

# LAP-C Pro Logic Analyzer USER GUIDE

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## Precautions

Users are advised to carefully review this section to avoid potential hazards to persons, this product and other products connected to it.

- To protect the instrument and the Device under Test (DUT), grounding is required during signal acquisition.
- Follow the "Operating environment" recommendations from Table 2:1.
- Protect the logic analyzer from static discharge.
- Avoid direct impacts and rough handling.
- The logic analyzer is an IEC 61010-1 Level 2 instrument. The relevant pollution caution is: "Normally only non-conductive pollution occurs. But temporary conductivity caused by the occasional condensation must be kept in mind."
- Do not place heavy objects on the logic analyzer.
- As a Class A product, the LAP-C Pro may cause radio interference in a domestic environment.
- Do not disassemble the logic analyzer as this will void the warranty and may affect its operation.

## 1. Introduction

## 1.1. Preface

This User Guide presents the Zeroplus\* logic analyzer, its operation and software. The purpose of the User Guide is to help users understand and get familiar with the operations of the instrument and the software. Throughout the document, the instrument software is referred to as ZP-Logic and the instruments as LAP-C Pro.

Zeroplus attaches great importance to users' suggestions. Users are welcome to give us feedback by email or telephone. Thank you for purchasing the logic analyzer.

\* Zeroplus is short for Zeroplus Technology Co., Ltd.

## 1.2. About this document

This User Guide is organized as follows: First, the characteristics of the logic analyzer are presented, followed by installation and setup procedures. The next section familiarizes the user with the software user interface. Section 4 then goes in-depth on the software functions.

- **NOTE** The software functions in chapter 4 are sorted by their locations on the ZP-Logic Main Menu.
- **NOTE** The latest version of this document can be downloaded from the Zeroplus website.
- **NOTE** Right-click menus are found under the corresponding view modes in chapters 4.45.1 and 4.45.2.
- **NOTE** The newest software UI might differ from the illustrations herein.

## 1.3. Product Introduction

The LAP-C Pro is a multi-purpose PC-based logic analyzer. It offers uncompromised breadth in one single instrument: high sample rate, large channel count and deep memory.

But the LAP-C Pro is not only about GHz and Mb. The extensive protocol library consisting of more than 120 protocol decoders, direct streaming to disk, channel folding, user-friendly software and a host of other functions make debugging a joy. All of these functions are described in chapter 4.

## 1.4. Package Content

All items contained in the package are listed in Table 1:1. If any of the items is missing or damaged, please contact your distributor as soon as possible.

Item	LAP-C Pro	LAP-C Pro	Detail
Channels	16 ch.	32 ch.	
Logic analyzer	1	1	
USB flash drive(software)	1	1	
2 x 5 pin Probe(short)	2	4	10cm
2 x 5 pin Probe(long)	2	4	25cm
1 pin Probe(gray)	4	4	25cm
1 pin Probe(block)	1	1	25cm
Clip-on connector	20	40	
USB 3.0 cable; PC-to-LAP-C Pro	1	1	A to B type; 1.5 m



## 1.5. System Requirements

### 1.5.1. Operating System Requirement

The ZP-Logic supports operating systems from Microsoft only. See Table 1:2 Supported operating systems

below for a list of supported operating systems. Please contact our Technical Support team if you have questions about older operating systems.

Supported OS	Versions	
Windows 10	32- and 64-bit	(Recommended)
Windows 8.1	32- and 64-bit	(Recommended)
Windows 7	32- and 64-bit	

Table 1:2 Supported operating systems

Item	Value	Туре
CPU	2 GHz	Minimum
Memory		
RAM	4 GB	Minimum
RAM	8 GB	Recommended
Hard disk	80 GB	Minimum
Interface		
	USB 3.0	Recommended support
	USB 2.0	Recommended compatibility
Display		
Display size	17"	Recommended
Display resolution	1,024 x 768	Minimum
Display card	8 Mb SDRAM	Recommended

### 1.5.2. Hardware Requirements

 Table 1:3 PC hardware requirements and recommendations

## 1.6. Product Specifications

### 1.6.1. Product Photo



#### Figure 1-1 Top view of the LAP-C Pro

### 1.6.2. Specifications

Item	Characteristic
Supported operating systems	See Table 1:2
Acquisition Channels	16 or 32
Interface	USB 3.0 (2.0 compatible)
Sampling Frequency	
Internal (Timing)	2 GHz
External (State)	250 MHz (Dual-edge)
Memory/channel	4, 8, 16, 32, 64 , 128, 256, 512Mb, 1Gb
Trigger	
Trigger Channels	16 or 32
Trigger Events	Pattern / Edge / Pulse-width / Interval (Time)
Trigger Delay	Yes
Trigger Sequence Levels	256
Trigger Pass	1-65,535
Trigger Voltage	4 simultaneous levels; 1 for each of the 4 ports

Auxiliary Cursors	250
Protocol Triggers (HW)	I2C, I2S, SPI, SVID, UART, CAN2.0B
Software functions	
Languages	English, Chinese (Traditional), Chinese (Simplified)
Zooming & Panning	Two cursor modes
Wavefrom & UI	Modify the appearance of channels, menus, traces,
customization	windows etc
State List & Waveform View	Present the samples as a list of 1s and 0s or as a
	waveform
DSO Connection	Connect to and import signals from DSOs
Files Comparison	Compare 2 files to quickly see where and how they differ
Navigator	Instantly navigate to distant parts of the waveform
Memory View	See what the memory looks like; what is read/written to
	each address
Packet List	Breakdown of all packets in list form
Statistics	Table view of number of periods, periods that satisfy
	conditions etc
Find Results	Set conditions, look up the information meets the
	requirements
Real-time Signal Activity	Live view of probe activity
Protocol Decoders	More than 120 free, built-in protocol decoders
Miscellaneous	
Power	USB 5 V
Dimensions	125 x 92 x 25 mm
Certifications	FCC/CE/WEEE/RoHS/REACH

#### Table 1:4 LAP-C Pro specifications

The external sampling frequency requires the shortest probe, otherwise NOTE the ground wire added to each signal probe must be twisted.

#### 1.6.3. Available Models

Model	Channels	Memory depths available
LAP-C Pro	16	64 Mb /channel
LAP-C Pro	32	64 , 128, 256Mb /channel

#### Table 1:5 LAP-C Pro Available memory depths

#### 1.6.4. Optional Features

Table 1:6 lists the optional features; see chapters 4.40, 4.41 and 4.42.

Description
This function is used to stream samples directly to disk; see chapter
4.42 for details.
This function is used to stream samples directly to disk. The speed
can reach 200MB/s using USB 3.0. The Long-Time Record function
can be used to acquire signals for 7 hours to 35 days depending on the
acquisition setup and available storage; see chapter 4.41 for details.
Using 4 channels, it can simulate I2C, SPI, UART, CAN digital signals.
Please see chapter 4.42 for details.

#### Table 1:6 LAP-C Pro Optional features

#### 1.6.5. Electrical Specifications

Item	Power Supply
Working Voltage (DC)	5V
Working Current	0.6A
Working Power	3W

### Table 1:7 LAP-C Pro power specifications

### 1.6.6. Probe Specifications

The following probe are also available for the LAP-C Pro.

Item	Description
Signal Type	Single-ended
Channels (Max)	32 + 4CK
Input Impedance	200 kohm
Capacitance	7 pF
Input Bandwidth (Max)	250 MHz

Trigger Level	User-defined
Trigger Level Range	-6 to 6V
Trigger Level Resolution	10mV/STEP
Reference Level Accuracy	±100mV+5%Vth
Input DC V (Max)	±30 V

#### Table 1:8 LAP-C Pro input channel specifications

**NOTE** The Input Bandwidth (Max) requires the shortest probe, otherwise the ground wire added to each signal probe must be twisted.

#### 1.6.7. Port Overview

Figure 1-2 shows the pin overview of the LAP-C Pro.



Figure 1-2 LAP-C Pro pin overview

Port	Number	Description
Signal	32/16	USB connections to probes for signal acquisition.
Channels		
CLK IN	4/2	External clock input for State mode acquisitions; see chapter
		4.17
T_0	1	Send output signal upon triggering.
T_I	1	Trigger in
Pattern	4	Pattern output
Generate		
USB	1	Connection to the PC; both USB 3.0 and 2.0 are supported.
EXPAND	1	Reserved

#### Table 1:9 LAP-C Pro pin overview

In Figure 1-3, cables are connected to the LAP-C Pro ports listed above. Some of the 32 signal channel ports are seen in the left part of the picture.



Figure 1-3 Cable connections to the LAP-C Pro

## 2. Installation and Setup

## 2.1. Software Installation

**NOTE** For users who have internet access, we recommend that you download the latest version of the ZP-Logic software from our website: <u>www.zeroplus.com.tw</u>.

Close all other programs and connect the logic analyzer to the PC via USB. Insert the ZP-Logic Software USB flash drive into the PC. Open the Setup.exe file manually. The dialog box from Figure 2-1 will be shown.

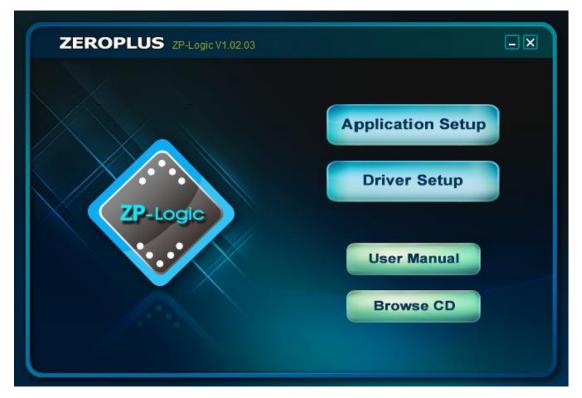


Figure 2-1 Main installation window

Choose the Application Setup as this option will install both the software and the instrument driver. The Driver Setup is for driver reinstallation.

Before the installation starts you will be asked to read the License Agreement carefully. "I accept the terms of the license agreement" must be checked to continue.



Clicking "Next" throughout the installation to install the standard version is recommended, but options for customizing the installation are also available for users who want that. Upon completion, the user will be prompted to restart the computer; it is recommended to do so.

## 2.2. Hardware Setup

Connect the probe to the instrument; see Figure 2-2.



Figure 2-2 Probe connected to the LAP-C Pro



Connect the LAP-C Pro to the PC using the USB. The power lamp indicated in Figure 2-3 turns on when the power is connected.



Figure 2-3 Probe and USB cable connection

## 2.3. Trigger In/Out

The LAP-C Pro can be connected to a DSO (or another instrument) for external or internal triggering.

**NOTE** It is also possible to display the analog waveform of a connected DSO in ZP-Logic. This is described in chapter 4.17.2.2.DSO Connection.

#### 2.3.1. Trigger In

The LAP-C Pro can be triggered by an external source, most commonly a DSO or another logic analyzer. The external trigger should then be connected to the T\_I channel of the LAP-C Pro and the External Trigger checkbox in the Trigger Setup must be selected.

### 2.3.2. Trigger Out

When the trigger conditions have been met the LAP-C Pro can emit a signal that can be used to trigger another instrument. This signal can be sent on the occurrence of three different events. The signal is sent from the T\_O channel.

To trigger out, the "Send output signal upon triggering" must be checked in the Trigger Options dialog box (Figure 4-37).

## 2.4. Operating Environment and

## Maintenance

Please follow the below instructions when using, cleaning or storing your logic analyzer and probes. Please also see the Precautions chapter prior to the Introduction.

Type Description									
Cleaning									
Clean with a soft, damp clo	Clean with a soft, damp cloth using a mild detergent.								
Do not spray any liquid on	the logic analyzer.								
Do not immerse the logic a	nalyzer in any liquio	d.							
Do not use harsh chemical	s or cleaners contair	ning substances such as benzene, toluene,							
xylene or acetone.									
Operating environment									
Temperature (Working)	Min: 5° C	Max: 35° C							
Temperature (Storage)	Min: -20° C	Max: 60° C							
Rel. humidity (Working)	Min: 20%	Max: 85%							
Rel. humidity (Storage)	-	Max: 90%							
Altitude	-	Max: 2,000 m							
nsolation Avoid direct sunlight.									
Environment	Use in a dust free, r	non-conductive environment.							

#### Table 2:1 General advices for cleaning, operation and storage

## 3. User Interface

The ZP-Logic user interface is shown in Figure 3-1.

File(F) Acquisition	(A) A halysis(D) Options(O) Viev	LAP-F(64CH 64M) (S/N:000000-0000	) - [Doc1]		- 8 ×
(< ) / / / / / / / / / / / / / / / / / /	🚔 🕞 🛧 🎄 🝴 🤇		7 💉 👒 🧐 🧐	📰 O, O, Q	, "C, 🖉 📀 ,
Doc1 × +					
	С			He -	( )) )) ] /1
Scale:20ns		A Pos -300ns 💦 🛛 🔺	T 300ns 🗛 🗸		Control Panel 🗢 🖣 🗙
Total:655.2us	Display Range:-500ns ~ 5	B Pos 300ns D B-	T 300ns P		Zoom
Bus/Signal Trig	gger <mark>=</mark>	-200ns -100ns 0ns	100ns 200ns 300ns	400ns 500ns	20ns 🔽 🔍 🔍
× • A0 A0	🛛	160ns 160ns	160ns 160		Sample Depth 32K 655.2us
	320ns	320ns	320ns	=	
<u></u> <b>∠ ∠ ∠ ∠</b>	8 640ns		640ns		
🗲 A3 A3 🚺	1.28us		1.2	8us	Timing (Internal)
	F		2. 56us		multiliding
			655. 2us		
			655. 2us		
		G	655. 2us		5MHz 1GHz
			655. 2us		50MHz 🖌
			655. 2us 655. 2us		Trigger Position
			655. 2us		1 10 20 30 40 50 60 70 80 90 100
	<u> </u>		655. 2us		1 10 20 30 40 30 00 70 00 30 100
	<u></u>		655. 2us		Н
	 ⊠		655. 2us		
			655. 2us	•	
Avigator	<u>.</u> Q 4			→ → → ×	
				• # *	
					J
		I			San 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Navigator Packet List   Stati	istics   Memory View   Find Results				
					End

Figure 3-1 ZP-Logic user interface

The ZP-Logic window can be divided into sections; see Table 3:1. Note that many functions can be accessed with Hot Key combinations.

Name	Area	Description
Main Menu	А	All operations can be accessed from the Main Menu bar. The
		organization of chapter 4 corresponds to that of the Main
		Menu; see chapter 4 for details.
Quick Access	В	The Quick Access Toolbar provides convenient access to
Toolbar		frequently used functions; see chapter 4.11.3 for details.
File Bar	С	The File Bar consists of File Page, Memory Page and Show All.
		The File Page displays the new added files. File Page can be
		minimized, restored and closed.

Timing Bar	D	Facilitates quick reading of the samples and traces; see 4:55 for
		details.
Channel Column	Е	See and edit channels; see Figure 4-73 for details.
Trigger Column	F	Set trigger conditions; Figure 4-75 for details.
Waveform Area	G	Displays the captured signals as traces or as a numeric list; see
		chapter 4.45 for details.
Control Panel	Н	The Control Panel gives quick access to acquisition settings; see
		chapter 4.48 for details.
Secondary	Ι	Area where the Navigator, Packet List, Statistics, Memory View,
Display		LTR Monitor are shown and Find Results; see chapters 4.49,
		4.50, 4.51, 4.52, 4.53 and 4.56.
Action Wheel	J	The Action Wheel provides shortcuts to functions related to
		acquisition and searching; see Figure 4-83 for more details.

#### Table 3:1 UI description; "Area" refers to the letter codes on the figure above

**NOTE** The Control Panel and the Secondary Display can be repositioned or hidden. Right-click to bring up the menu from Figure 3-2.



#### Figure 3-2 Reposition/hide sector; right-click menu

Item	Description					
Floating	Move the Control Panel/Secondary Window freely; see Figure 3-3 for an					
	example.					
Docking	Fix the Control Panel/Secondary Window to its position.					
Autohide	The control panel hides in the right edge, users could move the cursor to					
	the icon of "Control Panel" to show it.					
Hide	Don't show the Control Panel/Secondary Window; use the View menu to					
	have it appear again.					

#### Table 3:2 Reposition/hide sector; right-click menu description



Figure 3-3 shows an example where the Control Panel is "floating"; if the user un-clicks the mouse when hovering over one of the arrows the Panel will be repositioned to the corresponding transparent/blue area (in the example the user is holding the mouse over the upward arrow).

				LAP	-F(64CH 6	4M) (S/N:0	00000-00	00) - (D	oc1]						- 8 ×
File(F)	Acquisition(A)	Analysis(D)	Options(O)	View(V)	Help(H)										
‹‹ 📄 🛽	🖌 🖹 🍝	- 🔡 🜟	ः 🤹 🍴	<u></u>		- 📕	1		ee 👯	183	🗐 🧰	୍ତ୍ତ	् 🍳 🍐	2,0*	📀 🛛 »
Doc1	× +													<	1> - 8 ×
1														н н	/1
Scale:20ns Total:655.20	IS		lay Position:0 lay Range:-50		ins	A Pos				A-T 6-T			A 🛩 0 P	<u> </u>	l
			-400ns			0hs	-100ns		. ens	100		10ns		400ns	
🗙 🖝 A0 A0	- X	160ns		160ns											
	8		320ns					20ns				320n:			
			640ns												
<b>- A3</b> A3	8		1.28us										1.28us		
	8					Control	Panel	_				6us			
A5 A5	8						_ ·	loom Je Dep	th						
A6 A6						_	•	_	nal) 🙌		655.	.2us	_		
A7 A7		I				_					655.				
🕊 A8 A8						_	11				655.				
🗲 A9 A9		1				_	10		in in		655.				
✓ A10 A				+		-1	SMHz SOMHz	$\sim$	IGH:		655.				
- A11 /	.1. 🖸			+		-1		per Posit			655.				
A12 //						- 1	1				655.				
A13 / A14 /								40 50 60 3	70 80 90 100		655. 655.				
✓ A14 //											655.				
	نة <mark>بر</mark> ال							-			0.4.5	208			
Navigator				-	-	-		P		_					- a :
							s 🔊 🖥	<b>9 ID</b>	2						
							$\sim$								
						- 1-									_
Navigator Pac	et List Statistics	Memory View	Find Results			_									
		,,		_											End

Figure 3-3 Repositioning the Control Panel example

## 4. Software Operations

This chapter follows the ZP-Logic Main Menu organization. Each section starts off by showing the corresponding drop-down menu from the Main Menu. The functions are presented one by one in the succeeding subchapters.

**NOTE** ZP-Logic will automatically check online for updates upon startup.

## File

Press ALT + F to open this Main Menu item with the keyboard.

## 4.1. Menu Layout

Ctrl+N
Ctrl+O
Ctrl+F4
Ctrl+S
>
Ctrl+P
Ctrl+Alt+I

#### Figure 4-1 File drop-down menu

## 4.2. New

Create a new, empty file.

9

Hot Key: CTRL + N.

## 4.3. Open

Open an existing file. When selecting a file in the Open file dialog box, file information such as author name, creation date, project title will be shown in the lower part of the dialog box. Some of this information is user-added to the file when saving; the rest is automatically added by ZP-Logic.

Hot Key: CTRL + O.

## 4.4. Close

Close the active file. When closing a file that has previously not been saved, ZP-Logic prompts the users to save it before closing.

Hot Key: CTRL + F4.

## 4.5. Save

Save the active file. If the file has not been saved before, the Save As dialog box will open; see chapter 4.6.

Hot Key: CTRL + S.

## 4.6. Save As

Save As is useful for users who wish to save a file under a different name or type or change the destination folder. The Save As dialog box also opens when the user saves a file for the first time so that these parameters can be defined.

The Save As dialog box lets users input file information such as author name and a note. This information is used for previews in the Open file dialog box; see chapter 4.3.

In the Store Settings the user can chose which section of the data to store; this can be particularly useful for long acquisitions with a limited amount of interesting data.

- **NOTE** Acquisitions are stored as temporary files that are instantly available to the user for most software functions. These temporary acquisition files need to be processed before they can be saved.
- **NOTE** Since file processing slows down the software, users can choose not to process the temporary acquisition files automatically. If chosen, users who try to save a file (or initiate certain other functions) will be informed that the acquired data needs to be processed to proceed. This setting is accessed under General in the Options dialog box as "Automatically process acquired data (NB: Slower)".

## 4.7. Export

Users can choose between three types of exports: Waveform, Packet List or Memory View. The characteristics of each type are presented below.

#### 4.7.1. Waveform

This chapter treats the export of waveforms; please refer to chapter 4.45.1 for more details on the Waveform View itself. The Export Waveform dialog box is shown in Figure 4-2.

🐵 Export Wavefo	orm					×
Save in:	LA File		~	G 🤌	>⊞ و	
Quick access	Name	^ No it	ems match your s	Date mo earch.	dified	Туре
Desktop						
Libraries						
This PC						
٢	<					>
Network	File name:	Wave.txt				Save
	Save as type:	Text Files(*.txt)			~	Cancel
Include environm		Arrange Output Da	ta O By Timestamp		Selection	
Data to Export Channels/buses	: All channels a	nd hunne				
Data Selection:	Show all data					
Range	brieff dir data					
	ng of Data 🛛 🗸	-655.2us	To: End of Data	~	5.8984ms	
Limit the num	nber of lines per	export file (1,000-10	0,000)	6000	00	
✓ Open file aft	er exporting		Use commas to	separate d	ata	

### Figure 4-2 Export Waveform dialog box

Item	Description
File name	Input the file name; the default is Wave.
Save as type	Save the file as .txt or .csv; the default is .txt.
Include environment	Include acquisition parameters etc. in the export file; checked
info	by default.
Arrange Output Data	
By channel/bus	Each column in the export file contains data for one channel;



	default option.
By Timestamp	Each column in the export file contains data for one
	timestamp.
Data to Export	
All channels and buses	Export channel, bus and protocol decoder data.
All buses (excl. channels)	Export bus and protocol decoder data.
Buses with PD (incl.	Export protocol decoder data (channel data included).
channels)	
Buses with PD (excl.	Export protocol decoder data (channel data not included).
channels)	
Data Selection	
All Data	Export all data.
Show changes in state	Export data for timestamp X only if at least one signal has
only	changed state from timestamp X-1 to timestamp X.
Show changes in data	Export data for timestamp X only if at least one data has
only	changed state from timestamp X-1 to timestamp X (for buses
	only).
Bus Selection	Select buses to be included in the export file.
Range	
From, To	Select the range for the data to be exported; the measure for
	the range is time.
Limit the number of lines	Limit the size of exported files; if there are data don't fit on the
per export file	amount of lines selected by the user then multiple files will be
	created.
Open file automatically	Open the exported file once it is ready; activated by default.
after exporting	
Use tabs to separate data	When selected, blank spaces in the export file are replaced by
(Faster)	tabs; this increases the writing by up to 50%; selected by
	default.
Table 4:1	Export Waveform dialog box description

#### Table 4:1 Export Waveform dialog box description

**NOTE** To export a waveform, the temporary acquisition file must be processed; see note in chapter 4.11.1 for details.

### 4.7.2. Packet List

This chapter treats the export of Packet Lists; please refer to chapter 4.51 for more details on the Packet List function itself. The Export Packet List dialog box is shown in Figure 4-3.

🚸 Export Pack	ket List				×			
Save i	n: 🚺 LA File		~	3 🌶 📂 🖽 -				
Quick access	Name	Name Date modified No items match your search.						
Desktop								
Libraries								
Lange Contract This PC								
Setwork	<				>			
	File name:	Packet.txt		~	Save			
	Save as type:	Text Files(*.txt)		$\sim$	Cancel			
Range			Export Se	ettings				
From: First	t v	-655.2us	🗹 Indu	de environment info				
To: Last	· · ·	5.8984ms	🗹 Indu	de packet names				
Export m	ultiple pages		✓ Oper	n file after exporting				
(100-60	number of packet ,000)	s per export file	Packe	t List Settings				
60000			Packet	Filter Settings				

Figure 4-3 Export Packet List dialog box

Item	Description
File name	Input a file name; the default is Packet.
Save as type	Export in .csv or .txt format; the default is .txt.
Range	

From, To	Select the range for the data to be exported; the range is
	measured in pages.
Export multiple pages	If the file to be exported comprises more than one Memory
	Page these can be exported together; unchecked by default.
Limit the number of	Set the maximum quantity of lines per export file; if the file
packets per export file	length overshoots the limitation then several files will be
(100-60,000)	created; selected by default.
Export Settings	
Include environment	Include acquisition parameters etc. in the export file; checked
info	by default.
Include packet names	Include packet titles in the export; unselected by default.
Open file after exporting	Open the exported file once it is ready; activated by default.
Packet List Settings	Open the Packet List Settings dialog box; see details in Figure
	4-90.
Packet Filter Settings	It is only applied to protocol bus, export the packet meet the
	condition by Filter settings.

Table 4:2 Export Packet List dialog box description

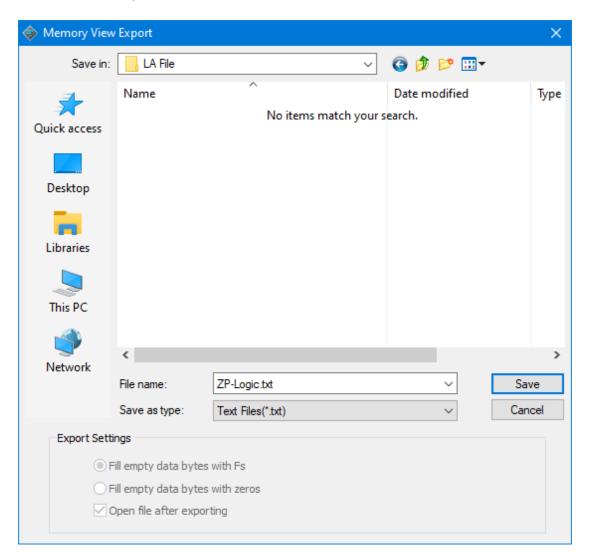
Exporting the protocol bus, user can set the filter settings, and click Match whole condition only to export data matching the all setting conditions.

Packet Filter S	Settings						×
BUSO(I2C)							
Only expo	ort conditions below						
	Unknown	$\sim$	None	$\sim$	0		
	Unknown	$\sim$	None	$\sim$	0		
	Unknown	$\sim$	None	$\sim$	0		
Match w	hole condition only						
				C	Ok	Cano	el

Figure 4-4 Packet Filter Settings dialog box

#### 4.7.3. Memory View

This chapter is about exporting the Memory View; please refer to chapter 4.49 for more details on the Memory View function itself. The Export Memory View dialog box is shown in figure 4-5.



#### Figure 4-5 Export Memory View dialog box

Item	Description
File name	Choose a name for the file to be saved; the default is
	ZP-Logic.
Save as type	Export in .txt, .csv or .bin format; the default is .txt.
Export Settings	Available for .bin exports.

Fill empty data bytes with Fill empty spaces with the letter F; selected by default.

Fs

Fill empty data bytes with Fill empty spaces with the number 0.

zeros

Open file after exporting Open the exported file once it is ready; selected by default.

```
Table 4:3 Export Memory View dialog box description
```

# 4.8. Screen Capture

Select a part of the screen – or all of it – and store it as a file or a picture; see the dialog box in figure 4-6. If Clipboard is selected the file will be stored in the RAM. Some level of customization is possible as described in Table 4:4.

💿 Screen Capture	×
Capture to Note: © File © Clipboard © Ms Paint Capture Region © Full Screen © Select Region	>
Select Line Color	Contrasting Colors
Note Color	
Capture	Cancel

### Figure 4-6 Screen capture dialog box

Item	Description
Capture to	
File	Save the captured region in .bmp or .jpg format.
Clipboard	Copy the captured region to the clipboard for editing in other software.
MS Paint	Open the captured region in MS Paint.

Capture Region

Full Screen	Capture the full screen.
Select Region	Select a part of the screen to be captured by dragging a square with the
_	left mouse button.
Note	Users can enter text to accompany the screen capture; if the field is not
	empty a blank area will be added below the screen capture where the
_	text will be displayed.
Note Color	Change the color of the Note text.
Line Color	Change the color of the Select Region frame; by default this is black.
Invert Colors	The Select Region frame color is the opposite of Line Color; selected by
	default.

 Table 4:4 Screen capture dialog box description

# 4.9. Print

The print function works on the part of the waveform or state list that is viewed at the moment of printing. The Timing Bar (above the waveform) and the Channel Column with the trigger conditions is also printed. The Waveform/State List background is printed as white and an extra field containing the file name, date and page number is added to the top of the page.

The print option dialog box has a standard layout that lets the user choose what to print and also gives access to other printer properties; see figure 4-7.

Hot Key: CTRL + P.

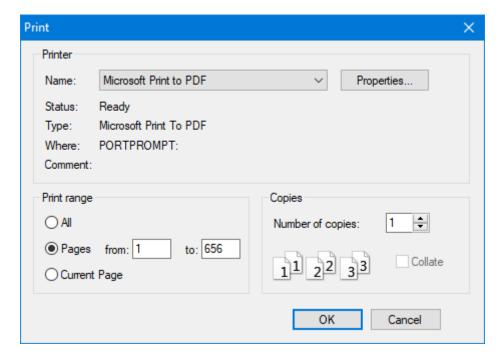


Figure 4-7 Print Setup dialog box

Item	Description
Name	Select a printer.
Properties	Open the Print Properties dialog box for more print options.
Print range	
All	Print the entire waveform or state list.
Pages	Print parts of the waveform or state list. What is currently being
	viewed is regarded as one page.
Current Page	Print the current view.
Copies	
Number of copies	Number of copies to be printed.
Collate	Organization of multiple copies. Ex: 2 copies of 3 pages will print
	1, 2, 3, 1, 2, 3 when collate is checked (default option) and 1, 1, 2,
	2, 3, 3 when unchecked.

#### Table 4:5 Print Setup dialog box description

# 4.10. Print Preview

Preview what the printed file will look like. When opening the Print Preview, a new toolbar will appear above the preview; this is used for zooming and navigation between pages. Press Esc to leave the Print Preview.



Hot Key: Press CTRL + ALT + I.

# 4.11. Options

The appearance and behavior of the user interface and functions can be customized. Configurations, options and settings are gathered under this menu item.

Options		?	×
General Start-up Quick Access Toolbar Color Settings Waveform Hot Keys Save Options	Select Language Chinese (Simplified) Other Chinese (Traditional) English		
	Post Capture Options When pressing Stop during sampling: Show previous acquisition Show newly acquir Automatically process acquired data (NB: Slower) Temp file: C:\ZP\PC-Based Instrument_2010\ZEROPL		1
	Packet Names © Full names PageSize 8M ~	Gridlines	
	OK Cancel D	efault	

### 4.11.1. General

### Figure 4-8 General settings dialog box

Item	Description
Select Language	Choose between English, Chinese (Simplified) and Chinese
	(Traditional); the one selected during installation is the default.
	The More option is used by customers who have developed a
	proprietary language pack.
Post Capture Options	
C1 :	

9

acquisition	Stop in the middle of an acquisition. If this option is selected then
	the previous acquisition will be displayed again.
Show newly acquired	When pressing Stop during an acquisition, the data acquired up
data	until the Stop moment is displayed; this is the default option.
Automatically process	Process the data upon finalizing acquisitions; if unchecked the
acquired data (NB:	ZP-Logic will prompt the user to process data when launching
Slower)	certain functions. See a more detailed explanation in chapter
	4.6.The function is turned on by default.
Temp	Location of temporary acquisition files.
Gridlines	Show vertical gridlines in the waveform area; unchecked by
	default.
Packet Name	
Full names	Display the full names of packets; this is the default option.
Abbreviations	Display packet names abbreviated to a single letter: Data is
	shown as D etc. This option lets users see the packet type for
	short packets where the full name would otherwise not be shown
	due to space limitations (which is a combination of packet size
	and zoom level).
Keyboard	Open an on-screen keyboard when inputting numbers. The
	on-screen keyboard is operated with the mouse; by default it is
	not shown.
PageSize	PageSize relates to our <i>Memory Page</i> feature. To speed up the
	loading of waveforms, large acquisitions are divided into pages.
	The PageSize determines the size of these pages. Ex: A 16 Mb
	acquisition will be split into 8 pages if the PageSize is set to 2 Mb.
	$1lash _2$ pages are displayed at a time and the user moves between
	pages by means of the File Bar; see Figure 3-1 for the location of
	this. It is also possible to navigate between pages using the Go To
	function; see chapter 4.31.

### Table 4:6 General settings dialog box description



### 4.11.2. Start-up

Options	?	×
Start-up Quick Access Toolbar Color Settings Waveform Hot Keys Save Options	<ul> <li>System Prompts</li> <li>Modification Description</li> <li>Open the last used file when starting a new session</li> <li>Round inputs up/down to nearest valid number</li> <li>Software Update</li> <li>Update module dll</li> <li>Show tips on hovering</li> <li>Quick Access Toolbar Descriptions</li> <li>Trace Information</li> </ul>	
	OK Cancel Default	

### Figure 4-9 Start-up settings dialog box

Item	Description
System Prompts	
Modification Description	Show modification descriptions.
Open the last used file	The last saved file is opened when ZP-Logic starts; selected by
when starting a new	default.
session	
Round inputs up/down	Illegal input values are automatically rounded to the nearest
to nearest valid number	valid value; selected by default.
Show Tips on Hovering	
Quick Access icon names	Show function names when hovering over the Quick Access
	Toolbar icons; selected by default.
Trace Information	Show channel name, signal state and trace information when
	hovering over a trace in the waveform view; selected by
	default.



### Table 4:7 Start-up settings dialog box description

### 4.11.3. Quick Access Toolbar

The Quick Access Toolbar consists of shortcut icons to commonly used functions. It is located below the Main Menu and is shown by default. Table 4:9 lists all functions that can be placed on the Quick Access Toolbar.

Users can customize the Quick Access toolbar by organizing the icons into groups. ZP-Logic comes with pre-defined groups; a Standard group and one group for each of the Main Menu items. The Standard group consists of a selection of common functions; the second type provides shortcut icons to all the functions under a Main menu item. Users can modify the Quick Access Toolbar in three ways:

- By selecting the group or groups that are displayed
- By adding or removing items from the pre-defined groups
- By creating a custom group

These modifications are done from the Quick Access Toolbar dialog box shown in figure 4-10.

Options			? ×
General Start-up Quick Access Toolbar Color Settings Waveform Hot Keys Save Options	Setting Group: Standard File Acquisition Analysis View Help	Item: New Open Save Save As Export Waveform Export Packet List Export Memory View Screen Capture Print Print Preview Save Options Options	~
	Add	elete Rename	2
	☐ Autohide ✓ Large Icons		
	ОК	Cancel Default	t

### Figure 4-10 Quick Access toolbar dialog box

Item	Description
Group	Select the group or groups to be displayed as large shortcut icons below
	the Main Menu; the Standard group is selected by default. Groups can be
	added, deleted or renamed (with exception of the Standard group).
Item	Check/uncheck items to add/remove them from the selected group (in
	blue in the left column).
Autohide	The Quick Access toolbar is hidden whenever the mouse cursor does not
	hover over it; this option is unchecked by default.
Large Icons	Set the icon size to 32x32 px; the default size is 24x24 px.

### Table 4:8 Quick Access Toolbar dialog box description

Table 4:9 below shows all the icons that can be placed on the Quick Access Toolbar and which function they link to.



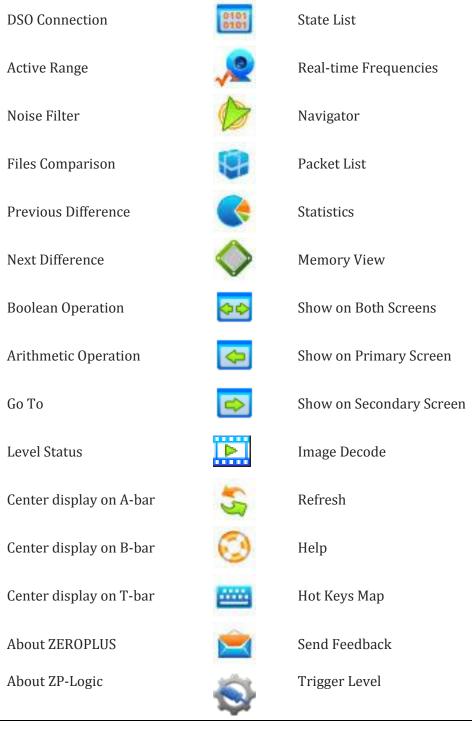
1		
5	)	

Icon	Function
	Create File
	Open File
B	Save File
1	Save File As
	Save Settings
	Export Waveform
1	Export Packet List
$\diamond$	Export Memory View
Ó	Screen Capture
	Print file
	Single Capture
	Repeated Capture
	Stop
11	Sampling Setup
1	Find
1	Find previous
20	Find next
*	Add Channel/Bus

Icon	Function
M	Analog Display
K	Pointer
*	Hand
0	Zoom Out
0	Zoom In
Q	Display All Waveform
40	Previous Zoom
0	Cancel Previous Zoom
1	Add Bar
1	Delete Bar
1	Reposition Bar
*	Customize
	Highlight Data
0	Don't Show Information
<b>∧</b> <sub>Hz</sub>	Frequencies
1	Number of Samples
	Time
<b>5</b> 77	Waveform







#### **Table 4:9 Quick Access toolbar icons**

#### 4.11.4. Colors

Users can customize the colors of bars, texts, traces and other elements of the user interface. To change the color of an element, click the corresponding color bar in the Color column of the dialog box shown in figure 4-11 to access the color palette. Proceed to select a predefined color or define a custom color for the element.

ptions			? ×
General	Color Settings		
Start-up Quick Access Toolbar	Name	Color	^
Color Settings	Waveform Background		
Waveform	State List Background - Odd lines		
Hot Keys Save Options	State List Background - Even lines		
	Horizontal Indicator (Dotted)		
	Gridlines		
	Unknown Line		
	Bus Lines		×
	<		>
	Preview 0 1 0 10 10 10	0     0     0     1       0     0     0     1       0     0     0     1       1     1     1     1	
	and white.	all traces are display ved in colors that con	
	OK	el De	fault

### Figure 4-11 Color settings dialog box

Description
Customizable element.
Current color of the element; click it to change the color.
Preview the color selections; the left frame shows the Waveform
and the right the State List.
The background and all traces are shown in black and white.
All traces are displayed in colors that contrast the background.

### Table 4:10 Color settings dialog box description

### 4.11.5. Waveform

The appearance of the traces and surrounding information can be changed from the dialog box in figure 4-12.

Options			?	×
General Start-up Quick Access Toolbar Color Settings Waveform Hot Keys Save Options	Trace Information O Don't show values Number of samples Waveform Options Trace Height: Trace Type: Waveform Scale Fixed Bar Snap to edges Center display arou	<ul> <li>Frequency</li> <li>Time</li> <li>26 </li> <li>Font Size: 12</li> <li>Square </li> <li>Samples/Time</li> </ul>	2 ~	
	OK	Cancel Defa	ault	

Figure 4-12 Waveform settings dialog box

Item	Description
Trace Information	
Frequency	Show frequencies between two edges. The frequency of full period
	(rising to rising edge) is displayed. See Table 4:50 for more details
	on the Trace Information.
Number of	Show number of samples between two edges.
samples	
Time	Show the time between two edges.
Don't show values	No information is shown inside the traces; this is the default option.
Waveform Options	
Trace Height	Set the trace amplitude from 22 to 180 px; the default is 26.
Font Size	Set the font size from 6 to 60. The default is 12.
Waveform Mode	Choose between saw tooth- and square-shaped traces.
Waveform Scale	
Fixed	The center of the screen is fixed at 0 sec.
Samples/Time	Second is defined as the trigger event; this is the default option.

0	5	

Bar	
Snap to edges	Bars snap automatically to the nearest trace edge when being
	repositioned.
Center display	Center the waveform area around the T-bar when the trigger
around the T-bar	condition is met.

#### Table 4:11 Waveform settings dialog box description

### 4.11.6. Hot Keys

In ZP-Logic, Hot Keys are keyboard combinations that invoke a function. See Table 4:61 for a complete description of all Hot Keys. Figure 4-13 shows the dialog box used to customize the Hot Keys.

Setting	Options		? ×	
General Start-up Quick Access Toolbar Color Settings       Commands:       Select New Hot Keys:         Previous Page Next Page First Page Last Page Zoom Out Zoom In Previous Zoom Selectior Undo Previous Zoom Selectior Undo Previous Zoom Selectior Undo Previous Zoom Selectior Current Keys:       Assign         Current Keys:       Conflict Keys:         Ctrl +Page Up       Description: Go to the previous page         Hot Key configuration document:       C:\ZP\PC-Based Instrument_i         OK       Cancel       Default	Start-up Quick Access Toolbar Color Settings Waveform Hot Keys	Previous Page         Next Page         First Page         Last Page         Zoom Out         Zoom Out         Zoom In         Previous Zoom Selection         Undo Previous Zoom Se         Current Keys:         Ctrl+Page Up         Description:         Go to the previous page         Hot Key configuration document:         C:\ZP\PC-Based Instrument_:	Assign Remove Conflict Keys: Setting Export	

### Figure 4-13 Hot Key settings dialog box

Item	Description	
Commands	Select a Command (function) for which a Hot Key can be	
_	assigned.	
Select New Hot Keys	Input the new Hot Keys combination (or single key) and	

	click Assign to make the change effective.	
Current Keys	Displays the current Hot Keys for the selected command.	
Conflict Keys	If the new Hot Keys are already in use, the command	
	currently using them will be shown.	
Description	Displays a brief description of the selected command.	
Shortcut-key Setting	Export the Hot Keys configuration document or load a	
document	different one.	

### Table 4:12 Hot Key settings dialog box description

### 4.11.7. Save Options

Options	? ×
General Start-up Quick Access Toolbar Color Settings Waveform Hot Keys Save Options	File name:       ZP-Logic         Path:       D:\LA File         Save Options          Save acquisitons automatically          Save acquisitions automatically          Save prime from first save; increment version number only          Save files under new names          File name +Date +File version       File name +Time +File version
	File name preview       ZP-Logic       OK     Cancel   Default

### Figure 4-14 Save Options dialog box

Item	Description
File name	Choose a name for the files to be saved; the default is
	ZP-Logic.
Path	Choose where to save files; the default is C:\Documents
	and settings\Administrator\ My Documents\ ZP-Logic

	Data (if C: is the system disk).		
Save Options			
Save acquisitions	Auto-save all acquisitions.		
automatically			
Keep time from first save;	When saving multiple acquisitions the file names will all		
increment version number	preserve the time of the first save and only change version		
only	number. If the first acquisition was made 3:45:12 pm and		
	the next 3:55:47 the names will become; FileName154500		
	and FileNameTime154500(1). This can be useful for		
	sorting the files.		
Update time and increment	In the example above the file names would become;		
version number	FileName154512 and FileName155547(1); this is the		
	default selection.		
Save files under new names	Files will overwrite each other if this option is not checked.		
	It is therefore common to combine this option with the		
	Save As function.		
File Name + Date + File	Add the date [Year, Month, Day] and version number after		
Version	the file name. Ex: August $25^{\text{th}} 2015$ becomes		
	ZP-Logic_20150825(1).		
File Name + Time + File	Add the time (Hour, Minute, Second) and the version		
Version	number after the file name. Ex: 13:45:02 pm becomes		
	ZP-Logic_134205(1); default selection.		
File Name Preview	Preview the name of files to be saved.		

#### Table 4:13 Save settings dialog box description

If the "Auto Add the Serial No" and is not activated, "Keep time from first save; increment version number only" and "Update time and increment version number" will be disabled. In other words, any new file that is saved will overwrite the existing file.

## 4.12. Exit

Exit ZP-Logic. The software prompts users to save unsaved files.

Hot Key: ALT + F4.



# Acquisition

Press ALT + A to open this Main Menu item with the keyboard.

# 4.13. Menu Layout

Add Channel	
Add Bus	
Add Protocol Decoder	Ctrl+B
Acquisition Setup	
Trigger Setup(quick)	
Trigger Setup(manual)	
Trigger Options	
Protocol Trigger	
Single Capture	F5
Repeated Capture	Ctrl+F5
Stop	
Autocapture	

Figure 4-15 Acquisition drop-down menu

# 4.14. Add Channel

To add one or several channels, select the channels to be included and bring them over to the right column using the arrow. The CTRL and SHIFT keys can be used to mark several channels at the same time. Using the lower arrows channels can also be removed. To finalize the inclusion of new channels the user must choose whether he wants all other channels to be deleted or not. The select channels dialog box is shown in figure 4-16 where four channels have been added.

Add Channel		?	×
Add Channel	Configuration - Port A - A4 - A5 - A6 - A7 - Port B - B0 - B1 - B2 - B2	?	×
	Back Next	Cance	:

Figure 4-16 Add Channel dialog box

# 4.15. Add Bus

Adding a bus follows the same routine as adding a channel (chapter 4.14), but the dialog box differs slightly; see Figure 4-17. First, it links to the Advanced Settings dialog box; see Figure 4-18. Second, the right-most column indicates which is the most significant bit and which is the least. Show caution to ensure that channels are added in the correct sequence; the first channel added will become the LSB and the final addition will be the MSB.

Hot Key: CTRL + B.

Add Bus		? ×
	Please select the channel of Bus	
	→ Port A     ▲       → A3     ▲       → A4     ▲       → A5     ▲       → A6     ▲       → A6     ▲       → A7     >>       → Port B     >>       → B0     →       → B1     →       → B2     →       → B3     <	LSB
*	Advanced Settings	Default
	Back Nex	t Cancel

Figure 4-17 Add Bus dialog box



Advanced Settings	?	×
Chip Select Settings		
Enable		
Latch Settings		
Activate A0 $\checkmark$ Either Edge	$\sim$	
Packet Setting		
Packet Interval 8ms		
Packet Idle(Time) 8ms		
OK Cancel	Def	ault

Figure 4-18 Add Bus / Advanced Settings dialog box

Item	Description
Chip Select	
(Channel and	The Chip Select function emulates a real chip select. The function is
Level)	similar to the Latch function (below) in that it decodes bus data, but it
	only does so when all the conditions are met.
Latch Settings	
(Channel and	The Latch function is used to analyze/decode bus activity that does not
Event)	use a specific protocol (referred to simply as a Bus in ZP-Logic). When
	selecting a channel and an event (for instance A0 and Falling Edge), the
	bus data will be decoded and displayed at every occurrence of this
	event.
Packet Setting	
Packet Interval	Set the Interval time of Packets for buses. Unchanged bus signals that
	meet the Interval time value are decoded as a packet. Eg: Set 8 ms as
	Interval time, if the unchanged signal exceeds 8ms the signal would be
	resolved to one 8 ms packet.

Packet IdleSet the Idle time of bus packets. Unchanged bus signals that meet the(Time)Idle time value would be decoded as one packet instead of being<br/>resolved.

 Table 4:14 Add Bus / Advanced Settings dialog box description

# 4.16. Add Protocol Decoder

Select the desired Protocol Decoder from the dialog box shown in Figure 4-19. The protocol decoders are arranged by industry in a list where each section can be collapsed/expanded using the minus/plus symbol to the left of the protocol decoder names. The right part of the dialog box shows a brief description of the selected protocol decoder.

Add Protocol Decoder		?	×
	Selection Protocol Decoder (Total: 129)	n	~
	Back	Next	ancel

**NOTE** Right-click on a decoder to add it to the topmost Favorites list.

Figure 4-19 Add Protocol Decoder dialog box



The ZP-Logic comes with more than 120 free protocol decoders; these are listed in Table 4:15. The protocol decoders are individual modules that are separated from the ZP-Logic software.

The protocol decoder dialog box shown in figure 4-20 is an example that shows the I2C decoder setup. Note that all protocol decoder dialog boxes have distinct designs.

PROTOCOL ANALYZER I2C			?	×	
		ΠĒ			
				J U.	
Pin Assignment	Data Mode				
SDA: A0 ~	Item	Name	Data Length		
SCL: A1 ~	Slave Addr:	Address	7	bit	
Timing Protocol Analyzer Format	Reg Addr:	Reg Addr	8	bit	
Settings	Data:	Data	8	bit	
Protocol Analyzer Property Format Packet					
Write Bit       Low Level       Don't stop analyzing when NACK appears       Active         ACK       Low Level       Add the Read/Write Bit for Slave Addr       File					
ACK  V Low Level Add the Read/	write bit for Slave Add	1	File		
	Default Back	Nex	t Car	icel	

### Figure 4-20 I2C Protocol Decoder Setup dialog box

Table 4:15 lists the protocol decoders available in ZP-Logic.

Built-in Protocol Decoders		
1-WIRE	I2S	Philips RC-6
1-WIRE (Advanced)	I3C	PMBus 1.1
3-WIRE	180	PROFI BUS
7-SEGMENT LED	IO-Link	PS/2
AC97	IDE	PSB Interface
AES_EBU	IRDA	PT2262/PT2272

AMD_SVI2	ISO7816 UART	QI
ARITHMETICAL LOGIC	JK FLIP-FLOP	Quad SPI
BDM	JTAG 2.0	RGB Interface
BMS	KEELOQ Code Hopping	S/PDIF
CAN 2.0B	KNX	S2Cwire/AS2Cwire
CAN FD	LCD1602	SAMSUNG K9 (NAND
		Flash)
CCIR601	LCD12864	SCCB
CCIR656	LED Pitch Array	SD2.0/SDIO
CMOS IMAGE	LG4572	SD3.0
Compact Flash 4.1	LIN 2.1	SDI03.0
DALI Interface	Line code	SDQ
DDC EDID	Low Pin Count	Serial GPIO IBPI
Differential Manchester	LPC-SERIRQ	Serial Wire Debug (SWD)
DIGITAL LOGIC	LPT	SHT11
DigRF	MANCHESTER	SIGNIA 6210
DM114/DM115	MCU-51 DECODE	SLE4442
DMX512	MDDI	SMBus 2.0
DP AUX Channel	MHL-CBUS	SoundWire
DS1302	MICROWIRE	SPI
DS18B20	MICROWIRE (EEPROM 93C)	SPI PLUS
DSA Interface	MIDI	SPI Compatible(Atmel
		Memory)
DSI Bus	MII	SSI Interface
FLEXRAY 2.1A	MILLER	ST7669
еММС	MIL-STD-1553	STBus
eSPI	MIPI DSI	SVID
FWH	MIPI RFFE	SWP
GPIB	MIPI_CSI-2	UART
HART	ModBus	UNI/O
HD Audio	MODIFIED MILLER	UPDOWNCOUNTER
HDLC	MODIFIED SPI	USB 1.1 plus
HDMI CEC	MVB	USB 2.0
HDQ	NEC PD6122	USB PD3.0

HID Over I2C	OPENTHERM 2.2	Wiegand
HPI	PCI	WTB
I2C	РСМ	WWV/WWVH/WWVB
I2C (EEPROM 24L)	PECI	YK-5
I2C	Philips RC-5	
(EEPROM24LCS61/24LCS62)		

Table 4:15 Built-in protocol decoders

# 4.17. Acquisition Setup

Acquisition/Trigger Setup choices such as channel assignment, Sampling mode and the Trigger Setup dialog box. This is also where users can adjust the voltage threshold for triggering and configure a DSO connection.

Add Signal       Delete Signal         A0       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4 <th></th>																																			
A0       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5																Г	A	dd S	igna	I			De	elete	Sigr	nal				Dele	ete A	All			
A0       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5	Port				Por	tA							Port	в		_				F	ort	c –						P	'ort I	)					
A1       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5	A0	0	1				5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
A2       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
A3       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
A4       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
A6       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
A7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
B0       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5	A6	0	1	2	3	4	5	6	7	0	1	2	3	4	5	б	7	0	1	2	3	4	5	б	7	0	1	2	3	4	5	6	7		
B1       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5	A7	0	1	2	3	4	5	6	7	0	1	2	3	4		6	7	0	1	2	3	4	5	6		0	1	2	3	4	5	6	7		
B2       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5	B0	0	1	2	3	4	5	6	7	0	1		3	4		6	7	0	1		3	4	5	6	7	0	1	2	3	4	5	6			
B3       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5	B1	0	1	2	3	4		6		0	1	2	3	4			7	0	1		3	4		6		0	1			4					
B4       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7         B6       0       1       2       3 <td>B2</td> <td>0</td> <td>1</td> <td></td> <td></td> <td>4</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> <td></td> <td>3</td> <td>4</td> <td></td> <td></td> <td></td> <td>0</td> <td>1</td> <td></td> <td></td> <td>4</td> <td></td> <td>6</td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td>	B2	0	1			4				0	1		3	4				0	1			4		6			1			4					
B5       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7         B6       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7         B6       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6       7         B6       0       1       2       3       4       5       6       7       0       1       2       3       4       5       6 <td< td=""><td>B3</td><td>-</td><td>1</td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td><td>1</td><td></td><td>_</td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td><td></td></td<>	B3	-	1			4					1		_						1								1			4					
B6 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7	B4	-	1			4				-	1			4	-			-	1								1			4					
	B5	-	1	_						-			_	4		6		_	1											4					
B7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7		-			-		-			-					_		· ·	-								-									
	B7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
Total 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	~	

### 4.17.1. Bus/Signal

### Figure 4-21 Bus/Signal Setup dialog box

Item	Description
Bus/Signal	One probe is connected to each of the channel ports of the LAP-C Pro
	and each probe samples one signal. By default, Port A0 (Probe0) is

	linked with channel A0 in the software etc. Channels can be renamed
	and rearranged: The left column shows the channel name in
	ZP-Logic and the purple coloring determines which of the
	ports/probes is linked to the channel.
Add Signal	Add a channel. The user must define which probe the new channel
	should be linked to; by default it's unassigned.
Delete Signal	Delete the selected channel.
Delete All	Delete all channels.

### Table 4:16 Bus/Signal Setup dialog box description

Acquisition/T	frigger setup		? ×	< l
Bus/Signal	Sampling Tri	igger		
Acc	quisiton Mode —			
	Timing (Intel	ernal)		
	O External Clo	ock CK 0 V		
	Rising Ed	ige O Falling Edge O Either Edge		
	Sample rate:	5MHz V Total: 13. 1072ms		
		(Min: 10KHz, Max: 2.0GHz)		
Sar	mple Depth			
	Sample depth:	64K V Compression		
Trig	gger Level			
	Port A	1.65 V		
	Port B	1.65 V		
	Port C			
	Port D	1.65 V		
	Schmitt Trig	jger		
Tot	al number of cha	DSO Connection		
		Apply Default Ok	Cancel	

### 4.17.2. Sampling

Figure 4-22 LAP-C Pro sampling Setup dialog box

Item	Description
Acquisition Mode	
State (External	In State mode (also called synchronous acquisition) the clock that
Clock)	governs when to sample data is provided by the DUT. State mode
	provides a view of how the system is executing. One sample is taken
	per clock cycle and the user must specify whether he wants to
	sample on rising or falling DUT clocks, or on either. The State mode

	sample rate goes from 0.001 Hz to 250 MHz.
Timing (Internal	In Timing mode (also called asynchronous acquisition) the input
Clock)	signals are sampled and stored at equal time intervals based on
	LAP-C Pro's internal clock. The Timing mode sample rate goes from
	5 MHz to 2 GHz.
Sample Rate	The sample rate or acquisition frequency determines how often
	samples are taken. Press CTRL + U to increase the sample rate and
	CTRL + D to decrease it.
Acquisition Choice	25
Sample Depth	Determine the amount of data to be acquired per channel; it is set to
	64 k by default.
Extended Mode	Set up folding or compression.
Trigger Level	See chapter 4.21.
Schmitt Trigger	Port C(V <sub>YH</sub> ) and Port A(V <sub>TL</sub> ) to transfer function, shown on Port A.
	Port $D(V_{YH})$ and Port $B(V_{TL})$ to transfer function, shown on Port B.
DSO Connection	Set up a DSO Connection; see chapter 4.37.

Table 4:17 LAP-C Pro sampling Setup dialog box description

### 4.17.2.1.Trigger Level

The Trigger Level defines when a signal changes state. In other words; if the voltage of a signal is inferior to the Trigger Level it will be regarded as 0 (Low), and vice versa. Similarly, when the signal voltage rises from below to above the Trigger Level, the LAP-C Pro will consider that a change of state from Low to High has occurred and that the new state is 1 (High). The Trigger Level is sometimes referred to as Trigger Voltage or Threshold Level.

The LAP-C Pro lets users use up to 4 different Trigger Levels at a time; one for each of the four port A, B, C and D. For each port, three pre-defined levels are available: 1.2/1.5/1.8 IO voltages. It is also possible to user-define the Trigger Level. See the dialog box in figure 4-24.

Trigger Level								
Port A			1				1.65	v
Port B				•			1.65	v
Port C	1	1					1.65	v
Port D	1	1	1	•	1	1 1	1.65	v



Item	Description
Trigger Level	
Port	The 4 ports can have individual trigger voltage levels. (Port A has
	ch. A0-A7 etc).
V	Adjust the duty cycle; voltages below the threshold are defined
	by the LAP-C Pro as Low or 0, and voltages above are defined as
	High or 1.

Table 4:18 Trigger Level dialog box description

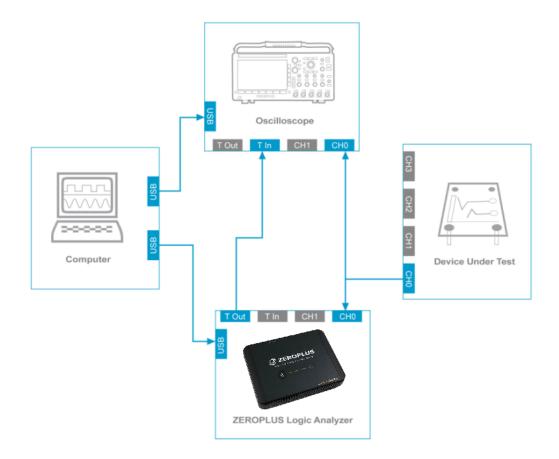
### ▶ 4.17.2.2.DSO Connection

A DSO Connection can be set up when users want to import and display a DSO signal in the ZP-Logic software. This can be useful since the logic analyzer does not have the ability to capture analog signals. The supported DSO models are listed in Table 4:20.

Two operation modes are possible; the connection can be set up with logic analyzer as master or slave depending on which instrument the user wants to provide the trigger signal. The two modes are described in continuation.

### Logic analyzer as Master

When the logic analyzer is the master the DSO is the slave. In this mode, the Trigger Out of the logic analyzer connects with the Trigger In of the DSO. When the trigger event occurs, the logic analyzer sends a trigger signal to the DSO which, upon receiving the signal, starts to capture data. See the complete connection diagram in Figure 4-24.

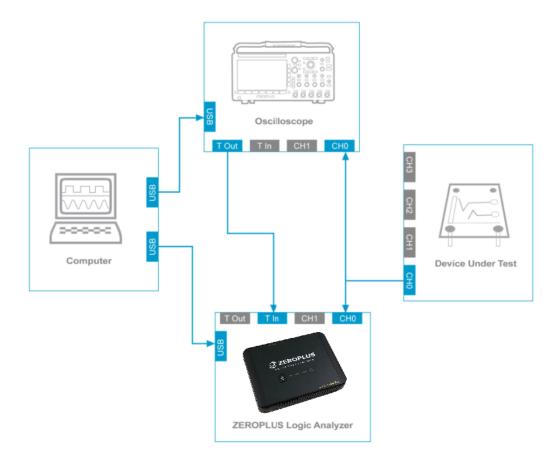


### Figure 4-24 Connection diagram with logic analyzer as master

### Logic analyzer as Slave

When the logic analyzer is the slave the DSO is the master. In this mode, the Trigger Out of the DSO connects with the Trigger In of the logic analyzer. When the trigger event occurs, the DSO sends a trigger signal to the logic analyzer which, upon receiving the signal, starts to store data. See the complete connection diagram in Figure 4-25.

Users can try to connect the DSO Trigger Out to any regular channel of the logic analyzer if the BNC connector is occupied by another instrument.



### Figure 4-25 Connection diagram with logic analyzer as slave

### Settings

Up to 4 analog signals can be shown; see the settings dialog box in Figure 4-26.



DSO Connection Settings	? ×
ResolutionsDSO_CH1:2V/DivVDSO_CH3:2V/DivVDSO_CH4:	
Options	
DSO_CH1 DSO_CH2 DSO_CH3	DSO_CH4
Heights	
DSO_CH1:         80         DSO_CH2:           DSO_CH3:         80         DSO_CH4:	80
Master	
Logic Analyzer     ODSO	
DSO Settings OK	Cancel Default

### Figure 4-26 DSO Connection dialog box

Item	Description
Resolutions	
DSO_Ch1-4	Adjust the vertical resolution of the input signals in Volts/Division
	ranging from 3V/Div to 2mV/Div in a total of 11 steps.
Options	
Show DSO signal	Choose which DSO signals to display in the waveform area and
only	their colors.
DSO_Ch1-4	
Heights	
DSO_Ch1-4	Set the trace height in pixels. 30-180 pixels can be chosen; the
	default is 80 px.
Master	
Logic Analyzer	The Logic analyzer is master and the DSO slave; see chapter
	4.17.2.2.; default option.
DSO	The Logic analyzer is master and the DSO slave; see chapter
	4.17.2.2.

DSO Settings Open the DSO Settings dialog box; the interface will depend on the DSO brand.

#### Table 4:19 DSO Connection dialog box description

### > Supported Oscilloscope Models

The supported DSO models are listed in Table 4:20.

Manufacturer	Model	Connection Mode
Tektronix	TDS1000 Series	USB
	TDS2000 Series	USB
	TDS3000 Series	USB, TCP/IP, GPIB
	TDS5000 Series	GPIB
	TDS6000 Series	Built-in GPIB
	DP07000 Series	USB, TCP/IP
OWON	SDS7102 Model	USB
PicoScope	3206B Series	USB
GwInstek	GDS-1000A Series	USB
	GDS-3000 Series	USB
Agilent	DSO5000 Series	USB
BK Precision	2540B, 2542B, 2540B-GEN,	USB
	2542B-GEN	
RIGOL	DS4034	USB

#### Table 4:20 Supported oscilloscope models

To use the logic analyzer with any of the DSOs listed above it is necessary to install software from the manufacturer; see Table 4:21 for details.

Brand	Driver	Website
Agilent	Windows USB Driver	www.chem.agilent.com
BK Precision	Windows USB Driver	http://www.bkprecision.com/
GwInstek	Windows USB Driver	www.gwinstek.com
Owon	Windows USB driver	www.owon.com.cn
PICO	Windows USB driver	www.picotech.com
Tektronix	Tekvisa Connectivity Software V3.3.4	www.tektronix.com
RIGOL	Windows USB Driver	http://www.rigol.com/

### Table 4:21 DSO driver needed for the DSO connection

### 4.17.3. Trigger

See chapter 4.18.

# 4.18. Trigger Setup(quick)

### 4.18.1. Trigger mode

Trigger mode has Waveform trigger and Pattern trigger.

### > Waveform trigger

In the UI of waveform trigger, clicking the button "Show the waveform area" and box choose waveform need to trigger, the Preview result as Figure 4-27.

Acquisition/Trigger setup ?	×
Bus/Signal Sampling Trigger	
• Trigger mode           • Drag-select the waveforms to set trigger conditions             • Edge trigger           • Trigger on channel edge rising             • Trigger on channel edge rising           • Show the waveform area             • Trigger on channel edge rising           • Trigger on channel edge rising             • Trigger on channel edge rising           • Preview             • Trigger on channel edge and patt           • Preview             • Trigger delay           • Trigger delay	
Pre-Fill Data       Trigger Count     1       Trigger Marks     1	
Default Ok C	Cancel

Figure 4-27 Waveform trigger dialog box

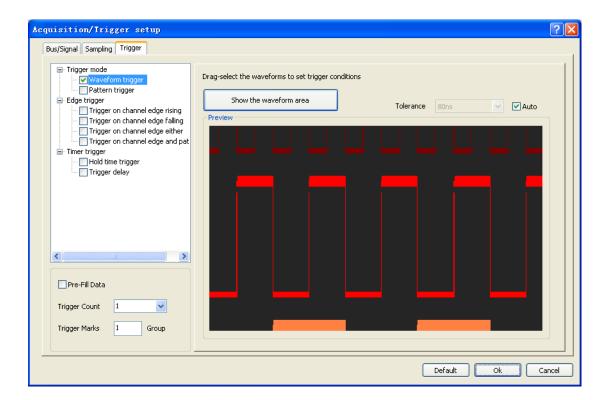
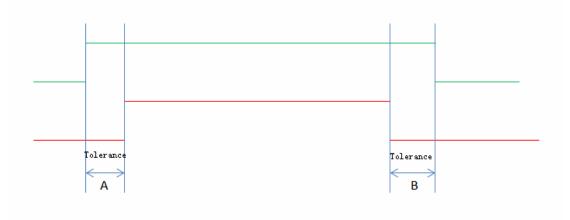
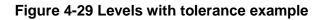


Figure 4-28 Waveform trigger preview dialog box

Select the triggered wave to trigger the wave in which high and low levels are in tolerance, the levels are shown:





### Pattern trigger

In the UI of Pattern trigger, there can set the condition of Interval, Width, Wait for Bus or Signal shown as Figure 4-33, Click "Go To" can start Trigger or Next Pattern shown as Figure 4-31.

Acquisition/Trigger setup	?	×
Bus/Signal Sampling Trigger		
Pre-fil Data   Trigger Count   Trigger Marks   Group     P1   Default   Ok	Can	

Figure 4-30 Pattern trigger dialog box

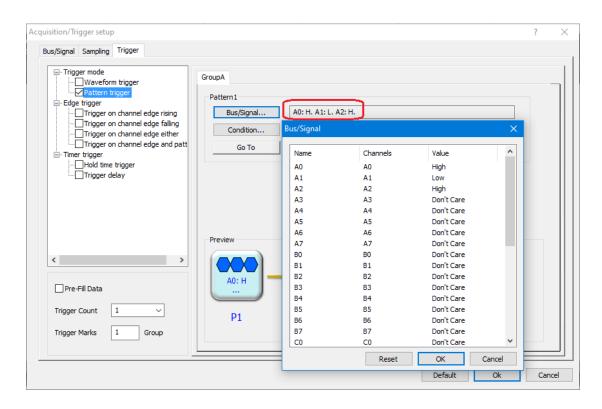


Figure 4-31 Bus/Signal dialog box

ndition	
Interval =       40ns       ~       40.96us         Interval =       40ns       ~       40.96us         Image: state stat	Action Wait
P1 Width	Default OK Cancel

Figure 4-32 Condition dialog box

### 4.18.2. Edge trigger

Edge trigger have Trigger on channel edge rising, Trigger on channel edge falling, Trigger on channel edge either, and Trigger on channel edge and pattern.



## > Trigger on channel edge rising

Acquisition/Trigger setup		?	×
Bus/Signal Sampling Trigger			
Waveform trigger	Trigger on channel edge rising		
Trigger on channel edge rising     Trigger on channel edge falling	Trigger channel A0 $\checkmark$		
Trigger on channel edge either     Trigger on channel edge and patt     Trigger     Tingger     Hold time trigger     Trigger delay	Note: Triggered by the signal rising		
	Example		
	T (Trigger)		
< >			
Trigger Count 1			
Trigger Marks 1 Group			
	Default Ok	Can	:el

## Figure 4-33 Trigger on channel edge rising dialog box

$\succ$	Trigger	on	channel	edge	falling
---------	---------	----	---------	------	---------

Acquisition/Trigger setup		?	×
Bus/Signal Sampling Trigger	Trigger on channel edge falling		
Waveform trigger Pattern trigger Edge trigger Trigger on channel edge rising	Trigger channel A0 V		
Trigger on channel edge falling     Trigger on channel edge either     Trigger on channel edge and patt     Timer trigger     Timer trigger     Timer trigger     Timger delay	Note: Triggered by the signal falling		
	Example T (Trigger)		
> >			
Trigger Count 1			
Trigger Marks 1 Group			
	Default Ok	Cance	1





## > Trigger on channel edge either

Acquisition/Trigger setup		?	×
Bus/Signal Sampling Trigger			1
Trigger mode     Waveform trigger     Pattern trigger     Trigger on channel edge rising     Trigger on channel edge and patt     Trigger on channel edge and patt     Trigger on channel edge and patt     Trigger delay      Pre-Fill Data	Trigger on channel either edge Trigger channel A0 Note: Triggered by any change of signal edge Example T (Trigger)		
Trigger Count 1			
Trigger Marks 1 Group			
	Default Ok	Cano	.el

## Figure 4-35 Trigger on channel edge either dialog box

> Trigger on channel edge and pattern

Acquisition/Trigger setup		? X
Bus/Signal Sampling Trigger		
Trigger mode  Trigger mode  Pattern trigger  Pattern trigger  Trigger on channel edge rising  Trigger on channel edge falling  Trigger on channel edge and patt  Trigger on channel edge and patt Trigger Tri	Trigger on channel edge and pattern         Sequence by       Rising Edge v       Channel set       A0 v         Target bus       NO BUS v       = 0x       0         Note: The data latch will be followed by the channel edge states	
< <p>Pre-Fill Data Trigger Count 1  Trigger Marks 1 Group</p>	Example Ch set Target Bus	
	Default Ok	Cancel

Figure 4-36 Trigger on channel edge and pattern dialog box

## 4.18.3. Timer trigger

Time trigger have Hold time trigger and Trigger delay.

## > Hold time trigger

Acquisition/Trigger setup		?	×
Bus/Signal Sampling Trigger			
Trigger mode     Waveform trigger     Pattern trigger     Constant of the trigger     Trigger on channel edge rising     Trigger on channel edge falling     Trigger on channel edge either     Trigger on channel edge and patt     Trigger on channel edge and patt     Trigger on channel edge and patt     Trigger delay	Hold time trigger Target bus / ch A0  = High Method >= 0  ns Note: Triggered by setting the "Bus Width" timer Example		
Pre-Fill Data       Trigger Count     1       Trigger Marks     1	T (Trigger)		
	Default Ok	Cano	cel

Figure 4-37 Hold time trigger dialog box



## > Trigger delay

Acquisition/Trigger setup		?	×
Bus/Signal Sampling Trigger			
Trigger mode     Waveform trigger     Pattern trigger     Fdge trigger     Trigger on channel edge rising     Trigger on channel edge falling     Trigger on channel edge either     Trigger on channel edge and patt     Timer trigger     Hold time trigger     Trigger delay	Trigger delay Target bus / ch A0		
< >>    Pre-Fill Data   Trigger Count   1   Trigger Marks   1	Example T (Trigger) Ox55 Delay Time		
	Default Ok	Can	cel

## Figure 4-38 Trigger delay dialog box

Item	Description
Trigger Mode	
Waveform trigger	Triggered by user drag wave form to setup.
Error Tolerance	Set the time of Tolerance, maximum is 800ns, and users can also
	check Auto to calculate automatically by the program default
	checked.
Pattern trigger	The bus/Signal setting data to trigger conditions.
Group A and Group	Group A: LAP – C Pro A0 – A7, B0 – B7, C0 – C7, D0-D7.
В	16 channels LAP-C Pro model all ports from channel C0 to D7 are
	disabled.
Bus/Signal	The bus set point to hexadecimal. Channel can choose five kinds of
	trigger mode: High Level (1), Low Level (0), Rising Edge
	(transition from low to high), Falling Edge (transition from high to
	low) and Either Edge (Rising or Falling Edge).
Condition	To set the Interval, width and trigger the Wait functions.
Interval	The scope of input interval value. Interval triggering can be
	activated when there are at least 2 levels.

width	Enter the width of the range value of the time. Pulse-width
	conditions can be set for High/Low trigger conditions.
Wait	Wait is used for multilevel triggering with High/Low conditions.
	Ex: You want to set up a Rising (R), Rising, High (H) trigger where
	the High event satisfies a certain pulse-width (PW). When an RRH
	event is found, the LAP-C Pro will check if the High satisfies the PW
	condition. If that is not the case, the LAP-C Pro will either keep
	looking for an H that satisfies the condition and trigger when it
	finds it (Wait is enabled), or it will restart the search and look for a
	new RRH pattern that satisfies the PW condition (Wait is disabled;
	default option).
Go To	Trigger or the next Setup.
Preview	According to the Trigger Level. Add or delete operation can be
	performed. There are 256 Trigger Levels. When the conditions of
	P1 are satisfied the LAP-C Pro looks for an event that satisfies the
	conditions of P2. When an event satisfying the last active trigger
	level is found the LAP-C Pro triggers.
Edge trigger	
Trigger on channel	Triggered by the signal rising.
edge rising	
Trigger on channel	Triggered by the signal falling.
edge falling	
Trigger on channel	Triggered by any change of signal edge.
edge either	
Trigger on channel	The data latch will be followed by the channel edge states.
edge and pattern	
Timer trigger	
Hold time trigger	Triggered by setting the "Bus Width" timer.
Trigger delay	Triggered at after the expiration of specified delay time period.
Pre-Fill Data	The Trigger Position combined with the Sample Depth determines
	how many bits of pre-trigger data should be stored. The Pre-Fill
	Data determines the ZP-Logic's behavior if the trigger event occurs
	before the pre-trigger data requirement has been fulfilled. If
	unchecked (default option) the LAP-C Pro will override the Trigger
	Position/Sample Depth requirement and start storing data when



	the trigger event occurs. If checked, triggering will be postponed
	until the pre-trigger data requirement has been fulfilled.
Trigger Count	Trigger on the Xth event that satisfies the trigger conditions; at the
	default value of 1 the LAP-C Pro will trigger on the first event.
Trigger Mark	Place a vertical bar on all samples that meet the trigger conditions.
	By default, only one trigger bar is shown (the T-bar), but there can
	be up to 256 trigger bars. These are numbered T0, T1, T2 etc.
	(Trigger Marks are sometimes referred to as Cursors or Auxiliary
	Cursors).

Table 4:22 Acquisition/Trigger Setup dialog box description

# 4.19. Trigger Setup(manual)

Trigger Setup (manual) offers settings as the following figure with multiple levels triggering, trigger wait, trigger delay and so on. logic analyzer would be triggered at first position meet conditions.

Port ABJC/D         PortA       7       6       5       4       3       2       1       0         PortB       7       6       5       4       3       2       1       0 <th>tup(manual)</th> <th></th> <th>?</th> <th>×</th>	tup(manual)												?	×
PortA       7       6       5       4       2       1         Trigger Condition       Image: Condition	Port A/B/C/D													
PortA       7       6       5       4       3       2       1       0         PortB       7       6       5       4       3       2       1       0         PortB       7       6       5       4       3       2       1       0         PortB       7       6       5       4       3       2       1       0         PortC       7       6       5       4       3       2       1       0         PortC       7       6       5       4       3       2       1       0         PortD       7       6       5       4       3       2       1       0         Trigger Condition       Image: Solution       Image:	Internal Trigger													
PortB       7       6       5       4       3       2       1       0         PortB       7       6       5       4       3       2       1       0         PortC       7       6       5       4       3       2       1       0         PortC       7       6       5       4       3       2       1       0         Trigger Condition       Image: Condition <t< td=""><td>PortA</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td></td><td></td><td></td><td><u> </u></td><td></td></t<>	PortA	7	6	5	4	3	2	1	0				<u> </u>	
PortB       7       6       5       4       3       2       1       0         Trigger Condition       Image: Conditi	Trigger Condition	$\square$				$\mathbf{X}$			- 22					
Ingget conduction       Image conduction       Image conduction       Image conduction         PortC       Trigger Condition       Image condition       Image condition       Image condition         PortD       To 5 4 3 2 1 0       Image condition       Image condition       Image condition         PortD       To 5 4 3 2 1 0       Image condition       Image condition       Image condition       Image condition         PortD       To 6 5 4 3 2 1 0       Image condition       Image condition       Image condition       Image condition         PortD       To 6 5 4 3 2 1 0       Image condition       Image condition       Image condition       Image condition         PortD       To 6 5 4 3 2 1 0       Image condition	PortB	7	6	5	4	3	2	1	0		🗖 Level 4			
PortC       7       6       5       4       3       2       1       0         Trigger Condition       7       6       5       4       3       2       1       0         PortD       7       6       5       4       3       2       1       0         Trigger Condition       7       6       5       4       3       2       1       0         Trigger Condition       7       6       5       4       3       2       1       0         Trigger Condition       7       6       5       4       3       2       1       0         Trigger Condition       7       6       5       4       3       2       1       0         Trigger Condition       1	Trigger Condition	$\square$				$\mathbf{X}$								
Ingger Condition       Image Condition         PortD       7       6       5       4       3       2       1       0         Trigger Condition       Image Condition <td>PortC</td> <td></td> <td>-</td> <td>5</td> <td>4</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	PortC		-	5	4	3								
PortD       Image: Condition         Trigger Condition       Image: Condition         Activate       Interval(Time)-Min         Mait       Enable         Year       Pulse-width-Min         Pulse-width-Min       Pulse-width-Max         Image: Previous Level       40ns         Previous Level       40ns         Image: Previous Level       Year	Trigger Condition													
Trigger Condition       Image: Condition         Image: Condition				5	4									
Activate       Interval(Time)-Min       Interval(Time)-Max         Wait       Enable       40ns       6000         Set As       Pulse-width-Min       Pulse-width-Max         Previous Level       Enable       40ns       227.68us         Default       Wait interval end point       Wait pulse-width end point       Interval the use inactive         Default All Levels       Trigger Count       1         Please set inconsecutive patterns at the beginning of the multi-level trigger.       Image: Count       1	Trigger Condition										🗖 Level 1	2		
Wait       Enable       40ns       40.96us         Set As       Pulse-width-Min       Pulse-width-Max         Default       Enable       327.68us         Wait interval end point       Wait pulse-width end point       Interval end point         Default       Wait interval end point       Wait pulse-width end point         Default       Default all Levels       Trigger Count         1       Prevenue	Activate		Interval(Ti	ime)-Min			Interva	l(Time)-Ma	ах					
Set As       Pulse-width-Min       Pulse-width-Max         Previous Level       Enable       40ns       Enable       327.68us         Default       Wait interval end point       Wait pulse-width end point       Previous Level       Previous Level         Default       Wait interval end point       Default       Trigger Count       1         Please set inconsecutive patterns at the beginning of the multi-level trigger.       Trigger Count       1			· · ·											
Default       Pre-Fill Data         Default       Wait interval end point         Wait interval end point       All levels inactive         Default All Levels       Trigger Count         Please set inconsecutive patterns at the beginning of the multi-level trigger.				th-Min									<b>~</b>	
Default All Levels     Trigger Count     1	Previous Level	Enable	40ns			✓ Enable	327.6	8us			Pre-Fill Data			
Please set inconsecutive patterns at the beginning of the multi-level trigger.	Default	Wait inte	rval end po	pint		🗸 Wait pu	lse-widt	n end poin	t		All levels ina	active		
Please set inconsecutive patterns at the beginning of the multi-level trigger.										-				
								Defau	ult All Level	s Tri	gger Count	1	~	
					the multi-	level trigge	er.			Tri	gger Marks	1	Group	
Cancel OK												Cancel		ОК

Figure 4-39 Trigger Setup(manual) dialog box

Item	Description
Port A/B/C/D	The 32 channels are sampled by ports A0-D7. For the 16 channel
	LAP-C Pro model all ports from channel C0 to D7 are disabled. For
	LAP-C Pro, A,B.C,D Port, each Port has 8 ports. For LAP-C Pro
	trigger conditions can only be set for 32 channels at a time.
Trigger Mode	
Internal Trigger	Fulfillment of a condition set makes the LAP-C Pro emit a trigger
	signal.
Trigger Condition	5 trigger conditions are available: High Level (1), Low Level (0),
	Rising Edge (transition from low to high), Falling Edge (transition
	from high to low) and Either Edge (Rising or Falling Edge).
Activate	Enable the trigger setup; this is done on a level-to-level basis
Wait	Wait is used for multilevel triggering with High/Low conditions.
	Ex: You want to set up a Rising (R), Rising, High (H) trigger where

	the High event satisfies a certain pulse-width (PW). When an RRH
	event is found, the LAP-C Pro will check if the High satisfies the PW
	condition. If that is not the case, the LAP-C Pro will either keep
	looking for an H that satisfies the condition and trigger when it
	finds it (Wait is enabled), or it will restart the search and look for a
	new RRH pattern that satisfies the PW condition (Wait is disabled;
	default option).
Set As Previous	Copy the trigger conditions from the previous level.
Level	
Default	Reset the level to default.
Pulse-widths and Int	tervals
Enable Interval	Interval triggering can be activated when there are at least 2
(Time)	levels.
Interval (Time) –	When Interval is enabled, for the condition set to be satisfied there
Min	needs to be a certain distance in time from trigger level X to
	trigger level X-1; the default min and max values are 180 and
	8,192 clocks.
Enable Pulse-width	Pulse-width conditions can be set for High/Low trigger conditions.
Pulse-width – Min	Set the length of periods – be it High or Low- as a trigger condition.
Wait Interval end	When an Interval condition is set and this option is enabled, the
point	LAP-C Pro will not trigger immediately (i.e. when the H/L event
	being looked for changes state) upon finding an event that satisfies
	the Interval condition, but wait until the Interval Max number of
	samples is reached and then trigger. The Interval Max is counted
	from the beginning of the H/L event in question.
Wait Pulse-width	When a pulse-width condition is set and this option is enabled, the
end point	LAP-C Pro will not trigger immediately (i.e. when the H/L event
	being looked for changes state) upon finding an event that satisfies
	the pulse-width condition, but wait until the Pulse-width Max
	number of samples is reached and then trigger. The Pulse-width
	Max is counted from the beginning of the H/L event in question.
Trigger Levels	
Trigger Level	There are 256 Trigger Levels. When the conditions of Level 1 are
	satisfied the LAP-C Pro looks for an event that satisfies the

conditions of Level 2. When an event satisfying the last active

	trigger level is found the LAP-C Pro triggers. Note that Level X	
	must be activated before Level X-1 can be activated.	
Pre-Fill Data	The Trigger Position combined with the Sample Depth determines	
	how many bits of pre-trigger data should be stored. The Pre-Fill	
	Data determines the ZP-Logic's behavior if the trigger event occurs	
	before the pre-trigger data requirement has been fulfilled. If	
	unchecked (default option) the LAP-C Pro will override the Trigger	
	Position/Sample Depth requirement and start storing data when	
	the trigger event occurs. If checked, triggering will be postponed	
	until the pre-trigger data requirement has been fulfilled.	
All Levels Inactive	Disable all trigger levels.	
Default All Levels	Set all trigger levels to default.	
Trigger Count	Trigger on the Xth event that satisfies the trigger conditions; at the	
	default value of 1 the LAP-C Pro will trigger on the first event.	
Trigger Mark	Place a vertical bar on all samples that meet the trigger conditions.	
	By default, only one trigger bar is shown (the T-bar), but there can	
	be up to 256 trigger bars. These are numbered T0, T1, T2 etc.	
	(Trigger Marks are sometimes referred to as Cursors or Auxiliary	
	Cursors).	
Navigation		
Back	Go to the Acquisition Setup dialog box.	
Next	Go to the Trigger Properties dialog box.	
Cancel	Leave the dialog box without saving the setting.	
ОК	Leave the dialog box and save the settings.	

Table 4:23 Trigger Setup(manual) dialog box description

# 4.20. Trigger Options

Adjust trigger properties such as Trigger Position and Trigger Delay.

Options	
er Properties	
🔾 Trigger Page	Trigger Delay
1 (Min: 1, Max: 65535)	Delay Time
Note: Trigger Page=memory length for each channel	Ons
Note: mgger Page=memory length for each channel	(Min:0ns , Max:21.474836475s)
rigger Position	
10%	Delay Samples
Note: When more than one trigger page are selected, the trigger bar	
will not be displayed.	(Min:0 , Max:4294967295)
rigger in	
Enable Rising	
end output signal upon triggering	
Enable When trigger condition is met	

## Figure 4-40 Trigger Options dialog box

Item	Description
Trigger	
Properties	
Trigger Page	Data Page; Each time acquisition as a page. Input trigger page by case.
Trigger Delay	Trigger a certain time or a certain amount of clock cycles after the
	trigger conditions have been met. The range goes from 0 ns to 687.19
	seconds; the default is zero.
Trigger Position	
	The trigger position determines which samples are stored. At the
	default 10%, 10% of the available memory is allocated to pre-trigger
	data and 90% to post-trigger data.
Send output signa	al upon triggering (Trigger Out)
	See chapter 2.3.2; Trigger Out can be sent on the occurrence of 3
	different events:
When trigger	Send the Trigger Out signal when the LAP-C Pro triggers.
condition is met	
When clicking	Send the Trigger Out signal when the user clicks Capture.

(	

Capture	
When clicking	Send the Trigger Out signal when the user clicks Stop.
Stop	
Continuously	Activate Long-time Record function; set the number of continuous
trigger out until	trigger times. User also can check Unlimited number of consecutive
	trigger output.
Trigger and	Activate Long-time Record function, set the value of that,
output pulse	0ns~1.431655765ms.
width	

Table 4:24 Trigger Options dialog box description

# 4.21. Trigger Level

See chapter 4.17.2.1.

# 4.22. Protocol Trigger

The Protocol Triggers are sophisticated hardware triggers specially designed for certain protocols. These triggers open a well of triggering opportunities; for the supported protocols it is possible to trigger on packets, read/write conditions, addresses etc. The triggers are hardware based, i.e. everything happens in the instrument. The logic analyzer comes with 6 protocol triggers:

- I2C
- I2S
- SPI
- SVID
- UART
- CAN2.0B

See the dialog box in figure 4-42 for an example of the dialog box for the I2C trigger.

Protocol Hardware Trigger	×
P1	
Address Address ACK Address ACK Data/Reg Address       Address     Read     Address ACK     Data/Reg Address       Image: Address ACK Address Image: Address	Stop V
Preview           Start         Address:0X1A         Read         ACK         Data:0X0         ACK         Stort	p
OK Cancel	Default

Figure 4-41 Protocol Trigger dialog box for I2C

Item	Description
Active	Activate the protocol trigger.
Conditions	Select the data pattern that is to be triggered on.
Preview	See a visual representation of the constructed condition set.

Table 4:25 Protocol Trigger dialog box for I2C description

# 4.23. Single Capture

Capture samples one time using the current Acquisition Settings and Trigger Conditions.

Hot Key: F5.

## 4.24. Repeated Capture

Repeated Capture is used to restart acquisition periodically until a Stop Condition is met. The Stop Condition can either be a function of number of triggers (trigger X



times then stop) or of time (trigger periodically for X seconds then stop); see figure 4-43.

#### Hot Key: CTRL + F5.

Repeated Capture Setting			×
Repeated Acquisition Set	ttings		
Acquisition Interval	1	second(s) $\lor$	
Stop Condition			
Trigger	10	time(s)	
◯ Trigger	1	minute(s) 🛛 🗸	
		0	ОК

Figure 4-42 Repeated Capture dialog box

Item	Description
Acquisition	Choose how often acquisition should restart. The available intervals
Interval	are: 1-2,592,000 seconds, 1-43,200 minutes, 1-720 hours or 1-30
	days; it is 1 second by default.
Stop Condition	
(Number of times)	Choose the number of times the acquisition should be restarted.
	LAP-C Pro will then restart acquisitions until the limit is reached.
	1-65,536 times is available; 10 times is the default option.
(Time)	Choose how long (in time) the acquisitions should be restarted.
	LAP-C Pro will then restart acquisitions until the limit is reached.
	The available time limits are: 1-2,592,000 seconds, 1-43,200
	minutes, 1-720 hours and 1-30 days.

#### Table 4:26 Repeated Capture dialog box description

# 4.25. Stop

Stop an ongoing acquisition. The user can chose between two different software behaviors when pressing Stop.



- Show the previous (complete) acquisition
- Show the newly acquired data

Switch between the two alternatives in the General Settings.

## 4.26. Autocapture

The Autocapture is similar to the Single Capture (chapter 4.23), but the optimal sample rate is auto detected by the software.

## Analysis

Press ALT + D to open this Main Menu item with the keyboard.

## 4.27. Menu Layout

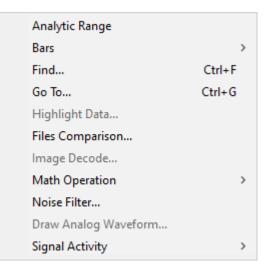


Figure 4-43 Analysis drop-down menu

## 4.28. Active Range

Adjust the analysis range by adjusting the position of the so-called Ds and Dp bars. The Ds-bar marks the beginning of the active range and the Dp-bar marks the end. The Active Range is used to reduce the size of acquisitions by hiding parts of the acquired data. This can be useful for navigation, reducing file sizes etc. These bars are locked whenever the user has not entered the Active Range.

**NOTE** Adjusting the Active Range will hide – not delete – data.

## 4.29. Bars

The ZP-Logic Waveform / State List areas come with 5 standard bars (these are sometimes referred to as Cursors). The bars delimit the analysis range and facilitate navigation and observation. The five standard bars are described in Table 4:27.

Bar	Description
Ds bar	Demarks the beginning of the buffer data area; use the Active Range function to
	adjust its position.
Dp bar	Demarks the end of the buffer data area; use the Active Range function to
	adjust its position.
T-bar	The T-bar marks the trigger event. Press T to center the waveform view on the
	T-bar.
A-bar	Default bar intended for navigation and measurement that the user can move
	freely. Press A to center the waveform view on the A-bar.
B-bar	Default bar intended for navigation and measurement that the user can move
	freely. Press B to center the waveform view on the B-bar.

#### Table 4:27 Description of the five standard bars

### 4.29.1. Add

Users can insert up to 250 additional bars. When adding a bar the user can select color and where it should be positioned (in time). The bars will automatically be named A0-A9, B0-B9 etc. User comments can be added to the bars after addition; see Figure 4-77.

Note that there is a second way to add bars: In pointer mode (see 4.44.1), move the cursor to the very left part of the waveform. The pointer will convert to a plus symbol and when left-clicking a bar will be added.

## 4.29.2. Reposition

Move a bar; the bar's new position will depend on how the user enters the reposition dialog box:

- If the user accesses the function from the Main Menu, the chosen bar will be placed at the center of the waveform area.
- If the user accesses the reposition dialog box by right-clicking in the waveform area, the chosen bar will be moved to where the user clicked.
- **NOTE** The T-bar cannot be moved and the Ds- and Dp-bars can only be moved using the Active Range function; see chapter 4.28.
- NOTE Users can also center the waveform on a bar by means of keyboard shortcuts. This is not the same as repositioning the bar. To center the display on the T-bar press T and correspondingly for the A- and B-bars. To focus on user defined bars use the number keys. To focus on for example the D1-bar, press 1 four time.

4.29.3. Delete

Any bar that is not a standard bar can be deleted.

## 4.30. Find

Post acquisition, Find is used to look up events that satisfy a set of user-defined conditions. There are Advanced Find and Easy Find. Find the data in the Find Results Windows. see Figure 4-45 or see chapter 4.57.

#### Hot Key: CTRL + F.

Press **CTRL** +  $\rightarrow$  to move to the next event that satisfies the Find conditions and **CTRL** +  $\leftarrow$  move to the previous event.



## > Easy Find

Find		×
Easy Find	Advanced Find Capture Find	
Find - Find Option	Results: 2048	
Find Channel	A0 ~	
Find Options	Rising Edge $\checkmark$	
Find Range	Ds v -> Dp v Mark Bar A v	
Stop Condition	None	

## Figure 4-44 Easy Find dialog box

Item	Description
Find	
Results	Count the number of events within the Find Range that meet the
	condition set.
Easy Find	
Find Channel	Choose the need to find the channel, bus or Protocol Decoder.
Find Options	Set corresponding bus/channel search conditions, channel choice:
	Rising Edge and Falling Edge or Either Edge Bus condition can
	choose "None", "=", ">", "<","Series", select "None" can facilitate
	statistics the packet number and find specific packets. Choosing
	"=", ">","<", edit box to the input value. When choosing condition
	"Series", users can input continuous data as the find condition.
Find Range	Set to find the range of data.
Mark Bar	Mark event that meets the Find condition set with a bar; the A-bar
	is the default bar.
Stop Condition	There are three options for stopping the lookup and the current
	recording when the stop condition is established.
	None.
	Stop searching and recording when finding out the specified data.
	Stop searching and recording after finding out the specified
	number data.

## Table 4:28 Easy Find dialog box description



## Advanced Find

Find					×
Easy Find	Advanced Find C	apture Find			
Find R	esults: 512				
Find Bus	BUS0	Channel	A0 $\sim$	Rising Edy $\sim$	
Find Range	Ds 🗸	-> Dp	✓ Mark Bar	Α ~	
Stop Condition	None		\ \	/	
N Packet	Packet No.	Condition	Data Type	Data	
1 Data	-	=	Hex	5	
		Add	Delete	Reset	

## Figure 4-45 Advanced Find dialog box

Item	Description
Find	
Results	Count the number of events within the Find Range that meet the
	condition set.
Advanced Find	
Find Channel	Choose the need to find bus or Protocol Decoder.
Find Range	Set to find the range of data.
Mark Bar	Mark event that meets the Find condition set with a bar; the A-bar
	is the default bar.
No.	Condition number. Set one or more conditions to find. Meet the
	conditions in order if two or more conditions.
Туре	Find type, select "Don't care" or "Packet". "Don't care" will ignore
	Packet name and other items. "Packet" follows setting items.
Packet Name	Select the packet name to find.
Packet No.	Input packet number in bus packets of each transmission when
	Packet Name is the packets of numerical type(e.g. Data). Default "-"
	with unspecified packet number. For example, Input 5 to packet
	No., that will find fifth Data packet in each signal.
Data Type	Data form to show with "Data". Hexadecimal or Binary.



Data

Input the value for numerical packets, "x" is for arbitrary value.





Figure 4-46 Advanced Find examples show

## 4.31. Go To

The Go To function is used to find and navigate to a bar or a Memory Page; see the dialog box in figure 4-47.

Hot Key: CTRL + G.

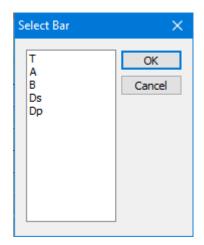


Figure 4-47 Go To dialog box

To go to a bar, select one from the drop-down menu. The waveform area will center on the selected bar. If there are several bars of type A (A0, A1, A2 etc) then click next to move from one bar to the next. The A-bar is the default choice. It is also possible to go to a page (read about ZP-Logic's pagination in Table 4:6). Input a page number and click Go To to move to the page. In Figure 4-48 the user has used the Go To dialog box to move to page 3 as indicated by the red frame on the page bar in the upper left corner.

	LAP-F(64CH 64M) (S/N:000000-0000) - [Doc1]	- 8 ×
File(F) Acquisition(A)	Analysis(D) Options(O) View(V) Help(H)	
« 🖹 👝 💾 📥	) 🖫 ★ 🍇 🎁 🚫 🕨 = 📜 💆 📝 🅓 🍓 🍓 🍓 🔍 🍳 🍭 🔍 🖍 (	📀 💫
Doc1 × +		⊳ - ₽ ×
P 1 2 3	KI (( )) )) 3	/4
Scale:20ns Total:671.08848ms	Display Position:394.2646ms AP06 67.04364ms ACC 67.04364ms A 0 Control Panel Display Range:394.2641ms 680c 67.04304ms 651 67.04304ms P 20	<del>▼</del> ₽ × om
Bus/Signal Trigger	20ns	<ul> <li>O</li> <li>O</li> </ul>
🕶 A0 A0 🛛 🕅	Sample 160ns 160ns 160ns 160ns 571.08864ms	e Depth 32M
🖝 A1 A1 🛛 🕅	320ns 320ns 320ns 320ns	
🛩 A2 A2 🛛 🕅	640ns 640ns	
× - A3 A3	1. 28 Go To	Internal) >>
🛹 A4 🛛 🕅	2. 56 Page(Memory Page) Bar Page number: 3 2. 56us	
🗢 A5 A5 🛛 🕅	Use plus and minus symbols to move away from the	
🛩 A6 A6 🛛 🕅	current location. "+4" will move four items forward and so on.	
🖝 A7 🛛 🕅	Go Close SMHz	۶ IGHz
🗸 A8 A8	50MHz	×
📕 A9 A9 🕅		Position
A10 A10 X		<b>••••</b>
A11 A11      A1     A12 A12		50 60 70 80 90 100
	251.658ms	
<ul> <li>A13 A13</li> <li>A14 A14</li> </ul>	251, 658ms 251, 658ms	
<b>A14</b> A14 <b>A14</b>	251. 658ms	
<ul> <li>III &gt; √⊙⊙</li> </ul>		
Navigator		
Navigator Packet List Statistics	Memory View Find Results	
		End

Figure 4-48 Go To example; the File bar shows that page 3 is shown

# 4.32. Highlight Data

Highlight Data colors data that satisfies a user-defined condition to make them stand out. See the dialog box in Figure 4-49. must be used after the add bus.

Highlight Data				?	×
Bus Name:	BUS0	$\sim$			
Data Condition:	Minimum:		Maximum:		
= ~	0		7		
Choose Color:					
	OK	Ca	ancel	Default	

### Figure 4-49 Highlight Data dialog box

Item	Description				
Bus Name	Select which bus the function should focus on.				
Condition	Select a condition among =, !=, In Range and Not In Range; = is the				
	default.				
Value / Minimum	Input the value that is to be met.				
Maximum	Input the maximum value (used for <i>Range/Not in range</i> only).				
Choose Color	Data that meet the condition are highlighted with the selected				
	color.				

Table 4:30 Highlight Data dialog box description

Figure 4-50 shows what how the Highlight Data function works. In the example, the conditions established in Figure 4-49 are used: The data belongs to BUS0 and are equal to zero. This are highlighted with an orange color. Had the function not been used, these data would have had the same white background color as the neighboring 0X1 data.

Bus/Signal	Trigger	<mark>.</mark> 	104.473	114.55	124. 	626 j	134.703	144.779	154.856		932	175.009	185.085	195.16
> BUSO	$\otimes$	0X1	0X0	0X2	0X0	0X3	0X0	0X4	0X0	0X5	0X0	0X6	0X0	0X7
🖝 AO AO	$\boxtimes$													_
<b>e</b> A1 A1	$\boxtimes$													
✓ A2 A2	$\boxtimes$													
🛩 A3 A3	$\boxtimes$													

Figure 4-50 Highlight Data example; packets with Data Min = 0 are orange

## 4.33. Files Comparison

Files Comparison examines how and where two files differ from each other. The number of differences between the two files is listed channel by channel in the dialog box, and new, curly traces in the waveform area evidence where the two signals differ; see an example in figure 4-52.

Figure 4-51 shows the Files Comparison dialog box and the result of a data comparison of two files in table format; the two files display a large number of differences.

Files Compar	ison						? 🗙
Contrast Type	omparison		OBus	; data			
Select Files			0.003	data		- Diselau Oetiese	
Reference File:	Doc1		~	BUSO		Display Options	
Reference File;	DOCI		×	6050	×	Show files horizontally	
Contrast File:	Doc2		*	BUSO	×	Synchronize navigation	
Start	Start End Error Tolerance					Highlight differences	
Ds	▼	Dp	*	None	*	Apply	
<< Hide Results Statistics	Select Ch	hannels		Execute		Previous	ext
Result				# of differ	·		^
A0 FA	IL			703			
A1 FA	[L			367			
A2 FA				170			
A3 FA				85			
A4 FA				43			
A5 PA:							
A6 PA:							
A8 PA							
A9 PA:							
A10 Fr				1			~

#### Figure 4-51 Files Comparison dialog box

Item	Description
Contrast Type	
Waveform	Contrast the difference of waveform in two files.
Bus Data	Contrast the difference of bus data in two files.
Select Files	
Reference File	Select a file. Note that only open files can be chosen. Only open files

	are available.
Contrast File	Select the file that is to be compared to the Reference File. When
	contrasting with None, the Reference File settings will be used to
	make an acquisition.
Settings	
Start	Select where to start the Files Comparison, using the reference file
	as base. You can also set it to ALL.
End	Select where to end the Files Comparison, using the reference file
	as base.
Error Tolerance	Define how many sample points that may differ between the two
	files before ZP-Logic regards the two files as unequal; 0-10
	samples can be chosen (the default is 0).
Display Options	
Show files	Display the two files horizontally; unchecked by default.
horizontally	
Synchronize	Synchronize panning across the two files. This option is unchecked
navigation	by default and only available if "Show files horizontally" is checked.
Highlight	Mark the different waveforms with red wavy lines, the default is
differences	not selected.
Apply	Make changes effective.
Hide/Unhide	Hide/Unhide the Results area.
Results	
Select Channels	Select the channels to be contrasted. At least one must be chosen;
	by default all are selected.
Execute	Perform the Files Comparison. Note that this function needs to
	pre-process a temporary file; see note in chapter 4.6.
Statistics	
Results	Display the status of channels contrast, PASS means the data in the
	channel is identical for the two files and FAIL means the data is
	different.
# of differences	The column shows the number of differences between the two files
	for each channel.
Navigation	
Previous	Go to the previous difference between the two files.
Next	Go to the next difference between the two files.

### Table 4:31 Files Comparison dialog box description

The reference file and the contrast file are displayed horizontally in the waveform area. New, orange, wavy traces ~~~~~ (one for each channel) in the lower window show where the two files differ. The orange waves marking the differences can be discerned in the lower waveform area in figure 4-53.



Figure 4-52 Files Comparison ex; differences marked in the lower window

# 4.34. Image Decode

The Image Decode function is specially designed for display type protocols such as CMOS Image, 7-SEGMENT LED, LCD12864, LCD1602 etc. Captured data that are decoded with one of the supported protocols are decoded and displayed as the original picture. This makes for a painless and straightforward verification of the data being correct or not. See figure 4-53 for an example of the function's output.



Figure 4-53 Image Decode for 7-Segment LED



The Image Decode function supports the following protocols:

- 7-Segment LED
- CCIR
- CMOS Image
- DM114/115
- DMX512
- LCD12864
- LCD1602
- LED Pitch Array
- LG4572
- CCIR601

Note that it's necessary to focus on the correct bus for the Image Decode function to be unlocked.

## 4.35. Math Operations

Create a new trace by performing a mathematical operation on two existing signals.

### 4.35.1. Arithmetic Operation

Using the Arithmetic operation function users can create a new signal through one the following arithmetic operations: Add, Subtract, Multiply or Divide.

Arithmetic Operat	ion		? ×
Channel	10	OBus	
Input 1:	A0 ~	Mathematical Operation:	Add 🗸
Input 2:	A1 ~	Output:	OUTPUT1
		OK Cancel	Default

ZP-Logic only accepts the creation of one arithmetic trace at a time.

Figure 4-54 Arithmetic operation dialog box

Item	Description
Channel/Bus	Choose to perform the operation on signals or buses (at least two buses
	must exist for this option to open).
Input 1	Select a signal.
Input 2	Select a signal to be joined with the first one using the arithmetic
	operator.
Operation	The available arithmetic operations are: Add, Subtract, Multiply and
	Divide.
Output Name	Input a name for the resulting trace.

#### Table 4:32 Arithmetic operation dialog box description

Figure 4-55 shows the resulting trace from an ADD operation on signals A0 and A1.

File(F) Acquisition(A)	Analysis(D) Options(O) View(V) Help(H)			
« 🖹 👝 💾 🚝	🛚 📇 🖈 🏶 👖 🖾 🕨 =	📜 📜 📅 🥓 👒	🐏 🤮 🧱 🔍 🔍	Q 🏷 🖉 📀 🛛 »
🔂 Doci 🗙 🕂				< < > < < >
				« « » » 1 /1
Scale:40ns Total:655.2us	Display Position:0ns (A Pos300ns Display Range:-1us ~ 1.06us (B Pos. 300ns	A - T 300ns B - T 300ns		Control Panel 🗸 🕈 X Zoom
Bus/Signal Trigger		ins Ons 200ns 400	Ins 600ns 800ns 1us	40ns 🕑 🔍 🔍
× 🗸 OUTPUT1		0 ( 1 ( 1 ) 2	() ()	Sample Depth 32K 655.2us
🖛 AO AO 🛛 🔀	160ns 160ns 160ns 160ns 160ns 1	60ns 160ns 160ns 160ns	160ns 160ns 160ns 160ns	
🖝 A1 A1 🛛 🕅	320ns 320ns 320ns	320ns 320ns	320ns 320ns	
🛩 A2 A2 🛛	640ns Arithmetic Operation		? 🛛	Timing (Internal)
🗸 A3 A3 🛛 🕅	⊙ Channel	0.5		www.hubding
<ul> <li>A4 A4</li> <li>A5 A5</li> </ul>		Bus		
<ul> <li>AS AS</li> <li>A6 A6</li> </ul>	Input 1: A0	Mathematical Operation:	Add	
<b>A</b> A A A A A A A A A A A A A A A A A A	Input 2: A1	V Output:	OUTPUT1	SMHz 1GHz
• A2 A2		OK Cancel	Default	Trigger Position
		OK Cancer	Deradit	*
🖝 A10 A10 🛛		655. 3	2us	1 10 20 30 40 50 60 70 80 90 100
🛩 A11 A11 🛛 🛛		655.2	Zus	
A12 A12		655. 3	Zus	
A13 A13 X		655.2		
		655.3		
Navigator			- n	×
Navigator Packet List Statistics	Memory View   Find Results			
				End

### Figure 4-55 Arithmetic operation example; ADD A0 and A1

## 4.35.2. Boolean Operation

With the Boolean operation, users can create a new signal using one of the Boolean operators; see Figure 4-56.



Note that an Arithmetic operation can also be performed on buses, granted that at least two buses have been created. However, ZP-Logic only accepts the creation of one Boolean trace at a time.

Boolean Ope	ration			? ×
Input 1:	A0	~	Boolean Operation:	AND ~
Input 2:	A1	~	Output:	OUTPUT1
		OK	Cancel	Default

Figure 4-56 Boolean Operation dialog box

Item	Description
Input 1	Select a signal.
Input 2	Select as second signal to be XX to the first one.
Boolean	The available Boolean operators are: AND, OR, NAND, NOR, XOR, XNOR
Operator	and NOT. NOT takes only one argument and inverts it.
Output Name	Input a name for the resulting trace.

#### Table 4:33 Boolean Operation dialog box description

Figure 4-57 shows a trace created from signals A0 and A1 using the Boolean operator AND.

File(F) Acquisition(A) Analysis(D) Opposite Control op	ptions(O) View(V) Help(H)		
« 🖹 👝 💾 🏯 😫 🛧 🕯	🎄 🝴 🕸 🕨 = 🗍	🛃 🕅 🎺 🧐 🔁	🖪 Q Q Q 🏷 🎢 📀 👘 🔅
Doci × +			< - 2 ×
			ke ≪ >> >> 1 /1
Scale:40ns Display Position:0 Total:655.2us Display Range:-1		▲ - T 300ns A ✓ 0 ● - T 300ns P	Control Panel - 4 ×
Bus/Signal Trigger	-600ns -400ns -200ns 0	ns 200ns 400ns 600ns	800ns 1us 40ns 🔽 🔍 🔍
× _>_OUTPUT1 8 160ns		0ns 160ns 480ns	160ns 32K 655.2us
		Ons 160ns 160ns 160ns 160ns	
	20ns 320ns 320ns	320ns 320ns	320ns
🗸 A2 🛛 640ns	640r	640	Dns
<b>A3</b> A3	1.28us	? 🛛 🗠	Timing (Internal) →
🛩 A4 A4 🛛 🔯	Input 1: A0 🗸	Boolean Operation: AND 🗸	
🗸 AS 🛛 🕅			
🖛 A6 🛛 🕅	Input 2: A1	Output: OUTPUT 1	
🖛 A7 🛛 🔀 🖌			5MHz 1GHz 50MHz V
- A8 A8		K Cancel Default	Trigger Position
- A9 A9		000.245	*
<b>A10</b> A10		655. 2us	1 10 20 30 40 50 60 70 80 90 100
- A11 A11		655. 2us	
✓ A12 A12 X		655. 2us	
C A13 A13		655. 2us	
		655. 2us	,
Navigator			• I X
3			
Navigator Packet List   Statistics   Memory View   Fin	d D		
Navigator Packet List Statistics Memory View Find			End

Figure 4-57 Boolean waveform example: A0 AND A1

# 4.36. Noise Filter

The Noise Filter is used to filter out short-lasting pulses or dips in signals that the user considers to be noise; see the dialog box in Figure 4-58.

After activating the Noise Filter, users select one or more channels to be filtered and move them to the right column using the right-pointing arrows. To select two or more channels at the same time, use the CTRL and SHIFT keys.

Once a channel is in the right column, the user can choose just how short pulses/dips in the signal of that channel have to be to be filtered out. Lengths are measured in sample points or time.

Noise Filter Setup				? ×
Activate				
Setting				
A3	^		A0: 20ns	
- A4			A1: 20ns	
A5 A6				
A0			A2: 20ns	
B0				
-B1		>>		
B2				
B3				
B4				
B5				
B6		<<		
B7				
C0				
C1				
C2				
-C3				
	~			
		OK	Canad	Default
		OK	Cancel	Default

Figure 4-58 Noise Filter dialog box

# 4.37. Draw Analog Waveform

The Draw Analog Waveform function is used to plot traces based on the value of bus data. It is especially useful for data that can be conveniently displayed visually, such as an ADC output represented by a sine wave. The function is available for simple buses (no packets); see the setup dialog box in Figure 4-59.

Analog Waveform	?	×
Activate		
Mode setting		
Single Analog Display		
O Mixed Analog Display		
Signed setting		
● Sawtooth ○ PCM		
OK Cancel	Defa	ault

### Figure 4-59 Draw Analog Waveform dialog box

Item	Description						
Mode Setting							
Single Analog Display	Draw the analog waveform on a dedicated channel; default						
	option.						
Mixed Analog Display	Show the drawing on top of the traces its based on.						
Signed Setting							
Unsigned	Binary data are read as unsigned; default option.						
Signed	Binary data are read as signed.						

## Table 4:34 Draw Analog Waveform dialog box description

Figure 4-60 shows a simple example output based on four signals changing state on regular intervals (signals A0 in dark red to A4 in green are used in the example).

> File(F) Acc	quisition(A)	Analysis(	(D) Or	otions(O)				000000-0	000) - [Doc	1]						_		- 1	8×
< 📄 🚞	🗄 🖶			🍋 🕴	\$		= j	1	1	e 🐏	1	10	<u>8181</u> C	, e		, <b>*</b> C	Ç*	0	>:
Doc1 X	+																-	$\triangleleft \triangleright$	-8>
P 1															He -	≪ ≫	₩ 1		/1
cale:40ns otal:655.2us		Display P Display R		ns Js ~ 1.06u	A Po 5 B Po	s -300ns s 300ns	1		A - T 300r B - T 300r			A 🛩 P		2		Control		Zoom	<b>•</b> 0
Bus/Signal	Trigger	2	-800ns	-600ns	-40	0ns A	-200ns	T Ons	200ns	3 40	Ons	600ns	800ns		1us 🗧 🕈	40	ıs	<b>~</b>	o, o,
BUS0		0X3	0X4	( 0X5 )	0X6	017	0X8	( 0X9	X0 XA	OXB	OXC	X OXD	X OXE	OXF	Ξχ	32		nple Depti	h 655.2
. AO AO															=				
A1 A1																			
🔍 A2 A2								_		_						×	Timin	g (Interna	-0 - N
🗕 <b>A3</b> A3												_			_			ululu,	II) PI
<b>e ao</b> ao		160ns	160ns	160ns	160ns	160ns	160ns	160ns	160ns	160ns	160ns	160n:	s 160ns	: 160	ns		1		
🖝 A1 A1		320ns	32	0ns	32	0ns	32	Ons	320	ns	3:	20ns	3	20ns				$\times$ )	
🗲 A2 A2		640ns		640	ns			64	l0ns			6	40ns				SMHz		SHz
🛹 A3 A3		L		1.28us						1.2	8us						50MHz	10	
🚩 A4 A4								2. 56u	5						L.		Trigg	er Positio	n
C AS AS										655.					_		<b>1</b>		
🧲 A6 A6										655.							10 20 30	40 50 60 70	80 90 1
✓ A7 A7										655.					_				
<b>A8</b> A8										655.									
A9 A9 A10 A10										655. 655.					-				
	► <mark>^©</mark> _©	•								655.	208								
vigator															ч <b>х</b>			*	
																	1	9 00/	20
																	$\mathbf{\nabla}$	and the	
avigator Packet Li	ist Statistics	Memory Vi	iew Einc	1 Results															
racket L	st - statistics			- Results															End

Figure 4-60 Draw Analog Waveform example

# 4.38. Signal Activity

Signal Activity offers the user real-time views of what the probes are seeing. Two modes are available; Real-time Frequencies and Signal Status. By means of these functions the LAP-C Pro monitors signal frequencies and states, thus assuming the function of a frequency counter and that of a logic pen.

### 4.38.1. Real-time Frequencies

Real-time frequencies of all channels as measured by the probes are shown; see Figure 4-61. The frequencies are updated twice per second.

🔿 Di	splay maximum frequer	ncy 💿 Di	isplay r	eal time frequency						Det	ection frequenc	y: 50	00MHz ∨
AO	18.498MHz A1	24.391KHz	A2	11.904KHz A3	2.181MHz	A4	24.637KHz A	5	18.419MHz	A6	20.01KHz	A7	19.948KHz
B0	13.987KHz B1	12.231KHz	B2	24.289KHz B3	2.734KHz	B4	27.761MHz B	5	18.605MHz	B6	29.412KHz	B7	15.37MHz
C0	2.505KHz C1	1.237KHz	C2	32.472KHz C3	29.887KHz	C4	30.832KHz C	5	25.904KHz	C6	7.236KHz	C7	13.203KHz
D0	3.665MHz D1	22.517KHz	D2	23.571KHz D3	18.894MHz	D4	10.232KHz D	5	10.014MHz	D6	10.517KHz	D7	20.924KHz

Figure 4-61 Real-time frequencies window

**NOTE** Other operations cannot be performed when the Real-time Frequencies window is open. Also, at least two periods must be captured for the function to work.

### 4.38.2. Signal Statuses

The Signal Statuses window shows another view of the probe activity; traffic lights indicate if channel signals are High (green light), Low (red) or transitioning (yellow); see Figure 4-62.

ignal S	Statuse	s														?	>
											Dete	ction fr	equency	:	500MH	lz V	
	A0	A1	A2	A3	A4	A5	A6	A7	BO	B1	B2	B3	B4	B5	B6	B7	
	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	•	٠	٠	٠	•	
	C0	C1	C2	C3	C4	C5	C6	C7	D0	D1	D2	D3	D4	D5	D6	D7	
	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	•	٠	٠	٠	•	
												•					
							Low	Level	High	Level	Т	ansitior	ning			Close	

Figure 4-62 Signal Statuses window



## Mode

Press ALT + M to open this Main Menu item with the keyboard.

# 4.39. Menu Layout

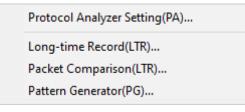


Figure 4-63 Options drop-down menu

## 4.40. Protocol Analyzer Setting

This optional function is available for the LAP-C Pro.

The Protocol Analyzer Setting (PA) function lets the user stream data directly to the computer over USB3.0, thus allowing much longer acquisitions than during normal operations when the samples are stored in the LAP-C Pro's internal memory. The PA function is perfect for, as an example, burn-in tests. The maximum length of the acquisition depends on the acquisition rate, the number of channel sampled, and the available memory. Post acquisition, the user can search for patterns in the acquired data.

A relatively powerful PC is required to run the PA function flawlessly. See Table 4:38 for the recommended PC setup.



Protocol Analyzer Setting(PA	) ? ×
📝 Enable	
Protocol:	I2C
Sample rate:	25MHz ▼ Ext Clock
Record Length:	0 ▼ h 24 ▼ m 51 ▼ s
Store on:	D:\
Maximum record length	: 00:49:46
Space free:	37.08 GB
Space required:	18.44 GB
Average transfer rate:	USB 3.0
Average write speed:	70.78 MB/s
	Trigger Level OK Cancel

### Figure 4-64 Protocol Analyzer dialog box

Item	Description
Protocol	Choose I2C, SPI, UART.
Sample rate	How often samples are acquired.
Record Length	How long the Logic analyzer should acquire data.
Store on	Location of stored samples.
Repeated Record	Acquire repeatedly data until press cancel.
Maximum record length	It is calculated by the number of channel, sampling
	frequency and disk space.
Space free	Show the remaining space to record for selected disk.
Space required	Estimate the disk space required for the recording.
Average transfer rate	Connected with Logic analyzer and enable LTR, check
	the USB transfer rate automatically.
Average write speed	Enable LTR and change the recorded disk, check the
	speed of writing disk.

## Table 4:35 Protocol Analyzer dialog box

Control Par	nel	<b>•</b> 1
Goto		
Number	1	
	Next Prov	ious
Search		
Condition	Address	•
Value		
	Next Prov	ious
Filter		
Condition	Address	-
Value		
	Apply Cle	ar
Start		
Start	Capture Setti	ng

Figure 4-65 Protocol Analyzer Control Panel

Description
Jump to the packet row of the set value.
Calculate the number equal to the condition value.
Only display packets with the same condition value.
Start recording.
Protocol decoding settings.

Table 4:36 Protocol Analyzer Control Panel description

# 4.41. Long-time Record

This optional function is available for the LAP-C Pro.

The Long-time Record (LTR) function lets the user stream data directly to the computer over USB3.0, thus allowing much longer acquisitions than during normal operations when the samples are stored in the LAP-C Pro's internal memory. The LTR function is perfect for, as an example, burn-in tests. The maximum length of the acquisition depends on the acquisition rate, the number of channel sampled, and



the available memory. Post acquisition, the user can search for patterns in the acquired data.

A relatively powerful PC is required to run the LTR function flawlessly. See Table 4:38 for the recommended PC setup.

Long-time Record	2 ×
📝 Enable	
Number of channels:	4
Sample rate:	25MHz ▼ Ext Clock
Record Length:	0 ▼ h 24 ▼ m 51 ▼ s
Store on:	D:\ Repeated Record
Maximum record length	: 00:49:46
Space free:	37.08 GB
Space required:	18.44 GB
Average transfer rate:	USB 3.0
Average write speed:	74.06 MB/s
	Trigger Level OK Cancel

### Figure 4-66 Long-time Record dialog box

Item	Description
Number of channels	Signals to be acquired.
Sample rate	How often samples are acquired.
Record Length	How long the Logic analyzer should acquire data.
Store on	Location of stored samples.
Repeated Record	Acquire repeatedly data until press cancel.
Maximum record length	It is calculated by the number of channel, sampling
	frequency and disk space.
Space free	Show the remaining space to record for selected disk.
Space required	Estimate the disk space required for the recording.
Average transfer rate	Connected with Logic analyzer and enable LTR, check

the USB transfer rate automatically.

Enable LTR and change the recorded disk, check the

Average write speed

speed of writing disk.

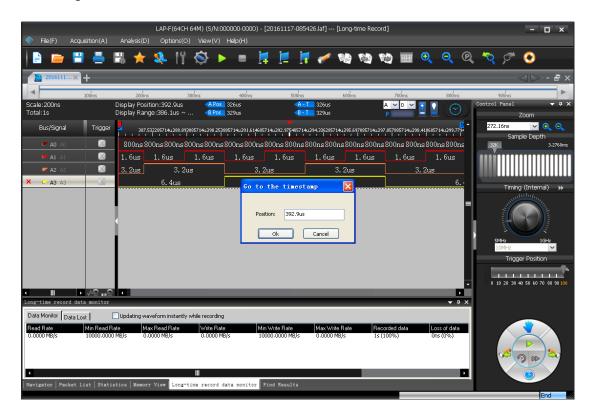
#### Table 4:37 Long-time Record dialog box

Item	Description
Motherboard	MSI H97M-E35
СРИ	Intel i5-4460 3.2g
RAM	Kingston KVR16N11/8
HDD	Toshiba DT01ACA100 * 1, Toshiba DT01ACA200 * 4
DVD	ASUS DRW-24D3ST
Power	Cooltek 400 YM-ATX400

#### Table 4:38 Standard PC requirments for the LTR function

NOTE While running the LTR function it is recommended that the PC is not used for anything else.

Enable LTR, software add the button "Go to the timestamp", click the button in the red box as followed figure, and bring up the setting dialog can input the timestamp need to go to.



#### Figure 4-67 LTR Go to the timestamp dialog box

### 4.42. Pattern Generator

The signal generator generates digital signals through 4 channels. Support mainstream bus and GPIO such as I2C, SPI, UART, CAN, etc. Need to import the provided Excel file.

PG Control	×
Repeat     Image: Repeat Count   1	Start
🔘 Repeat All	Stop
Pattern Voltage 3.3V  (1.5V ~ 5.0V)	Open Pattern File
Pattern File Path > C:\ZP\PC-Based Instrument_2010\ZEROPLUS\	ZP-Logic\Standard\PG F

Figure 4-68 Pattern Generator dialog box

Item	Description
Repeat Count	Set generation times.
Repeat All	Continuously repeated.
Pattern Voltage	There are 8 levels of voltage to choose from. 1.5, 1.8, 2.1, 2.5, 2.8, 3.0,
	3.3, 5V.
Open Pattern File	Open PG dedicated Excel file.
Pattern File Path	Example file path link.

#### Table 4:39 Pattern Generator dialog box description



### View

Press ALT + V to open this Main Menu item with the keyboard.

# 4.43. Menu Layout

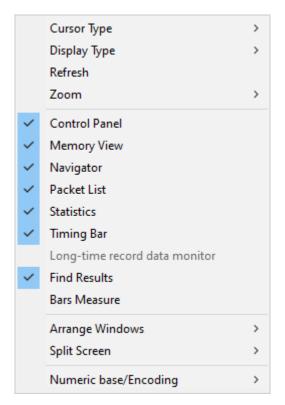


Figure 4-69 View drop-down menu

### 4.44. Cursor Type

The user can choose between two cursor types. Note that for both types, left/right movement in the waveform is achieved with the mouse wheel.

**Hot Key: SPACE** (the cursor mode changes temporarily when the user presses and holds the SPACE bar).

#### 4.44.1. Pointer

In Pointer mode, the left mouse button is used for zooming; click and drag squares with the pointer to zoom in.



- To zoom in; form squares by dragging downwards/leftwards. The area covered by the square will be amplified to occupy the entire waveform area. In other words, form small squares to zoom in quickly.
- Zooming out is achieved by doing the opposite of zooming in; drag squares upwards/rightwards. The larger the square, the faster the zoom-out.
- To move a bar, left click on the bar name and drag sideways.

#### 4.44.2. Hand

In Hand mode, the left mouse button is used for panning; click and hold the left mouse button to move left and write in the waveform area.

To move a bar, left click on the bar name and drag sideways.

# 4.45. Display Type

The menus that appear when right-clicking in the interface are found in these subchapters.

#### 4.45.1. Waveform

In Waveform view, the state of each channel is shown as a trace that changes between high and low depending on the state of the signal. This is the default view mode.

	LAP-F(64CH 64M) (S/N:000000-0000) - [Doc1]	- 8 ×
File(F) Acquisi	on(A) Analysis(D) Options(O) View(V) Help(H)	
<< 📄 🚞 🗄	· 📇 🐘 🛧 🎎 🎁 🚱 🕨 🔳 📜 📜 💆 🛷 🍓 🎕 🎕 🖼 🔍 🍳 🍳 🍫 🤉	<sup>ره</sup> 📀 🚽 »
🚡 Doci 🗙 🕂		<- <- <->
	K( (( )> )))	1 /1
Scale:40ns Total:655.2us	Display Position: 0ns AP02 -300ns Art 0 P I Control Pane Display Range:-1us ~ 1.06us 48P05 300ns 48-7 300ns P I I I I I I I I I I I I I I I I I I	el 🚽 🚽 I
Bus/Signal	rigger 🕘 -spons -spons -spons -spons -spons Dis 200ns 😫 spons spons tus 🔭 👘	
× F A0 A0	🛛   160ns 1	Sample Depth 655.2u
	📓 320ns 320ns 320ns 320ns 320ns 320ns 320ns 📲 📊	
✓ A2 A2	8 640ns 640ns 640ns	
🛩 A3 A3	1. 28us 1. 28us	iming (Internal) 🕨
🗲 A4 A4	2. <mark>5</mark> 6us	iming (Internal) >>
A5 A5	🛛 655. 2us	
🛩 A6 A6	S 655. 2us	
<b>e a7</b> A7	🛛 655. 2us	
✓ A8 A8	SMH2 655. 2us	
🖝 A9 A9	655. 2us	Trigger Position
<b>~ A10</b> A10	🛛 655. 2us 😭	
A11 A11	055. 2us 1 19 20	0 30 40 50 60 70 80 90 10
A12 A12	🔟 655. 2us	
C A13 A13	🚳 655. 2us	
	655. 2us	
A15 A15	655. 2us	
< III → • Navigator		
		5 💿 😰 🏷
Navigator Packet List	atistics   Memory View   Find Results	
Hangator Packet List		End

Figure 4-70 Waveform view

Figure 4-71 is shown when the user right-clicks in the trace area in Waveform View.

Trace Format	
Add Bar	
Go To	
Place	>
Trace Type	>
Packet Names	>
Find Pulse-width	

Figure 4-71 Waveform area; right-click menu

Item	Description
Trace Format	Change the appearance of traces, bus outlines and analog waveforms
	by altering their color and width. In Figure 4-78, trace A1 (in red) has
	been given triple weight.
	Notice that when right-clicking in the waveform a dotted horizontal
	line appear and a channel is highlighted in the channel column. This
	points to which trace will be modified.

Add Bar	Add a bar; see chapter 4.29.1.
Go To	Go to the memory page or bar.
Reposition	
A-bar	Reposition the A-bar to the cursor location. Hot Key: SHIFT + A.
B-bar	Reposition the B-bar to the cursor location. Hot Key: SHIFT + B.
Ds-bar	Reposition the Ds-bar to the cursor location (available when Active
	Range is enabled).
Dp-bar	Reposition the Dp-bar to the cursor location (available when Active
	Range is enabled).
More Bars	Reposition other bars to the cursor location, including new added bars.
Trace Type	
Square	Display traces with vertical edges; this is the default option.
Sawtooth	Display traces with gradually ascending/descending edges.
Packet Name	Display abbreviated (initials) or full packet name.
Find	Find the pulse-width of a signal.
Pulse-width	

#### Table 4:40 Waveform area; right-click menu description

Select Find Pulse-width in the right-click menu, show as figure 4-72.

Find Pulse-widt	h	×
Find	Results: 0	
- Find Option	ns	
Find Channel	A0 ~	
Find Options	In range V Pulse-width: 20ns -> 1.3107ms	
Find Range	Ds $\checkmark$ -> Dp $\checkmark$ Mark Bar A $\checkmark$	

#### Figure 4-72 Find Pulse-width dialog box

Item	Description
Find	After setting needed condition, click the button to start searching.
Results	Show the number of data that meet the searched condition. The results
	will be listed in the Find Results window.
Find Options	

Find Channel Select one channel to find pulse width. Bus cannot be selected.

Find Options	Set the condition for searching, there are "In range", "Min value", ">",	
	"=", "<".	
Pulse-width	Input the value or range for width.	
Find Range	Select the search range.	
Mark Bar	Marked with the bar in the position where pulse width is found.	

Table 4:41 Find Pulse-width dialog box description

Figure 4-73 is shown when the user right-clicks in the Channel Column in Waveform View.

Add Channel	
Add Bus	
Add Protocol Decoder	Ctrl+B
Сору	Ctrl+C
Paste	Ctrl+V
Delete	
Rename	F2
Bus/Protocol Decoder Property	
Numeric base/Encoding	>
Image Decode	
Draw Analog Waveform	
Invert signal(s)	
Restore Channels to Default	

Figure 4-73 Channel/Bus column; right-click menu

Item	Description
Add Element	
Add Channel	Add a channel; see chapter 4.14.
Add Bus	Add a bus; see chapter 4.15.
Add Protocol Decoder	Add a protocol decoder; see chapter 4.16.
Clipboard / Format	
Сору	Copy the selected channel or bus. Left-click with the mouse
	can be combined with pressing and holding SHIFT to select
	several channels or with CTRL to select a range of channels.

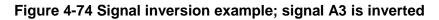
	Hot Key: CTRL + C.
Paste	Paste the copied channel(s) or bus(es). Hot Key: CTRL + V.
Delete	Delete the selected channel(s) or bus(es). Hot Key: DELETE.
Rename	Rename the selected channel or bus. This option is not
	available when multiple channels or buses are selected. Hot
	Key: F2.
Functions	
Bus/Protocol Decoder	Access the bus or protocol decoder properties; see chapter
Properties	4.15 and 4.16. This item is only available when right-clicking
	on a bus and which menu is opened depends on whether a
	protocol decoder is assigned or not to the bus.
Numeric Base /	Change the data format; see chapter 4.58.
Encoding	
Image Decode	Display the data as an image; see chapter 4.34.
Draw Analog Waveform	Draw an analog waveform to indicate the change of state; see
	chapter 4.37.
Invert	For traces, display high levels as low and vice versa. Inverted
	traces are drawn with dotted lines and a horizontal, blue bar
	is shown above the channel name. All channels can be
	inverted independently. See Figure 4-74.
Restore Channels to	Restore all Bus/Channels settings to default.
Default	

#### Table 4:42 Channel column; right-click menu description

**NOTE** Move the cursor to the bottom line of channel, the cursor will turn into an icon showing a two-sided arrow cut horizontally by a bar. Click and hold the left key and drag to adjust the height of trace.

Figure 4-74 shows an inverted signal. Note that the trace has become dotted and that a blue bar appears above the channel name (A3).

✓ A2 A2	$\boxtimes$	
× - A3 A3	$\sim$	
✓ A4 A4	$\boxtimes$	



When right-clicking in the trigger column, the menu from Figure 4-75 is shown. The menu is used to set the channel's trigger condition as an alternative to clicking through the trigger box for the right condition.



#### Figure 4-75 Trigger colum; right-click on channel menu

Item	Description
Don't Care	No trigger condition.
High	Trigger on a high level, i.e. the state of the signal is 1.
Low	Trigger on a low level, i.e. the state of the signal is 0.
Rising Edge	Trigger on a change of state of the signal from 0 to 1 (low to high).
Falling Edge	Trigger on a change of state of the signal from 1 to 0 (high to low).
Either Edge	Trigger on a change of state of the signal; either from $0$ to $1$ (low to
	high) or from 1 to 0 (high to low).
Default	Reset the trigger conditions of all channels.

#### Table 4:43 Trigger column; right-click on channel menu description

Figure 4-76 shows the trigger dialog box that is shown when right-clicking on a bus in the Trigger Column.

Bus/Signal	Triaaer	-588.15	-437.35	-286.55 -13	6.75 15.05	165.85 316.65 4
> BUS0	$\square$		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			I TERATI ATTA
C AO AO						
🖝 A1 A1 <mark>Click</mark>	here				ռույնու	
🗲 A2 A2	$\square$			Bus Trigger		
🛩 A3 A3	$\boxtimes$	64 64 64	64 64 64 6			
A4 A4	$\boxtimes$	<u>128</u> 128	128			
C A5 A5	$\boxtimes$		<u> </u>	Bus Name	Operator	Value
A6 A6	$\boxtimes$			BUS0	▼ =	F
<b>e</b> A7 A7	$\boxtimes$			- Data Format	• • • • • • • • • • • • • • • • • • •	
<b>C A8</b> A8	$\square$			Binary	Decimal	Decimal(Signed)
<b>e a9</b> A9				Hexade	cimal   ASCII	Gray Code
<b>~ A10</b> A10				Ŭ	-	Gray Code
A11 A11				Complen	nent	
A12 A12	$\square$					
A13 A13	$\boxtimes$					
A14 A14	$\boxtimes$				OK Cancel	Default Help

Figure 4-76 Trigger column; right-click on bus menu

Item	Description
Bus Name	Select one bus to trigger.
Operator	Select "=" or "Don't Care".
Value	Input one value when the operator selects "=". The value range
	depends on the bus.
Data Format	Binary, Decimal, Decimal (Signed), Hexadecimal, ASCIIC, Gray
	Code, Complement.

#### Table 4:44 Bus Trigger dialog box description

When right-clicking on a bar, the menu from Figure 4-77 is shown.

```
Set as Trigger Condition
Delete Bar
Delete All Added Bars
Edit Bar Name...
```

#### Figure 4-77 Bar; right-click menu

Item	Description
Set As Trigger	Set the trigger condition of each channel to equal the state (or
Condition	edge) of the channel where the selected bar is located.
Delete Bar	Delete the selected bar.
Delete All Added	Delete all added bars.
Bars	



Edit Bar Comments For user-added bars: Add a comment after the bar name. Ex: Add START to bar A2 to display the name as A2 (START). Comments can be maximum 10 characters long.

#### Table 4:45 Bar; right-click menu description

- **NOTE** The T-bar has no right–click menu.
- **NOTE** The A-bar, B-bar, Ds-bar and Dp-bar cannot hold comments or be deleted.

	LAP-F(64CH 64M) (S/N:000000-0000) - [Doc1]	- 8 ×
File(F) Acquisition(	(A) Analysis(D) Options(O) View(V) Help(H)	
‹‹ 🖹 📁 💾	플 🖫 ★ 🕸 🎁 🚫 🕨 = 🎁 💆 🎁 🛷 👒 👒 📟 역 역 역	<b>? 🖉 📀</b> »
Doc1 × +		- 8 ×
	ж. «. »	)) I /1
Scale:25MHz Total:655.2us	Display Position:0ns <u>APos</u> -000ns <u>A-T</u> 3.333MHz <u>A 0 0 0</u> 0 Contro Display Range:-1us ~ 1.06us <u>68Pos</u> 300ns <u>8-T</u> 3.333MHz P	ol Panel → ♯ × Zoom
Bus/Signal Trig	99er 📕 -800ns -600ns -400ns -200ns 0ns 200ns 400ns 600ns 800ns 10s	ns 🔽 🔍 🔍
🖝 A0 A0		Sample Depth 655.2us
× 🖝 A1 A1	X 1.563MHz 1.563MHz 1.563MHz	
🖝 A2 A2	781.25KHz	
🕶 A3 A3 🛛		Timing (Internal)
🛹 A4 🛛 🚺		Timing (Internal)
C A5 A5		
🕶 A6 A6 🛛 🚺		
🖝 A8 🗛 🚺		5MHz 1GHz 50MHz
		Trigger Position
		×
		. <u>10</u> 20 30 40 50 60 70 80 90 100
Navigator	• # X	
Navigator Packet List Stati	istics   Memory View   Find Results	End

Figure 4-78 Example of trace formatting (ch. A1 has 3pt thickness)

#### 4.45.2. State List

State List is a numeric view of the samples. As an alternative to the waveform traces, the State List shows all samples as digits. If the logic state of a signal is low then "0" is shown and if it is high then "1" is shown. Unknown states are shown as "U". Each column shows the samples of one channel and the leftmost column shows the sampling time. The State List view is shown in Figure 4-79.



Figure 4-79 State List view

Note that there are three main presentations of the samples in the State List. One option is to show all samples. Alternatively, the user can select to display only those samples that include at least one change of state or in data. Table 4:46 shows an example of how this works: Samples #1, #2 and #3 are shown if the user views all samples. If the user chooses to show changes in state only then Sample #2 will be hidden, as all channel states are identical to those of sample #1. The purpose of showing samples with changes in state only is to facilitate observation by reducing the quantity of displayed data. Likewise, the user can choose to only show samples where there has been a change in the data; see an example of this in Figure 4-81.

Timesta	amp	ch. A1	ch. A2	ch. A3	ch. A4
0 ns	(sample #1)	1	1	1	1
5 ns	(sample #2)	1	1	1	1
10 ns	(sample #3)	1	0	1	1

Table 4:46 State List example; chan	ige of channel state
-------------------------------------	----------------------

These presentation modes can be selected from by right-clicking in the State List number area; see Figure 4-80.

Add Bar	
Place	>
Data Display	>

#### Figure 4-80 State List view; right-click menu in the number area

Item	Description	
Add Bar	Add a new bar to mark a sample in the list. The bar is added to the	
	line where the cursor is placed. Contrary to the waveform bars,	
	bars in the State List are horizontal since each line represents a	
	time stamp.	
Reposition		
A-bar and B-bar	Reposition the A- or B-bar to the cursor position.	
Ds- and Dp-bar	Reposition the Ds- or Dp-bar to the cursor position. This option is	
	only available if "Active Range" has been activated.	
More Bars	Reposition another bar to the cursor position.	
Data Display		
All Data	All samples are shown; this is the default display mode.	
Show changes in state	Hide samples with timestamp X if no signal has changed state	
only	from timestamp X-1 to timestamp X.	
Show changes in data	Hide samples with timestamp X if no data has changed from	
only	timestamp X-1 to timestamp X (for buses only); see Figure 4-81.	

#### Table 4:47 State List view; right-click menu in the number area

Figure 4-81 shows an example of the "Show changes in data only" function; had the function not been active there would have been tens of thousands of lines (one per sample) instead of twenty-something.

Scale:5MHz Total:26.2128ms	Displ Displ				617m	าร		A Pos B Pos		.9682r .9622r					A - T B - T		.078H .632H				A	~	) ~	2	2		
Time	BUSO	AO F	A1	A2 	A3 	A4 🖝	A5 	A6 	<u>A7</u>	A8 	A9 -	A10	A11 ~	A12	A13	A14	A15	B0 	B1	B2 	B3 	B4 🖝	B5 	B6	B7	B8	B9 🗖
📭 -2.6202ms ~ -9.2us		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
-9us 357.4us 367.6us 362.8us 500.2us 5990.s 500.2us 5990.s 500.2us 5998.4us 670.us 680.8us 680.8us 682.8us 866.8us 782.2us 788.4us 783.2us 873.2us 788.2us 873.2us 965.6us 971.8us 10564as 1.0564as 1.1554as 1.1554as 1.232as 1.2442ms 1.2342as 1.2342ms 1.3344ms 1.3342ms 1.334as 1.5666ms 1.5666ms 1.5666ms 1.5666ms 1.5666ms 1.5666ms	Unknown Start Address:0 Write Data:0X85 D-ACK Data:0X85 D-ACK Data:0X06 D-ACK Data:0X07 D-ACK Data:0X07 D-ACK D-ACK D-ACK D-ACK D-ACK S Cop Unknown S Start S Address:0																										
1.0400ms 1.0044ms	s write	0	1	Q	Q	Q	Q	Q	Ŏ	Q	Q		<u>0</u>	Ö	<u>ŏ</u>	1	1	Q	Q	Q	Q	Q	Q	Q	0	Ö	0
1.6646ms ~ 1.6732ms 1.6734ms ~ 1.7572ms 1.7574ms ~ 1.7632ms 1.7634ms ~ 1.8472ms 1.8474ms ~ 1.8532ms	s A-ACK Data:0X51 D-ACK	0 0 0	1 1 1 1 1	000000000000000000000000000000000000000	0 0 0 0	000000000000000000000000000000000000000		000000000000000000000000000000000000000	000000000000000000000000000000000000000					000000000000000000000000000000000000000	0 0 0 0	1 1 1 1 1	1 1 1 1 1	0 0 0 0	0 0 0 0			0 0 0 0	000000000000000000000000000000000000000	0 0 0 0	0 0 0 0	000000000000000000000000000000000000000	
< ►	4				111																						

Figure 4-81 Show changes in data only example (I2C)

In State List view, the menu from Figure 4-82 is shown when right-clicking in the channel row above the number area.



Item	Description
Add Protocol Decoder	Add a protocol decoder; see chapter 4.16.
Protocol Decoder	Set the protocol decoder properties; see chapter 4.16. This
Properties	menu item is only available when clicking on a bus.
Format Row	Change the channel order or resize the column widths.

Figure 4-82 Channel/Bus (State List view); right-click menu

Table 4:48 Channel/Bus (State List view); right-click menu description

### 4.46. Refresh

After the "Active Range" is activated, users can click it to refresh the selected data.

### 4.47. Zoom

Zooming can also be achieved using the mouse while holding CTRL; see chapter 4.44. Note also that all zoom functions are unavailable in the State List view.

4.47.1. In

Zoom in the waveform.

Hot Key: Z.

4.47.2. Out

Zoom out the waveform.

Hot Key: SHIFT + Z.

4.47.3. Fit to Screen

Show all data between Ds and Dp in the waveform view area.

Hot Key: CTRL + ALT + P.

4.47.4. Previous

Cancel the last zoom. In other words; go back to the previous zoom level.

Hot Key: CTRL + Z.

4.47.5. Cancel Previous

Undo the previous zoom command.

Hot Key: CTRL + Y.

### 4.48. Control Panel

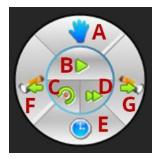
The Control Panel provides direct access to important acquisition and triggering settings and thereby helps to speed up the user's interaction with ZP-Logic. An example could be when the user wishes to redo a capture with a higher sample rate. The Control Panel is located in the rightmost part of the window estate.



See Figure 3-2 for the Control Panel right-click menu.

Item	Description
Zoom	Adjust the waveform zoom level; see chapter 4.47.
Memory depth	Select the memory depth per channel; see Table 4:16.
Sampling Mode	Adjust the sample rate by selecting a value from the pull down menu,
	inputting a value by hand or by dragging the pointer of knob. Click the
	grey, double arrows to switch between external and internal acquisition
	mode; see Table 4:16 for explanations of these.
Trigger	The trigger position determines which samples are stored. At 10%, $10\%$
Position	of the available memory is allocated to pre-trigger data and 90% to
	post-trigger data.
Action Wheel	See Figure 4-83 and Table 4:50.

#### Table 4:49 Control Panel description



#### Figure 4-83 Action Wheel

#	Item	Description
А	Cursor type	Switch between cursor types Hand and Pointer; see chapter
		4.44.
В	Single Capture	Capture once; see chapter 4.23.
С	Autocapture	LAP-C Pro selects the optimal sample rate and samples; see
		chapter 4.26.
D	Repeated Capture	Capture on regular intervals; see chapter 4.24.
Е	Trace information	Show information inside the traces (between two edges); see
		the available information types in Table 4:11. Note that there
		needs to be sufficient space between the edges for information
		to be shown. See Figure 4-84 as an example of times being
		displayed.

F	Previous	Center the display around the previous event that satisfies the
		Condition Set of the Find function.
G	Next	Center the display on the next event that satisfies the Condition
		Set of the Find function.

 Table 4:50 Action Wheel description

Bus/Signal	Trigger	-2.380965us -2.326615us -3	2.272264us -2.217914us -2.163563us	-2.109213us -2.054863us -2.000512us	-1.946162us -1.891
🖝 AO AO	$\boxtimes$		480ns	160ns	
× 🖝 A1 A1		160ns	160ns	160ns	=
✓ A2 A2	$\boxtimes$			1.44us	
🛩 A3 A3	$\boxtimes$			2. 72us	
🚩 A4 A4	$\boxtimes$	160ns	160ns	160ns	
C A5 A5				1.31ms	

Figure 4-84 Time between two edges is displayed inside the traces

### 4.49. Memory View

Memory View lets users see what the memory looks like after the signals have been transmitted. By decomposing the packets into basic elements, the relationship between data and addresses in a protocol is clarified. The Memory View window is located in the Secondary Display Area.

Concretely, the Memory View window consist of tables that show which data have been read from- and written to which address in the memory. Write data are written in blue; Read in blue; see an example of read data in Figure 3-1.

Two view modes can be accessed by right-clicking: Compact (default) and Full. The Compact Mode saves space as the information is presented in a matrix form; addresses are found by adding the column number/letter to the end of the row name, and the data located at that address is read directly from the intersection of the row/column.

	mpatible(Atmel	and a second	1.1.1.1													
Address	Write dat	a Kea	ad data	3	4	5	6	7	8	9	A	В	C	D	E	F
0X0000		-	-	-			, , , , , , , , , , , , , , , , , , ,		-				-			
						1	Unus	ed:0X0010~	0X7FFF							
0X8000	46	70	48	30	58	50	FA	F9	F8	F7	F6	F5	F4	F3	F2	F1
0X8010	FO	EF	EE	ED	EC	EB	EA	E9	E8	E7	E6	E5	E4	E3	E2	E1
0X8020	EO	DF	DE	DD	DC	DB	DA	D9	D8	D7	D6	D5	D4	D3	D2	D1
0X8030	DO	CF	CE	CD	CC	CB	CA	C9	C8	C7	C6	C5	C4	C3	C2	C1
0X8040	C0	BF	BE	BD	BC	BB	BA	B9	88	B7	B6	B5	B4	B3	B2	B1
0X8050	BO	AF	AE	AD	AC	AB	AA	A9	A8	A7	A6	A5	A4	A3	A2	A1
							Unus	ed:0X8060~	OXFFFF							

Figure 4-85 Memory View window showing an SPI protocol

Item	Description
	Navigation buttons: Move between packets. The packet in focus will be
	in the middle of the waveform view area and marked by the reaction
	bar (A-bar by default). The packet data will be displayed in the Memory
	View window.
×	Options; See Table 4:52 Memory View options dialog box description
ی ک	Import/Export/Merge: Users can import, export or merge .txt and .csv
	file for display in the Memory View or another software.
5	Refresh.
Ŭ	Reset: Delete the data in the Memory View window.
<b>\$</b>	Write Operation: The last written data will be shown in the cells as red
	text on white background. If there is incongruence between read and
	written data to the same address then errors will be shown on yellow
	background.
۲	Read Operation: The last read data will be shown in the cells as blue
	text on white background. If there is incongruence between read and
	written data to the same address then errors will be shown on yellow
	background.
Packet	Show the number of the packet where the reaction bar is located.
*	Find: Input an address to look it up and highlight it with a blue frame.

 Table 4:51 Memory view description



Opt	tion				×
	Packet to be Examine	d			
	Packet Location (s	elect bar): A		~	
	Display				
	Columns p	er line: 16		~	
	Color				
	Address	•••	Data <mark>(</mark> Read)		
	Data (Write)		Error	····	
		OK	Cancel	Default	]

#### Figure 4-86 Memory View options dialog box

Item	Description
Packet	The Memory View will analyze the packet that is located under the
Location	selected bar; the A-bar is selected by default. Note that the Ds, Dp and
	T-bars cannot be chosen.
Columns per	Choose how many cells to display per line. 4-100 is the permitted range;
line	16 is default.
Color	Change the color settings.

#### Table 4:52 Memory View options dialog box description

### 4.50. Navigator

The Navigator is a condensed form of the main waveform that is always zoomed to fit the entire capture of the pages in focus. It facilitates waveform navigation by providing an overview of the entire acquisition and a tool for quick movement between distant parts of the acquisition. The Navigator is synchronized with the main waveform so users can shift the waveform focus from one part of the acquisition to another simply by clicking in the Navigator.



A light blue frame (in the left part of Figure 4-87) in the Navigator indicates which part of the waveform that is in focus; this frame naturally changes size when zooming as it is inverse proportional to the zoom rate. Four signals are shown at a time; scroll up or down to focus on other channels.

The Navigator is show by default under the waveform area in the Secondary Display area; see Figure 4-87.

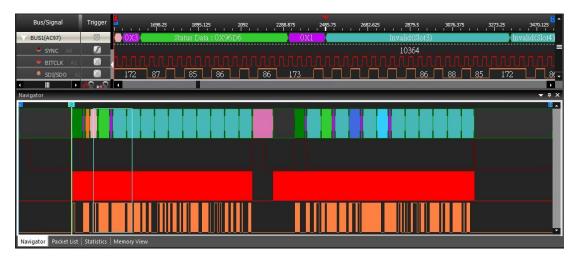


Figure 4-87 Navigator window example showing the AC97 protocol

### 4.51. Packet List

The Packet List shows all the acquired packets in their decomposed form. By presenting the packets in list form, the Packet List facilitates observation and analysis of all packets and their relation. Only packets under a protocol decoder can be displayed. The Packet List is located in the Secondary Display area; see Figure 4-88.

If packet in the Packet List is double-clicked, the waveform display focuses shifts focus to the location of that packet. On the contrary, double-click the waveform of a packet, the packet list also jumped to the location of the packet, and with the red box prompts, its packet guild grey light show. Mobile waveform window, the packet list will also synchronously mobile display packet, on the other hand, the mobile packet in the packet list, waveform window will not be shown synchronously move.



S 🚖 [	💷 🗰 🙀 🙀		RD PRO	RSR WSR SE B	E RID		
imeStamp	Name	RDSR	WPDI	Reserve	BP	WEN	Ready
Øns	BUS0(SPI Compatible(Atmel Memory))	0X 05	WPDI	Reserve	OX O	WEN	Ready
imeStamp	Name	Read	Reserv	ve Addres	is16	▶ Dat	a
4.94us	BUS0(SPI Compatible(Atmel Memory))	0X 03	Reser	ve 0X800	10	260BY	TES
imeStamp	Name	RDSR	WPDI	Reserve	BP	WEN	Ready
689.7us	BUS0(SPI Compatible(Atmel Memory))	0X 05	WPDI	Reserve	0X 0	WEN	Ready
imeStamp	Name	RDID	Manuf	acturer ID	Dev	vice I	D
94.68us	BUSØ(SPI Compatible(Atmel Memory))	0X15		0X1F		0X66	
imeStamp	Name	RDSR	WPDI	Reserve	BP	WEN	Ready
02.32us	BUS0(SPI Compatible(Atmel Memory))	0X 05	WPDI	Reserve	0X 0	WEN	Ready

Item	Description							
Menu Bar								
×	Settings; Open the Packet List Settings dialog box; see Figure 4-90.							
5	Refresh the content.							
<u>ی</u>	Export: Export the packet list; see chapter 4.7.1.							
≣↓	Find a particular packet and display at the top of the Packet List.							
	The data is highlighted with a red frame when found; see Figure							
	4-89.							
*	This also can search string. Input a string to find and it would be							
	displayed the first packet of String at the top. For strings.							
<b>a a</b>	Go to the previous or next packet that satisfies the Find condition.							
Display Area								
TimeStamp	The start time ranks the packets by ZP-Logic.							
Name	The packet name.							
Data	The data in the packet.							
Length	The length between the start point and the end point.							

#### Figure 4-88 Packet List window example showing an SPI protocol

Table 4:53 Packet List Items description

🐵 File(F) Acau	isition(A) Anal	vsis(D)		LAP-F(640 )) View(			000-0000)	) - [2016	0912-085	5638.laf]								- (	x c
		🗙 🐒	II	-			1		<b>e</b>	1	1	۲		्र	<b>)</b> (0)	<u>`````````````````````````````````````</u>	Ç*	0	
🤰 2016091 🗙	+																_		- 8 ×
															K	<b>↔ &gt;</b>	H 1		/1
Scale:25MHz Total:655.2us		y Position: y Range:-:			Pos -300 Pos 300n			A - T B - T	3.333Mi 3.333Mi			A 🖌 0 P	<u> </u>			Contro1	Panel	Zoom	<b>▼</b> ₽ >
Bus/Signal	Trigger	-20.385542	2857u:-20.14	7942857uz-19	.910342857	ur-19.67274	2857u:-19.43	5142857u:-	19.1975428	57u:-18.95	9942857uz	18.72234285	7u:-18.48	4742857u:	-18.24	47.5	52ns	<u> </u>	), O,
> BUS0				(3 \ 0X				V oxo	V 0X1	0X2	V 0X3	V OXO	0X1	V 0X2		32		ple Depth	655.2us
<b>~ AO</b> AO																			
<b>~ A1</b> A1					563MHz			1.56	53MHz			1.56	SWHz		_				
✓ A2 A2										25KHz						1			
- A3 A3								1			390	625KHz						g (Interna	) *
A4 A4								1					1	195.31	3KHz				
A5 A5																	Terrar and the second s	$(\mathbf{x})$	
🚩 A6 A6																	3		
✓ A7 A7															•		MH2 50MHz	1G	~
	<mark>∿</mark> ©© ∢														•		Trigg	er Position	
Packet List															<b>→</b> 廿 ×				%
🗶 💲 🕭 📃	📃 🗐 🙀															1		40 50 60 70	
TimeStamp -38.62us	Name BUSØ(Bus)	Data 0X0	Data ØX1	Data 0X2	Data ØX3	Data 0X0	Data ØX1	Data ØX2	Data 0X3		igth 28us	-			<b>A</b>				
TimeStamp	Name	Data	Data	Data	Data	Data	Data	Data	Data		ngth								
-37.34us	BUS0(Bus)	OX O	ØX1	ØX2	ØX3	OX O	ØX1	ØX2	0X3		28us					_			
TimeStamp	Name	Data	Data	Data	Data	Data	Data	Data	Data	Lei	ngth	Í							
-36.06us	BUSØ(Bus)	0X 0	ØX1	0X2	0X3	0X 0	0X1	ØX2	0X3	1.2	28us	]				_			<u> </u>
TimeStamp	Name	Data	Data	Data	Data	Data	Data	Data	Data	_	ngth								
-34.78us	BUS0(Bus)	0X 0	ØX1	0X2	ØX3	0X 0	ØX1	ØX2	0X3		28us	ļ					8	🤊 🗤 /	-20
TimeStamp	Name	Data	Data	Data	Data	Data	Data	Data	Data		ngth								
-33.5us	BUS0(Bus)	0X 0	0X1	0X2	0X3	0X 0	0X1	0X2	0X3	1.2	28us	1						<b>√</b> Hz	
Navigator Packet L	ist Statistics	Memory Vi	ew Find	Results															
													_	_	_	_	_	Er	nd

Figure 4-89 Packet List / Found item highlighted

Packet List Settings		×
Bus Selection	Packet Information	
BUS0(Bus)	✓ Timestamp     ✓ Name     Time Difference     ✓ Length       ····     ····     ····     ····     ····	
	Colors       Image: Colors       Image: Colors       Image: Color       Image: Colo	
< >>	✓ Wrap list ☐ The number of Bus Data packets 16	
	OK Cancel Default	t

#### Figure 4-90 Packet List Settings

Item	Description
Bus Selection	Select the buses to be displayed. Multiple bus, can only choose
	one
Packet Information	
TimeStamp	Select the Packet start time to be displayed and color.

Name	Include the names of the packets.
Time Difference	Time difference from packet X to packet X-1.
Length	Time between start packet and end packet.
Colors	
Text	Change the text color; by default it's white.
Auto Contrast Text	Automatically select text colors that contrast their background
Color	colors.
Background	Change the Packet List background color.
Wrap list	If a packet contains too much data for all to be shown on one line,
	it is shown over two or more lines; selected by default.
The number of Bus	When Wrap List is enabled, select how much data packets to be
Data packets	shown per line (between 1 and 64); applies to Data only.

#### Table 4:54 Packet List Settings description

Figure 4-91 shows the menu that is shown when right-clicking in the Packet List.

Hide Display	>
Color	
 Set as trigger condition	

#### Figure 4-91 Packet List Right-click menu

Item	Description
Hide	Hide the current selection of packets.
Display	Display the hidden packets.
Color	Change the packet color.
Set as Trigger	Set the particular data as the trigger condition; see Figure 4-92
Condition	below.

#### Table 4:55 Packet List Right-click menu description

ket List												•
🕻 💲 🚖 📃	📃 🗮 🕌 🕻	ลั										
TimeStamp	Name	Data	Data	Data	Data	Data	Data	Data	Data	Length		
-65.5us	BUS0(Bus)	0X 0	0X1	0X2	ØX3	97.9	874	87.5	0X3	1.28us	]	
TimeStamp	Name	Data	Data	Data	Dat	Hide			lata	Length		
-64.22us	BUS0(Bus)	0X 0	ØX1	ØX2	ØX3	Display			0X3	1.28us		
TimeStamp	Name	Data	Data	Data	Dat	Color			ata	Length	1	
-62.94us	BUS0(Bus)	0 X 0	ØX1	ØX2	ØX	Set as t	rigger co	ndition	<b>9</b> X3	1.28us		
TimeStamp	Name	Data	Data	Data	Data	Data	Data	Data	Data	Length	ĺ	
-61.66us	BUS0(Bus)	0X 0	0X1	0X2	ØX3	OX O	0X1	0X2	0X3	1.28us	1	
TimeStamp	Name	Data	Data	Data	Data	Data	Data	Data	Data	Length		
-60.38us	BUS0(Bus)	0X 0	0X1	0X2	ØX3	0X 0	ØX1	0X2	0X3	1.28us		
vigator Packet Lis	t Statistics   M	lemory Vi	ew   Find	Results								

#### Figure 4-92 Packet List / Set as trigger condition

**NOTE** When Data packet list more than 64, the user needs to click on the arrow left upper corner of the Data, according to the content of the hidden will bring up the dialog displays all the Data.

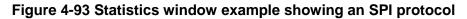
### 4.52. Statistics

Statistics Window is under the waveform view area after activated; it displays the quantity of positive and negative periods in a specific time range.

The Statistics window facilitates counting of signal transitions for each channel. Specifically, *Full-*, *Positive-* and *Negative periods* are all counted. *Conditional* counters are also shown; these count all periods that are shorter or longer than a set of user defined conditions. Finally, it is also possible to adjust the data range, i.e. to only count activity within a certain range of the total acquisition.

The Statistics window is shown in Figure 4-93; it is open by default and located in the Secondary Display area.

Channel	Full Periods	Positive Periods	Negative Periods	Full Periods (	Positive Perio	Negative Perio	Start Po	End Posi
40	2047	2047	2048	0	0	0	Ds	Dp
A1	1024	1024	1024	0	0	0	Ds	Dp
A2	512	512	512	0	0	0	Ds	Dp
A3	256	256	256	0	0	0	Ds	Dp
A4	128	128	128	0	0	0	Ds	Dp
A5	0	0	1	0	0	0	Ds	Dp
A6	0	0	1	0	0	0	Ds	Dp
A7	0	0	1	0	0	0	Ds	Dp





Item	Description						
2	Channel Selection; The default option is A0 - A7.see the dialog box in Figure 4-94.						
	4-94.						
	Customize; decide which counters to show; except Probe (name) all						
_	parameters are selected by default; see the dialog box in Figure 4-95.						
()	Filter; only count periods that fit the filter conditions. This function is not						
0	activated by default; see the dialog box in Figure 4-96.						
	Highlight signals; mark channels that don't fit the filter conditions in red;						
*	see the dialog box in Figure 4-97.						
-	Refresh; re-run the counters if there has been any change to the acquisition						
	or the settings.						
Count full	Periods that don't have both a rising and a falling edge will not be counted.						
periods							
only							
ALL	Consider all the acquired data. This function requires the processing of						
	temporary files.						

#### Table 4:56 Statistics window description

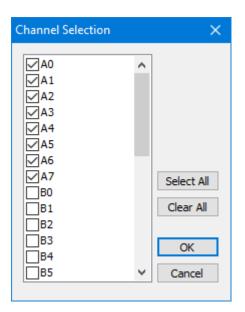


Figure 4-94 Statistics / Channel selection dialog box



Customize ×						
Probe						
Full Periods						
Positive Periods						
✓ Negative Periods						
Full Periods (Filtered)						
Positive Periods (Filtered)						
Negative Periods (Filtered)						
Start Position						
End Position						
Selected Data						
OK Cancel						

Figure 4-95 Statistics / Customize dialog box

Filter		×
Enable Full Periods (Filtere	ed)	
400ns	<= Time <=	1.3104ms
Positive Periods (F	iltered)	
200ns	<= Time <=	655.2us
Negative Periods (	Filtered)	
200ns	<= Time <=	655.2us
	ОК	Cancel

Figure 4-96 Statistics / Filter dialog box

Highlight Signals			×
🗹 Enable			
Conditions	Min	Max	
Period	✓ 10us	100us	
	10KHz	100KHz	
	ОК	Cancel	

Figure 4-97 Statistics / Highlight signals dialog box

### 4.53. LTR Monitor

The LTR Monitor window is used to monitor the data transfer between the DUT and the computer when using the Long-term Record function. It is located in the Secondary Display area; see Figure 4-98.

Long-time-record data ponitor V 1 > Data Monitor Data Lost Updating waveform instantly while recording							
ead Rate	Min Read Rate	Max Read Rate	Write Rate	Min Write Rate	Max Write Rate	Recorded data	Loss of data
.0000 MB/s	10000.0000 MB/s	0.0000 MB/s	0.0000 MB/s	10000.0000 MB/s	0.0000 MB/s	1s (100%)	Ons (0%)
			Ш				

Figure 4-98 TLR Monitor window

**NOTE** The high Lost Data percentage in the example owes to the screenshot being taken in demo mode.

Item	Description
Read	
Read Rate	The current rate at which the LAP-C Pro reads data.
Min Read Rate	The minimum rate at which the LAP-C Pro can read data.
Max Read Rate	The maximum rate at which the LAP-C Pro can read data.
Write	
Write Rate	The current rate at which the LAP-C Pro writes data.
Min Write Rate	The minimum rate at which the LAP-C Pro can write data.
Max Write Rate	The maximum rate at which the LAP-C Pro can write data.
Recorded Data	Data quantity currently acquired.
Loss of data	Data quantity currently lost.
File Save	Location where the acquired data are stored.
Data Lost	
No.	The number of lost data.
TimeStamp	Time of lost data.
Width	The width of lost data
Updating waveform	While recording, updating waveform instantly.
instantly while recording	g 5

# Table 4:57 LTR Monitor window dialog box

### 4.54. Find Results

The Find results function is used to locate events within a certain data range, using a straight-forward interface shown in figure 4-99.

Find Results					<u>≁</u> ҵ ≻
Find	Find Pulse-width			1	Jump To Previous Next
Number(2047)	TimeStamp	Data	Time Difference		
1	-653.4us	Rising Edge	Ons		
2	-650.2us	Rising Edge	3.2us		
3	-647us	Rising Edge	3.2us		
4	-643.8us	Rising Edge	3.2us		
5	-640.6us	Rising Edge	3.2us		
5	-637.4us	Rising Edge	3.2us		
7	-634.2us	Rising Edge	3.2us		
3	-631us	Rising Edge	3.2us		
9	-627.8us	Rising Edge	3.2us		
10	-624.6us	Rising Edge	3.2us		
lavigator   Pa	cket List   Statistics   Me	emory View Find Results			

#### Figure 4-99 Find Results window

Item	Description
Find	Bring up the find dialog box, set the need to find the bus/channel
	and conditions.
Find Pulse-width	Set the search condition and search the pulse.
Jump To	Input one index value matching statistics condition and click 'Jump
	To' go to that value in the statistics data and mark it with a bar.
Previous	Find the previous data that fitting the condition.
Next	Find the next data that fitting the condition.
Number	To display the number of eligible, starting from 1 until the last.
TimeStamp	To show eligible time pattern.
Data	Displays the starting point of the data found.
Time Difference	Show the time difference between the previous result and the result.

Table 4:58 Find Results window description

# 4.55. Timing Bar



Figure 4-100 Timing Bar



Item	Description
Scale	The scale is the inverse of the zoom level.
Total	Total acquisition time.
Waveform	Location of the current center of the waveform.
Center	
Display Range	Timing information for the part of the waveform currently in view.
A Pos	The position of the A-bar; click to select another bar.
BPos	The position of the B-bar; click to select another bar.
A-T	Time difference between the A and T-bars; click to select a
	different range.
8-T	Time difference between the B and T-bars; click to select a
	different range.
A ~ 0 ~	Select a bar.
P	Memory Page on which the bar is located.
<b>•</b>	Go to the selected bar.
	Reposition the selected bar to the current center of the waveform
	area.

Table 4:59 Timing Bar description

### 4.56. Arrange Windows

The windows showing the files (as waveforms or as lists of states) can be moved around freely.

#### 4.56.1. Horizontal

Display the open files above each other.

4.56.2. Vertical

Display the open files next to each other.

#### 4.56.3. Reset Window Locations

Reset all windows to their default positions.

### 4.57. Split Screen

If more than one screen is connected to the computer ZP-Logic is running on, users can choose to show ZP-Logic on either one of the screens or on both.

#### 4.57.1. Show on All

Show ZP-Logic on both detected screens. The waveform area is amplified to show a larger part of the traces.

#### 4.57.2. Show on Primary

Show ZP-Logic on what is defined as the primary screen.

#### 4.57.3. Show on Secondary

Show ZP-Logic on what is defined as the secondary screen.

### 4.58. Numeric Base / Encoding

Users can choose among seven types of number systems and encodings for the displayed bus data; see Table 4:60. Hexadecimal is the default format.

Description
Data are shown using the binary number system.
Data are shown using the decimal number system.
Data are shown using the signed decimal number system;
one bit (the first on the left) is used to specify the sign.
Data are shown using the hexadecimal number system.
Data are encoded as ASCII characters; this only works for
buses that comprise at least seven signals.
Data are encoded as Gray code.
Data are encoded as complements.

Table 4:60 Available data formats



### Help

Press ALT + H to open this Main Menu item with the keyboard.

# 4.59. Menu Layout

About ZP-Logic	
-	
About ZEROPLUS	
Help	F1
Hot key list	
Send Feedback	

Figure 4-101 Help drop-down menu

### 4.60. About ZP-Logic

The About ZP-Logic window shows the software version, modification history, the instrument model, serial number and so on; see Figure 4-102. This window is almost identical to the information window shown the first time the ZP-Logic is started.

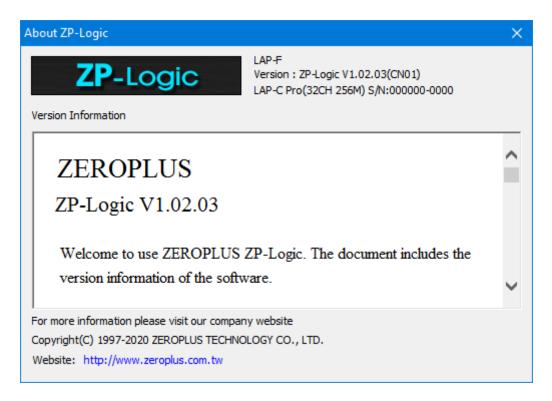


Figure 4-102 About ZP-Logic information window

### 4.61. About Zeroplus

The About Zeroplus item on the menu takes the user to the Zeroplus website; this is opened in a new tab in the default web browser.

# 4.62. Help

Click the Help item to open the Help file. The Help file contains descriptions of the installation procedure and of menus and functions, answers to FAQs etc. It is contains a Search function to facilitate lookups.

Hot Key: F1.

### 4.63. Hot Keys

The Hot Keys item displays a list of all Hot Keys combinations. Hot Keys are keyboard combinations that the user can press to execute an action or a function without having to open a menu or use the mouse. Some Hot Keys require only a single keystroke.

Users can customize the Hot Keys in the Settings menu; see chapter 4.11.6 for descriptions of the dialog box fields.

Command	Hot Keys	Description
File→New	Ctrl+N	Create a new file.
File→Open	Ctrl+O	Open an exit file.
File→Close	Ctrl+F4	Close the current file.
File→Save	Ctrl+S	Save the file.
File→Print	Ctrl+P	Print the file.
File→Print Preview	Ctrl+Alt+I	Preview the printing.

Acquisition→Single Capture	F5	Capture the signal.
Acquisition→Repeated Capture	Ctrl+F5	Capture the signal continuously.
Add depth	Ctrl+U	Increase the sampling depth.
Decrease depth	Ctrl+D	Decrease the sampling depth.
Analysis→Find	Ctrl+F	Open the Find dialog box to set find conditions.
Previous	Ctrl+←	Go to the previous find condition.
Next	Ctrl+→	Go to the next find condition.
Acquisition→Add Protocol Decoder	Ctrl+B	Open the Add Protocol Decoder dialog.
Analysis→Go To	Ctrl+G	Open the Go Todialog.
View→Cursor Type	Space	Switch between Normal and Hand mode.
View→Zoom→Out	Z	Zoom out the waveform.
View→Zoom→In	Shift+Z	Zoom in the waveform.
Whole page	Ctrl+Alt+P	Whole page mode.
Recovery zoom	Ctrl+Z	Return to the last zooming.
Cancel zoom	Ctrl+Y	Cancel the last zooming.
Help→Help	F1	Open the operating instructions of Zeroplus Logic Analyzer.
Go to A bar	A	Move A Bar with waveform to the middle of waveform area and lock it.

Go to B bar	В	Move B Bar with waveform to the	
	D	middle of waveform area and lock it.	
Go to T bar	т	Move T Bar with waveform to the	
	I	middle of waveform area.	
Reset A bar	Shift+A	Move A Bar to the middle of	
		waveform area.	
Reset B bar	Shift+B	Move B Bar to the middle of	
		waveform area.	
Reset T bar	Shift+T	Move T Bar to the middle of	
	Chint + 1	waveform area.	
Change scale	Ctrl+Mouse	Change the display scale of	
	Wheel	waveform area.	
Left	←	Move the display area/active bar to	
		the left.	
Right	-	Move the display area/active bar to	
		the right.	
Up	ţ	Move the display area upwards.	
Down	Ļ	Move the display area downwards.	
Previous page	Ctrl+Page Up	Go to the previous memory page.	
Next page	Ctrl+Page Down	Go to the next memory page.	
First page	Ctrl+Home	Go to the first memory page.	
Last page	Ctrl+End	Go to the last memory page.	
Previous view	Page Up	Go to the previous visible area.	
Next view	Page Down	Go to the next visible area.	



First view	Home	Go to the front end of the current visible area.
Last view	End	Go to the tail end of the current visible area.
Сору	Ctrl+C	Copy the selected item(s) in the channel area.
Paste	Ctrl+V	Paste the copied item (s) in the channel area.
Delete	Delete	Delete the selected item.
Rename	F2	Rename the selected item.
Select all	Ctrl+A	Select all channels in the channel area.
Go to bar	Number Key	Move the corresponding Bar and the waveform to the middle of screen.
Move bar	Shift+Number Key in the main keyboard	Move the corresponding Bar only to the middle of screen.
Cancel	Esc	Cancel
Open menu	Alt+Letter with a baseline	Perform the menu command(or command of other baseline).
Show waveform	Wheel	Move the waveform.
First channel	Ctrl+ ↑	Select the first channel.
Last channel	Ctrl+↓	Select the last channel.
Previous channel	Shift+ ↑	Select the previous channel.(Multiple-choice)



Next channel Shift+↓ Select the next channel.(Multiple-choice)

#### Table 4:61 Hot Key descriptions

### 4.64. Send Feedback

The Send Feedback form can be used to contact our Technical Support if the user runs into a problem. Users are requested to provide contact information and a description of the problem. Attachments can also be uploaded; see Figure 4-103. The benefit of using the Send Feedback form to contact the Technical Support is that data and information is automatically added to the communication: file information, instrument model, acquisitions settings, system parameters etc. This information makes it easier for the support team to get to the root of the problem and therefore

improves response times.

Users who prefer to contact our Technical Support team by means of regular email should use the following address: <a href="mailto:service\_2@zeroplus.com.tw">service\_2@zeroplus.com.tw</a>

۵	Problem Feedback	- ×
Company/School Name: Sender:	Problem Feedback	Send
User E-mail: Phone:		
Subject: Attachment:	Question	Browse
🥑 Content		^
<		>
Instrument: LAP-C Pro // File created: 2020/ // Setup information: // Acquisition mode: De // Internal sample rate	emo	^
<		>

Figure 4-103 Send Feedback dialog box

Item	Description
Contact Information	
Company / School	Name of the senders company / institution
Name	
Sender	Name of the sender
User Email	Sender's email address
Phone	Sender's phone number
Subject	Sender's brief description of the issue.
Attachment	Relevant files, graphs etc can be attached to the form.
Content	Elaborate a written description of the issue.
Parameters	ZP-Logic automatically adds information about the instrument
	type, acquisition settings etc. to the file to facilitate problem
	solving.

Table 4:62 Send Feedback dialog box description

# 5. Contact Us

Sales Department	
Email	sales@zeroplus.com.tw
Phone	+886-2-6620-2225 extension #380

Table 5:1 Sales department contact info

Technical Support	
Email	service_2@zeroplus.com.tw

#### Table 5:2 Technical support contact info