add bus/signal names
- To delete bus/signal names
- To delete all bus/signal names

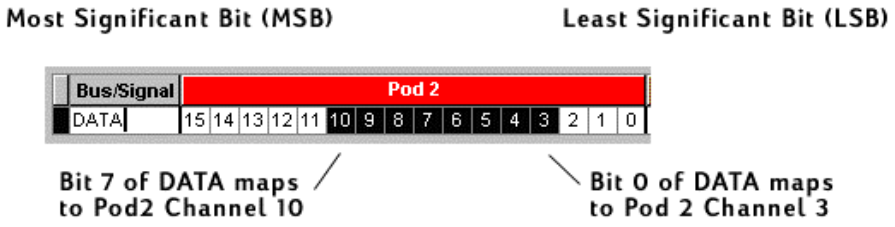
To assign bus/signal names

1. Open the Bus/Signal Setup dialog. You can do this by clicking the bus/signal setup button on the standard toolbar, or you can choose the Bus/Signal->Setup... command.



To add bus/signal names

1. Click the Add Bus/Signal button.
2. Click on the Bus/Signal name, and type the new name.
3. Select the channel(s) from Pod 1, Pod 2, or Clock.



4. Click OK.

When assigning bus names, the most significant bits of the bus are always the higher-order channel numbers.

To delete bus/signal names

1. Select the bus/signal.
2. Click the Delete Bus/Signal button.
3. Click OK.

To delete all bus/signal names

1. Click the Delete All button.
2. Click OK.

See Also

- Bus/Signal Setup
- Standard Toolbar

Capturing the Data

Capturing the Data

How to set up logic analyzer measurements.

- To select a timing or state analyzer
- To start/stop measurements
- To set up timing mode triggers (in Waveform view)
- To set up state mode triggers (in Listing view)
- To specify the trigger position
- To recall logic analyzer setups

To select a timing or state analyzer

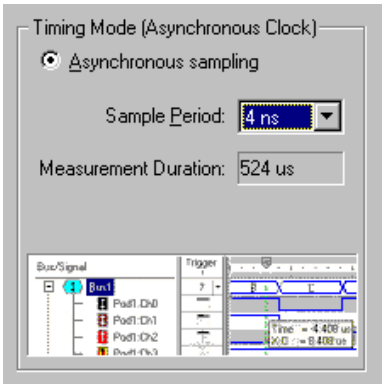
- To select the timing analyzer
- To set the timing analyzer sample period
- To select the state analyzer
- To set up the state analyzer sampling clock

A *timing analyzer* is a logic analyzer that samples based on an internal clock signal. This kind of sampling is also known as asynchronous sampling.

A *state analyzer* is a logic analyzer that samples based on a clock signal (or signals) from the device under test. Typically, the signal used to set up sampling is a state machine or microprocessor clock signal. This kind of sampling is also known as synchronous sampling.

To select the timing analyzer

1. Click the sampling setup button, or choose the Data->Sampling Setup... command.
2. In the Sampling Setup dialog, select the asynchronous sampling option.

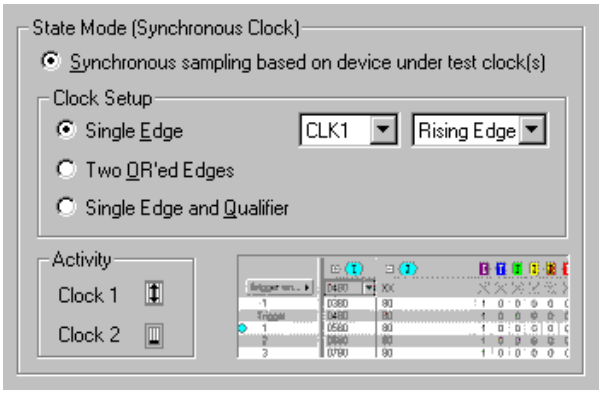


To set the timing analyzer sample period

1. Click the sampling setup button, or choose the Data->Sampling Setup... command.
2. In the Timing Mode area of the Sampling Setup dialog, increase or decrease the Sample Period. To capture signal level changes reliably, the sample period should be less than half (many engineers prefer one-fourth) of the period of the fastest signal you want to measure. Time interval measurements are made by counting the number of samples in the desired waveform area. These measurements are made to a +/- one sample error, so measurement accuracy is improved if the number of samples is maximized. For example, a 100 ns pulse width measured at a sampling period of 10 ns will be made with an accuracy of +/- 10 ns or +/- 10%. Increasing the sampling speed to a sampling period of 4 ns will improve the accuracy to +/- 4%. The resulting measurement duration changes accordingly.

To select the state analyzer

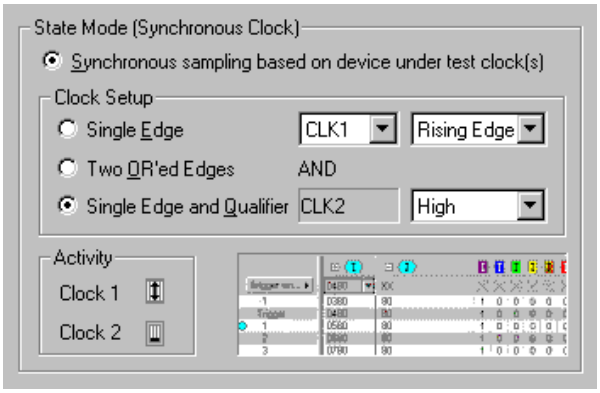
1. Click the sampling setup button, or choose the Data->Sampling Setup... command.
2. In the Sampling Setup dialog, select the synchronous sampling option.



3. Select the logic analyzer's CLK channel and signal edge that should be used as the sampling clock.

To set up the state analyzer sampling clock

1. Click the sampling setup button, or choose the Data->Sampling Setup... command.
2. In the State Mode area of the Sampling Setup dialog, select the logic analyzer clock inputs used to generate the state sampling clock.



See Also

- State analysis vs. timing analysis
- State analyzer sampling, OR'ed clocks
- State analyzer sampling, qualified clock

To start/stop measurements

- To start a measurement
- To stop a measurement

To start a measurement

1. Click the run single measurement or run repetitive measurement buttons or choose the Run/Stop->Single Measurement or Run/Stop->Repetitive Measurement commands The run single measurement button will save the captured data to trace memory one time. The run repetitive measurement button will save the captured data to trace memory repetitively.

To stop a measurement

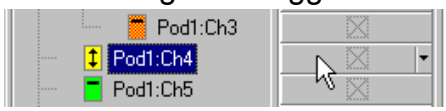
1. Click the stop acquisition button or choose the Run/Stop->Stop command.

To set up timing mode triggers (in Waveform view)

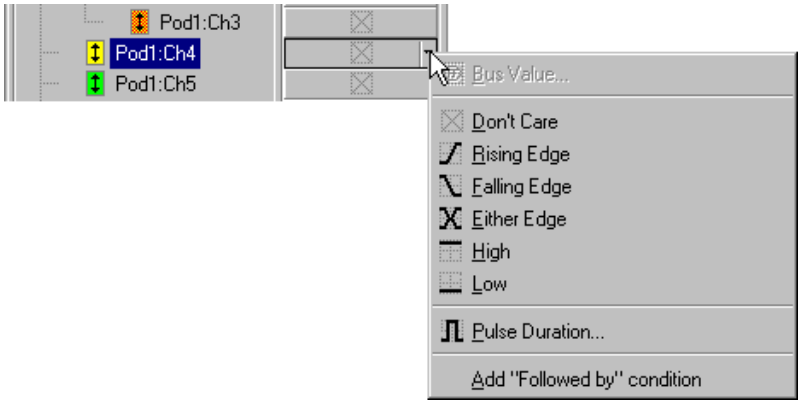
- To trigger on signal values
- To trigger on bus values
- To trigger on sequential events
- To erase the trigger setup

To trigger on signal values

1. Click the signal's Trigger button.

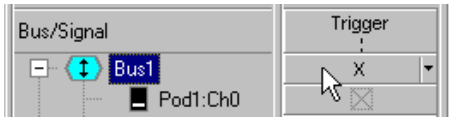


2. Keep clicking to cycle through the different types of triggers. Or: Select the type of trigger from the Trigger menu. Or: Click the Trigger button pull-down to select the trigger type from a menu.

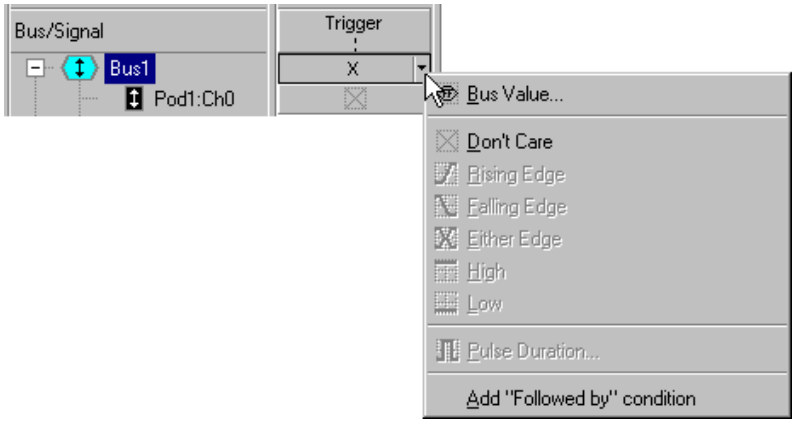


To trigger on bus values

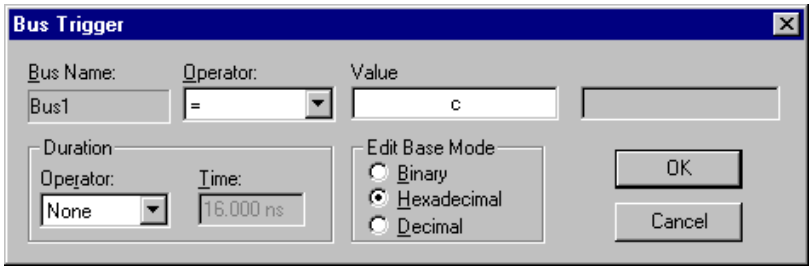
1. Click the bus' Trigger button.



Or: Select the type of trigger from the Trigger menu. Or: Click the Trigger button pull-down to select the trigger type from a menu.



2. In the Bus Trigger dialog, enter the value to trigger on.

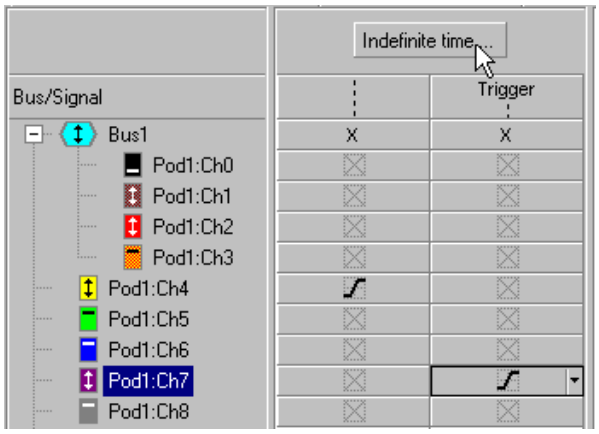


By selecting a different operator, you can also trigger on:

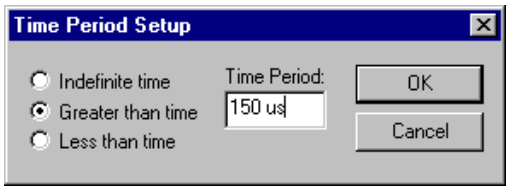
- Any bus value other than the specified value.
- A range of bus values.
- Any bus value outside the specified range.
- A symbol that has been defined for a particular bus value.

To trigger on sequential events

1. Choose "Add 'Followed by' condition" from the trigger menu.
2. Specify the event sequence.



3. In the Time Period Setup dialog, specify the amount of time between the events.



To return to a single-level trigger, specify all "don't cares" in the second level (or choose the Trigger->Reset command); then, choose "Add 'Followed by' condition" again to uncheck it.

NOTE: "Followed by" triggers will generally be off by one or two samples. Generally, the logic analyzer's sequencer can't detect the trigger condition until one or two samples past when the condition actually occurs. This means that, in the captured data, the trigger point shows up one or two samples past the actual trigger condition.

To erase the trigger setup

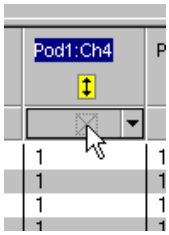
1. Choose the Trigger->Reset command.

To set up state mode triggers (in Listing view)

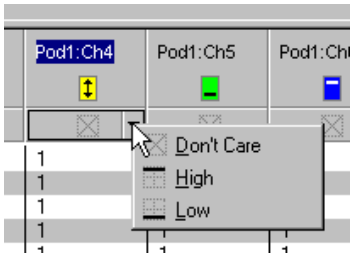
- To trigger on signal values
- To trigger on bus values
- To trigger on one of several values
- To trigger on sequential state events
- To trigger on the Nth occurrence of a value
- To erase the trigger setup

To trigger on signal values

1. Click the signal's Trigger button.

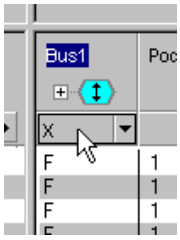


2. Keep clicking to cycle through the different types of triggers. Or: Select the type of trigger from the Trigger menu. Or: Click the Trigger button pull-down to select the trigger type from a menu.

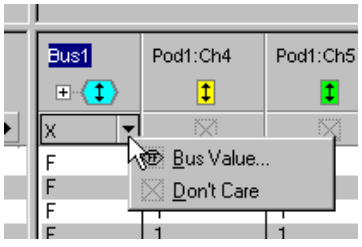


To trigger on bus values

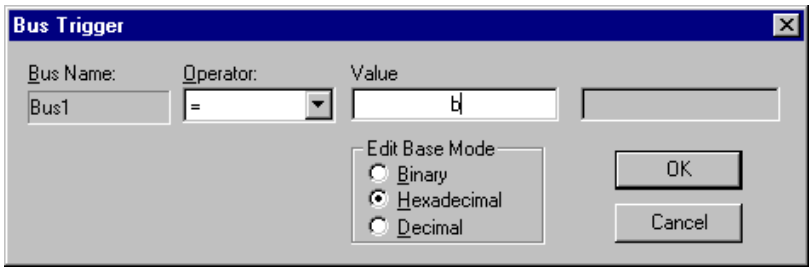
1. Click the bus' Trigger button.



Or: Select the type of trigger from the Trigger menu. Or: Click the Trigger button pull-down to select the trigger type from a menu.



2. In the Bus Trigger dialog, enter the value to trigger on.

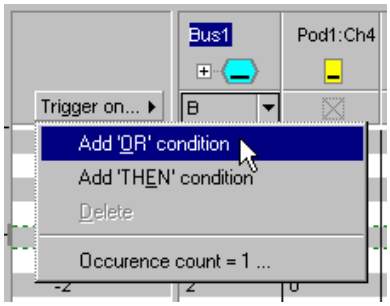


By selecting a different operator, you can also trigger on:

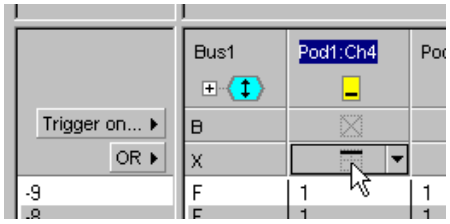
- Any bus value other than the specified value.
- A range of bus values.
- Any bus value outside the specified range.
- A symbol that has been defined for a particular bus value.

To trigger on one of several values

1. Click the Trigger on... button, and select Add 'OR' condition.

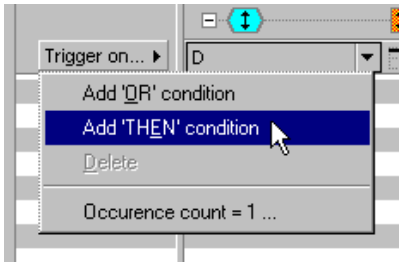


2. Specify the additional values.

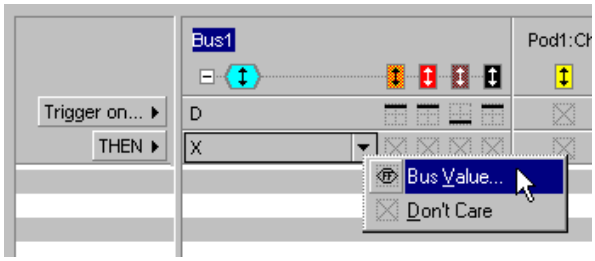


To trigger on sequential state events

1. Click the Trigger on... button, and select Add 'THEN' condition.

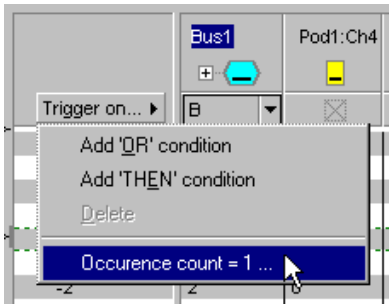


2. Specify the additional state events.



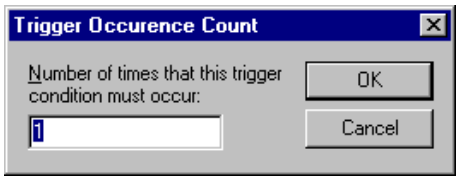
To trigger on the Nth occurrence of a value

1. Specify the signal or bus value to trigger on.
2. Click the Trigger on... button, and select Occurrence count = 1....



You can only trigger on the Nth occurrence of an event in state mode.

3. In the Trigger Occurrence Count dialog, specify which occurrence of the value to trigger on.

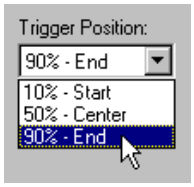


To erase the trigger setup

1. Choose the Trigger->Reset command.

To specify the trigger position

1. Open the Sampling Setup dialog. (You can do this by clicking the sampling setup button, or you can choose the Data->Sampling Setup... command.)
2. Select the trigger position.



The selections specify the amount of trace memory used for samples captured before the trigger. When "10% - Start" is selected, 90% of trace memory is used for samples captured after the trigger. When "90% - End" is selected, 90% of trace memory is used for samples captured before the trigger.

NOTE: The trigger position setting works differently in the state and timing sampling modes.

In the timing mode, the analyzer won't begin to look for the trigger until it has filled the pre-trigger portion of trace memory, thereby guaranteeing that the trigger will be positioned correctly in the captured data.

In the state mode, regardless of the trigger position setting, the analyzer will begin to look for a trigger after one state has been stored. Therefore, it is possible for the trigger to be the second state, even when the 90% trigger position is selected.

To recall logic analyzer setups

- To save a logic analyzer setup
- To open a logic analyzer setup

To save a logic analyzer setup

1. Click the save button or choose the File->Save or File->Save As... commands.
2. If the logic analyzer setup file is new, name the file in the file browser dialog.

Secondary Display windows are not saved.

To open a logic analyzer setup

1. Click the open button or choose the File->Open... command.
2. Select the logic analyzer setup file from the file browser dialog.

Secondary Display windows are not restored.

Displaying the Data

Displaying the Data

How to display captured data.

- To scale the waveform display
- To find a value in the captured data
- To use the X and O markers
- To group signals into buses
- To hide signals/buses
- To rename signals/buses
- To reorder signals/buses in the display
- To specify waveform colors
- To display absolute time information
- To display relative time information
- To display symbols in captured data
- To see an additional view of the captured data

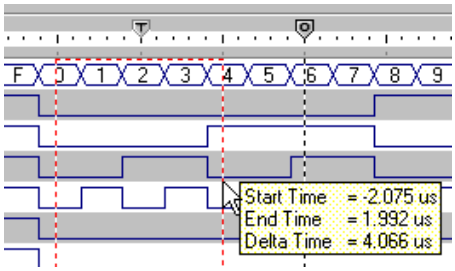
To scale the waveform display

- To zoom in on the data
- To zoom out on the data
- To undo the last zoom command

To zoom in on the data

- Lower the time-per-division on the display.

- Drag the mouse pointer around the area you want to zoom in on.



- Choose the Data->Zoom In command.

To zoom out on the data

- Raise the time-per-division on the display.

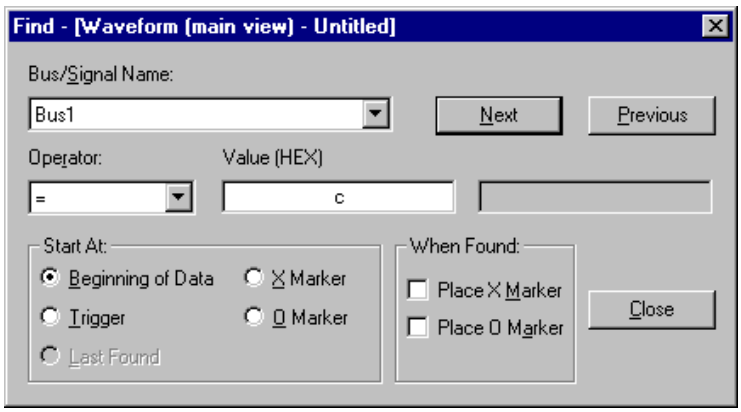
- Choose the Data->Zoom Out command.

To undo the last zoom command

- Click the zoom undo button on the Data Toolbar, or choose the Data->Undo Last Zoom command.

To find a value in the captured data

1. Click the find data value button or choose the Data->Find Data Value... command.
2. In the Find dialog, select the bus or signal name and enter the value you want to locate.



3. Click the Next or Previous buttons.

To use the X and O markers

- To place markers in the display
- To go to a marker

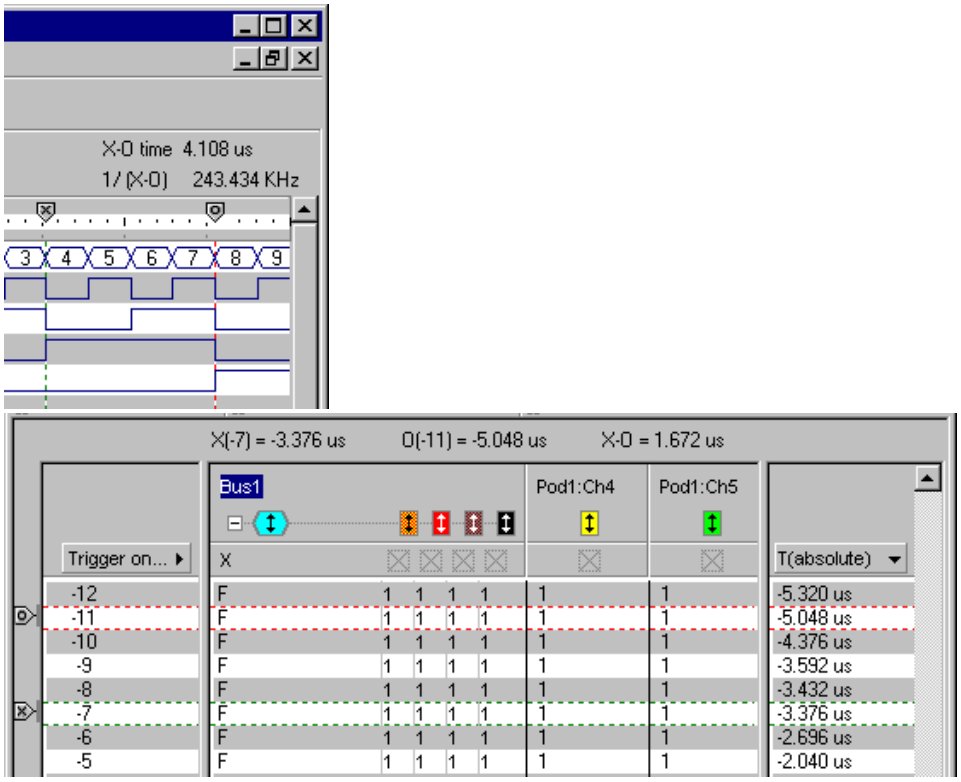
The X and O markers can be moved around in the captured data to measure time between events. For example, you can measure the time between edges that appear in the captured data, or you can measure the width of a pulse that appears in the captured data.

The T marker shows the trigger point which is a fixed point in the captured data.

NOTE: You can drag the T marker like the X and the O markers, but doing so moves all the captured data (and the X and O markers) relative to the time line and changes the delay. Going to the T marker repositions the marker and the captured data so that the delay is zero.

To place markers in the display

- Drag the X or O markers to place them at specific locations. The X and O markers are always in the data display, as is the time between markers.



To go to a marker

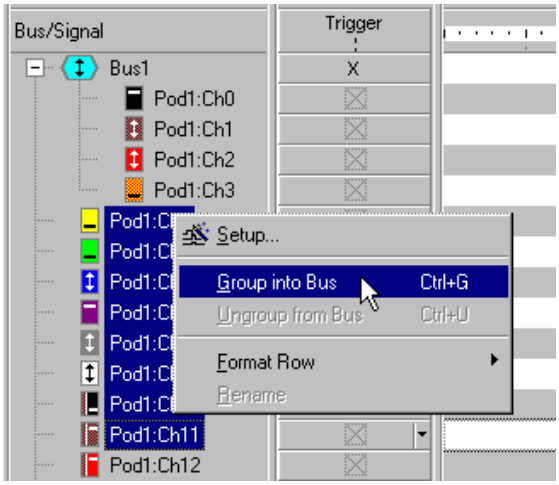
- Click the goto X marker or goto O marker buttons, or choose the Data->Go To->X Marker or Data->Go To->O Marker commands.

To group signals into buses

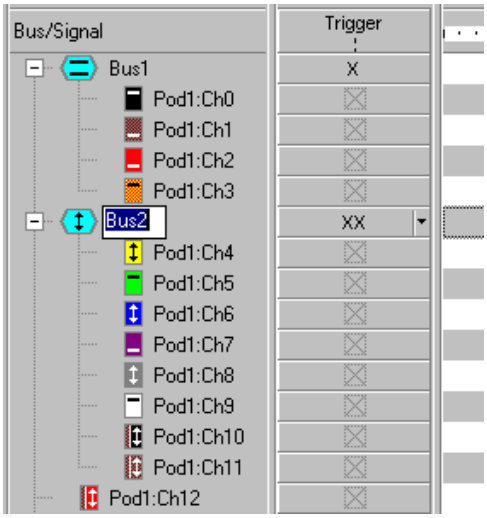
- To group signals
- To ungroup bus signals

To group signals

1. Select the signals that make up the bus (using Click, Shift+Click, and Ctrl+Click on the signal names).
2. Choose the Bus/Signal->Group Into Bus command, or type Ctrl+g.



3. Enter the name of the bus.



To ungroup bus signals

1. Select the bus.
2. Choose the Bus/Signal->Ungroup from Bus command, or type Ctrl+u.

See Also

- To assign bus/signal names to the logic analyzer probes

To hide signals/buses

- To hide signals/buses
- To show hidden signals/buses

To hide signals/buses

1. Select the signals/buses you want to hide (using Click, Shift+Click, and Ctrl+Click on the signal names).
2. Choose the Bus/Signal->Format Row->Hide command.

To show hidden signals/buses

1. Choose the Bus/Signal->Format Row->Show All command.

See Also

- To assign bus/signal names to the logic analyzer probes

To rename signals/buses

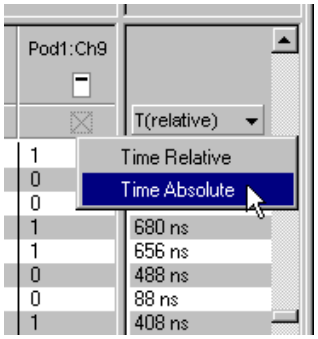
1. Select the signal/bus name.
2. Click on the selected signal name, or choose the Bus/Signal->Rename command.
3. In the resulting text field, type in the new signal name.

To reorder signals/buses in the display

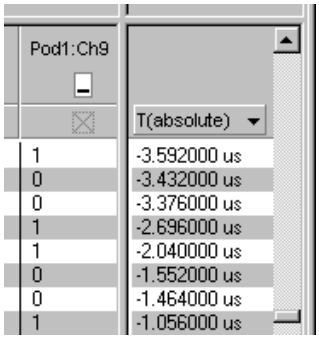
1. In the main window, select the signal or bus name.
2. Drag the signal or bus to its new location.

To display absolute time information

- Click the T(relative) button and select Time Absolute.

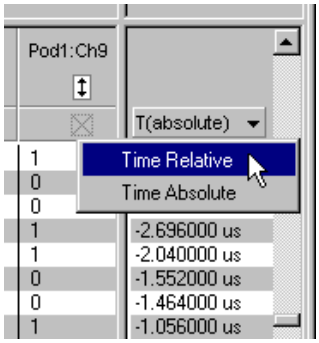


The absolute time from the trigger state is displayed.

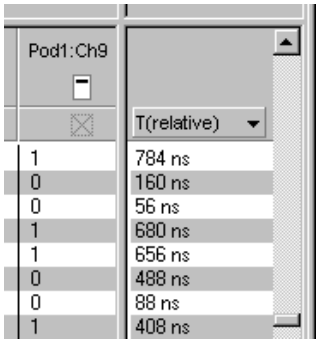


To display relative time information

- Click the T(absolute) button and select Time Relative.

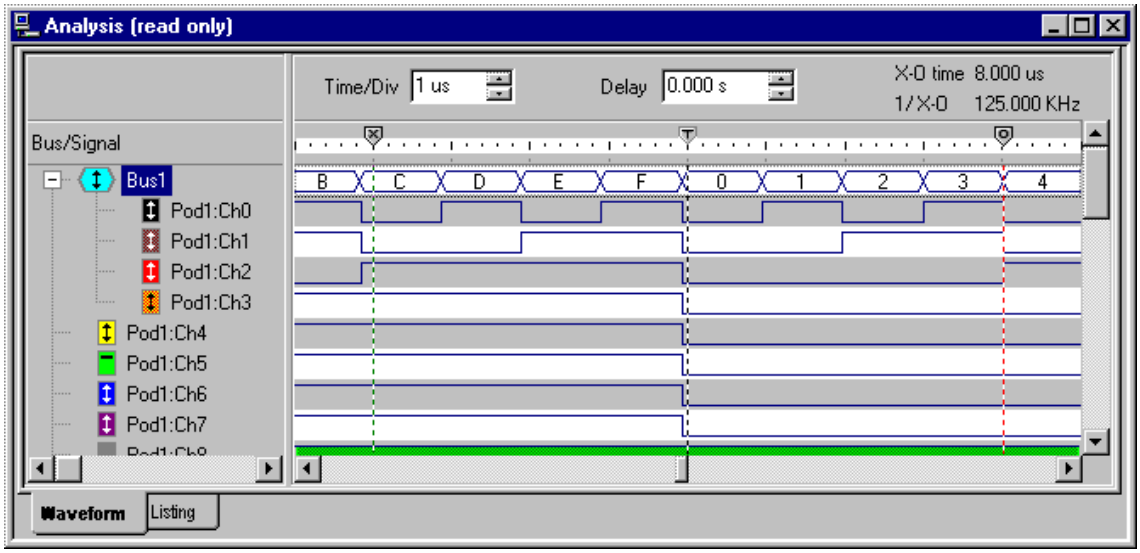


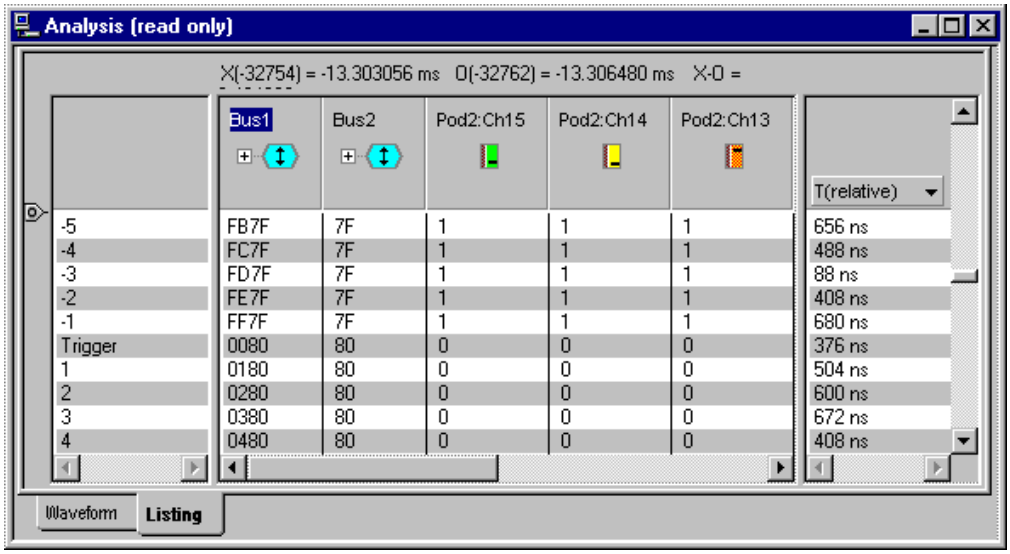
The relative time between captured states is displayed.



To see an additional view of the captured data

- Choose the Window->Secondary Waveform Display command, or choose the Window->Secondary Listing Display command. You can use the additional view to see data captured in state mode as waveforms, to see data captured in timing mode as numerical values, or to view different areas of the captured data.





Printing/Exporting Data

Printing/Exporting Data

How to move captured data to and from other PC programs.

- To print the displayed data
- To export data in ASCII format

To print the displayed data

- To print data
- To select the printer and the page format
- To preview the printed output

To print data

- Click the print button, or choose the File->Print... command.

To select the printer and the page format

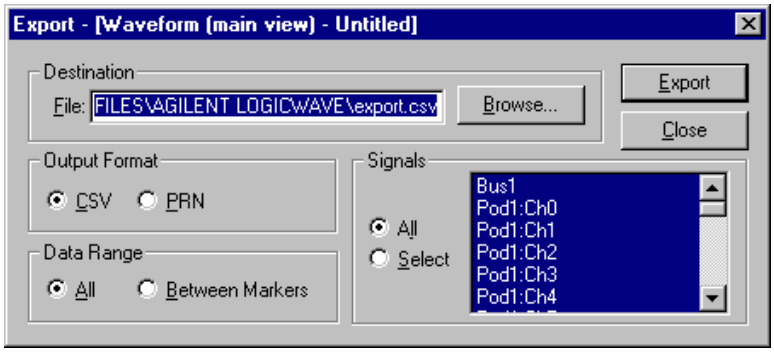
- Choose the File->Page Setup... command.

To preview the printed output

- Choose the File->Print Preview... command.

To export data in ASCII format

1. Choose the File->Export... command.
2. In the Export dialog, specify the name of the destination file.



3. Select between comma delimited (CSV) or tab delimited (PRN) output format.
4. Specify the data range.
5. Specify the signals to export.
6. Click Export.

Once the data has been exported, it can be imported into spreadsheet, database, or other data analysis programs.

Triggering Other Instruments

Triggering Other Instruments

How to trigger oscilloscopes with the logic analyzer.

- To trigger an oscilloscope with the logic analyzer
- To trigger the logic analyzer with another instrument

To trigger an oscilloscope with the logic analyzer

1. Connect a cable from the logic analyzer's output BNC to the oscilloscope's input BNC.
2. In the oscilloscope, set up the oscilloscope measurement.
3. In the logic analyzer, choose the Trigger->Trigger BNC->Output command.
4. In the oscilloscope, start the oscilloscope measurement.
5. In the logic analyzer, start the logic analyzer measurement.

NOTE: Terminate the BNC output into 50 ohms to ensure good signal quality. Not terminating the signal may result in false triggering on the negative edge of the BNC output due to the ringing on an unterminated cable.

If a 50 ohm load is not available, viewing the trigger event in the oscilloscope will show you how to set the oscilloscope's trigger level to get the best results.

To trigger the logic analyzer with another instrument

1. Connect a cable from the other instrument's output BNC to the logic analyzer's input BNC.
2. In the logic analyzer, choose the Trigger->Trigger BNC->Input from BNC->Agilent Scope or Trigger->Trigger BNC->Input from BNC->TTL command.
3. In the other instrument, set up the other instrument's measurement.
4. In the logic analyzer, start the logic analyzer measurement.
5. In the other instrument, start the measurement.

Reference

Reference

Describes windows, menus, dialogs, error messages, and specifications and characteristics.

- Windows - Describes the LogicWave windows.
- Menus - Describes the menus.
- Toolbars - Describes the toolbars.
- Dialogs - Describes the dialogs opened by a command or toolbar button.
- Error Messages - Tells you what caused the message and how to remedy the situation.
- Specifications and Characteristics - for LogicWave.

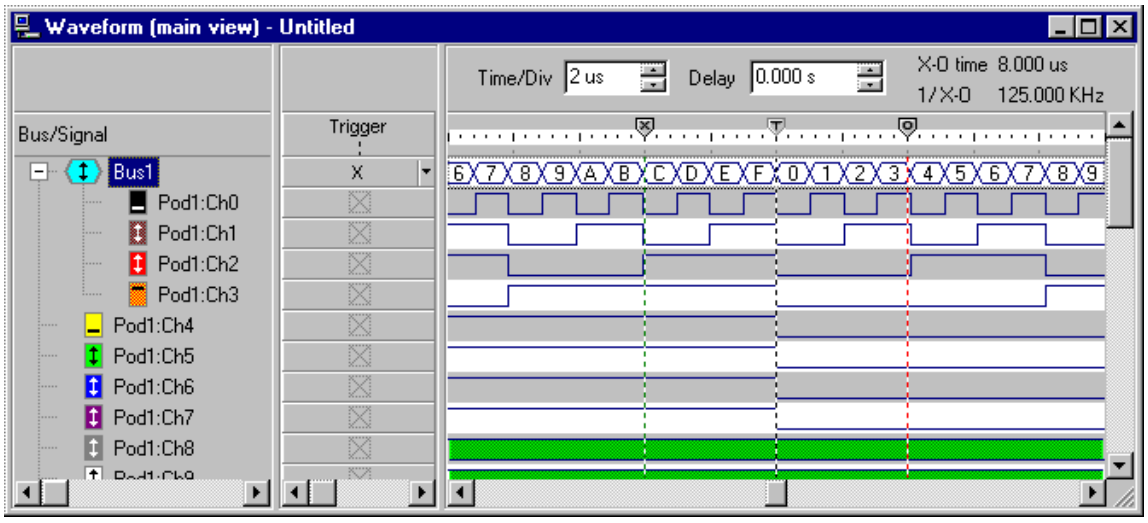
Windows

Windows

Describes the LogicWave windows.

- Waveform Window
- Listing Window
- Secondary Waveform Display
- Secondary Listing Display

Waveform Window

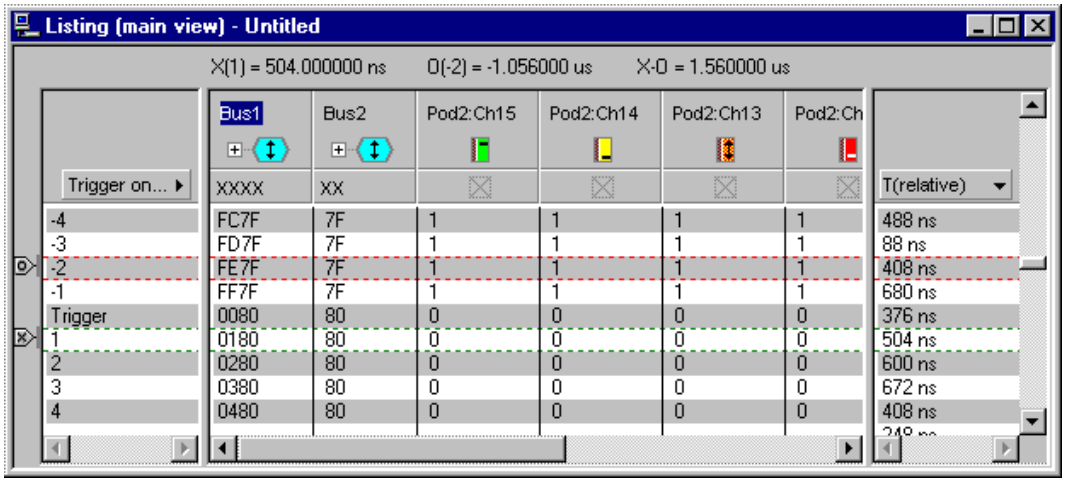


When timing mode sampling is selected, the Waveform window is displayed. The left pane shows the signals and buses that have been set up. The middle pane is used to set up trigger conditions. The right pane displays the captured signal values.

See Also

- To group signals into buses
- To hide signals/buses
- To rename signals/buses
- To reorder signals/buses in the display
- To set up timing mode triggers
- To locate a bus pattern
- To scale the waveform display
- To use the X and O markers
- To specify waveform colors

Listing Window



When state mode sampling is selected, the Listing window is displayed.

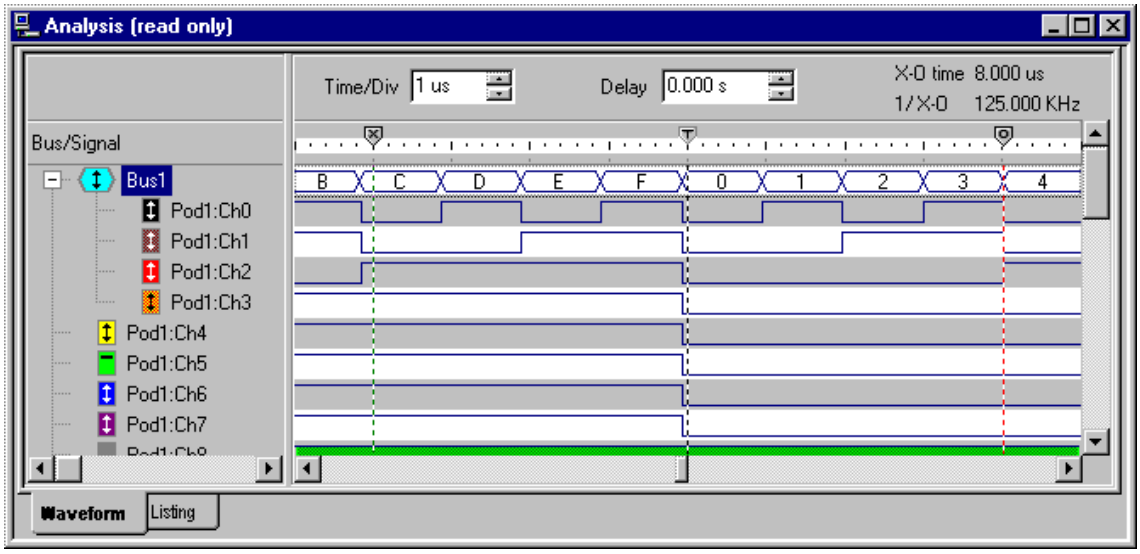
The first heading row shows the signals and buses that have been set up. The second heading row is used to set up trigger conditions. The remaining body rows display the captured signal values.

The left-most column shows captured state numbers, and the right-most column shows time information.

See Also

- To group signals into buses
- To hide signals/buses
- To rename signals/buses
- To reorder signals/buses in the display
- To set up state mode triggers
- To locate a bus pattern
- To use the X and O markers
- To display absolute time information
- To display relative time information

Secondary Waveform Display



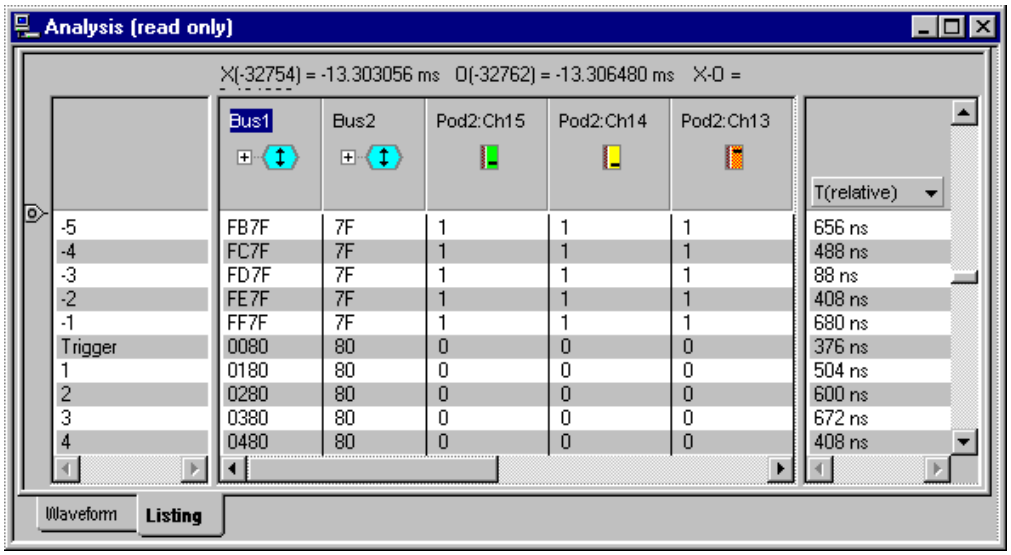
Secondary windows provide another view of the captured data. For example, you can view state mode data as waveforms, or you can view different signals or data.

See Also

- To hide signals/buses
- To reorder signals/buses in the display
- To locate a bus pattern
- To scale the waveform display
- To use the X and O markers
- To specify waveform colors
- Secondary Listing Display

Secondary windows are not saved in logic analyzer setup files.

Secondary Listing Display



Secondary windows provide another view of the captured data. For example, you can view timing mode data as numerical values, or you can view different signals or data.

See Also

- To hide signals/buses
- To reorder signals/buses in the display
- To locate a bus pattern
- To use the X and O markers
- To display absolute time information
- To display relative time information
- Secondary Waveform Display

Secondary windows are not saved in logic analyzer setup files.

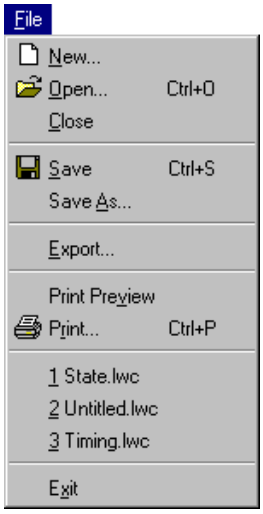
Menus

Menus

Describes the menu commands and their dialogs.

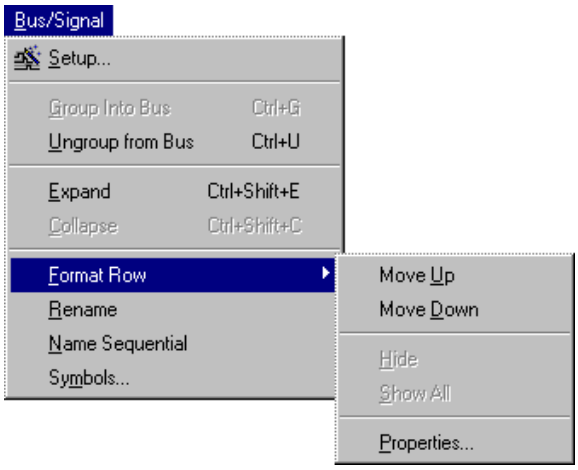
- File Menu
- Bus/Signal Menu
- Trigger Menu
- Run/Stop Menu
- Data Menu
- Tools Menu
- Window Menu
- Help Menu
- System Menus

File Menu



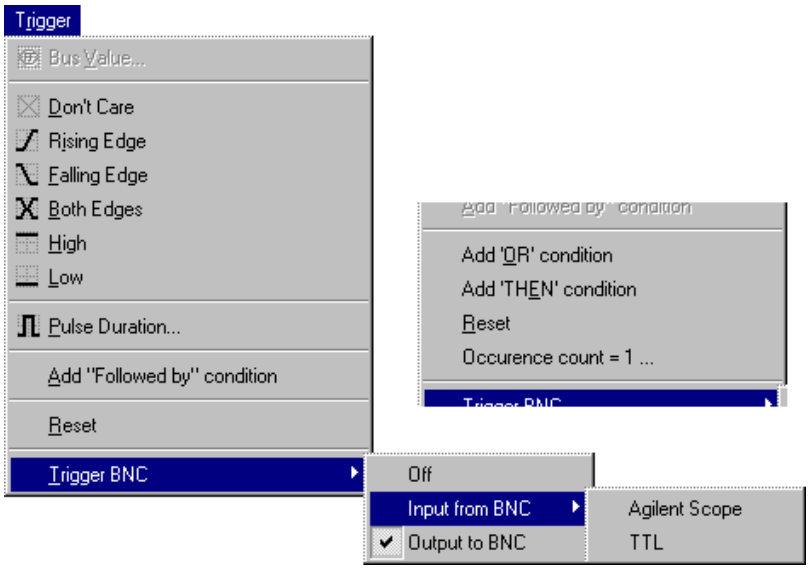
New...	Creates a new logic analyzer setup file.
Open...	Opens a previously saved logic analyzer setup file. Secondary Display windows are not restored.
Close	Closes the active window after asking whether to save its data.
Save	Saves the current logic analyzer setup to a file. If the current setup has not already been saved, you are prompted for a file name. Secondary Display windows are not saved.
Save As...	Saves the current logic analyzer setup to a file that you name.
Export...	Exports the captured data in ASCII format.
Print Preview...	Shows you what will be printed, given the current page setup.
Print...	Prints the captured data that is currently displayed.
Exit	Closes the LogicWave window.

Bus/Signal Menu



Setup...	Opens the Bus/Signal Setup dialog for naming buses and signals and setting the signal threshold.
Group Into Bus	Groups the selected signals into a bus.
Ungroup from Bus	Converts the selected bus into individual signals.
Expand	Expands the display of the selected bus so that the signals that make up the bus are also displayed.
Collapse	Collapses the display of the selected bus so that only the bus is displayed (and not the signals that make up the bus).
Format Row->Move Up	Moves the selected bus/signals up in the display.
Format Row->Move Down	Moves the selected bus/signals down in the display.
Format Row->Hide	Hides the selected bus/signals.
Format Row->Show All	Displays all defined buses and signals.
Format Row->Properties.. .	Lets you specify the waveform color.
Rename	Renames the selected signal or bus.
Name Sequential	Renames the signals in the selected bus to "bus_name[signal_number]" format.
Symbols...	Opens the Edit Symbols dialog for defining symbolic names that can be displayed instead of data values in the Listing view.

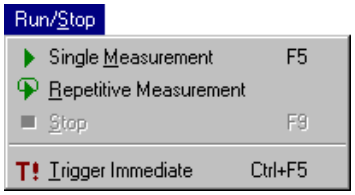
Trigger Menu



Bus Value...	Sets up to trigger on a certain value appearing on the selected bus.
Don't Care	The selected bus/signal is not used for triggering.
Rising Edge	Sets up to trigger on a rising edge of the selected signal.
Falling Edge	Sets up to trigger on a falling edge of the selected signal.
Either Edge	Sets up to trigger on any (rising or falling) edge of the selected signal.
High	Sets up to trigger on a logic high value of the selected signal.
Low	Sets up to trigger on a logic low value of the selected signal.
Pulse Duration...	Sets up to trigger on a pulse width of the selected signal.
Add "Followed by" condition	Displays second trigger setup column for specifying triggers on sequential events.
Add 'OR' condition	In the synchronous sampling state mode: displays additional trigger setup rows for specifying triggers on one of several values.
Add 'THEN' condition	In the synchronous sampling state mode: displays additional trigger setup rows for specifying triggers on sequential state events.
Reset	Returns to the default trigger specification.
Occurrence count = N...	In the synchronous sampling state mode: sets up to trigger on the Nth occurrence of a value.
Trigger BNC->Off	Turns off trigger signal input from, or trigger signal output to, other instruments (like oscilloscopes).
Trigger BNC-	Sets up to receive BNC trigger signal inputs at voltage

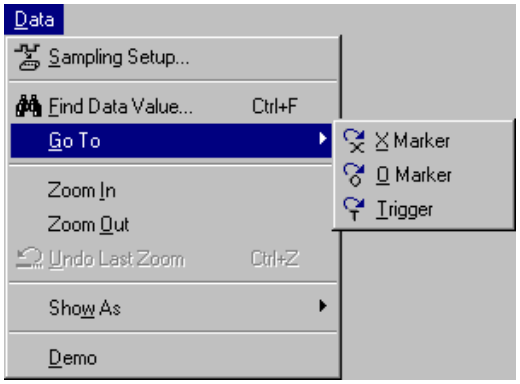
>Input from BNC->Agilent Scope	levels compatible with Agilent oscilloscopes.
Trigger BNC->Input from BNC->TTL	Sets up to receive BNC trigger signal inputs at TTL voltage levels.
Trigger BNC->Output to BNC	Sets up to send trigger signal output to other instruments. _____ **NOTE:** Terminate the BNC output into 50 ohms to ensure good signal quality. Not terminating the signal may result in false triggering on the negative edge of the BNC output due to the ringing on an unterminated cable. _____

Run/Stop Menu



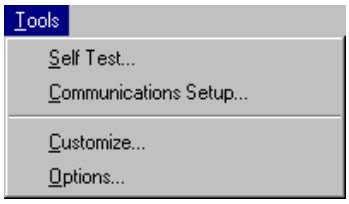
Single Measurement	Starts sampling, fills logic analyzer memory with samples around the trigger, and stops.
Repetitive Measurement	Starts sampling, fills logic analyzer memory with samples around the trigger, and repeats.
Stop	Stops a logic analyzer measurement that is in progress, for example, when the trigger condition is not found.
Trigger Immediate	Ignores the trigger that is currently set up, triggers on the first sample that is seen, fills logic analyzer memory with samples, and stops.

Data Menu



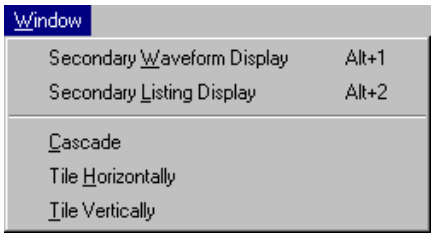
Sampling Setup...	Opens the Sampling Setup dialog for specifying the logic analyzer's sampling and trigger position.
Find Data Value...	Finds particular values in the captured data.
Go To->X Marker	Displays the captured samples around the X marker.
Go To->O Marker	Displays the captured samples around the O marker.
Go To->Trigger	Displays the captured samples around the sample that triggered the analyzer.
Zoom In	Decreases the display's time-per-division to show less data with better resolution.
Zoom Out	Increases the display's time-per-division to show more data with worse resolution.
Undo Last Zoom	Returns to the time-per-division setting before the last zoom command.
Show As	Specifies whether bus values are displayed in hexadecimal numbers, binary numbers, decimal numbers, or symbolic values.
Demo	Lets you use the user interface in demo mode with simulated signals.

Tools Menu



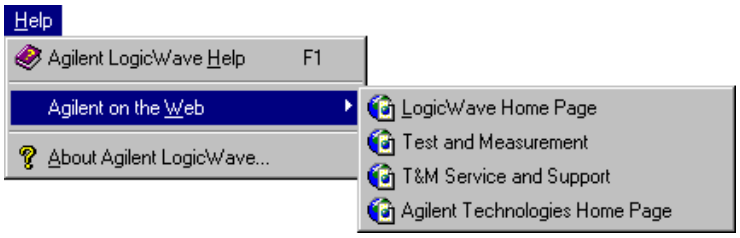
Self Test...	Runs the logic analyzer's performance verification self tests. You can run the self test while the logic analyzer is connected to a device under test.
Communications Setup...	Opens the Communications Setup dialog for specifying the parallel port that the LogicWave logic analyzer is connected to.
Customize...	Opens the Customize dialog for specifying user interface elements.
Options...	Opens the Options dialog for specifying LogicWave behavior.

Window Menu



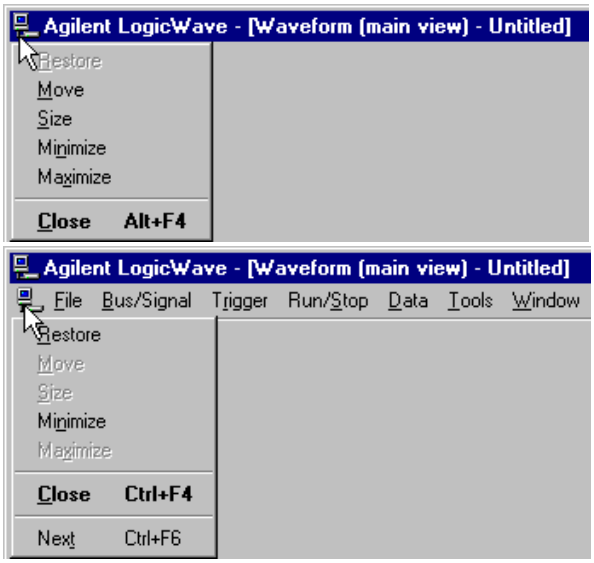
Secondary Waveform Display	Opens a secondary, read-only version of the Waveform display window. The secondary window, perhaps with a different time-per-division setting, gives you a different view of the data.
Secondary Listing Display	Opens a secondary listing display window.
Cascade	Displays the opened windows in an overlaid and offset manner.
Tile Horizontally	Displays the opened windows so that the horizontal display space is equally divided.
Tile Vertically	Displays the opened windows so that the vertical display space is equally divided.

Help Menu



Agilent LogicWave Help	Opens this help file.
Agilent on the Web->LogicWave Home Page	Opens the LogicWave home page on the world-wide web.
Agilent on the Web->Test and Measurement	Opens the Agilent Technologies test and measurement page on the world-wide web.
Agilent on the Web->T&M Service and Support	Opens the Agilent Technologies service and support page on the world-wide web.
Agilent on the Web->Agilent Technologies Home Page	Opens the Agilent home page on the world-wide web.
About Agilent LogicWave...	Displays product version and copyright information.

System Menus



Restore	Opens a window that has been minimized.
Move	Lets you drag a window to a new location.
Size	Lets you re-size a window.
Minimize	Makes the window as small as possible.
Maximize	Makes the window as large as possible.
Close	Closes the window.
Next	Opens and maximizes the next window.

Toolbars

Toolbars

Describes the toolbars.

- Standard Toolbar
- Run/Stop Toolbar
- Data Toolbar
- Trigger Toolbar

Standard Toolbar

Creates a new logic analyzer setup file.

 Opens a previously saved logic analyzer setup file.

Saves the current logic analyzer setup to a file.

Prints the currently displayed data.

Run/Stop Toolbar

Starts sampling, fills logic analyzer memory with samples around the trigger, and stops.

Starts sampling, fills logic analyzer memory with samples around the trigger, and repeats.

Stops a logic analyzer measurement that is in progress, for example, when the trigger condition is not found.

Ignores the trigger that is currently set up, triggers on the first sample that is seen, fills logic analyzer memory with samples, and stops.

Opens the Sampling Setup dialog for choosing asynchronous or synchronous sampling (in other words, timing or state analysis).

Opens the Bus/Signal Setup dialog for naming buses and signals and setting the signal threshold.

Data Toolbar

Centers the trigger point in the data display.

Centers the X marker reference point in the display.

Centers the O marker reference point in the display.

Searches for a value in the captured data.

Undoes the last zoom command.

Trigger Toolbar

Sets up a bus value trigger on the selected bus.

Triggers on a rising edge of the selected signal.

Triggers on a falling edge of the selected signal.

Triggers on any edge of the selected signal.

Triggers on a high value of the selected signal.

Triggers on a low value of the selected signal.

Triggers on any value of the selected signal. In other words, you don't care what the signal value is.

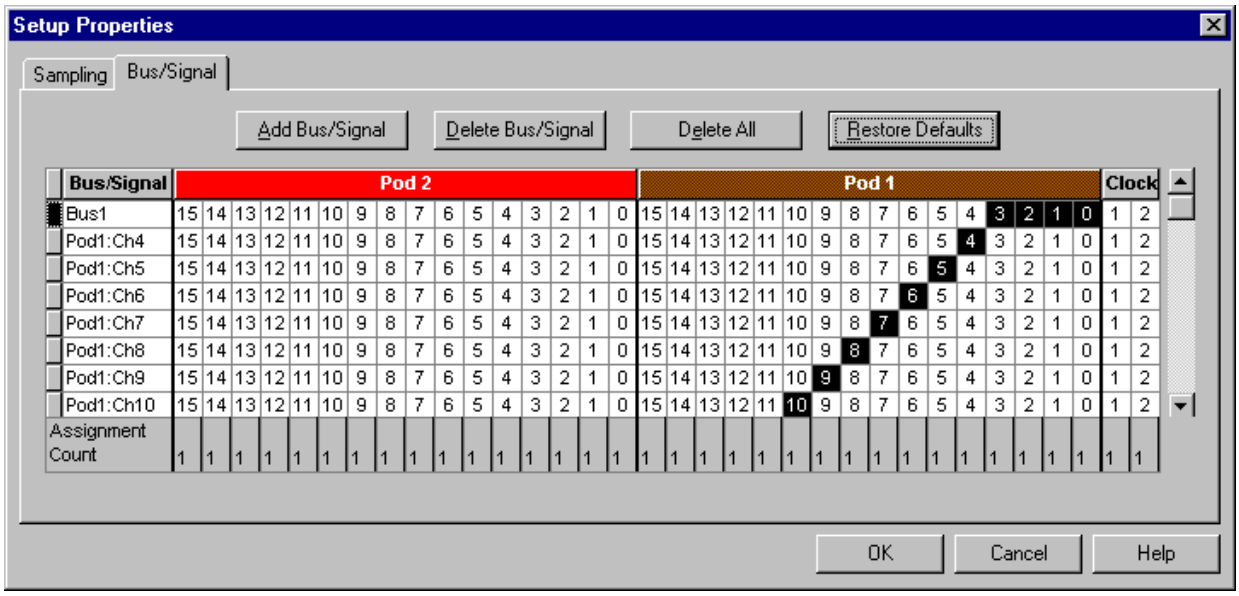
Sets up a pulse duration trigger on the selected signal.

Dialogs

Describes the dialogs.

- Bus/Signal Setup
- Communications Setup
- Customize
- Options
- Sampling Setup
- Time Period Setup

Bus/Signal Setup



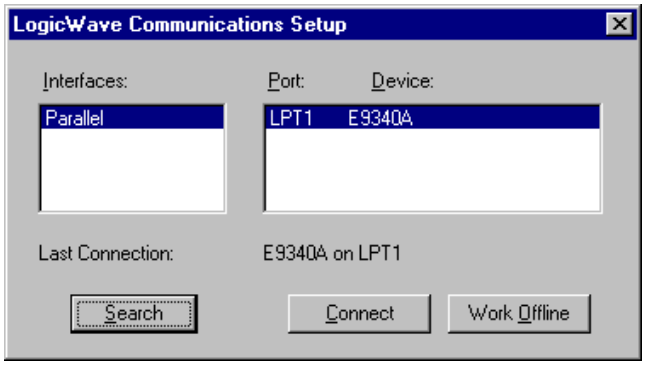
Add Bus/Signal	Adds a new bus/signal to the list.
Delete Bus/Signal	Deletes the selected bus/signal from the list.
Delete All	Deletes all buses/signals from the list.
Restore Defaults	Sets up the default bus/signal names.
Assignment Count	Shows the number of bus/signals that a logic analyzer channel has been assigned to.

See Also

- To assign bus/signal names to the logic analyzer probes
- To locate a bus pattern
- To group signals into buses
- To rename signals
- To reorder signals/buses in the display

- Bus/Signal Menu Commands
- Standard Toolbar

Communications Setup



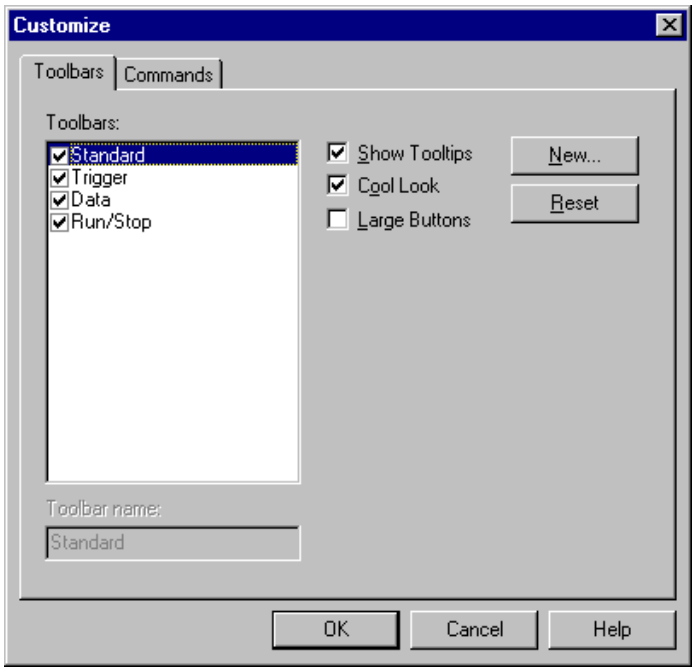
Search	Searches for interfaces that can be used with LogicWave.
Connect	Connects to the selected port and device.
Work Offline	Opens the LogicWave user interface without connecting to the logic analyzer. You can work offline by loading previously saved logic analyzer setups

See Also

- To recall logic analyzer setups

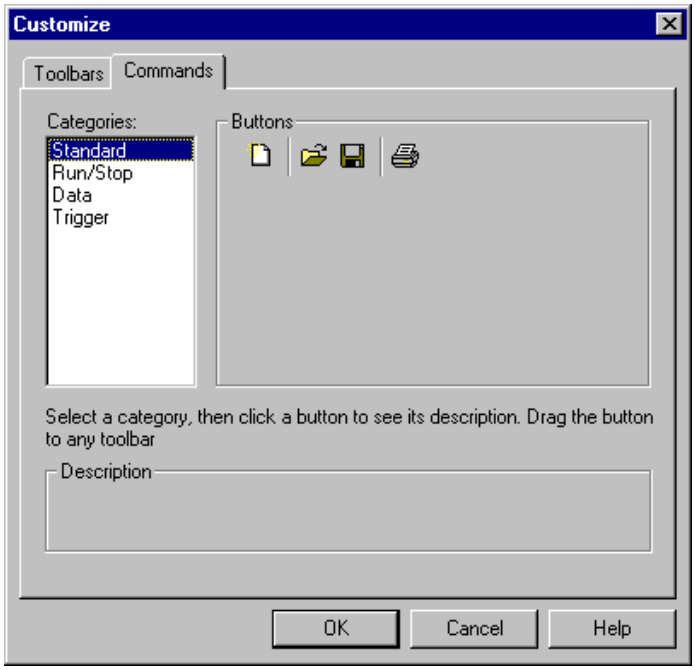
Customize

The Toolbars Tab



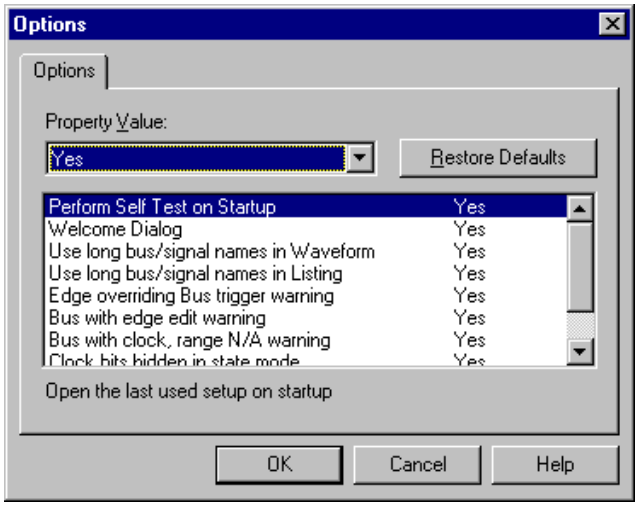
This dialog lets you change the look of toolbars and create new toolbars.

The Commands Tab



This dialog lets you move buttons to different toolbars.

Options



To change an option, select it; then select the new property value.

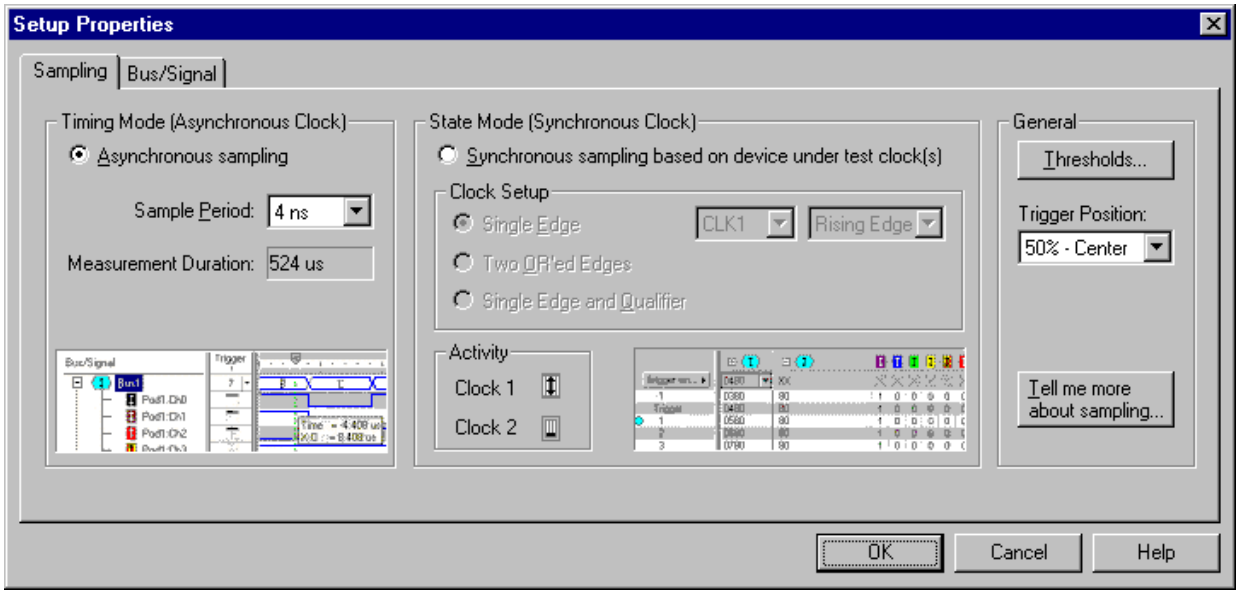
The options and their effects are:

Option	Effect
Perform Self Test on Startup	You can turn these off so that the LogicWave application starts faster. When the Welcome window is not shown, the last configuration is automatically used.
Welcome Dialog	
Use long bus/signal names in Waveform	These options change the default pod/channel signal names from Pod#:Ch# format to P#C# format.

Use long bus/signal names in Listing	
Edge overriding Bus trigger warning	You cannot trigger on a bus value and on an edge of one of the bus signals at the same time. These options let you turn off the warnings.
Bus with edge edit warning	
Bus with clock, range N/A warning	When using clock bits in a bus, you cannot set up to trigger on a range of values. This option lets you turn off the warning.
Clock bits hidden in state mode	You can turn this off to include the pod clock channels in the state mode Listing window.
Bad duration will be autoset	You can select whether bad trigger durations will be automatically corrected. A trigger duration can become bad when the sample period is changed. The minimum trigger duration depends on whether it is a GREATER THAN condition or a LESS THAN condition: • In a GREATER THAN condition, the minimum trigger duration is the sample period (except when the sample period is 4 ns, the minimum trigger duration is 8 ns). • In a LESS THAN condition, the minimum trigger duration is 2 times the sample period (except when the sample period is 4 ns, the minimum trigger duration is 16 ns). In both GREATER THAN and LESS THAN conditions, the maximum trigger duration is 1,048,587 times sample period.
Base mode change for edit warning	When you add bits to a bus, then edit the trigger, the number base is changed to binary while editing. This option lets you turn off the warning.
I/O performance warning	This warning tells you how to improve the performance of logic analyzer I/O by changing the parallel port transfer mode in the PC BIOS. This option lets you turn off the warning.

	The Extended Capabilities Port (ECP) is by far the best transfer mode setting for LogicWave because it is the fastest and the most versatile. Parallel ports set for ECP mode can also operate in Output Only (Standard Parallel Port, or SPP) or Bi-directional (PS/2) mode if necessary. This enables the host PC to continue to communicate with other parallel port hardware peripherals that may only support SPP or PS/2 transfer modes. In other words, you don't have to worry about breaking communications with your printer by changing a parallel port's CMOS settings to ECP mode. Also, there is often another CMOS setting available called ECP+EPP, where the ECP port can operate in EPP mode. That is an acceptable setting for LogicWave because it will see the port as an ECP port and operate in ECP mode. There is a possibility that the host PC will be set for ECP mode transfers, but a communication test done by LogicWave at startup will fail due to the PC's mother board configuration with respect to the parallel port hardware. In this case, LogicWave will force the ECP port to operate in bi-directional mode and reliably communicate with the analyzer.
Connection options at startup	Specifies whether the connection options are displayed at startup.

Sampling Setup

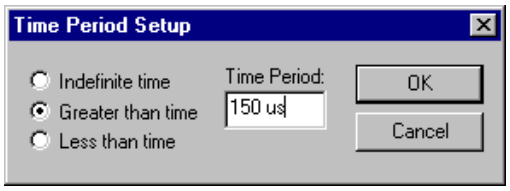


Timing Mode (Asynchronous Clock)	Contains the options for setting up timing mode sampling.
State Mode (Synchronous Clock)	Contains the options for setting up state mode sampling.
General	Contains the options for setting up sampling signal threshold voltages and specifying the trigger position.

See Also

- State analysis vs. timing analysis
- To set the logic analyzer threshold voltage
- To select a timing or state analyzer
- To specify the trigger position
- Data Menu Commands
- Standard Toolbar

Time Period Setup



Indefinite time	When the second event occurs any amount of time after the first event, the logic analyzer will trigger.
Greater than time	When the second event occurs more than the specified amount of time after the first event, the logic analyzer will trigger. If the second event occurs within the time period, the logic analyzer will not trigger. The minimum time period is either equal to the sample period or the absolute minimum of 8 ns.
Less than time	When the second event occurs within the time period after the first event, the logic analyzer will trigger. If the second event occurs after the time period, the logic analyzer will not trigger. The minimum time period is either twice the sample period or the absolute minimum of 16 ns.
Time Period	The time must be a multiple of the sample period. If the time you enter is not a multiple of the sample period, it will be rounded up to the nearest multiple.

See Also

- To set up timing mode triggers

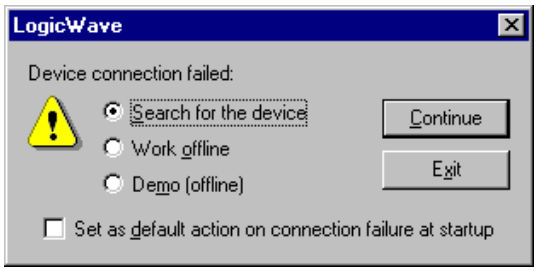
Error Messages

Error Messages

Describes the message and how to remedy the situation.

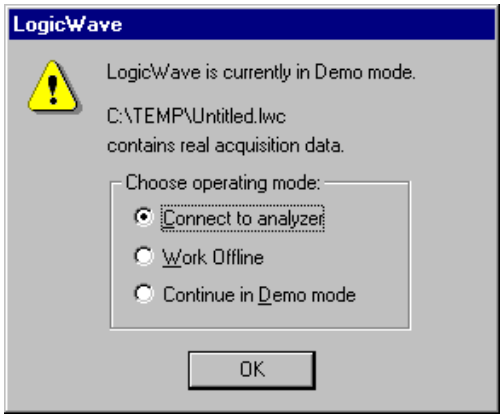
- Device connection failed
- LogicWave is currently in Demo mode

Device connection failed



Search for the device	Looks for the LogicWave logic analyzer on the PC's parallel ports.
Work offline	Lets you use the LogicWave's user interface for analyzing previously captured and saved data.
Demo (offline)	Lets you use the LogicWave's user interface.
Set as default action on connection failure at startup	When checked, makes the selected action the default whenever there is a connection failure at startup.
Continue	Starts the LogicWave logic analyzer user interface as specified.
Exit	Closes the dialog, and doesn't start the LogicWave logic analyzer user interface.

LogicWave is currently in Demo mode



This message dialog appears when the application is in demo mode and you open a previously saved file that contains real data.

Connect to analyzer	Looks for the LogicWave logic analyzer on the PC's parallel ports .
Work Offline	Lets you use the LogicWave's user interface for analysis of previously captured and saved data.
Continue in Demo mode	Lets you use the LogicWave's user interface in demo mode (without the data).

Specifications and Characteristics

Specifications and Characteristics

Describes the specifications, characteristics, and other characteristics and requirements of the LogicWave logic analyzer.

- LogicWave Specifications
- LogicWave Characteristics
- About the Probe Cable
- Signal Requirements

See Also

- What is a Specification?
- What is a Characteristic?

LogicWave Specifications

Maximum state clock:	100 MHz
Threshold Accuracy:	±(100 mV + 3% of threshold setting)
Setup/Hold Time:	4.0/0 ns fixed

LogicWave Characteristics

- General Information
- Probes (at end of flying lead set)
- State Analysis
- Timing Analysis
- Triggering
- Operating Environment Characteristics

General Information

State/timing channels:	34
Memory depth:	128K timing, 64K state
User interface:	Windows® 95/98/NT/2000, PC-hosted (runs as an application on any Pentium® or better, desktop or laptop, with a minimum display resolution of 800x600 -- large fonts are not supported)
"WYDIWYC" timing trigger:	"What you draw is what you capture" visual timing trigger setup
Printers:	Shared with the host PC - can print to any local or network printer supported by the PC
Probing:	100 kohms, 1.5 pF
Dimensions:	11.5" x 9" x 2.5" (29.1 x 22.8 x 6.3 cm)
Weight:	4.5 pounds (2.1 kg)

I/O Ports:	Enhanced Parallel connection to PC for fast display update rates, Trigger IN/OUT BNC
Supported file formats for screen shots:	Use Ctrl + Alt + PrintScreen to create bitmap
Configuration and data files:	Encoded in binary format (stored to or loaded from host PC); can export acquired data to an ASCII formatted file.

Probes (at end of flying lead set)

Input resistance:	100 kohm ±2%
Resistive tip capacitance:	1.5 pF
Minimum input voltage swing:	500 mV peak-to-peak
Threshold accuracy:	±(100 mV + 3% of threshold setting)
Threshold range:	TTL, ECL, ±6.0 V, adjustable in 50 mV increments
Maximum input voltage:	±40 V peak

State Analysis

Minimum state clock pulse width:	3.5 ns
Time tag resolution:	8ns or 0.1% (whichever is greater)
Maximum time count between states:	34 seconds
Clock qualifiers setup/hold:	4.0/0 ns fixed

Timing Analysis

Maximum timing sample rate:	250 MHz
Sample period accuracy:	±0.01% of sample period
Channel-to-channel skew:	2 ns typical, 3 ns max
Timing interval accuracy:	±(sample period accuracy + channel-to-channel skew + 0.01% of time interval reading ± one sample period)

Triggering

Sequencer speed:	125 MHz maximum
State sequence levels:	3
Timing sequence levels:	2
Port In delay:	35 ns between rising edge on Port In BNC and don't care logic analyzer trigger
Port Out delay:	120 ns between logic analyzer trigger and rising edge on Port Out BNC

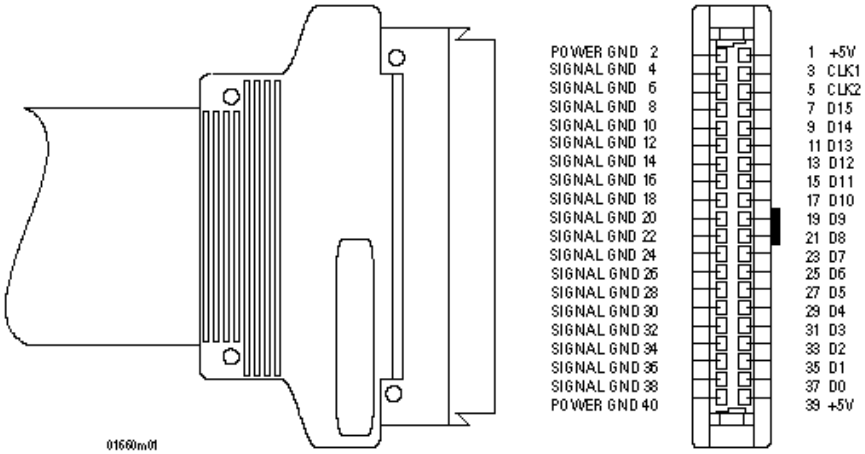
Operating Environment Characteristics

Temperature:	Instrument: 0°C to 55°C (+32°F to 131°F) Disk media: 10°C to 40°C (+50°F to 104°F)
Humidity:	Up to 95% relative humidity at 40°C
Altitude:	4,572 m (15,000 ft)

About the Probe Cable

The probe cable contains 18 signal lines, 17 chassis ground lines, two serial lines for communications with analysis probes, and 2 lines that carry minimal power for demo "device under test" systems.

The cable ground lines are chassis (earth) grounds and not "floating" grounds. All the lines are woven into a flat ribbon that is 4.5 feet long.



Signal Requirements

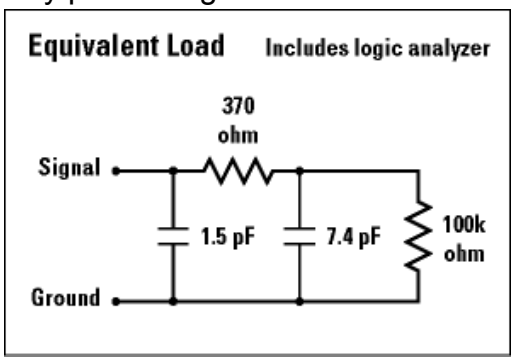
- Minimum Signal Amplitude
- Signal Loading
- Maximum Probe Input Voltage
- Overdrive

Minimum Signal Amplitude

Any signal line you intend to probe with the logic analyzer probes must supply a minimum voltage swing of 500 mV to the probe tip. If you measure signal lines with a smaller voltage swing, you may not get reliable results. The minimum input overdrive is the greater of 250 mV or 30% of signal amplitude.

Signal Loading

Any probed signal line must be able to handle the following load:



If the signal cannot handle this load, the target system may malfunction.

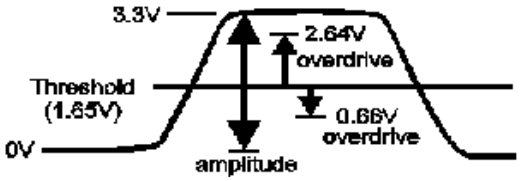
Maximum Probe Input Voltage

The maximum probe input voltage of each logic analyzer probe is 40 volts peak.

Overdrive

Overdrive is the amount a signal must exceed the threshold voltage for the logic analyzer to detect a change in logic level. For the LogicWave logic analyzer, overdrive is 250 mV or 30% of signal peak-to-peak amplitude, whichever is greater.

For example, given a 3.3 volt CMOS signal (low = 0V, high = 3.3 V) the optimal threshold is 1.65 V (50%). If the threshold is set less than 1.0 V or greater than 2.3 V, then a timing acquisition might show excessive channel-to-channel skew. For a state acquisition, the analyzer's setup and hold requirements might not be met.



The overdrive amount is specified as the greater of 250 mV or 30% of the signal amplitude because it has two purposes. The 250 mV ensures reliable switching or state detection. The 30% of amplitude ensures the threshold is reasonably centered within the waveform in order to minimize channel-to-channel skew (t_{PHL} vs t_{PLH}).

What is a Specification?

A specification is a numeric value, or range of values, that bounds the performance of a product parameter. The product warranty covers the performance of parameters described by specifications. Products shipped from the factory meet all specifications. Additionally, products sent to Agilent Customer Service Centers for calibration, and returned, meet all specifications. Specifications are verified by *calibration procedures*.

What is a Calibration Procedure?

Calibration procedures verify that products or systems operate within the

specifications. Parameters covered by specifications have a corresponding calibration procedure. Calibration procedures include both performance tests and system verification procedure. Calibration procedures are traceable and must specify adequate calibration standards.

Calibration procedures verify products meet the specifications by comparing measured parameters against a pass-fail limit. The pass-fail limit is the specification less any required guardband.

The term "calibration" refers to the process of measuring parameters and referencing the measurement to a calibration standard rather than the process of adjusting products for optimal performance.

What is a Characteristic?

Characteristics describe product performance that is useful in the application of the product, but that is not covered by the product warranty. Characteristics describe performance that is typical of the majority of a given product, but not subject to the same rigor associated with specifications. Characteristics are verified by *function tests*.

What is a Function Test?

Function tests are quick tests designed to verify basic operation of a product. Function tests include operator's checks and operation verification procedures. An operator's check is normally a fast test used to verify basic operation of a product. An operation verification procedure verifies some, but not all, specifications, and often at a lower confidence level than a calibration procedure.

Concepts

Concepts

How logic analyzers work and how they compare to other instruments.

- Logic analyzers vs. oscilloscopes
- State analysis vs. timing analysis
- State analyzer sampling, OR'ed clocks
- State analyzer sampling, qualified clock

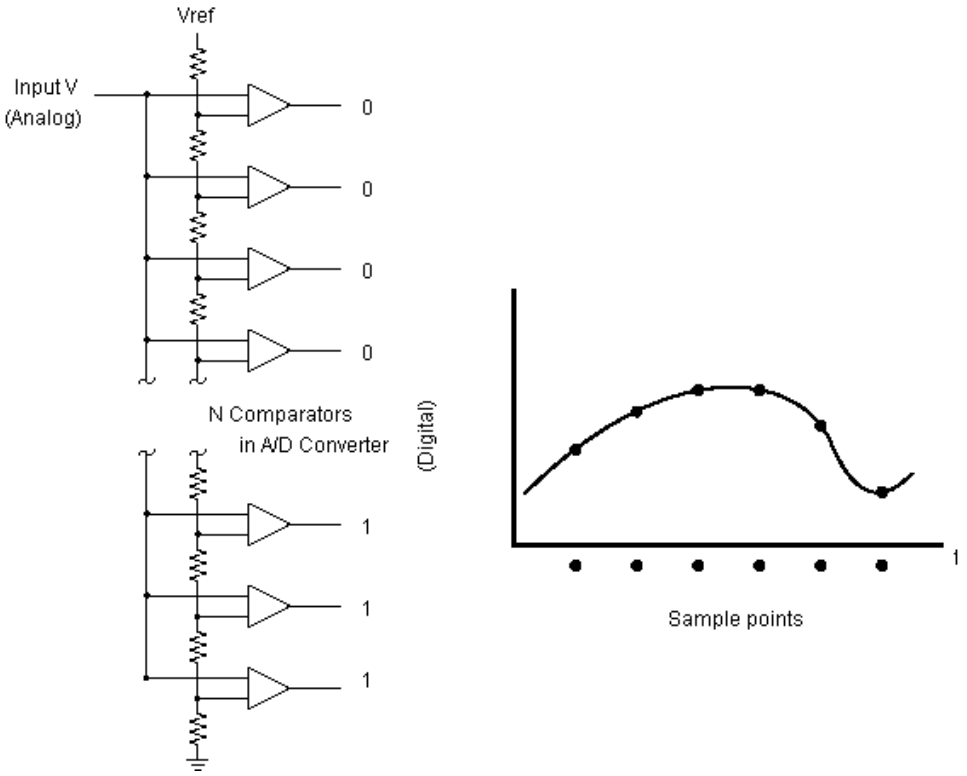
Answers to common questions about LogicWave.

- Frequently Asked Questions

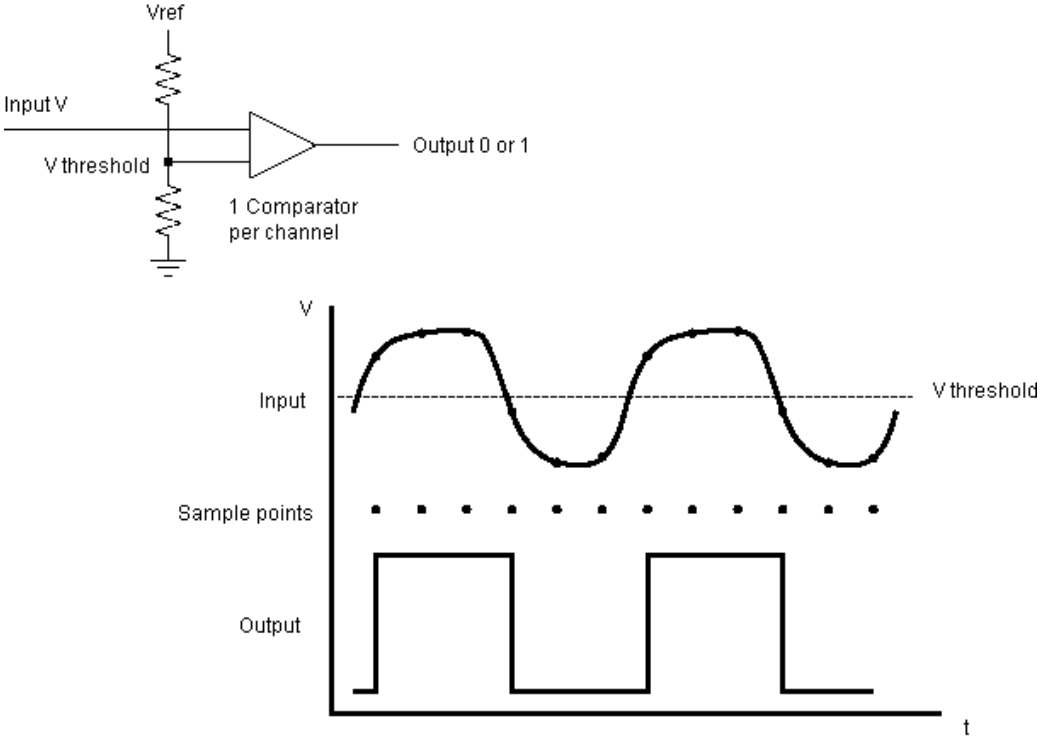
Logic analyzers vs. oscilloscopes

A logic analyzer is an instrument that captures digital signals. It's like a digital oscilloscope, except that it captures logic high and logic low values instead of many voltage levels.

For each channel (or probe) in a digital oscilloscope, many comparators are used to give high resolution on the voltage measured.

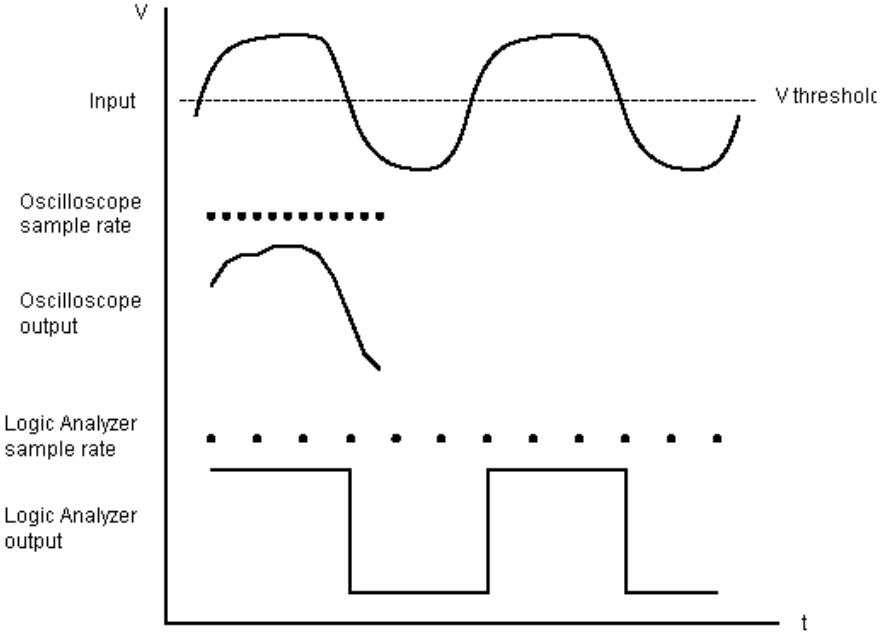


For each channel in a logic analyzer, only one comparator is used to detect a logic high or low. With the same number of comparators as an oscilloscope, a logic analyzer can capture data on many more channels.



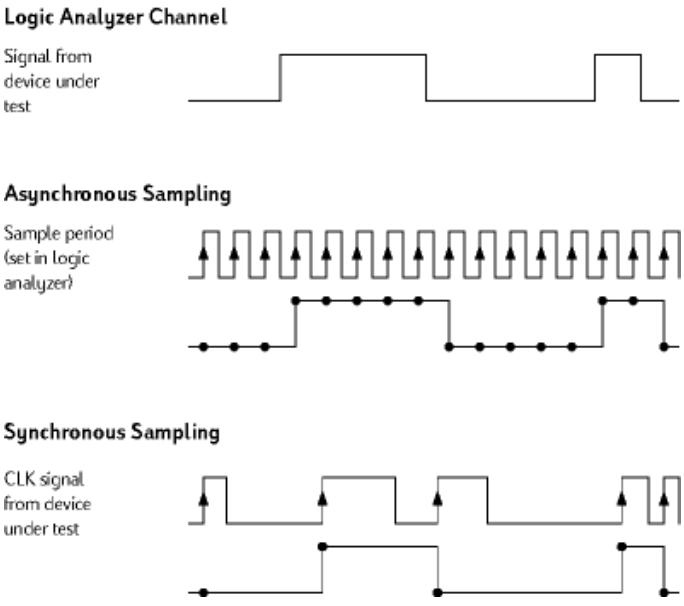
Also, in order to capture the high-frequency, analog component of signals, an oscilloscope must sample at a faster rate than a logic analyzer (although both

must sample at a rate faster than the highest frequency of the signals they measure). Given the same amount of memory to store samples, a logic analyzer can capture data over a greater time period than a digital oscilloscope.



An oscilloscope gives a highly detailed view of the parametrics of a few critical signals while a logic analyzer displays the functional relationship of a larger number of signals.

State analysis vs. timing analysis



What is a Timing Analyzer?

In timing mode, samples are acquired from the device under test at regular intervals, such as every 4 nanoseconds. An internal clock is used for sampling.

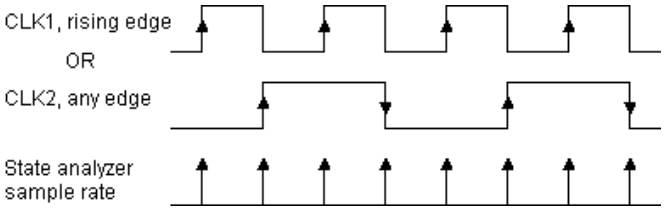
What is a State Analyzer?

In state mode, an event in the device under test, such as a rising edge of a clock signal, indicates when the logic analyzer should take a sample.

NOTE: There is a special clock channel on each pod that is labeled "CLK". These are the only channels that can be used for state mode sampling signals.

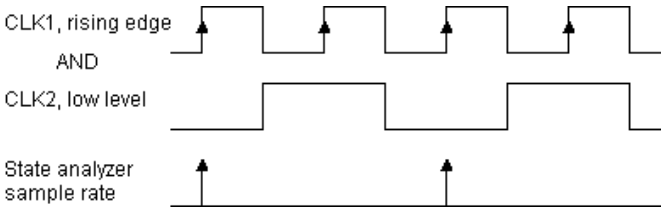
You can use one or both clock channels to provide state mode sampling signals, or you can use the signal on one clock channel to enable or disable the sampling signal on the other clock channel.

State analyzer sampling, OR'ed clocks



Two signals from the device under test are combined to tell the logic analyzer when to sample.

State analyzer sampling, qualified clock



One signal from the device under test enables/disables the sampling clock on the other signal.

Frequently Asked Questions

1. **What is a logic analyzer?**
2. **How does a logic analyzer work?**
3. **What is Timing Mode?**
4. **What is State Mode?**
5. **What are T, X, and O?**
6. **What is a pod?**
7. **What is a channel?**
8. **What are the color-coded symbols next to a pod/channel?**
9. **What is a Trigger?**
10. **How do I specify the trigger event?**
11. **Can I display state mode data in waveform format?**
12. **Can I display timing mode data in listing format?**
13. **What is an external trigger?**

14. What are symbols?

What is a logic analyzer?

A logic analyzer is an instrument that captures and displays digital signals from a device under test.

A logic analyzer is like an oscilloscope, except that it only displays two voltage levels (a logic high or 1 and a logic low or 0) instead of many voltage levels.

Also, logic analyzers have far more channels for analysis than oscilloscopes. The LogicWave logic analyzer has 34 channels.

Because a logic analyzer only captures 1s and 0s, its sample rate can be slower than an oscilloscope that needs to capture more voltage detail. Consequently, a logic analyzer can capture a greater amount of overall execution time.

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How does a logic analyzer work?

A logic analyzer samples signal values in the device under test and stores those values in its memory. It watches the samples for an event that you identify (the trigger event) to determine when to store sampled data into memory.

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What is Timing Mode?

Timing mode is when the logic analyzer acquires samples from the device under test asynchronously, that is, at regular intervals. The sampling interval or *sample period* is set by the user.

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What is State Mode?

State mode is when the logic analyzer acquires samples from the device under test synchronously, in other words, when a signal or signals from the device under test indicate when to acquire a sample. For example, the logic analyzer might take a sample whenever there is a rising edge on a signal from the device under test.

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What are T, X, and O?

T, X, and O are markers. T marks the trigger event and cannot be moved. X and O are markers that you can place anywhere in the captured data. Markers let you quickly return to data of interest using the Go To Marker commands.

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What is a pod?

A pod is a collection of logic analyzer channels on a single connector.

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What is a channel?

A (logic analysis) channel is a single line of input to the logic analyzer. Each channel corresponds to a lead that is connected to the device under test. Each channel is used to acquire one and only one signal from the device under test.

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What are the color-coded symbols next to a pod/channel?

The color indicates the channel. It matches the colors on the end of the probe cable.

The symbols are activity indicators. They show the level of the signal(s) that the pod/channel is connected to: high, low, or changing between high and low.

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What is a Trigger?

A trigger is the event you tell the logic analyzer to look for and capture data around. For example, you may want to trigger on an edge in order to see the events that lead up to it and the events that happen after it. The captured trigger event becomes a reference point in the data display.

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How do I specify the trigger event?

Click on a bus or signal's trigger button to select the condition to trigger on.

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Can I display state mode data in waveform format?

Yes. You can open a Secondary Waveform Display window to display state mode data in listing format.

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Can I display timing mode data in listing format?

Yes. You can open a Secondary Listing Display window to display timing mode data in waveform format.

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What is an external trigger?

An external trigger is a signal outside the logic analyzer that is used to synchronize measurements between instruments. For example, the logic analyzer can be armed (activated) by a signal that comes from another instrument, or when the logic analyzer triggers, it can output a signal to another instrument. Logic analyzers are commonly used to trigger oscilloscopes.

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What are symbols?

Symbols are names assigned to particular bus/signal values. Symbols in a display of captured data values are easy to read. Also, symbols make it easy to set up triggers on particular bus/signal values.

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Setup and Quick Reference

The *Agilent LogicWave Setup and Quick Reference Card* shows you how to connect the logic analyzer to your PC and install software.

Agilent LogicWave Setup and Quick Reference Card (PDF)

If you do not have the Adobe Acrobat Reader necessary for viewing PDF documentation, download your free Acrobat Reader now.

Glossary

activity indicators

Symbols next to logic analyzer channels that indicate whether a signal is a logic-high, logic-low, or whether the signal is changing between highs and lows.

arming signal

An enabling signal. For example, if an external trigger signal is connected to the logic analyzer's BNC input, it can be used to enable the logic analyzer to trigger.

asynchronous sampling

When the logic analyzer acquires samples from the device under test asynchronously, that is, at regular intervals, such as every 100 ns. Also known as timing mode.

bus/signal

Names assigned to the logic analyzer channels. Typically, these are the bus or signal names in the device under test.

captured data

Signal values that have been sampled by the logic analyzer and stored in its memory.

channel

A single line of input to the logic analyzer. Each channel corresponds to a lead that is connected to the device under test. Each channel is used to acquire one and only one signal from the device under test.

CLK channel

A logic analyzer input channel that can be used to determine the analyzer's sampling.

device under test (DUT)

The system under development whose digital signals are captured by the logic analyzer.

external trigger

A signal outside the logic analyzer that is used to synchronize measurements between instruments. For example, the logic analyzer can be armed (activated) by a signal that comes from another instrument, or when the logic analyzer triggers, it can output a signal to another instrument. Logic analyzers are commonly used to trigger oscilloscopes.

logic analyzer

An instrument that captures and displays digital signal values. A logic analyzer is like an oscilloscope, except that it only displays two voltage levels (a logic high or 1 and a logic low or 0) instead of many voltage levels. Also, logic analyzers have far more channels for analysis than oscilloscopes. The LogicWave logic analyzer has 34 channels. Because a logic analyzer only captures 1s and 0s, its sample rate can be slower than an oscilloscope that needs to capture more voltage detail. Consequently, a logic analyzer can capture a greater amount of overall execution time.

marker

A relocatable reference point in the data display. LogicWave has T, X, and O markers. T marks the trigger event and cannot be moved. X and O are markers that you can place anywhere in the captured data. Markers let you quickly return to data of interest using the Go To Marker commands.

oscilloscope

An instrument that captures and displays analog signal values (that is, many voltage levels).

pod

A collection of 16 logic analyzer probe channels.

repetitive measurement

A measurement in which the logic analyzer's trigger condition is searched for, and data storage is filled, repetitively.

sample period

The period at which the logic analyzer samples signals. The sample period can be based on an internal sampling clock (also known as timing analysis or asynchronous sampling). Or, the sampling can be based on a signal in the device under test (also known as state analysis or synchronous sampling).

sampled data

Signal values that are sampled by the logic analyzer (not neccessarily stored).

sampling

The process by which the logic analyzer looks at digital signals.

sampling clock

A clock signal used to determine the logic analyzer's sampling.

signal threshold

See *threshold voltage*.

single measurement

A measurement in which the logic analyzer's trigger condition is searched for, and data storage is filled, once.

state analyzer

A logic analyzer that samples based on a clock signal in the device under test.

state mode

When the logic analyzer acquires samples from the device under test synchronously, in other words, when a signal or signals from the device

under test indicate when to acquire a sample. For example, the logic analyzer might take a sample whenever there is a rising edge on a signal from the device under test. Typically, the signal used to set up the sampling is a state machine or microprocessor clock signal. Also known as synchronous sampling.

stop measurement

Stops the measurement currently in progress.

symbols

Names assigned to particular bus/signal values. Symbols in a display of captured data values are easy to read. Also, symbols make it easy to set up triggers on particular bus/signal values.

synchronous sampling

When the logic analyzer acquires samples from the device under test synchronously, in other words, when a signal or signals from the device under test indicate when to acquire a sample. For example, the logic analyzer might take a sample whenever there is a rising edge on a signal from the device under test. Typically, the signal used to set up the sampling is a state machine or microprocessor clock signal. Also known as state mode.

target system

See *device under test*.

threshold voltage

The voltage level that the signal must cross before the logic analyzer recognizes a change in voltage levels. When TTL is selected, the threshold voltage is +1.5 volts. When CMOS is selected, the threshold voltage is +1.65 volts. When ECL is selected, the threshold voltage is -1.3 volts.

timing analyzer

A logic analyzer that samples at regular intervals based on an internal clock signal.

timing mode

When the logic analyzer acquires samples from the device under test asynchronously, that is, at regular intervals, such as every 100 ns. Also known as asynchronous sampling.

trigger

The event about which acquired data is stored; in other words, the event that you are looking for. For example, you may want to trigger on an edge in

order to see the events that lead up to it and the events that happen after it. The event that triggers the logic analyzer becomes a reference point in the data display.

trigger position

The location of the trigger event in trace memory. If you want to view data after, about, or before the trigger event, you set the trigger position to the start, center, or end of trace memory, respectively.

trigger specification

Specifies when the logic analyzer stores sampled data. Usually the trigger specification is made in terms of sampled data. For example, "store sampled data when the interrupt signal becomes active."

Technical Support

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