



ZP-Studio

LOGIC ANALYZER

USE GUIDE

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Table of Content

Precautions	3
1. Introduction	4
1.1. Preface.....	4
1.2. About this document.....	4
1.3. Product Introduction	4
1.4. Package Content	5
1.5. System Requirements	6
1.6. Product Specifications	7
2. Installation Setup.....	11
2.1. Software Installation	11
2.2. Hardware Connection.....	13
2.3. Operating Environment and Maintenance	14
3. Interface and functions	16
3.1. User interface	16
3.2. Option.....	17
3.3. Single Run	39
3.4. Sample Settings	39
3.5. Channel Column	42
3.6. Trigger Column	51
3.7. Waveform Area	52
3.8. Information.....	54
3.9. Protocol decoders	55
3.10. Search.....	56
3.11. Secondary Display	57
4. Contact Us	63



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 LAP Educator from static discharge.*
- *Avoid direct impacts and rough handling.*
- *Do not place heavy objects on the LAP Educator.*
- *Do not disassemble the LAP Educator as this will void the warranty and may affect its operation.*



1. Introduction

1.1. Preface

This User Guide presents the ZeroPlus* LAP Educator 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-Studio and the instruments as LAP Educator.

ZeroPlus attaches great importance to users' suggestions. Users are welcome to give us feedback by email or telephone. Thank you for purchasing the LAP Educator 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 LAP Educator are presented, followed by installation and setup procedures. Section 3 then goes in to the software user interface and the software functions. End with contact information.

NOTE The latest version of this document can be downloaded from the ZeroPlus website.

NOTE The newest software UI might differ from the illustrations herein.

1.3. Product Introduction

The LAP Educator is a typical 8-channels logic analyzer bundled with an Arduino-based experiments educational kit and a comprehensive experiments guide.



The software ZP-Studio is an all-new UI especially designed for the LAP Educator. The UI is typical for its color gradient background and ease of operation. The extensive protocol library consisting of more than 80 protocol decoders, internal or external clock, direct streaming to disk, user-friendly software and a host of other functions make debugging a joy. All of these functions are described in chapter 3.

1.4. Package Content

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

No.	Item	Quantity
1	ARDUINO UNO REV3	1
2	Breadboard	1
3	I2C RGB LED	1
4	Sound sensor	1
5	DC Motor	1
6	LED	5
7	Push-button	5
8	LM335	1
9	Photoresistor 5M	1
10	Potentiometer 10k	1
11	Resistor 10k ohm	4
12	Resistor 330 ohm	4
13	Resistor 2.2k ohm	2
14	Capacitor 104uF	2
15	Transistor NPN	1
16	Diode 1N4148	1
17	20pins Male to Male Ribbon Cable	1
18	2 x AA Battery Holder	1
19	Toolbox	1
20	USB Bridge	1
21	LCD1602	1



22	LAP Educator	1
23	Micro Usb Data Transfer Cable	1
24	Dupont connectors (8Px1, 2Px1, 1Px1)	1
25	Clip-on hooks 10pcs	1
26	Experiments Guide	1
27	Warranty Card	1
28	USB Type B Data Transfer Cable	1

Table 1:1 LAP Educator package content

Package content shows as Figure 1-1.



Figure 1-1 Photo of the package content

1.5. System Requirements

1.5.1. Operating System Requirement

The LAP Educator supports operating systems from Microsoft only. See Table 1:2 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 7	Recommended
Windows 8.1	Support
Windows 10	Support

Table 1:2 Supported operating systems

1.5.2. Hardware Requirements

Item	Minimum	Recommended
CPU Speed	1GHz	2GHz
RAM	1 GB	4GB
Hard Drive Space	500 MB	1GB
Data Transfer	USB 1.1	USB 2.0
Display resolution	1,024 x 768	1,024 x 768

Table 1:3 PC hardware requirements and recommendations

1.6. Product Specifications

1.6.1. Product Photo



Figure 1-2 Photo of the LAP Educator



1.6.2. Specifications

Model	LAP Educator
Supported operating systems	Win 7 (Win 8.1, Win 10)
Acquisition Channels	8
Interface	USB 1.1 (2.0 compatible)
Sampling Frequency	
Internal (Timing)	100MHz
External (State)	75 MHz
Memory/channel	2, 16, 32 kb
Max compr. ratio	256
Trigger	
Trigger Channels	8
Trigger Events	Pattern / Edge
Pre/Post Triggering	YES; choose from 0-100% pre-trigger data)
Trigger Seq. Levels	1
Trigger Out	YES; send a trigger signal that sets off another instrument
Threshold Voltage	
Bandwidth	75 MHz
Range	-6V to +6V
Precision	±0.1V
Software functions	
Languages	English, Chinese (Traditional), Chinese (Simplified)
Customize-Environment	Modify the appearance of channels, menus, traces, windows etc
Files Comparison	Compare 2 files to quickly see where and how they differ
Navigator	Instantly navigate to distant parts of the waveform
Packet List	Breakdown of all packets in list form
Find Results	Set conditions, look up the information meets the requirements
Real-time Signal Activity	Live view of probe activity
Protocol Decoders	More than 80 free, built-in protocol decoders
Electrical Properties	

Phase Errors	< 1.5 ns
Source	DC Connection
Power	5V DC, < 500 mA (1W standby)
Maximum Input Voltage	$\pm 30V$
Impedance	500 k Ω /10pF
Dimensions	113 x 83.4 x 18.5mm
Certifications	FCC / CE / WEEE / RoHS

Table 1:4 LAP Educator specifications

1.6.3. Electrical Specifications

Item	Minimum	Normal	Maximum
Working Voltage (DC)	4.5	5 V	5.5.V
Standby Power	-	-	1W
Working Power	-	-	2W
Phase Error	-	-	1.5ns
V _{IN} of Text channels	-30V		30V
V _{REF}	-6V DC		6V DC
Input Resistance		500k/10pF	

Table 1:5 LAP Educator electrical specifications

1.6.4. Port Overview

Figure 1-3 shows the ports of the LAP Educator.

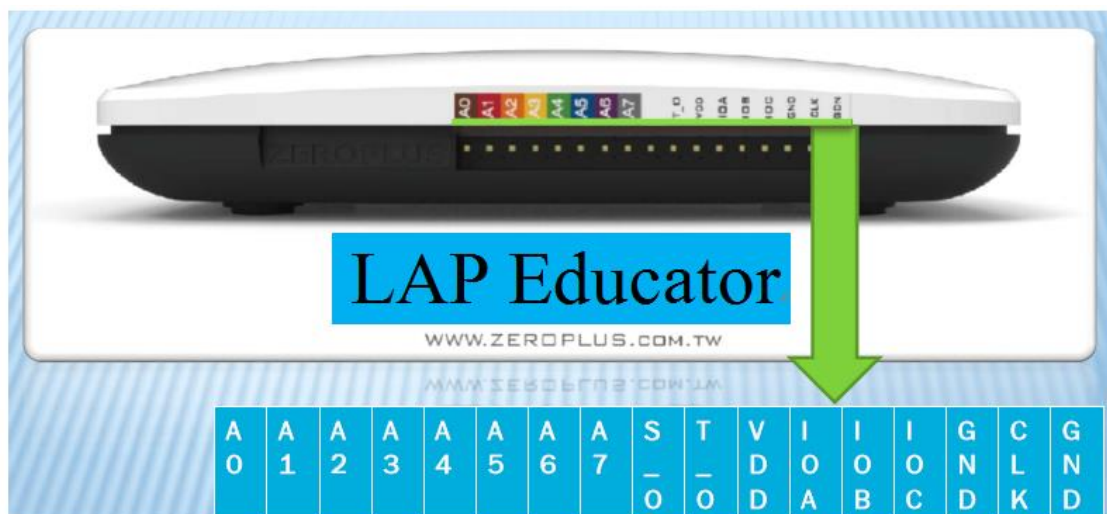


Figure 1-3 Port of the LAP Educator.



Port	Name	Description
A0-A7	Port A	Signal input pins.
S_O	Start Out	A 3.3 V DC rising edge signal is sent over the S_O pin when an acquisition is initiated by pressing RUN or the START button on the casing.
T_O	Trigger Out	When the trigger conditions have been met, the LAP Educator emits a signal that can be used to trigger another instrument. The signal is a 3.3 V DC rising edge signal that is sent over the T_O pin. Once the memory is full, a falling edge signal is sent.
VDD	Voltage Drain	+3.3 V output for powering external modules.
IOA, IOB, IOC	External I/O Module	Reserved
CLK	Clock	In State mode, connect this pin to the DUT clock.
GND	Ground	Ground pin.

Table 1:6 LAP Educator input ports



2. Installation Setup

2.1. Software Installation

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

1. It is recommended close all other programs.
2. Connect the LAP Educator to the PC via USB. Insert the installation CD into CD-ROM. If the CD does not auto play, open the setup.exe file manually. The dialog box from Figure 2-1 will be shown.

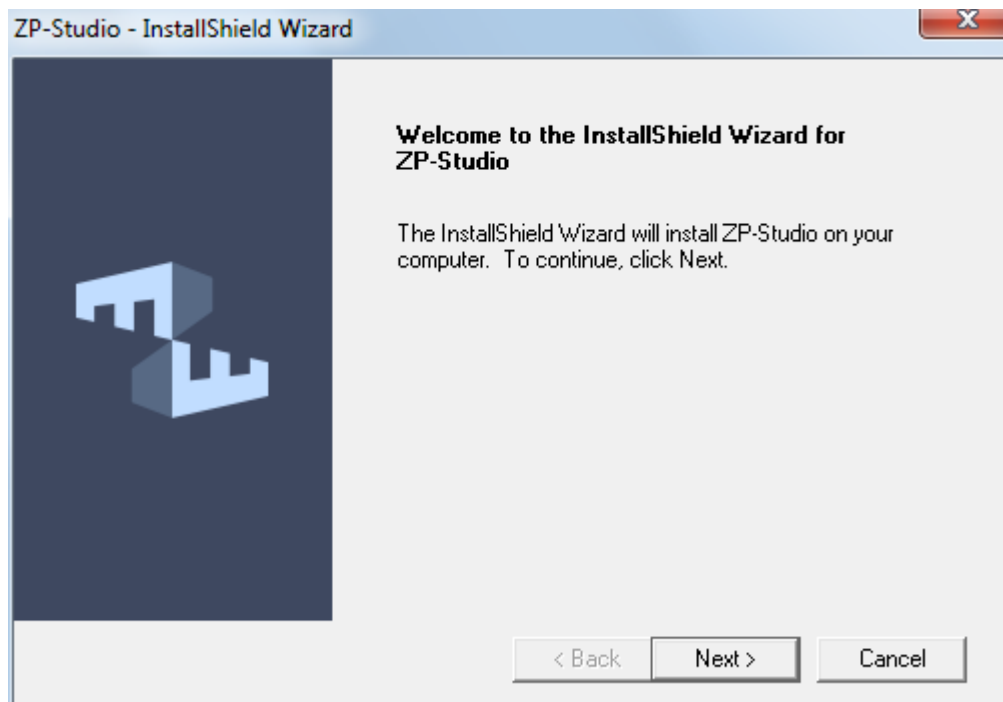


Figure 2-1 Main installation window

3. 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.



Figure 2-2 License Agreement window

4. 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.

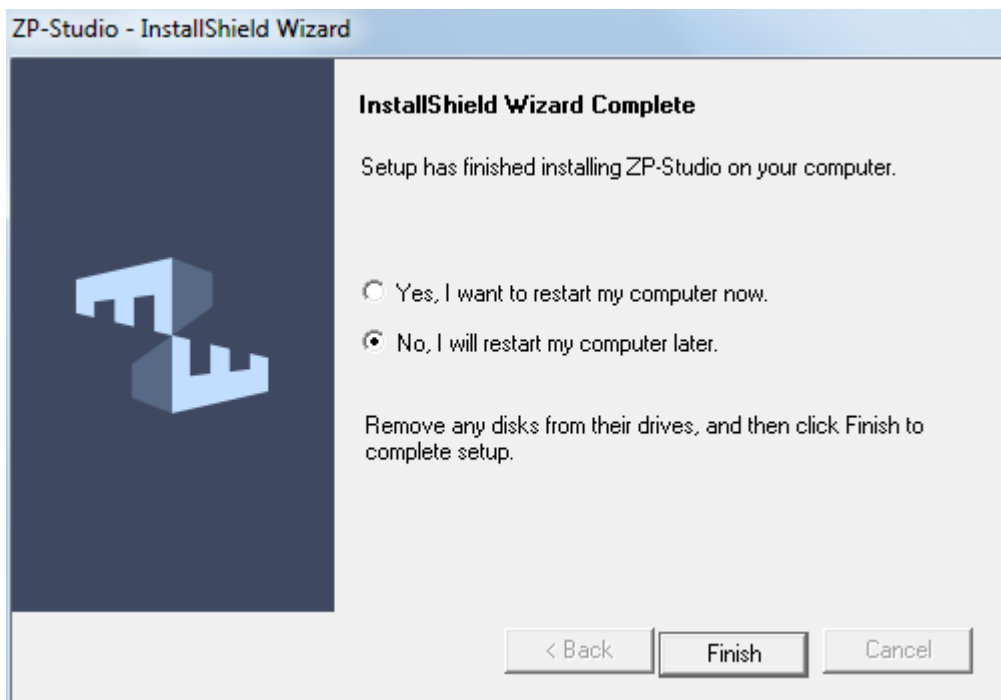


Figure 2-3 Main installation window



When the ZP-Studio is launched for the first time, a Find New Hardware dialog box will appear and the driver will then be installed automatically. ZP-Studio will also download all the available protocol decoders, as seen in Figure 2-4.

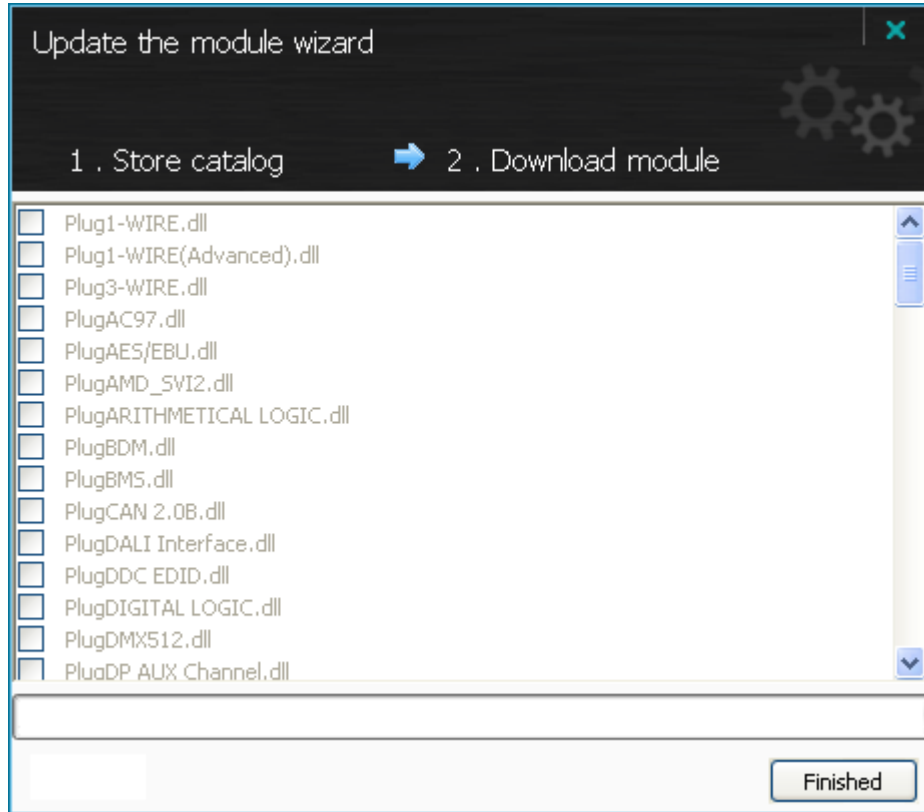


Figure 2-4 Protocol Wizard interface

Once the ZP-Studio and the driver installations have finished the LAP Educator and the ZP-Studio are ready for use.

2.2. Hardware Connection

Hardware installation/connection consists of the following simple procedure:

1. Plug the fixed end of the probes into the LAP Educator.
2. Plug the flying leads into the circuit board connectors.
3. Ground the DUT to the LAP Educator using the black ground cable.
4. Connect the USB cable between the PC and the LAP Educator.

NOTE At this point, the computer should be able to detect the Logic



NOTE Analyzer and finalize the installation for hardware connection.

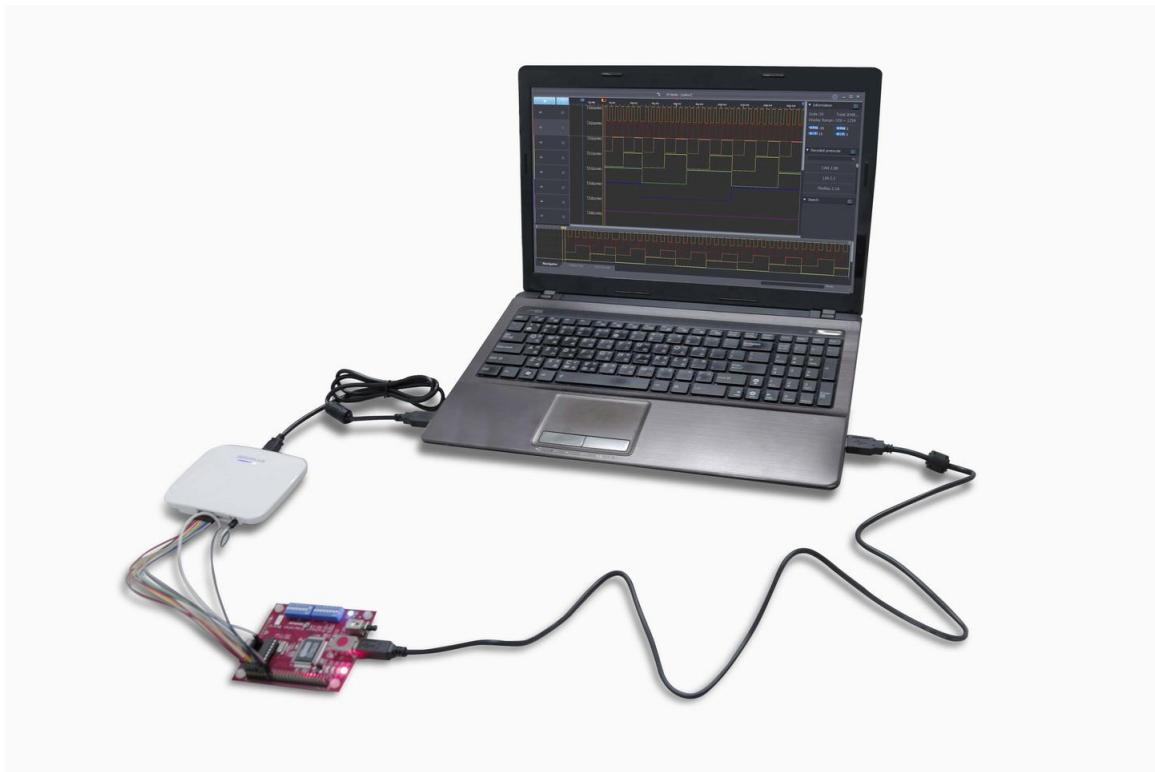


Figure 2-2 Signal cable connection and power lamp location

2.3. Operating Environment and Maintenance

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

Type	Description
Cleaning	<p>Clean with a soft, damp cloth using a mild detergent.</p> <p>Do not spray any liquid on the LAP Educator.</p> <p>Do not immerse the LAP Educator in any liquid.</p> <p>Do not use harsh chemicals or cleaners containing substances such as benzene, toluene, xylene or acetone.</p>
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
Insolation	Avoid direct sunlight.	
Environment	Use in a dust free, non-conductive environment.	

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



3. Interface and functions

This chapter shows ZP-Studio user interface (UI), the follows the ZP-Studio functions, each section introduces corresponding function and related setting according to their position on UI.

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

3.1. User interface

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

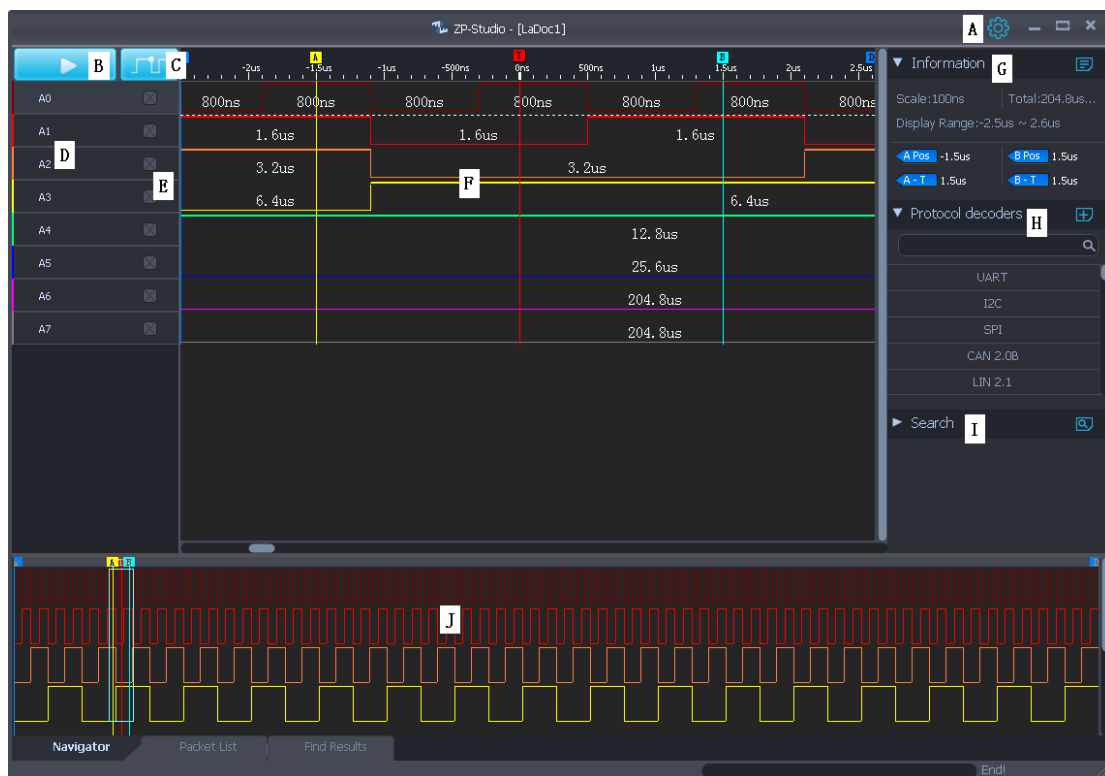


Figure 3-1 ZP-Studio user interface

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



Name	Area	Description
Option Menu	A	Access main functions by Option button. The details see corresponding function introduction.
Single Run	B	Acquisition signal one time or continuously with the current sample and trigger setting.
Sample Settings	C	The current sample settings with Sample rate (Internal or External clock), Memory, Trigger Level and Trigger Position. Enable compression function or not.
Channel Column	D	See and edit channels.
Trigger Column	E	Set trigger conditions.
Waveform Area	F	Displays the captured signals as traces or as a numeric list.
Information	G	See the information of acquiring data.
Protocol decoders	H	Add or look for Protocol decoders.
Search	I	Search the needed data.
Secondary Display	J	Area where the Navigator, Packet List and Find Results

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

3.2. Option

Click the Option button  in the UI, and the menu show as figure 3-2.

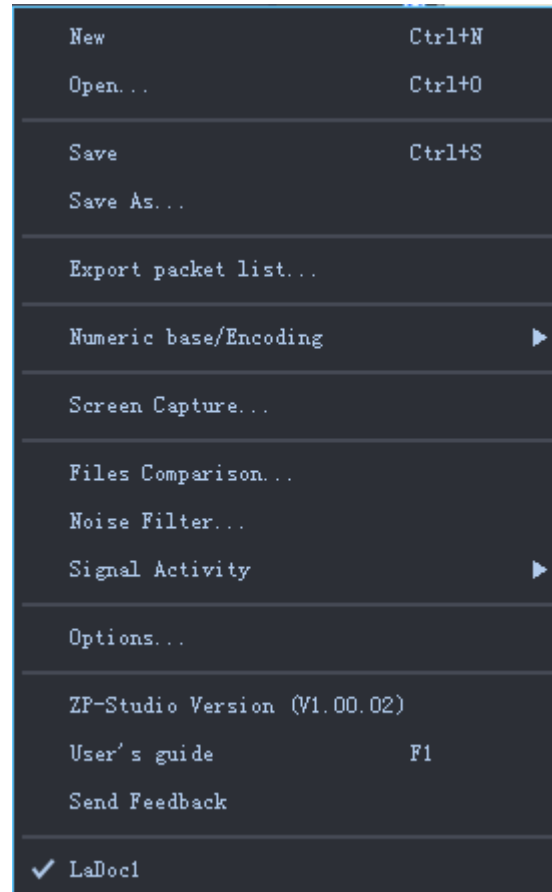


Figure 3-2 File drop-down menu

3.2.1. New

Create a new, empty file.

Hot Key: CTRL + N.

3.2.2. 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-Studio.

Hot Key: CTRL + O.

3.2.3. Save

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



Hot Key: CTRL + S.

3.2.4. 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.

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.

3.2.5. Export Packet List

This chapter treats the export of Packet Lists; please refer to chapter 3.11.2 for more details on the Packet List function itself. The Export Packet List dialog box is shown in Figure 3-2.

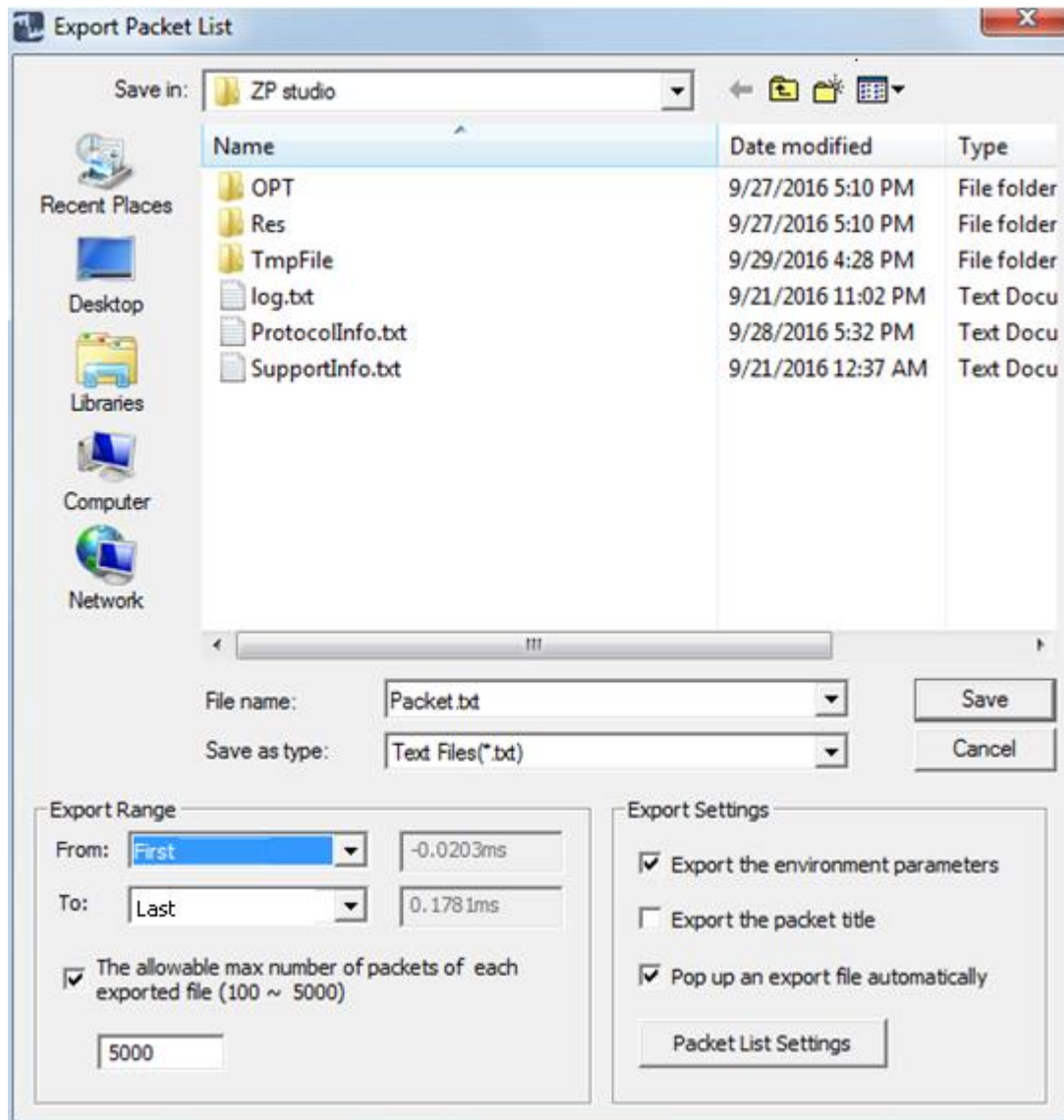


Figure 3-2 Export Packet List dialog box

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.
The allowable max number of packets of each exported file(100-5000)	Set the maximum quantity of lines per export file; if the file length overshoots the limitation then several files will be created; selected by default.
Export Settings	



Export the environment parameters	Include acquisition parameters etc. in the export file; checked by default.
Export the packet title	Include packet titles in the export; unselected by default.
Pop up an export file automatically	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 3-.

Table 3:3:2 Export Packet List dialog box description

3.2.6. Numeric Base / Encoding

Users can choose among seven types of number systems and encodings for the displayed bus data. Hexadecimal is the default format.

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

Table 3:3 Available data formats

3.2.7. 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 3-. If Clipboard is selected the file will be stored in the RAM.

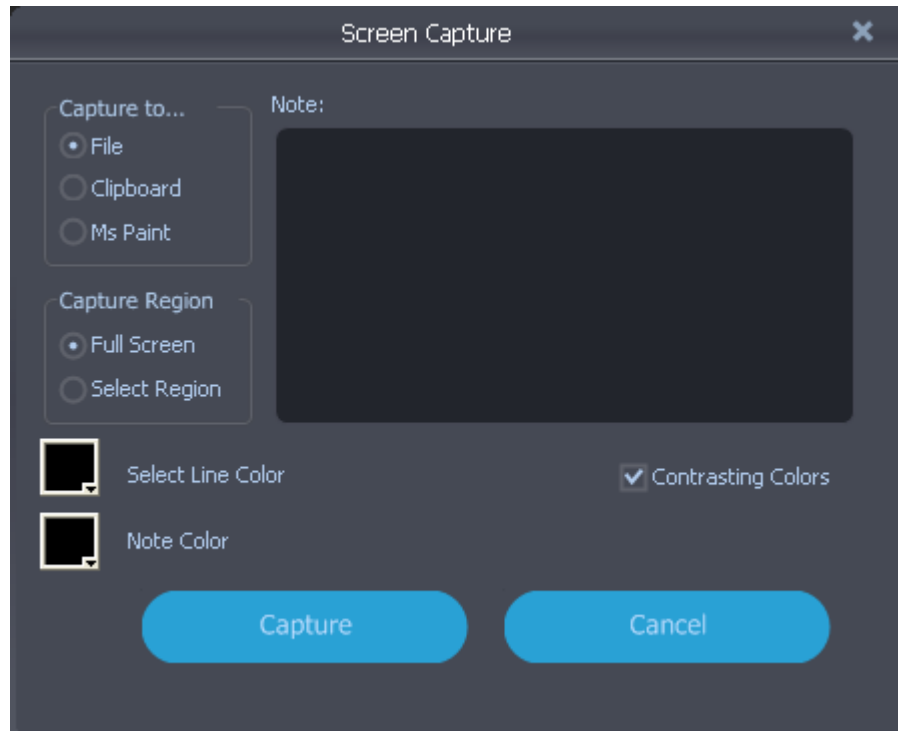


Figure 3-4 Screen capture dialog box

Item	Description
Capture to	
File	Save the captured region in .bmp or .jpeg 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 Below Screen Shot	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.
Select Line Color	Change the color of the Select Region frame; by default this is black.
Contrasting Colors	The Select Region frame color is the opposite of Line Color; selected by default.

Table 3:3:3 Screen capture dialog box description



3.2.8. 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.

錯誤! 找不到參照來源。 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.

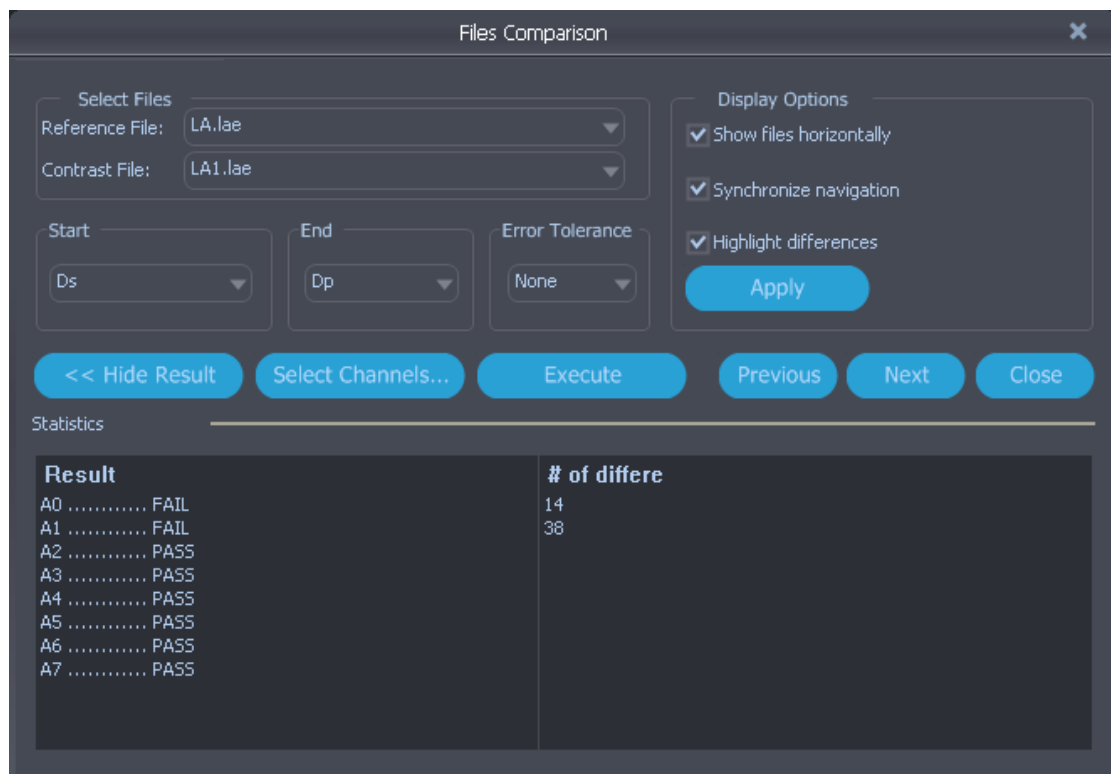


Figure 3-5 Files Comparison dialog box

Item	Description
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.
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-Studio regards the two files as unequal; 0-10 samples can be chosen (the default is 0).

Display Options

Show files horizontally	Display the two files horizontally; unchecked by default.
Synchronize navigation	Synchronize panning across the two files. This option is unchecked by default and only available if "Show files horizontally" is checked.
Highlight differences	Mark the different waveforms with red wavy lines, the default is not selected.
Apply	Make changes effective.

Hide/ Display Result Hide/ Display the Results area.

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 3.2.4.

Contrast Statistics

Contrast Result 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.

Error Stat. 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 3:5 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 [錯誤! 找不到參照來源。](#)

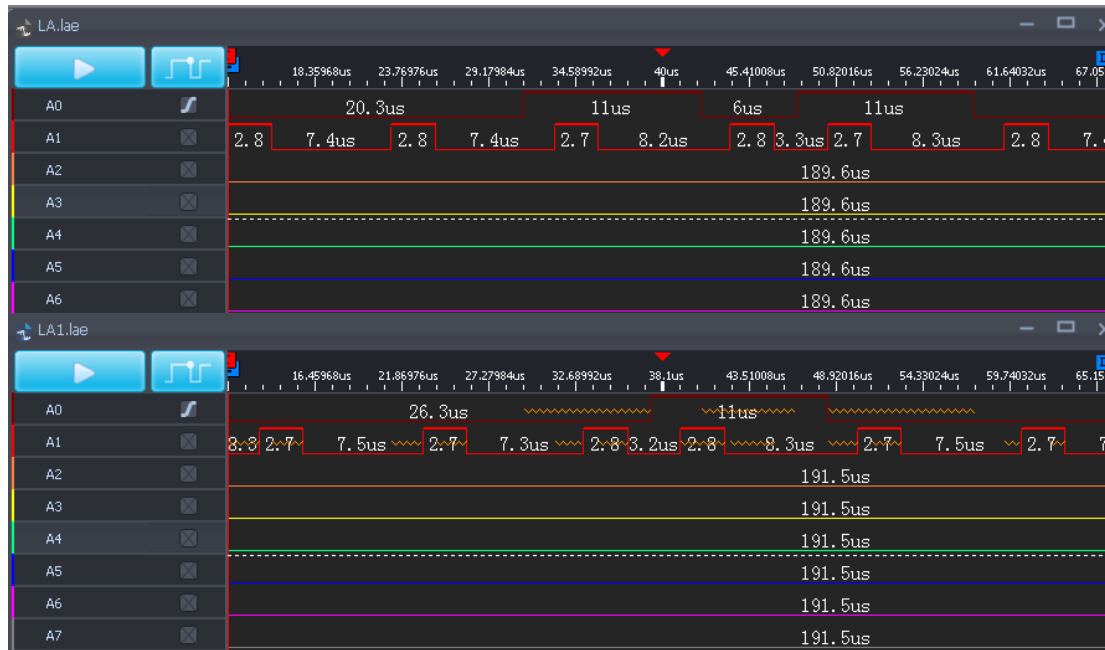


Figure 3-3 Files Comparison ex; differences marked in the lower window

3.2.9. 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 [錯誤! 找不到參照來源。](#).

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 filtered out. Lengths are measured in sample points or time.

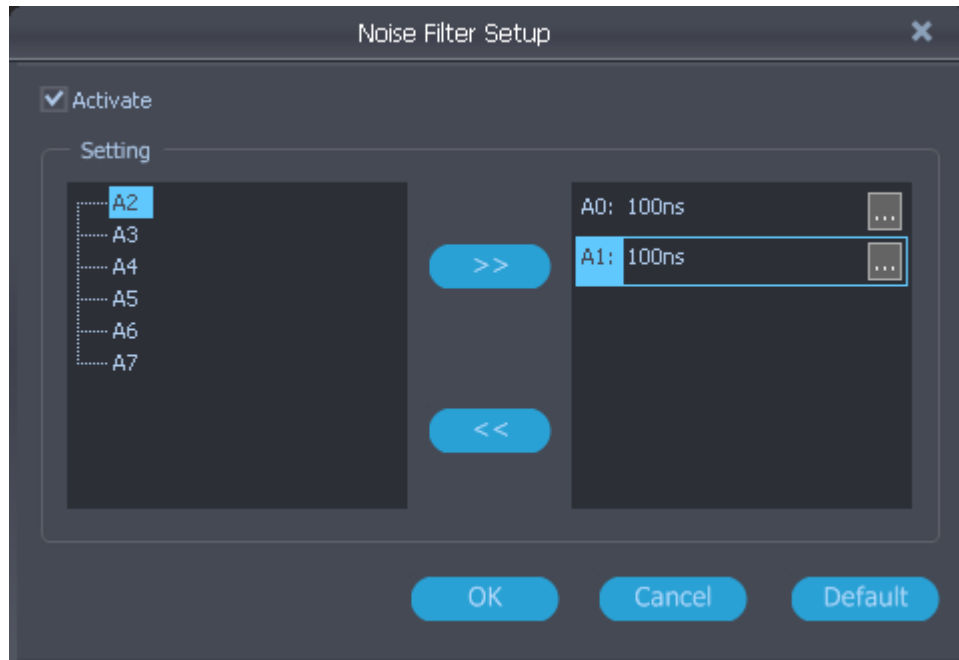


Figure 3-7 Noise Filter dialog box

3.2.10. 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 Educator monitors signal frequencies and states, thus assuming the function of a frequency counter and that of a logic pen.

➤ *Real-time Frequencies*

Real-time frequencies of all channels as measured by the probes are shown; see Figure 3-. The frequencies are updated twice per second.



Figure 3-8 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.

➤ *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 3-.

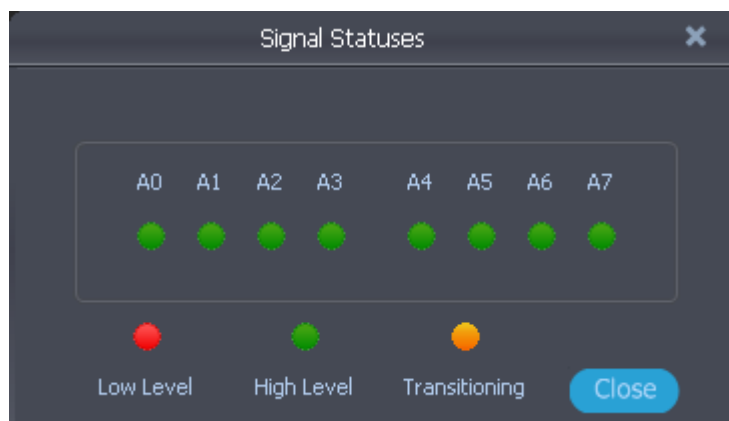


Figure 3-9 Signal Statuses window



3.2.11. Options

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

➤ *General*

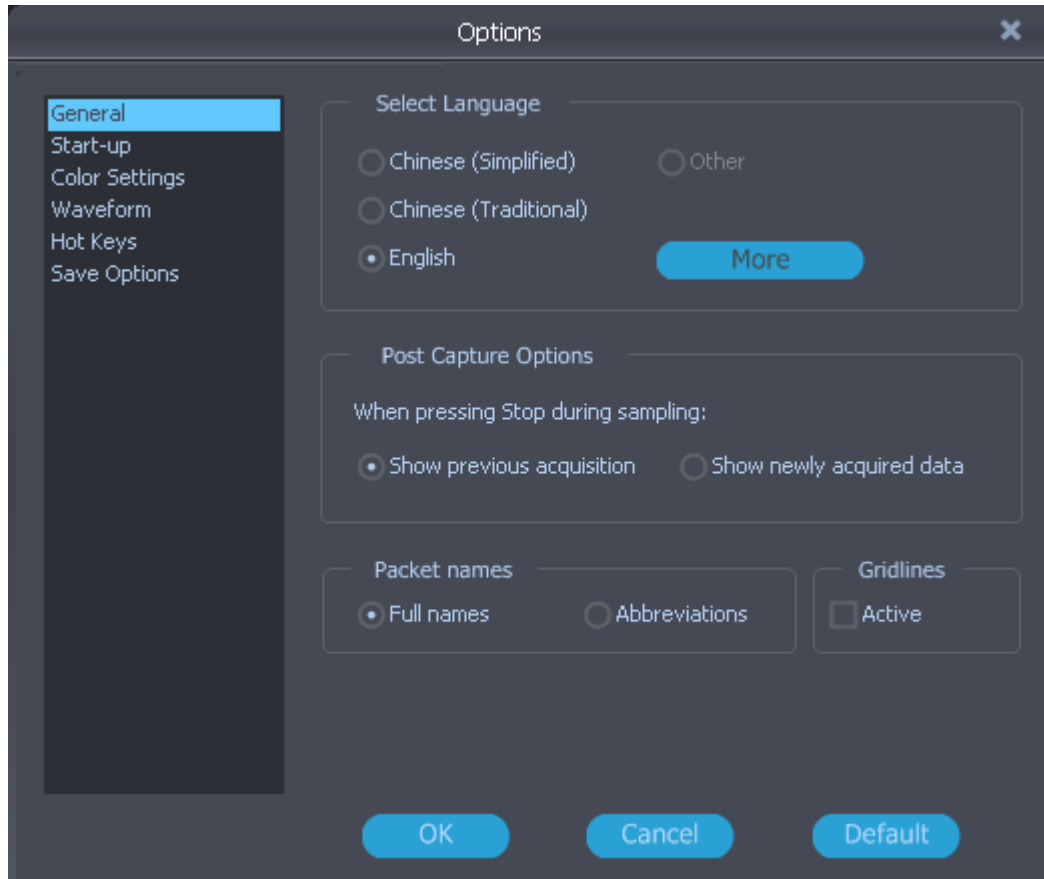


Figure 3-10 Environment settings dialog box

Item	Description
Select Language	Choose between English, Chinese (Simplified) and Chinese (Traditional); the one selected during installation is the default. The <i>More</i> option is used by customers who have developed a proprietary language pack.
Post Capture Option	
Show previous acquisition	This option governs the software behavior when the user pressing 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.
Gridlines	Show vertical gridlines in the waveform area; unchecked by default.
Packet Names	
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).

Table 3:3:4 Environment settings dialog box description

➤ *Start-up*

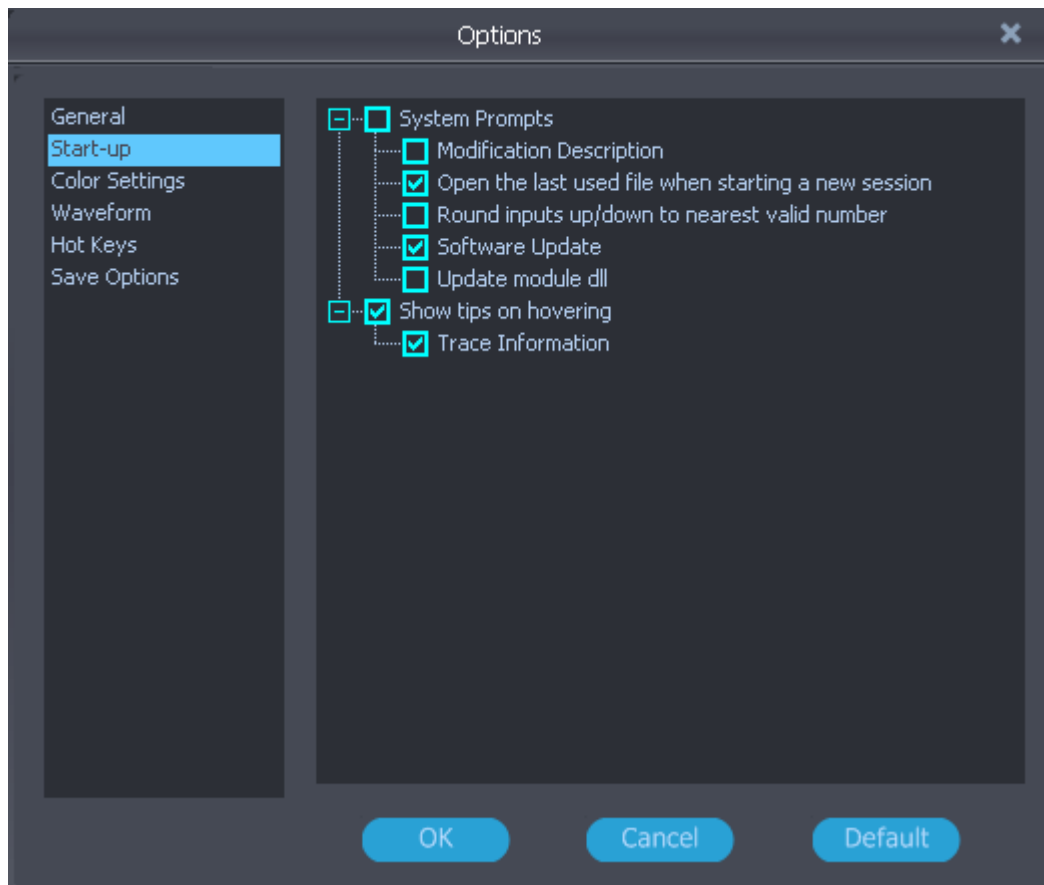


Figure 3-11 Start-up dialog box

Item	Description
System Prompts	



Modification Description	Show modification descriptions.
Open the last used file when starting a new session	The last saved file is opened when ZP-Studio starts; selected by default.
Round inputs up/down to nearest valid number	Illegal input values are automatically rounded to the nearest valid value.
Software Update	Inform the user to update software version when the software is updated; selected by default.
Update module dll	Inform the user that system would check and update automatically module dll when online.

Show tips on hovering

Trace Information	Show channel name, signal state and trace information when hovering over a trace in the waveform view; selected by default.
-------------------	---

Table 3:3:5 Start-up dialog box description

➤ *Color Settings*

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 3-4 to access the color palette.

Proceed to select a predefined color or define a custom color for the element.



Figure 3-4 Color Settings dialog box

Item	Description
Color Settings	Select displayed color for items.
Preview	Preview the color selections; the left frame shows the Waveform and the right the State List.
Black and white	The background and all traces are shown in black and white.
Contrast	All traces are displayed in colors that contrast the background.

Table 3:8 Color settings dialog box description

➤ **Waveform**

The appearance of the traces and surrounding information can be changed from the dialog box in Figure 3-5.

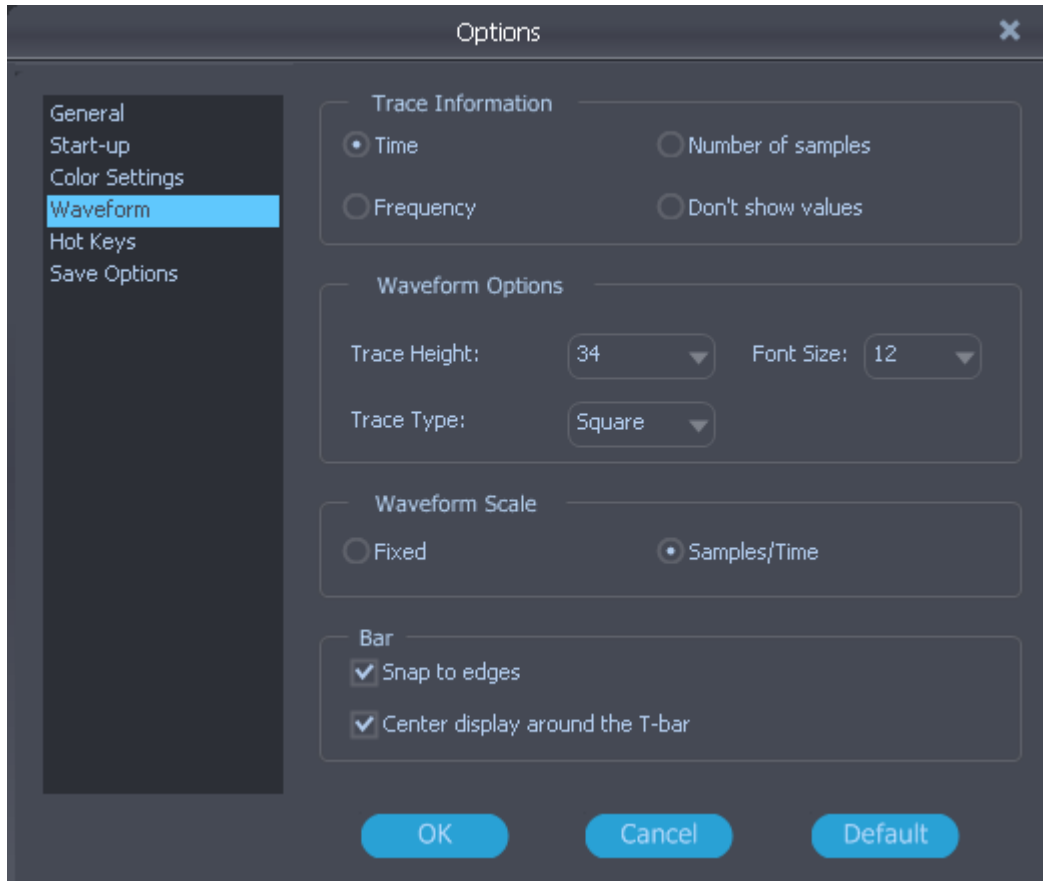


Figure 3-5 Waveform Area settings dialog box

Item	Description
Trace Information	
Time	Show the time between two edges; this is the default option.
Number of samples	Show number of samples between two edges.
Frequency	Show frequencies between two edges. The frequency of full period (rising to rising edge) is displayed. See 錯誤! 找不到參照來源。 for more details on the Trace Information.
Don't show values	No information is shown inside the traces.
Waveform Options	
Trace Height	Set the trace amplitude from 22 to 180 px; the default is 34.
Font Size	Set the font size from 6 to 60. The default is 12.
Trace Type	Choose between Sawtooth and Square 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.

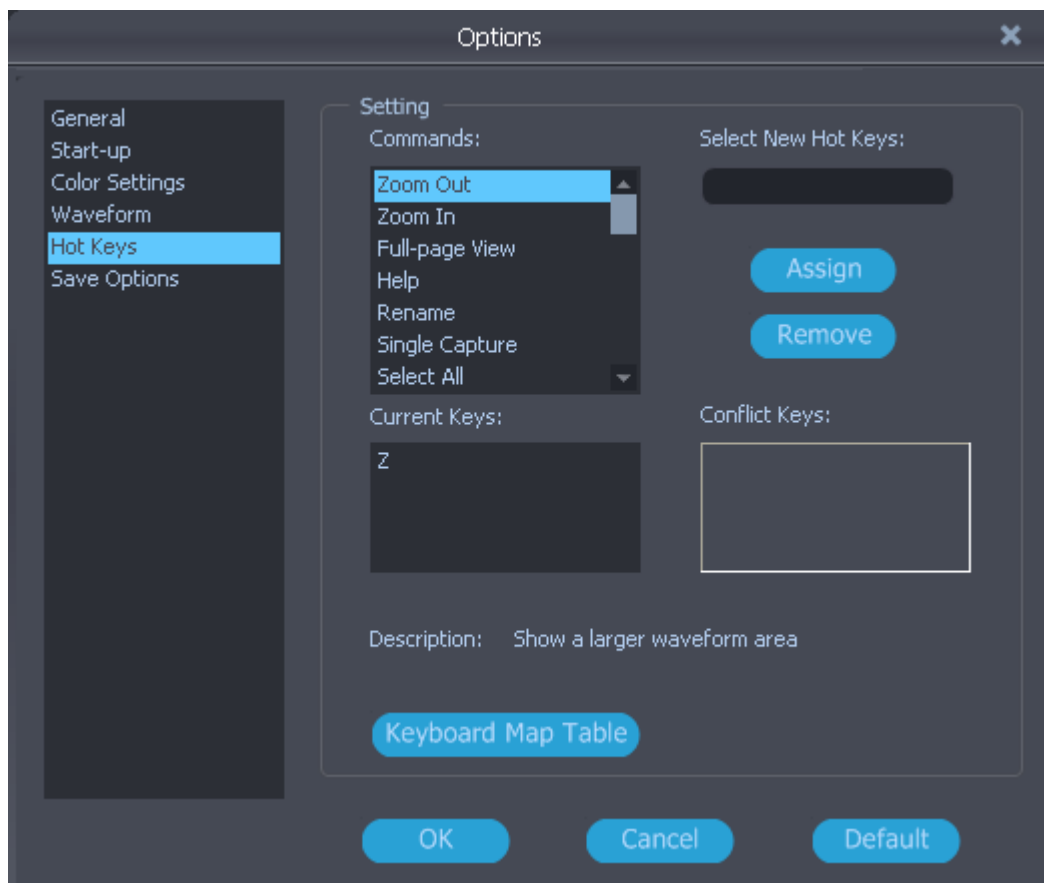
**Bar**

Snap to edges Bars snap automatically to the nearest trace edge when being repositioned.

Center display around the T-bar Center the waveform area around the T-bar when the trigger condition is met.

Table 3:9 Waveform Area settings dialog box description**➤ Hot Keys**

In ZP-Studio, Hot Keys are keyboard combinations that invoke a function. See Table 3:11 for a complete description of all Hot Keys. Figure 3- shows the dialog box used to customize the Hot Keys.

**Figure 3-14 Hot Keys 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.
Keyboard Map Table	Export the Hot Keys configuration document or load a different one.

Table 3:3:6 Hot Keys settings dialog box description

The descriptions of Hot Keys as follow.

Command	Hot Keys	Description
Zoom Out	Z	Zoom out waveform display area.
Zoom In	Shift+Z	Zoom out waveform display area.
Full-page Mode	Ctrl+Alt+P	Show the whole waveform display area.
Help	F1	Open the operating instructions of ZeroPlus Logic Analyzer.
Rename	F2	Rename the selected item.
Single Run	F5	Capture the signal one time.
Repetitive Run	Ctrl+F5	Capture the signal continuously.
Select all	Ctrl+A	Select all channels in the channel area.
Copy	Ctrl+C	Copy the selected item(s) in the channel area.
Paste	Ctrl+V	Paste the copied item (s) in the channel area.
New	Ctrl+N	Create a new file.



Open	Ctrl+O	Open an exit file.
Close	Ctrl+F4	Close the current file.
Save	Ctrl+S	Save the file.
Add Channel/Bus	Ctrl+B	Open the Add Protocol Decoder dialog.
Open Up File	Ctrl+↑	Open the File of last serial number.
Open Next File	Ctrl+↓	Open the File of next serial number.
Previous Display	Page Up	Go to the previous visible area.
Next Display	Page Down	Go to the next visible area.
Display Forefront	Home	Go to the front end of the current visible area.
Display End	End	Go to the tail end of the current visible area.

Table 3:11 Hot Keys descriptions

➤ *Save Options*

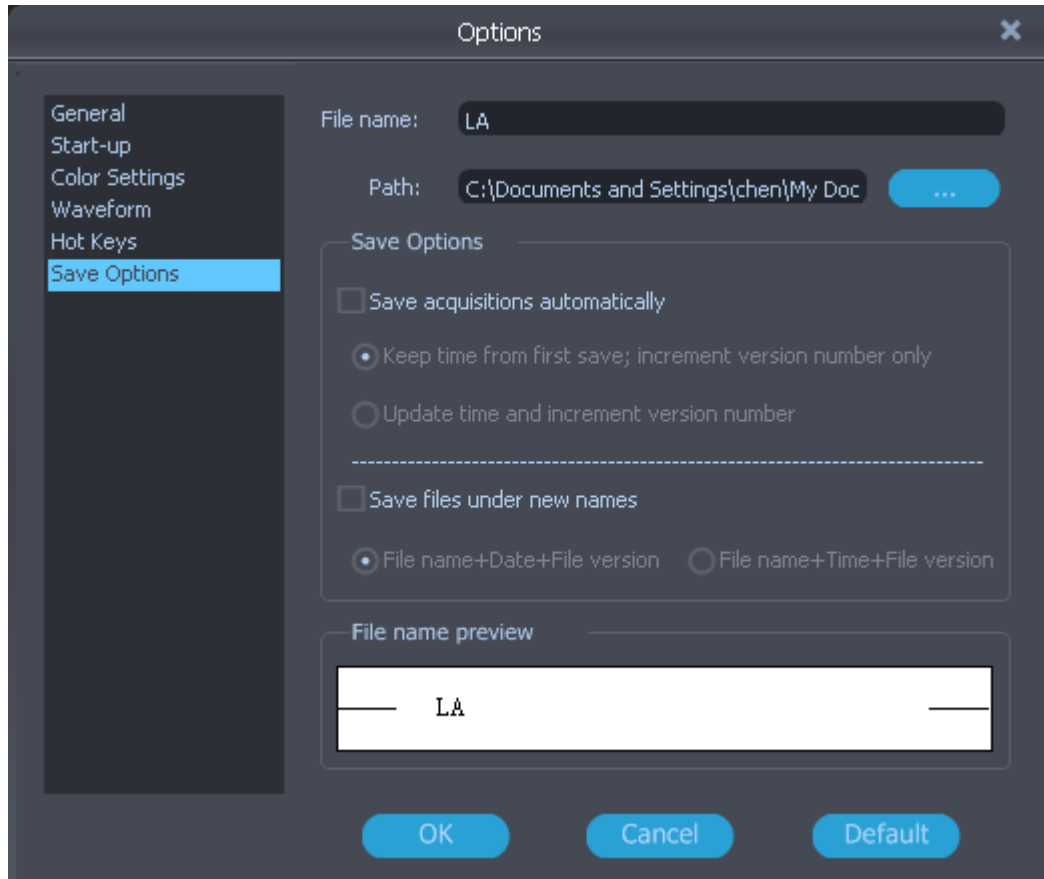


Figure 3-6 Save Options dialog box

Item	Description
File name	Choose a name for the files to be saved; the default is ZP-Studio.
Path	Choose where to save files; the default is C:\Documents and settings\Administrator\ My Documents\ ZP-Studio Data (if C: is the system disk).
Save Options	
Save acquisitions automatically	Auto-save all acquisitions.
Keep time from first save; increment version number only	When saving multiple acquisitions the file names will all preserve the time of the first save and only change version 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 version.	Add the date [Year, Month, Day] and version number after the file name. Ex: August 25 th 2015 becomes ZP-Studio_20150825(1).
File name + Time + File version	Add the time (Hour, Minute, Second) and the version number after the file name. Ex: 13:45:02 pm becomes ZP-Studio_134205(1); default selection.
File Name Preview	Preview the name of files to be saved.

Table 3:3:7 Save Options dialog box description

If the "Save files under new names" 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.

3.2.12. ZP-Studio Version

ZP-Studio Version window shows the software version, modification history, the instrument model, serial number and so on; see [錯誤! 找不到參照來源。](#). This window is almost identical to the information window shown the first time the ZP-Studio is started.

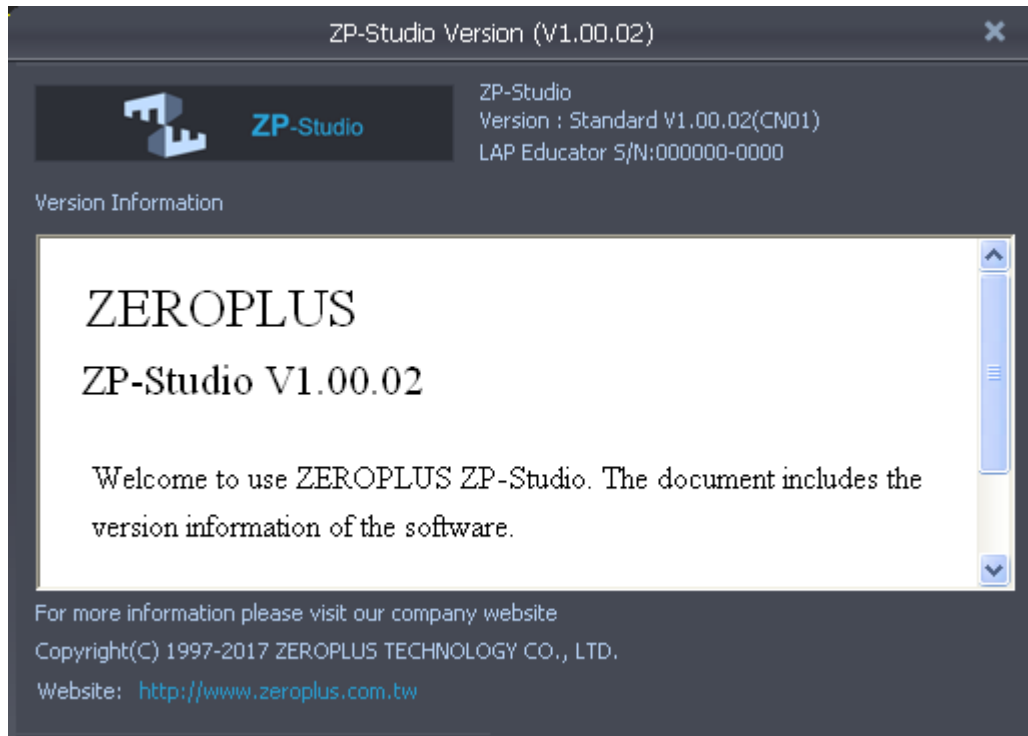


Figure 3-16 ZP-Studio Version information window

3.2.13. User's Guide

Click the User Guide item to open the Help file. The User Guide file contains descriptions of the installation procedure and of menus and functions. It contains a Search function to facilitate lookups.

Hot Key: F1.



3.2.14. Send Feedback

The Send Feedback form can be used to contact our Technical Support if the user runs into a problem. Users who prefer to contact our Technical Support team by means of regular email should use the following address: service_2@zeroplus.com.tw

3.3. Single Run

Right click the button , the menu show as follow.

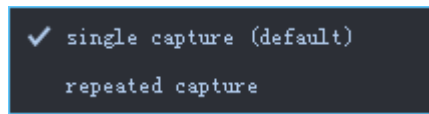




Figure 3-7 Single Run Right-click menu

Item	Description
Single capture(default)	Acquisition signal one time or continuously with the current sample and trigger Setting. Hot Key: F5.
Repeated capture	Acquisition signal continuously with the current sample and trigger until pressing cancel Hot Key:CTRL+F5.

Table 3:3:8 Single Run Right-click menu description

3.4. Sample Settings

Click the button  on the UI, the Sample Settings dialog shows as the figure 3-18. There are Sample rate (Internal or External clock), Memory, Trigger Level and

Trigger Position. Enable compression function or not by click the button .

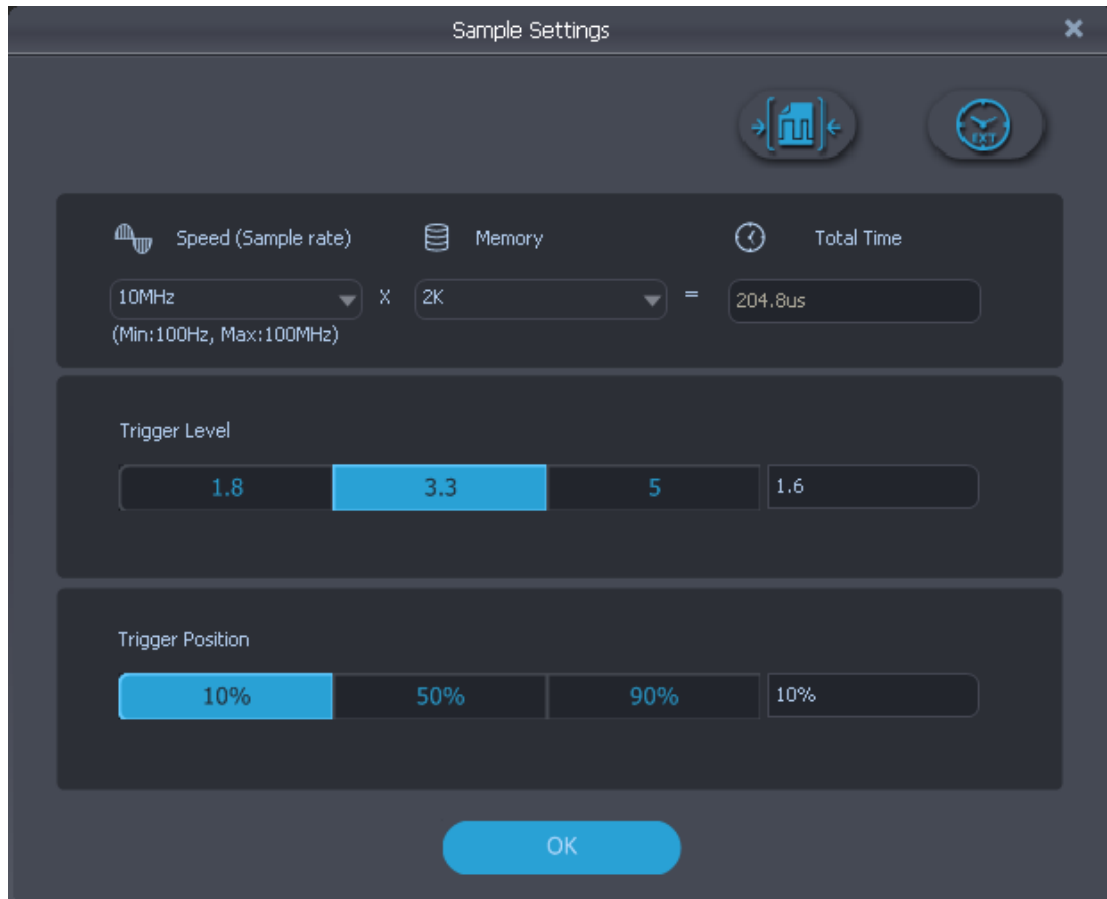



Figure 3-8 Sample Settings dialog box

If need to use the External clock by clicking the button , the setting dialog shows as figure 3-19.

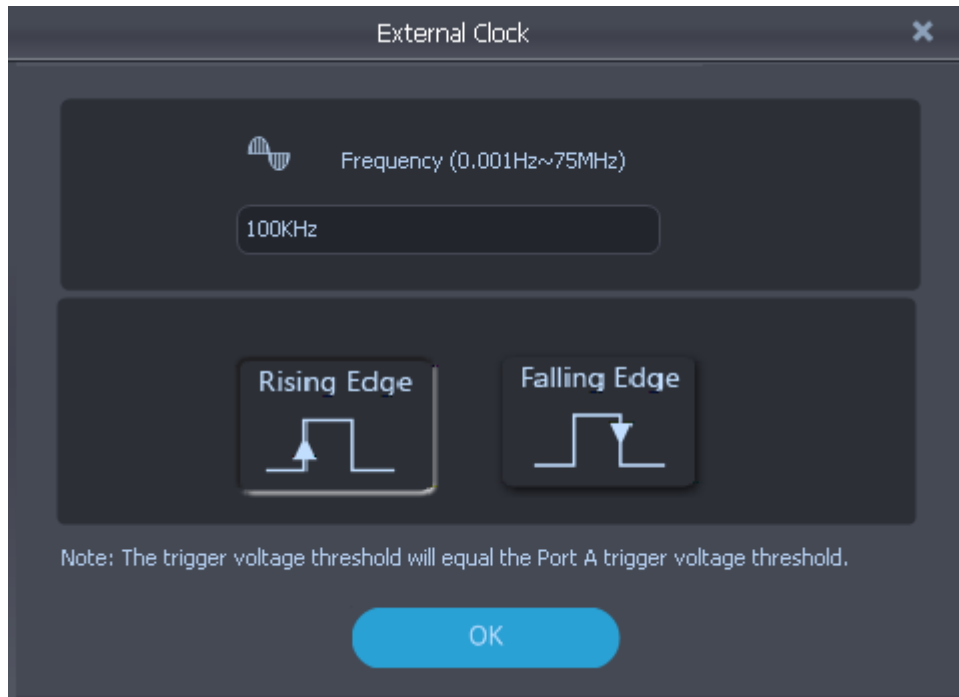


Figure 3-9 External Clock dialog box

Item	Description
Speed(Sample rate)	Also called asynchronous acquisition, the input signals are sampled and stored at equal time intervals based on LAP Educator's internal clock. The sample rate determines how often samples are taken. The Timing mode sample rate goes from 100Hz to 100MHz.
External Clock	Also called synchronous acquisition, the clock that governs when to sample data is provided by the DUT. External Clock 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 External sample rate goes from 0.001 Hz to 75MHz.
Memory	Determine the amount of data to be acquired per channel; it is set to 2 k by default.
Total Time	The total time of acquiring data depend on Sample rate and Memory.
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. That is set -6V to +6V.
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.
Compression	The Compression function can be used to extend the length of acquisitions. The principle goes as follows: Rather than storing 100 consecutive 1s, the LAP Educator stores 1x100 using the hardware based algorithm. The function is therefore most efficient when sampling buses that are idle for significant amounts of time, when a maximum compression rate of 255 can be reached. In other words, 1 Mb of memory can be used to acquire up to 255 Mb of data. Note that the function is disabled by default as a negative compression rate is possible for signals with high variability. Note that no data will be lost when using Compression.

Table 3:3:9 Sample Settings dialog box description

3.5. Channel Column

Right click the channel column and the menu as figure 3-20.

**Figure 3-20 Channel Column Right-click menu**

Item	Description
Add Channel/Bus	Add a channel or bus.
Copy	Copy a channel or bus. Hot Key: CTRL+C.
Paste	Paste the copied channel or bus. Hot Key: CTRL+V.



Delete	Delete the selected channel or bus. Hot Key: DELETE.
Rename	Rename the selected channel or bus. It is invalid if multi-select. Hot Key: F2.
Bus/Protocol Analyzer Property	Open the setting dialog of bus or Protocol Decoder, and it is valid right clicking the bus/ Protocol name.
Numeric base/Encoding	Change the format of data.
Image Encode	Encode the data as image.
Analog Waveform	Show the change with analog waveform.
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.
Restore Default Channels	Restore all Bus/Channels settings to default.

Table 3:3:10 Channel Column Right-click menu description

3.5.1. Add Channel/Bus

➤ *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 [錯誤! 找不到參照來源。](#) where four channels have been added.

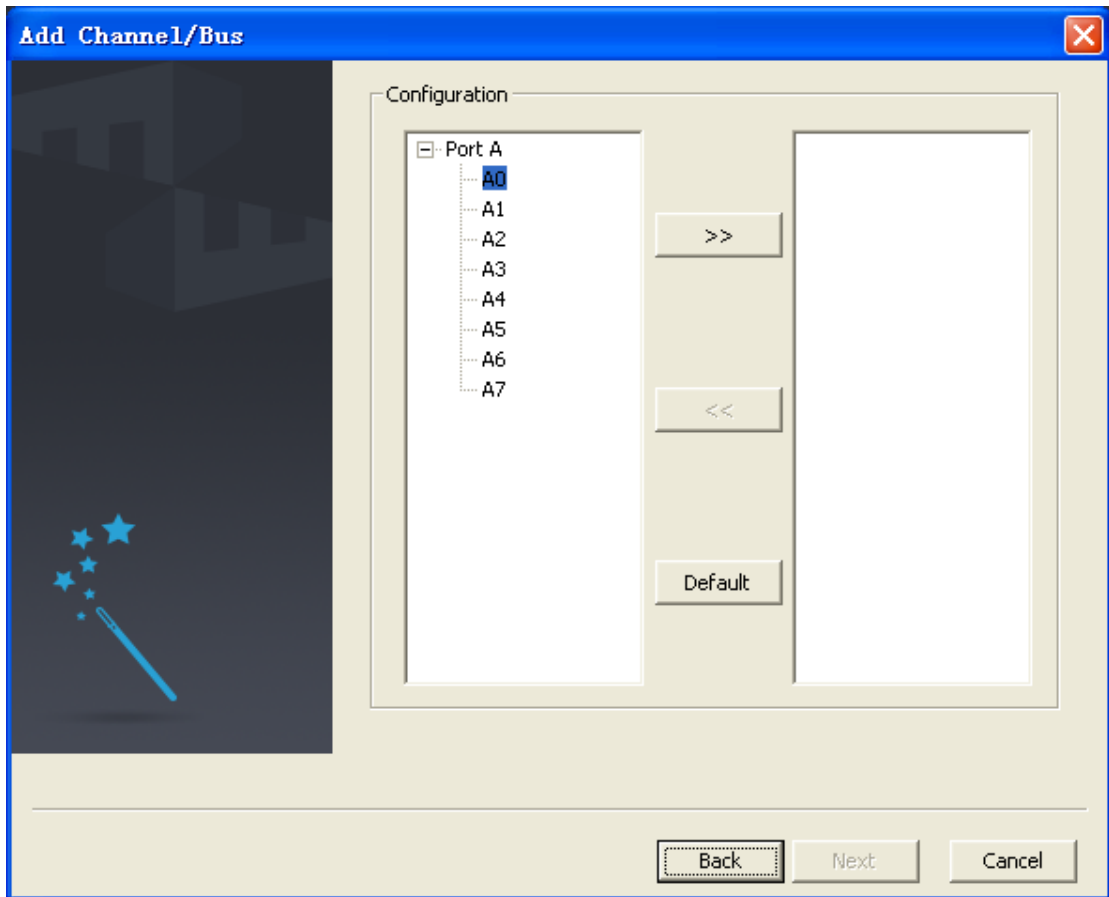


Figure 3-21 Add Channel dialog box

➤ **Add Bus**

Adding a bus follows the same routine as adding a channel, but the dialog box differs slightly; see Figure 3-. First, it links to the High Level Settings dialog box; see Figure 3-. 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.

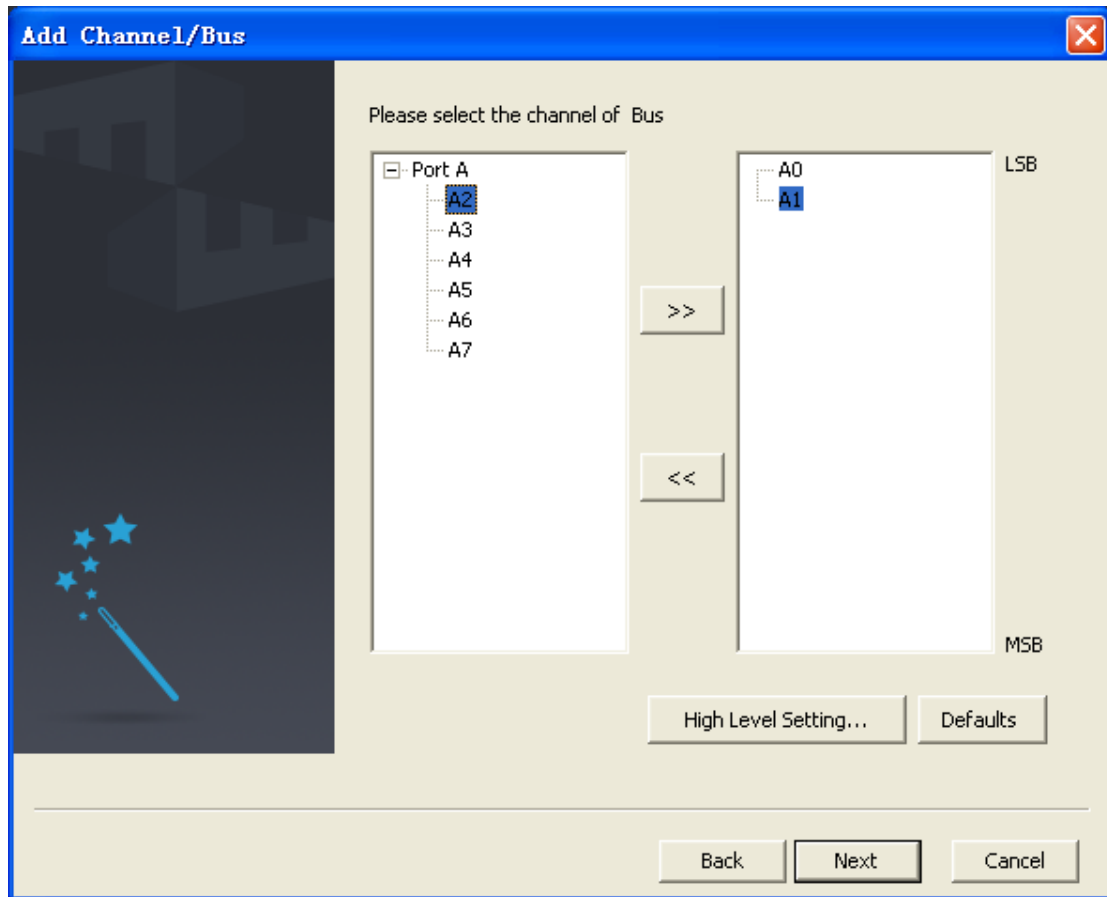


Figure 3-22 Add Bus dialog box

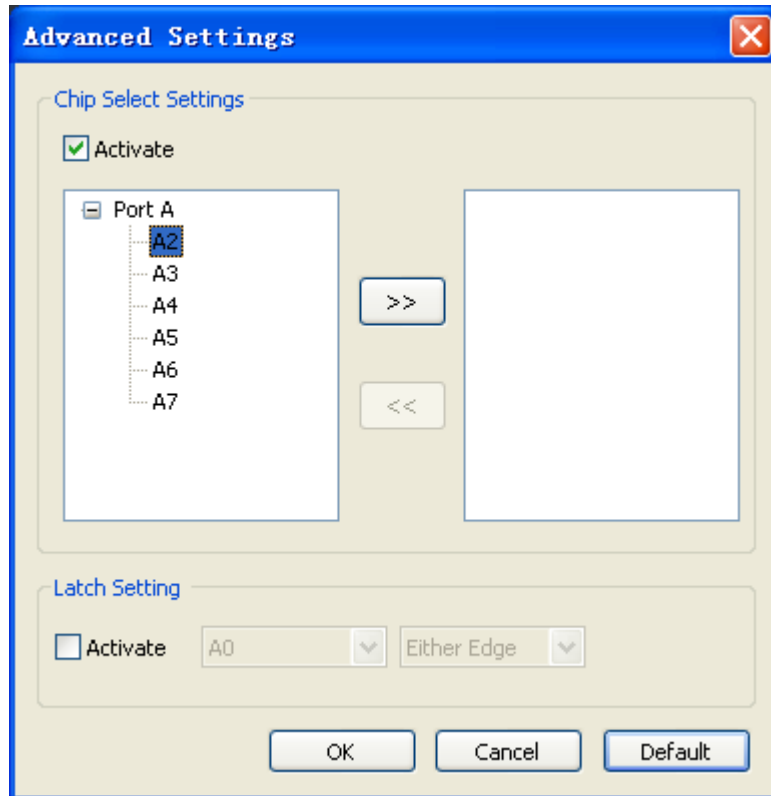


Figure 3-23 Add Bus / High level Settings dialog box

Item	Description
Chip Select Settings	
(Channel and Level)	The Chip Select function emulates a real chip select. The function is similar to the Latch function (below) in that it decodes bus data, but it only does so when all the conditions are met.
Latch Setting	
(Channel and Event)	The Latch function is used to analyze/decode bus activity that does not use a specific protocol (referred to simply as a Bus in ZP-Studio). 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.

Table 3:3:11 Add Bus / High level Settings dialog box description

➤ **Add Protocol Decoder**

Select the desired Protocol Decoder from the dialog box shown in Figure 3-. 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.

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

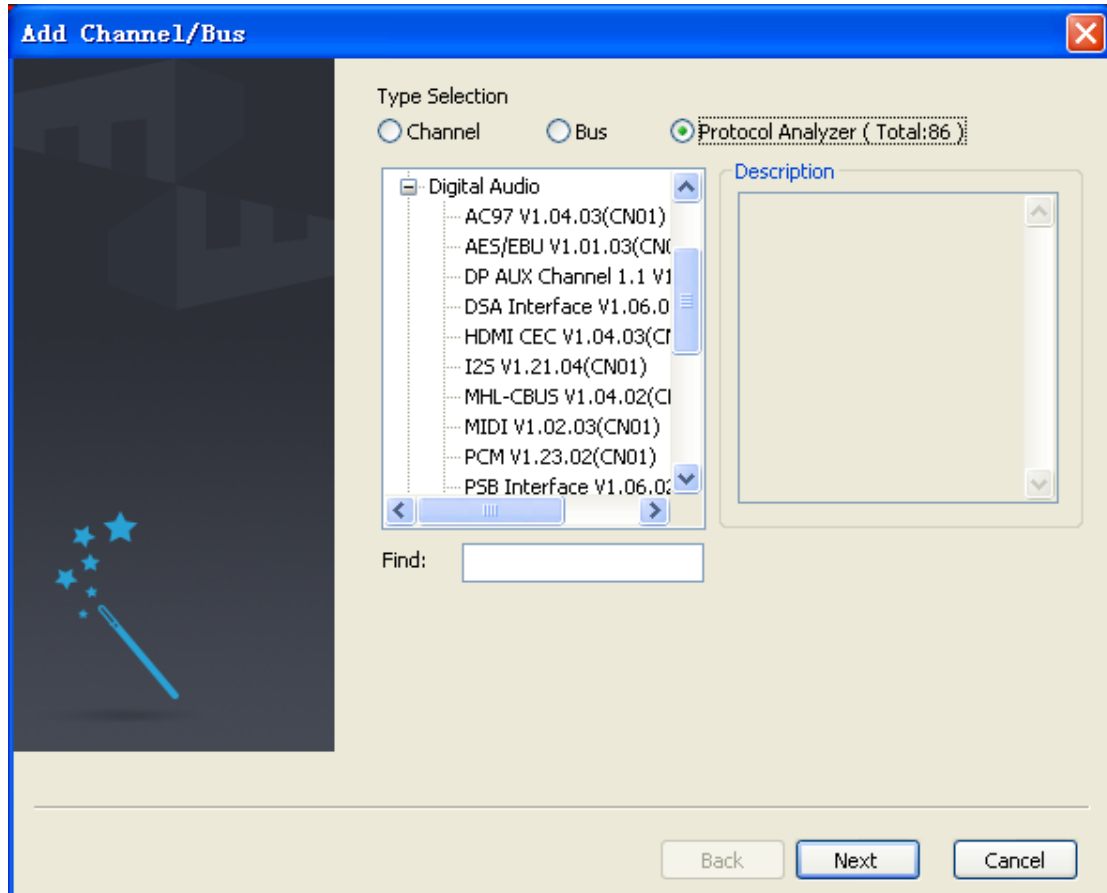


Figure 3-24 Add Protocol Decoder dialog box

The ZP-Studio comes with more than 80 free protocol decoders; these are listed in Table 3:.. The protocol decoders are individual modules that are separated from the ZP-Studio software.

The protocol decoder dialog box shown in Figure 3- is an example that shows the I2C decoder setup. Note that all protocol decoder dialog boxes have distinct designs.

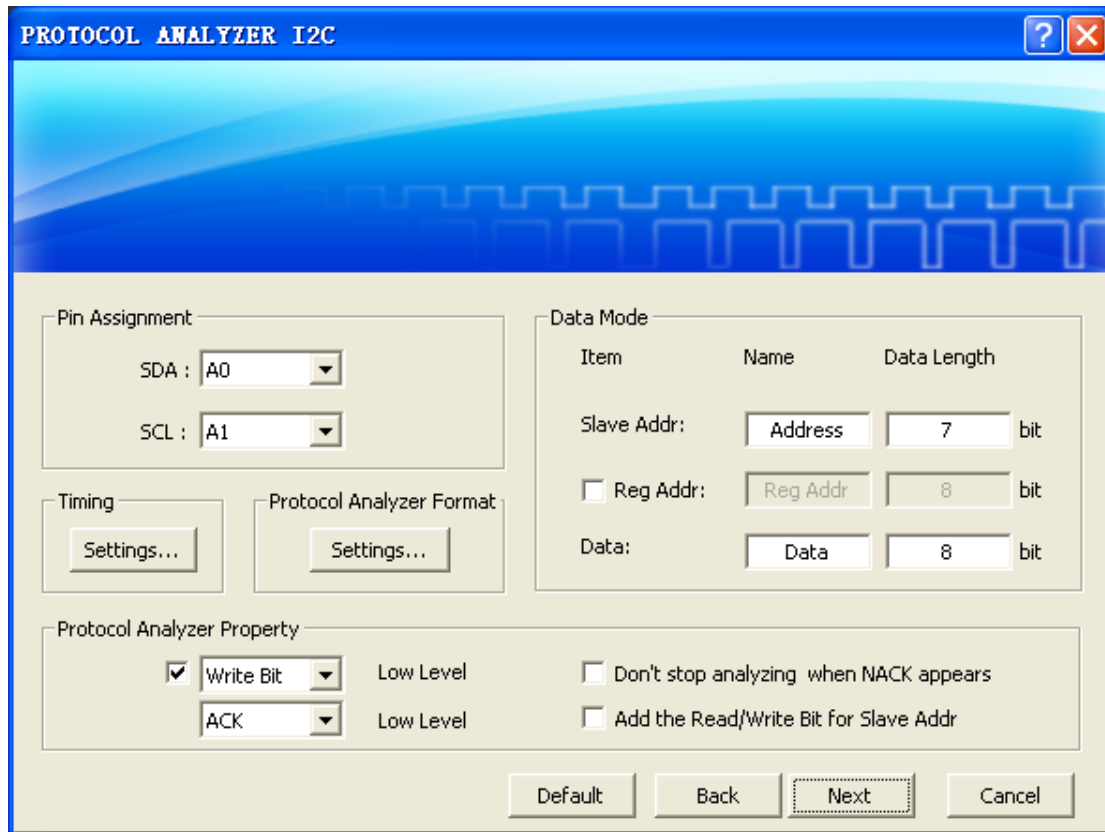


Figure 3-25 I2C Protocol Decoder Setup dialog box

3.5.2. Image Encode

The Image Encode function is specially designed for display type protocols such as I2S, 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 3- for an example of the function's output.

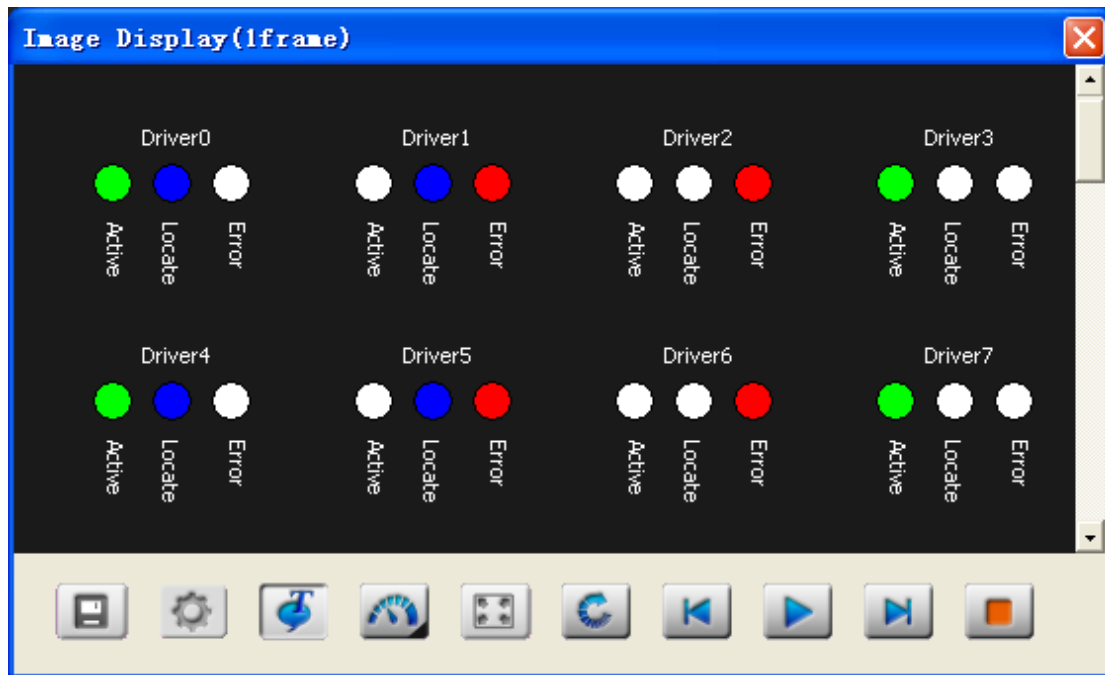


Figure 3-26 Image Encode for Serial GPIO IBPI

The Image Encode function supports the following protocols:

- DMX512
- I2S
- LCD1602
- LED Pitch Array
- LG4572
- Serial GPIO IBPI

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

3.5.3. Analog Waveform

The 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 3-.

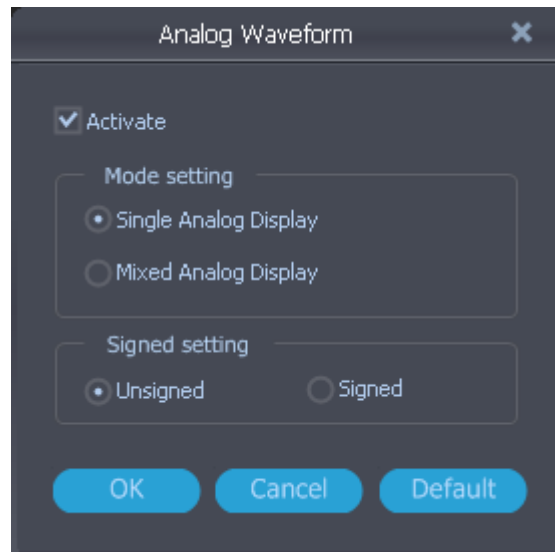


Figure 3-27 Analog Waveform dialog box

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 3:17 Analog Waveform dialog box description

Figure 3- shows a simple example output based on four signals changing state on regular intervals (signals A0 in dark red to A3 in green are used in the example).

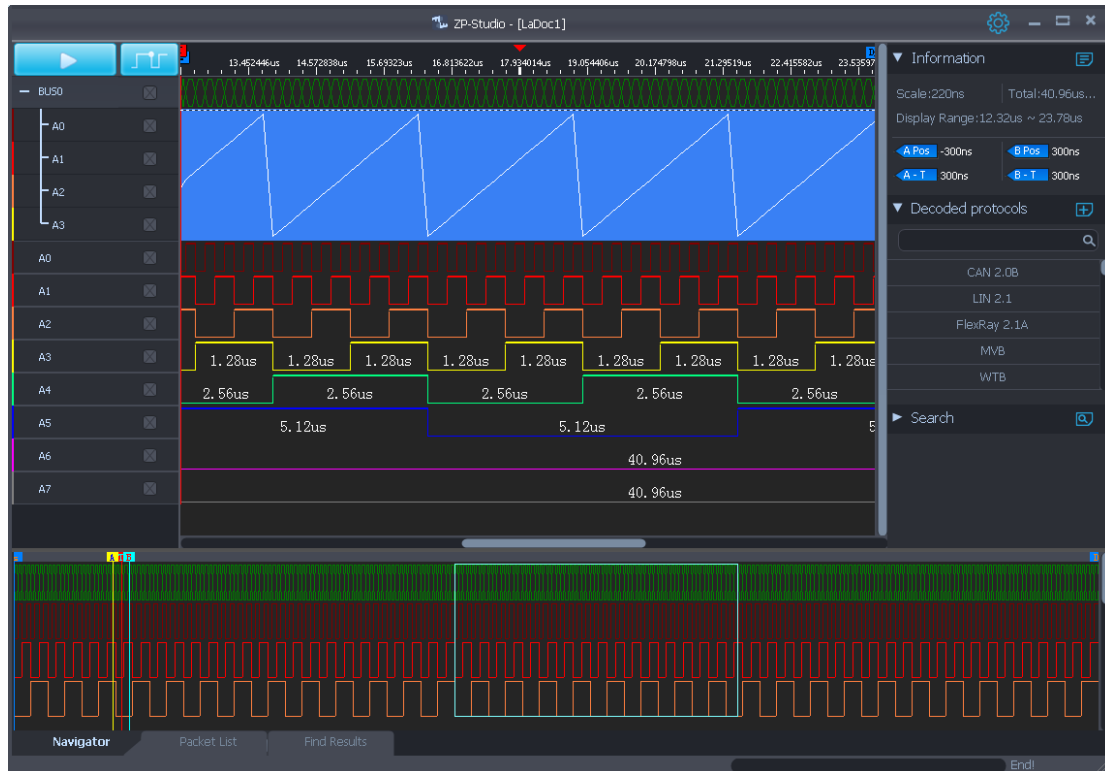


Figure 3-28 Analog Waveform example

3.6. Trigger Column

Right click the Trigger column and the menu as figure 3-29.

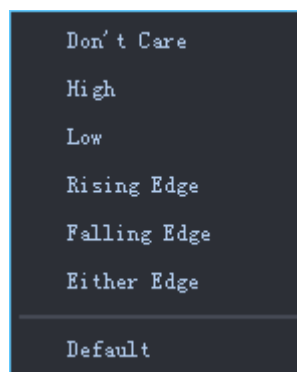


Figure 3-29 Trigger Column Right-click menu

Item	Description
Don't Care	No trigger condition.
High	Trigger on a high level, i.e. the state of the signal is 1.

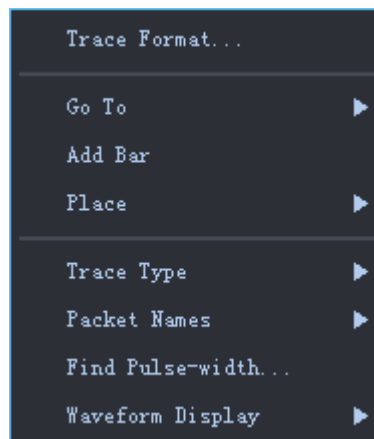


Low	Trigger on a low level, i.e. the state of the signal is 0.
Rising Edge	Trigger on a change of state of the signal from 0 to 1 (low to high).
Falling Edge	Trigger on a change of state of the signal from 1 to 0 (high to low).
Either Edge	Trigger on a change of state of the signal; either from 0 to 1 (low to high) or from 1 to 0 (high to low).
Default	Reset the trigger conditions of all channels.

Table 3:18 Trigger column right-click menu description

3.7. Waveform Area

Right click the Waveform Area and the menu as figure 3-30.

**Figure 3-30 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. 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.
Go To	Go To function is used to find and navigate to a bar.
Add Bar	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

Place



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).
User 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 Names	Display abbreviated (initials) or full packet name.
Find Pulse-width	Find the pulse-width of a signal.

Waveform

Display

Time Display	Show the time between two edges.
Sample Site Display	Show number of samples between two edges.
Frequency Display	Show frequencies between two edges. The frequency of full period (rising to rising edge) is displayed. See 錯誤! 找不到參照來源。 for more details on the Trace Information.
Hide time of waveform	No information is shown inside the traces; this is the default option.

Table 3:19 Waveform area right-click menu description

When right-clicking on a bar, the menu from Figure 3- is shown.

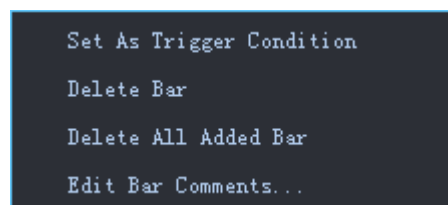


Figure 3-31 Bar; right-click menu



Item	Description
Set As Trigger Condition	Set the trigger condition of each channel to equal the state (or edge) of the channel where the selected bar is located.
Delete Bar	Delete the selected bar.
Delete All Added Bars	Delete all added 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 3:3:12 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.

3.8. Information

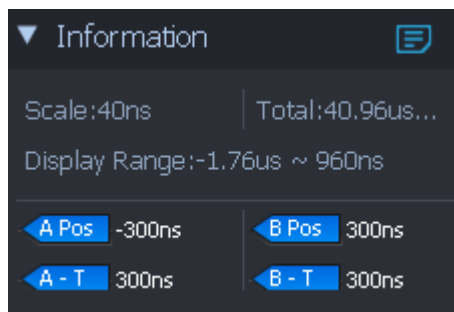


Figure 3-32 Information Display Area

Item	Description
Scale	The scale is the inverse of the zoom level.
Total	Total acquisition time.
Display Range	Timing information for the part of the waveform currently in view.

	The position of the A-bar; click to select another bar.
	The position of the B-bar; click to select another bar.
	Time difference between the A and T-bars; click to select a different range.
	Time difference between the B and T-bars; click to select a different range.

Table 3:21 Information Display Area description

3.9. Protocol decoders

Quick look for and add a protocol bus that same as Add Protocol Decoder Chapter 3.5.1.

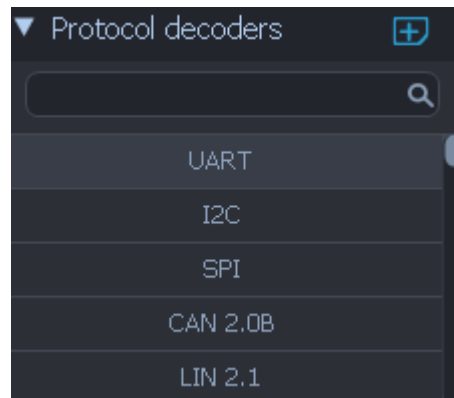


Figure 3-33 Protocols decoders Area

Table 3: lists the protocol decoders available in ZP-Studio.

Built-in Protocol Decoders		
1-WIRE	I2S	Philips RC-5
1-WIRE (Advanced)	IRDA	Philips RC-6
3-WIRE	ISO7816 UART	PMBus 1.1
AC97	JK FLIP-FLOP	PROFI BUS
AES_EBU	JTAG 2.0	PS/2
AMD_SVI2	KEELOQ Code Hopping	PSB Interface
ARITHMETICAL LOGIC	LCD1602	PT2262/PT2272
BDM	LED Pitch Array	QI
BMS	LG4572	S/PDIF
CAN 2.0B	LIN 2.1	S2Cwire/AS2Cwire
DALI Interface	Line code	SCCB
DDC EDID	MANCHESTER	SDQ



Differential Manchester	MDDI	Serial GPIO IBPI
DIGITAL LOGIC	MHL-CBUS	SHT11
DMX512	MICROWIRE	SLE4442
DP AUX Channel 1.1	MICROWIRE (EEPROM 93C)	SMBus 2.0
DS1302	MIDI	SPI
DS18B20	MII	SPI Compatible(Atmel Memory)
DSA Interface	MILLER	SSI Interface
DSI Bus	MIL-STD-1553	ST7669
FLEXRAY 2.1A	ModBus	STBus
HART	MODIFIED MILLER	UART
HIDOverI2C	MODIFIED SPI	UNI/O
HDMI CEC	MVB	USB 1.1 plus
HDQ	NEC PD6122	Wiegand
I2C	OPENTHERM 2.2	WTB
I2C (EEPROM 24L)	PCM	WWV/WWVH/WWVB
I2C (EEPROM24LCS61/24LCS62)	PECI	YK-5
USB PD3.0	HDLC	

Table 3:22 Built-in protocol decoders

3.10. Search

Quick search for needed data show Figure 3-34. The results are shown in the Find Results.

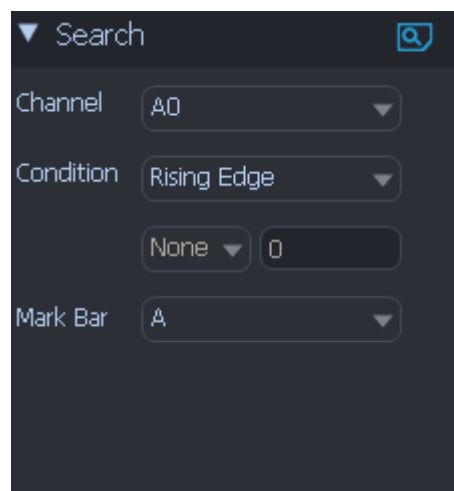


Figure 3-34 Search Area



Item	Description
Channel	Set the need to find the bus/channel and conditions.
Condition	Set the needed condition with Rising Edge, Falling Edge, Either Edge and the value of bus.
Mark Bar	Mark the results with bar default A-bar.

Table 3:23 Search Area description

3.11. Secondary Display

3.11.1. 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 3-) 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 3-.

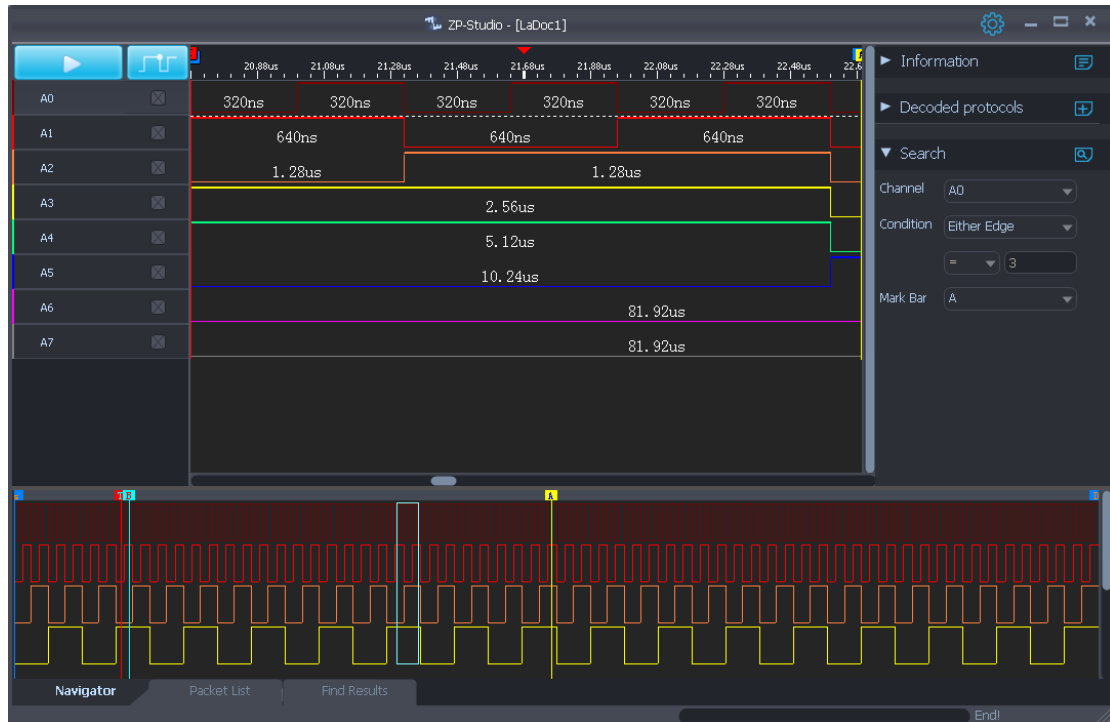


Figure 3-35 Navigator window example showing

3.11.2. 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 3-.

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.

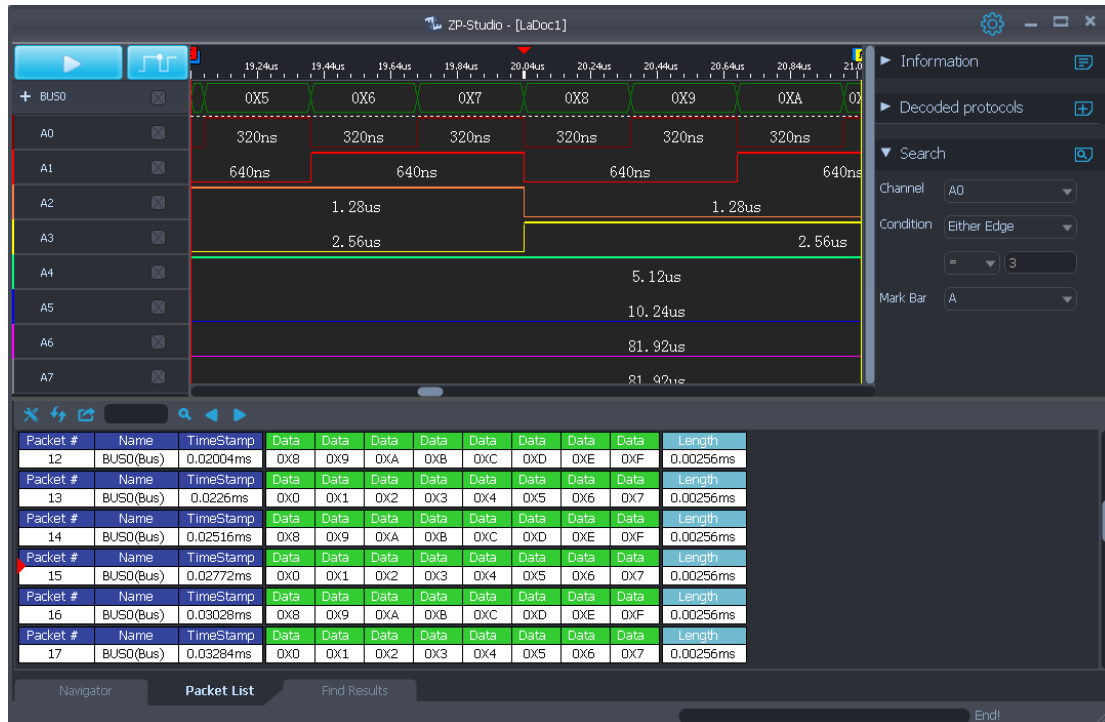


Figure 3-36 Packet List window example showing an SPI protocol

Item	Description
Menu Bar	
	Settings; Open the Packet List Settings dialog box; see Figure 3-.
	Refresh the content.
	Export: Export the packet list.
	Find a particular packet and display at the top of the Packet List. The data is highlighted with a red frame when found.
	Go to the previous or next packet that satisfies the Find condition.
Display Area	
Packet#	The number of packet.
Name	The packet name.
TimeStamp	The start time ranks the packets by ZP-Studio.
Data	The data in the packet.
Length	The length between the start point and the end point.

Table 3:24 Packet List Items description

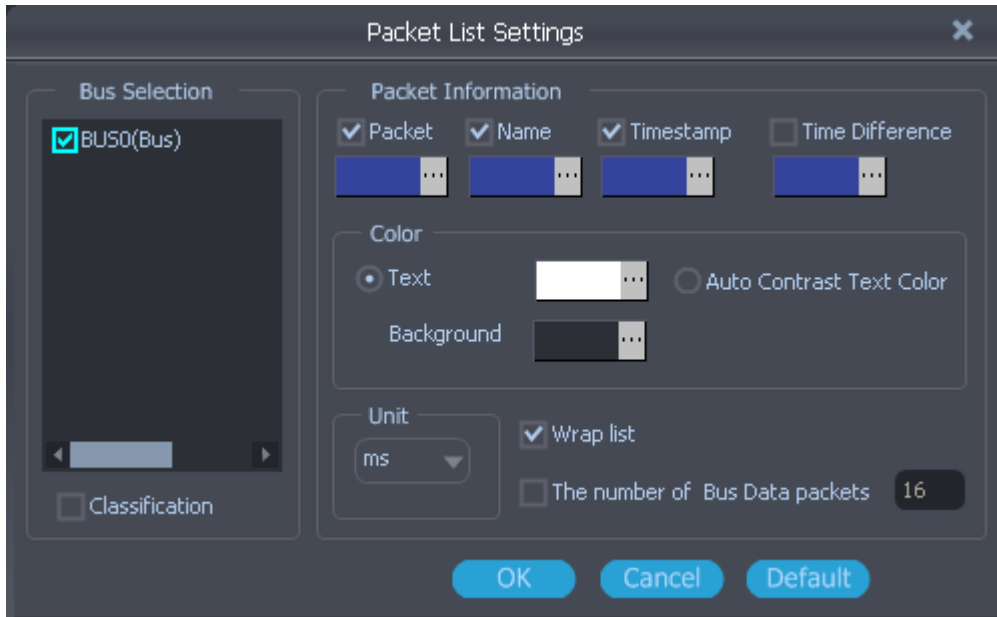


Figure 3-37 Packet List Settings

Item	Description
Bus Selection	Select the buses to be displayed. Multiple bus, can only choose one
Packet Information	
Packet	Packet number.
Name	Include the names of the packets.
Time Stamp	Select the Packet start time to be displayed and color.
Time Difference	Time difference from packet X to packet X-1.
Color	
Text	Change the text color; by default it's white.
Auto Contrast Text Color	Automatically select text colors that contrast their background 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 Data packets	When Wrap List is enabled, select how much data packets to be shown per line (between 1 and 64); applies to Data only.

Table 3:25 Packet List Settings description

Figure 3- shows the menu that is shown when right-clicking in the Packet List.

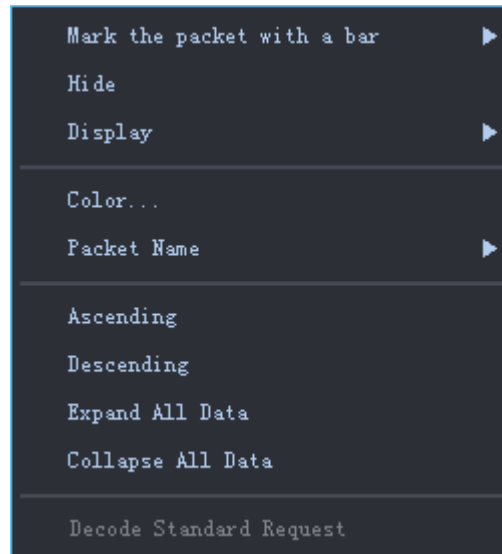


Figure 3-38 Packet List Right-click menu

Item	Description
Mark the packet with a bar	Mark the selected packet with the bar, and the start packet show in waveform center.
Hide	Hide the current selection of packets.
Display	Display the hidden packets.
Color	Change the packet color.
Packet Name	Select packet name with abbreviation or full-name.
Decode Standard Request	Some protocols support it.

Table 3:26 Packet List Right-click menu description

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.

3.11.3. Find Results

The Find results function is used to locate events within a certain data range, using a straight-forward interface shown in Figure 3-.

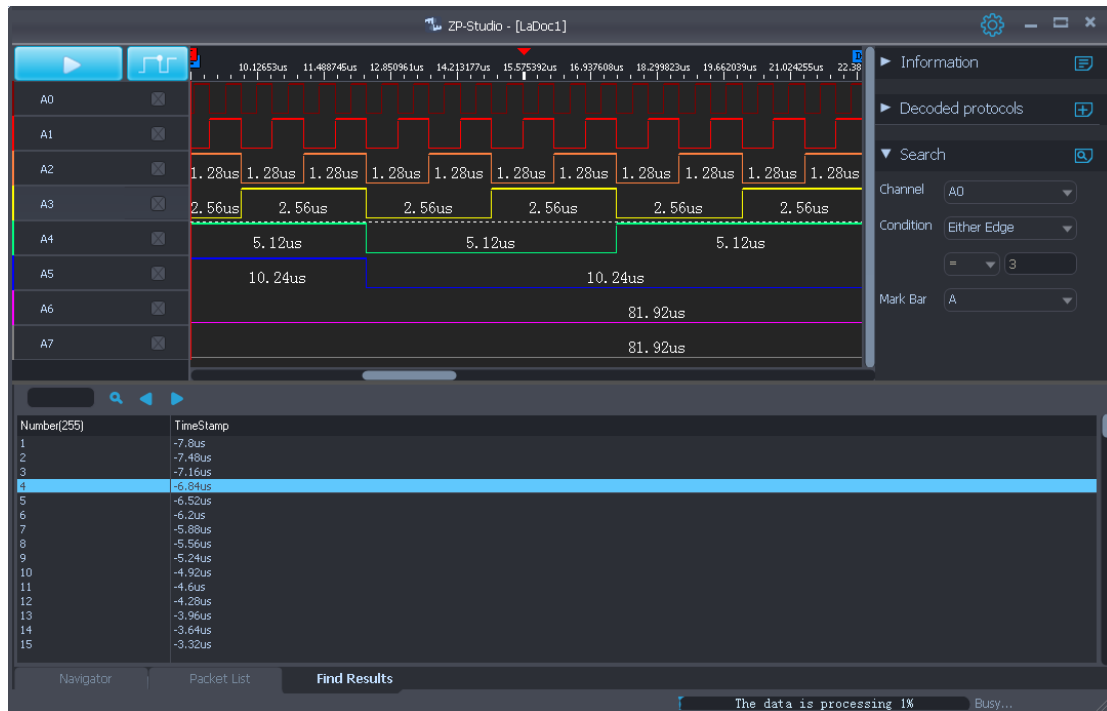


Figure 3-39 Find Results dialog box

Item	Description
	Input the number of results, then jump to it quickly and show it with marked bar in the waveform area.
	Look for the previous or next result.
Number	The total number of result that meet setting.
TimeStamp	Show the position of the result.

Table 3:27 Find Results dialog box description



4. Contact Us

Sales Department

Email service_1@zeroplus.com.tw

Phone +886-2-6620-2225 extension #221 or #311

Table 4:4:1 Sales department contact info

Technical Support

Email service_2@zeroplus.com.tw

Phone +886-2-6620-2225 extension #374

Table 4:4:2 Technical support contact info