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Installation Guide

PC-Based Logic Analyzer LAP-B Series

LAP-B (70256) / LAP-B (702000)

Index

Preface

This Quick Start Guide is designed to help new and intermediate users navigate and perform common tasks with the Zeroplus Logic Analyzer. Despite its simple packaging and interface, the Logic Analyzer is a sophisticated measurement and analysis tool. It is also a highly sensitive electrical current sensing device. Users must carefully read instructions and procedures pertaining to installation and operation. Any instrument connected to the unit should be properly grounded. A pair of anti-static gloves is strongly recommended when performing a task with the device. To ensure accuracy and consistency of output data, use of the bundled components is strongly recommended.

User opinions are very important to Zeroplus. Please contact our engineering team by telephone, fax or email with your questions or feedback. Thank you for choosing the Zeroplus Logic Analyzer.

1 Features of the Zeroplus Logic Analyzer

In this chapter, users will learn about the package contents, description, hardware specifications, system requirements, and safety issues of the Zeroplus Logic Analyzer. Though this chapter is purely informative, we highly recommend reading this carefully to ensure safety and accuracy when performing any operation with the Zeroplus Logic Analyzer.

1.1 Package Contents

Verify the package contents before discarding packing materials. The following components should be included with your product. For assistance, please contact our nearest distributor.

Table 1-1: Parts list for retail packages

Models	LAP-B(70256)	LAP-B(702000)
Logic Analyzer	1	1
AC Power Cable	1	1
8-Pin Testing Cable	8	8
Probe	36 pcs *2	36 pcs *2
USB Cable	1	1
Getting Started Guide	1	1
Driver CD**	1	1
1-PinTesting Cable (White)	4	4
2-Pin Testing Cable (Black)	4	4

* This Driver CD consists of a multilingual software interface program, as well as a multilingual User's Manual.

Fig. 1-1: Logic Analyzer

(8-Pins x 2+2-Pins*1+1-Pin*1)*4

Fig. 1-2: Testing Cables

36 pcs*2

Fig. 1-3: Probes
(varied depending on models)

Fig. 1-4: USB Cable

Fig. 1-5: Getting Started Guide

Fig. 1-6: USB Cable

Fig. 1-7: BNC Cable

Fig. 1-8: AC Power Cable

Fig. 1-9: Tool Box

1.2 Introduction

Zeroplus Logic Analyzer models LAP-B(70256), and LAP-B(702000) all share the same external features as illustrated in the following figures.

Fig. 1-9: A view of the Zeroplus Logic Analyzer LAP-B Series. see *Fig 1-12* for detailed information on the **Signal Connectors**.

Fig. 1-10: Rear view of the Zeroplus Logic Analyzer LAP-B Series.

Fig. 1-11: List of functional pins in each model.

Models	LAP-B(70256)	LAP-B(702000)
Port A **(A0~A7) (A8~A15)**	X	X
Port B **(B0~B7) (B8~B15)**	X	X
Port C **(C0~B7) (C8~C15)**	X	X
Port D **(D0~B7) (D8~D15)**	X	X
GND	X	X

Table 1-2: Definitions and Functions of pins for all models.

Models	LAP-B(70256)	LAP-B(702000)
Trigger Out	X	X
Trigger In (T0)	X	X
External Port	X	X

Trigger In (T0)	Trigger In Pin	When a trigger condition is established, the **T_In (T0)** will send a **Rising Edge** signal of DC3.3V.
Trigger Out	Trigger Out Pin	When a trigger condition is established, the **T_O** will send a **Rising Edge** signal of DC3.3V.
GND	Ground Pins	Two pins used for grounding the Logic Analyzer with a given external module to be analyzed.
External Port	Clock & Trigger In	There are T1 & T2 trigger in pins and C1 & C2 clock pins located at external port. Connects a given external signal to be analyzed

Table 1-3: Definitions and Functions of pins for advanced models (1).

R_O	Read (Out)	When the Logic Analyzer is about to upload data from memory to the PC, the **R_O** will send a **Rising Edge** signal of DC3.3V. When the upload is finished, a **Falling Edge** signal is sent.
T_O	Trigger (Out)	When a trigger condition is established, the **T_O** will send a **Rising Edge** signal of DC3.3V. When memory is full, a **Falling Edge** signal is sent.
S_O	Start (Out)	When a user initiates a sampling task by clicking the RUN icon in the window or clicking the START button on the device, the **R_O** will send a **Rising Edge** signal of DC3.3V. When the Logic Analyzer finishes uploading, a falling edge signal is sent.

Table 1-4 : Definitions and Functions of pins for advance models (2).

1.3 Hardware Specifications

Table 1-5: Hardware specifications of LAP-A Series.

Items\Type	LAP-B(70256)	LAP-B(702000)
Interface	USB 2.0 (1.1)	
Operating System	98SE/ME/2000/XP/Vista	
Power Supply	USB 1.1 (USB 2.0 Recommended)	
Channels	64	
Bandwidth	100MHz	
Memory Depth (Per Channel)	256 Kbits	2 MBits
Internal Clock Rate (asynchronous)	100 Hz ~ 400 MHz	
Max External Clock (synchronous)	Max 150MHz	
Trigger Condition	Edge/Pattern	
Pre-Trigger/ Post-Trigger	Yes	
Trigger Level	9 Levels	16 Levels
Trigger Count	1-65535	
Max Trigger Page	Max 8192	
Buses Data Decoded	Yes	
Enable Delay	Start: Edge and Pattern End: 1-65535	
Compression	64 Channel Compression 2^{31}	

1.4 System Requirements

This section discusses basic operating system and hardware requirements for the Logic Analyzer. Software and hardware capabilities may vary depending on PC configuration,. This manual assumes proper installation of a supported operating system as listed below.

1.4.1 Operating System Requirements

In this sub-section, we share our experiences testing the Zeroplus Logic Analyzer on the following Microsoft Windows operating systems. Since the Zeroplus Logic Analyzer requires operating system support of the USB protocol, Windows 95r2 and earlier OS versions are incompatible.

1) Windows NT 4.0 Workstation & Server, Service Pack 6 – not recommended
2) Windows 98, 98 Second Edition - supported
3) Windows ME – not recommended
4) Windows 2000 Professional, Server Family - supported
5) Windows XP Home, Professional Editions (32-Bit versions) - supported
6) Windows Server 2003 Standard Edition, Enterprise Edition, Small Business Edition. (32-Bit Versions) – not supported
7) Windows Vista (32-Bit Version or 64-Bit Version) - supported

1.4.2 Hardware System Requirements

- **CPU**
  Windows NT, 98, 98 SE
  166 MHz, or above.
  Windows 2000, XP
  300 MHz, or above (strongly suggest 900 MHz, or above).
  Windows Vista
  1GHz, or above

- **Memory**
  Windows NT, 98, 98 SE
  128 MB or above (64 MB minimum).
  Windows 2000, XP
  256 MB or above (128 MB minimum).
  Windows Vista
  1GB or above

- **Hard Drive**
  At least 100 Mb available space.

- **USB**
  USB 1.1 compatible (recommend USB 2.0).

- **Display Devices** (recommended)
  1. 17" monitor with 1024x786 resolution or higher.
  2. 8MB SDRAM on Video Card.

1.5 Device Maintenance and Safety

Follow these instructions for proper operation and storage of the Logic Analyzer.

Table 1-7: General Advice

Cautions	• Do not place heavy objects on the Zeroplus Logic Analyzer. • Avoid hard impacts and rough handling. • Protect the Logic Analyzer from static discharge. • Do not disassemble the Zeroplus Logic Analyzer; this will void the warranty and could affect its operation.
Cleaning	• Use a soft, damp cloth with a mild detergent to clean. • Do not immerse or spray any liquid on the Zeroplus Logic Analyzer.. • Do not use harsh chemicals or cleaners containing substances such as benzene, toluene, xylene or acetone.

Table 1-8: Electrical Specifications

Items	Minimum	Typical	Maximum
Working Voltage	DC 4.5 V	DC 5.0 V	DC 5.5 V
Current at Rest			200 mA
Current at Work			400 mA
Power at Rest			1 W
Power at Work			2W
Error in Phase Off*			**± 1.5 nS**
V_{input} of Testing Channels			± DC 30 V
$V_{Reference}$	DC -6		DC +6 V
Input Resistance		500KΩ/10pF	
Working Temperature	5°C		70°C
Storage Temperature	-40°C		80°C

Table 1-9* refer to the User Manual for error analysis calculation.

: Operating Environment

WARNING	• Avoid direct sunlight • Use in a dust free, non-conductive environment (see Note) • Relative Humidity: < 80% • Altitude: < 2000m • Temperature: 0 ~ 40 degrees C This is a Class A product which may cause radio interference in a domestic environment.
	Note: EN 61010-1:2001 specify degrees of pollution and their requirements. Logic Analyzer falls under Level 2. Pollution refers to 'addition of foreign matter, solid, liquid or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity'. Pollution Degree 1: No pollution or only dry, non-conductive pollution occurs. This pollution has no effect. Pollution Degree 2: Normally only non-conductive pollution occurs. Occasionally, however, temporary conductivity caused by condensation must be expected. Pollution Degree 3: Conductive pollution occurs or dry, non-conductive pollution occurs which becomes conductive due to condensation. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation and wind, but neither temperature nor humidity is controlled.
Storage Environment	Relative Humidity: < 80% Temperature: 0 ~ 50 Degrees C

Conclusion

After reading this section, users should have a basic grasp of the Logic Analyzer. A complete understanding of the **Safety and Care Recommendations section** is a critical prerequisite of any further operation as presented in the User Manual.

2 Installation

This chapter describes installation of the Logic Analyzer hardware and software. Software installation steps must be followed precisely to ensure successful installation.

2.1 Software Installation

In this section, users will learn how to install the software interface and drivers. As with proper installation of many USB devices, the Logic Analyzer application and driver software must be installed prior to connection of the hardware. The following steps illustrate an installation of a Zeroplus **LAP-702000U-B** Logic Analyzer. The other two models mentioned in Chapter 1 would follow identical procedures.

Step 1. Insert the driver CD-ROM in the PC CD drive.

Step 2. Execute the installation program. Go to the START menu, click **START**, click **Run**, click **Browse**, select **Setup.exe** file in the appropriate model folder and then click **OK**. It is recommended that all other programs are closed while installation proceeds.

Step 3. Choose the desired language.

Step 4. Click **Next** to proceed with the Install wizard

Step 5. Select "**I accept the term in this license agreement,** " and click **Next**.

Step 6. Enter User and Organization name.

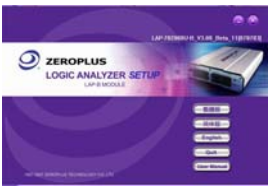
Step 7. Choose the setup type. We recommend **Complete** for most users.

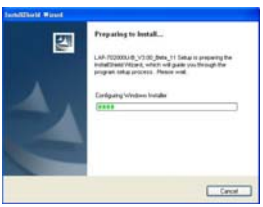
Step 8. Click **Install** to confirm settings and begin actual installation.

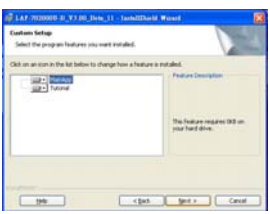
Step 9. Click **Yes** to acknowledge the Microsoft Digital Signature message and continue the installation.

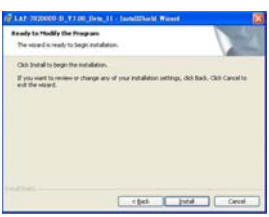
Step 10. Click **Finish** to complete the installation.

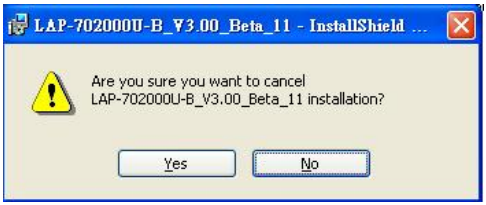
Step 11. Click **Yes** to restart the PC.

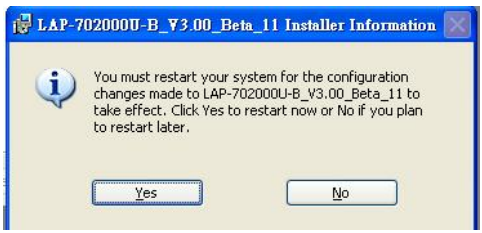

ZEROPLUS
LOGIC ANALYZER SETUP

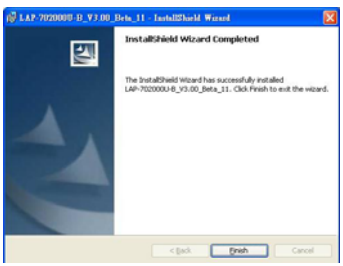


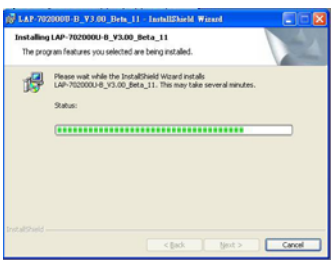





LAP-702000U-B_V3.00_Beta_11 - InstallShield ...
Are you sure you want to cancel
LAP-702000U-B_V3.00_Beta_11 installation?
Yes
No


LAP-702000U-B_V3.00_Beta_11 Installer Information
You must restart your system for the configuration changes made to LAP-702000U-B_V3.00_Beta_11 to take effect. Click Yes to restart now or No if you plan to restart later.
Yes
No


InstallShield Wizard Completed
Finish


Installing LAP-702000U-B_V3.00_Beta_11
Cancel

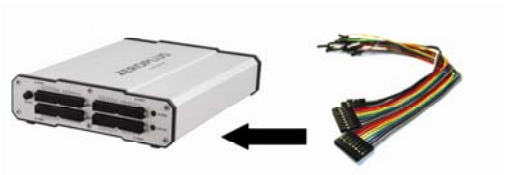
2.2 Hardware Installation

Hardware installation simply involves connecting the Logic Analyzer to your computer with the included USB Cable as shown in Figures 2-4 and 2-5.

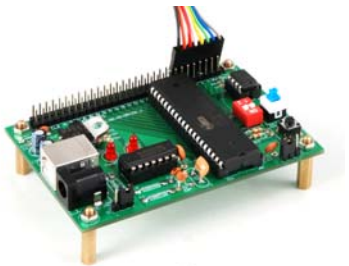
1. Plug AC power cables into the LA (Fig.2-1).

2. Plug the fixed end of the cables into the LA (Fig.2-1).

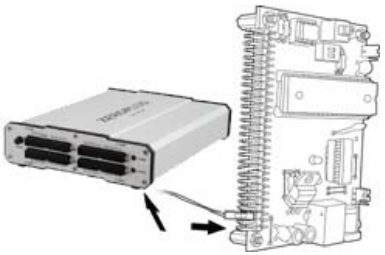
3. Plug the loose ends into the connectors on the circuit board to be analyzed (Fig.2-2).



Note: The following sequence must be observed when connecting the connectors into the circuit board: A0 = Brown, A2 = Red, A3=Orange and so on.



4. The circuit board must be grounded to the Logic Analyzer with the connecting cables (Fig.2-3).



Step 1 - Plug the thin male end of the USB cable into the laptop or PC.
Step 2 - Plug the square female end into the logic analyzer.

Fig. 2-1

5. Plug the square end of the USB cable into the Logic Analyzer (Fig.2-4).

6. Plug the thin end into the computer (Fig.2-5).

Fig. 2-2

At this point, the computer should be able to detect the Logic Analyzer and finalize the installation for hardware connection. For further information, refer to the Troubleshooting and Frequently Asked Questions (FAQ) chapters in the User Manual.

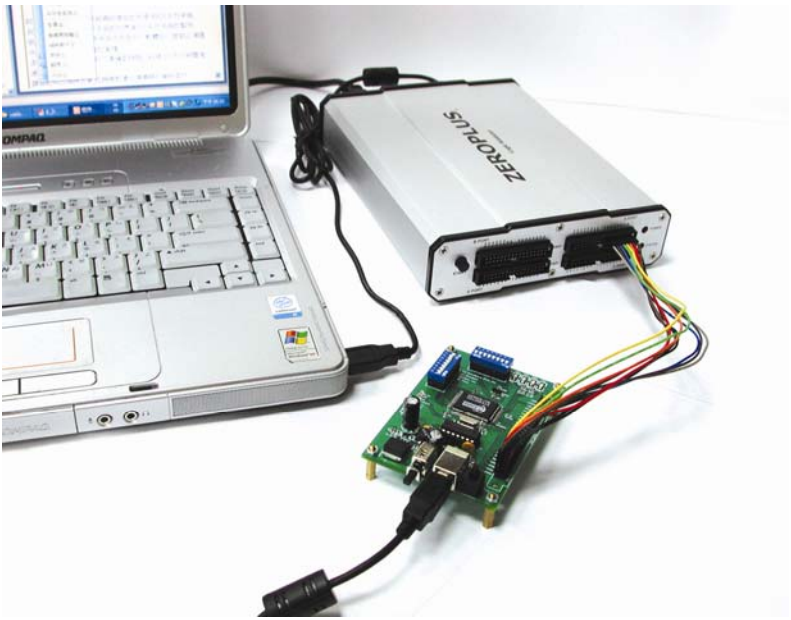


Fig. 2-3: An assembly of Laptop, Logic Analyzer, and a testing board.

2.3 Tips and Advice

1. When testing a circuit board, make sure that the internal sampling frequency (within the Logic Analyzer) is at least four times the external board frequency.
2. If the signal connector does not work well with the pins on the test board, try using the supplied probes.

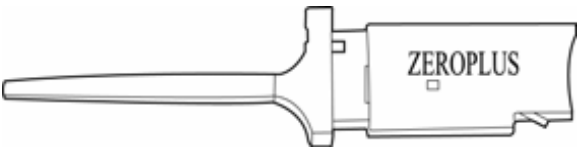


Fig. 2-4: Probes supplied with the Zeroplus.

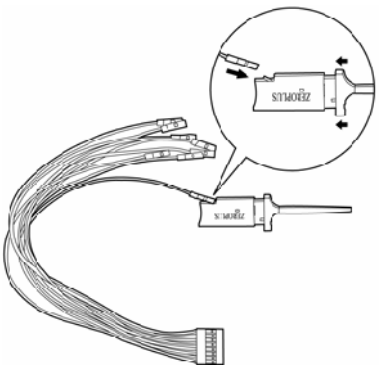


Fig. 2-5

3.

3-1. Take the loose end of the cable and insert it into the clip.

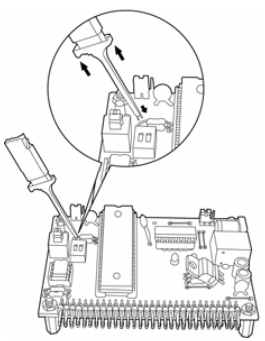


Fig. 2-6

3-2. Compress the probe as shown to reveal 2 metal prongs (Fig.2-8).

3-3. Place the metal prongs on a metal connector on the motherboard and release the fingers so that the prongs grip the metal connector (Fig.2-9).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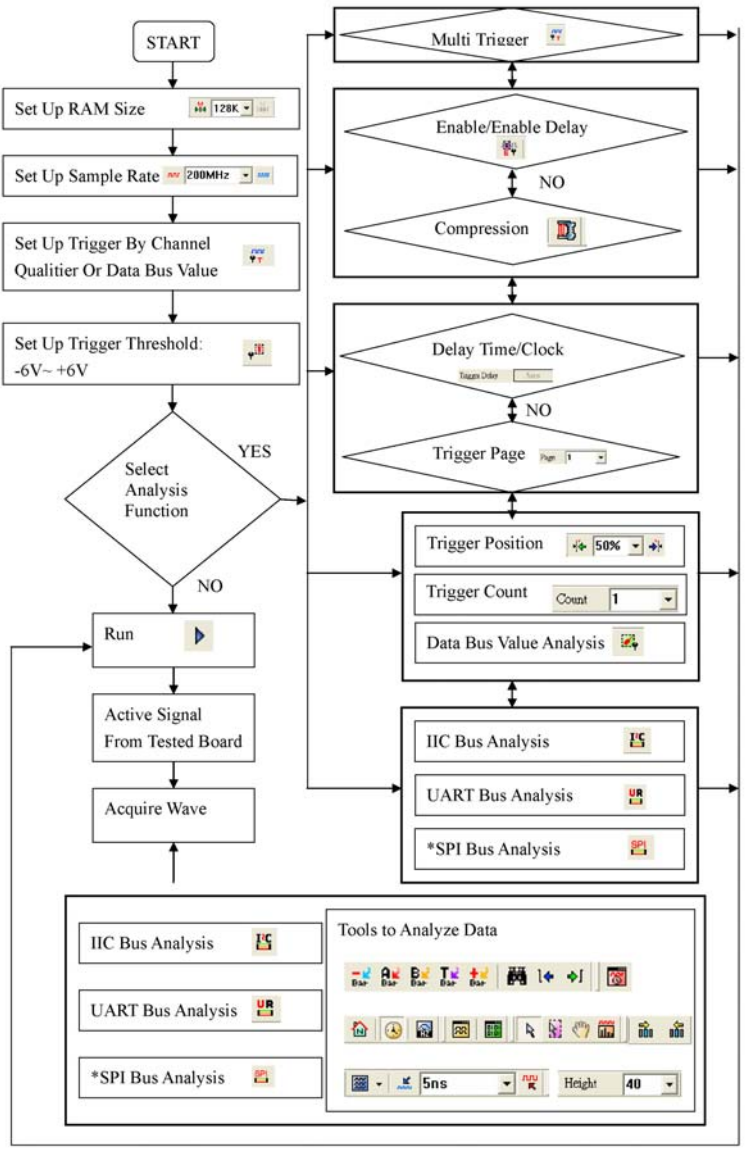
4. The Logic Analyzer will connect to the Zeroplus server for software updates if an internet connection is available.
5. Unwanted signals can be filtered out using the **Enable** or **Enable Delay** functions.
6. When measuring for a long period, **Compression** makes memory more efficient.
7. Trigger condition depends on the test board. If triggering does not work well, try narrowing the trigger conditions and optimize them repeatedly.
8. If a test board has a lower frequency than Logic Analyzer, sample signals according to the external clock.
9. When clocking by an external clock, filter extra signals with the Enable function.
10. Multi-Trigger levels function could be implemented to acquire more accurate signal triggered.

2.4 Flow of software operation



3 Introduction to Logic Analysis

Chapter 3 gives detailed instructions in performing two basic analysis operations and five advance analysis applications with the Logic Analyzer. The basic analytical operations are the Logic Analysis and the Bus Analysis, which are fundamental to all further applications.

3.1 Logic Analysis

Logic Analysis is meant for a single signal analysis. Section 3.1 gives detailed instructions on the software's basic setup.

Basic Software setup of the Logic Analysis

Task 1. Clock Source (Frequency) and RAM Size set up

Step 1. Click  icon or Click Sampling Setup from Bus/Signal on the menu bar, the dialogue as shown in Fig 3-1 will appear.

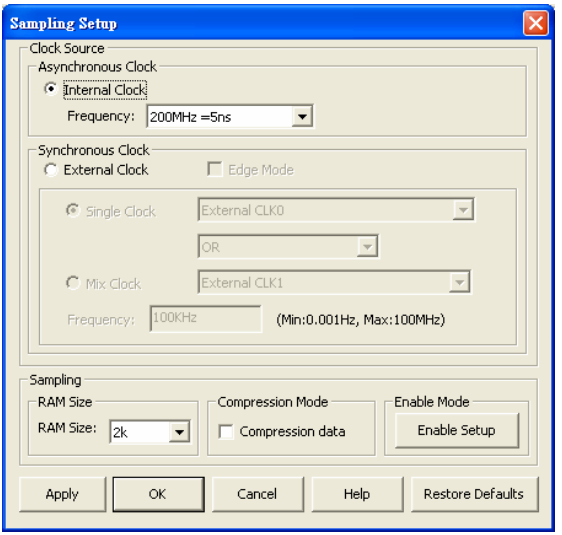


Fig 3-1 – Clock Source

Step 2. Internal Clock (Asynchronous Clock)

Click on Internal Clock, and then select the Frequency from the pull down menu to set up the frequency of the device under test (DUT). The frequency of the Internal Clock must be at least four times higher then the frequency of the Oscillator on the DUT. Or, select the frequency 

from the pull down menu on Tool Bar as Fig 3-2 shows.

Tip: Connect the signal output pin of the tested board to the Signal connector of Logic Analyzer to measure it using the internal clock of Logic Analyzer. The sampling rate should be set at 4 times the frequency of tested board. The 200MHz sampling could be implemented to measure up to 50MHz frequency tested board, and 400MHz sampling could be implemented to measure up to 100MHz tested board.

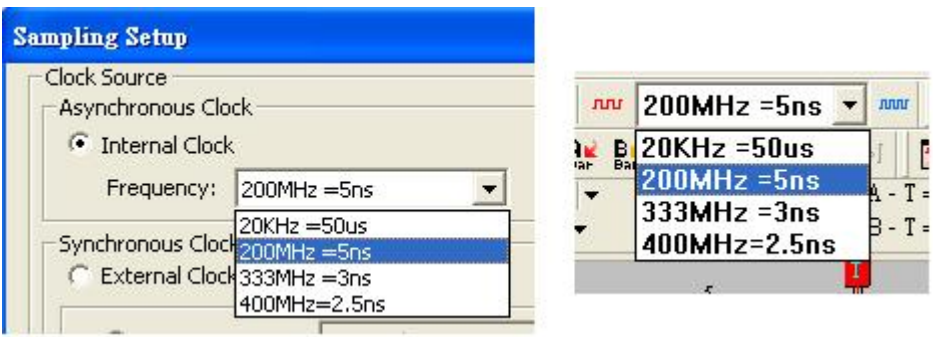


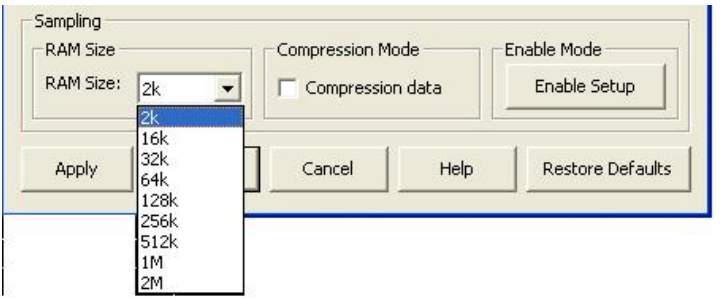
Fig 3-2 – Clock source drop down menu

External Clock (Synchronous Clock)

Click on External Clock, and then select "Rising Edge" or "Falling Edge" as the trigger condition of the DUT. In the Frequency column, type the frequency of the oscillator on the DUT.

Tip: The External Clock is applied when the frequency of the oscillator on the tested board is less then 100MHz. Connect the output pin of oscillator on the tested board to the CLK pin of Logic Analyzer as shown in Fig 3-3.

Step 3. RAM size
Click on the RAM size  from the pull down menu on the Sampling Setup dialogue as shown in Fig 3-3.



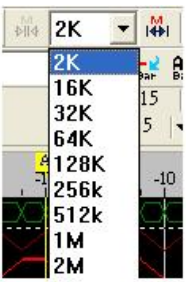


Fig 3-3 – RAM Size

Tip: The relationship between RAM size, Enable, Compression and channels as shown in Table 3-1 and Fig 3-3.

Table 3-1 RAM size vs Enable, and RAM size vs Compression and channels

Model No.	RAM sizes/ channel	Channels available	Compression Mode & Enable Mode	RAM size/ channel	Channels available	Compression Mode & Enable Mode
LAP-B(70256)	2K ~ 256K	64 channels	Available	256K	256 channels	Disable
LAP-B(702000)	2K ~ 1M	64 channels	Available	2M	256 channels	Disable

Task 2. Trigger Properties Setup

Step 1. Click  icon or Click Properties from the Trigger on the Menu Bar, select Trigger Properties. The dialogue will appear as shown in Fig 3-4.

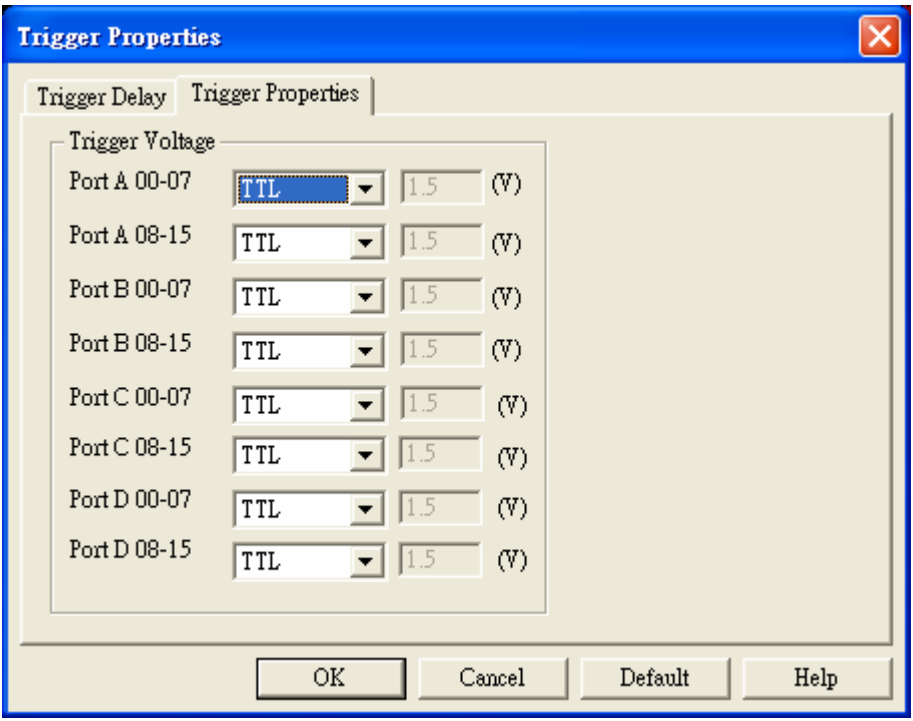


Fig 3-4 – Trigger Properties

Step 2. Trigger Level Setup

Click the drop down menu of Trigger Level on Ports A , B , C and D to select the Trigger Level as the voltage level that a trigger source signal must reach before the trigger circuit initiates a sweep.

Tip: There are four commonly used preset voltages for Trigger Level, TTL, CMOS (5V), CMOS (3.3V), and ECL. Users also may define their own voltage from -6V to +6V to fit with their DUT.
Port A represents the pins from A0 ~ A7 on the signal connector of the Logic Analyzer, and so do Ports B, C and D. The voltage of each port may be configured independently.

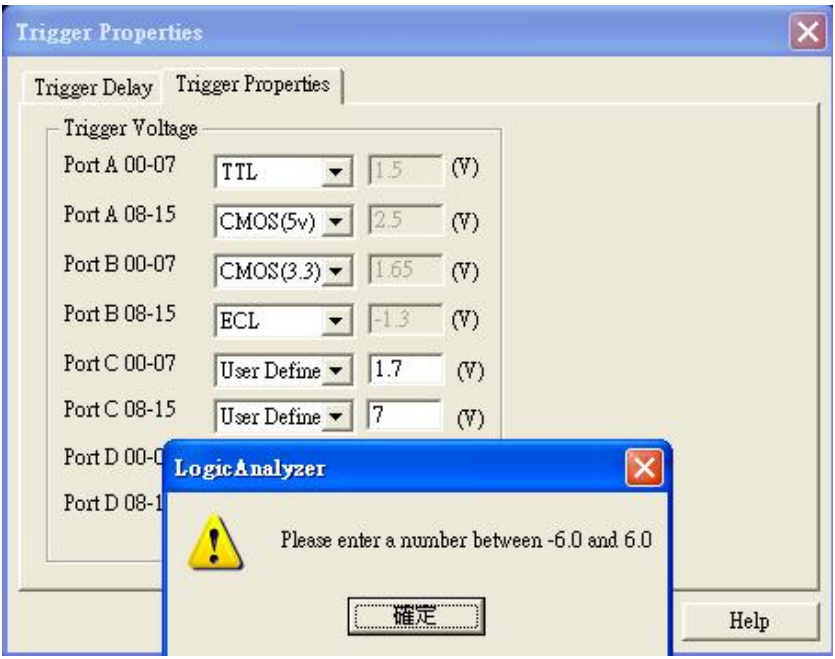
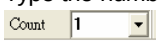


Fig 3-5 – **Trigger Properties Error**

Step 3. Trigger Count.

Type the numbers or select the number from the pull down menu of the Count 

on the Tool Bar or Click the pull down menu of the Trigger Count on the Trigger Properties dialogue as shown in Fig 3-5

The system will be triggered where the Trigger Count is set as shown in Figs 3-6,3-7 and Fig 3-8.

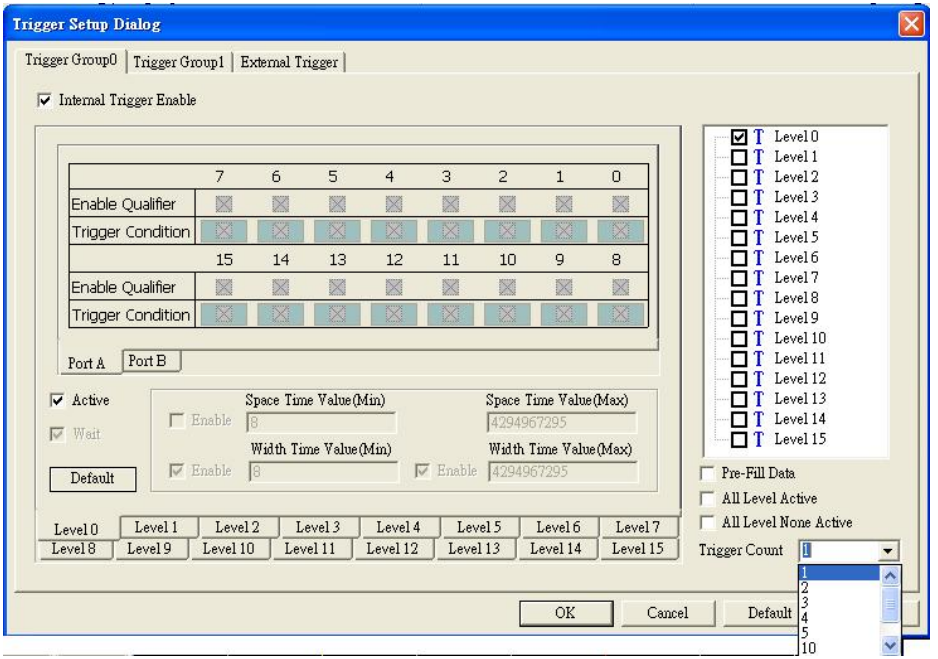


Fig 3-6 – Trigger Count Drop down Menu

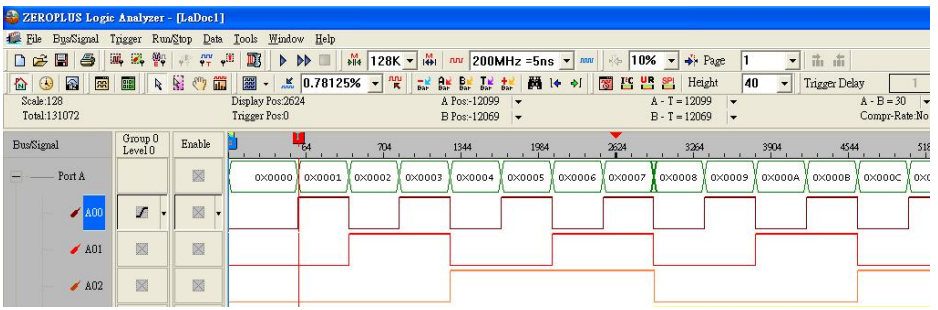


Fig 3-7 – Trigger Count Screen shot 1

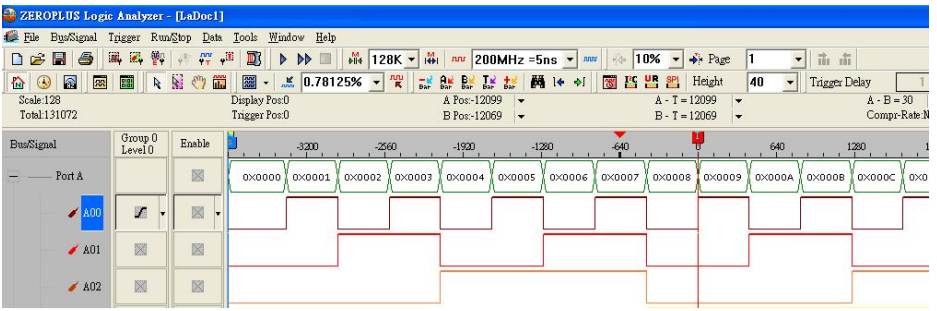
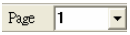


Fig 3-8 – Trigger Count Screen shot 2

Step 4. Trigger Page/ Delay Time and Clock

The Trigger Page and The Delay Time and Clock can't be applied at the same time.

1. Trigger Page:

Click Trigger Page, then Type the numbers or select the numbers from the pull down menu of the Page 

on the Tool Bar or Click the pull down menu of the Trigger Page on the "Trigger Delay" page of the Trigger Properties dialogue as shown in Figs 3-9,3-10 and 3-11. The page numbers selected will be displayed on the screen.

Tip: The Trigger bar (T bar) will not be displayed when the set up of the Trigger page is more than 1

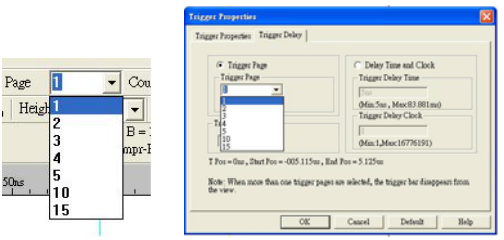


Fig 3-9 – Trigger Page

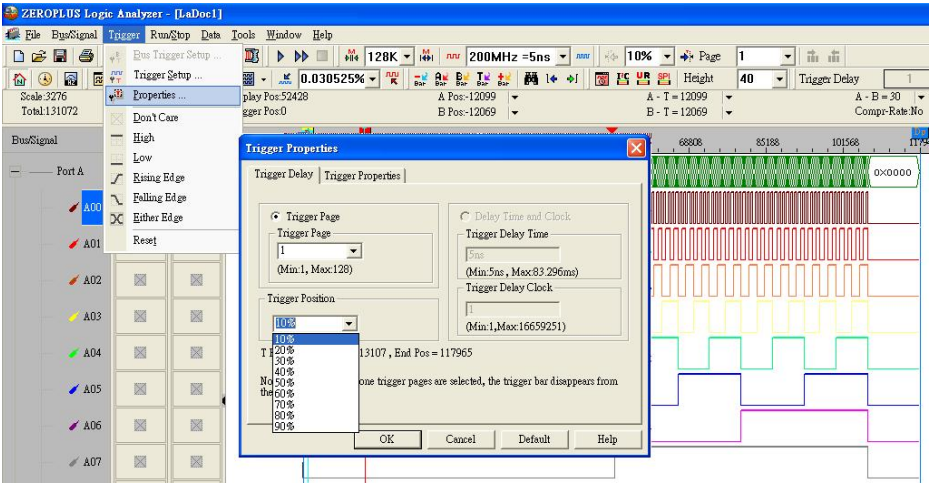


Fig 3-10 – Trigger Position

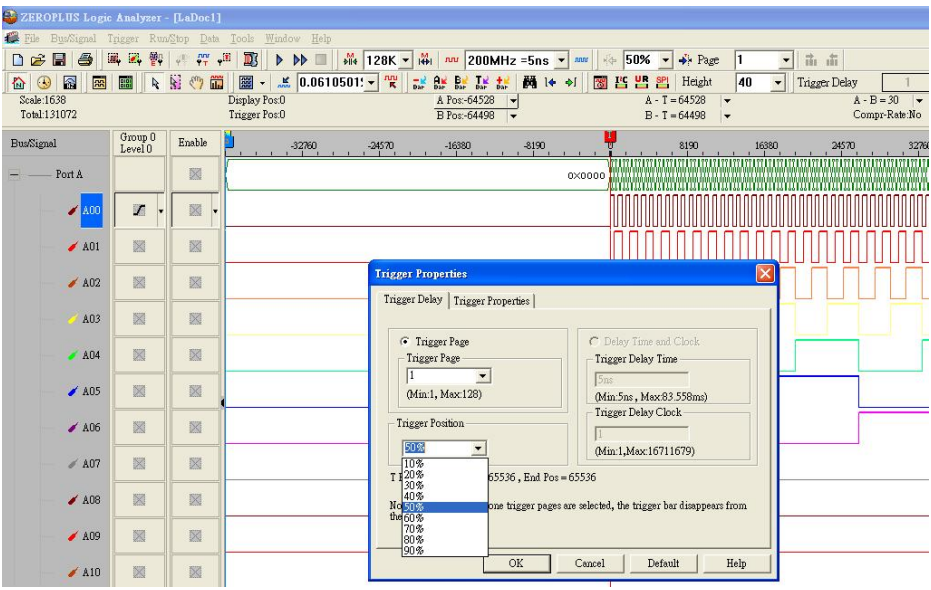
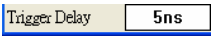


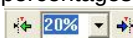
Fig 3-11 – Trigger Position and screen

2. Delay Time and Clock

Click the Delay Time and Clock, then type the numbers into the column of the Trigger Delay Time or type numbers into the Trigger Delay Clock at the

"Trigger Delay" page of the Trigger Properties dialogue as 0 and Fig **錯誤! 找不到參照來源。**. Or type the numbers into the column of Trigger Delay 

on the Tool Bar. The system will display the wave start.

Tip: The formula of Delay Time and Clock is " Trigger Delay Time = Trigger Delay Clock * (1/ Frequency)".ype the percentages or select the percentages from the pull down menu of the 

on the Tool Bar or Click the pull down menu of the Trigger Position on the "Trigger Delay" page of the Trigger Properties dialogue as shown in Figs 3-12, 3-13, 3-14, and 3-15, The Trigger Position percentages selected will be displayed where counted from the right side of the screen of the system.

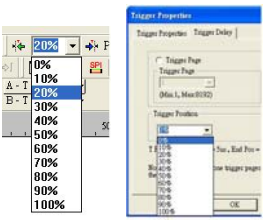


Fig 3-12 – Trigger Position Drop down menu

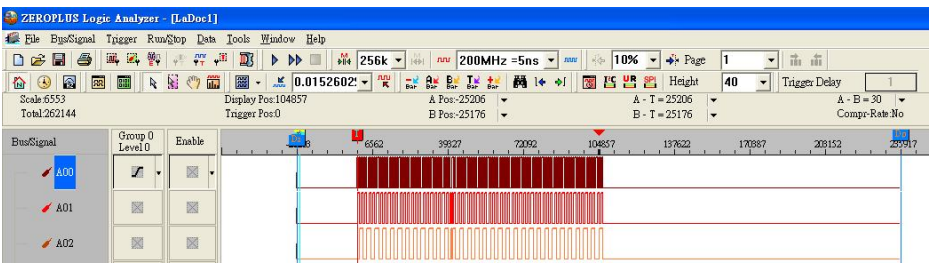


Fig 3-13 – Trigger Position 10%

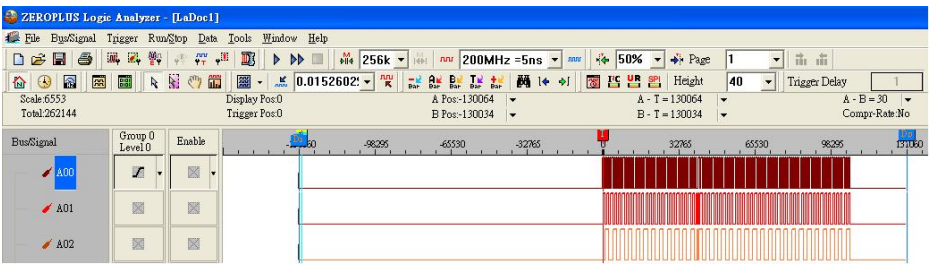


Fig 3-14 – Trigger Position 50%

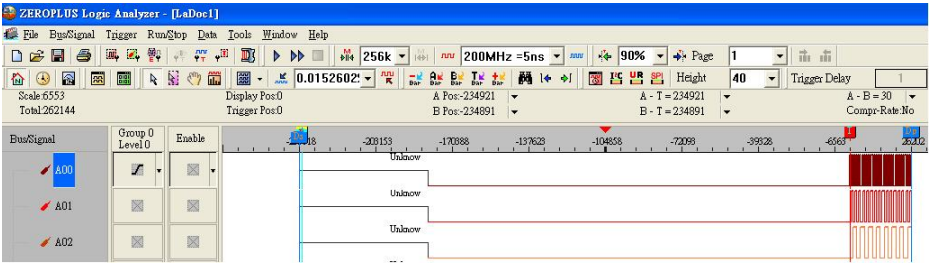


Fig 3-15 – Trigger Position 90%

Step 5. Click OK to confirm the setup and exit the Trigger Properties dialogue.

Task 3. Signal/Bus Trigger Edge Setup

Highlight a designated signal, and then set its required trigger edge.

1. Left click  to set the signal trigger edge as shown in Fig 3-16.
2. Right click  to set the signal trigger edge as shown in Fig 3-17.
3. Click Trigger on the menu bar and choose a trigger from the list of triggers as shown in Fig 3-18.

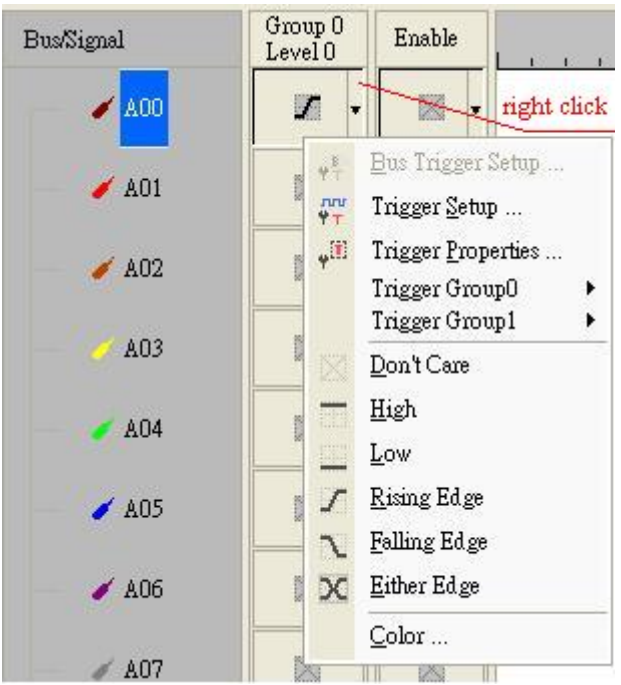


Fig 3-16 – Trigger Left click **Fig 3-17 – Trigger Right Click**

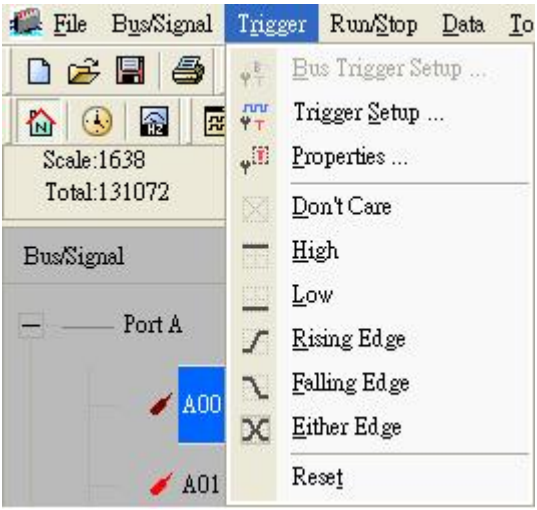


Fig 3-18 – Trigger menu

Task 4. Run to Acquire Data

1. Single Run

Click the Single Run icon from the tool bar or press START button on top of Logic Analyzer (or press F5), then activate the signal from the DUT to the Logic Analyzer to acquire the data shown in the wave display area.

2. Repetitive Run

Click the Repetitive Run icon from the tool bar, then activate continuous signal to the Logic Analyzer to acquire the repetitive Data, and then click the stop icon to end the repetitive run.

Tip: Click icon to view all the data, and then select the wave analysis tools to analyze the waves.

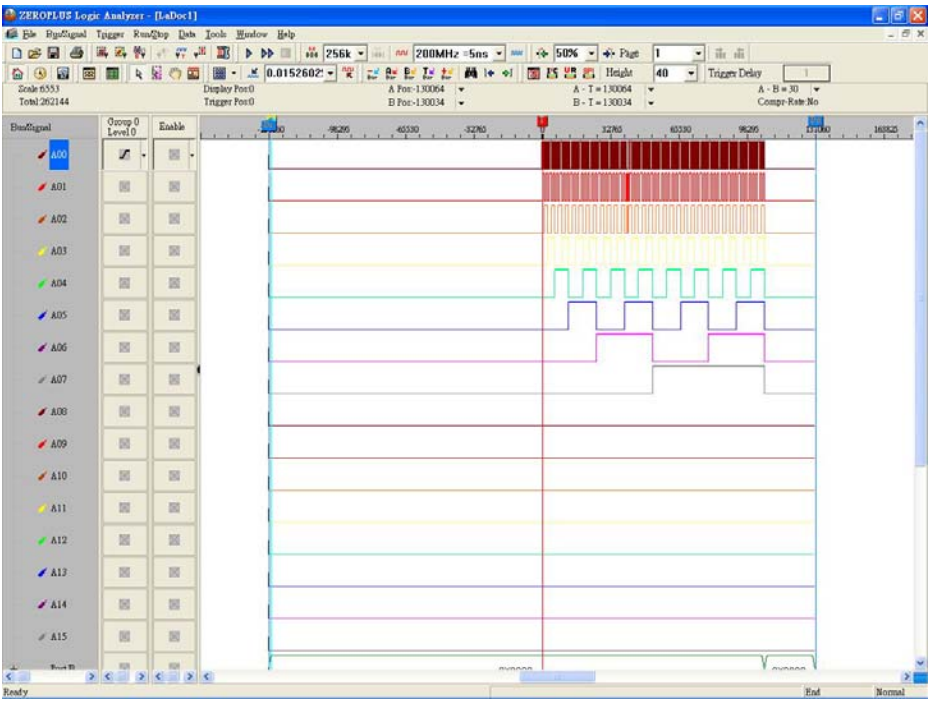


Fig 3-19 **–Click** **icon to view all the data**

3. Stop to End Run

Click the Stop icon to End the Run.

Tip: If the status stays displays "Waiting…" with no signal output as shown in Fig 3-20, click the stop icon to end the run, check the setup again, and try the run process again.

Fig 3-20 **– Waiting Status**

3.2 Bus Logic Analysis

Section 4.2 presents detailed instructions about logic analysis with a set of grouped signals, which is known as Bus Logic Analysis.

Basic Software setup of the Bus Logic Analysis

Step 1. Set up the RAM size, Frequency, Trigger level and Trigger position as described in Section 3.1.

Step 2. Group Signals into a Bus

Click Channels setup on Bus/Signal of menu bar, or click icon.
The dialogue window shown in Fig 3-21 will appear.

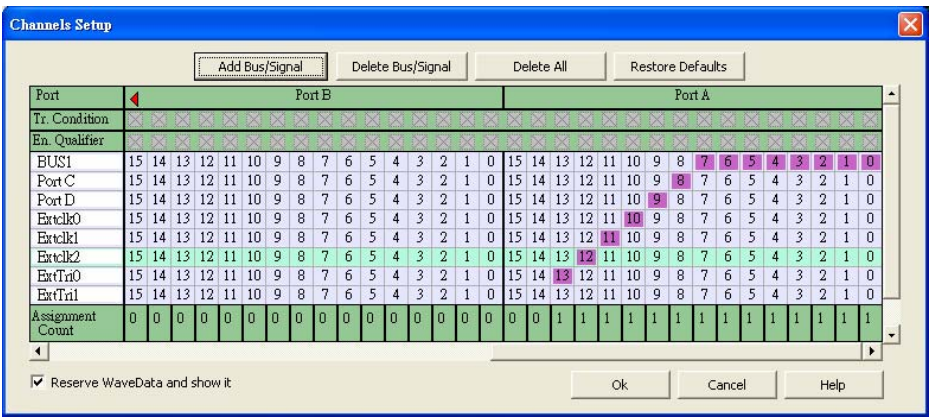


Fig 3-21 – Channel setup

Rename the bus and set up the signals of the bus as shown in Fig 3-22.

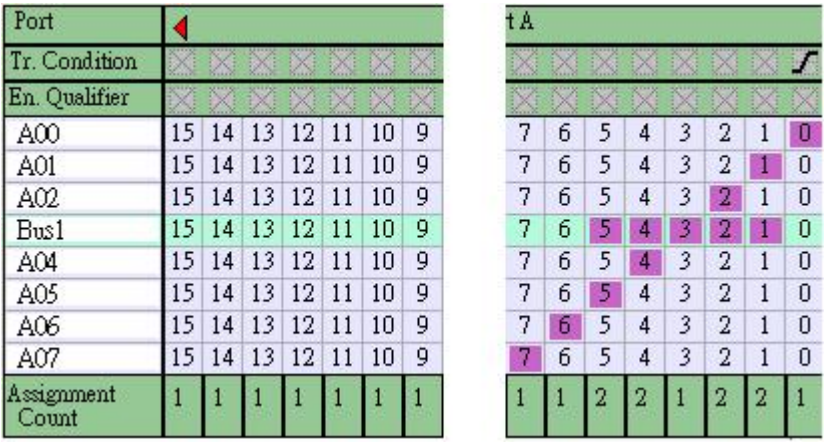


Fig 3-22 – Renaming Bus

1. Click the column with blue, then type the given name of the bus, and then press enter to confirm it.
2. Go to the relative channels show as shown in the example and, go to numbers 1,2,3,4,5 which are located on column A and row Bus1. Click them, to become purple, to set these segments of signals.
3. Click OK to get the result as shown in **錯誤! 找不到參照來源。** area 1.

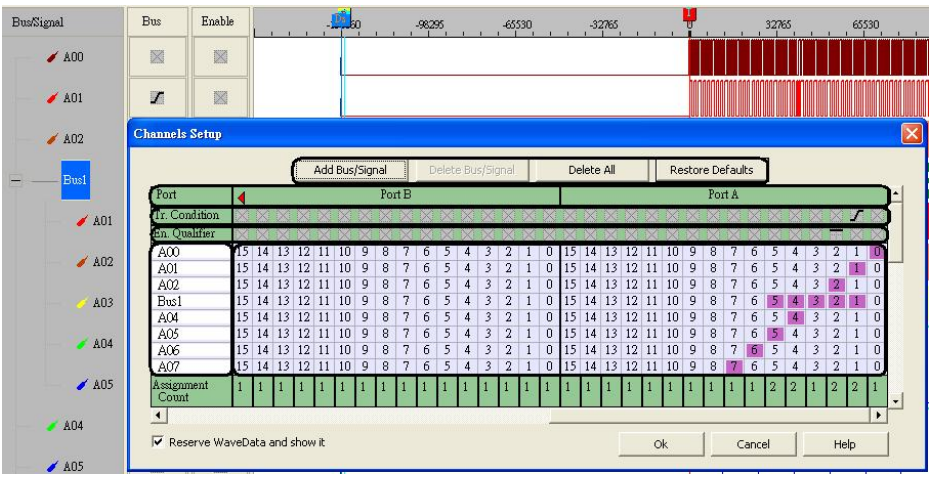


Fig 3-23 – Channel setup Window

Tip: Channels Setup

In Dialogue of Channels Setup, there isn't only Add Bus/Signal, but also Delete Bus/Signal, Delete All, Restore Defaults functions provided.

1. Delete Bus/Signal, first highlight the bus or channels on area 6 of Fig 3-23,

then click Delete Bus/Signal to delete it.

2. Delete All, click Delete All to delete all bus/signals on area 6 of Fig 3-23.
3. Restore Defaults, click Restore Defaults to restore the dialogue of Channels Setup as shown in Fig 3-21.

Step 3. Set Trigger condition

1. Highlight the bus which will be triggered then click  icon or select Bus from the Trigger of the Menu bar, the dialogue window as shown in Fig. 3-24 will appear.

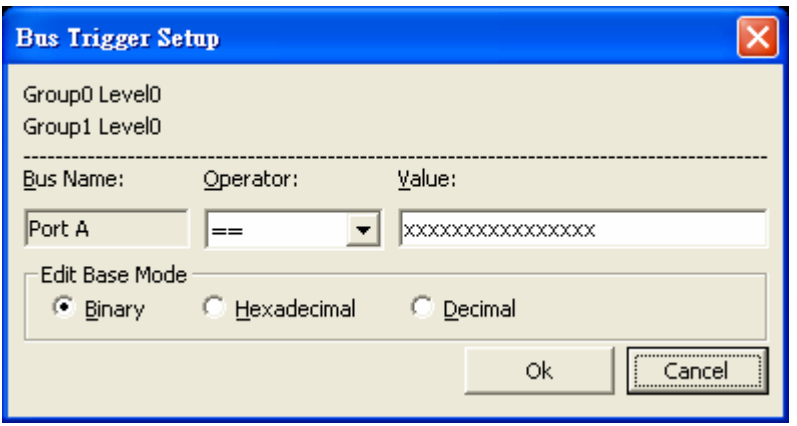


Fig 3-24 – Bus Trigger Setup

Tip: or double click on trigger column of the bus as shown in Fig 3-25.

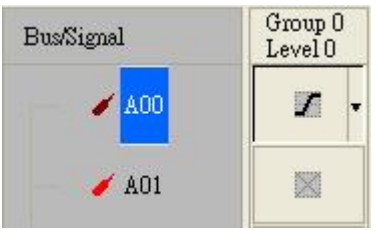


Fig 3-25 – Trigger Column

2. Set Binary, Hexadecimal or Decimal as the signal of the bus to represent the value(see Fig 3-24).
3. Set "= =" and type the value of bus into value column to set the trigger condition of the bus.
4. Click OK,

Step 4. Click run and activate the signal from the tested board to the system to get the result as shown in Fig 3-26.

Tip: Click icon to view all data, and then select the wave analysis tools to analyze the waves.

Set Value is 5E as Hexadecimal, and set Operator equal to "= =", then click OK, Click run and activate the signal from the tested board to the system to get the result as the trigger happens on 0X5E.

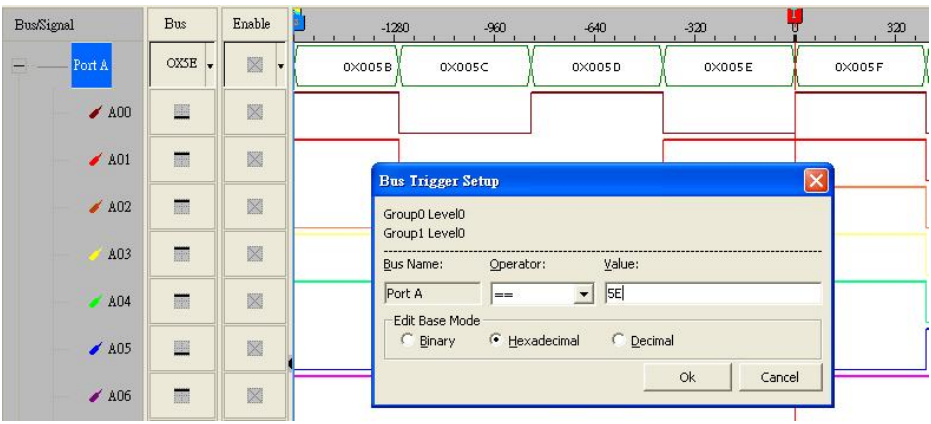


Fig 3-26 – Bus Trigger Setup